

# Letters to the Editor

## A Low-Cost, Flexible USB Interface (Jan/Feb 2008)

Hi Larry,

Thanks for publishing my article in such a nice way. When I looked at it in *QEX* I noticed a little typo in the schematic of Figure 1 on page 11. The signal at U1, the ATTiny2313 IC, pin 15 now reads "DDS SC Lock." It should read "DDS Clock." Maybe you print a little correction note in the next issue of *QEX*.

— Thanks and 73, Thomas Baier, DG8SAQ,  
University of Applied Sciences,  
Prittwitzstrasse 10, 89075 Ulm, Germany;  
baier@hs-ulm.de

Hi Tom,

I apologize for that error on the schematic diagram. Thanks for helping us make our readers aware of the correction.

— 73, Larry Wolfgang, WR1B, *QEX* Editor;  
lwolfgang@arrl.org

## Empirical Outlook (Mar/Apr 2008)

Hi Larry,

I enjoyed your comments in Empirical Outlook, and agree that there is a lot of good experimentation out there that doesn't get written up. I personally get a big kick out of writing technical material, (as well as a lot of other stuff), and I would be more than happy to be a "ghost writer" for any experimenter who might think he needs one.

I'm sure there might be a few others out there as well, and I encourage any more experienced wordsmiths to, perhaps, think about doing this as well.

— Sincerely, Eric Nichols, KL7AJ, Hard Right Productions, 3763 Lyle Ave, PO Box 56235, North Pole, AK 99705; kl7aj@acsalaska.net

## A Squelch Amplifier (Jan/Feb 2008)

Larry,

There is an error in the schematic (Figure 7 on page 38) for the +DC to -DC converter that is part of the article "A Squelch Amplifier," in the Jan/Feb 2008 issue of *QEX*. Capacitor C6 is installed backwards. The + terminal should be connected to ground, because the input voltage for U1 is negative.

I wish the circuit board was a little smaller. This circuit would be an excellent replacement for the various Kenwood radios that experience unstable output due to failure of the -6 V regulator that is the ALC reference voltage.

— 73, Steve Lund, K6UM, 15385 NE Kincaid Rd Newberg, OR 97132-6926; k6um.steve@gmail.com

Dear Larry,

Thanks for forwarding Steve's message. I note that C6 and C7 are both in error. The + side of both capacitors must be connected to ground. Also, the output labeled +E<sub>o</sub> is actually an unregulated -V output. The output from the "REG Out" terminal is a regulated -V output.

— 73, John Laughlin, KE5KSC, 11918 Pompano Ln, Houston, TX 77072;  
johnel@earthlink.net

Dear Steve and John,

Thank you for writing with those corrections. The mistakes on Figure 7 were either errors in the way I marked up the original drawing for our graphics artist, or errors he made that I didn't catch in the review process.

— 73, Larry, WR1B; lwolfgang@arrl.org

## Carbon Composition, Carbon Film and Metal Oxide Film Resistors (Mar/Apr 2008)

Dear Larry,

I just wanted to let you know I really enjoyed the article in the Mar/Apr 2008 issue by K8ZOA, Carbon Composition, Carbon Film and Metal Oxide Film Resistors. I found it quite interesting and picked up a lot of good knowledge from it. Sorry I can't wax eloquent; I don't do eloquent, but I do know when a good, well written article on a seemingly basic subject warms the cockles of my homebrewer, engineer-wannabe heart.

— 73, Mike Czuhajewski, WA8MCQ, 7945 Citadel Dr, Severn, MD 21144;  
wa8mcq@verizon.net

Hi Mike,

Thanks for the note to let us know you enjoyed Jack's article. I was also fascinated to read the report on his research. It looks like good science, with carefully documented measurements under reasonably controlled conditions.

— 73, Larry, WR1B; lwolfgang@arrl.org

## The Direct-Reading Reflection Coefficient and Power Meter (Nov/Dec 2007)

Dear Larry,

Thanks for publishing the errata / comments list for my Nov/Dec article in the Jan/Feb *QEX* Letters column.

There are "typos" and then there are "thinkos." Further thought and experimenting have convinced me that using the RC/P meter's reflection coefficient mode for insertion loss measurements is neither as simple nor as useful as it first appeared to be.

First of all, the resolution and stability of the RC zero adjustment make measurement of small values of RC very difficult, requiring frequent re-zeroing. A multi-turn wire-wound zero adjusting pot would presumably cure this problem.

