



# Updates on strip modules

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# Updates on strip modules

- Strip powering and services; DC-DC converters
- Laser setup for sensor tests
- Radiation hardness of analog structures on chip

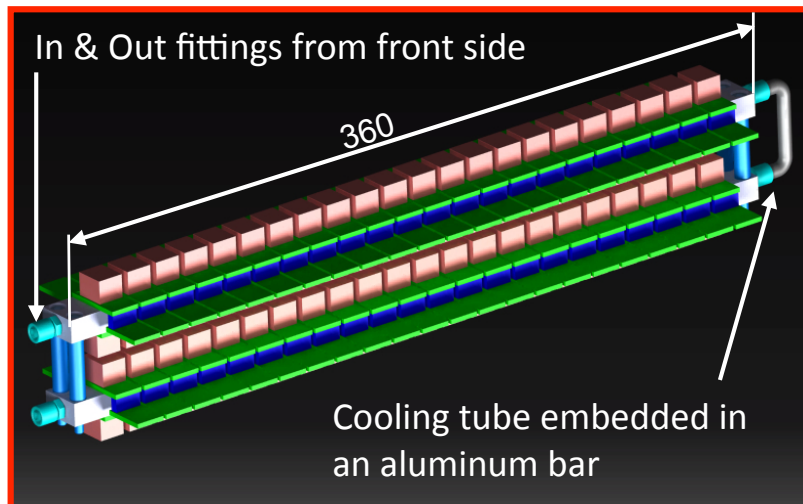
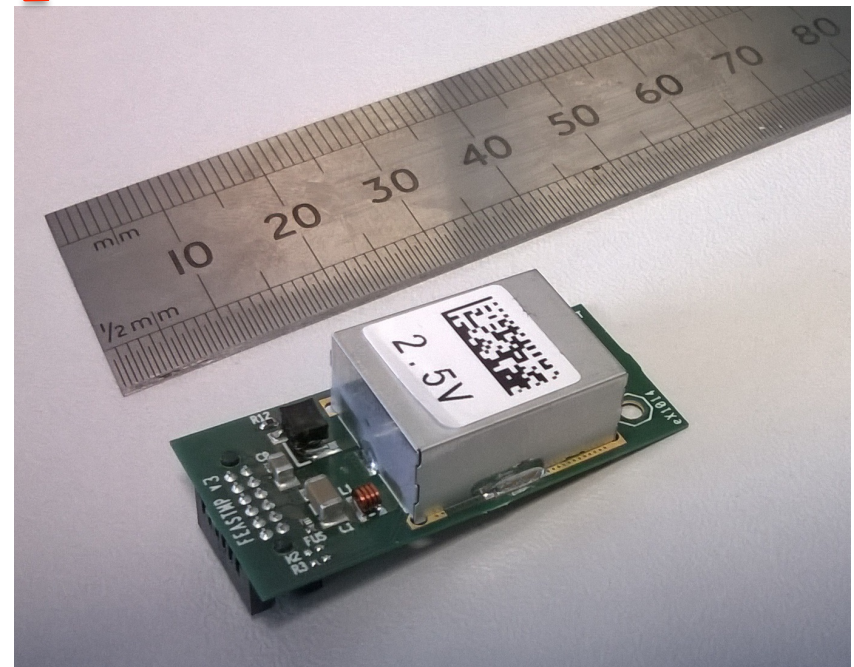
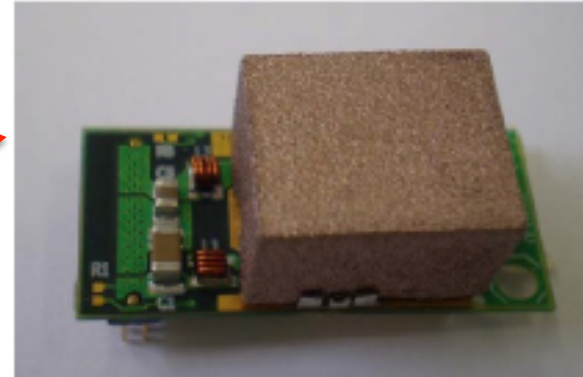
# Strip Powering and Services

## DC-DC Converters: size changed!

Old prototype: 28.4 x 13.5 mm

New prototype: 37.6 x 17 mm

From 88 to 68 modules per stave  
→ 1632 in total (were 2112)



# Strip Powering and Services

## Number of e-links:

Only 1 e-link is foreseen in output from the MDC:

→ Each sensor has only 1 e-link:

