
“Instrumental” Interpretation of the Burst Search

Peter Saulson
Syracuse University

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Outline

1. Why an “instrumental” interpretation?
2. Filters for the instrumental interpretation
3. Pipeline of the instrumental interpretation
4. Constructing an instrumental upper limit
5. Open questions

Why an instrumental interpretation?

The Burst Group is charged with looking for signals whose waveforms aren't predicted. Our tools are designed with this in mind.

We can interpret our results in terms of astronomical models. But given our assumption of ignorance, we need to be sure to interpret our search with a minimum of assumptions about the signals.

Instrumental interpretation stays closest to the measurement. We'll say there were no gravity waves stronger than X at a rate of Y , in each of a large set of tiles in the time-frequency plane.

Filters for the instrumental interpretation

By assumption, we aren't doing matched filtering.

We want to look with eyes wide open. At as wide a set of durations and frequency bands as we can.

Any DSO could be useful for the instrumental interpretation.

Simplest to describe in terms of the excess power statistic, with its explicit coverage of t - f plane.

Pipeline for the instrumental interpretation

For each t - f tile:

1. Generate single-ifo triggers, with low threshold.
2. Find coincident events, and make histogram.
3. Construct ensemble of false-coincidence histograms, to determine probability distribution for each bin of coincidence histogram.
4. Test actual coincidence histogram for consistency with chance.
5. Quantify any excess above chance rate.

For set of t - f tiles:

Include trials factor in discussion of significance.

Constructing an instrumental upper limit

Calibration checked by injection of simulated signals.

But upper limit is quoted in terms of h_{rms} or $h(f)$ in a band, not in terms of particular signals.

A rate *vs.* strength curve defines the upper limit for each tile.

Open questions

- How many t - f tiles?
- Coincidence definition (e.g. req't on strength match?)
- Resolution of individual events into “best” tile?
- Look only for events above threshold where we expect none, or can we set a more stringent upper limit?
- Computational burden of many tiles, many trials for false coincidence histograms?