

Protection of ALICE against head on collisions

Introduction

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ALICE requirements for RUN2

Physics

- Minimum bias $\sim 2 \cdot 10^{29} \text{ Hz/cm}^2$ (rate $\sim 15 \text{ kHz}$)
- If bkgd rate \gg collision rate \rightarrow MB $\sim 2 \cdot 10^{30} \text{ Hz/cm}^2$
- Rare triggers $\sim 7 \cdot 10^{30} \text{ Hz/cm}^2$ (rate $\sim 500 \text{ kHz}$)
- Max pile-up for RUN2: $\mu = 0.01$

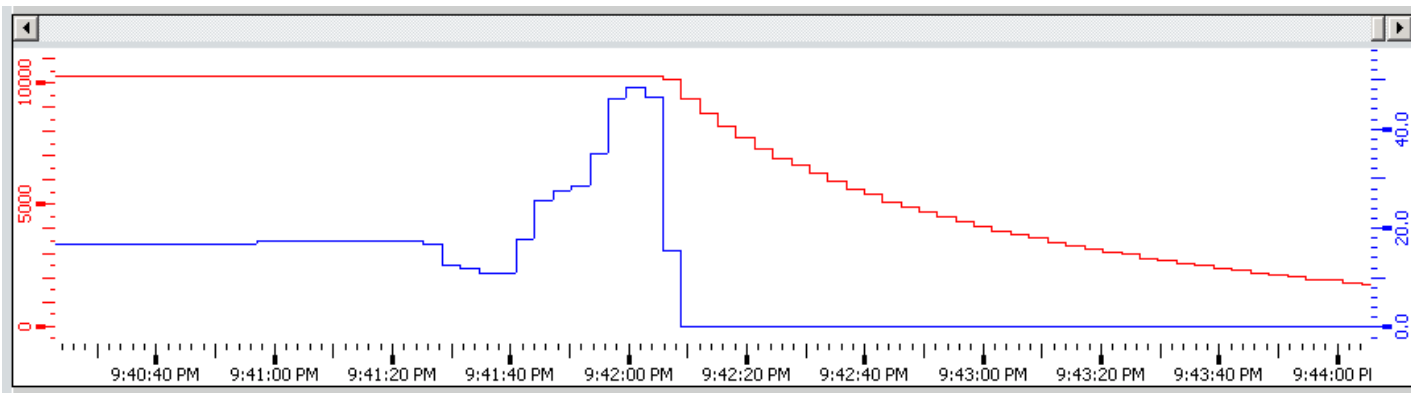
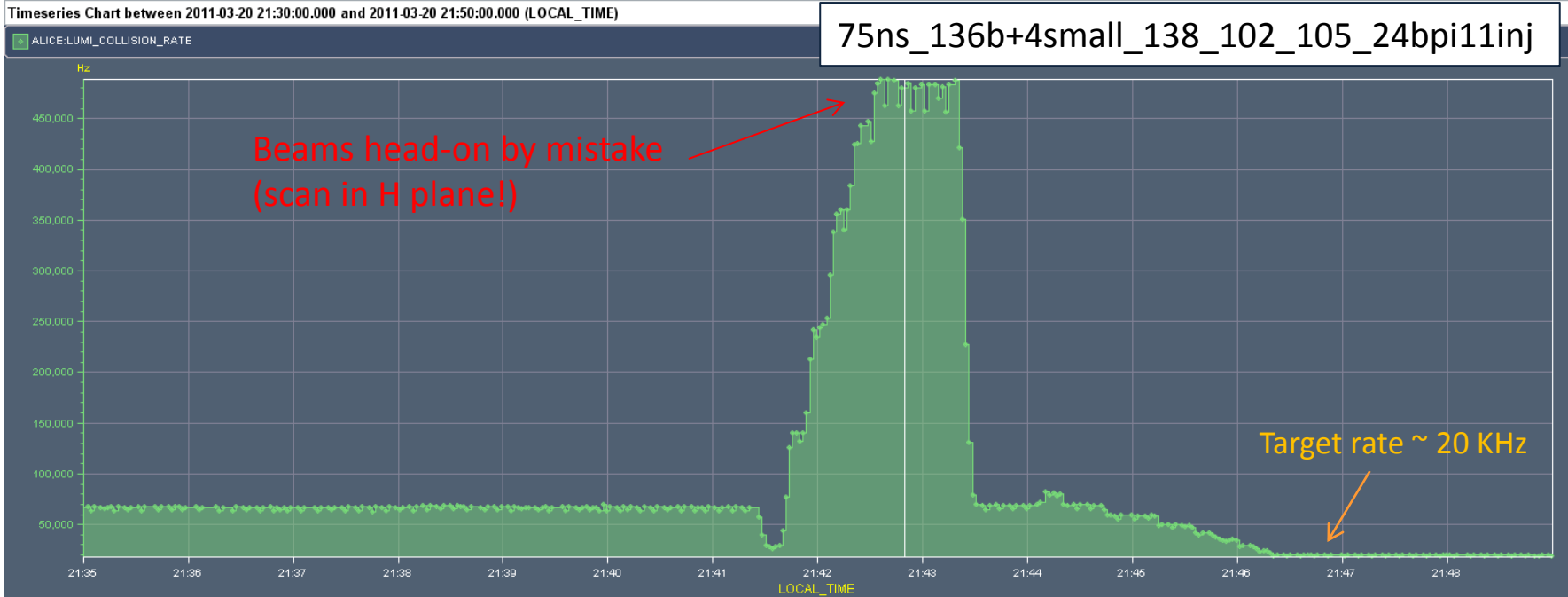
Detector safety

