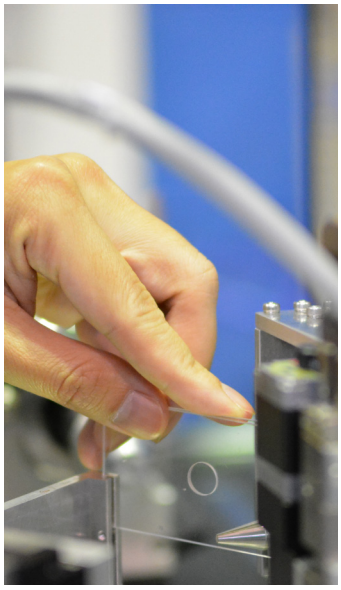
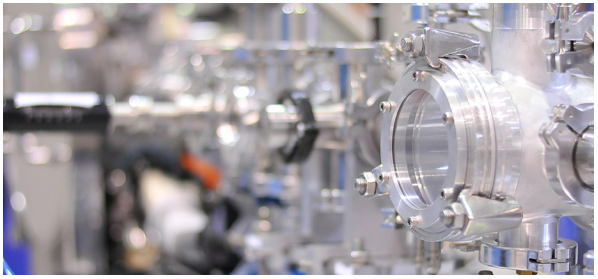
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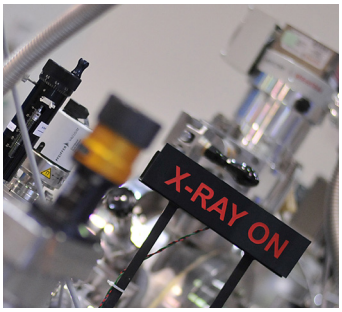
THAI SYNCHROTRON NATIONAL LAB

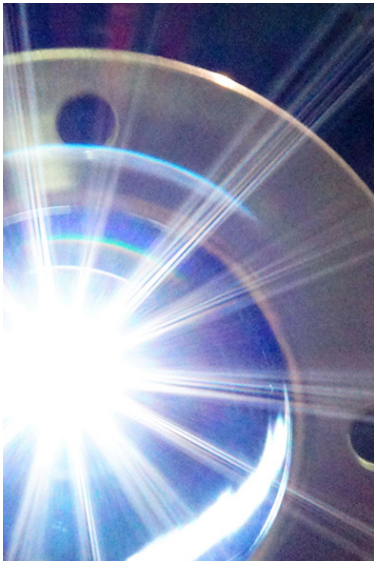
# SYNCHROTRON LIGHT

## Services & Facilities Overview

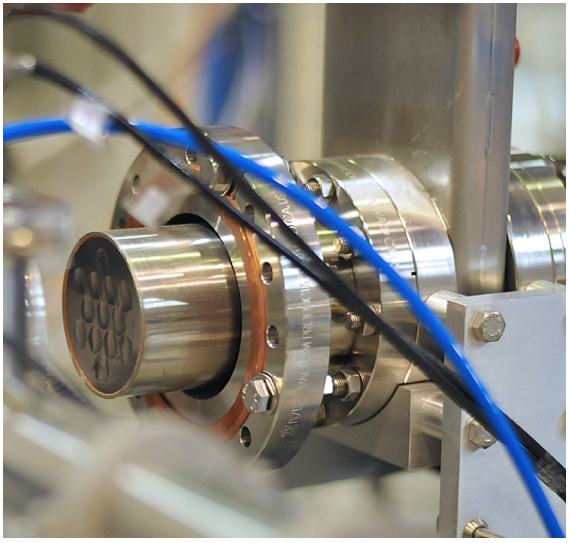


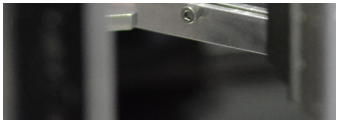


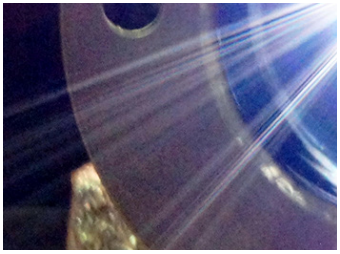


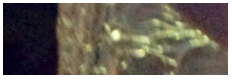




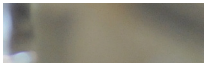














# WHAT IS SYNCHROTRON LIGHT

It is electromagnetic radiation containing a range of wavelengths from infrared to hard X-rays. Synchrotron light is extremely bright millions of times brighter than the Sun. This provides high resolution, reduces experimental time, and allows the study of fast phenomena such as chemical reactions.



