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## **Protocol: Theirworld Edinburgh Birth Cohort**

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## Protocol: Theirworld Edinburgh Birth Cohort

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#### Abstract

Introduction. Preterm birth is closely associated with altered brain development and is a leading cause of neurodevelopmental, cognitive and behavioural impairment across the life course. We aim to investigate neuroanatomic variation and adverse outcomes associated with preterm birth by studying a cohort of preterm infants and controls born at term, using brain magnetic resonance imaging (MRI) linked to biosamples and clinical, environmental and neuropsychological data.

Methods and Analysis. Theirworld Edinburgh Birth Cohort is a prospective longitudinal cohort study at the University of Edinburgh. We plan to recruit 300 infants born at <33 weeks gestational age (GA) and 100 healthy control infants born after 37 weeks GA. Multiple domains are assessed: maternal and infant clinical and demographic information; placental histology; immunoregulatory and trophic proteins in umbilical cord and neonatal blood; brain macro- and microstructure from structural and diffusion MRI; DNA methylation; hypothalamic-pituitary-adrenal axis (HPAA) activity; social cognition, attention and processing speed from eye-tracking during infancy and childhood; neurodevelopment; gut and respiratory microbiota; susceptibility to viral infections; and participant experience. Main analyses include creation of novel methods for extracting information from neonatal structural and diffusion MRI, regression analyses of predictors of brain maldevelopment and neurocognitive outcome associated with preterm birth, and determination of the quantitative predictive performance of MRI and other early life factors for childhood outcome.

Ethics and Dissemination. Ethical approval has been obtained from the National Research Ethics Service, South East Scotland Research Ethics Committee and NHS Lothian Research and Development. Results are disseminated through open access journals, scientific meetings, social media, newsletters, a study website (www.tebc.ed.ac.uk), and we engage with the University of Edinburgh public relations and media office to ensure maximum publicity and benefit.

## Strengths and limitations of this study

- 300 preterm infants and a comparator cohort of 100 term controls studied longitudinally from before birth to school age.
- Deep phenotyping using a combination of data from brain MRI, biosamples, • participant report, direct observation and clinical data from medical records.
- Collection of data about a range of theoretically informed variables to understand the wider impact of preterm birth on everyday lives of families.
- uith en policy en ead from a single cent. • Data access and collaboration policy sets out the terms and conditions on which deidentified TEBC data is available to the research community.
- Participants are recruited from a single centre.

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#### INTRODUCTION

Preterm delivery is estimated to affect 10.6% of all live births around the world, which equates to 14.84 million births per annum<sup>1</sup>. In resource rich settings advances in perinatal care and service delivery have led to improved survival over the past two decades: around 30% of infants born at 22 weeks who are offered stabilisation at birth will survive, and this number increases to around 80% for births at 26 weeks<sup>2-5</sup>. However, early exposure to extrauterine life can impact brain development, and is closely associated with long term intellectual disability, cerebral palsy, autism spectrum disorder, attention deficit hyperactivity disorder, psychiatric disease, and problems with language, behaviour, and socioemotional function (for review <sup>6</sup>). There are no treatments that reduce risk of impairment, which extends across the life course and carries considerable personal cost to affected individuals, and high health and education costs to society<sup>7</sup>.

Little is known about the ontogenesis of neurocognitive and psychiatric problems associated with preterm birth, or the biological, environmental and social risk factors associated with susceptibility and resilience. Much information about the cerebral effects of preterm birth comes from historic cohorts that do not reflect modern perinatal care practices; studies have been cross-sectional with outcomes assessed in very early childhood before important cognitive and social functions emerge; conventional diagnostic tools for assessing neurodevelopment are imprecise; and cohorts linked to imaging and biological metadata are few so mechanisms are poorly understood. There is an unmet need to study a contemporary cohort of preterm infants that is comprehensively characterised from genes to anatomy to function, integrated with information about the social graph.

Our aims are: first, to build a longitudinal cohort of preterm infants and term controls that is phenotyped with brain imaging and biological information to investigate causal pathways to, and consequences of, atypical brain development and injury; second, to develop novel computational algorithms for mapping brain growth and connectivity in early life; third, to identify new and multi-factorial methods for early detection of children at risk of long-term impairment; and fourth, to identify early life biological and environmental risk and resilience factors that affect the developing brain and so pave the way for new therapeutic strategies.

## METHODS AND ANALYSIS Study design Single-centre prospective I

 Single-centre prospective longitudinal cohort study.

## Study setting

The Theirworld Edinburgh Birth Cohort ("TEBC") study is conducted at the University of Edinburgh and the Simpson Centre for Reproductive Health (SCRH) which is located at the Royal Infirmary of Edinburgh, NHS Lothian, UK. The SCRH provides maternity and newborn services for residents of the City of Edinburgh and the Lothians. It receives 7,000 deliveries per annum and is the regional centre for all neonatal intensive care in South East Scotland. Approximately 100 infants with birthweight <1500g receive intensive care at SCRH per annum.

Participant recruitment, initial assessment and data collection points 1-3 (Table 1) take place in the SCRH or the Edinburgh Imaging Facility, Royal Infirmary of Edinburgh. Follow-up assessments take place in a dedicated child development laboratory at the University of Edinburgh, through online and in-person completion of questionnaires, and in Neonatal Outpatient clinics at the SCRH (timepoints 4-7, Table1). Recruitment began in November 2016 and is planned to complete in 2021.

## Study participants

## Inclusion criteria

Cases: 300 preterm infants born at <33 weeks gestational age (GA)\*.

Controls: 100 term infants born at >37 weeks GA\*.

\*GA is estimated based on first trimester ultrasound.

## Exclusion criteria

- Infants with congenital anomalies: structural or functional anomalies (e.g. metabolic disorders) that occur during intrauterine life and can be identified prenatally, at birth or later in life (World Health Organisation definition).
- 2. Infants with a contraindication to MRI at 3 Tesla.

## Sample selection and recruitment

## Sample size

The primary objective of the study is to investigate causes and consequences of preterm brain injury / atypical development by analysing data about brain macro- and microstructure from structural and quantitative MRI with biological, environmental and neuropsychological

 outcome data. There is no established methodology for power calculations using quantitative MRI techniques; sample size is based on sensitivity analysis for tract-based Spatial Statistics<sup>8</sup>, and precedents for detecting group differences in neonatal structural and diffusion MRI (dMRI) based on exposures and outcomes <sup>9-18</sup>. It assumes a successful image acquisition rate of 85%.

#### Identifying participants

Cases: Infants born to women who present to the SCRH with threatened preterm labour and for whom delivery is planned or expected at less than 32 completed weeks GA.

Controls: Infants born to women who attend the SCRH and deliver at >36 weeks GA.

The protocol reported here was partially developed through a separate, pilot "phase 1' cohort of 150 cases and 40 controls. This phase 1 pilot included neonatal MRI and infant-eyetracking, and a subset of this group are now participating in the 5-year assessment as described here (time point 7, table 1).

#### Screening for eligibility

The research nurse / clinical research fellow identifies potential participants using maternity TRAK, which is a system used by maternity services throughout NHS Lothian to record information about pregnancies and maternal care, and the neonatal electronic patient record. The clinical team provides an introductory leaflet about TEBC to eligible parents, and then informs the research team of parents who wish to discuss the study in greater detail. Those parents meet with a member of the research team and are provided with the Participant Information Sheet.

Participants from phase 1 studies being recalled for time point 7 (at 5 years) are contacted by the research team using contact details provided previously. Study information (introductory letter, patient information sheet, reply slip and prepaid envelope) is sent by post and followed up with a telephone call to answer any questions and review willingness to participate.

#### Consenting participants

Informed written consent is sought in two stages: first, consent for perinatal and neonatal sampling and assessment at initial enrolment to the study; second, consent for assessments post-discharge to 5 years is taken at time point 3 (see Table 1 below).

For phase 1 participants being recalled, consent is taken at the recall appointment, following circulation and discussion of the content by post and phone, as described above.

Informed consent may only be taken by a member of the research team with training in International Council for Harmonisation-Good Clinical Practice (ICH-GCP) and procedures for research involving children and young people.

#### Co-enrolment

The SCRH is an academic perinatal medicine centre that hosts observational research studies, and it is a recruiting centre for randomised controlled trials of therapies designed to improve the outcome of preterm infants and their mothers. Parents / carers of TEBC participants are encouraged to consider entry into such studies if eligible. Co-enrolment is informed by 'Guidelines for Co-enrolment' produced by the Academic and Clinical Central Office for Research and Development (ACCORD), which is a partnership between the University of Edinburgh and NHS Lothian Health Board. Co-enrolment will be recorded.

#### **Cohort retention**

Participants and their families are kept up to date with research progress through Newsletters, Twitter, Facebook and a website (www.tebc.ed.ac.uk). Birthday cards are sent to participants and we hold an annual event for research updates and public outreach.

#### Withdrawal of study participants

The decision to withdraw from the study is either at parental / carer request, or at the request of the attending consultant physician or the PI for clinical reasons.

#### **Outcomes and data analysis**

Table 1 summarises the assessment schedule, data collection methods, sample type / domain, and the test or task. Data from cases and controls are collected using the same data collection instruments.

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Time point	Age	Data collection method	Sample type / domain of measurement	Ň
1	Antenatal	Records & interview	Socio-economic status	Maternal & paternal education, Scottish Index of Multigele Deprivation derived from home post
-	/		Medical / demographic	Family and medical history and exposures
		Records, questionnaire &	Medical	History and exposures     Anthropometry
2	Birth	tissue	Placenta	Structured histopathology rating and storage
			Cord blood	Structured histopathology rating and storage       N         Panel of immunoregulatory and trophic proteins       N         Gene expression array*       N
		Tissue: blood	Blood spot	Panel of immunoregulatory and trophic proteins
		Tissue: saliva	Epigenetics	DNA methylation
		Tionus model surely	Nasal lining fluid	Antimicrobial peptides including cathelicidin levels*
		Tissue: nasal swab	DNA/RNA	Respiratory microbiota*     5       Gut microbiota*     3
		Stool	DNA/RNA	Gut microbiota*
		Direct observation	Medical	Anthropometry
3	Neonatal		ROP assessment	Grade retinopathy
5	Neonatai		Parent IQ	National Adult Reading Test
		MRI	Brain structure and connectivity	Structural and diffusion 3T MRI
			Medical / demographic	Breast-feeding and updated perinatal medical history
				Edinburgh Post-natal Depression Scale
		Questionnaire		Parenting Daily Hassles
				World Health Organisation – Quality Of Life
				Adult Temperament Questionnaire
		Questionnaire, by post or	Demographics	Updated Socio-economic status, maternal education, Beeastfeeding / nutrition, activities
	4.5	online or phone	Infant temperament	Infant Behaviour Questionnaire, Revised, short form
4	months	interview	Parent wellbeing	Edinburgh Post-natal Depression Scale
		Tissue: nasal swab	DNA/RNA	
		rissue. Hasal SWab	Epigenetics	Respiratory microbiota*     org       DNAm     CO
		Tissue: saliva	HPA axis	Cortisol: Waking, 30 minutes after waking, before bed 5 Pre and post Still Face procedure
	9 months	Tissue: nasal swab	Nasal lining fluid	Antimicrobial peptides including cathelicidin levels*
5			DNA/RNA	Respiratory microbiota*
		Eye-tracking	4	Free scanning: neutral faces
			Social development	Free scanning: "pop-out" task, looking to faces and disgractors
				Free scanning: "social preferential looking" to social ard non-social images
	I			

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			Free scanning: "dancing ladies" social and non-social vogeos	
		Attention	Switching and disengagement: "gap-overlap" task, fixagon to central and peripheral cues	
		Attention	Sustained attention: "follow the bird" task, following recoving target	
		Processing speed	Free scanning: odd-one-out visual search task (simple letters version)	
		Frocessing speed	Free-scanning: word-picture matching task	
		Visual acuity	Keeler card assessment	
	Direct observation	Social development	Still Face procedure (sub-set with computational motor assessment)	
		Social development	Parent-child play, for later behavioural coding: (sub-setwith computational motor assessme	
		Infant temperament	Infant Behaviour Questionnaire, Revised, short form	
			Sleep & Settle Questionnaire Q	
	Questionnaire	Language	MacArthur Communicative Development Inventory (wards and gestures)	
		Parent wellbeing	World Health Organisation – Quality Of Life	
		Feedback	Feedback form, monitoring satisfaction with research 🖉 oject	
	Direct observation	Anthropometry	Growth 5	
	Doront interview	Demographics	Family circumstances update form including breastfeeding, socio-economic status (home postcod	
	Parent interview	Developmental level	Vineland Adaptive Behaviour Scales: comprehensive interview form	
	Direct observation	Ophthalmology	Refraction	
		Anthropometry	Growth	
	Tissue: nasal swab	Nasal lining fluid	Antimicrobial peptides including cathelicidin levels*	
		DNA/RNA	Respiratory microbiota*	
	Eye-tracking		Free scanning: neutral faces	
		Social development	Free scanning: "pop-out" task, looking to faces and distractors	
			Free scanning: "social preferential looking" to social and non-social images	
			Free scanning: "dancing ladies" social and non-social videos	
		Attention	Switching and disengagement: "gap-overlap" task, fixation to central and peripheral cues	
		Attention	Sustained attention: "follow the bird" task, following neoving target	
			Free scanning: odd-one-out visual search task	
2 years		Processing speed	Ereo scapping; word nicture matching tack	
-		Social development	Parent-child play, for later behavioural coding	
	Direct observation	Executive function		
		Bayley-III	General developmental level*	
		Temperament	Early Childhood Behaviour Questionnaire, Revised, short form	
	Questionnaire	remperament	Child Sleep Habits Questionnaire	
		Language	MacArthur Communicative Development Inventory (words and sentences)	
		Social development	Quantitative Checklist for Autism in Toddlers	
		Executive function	Behaviour Rating Inventory for Executive Function, Preschool (BRIEF-P)	
			Early Executive Function Questionnaire	
		Developmental level	Vineland Adaptive Behaviour Scales: comprehensive part ating form	

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I			Parent wellbeing	World Health Organisation – Quality Of Life	5/bmiopen-2019-035
			Feedback	Feedback form, monitoring satisfaction with research	<u>n</u>
		Parent interview	Demographics	Family circumstances update form including breastfeed	
			Epigenetics		4
		Tissue: saliva	HPA axis		
		Tissue: nasal swab	DNA/RNA		
			Anthropometry	Growth	5 V
			Blood pressure	Hypertension	202
		Direct observation	Ophthalmology	Refraction and acuity	э <del>J</del>
		Direct observation	Social development	Parent-child play, for later behavioural coding	
			Executive function		<u> </u>
			Developmental level	Mullen Scales of Early Learning	
				Free scanning: neutral faces	
			Social development	Free scanning: "pop-out" task, looking to faces and dis	
				Free scanning: "social preferential looking" to social an	
7	5 years	Eye-tracking		Free scanning: "dancing ladies" social and non-social v	
1	5 years		Attention	Switching and disengagement: "gap-overlap" task, fixa	
				Sustained attention: "follow the bird" task, following n	
			Processing speed	Free scanning: odd-one-out visual search task (comple	
		Questionnaire	Temperament	Strengths and Difficulties Questionnaire (both teacher	and parent report versions)
			Language	Children's Communication Checklist	<b>7</b>
			Social development	Social Communication Questionnaire: Current	
			Executive function	DUPaul ADHD rating scale	
				Behaviour Rating Inventory for Executive Function -Pre	School (BRIEF-P)
			Visual perception	Cerebral Visual Impairment Inventory	- 
			Parent wellbeing	World Health Organisation – Quality Of Life	
			Feedback	Feedback form monitoring satisfaction with research p	
		Demonstrate start	Developmental level	Vineland Adaptive Behaviour Scales: domain-level pare	<u> </u>
		Parent interview	Demographics	Family circumstances update form including socio-eco	tomic status (nome postcode)
			a collection methods, sa	mple type / domain, and the test or task.	
*subse	t of partici	pants			
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#### Maternal and infant clinical and demographic information

Data are abstracted from the mothers' and infants' electronic medical records onto a standardised data collection sheet. A structured maternal interview is used to collect additional information that may not be recorded in routinely collected data, for example detailed family history about neurodevelopmental and mental health problems, and over-the-counter prescription and recreational drugs taken during pregnancy. For deaths the cause and post-mortem findings will be recorded.

#### Placentas

After delivery, placentae from all preterm infants are formalin fixed and stored at 4°C before sampling. The placentae are sampled according to a standardized protocol; distal and proximal sections of cord (the proximal section being taken at 1.5 cm from above the fetal surface), a roll of extraplacental membranes starting at the point of rupture and 4 full thickness sections from each quadrant. All are stained with Haematoxylin and Eosin and reported using a standardised, structured approach that describes any pathological features present, including but not limited to, fetal thrombotic vasculopathy, villitis, chorioamnionitis, funisitis and features of uteroplacental ischaemia<sup>19 20</sup>.

#### Immunoregulatory and trophic proteins

Analysis of a panel of immunoregulatory and trophic proteins (IL-1b, IL-2, IL-4, IL-5, IL-6, IL-8, IL-12, IL-17, TNF-a, MIP-1b, BDNF, GM-CSF, IL-10, IL-18, IFN-g, TNF-b, MCP-1, MIP-1a, C3, C5a, C9, MMP-9, RANTES and CRP) is undertaken on umbilical cord and neonatal blood samples. These proteins are selected to offer information with respect to the pro- and antiinflammatory innate response as well as the adaptive immune response. Blood is collected using Schleicher and Schuell 903 filter paper (6 x 3.2mm spots per subject) and analysed using a multiplex immunoassay (Meso Scale Discovery) at Statens Serum Institute, Copenhagen. We use the approach described by Skögstrand et al<sup>21</sup> to analyse differences in concentration between cases and controls.

#### Structural and diffusion magnetic resonance imaging

A Siemens MAGNETOM Prisma 3T MRI clinical scanner (Siemens Healthcare, Erlangen, Germany) and 16-channel phased-array paediatric head receive coil is used to acquire: 3D T1weighted MPRAGE (T1w) structural volume scan (acquired voxel size = 1 mm isotropic) with TI 1100 ms, TE 4.69 ms and TR 1970 ms; a 3D T2-weighted SPACE (T2w) structural scan (voxel size = 1mm isotropic) with TE 409 ms and TR 3200 ms; and a multi-shell axial dMRI scan (16 ×

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b = 0 s/mm<sup>2</sup>, 3 × b = 200 s/mm<sup>2</sup>, 6 × b = 500 s/mm<sup>2</sup>, 64 × b = 750 s/mm<sup>2</sup>, 64 × b = 2500 s/mm<sup>2</sup>) with optimal angular coverage<sup>22</sup> (see Supplementary material 1-3). If the infant stays settled axial 3D susceptibility weighted imaging (SWI; TR = 28 ms, TE = 20 ms, 0.75 x 0.75 x 3 mm acquired resolution) and axial 2D fluid-attenuated inversion-recovery BLADE imaging (FLAIR; TR = 10000 ms, TE = 130 ms, TI = 2606 ms, 0.94 x 0.94 x 3 mm acquired resolution) are acquired. In a subgroup of participants magnetisation transfer saturation imaging is acquired for evaluation of tissue myelin content, consisting of three sagittal 3D multi-echo spoiled gradient echo scans (TE = {1.54 ms, 4.55 ms, 8.56 ms}, 2-mm isotropic acquired resolution): magnetisation-transfer and proton-density weighted (TR = 75 ms, FA = 5°), and T1-weighted (TR = 15 ms, FA = 14°) acquisitions, supplementary material 4. Tissue heating and acoustic noise exposure are limited throughout the examination through the use of active noise cancellation and by setting the gradient slew rate and other pulse sequence parameters appropriately. Participants are scanned in normal mode with respect to both tissue heating and peripheral nerve stimulation.

Conventional images are reported by a paediatric radiologist using a structured system <sup>18, 23</sup>. We use image data to generate novel processing techniques optimised for neonatal data<sup>15 24-27</sup>, and we will use these and other publicly available pipelines for processing neonatal data<sup>28-30</sup> to derive image features for analyses with collateral data relating to exposures and outcomes. These include but are not limited to tract-based, morphometric and structural connectivity analyses <sup>13 16 20 24 31-34</sup>.

#### DNA storage

DNA is extracted form saliva, stored and catalogued at the Edinburgh Clinical Research Facility, ready for downstream analyses.

#### DNA methylation

Saliva is sampled using the DNA OG-575 kit (DNAGenotek, Ottawa, ON, Canada). DNA extraction is performed using published methods<sup>16</sup> and DNAm analyses are carried out at the Genetics Core of the Edinburgh Clinical Research Facility (Edinburgh, UK), using Illumina Infinium MethylationEPIC (San Diego, CA, USA), with interrogation of the arrays against ~850k methylation sites. We will investigate perinatal influences on DNAm using principal component analysis, mediation, and correlation analyses.

#### Hypothalamic-pituitary-adrenal axis (HPAA)

Salivary cortisol is used as a marker of HPAA activity. Saliva is collected in Sarstedt tubes at specified times at 9 months and 5 years. Timed saliva samples are also collected during the 9 months appointment before and after a behavioural paradigm (Still Face) which is known to elicit a biological stress response (one sample pretest and two samples post test to capture reaction and recovery). Samples are stored at -20C and analysed in batches at each time point. Anthropometric data are recorded at 9 months, 2 years and 5 years, and blood pressure is measured at 5 years.

#### Eye-tracking

We record eye-movements in response to visual stimuli at 9 months, 2 years and 5 years using a Tobii© x60 eye-tracker and bespoke analysis software (Matlab). Images are presented on a display monitor with a resolution of 1,440 × 900 pixels. The Tobii© ×60 system tracks both eyes to a rated accuracy of 0.3 degrees at a rate of 60 Hz. We analyse looking patterns, including time to first fixate and looking time at areas of interest, in tasks designed to enable inference about social development, attention, and processing speed<sup>31 35</sup>.

#### Standardised assessments

Standardised assessments of neurodevelopment by direct observation at appropriate time points are: Bayley-III scales; Mullen Scales of Early Learning; parental IQ (National Adult Reading Test). We will use validated questionnaires to assess: infant/parent temperament; parent/family characteristics (postnatal depression, stress, quality of life, socioeconomic status); infant / child sleep habits; language development; social development; executive functions; cerebral visual impairment; medical diagnoses; and behavioural outcomes (parent and teacher ratings). We also record parent-child interaction for subsequent analysis via video coding of complex behaviours in a naturalistic context.

#### Susceptibility to viral infection

We collect unstimulated nasal secretion samples (nasosorption samples) using methods described by Thwaites et al<sup>36</sup>. This collection is brief, minimally invasive and a minimally distressing process. Nasosorption Nasal lining fluid is collected using Nasosorption Fxi synthetic absorption matrix strips inserted into the anterior part of the inferior turbinate of the nasal cavity. After 30 seconds of absorption, the strip is removed, capped, maintained at 4°C for up to 4 hours and then frozen at -80°C. From these nasal fluid samples we will assess the levels of antimicrobial peptides, including cathelicidin, and inflammatory cytokines, by

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ELISA or luminex assay. Collection of these at birth (term equivalent age), 9 months and 2 years will enable us to characterise birth levels, levels at timepoints significant for respiratory syncytial virus (RSV) infection/disease and at a later time point.

#### Respiratory and gut microbiota

We collect faecal and nasopharyngeal swabs (paediatric Copan e-swab with flocked nylon fiber tip) as has been described in the WHO-guideline for respiratory sampling of bacterial pathogens<sup>66</sup>. Fecal material and e-swabs (in RNA protect), are frozen at -80°C until further analyses. DNA and RNA will be extracted<sup>37</sup> and metagenomics analyses will be executed by 16S-based sequencing according to previously described methods<sup>38</sup>. We will study temporal relationships between preterm birth and early life characteristics, consecutive microbiota development, inflammation and methylation findings, and respiratory and neurocognitive developmental outcomes.

#### Computational Motor Assessment

Light-weight, wearable, wireless motion sensors are deployed to record the movement of a sub-set of infants at 9 months during the Still-Face paradigm and Parent-Child interaction. Data are anonymised before being securely transferred to the University of Strathclyde for analysis. These data will be analysed to test for differences in motor function between at-risk and low-risk infants, and will employ machine learning algorithms to detect patterns predictive of developmental outcome at 2 and 5 years, and their potential for clinical stratification across the neurodevelopmental disorders and psychometric profiles (IQ, adaptive function, language). Further, motor data at 9 months can be correlated against neuroanatomical features measured by MRI scan at birth and developmental scales at 9 months.

#### Patient and Public Involvement

We seek feedback from parents / carers to monitor satisfaction with research participation at 9 months, 2 years and 5 years, and we have a public facing website that describes results from the study.

#### **ETHICS AND DISSEMINATION**

Safety assessment

There are no safety issues associated with collection of: placental tissue, umbilical cord / neonatal blood, saliva, faeces or hair. There are no safety issues in the conduct of planned neuropsychological assessments.

MRI does not involve ionizing radiation and there are no known risks from MRI provided standard safety measures for 3T scanning are in place. Infants are fed and wrapped and allowed to sleep naturally in the scanner. Pulse oximetry, electrocardiography and temperature are monitored. Flexible earplugs and neonatal earmuffs (MiniMuffs, Natus) are used for acoustic protection. All scans are supervised by a doctor or nurse trained in neonatal resuscitation. The scan is interrupted if there are any abnormalities in monitoring or if the baby wakes.

It is possible that incidental findings may be found on MRI or from questionnaires, for example intracranial structural anomalies or postnatal depression, respectively. In these circumstances, the findings are discussed with the participant's parent, and referral to the appropriate NHS service is made.

#### **Ethical approvals**

 The study has been approved by the National Research Ethics Service (South East Scotland Research Ethics Committee), NRES numbers 11/55/0061 and 13/SS/0143 (Phase 1) and NRES number 16/SS/0154 (Phase 2); and by NHS Lothian Research & Development (2016/0255).

#### Governance

The study is run by a management group that includes the principal investigator, a minimum of two co-investigators, the study coordinator and administrative and financial officers. A delegation log details the responsibilities of each member of staff working on the study. A scientific advisory board oversees the conduct and progress of the study. The study is co-sponsored by the University of Edinburgh & NHS Lothian Academic and Clinical Central Office for Research and Development (ACCORD).

#### **Publication and data statement**

The principles set down by the International Committee of Medical Journal Editors for authorship and non-author contributors are followed for publications and presentations resulting from the study. A Data Access and Collaboration Policy sets out the terms and conditions on which deidentified TEBC data, stimuli and tasks are accessible to the research community following reasonable request (www.tebc.ed.ac.uk).

#### SUMMARY

The aim of TEBC is to recruit a longitudinal cohort of 300 preterm infants and 100 term controls and to acquire brain MRI data that are linked to comprehensive biosampling and detailed clinical, environmental and neuropsychological data.

Data from TEBC will be used to:

- develop novel image processing algorithms for mapping brain growth and connectivity in early life;
- identify biological and environmental exposures that modify brain development;
- deepen understanding of the complex interaction between perinatal events and later environmental influences on brain health and outcome after preterm birth;
- develop methods for early detection of risk and resilience factors for long-term outcome.

#### **Author contributions**

JPB designed the study with input from all the authors. JPB, JH, MJT, RMR, SC, JS, DB, DJD, AJD, MEB and SF-W contributed to the establishment and refinement of study procedures and critically revised the manuscript. All authors approved the final version of the manuscript.

#### **Competing interests**

None declared.

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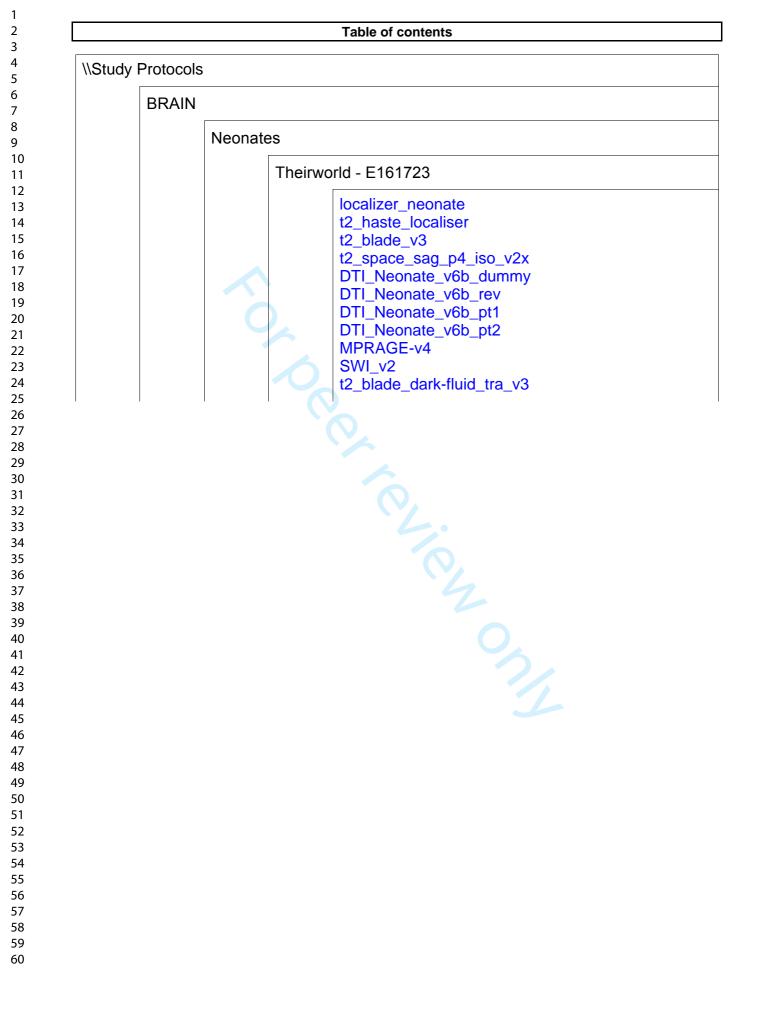
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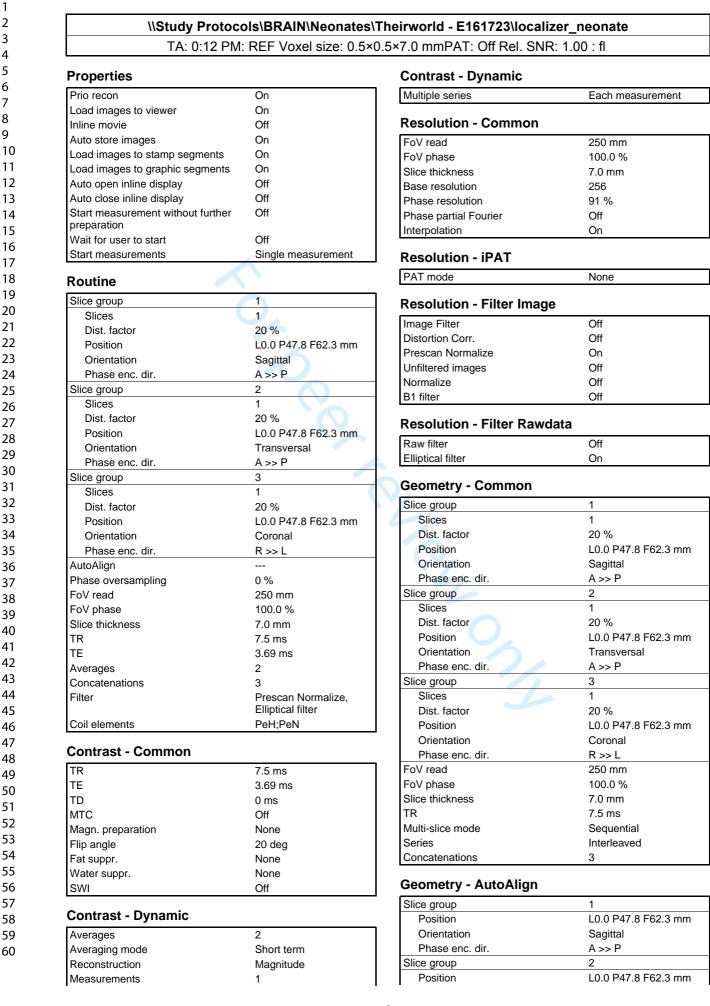
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### SIEMENS MAGNETOM Prisma

#### **Geometry - AutoAlign**

Orientation	Transversal
Phase enc. dir.	A >> P
Slice group	3
Position	L0.0 P47.8 F62.3 mm
Orientation	Coronal
Phase enc. dir.	R >> L
AutoAlign	
Initial Position	L0.0 P47.8 F62.3
L	0.0 mm
Р	47.8 mm
F	62.3 mm
Initial Rotation	0.00 deg
Initial Orientation	Sagittal

#### **Geometry - Saturation**

Saturation mode	Standard
Fat suppr.	None
Water suppr.	None
Special sat.	None

#### **Geometry - Tim Planning Suite**

Set-n-Go Protocol	Off
Table position	н
Table position	0 mm
Inline Composing	Off

#### System - Miscellaneous

Positioning mode	REF
Table position	Н
Table position	0 mm
MSMA	S-C-T
Sagittal	R >> L
Coronal	A >> P
Transversal	F >> H
Coil Combine Mode	Adaptive Combine
Save uncombined	Off
Matrix Optimization	Off
AutoAlign	
Coil Select Mode	Default

#### System - Adjustments

B0 Shim mode	Tune up
B1 Shim mode	TrueForm
Adjust with body coil	Off
Confirm freq. adjustment	Off
Assume Dominant Fat	Off
Assume Silicone	Off
Adjustment Tolerance	Auto

#### System - Adjust Volume

Position	Isocenter
Orientation	Transversal
Rotation	0.00 deg
A >> P	263 mm
R >> L	350 mm
F >> H	350 mm
Reset	Off

#### System - pTx Volumes

B1 Shim mode	TrueForm	
Excitation	Slice-sel.	

#### System - Tx/Rx

Frequency 1H	123.244318 MHz
Correction factor	1
Gain	High
Img. Scale Cor.	1.000
Reset	Off
? Ref. amplitude 1H	0.000 V

#### Physio - Signal1

1st Signal/Mode	None	
TR	7.5 ms	
Concatenations	3	
Segments	1	

#### Physio - Cardiac

Tagging	None
Magn. preparation	None
Fat suppr.	None
Dark blood	Off
FoV read	250 mm
FoV phase	100.0 %
Phase resolution	91 %

#### Physio - PACE

Resp. control	Off
Concatenations	3

## Inline - Common

Subtract	Off	
Measurements	1	
StdDev	Off	
Liver registration	Off	
Save original images	On	

#### Inline - MIP

MIP-Sag	Off	
MIP-Cor	Off	
MIP-Tra	Off	
MIP-Time	Off	
Save original images	On	

#### Inline - Soft Tissue

Wash - In	Off
Wash - Out	Off
TTP	Off
PEI	Off
MIP - time	Off
Measurements	1

#### Inline - Composing

Inline Composing	Off	
Distortion Corr.	Off	

#### Inline - Maplt

Save original images	On
MapIt	None
Flip angle	20 deg
Measurements	1
Contrasts	1
TR	7.5 ms
TE	3.69 ms

#### Sequence - Part 1

Introduction

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Sequence - Part 1	
Dimension	2D
Phase stabilisation	Off
Asymmetric echo	Allowed
Contrasts	1
Flow comp.	No
Multi-slice mode	Sequential
Bandwidth	320 Hz/Px
Sequence - Part 2	
Segments	1
Acoustic noise reduction	None
RF pulse type	Fast
Gradient mode	Fast
Excitation	Slice-sel.
RF spoiling	On
Sequence - Assistant	
	Off
Allowed delay	0 s
	Off 0s

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TR

TE

TR

TE

Multiple series

#### \\Study Protocols\BRAIN\Neonates\Theirworld - E161723\t2\_haste\_localiser TA: 6.0 s PM: REF Voxel size: 0.7×0.7×4.0 mmPAT: 2 Rel. SNR: 1.00 : h **Properties Resolution - Common** Prio recon Off FoV read 220 mm Load images to viewer On FoV phase 100.0 % Inline movie Off Slice thickness 4.0 mm Auto store images On Base resolution 320 80 % Load images to stamp segments On Phase resolution Phase partial Fourier Load images to graphic segments 4/8 On Auto open inline display Off Interpolation Off Auto close inline display Off **Resolution - iPAT** Start measurement without further Off preparation PAT mode GRAPPA Wait for user to start Off Accel. factor PE 2 Start measurements Single measurement Ref. lines PE 24 Reference scan mode Integrated Routine Slice group 1 **Resolution - Filter Image** Slices 1 Image Filter Off 30 % Dist. factor Distortion Corr. Off Position Isocenter Prescan Normalize On Sagittal Orientation Unfiltered images Off A >> P Phase enc. dir. Normalize Off Slice group 2 B1 filter Off Slices 1 Dist. factor 30 % **Resolution - Filter Rawdata** Position L0.0 P0.0 H5.2 mm Raw filter Off Orientation Transversal Elliptical filter On Phase enc. dir. R >> L Slice group 3 **Geometry - Common** Slices 1 Slice group 1 Dist. factor 30 % Slices 1 L0.0 P0.0 H10.4 mm Position 30 % Dist. factor Orientation Coronal Position Isocenter Phase enc. dir. R >> L Orientation Sagittal AutoAlign A >> P Phase enc. dir. Phase oversampling 0% Slice group 2 220 mm FoV read Slices 1 FoV phase 100.0 % Dist. factor 30 % Slice thickness 4.0 mm Position L0.0 P0.0 H5.2 mm 1500.0 ms Orientation Transversal 94 ms Phase enc. dir. R >> L Averages 1 Slice group 3 Concatenations 1 Slices 1 Filter Prescan Normalize, 30 % Dist. factor Elliptical filter Position L0.0 P0.0 H10.4 mm Coil elements HE1-4 Orientation Coronal **Contrast - Common** Phase enc. dir. R >> L FoV read 220 mm 1500.0 ms FoV phase 100.0 % 94 ms Slice thickness 4.0 mm MTC Off TR 1500.0 ms Magn. preparation None Multi-slice mode Single shot Flip angle 150 deg Series Interleaved Fat suppr. None Concatenations 1 Water suppr. None Restore magn. Off **Geometry - AutoAlign Contrast - Dynamic** Slice group 1 Position Isocenter Averages 1 Orientation Sagittal Averaging mode Long term Phase enc. dir. A >> P Reconstruction Magnitude Slice group 2 Measurements 1

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Each measurement

Position

L0.0 P0.0 H5.2 mm

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Orientation	Transversal
Phase enc. dir.	R >> L
Slice group	3
Position	L0.0 P0.0 H10.4 m
Orientation	Coronal
Phase enc. dir.	R >> L
AutoAlign	
Initial Position	Isocenter
P	0.0 mm
P H	0.0 mm 0.0 mm
Initial Rotation	0.00 deg
Initial Orientation	Sagittal
Geometry - Saturation	eaginai
Fat suppr.	None
Water suppr.	None
Restore magn.	Off
Special sat.	None
Geometry - Navigator	~
Geometry - Tim Planning S Set-n-Go Protocol	Off
Table position	н 💦
Table position	0 mm
Inline Composing	Off
System - Miscellaneous	
Positioning mode	REF
Table position	H 0 mm
Table position MSMA	S - C - T
Sagittal	R >> L
Coronal	A >> P
Transversal	F >> H
Coil Combine Mode	Adaptive Combine
Save uncombined	Off
Matrix Optimization	Off
AutoAlign	
Coil Select Mode	On - AutoCoilSele
System - Adjustments	
B0 Shim mode	Tune up
B1 Shim mode	TrueForm
Adjust with body coil	Off
Confirm freq. adjustment	Off
Assume Dominant Fat	Off
Assume Silicone	Off
Adjustment Tolerance	Auto
System - Adjust Volume	
Position	Isocenter
Orientation	Transversal
Rotation	0.00 deg
A >> P R >> L	263 mm
R >> L F >> H	350 mm
F >> H Reset	350 mm Off
	Vii
System - pTx Volumes	
B1 Shim mode	

#### System - Tx/Rx

Fr	equency 1H	123.244318 MHz
Co	equency 1H prrection factor	1
Ga	ain	High
Im	g. Scale Cor.	1.000
Re	eset	Off
? I	Ref. amplitude 1H	0.000 V

