PPM-DU data analysis

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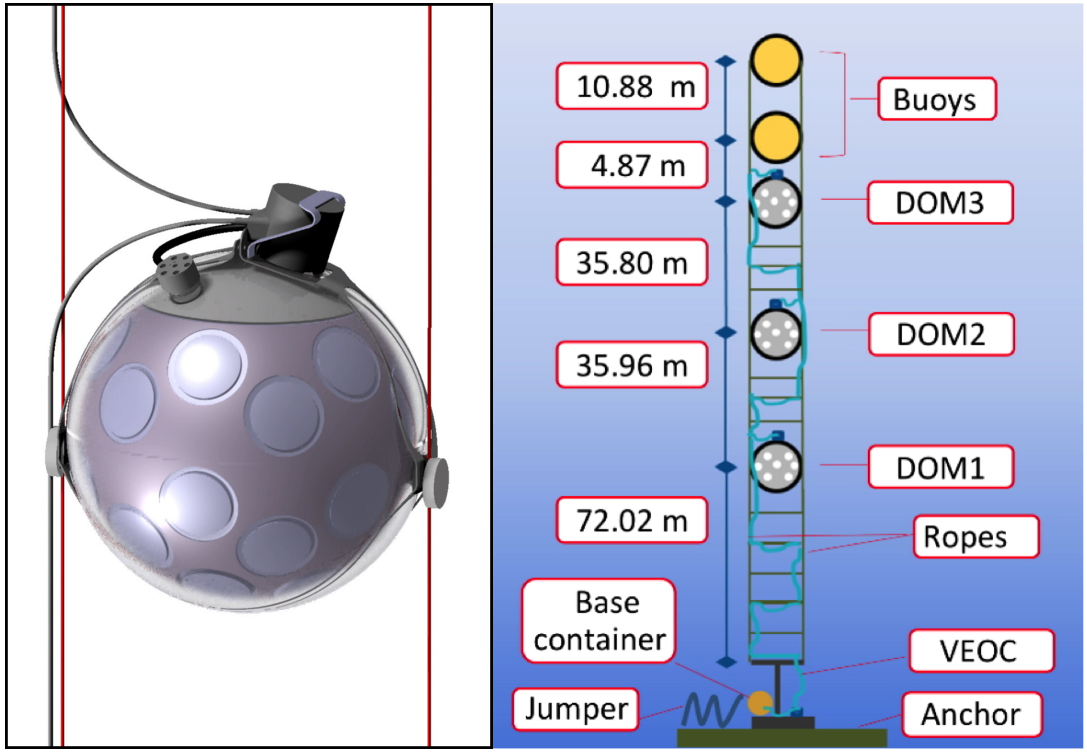
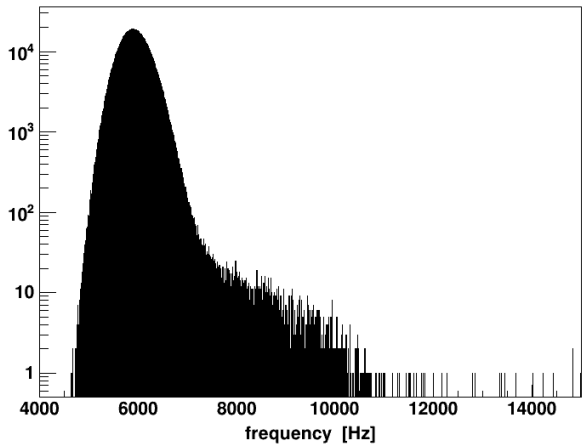


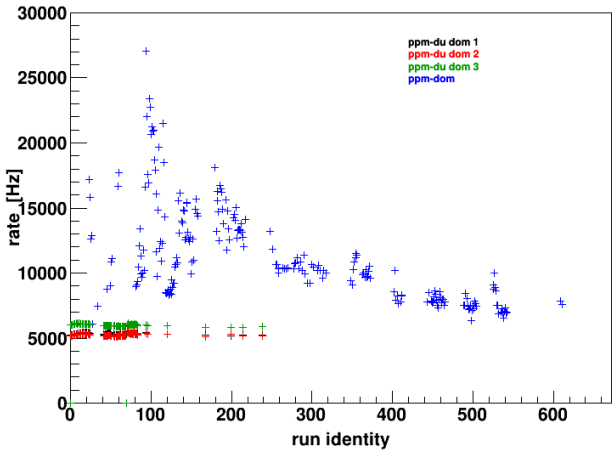
- 2 prototypes deployed in 2 sites
- PPM-DOM (April 2013) in Toulon
- PPM-DU (May 2014) in Capo Passero
- 1 DOM of 31 PMTs for the PPM-DOM
- 3 DOMs of 31 PMTs for the PPM-DU

