



VHF – More than a Repeater

One of the biggest challenges facing a new user of the VHF bands can be overcoming boredom. This is the case for both HF'ers trying out that "50" button on their new rig as well as the multitude of new hams who first get on the air as Technician Class license holders.

It appears that our new Technicians generally are only pointed towards the local FM repeaters. Often, they are not received with open arms by the locals who may be a close-knit group; other times they are accepted but in this "culture" they may not be openly encouraged to expand their horizons beyond the coverage area of the repeater.

While the world of repeaters may satisfy the needs of some, statistics clearly show that many had something else in mind when they studied for their ham radio operator license. A recent ARRL survey found that 25% of all persons obtaining a Technician license *never even make one QSO!* While there likely are a number of reasons for this fact, I maintain that many of them become discouraged and simply go away without knowing that their license could have taken them on so many more exciting VHF and UHF adventures across the country or, for that matter, across the globe.

I recently found myself in the second category of VHF ops. I became one of the HF'ers trying out the "50" button when I moved to Connecticut in the spring of 2002 to work for ARRL as Sales and Marketing Manager. I coincidentally purchased a rig with 6 meters capability. Shortly after moving into a house on a CT hilltop, I leaned up a temporary 40-foot tower and lashed on a 7-element yagi recommended to me by one of my new clients, 6 meter fanatic Ray Grenier K9KHW.

This article is about what I discovered that kept me from become a flash-in-the-pan VHF enthusiast. Instead, I remain a dedicated VHF'er who has significantly changed his discretionary time priorities, now devoting most of my time, energy, and entertainment dollars to the pursuit of VHF, 6 meters in particular, challenges and goals.

The Newbie Attacks the Band

ARRL staffers Dave Sumner K1ZZ, Mark Wilson K1RO, and Dave Patton NT1N (at the time) said they had been having a ball working lots of DX on 6 meters so the little temporary setup seemed like a quick way to get on the air - HF antennas were months away after much needed terrain analysis, etc. Of course, being a VHF newbie, I did not realize that they had had all their fun during the *previous year or two* during the peak of the sunspot cycle.

Sometimes ignorance is bliss, though, and I attacked 6 meters like the obsessive-compulsive character that I am. Having no reference point, I chased DX entities, states and grids night and day, not worrying about when the band and paths here and there were "supposed" to be open.

The VHF DXer group that hangs out on the DXers.Info website <http://www.dxers.info/> decided I was such an ever-present nuisance that they had better invite me to their site so that they could teach me a thing or two...and probably to keep an eye on this new in-band noise source. And, that they did. I encourage all new 6 meter enthusiasts to discover this awesome website and receive the best DX mentoring from the friendliest and most knowledgeable group you could hope to find.

The Band Dies and Then Opens with a Ping

Eventually, I did wring the 6 meter propagation dry when months later the post-winter Es season settled in bring weeks of nothing but white noise to my ears. Jack Carlson N3FZ sensed I needed a new challenge and invited me to leave the DXer website one evening and to visit the Ping Jockey Central website at <http://www.pingjockey.net/cgi-bin/pingtalk/>

Not knowing a Ping from a bee sting, I was not really sure what to expect but Jack had recently been talking a lot about working numerous long haul contacts every night using meteor scatter while I listened to nothing but hiss. My only previous experience with meteor scatter had been some surprise quick CW and SSB contacts that appeared out of nowhere and disappeared just as quickly during contests. The Wized Ones told me that those signals had come to me via this meteor scatter thing.

I hung in the shadows as a non-participant watching the gang in action on the Ping Jockey Central website and quickly realized that:

- There were people in the group I knew from my SSB/CW operating
- They were, indeed, working each other over long distances
- They were doing it using modest stations
- They were having fun doing it
- They all seemed like friendly people
- Most important of all, I did not have a clue how to join them instead of sitting on 50.110 MHz waiting for a band opening that apparently was not going to occur for a few months.

What is a Meteor?

It was clearly time to do some Internet surfing and knowledge gathering. There are massive amounts of information about meteors on the Internet from a vast group of people devoted to visually observing and, in some cases, recording meteor events with cameras. I also found several sources of information about meteors written by radio enthusiasts.

