Central Japan Synchrotron Radiation Research Facility Project

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Introductoin

Synchrotron radiation (SR) is an important tool not only for basic research, but also for engineering and industry-oriented research and development. For this purpose, an SR facility project has been proposed at Nagoya University since 1991. In the meantime, the Aichi Prefectural government has been planning a new research and development complex "Knowledge Hub" for industries in the Central area of Japan and the SR facility proposed at Nagoya University has been considered to be one of the leading facilities for "Knowledge Hub." Therefore, the prefecture, industries, universities, and research institute in the Aichi area are working together to realize this plan.

Construction Schedule

2009. Site formation for the buildings construction
2012. First synchrotron light

Management

Aichi Science & Technology Foudation is responsible for the operation and management.

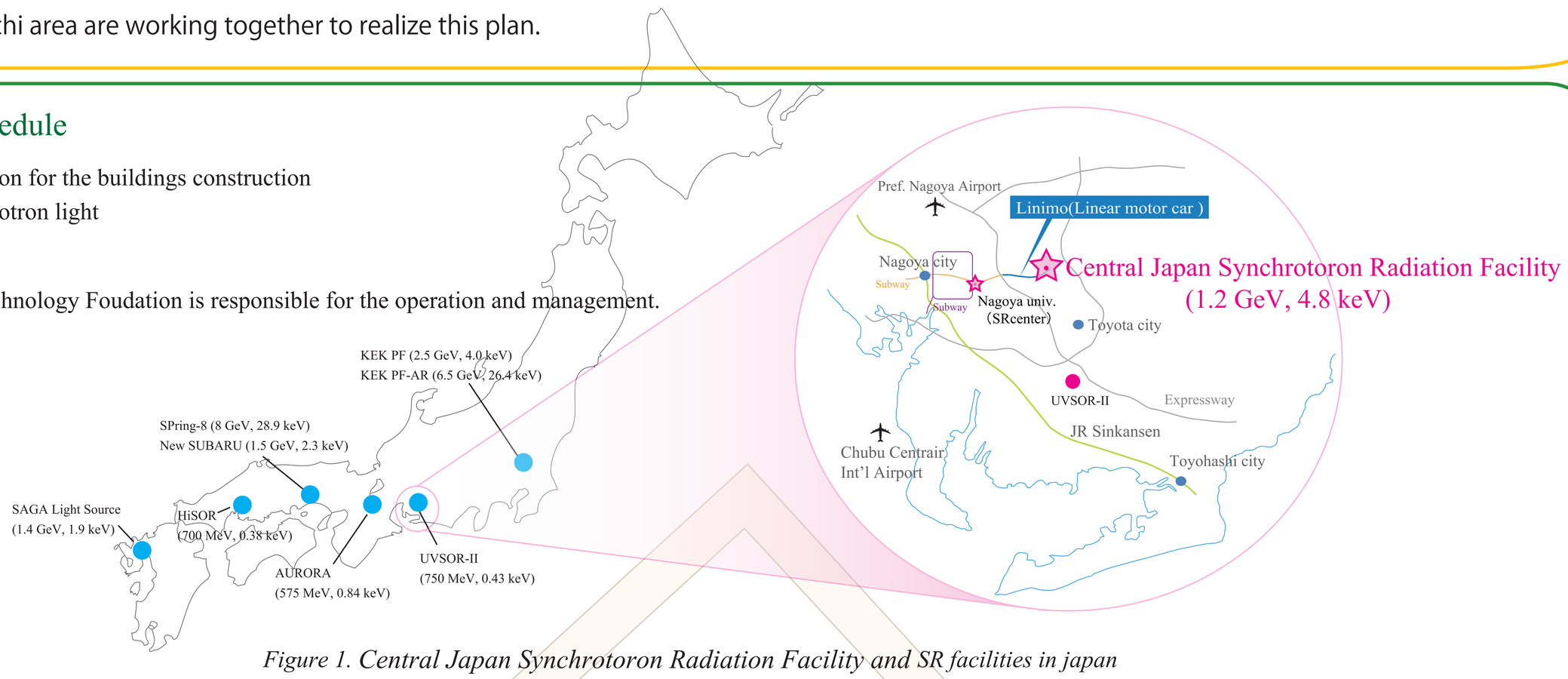

Figure 1. Central Japan Synchrotoron Radiation Facility and SR facilities in japan

