Status of energy deposition studies at IR7

Collimation Meeting
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Outline

• Summary of past activities & results
• Simulation of the cold arc under new conditions
  - Active absorbers on
  - Tertiary halo loss component
  - Case without secondary collimators
  - Vertical beam losses
  - Injection (pending)
• Simulations of doses in warm magnets, new conditions
  - Vertical beam losses
  - Dose in the pipes
  - Correction of position (pending)
• BLM's response
  - Cross-Talk
  - Individual detection spectra
Summary of past activities 1/2

cold magnets: active absorbers

- 20 cm long TCP active jaws
- No tertiary halo
- No passive absorbers
- Horizontal beam losses at 7 TeV
- 12 min accident scenario
Summary of past activities 2/2

Warm magnets: passive absorbers

Beam 1 (hori)

- TCLPA1 L.B1
  \[ s = -17803 \text{ cm} \]
  \[ 100 \text{ cm W} \]

- TCLPA2 L.B1
  \[ s = -17255 \text{ cm} \]
  \[ 20 \text{ cm W} \]

- TCSG.A6L7.B1
- MBW.B6L7
- MBW.A6L7

- MQW.A5L7
- MQW.AE
- MQW.AD

- TCLPA3 L.B1
  \[ s = -14436 \text{ cm} \]
  \[ 60 \text{ cm W} \]

No abs. with abs. absorber

- 60 cm long TCP
- Horizontal beam losses
- 7 TeV/beam
New simulation of the cold arc
Active absorbers + Tertiary halo + 60 cm TCP jaws + vert.

REMARKS:
- Hottest element MQ10
- Tertiary halo contributes 50% to the first elements
- Vertical losses less harmful
- Hottest element MQ11

Pending: Injection
New simulation of the warm magnets
vertical vs. horizontal beam loss scenario

Beam 1 (vert)

TCLAP.1L1B1  TCLAP.2L1B1
s = -17803 cm  s = -17255 cm
100 cm W  20 cm W

TCLAP.3L1B1
s = -14436 cm
60 cm W

MB/MQ... hori vert
TCLA

Energy [kW]

Peak dose [MGy/y]
New simulation of the warm magnets
dose in the pipes (horizontal loss scenario)

The heating film that wraps the pipes inside the MBW/MQW could be damaged...?
Simulation of Beam Loss monitors 1/3

Introduction

- BLM blocks after each collimator (TCP/TCS), below the beam line plane
- BLM twiss file created
- Each BLM contains 2 detectors
- Each detector measures:
  - **Fluence:** protons, neutrons, photons, muons (+/-), e-e+, pions
  - **Energy deposition**
- Each measurement made for a different beam source (loss in collimators)
Simulation of Beam Loss monitors 2/3

Cross-talk Matrices (vertical detector), 7 TeV/beam

### Horizontal beam loss scenario

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### Vertical beam loss scenario

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- Cross talk ~ 1/d
- Big cross-talk between primaries
- Little backscattering
- Similar picture for horizontal and vertical beam
- Similar cross-talk for the 2 detectors
- Loss estimation
  \[ L = (M^T M)^{-1} M \]
Simulation of Beam Loss monitors 3/3
Predicted response of every BLM

- Detected particles
  - Protons
  - Neutrons
  - Muons (+/-)
  - Photons
  - Electrons/positrons
  - Pions (+/-)

- Loss scenarios (7TeV)
  - Horizontal
  - Vertical
  - Full losses

- 2 detectors/BLM
- Injection not analyzed
Future outlook

- **Cold section: Injection**
- **Warm magnets:**
  - Correct position
  - Heat load during injection
  - Vertical case...
- **Reports**
  - IR7-FLUKA techniques
  - Optimization of the active absorber scheme for the protection of the dispersor suppressor
  - Protection of warm elements at IR7, passive absorbers and collimators
  - FLUKA simulations for the optimization of beam loss monitors
- ...