MRPCs:

construction and tests

AM 2018 05 02

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
20180222029	spare
20180227030	spare
20180228031	spare
20180320032	spare
20180322033	spare

All of them 6 gaps 250 um + 5 glasses 280 um.
Note the green band to identify (Roman)

Tests flow

Test during the constructions:

HV

strips

Test after constructions:

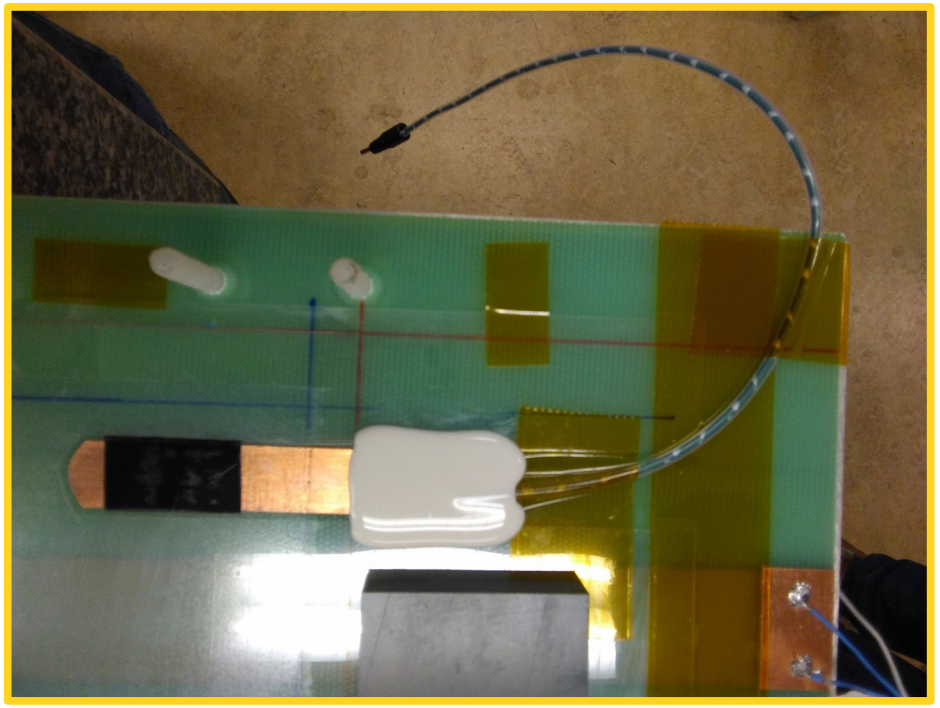
Gas tightness

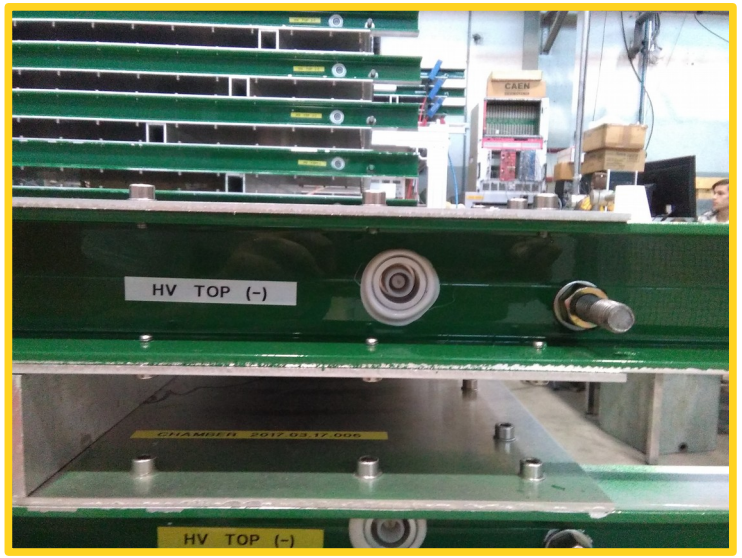
Efficiency
Dark rates
Dark currents

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.

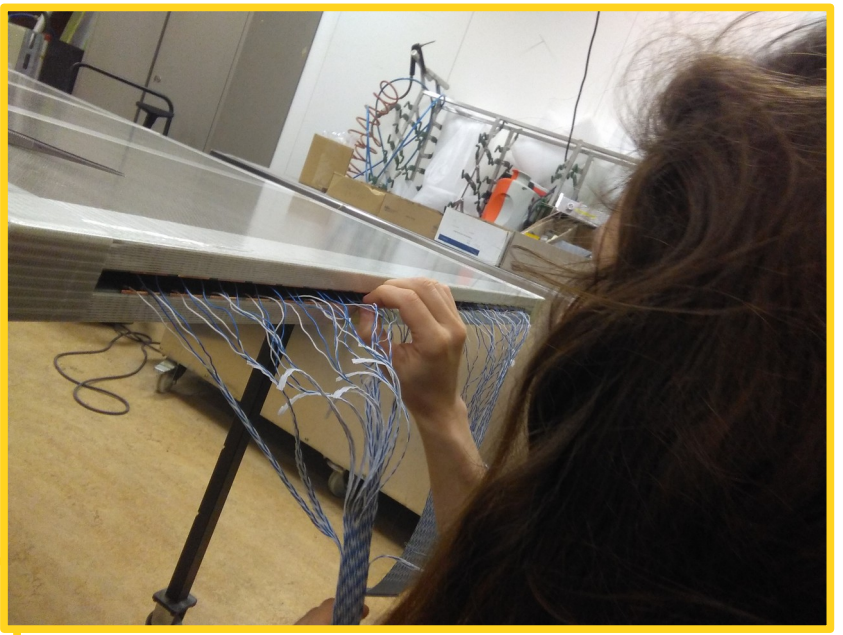
The electrodes are properly labeled for avoiding mistakes during the telescope installation

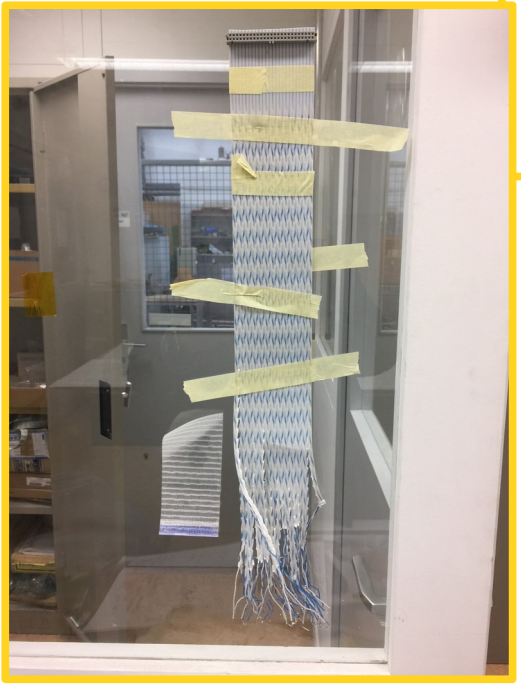
Tests during the constructions

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

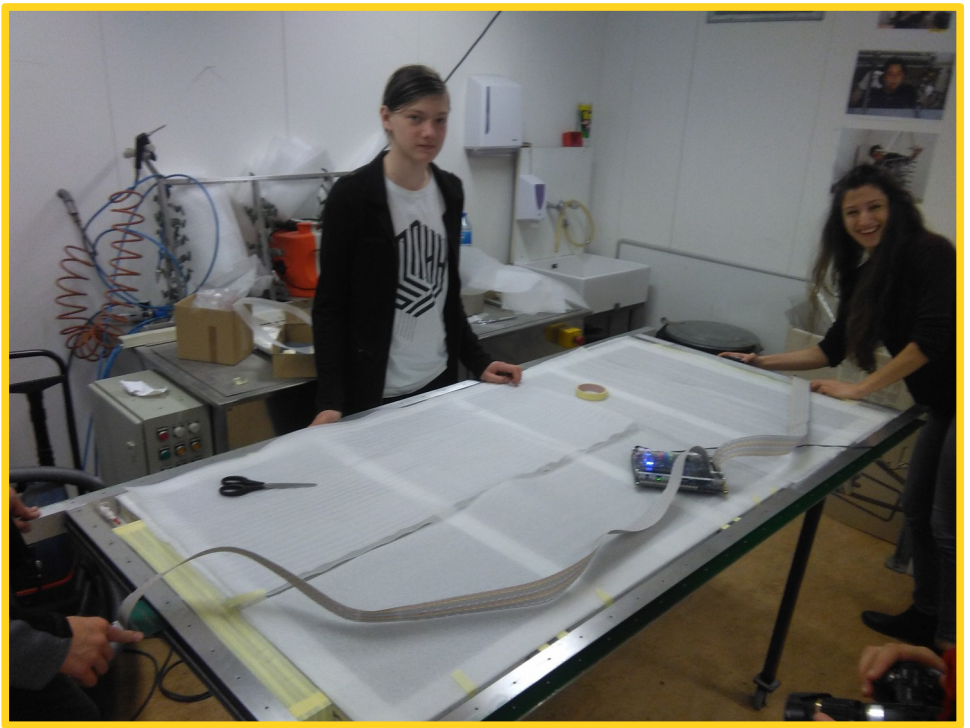
1. mechanical strength
2. right order

several times and by different people

Tests during the constructions

Good electrical connections are tested
by Bossini's Box 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

