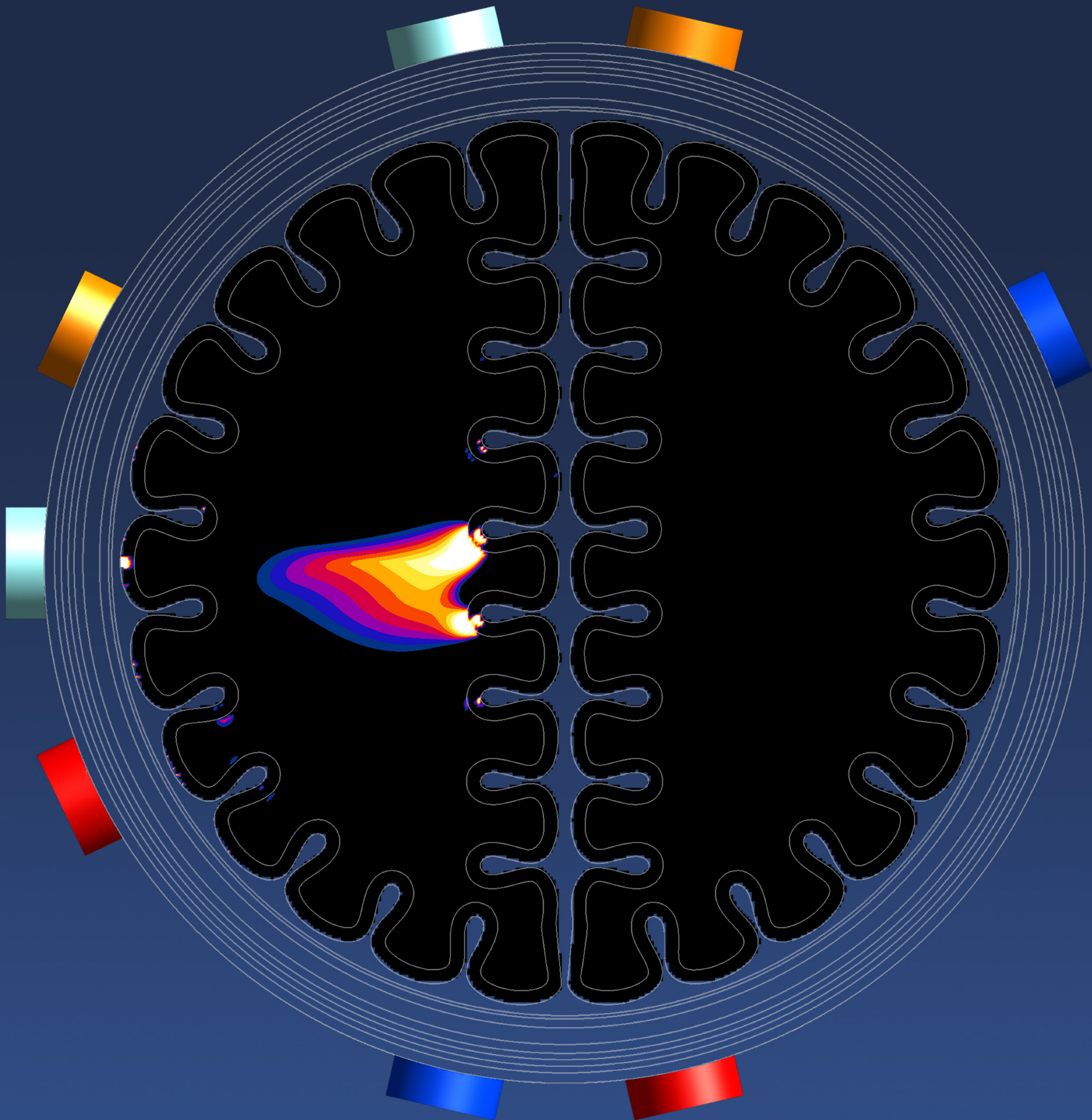
IT'IS FOUNDATION
2024



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Cover: Systematic evaluation of multi-frequency and phase-modulation temporal interference (TI) optimization with a simplified, symmetrical heterogeneous head model.

2024 – A YEAR OF CONSOLIDATION TO PREPARE FOR THE FUTURE

During 2024, the IT'IS Foundation focused on consolidating its activities across four primary research areas: electromagnetics, human and animal anatomical models, computational life sciences, and neuromodulation. Our key successes are highlighted below.

A game-changing breakthrough was achieved in March with the release of Sim4Life.web (www.sim4life.swiss), the first-ever computational platform natively implemented on the cloud! Sim4Life.web enables users to set up and execute even the most complex simulations on demand directly within a browser. This achievement builds upon our o²S²PARC technologies developed over the past seven years. With this solid foundation, we are now able to rapidly add new features to Sim4Life. Importantly, the web and desktop versions are identical twins, offering seamless compatibility, excellent responsiveness, and a unified user experience.

In April, IT'IS successfully completed the development, manufacture, and installation of 27.5 GHz exposure systems for *in vivo, in vitro,* and human studies, including the corresponding dosimetry, as part of the Horizon Europe SEAWave project. This task proved to be a significantly greater engineering challenge than initially anticipated, requiring the development of all components from the ground up. However, the concepts created during this process can be effectively adapted for future systems.

In terms of our Virtual Population anatomical models, we were able to greatly improve the current state-of-the-art artificial intelligence (AI)-driven head and spinal cord model generation from commonly accessible medical image data, which resulted in an expansion of our model library. The newly developed algorithms produce highly accurate and robust anatomical models that feature an increased number of distinguishable tissues for improved precision and versatility.

Temporal interference stimulation (TIS) has become a cornerstone of our neuromodulation research, and IT'IS is collaborating with leading research groups to play a pivotal role at the forefront of this field. By contributing cutting-edge computational modeling, hardware development, and TI planning tools, we have been able to publish several impactful joint publications (see page 15). Consistent with our mission to ensure the safe application of electromagnetic fields, we have also conducted a series of comprehensive studies to establish the safety boundaries of TIS (see pages 12–13).

Our dedication to sustainability resulted in the establishment of the Z43 NetZero Foundation in July, jointly funded by all Z43 entities, to drive the development of scalable, carbon-neutral technologies. Stay tuned for more updates on our channels during 2025.

None of these successes could have been realized without the commitment and drive of our researchers, students, and external advisors (see page 5), alongside the invaluable guidance of our Board Members (see page 4). We extend our deepest gratitude to Professor Alex Dommann, President of the Board, for his exceptional leadership and support. We are equally thankful to Professors Qiuting Huang, Mathieu Luisier, Lukas Novotny, and Klaas Prüssmann for their vital contributions in sharing infrastructure and mentoring our students and researchers. Furthermore, the clinical expertise of Professors Beatrice Beck Schimmer, Stephan Bodis, and Alvaro Pascual-Leone, and the technical advice and support of Professors Peter Achermann, Quirino Balzano, and Primo Schär have been indispensable to our continued progress.

Even with consolidation as a primary focus, IT'IS achieved remarkable breakthroughs in 2024. The success and resilience of our research efforts in a rapidly evolving research landscape can be attributed to our talented multidisciplinary team, strategic collaborations, and diverse funding sources, including Innosuisse, the Swiss National Science Foundation, Horizon Europe, the U.S. National Institutes of Health, and numerous sponsors and donors (see page 10). In 2025 and beyond, IT'IS will continue to push the boundaries in its fields of expertise, paving the way for ongoing, meaningful contributions to healthcare and technology.