I readily admit to being a non-techie type so I had to seriously simplify all the input into something even I could understand. My notes read like this:

- Meteors are the same thing as *falling or shooting stars* - but please do not tell Tinkerbell and the kids at Disneyland.
- Millions of meteors occur in our atmosphere each day.
- A meteor is actually the flash of light ones sees as a *meteoroid* – a particle or chunk of interplanetary matter – burns up as it enters Earth’s atmosphere. Most meteoroids are so small that they vaporize completely and never actually reach Earth. If a piece does survive and makes it all the way to the surface of our planet, it is called a *meteorite*.
- Most meteors are seen when they are 40 to 75 miles above ground. They usually disintegrate between 30 and 60 miles of altitude. Some really fast moving and maybe larger pieces of space matter may be visible at about 80 miles above ground all the way down to as low as only about 12 miles. These bright thrilling meteors are called *fireballs*.
- Air friction heats a meteoroid as it enters our atmosphere, causing a shining trail of gases and melted particles. Those gases are ionized and that is what reflects and scatters RF signals for a brief period. This pneumonia is referred to as *meteor scatter*.
- A signal heard by meteor scatter is called a *ping*.
- A ping can last anywhere from short milliseconds to a few minutes depending on a number of variables such as the size and speed of the meteor source matter and the frequency one is using.
- There are certain times of the day and the year when meteors are more abundant. Understanding the facts surrounding this truism will be part of the fun of learning how to make the most use of meteors to make contacts.
- The maximum distance for a meteor scatter contact is around 1,500 miles – much like single hop sporadic Es.

What to Do With the Burning Rock

I learned that 50 and 144 MHz signals readily scatter off meteor trails – even HF 10 meter operators may encounter the effects of meteors. Although there is not much activity by meteor scatter users on 220 MHz, signals on that band seem to play very well also. Some ops are even occasionally making good meteor scatter contacts up on 432 MHz. I am not aware of contacts on higher bands but that is not to say that contacts have never been completed by some of the extremely dedicated meteor scatter operators.

Due to the vast availability of plug and play high performance 6 and 2 meter rigs, these are the two most popular bands producing a lot of SSB, CW, and digital mode meteor scatter contacts. One can hear examples of meteor scatter most any night (actually, the morning hours after people are out of bed are probably better) by pointing your 6 meter antenna at a population center 500 to 1,000 miles away.

You can try the same thing on 2 meters; just expect pings to be less frequent and of shorter duration than you would hear on 6 meters.

Well-known and revered VHF DXers have been using meteor scatter to make history on SSB and CW for many years. Most 2 meter *Worked All States* awards are earned using some meteor scatter if moonbounce is not the means used to extend out past tropo ducting and the occasional sporadic Es opening.

Most SSB and CW meteor scatter contacts are made with one or both stations running high power and/or using large antenna arrays. Naturally, some contacts are made with more modestly equipped stations but that is the exception far more than the rule.

Meteor Scatter Fun for All

Since I have already stated that SSB and CW meteor scatter work is most easily done by stations with high power and larger antenna arrays, does that mean the owner of a typical VHF station (see sidebar) should stop reading right here? No, absolutely not! Thanks to the genius of Joe Taylor, K1JT, the world of meteor scatter fun and accomplishment has been opened to everyone.

A few short years ago, Joe developed software called **WSJT**. In Joe's own words "**WSJT** is the name of a computer program. It stands for "Weak Signal communication, by K1JT." The program is designed to facilitate meteor-scatter, moonbounce, and other difficult communication tasks on the amateur radio VHF/UHF bands. It is freely available to radio amateurs for non-commercial purposes.

To use the program you will need a computer equipped with a sound card and running the Microsoft Windows[®] operating system."

