

# International Conference on Precision Physics and Fundamental Physical Constants (FFK-2019)



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## Newtonian Gravitation Constant: History of Measurement and New Results

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The Newtonian gravitational constant  $G$  is one of the fundamental constants of nature. Accurate knowledge of this constant is not only of considerable methodological interest, but is also important due to the key role which it plays in gravity, cosmology, geophysics. The first experiment to measure the gravitation constant with a relative uncertainty of 1% has been performed in 1798 by Henry Cavendish, outstanding English scientist. A significant contribution to the measurement of  $G$  was made by the outstanding Hungarian physicist Roland Eötvös. 100 years after Cavendish, in a series of the experiments, he increased the accuracy of the  $G$  value in five times. To date, more than 200 experiments of the  $G$  measurement have been performed, including the experiments of Moscow University and Huazhong University of Science and Technology, but an accuracy of  $G$  value increases very slowly, only about 10 times in a century. So large discrepancies between different experimental values of  $G$  seems to be explained by the presence of systematic errors in the results of different experiments. One of the ways to solve this problem is to measure  $G$  simultaneously using different methods and different experimental setups.

Two independent experiments for  $G$  measurement have been performed at Huazhong University of Science and Technology (China). Two values of the gravitational constant with relative uncertainties of  $11.6 \times 10^{-6}$  were obtained in these experiments. These two  $G$  values coincide with each other on the  $3\sigma$  confidence. The obtained result allows to assume with a high probability that the measured  $G$  value is free from systematic errors. The results were published in *Nature*, 560 pp. 582-588 (2018).

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