Cryogenics Instrumentation electronics

Radiation tests in CNGS facility: intermediate report

RADWG 18/06/09

REMINDER

Two types of electronics under test:

1- LHC tunnel:
- -Temperature reading (18 Channels)
- - Helium level reading (12 Channels)
- - Digital inputs (24 Channels)
- - Cold mass electrical heater DC supply (4 Channels)
- - FIP communication (8 agents)
- - Power supply (2 cards)

2- Protected areas:
- - Insulated temperature reading (12 Channels)
- - QRL electrical heater AC supply (4 Channels)

SUMMARY

CNGS conditions at our station		
	Values	Units
TID	8.32	Gy
1 MeV eq. n	1.05E+11	n/cm2
Had >20MeV	3.76E+10	part/cm2

1- Tunnel electronics (until now):

- No SEE
- No degradation in accuracy
- No drift in current consumption

2- Electronics for the protected areas:

- SEU in insulated temperature channels
- Functional failure in QRL electrical heater channels
- No drift in current consumption

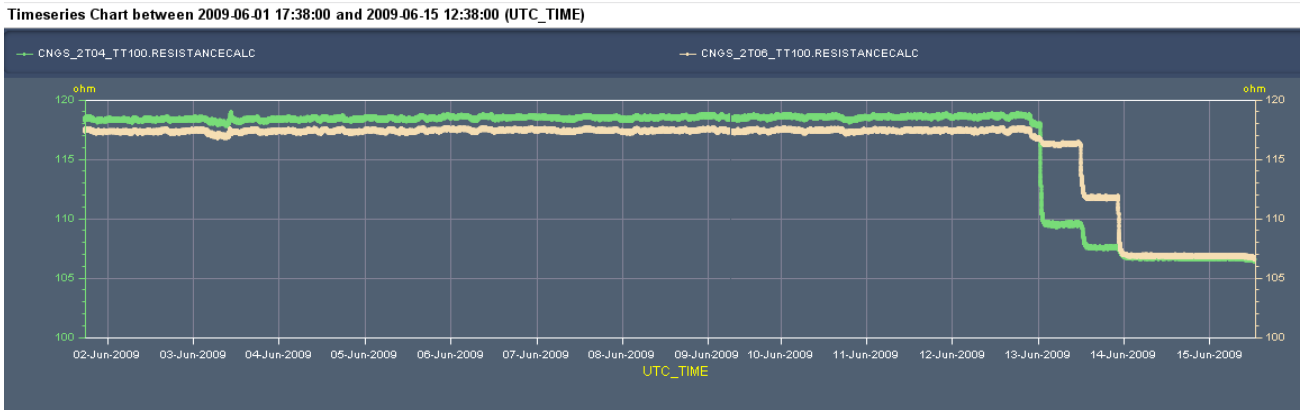
DETAILS (1)

Insulated Temperature Channels :

- 0.34 SEU / channel / hour in average
- recoverable by remote logic reset
- estimated channel cross-section: 3.13 e^{-9} cm^{-2}

QRL Heaters:

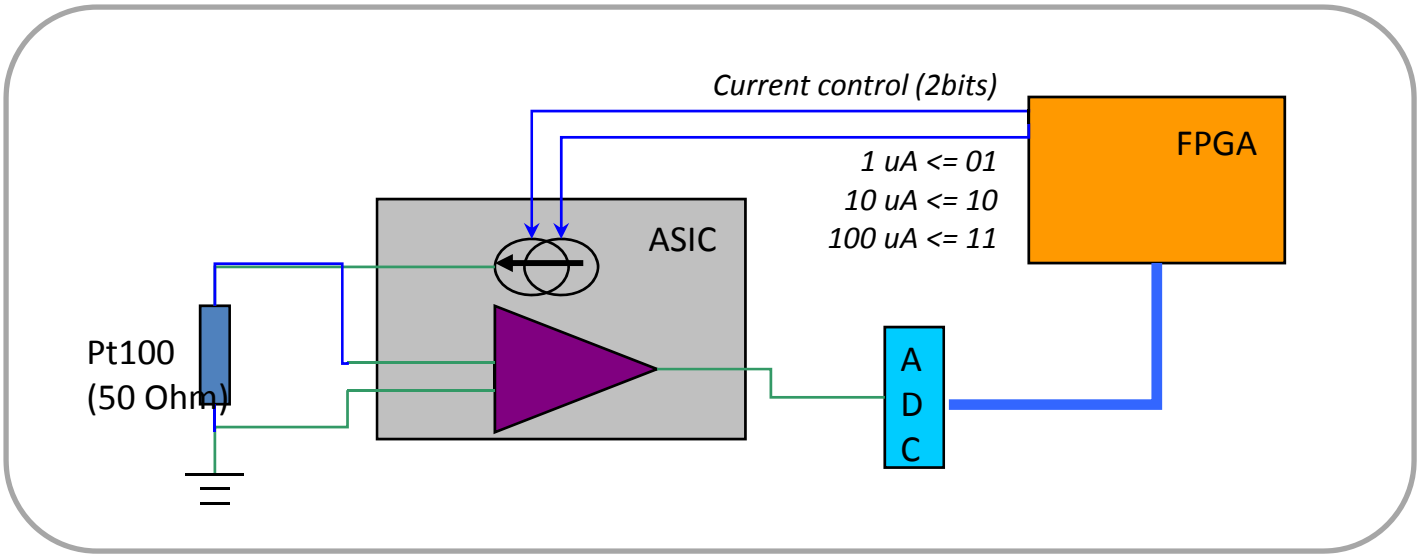
- Functional failure at ~ 6.7 Gy and 8.46 e^{10} n/cm^2 1 MeV eq.
- All channel failures within 1 day



