



Non-standard Test Setups for Optoelectronic COTS

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Non-standard Test Setups for Optoelectronic COTS

- What do I mean by Non-Standard?.
- Test Setups
 - Image Sensor Radiation Test
 - Thermal Vacuum
 - Temperature characterization with fiber bundles
 - Combined Temperature Radiation Tests
 - Monitoring Optical data
 - Optical Switches
 - Q-Carrier Laser Screening
- Summary

Optical Testing

**Sometimes optical aspects depend
on the point of view**

**“We cannot do it”
is NOT our answer,
but**

**“Please, give us some time
to think about it”.**



<http://www.taringa.net/posts/imagenes/14127661/Las-mejores-ilusiones-opticas--Increibles.html>.

Non-Standard Solutions



Goventosa's One Wheel Bike

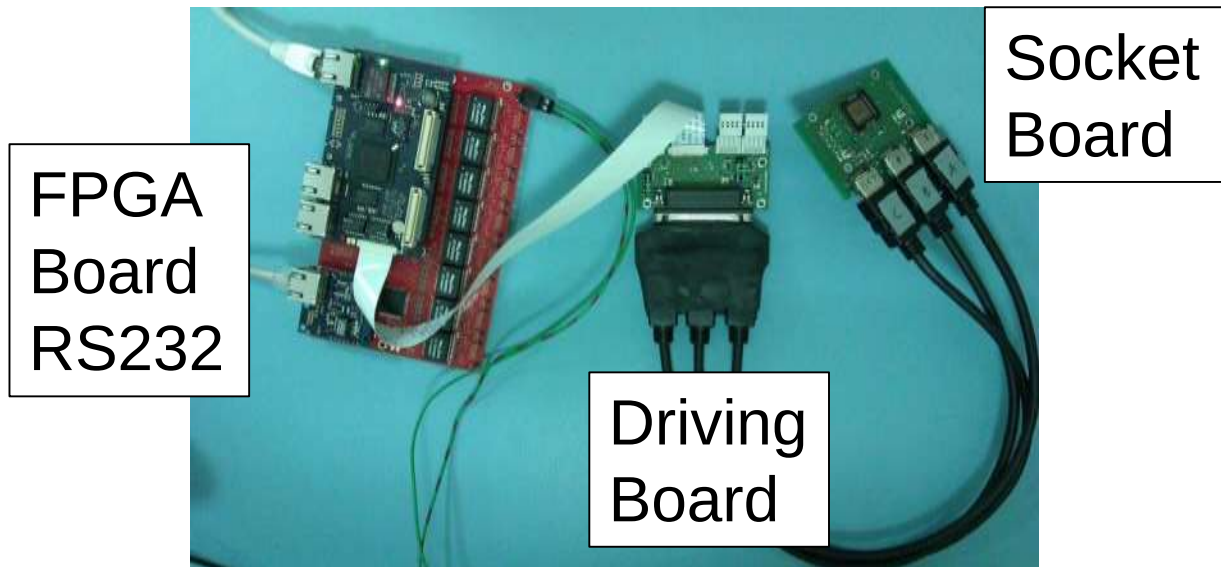
<http://blog.hemmings.com/index.php/2010/11/22/m-goventosas-one-wheel-to-obscurity/>



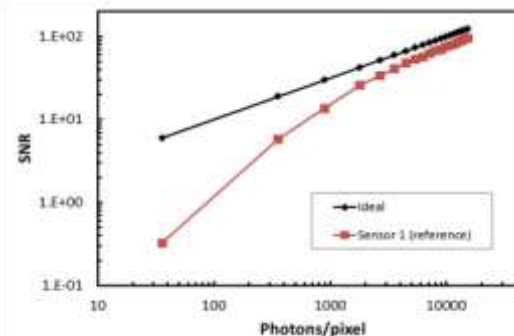
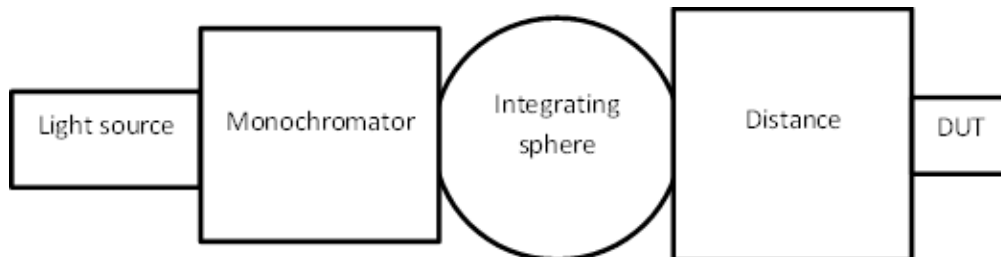
Rutan's SpaceShipOne

http://www.sott.net/image/s5/114181/full/Rutan_Image_2.jpg

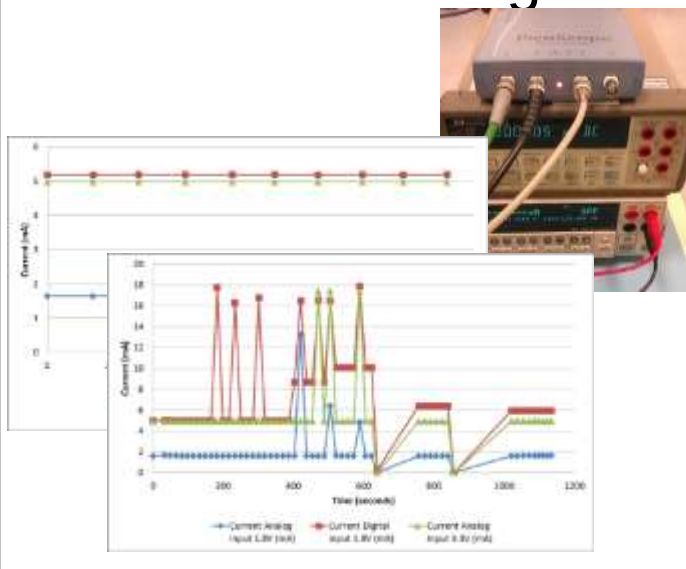
- Design and development of custom cameras
 - Support for CMOS and CCD image sensors
- Characterization of pixel performance
 - According to EMVA1288 standard and ESA standards
- On-line monitoring of electrical parameters and acquisition of images in different working conditions
 - Radiation
 - Temperature
 - Vacuum