Niels Kuster

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Jacqueline C. Pieper, Finance & Administration (EEO)
Tobias Ruff, PhD, Project Leader (EEO)
Werner Van Geit, Project Leader (EEO)
Jingtian Xi, PhD, Project Leader (EEO)
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Sylvain Anderegg, Senior Software Developer
Stefan Benkler, PhD, Senior Software Engineer
Mads Rystock Bisgaard, PhD, Senior Software Engineer
Cédric Bujard, PhD, Senior Software Engineer
Pedro Crespo-Valero, PhD, Senior Software Engineer
Paolo Crosetto, PhD, Senior Software Developer
Matus Drobuliak, Software Engineer
Carina Fuss, Application Engineer

Mingxiang Gao, PhD, Postdoctoral Researcher
Manuel Guidon, PhD, Senior Software Engineer
Yury Hrytsuk, Software Engineer
Elisabetta Iavarone, PhD, Support and Application Engineer
Dustin Kaiser, PhD, DevOps / Backend Software Engineer
Joel Macht, Software Engineer
Odei Maiz, Software Engineer
Lucas Monnin, Software Engineer
Andrei Neagu, Senior Software Engineer
Ignacio Pascual, Software Developer
Melanie Steiner, Software Engineer, AI / ML Specialist

Ninad Chitnis, PhD Student
Alessandro Fasse, PhD Student
Fariba Karimi, PhD Student
Cindy Karina, PhD Student
Lucia Moya Sans, PhD Student

Christian Baumgartner, Scientific Assistant
Paraskevi Chrysopoulidou, Scientific Assistant
Silvia Farcito, PhD, Scientific Assistant
Leo Horber, Scientific Assistant

Patricia L. Bounds, PhD, Scientific Writer
Anja Burse, Photography, Art Director & Media Design
Anastasia Liaskou, Visual Marketing Specialist
Charlotte Roberts, Personal Assistant to the Director
Mayuko Sasaki-Kuroiwa, Graphic Design

Ido Haber, Visiting PhD Student
Mathilde Reynes, Visiting Master Student

External Advisors

Quirino Balzano, PhD, Prof., University of Maryland, US
Andreas Christ, PhD, BR
Charlie Götschi and Markus Müller, Untersee Composites, CH
Tobias Oetiker, Oetiker+Partner, CH
Sabine Regel, PhD, SR Scientific GmbH, CH
Theodoros Samaras, PhD, Prof., Aristotle University of Thessaloniki, GR

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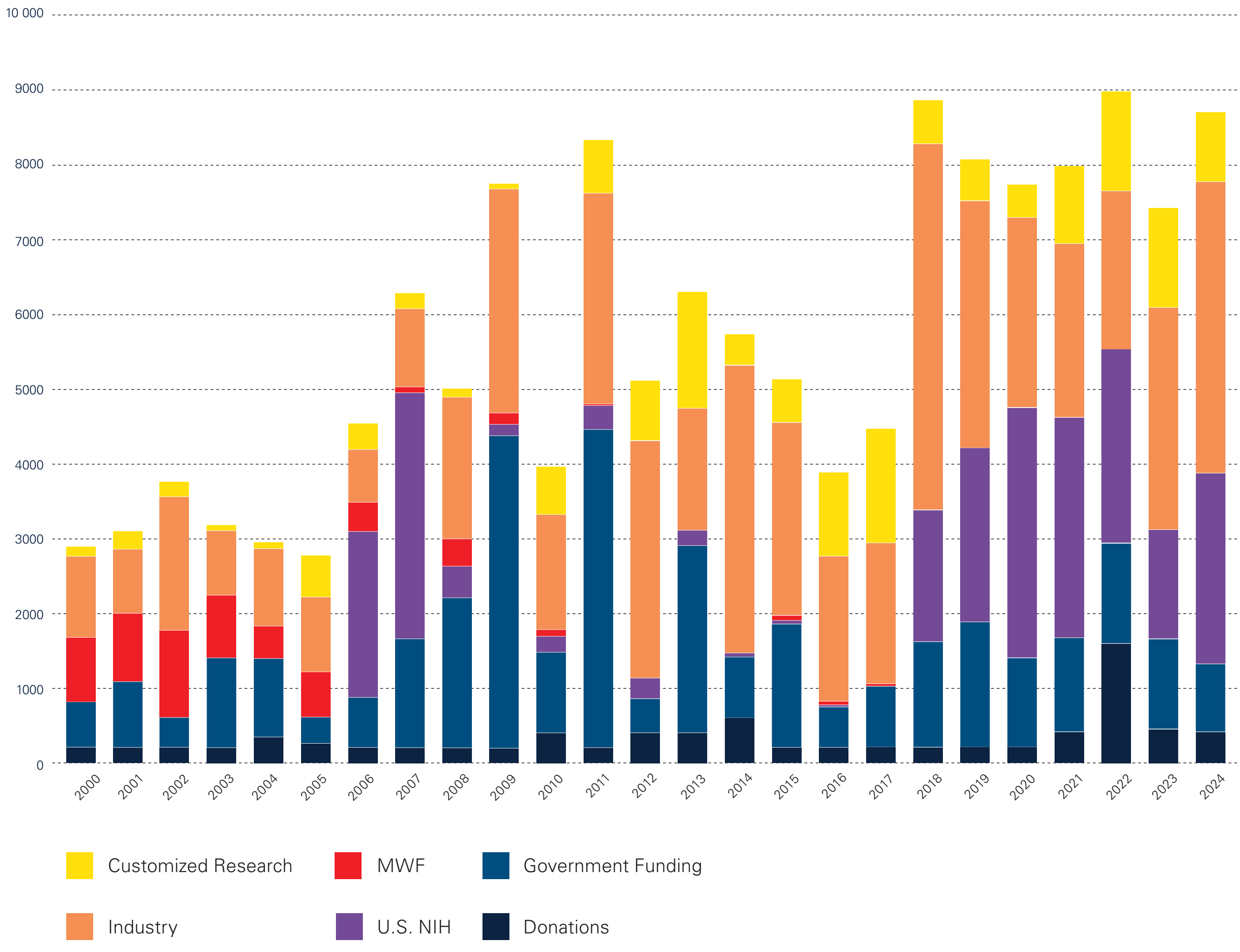
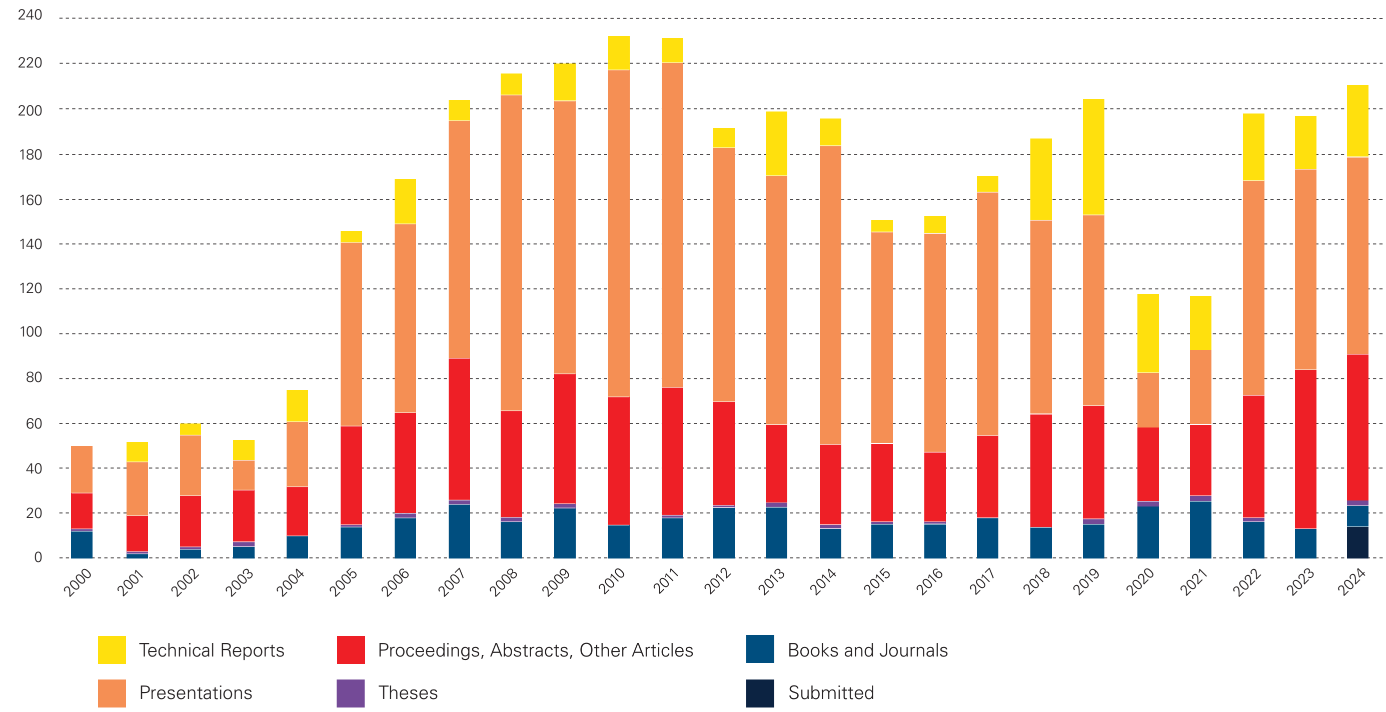
KEY FIGURES

