

OMC building status

- PZT assembly:

Glued with EP30-2 + bonding liner (75~90um sphere). Air baked (94degC).

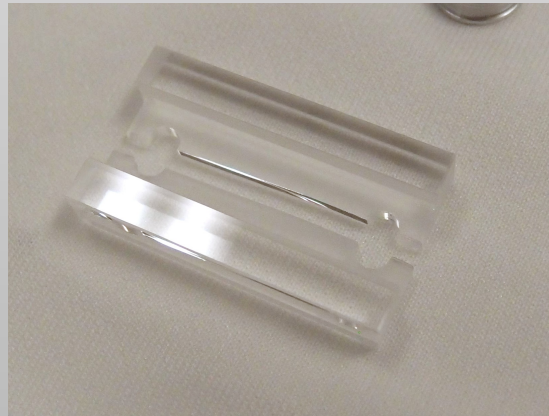
- All glass components were glued on the breadboard

Optics aligned with the template + micrometers (only for the curved mirrors)

The cavity FSR/TMS were kept characterized through out the gluing process

- Mounting brackets break with fastening torque

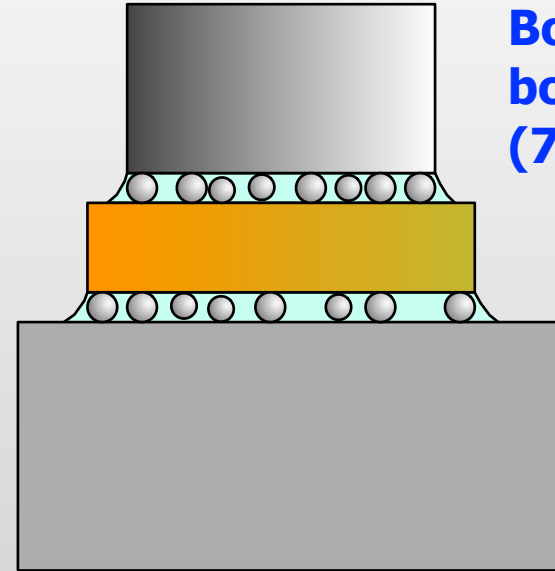
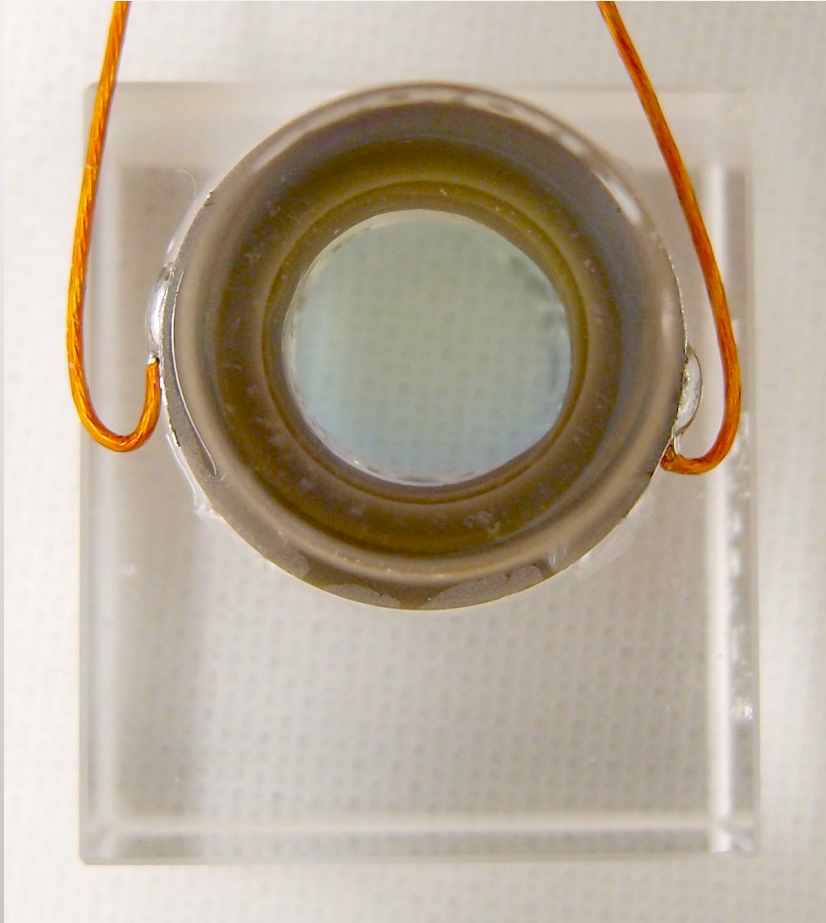
The issue will be circumvented with reinforcement by invar plates



