Research Highlights

The Photon Factory supplies highly-brilliant X-rays and VUV light, which provide the means to understand the basic structure and function of materials including condensed matter, biological systems, environmental and chemical materials and many others.

Analysis of asteroid Itokawa particles brought by Hayabusa

The early history of the small asteroid "Itokawa" has been uncovered by analyzing tiny granular samples brought back to the Earth by Hayabusa. It is suggested that Itokawa is similar in mineral composition to chondrite meteorites, the oldest and most primitive material in the solar system.

Hidden state revealed by time-resolved X-ray diffraction

Perovskite manganese oxides show thermally induced structural phase transitions coupled with an insulator-to-metal transition. Picosecond time-resolved X-ray diffraction technique revealed that a charge and orbitally ordered "hidden state" which cannot reach under thermal equilibrium conditions.

Structural basis of a protein complex responsible for cytokinesis

Cytokinesis is the final stage of cell division, during which cells exhibit drastic morphological changes. Structure of ARF6-MKLP1 complex was determined and revealed that the complex plays a crucial role in cytokinesis by connecting the microtubule bundle and membrane at the cleavage plane.

Using the Photon Factory

As a facility in the Inter-University Research Institute Corporation, the Photon Factory promotes a variety of synchrotron radiation research in material and life sciences. The Photon Factory is open to users at universities and public research institutions of all over the world as well as of Japan, at no charge. The number of active proposals is around 800 and the number of users is around 3000 per year. The Photon Factory also promotes an academic-industrial collaboration.

Education

The Photon Factory carries out graduate education in the School of High Energy Accelerator Science of the Graduate University for Advanced Studies (SOKENDAI). The Photon Factory also accepts graduate students from universities all over the Japan and the world to train them for the next generation.

International collaboration

The Photon Factory has been working on international research collaboration, especially in the Asia-Oceania region. The Australian Beamline at the Photon Factory was operated from 1992 to 2013. It contributed to cutting-edge research conducted by Australian researchers and to the establishment of the Australian Synchrotron. The Indian Beamline was built in 2009, which allows fundamental research by Indian researchers. The Photon Factory also contributes to the construction of the SESAME accelerator in the Middle East and African Light Source (AfLS) Project.
Photon Factory, a light source for material and life sciences

The Photon Factory is an accelerator-based light source facility, as a part of the High Energy Accelerator Research Organization (KEK), Japan. The Photon Factory operates two storage rings, the 2.5-GeV PF ring and the 6.5-GeV PF Advanced Ring (PF-AR). The Photon Factory supplies brilliant X-rays and VUV light, which provide the means to understand the function of materials and life.

When charged particles move in a circular orbit at speeds close to the speed of light, photons are emitted in the form of synchrotron radiation (SR). This radiation is called as synchrotron radiation (SR). The properties of the synchrotron radiation are:

- Electromagnetic Spectrum
- Electromagnetic wave
- Wavelength (Å)
- Energy of photon (electron volts, eV)
- Visible light
- Ultraviolet
- Vacuum ultraviolet

<table>
<thead>
<tr>
<th>Name of electromagnetic wave</th>
<th>Wavelength (Å)</th>
<th>Energy of photon (eV)</th>
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</thead>
<tbody>
<tr>
<td>Radio waves</td>
<td>&gt; 1000</td>
<td>&lt; 100</td>
</tr>
<tr>
<td>Microwaves</td>
<td>100 - 1000</td>
<td>100 - 1000</td>
</tr>
<tr>
<td>Infrared</td>
<td>10 - 100</td>
<td>1000 - 10000</td>
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<tr>
<td>Visible light</td>
<td>0.7 - 0.1</td>
<td>100 000 - 300 000</td>
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<tr>
<td>Ultraviolet</td>
<td>0.35 - 0.7</td>
<td>300 000 - 1000 000</td>
</tr>
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<td>Vacuum ultraviolet</td>
<td>&lt; 0.35</td>
<td>&gt; 100 000</td>
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</tbody>
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Materials interact with light in many ways. The light absorbed or transmitted, fluorescent X-rays or emitted electrons are detected by “detectors” to know how and what interaction takes place between radiation and materials. There are various types of experimental apparatuses in the Photon Factory.

- Superconducting magnet for X-ray experiments
- Experimental stations
- High-throughput protein crystallography station
- Angle-resolved photoelectron spectrometer with large area hemispherical electron analyzer
- Hemispherical electron analyzer
- Beamline
- Storage ring
- Undulator
- Control cabin
- Experimental hall

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