

Title

Prototype Dual Recycled Cavity Enhanced Michelson Interferometer

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**Rencontres de Moriond
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General Overview

Completed Table Top Experiments

- Power Recycling with Arm Cavities (~~Drever~~)
- Dual Recycling without Arm Cavities (~~Meers~~)
- Resonant Sideband Extraction without Power Recycling
(~~Mizuno~~)

Chosen Configurations

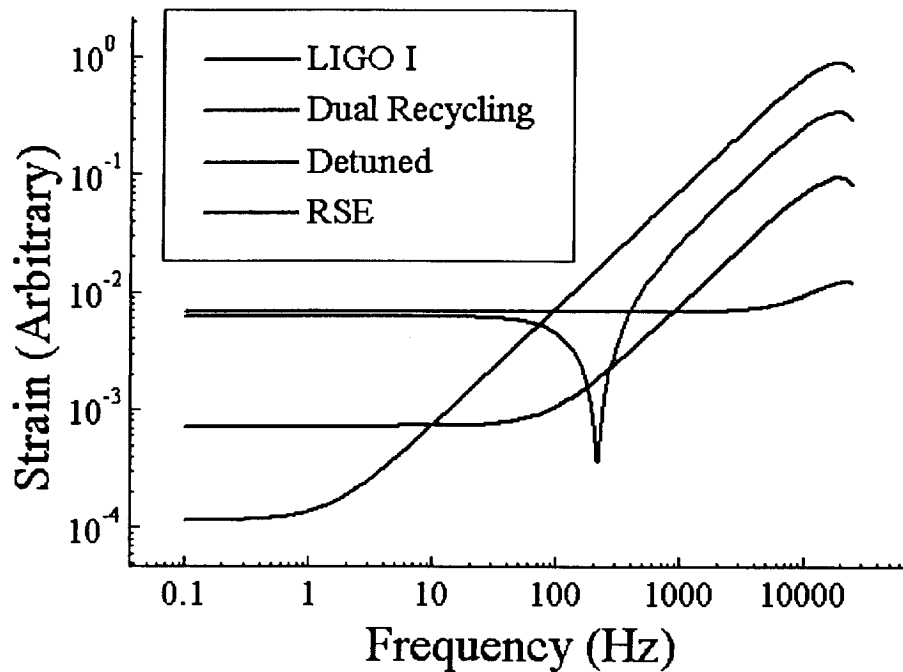
- Power Recycling with Arm Cavities
LIGO I, VIRGO, TAMA
- Dual Recycling without Arm Cavities
GEO

Table Top Experiments Underway

- Dual Recycling with Cavities
 - Resonant Sideband Extraction (Caltech)
 - Dual Recycling (UF)

