FIC–LIC
summary results

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Outlook

• Preliminary results for first test with FIC and LIC (refilled at 1.1 bar). Two independent experiments:
  – Radiation source. GIF. Response against low energy photons (DC irradiation).
  – HiRadMat. Response against pulsed (LHC-like) irradiation.
GIF experiment

- Measurements performed in laterall collimator
- Not standard place for previous calibrations

Source

Cs137

$E_\gamma = 662\text{KeV}$
GIF experiment

• View of detector location in lateral collimator.
• Signals integrated over 1 s (50 seconds/measurement)
GIF experiment

- Several measurements without radiation source.
- High offset current (−4 – 4 pA) in FIC detectors
GIF experiment

1) LHC-IC (position a)
2) FIC (position b) electrode perpendicular to source axis
3) FIC (position b) electrode parallel to source axis
4) refilled LIC (position b)
5) LIC 0.4 bar (position b)
6) LIC 0.4 bar (position c)

Expected Signal $\sim \frac{1}{r^2}$

Graph showing signal (pA) vs. distance to source (cm) with four curves and points labeled 1 to 6.
HiRadMat Experiment

- High Radiation for Materials. SPS extraction line.
- Beam conditions: 450 GeV, 1.5 E+11 p/bunch. Up to 144 bunches with 50ns bunch spacing.
- Detectors located to see secondary showers. Full beam impacting on dump (iron block).

FLUKA (Nikos Charitonidis)
450 GeV p beam
spot size ~2mm
directly hitting beam dump
HiRadMat Experiment

- Main parts of the experiment in photos

- DUMP
- CHAMBERS
- ELECTRONICS
- proton beam
- LHC-IC
  - LIC 1.1 bar
  - LIC 0.4 bar
  - FIC

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FIC–LIC summary
HiRadMat Experiment

- Detectors under investigation:

  \[
  \begin{align*}
  \text{CH1} &= \text{IC} \\
  \text{CH2} &= \text{LIC 1.1 bar} \\
  \text{CH3} &= \text{LIC 0.4 bar} \\
  \text{CH4} &= \text{FIC}
  \end{align*}
  \]
• Looks like a nice linear behaviour but.........
Signal (40us) vs Intensity (ZOOM FIC/LIC)

Collected Charge (C)

Intensity (p)

FIC and LIC 1.1 bar....

LIC 0.4 bar as previously measured

p0 1.944e-12
p1 3.854e-22

p0 -1.797e-12
p1 3.679e-22

p0 1.416e-12
p1 4.735e-22

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FIC–LIC summary
Wave pulses. 1 pilot bunch

Negative signals in FIC and LIC 1.1 bar
Wave pulses. 1 pilot bunch

Negative signals in FIC and LIC 1.1 bar

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FIC–LIC summary
Wave pulses. 6 nominal bunch

20dB attenuation in IC

High frequency noise (~100MHz) observed in all detectors
Post-hiradmat lab test

• Under modulation test, SEM and LIC detectors present the same behaviour.
• Modulation test showed that both LIC–FIC behaved as SEM without filter.
• Electrical box was open to find a wrong connection of Capacitor and resistance in both detectors.
Some photos of the opened FIC
Conclusions and work plan

- Chambers were tested in two different conditions:
  - Showed reasonable signals for DC irradiation.
  - Showed inverted signals.
- Problem found to be wrong connection of filter capacitor.
- Test to be performed in the dump line of the PSB (similar experiment conducted last year) to verify the proper functioning of the chambers.
- Possibly, repeat HiradMat experiment for LHC-like irradiation conditions.