#### Physio - Signal1

1st Signal/Mode	None
TR	1500.0 ms
Concatenations	1

#### Physio - Cardiac

Magn. preparation	None
Fat suppr.	None
Dark blood	Off
FoV read	220 mm
FoV phase	100.0 %
Phase resolution	80 %

#### Physio - PACE

Resp. control	Off	
Concatenations	1	

## Inline - Common

Subtract	Off
Measurements	1
StdDev	Off
Save original images	On

#### Inline - MIP

MIP-Sag	Off	
MIP-Cor	Off	
MIP-Tra	Off	
MIP-Time	Off	
Save original images	On	

#### Inline - Composing

Inline Composing	Off
Distortion Corr.	Off

## Sequence - Part 1

Introduction	On
Dimension	2D
Contrasts	1
Flow comp.	No
Multi-slice mode	Single shot
Echo spacing	7.22 ms
Bandwidth	601 Hz/Px

#### Sequence - Part 2

RF pulse type	Normal
Gradient mode	Whisper
Hyperecho	Off
Turbo factor	256

#### Sequence - Assistant

Mode	Min flip angle	
Min flip angle	130 deg	
Allowed delay	60 s	

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## \\Study Protocols\BRAIN\Neonates\Theirworld - E161723\t2\_blade\_v3

TA: 2:29 PM: REF Voxel size: 0.7×0.7×3.0 mmPAT: 2 Rel. SNR: 1.00 : qtseBR\_rr

## Properties

Prio recon	Off
Load images to viewer	On
Inline movie	Off
Auto store images	On
Load images to stamp segments	On
Load images to graphic segments	Off
Auto open inline display	Off
Auto close inline display	Off
Start measurement without further preparation	Off
Wait for user to start	Off
Start measurements	Single measurement

#### Routine

Slice group	1
Slices	40
Dist. factor	0 %
Position	R1.2 P40.0 H50.2 mm
Orientation	Transversal
Phase enc. dir.	A >> P
AutoAlign	
Phase oversampling	0.0 %
FoV read	220 mm
FoV phase	100.0 %
Slice thickness	3.0 mm
TR	4100.0 ms
TE	207 ms
Averages	1
Concatenations	4
Filter	Prescan Normalize
Coil elements	PeH;PeN

#### **Contrast - Common**

٢	R	4100.0 ms
Г	Ē	207 ms
Г	D	0.0 ms
Ν	ИТС	Off
Ν	Aagn. preparation	None
F	Flip angle	90 deg
F	at suppr.	None
	Vater suppr.	None
F	Restore magn.	On

#### **Contrast - Dynamic**

Averages	1
Averaging mode	Short term
Reconstruction	Magnitude
Measurements	1
Multiple series	Each measurement

#### **Resolution - Common**

FoV read	220 mm
FoV phase	100.0 %
Slice thickness	3.0 mm
Base resolution	320
BLADE coverage	100.0 %
Trajectory	BLADE
Interpolation	Off

#### **Resolution - iPAT**

PAT mode	GRAPPA
Accel. factor PE	2
Ref. lines PE	8
Reference scan mode	Integrated

#### **Resolution - Filter Image**

Image Filter	Off	
Distortion Corr.	Off	
Prescan Normalize	On	
Unfiltered images	Off	
Normalize	Off	
B1 filter	Off	

#### **Resolution - Filter Rawdata**

Raw filter	Off	
Elliptical filter	Off	

#### **Geometry - Common**

Slice group	1
Slices	40
Dist. factor	0 %
Position	R1.2 P40.0 H50.2 mm
Orientation	Transversal
Phase enc. dir.	A >> P
FoV read	220 mm
FoV phase	100.0 %
Slice thickness	3.0 mm
TR	4100.0 ms
Multi-slice mode	Interleaved
Series	Interleaved
Concatenations	4

#### Geometry - AutoAlign

Slice group	1
Position	R1.2 P40.0 H50.2 mm
Orientation	Transversal
Phase enc. dir.	A >> P
AutoAlign	
Initial Position	R1.2 P40.0 H50.2
R	1.2 mm
Р	40.0 mm
н	50.2 mm
Initial Rotation	0.00 deg
Initial Orientation	Transversal

#### **Geometry - Saturation**

Fat suppr.	None
Water suppr.	None
Restore magn.	On
Special sat.	None

#### **Geometry - Navigator**

#### **Geometry - Tim Planning Suite**

-	-
Set-n-Go Protocol	Off
Table position	Н
Table position	0 mm
Inline Composing	Off

#### **BMJ** Open

#### SIEMENS MAGNETOM Prisma

1		
2	System - Miscellaneous	
3	Positioning mode	REF
4	Table position	Н
5	Table position	0 mm
6	MSMA	S - C - T
7	Sagittal	R >> L
8	Coronal	A >> P
9	Transversal	F >> H
10	Coil Combine Mode	Adaptive Combine
10	Save uncombined	Off
12	Matrix Optimization	Off
12	AutoAlign	
13	Coil Select Mode	On - AutoCoilSelect
14	System - Adjustments	
		-
16	B0 Shim mode	Tune up
17	B1 Shim mode	TrueForm
18	Adjust with body coil	Off Off
19	Confirm freq. adjustment Assume Dominant Fat	Off Off
20	Assume Silicone	Off
21	Adjustment Tolerance	Auto
22	Aujustinent Tolerance	Auto
23	System - Adjust Volume	
24	Position	Isocenter
25	Orientation	Transversal
26	Rotation	0.00 deg
27	A >> P	263 mm
28	R >> L	350 mm
29	F >> H	350 mm
30	Reset	Off
31		
	System - nTx Volumos	
32	System - pTx Volumes	
32 33	B1 Shim mode	TrueForm
33		TrueForm
33 34		TrueForm
33 34 35	B1 Shim mode	TrueForm 123.244318 MHz
33 34 35 36	B1 Shim mode System - Tx/Rx	
33 34 35 36 37	B1 Shim mode System - Tx/Rx Frequency 1H	123.244318 MHz
33 34 35 36 37 38	B1 Shim mode System - Tx/Rx Frequency 1H Correction factor	123.244318 MHz 1
33 34 35 36 37 38 39	B1 Shim mode System - Tx/Rx Frequency 1H Correction factor Gain	123.244318 MHz 1 High
33 34 35 36 37 38 39 40	B1 Shim mode System - Tx/Rx Frequency 1H Correction factor Gain Img. Scale Cor.	123.244318 MHz 1 High 1.000
33 34 35 36 37 38 39 40 41	B1 Shim mode System - Tx/Rx Frequency 1H Correction factor Gain Img. Scale Cor. Reset ? Ref. amplitude 1H	123.244318 MHz 1 High 1.000 Off
33 34 35 36 37 38 39 40 41 42	B1 Shim mode System - Tx/Rx Frequency 1H Correction factor Gain Img. Scale Cor. Reset ? Ref. amplitude 1H Physio - Signal1	123.244318 MHz 1 High 1.000 Off
33 34 35 36 37 38 39 40 41 42 43	B1 Shim mode         System - Tx/Rx         Frequency 1H         Correction factor         Gain         Img. Scale Cor.         Reset         ? Ref. amplitude 1H         Physio - Signal1         1st Signal/Mode	123.244318 MHz 1 High 1.000 Off 0.000 V
<ul> <li>33</li> <li>34</li> <li>35</li> <li>36</li> <li>37</li> <li>38</li> <li>39</li> <li>40</li> <li>41</li> <li>42</li> <li>43</li> <li>44</li> </ul>	B1 Shim mode         System - Tx/Rx         Frequency 1H         Correction factor         Gain         Img. Scale Cor.         Reset         ? Ref. amplitude 1H         Physio - Signal1         1st Signal/Mode         TR	123.244318 MHz 1 High 1.000 Off 0.000 V None 4100.0 ms
33 34 35 36 37 38 39 40 41 42 43 44 45	B1 Shim mode         System - Tx/Rx         Frequency 1H         Correction factor         Gain         Img. Scale Cor.         Reset         ? Ref. amplitude 1H         Physio - Signal1         1st Signal/Mode	123.244318 MHz 1 High 1.000 Off 0.000 V
<ol> <li>33</li> <li>34</li> <li>35</li> <li>36</li> <li>37</li> <li>38</li> <li>39</li> <li>40</li> <li>41</li> <li>42</li> <li>43</li> <li>44</li> <li>45</li> <li>46</li> </ol>	B1 Shim mode         System - Tx/Rx         Frequency 1H         Correction factor         Gain         Img. Scale Cor.         Reset         ? Ref. amplitude 1H         Physio - Signal1         1st Signal/Mode         TR         Concatenations	123.244318 MHz 1 High 1.000 Off 0.000 V None 4100.0 ms
<ol> <li>33</li> <li>34</li> <li>35</li> <li>36</li> <li>37</li> <li>38</li> <li>39</li> <li>40</li> <li>41</li> <li>42</li> <li>43</li> <li>44</li> <li>45</li> <li>46</li> <li>47</li> </ol>	B1 Shim mode         System - Tx/Rx         Frequency 1H         Correction factor         Gain         Img. Scale Cor.         Reset         ? Ref. amplitude 1H         Physio - Signal1         1st Signal/Mode         TR         Concatenations         Physio - Cardiac	123.244318 MHz 1 High 1.000 Off 0.000 V None 4100.0 ms 4
<ul> <li>33</li> <li>34</li> <li>35</li> <li>36</li> <li>37</li> <li>38</li> <li>39</li> <li>40</li> <li>41</li> <li>42</li> <li>43</li> <li>44</li> <li>45</li> <li>46</li> <li>47</li> <li>48</li> </ul>	B1 Shim mode         System - Tx/Rx         Frequency 1H         Correction factor         Gain         Img. Scale Cor.         Reset         ? Ref. amplitude 1H         Physio - Signal1         1st Signal/Mode         TR         Concatenations         Physio - Cardiac         Magn. preparation	123.244318 MHz 1 High 1.000 Off 0.000 V None 4100.0 ms 4 None
<ol> <li>33</li> <li>34</li> <li>35</li> <li>36</li> <li>37</li> <li>38</li> <li>39</li> <li>40</li> <li>41</li> <li>42</li> <li>43</li> <li>44</li> <li>45</li> <li>46</li> <li>47</li> <li>48</li> <li>49</li> </ol>	B1 Shim mode         System - Tx/Rx         Frequency 1H         Correction factor         Gain         Img. Scale Cor.         Reset         ? Ref. amplitude 1H         Physio - Signal1         1st Signal/Mode         TR         Concatenations         Physio - Cardiac         Magn. preparation         Fat suppr.	123.244318 MHz 1 High 1.000 Off 0.000 V None 4 None None None
33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50	B1 Shim mode         System - Tx/Rx         Frequency 1H         Correction factor         Gain         Img. Scale Cor.         Reset         ? Ref. amplitude 1H         Physio - Signal1         1st Signal/Mode         TR         Concatenations         Physio - Cardiac         Magn. preparation         Fat suppr.         Dark blood	123.244318 MHz 1 High 1.000 Off 0.000 V None 4100.0 ms 4 None None None Off
33         34         35         36         37         38         39         40         41         42         43         44         45         46         47         48         49         50         51	B1 Shim mode         System - Tx/Rx         Frequency 1H         Correction factor         Gain         Img. Scale Cor.         Reset         ? Ref. amplitude 1H         Physio - Signal1         1st Signal/Mode         TR         Concatenations         Physio - Cardiac         Magn. preparation         Fat suppr.         Dark blood         FoV read	123.244318 MHz 1 High 1.000 Off 0.000 V None 4100.0 ms 4 None None None Off 220 mm
<ul> <li>33</li> <li>34</li> <li>35</li> <li>36</li> <li>37</li> <li>38</li> <li>39</li> <li>40</li> <li>41</li> <li>42</li> <li>43</li> <li>44</li> <li>45</li> <li>46</li> <li>47</li> <li>48</li> <li>49</li> <li>50</li> <li>51</li> <li>52</li> </ul>	B1 Shim mode         System - Tx/Rx         Frequency 1H         Correction factor         Gain         Img. Scale Cor.         Reset         ? Ref. amplitude 1H         Physio - Signal1         1st Signal/Mode         TR         Concatenations         Physio - Cardiac         Magn. preparation         Fat suppr.         Dark blood         FoV read         FoV phase	123.244318 MHz 1 High 1.000 Off 0.000 V None 4100.0 ms 4 None None Off 220 mm 100.0 %
33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53	B1 Shim mode         System - Tx/Rx         Frequency 1H         Correction factor         Gain         Img. Scale Cor.         Reset         ? Ref. amplitude 1H         Physio - Signal1         1st Signal/Mode         TR         Concatenations         Physio - Cardiac         Magn. preparation         Fat suppr.         Dark blood         FoV read         FoV phase         BLADE coverage	123.244318 MHz 1 High 1.000 Off 0.000 V None 4100.0 ms 4 None None Off 220 mm 100.0 % 100.0 %
<ul> <li>33</li> <li>34</li> <li>35</li> <li>36</li> <li>37</li> <li>38</li> <li>39</li> <li>40</li> <li>41</li> <li>42</li> <li>43</li> <li>44</li> <li>45</li> <li>46</li> <li>47</li> <li>48</li> <li>49</li> <li>50</li> <li>51</li> <li>52</li> </ul>	B1 Shim mode         System - Tx/Rx         Frequency 1H         Correction factor         Gain         Img. Scale Cor.         Reset         ? Ref. amplitude 1H         Physio - Signal1         1st Signal/Mode         TR         Concatenations         Physio - Cardiac         Magn. preparation         Fat suppr.         Dark blood         FoV read         FoV phase	123.244318 MHz 1 High 1.000 Off 0.000 V None 4100.0 ms 4 None None Off 220 mm 100.0 %
33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53	B1 Shim mode         System - Tx/Rx         Frequency 1H         Correction factor         Gain         Img. Scale Cor.         Reset         ? Ref. amplitude 1H         Physio - Signal1         1st Signal/Mode         TR         Concatenations         Physio - Cardiac         Magn. preparation         Fat suppr.         Dark blood         FoV read         FoV phase         BLADE coverage         Trajectory	123.244318 MHz 1 High 1.000 Off 0.000 V None 4100.0 ms 4 None None Off 220 mm 100.0 % 100.0 %
<ul> <li>33</li> <li>34</li> <li>35</li> <li>36</li> <li>37</li> <li>38</li> <li>39</li> <li>40</li> <li>41</li> <li>42</li> <li>43</li> <li>44</li> <li>45</li> <li>46</li> <li>47</li> <li>48</li> <li>49</li> <li>50</li> <li>51</li> <li>52</li> <li>53</li> <li>54</li> </ul>	B1 Shim mode         System - Tx/Rx         Frequency 1H         Correction factor         Gain         Img. Scale Cor.         Reset         ? Ref. amplitude 1H         Physio - Signal1         1st Signal/Mode         TR         Concatenations         Physio - Cardiac         Magn. preparation         Fat suppr.         Dark blood         FoV phase         BLADE coverage         Trajectory         Physio - PACE	123.244318 MHz 1 High 1.000 Off 0.000 V None 4100.0 ms 4 None None None Off 220 mm 100.0 % BLADE
33         34         35         36         37         38         39         40         41         42         43         44         45         46         47         48         49         50         51         52         53         54         55	B1 Shim mode         System - Tx/Rx         Frequency 1H         Correction factor         Gain         Img. Scale Cor.         Reset         ? Ref. amplitude 1H         Physio - Signal1         1st Signal/Mode         TR         Concatenations         Physio - Cardiac         Magn. preparation         Fat suppr.         Dark blood         FoV phase         BLADE coverage         Trajectory         Physio - PACE         Resp. control	123.244318 MHz 1 High 1.000 Off 0.000 V None 4100.0 ms 4 None None None Off 220 mm 100.0 % 100.0 % BLADE Off
33         34         35         36         37         38         39         40         41         42         43         44         45         46         47         48         49         50         51         52         53         54         55         56	B1 Shim mode         System - Tx/Rx         Frequency 1H         Correction factor         Gain         Img. Scale Cor.         Reset         ? Ref. amplitude 1H         Physio - Signal1         1st Signal/Mode         TR         Concatenations         Physio - Cardiac         Magn. preparation         Fat suppr.         Dark blood         FoV phase         BLADE coverage         Trajectory         Physio - PACE	123.244318 MHz 1 High 1.000 Off 0.000 V None 4100.0 ms 4 None None None Off 220 mm 100.0 % BLADE
33         34         35         36         37         38         39         40         41         42         43         44         45         46         47         48         49         50         51         52         53         54         55         56         57	B1 Shim mode         System - Tx/Rx         Frequency 1H         Correction factor         Gain         Img. Scale Cor.         Reset         ? Ref. amplitude 1H         Physio - Signal1         1st Signal/Mode         TR         Concatenations         Physio - Cardiac         Magn. preparation         Fat suppr.         Dark blood         FoV phase         BLADE coverage         Trajectory         Physio - PACE         Resp. control	123.244318 MHz 1 High 1.000 Off 0.000 V None 4100.0 ms 4 None None None Off 220 mm 100.0 % 100.0 % BLADE Off
33         34         35         36         37         38         39         40         41         42         43         44         45         46         47         48         49         50         51         52         53         54         55         56         57         58	B1 Shim mode         System - Tx/Rx         Frequency 1H         Correction factor         Gain         Img. Scale Cor.         Reset         ? Ref. amplitude 1H         Physio - Signal1         1st Signal/Mode         TR         Concatenations         Physio - Cardiac         Magn. preparation         Fat suppr.         Dark blood         FoV read         FoV phase         BLADE coverage         Trajectory         Physio - PACE         Resp. control         Concatenations	123.244318 MHz 1 High 1.000 Off 0.000 V None 4100.0 ms 4 None None Off 220 mm 100.0 % 100.0 % BLADE Off 4
33         34         35         36         37         38         39         40         41         42         43         44         45         46         47         48         49         50         51         52         53         54         55         56         57         58         59	B1 Shim mode         System - Tx/Rx         Frequency 1H         Correction factor         Gain         Img. Scale Cor.         Reset         ? Ref. amplitude 1H         Physio - Signal1         1st Signal/Mode         TR         Concatenations         Physio - Cardiac         Magn. preparation         Fat suppr.         Dark blood         FoV phase         BLADE coverage         Trajectory         Physio - PACE         Resp. control         Concatenations	123.244318 MHz 1 High 1.000 Off 0.000 V None 4100.0 ms 4 None None None Off 220 mm 100.0 % 100.0 % BLADE Off

#### Inline - Common

StdDev	Off	
Save original images	On	

#### Inline - MIP

MIP-Sag	Off
MIP-Sag MIP-Cor	Off
MIP-Tra	Off
MIP-Time	Off
Save original images	On

#### **Inline - Composing**

Inline Composing	Off	
Distortion Corr.	Off	

#### Sequence - Part 1

Introduction	On
Dimension	2D
Compensate T2 decay	Off
Contrasts	1
Flow comp.	Read
Multi-slice mode	Interleaved
Free echo spacing	Off
Echo spacing	10.9 ms
Bandwidth	363 Hz/Px

#### Sequence - Part 2

Define	Turbo factor
Echo trains per slice	8
Phase correction	Automatic
Acoustic noise reduction	Active
RF pulse type	Low SAR
Gradient mode	Fast
Hyperecho	On
WARP	Off
Motion correction	On
Red. EC sensitivity	Off
Turbo factor	36

## Sequence - Assistant

Mode	Off	
Mode Allowed delay	30 s	

## \\Study Protocols\BRAIN\Neonates\Theirworld - E161723\t2\_space\_sag\_p4\_iso\_v2x TA: 2:13 PM: REF Voxel size: 1.0×1.0×1.0 mmPAT: 4 Rel. SNR: 1.00 : spcR

## Properties

Prio recon	Off
Load images to viewer	On
Inline movie	Off
Auto store images	On
Load images to stamp segments	Off
Load images to graphic segments	Off
Auto open inline display	Off
Auto close inline display	Off
Start measurement without further preparation	Off
Wait for user to start	Off
Start measurements	Single measurement

#### Routine

Slab group	1
Slabs	
Position	R1.2 P36.9 H0.0 mm
Orientation	Sagittal
Phase enc. dir.	A >> P
AutoAlign	
Phase oversampling	0 %
Slice oversampling	0.0 %
Slices per slab	160
FoV read	128 mm
FoV phase	150.0 %
Slice thickness	1.00 mm
TR	3200 ms
TE	409 ms
Averages	1.4
Concatenations	1
Filter	Raw filter, Prescan
	Normalize
Coil elements	PeH;PeN

## **Contrast - Common**

TR	3200 ms
TE	409 ms
MTC	Off
Magn. preparation	None
Fat suppr.	Fat sat.
Fat sat. mode	Strong
Blood suppr.	Off
Restore magn.	On

## **Contrast - Dynamic**

Averages	1.4
Reconstruction	Magnitude
Measurements	1
Multiple series	Each measurement

## **Resolution - Common**

FoV read	128 mm
FoV phase	150.0 %
Slice thickness	1.00 mm
Base resolution	128
Phase resolution	100 %
Slice resolution	100 %
Phase partial Fourier	Allowed
Slice partial Fourier	Off
Interpolation	Off

## **Resolution - iPAT**

PAT mode	GRAPPA
Accel. factor PE	2
Ref. lines PE	24
Accel. factor 3D	2
Ref. lines 3D	24
Reference scan mode	Integrated

## **Resolution - Filter Image**

Image Filter	Off
Distortion Corr.	Off
Prescan Normalize	On
Unfiltered images	Off
Normalize	Off
B1 filter	Off

## **Resolution - Filter Rawdata**

Raw filter	On	
Elliptical filter	Off	

## Geometry - Common

Slab group	1
Slabs	1
Position	R1.2 P36.9 H0.0 mm
Orientation	Sagittal
Phase enc. dir.	A >> P
Slice oversampling	0.0 %
Slices per slab	160
FoV read	128 mm
FoV phase	150.0 %
Slice thickness	1.00 mm
TR	3200 ms
Series	Interleaved
Concatenations	1

## Geometry - AutoAlign

Slab group	1
Position	R1.2 P36.9 H0.0 mm
Orientation	Sagittal
Phase enc. dir.	A >> P
AutoAlign	
Initial Position	R1.2 P36.9 H0.0
R	1.2 mm
Р	36.9 mm
н	0.0 mm
Initial Rotation	0.00 deg
Initial Orientation	Sagittal

## **Geometry - Saturation**

Fat suppr.	Fat sat.
Fat sat. mode	Strong
Restore magn.	On
Special sat.	None

## **Geometry - Navigator**

## **Geometry - Tim Planning Suite**

-	•
Set-n-Go Protocol	Off
Table position	Н
Table position	0 mm
Inline Composing	Off

#### **BMJ** Open

#### SIEMENS MAGNETOM Prisma

System - Miscellaneous		Inline - Common
Positioning mode	REF	Measurements
Table position	Н	StdDev
Table position	0 mm	Save original images
MSMA	S - C - T	
Sagittal	R >> L	Inline - MIP
Coronal	A >> P	MIP-Sag
Transversal	F >> H	5
Coil Combine Mode	Adaptive Combine	MIP-Cor
	Off	MIP-Tra
Save uncombined	-	MIP-Time
Matrix Optimization	Off	Save original images
AutoAlign Coil Select Mode	 On AutoCoilSoloot	Inline Composing
Coll Select Mode	On - AutoCoilSelect	Inline - Composing
System - Adjustments		Inline Composing Distortion Corr.
B0 Shim mode	Standard	
B1 Shim mode	TrueForm	Sequence - Part 1
Adjust with body coil	Off	Introduction
Confirm freq. adjustment	Off	Dimension
Assume Dominant Fat	Off	
Assume Silicone	Off	Elliptical scanning
Adjustment Tolerance	Auto	Reordering
		Flow comp.
System - Adjust Volume		Echo spacing
		Adiabatic-mode
Position	R1.2 P36.9 H0.0 mm	Bandwidth
Orientation	Sagittal	
Rotation	90.00 deg	Sequence - Part 2
F >> H	128 mm	Echo train duration
A >> P	192 mm	RF pulse type
R >> L	160 mm	Gradient mode
Reset	Off	Excitation
System - pTx Volumes		Flip angle mode
B1 Shim mode	TrueForm	Turbo factor
Excitation	Non-sel.	Sequence - Assistar
		Allowed delay
System - Tx/Rx		
Frequency 1H	123.244318 MHz	
Correction factor	1	
Gain	High	
Img. Scale Cor.	3.000	
Reset	Off	
? Ref. amplitude 1H	0.000 V	
Physio - Signal1		
1st Signal/Mode	None	1
Trigger delay	0 ms	
TR	3200 ms	
Concatenations	1	
	·	<b>_</b>
Physio - Cardiac	None	1
Magn. preparation	None	
Fat suppr.	Fat sat.	
Dark blood	Off	
FoV read	128 mm	
FoV phase	150.0 %	
Phase resolution	100 %	J
Physia - PACE		1
Physio - PACE	Off	
Physio - PACE Resp. control Concatenations	Off 1	
Resp. control Concatenations		
Resp. control		]

#### Inline - Common

Measurements	1	
StdDev	Off	
Save original images	On	

#### Inline - MIP

MIP-Sag	Off	
MIP-Cor	Off	
MIP-Tra	Off	
MIP-Time	Off	
Save original images	On	

#### **Inline - Composing**

Inline Composing	Off	
Distortion Corr.	Off	

#### Sequence - Part 1

Introduction	On
Dimension	3D
Elliptical scanning	Off
Reordering	Linear
Flow comp.	No
Echo spacing	4.4 ms
Adiabatic-mode	Off
Bandwidth	592 Hz/Px

#### Sequence - Part 2

Echo train duration	1034 ms
RF pulse type	Low SAR
Gradient mode	Whisper
Excitation	Non-sel.
Flip angle mode	T2 var
Turbo factor	282

### Sequence - Assistant

Allowed	delay	30 s

For peer review only - http://bmjopen.9mj.com/site/about/guidelines.xhtml

## \\Study Protocols\BRAIN\Neonates\Theirworld - E161723\DTI\_Neonate\_v6b\_dummy TA: 0:28 PM: FIX Voxel size: 2.0×2.0×2.0 mmPAT: 4 Rel. SNR: 1.00 : epse

## **Properties**

Prio recon	Off
Load images to viewer	On
Inline movie	Off
Auto store images	On
Load images to stamp segments	Off
Load images to graphic segments	Off
Auto open inline display	Off
Auto close inline display	Off
Start measurement without further preparation	Off
Wait for user to start	Off
Start measurements	Single measurement

#### Routine

Slice group	1
Slices	58
Dist. factor	0 %
Position	R1.2 P39.7 H47.8 mm
Orientation	Transversal
Phase enc. dir.	R >> L
AutoAlign	
Phase oversampling	0 %
FoV read	256 mm
FoV phase	100.0 %
Slice thickness	2.0 mm
TR	3500 ms
TE	78.0 ms
Concatenations	1
Filter	Raw filter, Prescan Normalize
Coil elements	PeH;PeN

#### **Contrast - Common**

TR	3500 ms
TE	78.0 ms
MTC	Off
Magn. preparation	None
Fat suppr. Fat sat. mode	Fat sat.
Fat sat. mode	Strong

#### **Contrast - Dynamic**

Averaging mode	Long term
Reconstruction	Magnitude
Measurements	1
Delay in TR	0 ms
Multiple series	Off

#### **Resolution - Common**

00.0 % .0 mm 28 00 %
28
20.9/
JU 70
/8
ff

Resolution - iPAT	
Accel. mode	Slice accel.
Accel. mode Accel. factor PE Ref. lines PE	2
Ref. lines PE	40

#### **Resolution - iPAT**

Accel. factor slice	2
Reference scan mode	EPI/separate

#### **Resolution - Filter Image**

Distortion Corr.	Off	
Prescan Normalize	On	
Dynamic Field Corr.	Off	

#### **Resolution - Filter Rawdata**

Raw filter	On	
Elliptical filter	Off	

#### **Geometry - Common**

Slice group	1
Slices	58
Dist. factor	0 %
Position	R1.2 P39.7 H47.8 mm
Orientation	Transversal
Phase enc. dir.	R >> L
FoV read	256 mm
FoV phase	100.0 %
Slice thickness	2.0 mm
TR	3500 ms
Multi-slice mode	Interleaved
Series	Interleaved
Concatenations	1

#### Geometry - AutoAlign

Slice group	1
Position	R1.2 P39.7 H47.8 mm
Orientation	Transversal
Phase enc. dir.	R >> L
AutoAlign	
Initial Position	R1.2 P39.7 H47.8
R	1.2 mm
Р	39.7 mm
н	47.8 mm
Initial Rotation	90.00 deg
Initial Orientation	Transversal

#### **Geometry - Saturation**

Fat suppr.	Fat sat.
Fat sat. mode	Strong
Special sat.	None

#### **Geometry - Navigator**

#### **Geometry - Tim Planning Suite**

Set-n-Go Protocol	Off
Table position	Н
Table position	0 mm
Inline Composing	Off

#### System - Miscellaneous

Positioning mode	FIX
Table position	Н
Table position	0 mm
MSMA	S - C - T
Sagittal	R >> L

## SIEMENS MAGNETOM Prisma

1		
2	System - Miscellaneous	
3	Coronal	A >> P
4	Transversal	F >> H
5	Coil Combine Mode	Adaptive Combine
6	Matrix Optimization	Performance
7	AutoAlign	
8	Coil Select Mode	On - AutoCoilSelect
9	System - Adjustments	
10	B0 Shim mode	Standard
11	B1 Shim mode	TrueForm
12	Adjust with body coil	Off
13	Confirm freq. adjustment	Off
14	Assume Dominant Fat	Off
15	Assume Silicone	Off
16	Adjustment Tolerance	Auto
17	Custom Adiust Maluma	
18	System - Adjust Volume	
19	Position	R1.2 P39.7 H47.8 mm
20	Orientation	Transversal
21	Rotation R >> L	90.00 deg 256 mm
22	R >> L A >> P	256 mm
23	F >> H	116 mm
24	Reset	Off
25		
26	System - pTx Volumes	
27	B1 Shim mode	TrueForm
28	Excitation	Standard
29		
30	System - Tx/Rx	
31	Frequency 1H	123.244318 MHz
32 33	Correction factor	1
33 34	Gain	High 1.000
35	Img. Scale Cor. Reset	Off
36	? Ref. amplitude 1H	0.000 V
30 37		
38	Physio - Signal1	
39	1st Signal/Mode	None
40	TR	3500 ms
41	Concatenations	1
42	Physic DACE	
43	Physio - PACE	
44	Resp. control	Off
45	Concatenations	1
46	Diff - Neuro	
47	Diffusion mode	Free
48	Diff. directions	71
49	Diffusion Scheme	Monopolar
50	Diff. weightings	1
51	b-value	0 s/mm²
52	b-value	3
53	Diff. weighted images	On
54	Trace weighted images	Off
55	ADC maps	Off
56	FA maps	Off Off
57	Mosaic	Off Off
58	Tensor Noise level	Off 40
59		-U

## **Diff - Body**

Diffusion mode

## **Diff - Body**

Diff. directions	71
Diffusion Scheme	Monopolar
Diff. weightings	1
b-value	0 s/mm²
b-value	3
Diff. weighted images	On
Trace weighted images	Off
ADC maps	Off
Exponential ADC Maps	Off
FA maps	Off
Invert Gray Scale	Off
Calculated Image	Off
b-Value >=	0 s/mm²
Noise level	40

#### **Diff - Composing**

Inline Composing	Off	
Distortion Corr.	Off	

#### Sequence - Part 1

Introduction	Off
Optimization	None
Multi-slice mode	Interleaved
Free echo spacing	Off
Echo spacing	0.78 ms
Bandwidth	1446 Hz/Px

#### Sequence - Part 2

EPI factor	128
RF pulse type	Low SAR
Gradient mode	Normal
Excitation	Standard

#### Sequence - pTX Pulses



Free

#### SIEMENS MAGNETOM Prisma

## \\Study Protocols\BRAIN\Neonates\Theirworld - E161723\DTI\_Neonate\_v6b\_rev TA: 0:28 PM: FIX Voxel size: 2.0×2.0×2.0 mmPAT: 4 Rel. SNR: 1.00 : epse

## Properties

Prio recon	Off
Load images to viewer	On
Inline movie	Off
Auto store images	On
Load images to stamp segments	Off
Load images to graphic segments	Off
Auto open inline display	Off
Auto close inline display	Off
Start measurement without further preparation	Off
Wait for user to start	Off
Start measurements	Single measurement

#### Routine

Noutine	
Slice group	1
Slices	58
Dist. factor	0 %
Position	R1.2 P39.7 H47.8 mm
Orientation	Transversal
Phase enc. dir.	R >> L
AutoAlign	
Phase oversampling	0 %
FoV read	256 mm
FoV phase	100.0 %
Slice thickness	2.0 mm
TR	3500 ms
TE	78.0 ms
Concatenations	1
Filter	Raw filter, Prescan
	Normalize
Coil elements	PeH;PeN

#### **Contrast - Common**

TR	3500 ms
TE	78.0 ms
MTC	Off
Magn. preparation	None
Fat suppr. Fat sat. mode	Fat sat.
Fat sat. mode	Strong

## **Contrast - Dynamic**

Averaging mode	Long term
Reconstruction	Magnitude
Measurements	1
Delay in TR	0 ms
Multiple series	Off

## **Resolution - Common**

Accel mode	Slice eccel
Resolution - iPAT	
Interpolation	Off
Phase partial Fourier	7/8
Phase resolution	100 %
Base resolution	128
Slice thickness	2.0 mm
FoV phase	100.0 %
FoV read	256 mm

Accel. mode	Slice accel.
Accel. factor PE	2
Ref. lines PE	40

## **Resolution - iPAT**

Accel. factor slice	2
Reference scan mode	EPI/separate

#### **Resolution - Filter Image**

Distortion Corr.	Off	
Prescan Normalize	On	
Dynamic Field Corr.	Off	

#### **Resolution - Filter Rawdata**

Raw filter C	Dn
Elliptical filter C	Off

#### **Geometry - Common**

Slice group	1
Slices	58
Dist. factor	0 %
Position	R1.2 P39.7 H47.8 mm
Orientation	Transversal
Phase enc. dir.	R >> L
FoV read	256 mm
FoV phase	100.0 %
Slice thickness	2.0 mm
TR	3500 ms
Multi-slice mode	Interleaved
Series	Interleaved
Concatenations	1

## Geometry - AutoAlign

Slice group	1
Position	R1.2 P39.7 H47.8 mm
Orientation	Transversal
Phase enc. dir.	R >> L
AutoAlign	
Initial Position	R1.2 P39.7 H47.8
R	1.2 mm
Р	39.7 mm
н	47.8 mm
Initial Rotation	90.00 deg
Initial Orientation	Transversal

## **Geometry - Saturation**

Fat suppr.	Fat sat.
Fat sat. mode	Strong
Special sat.	None

## **Geometry - Navigator**

## **Geometry - Tim Planning Suite**

Set-n-Go Protocol	Off
Table position	Н
Table position	0 mm
Inline Composing	Off

#### System - Miscellaneous

•	
Positioning mode	FIX
Table position	Н
Table position	0 mm
MSMA	S - C - T
Sagittal	R >> L

# SIEMENS MAGNETOM Prisma

I		
<u>2</u>	System - Miscellaneous	
3	Coronal	A >> P
1	Transversal	F >> H
5	Coil Combine Mode	Adaptive Combine
5	Matrix Optimization	Performance
,	AutoAlign	
	Coil Select Mode	On - AutoCoilSelect
	System - Adjustments	
)	B0 Shim mode	Standard
1	B1 Shim mode	TrueForm
2	Adjust with body coil	Off
	Confirm freq. adjustment	Off
Ļ	Assume Dominant Fat	Off
5	Assume Silicone	Off
	Adjustment Tolerance	Auto
,	Adjustment Tolerance	Adio
3	System - Adjust Volume	
)	Position	R1.2 P39.7 H47.8 mm
)	Orientation	Transversal
	Rotation	90.00 deg
2	R >> L	256 mm
- 3	A >> P	256 mm
, 	F >> H	116 mm
	Reset	Off
5		
5	System - pTx Volumes	
7	B1 Shim mode	TrueForm
3	Excitation	Standard
)		
)	System - Tx/Rx	
	Frequency 1H	123.244318 MHz
	Correction factor	1
	Gain	High
ŀ	Img. Scale Cor.	1.000
5	Reset	Off
	? Ref. amplitude 1H	0.000 V
,	Physio - Signal1	
	1 st Signal/Mode	None
)	TR	3500 ms
)	Concatenations	1
	Concatenations	1
	Physio - PACE	
,	Resp. control	Off
	Concatenations	1
5		
7	Diff - Neuro	
3	Diffusion mode	MDDW
)	Diff. directions	6
	Diffusion Scheme	Monopolar
)	Diff. weightings	1
	b-value	0 s/mm²
	b-value	3
	Diff. weighted images	On
ł	Trace weighted images	Off
	ADC maps	Off
, ,	FA maps	Off
	Mosaic	Off
7	Tensor	Off
8	Naina laval	10

# Diff - Body

Noise level

Diffusion mode

# Diff - Body

Diff. directions	6
Diffusion Scheme	Monopolar
Diff. weightings	1
b-value	0 s/mm²
b-value	3
Diff. weighted images	On
Trace weighted images	Off
ADC maps	Off
Exponential ADC Maps	Off
FA maps	Off
Invert Gray Scale	Off
Calculated Image	Off
b-Value >=	0 s/mm²
Noise level	40

## **Diff - Composing**

Inline Composing	Off	
Distortion Corr.	Off	

## Sequence - Part 1

Introduction	Off
Optimization	None
Multi-slice mode	Interleaved
Free echo spacing	Off
Echo spacing	0.78 ms
Bandwidth	1446 Hz/Px

## Sequence - Part 2

RF pulse type Low SAR Gradient mode Normal Excitation Standard	EPI factor	128
		Low SAR
Excitation Standard	Gradient mode	Normal
Citation	Excitation	Standard

## Sequence - pTX Pulses



MDDW

#### SIEMENS MAGNETOM Prisma

## \\Study Protocols\BRAIN\Neonates\Theirworld - E161723\DTI\_Neonate\_v6b\_pt1 TA: 4:29 PM: FIX Voxel size: 2.0×2.0×2.0 mmPAT: 4 Rel. SNR: 1.00 : epse

## Properties

Prio recon	Off
Load images to viewer	On
Inline movie	Off
Auto store images	On
Load images to stamp segments	Off
Load images to graphic segments	Off
Auto open inline display	Off
Auto close inline display	Off
Start measurement without further preparation	Off
Wait for user to start	Off
Start measurements	Single measurement

## Routine

Slice group	1
Slices	58
Dist. factor	0 %
Position	R1.2 P39.7 H47.8 mm
Orientation	Transversal
Phase enc. dir.	L >> R
AutoAlign	
Phase oversampling	0 %
FoV read	256 mm
FoV phase	100.0 %
Slice thickness	2.0 mm
TR	3500 ms
TE	78.0 ms
Averages	1
Concatenations	1
Filter	Raw filter, Prescan Normalize
Coil elements	PeH;PeN

## **Contrast - Common**

TR	3500 ms
TE MTC	78.0 ms
MTC	Off
Magn. preparation	None
Fat suppr.	Fat sat.
Fat sat. mode	Strong

## **Contrast - Dynamic**

-	
Averages	1
Averaging mode	Long term
Reconstruction	Magnitude
Measurements	1
Delay in TR	0 ms
Multiple series	Off

## **Resolution - Common**

FoV read FoV phase	256 mm 100.0 %
Slice thickness	2.0 mm
Base resolution	128
Phase resolution	100 %
Phase partial Fourier	7/8
Interpolation	Off

# **Resolution - iPAT**

Accel. factor PE	2
Ref. lines PE	40
Accel. factor slice	2
Reference scan mode	EPI/separate

## **Resolution - Filter Image**

Distortion Corr.	Off	
Prescan Normalize	On	
Dynamic Field Corr.	Off	

## **Resolution - Filter Rawdata**

Raw filter	On	
Elliptical filter	Off	

## **Geometry - Common**

Slice group	1
Slices	58
Dist. factor	0 %
Position	R1.2 P39.7 H47.8 mm
Orientation	Transversal
Phase enc. dir.	L >> R
FoV read	256 mm
FoV phase	100.0 %
Slice thickness	2.0 mm
TR	3500 ms
Multi-slice mode	Interleaved
Series	Interleaved
Concatenations	1