More importantly, phase shift through the device under test invalidates the attenuation results, unless at the test frequency the total forward and reverse direction phase shift is negligible or a multiple of 360°.

For example, a shorted transmission line will have a real and minimum impedance at lengths of multiples of a half wavelength, and in principle, the reflection coefficient at these frequencies can be scaled to give the loss at the operating frequency. This is a very tedious and indirect measurement, and all told, measurement of attenuation by substitution in the power meter mode is far preferable.

With the benefit of hindsight, I'd delete the fourth sentence of the Introduction, and the fourth paragraph under Operation, so perhaps a further errata note is indicated.

In the Introduction, I would delete the sentence that says, "Among other applications, the meter provides a very simple and useful way to measure the loss of a device or a transmission line *from one end!*" The fourth paragraph in the Operation section begins with the sentence, "This effect of loss on RC provides a useful way to measure loss."

— 73, Ralph Gaze, W1RHG, 35 Linda Terrace, Portsmouth, RI 02871;  
rgaze@arrl.net

Hi Ralph,

Thanks for your further thoughts and clarifications about your direct-reading reflection coefficient and power meter. It is still an interesting and useful project, even if the loss measurement isn't as easy as you originally thought.

— 73, Larry, WR1B; lwolfgang@arrl.org

## Antenna Options (Jul/Aug 2007)

I have two questions regarding the Antenna Options column in the Jul/Aug 2007 issue of *QEX*. The first question concerns the Stub Loaded 2-Element Moxon Rectangle discussion. On page 55, the author says that the electrical length of the loading stub for a 30 m Moxon is 140.6 inches. When I calculated the required electrical length of the 30 m stub (at 10.125 MHz) I came up with a value of 169.8 inches. Please re-check and confirm the electrical length value for the 30 m stub that was published in the article.

Second question: On page 55, in the first paragraph under the heading "The Stub Loaded 2-Element Yagi," the author says,

"On 40 m the coax length is 258.8 inches, while on 30 m, the length is 182.3 inches." The author does not specify whether he is talking about the physical or electrical length of the coax stub. Which is it? I suspect he is referring to the stub's electrical length, but it is not clear.

You may be interested to know that I am using your Antenna Options notes to construct a reversible, stub loaded 2-element 17 m Yagi in my attic.

The Yagi will replace a 17 m Moxon that is now located there. The Moxon has worked very well but the dimensions of the attic prevent me from rotating the antenna. Because I cannot rotate the Moxon, I have been looking for ideas for bi-directional gain antennas that will fit in my attic. Your column in the Jul/Aug 2007 issue of *QEX* solved my problem. I elected to use the reversible Yagi concept rather than the reversible Moxon because the Yagi is, for my situation, simpler to construct.

— 73, Frank Riley, KK0K, 11721 Woodward St, Overland Park, KS 66210; frankriley@kc.rr.com

Dear Frank,

The Yagi stub lengths are electrical lengths for both the 40 and 30 m versions of the 2-element stub-loaded reversible Yagi, as shown in the model. For the stub-loaded Moxon, electrical lengths were intended, as shown in the models with a VF of 1.0, but, alas, I goofed on 30 m, and used the physical length based on a foam coax VF of 0.82.

So, Frank, you are correct about the electrical length being just under 170 inches ( $0.146\lambda$ , or close to 52.5 electrical degrees). Keep in mind, however, that real-world antenna site factors will require experimental determination of the final stub length for the situation.

I hope this helps.

— 73, L. B. Cebik W4RNL, 1434 High Mesa Dr, Knoxville, TN 37938; cebik@cebik.com

Thanks for the correction and clarification, L. B.

— 73, Larry, WR1B; lwolfgang@arrl.org

### Signal Resilience to Ionospheric Distortion of HF Digital Chat Modes (Nov/Dec) 2007

Daniel,

First, may I congratulate you for the excellent article, "Signal Resilience to Ionospheric Distortion of HF Digital Chat Modes," published in the Nov/Dec 2007 issue of *QEX*. The article is well written, and it is encouraging to see that serious attempts at analyzing digital mode performance (apart from mine, and that of Steve Richards, G4HPE) are now being undertaken. I fully appreciate how much work is involved in making these measurements.

