

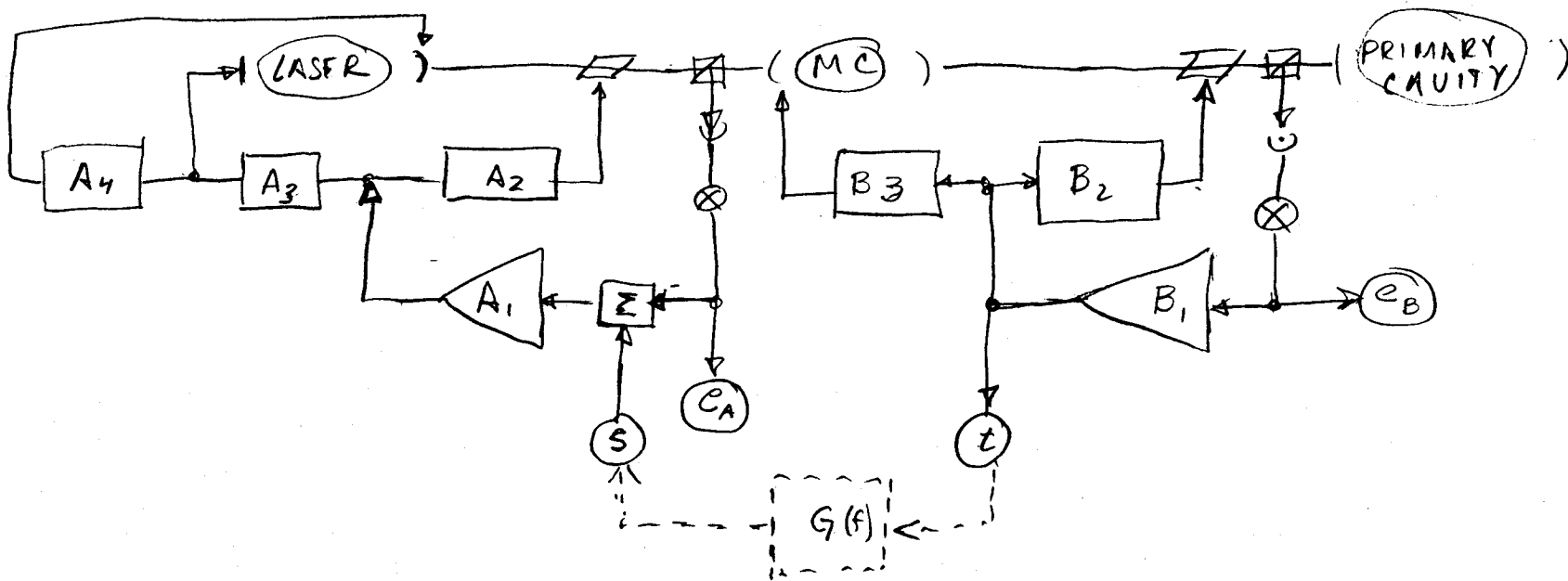
New Folder Name 40 m Interferometer

40m Interferometer: Goings On 10 October 1990

- I. measured XF $H(f)$, laser loop error signal offset \rightarrow primary cavity loop error signal (corrected to open-loop value by $1 + G_{pcl}$)
- II. investigated mag/phase anomaly in $H(f)$ around 100-200 kHz
 - A. critically depends on laser loop fast PZT/PC X-over
 - B. found laser loop pathological; three U.G.f.'s
 - C. dip below unity gain due to excessive FPZT/PC X-over freq.
- III. implemented less ambitious feedaround path to avoid bad spot;
 - A. arranged electronic XF to avoid dip in $H(f)$ at 100kHz \Rightarrow U.G.F \lesssim 80kHz
 - B. steep rolloff for gain at 1kHz
 - C. (alas) gain at 20 kHz insufficient to conquer laser noise
- IV. plans
 - A. go ahead w/polarizer, DC bias net for RFPC (vent system)
 - B. search and destroy problem w/ laser servo (Jake on the case...)
 - C. implement full BW feedaround when laser servo is cured

