Present Status and Future Prospects of Kurchatov Synchrotron Radiation Source

Yevgeniy Fomin

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What is Kurchatov synchrotron radiation source?
Kurchatov synchrotron radiation source layout

- Siberia – 2
  - X-ray source

- Siberia – 1
  - Booster
  - VUV and soft X-ray source

- SC wiggler
- LINAC
- RF system
LINAC, $E_b = 80$ MeV

Electron gun, $E_b = 40$ keV

Storage ring Siberia-1, $E_b = 450$ MeV
Superconducting wiggler, \( B_{\text{max}} = 7.5 \, \text{T} \)

Storage ring Siberia-2, \( E_b = 2.5 \, \text{GeV} \)
## Current status

### Siberia – 2:
- **beam energy**: 2.5 GeV
- **beam current**: 180 mA
- **beam life time**: ~20 h (at $I_b = 160$ mA)
  - ~35 h (at $I_b = 70$ mA)

### Siberia – 1:
- **beam energy**: 450 MeV
- **beam current**: 250 mA
- **beam life time**: 1.5 h (at $I_b = 250$ mA)

### Experimental stations:
- 10 - operate with SR from BMs of Siberia-2
- 3 - operate with SR from BM of Siberia-1
- 3 - under construction and will operate with SR from BMs
- 3 - under construction and will operate with SR from SC wiggler
Experimental stations

- FS
  Station for photoelectron spectroscopy

- SPECTR
  Station for condensed matter spectroscopy

- LOCUS
  Station for luminescent and optical studies

- SAS
  Station for small-angle scattering

- HPXO
  Station for high-precision X-ray optics

- LANGMUR
  Station for organic film

- X-RAY MOVIE
  Station for time-resolved small-angle diffraction

- LIGA
  Station for high-precision X-ray lithography

- EXAFS
  Station for fluorescence EXAFS spectrometry

- REFRA
  Station for X-ray refractive optics

- XCMS
  Station for X-ray crystallography and material science

- PC
  Station for protein crystallography

- MEDIANA
  Station for complex studies on medical diagnostics
### Main research activities

<table>
<thead>
<tr>
<th>Research Area</th>
<th>Activities</th>
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<tr>
<td>Nanodiagnostics and materials science</td>
<td>atomic structure, macromolecular structure, nanofilms, hetero-structures,</td>
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<td></td>
<td>superlattices, nanoclusters, fine-dispersed medium, radiation-induced</td>
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<td>defects, carbon nanostructures and etc.</td>
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<tr>
<td>Nanotechnology</td>
<td>molecular beam epitaxy, Langmuir-Blodgett technique and etc.</td>
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<tr>
<td>Biotechnology</td>
<td>protein crystallography, bio-organic films on the surface of the liquid and</td>
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<td></td>
<td>etc.</td>
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<td>Microsystem technology</td>
<td>LIGA technology</td>
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<td>Fundamental research</td>
<td>materials at super high pressures, &quot;cosmic“ crystals, X-ray optics and etc.</td>
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<td>Living systems and nuclear medicine</td>
<td>new methods of medicine diagnostics, permolecular structure of biological</td>
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<td>tissues and fluids and etc.</td>
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<tr>
<td>Dual technology</td>
<td>nondestructing test of critical parts, forensic examination and etc.</td>
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<tr>
<td>Metrological support of nanotechnology</td>
<td>spectroradiometry, metrology of layered structures and etc.</td>
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Modernization of
Kurchatov synchrotron radiation source.
Modernization of SR source

- New SR beam line at Siberia-1
- Upgrade of RF system of Siberia-2
- New nanosecond generators
- New automatic control system
- New SR beam lines at Siberia-2
- Use high brilliance optical structure of Siberia-2
- Full-energy booster synchrotron
- LINAC upgrade
- Feedback system
- New insertion devices at Siberia-2
Kurchatov synchrotron radiation source layout after upgrade

- **Full-energy booster**
  - SC wiggler $B = 7.5$ T
  - $dE = 20 - 200$ keV

- **SC wiggler $B = 3$ T**
  - $dE = 5 - 26$ keV

- **SC wiggler $B = 3$ T**
  - $dE = 5 - 40$ keV

- **SC wiggler $B = 3$ T**
  - $dE = 5 - 26$ keV

- **SC wiggler $B = 3$ T**
  - $dE = 5 - 26$ keV

- **Undulator**
  - $B = 0.75$ T
  - $dE = 2 - 7$ keV

- **Wiggler $B = 0.36$ T**
  - $dE = 5 - 270$ eV

- **Wiggler $B = 0.36$ T**
  - $dE = 25 - 1500$ eV

- **Wiggler $B = 0.36$ T**
  - $dE = 4 - 1200$ eV

- **ER beamline**
  - $dE = 0.1 - 350$ eV

- **Wiggler $B = 0.36$ T**
  - $dE = 4 - 1200$ eV
LINAC after upgrade

- Electron gun
- LINAC structure
- Magnetic mirror

- to booster
  $E_{\text{beam}} = 160 \text{ MeV}$

- to Siberia-1
  $E_{\text{beam}} = 80 \text{ MeV}$
Instead of conclusion

2-nd generation light source → Modernization → 3-rd generation light source
Thank you for your attention!