**11** BEAMLINES | **12** EXPERIMENTAL END-STATIONS

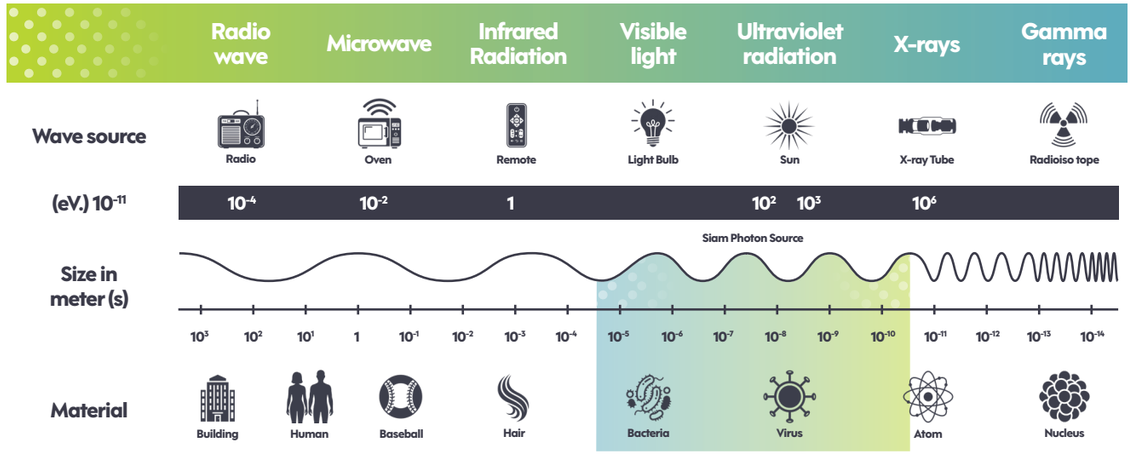
Synchrotron light reaches the beamlines—specialized laboratories where light interacts with matter to analyze its properties with a level of detail impossible to achieve with other techniques.



## Comparison table of the properties of synchrotron light sources

| Parameter | SPS-I | SPS-II |
|---|---|---|
| Circumference (m) | 81.3 | 327.6 |
| Electron beam emittance (nm · rad) | 41 | 0.96 |
| Electron current (mA) | 150 | 300 |






Electromagnetic Spectrum

## BL6 Deep X-ray Lithography (DXL) and Microsystem Laboratory (MES)

- Medical Applications
- Materials Science and Engineering
- Micro and Nanotechnology
- Biological and Life Science
- Energy Storage

## BL5.2 X-ray Absorption Spectroscopy (XAS, XRF)

- Materials Science and Engineering
- Environmental Science
- Earth Science, Gemology and Archeology
- Physics
- Biological and Life Science
- Chemistry
- Medical Applications
- Food and Agricultural Science

