

# Basic NEW shift guide

A. Laing, A. Simón

November 20, 2018

## 1 Introduction

This document provides basic information for the NEW shifter so that they can prepare themselves to take responsibility for data taking at LSC. Whenever possible it refers the reader to more detailed documents which will allow the shifter to troubleshoot any problems and direct them towards the experts who should be contacted in the case of more serious problems.

This guide is meant for normal operation and provides minimal trouble shooting advice. The shifter is referred to the subsystem trouble shooting documents and the technical support contacts in case of more serious problems.

## 2 General requirements

Before being able to act as shifter, members of the collaboration must fulfil certain requirements to be able to work at LSC and to be considered prepared to be a shifter.

### 2.1 Laboratory requirements

The laboratory requires certain documentation for all people who enter the underground facilities. For this reason, every NEXT member taking either *shift 1* or *shift 2* must have this documentation up to date or they will not be able to enter the laboratory for calibrations and physical checks.

#### 2.1.1 Access forms

The first time that a collaborator goes to work at LSC (at the latest for their training shift, see section 2.2) they must fill out and sign the [LSC access authorisation](#) and hand it in to the laboratory administration along with a photocopy of an official identity document. During the users first visit an access card will be made for them which they should take with them on all subsequent visits to the lab.

Additionally, the user must provide the laboratory with proof of insurance for work at the laboratory. This takes the form of the [LSC user permission](#) which must be signed by the appropriate authority of the members home institute and, since the request is made for defined dates, must be kept up to date. The collaboration recommends requesting one year or until the end of contract, whichever is shorter, so that the documentation does not need to be constantly renewed. The forms above are also available in latex format from the collaboration on request.

### 2.1.2 Access courses

Access to the underground facilities is only possible for those who have the forms above up to date and who have done the [basic access course](#). Those at LSC as *shifter 1* should also have the **responsible persons course** since they will act as the contact point for LSC staff with NEXT during the week of their shift.

The relevant courses will be requested for new users when needed for the days before shift start. Repetition of the courses will only be required in case of procedural changes made by the direction of the lab.

## 2.2 Shift training

Before taking their first shift each member of the collaboration will undergo basic training in the systems relevant to the steady operation of the detector and processing and monitoring of the data. Once complete they will be added to the list of approved shifters and will be periodically informed of systems or password changes.

Before going to Canfranc a remote meeting for training will be arranged and the first ever shift will be supervised by experienced shifters who will train the newcomer.

## 3 Shift structure

The most basic data shifts have a cycle of 1 week where up to two members of the collaboration take responsibility for the detector and data quality. The shifter(s) will be based in Canfranc and additional shifters may be needed in case of illness or if remote monitoring of data is required during the night.

Each shift cycle starts on Monday afternoon with the weekly change over at Canfranc. A meeting will take place at 16:00 where the outgoing shifters will report on the past week and planning for the incoming shift will be made. A general planning of data taking, calibrations and any intervention that will reduce data taking time. The outgoing shift is then free to leave Canfranc.

All shifters should monitor the shifter email account which will receive slow control reports and alarm notifications as well as general contact emails. The email of the account is:

Address: [next.shifter@gmail.com](mailto:next.shifter@gmail.com)

Password: **to be provided at training**

In addition to this, shifters are encouraged to register and use [Slack](#) during their shifts (email [me](#) for an invitation). Slack is a chat platform that is used as a fast communication channel between shifters and the persons of interests (namely, engineers and the run coordinator). Once registered in Slack, join the channel # shifters. There you'll also find pinned fast links to important information (such as the shifter guides or the web servers of the slow controls). You may find additional temporary considerations for your shift.

### 3.1 Shifter 1

The first shift is nominally in charge and will act as contact point for LSC staff and for technical experts. They will be based at LSC for the duration of their shift and they should have the responsible persons course which will allow the LSC based shifters to enter the underground facilities without the presence of LSC staff. Any planned work which requires entering the underground facilities should, where possible, be carried out between 09:30 and 18:00 but the shifters based at Canfranc should be prepared to enter the lab at any time in case of emergencies.

General monitoring of data taking can be performed from the surface building and the time can be divided between shifter one and two as they please but the time from 08:00 to 00:00 should be covered by shifters one and two.

### 3.2 Shifter 2

Shifter 2 will be assigned only when the detector is in unstable conditions, such as the beginning of each Run, or to train the shifter before letting him act as single shifter.

Shifter 2 will also be based at LSC for their shift. They will share general monitoring duties with shifter 1 and be prepared to enter the underground facilities with them whenever required.

If shifter 2 is not present, then NEXT staff based in Canfranc, namely either our GLIMOS (currently Jos Luis Rubió) or additional nexters (currently Javier Prez), will act as support for shifter 1; accompanying him inside the underground laboratory when required. That is for the daily checks and emergency interventions.

Slow Control	Web Server URL	Browser IP	Comp.
PWR	http://195.77.159.50:8001/NEW_PWR.html	nex_sc1-pc@ad	SC1
PMT	http://195.77.159.50:8002/NEW_PMT.html	next_sc3@ad	SC3
SNS	http://195.77.159.50:8002/NEW_SNS.html		
GAS	http://195.77.159.50:8003/NEW_GAS.html	next_sc4-pc@ad	SC4
HHV	http://195.77.159.50:8004/NEW_HHV.html	next_sc5@ad	SC5
MSC	http://195.77.159.50:8000/NEW_MSC.html	next_sc2-pc@ad	SC2
SC Viewer	http://195.77.159.50:8000/GAS_Viewer.html		

Table 1: Slow control remote access

## 4 Slow controls

A number of LabVIEW programs monitor and control the main systems of the detector. While many of the functions are completely automated and any error should be both reported (via e-mail to the shifter mail account) and the relevant system shut down without the need for intervention, the shifter is required to check the displays regularly and act as instructed whenever necessary. **Shifters should ignore any update request from the computers, the system versions will ONLY ever be changed or updated by the experts.**

**Shifters should access the slow control information using the web servers through an Internet navigator.** In those URLs, shown on Tab. 1, screenshots of the current slow control status are uploaded every 5 seconds. In addition to check the characteristic values of each slow control, detailed in the slow control guide, please pay attention to the timestamp of the screenshot, showed below the stop button. That time should be 1-2 minutes away from the checking time, **at most**. If not, please check through AnyDesk that the Slow Control is properly working and no error window has popped up.

The Slow control computers are displayed on the monitors of the control center on the next platform, with the exception of the Main Slow Control (MSC) and the SC Viewer (SCV) which are located in the offices of the central LSC building. These SC controls offer a summary of the information of the rest of Slow Controls.

If web servers are offline or a manipulations is needed, slow controls can also be accessed remotely using the **AnyDesk** application and the IDs listed in table 1.

If you enter in the mentioned computers the slow controls should be the the first thing you see, with tabs in the upper side for each monitor (for the computers hosting more than one slow control **AnyDesk** several monitors will appear). Interaction with the detector systems via the slow controls is protected by password. A shifter should, in general, have no reason to interact with other programs running on these computers and should **at no time** launch their own programs. Information about the functionality can be found below and in greater detail in the release notes and mini guide for the **C-3PO release** of the slow controls which **should be studied by shifters before going to LSC.** If any information on this manual is in contradiction with the Slow Control manual, the Slow Control instructions shall prevail.

