New calibration method

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Status of absolute calibration

Absolute calibration of the ESDs:
ESDs $\Rightarrow$ MMC2_feedback $\Rightarrow$ Master laser piezo

‚Confusion‘:

GEO noise (@ high frequencies) follows sqrt(Power)

$\neq$

predicted shot noise level

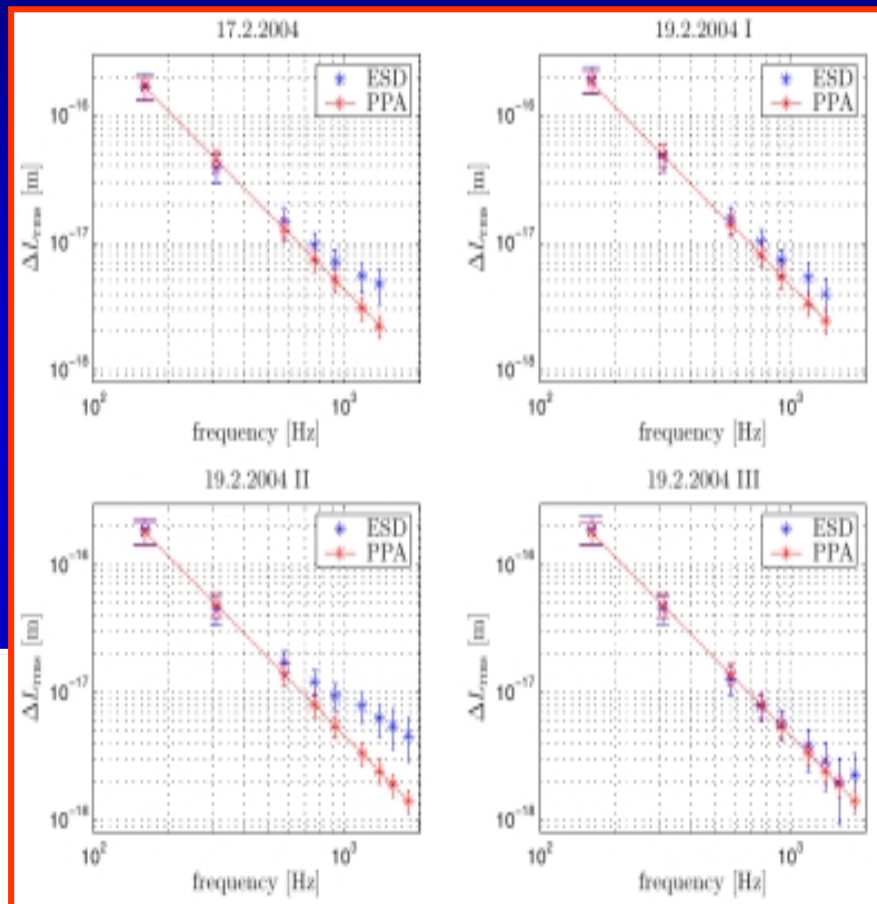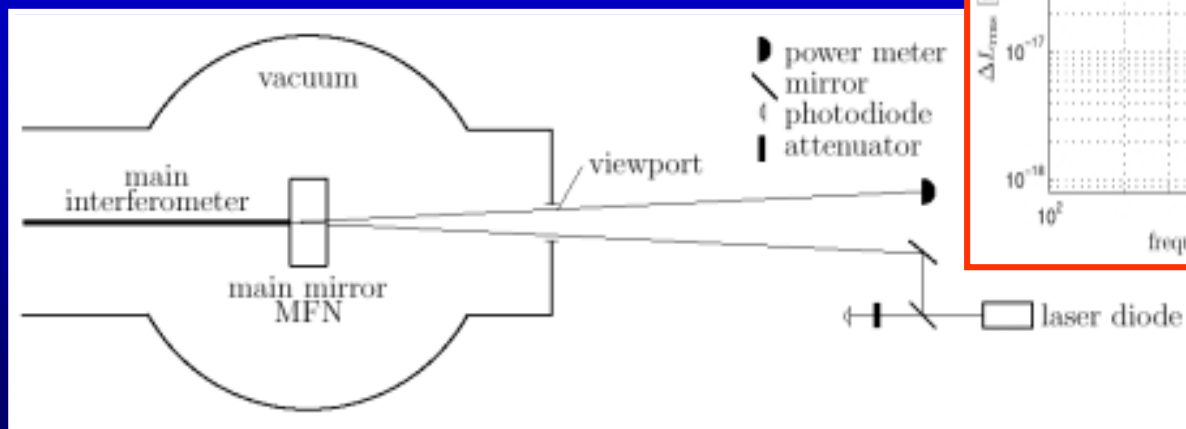Absolute calibration wrong ?
predicted shot noise level wrong ?

