

Letters to the Editor

Voltage-Magnitude Impedance Measurement (Jul/Aug 2007)

With regard to Figure 3 on page 15: For the equation given for “resistor inductance”, I calculate the result to be 0.104 microhenrys, or, 10.4 nanohenrys, not 13 nanohenrys. Also, in the equation for R_0 , I believe the denominator of the radicand incorrectly shows the value of the inductance instead of the capacitance.

— 73, Jim Olsen, W3KMN, 5905 Landon Ln, Bethesda, MD 20817; w3kmn@aol.com.

Hi Jim,

Thank you for pointing out my errors in Figure 3 of the Voltage-Magnitude Impedance Measurement article. I agree that the numbers provided give a calculated inductance of 10.4 nH rather than 13 nH.

I had modified the equation given originally by Dr. Eddy, based on the equation for inductance of a straight wire that I found in F. E. Terman’s *Radio Engineer’s Handbook* as well as *The ARRL Handbook*. Then I failed to correct the calculated value, as given in the original manuscript.

In the equation for R_0 near the bottom of Figure 3, I missed an error made when the ARRL Graphics Department created that Figure. You are right that the value for C should have been 4.2×10^{-13} F. When I run through that final calculation, if I use the calculated values of 1.04×10^{-8} H and 4.2×10^{-13} F then I get an R_0 value of 236 Ω rather than the original 264 Ω .

— 73, Larry Wolfgang, WR1B, QEX Editor; wolfgang@arrrl.org

Hi Jim,

I confess that I am quite red-faced with embarrassment, especially as Larry pointed out the problem with my original inductance of a straight wire equation early in his editing work on my article. Somehow I managed to overlook the loose end, for which I have no excuse.

I fear that much of this work on real 1/4-W resistor capacitance and inductance was done many years ago and my recollections of both measured parameters (using a Q-meter, and using extremely low value and extremely high value resistors for determining inductance and capacitance, respectively) and my own theoretical calculation (at the time) of L and C are blurry and based upon all too sketchy notes made at that time. Back then, I believed that the agreement between theoretical and measured Boella parameters was extremely good — perhaps even too good to be believable considering the crudeness of the experimental set-up.

I could weasel and say that in the real world these differences are no greater than the uncertain disposition of the resistor with the local ground plane. But I really cannot avoid taking responsibility for what surely appears on the surface to be an error in calculation, or measurement, or both. Because of the apparent agreement with the later network-analyzer measurements carried out by Les Besser (*RF Design*, July 1993, p 66, with unknown resistors in an entirely different set up), I have greater confidence in the measured 0.43 pF and 13 nH values than in my calculations (which may have been unknowingly skewed by my earlier measurements).

Before saying anything beyond this, I think I am obligated to repeat both my measurements and my theoretical estimates. To be sure I do not repeat any prior errors I think I should do this more carefully than is possible in a few days time.

[A few days later, in another e-mail, Dr Eddy continued:]

I repeated my earlier measurements, added to them, and between times tried to think over what was said (and not said) in the paper.

Larry and I both missed the failure to have the calculation jibe with the given formula. (We also failed to notice the misspelled “impedance” instead of impedance in the second line above the block, $R_0 \cong \sqrt{L/C}$, and the omission of any reference to Terman or Grover for the inductance calculation). But more importantly, I fear that the long ago measurements and their apparent agreement with crude, back-of-the-envelope estimates had acquired a misplaced aura of sanctity in my brain. I would nonetheless now argue that, on the basis of my ability to repeat them, the measurements themselves were quite accurate under the circumstances.

I adopted the following component lead-swallowing stratagem. On my Q meter and on a reference inductor I mounted brass tubing with an ID just able to “swallow” the resistor’s leads to within 2.5 mm of the resistor shell. The test resistor end of the tubing had a short section filed away so that the resistor (or a shorting wire the same diameter as the resistor’s wire leads) could be tack soldered in place. Basically, this configuration enabled me to make differential measurements, resistor-in versus resistor-out. I used resistors with a resistance very much smaller and very much larger than 270 Ω with the implied presumption that their distributed capacitance and inductance would be the same. For the very high resistance measurements, I mounted the resistor in parallel with an inductor resonant at the upper frequency limit of the VHF Q-meter. The brass, lead-swallowing

tubing was mounted so as to occupy the same position whether the resistor was inserted or not. I then adjusted the resonant frequency (with the Q-meter’s vernier tuning capacitor) to a suitable, easy-to-record value, with the resistor in place, and again with it removed. I measured the effective capacitance by noting the change in vernier capacitance setting required to regain resonance.

