



# After glow with BCM1F

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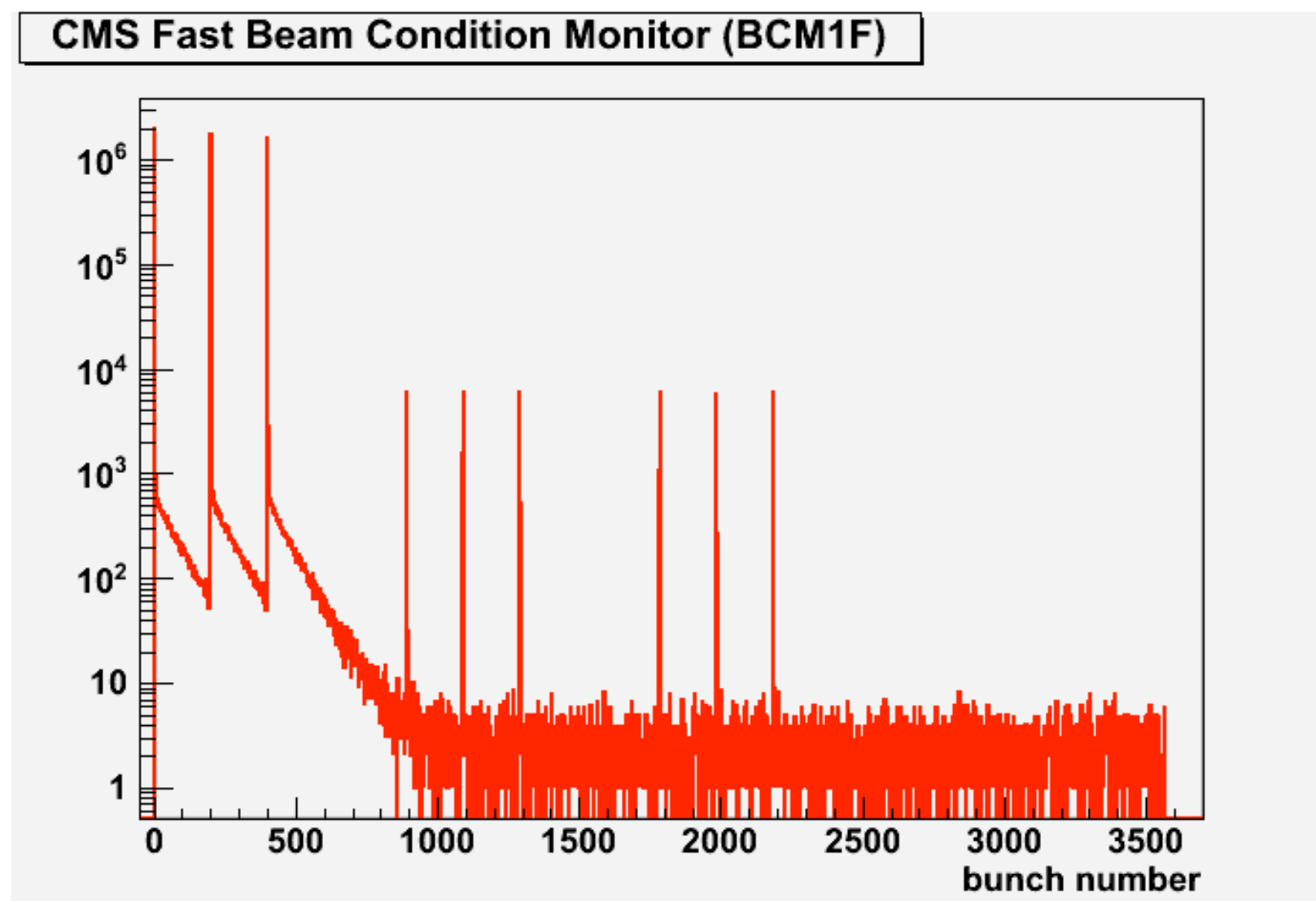
Roberval Walsh  
DESY