Slow control computers **should be rebooted each week** (usually done on Monday afternoon) to avoid crashes. Before this procedure, let the experts know through the Slack channel. It should be done inside the underground facilities if possible, following the instructions in the slow control guide. In general, Slow Controls should be stopped by pressing the STOP button on the upper right corner. Once this is done, the shifter can proceed to reboot the computer. Please pay **special attention to the HHV Slow Control** as you'll have to introduce the values at which the cathode and gate were set before the reboot.

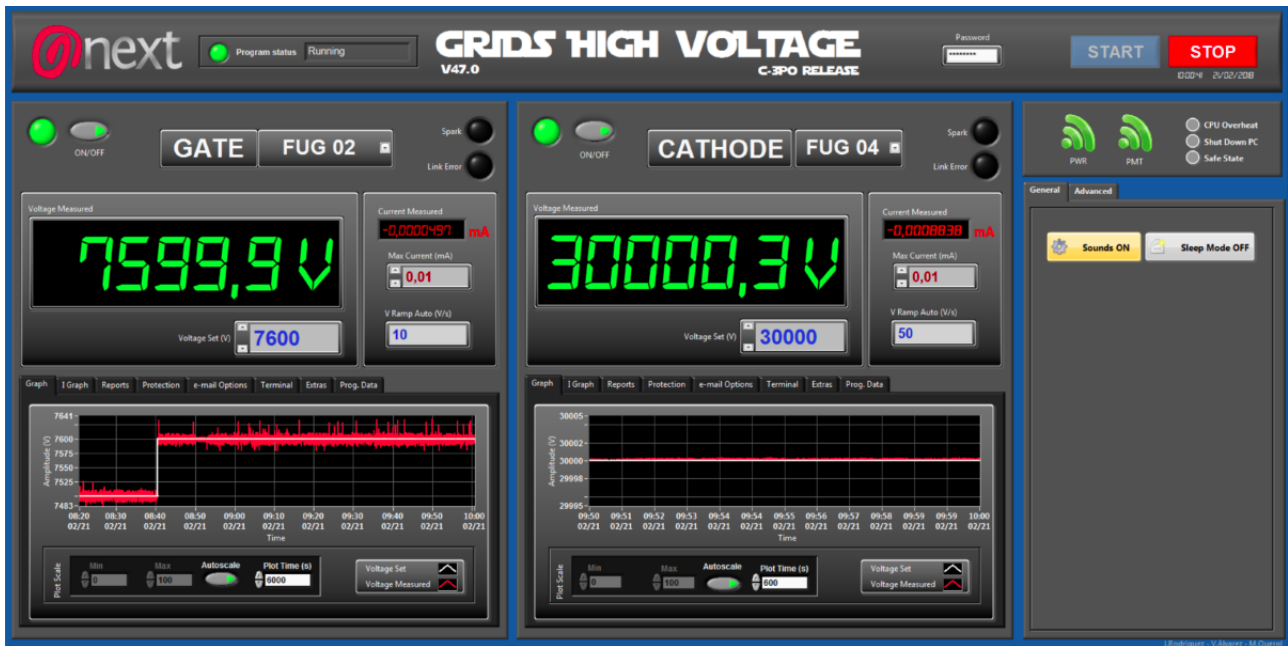


Figure 1: View of the high voltage slow control main window

## 4.1 HHV slow control

The HHV slow control runs on *SC5* and controls and monitors the setting of the high voltage of the cathode and gate grids. A screen shot of the main tab of the program is shown in figure 1. The read-only viewer can be found at [http://195.77.159.50:8004/NEW\\_HHV.html](http://195.77.159.50:8004/NEW_HHV.html). The set and measured voltages of the gate and cathode are shown along with a real-time graph for each. In general, the voltages will already be set when the shifter arrives and their only duty will be to check that there is no variation of the set levels and to act as instructed when there is an alarm. If a change to the voltages is required the shifter need only input the desired value (decided in run coordination meeting) in each of the *Voltage Set* boxes (in absolute value).

### 4.1.1 HHV troubleshooting

The slow control will sound an alarm in the case of sparks or connection problems and will act to rectify the problem. Any incident will be reported to the technical experts as well as to the **next\_shifter** email address (see section 3). Sparks in the gate can affect the functionality of the SiPM power supplies (PS) causing the voltage setting of the SiPMs to be unstable. If the instability continues the SiPMs and PS should be reset (see section 4.3).

As of August 2018 (Run 4), the nominal voltage levels are cathode at **30 kV** and gate at **7.9 kV**.

## 4.2 PMT slow control

The PMT slow control runs on *SC3* monitor 2 and controls and monitors the high voltage of the PMTs while also monitoring the vacuum level in the PMT volume. The main window is shown in figure 2. The read-only viewer can be found at [http://195.77.159.50:8002/NEW\\_PMT.html](http://195.77.159.50:8002/NEW_PMT.html). The slow control shows an image of the energy plane with the PMTs which are powered in green as well as the set and measured voltages and the measured current for each channel in digital and graphical form. This slow control is in constant communication with the sensors slow control (see section 4.5) which controls the power to the HV supply itself.

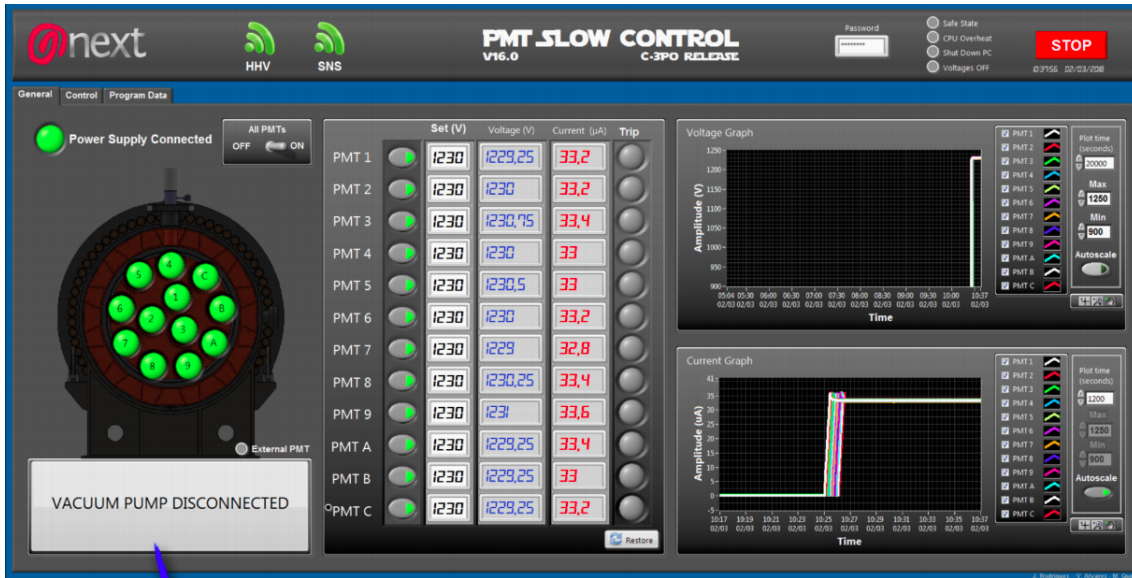


Figure 2: View of the PMT slow control main window

In general, the shifter need only monitor the graphs to make sure there are no variations from the norm. If the shifter is instructed to turn on/off the PMTs this can be done using the *All PMTs OFF/ON* button or individually using the buttons next to each PMT label. Nominal voltages are **1230 V** for all PMTs and nominal currents approximately **33 µA**. If the external pmt is to be used for tagging it can be turned on/off in the control tab. The status of the external pmt is shown on the main tab below the image of the detector energy plane.

