

LIGO-T030134-00-W

MC Notes from 1999 – Faraday Isolator Alignment

by Stan Whitcomb and Rick Savage

by Haisheng Rong and David Shoemaker

by Dave Ottaway

These notes were recorded in the MC Notebook at LHO between Aug and Oct of 1999.

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

8/12/99

RICK S., STAN W.

ALIGNED FARADAY ISOLATOR COMPONENTS:
FIRST POLARIZER ROTATED TO BE
PERPENDICULAR TO LOCAL HORIZONTAL
USING BUBBLE LEVEL TO ~ 1 MRAD

2ND POLARIZER ROTATED TO MINIMIZE
REJECTED LIGHT (PARALLEL TO
FIRST POLARIZER)

FARADAY INSERTED, $\lambda/2$ PLATE INSERTED

$\lambda/2$ PLATE ROTATED TO MINIMIZE
BACK TRANSMITTED BEAM (USING
RETRO-MIRROR)

MMT2 ALIGNMENT RECHECKED (RECENTLY
ON MMT3) AFTER CONTROLLER RESET

MMT2 CONTROLLER PARAMS

ALL OUTPUT MATRICES 100

ALL INPUT MATRICES 63

ALL SERVOS "BYPASS"

POS'N GAIN 18.3

PITCH GAIN 22.0 BIAS -1.914

YAW GAIN 19.5 BIAS -0.976

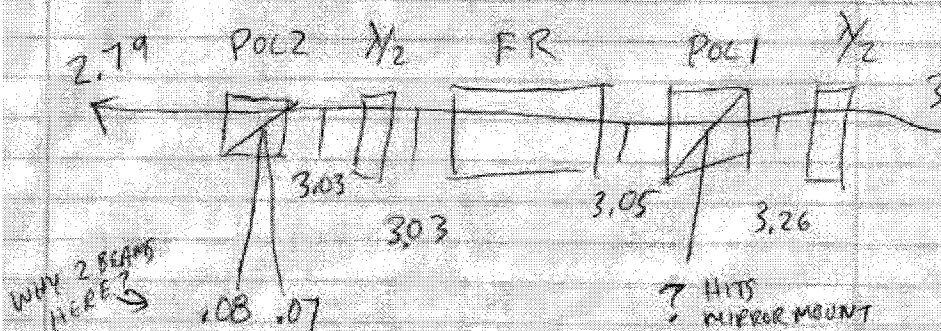
SIDE GAIN 11.0

8/13/99 RICK S., STAN W., MARK GUENTHER

RECHECK BEAM CENTERING ON SM2,
MMT1, HMT2 AFTER INSTALLATION
OF FARADAY; NO CHANGE

MEASURE TRANSMISSION + ISOLATION OF
FARADAY

INPUT TO FARADAY CHAIN 3.26
TRANSMITTED AT END OF FI 2.79

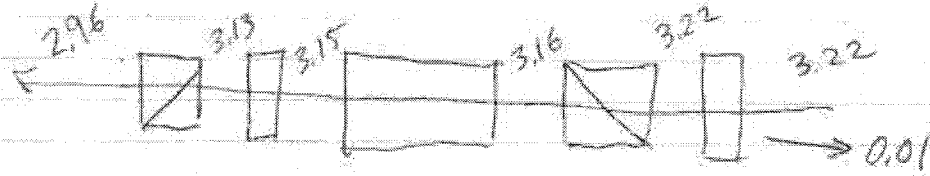


BACK TRANSMITTED SPOT < 0.01

ROTATE POL2 AROUND VERTICAL AXIS
TO INCREASE 2.79 → 2.86
ROTATE POL1 AROUND VERTICAL AXIS
TO INCREASE 2.86 → 2.98
BUT THIS INCREASES BACK TRANS
POWER TO 0.09

8/13/99 CONT.

READJUST POL1 AROUND VERTICAL
AXIS TO MINIMIZE BACK TRANSMISSION



8/16, 17

DAVE R.

- REALIGNED FARADAY TO MAXIMIZE REJECTION RATIO

FINAL VALUES : $P_{ENC} = 3.20 \text{ mW}$
 $P_{TRANS} = 2.91 \text{ mW}$
 $P_{BACK} = 42 \text{ mW}$

THROUGHPUT : 90.9% (low)