**Need Frontal Modulation Locking Scheme for each setup
(Locking Schemes are different for DR and RSE)**

Sensitivity Curves



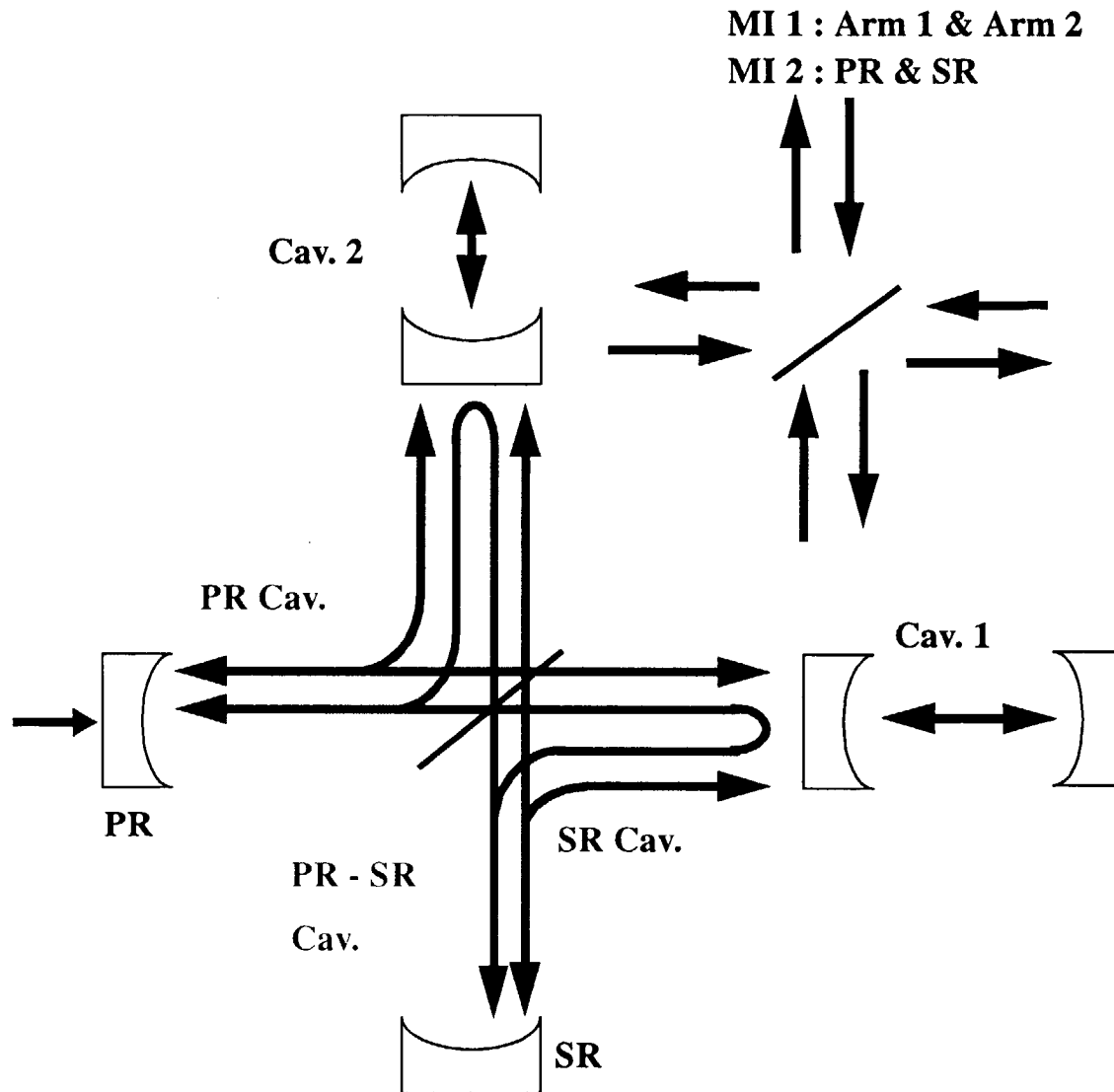
RSE

- High Finesse Cavities
- Less power on transmissive optics
- Higher sensitivity at tunable frequency

Dual Recycled

- Can possibly use optics in existing detectors
- Some tunability
- Easier Lock Acquisition?????

