RPC Cosmic Rays Test in Naples

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Outline

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- **The Test Procedure**
- **Examples of Test Results**
- **Statistic Distributions**
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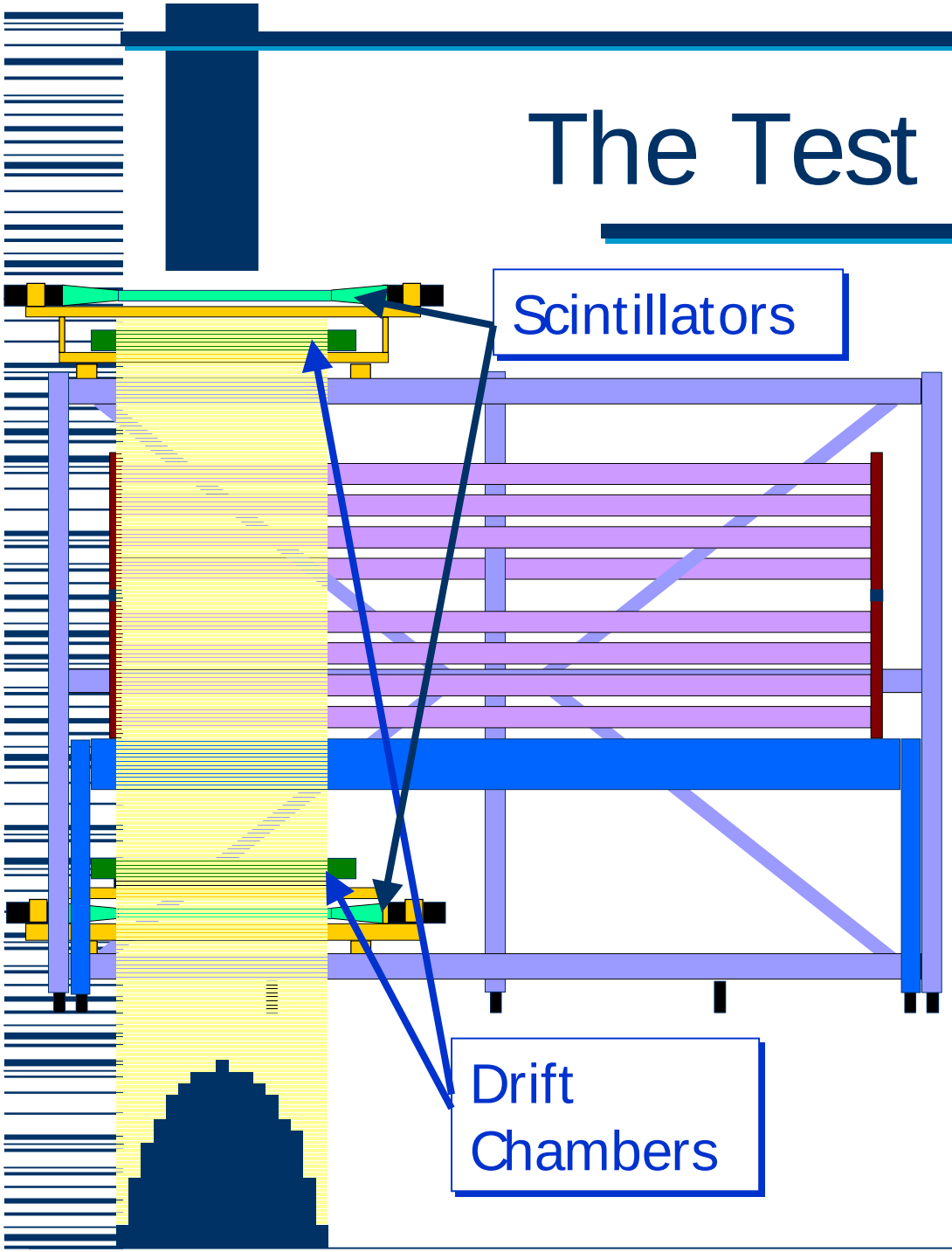
The Test Stand

The Test Stand



Tracking system :
2 Drift Chambers
2x and 2y planes per layer
Single wire resolution ~400μm

Trigger :
TOP & BOTTOM layers
2 x 1 m^2 scintillators

The 2 modules housing scintillators & tracking chambers are moved by step motors automatically during data taking

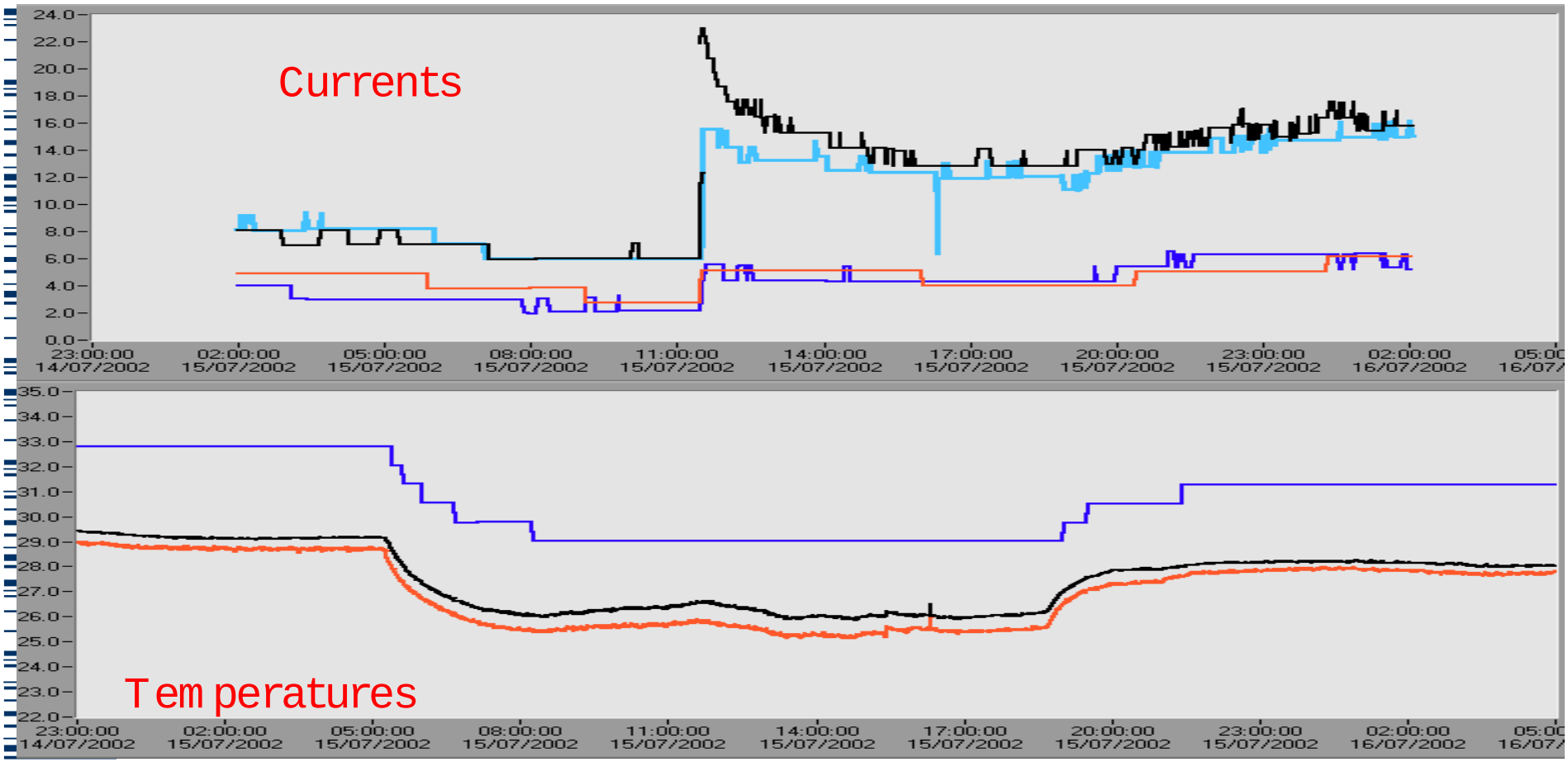
The Test Procedure

It takes about 7-10 days to test a set of chambers (8 RPCs):