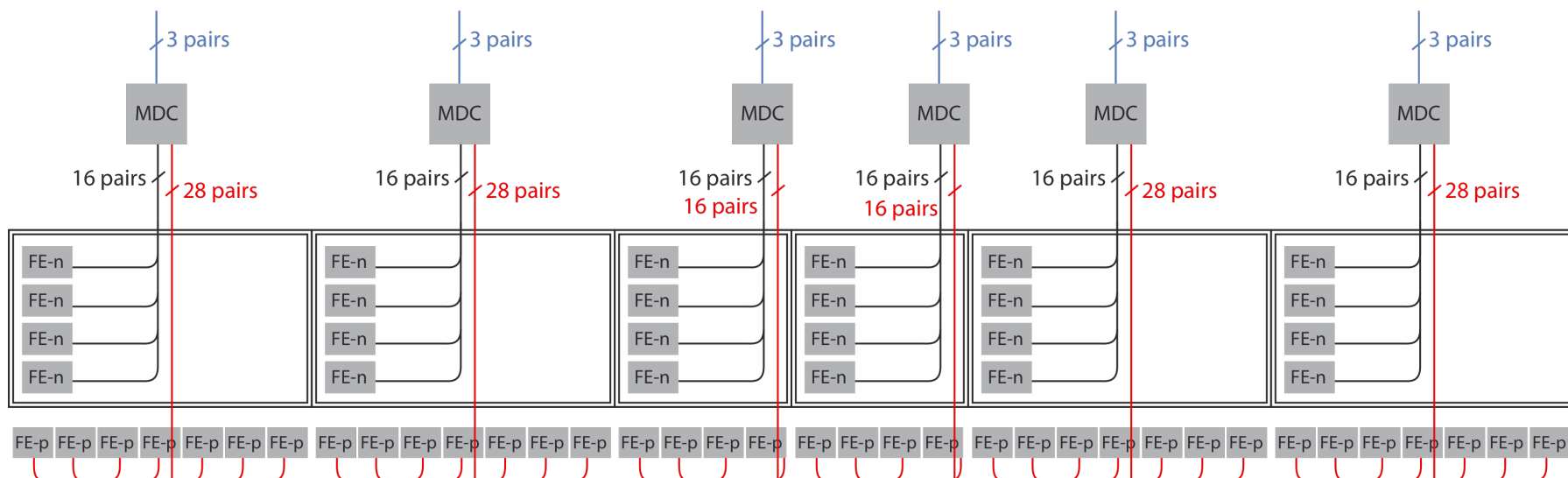
~~TOTAL: 390~~ 296

## Number of GBT boards:

- each GBT board has 8 (?) e-links  
→  $296 / 8 = 37$

~~TOTAL: 49~~ 37

12 GBT boards in excess (out of 171...)



# Strip Powering and Services

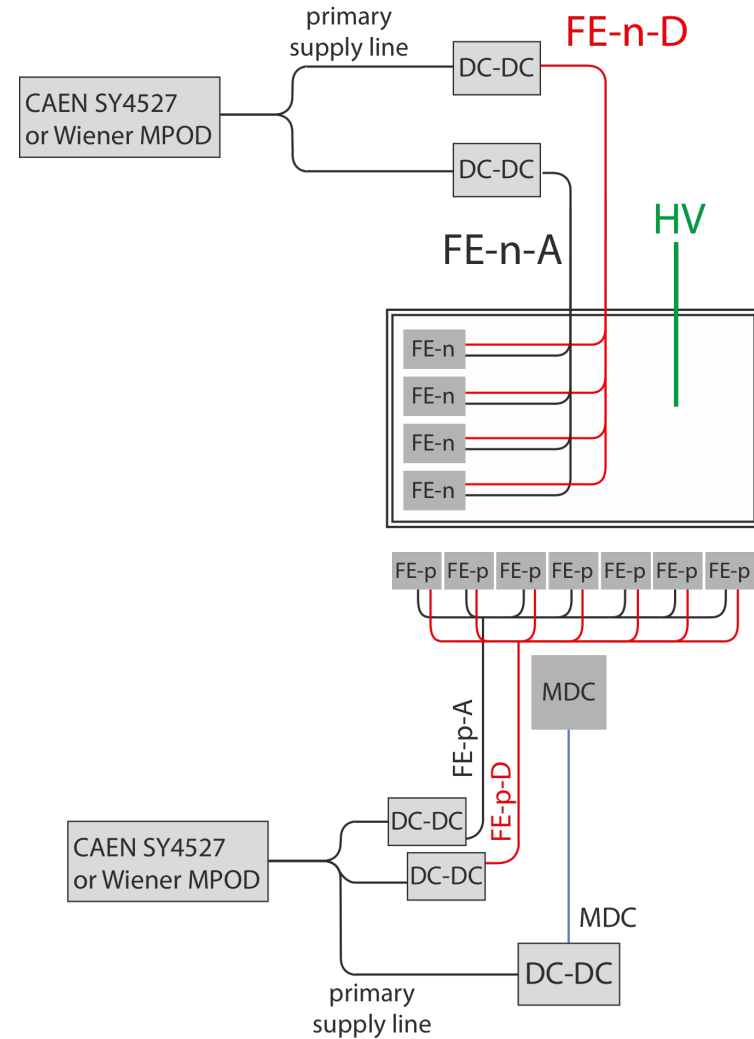
## Number of DC-DC converters:

