By David R. Hassall WA5DJJ
What we are doing?

- We are transmitting our Amateur Radio Calls using various modulation schemes at very low power to see how far it travels with the existing radio wave propagation.
- Most QRSS transmitters are built from scratch or kits
- The transmitter power rarely exceeds 1 watt and most run about 200 milliwatts.
- Reception of the signals is done with a stable receiver connected to a computer running a spectrum analyzer program.
Who is doing it?

- Radio Amateurs from all over the world who enjoy seeing just how far their tiny signal will travel and also enjoy studying Radio Wave Propagation.
- They come from all walks of life and are innovative experimenters.
- We are loosely banded together through the internet email reflector run by the KNIGHTS OF THE QRSS.
How are we doing it?

- Building little QRPp transmitters from plans or kits.
- Putting them on the air with an available antenna.
- Watching for the signal to appear on one of the established QRSS GRABBER stations or wait for an email from someone who copied our signal.
- We modify our station’s transmitter or Antenna to see if we can make our signal go farther than we did the last time.
- This is not an “instant gratification” form of Amateur Radio operation. In some ways it is like watching Grass grow.
What the signals look like.
This is a “Homebrewed” 140mW QRSS transmitter. It was built from Junkbox parts. It operates on 10,140,050 Hz (30M Amateur Band). It is easy to duplicate and was built using the “Manhattan Style” of construction. The Keyer IC was purchased from K1EL for about $6. The Crystal Oscillator is mounted in a foam box for temperature stability. It usually maintains it’s frequency +/- 3 Hz over a 24 hour period. I call this transmitter my Model 1 and there were about 3 of them constructed by me. This was my first QRSS Transmitter.
Taking what I had learned from the model 1 transmitter… I created the Model 2. It has a 300mW Power Amplifier stage, Crystal heater for better frequency control and a multiple message K1EL keyer. It’s frequency stability was +/- 2Hz over a 24 hour period. It had a fine frequency control knob so I could move the frequency slightly if I was colliding with someone. The schematics were posted on my website and there were many copies of this transmitter built.
QRSS Transmitters – Model 3

This is a picture of my Model 3 transmitter. It was a radical departure from the model 2. It used a Direct Digital Synthesis Oscillator that was software controlled by an Ardunio Processor. It worked great. The software for it was written by our Mesilla Valley Radio Club Builders Group. It could cover all the amateur Radio Bands and could be programmed to do different transmitter modes. Now my signals were stable and movable without buying more hard to find crystals. This was my prototype, I later repackaged this transmitter into a more usable form.
This is my model 5 transmitter. It was supposed to be the “Ultimate QRSS Transmitter”. It has an Ardunio controlled Direct Digital Synthesis oscillator modeled after a design from Russ KB1KGA, A multiband switchable output filter, a 170mW output power final amplifier and Dial in frequency. I later added GPS disciplined Oscillator stability which makes its frequency stability close to that of WWV. But it still isn’t the “Ultimate”. So, I keep studying and tinkering in my little workshop. Trying to come up with the NEXT simple transmitter that is going to let me go around the world on 1 microwatt.
Here are pictures of Rick Beatty NU7Z's transmitter. It is an excellent example of a “HOMEBREWED” MEPT Transmitter. It was built from individual modules that are available on the internet from various sources and then assembled into a working Manned Experimental Propagation Transmitter (MEPT). It is digitally synthesized and works on all the Amateur Radio Bands. Rick did an excellent job of building this transmitter.
This QRPLabs MEPT Transmitter was designed and produced by Hans Sommers G0UPL and Steve Farthing G0XAR. This kit has really increased the number of QRSS signals on the air. There have been many sold and a lot of them made it to the airways. It costs about $17 including postage from England. These transmitters come in three models for 80M, 40M and 30M bands.
This is a front and back view of QRP Labs latest creation. It does all the common CW modes, Hellscriber, and some limited graphics capabilities. It is easy to assemble and after getting used to using 2 switches to set all the menu parameters it is easy to put on the air. It comes as a 80M, 40M or 30M version. Cost is about $24 USD at last order. (It comes from England and price depends on current exchange rate) I have only had mine for about 5 days. It puts out 160mW and has already been to Australia, New Zealand and Tasmania for DX and Pensacola, FL, Austin, TX and Hawaii. This one is going to be fun to learn as there are a lot of software functions to explore.
ETHERKIT QRSS Transmitter Kit

This is one of the latest Kit QRSS Transmitters from EtherKit. It has just been on the market for a few months and has added some really nice modulation and keying features that were not available in the other kits. This one is still in testing at my station. It is the only US made kit available. I think there will be more popping up as the QRSS mode becomes more popular.
This is Earl KB5UEW’s Surface mount QRSS Transmitter that he built and is trying to develop into a Kit. It is a temperature stabilized crystal oscillator and has various keying modes. He makes his own PC Boards and His unique cabinet structure is a discarded Tin Can. You will see is very distinctive signal on the grabbers. There are two of these transmitters on the air. Richard KC5EVR also has one going. Its unique DFCW modulation with a triangle at the front and back is distinctive.
Receiving QRSS Signals

This is all you need to receive QRSS Signals from around the world. A antenna, a good stable receiver and a computer that can run the Spectrum Analyzer Software. The software that most of us use is FREEWARE available on the internet.
QRSS Frequency Bands:

- QRSS is operated in a 100Hz or 200Hz narrow frequency section on all the common Amateur Radio Bands:

