Si Sensor Studies for Beam Calorimeter

- Beam Calorimeter is a sizable project, ~2 m^2 of sensors.
- Sensors are in unusual regime: ~ 1 GRad of e^+/e^-; 10^{14} n/cm^2 after several years.
- There are on-going studies with GaAs, Diamond, Sapphire materials (FCAL report, Nov 2009).
- We'll concentrate on mainstream Si technology polished by decades of technical development.
- Neutron flux does not seem to be a problem for Si (RD50 findings).
- There are very few e^+/e^- radiation hardness studies:
  - S. Dittongo et al (2005); n/p-type Si;160 MRad of 900 MeV e^-
  - J.M. Rafi et al (2009); n-type Si; 1.7 GRad of 2 MeV e^-
- Our region of interest is ~100 MeV (incident) and lower (shower max)

Irradiation Plan

- Intend on using left-over sensors from ATLAS sensor R&D (made at Micron). Both n- and p- type, Magnetic Czochralski and Oxigenated Float Zone.
- Plan to use NL-CTA beam at 120 MeV (with degrader).
- Will assess the bulk damage effects. This will further assess the breakdown on NIEL scaling (x50 at 2 MeV and x4 at 900 MeV) in the energy range of interest.
- An interesting possibility is to mimic the expected radiation tail with an absorber, to be less dependent on radiation damage modeling.
- Want to also characterize the charge collection efficiency.