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**Comments on the manufacturing status and the planning for**

**GERSEMI (October 2017)**

# Planning

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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|  | 2017 | | | | | | | | | | | | | 2018 | | | | | | | | | | | | | | | | |
|  | October | | | | November | | | | | December | | | | January | | | | February | | | | March | | | | | April | | | |
|  | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 |
| junction box manufacturing |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| VB electrical wiring, closure and test |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Liquid insert electrical wiring |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| VC electrical wiring and test |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Simulator manufacturing and test |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Simulator electrical wiring |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Magnet insert manufacturing |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Magnet insert wiring |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Electrical cabinet delivery |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Final electrical wiring of control cabinet & test |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Control cabinet & automaton test |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| - Factory acceptance test with VC |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| - Factory acceptance test with simulator |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Control cabinet test with magnet insert |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Shipping of the vertical cryostat and liquid insert |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Shipping of the valve box and simulator |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Installation of project onsite |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Cryogenic tests with simulator |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Final installation of project without simulator |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Acceptance tests with liquid insert |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Acceptance tests with magnet insert |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

(Blue: planning defined by CD; Orange: update from the meeting 26th of November)

ACS analyzed the last planning issued by Cryo Diffusion the 1st of October, date set by Uppsala University during the follow-up meeting with FREIA team at Lery (July 6th – 7th).

During the 4th follow-up meeting, UU set 2 major milestones:

* Planning and status report at the start of October;
* Delivery of the systems for the onsite commissioning test in week 49.

CD send the planning in time, including explanations about the procurement and manufacturing issues. The planning was set to reach the dates fixed by Uppsala University during the meeting. The last procurement and manufacturing issues (updated at the end of October 2017) make the delivery difficult to keep before the end of 2017.

A solution is to test the vertical cryostat and the liquid insert first. Then, they will be disconnected, packed and send to Uppsala University end of December 2017. In parallel, the tests of the sequences involving the simulator will continue. The valve box and simulator will be send at the beginning of 2018. CD will keep the electrical cabinet longer to test the magnet insert. It allows FREIA laboratory to justify the reception of the test facilities, while installing them as and when required, without having to manage a too constraining storage.

Several tasks are done in parallel to keep the manufacturing in time. ACS is confident that the manufacturing of all systems will be completed at the end of November but doubt that the Factory Acceptance Tests will be done to reach the initial delivery date.

# Status

## Cryostat GERSEMI

The vertical cryostat itself can be divided into 3 major parts:

* Vacuum vessel (SOMINEX), manufacturing is done and waiting for final assembly;
* Pressure vessel (CD): the dewar manufacturing is done and underwent He leak test and pressure test. The upper flange pipes are welded. The instrumentation installation starts in week 43, 1 week delay but fast progress.
* Thermal shields: the pipe procurement issue is solved; the cooling circuit is ready and tested by He leak test and thermal shock. The welding of the cooling pipes on the shields is still ongoing because welders and qualified testers were focused on others tasks (VC upper flange pipes, VB, others projects).

The upper flange equipment are installed (W43) and the wiring is already done (should have started W44). In week 44, the electrician will start to complete the wiring to the junction box to end the task in week 45. The cabling from Vertical Cryostat to the electrical cabinet is maintained in week 45 to allow the electrical tests with Cernox in week 46.

Some manufacturing operations (thermal shield) are late according to the planning but critical tasks were completed in time to allow the electrical wiring start with few delay. A reorganization of the tasks at CD allows to keep the deadline for testing.

The vertical cryostat is not on a critical path because it is not used for the commissioning tests at Lery, only mechanical and electrical controls.

## Magnet insert

In order to specify the satellite components (heaters, flowmeters, and voltage measurement) and their procurement, FREIA gave cooling specifications (mass flow) for the current leads to ACS, but **more details are expected about the cooling specification (pressure drop).**

Manufacturing drawing review was done between CD and ACS, following UU last comments. Procurement is done at 90%, allowing to start the manufacturing week 44 (initially W43).

The top lid send for plasma cutting has to be send for water jet cutting because the subcontractor could meet the tolerances after the piece delivery at its workshop.

The heat exchanger HX683 design modification for the welding was presented by the subcontractor and validated by CD and ACS.

ACS will make a request to send the updated manufacturing plans to UU for validation.

The magnet insert is not on a critical path because it is not used for the commissioning tests.

## Liquid insert

The wiring of the equipment and the junction box is still to be done (date to confirm).

The handling of the insert to install the insert in the vertical cryostat will be done in week 44.

