

EEE Upgrade 2018: construction and tests

33 MRPCs built

20170222001	LAMP-01
20170223002	LAMP-01
20170225003	LAMP-01

20170314004	GENO-01
20170316005	GENO-01
20170317006	GENO-01

20170405007	SIEN-02
20170406008	SIEN-02
20170407009	SIEN-02

20170425010	CARI-01
20170426011	CARI-01
20170427012	CARI-01

20170509013	TORI-05
20170510014	TORI-05
20170511015	TORI-05

20170523016	LODI-03
20170524017	LODI-03
20170524018	LODI-03

20170719019	spare – ROMA-01
20170921020	spare – FRAS-01

20170926021	CAGL-04
20170927022	CAGL-04

20170928023	spare
20171026024	spare – COSE-01

20171121025	BOLO-05
20171123026	BOLO-05
20171124027	BOLO-05

20180221028	CAGL-04
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20180222029	spare
20180227030	spare
20180228031	spare
20180320032	spare
20180322033	spare

All of them 6 gaps 250 um
+ 5 glasses 280 microns

Tests flow

Test during the
constructions:

HV
strips

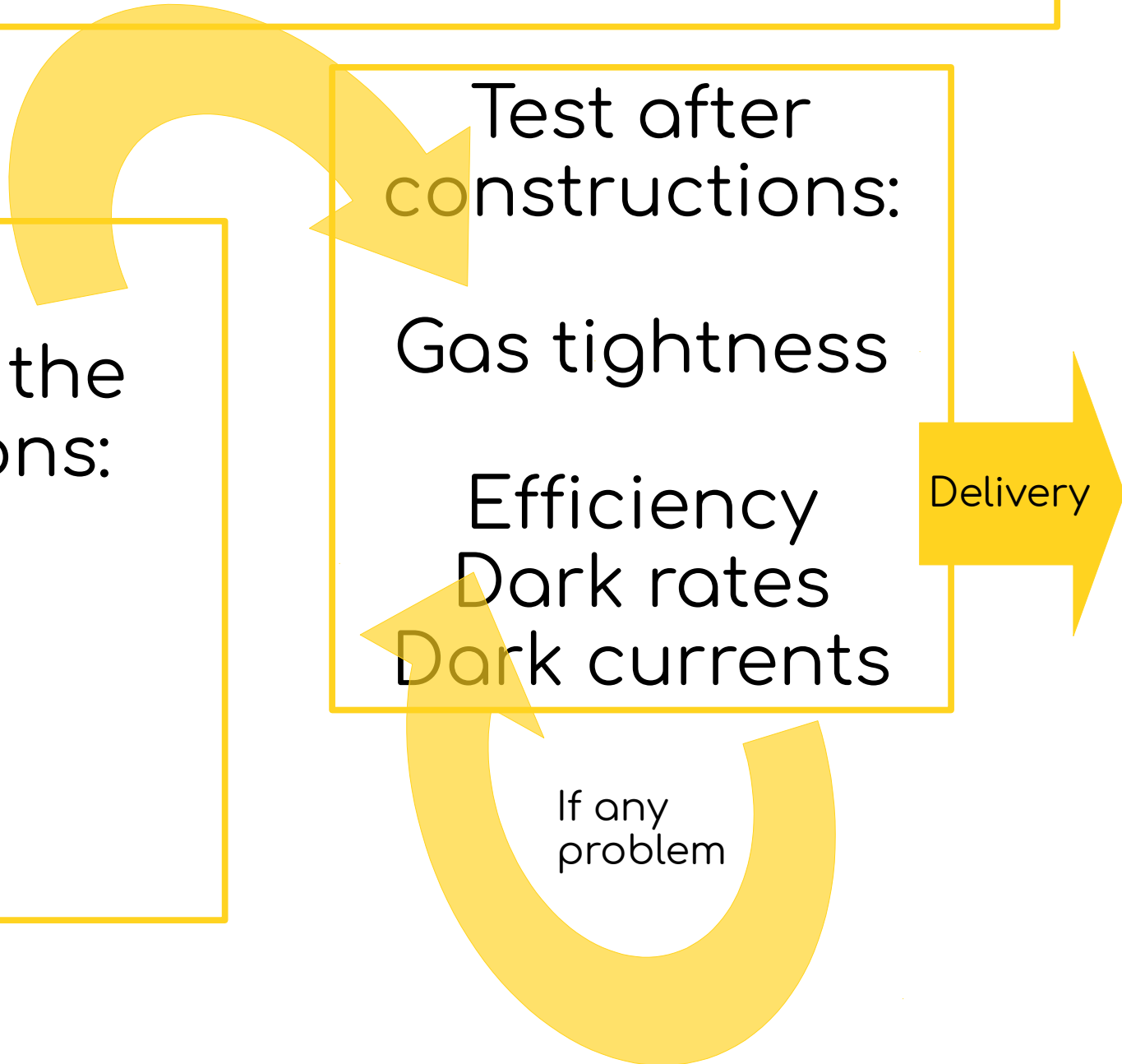
Test after
constructions:

