

**LASER INTERFEROMETER GRAVITATIONAL WAVE OBSERVATORY  
-LIGO-  
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**Technical notes:  
Block Diagrams of Length Sensing and Control (LSC) System**

**by**

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**Distribution:  
all**

**This is a publication of the LIGO Project.**

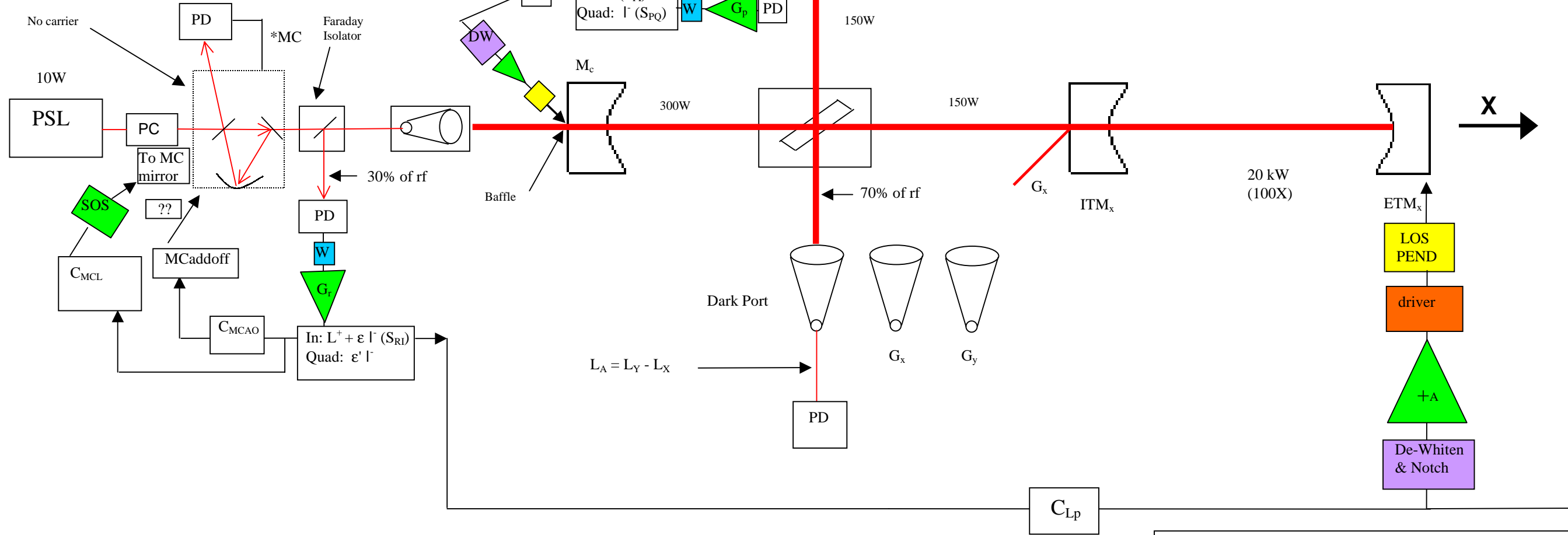


Common Mode LSC

**KEY**

Resonant TF =  $C * \frac{2\pi f_p s}{s^2 + \frac{2\pi f_p}{Q} s + (2\pi f_p)^2}$

- SOS Pend  $f_p=1\text{Hz}$ ,  $Q\sim 8$  with Gain= $6e7\text{Hz/V}$  ???
- LOS PEND  $f_p=74\text{Hz}$ ,  $Q\sim 8$  with local dampening
- C<sub>ISUS</sub> =(LOS coil driver)  $z=40, p=1\text{Hz}$
- ▲ A=LOS Gain =  $\frac{dm}{dV} = 9 \times 10^{-7}$
- ▲ G<sub>p</sub>=.0265; G<sub>r</sub>=.226
- C<sub>lp</sub>=690\*{z=10,10,10; p=.1, 40Hz}\*  
{1+TF (with Q=100, C=.25, f<sub>r</sub>=13)}\*  
{fsb<sub>center</sub>=9.48e3 (bandstop filter)}
- C<sub>Lp</sub>=40\*{z=1,1;p=.1Hz}\*  
{fsb<sub>start</sub>=30, fsb<sub>stop</sub>=150 (4<sup>th</sup> order 40db bandstop filter)}\*  
{f<sub>c</sub>=30 (4<sup>th</sup> order, Chebyshev filter)}
- C<sub>MCL</sub>=2.7e-5\*{z=1Hz}\*  
{f<sub>c</sub>=8e3 (6<sup>th</sup> order, Chebyshev filter)}
- C<sub>MCAO</sub>=1.8e-7\*{z=1,1,1; p=50, 50, 50Hz}



All Controls use the beam that is resonant in the recycled Michelson cavity.

Whitening, Dewhitening and Notch

$DW = (\text{under revision by ISC group})\{p=2.5,2.5,5000,5000;z=150,150,300\text{Hz}\}$   
 $W = \text{Whitening filter (2 zeros at 15 Hz and 2 poles at 150 Hz) (two of these in } S_{AQ} \text{ only)}$   
Notch = notches at 9.5 kHz, 14.5 kHz (resonance of test masses).