# Geometry - AutoAlign

Slice group	1
Position	R1.2 P39.7 H47.8 mm
Orientation	Transversal
Phase enc. dir.	L >> R
AutoAlign	
Initial Position	R1.2 P39.7 H47.8
R	1.2 mm
Р	39.7 mm
н	47.8 mm
Initial Rotation	-90.00 deg
Initial Orientation	Transversal

## **Geometry - Saturation**

Fat suppr.	Fat sat.
Fat sat. mode	Strong
Special sat.	None

## Geometry - Navigator

## **Geometry - Tim Planning Suite**

Set-n-Go Protocol	Off
Table position	н
Table position	0 mm
Inline Composing	Off

## System - Miscellaneous

Positioning mode	FIX	
Table position	Н	
Table position	0 mm	

# For peer review only - http://bmjopen1.5mj.com/site/about/guidelines.xhtml

# SIEMENS MAGNETOM Prisma

1		
2	System - Miscellaneous	
3	MSMA	S - C - T
4	Sagittal	R >> L
5	Coronal	A >> P
6	Transversal	F >> H
7	Coil Combine Mode	Adaptive Combine
8	Matrix Optimization	Performance
9	AutoAlign	
9 10	Coil Select Mode	On - AutoCoilSelect
10	Sustam Adjustments	
12	System - Adjustments	
12	B0 Shim mode	Standard
13	B1 Shim mode	TrueForm
• •	Adjust with body coil	Off
15	Confirm freq. adjustment	Off
16	Assume Dominant Fat	Off
17	Assume Silicone	Off
18	Adjustment Tolerance	Auto
19	System Adjust Volume	
20	System - Adjust Volume	
21	Position	R1.2 P39.7 H47.8 mm
22	Orientation	Transversal
23	Rotation	-90.00 deg
24	R >> L	256 mm
25	A >> P	256 mm
26	F >> H	116 mm
27	Reset	Off
27	System - nTx Volumos	
20	System - pTx Volumes	
	B1 Shim mode	TrueForm
30	Excitation	Standard
31	Suctom Tx/Px	
32	System - Tx/Rx	
33	Frequency 1H	123.244318 MHz
34	Correction factor	1
35	Gain	High
36	Img. Scale Cor.	1.000
37	Reset	Off
38	? Ref. amplitude 1H	0.000 V
39	Physio - Signal1	
40		
41	1st Signal/Mode	None
42	TR	3500 ms
43	Concatenations	1
44	Physio - PACE	
45	-	~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~
46	Resp. control	Off
47	Concatenations	1
48	Diff - Neuro	
49		
	Diffusion mode	Free
50	Diff. directions	71
51	Diffusion Scheme	Monopolar
52	Diff. weightings	2 0. a/mm <sup>2</sup>
53	b-value 1	0 s/mm <sup>2</sup>
54	b-value 2	750 s/mm <sup>2</sup>
55	b-value 1	1
56	b-value 2	1 On
57	Diff. weighted images	On Off
58	Trace weighted images	Off Off
59	ADC maps FA maps	Off
60	FA maps Mosaic	Off On
	Tanaar	On Off

Tensor

## Diff - Neuro

Diff - Neuro		
Noise level	40	
Diff - Body		
Diffusion mode	Free	
Diff. directions	71	
Diffusion Scheme	Monopolar	
Diff. weightings	2	
b-value 1	0 s/mm²	
b-value 2	750 s/mm <sup>2</sup>	
b-value 1	1	
b-value 2	1	
Diff. weighted images	On	
Trace weighted images	Off	
ADC maps	Off	
Exponential ADC Maps	Off	
FA maps	Off	
Invert Gray Scale	Off	
Calculated Image	Off	
b-Value >=	0 s/mm <sup>2</sup>	
Noise level	40	

## **Diff - Composing**

Inline Composing	Off	
Distortion Corr.	Off	

## Sequence - Part 1

Introduction	Off
Optimization	None
Multi-slice mode	Interleaved
Free echo spacing	Off
Echo spacing	0.78 ms
Bandwidth	1446 Hz/Px

## Sequence - Part 2

EPI factor	128
RF pulse type	Low SAR
Gradient mode	Normal
Excitation	Standard

## Sequence - pTX Pulses



Off

#### SIEMENS MAGNETOM Prisma

## \\Study Protocols\BRAIN\Neonates\Theirworld - E161723\DTI\_Neonate\_v6b\_pt2 TA: 5:01 PM: FIX Voxel size: 2.0×2.0×2.0 mmPAT: 4 Rel. SNR: 1.00 : epse

## Properties

Prio recon	Off
Load images to viewer	On
Inline movie	Off
Auto store images	On
Load images to stamp segments	Off
Load images to graphic segments	Off
Auto open inline display	Off
Auto close inline display	Off
Start measurement without further preparation	Off
Wait for user to start	Off
Start measurements	Single measurement

#### Routine

· · · · · · · · · · · · · · · · · · ·	
Slice group	1
Slices	58
Dist. factor	0 %
Position	R1.2 P39.7 H47.8 mm
Orientation	Transversal
Phase enc. dir.	L >> R
AutoAlign	
Phase oversampling	0 %
FoV read	256 mm
FoV phase	100.0 %
Slice thickness	2.0 mm
TR	3500 ms
TE	78.0 ms
Averages	1
Concatenations	1
Filter	Raw filter, Prescan Normalize
Coil elements	PeH;PeN

#### **Contrast - Common**

TR	3500 ms	
TE MTC	78.0 ms	
MTC	Off	
Magn. preparation	None	
Fat suppr. Fat sat. mode	Fat sat.	
Fat sat. mode	Strong	

#### **Contrast - Dynamic**

_	-	
ſ	Averages	1
	Averaging mode	Long term
	Reconstruction	Magnitude
	Measurements	1
	Delay in TR	0 ms
	Multiple series	Off

#### **Resolution - Common**

FoV read	256 mm
FoV phase	100.0 %
Slice thickness	2.0 mm
Base resolution	128
Phase resolution	100 %
Phase partial Fourier	7/8
Interpolation	Off

#### **Resolution - iPAT**

Accel. factor PE	2
Ref. lines PE	40
Accel. factor slice	2
Reference scan mode	EPI/separate

#### **Resolution - Filter Image**

Distortion Corr.	Off
Prescan Normalize	On
Dynamic Field Corr.	Off

#### **Resolution - Filter Rawdata**

Raw filter	On	
Elliptical filter	Off	

#### **Geometry - Common**

Slice group	1
Slices	58
Dist. factor	0 %
Position	R1.2 P39.7 H47.8 mm
Orientation	Transversal
Phase enc. dir.	L >> R
FoV read	256 mm
FoV phase	100.0 %
Slice thickness	2.0 mm
TR	3500 ms
Multi-slice mode	Interleaved
Series	Interleaved
Concatenations	1

## Geometry - AutoAlign

Slice group	1
	1
Position	R1.2 P39.7 H47.8 mm
Orientation	Transversal
Phase enc. dir.	L >> R
AutoAlign	
Initial Position	R1.2 P39.7 H47.8
R	1.2 mm
Р	39.7 mm
н	47.8 mm
Initial Rotation	-90.00 deg
Initial Orientation	Transversal

#### **Geometry - Saturation**

Fat suppr.	Fat sat.
Fat sat. mode	Strong
Special sat.	None

#### **Geometry - Navigator**

#### **Geometry - Tim Planning Suite**

Set-n-Go Protocol	Off
Table position	Н
Table position	0 mm
Inline Composing	Off

#### System - Miscellaneous

Positioning mode	FIX
Table position	Н
Table position	0 mm

# SIEMENS MAGNETOM Prisma

1		
2	System - Miscellaneous	
3	MSMA	S - C - T
4	Sagittal	R >> L
5	Coronal	A >> P
6	Transversal	F >> H
7	Coil Combine Mode	Adaptive Combine
8	Matrix Optimization	Performance
9	AutoAlign	
10	Coil Select Mode	On - AutoCoilSelect
11	System - Adjustments	
12	System - Adjustments	
13	B0 Shim mode	Standard
14	B1 Shim mode	TrueForm
15	Adjust with body coil	Off
	Confirm freq. adjustment	Off
16	Assume Dominant Fat	Off
17	Assume Silicone	Off
18	Adjustment Tolerance	Auto
19	System - Adjust Volume	
20		
21	Position	R1.2 P39.7 H47.8 mm
22	Orientation	Transversal
23	Rotation	-90.00 deg
24	R >> L	256 mm
25	A >> P	256 mm
26	F>>H	116 mm
27	Reset	Off
28	System - pTx Volumes	
29		
30	B1 Shim mode	TrueForm
31	Excitation	Standard
32	System - Tx/Rx	
33	Frequency 1H	123.244318 MHz
34	Correction factor	1
35	Gain	High
36	Img. Scale Cor. Reset	1.000 Off
37		0.000 V
38	? Ref. amplitude 1H	0.000 V
39	Physio - Signal1	
40	1st Signal/Mode	None
41	TR	3500 ms
42	Concatenations	1
43	Concatenations	1
44	Physio - PACE	
45	Resp. control	Off
46	Concatenations	1
47	Concatchations	1
48	Diff - Neuro	
49	Diffusion mode	Free
50	Diff. directions	80
50	Diffusion Scheme	Monopolar
	Diff. weightings	2
52	b-value 1	2 0 s/mm <sup>2</sup>
53	b-value 2	2500 s/mm <sup>2</sup>
54	b-value 2	1
55	b-value 2	1
56	Diff. weighted images	On
57	Trace weighted images	Off
58	ADC maps	Off
59	FA maps	Off
60	Mosaic	On
	Tensor	Off

## Diff - Neuro

Diff - Neuro		
Noise level	40	
Diff - Body		
Diffusion mode	Free	
Diff. directions	80	
Diffusion Scheme	Monopolar	
Diff. weightings	2	
b-value 1	0 s/mm <sup>2</sup>	
b-value 2	2500 s/mm <sup>2</sup>	
b-value 1	1	
b-value 2	1	
Diff. weighted images	On	
Trace weighted images	Off	
ADC maps	Off	
Exponential ADC Maps	Off	
FA maps	Off	
Invert Gray Scale	Off	
Calculated Image	Off	
_		

## **Diff - Composing**

b-Value >=

Noise level

Inline Composing	Off	
Distortion Corr.	Off	

0 s/mm<sup>2</sup>

40

## Sequence - Part 1

Introduction	Off
Optimization	None
Multi-slice mode	Interleaved
Free echo spacing	Off
Echo spacing	0.78 ms
Bandwidth	1446 Hz/Px

## Sequence - Part 2

EPI factor	128
RF pulse type	Low SAR
Gradient mode	Normal
Excitation	Standard

## Sequence - pTX Pulses



Off

Tensor

#### SIEMENS MAGNETOM Prisma

## \\Study Protocols\BRAIN\Neonates\Theirworld - E161723\MPRAGE-v4

TA: 3:09 PM: FIX Voxel size: 1.0×1.0×1.0 mmPAT: 2 Rel. SNR: 1.00 : tfl

## Properties

Prio recon	Off
Load images to viewer	On
Inline movie	Off
Auto store images	On
Load images to stamp segments	On
Load images to graphic segments	Off
Auto open inline display	Off
Auto close inline display	Off
Start measurement without further preparation	Off
Wait for user to start	Off
Start measurements	Single measurement

#### Routine

Slab group	1
Slabs	1
Dist. factor	50 %
Position	R1.1 P38.9 F20.7 mm
Orientation	Sagittal
Phase enc. dir.	A >> P
AutoAlign	
Phase oversampling	20 %
Slice oversampling	0.0 %
Slices per slab	160
FoV read	160 mm
FoV phase	100.0 %
Slice thickness	1.00 mm
TR	1970.0 ms
TE	4.69 ms
Averages	1
Concatenations	1
Filter	Prescan Normalize
Coil elements	PeH;PeN;SP1

#### **Contrast - Common**

TR		1970.0 ms
TE		4.69 ms
Magn.	preparation	Non-sel. IR
ΤI		1100 ms
Flip ar	ngle	9 deg
Fat su	ppr.	None
Water	suppr.	None

#### **Contrast - Dynamic**

Averages	1
Averaging mode	Long term
Reconstruction	Magnitude
Measurements	1
Multiple series	Each measurement

#### **Resolution - Common**

FoV read	160 mm
FoV phase	100.0 %
Slice thickness	1.00 mm
Base resolution	160
Phase resolution	100 %
Slice resolution	100 %
Phase partial Fourier	7/8
Slice partial Fourier	Off
Interpolation	Off

#### **Resolution - iPAT**

PAT mode	GRAPPA
Accel. factor PE	2
Ref. lines PE	24
Accel. factor 3D	1
Reference scan mode	Integrated

## **Resolution - Filter Image**

Image Filter	Off	
Distortion Corr.	Off	
Prescan Normalize	On	
Unfiltered images	Off	
Normalize	Off	
B1 filter	Off	

#### **Resolution - Filter Rawdata**

Raw filter	Off	
Elliptical filter	Off	

#### **Geometry - Common**

_	
Slab group	1
Slabs	1
Dist. factor	50 %
Position	R1.1 P38.9 F20.7 mm
Orientation	Sagittal
Phase enc. dir.	A >> P
Slice oversampling	0.0 %
Slices per slab	160
FoV read	160 mm
FoV phase	100.0 %
Slice thickness	1.00 mm
TR	1970.0 ms
Multi-slice mode	Single shot
Series	Interleaved
Concatenations	1

#### **Geometry - AutoAlign**

Slab group	1
Position	R1.1 P38.9 F20.7 mm
Orientation	Sagittal
Phase enc. dir.	A >> P
AutoAlign	
Initial Position	R1.1 P38.9 F20.7
R	1.1 mm
Р	38.9 mm
F	20.7 mm
Initial Rotation	0.00 deg
Initial Orientation	Sagittal

#### **Geometry - Navigator**

#### **Geometry - Tim Planning Suite**

Set-n-Go Protocol	Off
Table position	Н
Table position	0 mm
Inline Composing	Off

#### System - Miscellaneous

•	
Positioning mode	FIX
Table position	Н
Table position	0 mm

# BMJ Open

## SIEMENS MAGNETOM Prisma

1		
2	System - Miscellaneous	Inl
3	MSMA	S - C - T Sa
4	Sagittal	R >> L
5	Coronal	A >> P Inl
6	Transversal	F>>H
7	Coil Combine Mode	Adaptive Combine MI
8	Save uncombined	Off MI
9	Matrix Optimization Coil Focus	
10	AutoAlign	Flat Sa
11	Coil Select Mode	On - AutoCoilSelect
12		Inl
13	System - Adjustments	Di
14	B0 Shim mode	Standard
15	B1 Shim mode	TrueForm In
16	Adjust with body coil	Off Sa
17	Confirm freq. adjustment	Off Ma
18	Assume Dominant Fat	Off Fli
19	Assume Silicone Adjustment Tolerance	Off Me
20	Adjustment Tolerance	
21	System - Adjust Volume	TE
22 23	Position	R1.1 P38.9 F20.7 mm
23 24	Orientation	Sagittal
24 25	Rotation	0.00 deg
25 26	A >> P	160 mm
20 27	F >> H	160 mm Re
27 28	R >> L	160 mm As
28 29	Reset	Off Flo
30	System - pTx Volumes	Mu
30	B1 Shim mode	TrueForm
32	Excitation	TrueForm Non-sel.
33	Exolution	Se
34	System - Tx/Rx	RE
35	Frequency 1H	123.244318 MHz Gr
36	Correction factor	1 Ex
37	Gain	Low
38	Img. Scale Cor.	4.000 Inc
39	Reset	Off Tu
40	? Ref. amplitude 1H	0.000 V
41	Physio - Signal1	Se
42	1st Signal/Mode	None
43	TR	1970.0 ms
44	Concatenations	1
45		
46	Physio - Cardiac	
47	Magn. preparation	Non-sel. IR
48		1100 ms
49	Fat suppr.	None
50	Dark blood	Off
51	FoV read	160 mm
52	FoV phase Phase resolution	100.0 % 100 %
53		100 /0
54	Physio - PACE	
55	Resp. control	Off
56	Concatenations	1
57	, <sup>_</sup>	
58 50	Inline - Common	
59 60	Subtract	Off
60	Measurements	1
	StdDev	Off

## line - Common

	Save original images	On
--	----------------------	----

#### line - MIP

MIP-Sag	Off	
MIP-Cor	Off	
MIP-Tra	Off	
MIP-Time	Off	
Save original images	On	

## line - Composing

Inline Composing	Off	
Distortion Corr.	Off	

## line - Maplt

Save original images	On
MapIt	None
Flip angle	9 deg
Measurements	1
TR	1970.0 ms
TE	4.69 ms

## equence - Part 1

Introduction	On
Dimension	3D
Elliptical scanning	Off
Reordering	Linear
Asymmetric echo	Off
Flow comp.	No
Multi-slice mode	Single shot
Echo spacing	10.8 ms
Bandwidth	140 Hz/Px

## equence - Part 2

RF pulse type	Normal
Gradient mode	Whisper
Excitation	Non-sel.
RF spoiling	On
Incr. Gradient spoiling	Off
Turbo factor	160

Off

## equence - Assistant

lode



#### SIEMENS MAGNETOM Prisma

## \\Study Protocols\BRAIN\Neonates\Theirworld - E161723\SWI\_v2

TA: 2:23 PM: FIX Voxel size: 0.8×0.8×3.0 mmPAT: 3 Rel. SNR: 1.00 : qswi\_r

## Properties

Prio recon	Off
Load images to viewer	On
Inline movie	Off
Auto store images	On
Load images to stamp segments	Off
Load images to graphic segments	Off
Auto open inline display	Off
Auto close inline display	Off
Start measurement without further preparation	Off
Wait for user to start	Off
Start measurements	Single measurement

#### Routine

Roatino	
Slab group	1
Slabs	1
Dist. factor	20 %
Position	L0.0 A2.3 H2.2 mm
Orientation	Transversal
Phase enc. dir.	R >> L
AutoAlign	
Phase oversampling	0 %
Slice oversampling	20.0 %
Slices per slab	40
FoV read	240 mm
FoV phase	84.4 %
Slice thickness	3.00 mm
TR	28.0 ms
TE	20.00 ms
Averages	1
Concatenations	1
Filter	Prescan Normalize
Coil elements	HEA;HEP

#### **Contrast - Common**

TR	28.0 ms
TE	20.00 ms
MTC	Off
Magn. preparation	None
Flip angle	9 deg
Fat suppr.	None
Fat suppr. Water suppr.	None
SWI	On

#### **Contrast - Dynamic**

Averages	1
Averaging mode	Short term
Reconstruction	Magn./Phase
Measurements	1
Multiple series	Each measurement

#### **Resolution - Common**

FoV read	240 mm
FoV phase	84.4 %
Slice thickness	3.00 mm
Base resolution	320
Phase resolution	100 %
Slice resolution	100 %
Phase partial Fourier	Off
Slice partial Fourier	Off

## **Resolution - Common**

Interpolation		
Interpolation	Off	

## Resolution - iPAT

PAT mode	GRAPPA
Accel. factor PE	3
Ref. lines PE	24
Accel. factor 3D	1
Reference scan mode	Integrated

#### **Resolution - Filter Image**

Image Filter	Off	
Distortion Corr.	Off	
Prescan Normalize	On	
Unfiltered images	Off	
Normalize	Off	
B1 filter	Off	

#### **Resolution - Filter Rawdata**

Raw filter	Off	
Elliptical filter	Off	

#### Geometry - Common

Slab group	1
Slabs	1
Dist. factor	20 %
Position	L0.0 A2.3 H2.2 mm
Orientation	Transversal
Phase enc. dir.	R >> L
Slice oversampling	20.0 %
Slices per slab	40
FoV read	240 mm
FoV phase	84.4 %
Slice thickness	3.00 mm
TR	28.0 ms
Multi-slice mode	Interleaved
Series	Interleaved
Concatenations	1

## Geometry - AutoAlign

Slab group	1
Position	L0.0 A2.3 H2.2 mm
Orientation	Transversal
Phase enc. dir.	R >> L
AutoAlign	
Initial Position	L0.0 A2.3 H2.2
L	0.0 mm
A	2.3 mm
н	2.2 mm
Initial Rotation	89.61 deg
Initial Orientation	Transversal

## **Geometry - Saturation**

Saturation mode	Standard
Fat suppr.	None
Water suppr.	None
Special sat.	None

#### **Geometry - Tim Planning Suite**

Set-n-Go Protocol	Off
Table position	Н

## **BMJ** Open

# SIEMENS MAGNETOM Prisma

<b>Geometry - Tim Planning S</b>	Suite
Table position	0 mm
Inline Composing	Off
System - Miscellaneous	
Positioning mode	FIX
Table position	Н
Table position	0 mm
MSMA	S - C - T
Sagittal	R >> L
Coronal	A >> P
Transversal	F >> H
Coil Combine Mode	Adaptive Combine
Save uncombined	Off
Matrix Optimization	Off
AutoAlign	
Coil Select Mode	On - AutoCoilSelect
System - Adjustments	
B0 Shim mode	Standard
B1 Shim mode	TrueForm
Adjust with body coil	Off
Confirm freq. adjustment	Off
Assume Dominant Fat	Off
Assume Silicone	Off
Adjustment Tolerance	Auto
System - Adjust Volume	
Position	L0.0 A2.3 H2.2 mm
Orientation	Transversal
Rotation	89.61 deg
R >> L	203 mm
A >> P	240 mm
F >> H	120 mm
Reset	Off
Neset	
System - pTx Volumes	
B1 Shim mode	TrueForm
	Slab-sel.
Excitation	Slab-sei.
System - Tx/Rx	
	100 044048 MIL-
Frequency 1H Correction factor	123.244318 MHz 1
	-
Gain	Low
Img. Scale Cor.	1.000
Reset	Off
? Ref. amplitude 1H	0.000 V
Physic - Signal	
Physio - Signal1	
1st Signal/Mode	None
TR	28.0 ms
Concatenations	1
Segments	1
Physio - Cardiac	
Tagging	None
	None
Magn. preparation	
Magn. preparation Fat suppr.	None
	None Off
Fat suppr.	
Fat suppr. Dark blood FoV read	Off
Fat suppr. Dark blood	Off 240 mm

## **Physio - PACE**

,	
Resp. control	Off
Concatenations	1

## Inline - Common

Subtract	Off
Measurements	1
StdDev	Off
Liver registration	Off
Save original images	On

#### Inline - MIP

MIP-Sag	Off
MIP-Cor	Off
MIP-Tra	Off
MIP-Time	Off
Save original images	On

## Inline - Soft Tissue

Wash - In	Off
Wash - Out	Off
TTP	Off
PEI	Off
MIP - time	Off
Measurements	1

## **Inline - Composing**

Inline Composing	Off	
Distortion Corr.	Off	

## Inline - Maplt

Save original images	On
MapIt	None
Flip angle	9 deg
Measurements	1
Contrasts	1
TR	28.0 ms
TE	20.00 ms

## Sequence - Part 1

Introduction	On
Dimension	3D
Elliptical scanning	Off
Phase stabilisation	Off
Asymmetric echo	Off
Contrasts	1
Flow comp.	Yes
Multi-slice mode	Interleaved
Bandwidth	120 Hz/Px

#### Sequence - Part 2

Segments	1
Acoustic noise reduction	Active
RF pulse type	Fast
Gradient mode	Whisper
Excitation	Slab-sel.
RF spoiling	On

## Sequence - Assistant

Mode	Off
Allowed delay	30 s

## \\Study Protocols\BRAIN\Neonates\Theirworld - E161723\t2\_blade\_dark-fluid\_tra\_v3 TA: 3:22 PM: REF Voxel size: 0.9×0.9×3.0 mmPAT: 2 Rel. SNR: 1.00 : qtirB\_rr

## **Properties**

Prio recon	Off
Load images to viewer	On
Inline movie	Off
Auto store images	On
Load images to stamp segments	On
Load images to graphic segments	Off
Auto open inline display	Off
Auto close inline display	Off
Start measurement without further preparation	Off
Wait for user to start	Off
Start measurements	Single measurement

## Routine

Routine	
Slice group	1
Slices	40
Dist. factor	0 %
Position	Isocenter
Orientation	Transversal
Phase enc. dir.	R >> L
AutoAlign	
Phase oversampling	0.0 %
FoV read	240 mm
FoV phase	100.0 %
Slice thickness	3.0 mm
TR	10000.0 ms
TE	130 ms
Averages	1
Concatenations	2
Filter	Prescan Normalize
Coil elements	HEA;HEP

## **Contrast - Common**

TR	10000.0 ms
TE	130 ms
TD	0.0 ms
MTC	Off
Magn. preparation	Slice-sel. IR
ТІ	2606 ms
Flip angle	130 deg
Fat suppr.	Fat sat.
Fat sat. mode	Strong
Water suppr.	None
Restore magn.	Off
Freeze suppressed tissue	On

# **Contrast - Dynamic**

Averages	1
Averaging mode	Short term
Reconstruction	Magnitude
Measurements	1
Multiple series	Each measurement

# **Resolution - Common**

FoV read	240 mm
FoV phase	100.0 %
Slice thickness	3.0 mm
Base resolution	256
BLADE coverage	100.0 %
Trajectory	BLADE

# **Resolution - Common**

Interpolation	Off

# **Resolution - iPAT**

RAPPA
itegrated
ľ

## **Resolution - Filter Image**

Image Filter	Off	
Distortion Corr.	Off	
Prescan Normalize	On	
Unfiltered images	Off	
Normalize	Off	
B1 filter	Off	

## **Resolution - Filter Rawdata**

Raw filter	Off	
Elliptical filter	Off	

## **Geometry - Common**

Slice group	1
Slices	40
Dist. factor	0 %
Position	Isocenter
Orientation	Transversal
Phase enc. dir.	R >> L
FoV read	240 mm
FoV phase	100.0 %
Slice thickness	3.0 mm
TR	10000.0 ms
Multi-slice mode	Interleaved
Series	Interleaved
Concatenations	2

## **Geometry - AutoAlign**

Slice group	1
Position	Isocenter
Orientation	Transversal
Phase enc. dir.	R >> L
AutoAlign	
Initial Position	Isocenter
L	0.0 mm
Р	0.0 mm
н	0.0 mm
Initial Rotation	90.00 deg
Initial Orientation	Transversal

## **Geometry - Saturation**

Fat suppr.	Fat sat.
Fat sat. mode	Strong
Water suppr.	None
Restore magn.	Off
Special sat.	Parallel F
Gap	10 mm
Thickness	70 mm

#### **Geometry - Navigator**

#### **BMJ** Open

#### SIEMENS MAGNETOM Prisma

1		4
2	Geometry - Tim Planning Sui	
3	Set-n-Go Protocol	Off
4	Table position	Н
5	Table position	0 mm
6	Inline Composing	Off
7	System - Miscellaneous	
8	Positioning mode	REF
9	Table position	H
10	Table position	0 mm
11	MSMA	S - C - T
12	Sagittal	R >> L
13	Coronal	A >> P
14	Transversal	F >> H
15	Coil Combine Mode	Adaptive Combine
16	Save uncombined	Off
17	Matrix Optimization	Off
18	AutoAlign	
19	Coil Select Mode	On - AutoCoilSelect
20	System - Adjustments	
21	System - Adjustments	
22	B0 Shim mode	Standard
23	B1 Shim mode	TrueForm
24	Adjust with body coil	Off Off
25	Confirm freq. adjustment	Off Off
26	Assume Dominant Fat Assume Silicone	Off Off
27	Adjustment Tolerance	Auto
28		71010
29	System - Adjust Volume	
30	Position	Isocenter
31	Orientation	Transversal
32	Rotation	90.00 deg
33	R >> L	240 mm
34	A >> P	240 mm
35	F >> H	120 mm
36	Reset	Off
37		
38	System - pTx Volumes	
39	B1 Shim mode	TrueForm
40	System - Tx/Rx	
41	•	
42	Frequency 1H	123.244318 MHz
43	Correction factor	1 1 (internet)
44	Gain Img. Scale Cor.	High 1.000
45	Reset	Off
46	? Ref. amplitude 1H	0.000 V
47		0.000 V
48	Physio - Signal1	
49	1st Signal/Mode	None
50	TR	10000.0 ms
51	Concatenations	2
52		
53	Physio - Cardiac	
54	Magn. preparation	Slice-sel. IR
55	ТІ	2606 ms
56	Fat suppr.	Fat sat.
50 57	Dark blood	Off
58	FoV read	240 mm
58 59	FoV phase	100.0 %
60	BLADE coverage Trajectory	100.0 % BLADE
	Пајескогу	

## **Physio - PACE** D,

	Resp. control	Off
Concatenations		2

## Inline - Common

Subtract	Off
Measurements	1
StdDev	Off
Save original images	On

## Inline - MIP

MIP-Sag MIP-Cor	Off	
MIP-Cor	Off	
MIP-Tra	Off	
MIP-Time	Off	
Save original images	On	

# Inline - Composing

	-
Inline Composing	Off
Distortion Corr.	Off

## Sequence - Part 1

Introduction	On
Dimension	2D
Compensate T2 decay	Off
Contrasts	1
Flow comp.	Read
Multi-slice mode	Interleaved
Free echo spacing	Off
Echo spacing	8.64 ms
Bandwidth	362 Hz/Px

## Sequence - Part 2

-	
Define	Turbo factor
Echo trains per slice	9
Phase correction	Automatic
Acoustic noise reduction	Active
RF pulse type	Low SAR
Gradient mode	Normal
Hyperecho	Off
WARP	Off
Motion correction	On
Red. EC sensitivity	Off
Turbo factor	28

# Sequence - Assistant

-	
Mode	Min flip angle
Min flip angle	130 deg
Allowed delay	30 s

1	
1 2	
3	# Authors represent m (Michael Thringlater) manually adited
4	<pre># Author: qspace2siemens.m (Michael Thrippleton), manually edited</pre>
5	into 2 parts
6	<pre># Source file: ./vector_tables/neonate/04-shells-3-6-64-64.txt</pre>
7	# b-value at UI: 750
8	<pre># non-zero b-values: 750</pre>
9	<pre># number of non-zero shells: 1</pre>
10	<pre># number of directions per non-zero shell: 64</pre>
11	<pre># number of b=0 volumes: 7</pre>
12	<pre># total number of directions including b0: 71</pre>
13	[directions=71]
14	normalization = none
15	coordinatesystem = xyz
16	comment=bUI: 750, b: 750, Nb0: 7
17	vector[0] = ( 0.000000, 0.000000, 0.000000 )
18	vector[1] = ( -0.538981, 0.033731, -0.091439 )
19	vector[2] = ( -0.000440, 0.429608, 0.339760 )
20	vector[3] = ( -0.147395, -0.494556, -0.183546 )
21	vector[4] = ( 0.239035, -0.347062, 0.349872 )
22	vector[5] = ( -0.016278, -0.195328, 0.511451 )
23 24	vector[6] = ( -0.061295, -0.451376, 0.304143 )
25	vector[7] = ( 0.025626, -0.008709, -0.547053 )
26	vector[8] = ( -0.231133, -0.471788, 0.154896 )
27	vector[9] = ( -0.397538, -0.105537, -0.361699 )
28	vector[10] = ( 0.447399, -0.280126, -0.146162 )
29	vector[11] = ( 0.000000, 0.000000, 0.000000 )
30	vector[12] = ( -0.347344, -0.305418, 0.293379 )
31	vector[13] = ( 0.195148, -0.224679, 0.459823 )
32	vector[14] = ( 0.219722, 0.401006, -0.301523 )
33	vector[15] = ( 0.496386, 0.051099, 0.225809 )
34	vector[16] = ( -0.490022, 0.181524, -0.164098 )
35	vector[17] = ( 0.415886, 0.250359, 0.253691 )
36	vector[18] = ( 0.293795, 0.319409, 0.334159 )
37	vector[19] = ( 0.446457, -0.091032, 0.303955 )
38	vector[20] = ( 0.218923, -0.268898, -0.423989 )
39	vector[21] = ( -0.245685, -0.236576, 0.428568 )
40 41	vector[22] = ( 0.000000, 0.000000, 0.000000 )
41	vector[23] = ( 0.023434, -0.514342, -0.186823 )
43	vector[24] = ( 0.210090, -0.495890, -0.099773 )
44	vector[25] = ( 0.127918, 0.282591, 0.451419 )
45	vector[26] = ( -0.497742, -0.190842, -0.125826 )
46	vector[27] = ( -0.352216, -0.116300, 0.403012 )
47	vector[28] = ( -0.439047, 0.004691, 0.327438 )
48	vector[29] = ( 0.143700, -0.138995, -0.509932 )
49	vector[30] = (-0.483604, 0.256940, -0.010438)
50	vector[31] = (0.536886, 0.108072, -0.008594)
51	vector[32] = ( -0.113008, -0.337640, 0.416207 )
52	vector[33] = ( 0.000000, 0.000000, 0.000000 )
53	vector[34] = (0.346021, -0.402459, -0.135263)
54	vector[35] = ( -0.172278, 0.446108, 0.267035 )
55	vector[36] = (-0.309270, 0.076830, -0.445476)
56	vector[37] = ( 0.274066, -0.423055, 0.214272 )
57	vector[38] = ( 0.052227, -0.321802, 0.440132 )
58 59	vector[39] = (0.075465, 0.519169, -0.157382)
60	vector[40] = ( 0.152874, 0.405328, 0.335170 )
00	

2	
3	vector[41] = ( 0.109576, 0.536320, 0.018825 )
4	vector[42] = ( -0.045652, 0.300780, 0.455464 )
5	vector[43] = (0.000000, 0.000000, 0.0000000)
6	vector[44] = (-0.533887, 0.114345, 0.043471)
7	vector[45] = (-0.097529, 0.434255, -0.319235)
8	vector[46] = (0.391774, -0.236122, -0.301263)
9	vector[47] = (0.399513, -0.317429, 0.199068)
10	vector[48] = (0.200167, 0.067226, 0.505385)
11	
12	vector $[49] = (0.385668, -0.387145, 0.037137)$
13	vector $[50] = (0.059543, 0.145424, 0.524697)$
14	vector $[51] = (-0.445546, -0.189946, 0.255752)$
15	vector[52] = ( 0.263180, -0.007998, -0.480284 )
16	vector[53] = ( -0.375132, -0.375662, 0.134735 )
17	vector[54] = ( 0.000000, 0.000000, 0.000000 )
18	vector[55] = (-0.100958, 0.513042, -0.163080 )
19	vector[56] = ( 0.266095, 0.478340, 0.019604 )
20	vector[57] = ( 0.480516, -0.133538, -0.226434 )
21	vector[58] = ( 0.253431, -0.482875, 0.051025 )
22	vector[59] = ( 0.361384, -0.227994, 0.342667 )
23	vector[60] = ( -0.479164, -0.248769, 0.092279 )
24	vector[61] = (-0.422438, -0.343026, -0.062282)
25	vector[62] = ( 0.525823, 0.037772, -0.148605 )
26	vector[63] = (0.112166, -0.092301, 0.528109)
27	vector[64] = (0.050487, -0.545354, 0.006363)
28	vector[65] = (0.000000, 0.000000, 0.000000)
29	vector[66] = (-0.290577, 0.355116, 0.299095)
30	vector[67] = (-0.303506, -0.415037, -0.188755)
31	vector[68] = (-0.340501, 0.129187, 0.409109)
32 33	vector[69] = (-0.275521, -0.188617, -0.434179)
33 34	vector[70] = (0.148849, 0.097956, -0.517928)
35	Vector[70] = (0.140049, 0.097950, -0.517920)
36	
37	
38	
50	

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1	
2 3	
4	<pre># Author: qspace2siemens.m (Michael Thrippleton), manually edited</pre>
5	into 2 parts
6	<pre># Source file: ./vector_tables/neonate/04-shells-3-6-64-64.txt</pre>
7	# b-value at UI: 2500
8	# non-zero b-values: 200 500 2500
9	<pre># number of non-zero shells: 2</pre>
10	<pre># number of directions per non-zero shell: 3 6 64</pre>
11	# number of b=0 volumes: 7
12	<pre># total number of directions including b0: 151</pre>
13	[directions=80]
14	normalization = none
15	coordinatesystem = xyz
16	comment=bUI: 2500, b: 200 500 2500, Nb0: 7
17	vector[0] = ( 0.000000, 0.000000, 0.000000 )
18	vector[1] = ( 0.252007, 0.053675, -0.116668 )
19	vector[2] = ( 0.118341, -0.013011, 0.256566 )
20	vector[3] = ( 0.047528, -0.276133, -0.038625 )
21	vector[4] = (-0.303298, -0.002700, -0.328638)
22	vector[5] = ( -0.128927, -0.159163, 0.397549 )
23	vector[6] = ( 0.288240, 0.341931, 0.000938 )
24	vector[7] = ( -0.166829, 0.397185, -0.120052 )
25	vector[8] = ( -0.069301, 0.303423, 0.321142 )
26	vector[9] = (0.425645, -0.074339, -0.115324)
27	vector[10] = ( 0.391424, -0.221918, 0.893051 )
28	vector[11] = ( 0.458593, -0.241695, -0.855147 )
29	vector[12] = ( 0.354539, 0.919288, 0.170913 )
30 31	vector[13] = (0.495263, -0.780339, -0.381819)
32	vector[14] = (-0.574230, 0.458191, 0.678470)
33	vector[15] = (0.000000, 0.000000, 0.000000)
34	vector[16] = (-0.188453, -0.033220, -0.981520)
35	vector[17] = (0.594951, -0.772279, 0.222754)
36	vector[18] = (0.076963, -0.202692, -0.976213)
37	vector[19] = (-0.354234, 0.663631, 0.658872)
38	vector[20] = ( -0.245839, 0.923577, 0.294225 )
39	vector[21] = (-0.646526, -0.378550, -0.662347)
40	vector[22] = ( 0.782685, 0.616196, -0.087788 )
41	vector[23] = ( -0.102171, -0.675368, -0.730369 )
42	vector[24] = ( -0.593833, 0.627627, -0.503435 )
43	vector[25] = (-0.289839, 0.954652, -0.068065)
44	vector[26] = ( 0.000000, 0.000000, 0.0000000 )
45	vector[27] = (0.932852, 0.268018, -0.240735)
46	vector[28] = ( -0.292661, 0.011816, 0.956143 )
47	vector[29] = (-0.125932, -0.877649, -0.462465)
48 49	vector[30] = ( 0.287138, 0.947828, -0.138468 )
49 50	vector[31] = ( -0.400507, -0.785392, -0.471967 )
51	vector[32] = ( 0.046561, 0.178494, -0.982839 )
52	vector[33] = (0.774106, -0.243372, -0.584405)
53	vector[34] = ( -0.709331, 0.570685, 0.413724 )
54	vector[35] = ( 0.258673, -0.649858, 0.714684 )
55	vector[36] = (0.000000, 0.000000, 0.000000)
56	vector[37] = (0.812504, 0.520520, 0.262482)
57	vector[38] = (-0.551995, -0.116325, -0.825694)
58	vector[39] = (-0.680119, 0.223136, -0.698319)
59	vector[40] = (-0.848362, -0.280672, -0.448893)
60	Vector [+0] = ( 010+0302; 01200072; 014+0033 /

