Possible Reasons for Differences in the Velocity Measurements of Orbiting Celestial Bodies

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Abstract

The anomalous galaxy rotation curve is a well known problem in physics today and has given rise to speculation that some form of gravitating dark matter might exist within galaxies, providing the additional force required to explain the flat non Keplerian rotation curve. In this paper an alternative explanation for the flat rotation curve arising from incompatible measurement origins.

Prograde vs. Retrograde Motion

In the time of Johannes Kepler and Tycho Brahe the modern understanding of the motions of celestial bodies was being developed, the velocities of celestial bodies were carefully measured with respect to the fixed background stars and recorded. At that time the Universe was believed to be static, i.e neither contracting nor expanding, so one might presume that Kepler and Tyco Brahe considered the orbiting bodies to have a positive velocity vector. Kepler famously showed that the velocity of orbiting bodies follow a $1/r^2$ rule and presumed the velocity vector to be positive. Today we know that the Universe is expanding, and that space is stretching equally in all directions. This gives rise to ambiguity in respect of a positive velocity vector. If we define positive velocity as observer directed, then an orbiting body where the radius is increasing can only be negative with respect to the observer, but must be positive with respect to the distant fixed stars, herein arises the apparent problem with galaxy rotation curves, Keplerian rotation curves come from positive velocity vectors, i.e. measurements based on the fixed background stars, however the technique used to measure velocities in the discs of distant galaxies is the doppler shift of the light spectra of the distant stars, and should therefore be assigned negative velocities. It can now easily be shown that by changing the sign of the velocity vector, the sum of negative velocities does indeed produce a flat rotation curve as seen in observations. Providing confirmation of this theory by real data, there is possibly no reason to hypothesise or continue the search for dark matter.