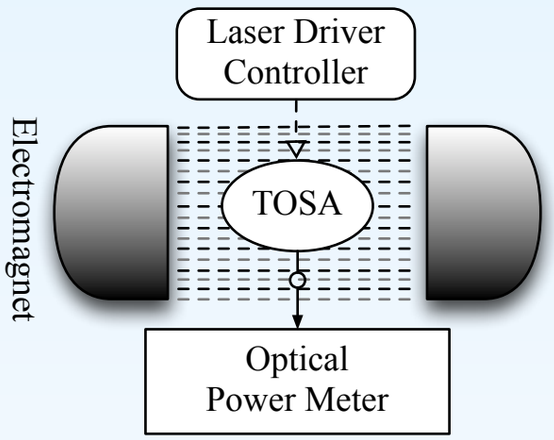
Environmental Testing at CERN

- Magnetic Field
- Temperature
  - Full modules
- Radiation
  - Total Dose
  - Total Fluence predictions
  - Total Fluence irradiation plans

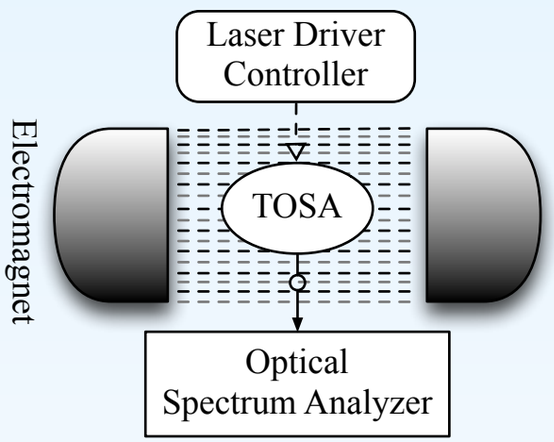
B-field test setup

- Measured LIV/RIN/Spectra of TOSAs for different magnetic field strengths and orientations of DUT relative to the field.

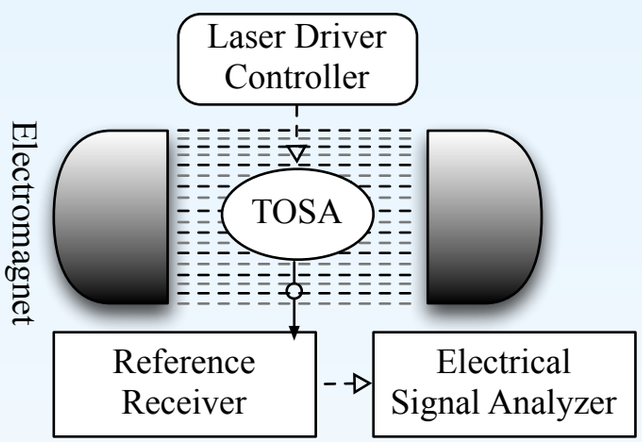
LIV



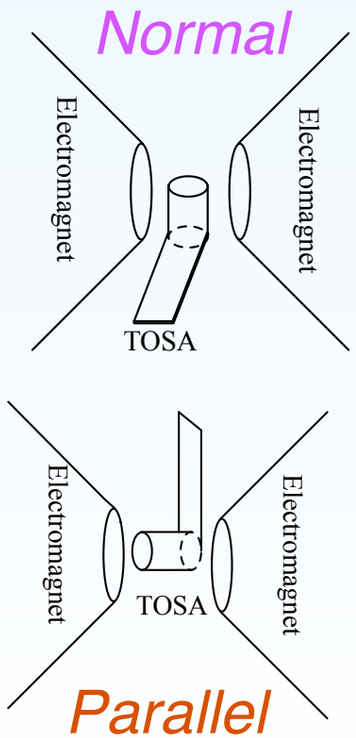
Optical Spectra

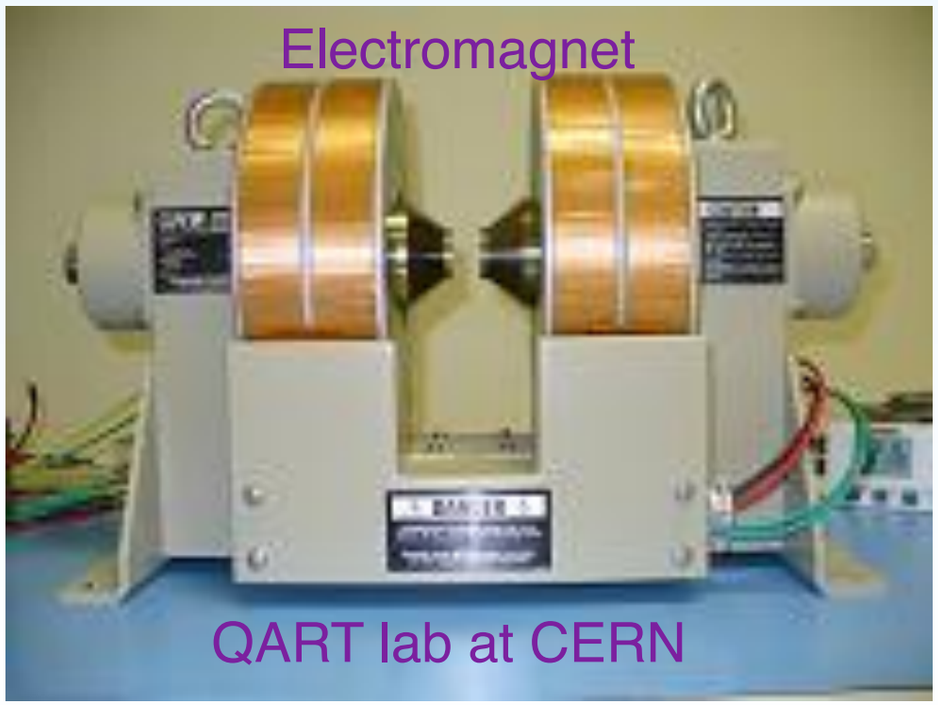


RIN



Work by Sarah Storey





Devices Tested

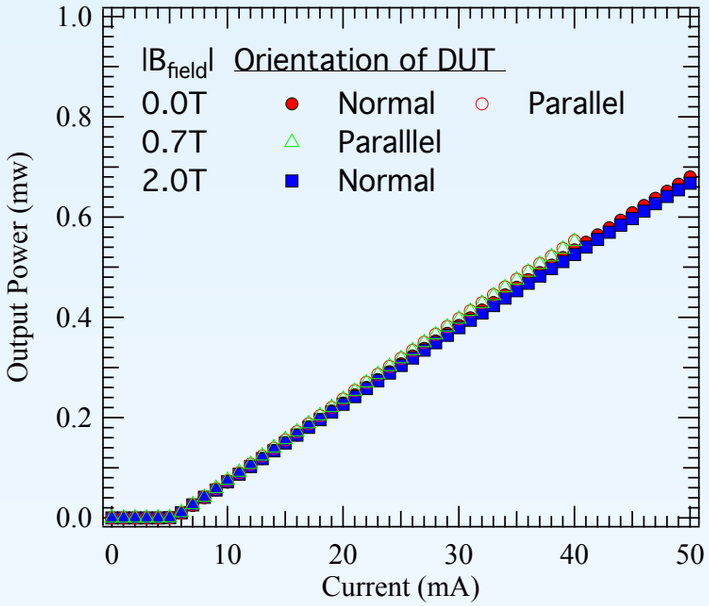
Manufacturer	Structure	Type
A	*FP*	SM
A	*DFB**	SM
B	*FP*	SM
C	*FP*	SM
D	*VCSEL*	SM