1	
2	
3	$v_{0} = v_{0} = (0.460227 - 0.220447 - 0.957271)$
4	vector[41] = (-0.460227, -0.230447, 0.857371)
5	vector[42] = (0.639224, 0.615748, 0.460703)
6	vector[43] = (0.953358, -0.285443, 0.098132)
7	vector $[44] = (-0.501430, 0.459528, -0.733077)$
8	vector[45] = (0.922461, 0.385130, 0.027209)
9	vector[46] = (-0.815410, 0.546002, -0.192323)
10	vector[47] = (0.000000, 0.000000, 0.000000)
11	vector[48] = ( -0.924442, 0.129694, -0.358591 )
12	vector[49] = ( 0.549990, 0.820347, -0.156657 )
13	vector[50] = (0.774802, 0.509647, -0.374089)
14	vector[51] = ( 0.907672, -0.355700, -0.222731 )
15	vector[52] = ( 0.051712, 0.985317, 0.162714 )
16	vector[53] = ( -0.970546, -0.135098, -0.199471 )
17	vector[54] = ( -0.621107, -0.417526, 0.663249 )
18	vector[55] = ( -0.776136, 0.621968, 0.103774 )
19	vector[56] = ( 0.551897, -0.830144, -0.079188 )
20	vector[57] = ( 0.555009, 0.711394, -0.431142 )
21	vector[58] = ( 0.000000, 0.000000, 0.000000 )
22	vector[59] = ( -0.239295, 0.451777, 0.859439 )
23	vector[60] = ( -0.325801, -0.314211, -0.891698 )
24	vector[61] = ( 0.649939, -0.012663, -0.759881 )
25	vector[62] = ( -0.042327, 0.894181, -0.445699 )
26	vector[63] = ( -0.159022, 0.408833, -0.898648 )
27	vector[64] = ( 0.388219, 0.606776, -0.693620 )
28 29	vector[65] = ( -0.329997, 0.825600, -0.457697 )
30	vector[66] = (0.060764, 0.443276, 0.894323)
31	vector[67] = ( -0.794452, 0.390958, -0.464756 )
32	vector[68] = (-0.392295, -0.567128, -0.724204)
33	vector[69] = (0.000000, 0.000000, 0.000000)
34	vector[70] = ( 0.272234, 0.851327, -0.448477 )
35	vector[71] = (0.785891, 0.193927, -0.587169)
36	vector[72] = (-0.145787, 0.828569, 0.540573)
37	vector[73] = ( 0.616784, 0.765973, 0.181281 )
38	vector[74] = (-0.808755, -0.029868, -0.587387)
39	vector[75] = (0.997247, -0.010658, -0.073384)
40	vector[76] = (-0.152743, -0.477444, 0.865284)
41	vector[77] = (-0.040188, -0.715882, 0.697064)
42	vector[77] = (-0.907740, 0.040990, 0.417525)
43	vector[78] = (-0.907740, 0.040990, 0.417525) vector[79] = (0.008357, -0.985450, 0.169758)
44	Vector[/3] - ( 0.00055/, -0.305450, 0.109/58 )
45	
45	

¢

## \\Study Protocols\BRAIN\Neonates\Theirworld - E161723 - MT\_test\MTSatOn\_neonate\_v2 TA: 2:58 PM: REF Voxel size: 2.0×2.0×2.0 mmPAT: 3 Rel. SNR: 1.00 : qfl

## Properties

Prio recon	Off
Load images to viewer	On
Inline movie	Off
Auto store images	On
Load images to stamp segments	Off
Load images to graphic segments	Off
Auto open inline display	Off
Auto close inline display	Off
Start measurement without further preparation	Off
Wait for user to start	Off
Start measurements	Single measurement

#### Routine

(outino	
Slab group	1
Slabs	
Dist. factor	20 %
Position	R6.7 P19.4 H34.5 mm
Orientation	Sagittal
Phase enc. dir.	A >> P
AutoAlign	
Phase oversampling	0 %
Slice oversampling	0.0 %
Slices per slab	72
FoV read	128 mm
FoV phase	121.9 %
Slice thickness	2.00 mm
TR	75.0 ms
TE 1	1.54 ms
TE 2	4.55 ms
TE 3	8.56 ms
Averages	1
Concatenations	1
Filter	Prescan Normalize
Coil elements	PeH;PeN

#### **Contrast - Common**

TR	75.0 ms
TE 1	1.54 ms
TE 2	4.55 ms
TE 3	8.56 ms
MTC	On
Magn. preparation	None
Flip angle	5 deg
Fat suppr.	None
Water suppr.	None
SWI	Off

## **Contrast - Dynamic**

Averages	1
Averaging mode	Short term
Reconstruction	Magnitude
Measurements	1
Multiple series	Each measurement

#### **Resolution - Common**

FoV read	128 mm
FoV phase	121.9 %
Slice thickness	2.00 mm
Base resolution	64

## **Resolution - Common**

Phase resolution	100 %	
Slice resolution	100 %	
Phase partial Fourier	6/8	
Slice partial Fourier	Off	
Interpolation	Off	

## **Resolution - iPAT**

PAT mode	GRAPPA	
Accel. factor PE	3	
Ref. lines PE	24	
Accel. factor 3D	1	
Reference scan mode	Integrated	

## **Resolution - Filter Image**

Image Filter	Off
Distortion Corr.	Off
Prescan Normalize	On
Unfiltered images	Off
Normalize	Off
B1 filter	Off

## **Resolution - Filter Rawdata**

Raw filter	Off	
Elliptical filter	Off	

#### **Geometry - Common**

Slab group	1
Slabs	1
Dist. factor	20 %
Position	R6.7 P19.4 H34.5 mm
Orientation	Sagittal
Phase enc. dir.	A >> P
Slice oversampling	0.0 %
Slices per slab	72
FoV read	128 mm
FoV phase	121.9 %
Slice thickness	2.00 mm
TR	75.0 ms
Multi-slice mode	Interleaved
Series	Interleaved
Concatenations	1

## **Geometry - AutoAlign**

Slab group	1
Position	R6.7 P19.4 H34.5 mm
Orientation	Sagittal
Phase enc. dir.	A >> P
AutoAlign	
Initial Position	R6.7 P19.4 H34.5
R	6.7 mm
Р	19.4 mm
н	34.5 mm
Initial Rotation	0.00 deg
Initial Orientation	Sagittal

#### **Geometry - Saturation**

Saturation mode	Standard
Fat suppr.	None
Water suppr.	None
Special sat.	None

## BMJ Open

## SIEMENS MAGNETOM Prisma

1	Coometry Tim Dianning Su	ita
2	Geometry - Tim Planning Su	
3	Set-n-Go Protocol	Off
4	Table position	H
5	Table position	0 mm
6	Inline Composing	Off
7	System - Miscellaneous	
8	Positioning mode	REF
9	Table position	Н
10	Table position	0 mm
11	MSMA	S - C - T
12	Sagittal	R >> L
13	Coronal	A >> P
14	Transversal	F >> H
15	Coil Combine Mode	Sum of Squares
16	Save uncombined	Off
17	Matrix Optimization	Off
18	AutoAlign	
19	Coil Select Mode	Off - AutoCoilSelect
20	System - Adjustments	
21		Turneturn
22	B0 Shim mode	Tune up
23	B1 Shim mode	TrueForm Off
24	Adjust with body coil Confirm freq. adjustment	Off
25	Assume Dominant Fat	Off
26	Assume Silicone	Off
27	Adjustment Tolerance	Auto
28		
29	System - Adjust Volume	
30	Position	Isocenter
31	Orientation	Transversal
32	Rotation	0.00 deg
33	A >> P	263 mm
34	R >> L	350 mm
35	F >> H	350 mm
36	Reset	Off
37	Swatam nTv Valumaa	
38	System - pTx Volumes	
39	B1 Shim mode	TrueForm
40	Excitation	Non-sel.
41	System - Tx/Rx	
42		400 044400 MUL
43	Frequency 1H Correction factor	123.244480 MHz 1
44	Gain	Low
45	Img. Scale Cor.	3.000
46	Reset	Off
47	? Ref. amplitude 1H	0.000 V
48		
49	Physio - Signal1	
50	1st Signal/Mode	None
51	TR	75.0 ms
52	Concatenations	1
53	Segments	1
55 54		
55	Physio - Cardiac	
55 56	Tagging	None
50 57	Magn. preparation	None
	Fat suppr.	None
58	Dark blood	Off
59 60	FoV read	128 mm
60	FoV phase	121.9 %
	Phase resolution	100 %

## **Physio - PACE**

<b>J</b> = -		
Resp. control	Off	
Concatenations	1	

#### Inline - Common

Subtract	Off
Measurements	1
StdDev	Off
Liver registration	Off
Save original images	On

#### Inline - MIP

MIP-Sag MIP-Cor	Off	
MIP-Cor	Off	
MIP-Tra	Off	
MIP-Time	Off	
Save original images	On	

## Inline - Soft Tissue

Wash - In	Off
Wash - Out	Off
TTP	Off
PEI	Off
MIP - time	Off
Measurements	1

## **Inline - Composing**

Inline Composing	Off	
Distortion Corr.	Off	

## Inline - Maplt

Save original images	On	
MapIt	None	
Flip angle	5 deg	
Measurements	1	
Contrasts	3	
TR	75.0 ms	
TE 1	1.54 ms	
TE 2	4.55 ms	
TE 3	8.56 ms	

## Sequence - Part 1

Introduction	Off
Dimension	3D
Elliptical scanning	On
Phase stabilisation	Off
Asymmetric echo	Off
Contrasts	3
Flow comp. 1	No
Readout mode	Bipolar
Multi-slice mode	Interleaved
Bandwidth 1	580 Hz/Px
Bandwidth 2	580 Hz/Px
Bandwidth 3	580 Hz/Px

## Sequence - Part 2

Segments	1
Acoustic noise reduction	Active
RF pulse type	Low SAR
Gradient mode	Normal
Excitation	Non-sel.
RF spoiling	On

#### SIEMENS MAGNETOM Prisma

Sequence - Assistant		
Mode	Off	
Allowed delay	30 s	

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## BMJ Open SIEMENIS MACHETOM Driama

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	SIEMENS MA	GNETOM Prisma	
\\Study Protocols\BR/	AIN\Neonates\Theirw	orld - E161723 - MT_test\MT	SatOff_neonate_v2
TA: 2:58 PM	/I: FIX Voxel size: 2.0×2	2.0×2.0 mmPAT: 3 Rel. SNR:	1.00 : qfl
Properties		<b>Resolution - Common</b>	
Prio recon	Off	Phase resolution	100 %
Load images to viewer	On	Slice resolution	100 %
Inline movie	Off	Phase partial Fourier	6/8
Auto store images	On	Slice partial Fourier	Off
Load images to stamp segments	Off	Interpolation	Off
Load images to graphic segments	Off		
Auto open inline display	Off	Resolution - iPAT	
Auto close inline display	Off	PAT mode	GRAPPA
Start measurement without further	On	Accel, factor PE	3
preparation		Ref. lines PE	24
Wait for user to start	Off	Accel, factor 3D	1
Start measurements	Single measurement	Reference scan mode	Integrated
		Telefence scan mode	Integrated
Routine		Resolution - Filter Imag	e
Slab group	1	Image Filter	Off
Slabs	1	Distortion Corr.	Off
Dist. factor	20 %	Prescan Normalize	On
Position	R6.7 P19.4 H34.5 mm	Unfiltered images	Off
Orientation	Sagittal	Normalize	Off
Phase enc. dir.	A >> P	B1 filter	Off
AutoAlign	-		
Phase oversampling	0 %	Resolution - Filter Rawo	lata
Slice oversampling	0.0 %	Raw filter	Off
Slices per slab	72	Elliptical filter	Off
FoV read	128 mm		
FoV phase	121.9 %	Geometry - Common	
Slice thickness	2.00 mm		
TR	75.0 ms	Slab group	1
TE 1	1.54 ms	Slabs	1
TE 2	4.55 ms	Dist. factor	20 %
TE 3	8.56 ms	Position	R6.7 P19.4 H34.5 n
Averages	1	Orientation	Sagittal
Concatenations	1	Phase enc. dir.	A >> P
Filter	Prescan Normalize	Slice oversampling	0.0 %
Coil elements	PeH;PeN	Slices per slab	72
<b>b</b>		FoV read	128 mm
Contrast - Common		FoV phase	121.9 %
TR	75.0 ms	Slice thickness	2.00 mm
TE 1	1.54 ms	TR	75.0 ms
TE 2	4.55 ms	Multi-slice mode	Interleaved
TE 3	8.56 ms	Series	Interleaved
MTC	Off	Concatenations	1
Magn. preparation	None		
Flip angle	5 deg	Geometry - AutoAlign	
Fat suppr.	None	Slab group	1
Pai suppr. Water suppr	None	Position	R6.7 P19.4 H34.5 n

Contrast -	Dynamic
------------	---------

Water suppr.

SWI

Averages	1
Averaging mode	Short term
Reconstruction	Magnitude
Measurements	1
Multiple series	Each measurement

None

Off

#### **Resolution - Common**

FoV read	128 mm
FoV phase	121.9 %
Slice thickness	2.00 mm
Base resolution	64
•	

Phase resolution	100 %	
Slice resolution	100 %	
Phase partial Fourier	6/8	
Slice partial Fourier	Off	
Interpolation	Off	

PAT mode	GRAPPA
Accel. factor PE	3
Ref. lines PE	24
Accel. factor 3D	1
Reference scan mode	Integrated

Image Filter	Off
Distortion Corr.	Off
Prescan Normalize	On
Unfiltered images	Off
Normalize	Off
B1 filter	Off

Raw filter	Off	
Elliptical filter	Off	

Slab group	1
Slabs	1
Dist. factor	20 %
Position	R6.7 P19.4 H34.5 mm
Orientation	Sagittal
Phase enc. dir.	A >> P
Slice oversampling	0.0 %
Slices per slab	72
FoV read	128 mm
FoV phase	121.9 %
Slice thickness	2.00 mm
TR	75.0 ms
Multi-slice mode	Interleaved
Series	Interleaved
Concatenations	1

Slab group	1
Position	R6.7 P19.4 H34.5 mm
Orientation	Sagittal
Phase enc. dir.	A >> P
AutoAlign	
Initial Position	R6.7 P19.4 H34.5
R	6.7 mm
Р	19.4 mm
н	34.5 mm
Initial Rotation	0.00 deg
Initial Orientation	Sagittal

## **Geometry - Saturation**

Saturation mode	Standard
Fat suppr.	None
Water suppr.	None
Special sat.	None

## SIEMENS MAGNETOM Prisma

Set-n-Go Protocol	Off
Table position	Н
Table position	0 mm
Inline Composing	Off
System - Miscellaneous	
Positioning mode	FIX
Table position	Н
Table position	0 mm
MSMA	S - C - T
Sagittal	R >> L
Coronal	A >> P
Transversal	F >> H
Coil Combine Mode	Sum of Squares
Save uncombined	Off
Matrix Optimization	Off
AutoAlign	<u> </u>
Coil Select Mode	Off - AutoCoilSelect
System - Adjustments	
B0 Shim mode	Tune up
B1 Shim mode	TrueForm
Adjust with body coil	Off
Confirm freq. adjustment	Off
Assume Dominant Fat	Off
Assume Silicone	Off
Adjustment Tolerance	Auto
System - Adjust Volume	
Position	Isocenter
Orientation	Transversal
Rotation	0.00 deg
A >> P	263 mm
R >> L	350 mm
F >> H	350 mm
Reset	Off
System - pTx Volumes	
B1 Shim mode	TrueForm
Excitation	Non-sel.
System - Tx/Rx	
Frequency 1H	123.244480 MHz
Correction factor	1
Gain	Low
Img. Scale Cor.	3.000
Reset	Off
? Ref. amplitude 1H	0.000 V
Physio - Signal1	
1st Signal/Mode	None
TR	75.0 ms
Concatenations	1
Segments	1
Physio - Cardiac	
Tagging	None
Magn. preparation	None
Fat suppr.	None
Dark blood	Off
	100
FoV read	128 mm
FoV read FoV phase	128 mm 121.9 %

#### Physio - PACE

•		
Resp. control	Off	
Concatenations	1	
		-

## Inline - Common

Subtract	Off
Measurements	1
StdDev	Off
Liver registration	Off
Save original images	On

#### Inline - MIP

MIP-Sag	Off	
MIP-Cor	Off	
MIP-Tra	Off	
MIP-Time	Off	
Save original images	On	

## Inline - Soft Tissue

Wash - In	Off
Wash - Out	Off
TTP	Off
PEI	Off
MIP - time	Off
Measurements	1

## **Inline - Composing**

Inline Composing	Off	
Distortion Corr.	Off	

## Inline - Maplt

Save original images	On
MapIt	None
Flip angle	5 deg
Measurements	1
Contrasts	3
TR	75.0 ms
TE 1	1.54 ms
TE 2	4.55 ms
TE 3	8.56 ms

## Sequence - Part 1

Introduction	Off
Dimension	3D
Elliptical scanning	On
Phase stabilisation	Off
Asymmetric echo	Off
Contrasts	3
Flow comp. 1	No
Readout mode	Bipolar
Multi-slice mode	Interleaved
Bandwidth 1	580 Hz/Px
Bandwidth 2	580 Hz/Px
Bandwidth 3	580 Hz/Px

#### Sequence - Part 2

Segments	1
Acoustic noise reduction	Active
RF pulse type	Low SAR
Gradient mode	Normal
Excitation	Non-sel.
RF spoiling	On

## SIEMENS MAGNETOM Prisma

ode	Off
ved delay	30 s

## \\Study Protocols\BRAIN\Neonates\Theirworld - E161723 - MT\_test\MTSatT1\_neonate\_v2 TA: 0:36 PM: FIX Voxel size: 2.0×2.0×2.0 mmPAT: 3 Rel. SNR: 1.00 : qfl

## Properties

Prio recon	Off
Load images to viewer	On
Inline movie	Off
Auto store images	On
Load images to stamp segments	Off
Load images to graphic segments	Off
Auto open inline display	Off
Auto close inline display	Off
Start measurement without further preparation	On
Wait for user to start	Off
Start measurements	Single measurement

#### Routine

Slab group	1
Slabs	1
Dist. factor	20 %
Position	R6.7 P19.4 H34.5 mm
Orientation	Sagittal
Phase enc. dir.	A >> P
AutoAlign	
Phase oversampling	0 %
Slice oversampling	0.0 %
Slices per slab	72
FoV read	128 mm
FoV phase	121.9 %
Slice thickness	2.00 mm
TR	15.0 ms
TE 1	1.54 ms
TE 2	4.55 ms
TE 3	8.56 ms
Averages	1
Concatenations	1
Filter	Prescan Normalize
Coil elements	PeH;PeN

#### **Contrast - Common**

TR	15.0 ms
TE 1	1.54 ms
TE 2	4.55 ms
TE 3	8.56 ms
MTC	Off
Magn. preparation	None
Flip angle	14 deg
Fat suppr.	None
Water suppr.	None
SWI	Off

## **Contrast - Dynamic**

Averages	1
Averaging mode	Short term
Reconstruction	Magnitude
Measurements	1
Multiple series	Each measurement

#### **Resolution - Common**

FoV read	128 mm
FoV phase	121.9 %
Slice thickness	2.00 mm
Base resolution	64

## **Resolution - Common**

Phase resolution	100 %	
Slice resolution	100 %	
Phase partial Fourier	6/8	
Slice partial Fourier	Off	
Interpolation	Off	

#### **Resolution - iPAT**

PAT mode	GRAPPA	
Accel. factor PE	3	
Ref. lines PE	24	
Accel. factor 3D	1	
Reference scan mode	Integrated	

## **Resolution - Filter Image**

Image Filter	Off
Distortion Corr.	Off
Prescan Normalize	On
Unfiltered images	Off
Normalize	Off
B1 filter	Off

## **Resolution - Filter Rawdata**

Raw filter	Off	
Elliptical filter	Off	

#### **Geometry - Common**

Slab group	1
Slabs	1
Dist. factor	20 %
Position	R6.7 P19.4 H34.5 mm
Orientation	Sagittal
Phase enc. dir.	A >> P
Slice oversampling	0.0 %
Slices per slab	72
FoV read	128 mm
FoV phase	121.9 %
Slice thickness	2.00 mm
TR	15.0 ms
Multi-slice mode	Interleaved
Series	Interleaved
Concatenations	1

## **Geometry - AutoAlign**

Slab group	1
Position	R6.7 P19.4 H34.5 mm
Orientation	Sagittal
Phase enc. dir.	A >> P
AutoAlign	
Initial Position	R6.7 P19.4 H34.5
R	6.7 mm
Р	19.4 mm
н	34.5 mm
Initial Rotation	0.00 deg
Initial Orientation	Sagittal

#### **Geometry - Saturation**

Saturation mode	Standard
Fat suppr.	None
Water suppr.	None
Special sat.	None

## BMJ Open

## SIEMENS MAGNETOM Prisma

1		· · ·
2	Geometry - Tim Planning Su	ite
3	Set-n-Go Protocol	Off
4	Table position	Н
5	Table position	0 mm
6	Inline Composing	Off
7	System - Miscellaneous	
8	Positioning mode	FIX
9	Table position	Н
10	Table position	0 mm
11	MSMA	S - C - T
12	Sagittal	R >> L
13	Coronal	A >> P
14	Transversal	F >> H
15	Coil Combine Mode	Sum of Squares
16	Save uncombined	Off
17	Matrix Optimization	Off
18	AutoAlign Coil Select Mode	 Off - AutoCoilSelect
19		OII - Autocoliselect
20	System - Adjustments	
21	B0 Shim mode	Tune up
22	B1 Shim mode	TrueForm
23	Adjust with body coil	Off
24	Confirm freq. adjustment	Off
25	Assume Dominant Fat	Off
26	Assume Silicone	Off
27	Adjustment Tolerance	Auto
28		
29	System - Adjust Volume	
30	Position	Isocenter
31	Orientation	Transversal
32	Rotation	0.00 deg
33	A >> P R >> I	263 mm 350 mm
34	F >> H	350 mm
35	Reset	Off
36	10001	
37	System - pTx Volumes	
38	B1 Shim mode	TrueForm
39	Excitation	Non-sel.
40 41		
41	System - Tx/Rx	
42	Frequency 1H	123.244480 MHz
43 44	Correction factor	1
44	Gain	Low
45	lmg. Scale Cor. Reset	3.000 Off
40 47	? Ref. amplitude 1H	0.000 V
47		0.000 V
48 49	Physio - Signal1	
49 50	1st Signal/Mode	None
50	TR	15.0 ms
52	Concatenations	1
53	Segments	1
54	Diversity Occurit	
55	Physio - Cardiac	
56	Tagging	None
50 57	Magn. preparation	None
58	Fat suppr.	None
58 59	Dark blood	Off
60	FoV read	128 mm 121.9 %
	FoV phase Phase resolution	121.9 %
		100 /0

# **Physio - PACE**

Resp. control	Off
Concatenations	1

## Inline - Common

Subtract	Off
Measurements	1
StdDev	Off
Liver registration	Off
Save original images	On

#### Inline - MIP

MIP-Sag	Off	
MIP-Sag MIP-Cor	Off	
MIP-Tra	Off	
MIP-Time	Off	
Save original images	On	

## Inline - Soft Tissue

Wash - In	Off
Wash - Out	Off
TTP	Off
PEI	Off
MIP - time	Off
Measurements	1

## **Inline - Composing**

Inline Composing	Off	
Distortion Corr.	Off	

## Inline - Maplt

Save original images	On
MapIt	None
Flip angle	14 deg
Measurements	1
Contrasts	3
TR	15.0 ms
TE 1	1.54 ms
TE 2	4.55 ms
TE 3	8.56 ms

## Sequence - Part 1

Introduction	Off
Dimension	3D
Elliptical scanning	On
Phase stabilisation	Off
Asymmetric echo	Off
Contrasts	3
Flow comp. 1	No
Readout mode	Bipolar
Multi-slice mode	Interleaved
Bandwidth 1	580 Hz/Px
Bandwidth 2	580 Hz/Px
Bandwidth 3	580 Hz/Px

## Sequence - Part 2

Segments	1
Acoustic noise reduction	Active
RF pulse type	Low SAR
Gradient mode	Normal
Excitation	Non-sel.
RF spoiling	On

#### SIEMENS MAGNETOM Prisma

Sequence - Assistant		
Mode	Off	
Allowed delay	30 s	

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## Impact of preterm birth on brain development and longterm outcome: protocol for a cohort study in Scotland

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Impact of preterm birth on brain development and long-term outcome: protocol for a cohort study in Scotland

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#### Abstract

Introduction. Preterm birth is closely associated with altered brain development and is a leading cause of neurodevelopmental, cognitive and behavioural impairment across the life course. We aim to investigate neuroanatomic variation and adverse outcomes associated with preterm birth by studying a cohort of preterm infants and controls born at term, using brain magnetic resonance imaging (MRI) linked to biosamples and clinical, environmental and neuropsychological data.

Methods and Analysis. Theirworld Edinburgh Birth Cohort is a prospective longitudinal cohort study at the University of Edinburgh. We plan to recruit 300 infants born at <33 weeks gestational age (GA) and 100 healthy control infants born after 37 weeks GA. Multiple domains are assessed: maternal and infant clinical and demographic information; placental histology; immunoregulatory and trophic proteins in umbilical cord and neonatal blood; brain macro- and microstructure from structural and diffusion MRI; DNA methylation; hypothalamic-pituitary-adrenal axis (HPAA) activity; social cognition, attention and processing speed from eye-tracking during infancy and childhood; neurodevelopment; gut and respiratory microbiota; susceptibility to viral infections; and participant experience. Main analyses include creation of novel methods for extracting information from neonatal structural and diffusion MRI, regression analyses of predictors of brain maldevelopment and neurocognitive outcome associated with preterm birth, and determination of the quantitative predictive performance of MRI and other early life factors for childhood outcome.

Ethics and Dissemination. Ethical approval has been obtained from the National Research Ethics Service, South East Scotland Research Ethics Committee and NHS Lothian Research and Development. Results are disseminated through open access journals, scientific meetings, social media, newsletters, a study website (www.tebc.ed.ac.uk), and we engage with the University of Edinburgh public relations and media office to ensure maximum publicity and benefit.

# Strengths and limitations of this study

- Three hundred preterm infants and a comparator group of 100 term controls are studied longitudinally from before birth to school age.
- Phenotypic information includes data from brain MRI, biosamples, participant • report, direct observation and clinical data from maternal and infant medical records.
- We collected data about a range of theoretically informed variables to understand the impact of preterm birth on everyday lives of families.
- • A data access and collaboration policy sets out the terms and conditions on which deidentified data are available to the research community.
- Participants are recruited from a single centre.

#### INTRODUCTION

Preterm delivery is estimated to affect 10.6% of all live births around the world, which equates to 14.84 million births per annum<sup>1</sup>. In resource rich settings advances in perinatal care and service delivery have led to improved survival over the past two decades: around 30% of infants born at 22 weeks who are offered stabilisation at birth will survive, and this number increases to around 80% for births at 26 weeks<sup>2-5</sup>. However, early exposure to extrauterine life can impact brain development, and is closely associated with long term intellectual disability, cerebral palsy, autism spectrum disorder, attention deficit hyperactivity disorder, psychiatric disease, and problems with language, behaviour, and socioemotional function (for review <sup>6</sup>). There are no treatments that reduce risk of impairment, which extends across the life course and carries considerable personal cost to affected individuals, and high health and education costs to society<sup>7</sup>.

Little is known about the ontogenesis of neurocognitive and psychiatric problems associated with preterm birth, or the biological, environmental and social risk factors associated with susceptibility and resilience. Much information about the cerebral effects of preterm birth comes from historic cohorts that do not reflect modern perinatal care practices; studies have been cross-sectional with outcomes assessed in very early childhood before important cognitive and social functions emerge; conventional diagnostic tools for assessing neurodevelopment are imprecise; and cohorts linked to imaging and biological metadata are few so mechanisms are poorly understood. There is an unmet need to study a contemporary cohort of preterm infants that is comprehensively characterised from genes to anatomy to function, integrated with information about the social graph.

Our aims are: first, to build a longitudinal cohort of preterm infants and term controls that is phenotyped with brain imaging and biological information to investigate causal pathways to, and consequences of, atypical brain development and injury; second, to develop novel computational algorithms for mapping brain growth and connectivity in early life; third, to identify new and multi-factorial methods for early detection of children at risk of long-term impairment; and fourth, to identify early life biological and environmental risk and resilience factors that affect the developing brain and so pave the way for new therapeutic strategies.

## **METHODS AND ANALYSIS**

## Study design

Single-centre prospective longitudinal cohort study.

#### **Study setting**

The Theirworld Edinburgh Birth Cohort ("TEBC") study is conducted at the University of Edinburgh and the Simpson Centre for Reproductive Health (SCRH) which is located at the Royal Infirmary of Edinburgh, NHS Lothian, UK. The SCRH provides maternity and newborn services for residents of the City of Edinburgh and the Lothians. It receives 7,000 deliveries per annum and is the regional centre for all neonatal intensive care in South East Scotland. Approximately 100 infants with birthweight <1500g receive intensive care at SCRH per annum.

Participant recruitment, initial assessment and data collection points 1-3 (Table 1) take place in the SCRH or the Edinburgh Imaging Facility, Royal Infirmary of Edinburgh. Follow-up assessments take place in a dedicated child development laboratory at the University of Edinburgh, through online and in-person completion of questionnaires, and in Neonatal Outpatient clinics at the SCRH (timepoints 4-7, Table1). Recruitment began in November 2016 and is planned to complete in 2021.

#### **Study participants**

#### Inclusion criteria

Cases: 300 preterm infants born at <33 weeks gestational age (GA)\*.

Controls: 100 term infants born at >37 weeks GA\*.

\*GA is estimated based on first trimester ultrasound.

Cases are included if a mother booked her pregnancy and delivered at SCRH (the study centre), or if a mother booked her pregnancy at a hospital outside the study centre but was transferred to it with her baby *in utero* due to planned or expected birth <33 weeks. Preterm infants who are transferred to SCRH *ex utero* for intensive care are not included.

#### **Exclusion criteria**

- Infants with congenital anomalies: structural or functional anomalies (e.g. metabolic disorders) that occur during intrauterine life and can be identified prenatally, at birth or later in life (World Health Organisation definition).
- 2. Infants with a contraindication to MRI at 3 Tesla.

## Sample selection and recruitment

#### Sample size

A key aim of the study is to investigate causes and consequences of preterm brain injury / atypical development by analysing data about brain macro- and microstructure from structural and quantitative MRI with biological, environmental and neuropsychological outcome data. In the absence of established methodology for power calculations using quantitative MRI techniques, the sample size is based on: exemplars of indicative sensitivity and power from computational modelling and previous data; and realistic assessment of recruitment, successful image acquisition of 85%, and follow-up. Studies indicate it is possible to detect group-wise differences in brain anatomy associated with specific exposures by applying computational techniques to MRI data from relatively small group sizes in univariate models: for example Tract-based Spatial Statistics (TBSS) and Network-based Statistics (NBS) are sensitive to generalised changes microstructure and connectivity with 20-60 infants per group<sup>8-14</sup>, and morphometric methods detect anatomic variation with similar group sizes, depending on the image feature of interest<sup>15 16</sup>. However, a key strength of the study is that larger samples (n=300-400) are required to construct multivariate models (needed to investigate multiple exposures that influence brain development), to combine information from different MRI modalities using data-driven methods, to investigate associations between image phenotypes and behavioural outcomes which often require larger study populations<sup>17 18</sup>, and to develop analytic methods that support causal inference. Another aim is the development of novel computational methods for mapping growth and connectivity in development. While certain technical developments such as image segmentation and methods for studying crossing fibres are achievable with sample sizes of <100<sup>19-22</sup>, larger sample sizes are needed to address other challenges. For example, larger atlases of the developing brain than are currently available are required to understand population diversity, and machine learning methods are being used to develop image biomarkers, and to improve the interoperability of multi-site acquisitions, which will enable researchers to increase study power, carry out essential replication studies, and investigate risk and resilience in brain development conferred by the genome<sup>23-25</sup>. We expect to address some of these issues with the planned sample of 400, and to make material contribution to wider data-sharing initiatives subject to the study's Data Access and Collaboration policy.

## Identifying participants

Cases: Infants born to women who present to the SCRH with threatened preterm labour and for whom delivery is planned or expected at less than 32 completed weeks GA.

Controls: Infants born to women who attend the SCRH and deliver at >36 weeks GA.

The protocol reported here was partially developed through a separate, pilot 'phase 1' cohort of 150 cases and 40 controls. This phase 1 pilot included neonatal MRI and infant-eyetracking, and a subset of this group are now participating in the 5-year assessment as described here (time point 7, table 1).

#### Screening for eligibility

The research nurse / clinical research fellow identifies potential participants using maternity TRAK, which is a system used by maternity services throughout NHS Lothian to record information about pregnancies and maternal care, and the neonatal electronic patient record. The clinical team provides an introductory leaflet about TEBC to eligible parents, and then informs the research team of parents who wish to discuss the study in greater detail. Those parents meet with a member of the research team and are provided with the Participant Information Sheet.

Participants from phase 1 studies being recalled for time point 7 (at 5 years) are contacted by the research team using contact details provided previously. Study information (introductory letter, patient information sheet, reply slip and prepaid envelope) is sent by post and followed up with a telephone call to answer any questions and review willingness to participate.

#### **Consenting participants**

Informed written consent is sought in two stages: first, consent for perinatal and neonatal sampling and assessment at initial enrolment to the study; second, consent for assessments post-discharge to 5 years is taken at time point 3 (see Table 1 below).

For phase 1 participants being recalled, consent is taken at the recall appointment, following circulation and discussion of the content by post and phone, as described above.

Informed consent may only be taken by a member of the research team with training in International Council for Harmonisation-Good Clinical Practice (ICH-GCP) and procedures for research involving children and young people.

#### Co-enrolment

The SCRH is an academic perinatal medicine centre that hosts observational research studies, and it is a recruiting centre for randomised controlled trials of therapies designed to improve the outcome of preterm infants and their mothers. Parents / carers of TEBC participants are encouraged to consider entry into such studies if eligible. Co-enrolment is informed by 'Guidelines for Co-enrolment' produced by the Academic and Clinical Central Office for Research and Development (ACCORD), which is a partnership between the University of Edinburgh and NHS Lothian Health Board. Co-enrolment will be recorded.

#### **Cohort retention**

Participants and their families are kept up to date with research progress through Newsletters, Twitter, Facebook and a website (www.tebc.ed.ac.uk). Birthday cards are sent to participants and we hold an annual event for research updates and public outreach.

#### Withdrawal of study participants

The decision to withdraw from the study is either at parental / carer request, or at the request of the attending consultant physician or the PI for clinical reasons.

#### **Outcomes and data analysis**

Table 1 summarises the assessment schedule, data collection methods, sample type / domain, and the test or task. Data from cases and controls are collected using the same data collection instruments.

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				BMJ Open <u>B</u>	
				BMJ Open Test / task	
Time point	Age	Data collection method	Sample type / domain of measurement		
1	Antenatal	Records & interview	Socio-economic status	Maternal & paternal education, Scottish Index of Multigele Deprivation derived from home post	
-			Medical / demographic	Family and medical history and exposures	
		Descude ausstication 2	Medical	History and exposures     S       Anthropometry     G	
2	Birth	Records, questionnaire & tissue	Placenta	Structured histopathology rating and storage	
			Cord blood	Structured histopathology rating and storage       N         Panel of immunoregulatory and trophic proteins       N         Gene expression array*       N	
		Tissue: blood	Blood spot	Gene expression array*     Panel of immunoregulatory and trophic proteins       Gene expression array*     Sector	
		Tissue: saliva	Epigenetics	DNA methylation	
		Tienue, need such	Nasal lining fluid	Antimicrobial peptides including cathelicidin levels*	
		Tissue: nasal swab	DNA/RNA	Respiratory microbiota*     5       Gut microbiota*     3	
		Stool	DNA/RNA	Gut microbiota*	
			Medical	Anthropometry	
3	Neonatal	Direct observation	ROP assessment	Grade retinopathy	
-			Parent IQ	National Adult Reading Test	
		MRI	Brain structure and connectivity	Structural and diffusion 3T MRI	
			Medical / demographic	Breast-feeding and updated perinatal medical history	
				Edinburgh Post-natal Depression Scale	
		Questionnaire		Parenting Daily Hassles	
				World Health Organisation – Quality Of Life	
				Adult Temperament Questionnaire	
		Questionnaire, by post or	Demographics	Updated Socio-economic status, maternal education, Beastfeeding / nutrition, activities	
	4.5	online or phone	Infant temperament	Infant Behaviour Questionnaire, Revised, short form &	
4	months	interview	Parent wellbeing	Edinburgh Post-natal Depression Scale	
			Tissue: nasal swab	DNA/RNA	
		115566. 110501 59900	Epigenetics	Respiratory microbiota*     or       DNAm     op	
		Tissue: saliva	HPA axis	Cortisol: Waking, 30 minutes after waking, before bed	
	9 months		Nasal lining fluid	Antimicrobial peptides including cathelicidin levels*	
5		Tissue: nasal swab	DNA/RNA	Respiratory microbiota* $\overline{\sigma}$	
		Eye-tracking	Social development	Free scanning: neutral faces	
				Free scanning: "pop-out" task, looking to faces and disgractors	
				Free scanning: "social preferential looking" to social ar	
	I				

			BMJ Open
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			ြ Free scanning: "dancing ladies" social and non-social vueeos
		<b>.</b>	Switching and disengagement: "gap-overlap" task, fixation to central and peripheral cues
		Attention	Sustained attention: "follow the bird" task, following noving target
		Processing speed	Free scanning: odd-one-out visual search task (simple Letters version)
			Free-scanning: word-picture matching task
		Visual acuity	Keeler card assessment
	Direct observation	Social development	Still Face procedure (sub-set with computational motor assessment)
			Parent-child play, for later behavioural coding: (sub-set with computational motor assessment)
		Infant temperament	Infant Behaviour Questionnaire, Revised, short form
	Questionnaire		Sleep & Settle Questionnaire         Q           MacArthur Communicative Development Inventory (wards and gestures)         Inventory (wards and gestures)
	Questionnaire	Language Parent wellbeing	World Health Organisation – Quality Of Life
		Feedback	Feedback form, monitoring satisfaction with research <b>B</b> oject
	Direct observation	Anthropometry	Growth 5
		Demographics	Family circumstances update form including breastfeeding, socio-economic status (home postcoc
	Parent interview	Developmental level	Vineland Adaptive Behaviour Scales: comprehensive interview form
	Diverse a base mustices	Ophthalmology	Refraction
	Direct observation	Anthropometry	Growth 3
	Tissue: nasal swab	Nasal lining fluid	Antimicrobial peptides including cathelicidin levels*
		DNA/RNA	Respiratory microbiota*
		Social development	Free scanning: neutral faces
			Free scanning: "pop-out" task, looking to faces and distractors
			Free scanning: "social preferential looking" to social and non-social images
	Eye-tracking		Free scanning: "dancing ladies" social and non-social vigeos
		Attention	Switching and disengagement: "gap-overlap" task, fixation to central and peripheral cues Sustained attention: "follow the bird" task, following moving target
2 years		Processing speed	Free-scanning: word-nicture matching task
z yeurs		Social development	Parent-child play, for later behavioural coding
	Direct observation	Executive function	Following Instructions task
		Bayley-III	General developmental level*
		Temperament	Early Childhood Behaviour Questionnaire, Revised, short form
			Child Sleep Habits Questionnaire
		Language	MacArthur Communicative Development Inventory (words and sentences)
	Questionnaire	Social development	Quantitative Checklist for Autism in Toddlers
	Questionnaire		Behaviour Rating Inventory for Executive Function, Preschool (BRIEF-P)
		Executive function	Early Executive Function Questionnaire
		Developmental level	Vineland Adaptive Behaviour Scales: comprehensive participation form
	1	1	

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		7	Parent wellbeing	BMJ Open BMJ Open World Health Organisation – Quality Of Life
			Feedback	Feedback form, monitoring satisfaction with research Project
		Parent interview	Demographics	Family circumstances update form including breastfeeding, socio-economic status (home postc
			Epigenetics	DNA methylation 4
		Tissue: saliva	HPA axis	Cortisol
		Tissue: nasal swab	DNA/RNA	Respiratory microbiota*
			Anthropometry	
			Blood pressure	Growth N Hypertension N
			Ophthalmology	Befraction and acuity
		Direct observation	Social development	Parent-child play, for later behavioural coding 2
			Executive function	Following Instructions task
			Developmental level	Mullen Scales of Early Learning
				Free scanning: neutral faces
			Social development	Free scanning: "pop-out" task, looking to faces and distractors
				Free scanning: "social preferential looking" to social and non-social images
-	5 years	Eye-tracking		Free scanning: "dancing ladies" social and non-social veeos
7			Attention	Switching and disengagement: "gap-overlap" task, fixation to central and peripheral cues
				Sustained attention: "follow the bird" task, following reving target
			Processing speed	Free scanning: odd-one-out visual search task (complex objects version)
		Questionnaire	Temperament	Strengths and Difficulties Questionnaire (both teacher and parent report versions)
			Language	Children's Communication Checklist
			Social development	Social Communication Questionnaire: Current
			Executive function	DUPaul ADHD rating scale
				Behaviour Rating Inventory for Executive Function -Pre-school (BRIEF-P)
			Visual perception	Cerebral Visual Impairment Inventory
			Parent wellbeing	World Health Organisation – Quality Of Life
			Feedback	Feedback form monitoring satisfaction with research project
			Developmental level	Vineland Adaptive Behaviour Scales: domain-level parent rating form
		Parent interview	Demographics	Family circumstances update form including socio-eco mic status (home postcode)

#### Maternal and infant clinical and demographic information

Data are abstracted from the mothers' and infants' electronic medical records onto a standardised data collection sheet. A structured maternal interview is used to collect additional information that may not be recorded in routinely collected data, for example detailed family history about neurodevelopmental and mental health problems, and over-the-counter prescription and recreational drugs taken during pregnancy. For deaths the cause and post-mortem findings will be recorded.

