Subjects for Master Theses

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HL –HLC, CMS Tracker Upgrade

Detector Instrumentation Lab

Candidate Profile:

1)Physicist/Engineer

2) Programming skills-> C++ /ROOT

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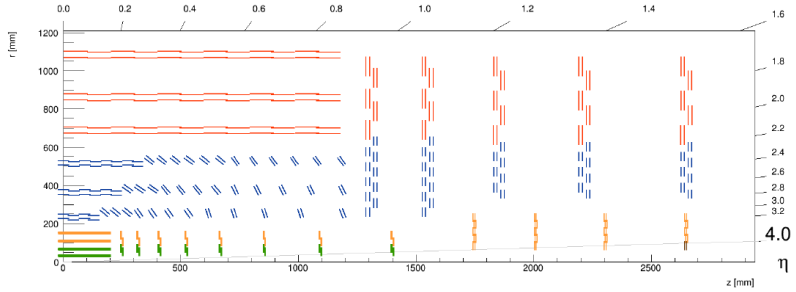
CMS Tracker Layout

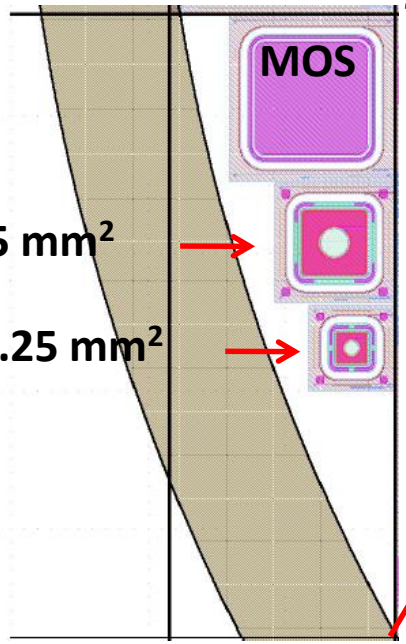


2 types of Outer Tracker:

- 2S (Strip-Strip sensor modules)
- PS (macro-Pixel Strip sensor modules)

