Veto streams studies with pyCBC (and MBTA) offline O3 results

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Inputs

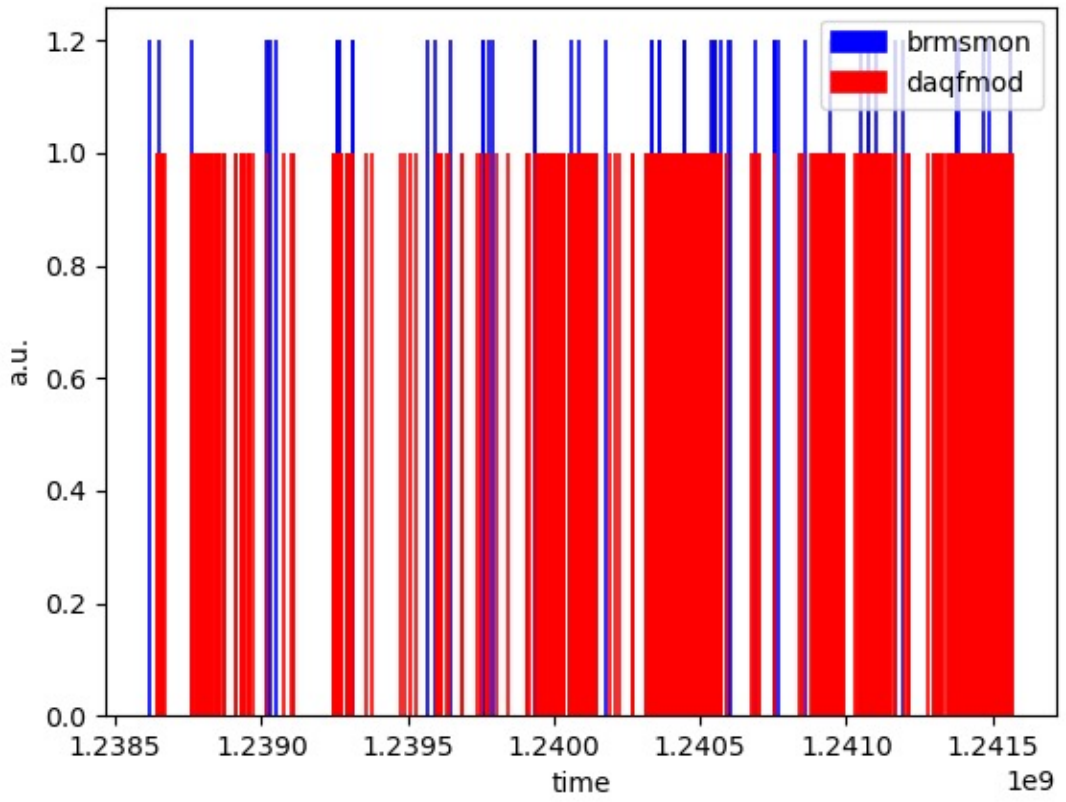
- Veto streams by Florent (April 1st – May 11th 2019, chunks 1 to 5)

- pyCBC : V single triggers (SNR > 6), clustered by raw/rwSNR.
  Info: ['approximant', 'bank_chisq', 'bank_chisq_dof', 'chisq', 'chisq_dof', 'cluster_window', 'coa_phase', 'cont_chisq', 'cont_chisq_dof', 'end_time', 'f_lower', 'mass1', 'mass2', 'psd_var_val', 'search', 'sg_chisq', 'sigmasq', 'snr', 'spin1z', 'spin2z', 'stat', 'template_duration', 'template_id']

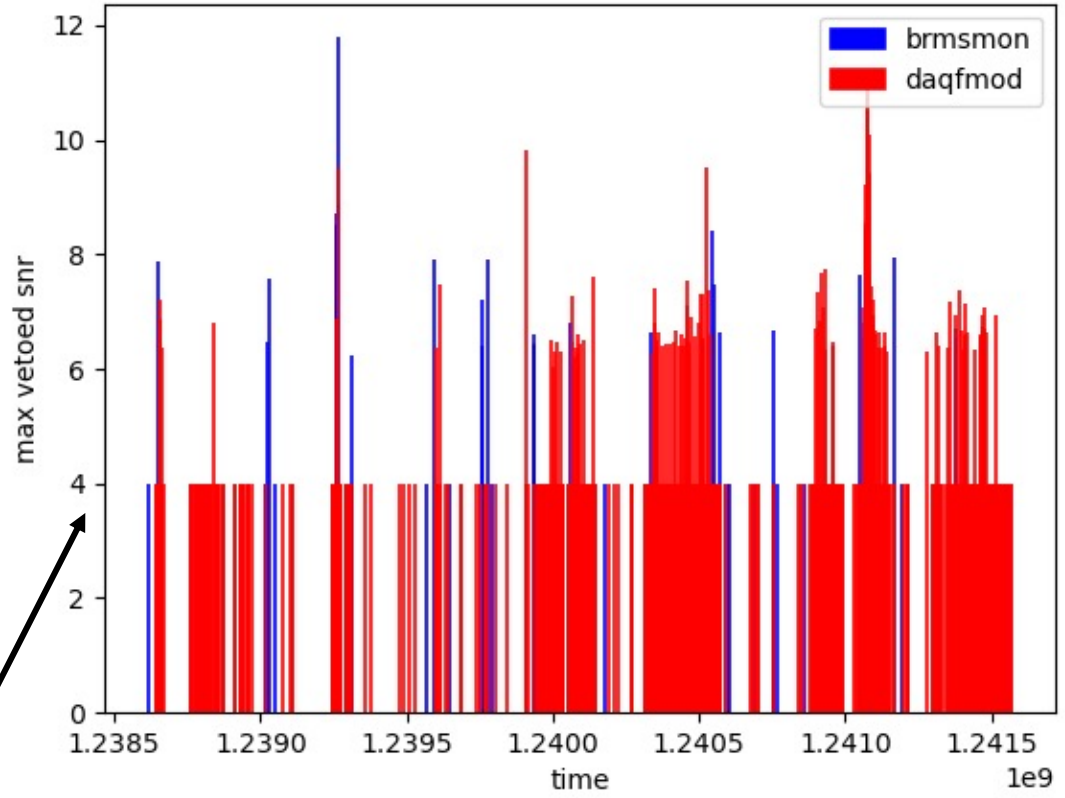
- MBTA :
  - cumulative number of events (32 Hz sampled) with SNR>4.8 for BBH and search
  - info about gating and ExcessRate.

