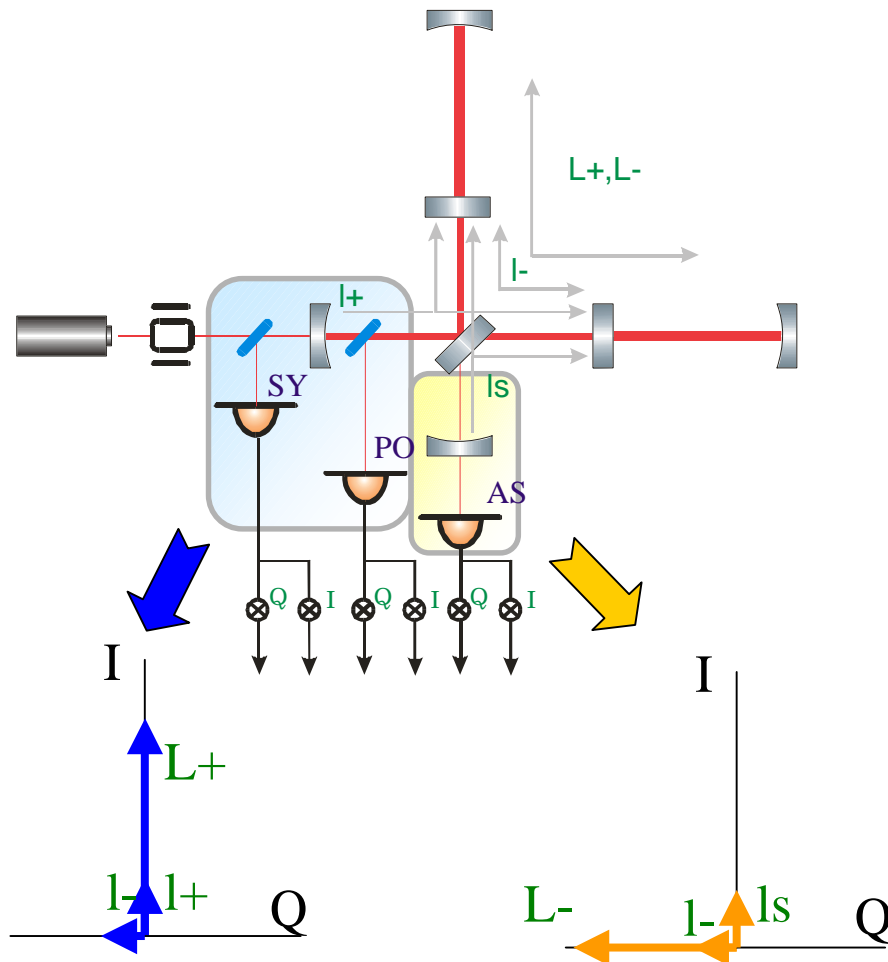
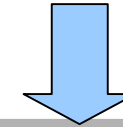


Difficulty of the signal extraction for SEC(l_s) by one modulation



- The problem is that L^- signal disturbs l_s signal if **demodulation phase** has offset.