#### Placentas

 After delivery, placentae from all preterm infants are formalin fixed and stored at 4°C before sampling. The placentae are sampled according to a standardized protocol; distal and proximal sections of cord (the proximal section being taken at 1.5 cm from above the fetal surface), a roll of extraplacental membranes starting at the point of rupture and 4 full thickness sections from each quadrant. All are stained with Haematoxylin and Eosin and reported using a standardised, structured approach that describes any pathological features present, including but not limited to, fetal thrombotic vasculopathy, villitis, chorioamnionitis, funisitis and features of uteroplacental ischaemia<sup>12 26</sup>.

#### Immunoregulatory and trophic proteins

Analysis of a panel of immunoregulatory and trophic proteins (IL-1b, IL-2, IL-4, IL-5, IL-6, IL-8, IL-12, IL-17, TNF-a, MIP-1b, BDNF, GM-CSF, IL-10, IL-18, IFN-g, TNF-b, MCP-1, MIP-1a, C3, C5a, C9, MMP-9, RANTES and CRP) is undertaken on umbilical cord and neonatal blood samples. These proteins are selected to offer information with respect to the pro- and antiinflammatory innate response as well as the adaptive immune response. Blood is collected using Schleicher and Schuell 903 filter paper (6 x 3.2mm spots per subject) and analysed using a multiplex immunoassay (Meso Scale Discovery) at Statens Serum Institute, Copenhagen. We use the approach described by Skogstrand et al<sup>27</sup> to analyse differences in concentration between cases and controls.

#### Structural and diffusion magnetic resonance imaging

A Siemens MAGNETOM Prisma 3T MRI clinical scanner (Siemens Healthcare, Erlangen, Germany) and 16-channel phased-array paediatric head receive coil is used to acquire: 3D T1weighted MPRAGE (T1w) structural volume scan (acquired voxel size = 1 mm isotropic) with TI 1100 ms, TE 4.69 ms and TR 1970 ms; a 3D T2-weighted SPACE (T2w) structural scan (voxel size = 1mm isotropic) with TE 409 ms and TR 3200 ms; and a multi-shell axial dMRI scan (16 ×

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b = 0 s/mm<sup>2</sup>, 3 × b = 200 s/mm<sup>2</sup>, 6 × b = 500 s/mm<sup>2</sup>, 64 × b = 750 s/mm<sup>2</sup>, 64 × b = 2500 s/mm<sup>2</sup>) with optimal angular coverage<sup>28</sup> (see Supplementary material 1-3). If the infant stays settled axial 3D susceptibility weighted imaging (SWI; TR = 28 ms, TE = 20 ms, 0.75 x 0.75 x 3 mm acquired resolution) and axial 2D fluid-attenuated inversion-recovery BLADE imaging (FLAIR; TR = 10000 ms, TE = 130 ms, TI = 2606 ms, 0.94 x 0.94 x 3 mm acquired resolution) are acquired. In a subgroup of participants magnetisation transfer saturation imaging is acquired for evaluation of tissue myelin content, consisting of three sagittal 3D multi-echo spoiled gradient echo scans (TE = {1.54 ms, 4.55 ms, 8.56 ms}, 2-mm isotropic acquired resolution): magnetisation-transfer and proton-density weighted (TR = 75 ms, FA = 5°), and T1-weighted (TR = 15 ms, FA = 14°) acquisitions, supplementary material 4. Tissue heating and acoustic noise exposure are limited throughout the examination through the use of active noise cancellation and by setting the gradient slew rate and other pulse sequence parameters appropriately. Participants are scanned in normal mode with respect to both tissue heating and peripheral nerve stimulation.

Conventional images are reported by a paediatric radiologist using a structured system <sup>29, 30</sup>. We use image data to generate novel processing techniques optimised for neonatal data<sup>11 19-21 31</sup>, and we will use these and other publicly available pipelines for processing neonatal data<sup>13 32 33</sup> to derive image features for analyses with collateral data relating to exposures and outcomes. These include but are not limited to tract-based, morphometric and structural connectivity analyses <sup>10-12 34-38</sup>.

#### DNA storage

DNA is extracted form saliva, stored and catalogued at the Edinburgh Clinical Research Facility, ready for downstream analyses.

#### DNA methylation

Saliva is sampled using the DNA OG-575 kit (DNAGenotek, Ottawa, ON, Canada). DNA extraction is performed using published methods<sup>36</sup> and DNAm analyses are carried out at the Genetics Core of the Edinburgh Clinical Research Facility (Edinburgh, UK), using Illumina Infinium MethylationEPIC (San Diego, CA, USA), with interrogation of the arrays against ~850k methylation sites. We will investigate perinatal influences on DNAm using principal component analysis, mediation, and correlation analyses.

#### Hypothalamic-pituitary-adrenal axis (HPAA)

Salivary cortisol is used as a marker of HPAA activity. Saliva is collected in Sarstedt tubes at specified times at 9 months and 5 years. Timed saliva samples are also collected during the 9 months appointment before and after a behavioural paradigm (Still Face) which is known to elicit a biological stress response (one sample pretest and two samples post test to capture reaction and recovery). Samples are stored at -20C and analysed in batches at each time point. Anthropometric data are recorded at 9 months, 2 years and 5 years, and blood pressure is measured at 5 years.

#### Eye-tracking

We record eye-movements in response to visual stimuli at 9 months, 2 years and 5 years using a Tobii© x60 eye-tracker and bespoke analysis software (Matlab). Images are presented on a display monitor with a resolution of 1,440 × 900 pixels. The Tobii© ×60 system tracks both eyes to a rated accuracy of 0.3 degrees at a rate of 60 Hz. We analyse looking patterns, including time to first fixate and looking time at areas of interest, in tasks designed to enable inference about social development, attention, and processing speed<sup>35 39</sup>.

#### Standardised assessments

Standardised assessments of neurodevelopment by direct observation at appropriate time points are: Bayley-III scales; Mullen Scales of Early Learning (MSEL); parental IQ (National Adult Reading Test). We selected the MSEL for assessing cognitive ability at 5 years because: it has separate verbal and nonverbal standardised scores so is useful for assessing cognitive abilities in children with social communication and language difficulties; internal consistency reliability and test/retest reliability for the 5 component scales is high; and the early learning composite (and its components) correlate with other psychometric tests used in this age group. We will use validated questionnaires to assess: infant/parent temperament; parent/family characteristics (postnatal depression, stress, quality of life, socioeconomic status); infant / child sleep habits; language development; social development; executive functions; cerebral visual impairment; medical diagnoses; and behavioural outcomes (parent and teacher ratings). We also record parent-child interaction for subsequent analysis via video coding of complex behaviours in a naturalistic context.

#### Susceptibility to viral infection

We collect unstimulated nasal secretion samples (nasosorption samples) using methods described by Thwaites et al<sup>40</sup>. This collection is brief, minimally invasive and a minimally

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distressing process. Nasosorption Nasal lining fluid is collected using Nasosorption Fxi synthetic absorption matrix strips inserted into the anterior part of the inferior turbinate of the nasal cavity. After 30 seconds of absorption, the strip is removed, capped, maintained at 4°C for up to 4 hours and then frozen at -80°C. From these nasal fluid samples we will assess the levels of antimicrobial peptides, including cathelicidin, and inflammatory cytokines, by ELISA or luminex assay. Collection of these at birth (term equivalent age), 9 months and 2 years will enable us to characterise birth levels, levels at timepoints significant for respiratory syncytial virus (RSV) infection/disease and at a later time point.

#### Respiratory and gut microbiota

We collect faecal and nasopharyngeal swabs (paediatric Copan e-swab with flocked nylon fiber tip) as has been described in the WHO-guideline for respiratory sampling of bacterial pathogens<sup>41</sup>. Fecal material and e-swabs (in RNA protect), are frozen at -80°C until further analyses. DNA and RNA will be extracted<sup>42</sup> and metagenomics analyses will be executed by 16S-based sequencing according to previously described methods<sup>43</sup>. We will study temporal relationships between preterm birth and early life characteristics, consecutive microbiota development, inflammation and methylation findings, and respiratory and neurocognitive developmental outcomes.

#### **Computational Motor Assessment**

Light-weight, wearable, wireless motion sensors are deployed to record the movement of a sub-set of infants at 9 months during the Still-Face paradigm and Parent-Child interaction. Data are anonymised before being securely transferred to the University of Strathclyde for analysis. These data will be analysed to test for differences in motor function between at-risk and low-risk infants, and will employ machine learning algorithms to detect patterns predictive of developmental outcome at 2 and 5 years, and their potential for clinical stratification across the neurodevelopmental disorders and psychometric profiles (IQ, adaptive function, language). Further, motor data at 9 months can be correlated against neuroanatomical features measured by MRI scan at birth and developmental scales at 9 months.

#### Patient and Public Involvement

We seek feedback from parents / carers to monitor satisfaction with research participation at 9 months, 2 years and 5 years, and we have a public facing website that describes results from the study.

#### **ETHICS AND DISSEMINATION**

#### Safety assessment

 There are no safety issues associated with collection of: placental tissue, umbilical cord / neonatal blood, saliva, faeces or hair. There are no safety issues in the conduct of planned neuropsychological assessments.

MRI does not involve ionizing radiation and there are no known risks from MRI provided standard safety measures for 3T scanning are in place. Infants are fed and wrapped and allowed to sleep naturally in the scanner. Pulse oximetry, electrocardiography and temperature are monitored. Flexible earplugs and neonatal earmuffs (MiniMuffs, Natus) are used for acoustic protection. All scans are supervised by a doctor or nurse trained in neonatal resuscitation. The scan is interrupted if there are any abnormalities in monitoring or if the baby wakes.

It is possible that incidental findings may be found on MRI or from questionnaires, for example intracranial structural anomalies or postnatal depression, respectively. In these circumstances, the findings are discussed with the participant's parent, and referral to the appropriate NHS service is made.

#### **Ethical approvals**

The study has been approved by the National Research Ethics Service (South East Scotland Research Ethics Committee), NRES numbers 11/55/0061 and 13/SS/0143 (Phase 1) and NRES number 16/SS/0154 (Phase 2); and by NHS Lothian Research & Development (2016/0255).

#### Governance

The study is run by a management group that includes the principal investigator, a minimum of two co-investigators, the study coordinator and administrative and financial officers. A delegation log details the responsibilities of each member of staff working on the study. A scientific advisory board oversees the conduct and progress of the study. The study is co-sponsored by the University of Edinburgh & NHS Lothian Academic and Clinical Central Office for Research and Development (ACCORD).

#### **Publication and data statement**

The principles set down by the International Committee of Medical Journal Editors for authorship and non-author contributors are followed for publications and presentations resulting from the study. A Data Access and Collaboration Policy sets out the terms and

conditions on which deidentified TEBC data, stimuli and tasks are accessible to the research community following reasonable request (www.tebc.ed.ac.uk).

#### Author contributions

JPB designed the study with input from all the authors. JPB, JH, MJT, RMR, SC, JS, DB, DJD, AJD, MEB and SF-W contributed to the establishment and refinement of study procedures and critically revised the manuscript. All authors approved the final version of the manuscript.

#### **Competing interests**

None declared.

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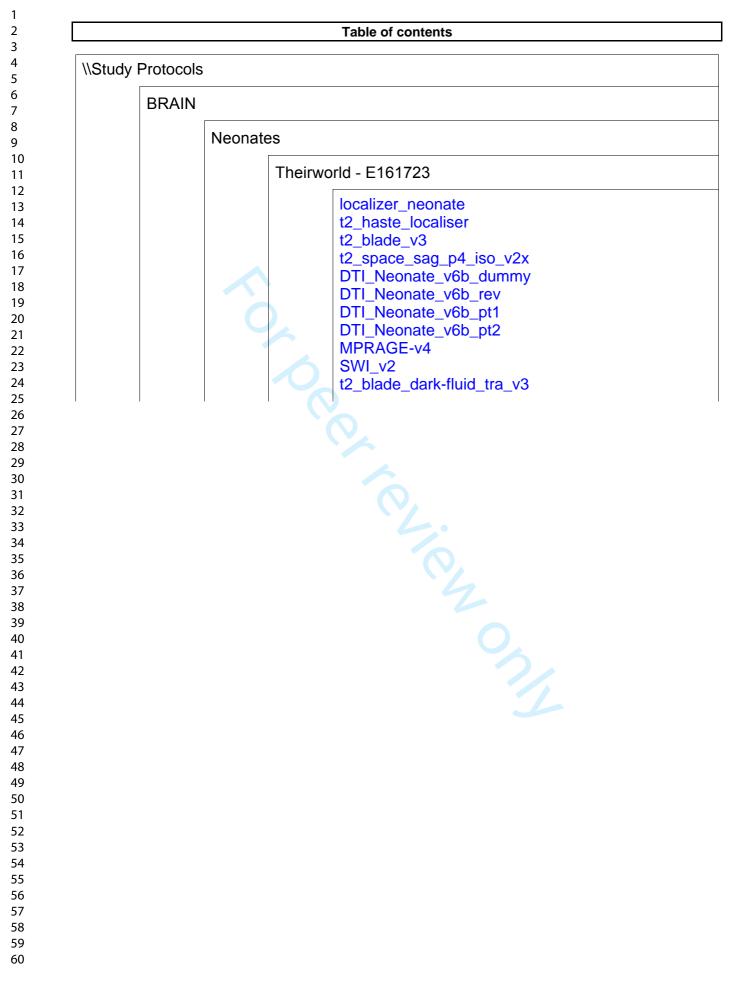
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for occreations with

# SIEMENS MAGNETOM Prisma



#### SIEMENS MAGNETOM Prisma

#### \\Study Protocols\BRAIN\Neonates\Theirworld - E161723\localizer\_neonate TA: 0:12 PM: REF Voxel size: 0.5×0.5×7.0 mmPAT: Off Rel. SNR: 1.00 : fl **Contrast - Dynamic** On Multiple series Each measurement On **Resolution - Common** Off On FoV read 250 mm Load images to stamp segments On FoV phase 100.0 % Load images to graphic segments On Slice thickness 7.0 mm Off 256 Base resolution Off Phase resolution 91 % Start measurement without further Off Phase partial Fourier Off Interpolation On Off Single measurement **Resolution - iPAT** PAT mode None 1 1 20 % L0.0 P47.8 F62.3 mm Sagittal A >> P 2 1 20 % L0.0 P47.8 F62.3 mm Transversal A >> P 3 1 20 % L0.0 P47.8 F62.3 mm Coronal R >> L

#### Filter Prescan Normalize, Elliptical filter Coil elements PeH;PeN **Contrast - Common** TR 7.5 ms TF 3 69 ms

	5.03 115
TD	0 ms
MTC	Off
Magn. preparation	None
Flip angle	20 deg
Fat suppr.	None
Water suppr.	None
SWI	Off
Contrast - Dynamic	
Averages	2

0%

250 mm

100.0 %

7.0 mm

7.5 ms

2

3

3.69 ms

Short term

Magnitude

1

PAT mode	None
Resolution - Filter Image	
Image Filter	Off
Distortion Corr.	Off
Prescan Normalize	On
Unfiltered images	Off
Normalize	Off
B1 filter	Off
Resolution - Filter Rawdat	a
Raw filter	Off
Elliptical filter	On
Geometry - Common	
Slice group	1
Slices	1
Dist. factor	20 %
Position	L0.0 P47.8 F62.3 mm
Orientation	Sagittal
Phase enc. dir.	A >> P
Slice group	2
Slices	1
Dist. factor	20 %
Position	L0.0 P47.8 F62.3 mm
Orientation	Transversal
Phase enc. dir.	A >> P
Slice group	3
Slices	1
Dist. factor	20 %
Position	L0.0 P47.8 F62.3 mm
Orientation	Coronal
Phase enc. dir.	R >> L
FoV read	250 mm
FoV phase	100.0 %
Slice thickness	7.0 mm
TR	7.5 ms
Multi-slice mode	Sequential
Series	Interleaved
Concatenations	3
Geometry - AutoAlign	
Slice group	1
Position	L0.0 P47.8 F62.3 mm

**Properties** 

Load images to viewer

Auto open inline display

Auto close inline display

Wait for user to start

Start measurements

Auto store images

Prio recon

Inline movie

preparation

Routine

Slice group

Slices

Dist. factor

Orientation

Dist. factor

Orientation

Dist. factor

Orientation

Phase enc. dir.

Phase oversampling

Position

AutoAlign

FoV read

Averages

TR

ΤE

FoV phase

Slice thickness

Concatenations

Averaging mode

Reconstruction

Measurements

Phase enc. dir.

Position

Slice group

Slices

Phase enc. dir.

Position

Slice group

Slices

# **BMJ** Open

# SIEMENS MAGNETOM Prisma

Orientation	Transversal
Phase enc. dir.	A >> P
Slice group	3
Position	L0.0 P47.8 F62.3
Orientation	Coronal
Phase enc. dir.	R >> L
AutoAlign	
Initial Position	L0.0 P47.8 F62.3
L	0.0 mm
P	47.8 mm
F	62.3 mm
Initial Rotation	0.00 deg
Initial Orientation	Sagittal
Geometry - Saturation	
Saturation mode	Standard
Fat suppr.	None
Water suppr.	None
Special sat.	None
Geometry - Tim Planni	ng Suite
Set-n-Go Protocol	Off
Table position	H
Table position	0 mm
Inline Composing	Off
System - Miscellaneou	is K
Positioning mode	REF
Table position	H
Table position	0 mm
MSMA	S - C - T
Sagittal	R >> L
Coronal	A >> P
Transversal	F >> H
Coil Combine Mode	Adaptive Combine
Save uncombined	Off
	Off
Matrix Optimization	-
AutoAlign	 Defeult
Coil Select Mode	Default
System - Adjustments	
B0 Shim mode	Tune up
B1 Shim mode	TrueForm
Adjust with body coil	Off
Confirm freq. adjustment	Off
Assume Dominant Fat	Off
	Off
Assume Silicone	Auto
Assume Silicone Adjustment Tolerance	
Adjustment Tolerance	ne
Adjustment Tolerance System - Adjust Volun Position	lsocenter
Adjustment Tolerance <b>System - Adjust Volun</b> Position Orientation	
Adjustment Tolerance System - Adjust Volun Position	Isocenter
Adjustment Tolerance <b>System - Adjust Volun</b> Position Orientation	lsocenter Transversal
Adjustment Tolerance <b>System - Adjust Volun</b> Position Orientation Rotation	lsocenter Transversal 0.00 deg
Adjustment Tolerance System - Adjust Volun Position Orientation Rotation A >> P	Isocenter Transversal 0.00 deg 263 mm
Adjustment Tolerance System - Adjust Volun Position Orientation Rotation A >> P R >> L	Isocenter Transversal 0.00 deg 263 mm 350 mm

# System - pix volumes

B1 Shim mode	TrueForm
Excitation	Slice-sel.

# System - Tx/Rx

- /	
Frequency 1H	123.244318 MHz
Frequency 1H Correction factor	1
Gain	High
Img. Scale Cor.	1.000
Reset	Off
? Ref. amplitude 1H	0.000 V

# Physio - Signal1

1st Signal/Mode	None	
TR	7.5 ms	
Concatenations	3	
Segments	1	

# **Physio - Cardiac**

Tagging	None	
Magn. preparation	None	
Fat suppr.	None	
Dark blood	Off	
FoV read	250 mm	
FoV phase	100.0 %	
Phase resolution	91 %	

# Physio - PACE

Resp. control	Off
Concatenations	3

# Inline - Common

Subtract	Off	
Measurements	1	
StdDev	Off	
Liver registration	Off	
Save original images	On	

# Inline - MIP

MIP-Sag	Off	
MIP-Sag MIP-Cor	Off	
MIP-Tra	Off	
MIP-Time	Off	
Save original images	On	

# Inline - Soft Tissue

Wash - In	Off
Wash - Out	Off
TTP	Off
PEI	Off
MIP - time	Off
Measurements	1

# **Inline - Composing**

Inline Composing	Off	
Distortion Corr.	Off	

# Inline - Maplt

Save original images	On
MapIt	None
Flip angle	20 deg
Measurements	1
Contrasts	1
TR	7.5 ms
TE	3.69 ms

# Sequence - Part 1

Introduction

# BMJ Open SIEMENS MAGNETOM Prisma

1			
2	Sequence - Part 1		
3	Dimension	2D	
4	Phase stabilisation	Off	
5	Asymmetric echo Contrasts	Allowed 1	
6	Flow comp.	No	
7	Multi-slice mode	Sequential	
8	Bandwidth	320 Hz/Px	
9 10			
10	Sequence - Part 2		
12	Segments	1	
13	Acoustic noise reduction	None	
14	RF pulse type Gradient mode	Fast Fast	
15	Excitation	Slice-sel.	
16	RF spoiling	On On	
17		-	
18	Sequence - Assistant		
19	Mode	Off	
20	Allowed delay	0 s	
21		Off 0 s	
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# BMJ Open

#### SIEMENS MAGNETOM Prisma

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TA: 6.0 s PM: REF Voxel size: 0.7×0.7×4.0 mmPAT: 2 Rel. SNR: 1.00 : h			
Properties		<b>Resolution - Common</b>	
Prio recon	Off	FoV read	220 mm
Load images to viewer	On	FoV phase	100.0 %
Inline movie	Off	Slice thickness	4.0 mm
Auto store images	On	Base resolution	320
Load images to stamp segments	On	Phase resolution	80 %
Load images to graphic segments	On	Phase partial Fourier	4/8
Auto open inline display	Off	Interpolation	Off
Auto close inline display	Off	morpolation	
Start measurement without further	Off	<b>Resolution - iPAT</b>	
preparation		PAT mode	GRAPPA
Wait for user to start	Off	Accel, factor PE	2
Start measurements	Single measurement	Ref. lines PE	24
		Reference scan mode	Integrated
Routine		Reference scan mode	integrated
Slice group	1	<b>Resolution - Filter Imag</b>	е
Slices	1	Image Filter	Off
Dist. factor	30 %	Distortion Corr.	Off
Position	Isocenter	Prescan Normalize	On
Orientation	Sagittal	Unfiltered images	Off
Phase enc. dir.	A >> P	Normalize	Off
Slice group	2	B1 filter	Off
Slices	1	DTIME	
Dist. factor	30 %	<b>Resolution - Filter Raw</b>	lata
Position	L0.0 P0.0 H5.2 mm		
Orientation	Transversal	Raw filter	Off
Phase enc. dir.	R >> L	Elliptical filter	On
Slice group	3		
Slices	1	Geometry - Common	
		Slice group	1
Dist. factor	30 %	Slices	1
Position	L0.0 P0.0 H10.4 mm	Dist. factor	30 %
Orientation	Coronal	Position	Isocenter
Phase enc. dir.	R >> L		
AutoAlign		Orientation	Sagittal
Phase oversampling	0 %	Phase enc. dir.	A >> P
FoV read	220 mm	Slice group	2
FoV phase	100.0 %	Slices	1
Slice thickness	4.0 mm	Dist. factor	30 %
TR	1500.0 ms	Position	L0.0 P0.0 H5.2 mr
TE	94 ms	Orientation	Transversal
		Phase enc. dir.	R >> L
Averages	1	Slice group	3
Concatenations	1	Slices	1
Filter	Prescan Normalize,		
<b>0</b>	Elliptical filter	Dist. factor	30 %
Coil elements	HE1-4	Position	L0.0 P0.0 H10.4 m
• • • •		Orientation	Coronal
Contrast - Common		Phase enc. dir.	R >> L
TR	1500.0 ms	FoV read	220 mm
TE	94 ms	FoV phase	100.0 %
MTC	Off	Slice thickness	4.0 mm
Magn. preparation	None	TR	1500.0 ms
		Multi-slice mode	Single shot
Flip angle	150 deg	Series	Interleaved
Fat suppr.	None	Concatenations	1
Water suppr.	None	Concatenations	I
Restore magn.	Off	Geometry - AutoAlign	
Contrast - Dynamic		Slice group	1
-	4	Position	Isocenter
Averages	1	Orientation	Sagittal
Averaging mode	Long term		5
Reconstruction	Magnitude	Phase enc. dir.	A >> P
Measurements	1	Slice group	2
Multiple series	Each measurement	Position	L0.0 P0.0 H5.2 mr

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### SIEMENS MAGNETOM Prisma

Orientation	Transversal
Phase enc. dir.	R >> L
Slice group	3
Position	L0.0 P0.0 H10.4 m
Orientation	Coronal
Phase enc. dir.	R >> L
AutoAlign	
Initial Position	Isocenter
L	0.0 mm
P	0.0 mm
H	0.0 mm
Initial Rotation	0.00 deg
Initial Orientation	Sagittal
Geometry - Saturation Fat suppr.	None
Water suppr.	None
Restore magn.	Off
Special sat.	None
Geometry - Navigator	~
Geometry - Tim Plannin Set-n-Go Protocol	Off
Table position	Н
Table position	0 mm
Inline Composing	Off
System - Miscellaneous	
Positioning mode	REF
Table position	H
Table position	0 mm
MSMA	S - C - T
Sagittal	R >> L
Coronal	A >> P
Transversal	F >> H
Coil Combine Mode	Adaptive Combine
Save uncombined	Off
Matrix Optimization	Off
AutoAlign	
Coil Select Mode	On - AutoCoilSele
System - Adjustments	
B0 Shim mode	Tune up
B1 Shim mode	TrueForm
Adjust with body coil	Off
Confirm freq. adjustment	Off
Assume Dominant Fat	Off
Assume Silicone	Off
Adjustment Tolerance	Auto
System - Adjust Volume	•
Position	Isocenter
Orientation	Transversal
Rotation	0.00 deg
	263 mm
A >> P	350 mm
R >> L	
R >> L F >> H	350 mm
R >> L	350 mm Off
R >> L F >> H	

#### System - Tx/Rx

-	
Frequency 1H	123.244318 MHz
Correction factor	1
Gain	High
Img. Scale Cor.	1.000
Reset	Off
? Ref. amplitude 1H	0.000 V

#### Physio - Signal1

1st Signal/Mode	None
TR	1500.0 ms
Concatenations	1

#### Physio - Cardiac

Magn. preparation	None
Fat suppr.	None
Dark blood	Off
FoV read	220 mm
FoV phase	100.0 %
Phase resolution	80 %

#### Physio - PACE

Resp. control	Off	
Concatenations	1	

# Inline - Common

Subtract	Off
Measurements	1
StdDev	Off
Save original images	On

#### Inline - MIP

MIP-Sag	Off
MIP-Cor	Off
MIP-Tra	Off
MIP-Time	Off
Save original images	On

#### Inline - Composing

Inline Composing	Off
Distortion Corr.	Off

# Sequence - Part 1

Introduction	On
Dimension	2D
Contrasts	1
Flow comp.	No
Multi-slice mode	Single shot
Echo spacing	7.22 ms
Bandwidth	601 Hz/Px

#### Sequence - Part 2

RF pulse type	Normal
Gradient mode	Whisper
Hyperecho	Off
Turbo factor	256

#### Sequence - Assistant

Mode	Min flip angle	
Min flip angle	130 deg	
Allowed delay	60 s	

#### BMJ Open

#### SIEMENS MAGNETOM Prisma

# \\Study Protocols\BRAIN\Neonates\Theirworld - E161723\t2\_blade\_v3 TA: 2:29 PM: REF Voxel size: 0.7×0.7×3.0 mmPAT: 2 Rel. SNR: 1.00 : qtseBR\_rr

#### Properties

Prio recon	Off
Load images to viewer	On
Inline movie	Off
Auto store images	On
Load images to stamp segments	On
Load images to graphic segments	Off
Auto open inline display	Off
Auto close inline display	Off
Start measurement without further preparation	Off
Wait for user to start	Off
Start measurements	Single measurement

#### Routine

Slice group	1
Slices	40
Dist. factor	0 %
Position	R1.2 P40.0 H50.2 mm
Orientation	Transversal
Phase enc. dir.	A >> P
AutoAlign	
Phase oversampling	0.0 %
FoV read	220 mm
FoV phase	100.0 %
Slice thickness	3.0 mm
TR	4100.0 ms
TE	207 ms
Averages	1
Concatenations	4
Filter	Prescan Normalize
Coil elements	PeH;PeN

#### **Contrast - Common**

TR	4100.0 ms
TE	207 ms
TD	0.0 ms
MTC	Off
Magn. preparation	None
Flip angle	90 deg
Fat suppr.	None
Water suppr.	None
Restore magn.	On

#### **Contrast - Dynamic**

1
Short term
Magnitude
1
Each measurement

#### **Resolution - Common**

FoV read	220 mm
FoV phase	100.0 %
Slice thickness	3.0 mm
Base resolution	320
BLADE coverage	100.0 %
Trajectory	BLADE
Trajectory Interpolation	Off

#### **Resolution - iPAT**

PAT mode	GRAPPA
Accel. factor PE	2
Ref. lines PE	8
Reference scan mode	Integrated

#### **Resolution - Filter Image**

Image Filter	Off	
Distortion Corr.	Off	
Prescan Normalize	On	
Unfiltered images	Off	
Normalize	Off	
B1 filter	Off	

#### **Resolution - Filter Rawdata**

Raw filter	Off	
Elliptical filter	Off	

#### **Geometry - Common**

Slice group	1
Slices	40
Dist. factor	0 %
Position	R1.2 P40.0 H50.2 mm
Orientation	Transversal
Phase enc. dir.	A >> P
FoV read	220 mm
FoV phase	100.0 %
Slice thickness	3.0 mm
TR	4100.0 ms
Multi-slice mode	Interleaved
Series	Interleaved
Concatenations	4

#### Geometry - AutoAlign

Slice group	1
Position	R1.2 P40.0 H50.2 mm
Orientation	Transversal
Phase enc. dir.	A >> P
AutoAlign	
Initial Position	R1.2 P40.0 H50.2
R	1.2 mm
Р	40.0 mm
н	50.2 mm
Initial Rotation	0.00 deg
Initial Orientation	Transversal

#### **Geometry - Saturation**

Fat suppr.	None
Water suppr.	None
Restore magn.	On
Special sat.	None

#### **Geometry - Navigator**

#### **Geometry - Tim Planning Suite**

Set-n-Go Protocol	Off
Table position	Н
Table position	0 mm
Inline Composing	Off

## SIEMENS MAGNETOM Prisma

Positioning mode	REF
Table position	H
Table position	0 mm
MSMA	S - C - T
Sagittal	R >> L
Coronal	A >> P
Transversal	F >> H
Coil Combine Mode	Adaptive Combine
Save uncombined	Off
Matrix Optimization	Off
AutoAlign	
Coil Select Mode	On - AutoCoilSele
System - Adjustments	
B0 Shim mode	Tune up
B1 Shim mode	TrueForm
Adjust with body coil	Off
Confirm freq. adjustment	Off
Assume Dominant Fat	Off
Assume Silicone	Off
	Auto
Adjustment Tolerance	Auto
System - Adjust Volume	
Position	Isocenter
Orientation	Transversal
Rotation	0.00 deg
A >> P	263 mm
R >> L	350 mm
F >> H	350 mm
Reset	Off
B1 Shim mode	TrueForm
System - Tx/Rx	
Frequency 1H	123.244318 MHz
Correction factor	1
Gain	High
Img. Scale Cor.	1.000
Reset	Off
? Ref. amplitude 1H	0.000 V
Physio - Signal1 1st Signal/Mode	None
TR	4100.0 ms
Concatenations	4
Physio - Cardiac	
-	
Magn. preparation	None
-	None None
Magn. preparation	
Magn. preparation Fat suppr.	None
Magn. preparation Fat suppr. Dark blood FoV read	None Off 220 mm
Magn. preparation Fat suppr. Dark blood FoV read FoV phase	None Off 220 mm 100.0 %
Magn. preparation Fat suppr. Dark blood FoV read	None Off 220 mm
Magn. preparation Fat suppr. Dark blood FoV read FoV phase BLADE coverage Trajectory	None Off 220 mm 100.0 % 100.0 %
Magn. preparation Fat suppr. Dark blood FoV read FoV phase BLADE coverage Trajectory Physio - PACE	None Off 220 mm 100.0 % 100.0 %
Magn. preparation Fat suppr. Dark blood FoV read FoV phase BLADE coverage Trajectory	None Off 220 mm 100.0 % 100.0 % BLADE
Magn. preparation Fat suppr. Dark blood FoV read FoV phase BLADE coverage Trajectory Physio - PACE Resp. control Concatenations	None Off 220 mm 100.0 % 100.0 % BLADE
Magn. preparation Fat suppr. Dark blood FoV read FoV phase BLADE coverage Trajectory Physio - PACE Resp. control	None Off 220 mm 100.0 % 100.0 % BLADE

Measurements

#### Inline - Common

StdDev	Off	
Save original images	On	

#### Inline - MIP

MIP-Sag	Off	
MIP-Sag MIP-Cor	Off	
MIP-Tra	Off	
MIP-Time	Off	
Save original images	On	

#### **Inline - Composing**

Inline Composing	Off	
Distortion Corr.	Off	

#### Sequence - Part 1

Introduction	On
Dimension	2D
Compensate T2 decay	Off
Contrasts	1
Flow comp.	Read
Multi-slice mode	Interleaved
Free echo spacing	Off
Echo spacing	10.9 ms
Bandwidth	363 Hz/Px

#### Sequence - Part 2

Define	Turbo factor
Echo trains per slice	8
Phase correction	Automatic
Acoustic noise reduction	Active
RF pulse type	Low SAR
Gradient mode	Fast
Hyperecho	On
WARP	Off
Motion correction	On
Red. EC sensitivity	Off
Turbo factor	36

# Sequence - Assistant

Off	
30 s	

# BMJ Open

# SIEMENS MAGNETOM Prisma

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# \\Study Protocols\BRAIN\Neonates\Theirworld - E161723\t2\_space\_sag\_p4\_iso\_v2x TA: 2:13 PM: REF Voxel size: 1.0×1.0×1.0 mmPAT: 4 Rel. SNR: 1.00 : spcR

#### Properties

Prio recon	Off
Load images to viewer	On
Inline movie	Off
Auto store images	On
Load images to stamp segments	Off
Load images to graphic segments	Off
Auto open inline display	Off
Auto close inline display	Off
Start measurement without further preparation	Off
Wait for user to start	Off
Start measurements	Single measurement

#### Routine

Slab group	1
Slabs	1
Position	R1.2 P36.9 H0.0 mm
Orientation	Sagittal
Phase enc. dir.	A >> P
AutoAlign	
Phase oversampling	0 %
Slice oversampling	0.0 %
Slices per slab	160
FoV read	128 mm
FoV phase	150.0 %
Slice thickness	1.00 mm
TR	3200 ms
TE	409 ms
Averages	1.4
Concatenations	1
Filter	Raw filter, Prescan
	Normalize
Coil elements	PeH;PeN

#### **Contrast - Common**

TR	3200 ms
TE	409 ms
MTC	Off
Magn. preparation	None
Fat suppr.	Fat sat.
Fat sat. mode	Strong
Blood suppr.	Off
Restore magn.	On

#### **Contrast - Dynamic**

Averages	1.4
Reconstruction	Magnitude
Measurements	1
Multiple series	Each measurement

#### **Resolution - Common**

FoV read	128 mm
FoV phase	150.0 %
Slice thickness	1.00 mm
Base resolution	128
Phase resolution	100 %
Slice resolution	100 %
Phase partial Fourier	Allowed
Slice partial Fourier	Off
Interpolation	Off

#### **Resolution - iPAT**

PAT mode	GRAPPA
Accel. factor PE	2
Ref. lines PE	24
Accel. factor 3D	2
Ref. lines 3D	24
Reference scan mode	Integrated

#### **Resolution - Filter Image**

Image Filter	Off	
Distortion Corr.	Off	
Prescan Normalize	On	
Unfiltered images	Off	
Normalize	Off	
B1 filter	Off	

#### **Resolution - Filter Rawdata**

Raw filter	On	
Elliptical filter	Off	

#### Geometry - Common

Slab group	1
Slabs	1
Position	R1.2 P36.9 H0.0 mm
Orientation	Sagittal
Phase enc. dir.	A >> P
Slice oversampling	0.0 %
Slices per slab	160
FoV read	128 mm
FoV phase	150.0 %
Slice thickness	1.00 mm
TR	3200 ms
Series	Interleaved
Concatenations	1

#### Geometry - AutoAlign

Slab group	1
Position	R1.2 P36.9 H0.0 mm
Orientation	Sagittal
Phase enc. dir.	A >> P
AutoAlign	
Initial Position	R1.2 P36.9 H0.0
R	1.2 mm
Р	36.9 mm
н	0.0 mm
Initial Rotation	0.00 deg
Initial Orientation	Sagittal

#### **Geometry - Saturation**

Fat suppr.	Fat sat.
Fat sat. mode	Strong
Restore magn.	On
Special sat.	None

#### **Geometry - Navigator**

#### **Geometry - Tim Planning Suite**

Set-n-Go Protocol	Off
Table position	Н
Table position	0 mm
Inline Composing	Off

#### **MAGNETOM** Prisma

SIEMENS
REF
Н
0 mm
S-C-T
R >> L
A >> P F >> H
Adaptive Combine
Off
Off
On - AutoCoilSelect
Standard
Standard TrueForm
TrueForm Off Off
TrueForm Off Off Off
TrueForm Off Off Off Off
TrueForm Off Off Off
TrueForm Off Off Off Off
TrueForm Off Off Off Off Auto
TrueForm Off Off Off Auto R1.2 P36.9 H0.0 mm
TrueForm Off Off Off Auto R1.2 P36.9 H0.0 mm Sagittal
TrueForm Off Off Off Auto R1.2 P36.9 H0.0 mm Sagittal 90.00 deg
TrueForm Off Off Off Off Auto R1.2 P36.9 H0.0 mm Sagittal 90.00 deg 128 mm
TrueForm Off Off Off Auto R1.2 P36.9 H0.0 mm Sagittal 90.00 deg 128 mm 192 mm
TrueForm Off Off Off Off Auto R1.2 P36.9 H0.0 mm Sagittal 90.00 deg 128 mm

# System - Adjust Volume

System - Miscellaneous

Positioning mode

Table position

Table position

MSMA

Sagittal

Coronal

Transversal

AutoAlign

Coil Combine Mode

Save uncombined

Matrix Optimization

System - Adjustments

Coil Select Mode

B0 Shim mode

B1 Shim mode

Adjust with body coil

Confirm freq. adjustment

Assume Dominant Fat

Adjustment Tolerance

Assume Silicone

1

2 3

4

5

6

7

8

9

10

11

12

13

14

15 16

17

18

19

20

21

22 23

24 25 26

32 33

34

35

55 56 57

58

59

60

Position	R1.2 P36.9 H0.0 mm
Orientation	Sagittal
Rotation	90.00 deg
F >> H	128 mm
F >> H A >> P R >> L	192 mm
R >> L	160 mm
Reset	Off

#### System - pTx Volumes

B1 Shim mode	TrueForm	
Excitation	Non-sel.	