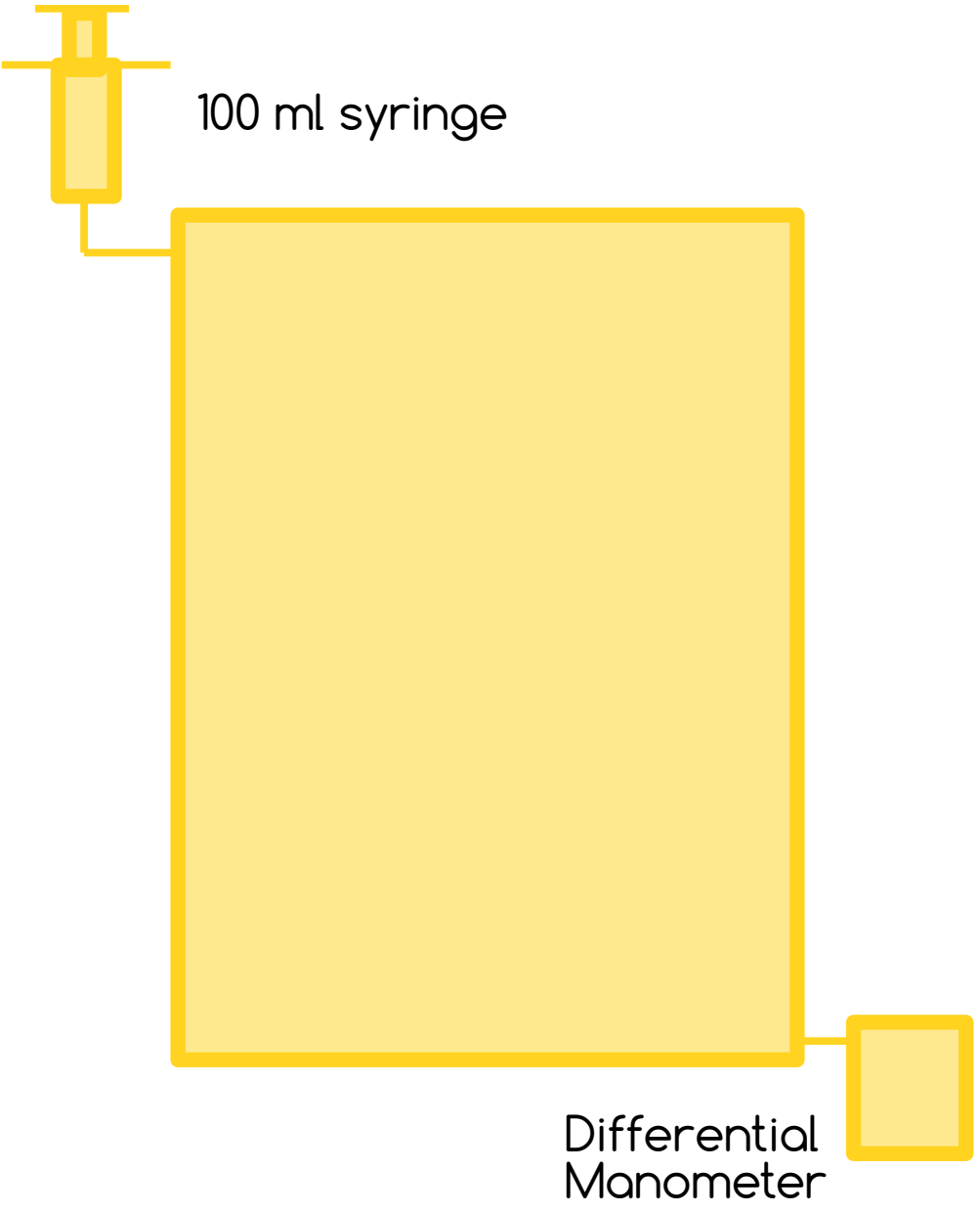
The gas tightness test is performed as follows:

1. 100 ml of air are injected during each step up to 2 mbar of overpressure

2. Volume vs Pressure curve is measured

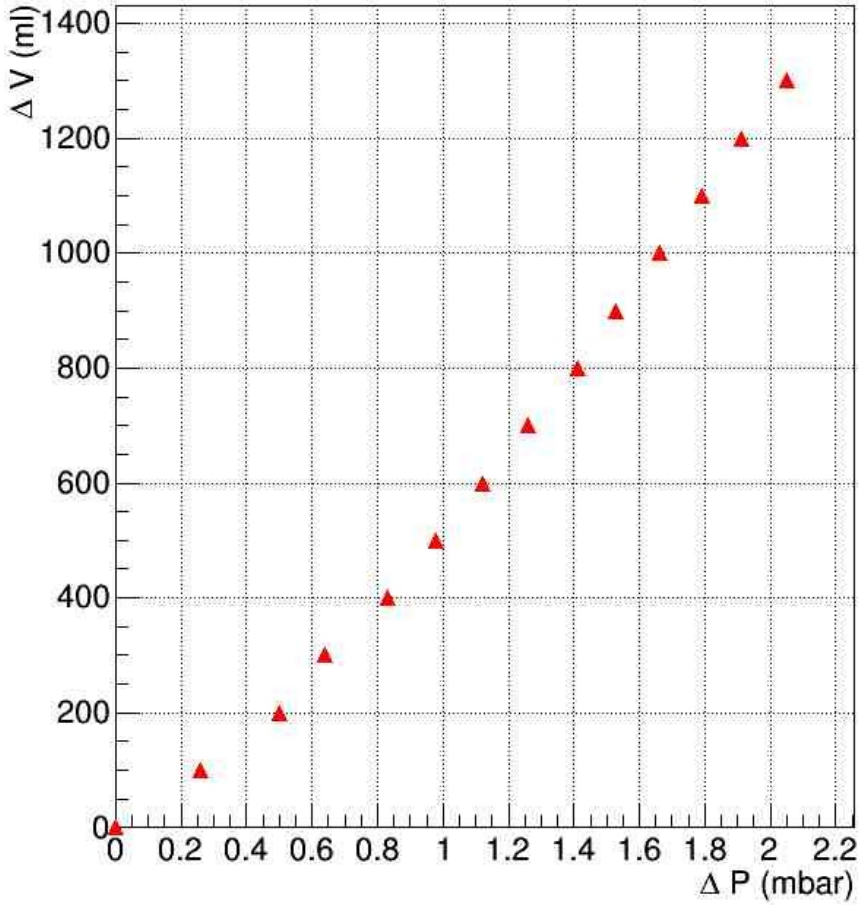
3. the chamber is closed and the Pressure variation vs time is measured

4. corrections for volume variation due to Temperature are applied
5. the volume time derivative is the estimated leakage