Gas tightness

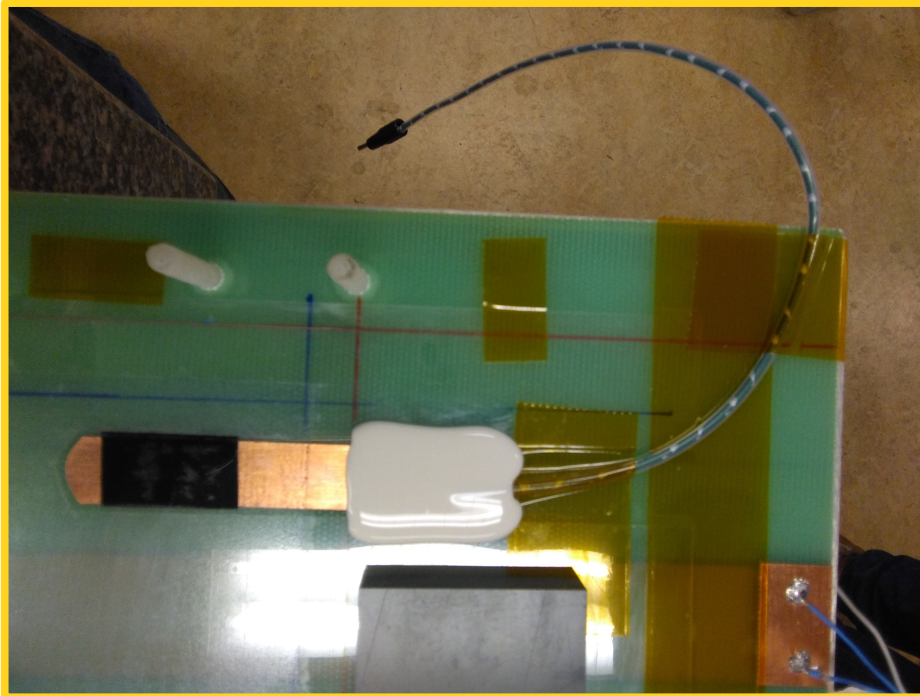
Efficiency
Dark rates
Dark currents

Delivery

If any
problem



Tests during the constructions



HV

The good quality of HV contact on electrodes is ensured by **carbon tape** (black) between contact and glass.

The **upper electrode is the negative**.

The electrodes are **properly labeled** for avoiding mistakes during the telescope installation

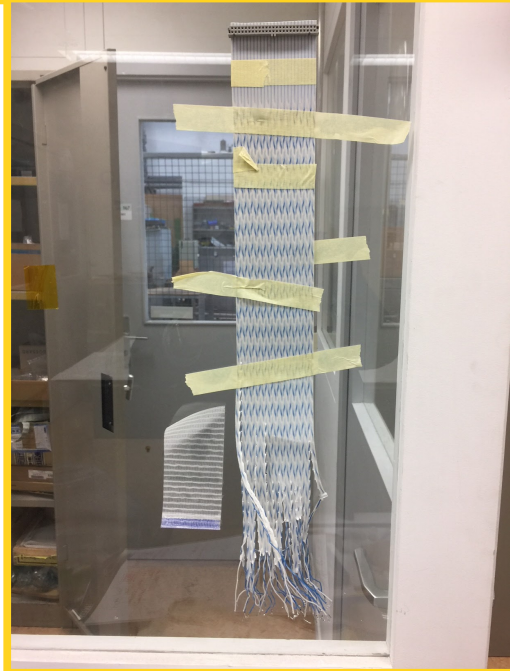
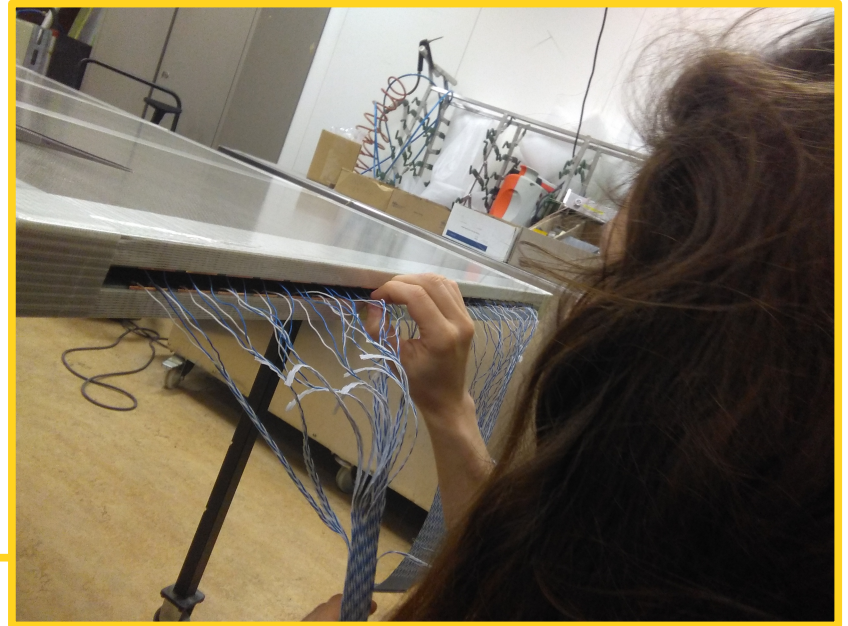


Tests during the constructions

Flat cables are prepared in advance.

Right orientation is taught and checked during soldering.

Unused twisted pair are tied.



