

# The synchrotron projects of Thailand

What have been done and the impact

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INTERNATIONAL CONFERENCE ON

## ACCELERATORS FOR RESEARCH AND SUSTAINABLE DEVELOPMENT

From good practices towards socioeconomic impact



**23–27 May 2022**

IAEA Headquarters, Vienna, Austria

# The Synchrotron Light Research Institute

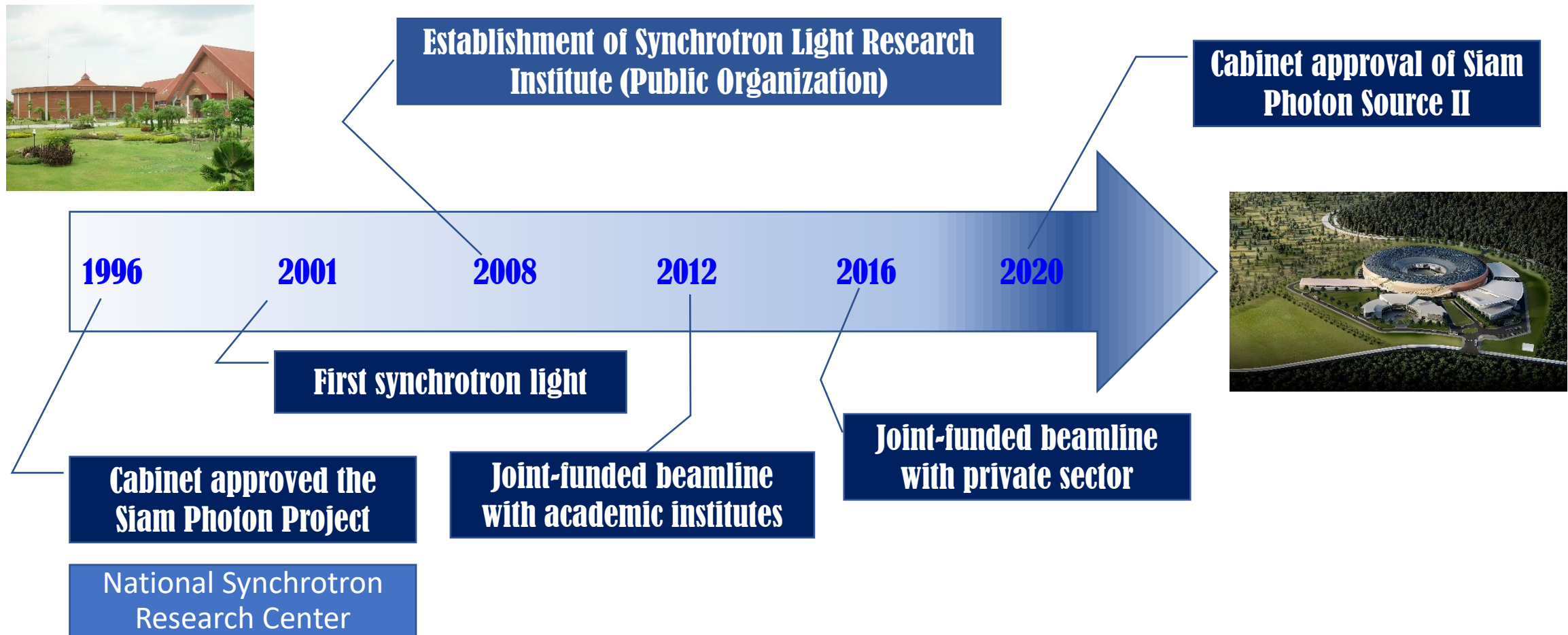


**Located near the city of Nakhon Ratchasima, 250 km NE of Bangkok**



# The Siam Photon Project

## The Siam Photon Source: a first synchrotron light source in Thailand

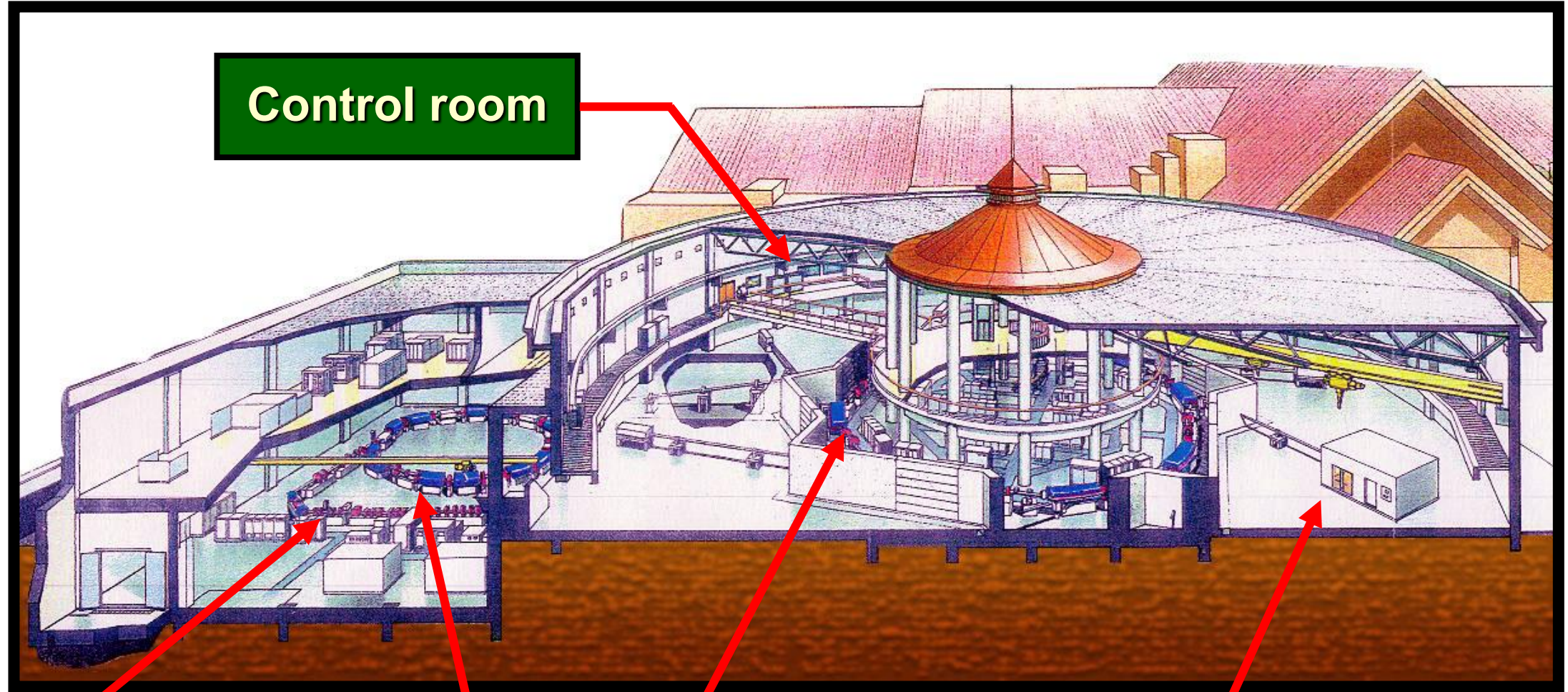


# The Synchrotron Light Research Institute (Public Organization)

- ❖ **A (non-profit) national facilities**
- ❖ **Autonomous government institution with Executive Board as a policy maker**
- ❖ **Under supervision of Ministry of Higher Education, Science, Research and Innovation (MHESI)**
- ❖ **Annual budget approx. 13M EUR**
- ❖ **200 staff (60 Researchers, 80 Engineers & Technicians)**
- ❖ **Operating 1.2 GeV Siam Photon Source + facilities**
- ❖ **3.0 GeV SPS-II design and construction**