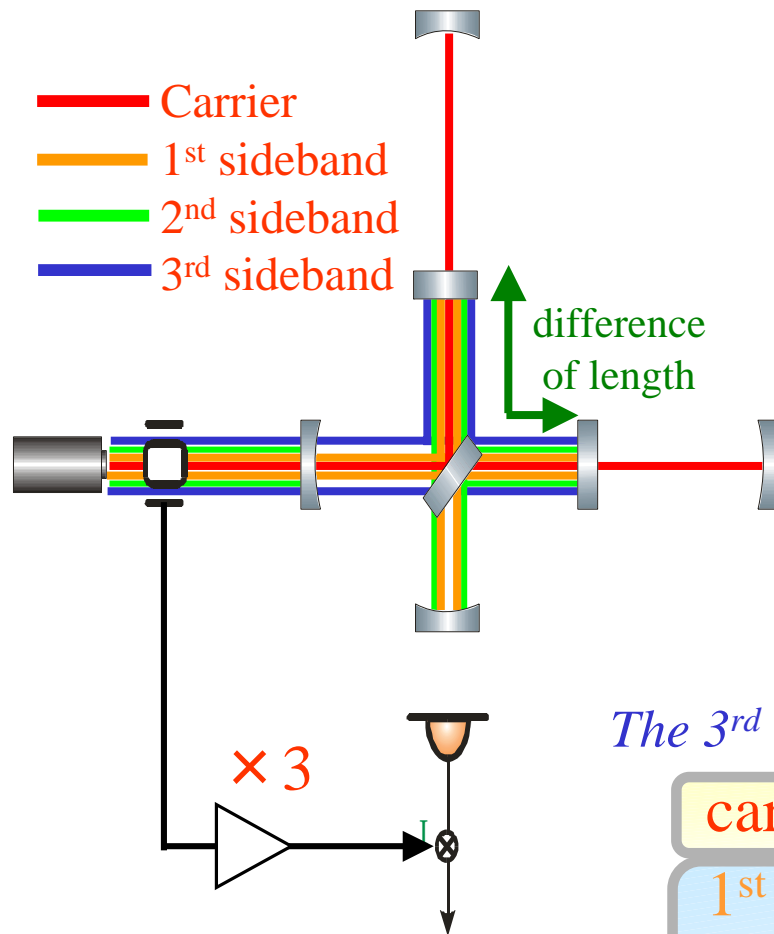


- How accuracy should we set for the **demodulation phase** ?

or

- How can we **remove L^-** ?
⇒ However L^- is the **gravitational wave** itself ??

A new signal extraction method for the SEC with one modulation



Principle is

- to make 3rd order sideband output be a dark fringe at the signal port with using an asymmetry
- to use the 3rd harmonic demodulation

The 3rd demodulation signal is *sum* of the beat of

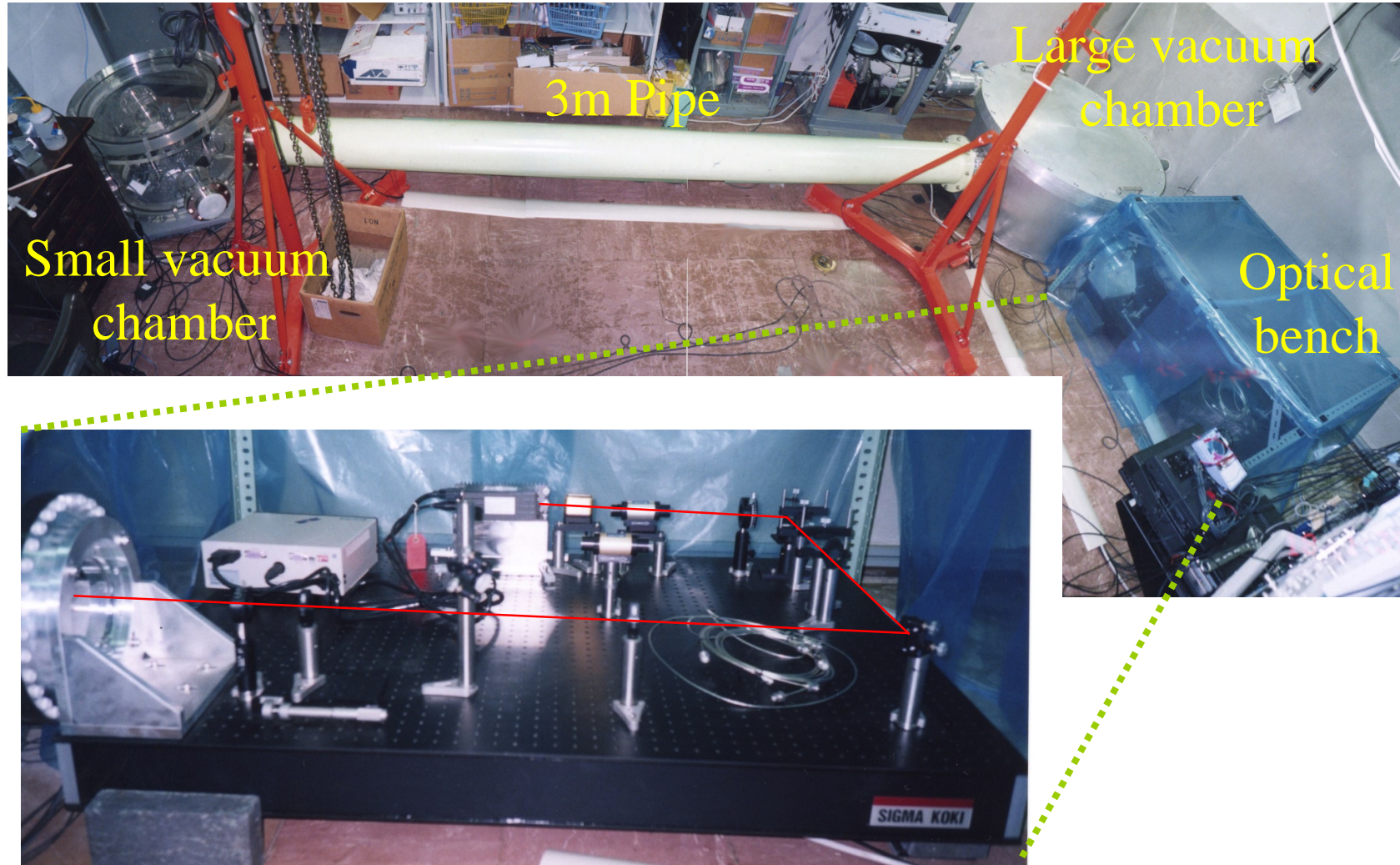
carrier and ~~$\pm 3^{\text{rd}}$ sidebands~~ \rightarrow arm

