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To: RFI Group

From: Alan E.E. Rogers

Subject: Study of Radio Astronomy (RA) Bands

The following table lists the RA bands

Frequency (MHz)	Exclusively passive	Other Users	Comments
37.5-38.25	N		Down on antenna response
73-74.6	Y		Continuum RFI
150.05-153	N	DoD, business	150.05 to 150.8 may be clear
322-328.6	N	DoD	Not a RA band in USA
406.1-410	N	LMR	Strong 100 W transmitter in unprotected regions
608-614	N	TV sidebands	Partially clobbered by Ch 38 TV – Note 1
1400-1427	Y		Clear
LMR = Land Mobile Radio (Motorola Astro Smart Net)			
Note 1. FCC only requires 60 dB attenuation of sidebands on analog TV			

As far as I can tell from the chart on Dan's wall the only bands which are exclusively passive are the 73-74.6 and 1400-1427 bands.

The only bands which appear to clear at our current sensitivity are

37.5	-	38.25
73	-	74.6
322	-	328.6
1400	-	1427

There may be some continuum in the upper part of the 73 – 74.6 MHz band. Special tests with a filter will be needed to be sure. The following figures 1 thru 5 show the RA bands with 10 kHz resolution.

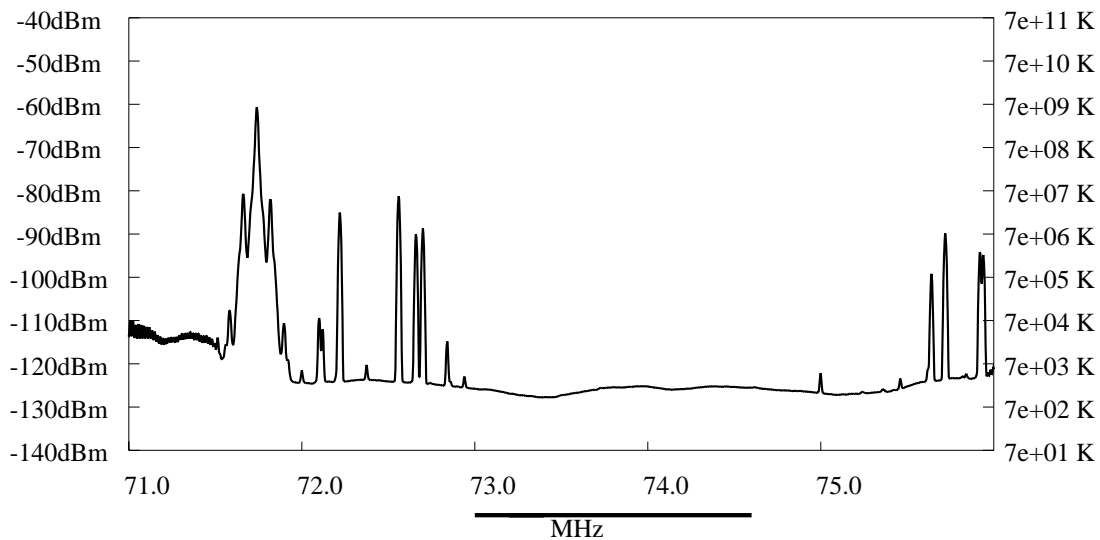
A sensitive way to see any activity in a band is to difference alternating integration periods looking at the antenna and then plot the average of the magnitudes of the differences.

Figure 1 through 5 show high resolution spectral of the 73-74.6, 150.05 – 153, 406.1-410, 608-614 and 1400-1427 MHz bands respectively.

## Comments on our sensitivity

With a “single” antenna we can only identify RFI from natural thermal noise by having an accurate knowledge of the absolute antenna temperature or by observing changes in the antenna temperature. Our knowledge of the absolute temperature is limited by the antenna reflections while our sensitivity to changes is limited by the effective integration time of the spectrum analyzer and its stability. In either case we use a switching technique comparing with a load or within an adjacent integration period. The current level of absolute accuracy varies with frequency being about 50 K at best. Our sensitivity to changes is currently at about the 10 K level. An exception is the 37.5 to 38.25 for which the VSWR of the discone is very high limiting our sensitivity to several thousand Kelvin.