#### 4.2.1 PMT troubleshooting

The slow control will send an alarm in case of sparks, trips, connection errors or if the vacuum levels vary from the limits set. In all cases the slow control will act automatically to rectify the problem and return to stable functionality. In the initial runs the vacuum pump will be off and the volume filled with nitrogen.

If any disconnectivity continues beyond a few moments an expert should be contacted.

#### 4.3 PWR slow control

The PWR slow control runs on SC1 and controls and monitors the sensor front-end power supplies as well as the bias voltages for the SiPMs. The main window is shown in figure 3. The read-only viewer can be found at [http://195.77.159.50:8001/NEW\\_PWR.html](http://195.77.159.50:8001/NEW_PWR.html). The slow control main window has two sections: the first shows the status, voltages and currents drawn by the front end power supplies; the second shows a representation of the 28 SiPM DICE boards of the tracking plane with their status (Dark grey OFF and light grey ON), temperatures and bias voltages.

In general, the shifter will only need to monitor the settings and follow instructions in case of an alarm. If it is necessary to turn on/off the SiPM biases, the shifter should use the *ON ALL* or *OFF ALL* buttons respectively. If after resetting any error persists the **SiPM PS** line should be turned off and on also. This takes time as the PS have to shut down safely.

**In case of a SPARK**, electronics should be shutted down by the *STOP ALL* button in the bottom left. Once all the voltages reading are at 0, turn on all the electronics by pushin the

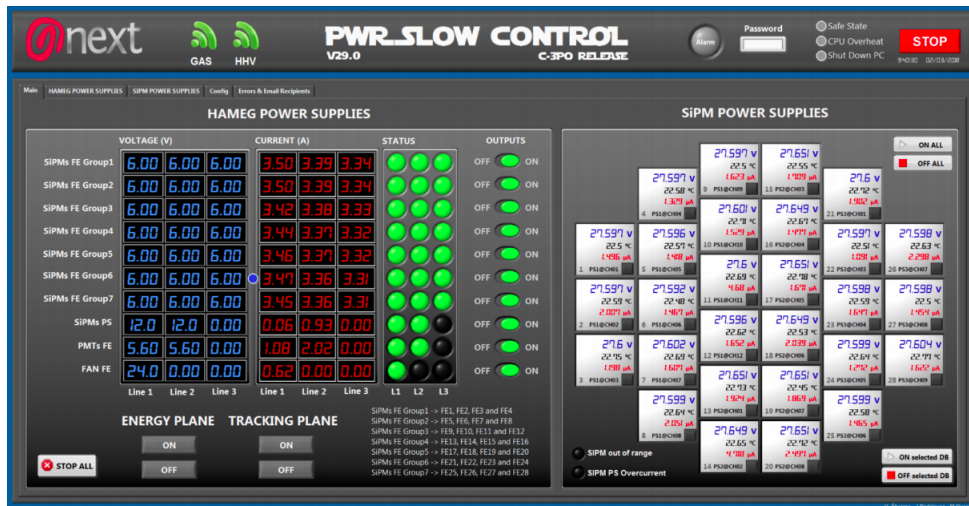


Figure 3: View of the PWR slow control main window

*ON* buttons of the Energy and Tracking Plane and the *ON ALL* of the SiPM Power Supplies section.

Nominal values for the power supplies and front ends are shown in figure 3 on the left side. The DICE boards have nominal values (also shown in the figure) of  $\sim 27.58$  V,  $\sim 22$  °C and currents of between 1.0–2.2  $\mu$ A with the exception of DICE 3, 10, 14 and 20 which draw 830  $\mu$ A, 362  $\mu$ A, 4.6  $\mu$ A and 3.8  $\mu$ A respectively.

#### 4.3.1 PWR troubleshooting

In case an electronics reset is requested by an expert the shifter should do this by first turning off the bias voltage at least for the DICE boards connected to this supply and then pressing the *OFF* button in the **tracking plane** list at the bottom of the left section and waiting until all the **green** power indicator lights associated with the SiPM power supplies (the first 8 rows) to go off. The *ON* button can then be pressed to turn them back on.

If the slow control detects an error in the system the *Alarm* indicator at the top of the window will flash yellow and the shifter email an experts will be informed via email. In this case the shifter should go to the tab intitled *Errors & email recipients* to see the details of the error. There are three types of error which can be resolved, at least partially, by the shifter:

1. Date error: the system will sort itself, press the *disable alarm* button.
2. NTC connection error: as above.
3. Overcurrent/Out of range: The DICE indicated in the error should be checked. If the voltages and currents are at nominal the error has been corrected and the shifter need only disable the alarm and remove the flag. If the error persists the shifter should select the check box of the affected dice and click the *OFF Selected DB* button. The DICE should then be turned on again using the *ON Selected DB* button. If the error remains the DICE should be turned off and an expert contacted. In cse of any reset, data taking should be stopped and the reason logged in the elog (see section 5.3).

Any other type of error should be dealt with by turning all sensors off using the *OFF ALL* button on the main panel right side and informing an expert. If at any point any DICE have to be turned off **the run should be stopped** (see section 5.1.1).