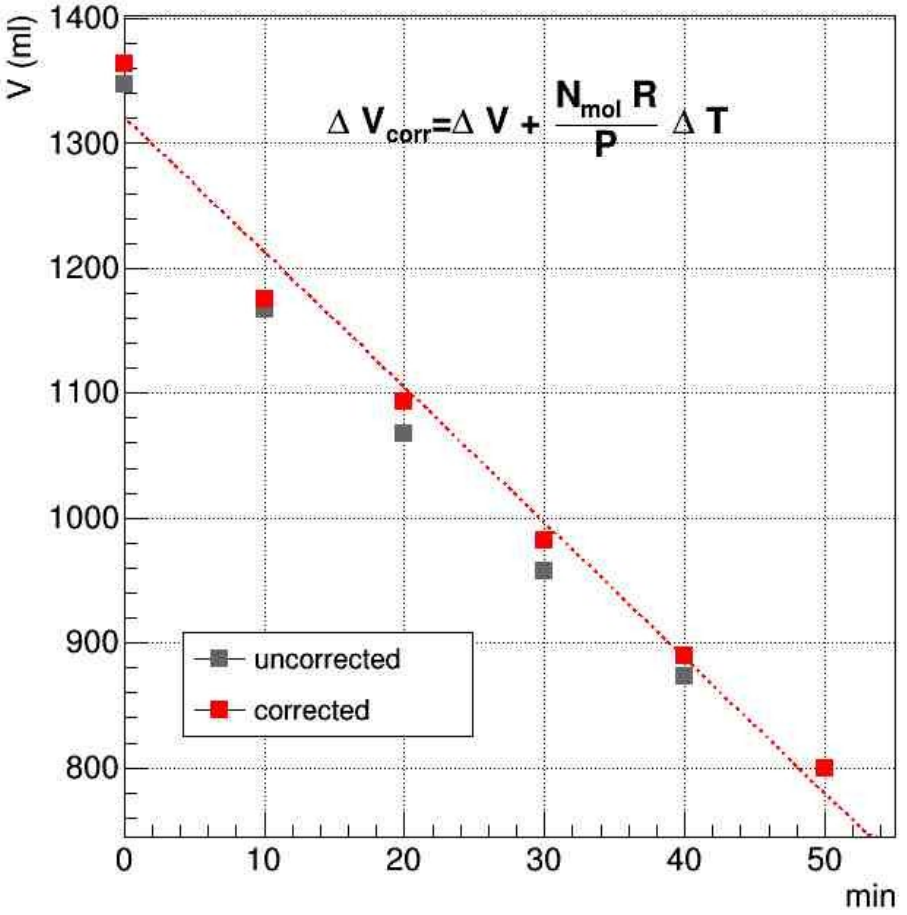


Gas tightness tests

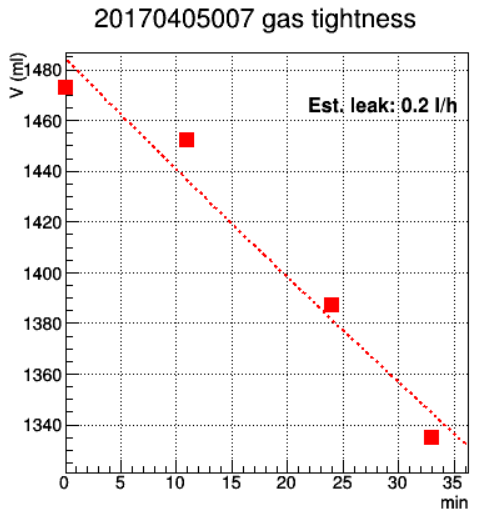
Calibration curve

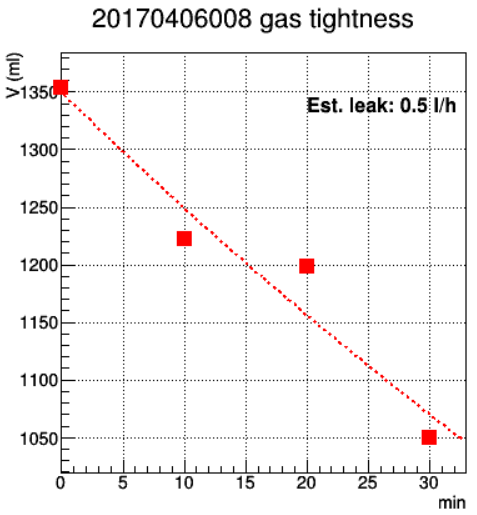


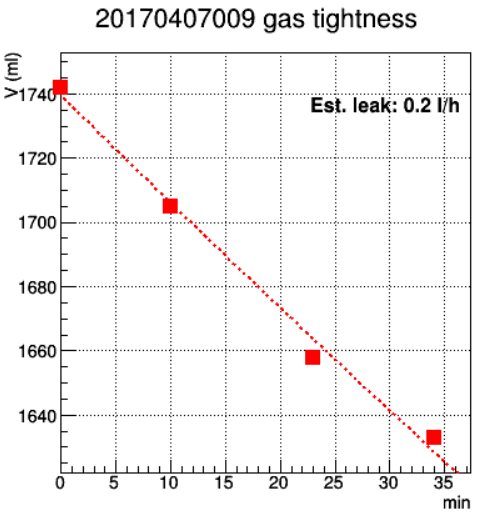
Temperature correction

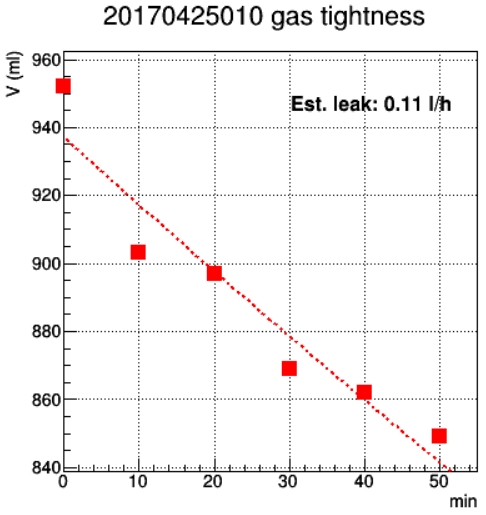


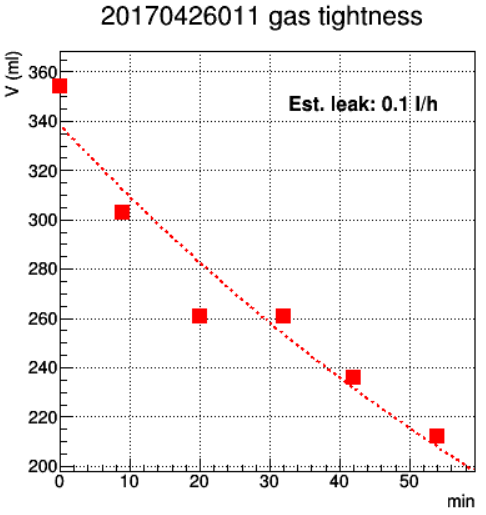
Gas tightness tests

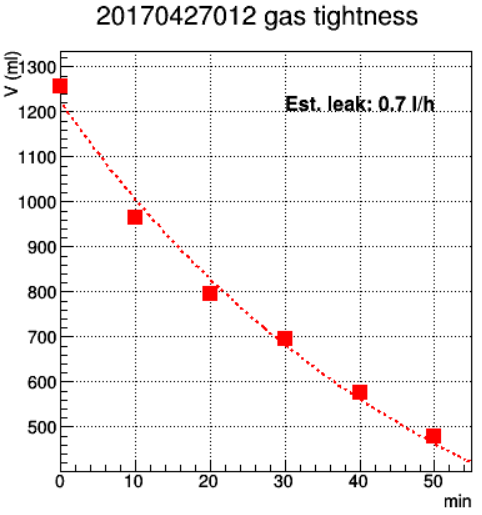






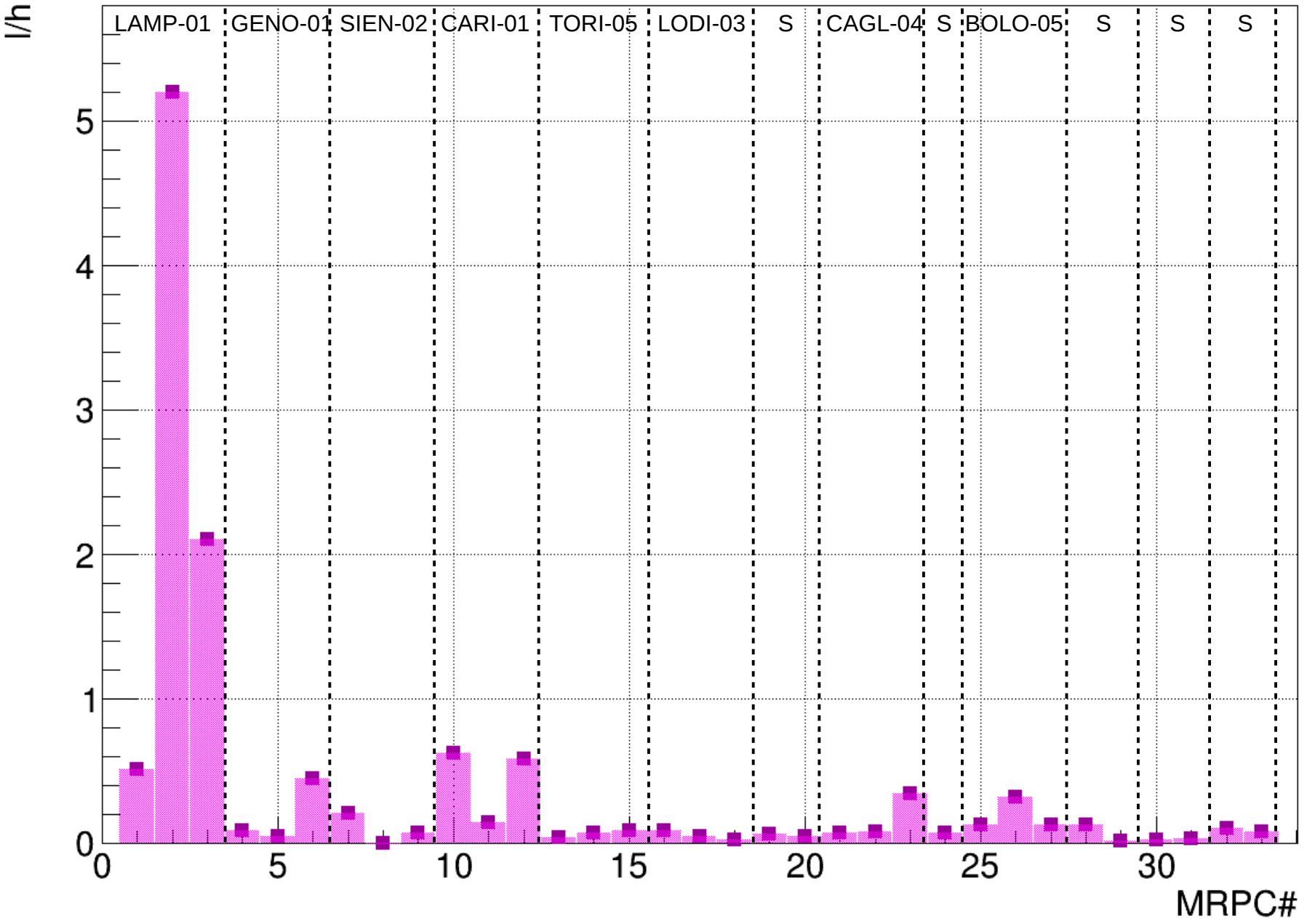




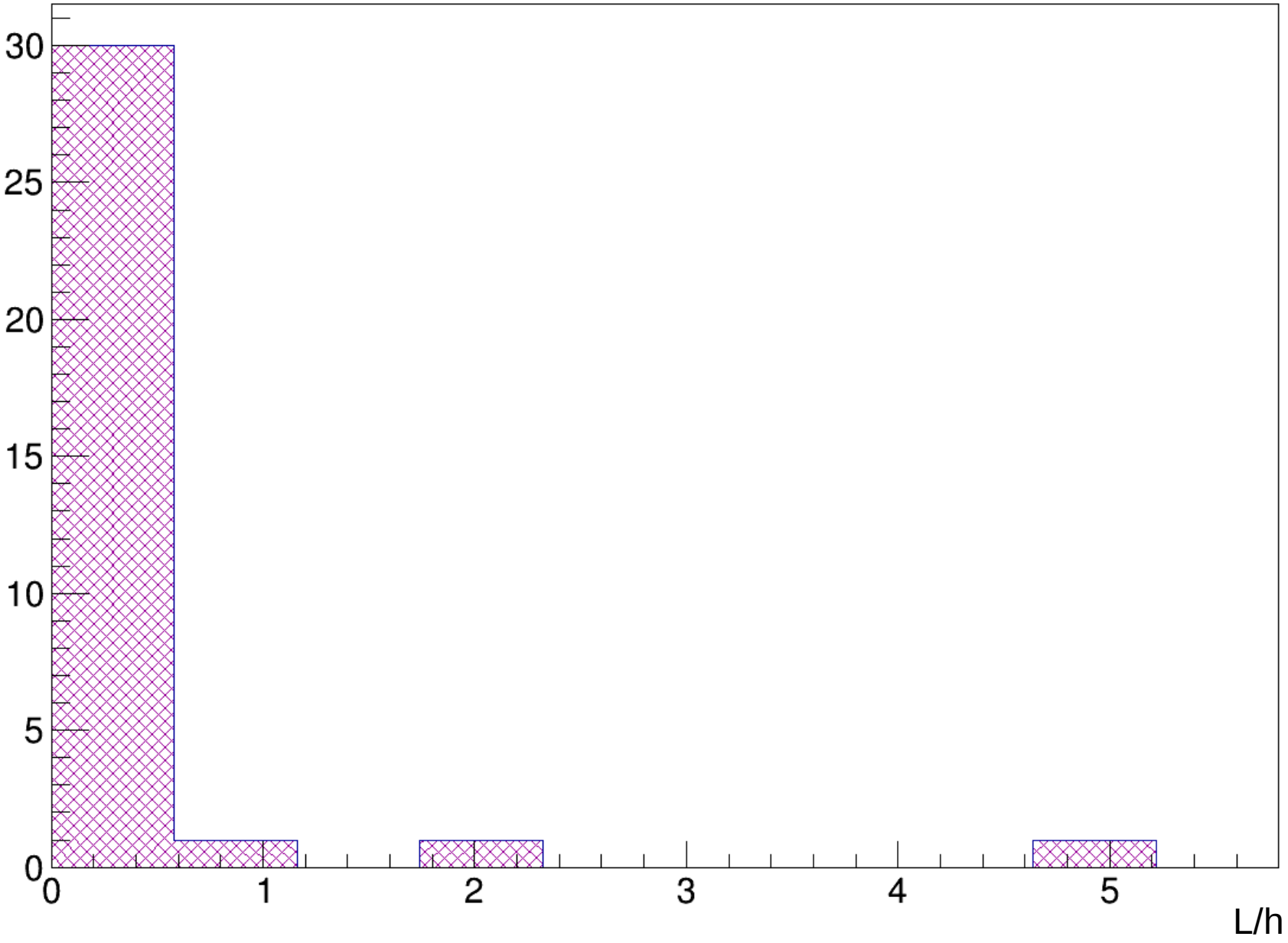


Extraction of the leakage flux:
pressure decrease vs time exponential behaviour
allows to measure the chamber leakage at ΔP~1 mbar
