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Question: What are the most recent advances in submillimeter detected galaxies? Now that ALMA offers the possibility for resolving them what have we learned about their sizes, gas fractions, distribution of gas, dust and stars.

LMT CO Spectroscopy of a Large Sample of Lensed and Unlensed Submillimeter Galaxies and Spatially Resolved Spectral Imaging using ALMA and SMA

Recent and ongoing large area surveys in the millimeter and submillimeter wavelengths using ground-based (AzTEC, SCUBA-2, LABOCA, ACT, SPT) and space-born (Herschel/SPIRE, Planck) instruments have now produced an enormously large database of so-called "submillimeter" galaxies (SMGs). The rapid imaging capability of ALMA has been extremely successful in carrying out follow-up studies of a selected subset to yield reliable identification of multi-wavelength counterparts and addressing the confusion/multiplicity issue that has plagued earlier low resolution surveys. Obtaining spectroscopic redshifts through CO and [C II] spectroscopy has been painfully slow in comparison, even for ALMA, and our understanding of the redshift distribution and cosmic evolution of these luminous infrared sources at cosmological distances is limited to a (potentially highly biased) subset of sources with an optically bright counterpart. As part of the Early Science Operation program, the Redshift Search Receiver on the Large Millimeter Telescope (LMT) has started a CO spectroscopic survey of a large sample of lensed and unlensed SMGs, with the aim of determining a reliable redshift distribution and gas content evolution among these luminous infrared galaxies. We will present some of the initial results from the LMT-RSR survey and the lessons learned from such "blind" spectroscopy observations. We will also discuss how these LMT spectroscopy can help maximize the scientific output of ALMA and other interferometric facilities, including an example of our successful SMA [C II] follow-up observations of the unlensed $z=4.3$ AzTEC source in the COSMOS field.