Need an independant method for absolute calibration

Simple mechanism:

$$F = 2\,\frac{P}{c}$$

Unfortunately we can't explain the strange experimental results

$$F_G = G \frac{m_1 m_2}{r^2}$$
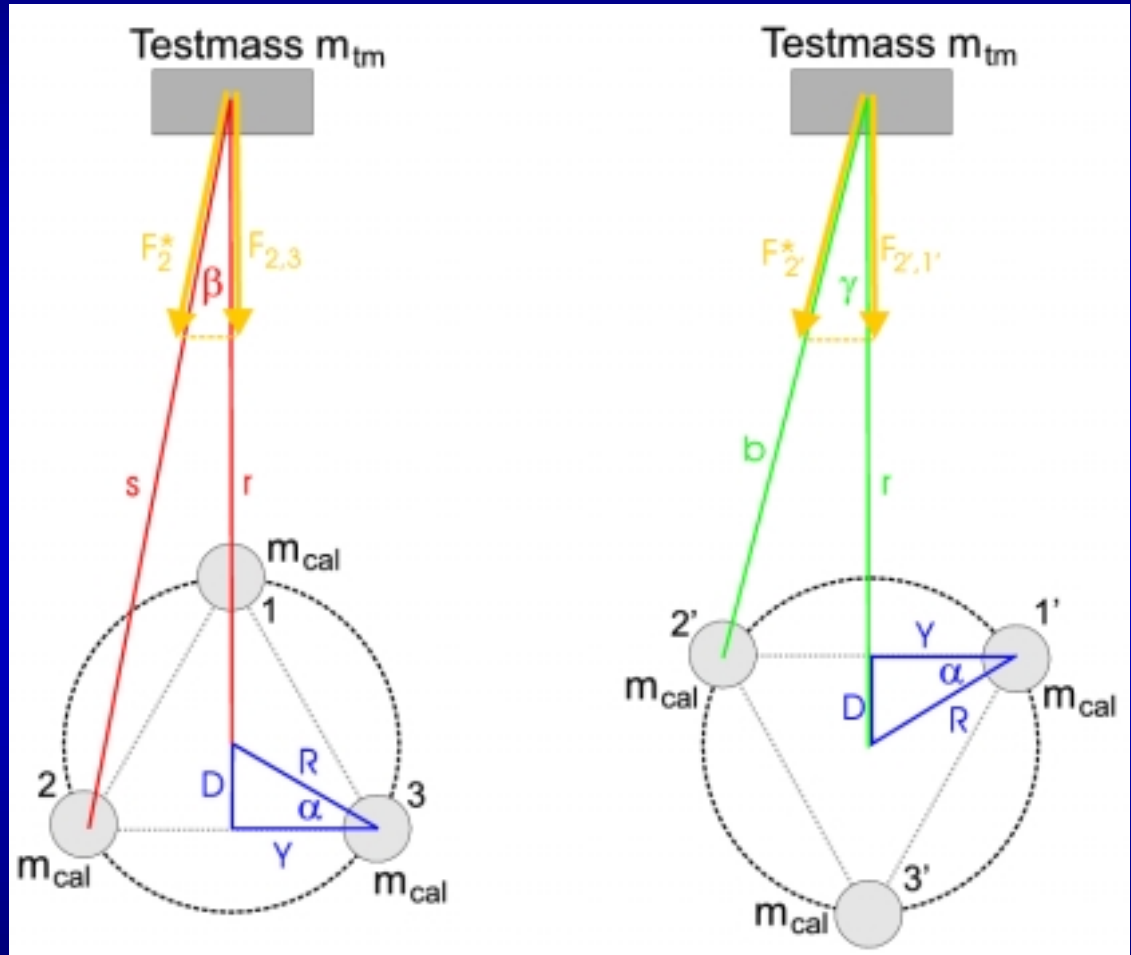
Using rotating masses

1 mass:
Coupling via seismic, electrical and magnetic fields

2 masses:
First harmonic

3 masses:
???