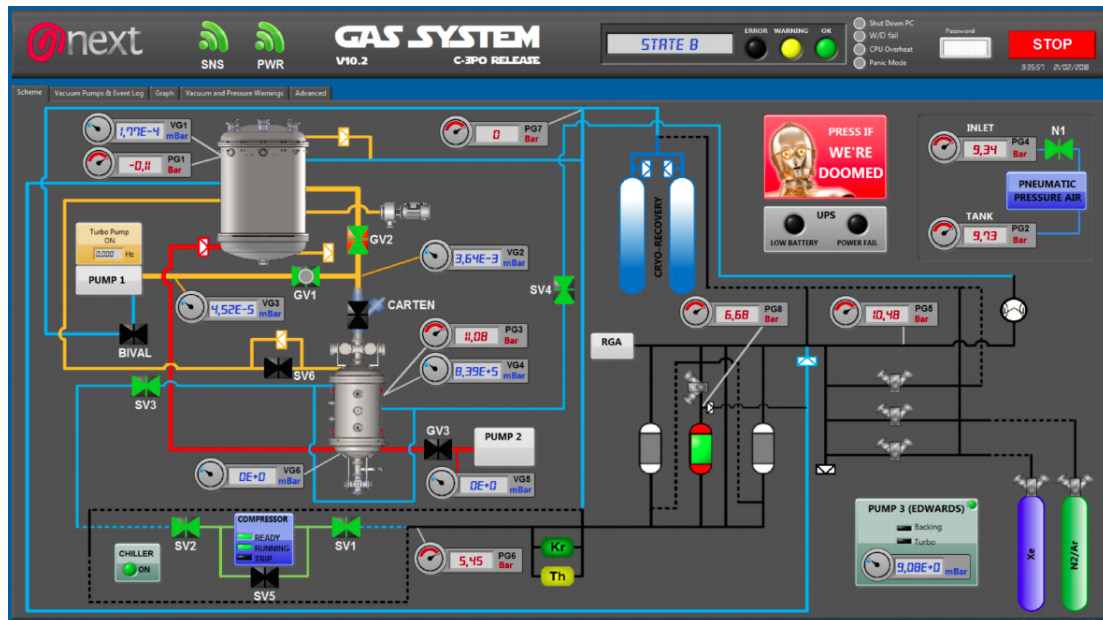


Figure 4: View of the gas system slow control main window

## 4.4 Gas system slow control

The gas system slow control monitors the state of the circulation of gas through the detector and the pressure/vacuum level at all points being monitored. It also controls emergency recovery of the gas in case of detection of a leak. The main window is shown in figure 4. The read-only viewer can be found at [http://195.77.159.50:8003/NEW\\_GAS.html](http://195.77.159.50:8003/NEW_GAS.html). For the shifter this slow control is purely a monitor as all functions are controlled automatically. The shifter should familiarise themselves with the layout of the gas system itself and which physical valves etc are represented. However, beyond reporting to the technical experts any behaviour that seems out of the ordinary no intervention on the part of the shifter should be necessary. The shifter should regularly check the graphs plotted automatically on the third tab as well as the numeric values represented on the schematic. If there is any deviation of more than 20 mbar an expert should be contacted immediately. The PRESS IF WE'RE DOOMED button will put the gas system into secure mode and should only be used under supervision by an expert or in case of an ongoing problem without the possibility to have direct technical support.

## 4.5 Sensors slow control

The sensors slow control groups together the monitoring of various miscellaneous sensors as well as the on/off controls of the PMT power supply, the ATCA power supply and the HHV power supply. The main window is shown in figure 5. In general, the shifter will just have to monitor the temperatures represented. All other controls should only be used under supervision from an expert. The read-only viewer can be found at [http://195.77.159.50:8002/NEW\\_SNS.html](http://195.77.159.50:8002/NEW_SNS.html).

**Important and reiterative issue:** If an email with the following message ("At least one FEB64 temperature is out of date. Please check the JAVA is properly working. If the FEB64 are powered off ignore this message.") is received the data acquisition of one of the SiPM DICES is highly likely to have hanged. In this scenario, stop the acquisition (STOP Run button in the Java application), reset the TP electronics (Tracking Plane OFF in the PWR slow control, then ON), reset the Java (RST button) and launch a new run with the same configuration as the previous run.





Figure 5: View of the main slow control main window

## 4.6 Main and SC Viewer

The main slow controls give an overview of the most pertinent information for each of the others and are in constant contact with them in order to report errors. They have access to video feeds from the platform and plots summarising the gas status. The main windows are shown in figure 6. These controls are open on the screens in the NEXT office in the surface building and can be viewed in the browser at [http://195.77.159.50:8000/NEW\\_MSC.html](http://195.77.159.50:8000/NEW_MSC.html) and [http://195.77.159.50:8000/GAS\\_Viewer.html](http://195.77.159.50:8000/GAS_Viewer.html)