Pixel performance



On-line monitoring



Radiation tests

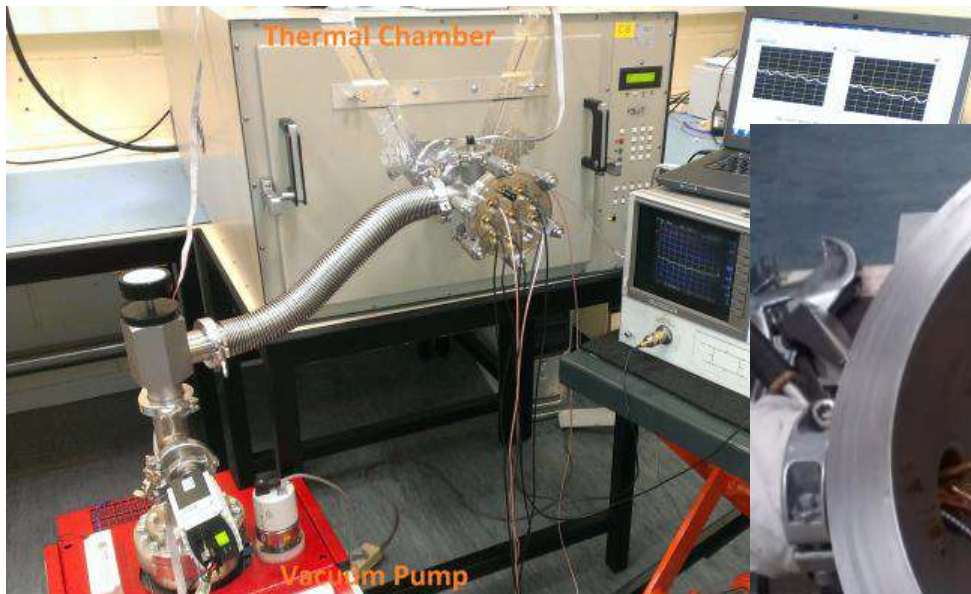


2- Thermal Vacuum Test Setup

Thermal Vacuum

Thermal Vac System (Our own design)

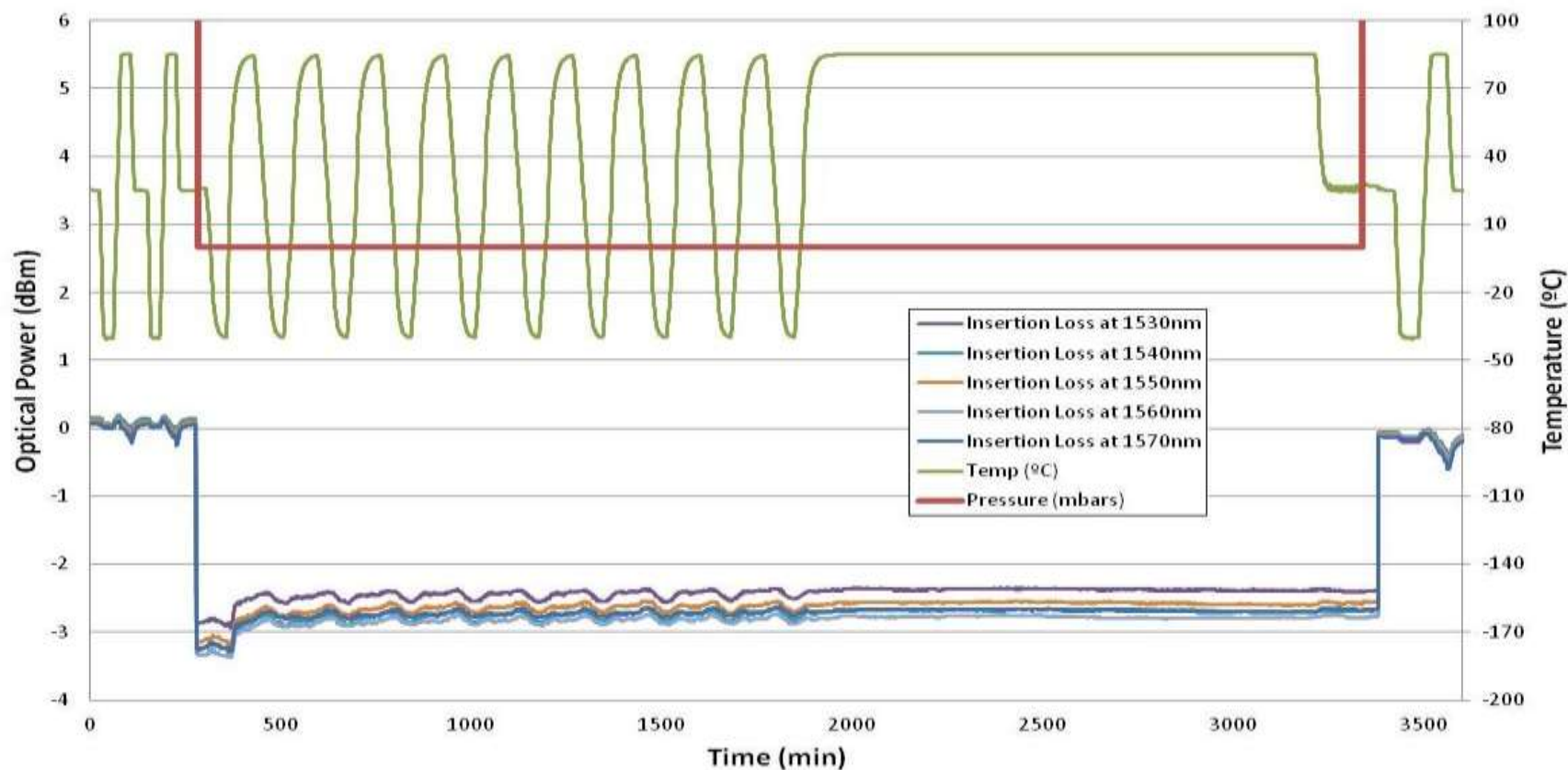
- Temperature range: -184°C to $+200^{\circ}\text{C}$
- Vacuum range: ambient to $10\text{E-}7$ mbar
- Temperature rate: $<2^{\circ}\text{C/min}$
- Multiple optical feed-through