The inductance measurements were made similarly, but at a lower frequency, and with a resistor value smaller than the inductor’s series resistance. I substituted a shorting wire in place of the resistor with the two lead-swallowing sections of brass tubing butted against one another. Using the vernier capacitor, I noted the change in capacitance to maintain a constant resonant frequency. For dL and dC (changes in inductance and capacitance) small compared with L and C such that the dL dC cross term is negligible, the differential inductance is then given by $dL = dC / (L C)$.

I made the foregoing measurements (this time) with $R1 = 100 \Omega$, and $R2 = 6.8 \text{ k}\Omega$ using 5% 1/4-W Allen-Bradley resistors, arguing that the internal design of these resistors was sensibly identical with, say, that of a 270 Ω resistor. To the extent that is correct, I would argue that the foregoing measurements are accurate to something on the order of 5%. I repeated the measurements at several different frequencies to obtain independent estimates (different settings of the vernier and main tuning capacitor dials). These measurements showed no significant difference relative to my earlier experimental results (the published 0.43 pF and the 13 nH values, with now forgotten resistor values). Fortuitously or not, these measurements are roughly consistent with those published much later by Les Besser (using a much more expensive network analyzer in place of my antiquated Q meter!).

I hope that QEX readers understand that the theoretical analysis presented for estimation of resistor inductance and capacitance is no more than a back-of-the-envelope calculation running rough-shod over the complexities of butting reference resistors with only 5 mm separation available for soldering — not to mention the inductive and capacitive coupling between contiguous components and a possible ground plane, and so on.

In retrospect, I would argue that my initial gloating in having achieved what seemed to be a fortuitous agreement between experimental measurement and theoretical prediction was inappropriate. Agreement to within 25% would have been satisfying; to within 50%, perhaps not unreasonable. I

am surely derelict to the extent that I may have implied any greater accuracy for the theoretical calculations. Somewhat chastened by all this, I do think I should have made it clear that while useful measurements can be made at 2 meters, and possibly even 1 meter, operation above a few hundred MHz is questionable.

— *Sincerely, F. Neal Eddy, 40 Finn Rd, Harvard, MA 01451; fneddy@charter.net*

High-Performance Audio Speech Low-Pass and CW Band-Pass Filters in SVL Design

The elliptic audio filters in DC8NR's article meant for use on CW would be found to be unusable were they truly elliptic filters. Due to the very low inductor Q ($Q = 7$), the CW filters presented, while designed as elliptic function filters, do not have the characteristics of an elliptic filter and that is what makes them usable. If high-enough Q inductors were used in these filter designs to realize the response of an elliptic filter, the ringing would make the filters useless on CW. It is interesting that for the given number of components, I don't know of any other filter that would have the steepness of this filter's skirts.

— *Sincerely, Joseph F. Bagdal, W8AVD, 645 Cascade, Cincinnati, OH 45240; jfb45240@yahoo.com*

Hi Joseph,

Thank you for writing with your comments about the filters presented in this article.

— *73, Larry, WR1B*

Letters (Jul/Aug 2007): On the Crossed-Field Antenna Performance, Parts 1 and 2 (Jan/Feb and Mar/Apr 2007)

Hello Larry!

Please allow me to reply to two "Letters To The Editor" in the Jul/Aug 2007 issue of *QEX*.

One writer complains that you carried an article about the "Crossed-Field Antenna." Of many articles I've read about this antenna, this one was the most complete, straightforward, clearly set forth, and understandable by Amateurs of many levels of technical proficiency. Our Broadcast Engineering weekly lunch group in Albuquerque, of which nearly everyone is a licensed Amateur, spent an hour discussing the reports in your article, and appreciate very much its publication (and debunking!).

Another writer complains that you carried "another IEEE article reprint." For the many of us who are not members of IEEE, having *QEX* republish "the best of the best" articles from other publications is a welcome "digest" service for us, your readers.

I recognize that the personal circumstances of the two letter-writers leads them to feel *QEX* wasn't speaking to them with these two articles. Take heart, however, as these

articles and others like them speak directly to the vast majority of your readers, and we are most appreciative.

— *73, Mike Langner, K5MGR, 929 Alameda Road NW, Albuquerque, NM 87114; mlangner@swcp.com*

Thanks Mike. I am trying to learn how to gauge our reader's interest in the various articles we publish. I hope we can provide several articles in each issue that will be particularly interesting to each individual reader, but certainly recognize that not every reader will enjoy every article.