The veto streams

Distribution vs time

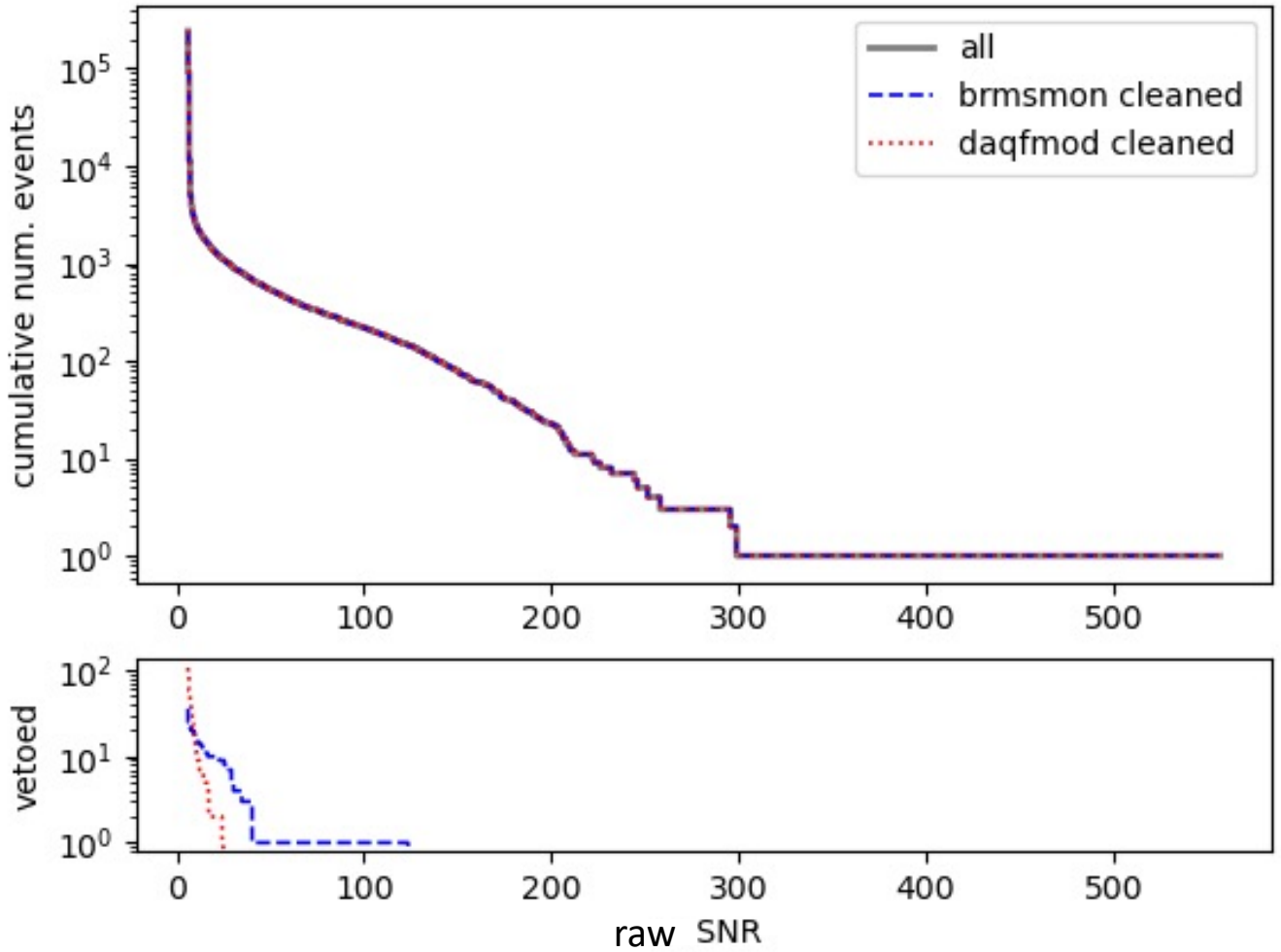


Maximum vetoed (rw)SNR - pyCBC



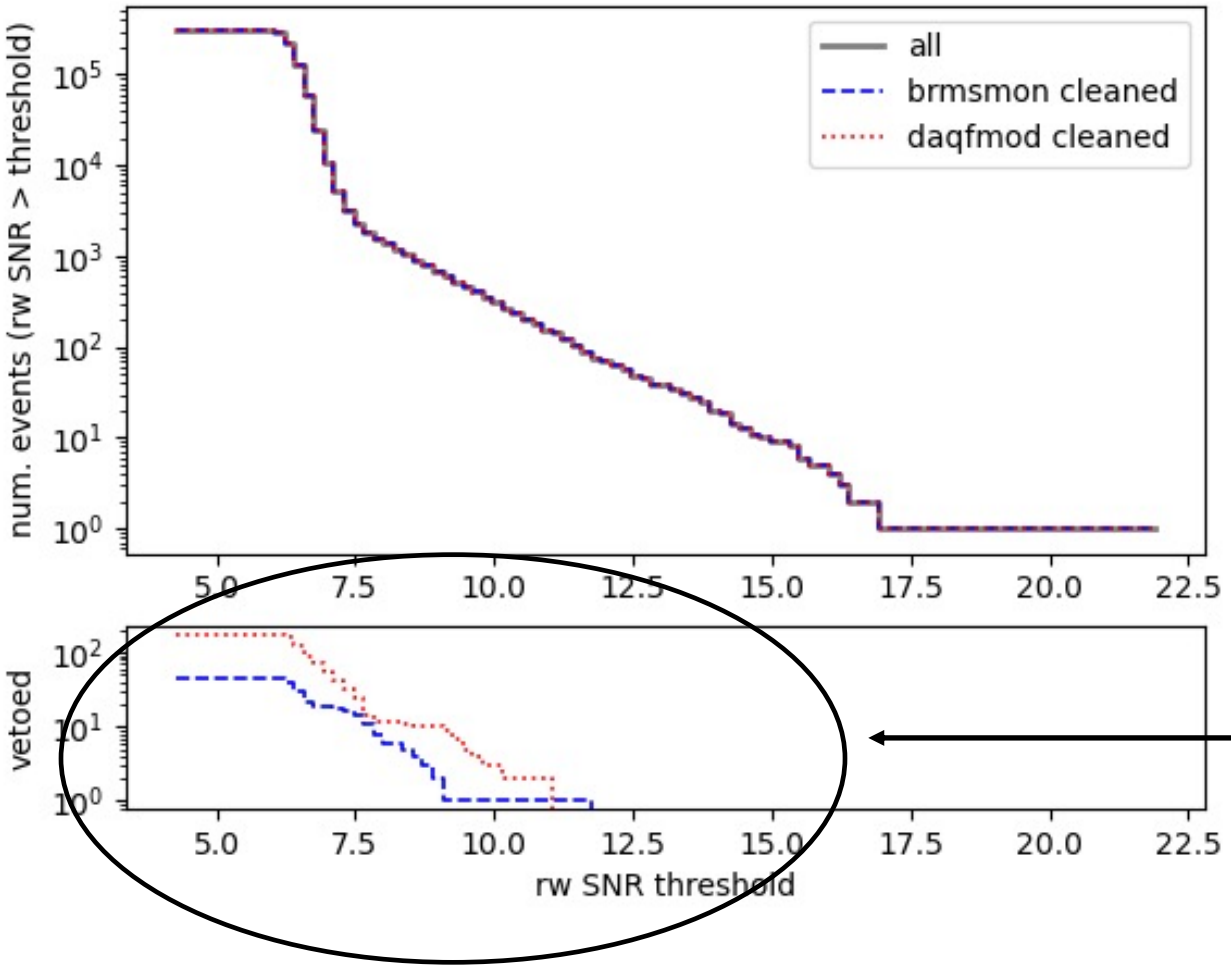
Vetoed SNR = 4 means no vetoed event

pyCBC – raw SNR



Cumulative number of vetoed events with raw SNR higher than the value on the x axis.

pyCBC – rw SNR



Cumulative number of vetoed events with raw SNR higher than the value on the x axis.

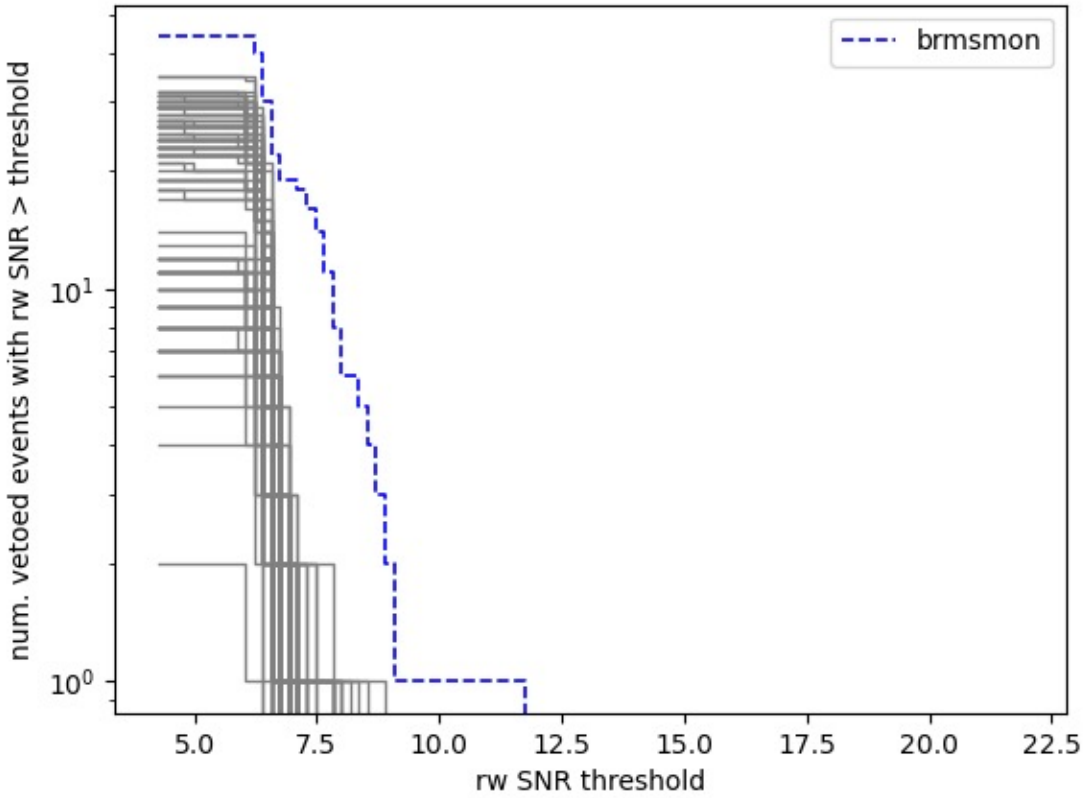
Overall, out of 244696 events

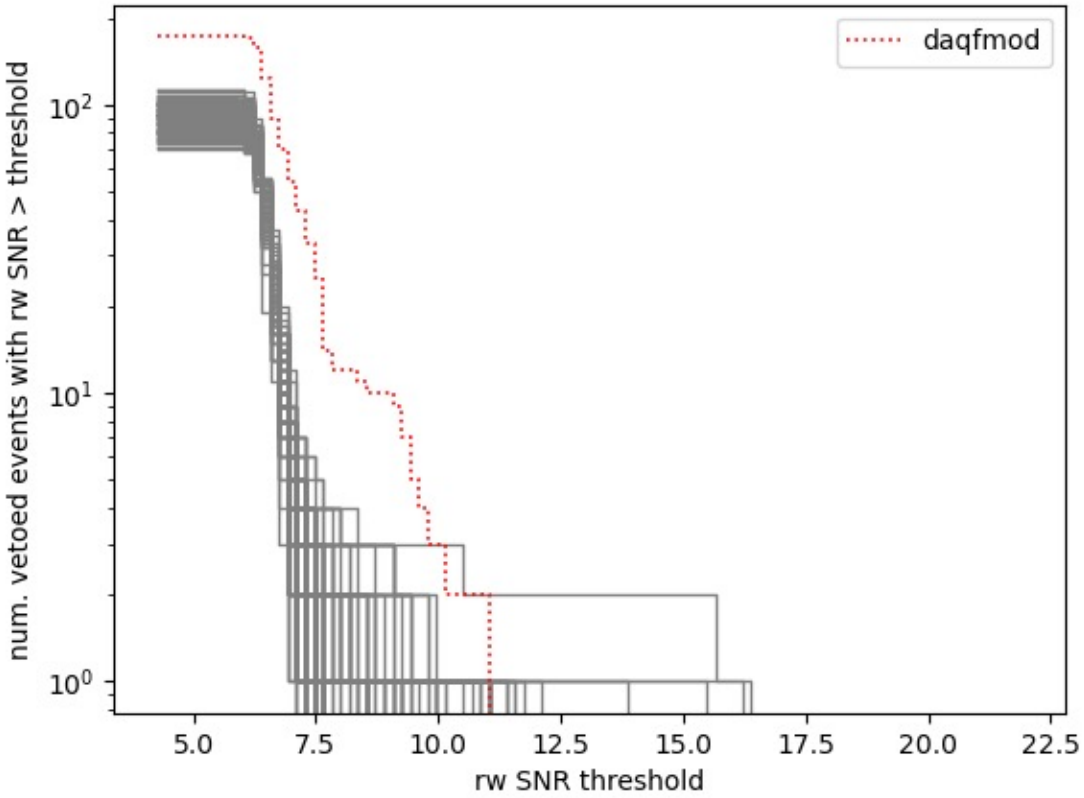
- 33 are vetoed by brmsmon (fraction 0.00013 +/- 0.000023)
- 62 are vetoed by daq_fmod (fraction 0.00025 +/- 0.00003)

In the next slides, these distributions when the vetoed segmentes are sihfted in time