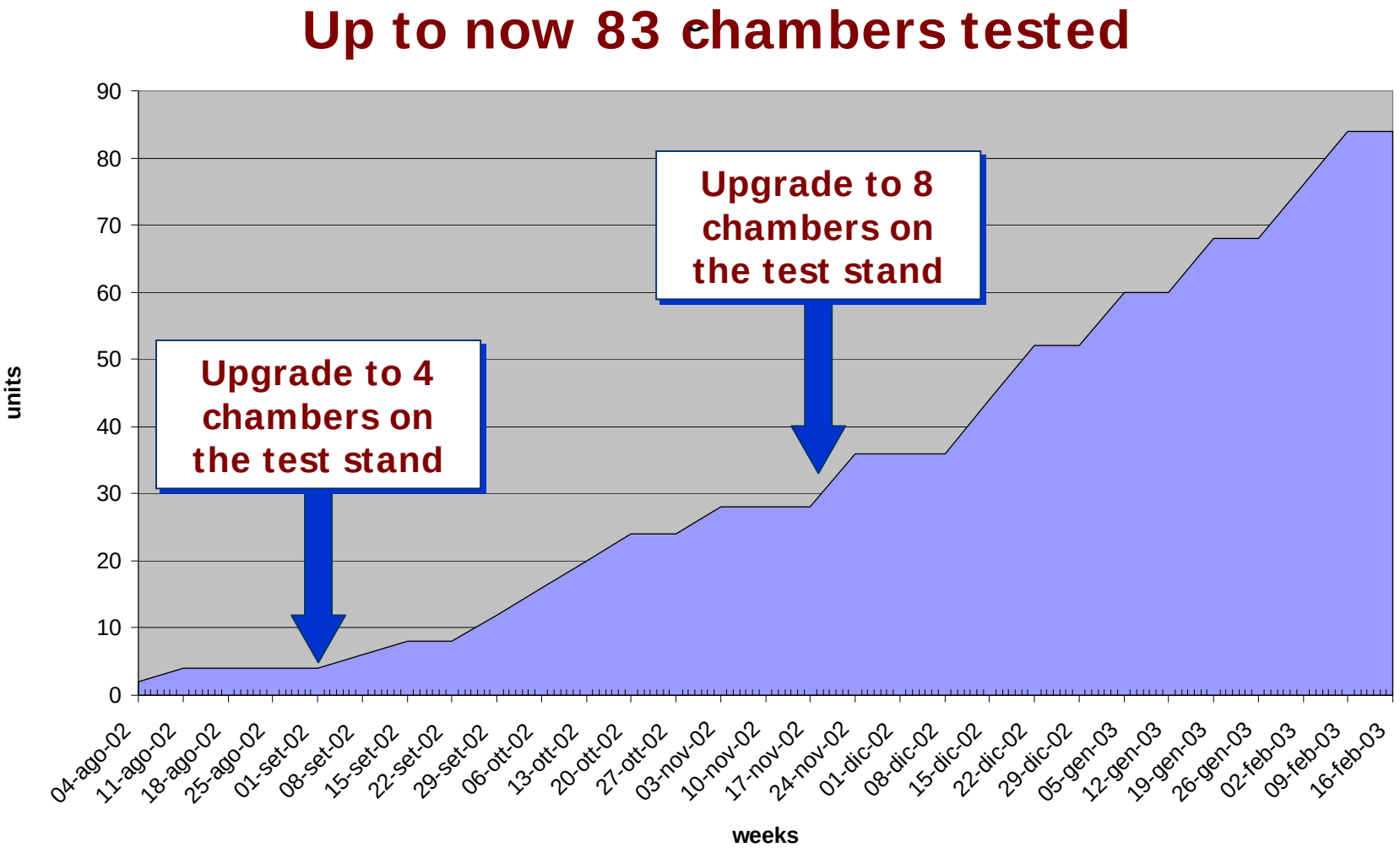
- **Preliminary Operations (cabling, flushing, leak test): 2 days**
- **Efficiency plateau at three different thresholds (0.7mV, 0.6mV, 0.5mV): 7 hours per th.**
- **Radiography: 50 hours**
- **Random trigger (single rate strip by strip): 3-4 hours**
- **Current & single rate scan at three different thresholds: 6-8 hours**
- **Data Analysis: 4 hours**

Parameters Monitoring

During the test the working and environment parameters (HV, gap and CAEN currents, gas flow, temperature, humidity, atmospheric pressure etc.) are continuously monitored and stored in a dedicated database



Chambers Tested from Aug. 2002 to Feb. 2003



Examples of Plateau

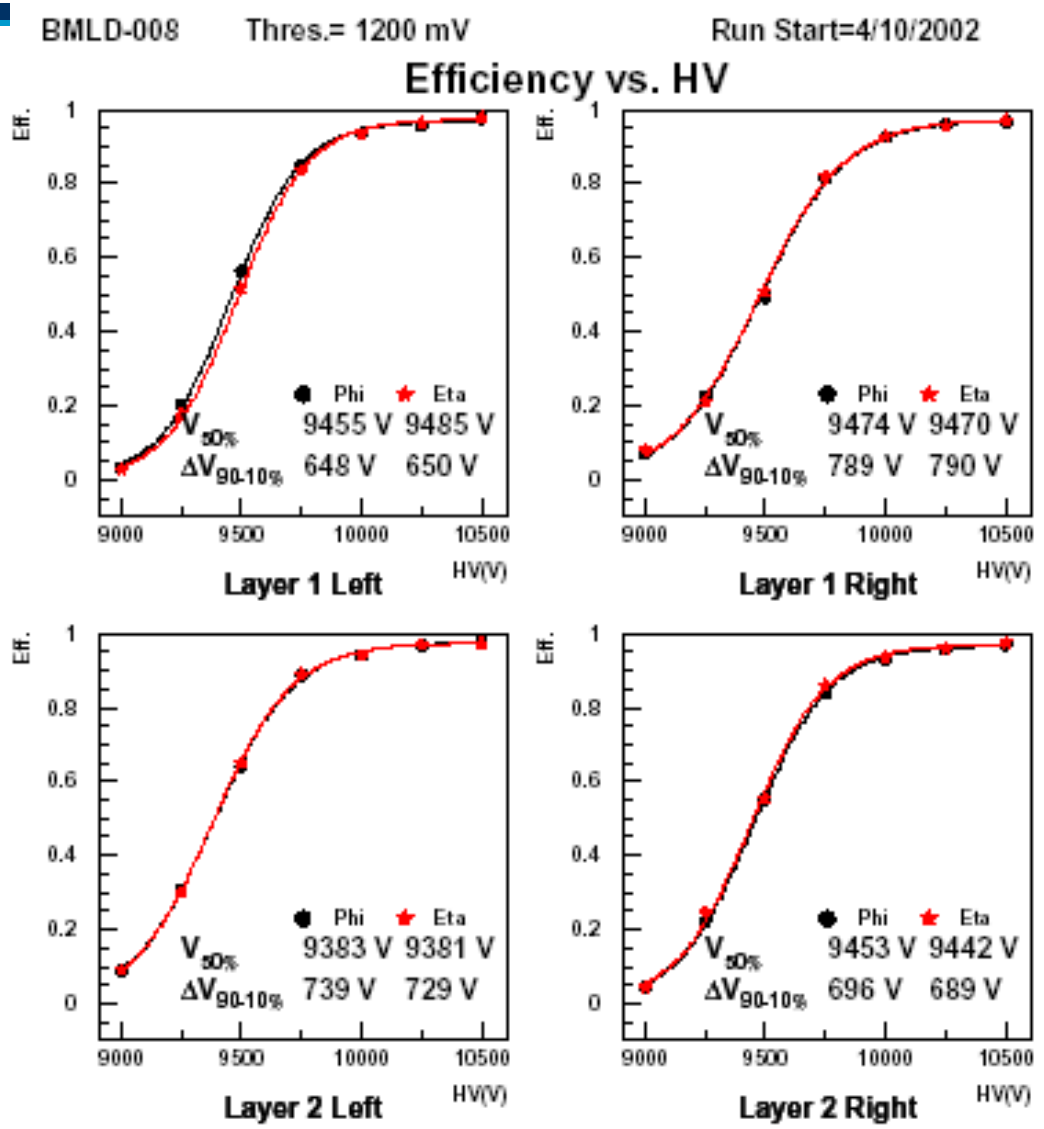
12.5 K (2.5K x 5) events per fixed HV and th

