

Actions in CLEAR foreseen for winter shutdown 2022

Week 5

(Wilfrid, Pierre & Alexander)

The scope of this memo is to list the actions that could be achieved in CLEAR during the winter shutdown 2022. These activities were mentioned during the meeting held on Monday 10th January and are still to be discussed to decide how to adapt and prioritize them taking into account the CERN requirement for teleworking.

1/ Installation of a new quad on the breadboard of the final test stand.

In accordance with the experiment request from Manchester University (Roger and Lucy), regarding strong focusing in a water phantom.

- Final test-stand breadboard has been cleaned of all its equipment to ease the installation
- Quadrupole has been identified with Antony in the storage building 530. Antony proposes a quick check (essentially water leak) before installation if his team has some availability.
- The quadrupole will then be transported in CLEAR (transport availability to be checked) with its present support that needs some minor machining before placing it on the final test stand breadboard.
- Alan has visited the installation and will take care of power cables extension (12 meters). Indeed cables of former CB.BHB1100 (end of TBL) will be used **(1 day)**
- Loic has been contacted to install a new power supply with 250A capability in the rack RY-024.
- Support re-machining will be achieved in our workshop **(1 day)**.
- We will have to remove a small chamber length from BHB800 spectral line to leave some clearance for cable connection **(0.5 day)** including replacement of vacuum window and pumping)
- The yellow crane, small enough to enter through the chicane, will be used to lift the quad and install it **(1 day)**.
- Alignment will be performed by ourselves using the laser inside the vacuum chamber, and centring blocks (to be machined) inside the quad yoke **(1 day)**
- Water connection and flow rate interlock **(0.5 day)**
- Declaration in the command control data base, software upgrade (teleworking ?)
- Reparation of the Manchester water Phantom punched by the beam. Replacement of the entrance wall with a kapton window **(1 day)**

In total 6 days on site for 2 people are requested for this action.

Progress:

- The quadrupole has been installed on the in-air test stand table.
- It was roughly aligned.
- Water and electrical connections to be done this week.

2/ Possible removing of the CLIC ACS

A discussion has occurred about the interest of removing the CLIC ACS from the CLEAR line (easier transport at high charge), but this will of course prevent to resume studies on this structure in passive mode (kicks and WFM).

If decided so the actions will be:

- Identified the replacement chamber, bellow, ACS support from our storage **(0.5 day)**
- Break the vacuum in this sector, disconnect the ACS and the RF load, disconnect the WFM cables taking care of identifying the various cables for future reconnection, lift the ACS from the beam line with the yellow crane and place it on its support, pump down the line **(2 days)**

Previously we have to contact Ruben (Serge replacement) to secure a plan for ACS reinstallation when X-band klystron will be available **(action CLEAR team)**.

This action requires 2.5 days of presence for 2 to 3 people. The ACS will remain inside CLEAR (no transport)

Progress:

- The CLIC cavity BPMs were removed as requested by the CLIC BPMs team (for testing them in the lab).
- The vacuum has been recovered (5.1 e-8 mbar in section 5, 2.5 e-7 in section 7 and 3.1 e-6 in section 8).
- The alignment laser goes to the end of the beam line.

3/ Installation of Cherenkov BPM in vacuum

Availability of this new device is to be checked towards Stefano **(action CLEAR operation team)**. It is foreseen to be installed downstream to the CLIC cavity BPMs.

Installation is to be supervised by a CLEAR team people **(3 days 1 person)**.

Progress:

- To be installed earliest in May.
- Stefano and Nicolas will come this morning to discuss about the present status of the beam line and their plans.

4/ Installation of the Russian soft X-ray experiment

Since the large chamber (already in CLEAR) is to take place at the same position as the Cherenkov in vacuum device, its installation is not likely to occur during this shutdown. However confirmation is to be sought towards Stefano.

Progress:

- Nothing new.

5/ Diagnostic consolidation

It has been mentioned that Inductive BPM are presently providing inconsistent data. This is probably a software issue. Mika is to be contacted (**action CLEAR operation team**). We should also check them using the inner calibration function (**1 day**).

Beam charge monitor saturates for beam charge higher than 48nC. A possible solution will be to install on the electronic rack input a 3dB attenuator and adapt all software readings accordingly (**1 day**)

From a long time we are waiting for a complete FESA class for digital camera. Stefano said that this deployment could occur in February (action: to be checked). Our software should then be adapted accordingly (**3 days**, difficult in teleworking since on the technical network)

Total: 5 days for 2 people

Progress:

- All digital cameras, filters, lights and screen movers were tested and are working well.

