Graphing WSPR SNR Reports Using Excel

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WSPR-2 and -15 is a tool for quantitatively testing propagation between a transmitting station and a receiving station. Typically the WSPR signals are transmitted periodically over a period of many hours with the receiving station recording the decodes and forwarding them on to WSPRnet.org where they are available in the database. A typical excerpt from the database looks like this:

Timestamp	Call	MHz	SNR	Drift	Grid	Pwr	Reporter	RGrid	km	AZ
2014-01-30 17:34	WG2XIQ	0.475666	-17	0	EM12mp	0.05	WG2XXM	EM15lj	306	359
2014-01-30 17:36	G3XIZ	0.475700	-29	0	IO92ub	0.5	DD7PC	JN49ax	627	108
2014-01-30 17:38	WG2XIQ	0.475666	-17	0	EM12mp	0.05	WG2XXM	EM15lj	306	359
2014-01-30 17:40	DL8YCA	0.475782	-11	-1	JO31or	0.01	PI4THT	JO32kf	60	338

Besides the database there is also a configurable Map available to show the geographic locations of the transmitting and reporting stations. A typical map looks like (thanks to Ralph W0RPK) this:

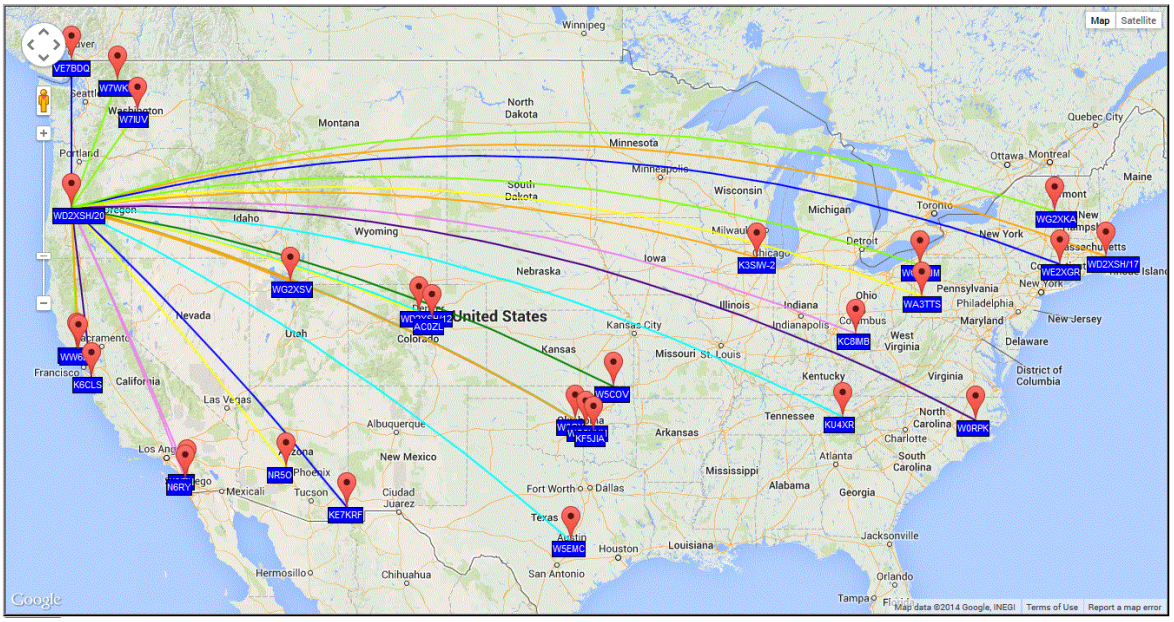

Figure 1 WSPR-2 WD2XSH/20 to W0RPK, 28 Jan 2014.

While the map is really slick it isn't quantitative. What I've done is to select the data I'm interested in from the database and dump it into an Excel spreadsheet where I can graph the signal to noise ratio (SNR) as a function of time (UTC) through the night for a given path. An example for the WD2XSH/20 to W0RPK path using WSPR-2 is given in figure 2.

