APPLICATION OF THE CARRIER SUPPRESSION INTERFEROMETRY IN THE MAGO PROJECT.

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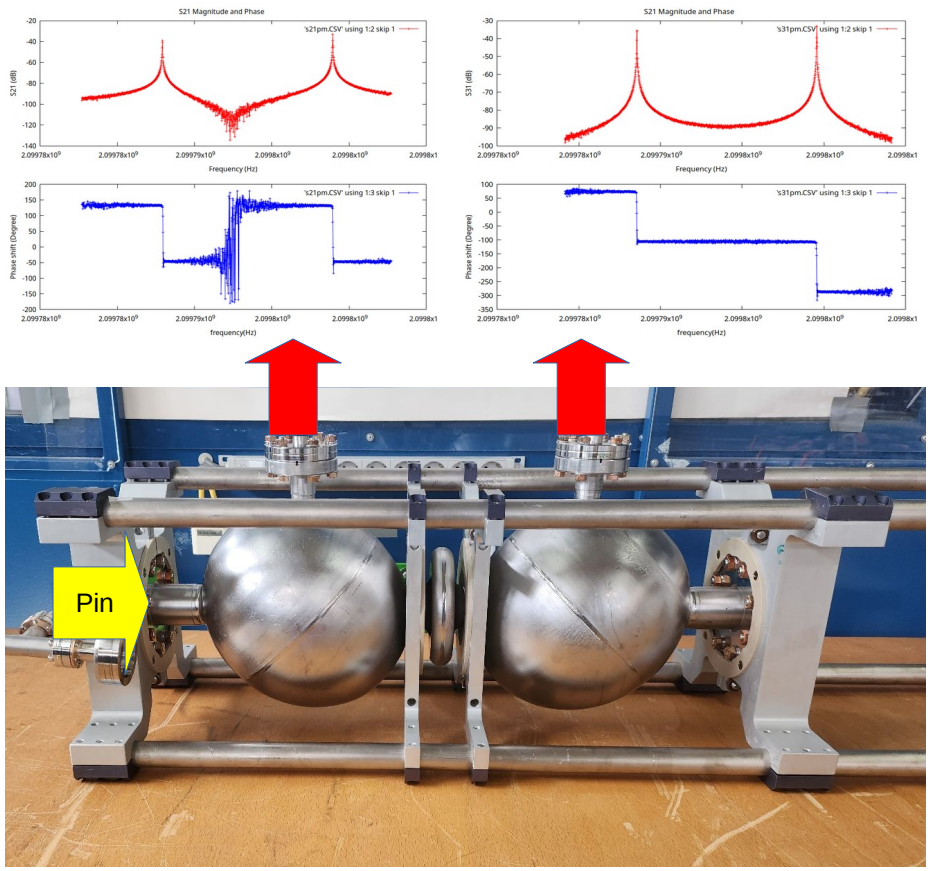
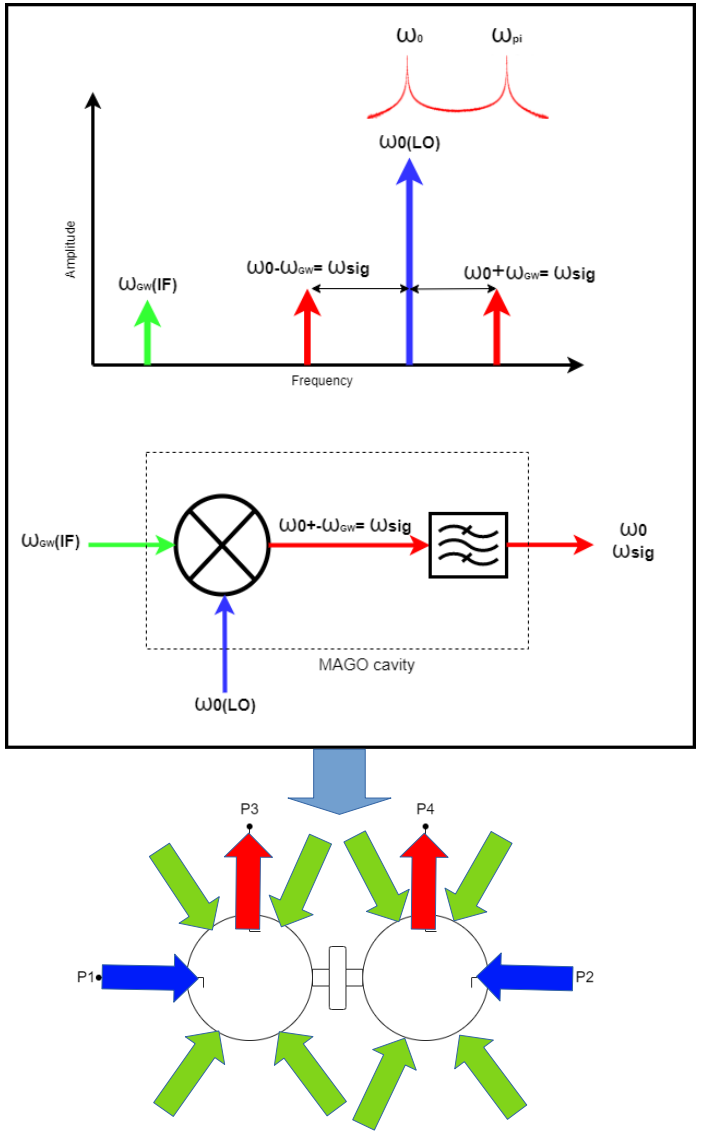
MAGO Project (Microwave Apparatus for Gravitational Waves Observation)