* *with isolator*

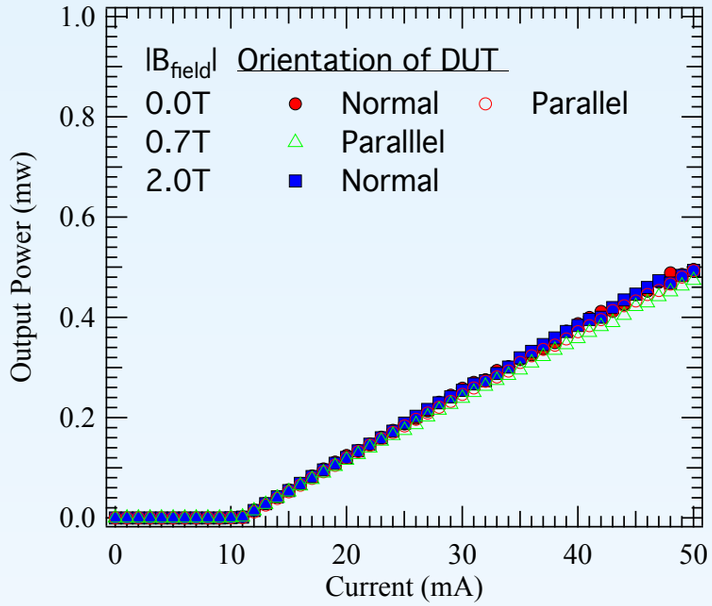
B-field LIV results

Work by Sarah Storey

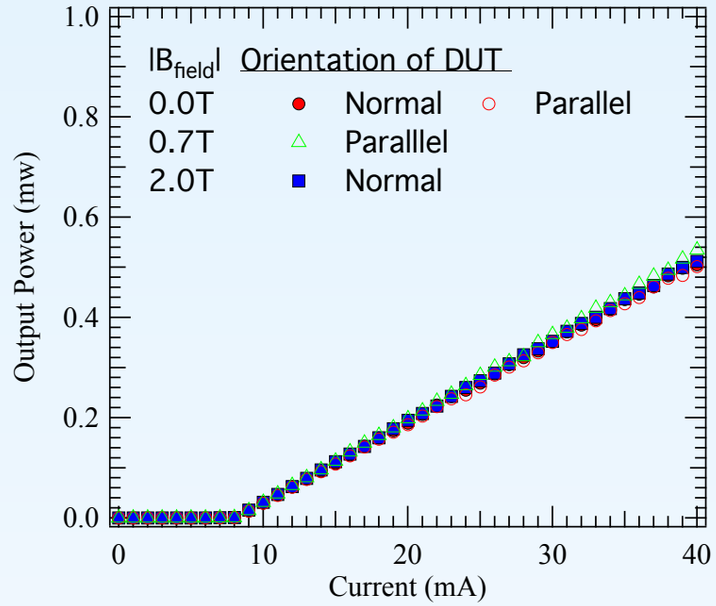
FP Device (A)



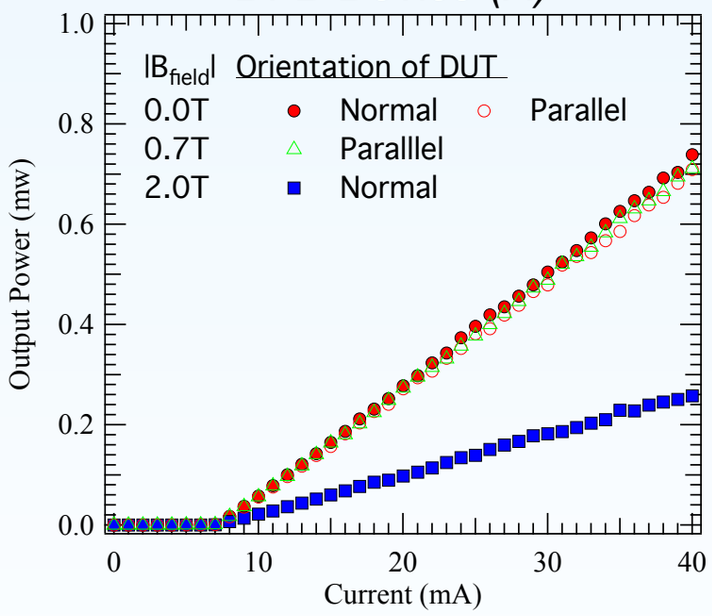
FP Device (B)



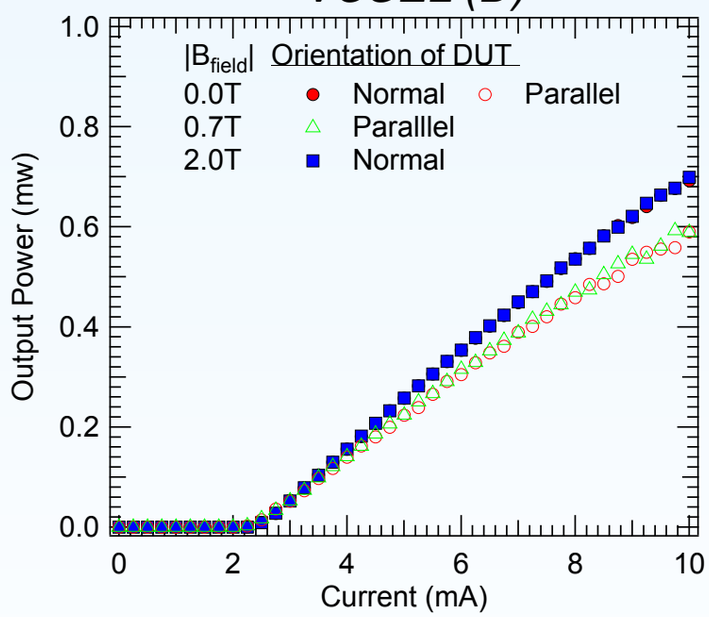
FP Device (C)



