Contribution ID: **89** Type: **Oral Presentation**

LED-Triggered Photoconductive Semiconductor Switches for Nanosecond Pulse Generation

Wednesday 6 July 2016 16:00 (15 minutes)

Photoconductive semiconductor switch (PCSS) is of interest to the high voltage, pulsed power technology and their applications due to its excellent properties of high hold-off voltage, fast response time, low jitter and robust stability. It is known that optical switches have advantages in electrical insulation and flexibility over electrical switches especially for high voltage pulsed power switching. PCSSs are solid-state switches but optically triggered, and thereby promise low jitter, delay, and free of electromagnetic interference [1]. The traditional optical sources for triggering PCSS are nanosecond solid-state lasers or laser diodes and the lowest optical energy of triggering was reported at about 2 nJ [2]. With the recent development of light-emitting diodes (LEDs), the optical yield of certain types of LEDs has been sufficient for potential PCSS triggering [3]. We report here a nanosecond pulsed power generation using a LED-triggered PCSS. A GaAs-based PCSS was tested to hold off up to 4.5 kV with a LED-based optical pulse. When the LED was driven by a 16.3-ns pulsed current of 110 A, with a rise time of 7.75 ns, the optical pulse was sufficient to turn on the PCSS at an energy of 0.8 nJ. A 19-ns long 4.5 kV voltage pulse with a rise time of 10 ns was generated from the main circuit.

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Session Classification: Oral 3

Track Classification: Opening, Closing, and Solid State Switches