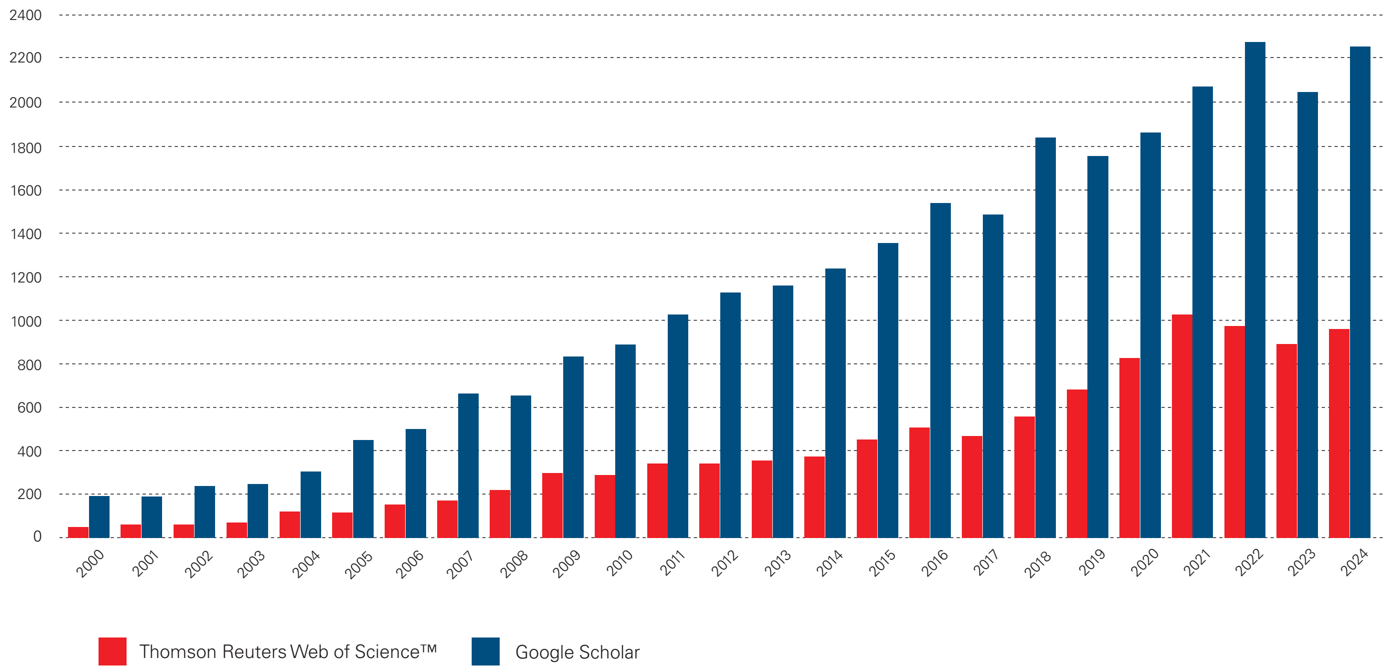
Level of Funding (in 1000 CHF)



Number of Publications



Group Citation Index



The Citation Index is given by the number of citations per year. The compiled index represented in red is based on data available from the Thomson Reuters Web of Science™ database; the number of citations reported are from peer-reviewed publications and excludes self-citations. The index represented in blue is based on data available from Google Scholar.

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Medical Center, University of Freiburg, DE
Medical University of Vienna*, AT
Rizzoli Orthopedic Institute, IT
Roswell Park Comprehensive Cancer Center, US
Schneider Children's Medical Center of Israel, IL
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University Children's Hospital Basel*, CH
University Children's Hospital Zurich*, CH
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University Hospital Erlangen*, DE

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Economic Development, IT
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French National Institute for Industrial Environment and Risks, FR
Greek Atomic Energy Commission, GR
Health Council of the Netherlands, NL
Institute of Electronic, Information and Communication Engineers, JP
International Agency for Research on Cancer, FR
Italian National Agency for New Technologies, Energy and Sustainable
Laboratoire National de Métrologie et d'Essais, FR
National Frequency Agency, FR
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National Institute of Standards and Technology, US
National Institutes of Health, US
National Metrology Institute of Germany, DE
National Physical Laboratory, UK
National Research Council, IT
Norwegian Institute of Public Health, NO
Public Health England, UK
Radiation and Nuclear Safety Authority, FI
Radio Research Agency, KR
Russian Academy of Medical Science, RU
South African Bureau of Standards, ZA
Spanish National Research Council, ES
Spectrum, Information Technologies and Telecommunications (SITT) Sector, CA
State Radio Monitoring Center, Ministry of Information Industry, CN
State Secretariat for Economic Affairs, CH
Swiss Federal Office of Energy, CH
Telecommunication Metrology Center, CN
U.S. Food and Drug Administration, US
World Health Organization, CH

