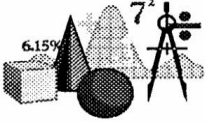




SPARKS

Daytona Section Newsletter
April 2021



APRIL SECTION MEETING

Thursday April 22nd at the Halifax River Yacht Club, 5:30 PM
331 South Beach Street, Daytona Beach, Florida 32114

PRESENTATION

ERAU Student Presentations & Tomoka Science Fair IEEE Award Winners

CHAIR'S REPORT



New things are happening around the Daytona Section. Dr. Helen Hernandez is rebuilding the section website. She is not finished yet, but feel free to visit the site at <https://r3.ieee.org/daytona/> and tell us on our Facebook page (<https://www.facebook.com/daytonaieee>) what you think. Our first face-to-face meeting will be in less than two weeks where Embry-Riddle and Bethune Cookman students will be presenting. I and the EXCOM really hope to see you there.

Now for some unfinished business. I am still gathering information as to the effectiveness of the communication within the Daytona Section. Thus far, I have obtained some statistics, but I have not heard from all the sources yet. During May 2021, the Daytona Section EXCOM will be meeting to discuss and strategize, but we still need to hear from many of you. Linked at the bottom of our new web site and the top of the Facebook feed, is the short one-minute survey I provided last month seeking your feedback. That survey will remain open until the May EXCOM meeting. I would appreciate each recipient of this newsletter responding to the five questions of the survey as soon as possible, even now while you are reading this.

In closing, I would like to challenge Daytona Section members to reconnect with those have become disconnected over the last year. If you have not talked with a Section member recently reach out to them, reconnect, meet for coffee, or go for a walk. Please join us for the April Section meeting and find out what our student members have been up to.

Shawn

W. Shawn Wilkerson
386 322-7999

ANOTHER TALE FROM THE OLD PROFESSOR

MR. SMITH'S MAGICAL CHART

Recently I wanted to make a matching network that I could use with a Marconi vertical antenna on a different frequency than it was cut for. A Marconi vertical antenna would be resonant at the frequency where the electrical length is $\frac{1}{4}$ wavelength. For most antennas, the physical and electrical lengths are essentially the same.

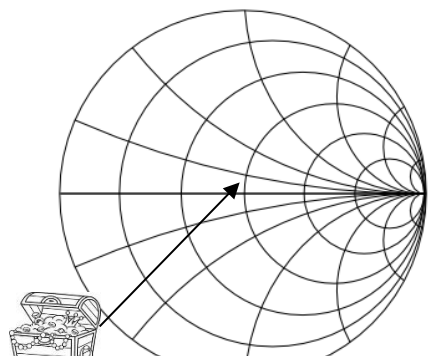
The antenna was resonant at 14.05MHz and I wanted to use it at 10.125MHz which means it would be shorter than $\frac{1}{4}$ wavelength at the lower frequency. Therefore, the impedance of the antenna would be less than the desired 50 ohms resistive and would have a reactive component. The antenna impedance at the lower frequency was measured to be $20-j100$ ohms. A matching network would be necessary to transform that impedance to $50+j0$ ohms.

Short Marconi antennas are very common. Nearly all AM broadcast stations use Marconi vertical antennas shorter than $\frac{1}{4}$ wavelength and have matching networks in what is called the "tuning hut" at the base of the antenna.



It had been a while since I designed an impedance matching circuit but I found a blank Smith Chart in my archives and set about designing the circuit. The Smith Chart is a graphical method of not only designing circuits but as a method of visualizing how the addition of series and parallel components affects the circuit behavior. The chart would not only provide a numerical answer but show different possible topologies for the matching network. It is a very clever design and has been in use since 1939. Even more interesting, Mr. Smith did not patent the chart but copyrighted it. Patents have a limited lifetime but copyrights can last for very long times usually longer than the copyright holder will live.

Designing an impedance matching network with the Smith chart is sort of like a treasure map. For my matching network the treasure is at the center of the chart. To use the Smith chart, you have to first "normalize" your desired input and output impedances which in my case, the treasure was $50+j0$ ohms. The antenna, $20-j100$ ohms, when normalized is $0.4-j2$. I put a mark at the point on the chart that represents $0.4-j2$ ohms. My goal was to find a path to the treasure, $1+j0$, or $50+j0$ ohms at the center.



Mr. Smith's magical chart
This is the impedance chart. An admittance chart is the mirror image and makes it easier to use shunt elements and can be superimposed on the impedance chart.

One would think the obvious path to the treasure would be a straight line to the center of the chart. I wanted to use only inductance and/or capacitance and the addition of these components in series or parallel won't take a straight-line path to the center but take semicircular paths with only one going to the center. The trick to get to the center is to add a reactance either in series or parallel and travel along one of the semicircular paths until it meets a semicircular path that does go to the center. The distance travelled along a path is set by the value of the reactance added. I could also see that there were two possible paths to get to the center. One involved two inductances and the other a capacitor and an inductance. I wanted to avoid the two-inductance approach because capacitors tend to have much less loss than inductors at radio frequencies so I chose a shunt capacitance on the $50+j0$ side and a series inductor to the antenna.

At first, I struggled with the Smith chart as I had forgotten how to use it; having not used it in quite a while. I decided to see if I could find an “app” online that would calculate the reactance values for me. There was, and I entered my desired input and output impedances and, in a flash, I got two circuits that would do the job. I built the hardware, tested it, and it did exactly what I wanted.

But I felt a bit of shame. Had I continued with the Smith chart, I would have relearned how to use it and how it works. So, I went back to the Smith chart and after remembering how to use it, I verified that the on-line calculator did provide the correct solution although I already knew that because I built my hardware and it was working perfectly.

