

Signal Recycling and Resonant Sideband Extraction

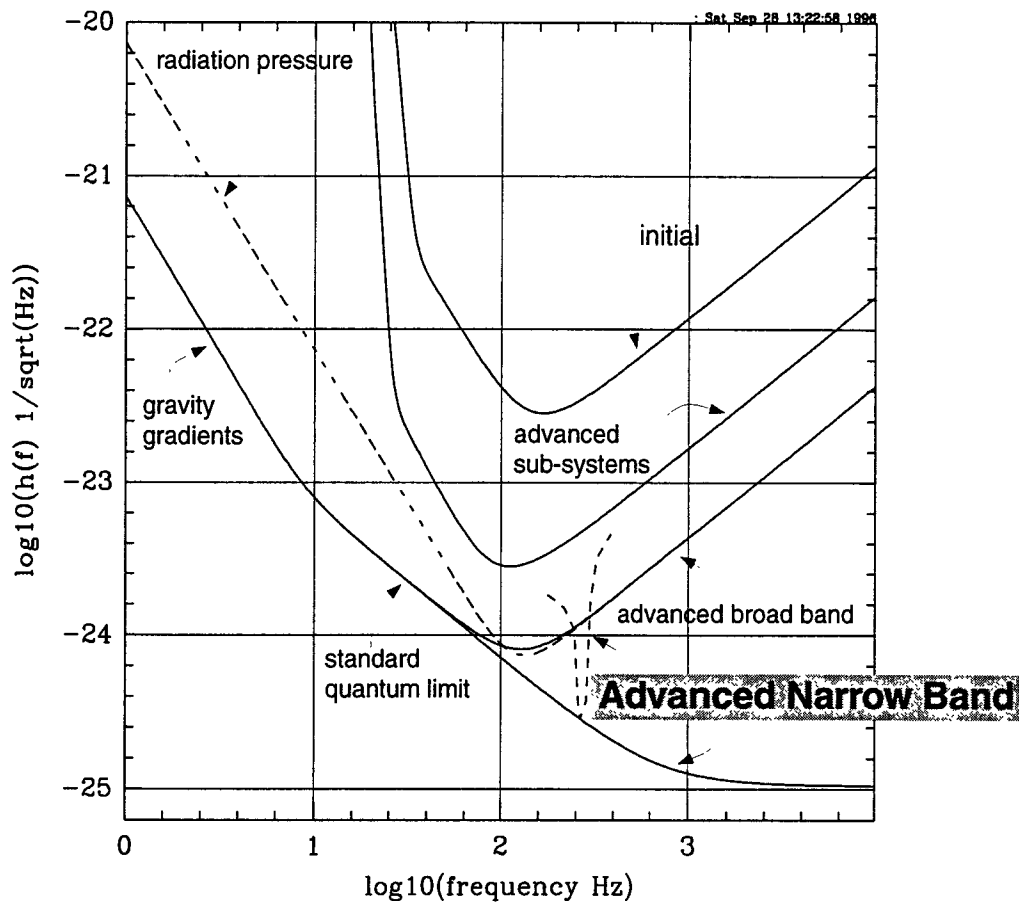
Seiji Kawamura
(LIGO, Caltech)

