# OPTICAL TRX MODULES

VERSATILE LINK PLUS PROJECT

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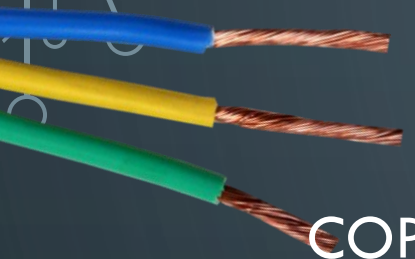
# IN A NUTSHELL

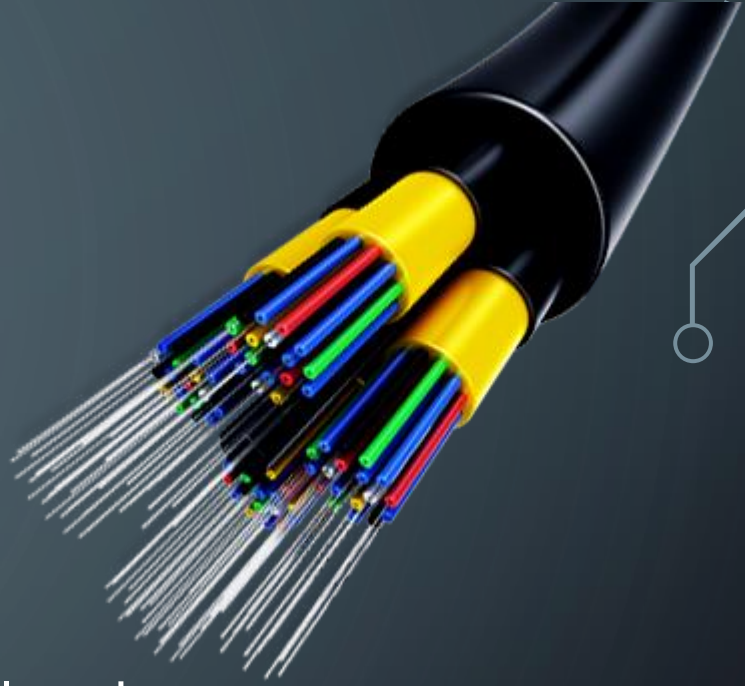
- Detectors collect analog data
- ADC converts data to digital
- Data are filtered by DSP (optional)
- Serialized data arrives at TRx

# WHY OPTICAL?



## COPPER CABLE

- Shorter reach
- Strong frequency dependence
- High mass
- Insensitive to radiation



