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Progress in the Block Normal ETG

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Block Normal Improvements Since November

- Integrated Simulations Engine into BN-Pipeline (Stuver)
  - Now able to inject signals in strain across all IFOs
- Integrated coincidence step into BN-Pipeline
  - Time-shifting and zero-lag
- Change-point iteration Algorithm improved
- In-band *calibrated* energy calculated
- Cross-band merging
- Job completion verification checking done.
- Handoff of triggers to r-statistic

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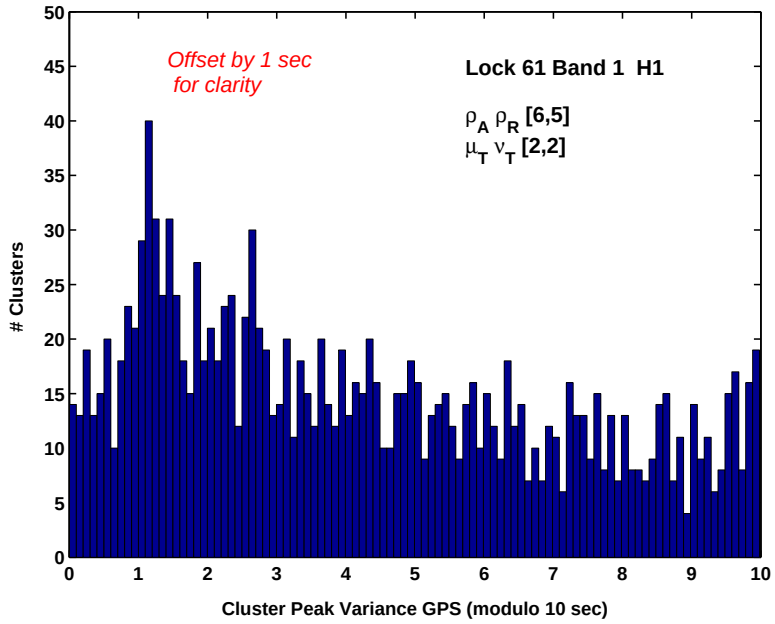
BlockNormal Recent Milestones

- S2 Playground analyzed / Tuning done.
- S2 Burst MDC Frames analyzed
  (Sine-Gaussian, Gaussian, Black Hole Ring Downs)
- S2 Non-Playground fully analyzed.

Change-point Iteration Algorithm improved

- ~10 s periodicity

BEFORE:



Change-point Iteration Algorithm improved

- ~10 s periodicity

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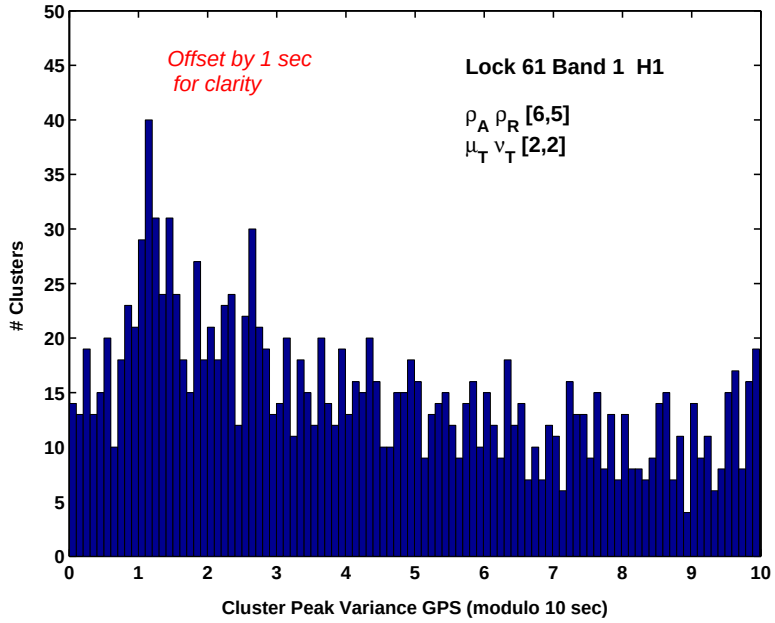
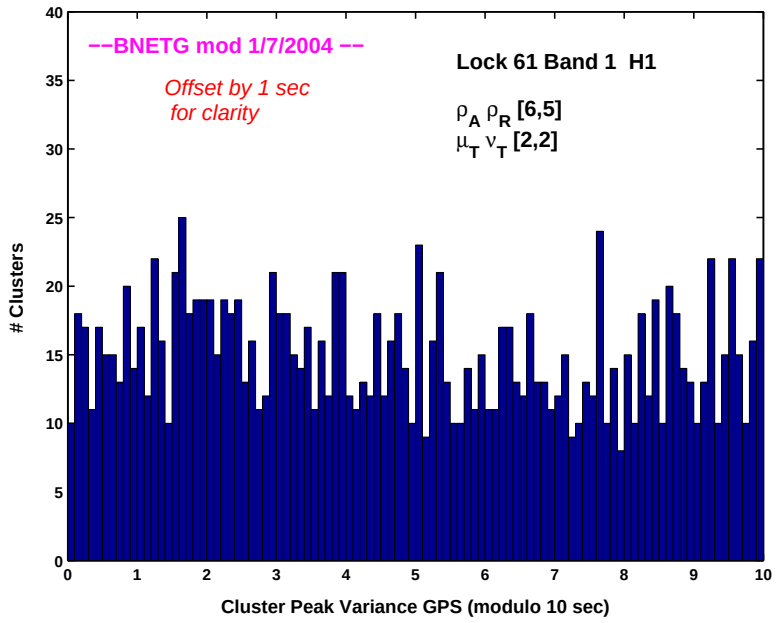