10/9/90 MEZ

SCHEMATIC OF LASER, PRIMARY CAVITY SERVO LOOPS



$$\frac{z}{s} \equiv H(f)$$

$H(f) G(f) =$ open-loop gain of feed-around servo path

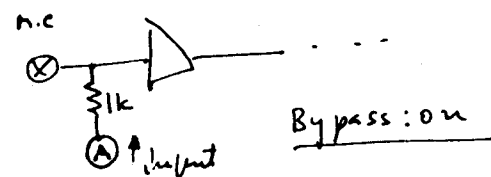
$$H(f) \propto \frac{G_{\text{LASER}}}{1 + G_{\text{LASER}}} \quad \text{where } G_{\text{LASER}} = \text{open-loop gain of laser loop}$$

10/9 ①, FEEL-AROUND PATH TRANSFER F/N H(S)

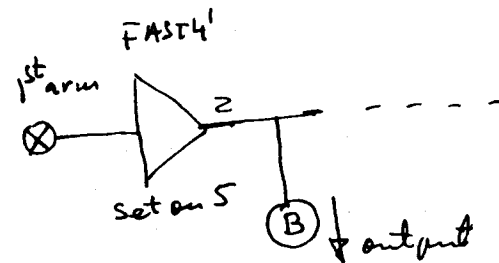
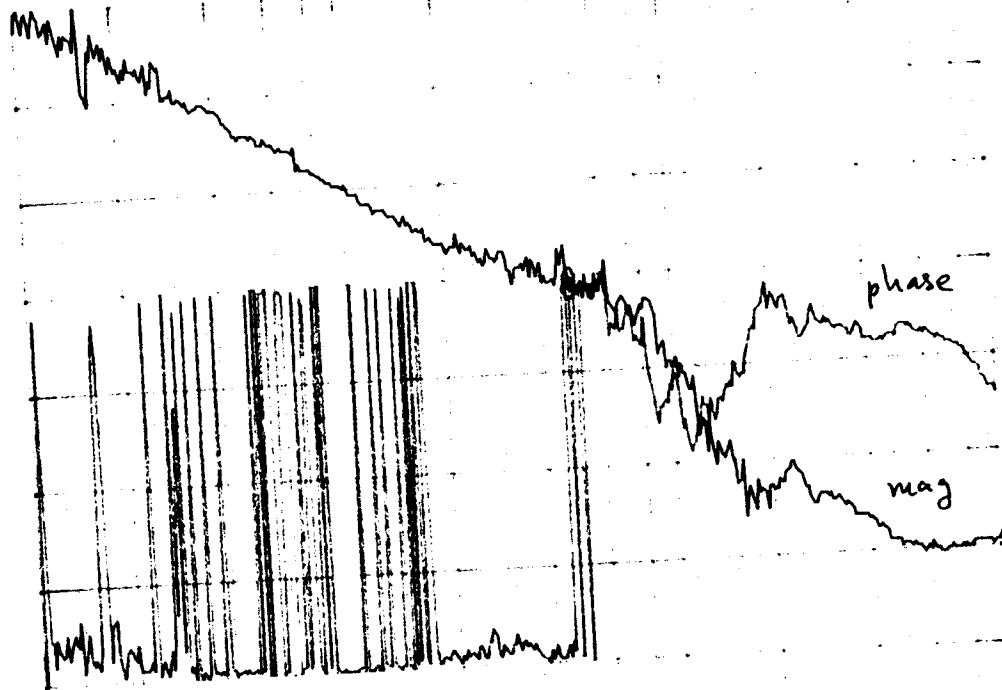
3-Oct-90 16:55

Laser locking error point →
→ 1st arm error point transfer function.

NETWORK	Cor	0 MKR	48 696.753 Hz
A: REF	B: REF	T/R	-346.509m dB
30.00	225.0	θ	83.7793 deg
[dB]	[deg]		



Measured using the 4195A (HP)



Displayed traces:

