

## **LIGO-T030132-00-W**

MC Notes from 1999 – Mode Cleaner Length Measurement  
by Nergis Mavalvala

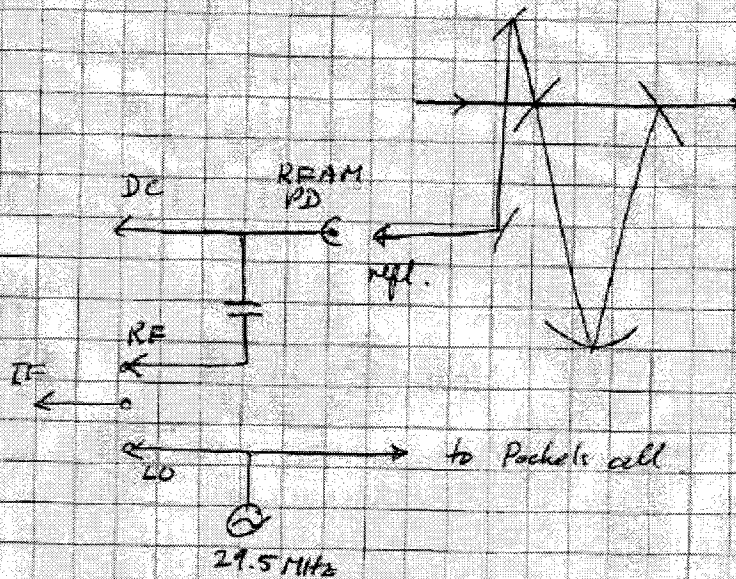
These notes were recorded in the MC Notebook at LHO on 7/02/99.

Submitted to the DCC 7/9/03 by Betsy Bland

07/02/99

Measure length of mode cleaner

(a) Measurement setup:



(b) Procedure:

Set  $f = 29.486$  MHz

Maximize signal in I-phase demod

Scan  $f$  to minimize I demod signal

(c) Results:

i) With Mini Circuits mixer and cable for  $\phi$ -shift:

$f$	$V_{demod}$
29.486	267 $\mu$ V
29.434	$\sim 0$ mV

ii) with WFS type demod board

f	V <sub>demod</sub>
29.486	2.99 V
29.438	-0 V

About 1 hr later this measurement is not repeatable  
Now I find a zero Xing at

29.25 MHz and 29.15 MHz ??

When find V<sub>demod</sub> = 0 V<sub>DC</sub> see large (+2 dBm) peak at  
2.53 MHz (beat b/w 26.717 and 29.255 MHz)

Can minimize the beat to -87 dBm at f = 29.474 MHz

zero Xings: 29.192 MHz      2.5 MHz beat gets small  
29.912 MHz

Repeat with mini-circuit mixer

⊙ Xing = 29.259 MHz

07/02/99

7:30 PM

The mode cleaner has lost lock. It's completely misaligned. The spot is hitting MC2 way to the edge. Aligning MC3 to center spot on MC2 does not restore fringes, so not just MC3 snap.

Try tweaking alignment of each MC to see if any one alone lost alignment

Initial bias settings:

	pitch	yaw
MC1:	-7.657	-5.926
MC2:	0.358	6.790
MC3:	5.771	-2.171

MC 1 and 3, no change. MC2 yaw  $\rightarrow$  2.683, get TEM00 mode again. Mode cleaner locks.

$$V_{\text{CRANS}} = 6 \text{ V}$$

$$V_{\text{REFL}} = 750 \text{ mV}$$

But now spot on MC2 is  $\sim$  1 cm too low



1/99

NOTE: There was an earthquake at  $\sim$  6:45 pm. Seismometers went nuts, heard about it on the news that night.

7/02/99

Find PSL  $\text{ill}$ . PMC locked on TEM00 mode but very dim. PSL screens dead (no readbacks, just white boxes)

$P = 19.5 \text{ mW}$  maximum after EOMs

Laser / reference cavity looks OK Reboot PSL Vme

Reset settings using psl\_990628\_093713\_0.snap Now get  
 $P = 5.44 \text{ W}$  max after EOMs

Reset  $P = 100 \text{ mW}$  after EOMs

Lock mode cleaner w/ Ptrans = 9.5 V  $\rightarrow$  Tweak to  $P_{\text{trans}} = 6 \text{ V}$

REAM PD on IOT7 has  $V_{oc} = 1.31 \text{ V}$

Maximize Q-phase signal at  $f = 29.000 \text{ MHz}$

Find minimum ( $\phi$  King) at  $f = 29.339$

29.317

29.309

29.400

29.392

29.457

$\leftarrow$  minima correspond to minima in 2-7 MHz heat also.

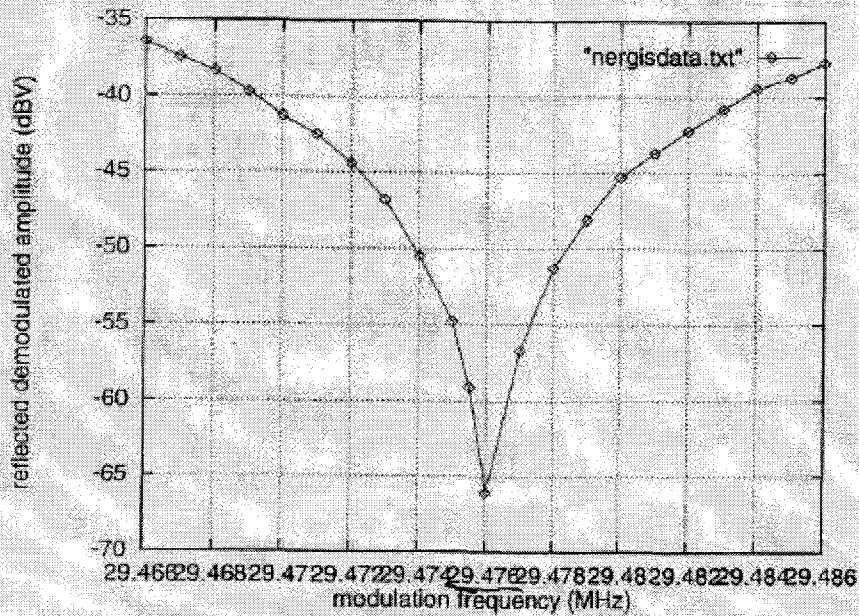
The measurement at DC seems meaningless. Perhaps it's swamped with REAM?

Modulate MC length at 87 Hz by driving LSC input of MC2 with 1 V<sub>rms</sub> sine wave.

Set  $f_{\text{mod}} = 29.486 \text{ MHz}$ . Shift  $\phi$  to maximize I-phase signal ( $\approx 70 \text{ mV}$ ). Now shift  $f$  to minimize 87 Hz signal on SA.

$\Rightarrow f = 29.475 \text{ MHz}$   $V_{\text{mod}} = -49 \text{ dB}$

f (MHz)	V (dBV)	
29.486 000	-37.7	(82 mV <sub>p-p</sub> )
29.485	-38.7	
484	-39.4	
483	-40.8	
482	-42.2	
481	-43.7	
480	-45.3	
479	-48.1	
478	-51.3	
477	-56.7	
* 476	-66.1	⇒ $l_{rc} = 15.256 \text{ m}$
4755	-59.1	
475	-54.8	
474	-50.5	
473	-46.8	
472	-44.4	
471	-42.5	
470	-41.3	
469	-39.7	
468	-38.3	
467	-37.4	
466	-36.4	



$l_{rc} = 15.24 \text{ m}$