Status of the LHCb RPC detector

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- *Introduction*
- *Detector requirements*
- *Ageing tests*
- *Oil vs. No-Oil*
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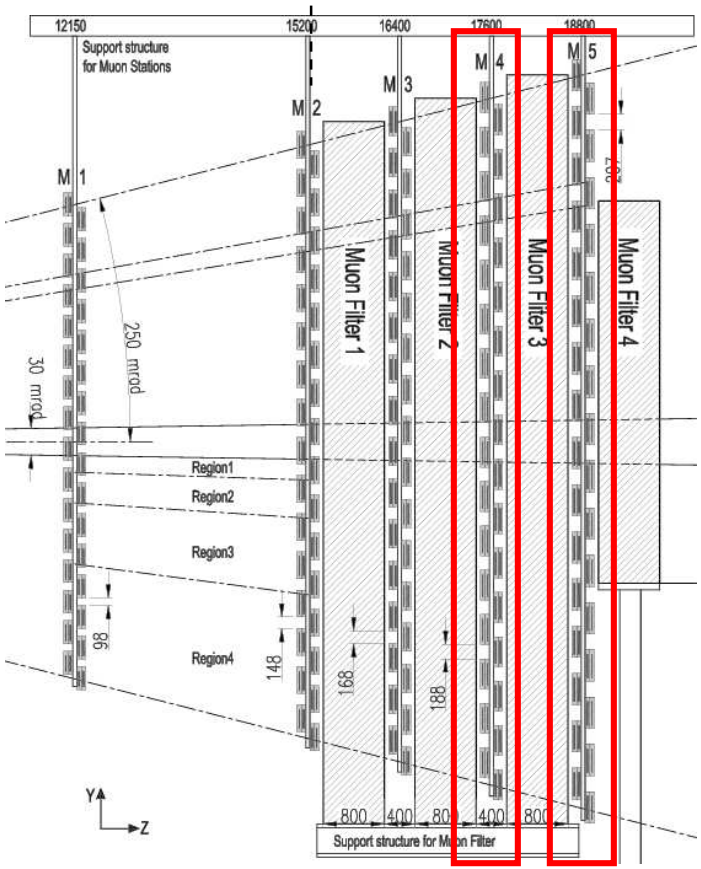
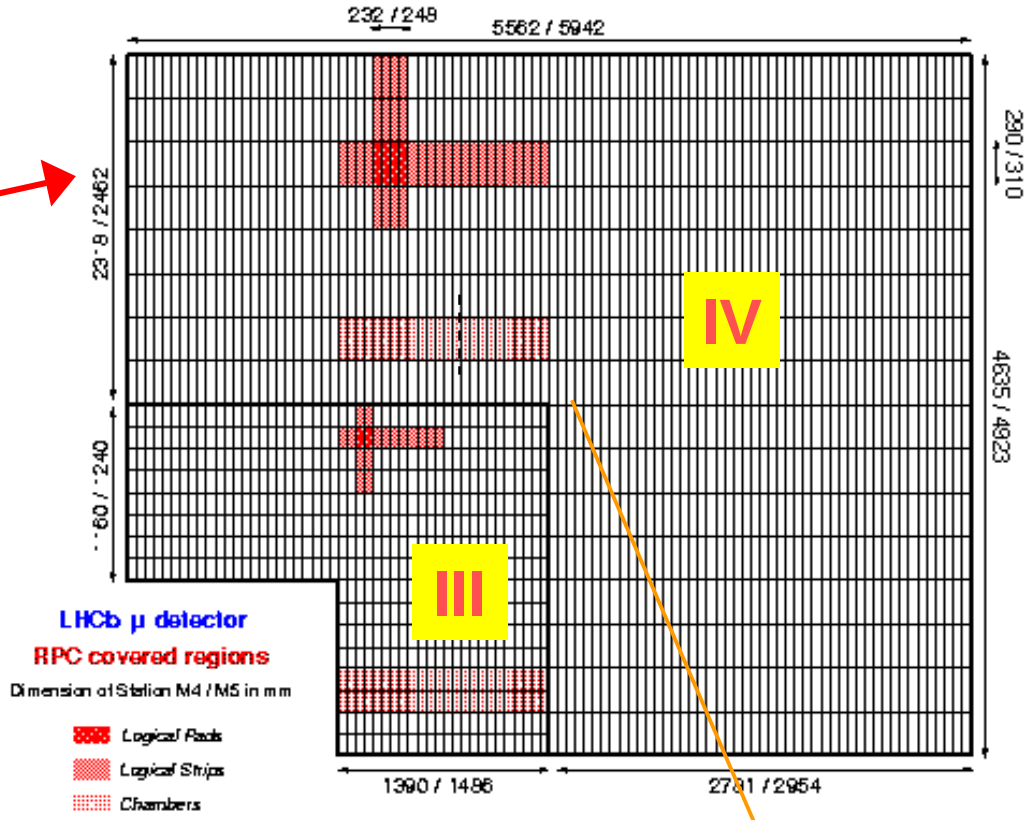
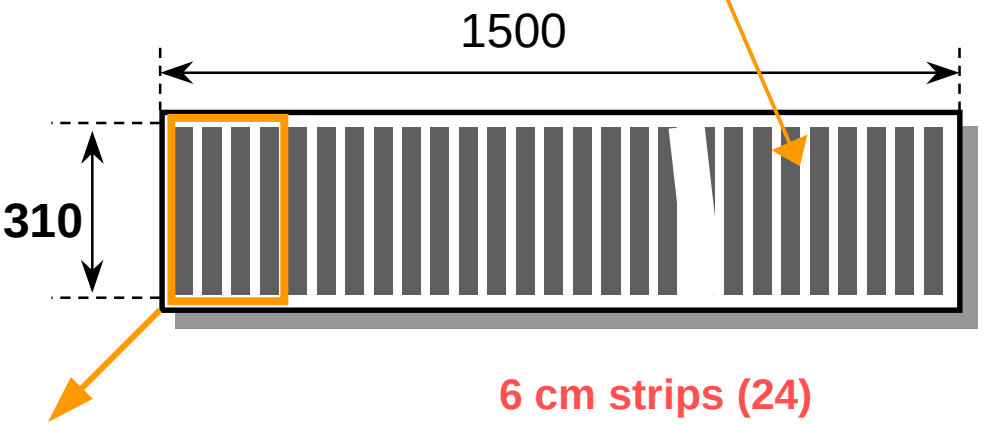
RPC detector

