Status of the LIGO-TAMA Joint Data Analyses

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Joint Working Group

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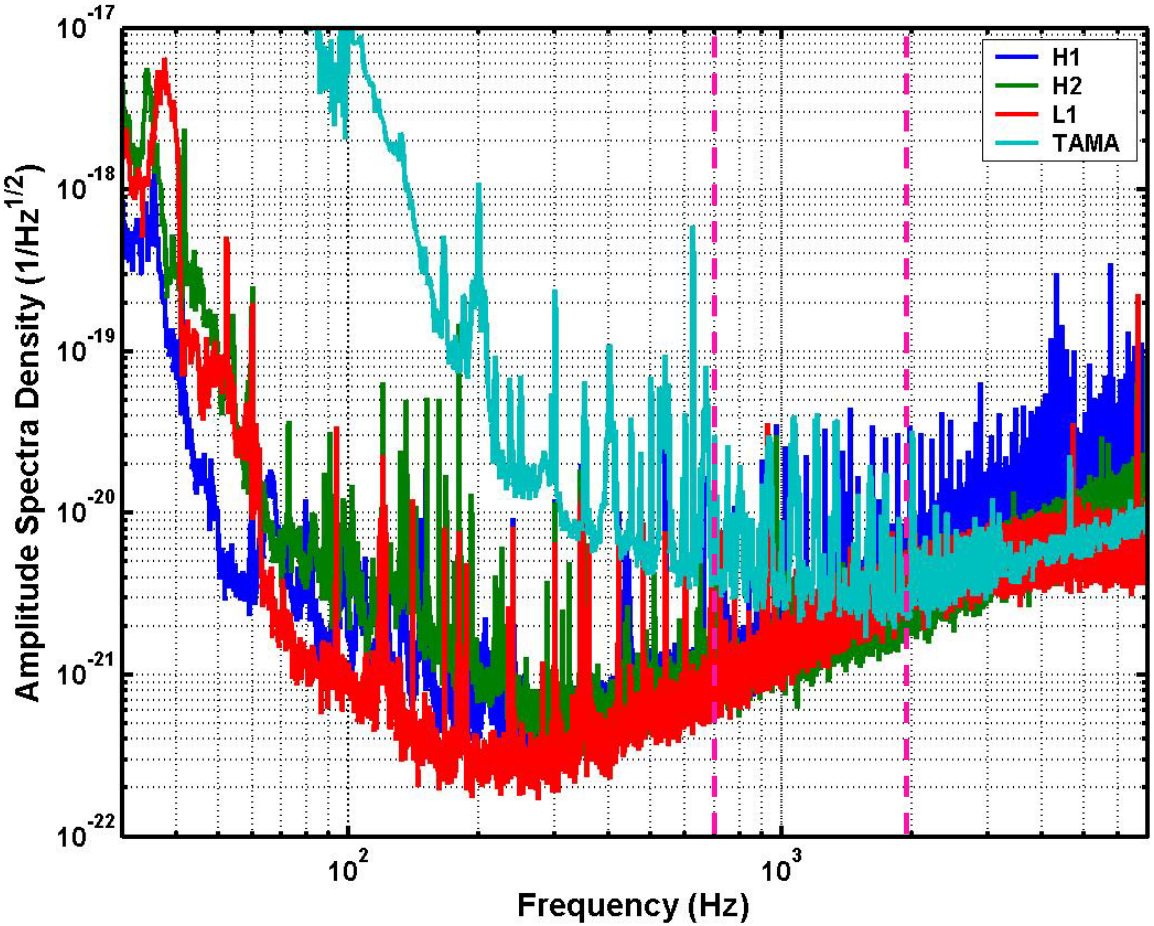
LIGO-TAMA Joint Analyses

- GRB-triggered search for unmodelled bursts (Marka)
- Inspirals (Fairhurst)
- Untriggered search for unmodelled bursts (Sutton)

Untriggered Bursts Analysis

- The bursts analysis for high-frequency LIGO data is done in coincidence with TAMA.
- Unmodelled GWBs:
  - » duration ~< 1s
  - » frequency 700-2000Hz.
- Goals:
  - » Upper limit on number of detected GWBs.
  - » Upper limit on rate-vs-strength for selected signal and population models.

