



Contribution ID: 360

Type: Oral

Initial Experiments with the LANL “Ranchero-S” Flux Compression Generator

Wednesday 21 June 2017 12:00 (15 minutes)

Initial experiments have been conducted with a new model of the LANL Ranchero magnetic flux compression generator (FCG) that has been introduced as the Ranchero-S configuration. The design overcomes a weakness in the earlier versions related to possible flux pocketing near the output glide plane when currents become very high. In addition to employing an armature that is sculpted to match a contoured stator, the high explosive (HE) is pressed, machined, and glued PBX 9501 pieces instead of a single PBXN-110 casting. PBX 9501 provides higher armature velocity, but presents unique assembly challenges. This first test uses a capacitor bank to supply a 3.5 MA seed current to the 87 nH FCG. Peak current is ~40 MA as measured by Rogowski coils and Faraday rotation loops (including development of an improved Faraday rotation configuration). Peak current is applied into an imploding 100-gram aluminum liner load capable of exceeding velocities of 1 cm/ μ s and with an initial inductance of 2.5 nH and a peak inductance of 3.5 nH at peak current. Liner performance, including liner velocity and liner/glide plane interaction effects, is monitored via an array of photon Doppler velocimetry probes positioned about the central measuring unit. Our experimental results are compared with our MHD calculation predictions.

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Session Classification: Oral session 13 - High-Voltage Insulation and Dielectric Breakdown Phenomena, Explosively-Driven Pulsed Power - Session Chair : Yakov Krasik

Track Classification: Pulsed Power Physics and Technology, Components and HV Insulation