Dual Recycled IFO



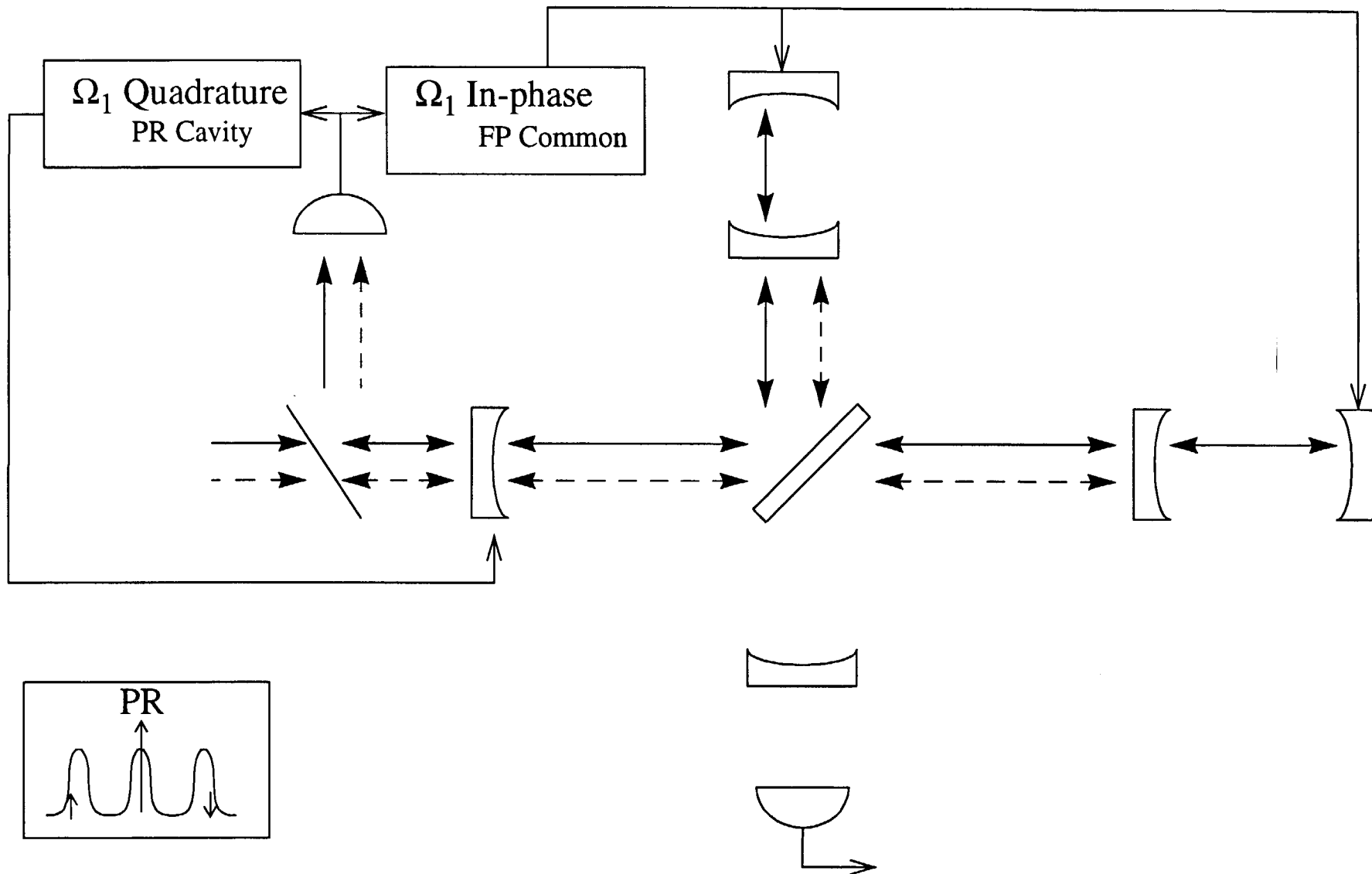
MI 1 : Arm 1 & Arm 2
 MI 2 : PR & SR

- 5 Cavities
- 2 Michelsons
- Cavities & MIs Coupled

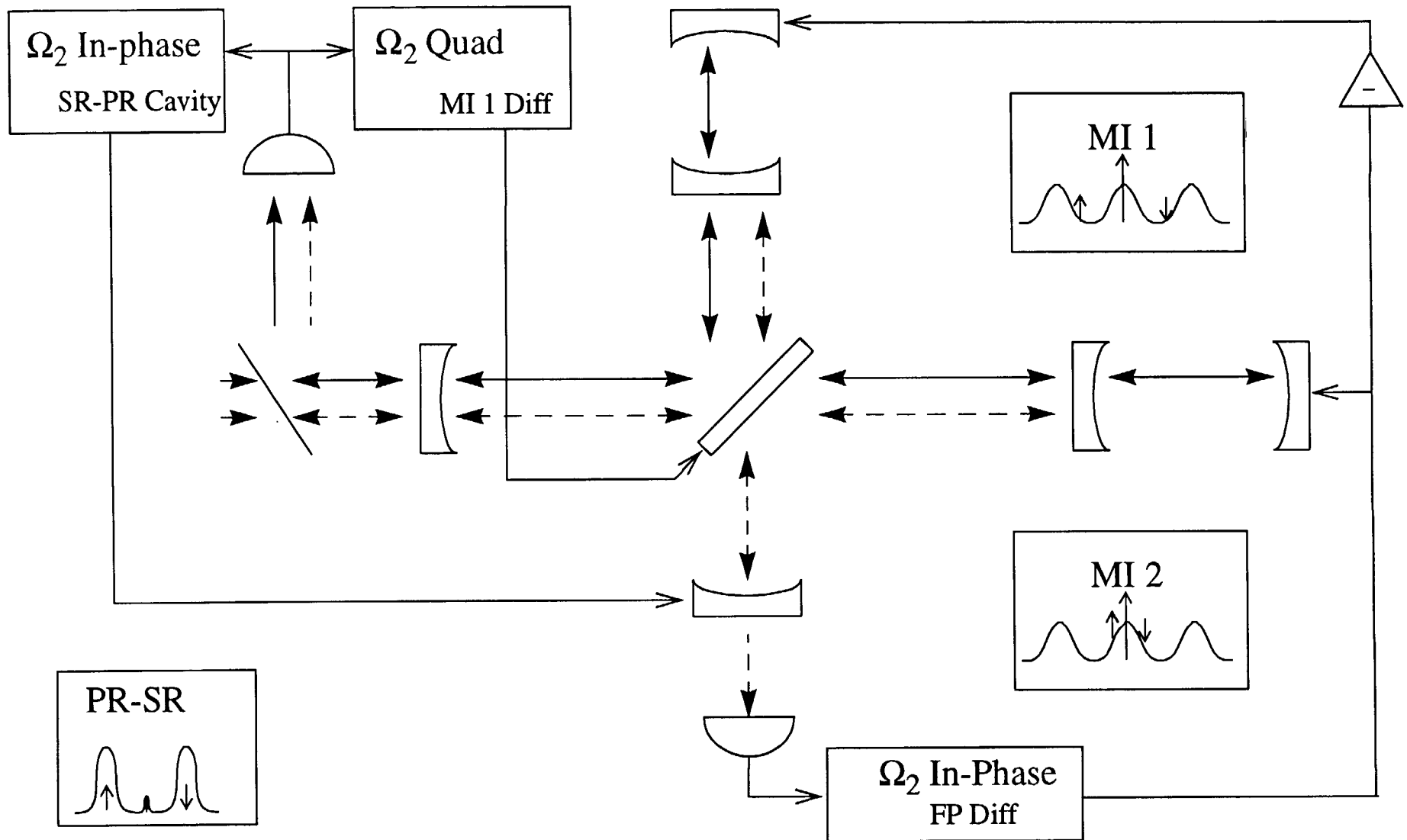
» **5 Degrees of Freedom**

1. PR Cavity
2. MI 1 Differential
3. Common FP
4. Differential FP (GW Signal)
5. PR-SR Cavity

The Locking Point I



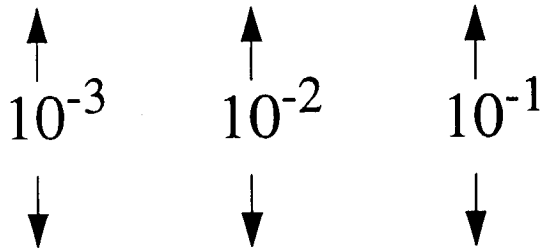
The Locking Point II



Length Sensing Matrix

60 Mhz Inphase

	Reflected	Pick off	Transmitted
PR	0.02	0.01	0.00
Diff MI	0.00	0.00	0.02
Diff FP	0.06	0.06	1.00
Com FP	1.00	1.00	0.06
SR	0.00	0.00	0.00

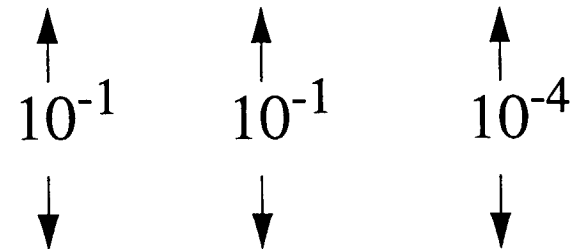


60 MHz Quadrature

	Reflected	Pick off	Transmitted
PR	1.00	1.00	0.00
Diff MI	0.29	-0.14	1.00
Diff FP	0.38	0.18	-4.55
Com FP	0	0	0
SR	-0.01	0.00	-0.01

