# Electrical breakdown in space borne microwave equipment

Electrical breakdown (multipactor) constitutes a severe problem in many modern microwave systems, e.g space borne communication equipment. The breakdown discharge tends to generate noise, change the device impedance, heat the device walls and may permanently damage the devices. The basic physics involved in the multipactor breakdown phenomenon is well known. However, new applications give rise to situations where previous results concerning breakdown are not applicable. The concomitant uncertainties in predicted breakdown power levels makes it necessary to allow for large safety margins in device specifications and/or to use expensive test procedures.

To improve the situation, a strong effort has been made within a close collaboration between Centre National d'Etudes Spatiales in Toulouse, France, Chalmers University of Technology, Gothenburg, Sweden, Institute of Applied Physics, Nizhny Novgorod, Russia and General Physics Institute, Moscow, Russia. The present paper reports on recent results obtained for coaxial wave guides which are commonly used for transmission of microwaves. A comprehensive analysis is made of multipactor breakdown thresholds in such structures using theoretical modeling and numerical simulations which are corroborated with results of detailed experiments.

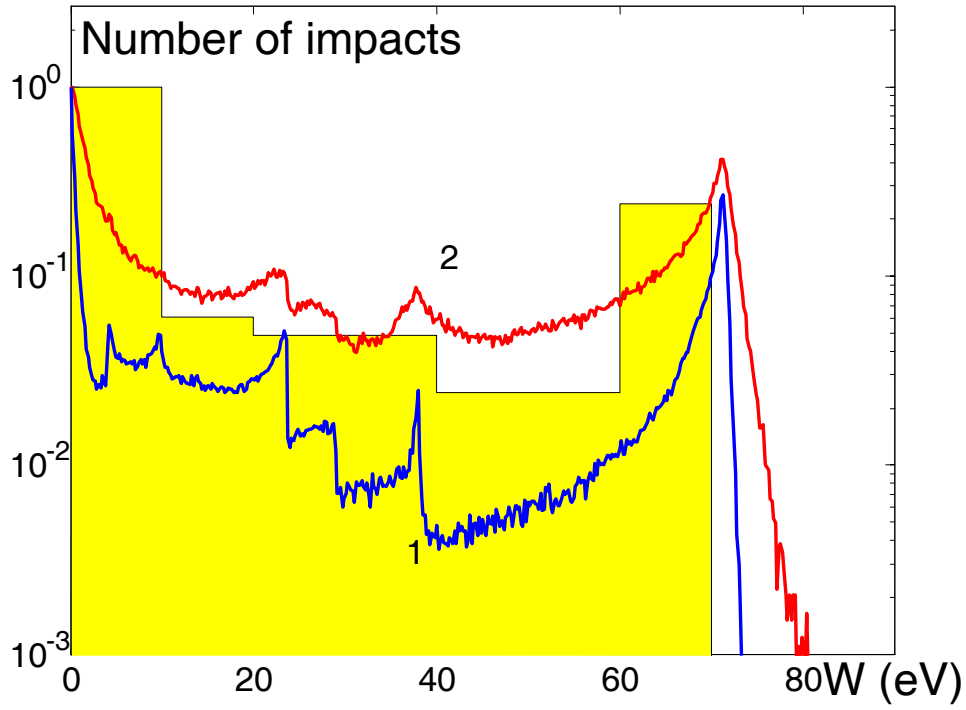


FIG. 1. Example of a comparison between theoretical and experimental results for the distribution of impact energy of discharge electrons at the outer wave guide electrode. Lines 1 and 2 correspond to different theoretical predictions and are superimposed on the experimental results.

The results provide new knowledge and prediction capability concerning multipactor breakdown in microwave systems involving coaxial waveguides and should be an important input for an upgrading of the document for European Cooperation for Space Standardization.

I A Kossyi, G S Luk'yanchikov, V E Semenov, N A Zharova, D Anderson, M Lisak and J Puech "Experimental and numerical investigation of multipactor discharges in a coaxial waveguide", J. Phys. D: Appl. Phys. 43 345206 (2010)