48% of total area







480 chambers
2 gaps/chamber

M4 M5

Logical pad

6 cm strips (24)

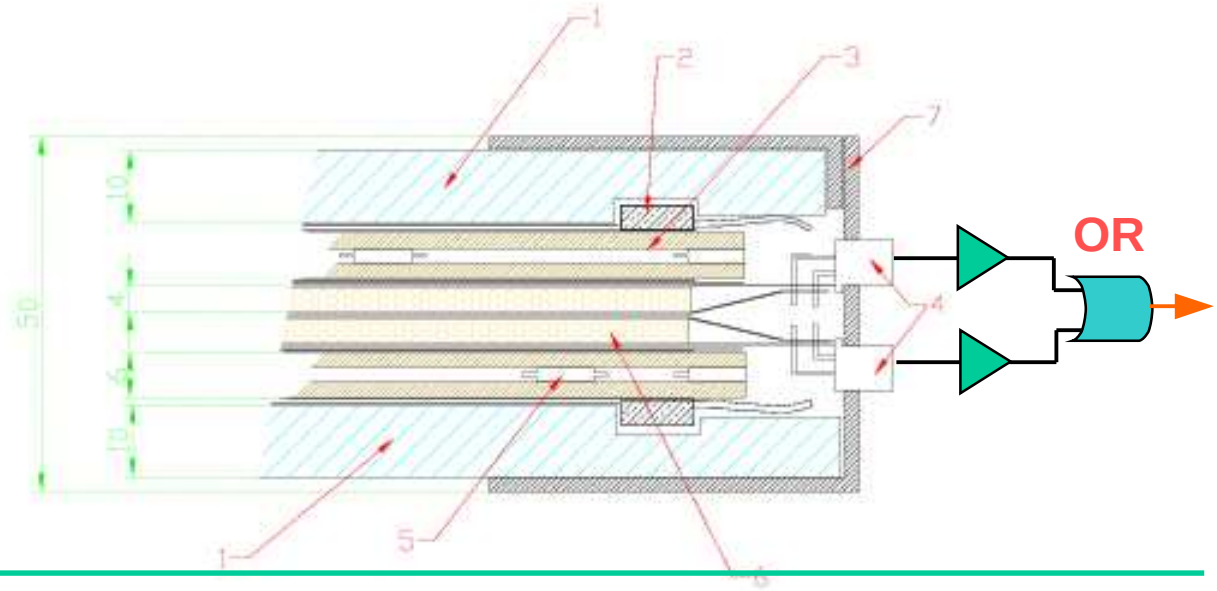
RPC requirements

Spatial efficiency per station:	**> 99%**
Rate capability (MIPs)	**1.2 kHz/cm2**
Rate capability (GIF test)	**0.6 kHz/cm2**
Time resolution	**< 2ns**
Current density max.	**18 nA/cm2**
Charge density in 10 y op.	**1.8 C/cm2**