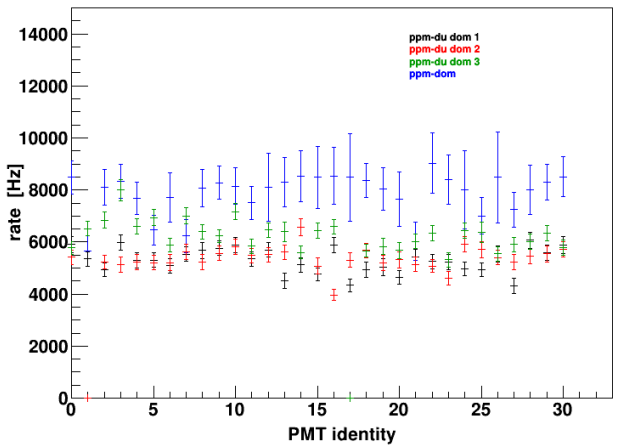
Rates from slice content



- one time slice: $2^{27}\,\mathrm{ns}$
- Gaussian distribution with tail
- mean μ is taken for single rate
- High Rate Cut (HRC) is defined as $\mu + 3\sigma$
- burst fraction is defined as $\frac{\text{number of slices above } \mathit{HRC}}{\text{total number of slices}}$

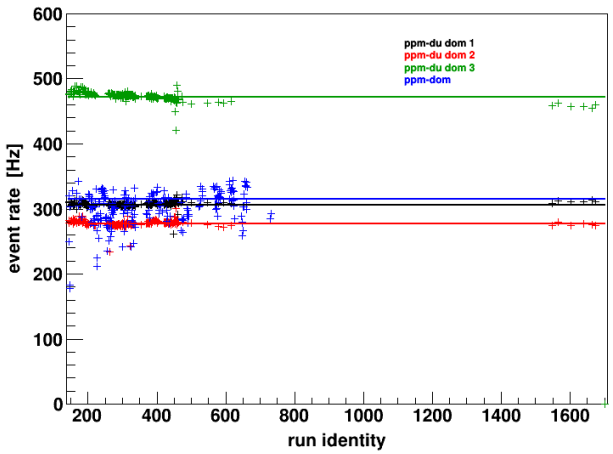
Rates

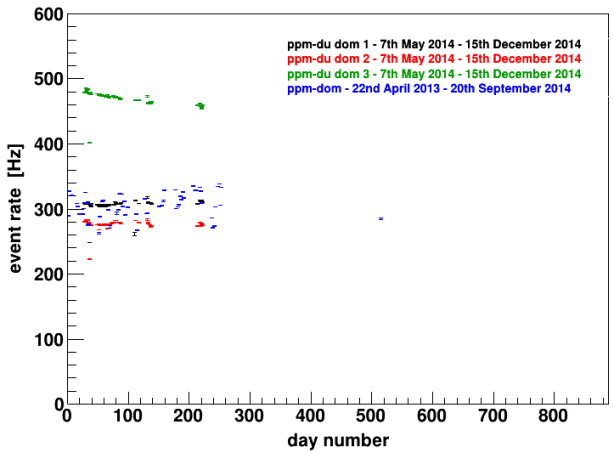




- more than one year of data taking for both prototypes
- more bioluminescence for Toulon site as compared to Capo Passero
- stable all over the DOM
- DOM 3 of the PPM-DU (green) as larger surface detection

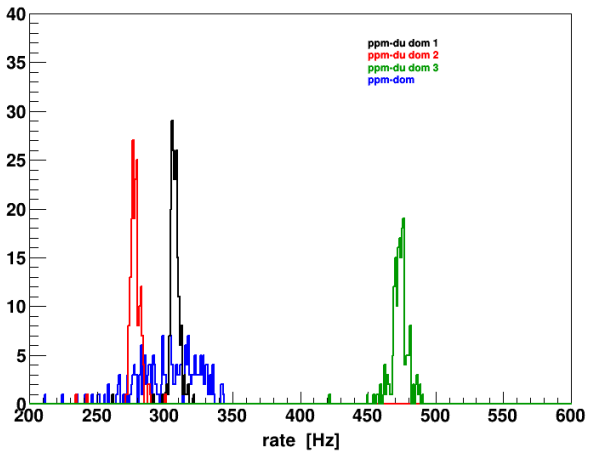
2-fold rates





- after combinatorial background subtraction
- shuffling of the event start time within a slice
- small systematics (below 5%)

