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SRF Linac for IFMIF DONES
Introduction

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F4E Market Survey

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Outline

1. DONES facility introduction
2. SRF Linac requirements
3. F4E scope for SRF Linac
4. SRF Linac design
5. Procurement schedule
6. F4E market research

DONES facility

- SRF linac is a key piece to achieve the goals of accelerating Deuterons for the high flux neutron test cell
- SRF linac hosts the superconducting RF cavities that accelerate the Deuteron beam
- SRF Linac is broken in 5 pieces to ease manufacturing, transport and operation.
- It's heavily reliant on: beamline, RF power system, cryogenics plant/distribution and vacuum system.

SRF Linac requirements

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IDENTIFIED AS DONES WBS 6.5

- Acceleration from 5 to 40MeV
- D+ beamline at 125mA CW
- 175MHz Half Wave Resonator Cavities
  - Nb superconducting cavities cooled at 4.45K
  - External compression tuning system
  - Low Beta and High Beta Variants
  - 100kW LB and 200kW HB radio frequency power couplers
- 6T superconducting solenoid magnets + steerers

Cryomodule	CM1	CM2	CM3	CM4	CM5
HWR beta optimum	Low 0.116	Low 0.116	High 0.179	High 0.179	High 0.179
Elementary sequence	1 solenoid + 1 cavity	1 solenoid + 2 cavities	1 solenoid + 2 cavities	1 solenoid + 2 cavities	1 solenoid + 2 cavities
Number of elementary sequences	8	5	4	4	4
Inlet section	none	1 solenoid + 1 cavity	1 solenoid + 1 cavity	1 solenoid + 1 cavity	1 solenoid + 1 cavity
Total number of cavities	8	11	9	9	9
Total number of solenoids	8	6	5	5	5
Output energy (MeV)	8.3	13.9	21.3	30.3	40

F4E scope for 6.5 SRF Linac

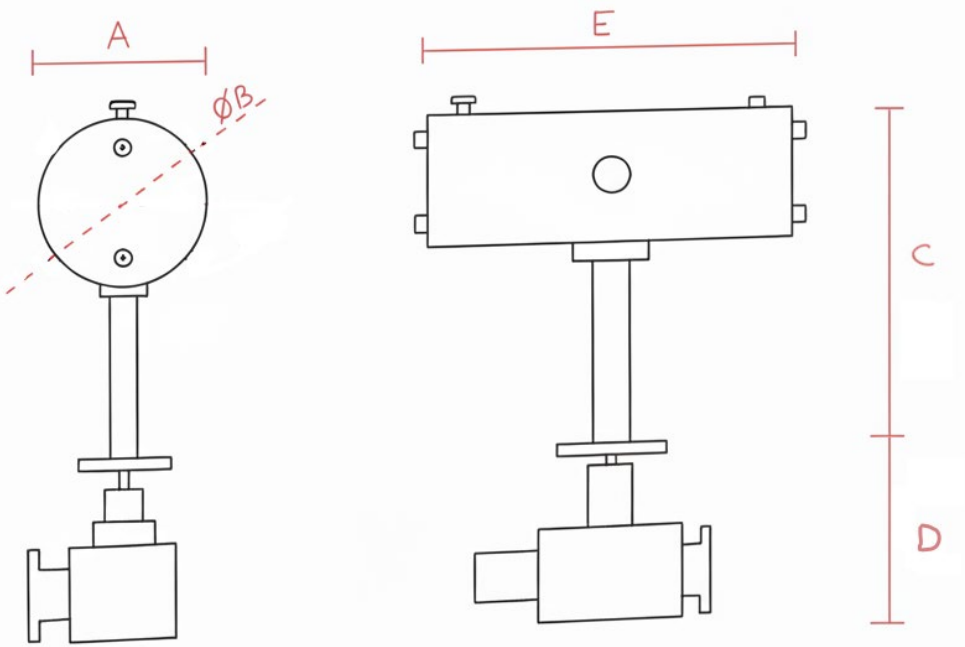
- Outfitting of SRF testing facilities necessary for the project (coupler conditioning stand, adapt cryostat for cavity+coupler+tuner test)
- Critical components design, qualification and series production
  - Power couplers: 19x 100kW + 2 spares, 27x 200kW + 2 spares
  - Cavities: 19x LB + 2 spares, 27 HB + 2 spares
  - Solenoids: 29 units + 4 spares
  - Beam diagnostics: µLM, BLM, BPM
- Manufacturing of 5 cryomodules and integration of critical components
- Local Instrumentation and Control System
- Beamline warm sections interconnecting cryomodules
- Transportation and rigging: Vibration absorption frame + delivery to DONES site
- Installation, Construction Completion Review and Site Acceptance Test

Cryomodule: Beam diagnostics

- **µLM**: Micro Loss Monitors.
  With 3 units located in each solenoid, provide beam loss sensitivity helping beam fine tuning and to launch the MPS to protect the cold-mass components if losses exceed 1 W/m.
- **nBLM**: Beam Loss Monitors.
  Interlock connection to the machine protection system with response required in less than 10 µs if losses exceed 1W/m.
- **BPM**: Beam Position Monitors
  Button type beam position monitors with 4 pickups in each solenoid, operating at 4.45K
- Space in warm sections for future install of SEM grid in the warm sections.

Dimensions of cavity +RF coupler

Not represented: Tuner assembly, cryogenic, beam and vacuum interfaces



	Low Beta	High Beta
A	388	407
B	228	400
C	819	890
D	650	650
E	1029	1042

Dimensions in millimeters

F4E market research

F4E is evaluating the vendors in the market survey with the following categories:

Capabilities to work on a cryomodule full scope project

- Vendor internal resources: project managers and engineers
  - Capabilities beyond “build to print”
- Vendor existing scientific partners for such a project
- Production capacity to build 5 cryomodules

Capabilities of SRF testing beyond jacketed cavity acceptance tests

- Test with HB cavity + coupler + tuner
- RF coupler conditioning
- Full size cryomodule test

Specialized experience in the topics listed:

- Full cryomodule thermohydraulic design, mechanical design and integration
- Scientific partners
- Beam instrumentation
- Superconducting magnets
- RF power couplers

Summary

- F4E researching industry capabilities on the potential scope of supply presented in the market survey
- Scientific partners are key for design maturity of some components
- Aggressive schedule heavily dependent on the engineering resources and production capacity of the selected suppliers.