BCM Workshop  
Zeuthen, 14.10.2010



# After glow within an orbit

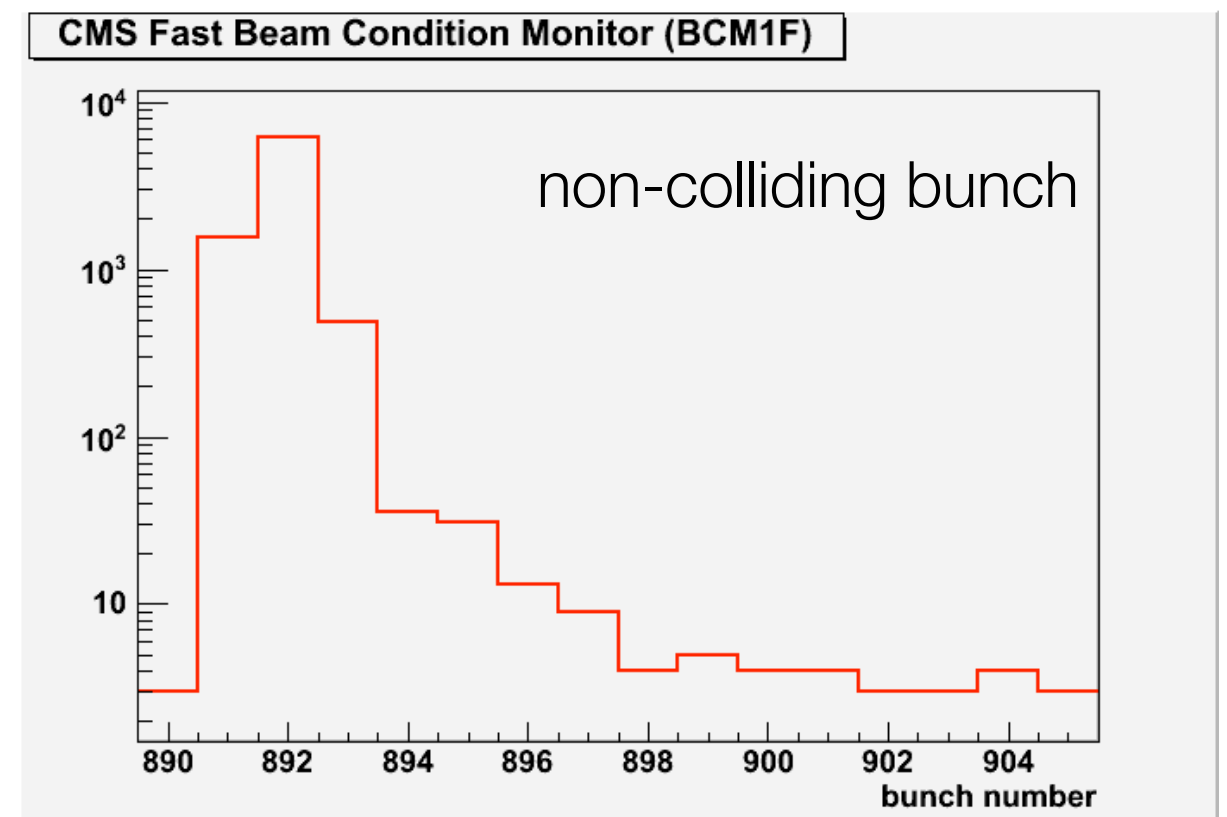
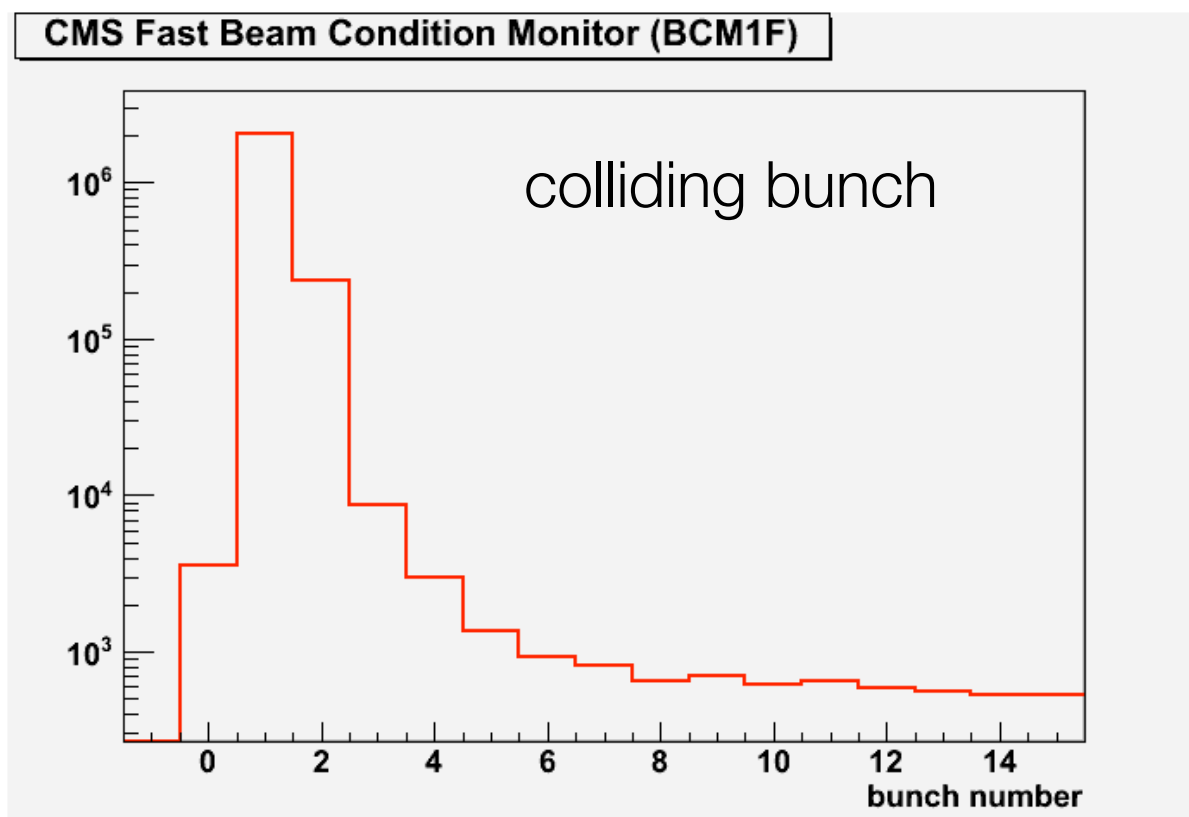
- Long tails observed in the time distribution along the LHC orbit in colliding bunches – products of collisions excite the material of the detector, that subsequently decays.





