Showering Studies for BLMs

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• **Idea:**
  
  detect shower particles outside cryostat induced by beam 
  particle losses
  
  - relation between beam particles and quenchlevels
  - correspondence between particle fluence outside cryostat and quenchlevels

• **Method:**
  
  ➔ proton loss distribution: most likely position of losses 
    misalignment, $\beta_{\text{max}}$

  ➔ proton loss shower simulation

  ➔ obtain detector signals per lost proton
• proposal for beam loss detectors
  position, corresponding signals for quenchlimit.

With the

• Aim
  ➔ distinguish between 2 beams
  ➔ find out where loss has happened
Proton shower simulation

Geant 3.21

Dispersion Suppressor

- Detailed simulation of magnet geometry, Version 6.3
  MB, MQ, MQM, MQML, MQMC, MQTL,
  MCBCB, MSCBA, MCDO, MCS, BPOM,

- Magnetic field maps for Quadrupoles, Dipoles (Roxie)

Point loss

- Incident angle of 0.25mrad
- Losses in horizontal (QF) and vertical plane (QD) of beam screen
- 150 events with same impact parameters
MQML in Q10

 MQML

beam2
beam1

D
F

left detector
right detector

x
y
z
Typical shower distribution of point-loss in MQML

beam1 impact at -3543cm
shower maximum at ~-3450cm
(~100cm later)

right detector signal

beam impact shower max. z [cm]
Impact of beam1 and beam2, cross-talk...

proposed detector@ -3450cm

Q10

right detector signal

beam1
loss@ -3543cm

beam2
loss@ -3543cm

proposed detector@ -3650cm

Q10

left detector signal

MBB MQML MCBCB MCDO MBA MCS MBB

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6.6x 10^{-5} ch./p/cm^2 6.6x 10^{-5} ch./p/cm^2
• Longitudinal proton loss distribution will modify shower distribution significantly!
Proton loss density in DS

proton loss density in DS with collimators in D2 and D5

lost protons/m/s

distance from IP1 (m)

vertical crossing in IP1
horizontal crossing in IP5
zero crossing in IP1 or IP5