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41Medical AG, CH
Abbott (former St. Jude Medical Inc.), US
AGC Automotive, US
Alnair Labs, JP
Altavo GmbH, DE
Antia Therapeutics AG, CH
Association of Radio Industries and Businesses, JP
Axcelis Technologies, US
Biotronik, DE
BoneBridge AG, CH
Boston Scientific Corporation, US
BrainsGate, US
Cambridge Consultants, US
Cardiatis S.A., BE
cetecom advanced, DE
Cochlear, AU
CoreRhythm Medical Technology, CN
CranioVation, US
CTIA, US
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Sunrise GmbH, CH
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Swisscom, CH
Synchron, US
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THESS, GR
TI Solutions AG, CH
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Valeo, FR
Vodafone Group Plc., UK
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Vratis, PL
WiTricity, US
York EMC Services, UK
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EUREKA, BE
EUROSTARS, BE
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Federal Office for the Environment, CH
Federal Office of Communications, CH
Federal Office of Public Health, CH
Federal Institute for Occupational Safety and Health, DE
Federal Office for Radiation Protection, DE
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French National Institute for Industrial Environment and Risks, FR
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U.S. Food and Drug Administration, US

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Swiss Research Foundation for Electricity and Mobile Communication, CH
Swiss Academy of Medical Sciences, CH
Swiss Federal Institute of Technology in Lausanne (EPFL), CH
Swiss Federal Institute of Technology in Zurich (ETHZ), CH
University of Zurich, CH
Wyss Center for Bio and Neuroengineering, CH

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Abbott (formerly St. Jude Medical Inc.), US
Association of Radio Industries and Businesses, JP
Auden Techno Corp., TW
Biotronik, DE
Boston Scientific Corporation, US
Cisco Systems, US
Clarins Laboratories, FR
Cochlear, AU
CTIA, US
Disney Research, CH
dormakaba Holding AG (Kaba Gruppe), CH
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GE HealthCare, US
GSM Association, CH
Intel Corporation, US
International Business Machines Corporation, US
LG Electronics, KR
LivaNova, US
MED-EL, AT
Medartis AG, CH
MediaTek, TW
Micro Systems Engineering, Inc., US
Mobile & Wireless Forum (MWF), BE
Motorola, US
Nevro Corporation, US
Nokia Research Center, FI
NTT DoCoMo Inc., JP
Oticon Medical, FR
Panasonic Corporation, JP
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Siemens AG, DE
Sonova Communications AG, CH
Sony Corporation, JP
TÜV SÜD, DE
Vodafone Group Plc., UK

Small and Medium Enterprises
Autem Medical, US
BoneBridge AG, CH
Cardiatis S.A., BE
Dotspace Inc., TW
Galvani Bioelectronics, UK
Healtis SAS, FR
IndexSAR, UK
Mainstay Medical, US
maxwave AG, CH
Medico S.p.A., IT
Pharma Digital, CH
Schmid & Partner Engineering AG (SPEAG), CH
Sensimed AG, CH
SetPoint Medical, US
UNEEG medical A/S, DK
ZMT Zurich MedTech AG (ZMT), CH

PROJECTS

Electromagnetic Technology

5&6GEARS	Development of an ultra-miniature wideband 5G and 6G electromagnetic radiation sensor for future mobile communication systems
Dielectric Spectroscopy	Development of novel methodologies for characterization of materials from DC to >100 GHz
expo6G	Multi-modal optimization of 5G and 6G hybrid wireless and internet of things communication networks in Switzerland
MEWS	Metrology for emerging wireless standards
MRIcompLEAD	Magnetic resonance imaging-compatible leads
Science for Standards	Provision of science in support of electromagnetic product standards and support of standard committees and governments
STASIS	Standardization for safe implant scanning in magnetic resonance imaging
TD SENSOR	Development of time-domain near-field sensor technology
WPT	Development of test equipment and software to show compliance with electromagnetic safety guidelines of wireless power transfer systems

IT'IS for Health

CLS – CRANIO	Modeling of craniospinal compliance in humans to advance the understanding of dynamic compliance and its pathophysiological basis
CLS – o^{2}S^{2}PARC	Establishment of an interactive, freely accessible online computational platform for simulating peripheral nerve system neuromodulation / stimulation
CLS – OptiStim	Optimal neurostimulation for the treatment of chronic headaches
CLS – PersonalizedSTIMO	Personalized epidural electrical stimulation of the lumbar spinal cord for clinically applicable therapy to restore mobility after paralyzing spinal cord injury
CLS – SENS-THERM	Development of hardware and software for electromagnetic sensing, video control, and meta-modeling in thermotherapy of advanced head and neck (H&N) cancer
CLS – TARA	Development of a platform to provide an open-access repository and database for acupoint research
CLS – UNMOD	Experimentally validated computational pipeline of ultrasound propagation and neuron-coupling for non-invasive peripheral nervous system stimulation
CLS – V&V40	Development of novel concepts for verification and validation of computational life science software platforms and their applications
EpiTI-W	Establishment of temporal interference stimulation to treat epilepsy by minimally invasive targeting of deep brain structures
MRI – Implant Safety	Improved procedures and instrumentation for magnetic resonance imaging safety evaluation of medical implants
REPLICATIONS	Co-funding of confirmation studies of bioelectromagnetic experiments
TI	Temporal interference stimulation device and planning tool: Basic research, and hardware and software development
ViP 4.x	Development of the next generation of high-resolution computational anatomical models
ViP-P/VM/M	Development of novel posers, methodology for enhanced volume meshes of anatomical structures, and a physically realistic morphing tool

Electromagnetic Exposure and Risk Assessment

Brain in a dish	Investigation of the effects of radiofrequency electromagnetic fields (5G) on brain development and neurodegeneration
Sleep Studies	A causal role for a voltage-gated $Ca_v1.2$ calcium channel in mediating non-ionizing radiation 5G frequency range 1 effects on sleep associated brain health in humans?
SEAWave	Scientific-based exposure and risk assessment of radiofrequency and millimeter wave systems from children to elderly (5G and beyond)
RADIODEP	Investigation of the effects of radiofrequency (5G) in healthy and depressive subjects: Behavioral and neurobiological approaches of electromagnetic hypersensitivity in the rat
RADIOFERTI	Investigation of the impact of 5G radiofrequency on male reproductive function in rats
sXc, sXv, sXh	Development of optimized exposure systems for bio-experiments from static to >100 GHz, including the systems for the U.S. National Institute of Environmental Health Sciences *in vivo* follow-up studies

ENSURING SAFETY IN NEXT-GENERATION NON-INVASIVE BRAIN STIMULATION

Non-invasive brain stimulation (NIBS) is rapidly transforming the landscape of neurological and psychiatric treatments[1]. In particular, temporal interference stimulation (TIS), introduced in 2017, allows for targeted neuromodulation of deep brain structures[2]. However, two critical questions arise: First, what are the fundamental safety boundaries for TIS? And second, how can we ensure safety for the growing population of patients with conductive implanted medical devices that may distort and/or amplify the electric (E-) fields induced by NIBS?

The IT'IS team has tackled these questions head-on through a series of investigations described in three recent scientific publications that combine advanced computational modeling and experimental validation to probe NIBS safety. The first two articles are companion papers in which quantitative guidelines for the safe application of TIS[3,4] are proposed, while the third is an assessment of NIBS safety in the presence of conductive implants[5].