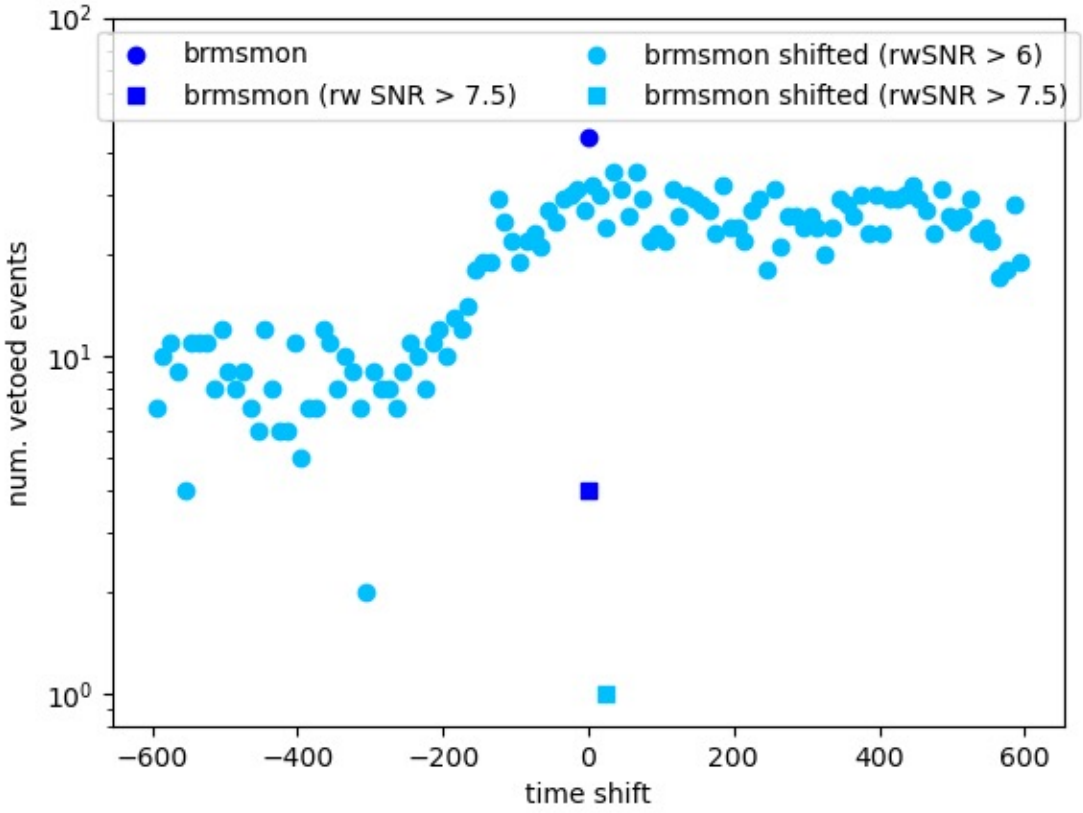
pyCBC – rw SNR – time shifts

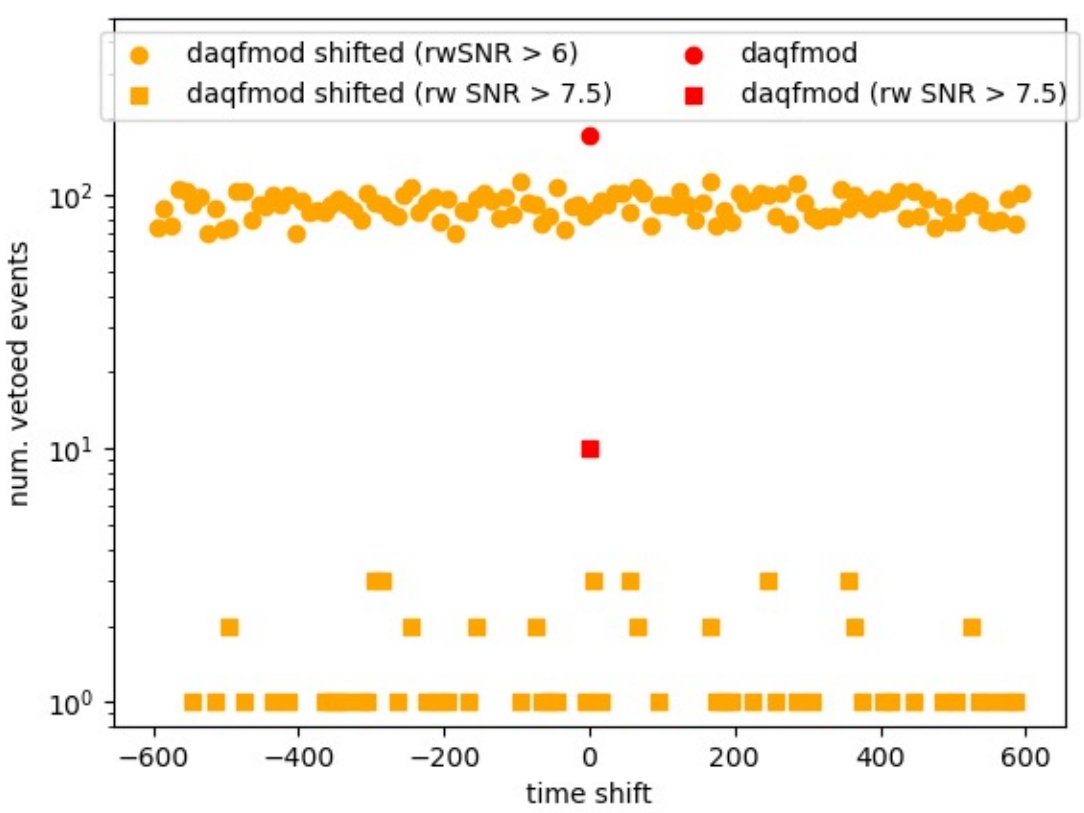
120 time shifts, from -600 to +600 seconds, in steps of 10 seconds