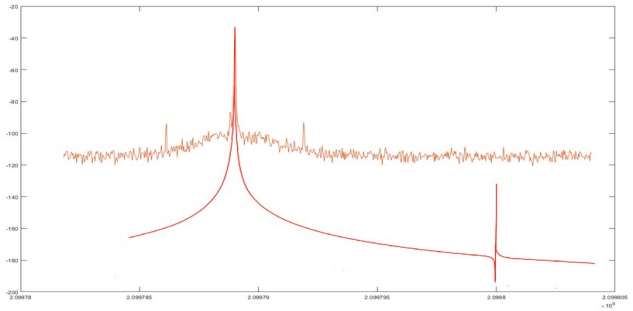


MAGO cavity



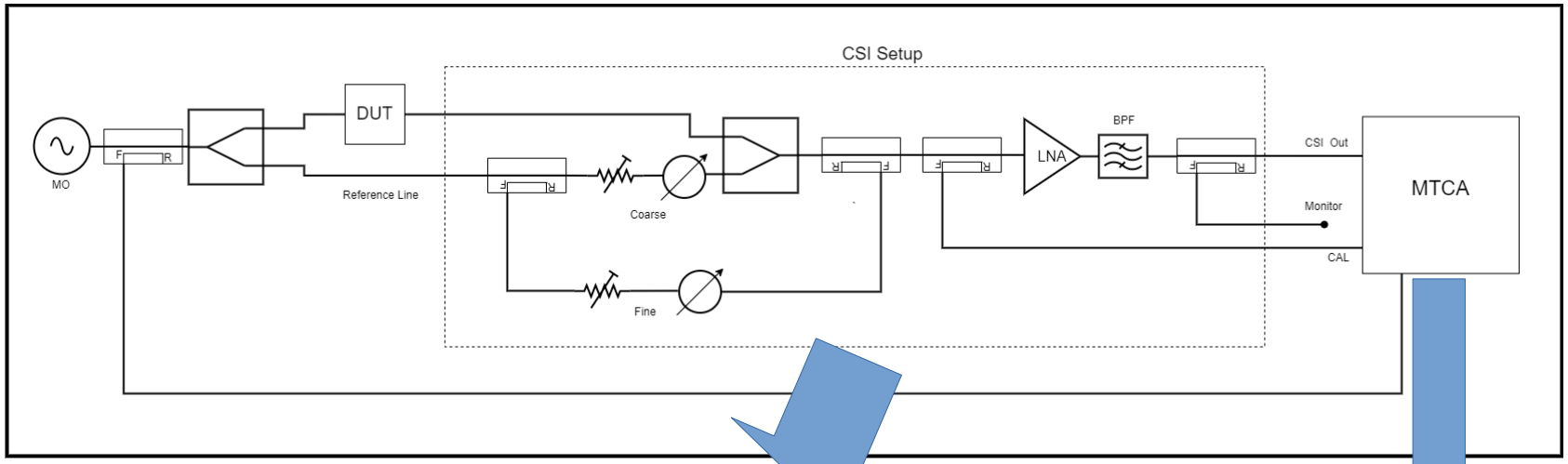
Principle of the detection

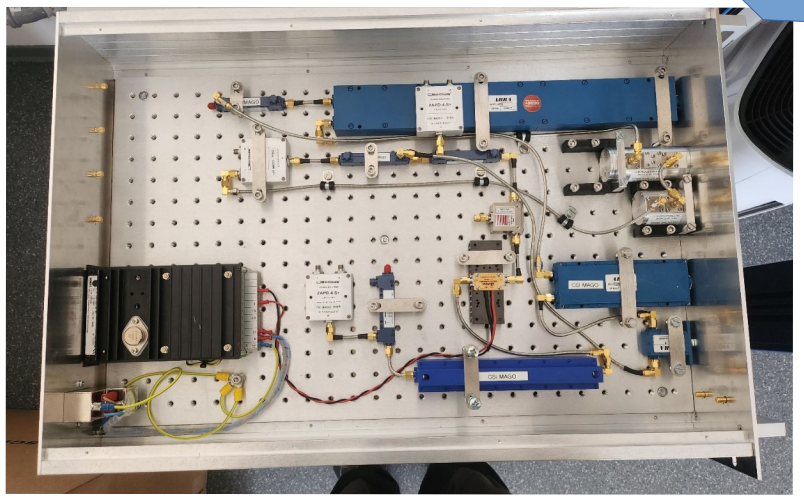
- MAGO cavity consists weak coupling of the two identical spherical cells. Coupling of the two cells causes a split in the resonance frequency. (Zero and pi mode)
- Resonant behavior of the cavity is similar to coupled pendulums.
- Since working principle relies on heterodyne detection, MAGO cavity acts like an RF mixer and band pass filter.
