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ScienceDirect

Infrared Physics & Technology 49 (2006) 147–151

INFRARED PHYSICS & TECHNOLOGY

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Infrared and terahertz spectromicroscopy beam line BL6B(IR) at UVSOR-II

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Available online 3 March 2006

Abstract

We have recently installed an infrared (IR)–terahertz (THz) beam line BL6B at UVSOR-II. The beam line collects a large acceptance angle of 215(H) × 80(V) mrad^2 to obtain high flux in the IR and THz regions. A "magic mirror" with vertical angle focusing was employed as the first mirror. The mirror chamber was directly connected to the bending magnet chamber for collecting the high flux and high brilliance IR and THz light. The obtained performance and the outline of the end stations are reported.

PACS: 07.57.−c; 78.30.−j

Keywords: Infrared synchrotron radiation; Beamline; UVSOR-II

1. Introduction

Infrared synchrotron radiation (IRSR) is now a useful experimental tool for an infrared (IR) microscope with the diffraction limit resolution and for a high intensity source in the terahertz (THz) region [1]. IRSR has been firstly dedicated for users about two decades ago at UVSOR, Institute for Molecular Science, Japan [2]. After beginning of the application, the brilliance advantage of the IRSR has been proved at several storage rings in the world [3]. Recently, UVSOR was upgraded to a low emittance ring with 27 nm rad and the name was changed to UVSOR-II [4]. The storage ring of UVSOR-II equips six straight sections; three in six are 3-m long sections and the other three 1-m short ones. Since the old IRSR beam line locates on the extended line of one of the short straight sections, the beam line had to move to the down stream position of the bending magnet. Then we planned to reconstruct the IR beam line to a new one named as BL6B with higher photon flux and higher brilliance in the infrared and terahertz regions. In this paper, the design of the whole beam line, the obtained performance (beam size, photon flux and brilliance) and the outline of the end stations are reported.

2. Front end

Fig. 1 shows a schematic view of the front end part of BL6B [5]. The acceptance angles are about 215 mrad (H) and 80 mrad (V). The horizontal acceptance angle of 215 mrad together with a bending radius (2.2 m) of UVSOR-II gives an emission length of 0.47 m. Since the first focal point locates at 2.5 m from the first mirror (M0), it is difficult to get good focal conditions by using conventional spherical or elliptical mirrors. Therefore, we employed a three-dimensionally extended magic mirror that has been installed at SPring-8 BL43IR [6]. At SPring-8, one plane mirror with a slit on the orbital plane was employed to avoid the heat load for the first mirror

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doi:10.1016/j.infrared.2006.01.008

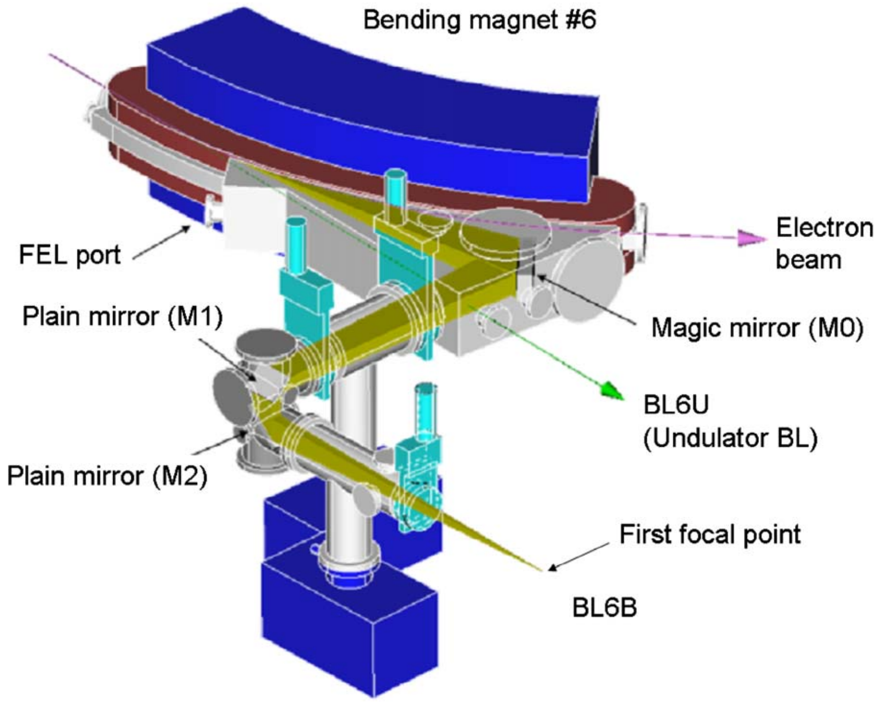

Fig. 1. Schematic view of the front end of UVSOR-II BL6B. The emitted IRSR is collected only by a magic mirror and focused to the first focal point [5].

