Reviewer Report for the S2 Time-Domain Pulsar Search

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Plus lots of work done by Réjean Dupuis, Graham Woan, Matthew Pitkin, Michael Landry, Greg Mendell, Uta Weiland

LSC Meeting
June 5, 2004

Organization

Initial push was to review APS Meeting presentation

Preliminary results shown for the first time

Created a web page to track tasks, status, comments, links

`http://www.ligo.caltech.edu/~pshawhan/lsc/pulreview/s2td/`

Links to Réjean's web pages, etc.

A few things have not been updated

Considered five areas of concern

- Appropriateness of method
- Checks of input data
- Software validation
- Systematic uncertaintites
- Checks of results

Appropriateness of Method

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Went over the method with Réjean and Graham, and concluded that it is appropriate

Narrower filtering

Marginalise over unknown noise in 30-minute blocks

Checks of Input Data

Checked whether frequencies and positions of target pulsars are known well enough

The 18 with Jodrell Bank timing info are fine

Of the 10 which rely on ATNF catalog info, frequencies are marginally known for a few

Positions are known well enough

Ensured that parameter data and input files are recorded in an accessible place

Checked input parameter files for mistakes

Found a transcription error for one pulsar, which was fixed and re-analyzed

Among the input files, some contain extraneous parameters (which are sometimes inconsistent); have recommended improving parameter input

Checks of Input Data

Examined input files used to analyze hardware injections

Some parameters are handled differently; checked source code carefully to make sure this didn't invalidate the test

Verified that input segment list was appropriate

Time intervals with *any* data quality flag were discarded

Verified that correct calibration information was used

Software Validation

Hardware injections give us much confidence

Parameters are successfully recovered

Required software to be in CVS

Tag (or at least record) version used for final analysis

Evaluated software documentation and structure

Read code to check for bugs

Found a number of minor bugs / "gotchas" which had no real effect

Found a mistake in calculation of likelihood in "Student t" case; fixed and re-run

Software Validation

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Cross-checked S1 vs. S2 analysis pipelines