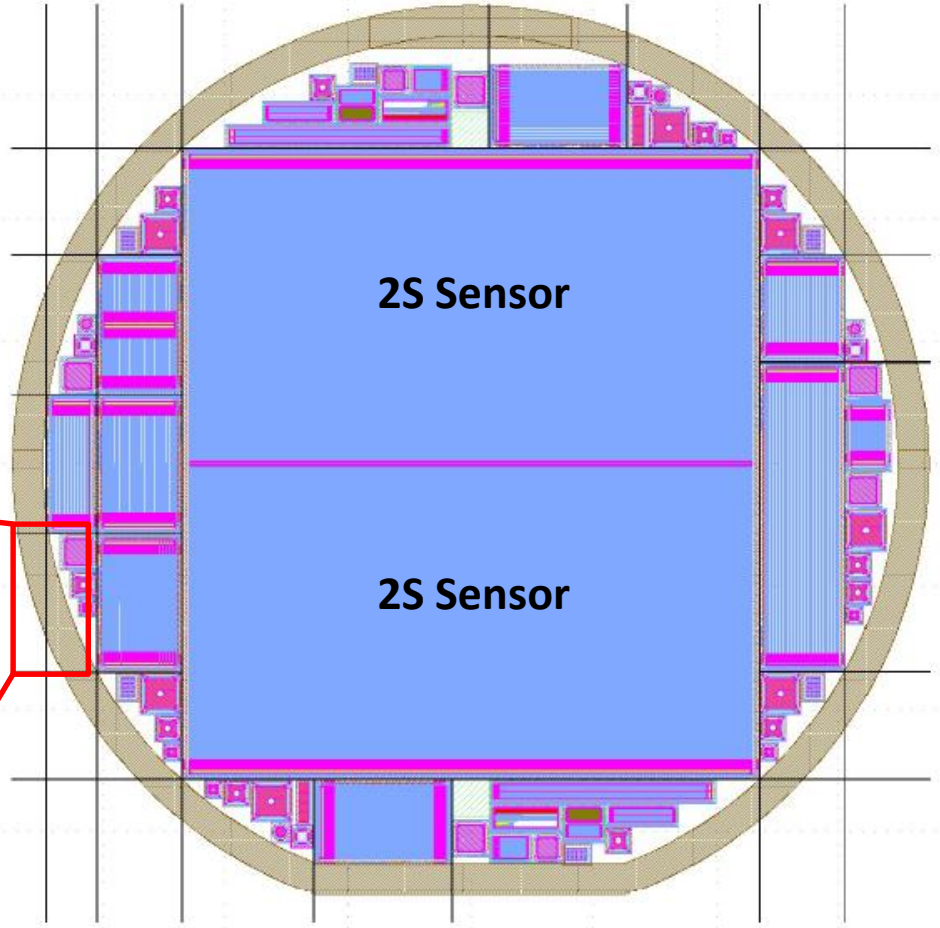
2 types of Inner Tracker modules

- 2×2 Pixel Chip modules
- 2×1 Pixel Chip modules



Diode:2.5x2.5 mm²

Diode:1.25x1.25 mm²

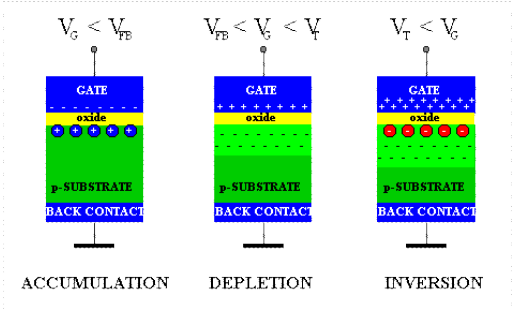


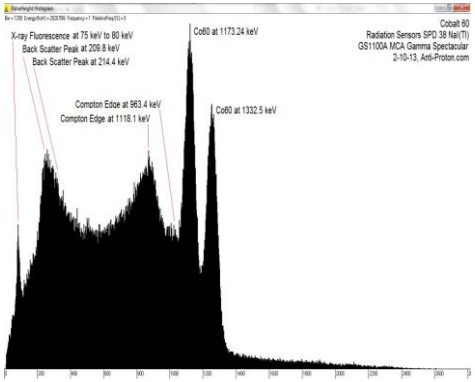
HL-LHC : 6'' wafer with 2S Sensors

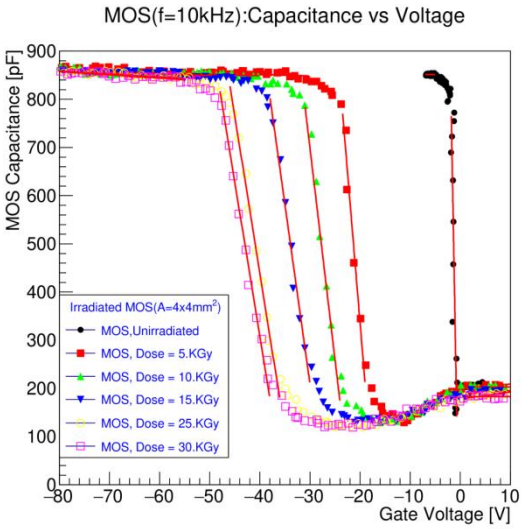
FZ 240μm width p-type wafer

Sensor Irradiation, CV measurements

^{60}Co, 11TBq







➢Clear evidence of positive charge induced in the oxide of the MOS structures after exposure to gamma photons

➢Shift of the flatband voltage (V_{fb}) to higher absolute values and increase of the dopant concentration (N_{dop})

➢ Oxide thickness remains not affected because it is a geometric characteristic of the device

Dose [kGy]	C_{acc} (pF)	C_{inv} (pF)	t_{ox} [μm]	V_{fb} [V]	N_{dop} [cm^{-3}]
0	851.65	203.42	0.65	-1.32	8.30×10^{12}
5	839.06	202.75	0.66	-22.80	8.37×10^{13}
10	835.72	202.75	0.66	-29.80	8.16×10^{13}
15	835.73	187.41	0.66	-36.43	9.12×10^{13}
25	811.08	178.22	0.68	-43.66	1.01×10^{14}
30	803.90	182.97	0.69	-45.71	1.03×10^{14}

Table 1. Various features of the MOS before and after irradiation; f = 10 kHz.

