Astronomy Day in 1993 within the context of the International Space Year. The data that were collected will supply an importance reference set for the observations to be made this July during the impacts.

The possibility exists that the phenomena will not live up to the public's expectations for we cannot expect astrophysical forecasting to be as accurate as weather forecasts, even in these times of advanced techniques and extensive whole-Earth observation from satellites. However, we can be sure that the observational effort will contribute enormously to our understanding of planetary phenomena, especially to atmospheric physics and the interactions between particles in planetary magnetospheres.

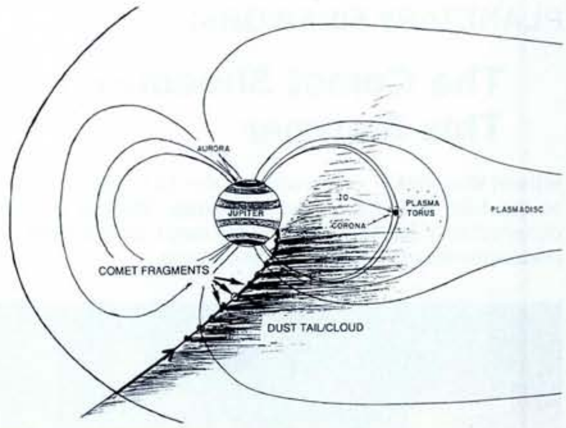
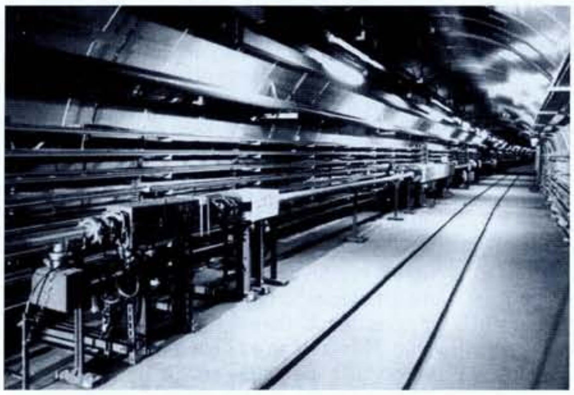


Fig. 2 — A drawing (not to scale) illustrating the geometry of the collision between the comet SL-9 and the planet Jupiter. A wide variety of plasma and atmospheric phenomena will take place in the very dynamic environment of the Jovian system. (Courtesy of R. Prange, IAS, Orsay)

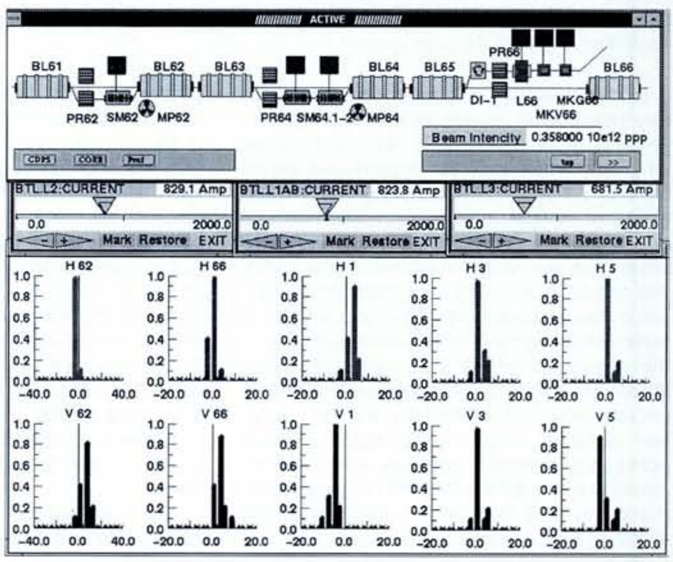
UNK, Protvino

A Milestone in Spite of Hardships



View of the UNK's transfer-line tunnel showing the beam-line magnets.

A typical control screen for the transfer line. At the top, a synoptic view of equipment in the beam line; at the centre, so-called "sliders" allowing adjustment of magnet currents; at the bottom, horizontal and vertical beam profiles as measured at points along the line. The control software was developed using Vsystem, a commercial controls package from Vista Control Systems, Inc., Los Alamos, USA.



On the weekend of 12-14 March, a proton beam was extracted from the 70 GeV injector synchrotron and successfully steered through 2 km of the fully equipped transfer tunnel leading to the UNK accelerator and storage ring complex which is under construction at Protvino, 100 km south of Moscow.

UNK is an ambitious project, originally involving three accelerators in a 21 km in circumference tunnel. A conventional magnet synchrotron (Stage 1) would take the proton beam from 70 to 400 GeV. Thereafter it would be accelerated to 3 TeV in two counter-rotating superconducting accelerator storage rings (Stages 2 and 3), thus aiming at collider physics of 6 TeV in the centre-of-mass. Following financial difficulties after perestroika, it was decided to concentrate for the time being on the conventional Stage 1 accelerator which can be run up to 600 GeV for fixed-target physics. Conditions did not improve meanwhile so construction of even the first stage stagnated until recently. In spite of this malaise the transfer line continued slowly but steadily to be equipped with its magnets, vacuum system, beam diagnostic instrumentation, and computer controls. It was then logical that this transfer line be tried out with an actual proton beam well in advance of the accelerator itself, as was the case for CERN's LEP collider.

The exercise aimed to test two main aspects: first, the functioning of the design and the implementation of the beam ejection and transfer line and, second, the integration of the equipment into a coherent unit using the beam diagnostics and control systems. The 2.7 km-long transfer line houses 52 dipole magnets of 5.8 m in length, 88 quadrupole lenses and 56 correction magnets. The beam diagnostics comprise 3 current monitors, 46 position monitors, 26 profile monitors as well as beam loss and halo monitors. The control system uses microprocessor-based equipment controllers, personal computers at an intermediate level and, as the operator interface, workstations with modern graphics software packages.

The injector synchrotron U70 accelerated 5 out of the possible 30 proton bunches at 6 MHz to 65 GeV, at which energy the beam was recaptured at 200 MHz, as is required for UNK. A beam of about 3.5×10^{11} protons per pulse was thus ejected into the transfer line and successfully steered up to a beam stopper placed at 2 km from the start. The emitance measured at that point was in good agreement with the design value. The combination of beam diagnostics and control systems, which were in part developed in collaboration with CERN, allowed operation of the whole beam-transfer line from one central point in a user-friendly way.

Accelerator staff and particle physicists everywhere rejoice with their Russian colleagues in Protvino and hope that the milestone signifies a lasting positive turn in the UNK endeavour.

B. Kuiper, *CERN*

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