

Plenarvortrag

PV IX Do 9:15 HZO 20

Ultrashort High Voltage Pulses for Medical and Environmental Applications — •JÜRGEN F. KOLB, ANNA STEUER, JIE ZHUANG, QIAN ZHANG, and THOMAS VON WOEDTKE — Leibniz-Institute for Plasma Science and Technology (INP Greifswald e.V.), Felix-Hausdorff-Str. 2, 17489 Greifswald, Germany

The generation of pulsed electric fields with durations on the order of only nanoseconds and field strengths of several tens of kilovolts per centimeter has encouraged the development of novel medical therapies and environmental treatment options. Besides applications in water decontamination, in particular the possibility to affect cell functions is attracting the interest of the medical community. In the meantime several studies in vivo could demonstrate that the treatment with

nanosecond pulsed electric fields is effective against several types of cancer. The technical challenge of the method is the application of short high voltage pulses across load-impedances that are on the order of a few Ohms. The much greater challenge is the diagnostic of the initial biophysical effects that are affecting cell functions and are eventually responsible for the biological response. Basic studies have so far almost exclusively been studied in single cells. Conversely, the response of a tumor is inherently the collective reaction of cells connected in a tissue. Accordingly we have recently started investigating the effects of pulsed electric fields in tissue models and focused in particular on the communication between cells. In a related effort we are investigating the possibilities to increase the efficacy of pulsed electric field treatments by combining the method with plasma treatments.