The experimental station will consist of a six-circle diffractometer. Four main circles are in the incident beam while two circles are in the scattered beam, and contain the analyzer crystal. The experimental station sits on a stand with five degrees of freedom for sample adjustments. The 2θ resolution of 0.15^0(mode A), 0.02^0 (mode B) and 0.15^0 (mode C) will be achieved in the set up. There will be scintillation counter as well as area x-ray detectors.

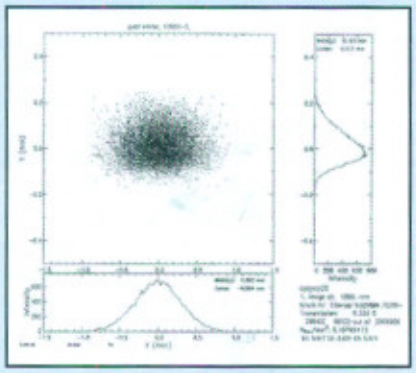

Fig. A.9.2 The spot diagram for 5-element configuration, WLS source and the angle of incidence of the photon beam on the mirror is 3 mrad for mode A

(Contributed by: Dr. RV Nandedkar; nrv@cat.ernet.in)

A.10 Radiation safety in Indus-1

Due to interaction of electrons with vacuum components, structural materials and residual gas molecules in vacuum envelope, ionizing radiation is produced which is the main occupational hazard in Indus-1. The prompt radiations, which are present, only when accelerator is 'ON' are Bremsstrahlung x-rays and photo-neutrons. Bremsstrahlung x-rays have a broad spectrum with energies extending up to the primary electron energy and are highly angle dependent. Intensity of these x-rays peak in the forward direction of the beam. Dose due to photo-neutrons is insignificant in comparison with x-ray dose rates.

Bremsstrahlung x-ray spectrum measurements were carried out at experimental hall of Indus-1 using a 2" x 2" BGO detector, in search for any high-energy photons reaching the experimental area. The measurements indicated that the photons reaching at most of the experimental stations are within 10MeV. The injection and storage mode operation did not indicate significant change in the spectra (fig. A.10.1). Besides, the comparison of direct (without any shield) and transmitted (with 8 cm lead shield) at the high-resolution beam line showed that the spectra extends up to several hundreds of MeV. Various measurements have proved that all the experimental stations in use have a radiation level ~ 0.1μSv/hr (10μRem/hr), similar to background radiation levels.

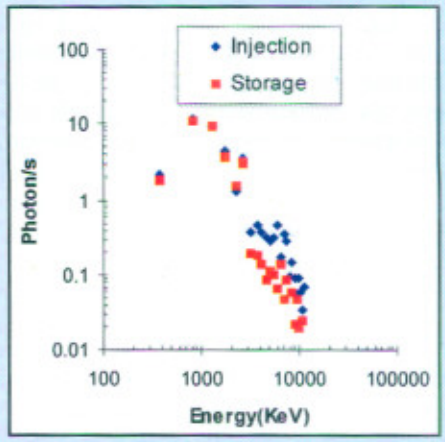

Fig.A.10.1 Bremsstrahlung spectra at reflectivity beam line during injection & storage

(Contributed by: Haridas G Nair; haridas@cat.ernet.in)

A.11 Gas phase multiple ionisation experiments at Indus-1

Photoionisation cross-sections of rare gases have been measured in the past, but there is a paucity of accurate experimental data for higher charge-states. The aim of this series of experiments is to generate a systematic data set for thresholds of multiple ionisation and for energy dependence of ionisation cross-sections. These measurements are important for understanding the correlated behavior of multi-electron systems.

A time-of-flight mass spectrometer (TOF) was designed and indigenously built for these measurements. The spectrometer uses two uniform, linear electric fields, conforming to the Wiley-McLaren geometry (fig. A.11.1). Ion charge states are separated on the basis of their flight times. Ions formed in a small overlap volume of the crossed neutral beam and photon beam. The neutral beam is formed by effusion of a gas through a capillary, whose position is fixed with respect to the other spectrometer components.

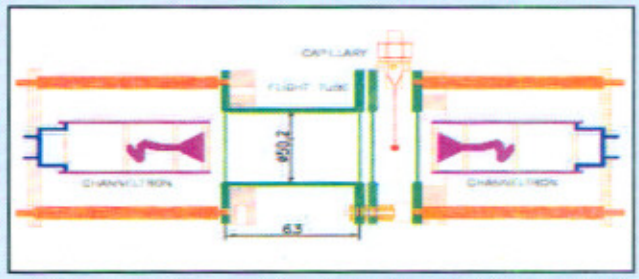

Fig. A.11.1 Spectrometer field layout