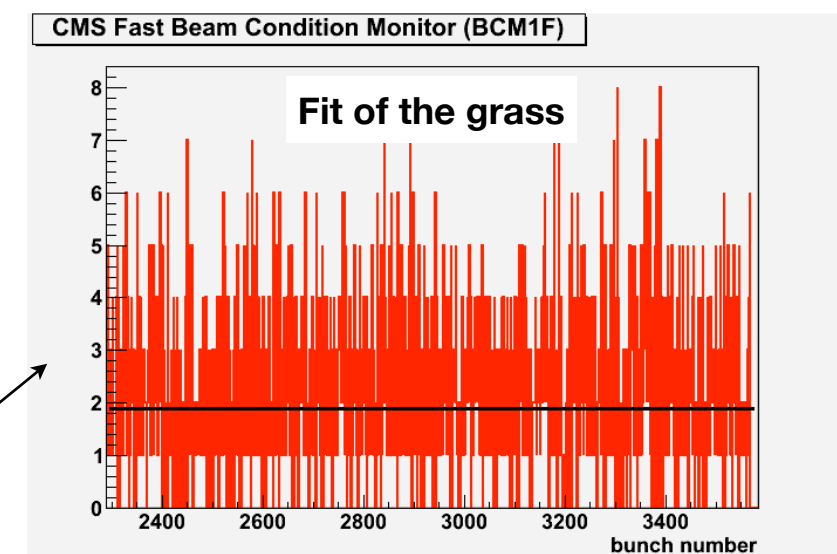
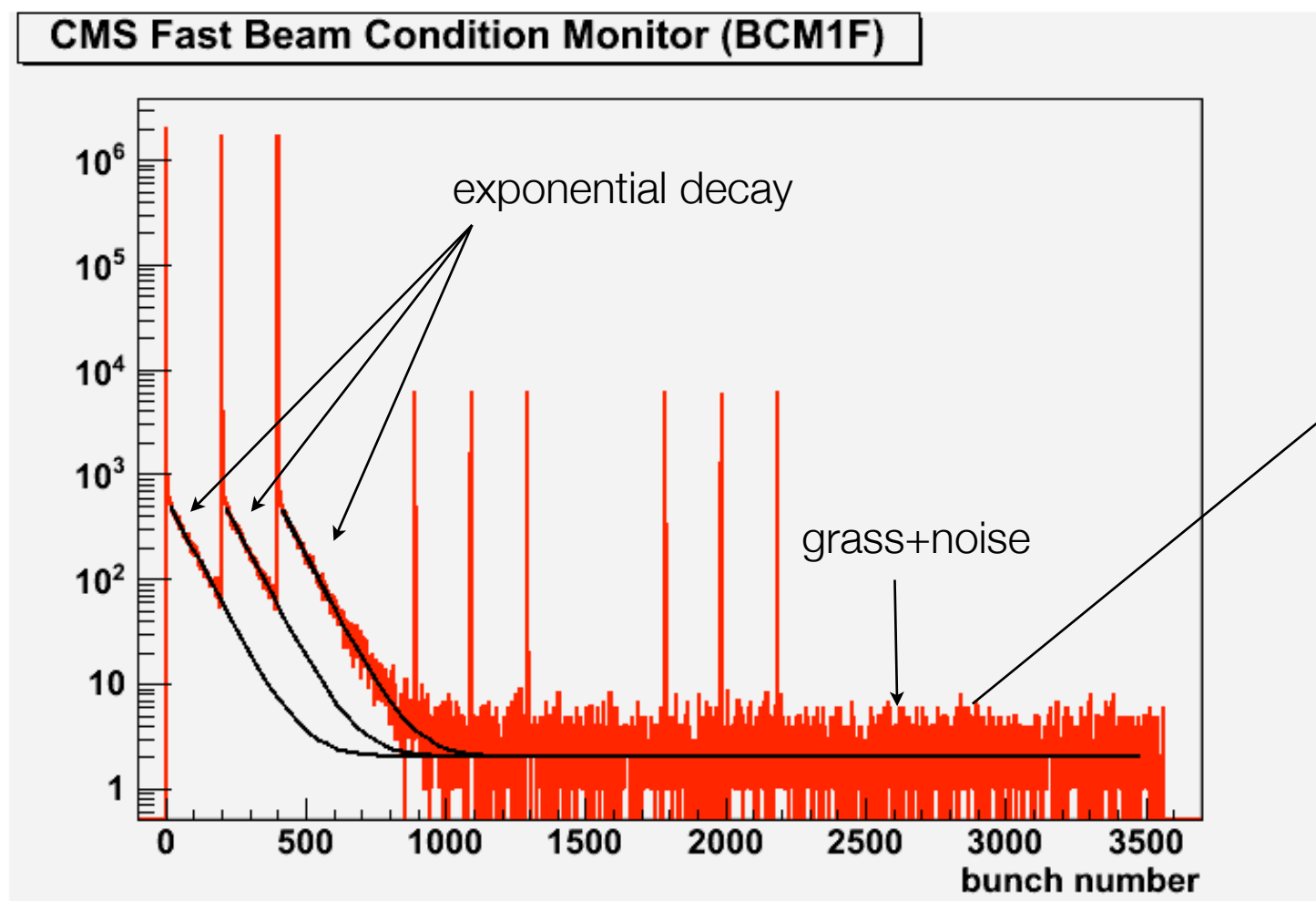
# After glow within an orbit

