

RECENT STATUS NEW SUPERCONDUCTING CW HEAVY ION LINAC@GSI

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Abstract

The demonstrator is a prototype of the first section of the proposed cw-LINAC@GSI, comprising a superconducting CH-cavity embedded by two superconducting solenoids. The sc CH-structure is the key component and offers a variety of research and development. The beam focusing solenoids provide maximum fields of 9.3 T at an overall length of 380 mm and a free beam aperture of 30 mm. The magnetic induction of the fringe is minimized to 50 mT at the inner NbTi-surface of the neighboring cavity. The fabrication of the key components is still in progress and is near to completion. After cold performance testing of the RF cavity, the helium jacket will be welded on. The cryostat is partly assembled and will be finished in the next weeks. The test environment is completely prepared. Advanced emittance measurement is foreseen to prepare for best matching of the heavy ion beam from the injector. Integration of the cryostat into the beam line, the first cool down of the module and commissioning of the RF elements will be performed as next steps towards a complete testing of the demonstrator.

Testing Area

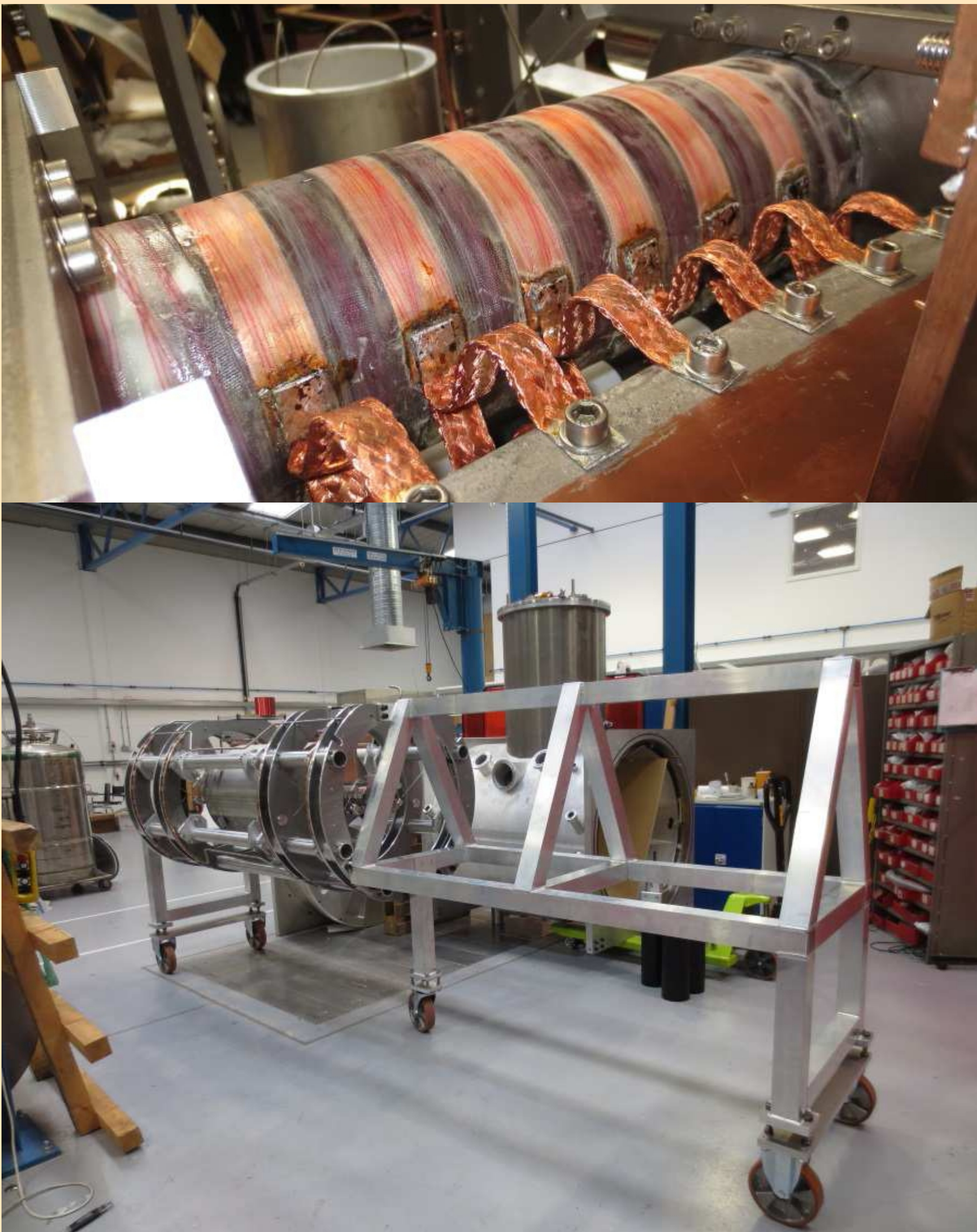


Protection cave for the cw-Demonstrator at the testing environment at GSI-HLI

Time Schedule

	cw-LINAC – Demonstrator-Project
2010	Kick-off at GSI Tendering of demonstrator components
2011	Delivery of LHe-supply and rf-amplifier Ordering of cavity, solenoids, cryostat Assembly of test area @GSI started
2013	Delivery of cavity 1st tests (warm + cold) at IAP
2015	Delivery of solenoid and cryostat
2016	Full performance test at GSI HLI