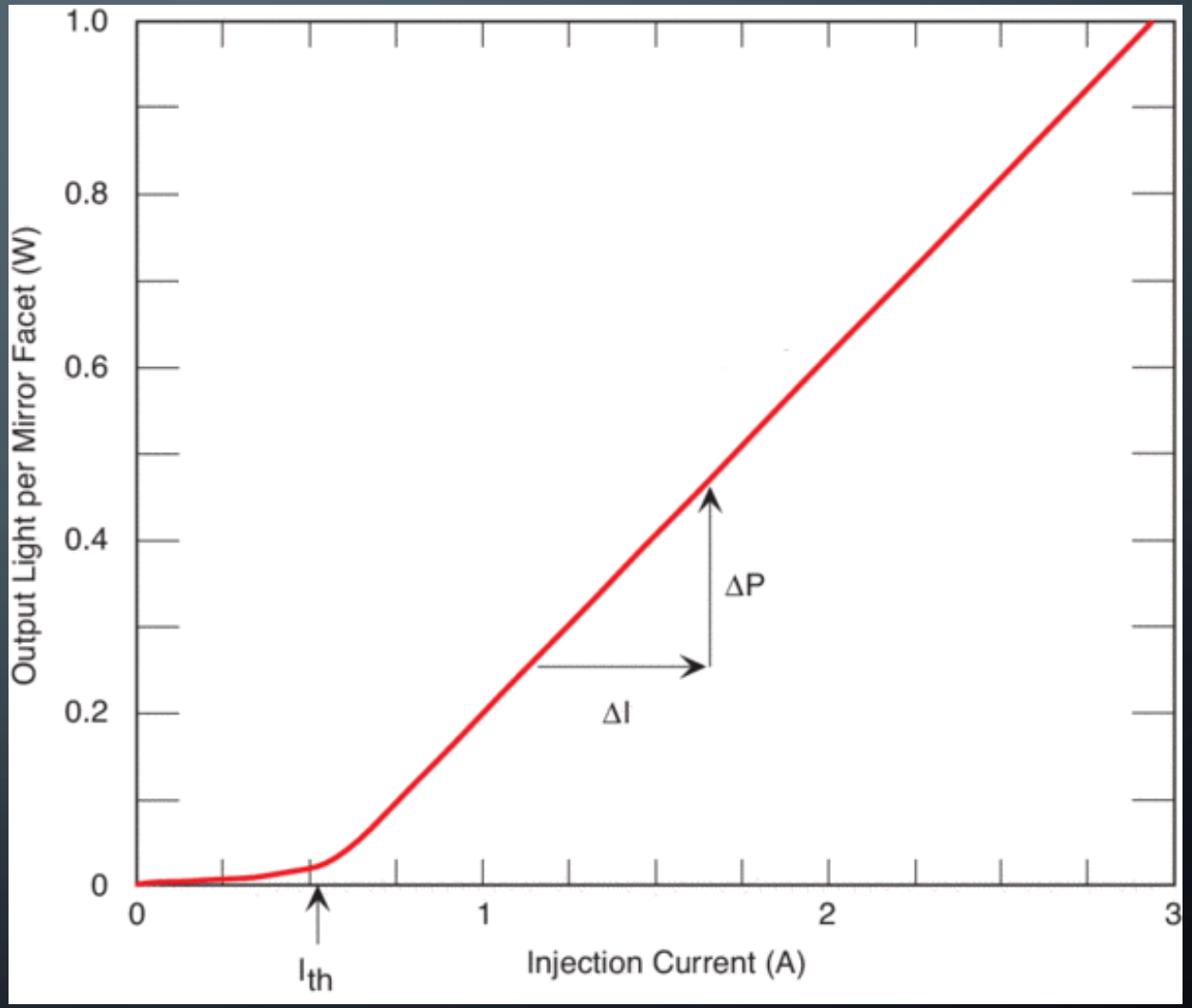
## OPTICAL FIBRE

- Less sensitivity to length
- Better performance at high frequencies
- Optical fibres are transparent to the detector
- Sensitive to radiation

# HOW OPTICAL?

- Vertical Cavity Surface Emitting Laser (VCSEL)
  - $I_{threshold}$ , Slope Efficiency
- VCSEL is directly modulated
  - $I_{BIAS}$
  - $I_{mod}$

