

Opto-Electronics

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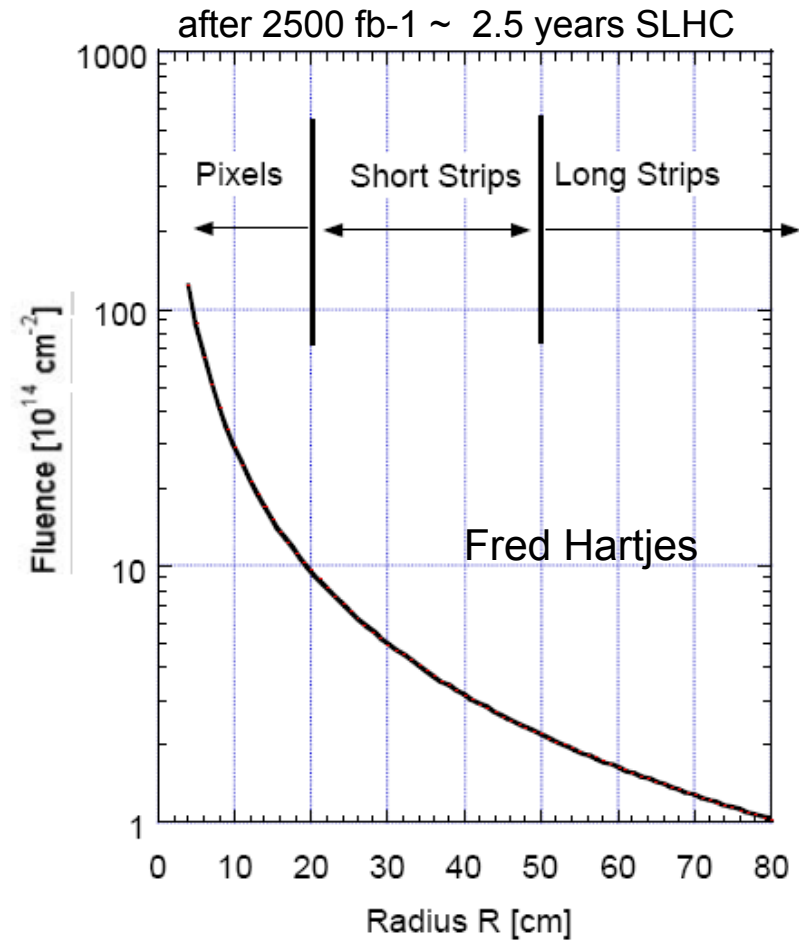
Bandwidth Estimation for SLHC

- Define a 'readout unit' like a stave.
- Assumptions:
 - The granularity of the detector increases by a factor of 6.
 - Occupancy increases by a factor of $10/6 = 1.66$.
 - The average L1 trigger rate is 100 kHz.
- Reading out 6 upper (or lower) Modules:
3.4 (binary) – 4.6 (digital) GBits/sec with a safety factor of 2
- Current ID opto-electronic readout system can go up to 1.6 GBits/sec

Radiation Environment

Readout devices for strips
must resist $n \times 10^{15} \text{ cm}^{-2}$

Current opto-electronic readout system
was tested up to $\sim 2 \times 10^{14} \text{ cm}^{-2}$.

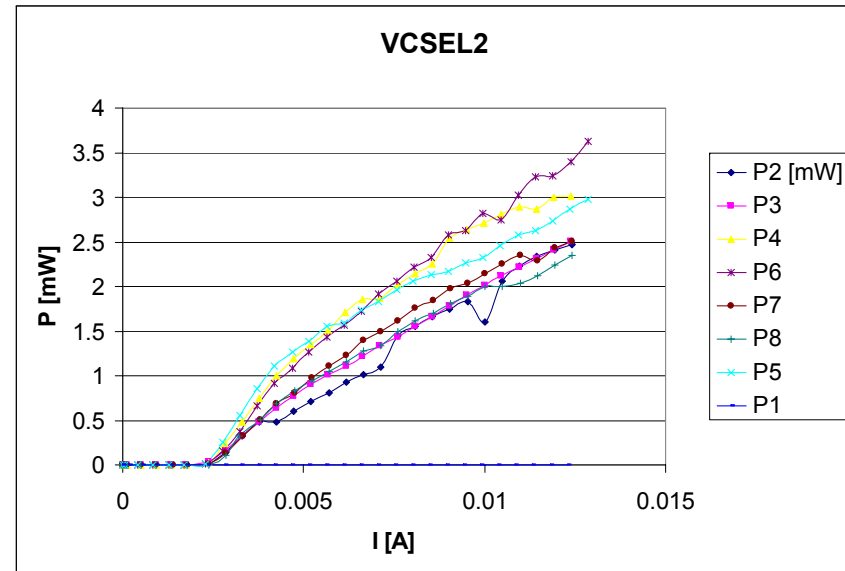


Open Questions

- How much fluence can the current devices tolerate:
 - Driver Chip and Phase-Locked-Loop-IC (GOL, QPLL used by LHCb)
 - VCSELs
 - Pin Diodes
- What is the SEU cross section @ GBits/sec?
- If current devices fail,
 - need to explore COTS or radiation hard devices.
 - **OR** place devices at radii where they can be operated.
- Readout systems @ 2-3 GBits/sec? Gain from other group's R&D efforts.

Current Activities & Short Term Plans

- Received six pixel VCSELs from Taiwan → started to characterise them
 - Automating these measurements
- Received Centronic pin diodes + Test Kit from B'ham → working
- Plan to irradiate VCSELs & diodes up to $O(10^{15})$ protons cm^{-2}
 - Use n reactor at Ljubljana
 - How much are the devices activated?
 - **Answers Wednesday.**
 - Non-biased: irradiate, anneal,...
 - Biased test will follow.



- Planning SEU test board (GOL, VCSELs, QPLL, PIN) for GBits/sec operation of devices while irradiation
- Collaboration with SMU (ATLAS LAr)

Current Activities & Short Term Plans

- Fibre's that are currently used for ATLAS will be irradiated up to 100MRad by Taiwan group.

Proposals in the works

- EURYI proposal passed national hurdle
 - Would provide resources for most all tests and equipment ~3 years.
 - Manpower as well.
- Writing a seed-corn proposal
 - 3 – years, similar resources as EUYI
- Working with other UK groups
 - Complimentary projects
 - Other groups involved in sensors, Rad. Simulation etc.
- At moment considering only testing/evaluation of new designs
 - Want to work closely with Design groups, have input, influence, obtain instruction on operation.
- Cable design (optical and electrical)