



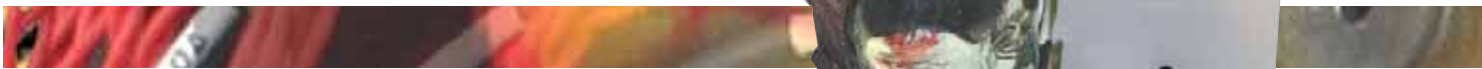
THE REVOLUTION CONTINUES

MagLink RTTM

*True Simultaneous EEG and fMRI in Real Time
No Compromises – Infinite Possibilities*



MagLink RT™

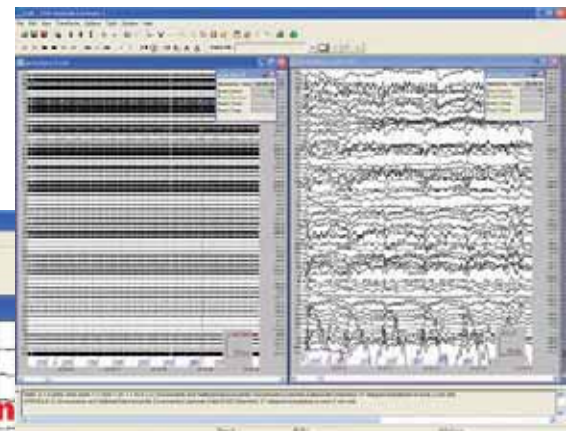


Compumedics Neuroscan continues its achievements for recording EEG and ERP in the MRI, with the release of our third generation system. The MagLink RT advances the core hardware and software of the original MagLink technology. The result is even higher quality EEG data and the capability of real time reduction for both EPI gradient and ballistocardiogram artifact.

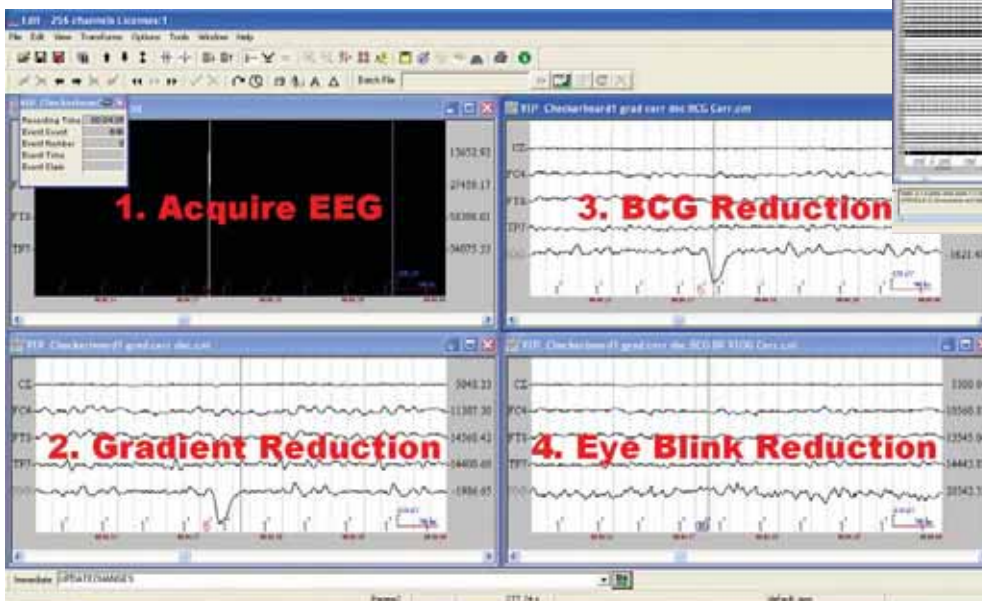
MagLink RT is a multi-component system engineered for optimal integration and performance. As the foundation of the **MagLink RT**, the **SynAmps²** was designed to have the dynamic range, the bandwidth, and inherent simultaneous multi-channel data acquisition characteristics necessary for real-time artifact correction, at 64 channels of EEG and beyond, without introducing RF artifact into the MR data. The **MagLink RT** accepts either TTL and optical triggers from the gradient artifact or detects that gradient onset automatically.

While the standard **MagLink RT** is suitable for the vast majority of applications, Neuroscan has developed an optional impedance-matching buffer amplifier to further enhance signal quality. This optional amplification provides an added SNR boost to the EEG data transmitted from edge of the magnet bore back to the **SynAmps²** amplifier located in the control room.