- When the GW interacts with the cavity, frequency of the GW causes harmonic generation around the zero mode frequency.
- Pi mode of the cavity filters out the lower harmonic and only allows the passage of the higher harmonic. GW signal appears on pi mode frequency of the cavity.
- Reception frequency can be tuned by changing the coupling between the cells (Coupling changes the band gap between modes) .



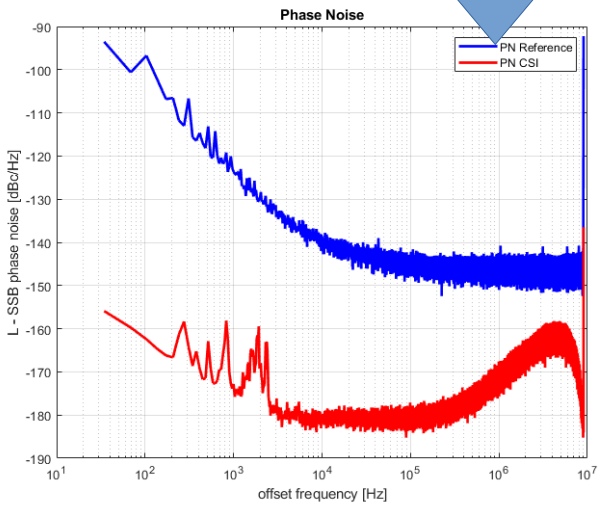
Noise floor covarage of the zero mode

Carrier Suppressing Interferometry (CSI)