$$\frac{V_B}{V_A}$$

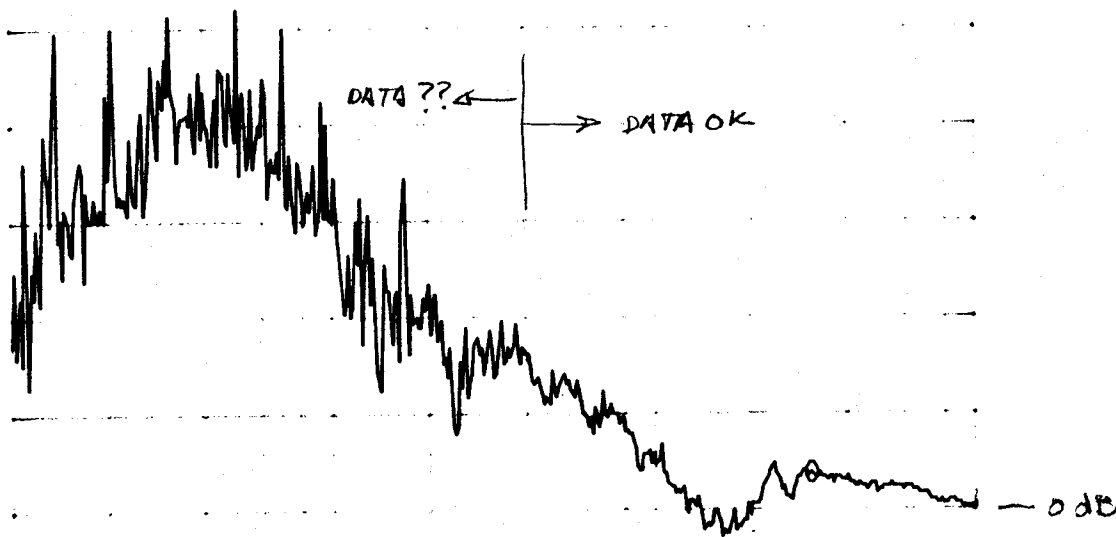
Obtained by measuring $\frac{V_B}{V_A}$, with 1st arm locked (no by pass), and multiplying with (1st arm loop gain + 1)_{measured}.

DIV	DIV	START	1 000.000 Hz
10.00	45.00	STOP	1 000 000.000 Hz
RANGE: 10, 0, 10 dBm			

10/9 ②, LASER PRESTABILIZATION LOOP GAIN

AT LOW F
BUT MAGNITUDE
ONLY

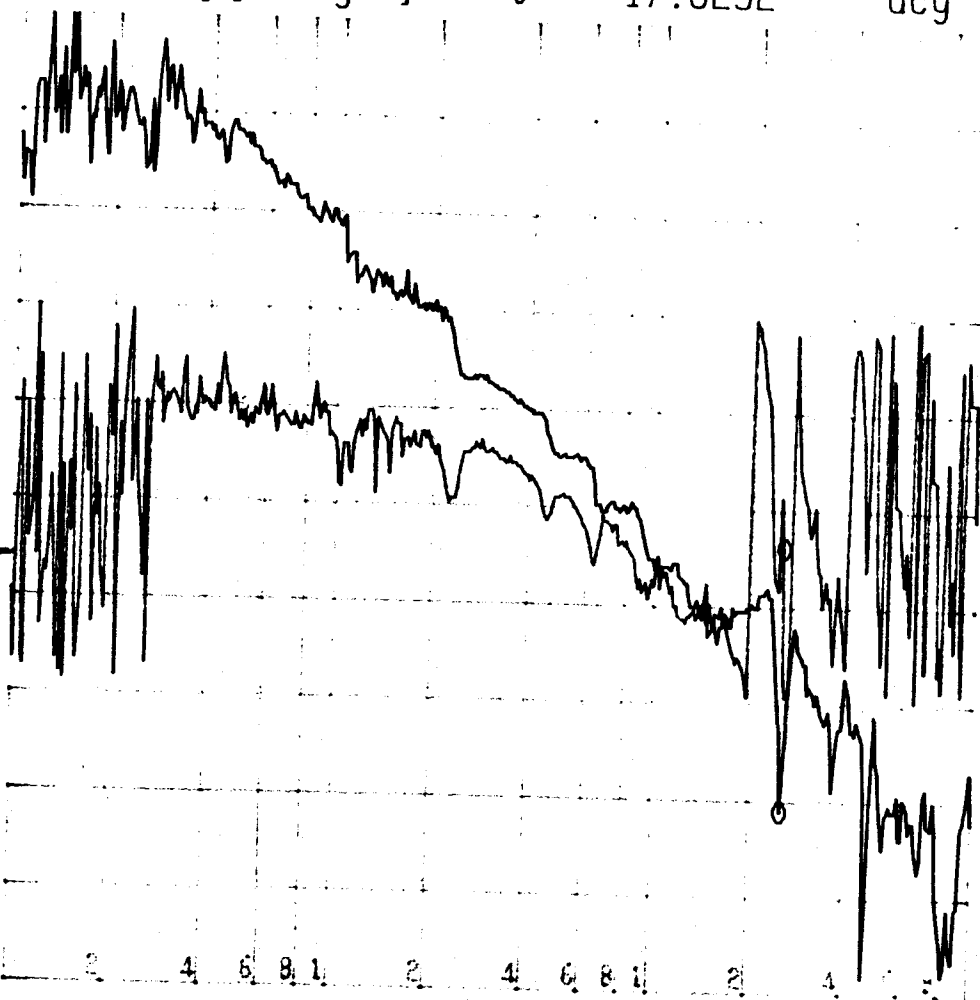
NETWORK	Cor	0 MKR	309 029.543 Hz
A: REF	B: REF	T/R	3.64241 dB
70.00	225.0	θ	deg
[dB]	[deg]		