Thermal Vacuum

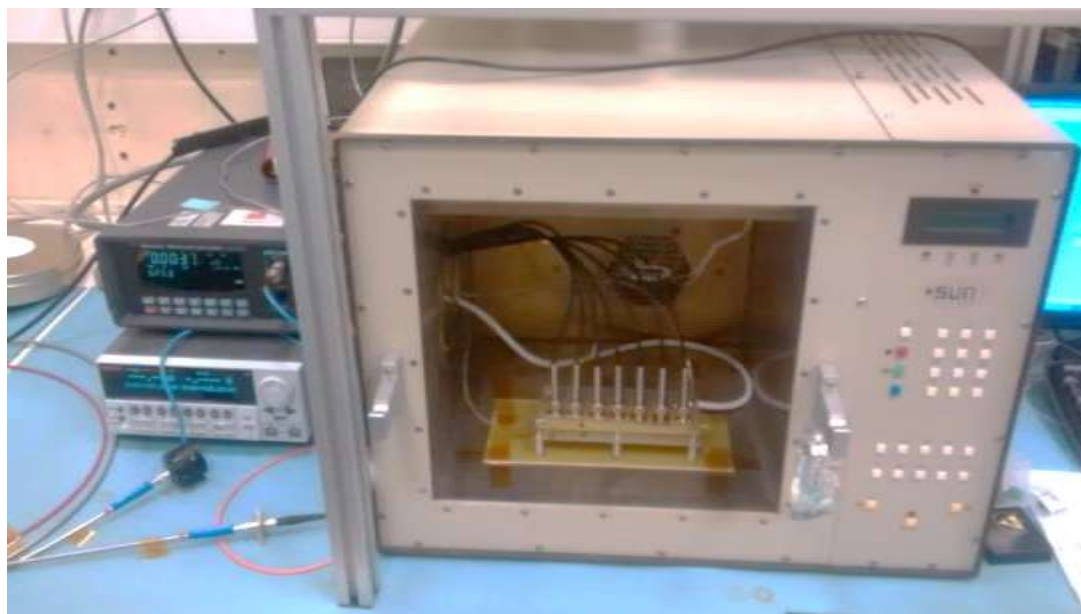
THERMAL VACUUM TEST TO OPTICAL ISOLATORS MONITORING OPTICAL LOSSES

SN VB13-50339R Insertion Losses



Fiber Bundles

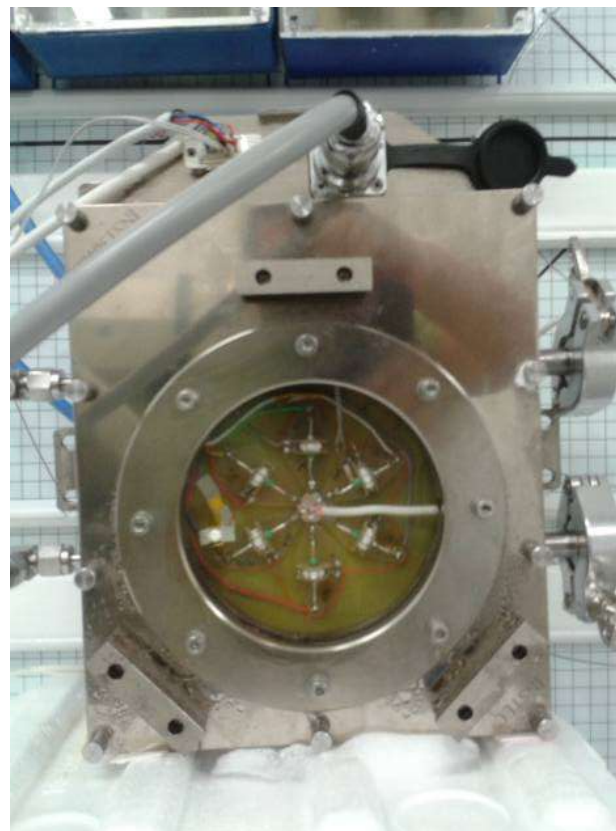
- Photodiode characterization in Temp
 - One branch for Optical power monitored in parallel with PD measurements
 - Variations of the light source have no impact on responsivity measurements
- LED parallel characterization
- Used for UV Photodiodes in REMS (Curiosity Rover)



Combined Testing

Radiation at Low Temperature

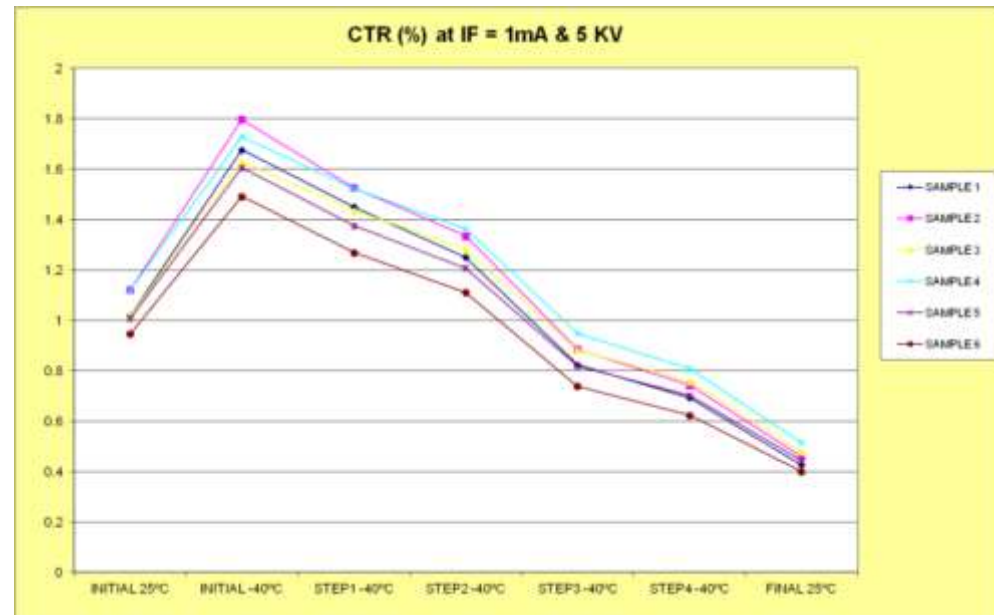
- High Voltage Optocoupler
 - Small temp chamber with window.