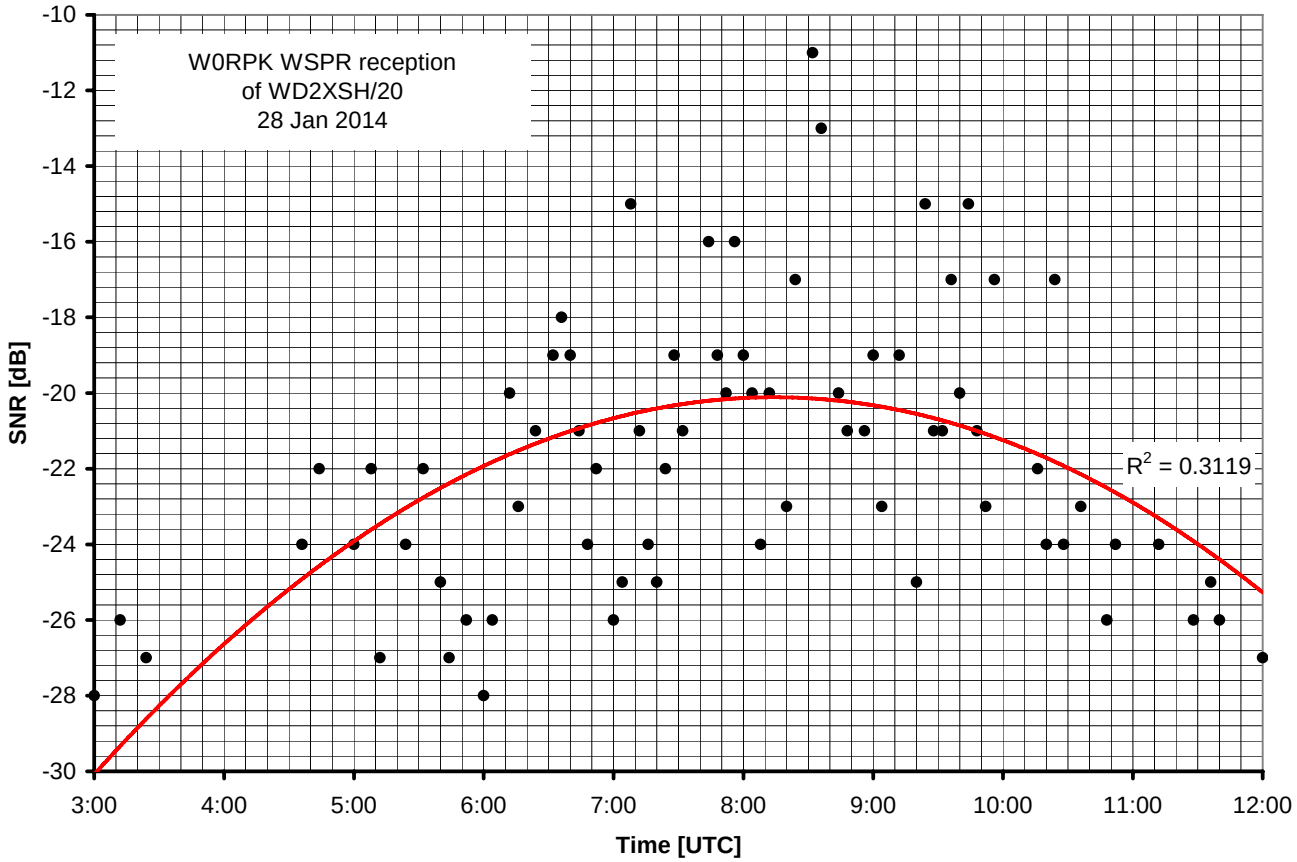

Figure 2, WSPR-2 SNR WD2XSH/20 to W0RPK, 28 Jan 2014.

Typical SNR data is very noisy so we see the data points scattered over a large range of SNR. 0300 UTC is about my sunset and 1200 UTC is roughly Ralph's sunrise. Looking at the scattered data points we can see that the signal tends to get better roughly half way through the night and then peter out with coming sunrise at the eastern end. One way to get more information from noisy data is to run a trend line through it. The red line is a second order polynomial trend line. This is more informative, clearly showing the improvement in snr through the night. But we have to be a bit careful; the R^2 value shown on the graph is an estimate of the correlation between the trend line and the data. 0.31 is pretty low. You can improve the correlation by using a higher order approximation as shown in figure 3 where R^2 in now up 0.54. Better but not perfect!

Comparing figures 2 and 3, which are for two different nights (28 and 29 Jan 2014), we can see that the trend lines are very similar although the data is less noisy on the 29th. I think we need to keep in mind that the propagation has a couple of components, first there is the propagation between the two points but there is also the local noise at the receiving end. If the receiving end noise increases then SNR will fall. From the graphs it would appear that the underlying propagation may have been very similar on both nights but the noise at Ralphs end varied but this is only a guess.