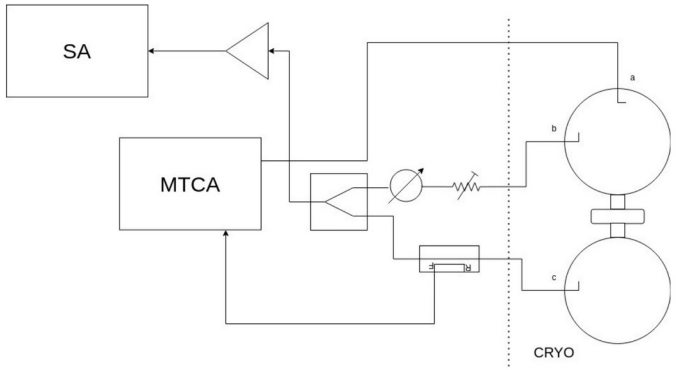


CSI setup for the MAGO (Under development)



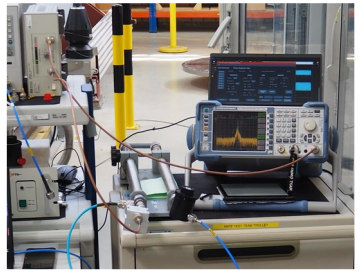
- **Carrier Suppressing Interferometry (CSI) is a setup for measuring extremely low (-205 dBc/Hz) phase noise by suppression of the carrier noise floor.**
- **Working principle of the CSI relies on destructive interference between reference (carrier) signal and the reference signal pass through device under test. Because of the difference between the two signals, resulting signal gives information about devices phase noise characteristics.**
- **CSI is a promising method for the extraction of the GW signal in the MAGO project. Due to extremely low amplitudes of the GW signal.**
- **CSI setup will be used for rejection of the excited mode (zero mode) signal to increase the detection sensitivity of the pi mode signal.**