DFB Device (A)



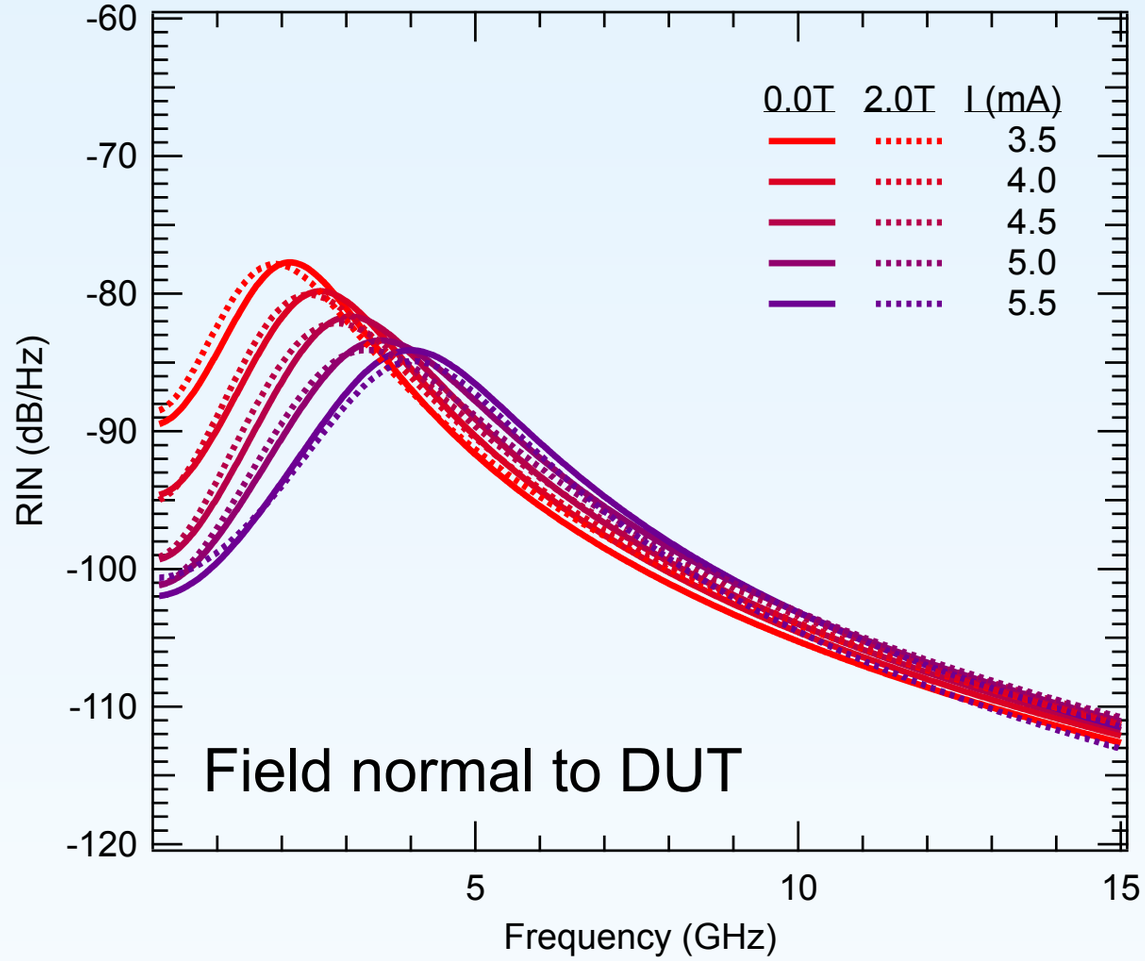
VCSEL (D)



- Only the slope efficiency of the DFB device (which contains an isolator) is affected by the magnetic field, and only when the device is not placed in-line with the external magnetic field - 65% decrease at 2T.

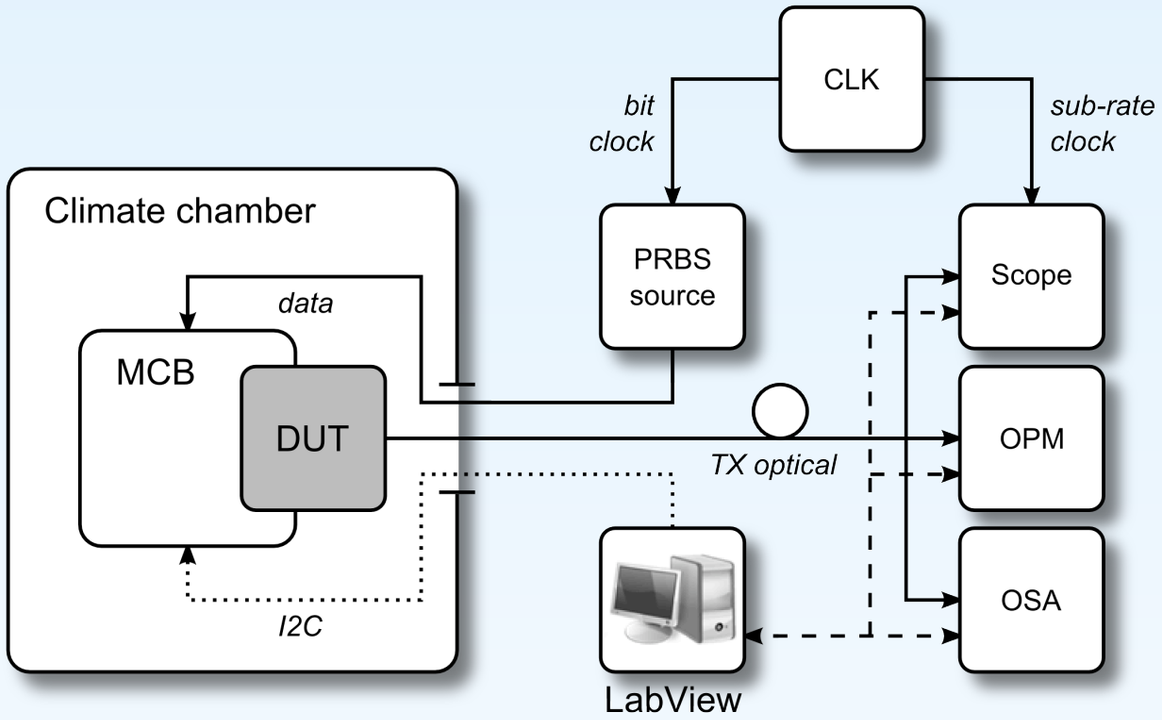
B-field RIN results

- RIN only measurable on VCSEL device due to setup limitations
- Fitted curves show very slight changes
  - Not at a level to cause concern

