ASIS MEETING SUMMARY
for
LSC CLOSEOUT SESSION

15' Gaby Gonzalez: S2 calibration error estimates
15' Gaby Gonzalez: S3 calibration status

Described how calibration was done for S2 and S3, using matlab models, open loop and dc gain measurements. S2 (version 3) calibrations are FINAL. Typical maximum errors (amplitude 14% L1, 20%/10% H1) dominated by errors in DC gain measurements. Phase errors smaller (5-10 degrees). S3 calibration work underway: beta dynamic to keep open loop gain constant.

VERY IMPORTANT: gain variations +-30% on few-second timescale.

15' Xavi Siemens: Time domain calibration
15' Martin Hewitson: Producing h(t) - format/storage/retrieval

Bottom line: the GEO method of producing a time-domain calibrated h(t) has been adapted for use with LIGO data. Frame data containing h(t) for the S2 science data now published using LDR. Will do this for S3 data when final calibration available. On-line plans (??) for S4.

Some signs of systematic error in reference calibration functions for S2 (at 1-3% level).

Common frame format for GEO/LIGO/VIRGO strain data under intensive development T040026-01-E. Should simplify many analyses. The 'mothership' frames will contain everything needed to reproduce calibrated data starting with raw data.

SIZE?

10' John Zweizig: S2/S3 data quality
15' Szabi Marka / Daniel Sigg: Timing stability & atomic clocks

KEITH WILL REPORT

Pulsar / CW source detection

15' Joel Veitch / Nelson Christensen: Markov chain Monte Carlo methods for pulsars

Are investigating the use of this method to search for signals from a possible pulsar remenant of SN1987a (Middleditch). Method which searched previously over four nuisance parameters (h, iota, phi, psi) now extended to search over f and fdot as well. Correlations between different nuisance parameters and good annealing strategies are being investigated.

15' Xavier Siemens: Expected values of phase in hardware injected pulsar signals

The phase of the actuation function was neglected in S2 injections. After careful and systematic accounting for this phase (and some missing signs) we can now explain the phase of the S2 pulsar injections with error bars of the correct size (few degrees).

S3: the phase of the actuation function added rather than subtracted, and a 180 degree shift was neglected. Can now explain H1 and H2 phases perfectly. But appears to be a large error in L1 phases (is it 180 degrees?).

15' Badri Krishnan: Optimized hierarchical continuous-wave searches

Important extension of the Brady/Creighton work on hierarchical pulsar detection. Systematic method for determining optimal parameters for 2, 3, N stage searches. May be directly useful for Einstein@home type work and other hierarchical searches.

(Bruce's) prediction: a year from now we'll be seeing first reports on hierarchical pulsar searches.

15' Ian Jones: Template placement for all-sky pulsar search

Talked about placement of templates on the sky in the approximation that earth rotation and orbital motion are circles. First steps indicate perhaps 80,000 templates needed for an 11-hour search. Code written in LAL for actually doing this.

Astrophysical figures of merit (FOM) for the control room:

10' Patrick Sutton: Standardized interface for strain-based FOM's

A common problem in producing FOM is doing calibration. Patrick has produced a 'Calibrate' class, abstracted for sensemon, for this purpose. Will handle the problem of making correct freq-domain calibration functions for any DMT code. Almost done (weeks) away.

5' Patrick Sutton: S4 plans of the Inspiral Group

Is going to add a 2 x 10 M_solar inspiral range, sensitive at lower frequencies than existing 2 x 1.4 M_solar.

10' Jennifer Barre' & John Whelan: S4 plans of the Stochastic Group

Will show both instantaneous overall sensitivity and integrated sensitivity (run, year). Note: this depends upon

power spectra of TWO instruments. Interesting discussion of 'best' choice to use for the 'other' instrument.

10' Keith Riles: S4 plans of the Pulsar Group

Will show sensitivity graphs for h0 for 1 day, length of run, and 1 year. Will also show live-time needed to reach spin-down limit on h0 for crab, and eccentricity limits obtainable for fastest 28 known pulsars.

10' Julien Sylvestre: S4 plans of the Burst Group

Discused preliminary work on making a monitor that has:
- less than 5 minute lag
- a single number
- accurate
- orthogonal to OTHER FOM monitors.

Has found correlation coefficients with (for example) sensemon, and is investigating a couple of different strategies.

15' Albert Lazzarini: Optimum H1/H2 combination in stochastic analysis

Method for optimally combining H1 and H2 to get two orthogonal signals. One is a 'null channel' free of h. The other is a best estimate of h after removing instrumental/environmental correlations.