OMC status update

K Arai/J Lewis/W Korth/L Barsotti
Apr. 19, 2013 / LIGO-G1300474-v1 P2

PZT assembly gluing



**Borosilicate sphere
bond liner
(75-95um dia.)**

- Valera and Ryan expressed the concern of excess noise
The glass sphere will be sent to LLO for the noise testing

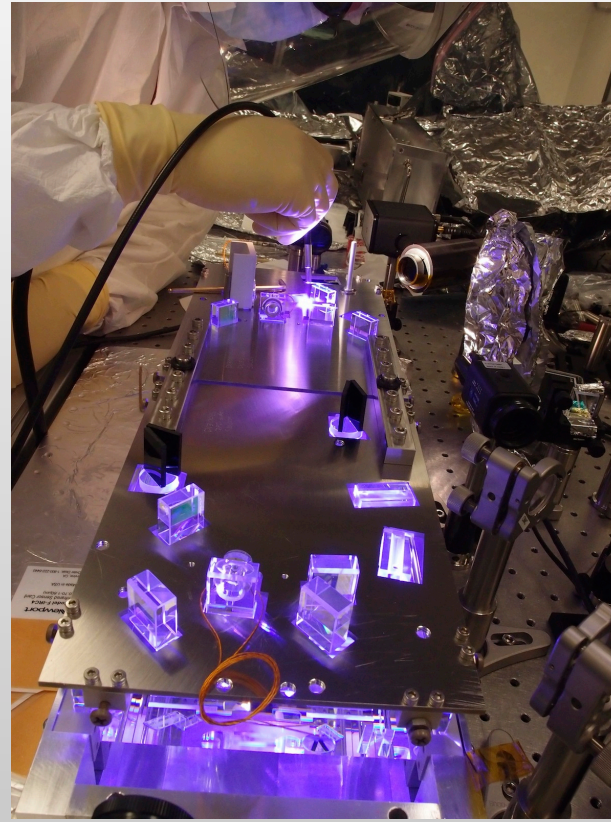
OMC status update

K Arai/J Lewis/W Korth/L Barsotti
Apr. 19, 2013 / LIGO-G1300474-v1 P3

Bottom-side gluing



Micrometers
for cavity length / spot position
control



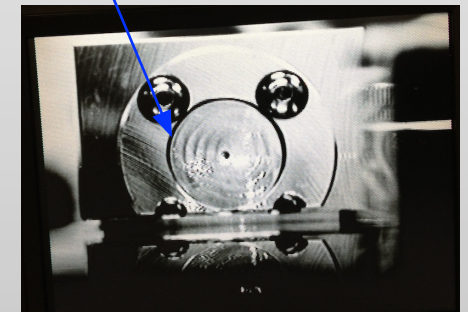
Anti-slippage
device

Main spot
on a QPD mount

center hole



Alignment disk



Same photo with
ambient illumination

Spots are $\sim 0.5\text{mm}$
too low on the PDs
will be absorbed by
the mount adjustment

Cavity test ~ Transmission

REFL (unlocked)



REFL (locked)



TRANS (locked)



Cavity transmission (in lock): **94.4%** (does not include the BS for the PDs)

Cavity reflection (in lock): **3.2%** (=sidebands 2% + junk light 1.2%)

=>

Matched Carrier throughput: **97.6%** (Mirrors not yet cleaned by First Contact)

Steering Mirror transmission: **0.7%**

Cavity mirror transmissions: **1.1%**

=>

Loss in the cavity ~50ppm (roundtrip)

Cavity test ~ FSR, Transverse mode spacing

- FSR:

PDH locking with slight ($\sim 1/100$ line width) offset

=> PM-AM conversion at around the FSR

$f_{\text{FSR}} = 264.963 \text{ MHz} \Rightarrow 1.1314\text{m}$ (nominal 1.132m)

- TMS:

Pitch: $f_{\text{TMS}} = 58.0177 \text{ MHz} = 0.218966 f_{\text{FSR}}$ (nominal $0.21879 f_{\text{FSR}}$)

Yaw: $f_{\text{TMS}} = 58.0857 \text{ MHz} = 0.219221 f_{\text{FSR}}$ (nominal $0.21939 f_{\text{FSR}}$)

- Separation from some dangerous modes: (LW=linewidth)

