

Objective criteria for the selection of very high redshift radio galaxies

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Abstract: The Epoch of Reionization (EoR), when the first stars and galaxies formed and transformed the Universe from being almost completely neutral to almost completely ionised ($z \sim 7-11$) is one of the major frontiers in the knowledge of galaxy and structure formation. Identifying the most distant galaxies is a difficult and time-consuming procedure, as one is pushing the most powerful observational facilities to the limit of their capabilities. Radio selection methods have recently gained an increased interest for the selection of the most distant galaxies, as powerful radio-AGN at very high redshifts are well within the sensitivity limits of current deep radio surveys and, with the advent of the next generation of radio telescopes, like ASKAP, MeerKAT and LOFAR, there is a potentially large number of very high redshift sources that will be detected. However, objective criteria for the efficient selection of these sources still require development. Radio-based criteria, like the Ultra Steep Spectrum criteria, seem to be less efficient as radio-driven multiwavelength criteria, such as the recent Infrared Faint Radio Source criteria.

In this thesis, the student will seek to develop new, efficient ways to select high redshift radio galaxies, studying the properties of those already known ($z \sim 4-5.2$) in the infrared and millimetre wavelengths, and of the substantial amount of high-redshift candidates waiting for confirmation. Consideration of the characteristics of the EoR and their effect on the observability of the radio emission of extremely high-redshift radio galaxies will be necessary, via a theoretical treatment of the emission mechanisms in radio galaxies under the effect of an increasingly hot background of photons. The results of this project will then be used to (a) find and analyse robust candidates for very high redshift radio galaxies in current deep radio surveys, in particular using the unique capabilities of ALMA and (b) optimise the design of the next generation of whole-sky radio surveys such as EMU and WODAN, which are currently being developed with the participation or the leadership of CAAUL members.