

THE SARAF-LINAC PROJECT 2019 STATUS

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Abstract

SNRC and CEA collaborate to the upgrade of the SARAF accelerator to 5 mA CW 40 MeV deuteron and proton beams (Phase 2). CEA is in charge of the design, construction and commissioning of the MEBT line and the superconducting linac (SARAF-LINAC Project). The prototypes of the 176 MHz NC rebuncher, SC cavities, RF coupler have been tested recently. Meanwhile, the cryomodules technical specifications have been written and called for tender. This paper presents the status of the SARAF-LINAC Project at April 2019.

INTRODUCTION

The SARAF-LINAC project, managed by CEA (France), integrated to the SARAF-Phase 2 project managed by SNRC (Israel) has been introduced in [1].

In 2014, a first System Design Report (on the base of which [1] was written) was presented and served of basis on an agreement between CEA and SNRC.

The < 8 year project can be simplified in 3 overlapping phases (Fig. 1):

- ~4.5y of detailed design, including prototyping,
- ~4y of construction, assembly and test at Saclay,
- ~2.5y of installation and commissioning at Soreq.

Following the IPAC'18 status [2], this paper presents the SARAF-LINAC status after four years of development. Here are the highlights since IPAC'18:

- Manufacturing and test of the first MEBT rebuncher.
- CDR of the MEBT,
- Manufacturing & test of the LB HWR prototype.
- Manufacturing & test of the RF coupler prototypes.
- Manufacturing & test of the current leads prototype.

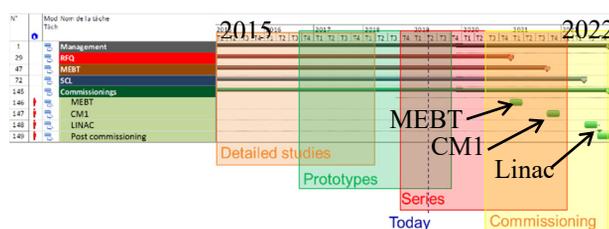


Figure 1: SARAF-LINAC major schedule.

THE MEBT

The MEBT (Medium Energy Beam Transport, see Fig. 2) line passed its CDR in November 2018. The support, beam chambers, vacuum and cooling circuits are now being built. The line is planned to be assembled and tested at Saclay from T4-2019 to T2-2020 before transportation to SNRC.