  160M – 1,843,000 to 1,843,100 Hz
  80M – 3,500,800 to 3,500,900 Hz
  40M – 7,000,800 to 7,000,900 Hz
  30M – 10,139,900 to 10,140,100 Hz
  20M – 14,000,800 to 14,000,800 Hz
  17M – 18,068,800 to 18,068,900 Hz
  15M – 21,000,800 to 21,000,900 Hz
  12M – 24,890,800 to 24,890,900 Hz
  10M – 28,332,800 to 28,332,900 Hz
SPECTRUM ANALYZER SOFTWARE:

- ARGO Software is the easiest to use and configure for the first time user.
- SPECTRUM LAB is more difficult to setup but offers more analytical features.
- There are other Audio Spectrum Analyzers you can use but the above programs have special QRSS Setups built in.
- You can use the same setup that you would use for PSK-31 or SSTV except you just receiving QRSS.
BECOMING A GRABBER:

- The only thing you have to add to the basic QRSS receiving system is an internet connection and a website to be a Grabber.

- We are in dire need of more 24/7 automated Grabbers on all of the QRSS Frequency bands around the world on the Internet. If radio wave propagation could be studied on all of the Amateur Radio frequencies at the same time, it may give us valuable clues as to what is REALLY happening.
The Red dots show the existing operating QRSS 24/7 Grabbers. Most of them are on the 30M frequency band 10,140,000 Hz +/- 100Hz. WE COULD USE MANY MORE.
QRSS is a Learning Experience:

- Just getting a QRSS transmitter on the air is a real learning experience. Even if you’re an "Expert"!
- Then getting your QRSS transmitter to stay on Frequency is another Lesson.
- Antenna building and installation is another learning experience.
- Watching what the atmospheric conditions does to your transmitted signal is another learning experience.
- There are many things you learned about propagation as an experienced Amateur Radio Operator that will, somehow, turn out to be DIFFERENT, when you start working with QRSS.
Propagation of my Signal:

In this grabber screen shot, My signal is at the bottom of the screen. It should be a clear line with the up and down shifts. Instead the Ionosphere is modulating my signal so it appears as a broad line at the top and bottom of the shifts. What is interesting is the two signals at the top of the screen are hardly being modulated at all. One is coming from Mc Kinney, Texas and the W is from Concord, MA. Why is this happening?
Effects of Solar Flares:

This was the effects of a Solar Storm from Last year. My transmitter was putting out 100mW and was received in Pensacola, Florida. My transmitter was GPS Stabilized and was only transmitting 1 frequency, Yet the spectrum capture show multiple frequencies. I have no explanation as to what is happening in this screen shot.
This is an Aircraft Echo of my 100mW transmitted Signal as received by Chris WB5FKC in El Paso, Texas. He was able to receive both my direct signal and a reflection off of an Aircraft either leaving or arriving at El Paso Airport. The upper signal on this screen shot comes from a transmitter that is less than a half mile from mine. Yet, there is no reflection on his signal.
Very Weak Signal Tests:

This was the test setup for my most successful weak signal test. It consists of a Modified QRP labs 30M transmitter. A switched attenuator and my M cubed frequency counter/power meter. My antenna was a 30/17/12 meter inverted Vee antenna with the apex at 40 feet off the side of my tower. The test was done over a period of about 6 weeks. I started at 1mW and decreased the power by ½ (3dB) each time it was copied. My receiving end was W4HBK in Gulf Breeze, FL a distance of 1,163.7 miles. The next few slides show the results of this test.
Las Cruces, NM to Pensacola, FL:

My Signal WA5DJJ is at the bottom of this Grabber screen shot. My power level at my transmitter was 8.51 uW or .00000851 Watts. It was done on July 28, 2011.
Las Cruces to Pensacola Florida: Close but no Cigar!

This was another attempt that came close, But no cigar. W4HBK only copied 4 of my 6 call letters and this attempt was at a power level of 3.89uW (.00000389 Watts). We use a method of Stacking the screenshots to gain some sensitivity. The original images that were stacked did not show any signals at all, Yet when they were processed, My signal and those of P29ZL and WB5FKC popped out of the noise.
QRP Amateur Radio Club International (sm)

1000 Miles Per Watt

Be It Known That
David R. Hassall, WA5DJJ

Has as of Nov 7, 2011 been elected a full member of the 1000 Miles Per Watt Club #3181

Election was based on submission of satisfactory proof of a one way QRSS contact between
Tx QRP station WA5DJJ located in Las Cruces, NM running 8.51 uW
And Rx station W4HBK in Gulf Breeze, FL
Which represents successful communications equivalent to

136,780,259 Miles Per Watt

10 MHz Band #85
QRSS Mode #1

Paul Stroud, AA4XX
Awards Manager QRPARCI (sm)
I am always looking for new converts:

- I am the “GODFATHER” of the Las Cruces QRSS Mafia. There are more QRSS Operators within 100 miles of Las Cruces, New Mexico than anywhere else in the world. We total 20 at last count. Four years ago there was only ONE. There is always room for MORE.

- If you have grown tired of the YADAA, YADAA, YADAA of Amateur Radio Operations, Come join us. It will grab your soul and won’t let go.

- To get started, Check out “MY QRSS ADVENTURE” on the web at: http://www.zianet.com/dhassall/
Questions?

- We have some time for Questions and answers.
- My website’s “MY QRSS ADVENTURE”
- Email me at my QRZ.COM address.
- Join the KNIGHTS OF THE QRSS.
- SEEK out OTHERS who would be interested in doing QRSS Operation and learn together.
- Blaze a new trail, There is always room for more innovation.