Five per sensor:

- n-side FEs
  - analog
  - digital
- p-side FEs
  - analog
  - digital
- MDC

+ 37 for the GBT boards:

**TOTAL: 1517**



# Strip Powering and Services

## Number of DC-DC converters:

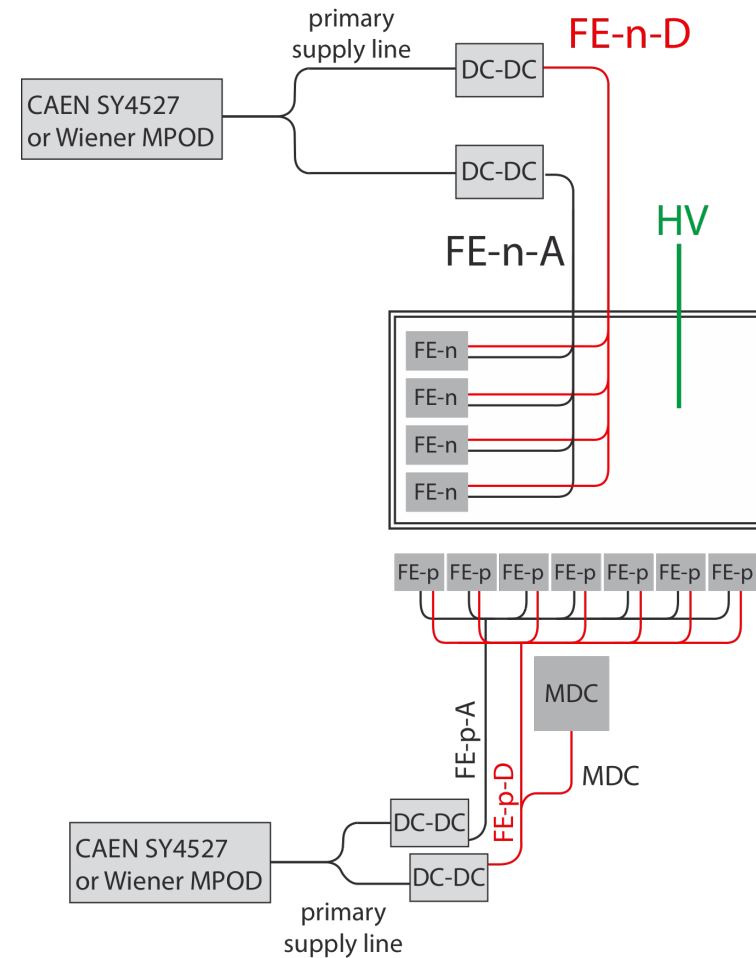
Four per sensor:

- n-side FEs
  - analog
  - digital
- p-side FEs
  - analog
  - digital + MDC

+ 37 for the GBT boards:

~~TOTAL: 1517~~ 1221  
(- 296)

(480 lost because of module size)



# Strip Powering and Services

## Consequences of having common MDC + FEpD supply line:

- The MDC chips MUST use the same supply voltage as PASTA (1.2V)
- Slightly higher current on those supply lines ☹️

0.6 A → 0.85 A (four chips)

1.05 A → 1.3 A (seven chips)

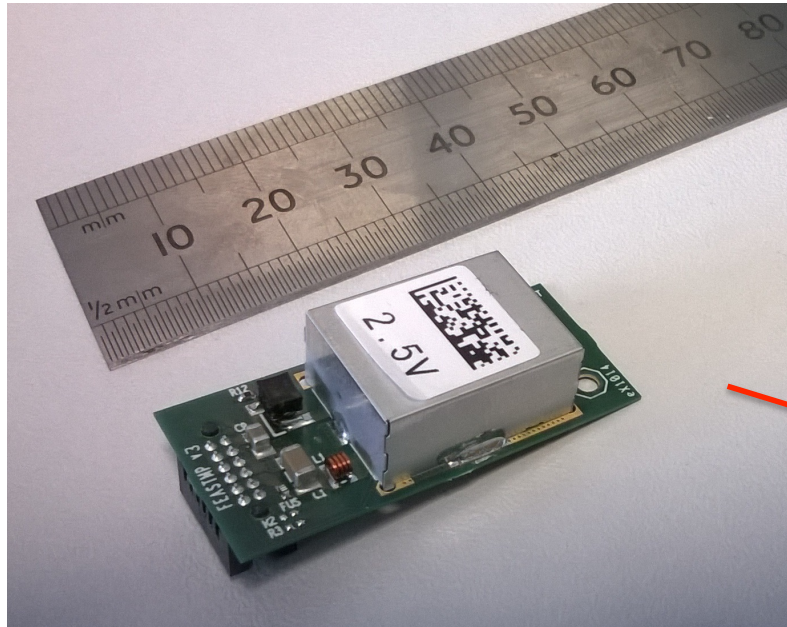
- Fewer supply lines 😊

50 wires → 40 wires (BL3 staves)

