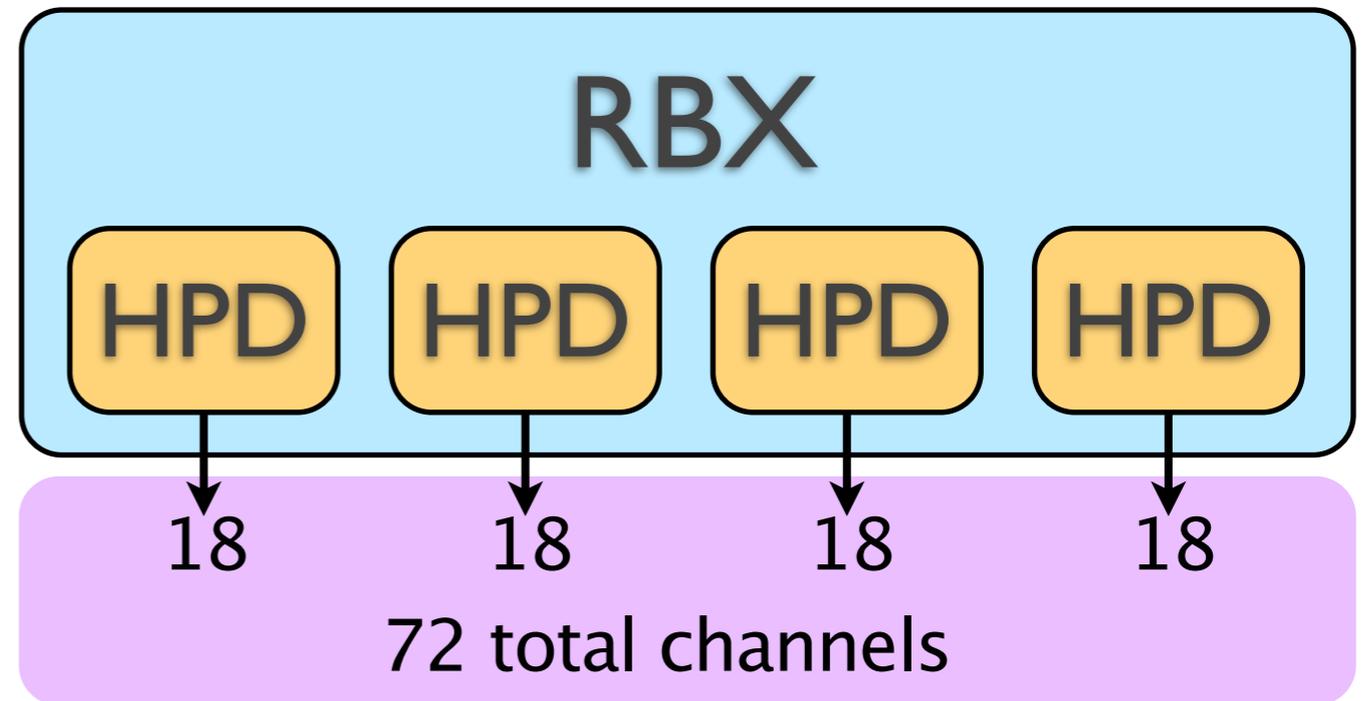


Hcal HPD/RBX Noise in CRAFT 09

S. Kunori, J. Wang,
F. Santanastasio,
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15 September 2009

3 Types of Noise

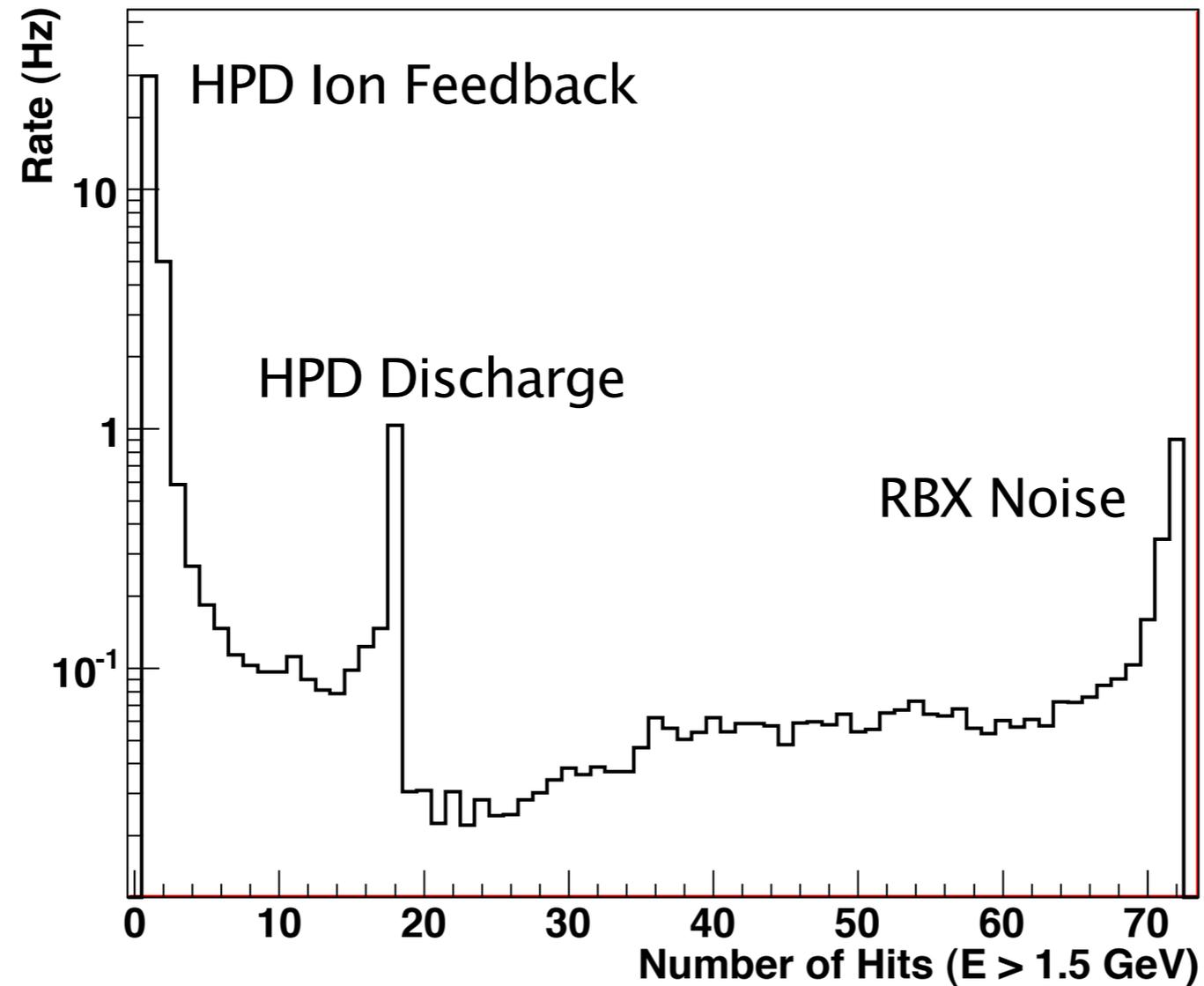


Noise Type	Hit Multiplicity
HPD ion feedback	$< 8^*$ hits in a single HPD
HPD discharge	$\geq 8^*$ hits in a single HPD
RBX noise	Hits in more than one HPD

* 8 is arbitrary. HPD ion feedback (discharge) events are low (high) hit multiplicity events.