#### System - Tx/Rx

Frequency 1H Correction factor	123.244318 MHz
Correction factor	1
Gain	High
Img. Scale Cor.	3.000
Reset	Off
? Ref. amplitude 1H	0.000 V

#### Physio - Signal1

1st Signal/Mode	None
Trigger delay	0 ms
TR	3200 ms
Concatenations	1

#### **Physio - Cardiac**

Magn. preparation	None	
Fat suppr.	Fat sat.	
Dark blood	Off	
FoV read	128 mm	
FoV phase	150.0 %	
Phase resolution	100 %	

#### Off Resp. control Concatenations 1

Off

# **Inline - Common**

Subtract

# **Inline - Common**

Measurements	1	
StdDev	Off	
Save original images	On	

# Inline - MIP

MIP-Sag	Off	
MIP-Sag MIP-Cor	Off	
MIP-Tra	Off	
MIP-Time	Off	
Save original images	On	

#### **Inline - Composing**

Inline Composing	Off	
Distortion Corr.	Off	

# Sequence - Part 1

Introduction	On
Dimension	3D
Elliptical scanning	Off
Reordering	Linear
Flow comp.	No
Echo spacing	4.4 ms
Adiabatic-mode	Off
Bandwidth	592 Hz/Px

#### Sequence - Part 2

Echo train duration	1034 ms
RF pulse type	Low SAR
Gradient mode	Whisper
Excitation	Non-sel.
Flip angle mode	T2 var
Turbo factor	282

# Sequence - Assistant

	Allowed delay	30 s	
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# BMJ Open

#### SIEMENS MAGNETOM Prisma

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# \\Study Protocols\BRAIN\Neonates\Theirworld - E161723\DTI\_Neonate\_v6b\_dummy TA: 0:28 PM: FIX Voxel size: 2.0×2.0×2.0 mmPAT: 4 Rel. SNR: 1.00 : epse

#### Properties

Prio recon	Off
Load images to viewer	On
Inline movie	Off
Auto store images	On
Load images to stamp segments	Off
Load images to graphic segments	Off
Auto open inline display	Off
Auto close inline display	Off
Start measurement without further preparation	Off
Wait for user to start	Off
Start measurements	Single measurement

#### Routine

Noutine	
Slice group	1
Slices	58
Dist. factor	0 %
Position	R1.2 P39.7 H47.8 mm
Orientation	Transversal
Phase enc. dir.	R >> L
AutoAlign	
Phase oversampling	0 %
FoV read	256 mm
FoV phase	100.0 %
Slice thickness	2.0 mm
TR	3500 ms
TE	78.0 ms
Concatenations	1
Filter	Raw filter, Prescan Normalize
Coil elements	PeH;PeN

#### **Contrast - Common**

TR	3500 ms
TE	78.0 ms
MTC	Off
Magn. preparation	None
Fat suppr. Fat sat. mode	Fat sat.
Fat sat. mode	Strong

#### **Contrast - Dynamic**

Averaging mode	Long term
Reconstruction	Magnitude
Measurements	1
Delay in TR	0 ms
Multiple series	Off

#### **Resolution - Common**

Accel. factor PE

Ref. lines PE

FoV read	256 mm	
FoV phase	100.0 %	
Slice thickness	2.0 mm	
Base resolution	128	
Phase resolution	100 %	
Phase partial Fourier	7/8	
Interpolation	Off	

#### **Resolution - iPAT**

Accel. factor slice	2
Reference scan mode	EPI/separate

#### **Resolution - Filter Image**

Distortion Corr.	Off	
Prescan Normalize	On	
Dynamic Field Corr.	Off	

#### **Resolution - Filter Rawdata**

Raw filter	On	
Elliptical filter	Off	

#### **Geometry - Common**

Slice group	1
Slices	58
Dist. factor	0 %
Position	R1.2 P39.7 H47.8 mm
Orientation	Transversal
Phase enc. dir.	R >> L
FoV read	256 mm
FoV phase	100.0 %
Slice thickness	2.0 mm
TR	3500 ms
Multi-slice mode	Interleaved
Series	Interleaved
Concatenations	1

#### Geometry - AutoAlign

Slice group	1
Position	R1.2 P39.7 H47.8 mm
Orientation	Transversal
Phase enc. dir.	R >> L
AutoAlign	
Initial Position	R1.2 P39.7 H47.8
R	1.2 mm
P	39.7 mm
н	47.8 mm
Initial Rotation	90.00 deg
Initial Orientation	Transversal

#### **Geometry - Saturation**

Fat suppr.	Fat sat.
Fat sat. mode	Strong
Special sat.	None

#### **Geometry - Navigator**

#### **Geometry - Tim Planning Suite**

Set-n-Go Protocol	Off
Table position	Н
Table position	0 mm
Inline Composing	Off

#### System - Miscellaneous

Positioning mode	FIX
Table position	Н
Table position	0 mm
MSMA	S - C - T
Sagittal	R >> L

#### SIEMENS MAGNETOM Prisma

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System - Miscellaneous

Coronal	A >> P
Transversal	F >> H
Coil Combine Mode	Adaptive Combine
Matrix Optimization	Performance
AutoAlign	
Coil Select Mode	On - AutoCoilSelect

#### System - Adjustments

Standard	
TrueForm	
Off	
Off	
Off	
Off	
Auto	
	TrueForm Off Off Off Off

#### System - Adjust Volume

- ,	
Position	R1.2 P39.7 H47.8 mm
Orientation	Transversal
Rotation	90.00 deg
R >> L	256 mm
A >> P	256 mm
F >> H	116 mm
Reset	Off

#### System - pTx Volumes

<i>,</i> ,		
B1 Shim mode	TrueForm	
Excitation	Standard	

#### System - Tx/Rx

-	
Frequency 1H	123.244318 MHz
Correction factor	1
Gain	High
Img. Scale Cor.	1.000
Reset	Off
? Ref. amplitude 1H	0.000 V

#### Physio - Signal1

1st Signal/Mode	None
TR	3500 ms
Concatenations	1

#### **Physio - PACE**

Resp. control	Off
Concatenations	1

#### Diff - Neuro

Diffusion mode	Free	
Diff. directions	71	
Diffusion Scheme	Monopolar	
Diff. weightings	1	
b-value	0 s/mm <sup>2</sup>	
b-value	3	
Diff. weighted images	On	
Trace weighted images	Off	
ADC maps	Off	
FA maps	Off	
Mosaic	Off	
Tensor	Off	
Noise level	40	

Free

# Diff - Body

Diffusion mode

#### Diff - Body

Diff. directions	71
Diffusion Scheme	Monopolar
Diff. weightings	1
b-value	0 s/mm²
b-value	3
Diff. weighted images	On
Trace weighted images	Off
ADC maps	Off
Exponential ADC Maps	Off
FA maps	Off
Invert Gray Scale	Off
Calculated Image	Off
b-Value >=	0 s/mm²
Noise level	40

# **Diff - Composing**

Inline Composing	Off
Distortion Corr.	Off

#### Sequence - Part 1

· · · · · · · · · · · · · · · · · · ·	
Introduction	Off
Optimization	None
Multi-slice mode	Interleaved
Free echo spacing	Off
Echo spacing	0.78 ms
Bandwidth	1446 Hz/Px

#### Sequence - Part 2

-	
EPI factor	128
RF pulse type	Low SAR
Gradient mode	Normal
Excitation	Standard

#### Sequence - pTX Pulses



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# BMJ Open

#### SIEMENS MAGNETOM Prisma

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# \\Study Protocols\BRAIN\Neonates\Theirworld - E161723\DTI\_Neonate\_v6b\_rev TA: 0:28 PM: FIX Voxel size: 2.0×2.0×2.0 mmPAT: 4 Rel. SNR: 1.00 : epse

#### Properties

Prio recon	Off
Load images to viewer	On
Inline movie	Off
Auto store images	On
Load images to stamp segments	Off
Load images to graphic segments	Off
Auto open inline display	Off
Auto close inline display	Off
Start measurement without further preparation	Off
Wait for user to start	Off
Start measurements	Single measurement

#### Routine

Roatine	
Slice group	1
Slices	58
Dist. factor	0 %
Position	R1.2 P39.7 H47.8 mm
Orientation	Transversal
Phase enc. dir.	R >> L
AutoAlign	
Phase oversampling	0 %
FoV read	256 mm
FoV phase	100.0 %
Slice thickness	2.0 mm
TR	3500 ms
TE	78.0 ms
Concatenations	1
Filter	Raw filter, Prescan Normalize
Coil elements	PeH;PeN

#### **Contrast - Common**

TR	3500 ms
TE	78.0 ms
MTC	Off
Magn. preparation	None
Fat suppr. Fat sat. mode	Fat sat.
Fat sat. mode	Strong

#### **Contrast - Dynamic**

Averaging mode	Long term
Reconstruction	Magnitude
Measurements	1
Delay in TR	0 ms
Multiple series	Off

#### **Resolution - Common**

256 mm
100.0 %
2.0 mm
128
100 %
7/8
Off

# Accel. modeSlice accel.Accel. factor PE2Ref. lines PE40

#### **Resolution - iPAT**

Accel. factor slice	2
Reference scan mode	EPI/separate

#### **Resolution - Filter Image**

Distortion Corr.	Off	
Prescan Normalize	On	
Dynamic Field Corr.	Off	

#### **Resolution - Filter Rawdata**

Raw filter	On	
Elliptical filter	Off	

#### **Geometry - Common**

Slice group	1
Slices	58
Dist. factor	0 %
Position	R1.2 P39.7 H47.8 mm
Orientation	Transversal
Phase enc. dir.	R >> L
FoV read	256 mm
FoV phase	100.0 %
Slice thickness	2.0 mm
TR	3500 ms
Multi-slice mode	Interleaved
Series	Interleaved
Concatenations	1

#### Geometry - AutoAlign

Slice group	1
Position	R1.2 P39.7 H47.8 mm
Orientation	Transversal
Phase enc. dir.	R >> L
AutoAlign	
Initial Position	R1.2 P39.7 H47.8
R	1.2 mm
P	39.7 mm
н	47.8 mm
Initial Rotation	90.00 deg
Initial Orientation	Transversal

#### **Geometry - Saturation**

Fat suppr.	Fat sat.
Fat sat. mode	Strong
Special sat.	None

#### **Geometry - Navigator**

#### **Geometry - Tim Planning Suite**

Set-n-Go Protocol	Off
Table position	Н
Table position	0 mm
Inline Composing	Off

#### System - Miscellaneous

P	ositioning mode	FIX
Та	able position	Н
Та	able position	0 mm
Μ	SMA	S - C - T
Sa	agittal	R >> L

#### SIEMENS MAGNETOM Prisma

Coronal	A >> P
Transversal	F >> H
Coil Combine Mode	Adaptive Combine
Matrix Optimization	Performance
AutoAlign	
Coil Select Mode	On - AutoCoilSelect

#### System - Adjustments

B0 Shim mode	Standard	
B1 Shim mode	TrueForm	
Adjust with body coil	Off	
Confirm freq. adjustment	Off	
Assume Dominant Fat	Off	
Assume Silicone	Off	
Adjustment Tolerance	Auto	

#### System - Adjust Volume

Position	R1.2 P39.7 H47.8 mm
Orientation	Transversal
Rotation	90.00 deg
R >> L	256 mm
A >> P	256 mm
F >> H	116 mm
Reset	Off

#### System - pTx Volumes

B1 Shim mode	TrueForm	
Excitation	Standard	

#### System - Tx/Rx

-	
Frequency 1H	123.244318 MHz
Frequency 1H Correction factor	1
Gain	High
Img. Scale Cor.	1.000
Reset	Off
? Ref. amplitude 1H	0.000 V

#### Physio - Signal1

1st Signal/Mode	None
TR	3500 ms
Concatenations	1

#### **Physio - PACE**

Resp. control	Off
Concatenations	1

#### Diff - Neuro

Diffusion mode	MDDW	
Diff. directions	6	
Diffusion Scheme	Monopolar	
Diff. weightings	1	
b-value	0 s/mm <sup>2</sup>	
b-value	3	
Diff. weighted images	On	
Trace weighted images	Off	
ADC maps	Off	
FA maps	Off	
Mosaic	Off	
Tensor	Off	
Noise level	40	

MDDW

Diffusion mode

#### Diff - Body

Diff. directions	6
Diffusion Scheme	Monopolar
Diff. weightings	1
b-value	0 s/mm²
b-value	3
Diff. weighted images	On
Trace weighted images	Off
ADC maps	Off
Exponential ADC Maps	Off
FA maps	Off
Invert Gray Scale	Off
Calculated Image	Off
b-Value >=	0 s/mm²
Noise level	40

# **Diff - Composing**

Inline Composing	Off	
Distortion Corr.	Off	

#### Sequence - Part 1

Introduction	Off
Optimization	None
Multi-slice mode	Interleaved
Free echo spacing	Off
Echo spacing	0.78 ms
Bandwidth	1446 Hz/Px

#### Sequence - Part 2

EPI factor	128
RF pulse type	Low SAR
Gradient mode	Normal
Excitation	Standard

#### Sequence - pTX Pulses



# BMJ Open

#### SIEMENS MAGNETOM Prisma

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\\Study Protocols\BRAIN\Neonates\Theirworld - E161723\DTI\_Neonate\_v6b\_pt1 TA: 4:29 PM: FIX Voxel size: 2.0×2.0×2.0 mmPAT: 4 Rel. SNR: 1.00 : epse

#### Properties

	- · · ·
Prio recon	Off
Load images to viewer	On
Inline movie	Off
Auto store images	On
Load images to stamp segments	Off
Load images to graphic segments	Off
Auto open inline display	Off
Auto close inline display	Off
Start measurement without further preparation	Off
Wait for user to start	Off
Start measurements	Single measurement

#### Routine

Slice group	1
Slices	58
Dist. factor	0 %
Position	R1.2 P39.7 H47.8 mm
Orientation	Transversal
Phase enc. dir.	L >> R
AutoAlign	
Phase oversampling	0 %
FoV read	256 mm
FoV phase	100.0 %
Slice thickness	2.0 mm
TR	3500 ms
TE	78.0 ms
Averages	1
Concatenations	1
Filter	Raw filter, Prescan Normalize
Coil elements	PeH;PeN

#### **Contrast - Common**

TR	3500 ms	
TE MTC	78.0 ms	
MTC	Off	
Magn. preparation	None	
Fat suppr. Fat sat. mode	Fat sat.	
Fat sat. mode	Strong	

#### **Contrast - Dynamic**

Averages	1
Averaging mode	Long term
Reconstruction	Magnitude
Measurements	1
Delay in TR	0 ms
Multiple series	Off

#### **Resolution - Common**

FoV read	256 mm
FoV phase	100.0 %
Slice thickness	2.0 mm
Base resolution	128
Phase resolution	100 %
Phase partial Fourier	7/8
Interpolation	Off

#### **Resolution - iPAT**

Accel. factor PE	2
Ref. lines PE	40
Accel. factor slice	2
Reference scan mode	EPI/separate

#### **Resolution - Filter Image**

Distortion Corr.	Off
Prescan Normalize	On
Dynamic Field Corr.	Off

#### **Resolution - Filter Rawdata**

Raw filter	On	
Elliptical filter	Off	

#### **Geometry - Common**

Slice group	1
Slices	58
Dist. factor	0 %
Position	R1.2 P39.7 H47.8 mm
Orientation	Transversal
Phase enc. dir.	L >> R
FoV read	256 mm
FoV phase	100.0 %
Slice thickness	2.0 mm
TR	3500 ms
Multi-slice mode	Interleaved
Series	Interleaved
Concatenations	1

#### Geometry - AutoAlign

Slice group	1
	1
Position	R1.2 P39.7 H47.8 mm
Orientation	Transversal
Phase enc. dir.	L >> R
AutoAlign	
Initial Position	R1.2 P39.7 H47.8
R	1.2 mm
Р	39.7 mm
н	47.8 mm
Initial Rotation	-90.00 deg
Initial Orientation	Transversal

#### **Geometry - Saturation**

Fat suppr.	Fat sat.
Fat sat. mode	Strong
Special sat.	None

#### **Geometry - Navigator**

#### **Geometry - Tim Planning Suite**

Set-n-Go Protocol	Off
Table position	н
Table position	0 mm
Inline Composing	Off

#### System - Miscellaneous

Positioning mode	FIX
Table position	Н
Table position	0 mm

# SIEMENS MAGNETOM Prisma

1 2 3 4 5	
6 7 8 9 10 11	
12 13 14 15 16	
17 18 19 20 21 22	
23 24 25 26 27 28	
29 30 31 32 33 34	
35 36 37 38 39 40	
41 42 43 44 45 46	
47 48 49 50 51	
52 53 54 55 56 57	
58 59 60	

MSMA	S - C - T
Sagittal	R >> L
Coronal	A >> P
Transversal	F >> H
Coil Combine Mode	Adaptive Combine
Matrix Optimization	Performance
AutoAlign	
Coil Select Mode	On - AutoCoilSelect
System - Adjustments	
B0 Shim mode	Standard
B1 Shim mode	TrueForm
Adjust with body coil	Off
Confirm freq. adjustment	Off
Assume Dominant Fat	Off
Assume Silicone	Off
Adjustment Tolerance	Auto
System - Adjust Volume	
Position	R1.2 P39.7 H47.8 mm
Orientation	Transversal
Rotation	-90.00 deg
R >> L	256 mm
A >> P	256 mm
F >> H	116 mm
Reset	Off
System - pTx Volumes	
B1 Shim mode	TrueForm
Excitation	Standard
System - Tx/Rx	
Frequency 1H	123.244318 MHz
Correction factor	1
Gain	High
Img. Scale Cor.	1.000
Reset	Off
? Ref. amplitude 1H	0.000 V
Physio - Signal1	
1st Signal/Mode	None
TR	3500 ms

# Concatenations Physio - PACE

•	
Resp. control	Off
Concatenations	1

1

# Diff - Neuro

Diffusion mode	Free
Diff. directions	71
Diffusion Scheme	Monopolar
Diff. weightings	2
b-value 1	0 s/mm²
b-value 2	750 s/mm²
b-value 1	1
b-value 2	1
Diff. weighted images	On
Trace weighted images	Off
ADC maps	Off
FA maps	Off
Mosaic	On
Tensor	Off

# Diff - Neuro

Noise level	40	

# Diff - Body

9
opolar
mm²
s/mm²
mm²

# Diff - Composing

Distortion Corr Off	Inline Composing	Off
	Distortion Corr.	Off

## Sequence - Part 1

Introduction	Off
Optimization	None
Multi-slice mode	Interleaved
Free echo spacing	Off
Echo spacing	0.78 ms
Bandwidth	1446 Hz/Px

# Sequence - Part 2

EPI factor	128
RF pulse type	Low SAR
Gradient mode	Normal
Excitation	Standard

# Sequence - pTX Pulses



# BMJ Open

# SIEMENS MAGNETOM Prisma

#### 

# \\Study Protocols\BRAIN\Neonates\Theirworld - E161723\DTI\_Neonate\_v6b\_pt2 TA: 5:01 PM: FIX Voxel size: 2.0×2.0×2.0 mmPAT: 4 Rel. SNR: 1.00 : epse

#### Properties

Prio recon	Off
Load images to viewer	On
Inline movie	Off
Auto store images	On
Load images to stamp segments	Off
Load images to graphic segments	Off
Auto open inline display	Off
Auto close inline display	Off
Start measurement without further preparation	Off
Wait for user to start	Off
Start measurements	Single measurement

#### Routine

Slice group	1
Slices	58
Dist. factor	0 %
Position	R1.2 P39.7 H47.8 mm
Orientation	Transversal
Phase enc. dir.	L >> R
AutoAlign	
Phase oversampling	0 %
FoV read	256 mm
FoV phase	100.0 %
Slice thickness	2.0 mm
TR	3500 ms
TE	78.0 ms
Averages	1
Concatenations	1
Filter	Raw filter, Prescan
	Normalize
Coil elements	PeH;PeN

#### **Contrast - Common**

TR	3500 ms	
TE MTC	78.0 ms	
MTC	Off	
Magn. preparation	None	
Fat suppr.	Fat sat.	
Fat sat. mode	Strong	

#### **Contrast - Dynamic**

Averages	1
Averaging mode	Long term
Reconstruction	Magnitude
Measurements	1
Delay in TR	0 ms
Multiple series	Off

#### **Resolution - Common**

FoV read	256 mm
FoV phase	100.0 %
Slice thickness	2.0 mm
Base resolution	128
Phase resolution	100 %
Phase partial Fourier	7/8
Interpolation	Off

#### **Resolution - iPAT**

Accel. factor PE	2
Ref. lines PE	40
Accel. factor slice	2
Reference scan mode	EPI/separate

#### **Resolution - Filter Image**

Distortion Corr.	Off
Prescan Normalize	On
Dynamic Field Corr.	Off

#### **Resolution - Filter Rawdata**

Raw filter	On	
Elliptical filter	Off	

#### **Geometry - Common**

Slice group	1
Slices	58
Dist. factor	0 %
Position	R1.2 P39.7 H47.8 mm
Orientation	Transversal
Phase enc. dir.	L >> R
FoV read	256 mm
FoV phase	100.0 %
Slice thickness	2.0 mm
TR	3500 ms
Multi-slice mode	Interleaved
Series	Interleaved
Concatenations	1

# Geometry - AutoAlign

Slice group	1
	1
Position	R1.2 P39.7 H47.8 mm
Orientation	Transversal
Phase enc. dir.	L >> R
AutoAlign	
Initial Position	R1.2 P39.7 H47.8
R	1.2 mm
Р	39.7 mm
н	47.8 mm
Initial Rotation	-90.00 deg
Initial Orientation	Transversal

#### **Geometry - Saturation**

Fat suppr.	Fat sat.
Fat sat. mode	Strong
Special sat.	None

#### **Geometry - Navigator**

#### **Geometry - Tim Planning Suite**

Set-n-Go Protocol	Off
Table position	Н
Table position	0 mm
Inline Composing	Off

#### System - Miscellaneous

Positioning mode	FIX
Table position	Н
Table position	0 mm

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## SIEMENS MAGNETOM Prisma

1 2 3	
4 5 6 7	
8 9 10	
11 12 13 14	
15 16 17 18	
19 20 21	
22 23 24 25	
26 27 28 29 30	
31 32 33	
34 35 36 37	
38 39 40 41	
42 43 44	
45 46 47 48	
49 50 51 52	
53 54 55 56	
57 58 59 60	

#### **System - Miscellaneous** MSMA S-C-T Sagittal R >> L Coronal A >> P Transversal F >> H Coil Combine Mode Adaptive Combine Matrix Optimization Performance AutoAlign On - AutoCoilSelect Coil Select Mode System - Adjustments B0 Shim mode Standard B1 Shim mode TrueForm Adjust with body coil Off Confirm freq. adjustment Off Off Assume Dominant Fat Off Assume Silicone Adjustment Tolerance Auto System - Adjust Volume Position R1.2 P39.7 H47.8 mm Orientation Transversal Rotation -90.00 deg R >> L 256 mm A >> P 256 mm F >> H 116 mm Reset Off System - pTx Volumes B1 Shim mode TrueForm

# B1 Shim mode TrueForm Excitation Standard System - Tx/Rx 123.244318 MHz Frequency 1H 123.244318 MHz Correction factor 1 Gain High Img. Scale Cor. 1.000 Reset Off ? Ref. amplitude 1H 0.000 V

#### Physio - Signal1

1:	st Signal/Mode	None
Т	R	3500 ms
С	oncatenations	1

# Physio - PACE

Resp. control	Off	
Concatenations	1	

#### Diff - Neuro

Diffusion mode	Free
Diff. directions	80
Diffusion Scheme	Monopolar
Diff. weightings	2
b-value 1	0 s/mm <sup>2</sup>
b-value 2	2500 s/mm²
b-value 1	1
b-value 2	1
Diff. weighted images	On
Trace weighted images	Off
ADC maps	Off
FA maps	Off
Mosaic	On
Tensor	Off

# Diff - Neuro

Noise level	40	
-------------	----	--

# Diff - Body

2003		
Diffusion mode	Free	
Diff. directions	80	
Diffusion Scheme	Monopolar	
Diff. weightings	2	
b-value 1	0 s/mm²	
b-value 2	2500 s/mm <sup>2</sup>	
b-value 1	1	
b-value 2	1	
Diff. weighted images	On	
Trace weighted images	Off	
ADC maps	Off	
Exponential ADC Maps	Off	
FA maps	Off	
Invert Gray Scale	Off	
Calculated Image	Off	
b-Value >=	0 s/mm²	
Noise level	40	

# **Diff - Composing**

Inline Composing	Off
Distortion Corr.	Off

# Sequence - Part 1

Off
None
nterleaved
Off
0.78 ms
1446 Hz/Px

#### Sequence - Part 2

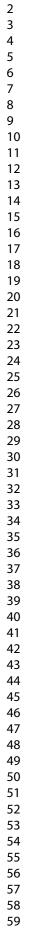
EPI factor	128
RF pulse type	Low SAR
Gradient mode	Normal
Excitation	Standard

# Sequence - pTX Pulses



# BMJ Open

# SIEMENS MAGNETOM Prisma



60

TA: 3:09 PM: FIX Voxel size: 1.0×1.0×1.0 mmPAT: 2 Rel. SNR: 1.00 : tfl

#### Properties

Off On Off On On
Off On
On
On
UII
Off
Single measurement

#### Routine

liteatine	
Slab group	1
Slabs	
Dist. factor	50 %
Position	R1.1 P38.9 F20.7 mm
Orientation	Sagittal
Phase enc. dir.	A >> P
AutoAlign	
Phase oversampling	20 %
Slice oversampling	0.0 %
Slices per slab	160
FoV read	160 mm
FoV phase	100.0 %
Slice thickness	1.00 mm
TR	1970.0 ms
TE	4.69 ms
Averages	1
Concatenations	1
Filter	Prescan Normalize
Coil elements	PeH;PeN;SP1

#### **Contrast - Common**

TR	1970.0 ms
TE	4.69 ms
Magn. preparation	Non-sel. IR
ті	1100 ms
Flip angle	9 deg
Fat suppr.	None
Water suppr.	None

#### **Contrast - Dynamic**

Averages	1
Averaging mode	Long term
Reconstruction	Magnitude
Measurements	1
Multiple series	Each measurement

#### **Resolution - Common**

FoV	read	160 mm	
FoV	phase	100.0 %	
Slice	e thickness	1.00 mm	
Base	e resolution	160	
Pha	se resolution	100 %	
Slice	e resolution	100 %	
Pha	se partial Fourier	7/8	
Slice	e partial Fourier	Off	
Inter	polation	Off	

#### **Resolution - iPAT**

PAT mode	GRAPPA
Accel. factor PE	2
Ref. lines PE	24
Accel. factor 3D	1
Reference scan mode	Integrated

#### **Resolution - Filter Image**

Image Filter	Off	
Distortion Corr.	Off	
Prescan Normalize	On	
Unfiltered images	Off	
Normalize	Off	
B1 filter	Off	

#### **Resolution - Filter Rawdata**

Raw filter	Off	
Elliptical filter	Off	

#### **Geometry - Common**

-	
Slab group	1
Slabs	1
Dist. factor	50 %
Position	R1.1 P38.9 F20.7 mm
Orientation	Sagittal
Phase enc. dir.	A >> P
Slice oversampling	0.0 %
Slices per slab	160
FoV read	160 mm
FoV phase	100.0 %
Slice thickness	1.00 mm
TR	1970.0 ms
Multi-slice mode	Single shot
Series	Interleaved
Concatenations	1

#### **Geometry - AutoAlign**

Slab group	1
Position	R1.1 P38.9 F20.7 mm
Orientation	Sagittal
Phase enc. dir.	A >> P
AutoAlign	
Initial Position	R1.1 P38.9 F20.7
R	1.1 mm
Р	38.9 mm
F	20.7 mm
Initial Rotation	0.00 deg
Initial Orientation	Sagittal

#### **Geometry - Navigator**

#### **Geometry - Tim Planning Suite**

-	-
Set-n-Go Protocol	Off
Table position	Н
Table position	0 mm
Inline Composing	Off

#### System - Miscellaneous

Positioning mode	FIX
Table position	Н
Table position	0 mm

#### SIEMENS MAGNETOM Prisma

MSMA	S - C - T
Sagittal	R >> L
Coronal	A >> P
Transversal	F >> H
Coil Combine Mode	Adaptive Combi
Save uncombined	Off
Matrix Optimization	Off
Coil Focus	Flat
AutoAlign	
Coil Select Mode	On - AutoCoilSe
System - Adjustments	
B0 Shim mode	Standard
B1 Shim mode	TrueForm
Adjust with body coil	Off
Confirm freq. adjustment	Off
Assume Dominant Fat	Off
Assume Silicone	Off
Adjustment Tolerance	Auto
System - Adjust Volume	
Position	D1 1 D28 0 E20
	R1.1 P38.9 F20
Orientation	Sagittal
Rotation	0.00 deg
A >> P	160 mm
F >> H	160 mm
R >> L	160 mm
Reset	Off
System - pTx Volumes	
B1 Shim mode	TrueForm
Excitation	Non-sel.
System - Tx/Rx	
Frequency 1H	123.244318 MH
Correction factor	1
Gain	Low
Img. Scale Cor.	4.000
Reset	Off
? Ref. amplitude 1H	0.000 V
i i i i i i i i i i i i i i i i i i i	
Physio - Signal1	
1st Signal/Mode	None
TR	1970.0 ms
Concatenations	1
Physic Cardias	
Physio - Cardiac	
Magn. preparation	Non-sel. IR
-	Non-sel. IR 1100 ms
Magn. preparation	

Off

160 mm

100.0 %

100 %

Off

Off

Off

Inline - Common
Save original images

Save original images	On	

# Inline - MIP

MIP-Sag MIP-Cor	Off
MIP-Cor	Off
MIP-Tra	Off
MIP-Time	Off
Save original images	On

#### **Inline - Composing**

Inline Composing	Off	
Distortion Corr.	Off	

#### **Inline - Maplt**

Save original images	On
MapIt	None
Flip angle	9 deg
Measurements	1
TR	1970.0 ms
TE	4.69 ms

#### Sequence - Part 1

Introduction	On
Dimension	3D
Elliptical scanning	Off
Reordering	Linear
Asymmetric echo	Off
Flow comp.	No
Multi-slice mode	Single shot
Echo spacing	10.8 ms
Bandwidth	140 Hz/Px

#### Sequence - Part 2

RF pulse type	Normal
Gradient mode	Whisper
Excitation	Non-sel.
RF spoiling	On
Incr. Gradient spoiling	Off
Turbo factor	160

Off

#### Sequence - Assistant

Mode



Dark blood

FoV phase

Phase resolution

**Physio - PACE** 

Resp. control

Subtract

StdDev

Concatenations

Measurements

Inline - Common

FoV read

#### SIEMENS MAGNETOM Prisma

		ates\Theirworld - E161723	_
TA: 2:23 PM:	FIX Voxel size: 0.8×0.8	×3.0 mmPAT: 3 Rel. SNR: 1	1.00 : qswi_r
Properties		<b>Resolution - Common</b>	
Prio recon	Off	Interpolation	Off
Load images to viewer	On		
Inline movie	Off	<b>Resolution - iPAT</b>	
Auto store images	On	PAT mode	GRAPPA
Load images to stamp segments	Off	Accel, factor PE	3
Load images to graphic segments	Off	Ref. lines PE	24
Auto open inline display	Off	Accel. factor 3D	1
Auto close inline display	Off		Integrated
Start measurement without further	Off	Reference scan mode	Integrated
preparation	011	<b>Resolution - Filter Ima</b>	ao
Wait for user to start	Off		-
Start measurements	Single measurement	Image Filter	Off
		Distortion Corr.	Off
Routine		Prescan Normalize	On
	1	Unfiltered images	Off
Slab group	1	Normalize	Off
Slabs	1	B1 filter	Off
Dist. factor	20 %		
Position	L0.0 A2.3 H2.2 mm	Resolution - Filter Raw	vdata
Orientation	Transversal	Raw filter	Off
Phase enc. dir.	R >> L	Elliptical filter	Off
AutoAlign			Oli
Phase oversampling	0 %	Geometry - Common	
Slice oversampling	20.0 %	-	
Slices per slab	40	Slab group	1
FoV read	240 mm	Slabs	1
FoV phase	84.4 %	Dist. factor	20 %
Slice thickness	3.00 mm	Position	L0.0 A2.3 H2.2 m
ſR	28.0 ms	Orientation	Transversal
E	20.00 ms	Phase enc. dir.	R >> L
verages	1	Slice oversampling	20.0 %
oncatenations	1	Slices per slab	40
Filter	Prescan Normalize	FoV read	240 mm
coil elements	HEA;HEP	FoV phase	84.4 %
Joir elements		Slice thickness	3.00 mm
Contrast - Common		TR	28.0 ms
		Multi-slice mode	Interleaved
TR	28.0 ms	Series	Interleaved
TE	20.00 ms	Concatenations	1
MTC	Off	Conductiduono	1
Magn. preparation	None	Geometry - AutoAlign	
Flip angle	9 deg		
Fat suppr.	None	Slab group	1
Water suppr.	None	Position	L0.0 A2.3 H2.2 m
SWI	On	Orientation	Transversal
		Phase enc. dir.	R >> L
Contrast - Dynamic		AutoAlign	
Averages	1	Initial Position	L0.0 A2.3 H2.2
Averaging mode	Short term	L	0.0 mm
Reconstruction	Magn./Phase	А	2.3 mm
	1	н	2.2 mm
Multiple agrice	I Foob measurement	Initial Rotation	89.61 deg
Multiple series	Each measurement	Initial Orientation	Transversal
Resolution - Common		Geometry - Saturation	
FoV read	240 mm		
FoV phase	84.4 %	Saturation mode	Standard
Slice thickness	3.00 mm	Fat suppr.	None
Base resolution	320	Water suppr.	None
Phase resolution	320 100 %	Special sat.	None
Slice resolution	100 %	Geometry - Tim Planni	ng Suite
Phase partial Fourier	Off	Set-n-Go Protocol	Off
Slice partial Fourier	Off		UII

#### SIEMENS MAGNETOM Prisma

Table position	0 mm
Inline Composing	Off
System - Miscellaneous	
Positioning mode	FIX
Table position	Н
Table position	0 mm
MSMA	S - C - T
Sagittal	R >> L
Coronal	A >> P
Transversal	F >> H
Coil Combine Mode	Adaptive Combine
Save uncombined	Off
Matrix Optimization	Off
AutoAlign Coil Select Mode	 On - AutoCoilSelect
	OII - AdioColiSelect
System - Adjustments	Clondard
B0 Shim mode	Standard
B1 Shim mode	TrueForm
Adjust with body coil	Off Off
Confirm freq. adjustment	Off Off
Assume Dominant Fat	Off
Assume Silicone	Off
Adjustment Tolerance	Auto
System - Adjust Volume	
Position	L0.0 A2.3 H2.2 mm
Orientation	Transversal
Rotation	89.61 deg
R >> L	203 mm
A >> P	240 mm
F >> H	120 mm
Reset	Off
System - pTx Volumes	
B1 Shim mode	TrueForm
Excitation	Slab-sel.
System - Tx/Rx	
Frequency 1H	123.244318 MHz
Correction factor	1
Gain	Low
Img. Scale Cor.	1.000
Reset	Off
? Ref. amplitude 1H	0.000 V
Physio - Signal1	None
1st Signal/Mode	
1st Signal/Mode TR	28.0 ms
1st Signal/Mode	28.0 ms 1
1st Signal/Mode TR	
1st Signal/Mode TR Concatenations Segments	1
TR Concatenations Segments Physio - Cardiac	1
1st Signal/Mode TR Concatenations Segments Physio - Cardiac Tagging	1 1
1st Signal/Mode TR Concatenations Segments Physio - Cardiac Tagging Magn. preparation	1 1 None
1st Signal/Mode TR Concatenations Segments Physio - Cardiac Tagging	1 1 None None
1st Signal/Mode TR Concatenations Segments Physio - Cardiac Tagging Magn. preparation Fat suppr. Dark blood	1 1 None None Off
1st Signal/Mode TR Concatenations Segments Physio - Cardiac Tagging Magn. preparation Fat suppr.	1 1 None None None

#### Physio - PACE

<b>J</b> = -	
Resp. control	Off
Concatenations	1

# Inline - Common

Subtract	Off
Measurements	1
StdDev	Off
Liver registration	Off
Save original images	On

#### Inline - MIP

MIP-Sag	Off
MIP-Cor	Off
MIP-Tra	Off
MIP-Time	Off
Save original images	On

#### Inline - Soft Tissue

Wash - In	Off
Wash - Out	Off
TTP	Off
PEI	Off
MIP - time	Off
Measurements	1

#### **Inline - Composing**

Inline Composing	Off	
Distortion Corr.	Off	

#### Inline - Maplt

Save original images	On
MapIt	None
Flip angle	9 deg
Measurements	1
Contrasts	1
TR	28.0 ms
TE	20.00 ms

#### Sequence - Part 1

Introduction	On
Dimension	3D
Elliptical scanning	Off
Phase stabilisation	Off
Asymmetric echo	Off
Contrasts	1
Flow comp.	Yes
Multi-slice mode	Interleaved
Bandwidth	120 Hz/Px

#### Sequence - Part 2

Segments	1
Acoustic noise reduction	Active
RF pulse type	Fast
Gradient mode	Whisper
Excitation	Slab-sel.
RF spoiling	On

#### Sequence - Assistant

Mode	Off
Allowed delay	30 s

# BMJ Open

# SIEMENS MAGNETOM Prisma

#### 

# \\Study Protocols\BRAIN\Neonates\Theirworld - E161723\t2\_blade\_dark-fluid\_tra\_v3 TA: 3:22 PM: REF Voxel size: 0.9×0.9×3.0 mmPAT: 2 Rel. SNR: 1.00 : qtirB\_rr

# Properties

Prio recon	Off
Load images to viewer	On
Inline movie	Off
Auto store images	On
Load images to stamp segments	On
Load images to graphic segments	Off
Auto open inline display	Off
Auto close inline display	Off
Start measurement without further preparation	Off
Wait for user to start	Off
Start measurements	Single measurement

#### Routine

Slice group	1
Slices	40
Dist. factor	0 %
Position	Isocenter
Orientation	Transversal
Phase enc. dir.	R >> L
AutoAlign	
Phase oversampling	0.0 %
FoV read	240 mm
FoV phase	100.0 %
Slice thickness	3.0 mm
TR	10000.0 ms
TE	130 ms
Averages	1
Concatenations	2
Filter	Prescan Normalize
Coil elements	HEA;HEP

#### **Contrast - Common**

TR	10000.0 ms
TE	130 ms
TD	0.0 ms
MTC	Off
Magn. preparation	Slice-sel. IR
ті	2606 ms
Flip angle	130 deg
Fat suppr.	Fat sat.
Fat sat. mode	Strong
Water suppr.	None
Restore magn.	Off
Freeze suppressed tissue	On

#### **Contrast - Dynamic**

Averages	1
Averaging mode	Short term
Reconstruction	Magnitude
Measurements	1
Multiple series	Each measurement

#### **Resolution - Common**

) mm
0.0 %
mm
3
0.0 %
ADE

# **Resolution - Common**

Interpolation	Off	

# **Resolution - iPAT**

PAT mode	GRAPPA
Accel. factor PE	2
Ref. lines PE	8
Reference scan mode	Integrated

#### **Resolution - Filter Image**

Image Filter	Off
Distortion Corr.	Off
Prescan Normalize	On
Unfiltered images	Off
Normalize	Off
B1 filter	Off

#### **Resolution - Filter Rawdata**

Raw filter	Off	
Elliptical filter	Off	

#### **Geometry - Common**

Slice group	1
Slices	40
Dist. factor	0 %
Position	Isocenter
Orientation	Transversal
Phase enc. dir.	R >> L
FoV read	240 mm
FoV phase	100.0 %
Slice thickness	3.0 mm
TR	10000.0 ms
Multi-slice mode	Interleaved
Series	Interleaved
Concatenations	2

# Geometry - AutoAlign

Slice group	1
Position	Isocenter
Orientation	Transversal
Phase enc. dir.	R >> L
AutoAlign	
Initial Position	Isocenter
L	0.0 mm
Р	0.0 mm
н	0.0 mm
Initial Rotation	90.00 deg
Initial Orientation	Transversal

#### **Geometry - Saturation**

Fat suppr.	Fat sat.
Fat sat. mode	Strong
Water suppr.	None
Restore magn.	Off
Special sat.	Parallel F
Gap	10 mm
Thickness	70 mm