close to operating conditions

Gas tightness tests: trends



Gas tightness tests: Leak distribution



Gas tightness tests

Chamber tightness is good.

Very few important leakages above 1 l/h:

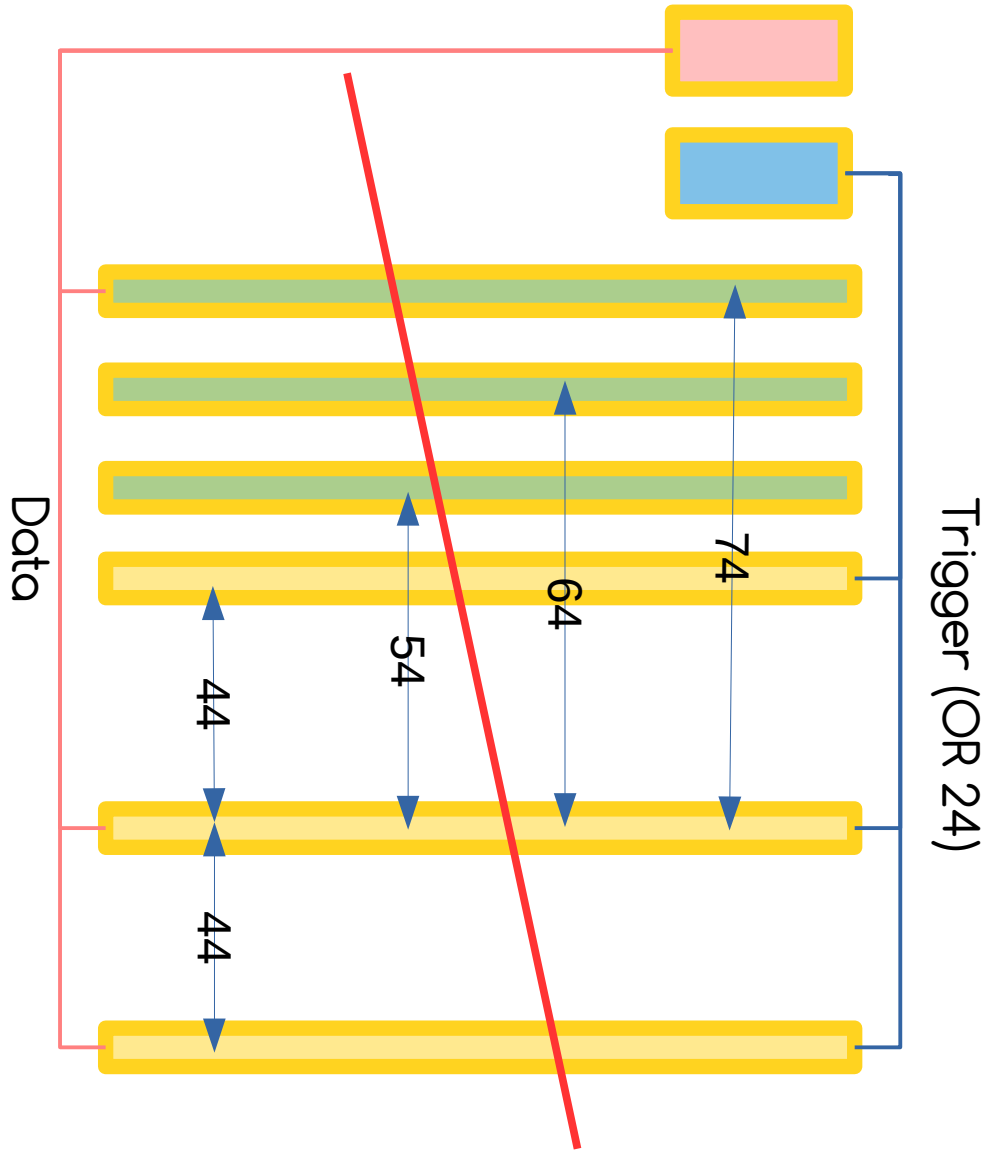
20170223002	LAMP-01
20170225003	LAMP-01

Very few minor leakages above 0.5 l/h:

20170425010	CARI-01
20170427012	CARI-01

Typical leakages are around 0.1 l/h

Efficiencies/Dark Rate/Dark Current



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

Chambers are fluxed
4 days before measurements.

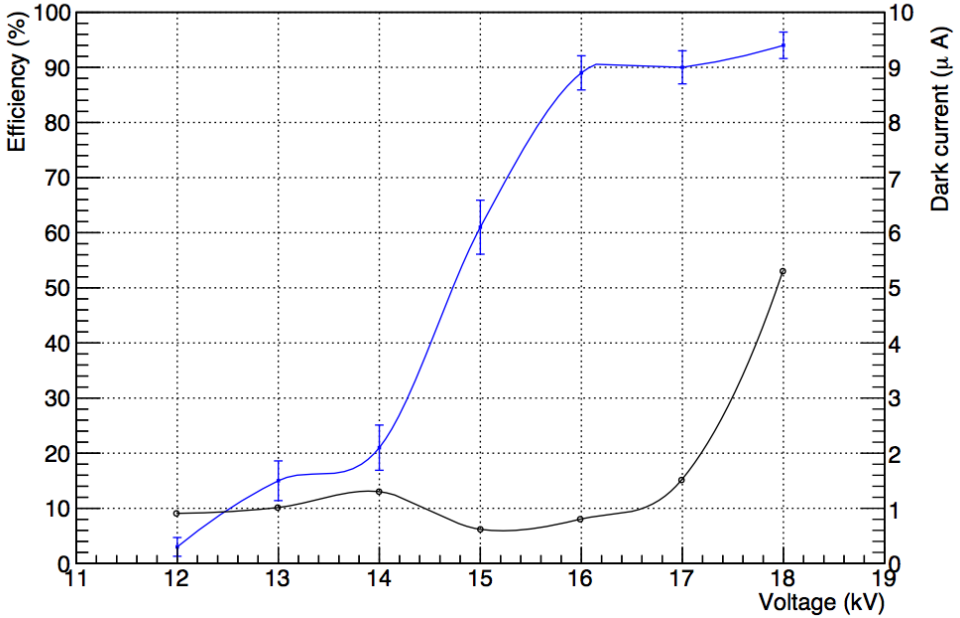
The trigger is the CERN-01.

