

RF



ORANGE COUNTY AMATEUR RADIO CLUB, INC.

VOL. LVI NO. 05

P.O. BOX 3454, TUSTIN, CA 92781-3454

May 2015

The Prez Sez.....

By Tim N6TMT



When I was growing up a “rocket propulsion” engineer I knew was assembling a small plane from a kit. He strongly believed that you should not pilot an aircraft if you didn’t fully understand physics. Thankfully the hobby of flying did not follow his lead or all aircraft would only be flown by PhD engineers and physicists.

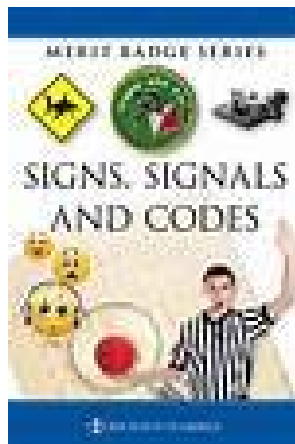
Don Wallace (W6AM), silent key and legendary amateur radio operator approached our hobby in a markedly different way. Don started in the hobby as a kid and in those early days most people learned by trial and error. If you couldn’t afford something or you wanted to try something for which equipment did not yet exist then “home brewing” was the answer.

Reading Don’s biography is a fascinating tale of amateur radio from its early days till the mid eighty’s and if you haven’t done so I would encourage you to take a look sometime

at *Don C. Wallace: W6AM, Amateur Radio’s Pioneer.*

Today we have a great advantage of the accumulated knowledge of pioneers like W6AM. Also, we have abundant cutting edge equipment as well as much great older equipment readily available. Speaking of which if you haven’t checked out our website “For Sale” page lately give it a view: <http://www.w6ze.org/FOR-SALE/For-Sale-Portfolio.html>.

In other news one of the latest Boy Scout Merit Badges is “Signs, Signals and Codes”. And yes, Morse Code is included. Perhaps it is true as they say in France “Plus ca change, plus c’est la meme chose” or “the more things change, the more they stay the same”



May all your signals be strong, constant and clear!

de N6TMT - Tim

Next Meeting

The next [General Meeting](#) of the OCARC will be held on **Friday, May 15th, 2015**. The presentation will be on:

“Portable HF Operations”

by Nicholas AF6CF and will demonstrate RaDAR (Rapid Deployment Amateur Radio). His presentation will cover a portable HF operations with equipment comparisons, operating hints and general information.

(See page 3 for more details on RaDAR)

The next general meeting will be on:

Friday, May 15th, 2015
@ 7:00 PM

As usual, we will be meeting in the east Red Cross Building, Room 208.
See you there!

In This Issue:	Page
The Prez Sez	1
Next meeting info	1
CLUB INFORMATION	2
RaDAR Intro Picture.....	3
Field Day News	4
TechTalk118	5 - 8
Short Circuit Protection	9
April General Meeting Minutes.....	10
May Board Meeting Minutes.....	11
Estate Sale.....	12,13
ARRL Hamcon	14
DATV-Express Advertisement.....	15

**ORANGE COUNTY
AMATEUR RADIO CLUB**
www.W6ZE.org



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Monthly Events:

General Meeting:

Third Friday of the month
at 7:00 PM
American Red Cross
600 Parkcenter Drive
(Near Tustin Ave. & 4th St.)
Santa Ana, CA

Club Breakfast:

First Saturday – June 6 at 8:00am
Marie Callender's Restaurant 2525
North Grand Ave (North of 17th
Street) Santa Ana, CA

Club Nets (Listen for W6ZE):

28.375 ± MHz SSB
Wed- 7:30 PM - 8:30 PM
Bob AF6C, Net Control

146.55 MHz Simplex FM
Wed- 8:30 PM - 9:30 PM
Bob, WB6IXN, Net Control

7.086 ± MHz CW **OCWN**
Sun- 9:00 AM – 10 AM
John WA6RND, Net Control

VISIT OUR WEB SITE

<http://www.w6ze.org>

for up-to-the-minute club
information, the latest
membership rosters, special
activities, back issues of RF,
links to ham-related sites,
vendors and manufacturers,
pictures of club events and much
much more.

Club Dues:

Regular Members	...\$20
Family Members*	...\$10
Teenage Members	..\$10
Club Badge**\$3

Dues run from Jan thru Dec and are
prorated for new members.

*Additional members in the family of
a regular member pay the family rate
up to \$30 per family.

**There is a \$1.50 charge if you'd
like to have your badge mailed to
you.



A portable HF operations presentation with equipment comparisons, operating hints and general information.

