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**Micro-Discharge Scaling and Development from Centimetres to Microns: DC and RF Breakdown and Discharge Characterization around the Paschen Minimum**

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Joint talk with Z. Lj. Petrovic (Institute of Physics, Belgrade) Two aspects of micro discharges are addressed: The scaling of electrical characteristics and the properties of a recently developed RF micro discharge. We review attempts to measure voltage and current waveforms, Paschen curves and oscillation characteristics of dc and rf discharges from the macroscopic (cm) scale to micro discharges, considering pd values below, at and above the Paschen minimum. Conventional scaling (pd, E/N and jd^2) are found to be valid for dimensions down to 100 microns, however anomalous Paschen curves are observed below this value and field emission and or long path breakdown are considered as possible explanations. We also present radial profiles estimates for sub mm discharges in an attempt to determine realistic local current densities. In order to explore fundamental discharge mechanisms at reduced scales, we have developed the first radio frequency micro-hollow cathode (RF-MHC) device. This operates stably, for many hours, in neon and in argon. We present measurements performed with a 50 micro metre diameter RF MHC neon discharge. Electron heating modes and information on the electron energy distribution were investigated through electrical and spectroscopic techniques. A number of discharge modes are observed and analysis points to the possibility of pendular electron heating at low voltages. Collaborators: D. Maric, N. Skoro, G. Malovic & M. Radmilovic –Radjenovic (Institute of Physics, Belgrade), C.M.O. Mahony (University of Ulster), WG Graham & T. Gans, (Queen's University Belfast).