Roman Pot Insertions in High-Intensity Beams for the CT-PPS Project at the LHC

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Collision Debris Showers Interacting with the RP

Physics Objective: Central Production with 2 surviving protons:

\[ p \cdot \xi = p \cdot \xi = \text{fractional momentum loss} \]

\[ p \cdot \xi = p \cdot \xi = \text{measured in central CMS detectors} \]

\[ \sigma \] is photonic / Pomeron / Odderon exchanges

Collision Debris Showers Interacting with the RP

1. Beam Temperature and Beam Vacuum Response to RP Insertion

First RP Insertion Tests with High Intensity Beams before the Long Shutdown 1: Impedance Problems

The CMS - TOTEM Precision Proton Spectrometer (CT-PPS) Project (launched in 2014)

Detection of both surviving protons with Roman Pots:
- Tracking detectors: reconstruction of the momentum losses \( \xi_1, \xi_2 \)
- Time-of-flight detectors: measurement of longitudinal vertex position \( \xi_3 \)
  - vertex identification in high pileup
  - first diamond detectors to be installed in June 2016!

\[ \xi_1, \xi_2, \xi_3 \]

First RP Insertion Tests with High Intensity Beams before the Long Shutdown 1: Impedance Problems

The TOTEM / CT-PPS Roman Pot System after Long Shutdown 1: symmetric about IPS, shown here: sector 5-6

Collision Debris Showers Interacting with the RP

Beams 1 and 2 from IPS

Impedance heating combined with outgassing:
- Temperature rise on electronics cards inside RP's despite active cooling
- Mass (Mlxg. spec.) of metal outgassing on inserted RP box next to a broken ferrite
- Ferrite (Ferroxcube 4S60, not baked out at 1000 ºC) outgassing
- Beam vacuum deterioration

No beam instabilities observed

Summary:
- BLM response: linear with luminosity and with insertion distance extrapolation to 10^{34} and to 15 °m distance: no problem expected
- Beam pressure dependency on luminosity, generally rising, other strong systematic effects, no problem expected
- Temperature in RP: moderate increase with beam intensity, no problem expected
- Active cooling will protect detectors
- No beam instabilities introduced

Plan for 2016:
- RP insertions to 15 °m, later to 15 °m
- Physics data taking with diamond timing detectors

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