

fMRI accessories

fMRI (functional magnetic resonance imaging) can be done with both of our 3T Prisma MRI scanners. But for typical fMRI studies various additional MR compatible devices are required to deliver auditory or visual stimuli to participants or to measure participant's response. Therefore, a lot of fMRI accessories is available in MAFIL. There are LCD screens placed behind the scanner, headphones, eye tracking systems, MR compatible cameras, tablet with pen, various buttons, microphone, etc.


■ Optoacoustics – OptoACTIVE II™ ANC Headphones

OptoACTIVE™ provides high level of noise reduction in MRI-safe headphones.

Basic specification:

- Removes 60 dB (95%) of MR EPI main gradient noise
- Proprietary real-time algorithmic, out-of-phase harmonic active noise cancelling
- Unsurpassed passive noise reduction
- Slim design fits all head coils (including 32- and 64-channel for 3T)
- Outstanding sound clarity enables use of high fidelity audio stimuli
- Certified for MRI
- Built-in optical microphone for auto-calibration, SP monitoring and recording in real time
- Inputs for concurrent SPDIF and TTL
- Outputs for real-time recording and web-based broadcast
- Push-to-talk (PTT) inline communications with patient during all operations.

Technical specification:

<ul style="list-style-type: none"> ▪ Frequency Response Range: 50-15,000 Hz ▪ Maximum Sound Pressure Level: 104 dB SPL ▪ Total Harmonic Distortion: < 1 % at 1 Pa ▪ Passive Noise Attenuation: 25 dB ▪ Active Noise Cancellation: > 20 dB SPL (> 90 %) ▪ EPI Main Resonance Attenuation: > 50 dB (> 99%) ▪ Total Noise Attenuation: > 40 dB SPL (> 99 %) ▪ DSP Latency: 0 msec, Real-time ▪ Maximum Headphone Thickness: 10 mm 	
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■ Optoacoustics – FoMRI III™

Fiber Optic Microphone for capturing speech in MRI.

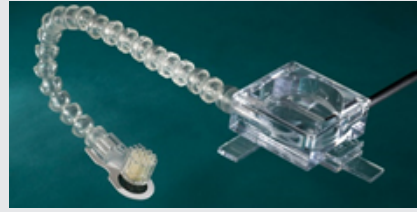
Basic specification:

- Crisp, clear speech in real time
- Built-in console loudspeaker
- Selectable, automatic noise reduction
- Hands-off auto recording and TTL synchronization
- Speech output broadcast mode
- Plug-and-play operation
- Easy microphone mounting on your RF coil
- Completely safe, EMI/RFI immune system.



Technical specification:

- Configuration Type: Dual channel, perpendicular
- Frequency Response Range: 50-20,000 Hz
- Maximum Sound Pressure Level: 130 dB SPL
- Total Harmonic Distortion: < 1 % at 94 dB SPL
- DSP Latency: 16/24/32 msec (selectable)

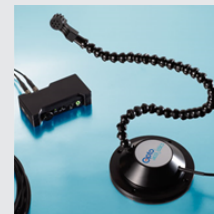


■ Optoacoustics – OPTIMIC™ MEG

Completely passive fiber optic microphone for highly sensitive communications in MEG.

Technical specification:

- Frequency Response Range: 30-15,000 Hz
- Equivalent Self Noise: 31 dBA SPL
- Maximum Acoustic Pressure Level: 114 dB SPL
- Total Harmonic Distortion: < 1 % at 84 dB SPL



Producer's web: <http://www.optoacoustics.com/medical/>

■ Siglent SDG1025 25MHz Function Generator

SIGLENT's SDG1025 is a dual-channel function/arbitrary waveform generator with a 25 MHz maximum bandwidth, 125 MSa/s sampling rate and 14-bit vertical resolution. This generator can be used for external triggering (and synchronization) of scanners – especially in case of dual fMRI hyperscanning.

Technical specification:

- Includes built-in high precision, 200 MHz frequency counter
- Multiple modulation functions, sweep-frequency function, pulse train function
- Standard PC connections:
 - USB Device
 - USB Host
 - U-Disk storage and software
 - GPIO (optional)
- Seamlessly connects to the SDS series digital oscilloscopes
- Remote computer control

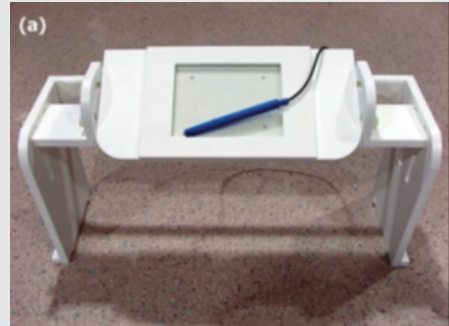


Producer's web: <https://www.siglent.eu/product/1140255/siglent-sdg1025-25mhz-function-arbitrary-waveform-generator>

■ Tablet

Technical specification:

- MRI compatible
- For writing and drawing during Functional MRI
- Included:
 - Touch-sensitive tablet
 - Elevated support platform
 - Stylus
 - Controller box
 - Necessary cabling
- Software to record responses and provide task-related feedback



Producer: Tam F, Churchill NW, Strother SC, Graham SJ. (DOI: 10.1002/hbm.21013)

■ EyeLink 1000 Plus

The Fiber Optic Camera upgrade and Long Range Mount allow the EyeLink 1000 Plus camera to be used in MRI, EEG, and other eye tracking scenarios that require the optics to be up to 150 cm from the eye.

