

OPO pump power stabilization and mode cleaner status

Martina De Laurentis – AdV-squeezing Face to Face meeting – Cascina 17/09/2014

Pump Power Stabilization

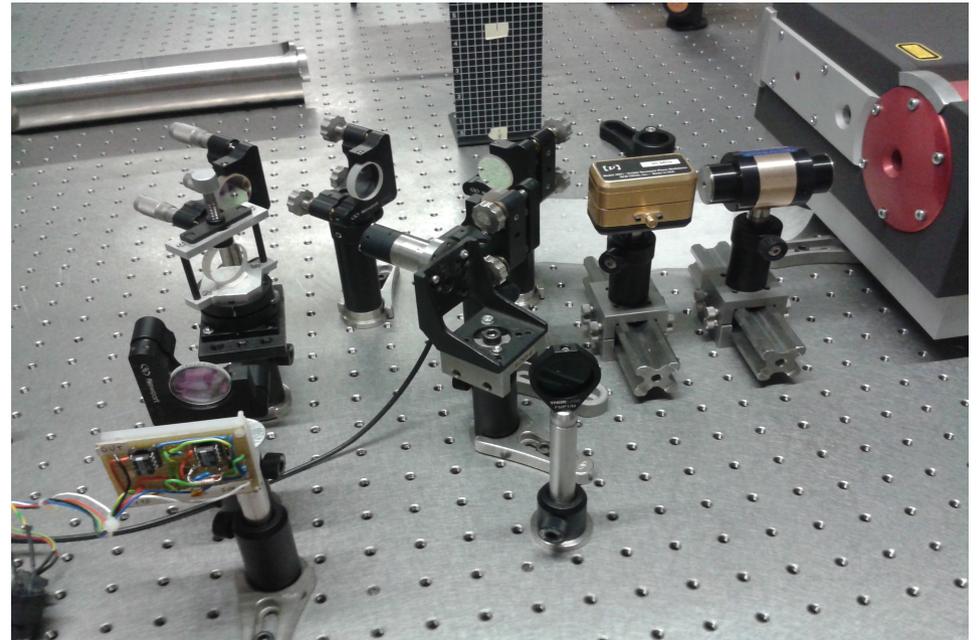
Pump power stabilization system that does not rely on non-linear effect:
unbalanced Mach-Zehnder interferometer

more efficient, simpler, more precise and less expensive
with respect to the common noise eater based on the Pockels cells

absence of the non linear medium avoids the thermal effects that could cause aging and disease on the long period.

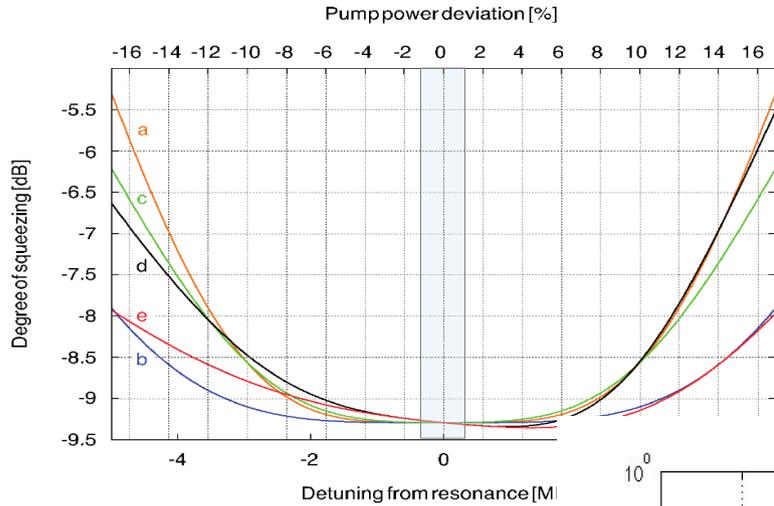
Long period operation demonstrated
in GEO600 and LIGO

