SEU Studies

- **Tests of opto-link with MIPs(β) from Sr^{90} source showed no increase in BER (SEU).**
- **Tests at the Birmingham Cyclotoron showed no SEU at highest rates expected for SCT.**
- **Tests continued to the highest rate expected for the Pixel B-layer.**

SEU Studies at NPL

- **SEU measurements performed at NPL using D,T to give 14 MeV n**
- **BER increases linearly with beam flux.**
- **BER decreases with optical power into TTC link (==> Figures).**
- **This is genuine SEU and comes from energy deposited in the PIN diode.**

SEU Rate Calculation

- **Model DORIC as simple RC with bandwidth of 160 MHz ($\omega_0=2\pi*160MHz$)**
- **Deposit energy PIN instantaneously. Creates number of electron-hole pairs given by N=E/3.6 eV.**
- **DORIC response $I=(Q\omega_0)\exp(-\omega_0 t)$**
- **Bit error requires energy deposited in active layer of epi Si PIN to give a signal $I>I_0$**
- **Effective threshold increases with optical power (because we have an AC coupled system with fixed threshold near 0).**
- **$P^{optical}$=200 μW ==> E_{th}=1.35 MeV**
- **$P^{optical}$=600 μW ==> E_{th}=3.6 MeV**

SEU Rate Calculation-2

- **Use calculations of Huhtinen to calculate probability per unit flux of depositing energy above threshold.**
- **Assume 20 MeV proton same as 14 MeV neutron.**
- **Assume result scales with size of active layer of epi Si PIN diode.**
- **$P^{optical}$=200 μW and flux=2.3 10^{7} ==> BER ~ 6 10^{-9}**
- **Crude calculation gives correct order of magnitude.**
- **Better calculations for our sensitive volume and energy.**
- **Repeat test with pions at PSI (beam time requested for next year).**