

The Module Tester Guide.

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Introduction

This is a procedure description of performing CMS-BPIX-Module-Full-Qualification with the ETH Cleanroom-Cold-Box-setup. It can/should also be extended by Module Testing with Xray setup.

Contents

1	Before starting	1
2	Placement of modules on the plate	1
3	Activating and configuring the setup	1
3.1	Reducing the humidity	1
3.2	Activating the setup	1
3.3	Configure softwares	1
	pXar • elComandante	
4	Performing Full Qualification	2
5	Finishing the test	3
6	What to do with the data	3
6.1	Create backup	3
6.2	MoReWeb Analysis	3
6.3	Upload to the database	3

1. Before starting

For the Full Qualification in the cleanroom you will need the following components.

- 1 Cold Box (currently Red October)
- 1 PC dedicated to the Cold Box (Currently Daim)
- 4 (at least one) digital Modules
- As many Digital Test Boards as Modules
- 2 power suppliers for the Cold Box TEMs
- 1 Keithley High Voltage Supplier

Check that everything except the PC is turned off. Place the Module Transportation Box/ Tray in a stable position close to the Cold Box.

2. Placement of modules on the plate

Wear the ESD armband while performing this operation. Place one module at the time, starting from position 0 as marked on the plate. Then, connect the adaptor cards to the adaptor boards. In this phase, attention should be put at the length of the molex cable. Some cables might be too short to allow a proper insertion of the card, and the cable can be pulled off from the connector in the attempt to connect it. It is thus important to check that the position of the Testboard-plate allows for a safe installation of the adaptor cards. The molex cable should not be stretched and should be loose enough to be able to close the lid of the box without pulling it. The box can then be closed and turned on. A lead block is put on top of the lid to improve the sealing of the controlled volume. Now we can start and configure our devices for the Full Qualification.

3. Activating and configuring the setup

Until now, everything except the PC should still be turned off. It is important now to follow the procedure described below in the correct order.

3.1 Reducing the humidity

Turn on the Cold Box, select the program *p17* and start it. Wait until the relative humidity reaches a value below 20% (typically around one minute). End the program *p17*. Leave the Cold Box on.

3.2 Activating the setup

1. Turn on the chiller. The main red switch closes the power circuit. The chiller is then turned on (if not already) by pressing for 5s the return button on the interface. The set temperature can be changed using up/down arrows and confirmed using the return button. It is usually set to 5°C. The chiller will now start to cool/heat the liquid, while pumping it through the cooling box pipes.
2. Turn on both power supplies of the TEM outside the Cold Box. The voltage should be set to 12.7V on both PSs.

3. Activate all DTBs by plugging in the power cable. Check that the USB connection is also established. One can verify this by typing *usbview* in the Terminal. Also check that all DTBs are correctly connected to the Keithley.
4. Turn on the Keithley. From now on, there is a chance of a high voltage going through the setup. Therefore it is better not to touch the setup for safety reasons.

3.3 Configure softwares

One has to be sure that both softwares, *pXar* and *elComandante*, are correctly configured before starting. By default, the minimum amount of configuration needed is to adjust the *elComandante.ini* file. It is assumed that one is logged in with the *production* user.

3.3.1 pXar

Go to the pXar build directory.

```
$ cd /pXar/build
```

Switch to the masterbranch.

```
$ git checkout master
```

If new default parameters need to be set (e.g. a module with a new TBM) or if one wishes to start pXar manually, do the following

```
$ ../main/mkConfig -h
```

and follow the instructions. An example for a L2 Module would be

```
$ ../main/mkConfig -d ../data/M2068 -t TBM09C
-r digv2lrespin -m
```

To start pXar for module MXXXX, do

```
$ ../bin/pXar -d ../data/MXXXX -g
```

3.3.2 elComandante

Elcomandante is supervising pXar, the Keithley and the Cold Box. There is an elComandante installation dedicated to Full Qualification with the cleanroom Cold Box in

```
$ ~/elComandanteFullQualification
```

Do not use elComandanteXray or elComandanteReception.

It can be configured through two files:

```
$ configure/elComandante.ini
```

and

```
$ configure/elComandante.conf
```

In elComandante.ini, the main fields to check are:

- *[Modules]*: insert here the module IDs
- *[Tests]*: for the Preliminary Test:
Test = Pretest@17, leakageCurrentPON@17
TestDescription = LeakageCurrentPON
 At this stage modules with communication problems (errors in the log files) or bad sensors (high leakage current) can be identified and taken out of the box.
- *[Tests]*: for the Full Qualification:
Test = FulltestPxar@-20,Cycle,FulltestPxar@-20,IV@-

20,FulltestPxar@17,IV@17

TestDescription = FullQualification

This is the standard test sequence for the Full Qualification.

- *[TestboardUse]*: Should be *True* for the used Testboard.
- *[ModuleType]*: For TBM09C, use
tbm09c-prod11
 For TBM08C, use
tbm08c

In elComandante.conf, one usually does not need to change anything. The main fields to check are:

- *[TestboardAddress]*: Check that the DTB names and positions are correct.
- *[keithleyClient]*: For the cleanroom setup, it should be
port: /dev/ttyUSB1
- *[defaultParameters]*: If one has created a new set of default parameters, they can be inserted here.
- *[jumoClient]*: By default, it should be
port: /dev/ttyJUMO
programName: coolingBoxClient.py

4. Performing Full Qualification

For starting elComandante, one does the following:

1. End any programs running locally on the JUMO.
2. Immediately (less than 2 minutes) run elComandante.

To run elComandante, go to

```
$ cd ~/elComandanteFullQualification/elComandante
```

and type

```
$ python el.comandante.py
```

It is recommended to first do the Preliminary test and then proceed with the Full Qualification. The setting changes are explained in section 3.3.2. During the whole procedure, it would be wise to keep an eye on the log-output of elComandante, pXar client, JUMO client and Keithley client in case of any problems. Principally, one can now wait until the Test is done.

5. Finishing the test

When elComandante has completed all foreseen tests, it will ask the user to take out the modules. Do so. Then it will ask to press enter and the test summary will be displayed. Then it will ask to press enter again to and the program and store the data. Do so.

After the Modules are taken out and put in a safe place and the software is terminated, turn of the setup by.

1. Turn off the Keithley.
2. Unplug the power cables for the DTBs.
3. Turn off the PSs.
4. Turn off the chiller.
5. For the last, turn off the Cold Box.

6. What to do with the data

6.1 Create backup

The results are stored in a local folder and have to be moved to a shared folder. In order to do so, please copy only the new *.tar files results from

```
$ /usr/local/coldboxDATA
```

to

```
$ /home/production/data
```

6.2 MoReWeb Analysis

MoreWeb results should be carried out on an external hard drive. Connect to the PC with the external harddrive, copy the results from /home/production/data to the external drive, untar them by doing

```
$ tar -xf [FILE]
```

and run MoReWeb by doing

```
$ python ~/MoReWeb/Analyse/Controller.py -new
```

. The results will be available in

```
$ Overview/Overview.html
```

6.3 Upload to the database

This can be done by doing

```
$ scp -P 23481 -i /data/Equipment/labcomputer/eth-pisa-key.rsa  
[tarFILE] eth@cmspixelprod.pi.infn.it:/home/eth/dropbox/
```

If modules tested already exist in the DB, just run:

```
$ scp -P 23481 -i /data/Equipment/labcomputer/eth-pisa-key.rsa  
[tarFILE] eth@cmspixelprod.pi.infn.it:/home/eth/dropbox/
```

changing the tar archive with the needed one for every module.