Z43 NEWSQUARTER
No.19/2022

IT'IS FOUNDATION
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Dear Z43 Partners, Friends, and Followers

The most spectacular success of the past three months was certainly the joint publication in Nature Medicine – which showed that patient-specific computational modeling in Sim4Life was key for optimized surgical placement of an in silico designed and validated paddle lead to restore mobility after severe spinal cord injury – and the related news coverage. But that's not all: there is good news also for our DASY customers, who can now benefit from the new source reconstruction algorithm for the very near field, which has been made available in DASY8/6 Module mmWave V3.0.

MEASUREMENT

DASY8/6 Module mmWave V3.0
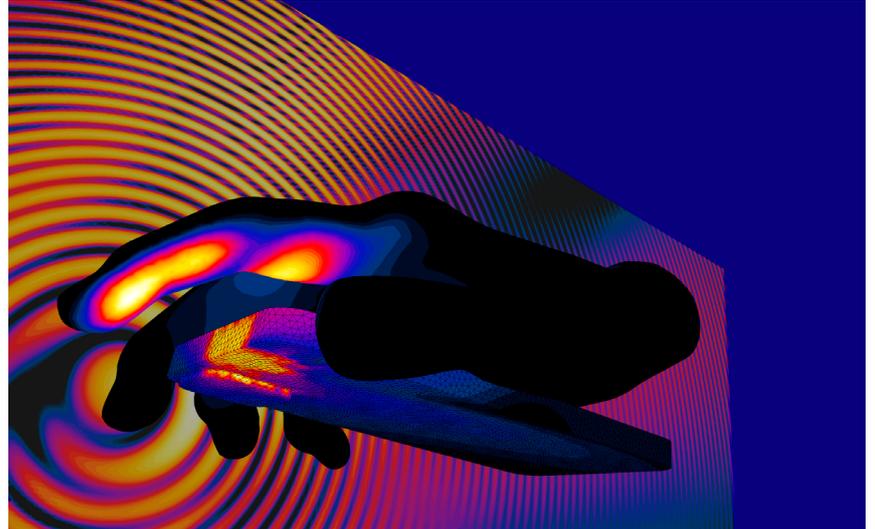
Joint and concentrated effort expended by IT'IS, ZMT, and SPEAG during the last 24 months has resulted in development of a novel equivalent source reconstruction algorithm based on amplitude information in structured and unstructured grids. The new algorithm provides excellent results, even in the extreme relative near-field (d <0.05 λ). The first implementation enables accurate and simple certification of Wi-Fi 6E devices. In the near future, SPEAG plans to release a more general implementation to resolve the remaining compliance testing issues for devices operating at frequencies >6 GHz.

VIRTUAL POPULATION

Visible Human Overhaul: Eddie cV3.1

After being on the shelf for almost 20 years, the Visible Human male model is back! IT'IS is proud to bring this model to new life and with superior quality. The new Eddie cV3.1 model is consistent with other Virtual Population models, and, thanks to the richness of the cryosection image data, Eddie cV3.1 includes segmentations of the peripheral nervous system that are far more detailed than those of current models based on this dataset.

Eddie cV3.1:
Joseph Unchained
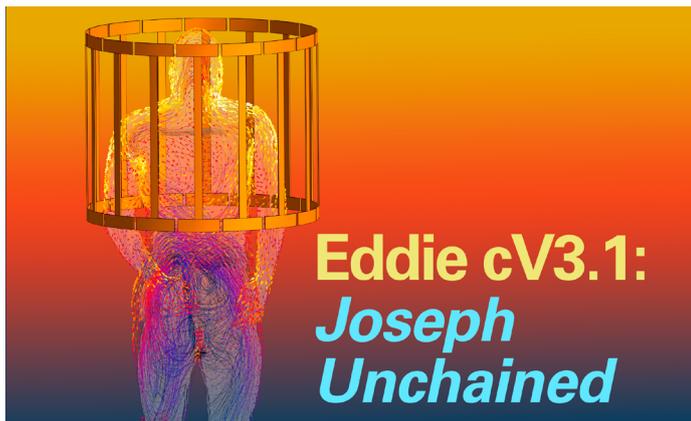
VIRTUAL POPULATION