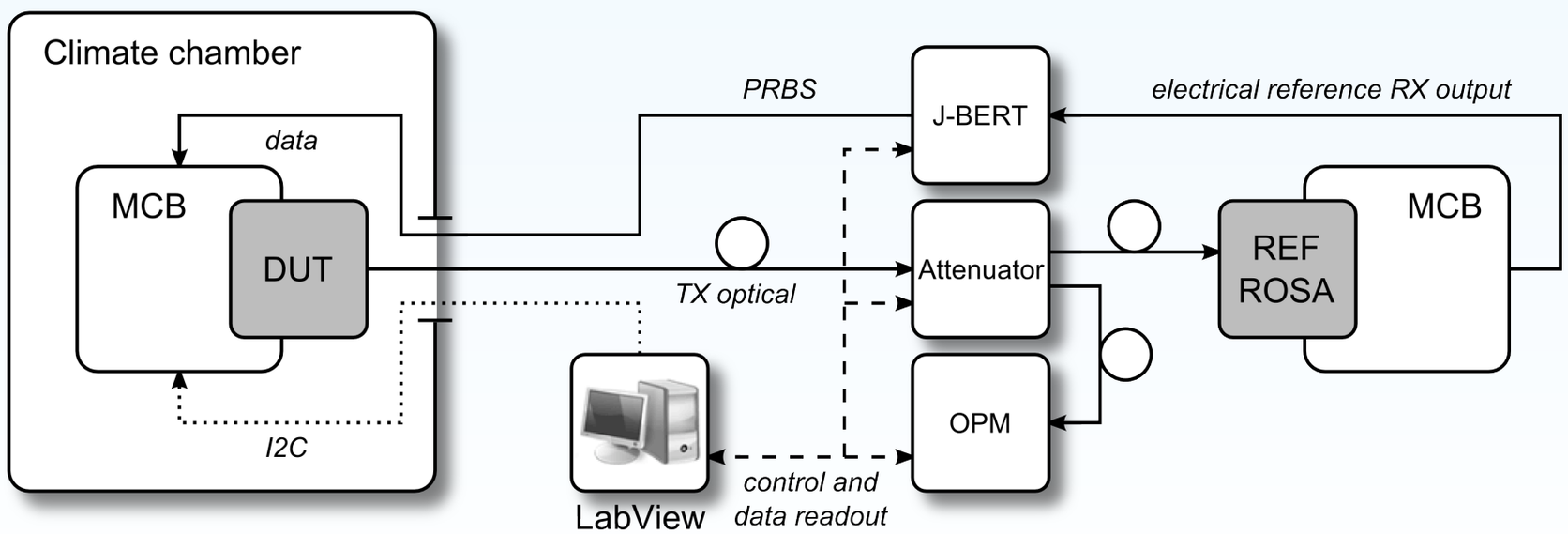


Full test report in preparation

Temperature Testing of VTRx



- Establish the need (or not) for tuning of operating parameters of the Transmitter when ambient temperature varies
  - Spec. operating temperature range: -30 to +60 °C

