Crystal Collimation

Malin Klintefjord
Supervisor: Walter Scandale

EN-STI-EET

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Outline


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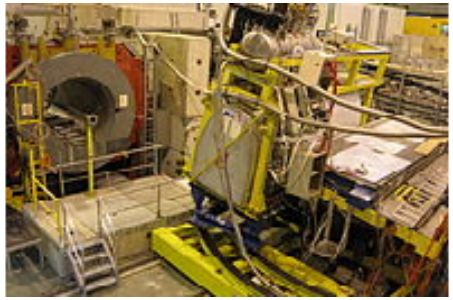
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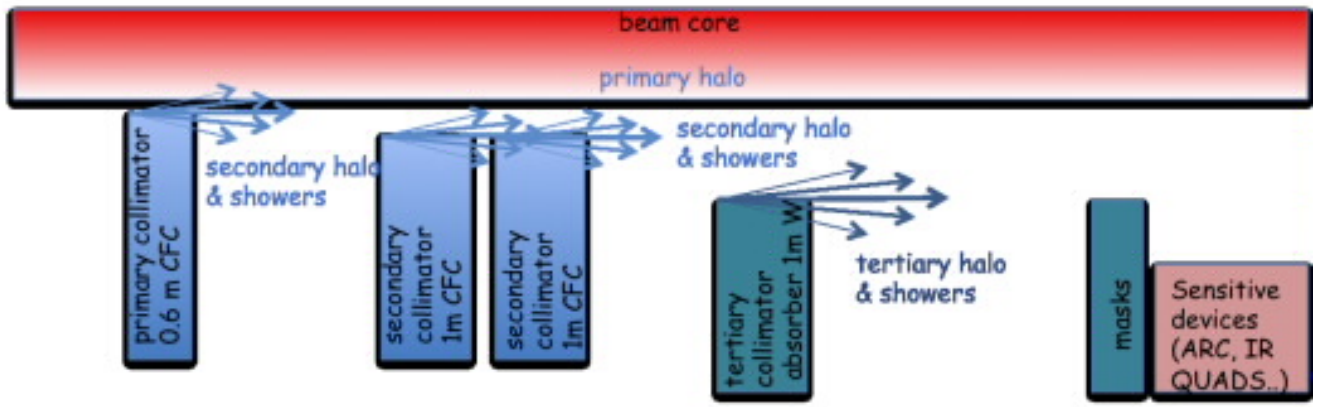
- Why?
- How?
- Result?

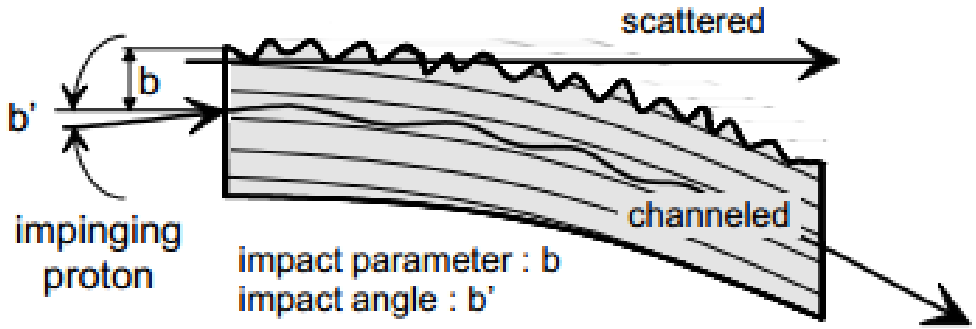
Collimation

- Beam emittance increases due to scattering during bunch crossing, between protons in the same bunch or scattering with residual gas.
- Create Halo of off-momentum particles.
- Quench of superconducting magnets.
- Scattering in primary collimator gives a kick and some of the particles reach secondary collimator.

