

A WEB-BASED PLATFORM FOR SIMULATING MRI RF-INDUCED HEATING WITH IMPLANTED DEVICES

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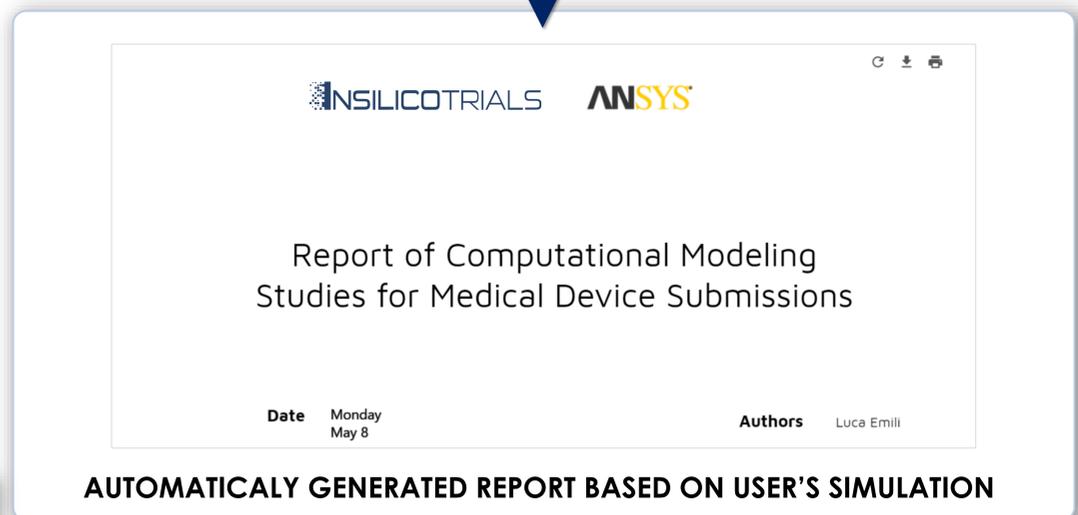
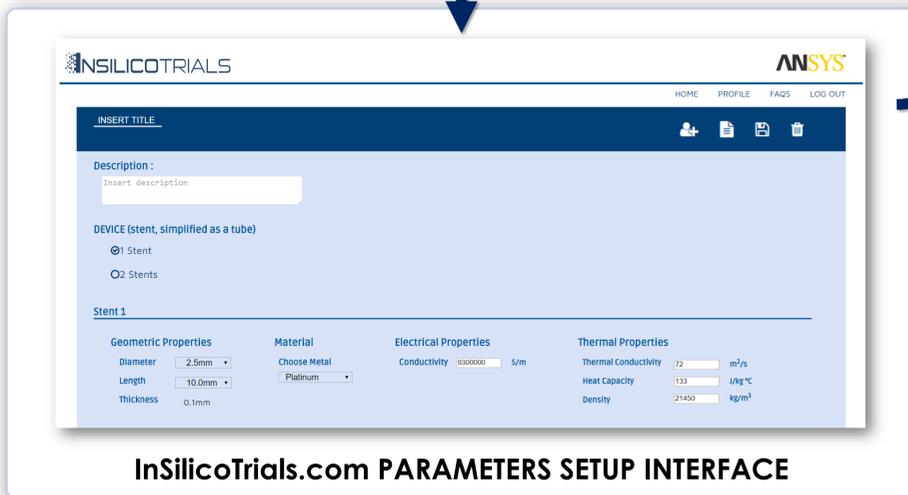
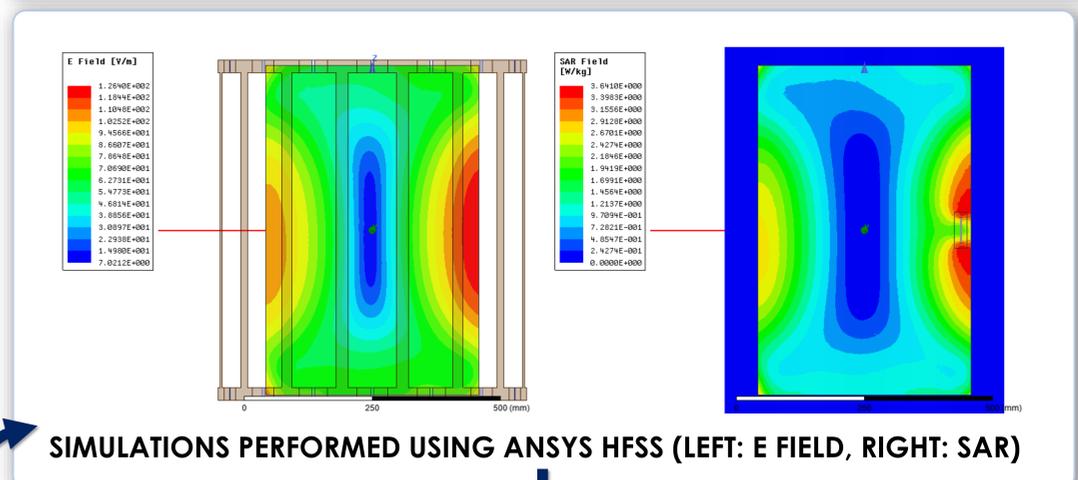
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INTRODUCTION

- **Magnetic resonance imaging (MRI) on patients with metallic implants can generate radio-frequency (RF)-induced heating, leading to potential damage of surrounding tissues.**
- Because of **safety concerns**, the **accessibility of patients** to the benefits of MRI is restricted to **specific conditions of use**.
- Use of **computational modeling and simulation (CM&S)** in pre-clinical testing [1], known as **in silico trials**, is often limited by the required **expert know-how** and costs of **computational infrastructure**.
- InSilicoTrials.com platform supports the **broadening use of CM&S for Electromagnetic Safety Analysis**, with the goal of further improving the **access of patients with implanted devices to MRI**.

MATERIALS and METHODS

- **Computational model** created to simulate **RF-induced energy absorption** near a stent based on the **ASTM F2182 standard test method** [2].
- Computational model consisting of a **simplified stent**, an **ASTM phantom**, and a **128 MHz RF transmit coil** [3].
- **Electric field** and **specific absorption rate (SAR)** calculated using the finite element solver **ANSYS HFSS v18.0** (ANSYS, Inc., Canonsburg, PA, USA).
- **Web-based platform** allows user to **easily change simulation input parameters**, including **stent properties**, and **automate execution** of the in silico testing.
- Simulations are performed in the **cloud** and results are stored in a **secure and reliable environment**.
- **Results page** and **summary report**, based on current regulatory guidelines [4], are **automatically generated**.



RESULTS

- The proposed platform ensures that simulations are executed according to established **simulation best practices**.
- **No specific expertise** in numerical methods or solvers is required.
- **No need for extensive hardware infrastructure** since all simulations are run **remotely in the cloud**.

CONCLUSIONS

- **Easy and ready-to-use workflows** within InSilicoTrials.com platform promote the **broader adoption of CM&S in preclinical trials** for RF safety analysis, aiming to a **democratization of simulations in healthcare**.

REFERENCES

- [1] Morrison et al., 2016 BMES/FDA Frontiers in Medical Devices Conference, Annals of Biomedical Engineering 44(12):3719-3749;
 [2] ASTM F2182-11a, Standard Test Method for Measurement of Radio Frequency Induced Heating On or Near Passive Implants During Magnetic Resonance Imaging;
 [3] Serano et al., 2015 BMES/FDA Frontiers in Medical Devices Conference; [4] FDA Guidance: Reporting of Computational Modeling Studies in Medical Device Submissions, 2016.