Electronics Safety

SLAC

Two issues were we have safety concerns

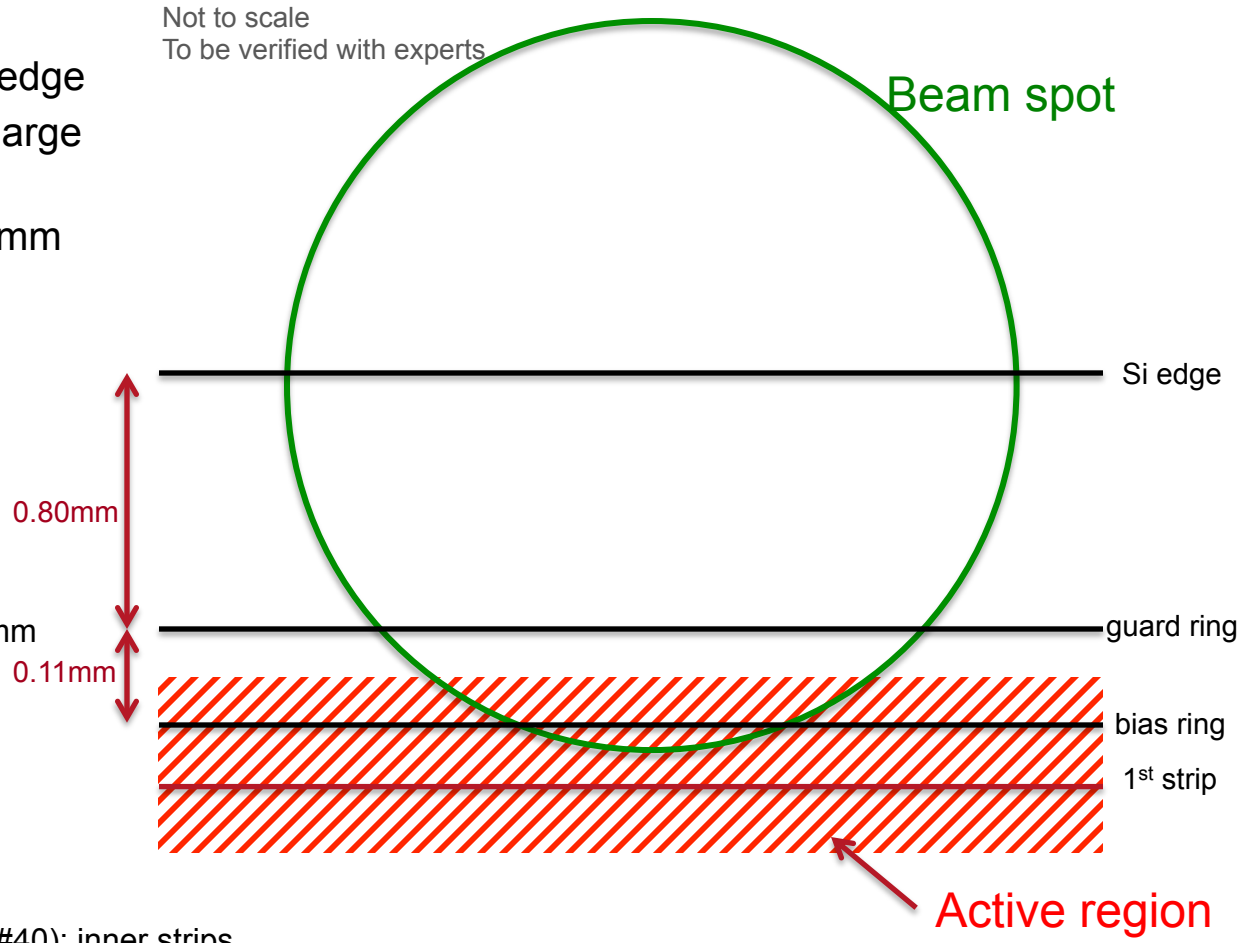
- Beam accidents with thin collimator setup (Takashi)
  - Need this…or use thicker collimator
- Running DAQ during edge irradiation test beam at SLAC (only very coarse study so far)
  - Might not need this…

Safety of the half-modules is non-trivial;Vitaliy provided a list of initial ideas based on Atlas modules

- Damage to amplifier (APV25 specific)
- Damage to coupling capacitor (localized field breakdown between implant and backplane can give large voltages)
- Problems might be mitigated by the exact biasing/filtering implementation
- A dedicated presentation might be interesting