Strips

Solderings are checked both for

1. **mechanical strength**
2. **right order**

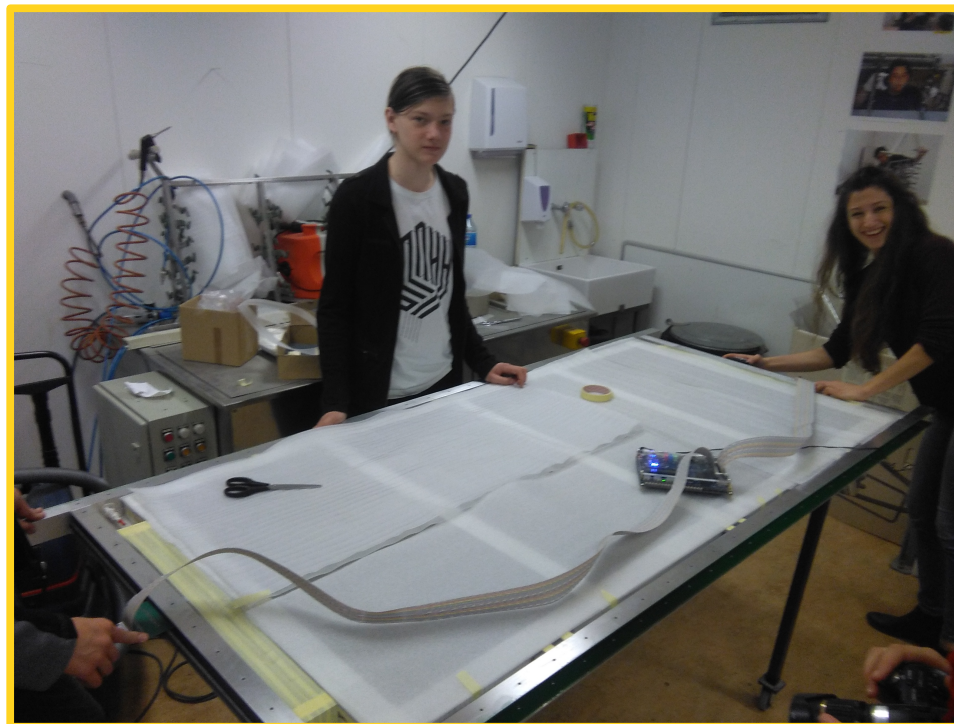
several times and by different people

Tests during the constructions

Good electrical connections are tested
on both sides.

The test is repeated:

1. with dummy connectors **before closing** the chamber
2. **after laying the chamber** within the chassis
3. **after chassis closing**

