CURRENT STATUS AND PERSPECTIVES IN ABSOLUTE GRAVIMETRY

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In conventional terminology, the absolute measurement of the gravity field is the measurement of free-fall acceleration of the test body in the gravity field. Today's absolute ballistic gravimeters are instruments where the free-fall motion of the test body is realized in vacuum, and the free-fall acceleration *g* is calculated from the measured pairs of time and distance intervals using the equation of motion of the test body. A laser displacement interferometer is used for the measurement of the displacement of the test body. To have a measurement of *g* with an uncertainty of a few microgals (or a few parts in 10^9 in relative units), the uncertainty in the displacement measurement should be less than 1 nm. An additional complication is that the measurement of displacement in absolute ballistic gravimeters is not quasi-static as in a conventional dimensional metrology, but a dynamic measurement with the frequency of the interference fringe counting up to 6 MHz.

The only way to determine the current level of precision of absolute gravimeters is the comparison of the results of their measurements organized in a possibly short period of time on a well-established gravity network.

The principles of the operation of absolute gravimeters, different designs of existing gravimeters, the sources of the uncertainties in the *g*-measurement, and the results of the international comparisons of absolute gravimeters at the BIPM are presented. The possible future development of new, improved instruments for the measurement of free-fall acceleration and vertical gravity gradient are discussed.