EXPERIMENTAL CHARACTERIZATION OF RADIAL MULTI-CHANNEL PSEUDOSPARK SWITCH FOR HIGH CURRENT APPLICATIONS

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Abstract

There is resurgent of interest in the design and development of high power pseudospark switches for pulse power applications[1-2]. In the recent past, CSIR-CEERI has designed and developed coaxial multi-channel pseudospark switches (PSS) for medium current applications[2]. For high current switching, radial multi-channel pseudospark switch (RM-PSS) is generally preferred over coaxial geometry in long run. In this direction, 20 kA current at 20 kV hold-off voltage has been demonstrated in RM-PSS configuration[3]. A more refined metal-ceramic demountable prototype of RM-PSS has been designed and developed for higher current rating where a high dielectric surface discharge trigger source is employed. The high voltage electrodes are made of OFHC copper material. The developed RM-PSS has been characterized for different operating conditions using hydrogen gas. The circuit is also optimized for fast current rise and peak current (up to 200 kA) generation. The charge transfer capability of the switch has been tested with14 microfarad capacitor bank. A series of experiments have been performed with parallel combination of high voltage capacitors at different gas pressures and anode voltages to analyze the switching behavior of the developed PSS. A series RLC circuit Matlab Simulink model for the discharge path has also been developed and validated by comparing the experimental wavefroms with the simulink waveforms. The PSS has been operated for hundreds of high current shots. The obtained pulse shape and parameters show that the proposed geometry of RM-PSS is suitable for very high current applications. Besides the geometry, there are many other factors like, electrode materials, trigger sources, metal to ceramic brazing and gas selection which needs further research for improve switching performance.

References:

[1] K. Frank, et al, "Pseudospark switches for high repetition rates and high current applications", Proceedings of the *IEEE* **80**, P-958, (1992).

[2] R. P. Lamba, et al, "A sealed-off double-gap pseudospark switch and its performance analysis", *Plasma Sources Sci. Technol.* **27**, P-035003, 2018.

[3] R. P. Lamba, et al, "Investigations of a high current linear aperture radial multichannel pseudospark switch", *Rev. Sci. Instrum*, **86**, P-103508, (2015).

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