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Review the enhancement of low frequency dielectric barrier discharge (DBD) plasmas generation by using Silicon Diodes for Alternating Current (SIDAC)

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We are reporting on enhancing low-frequency dielectric barrier discharge (DBD) plasmas generation using Silicon Diodes for Alternating Current (SIDAC). SIDAC is a bidirectional switching device designed to interface the power line directly. When the applied voltage meets or exceeds its breakover voltage (V_{BO}), the SIDAC will switch from the blocking state to the conducting state. The conducting state will continue until the main terminal current drops below the holding current (I_H). If the number of SIDACs in a series connection is N, the breakover voltage of this connection will be increased to N times, but the holding current (I_H) will be kept the same as the single one. When this connection is switched on, a sharp change of up to kV range in applied voltage with a rise time of several hundred nanoseconds will be generated.

Using high-voltage SIDACs with a conventional AC or DC power supply could offer a stepped change in the output due to the SIDACs' high-speed switching. Such stepped high-voltage operation can easily establish DBDs with low cost instead of expensive high-frequency power sources and pulse voltage power sources.

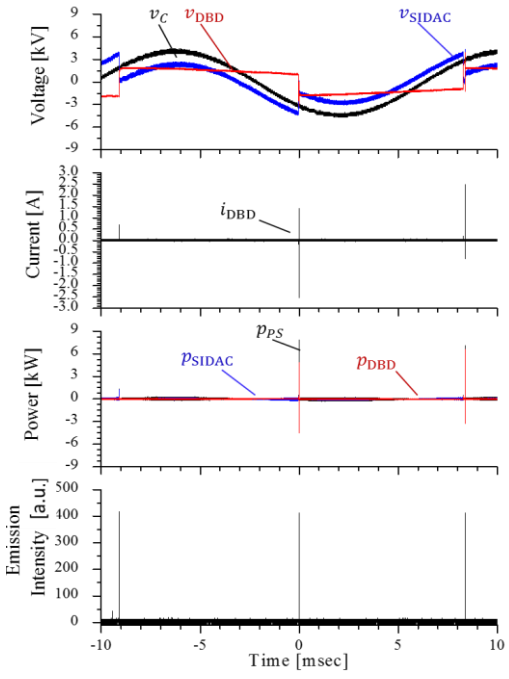

Fig.1 Discharge waveform using a low frequency AC voltage source

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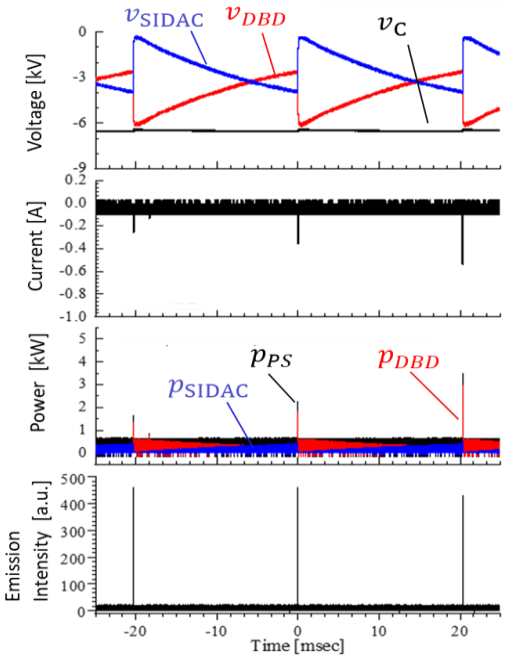

Fig.2 Discharge waveform using a DC voltage source