

PEF Equipment Design and Operation

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Abstract: Various applications of the pulsed electric field technology (PEF), spanning from basic research to industry, demand for different high voltage pulse generation concepts. The required pulse duration ranges from nanoseconds to milliseconds. Pulse amplitudes of several 100 V up to some 100 kV have to be generated. This presentation deals with pulse generator concepts based on capacitive energy storage. After illustrating the basics of capacitor charging and single-stage discharging, concepts of pulse voltage multiplication, e.g. the Marx generator concept, will be explained. For generation of short rectangular-shaped pulses up to several μs of pulse duration transmission line generators are advantageous and have established especially for basic research in laboratory environment. Rectangular pulses of higher energy content can be provided by pulse forming network generators mainly consisting of a series connection of LC elements. Switches are important components of pulse generators. Traditionally high voltage switching is accomplished by gas discharge switches. The very basics of gas discharge switching and on improving gas discharge switch performance will be explained. Current developments in switching technology tend to replace gas discharge switches by semiconductor switches. Advantages and disadvantages of gas discharge and semiconductor switching technologies will be discussed. Finally basic designs of treatment chambers will be illustrated, which, from the engineering point of view, represent the ohmic load for absorption of pulse energy.