Equipment Development Center

KATOH, Masahiro	Director
MIZUTANI, Nobuo	Technical Associate
AOYAMA, Masaki	Technical Associate
YANO, Takayuki	Technical Associate
KONDOU, Takuhiko	Technical Associate
YOSHIDA, Hisashi	Technical Associate
UTCHIYAMA, Kouichi	Technical Associate
TOYODA, Tomonori	Technical Associate
NAGATA, Masaaki	Technical Associate
TAKADA, Noriko	Technical Associate
MIYASHITA, Harumi	Technical Fellow
SUGITO,Shouji	Technical Fellow
URANO, Hiroko	Secretary

Researches and developments of novel instruments demanded in the forefront of molecular science, including their design and fabrication, are the missions of this center. Technical staffs in the three work sections, mechanics, electronics and glass works are engaged in developing state-of-the-art experimental instruments, in collaboration with scientists. We expanded our service to other universities and research institutes since 2005, to contribute to the molecular science community and to improve the technology level of the center staffs. A few selected examples of our recent developments are described below.

Development of Magnetic Field Compensation Device by High Sensitive Magnetic Sensor and Helmholtz Coils

On the research of Yokoyama Group (Division of Electronic Structure), the earth magnetic field (~0.4 G) and magnetic field generated by other instruments sometimes affect the magnetic measurements and the preparation of magnetic thin films.

We have developed three axes Helmholtz coils combined with high sensitive magnetic sensor, which automatically measures the magnetic field inside an enclosed space and subsequently drives the coils to cancel the field inside. This instrument consists of 3D magnetic measurement with high accuracy, *x*,*y*,*z* Helmholtz coils, and current sources to drive the coils. The magnetic field compensation is done with a computer controlled program.

The magneto impedance (MI) sensor can measure the magnetic field up to 2 G with a resolution of 0.003 G. The constant current circuit supplies up to 2 A with a resolution of 1 mA, which is driven by the digital-to-analogue converter from PC. Through PC USB port, all the measured magnetic field is received and the coil current driving voltage is sent. The computer program keeps the magnetic field constant by a feedback control in which the controller measures the magnetic field and supplies current proportional to the deviation between the measured and target fields.

With a cage of a 30 cm cube wound with coils, we can control the magnetic field with a resolution of below ±0.005 G and with a response time of 18 ms. We are planning to improve the response time to compensate a high-speed pulse magnetic field generated by other instruments.

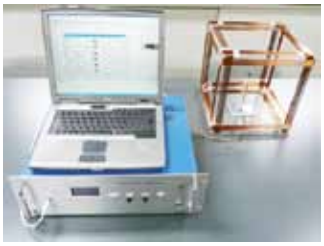

Figure 1. Magnetic field compensation device.

Fabrication of Multi-Wire Correction Coils for Variable Polarization Undulator in UVSOR-II

An apple-II undulator with about 3m length have been installed in UVSOR-II for producing synchrotron light of various polarization properties. However, when the undulator is operated in the vertical polarization mode, the lifetime of electron beam circulating in the storage ring significantly decreases. The reason is considered to be due to the non-linear magnetic field in the undulator, which strongly depends on the undulator gap. To cancel the non-linear field, we fabricated and installed a specially designed correction coils on the upper and the under surface of the beam duct at the undulator.

As shown Figure 2, the correction coils are made from flat copper wires each of which has a cross section of 0.3 mm × 3 mm. 14 wires have been glued onto the surface of acrylic jig which has 14 grooved lines by polyimide tapes. The wires are connected to several power supplies to produce desired non-linear field. In the test operation, it was successfully demonstrated that the lifetime of electron beam was significantly improved.

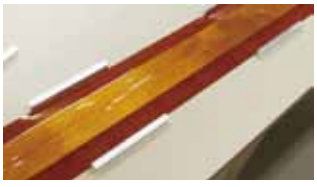

Figure 2. Correction coils.