100th anniversary of Roland Eötvös (1848-1919), physicist, geophysicist, and innovator of higher education
Commemorated in association with UNESCO

Remeasurement of the Eötvös equivalence experiment

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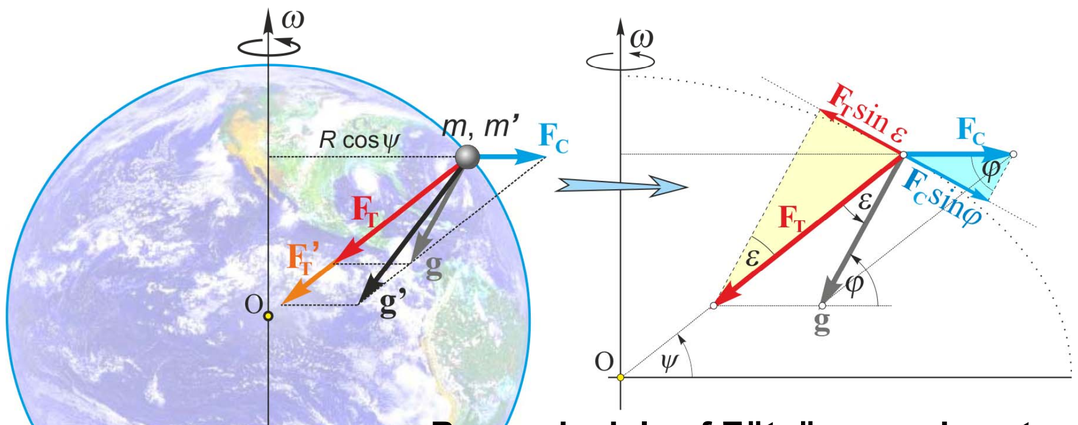
Loránd Eötvös with his colleagues D. Pekár and J. Fekete made a revolutionary precision measurement (**Eötvös experiment**) **checking the equivalence of gravitational and inertial mass**. In 1986, Fischbach and his colleagues discovered a systematic matter dependence in the EPF measurement results, which they were finally unable to conform experimentally. *Analysis of the Eötvös experiment revealed a possible bias that justifies repeating the measurements under better conditions and using modern technology*. Preparations for the measurements started at July of 2017 by the Wigner Research Centre for Physics, Department of Geodesy and Surveying, Department of Control Engineering and Information Technology of Budapest University of Technology and Economics (BME), and the Society for the Unity of Science and Technology in cooperation with other organizations, departments and experts. In December 2018, after more than one year of careful preparation preliminary tests have been started at 30 m below ground level in a controlled and undisturbed environment of the Jánossy Underground Laboratory at KFKI. The Eötvös year in 2019 is the 100th anniversary of Eötvös's death, which provides another good reason for repeating the Eötvös experiment.

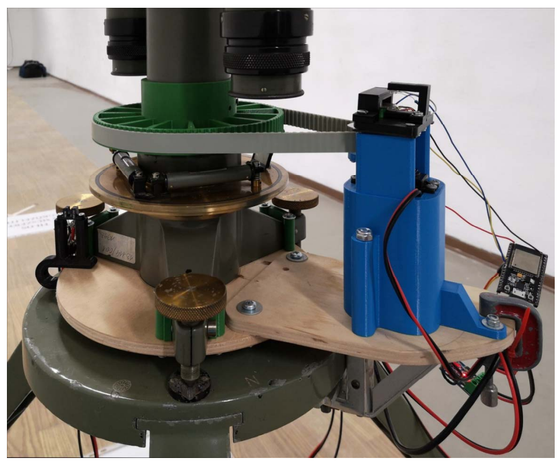


Base principle of Eötvös experiment:
Assumption: different materials have different gravitational forces but the same rotation centrifugal force.