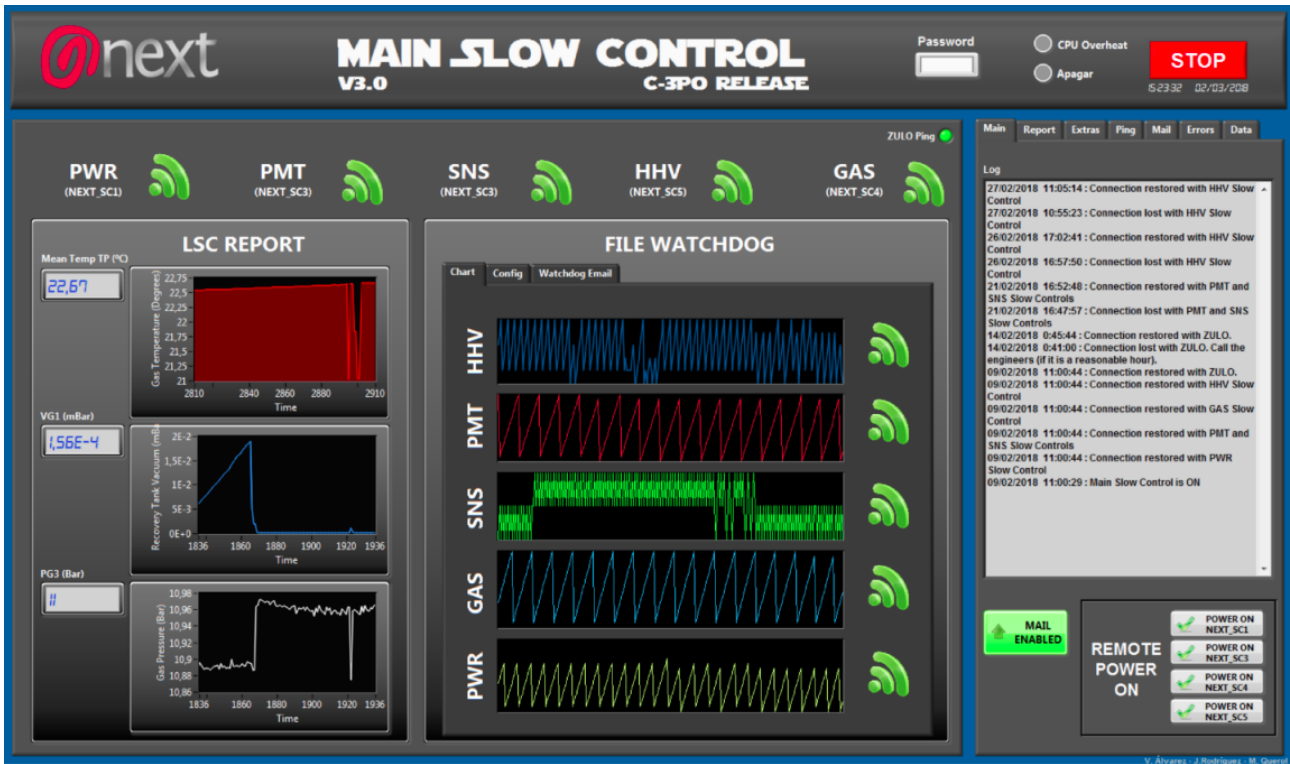


Figure 6: View of the main slow controls

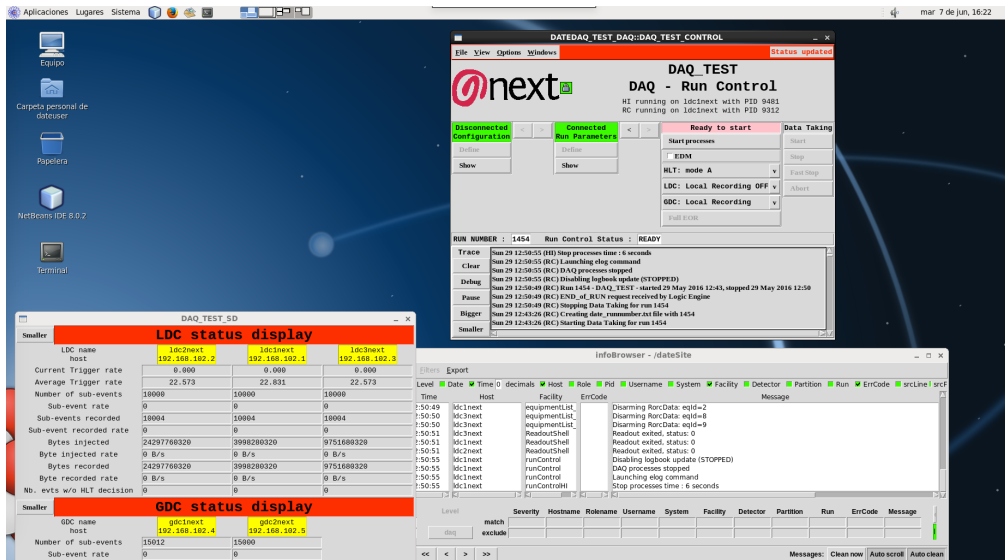


Figure 7: View of all the DATE windows on the desktop

## 5 Run control

The Data acquisition system is controlled via **DATE** with the trigger settings being configured using a Java program (NEXT starter). Both can be accessed remotely using **VNC viewer** which can be downloaded from [here](#). The access details are:

IP from outside LSC: 195.77.159.50:6951

IP from within LSC: 192.168.3.101:5951

In case of connection problems: 80.38.153.156:6951

Passwords will be provided in training. Once logged into the control computer the view will be of the last scientific linux desktop viewed. **DATE** should be open on the left-most desktop (changed by clicking the appropriate window on the dock) and the Java should be running on the second from the left.

### 5.1 Preparing DATE

The DATE DAQ control window should look like that shown in figure 7 where the system is ready to start a run. If any of the three windows are not present or are different to those shown the shifter should contact an expert.

In figures 7 and 8 DATE is shown idle with the data acquisition computers prepared but the run not yet configured. DATE will be in this state only between runs, initializing DATE will change the run number ready for data taking.

#### 5.1.1 Run start/stop

Starting from the idle state shown in figure 8 perform the following commands to prepare a new run:

Make sure the JAVA has been stopped (see section 5.2).

Make sure that the **GDC:** line below the *Start processes* button reads *GDC: Local Recording* and change it to that using the drop down menu if not.



Figure 8: View of DATE control panel

Click the *Start processes* button.

Wait for the *Start/Stop* buttons to be clickable.

Click the *Start* button.

At this point **DATE** is ready for data taking and, once configured properly, data taking can be started using the *Start Run* in the JAVA run starter (see section 5.2).

If the run number has to be changed or data taking is to be stopped the shifter must first make sure that triggers are not being received (stopping the run in JAVA, see section 5.2) then click the *Stop* button. If a new run is to be started the shifter should wait until the processes are completely stopped (around 30 seconds ending with the *Start processes* button being available again) before following the start instructions above.

### 5.1.2 DATE trouble shooting

DATE will automatically inform the shifters by email if the trigger rate drops to zero or if there is an error in DATE. In general, the shifter should inform the run coordinator, stop the run and try to start a new one.

If at any point the trigger rate stops for one ldc the run will hang. The shifter will have to stop the run, reset the configuration program (JAVA) and reconfigure before relaunching a run.

## 5.2 Run configuration

Run configuration and launch are controlled from a JAVA GUI running on the same computer as the DATE system (shown in figure 9). This section describes basic run configuration, for a more detailed explanation the shifter should refer to the [DAQ system manual](#).

Some of the actions take a moment to be realized and the shifter should always be patient and not click the same button multiple times unless there has been a change that requires

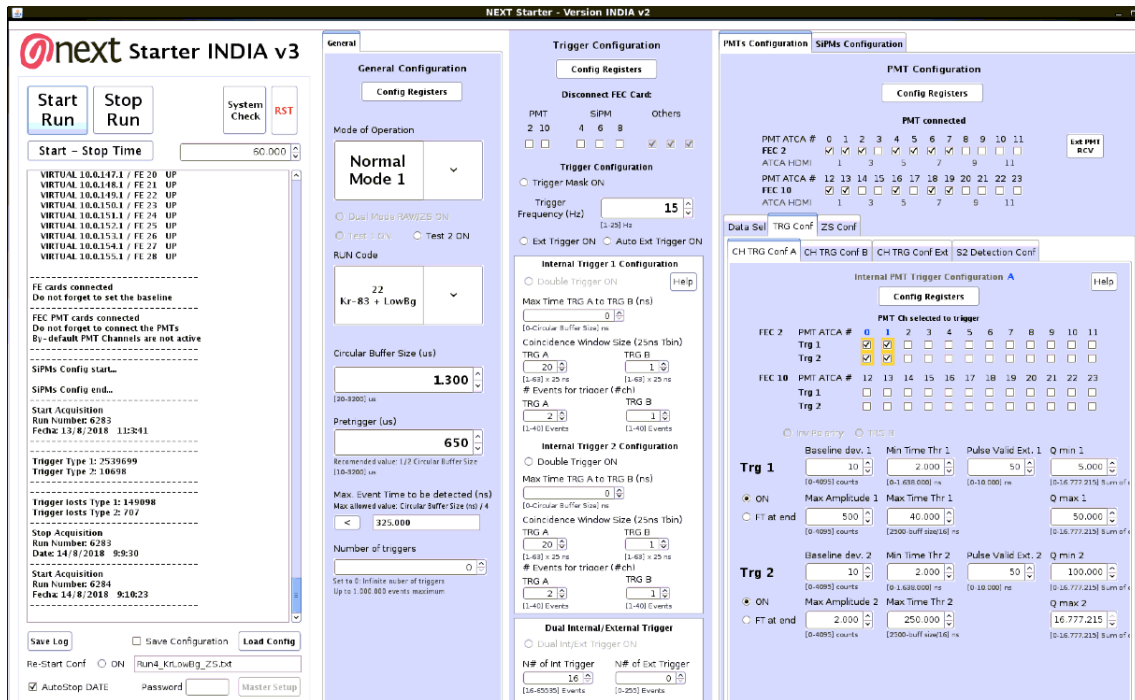


Figure 9: View of the run control Java.

reconfiguration.

### 5.2.1 Basic run configuration

The trigger conditions to be used for specific types of runs are recorded for loading and in the example runs in the elog. In general, the shifter will only have to load the configuration file saved for the run that they have been told to launch. This is done by pushing the *Load Config* button in the bottom left part of the JAVA window. Once loaded, wait a couple of minutes while the JAVA configures itself and once the *SiPMs Config end...* appears in the JAVA log window the shifter should start the run (provided that DATE has been previously set up) by pushing the *Start Run* button, located at the upper left part of the JAVA window.

To stop a run just push the *Stop Run* button next to the *Start Run* one. Usually this will also stop DATE so remember to set it up again (see 5.1) when starting again data acquisition.

The configuration files for Run IV are the following:

- Kr trigger: Run4\_Kr\_ZS.txt
- Kr + LowBg trigger: Run4\_KrLowBg\_ZS\_Trg2TimeThr325.txt

The JAVA remains configured after stopping a run **iif the RST button has not been used**. Therefore, if shifters need to start a run identical to the previous one, there's no need to reload the configuration, just push the *Start Run* button as soon **DATE** is ready.