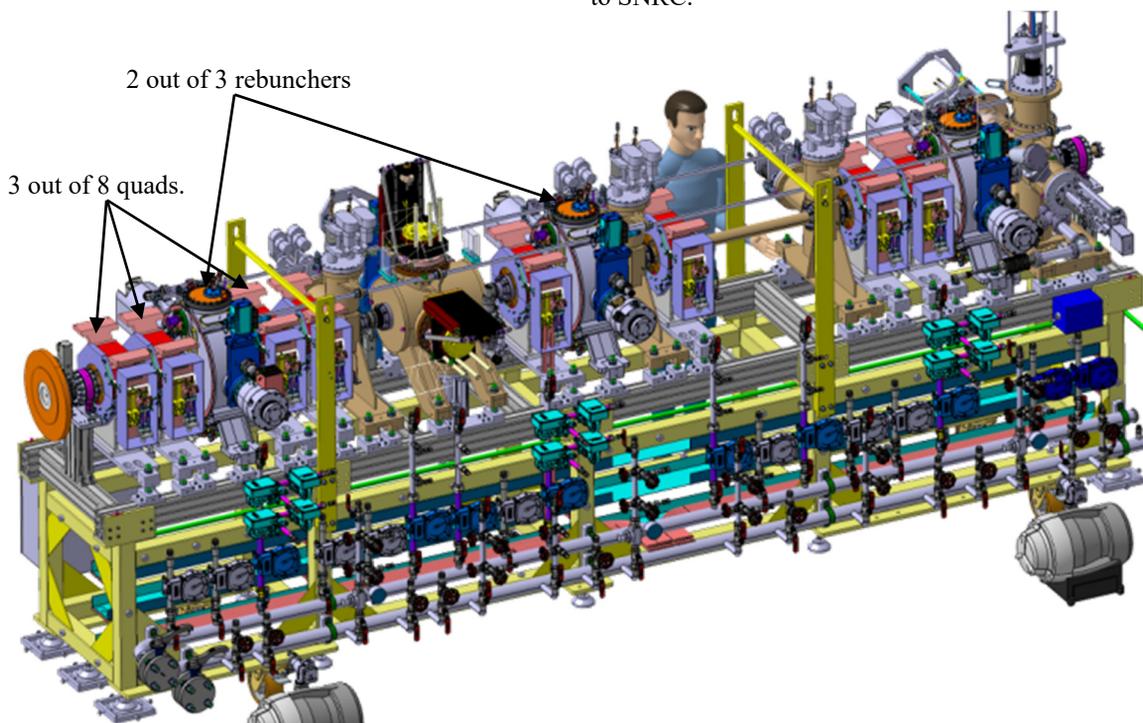


Figure 2: 3D view of the MEBT. The beam coming from the RFQ enters the MEBT on the left.

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The MEBT Rebunchers

The first of the 3 rebunchers has been built (by SDMS [3]) and tested at Saclay on a dedicated test stand (RBTS) achieving all its requirements [4]. Fig. 3 shows Rebuncher inside view.



Figure 3: Rebuncher inside view.

The MEBT Quadrupoles

The first of the 8 quadrupoles/steerers has been built (by SEF) and tested in the company premises and at Soleil Synchrotron. Fig. 4 shows its cooling test.



Figure 4: Quadrupole cooling test.

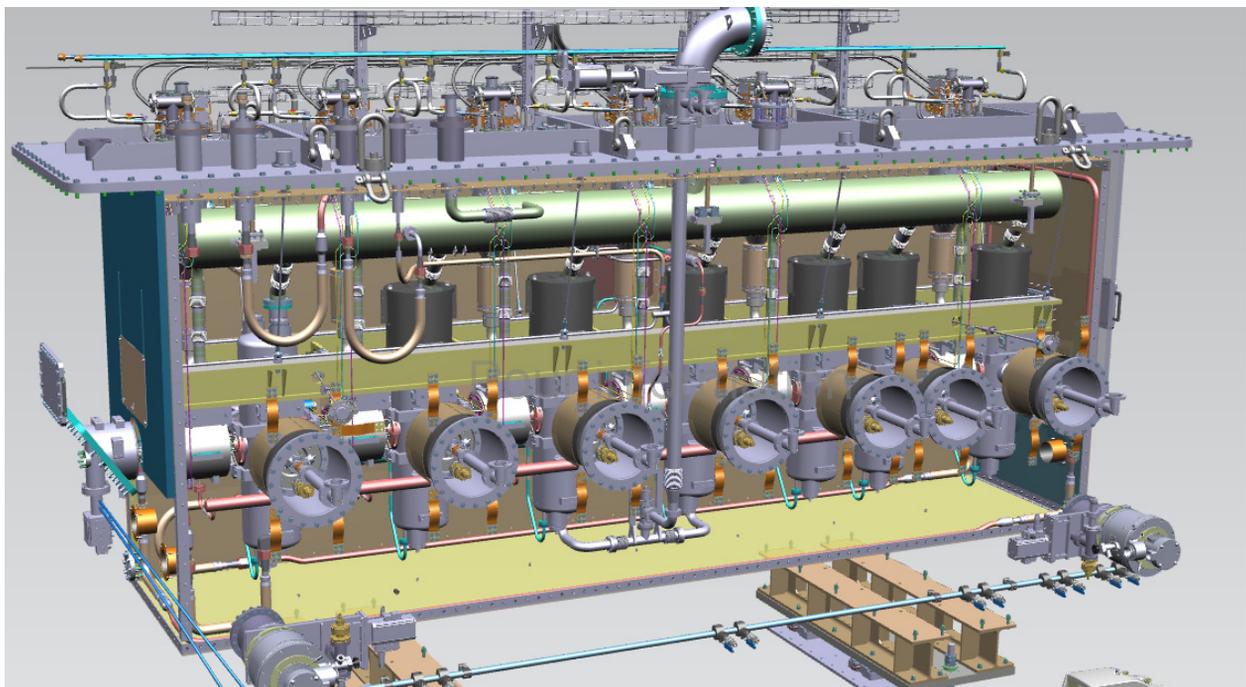


Figure 5: 3D view of CM2. The beam enters from the left.