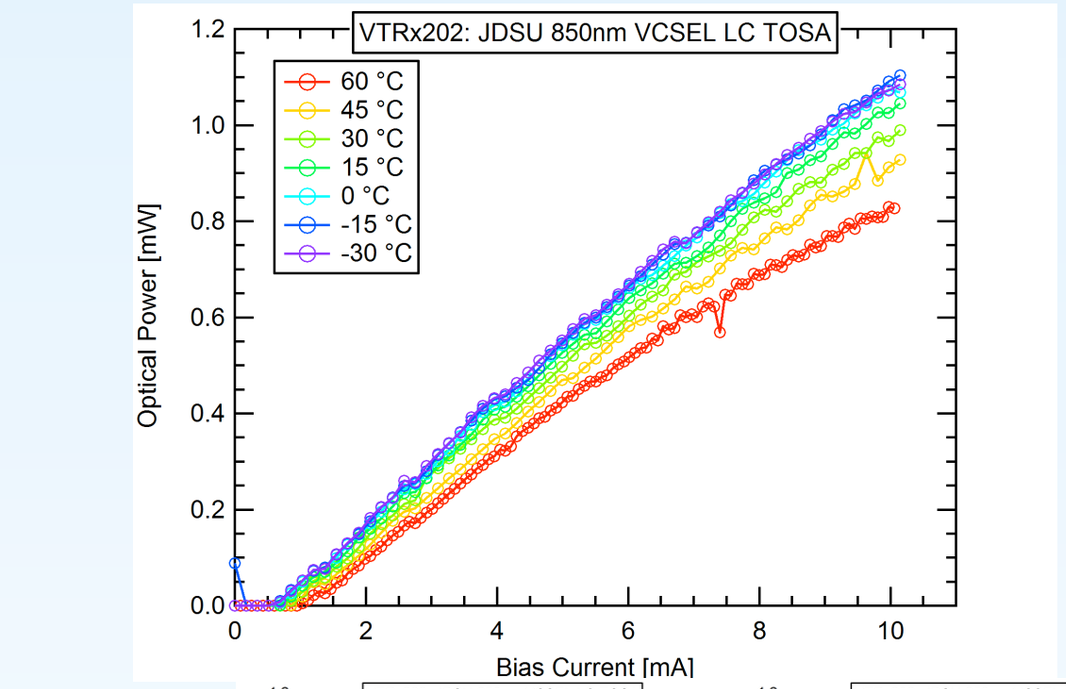


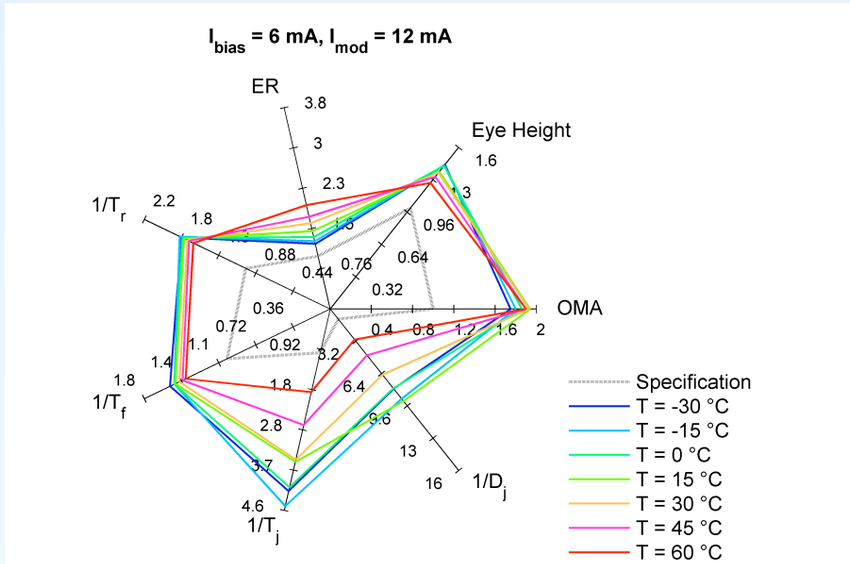
Work by Lauri Olanterä

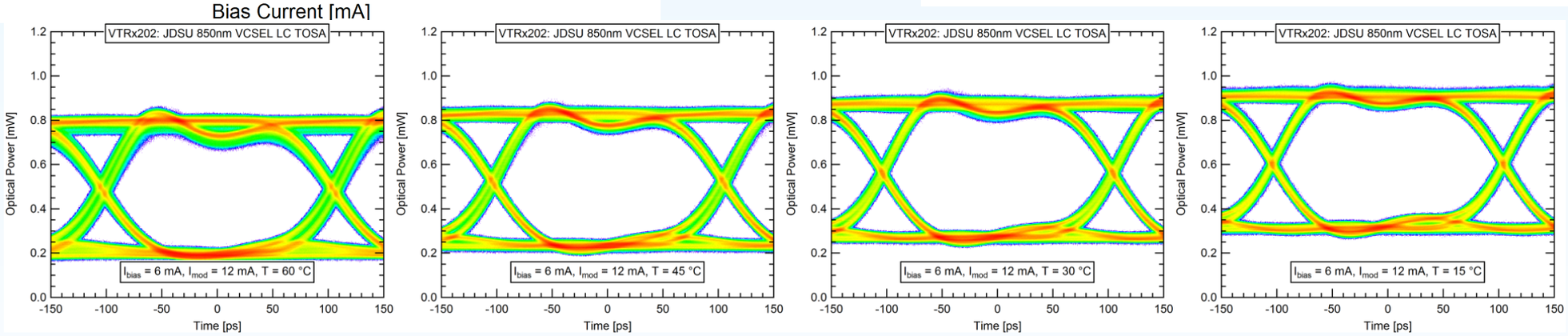
Temperture Testing of VTRx

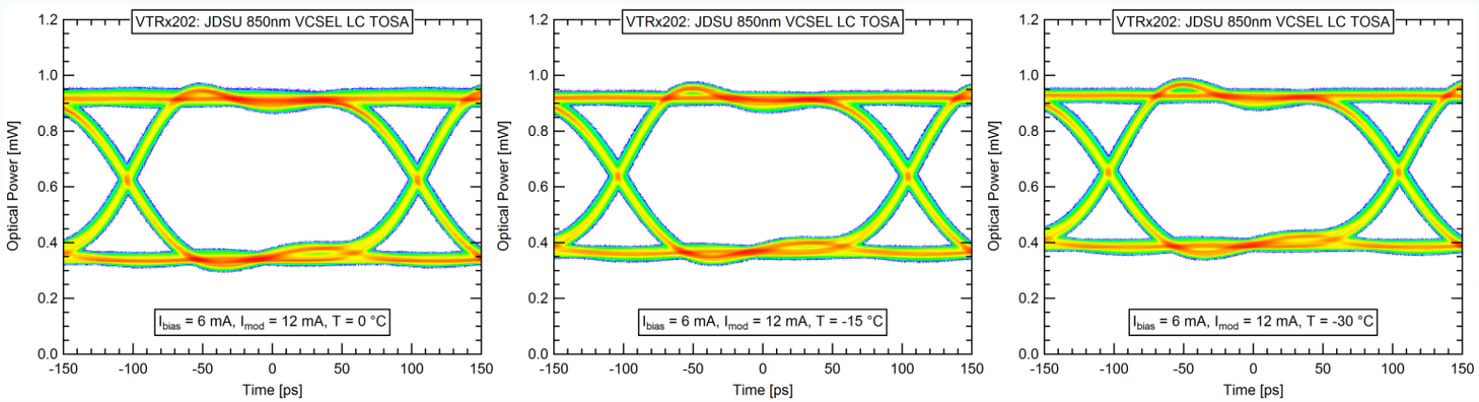
Versatile Link

- Basic performance without changing parameters in spec









Work by Lauri Olanterä

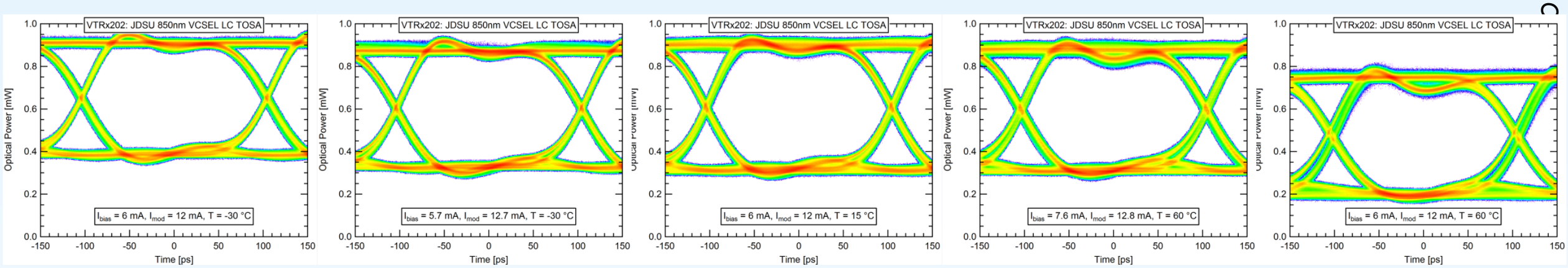
Temperature Testing of VTRx (2)