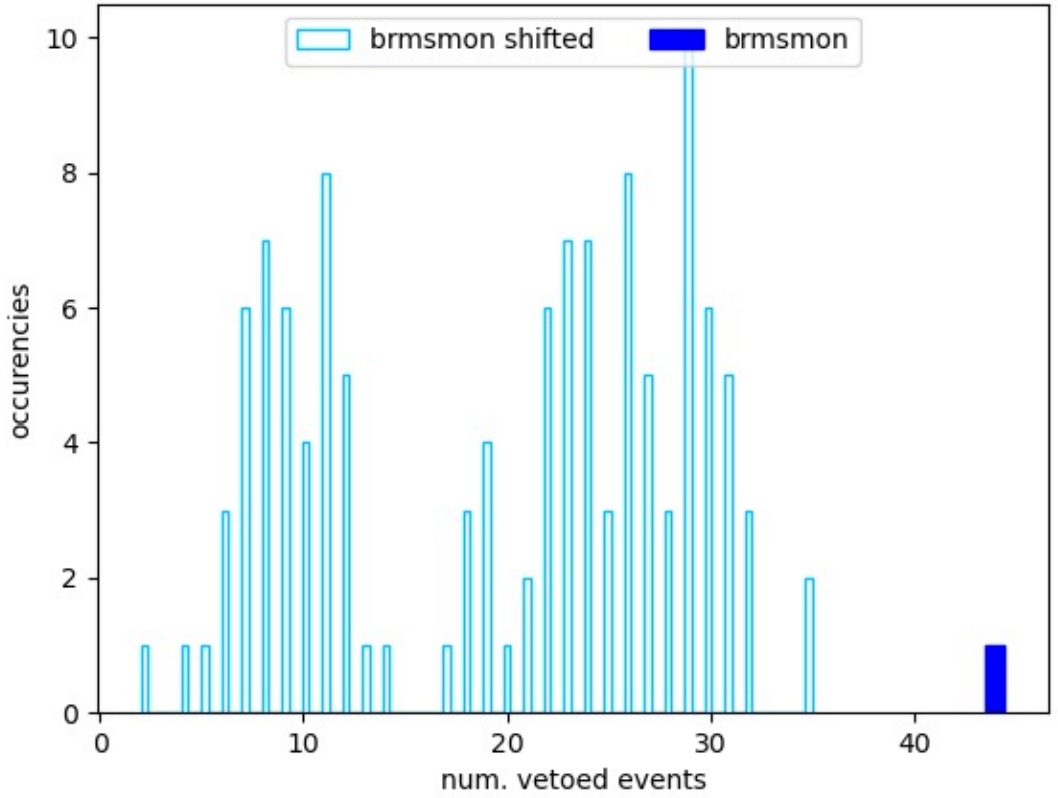


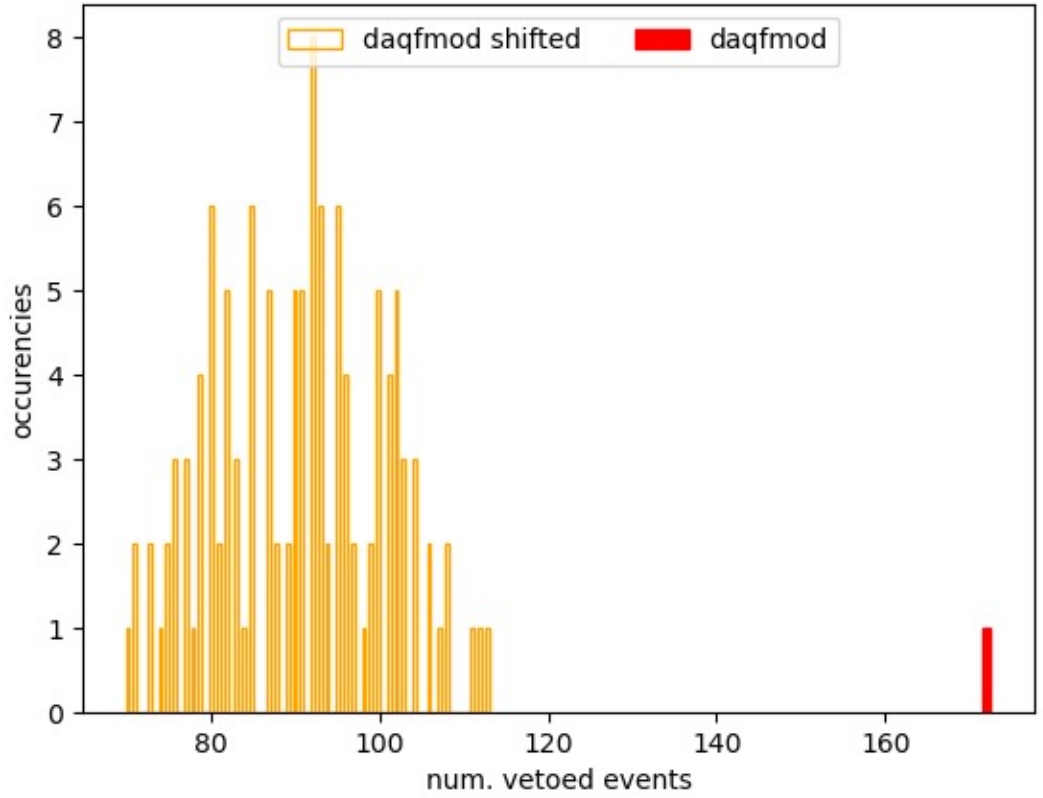
pyCBC – rw SNR – time shifts





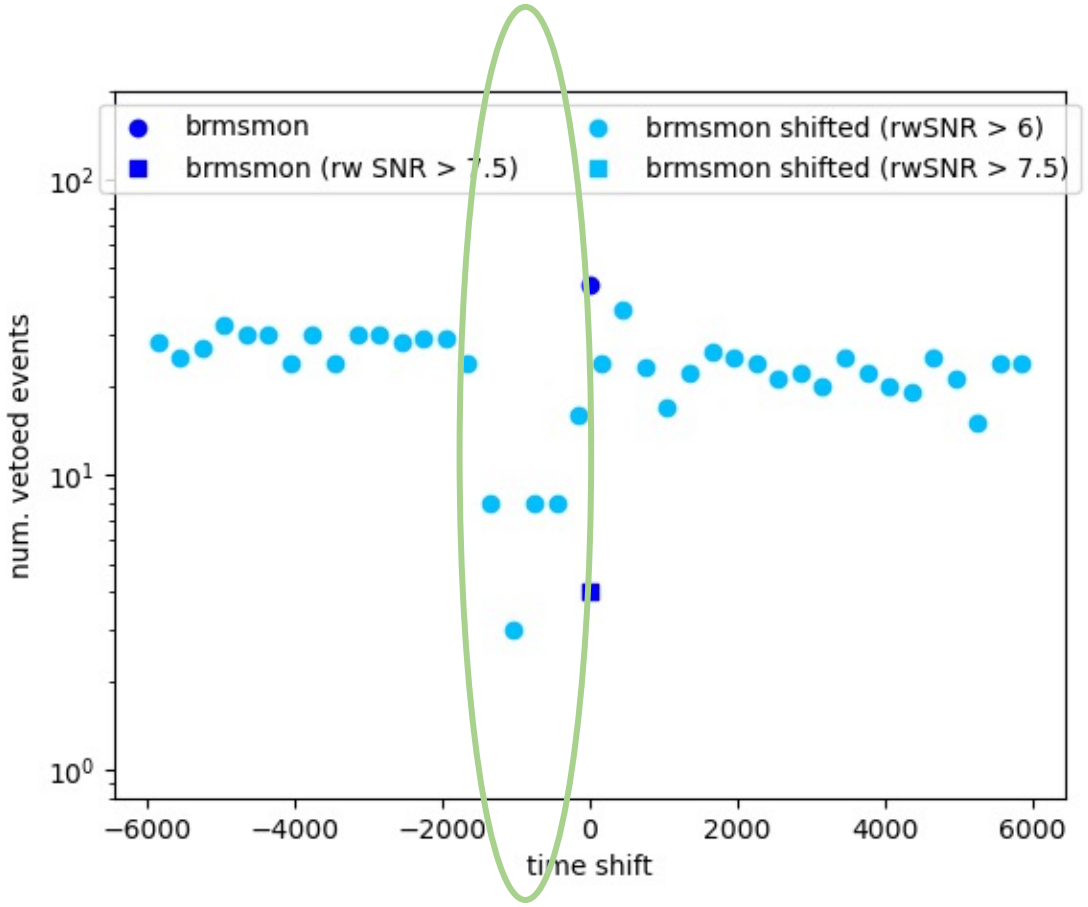
pyCBC – rw SNR – time shifts

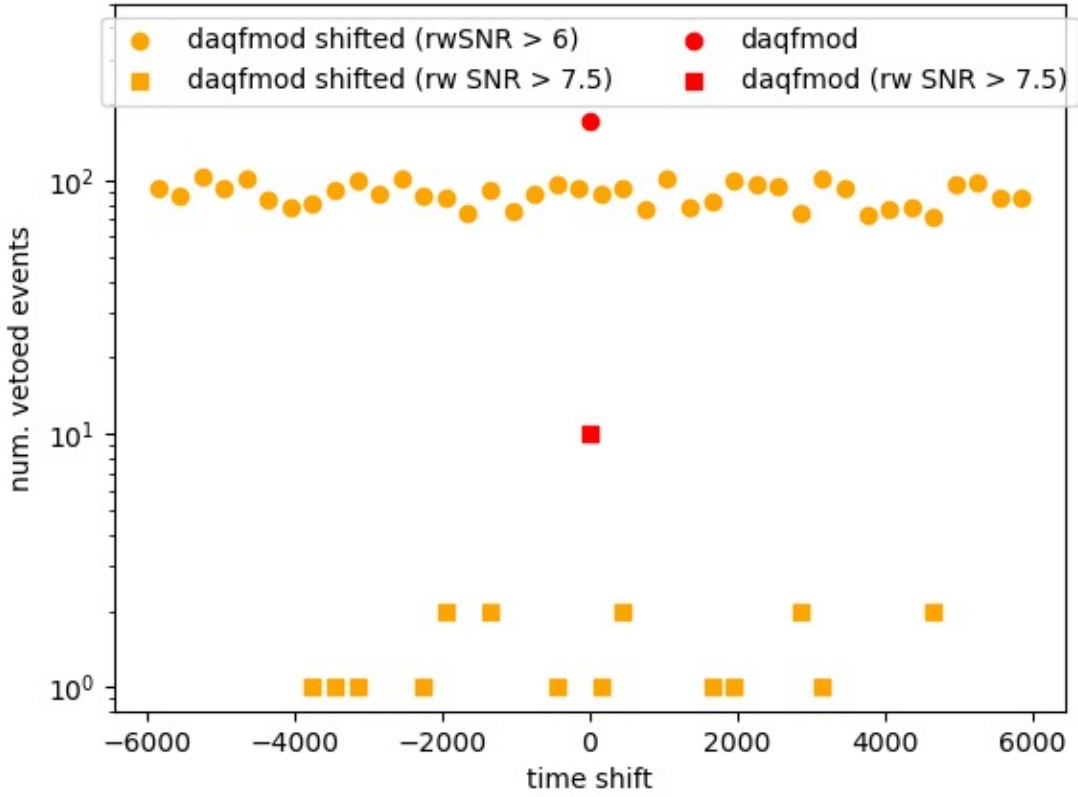




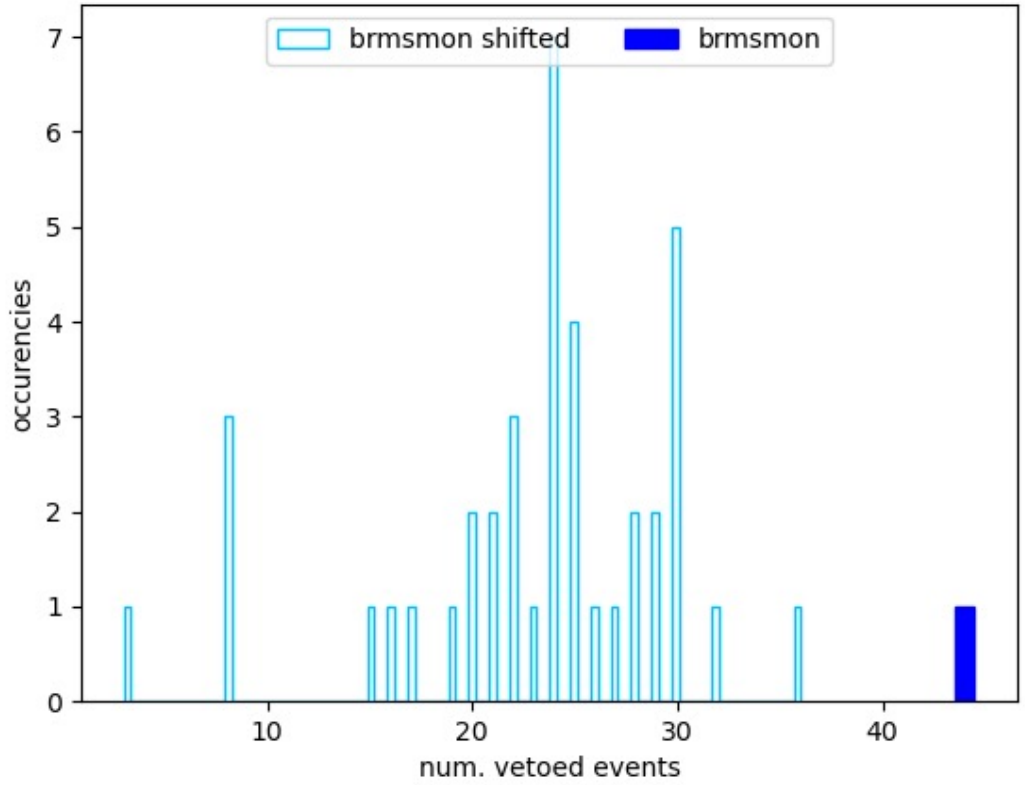
We can think of somehow using the distributions of values obtained for time-shifted vetoes to evaluate the ‘significance’ of the value observed for the nominal vetoes (more about double peak later)