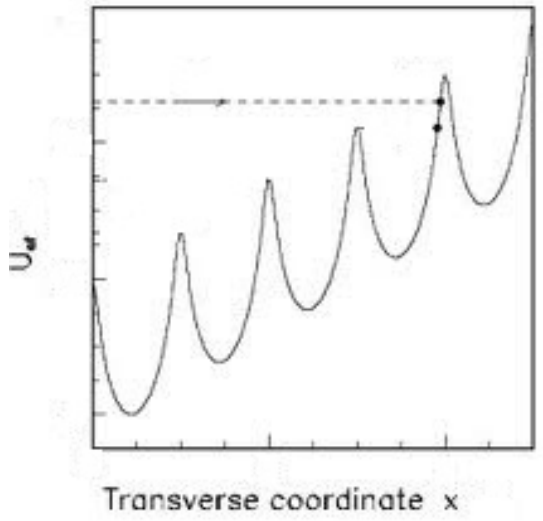


- Problem: Lots of particles escape due to multiple scattering in primary collimator and small angle of deflection.

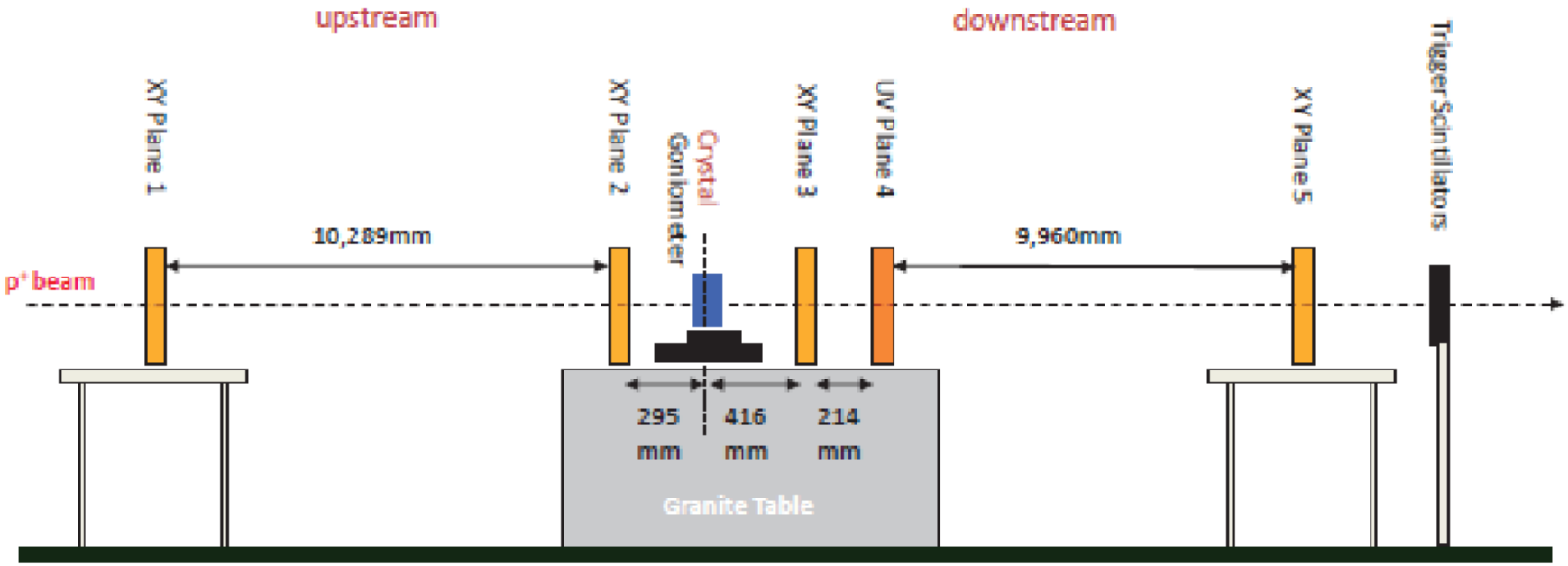
Bent crystals



- Potential in bent crystal

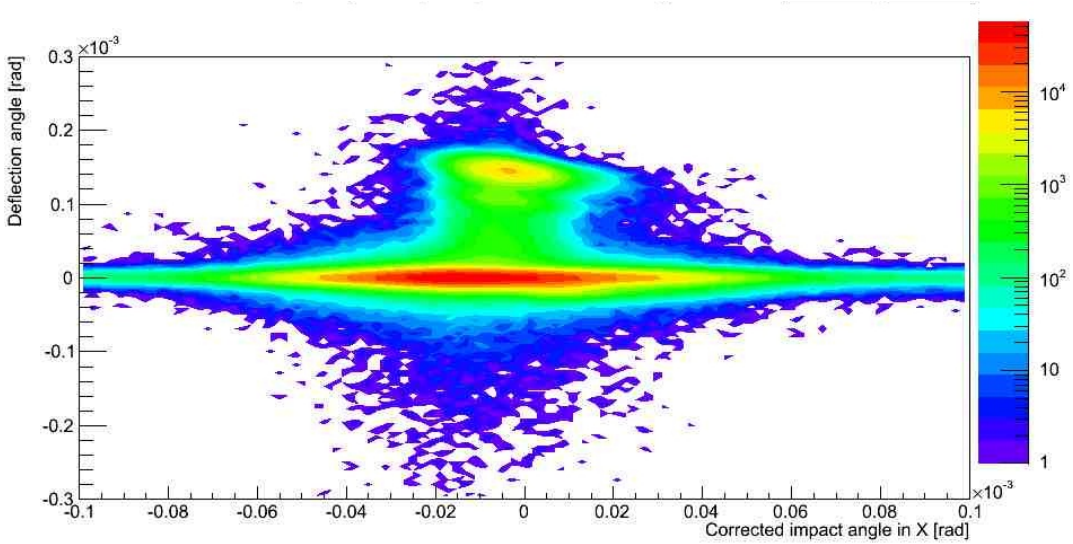


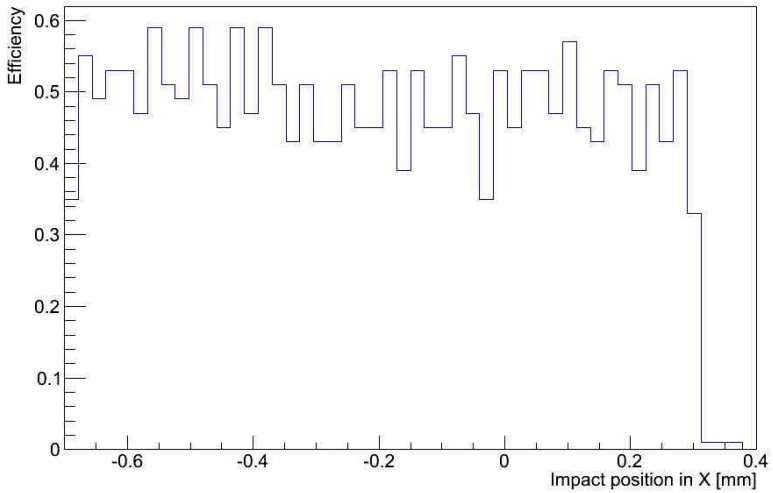
H8 setup



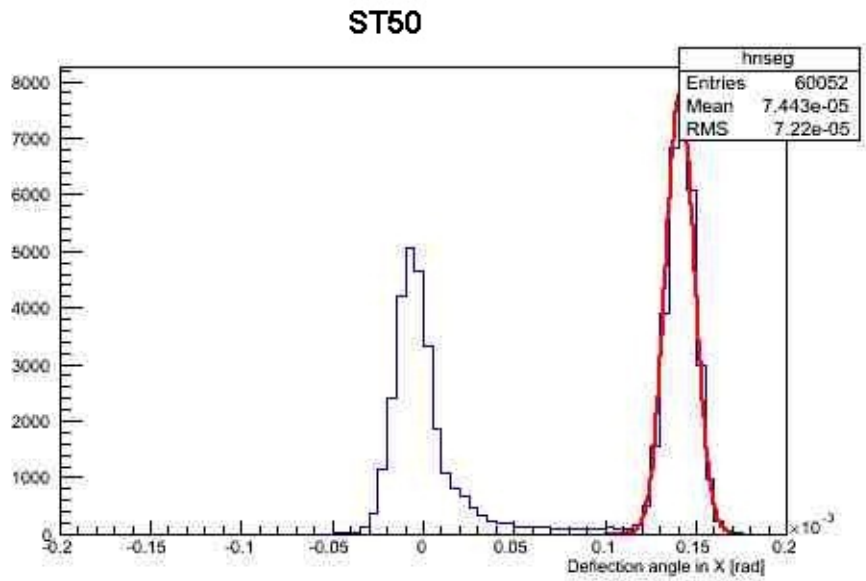
