

MAGO 2.0: Simulation and Theory

COMSOL, CST Studio and Test Measurements

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Theory

Continue work of Robin Löwenbergs Masterthesis towards high frequency GW.

Change strain metric from $h_{00} = \frac{1}{2c^2} \ddot{h}_{ij}^{TT}(g) x^i x^j$ to

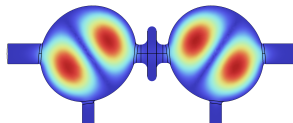
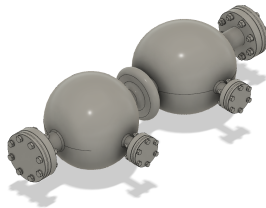
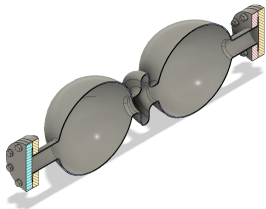
$$h_{00} = x^k x^l \ddot{h}_{kl}^{TT} \cdot \left[-\frac{i}{\omega_g z} + \frac{1 - e^{-i\omega_g z}}{(\omega_g z)^2} \right]$$

$$h_{0i} = -x^k x^l (\partial_l \dot{h}_{ki}^{TT} - \partial_i \dot{h}_{kl}^{TT}) \cdot \left[-\frac{i}{2\omega_g z} - \frac{e^{-i\omega_g z}}{(\omega_g z)^2} - i \frac{1 - e^{-i\omega_g z}}{(\omega_g z)^3} \right]$$

$$h_{ij} = x^k x^l \partial_i^2 \delta_{ij} h_{kl}^{TT} \cdot \left[-\frac{1 + e^{-i\omega_g z}}{(\omega_g z)^2} - 2i \frac{1 - e^{-i\omega_g z}}{(\omega_g z)^3} \right]$$

Electromagnetic Modes Simulation

Pump mode at 1.7673026 GHz and Signal mode at 1.7673407 GHz from COMSOL

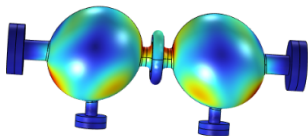


Electromagnetic Modes Simulation

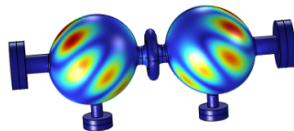
Mode #	Frequency GHz	Mode #	Frequency GHz
1	1.24957238	11	1.78036075
2	1.24958242	12	1.78036580
3	1.25272760	13	1.79174085
4	1.25273202	14	1.79175194
5	1.30042760	15	1.79709572
6	1.30043197	16	1.79710112
7	1.76724123	17	2.07254334
8	1.76727638	18	2.07256438
9	1.77471182	19	2.07653114
10	1.77474795	20	2.07655352

Mechanical Modes Simulation

Lowest lying quadrupole modes of the MAGO cavity with variable coupling:



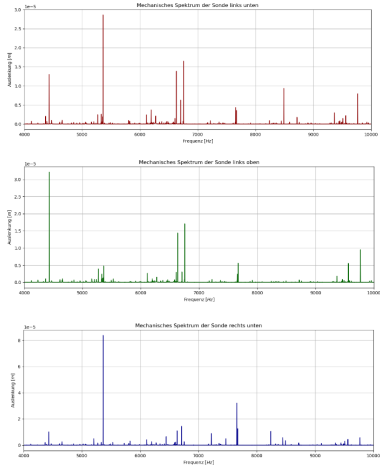
4122Hz



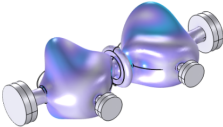
4610Hz

Mechanical Modes Simulation

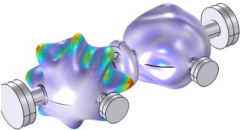
Full mechanical spectrum of hit response from COMSOL



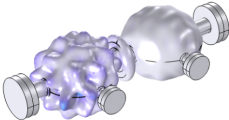
4430Hz



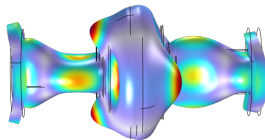
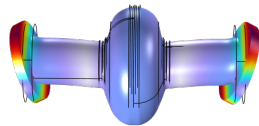
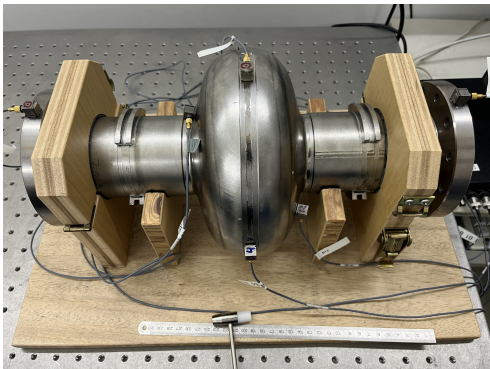
5362Hz



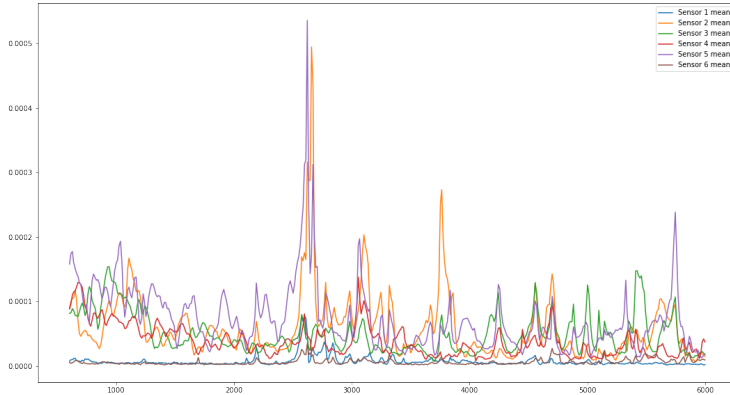
7656Hz



Test Measurements



Test Measurements



Test Measurements

