



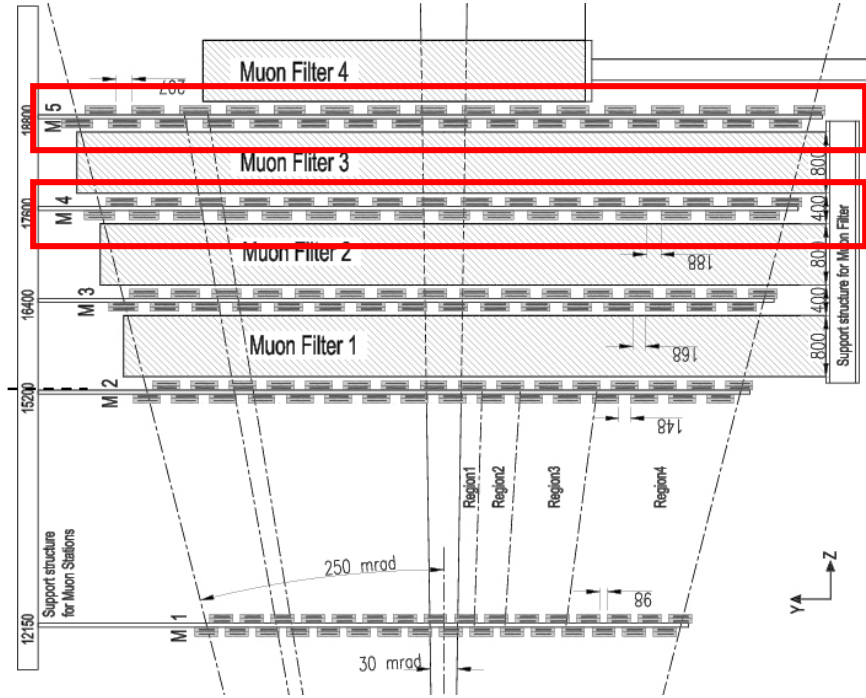
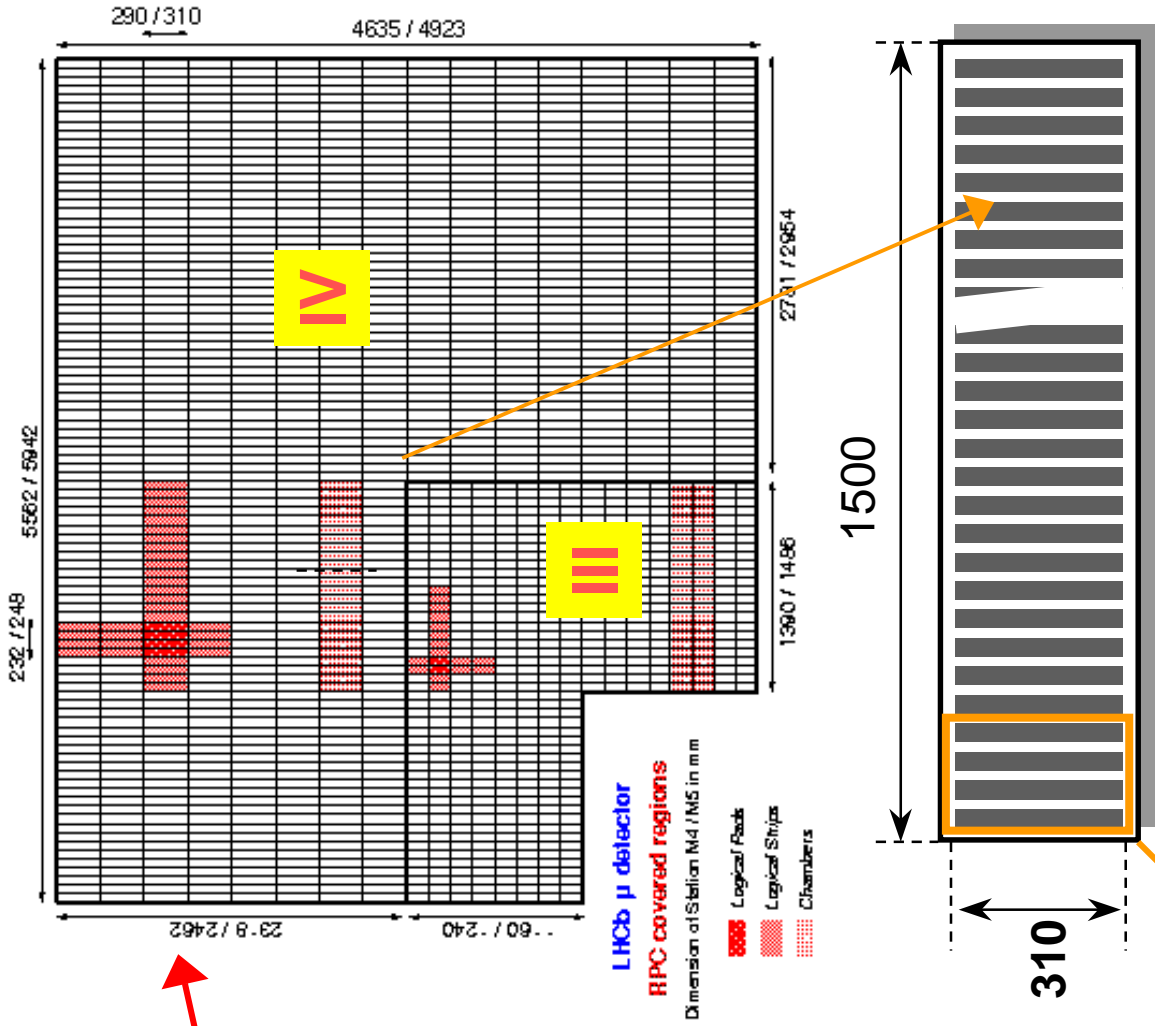
Status of the LHCb RPC detector

