

Fifth Workshop on Millimetre Astronomy in Italy



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Federico Lelli - Cold gas dynamics in high-*z* galaxies

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High-resolution ALMA observations have opened a new window to study galaxy dynamics at $z > 1$ using cold gas tracers, such as CO, [C I], and [C II] emission lines. In this talk, I will present in-depth studies of individual galaxies at $z = 1-5$ with ALMA data at angular resolutions between $0.05''-0.5''$. In such galaxies, the cold gas forms dynamically-cold rotation-supported disks with high rotation-to-dispersion ratios, in contrast to the common picture of “turbulent” high- z disks from H-alpha data. In most cases, the galaxy rotation curve is flat and requires the presence of a central mass concentration (a stellar bulge) in addition to a pure exponential disk. Finally, I will present preliminary results from the TRICEPS project: a [C II] survey of 15 massive galaxies at $z = 4-5$ with spatial resolutions of only 0.5-1.0 kpc. The TRICEPS data show that rotating gas disks are common in massive galaxies ($M_{\text{star}} \sim 10^{10}-10^{11} M_{\text{sun}}$) at $z = 4-5$, living during the first 1.5 Gyrs of the Universe’s lifetime. Overall, the ALMA data suggest that massive galaxies must have formed and evolved surprisingly fast, in analogy to recent independent results from JWST.

Session Classification: Galaxies and AGNs