$$\Delta F = G \cdot m_{tm} \cdot m_{cal} \left[\frac{1}{(r+R)^2} + \frac{2\cos(\arctan(\frac{R\cos\alpha}{r+R\sin\alpha}))}{r^2 - rR + R^2} - \frac{1}{(r-R)^2} - \frac{2\cos(\arctan(\frac{R\cos\alpha}{r-R\sin\alpha}))}{r^2 + rR + R^2} \right] \Rightarrow \quad x_\omega = \frac{\Delta F}{m_{tm}\omega^2}$$

First tests:

- simple commercial system
- low cost
- 2 and 3 mass configuration
- frequencies around 100 Hz

Gravity calibrator with 3 masses
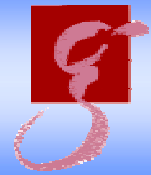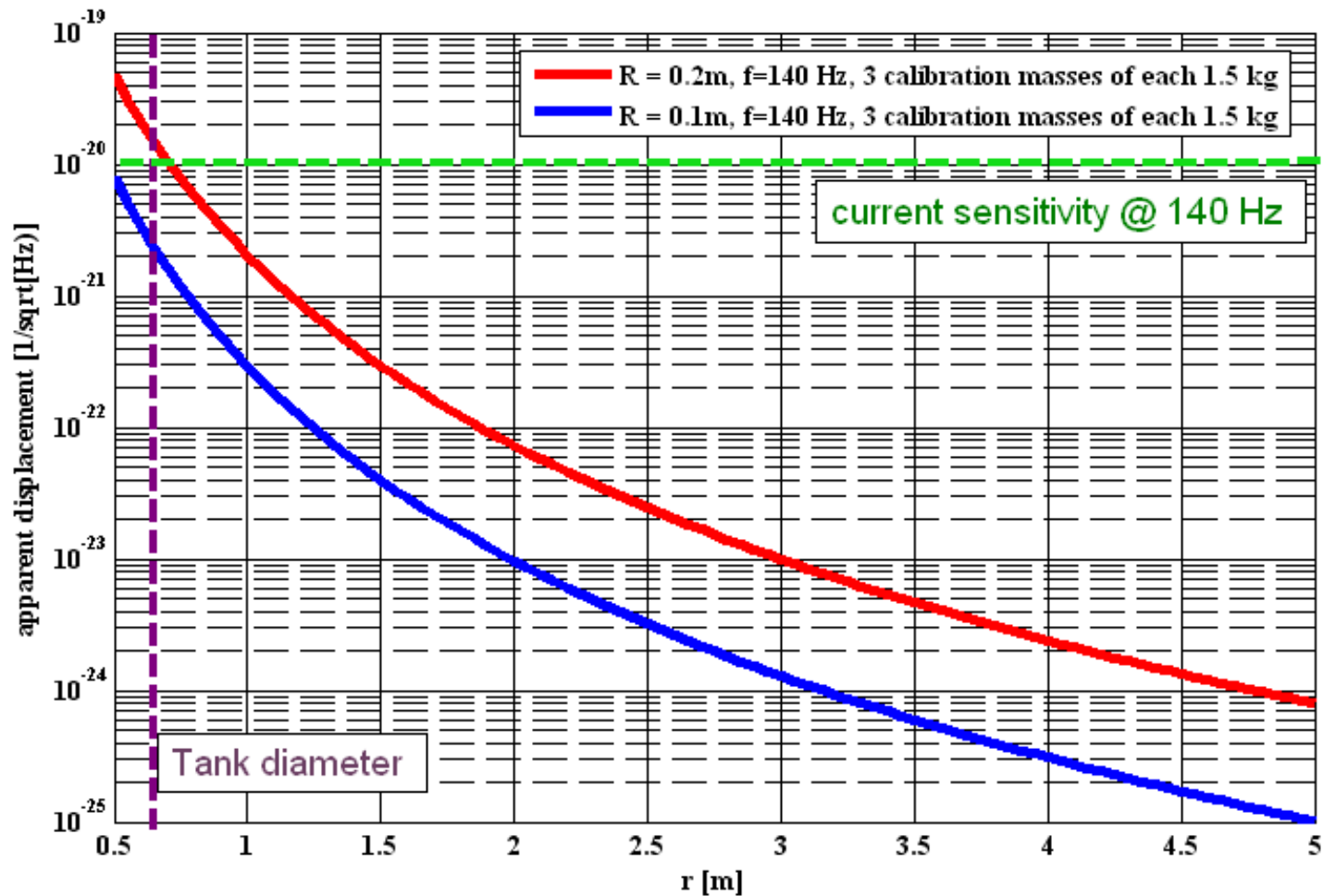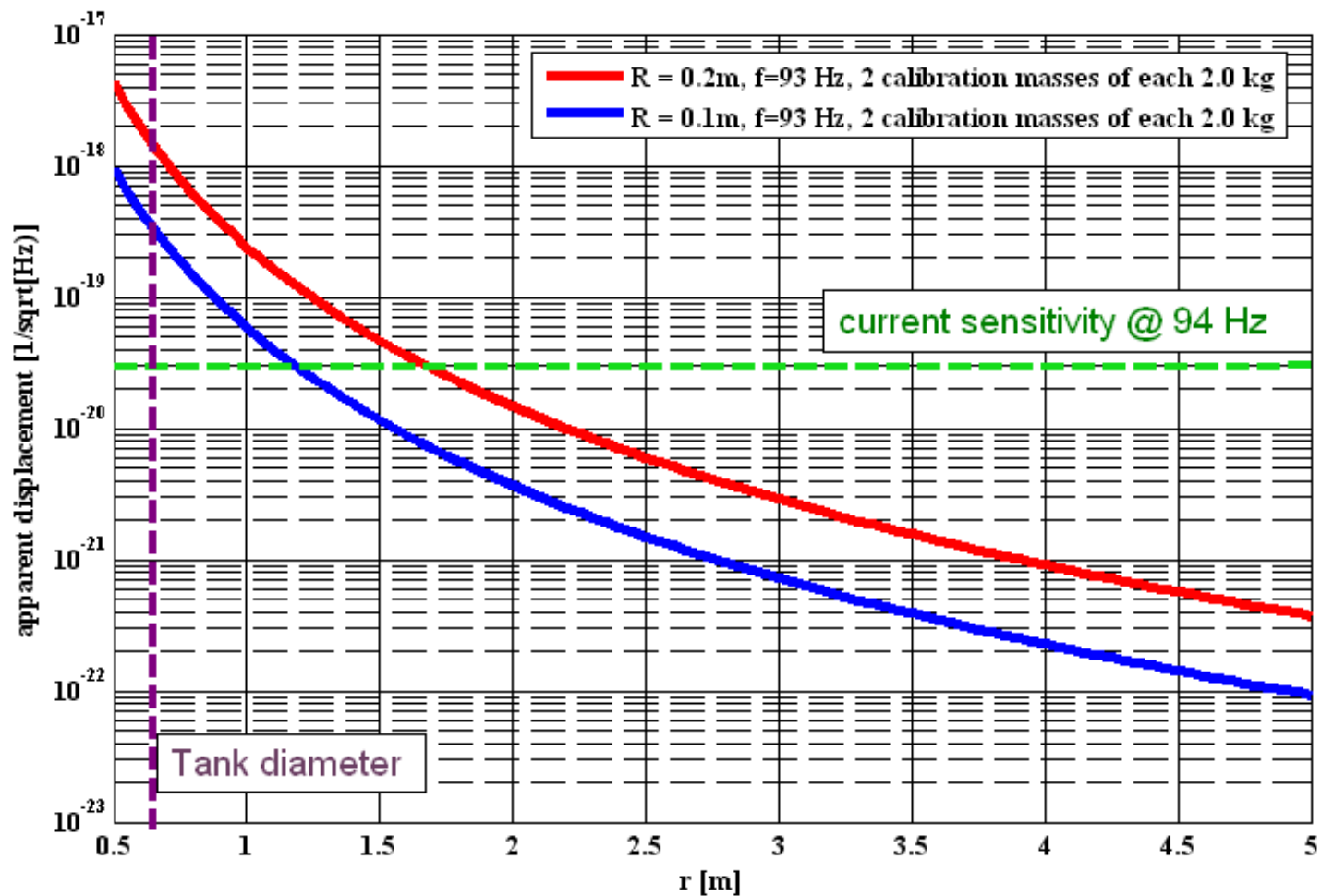
Gravity calibrator with 2 masses

To Do

- **Prove of principale with the „GEO Spin dryer"** (safety precautions)

- **Estimate potential accuracy:**

    - mass and geometry of calibration masses

    - distance between calibration masses and mirror

    - frequency stability of calibrator

- **Need finite element modelling for F_{grav}**

- **...**

- **...**

- **Development of a ‚proper' gravity calibrator**