Giovanni Carboni - Roma 2

- *Introduction*
- *Detector requirements*
- *Ageing tests*
- *Oil vs. No-Oil*
- *Conclusions*



RPC detector
48% of total area



480 chambers
2 gaps/chamber

M4 M5

6 cm strips (24)

Logical pad

RPC requirements

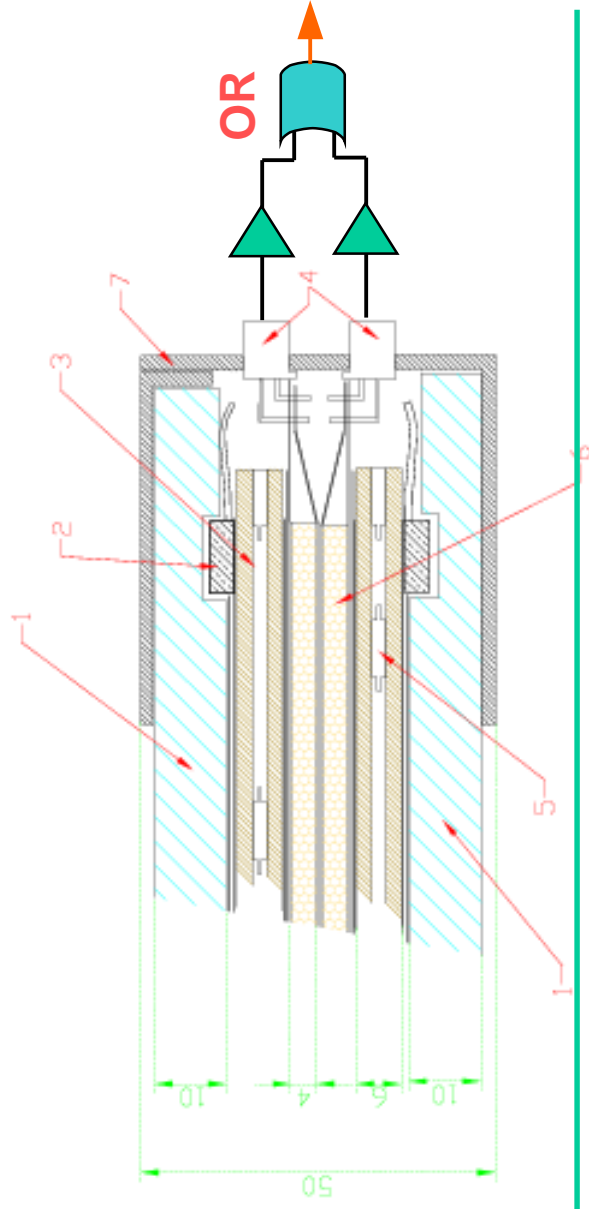
Spatial efficiency per station:
 Rate capability (MIPs)
 Rate capability (GIF test)
 Time resolution
 Current density max.
 Charge density in 10 y op.

