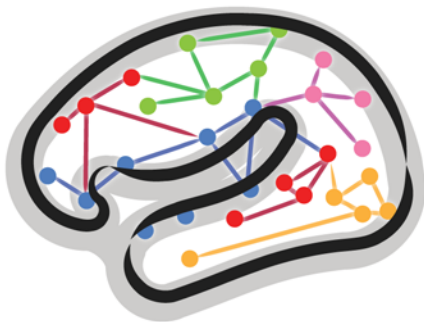




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WU-Minn HCP MEG Initial Data Release: Reference Manual

Appendix I – HCP MEG Session Protocol Details

4 March 2014



Table of Contents

HCP MEG Scan Protocol Details	3
Mailing List	7

HCP MEG Scan Protocol Details

HCP MEG data acquisition is performed on a whole head MAGNES 3600 (4D Neuroimaging, San Diego, CA) system housed in a magnetically shielded room, located at the Saint Louis University (SLU) medical campus. This document details the scan protocol and scanner parameters used for all HCP subjects selected for MEG scanning. See [HCP MEG Initial Release Appendix II](#) for Standard Operating Procedures used by HCP research staff to ensure consistent data acquisition between subjects.

When planning MEG experiments on your local system, we caution that performance may vary from system to system, even within a single scanner platform. For best performance, you may need to adjust your protocols.

Several key choices were made regarding the HCP MEG recordings. Sampling rate was selected to be as high as possible (2034.51 Hz) while collecting all channels (248 magnetometer channels together with 23 reference channels). Bandwidth was set (at DC, 400Hz) to capture physiological signals, and optimize file sizes and the signal-to-noise ratio. All our experiments were recorded in continuous mode to allow the greatest user flexibility in determining epoch widths in analyses. Since the bit noise on our system was higher than our sensor noise, Delta encoding is used to increase the bitrate.

The order of scans in the HCP MEG protocol is as follows for all subjects:

Scan	Description	Duration (min)
1-Rnoise	Empty Room scan establishes a baseline noise level	5:00
2-Pnoise	Patient scan, multiple if degaussing of the head is necessary.	1:00
	Participant Digitization	~ 20
3-Restin	First resting state scan, eyes open, fixated.	6:00
4-Restin	Second resting state scan, eyes open, fixated.	6:00
5-Restin	Third resting state scan, eyes open, fixated.	6:00
	Break for button box placement	~2
6-Wrkmem	First half, Working Memory scan	10:00
7-Wrkmem	Second half, Working Memory scan	10:00
	Break for otic placements	~2
8-StoryM	First Half, Language scan	7:00
9-StoryM	Second Half, Language scan	7:00
	Break for muscle sensor placement (EMG)	~10
10-Motort	First Half, Motor scan	14:00
11-Motort	Second Half, Motor scan	14:00

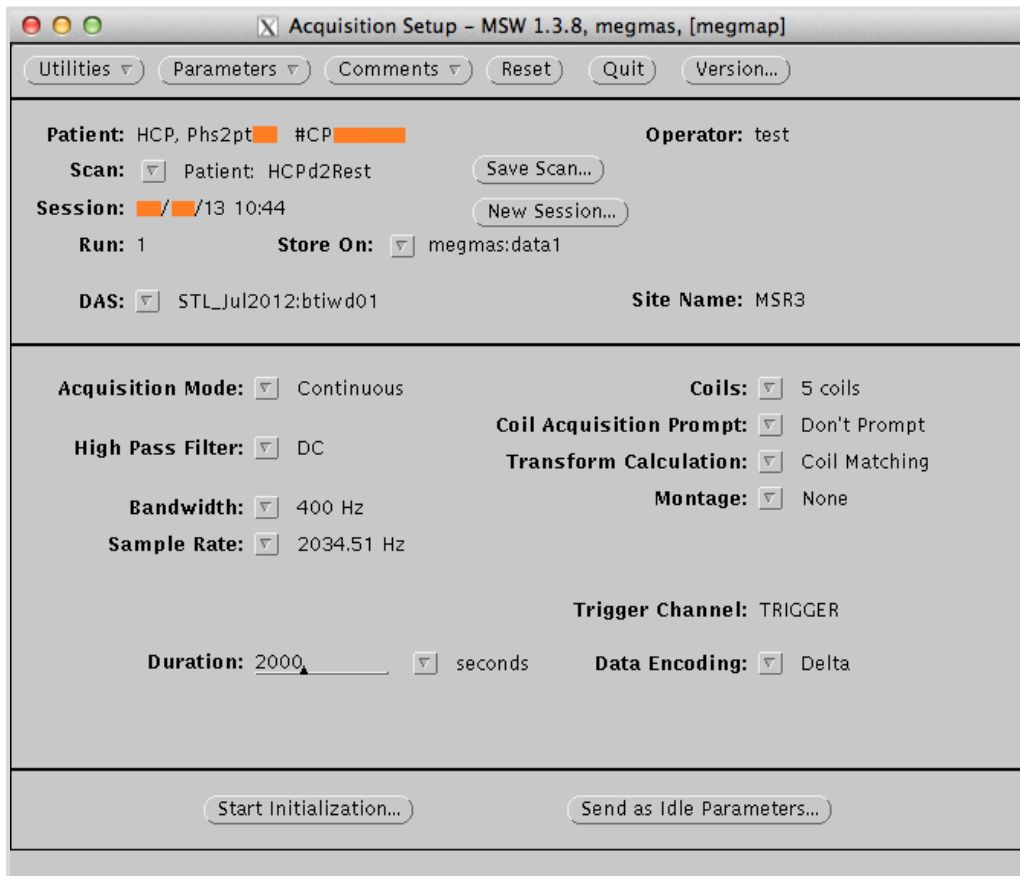
In a particular session, multiple PNoise scans may be performed if the first shows artifact, generally from missed metal on the head or body of the participant, or dental work with residual magnetic fields. We can degauss the participant, if necessary, and in such cases the PNoise will be repeated until a good artifact-free scan is reviewed. The final PNoise in a subfolder will represent the baseline noise-state of this participant for other scans in the session.