#### **Geometry - Navigator**

### SIEMENS MAGNETOM Prisma

Off
Н
0 mm
Off
REF
Н
0 mm
S - C - T
R >> L
A >> P
F>>H
Adaptive Combine Off
Off
Oli
On - AutoCoilSelect
Standard
TrueForm
Off
Off
Off
Off
Auto
Isocenter
Transversal
90.00 deg
240 mm
240 mm
120 mm
Off
TrueForm
123.244318 MHz
1
High
1.000
Off 0.000 V
None
10000 0 ms
10000.0 ms 2
2
2 Slice-sel. IR
2 Slice-sel. IR 2606 ms Fat sat. Off
2 Slice-sel. IR 2606 ms Fat sat. Off 240 mm
2 Slice-sel. IR 2606 ms Fat sat. Off

#### **Physio - PACE**

Resp. control	Off
Concatenations	2

### Inline - Common

Subtract	Off
Measurements	1
StdDev	Off
Save original images	On

### Inline - MIP

MIP-Sag MIP-Cor	Off	
MIP-Cor	Off	
MIP-Tra	Off	
MIP-Time	Off	
Save original images	On	

### **Inline - Composing**

	-
Inline Composing	Off
Distortion Corr.	Off

### Sequence - Part 1

Introduction	On
Dimension	2D
Compensate T2 decay	Off
Contrasts	1
Flow comp.	Read
Multi-slice mode	Interleaved
Free echo spacing	Off
Echo spacing	8.64 ms
Bandwidth	362 Hz/Px

### Sequence - Part 2

Define	Turbo factor
Echo trains per slice	9
Phase correction	Automatic
Acoustic noise reduction	Active
RF pulse type	Low SAR
Gradient mode	Normal
Hyperecho	Off
WARP	Off
Motion correction	On
Red. EC sensitivity	Off
Turbo factor	28

### Sequence - Assistant

Mode	Min flip angle
Min flip angle	130 deg
Allowed delay	30 s

<pre># Author: qspace2siemens.m (Michael Thrippleton), manually edited into 2 parts # Source file: ,/vector_tables/neonate/04-shells-3-6-64-64.txt # b-value at UI: 750 # number of non-zero shells: 1 # number of directions per non-zero shell: 64 # number of directions per non-zero shell: 64 # number of directions including b0: 71 [directions=71] normalization = none coordinatesystem = xyz comment=bull: 750, b750, ND0: 7 vector[0] = (0.000000, 0.000000, 0.000000) vector[1] = (-0.53981, 0.03371, -0.091439) vector[2] = (-0.000440, 0.429608, 0.339760) vector[2] = (-0.016278, -0.195328, 0.511451) vector[5] = (-0.016278, -0.195328, 0.511451) vector[6] = (-0.016278, -0.195328, 0.511451) vector[7] = (0.025626, -0.195328, 0.511451) vector[9] = (-0.337338, -0.105537, -0.361699) vector[1] = (0.025626, 0.000790, -0.547053) vector[1] = (0.025626, 0.008709, -0.547053) vector[1] = (0.025638, -0.195328, -0.146162) vector[1] = (0.493022, 0.016162, 0.33970) vector[1] = (0.493022, 0.016162, 0.33973) vector[1] = (0.496386, 0.05539, 0.25369) vector[1] = (0.496386, 0.050199, 0.225809) vector[1] = (0.496386, 0.050199, 0.225809) vector[1] = (0.496386, 0.05199, 0.225809) vector[1] = (0.219722, 0.0181524, -0.164088) vector[1] = (0.219722, 0.0181524, -0.164088) vector[1] = (0.219722, 0.0181524, -0.164089) vector[1] = (0.219722, 0.0181524, -0.164089) vector[1] = (0.496386, 0.05199, 0.225809) vector[1] = (0.219722, 0.0181524, -0.164089) vector[2] = (0.000000, 0.000000, 0.000000) vector[2] = (0.219722, 0.0181524, -0.164089) vector[2] = (0.219090, -0.495800, -0.29379) vector[2] = (0.219090, -0.495800, -0.29379) vector[2] = (0.219090, -0.495800, -0.29379) vector[2] = (0.217278, 0.4461081, 0.22738) vector[2] = (0.217278, 0.4461081, 0.22738) vector[3] = (0.072278, 0.4461081, 0.22738) vector[3] = (0.072278, 0.4461081, 0.22738</pre>	1	
<pre># Author: gspace2siemens.m (Michael Thrippleton), manually edited into 2 parts # Source file: ./vector_tables/neonate/04-shells-3-6-64-64.txt # b-value at UI: 750 # non-zero b-values: 750 # number of non-zero shells: 1 # number of directions per non-zero shell: 64 # number of directions per non-zero shell: 64 # number of directions per non-zero shell: 64 # normalization = none coordinatesystem = xyz comment=bUI: 750, b: 750, Nb0: 7 # vector[1] = ( -0.538981, 0.033731, -0.091439) # vector[2] = ( -0.012789, -0.195328, 0.51451) # vector[2] = ( -0.012789, -0.195328, 0.51451) # vector[3] = ( -0.12789, -0.195328, 0.51451) # vector[6] = ( -0.42739, -0.280126, -0.340143) # vector[6] = ( -0.437344, -0.195328, 0.51496) # vector[1] = ( 0.039738, -0.105537, -0.361089) # vector[1] = ( 0.195148, -0.224679, 0.459823) # vector[1] = ( 0.195148, -0.224679, 0.459823) # vector[1] = ( 0.195148, -0.224679, 0.459823) # vector[1] = ( 0.239722, 0.401066, -0.301523) # vector[1] = ( 0.249622, 0.181524, -0.164098) # vector[1] = ( 0.249635, -0.236576, 0.225899) # vector[2] = ( 0.218923, -0.268989, -0.23989) # vector[2] = ( 0.143700, -0.138955, -0.218826) # vector[2] = ( 0.143700, -0.138955, -0.218826) # vector[2]</pre>	1	
<pre>into 2 parts into 2 parts is Source file: ./vector_tables/neonate/04-shells-3-6-64-64.txt # b-value at UI: 750 into 2 parts into 2</pre>		# Authors represent (Michael Thrippleter) repuelly edited
<pre>     Source file: ./vector_tables/neonate/04-shells-3-6-64-64.txt     # Source file: ./vector_tables/neonate/04-shells-3-6-64-64.txt     # bronzero b-values: 750     # number of honzero shells: 1     # number of directions per nonzero shell: 64     # nonzerost     # total number of directions including b0: 71     [directions=71]     normalization = none     coordinatesystem = xyz     cooment=bUI: 750, b: 750, Nb0: 7     vector[2] = (-0.38981, 0.033731, -0.091439)     vector[2] = (-0.31233, 0.037462, 0.349872)     vector[3] = (-0.12728, -0.159328, 0.511451)     vector[6] = (-0.061295, -0.451376, 0.304143)     vector[6] = (-0.231133, -0.471788, 0.154096)     vector[8] = (-0.231133, -0.471788, 0.154096)     vector[10] = (0.447399, -0.280126, -0.146162)     vector[10] = (-0.437344, -0.208126, -0.146162)     vector[10] = (0.493344, -0.208126, -0.146162)     vector[11] = (0.95148, -0.224679, 0.459823)     vector[13] = (0.496386, 0.051099, 0.225809)     vector[13] = (0.496386, 0.051099, 0.225809)     vector[13] = (0.23972, 0.410406, -0.303513, 0.29379)     vector[13] = (0.24665, -0.236576, 0.423689)     vector[13] = (0.23939, -0.268598, -0.236599, 0.253691)     vector[23] = (-0.337648, -0.514342, -0.164098)     vector[23] = (0.214923, -0.268088, -0.423809)     vector[23] = (0.23434, -0.514342, -0.186823)     vector[23] = (0.23434, -0.514342, -0.186823)     vector[23] = (0.239745, 0.236579, 0.423569)     vector[23] = (0.239745, 0.236579, 0.423569)     vector[23] = (0.23434, -0.514342, -0.186823)     vector[23] = (0.23434, -0.514342, -0.186823)     vector[23] = (0.436645, -0.609132,</pre>		
<pre></pre>		
<pre>7 # Dovalue at U1 / 30 8 # non-zero b-values: 750 8 # number of bora-zero shells: 1 9 # number of directions per non-zero shell: 64 1 # normalization = none 1 coordinatesystem = xyz 6 comment=bUI: 750, b: 750, Nb0: 7 17 vector[0] = ( 0.000000, 0.000000, 0.000000 ) 18 vector[1] = ( -0.538981, 0.033731, -0.091439 ) 19 vector[2] = ( -0.000440, 0.429608, 0.339760 ) 19 vector[3] = ( -0.14795, -0.494556, -0.183546 ) 10 vector[3] = ( -0.14795, -0.494556, -0.183546 ) 10 vector[3] = ( -0.016278, -0.195328, 0.511451 ) 10 vector[6] = ( -0.061295, -0.451376, 0.304143 ) 10 vector[6] = ( -0.061295, -0.451376, 0.304143 ) 10 vector[9] = ( -0.397538, -0.105537, -0.316199 ) 10 vector[1] = ( 0.025626, -0.008709, -0.547053 ) 10 vector[1] = ( 0.000000, 0.000000, 0.000000 ) 10 vector[1] = ( 0.000000, 0.000000, 0.000000 ) 10 vector[1] = ( 0.447399, -0.280126, -0.16162 ) 10 vector[1] = ( 0.447399, -0.280126, -0.16162 ) 10 vector[1] = ( 0.497544, -0.22679, 0.459823 ) 11 vector[1] = ( 0.49722, 0.401066, -0.301523 ) 12 vector[1] = ( 0.496386, 0.050199, 0.225809 ) 13 vector[1] = ( 0.496386, 0.050199, 0.225809 ) 14 vector[16] = ( -0.49022, 0.181524, -0.164098 ) 15 vector[16] = ( -0.492032, -0.268986, -0.423989 ) 16 vector[16] = ( -0.245685, -0.236576, 0.428568 ) 17 vector[16] = ( 0.245685, -0.236576, 0.428568 ) 18 vector[21] = ( -0.245685, -0.236576, 0.428568 ) 19 vector[22] = ( 0.143700, -0.138957, -0.59932 ) 19 vector[23] = ( 0.024004, -0.408691, 0.327438 ) 10 vector[23] = ( 0.024004, -0.408691, 0.327438 ) 10 vector[24] = ( 0.436644, -0.2352591, 0.437181 ) 10 vector[31] = ( 0.356866, 0.108072, -0.</pre>		
<pre># number of non-zero shells: 1 # number of number of obless: 7 # number of be0 volumes: 7 # total number of directions including b0: 71 [directions=71] normalization = none comment=bUI: 750, b: 750, Nb0: 7 vector[0] = ( 0.000000, 0.000000 ) vector[2] = ( -0.038981, 0.033731, -0.091439 ) vector[2] = ( -0.000440, 0.429608, 0.339760 ) vector[2] = ( -0.000440, 0.429608, 0.339760 ) vector[2] = ( -0.016278, -0.494556, -0.183546 ) vector[3] = ( -0.147395, -0.494556, -0.183546 ) vector[3] = ( -0.016278, -0.451376, 0.349872 ) vector[5] = ( -0.061295, -0.451376, 0.349872 ) vector[6] = ( 0.060295, -0.451376, 0.304143 ) vector[7] = ( 0.025626, -0.008709, -0.547053 ) vector[7] = ( 0.025626, -0.008709, -0.547053 ) vector[8] = ( -0.231133, -0.471788, 0.154896 ) vector[1] = ( 0.000000, 0.000000 , 0.000000 ) vector[1] = ( 0.000000, 0.000000 , 0.000000 ) vector[14] = ( 0.219722, 0.401006, -0.301523 ) vector[14] = ( 0.219723, -0.280895, 0.423989 ) vector[14] = ( 0.219723, -0.280895, -0.423979 ) vector[14] = ( 0.219723, -0.280895, -0.423989 ) vector[14] = ( 0.2193955, -0.315424, -0.18524, -0.18523 ) vector[14] = ( 0.218932, -0.268895, -0.423958 ) vector[2] = ( -0.32316, -0.101032, 0.334159 ) vector[2] = ( 0.023344, -0.236586, 0.428588 ) vector[2] = ( 0.023434, -0.236896, -0.423588 ) vector[2] = ( 0.439474, -0.138989, -0.423999 ) vector[2] = ( 0.439474, -0.138989, -0.432586 ) vector[2] = ( 0.439474, -0.138989, -0.435786 ) vector[2] = ( 0.439047, -0.138089, -0.493789 ) vector[2] = ( 0.439047, -0.138989, -0.435786 ) vector[2] = ( 0.439047, -0.138989, -0.435786 ) vector[2] = ( 0.438686, 0.108072, -0.018533 ) vector[2] = ( 0.439047, 0.404618, 0.267033 ) vector[3</pre>		
<pre> # number of directions per non-zero shell: 64 # number of b=0 volumes: 7 # total number of directions including b0: 71 [directions=71] normalization = none Coordinatesystem = xyz Comment=bUI: 750, b: 750, Nb0: 7 vector[0] = (0.000000, 0.000000, 0.000000) vector[2] = (-0.000400, 0.29608, 0.339760) vector[3] = (-0.147395, -0.494556, -0.183546) vector[3] = (-0.016278, -0.195328, 0.511451) vector[5] = (-0.016278, -0.195328, 0.511451) vector[6] = (-0.061295, -0.451376, 0.304143) vector[7] = (0.052626, -0.008709, -0.451376, 0.304143) vector[6] = (-0.061295, -0.451376, 0.304143) vector[8] = (-0.231133, -0.471788, 0.154896) vector[8] = (-0.231133, -0.471788, 0.154896) vector[10] = (0.447399, -0.280126, -0.146162) vector[11] = (0.000000, 0.000000, 0.000000) vector[12] = (-0.397538, -0.185577, -0.361699) vector[13] = (0.195148, -0.224679, 0.459823) vector[13] = (0.195148, -0.226079, 0.25809) vector[13] = (0.195380, 0.051099, 0.25809) vector[13] = (0.496380, 0.051299, 0.25809) vector[14] = (0.219722, 0.401006, -0.301523) vector[15] = (0.496380, 0.051299, 0.25809) vector[13] = (0.195148, -0.226898, -0.423989) vector[20] = (0.218923, -0.268898, -0.423989) vector[21] = (-0.490822, 0.181524, -0.164082) vector[23] = (0.023434, -0.514342, -0.186823) vector[23] = (0.023434, -0.514342, -0.126826) vector[23] = (0.023434, -0.514342, -0.126826)) vector[23] = (0.023434, -0.514342, -0.126826) vector[23] = (0.023434, -0.514342, -0.126826) vector[23] = (0.023434, -0.514342, -0.126826)) vector[23] = (0.023434, -0.514342, -0.126826)) vector[23] = (0.023434, -0.514342, -0.126826)) vect</pre>	8	
<pre># number of b=0 volumes: 7 # total number of directions including b0: 71 [directions=71] idirections=71] idirections=71]</pre>	9	
<pre># total number of directions including b0: 71 [directions=71] normalization = none coordinatesystem = xyz comment=bUIT 750, bb: 750, Nb0: 7 vector[0] = ( 0.000000, 0.000000, 0.000000) vector[2] = ( -0.000440, 0.429608, 0.339760 ) vector[3] = ( -0.147395, -0.494556, -0.183546 ) vector[3] = ( -0.016278, -0.195328, 0.511451 ) vector[4] = ( 0.239035, -0.347062, 0.349872 ) vector[5] = ( -0.016278, -0.195328, 0.511451 ) vector[7] = ( 0.025626, -0.082709, -0.364143 ) vector[7] = ( 0.025626, -0.082709, -0.364143 ) vector[8] = ( -0.397538, -0.195328, 0.511451 ) vector[8] = ( -0.397538, -0.195378, -0.15659 ) vector[10] = ( 0.447399, -0.280126, -0.146162 ) vector[10] = ( 0.447399, -0.280126, -0.146162 ) vector[10] = ( 0.447399, -0.280126, -0.146162 ) vector[12] = ( -0.347344, -0.385418, 0.293379 ) vector[13] = ( 0.195148, -0.224679, 0.459823 ) vector[13] = ( 0.496386, 0.051099, 0.225809 ) vector[13] = ( 0.496386, 0.0551099, 0.225809 ) vector[14] = ( 0.219722, 0.401006, -0.301523 ) vector[15] = ( -0.446457, -0.091032, 0.339355 ) vector[17] = ( 0.415886, 0.256359, -0.423898 ) vector[21] = ( -0.245685, -0.236576, 0.428568 ) vector[22] = ( -0.249795, 0.319409, 0.334159 ) vector[23] = ( 0.023434, -0.514342, -0.186823 ) vector[23] = ( 0.023434, -0.514342, -0.186823 ) vector[23] = ( 0.023434, -0.513432, -0.186823 ) vector[23] = ( 0.023434, -0.513432, -0.186823 ) vector[23] = ( 0.439047, 0.004691, 0.327438 ) vector[23] = ( 0.439047, 0.004691, 0.327438 ) vector[23] = ( 0.439047, 0.004691, 0.327438 ) vector[33] = ( 0.439047, 0.004691, 0.327438 ) vector[33] = ( 0.439364, -0.5134342, -0.186823 ) vector[33] = ( 0.439364, -0.5134342, -0.186823 ) vector[33] = ( 0.439047, 0.004691, 0.327438 ) vector[33] = ( 0.439047, 0.004691, 0.327438 ) vector[33] = ( 0.000000, 0.000000 ) vector[33] = ( 0.439047, 0.004691, 0.327438 ) vector[33] = ( 0.000000, 0.000000 ) vector[33] = ( 0.744665, -0.423659, -0.013505 ) vector[33] = ( 0.744666, -0.423659, 0.24597 ) vector[33] = ( 0.744666, -0.423659, 0.24597 ) vector[33] = ( 0.744666, -0.423659, 0.2145</pre>	10	
13       [direction=71]         14       normalization = none         15       coordinatesystem = xyz         16       comment=bUI: 750, b: 750, Nb0: 7         17       vector[1] = (-0.538981, 0.033731, -0.091439)         19       vector[2] = (-0.000440, 0.429608, 0.339760)         10       vector[3] = (-0.147395, -0.494556, -0.183546)         11       vector[3] = (-0.147395, -0.494556, -0.183546)         12       vector[6] = (-0.061295, -0.451376, 0.304143)         12       vector[6] = (-0.061295, -0.451376, 0.304143)         12       vector[8] = (-0.231133, -0.471788, 0.154896)         12       vector[9] = (-0.397538, -0.105537, -0.361699)         12       vector[10] = (0.447399, -0.224679, 0.459823)         13       vector[11] = (0.000000, 0.000000, 0.000000)         14       vector[12] = (-0.347344, -0.305418, 0.293379)         15       vector[13] = (0.490202, 0.181524, -0.164098)         16       vector[14] = (0.219722, 0.401006, -0.301523)         17       vector[16] = (-0.449394, 0.256359, 0.253691)         18       vector[16] = (-0.49022, 0.181524, -0.164098)         19       vector[13] = (0.415886, 0.250359, 0.253691)         19       vector[20] = (0.218923, -0.268989, -0.423989)         19       vector[21] = (-0.245685, -0.236576, 0.428568)<	11	
Image: normalization = none           Image: normalization = normalization = normalization           Image: normalization <td></td> <td>· · · · · · · · · · · · · · · · · · ·</td>		· · · · · · · · · · · · · · · · · · ·
Coordinatesystem = xyz           Comment=bUI: 750, b:00           Vector[0] = (0.000000, 0.000000, 0.000000)           Vector[1] = (-0.530981, 0.033731, -0.091439)           Vector[3] = (-0.147395, -0.494556, -0.183546)           Vector[3] = (-0.147395, -0.494556, -0.183546)           Vector[6] = (-0.16278, -0.195328, 0.511451)           Vector[6] = (-0.061295, -0.451376, 0.304143)           Vector[6] = (-0.397538, -0.470762, 0.347053)           Vector[9] = (-0.33133, -0.471788, 0.154896)           Vector[1] = (0.000000, 0.000000, 0.000000)           Vector[1] = (0.000000, 0.0000000, 0.000000)           Vector[1] = (-0.347344, -0.385418, 0.233379)           Vector[1] = (0.195148, -0.224679, 0.459823)           Vector[1] = (0.496386, 0.051099, 0.225809)           Vector[1] = (0.446357, -0.091032, 0.303955)           Vector[1] = (0.446457, -0.091032, 0.3334159)           Vector[1] = (0.219722, 0.401006, 0.000000)           Vector[1] = (0.446457, -0.091032, 0.339355)           Vector[1] = (0.446457, -0.091032, 0.339355)           Vector[2] = (0.210932, -0.25809, 0.25808]           Vector[2] = (0.127918, 0.32591, 0.451419)           Vector[2] = (0.218923, -0.268938, -0.423980)           Vector[2] = (0.127918, 0.252591, 0.451419)           Vector[2] = (0.127918, 0.325591, 0.451419)           Vector[2] = (0.138504, 0.256930, 0.40699773)      <		
16       comment=bUI: 750, b: 750, Nb0: 7         17       vector[0] = (0.00000, 0.000000, 0.000000)         18       vector[1] = (-0.538981, 0.033731, -0.091439)         19       vector[2] = (-0.000440, 0.429608, 0.339760)         20       vector[3] = (-0.147395, -0.494556, -0.183546)         21       vector[4] = (0.239035, -0.347662, 0.349872)         22       vector[5] = (-0.016278, -0.195328, 0.511451)         23       vector[7] = (0.025626, -0.008709, -0.547053)         24       vector[8] = (-0.31733, -0.471788, 0.154896)         25       vector[9] = (-0.397538, -0.105537, -0.361699)         26       vector[10] = (0.447399, -0.280126, -0.146162)         27       vector[10] = (0.447399, -0.280126, -0.416162)         28       vector[11] = (-0.347344, -0.395418, 0.023379)         30       vector[12] = (-0.447392, 0.401006, -0.301523)         31       vector[13] = (0.446386, 0.651099, 0.225809)         32       vector[14] = (0.219722, 0.401006, -0.301523)         33       vector[16] = (-0.490022, 0.181524, -0.164098)         34       vector[16] = (-0.490022, 0.31459, 0.33159)         35       vector[18] = (0.219725, 0.319409, 0.33159)         36       vector[18] = (0.219727, -0.1080842, -0.128268)         40       vector[21] = (-0.490022, 0.181524, -0.164088)		
17 $vector[0] = (0.000000, 0.000000, 0.000000)$ 18 $vector[1] = (-0.538981, 0.033731, -0.091439)$ 19 $vector[2] = (-0.000440, 0.429608, 0.339760)$ 20 $vector[3] = (-0.147395, -0.494556, -0.183546)$ 21 $vector[3] = (-0.016278, -0.195328, 0.511451)$ 22 $vector[6] = (-0.016278, -0.195328, 0.511451)$ 23 $vector[6] = (-0.016278, -0.195328, 0.511451)$ 24 $vector[6] = (-0.051295, -0.451376, 0.304143)$ 25 $vector[8] = (-0.25133, -0.471788, 0.154896)$ 26 $vector[9] = (-0.397538, -0.105537, -0.361699)$ 27 $vector[10] = (0.447399, -0.280126, -0.146162)$ 29 $vector[11] = (0.000000, 0.000000, 0.000000)$ 30 $vector[12] = (-0.347344, -0.305418, 0.293379)$ 31 $vector[13] = (0.195148, -0.224679, 0.459823)$ 32 $vector[14] = (0.219722, 0.401006, -0.301523)$ 33 $vector[15] = (0.446386, 0.051099, 0.225809)$ 34 $vector[17] = (0.445886, 0.250359, 0.253691)$ 35 $vector[17] = (0.445685, -0.236576, 0.428568)$ 36 $vector[20] = (0.218923, -0.26898, -0.423989)$ 37 $vector[21] = (-0.245685, -0.236576, 0.428568)$ 40 $vector[22] = (0.00000, 0.000000, 0.000000)$ 41 $vector[23] = (0.218923, -0.168989, -0.423989)$ 42 $vector[24] = (0.218923, -0.256980, -0.423989)$ 43 $vector[23] = (0.023434, -0.513424, -0.156823)$ 44 $vector[24] = (0.218923, -0.256980, -0.423989)$ 45 $vector[26] = (-0.4397742, -0.190842, -0.125826)$ 46 $vector[27] = (-0.552216, -0.116300, 0.403012)$		
18 $vector[1] = (-0.5389i], 0.0337i], -0.091439 )19vector[2] = (-0.000440, 0.429608, 0.339760 )20vector[3] = (-0.147395, -0.494556, -0.183546 )21vector[4] = (0.239035, -0.347062, 0.349872 )22vector[5] = (-0.016278, -0.195328, 0.511451 )23vector[6] = (-0.061295, -0.451376, 0.304143 )24vector[7] = (0.025626, -0.008709, -0.547053 )25vector[9] = (-0.337538, -0.147587, -0.361699 )26vector[10] = (0.447399, -0.280126, -0.146162 )29vector[11] = (0.09000, 0.000000, 0.000000 )30vector[12] = (-0.347344, -0.305418, 0.293379 )31vector[13] = (0.195148, -0.224679, 0.459823 )32vector[14] = (0.219722, 0.401006, -0.301523 )33vector[15] = (0.496386, 0.051099, 0.225809 )34vector[16] = (-0.490022, 0.181524, -0.164098 )35vector[18] = (0.233795, 0.319409, 0.334159 )36vector[18] = (0.219722, -0.268898, -0.423989 )37vector[12] = (-0.245685, -0.236576, 0.428568 )40vector[21] = (-0.245685, -0.236576, 0.428568 )41vector[22] = (0.00000, -0.000000, 0.000000 )42vector[23] = (0.023434, -0.5134342, -0.186823 )43vector[24] = (0.127918, 0.232591, 0.453149 )44vector[25] = (0.127918, 0.232591, -0.436823 )45vector[26] = (-0.439747, -0.108424, -0.125826 )46vector[26] = (-0.439747, -0.108424, -0.125826 )47vector[26] = (-0.439747, 0.004691, 0.327438 )48vector[28] = (-0.133044, -0.256940, -0.010438 )$		
19       vector[2] = ( -0.000440, 0.429608, 0.339760 )         20       vector[3] = ( -0.147395, -0.494556, -0.183546 )         21       vector[5] = ( -0.016278, -0.195328, 0.511451 )         22       vector[6] = ( -0.061295, -0.451376, 0.304143 )         24       vector[7] = ( 0.025626, -0.008709, -0.547053 )         25       vector[8] = ( -0.231133, -0.471788, 0.154896 )         26       vector[10] = ( 0.447399, -0.280126, -0.146162 )         29       vector[11] = ( 0.400000, 0.000000, 0.000000 )         30       vector[12] = ( -0.347344, -0.305418, 0.293379 )         31       vector[13] = ( 0.195148, -0.224679, 0.459823 )         32       vector[14] = ( 0.219722, 0.401006, -0.301523 )         33       vector[15] = ( 0.49636, 0.051099, 0.225809 )         34       vector[16] = ( 0.219722, 0.401006, -0.301523 )         35       vector[16] = ( 0.219722, 0.401006, -0.301523 )         36       vector[16] = ( 0.495367, -0.091032, 0.33955 )         37       vector[18] = ( 0.22375, 0.319409, 0.334159 )         38       vector[20] = ( 0.218923, -0.268988, -0.423989 )         39       vector[21] = ( -0.439047, -0.09060, 0.000000 )         40       vector[22] = ( 0.023434, -0.514342, -0.126826 )         41       vector[23] = ( 0.023434, -0.514342, -0.125826 )         42       vector[23] = ( 0.1		
<pre>vector[3] = ( -0.147395, -0.494556, -0.183546 ) vector[4] = ( 0.239035, -0.347062, 0.349872 ) vector[6] = ( -0.0661295, -0.451376, 0.304143 ) vector[6] = ( -0.061295, -0.451376, 0.304143 ) vector[7] = ( 0.025626, -0.008709, -0.547053 ) vector[8] = ( -0.231133, -0.471788, 0.154896 ) vector[9] = ( -0.397538, -0.105537, -0.361699 ) vector[10] = ( 0.447399, -0.280126, -0.146162 ) vector[11] = ( 0.000000, 0.000000, 0.000000 ) vector[12] = ( -0.347344, -0.305418, 0.293379 ) vector[13] = ( 0.195148, -0.224679, 0.459823 ) vector[14] = ( 0.219722, 0.401006, -0.301523 ) vector[15] = ( 0.496386, 0.051099, 0.225809 ) vector[16] = ( -0.490022, 0.181524, -0.164098 ) vector[16] = ( -0.490022, 0.181524, -0.164098 ) vector[17] = ( 0.446457, -0.091032, 0.303955 ) vector[18] = ( 0.223379, -0.268898, -0.423989 ) vector[20] = ( 0.218923, -0.268898, -0.423989 ) vector[21] = ( 0.24565, -0.25756, 0.424568 ) vector[22] = ( 0.000000, -0.495809, -0.099773 ) vector[23] = ( 0.223434, -0.514342, -0.186823 ) vector[24] = ( 0.210090, -0.495809, -0.099773 ) vector[25] = ( 0.127918, 0.282591, 0.451419 ) vector[26] = ( -0.439647, 0.004691, 0.327438 ) vector[27] = ( -0.439647, 0.004691, 0.327438 ) vector[28] = ( -0.439647, 0.004691, 0.327438 ) vector[28] = ( -0.439647, 0.004691, 0.327438 ) vector[29] = ( 0.113700, -0.138995, -0.509932 ) vector[31] = ( 0.36686, 0.108072, -0.008594 ) vector[31] = ( 0.36686, 0.108072, -0.008594 ) vector[31] = ( 0.36021, -0.433649, 0.451627 ) vector[32] = ( -0.172278, 0.446108, 0.267035 ) vector[33] = ( 0.030270, 0.076300, -0.445476 ) vector[33] = ( 0.074066, -0.423055, -0.1325263 ) vector[34] = ( 0.074656, -0.432055, -0.1325263 ) vector[35] = ( -0.172278, 0.446108, 0.267035 ) vector[33] = ( 0.07247, 0.076300, -0.445476 ) vector[33] = ( 0.074656, -0.432055, -0.132263 ) vector[33] = ( 0.074656, -0.423055, -0.132263 ) vector[33] = ( 0.07427, 0.076830, -0.445476 ) vector[33] = ( 0.07427, 0.076830, -0.445476 ) vector[33] = ( 0.075465, 0.519169, -0.157382 ) vector[40] = ( 0.075465, 0.519169, -0.157382 ) vector[40] =</pre>		
<pre>vector[4] = ( 0.239035, -0.347062, 0.349372 ) vector[5] = ( -0.016278, -0.195328, 0.511451 ) vector[7] = ( 0.025626, -0.008709, -0.547053 ) vector[8] = ( -0.3373313, -0.471788, 0.154896 ) vector[9] = ( -0.397538, -0.105537, -0.361699 ) vector[10] = ( 0.447399, -0.280126, -0.146162 ) vector[11] = ( 0.000000, 0.000000, 0.000000 ) vector[12] = ( -0.347344, -0.305418, 0.29379 ) vector[13] = ( 0.195148, -0.224679, 0.459823 ) vector[14] = ( 0.219722, 0.401006, -0.301523 ) vector[15] = ( 0.496386, 0.051099, 0.225809 ) vector[16] = ( -0.490022, 0.181524, -0.164098 ) vector[17] = ( 0.44657, -0.091032, 0.303955 ) vector[19] = ( 0.245685, -0.236576, 0.423569 ] vector[20] = ( 0.218923, -0.268988, -0.423989 ) vector[21] = ( -0.245685, -0.236576, 0.428568 ) vector[22] = ( 0.020000, 0.000000, 0.000000 ) vector[23] = ( 0.224334, -0.514342, -0.168623 ) vector[24] = ( 0.210909, -0.495809, -0.099773 ) vector[25] = ( 0.127918, 0.22591, 0.451419 ) vector[26] = ( -0.439047, 0.004691, 0.327438 ) vector[28] = ( -0.439047, 0.004691, 0.327438 ) vector[29] = ( 0.143700, -0.138995, -0.509932 ) vector[23] = ( 0.030004, 0.256909, -0.009594 ) vector[23] = ( 0.030047, 0.004691, 0.327438 ) vector[23] = ( 0.330467, 0.030651, 0.425866 ) vector[23] = ( 0.370486, 0.256919, 0.327438 ) vector[23] = ( 0.143700, -0.138995, -0.50932 ) vector[33] = ( 0.300000, 0.000000, 0.000000 ) vector[33] = ( 0.33047, 0.004691, 0.327438 ) vector[33] = ( 0.330270, 0.030655, 0.125866 ) vector[33] = ( 0.330270, 0.030655, 0.103637 ) vector[33] = ( 0.330270, 0.0306591, 0.327438 ) vector[33] = ( 0.030270, 0.0306305, 0.000000 ) vector[33] = ( 0.330270, 0.0306305, 0.000000 ) vector[33] = ( 0.330271, 0.0306591, 0.327438 ) vector[33] = ( 0.330270, 0.076830, -0.445476 ) vector[33] = ( 0.074066, -0.423595, 0.214272 ) vector[33] = ( 0.075465, 0.519169, -0.157382 ) vector[33] = ( 0.075465, 0.519169, -0.157382 ) vector[34] = ( 0.0552277,</pre>		
<pre>vector[5] = ( -0.016278, -0.195328, 0.551451 ) vector[6] = ( -0.061295, -0.451376, 0.304143 ) vector[8] = ( -0.231133, -0.471788, 0.154896 ) vector[8] = ( -0.331738, -0.105537, -0.361699 ) vector[9] = ( -0.397538, -0.105537, -0.361699 ) vector[10] = ( 0.447399, -0.280126, -0.146162 ) vector[11] = ( 0.000000, 0.000000, 0.000000 ) vector[12] = ( -0.347344, -0.305418, 0.293379 ) vector[13] = ( 0.195148, -0.224679, 0.459823 ) vector[14] = ( 0.21972, 0.40106, -0.301523 ) vector[15] = ( 0.496386, 0.051099, 0.225809 ) vector[16] = ( -0.490022, 0.181524, -0.164098 ) vector[17] = ( 0.415886, 0.250359, 0.253691 ) vector[18] = ( 0.293795, 0.319409, 0.334159 ) vector[18] = ( 0.219725, 0.26898, -0.423989 ) vector[20] = ( 0.218923, -0.26898, -0.423989 ) vector[21] = ( -0.445685, -0.236576, 0.428568 ) vector[22] = ( 0.000000, 0.000000, 0.000000 ) vector[22] = ( 0.000000, 0.000000, 0.000000 ) vector[23] = ( 0.218923, -0.286989, -0.423989 ) vector[24] = ( 0.219718, 0.282591, 0.451419 ) vector[25] = ( 0.127918, 0.282591, 0.451419 ) vector[26] = ( -0.497742, -0.198842, -0.128826 ) vector[27] = ( -0.439047, 0.004691, 0.327438 ) vector[28] = ( -0.439047, 0.004691, 0.327438 ) vector[29] = ( 0.113008, -0.337640, 0.416207 ) vector[31] = ( 0.368664, 0.256940, -0.018438 ) vector[31] = ( 0.376864, 0.256940, -0.138262 ) vector[31] = ( 0.300270, 0.076830, -0.425735 ) vector[33] = ( 0.000000, 0.000000, 0.000000 ) vector[34] = ( 0.346021, -0.423655, 0.214272 ) vector[34] = ( 0.07465, 0.519169, -0.133263 ) vector[34] = ( 0.075465, 0.519169, -0.157322 ) vector[34] = ( 0.075465, 0.519169, -0.15732 ) vector[34] = ( 0.075465, 0.519169,</pre>		
<pre>vector[3] = ( -0.0612676, -0.151376, 0.304143 ) vector[7] = ( 0.025626, -0.008709, -0.547053 ) vector[8] = ( -0.231133, -0.471788, 0.154396 ) vector[9] = ( -0.397538, -0.105537, -0.361699 ) vector[10] = ( 0.447399, -0.280126, -0.146162 ) vector[11] = ( 0.000000, 0.000000, 0.000000 ) vector[12] = ( -0.347344, -0.305418, 0.293379 ) vector[13] = ( 0.195148, -0.224679, 0.459823 ) vector[14] = ( 0.219722, 0.401006, -0.301523 ) vector[15] = ( 0.496386, 0.051099, 0.225809 ) vector[16] = ( -0.490022, 0.181524, -0.164098 ) vector[17] = ( 0.415886, 0.250359, 0.253691 ) vector[18] = ( 0.293795, 0.319409, 0.334159 ) vector[19] = ( 0.446457, -0.091032, 0.33955 ) vector[19] = ( 0.446457, -0.091032, 0.33955 ) vector[20] = ( 0.218023, -0.268898, -0.423989 ) vector[21] = ( -0.245685, -0.236576, 0.428568 ) vector[22] = ( 0.000000, 0.000000, 0.000000 ) vector[23] = ( 0.210090, -0.495890, -0.099773 ) vector[24] = ( 0.210090, -0.495890, -0.125826 ) vector[25] = ( -0.43947, 0.034691, 0.327438 ) vector[26] = ( -0.439047, 0.0380452, -0.125826 ) vector[30] = ( 0.536886, 0.108072, -0.008594 ) vector[31] = ( 0.536886, 0.108072, -0.008594 ) vector[31] = ( 0.346021, -0.337640, 0.416207 ) vector[31] = ( 0.302270, 0.07633, -0.415476 ) vector[33] = ( 0.07466, -0.337640, 0.445476 ) vector[34] = ( 0.27278, 0.446108, 0.267935 ) vector[35] = ( -0.77278, 0.446108, 0.26793 ) vector[36] = ( -0.72278, 0.451849, -0.15826 ) vector[36] = ( -0.72278, 0.451849, -0.135263 ) vector[36] = ( -0.72278, 0.445189, 0.416207 ) vector[36] = ( -0.72278, 0.445189, 0.267935 ) vector[36] = ( -0.77278, 0.446108, 0.267935 ) vector[36] = ( -0.77278, 0.446108, 0.267935 ) vector[37] = ( 0.075465, 0.519169, -0.135263 ) vector[38] = ( 0.075465, 0.519169, -0.135263 ) vector[39] = ( 0.075465, 0.519169, -0.157382 ) vector[39] = ( 0.075465, 0.519169, -0.157382 ) vector[39] = ( 0.075465, 0.519169, -0.157382 ) vector[40] = ( 0.075465, 0.519169, -0.157382 ) vector[40] = ( 0.05545, 0.519169, -0.157382 ) vector[40] = ( 0.05545, 0.519169, -0.157382 ) vector[40] = ( 0.05545, 0.5191</pre>		
<pre>24 vector[7] = ( 0.025626, -0.008709, -0.547053 ) 25 vector[8] = ( -0.231133, -0.471788, 0.154896 ) 27 vector[9] = ( -0.397538, -0.105537, -0.361699 ) 28 vector[11] = ( 0.000000, 0.000000, 0.000000 ) 30 vector[12] = ( -0.347344, -0.305418, 0.293379 ) 31 vector[13] = ( 0.195148, -0.224679, 0.459823 ) 32 vector[14] = ( 0.219722, 0.401006, -0.301523 ) 33 vector[15] = ( 0.496386, 0.051099, 0.225809 ) 34 vector[16] = ( -0.490022, 0.181524, -0.164098 ) 35 vector[17] = ( 0.415886, 0.250359, 0.253691 ) 36 vector[18] = ( 0.293795, 0.319409, 0.334159 ) 37 vector[18] = ( 0.218923, -0.268898, -0.423989 ) 38 vector[20] = ( 0.42685, -0.236576, 0.428568 ) 40 vector[21] = ( -0.245685, -0.236576, 0.428568 ) 41 vector[22] = ( 0.000000, 0.000000, 0.000000 ) 41 vector[23] = ( 0.213434, -0.514342, -0.186823 ) 42 vector[24] = ( 0.210090, -0.495890, -0.099773 ) 43 vector[26] = ( -0.439047, 0.04691, 0.327438 ) 44 vector[27] = ( -0.439047, 0.004691, 0.327438 ) 45 vector[28] = ( -0.439047, 0.004691, 0.327438 ) 46 vector[29] = ( 0.113700, -0.138095, -0.50932 ) 47 vector[23] = ( 0.013004, -0.036576, 0.416207 ) 48 vector[23] = ( 0.0130947, 0.004691, 0.327438 ) 49 vector[23] = ( -0.439047, 0.004691, 0.327438 ) 40 vector[23] = ( -0.439047, 0.004691, 0.327438 ) 41 vector[23] = ( -0.113008, -0.337640, 0.416207 ) 42 vector[33] = ( 0.036040, 0.250940, -0.135263 ) 43 vector[33] = ( 0.034024, -0.53040, 0.403012 ) 44 vector[33] = ( 0.034024, -0.337640, 0.416207 ) 45 vector[33] = ( -0.17278, 0.446108, 0.267035 ) 54 vector[33] = ( -0.17278, 0.476108, 0.267035 ) 55 vector[33] = ( 0.02727, -0.321802, 0.440132 ) 56 vector[33] = ( 0.0277, -0.321802, 0.440132 ) 57 vector[33] = ( 0.027466, -0.423055, 0.214272 ) 58 vector[33] = ( 0.052227, -0.321802, 0.440132 ) 59 vector[40] = ( 0.05227, -0.321802, 0.445132 ) 50 vector[33] = ( 0.075465, 0.519169, -0.15732 ) 59 vector[30] = ( 0.075465, 0.519169, -0.15732 ) 50 vector[30] = ( 0.075465, 0.519169, -0.157382 ) 59 vector[40] = ( 0.05227, -0.321802, 0.440132 ) 50 vector[30] = ( 0.075465, 0.519169, -0.157382 )</pre>		
<pre>vector[8] = ( -0.231133, -0.471788, 0.154896 ) vector[9] = ( -0.397538, -0.105537, -0.361699 ) vector[10] = ( 0.447399, -0.280126, -0.146162 ) vector[11] = ( 0.00000, 0.000000, 0.000000 ) vector[12] = ( -0.347344, -0.305418, 0.293379 ) vector[13] = ( 0.195148, -0.224679, 0.459823 ) vector[14] = ( 0.219722, 0.401066, -0.301523 ) vector[15] = ( 0.496386, 0.051099, 0.225809 ) vector[16] = ( -0.490022, 0.181524, -0.164098 ) vector[17] = ( 0.446886, 0.250359, 0.253691 ) vector[18] = ( 0.293795, 0.319409, 0.334159 ) vector[19] = ( 0.446457, -0.091032, 0.303955 ) vector[20] = ( 0.218923, -0.268898, -0.423969 ) vector[21] = ( -0.245685, -0.236576, 0.428568 ) vector[22] = ( 0.000000, 0.000000, 0.000000 ) vector[23] = ( 0.023434, -0.514342, -0.186823 ) vector[24] = ( 0.212090, -0.495890, -0.099773 ) vector[25] = ( 0.127918, 0.325511, 0.451419 ) vector[25] = ( 0.127918, 0.325591, 0.438626 ) vector[27] = ( -0.439047, 0.004691, 0.327438 ) vector[28] = ( -0.439047, 0.038955, -0.50932 ) vector[29] = ( 0.143700, -0.138995, -0.50932 ) vector[30] = ( -0.43864, 0.256940, -0.010438 ) vector[31] = ( 0.536886, 0.108072, -0.086594 ) vector[31] = ( 0.346021, -0.432591, 0.416207 ) vector[31] = ( 0.13008, -0.337640, 0.416207 ) vector[33] = ( 0.000000, 0.000000 ) vector[33] = ( 0.000000, 0.000000 ) vector[34] = ( 0.1340027, -0.086594 ) vector[35] = ( -0.172278, 0.446108, 0.267035 ) vector[36] = ( -0.052277, -0.321802, 0.440132 ) vector[37] = ( 0.052277, -0.321802, 0.440132 ) vector[39] = ( 0.057277, -0.321802, 0.440132 ) vector[30] = ( 0.057277, -0.321802, 0.440132 ) vector[30] = ( 0.057277, 0.321802, 0.440132 ) vector[30] = ( 0.057277, 0.321802, 0.440132 ) vector[30] = ( 0.057277, 0.321802, 0.440132 ) vector[30] = ( 0.057247, 0.452385, 0.335170 )</pre>	24	
<pre>vector[9] = ( -0.397538, -0.105537, -0.361699 ) vector[10] = ( 0.447399, -0.280126, -0.146162 ) vector[11] = ( 0.00000, 0.00000, 0.000000 ) vector[12] = ( -0.347344, -0.305418, 0.293379 ) vector[13] = ( 0.195148, -0.224679, 0.459823 ) vector[14] = ( 0.219722, 0.401006, -0.301523 ) vector[15] = ( 0.496386, 0.051099, 0.225809 ) vector[16] = ( -0.490022, 0.181524, -0.164098 ) vector[18] = ( 0.293795, 0.319409, 0.334159 ) vector[19] = ( 0.446457, -0.091032, 0.303955 ) vector[20] = ( 0.218923, -0.268898, -0.423989 ) vector[21] = ( -0.245685, -0.236576, 0.428568 ) vector[22] = ( 0.00000, 0.000000, 0.000000 ) vector[23] = ( 0.023434, -0.514342, -0.186823 ) vector[24] = ( 0.210990, -0.495890, -0.099773 ) vector[25] = ( 0.127918, 0.282591, 0.451419 ) vector[26] = ( -0.439047, 0.004691, 0.327438 ) vector[28] = ( -0.438047, 0.268498, -0.010438 ) vector[31] = ( 0.536846, 0.256340, -0.610438 ) vector[32] = ( 0.000000, 0.004691, 0.327438 ) vector[33] = ( 0.036047, 0.04591, 0.327648 ) vector[33] = ( 0.036047, 0.04591, 0.327648 ) vector[33] = ( 0.352804, 0.256940, -0.610438 ) vector[33] = ( 0.039047, 0.004691, 0.327648 ) vector[33] = ( 0.032700, 0.076830, -0.445476 ) vector[33] = ( 0.02000, 0.000000, 0.000000 ) vector[34] = ( 0.352870, 0.42599, -0.335263 ) vector[34] = ( 0.32748, 0.446108, 0.267035 ) vector[34] = ( 0.02770, 0.076830, -0.445476 ) vector[33] = ( 0.05227, -0.321802, 0.446132 ) vector[34] = ( 0.05227, -0.321802, 0.440132 ) ve</pre>	25	
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$\begin{array}{cccc} & \text{vector}[21] = (-0.24303, -0.24303, 0.0420300) \\ & \text{vector}[22] = (0.00000, 0.000000, 0.000000) \\ & \text{vector}[23] = (0.023434, -0.514342, -0.186823) \\ & \text{vector}[24] = (0.210090, -0.495890, -0.099773) \\ & \text{vector}[25] = (0.127918, 0.282591, 0.451419) \\ & \text{vector}[26] = (-0.497742, -0.190842, -0.125826) \\ & \text{vector}[26] = (-0.497742, -0.190842, -0.125826) \\ & \text{vector}[27] = (-0.352216, -0.116300, 0.403012) \\ & \text{vector}[28] = (-0.439047, 0.004691, 0.327438) \\ & \text{vector}[29] = (0.143700, -0.138995, -0.509932) \\ & \text{vector}[30] = (-0.483604, 0.256940, -0.010438) \\ & \text{vector}[30] = (-0.483604, 0.256940, -0.010438) \\ & \text{vector}[31] = (0.536886, 0.108072, -0.008594) \\ & \text{vector}[32] = (-0.113008, -0.337640, 0.416207) \\ & \text{vector}[33] = (0.000000, 0.000000, 0.000000) \\ & \text{vector}[34] = (0.346021, -0.402459, -0.135263) \\ & \text{vector}[35] = (-0.172278, 0.446108, 0.267035) \\ & \text{vector}[36] = (-0.309270, 0.076830, -0.445476) \\ & \text{vector}[38] = (0.052227, -0.321802, 0.440132) \\ & \text{vector}[39] = (0.075465, 0.519169, -0.157382) \\ & \text{vector}[40] = (0.152874, 0.405328, 0.335170) \\ \end{array}$		
$\begin{array}{rcl} & \mbox{vector} [22] = ( 0.000000, 0.00000, 0.00000, 0.00000, 0.000$		· · ·
$\begin{array}{ccccc} & \text{vector}[23] = (& 0.023434, & -0.314342, & -0.160623) \\ & \text{vector}[24] = (& 0.210090, & -0.495890, & -0.099773) \\ & \text{vector}[25] = (& 0.127918, & 0.282591, & 0.451419) \\ & \text{vector}[26] = (& -0.497742, & -0.190842, & -0.125826) \\ & \text{vector}[27] = (& -0.352216, & -0.116300, & 0.403012) \\ & \text{vector}[28] = (& -0.439047, & 0.004691, & 0.327438) \\ & \text{vector}[29] = (& 0.143700, & -0.138995, & -0.509932) \\ & \text{vector}[30] = (& -0.483604, & 0.256940, & -0.010438) \\ & \text{vector}[31] = (& 0.536886, & 0.108072, & -0.008594) \\ & \text{vector}[31] = (& 0.536886, & 0.108072, & -0.008594) \\ & \text{vector}[32] = (& -0.113008, & -0.337640, & 0.416207) \\ & \text{vector}[33] = (& 0.000000, & 0.000000) \\ & \text{vector}[34] = (& 0.346021, & -0.402459, & -0.135263) \\ & \text{vector}[35] = (& -0.172278, & 0.446108, & 0.267035) \\ & \text{vector}[36] = (& -0.309270, & 0.076830, & -0.445476) \\ & \text{vector}[37] = (& 0.274066, & -0.423055, & 0.214272) \\ & \text{vector}[38] = (& 0.075465, & 0.519169, & -0.157382) \\ & \text{vector}[40] = (& 0.152874, & 0.405328, & 0.335170) \\ \end{array}$		
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46 $vector[27] = (-0.352216, -0.116300, 0.403012)$ 47 $vector[28] = (-0.439047, 0.004691, 0.327438)$ 48 $vector[29] = (0.143700, -0.138995, -0.509932)$ 49 $vector[30] = (-0.483604, 0.256940, -0.010438)$ 50 $vector[31] = (0.536886, 0.108072, -0.008594)$ 51 $vector[32] = (-0.113008, -0.337640, 0.416207)$ 52 $vector[33] = (0.000000, 0.000000, 0.000000)$ 53 $vector[34] = (0.346021, -0.402459, -0.135263)$ 54 $vector[35] = (-0.172278, 0.446108, 0.267035)$ 55 $vector[36] = (-0.309270, 0.076830, -0.445476)$ 56 $vector[37] = (0.274066, -0.423055, 0.214272)$ 57 $vector[38] = (0.052227, -0.321802, 0.440132)$ 58 $vector[39] = (0.075465, 0.519169, -0.157382)$ 59 $vector[40] = (0.152874, 0.405328, 0.335170)$		
48 $vector[29] = (0.143700, -0.138995, -0.509932)$ $49$ $vector[30] = (-0.483604, 0.256940, -0.010438)$ $50$ $vector[31] = (0.536886, 0.108072, -0.008594)$ $51$ $vector[32] = (-0.113008, -0.337640, 0.416207)$ $52$ $vector[33] = (0.000000, 0.000000, 0.000000)$ $53$ $vector[34] = (0.346021, -0.402459, -0.135263)$ $54$ $vector[35] = (-0.172278, 0.446108, 0.267035)$ $55$ $vector[36] = (-0.309270, 0.076830, -0.445476)$ $56$ $vector[37] = (0.274066, -0.423055, 0.214272)$ $57$ $vector[38] = (0.052227, -0.321802, 0.440132)$ $vector[39] = (0.075465, 0.519169, -0.157382)$ $9$ $vector[40] = (0.152874, 0.405328, 0.335170)$	46	
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$\begin{array}{llllllllllllllllllllllllllllllllllll$		
$\begin{array}{llllllllllllllllllllllllllllllllllll$		• •
$\begin{array}{l} 58 \\ 59 \\ \hline \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ $		
$^{59}$ vector[40] = ( 0.152874, 0.405328, 0.335170 )		
60		
	60	

