Getting Started on 630 metres

Steve McDonald, VE7SL

Three loud raps on the basement door announced the arrival of Edgar, a nearby ham friend from down the road.

"What a night! That darn snow is really starting to build up on your antennas already", he said, shaking the white stuff from his heavy coat. "I see something new out there Jack, a big fat coil at the base of your inverted-L. What's that all about?"

"That's the new loading coil I added to my 80-metre antenna so that I can use it on 630 metres, our latest new ham band."

"Okay. I remember. We've had the band for a little over two years now, right?" (see the sidebar on the right)

"So... you do listen to me once in a while", said Jack. "It took several years of diplomacy as well as some experimental operating permits, but RAC and Industry Canada – now Innovation, Science and Economic Development Canada (ISED) – came through for us in the end."

"What about the States. They've got the band already, right?"

"Nope! The boys down south are still hoping to get the band one of these days as well. Believe me, we're pretty darn lucky to have it I think. Once they get the band, things will really be hopping, but I'm not waiting for them. Who knows, it might be a while yet. There's plenty of fun to be had right now."

With that, Jack hung the snow-covered jacket near the shack's wood stove as Edgar made himself comfortable next to the operating desk.

"Have a listen to the band. You might be surprised", said Jack.

Tuning from 472 kHz slowly up to the end of the band, at 479 kHz, revealed several stations. Two of them were having a ragchew on CW, one "VE" was calling CQ on CW, while two or three others were on WSPR, a popular digital mode for propagation study.

Figure 1: Some of the 630m-to-HF "crossband" contacts made from Mayne Island, BC by VE7SL.

"Man, it's not very wide is it... only seven kilohertz? How can that be of much use Jack?"

"It may not seem like much, but you can squeeze a lot of activity into that space – way more than you're hearing right now. CW signals don't take much room and with some of the digital modes that the guys are using, there's enough space for a lot of activity."

Jack tuned the receiver down the band a bit.

"Now take these two stations on CW. They're both just across the line, in the States, but using an experimental licence", explained Jack.

"They'll definitely be ready when 630 metres becomes a ham band down there! Can we give them a call?", asked Edgar.

"Unfortunately not. We're not allowed to work them since they're not actually operating within the "Amateur Service". They're only allowed to work each other... but their strong signals are really encouraging."

Retuning slightly, revealed that the "VE" who had been CQing was now in contact with another "VE", two provinces over.

"Those two guys were my first and second contacts", said Jack. "I've also been working a number of stations on 'crossband', while they listen on 630 but transmit on HF. It's great fun and gives me a good idea of how well I'm getting out." (see Figure 1)

"I'm really amazed at how good the propagation is on 630 metres. It's way better than I would have thought", added Edgar. (see the sidebar on the right)

"Well remember. This part of the spectrum used to be part of the old 'maritime band'. I can recall doing a lot of listening there several years ago. On many winter nights I could copy the coastal stations and some of the ships clear across to the other coast and down into the Gulf of Mexico. The propagation can be really amazing at times. It's going to be a fun part of the spectrum to be working on, you can be sure of that", said Jack.

"So what are you using for a transmitter Jack?"

"Thought you'd never ask. It's a pretty simple little circuit and can be built with just a few parts. It was designed by

In the early morning hours of September 15, 2016, the first 630 metre contact between North America and Australia was completed when Roger, VK4YB and Steve, VE7SL, completed a two-way contact on 475.300 kHz at 1319Z. The contact was made on the JT-9 digital mode, the WSPR QSO mode designed for two-way work on LF/MF and the HF bands. At the time this article was submitted, this 11,800 kilometre path is the furthest two-way work on 630 metres worldwide and indicates the potential for long-distance Amateur Radio work in this part of the spectrum, particularly over the next few years of solar minimum.