60 wires → 48 wires (BL4 staves)

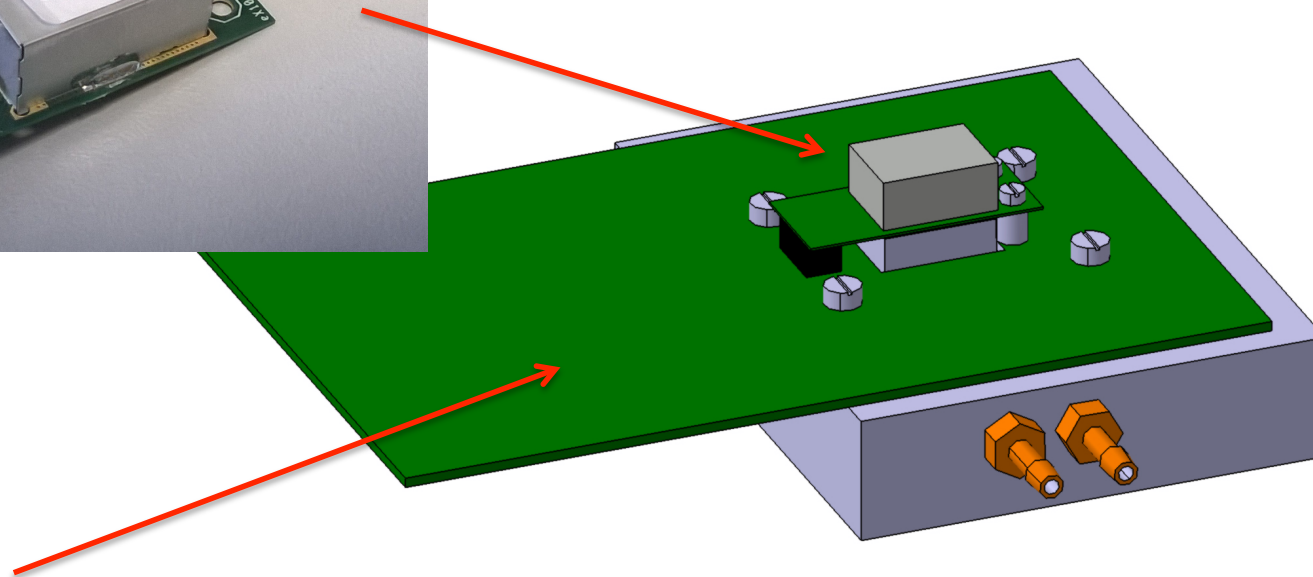
2560 → 2048 (full strip barrel)