1st and -2nd sidebands

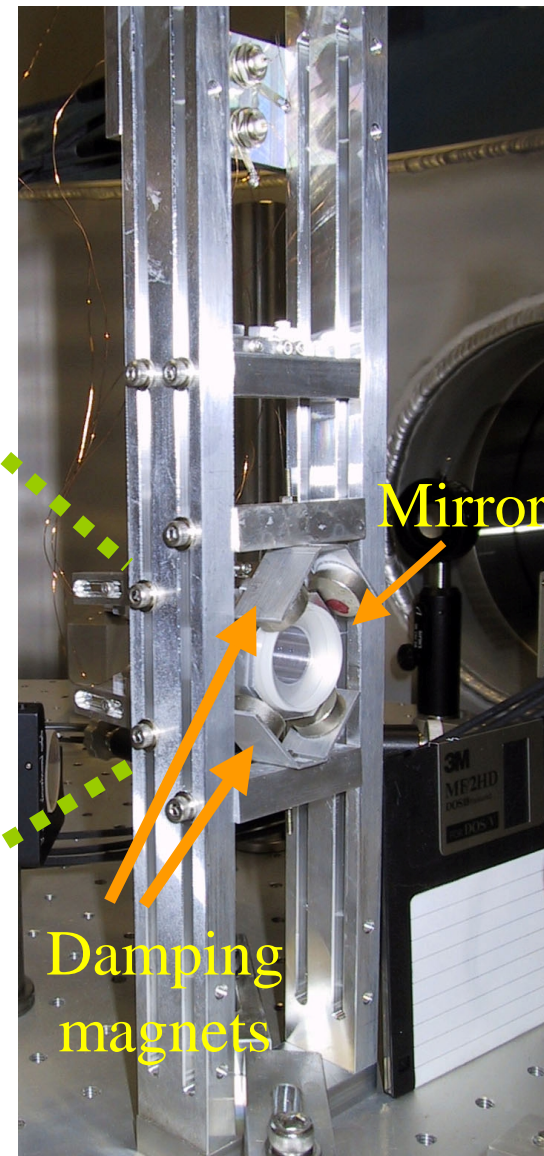
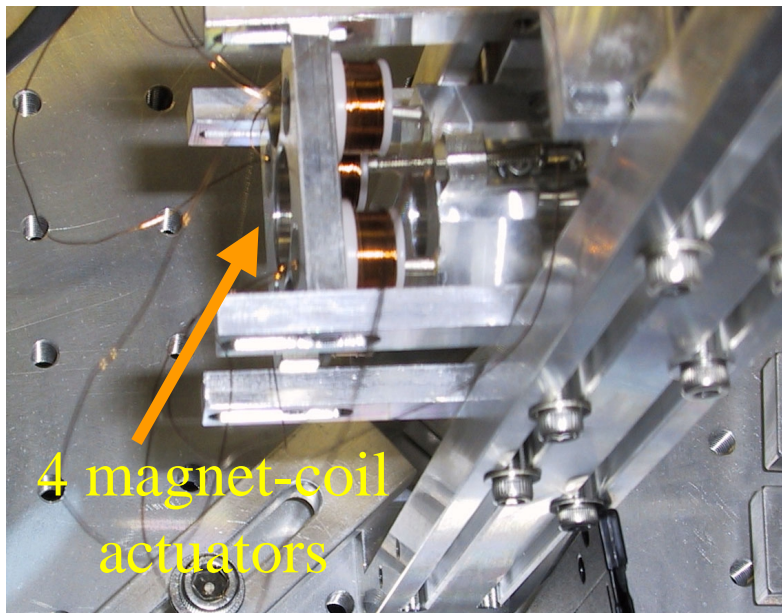
2nd and -1st sidebands