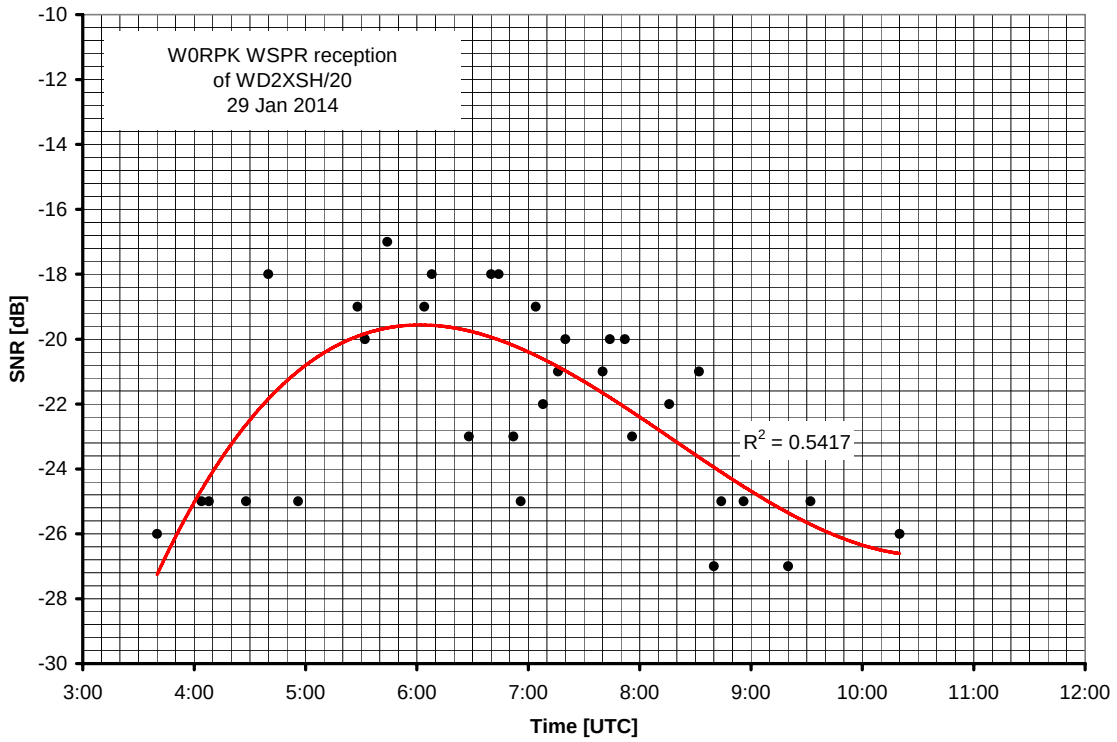

Figure 3 - WSPR-2 SNR WD2XSH/20 to W0RPK, 29 Jan 2014.

I also graphed the data provided by KU7PY, WD2XSH/12 (Mike) and WE2XPQ (Laurence). This data is graphed in figures 4, 5 and 6.