Particular scans may have been rejected from the data release for quality reasons in acquisition or preprocessing.

The exact duration of each scan in seconds is variable as the recording brackets the stimulus-presentation time with buffer at the start and end.

The screenshots below show the HCP acquisition setup and parameters set for the MAGNES 3600 magnetometer for an exemplar MEG session.

In the first shot, the general acquisition parameters are shown. Duration is set at 2000 seconds for most scans, and manually stopped after the E-Prime run is concluded, to ensure the data are not prematurely clipped.



Acquisition Setup - MSW 1.3.8, megmas, [megmap]

Utilities Parameters Comments Reset Quit Version...

Patient: HCP, Phs2pt #CP Operator: test

Scan: Patient: HCPd2Rest Save Scan...

Session: /13 10:44 New Session...

Run: 1 Store On: megmas:data1

DAS: STL_Jul2012:btwd01 Site Name: MSR3

Acquisition Mode: Continuous Coils: 5 coils

High Pass Filter: DC Coil Acquisition Prompt: Don't Prompt

Bandwidth: 400 Hz Transform Calculation: Coil Matching

Sample Rate: 2034.51 Hz Montage: None

Trigger Channel: TRIGGER

Duration: 2000 seconds Data Encoding: Delta

Start Initialization... Send as Idle Parameters...



In the Scan Information screenshot, whole head and the miscellaneous setup parameters are shown for a resting state scan. In all acquisitions 287 channels are acquired, always with a Gain of “x1”.

Patient ID: CP Patient Name: HCP, Phs2pt20
Scan: HCPd2Rest
Scan used by 1 process(es)

MAGNES 3600 WH (WHOLE HEAD) PARAMETERS:

SP_Version: 6
Acquisition Mode: Continuous
Duration: 2 ks
High Pass Filter: DC
Sample Rate: 2034.51 Hz
Bandwidth: 400 Hz

MISCELLANEOUS SETUP PARAMETERS:

Use Cardiac Mode: No
Transform Algorithm: Coil Matching
Coil Acquisition Prompt: None
Auto Artifact Reject Level: 0
Alternate Filter Card: 1
Alternate High Pass Filter: DC
Filter Name: 1p400
Notch Filter: None
Enable Delta: Yes
Use Coils on Head: Yes
Use Analog Weights: Yes
Use Digital Weights: Yes
Weight Table: "Supine"
EEG Montage File: None
External Data Tap Process: None
Default Video Setup: 1

CHANNELS ACQUIRED:

Name	Label	Type	Gain
"A1"	"	MEG	X1
"A2"	"	MEG	X1
"A3"	"	MEG	X1
"A4"	"	MEG	X1
"A5"	"	MEG	X1
"A6"	"	MEG	X1

Buttons: Display Data Size... Print

In the Data File Information screenshot, Channel reference information is given for the first few channels. A complete listing of this info is contained in the headers, which are accessible by reading the data into MATLAB. Because we record continuous data, “epoch information” will reflect the whole scan as a single epoch. Points (times) sample period = epoch duration.



Quit Version... Print

Patient Selection: Data File Information

Patient: CP
Scan: HCPd2Rest
Session: / /13 09:29
Run: 1
File: c,rfDC
pdf path:
/home/whsbti/data/megmas_data1/CP/HCPd2Rest/%13@09:29/1/c,rfDC

Version: 1
File Type: 'Bts'
Data Format: Float (32 bits)
Acquisition Mode: Continuous
Sample Period: 491.519 us(2.03451 kHz)
X Axis Label: 's'
Timestamp:
Total Channels: 287
Total Epochs: 1
Input Epochs: 0
Index of Longest Epoch: 0

Epoch information:
Points in Epoch: 745619
Epoch Duration: 366.486 s
Expected Intertrigger Interval: 0 s
Actual Intertrigger Interval: 0 s
Epoch Timestamp: 0 slices, 0.000 s
Number of Variable Events: 0

Fixed Event information:
Event Name: 'Trigger'
Start Latency: 0 s
End Latency: 10 ms
Fixed Event Flag: True

Channel Reference information:
Channel Name: 'TRIGGER'
Channel Label: 'TRIGGER'
Channel Number: 1
Attributes: Channel Triggered Acquisition
Scale: 1
Y Axis Label: 'bit'
Valid Min/Max Flag: True
Y Minimum: -32.767 kbit
Y Maximum: 32.767 kbit
Index: 0

Channel Name: 'RESPONSE'
Channel Label: 'RESPONSE'
Channel Number: 2
Attributes:
Scale: 1
Y Axis Label: 'bit'
Valid Min/Max Flag: True
Y Minimum: -32.767 kbit
Y Maximum: 32.767 kbit
Index: 1

Channel Name: 'MLzA'
Channel Label: 'MLzA'
Channel Number: 3
Attributes:
Scale: 1
Y Axis Label: 'T'
Valid Min/Max Flag: True
Y Minimum: -36.0437 nT
Y Maximum: 36.0437 nT
Index: 2



Mailing List

Individuals with further protocol-related questions are encouraged to use the HCP Data Users mailing list (hcp-users@humanconnectome.org) by signing up at <http://www.humanconnectome.org/contact/> or by checking the appropriate box when registering to download HCP data. We also encourage individuals to share their protocols of what they find works best (and what does not) via this forum!