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# Detection Confidence Discussion: S2/S3 Scenarios

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*Hannover*

- S2
  - » Possible signal at an  $h$  of  $3e-24$  at a frequency of 380 Hz in L1
  - » Confidence level 80% in L1
  - » H1/H2 consistent, but do not add significantly to confidence
  - » If  $\dot{f}$  is due to slowing due to gravitational waves, the distance to the (presumed) neutron star source is 300 pc
- S3
  - » Template with previous observed  $f$  and  $\dot{f}$  shows no signal.
  - » If the same  $\dot{f}$  and an  $f$  which is increased by 0.7 mHz are used. L1 sees a signal of  $2e-24$  at a confidence level of 90%.
  - » H1 sees a signal of  $1.5e-24$  at a confidence level of 85%.
  - » H2 consistent, but do not add significantly to confidence

- S2 result:
  - » L1-H1  $\Omega = 0.3 \pm 0.2$  (error bars are 90% confidence)
  - » L1-H2  $\Omega = 0.2 \pm 0.3$
- S3 result:
  - » L1-H1  $\Omega = 0.2 \pm 0.15$
  - » L1-H2  $\Omega = 0.0 \pm 0.2$
- In both runs:
  - » H1-H2 dominated by clear instrumental correlations
- One deviation from the "expected" result
  - » Spectrum of  $\Omega(f)$  not consistent with flat,
  - » Fits power law between  $f$  (0.7 -1.4)

- Nothing in the S2, but S3 has the following "event"
  - » Strongest L1 trigger  $\rho = 18$  event.
  - » Highest  $\rho$  in 6.6 - 4.8 solar mass BH template
  - » Distance estimate is 8 Mpc.
  - » It passes the  $\chi^2$  test with flying colors
  - » The next highest  $\rho$  during the two runs is 13
- H1 and GEO were down.
- H2 sees the event but it is much less gold-plated than L1.
  - » It shows a  $\rho = 7$  in the same template as the L1 event,
  - » Maximum  $\rho$  comes in a different template, with 7.8 - 6.2 solar masses.
  - » Both just barely pass the  $\chi^2$  test
  - » The time delay between the H2 and L1 events is between +130 ms and -60 ms depending on which template in H2 you use for the coincidence
  - » The amplitude as measured by H2 is 1.25 times that measured by L1

# Burst Search

- S2 event:
  - » One coincident event observed in H1, H2, and TAMA; L1 down
  - » H1 and H2 have good cross-correlation
  - » A duration of ~15 ms and a central frequency of 750 Hz
  - » H1H2 amplitudes consistent, TAMA sees at 60% of the LHO amplitude
  - » Time delay to TAMA is ~12 ms; H1/H2 delay  $-0.3$  ms or  $-1.6$  ms
  - » Location circle crosses galactic plane at  $20^\circ$  and  $35^\circ$  from galactic center
  - » Accidental coincidences estimated by time shifting (TAMA against LHO)
    - Out of 100 time shifts, only 2 show an event like the zero time lag one
- S3 event:
  - » One coincident event observed in H1, H2, and L1; GEO600, TAMA down
  - » H1/H2 and H1/L1 show good cross-correlation
  - » H1H2 amplitude ratio  $0.8 \pm 0.15$ , H1/L1 ratio  $1.1 \pm 0.1$
  - » A duration of ~20 ms and a central frequency of 550 Hz
  - » Time delay LHO/LLO is ~8 ms; H1/H2 delay  $-0.3$  ms or  $+1.8$  ms
  - » Location circle does not cross galactic plane
  - » Accidental coincidences estimated by time shifting (LLO against LHO)
    - Out of 100 time shifts, only 13 show an event like the zero time lag one

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