Setting the Boundaries: TIS Safety Framework

Our two-part investigation of TIS safety represents the first systematic effort to establish quantitative safety guidelines for this emerging technology. In TIS, unlike in conventional brain stimulation, two high-frequency E-fields are applied through scalp electrodes at slightly different frequencies (e.g., 10.00 kHz and 10.01 kHz). While these frequencies are themselves too high to directly stimulate neurons, their interaction creates a low-frequency – in this case 10 Hz – modulation envelope that can influence neural activity at targeted locations deep in the brain. Using advanced computational modeling, we systematically simulated various NIBS exposure scenarios, including TIS, transcranial alternating current stimulation (tACS), and deep brain stimulation (DBS), in a detailed model of the head and brain. By matching field exposure magnitudes across the three stimulation modalities, we calculated TIS parameters that produce conditions known to be safe for tACS and DBS and used these to establish thresholds for the safe application of TIS.

Notably, TIS allows for significantly higher thresholds compared to conventional stimulation methods due to reduced skin sensations at higher frequencies. Also, temperature increases remain well below critical thresholds, with brain tissue heating limited to 0.2°C even at the maximum recommended current. Skin heating stays well below the limit of 2°C set by the U.S. Food and Drug Administration (FDA), ensuring effective blinding conditions and enhancing comfort in experimental and clinical settings. Moreover, TIS permits increased E-field focality compared to conventional stimulation, allowing the targeting of deep brain regions with minimal activation of overlying cortical areas.

The practical implementation of TIS demands careful consideration of several additional parameters to ensure optimal safety and efficacy. Electrode size should be selected on the basis of intended target depth and desired focality, with sufficient separation between electrodes to prevent unwanted field interactions. Also, TIS requires careful ramping protocols to avoid transient neural effects during stimulation onset. Finally, simulations should be performed prior to applying TIS to improve focality, ensure safety in light of anatomical variation, and account for the presence of conductive implants.

Managing Implant Interactions

A parallel investigation was focused on the specific challenges posed by metallic implants, such as DBS electrodes or recording devices, in the context of NIBS[5].

Metric	Relevance	< 2.5 kHz	2.5 – 100 kHz
E-field brain (peak)	brain stimulation	16 mA (30 V/m, DBS outside stimulation zone)	16 mA × ƒ/2.5 kHz (30 V/m × ƒ/2.5 kHz, DBS outside stimulation zone)
E-field skin (peak)	skin stimulation	**7 mA (200 V/m, tACS)**	**7 mA × ƒ/2.5 kHz (200 V/m × ƒ/2.5 kHz, tACS)**
total current (peak)	electrode-tissue interface effects	18 mA (DBS)	18 mA × ƒ/2.5kHz (DBS with frequency scaling)
charge/phase (peak)	electrochemistry	400 mA × ƒ/1 kHz (1.3 mC, tACS)	400 mA × ƒ/1 kHz (1.3 mC, tACS)
brain temperature increase (peak)	brain heating	14 mA (0.1°C, FDA)	**14 mA (0.1°C, FDA)**
skin temperature increase (peak)	skin heating	100 mA (2°C, FDA)	100 mA (2°C, FDA)
applied voltage (peak-to-peak)	leakage current	60 V (IEC/ISO 60601-1)	60 V (IEC/ISO 60601-1)

Table 1. Proposed safety thresholds for TIS by exposure metric (3 cm² electrodes)[3]: *TIS can be safely used to apply currents of up to 7 mA at frequencies below 2.5 kHz. At frequencies above 2.5 kHz, safe current levels increase linearly with frequency. To avoid unsafe brain tissue heating, no more than 14 mA should be applied at any frequency.*

Figure 1

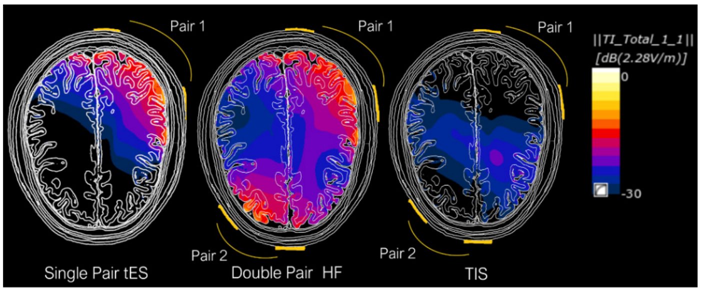

Figure 2

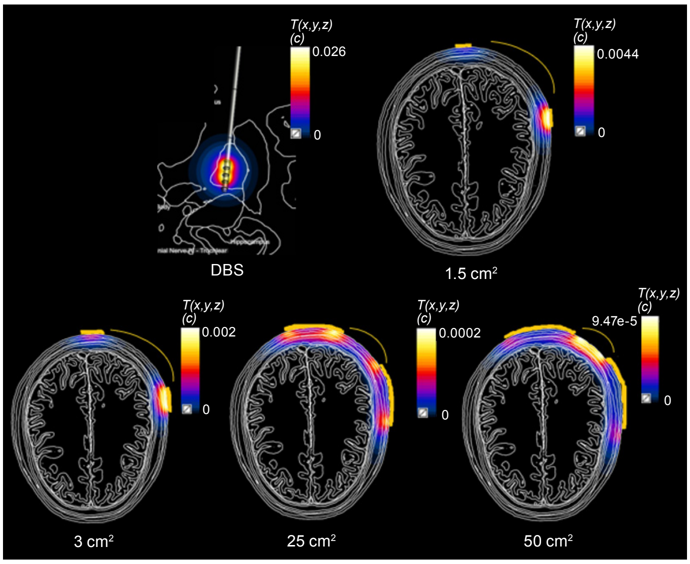

Figure 3

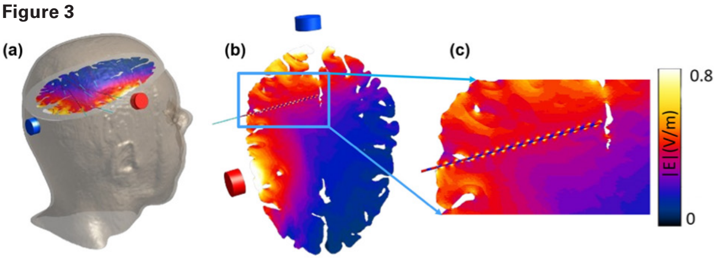

Figure 1. Comparison of TIS and transcranial electrical stimulation (tES). *Comparison between conventional single tES (left) and total TIS high frequency E-field exposure (center), as well as the corresponding low-frequency TIS modulation magnitude distribution (right). The total TIS carrier frequency E-field map (center) shows the maximal high-frequency field magnitude achieved for in-phase, constructive interference.*

Figure 2. Simulated steady-state temperature increase distributions for DBS and tES. *Input current of 1 mA, bipolar electrode configuration (top-left) with various electrode sizes. Heating is principally localized near the electrodes, such that brain heating is minimal for tES. In all cases, heating is well below published thresholds for direct tissue damage.*

Figure 3. Anatomical model validation of the enhancement factor approach. *(a) Illustration of the IXI025 head model (29 different tissue classes, isotropic material properties), with a transverse E-field slice overlay depicting transcranial direct current stimulation (tDCS) with implanted stereoelectroencephalography (SEEG) electrodes, (b) E-field magnitude distribution on a slice containing an SEEG electrode, and (c) zoomed E-field distribution near the SEEG implant.*

Our analysis revealed that field enhancement effects near implanted conductors can reach factors of up to 10-fold for typical implant geometries, with enhancement scaling proportionally to conductor length in elongated implants. Importantly, while these local field concentrations are significant, they generally remain below neural activation thresholds during NIBS. We also discovered that the formation of scar tissue around implants actually helps reduce enhancement effects in the surrounding brain tissue.