- For non-colliding bunches a short fast falling tail looks similar to the colliding bunches.



# After glow within an orbit

- The tails were fitted to exponentials,  $f(x) = \exp(p_0 + p_1 x)$ .
- The after-glow contributions from previous colliding bunches were subtracted.
- The 'grass' was fitted to a constant ( $C=2$ ) in a range at the end of the orbit.





# After glow within an orbit

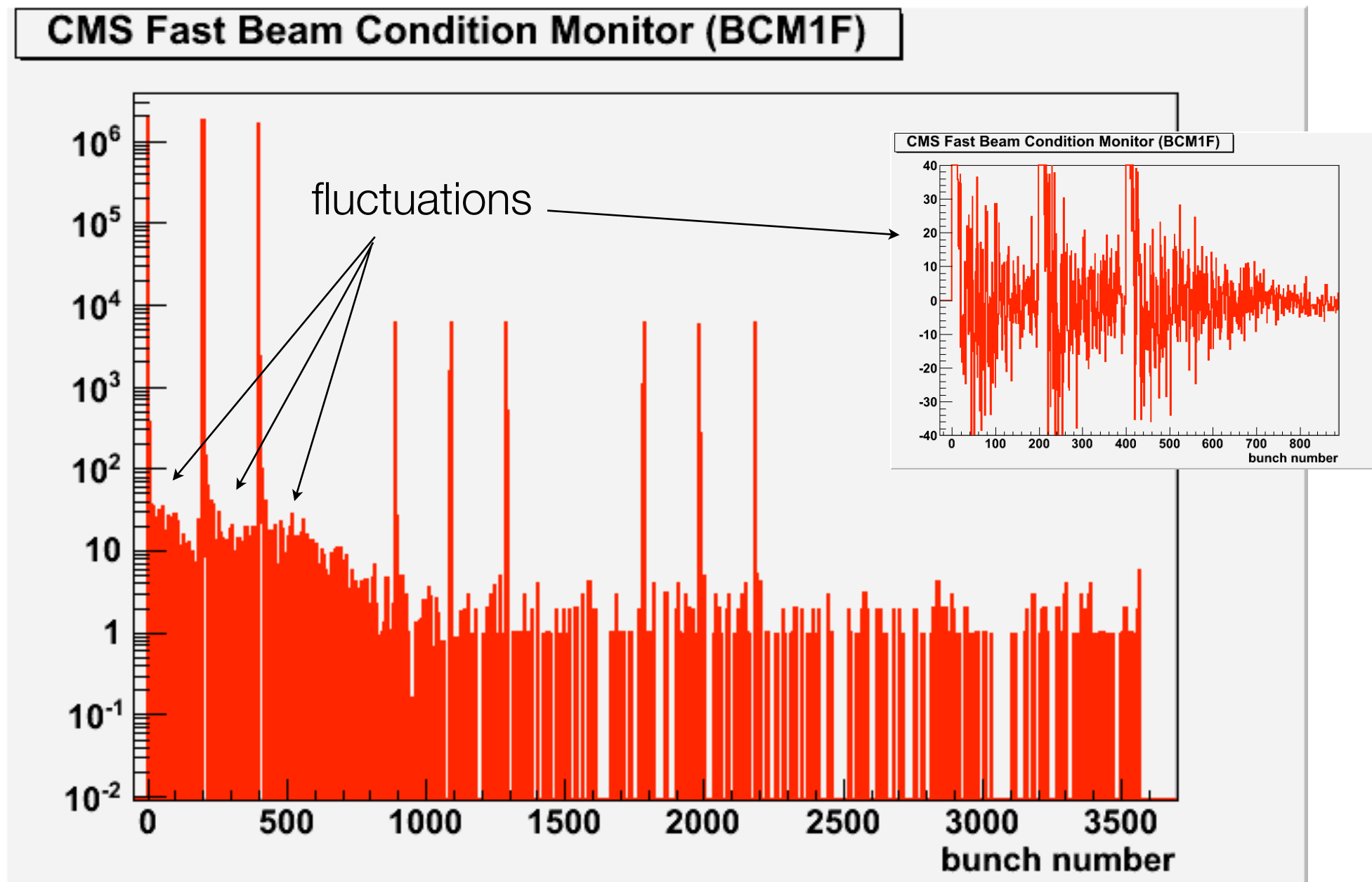
- Fit results

	p0	p1( $\times 10^{-2}$ )	$\chi^2/\text{dof}$
1 <sup>st</sup> colliding bunch	$6.41 \pm 0.01$	$-1.18 \pm 0.01$	1.02
2 <sup>nd</sup> colliding bunch	$8.61 \pm 0.04$	$-1.18 \pm 0.01$	1.04
3 <sup>rd</sup> colliding bunch	$10.94 \pm 0.06$	$-1.18 \pm 0.01$	1.07