2 4 6 8 1 2 4 6 8 1 2 0 4 6 8

DIV 10.00 DIV 45.00 START 1 000.000 Hz
 STOP 1 000 000.000 Hz
 RBW: 300 Hz ST: 40.9 sec RANGE: R= 10, T= 20dBm
 DIV= 4.50000E+01

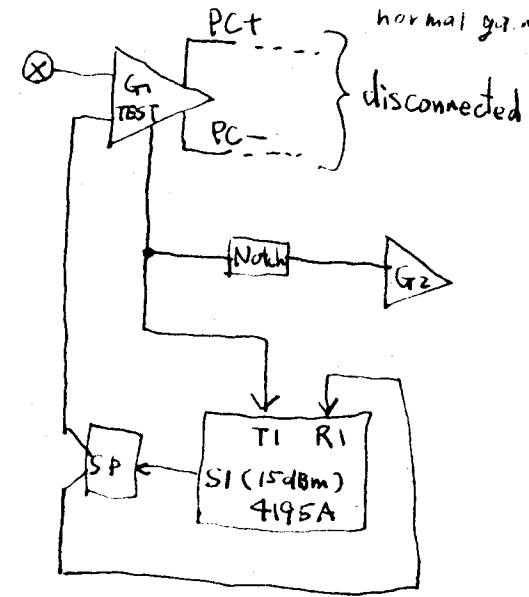
NETWORK	COR		0 MKR	251 188.643 Hz
A: REF	B: REF	T/R	-40.8756	dB
40.00	225.0	θ	-17.6292	deg
[dB]	[deg]			



DIV	DIV	START	1 000.000 Hz
10.00	45.00	STOP	1 000 000.000 Hz
RBW: 100 Hz	ST: 2.00	min	RANGE: R= 10, F= 20 Hz
REF= 2.25000E+02			

10-4-90 15:40
Gain of ONLY PZT loop
in Laser stabilization

(Bypass off, $G_1 = 4$
 $G_2 = 2.80$)
The current gain is -16 dB of the
normal gain



This plot:

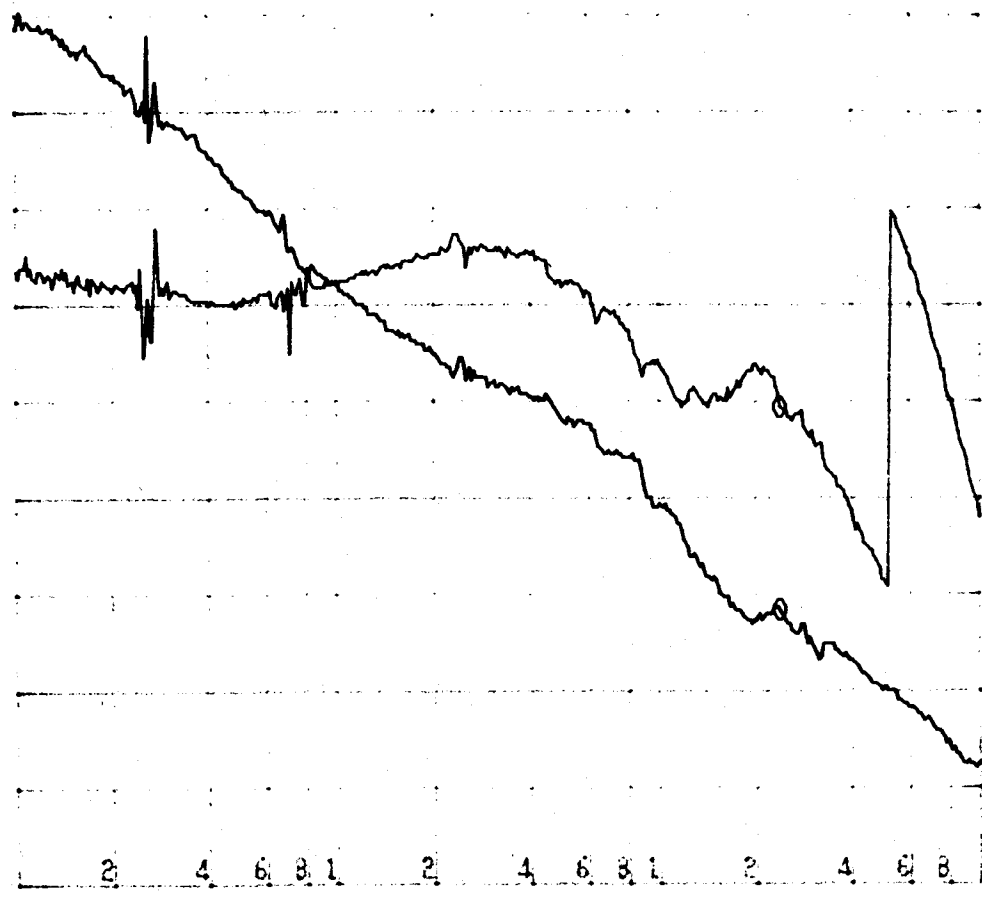
$$\frac{\left(\frac{T_i}{R_i}\right)_{open}}{\left(\frac{T_i}{R_i}\right)_{close}} - 1$$

Stored in disk as
" LZG 1004 "

10/9 (4)
 FEED-AROUND
 "MARK I"
 LOOP GAIN

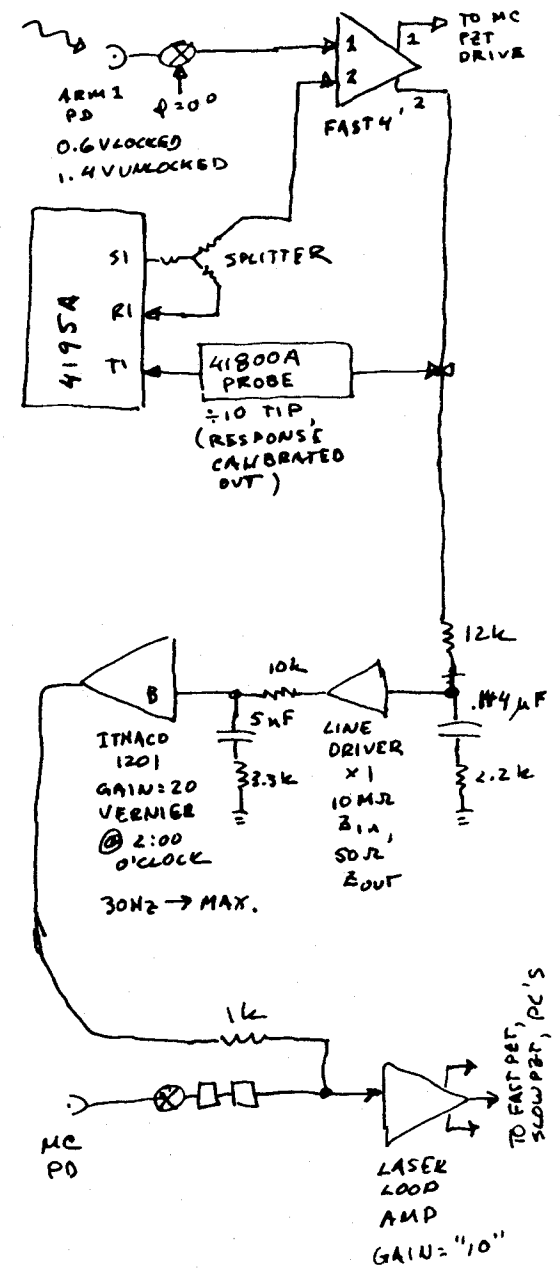
NETWORK	Cor	0 MKR	238 506.380 Hz
A: REF	B: REF	T/R	-21.7977 dB
50.00 [dB]	225.0 [deg]	θ	-2.77482 deg

