

The Kepler Extra-Galactic Survey (KEGS): Supernovae, AGN, QSOs and BL Lacs

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We propose to observe a sample of extragalactic objects with the K2 mission, campaign #0. These objects comprise of three subsamples: 1) QSO, AGN and BL Lac objects, 2) relatively nearby regular galaxies and 3) “SN galaxies:” small galaxies selected from the 2MASS extended source catalog. Our goals are: 1) to substantially enlarge the sample of QSOs and AGN with Kepler cadence, 2) to obtain an observational inventory of what varies in “regular,” galaxies [we are also hoping to get lucky and discover a supernova in one of those nearby systems], and 3) to perform a systematic survey for supernovae.

Our work on the four SNe discovered by Kepler indicates that K2 can measure SN lightcurves with unprecedented accuracy (Olling et al 2013,2014). These lightcurves already indicate that the progenitors of type Ia supernovae may in fact be systems of double white dwarfs. To establish this with more certainty, we propose here to work towards obtaining such larger samples, and we plan to follow-up on this proposal for the high-latitude K2 campaigns. K2 supernova lightcurves can also help better calibrate SN Ia, and to eliminate systematic uncertainties in our understanding of SNe as standardizable candles for cosmological purposes.

We will also undertake a significant, concurrent ground-based effort to observe the K2/C0 field every other day or so with the SkyMapper and ATLAS Pathfinder (and possibly other) programs. If variable objects are found in the GB data, we will densify the observations and obtain multi-color photometry and spectra to definitely classify the variable objects. Such data will have great (legacy) value for constraining the physical processes that cause the transients. This photometry of the K2/C0 will be made available to the astronomical community.

As instructed, we have selected sources within a 12 degrees radius of $(\alpha, \delta) = (101.74, 21.37)$ degrees, which encompasses an area roughly 4.6 times larger than K2’s active CCD area. We have ordered our target list in order of priority: first the 27 QSOs and AGNs, then the 181 nearby-ish galaxies, followed by 6,496 “SN galaxies.” We chose the size of the “SN galaxies” sample such that it will yield, statistically speaking, two supernovae. The magnitudes listed in the target list are “KepMag-like,” as estimated from JHK photometry.

REFERENCES: Olling, Shaya & Mushotzky 2014, submitted to Nature

Olling et al., 2013b, <http://connect.arc.nasa.gov/p8nmxmhjgzw0/>

Olling et al., 2013a, http://keplerscience.arc.nasa.gov/docs/WhitePapers/Olling_WhitePaper.pdf