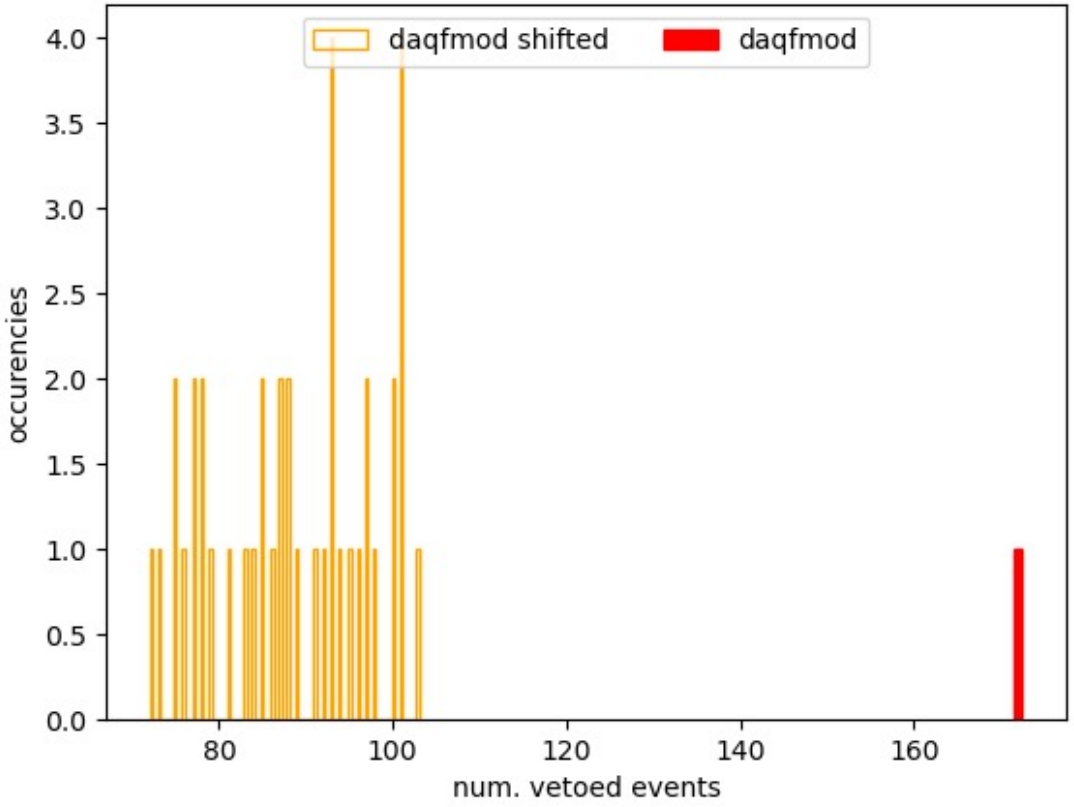
pyCBC – rw SNR – wider look





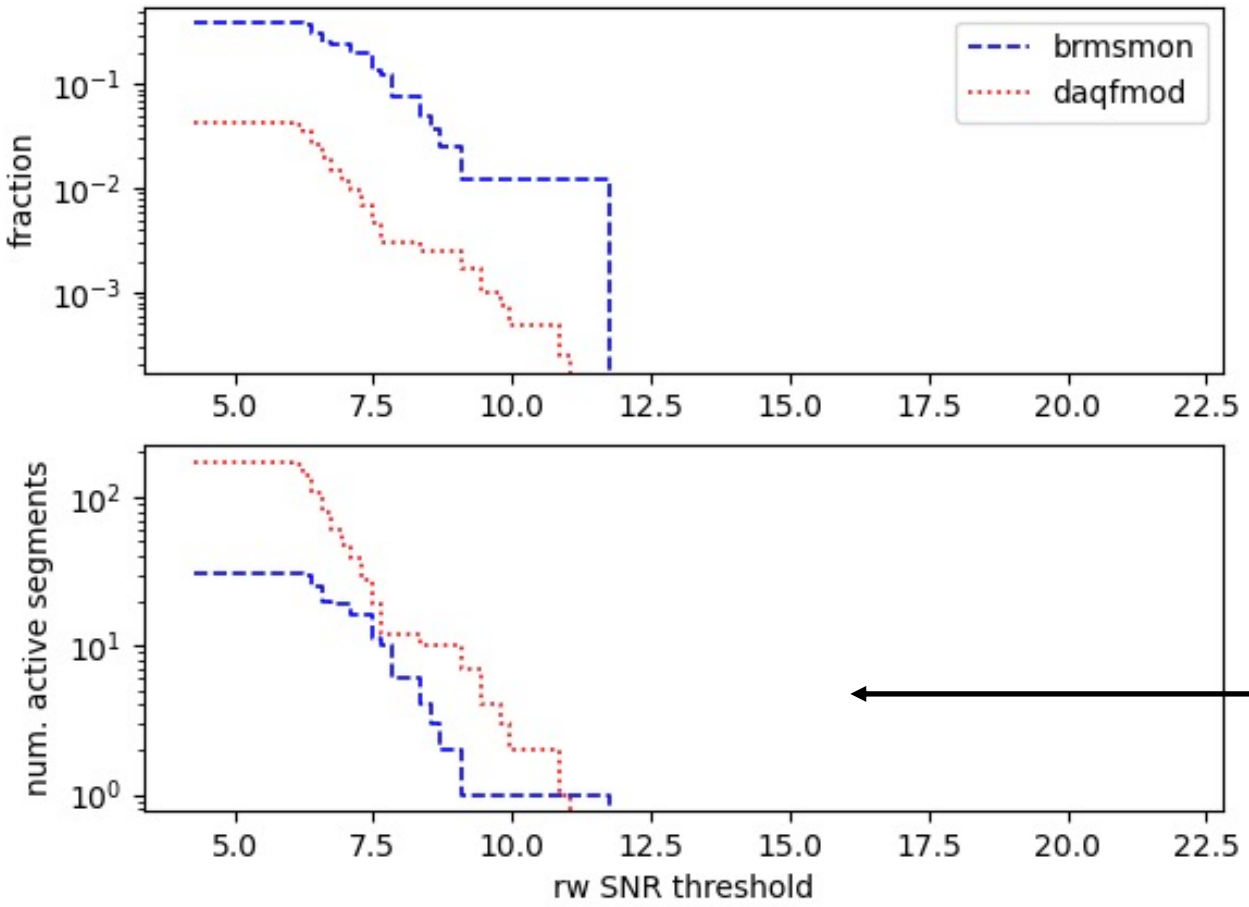
pyCBC – rw SNR – wider look time shifts





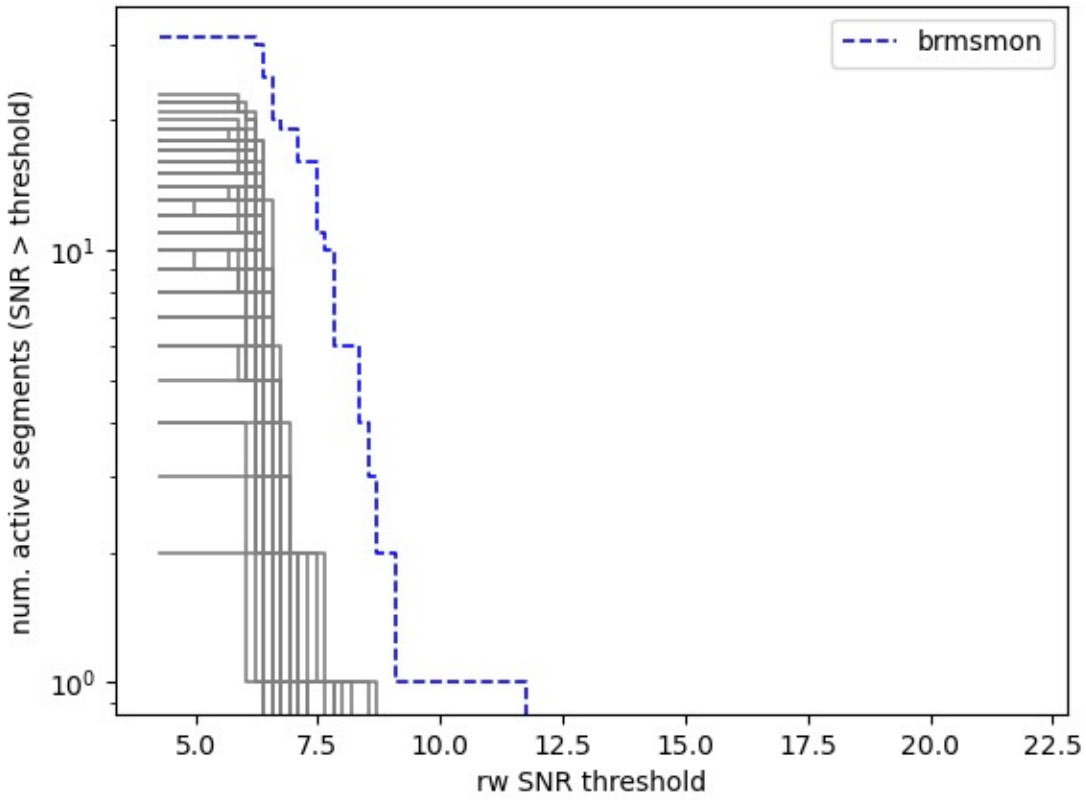
pyCBC – rw SNR – active segments

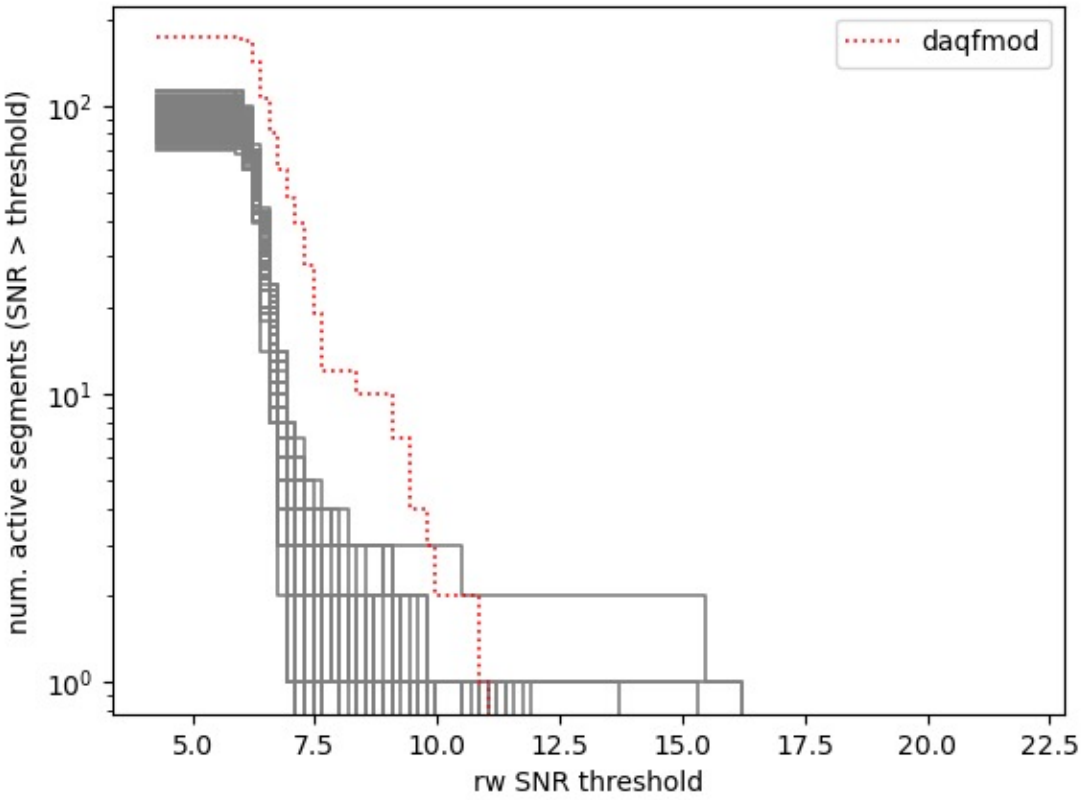
Looking at number (and fraction) of veto segments that actually did veto at least one trigger



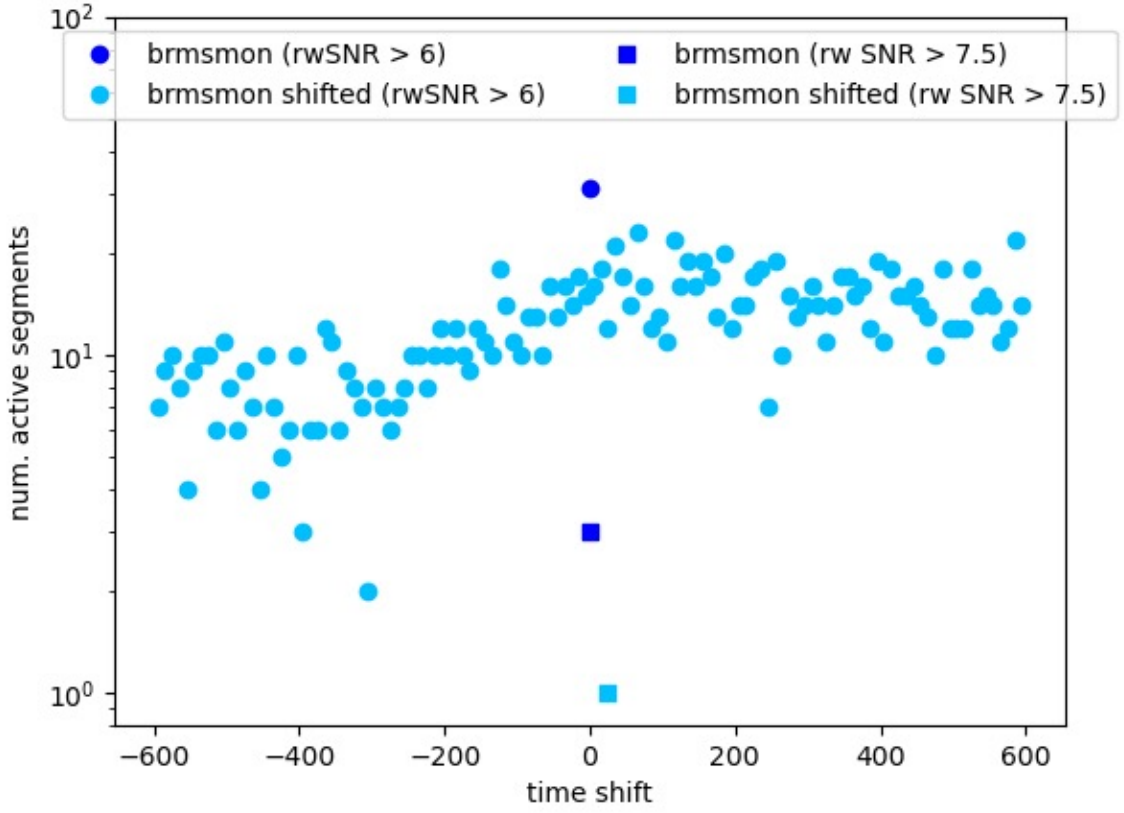
In the next slides, these distributions when the vetoed segmentes are sihfted in time

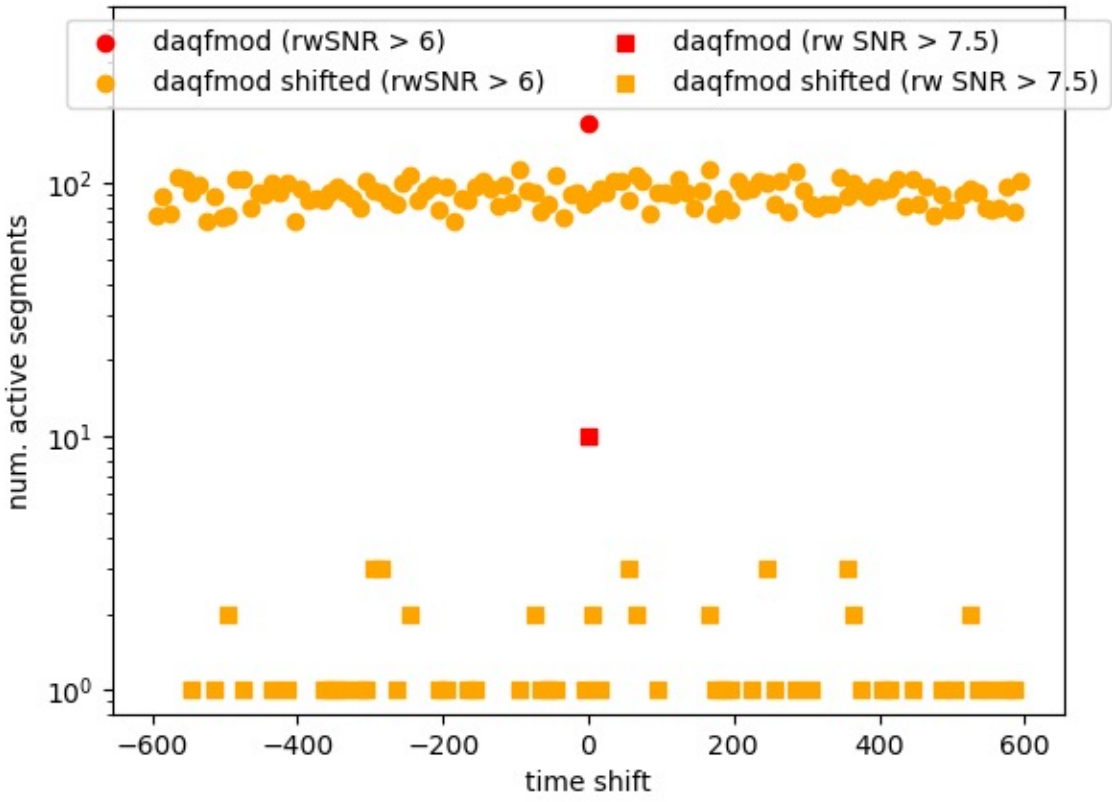
pyCBC – rw SNR – active segments with time shift