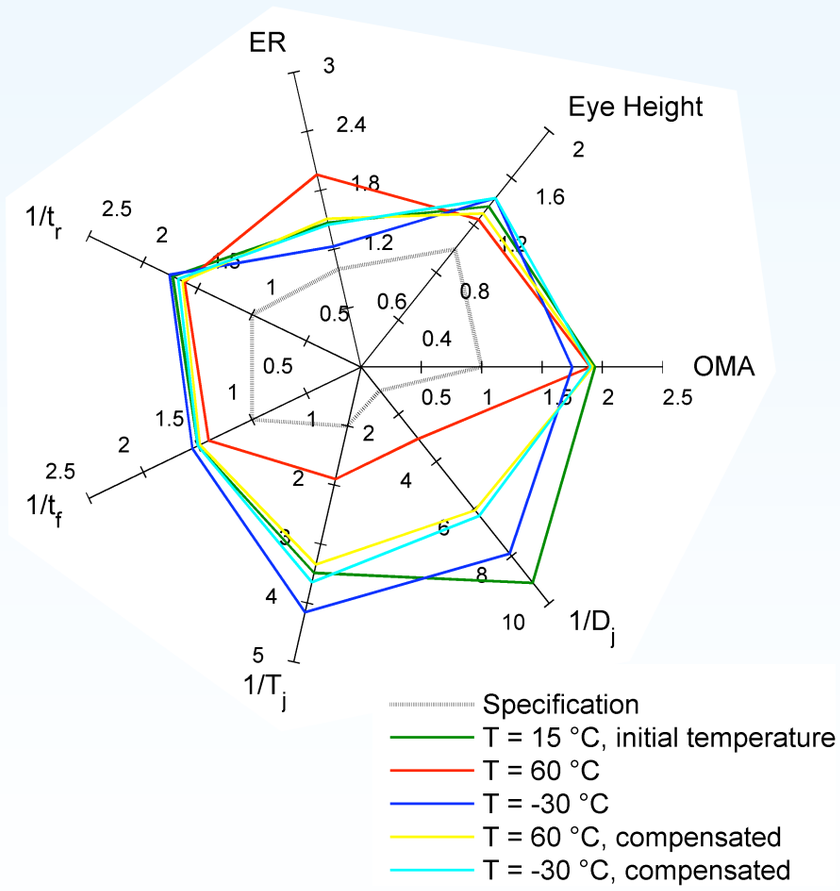
Versatile Link

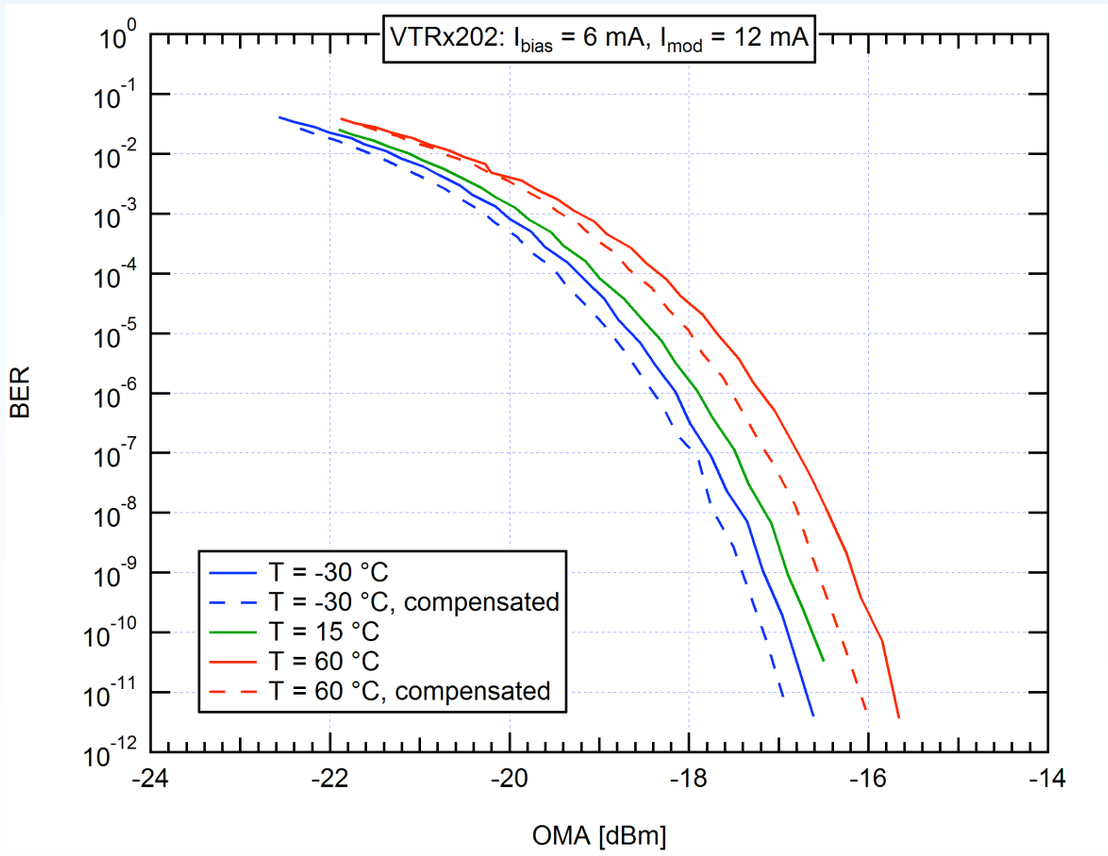
- Test of compensation to match 15 °C performance