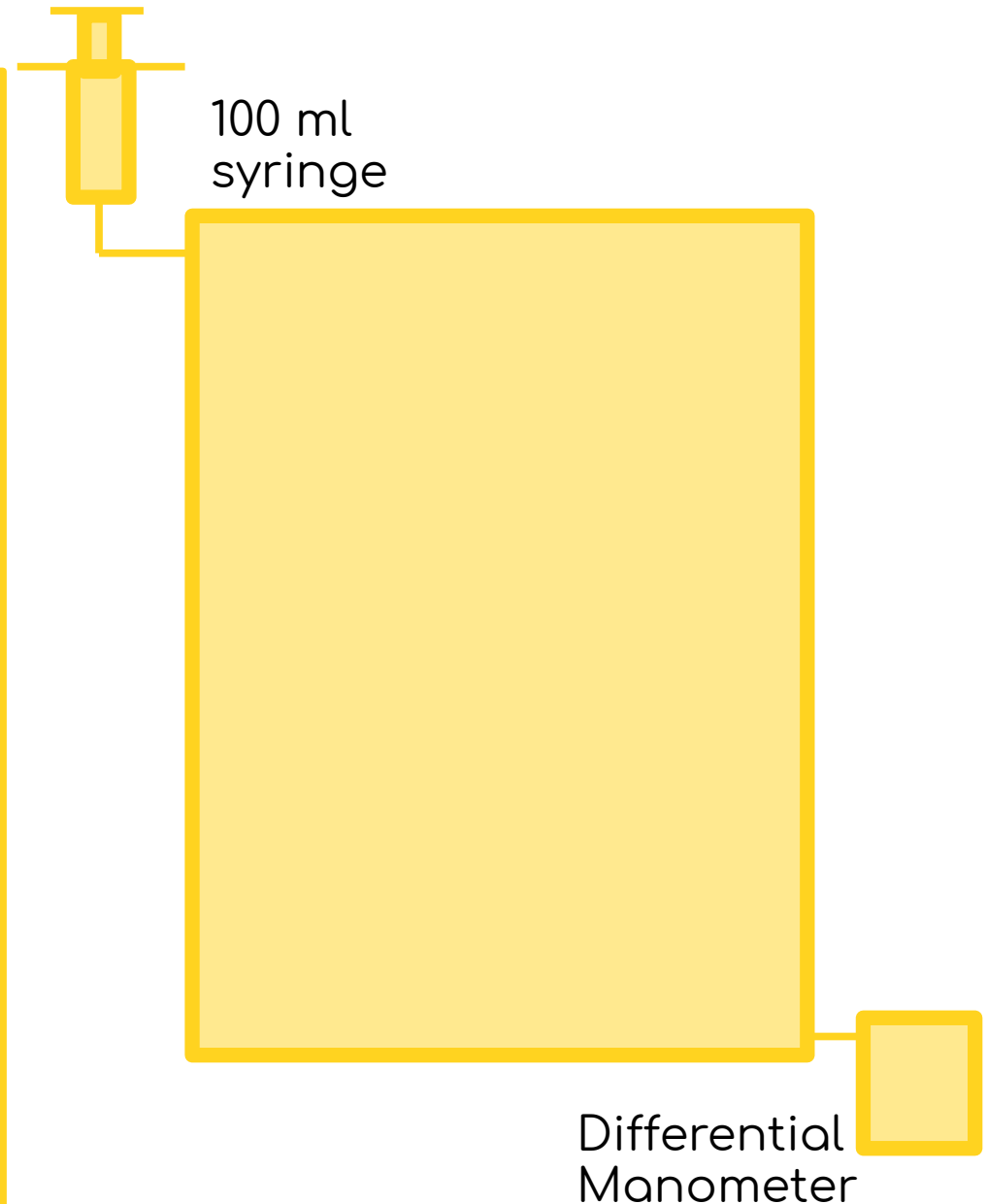


Strips

Gas tightness tests

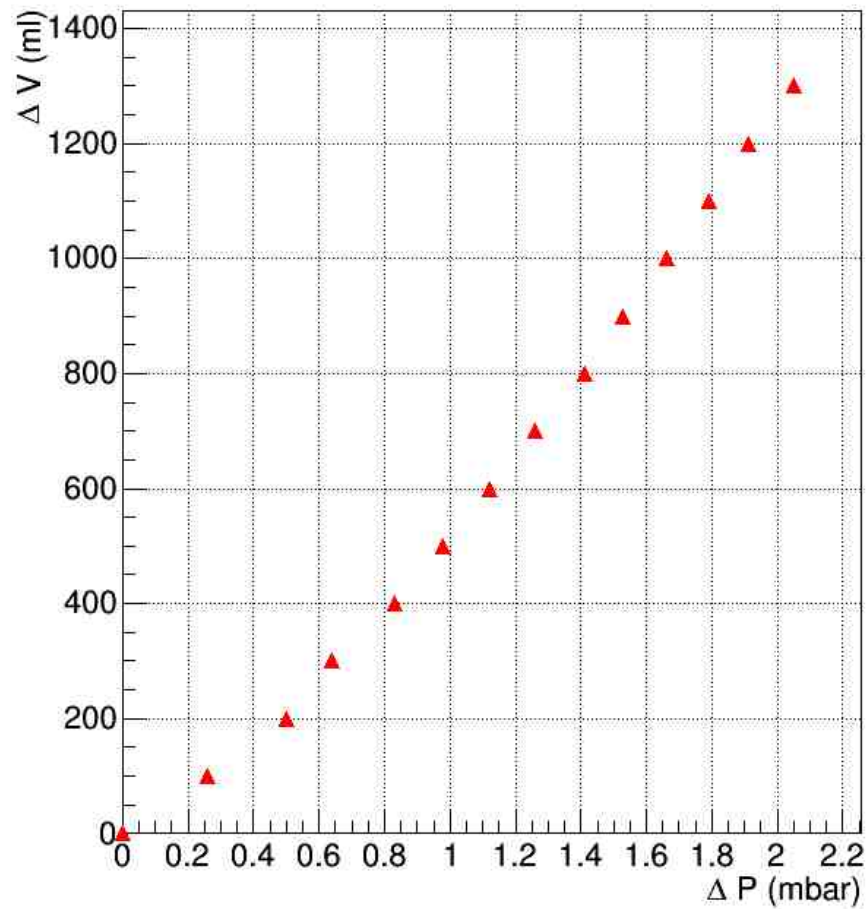
The gas tightness test is performed as follows:

1. 100 ml of air are injected during each step up to 2 mbar of overpressure
2. Volume vs Pressure curve is measured
3. the chamber is closed and the Pressure variation vs time is measured
4. corrections for volume variation due to Temperature are applied
5. the volume time derivative is the estimated leakage

