Rate problem investigation

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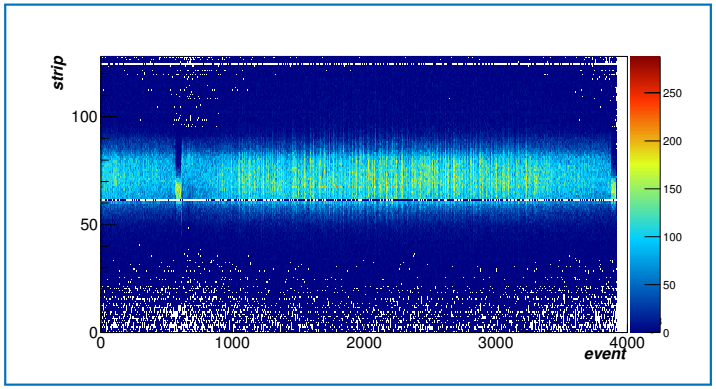
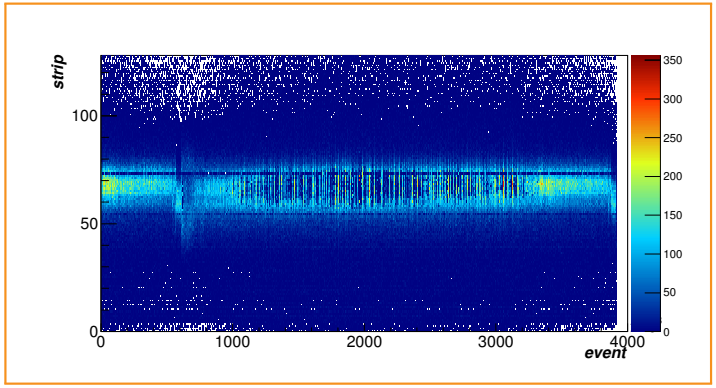
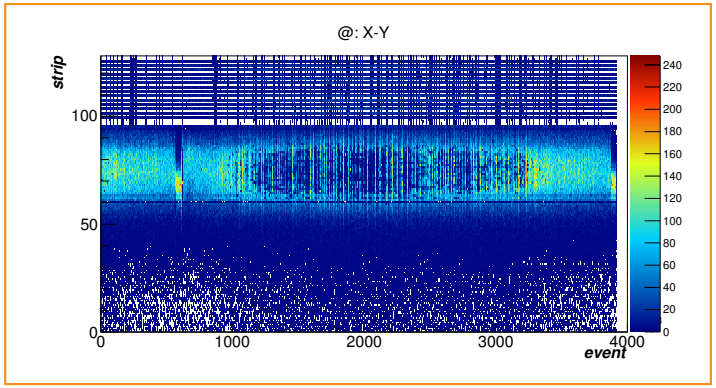
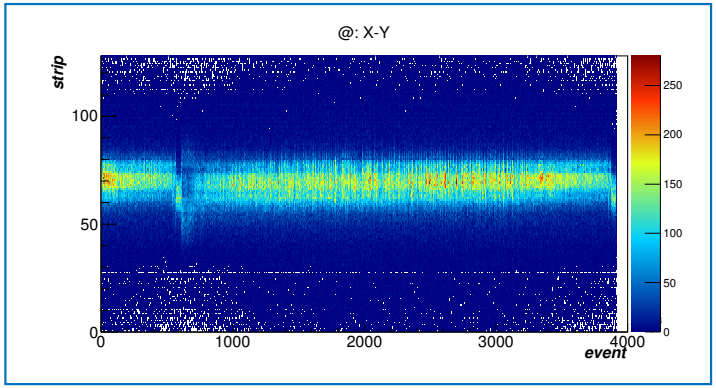
High intensity run

Data loss

For highest intensity runs, with beam rate > 300 kHz, significant drop of the detected hits on one sensor side.

	X-position	Y-position
1st det.		
2nd det.		