Work by Lauri C

-30°C | -30°C compensated | 15°C | 60°C compensated | 60°C







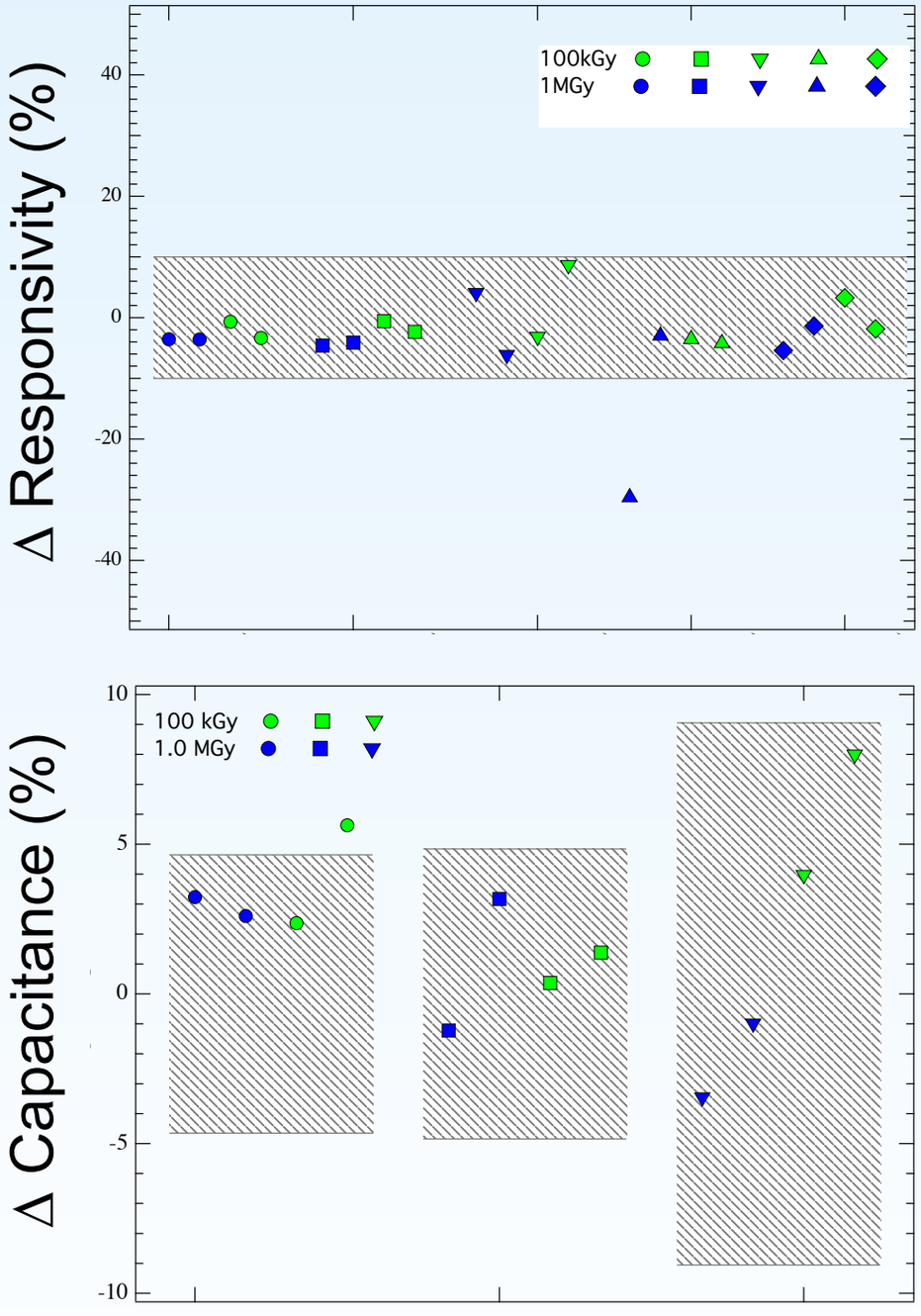
Compensation brings 0.2-0.4 dB improvement

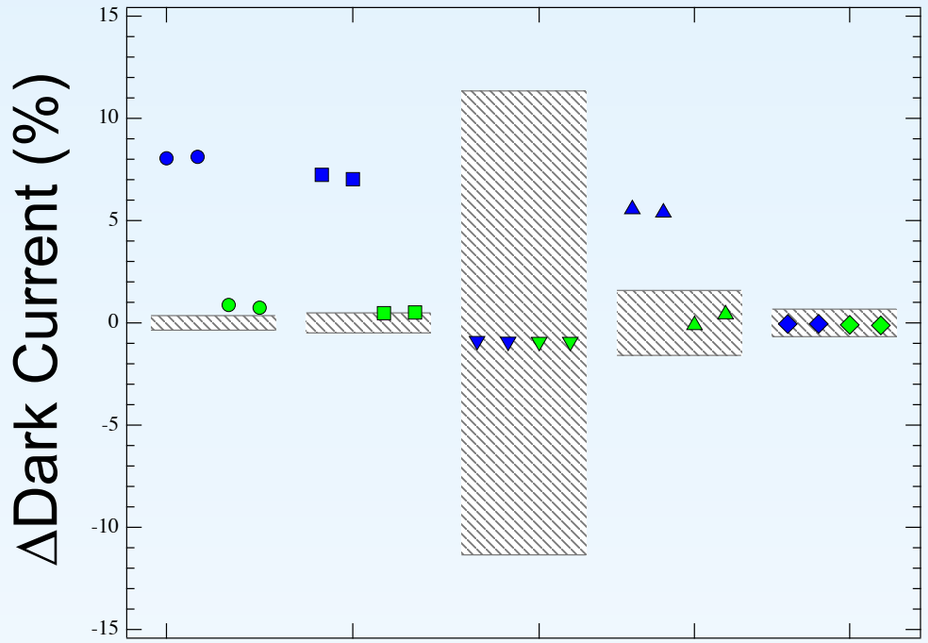
Gamma irradiation

- Simple passive irradiation test carried out at beginning of 2012 of candidate lasers and photodiodes
  - Two Dose levels: 100 kGy & 1 MGy
- Measurement before and after irradiation
  - Necessarily large errors associated with this method
  - Ok for a pass/fail test

Work by Sarah Storey

Gamma test results - Pins





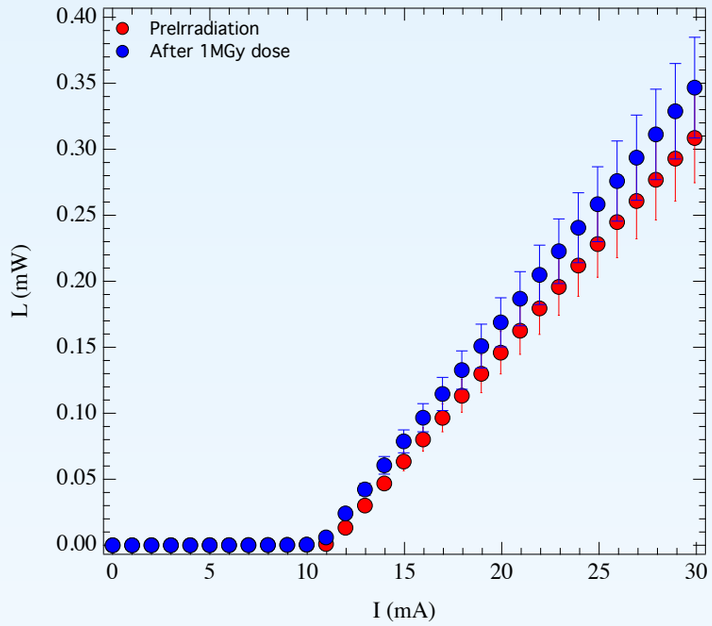
- No significant degradation observed up to 1 MGy total dose.
  - Within uncertainties
- Result as expected

Work by Sarah Storey

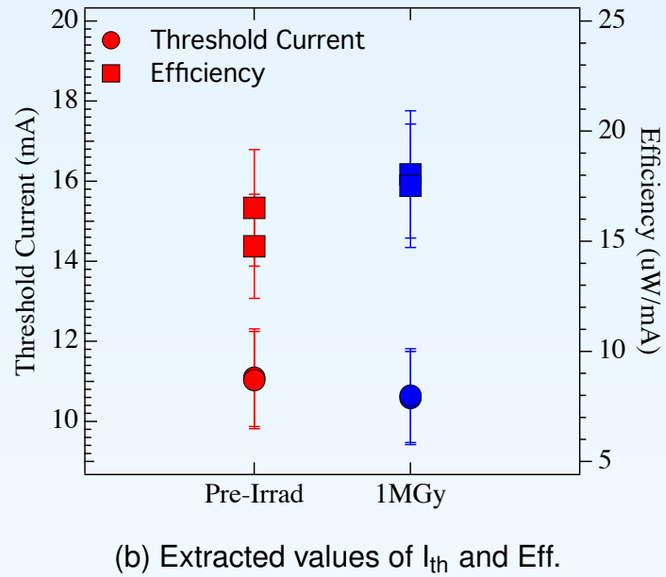
Gamma test results - Lasers

Versatile Link

- No significant degradation observed up to 1 MGy total dose.