Sensor Irradiation, IV measurements

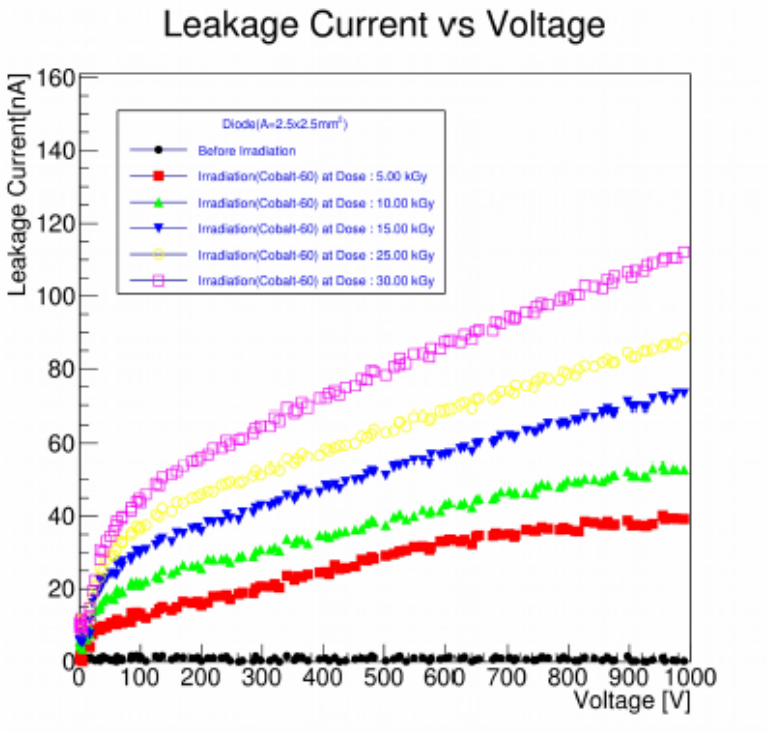


Figure 9. IV curves for the 2.5 mm-size diode for various doses.