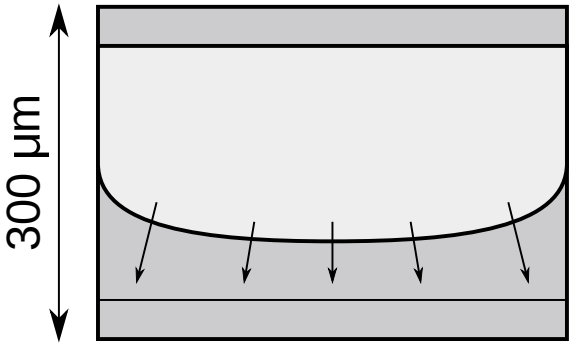
Negative polarity signal – HV side

Positive polarity signal – LV side

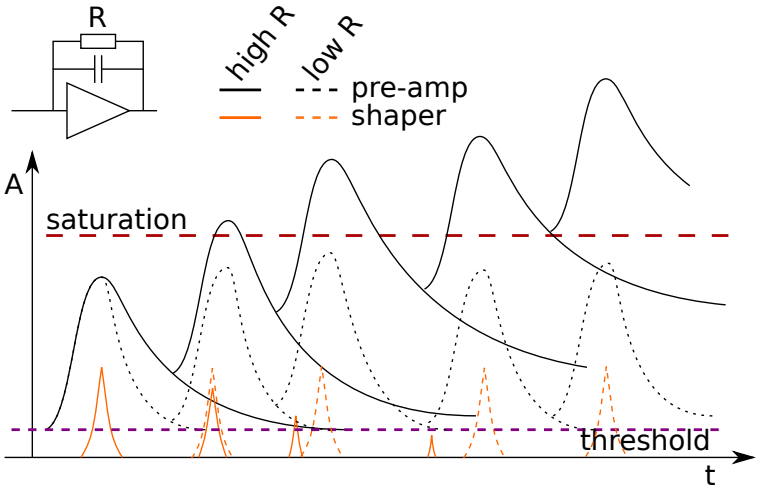
High intensity run

Possible solutions

1. Biasing problem
   - To low bias causes not fully depleted bulk of the sensor –In out case LV side.
   - But we are above biasing potential. . .
   - Tests with high intense beta source are planned.



2. Pre-amplifier saturation
   - With high data rate, possible pile-ups and saturation of pre-amplifier output.
   - This may lead to degradation of the shaper output amplitude.
   - Discriminator is not detecting hits any more.
   - This effect was noticed in 2012 by CBM-GEM group.
   - Solution → reduction of the discharge resistance R.



