Contribution ID: **309** Type: **Poster**

Characterisation of a Corona-stabilised Switch in Alternative Gas Mixtures

Tuesday 20 June 2017 13:30 (1h 30m)

Sulphur hexafluoride (SF6) has traditionally been used as a switching medium within corona-stabilised switches (CSS). Due to its high global warming potential (GWP), however, other gases are under test in order to find a suitable alternative that can be used within CSS, without compromising on switching performance. Design changes may have to be made in order for the switch to remain at the high level of performance achieved when filled with SF6. This paper reports preliminary results obtained using a CSS operated with the refrigerant 1,3,3,3-tetrafluoropropene, known as HFO-1234ze, as the basis of the operating gas. The electronegativity of HFO-1234ze makes it an attractive option to replace SF6 for switching applications. Additionally, the global warming potential (GWP) of this gas is 6 in a 100-year time horizon, compared to SF6 with a value of 23900.

The performance of the switch has been characterized in terms of voltage recovery, triggering range, delay time and jitter over a range of pressures when filled with dry air as a reference, as well as with HFO-1234ze in various mixtures with high proportions (>90%) of buffer gases such as carbon dioxide (CO2) and nitrogen (N2). The results presented provide data on the feasibility of the approach of using HFO-1234ze as the operating gas in corona stabilised switches. They will also provide the initial basis for work refining the use of buffer gases, and for the development of optimised switch configurations.

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Session Classification: Poster session II - Pulsed Power Physics and Technology, Components and HV Insulation

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