Below is a short example configuration to give an idea of how to manually configure a run in the case of necessity.

The panel on the left of the Java controls run start/stop and shows information about the status of a run. Once the run is fully configured and **DATE** is ready to receive triggers (see above) the *Start Run* button should be clicked to launch the run. If the run is to be changed and no maximum number of triggers is set, the *Stop Run* button should be clicked before **DATE** is stopped.

As an example, a PMT calibration run could be manually configured as follows (The SiPMs are not configured here as they should be off for the use of the built in LEDs):

- In the *General* tab:
  - \* Set *mode of operation* to **Test Mode**
  - \* Set *RUN code* to **PMT calibration**.
  - \* Make sure *Dual Mode RAW/ZS ON* is not selected.
  - \* Set *Circular buffer Size* and *Pretrigger* to the desired times.
  - \* Set the *Number of triggers* to 5000.
  - \* Click the *Config Registers* button.
- In the *Trigger Configuration* panel:
  - \* Make sure the *PMT* and *SiPM* FEC cards are not checked in *Disconnect FEC Card*.
  - \* Select a *Trigger Frequency* of 29 Hz.
  - \* Select *External Trigger ON* and *Auto Ext Trigger ON*.
  - \* Click *Config Registers*.
- In the *PMTs Configuration* tab:
  - \* Make sure the correct HDMI connections are selected
  - \* Click the top *Config Registers* button.
- In the *SiPMs Configuration* tab.
  - \* In the lower panel, select the *LED Conf* tab.
  - \* Select in the tracking plane drawing the DICE LEDs to be used (DICE 11 for now).
  - \* Select *ON*.
  - \* Set *Time Pulse ON* to the desired amount (nominal 455).
  - \* Set *Pulse period* to the desired time between pulses (50  $\mu$ s nominal).
  - \* Click *Config Registers*.
- Make sure **DATE** is ready for data.
- Launch the run by clicking *Start Run*.

### 5.2.2 Acquisiton recovery after a spark

Usually after a spark the PMTs in a FEC will desynchronize and manual recovery needs to be done. To perform it just click on the *Ext PMT RCV* button on the right of the *PMT Configuration* section. This will open a pop-up window with two buttons, one for the recovery of FEC2 and one for the recovery of FEC10 (the PMTs FECs), click one of them, wait till the JAVA log shows a message indicating that the recovery has finished and do the same for the other FEC. After this the FECs should be recovered.

To check if the recovery has worked, a 'Ramp' run has to be taken and checked. To do so, set the *Mode of Operation*, in the *General Configuration* section, to Test Mode. After that, Activate *Test 2 ON*, just below the *Mode of Operation* and set the *Number of triggers* to 10. Once this is done, click the *Config Registers* button of the *General Configuration* section.

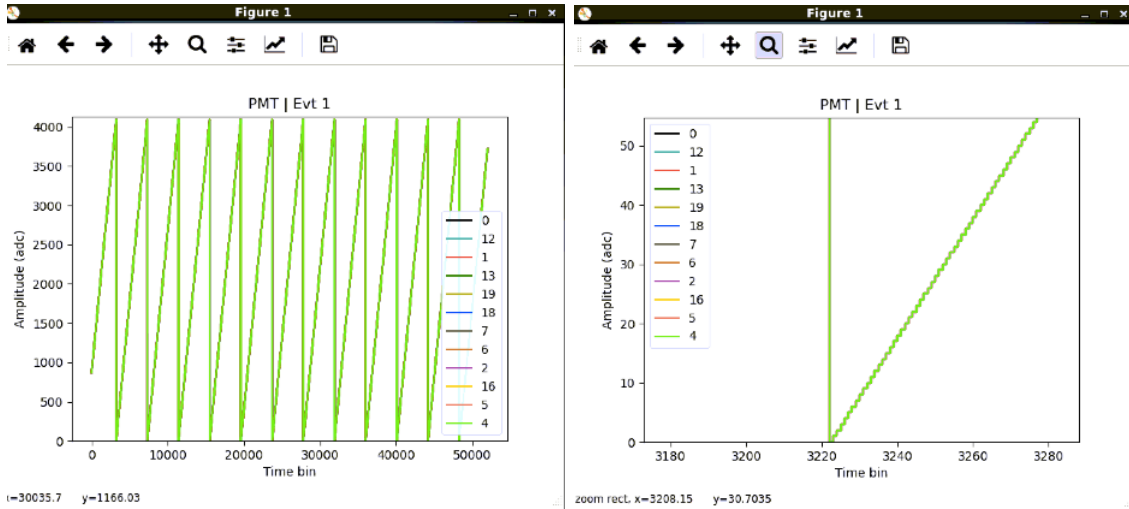


Figure 10: PMT waveforms in Ramp runs.

Now, on the *Trigger Configuration* section, activate the Ext Trigger ON and Auto Ext Trigger ON and click on the *Config Registers* button on the *Trigger Configuration* section. Once this is done, decode the data (see sec. 6.1) and plot the waveforms in one of the terminal shells (they are at the third desktop of the acquisition computer) using the following command: **plotrwf --file /analysis/run\_number/hdf5/data/run\_run\_number\_0000\_waveforms.h5 -pmt --overlay**.

A plot similar to the left one of Fig. 10 will show up. Make zoom to one of the peaks until you're on a similar level of that shown in the right plot of Fig. 10. If the lines of all PMTs are not identical the recovery has not been done properly, try to recover it again and, if not working, contact either Raúl Esteve or the run coordinator (Ander).

If everything is ok then do a Java RST and proceed with the usual data taking by loading the corresponding configuration file.

### 5.3 elog

All the run configuration parameters are automatically saved to the online elog (<http://193.146.122.114:6080/elog/>). This information can be accessed by a user at the link above with user name and password:

user: next

password: **“Given at training”**

It is also possible to add comments and files to an entry using the *edit* button and then filling out the comments section or uploading a file as instructed. The comments section should be used to add pulse generator and energy plane LED information for SiPM calibration runs as this is currently controlled separately and is not included automatically. Basic monitoring plots can also be added or, in the case of a bad run for example, examples of waveforms.

## 6 Regular checks

The shifter in charge of data monitoring should launch the data production and make regular checks of the status of the detector and the data taking and add observations to the [elog](http://193.146.122.114:6080/elog/). Additionally, the shifter should update the daily report (<https://nextbb.teamwork>).