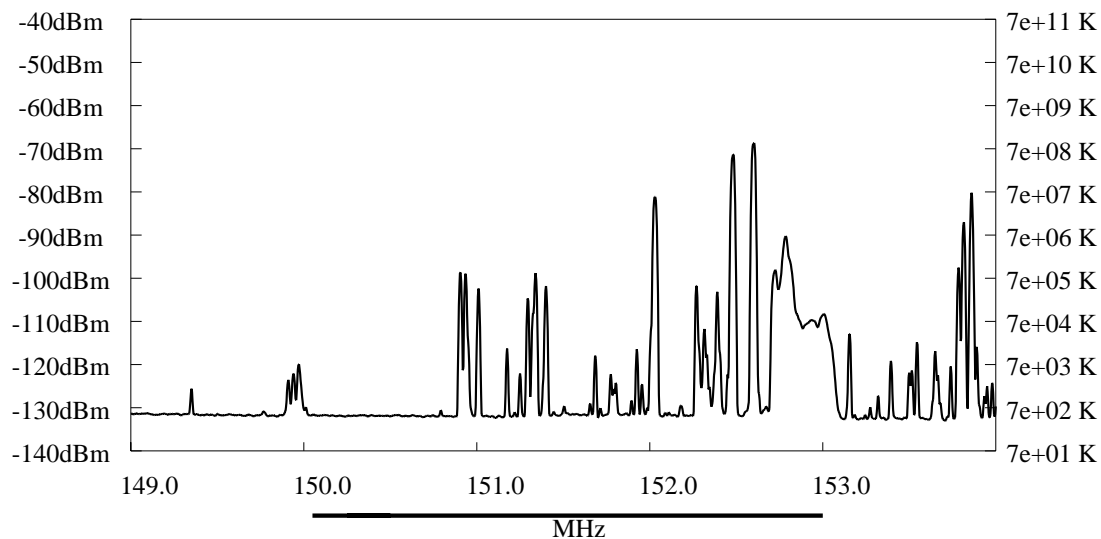
Figure 6 shows the spectrum changes in the 73-74.6 MHz band. The band is noisy (sounds like power line noise on my handheld) and the levels of continuum are variable. Figure 7 shows the LST variation in a band from 150.1 to 150.6 MHz. This portion of the RA band may be free of transmitters. We may actually be seeing the sky noise indicated by seeing the sky noise indicated by the sky model shown by the solid line on the plot.



spectrum from Tektronix RSA3308A with preamp  
start 2005:079:00:03:10 stop 2005:079:23:55:42 resolution 10.0 kHz

Mon Mar 21 12:51:51 2005

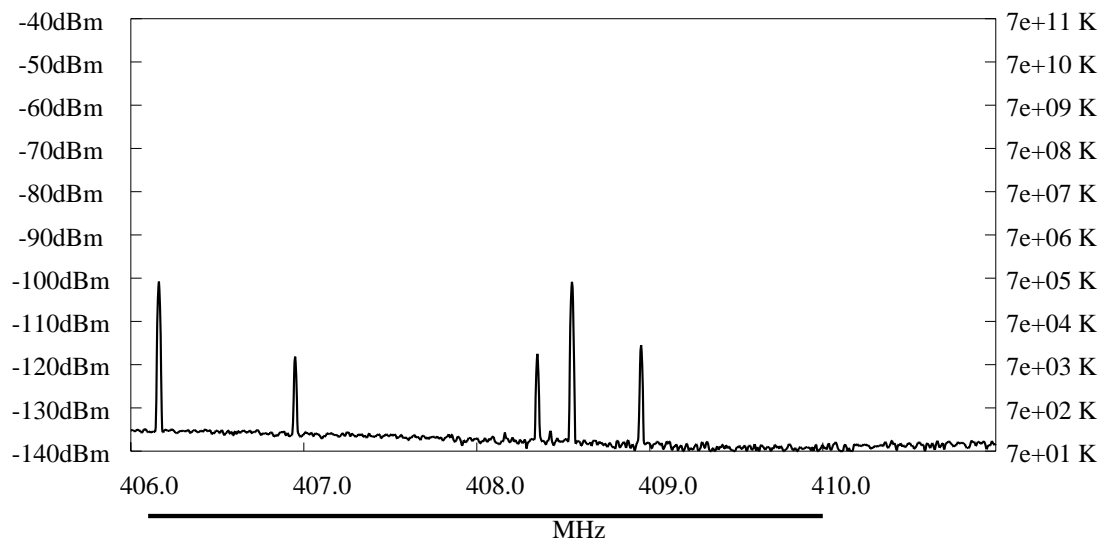
Figure 1



spectrum from Tektronix RSA3308A with preamp  
start 2005:079:00:03:20 stop 2005:079:23:55:52 resolution 10.0 kHz

