Status of RF system
for the JAERI Energy-Recovery Linac FEL

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History of JAERI RF System

• All-Solid-State Amplifier
  1990    4kW Pulse for SHB (83.3MHz)
  1991    6kW Pulse for Single-Cell SCA (499.8MHz)
  1992    50kW Pulse for 5-Cell SCA (499.8MHz)

• IOT
  2002    50kW CW for Single-Cell SCA (499.8MHz)
  2004    50kW CW for 5-Cell SCA (499.8MHz)
Layout of the JAERI ERL-FEL

before

6kW All-Solid-State Amp

50kW All-Solid-State Amp

50kW IOT

now

HV for 50kW IOT

50kW IOT
Breakdown

• All-Solid-State Amplifier
  No Major breakdown for Amplifier Modules
  Minor breakdown
    - discharge in Power Combiners
    - matching resistance burnout
    - DC power source failure for control unit

• IOT
  Critical failure
    - ceramic crack during tuning
Bandwidth

All-Solid-State 55MHz
IOT 6.5MHz
## Cost for 500MHz RF Source

<table>
<thead>
<tr>
<th></th>
<th>Pulse</th>
<th>CW</th>
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</thead>
<tbody>
<tr>
<td><strong>All-Solid-State</strong></td>
<td>~¥70M JPY, ~$0.7M</td>
<td>~200M JPY, ~$2M</td>
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<tr>
<td><strong>IOT</strong></td>
<td></td>
<td>~26M JPY, ~$0.26M</td>
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</table>

100 JPY = $1

- Tube: $0.05M*35 + $0.26 ~ $2M

No of replacement
Conclusion

• All-Solid-State merits
  – Wide bandwidth
  – little critical failure

• IOT merits
  – Low cost
  – High efficiency