## BL5.1W X-ray Absorption Spectroscopy (XAS, Micro-XAS, XRF, Micro-XRF)

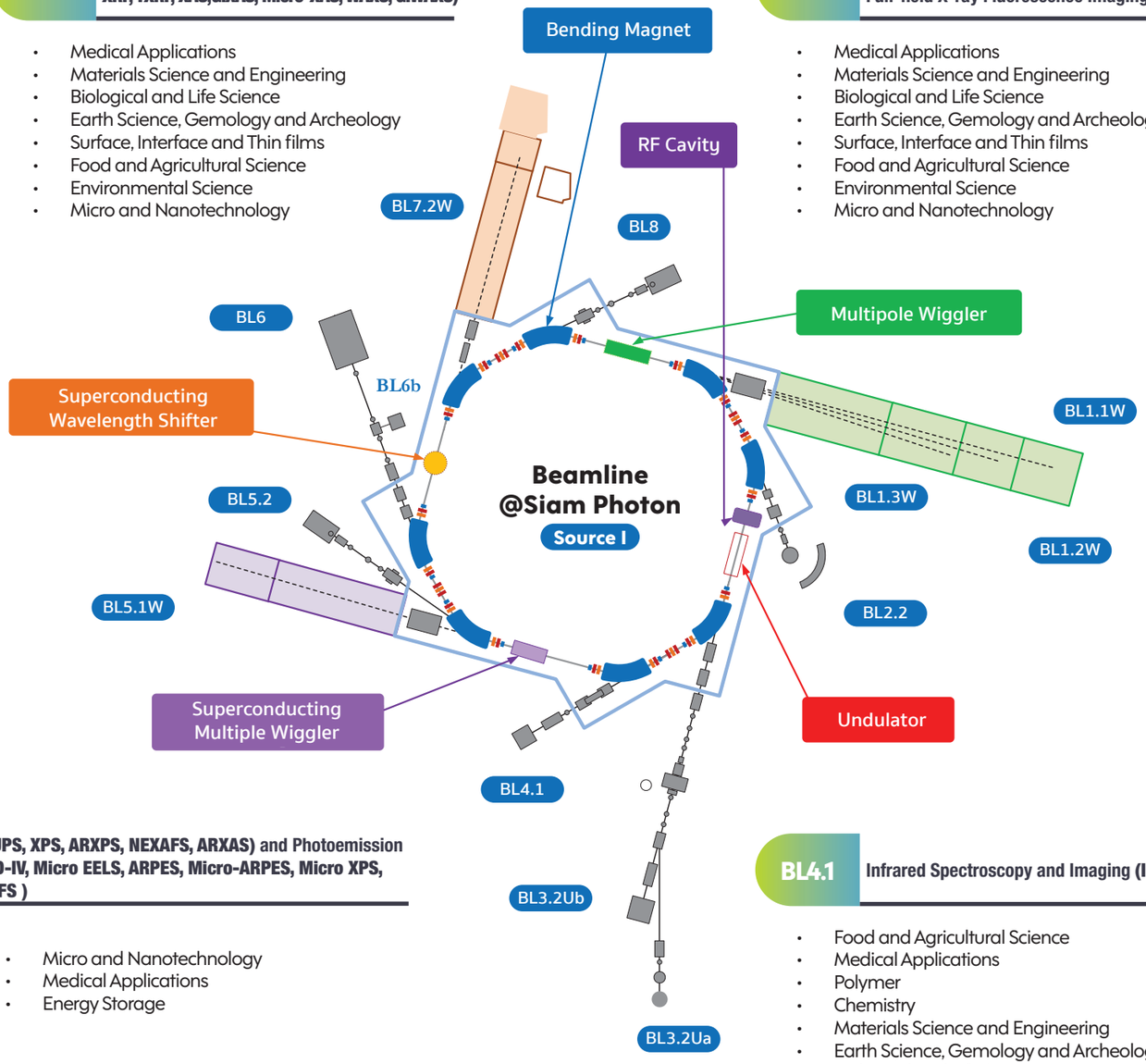
- Materials Science and Engineering
- Environmental Science
- Earth Science, Gemology and Archeology
- Physics
- Biological and Life Science
- Chemistry
- Medical Applications

## BL3.2U Photoemission Electron Spectroscopy (PES, ARPES, UPS, XPS, ARXPS, NEXAFS, ARXAS) and Photoemission Electron Microscopy (PEEM, LEEM, Micro-LEED, LEED-IV, Micro EELS, ARPES, Micro-ARPES, Micro XPS, Imaging- XPS, Imaging NEXAFS, Auger, Micro-NEXAFS )

- Materials Science and Engineering
- Surface, Interface and Thin films
- Physics
- Micro and Nanotechnology
- Medical Applications
- Energy Storage

## BL7.2W Macromolecular Crystallography (MX, XRF, Mcro-XRF, TXRF, XAS,GIXAS, Micro-XAS, WAXS, GIWAXS)

- Medical Applications
- Materials Science and Engineering
- Biological and Life Science
- Earth Science, Gemology and Archeology
- Surface, Interface and Thin films
- Food and Agricultural Science
- Environmental Science
- Micro and Nanotechnology




## BL8 X-ray Absorption Spectroscopy (XAS, XRF) and Full-field X-ray Fluorescence Imaging (FXI)

- Medical Applications
- Materials Science and Engineering
- Biological and Life Science
- Earth Science, Gemology and Archeology
- Surface, Interface and Thin films
- Food and Agricultural Science
- Environmental Science
- Micro and Nanotechnology

## BL4.1 Infrared Spectroscopy and Imaging (IR)

- Food and Agricultural Science
- Medical Applications
- Polymer
- Chemistry
- Materials Science and Engineering
- Earth Science, Gemology and Archeology
- Biological and Life Science
- Environmental Science