DAQ during irradiation test beam

- Beam aimed at Si cut edge
- Active region at ~1mm from edge
- Beam deposits significant charge in active region
- Assuming active region at 1mm 15% of the beam is in active region

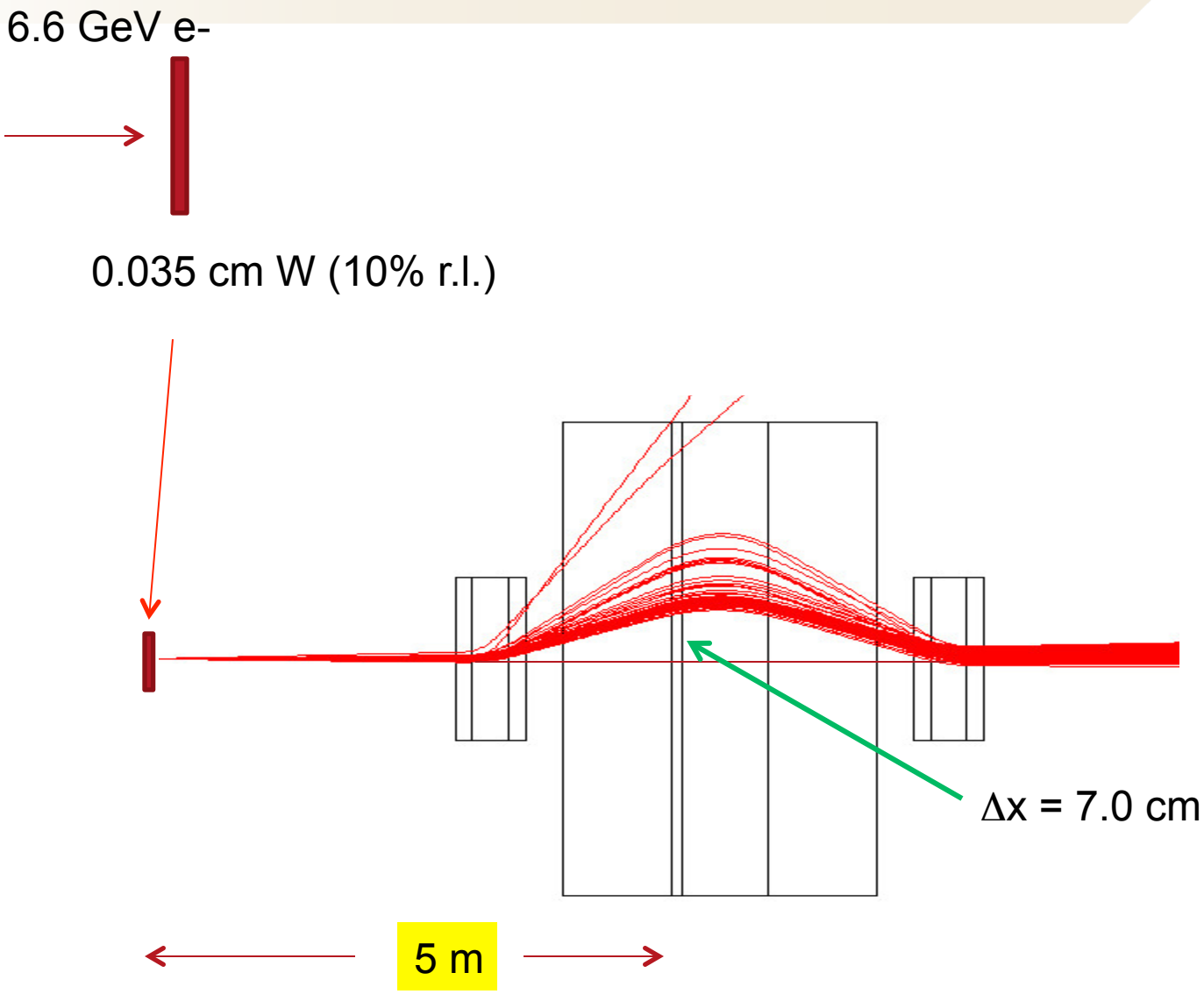


Per bunch (120pC)
⇒ 18pC (~10'000 mips) in active region
⇒ 1.4% of beam is in 60um wide strip at ~1mm from Si edge
⇒ 1.68pC (~900mips) peak charge in single strip

- 6 mips/strip deposited at 3.3mm (~strip #40): inner strips would be saturated
- Accident: if beam hits silicon directly we'd get up to 2.4% or 3pC in single strip per bunch or 15pC/sec (2e8 e's/sec)

- How much do we gain by running the DAQ?

