Progress of the 10-meter atom interferometer

L. Zhou
Wuhan Institute Of Physics And Mathematics, CAS

Weak equivalence principle test with microscopic particles based on atom interferometer has made new progress in recent years. We designed and completed a 10-meter atom interferometer, and test the weak equivalence principle using (85)^Rb and (87)^Rb double-diffraction Raman atom interferometer at a level of 10^(−8). The precision of weak equivalence principle test is still limited by many factors, such as vibration noise, Coriolis effect, ac Stark shift, background magnetic field noise, etc. To reduce the background magnetic field noise, to improve the magnetic field shielding system is necessary. After years of hard work, multiple rounds of overall welding, annealing and tests, the technical bottleneck of the long-baseline magnetic shielding is overcome, and the active compensation technologies inside and outside magnetic shielding layer are developed. As a result, the fluctuation of the magnetic field of interference area is improved to 10 nT level. Recently, we realize atom fountain with height exceeds 12 m, the free fall time of atoms for the Mach-Zehnder type atom interferometer in the 10-meter uniform magnetic field area is 2.8 s. The unceraity of differential gravity measurement using (85)^Rb and (87)^Rb atoms is 5.1× 10^(−10).