MagLink systems have successfully recorded up to 128 channels and in field strengths up to 4 Tesla. The **MagLink RT's** filter interface connects to the patch panel to ensure that RF noise is not injected into the shielded room. With or without the buffer amplifier, the result is fMRI data that is uncompromised even though valuable EEG data is being collected simultaneously. Advanced **MagLink RT** software, written exclusively to handle the processing needs of data recorded in MRI environment, allows display of clean EEG and ERP data in real time.

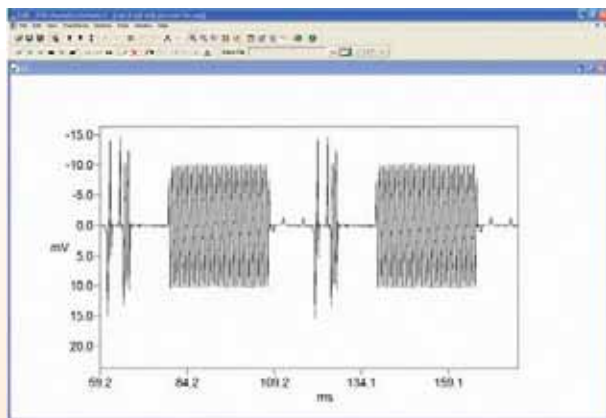


Pre- and post-fMRI filter application. Same time scale, different amplitude.

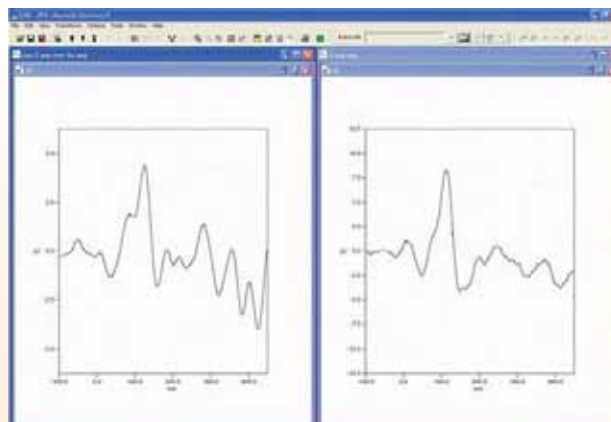


The Compumedics Neuroscan four stages of continuous EEG/fMRI processing

Combining Space And Time



Enhanced view to show detail of two slices within the volume. 20,000 Hz sampling allows for accurate removal of the artifact. This is not an average, this is a single volume.



VEPs (Visual Evoked Potentials) collected during fMRI acquisition and recovered.

The researcher or clinician wishing to obtain quality EEG and ERP data in an fMRI environment faces many challenges. Neuroscan has designed a system that allows your lab to overcome each of these obstacles. Presented here are the Neuroscan products required to achieve these incredible results.

MagLink Cap - Is a specially engineered Quik-Cap, with braided non-ferrous cabling and current-limiting in-line filters. Designed to address both subject safety and performance concerns, this electrode application system combines safe and accurate recording with fast application times. Obtaining low impedance connections at each electrode - scalp site is critical in the MRI. MagLink Caps are compatible with the QuikCell electrode application system.

MagLink RT conduit - Our new conduit features a more robust and compact solution for transmitting the EEG signals. Each cable now handles up to 64 channels of EEG and integrates directly with the MagLink RT RF interface. This conduit allows for either passive or active transmission and provides a more compact and durable solution.

MagLink RT RF Interface - Our proprietary interface has been specifically designed to ensure that the installation of the MagLink RT is as simple and as flexible as possible. More importantly, the shielding of the interface is constructed so that, when installed as specified, RF leakage into the MR chamber is virtually eliminated.

MagLink RT Software - Specifically written for processing data recordings in MRI environments, the advanced artifact suppression algorithms provide real-time suppression of gradient and BCG artifact. A dynamic interface allows the user to adjust the suppression parameters in real-time. Once a working parameter

has been generated, it is automatically recalled for each recording session. Both raw data and online corrected data can be stored from a recording session.

Independent BKG Triggering - Unlike the gradient artifact, the BKG artifact is less deterministic and thus more variable. Consequently, removal of the ballistocardiogram artifact is typically more difficult than EPI artifact. MagLink RT provides multiple methods for removal as well as several different triggering methods.