} SEC

Experimental setup



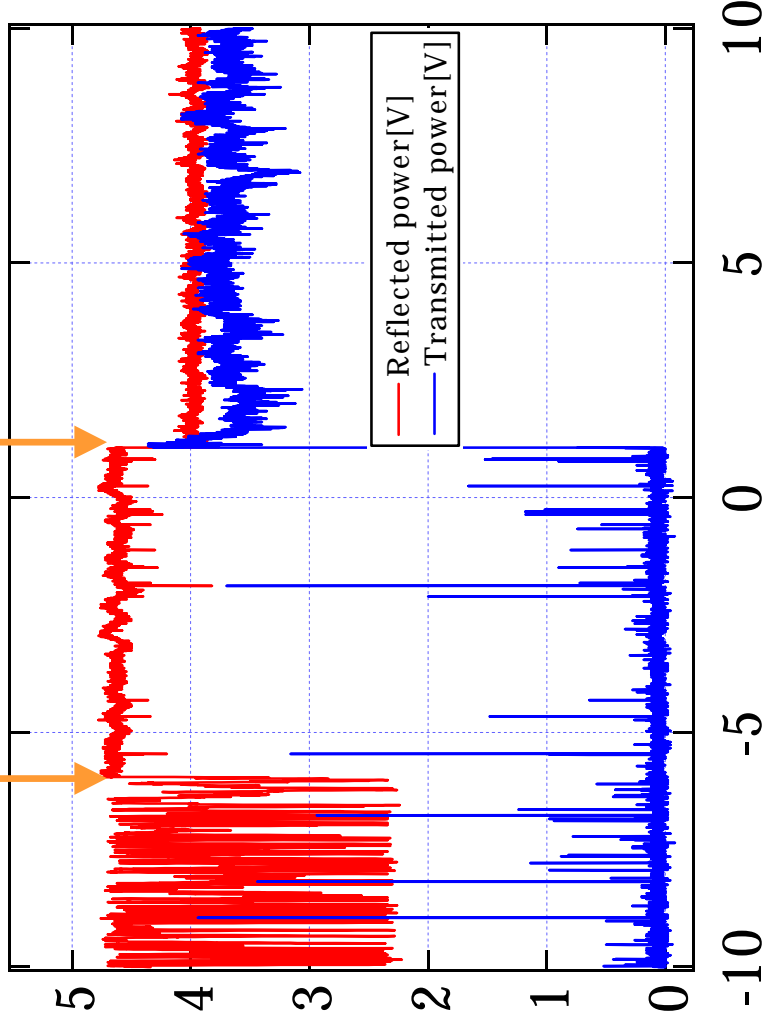
Small Suspension System (SSS)