Fitted with Fermi's function

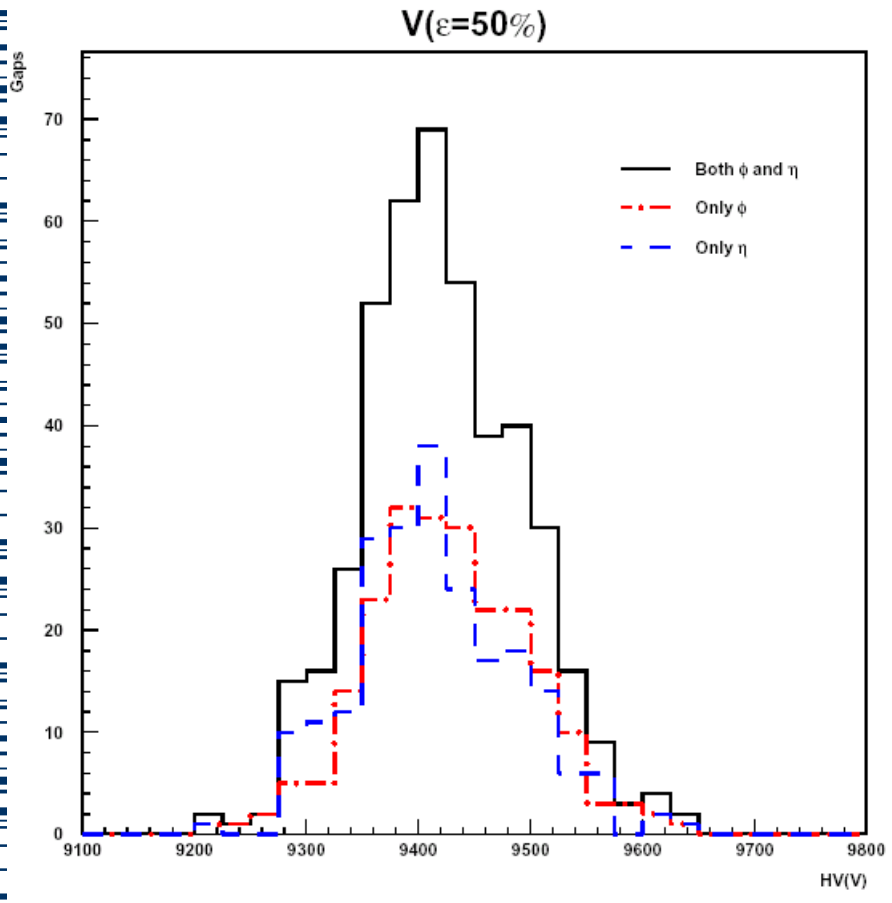
$$\varepsilon = \frac{A}{1 + e^{B(V - V_0)}}$$

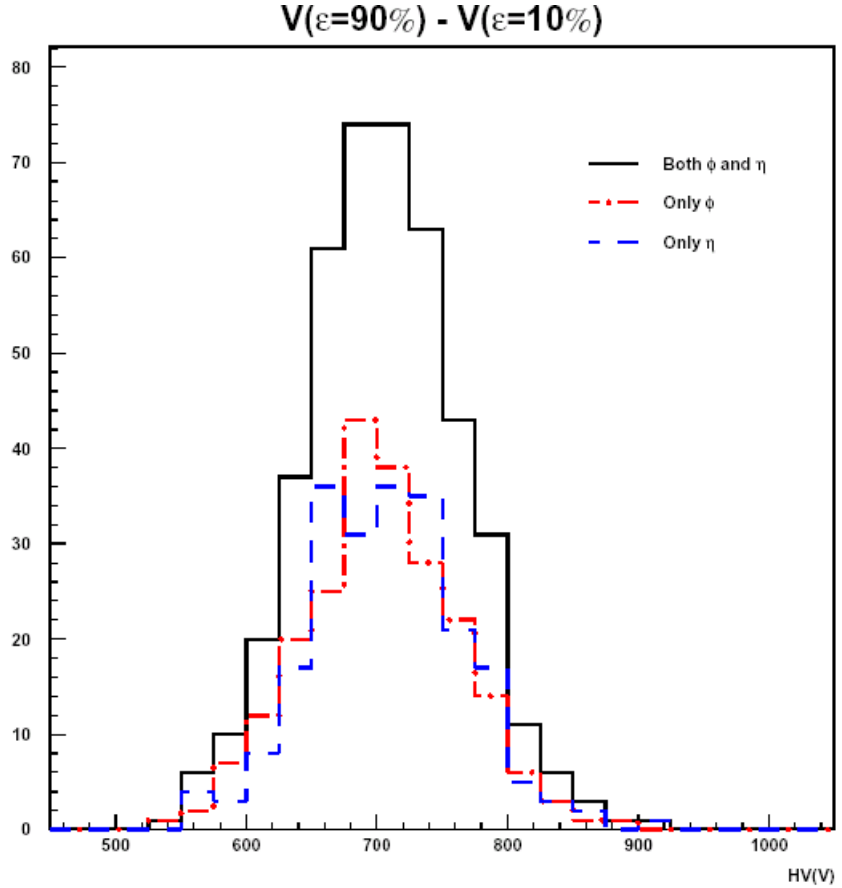
V_0 is the HV at 50% of maximum efficiency A

$\Delta V = 4 \ln 81 / B$ is the difference between HV at 90% and 10% of maximum efficiency

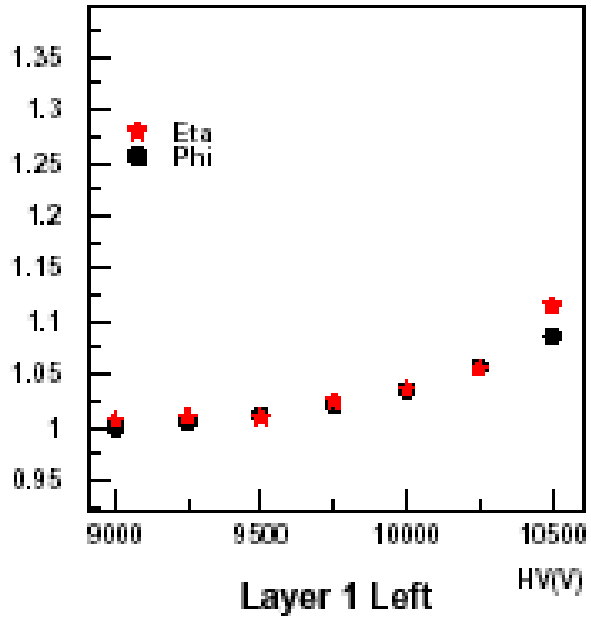


Plateau Statistics





Example of Cluster

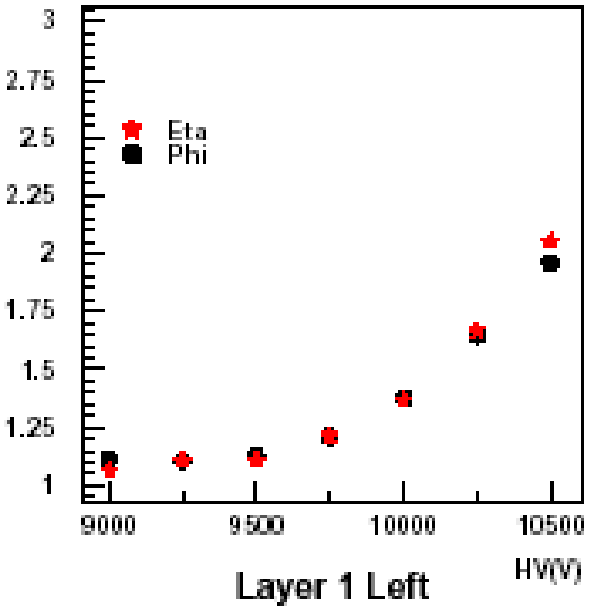


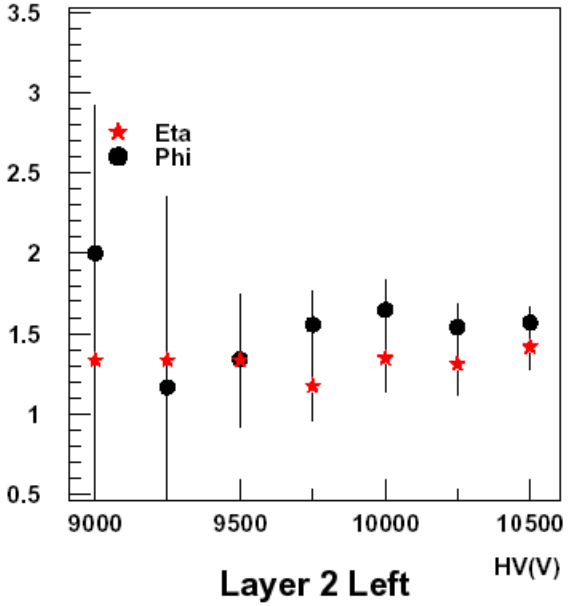
Cluster Multiplicity

(1.1-1.3)

