

# The ProRad Experiment

**Mostafa Hoballah**  
**IPN d'Orsay, France**

The ProRad (Proton Radius) experiment aims to measure the proton electric form factor with high precision at very low momentum transfer  $10^{-6}$ - $10^{-4}$  (GeV/c<sup>2</sup>)<sup>2</sup>. The experiment consists in measuring the cross section for the elastic scattering of 30-70 MeV/c electrons off protons in the 6°-15° angular range. The goal is to provide an image of the behavior of the electric form factor in this region and constrain the zero-momentum transfer extrapolation of the electric form factor necessary for the extraction of the proton radius. ProRad data, along with data from other experiments at low momentum transfer, will add the missing pieces to the proton radius puzzle.

Being in a momentum transfer region close to zero, accuracy in all respects is the key challenge for this experiment. Starting with a well-defined and established PRAE (Platform for Research and Applications with Electrons) electron beam, an energy compression system intends to reduce the beam momentum dispersion down to  $5 \cdot 10^{-4}$ . A spectrometer measures the beam energy with a  $5 \cdot 10^{-4}$  accuracy. The interaction region consists of a 250 μm beam spot size colliding with a boundary-free self-replenishing laminar liquid hydrogen jet. The detector setup is built from up to 28 elementary cells constituting of a position measurement device and a BGO crystal. The principle of operation of the essential elements of the ProRad experiment will be discussed.