OK: Note LHCb 2000-053

ρ = 9 10^9 Ω cm (bakelite)
Gas mixture:
95% $C_2H_2F_4$, 4% I-C_4H_{10} 1% SF_6

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

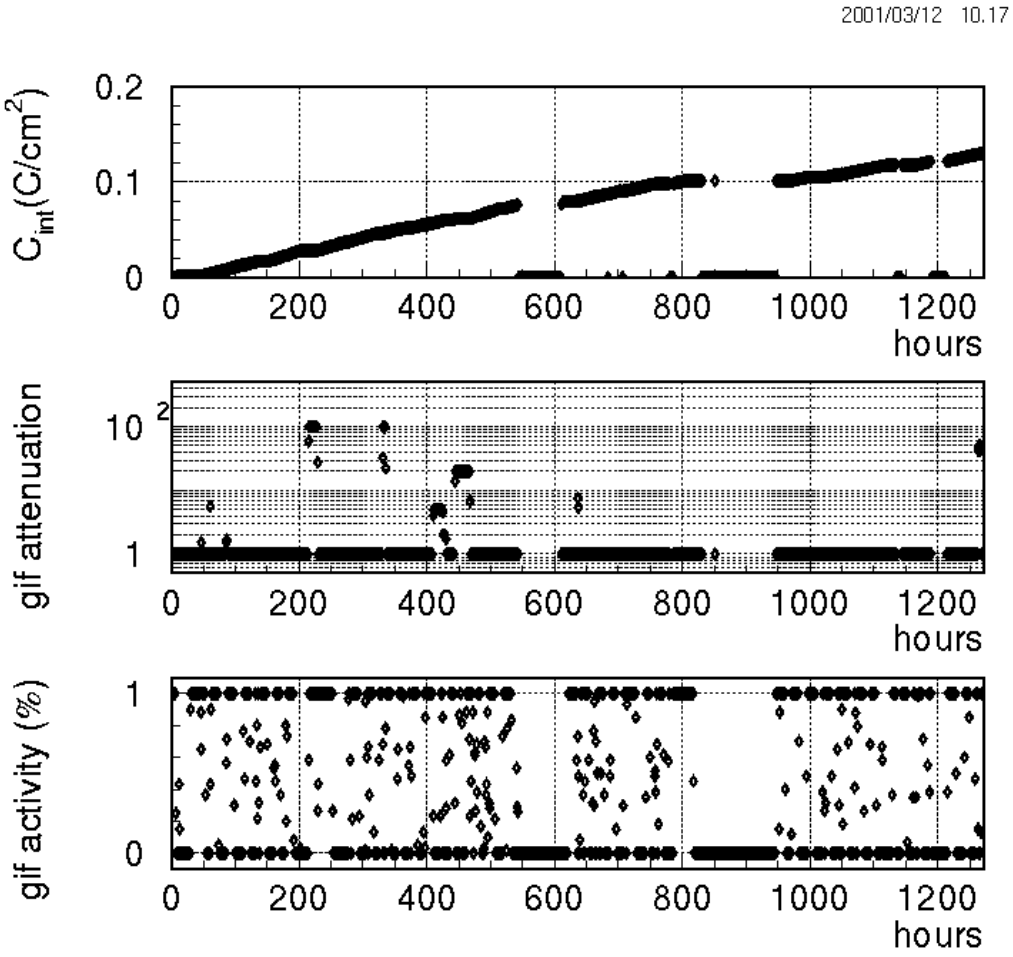


GIF Ageing Test

Ageing requirements in LHCb
(including safety factors)