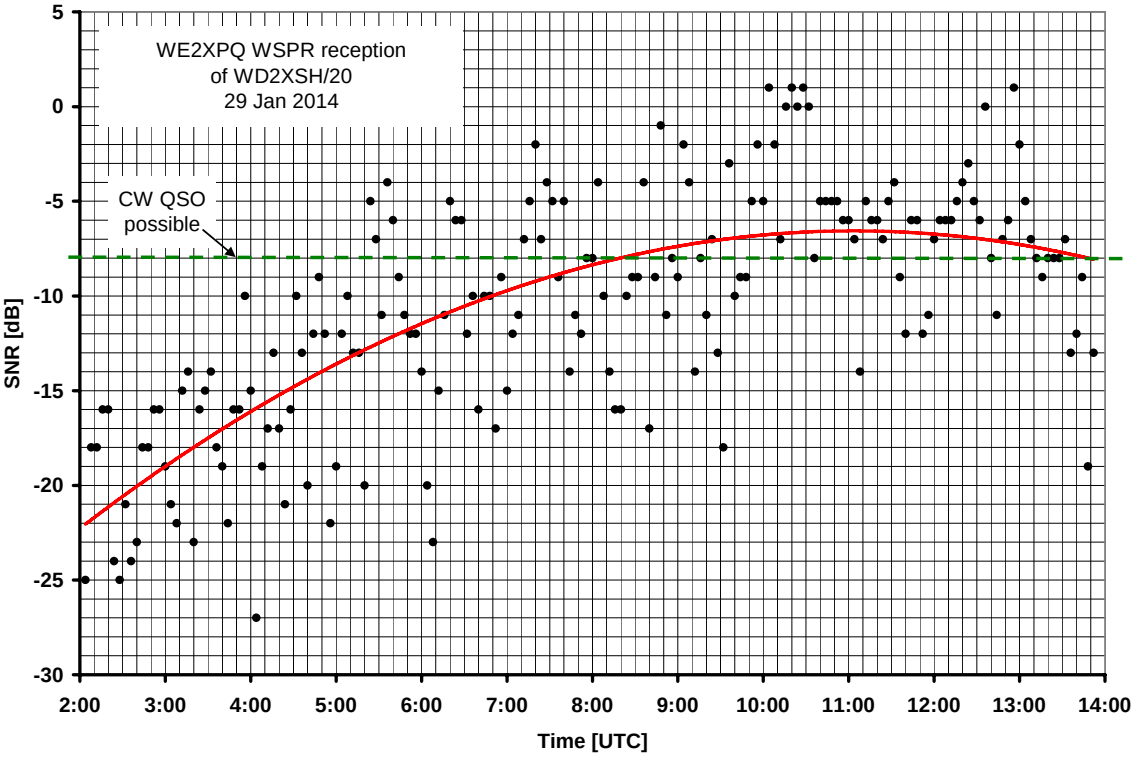

Figure 4 - WSPR-2 SNR WD2XSH/20 to WE2XPQ, 29 Jan 2014.

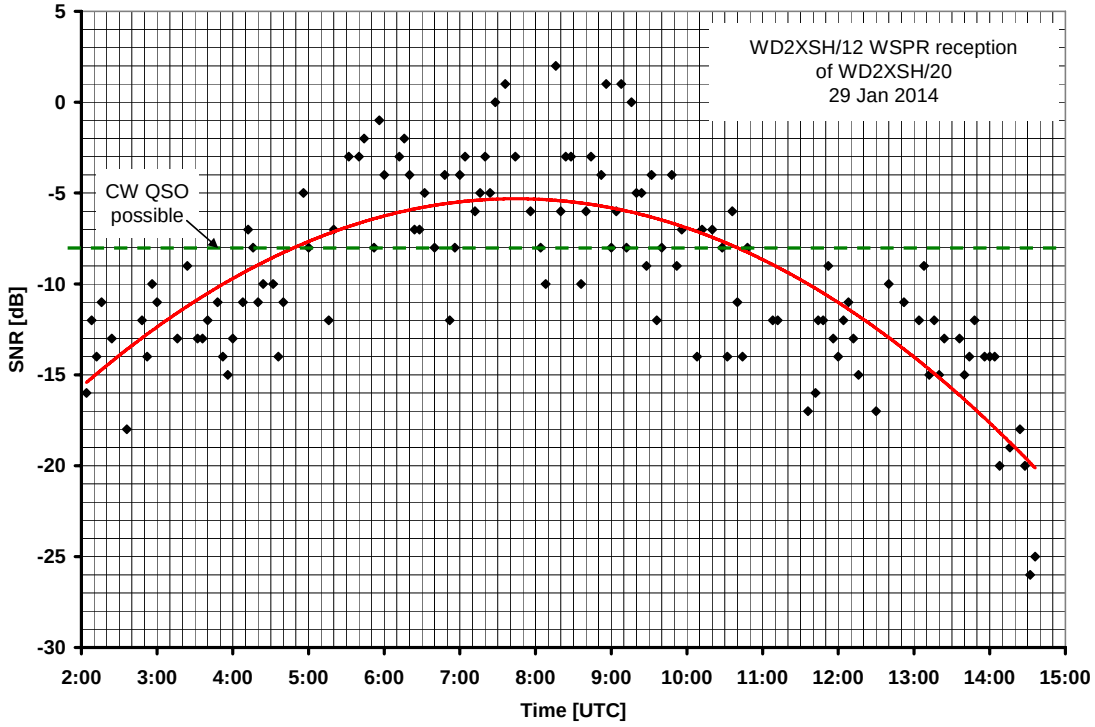

Figure 5 - WSPR-2 SNR WD2XSH/20 to WD2XSH/12, 29 Jan 2014.