## BL1.1W Multiple X-ray Techniques (XAS, GIXAS, PXRD, AXRD, WAXS, GIWAXS, Residual stress, XRR, XRF)

- Materials Science and Engineering
- Environmental Science
- Earth Science, Gemology and Archeology
- Food and Agricultural Science
- Surface, Interface and Thin films
- Polymers
- Physics
- Energy Storage
- Micro and Nanotechnology
- Chemistry

## BL1.2W X-ray Tomographic Microscopy (XTM)

- Medical Applications
- Material Science and Engineering
- Biological and Life Science
- Earth Science, Gemology and Archeology
- Environmental Science
- Food and Agricultural Science

## BL1.3W Small and Wide-Angle X-ray Scattering (SAXS, WAXS, XRF)

- Materials Science and Engineering
- Micro and Nanotechnology
- Earth Science, Gemology and Archeology
- Surface, Interface and Thin films
- Polymers
- Physics

## BL2.2 Time-Resolved X-ray Absorption Spectroscopy (TRXAS)

- Materials Science and Engineering
- Physics
- Environmental Science
- Chemistry
- Energy Storage

## Beamtime Service for General Users
## Procedure for SLRI Beamtime Request for Educational Institute and Government Sector

**Free of charge**

1. Beamline Scientists/ User Service Section offers advise applicants on making beamtime proposals.
2. Submit proposals via the Beamtime Application system (BeamApp) (https://user.slri.or.th).
3. Review the submitted proposals by SLRI Committee
4. Beamtime allocation schedule announcement to applicants 14 days before beamtime service.
5. Confirm the beamtime allocation and add the list of all members conducting experiment at SLRI.
6. All new users must complete and pass the online safety training for SLRI users
7. Upon arrival, gets radiation dosimeter, a radiation record form, and a SPL access card before doing experiment.
8. After the experiment, each user returns adosimeter, a completed form, and an access card to a security guard,and submits experimental report via online platforms https://user.slri.or.th.

## Beamtime Service for Business Users
## Procedure for SLRI Beamtime Request for Industry and Social Sector

**Service Charge Is Included**

1. Fill out and submit the application form through https://bdd.slri.or.th/bdd
2. Evaluate and propose the quotation to users
3. Investigate the quotation and issue the purchase order
4. Start providing research, analysis, or production services
5. Declare the experiment report to users
6. Proceed with the service payment





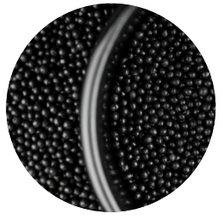
## Target for Industries Field



**Medical, Pharmaceutical and Cosmetic**



**Metallurgy and Ceramic**



**Rubber and Polymer**



**Electronics and Microelectronic Components**



**Food and Agriculture**



**Automotive**



**Petroleum and Chemicals**



**Textile products**

## Type of Service









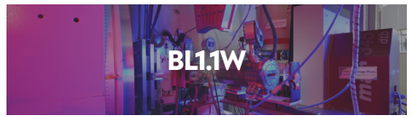
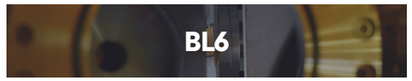