AFTER



Calibrating BlockNormal Triggers

- To determine an "energy" in counts:

$$E_{\text{counts}} = \sum_i T_i \left[\mu_i^2 + \frac{N-1}{N} \sigma_i^2 \right]$$

Define an *average effective response function* for the *frequency band*:

$$\overline{|R_{\text{eff}}(t)|} = \frac{\Delta f}{f_{\text{H}} - f_{\text{L}}} \sum_i \left| \frac{1 + \alpha(t)\beta(t)G(f_i)}{\alpha(t)C(f_i)} \right|$$

In-band HRSS calculated:

$$h_{\text{rss}} = \sqrt{\frac{E_{\text{counts}}}{\overline{|R_{\text{eff}}(t)|}^2}}$$

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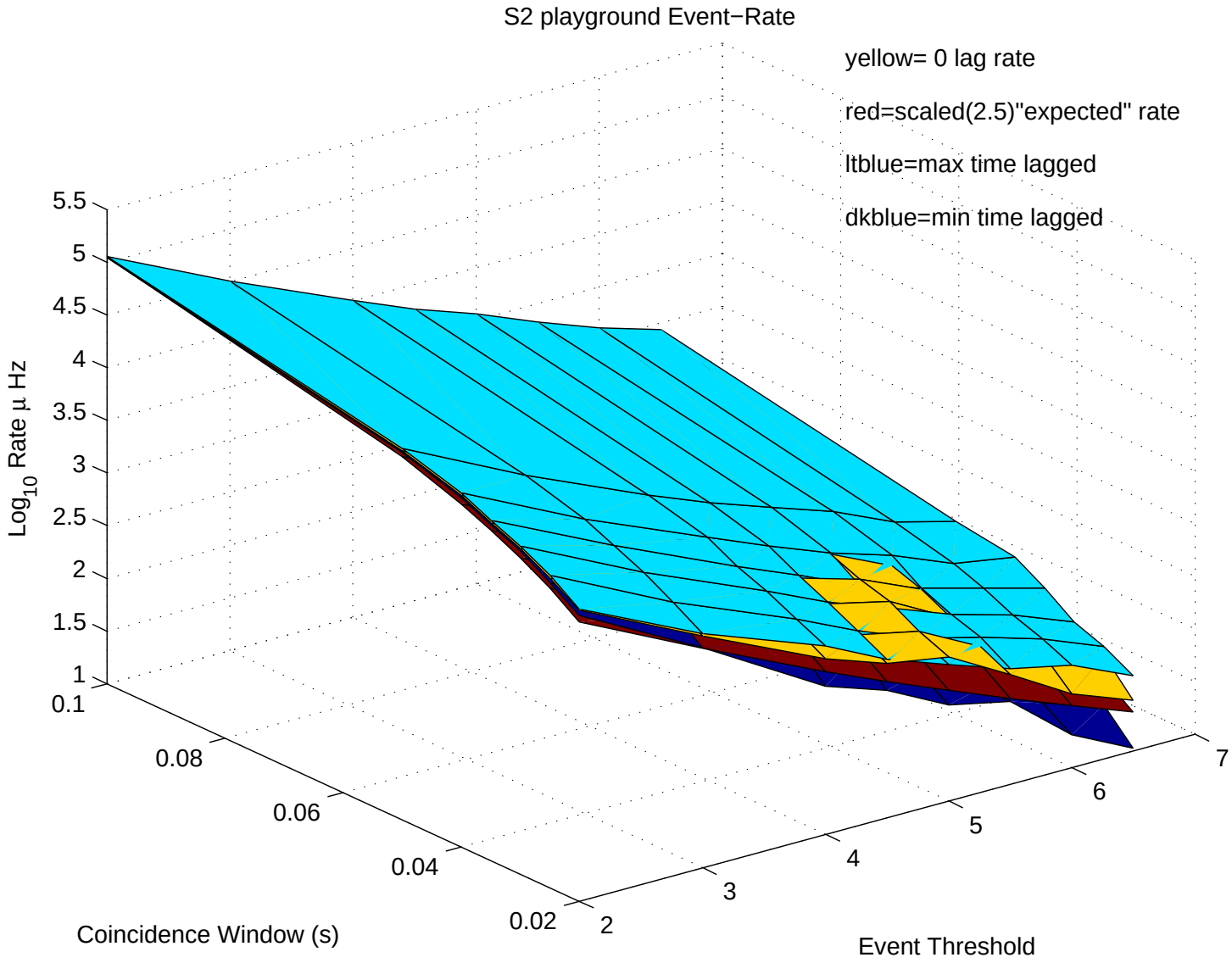
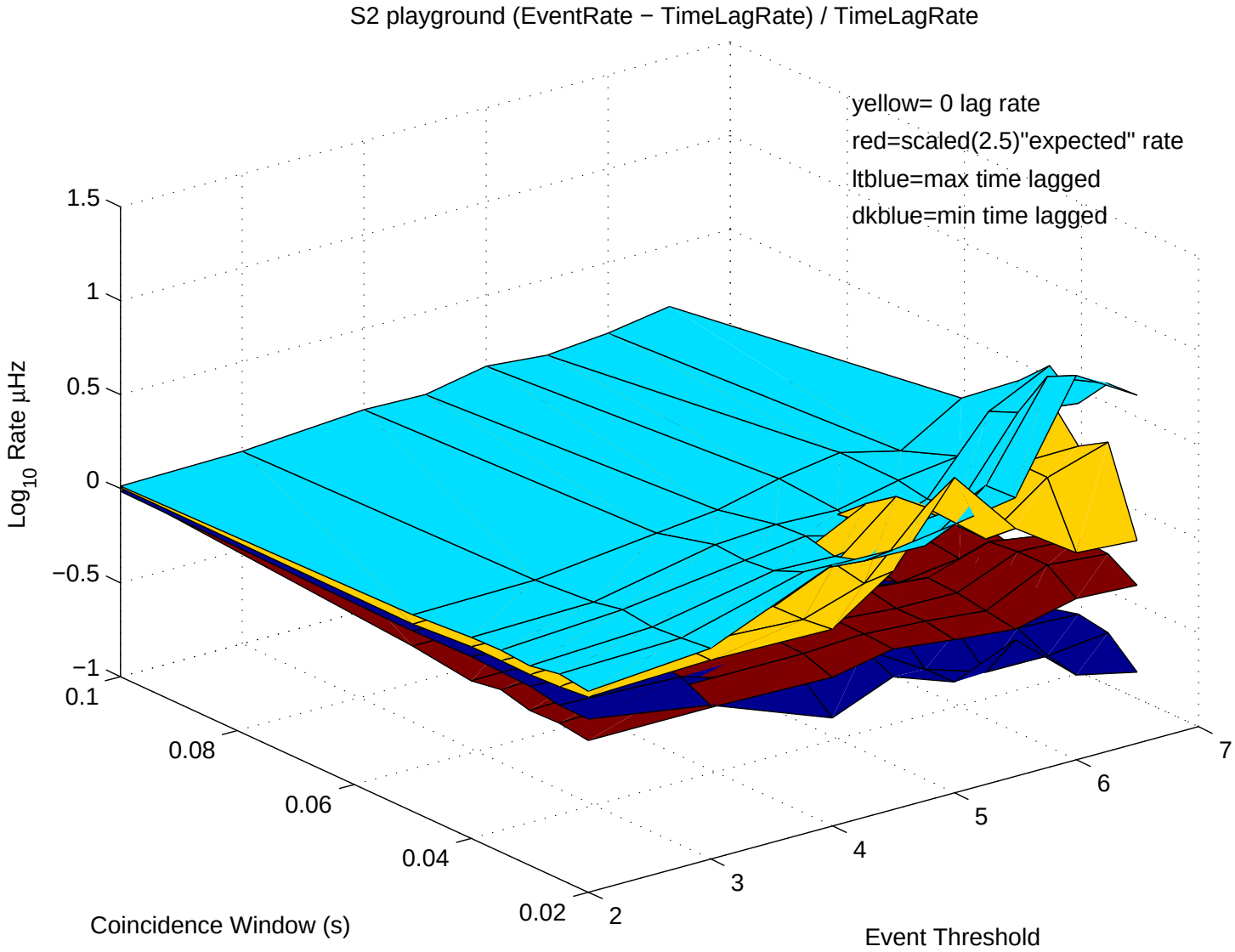
Tuning Block Normal

