Radiation Test Status

T. Bolton—KSU—3/13/03

- Problem: V_{dep} and α point to flux discrepancy of ~3 (we overestimated flux).
- Big part = spreadsheet error (L1 area used vs. L2). Factor of ~2. Error introduced in write-up, not in irradiation sessions.
- Regina will show revised V_{dep},I_{leak} results.

Check 0: analysis/procedure

- We will analyze our data more quickly– as available-- in future tests.
- Would like to expose a set of single diodes on test structures– more reliably comparable to models.
- Important thing is to put enough radiation on sensors.

Check 1-- electronics

- Flux measured by counting charge in Faraday cup. First step=electronics checks:
  - Independent Faraday cups agree.
  - No electron effects (“electron suppressor” in/out).
  - Digital/analog output of integrator agree.
  - Integrator agrees with independent analog pico-ammeter.
- Basic charge measurement looks OK.
- Will measure some smaller effects next Wed. (scattering from halo into Faraday cup, etc.)

Check 2– totally independent fluence via Cu foil activation

- Will irradiate foil next Wednesday and analyze with help of KSU nuclear engineering.
- Pursuing independent measurement through FNAL (problem: V. Capps busy…)

Check 3– “channeling”

- Is the very well-collimated p-beam channeling through the Si and producing an anomalously low NIEL?
- Measured backscatter rate at beam incident angles of 0,7,14 deg. On Tuesday, 3/11/03.
- No difference in rates→ channeling unlikely.

Check 4: calibrating hardness parameter *k*

- This is more difficult. We use *k=3.87* from a model calculation.
- Some evidence for lower *k* from 10 MeV Toronto measurement.
- Could use α itself to calibrate ("fudge").
- More ambitious→ can measure 1-2 sensors in low power KSU reactor via neutron irradiation.
  - Not suitable for production– one time test.
  - KSU nuclear engineers willing to help.
  - Some uncertainty, but widely used and conventional method.
- To ensure full irradiation range, I recommend accumulating a 10 MeV p fluence equal to that desired for 1 MeV n (assuming *k=1.00* vs *3.87*).