Cluster size for physical cluster

(~2)





Cluster size for non physical cluster

(~1.5)

Typical values at 10500 V and 0.5mV threshold

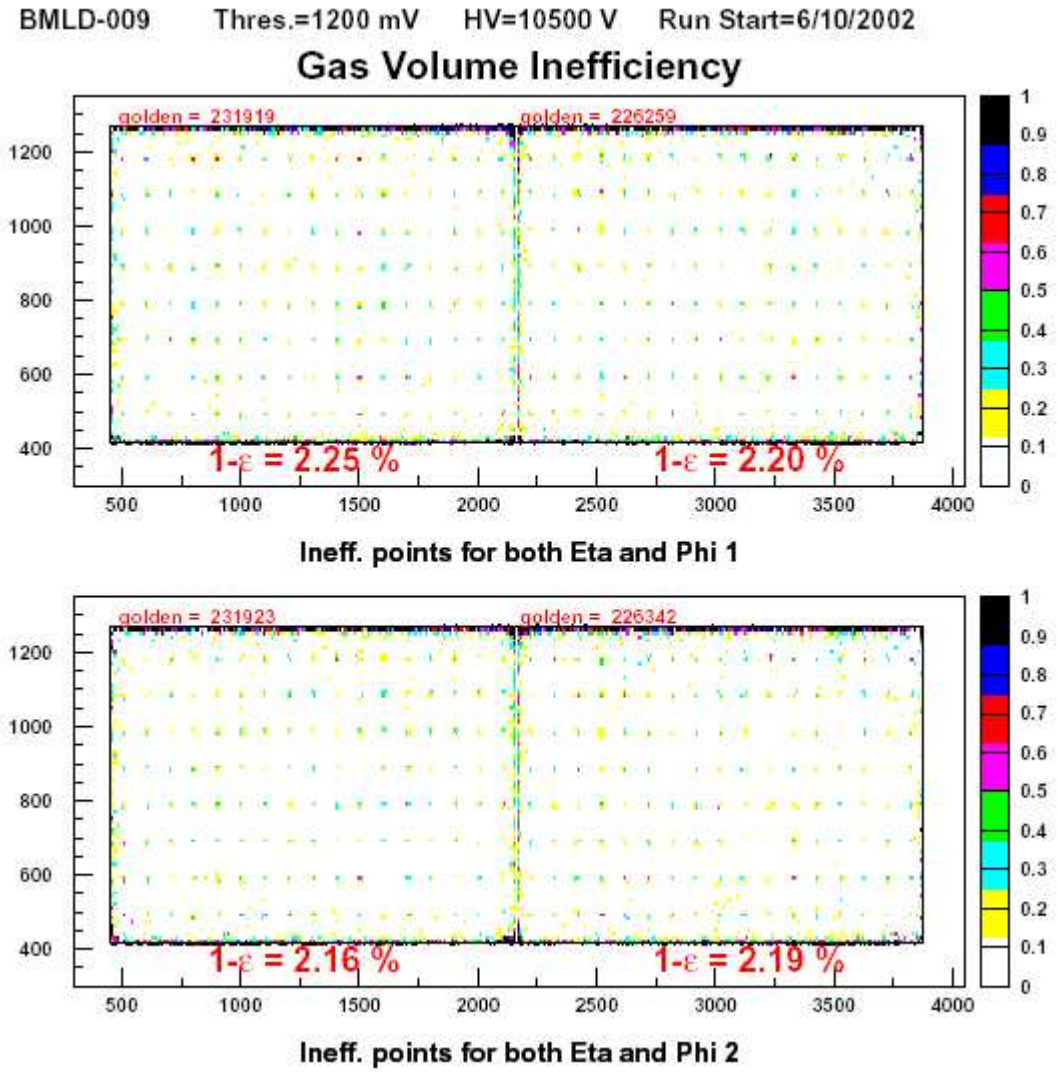
Gas Volume Radiography

1.25 M (250K x 5) events per fixed HV and threshold

Efficiency of "golden tracks" selection ~ 40% -50%

Inefficiency of gas volume (not η neither φ)

Measured inefficiencies (2%) correspond to spacers and frames.

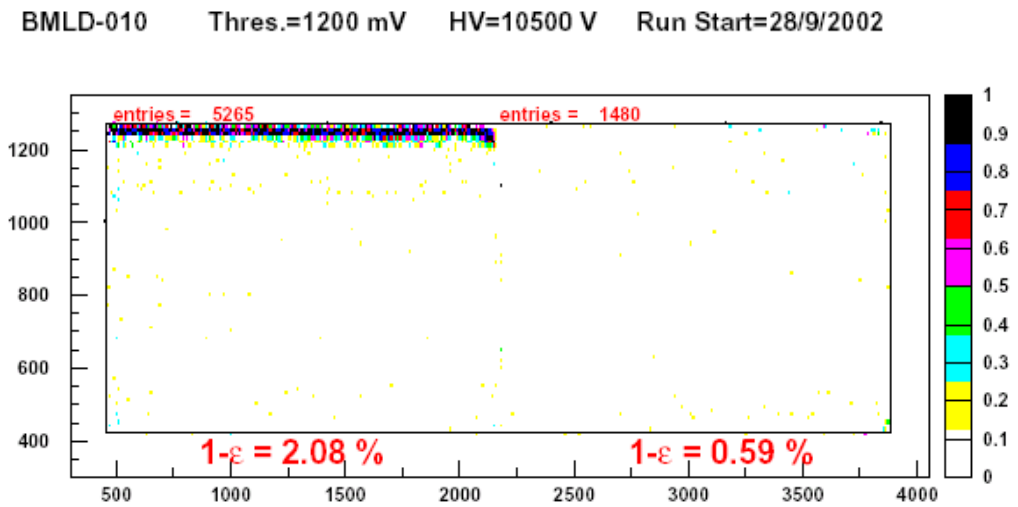


Read-out panels radiography

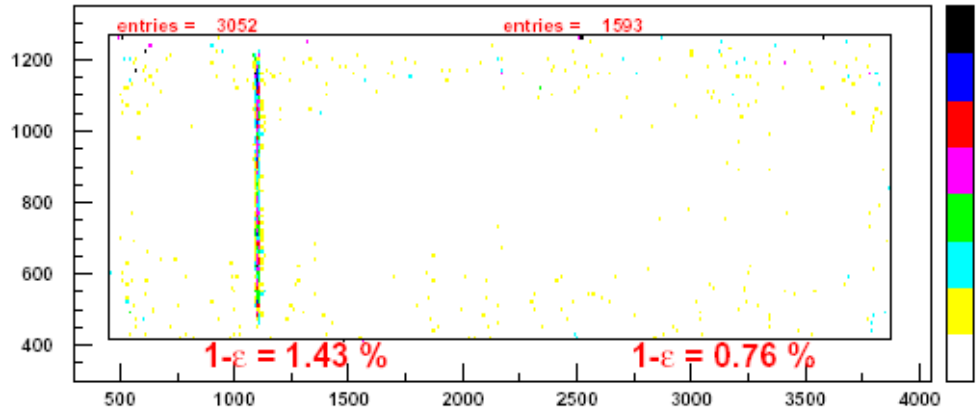
Electronic

Inefficiency (η yes φ no and viceversa)