I have heard from several other readers who either did or did not like these two articles, either for technical reasons or because they were picked up from an IEEE publication. I certainly do not intend to make it a common practice to pick up previously published works for *QEX*. We may do that occasionally, however, to share a particularly interesting article.

— *73, Larry, WR1B*

Congratulations to our new QEX Editor

Hi Larry:

First, let me offer my hearty congratulations to your appointment as editor of *QEX*. I feel very confident that you will continue the *QEX* legacy and will forge new and more interesting aspects of Amateur Radio to be explored and published.

My purpose in writing is to provide a couple of suggestions for you to consider as you move into *QEX* leadership. I am retiring at the end of the year and will again be able to delve more fully into the realm of Amateur Radio. Licensed and continuously active since 1958, I am an avid HF user, devoted primarily to CW operation. I enjoy QRP and have built several of my own rigs. I have been an ARRL member and supporter for many years, with a few intervening "off" periods due to work and family raising responsibilities. Amateur Radio is, and continues to be my primary hobby and I hope to take it to another level in the years to come.

Last Christmas, at my request, my daughter gave me a subscription to *QEX*. I have often felt that many of its articles and explanations of radio phenomenon were quite above my ability to understand, and to some degree I have found that to be true. Given that I am a business administrator professionally, however, and not engaged in electronics except as a hobby, I have been forced to learn more. That is a very good thing, and has expanded both my horizons and my mental abilities.

To me, *QST* provides Amateur Radio theory and construction material in very limited quantities. The explanations are often times somewhat clipped, because of publishing space and costs, I am sure. I look forward to each month's issue with as much anticipation

today, however, as I did in the late 1950s!

I understand that "outstanding" articles are not always available in quantity, but perhaps some of the articles that are easier to understand for the average ham could be included. Quite frankly, many of the articles in *QEX* thus far are over my head. I have learned a lot and each issue I do read each article in its entirety. I get lost, try to regroup, head to my extensive ARRL library for reference work and do my best to at least understand what the author is saying.

If some of those less technical or theoretical articles that are not suitable for *QST* publication could be included, I would find the mix to be more to my liking. I would still be pushed hard to understand the real geniuses who know electronics, but I would be rewarded for my patience and hard work with articles that I could perhaps master the contents and really take something away for use at my station.

As I said, Larry, I really have enjoyed reading *QEX*, and even if there are no changes I plan on continuing my subscription. I sincerely wish that I had the expertise to contribute at this time, but sadly that is not the case. But, hope springs eternal and with some more years of *QEX* exposure under my belt, I just might have something to offer.

Again, my congratulations and I wish you the very best in your new responsibilities.

— *73, Bob Brock, K9OSC, 1816 Chapman Dr, Waukesha, WI 53189; k9oscw@yahoo.com*

Hi Larry,

I just read that you have taken over the reins of *QEX*. I would like to offer best wishes, and a few words of encouragement for this important work.

As I see it, *QEX* is the place for articles that are aimed for a narrower, more technical audience than *QST*, require many more pages, or describe works in progress that invite participation at a high technical level by the community. My favorite recent article is the one by Fritz Raab describing the 500 kHz experiments.

I will do my best to encourage some new, sharp young authors to send interesting articles in your direction. I am currently mentoring three of them in that direction.

Technical publishing within the ham community is a great tradition, and it's not just hard work, it's a real honor. Once again, congratulations and best regards.

— *Rick Campbell, KK7B, 4105 NW Carlton Ct, Portland, OR 97229; kk7b@arrl.net*

Dear Readers,


I was both surprised and honored by the number of congratulatory e-mails that I received after the announcement of my new responsibilities was posted on the ARRL Web page. Thank you all for your well wishes. In this issue's Empirical Outlook I shared a few

thoughts with regard to my vision and ideas for the future of *QEX*. Of course I cannot do anything with the magazine without your support and assistance.

Please share with me your suggestions for

ways to make *QEX* more interesting to you. I won't promise that we will make every change you suggest, but I will evaluate each suggestion for practicality, within our charter and budget. Please also submit articles about proj-

ects or concepts of interest to you. Together I am confident we can continue to keep *QEX* vibrant and interesting!

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

Upcoming Conferences

The 26th Digital Communications Conference

September 28-30, 2007, Hartford, CT

The ARRL and TAPR Digital Communications Conference is an international forum for radio amateurs to meet, publish their work, and present new ideas and techniques. Presenters and attendees will have the opportunity to exchange ideas and learn about recent hardware and software advances, theories, experimental results, and practical applications. Full information can be found at www.tapr.org/dcc.html.

