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LIGO-G040263-00-E

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

May 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

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

- Narrower filtering
- Marginalise over unknown noise in 30-minute blocks

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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

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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

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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

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Software Validation

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

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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

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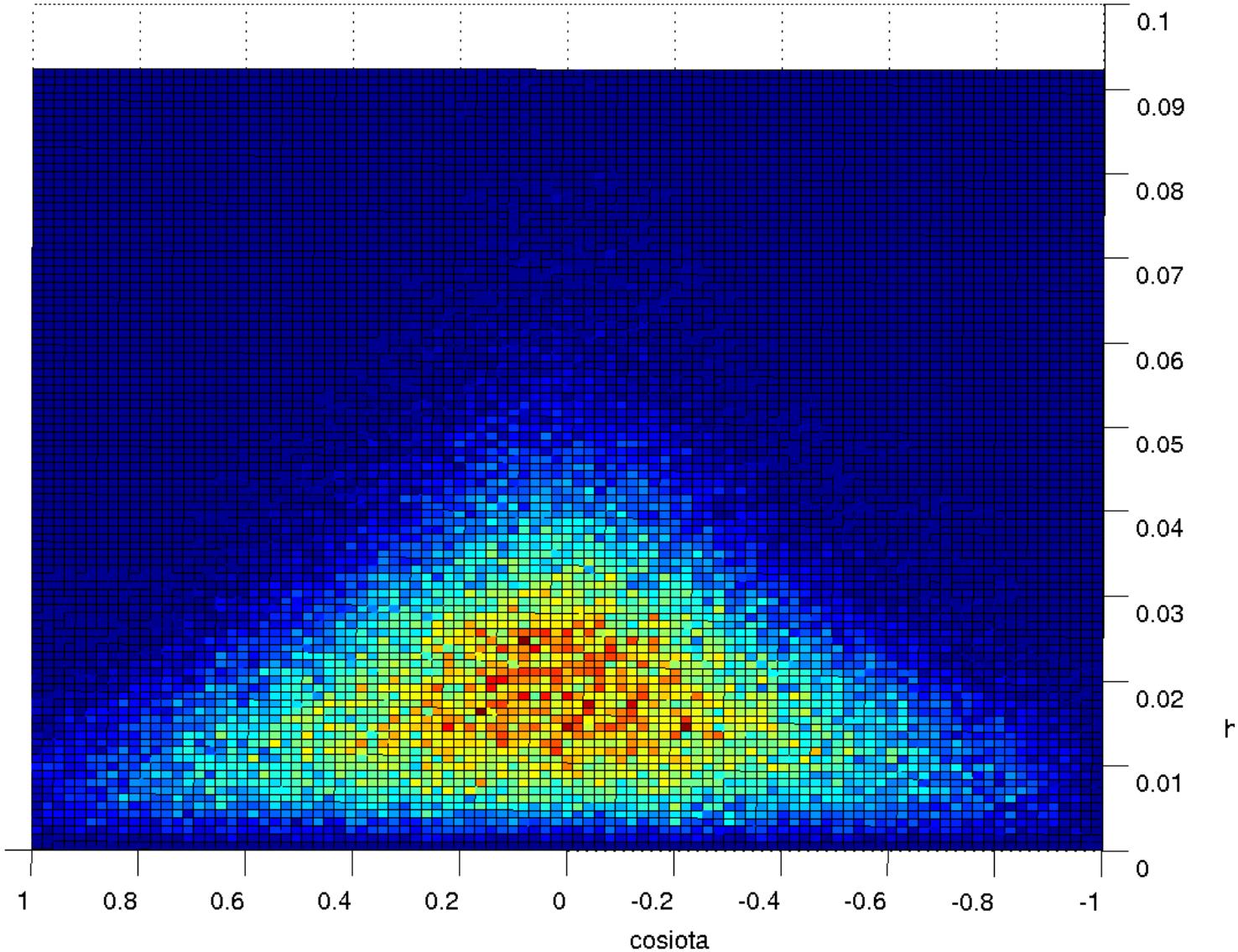
Checks of Results