- The 8 gaseous detectors (TPC, TRD, TOF, HMPID, MCH, MTR, PMD, CPV) are protected against sparking by current trip thresholds in HV power supplies
- High luminosity is equivalent to large currents in the HV-PS
- Increasing current trip thresholds could weaken the protection in case of “diverging events”
- Max tolerable rate: $\sim 700 \text{ kHz} \sim 1 \cdot 10^{31} \text{ Hz/cm}^2$



Lumi jump on March 20, 2011 @ 21:42

FILL 1640, Stable Beams



μ -TRIG RPC
chambers tripped,
all other gaseous
detectors
approached the
trip limit



From BE-OP logbook 20/03/2011 21:47

“Optimized Alice (first started an optimization in H by mistake, cancelled). Then separated to the desired 0.36.

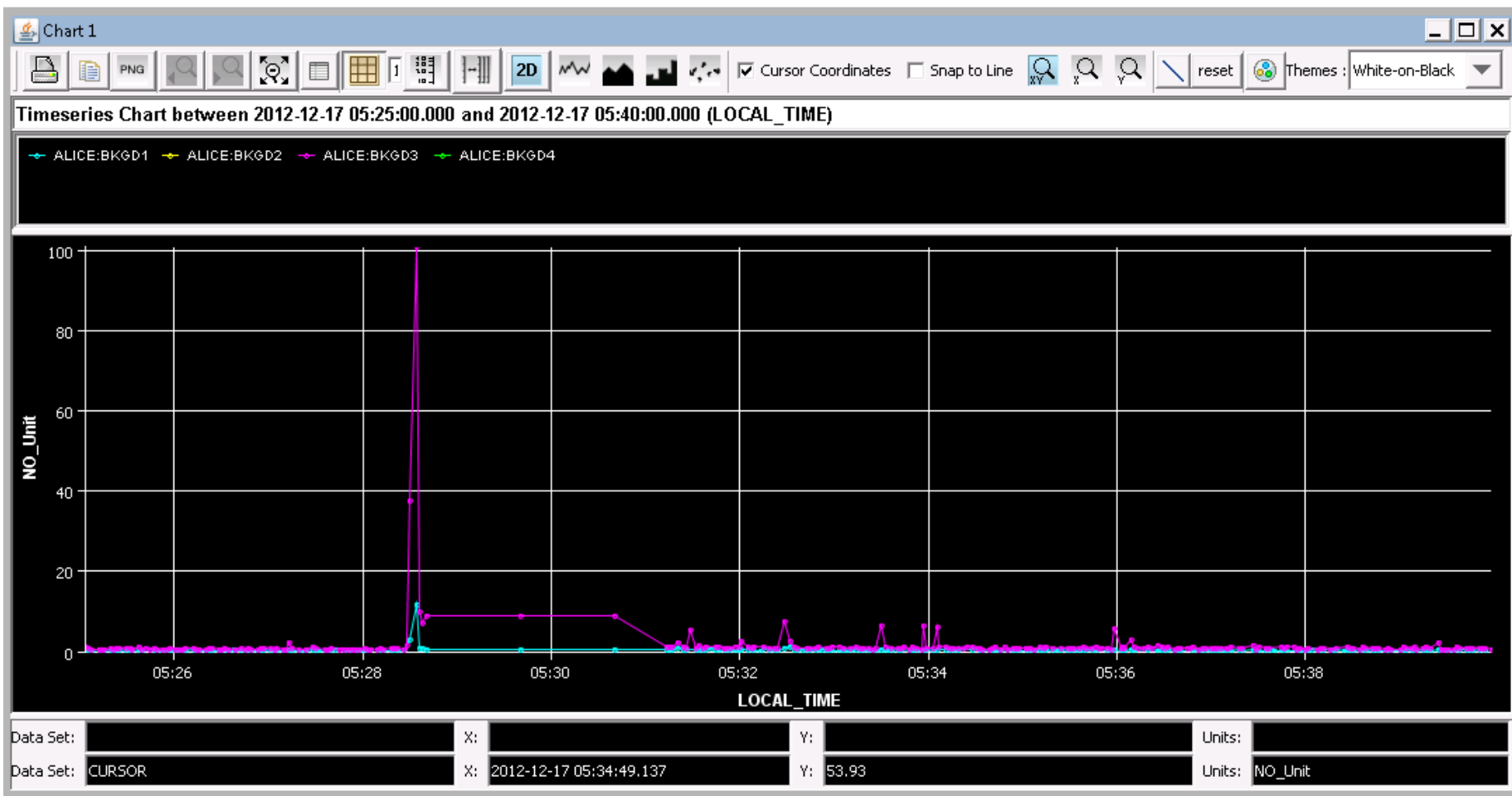
To avoid such mistakes in the future, correct Alice to the value they desire first, and only then declare stable beams.