- Decay lifetime:  $\sim 2.12 \mu\text{s}$  or 85 bunch numbers.
- Integrating the fit function, the number of hits from the long tails and the grass correspond to  $\sim 2\%$  of the total number of hits.

# After glow within an orbit

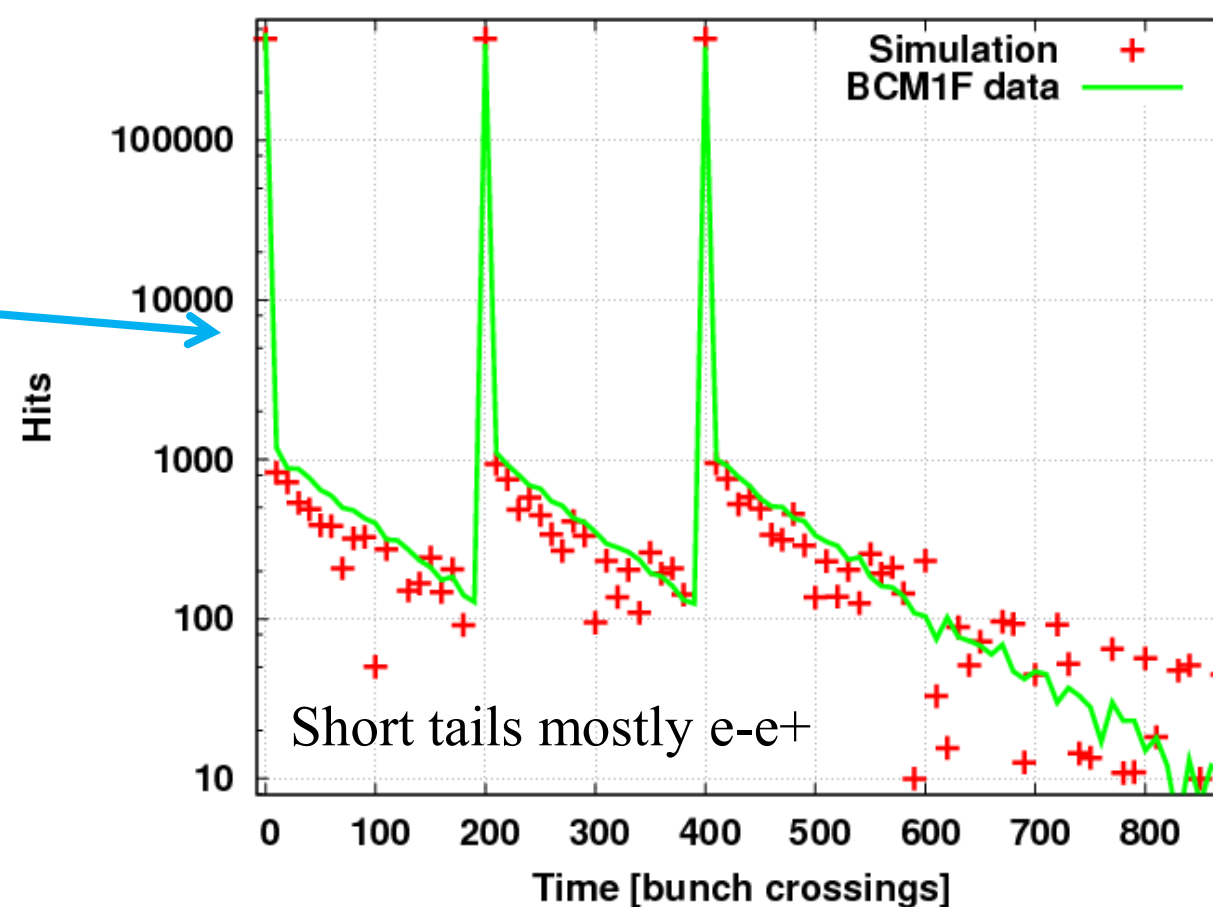
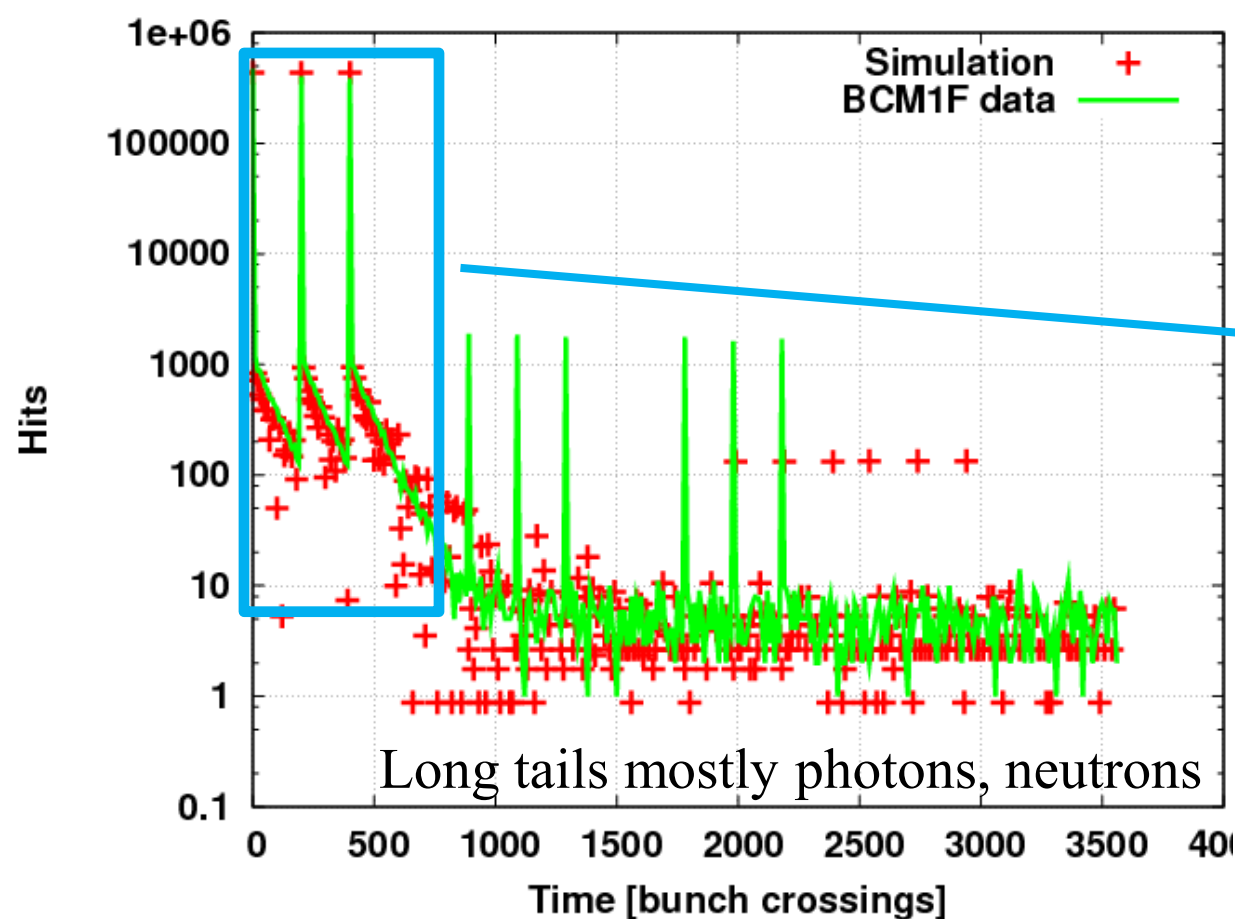
- Subtracting the after-glow and grass contributions obtained from the fit...



