An Experimental Apparatus for Novec™ 4710 for Pulsed Power Applications

J. Matthies*, L. Silvestre*, J. Stephens*, J. Dickens*, J. Mankowski*, A. Young**, A. Neuber*

* Texas Tech University, Lubbock, TX
** Lawrence Livermore National Laboratory, Livermore, CA

Sulphur hexafluoride (SF_6) is a prevalent insulating gas in high voltage environments. However, the high global warming potential of SF_6 has motivated a search for an alternative, more environmentally friendly insulating gas. Novec™ 4710 (C_4F_7N) is a primary candidate due to potentially having nearly twice the voltage hold-off of SF_6, significantly lower atmospheric lifetime, and a greatly reduced greenhouse effect.

While prior work has focused chiefly on DC and AC (power utility) frequencies, an experimental apparatus was developed to assess the pulsed power performance characteristics of Novec™ 4710 in mixtures with CO_2 and N_2 at pressures of up to three atmospheres. The pressure chamber has interchangeable anode and cathode connections to facilitate the testing of multiple breakdown geometries such as plane-to-plane, rod-to-plane, et cetera. The electrode design permits the study of various electric field gradients on the hold-off voltage of Novec™ 4710. Within the chamber, the electrodes are integrated as center conductors in a 50 Ohm coaxial transmission line geometry. Thus, the system maintains 50 Ohm impedance throughout the geometry, thereby minimizing reflections and allowing for voltage and current diagnostics with fast, nanosecond resolution.

184 words; 500 allowed.

Abstract prepared for submission to the 2022 IEEE International Power Modulator High Voltage Conference (IPMHVC)

2022 IPMHVC-EIC: https://ipmhvc-eic-2022.com/; Deadline: February 1st, 2022