"AF6CF will demonstrate **RaDAR** (Rapid Deployment Amateur Radio)"



Field Day June 27 – 28, 2015

Start: 1100 PDT Saturday
End 1100 PDT Sunday

Next Field Day planning meeting will again be at Tom Cowart's home (W6ETC) in Tustin on May 21 at 7:00 PM.

A Field Day Training Class, targeted at a beginning level operator who will be using the microphone (phone) on Field Day, will be held at 6:00 PM on Friday May 15th (one hour before our next scheduled General meeting time) at our normal General meeting location (600 Parkcenter Drive in Santa Ana). Topics for this class include:

- Introduction to Field Day – What is it?
- How to call CQ
- What is Search and Pounce, and when to use it
- Use of Phonetics
- Use of the N3FJP Field Day software, with hands- on practice

The OCARC Field Day site is virtually confirmed at this time. It will again be at the Walter Knott Education Center in Buena Park. On Friday, June 26th, antenna and mast setup will begin at 9:00 AM and run until all FD infrastructure is in place and all antennas have been installed and verified as working. Those that have aided the Friday set-up effort will enjoy a catered dinner that evening.

Proposed Stations / Band Captains:

Station #	Band / Transmission Type	Band Captain
1	15 M + 40 M CW + SSB	Dan KI6X + Tim N6GP
2	20 M CW	Paul W6GMU
3	GOTA 10 M PSK	Cory KE6YHK
4	20 M SSB	Ken W6HHC + Bob AF6C
5	10 M SSB + (maybe 75 M SSB)	Doug K6PGH
6	10-80 M + 6 M PSK-31 + (Maybe 10-?? CW)	Greg W6ATB
7	2M + 440 FM + SSB	Robbie KB6CJZ

TechTalk118

Antenna Modeling Software

By Ken Konechy W6HHC

Allow me to start by explaining what Antenna Modeling software can do on your computer:

- Teach you more about antennas by letting you experiment on a PC
- Teach you how to design better antennas
- How to predict antenna performance
- How to “tune” the antenna design or the antenna installation for performance

Investing about \$90 in a software program like EZNEC to model ham antennas...and investing a couple weeks of evenings to learn how to use the Antenna Modeling software can be a good way to homebrew design and build your own antennas. Or even modify/improve a commercially built antenna that you already use.

Describing an Antenna in Software

The most significant step to use Antenna Modeling software is to describe the antenna you want to analyze to the software. **Fig01** shows how a 40M Inverted-Vee antenna can be described using the EZNEC software. There are two “wires” described by the two lines (rows) of numbers you see in **Fig01**. One row of numbers is the end points for the left wire. On row one, that wire slopes from 50 ft. above ground (the Z coordinate) down to 37.6 feet above ground at the other end-point for that wire. Row 2 describes the second sloping wire that connects to the feedline (coax, ladder-line, etc.).

Fig02 describes a 2-element 10M beam where each element is constructed from three pieces of Aluminum tubing that have different diameters of tubing. The two smaller-diameter pieces of tubing for the element end pieces slide inside the larger-diameter tube that is used at the center of the element.

Wire	Seg.	X1	Y1	Z1	X2	Y2	Z2	Dia.	Conduct	Src.Ld
1	5	-106.2	0	240	-54	0	240	0.0313	6061	0.0
2	11	-54	0	240	54	0	240	0.0417	6061	0.0
3	5	54	0	240	106.2	0	240	0.0313	6061	0.0
4	5	-98.5	57.6	240	-54	57.6	240	0.0313	6061	0.0
5	11	-54	57.6	240	54	57.6	240	0.0417	6061	1.0
6	5	54	57.6	240	98.5	57.6	240	0.0313	6061	0.0

Fig 2 - NEC-Win Software Describing a 10M 2-Element Beam

In **Fig02**, the first three rows of numbers describe the end-points used in the three pieces of tubing used for the reflector element. Rows 4-through-6 describe the end-points of the three tubes used to construct the driven-element.

Fig03 below shows choices to select a material for “wires” and tubing.

Conductivity	Wire Diameter
<input type="radio"/> Perfect	<input type="radio"/> 8 AWG <input type="radio"/> 14 AWG
<input type="radio"/> Silver	<input type="radio"/> 9 AWG <input type="radio"/> 16 AWG
<input checked="" type="radio"/> Copper	<input type="radio"/> 10 AWG <input type="radio"/> 18 AWG
<input type="radio"/> Pure Aluminum	<input type="radio"/> 11 AWG <input type="radio"/> 20 AWG
<input type="radio"/> 6063-T832 (Al alloy)	<input type="radio"/> 12 AWG <input type="radio"/> 22 AWG
<input type="radio"/> 6061-T6 (Al alloy)	<input type="radio"/> 13 AWG
<input type="radio"/> Brass (35% zinc)	<input checked="" type="radio"/> Other: 0.0067354
<input type="radio"/> Phosphor Bronze (5% tin)	(feet)
<input type="radio"/> Steel (Stainless type 302)	<input type="button" value="OK"/> <input type="button" value="Cancel"/>
<input type="radio"/> Other:	