# The Siam Photon Laboratory



**Control room**

**LINAC**

**Booster Synchrotron**

**Storage ring**

**Experimental station**



# The Siam Photon Laboratory

**11 stations in operation  
(+4 under development)**

**DXL: micro fabrication**

- micro sensors
- micro devices

**MX: Macro molecule structure**

- Enzymes
- Virus

**XRF: elemental analyses**

- Elemental composition
- Forensic science
- Archeology

**XRD/GIXRD: Crystal structures,**

- Materials, Thin films

**XRT: 3D x-ray imaging**

- Tissues, Bones, Fibers
- Archeology, Medicine

**SWAXS: nano structures**

- Nanoparticles, micelles
- Polymers, Bio materials
- Protein, Starch

**TRXAS: catalysts**

- Battery, Fuel cells

**PES/PEEM: surface electronic structures, microspectroscopy**

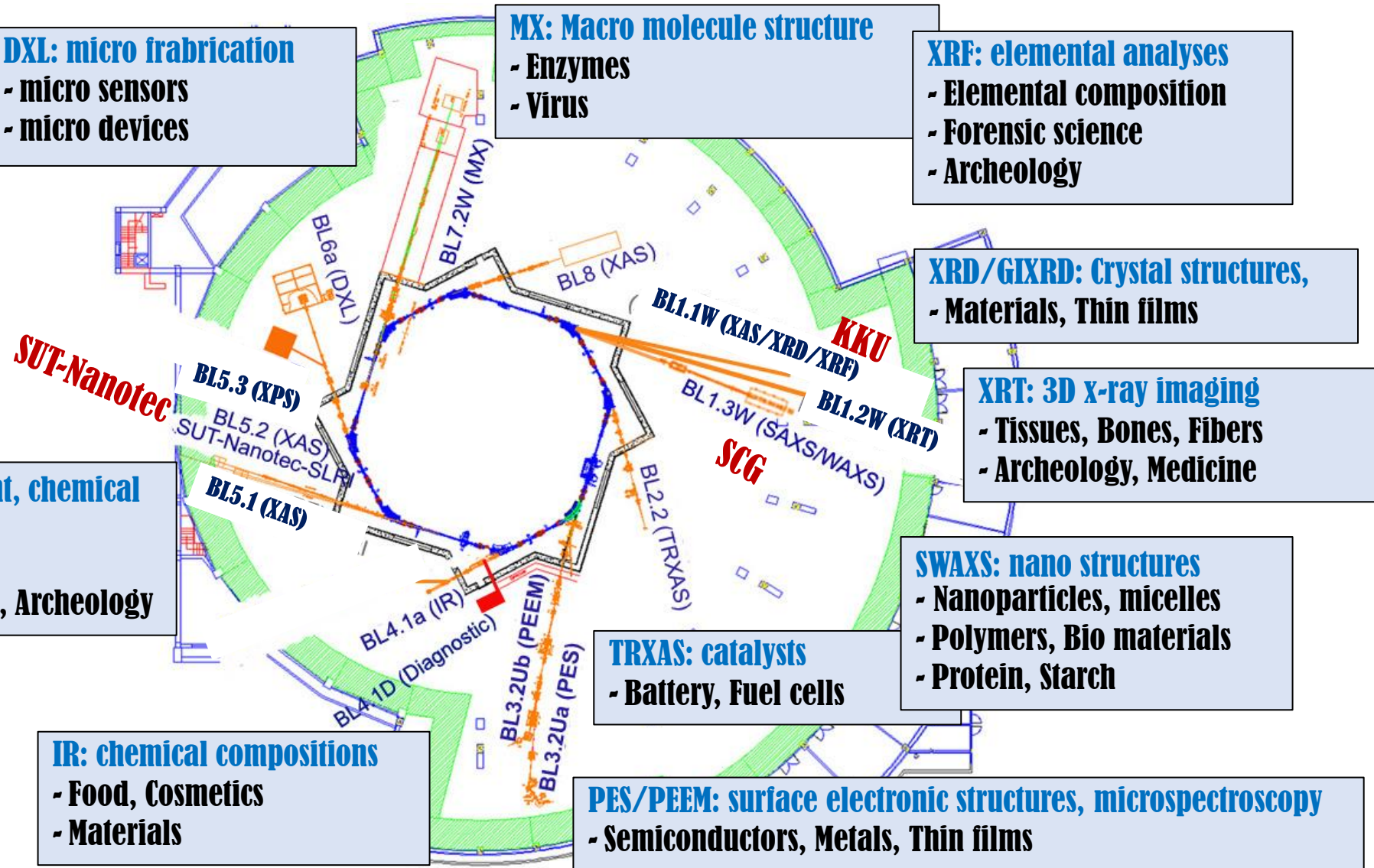
- Semiconductors, Metals, Thin films

**XAS: atomic arrangement, chemical form**

- Atomic structures
- Environment, Materials, Archeology

**IR: chemical compositions**

- Food, Cosmetics
- Materials



# The synchrotron impact on Thailand

**Economic Value Assessment**

**40M EUR/year**

**Scientific publications**

**220 /year**

**Graduate students**

**230 /year**

**Research projects**

**500 /year**

**ASEAN**

**10%**

**International**

**5%**

**Companies (projects)**

**20 /year**



# What we have done well

**Development of technological capability for self sustainability**

- **Vacuum system**
