BLM Settings for Start-Up

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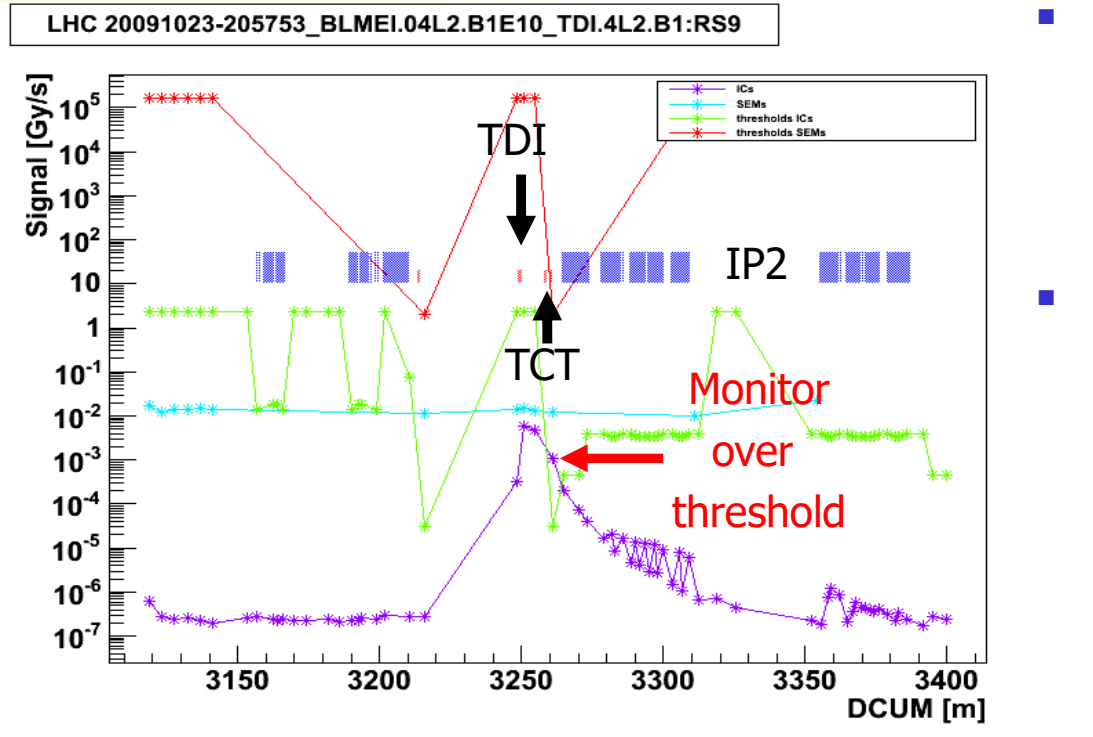
CERN BE/BI

- TDI – TCT settings
- Response time and maximum scale of scale of acquisition system