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

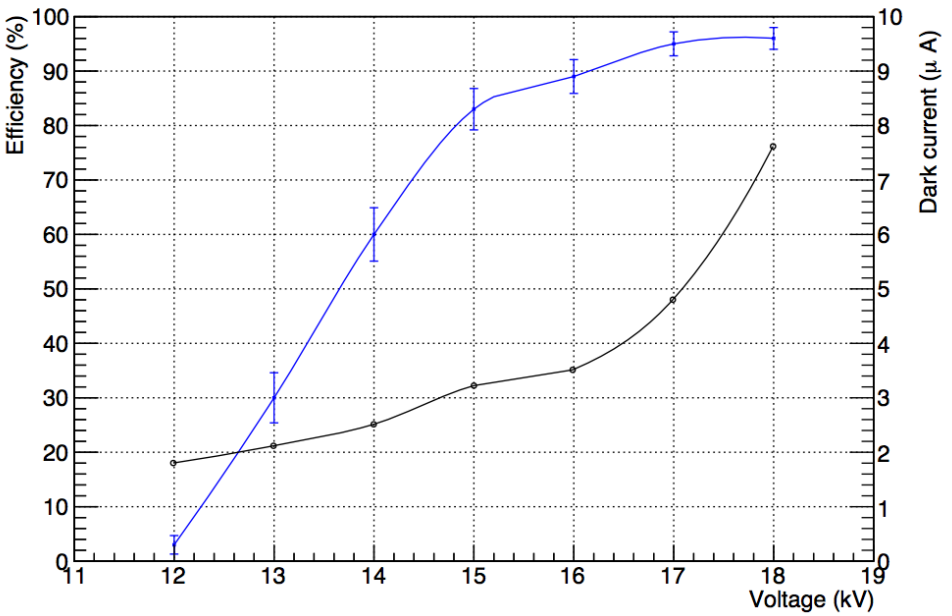
By reconstructing tracks triggered
by CERN-01,
hits on tested chamber
are searched.

Efficiencies/Dark Rate/Dark Current

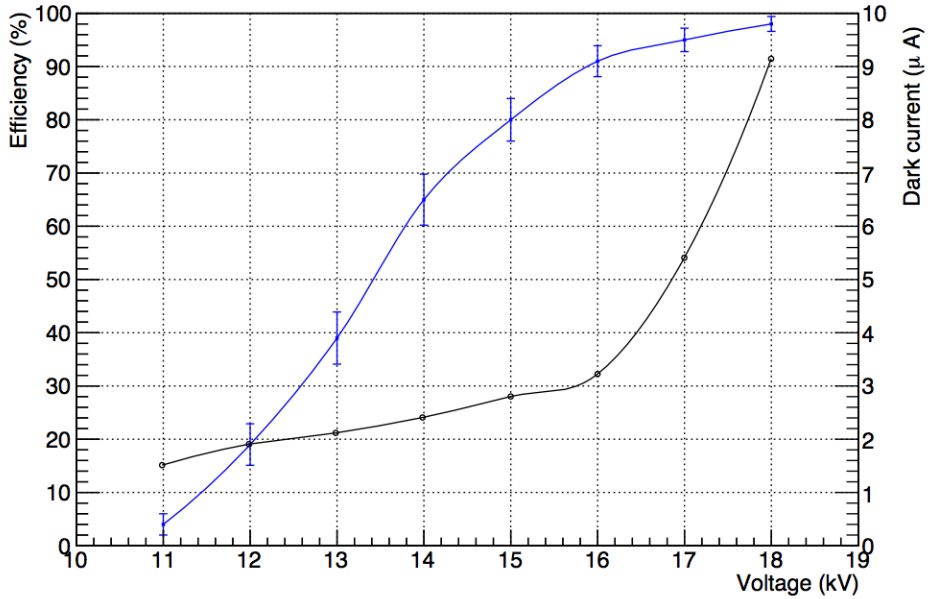
20170222001 by scintillators



20170223002 by scintillators

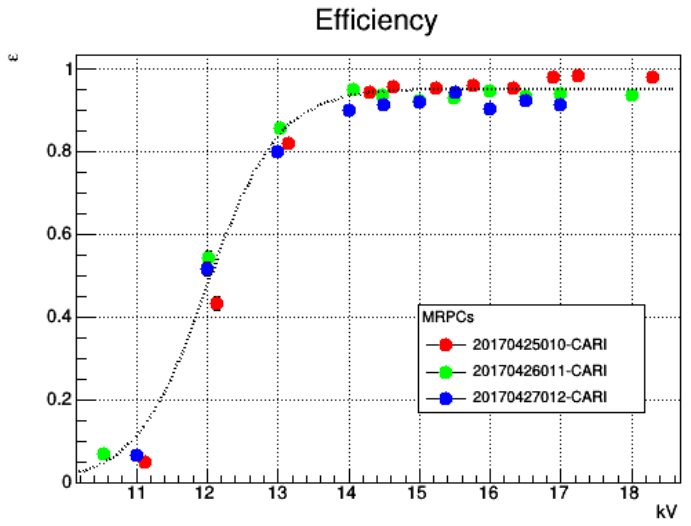


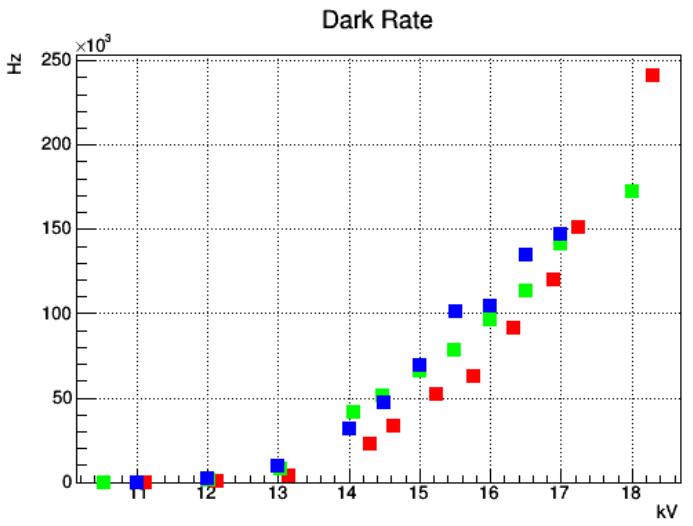
20170252003 by scintillators

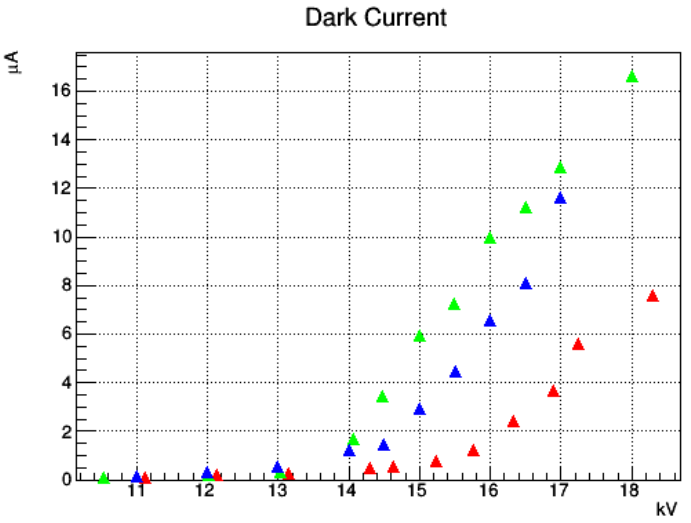


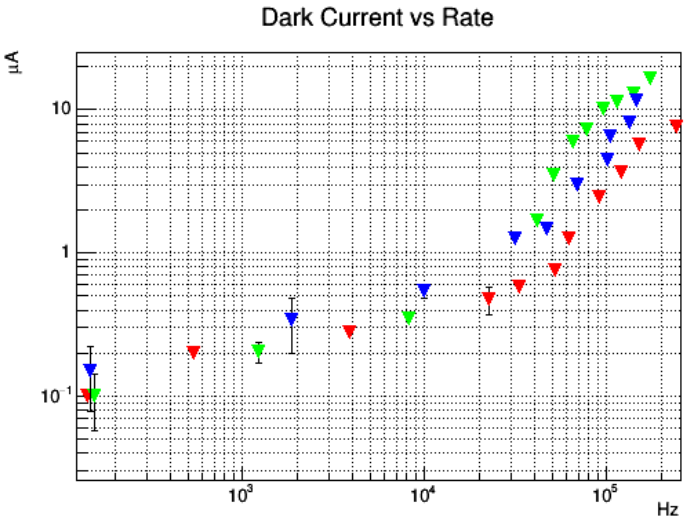
These chambers shows also leak problems, thus maybe a test with standard setup and recon is useful in order to have a consistent set of information for all the chambers