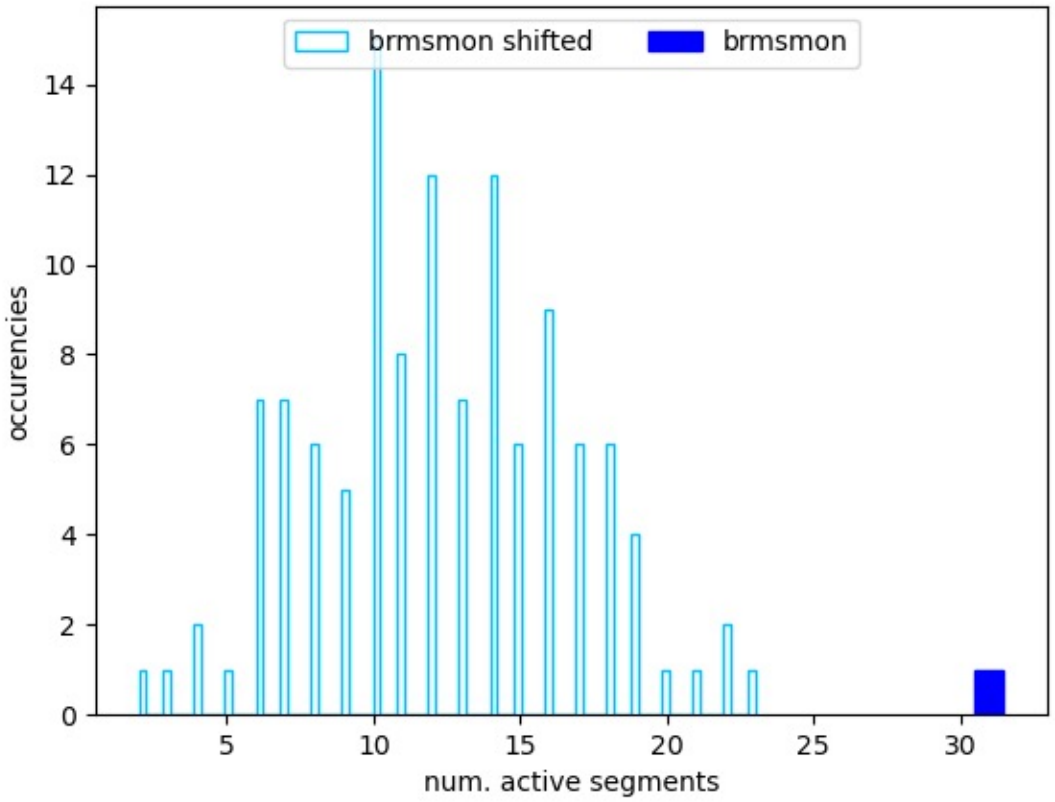


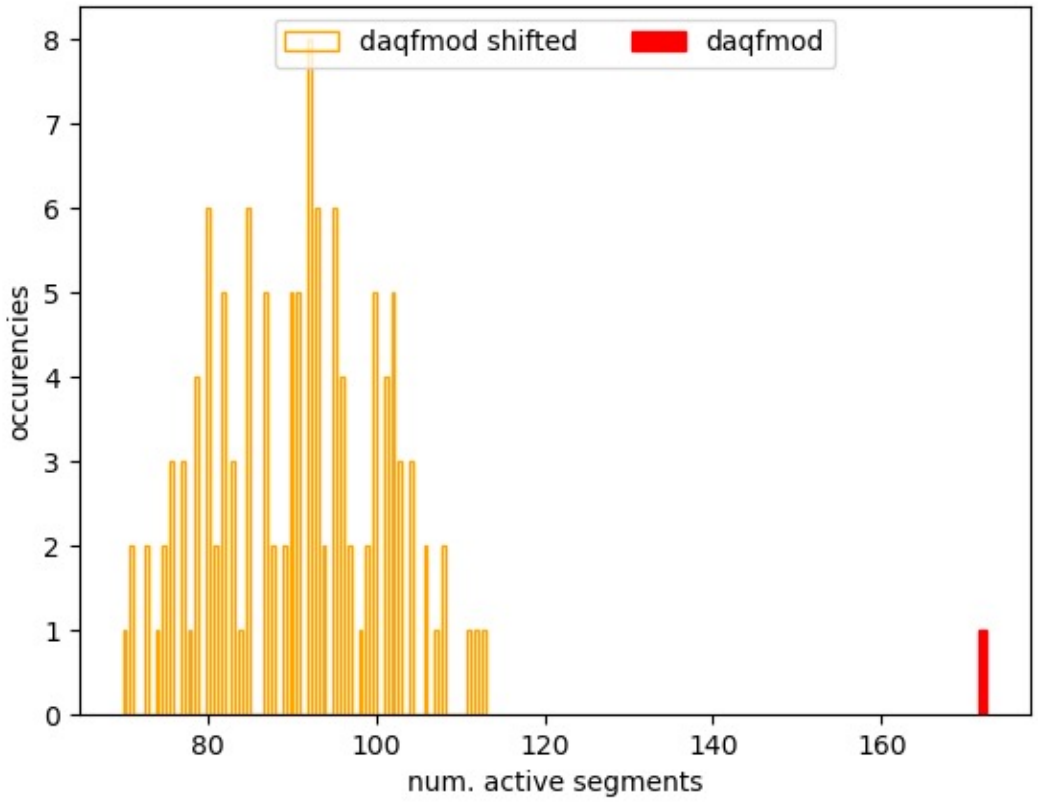
pyCBC – rw SNR – active segments with time shift





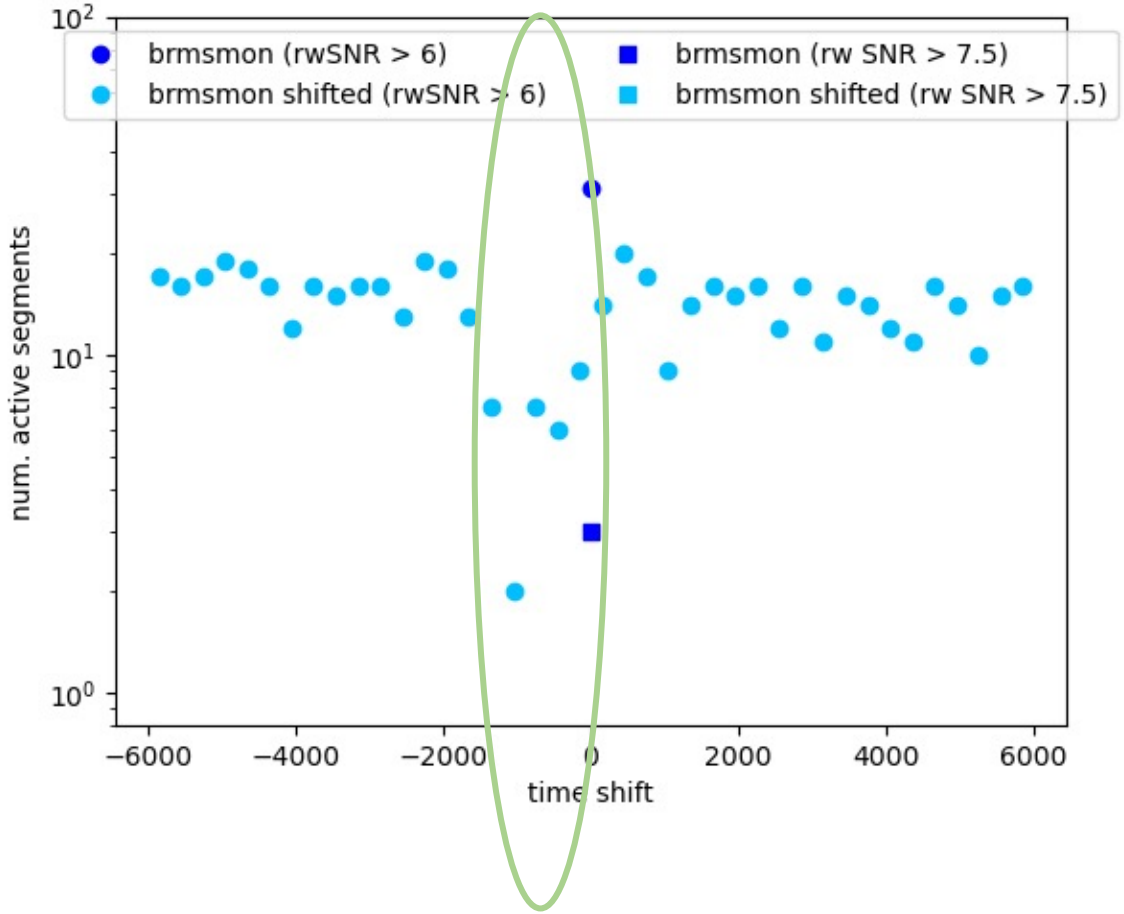
pyCBC – rw SNR – active segments with time shift

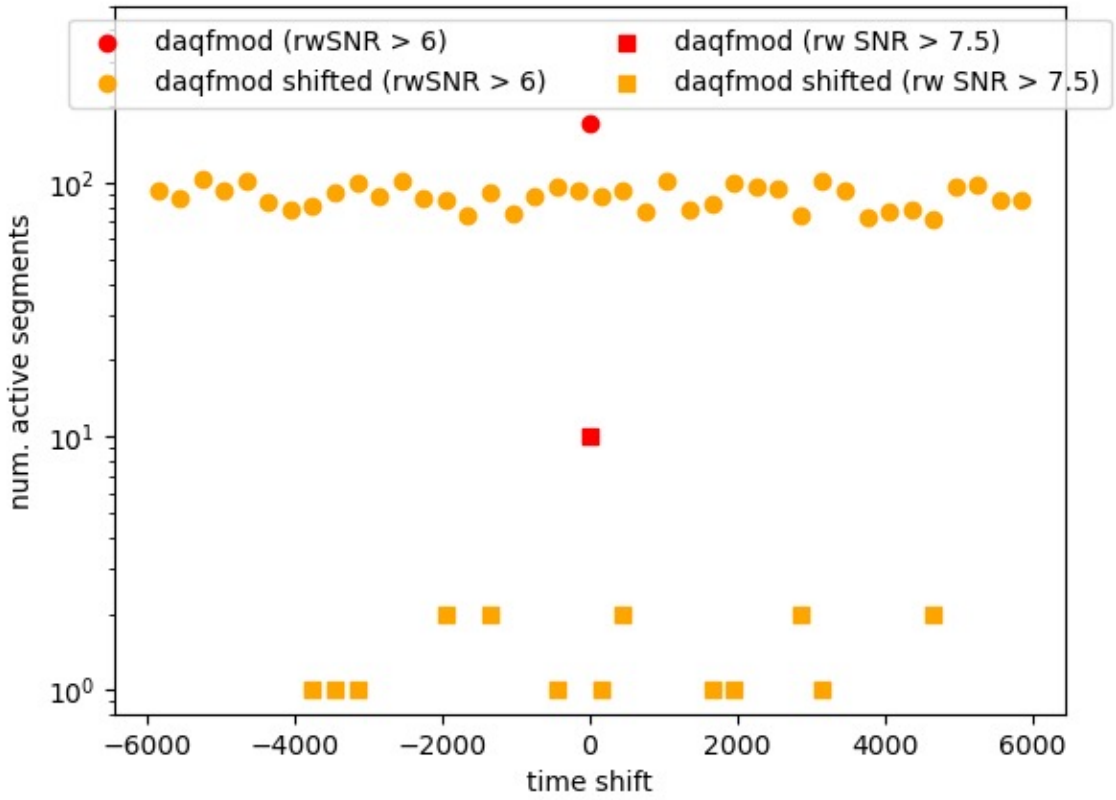




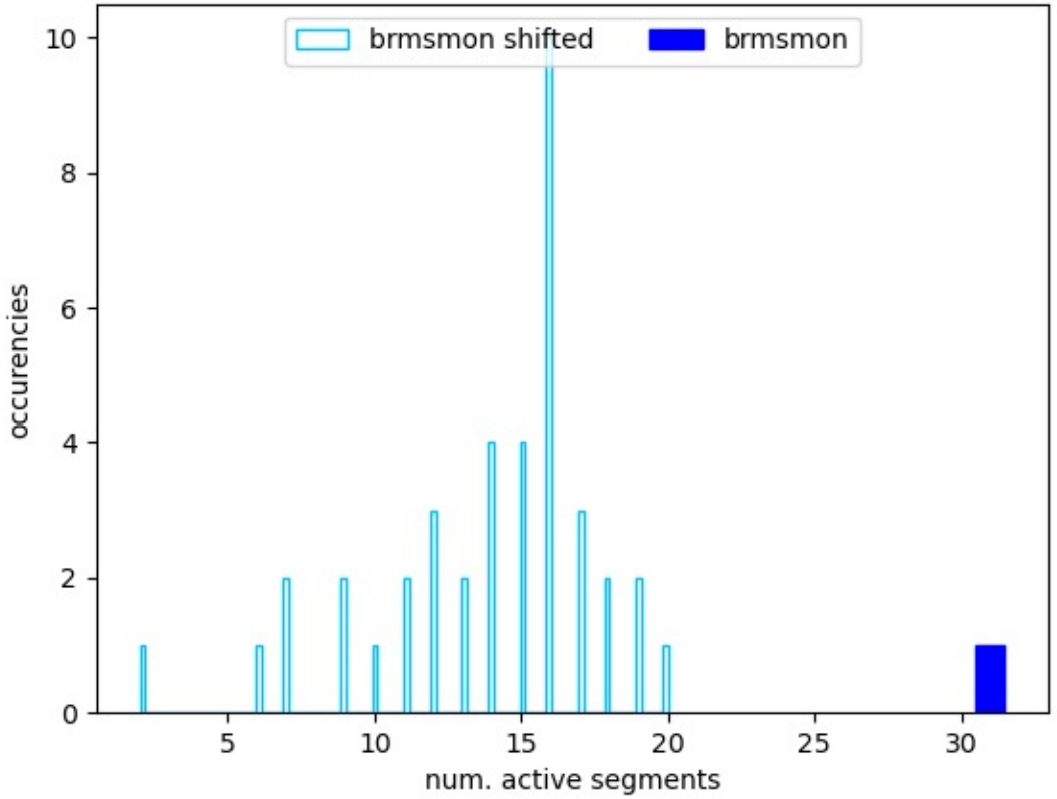
E.g. simple Gaussian fit would give 4σ for brmsmon and 6σ for daqfmod…