- TCT and TCL settings
- Start-Up procedure

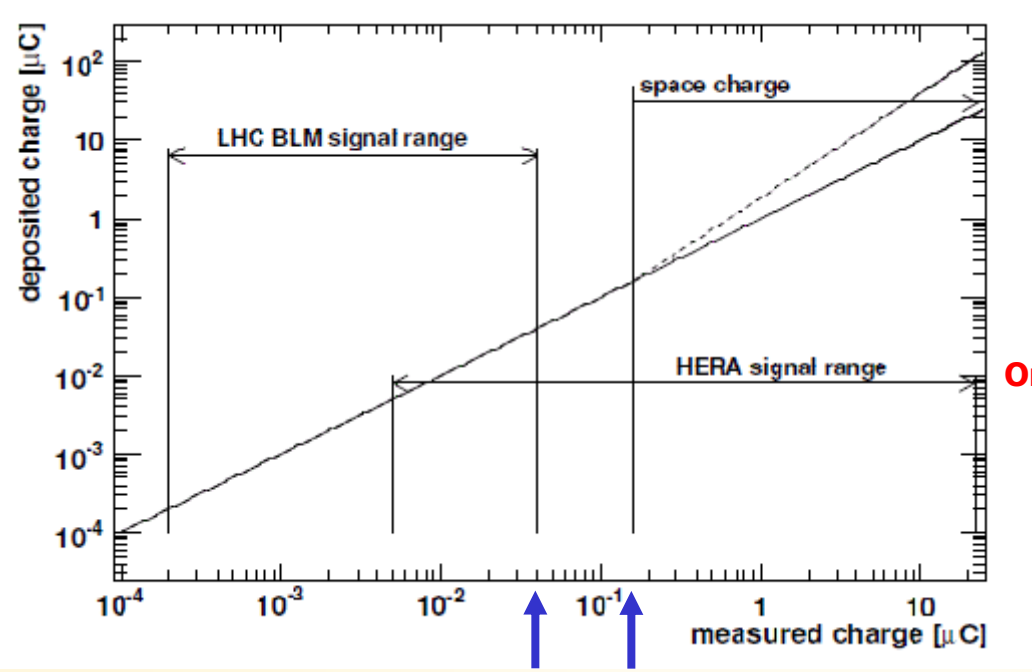
TDI – TCT threshold settings



- Signal on TCT monitor over threshold during dump of beam on TDI
- Reason two fold:
  - secondary particles of TDI hit jaw of TCT and detected by downstream IC
  - secondary particles of TDI reach directly TCT IC (crosstalk)
- Actions:
  - Understanding of importance of both effects
    - Scanning of TDI, done; data analysis, to be done
    - Scanning of TCT, to be done
  - Increase threshold of TCT
    - Ratio of energy deposition in collimator and detector under investigation, BLM team
    - Increase aboard threshold (number of protons hitting collimator), collimation team