- “Tuning” Criteria of Burst group: 12 μHz
- Only two knobs:
  - Event Threshold
  - Coincidence Window

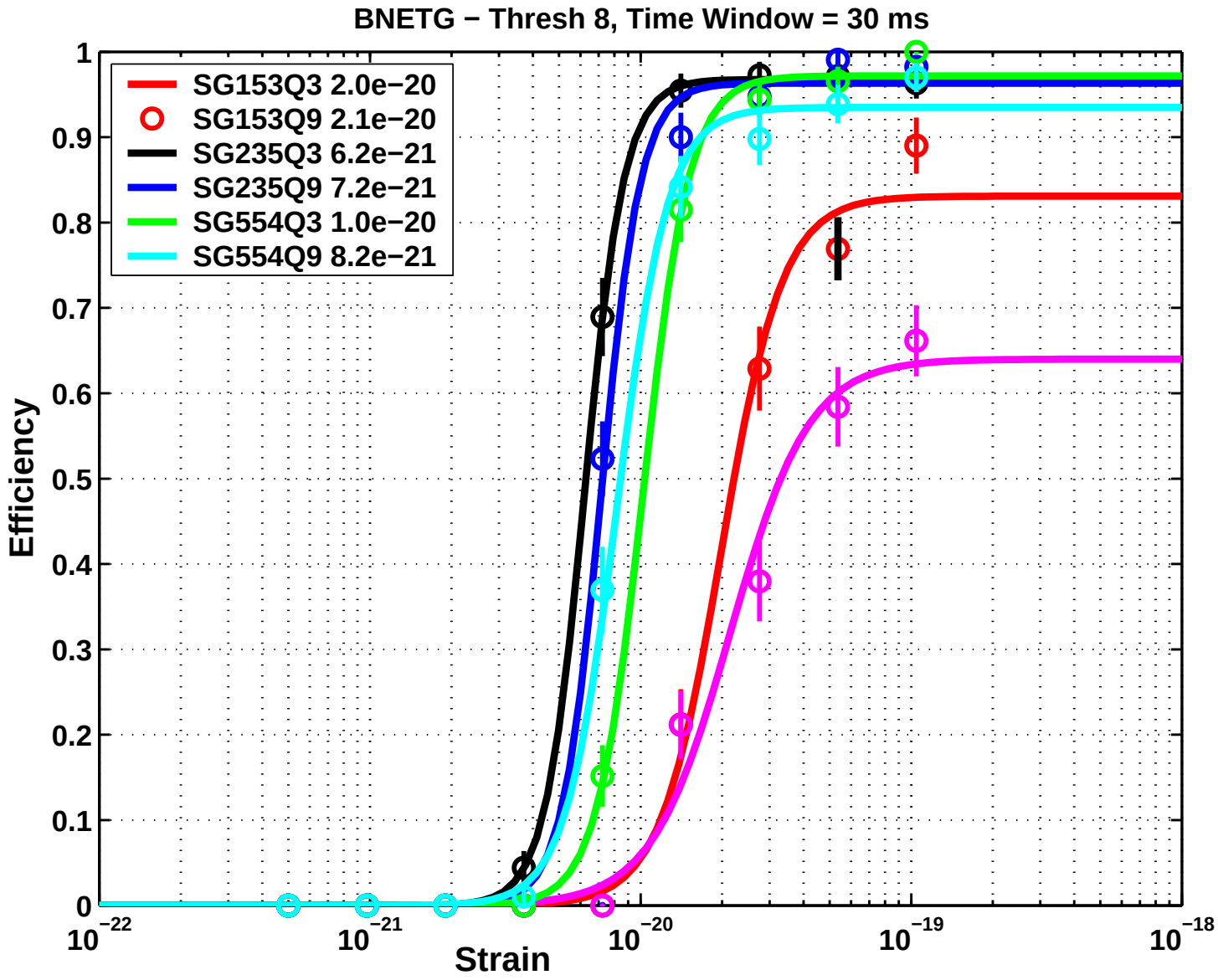
Tuning Block Normal



Tuning Block Normal



Tuning Block Normal: part 2



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Tuning Block Normal: part 2

band #	Frequency	Bandwidth	Minimum Event Size
3	128-192	64	15.6 ms
5	192-320	128	7.8 ms
2	320-448	128	7.8 ms
1	512-640	128	7.8 ms
4	704-1024	320	3.1 ms