Easy to see readout channels with problems

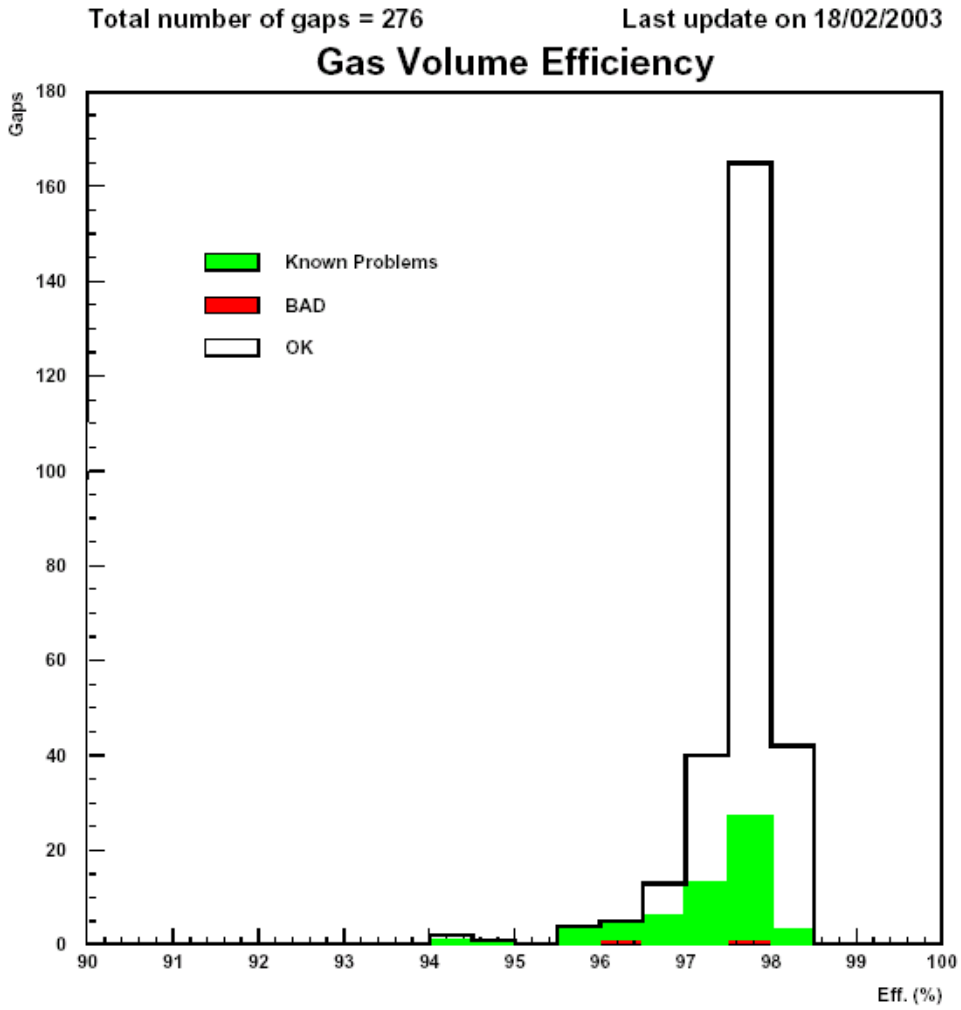


Ineff. Points for Eta when Phi eff.



Ineff. Points for Phi when Eta eff.

Radiography Statistics (I)



Gas volume efficiencies obtained with radiography:

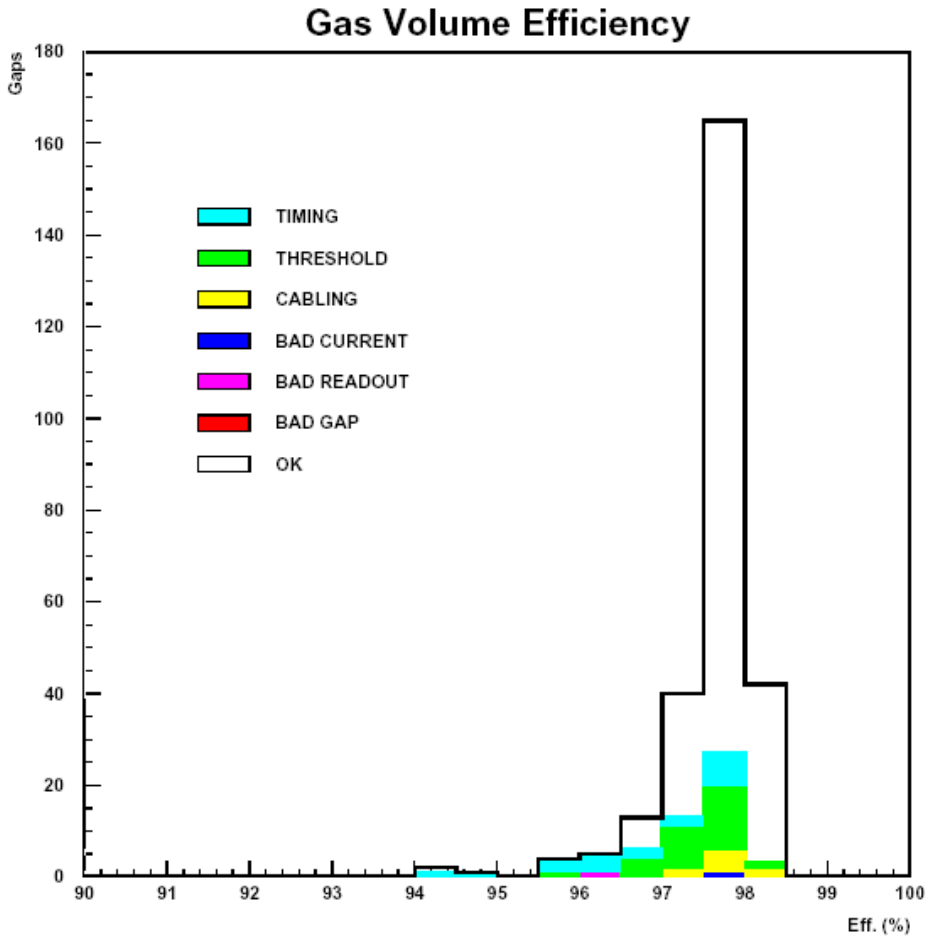
- White: GV OK

- Green: GV OK

(measurement affected by known problem)

