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# MAGIC

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## Science of the Cosmos

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### **Measuring the speed of gravity in short distances: improving the detector and the emitter**

In order to investigate the speed of gravitational signals traveling in air and through a different medium a experiment is proposed. The experiment contains 2 masses vibrating (emitters), the masses will emit a periodic tidal gravitational signal and one sapphire device that behaves as a detector is located between the two vibrating masses. This detector is suspended in vacuum and cooled down to 4.2 K will. The vibrational amplitude of the sapphire detector is measured by a microwave signal with ultralow phase-noise that uses resonance in the whispering gallery modes inside the detector device. Sapphire has quite high mechanical and electrical Qs which implies a very narrow detection band thus reducing the detector sensitivity but amplifies the phase difference of the signal coming from the emitters. With the aid of a finite element program the normal mode frequencies of the detector can be calculated with high precision. The results show that to improve the sensitivity of the experiment is necessary to improve the signal strength. New emitter and detector are proposed then the new best operational frequency is calculated showing a better design for the experiment.

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