Collimator Scattering

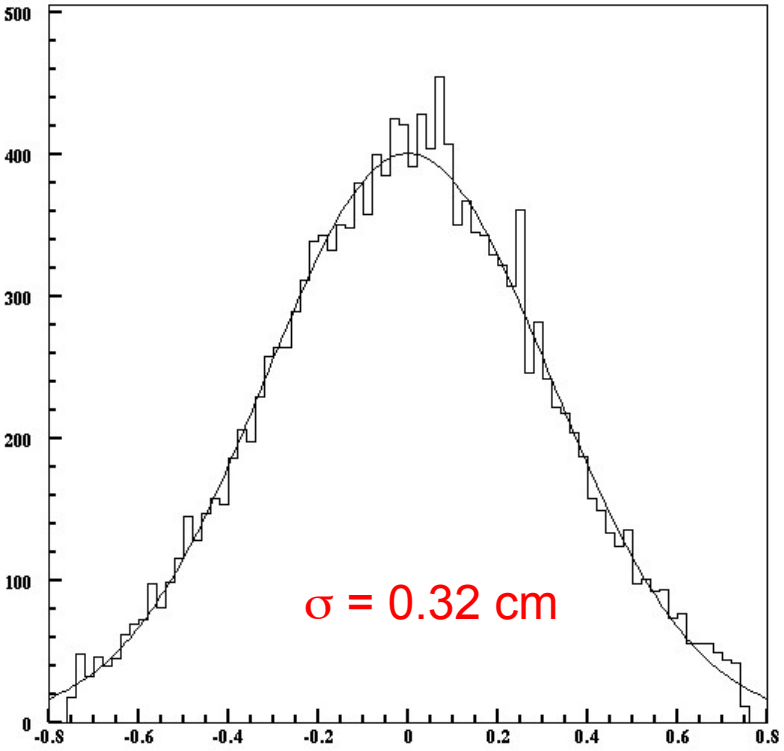


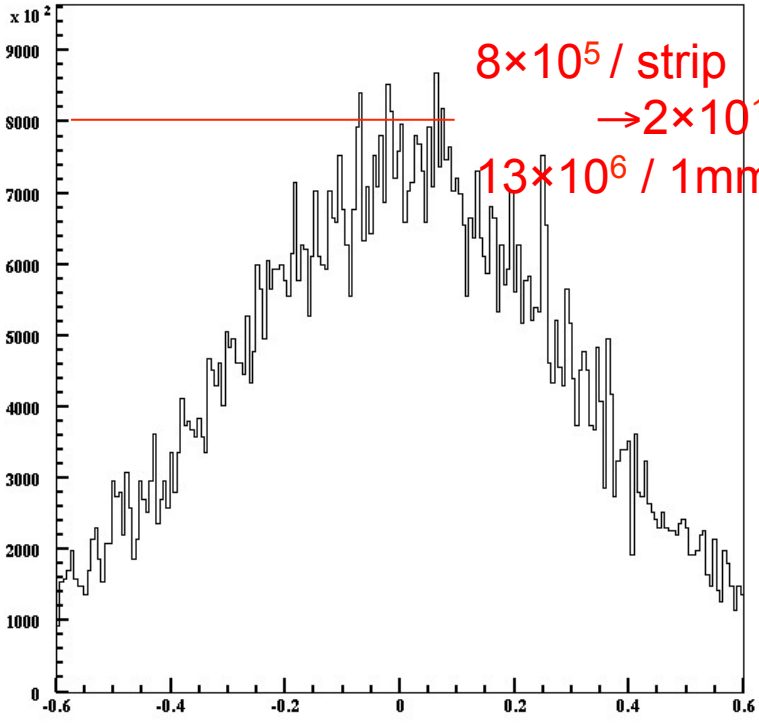
Collimator Scattering

SLAC

1.1×10^{8} in 40 μsec of 450 nA

e- / 60 μm in 40 μsec





Normal run: 0.01/22,500 = 1.25×10^{6}/sec

Summary

SLAC

Irradiation study at SLAC

- Peak charge/strip per bunch: 2.7x10^7 e's (1.7pC, 900mips) or 1.4x10^8/sec (5Hz)
- Total charge on active sensor per bunch (5Hz): 2.9x10^8 e's (18pC,~10k mips)
- Beam accident: up to 5x10^7 e's/strip (1600mips)

Thin protection collimator option in Hall-B (nr's for 450nA)

- Total fluence on sensor is 1.1x10^8 in 40us
- Up to 8x10^5/strip in 40us or 2x10^10/strip/sec