> 99%
 1.2 kHz/cm²
 0.6 kHz/cm²
 < 2ns
 18 nA/cm²
 1.8 C/cm²

OK: Note LHCb 2000-053

$\rho = 9 \cdot 10^9 \Omega \text{ cm}$ (bakelite)
 Gas mixture:
 95% C₂H₂F₄, 4% I-C₄H₁₀, 1% SF₆

1. Al-poly sandwich
2. HV connection
3. Gas-gap
4. Signal connectors
5. Spacing planes
6. Strip planes
7. Al box





2001/03/12 10.17

GIF Ageing Test

Ageing requirements in LHCb
(including safety factors)

$J = 18 \text{ nA cm}^{-2}$

10-year fluence $\Phi = 6 \cdot 10^{10} \text{ cm}^{-2}$

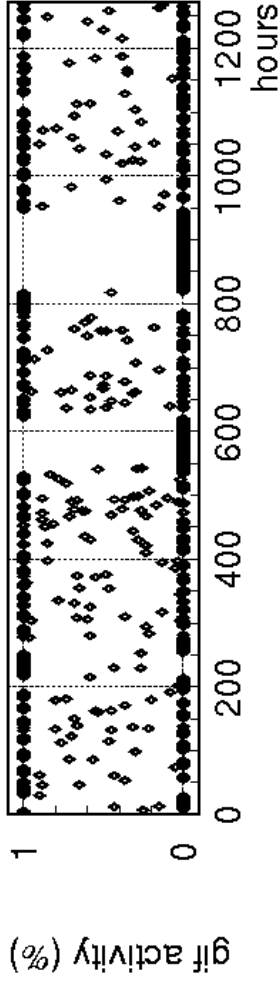
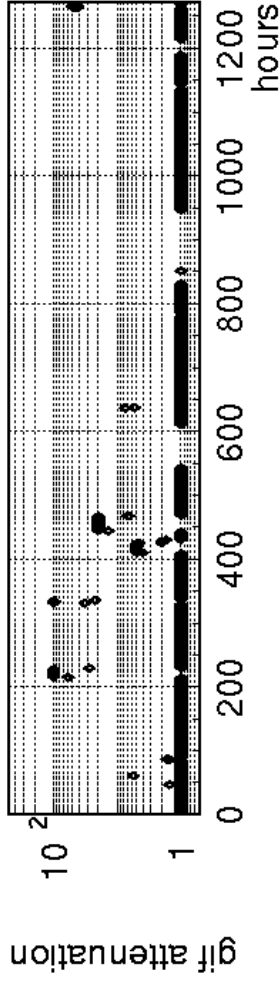
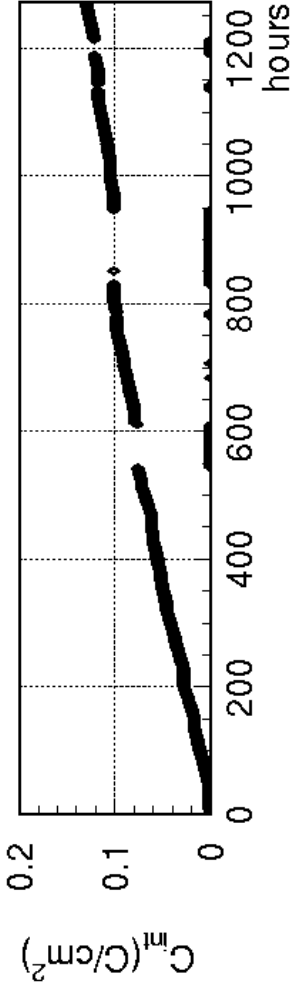
30 pC/avalanche $\rightarrow 1.8 \text{ C cm}^{-2}$ in 10 years

CMS test

0.2 C cm⁻²

ATLAS test

0.3 C cm⁻²



GIF test: started Jan. 15, to continue up to June (-> December ?)