J = 18 nA cm^{-2}
10-year fluence Φ = 6 10^{10} cm^{-2}
30 pC/avalanche → 1.8 C cm^{-2} in 10 years

CMS test	0.2 C cm^{-2}
ATLAS test	0.3 C cm^{-2}

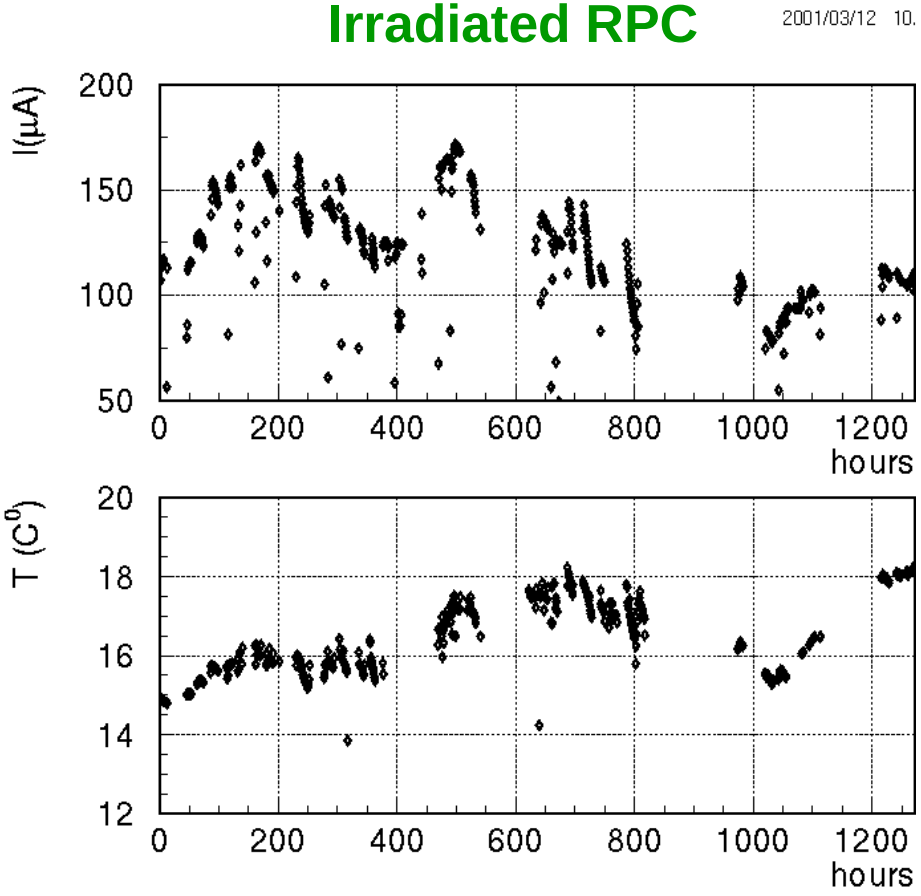


GIF test: started Jan. 15, to continue up to June (-> December ?)