First Prototype



Pump Beam Stabilization

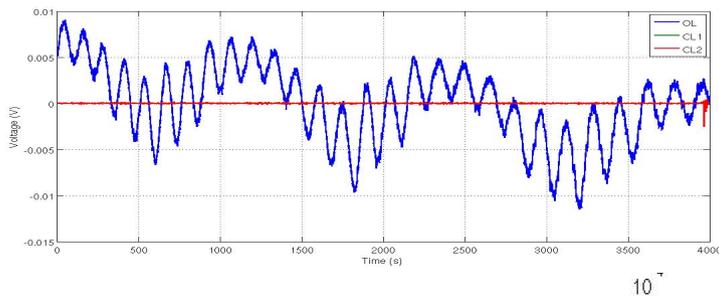
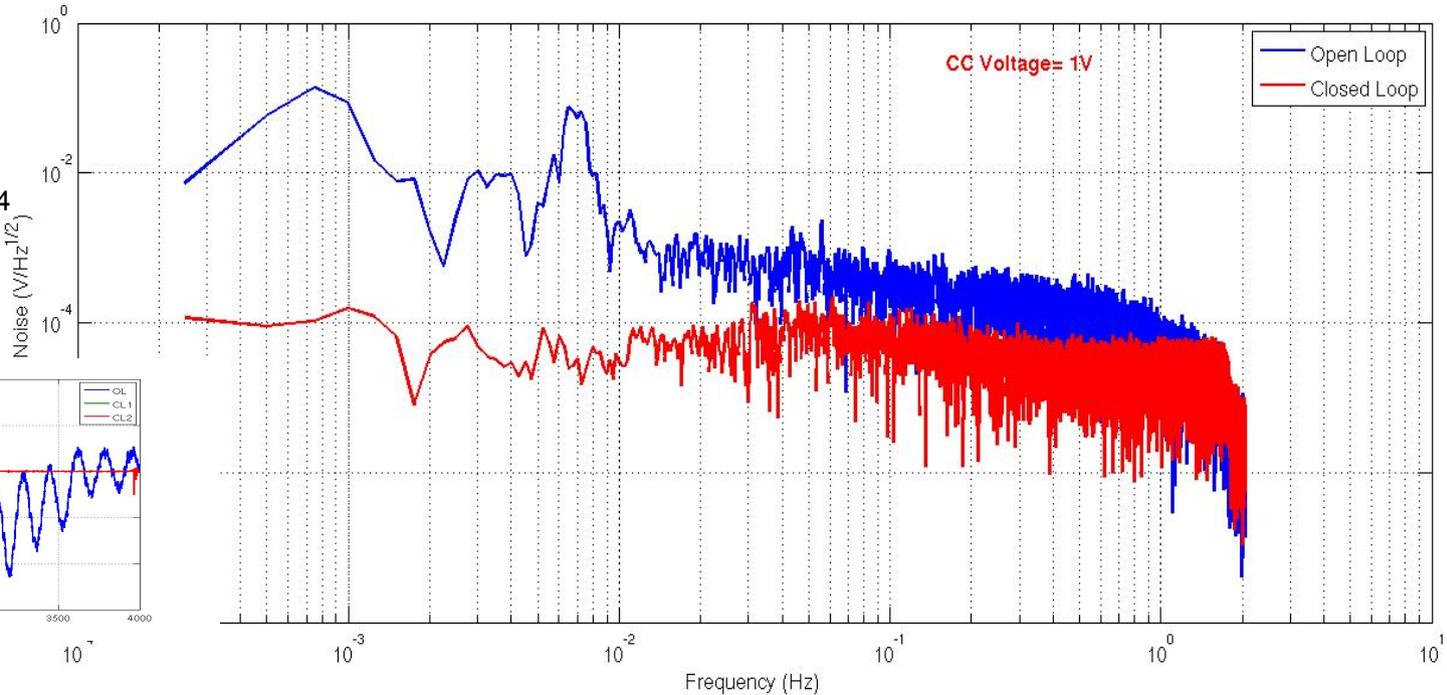
Alexander Khalaidovski's PhD Dissertation (sec. 3.8)



Simulation of Frequency-dependent squeezing affected by Pump Power Fluctuations

Stable squeezing for $\Delta P \leq 1\%$

Our first prototype of Mac Zehnder Stabilizator assures fluctuations $\sim 1 \times 10^{-4}$



OPO pump Mode Cleaner Cavity technical design

Triangular ring cavity

Design:

trade-off between astigmatism and backscattering minimization

two plane input/output coupler mirrors

one plane-concave with RoC = 1 m.

Plane mirrors incidence input angle $\alpha = 43.88^\circ$

concave mirror incidence angle $\theta = 2.25^\circ$

Cavity length $L = 582.29$ mm.



	w_0	w_{in}	w_{out}	w_{cc}	z_R	Gouy phase	g
	(μm)	(μm)	(μm)	(μm)	(mm)	(π)	
x	392.036	392.151	392.151	465.785	453.797	0.3625	0.6991
y	392.463	392.577	392.577	465.996	454.784	0.3631	0.7006

Next steps

- **Realization of the MZ control loop board**
- **Realization of the MC control loop**
(we are waiting for some definitive electronic components)
- **MC alignment and locking**
(the mirrors will arrive at the end of october)
- **Realization of the MZ compact holder**
(we are in waiting list for mechanical design and production)