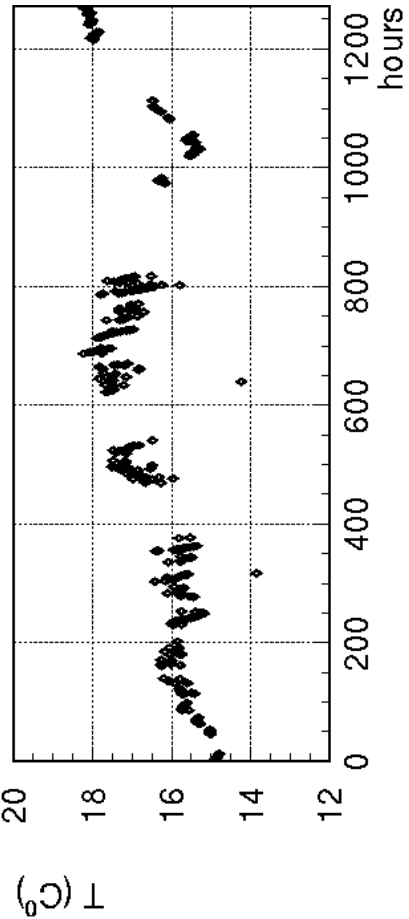
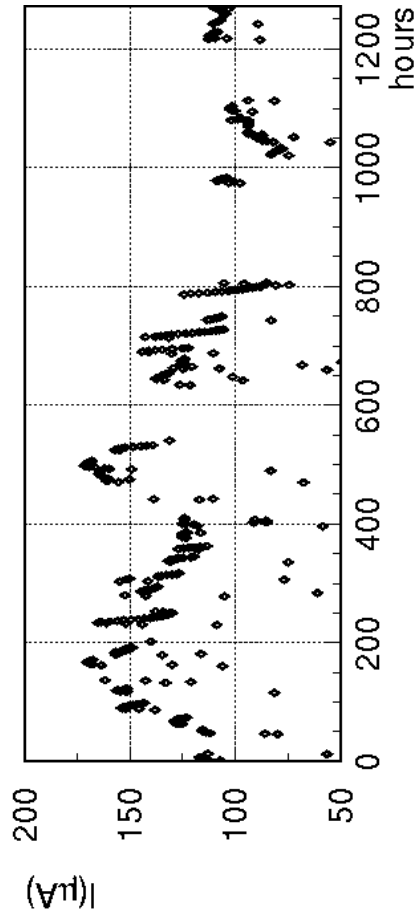
$\approx 0.12 \text{ C cm}^{-2}/\text{month} \rightarrow 4 \text{ LHCb years}$
possible in 6 months, 7 in 12 months

GIF Ageing test



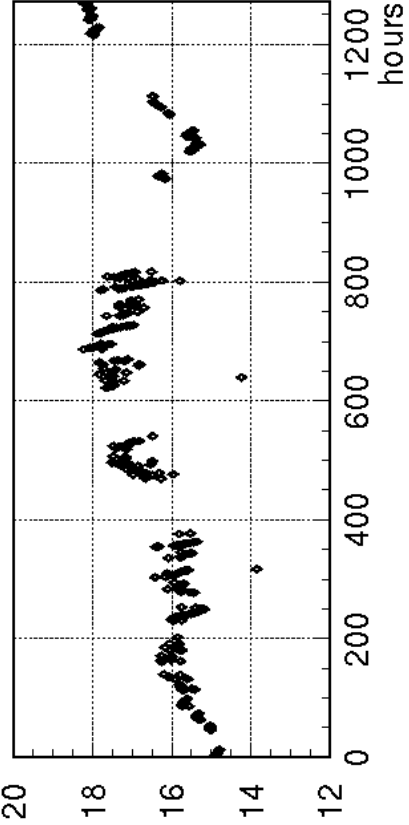
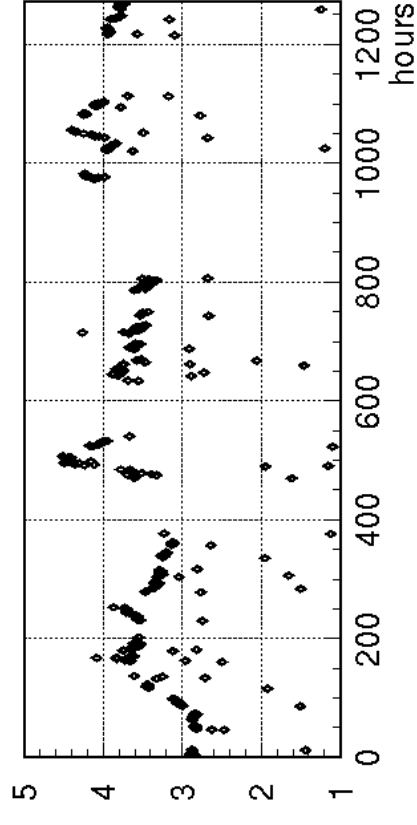
Irradiated RPC

2001/03/12 10.



