TRISTAN TECHNOLOGIES

MAGView™

Whole Head Neonatal Biomagnetometer

A new, noninvasive investigational tool for pre- and full-term infants

Mapping brain function and detecting neurological abnormalities in infants

Detection of cortical function in newborns is needed for clinical intervention in the early stages of neurological disorders, before external signs appear and the conditions develop and worsen. The MAGView™ allows for measuring the magnetic signal from infant brains.

Identifying how infants learn is of interest to many sectors of society, but such studies rely heavily on behavioral analyses. Having a direct measure of cortical activity would provide precise information on the dynamic response in the brain during learning processes. Potential uses of MAGView™ for developmental studies include:

- Mapping of sites and dynamics of sensory functions - auditory, somatosensory, and visual modalities
- Assay stages of nervous system development

The Tristan MAGView™ Biomagnetometer features whole head coverage for a helmet designed to fit a 50 cm circumference head. It is used to non-invasively measure weak magnetic fields produced by electrical activity from the brain of infants and children. The system consists of the following principal components: the sensor, a mobile patient bed, an electronics cart containing SQUID electronics, an external electronics rack for power supplies and data acquisition hardware, and a computer. The patient bed, sensor, and SQUID electronics rack are designed to fit inside a magnetically shielded room (MSR).

Unique Features of **MAGView™**

- Superior spatial resolution and sensitivity
- Significantly more sensitive to neuronal sources than conventional whole-head MEG systems
- Similar or better spatial resolution compared to existing whole-head MEG sensors
- Better spatial resolution than EEG. EEG signals are distorted by skull defects (fontanels and sutures), making it difficult localize epileptiform tissue
- Rapid scanning: a typical clinical scan can be completed within thirty minutes
- Anti-vibration construction; infant motion will not cause vibrational artifacts
- Sensor noise level < 10 fT/√Hz
- A dense array of closely-spaced sensors located just below the outer surface of a helmet.
- Allows simultaneous measurement of the occipital area, parietal areas, and temporal areas
- Includes position tracking device and software, permitting measurements during sleep or relatively quiescent wakefulness

MAGView™ System Description

Principles of Operation

Like adult Magnetoencephalography (MEG) systems, MAGView™ uses superconducting sensors to non-invasively detect and map magnetic fields generated by cortical neural activity. However, MAGView™ takes advantage of the fact that the infant's scalp and skull are very thin. Tristan's fabrication methods put the sensing coils very close to the infant brain's sources of activity, even though SQUIDs must operate in an ultra-cold liquid helium environment. The net result is a significant increase in amplitude of neonate MEG signals. Also, the high density of detectors results in higher spatial resolution compared to adult whole-head MEG.

The MAGView™ signal detector channels are specified to have a noise level and sensitivity to magnetic fields of at least 10 fT/√Hz or better on average. Ambient magnetic fields in a typical hospital environment are generally much greater than this sensitivity, and in many cases, the system will be operated within a magnetically shielded room to enable measurements with the full sensitivity capability.

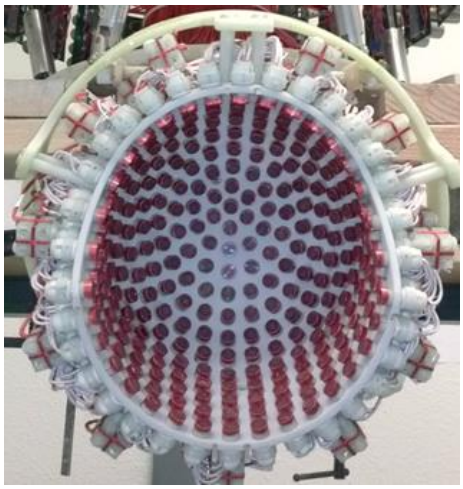
Image of representative baby head in the MAGView helmet

System Components

- Sensor/ Cart/ Mobile patient bed – easily accessed height
- An electronics rack containing SQUID electronics
- An external electronics rack for power supplies and data acquisition hardware, and a computer
- Optional optical tracking system updates movement at 30 Hz with 1/2 mm accuracy
- Part-wise mapping or optional optical one-click 3D imaging system.

SQUID Sensor Array

- 200 to 400 channel sensors within the helmet
- Magnetometer detectors
- Reference channels for ambient noise reduction
- Coil-in-vacuum configuration for superconducting coil array and SQUIDs
- Coil-to-surface gap ~ 6 mm
- Average system white noise < 10 fT/√Hz in magnetically quiet environment
- Helmet designed for whole head coverage, with 50 cm circumference
- Helmet positioned at a height between 30-36" from MSR floor
- Subjects measured in a supine position



Array arrangement within the dewar hemet

Power and Physical Requirements

- Power: 1.5 kW filtered circuit
- Patient bed: 1 m x 2 m x 1.1m (40" x 79" x 42")
- Patient bed, Sensor, SQUID electronics rack: 400 kg (900 lbs)
- Electronics Rack: 400 kg (900 lbs)

Larger coverage areas, higher channel counts, and/or different coil dimensions and configurations are available on request. Contact Tristan for additional information.

All Tristan products are covered by a 1-year warranty. Service contracts may be purchased to provide post-warranty coverage.

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