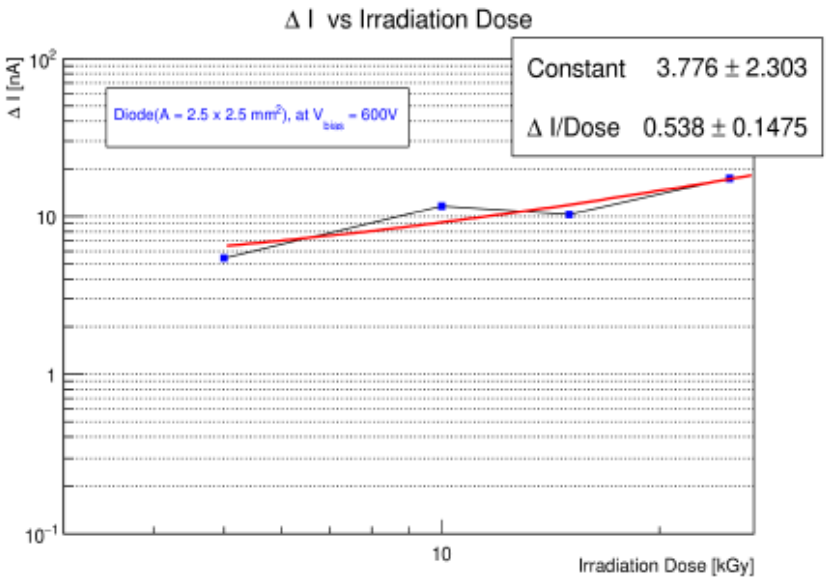


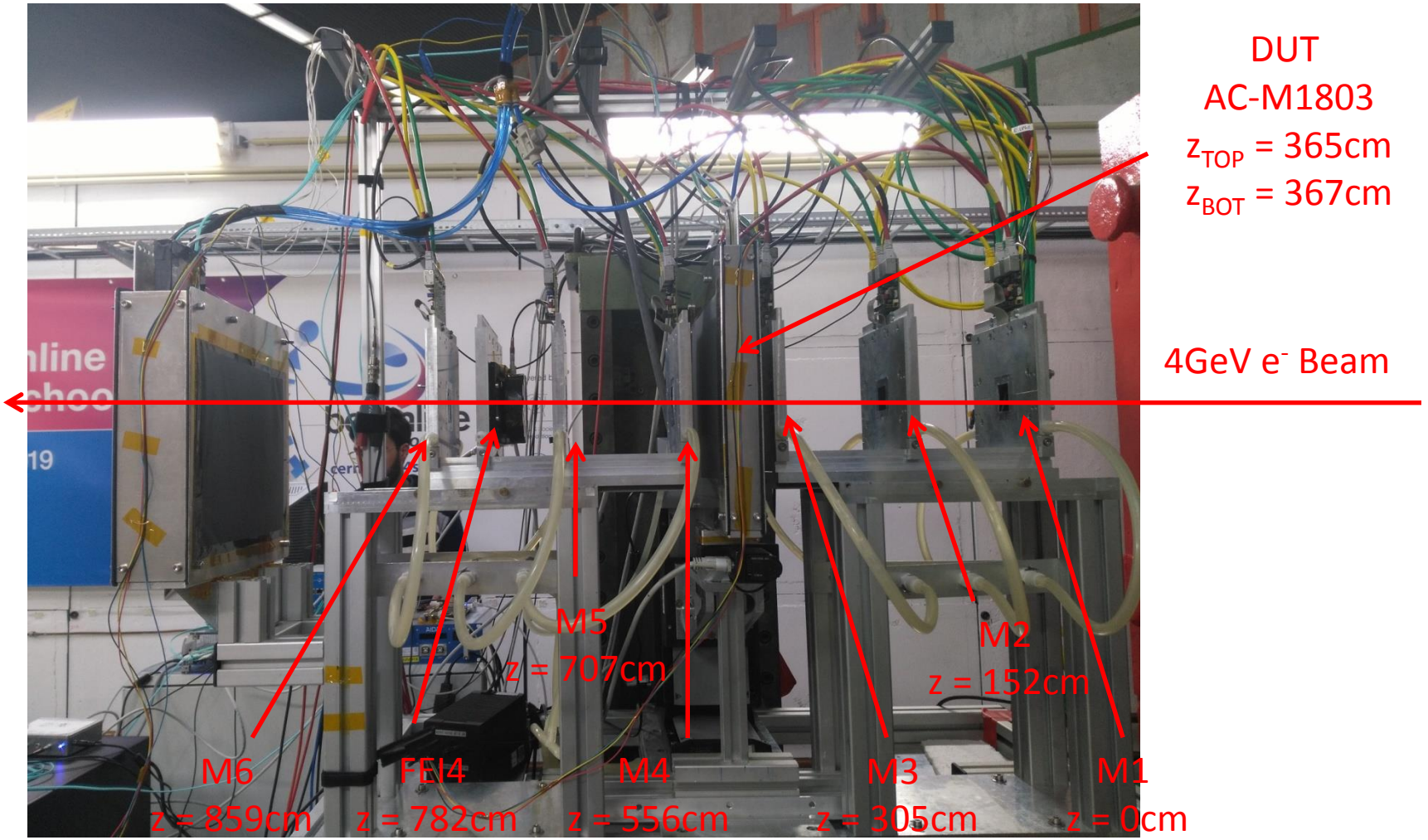
Figure 10. ΔI - dose curve at V = -600 V for the 2.5 mm-size diode; f = 100 kHz.

DESY - Test Beam Analysis (I)