2-fold rates



- after combinatorial background subtraction
- shuffling of the event start time within a slice
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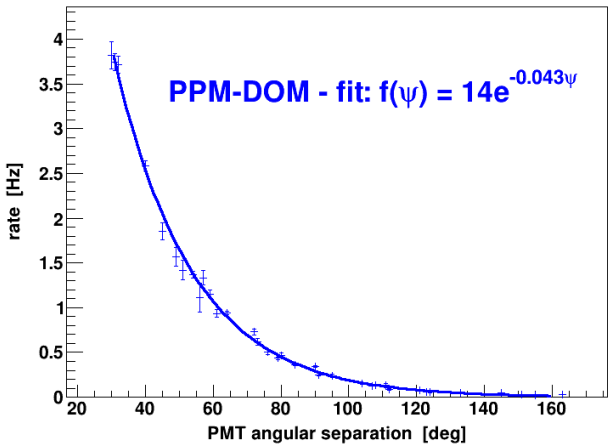
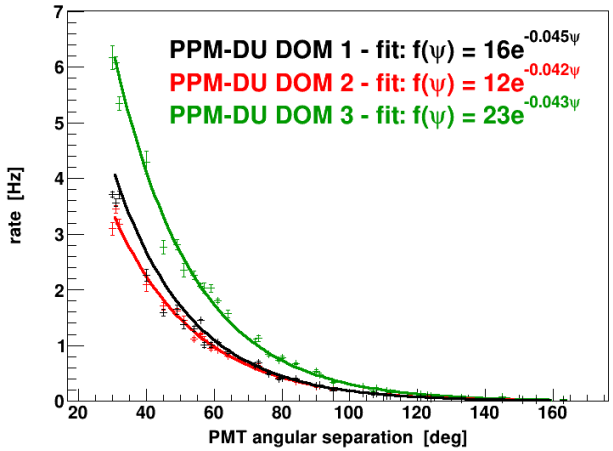
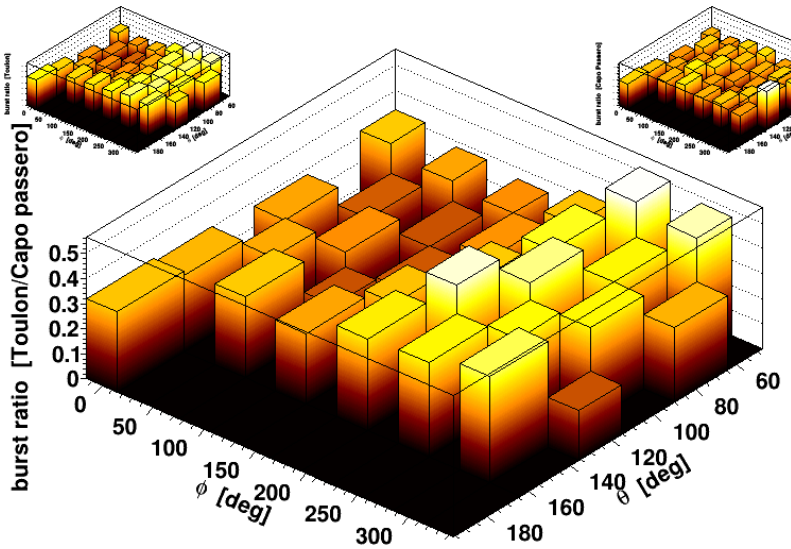
Angular separation between PMTs





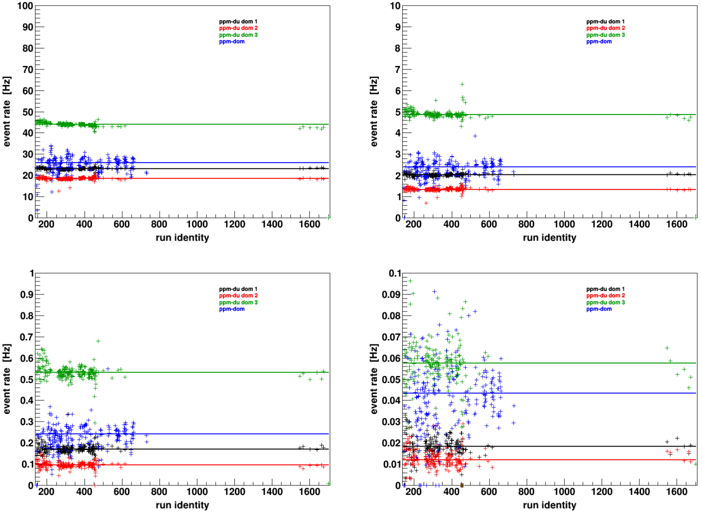
- PMTs looking in a similar direction see more coincidences
  $\rightarrow$ Cherenkov light of the ^{40}K decay product
- the decay angles are the very similar
  $\rightarrow$ ^{40}K rates are the same in both sites
- constants are slightly different
  $\rightarrow$ different detection efficiencies