## Synchrotron Technique Service for Industrial and Social Users

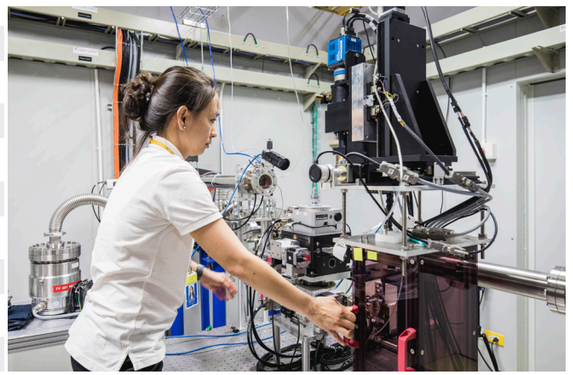
| | |
|---|---|
|  BL1.1W | Multiple X-ray Techniques (XAS, GIXAS, PXRD, AXRD, WAXS, GIWAXS, Residual stress, XRR, XRF) |
|  BL1.2W | X-ray Tomography Microscopy (XTM) |
|  BL1.3W | Small and Wide-angle X-ray Scattering (SAXS, WAXS, XRF) |
|  BL2.2 | Time-resolved X-ray Absorption Spectroscopy (TRXAS) |
|  BL3.2U | Photoemission Electron Spectroscopy (PES, ARPES, UPS, XPS, ARXPS, NEXAFS, ARXAS) and PhotoemissionElectron Microscopy (PEEM, LEEM, Micro-LEED, LEED-IV, Micro EELS, ARPES, Micro-ARPES, Micro XPS, Imaging- XPS,Imaging NEXAFS, Auger, Micro-NEXAFS ) |
|  BL4.1 | Infrared Spectroscopy and Imaging (IR) |
|  BL5.1W | X-ray Absorption Spectroscopy (XAS) |
|  BL5.2 | X-ray Absorption Spectroscopy (XAS, XRF) |
|  BL6 | Deep X-ray Lithography (DXL) and Microsystem Laboratory (MES) |
|  BL7.2W | Macromolecular Crystallography (MX, XRF, Micro-XRF, TXRF, XAS, GIXAS, Micro-XAS, WAXS, GIWAXS) |
|  BL8 | X-ray Absorption Spectroscopy (XAS, XRF) and Full-field X-ray Fluorescence Imaging (FXI) |





## Instrument Service

| Chemical and Biological | Physical |
|---|---|
| Dispersive Raman Microscope | Atomic Force Microscope (AFM) |
| FT-Raman Spectrometer | Scanning electron microscope (SEM) |
| SENTERRA II with FT-RAMAN module | Transmission electron microscope (TEM) |
| Laser Ablation Inductively Coupled Plasma Mass Spectrometry (LA-ICP-MS) | X-ray Photoelectron spectroscopy (XPS) |
| FTIR Micro-Spectrometer | |
| UV-Vis spectrophotometer | |
| X-ray Diffractometer (XRD) | |
| Wavelength dispersive X-ray Fluorescence (WD-XRF) | |
| Gas Chromatography – Mass Spectrometry (GC-MS/MS) | |
| Gel Permeation Chromatography (GPC) | |
| Ultra-High Performance Liquid Chromatography (UHPLC) | |
| High-Resolution Mass Spectrometry (LC-HRMS) | |
| Artificial Digestive System Tiny TIM | |



# Research Clusters







## Earth Science, Gemology & Archaeology

| Academic Explantion | Techniques | Beamline |
|---|---|---|
| **Non-destructive characterization of mineral composition, crystal structure, elemental content, micro-inclusions, pigments, and internal structures, made available by synchrotron light, preserves sample integrity while revealing how gem treatments induce color change and informing the development of improved treatment techniques. The same approach traces the geological origin of archaeological materials and ancient artifacts, shedding light on historical trade routes and exchange networks.** | PXRD, AXRD, Residual Stress (Sin²ψ) | BL1.1W |
| | GIXAS | BL1.1W, BL1.3W, BL5.1W, BL5.2, BL7.2W, BL8 |
| | TXRF | BL7.2W |
| | XAS | BL1.1W, BL5.1W, BL5.2, BL7.2W, BL8 |
| | TRXAS | BL2.2 |
| | XRF | BL1.1W, BL7.2W |
| | Micro-XRF, Micro-XAS | BL5.1W, BL7.2W |
| | FXI | BL8 |
| | XTM / 2D imaging | BL1.2W |
| | IR | BL4.1 |



## Materials Science and Engineering

| Academic Explantion | Techniques | Beamline |
|---|---|---|
| **Quantification of compositional,crystallographic, morphological, and residual stress characteristics, achieved through synchrotron-based characterization, establishes structure-processing-property relationships critical to materials engineering, enabling the design of lighter, stronger, and more durable materials for aerospace, automotive, and infrastructure applications.** | PXRD, AXRD, Residual Stress (Sin²ψ), XRR | BL1.1W |
| | SAXS | BL1.3W |
| | WAXS, GIWAXS | BL1.1W, BL1.3W, BL7.2W |
| | XRF | BL1.1W, BL1.3W, BL5.1W, BL5.2, BL7.2W, BL8 |
| | TXRF | BL7.2W |
| | XAS | BL1.1W, BL5.1W, BL5.2, BL7.2W, BL8 |
| | TRXAS | BL2.2 |
| | GIXAS | BL1.1W, BL7.2W |
| | Micro-XRF, Micro-XAS | BL5.1W, BL7.2W |
| | FXI | BL8 |
| | PES, UPS, ARPES, ARXPS, SXAS, NEXAFS, SXPS | BL3.2Ua |
| | PEEM, micro/imaging-NEXAFS, XPS, ARPES, Work-Function mapping, LEEM, Micro-LEED, Micro-EELS | BL3.2Ub |
| | XTM | BL1.2W |
| | IR | BL4.1 |
| | DXL, MES | BL6 |

