

# Criteria for Detection of Gravitational Waves

## Impulsive signal

- 1) Observation in all three LIGO interferometers
  - Same spectra (time series) to the limit of the statistics
  - 1:1, 1:2 amplitude ratio to the limit of the statistics
  - Reasonable time delay between LA and WA
  - Simultaneous in 2 and 4 km
- 2) Not observed in the environmental monitor channels
- 3) Not observed in the ancillary detector channels

## Periodic signal (long integration)

- 1) Observation in all three LIGO interferometers
  - Same frequency, frequency and amplitude modulation indices
  - 1:1, 1:2 amplitude ratio
- 2) Not observed in the environmental monitor channels
- 3) Not observed in the ancillary detector channels

## Stochastic background

- 1) Observed in 4km(WA)  $\otimes$  4km(LA) and 2km(WA)  $\otimes$  4km(WA) statistical
- 2) Not observed with same delay in 4km  $\otimes$  environmental channel
- 3) Not observed with same delay in 4km  $\otimes$  ancillary channel

**Recommend agreement with all other detector groups, with corresponding sensitivity, to establish if observation has been made (preferably a joint announcement) and, if not, to jointly arrive at a reasonable hypothesis why not.**

April 30, 1998

TO: Leaders of the Gravitational Wave Projects

I would like you to consider a strategy for the opening days of the large baseline interferometer gravitational wave detectors that will provide the best for the science itself and can be held up as a model for how a new field is opened responsibly.

The proposed strategy is extremely simple.

A detection of gravitational waves is to be announced only after a statistically meaningful analysis has been performed of the data of ALL instruments that were observing throughout the world.

The instruments include the large and medium baseline interferometers, the acoustic detectors and the prototype detectors.

The data analysis for the individual instruments is carried out by the scientists associated with these instruments and their collaborators. The data and statistical results are brought to a council composed of representatives from each observing group. The initial publication is submitted in two parts. A paper from the group(s) making the observation and their analysis and a second paper from the council discussing the statistical significance in regards to the worldwide effort, in particular, the probability and confidence of detection in some of the instruments as well as the reasons for non-detection in others.

Suggest that the council be formed within the next year and that one of the functions of the council be to maintain an inventory of the schedule of operations of the various gravitational wave detectors throughout the world.

Sincerely yours,

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