# DC – DC converters



**60 DC-DC converters  
bought and received:**

- 40x @ 1.2 V
- 20x @ 2.5 V

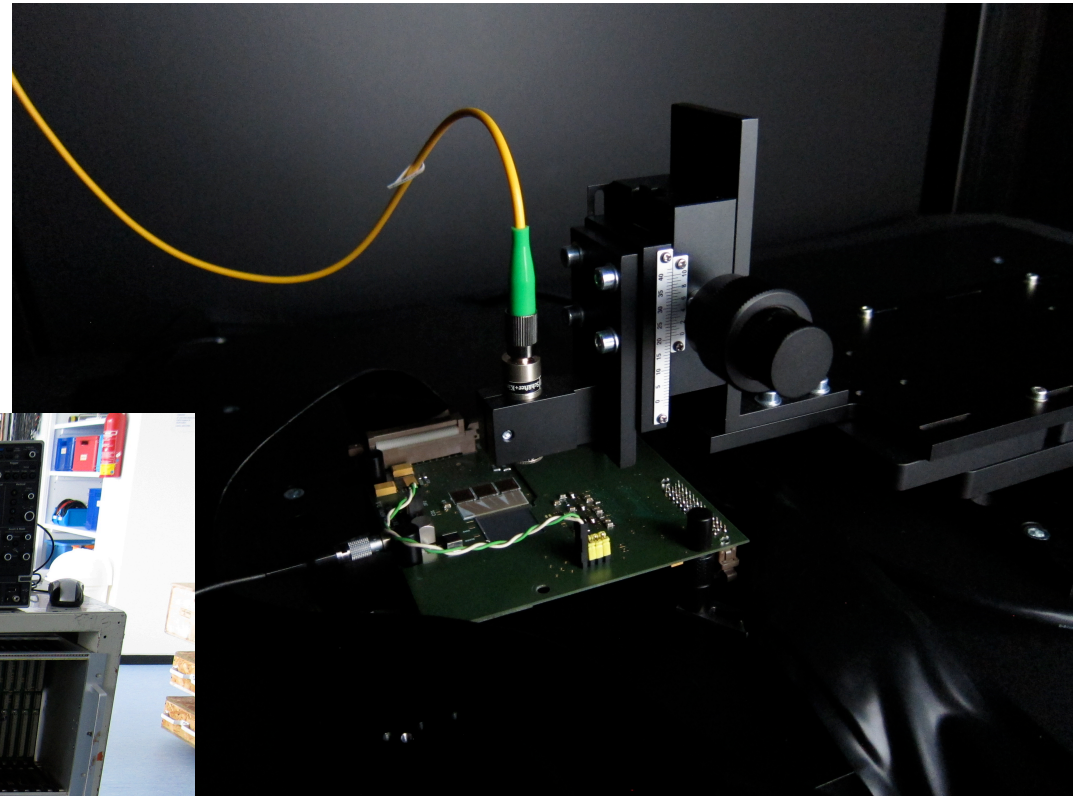


- Test board and cooling system is currently being designed
- Implementation on the existing sensor supply boards (APV powering) in progress

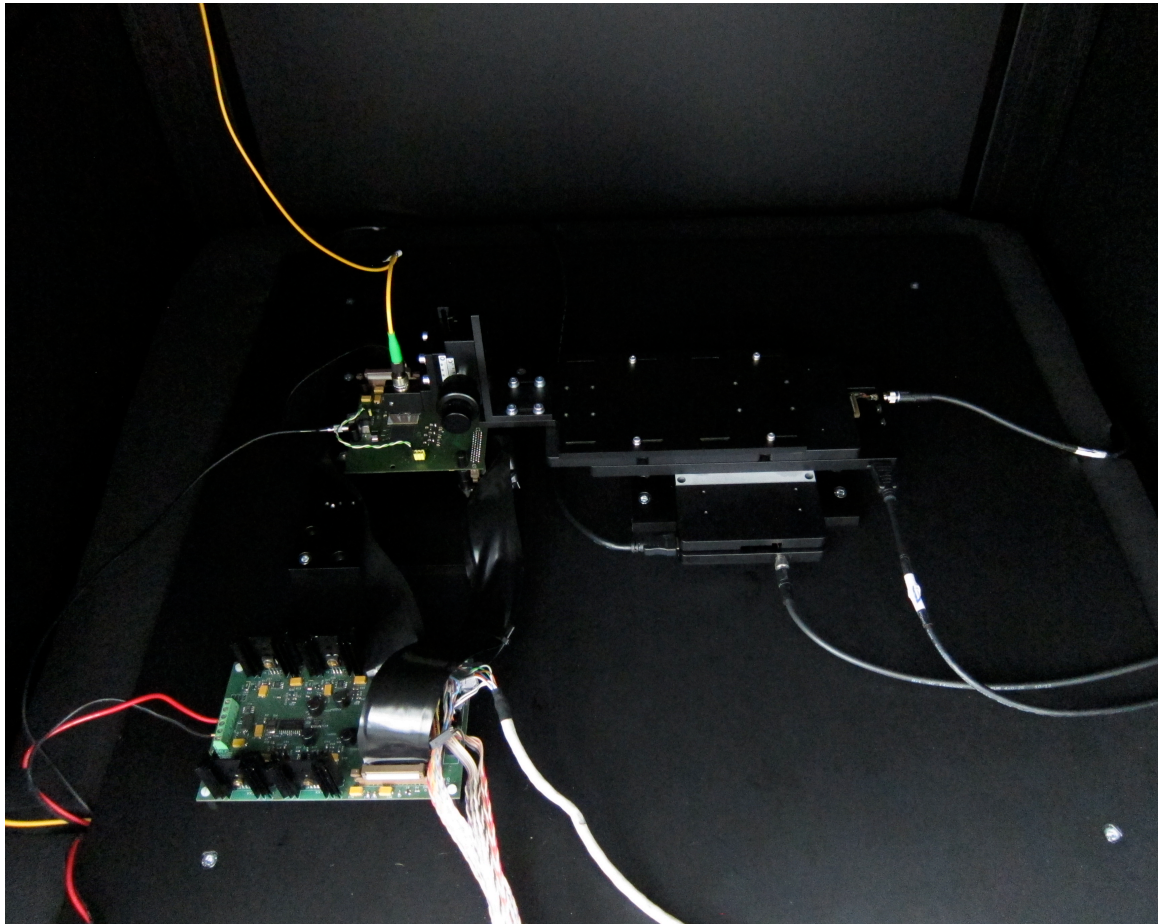


# Laser test setup

- PicoQuant IR laser system
- X-Y table control integrated with laser control
- System fully operational, first measures ongoing