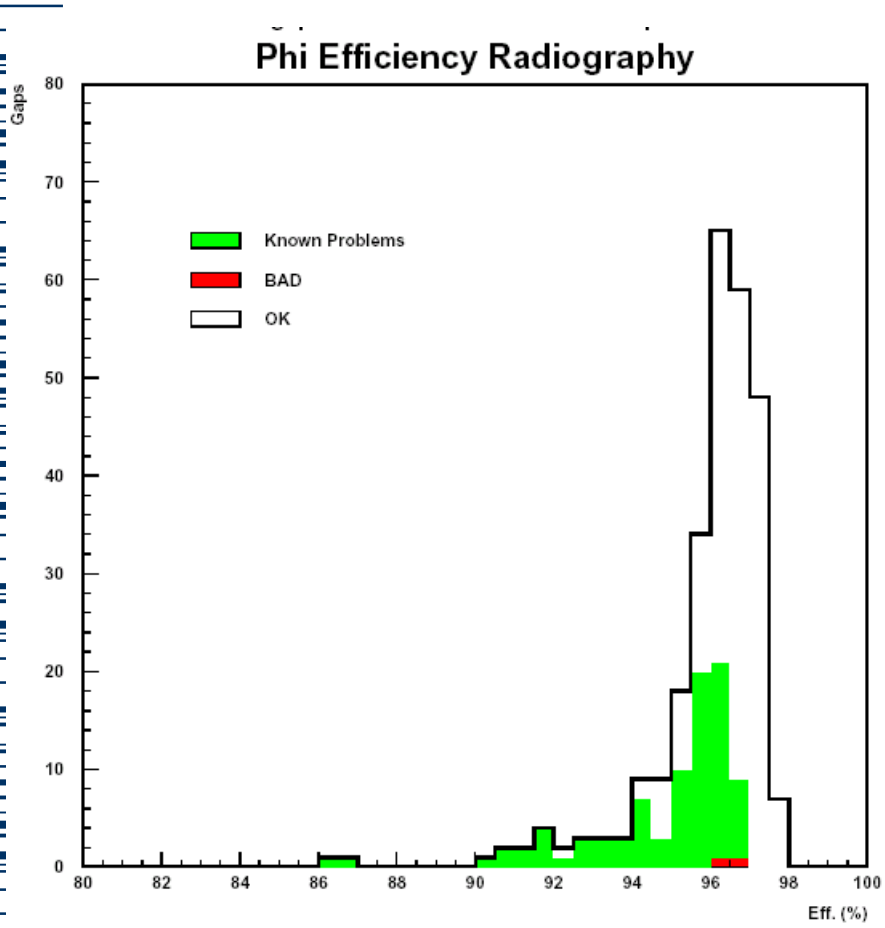
- Red: GV to be replaced

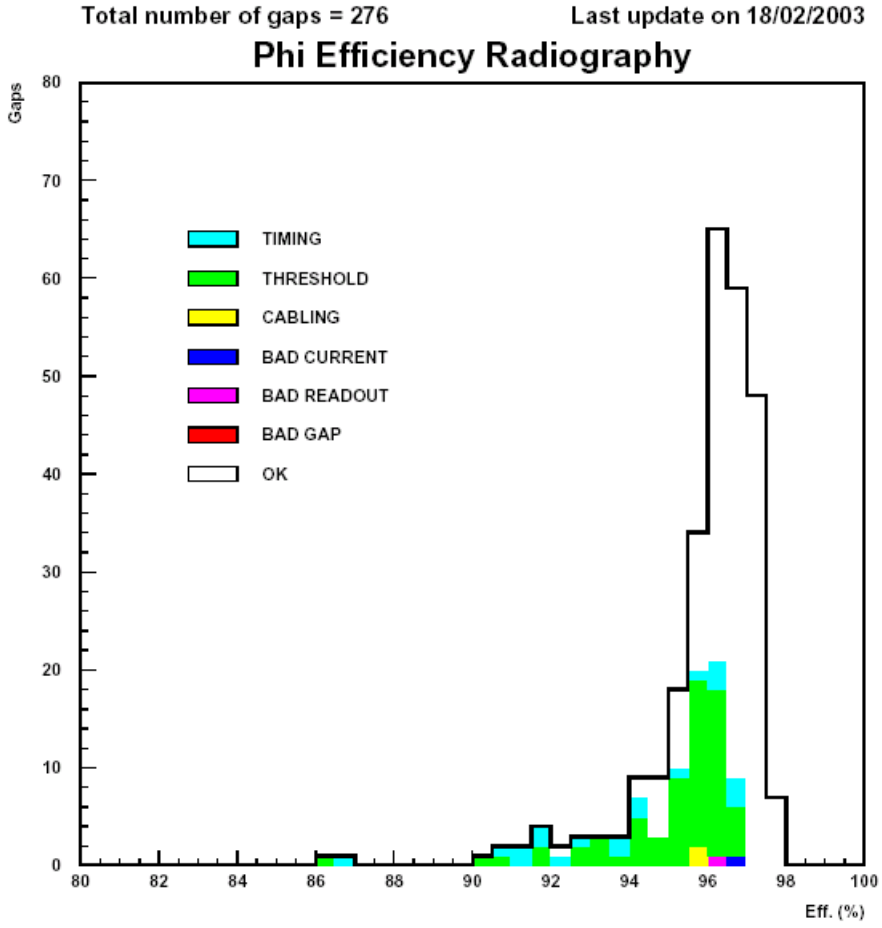
Radiography Statistics (II)



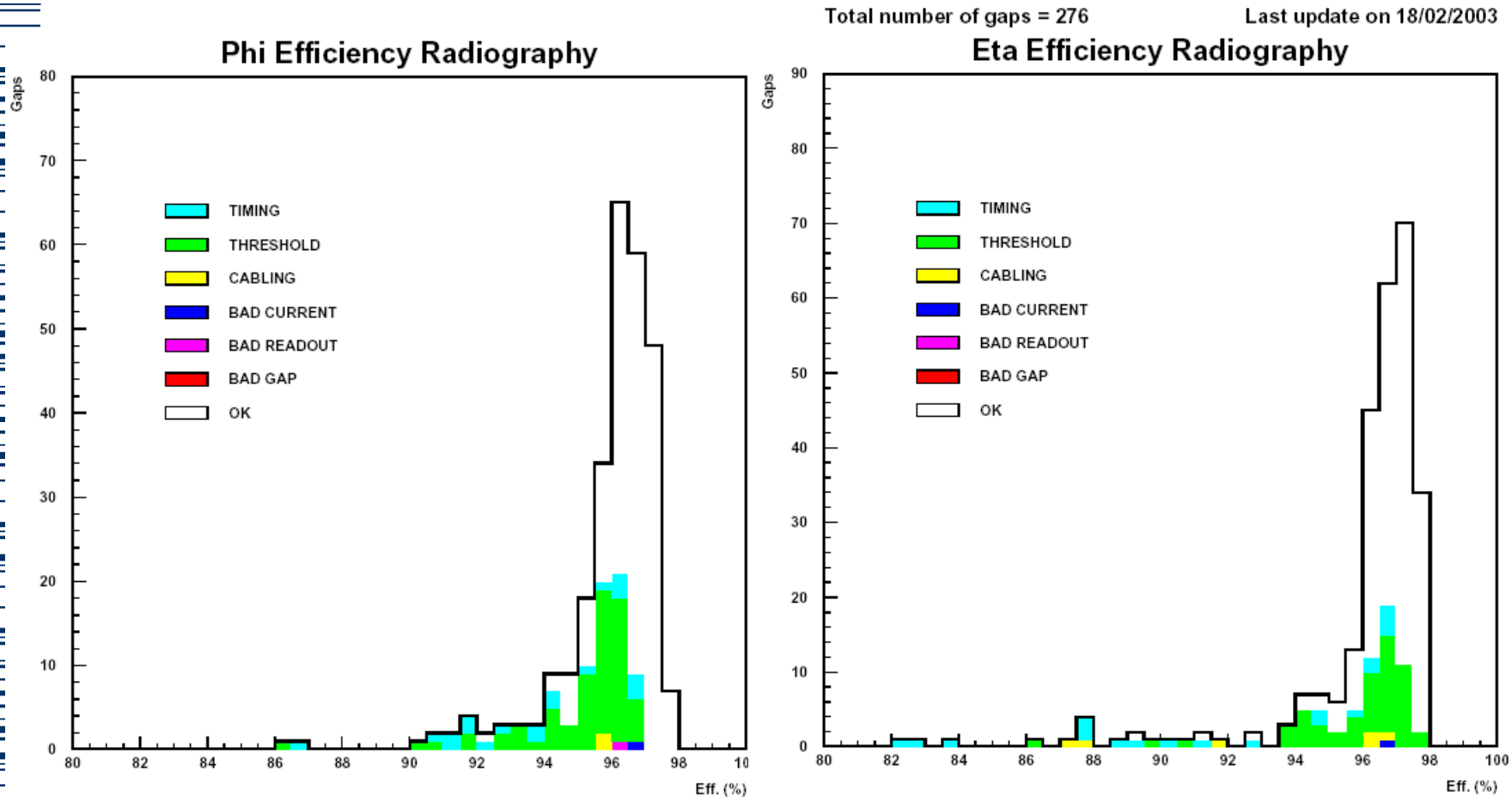
Same as previous but with detail of known problem.

Radiography Statistics (III)