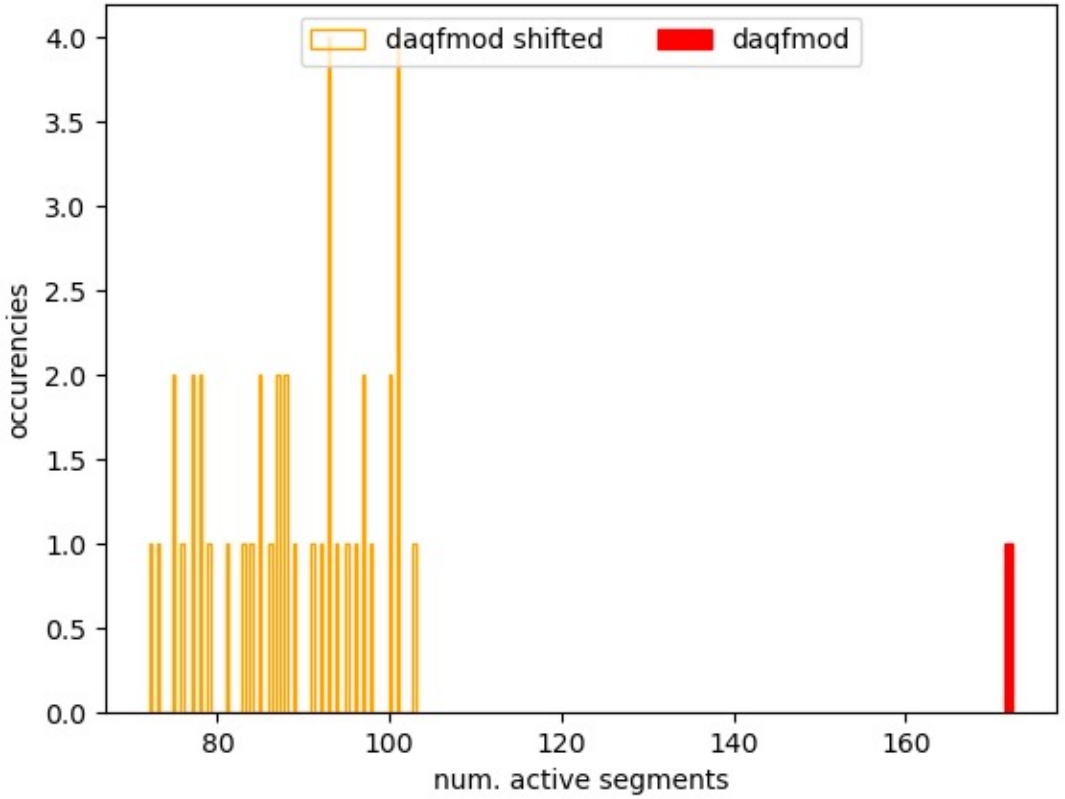
pyCBC – rw SNR – active segments with time shift wider look





pyCBC – rw SNR – active segments with time shift wider look

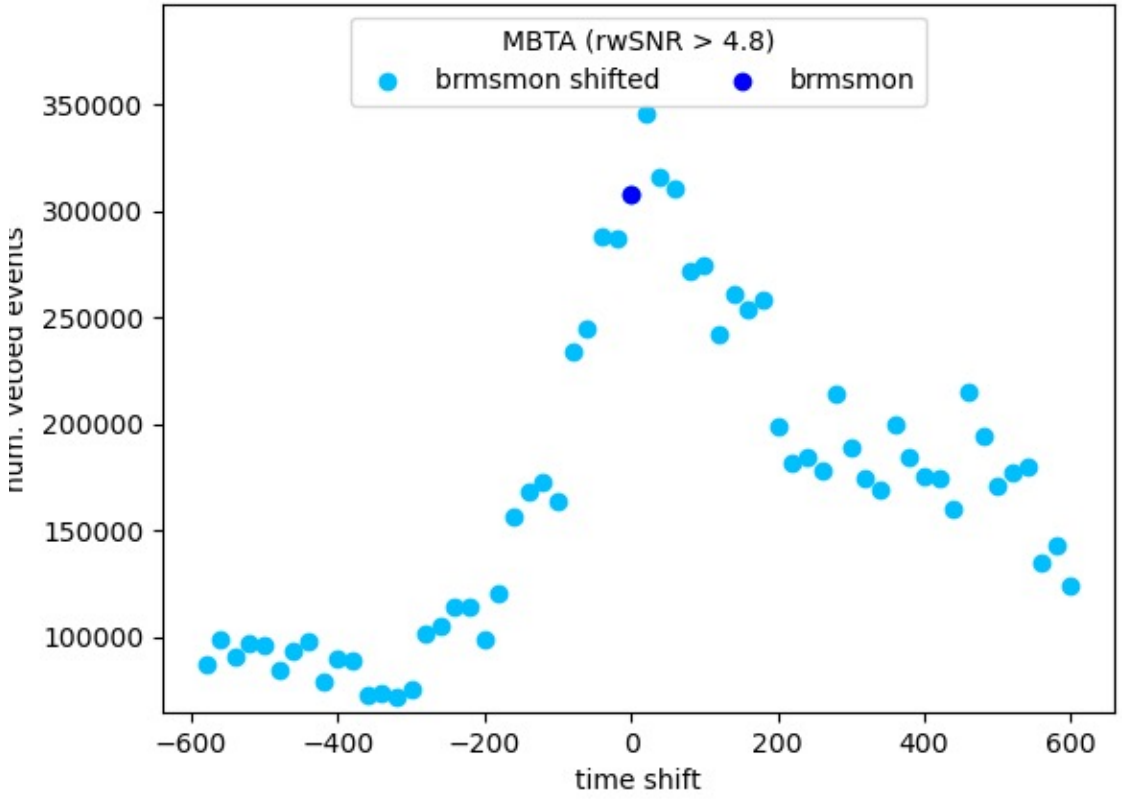


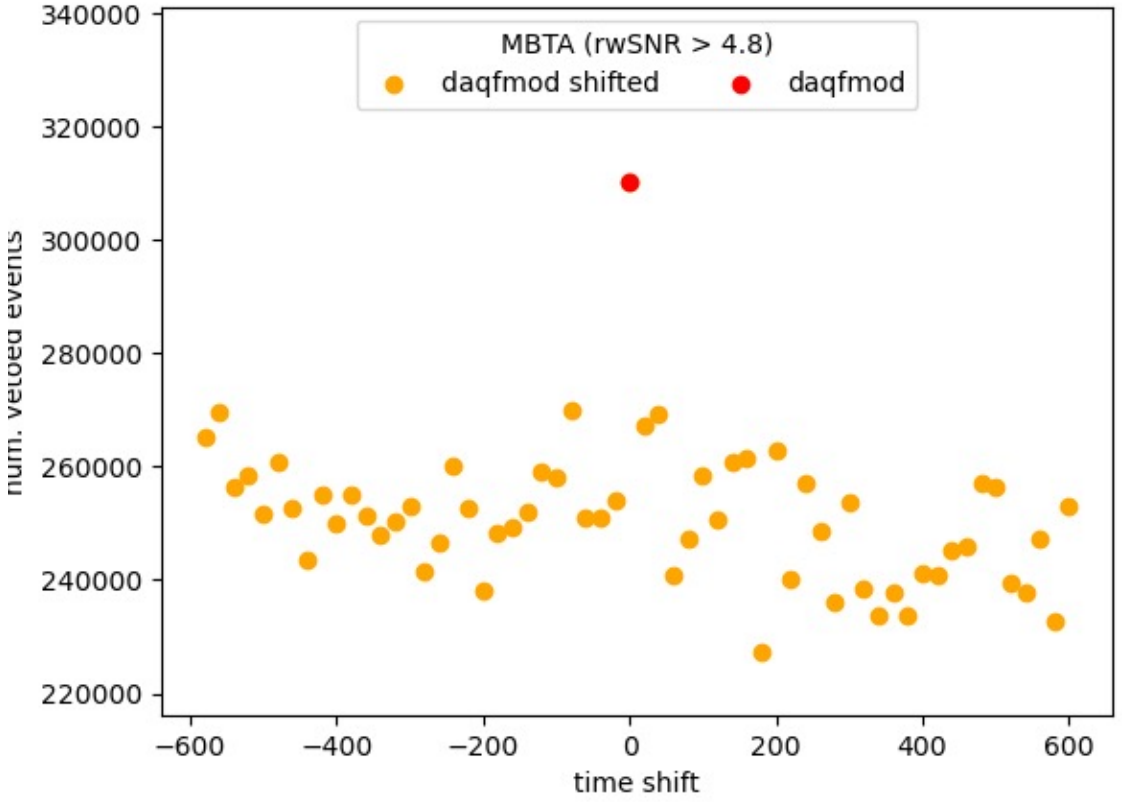


MBTA

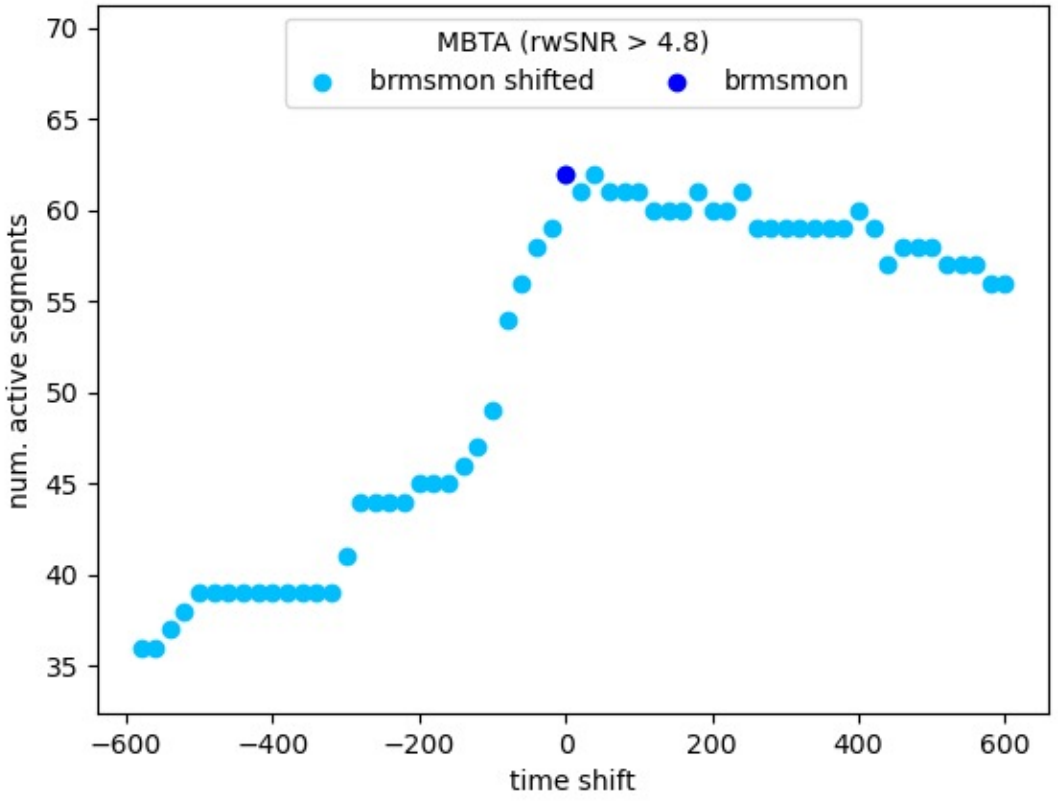
- Veto streams are not strongly correlated with MBTA gating :
  - daq_fmod: 945.56 sec (of which 0.84 gated)
  - brmsmon: 283 (of which 0.97 gated)
- Quite correlated with ER
- Studied overall fraction of single triggers vetoed by veto segments, using rw SNR and after gating. Can make the study with raw SNR if we think it is interesting.