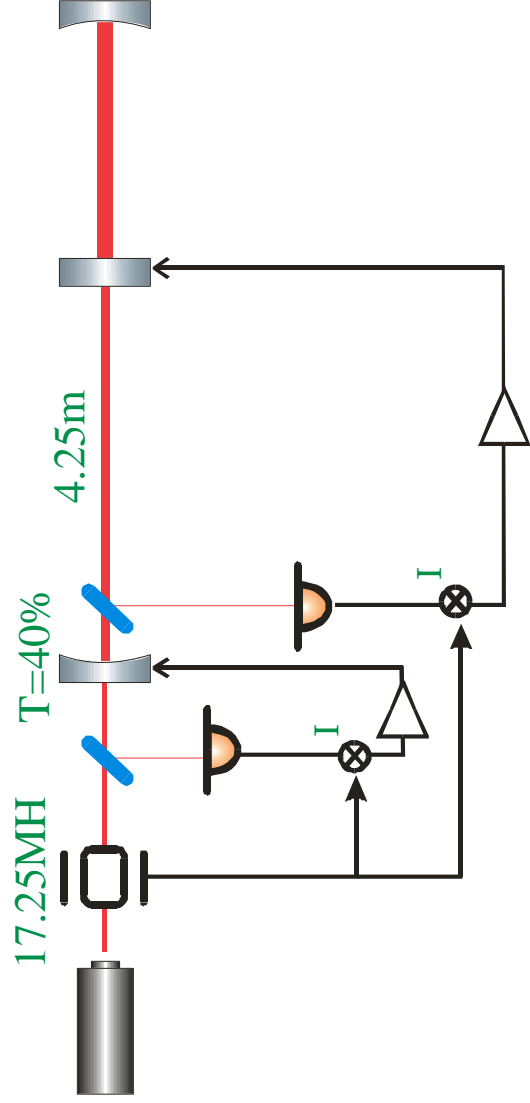
3 mirrors coupled cavity

Sidebands are locked in Carrier is locked in

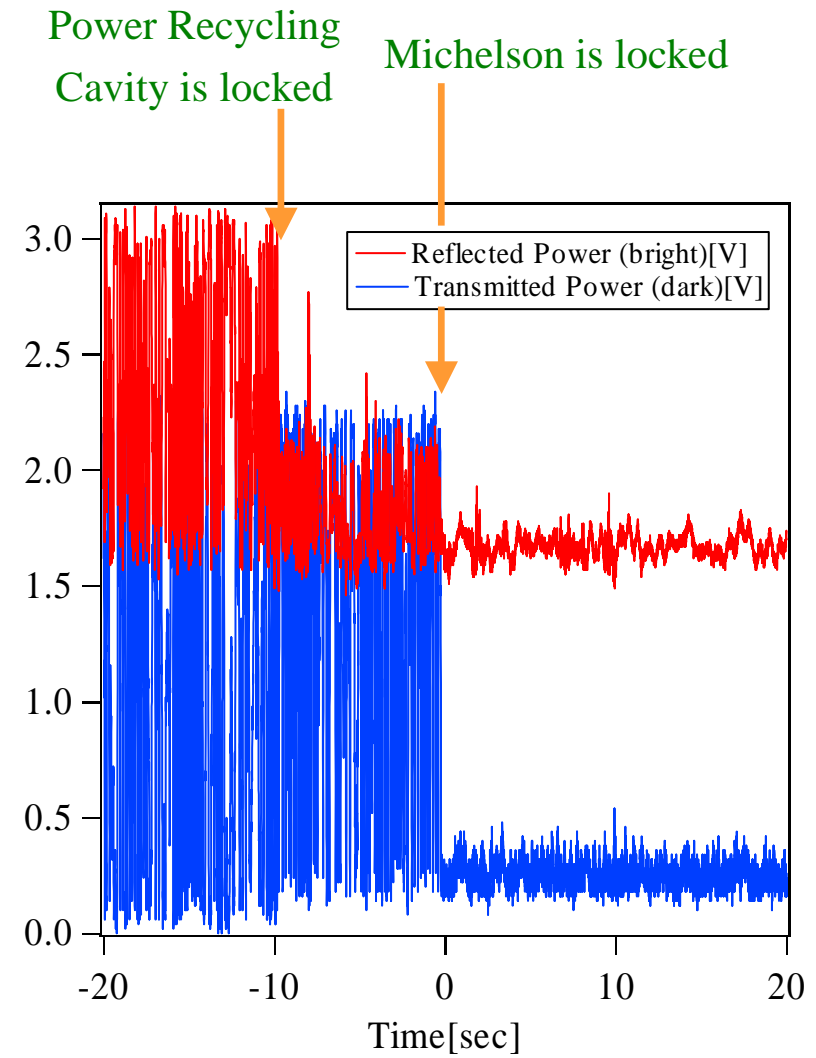
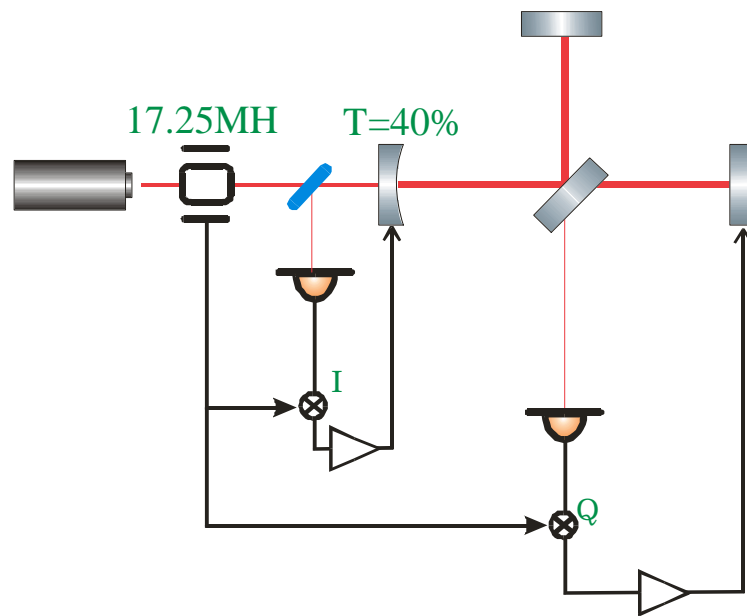
locked in PRC FP arm and PRC



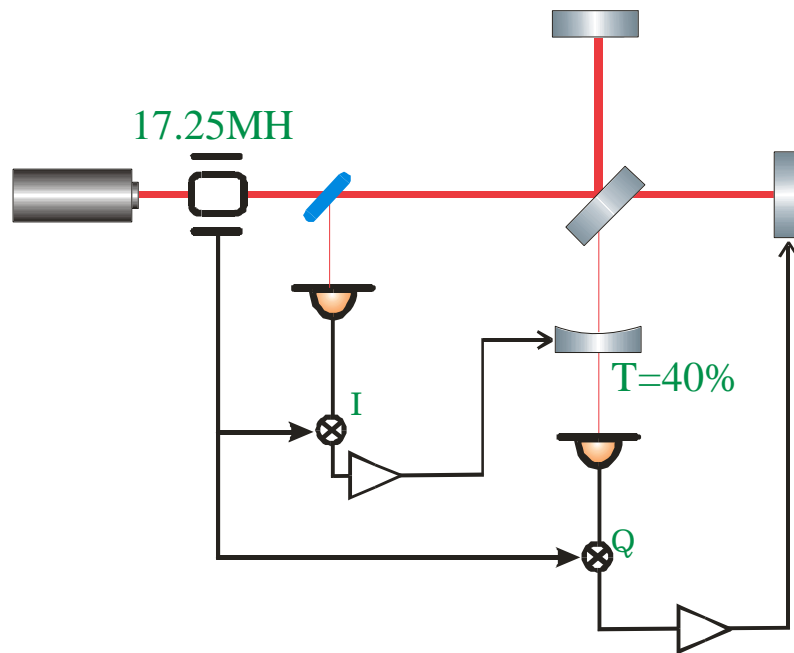
Time[sec]