Reference RPC

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Oil vs. No-Oil

Linseed oil on bakelite

✓ improves

- Noise (less load on trigger)
- Dark current (less ageing)



is an additional variable

- construction more critical
- extra quality control req'd

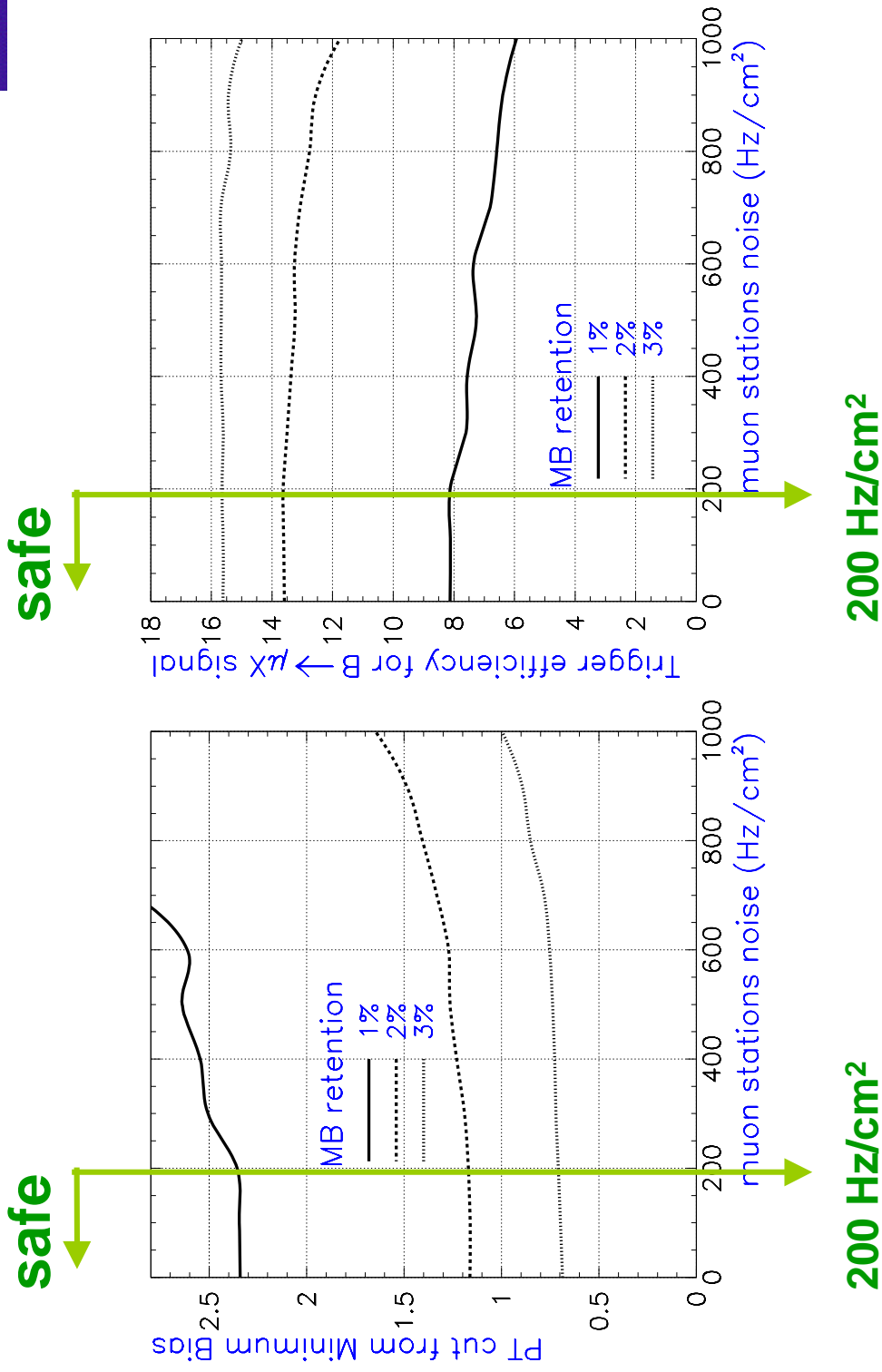
Current and noise ok with oil. However we favor a solution without oil.

From physics in LHCb expect $< 18 \text{ nA/cm}^2$

→ $I_{\text{DARK}} \ll 18 \text{ nA/cm}^2$



Effect of noise on trigger



Conclusions

Ageing:

Test to be extended up to the end of the year

Milestones: June and December

Oil vs. non-oil:

New melaminic bakelite plates without oil to be tested soon.

Milestones: by October prove that

- the current density can be kept below 2 nA/cm^2 ($20 \text{ }\mu\text{A/m}^2$)
(extra ageing effect < 10%)
- the noise rate can be kept below 200 Hz/cm^2
(can be handled safely by the trigger)