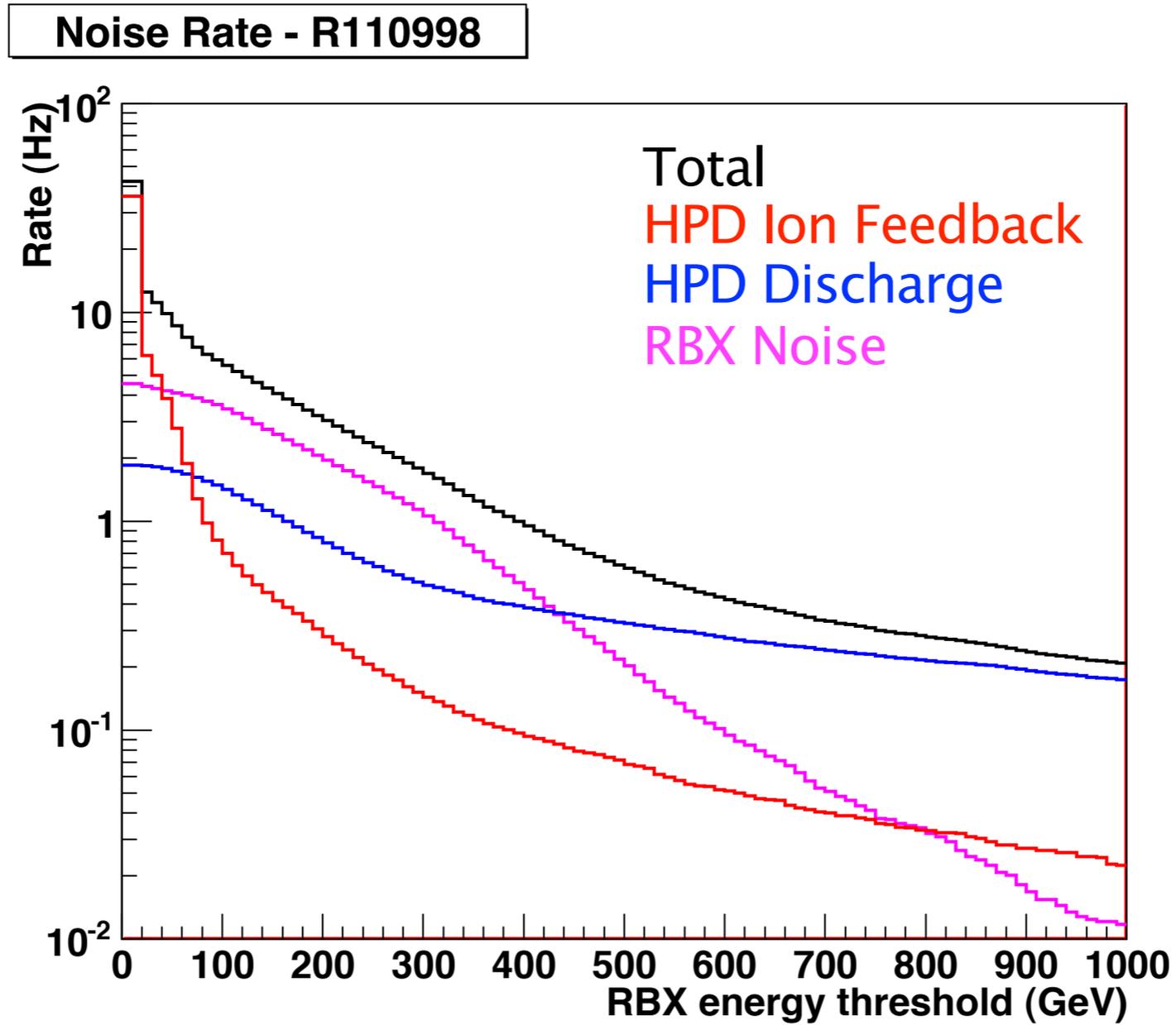
3 Types of Noise

Number of Hits in RBX



