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

Alasdair Thomson, Tom Muxlow, Rob Beswick, Jack Radcliffe, Nick Wrigley, Ian Smail, Ian McHardy, 
Rob Ivison, Isabella Prandoni

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.