SIMULTANEOUS OPTICAL AND RADIO MONITORING OF NEARBY GALAXY NUCLEI WITH KEPLER AND THE ALLEN TELESCOPE ARRAY

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We propose to obtain simultaneous optical and radio light curves for the nuclear regions of a sample of 117 nearby galaxies, including some which are known to host AGN. These light curves will be valuable for constraining physical conditions in the galaxies studied, including the origin of AGN activity and of radio-loudness, black hole accretion mechanisms, and the presence of supernovae, X-ray binaries, or other variables in the nuclear regions of galaxies. Optical and radio data will probe a range of energies and size scales. The Allen Telescope Array (ATA) is a radio telescope designed for fast surveying of large areas of sky, with a particular emphasis on transient and variable sources. With a 5 square degree field of view at 20 cm, a sensitivity of ~10 mJy in a one minute observation, and the ability to observe simultaneously in two 100 MHz bands anywhere in the 0.5 - 10 GHz range, the ATA is opening new regions of parameter space in cadence, sensitivity, and area covered. Several ongoing surveys are in progress, including a survey of a ~10 square degree field in Cygnus which is observed for ~8 hours every few days. This survey is designed to study transient emission from objects such as supernovae and gamma ray bursts, as well as variable sources such as AGN and flare stars. Since we have coverage of the full 10 square degree ATA field, and not just the objects we propose to observe with Kepler, we will also be able to supply radio light curves to the Kepler team for any other objects (e.g., brown dwarfs, flare stars, etc.) in our radio data which show interesting characteristics such as variability. We select a sample of galaxies (including known AGN), most of which are associated with the low-redshift rich galaxy cluster Abell 2319, within the Kepler and ATA Cygnus Survey fields of view. The ATA will observe this field with a rolling cadence, allowing us to explore variability on many timescales, from minutes to years. Tools have been developed for imaging, catalog extraction, and light curve generation which will allow us to easily compare variability in the radio with variability at optical wavelengths from Kepler.