# After glow simulations

S. Mueller

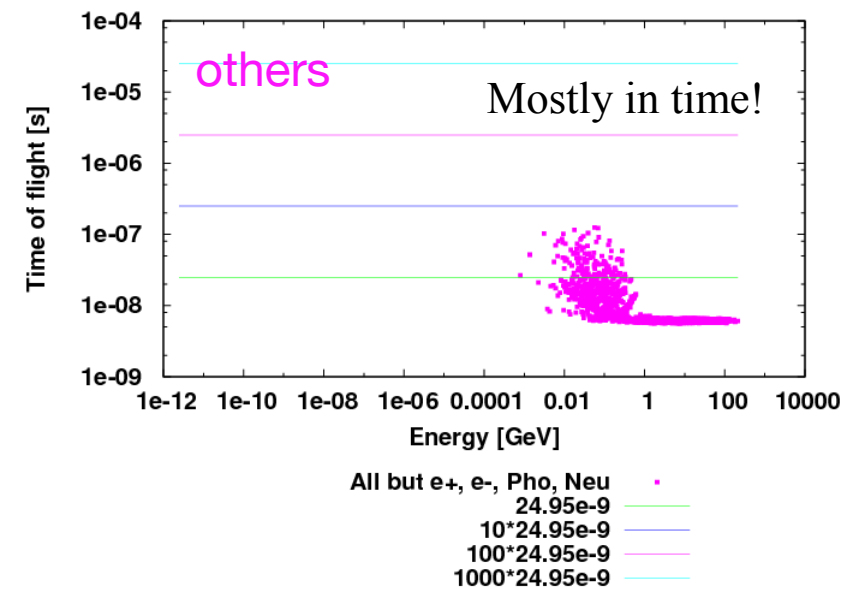
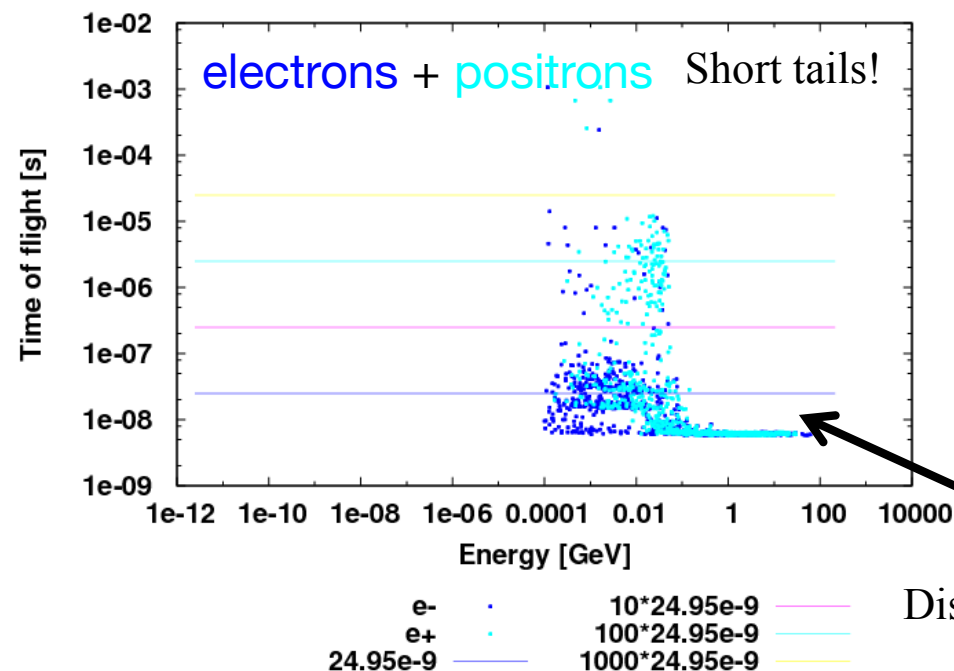
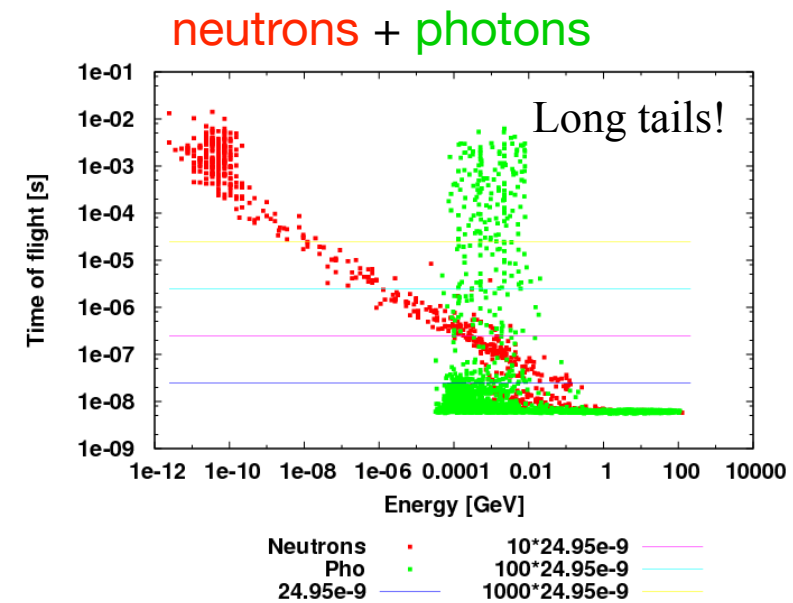
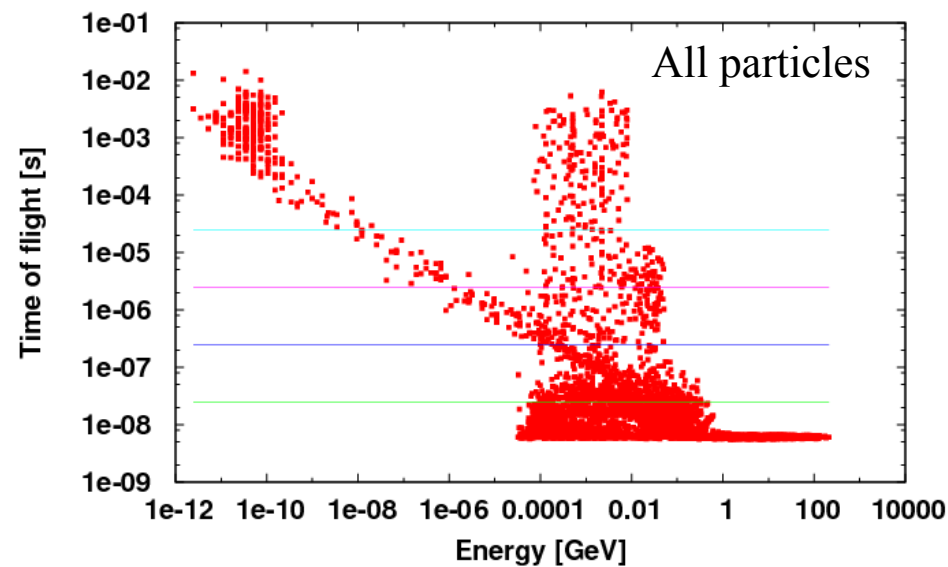
- Fluka simulation in good agreement with the data.
- Colliding bunches only.



