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NEW DISTANCE LIMIT FOR THE 3-5-79 SOURCE*

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ABSTRACT. We provide new distance limits for the March 5, 1979 gamma ray transient source based on the synchrotron interpretation and the lack of low frequency self-absorption cutoff. This leads to upper limits of 0.6-11 kpc for emission areas ranging from 1 squared km polar caps to a 10 km radius stellar surface.

The burst spectrum of the March 5, 1979 event shows no self-absorption cutoff down to 30 keV. This provides an upper limit to the synchrotron emission column density as a function of electron distribution (temperature or injection energies) and magnetic field. Combining this with the observed flux at earth, spectral shape and the requirement that magnetic field energy density exceeds radiation energy density, we obtain a conservative upper limit to the synchrotron luminosity distance modulo the emission area for steady thermal and cooling electron distributions. It ranges from 0.6 kpc for a 1 squared km polar cap to 11 kpc for a 10 km radius surface.

If in addition we interpret the hard tail above 300 keV (minus the 400 keV annihilation line) as due to thermal self-Compton of the synchrotron photons, we obtain a distance estimate (not upper limit) of 0.1 - 2 kpc for the above emission area ranges. The above distance limit can be pushed to 55 kpc only if the emission surface area is increased to 10^{14} sq. cm. These results strongly suggest, but do not prove, that the source is Galactic and the association with N49 of LMC is chance coincidence. Future observations (e.g. optical) should be able to settle this issue definitively. For further details see Ref. 1.

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References

1. E. P. Liang, Astrophys. J. Lett., 308 L00 (1986).