Both used to analyze S1 data with J1939+2134 params

Mysterious discrepancy: S2 pipeline gave larger errors

Traced to calling barycentering code at 32 Hz instead of 16384 Hz

Checked extra demodulation used for Crab pulsar

Did not find the time to review this code thoroughly

Crab frequency was rather well-behaved during S2 run

Cross-checked results with and without extra demodulation; very similar

Systematic Uncertaintites

Considered effect of calibration errors

Effect should be quite small

No quantitative estimate made

Considered non-stationarity of noise

Expect method to be robust against this

Noise assumed to be stationary over 30-minute intervals

Checks of Results
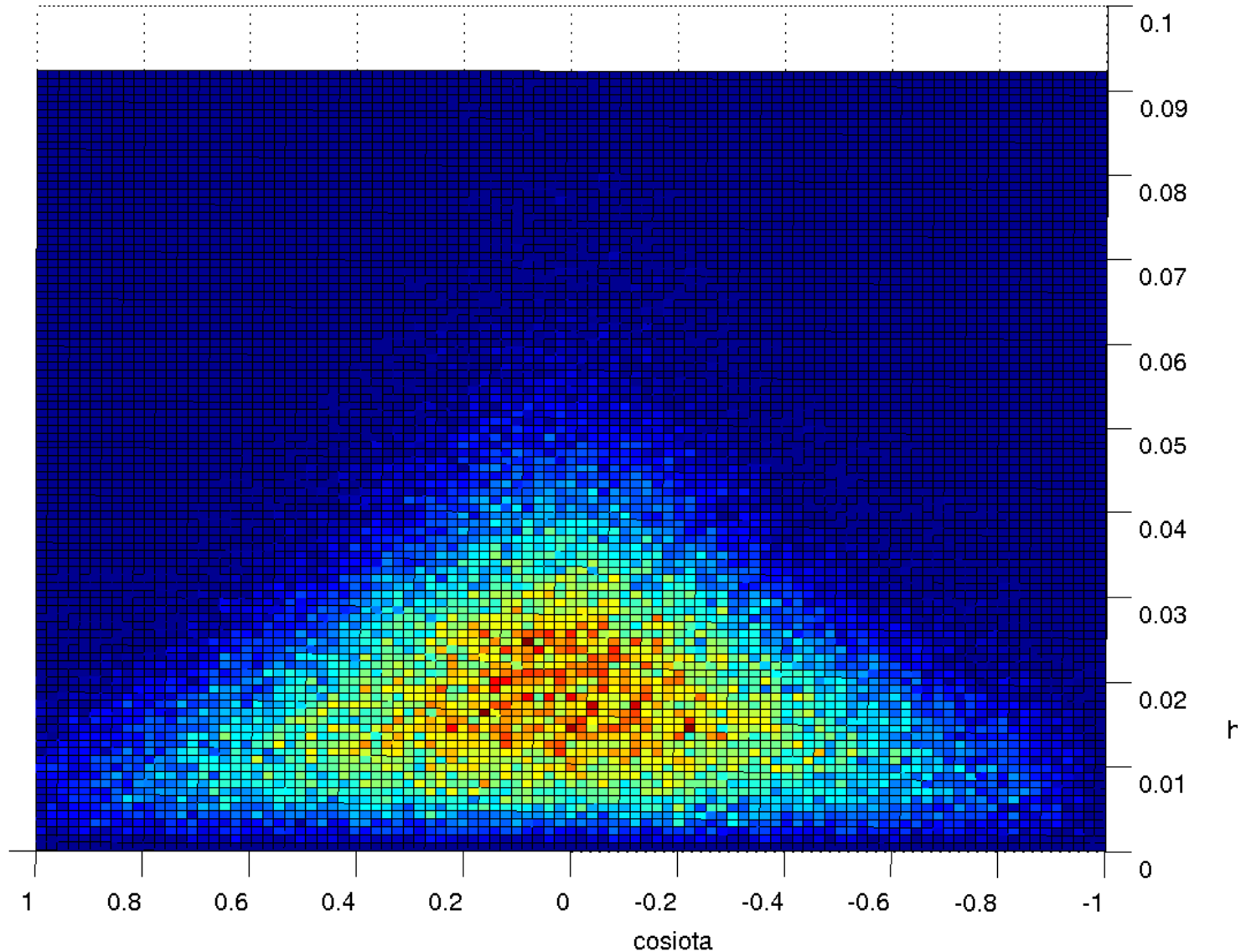
Examined posterior pdf distributions and numerical limits
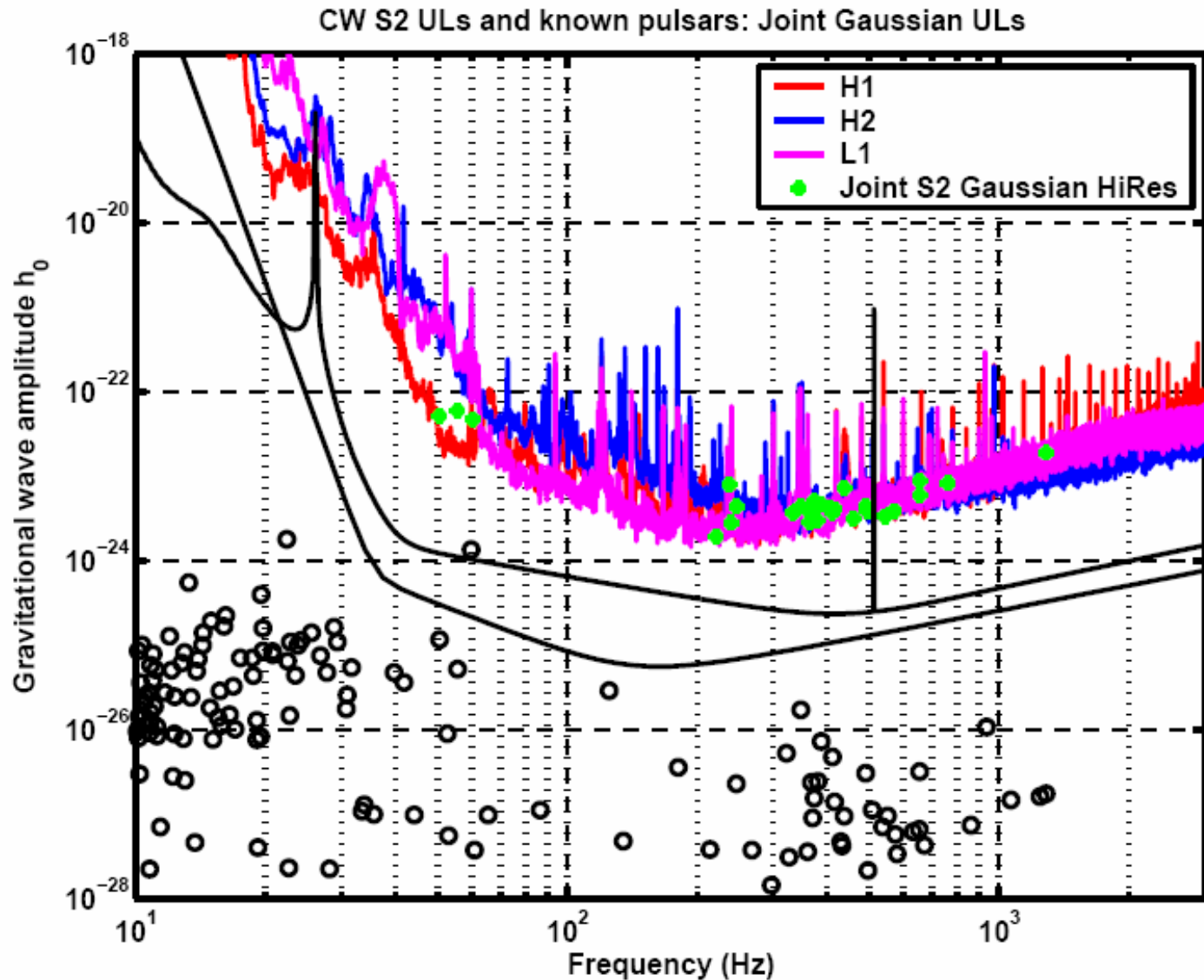
Sanity checks

Consistency check

Understand why cos(iota) is usually peaked near zero

Due to marginalisation with correlated parameters

Checked calculated upper limits against expectations

Given noise curves

CW S2 ULs and known pulsars: Joint Gaussian ULs

Summary

Organization was crucial for review process

Good communication between proponents and reviewers

Code in CVS

Static web pages with studies and reports

We have reviewed the method and results

We believe they are correct

Review process uncovered some problems, which have been fixed

Now have to help get the paper finished

Where to publish? What scope?