The software is free and can be downloaded from Joe's website – see below

Learn More about the Installation and Use of WSJT Software

WSJT Home Page by Joe Taylor - <http://pulsar.princeton.edu/~joe/K1JT/index.htm>

So You Want to Operate WSJT? by "Tip" Tipton WA5UFH - <http://www.qsl.net/wa5ufh/>

Seven Necessary Steps by "Tip" Tipton - <http://6mt.com/wsm2.htm>

WSJT High Speed Meteor Scatter Information by Eric Dodson WB5APD - <http://www.qsl.net/wb5apd/wsjt-fsk441.html>

The minute the word "software" appeared when I went to Joe's site, that was just about the end of my mission to get in the meteor scatter game because I am computer challenged - in a big way. I always consider myself having a good day when I turn the computer on, it boots up, and I do not hurt myself in the process. Jack N3FZ told me not to worry, **WSJT** was very user friendly – and it turned out Jack was right.

A Typical WSJT Meteor Scatter Station

I asked the majority of the stations I have worked on 6 and 2 meter WSJT meteor scatter to tell me about their stations. While a handful of them had the KW, receiver preamplifiers, and stacked antenna arrays, you will be delighted to know that the typical station is:

6 meters	50 - 150 watts	3 - 5 element horizontal yagi
2 meters	100 – 150 watts	8 – 13 element horizontal yagi

Most of them told me they were running a typical off-the-shelf rig with 6 meter capability without any sort of power or receive amplifier. The situation on 2 meters was essentially the same except that many had added one of the easily obtained “brick” power amplifiers, most of which included a receiver preamp as well.

The antennas mentioned above are, in many cases, smaller than a high gain Radio Shack TV antenna. The ones not fitting that description are only slightly bigger and could easily be turned with a small rotor while being supported by a guyed push-up mast or chimney mount mast.

It was exciting for me to discover that a number of stations that I have worked repeatedly are using much less glamorous antennas than even these little but effective yagis. I have worked stations out as far as 1,000 miles that used only halos, wire antennas in trees, and, even HF antennas. It appears that if the rig will load it, it can be used to make meteor scatter WSJT contacts.

I have completed contacts with stations running as little as 10 watts. W9SE told me he worked K5CM who is about 500 miles away while they were running 3 watts and 1 watt, respectively; so do not let low power keep you from getting in on the fun.

Rig to Computer Hook-up

After getting over the word *software* chills, I next faced the dilemma of making the connections between my rig and the dreaded computer beast. In my case, this was easy, the cable I had managed to lash together to get on RTTY on the HF bands using WriteLog and MMTTY was sufficient. For those not so fortunate, one of the terrific sites put together by experienced WSJT users listed above will walk you through this with ease. You likely will need to get familiar with that auxiliary plug on the back of your radio or at least open the rig’s Operations Manual – I know this may be the first time many of you will take such dramatic action.

Of course, when all else fails, put out a quick plea for help on the Ping Jockey Central website where someone will take you off the main page and help you. I found that the information useful that is provided by Peter Gouweleeuw, PA2VST on website <http://www.uksmg.org/practicalwsjtinf.htm> .

A few weeks ago, many months after my first 200 or so WSJT contacts, I added one of the handful of commercially available interface boxes designed to connect rig and computer. These little jewels take care of insuring that your audio levels are proper and that your signals are free of ground loop hum, etc.

They provide many other features that may or may not appeal to you so check out a few if you wish to skip the mess of melted down DIN connector, etc., if you still solder with a copper pipe soldering iron like me.

Check out the interfaces offered by West Mountain Radio and MFJ Enterprises to do some feature shopping for your specific needs

Load and Go...almost

I went to the WSJT website, started the download, and simply followed each step of the automatically generated instructions as the download unfolded. In no time at all, I had the software fired up, a “short cut” safely placed on my computer desktop screen and the WSJT operating screen similar to Fig. 1 looking at me.