# After glow simulations

S. Mueller

- Particle composition from simulation.

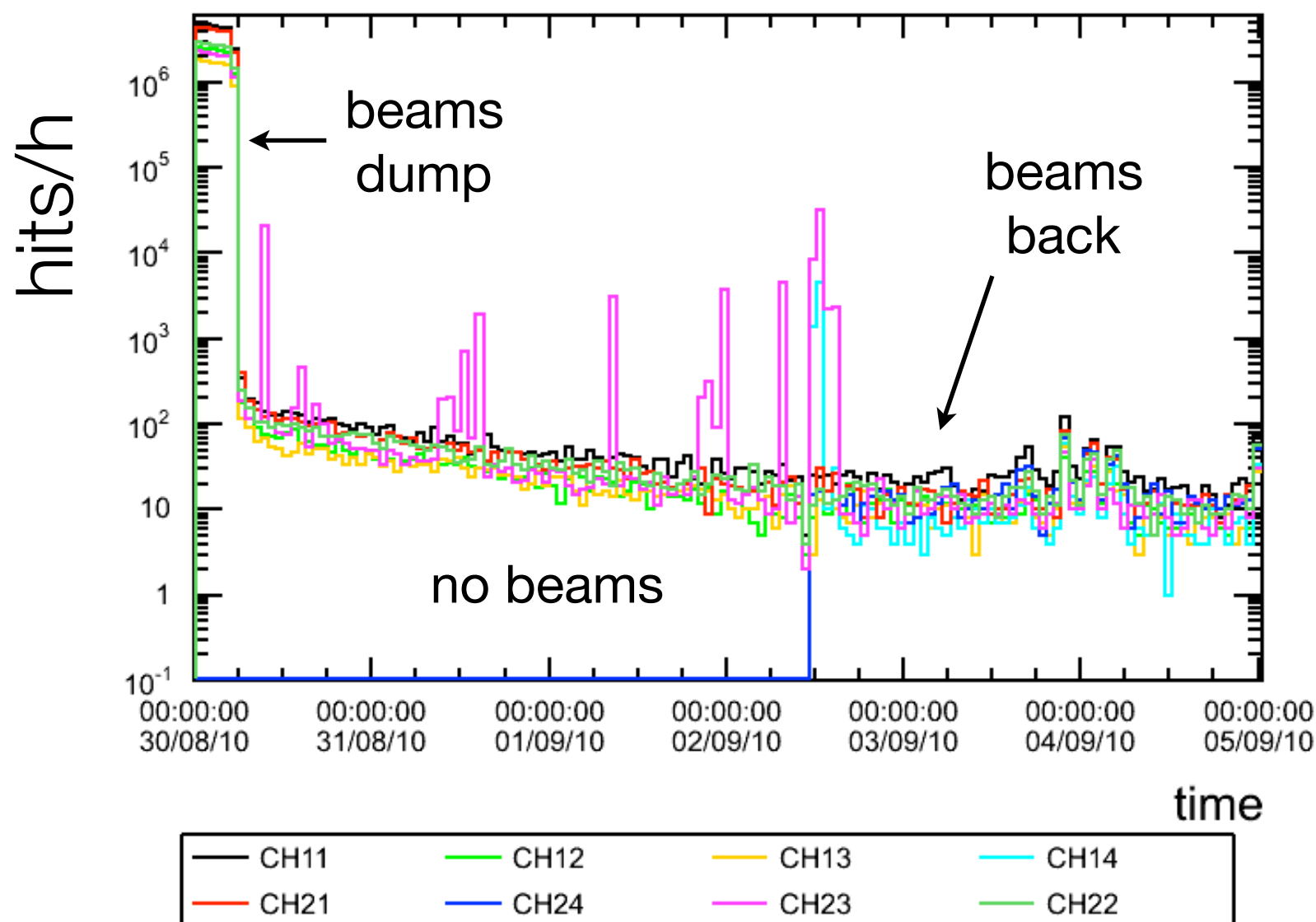


Discreet clusters in time!



# After glow late effects

## CMS Fast Beam Condition Monitor (BCM1F)



- Beginning of September no beams for few days.
- Observation of the detector material decaying with a long lifetime.
- Rates of the order of the noise.
- Spiky noise in channels 23 and 14.



# Outlook

- After glow observed with BCM1F.
- Lifetime estimated using the TDCs: **2.12  $\mu$ s**
- Simulation:
  - Long-tail contributions coming from neutrons (exponential decay) and photons (grass)
  - Short-tail contributions from electrons and positrons in clusters.
  - Other particles contribute with hits in time with the collision products.
- Activation after beams dump is at the order of the noise, but slope is observed in the rates.
- Need further studies, e.g. correlations with beam parameters.