

Crystal Channeling Meeting, CERN, 8-9 December 2005

CHAIRMAN: Walter Scandale

PRESENT: Gianluigi Arduini, Cristina Biino, Massimiliano Fiorini, Vincenzo Guidi, Yuri Ivanov, Mario Macri, Riccardo Milan, Nikolai Mokhov, Anatoly Petrunin, Stefano Redaelli, Vladimir Samsonov, Walter Scandale, Giovanni Valenti, Frank Zimmermann

TOPICS: Reflection of protons from bent atomic planes; Crystal collimation at the Tevatron; Crystal channelling experiment at the CERN SPS

PRESENTATIONS:

Thursday 8 December (morning):

- Yuri Ivanov (PNPI) introduced the experimental observation of proton reflection from bent atomic planes.
- Nikolai Mokhov (FNAL) showed the results obtained at the Tevatron collider concerning the application of crystal channelling for the improvement of collimation efficiency.
- Yuri Ivanov showed his interpretation of the crystal collimation data from colliders.

Friday 9 December (morning):

- Yuri Ivanov proposed a layout to study crystal channelling using an extracted beam from the SPS machine.
- Massimiliano Fiorini (FERRARA University) introduced possible choices of detectors.
- Vincenzo Guidi (FERRARA University) presented new materials and techniques for crystal production and characterization.

Friday 9 December (afternoon):

- Stefano Redaelli (CERN) illustrated preliminary calculations for the LHC.

DISCUSSION:

Concerning the experimental layout proposed by Y. Ivanov to study proton small-angle scattering it was proposed to have more redundancy on the detector side by using, for example, scintillating hodoscopes in addition to the AMS-like silicon detectors. The possibility of using fluorescent screens should be considered as well.

Depending on the beam divergence that will be provided by the accelerator it will be crucial or not to track every single particle impinging on the crystal.

The amount of material placed in the path of the particle before the crystal should be as small as possible in order not to spoil the beam divergence.

Downstream of the whole setup and outside of the vacuum pipe a hodoscope could be placed for triggering and monitoring purposes (for example the RD22 one).

It is proposed to create a setup with 2 crystals (to be used at CERN and at FermiLab) and 2 goniometers: the RD22 tank (to be refurbished) can be used for that purpose.

M. Macri proposed to use scintillating fiber detectors using VLPC readout (D0 and E835 at FNAL) to be used as a hodoscope.

W. Scandale reported that beam time has been requested to the SPS coordinator for a 3 weeks period in 2006. The desired beam is a positive hadron beam, with at least 300 GeV/c momentum and very low divergence (the proposed beam-lines are H8 and H4). C. Biino said that the P0 beam-line could be a valuable alternative to H8 (that is probably overbooked for 2006): calculations of the attainable divergence will be made soon by Lau Gatignon.

The chairman proposed M.Fiorini to be responsible for the extracted beam experiment. The people present agreed that W. Scandale and M. Fiorini will be co-responsible.

The first useful run period will be the first week of June 2006 (beam is available from April to November). It is proposed to run with the simplest configuration (stations with scintillating detectors only) if the AMS silicon strips will not be available in a short time scale. The crystal will be bent at an angle of $\sim 100 \mu\text{rad}$ and the use emulsions could be considered as well.

CRYSTALS TO BE USED (inputs from N. Mokhov):

- 1) build 1 pair of 1mm long and 1 pair of 3 mm long crystals
- 2) $120 \mu\text{rad}$ bending angle
- 3) possibly zero miscut angle
- 4) no preference between planar or axial channelling
- 5) thickness to be studied by V. Guidi as a function of mechanical stability and on the possibility of anticlastic bending
- 6) use (1,1,1) plane

MONEY REQUESTS:

To be clarified within short time and discussed next meeting.

LIST OF ITEMS TO BE BUILT/MODIFIED AND PROPOSAL OF RESPONSIBILITIES:

- | | | |
|----------------------------------|----------------|---|
| 1. Tank: | a. Goniometers | (Vomiero,LNL) |
| | b. Crystals | (Chesnokov, IHEP
Guidi, Ferrara
Ivanov, PNPI) |
| | c. Integration | (Scandale, CERN) |
| 2. Pipe with detector insertions | | (Kovalenko, JINR) |
| 3. Scintillators | | (Fiorini, Ferrara
Ivanov, PNPI
Kovalenko, JINR) |
| 4. Calculations | | (Biryukov, IHEP
Mokhov, FNAL
Taratin, JINR) |
| 5. Data Analysis | | Scandale, CERN
INTAS |
| 6. Silicon Detectors | | CERN, INFN, JINR, PNPI |
| 7. DAQ (Data Acquisition) | | CERN, INFN |

PLANNING:

- 1) Send goniometers to LNL for modifications (before Christmas)
- 2) Organize a meeting on the 2nd-3rd of February 2006 and fix the list of responsibilities
- 3) Organize regular telephone meetings every 2 weeks (proposed time is Wednesday 16.00 Geneva time) → next phone meeting on Wednesday December 21st 2005
- 4) Create a mailing list and a web site (as a CARE working group)
- 5) Check the availability of Roman Pots (TOTEM, UA4) → M. Macri
- 6) Ask Battiston (Perugia University) for availability of AMS silicon strip detector samples
- 7) Check the availability of scintillating fiber detectors using VLPC readout at FNAL → N. Mokhov

ADDITIONAL OPTIONS TO BE STUDIED:

- 1) use of a crystal instrumented with sensitive area (V. Samsonov)
- 2) radiation hardness of detectors to be put after the crystal in the Tevatron (possibility of using MSGC, as the ones used in the RD22 experiment, or GEM detectors)