Mon Mar 21 12:42:43 2005

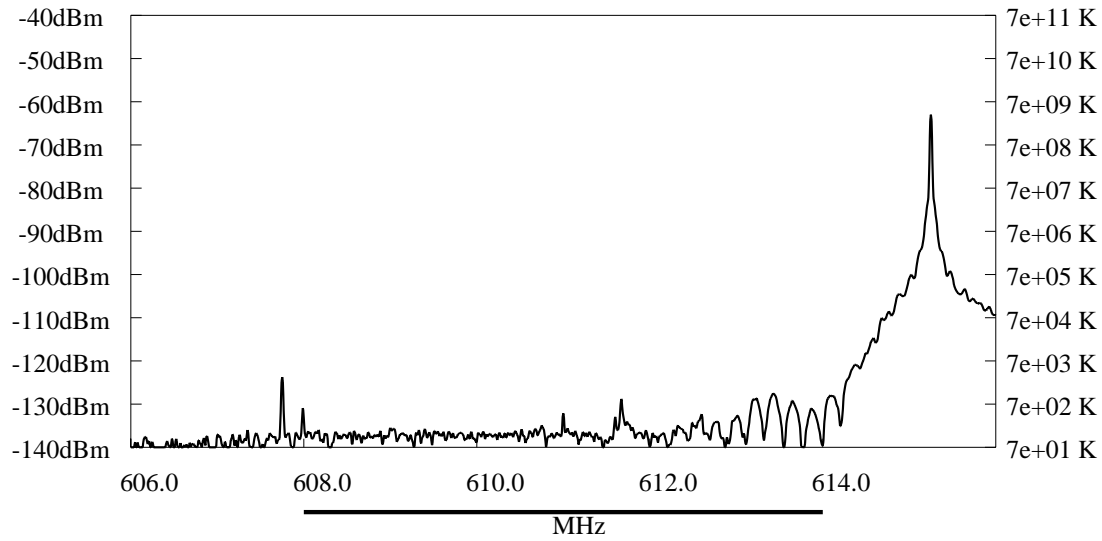
Figure 2



spectrum from Tektronix RSA3308A with preamp  
start 2005:079:00:03:30 stop 2005:079:23:56:02 resolution 10.0 kHz

Mon Mar 21 12:45:43 2005

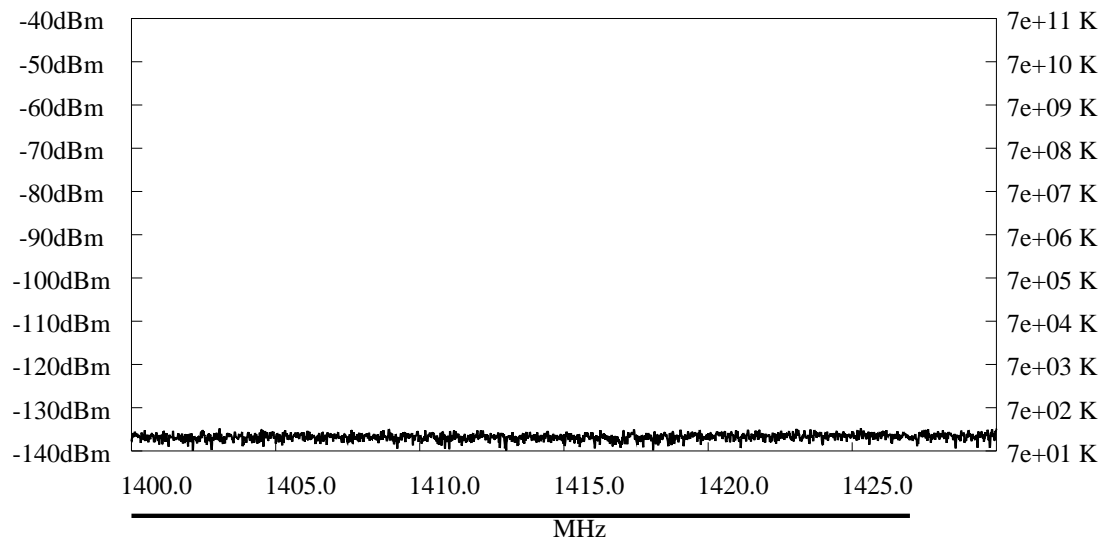
Figure 3



spectrum from Tektronix RSA3308A with preamp  
 start 2005:079:00:03:40 stop 2005:079:23:56:12 resolution 10.0 kHz

