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Presentation Requested: oral
Category: Role of AGN in Galaxy Evolution in the ALMA Era
Question: Is AGN feedback more, less or equally important as stellar feedback? Is this dependent on the galaxy types and how? What is the role that ALMA and other new facilities like NuStarr play in addressing this question?

Unveiling Dusty Star Formation and AGN Activities in high-z LIRGs

A major issue in observational cosmology is to reconstruct growth history of galaxies and Active Galactic Nuclei (AGNs), which can be traced with Luminous InfraRed Galaxies (LIRGs) detected by the infrared observing satellites as the ISO, the Spitzer, the AKARI, and the Herschel. In general, their IR emissions are also expected not only with Star Formation (SF) but also with AGN activities, which possibly regulate or quench the SF with their feedback mechanism in galaxy evolutions. Even though MIPS selected LIRGs at $z \sim 2$ have been frequently studied for studying the connection between the SF and AGN activities, their IR SF-AGN distinction at $z < 2$ is limited since the strongest Polycyclic Aromatic Hydrocarbon (PAH) $\sim 8\mu$m emission enters in an MIR photometry gap between the IRAC and the MIPS boarded on the Spitzer. With the Spectral Energy Distribution (SED) analysis of unique AKARI multi-MIR photometry covering this gap, however, we could classify LIRGs up to $z \sim 2$ into PAH Luminous starburst-dominated (sb-LIRGs), starburst-AGN (s/a-LIRGs), and AGN-dominated (agn-LIRGs) populations with using a ratio of monochromatic luminosity at 8μm of the PAH emissions from dusty SF regions to that at 5μm of continuum emissions from AGN dusty tori; $\nu L_\nu(8\mu\mathrm{m})/\nu L_\nu(5\mu\mathrm{m})$ (Hanami+2012). The SF/AGN distinction of these AKARI classified LIRGs becomes recently confirmed by using the CXO (Krumpe+ 2014), the Herschel (PI: S. Serjeant). Alternative causes for the PAH weakness on $\nu L_\nu(8\mu\mathrm{m})/\nu L_\nu(5\mu\mathrm{m})$ in IR spectra of LIRGs are recently discussed with using the Spitzer and the Herschel as a compact and intense radiation field induces the PAH deficit as mimic of [CII] deficit [m]. Thus, the MIR SED analysis is a unique technique for studying co-evolution of dusty SF and AGN activities with dusty tori, which should be confirmed with using ALMA soon and be also applied with using MIRI/JWST in future multi-wavelength surveys. We will discuss the hidden connection between dusty starbursts and AGNs reported in Hanami+ (2012) and Krumpe+ (2014) adding resent radio observational results obtained with the e-Merlin and the J-VLA (Nakanishi,K.).