Update of Tissue Properties Database

Tissue DB V4.1
Low-Frequency Upgrade
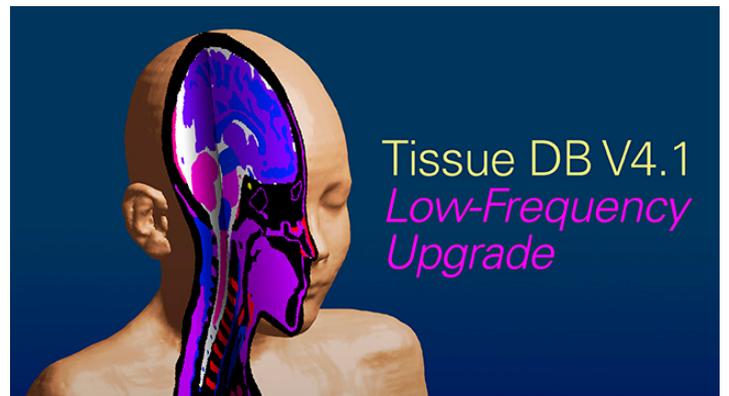
IT'IS has upgraded its Tissue Properties Database. Regular updates have been made over the last decade to apply the latest results published in the scientific literature to keep the database up-to-date and as comprehensive as possible. The latest release, V4.1, includes measurements reported in recent publications of electrical conductivity at low frequencies based on diffusion tensor imaging. In addition, the IT'IS team has undertaken a careful re-evaluation of the combined standard deviation values.

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SIMULATION

Sim4Life V7.0 and SEMCAD X Matterhorn V20.0

New major releases of Sim4Life and SEMCAD X *Matterhorn* have been made available! The updates include many new features that elevate the software above competitor products, particularly in terms of neuromodeling, safety and efficacy evaluation, and mm-wave device design and evaluation. In addition, ZMT and SPEAG have taken another major step forward by connecting our powerful and versatile experimental platform DASY8/6 with the Sim4Life and SEMCAD X *Matterhorn* simulation platforms.

Z43 SOCIAL

Z43 Retreat 2022

The first Z43 (nearly) post-COVID-19 retreat was held at historic Grimsel-Hospiz at the end of January. The theme of the retreat was "Witches vs. Bill Gates: Conspiracy Beliefs & the Role of Science — Implications for Gender Bias & Inequality". The first day was devoted to dissection of conspiracy theories and approaches for debunking them, as well as historical accounts of witches and witchcraft. Breakout groups conducted role-playing exercises to explore how difficult it can be to combat deeply held beliefs, even with scientific arguments. The focus of the second day was gender issues, with examinations of implicit biases that work to disadvantage women in a world designed for men. In brainstorming sessions, participants collected ideas to add to a draft of a Gender Equality Plan for Z43. The plan — intended to codify Z43's long established gender balanced atmosphere — will soon be finalized, then implemented and tested during the next four years.

PRESS

STIMO Study Results Published in Nature Medicine

In Silico Optimization for Immediate Recovery

Fantastic success! IT'IS and ZMT are proud to announce that the joint paper "Activity-dependent spinal cord neuromodulation rapidly restores trunk and leg motor functions after complete paralysis", has been published in Nature Medicine. Patient-specific treatment modeling with Sim4Life was key for identifying the safest and most effective surgical positioning of a new paddle electrode array consisting of 16 electrodes that target the sacral, lumbar, and low-thoracic dorsal root ensemble associated with leg and trunk movements. High-end computational modeling in Sim4Life also enabled the generation of detailed, realistic, and personalized computational models of the interactions between epidural electrical stimulation and the spinal cord neural activity array arrangements, which were used *in silico* to optimize the implant design and ensure proper coverage of the relevant patient population.

Several videos are available as supplementary information to the paper – watch the videos here and see some of the fantastic milestones achieved by the three study participants. For the modeling enthusiasts, make sure you check out the links to the explorable models on the IT'IS website.

RESEARCH

PUBLICATIONS

Hyperthermia: A Potential Game-Changer in the Management of Cancers in Low-Middle-Income Group Countries

N. R. Datta, et al. 2022, Cancers, Volume 14, Issue 2, Article No. 315, doi: 10.3390/cancers14020315 (online 9 January 2022)

Activity-Dependent Spinal Cord Neuromodulation Rapidly Restores Trunk and Leg Motor Functions after Complete Paralysis

A. Rowald, et al. 2022, Nature Medicine, Volume 28, Issue 2, p. 260–271, doi: https://doi.org/10.1038/s41591-021-01663-5 (online 7 February 2022)

Improving Needleless Electrospinning Throughput by Tailoring Polyurethane Solution Properties with Polysiloxane Additives

K. Iranshahi, et al. 2022, ACS Applied Polymer Materials, Volume 4, Issue 3, p. 2205–2215 doi: 10.1021/acsapm.2c00263 (online: 1 March 2022)