Thursday 26th May 2005

RADECS Thematic Workshop on European SEE Accelerators

Round Table 3: Open (Proton Irradiation)

Chairs : Sophie Duzellier/ONERA & Renaud Mangeret/EADS Astrium

Introduction points (by Sophie): See presentation

- Activation of sample,, shielding of nearby equipment, Radioprotection / Safety issues.
- TID degradation of devices, SEE sensitivity may increase by increasing TID degradation.
- Angular dependence of the cross section.
  - concerns direct and indirect ionisation (SET in optocouplers)
  - Anisotropic distribution of recoils (SEU/MBU due to nuclear reactions spallation in devices mean > Qc)
- Use of degraders or tuned beams, a problem?
  - Correlated to angular dependence.
  - SEE cross section may be different for tuned and degraded energies.
- Energy range, saturation effects?
  - Is a 60MeV proton facility sufficient? One may have to employ larger energies to get the entire cross section curve.
- Future needs, low flux, high flux (dose deposition), Representative samples (DDD).. Etc.

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Panel points:

- There does not seem to be any body that proton irradiate devices at different angles.
- The angular effect is dependent on the device type employed.
- Is the angular effect within the experimental errors. How large is the problem? Is it a factor of two or a factor of 10?
- Not many papers describing this effect is available.
- One should maybe be cautious with regards to modern components (the angular effect may be a problem for these devices).
- Proton irradiation testing at different angles is not common.
- For SET there are some HI data related to SET. In general the LET threshold is low, one may thus conclude that these are proton sensitive. Not much proton data is available. It is strange that there are so few results with respect to protons and SETs.
- Second comment is regarding the tools for calculating SET rates for protons.
- Is there an action in the radiation community to standardise or employ such tools (proton SET rate calculations).

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- Future needs: Low fluxes are required for calibration of detectors (Some 100 particles/cm^2/s). Because in space the flux may vary from nothing to high values when crossing the belts. Would like to reproduce extreme space environment conditions (for material degradation and investigation of component functionality). CNES is currently unable to obtain low flux proton beam.
- For SEE and displacement damage 60MeV proton beams (upper limit for many facilities) is not sufficient to perform SET characterisation. Also for verification of NIEL there is a need for proton energies that cover 10 to 100 MeV (good for SEE and displacement damage).
- Testing of CCD would also require lower energies (narrow spectrum, good spectrum). 1 MeV would be good to have. Currently one would need to employ a number of facilities.
- At PSI they were capable of providing fluxes as low as 100 p/cm2/s
- CERN have requirements in the opposite. They require higher fluxes. (fluxes of 10E8 with a 25cm beam diameter.