

JINR-IMP CAS SRF cooperation at development of superconducting HWRs and cryostat

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Nuclotron-based Ion Collider fAcility (NICA) is new accelerator complex under construction at JINR. The Alvarez-type DTL linac LU-20 is planned to be replaced by the new linac, partially consisting of SRF cavities. New linac of 30 MeV energy for protons and ≥ 7.5 MeV/nucleon for deuterium beam is discussed now. It is proposed that the new linac will include a number of superconducting (SC) cavities.

1. Manufacturing of HWR's and training of staffs in field of SRF:

It is proposed to do the following works to produce HWR's for the new Nuclotron-NICA injection linac:

Performed works

- **JINR provides the current design of HWR (operating frequency 325 MHz, geometric velocity 0.21c) with conical central conductor;**
- **IMP provides the benchmarking of the HWR design including RF, thermal and mechanical simulations. JINR and IMP commonly do the necessary modifications in HWR design caused both by the cavity optimization and technological needs;**

Works in progress

- **IMP and JINR commonly design necessary mechanical equipment for the HWR operation (frequency tuning system, supports, helium jacket, vacuum ports, flanges, motion inputs, etc.)**
- **IMP provides the benchmarking of the RF coupler and the RF load design including RF, thermal and mechanical simulations. JINR and IMP commonly do the necessary modifications in the RF coupler and the RF load design caused both by the cavity optimization and technological needs;**
- **After all necessary simulations and corrections IMP provides 3D model and mechanical drawings for production. Results of these works should be delivered to JINR.**
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- **IMP provides manufacturing and assembling of FOUR HWR cavities, provides all necessary preparations of cavities for tests (including BCP, HPR, high temperature bake, vacuum tests, etc.)**

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IMP and JINR commonly provide the low-power RF tests, HWR cooling. Tests will be realized on the IMP site using a cryostat developed by IMP for four JINR HWR commonly with JINR staffs ;-

- Finally two manufactured and tested cavities should be delivered for JINR.**

IMP staffs should to take part in HWR s tests and commission at JINR.

2. Development and manufacturing of additional equipment for SRF cavities:

2.1. Two focusing solenoids with the following parameters:

- M-field on axes up to 2T;**
- Solenoid length 20-35 cm;**
- Fringe fields – not longer than 3-4 cm from the ends of solenoid;**
- Operation mode – CW (quasi-CW);**
- Aperture diameter 40 mm.**

2.2. Operating cryostat for 4 HWR and 2 solenoids with all necessary equipment (vacuum, cryogenics, mechanical, etc.).

2.3 slow tuners, for 4 HWRs,

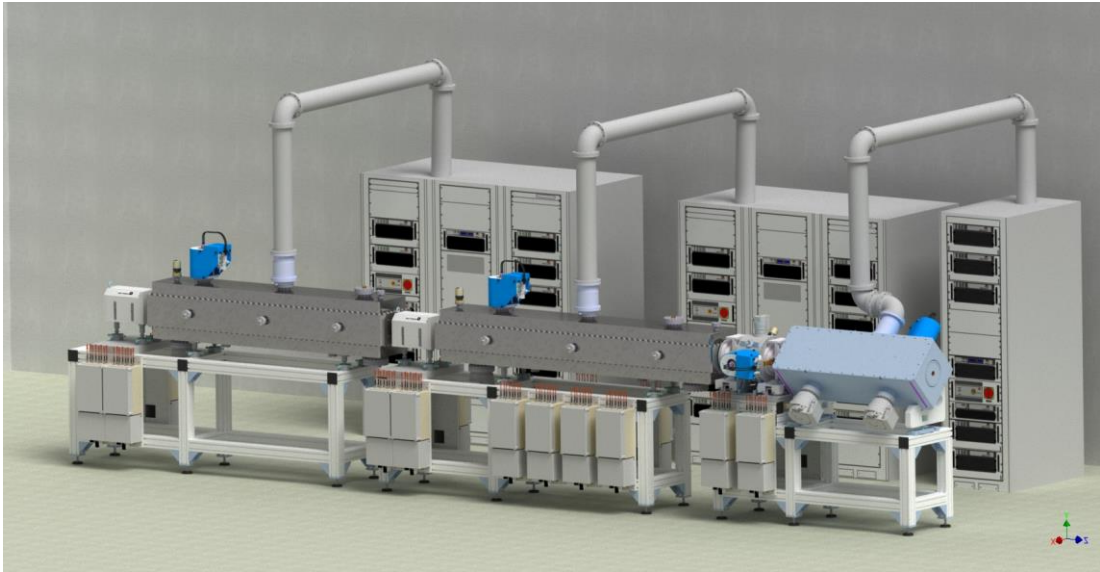
2.4 couplers, for 4 HWRs, including conditioning offline,

2.5 Cold BPMs,

2.6 Temperature, liquid helium diagnostics in cryomodule

2.7 Cryomodule assembly at IMP, around 3 months, including clean assembly of cold mass, alignment in warm and cold conditions, dirty assembly, thermal shielding, etc. IMP staffs should to take part in cryomodule with HWR s tests and commission at JINR