Sample S2/DT8 Spectra

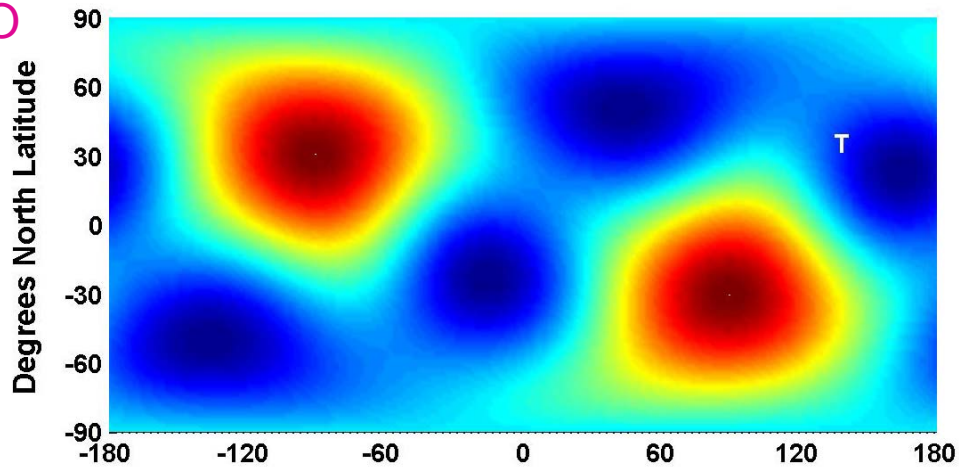


LIGO and TAMA look with best sensitivity at different frequencies:

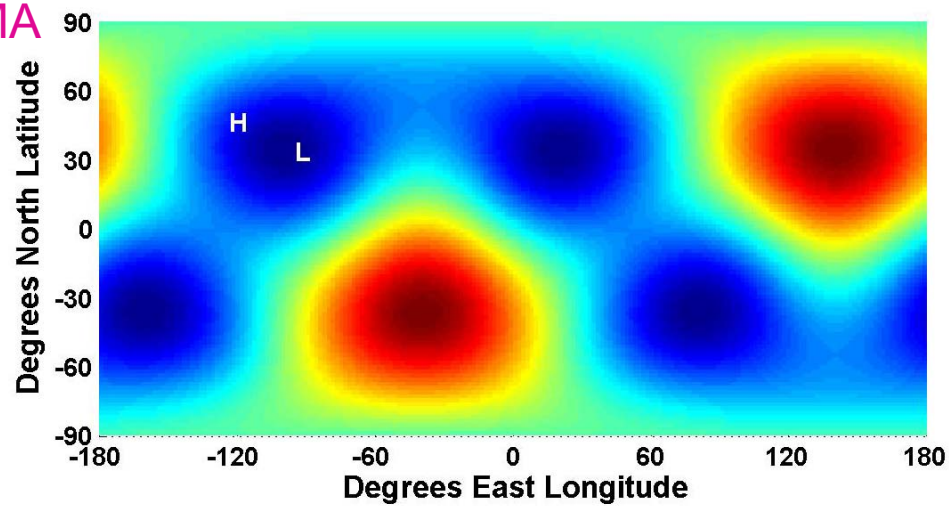
- Tune for signals near minimum of envelope, [700-2000]Hz.

