TIBS-R

Temporal Interference Stimulation For Tomorrow's Therapies

What is TIBS-R?

The Temporal Interference Brain Stimulator for Research (TIBS-R) is a flexible and smart current source with 8 fully differential channels designed specifically to explore and study the potential for non-invasive stimulation/modulation of brain and peripheral nerve activity. TIBS-R permits the application of any signal shape at frequencies ranging from direct current (DC) to 100 kHz, with or without external synchronization. It provides the channel isolation and linearity required for temporal interference applications. Concurrent magnetic resonance imaging (MRI) and electroencephalogram (EEG) investigatons are also supported.

TI Solutions

TIBS-R Device for Temporal Interference Research

Background

Temporal interference (TI) stimulation is a non-invasive technique in which interfering electrical fields are used to stimulate/modulate neural activity in targeted regions, including deep within the brain, via standard electrodes mounted on the head (Cell, 2017, 169(6):1029–1041). The new TIBS-R developed by TI Solutions AG (www.temporalinterference.com) offers the most advanced technology to perform highly controlled TI stimulation with maximum flexibility.

Device

The core of TIBS-R is the *Intelligent Current Source* with unique specifications that can be connected to 3rd-party electrodes via an *Electrode Connection Box* (ECB) and controlled by a computer (PC) via an *Application Programming Interface* (API). The highly flexible scripting interface is available in Python and MATLAB (other languages on request). A basic graphical user interface (GUI) is available from 3rd-party sources. Customized GUIs can be developed using the scripting API. The TIBS-R is battery powered and electrically isolated, in compliance with the relevant standards. Optical links connect it to the PC and to peripherals like triggers for synchronization with EEG and other instruments. All pertinent information, including stimulation protocol, currents, voltages, impedances and events, are continuously recorded and displayed to the researchers.

TI Planning Tool

The TI planning tool of the IT'IS Foundation (www.itis.swiss) provides high-quality optimization and visualization of alternating current and TI exposure conditions based on electromagnetic simulations involving detailed, high-resolution and personalized representations of head anatomies of both humans and animals. Thanks to a state-of-the-art, cloud-based modeling platform, simulations of complex realistic setups can be performed without specialized software or hardware.

Fields of Application

TIBS-R and its derivatives can be used for advanced human, animal, and *in vitro* studies and can be customized for specific applications.

Early Adopter Program

As part of our *Early Adopter Program* (EAP), TI Solutions AG is pulling together a select group of researchers who are interested in applying the investigational TIBS-R device as part of their research studies.

Researchers interested in participating in the EAP should contact us at eap@temporalinterference.com.

For further information, visit www.temporalinterference.com

Specifications

Frequency Range	DC – 100 kHz
Waveforms	Sinusoid, phase modulation, frequency modulation, AWG*
Number of Channels	8, synchronized, fully differential
EEG Compatibility	TI-EEG Filter Solutions for Brain Products, Geodesic (3rd party products), passive electrodes only#
MRI Compatibility	TI-MRI Filter Solutions for 2.9T, 3.0T and 7.0T (3rd party products)#
Operation Time	ca. 4 hrs active use on single battery charge, unlimited with WPT-TX/RX
Battery Charger	USB-C
Peak Output Voltage	52 V differential**
Peak Output Current	5 mA max at ≤1.8 kHz** 7 mA max at 2.5 kHz** 14 mA max at ≥5 kHz**
Trigger / Sync Output	External instrument and synchronization (optical)
Trigger Input	Yes (digital, optical)
EEG Level Output of Excitation Envelope	Yes (optical)
Sample Rate	1 MSamples/s
AWG Memory Depth	>2 Msamples (2 s)*
Dynamic Range	>60 dB (10 µA – 10 mA)
Precision / Resolution	16 bit, 1 µs, synchronous update
Total Harmonic Distortion	<0.05%
2nd Order Intermodulation	-110 dBc typical (≤ -135 dBc#)
Ground Reference	Yes
Ground Current Monitoring	Yes
Monitoring - Currents / Voltages	Yes, synchronous sampling / logging of stimulation
Electrode Impedance Detection	Yes (online)
Emergency Stop Button	Optical, suitable for MRI
Safety	Hardware-limited peak currents and voltages**
Control Unity	Optical connection to host PC
Compliance	IEC 60601-1:2005 + A1:2012 + A2:2020 IEC 62304:2006 + A1:2015 IEC 60601-1-6:2010 A1:2013 + A2:2020 ISO 14971:2007 IEC 60601-1-2:2014 + A1:2020
Scripting	Python, MATLAB (others on request)
Environment	+5 – +40°C
Instructions for Use	Yes
IP Protection (Patents)	US 10173061, 10905878, 11759634 EP 3204113, only in FR, DE, GB, IT, ES, FI, DK, BE, NL, CH and LI, CZ

AWG: arbitrary waveform generator; WPT-TX/RX: wireless power transfer option
** in future release only; ** compliant with implemented safety concept*
(Cassarà et al. (2025) DOIs: 10.1002/bem.22542 + 10.1002/bem.22536; IEC standards)
 # EEG and MRI Filter Solutions provided by IT'IS Foundation
Minimal PC specifications: Win 11 Pro, 16 GB RAM, UHD graphics, USB-C

TI Solutions

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