Contribution ID: **29** Type: **Oral Presentation**

An Investigation into the Next Generation of High Density, Ultra High Voltage, Power Supplies

Wednesday 6 June 2018 10:30 (15 minutes)

There is growing interest, from both industry and academia, for a DC power supply capable of outputting 2MW at 1MV. Ideally, the geographic footprint of such a power supply would be as small as possible, meaning that the design will need a high power density. If a fault, such as a short circuit, were to occur in a system that stored a lot of energy the results could be catastrophic. For this reason, the amount of stored energy should be kept to a minimum. The combination of these factors means that many conventional technologies, such as Cockroft-Walton Generators, are ill-suited for the purpose.
A number of other techniques were explored, leading to a more thorough investigation of two possible technologies. Namely the High Frequency Cascade Transformer (HFCT) and the Insulated Core Transformer (ICT). Each were simulated to model the flux loss across them. Physical experiments were also carried out, on a practical test rig, to verify the results of the simulations. Methods for limiting flux loss within both designs will be detailed in the full paper.

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Session Classification: Oral 10 - Power Electronics

Track Classification: Power Electronics, Power Supplies, Prime Power, Rotating Machines, and Energy Converters