Examined posterior pdf distributions and numerical limits

- Sanity checks
- Consistency check

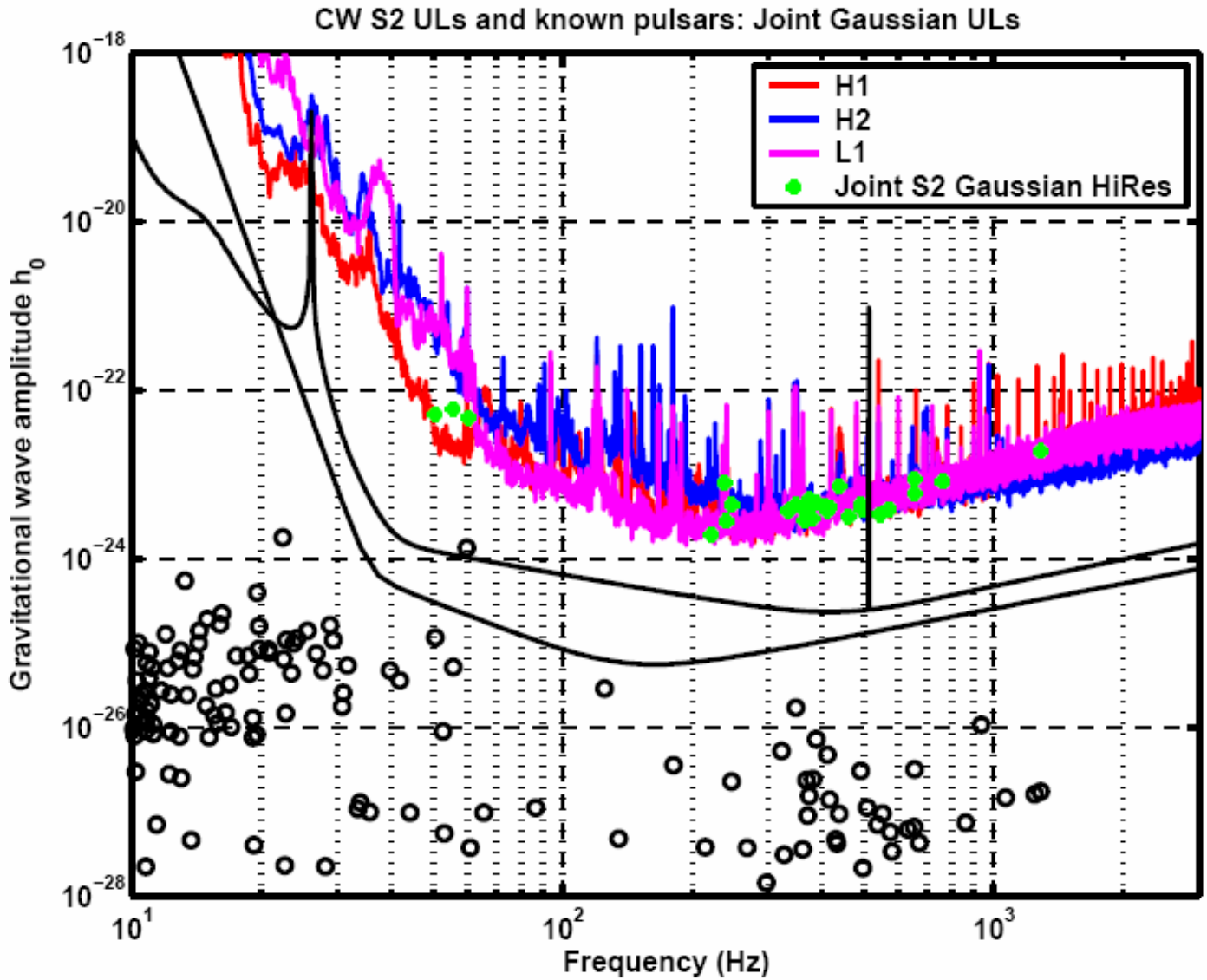
Understand why cos(iota) is usually peaked near zero

Due to marginalisation with correlated parameters



Checked calculated upper limits against expectations

Given noise curves



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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?