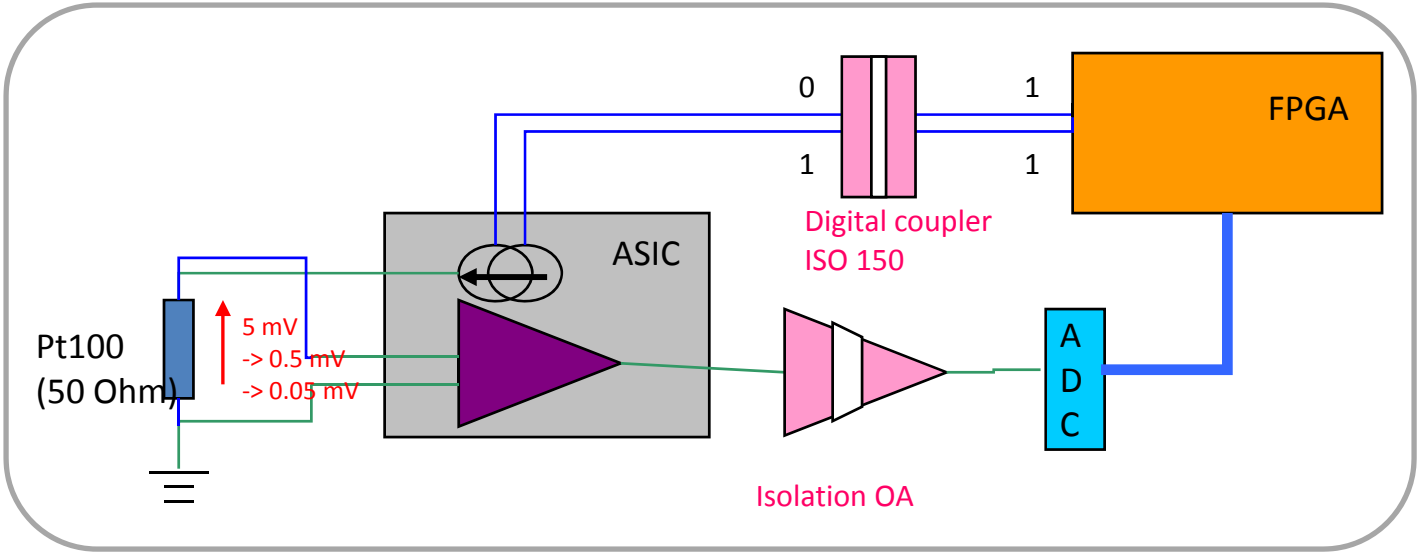
Pulse width modulation AC supply, monitored through temperature sensors on the loads

DETAILS (2)

Non-insulated Temperature Channels (LHC tunnel)



Insulated Temperature Channels



WHAT'S NEXT?

- Continue the monitoring of the cumulative effects in both types of electronics
  - Current consumptions
  - Current sources drifts
  - References drifts
  - Overall accuracy

- Wait for SEE in the LHC tunnel electronics in order to establish an estimated error cross-section
  - Signal conditioners
  - FIP communication