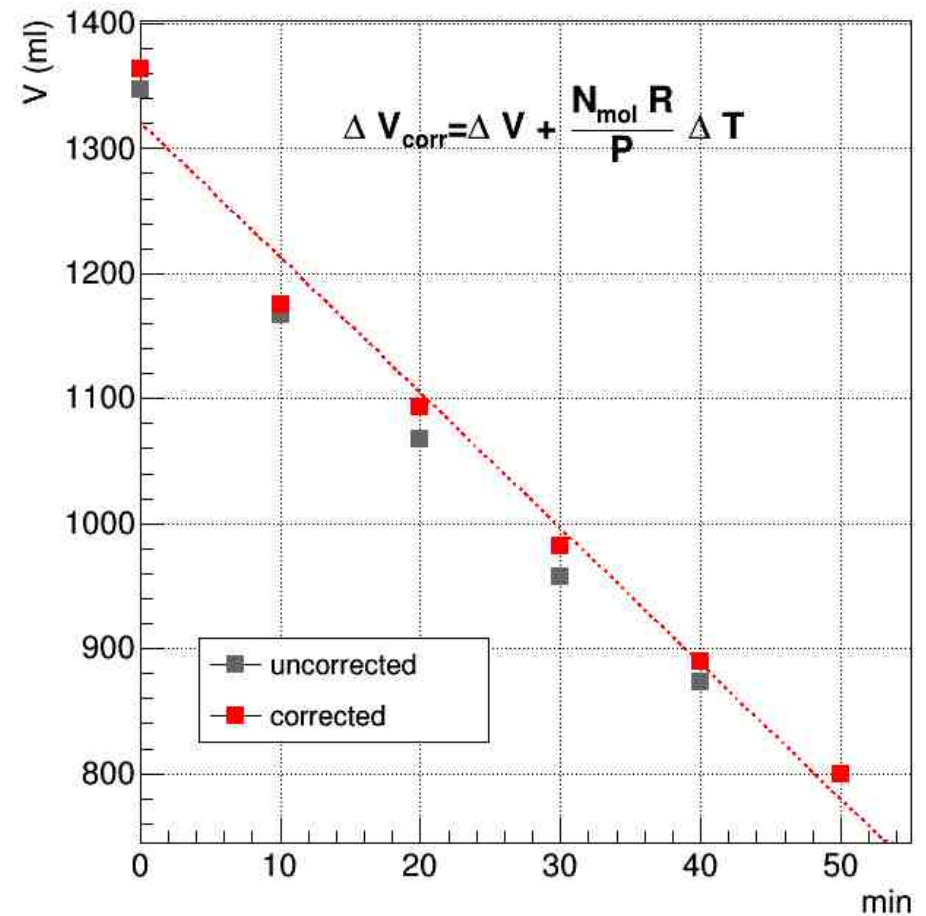


Gas tightness tests

Calibration curve

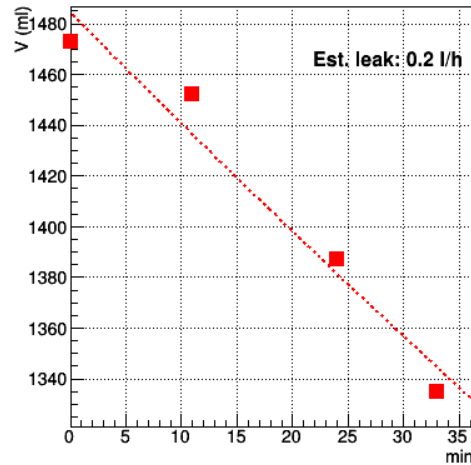


Temperature correction

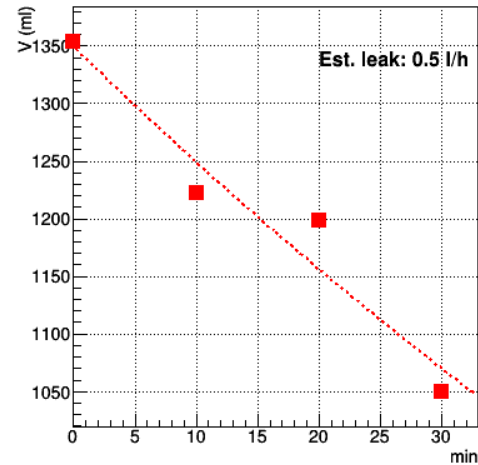


Gas tightness tests

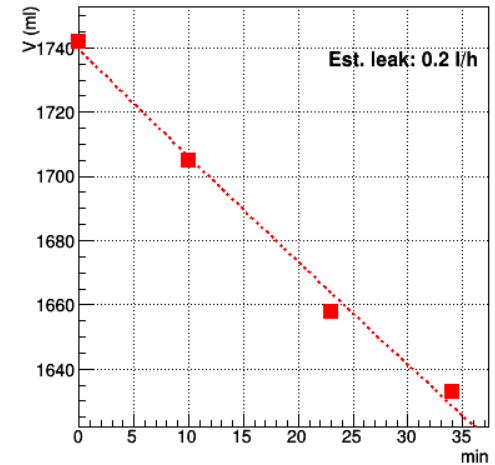
20170405007 gas tightness



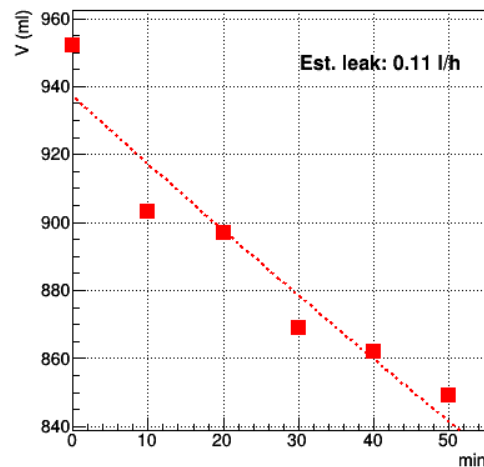
20170406008 gas tightness



