Detectors for the INTAS experimental program

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Meeting on Crystal Channeling
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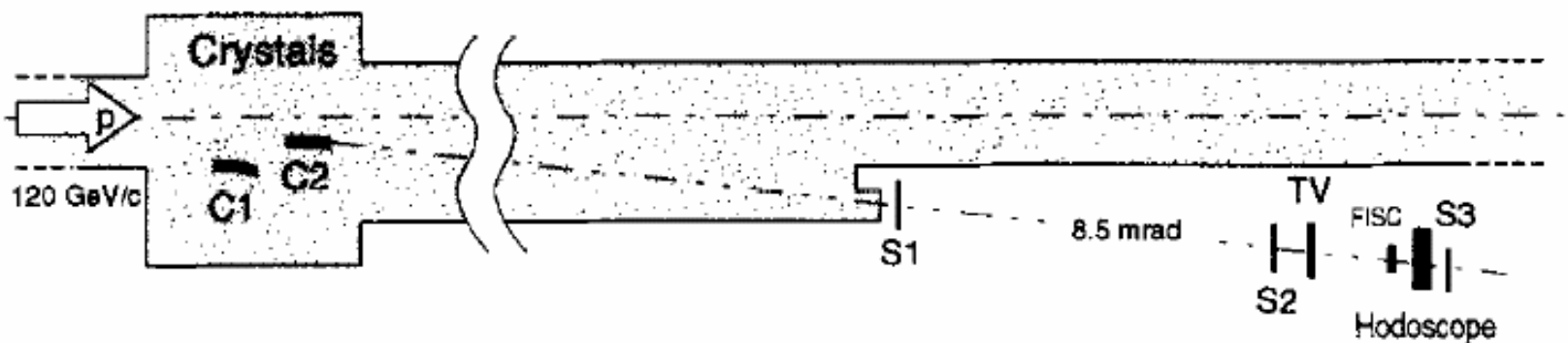
INTAS PROPOSAL

- INTAS Proposal "**Experimental study of crystal channeling at CERN SPS for use at the LHC in diffractive physics and halo cleaning**", Ref. Nr 05-103-7525
- "a facility at CERN SPS for tests and characterization of crystals to be used for particle channeling studies in the SPS"
- 2 crystal stations: deflection at large (some mrad) and low (200 μrad) angles
- station equipped with goniometers, crystal holders and particle detectors