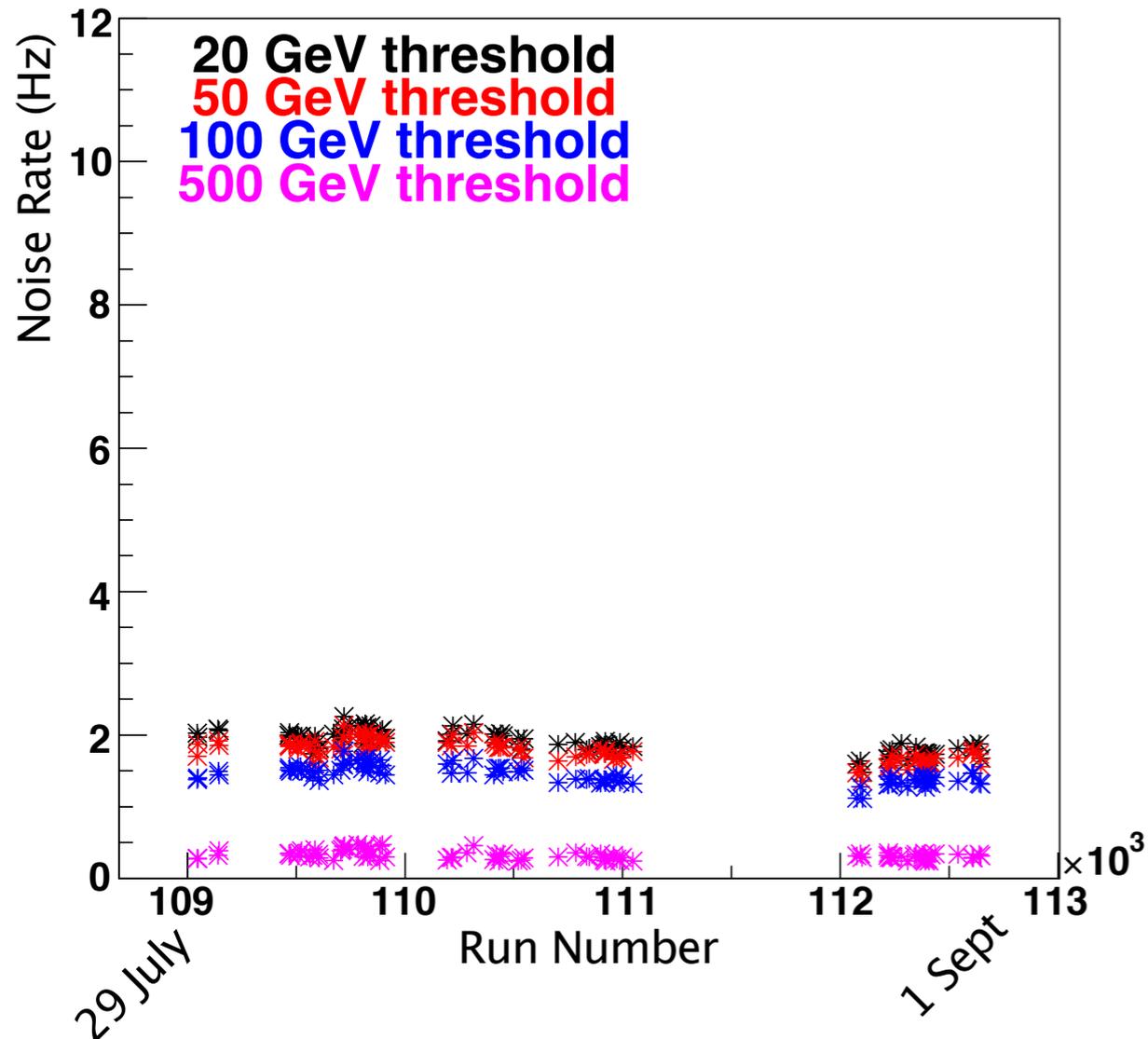
- 18 channels/HPD.
- 72 channels/RBX.