Demonstrator

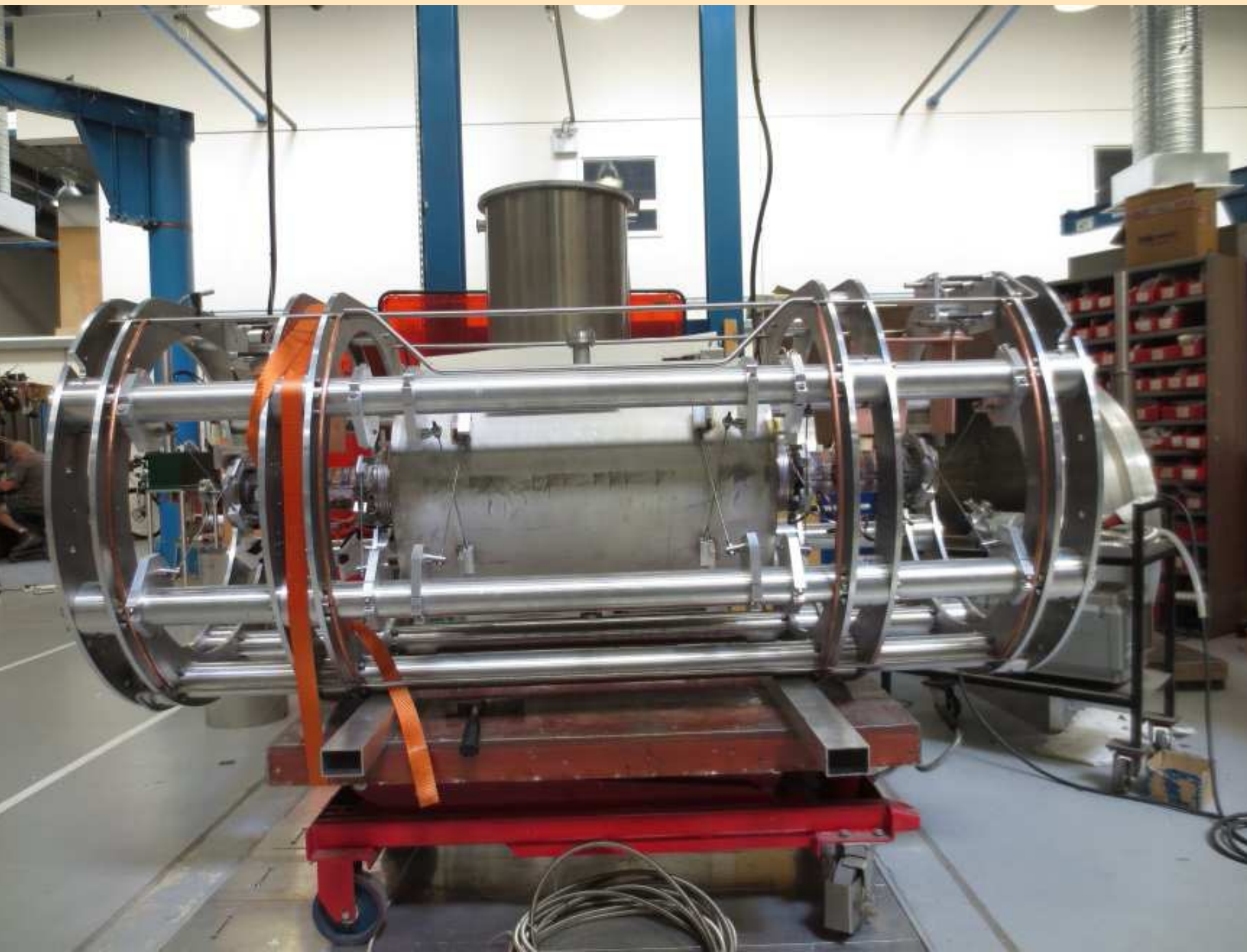


Dry cooled solenoids (top picture).
Loading/unloading the cryostat with an aluminum frame (bottom picture)

