KEPLER MISSION EXTENSION, "K2", FIELD 1 CAMPAIGN

M. Fanelli (NASA-Ames & BAERI), P. Marcum (NASA-Ames)

The Kepler Extragalatic Science Community

Science Drivers

The following content is a mildly modified update to the material provided for the K2-0 campaign, as the science justification is essentially unchanged.

Kepler's combination of high-photometric precision and near-continuous observing cadence provides a unique insight on variabiity in extragalactic systems, by opening up the time domain in previously unavailable detail. Long-term monitoring of galaxies is sensitive to both continuous variability, especially low-level variations from embedded active nuclei, and random episodic events, such as supernovae. The primary applications are (a) to define the photometric baseline of galactic systems over a range of amplitudes and timescales, (b) quantify the frequency and amplitude of optical AGN signals in galaxy cores, both quasi-continuous and episodic, (c) provide a direct measure of supernovae rates across galaxy types, complementary to ground-based supernova searches, and (d) quantify the early brightening of supernova as the explosion rises to peak luminosity, which provides critical diagnostics of the origin and shock breakout physics of supernova explosions. The reduced sensitivity expected in the K2 extension still opens up parameter space not accessible from the ground for the topics described above.

The detailed case for precision time series of galaxies has been described in the prime mission GO programs of Carini, Mushotzky, Wehrle, Olling, Fanelli, and Garnavich. First results, all concerning analysis of the power spectrum of optical flucuations from AGN, have been presented by Mushotzky+ 2011 (ApJL 743, 12); Carini+ 2012 (ApJ 749, 70); Edelson+ 2013 (ApJ 766, 16) and Wehrle+ 2013 (ApJ 773, 89). Recently Olling etal (2013, 2nd Kepler Conference) have identified a few supernova candidates in the Kepler data and the statistics of observed variabilty described by Fanelli etal (2013, 2nd Kepler Conference).

Targets In Field 1

Using the field center defined in the K2 target proposal call, we executed a radial search for bright galaxies using NED and a few galaxy catalogs. Field 1, unlike the original Kepler FOV, is located far from the galactic plane, partially overlapping with the Sloan Survey. Many extragalactic targets are catalogged in this field including a number of AGN, all with good quality photometry. Only galaxies with known redshifts were selected, as a robust measure of the SN rate across galaxy types requires knowledge of the galaxy luminosity.

AGNs: From the Vernon-Cetty AGN Catalog we selected bright AGNs along with a few fainter objects in the BL Lac class. A total of **49** AGNs are listed in the target table. The Field 1 campaign will provide about 4 times as many active galaxies as were observed in the prime mission over a broader range of AGN types.

Galaxies: The proposed target list contains **248** objects, selected as the brightest in this FOV. Coordinates listed in EPIC were checked against the SDSS and digitized POSS images to ensure that the proposed target is actually a galaxy at that position. This sample contains a full range of morpholgical types.

Brightness estimates: We used the Kepmags in the EPIC database. Many of these mags are signficantly in error for extended sources, however the aperture masking approach described on the K2 webpage should be adequte to capture most of the flux from this sample.

Target sheet: The target sheet is provided as an excel spreadsheet as requested on the Kepler Science Center webpage. Proposed AGN targets are listed first, followed by the galaxies. Long cadence is requested for all targets.