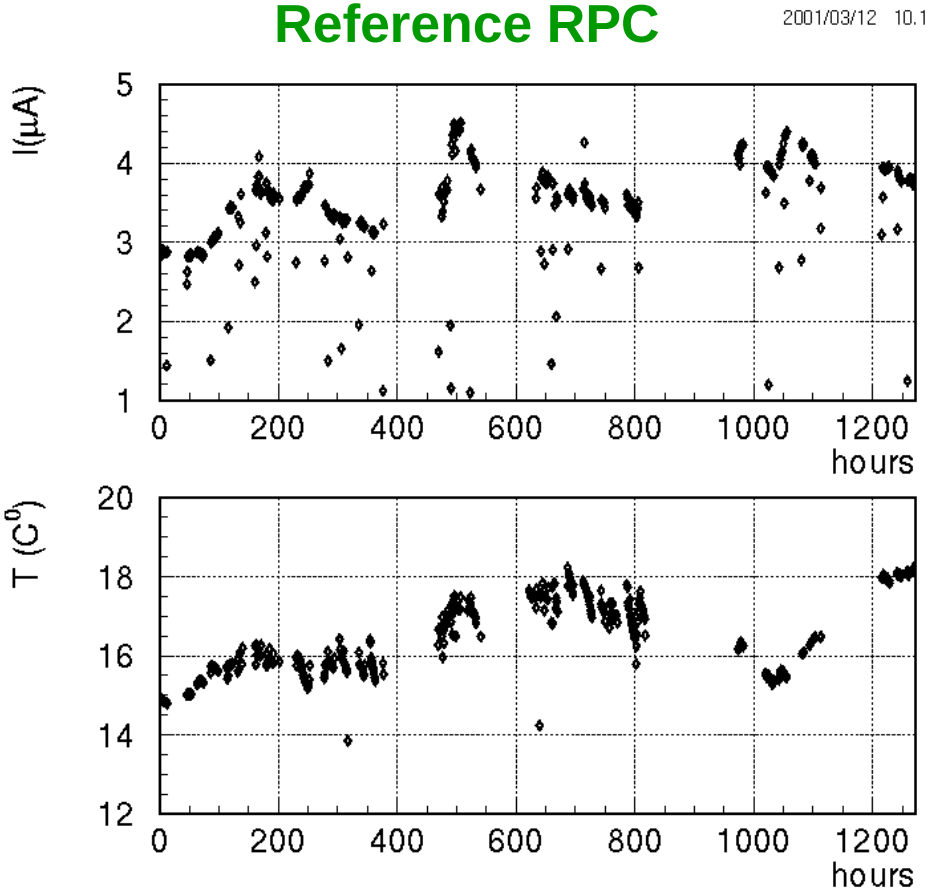
≈ 0.12 C cm^{-2}/month → 4 LHCb years possible in 6 months, 7 in 12 months