Message ID 846		Entry time: Sun May 29 12:43:39 2016	
Run Number:	1454		
Author:	ATCA		
Type:	Run Conditions		
Run Type:	0 - No physics		
DETECTOR CONDITIONS - RUN 1454			
Pressure (bar)	Temperature (°C)		
0.38	21.22		
JAVA CONDITIONS			
GENERAL CONFIGURATION			
Mode of operation	Buffer Size	Pretrigger	Number of Triggers
	128		10000
REC & FE CONNECTIVITY			
REC 0 (TRIGGER)		REC 2 (VIRTUAL)	
FE 0	FE 1	FE 10	FE 11
ON	ON	ON	ON
REC 1 (JAW)		REC 4 (VIRTUAL)	
FE 2	FE 3	FE 12	FE 13
ON	ON	ON	ON
REC 3 (VIRTUAL)		REC 5 (VIRTUAL)	
FE 4	FE 5	FE 14	FE 15
ON	ON	ON	ON
REC 6 (VIRTUAL)		REC 8 (VIRTUAL)	
FE 6	FE 7	FE 16	FE 17
ON	ON	ON	ON
REC 7 (VIRTUAL)		REC 9 (VIRTUAL)	
FE 8	FE 9	FE 18	FE 19
ON	ON	ON	ON
TRIGGER CONFIGURATION			
Trigger Mask	Trigger Pres	Auto External Trigger	External Trigger
0x	0x	ON	ON
Double Trigger	Min. Time Try 2/3/4	Event Try A	Event Try B
ON	0	ON	ON
Clk Stop Try A	Clk Stop Try B	Dual Trigger Trigger	Ed. Try per dual HV/En
ON	ON	ON	0
Min. Try per Dual HV/En	Min. Try per Dual HV/En		
0	0		
PMT FE2 CONNECTIVITY			
PMT 0	PMT 1	PMT 2	PMT 3
NO	NO	NO	NO
PMT 4	PMT 5	PMT 6	PMT 7
NO	NO	NO	NO
PMT 8	PMT 9	PMT 10	PMT 11
NO	NO	NO	NO
PMT 12	PMT 13	PMT 14	PMT 15
NO	NO	NO	NO
CR 0	CR 1	CR 2	CR 3
ON	ON	ON	ON
CR 4	CR 5	CR 6	CR 7
ON	ON	ON	ON
CR 8	CR 9	CR 10	CR 11
ON	ON	ON	ON
CR 12	CR 13	CR 14	CR 15
ON	ON	ON	ON
PMT FE3 CONFIGURATION			
Fiber Samples	Trig	Root Samples	Phi Samples
5	ON	127	ON
Trig. Ch/Off	Phi. Ch/Off	Phi. Priority	Phi. A/B
OFF	OFF	1	0
Shallow dev.	Max Amplitude	Max Time Tr	Q max
5	2000	150	0
Q max	Q max	Max. Ev. Count	Max. Ev. Count
100000	100000	150	100000
Phi. Ch/Off	Phi. Ch/Off	Phi. Ch/Off	Phi. Ch/Off
ON	ON	ON	ON
SIPM REC CONNECTIVITY			
REC 0	REC 1	REC 2	REC 3
YES	YES	YES	YES
REC 4	REC 5	REC 6	REC 7
YES	YES	YES	YES
REC 8	REC 9	REC 10	REC 11
YES	YES	YES	YES
REC 12	REC 13	REC 14	REC 15
YES	YES	YES	YES

Figure 11: Partial ELOG entry for a sensor calibration run.

com/#projects/209875/notebooks) with data taken, problems encountered at least once per day and they should make and log the physical checks necessary.

In general the shifters should only move around in the experimental area to do scheduled checks and, wherever possible, should not approach the electronics racks which have sensitive connections which can be affected by vibrations.

The Slow control computers windows installation can sometimes cause memory problems which require them to be restarted. In order to do this in a controlled maner the shifters should **restart the computers once a week on the morning of shift hand-over day**

## 6.1 Data production and monitoring

**Every time a run is started shifters must start a daemon that is in charge of processing the data** that is being taken. A full detailed guide of the different daemons can be found at [http://next.ific.uv.es/DocDB/0005/000563/002/Shiftertools\\_RunIV.pdf](http://next.ific.uv.es/DocDB/0005/000563/002/Shiftertools_RunIV.pdf) but the usual action will be to launch the *runProdDaemon* daemon. To launch this go to the third desktop of the VNC computer (the computer used to launch the data acquisition) and look for a terminal shell which is logged in *shifter@frontend1next*, if there is none log in using the following command: **ssh shifter@frontend1next** (password provided at training).

Once in a working shell, launch *runProdDaemon* using the following command: **runProdDaemon run\_number krbg1300**. This will launch the daemon and all the processing and monitoring scheme will start with no further action needed. **Once the run is stopped, the daemon must be stopped with a single use of Ctrl+C in the shell where the daemon was running.**

In case of needing to only decode the data, as needed for example for the Ramp runs, launch instead the following command: **runDecoDaemon run\_number**.

Additionally, shifters will need to run the kDST lifetime monitor, to do it run on an *icuser* shell (there will be one opened in the terminal, if not log in with **ssh icuser@frontend1next** (password provided at training)) the following command:

**/home/icuser/lifetime\_monitor/compute\_lifetime.sh 1800 run\_number**.

This will generate a set of plots every half hour that can be found at [https://anaconda.org/icuser/current\\_lifetime/notebook](https://anaconda.org/icuser/current_lifetime/notebook). In general, any strange deviation in the different plots from the usual behavior should be detailed in the daily report and the run coordinator should be informed.



The basic status of DATE can be viewed using the link [http://195.77.159.50:6080/DATE\\_Viewer/](http://195.77.159.50:6080/DATE_Viewer/), this link should be used for basic monitoring to limit the use of vnc to the maximum necessary.

## 6.2 Slow control checks

The shifter should log the status of the detector at least every two hours and be constantly ready to act in the case of alarms. Wherever possible the browsers should be used to check the status of the slow controls with TeamViewer being used to monitor the 'main' slow control or to make any changes to detector status necessary. The shifter should also pay attention to the shifter gmail to be aware of any additional alarms, status updates or communication from the collaboration.

Every second hour the shifter should check and log the following information:

- The Vessel gas pressure (PG3)
- The cathode and gate measured voltage.
- Status of the PMTs (All on/nominal currents).
- Status of SiPMs (All on/nominal currents).
- The FEE, ATCA, rack and PS temperatures.

Any drop/change in gas pressure of more than 20 mbar should be reported to the gas system technical experts and the technical coordinator and logged in the daily reports.

## 6.3 Data monitoring

## 6.4 Physical checks

In addition to the general status and data monitoring the shifters working at the laboratory should check the experimental area once a day to make sure everything is in order. Additionally, the shifters should check the compressor oil pressure and level once a week.

The compressor is checked in the following way. The oil pressure is shown on the control screen of the compressor and should be at 48 bar. On the same side of the compressor below the main gauges there is a level gauge for the oil. This should be checked at least every second day. The level should be between the upper and lower level indicators (shown in fig. 12).

There are check lists available on the control table which should be filled out daily and weekly with the status of the compressor. Examples are attached at the end of this document and GLIMOS should be contacted if further copies are required.

The Daily checks required are:

- Check the oil pressure on the compressor control screen (should be 47-48 bar).
- Check the oil level (see fig. 12).
- Check that there are no leaks of coolant or oil from the compressor.
- Check the pressure at the Cryo recovery bottle (should be at around 25 bar).
- Check the power output of the UPS (should be around 9-10 kVA and 9-10 kW).
- General check of cleanliness in the experimental area, especially the hot getter.