The Canadian Table of Frequency Allocations (Canadian Table) along with the RBR-4 – Standards for the Operation of Radio Stations in the Amateur Service, assigns the electromagnetic spectrum and establishes the frequency allocations available for radio services in Canada. The 2014 Allocations edition contains the following information with regard to 630 metre transmissions:

*"**5.80A** – The maximum equivalent isotropically radiated power (EIRP) of stations in the Amateur Service using frequencies in the band 472-479 kHz shall not exceed 1W. Administrations may increase this limit of EIRP to 5W in portions of their territory which are at a distance of over 800 km from the borders of Algeria, Saudi Arabia, Azerbaijan, Bahrain, Belarus, China, Comoros, Djibouti, Egypt, United Arab Emirates, the Russian Federation, Iran (Islamic Republic of), Iraq, Jordan, Kazakhstan, Kuwait, Lebanon, Libya, Morocco, Mauritania, Oman, Uzbekistan, Qatar, Syrian Arab Republic, Kyrgyzstan, Somalia, Sudan, Tunisia, Ukraine and Yemen. In this frequency band, stations in the Amateur Service shall not cause harmful interference to, or claim protection from, stations of the aeronautical radionavigation service. (WRC-12)*

***5.82** – In the maritime mobile service, the frequency 490 kHz is to be used exclusively for the transmission by coast stations of navigational and meteorological warnings and urgent information to ships, by means of narrow-band direct-printing telegraphy. The conditions for use of the frequency 490 kHz are prescribed in Articles 31 and 52. In using the frequency band 415-495 kHz for the aeronautical radionavigation service, administrations are requested to ensure that no harmful interference is caused to the frequency 490 kHz. In using the frequency band 472-479 kHz for the Amateur Service, administrations shall ensure that no harmful interference is caused to the frequency 490 kHz. (WRC-12)*

a 630 metre experimenter in the UK, where they've had the band for a few years already."

"Those boys are really great at homebrewing, it seems, and always have been", added Edgar.

The two moved over to the workbench where Jack thumbed through one of his many "circuit notebooks" and found the notes he had made while building. He had learned, over the years, the importance of keeping detailed notes on his various construction projects.

"Here it is. It was designed by Roger, GW3UEP (see note 1), and uses an inexpensive switching FET in the final, an IRF540. Don't get mad now, but I got the FET and a couple of others out of that old VCR that you gave me a few months ago", said Jack.

"I might have known that would happen. You practically ripped that thing out of my hands when I said it was toast."

"Don't worry. I'll give you some of your parts back. I'll make a real homebrewer out of you yet, my boy."

"This is a great little transmitter to get started with on 630. It'll loaf along at 25 watts out with just 12 volts, cool as can be. If you double the voltage, you can get around 100 watts out of it – enough for some serious work."

"That seems like just what I need to get started. Does it use a VFO or …?"

"You could build a VFO if you wanted, or you could even run it from that little DDS kit that you built last month. The basic transmitter uses a crystal and the good news is that I've got a half-dozen of them. They're a common computer crystal, 7600 kHz and cost less than a dollar a piece!", said Jack.

Jack pointed to the oscillator circuit diagram. (see Figure 2)

"See here. The transmitter uses a common CD4060 IC to do double-duty. It oscillates the crystal and then divides its frequency down to 475 kilohertz to put you smack in the middle of the band. The crystal's frequency is just divided by 16 and at the same time, the oscillator's stability becomes 16 times more stable! The output is actually a nice squarewave that is used to switch the FET amplifier."

"Pretty nifty idea! And then I see a little transistor stage between the oscillator and the switching FET output stage", noted Edgar.

"That's right. The output from the oscillator-divider stage is coupled to this intermediate stage. It's called a 'totem pole' driver and the output from it is sent to the gate of the IRF540 switching amplifier (see Figure 3 on the next page). These switching amps are pretty darn efficient. In fact, the two I built are just over 80% efficient", said Jack.

"Now just a minute. Wouldn't all of those squarewaves create a lot of harmonics in the broadcast band? I don't think old man Fletcher would be too happy to hear your CW on top of his favourite news station!", said Edgar.