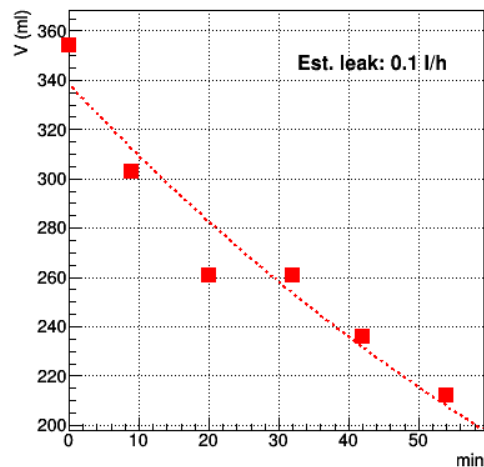
20170407009 gas tightness



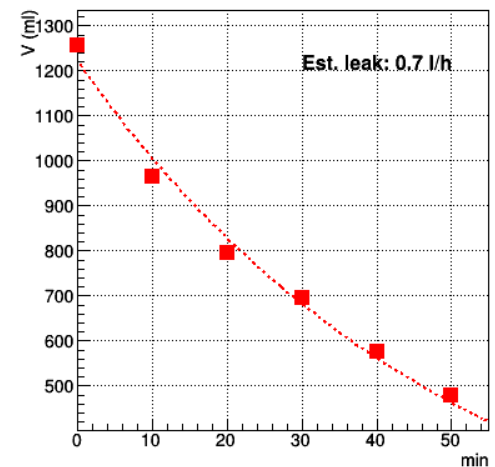
20170425010 gas tightness



20170426011 gas tightness

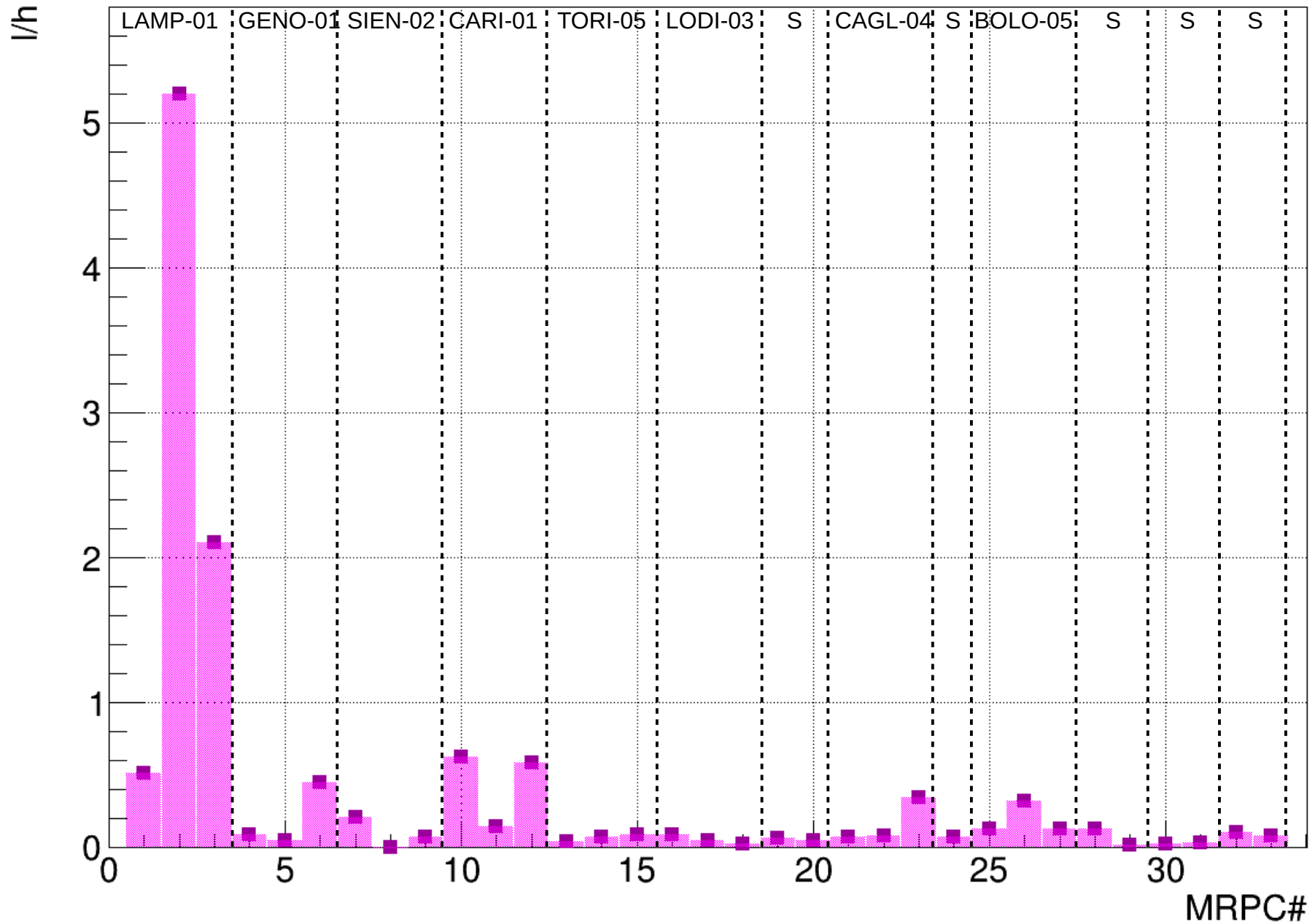


20170427012 gas tightness

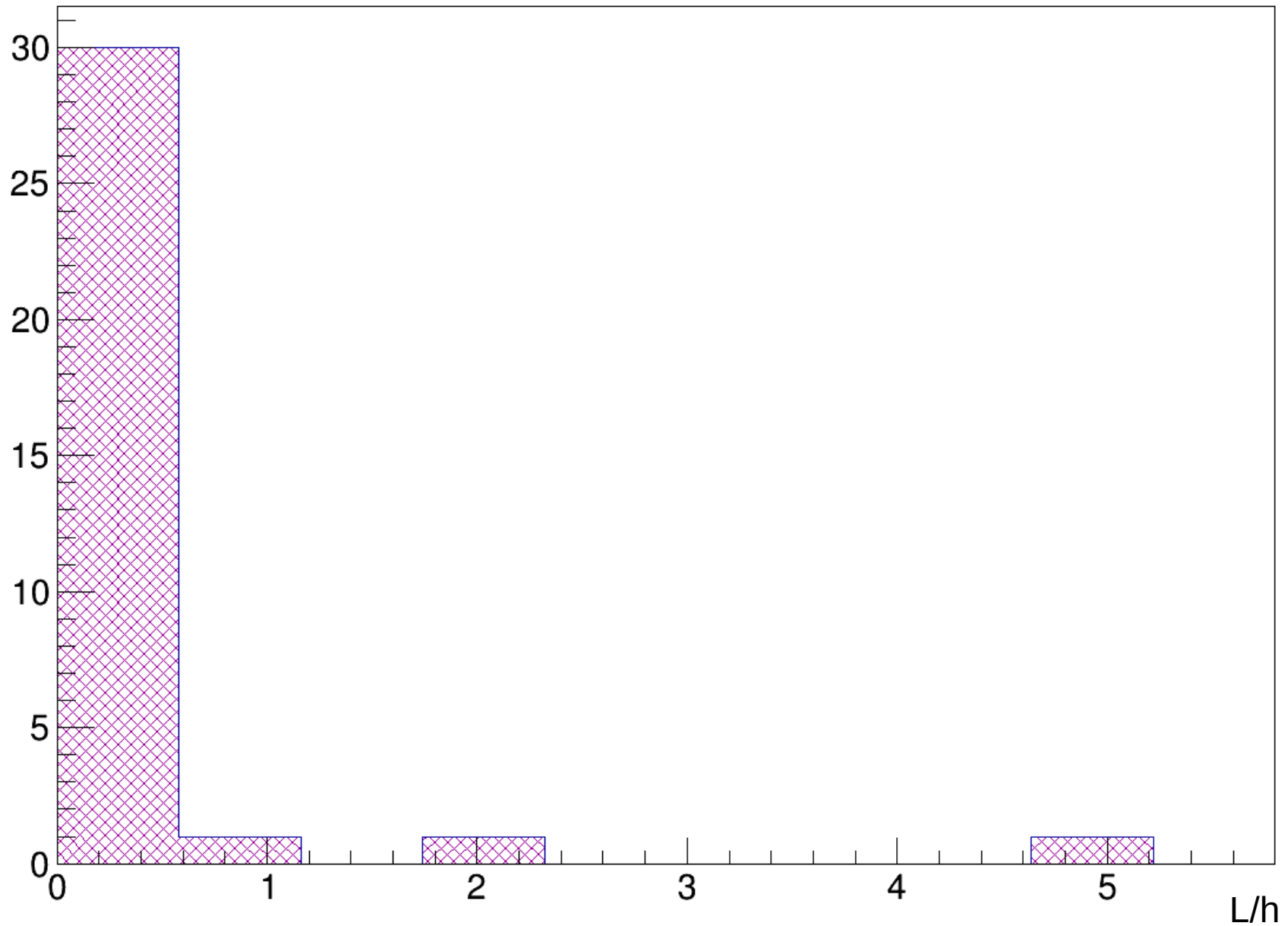


Extraction of the leakage flux:
pressure decrease vs time exponential behaviour
allows to measure the chamber leakage at $\Delta P \sim 1$ mbar
close to operating conditions

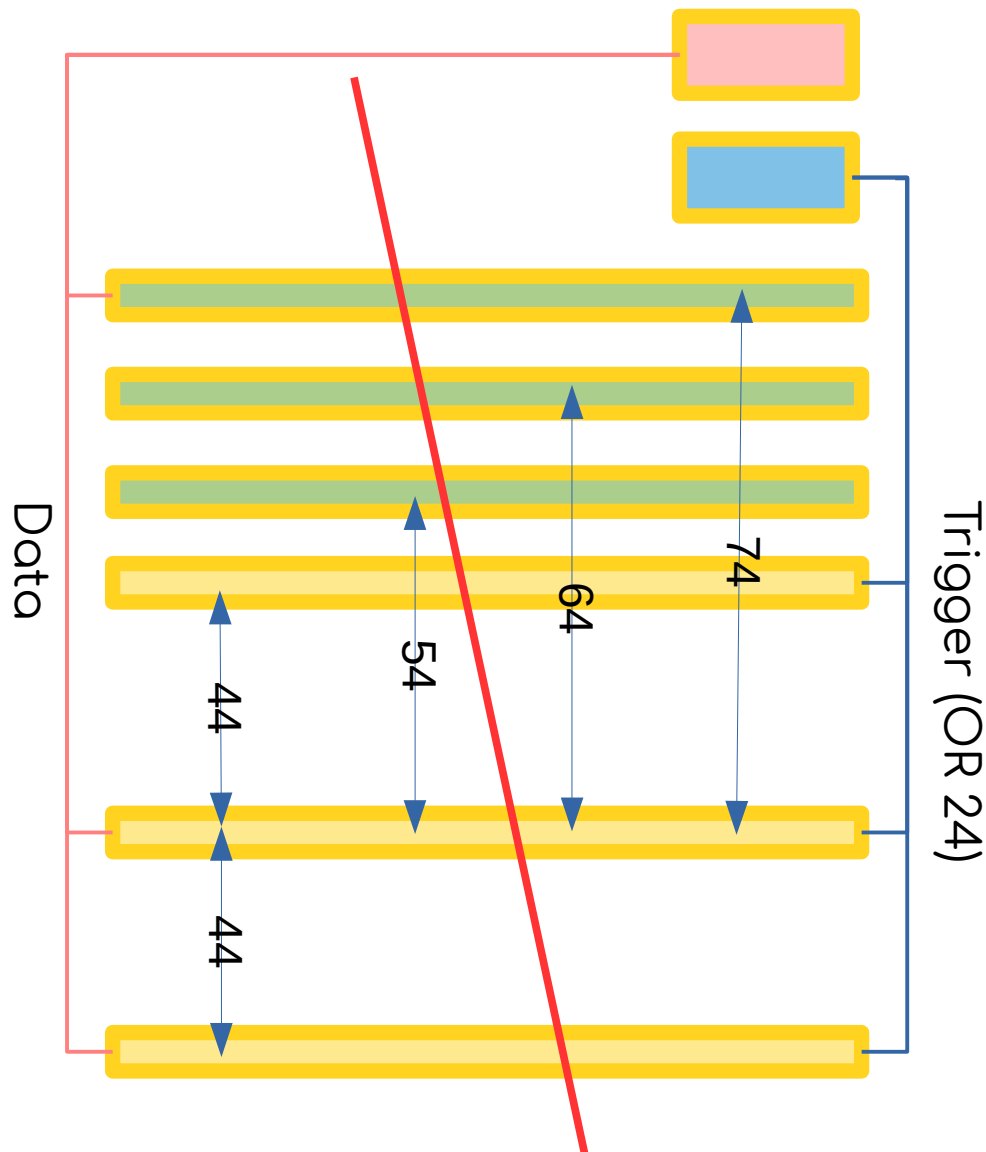
Gas tightness tests: trends



Gas tightness tests: Leak distribution



Efficiencies/Dark Rate/Dark Current



Efficiency is measured for the 3 chambers laying on CERN-01 (green).

