Optical design of an undulator based ARPES beamline on Indus-2

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The design of an undulator based Angle Resolved Photoelectron Spectroscopy (ARPES) beamline is presented here, which is proposed to be installed in Indus-2 (2.5 GeV, 300 mA) synchrotron radiation source. The undulator proposed for this beamline is a planer Pure Permanent Magnet (PPM) type undulator which has 23 periods and a period length of 93 mm. The ARPES experimental station is proposed to have a five axis sample manipulator with sample temperature down to ~ 30K. The beamline is designed to cover the energy range of 30-1000 eV and is expected to give resolving power of about 12000-3000 for the energy range with moderated flux. It consists of three types of optical elements: two toroidal mirrors, two spherical mirrors, four Varied Line Spacing Plane Gratings (VLS-PG). The two toroidal mirrors have been used as pre and post focusing mirrors. In the monochromator section spherical mirror and VLS-PG are mounted in Monk-Gillieson configuration [1]. In order to cover the energy range of interest, two interchangeable spherical mirrors and four interchangeable VLS-PGs have been used in the monochromator section. The VLS-PGM operates in two constant included angle configurations to cover two photon energy ranges of 30-270 eV and 215-1000 eV. The output beam from last optical element of the beamline is horizontal at a height of ~ 1100 mm so as to be compatible to the proposed experimental station. The overall performance of the beamline has been evaluated by carrying out ray tracing simulation with SHADOWvui [2]. SPECTRA [3] has been used to study the characteristics of the undulator radiation and to determine the size of an aperture at a distance of 10 m from the centre of the undulator. The ultimate resolution and photon flux at 30 eV from ray tracing simulation are 5 meV and 2.5×10^{12} photons/s/0.1 % BW, respectively, with the spot size (FWHM) of ~300 µm (H) ×110 µm (V) at the sample.

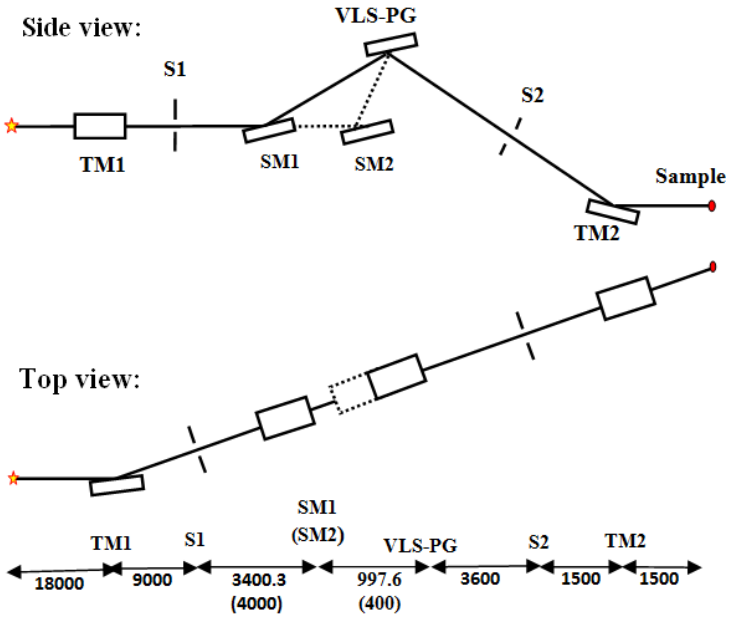

Fig. 1. Optical layout of the beamline

[1] K. Amemiya et al., Journal of Synchrotron Radiation, **3**,282-288, (1996)
[2] F. Cerrina et al., SHADOWvui, Centre for X-ray Lithography, University of Wisconsin
[3] T. Tanaka and H. Kitamura, Journal of Synchrotron Radiation **8**, 1221, (2001)