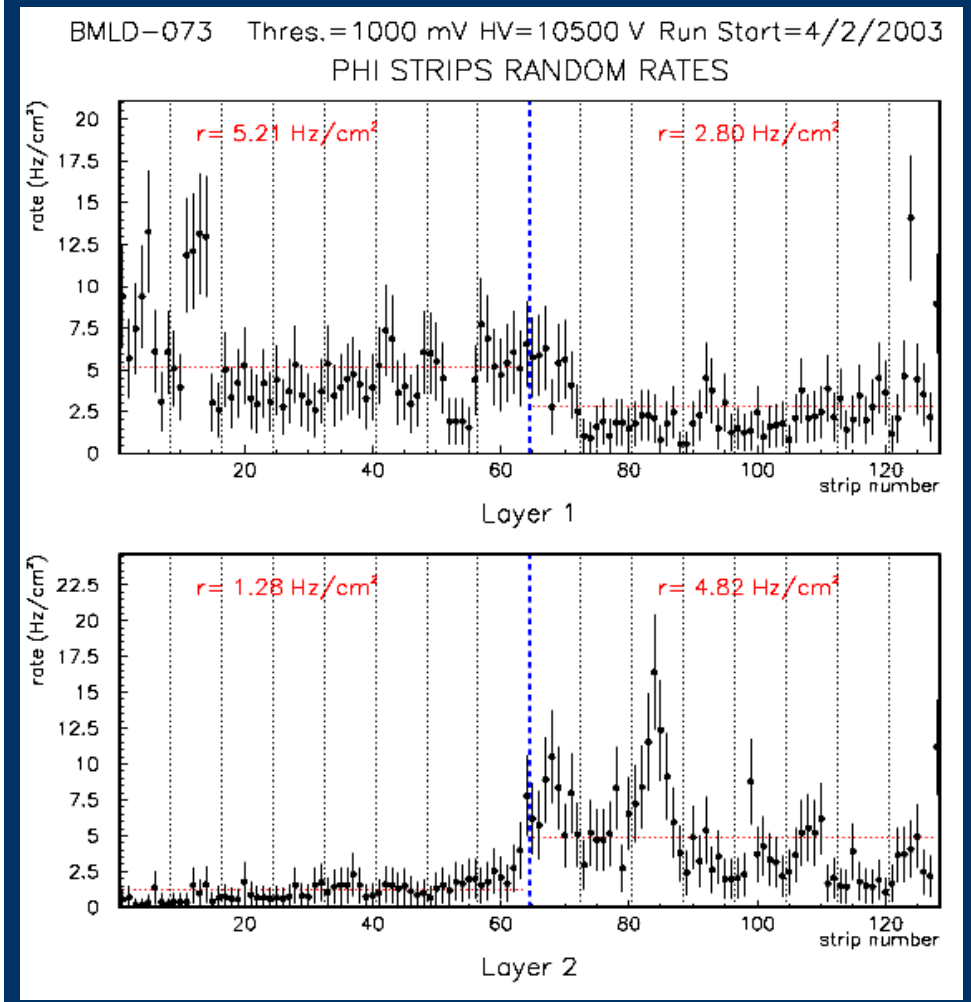


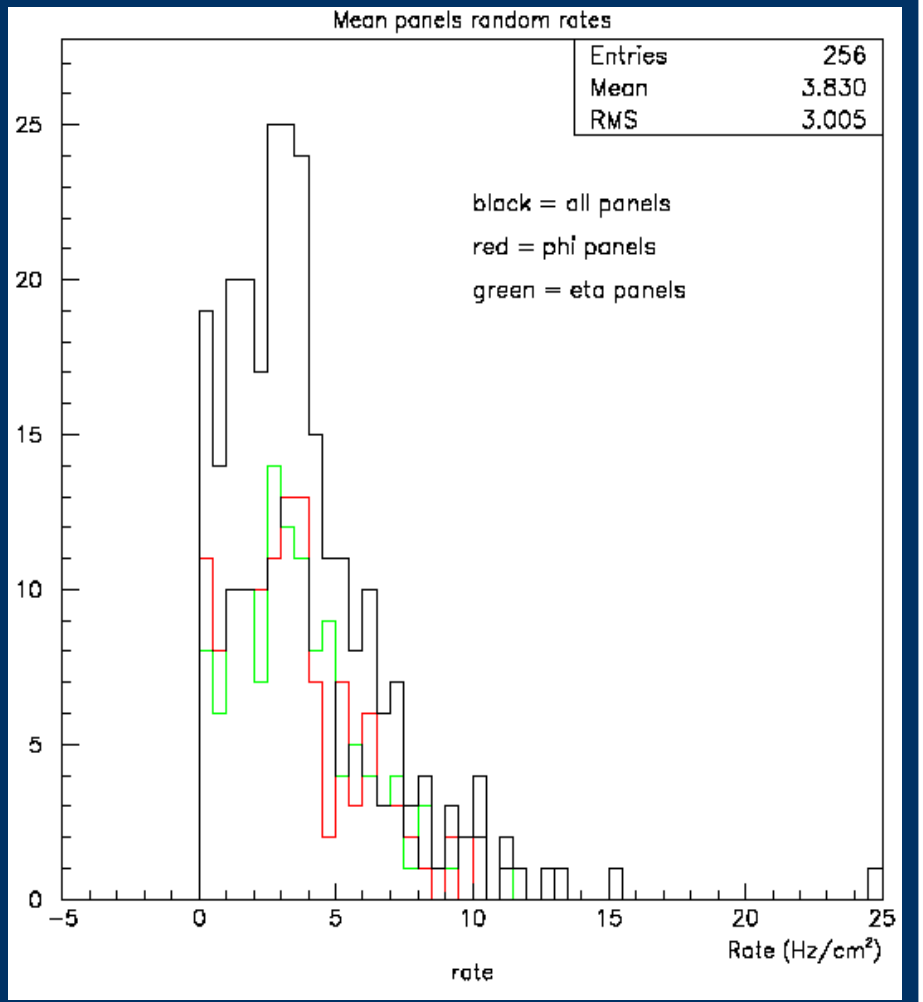


Radiography Statistics (V)