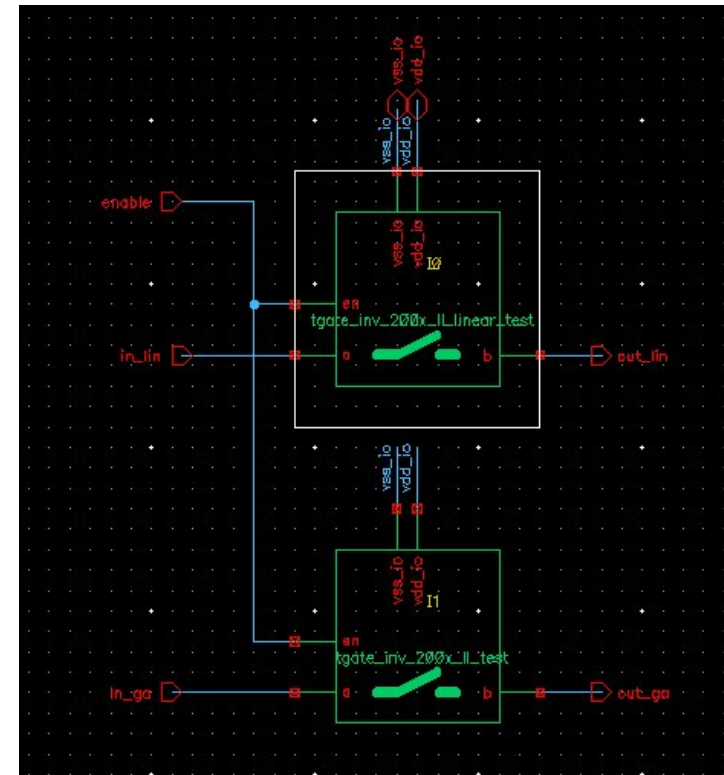
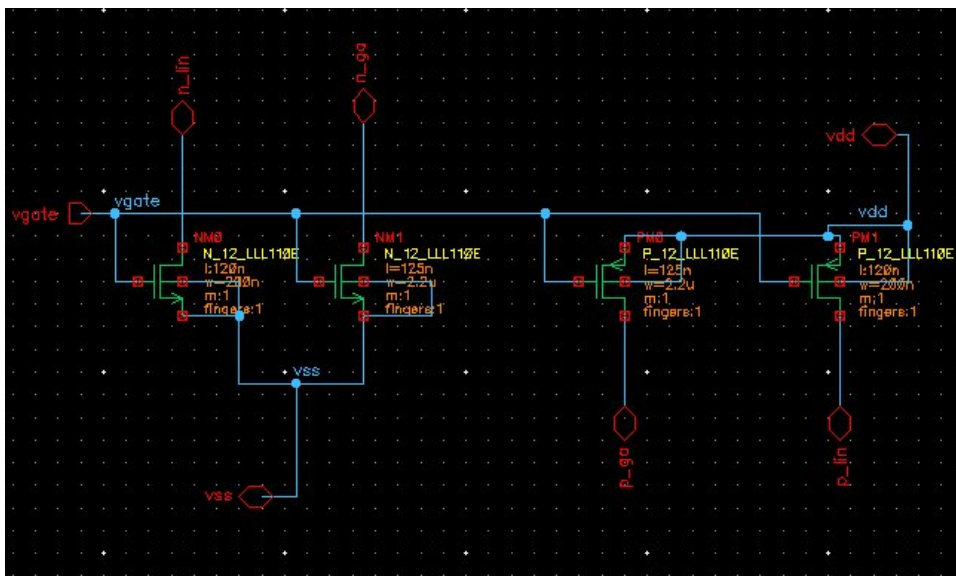


