

LIGO-1 Analysis Wrap-up:

Alan Wiseman
University of Wisconsin -- Milwaukee

G030646-00-Z

- **Results Talks: Potentially ...**
 - » **Known pulsars, External Triggers, Any others? Please Notify**
 - » **Review standard: method and results fully checked for correctness**
- **Status Talks: (Sensitivity, yes: Statements about the sky, no):**
 - » **Pulsars, Inspiral, Stochastic, bursts ...**
 - » **Review standard: results unlikely to change significantly**
- **Technical Talks: ... many**
 - » **Review standard: Posted for comment prior to the meeting**

“While not all coauthors may be familiar with all aspects of the research presented in their papers [talks], **all collaborations should have in place an appropriate process for reviewing and ensuring the accuracy and validity of the results, and all coauthors should be aware of the process.**” (APS guidelines for professional conduct)

•Timeline:

- Now: Warn reviewers that they will be called on again. Thanks.
- After each Analysis Group’s next telecon (ie next week) submit list of talks to Peter Saulson and AGW and Bruce Allen.
 - Deadline for abstract submission Friday 21 November
- ASAP: Draft transparencies and other materials (eg internal reports, pointers to logs, etc) for Status and Results talks to the reviewers (and AGW and Peter Saulson). Practical suggestion: Invite the reviewer to your next telecon.
- December 2: Final Transparencies to Reviewers (and AGW and Peter Saulson).
 - Peter and I will find a mechanism to make the transparencies available to the collaboration as a whole (eg. authorlist)
- Comments back from reviewers (and collaboration) by 9 December.
- Iteration during week leading up to GWDAW.

S2 DATA SEARCHES

confident of having final results by March LSC meeting

- production of 30min calibrated SFTs well under way (see talks by V.Dergachev., X. Siemens in ASIS/DetChar). Expect calibrated $h(t)$ in the next 2 weeks.
- All-sky, wide-frequency FDS, Tobs \sim 1/2 day GC, wide-frequency FDS, Tobs: entire run
- FDS of signals from ScoX1
- Hough transform

S2 DATA SEARCHES - not quite as confident

- TDS of signals from all known isolated pulsars (a bit less confident due to follow-up work)
- Stack-slide search
- Unbiased search

- Changes to pipeline
 - » now updating calibration & PSD every minute
 - » overall errorbars now from PSDs, not spread of CC measurements
- Changes to implementation:
 - » Entire pipeline in LALWrapper
 - » Can do Monte Carlo on the fly
- Pipeline improvements still under consideration:
 - » overlapping window
 - » high-pass filtering
 - » averaging calibration factors
 - » Pseudo-detector method for combining L1-H1 & L1-H2 measurements □ □
- Preliminary results (S2):
 - » LLO-LHO consistent w/0, error bars $O(1e-2)$
 - » 10-sigma correlation in H1-H2
- ALLEGRO-LLO analysis plans
 - » Work w/calibrated ALLEGRO $h(t)$ to mitigate sharp spectral features
 - » Handle differently-sampled data by doing CC in freq domain
- Signal injection:
 - » Software: pipeline now optimized for Monte Carlo
 - » Hardware: signals injected into all pairs for S2 & S3;
 - » analysis just underway
- E10 coherence: preliminary indication H1-H2 much less correlated than in S2

LIGO Inspiral Working Group Summary

- Binary Neutron Stars
 - » S2 playground data has been fully analyzed
 - » Single interferometer thresholds have been tuned
 - » Coincidence criteria have been determined
 - » Data quality cuts decided except for a couple of safety studies
 - » Veto studies continue, but this is still the most difficult part
 - » Will tune final cuts to 1% false alarm probability on time-shifted data set
 - » Will present overview of pipeline, tuning and background studies for playground data set at GWDAAW



LIGO Inspiral Working Group Summary

- Binary Black Holes
 - » S2 playground analyzed with 2pN Taylor approximant templates; Veto studies beginning
 - » BCV template family implemented for detection; Expect pipeline to be completed in week after LSC meeting
 - » Paper will present (null) result of search for BBH signals & range versus mass plot for canonical templates
 - » Coincidence with ringdown and bursts will be used to add confidence in case of detection
- MACHO Binaries:
 - » About 5,000 templates for masses from 0.3-1.0 Msun
 - » Search of playground complete
 - » Computationally very costly (need LSC dataGrid)
 - » Efficiency studies under way
 - » Veto studies to begin, but expected to follow BNS pipeline

» Searching for known and unknown sources of Gravitational Wave Transients

- Untriggered and poorly or not modeled – generic time and/or frequency algorithms
- Untriggered but modeled (SN, BH Ringdowns) – matched filter techniques
- Externally triggered by GRBs – cross correlation search methods

» Status of the analyses

- S2 playground extensively investigated for veto purposes and by 4 different astrophysical search engines
 - Vetoes and data quality: machinery is ready, many options are available but not finalized yet
 - Astrophysical event search engines (ETGs):
 - » Waveburst (wavelet domain)
 - » Excess Power (Fourier domain)
 - » Blocknormal (time domain at multiple frequency bands)
 - » TFCLUSTERS (Fourier domain)
 - All ETGs have reported:
 - » Improved data conditioning
 - » Tuning of parameters
 - » Sensitivity to ad hoc waveforms at comparable levels
 - » Burst parameter estimation (time, frequency, amplitude) significantly improved w/r/t S1
 - » Preliminary estimates of false alarm rates for the playground
 - Post-coincidence analysis now introduces amplitude and cross-correlation check
- External Triggered search: GRB030329 analysis complete, upper limit presented

» Outlook

- S2 playground choices finalized within the next few weeks
- Target results for GWDAA: GRB030329, efficiencies, playground
- Looking at the full S2 data sample within 2003
- Pursue a cross-correlation analysis of the rest of the GRBs coincident with S2