Burst fraction

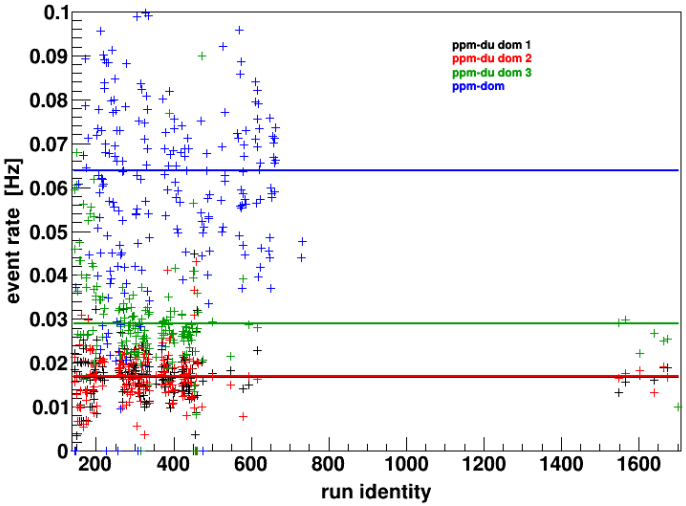


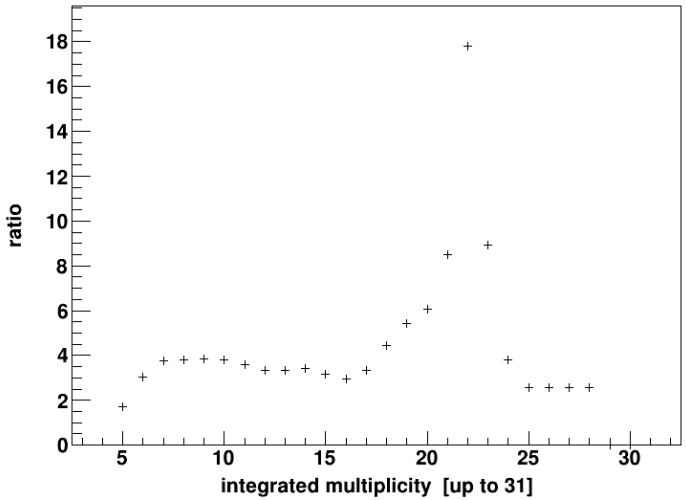
- burst fraction for the PPM-DOM and the DOM 1 (PPM-DU)
- ratio of the burst fraction
- PPM-DOM: increase in the direction of the LCM structure
- PPM-DU: no LCM, only 2 thin strings

3, 4, 5 and 6-fold



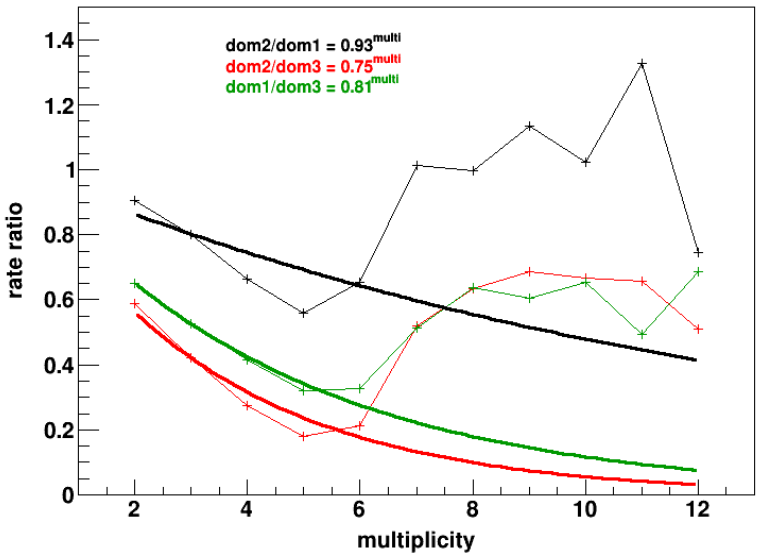
muon (> 6-fold)





