Artificial Gravitational Field Generated in the Laboratory?

In a recent experiment, funded by the European Space Agency (ESA) and the Air Force Office of Scientific Research (March 2006), Tajmar et al. of ARC Seibersdorf, Austria (ESA test center) report on the generation of a toroidal (tangential) gravitational field in a rotating accelerated (time dependent angular velocity) superconducting *Niobium* ring, see figure below. In recent presentations at AIAA JCP Sacramento and Berkeley University Dr. M. Tajmar (July 2006) showed improved experimental results that confirmed previous experimental findings of the last three years.

This would be the first time that an artificial gravitational field in the laboratory has been generated and, if correct, could have great impact on future space propulsion technology. Although general relativity predicts such an effect, the measured acceleration is about 20 orders of magnitude larger, and therefore is not predicted by current physics. The experiment would demonstrate the interaction of electromagnetic and gravitational fields, and thus would allow for a completely new propulsion principle. This type of field propulsion would not be based on momentum generation by fuel.

Since the present experiment (see figure below) generates a tangential gravitational field, it cannot be used directly as a propulsion system. It is, however, of great importance, since it shows for the first time that a gravitational field can be generated other than by the accumulation of mass. A physical explanation, namely the Higgs mechanism to be responsible for the graviton to gain mass, was given by de Matos and Tajmar, which they termed the *Gravitomagnetic London effect*.

A modified experiment that should result in a vertical force (with respect to the plane of the rotation ring, see figure below) was suggested by Dröscher and Hauser in their recent AIAA-2006-4608 paper, along with an alternative theoretical explanation of the experimental results, predicting a physical *interaction between electromagnetism and gravitation*. Efforts are being made to further improve the accuracy of the experiment and to eliminate sources of noise.

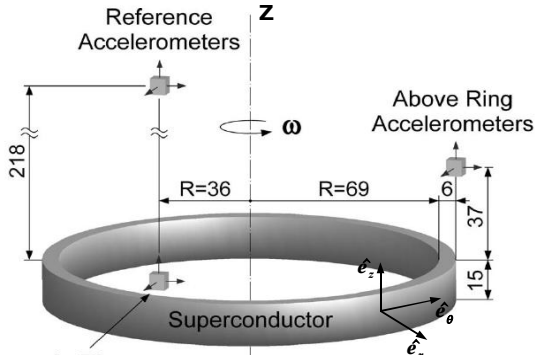

Figure 1: Rotating superconducting torus (Niobium) as used in the experiment of Tajmar et al. All dimensions are in *mm*. A cylindrical coordinate system (r, θ, z) with origin at the center of the ring is used. In Ring accelerometers measure a gravitational acceleration of some 100 μg in the azimuthal (tangential, θ) direction when the ring was subject to angular acceleration. The acceleration field *does not* depend on ω. No acceleration was measured in the z-direction (upward). A more recent experiment employed a set of 4 in-ring accelerometers and confirmed the rotational character of this field. If the direction of rotation is reversed, the acceleration field changes sign, too (gravitational Lenz rule).

1.Tajmar, M. et al.: *Experimental Detection of the Gravitomagnetic London Moment*, arXiv, gr-qc/ 06030332006.

2.de Matos, C. J., Tajmar, M.: *Gravitomagnetic London Moment*, *and the Graviton Mass Inside a Superconductor*, PHYSICA C 432, 2005, pp.167-172.

3.Tajmar, M.: *A note on the local cosmological constant and the dark energy coincidence problem*, Class. Quantum. Grav. , 23 (2006) 5079-5083.

4.Dröscher, W., J. Hauser: *Spacetime Physics and Advanced Space Propulsion*, AIAA 2006-4608, 43nd AIAA/ASME/SAE/ASE Joint Propulsion Conference & Exhibit, Sacramento, CA, 10-13 July, 2006.