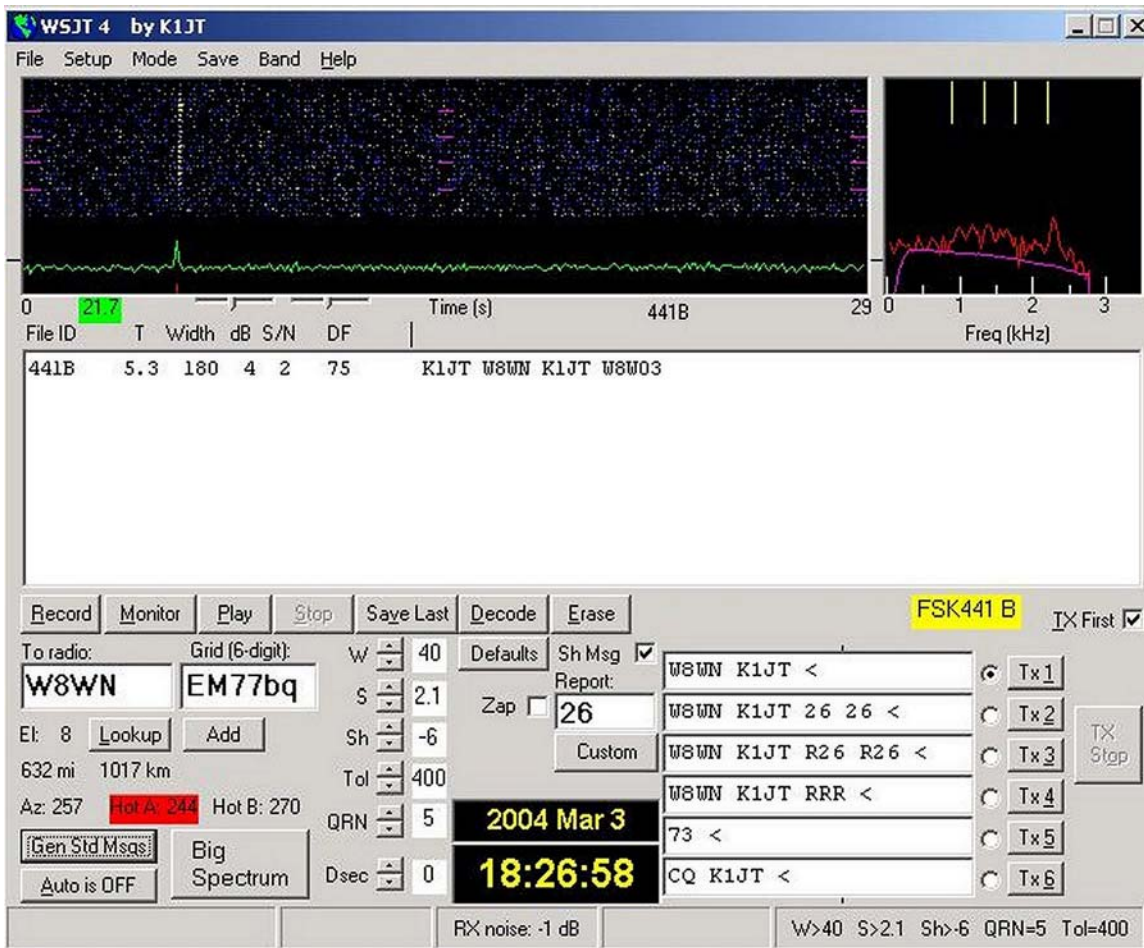


Fig 1 – WSJT screen for meteor scatter digital mode FSK441B

I am not the sharpest tool in the shed but I immediately recognized that my call is not K1JT or W8WN so there was more work to do. The gang on Ping Jockey Central told me to read the instructions. It is not their fault that they did not know that I am one those people with the anti-instruction manual defect – my children still have scars from Christmas toys that did not quite play the way they were supposed to.

Nevertheless, I finally reasoned that I needed to get this software set up so a logical starting point might be to click on “Setup.” Sure enough, Setup menu tinkering got my software easily routed to the right COM Port, my software knowing my call, my grid, and that fact that I am located in the Eastern Time zone.

Determine your grid – visit <http://www.arrl.org/locate/gridinfo.html>

N3FZ finally deduced that I was not an instruction book reader so he took me off to a side chat page and patiently walked me through my first contact by telling me what buttons to click on the software and how to make sure my send and receive levels were set right for my laptop computer sound card.