Jack reached down to switch on his scope that monitored the current and voltage on his 630 metre antenna system.

"Not to worry, press the key for a few seconds will you and have a look at the scope just above the transmitter. You can see that the output is a nice clean sinewave. That's the rest of the circuit doing its job – the parts after the FET. Those little coils and capacitors will clean-up the squarewave output as well as provide low pass filtering. The harmonic energy won't bother anyone", Jack indicated.

"Well now you've really got me thinking. Can I get a copy of that circuit and a parts list Jack?"

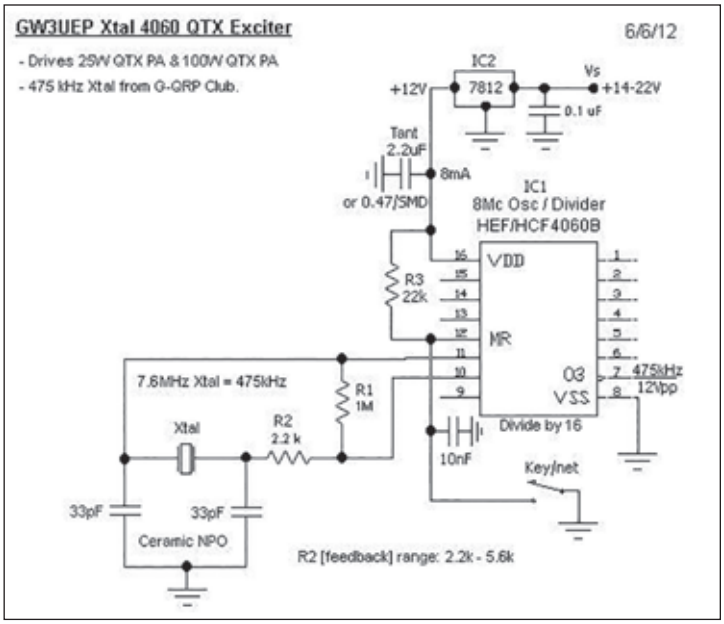
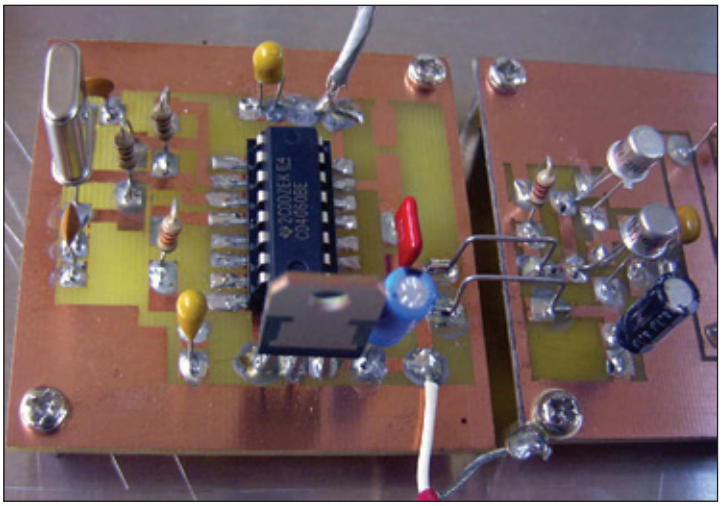


Figure 2: The 4060 oscillator-divider circuit schematic is shown above and below is a photo of the 4060 oscillator-divider stage. This stage feeds the "totem pole" FET driver stage seen on the amplifier board.



Jack grabbed the mouse on the shack's laptop. "No problem. Here, take a look at Rog's website (note 2) with the info, and lots more, including the VFO if you prefer. He has a couple of different building options here. Let me print this out for you, no charge", grinned Jack.

Edgar had another close look at the transmitter diagram. "Great. I just noticed that I won't even have to buy any fancy toroids! All of those inductors are wound on small pieces of PVC tubing. I've got a few left over from my last plumbing job."