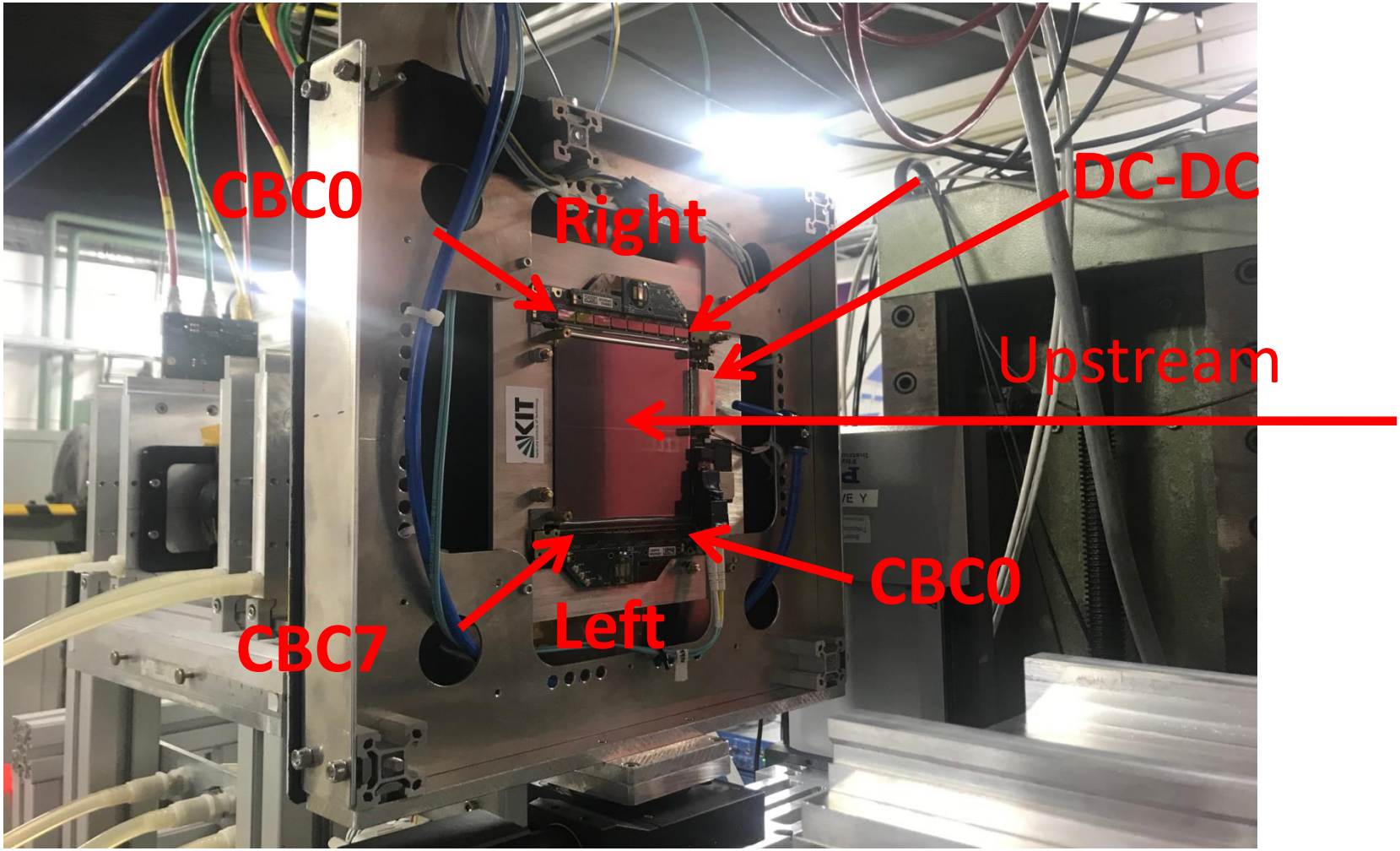
1.5 T Dipole Magnet

Mimosa Telescope
- MAPS pixel planes
- 1 x 2 cm^2 size
- 18.4µm pixel pitch

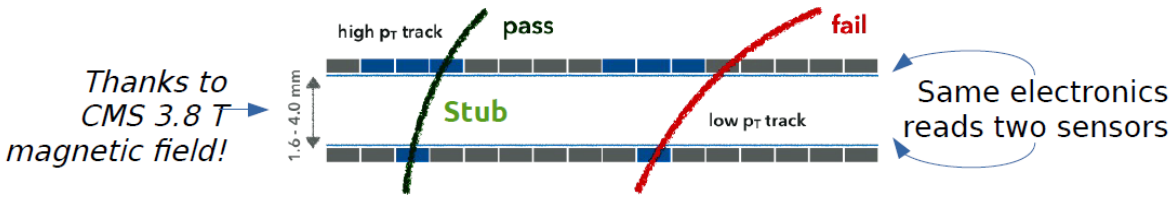
DESY - Test Beam Analysis (II)



DESY - Test Beam Analysis (III)