## Biological & Life Sciences

| Academic Explantion | Techniques | Beamline |
|---|---|---|
| **Thorough elucidation of protein and biomolecular structures, elemental distributions, and tissue-level architecture, supported by synchrotron-based techniques, advances fundamental understanding of biological function and disease mechanisms, informing the development of new therapeutics, vaccines, and diagnostic strategies.** | MX | BL7.2W |
| | XAS | BL1.1W, BL5.1W, BL5.2, BL7.2W, BL8 |
| | TRXAS | BL2.2 |
| | XRF | BL1.1W, BL1.3W, BL5.1W, BL5.2, BL7.2W, BL8 |
| | Micro-XRF, TXRF | BL7.2W |
| | IR | BL4.1 |
| | FXI | BL8 |
| | XTM | BL1.2W |
| | BioSAXS | BL1.3W |
| | WAXS | BL1.1W, BL1.3W, BL7.2W |

## Food & Agricultural Science

| Academic Explantion | Techniques | Beamline |
|---|---|---|
| Comprehensive characterization of food composition, chemical state, microstructure, nutrient distribution, and contaminant profiles, afforded by synchrotron-based analysis, provides a scientific basis for improving food quality, safety, and processing efficiency, supporting adulteration detection, export quality compliance, and the development of nutritionally enhanced food products. | XRF | BL1.1W, BL1.3W, BL5.1W, BL5.2, BL7.2W, BL8 |
| | TXRF | BL7.2W |
| | XAS | BL1.1W, BL5.1W, BL5.2, BL7.2W, BL8 |
| | TRXAS | BL2.2 |
| | GIXAS | BL1.1W, BL7.2W |
| | Micro-XRF, Micro-XAS | BL5.1W, BL7.2W |
| | FXI | BL8 |
| | IR | BL4.1 |
| | FXI | BL1.2W |
| | SAXS | BL1.3W |
| | WAXS | BL1.1W, BL1.3, BL7.2W |
| | PXRD | BL1.1W |









## Micro & Nanotechnology

| Academic Explantion | Techniques | Beamline |
|---|---|---|
| Precise microfabrication, chemical mapping, and structural characterization of micro- and nanoscale materials, opened up by synchrotron-based methods, supports the development of advanced devices and nano technology applications. | DXL, MES | BL6 |
| | Micro-XAS, Micro-XRF, TXRF | BL7.2W |
| | XPS, ARXPS, NEXAFS | BL3.1, BL3.2Ua |
| | PEEM, LEEM, Micro-LEED, Micro-EELS | BL3.2Ub |
| | SAXS | BL1.3W |
| | WAXS, GIWAXS, GIXAS, XRR | BL1.1W, BL1.3W, BL7.2W |
| | XTM | BL1.2W |

## Polymers

| Academic Explantion | Techniques | Beamline |
|---|---|---|
| In-depth characterization of molecular arrangement, crystallinity, and internal morphology, achieved via synchrotron-based analysis, guides the design of stronger, more durable, and application-specific polymers, accelerating the development of advanced packaging, biomedical, and industrial materials. | SAXS | BL1.3W |
| | WAXS, GIWAXS | BL1.1W, BL1.3W, BL7.2W |
| | IR | BL4.1 |
| | XTM | BL1.2W |

## Physics

| Academic Explantion | Techniques | Beamline |
|---|---|---|
| Investigation of electronic structure, surface phenomena, structural order, and dynamic processes, delivered by synchrotron facilities, deepens theoretical and experimental understanding of condensed matter and material properties, driving the discovery of novel materials for next-generation semiconductors, quantum devices, and energy technologies. | ARPES, UPS, PES, NEXAFS, ARXAS | BL3.2Ua |
| | PEEM, LEEM, Micro-ARPES | BL3.2Ub |
| | XAS | BL1.1W, BL5.1W, BL5.2, BL7.2W, BL8 |
| | TRXAS | BL2.2 |
| | SAXS | BL1.3W |
| | PXRD, XRR | BL1.1W |
| | WAXS, GIWAXS | BL1.1W, BL1.3W |
| | GIWAXS | BL1.1W, BL7.2W |