Power Recycled Michelson



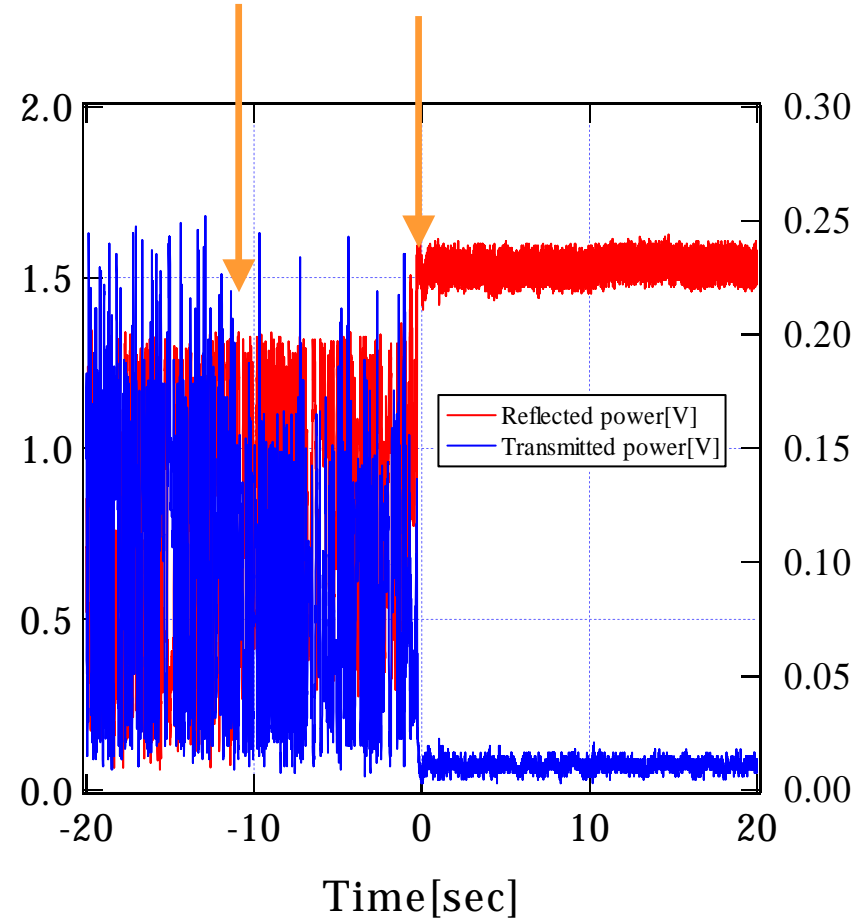
Signal Recycled Michelson



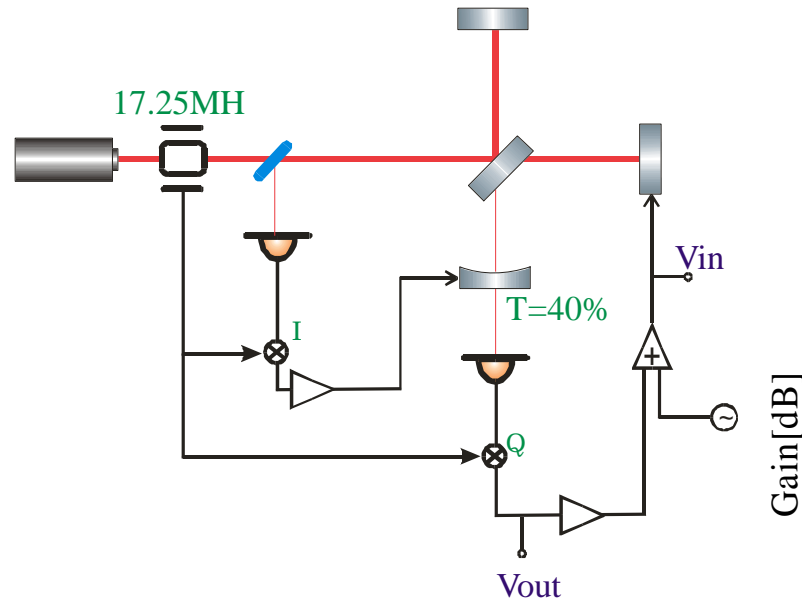
Signal Recycling

Cavity is locked

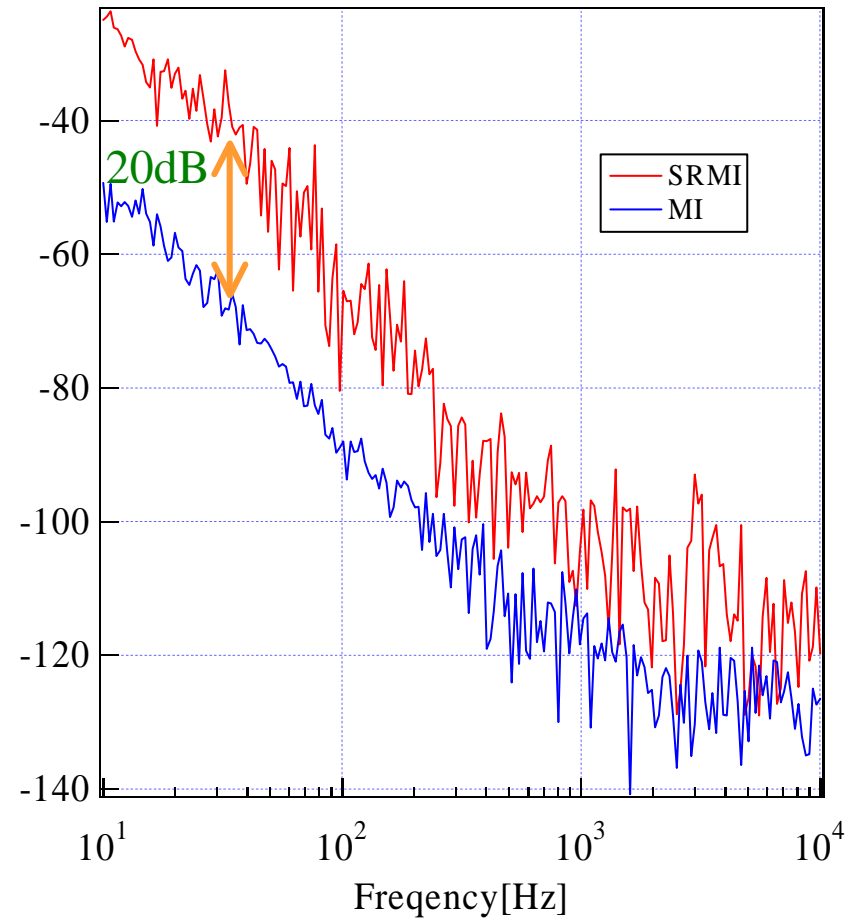