HL-LHC : CBC STUB logic



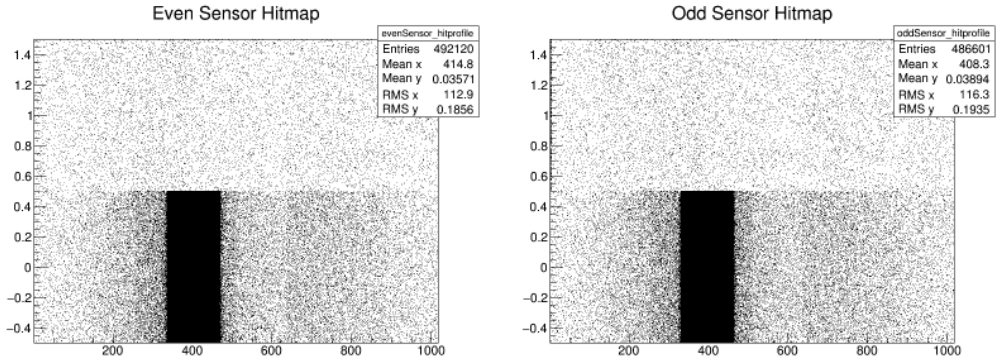
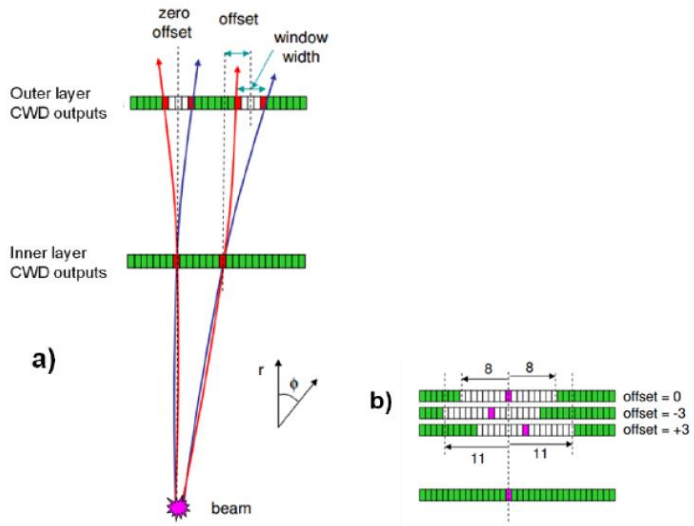
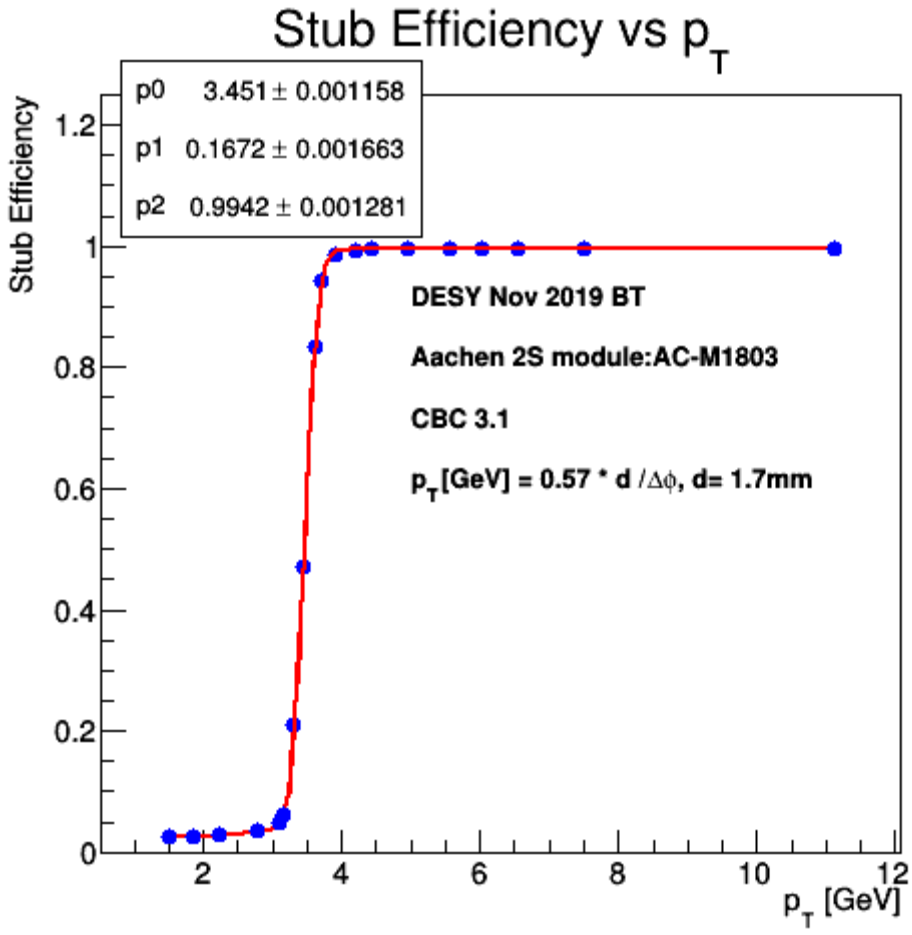


Figure 9.14: Raw hits on the sensors during November 2015 BT. Left, even sensors raw hits. Right, odd sensors raw hits. The upper half planes do not have many hits due to the beam not hitting in the center of the DUT.