The bath insert will be used for the commissioning tests at Uppsala with the vertical cryostat.

## Valve box

The valve box manufacturing is done. CD complete the assembly of pipes for all circuits in week 42 and leak test are running.

Cernox were wired by a subcontractor of CD and send to IPN for calibration but the calibration machine was out of service. The assembly of the valve bow was on a critical path so an agreement had to be made. CD recovered 20 calibrated Cernox and adaptor from IPN to complete the assembly of the valve box (including the spares). Those Cernox won’t be removed and replaced by the original ones. IPN started the adaptor manufacturing and wiring (LEMO send by CD) in week 42 and the delivery was in week 43, as provided for in the agreement, to complete the assembly and performed the final manufacturing tests in week 44.

Cernox installation started after their reception in week 43 and will be completed beginning of week 44. Then, the valve box will be closed to start the cabling from the valve box to the electrical cabinet in week 44.

The valve box is on a critical path because it is required for commissioning at Lery and at Uppsala. Further delay will make the commissioning tests difficult to do in time. ACS will be reactive to help on the manufacturing tests (leak test, electrical tests).

*IPN announced the machine is repaired so the calibration of the remaining Cernox will start again for a delivery expected at the latest mid-November (15/11/2017). Note that 4 additional Cernox are necessary for the simulator, which can be used now as a small vertical cryostat, so won’t be removed. UU must buy 20 Cernox CX-1050-AA and send it at IPN to replace the IPN Cernox installed in the valve box.*

## Transfer lines

The procurement and the manufacturing for the transfer lines will be done in parallel of others GERSEMI systems.

The transfer lines detail drawings will be completed in week 44, procurement in week 47 and manufacturing and test in week 50.

UU request a last check on the 3D model to validate the critical dimensions of the transfer lines and avoid misadjustment onsite. Another request was made to check the bayonets and the interface with the reheater.

The transfer line are not on a critical path because it is not used for the commissioning tests at Lery.

ESS transfer lines are in final manufacturing tests (2 singles lines completed, a multiline to test).

## Simulator box

The design and drawings are done by ACS. ACS and CD reviewed the manufacturing drawings according to CD standards. A copy will be send to UU after translation.

The manufacturing starts week 43, delayed according to previous planning (week 35) due to the team still working on the valve box. The issue about the Cernox doesn’t impact the simulator manufacturing anymore. The Cernox send to IPN for calibration should be received in week 46 (15/11/2017), in time for the wiring according to the last update.

The inner vessel welding started in week 43. The thermal shield and MLI manufacturing will start in week 44 and the vacuum vessel welding in week 45. The assembly will be done in week 46. Inner vessel and vacuum vessel will be tested after welding.

The simulator is on a critical path because it is required for commissioning at Lery and at Uppsala. More delay will make the commissioning tests difficult to do in time.

## Control system design

The program is carried out by ISII-Tech and had been checked with ACS during the period from June to August 2017.

The program is ready for the commissioning tests.

## Control system procurement

CD and Technergie work together to complete the installation of the junction boxes and the wiring on the equipment required for the Factory Acceptance Tests at Lery.

The cable path were designed by CD after the first proposal from ACS. UU already checked and validated the dimensions but asks for ACS to confirm on its 3D model. Phillippe BUJARD confirmed the cables length according to the data exchanged by mails.

Technergie delivered the electrical cabinet and will start the cabling between the valve box and the electrical cabinet in week 45.

The external cabling is on a critical path to allow the commissioning test at Lery and the electrical test of the several systems of GERSEMI.

## Commissioning tests

During the last meeting CD-ISII-TECH-ACS (26th October 2017), a talk was held to define the electrical and sequence tests:

* Week 47: wiring check (VC and liquid insert, no Cernox);
* Week 48: wiring check (VC and liquid insert, with Cernox);
* Week 49: sequences 22,23 (automation and VC) without cryogenic fluid;
  + Once tested, the vertical cryostat and the liquid insert will disconnected and prepared for shipping in week 50
* Week 50&51: sequences 1,3,5,8,9,10,12,14,21,25 (automation and simulator);
  + Valve box and simulator send for week 1 (2018)
* Week? (to define): electrical test with magnet insert.

# Future tasks

Final tests for the valve box:

* He leak tests for all circuits and valves (date to confirm, expected W44);
* Electrical tests (date to confirm, expected W44).

Final tests for the liquid insert:

* Electrical tests (date to confirm).

ACS will specify the satellite components (heaters, flowmeters, and voltage measurement) for the current leads of the magnet insert but some details are necessary from UU.