31.8 Mhz Inphase

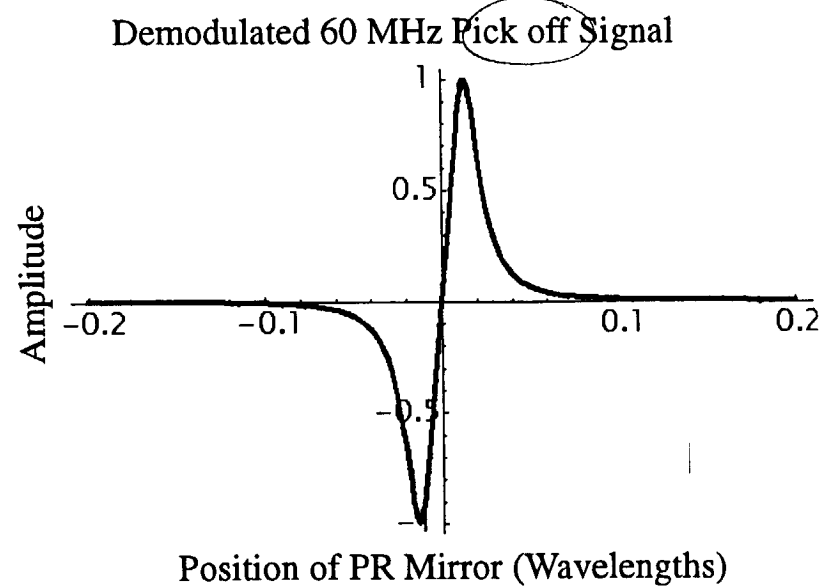
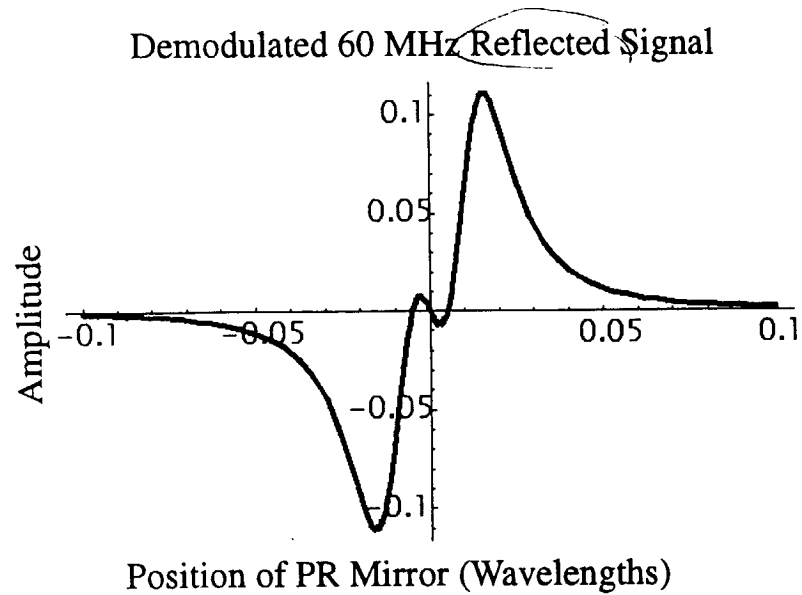
	Reflected	Pick off	Transmitted
PR	0.05	0.30	0.00
Diff MI	0.00	-0.12	0.03
Diff FP	0.08	-2.15	1.00
Com FP	1.00	-61.54	0.06
SR	0.01	1.00	0.00