We started the sending and receiving sequences. At first, I heard nothing, then *PING!* - there was a short but loud burst of data sounding signal from Jack. When his turn for sending was over and mine started, the software automatically went to work decoding that signal burst I heard with my ears. It was Jack calling me repeatedly just like the Tx 1 message said. On a dead band, I was hearing signals and communicating information over hundreds of miles! It felt unreal and I was so excited, I ran down and told my wife Lieska that I had just heard a signal bounced off a meteor trail way up in the sky.

In no time, we sequenced through the messages. Well, actually, it was clumsy because, remember, I did not read the instructions. There is a set protocol for when to send what message – if I had simply pressed the F5 key, a popup would have jumped out clearly explaining this much needed information...blush.

Anyway, Jack was patient with me. The bad news was, he said I apparently needed additional software (cringe) because my computer clock was off and I was off several seconds in the sequence of transmitting and receiving.

And the Time is....

Jack sent me to Thinking Man Software – Dimension 4
<http://www.thinkman.com/dimension4/download.htm> to download their freeware.

Dimension 4 software turned out to be a fast and easy way to synchronize my Windows-based PC's clock. Once Dimension 4 was installed and I had made a few adjustments, I have been able to forget it and let it run automatically ever since. It is that automatic.

Dimension 4 monitors my Internet connection and automatically adjust my PC's clock when I am online – this action in turn makes sure that my transmit and receive sequences are in step with the rest of the WSJT users. I am sure a visit to the D4 website will answer all those questions you technical types reading this have lingering just behind your forehead. Me? I was just glad I easily got it running without crashing my computer or breaking the Internet.

Not being a computer whizzo, though, I did encounter some trouble getting my adjustments right. Thanks to easily understood information readily available on the wonderful WSJT help website Eric WB5APD has setup at <http://home.alltel.net/wb5apd/wsjt-fsk441.html>, I was quickly able to get my time tracking software doing its very important job so I could forget it and get on with enjoying WSJT meteor scatter fun.

I presume there is other terrific software out there to keep your computer clock set to the proper time if you chose to seek it out.

Let the Pileup Begin

As soon as the Ping Jockey Central users figured out that I was able to make contacts without flopping around too much, the rush was on to make a contact with me. I was like a new country showing up on the bands for these people! Later, I observed that every newcomer is treated to the same enthusiastic reception.

It turns out the WSJT crowd likes to measure their success by tracking the number of individual stations, states, grids and even countries they work on “pure” meteor scatter. In a very friendly non-cat-fighting way, they enjoy stacking their numbers up against other users. Bob Mobile K1SIX maintains website http://personalpages.mcttelecom.com/~b_mobile/6MFSK441.htm to help the group keep an eye on what can be done based on the accomplishments of others. I constantly see these WSJT users helping each other enrich their “numbers” – an example of camaraderie that is definitely a pleasure to witness.

The Race is On

All of those offers of assistance and requests for contacts with these enthusiastic meteor scatter people whet my appetite to see where *my own personal boundaries* might be with this fun new mode of operation.

I decided to hold my own personal contest. The rules were simple – since meteor scatter is geometrically and scientifically limited to a range of about 1,500 miles, I set a goal of working every one of the thirty-seven (37) states inside that window based on my Connecticut QTH.

The obsessive-compulsive devil once again raised its ugly head - I spiced up the challenge by setting a self-imposed limit of only 60 days to accomplish this feat. My new meteor scatter friends quietly chuckled at this declaration but not without encouraging me to go for it, mainly because at the time, none of the old timers had managed to work more than about 30 or so states over the entire few year history of WSJT existence.

I had such a great time trying to work all of the operators that were active during that period of time. They knew I was on the hunt and many of them went beyond the call of duty to make late night and very early morning skeds with me to add their state to my Worked list. However, some of the states simply had no active WSJT users on the air at this time. Never one to understand the true meaning of the word NO, this fact simply pushed me to spread the WSJT word to other 6 meter operators I had met around the USA and encourage them to download the software and enjoy the fun. And, “Oh yeah, could I work you as soon as possible, I need that state on WSJT.” All this was good for the Ping Jockey crowd because every one of us benefited from the appearance of another newbie to expand our ranks.