Combined Testing

Main Results

- Higher degradation with Protons at Low Temp (-40°C) than at RT.
- The low Temp degradation is maintained when going back to RT.
- Higher degradation when radiated at actual operational conditions



Life Test Setups

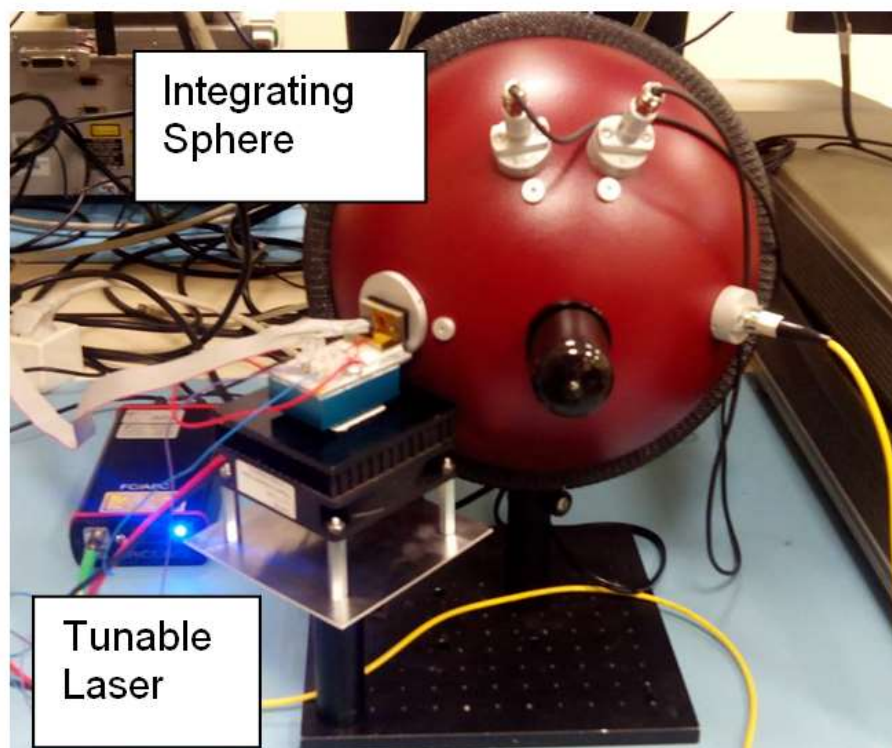
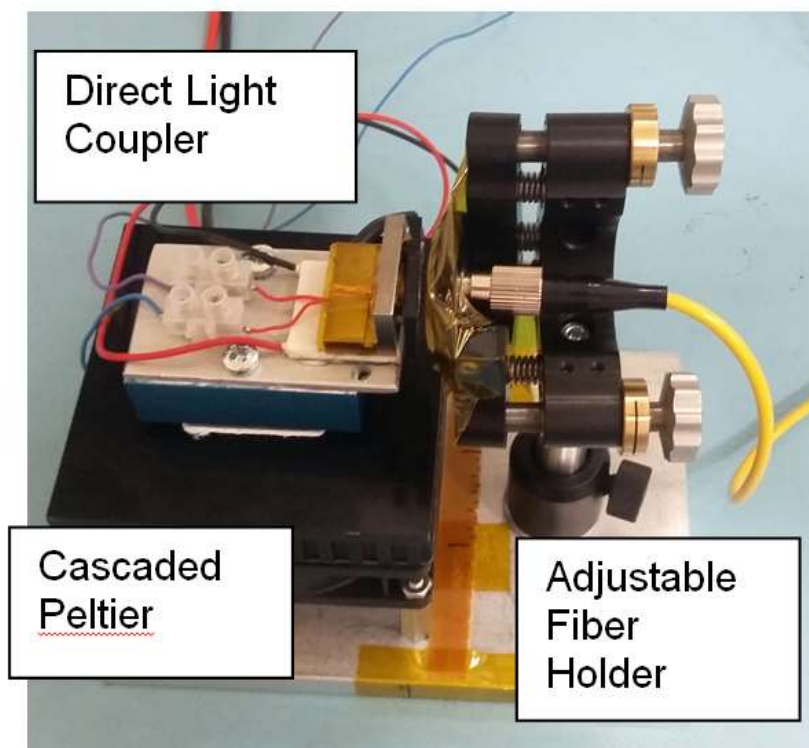
- Multiple Peltier controllers
- Parallel monitoring with PD out of high Temp area