# Laser test setup



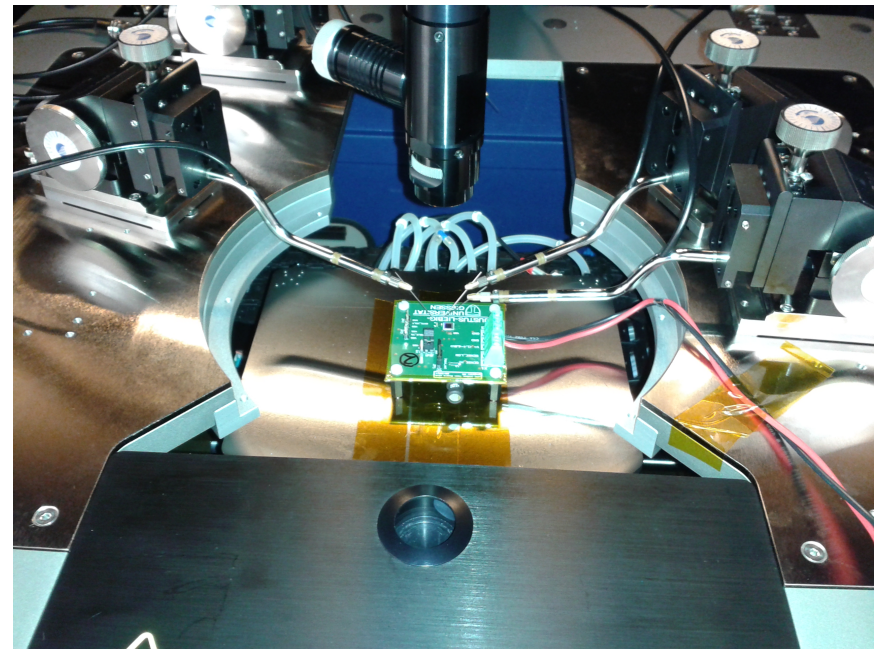
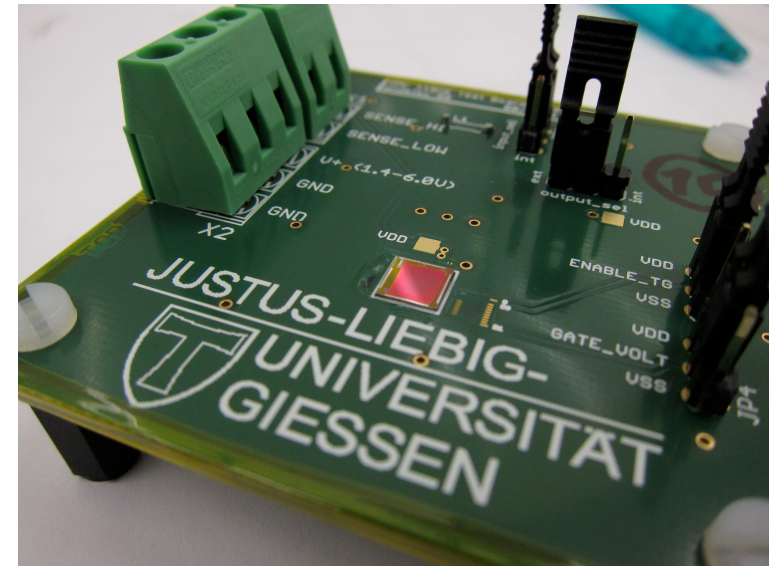
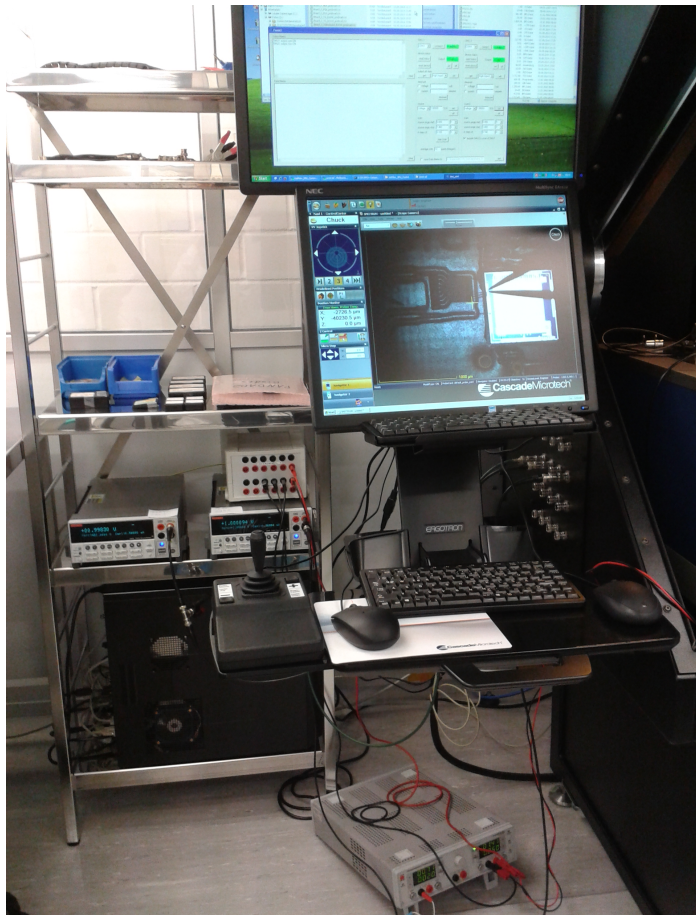
# Radiation hardness tests

- Test of analog structures for PASTA
- PSI test chip with 6 test structures:
  - NMOS linear transistor
  - PMOS linear transistor
  - NMOS enclosed-layout transistor
  - PMOS enclosed-layout transistor
  - Array of transmission gates with linear transistors
  - Array of transmission gates with enclosed-layout transistors



