

Radioastronomy..

for these like me, that love radio as well as the sky, radioastronomy is an "obvious" consequence..

Radioastronomy is one of the most recent human science, born on the '30s and developed on the second half of the XX century.

Even with a small station like mine own, it's possible to run some experiences on this field.

First of all, the cares taken and the sut-up arranged so far, to ensure good results:

- - clean pattern of the antennas
- - good preamplifier (0.5dB NF, MGF1302)
- - possibility to switch the input of the receiver on the antennas or to a 50 ohm dummy
- - 2m rig, with AGC off (FT-726 modified)
- - true RMS audio meter (HP3400 with an external digital readout)

Some consideration:

50 Ohm dummy: if you can have the gain of your receiver very, very stable, probably you could just skip it. In such a case, you get a "total power" system. Using regular ham gears, this condition is very far to be satisfied, therefore you need some kind of reference level. In my case, right before to "read the sky source" I switch the Rx to a 50 Ohm resistor and I set that value as ref. Then I switch back the Rx to the antennas and I measure the difference. The ratio (on dB) is then logged and plotted along the days. Average value is computed as well as a standard deviation.

AGC: As long as you try to detect radio sources that give 1-2 dB of extra noise, probably this is not an issue. But when the step rise to 4-5 dB, then the compression effect of the AGC is visible and leads to a serious error on the measurement. Very few radios have the possibility to switch it off, therefore most likely you will have to "put your hands" on it.



Radio sources: there are many on the sky, but only a few are detectable


with my station. I took the list from the "offers" of the VK3UM software. I divided them into 4 groups: Sun, Strong, Faint, Silent. It could seem strange to find "noiseless" areas of the sky in this list. The purpose is to have also some "silent" spot to verify the Tsys, or in other words, to check that my Rx chain is able to receive the sky's noise much more than the human made noise (cars, plants, splatters, etc.).

Bandwidth: as broad as better. Unfortunately willing to work on hams band, a broad band brings into the receiver a lot of signal that nothing have to do with sky noise, like packet, ssb, JT, etc. Surely the 2-3 kHz of a standard radio are too narrow (but still enough to start up the activity), probably something in the range 20-200 kHz could be the best compromise.

Output meter: it's intended to measure the power of the incoming noise, therefore a true RMS meter is advisable. Very likely it will be also "too fast", giving an unstable reading. A "stupid" RC filter of few seconds of time constant will give you a steady figure to log.

Well, let's see now what I got so far:

name	ave [dB]	st.dev. [dB]	f.u. @178 MHz	picture	notes
Sun	7.3	2.5	-		very unstable on this low frequency, almost every figure between 3 to 10 dB
Cassiopeia	3.1	0.2	11000		supernovae residual (Tycho)
Sagittarius	n.a.	n.a.	4500 (@86 MHz)		milky way center no data collected so far due to its "closeness" to the sun
Cygnus	3.8	0.3	8100		radio galaxy

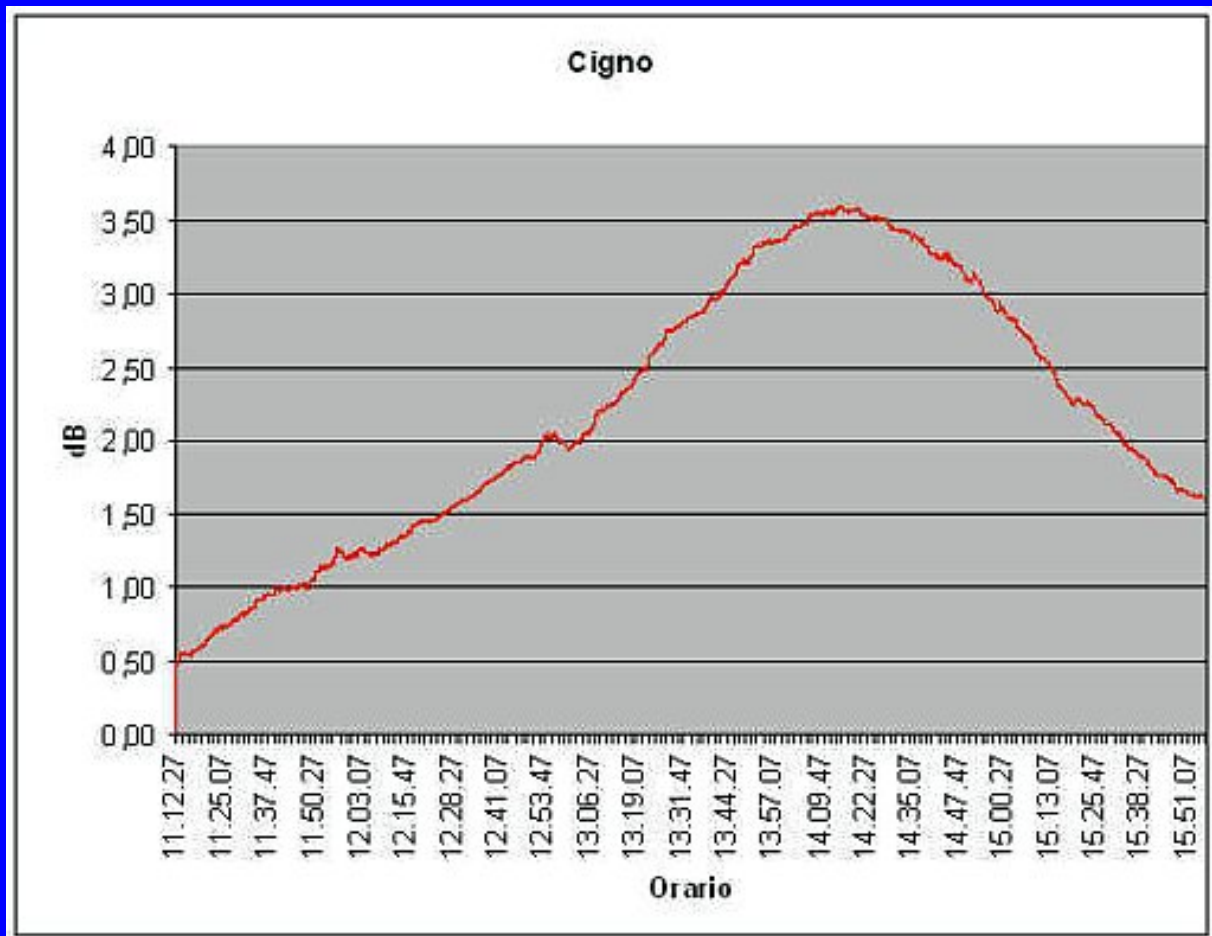
					
Omega 17	n.a.	n.a.			no data collected so far due to its "closeness" to the sun
Orion M42	0.7	0.2			
Taurus A	1.6	0.1	1420		supernovae residual (Y1054)
Virgo	0.5	0.1			radio galaxy
Perseus A	1.6	0.1			
Acquarius	0.3	0.3	n.r.		
Leonis	-0.5	0.3	n.r.		

Cosiderations: after jsut one month of "work" I should be happy for the results. Every radio sources of 1000 f.u. or so, is clearly detectable by my station. And the -0.5 dB of the Leonis, tells that my Tsys is rather

low...

Another way to "see" radio sources, is to record its passage in front of our antennas. In this case, you have to beam your array some hours in advance to the pass of the source, let it then steady, start to record the noise level and just wait for the passage.

Here an example I did by my own with Cygnus:



Well, that's all so far... nothing special but a good way to spend time and learn. This pages should encourage everybody to try too.. the sky isn't so far!