

A12a **Luminous Infrared Galaxies with the Submillimeter Array: Probing the CO(3-2) gas in LIRGs Near and Far**

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between a local sample of luminous infrared galaxies (LIRGs) and high redshift galaxies that comprise submm selected galaxies (SMGs) and quasars. The local sample consist of our recent Submillimeter Array survey of CO (3-2) emission in LIRGs while the CO (3-2) data for the high redshift population are obtained from the literature. We find that the derived $L'_{\text{CO}(3-2)}$ and L_{FIR} including all three population is correlated over four orders of magnitudes, which suggests that the molecular gas traced in CO (3-2) emission is a robust tracer of star formation activity. The linear correlation between $L'_{\text{CO}(3-2)}$ and L_{FIR} is also predicted by recent theoretical models. By comparing the size of the molecular disks between LIRGs and SMGs, we show evidence that not only the star forming region traced in CO (3-2) emission in SMGs is significantly extended, but also that intense starbursts which are only possible in the nuclear regions of LIRGs locally are possible more disk wide in the SMGs/quasars. Finally, based on the observed linewidths and the excess 1.4 GHz emission seen in all of the quasars that are radio detected, we argue in favor of the unification model in which submm-bright quasars are intrinsically similar to SMGs but with more pronounced AGN activity in radio-loud quasars, and further viewed through a low inclination angle such that the central AGN is more clearly visible along our line of sight.