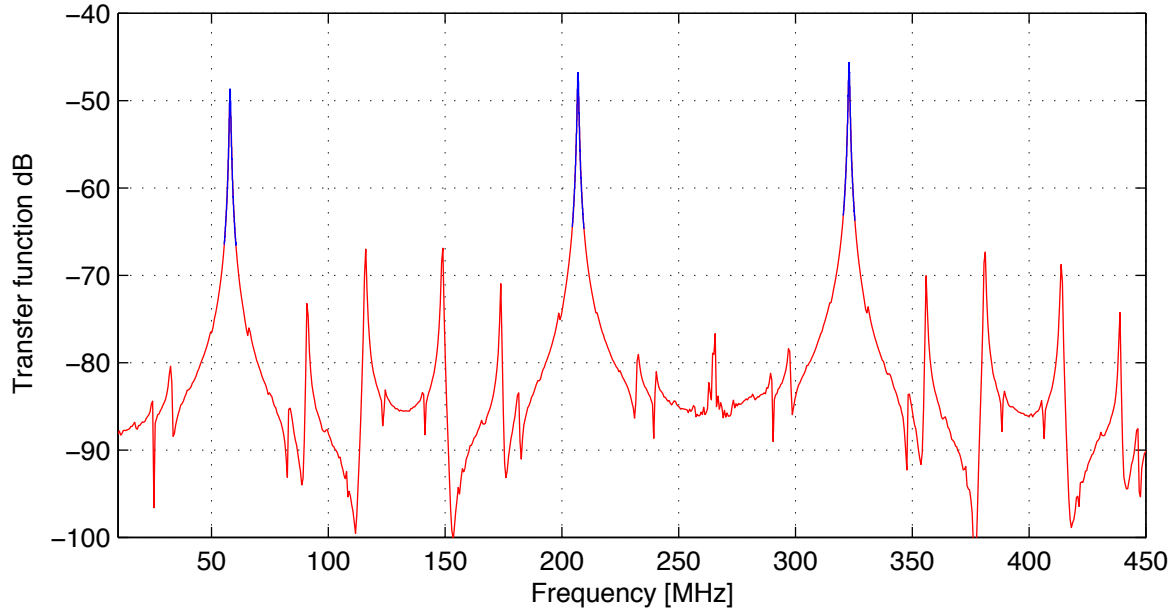
Sideband freq: 45.48135MHz

9th order carrier: TEM(0,9): 11.7 LW, TEM(9,0) 10.8 LW

13th order upper sideband: TEM(0,13): 7.3 LW, TEM(13,0) 8.6 LW

19th order lower sideband: TEM(0,19): 4.5 LW, TEM(19,0) 2.6 LW

130412_Pitch: L1OMC – HOM measurement(2013/04/12)



Fit Result

== Peak 1 ==

Peak1: 58.022602 +/- 0.000241 MHz
 Cavity pole: 323.356834 +/- 0.264726 kHz
 Finesse (1st order): 409.705559 +/- 0.335419

== Peak 2 ==

Peak2: 206.949449 +/- 0.000205 MHz
 Cavity pole: 326.256720 +/- 0.225569 kHz
 Finesse (1st order): 406.063950 +/- 0.280747

== Peak 3 ==

Peak3: 322.984787 +/- 0.000277 MHz
 Cavity pole: 322.699788 +/- 0.304389 kHz
 Finesse (1st order): 410.539756 +/- 0.387246

