

Using globular clusters to test gravity in the weak acceleration regime: NGC 6171

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As part of an ongoing program to test Newton's law of gravity in globular clusters, we present here new results obtained for NGC 6171. Combining VLT+FLAMES spectra for 107 stars with data from the literature, we were able to trace the velocity dispersion profile up to ~ 16 pc from the cluster center. The velocity dispersion remains constant at large radii (with an asymptotic values of ~ 2.7 km s⁻¹) rather than follow the Keplerian behavior, as was previously found for the globular clusters ω -Centauri and M15. The profile flattens at 8 ± 1.5 pc where the acceleration of gravity is $a = 1.4^{+0.7}_{-0.4} \cdot 10^{-8}$ cm s⁻². We have now studied three clusters and all three have been found to have a flat dispersion profile beyond the radius where their internal acceleration of gravity is $a_0 = 1.2 \cdot 10^{-8}$ cm s⁻². Whether this indicates a failure of Newtonian dynamics or some more conventional dynamical effect (e.g., tidal heating) is still unclear. However, the similarities emerging between globular clusters and elliptical galaxies seem to favor the first of the two possibilities.

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