Noise Rates in CRAFT 09

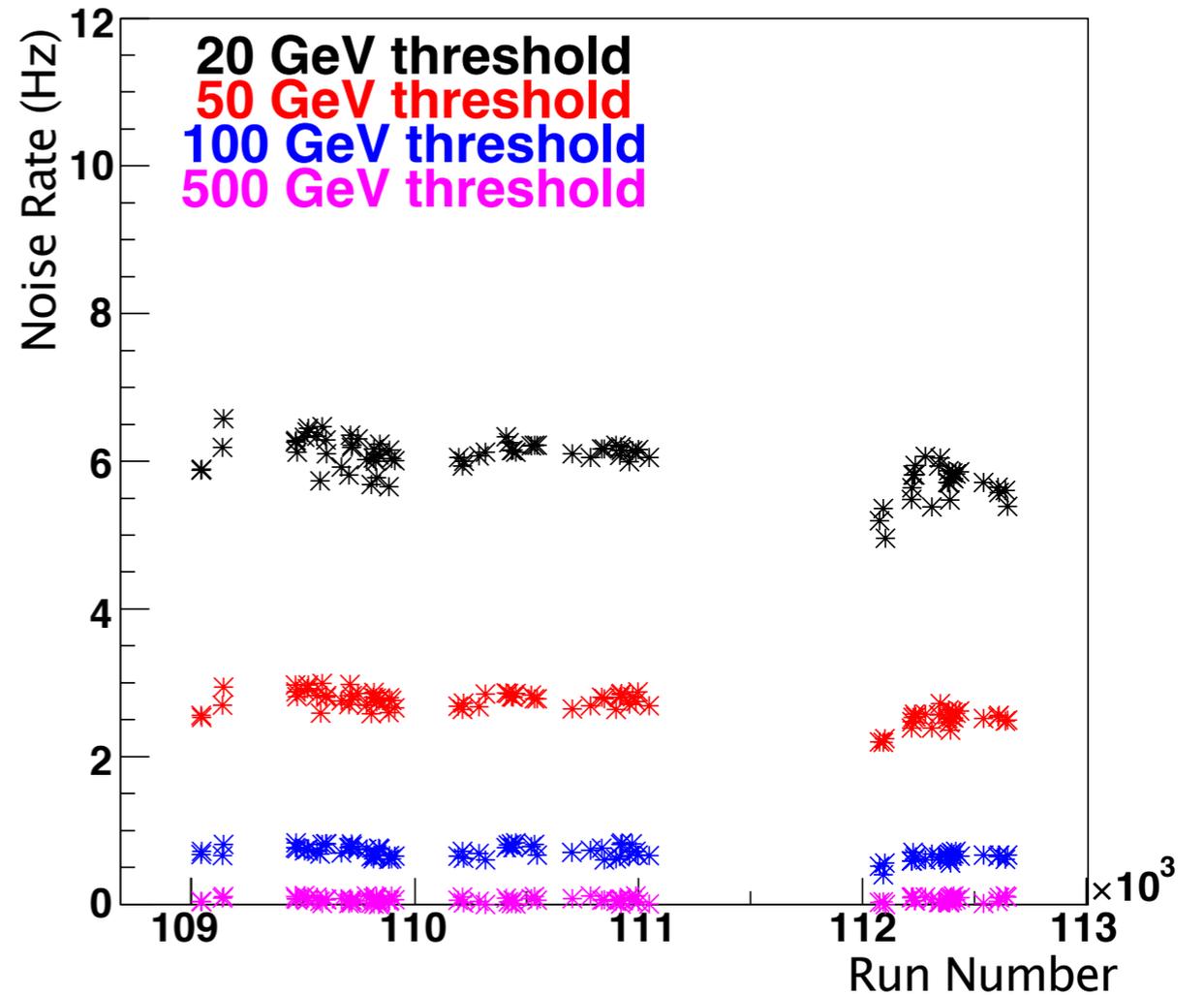


HPD Noise Stable in CRAFT 09

HPD Discharge Rate (Hz)