Different Antenna Patterns

LLO



TAMA



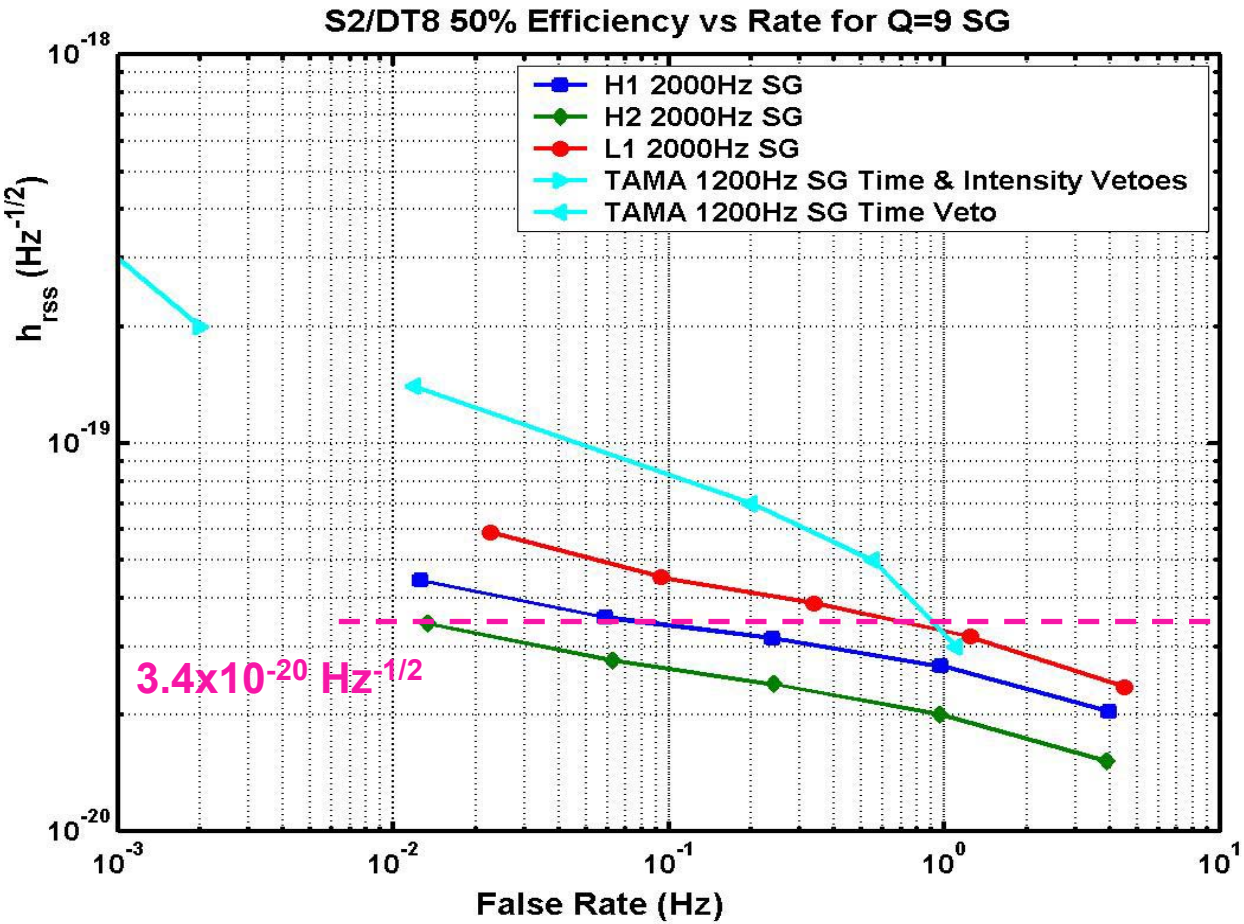
- Increase $h_{50\%}$ in zenith ⇒ all sky averaging:
  - » x8 for LIGO-TAMA
  - » x3 for LIGO only.
- Polarization-dependent response: restrict r-statistic test to LIGO.

(This plot: Equal power in uncorrelated polarizations)

Analysis Procedure

- Single-IFO Event Generation separately for each IFO:
  - » BlockNormal, Power, TFClusters, WaveBurst for LIGO, Power for TAMA
  - » Tuning: maximize efficiencies while keeping < 1 background event for S2.
- Coincidence & Coherence:
  - » Temporal coincidence in all 4 IFOs
  - » r-statistic among LIGO triggers to reduce false rate
- Efficiencies:
  - » Measure using coordinated signal injections: Gaussians, sine-Gaussians, damped sinusoids, Lazarus black-hole mergers (?).
- Upper Limits:
  - » As for low-frequency search (number of detected events, rate versus strength).

Sample Tuning: TFClusters



IFO	Rate (Hz)	
TAMA	0.93	
H1	0.10	
H2	0.014	
L1	0.80	

Guesstimates:

$R^{4X} \sim 10^{-7}$Hz
(before r-statistic)

$h_{rss}^{4X} \sim 2.6x10^{-19}Hz^{-1/2}$
(all sky, 2000Hz SG)

Analysis Status

- Single-IFO Event Generation:
  - » WaveBurst done
  - » TFClusters & TAMA Power underway: tuning in hand; ready to make choice for production of triggers.
  - » Power, BlockNormal: tuning underway.
- Efficiencies:
  - » Zenith injections done. (Simulation data being exchanged.)
  - » Coordinated signal injections in preparation.
- 4 x Coincidence & Coherence:
  - » Coincidence window determination underway.
  - » r-statistic tuning (for LIGO) underway.
- Schedule: Finish for June Meeting