- **UHV welding, brazing**
- **Component fabrication**
- **Control system**
- ...

**Collaboration with experts from other facilities**

- **Technical trainings of staff and students**
- **International Advisory Committee**





# What we have done well

## User training

- Schools and workshops
- 3 ASEAN workshops annually
- User trainings

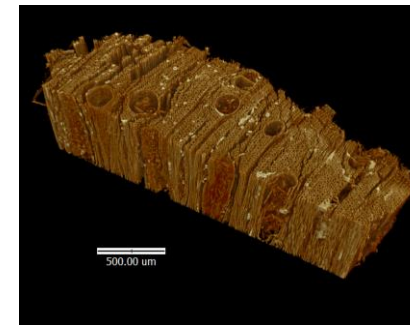
## Public awareness

- Science events
- High social impact research



**Krieb mirror**

**Archeology**



**Fossil,  
Artifact  
preservation**

## Studies of local food



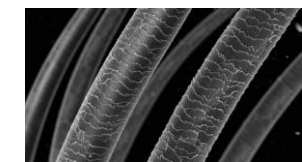
**Agriculture**



**Silk pattern  
design**



**Forensic science**



# Thai Silk Mask

Weaving pattern designed with Synchrotron X-ray Tomography  
Produced by local silk town



Thai Silk 4 warp (6-yarn thread)



# Challenges

## Human resource preparation

- **Need more skilled scientists and engineers**
- **Need more active user groups**

## Tangible applications

- **Require more tangible applications for public and political supports**

## Involvement of industries

- **Need more companies to invest in long-term R&D**
- **Public and government expect more industrial uses of the synchrotron**

# The future: The Siam Photon Source II

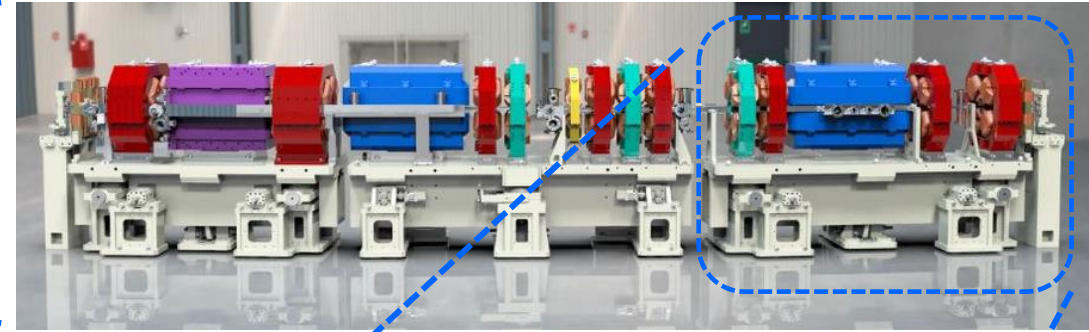
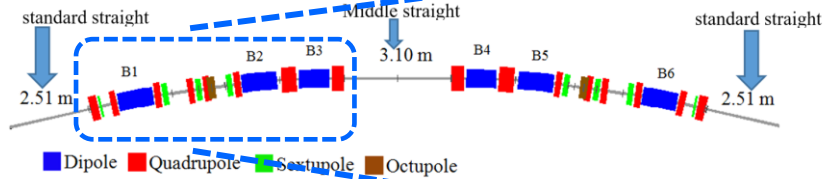