6/ Optic fibre for beam loss monitor installation

Belem and Sarah from the BLM group, after having observed promising results with the optic fibre presently installed on the CLEAR room ceiling, wish to install a new fibre closer to the beam chamber.

- Adapted supports design and manufacturing in our workshop (**3 days**)
- Fibre pulling and fixing (**1 day**)
- Test of the electronic in the gallery (**1 day**)

Total 5 days for 2 people, better if we can use our new 3D printer.

Progress:

- The optical fibre will be installed this afternoon at 14:00.

7/ Production of a shaped applicator for beam flattening

Cameron has recently proposed a method to generate a flat beam by scattering a Gaussian beam with a shaped applicator.

Such an applicator could be produced in our workshop either with conventional lathe or with or 3D printer.

Estimated time: 2 days for 2 people

Progress:

Nothing new. Meeting postponed.

8/ Photo-cathode renewal

Considering that Eric will leave soon and that his official replacement is not likely to arrive before, a provisional solution is to be sought. Miguel and/or Edu are keen to learn how to evaporate a thin layer on a photocathode. This knowledge transfer should occur during this shutdown. A higher efficiency photocathode is also desirable for CLEAR operation.

- 3 days if only evaporation is performed
- 2 weeks if the copper plug is to be replaced (baking process after chamber opening)

Action for CLEAR operation team: contact Valentine and Eric.

Progress:

Eric proposes the 3rd week of February.

9/ Laser activities

Edu and Miguel to be contacted

Progress:

Laserists are working on it

10/ Samples Handling Robot upgrades

CHUV has a request for more samples in a batch capability. We believe that we can pass from 22 to about 30 by redesigning the storage support and adapting the code. **(1 day with laser cutting, 1 day for the code)**

Operation either with low charge (CONV) and at high charge (FLASH) will benefit of a movable filter in front of the camera fixed on the grabber. **(5 days for design, 3D printing, cabling a new servo-controller, software adaptation and test)**

Design and 3D printing of a support for the new YAG screen **(1 day)**

Total 8 days for 2 people

Progress:

- The Z axis electrical cables were reconnected and everything works now.*
- This week, we will implement the rotating filter in the Arduino and Matlab codes.

11/ Samples Handling Robot replication

The interest of replicating the present robot, for spare or for exhibition, has also been mentioned.

Once procured the various equipment: linear stages, construction rails, cable trails... **10 days - 3 people** will at least be necessary to fully reconstruct one (mechanics, cabling, electronic cabinet, software).

Procurement of the linear stages is not possible using the normal CERN DAI, instead we have to send the money first to the manufacturer (Fuyu)

Progress:

Still on the to-do-list: purchase linear stages, motor drivers, power supplies and limit switches (total \$552).

12/ Vacuum consolidation activities

The crate controlling the turbo pump is still inside the CLEAR and suffers from the radiations, resulting in frequent shut-down of the pump.

The vacuum control panel (PVSS) is not actualised with the recent line modification.

(Action for CLEAR operation team: contact Alice and Jose and check their availability to achieve these consolidation during the shut-down).

Progress:

- Jose is working on the vacuum Synoptic to update the names of pumps and gauges.

13/ Control room consolidation

Control room is to be made friendlier for us and for our users.

- New screens have been purchased, they still have to be attached correctly
 - Keyboard with a switch for computer selection, like in the CCC, should be used
 - Speaker could deliver warning signals like klystron failure (synthetic voice ?)
 - New armchairs have been ordered
 - kitchen equipment are to be cleaned or replaced (micro-oven)
- We also mentioned the acquisition of a good coffee machine, with grain grinder. For this purchase we have to share the cost between us. To be noticed that Roberto is kindly offering to paid an extra part of it.

2 days for 2 people to arrange the control room

Progress:

- Nothing new, still waiting for chairs and usb hub.

14/ AOB

Summary of the activities requiring effective presence at CERN

Activities	Number of days	Number of people
New Quad installation in final test stand	6	2
Removal of the CLIC X-band structure	2.5	3
Installation of the Cherenkov BPM in vacuum	1	3
Diagnostic consolidation	5	2
BLM optic fibre installation	5	2
Production of a shaped beam applicator	2	2
Photo-cathode renewal	3	2
Laser activities	?	
Handling robot upgrade	8	2
Handling robot replication	10	3
Vacuum consolidation	?	
Control room consolidation	2	2