

# DESIGN & DEVELOPMENT of 100 kA/20 kV HIGH CURRENT PSEUDOSPARK SWITCH

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## Abstract

Pseudospark discharge based high current switches have gained much interest of the high energy discharge community for their peculiar properties and uses. High current PSS have huge potential to meet the adequate pulse parameters of high current requirements and hence useful for variety of emerging applications including shock wave generation, electro-magnetic forming process, study of high energy physics, etc [1]. CSIR-CEERI has capabilities to develop low current thyratrons and Pseudospark Switches. Thyatron and Ignitron have many limiting features over PSS including hot cathode operation, toxic mercury use, service life, less current rise, etc. At CSIR-CEERI, a 20kV/20kA radial multi-channel PSS has been realized first time in the country [3]. More refined robust structure needed to be developed to achieve very high currents up to 100s kA to meet strategic needs in India. Such switches are being presently imported and time to time are subjected to import restrictions.

In this paper a PSS design for very high current up to 100 kA at 20kV hold-off voltage is reported, which has been enriched by geometrical parameters. The electrode shape and the material plays a crucial role in withstanding high voltage and subsequently commutating the high current switch. Accordingly these two important issues have been taken care in the modified design. The radial multi-channel geometry has been evaluated in terms of electric field and voltage distribution to avoid any unwanted voltage breakdown in the geometrical structure. In this design a diagnostic arrangement has been made to carry out the spatial and temporal behavior analysis using optical emission spectroscopy of the discharge in a linear aperture radial-multi-channel geometry of PSS. The proposed design is being validated by switching characteristics for high current applications.

## References :

- [1] Prospective pulsed power applications of pseudospark switches, Proceeding of Pulsed Power Conference, PPC, IEEE, p. 255-259, (2009)
- [2] Application of TPI-thyratrons in a Double-pulse Mode Power Modulator with Inductive-resistive Load, IEEE Trans. on Dielectrics and Electrical Insulation, **17**, p 716-720, (2010)
- [3] Investigation of a high current linear aperture radial multichannel pseudospark switch, Rev. Sci. Instrum. **86**, 103508 (2015).

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