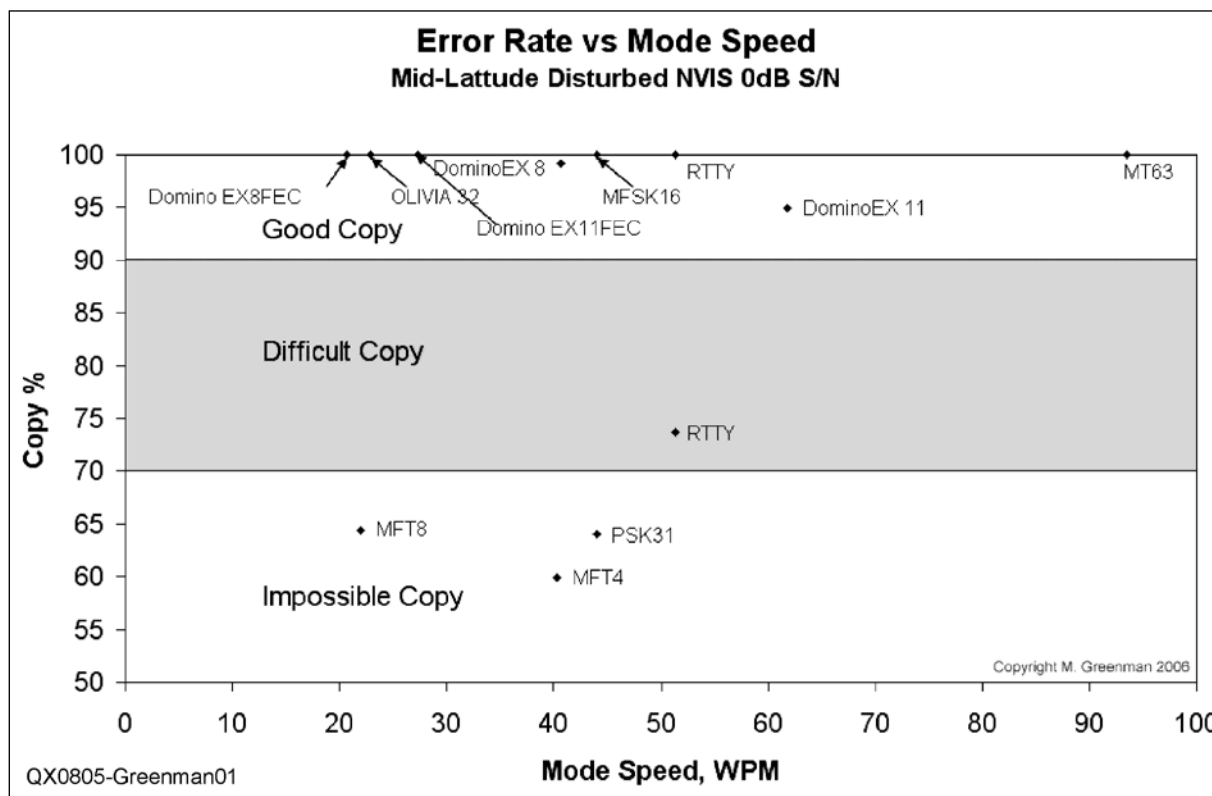
I have been making assessments of digital modes for some time now, partly as an on-going research, partly to compare software packages, and partly to compare new

developments with the existing modes. I was pleased to discover that you use the same tools (specifically the PathSim program by Moe Wheatley, AE4JY), and that your method of rating copy performance is similar to my own. (You use %error, while I use %copy, but they are equivalent since %error = 100 - %copy.)

I have made PathSim recordings using DIRECT path for just about every mode imaginable. I used a one minute recording of "Quick Brown Fox," and play the file back through the required simulation, then rate the % copy manually by counting good characters and total characters (the latter by playing back with DIRECT path and no noise). When I started, there was no error rate measurement tool available. My measurements for the paths you discuss agree very well, despite slight differences in methodology.