## Environmental Science

| Academic Explantion | Techniques | Beamline |
|---|---|---|
| Precise identification of pollutant species, their chemical speciation, structural form, and spatial distribution, unlocked by synchrotron-based analysis, supports environmental monitoring, contamination tracing, and remediation strategies, while also enabling reliable detection of microplastic contaminants through their chemical fingerprints. | XRF | BL1.1W, BL1.3W, BL5.1W, BL5.2, BL7.2W, BL8 |
| | TXRF | BL7.2W |
| | XAS | BL1.1W, BL5.1W, BL5.2, BL7.2W, BL8 |
| | TRXAS | BL2.2 |
| | GIXAS | BL1.1W, BL7.2W |
| | Micro-XRF, Micro-XAS | BL5.1W, BL7.2W |
| | FXI | BL8 |
| | IR | BL4.1 |
| | XTM | BL1.2W |
| | SAXS | BL1.3W |
| | PXRD | BL1.1W |

## Medical Applications

| Academic Explantion | Techniques | Beamline |
|---|---|---|
| Extensive structural, elemental, and imaging analysis of biological and pharmaceutical samples, provided by synchrotron-based imaging and analysis, underpins drug development and biomaterial characterization, accelerating the discovery of new treatments and the design of safer implants and diagnostic tools. | MX | BL7.2W |
| | XTM | BL1.2W |
| | XRF | BL1.1W, BL1.3W, BL5.1W, BL5.2, BL7.2W, BL8 |
| | Micro-XRF, TXRF | BL7.2W |
| | FXI | BL8 |
| | XAS | BL1.1W, BL5.1W, BL5.2, BL7.2W, BL8 |
| | TRXAS | BL2.2 |
| | XPS, ARXPS | BL3.1, BL3.2Ua: PES |
| | IR | BL4.1 |
| | PXRD | BL1.1W |
| | WAXS | BL1.1W, BL1.3W, BL7.2W |
| | SAXS | BL1.3W |
| | DXL, MES | BL6 |





## Surface, Interface and Thin Films

| Academic Explantion | Techniques | Beamline |
|---|---|---|
| High-resolution characterization of surface chemistry, interfacial phenomena, and thin-film architecture, achieved using synchrotron-based analysis, guides the optimization of coatings, electronic devices, and functional materials, improving the efficiency of solar cells, semiconductors, batteries, and corrosion-resistant surfaces. | WAXS, GIWAXS, GIXAS | BL1.1W, BL1.3W, BL7.2W |
| | GIXAS | BL1.1W, BL7.2W |
| | XRR | BL1.1W |
| | XPS, ARXPS | BL3.1, BL3.2Ua |
| | ARPES, UPS, PES, NEXAFS | BL3.2Ua |
| | PEEM, LEEM, LEEM-IV, Micro-LEED, Micro-EELS | BL3.2Ub |
| | SAXS | BL1.3W |
| | TXRF | BL7.2W |

## Chemistry

| Academic Explantion | Techniques | Beamline |
|---|---|---|
| In-situ investigation of atomic, electronic, and crystallographic structures alongside reaction dynamics, facilitated by synchrotron radiation, offers mechanistic insight into chemical processes and catalytic performance essential for catalyst design, accelerating the development of greener industral processes, cleaner fuels, and more efficient chemical manufacturing. | XAS | BL1.1W, BL5.1W, BL5.2, BL7.2W, BL8 |
| | TRXAS | BL2.2 |
| | XRF | BL1.1W, BL1.3W, BL5.1W, BL5.2, BL7.2W, BL8 |
| | Micro-XRF, TXRF | BL7.2W |
| | PXRD | BL1.1W |
| | WAXS | BL1.1W, BL1.3W, BL7.2W |
| | IR | BL4.1 |
| | SAXS | BL1.3W |
| | PES, UPS, ARPES, ARXPS, SXAS, NEXAFS, SXPS | BL3.2Ua |

# SYNCHROTRON LIGHT RESEARCH INSTITUTE
(PUBLIC ORGANIZATION)

## CONTACT INFORMATION


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SLRI User Group

BeamApp

IPS

