Nuclear Resonant Scattering Beamline

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The nuclear resonant scattering beamline is one of the beamlines rich in the advanced research sciences and technologies in SPring-8. The beamline will be used for the following experiments:

(1) Time domain Moessbauer spectroscopy,
(2) Conversion electron spectroscopy,
(3) Nuclear resonant scattering process under magnetic perturbation,
(4) Cascade decay of nuclear transitions in a single crystal,
(5) Extremely high energy resolution spectroscopy,
(6) X-ray interferometric study using nuclear resonant scattering,
(7) Intensity correlation experiments for X-ray photons,
(8) X-ray inelastic scattering in materials and biology.

The choice of the insertion device is governed by the distinct transition energies of the nuclear levels. The beamline makes use of the time structure of the synchrotron radiation and ultra-high monochromatization, typically $\Delta E/E \sim 10^{-13}$. Time resolved investigations (time resolutions involved are 100ps to 1ns) are common practice for experiments performed at his beamline. It is necessary to set up experiments a few-bunch mode (7 to 21 bunches corresponding to a spacing of 680 to 230ns between adjacent bunches) or a single bunch mode (4.8 μs spacing) of the storage ring. A signal-to-background ratio better than 10^8 using a cleaning process of buckets will be very encouraging for future applications.

A monochromatization down to $\Delta E/E \sim 10^{-13}$ will be achieved with electronic and successive nuclear monochromators. The first stage of monochromatization down to about $\Delta E/E \sim 10^{-7}$ can be obtained by means of electronic monochromators. A further monochromatization can be obtained only by nuclear monochromators. The monochromatization by the electronic monochromator will be done in two steps. First there will be a conventional Si (111) monochromator to overcome the heat load (Fig.1). The second electronic monochromator will be a four-crystal setting.

In the experimental station, high precision diffract meter is installed for nuclear resonant scattering experiments (Fig. 2). Several high precision goniometers are mounted on the anti-vibrated table to meet the user's requirements of wide versatility for crystal arrangements.

