# INTAS 2005-103-7525

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## Experimental study of crystal channelling at CERN SPS for use at the LHC in diffractive physics and halo cleaning

**From** 2006-06-01 **to** 2008-11-30

## Project details

**Total cost:**

EUR 102 000

**EU contribution:**

EUR 139 800

**Coordinated in:**

Switzerland

## Objective

The research program aims to create at CERN SPS a facility to test and characterize crystals for channelling and to validate the procedure to obtain a very powerful collimation system for the LHC and a system to increase the experimental possibilities in proton-proton diffractive physics. This has been reviewed in a recent workshop held at CERN on March 7 & 8, 2005. The project will proceed with modifications to the SPS lattice and hardware (point 1 & 2 in the list below). The new generation silicon crystals will be produced at PNPI Gatchina (point 3) under the provision obtained from the calculation performed for LHC collimation system studies (point 4 & 6) and the diffraction studies (point 5). Before installation in the SPC, the crystals will be tested in the laboratories of the Ferrara University and LNL and be tested in a first characterization run in the Protvino accelerator (point 7, 8 & 9).

The tasks of the project are:
1. Lattice calculations and software implementation for extraction- and collimation- modes in the crystal channelling experiments at the SPS.
2. Simulations for crystal experiments in the SPS for optimal location, choice of the crystal, bending angles and other related issues to provide the basis for proper layout and geometry of the experimental set-up for crystal experiments in the SPS.
3. Simulations for optimal design of a crystal for application in experiments on diffractive proton-proton interactions.
4. Preparation of bent crystals to be tested at the SPS with 270GeV/c protons. Development of silicon crystal deflectors for high-energy particles.
5. Surface treatment of crystal samples for use in the SPS.
6. New crystalline materials for channelling in the SPS
7. Morphological and structural characterizations of crystalline materials to be used in the SPS.
8. First characterization of crystals in the U70 facility at 70GeV/c.
9. Preparation of the experimental set-up for crystal channelling measurements at the SPS: crystal holders, goniometers, particle detectors and data acquisition.
10. Perform data taking runs of crystals channelling experiment in the various conditions.
11. Assessment of crystal channelling technique as potential beam instrument at the LHC energies, in particular for the use at LHC in diffractive physics and for halo cleaning.
12. Comparison of experimental results achieved in the SPS measurements with current theories of beam multi-pass steering by short crystals in a broad range of energies.

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