CSI for the Signal Extraction

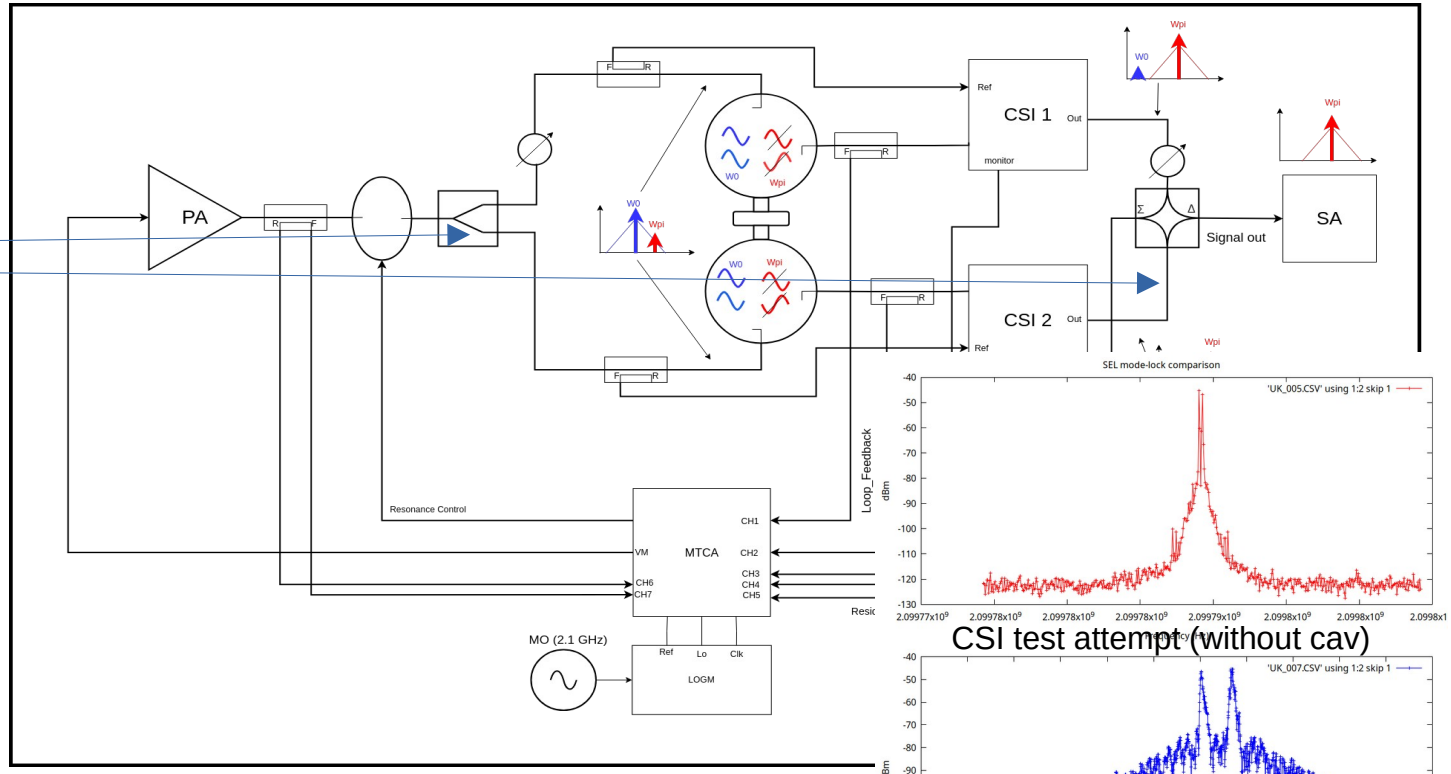


Mode rejection test setup (First 4K test of the cavity)

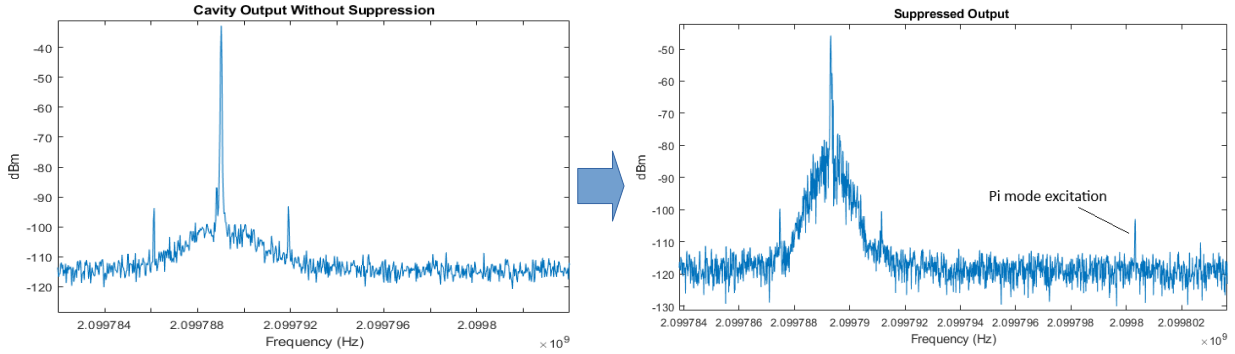
Digital self excited loop for the resonance tracking



Prototype mode rejection setup



CSI test attempt (without cav)



- Signal extraction setup consists of three main d
the pi mode, second stage is for suppression of
residual noise and amplification of the GW signa
- In the first cold test of the cavity, MTCA based digital self excited loop used as resonance tracker.
- Bandwidth of the drive signal should be narrower than the bandwidth of the cavity for the noise free suppression of the output signal of the MAGO cavity. And resonance tracker should not add phase noise to the input signal.

Thank You.

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