Among other uses, this will allow one to optimally combine the L1-H1 and L1-H2 stochastic bg limits. (Same as 'expected' result if H1-H2 correlation is small: reassuring!)

15' Sam Finn: Veto selection criteria for gravitational wave burst searches

Optimal methods for selecting vetos and vetoing thresholds. Described a method that can be used for determining what thresholds to use, and when a veto strategy is 'effective'.

15' Ben Owen: Template placement for precessing binary search

Outstanding problem: binaries with spinning components. Orbital ang momentum precesses about total ang momentum. Neat insight: just as earths motion modulates CW signal to make two sidebands (chi^2 with four degrees of freedom) the precession of the orbital plane modulates chirp signal and suggests a new detection statistic base on sum of carrier plus two sidebands (6 dof). May be very suited to a hierarchical search method. Has been constructing template banks (eg, 185000 for LIGO 1 SRD).

15' Saikat Ray Majumder: Excess power method: preparing for

automated analysis of LIGO data for burst sources

LAL+LALAPPS+Condor based code, that uses a combination of grid tools and Condor DAGman scripts.Provides completely automated robust analysis for power code. Needs to add a time-shifted background estimation and correlation test into the pipeline

15' Bernard Schutz / B. S. Sathyaprakash: Triggered and blind searches for NS normal modes

Importance of search for NS oscillation modes (astro-seismology) to learn about EOS. Modes could be excited by glitches, NS formation or NS merger. Freq range of 1-10 kHz makes these unlikely LIGO or AdLIGO sources, but need to gear up for more advanced detectors. Typical Qs of 10^2 or 10^3. Work underway to make track glitches with Jodrell bank. Such glitches might have h~10^-24 (Vela) and set up catalog of souces and search times (Balasubramanian, Regimbau)

15' Laura Cadonati: Performance of r^2 statistic in S2 :20

Showed that the r statistic is not reducing the efficiency of the pipeline. Extremely effective at reducing false rates.

15' Duncan Brown: Search pipeline for binary inspirals

S2 inspiral pipeline fairly complex. As in the powe code, convenient to run this using DAGman/Condor. Scripts to create necessary scripts are in LALAPPS and are easily extendible to GEO, and other search pipelines (eg, stochastic). Reusable for S3, S4, etc. Read data from frames, write data to XML files and/or frames.

15' Amber Stuver: A gravitational-wave simulation engine

Capabilities: full sky, population simulations, both + and x polarizations, projects onto Antenna pattern, calibrates to AS_Q. Developed in MATLAB, documented in DCC. Originally designed for burst simulations (short) but can be used for arbitrariy long simulations. Can be compiled into standalone code. Flexible, includes multiple detectors (including TAMA, GEO, VIRGO, LIGO) with appropriate IFO. Are working on expanding population models, waveform catalog.

Burst source detection

20' John McNabb: Block-normal update from November

Able to do injections using GraEng, do energy correlations, have made improvements to change-point iteration algorithm, can now hand-off data to r-statistic stage. Tuning window and threshold for false alarm rates on playground. (At low freq,

small bandwidth meant coincidence window too small.) Have also looked at detection efficiencies.

S2 tuning parameters determined, S2 analyzed.

Need to repeat this for S3.

20' Igor Yakushin: MDC burst frames

MDC burst frames (as decided in previous LSC meeting). Inject software signals in playground data and store as frame. 20+600+20 seconds, with signal every 9+rand seconds. Sine Gaussians, BH-BH mergers, Gaussian pulses, and time-shifted injections. Each frame 120 MB, total for each set (source type) of injections is 14 GB.

Future plans: make more! Fire drills, black box validation with reviewers.

20' Igor Yakushin: Waveburst

Reconstruction of burst properties (time, freq, strain) from waveburst. Require frequency coincidence, dt < 20 ms. Details of how to combine confidence values from 6 different coincidence lists. Central time reconstructed to +- 2ms for all source types. Freq reconstructed to +-15 Hz.

Future: waveform reconstruction via inverse wavelet transform.

20' Ken Yoshiki Franzen: Tuning Wavemon

DMT Wavelet transform tool generates veto triggers for 65 x 3 channels. Have analyzed all playground and some full data (months). Threshold on combined WaveMon + Glitchmon triggers.

For veto safety: ignore AS_I.

S2 playground: very effective vetos for L1 and H2. Doesn't work well for H1. 4.6% dead time leads to 76% veto efficiency. Improved by adding glitchmon to vetoing.

20' Sam Finn: Tuning Event Trigger Generators for Burst Searches

Up till now: raise thresholds to the one false event/data set level on playground. Then see if excess events in full dataset. Goal: maximize detected event rate an fixed false rate. Need population model, signal mode.