SCAN Acquisition and Analysis software - SCAN is a world leading software solution for EEG and ERP analysis and source localization, SCAN 4 provides cutting edge technology and ease of use for processing EEG data. SCAN is essential for acquiring and processing EEG data.

SynAmps² - Critical to obtaining accurate EEG recordings in the MRI is low electrode impedance, excellent signal to noise ratio, extensive input range and true DC recordings. The SynAmps², 24 bit amplifiers with active noise reduction meets these demands.

CURRY 5 - Provides true multi-modal Neuroimaging capabilities, allowing you to compute and visualize ERP source solutions on both MRI and fMRI results. Dramatically improved user interface, advanced co-registration and automated BEM development, ensure ease of use and advanced analysis.

New Standard	Explanation of the compromises without this technology	Explanation of the new technology and its benefits
Passive Transmission: Clean and effective signal transmission path.	The MagLink RT System uses the full capabilities of the SynAmps2 amplifier, with no pre-amplifier or multiplexer to enhance the quality of the EEG signal. The same specifications and EEG quality recorded outside of the MRI are precisely what can be achieved within the MRI.	Active systems for recording EEG in the MRI add electronics to the sensitive MRI environment and increase the potential for noise and artifacts on the MRI image. Active systems also use pre-amplifiers and multiplexers which limit the quality, sampling rate and bandwidth of the data. Multiplexers present additional timing issues as they need to be amplified and converted, then sent out of the MRI and converted again.
DC - 3500 Hz Bandwidth: Ensures accurate fMRI artifact removal and instantaneous artifact recovery.	fMRI artifacts are an order of magnitude larger than typical EEG, and need to be accurately measured to be quantified and removed. The SynAmps2 allows full bandwidth data to be recorded. The DC component of the system ensures that the recovery from artifacts is as fast as possible, thereby greatly facilitating artifact removal.	MRI artifacts are very large and encompass a very broad frequency range. The large impulse of the fMRI artifact requires a DC amplifier to ensure the amplifier does not ring at the offset of the pulse. AC amplifiers will ring, masking the EEG and effecting the quality of the artifact removal. Aliasing may be an issue with the typical low-pass filters used for EEG, as sampling the fMRI artifact is very high frequency. Undersampling this will produce artifacts in the range of EEG interest.
20,000 Hertz Sampling and Time Locked Sampling: Limits aliasing to a minor factor in the artifact correction.	The frequency of the fMRI artifact is in the Mega-Hertz range and its harmonic frequencies overlap with EEG signals of interest. Using the highest sampling possible allows the cleanest picture of the primary artifact and therefore its natural harmonics. Time locking the MRI sample clock and the EEG sample clock is another option to reduce the fMRI effect on EEG. The MagLink RT System allows this recording method with the addition of a down-sampling clock.	Accurate timing is critical for capturing and removing MR artifact accurately. Trigger jitter, which can occur with insufficient sampling rates, greatly reduces the effectiveness of the artifact removal.
Online fMRI Artifact Correction: New filter tools remove fMRI in real time to allow viewing of the EEG during the pulse sequence.	A critical part of the MagLink RT System is the capability to remove episequencing artifact both online and offline. Using advanced algorithms, we provide a method for reducing the fMRI artifact to the extent that you can review on-going EEG during fMRI acquisition.	Magnet time is expensive and subject time is valuable. If you cannot verify that you are acquiring valid data until you perform offline analyses, you run the risk of losing time, money and subjects.
Online BCG Artifact Correction: Real-time reduction of the ballistocardiogram artifact based on implicit EKG recording.	Once the fMRI artifact is reduced, the second artifact effecting the EEG in the MRI is revealed. This is the ballistocardiogram or the pulse artifact from the heart beat. An advanced adaptive algorithm has been created to reduce this artifact significantly. Correction for the BCG can be applied online or offline.	BCG is perhaps even more challenging to reduce than the MR episequencing artifact. Inadequate methods for removing BCG can distort the EEG data while failing to remove the BCG artifact.
Regulatory Certification: MagLink RT is FDA, CE and CSA accredited.	Neuroscan commitment to quality is assured by our adherence to all relevant research, electrical, medical and manufacturing standards.	

Compumedics divisions:



Please contact us for more information about this product or any other Compumedics products.

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