Four critical mechanisms were evaluated:

– local field enhancement near metallic contacts
– capacitive effects in implant leads
– thermal considerations, particularly at higher frequencies
– special cases, including abandoned leads and damaged insulation

This comprehensive understanding of field-implant interactions enables precise, patient-specific optimization of stimulation parameters.

From Research to Clinical Practice

These scientific insights have been directly incorporated into our products. For example, the Temporal Interference Brain Stimulator for Research (TIBS-R)* includes hardware-level current limiting that auto-matically enforces safety boundaries while providing real-time impedance monitoring to ensure reliable electrode contact. Working in concert with TIBS-R, the TI Planning (TIP) tool – our dedicated platform for TIS planning – offers a streamlined, web-accessible tool for personalized TI planning and optimization.

Finally, Sim4Life* provides detailed, subject-specific safety assessments, with particular attention to field-implant interactions. Together, these tools offer researchers and clinicians automated enforcement of safety guidelines, subject-specific and risk-minimized TIS optimization, real-time monitoring and adjustment capabilities, and complete documentation for regulatory compliance.

Looking Ahead

As brain stimulation applications continue to evolve, our research ensures they can be delivered safely to an expanding patient population. Through continued research and development, we are committed to advancing the field of NIBS while maintaining the highest safety standards. The TIBS-R system, TIP, and Sim4Life platform provide researchers and clinical scientists with the tools they need to deliver TIS safely and effectively.

* TIBS-R is a product of TI Solutions AG, and Sim4Life is a product of ZMT Zurich MedTech AG; both are Z43 alliance members.

1 R. Polanía, *et al. Studying and modifying brain function with non-invasive brain stimulation*. Nature Neuroscience, 21:174–187, January 2018. DOI: 10.1038/s41593-017-0054-4

2 N. Grossman, *et al. Noninvasive deep brain stimulation via temporally interfering electric fields*. Cell, 169(6):1029–1041.e16, June 2017. DOI: 10.1016/j.cell.2017.05.024

3 A. M. Cassarà, *et al. Recommendations for the safe application of temporal interference stimulation in the human brain Part II: Biophysics, dosimetry, and safety recommendations*. Bioelectromagnetics, 46(1):e22536, January 2025. DOI: 10.1002/bem.22536

4 A. M. Cassarà, *et al. Recommendations for the safe application of temporal interference stimulation in the human brain Part I: Principles of electrical neuromodulation and adverse effects*. Bioelectromagnetics, 46(2):e22542, February 2025. DOI: 10.1002/bem.22542

5 F. Karimi, *et al. Safety of non-invasive brain stimulation in patients with implants: A computational risk assessment*. Journal of Neural Engineering, 22(1):016039, February 2025. DOI: 10.1088/1741-2552/ad8efa

INFRASTRUCTURE

Dosimetric, Near-Field, and EMC/EMI Facilities

Semi-Anechoic Chamber

This shielded, rectangular chamber has the dimensions 7 × 5 × 2.9 m (L × W × H). It is equipped with a reflecting ground plane floor, and half of its walls are covered with baffling panels to absorb electromagnetic waves. The chamber, which contains an integrated DASY52NEO system, can be used for all research activities involving: dosimetric, near-field, and far-field evaluations; the development and optimization of handheld devices, body-mounted transmitters, implants, desktop applications, micro-base and pico-base station antennas, exposure setups, and calibration procedures; electromagnetic interference, magnetic resonance imaging safety, and compliance testing of implants; and more.

Facility for Radiofrequency Compliance Testing

IT'IS shares with Schmid & Partner Engineering AG a facility equipped with the latest DASY8 systems for testing device compliance with any national and international guidelines, standards, and regulations as well as for a wide range of research and development measurement tasks related to exposure to electromagnetic waves at frequencies from 3 kHz – 110 GHz. The facility is accredited per ISO/IEC 17025d.

Technical Equipment and Instrumentation

Spectrum and Network Analyzers

1 Copper Mountain R60 Vector Reflectometer
1 HP 8753E Network Analyzer, 30 kHz – 6 GHz
1 HP APC 85033B Calibration Kit
1 Keysight E5061B Vector Network Analyzer, 5 Hz – 1.5 GHz
1 Rohde & Schwarz FSP Spectrum Analyzer, 9 kHz – 30 GHz
1 Rohde & Schwarz FPL1003 Spectrum Analyzer, 5 kHz – 26 GHz
1 Rohde & Schwarz ZVA24 Vector Network Analyzer, 10 MHz – 24 GHz
1 Rohde & Schwarz ZVA50 Vector Network Analyzer, 10 MHz – 50 GHz
1 Rohde & Schwarz ZVA67 Vector Network Analyzer, 10 MHz – 67 GHz
1 Rohde & Schwarz ZV-Z52 Calibration Kit
1 NI PXIe-5668R Vector Signal Analyzer, 100 kH – 26.5 GHz

Signal Generators and Testers

3 Agilent 33120A, Waveform Generators
1 Agilent 33250A, Waveform Generator
1 Agilent E8251A Signal Generator, 250 kHz – 20 GHz
3 Anritsu 3700A Vector Signal Generators
2 Anritsu MG3700A Vector Signal Generators
1 HP 8647A Signal Generator, 250 kHz – 1000 MHz
1 Rohde & Schwarz CMU200 Universal Radio Communication Tester
1 Rohde & Schwarz CMW500 Wideband Radio Communication Tester
1 Rohde & Schwarz CTS55 Digital Radio Tester
1 Rohde & Schwarz SMIQ02B Signal Generator
2 Rohde & Schwarz SML02 Signal Generators
1 Rohde & Schwarz SML03 Signal Generator
1 Rohde & Schwarz SMT06 Signal Generator
1 Rohde & Schwarz SMU200A Signal Generator
1 Rohde & Schwarz SMY02 Signal Generator
1 Rohde & Schwarz SMW200 Vector Signal Generator
1 Spectrum DN2.816-02 16-Bit Hybrid Netbox

DASY, cSAR3D, ICEy, DAE, EASY4MRI, EASY6, MITS, PiX, Phantoms, Resonators

1 INDY (3-year-old child head) Phantom
1 ISABELLA (6-year-old child head) Phantom
1 SPEAG ASTM Phantom
5 SPEAG cSAR3D (2 Flat, 1 Left Head, 1 Right Head, and 1 Quad)
2 SPEAG DAE4, Data Acquisition Electronics
1 SPEAG DAE4A, Data Acquisition Electronics
2 SPEAG DAE4ip, Data Acquisition Electronics
4 SPEAG DAEasy4MRI, Data Acquisition Electronics
2 SPEAG DASY52NEOs
1 SPEAG EASY4MRI
2 SPEAG EASY6
4 SPEAG EASY6 DAE, Data Acquisition Electronics
2 SPEAG ELI4 Phantoms
1 SPEAG HAC Radiofrequency Extension
1 SPEAG HAC T-Coil Extension
1 SPEAG ICEy-EMC and -mmW
1 SPEAG SAM V6.0 Phantom
3 SPEAG SHO V2 RB, RC, and RP OTA Hand Phantoms
1 ZMT MITS 1.5 with ELIT Phantoms
1 ZMT MITS 3.0 with ELIT Phantoms
2 ZMT Dual Cylinder Phantoms
1 ZMT MITS Gradient v1
1 ZMT MITS Gradient v2
1 ZMT PiXE64
1 ZMT MITS-HFR1.5
1 ZMT MITS-HFR3.0
1 ZMT MITS-TT