Test SETUP

Triple Photodiode Characterization Setup

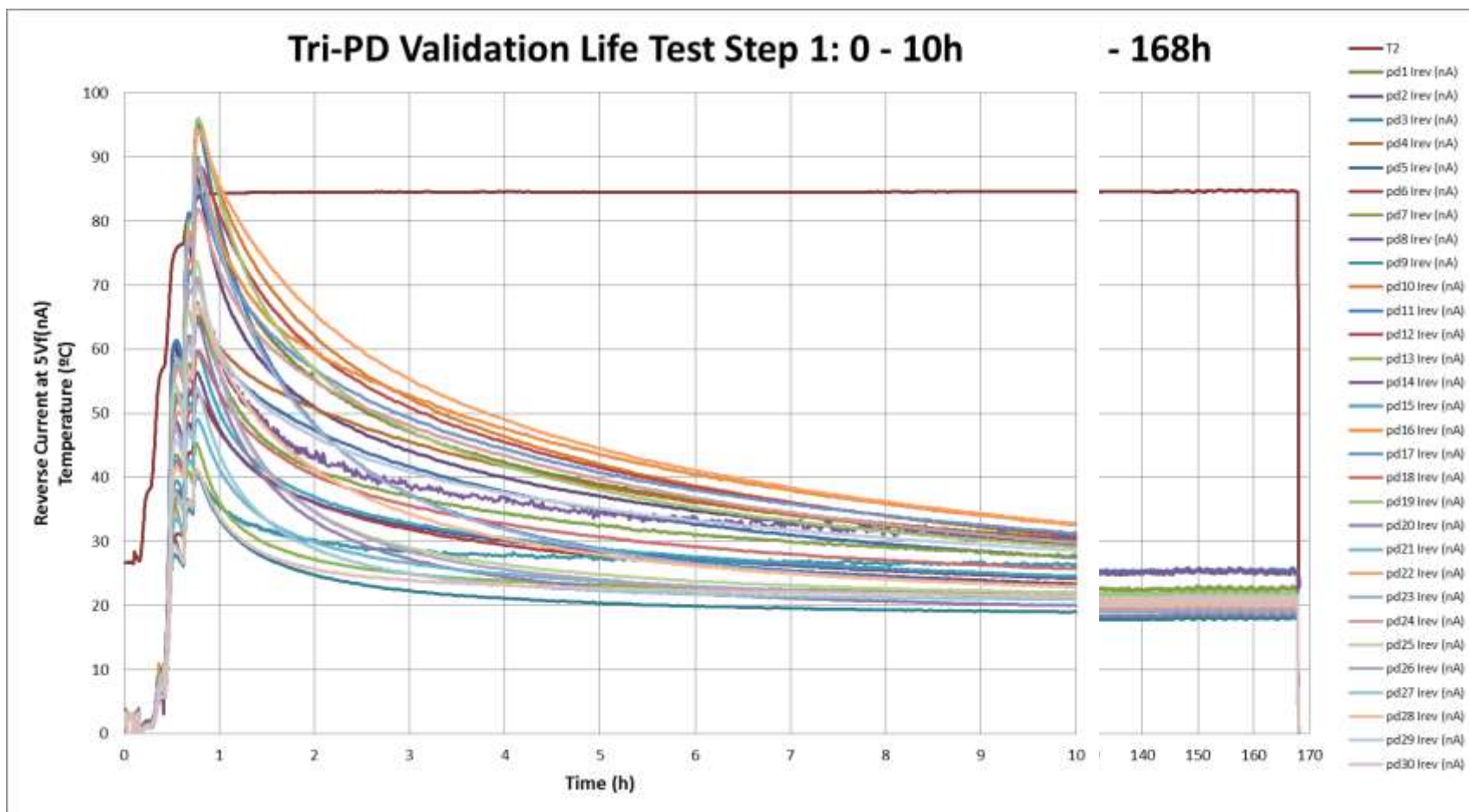
- Integrating Sphere for uniform illumination
- Direct Exposition for Linearity with higher Optical Power Input
- Cascade Peltiers for better cooling



5 – Monitoring data during long test Tri-PD Main Results: Life Test

Life Test

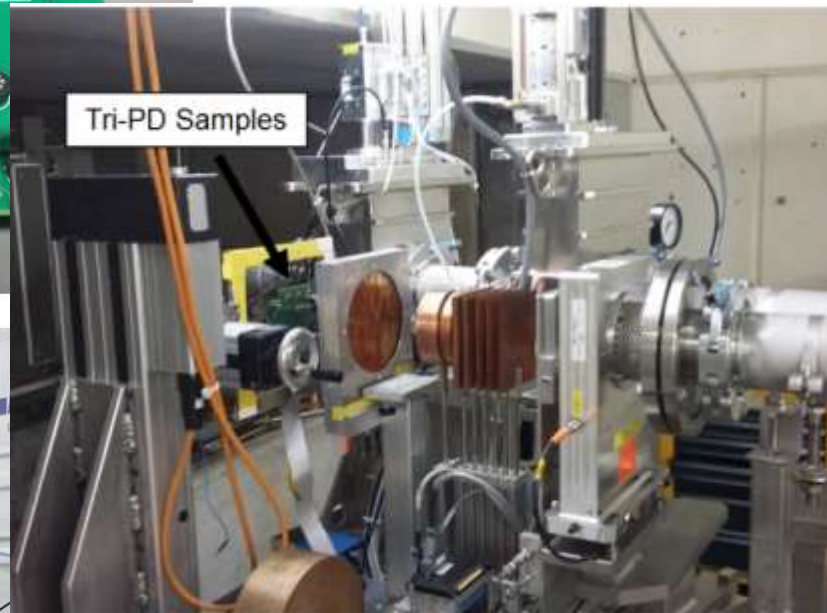
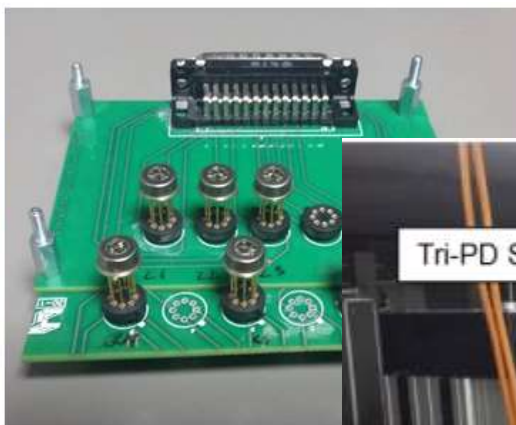
- Initial Increase of reverse current with temperature the first time
- Stabilized after 24 hours approx and only the first time



