Observations of blazars in the K2 F2 & F3 fields
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Blazars are extreme examples of the phenomena known as Active Galactic Nuclei (AGN). Many different types of astrophysical sources are included under the heading of AGN. Our current understanding of these objects is that they all have the same internal structure; we see different behavior because we are looking at the objects from different viewing angles. The defining characteristics of blazars are a featureless (or nearly featureless) optical continuum, large amplitude and highly variable polarization, and large amplitude continuum variability at all wavelengths. The dearth and in some cases absence of discrete features in their spectrum leaves us with only continuum variability and/or polarization variability as a diagnostic of the emission mechanisms at work in these objects. The blazar class of objects is comprised of the BL Lacertae (BL Lac) objects and the flat spectrum radio quasars (FSRQ). The difference between a BL Lac and a FSRQ lies primarily in the strength of any emission lines present in the spectrum. In the BL Lac objects, emission lines are non–existent or are present with equivalent widths < 5 Å, while in the FSRQ emission lines are present with equivalent widths > 5 Å. Blazar spectral energy distributions display a two-bump structure. At low energies there is a peak arising from synchrotron emission in the jet, while at higher energies the peak is believed to be the result of inverse Compton scattering of photons off of relativistic electrons in the jet. The frequency of the low energy (synchrotron) peak divides blazars into sub-classes; low frequency peaked (LBL) intermediate frequency peaked (IBL), and high frequency peaked (HBL).

Observations of 5 blazars identified in the F2 field and 4 blazars in the F3 field of the K2 mission are proposed. The Kepler spacecraft demonstrated the ability to produce unprecedented light curves of AGN, including blazars, during the prime Kepler mission (Mushotzky et al. 2011, Carini & Ryle 2012, Edelson et al. 2013, Wherle et al. 2013). The continuous, highly sampled light curves that will be obtained in the K2 mission will allow a detailed exploration of blazar variability on timescales of minutes to several months that is not possible with ground based observations. These observations will allow the determination of the minimum timescale of the variability, which is related to the size of the emitting region in the jet via light travel time arguments. They will also provide a significant improvement in the determination of the slope of the power density spectrum on timescales from minutes to several months and allow searches for breaks in the high frequency PDS which indicate characteristic variability timescales. Finally, the expected sampling and quality of this data set will allow a search for rapid quasi-periodic oscillations on the optical light curves of blazars. If the source of any detected quasi-periodic oscillations is located in the accretion disk, this provides a direct estimate of the black hole mass.

Long cadence observations are requested for all sources. All sources will be photometrically monitored from the ground during the course of the K2 observations. It is likely that the ground based observations will only be possible during the first 6 weeks of each campaign given the location of the fields and the time of year. Such observations will be extremely useful in validating as intrinsic to the source variability observed on daily to monthly timescales.

Carini, M.T., Ryle, W.T., 2012, ApJ, 749, 70; Edelson, R. et al., 2013, ApJ 766 16; Mushotzky, R.F., et al. 2011, ApJ Letters, 743, 12; Wherle, A. E. et al., 2013, ApJ, 773, 89.