Probes

1 Greisinger GMH 5430 Conductivity Meter
1 METROLAB THM 1176 Magnetic Field Sensor
1 SPEAG 1RU1PXI TDS Remote Unit
1 SPEAG AMIDV2 Audio Magnetic Field Probe
1 SPEAG AMIDV3 Audio Magnetic Field Probe
1 SPEAG DAK Kit 12 / 3.5 / 1.2E
1 SPEAG DAKS-12 Probe
2 SPEAG E1TDSz Electric Field Time Domain Sensor and Remote Units
1 SPEAG E1TDSx-ICEy Electric Field Time Domain Sensor
1 SPEAG E1TDSz-ICEy Electric Field Time Domain Sensor
1 SPEAG EE3DV1 Electric Field Probe
1 SPEAG EF3DV3 Electric Field Probe
1 SPEAG EL3DV2 Electric Field Probe for Wireless Power Transfer
2 SPEAG ER3DV6 Electric Field Probes
1 SPEAG ES3DV2 Electric Field Probe
1 SPEAG ET1DV4 Dosimetric Probe
2 SPEAG ET3DV6 Dosimetric Probes
1 SPEAG EU2DV2 Dosimetric Probe
1 SPEAG EUmmW Electric Field Probe
1 SPEAG EX3DV3 Dosimetric Probe
4 SPEAG EX3DV4 Dosimetric Probes
3 SPEAG H1TDSx Magnetic Field Time Domain Sensor and Remote Units
1 SPEAG H1TDSx-ICEy Magnetic Field Time Domain Sensor
1 SPEAG H1TDSz-ICEy Magnetic Field Time Domain Sensor
4 SPEAG H3DV6 Magnetic Field Probes
3 SPEAG H3DV7 Magnetic Field Probes
1 SPEAG HL3DV2 Magnetic Field Probe for Wireless Power Transfer
1 SPEAG HU2DV1 Magnetic Field Probe
2 SPEAG T1V3 Temperature Probes
2 SPEAG T1V3LAB Temperature Probes
1 SPEAG T1V4LAB Temperature Probe
5 SPEAG RFoF1P4MED Probes and 1 Remote Unit

Meters

3 Agilent 34970A Data Acquisition Units
2 Agilent E4419B and 4 HP 8482A Power Meters
3 Agilent HP 436A and 3 HP 8481A Power Meters
1 Handyscope HS3 Data Acquisition Unit
1 Handyscope HS4 Data Acquisition Unit
1 Magnet Physik FH49 – 7030 Gauss / Teslameter
2 Rohde & Schwarz NRP2 Power Meters

Amplifiers

1 Amplifier Research 10S1G4A, Amplifier, 800 MHz – 4.2 GHz
1 Kalmus 717FC RF Power Controller, 200 – 1000 MHz
8 Mini-Circuit ZHL42 Amplifiers, 700 – 4200 MHz
2 Mini-Circuit ZVE-8G Amplifiers, 2 – 8 GHz
1 Nucletudes ALP336 Amplifier, 1.5 – 2.5 GHz
2 Ophir 5141 Amplifiers, 700 MHz – 3 GHz

Other Equipment

1 Narda EHP-50 Electromagnetic Field Probe Analyzer, 5 Hz – 100 KHz
1 Narda ELT-400 Magnetic Field Probe, 1 Hz – 400 KHz
1 CEPH Storage Cluster for o^{2}S^{2}PARC:
· *(3 nodes) each 64 core AMD 2.25 GHz, 256 GB RAM, 500 TB storage (total)*
1 Extension of o^{2}S^{2}PARC In-House Cluster:
· 2x 16 core AMD 4.3 GHz, 256 GB RAM, RTX 3060 GPU 12 GB, 3 TB disks
· 2x 16 core AMD 3.4 GHz, 128 GB RAM, RTX 3060 GPU 12 GB, 3 TB disks
1 TIP.ITIS.SWISS Mini Cluster:
· *(4 nodes) each 16 core AMD 3.4 GHz, 128 GB RAM, RTX 3060 GPU 12 GB, 3 TB disks*
CPU: 2 x 64 Core 3.1GHz Processor RAM: 1152GB DDR5 ECC
DISK: 2x3.84TB Enterprise SSD

Computers

75 Laptops (from Acer, Apple, Asus, Dell, HP, IBM, Lenovo)
83 Desktop Workstations (from HP, Dell, Acceleware, Dalco, custom built)
13 High Performance Computing Workstations/Servers (from Dalco, Acceleware, custom built)
7 QNAP Network Data Storage Servers
10 Dalco Servers
9 Miscellaneous Peripherals (network devices, printers, scanners, etc.)

SELECTED PUBLICATIONS

T. Goren, S. Reboux, S. Farcito, B. Lloyd, and N. Kuster. *Influence of patient head definition on induced E-fields during MR examination,* Magnetic Resonance in Medicine, 91(2):735–740, February 2024. DOI: 10.1002/mrm.29894

J. Brus, J. A. Heng, V. Beliaeva, F. Gonzalez Pinto, A. M. Cassarà, E. Neufeld, M. Grueschow, L. Imbach, and R. Polanía. *Causal phase-dependent control of non-spatial attention in human prefrontal cortex*, Nature Human Behaviour, 8:743–757, February 2024. DOI: 10.1038/s41562-024-01820-z

C. Bujard, E. Neufeld, M. Douglas, J. Wiart, and N. Kuster. *A Gaussian process based approach for validation of multi-variable measurement systems: Application to SAR measurement systems*, IEEE Access, 12:60404–60424, April 2024. DOI: 10.1109/ACCESS.2024.3393778

IT'IS Foundation. *How do you know how a medical implant will behave before it's manufactured?*, Nature Portfolio: Nature Spotlight on Switzerland, April 2024, https://www.nature.com/articles/d42473-023-00414-z

P. Vassiliadis, E. Beanato, T. Popa, F. Windel, T. Morishita, E. Neufeld, J. Duque, G. Derosiere, M. J. Wessel, and F. C. Hummel. *Non-invasive stimulation of the human striatum disrupts reinforcement learning of motor skills*, Nature Human Behaviour, 8:1581–1598, May 2024. DOI: 10.1038/s41562-024-01901-z

A. Fasse, T. Newton, L. Liang, U. Agbor, C. Rowland, N. Kuster, R. Gaunt, E. Pirondini, and E. Neufeld. *A novel CNN-based image segmentation pipeline for individualized feline spinal cord stimulation modeling*, Journal of Neural Engineering, 21(3):036032, June 2024. DOI: 10.1088/1741-2552/ad4e6b

E. Beanato, H. J. Moon, F. Windel, P. Vassiliadis, M. J. Wessel, T. Popa, M. Pauline, E. Neufeld, E. De Falco, B. Gauthier, M. Steiner, O. Blanke, and F. C. Hummel. *Noninvasive modulation of the hippocampal-entorhinal complex during spatial navigation in human*s, Science Advances, 10(44):eado4103, October 2024. DOI: 10.1126/sciadv.ado4103

F. Karimi, A. M. Cassarà, M. Capstick, N. Kuster, and E. Neufeld. *Safety of non-invasive brain stimulation in patients with implants: A computational risk assessment*, Journal of Neural Engineering, accepted manuscript online November 5, 2024. DOI: 10.1088/1741-2552/ad8efa