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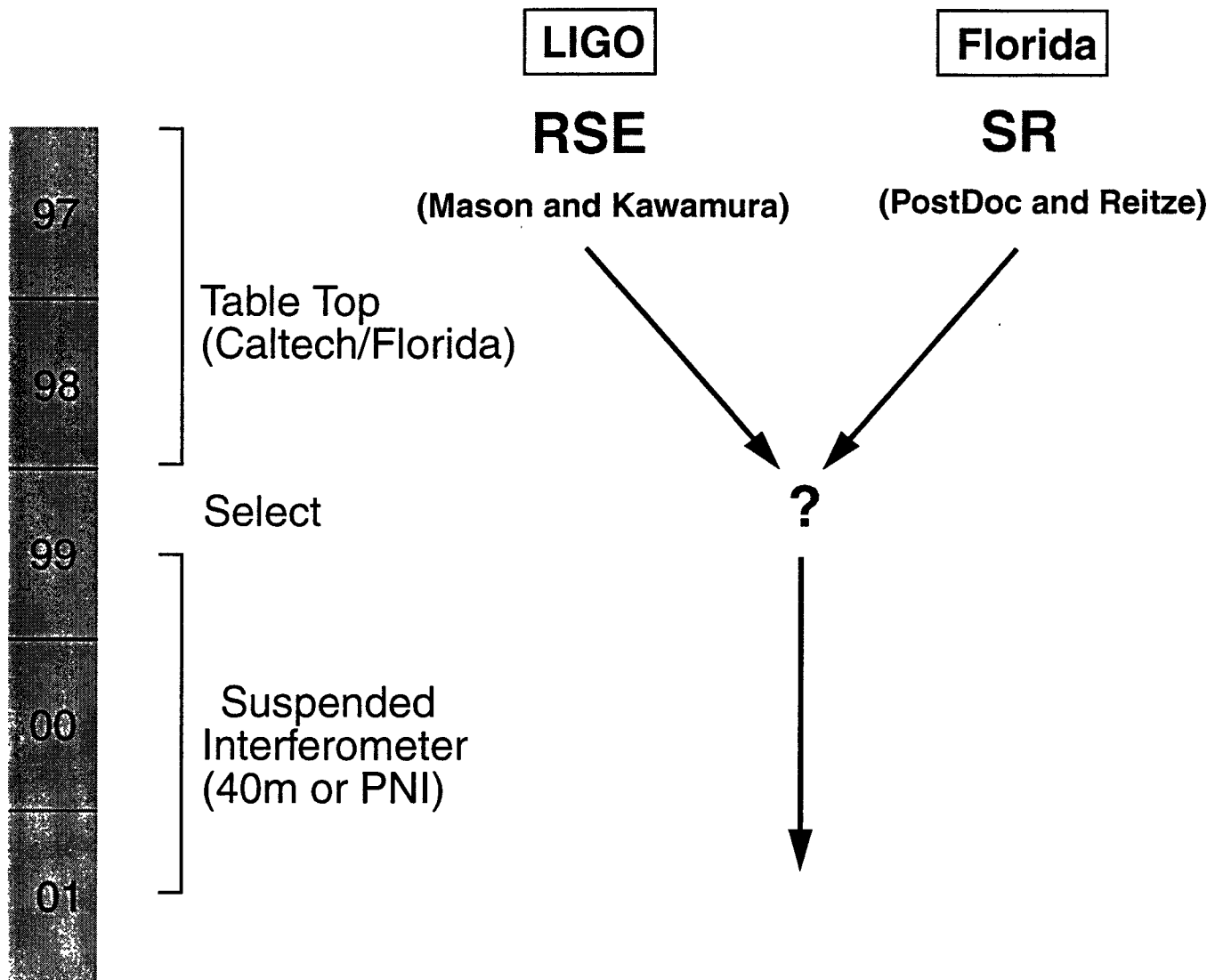
Sensitivity of the Advanced LIGO



Advanced Optical Configuration

- Signal Recycling (Dual Recycling)
 - ›› Invented by B. Meers
 - ›› Signal is recycled by an additional mirror at an antisymmetric port.
 - ›› Narrowband operation is possible.
 - ›› Experiment (no arm cavities) done using external modulation
 - ›› Adopted for GEO configuration (No arm cavities)
- Resonant Sideband Extraction
 - ›› Invented by J. Mizuno
 - ›› Signal is extracted by an additional mirror at an antisymmetric port.
 - ›› Narrowband operation is possible.
 - ›› Power at a beamsplitter can be low, thus less heating effect.
 - ›› Experiment done using external modulation.