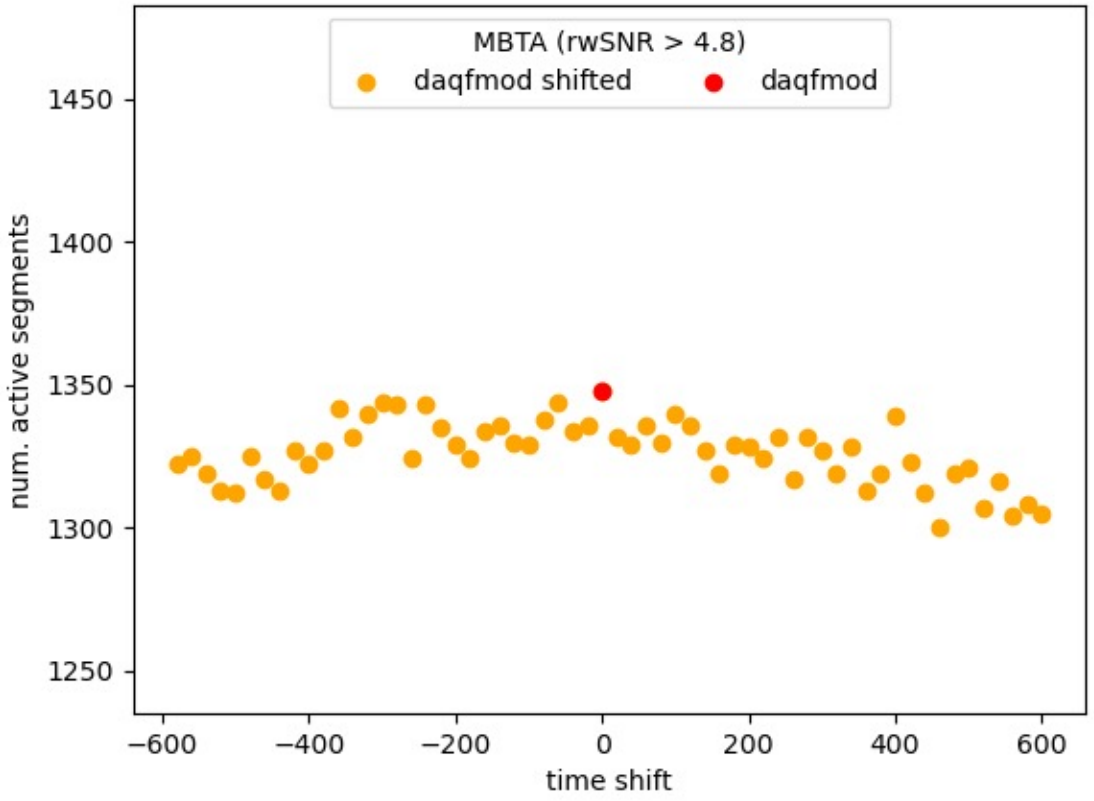
MBTA - rw SNR – time shift



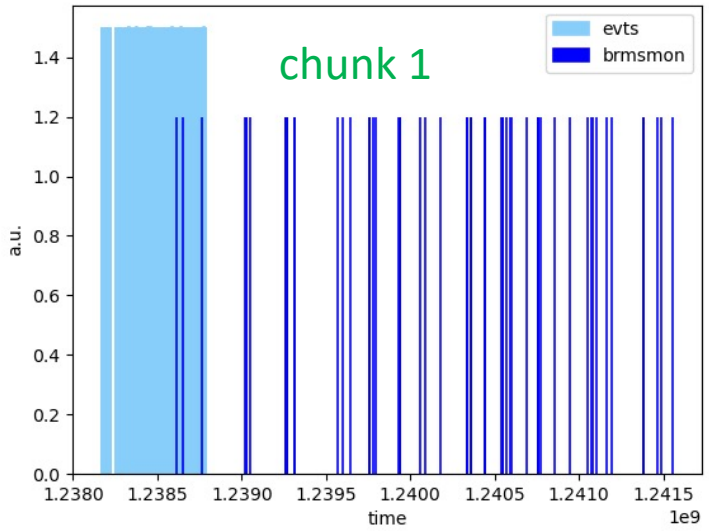


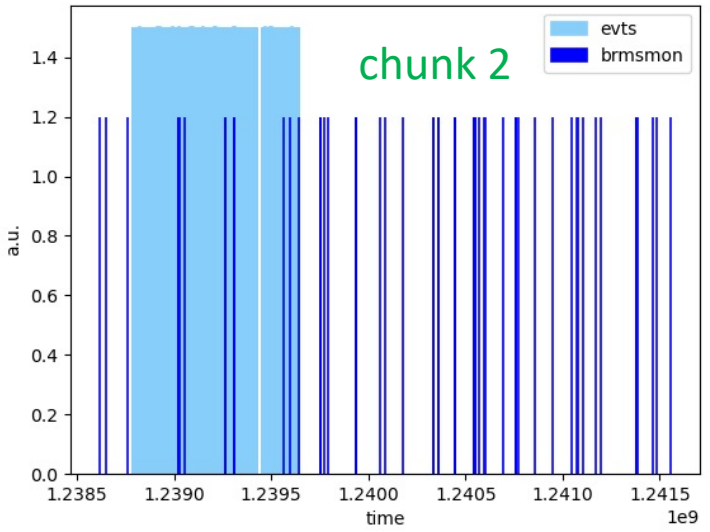
MBTA - rw SNR – active segments with time shift

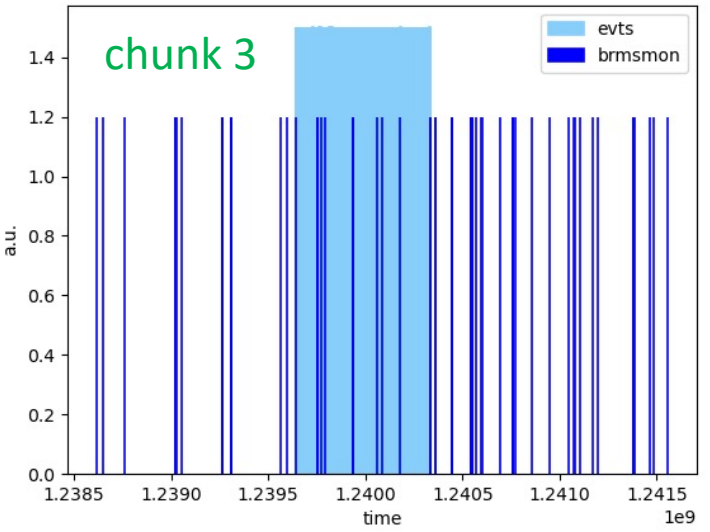


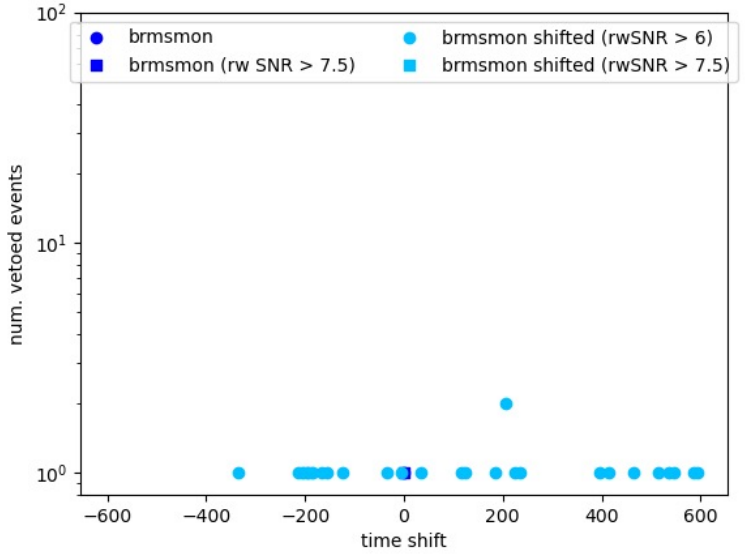


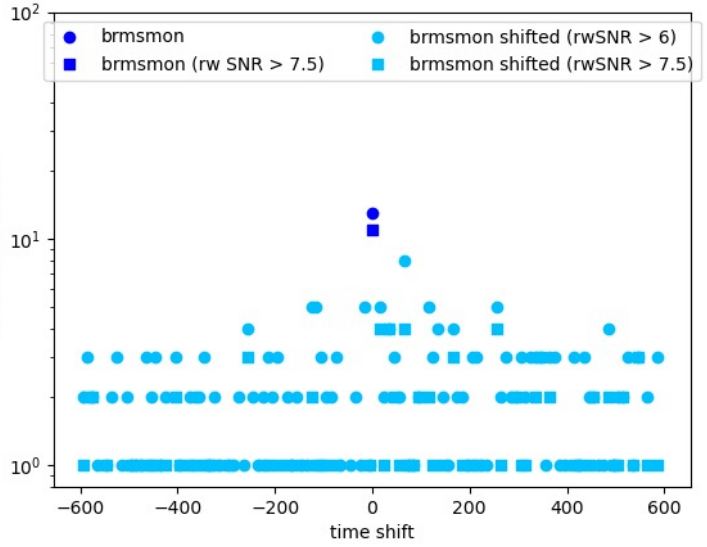
brmsmon (pyCBC) - chunk by chunk

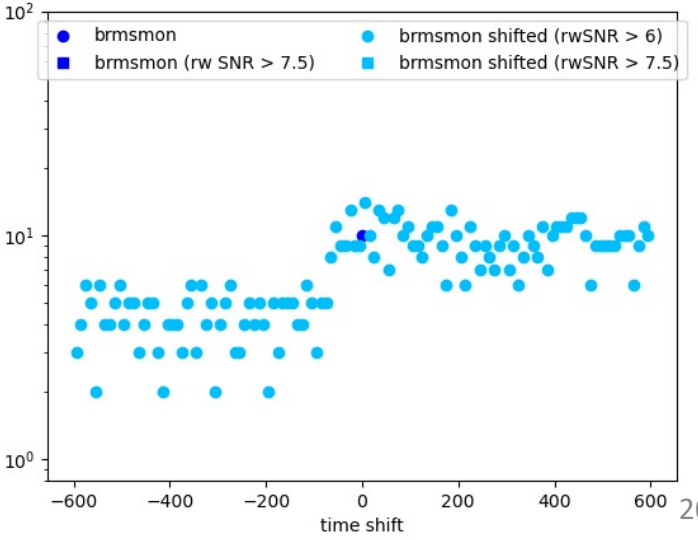












brmsmon (pyCBC) - chunk by chunk