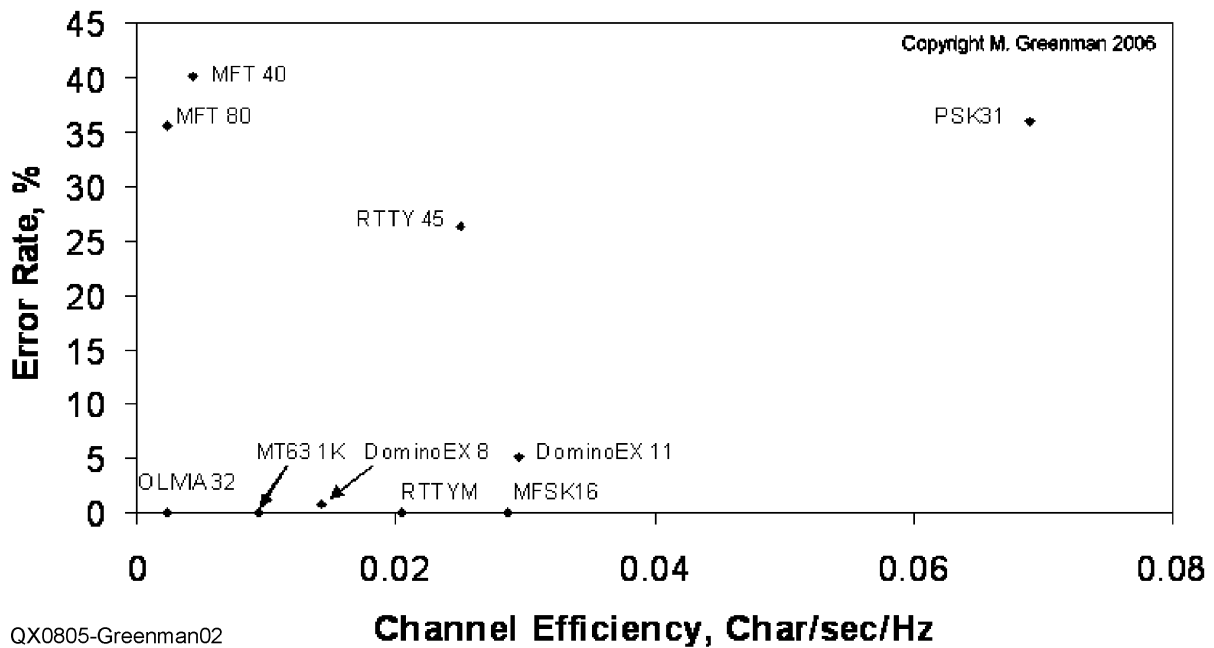
There are, however, a few points where I feel you could have made a better emphasis, or provided more thorough results. These are:

1. You make no comment about which modes have FEC or high redundancy, and which do not. Users will wish to know how the modulation technique is affected by propagation, and in some cases this is masked by the use of FEC. I recognize that in some modes you can't turn the FEC off, but it does distort the results. For example, I know performance of MFSK16 (which I designed) is rather more modest with the FEC off.



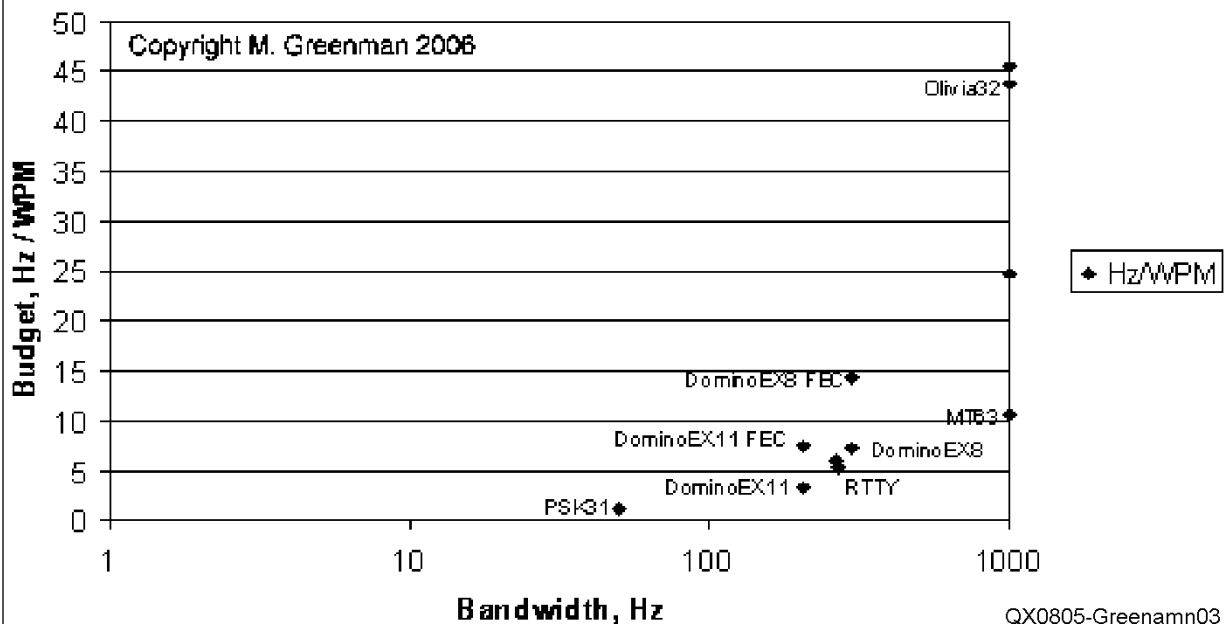
## Mode Error Rate vs Channel Efficiency,