Stub logic in CBC chip

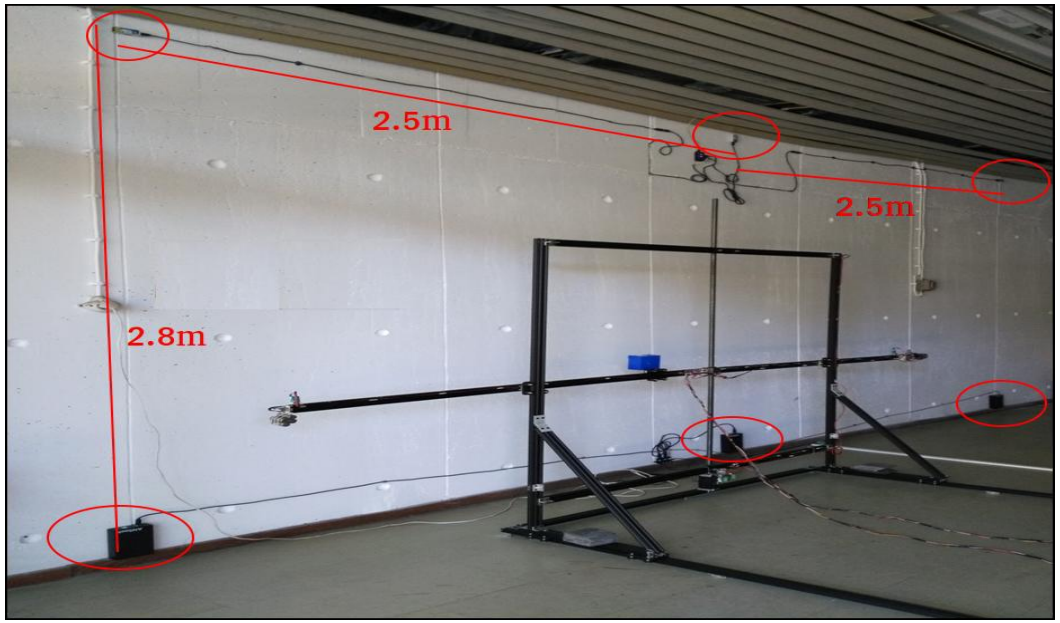


Radioactive Source Localization Lab

Contact person: kyriakis@inp.demokritos.gr

Radioactive Source Localization by a Network of CZT Sensors

Main task: Localization of light shielded and/or moving sources



Using Planar spectroscopic CZT sensor topology study the capability to localize Radioactive Sources in an open area

Candidate Profile:
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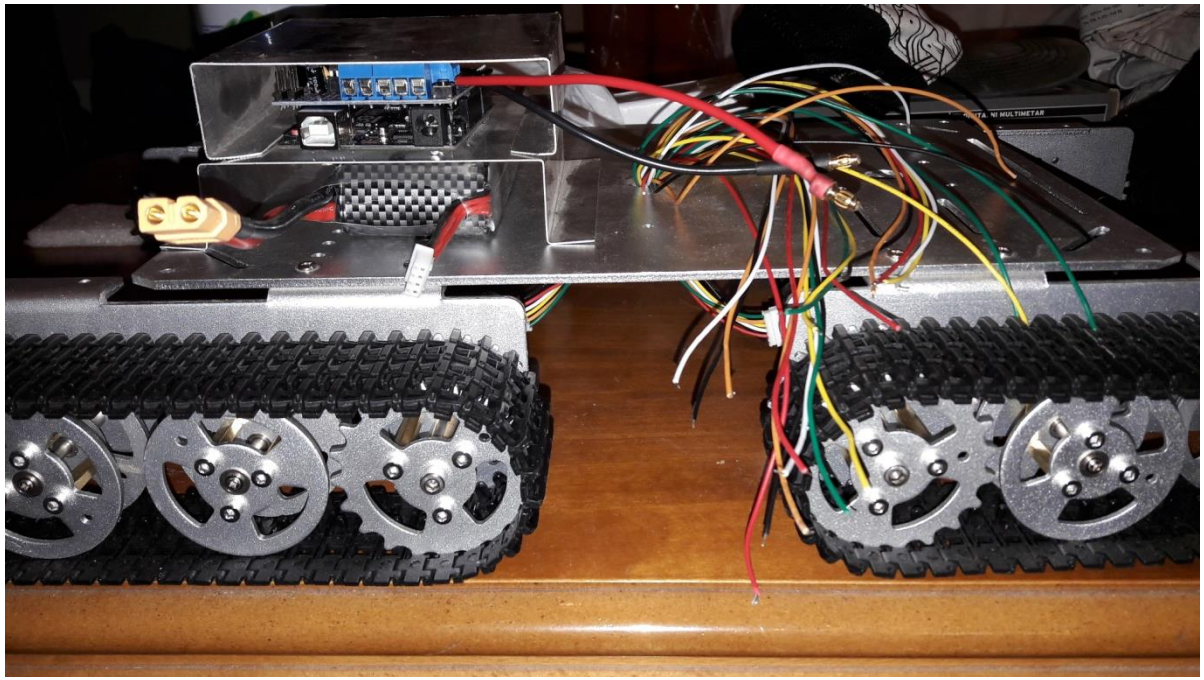
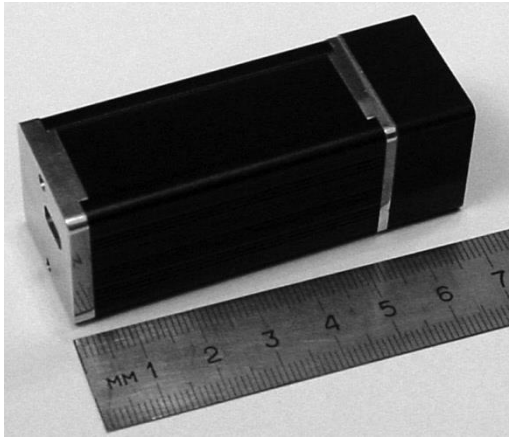
2) Programming skills-> C++/ Java /ROOT