31.8 MHz Quadrature

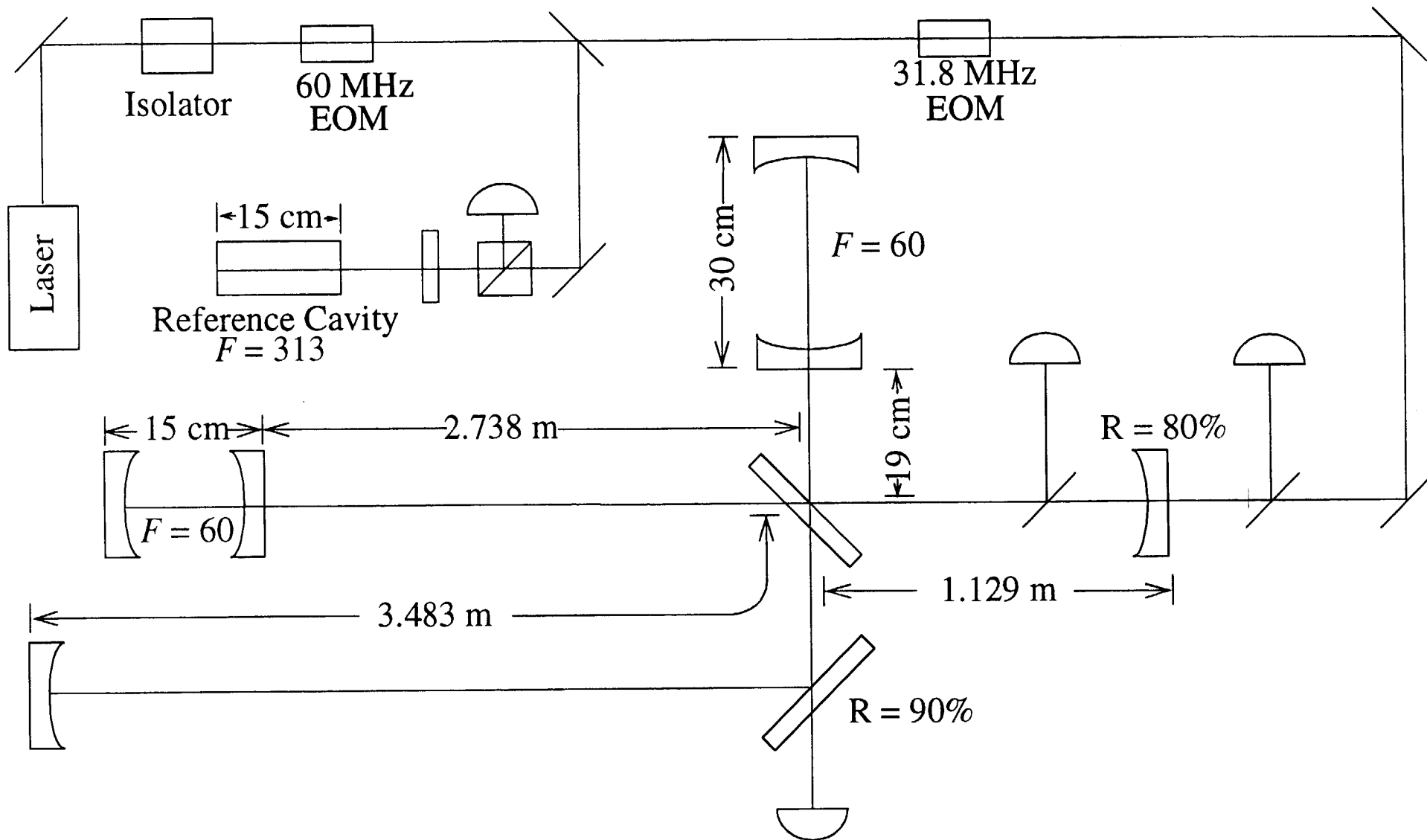
	Reflected	Pick off	Transmitted
PR	0.03	-0.38	1.92
Diff MI	0.01	1.00	-0.17
Diff FP	0.07	0.63	0
Com FP	1.00	-14.47	3.00
SR	0	0	1.00

Error Signals



- Typical error signals
- Signal changes sign because of coupling

Table Top Layout



LIGO II Schedule

1/98 - 6/00	Table Top Experiment
1/00 - 6/00	Design Suspended Experiment
7/00 - 12/04	Suspended Experiment
1/05 - 12/05	Installation
1/06 - 12/08	Data Taking