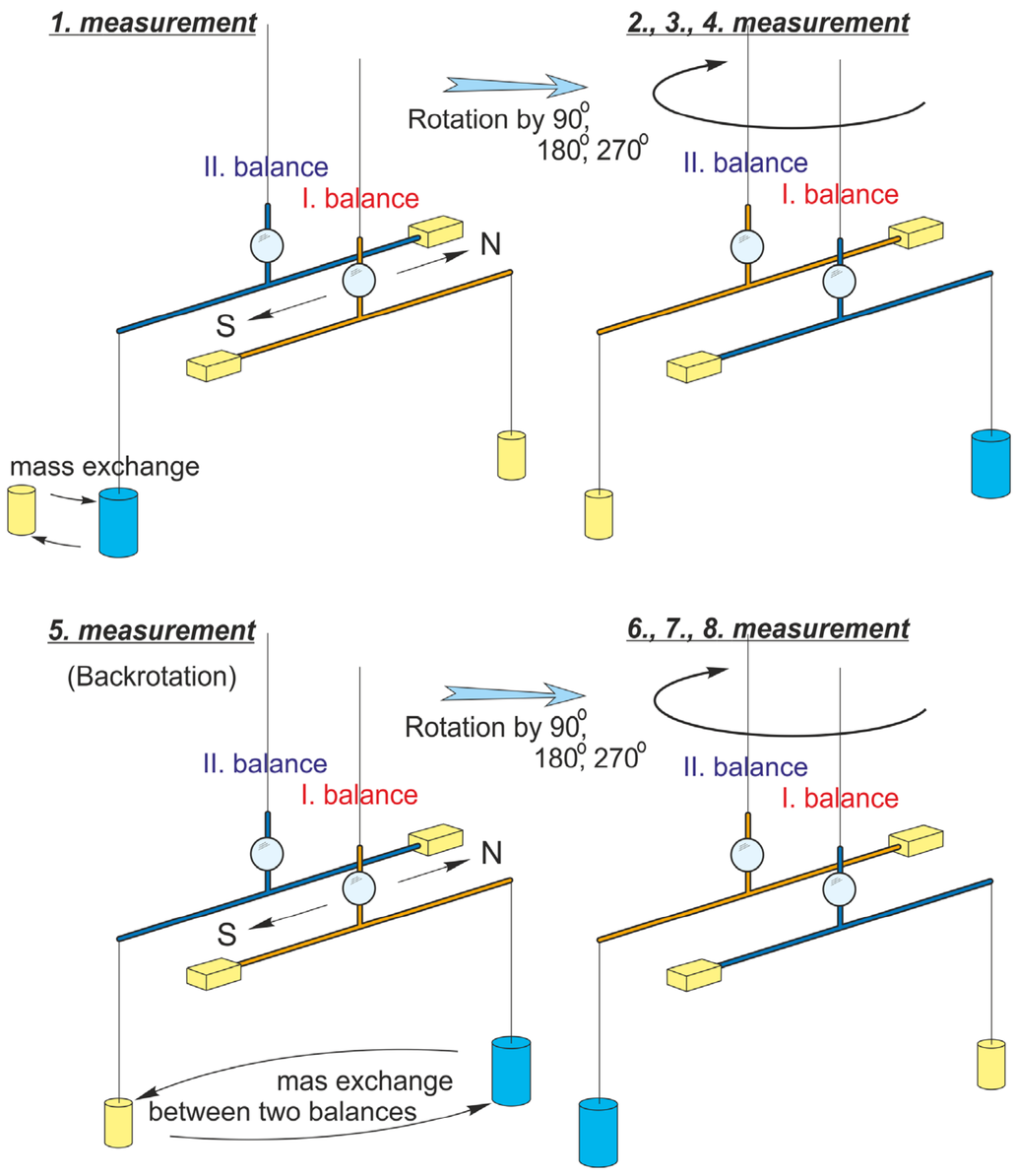
Basic instrument:
Eötvös-Pekár torsion balance

Modifying the instrument: Automatic reading with CCD sensors:

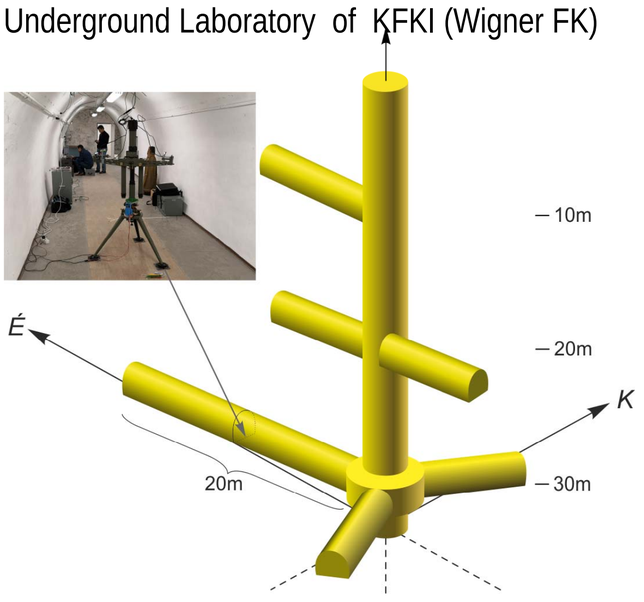
Rotation by computer remote control:



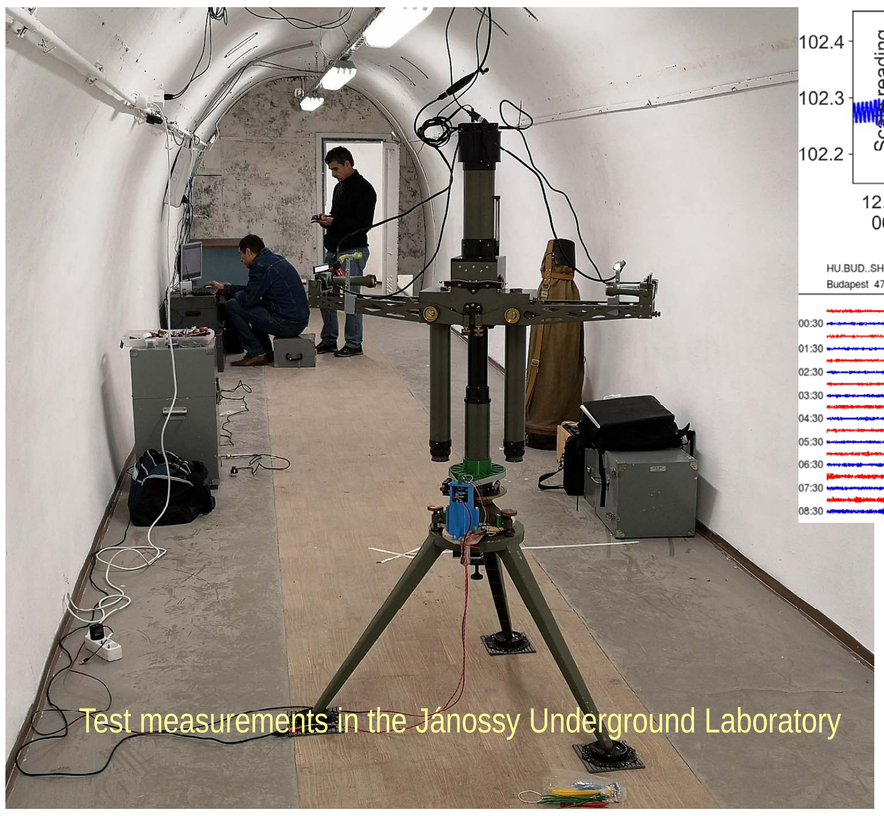
Mass exchanging measurement strategy:



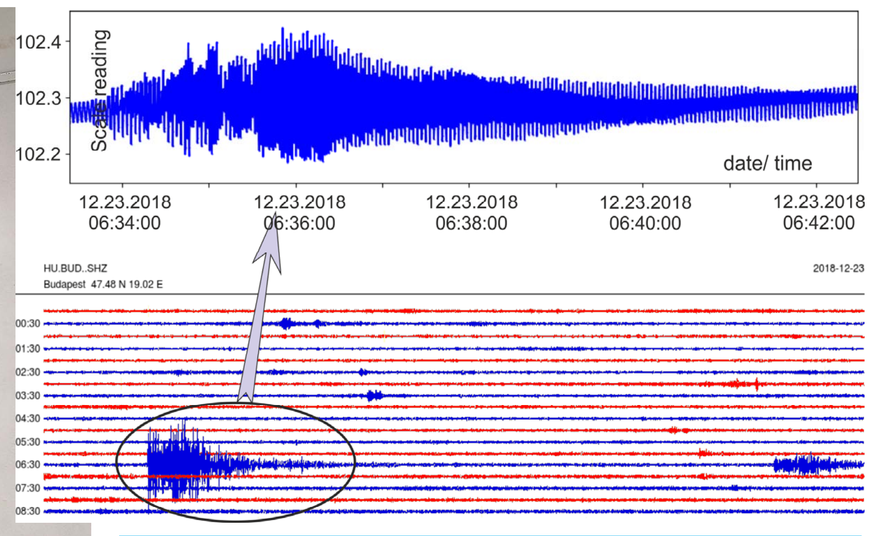
Location of measurements: Jánossy Underground Laboratory of KFKI (Wigner FK)



The "fine-tuning" of the operation of the modified torsion balance at the Dept. of Geodesy and Surveying of BME



Test measurements in the Jánossy Underground Laboratory



The functionality and accuracy of the system is characterized by the fact that for the first time in the history of the torsion balance we managed to record earthquake waves with the instrument. Upper picture is the registration of the torsion balance and lower part is the seismogram registered by seismograph.

The preparatory work of the measurements took place for more than one year at the Department of Geodesy and Surveying of BME. The Eötvös-Pekár torsion balance has been prepared for Eötvös experiment, remote-controlled rotation mechanics are working, CCD sensors and appropriate illumination are well suited for measurements, most of the required software have been written and tested. The Eötvös-Pekár torsion balance, prepared for the measurements was placed to the final place in the Jánossy Underground Laboratory on December 20.2018. Calibration and test measurements have begun and are underway, the accuracy of our measurements exceeds the original by nearly two orders of magnitude.