THE ELECTRON DENSITY IN THE PLANE OF THE GALAXY

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Pulsars provide probably the best probes of electron density in the plane of the Galaxy. The dispersion measure, the path integral of electron density along the line of sight from the pulsar to Earth, $\int n_e ds$, is directly measurable from multi-frequency pulse-timing observations. The distance to a pulsar, d, can be estimated from its HI absorption and emission spectra. The mean electron density along the line of sight is then just $\langle n_e \rangle = \int n_e ds/d$.

We have recently used the Arecibo 305-meter telescope to measure the HI absorption and emission spectra in the direction of nine pulsars. These measurements bring to 42 the number of pulsars with distance estimates and hence estimates of mean electron densities along the lines of sight. However, since most pulsars are weak radio sources at 21-cm wavelength, a significant fraction of the reported pulsar distance measurements are corrupted by noise or overzealous interpretation. We have reanalyzed all published pulsar distance measurements, rejecting those deemed marginal and estimating kinematic distances in a uniform fashion for the remainder of the sample (32 pulsars).

If we restrict our attention to the 16 lines of sight with both upper and lower distance limits (and hence lower and upper electron density limits), then we find that the electron density distribution peaks sharply near .03 cm^{-3}. The density enhancements previously noted in the direction of the Gum Nebula and the inner Galaxy (Ables and Manchester 1976, Weisberg et al. 1980) are less evident in our selected sample, although they are still marginally visible.

REFERENCES

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