Accelerators & Beamlines

Table1. Parameters of Accelerators

Storage Ring	
Beam energy	1.2 GeV
Current	>300 mA
Circumference	72.0 m
Normal bend	1.4 T, 39° x 8
Super bend	5 T, 12° x 4
RF frequency	500 MHz
Natural emittance	53 nmrad
Magnetic lattice	Triple Bend Cell x 4
Straight sectoin	5.2 m x 1, 4.3 m x 1
Booser synchrotron	
Beam energy	1.2 GeV
Circumference	48.0 m
RF frequency	500 MHz
Injector linac	
Beam energy	40 MeV
Current	60 mA
RF frequency	2856 MHz

The key facility of the plan is a compact electron storage ring, which is able to supply hard X-rays. The SR facility, consisting of accelerators, beamlines, peripheral equipments and housing, has been designed at the Nagoya University Synchrotron Radiation Research Center. The configuration of NSSR (Nagoya University Small Synchrotron Radiation Ring) is based on the Triple Bend with twelve bending magnets. Eight of them are normal conducting magnets of 1.4 T and four of them are 5 T superconducting magnets (superbends), respectively. The bending angle of them is 12 degrees and two or three hard X-ray beamlines can be constructed at each superbend, so that more than 10 hard X-ray beamlines can be constructed in our facility. The number of beamlines from normal conducting bending magnets is more than 16. In addition, we will install an undulator or a wiggler in straight sections.

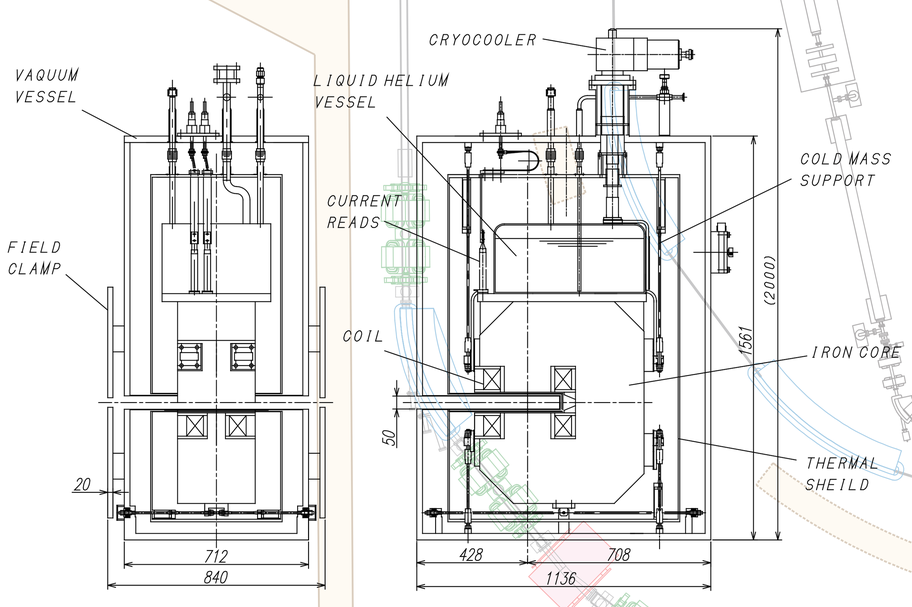

Figure 2. Schematic view of the superbend

Table 2. Parameters of the superbend

York type	C type	Length	< 950 mm
Peak field	> 5 T	Hight	< 3000 mm
Bending angle	12° (1.2 GeV)	Width	< 900 mm