Radiation Test

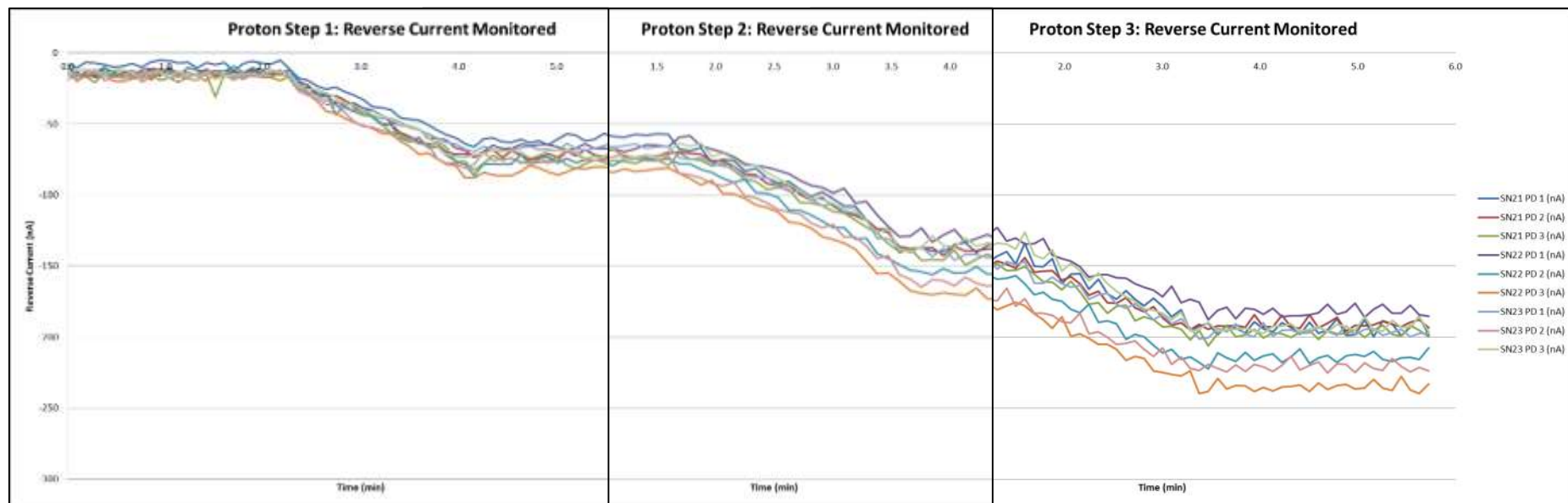
Gamma and Proton Rad

- Dark current monitoring



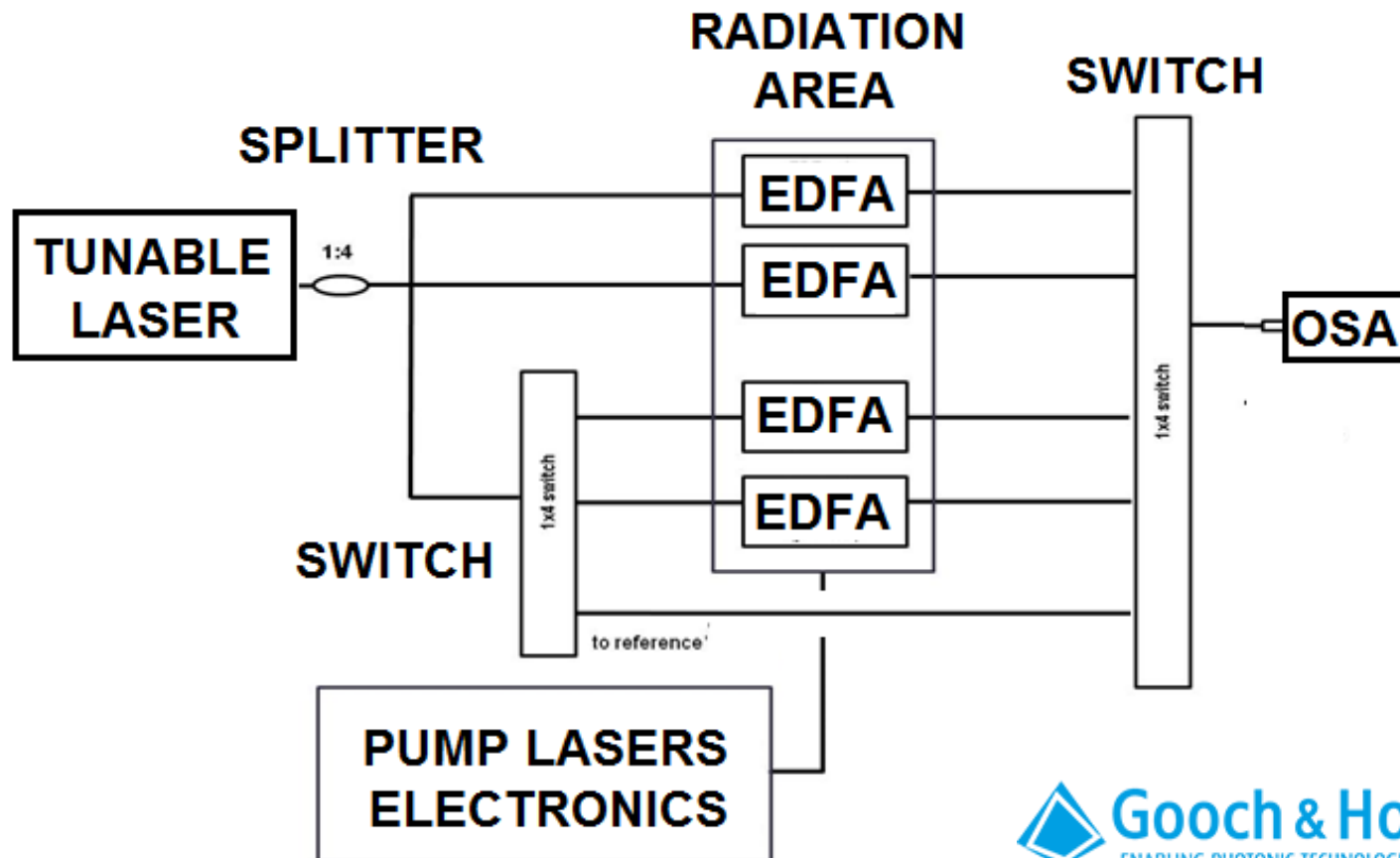
Radiation Test

- Proton Rad
 - Reverse Current Monitored



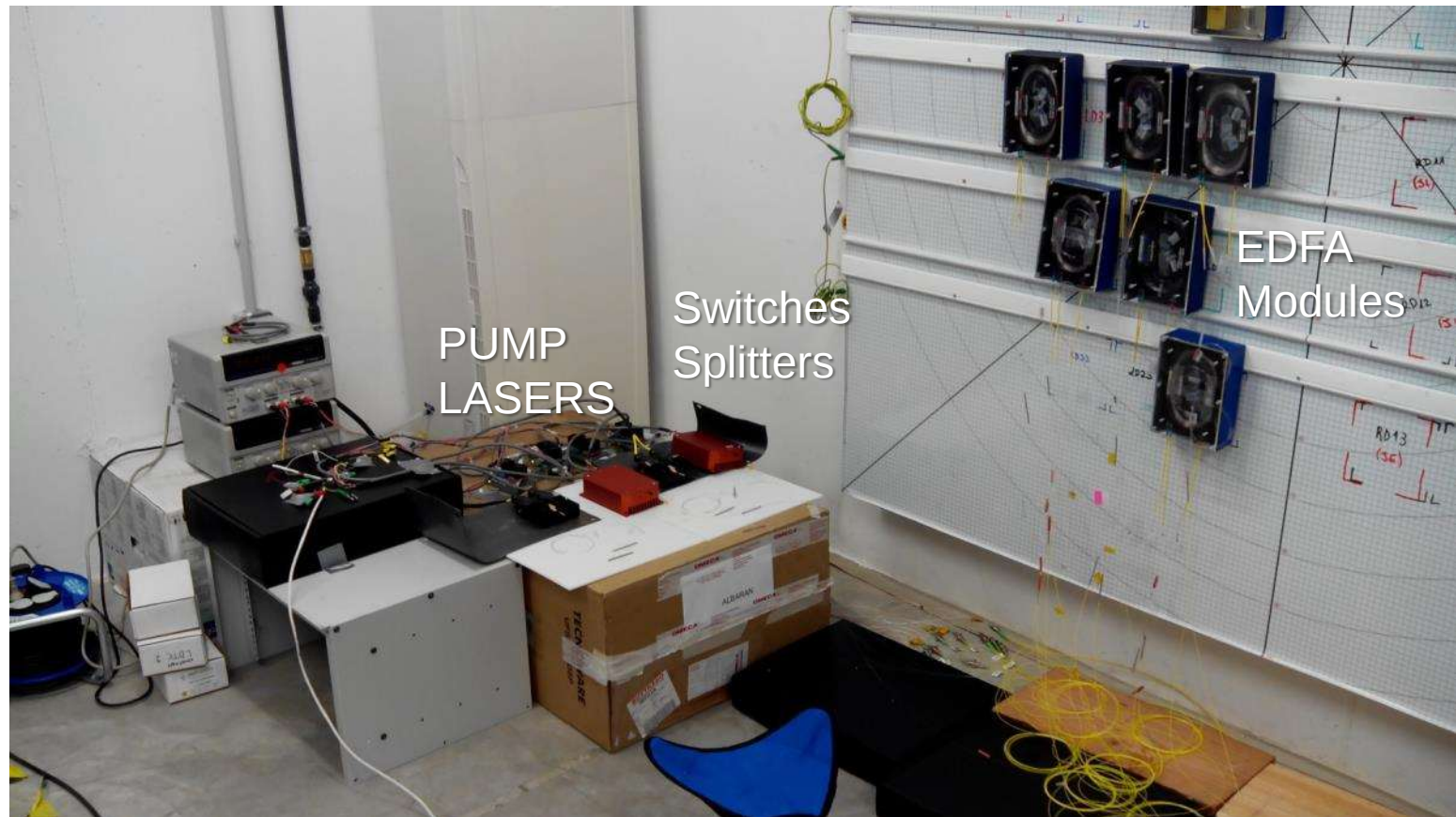