GIF Ageing test

Irradiated RPC



Reference RPC



Oil vs. No-Oil

Linseed oil on bakelite

✔ **improves**

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

is an additional variable

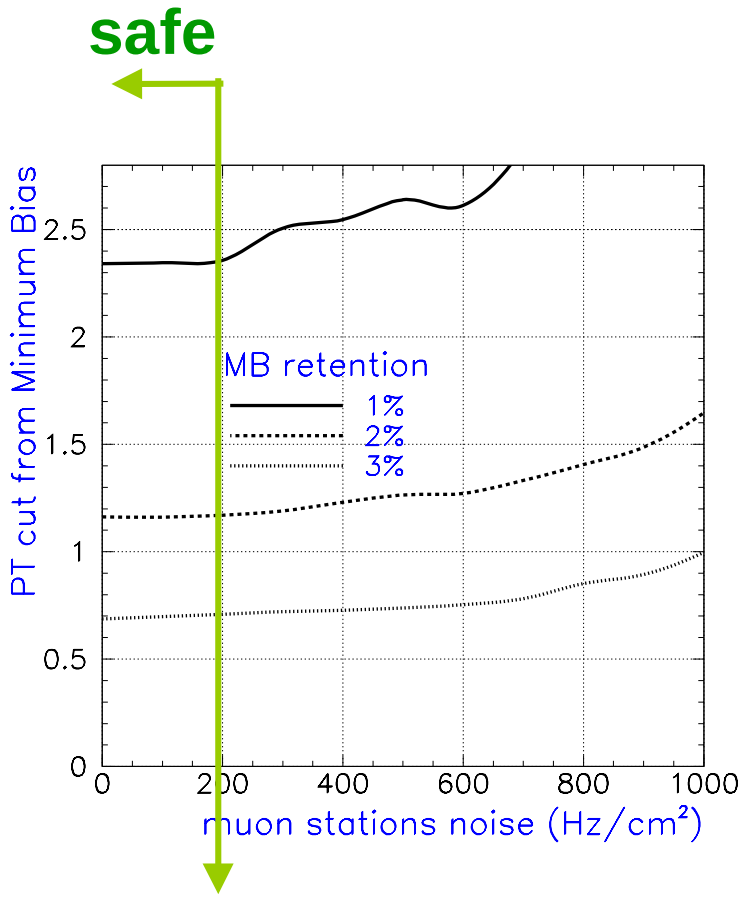
- construction more critical
- extra quality control req'd

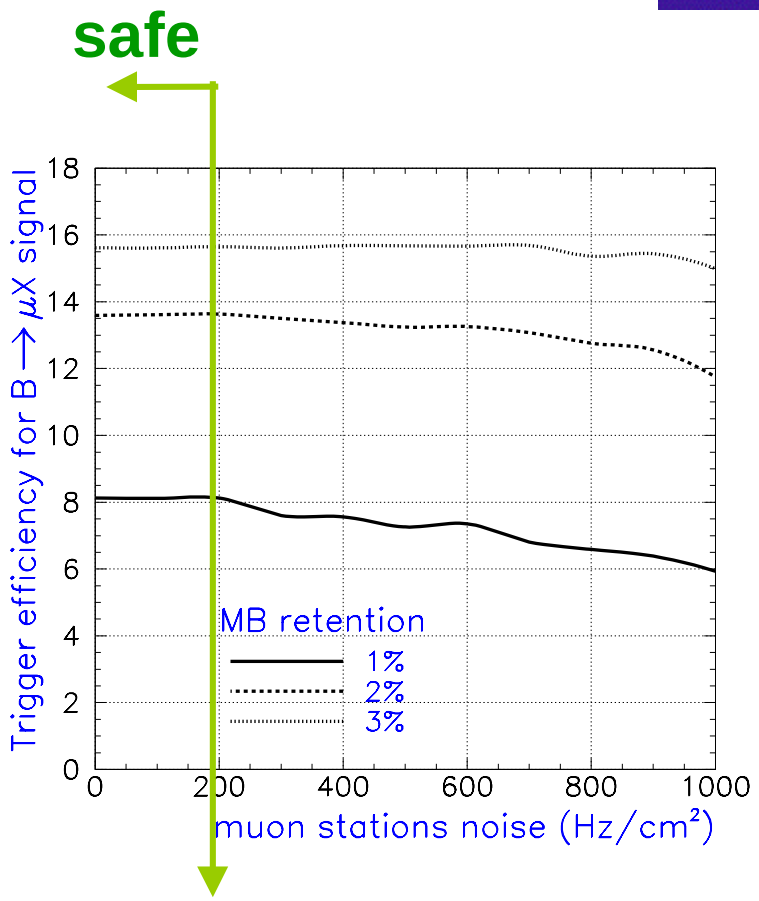
Current and noise ok with oil. However we favor a solution without oil.

From physics in LHCb expect < 18 nA/cm2

⇒ I_{DARK} << 18 nA/cm2

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 μA/m^2)
  (extra ageing effect < 10%)

- the noise rate can be kept below 200 Hz/cm^2
  (can be handled safely by the trigger)