Construction of warm sections in Bevatech (Germany)

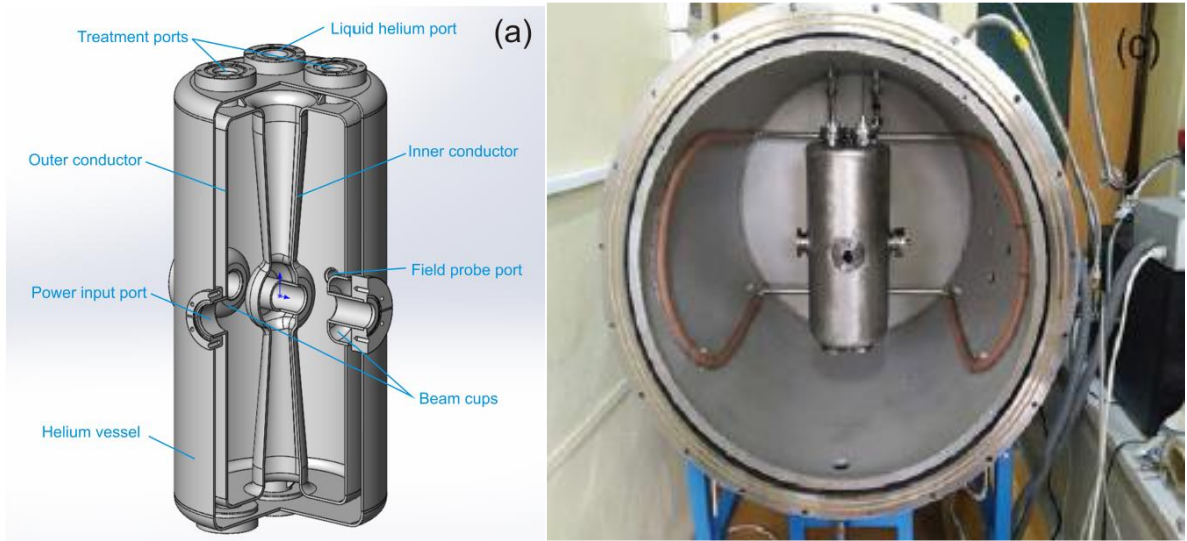


Warm part of 13 MeV LILAC (2024)

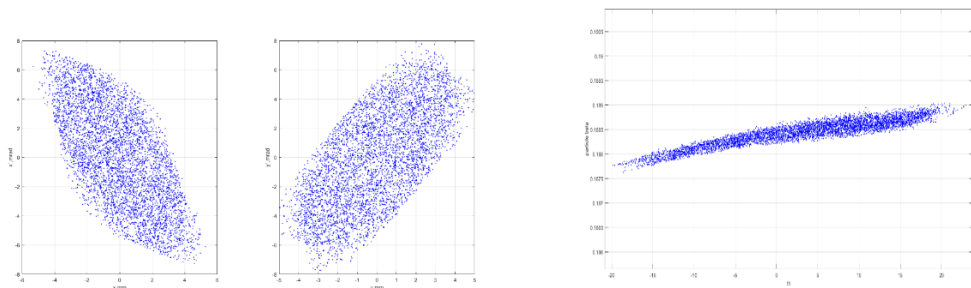
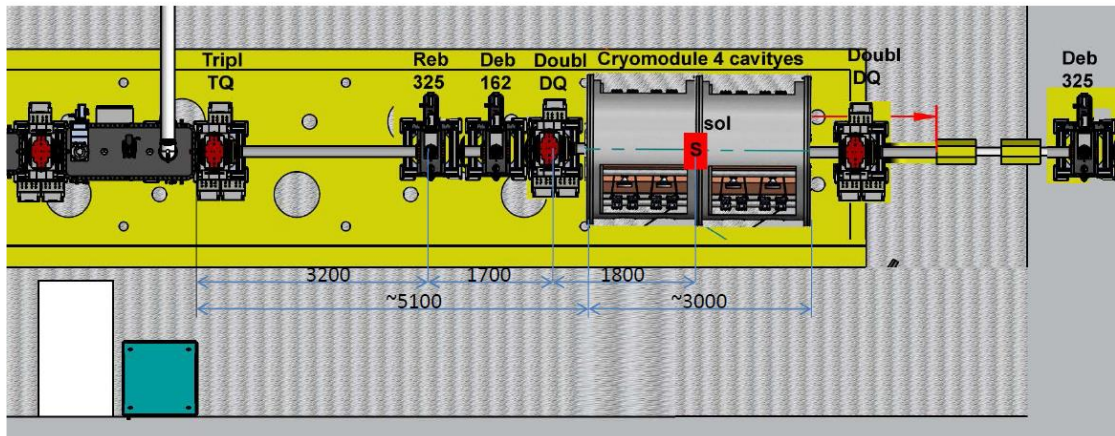


RFQ of LILAC

Construction of two HWR in Belarussia, JINR-PhTI NAB and BSU cooperation



Design of superconducting accelerator section with four HWRs prepared by JINR- IMP CAS Cooperation



Beam emittances