Michelson is locked



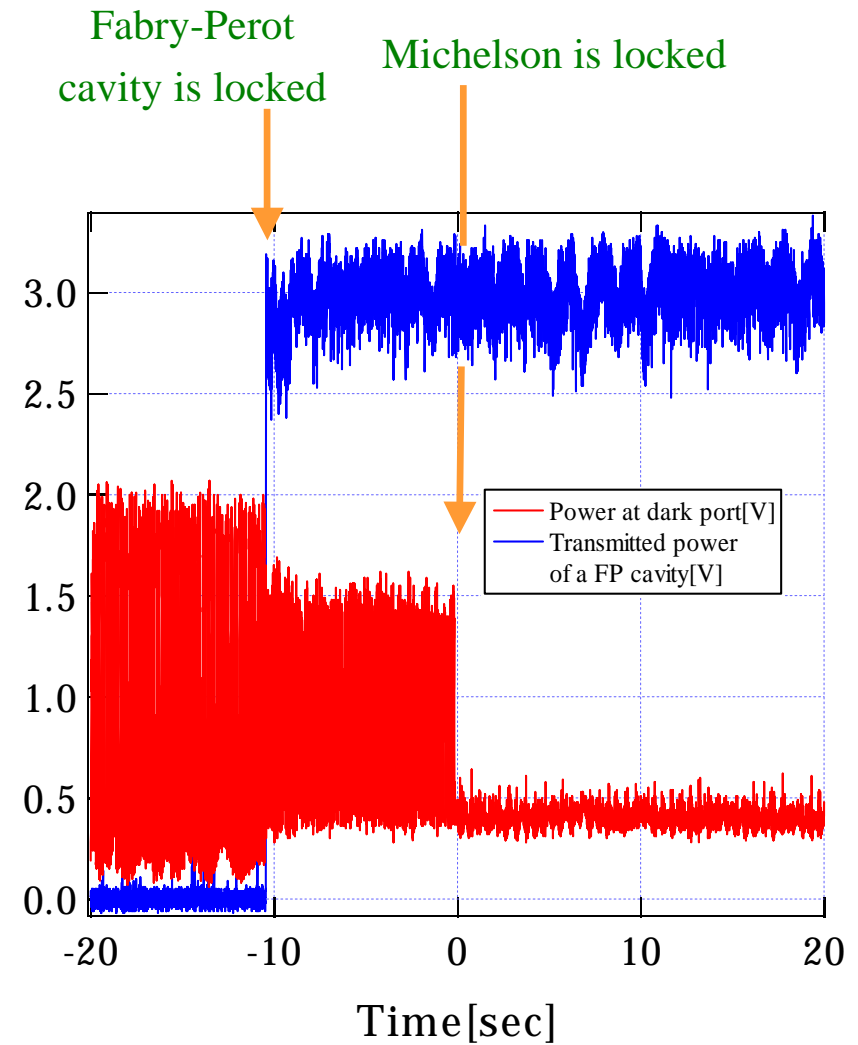
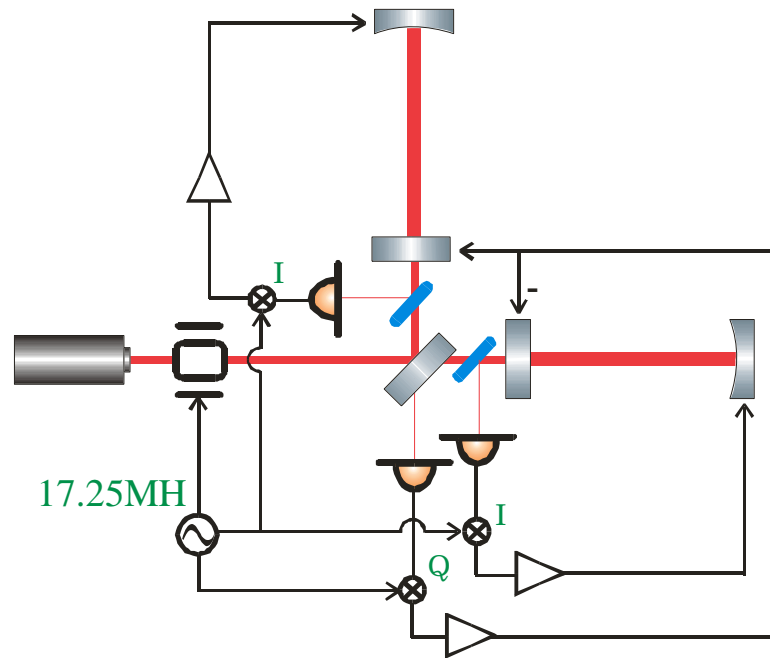
Optical gain of Signal Recycled Michelson



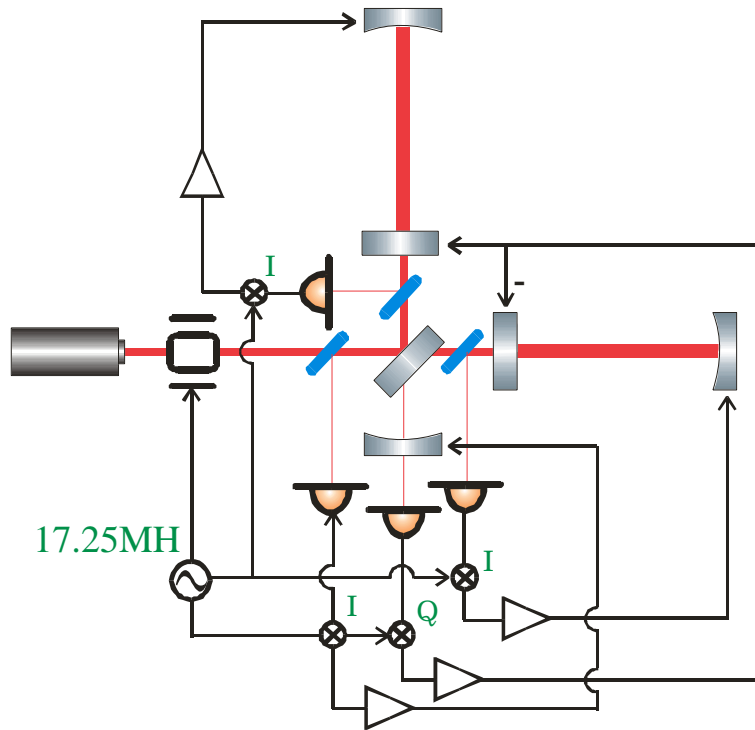
$$\frac{V_{\text{out}}}{V_{\text{in}}} = \text{Pendulum T.F.} \times \text{Optical Gain} \quad (\times \text{DC})$$



Fabry-Perot Michelson



Resonant Sideband Extraction



We have locked Signal Extraction Cavity.

--Unstable, longest lock was 10 sec.