REJECTION RATIO: < 0.00069 (GOOD)
 $< 32 \text{ dB}$

8/18

DAVE R, STANW

- BEAMS ALIGNED TO IOT 7, ISCT

- MMT3 FREED ; PAM MAGNETS SET

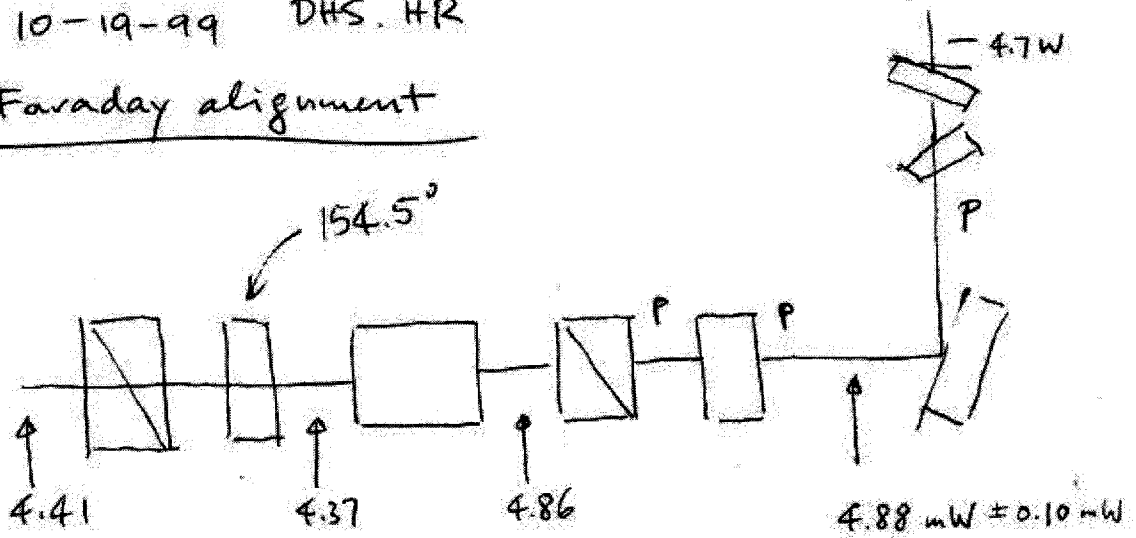
8/19

DAVE, HAISHENG

- ALIGNING THROUGH MMT3 ; RM

10-19-99 DHS, HR

Faraday alignment

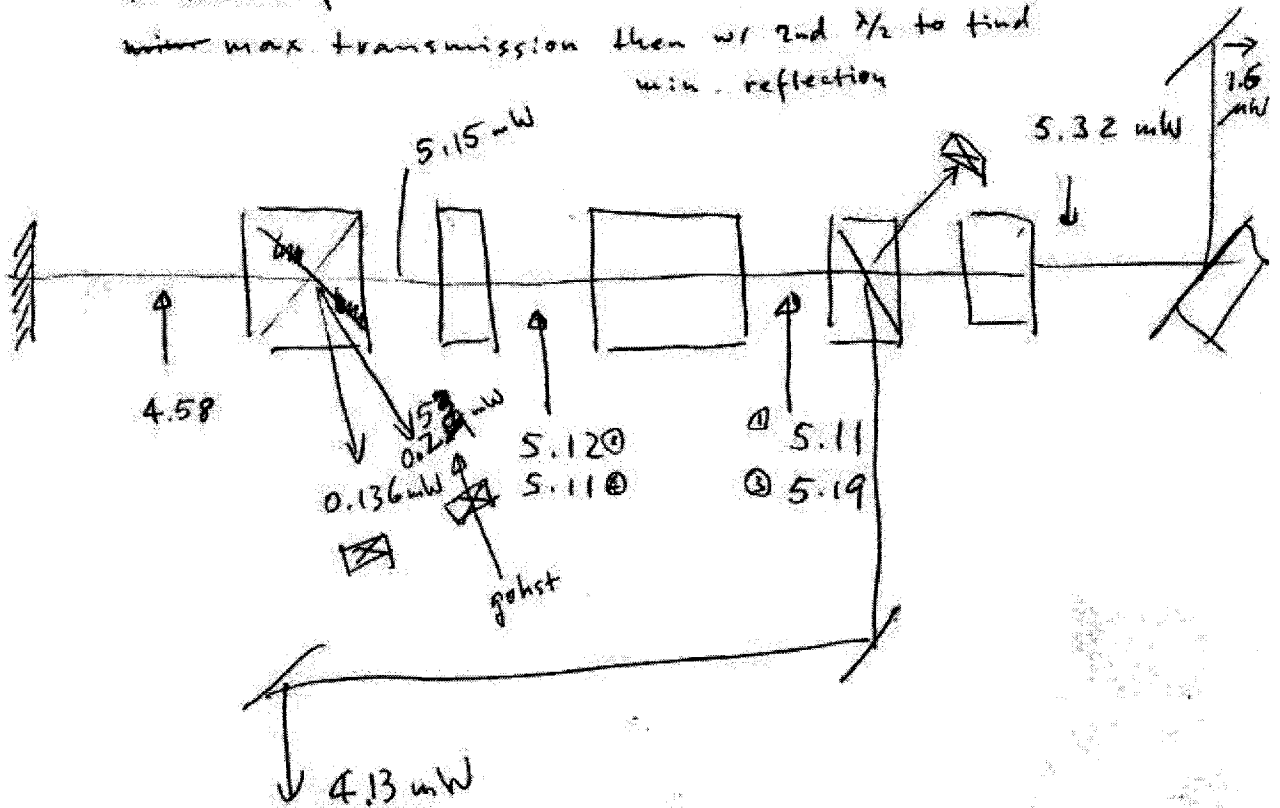


Center beam thru all elements

rotate polarizers around vertical axis and using $\lambda/2$

to rotate polarization \rightarrow find good extinction:

min. max transmission then w/ 2nd $\lambda/2$ to find min. reflection



X-POP3-Rcpt: cgray@apex
Date: Thu, 14 Dec 2000 15:47:02 -0800
From: David Ottaway <ottaway_d@ligo-wa.caltech.edu>
X-Mailer: Mozilla 4.7 [en] (Win98; I)
X-Accept-Language: en
To: David Tanner <tanner@phys.ufl.edu>, David Reitze <reitze@phys.ufl.edu>
CC: gray_c@ligo-wa.caltech.edu
Subject: Faraday isolator

Daves

After extensive testing we have come up with the following results for the Faraday Isolator that will be used on the 4K IO set-up

Transmission=0.87 Isolation= 1/10000

The Faraday rotator rotation was measured and found to be only 41 degrees

The main causes of loss were insignificant polarization rotation (2.7 %) and the insertion loss of the Glan Thomson polarizers (3% and 6 % respectively)

My results that I gave to Dave T on the phone were premature, it turns out that only one half wave plate needs to be replaced. Because it causes a depolarization loss of nearly 20 %. The other half wave plate was significantly better with only a minimal depolarization loss.

Regards
Dave

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