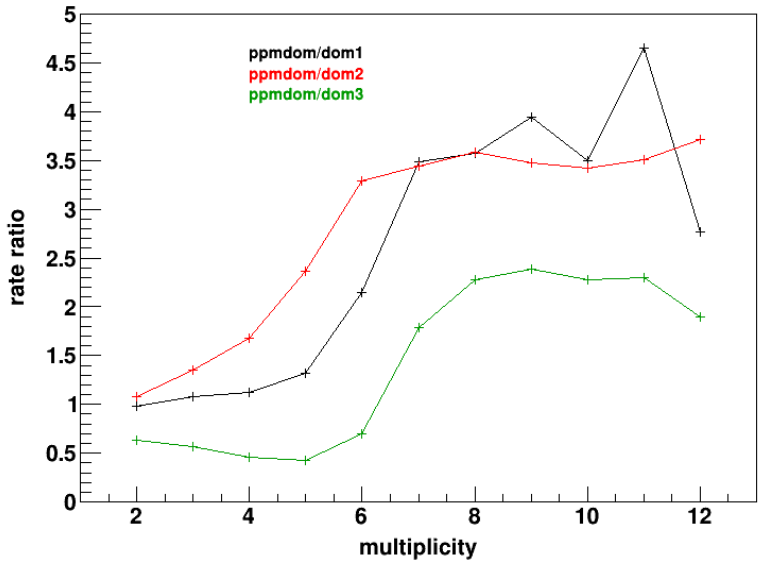
	PPM-DOM [Hz]	PPM-DU [Hz]			$\frac{PPMDOM}{DOM1}$
		DOM 1	DOM 2	DOM 3	
single	$244 \cdot 10^3$	$166 \cdot 10^3_{\pm 4 \cdot 10^3}$	$162 \cdot 10^3_{\pm 12 \cdot 10^3}$	$188 \cdot 10^3_{\pm 14 \cdot 10^3}$	1.49
2fold	$302.4_{\pm 23.5}$	$307.4_{\pm 4.7}$	$278.2_{\pm 5.50}$	$473.5_{\pm 7.2}$	0.984
3fold	$25.09_{\pm 3.66}$	$23.15_{\pm 0.50}$	$18.56_{\pm 0.70}$	$44.07_{\pm 0.86}$	1.084
4fold	$2.266_{\pm 0.454}$	$2.028_{\pm 0.073}$	$1.347_{\pm 0.082}$	$4.895_{\pm 0.190}$	1.117
5fold	$0.226_{\pm 0.060}$	$0.171_{\pm 0.024}$	$0.096_{\pm 0.016}$	$0.534_{\pm 0.037}$	1.319
6fold	$0.040_{\pm 0.016}$	$0.018_{\pm 0.005}$	$0.012_{\pm 0.005}$	$0.057_{\pm 0.011}$	2.235
>6fold	$0.058_{\pm 0.021}$	$0.017_{\pm 0.006}$	$0.017_{\pm 0.006}$	$0.030_{\pm 0.011}$	3.456

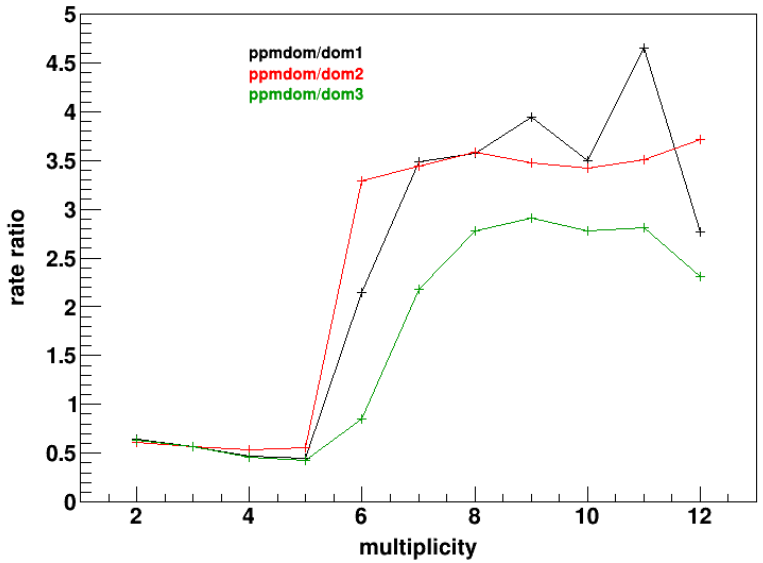
PPM-DU detection efficiency



- rate ratio driven by the detection efficiency ratio to the power of the multiplicity
- fit for multiplicities within in $[2; 5]$
- the relative detection efficiency given by the fit
- above 5, out of the single photo-electron regime

PPM-DOM detector efficiency





- correction from the relative efficiencies between DOMs of the PPM-DU
- correction from the surface area for DOM 3 of the PPM-DU

Conclusion

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