Tripling a redshift record: HI emission in a gas-rich, strongly-lensed major-merger at z=1

Abstract

Deep MeerKAT surveys will dramatically improve our understanding of neutral hydrogen (HI) emission in individual galaxies out to redshifts (z ~ 0.6) for the deepest single pointing survey, LADUMA, however the use of statistical techniques will be necessary to attempt to probe beyond that into the epoch of galaxy mass assembly. Fortunately, as was demonstrated in the early 1990s with molecular line observations, the cold interstellar medium can be explored well beyond what a telescope's sensitivity limits imply by using strong gravitational lensing. Following on from the experience and expertise gained through our \hi lensing simulations and recent successful results on previously observed lensed \hi systems, we propose a deep MeerKAT observation of a Herschel-ATLAS-discovered lensed galaxy, H1429-0028, at z = 1 (lookback time ~7.8 Gyr). This system has been modelled with high-resolution HST/Keck-AO/ALMA maps to have a mean magnification of \mu ~ 9, decreasing the required observation length by almost two orders of magnitude. A successful detection would triple the highest redshift \hi emission detected to date (z = 0.376, M_HI ~ 3 x 10^10 solar masses, Fernandez et al., 2016). We predict a significant detection of H1429-0028 within 9 hours using MeerKAT's UHF receivers based on what we believe to be reasonable assumptions. The detection of cosmic laboratories such as this would play an important role in realizing the high-redshift \hi science cases of MeerKAT and the SKA, just as other strong lenses done for major observatories across the electromagnetic spectrum.