Optical Contamination Testing Status

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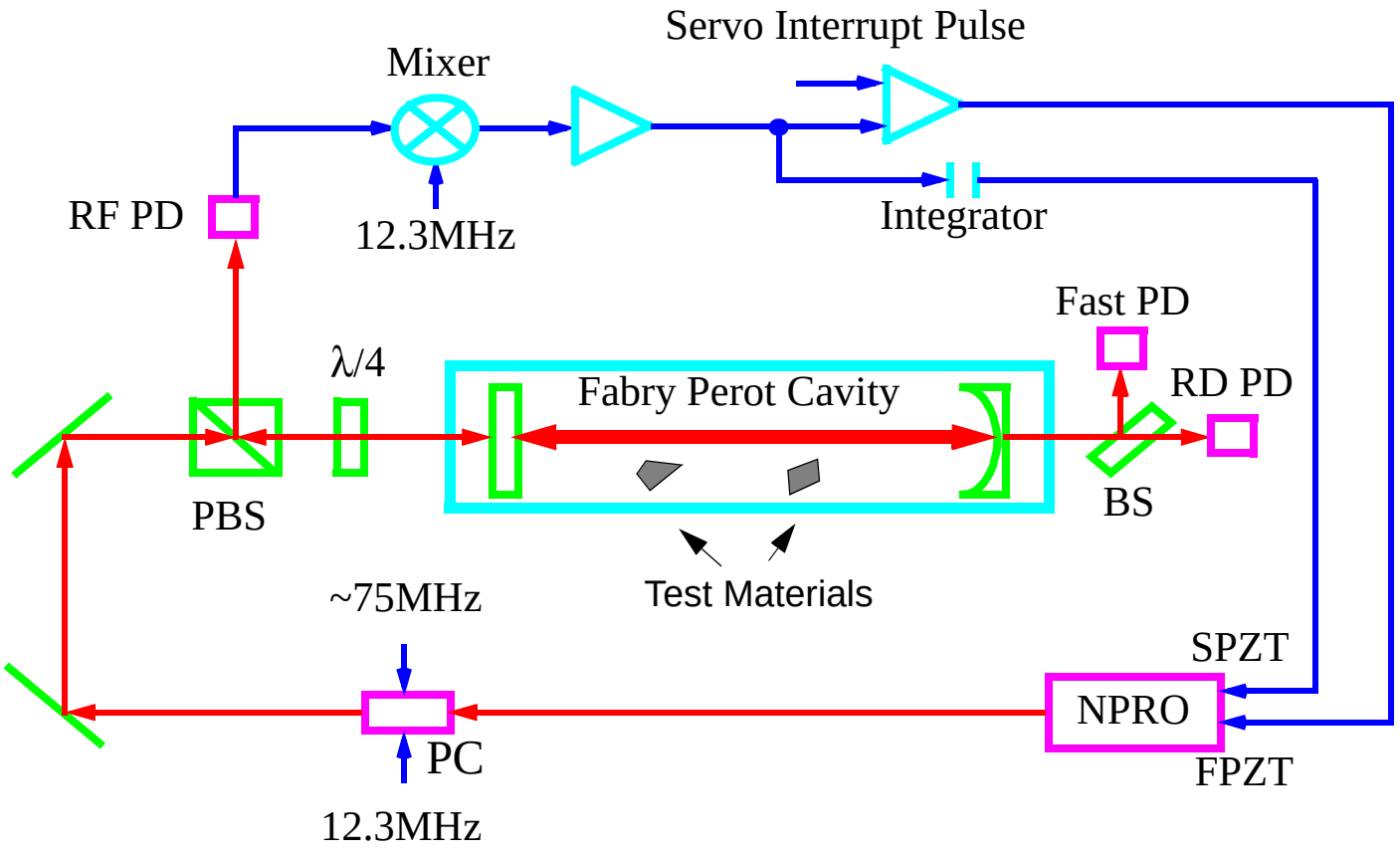
LIGO-G990016-00-D

LIGO-G990022-38-M

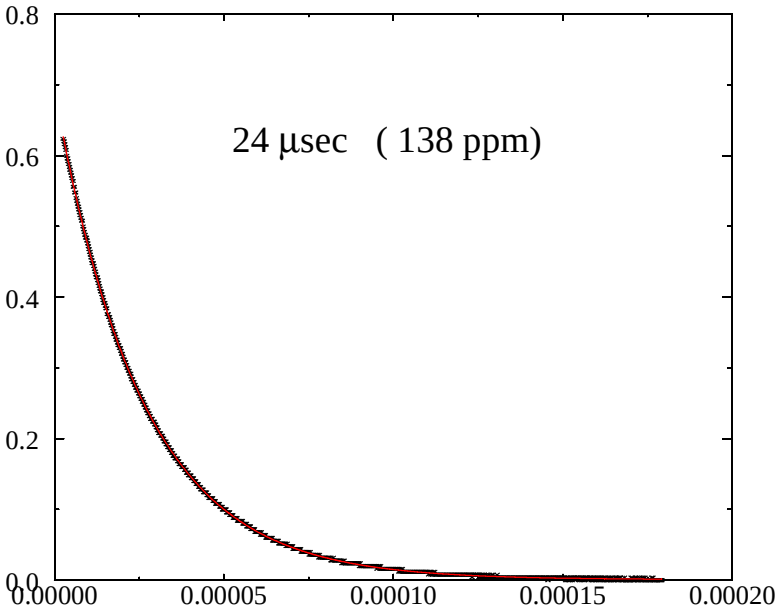
Contamination Test Program
D. Li

- Expose optical cavity to materials and monitor losses
  - ›› LIGO requirement < 10 ppm / yr scatter, 1 ppm / yr absorption
- High finesse so small change in loss easy to observe
- Low pump speed (10 l/sec) for accelerated testing (high material outgassing pressure)
- Tested materials undergo LIGO vacuum preparation procedures