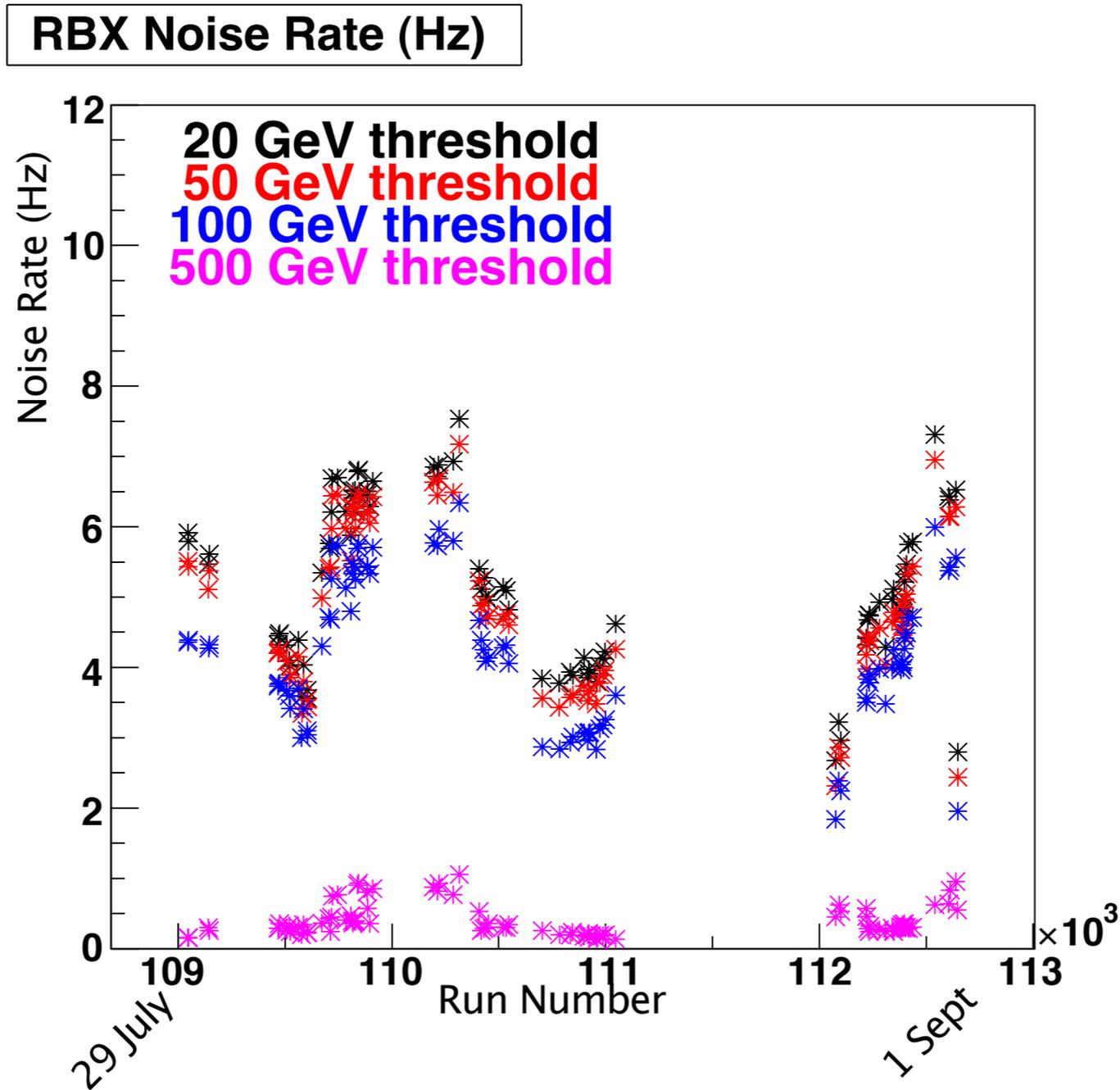


HPD Ion Feedback Rate (Hz)



- Threshold is on total energy in RBX.
- Total noise rates (all HB/HE HPDs summed) averaged over all lumi segs.
- HPD ion feedback rate (20 GeV threshold) \cong 6 Hz.

RBX Noise



- Threshold is on total energy in RBX.
- Trends in RBX noise are being investigated.
- $4 \text{ Hz} < \text{RBX noise rate (20 GeV threshold)} < 7.5 \text{ Hz}$.

