

Neutral Hydrogen emission at $z = 0.654$ in a strongly-lensed quasar

Abstract

Determining the cosmic evolution of the cold gas content of the Universe is a key goal in modern astrophysics. In particular, the determination of the cosmic evolution of the molecular to neutral fraction is key to understanding galaxy formation, as these represent the raw fuel supply for star formation and supermassive black hole growth in a galaxy, and likely underpin the observed cosmological decline in both of those components from their peak at $z = 2$ to the present day. Developments in instrumentation have led to great advances in cold gas studies at high- z in recent years. Here we propose to bring MeerKAT to the fore via the detection of neutral hydrogen in emission at $z = 0.654$, almost doubling the current distance record. The target is RX J1131-1231, a unique system that allows us to leverage the advantages of strong gravitational lensing to detect the HI line using only 9 hours of UHF time. This single detection will be a critical anchor point for studies of cold gas and galaxy evolution, and allow us to study the HI content of a quasar for the first time.