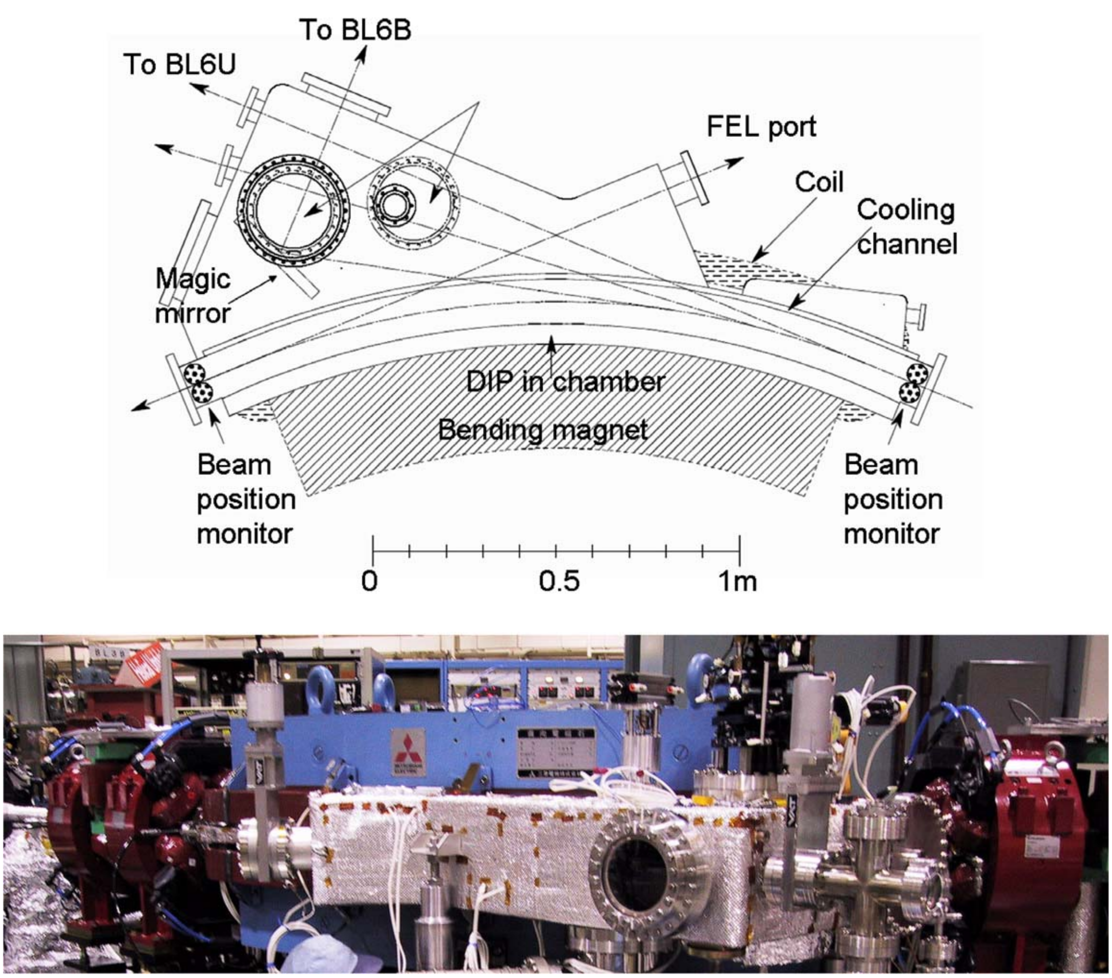

Fig. 2. Top view (top) and the photograph (bottom) of the M0 mirror chamber with bending duct of UVSOR-II BL6B.