



Contribution ID: 140

Type: **talk**

Measurement of 300MV/m Accelerating Gradients in a Dielectric Wakefield Accelerator

Monday, 14 September 2015 16:15 (15 minutes)

The future of electron driven light sources and colliders alike is quickly approaching a financial barrier that is only overcome by international collaborations. Size reduction of experimental systems, along with attendant reduction in cost, is one of many possible steps necessary to reaching TeV scale linear colliders and allowing for the spread of short-pulse x-ray light sources, such as free-electron lasers (FEL). To that end we present new experimental results that measure accelerating gradients using a witness electron bunch in excess of 300 MV/m in a Dielectric Wakefield Accelerator (DWA). The fields were measured in an annular quartz dielectric structure of 10 cm length driven by a 1.6 nC electron bunch of 55 μm r.m.s. length and witnessed by an 880 pC electron bunch of 30 μm r.m.s. length. The nominal energy of the two bunches was 20.35 GeV before interaction in the structure. This work, performed at the FACET facility at SLAC National Accelerator Laboratory, shall be presented in the context of preceding work that demonstrated that fields in excess of 1 GV/m are attainable in DWA systems as well as plans for future work.

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Session Classification: WG3 - Electron beams from electromagnetic structures, including dielectric and laser-driven structures

Track Classification: WG3 - Electron beams from electromagnetic structures, including dielectric and laser-driven structures