High Power Conditioning of Annular–ring Coupled Structures for the J–PARC Linac

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Overview of J–PARC

LINAC (From 181 to 400 MeV)

3–GeV Rapid Cycle Synchrotron (RCS)

Materials and Life science Facility (MLF)

Main Ring Synchrotron (30 to 50 GeV)

Hadron Experimental Hall

1MW for MLF

Neutrino beam to Kamioka (T2K)

1MW for MLF
**Configuration from 191 to 400 MeV**

**181 MeV LINAC**
- 3.1 m 27.1 m 91.2 m
- IS - RFQ - DTL - SDTL - DB1
- MEBT1 (324MHz)
- 3 MeV 50.1 MeV 181 MeV
- (Two SDTL tanks are used as a debuncher temporarily.)
- To 3-GeV RCS  
  L3BT  
  (Linac 3-GeV Beam Transport)

**400 MeV LINAC**
- 15.9 m 108.3 m
- IS - RFQ - DTL - SDTL - B1,2 - ACS - DB1,2
- MEBT1 (324MHz)  
  MEBT2 (972MHz)
- 190.8 MeV 400 MeV
- To 3-GeV RCS  
  L3BT

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**25 Annular-ring coupled structure (ACS) cavities**

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SCS vs. ACS (3D model)

- Side coupled
- Annular-ring coupled

- Negligibly small transverse kick field,
- Possibility of precise machining by a lathe,
- Mechanical stability.
ACS accelerating module

[Diagram of ACS accelerating module with labels: Bridge tank, 500 L/s Ion pump, 150 L/s Ion pump, Accelerating tank, Manifold, Beam axis, B-A vacuum gauge]
Before cavity installation

Moving ACS cavity to acc. tunnel

Ground level to acc. tunnel

Using moving rollers (motor-driven)

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After cavity installation

400 MeV

H- beam

190.8 MeV

(16. Nov. 2013)
Typical conditioning history

- ACS05 (First conditioning)

ACS05

Repetition 25 Hz

Input power [MW]

Pressure [Pa]

Conditioning time [hour]

50 µs  600 µs
Successfully conditioned all cavities within three weeks.

Average 149 h
400 MeV acceleration

The J–PARC linac successfully achieved 400 MeV as of 14:34 Jan. 17.

W = 400.5 (MeV)

Time of flight

(by linac commissioning group)

Please visit THPP089 for details.
Thank you for your attention.