Single Rates

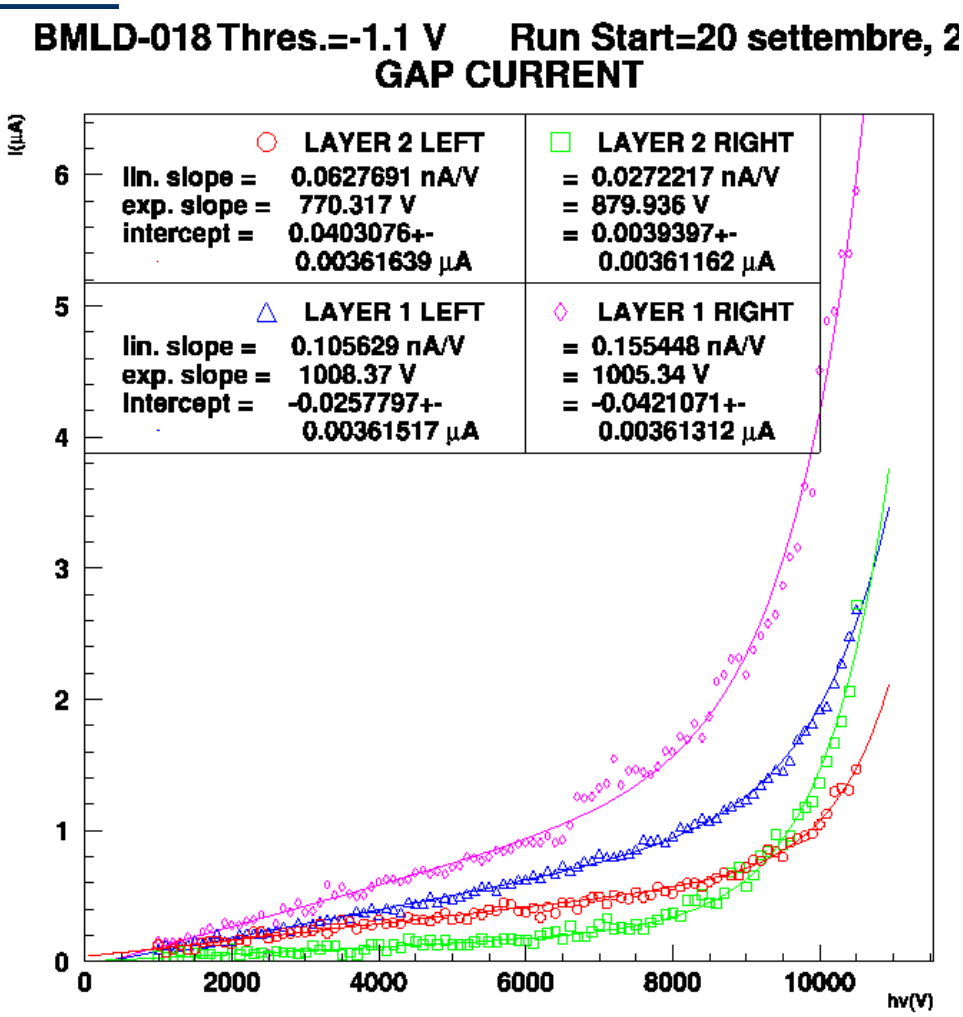


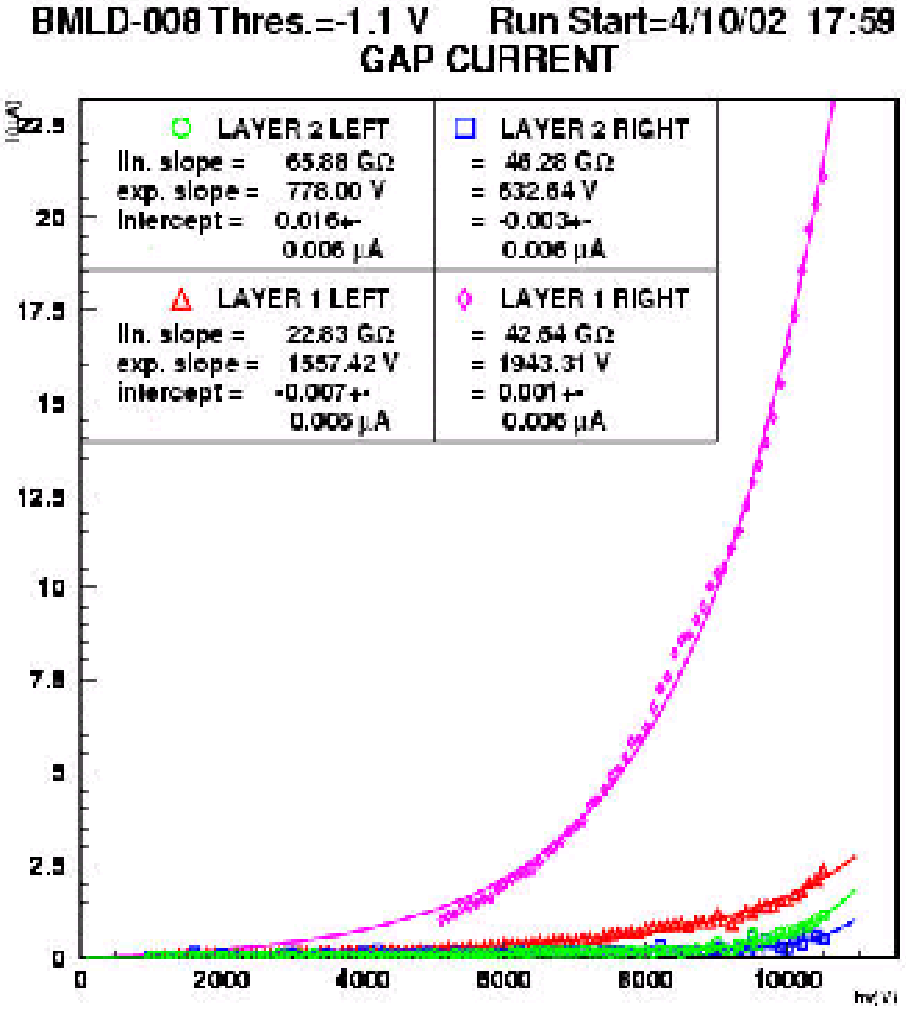


Currents Scan & Single Rates

Fitted with function:

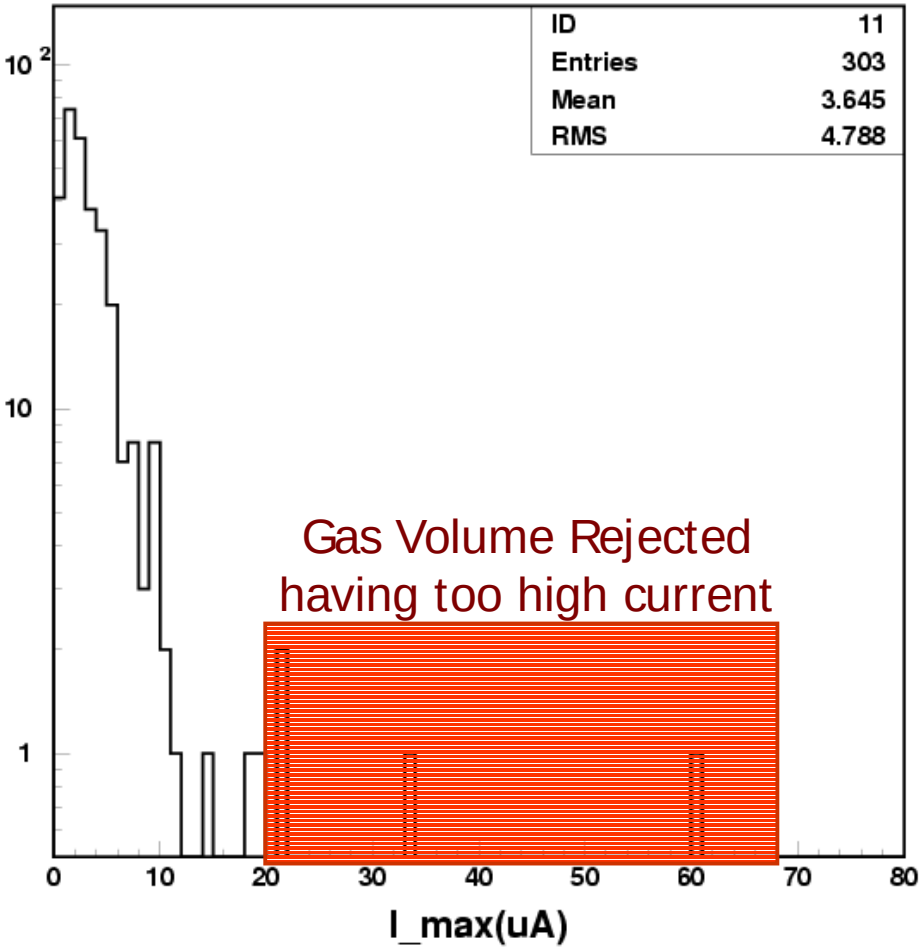
$I = a + bV + I_0 \exp(V/k)$

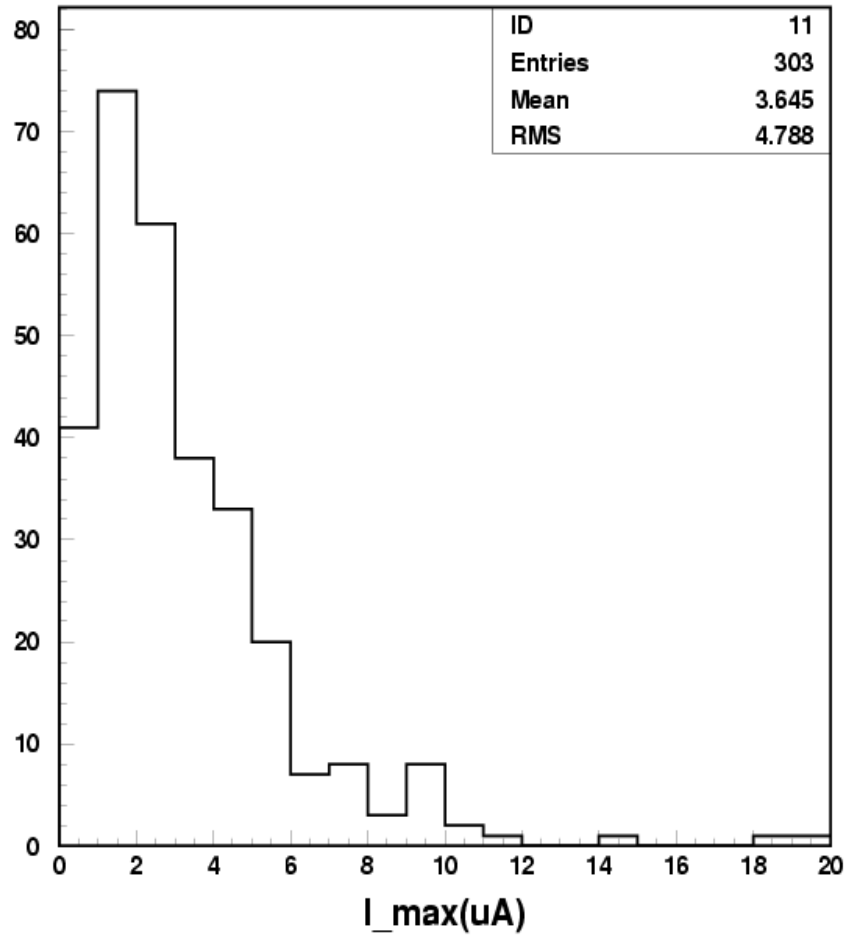




Currents Scan Statistic

At HV = 10500 V





Conclusions

- **RPC test in Naples are going on at a rate of about 8 chambers per week**
- **Up to now 83 BML-D chambers (out of 148) have been tested**
- **The test procedure allows to certificate each chamber analyzing all its working parameters (gas volume efficiency, electronics, currents, plateau etc)**
- **Tested chambers are stored in the test area in Naples, packed and ready to come to CERN, and….**

Conclusion(II)

...very soon we will have problem of storage space.