Name: **Alexey ZHABIN**
Email: alexey.zhabin@univ-pau.fr

Supervisors: Laurent Pecastaing
Partners/Funding: Loughborough University / SIAME / E2S

Status: PostDoc started on the 06/2020

Determination of Breakdown Voltage along the Surface of a Cylindrical Insulator

Abstract

The electric breakdown along the surface of a cylindrical dielectric, part of a coaxial transmission line, was investigated. The particular geometry of the insulator is very common, as it is used at the input or output of most high-power, high voltage generators. The streamer propagation criterion was used to calculate the flashover voltage. The dependences of the flashover voltage on the distance between the electrodes were obtained in tests with DC voltage and also by applying voltage impulses with different durations and rise-times.

Results and Discussion

The tests were carried out for various distances between the electrodes in the interval 4 cm to 32 cm with the electrodes placed in different relative positions to provide different electric field distributions along the insulator surface. The tests demonstrated the flashover voltage increases linearly with the inter-electrode distance. The highest difference between the estimated values and the experimental data is less than 15%, which proves the applicability of the criterion for determining the surface breakdown voltage within the geometry under study. One of the conclusions of the present work is that the flashover voltage for the considered experimental conditions seems to only depend on the fulfillment of the streamer propagation condition.

Based on experimental data, the dependence of the pre breakdown time delay on the applied electric field was also determined. This dependence is well approximated by a power function. This curve allows to estimate the flashover voltage for impulses having different durations.

The results of the studies presented in this work, allowed the precise design and successful testing of the output insulator used in a 0.5 MV pulsed power system currently under development.