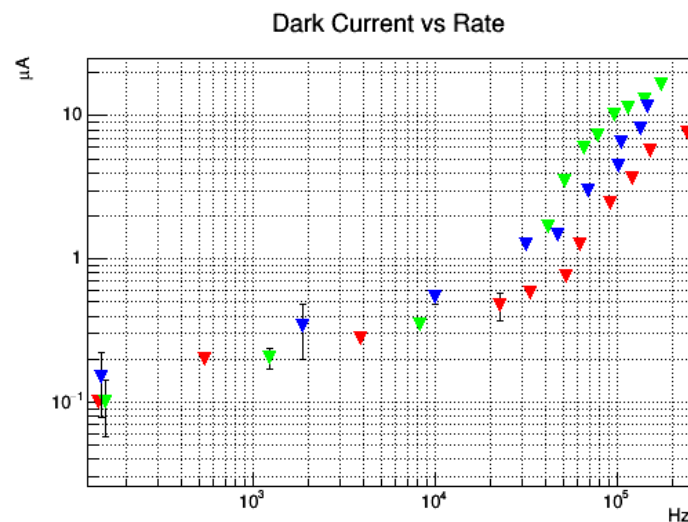
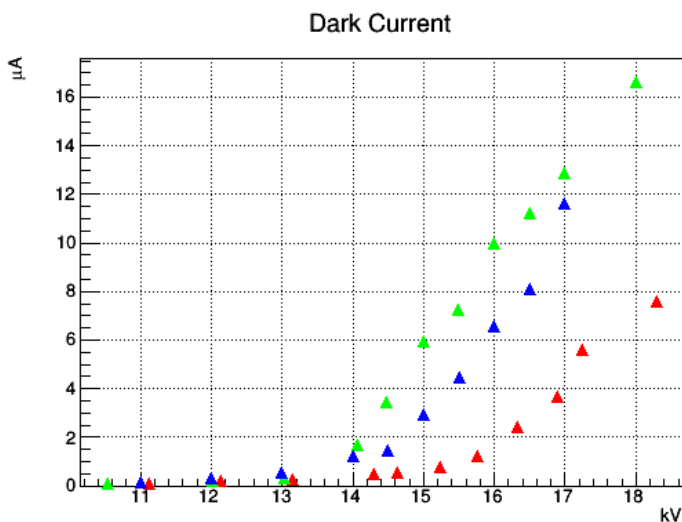
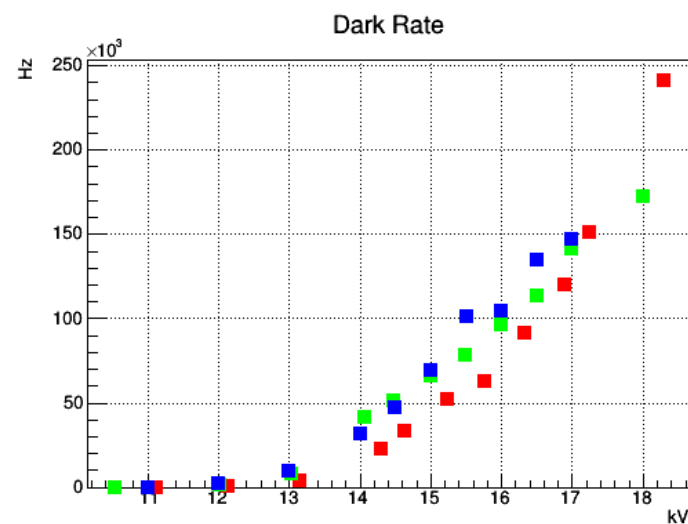
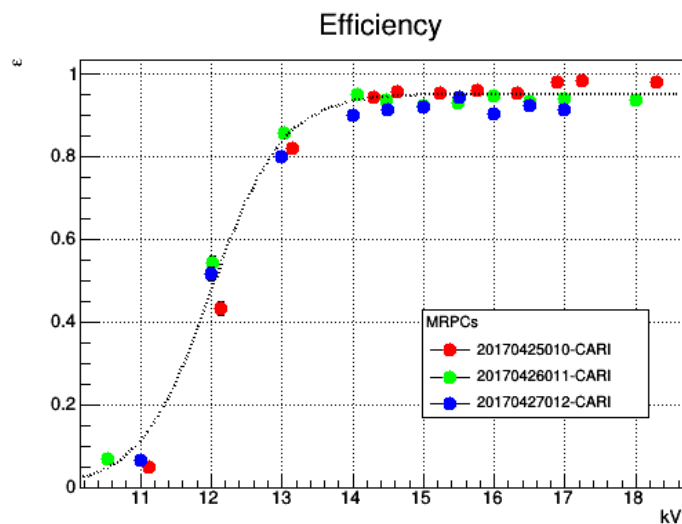
Chambers are fluxed 4 days before measurements.

The trigger is the CERN-01.

The data sent to DAQ come from CERN-01 bottom and middle chamber and one of the chambers under test.

By reconstructing tracks triggered by CERN-01, hits on tested chamber are searched.

Efficiencies/Dark Rate/Dark Current



A typical 3 chamber-set parameters