== Summary ==

Free Spectral Range (FSR):
 264.962185 +/- 0.000367 MHz

Cavity roundtrip length:
 1.131454 +/- 0.000002 m

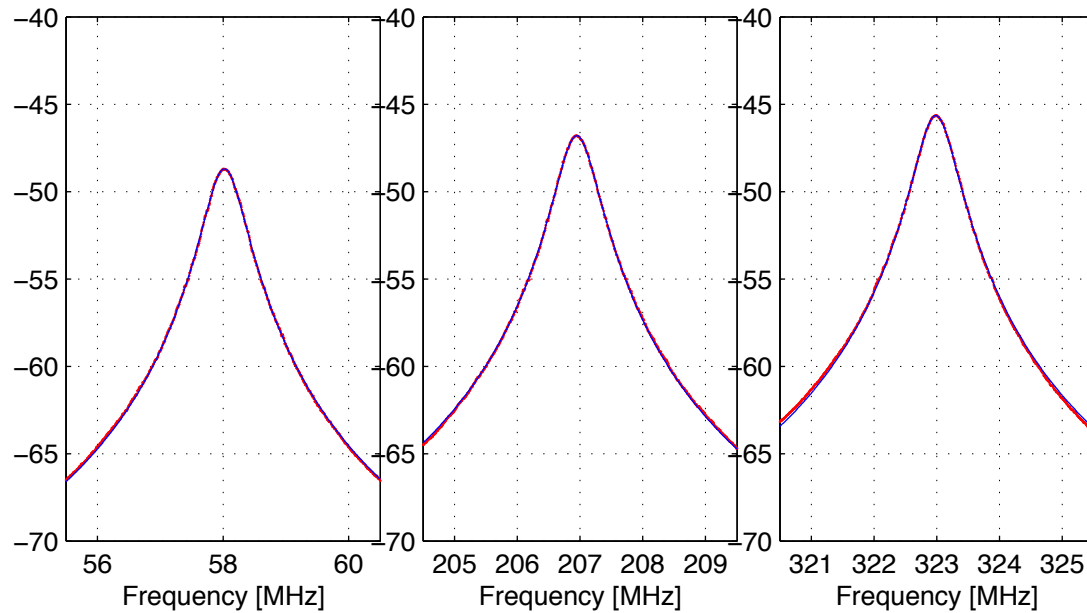
Lock offset:
 4.932817 +/- 0.296303 kHz

Transverse mode spacing (TMS):
 58.017669 +/- 0.000172 MHz

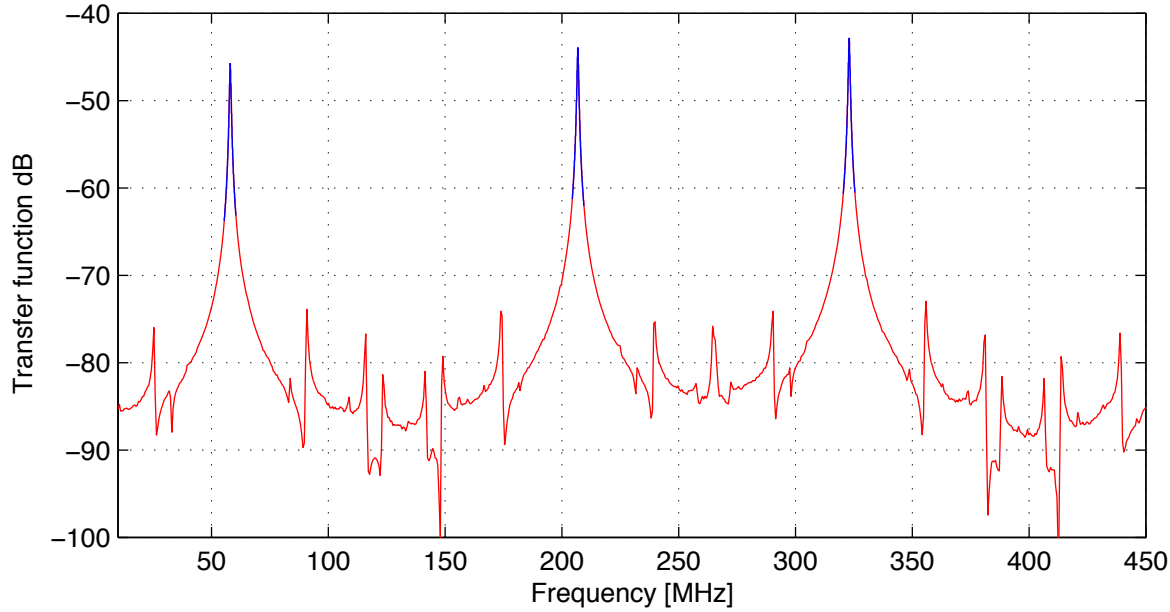
TMS/FSR:
 0.218966 +/- 0.000001

Cavity pole (1st order modes, avg and stddev):
 324.104448 +/- 1.892653 kHz

Finesse (1st order modes, avg and stddev):
 408.769755 +/- 2.380128



130412_Yaw: L1OMC – HOM measurement(2013/04/12)



Fit Result

== Peak 1 ==
 Peak1: 58.086312 +/- 0.000100 MHz
 Cavity pole: 328.702806 +/- 0.109869 kHz
 Finesse (1st order): 403.045845 +/- 0.134718

== Peak 2 ==
 Peak2: 206.879535 +/- 0.000097 MHz
 Cavity pole: 328.170276 +/- 0.106316 kHz
 Finesse (1st order): 403.699878 +/- 0.130786

== Peak 3 ==
 Peak3: 323.050912 +/- 0.000141 MHz
 Cavity pole: 327.651057 +/- 0.155395 kHz
 Finesse (1st order): 404.339610 +/- 0.191766

== Summary ==
 Free Spectral Range (FSR):
 264.964601 +/- 0.000173 MHz

Cavity roundtrip length:
 1.131443 +/- 0.000001 m

Lock offset:
 0.622955 +/- 0.131485 kHz

Transverse mode spacing (TMS):
 58.085689 +/- 0.000086 MHz

TMS/FSR:
 0.219221 +/- 0.000000

Cavity pole (1st order modes, avg and stddev):
 328.174713 +/- 0.525889 kHz

Finesse (1st order modes, avg and stddev):
 403.695111 +/- 0.646895