Basic specification:

- The EyeLink 1000 Plus is the fastest, most precise and accurate eye-tracker for MRI and MEG.
- Camera can be used both as a relay for the fiber optic camera in MRI environments or in traditional eye-tracking laboratories (with a suitable mount).
- components have low interference, non-ferromagnetic optimized design for MRI
- Compatible with multiple head coils.

Technical specification:

Fiber Optic Camera Upgrade

- Extends the EyeLink 1000 Plus for use in fMRI and environments.
- For use in MRI systems from 1.5T to 13T.
- High-speed
 - Up 2000 Hz monocular
 - 1000 Hz binocular
- High-precision recording with 0.25° - 0.5° accuracy

Long Range Mount

- Mounts can position the eye tracker in or out of the bore, for tracking with LCD monitors and back-projected images with dozens of different head coils.
- Compatible with EEG and other scanner peripherals.
- Unique infrared illuminator available for dark-adapted tracking.



Producer's web: <https://www.sr-research.com/fmri-meg-systems/>

■ MRC Eye Tracking

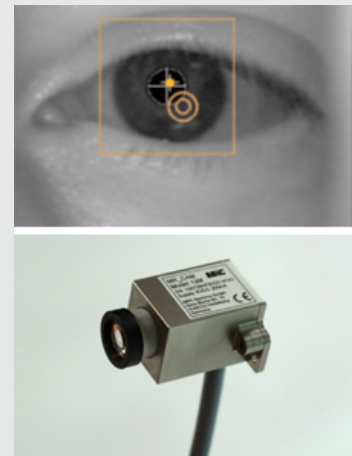
The software "MRC Eye-Tracking" is intended to be used for gaze detection of human subjects. Camera with an infrared LED creates a reflex from the cornea.

Basic specification:

- Dark pupil eye-tracking with cornea reflex (monocular or binocular)
- Overlay of detected pupil boundary, pupil center and cornea reflex
- Gaze points: Display of determined gaze points in control screen
- Real time comparison of gaze points with calibration points.
- Interference-free use inside the MRI bore

Technical specification:

- Camera image (monocular): 640x480 pixels
- Accuracy 0.4°
- Precision 0.5°
- Frequency: Variant A: 60 Hz / Variant GigE: 250 Hz
- Calibration:
 - Different patterns on separate screen
 - Variable point diameters
 - Selectable number of calibration points
 - Real time calculation of calibrated gaze points with time stamp
- Available with b/w sensor
- Focal length selectable
- VGA resolution
- Very small size, low weight



Producer's web: <https://www.mrc-systems.de/en/products/mr-compatible-cameras>

■ MRC High Resolution Camera

The software "MRC Eye-Tracking" is intended to be used for gaze detection of human subjects. Camera with an infrared LED creates a reflex from the cornea.

Technical specification:

- Interference-free use inside the MRI bore
- HD resolution: 1,280x960 @43Hz, 1,280x720 @60Hz
- Sensor type: CMOS, color, global shutter
- Focal length selectable
- Interface: Gigabit Ethernet / GigE-Vision



Producer's web: <https://www.mrc-systems.de/en/products/mr-compatible-cameras>

■ Response devices

Basic specification:

Response pads

- MRI compatible pads in several designs
- For collecting answers from subjects or provide task-related feedback during functional MRI



Response interface

- Output from these devices is available from the box via USB, the device emulates a USB keyboard



Producer: MAFIL CEITEC MU in-house design

■ BOLDscreen 24 LCD for fMRI

MR Safe LCD display for 3T fMRI with no time lag, integrated sensor for luminance calibration and no interference with the scanner, even when positioned right at the exit of the bore.

Technical specification:

- 24" 1920 x 1200 full colour H-IPS LCD with fixed 60Hz frame rate
- Native 8-bit colour resolution, true colour 16.7 million display
- Light output is synchronous to the input video signal
- Digital DVI video input delivers high fidelity noise-free displays
- Super bright LED matrix backlight, peak white up to 800cd.m⁻²
- Typical contrast ratio 1000:1
- Typical spatial uniformity 2% over central 75% of display area
- Typical grey-to-grey response time 5ms
- Normal switching frequency of the backlight is 75kHz
- Automatic compensation of brightness for temperature and ageing
- Image can be flipped to correct for viewing via a mirror



Producer's web: <https://www.crsLtd.com/tools-for-functional-imaging/mr-safe-displays/boldscreen-24-lcd-for-fmri/>

■ Contacts

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