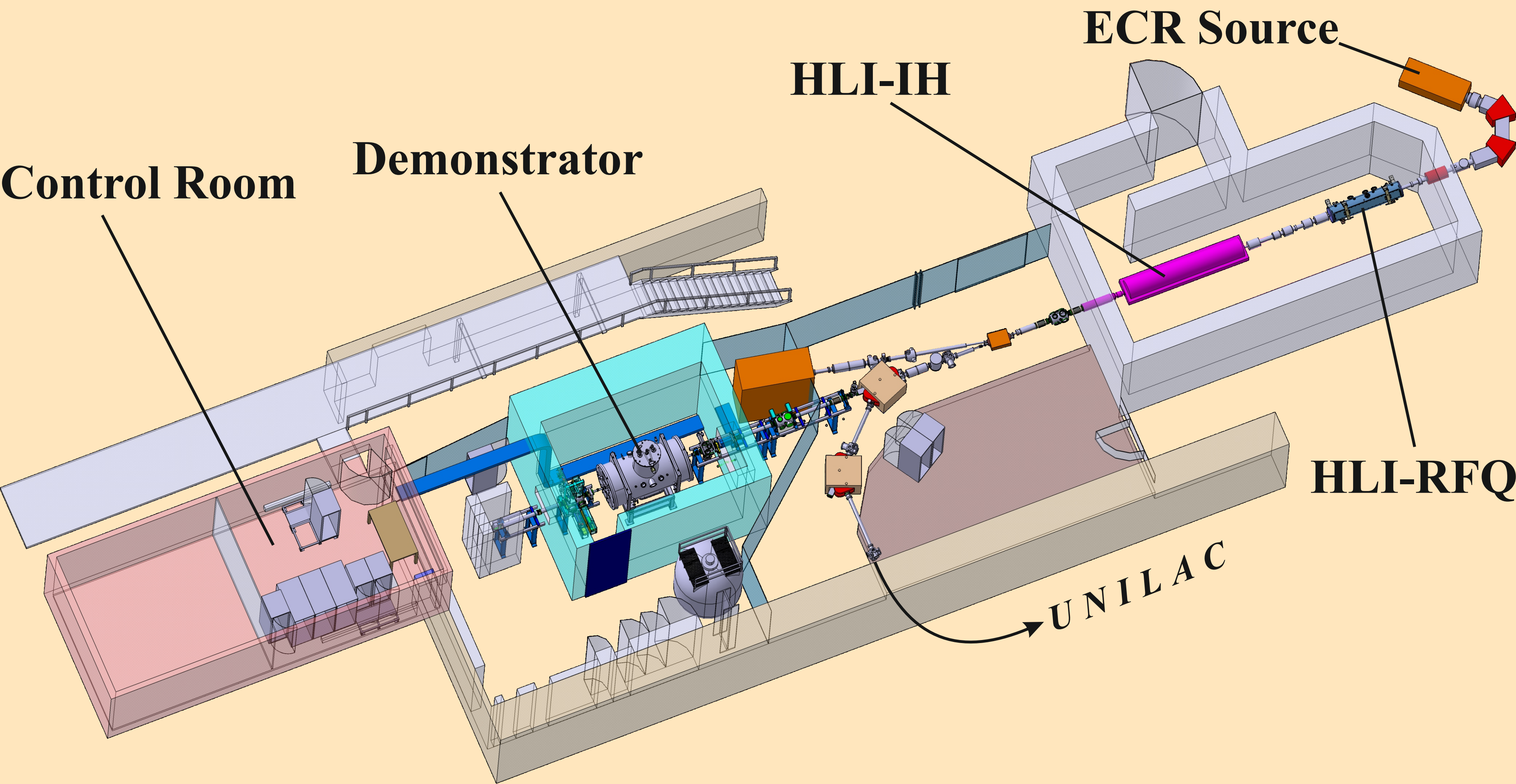
General Parameters of the sc cw-LINAC Demonstrator

CH-Cavity		
β		0.059
max A/Q		6
Resonance Frequency	MHz	217
Gap number		15
Total length	mm	690
Cavity Diameter	mm	409
Aperture	mm	20
Effective gap voltage	kV	225
Accelerating gradient	MV/m	5.1
Cryostat		
Inner length	mm	2200
Inner diameter	mm	1120
Material		Al
Operating temperature	°K	4.4
Operating pressure above atmosphere	bar	< 1
Solenoids		
Bore	mm	30
Overall length	mm	380
Max. field	T	9.3
Nominal current	A	110

Demonstrator string



The Demonstrator string. The Cavity Dummy embedded by two sc solenoids, hanging in a support system



3D layout of the GSI High Charge State Injector with the new cw-LINAC Demonstrator environment

Outlook

The Demonstrator project is a proof of principle on the CH cavity. Successful full performance tests with beam of the sc CH-cavity open a broad field of accelerator applications, e.g.:

- 1. The first 360 MHz prototype was developed within EUROTRANS. The follow-up project, MYRRHA, is planned to be commissioned in 2023. Four 176 MHz sc CH cavities are integrated into the ADS.
- 2. Another future application is the sc cw-LINAC at GSI Especially the Super Heavy Elements (SHE) program at GSI and at HIM benefits highly from such a dedicated accelerator. As a next step the extension of the Demonstrator to a string of five 217 MHz CH-cavities is proposed (Advanced Demonstrator).