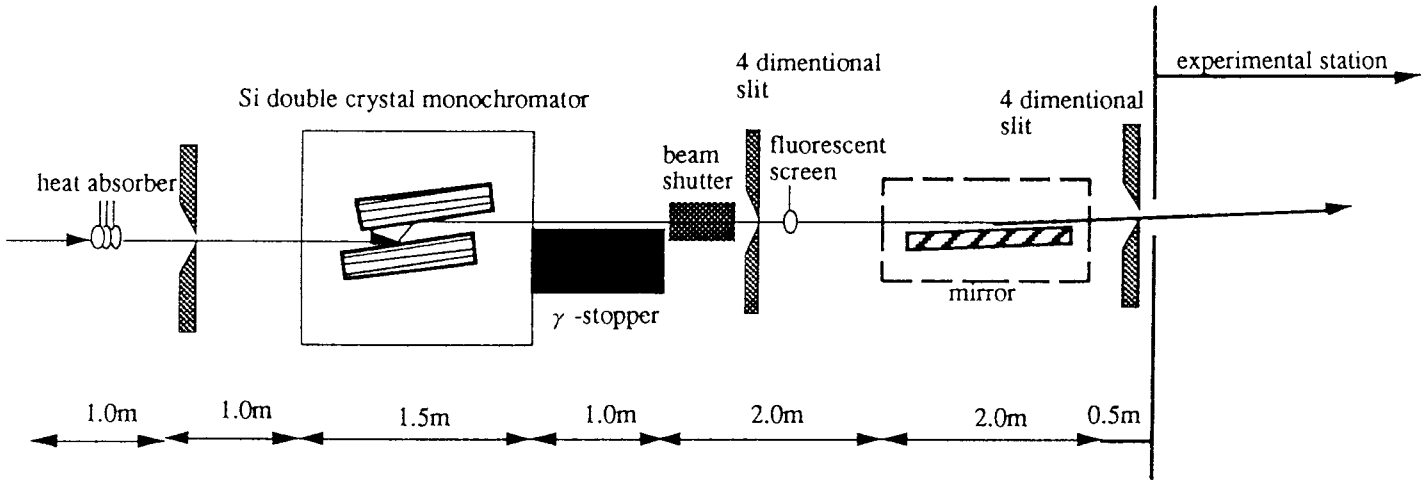

Fig.1 Outline of optics

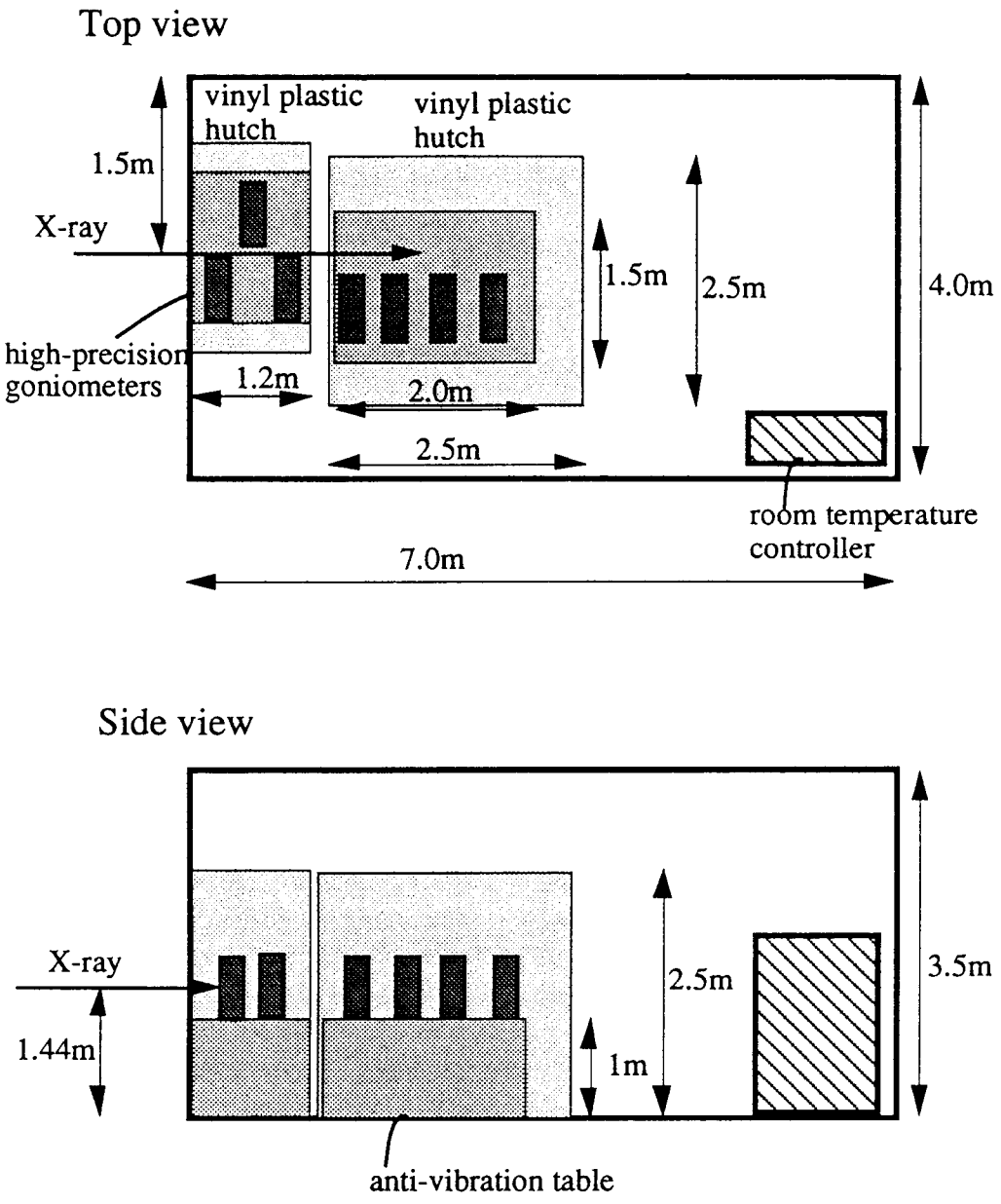

Fig. 2 Outline of experimental station