EDFAs Radiation Test

- PM Tunable Laser, PM Switches, PM Splitters
- Optical Amplifier: Monitored Gain and NF



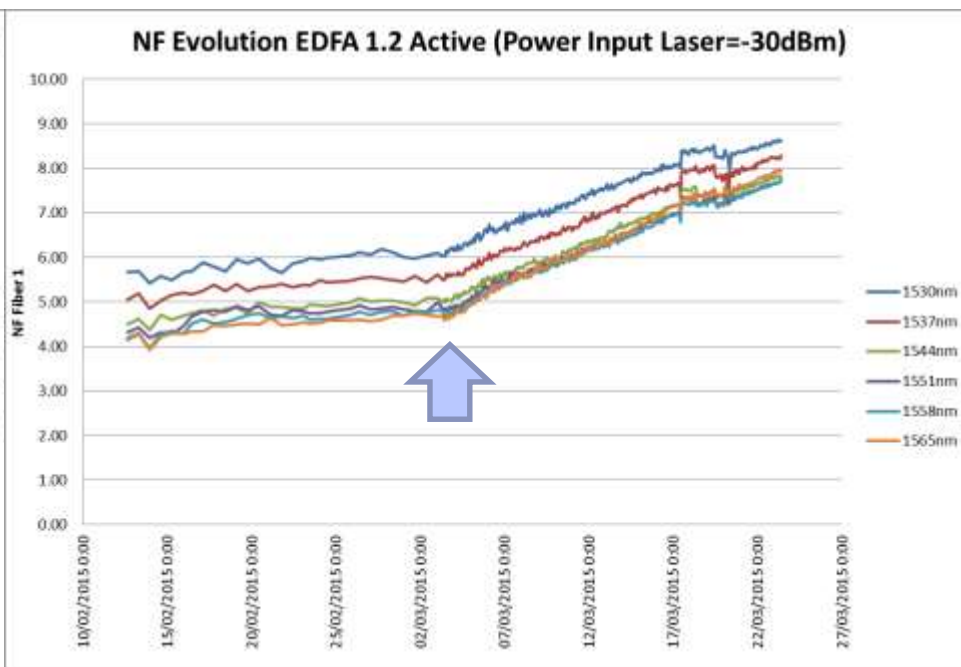
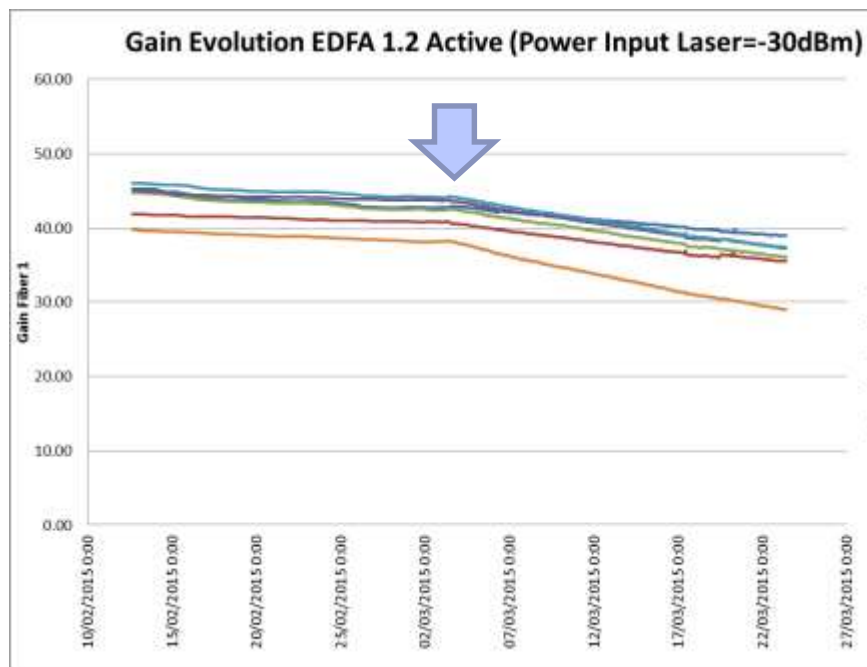
EDFAs Radiation Test

