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Modeling the Galaxy's Rotation Curve DANIEL SERRANO, J. HASBUN, University of West Georgia — The orbital speed of material in the Galaxy does not behave according to Kepler's 3^{rd} law. This has led astronomers to postulate the existence of Dark Matter. Dark Matter is a form of missing mass; it is basically undetected matter in the universe that is under luminous and probably quite different from ordinary matter (Comins and Kaufmann 2005). In this paper we investigate the modeling of the Galaxy's rotation curve. Our models make use of a modified version of Newton's universal law of gravitation. The idea is that we employ Gauss' Law as applied to gravitation; i.e., $\oint g \cdot \hat{n} d\vec{A} = -4\pi G \int \rho d\tau$, to obtain expressions for the orbital velocity of the material within the galaxy. While this formula is capable of obtaining Newton's universal law of gravitation for constant densityρ, it is also flexible in that the density can be a variable. The variability in the density ρ is studied to investigate the fluctuations present in the experimental rotation curve. Six models are presented for this purpose: (a) The Exponential model, (b) the Gaussian model, (c) the Spiral model, (d) the Exponential-Cosine model, (e) the Gaussian-Cosine model, and (f) the Harmonic model. The models are listed in order of increasing improvement when compared to the observational curve.

J. Hasbun
University of West Georgia

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