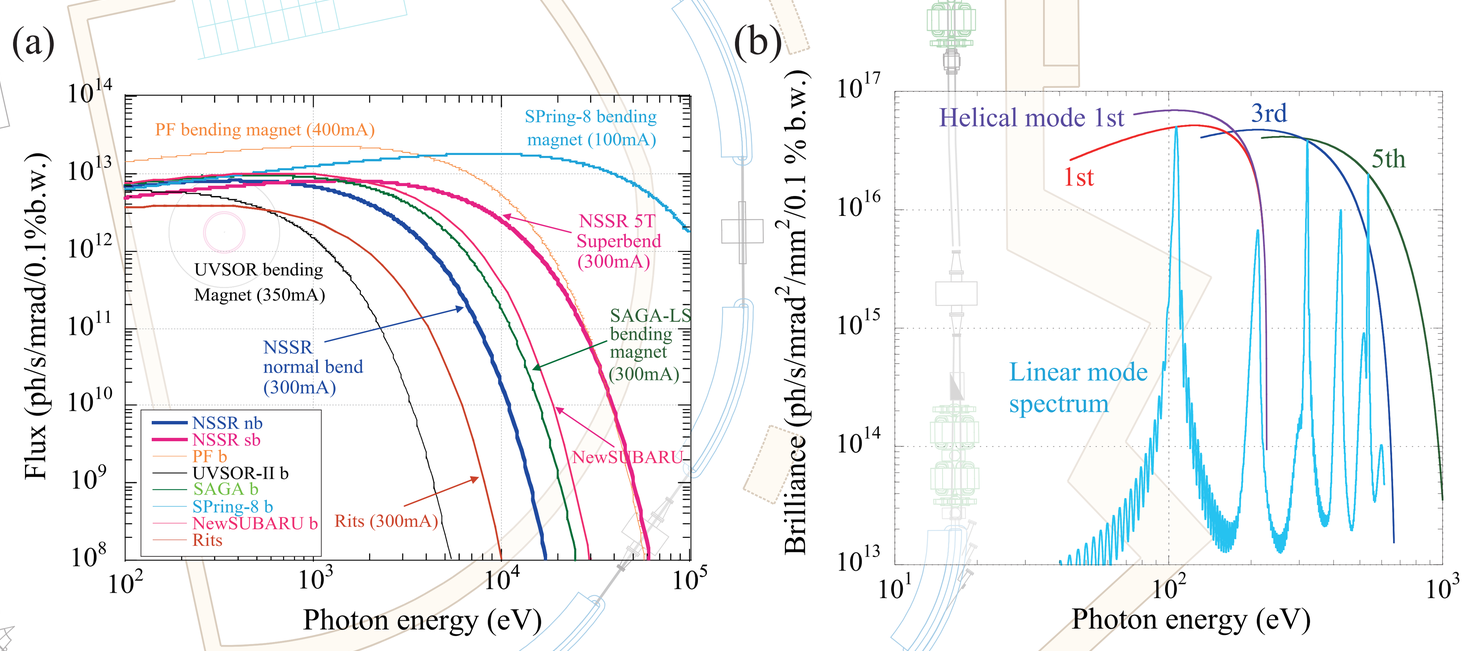

Figure 3. Spectra of photon flux from bending magnets (a) and brilliance from undulator (b)

Table 3. Six beamlines constructed in the first phase

Beamlines	Energy Range (keV)	Acceptance Angle (mrad)	Flux (photons/sec)	Energy Resolution (E/ΔE)
Hard X-ray XAFS	5 - 20	2	1×10^{11}	7,000
Soft X-ray XAFS	0.8 - 6	7.5	7×10^{10}	2,000
VUV & Photoemission Spectroscopy	0.03 - 0.9	0.5	-	-
Small angle X-ray Scattering	15	2	7×10^{10}	2,000
X-ray Diffraction	5 - 20	2	4×10^{10}	1,700
X-ray Fluorescence & Reflectivity	5 - 20	2	1×10^{11}	2,000