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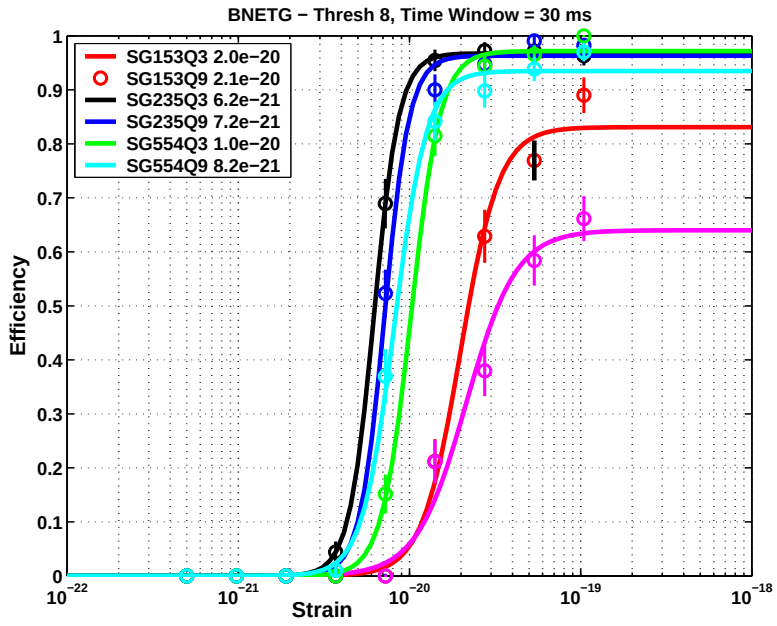
Tuning Block Normal: part 3

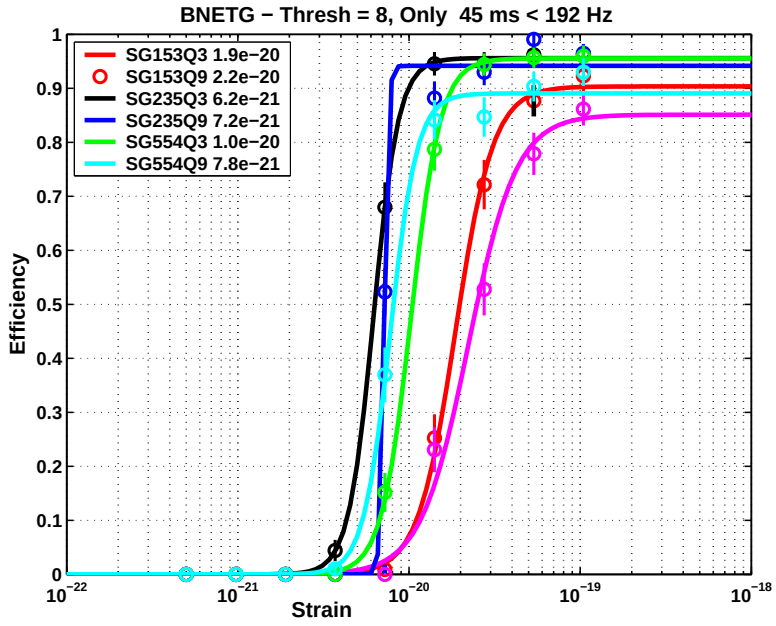
band 3 window	30 ms	45 ms	45 ms	45 ms
band 1,2,5 window	30 ms	30 ms	45 ms	45 ms
band 4 window	30 ms	30 ms	30 ms	45 ms
# false events (46 timelags)	72	76	137	163

Tuning Block Normal: part 2

BEFORE:



AFTER



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Where do we go from here?

- S3
- Alternative Tuning Strategies (Up to Burst group)
- Bands > 1Khz (for LIGO-TAMA)
- Proposed MATLAB Coding Guidelines (T040035-00-Z)
- Understand Coincident Rates vs. Dead Reckoning