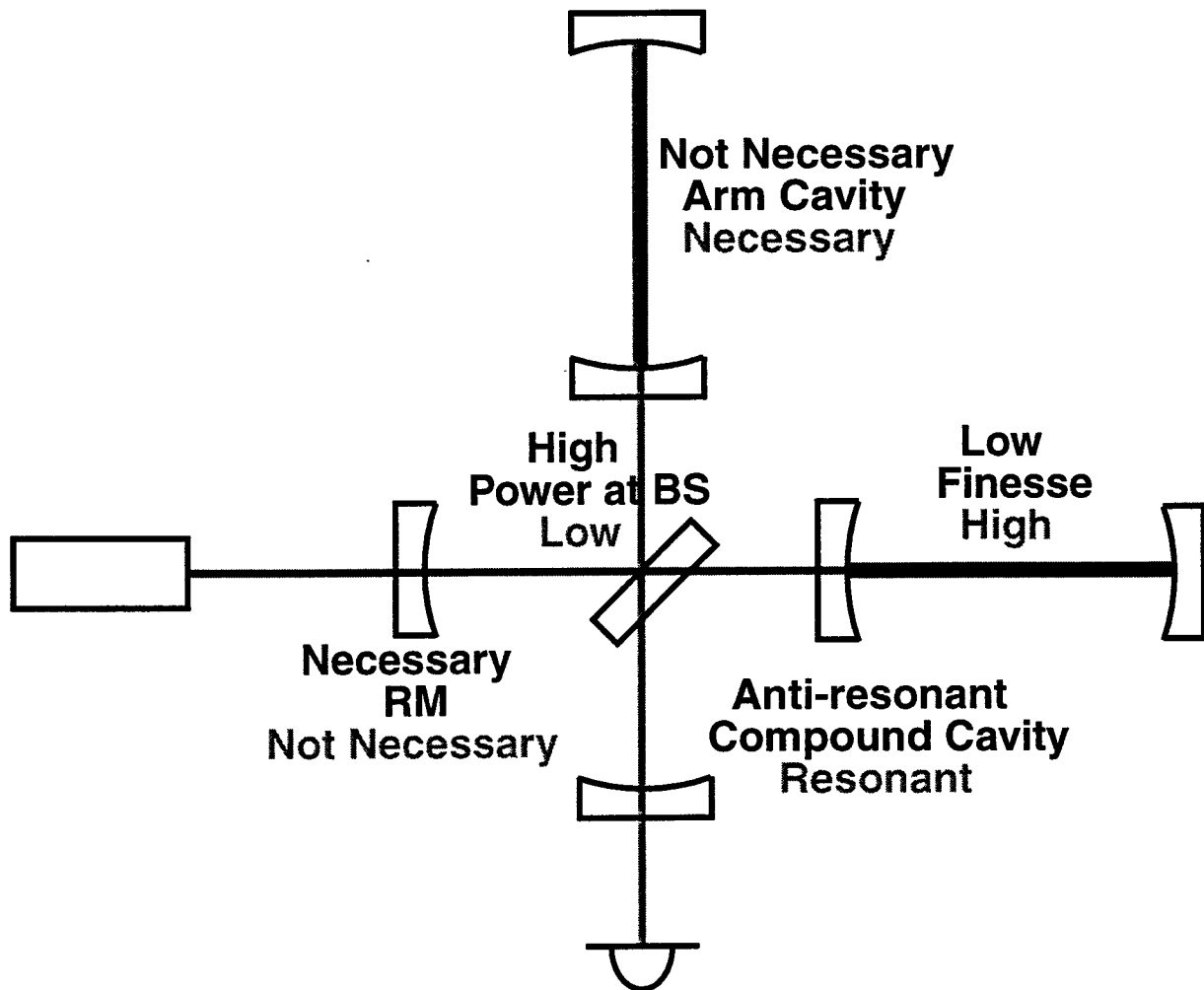
Research Program



Two Table Top Experiments

- First experiment of DR (with arm cavities) and RSE using the Schnupp modulation
 - ›› Sensing and control the length signals
 - ›› Switching between broad band mode to narrow band mode
- Comparison
 - ›› Practically achievable broad and narrow band sensitivity
 - ›› Ease of the band-switching, lock holding, and lock acquisition
 - ›› General feasibility and reliability
 - ›› Future potentiality
- General experience with each method as a basis for selection for a suspended interferometer experiment

Comparison between SR and RSE



Experiment on a Suspended Interferometer

- To investigate issues associated with scaling to a suspended interferometer
- To learn the way to operate the interferometer (including control issues such as lock acquisition and hold) with the scheme in more realistic condition
- To achieve the shot noise limited sensitivity predicted by the model
- To assess the feasibility of implementing at the level of a full scale enhanced LIGO