1	
2	
3	vector[41] = ( 0.109576, 0.536320, 0.018825 )
4	vector[42] = (-0.045652, 0.300780, 0.455464)
5	vector[43] = (0.000000, 0.000000, 0.000000)
6	vector[44] = ( -0.533887, 0.114345, 0.043471 )
7	vector[45] = ( -0.097529, 0.434255, -0.319235 )
8	vector[46] = ( 0.391774, -0.236122, -0.301263 )
9	vector[47] = (0.399513, -0.317429, 0.199068)
10	vector[48] = (0.200167, 0.067226, 0.505385)
11	vector[49] = (0.385668, -0.387145, 0.037137)
12 13	vector[50] = (0.059543, 0.145424, 0.524697)
13	vector[51] = (-0.445546, -0.189946, 0.255752)
15	vector[52] = (0.263180, -0.007998, -0.480284)
16	vector $[53] = (-0.375132, -0.375662, 0.134735)$
17	vector[54] = (0.000000, 0.000000, 0.000000)
18	vector $[55] = (-0.100958, 0.513042, -0.163080)$
19	vector[56] = ( 0.266095, 0.478340, 0.019604 )
20	vector[57] = (0.480516, -0.133538, -0.226434)
21	vector[58] = (0.253431, -0.482875, 0.051025)
22	vector[59] = (0.361384, -0.227994, 0.342667)
23	vector[60] = (-0.479164, -0.248769, 0.092279)
24	vector $[61] = (-0.422438, -0.343026, -0.062282)$
25	
26	vector[62] = (0.525823, 0.037772, -0.148605)
27	<pre>vector[63] = ( 0.112166, -0.092301, 0.528109 ) vector[64] = ( 0.050487, -0.545354, 0.006363 )</pre>
28	vector[65] = (0.000000, 0.000000, 0.000000)
29	vector[66] = (-0.290577, 0.355116, 0.299095)
30	vector[67] = (-0.303506, -0.415037, -0.188755)
31	vector[68] = (-0.340501, 0.129187, 0.409109)
32	vector[69] = (-0.275521, -0.188617, -0.434179)
33	vector[70] = (0.148849, 0.097956, -0.517928)
34	Vector[70] = (0.148849, 0.097950, -0.517928)
35 36	
30 37	
38	
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1	
2	
3	<pre># Author: qspace2siemens.m (Michael Thrippleton), manually edited</pre>
4	into 2 parts
5	<pre># Source file: ./vector_tables/neonate/04-shells-3-6-64-64.txt</pre>
6	# b-value at UI: 2500
7	# non-zero b-values: 200 500 2500
8	# number of non-zero shells: 2
9	<pre># number of directions per non-zero shell: 3 6 64</pre>
10 11	# number of b=0 volumes: 7
12	<pre># total number of directions including b0: 151</pre>
13	[directions=80]
14	normalization = none
15	coordinatesystem = xyz
16	comment=bUI: 2500, b: 200 500 2500, Nb0: 7
17	vector[0] = ( 0.000000, 0.000000, 0.000000 )
18	vector[1] = ( 0.252007, 0.053675, -0.116668 )
19	vector[2] = ( 0.118341, -0.013011, 0.256566 )
20	vector[3] = ( 0.047528, -0.276133, -0.038625 )
21	vector[4] = ( -0.303298, -0.002700, -0.328638 )
22	vector[5] = ( -0.128927, -0.159163, 0.397549 )
23 24	vector[6] = ( 0.288240, 0.341931, 0.000938 )
25	vector[7] = (-0.166829, 0.397185, -0.120052)
26	vector[8] = ( -0.069301, 0.303423, 0.321142 )
27	vector[9] = ( 0.425645, -0.074339, -0.115324 )
28	vector[10] = (0.391424, -0.221918, 0.893051)
29	vector[11] = (0.458593, -0.241695, -0.855147)
30	vector[12] = ( 0.354539, 0.919288, 0.170913 )
31	vector[13] = (0.495263, -0.780339, -0.381819)
32	vector[14] = (-0.574230, 0.458191, 0.678470)
33	vector[15] = (0.000000, 0.000000, 0.000000)
34 35	vector[16] = ( -0.188453, -0.033220, -0.981520 ) vector[17] = ( 0.594951, -0.772279, 0.222754 )
36	vector[18] = (0.076963, -0.202692, -0.976213)
37	vector[19] = (-0.354234, 0.663631, 0.658872)
38	vector[20] = (-0.245839, 0.923577, 0.294225)
39	vector[21] = (-0.646526, -0.378550, -0.662347)
40	vector[22] = ( 0.782685, 0.616196, -0.087788 )
41	vector[23] = ( -0.102171, -0.675368, -0.730369 )
42	vector[24] = ( -0.593833, 0.627627, -0.503435 )
43	vector[25] = ( -0.289839, 0.954652, -0.068065 )
44 45	vector[26] = ( 0.000000, 0.000000, 0.000000 )
46	vector[27] = ( 0.932852, 0.268018, -0.240735 )
47	vector[28] = ( -0.292661, 0.011816, 0.956143 )
48	vector[29] = ( -0.125932, -0.877649, -0.462465 )
49	vector[30] = ( 0.287138, 0.947828, -0.138468 )
50	vector[31] = ( -0.400507, -0.785392, -0.471967 )
51	vector[32] = ( 0.046561, 0.178494, -0.982839 )
52	vector[33] = ( 0.774106, -0.243372, -0.584405 )
53	vector[34] = ( -0.709331, 0.570685, 0.413724 )
54	vector[35] = ( 0.258673, -0.649858, 0.714684 )
55	vector[36] = ( 0.000000, 0.000000, 0.000000 )
56	vector[37] = ( 0.812504, 0.520520, 0.262482 )
57	vector[38] = ( -0.551995, -0.116325, -0.825694 )
58 59	vector[39] = (-0.680119, 0.223136, -0.698319)
60	vector[40] = ( -0.848362, -0.280672, -0.448893 )

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2	
3	vector[41] = ( -0.460227, -0.230447, 0.857371 )
4	vector[42] = (0.639224, 0.615748, 0.460703)
5	vector $[43] = (0.953358, -0.285443, 0.098132)$
6	vector $[44] = (-0.501430, 0.459528, -0.733077)$
7	
8	vector[45] = (0.922461, 0.385130, 0.027209)
9	vector[46] = (-0.815410, 0.546002, -0.192323)
10	vector[47] = ( 0.000000, 0.000000, 0.000000 )
11	vector[48] = (-0.924442, 0.129694, -0.358591)
12	vector[49] = ( 0.549990, 0.820347, -0.156657 )
13	vector[50] = ( 0.774802, 0.509647, -0.374089 )
14	vector[51] = ( 0.907672, -0.355700, -0.222731 )
15	vector[52] = ( 0.051712, 0.985317, 0.162714 )
16	vector[53] = ( -0.970546, -0.135098, -0.199471 )
17	vector[54] = ( -0.621107, -0.417526, 0.663249 )
18	vector[55] = ( -0.776136, 0.621968, 0.103774 )
19	vector[56] = ( 0.551897, -0.830144, -0.079188 )
20	vector[57] = ( 0.555009, 0.711394, -0.431142 )
21	vector[58] = (0.000000, 0.000000, 0.000000)
22	vector[59] = (-0.239295, 0.451777, 0.859439)
23	vector $[60] = (-0.325801, -0.314211, -0.891698)$
24	vector[61] = (0.649939, -0.012663, -0.759881)
25	
26	<pre>vector[62] = ( -0.042327, 0.894181, -0.445699 ) vector[63] = ( -0.159022, 0.408833, -0.898648 )</pre>
27	
28	vector[64] = (0.388219, 0.606776, -0.693620)
29	vector $[65] = (-0.329997, 0.825600, -0.457697)$
30	vector[66] = (0.060764, 0.443276, 0.894323)
31	vector[67] = (-0.794452, 0.390958, -0.464756)
32	vector[68] = (-0.392295, -0.567128, -0.724204)
33	vector[69] = (0.000000, 0.000000, 0.000000)
34	vector[70] = ( 0.272234, 0.851327, -0.448477 )
35	vector[71] = ( 0.785891, 0.193927, -0.587169 )
36	vector[72] = ( -0.145787, 0.828569, 0.540573 )
37	vector[73] = ( 0.616784, 0.765973, 0.181281 )
38	vector[74] = ( -0.808755, -0.029868, -0.587387 )
39	vector[75] = ( 0.997247, -0.010658, -0.073384 )
40	vector[76] = ( -0.152743, -0.477444, 0.865284 )
41	vector[77] = ( -0.040188, -0.715882, 0.697064 )
42	vector[78] = ( -0.907740, 0.040990, 0.417525 )
43	vector[79] = ( 0.008357, -0.985450, 0.169758 )
44	
45	

### BMJ Open SIEMENS MAGNETOM Prisma

#### 

\\Study Protocols\BRA	AIN\Neonates\Theirwo	orld - E161723 - MT_test\M	TSatOn_ne
TA: 2:58 PM	: REF Voxel size: 2.0×2	2.0×2.0 mmPAT: 3 Rel. SNR	: 1.00 : qfl
Properties		<b>Resolution - Common</b>	
Prio recon	Off	Phase resolution	100
Load images to viewer	On	Slice resolution	100
Inline movie	Off	Phase partial Fourier	6/8
Auto store images	On	Slice partial Fourier	Off
Load images to stamp segments	Off	Interpolation	Off
Load images to graphic segments	Off		
Auto open inline display	Off	Resolution - iPAT	
Auto close inline display	Off	PAT mode	GRA
Start measurement without further	Off	Accel. factor PE	3
preparation		Ref. lines PE	24
Wait for user to start	Off	Accel. factor 3D	1
Start measurements	Single measurement	Reference scan mode	Integ

#### Routine

toutino	
Slab group	1
Slabs	1
Dist. factor	20 %
Position	R6.7 P19.4 H34.5 mm
Orientation	Sagittal
Phase enc. dir.	A >> P
AutoAlign	
Phase oversampling	0 %
Slice oversampling	0.0 %
Slices per slab	72
FoV read	128 mm
FoV phase	121.9 %
Slice thickness	2.00 mm
TR	75.0 ms
TE 1	1.54 ms
TE 2	4.55 ms
TE 3	8.56 ms
Averages	1
Concatenations	1
Filter	Prescan Normalize
Coil elements	PeH;PeN

### **Contrast - Common**

TR	75.0 ms
TE 1	1.54 ms
TE 2	4.55 ms
TE 3	8.56 ms
MTC	On
Magn. preparation	None
Flip angle	5 deg
Fat suppr.	None
Water suppr.	None
SWI	Off

### **Contrast - Dynamic**

Averages	1
Averaging mode	Short term
Reconstruction	Magnitude
Measurements	1
Multiple series	Each measurement

### **Resolution - Common**

FoV read	128 mm	
FoV phase	121.9 %	
Slice thickness	2.00 mm	
Base resolution	64	

### - Common

Phase resolution	100 %	
Slice resolution	100 %	
Phase partial Fourier	6/8	
Slice partial Fourier	Off	
Interpolation	Off	

MT\_test\MTSatOn\_neonate\_v2

### - iPAT

PAT mode	GRAPPA	
Accel. factor PE	3	
Ref. lines PE	24	
Accel. factor 3D	1	
Reference scan mode	Integrated	

### **Resolution - Filter Image**

Image Filter	Off
Distortion Corr.	Off
Prescan Normalize	On
Unfiltered images	Off
Normalize	Off
B1 filter	Off

### **Resolution - Filter Rawdata**

Raw filter	Off	
Elliptical filter	Off	

### **Geometry - Common**

Slab group	1
Slabs	1
Dist. factor	20 %
Position	R6.7 P19.4 H34.5 mm
Orientation	Sagittal
Phase enc. dir.	A >> P
Slice oversampling	0.0 %
Slices per slab	72
FoV read	128 mm
FoV phase	121.9 %
Slice thickness	2.00 mm
TR	75.0 ms
Multi-slice mode	Interleaved
Series	Interleaved
Concatenations	1

### **Geometry - AutoAlign**

Slab group	1
Position	R6.7 P19.4 H34.5 mm
Orientation	Sagittal
Phase enc. dir.	A >> P
AutoAlign	
Initial Position	R6.7 P19.4 H34.5
R	6.7 mm
Р	19.4 mm
н	34.5 mm
Initial Rotation	0.00 deg
Initial Orientation	Sagittal

### **Geometry - Saturation**

Saturation mode	Standard
Fat suppr.	None
Water suppr.	None
Special sat.	None

### SIEMENS MAGNETOM Prisma

Set-n-Go Protocol	Off
Table position	Н
Table position 0 mm	
Inline Composing	Off
System - Miscellaneous	
Positioning mode	REF
Table position	Н
Table position	0 mm
MSMA	S - C - T
Sagittal	R >> L
Coronal	A >> P
Transversal	F >> H
Coil Combine Mode	Sum of Squares
Save uncombined	Off
Matrix Optimization	Off
AutoAlign	
Coil Select Mode	Off - AutoCoilSelect
System - Adjustments	
B0 Shim mode	Tune up
B1 Shim mode	TrueForm
Adjust with body coil	Off
Confirm freq. adjustment	Off
Assume Dominant Fat	Off
Assume Silicone	Off
Adjustment Tolerance	Auto
System - Adjust Volume	
Position	Isocenter
Orientation	Transversal
Rotation	0.00 deg
A >> P	263 mm
R >> L	350 mm
F >> H	350 mm
Reset	Off
System - pTx Volumes	
B1 Shim mode	TrueForm
Excitation	Non-sel.
System - Tx/Rx	
Frequency 1H	123.244480 MHz
Correction factor	1
Gain	Low
Img. Scale Cor.	3.000
Reset	Off
? Ref. amplitude 1H	0.000 V
Physio - Signal1	
1st Signal/Mode	None
TR	75.0 ms
Concatenations	1
Segments	1
Physio - Cardiac	
Tagging	None
Magn. preparation	None
Fat suppr.	None
i al suppi.	
Dark blood	Off
	Off 128 mm
Dark blood	

### Physio - PACE

Resp. control	Off
Concatenations	1

### Inline - Common

Subtract	Off	
Measurements	1	
StdDev	Off	
Liver registration	Off	
Save original images	On	

#### Inline - MIP

MIP-Sag MIP-Cor	Off	
MIP-Cor	Off	
MIP-Tra	Off	
MIP-Time	Off	
Save original images	On	

### Inline - Soft Tissue

Wash - In	Off
Wash - Out	Off
TTP	Off
PEI	Off
MIP - time	Off
Measurements	1

### **Inline - Composing**

Inline Composing	Off	
Distortion Corr.	Off	

### Inline - Maplt

Save original images	On
MapIt	None
Flip angle	5 deg
Measurements	1
Contrasts	3
TR	75.0 ms
TE 1	1.54 ms
TE 2	4.55 ms
TE 3	8.56 ms

### Sequence - Part 1

Introduction	Off
Dimension	3D
Elliptical scanning	On
Phase stabilisation	Off
Asymmetric echo	Off
Contrasts	3
Flow comp. 1	No
Readout mode	Bipolar
Multi-slice mode	Interleaved
Bandwidth 1	580 Hz/Px
Bandwidth 2	580 Hz/Px
Bandwidth 3	580 Hz/Px

### Sequence - Part 2

Segments	1
Acoustic noise reduction	Active
RF pulse type	Low SAR
Gradient mode	Normal
Excitation	Non-sel.
RF spoiling	On

### SIEMENS MAGNETOM Prisma

lode	Off	
ved delay	30 s	

# \\Study Protocols\BRAIN\Neonates\Theirworld - E161723 - MT\_test\MTSatOff\_neonate\_v2

## TA: 2:58 PM: FIX Voxel size: 2.0×2.0×2.0 mmPAT: 3 Rel. SNR: 1.00 : qfl

### Properties

Prio recon	Off
Load images to viewer	On
Inline movie	Off
Auto store images	On
Load images to stamp segments	Off
Load images to graphic segments	Off
Auto open inline display	Off
Auto close inline display	Off
Start measurement without further preparation	On
Wait for user to start	Off
Start measurements	Single measurement

### Routine

Slab group	1
Slabs	
Dist. factor	20 %
Position	R6.7 P19.4 H34.5 mm
Orientation	Sagittal
Phase enc. dir.	A >> P
AutoAlign	
Phase oversampling	0 %
Slice oversampling	0.0 %
Slices per slab	72
FoV read	128 mm
FoV phase	121.9 %
Slice thickness	2.00 mm
TR	75.0 ms
TE 1	1.54 ms
TE 2	4.55 ms
TE 3	8.56 ms
Averages	1
Concatenations	1
Filter	Prescan Normalize
Coil elements	PeH;PeN

### Contrast - Common

TR	75.0 ms
TE 1	1.54 ms
TE 2	4.55 ms
TE 3	8.56 ms
MTC	Off
Magn. preparation	None
Flip angle	5 deg
Fat suppr.	None
Water suppr.	None
SWI	Off

### Contrast - Dynamic

Averages	1
Averaging mode	Short term
Reconstruction	Magnitude
Measurements	1
Multiple series	Each measurement

### **Resolution - Common**

FoV read	128 mm
FoV phase	121.9 %
Slice thickness	2.00 mm
Base resolution	64
Base resolution	64

### **Resolution - Common**

Phase resolution	100 %	
Slice resolution	100 %	
Phase partial Fourier	6/8	
Slice partial Fourier	Off	
Interpolation	Off	

### **Resolution - iPAT**

PAT mode	GRAPPA	
Accel. factor PE	3	
Ref. lines PE	24	
Accel. factor 3D	1	
Reference scan mode	Integrated	

### **Resolution - Filter Image**

Image Filter	Off
Distortion Corr.	Off
Prescan Normalize	On
Unfiltered images	Off
Normalize	Off
B1 filter	Off

## Resolution - Filter Rawdata

Raw filter	Off	
Elliptical filter	Off	

### Geometry - Common

,	
Slab group	1
Slabs	1
Dist. factor	20 %
Position	R6.7 P19.4 H34.5 mm
Orientation	Sagittal
Phase enc. dir.	A >> P
Slice oversampling	0.0 %
Slices per slab	72
FoV read	128 mm
FoV phase	121.9 %
Slice thickness	2.00 mm
TR	75.0 ms
Multi-slice mode	Interleaved
Series	Interleaved
Concatenations	1

### Geometry - AutoAlign

<u> </u>	
Slab group	1
Position	R6.7 P19.4 H34.5 mm
Orientation	Sagittal
Phase enc. dir.	A >> P
AutoAlign	
Initial Position	R6.7 P19.4 H34.5
R	6.7 mm
Р	19.4 mm
н	34.5 mm
Initial Rotation	0.00 deg
Initial Orientation	Sagittal

### Geometry - Saturation

Saturation mode	Standard
Fat suppr.	None
Water suppr.	None
Special sat.	None

### BMJ Open

### SIEMENS MAGNETOM Prisma

1		.,
2	Geometry - Tim Planning Su	ite
3	Set-n-Go Protocol	Off
4	Table position	Н
5	Table position	0 mm
6	Inline Composing	Off
7	System - Miscellaneous	
8		
9	Positioning mode	FIX
10	Table position	H
11	Table position MSMA	0 mm S - C - T
12	Sagittal	R>>L
13	Coronal	A >> P
14	Transversal	F >> H
15	Coil Combine Mode	Sum of Squares
16	Save uncombined	Off
17	Matrix Optimization	Off
18	AutoAlign	
10	Coil Select Mode	Off - AutoCoilSelect
20		
20	System - Adjustments	
22	B0 Shim mode	Tune up
22	B1 Shim mode	TrueForm
23 24	Adjust with body coil	Off
	Confirm freq. adjustment	Off
25	Assume Dominant Fat	Off
26	Assume Silicone	Off
27	Adjustment Tolerance	Auto
28		
29	System - Adjust Volume	
30	Position	Isocenter
31	Orientation	Transversal
32	Rotation	0.00 deg
33	A >> P	263 mm
34	R >> L	350 mm
35	F >> H	350 mm
36	Reset	Off
37	System - pTx Volumes	
38	B1 Shim mode	TrueForm
39	Excitation	Non-sel.
40	Excitation	Non-sei.
41	System - Tx/Rx	
42	Frequency 1H	123.244480 MHz
43	Correction factor	1
44	Gain	Low
45	Img. Scale Cor.	3.000
46	Reset	Off
47	? Ref. amplitude 1H	0.000 V
48	· · · ·	
49	Physio - Signal1	
50	1st Signal/Mode	None
51	TR	75.0 ms
52	Concatenations	1
53	Segments	1
54		
55	Physio - Cardiac	
55 56	Tagging	None
50 57	Magn. preparation	None
	Fat suppr.	None
58	Dark blood	Off
59	FoV read	128 mm
60	FoV phase	121.9 %
	Phase resolution	100 %

### **Physio - PACE**

<b>1 1 1</b>		
Resp. control	Off	
Concatenations	1	

### Inline - Common

Subtract	Off
Measurements	1
StdDev	Off
Liver registration	Off
Save original images	On

#### Inline - MIP

MIP-Sag	Off	
MIP-Cor	Off	
MIP-Tra	Off	
MIP-Time	Off	
Save original images	On	

### Inline - Soft Tissue

Wash - In	Off
Wash - Out	Off
TTP	Off
PEI	Off
MIP - time	Off
Measurements	1

### **Inline - Composing**

Inline Composing	Off	
Distortion Corr.	Off	

### Inline - Maplt

Save original images	On	
MapIt	None	
Flip angle	5 deg	
Measurements	1	
Contrasts	3	
TR	75.0 ms	
TE 1	1.54 ms	
TE 2	4.55 ms	
TE 3	8.56 ms	

### Sequence - Part 1

Introduction	Off
Dimension	3D
Elliptical scanning	On
Phase stabilisation	Off
Asymmetric echo	Off
Contrasts	3
Flow comp. 1	No
Readout mode	Bipolar
Multi-slice mode	Interleaved
Bandwidth 1	580 Hz/Px
Bandwidth 2	580 Hz/Px
Bandwidth 3	580 Hz/Px

### Sequence - Part 2

Segments	1
Acoustic noise reduction	Active
RF pulse type	Low SAR
Gradient mode	Normal
Excitation	Non-sel.
RF spoiling	On

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Sequence - Assistant		
Mode	Off	
Allowed delay	30 s	

for peer teries only

# BMJ Open

### SIEMENS MAGNETOM Prisma

### \\Study Protocols\BRAIN\Neonates\Theirworld - E161723 - MT\_test\MTSatT1\_neonate\_v2

TA: 0:36 PM: FIX Voxel size: 2.0×2.0×2.0 mmPAT: 3 Rel. SNR: 1.00 : qfl

### Properties

Prio recon	Off
Load images to viewer	On
Inline movie	Off
Auto store images	On
Load images to stamp segments	Off
Load images to graphic segments	Off
Auto open inline display	Off
Auto close inline display	Off
Start measurement without further preparation	On
Wait for user to start	Off
Start measurements	Single measurement

#### Routine

loutino	
Slab group	1
Slabs	1
Dist. factor	20 %
Position	R6.7 P19.4 H34.5 mm
Orientation	Sagittal
Phase enc. dir.	A >> P
AutoAlign	
Phase oversampling	0 %
Slice oversampling	0.0 %
Slices per slab	72
FoV read	128 mm
FoV phase	121.9 %
Slice thickness	2.00 mm
TR	15.0 ms
TE 1	1.54 ms
TE 2	4.55 ms
TE 3	8.56 ms
Averages	1
Concatenations	1
Filter	Prescan Normalize
Coil elements	PeH;PeN

### **Contrast - Common**

TR	15.0 ms	
TE 1	1.54 ms	
TE 2	4.55 ms	
TE 3	8.56 ms	
MTC	Off	
Magn. preparation	None	
Flip angle	14 deg	
Fat suppr.	None	
Water suppr.	None	
SWI	Off	

### **Contrast - Dynamic**

Averages	1
Averaging mode	Short term
Reconstruction	Magnitude
Measurements	1
Multiple series	Each measurement

### **Resolution - Common**

FoV read	128 mm
FoV phase	121.9 %
Slice thickness	2.00 mm
Base resolution	64

### **Resolution - Common**

Phase resolution	100 %	
Slice resolution	100 %	
Phase partial Fourier	6/8	
Slice partial Fourier	Off	
Interpolation	Off	

### **Resolution - iPAT**

PAT mode	GRAPPA	
Accel. factor PE	3	
Ref. lines PE	24	
Accel. factor 3D	1	
Reference scan mode	Integrated	

### **Resolution - Filter Image**

Image Filter	Off
Distortion Corr.	Off
Prescan Normalize	On
Unfiltered images	Off
Normalize	Off
B1 filter	Off

### **Resolution - Filter Rawdata**

Raw filter	Off	
Elliptical filter	Off	

### **Geometry - Common**

Slab group	1
Slabs	1
Dist. factor	20 %
Position	R6.7 P19.4 H34.5 mm
Orientation	Sagittal
Phase enc. dir.	A >> P
Slice oversampling	0.0 %
Slices per slab	72
FoV read	128 mm
FoV phase	121.9 %
Slice thickness	2.00 mm
TR	15.0 ms
Multi-slice mode	Interleaved
Series	Interleaved
Concatenations	1

### **Geometry - AutoAlign**

Slab group	1
Position	R6.7 P19.4 H34.5 mm
Orientation	Sagittal
Phase enc. dir.	A >> P
AutoAlign	
Initial Position	R6.7 P19.4 H34.5
R	6.7 mm
Р	19.4 mm
н	34.5 mm
Initial Rotation	0.00 deg
Initial Orientation	Sagittal

### **Geometry - Saturation**

Saturation mode	Standard
Fat suppr.	None
Water suppr.	None
Special sat.	None

### SIEMENS MAGNETOM Prisma

Set-n-Go Protocol	Off
Table position	Н
Table position	0 mm
Inline Composing	Off
System - Miscellaneous	
Positioning mode	FIX
Table position	Н
Table position	0 mm
MSMA	S - C - T
Sagittal	R >> L
Coronal	A >> P
Transversal	F >> H
Coil Combine Mode	Sum of Squares
Save uncombined	Off
Matrix Optimization	Off
AutoAlign	<u> </u>
Coil Select Mode	Off - AutoCoilSelect
System - Adjustments	
B0 Shim mode	Tune up
B1 Shim mode	TrueForm
Adjust with body coil	Off
Confirm freq. adjustment	Off
Assume Dominant Fat	Off
Assume Silicone	Off
Adjustment Tolerance	Auto
System - Adjust Volume	
Position	Isocenter
Orientation	Transversal
Rotation	0.00 deg
A >> P	263 mm
R >> L	350 mm
F >> H	350 mm
Reset	Off
System - pTx Volumes	
B1 Shim mode	TrueForm
Excitation	Non-sel.
System - Tx/Rx	
Frequency 1H	123.244480 MHz
Correction factor	1
Gain	Low
Img. Scale Cor.	3.000
Reset	Off
? Ref. amplitude 1H	0.000 V
Physio - Signal1	
1st Signal/Mode	None
TR	15.0 ms
Concatenations	1
Segments	1
Physio - Cardiac	
Tagging	None
Magn. preparation	None
Fat suppr.	None
Dark blood	Off
	128 mm
FoV read	
FoV read FoV phase	121.9 %

### Physio - PACE

•	
Resp. control	Off
Concatenations	1

### Inline - Common

Subtract	Off
Measurements	1
StdDev	Off
Liver registration	Off
Save original images	On

#### Inline - MIP

MIP-Sag	Off	
MIP-Cor	Off	
MIP-Tra	Off	
MIP-Time	Off	
Save original images	On	

### Inline - Soft Tissue

Wash - In	Off
Wash - Out	Off
TTP	Off
PEI	Off
MIP - time	Off
Measurements	1

### **Inline - Composing**

Inline Composing	Off	
Distortion Corr.	Off	

### Inline - Maplt

Save original images	On	
MapIt	None	
Flip angle	14 deg	
Measurements	1	
Contrasts	3	
TR	15.0 ms	
TE 1	1.54 ms	
TE 2	4.55 ms	
TE 3	8.56 ms	

### Sequence - Part 1

Introduction	Off
Dimension	3D
Elliptical scanning	On
Phase stabilisation	Off
Asymmetric echo	Off
Contrasts	3
Flow comp. 1	No
Readout mode	Bipolar
Multi-slice mode	Interleaved
Bandwidth 1	580 Hz/Px
Bandwidth 2	580 Hz/Px
Bandwidth 3	580 Hz/Px

### Sequence - Part 2

Segments	1
Acoustic noise reduction	Active
RF pulse type	Low SAR
Gradient mode	Normal
Excitation	Non-sel.
RF spoiling	On

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wed delay 30 s