- High resolution Si microstrip detectors for tracking the particles before and after the crystal.
- Crystal mounted on goniometer in order to align crystal planes with the beam.

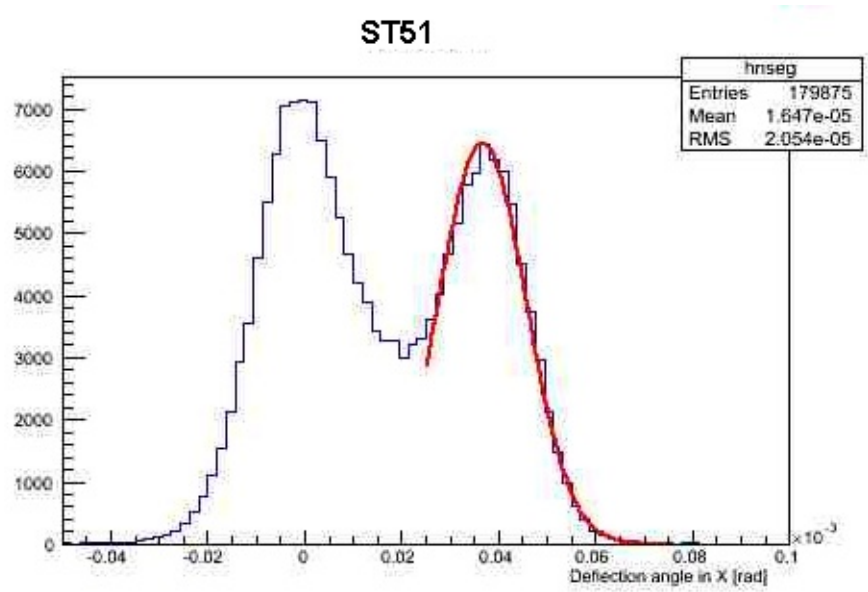
Channeling


Deflection angle [rad]
×10^-3
0.3
0.2
0.1
0
-0.1
-0.2
-0.3
-0.1
-0.08
-0.06
-0.04
-0.02
0
0.02
0.04
0.06
0.08
0.1
Corrected impact angle in X [rad]
×10^-3
10^4
10^3
10^2
10
1


Efficiency
0.6
0.5
0.4
0.3
0.2
0.1
0
-0.6
-0.4
-0.2
0
0.2
0.4
Impact position in X [mm]

Deflection angle





ST50-SPS

- Thickness: 2mm
- Bending angle: 170 μrad
- Best efficiency: 66%
- Torsion: 0.62 μrad/mm

ST51-LHC

- Thickness: 3mm
- Bending angle: 45 μrad
- Best efficiency: 77%
- Torsion: -1.05 μrad/mm


Questions?
CERN
ATLAS