I thought I had the goal in the bag when I finally recruited a fellow in North Dakota to download WSJT and join the fun. Unfortunately, night after night of 6 meter WSJT skeds just would not produce a two-way complete contact.

My new friend was 1,467 miles away so I most certainly was playing on the ragged edge of my limitations. The 60th day arrived with no ND in the log – in fact, No.37 is still missing from the log. Nevertheless, I still am quite proud of the other 36, though...

VUCC - WSJT Meteor Scatter Only

Months pasted, when one day I realized I had worked about 80 grids on pure 6 meter WSJT meteor scatter. Up popped the Hyper Type A character defect devil again and the race was on to see how fast I could complete my own personal goal of working 100 grids using only WSJT meteor scatter. Again, I ran into trouble finding enough people active on WSJT in a number of grids I still needed so emails flew through the Internet, new people were lured to Ping Jockey and the fire of enthusiasm once again fueled an increase in the number of WSJT users.

I completed the 100th grid contact just weeks before the 2004 SVHFS Conference in Atlanta, GA. More important is the fact that long time WSJT Meteor Scatter King “Tip” Tipton WA5UFH accomplished the same thing sometime before me as would be absolutely appropriate.

It appears to me that VUCC is within reach of *anyone* wanting to work for it – with or without a microphone or Morse code key!

Some Important Lessons I Learned

Pursuing the goals mentioned above involved a fair amount of time committed to on-the-air time learning how to use my new WSJT software and how to get the most out of my station chasing burning rocks. Along the way, I picked up a few tips worthy of mention here.

- Understand that the meteor scatter gang takes the validity of a contact being a “good one” quite serious. They want that contact to be made without assistance once the sked has been made on Ping Jockey Central or by other means. The Ping Jockey site has an explanation of what constitutes a good contact. You will want to make sure you understand these basic common sense rules to show that group that you are sincere in respecting the ethics of this mode of operating.
- Understand who transmits in the first and second halves of each minute – there is an easily understood protocol.
- Press that F5 key and keep the popup in front of you on the computer screen while making each contact until you firmly understand the message sequencing.
- Pay close attention to the fact that your rig may not be able to run full power with WSJT – many ops run 50% power out levels when in doubt so that they do not cause damage due to excessive heat with those 30 second key-down transmissions.
- Make sure your rig or rig/transverter are on frequency – WSJT is somewhat off-frequency tolerant, but we are talking Hz, not Kilo-Hz.

- Learn from the others how to be sure that you do not make a sked on a frequency that is already being used.
- Have others point you to the various websites and freeware that will help you take the most advantage of meteor showers, operating times and optimum sked times between two given grid squares.
- On the 2 meter and higher bands, you will want to have one of the old timers explain Doppler and its affects on shifting frequencies.
- If you did not hear the ping, it probably did not happen and that decode you think you see likely is garble. “The ears are still the best judge” is the view held my most meteor scatter enthusiast.
- Learn how to use a light touch on the RF gain control to increase your meteor scatter signal reception success.
- Become aware of the various meteor scatter fun competitions that occur each year to enrich your grid and state numbers. Competitions always liven up the group, often times bringing some of the less active ops on the air for some action.

WSJT - Team Sport

What an incredibly inspiring time I have had trying to accomplish my goals with all the help the many other Ping Jockey users gave me. I seriously doubt there are many Amateur Radio activities that share such a close bond of mutual satisfaction helping each other expand their horizons just one more grid or one state further away.

Unlike some of the uglier aspects of HF DXing and Contesting, I found that operating WSJT meteor scatter was very much a Team Sport. I cannot think of a better place to send new Technician Class licensees or people new to the VHF bands.

With WSJT Meteor Scatter, THE BAND IS NEVER CLOSED

A Microsoft PowerPoint® presentation was prepared with this same title for the 2004 SVHFS Conference in Atlanta, GA. The presentation includes several .gif and .wav video and audio files that simply could not make the transition to printed matter for the conference proceedings.

This article was written to pique your interest in trying a new source of VHF fun and discovery, Digital Mode WSJT Meteor Scatter action. I would be delighted to make the full PowerPoint presentation available to readers upon request.