To avoid they get too much luminosity, which risks tripping parts of their detectors...”



Lumi jump on Dec 17, 2012 @ 05:28

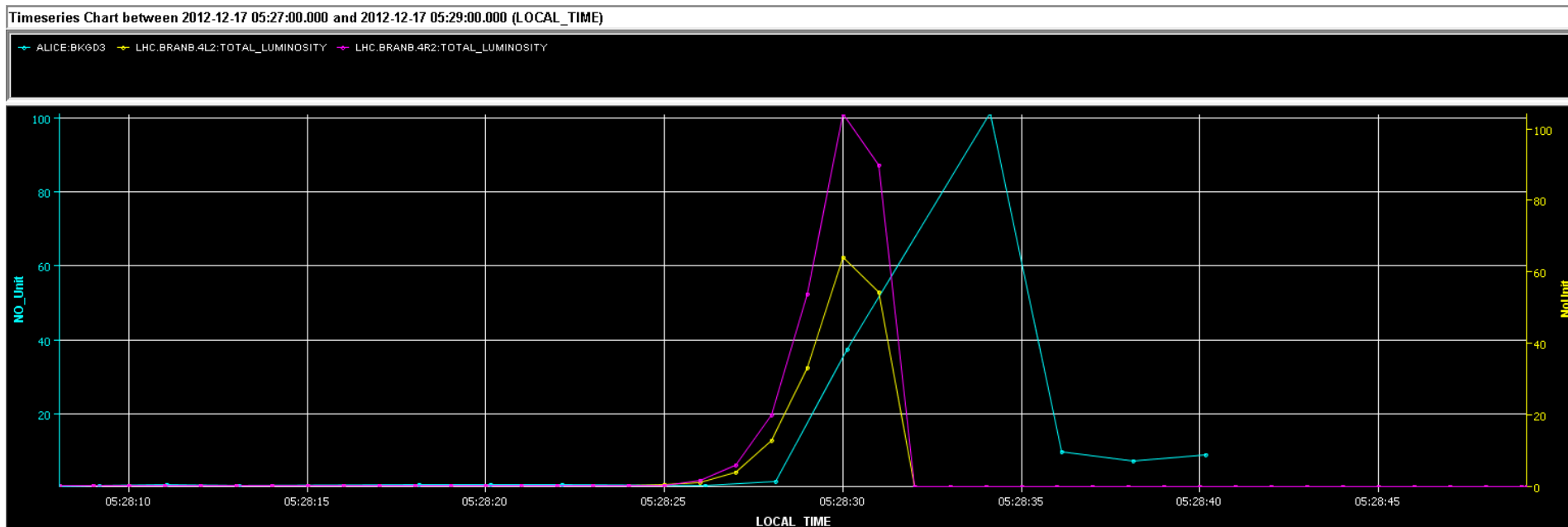
FILL 3457, Adjust



BCM RS32 (ALICE:BKGD3) just above dump threshold, all detectors were in stand-by

BCM thresholds

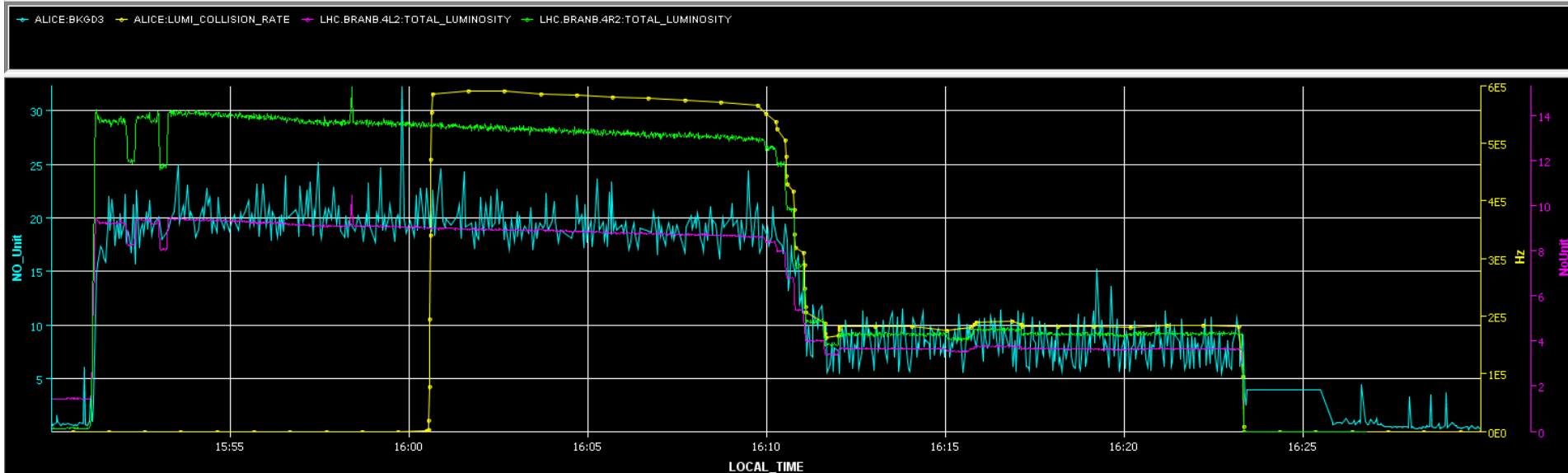
- On FILL 3457 dump ALICE luminometer (V0 detector) was not ON → try to use BRANs to **extrapolate** collision rate/luminosity corresponding to BCM thresholds





FILL 3220

Timeseries Chart between 2012-10-25 15:50:00.000 and 2012-10-25 17:29:00.000 (LOCAL_TIME)



FILL/DATE	ALICE BKGD3 (% of dump threshold, BCM RS32)	BRAN.4R2/4L2	Collision rate	Luminosity
3220, 25/10/12 16:02	20%	13/8.6	590 kHz	$8.4 \cdot 10^{30} \text{ Hz/cm}^2$
3220, 25/10/12 16:16	9%	4.1/3.3	186 kHz	$2.7 \cdot 10^{30} \text{ Hz/cm}^2$
3457, 17/12/12 05:28	101%	104/66	4.65/ 3.7 MHz	$6.6/ 5.3 \cdot 10^{31} \text{ Hz/cm}^2$

(4R2 scales linearly with rate)

Possible solutions

- Use lumi-levelling with “intrinsic” soft protection
- Implement in DCS detectors ramp-down on sudden luminosity increase (could be not fast/smart enough)
- Reduce BCM dump threshold to value equivalent to 10^{31} Hz/cm² ?
- Any other option?