# TYPICAL L-I CURVE



# ITS NOT THAT SIMPLE

## RADIATION

Modules aren't usually exposed to radiation, ours are

## SMALL

We want to cram as many modules as possible inside the space we've got

## LOW POWER

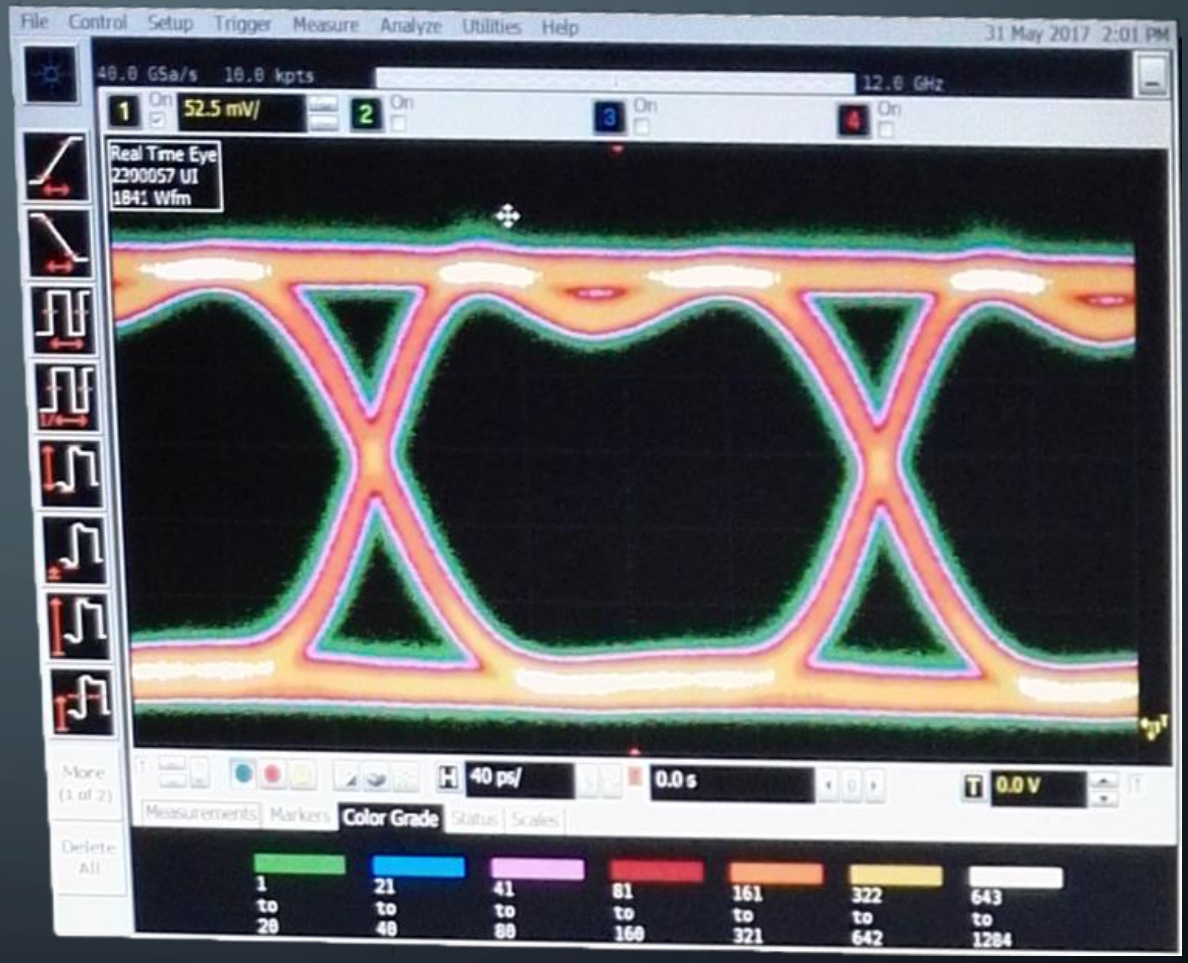
The environment the modules are in is cooled so they must be fit for cold and must not output heat

## TRANSPARENT

The modules must be made of materials that do not affect the measurement of the collision