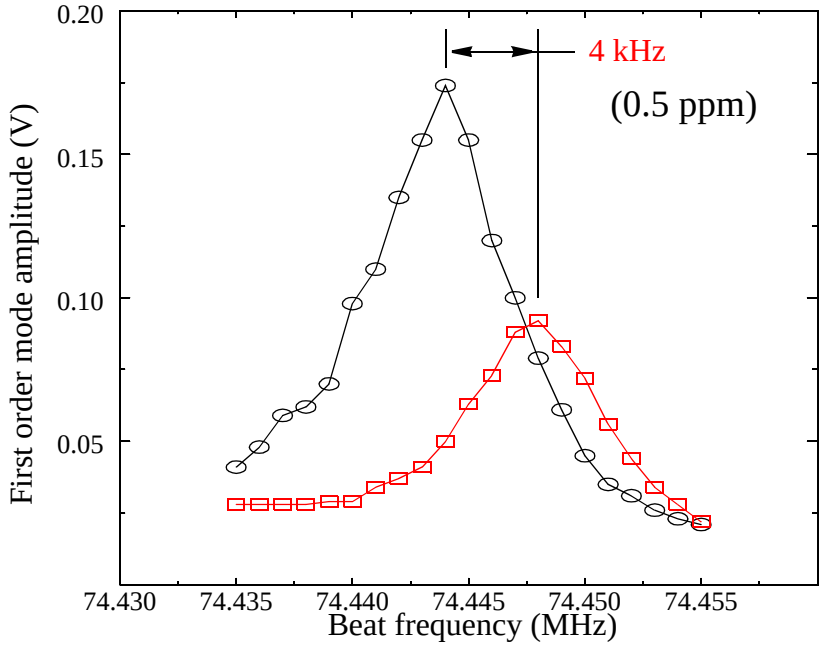
Optical Contamination Cavity Setup



Loss Measurements

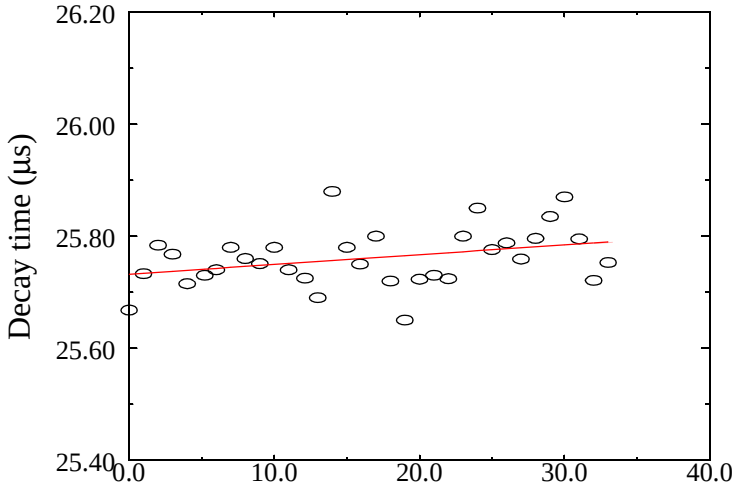


Cavity decay time --> Total Loss

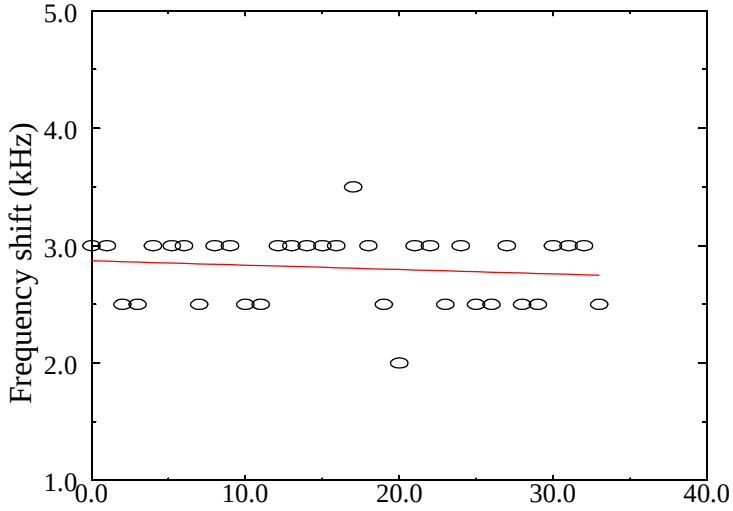


Cavity mode spacing --> Absorption Loss

Data from Vac-Seal Epoxy



Scatter + Absorption
4 ppm / yr



Absorption
- 0.5 ppm / yr

Materials Test Results

Table 1: Measured Contamination Rates

Material	Measured Loss in Contamination Cavity	
	Total ppm / yr	Absorption ppm / yr
LED's and photodiodes	8.5 ± 2.6	0.7 ± 0.5
Kapton cable	8.4 ± 2.1	-1.3 ± 0.7
Vac-seal epoxy	-3.9 ± 1.9	-0.5 ± 0.6
Faraday Isolator	-5.2 ± 15.6	0.7 ± 0.5
Teflon coated wires	-1.0 ± 2.5	1.7 ± 0.9

- No evidence for gradual optical degradation from hydrocarbon cracking