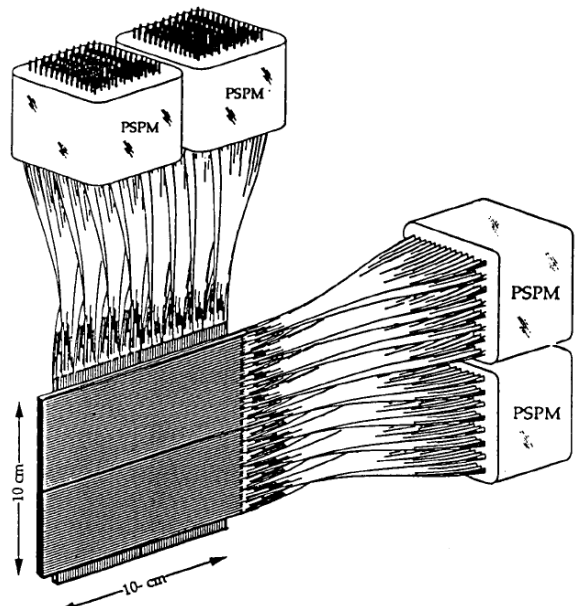
RD22 experiment

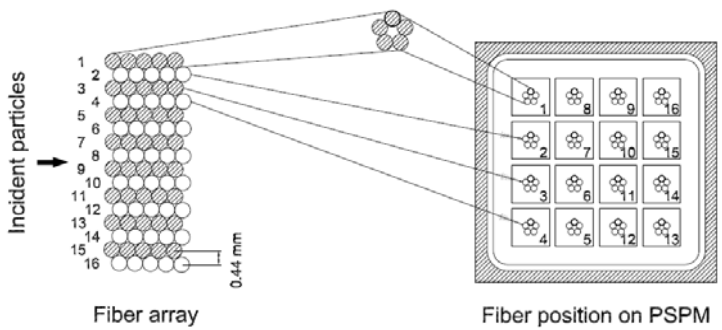
- 120 GeV/c SPS proton coasting beam, 5×10^{11} p
- 8.5 mrad bending angle
- extracted protons measured in external telescope:
  - scintillators for counting and triggering, FISC for monitoring
  - scintillating hodoscope to measure beam profile:
    - 3.2 x 3.2 cm^2
    - 32 H + 32 V 1 mm strips (64 PMTs)
    - maximum rate per strip 10^7 s^{-1}
    - detection efficiency 98%



First crystal station (1)

- external telescope to detect the protons extracted from the SPS through a crystal bent with an angle of some mrad (arrangement similar to RD22)
- DIRAC SCI-FI detector:
  - 10x10 cm^2
  - column pitch 0.44 mm
  - 0.5 mm Φ fibers (0.28 mm prototype)
  - 16 channels PSPM
  - 5 fibers per pixel
  - for 2 planes 480 channels (30 PMTs)
  - spatial resolution: 127μm
  - time resolution: 650 ps at flux $2x10^7$ s^{-1}





First crystal station (2)

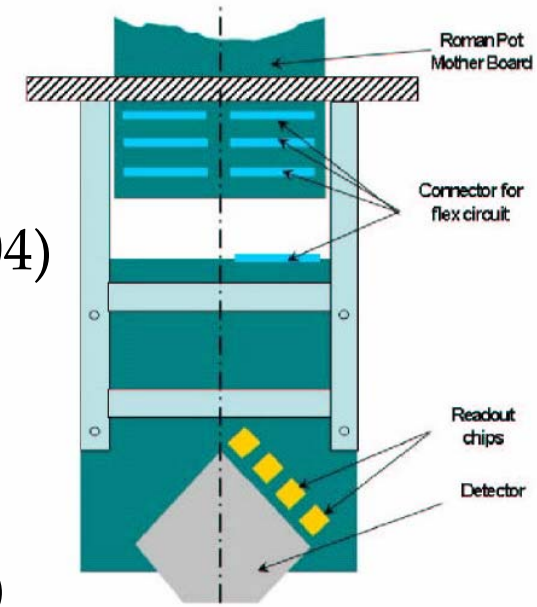
- GEM detectors (TOTEM, COMPASS)
  - good spatial resolution (~ 70 μm) with very high rate capability
  - the detector sensitive area can be tailored into the shapes required by the experiment

- AMS silicon microstrip tracker (spatial resolution of ~ 10 μm, thickness 300 μm)

Second crystal station (1)

- assembly of 2 Roman Pots to detect the particles bent by the first crystal at low angles (200 μrad)
- Roman Pots could be equipped with either silicon microstrips or scintillating-fiber detectors

- TOTEM Roman Pots:
  - Prototype installed and operated in SPS (2004)
  - access the beam vertically
  - stepping motors 5 μm resolution
  - vacuum requirements: ~10^{-7} mbar for SPS (primary) and ~10^{-4} mbar for pot (secondary)



Second crystal station (2)

- Silicon strip detector (TOTEM)
  - 3x3 cm^2, strip pitch of 50-100 μm, achievable spatial resolution of 10-20 μm
  - 200 μm window separates the detectors from the primary beam vacuum
- Scintillating fiber detector (ATLAS Luminosity)
  - 3x3 cm^2, 0.5 mm square fibers, 10 fibers along track path
  - 10 layers of one plane staggered in multiples of 50 μm (spatial resolution of 20-30 μm)
  - 2 planes (X,Y) and a scintillator plate