Topics include, but are not limited to:

- Software defined radio (SDR)
- Digital voice
- Digital satellite communications
- Global position system
- Precise timing
- Automatic position reporting system (APRS)
- Short messaging (a mode of APRS)
- Digital signal processing (DSP)
- HF digital modes
- Internet interoperability with Amateur Radio networks
- Spread spectrum
- IEEE 802.11 and other Part 15 license-exempt systems adaptable for Amateur Radio
- Using TCP/IP networking over Amateur Radio
- Mesh and peer-to-peer wireless networking
- Emergency and Homeland Defense backup digital communications in Amateur Radio
- Updates on AX.25 and other wireless networking protocols
- Topics that advanced the Amateur Radio art.

The Conference

Friday, Saturday and Sunday: This is a must attend conference for technically inclined amateurs. Now, more than ever, amateur radio needs this great meeting of the minds to demonstrate a continued need for our current frequency allocations by pushing forward and documenting our achievements. The ARRL and TAPR Digital Communications Conference is the best way to record our accomplishments and challenge each other to do more.

This conference is for all levels of techni-

cal experience, not just for the expert. Not only is the conference technically stimulating, it is a weekend of fun for all who have more than a casual interest in any aspect of amateur digital electronics and communications.

Technical and introductory sessions are scheduled throughout the conference to introduce new technical topics for beginners and experts alike.

Friday Evening Social: Join others at the conference for a Friday evening social get together.

Saturday Evening Banquet with an invited speaker that concludes with award presentations and prize drawing. This year's speaker is well-known *Linux* advocate, Bruce Perens, K6BP.

The ever-popular *Sunday Seminar* that focuses on a topic and provides an in-depth four-hour presentation by an expert in the field. This year's seminar topic has not been confirmed at this time.

Sunday is also Tuscon Amateur Packet Radio's (TAPR) annual meeting.

Demonstration Room: Each year at the DCC a separate (and lockable) room is provided for people to bring and show off their latest projects. Tables and power will be provided. Bring your equipment and display for all to see, learn, and ask questions about. Be sure to bring a small sign and/or flyer naming and describing your project.

Hotel

Conference presentations, meetings, and seminars will be held at the Doubletree Hotel Bradley International Airport, Windsor Locks, CT.

It is highly recommended that you book your room prior to arriving. A block of rooms has been reserved at the special DCC room rate of \$79.00, single/double. This special rate is good until August 30, 2007, or until the block of rooms are all sold out. To book your room, call the hotel directly and mention the group code DCC when making reservations. Be sure to book your rooms early!

Doubletree Hotel Bradley International Airport

16 Ella Grasso Turnpike
Windsor Locks, CT 06096

Tel: (860) 627-5171

Fax: (860) 627-7029

Internet: www.doubletree.com/en/dt/hotels/index.jhtml?ctyhocn=BDLETD

Transportation: The nearest airport is Bradley International Airport (BDL). The Doubletree Hotel provides a complimentary airport shuttle service. Contact the hotel front desk for availability and scheduling.

Registration Fees

Note: Student pricing (17 years and younger) is 50% off regular registration price (meals excluded)

Pre-registration* (before September 1, 2007)

Two Day Conference — \$70.00

Friday Only Conference — \$40.00

Saturday Only Conference — \$40.00

Sunday Seminar: Sunday 8:00 AM-12:00 PM — \$25.00

Late Registration* (after September 1, 2007)

Two Day Late Registration after Sept 1 or at door — \$80.00

Friday Only Late Registration after Sept 1 or at door — \$50.00

Saturday Only Late Registration after Sept 1 or at door — \$50.00

* Conference registration includes conference proceedings, sessions, meetings.

Lunches: Friday \$15.00; Saturday \$15.00

Saturday Evening Banquet: \$35.00

Microwave Update 2007

October 18-20, 2007

Microwave Update 2007 Details

Microwave Update 2007 will be held at historic Valley Forge, near Philadelphia, Pennsylvania. Thursday sightseeing or possible surplus tour. Conference Friday and Saturday; Flea Market Friday night, Vendors on site; Banquet Saturday night; Door prizes and raffles; Hospitality room. Hosted by the Pack Rats — Mt Airy VHF Radio Club. Spouses, friends and family invited. Alternative family/spouse programs available.

\$79 early-bird registration until Sep 1 includes Conference, proceedings and banquet; \$89 from Sep 1-Oct 1; \$99 thereafter. Extra banquet Tickets \$39. Special hotel rate \$92 per night. Full info and registration at www.microwaveupdate.org.

Questions to chairpersons Philip Theis,