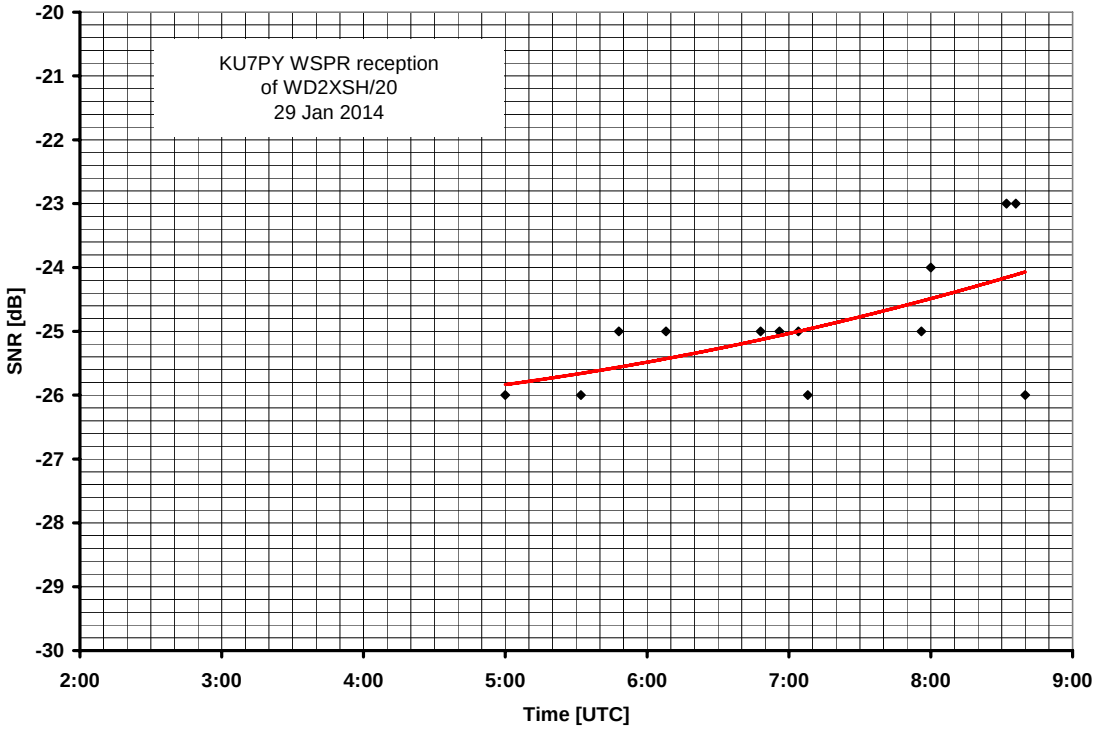

Figure 6 - WSPR-2 SNR WD2XSH/20 to KU7PY, 29 Jan 2014.

In figures 4 and 5 I've added another wrinkle. Over the past several weeks I've noticed that the WSPR signals become audible at SNR> 8 dB so in I've added the dashed green line to indicate the level at which a CW QSO might be possible. Of course this is only the data going one way! To judge whether

a QSO was possible we need the data from both directions. Ralph has suggested that PSK10 should be possible with SNR> -17 dB and PSK31 with SNR> -11 dB. This is just suggestion on how we might evaluate the possibilities for different modes. I think there is probably much more we could do, especially testing those numbers.

Here is an outline of how I transfer the data from WSPRnet to an Excel spreadsheet in a form which can be graphed:

1. Set the WSPRnet data base to sort the desired data. I suggest you order it with the earliest time at the top. This makes your life easier when graphing.
2. Select the data on the screen and copy.
3. Go to the open Excel spreadsheet and under the edit menu select “paste special”.
4. Under paste special chose “text” and paste the data.
5. All the data will now be in one column! Go to the Data menu and select “text to columns”. This will separate the data columns nicely.
6. Delete the data columns you don’t need.
7. Now you’re ready to graph. The time will have the format xx:xx which is fine, Excel will use that for the x-axis. Adjusting the scale for the x-axis is a bit weird however. Even though the scale on the graph will be in xx:xx form the scale menu will have some small digits. Ignore this and just enter the desired scales in the xx:xx format.

All of this is a very rough beginning but I hope it gives us some ideas on how we might use the WSPR data to better understand propagation on 630m.