Efficiencies/Dark Rate/Dark Current



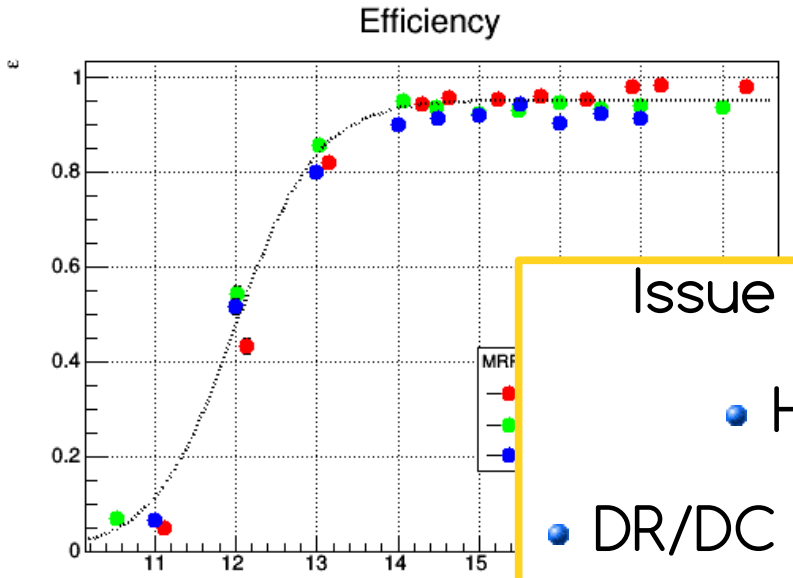


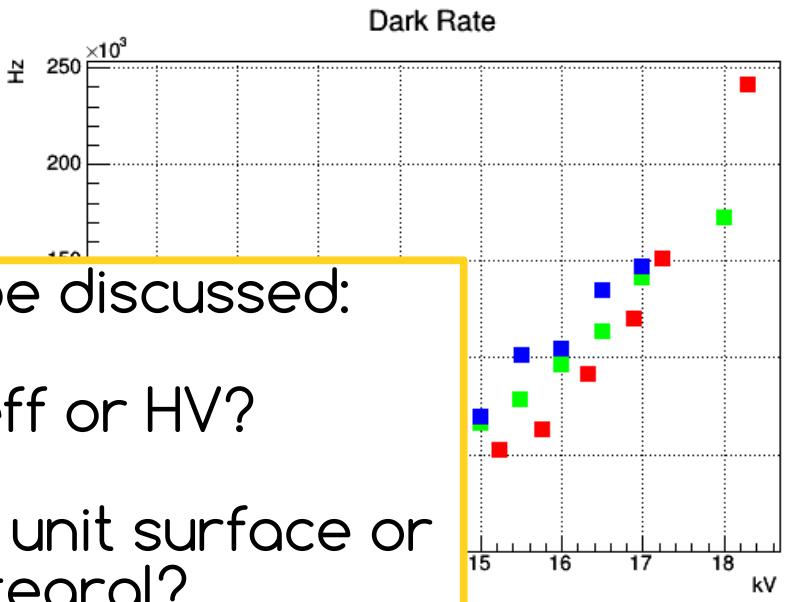




Plot proposal to be published on the EEE MRPC database

Efficiencies/Dark Rate/Dark Current

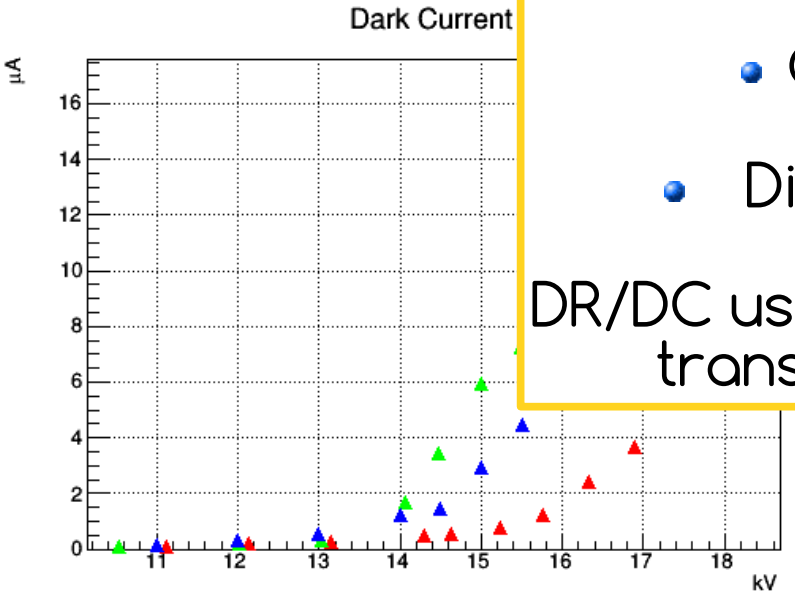


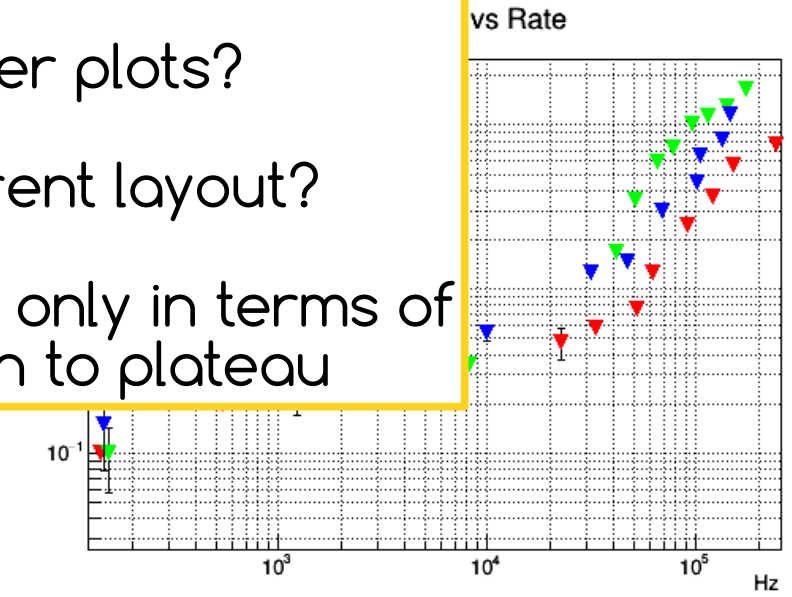


Issue to be discussed:

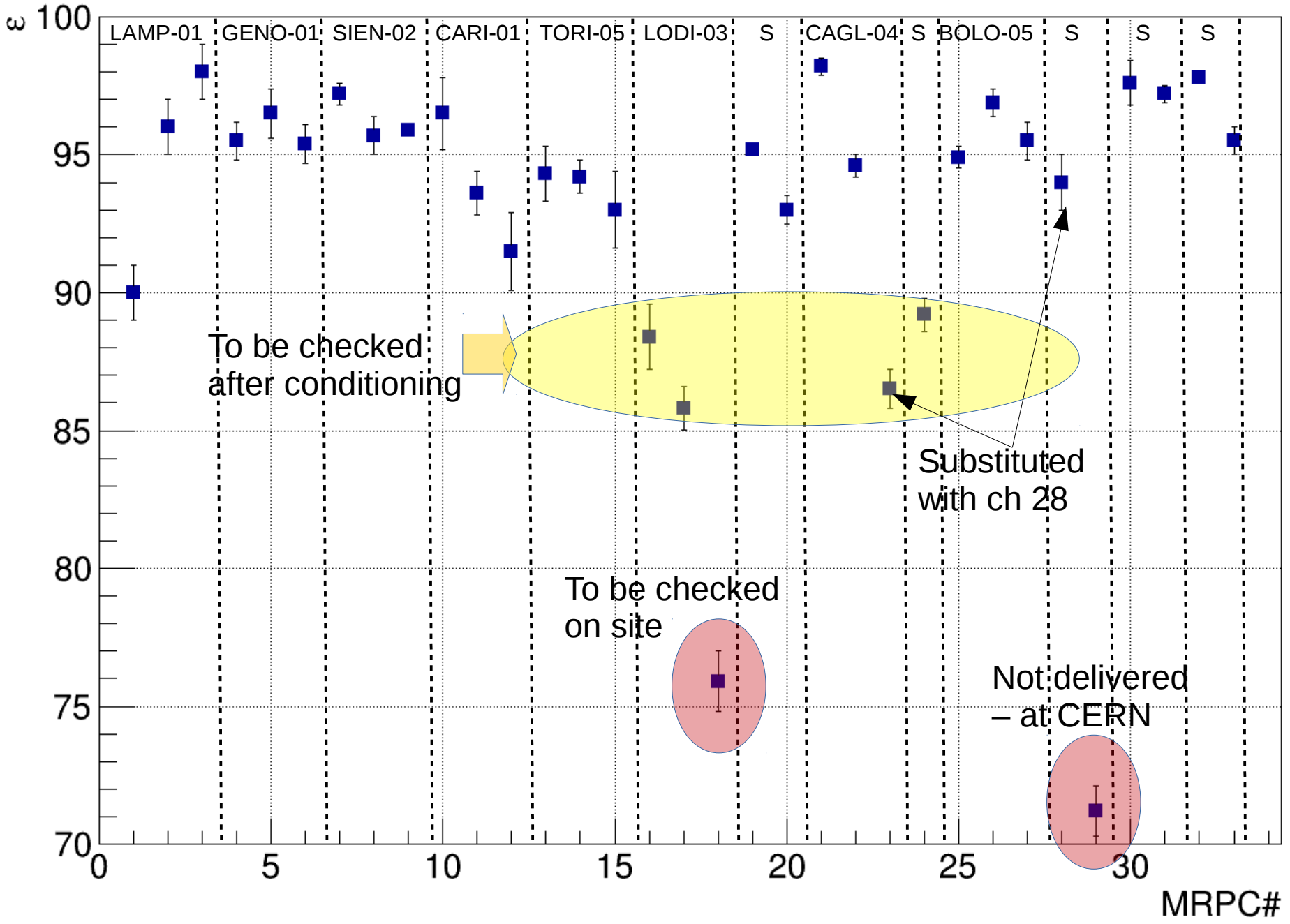
- HV eff or HV?
- DR/DC per unit surface or integral?
- Other plots?
- Different layout?