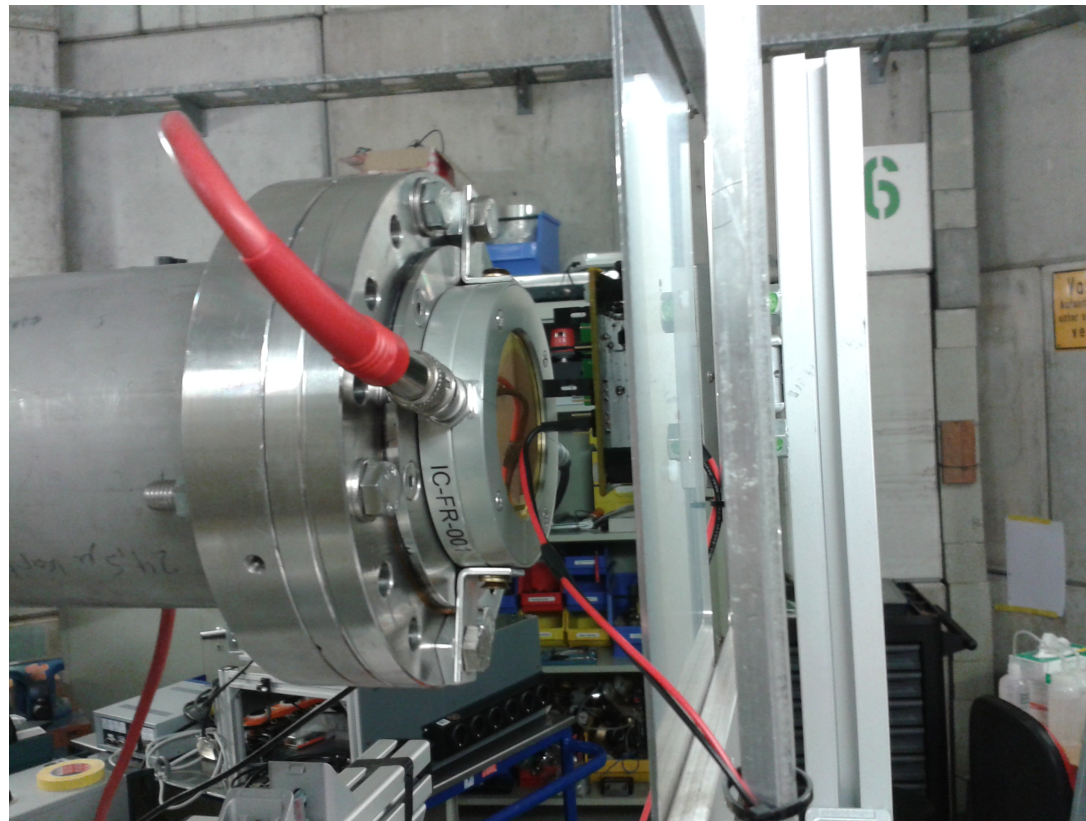
# Radiation hardness tests

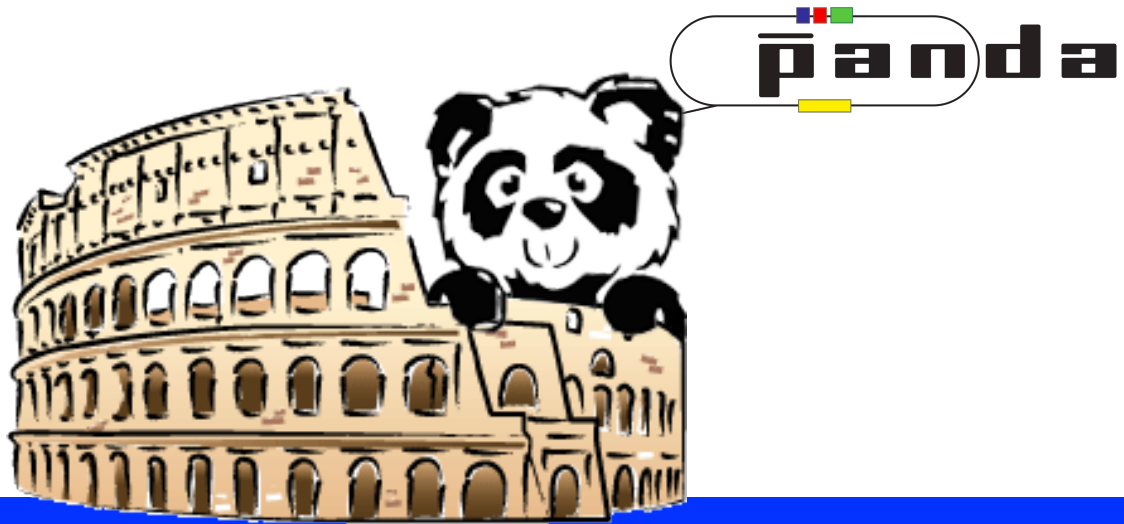
- Assembly of chips and wire bonding done in Gießen
- Pre-irradiation measurements done on probe station using 2 Keithley source-measure units controlled from a PC



# Radiation hardness tests

- 10 chips irradiated at GSI with 5MeV/u  $^{132}\text{Xe}$  ion beam (Bragg peak on surface)
- Chips biased during irradiation
- Doses applied: 0.3 MRad, 1.0 MRad, 4.0 MRad, 10.0 MRad, 20.0 Mrad
- Chips stored cool after irradiation to prevent annealing
- Post irradiation measurements ongoing





Thank you for your attention!