IC Saturation and Upper Limit of Acquisition Signal Chain

LHC BLM ionisation chamber saturation:



Lit: M. Stockner thesis "http://cern.ch/blm/Talks_and_papers/stockner/thesis_mstockner_cern_11_2007.pdf"

Charge to dose conversion factor: $Q\_D := 53\,\frac{\mu C}{Gy}$

Onset of saturation (charge): $Q_{saturation} := 0.16\mu C$

Onset of saturation (dose): $D_{saturation} := \frac{Q_{saturation}}{Q\_D} = 3.019 \times 10^{-3}\cdot Gy$

Onset of saturation (dose rate, t_pulse < 40?s):

$$D_{saturation\_rate} := D_{saturation}\cdot\frac{1}{4\cdot 10^{-5}} = 75.472\,s\cdot\frac{Gy}{s}$$

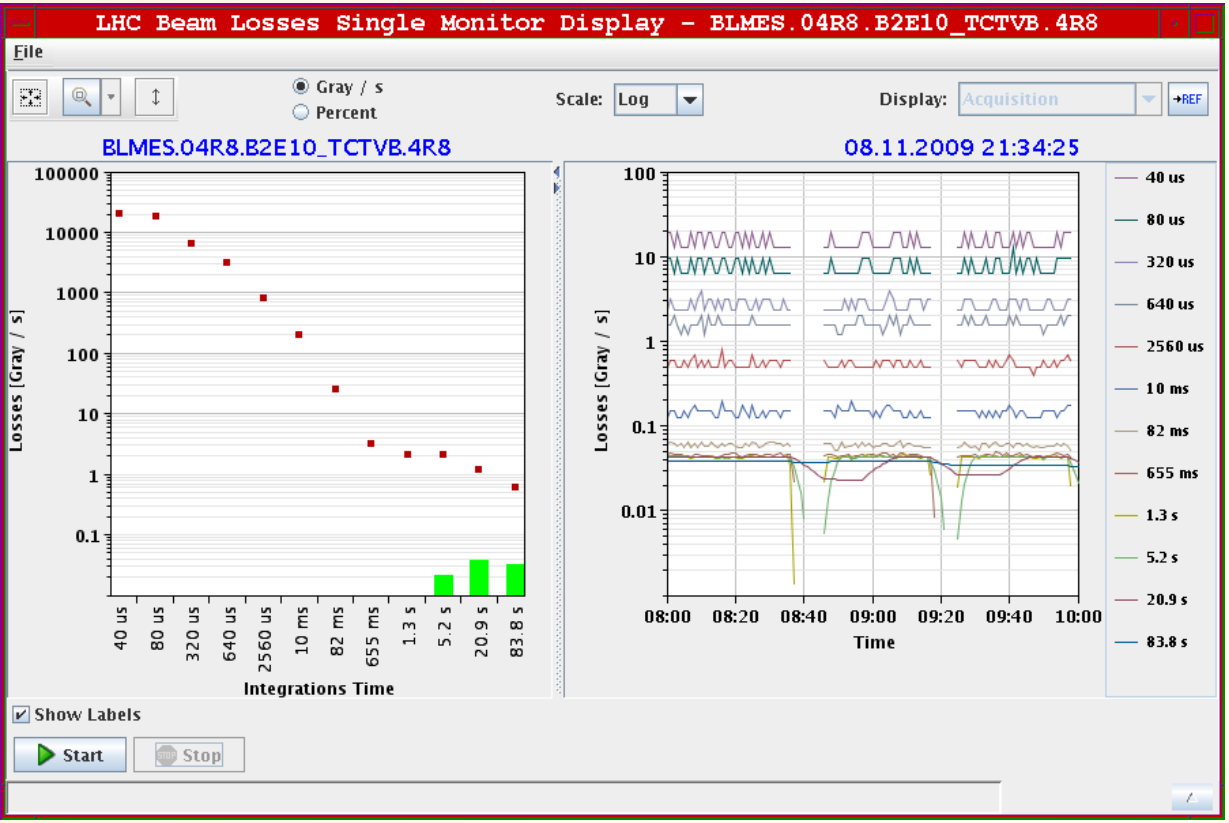
LHC BLM electronic Saturation:

detector signal at RS1 (40 us running sum) < $Dose\_rate_{max}$

Only seen using RS01 $Dose\_rate_{max} := 23\cdot\frac{Gy}{s}$

- Upper limit of the acquisition signal chain:
  - quench threshold
  - MB magnet
  - 450 GeV
  - Loss duration 89 us

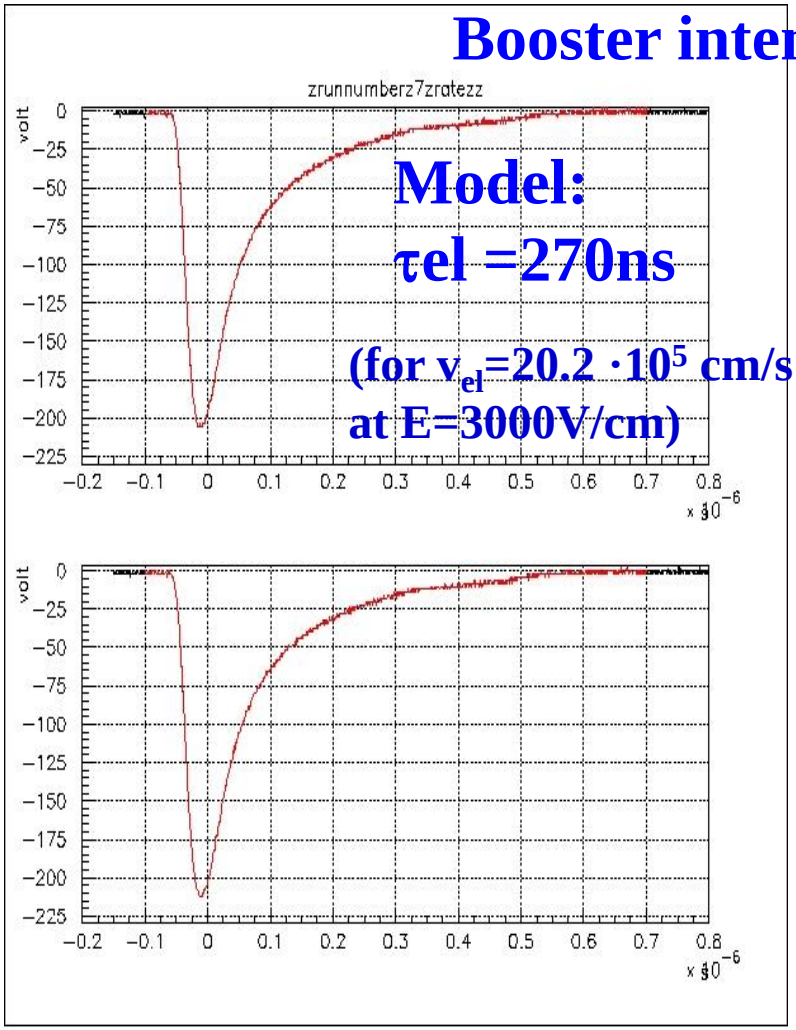
Pulse Response

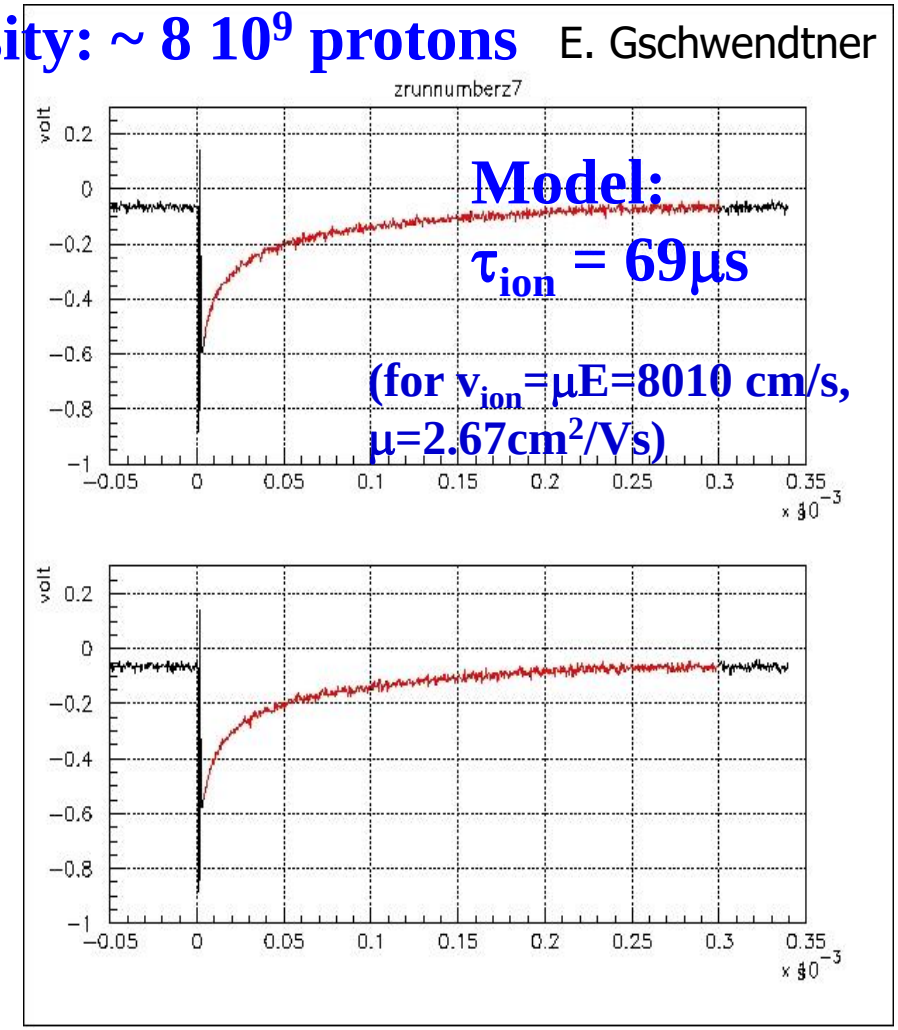


- Observation
  - After single bunch impact some channels show signal decreasing to zero
  - Effect due to cross talk over high voltage supply of detectors
  - Effect proportional to du/dt on chamber and caused by particle signal rise/fall time
  - After last years observation additional high voltage cabling (separation of IC and SEM and sectorisation of IC HV in straight sections (tuning may needed)
  - **Expected rise times over several turns (> 100us).**
  - **Expected reduction of effect by 3 orders of magnitude**