- **Located in the Eastern Economic Corridor area in Rayong**
- **40 min from Pattaya, 2 hours SE of Bangkok)**
- **A high speed train line is being constructed**

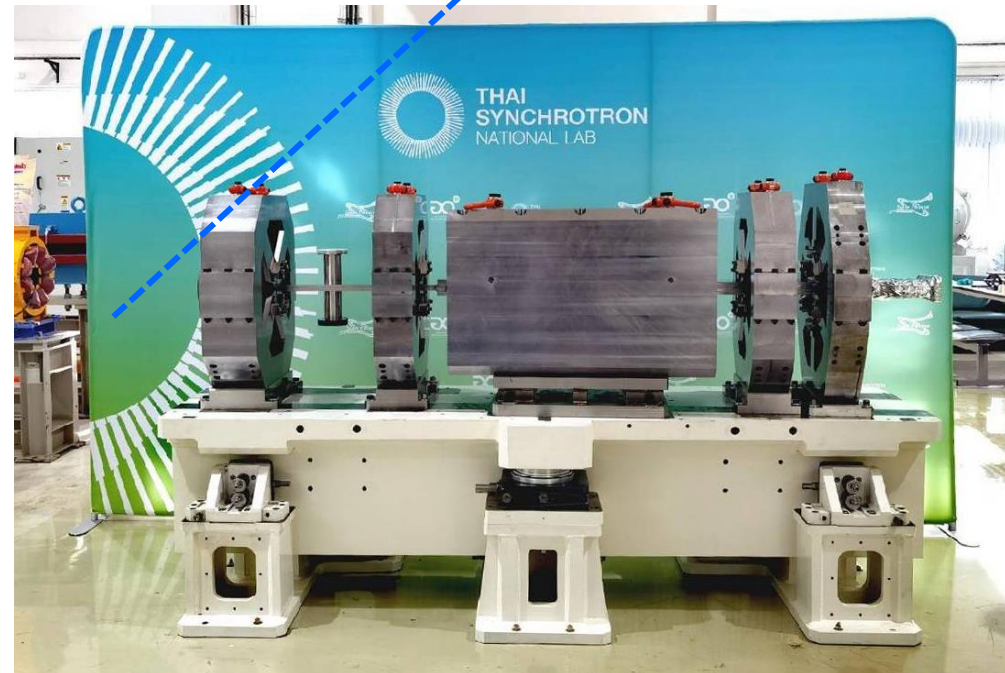




# The future: The Siam Photon Source II



- **260M EUR project approved by the cabinet**
- **Expected to start construction in 2023**
- **Detailed designs and prototyping in progress**



# Challenges and plans

## Human resource preparation

- **Setting up PhD projects (Thai + ASEAN students)**
- **Recruiting more scientists and engineers (Thailand, ASEAN)**
- **Training of current staff**

## Participating beamlines

- **Beamlines construction and operation jointly funded by academic consortiums**
- **Beamlines jointly operated by ASEAN countries**

## Involvement of industries

- **Significant portion of components fabricated by local industries**
- **Joint-funded beamlines with large R&D companies**



# Thank you



**Acknowledgement: TC Regional Project RAS0080 - Promoting Self-Reliance and Sustainability of National Nuclear Institutions**