# PROCEDURE OF TESTING

- Measurement deficiencies
- Eye diagram
- Bit/Error rate + Confidence Level

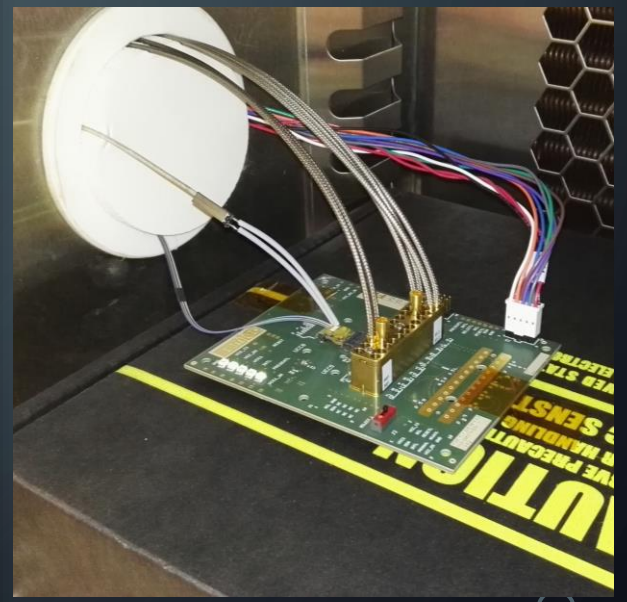


# TEST BENCH

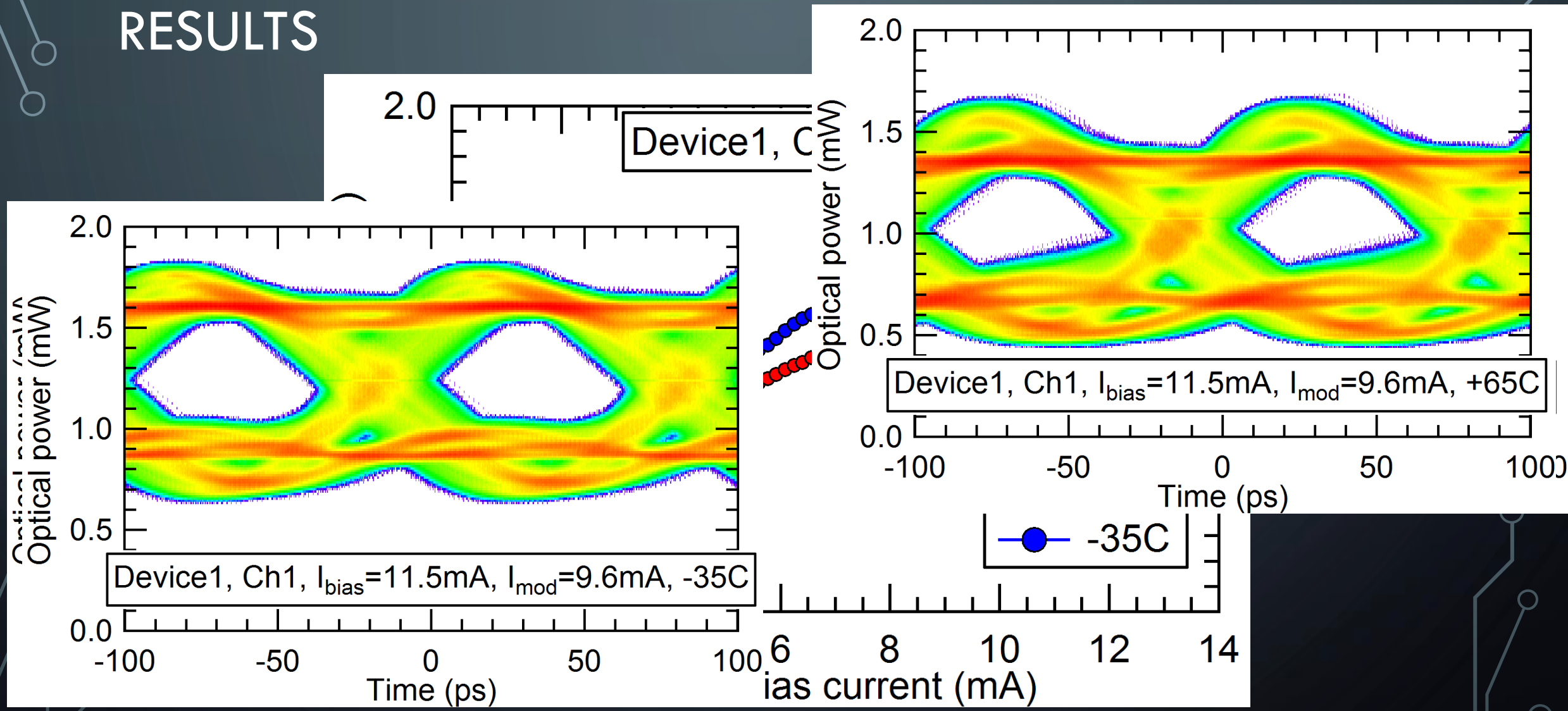
GPIB lets us control everything through one computer

We use FPGA to generate the signals which will be picked up by the oscilloscope

Temperature and supply current are continously monitored and recorded

# RESULTS


2.0
1.5
1.0
0.5
0.0
Optical power (mW)
Device1, Ch1, $I_{bias}$=11.5mA, $I_{mod}$=9.6mA, -35C
-100
-50
0
50
100
Time (ps)
Device1, Ch1, $I_{bias}$=11.5mA, $I_{mod}$=9.6mA, +65C
-35C
6
8
10
12
14
ias current (mA)

# CONCLUSION

The module seems to be working better at low temperatures

Our test bench will be further improved down the line (stability & signal quality)