Radioactive Source Localization by an autonomous rover equipped with CZT Sensors

Main task: write a stand alone software in java to retrieve data from CZT sensor and analyze them





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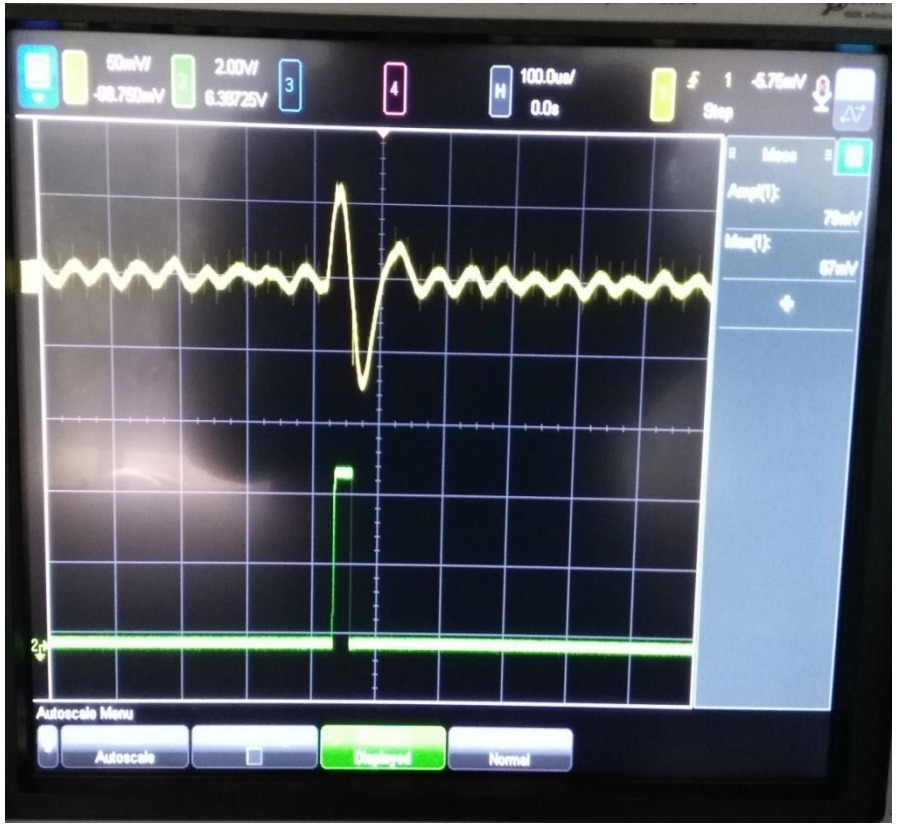
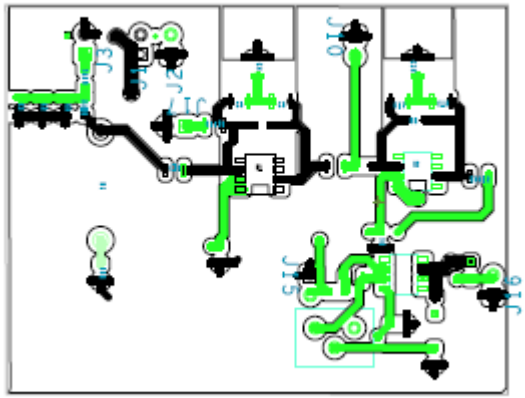
2) Programming skills->
C++/ Java /python

Low-Cost Radiation detectors

Main Task: Design Low noise board + evaluation software





Candidate Profile:
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2) Programming skills-> Cadence/Orcad/Pspice simulation packages