DISK
 FILE "A1FALPGNT" (green)

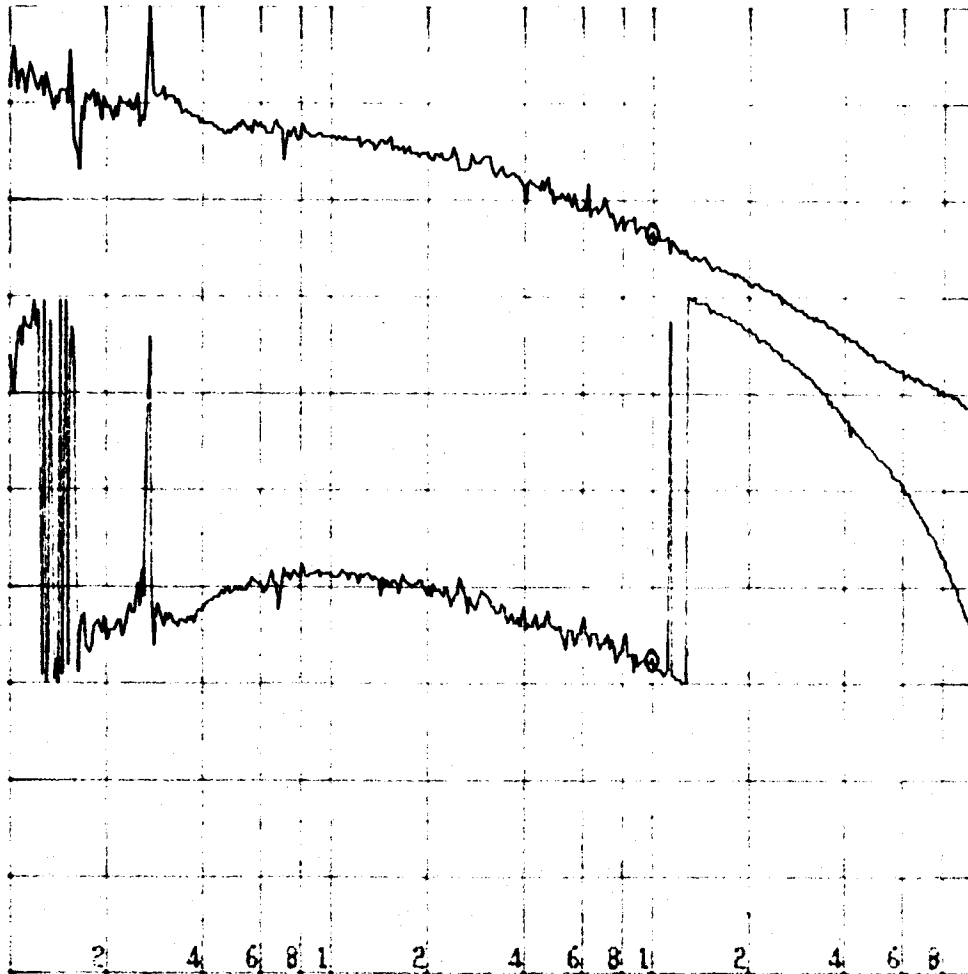


DIV 10.00	DIV 45.00	START 1 000.000 Hz	STOP 1 000 000.000 Hz
RBW: 300 Hz	ST: 40.9 sec	RANGE: R= 0, T=-10dBm	

LOOP GAIN OF PRIMARY
 SERVO WITH FEED-AROUND
 PATH (FAST & SLOW PC
 PATHS ARE BROKEN)



NETWORK Cor
 A: REF B: REF 0 MKR 100 577.306 Hz
 30.00 225.0 T/R 6.43018 dB
 [dB] [deg] θ -78.4519 deg



DIV DIV START 1 000.000 Hz
 10.00 45.00 STOP 1 000 000.000 Hz
 RBW: 300 Hz ST: 13.7 sec RANGE: R= 0, T= 0dBm
 PSCALE= 2460, 1418, 7540, 6498

1st arm open

loop gain

measured by the same
technique as "26-Sep-90
14:40"

same set-up as "26-Sep-90"
14:40

with 4195A

Stored on disk as:
A1TR0310

10/9 (5)

OCC PRIMARY CAVITY
LOOP GAIN