THE SCL

The SuperConducting Linac (SCL) is made of 4 cryomodules. The first two host a total of 13 Low-Beta (LB) HWR (0.091) and 12 superconducting Solenoid Packages (SP). The last two host a total 14 High-Beta (HB) HWR (0.181) and 8 SP.

The Cryomodules

The cryomodules (Fig. 5) passed their CDR in March 2018. All the drawings have been made and the cryomodule components are in call for tender process.

The SC Magnet and Current Leads

The manufacturing (by Elytt [5]) of the SC Magnets encountered issues and delays. It should be delivered in

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the following days, then be tested in the dedicated test stand (SPTS).

The Current Lead prototype, manufactured by Criotec Impianti [6], has been tested at Saclay in the SPTS (Fig. 6), reaching the requirements. Final tests are waiting for the delivery of the solenoid package prototype.



Figure 6: Current leads on SPTS top plate.

The SC HWR Cavities and RF Coupler

The HWR are being built by RI Company [7]. The LB prototype has been prepared and tested at Saclay reaching the design requirements in vertical cryostat (VCTS) but also in a specific test stand (ECTS) where cavity, power coupler and tuning system are tested all together. Fig. 7 summarizes the achieved cavity performances. More details can be found in [8] and [9]. The series production has been launched.

The HB prototype is now in manufacturing process.

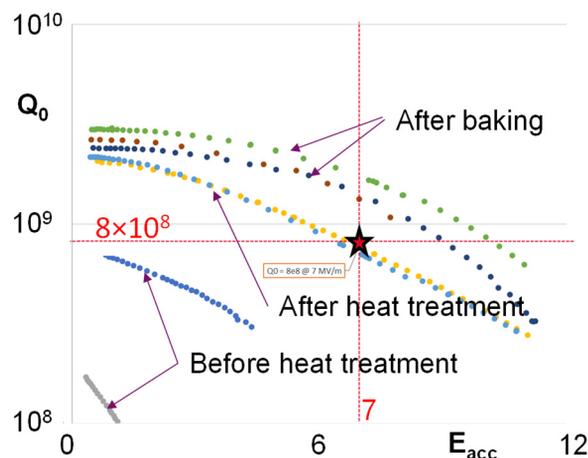


Figure 7: Summary of LB-HWR prototype performances.

Four RF coupler prototypes have been built by CETD Company [10]. They have been tested two by two in a dedicated test stand (C2TS, Fig. 8) but also with the cavity in ECTS. The required performances have been achieved [11]. The series production is being launched.

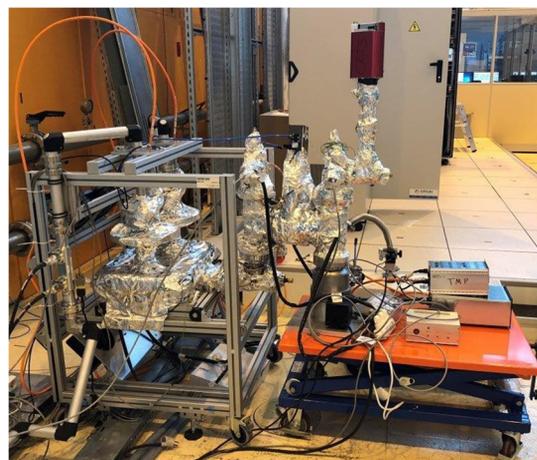


Figure 8: Couplers power test on C2TS.

CONCLUSION

The SARAF-LINAC prototypes for major components are now (being) tested. Those already tested (rebuncher, LB-HWR, RF couplers, Current leads) reach the required performances. Their series manufacturing are starting. Cryomodule manufacturing is also starting within a couple of months.

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