"You could wind them on toroid cores if you wanted to but I built mine with PVC tubing just like in the article. They're easy to wind. I've built two of these things now. One was built 'ugly-style', and the second one – the one in the rack there – was built on a PC board, 'muppet-style' (note 3). Both of them worked just as advertised so it's a good solid design for sure – even you could do it", Jack chided.

"You know, I think you're right," said Edgar. " I might just put this at the top of my project list."

"Of course if you don't have the time to build a transmitter, there are a couple of alternatives available. There's a very popular simple transverter kit being offered by one of the US

experimental guys. There are lots of them in use now and it seems to work really well." (note 4)

"I'll keep that in mind Jack, but I think I'd really like to have a go at the homebrew job first – it looks like fun".

"I'm glad you're excited. There's more and more guys finding out about the band every week and the more activity we can generate, the more fun we'll all have."

"Once you get that built, we can talk about antennas plus some nifty other stuff that you'll find very handy. This new band is really a homebrewer's dream come true", added Jack.

"Oh-oh. I kind of forgot about the antenna situation. You know I've just got a small backyard, right?", said Edgar, looking somewhat discouraged.

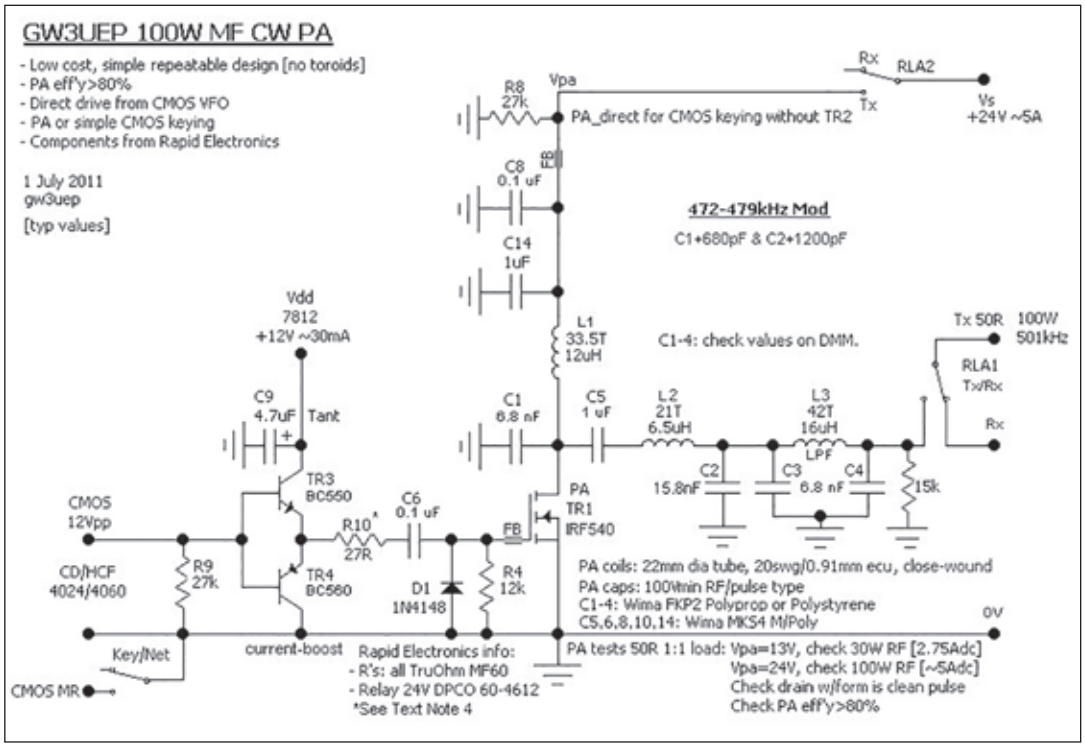
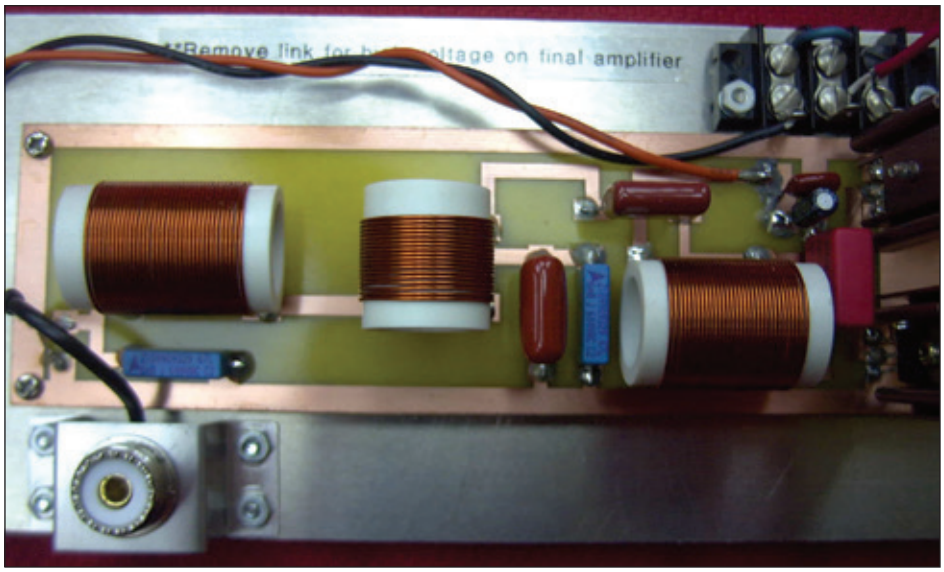