Ludwig's tests

Eleni source

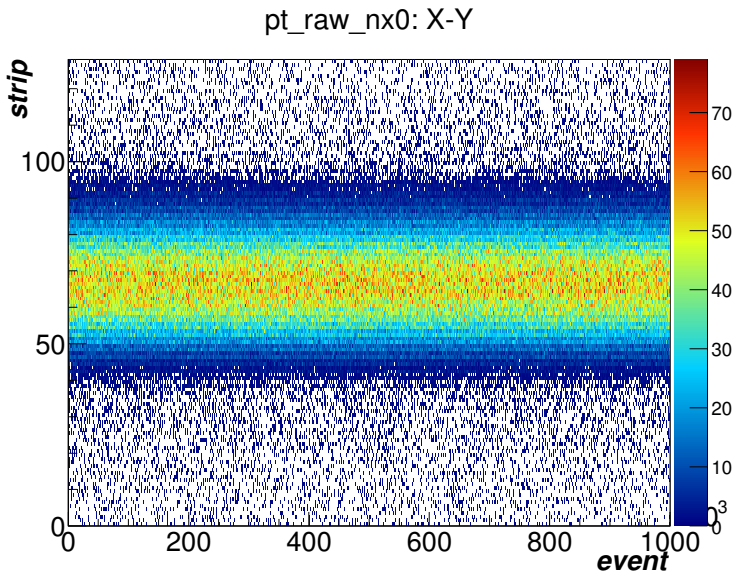
Technische Universität München

Excellence Cluster Universe

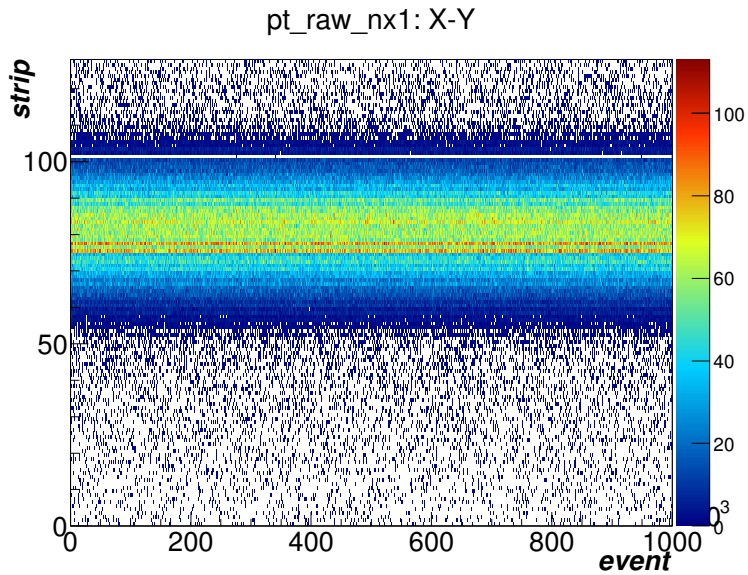
Radioactive sources:

Alpha tripple alpha source, $A_a \approx 1\,\text{kBq}$, $R \approx 300\,\text{s}^{-1}$

Eleni tripple alpha source, $A_e > 1\,\text{MBq}$, $R \approx 5 \times 10^5\,\text{s}^{-1}$



Positive polarity signal – LV side



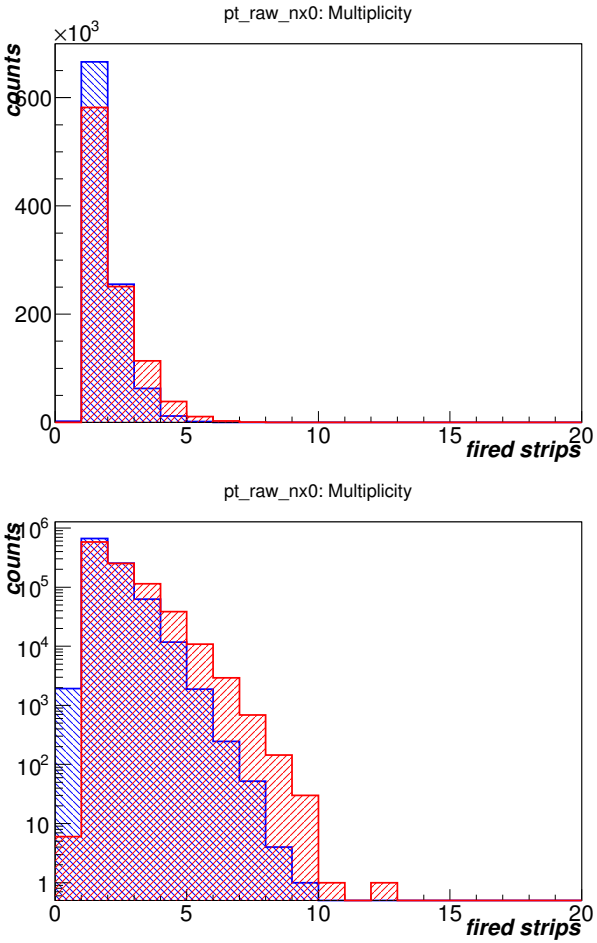
Negative polarity signal – HV side

Ludwig's tests

Bias vs. rate scan

HV [V]	Vbfb	Rate [1/s] Nx-0	Nx-1	Pileup-0	Pileup-1
150	30	507k	450k	2.3k	9.9k
150	130	506k	423k	3.7k	2.7k
140	130	501k	426k	3.8k	2.9k
130	130	— no significant change —			
120	130	— n.s.c. —			
110	130	— n.s.c. —			
100	130	520k	432k	?	?
100	30	592k	471k	2.3k	8.5k

Conclusion: no significant influence of the bias voltage to the data rate.



Summary

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- No influence of the source intensity to the data rate
- No influence of biasing to the data rate

Outlook

- Checking the charge value for reduced bias
- Repeat tests with the same firmware like in Cosy