Mon Mar 21 12:46:46 2005

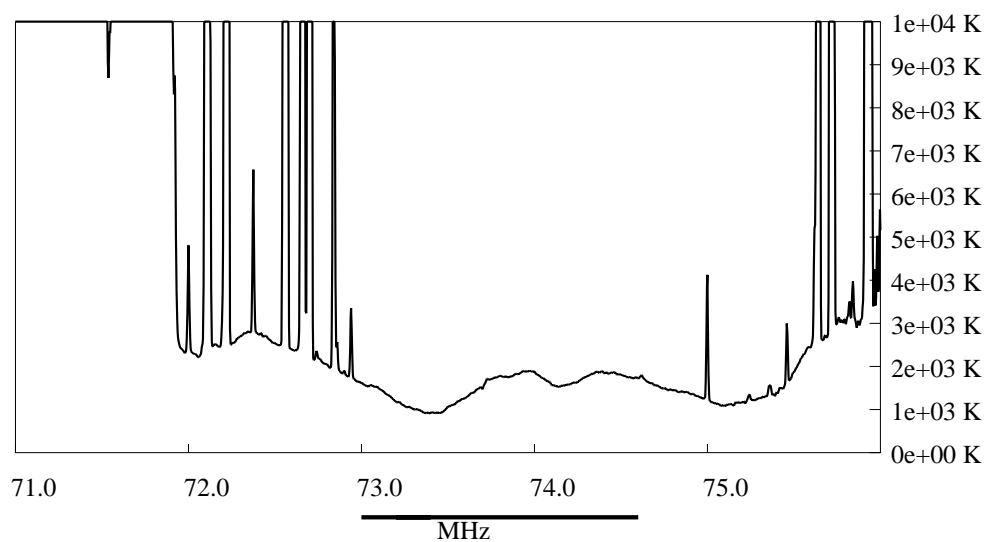
Figure 4



spectrum from Tektronix RSA3308A with preamp  
 start 2005:079:00:03:53 stop 2005:079:23:56:28 resolution 10.0 kHz

Mon Mar 21 12:49:21 2005

Figure 5



spectrum from Tektronix RSA3308A with preamp  
start 2005:079:00:03:10 stop 2005:079:23:55:42 resolution 10.0 kHz

Mon Mar 21 13:03:17 2005

Figure 6

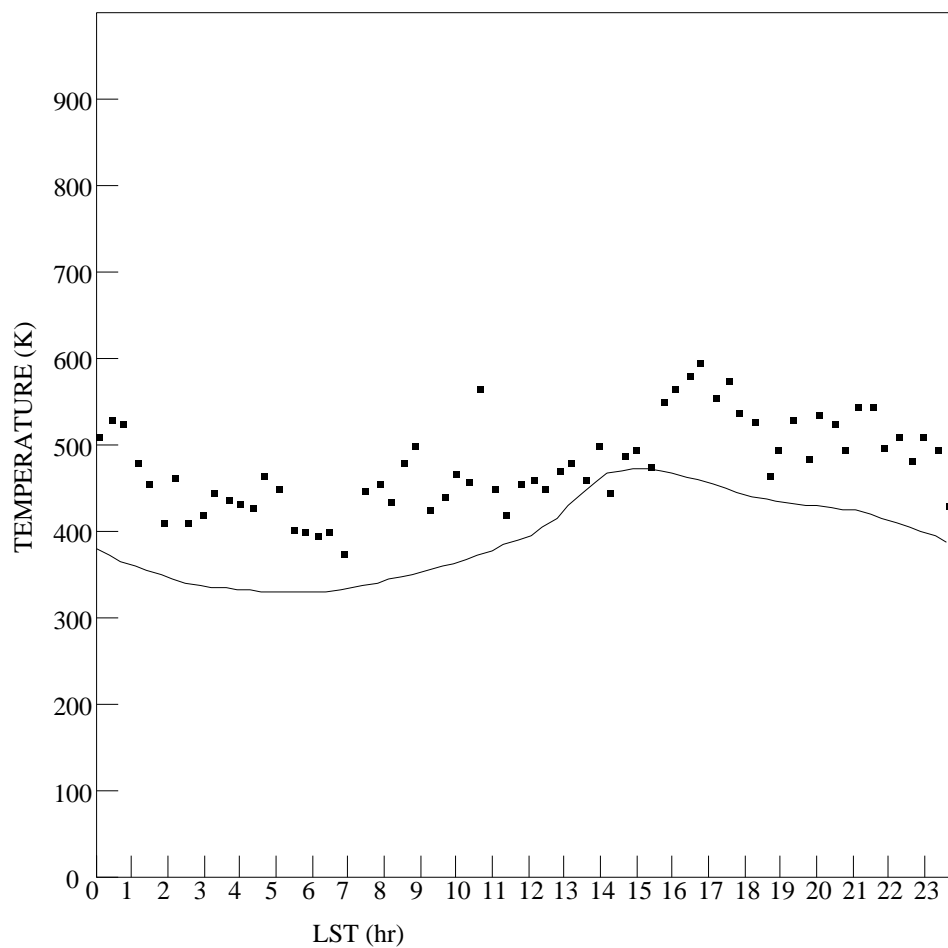


Figure 7