Figure 3: The MOSFET amplifier schematic (above), along with the FET driver stage. Below: The MOSFET amplifier. This version uses two FETs connected in parallel.



"No problem. Your yard is big enough for that 40m antenna, correct? Well then its big enough for 630. Most of those guys we heard tonight all live in the burbs like us. They're all having a great time on 630 metres it seems to me".

"OK then, that seals the deal Jack. What type of antenna would you suggest then?"

"Now hold on buddy, one thing at a time. Let's save the antenna discussion for your next visit! You'll want to concentrate on building that transmitter first. Let's gather up some parts for you before you go. Here's a list of some reading to keep you busy in the meantime." (see the list provided at the end of this article)

"Sounds good Jack. Thanks for the help so far. I owe you one", said Edgar, heading out the door.

"That's OK. Mind brushing that snow off the loading coil as you go by… then we'll call it even!"

"Will do Jack. Thanks again."

Notes

1) Many thanks go to Roger Plimmer, GW3UEP, for providing permission to publish his transmitter details.

2) http://www.gw3uep.ukfsn.org/

3) http://www.k7qo.net/

4) MS Solutions 630m Transverter: https://wg2xka.wordpress.com/for-sale-wanted/

Monitor Sensor 630m Transverter: http://www.monitorsensors.com/ham-radio

A compilation of 630m readings:

RSGB's LF Group: https://uk.groups.yahoo.com/neo/groups/rsgb_lf_group/info

VE7SL 630m Blog Notes: http://ve7sl.blogspot.ca/search/label/630m

Canadians On LF: http://www.qsl.net/ve7sl/136.html

KB5NJD's 630m Daily Reports: http://njdtechnologies.net/category/630-meters/

Innovation, Science and Economic Development Canada links:

The Canadian Table of Frequency Allocations (Canadian Table): http://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/sf10759.html

RBR-4 – Standards for the Operation of Radio Stations in the Amateur Service: http://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/sf01226.html

First licensed at age 15, Steve McDonald, VE7SL, is a retired high-school Tech-Ed teacher, now living on Mayne Island in British Columbia. His main interests are homebrewing and CW, particularly on 50 MHz, 160m and on the new 630m band.