DR/DC useful only in terms of transition to plateau

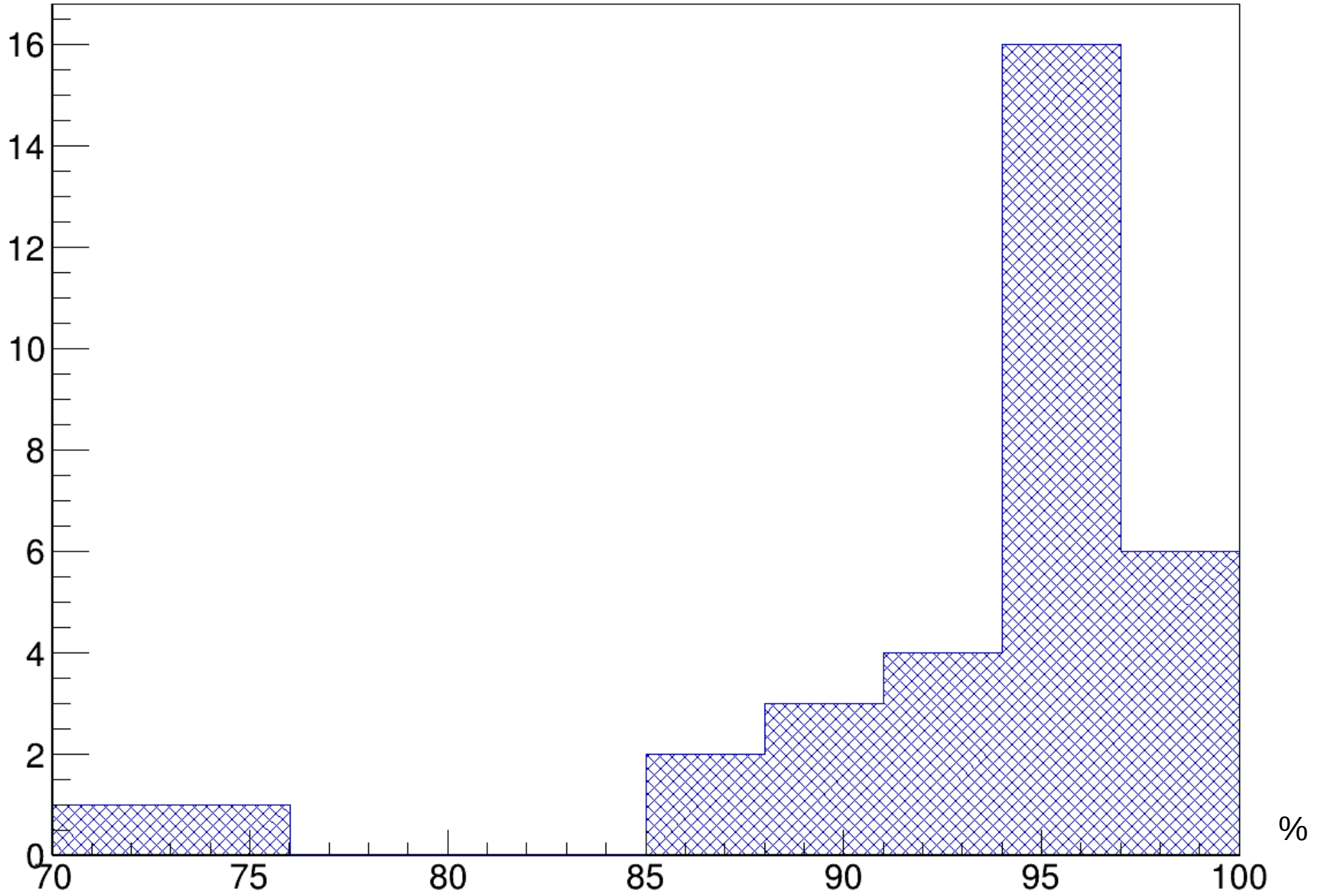




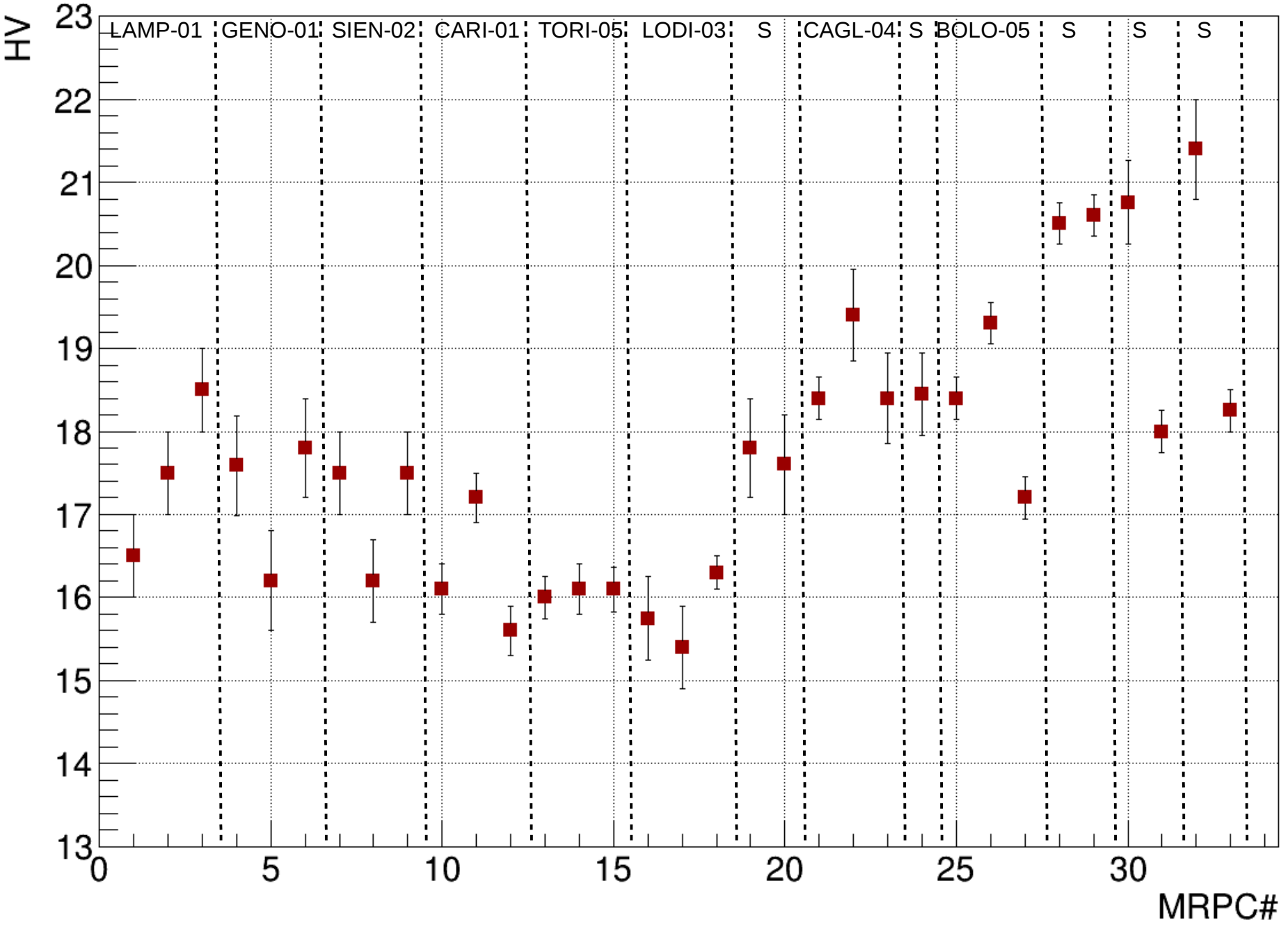
Efficiencies: trend



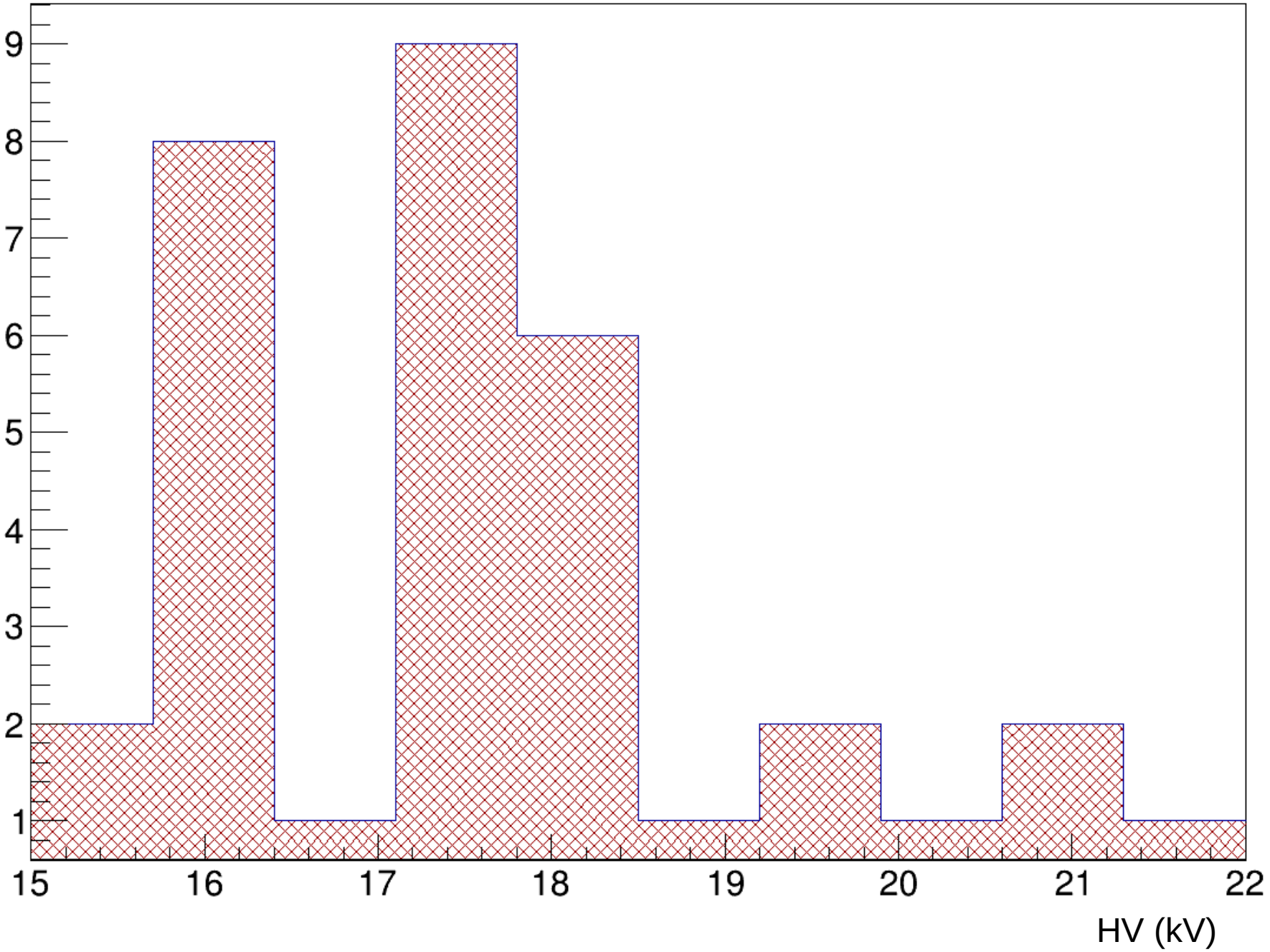
Efficiencies: distribution



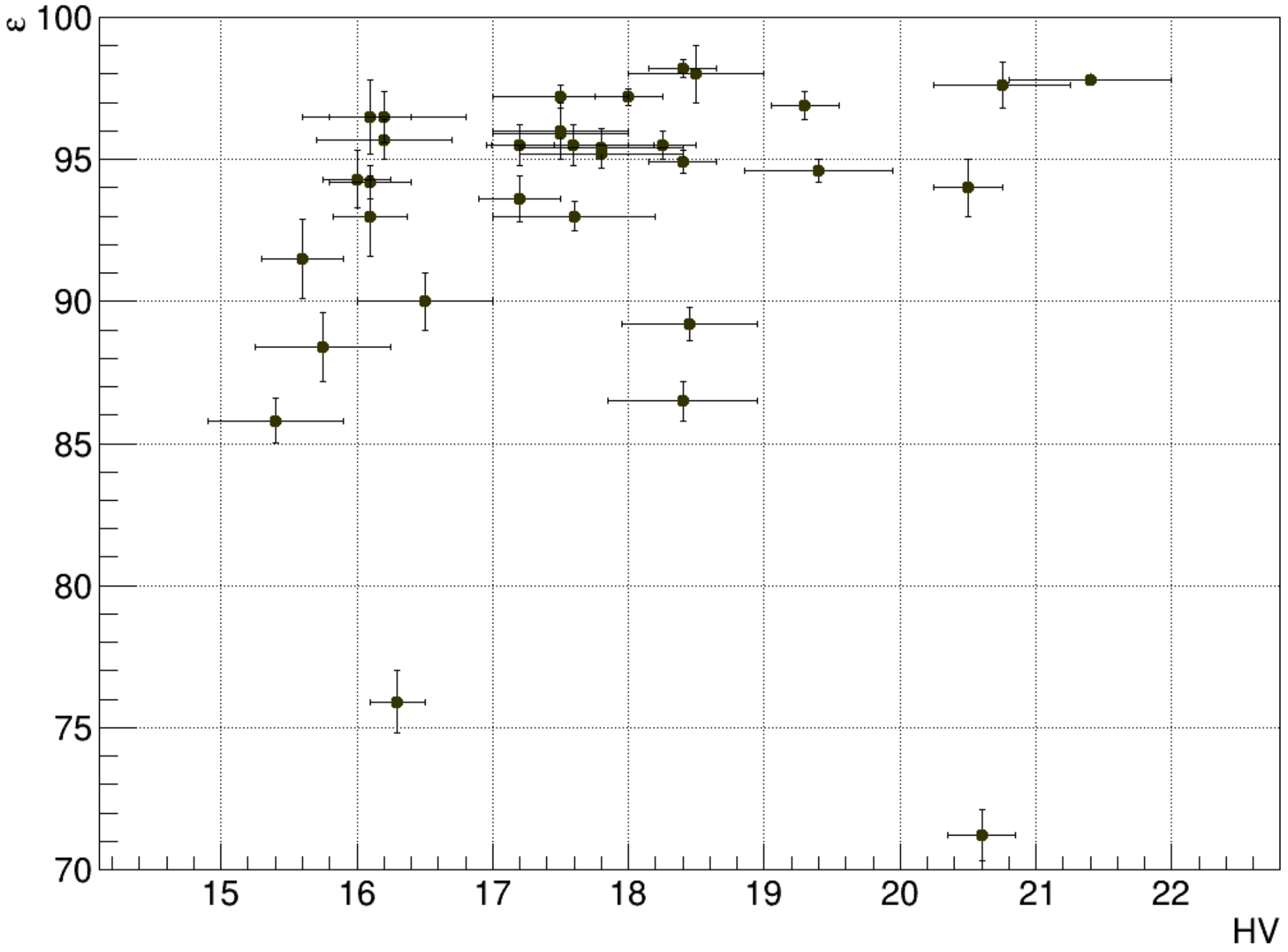
Plateau: trend



Plateau: distribution



Efficiencies vs Plateau



Efficiencies and Plateau

Few chambers with very low efficiencies < 80%:

20170524018 LODI-03
20180222029 spare (at CERN)

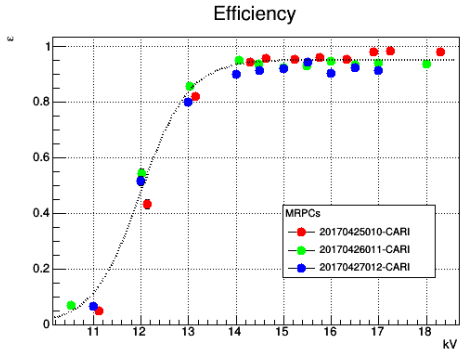
Few chambers with 85% < efficiencies < 90%

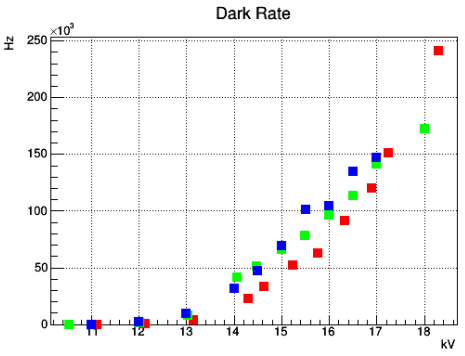
20170523016 LODI-03
20170524017 LODI-03
20170928023 spare (ex CAGL-04, now at CERN)
20171026024 spare COSE-01

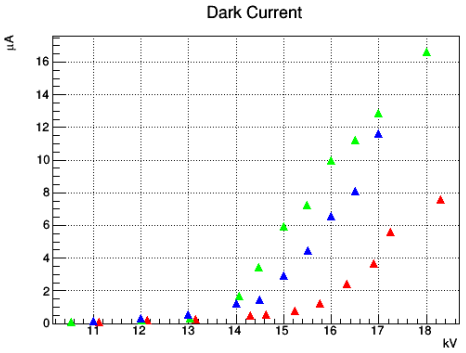
78% of the chambers eff > 90%
66% of the chambers eff > 94%

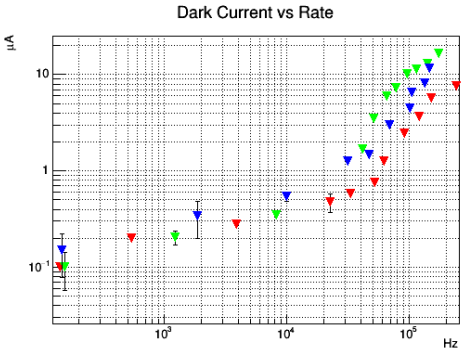
Ch 16-17-18-24 to be checked in 2 months

Ch 23-29 are at CERN: should we open them?









MRPC db page

Bin files + txt summary

Root files

Plot Trees

2018-01-28	CARI-01
2018-09-27	Leakage on HV+ connector/silicon used
2019-04-23	Left connector/pin #15 cut
2020-04-15	MOSC-01
.....	.....
....	.....

Summary

20170222001	LAMP-01	
20170223002	LAMP-01	leak > 1 l/h
20170225003	LAMP-01	leak > 1 l/h
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	eff 88%
20170524017	LODI-03	eff 86%
20170524018	LODI-03	eff 76%

20170719019	spare – ROMA-01	
20170921020	spare – FRAS-01	
20170926021	CAGL-04	
20170927022	CAGL-04	
20170928023	spare	eff 87%
20171026024	spare – COSE-01	eff 89%
20171121025	BOLO-05	
20171123026	BOLO-05	
20171124027	BOLO-05	
20180221028	CAGL-04	
20180222029	spare	eff 71%
20180227030	spare	
20180228031	spare	
20180320032	spare	
20180322033	spare	

+ ch 29-30 with HV labels inverted

Comments/Ideas/Upgrades