## BL32B2 R&D-BM

## 1. Introduction

BL32B2 is allocated to the R&D beamline for facility-related problems and challenges, which are relevant to a bending-magnet beamline. This beamline was rebuilt and restarted along with two experimental hutches (EH1 and EH2) in FY2018. Thereafter, BL32B2 has undergone the following updates: the replacement of the counter/timer module and the pulse motor-driving system (FY2019), the installation of the flight tuberetracting mechanism in EH1 to facilitate the handling of huge tube (FY2019), the introduction of SPEC software for instrument control and data acquisition (FY2020), the update on the beamline interlock system (FY2021), and the introduction of the MOSTAB system (FY2022).

The optics are composed of transport-channel slits, a double-crystal monochromator, and a pair of total-reflection mirrors. To provide high-energy Xrays, a net plane of a silicon-crystal pair can be switched from Si (111) to Si (311). The type of mirror coating can be selected from platinum and rhodium in accordance with the situation. A mirrorbending mechanism is available for vertical focusing, and the cylindrical shunt on the second mirror is used for horizontal focusing. EH1 is dedicated to R&D studies and has the dimensions of  $5.0 \text{ m}(\text{W}) \times 3.0 \text{ m}(\text{D}) \times 3.3 \text{ m}(\text{H})$ . An optical bench is placed inside this hutch. It accommodates two XY and five Y carriers, which can load user test benches. For computers embedded within user equipment, KVM extenders are laid between the optical bench and the operation console desk. An 8-channel counter/timer module (CT08-01F) can count at rates

up to 300 MHz for FAST NIM and 100 MHz for TTL. Silicon PIN photodiodes, ionization chambers, high-speed trans-impedance amplifiers, voltage-tofrequency converters, and high-voltage power supplies are also provided to users. A 16-channel pulse motor controller (PM16C-16HW2) can run all subordinate motors simultaneously. The default setting is 16 Type-II pulse motor driver units. Four Type-I pulse motor driver units can be used if necessary. Motor cables are wired into the hutch and have a TRIM TRIO connector (8P socket plug type) on the motor side. A GPIB instrument control device (GPIB-ENET/1000) intermediates between the SPEC and legacy instrument components. EH2 is now devoted to the RISING3 Project of NEDO and Kyoto University. The beam path in EH1 must be bridged by a wide-bore vacuum flight tube during experiments at EH2, so the long-term installation of any equipment in EH1 is prohibited.

## 2. Recent activities

In 2023, motorized stages (KLSA-200X-0B and HST-200Z) were installed on the optical bench (see Fig. 1). The translation stage unit provides up to 200 mm of X and Z travel. Equipping the ready-to-use multipurpose positioner helps to save time when preparing detectors and other devices brought in by users. It is also intended to be used as a specimen scanner. For example, by simply invoking a single command provided in SPEC, the stages can be operated so that a specimen moves through an X-ray beam in a raster pattern. The translation stage unit has a load capacity of up to 10 kg.



Fig. 1. Appearance of an XZ translation stage unit installed on the optical bench.

Various user experiments were conducted at EH2 by NEDO and Kyoto University to investigate battery science. At EH1, several studies were carried out to evaluate the stability of the X-ray beam. The results indicated the need for extensive maintenance of a crystal adjustment mechanism in the equipped monochromator. In addition, to reduce the downtime associated with switching between the 111 and 311 reflection net planes, the monochromator was replaced during the shutdown period at the end of FY2023. In the newly installed monochromator, two pairs of silicon (111) and (311) crystals are arranged side by side and can be selected by moving the translation stages. As a result of this upgrade, the time taken to align an asymmetric reflection plane required to achieve

thermal equilibrium has been significantly reduced, increasing the uptime for data acquisition in user experiments.

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