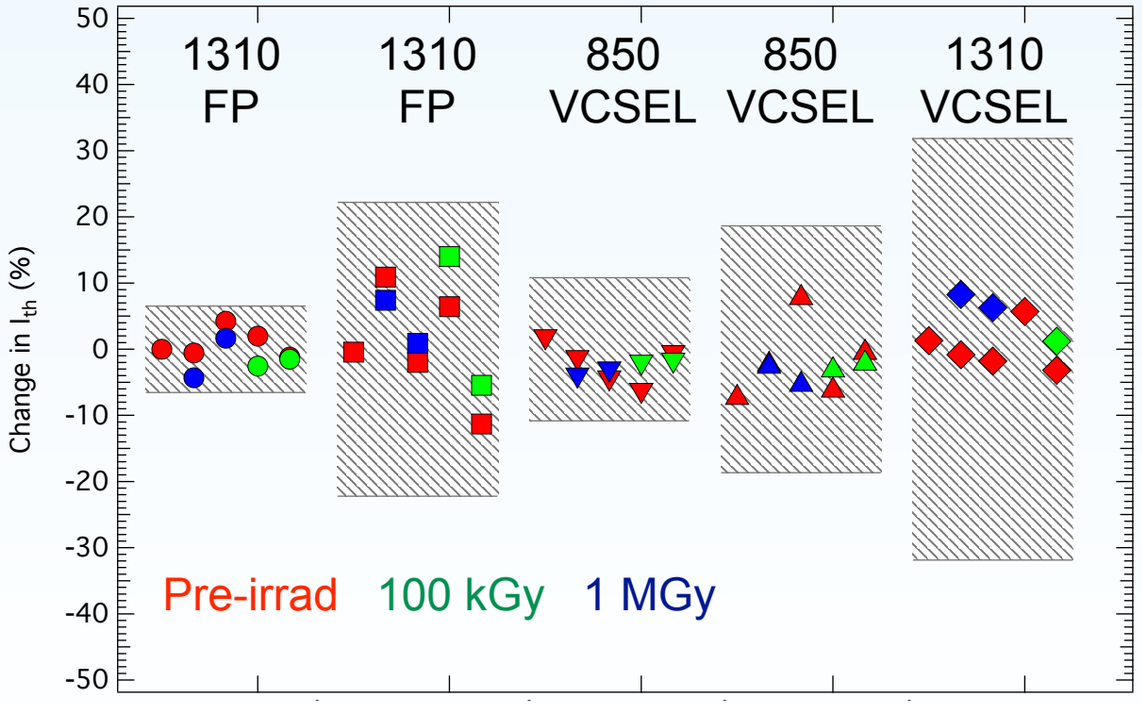


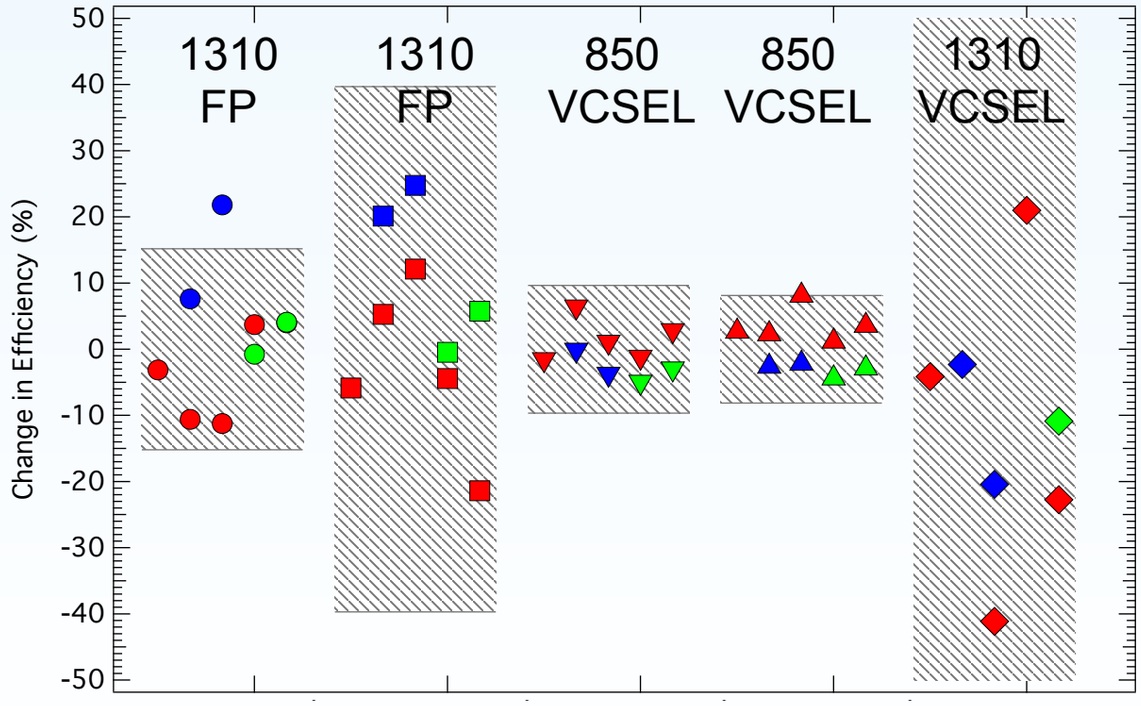
(a) Example LI curve.



(b) Extracted values of I_{th} and Eff.

Large Uncertainties!





Work by Sarah Storey

Future testing

- One major test planned for Autumn 2012
- Neutron irradiation of components and full VTRx modules operating at 4.8 Gb/s
- VTRx irradiation will yield online SEU measurements and allow us to check link compensation methods by changing of GBLD settings
- Will also include some new Si Photonics components
  - Started testing this new technologies, results will be reported when results are mature