The Smith chart is a wonderful tool. It does more than provide answers. It shows how adding components affects the circuit performance. It can do more than lumped-element networks and is a great tool for using transmission lines for impedance matching which is common for microwave circuits. Many microwave component datasheets provide data as points on a Smith chart in addition to a numerical tabulation. There are apps for everything these days and my students used to love to use them. But I fear if engineers rely too much on “apps” they can get disconnected from how circuits really work.

Al Helfrick, a.k.a. The Old Professor

PE CORNER

NEW FEMC DIRECTOR AND OTHER INFO FROM FBPE

Last month I wrote about the Florida Board of Professional Engineers’ open board seats and that Governor DeSantis hasn’t appointed new board members since taking office. To date, nothing has changed. Thankfully, the Florida Engineers Management Corporation board (which I am the Chair) engineer members are appointed by the sitting FBPE board members. At their recent meeting, the FBPE appointed Dr. Mark Tumeo, PE, to the FEMC board. Dr. Tumeo holds a Ph.D. and an M.S. in environmental engineering from the University of California, Davis, a J.D. from Cleveland State University, and B.S. degrees in civil engineering and biology from the University of Notre Dame. He is a registered Professional Engineer in Florida, Oklahoma, and Alaska, and is a member of the Ohio Bar. Dr. Tumeo is currently the senior engineer at Earth Systems, an environmental consulting firm with offices in four states.

The FEMC Board consists of five professional engineers appointed by the FBPE Board and two public members, appointed by the Secretary of the Florida Department of Business and Professional Regulation. At this time, one of the public member seats is open and the current public member has been submitted for reappointment to a second term. However, the DPBR Secretary has not yet reappointed this individual, though the application has been pending for a year.

On another noted, part of the PE renewal process requires that individuals provide a valid email address. These email addresses are considered public records under Florida’s sunshine laws. As a result, you probably receive solicitations for continuing education, among other things, that are sent to many Florida PEs by individuals who get names and associated email addresses from DBPR. Unfortunately, the availability of this email list has led to a rash of phishing emails. The FBPE has put out the following notice regarding this issue.

“Please be aware of spam emails being sent to Professional Engineers and engineering firms that appear to have been sent from the Florida Board of Professional Engineers. This email was not sent by FBPE and should be deleted immediately. These emails will have FBPE as the sender, but the actual return address isn’t from “@fbpe.org.” All emails [actually from FBPE are] sent using our domain, fbpe.org. The body of the email has a link to view a document. *Do not click the link or open any attachments.* If you did click on the link or open any attachments, contact your technical support desk or run an anti-virus check. Unfortunately, there is little we can do about the email scam attempts. The email addresses used by the phishing attempts were obtained through Florida Sunshine Law. Under Florida law, email addresses are public records.”

Whether you are a PE looking to attain required CEHs, or an engineer looking to learn something new or keep current with the latest trends in the profession, IEEE has seminars that will meet your needs.

Art Nordlinger, PE, Senior Member

DAYTONA SECTION SHIRTS



We are pleased to offer Daytona Section polo shirts for our Section members. The shirts are embroidered with the IEEE Logo and DAYTONA SECTION on the left and your name and grade, if desired, on the right. The shirt is a high quality 5 oz, 65/35 poly/cotton pique in Royal Blue with white embroidery. Available in S - 2XL in men’s as well as ladies’ sizes. Price is \$30, including tax, for S-XL size’s, 2XL size is \$3 additional.

For more information or to order shirts contact: Allan Jusko 386-671-3706 or a.jusko@ieee.org

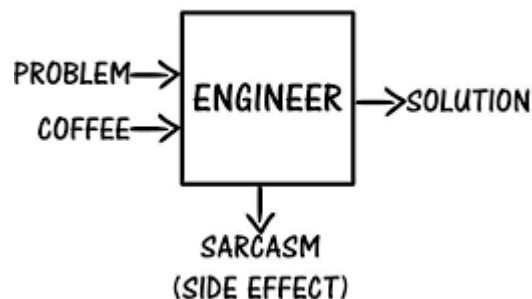
FUTURE MEETING DATES:

Planned 2021 meetings, depending on the coronavirus situation at the time:
Fall semester: Sep 23, Oct 28, Dec 2

EDITORS NOTES

Visit our Daytona Section website: <https://r3.ieee.org/daytona/>
Daytona Section’s Facebook page: <https://www.facebook.com/daytonaieee>

ENGINEERING HUMOR



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APRIL 2021 MEETING

Thursday April 22nd at the Halifax River Yacht Club
331 South Beach Street, Daytona Beach, Florida 32114
Just south of the Fire Station at the corner of Beach and Orange Streets

TOPIC– Student Presentations

SPEAKERS – ERAU, B-CU Students,
Tomoka Science Fair Winners

AGENDA

5:30 PM Greetings & Cocktails
6:00 PM Dinner
7:00 PM Presentation

Dinner Menu

Italian Buffet

Members and guests \$20.00 each
Students \$5.00

IMPORTANT DINNER NOTE!

The Yacht Club is requiring us to give them a dinner count by the Tuesday afternoon before our meeting.

As always, all members and guests are welcome to attend the meeting and presentations, however any dinner requests received after Tuesday afternoon may not be accepted

Please contact Allan Jusko by Tuesday April 20th at noon to give us a count for dinner or for further information

If you make reservations and are unable to attend, call prior to the event to cancel.

The Section is charged for all dinners ordered, please let us know if your plans change

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