- Actual Setup at Rad Facility
- Variable Dose Rate



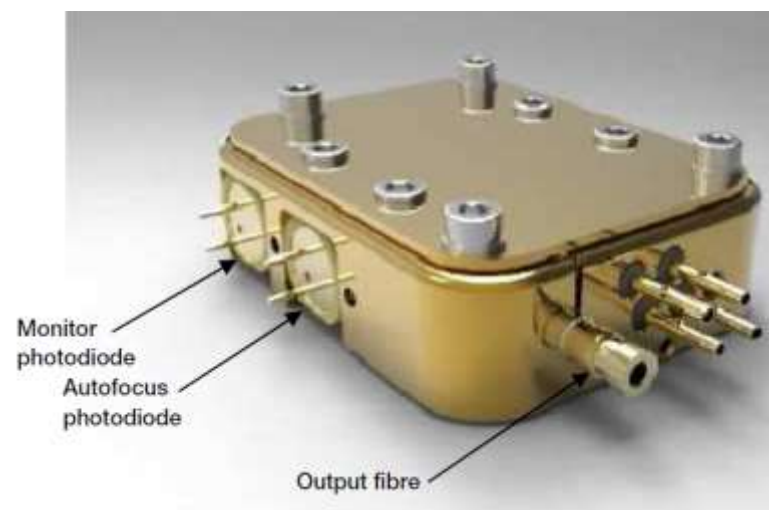
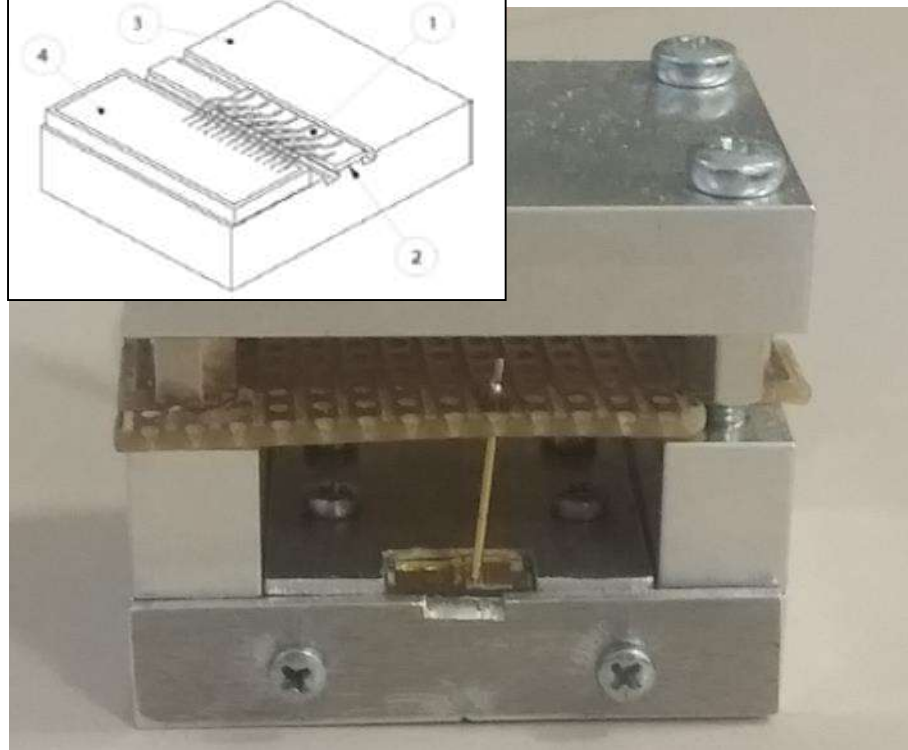
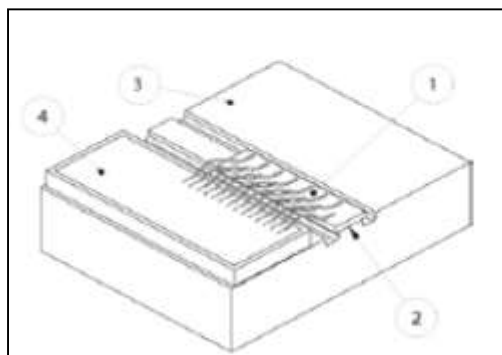
EDFAs Radiation Test

- Tunable wavelength
- Selectable Laser Input power and Pump
- Variable Dose Rate



Raman Project

- Pump lasers at 808nm for RAMAN on Mars
- Screening of Q-Carrier Lasers with need to transport for test.
- Minimize the number of contacts



- Many times Non-Standard Test Solutions are needed
- Combined testing can give light to hidden problems
- Monitoring data during long test provides a lot of information
 - No variations of the setups during monitoring
 - Real evolution during tests.
- INNOVATION... also for TESTING



Thank you
for your attention

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