Status of SLiT-J
- a high brilliant compact 3 GeV light source project in Japan -

SLiT-J : Synchrotron Light in Tohoku, Japan
The project was proposed by 7 national universities in Tohoku area in 2011

Hiroyuki Hama for SLiT-J Design Team
Tohoku University
RIKEN/SPring-8
Japanese Light Sources

Many small facilities, but no SR facility in northern Japan.
No 3rd generation light source except SPring-8.
No modern 3 GeV class machine for advanced science and technology.
Latest Light Sources and Future

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Japanese Light Source’s Brilliance

this is our motivation
SLiT-J Storage Ring – DDBA Lattice -

Beta Function (m)

Dispersion Function (m)

Path Length (m)
## SLiT-J Storage Ring

<table>
<thead>
<tr>
<th>Lattice parameter</th>
<th>妙高2 version</th>
<th>with insertions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beam energy E (GeV)</td>
<td>2.998</td>
<td></td>
</tr>
<tr>
<td>Lattice structure</td>
<td>DDBA</td>
<td></td>
</tr>
<tr>
<td>Circumference C (m)</td>
<td>353.740</td>
<td></td>
</tr>
<tr>
<td>Number of cells Ns</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>Long straight section (m)</td>
<td>5.44 × 16</td>
<td>14</td>
</tr>
<tr>
<td>Short straight section (m)</td>
<td>1.84 × 16</td>
<td>12</td>
</tr>
<tr>
<td>Betatron tune x / y</td>
<td>29.21 / 9.28</td>
<td></td>
</tr>
<tr>
<td>Natural chromaticity x / y</td>
<td>-69.302 / -41.119</td>
<td>~ 0.7</td>
</tr>
<tr>
<td>Natural horizontal emittance (nmrad)</td>
<td>0.92</td>
<td>0.7</td>
</tr>
<tr>
<td>Momentum compaction factor</td>
<td>α</td>
<td>0.00045</td>
</tr>
<tr>
<td>Natural energy spread σE/E (%)</td>
<td>0.082</td>
<td></td>
</tr>
<tr>
<td>Lattice functions at LSS βx / βy / ηx (m)</td>
<td>13.0 / 3.0 / 0.0</td>
<td></td>
</tr>
<tr>
<td>Lattice functions at SSS βx / βy / ηx (m)</td>
<td>4.28 / 3.32 / 0.07</td>
<td></td>
</tr>
<tr>
<td>Damping partition number Jx / Js</td>
<td>1.424 / 1.576</td>
<td></td>
</tr>
<tr>
<td>Damping time τx / τy / τs (ms)</td>
<td>8.66 / 12.34 / 7.83</td>
<td></td>
</tr>
<tr>
<td>Energy loss in bends (MeV/turn)</td>
<td>0.573</td>
<td></td>
</tr>
<tr>
<td>RF frequency (MHz)</td>
<td>508.51</td>
<td></td>
</tr>
<tr>
<td>Harmonic number h</td>
<td>600</td>
<td></td>
</tr>
</tbody>
</table>

If all L.s.s. are filled with high field undulators

If 24-cell available (530m), Emittance is 260 pmrad
SLiT-J Storage Ring, DA

Dynamic aperture

Diffusion map
Advanced techs developed at SPring-8

1. TM020 cavity (Dr. Ego)
   - Only one straight section
   - + 3\textsuperscript{rd} harmonic cavity

2. Attractive force free undulator (Dr. T. Tanaka)
   - Pretty compact

3. Permanent magnet bend (Dr. T. Watanabe)
   - How about longitudinal gradient combined bend?
SLiT-J Injector

Thermionic cathode RF gun injector

CT: Current transformer
SCM: Screen monitor
Q-mag: Q Magnet
B-mag: Bending Magnet

ε@3GeV ~ 1nmrad
3-bunch injection

To C-bands
SLiT-J Facility

Floor plan

**Power consumption**

<table>
<thead>
<tr>
<th>Component</th>
<th>Power (MW)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Storage ring</td>
<td>2.00</td>
</tr>
<tr>
<td>Injector linac @1Hz</td>
<td>0.26</td>
</tr>
<tr>
<td>Control system</td>
<td>0.10</td>
</tr>
<tr>
<td>Beam line (24 stations)</td>
<td>0.28</td>
</tr>
<tr>
<td>Utility and others</td>
<td>1.70</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>4.34 MW</strong></td>
</tr>
</tbody>
</table>

**SPring-8** ~ 40 MW
**J-PARC** ~ 100 MW
**ILC** ~ 160 MW

**SLiT-J : Integrated package of the facility**

- easy maintenance
- small energy consumption
- low running cost

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SLiT-J Storage Ring, Size

NSLS-II

MAX-IV

TPS

SIRIUS

SLiT-J

910 pmrad

24 cell - 530 m
260 pmrad

Because of budget !!!

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SLiT-J Facility

2020?

May the Light be with you.

We ask your strong support. Thank you.
推進体制（Progress Organization）

SLiT-Jへの体制

Universities

Local governments

Industries

Politicians

Scientific Community
SLiT-J Brightness