

Target Observations

CWSig	PulSig	ZeroDft	RctRfi	CWCand	PulCand	CWConf	PulConf
111091	15439	17751	86959	1809	1438	21	1115

Target1-ON

CWSig	PulSig	ZeroDft	RctRfi	CWCand	PulCand	CWConf	PulConf
39701	8233	1	2	28	1102	0	5

Target1-OFF

CWSig	PulSig	ZeroDft	RctRfi	CWCand	PulCand	CWConf	PulConf
5047	5085	0	0	1	4	1	3

Target2-ON

CWSig	PulSig	ZeroDft	RctRfi	CWCand	PulCand	CWConf	PulConf
6004	689	0	0	1	3	0	0

Note: for the follow-up observations the new CW and Pulse detections are not relevant, the system is tracking candidates from the initial observation.

During observations of the 50 KOIs within their habitable zones (Table 6 of the Feb 1, 2011 Kepler data release paper), over the frequency range from 1420 MHz to 1720 MHz (the so-called terrestrial waterhole) – the quietest part of the Terrestrial Microwave Window running from 1 to 10 GHz – the SonATA digital processing system (SETI on the ATA) detected 111,091 CW signals and 15,439 pulsed signals. Of these 17,751 were judged to be due to interference generated by computers and other equipment local to the signal processing room, another 86,959 signals were recognized as being the same signals that had been seen recently when the array was pointing to a different direction on the sky, and were therefore classified as interference entering the low level sidelobes of the antenna. 1809 candidate CW signals and 1438 candidate pulse signals were identified during the initial observations on each of these 50 targets. Further analysis of these candidate reclassified most of the CW candidates as interference because they were detected in two or more of the target beams on the sky that are observed simultaneously, reducing the number of confirmed CW signals to 21, whereas most of the pulse signals survived the reclassification to produce 1115 distinct confirmed pulse signals. These confirmed signals all triggered sequences of automatic reobservations. A second, immediate observation was made of each KOI with confirmed candidates. At this step, all of the 21 confirmed candidate signals were not detected again, indicating that the original detection was a noise-above-threshold statistical event, but 5 of the 1115 confirmed pulse candidates were observed again and confirmed. These 5 confirmed pulse candidates then triggered an immediate ‘off-source’ observation in which the array beam was phased away from the KOI target by 2 beamwidths. 3 of the 5 confirmed pulses were detected again when the array was not pointed at the KOI target, and were reclassified as interference entering the low level sidelobes of the array. 2 confirmed pulses were not detected ‘off-source’ and these triggered the array to phase up its beam on the KOI target again. Unfortunately, these 2 confirmed pulse signals did not reappear. Although we have not quite completed the observations of all 50 KOIs from Table 6 at all frequencies, at this time there are no remaining candidate signals of interest in the waterhole spectrum region from the vicinity of the 50 KOIs we have observed during the past month with the ATA. We will add these targets to our general HabCat list and continue to observe them over the rest of the 1 to 10 GHz window.

The temporal variation of the radio frequency interference environment even at this remotely located site in northern California poses our most difficult challenge in trying to distinguish engineered terrestrial signals from those of extraterrestrial origin. Because of our requirement that signals persist long enough to be identified through a 3-stage automated follow-up sequence of on-off-on, our sensitivity to many types of legitimate ETI, transient signals is limited.

Kepler HZ Targets
ATA SETI Observations - 31 Jan. 2011