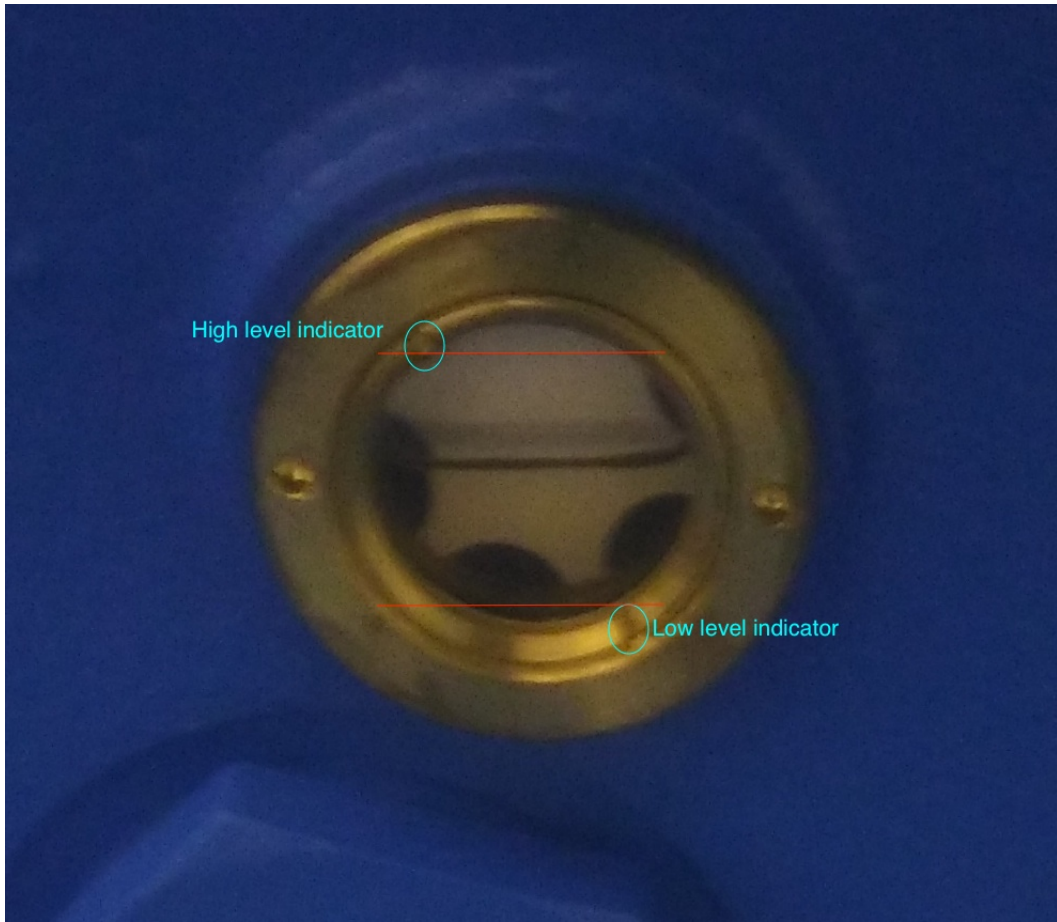


Figure 12: View of compressor oil level indicator.

The weekly checks required:

- Check compressor status in general. Checks of power consumption.
- Clean the getter removing any dust that has built up.
- check coolant levels of the chiller and top up as required.

## 7 Check sheets

Daily visual inspection			
Person		Date	
Oil pressure of compressor , oil and coolant leaks, and general condition of compressor and the experimental area			
Notes			
Person		Date	
Oil pressure of compressor , oil and coolant leaks, and general condition of compressor and the experimental area			
Notes			
Person		Date	
Oil pressure of compressor , oil and coolant leaks, and general condition of compressor and the experimental area			
Notes			
Person		Date	
Oil pressure of compressor , oil and coolant leaks, and general condition of compressor and the experimental area			
Notes			
Person		Date	
Oil pressure of compressor , oil and coolant leaks, and general condition of compressor and the experimental area			
Notes			
Person		Date	
Oil pressure of compressor , oil and coolant leaks, and general condition of compressor and the experimental area			
Notes			
Person		Date	
Oil pressure of compressor , oil and coolant leaks, and general condition of compressor and the experimental area			
Notes			
Person		Date	
Oil pressure of compressor , oil and coolant leaks, and general condition of compressor and the experimental area			
Notes			

Figure 13: Daily maintenance check sheet.

Weekly maintenance			
		Week	
<b>COMPRESSOR</b>			
Person		Date	
Check: visual examination, oil pressure, oil filling level			
Notes			
<b>HOT GETTER</b>			
Person		Date	
Cleaning should be performed as often as necessary to maintain the purifier's appearance.			
Notes			
<b>CHILLER</b>			
Person		Date	
Check coolant level. Refill if necessary			
The chiller is filled with a solution of water and ethylene-glycol (20-30% in volume)			
The ethylene glycol is stored in the yellow chemicals cupboard in the main corridor.			
In the handling of the product, follow the Material Safety Data Sheet instructions			
Notes			
		Week	
<b>COMPRESSOR</b>			
Person		Date	
Check: visual examination, oil pressure, oil filling level			
Notes			
<b>HOT GETTER</b>			
Person		Date	
Cleaning should be performed as often as necessary to maintain the purifier's appearance.			
Notes			
<b>CHILLER</b>			
Person		Date	
Check coolant level. Refill if necessary			

Figure 14: Weekly maintenance check sheet.

## 8 Contacts

This list shows the points of contact for troubleshooting and contact with the shifters. The shifters for a particular week will be noted in the teamwork calendar. All telephone numbers are Spanish unless country code stated (add +34 to call internationally).

Name	position	telephone	skype ID
<b>First points of contact</b>			
Francesc Monrabal	Tech. coord.. Hardware problems.	699591663	monrabal22
Ander Simón	Run coordination	629992381	aretno
<b>Technical experts</b>			
IFIC Zulo	General expertise	963543711	-
Javi Rodríguez	Electronics/Slow control	630655813	er_jae
Marc Querol	Electronics/Slow control	692007200	mquerol90
Vicente Álvarez	Electronics/Slow control	657868454	vialpuer
Alberto Martínez	Mechanics	659337929	
Sara Cárcel	Mechanics	655232416	
Raúl Esteve	Electronics/DAQ		rauesbos
<b>Curro</b>	Electronics/BOSS	669036073	j.toledo-alarcon
Mafalda Musti	GLIMOS, LSC NEXT	+393470018600	
Vicente Herrero	Electronics		viherbos
Jordi Torrent	Mechanics		
José Vicente Carrión	IT	636527269	burcarjo
<b>LSC out of hours contact</b>			
Alejandro Calvo	LSC manager	638158633	-
LSC Guardia	weekend shift LSC staff	686580974	-
<b>shifters</b>			
Platform		974 373 499	-
Underground office			-
Surface office 1	Front office	974373539	-
Surface office 2	Back office	974373540	-
Andrew Laing		633085659	andrewlglasg
Ander Simón		629992381	aretno
Gonzalo Martínez		639977539	gonzaponte
Brais Palmeiro		698137530	brais.palmeiro
Javi Pérez		677239608	
Josh Renner		603659293	josh_e_renner
Neus López		610340383	neusii
Paola Ferrario		699848680	sbottom
José María Benlloch		622011337	jmbenlloch
José Ángel Hernando			joseahernando
Ryan Felkai		+33673366550	
Pau Novella		661822559	paunoga
Michel Sorel		671344450	msorel1
Miquel Nebot		651310802	minegui86