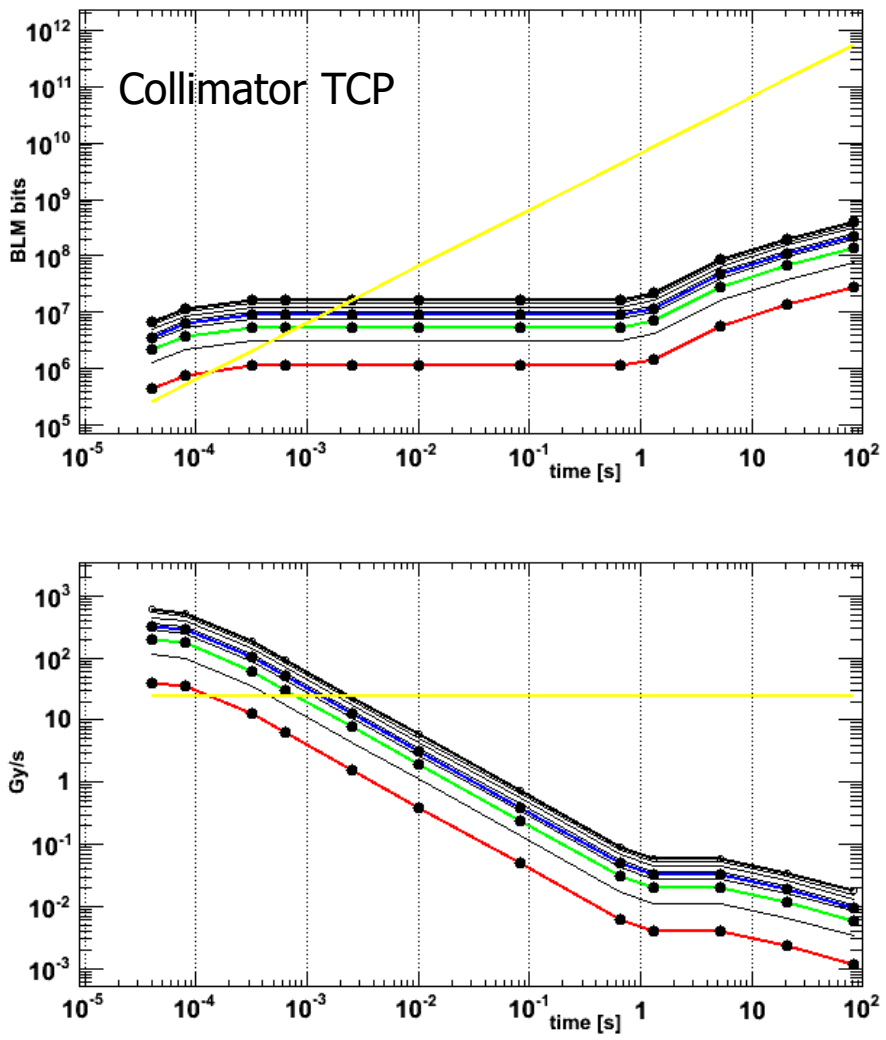
Electron & ion induced signal

Booster intensity: ~ 8 10^9 protons E. Gschwendtner





Check of BLM response in collimation areas



- Scan of collimators in IP3 (beam 1) and IP7 (beam 2)
  - IC signal:
    - all channels responded as expected
  - SEM signal:
    - Signal in the noise
    - Some channels have a to large signal; likely the detector has a vacuum leak
    - investigation are ongoing
    - Consequence: threshold settings only on ICs

Start-Up for the BLM system procedure

- Initial settings:
  - All BLM are set as mask-able, except some used for quench level calibration test and MKI ICs (settings are done in BLM system)
    - ARC test with nQPS system
    - MKI request by Brennan, thresholds to be defined by Brennan
  - All BIS BLM inputs are enabled (mask-able and un-mask-able)
- Depending of observations during low intensity running BLM channels are successively moved from the mask-able to the un-mask-able signal chain.
  - First IC
  - Later SEM
- Investigation on SEM signal observation are continued
- Electronic saturation of IC channels for single bunch loss observations
  - Installation of some more ICs on targets with a filter in the electronic chain
  - Not connected to the BIS
  - Targets are to be defined by Brennan
  - To be done in January
- Test time requests
  - Check of BLM response in IP3 for beam 2 (injected beam), 1 hour
  - Check of BLM response in IP7 for beam 1 (injected beam), 1 hour
  - Check of SEM response with (circulating beam), 1 hour
  - Quench level test with nQPS system, 4 hours