P. L. Bounds and W. H. Koppenol. *Peroxynitrite: A tale of two radicals*, Redox Biochemistry and Chemistry, 10:100038, December 2024. DOI: 10.1016/j.rbc.2024.100038

A. M. Cassarà, T. H. Newton, K. Zhuang, S. J. Regel, P. Achermann, A. Pascual-Leone, N. Kuster, and E. Neufeld. *Recommendations for the safe application of temporal interference stimulation in the human brain Part I: Principles of electrical neuromodulation and adverse effects*, accepted in Bioelectromagnetics Special Issue on Neuromodulation

A. M. Cassarà, T. H. Newton, K. Zhuang, S. J. Regel, P. Achermann, A. Pascual-Leone, N. Kuster, and E. Neufeld. *Recommendations for the safe application of temporal interference stimulation in the human brain Part II: Biophysics, dosimetry, and safety recommendations*, accepted in Bioelectromagnetics Special Issue on Neuromodulation

B. Botzanowski, E. Acerbo, S. Lehmann, S. L. Kearsley, M. Steiner, E. Neufeld, F. Missey, L. Muller, V. Jirsa, B. D. Corneil, and A. Williamson. *Focal control of non-invasive deep brain stimulation using multipolar temporal interference*, submitted

F. Karimi, E. Neufeld, A. Fallahi, V. Kurtcuoglu, and N. Kuster. *Efficient Fourier base fitting on masked or incomplete structured data*, submitted

F. Karimi, M. Steiner, T. H. Newton, B. A. Lloyd, A. M. Cassarà, P. de Fontenay, S. Farcito, J. P. Triebkorn, E. Beanato, H. Wang, E. Iavarone, F. C. Hummel, N. Kuster, V. Jirsa, and E. Neufeld. *Precision non-invasive brain stimulation: An in silico pipeline for personalized control of brain dynamics*, submitted

L. Kranold, J. Xi, T. Goren, and N. Kuster. *Dosimetric electromagnetic safety of people with implants: A neglected population?*, submitted

A. A. Phillips, A. P. Gandhi, N. Hankov, S. D. Hernandez Charpak, J. Rimok, A. Incognito, A. E. J. Nijland, M. D'Ercole, A. Watrin, M. Berney, A. Damianaki, G. Dumont, N. Macellari, L. De Herde, E. Baaklini, D. Smith, R. Miller, J. Lee, N. Intering, J.-B. Ledoux, J. G. Ordóñez, T. H. Newton, E. F. Meliadò, L. Duguet, C. Jacquet, L. Bole-Feysot, M. Rieger, K. Gelenitis, Y. Dumeny, M. Caban, D. Ganty, E. Paoles, T. Baumgartner, Clinical Study Team, Onward Team, C. Harte, C. D. Sasportes, P. Romo, T. Vouga, J. Fasola, J. Ravier, M. Gautier, F. Merlos, R. Buschman, T. Milekovic, A. Rowald, S. Mandija, C. A. T. van den Berg, N. Kuster, E. Neufeld, E. Pralong, L. Hirt, S. Carda, F. Becce, E. Aleton, K. Rogan, P. Schoettker, G. Wuerzner, N. Langerak, N. L. W. Keijsers, B. K. Kwon, J. D. Guest, E. Ross, J. Murphy, E. Kurt, S. Casha, F. Girgis, I. van Nes, K. A. Larkin-Kaiser, R. Demesmaeker, L. Asboth, J. W. Squair, J. Bloch, and G. Courtine. *The implantable system that restores hemodynamic stability after spinal cord injury*, submitted

J. Tharayil, J. Isbister, E. Neufeld, and M. Reimann. *Computational modeling reveals biological mechanisms underlying the whisker-flick EEG*, submitted

G. Vermeeren, B. Debaillie, S. Kühn, G. Torfs, N. Kuster, P. Demeester, L. Martens, and W. Joseph. *Experimental and numerical assessment of near-field exposure of a 60 GHz communication antenna*, submitted

A. Williamson, F. Missey, E. Acerbo, Adam Dickey, J. Trajlinek, O. Studnička, C. Lubrano, M. de Araújo e Silva, E. Brady, V. Všianský, J. Szabo, I. Dolezalova, D. Fabo, M. Pail, C.-A. Gutekunst, R. Migliore, M. Migliore, S. Lagarde, R. Carron, F. Karimi, R. Castillo Astorga, A. M. Cassarà, N. Kuster, E. Neufeld, F. Bartolomei, N. Pedersen, R. Gross, V. Jirsa, D. Drane, and M. Brazdil. *Non-invasive temporal interference stimulation of the hippocampus suppresses epileptic biomarkers in patients with epilepsy*, submitted

E. Acerbo, B. Botzanowski, D. Dellavale, M. A. Stern, E. R. Cole, C. A. Gutekunst, M. L. Gantt, M. Steiner, F. Missey, A. M. Cassarà, E. Neufeld, K. Berglund, V. Jirsa, R. E. Gross, D. L. Drane, E. D. Glowacki, A. G. Pakhomov, and A. Williamson. *Improved temporal and spatial focality of non-invasive deep-brain stimulation using multipolar single-pulse temporal interference with applications in epilepsy*, bioRxiv, January 2024. DOI: 10.1101/2024.01.11.575301

J. Tharayil, J. Blanco Alonso, S. Farcito, B. Lloyd, A. Romani, E. Boci, A. M. Cassarà, F. Schürmann, E. Neufeld, N. Kuster, and M. Reimann. *BlueRecording: A pipeline for the efficient calculation of extracellular recordings in large-scale neural circuit models*, bioRxiv, May 2024. DOI: 10.1101/2024.05.14.591849

E. Acerbo, B. Botzanowski, D. Dellavale, M. A. Stern, E. R. Cole, C. A. Gutekunst, M. L. Gantt, M. Steiner, F. Missey, A. M. Cassarà, E. Neufeld, K. Berglund, V. Jirsa, R. E. Gross, D. L. Drane, E. D. Glowacki, A. G. Pakhomov, and A. Williamson. *Non-invasive deep-brain stimulation using pulsed temporally interfering electric fields for epilepsy*, SSRN, June 2024. DOI: 10.2139/ssrn.4849682

E. Neufeld, T. Tarnaud, T. Plovie, E. Vicari, P. B. Garcia, R. Schoeters, N. Kuster, W. Joseph, L. Martens, S. Micera, and E. Tanghe. *Computational pipeline for modeling ultrasound propagation and electrophysiological impacts for non-invasive peripheral nervous system stimulation*, Neuromodulation: Technology at the Neural Interface, 27, October 2024. DOI: 10.1016/j.neurom.2024.06.345

IT'IS FOUNDATION

History
The IT'IS Foundation was established in 1999 through the initiative and support of the Swiss Federal Institute of Technology (ETH) Zurich, the global wireless communications industry, and several government agencies. IT'IS stands for "Information Technologies in Society".

Legal status
The IT'IS Foundation is a non-profit, tax-exempt, independent research foundation.

Mission
The IT'IS Foundation is dedicated to expanding the scientific basis of the safe and beneficial application of electromagnetic energy in health and information technologies.

The IT'IS Foundation is committed to improving and advancing precision medicine and the quality of life of people with disabilities, in particular, through innovative research.

The IT'IS Foundation provides a proactive, creative, and innovative research environment for the cultivation of sound science and research, and education.

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