HPD Noise : CRAFT 09 vs CRAFT 08

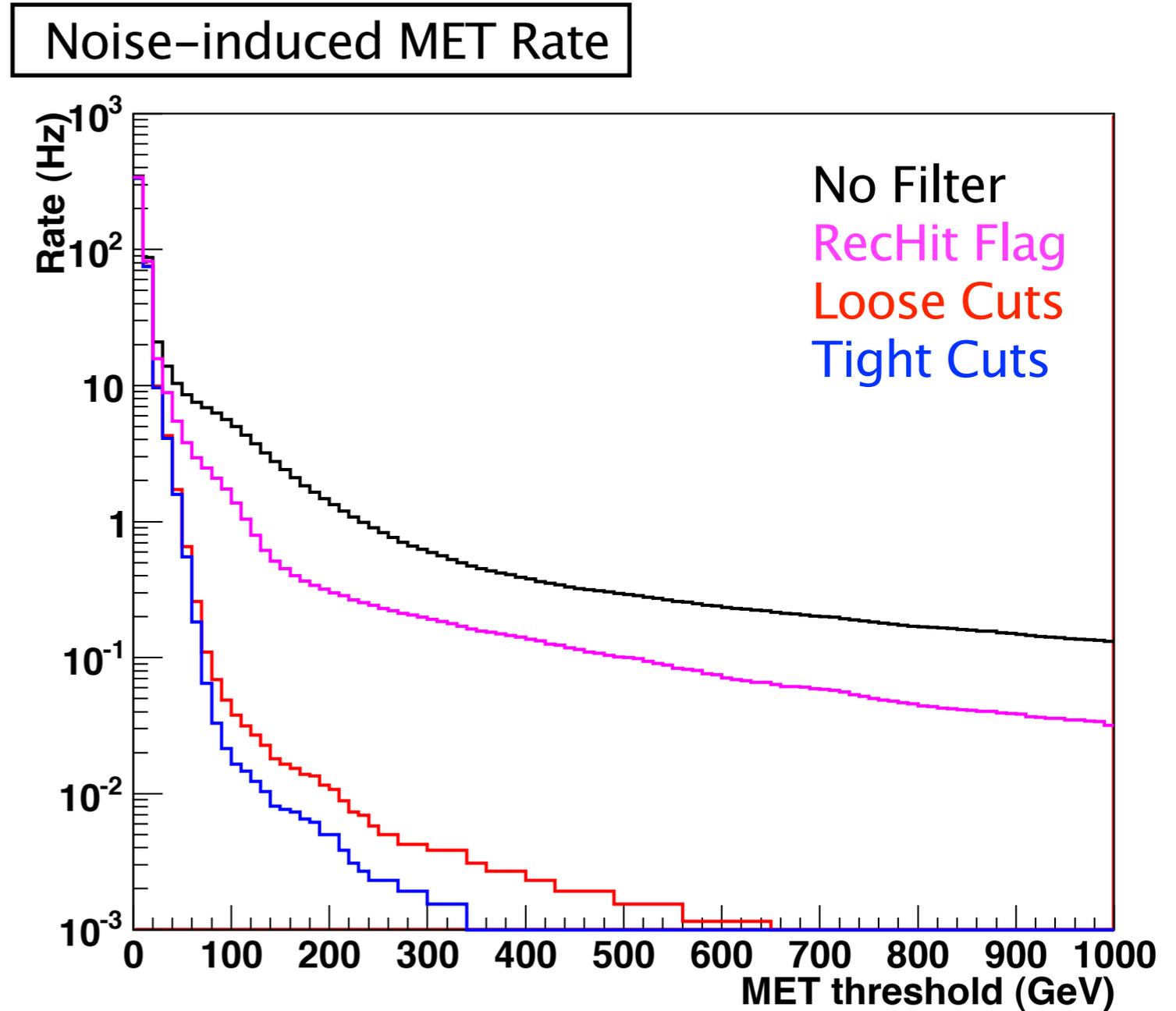
- HPD noise above 50 fC (\cong 10 GeV) threshold reduced by factor ~ 2 in CRAFT 09.
 - Replaced noisiest HPDs during shutdown.
 - HB/HE HV lowered from 7.5 kV to 7.0 kV (decreasing gain $\sim 12\%$).

Noise Rates*	0 T	3.8 T
CRAFT 08	0.27 Hz	0.29 Hz
CRAFT 09	0.14 Hz	0.16 Hz

*Per HPD in HB/HE for ~ 10 GeV threshold.

Rate of Noise-induced MET

- Noise filter uses hit pulse shape, multiplicity, timing, and ADC readout errors.
- **Loose** (**Tight**) filtering on these inputs keeps **99.6%** (**96.9%**) of top events.



Rate of Noise-induced MET II

- Noise contribution to MET HLT rates expected to be negligible during `09-`10 LHC run.
- Measured MET L1 rates (noise dominated) during CRAFT09:
 - $L1_ETM20 \approx 10 \text{ Hz}$ for 3446 bunch crossings (BX).
 - For 43 (432) BX at $L=8E29$ ($8E32$) at start (end) of 09/10 LHC run, $L1_ETM20 \approx 0.1 \text{ Hz}$ (1 Hz).
- Expected physics MET rates (from MC):
 - $L1_ETM20 \approx 14 \text{ Hz}$ for $8E29$.
 - $L1_ETM20 \approx 10 \text{ Hz}$ for $1E31$ (with prescale of 20).