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Duty cycle and energetics of the remnant radio galaxy MIDAS J2253-3446

Abstract

The duration of the active and remnant phases of a radio galaxy, as well as the AGN duty cycle, can each be constrained from the observations of remnant radio galaxy lobes. To perform such analysis we must fit the spectral age across spatially-resolved images; this technique requires at least three resolution-matched multi-wavelength observations to constrain both the injection index and spectral age across the source. MIDAS J2253-3446 is a recently confirmed remnant radio galaxy which we have been awarded 24 hours of high resolution observations with the Australia Telescope Compact Array (ATCA) at 5.5 GHz and 9 GHz. We are proposing to observe this source with MeerKAT to obtain matched-resolution observations at low(er) frequency. Our goal is to (i) derive the duration of the active and remnant phase for MIDAS J2253-3446, (ii) constrain an upper limit on the AGN duty cycle, and (iii) understand the mixing of the lobe plasma. We request a total of 3.5 observing hours.