

# **Proposed Principles for S5 Burst Searches**

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*What will we require to make a detection claim?  
Here are some proposed principles...*

- ▶ **Must be insensitive to localized disturbances**
- ▶ **Signals in all operating detectors must be consistent**
- ▶ **Raw data streams must show appropriate cross-correlation**
- ▶ **Consistency should not require just-so assumptions about source position, polarization**
- ▶ **Joint signal must be statistically significant, relative to false alarm rate expected from actual detector noise**
- ▶ **Significance of signal must not depend on fine-tuning cuts**
- ▶ **Comprehensive veto checks must be done**

▶ **Must be insensitive to localized disturbances**

Signal must be seen distinctly in two or more highly sensitive detectors at different sites

▶ **Signals in all operating detectors must be consistent**

Estimated frequency content, amplitudes, durations (if available and reliable) should be consistent

Have to allow for time shifts, antenna patterns, sensitivities

▶ **Raw data streams must show appropriate cross-correlation**

r-statistic / null stream / multi-site coherent analysis

▶ **Consistency should not require just-so assumptions about source position, polarization**

Suggestion: require a certain minimum response from other operating high-sensitivity detectors, e.g. 25%

Subtle in multi-detector case

- ▶ **Joint signal must be statistically significant, relative to false alarm rate expected from actual detector noise**

  - A single detection candidate could be sufficient, if false alarm rate is low enough

  - Suggested minimum confidence level: 1% for a "possible signal"

- ▶ **Significance of signal must not depend on fine-tuning cuts**

  - Some tuning of cuts is likely to isolate outliers

  - Evaluation of statistical significance should be conservative if cuts have been influenced by event candidate(s)

- ▶ **Comprehensive veto checks must be done**

  - Should keep chance of false dismissal under control

**Details of a search method may vary, but should follow principles**

**Detection principles should guide how we approach searches using data from other detectors**

Example 1: Distinct signal in H1+L1, follow-up in GEO, VIRGO, bars

Example 2: Initial trigger from a method analyzing data streams jointly; distinct signal in Virgo+H2 (H1 down), follow-up in L1, GEO, bars

**Making appropriate use of network of available detectors**

**Technical and political implications of checking for consistency in all operating detectors**

**Issues of “credit” if a detection is made**

If a less-sensitive detector’s data is used for a consistency check but does not show the signal, has it still played a role in the discovery?

**Papers**

Whether/how to write papers on detection searches that don't find anything