Mid-Latitude Disturbed NVIS 0dB S/N



## Bandwidth Budget

Mid-Latitude Disturbed NVIS 0dB S/N



2. On a related point, the FEC affects the throughput (typing speed) and adds significant latency (receiver delay), and users will be interested to know the cost of using the FEC.

3. You make no differentiation between wide bandwidth modes and narrow modes. There is significant interest in keeping bandwidth usage to a minimum and an assessment of the bandwidth cost (bandwidth per unit throughput) is very useful. Modes that are intentionally narrow-band should not be criticized for poorer performance without this understanding (and vice versa).

4. There is no assessment of mode throughput. Sure, MT63 performs very well in tests, but it has high redundancy (equivalent FEC rate of 7:64) and for a raw throughput of 640 bps achieves only 100 WPM. Similarly, while you give one of the plethora of Olivia modes good ratings in some tests, the bandwidth of 1 kHz and throughput of barely 25 WPM with horrendous latency are significant factors to users. (See later — I've included some bandwidth budget information.)

5. While you encourage operators to choose a mode that best suits conditions (and I heartily agree!), you then test some modes only in configurations that do not suit the conditions. In particular I am disappointed that you only tested DominoEX at 11 baud. It performs far better in 8 baud mode under many conditions, and DominoEX4 under AWGN performs at -18 dB S/N and still achieves 25 WPM with no latency (compare that with Olivia!)

6. Further relating to DominoEX, one of the important design points of this mode is that the receiver FFT should operate with 4x the resolution of the tone spacing. This provides for the ability to round out fractional differences due to drift, tuning offset, and most importantly, Doppler. This is done correctly only in the ZL2AFP DominoEX software, which even includes a Doppler meter. However, this approach is *not* used in MultiPSK (which instead uses AFC), and I believe this will lead to poorer performance in conditions with considerable Doppler shift, such as NVIS and Flutter. My point is that care needs to be taken to ensure that the performance measured is not an artifact of the software used. Another way to look at this is that the simulator provides us with a very good way to rate the performance of the receiving software!

7. Finally, I am sorry that you did not include an NVIS simulation (such as "Mid Latitude Disturbed NVIS"), which is very typical of low HF band operation — and let's be honest — these are very common conditions. In order to correct this, I've attached my own assessment of this simulation. Figure 1 shows the results of my error versus speed measurements. The error versus efficiency data of Figure 2 was measured at 0 dB S/N. Figure 3 is a bandwidth budget graph, again assessed at 0 dB S/N. I have figures for other amounts of AWGN, but will

have to go back to the data to produce graphs with the same axes as yours.

As you probably will appreciate, at this point in the sunspot cycle, I've been working on designing modes that give good performance on noisy bands under NVIS conditions (80 m at night). I feel that with DominoEX, we have an excellent mode for these conditions, and it certainly helps if the range of simulations used in assessment point out clearly which mode is best under each of the conditions, but at what speed, what latency, and at what cost of bandwidth.

Perhaps there will soon be a Part 2 to your article!

— 73, Murray Greenman ZL1BPU, 94 Sim Road, Karaka, RD1 Papakura, NEW ZEALAND; [murray@rakon.co.nz](mailto:murray@rakon.co.nz)

**Hi Murray,**

Thanks for your mail. I could not dream of a better critical opinion. I have read your comments and suggestions with great attention. I do consider your book and your Web site as the best references on the subject.

Thanks Murray. Your intervention is exactly what makes me love ham radio.

— 73, Daniel Crausaz, HB9TPL, Russel 7, CH1025 St, Sulpice, Switzerland; [cecidan@bluewin.ch](mailto:cecidan@bluewin.ch)



