



Eight-Channel Pneumatic Tactile Stimulus System

fMRI, EEG, fNIRS, & CT Compatible



Opening New Research Possibilities

Brain Mapping... Reinvented.

We set out to provide researchers with a new imaging-compatible stimulus system. What we created has reinvented the types of research possible within functional neuroimaging environments.

Research without limitations.

Some would say that the study of the human brain is one of the last great frontiers. Human understanding of the brain has been limited by technology for most of history, but with each passing decade, new solutions are discovered that unlock incredible new breakthroughs. The Galileo is the newest device in that proud tradition of technological progress.

Functional brain mapping has long been limited by a lack of methods for stimulating activity in the sensorimotor cortices within a magnetic imaging environment, and in particular, methods using natural nerve recruitment order.

Therapeutic potential.

It has long been understood that certain types of stimulus may be effective in generating an adaptation response in the brain. With Galileo, the researcher can provide stimulus to specific cortices while watching the response in real time using fMRI - a research process previously impossible.

The Problem

Researchers have long desired the ability to deliver a tactile stimulus to a subject in an fMRI or other imaging system in order to assess responses in real time. Magnetic, electrical, and audible mechanical systems of tactile stimulus interfere with the magnetic imaging of the brain. In addition, electrical stimulus reverses nerve recruitment, meaning that an adaptation response is absent or extremely limited.

The Solution

The Galileo Tactile Stimulus System was designed with maximum controllability for research environments. The stimulus uses pneumatic pulses generated through a proprietary system, which creates incredibly fast-rising pressure waves. This punctate tactile stimulus is ideally suited for somatosensory stimulus.

Our engineers worked with leading brain researchers to develop the perfect waveform. Once the ideal stimulus was established, they expanded it into a highly customizable 8-channel system.

Software

The real power of the Galileo is the ability to control the system's many features via our included proprietary software package. Since we know that the Galileo will be used in a wide variety of experimental applications, it was designed for maximum customization.

Researchers can design custom pulse sequences, each of which can use different pulse durations, start times, and cycle times. The sequences can be repeated infinitely, stratified, or run randomly to suit the experiment. Data are recorded to a text file.

Researchers running more complex experiments that require integration of multiple stimulus devices, behavioral triggers, or sensory inputs can use serial commands via USB 2.0 to send instructions to the Galileo. Because the pulse delay times are constant, the calculations and programming required are minimal. The Galileo Tactile Stimulus System can be controlled by any software package capable of generating serial commands. The Galileo also accepts per-channel 5V TTL input triggers to do real-time triggering in event-based and cognitive behavioral study environments.

Galileo in actio

TAC-Cell connectors come in a variety of sizes and configurations, for use in experiments with humans, primates, small mammals, and rodents. Custom TAC-Cells can also be engineered for specific projects.





Side-mount TAC-Cell

Practical Applications

An Array of Research Uses

Our customers come from many fields of research, from motor to speech to behavioral studies. Over time, the Galileo has incorporated new features to expand its usefulness into fields of study we never imagined. We know that the Galileo will become an indispensable tool in your laboratory as well.

Sensorimotor

The Galileo was initially designed to assist researchers doing sensorimotor research. We have developed a system optimized for this type of research, with a wide array of I/O and synchronization inputs. Researchers in this feild are primarily interested in developing adaptation therapies. Motion & Gait One of the unexpected areas in which Galileo has made its mark is in simulating dynamic motion and impact on the body. Galileo Systems acquired for this purpose are factory-optimized before they ship. The Galileo TAC-Cells can be attached to any impact point and fired to simulate motion, all in an fMRI. Behavioral The Galileo has special controls to allow it to be integrated into complex experiments. Pulses and/or sequences can be triggered via sensor within a behavioral experiment, simply by creating a trigger within your serial control software. Sequences can also be triggered using a digital TTL (BNC) input.

Hardware Interface

Positive Pressure	Waveform Amplitude Gives control over the amplitude of the pressure waveform.
Negative Pressure	Minimum Negative Pressure Allows the user to raise and lower the minimum negative pressure.
Channel Outputs	Individual Synchronization Allows each channel to connect with the imaging system.
Integrated Output	Comprehensive Synchronization Allows 8-channel synchronization through a single TTL connection.
USB & TTL Input	Flexible Software Control Allows USB 2.0 connection with our proprietary software or third-party serial control, or sequence triggering with a digital TTL (BNC) input.



Ongoing Research

The Galileo Tactile Stimulus System is being used in a number of fields for discovery of therapies using this type of stimulus.

The research potential for Galileo stimulus is huge, with applications ranging from stroke, traumatic brain injury, and fetal neural development all the way to Autism Spectrum Disorders, PTSD, and other behavioral disorders of the brain.

EMCI selectively funds research into therapeutic research for a number of fields. This research helps both in refining the Galileo system and in developing new technologies and claims for future EMCI products. We are encouraged by the early research and are excited to see what other projects are undertaken by Galileo customers. Your feedback, input, and data are always appreciated and will be recognized.

Peer-reviewed published research has already shown an adaptation response in S1, S2, and the post parietal cortex using Galileo (TAC-Cell) stimulus.

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System Integration

Elegant technology, built for simple setup

No programming or code required... unless you prefer it that way.

Using our included proprietary software package, you simply design your sequence sets in the interface. A visual display shows what your sequence will do, and you can be up and running in less than 15 minutes. Our experience has shown us one thing. Researchers don't want tools that add complexity to their lives. They want systems that work well and don't require hours of valuable time to get going.

Galileo does not require special training or factory technicians to install it. Simply put the unit onto a solid surface or rack mount in your control room, plug it into the wall, and run the hose assembly into the imaging suite. Once you power on the system, plug in the USB to your computer and start the Galileo software.

Once you've set up your system, you can begin connecting the synchronization outputs to the imaging system. Use one cable in the "All Channels" sync port, or connect each channel to its own port on your imaging system. For more complex projects, create a serial port in your favorite lab software to control Galileo.

Support Leveraging your Galileo System for success

Purchasing your Galileo system is only the beginning. We aren't simply a vendor. EMCI is on the leading edge of medical-device research and development, with active development projects ranging across more than a dozen disciplines.

When you purchase a system from EMCI, you are also gaining a research ally. We regularly provide custom accessories and technical support. We are committed to making sure your research needs are fully met, and we won't rest until you are getting the results you need.

Our growing network of researchers can connect through our online forum.

Because of the revolutionary design of the Galileo, entirely new areas of research have opened up. As a result, researchers are on new ground as they deploy Galileo in their labs, and our forums provide a place to share ideas and collaborate.







"As a biomedical device manufacturer with an impressive portfolio of sustainable products over many years, EMCI has the in-house expertise ranging from bioengineering and instrument design to the necessary experience to obtain FDA certification and efficient marketing to propel new concept from bench to bedside. EMCI has a successful history of partnerships and collaboration with academic scientists. EMCI's professionalism and expertise translates to efficiency in developing a new biomedical concept to improve human health and well-being.

The Galileo represents the first high-speed pneumatically-based somatosensory stimulation system suitable for functional brain mapping using unique spatial arrays of tactile cells placed on either glabrous and/or hairy skin to determine neural pathway integrity, adaptation, directional and velocity encoding, and cortical plasticity. The Galileo has significant potential as a neurotherapeutic device to induce mechanisms of brain plasticity to improve human health and well-being following traumatic insults such as cerebrovascular stroke."

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