Milliarcsecond Imaging of the Highest Redshift Radio-Loud Quasars
USNC-URSI National Radio Science Meeting

Emmanuel Momjian[(1)]
(1) National Radio Astronomy Observatory, Socorro, NM, 87801, USA

To date, more than 150 quasars have been discovered at $z \sim 6$ and up to $z \sim 7.5$. These high-z quasars represent the first Supper Massive Black Holes (SMBH) and galaxies formed close to the epoch of reionization, the edge of the "dark ages", providing a unique tool to investigate the nuclear activity in galaxies at the earlier stages of cosmic evolution. Furthermore, the black hole mass values of such quasars have great importance for hierarchical structure formation models in the early universe, placing important constraints on parameters such as the seed mass, the velocity dispersion, the radiation efficiency and the accretion luminosity.

Both cosmological simulations and observations indicate that these high-z quasars trace highly biased regions in the Universe and are likely progenitors of the most massive galaxies and clusters observed locally and out to redshifts as high as $z \sim 5$.

Radio observations of the optically luminous quasars at such high redshifts yield a radio-loud fraction of about 8%, which seems comparable to the radio-loud fraction found at low redshifts. However, studies have shown that the radio-loud fraction of quasars may be a function of both optical luminosity and redshift, with this fraction decreasing with increasing redshift and decreasing luminosity.

In this presentation, I give an overview of the known radio-loud quasars at $z > 5.8$, and show their properties as revealed through high angular resolution observations using Very Long Baseline Interferometry (VLBI). I also present recent results on the most radio-loud quasar known-do-date near $z \sim 6$, and its milliarcsecond imaging at 1.54 GHz. These observations resolve the radio emission from this quasar into multiple components with an overall linear extent of 1.62 kpc (0.28"), and suggest a morphology that is compatible with either a radio core with a one sided jet, or a Compact or a Medium-size Symmetric Object (CSO/MSO).

I discuss the VLBI results on these high-redshift radio-loud quasars in the context of quasar-mode feedback during the earliest formation of Active Galactic Nuclei (AGN) and the most massive galaxies. I also present the potential of carrying out H 21 cm absorption studies toward such high-redshift quasars to detect the neutral IGM, as well as studying the apparent proper motion of the jet components and its cosmological implications.