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Studying galaxy evolution through cosmic time via the μJy radio population: early results from eMERGE DR1

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eMERGE is a multi-tiered legacy survey being carried out with eMERLIN and the VLA at 1.5GHz and 6GHz. Exploiting the unique combination of high sensitivity and high angular resolution provided by radio interferometry, these observations will provide a powerful, obscuration-independent tool for tracing intense star-formation and AGN activity in galaxies out to z~5.

In our first data release (DR1), we present eMERGE Tier 1, a 12-arcmin pointing centred on GOODS-N, imaged at 1.5GHz with the VLA and eMERLIN at ~270mas resolution down to an rms sensitivity of ~1.5μJy/beam, along with 6GHz imaging from the VLA at ~0.5” resolution and comparable sensitivity. This unique radio survey – unrivalled in its combination of depth, areal coverage and angular resolution in the pre-SKA era – allows us to localise and separate extended star-forming regions, nuclear starbursts and compact AGN core/jet systems in galaxies over the past two-thirds of cosmic history, a crucial requirement of tracing the apparently simultaneous growths of the stellar populations and central black holes in massive galaxies.

In this talk I will highlight some early science results from eMERGE DR1, including the first reliable angular size distribution for a large (>200) sample of ~μJy radio galaxies (providing a crucial benchmark for studies of the sub-μJy population of “main sequence” galaxies out to high redshift, which will be undertaken by SKA in the next decade), as well as a characterisation of the multi-frequency radio properties of dusty starburst galaxies at z=2-3. Ongoing eMERGE observations will eventually quadruple the area of Tier 1 (to 30') and double the sensitivity (to ~1uJy/beam) at 1.5GHz, while planned eMERLIN observations at 6GHz will reach ~40mas resolution (~300pc at z=2) at ~1μJy/beam, providing the resolution and sensitivity necessary to search for star-formation occurring in dense giant molecular clouds at cosmic noon.