Wires										
No.	End 1				End 2				Diameter	Segs
	X (ft)	Y (ft)	Z (ft)	Conn	X (ft)	Y (ft)	Z (ft)	Conn	(in)	
1	0	0	50	W2E1	0	30.6	37.6		#12	25
2	0	0	50	W1E1	0	-30.6	37.6		#12	25

Fig 1 - EZNEC Software Describing a 40M Inverted-Vee

Describing the Ground at your QTH

Any good DX-er would be able to describe to you why the ground/soil conditions at the antenna site are very important to working DX. That is: usually low angles of antenna radiation will travel further on HF skip. That is why DX-pedition people smile when they say they used a vertical antenna on a saltwater beach. In order to simulate the effects that grounds have on "angle of radiation", **Fig04** shows that the

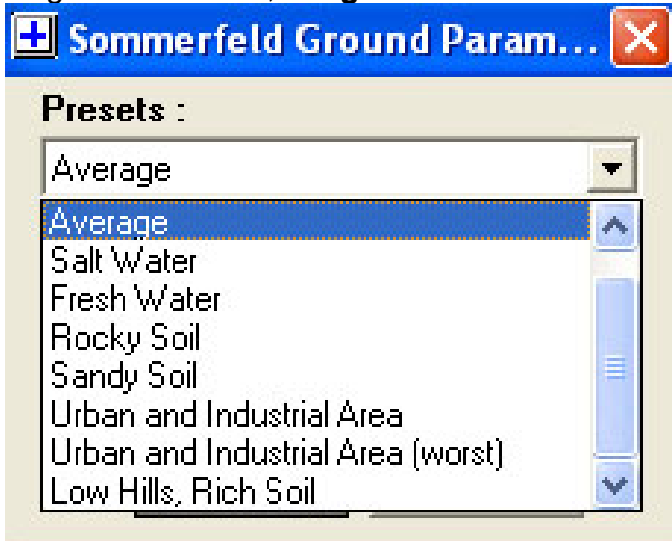


Fig 4 – Choosing Soil Conditions for Simulation

software allows selecting the soil conditions that exist at your QTH or antenna site.

Looking at Antenna Radiation Patterns

There are three aspects of antenna radiation patterns that are significant to analyze:

- 1) What is the elevation angle of radiation?
- 2) For beams, what is width of forward gain?
- 3) For Beams, what is front-to-back ratio

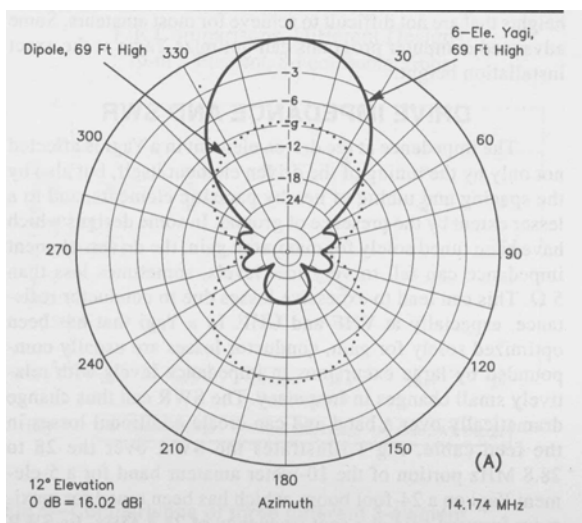


Fig 5 – Beam-width radiation of 6-ele 20M Beam

Physicists and Scientists always like to look at radiation patterns in free space. Free space is NOT of much interest to most hams...but free space does create a common denominator of antenna design. The important aspect of free space is that it does NOT distort the radiation patterns with reflections caused by the soil.

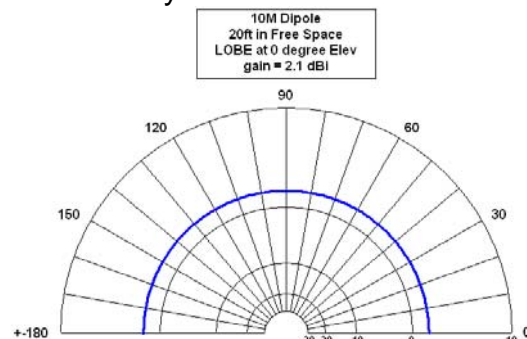


Fig 6 – "free space" Elevation Pattern of 10M Dipole (looking down the wire)

As you can see in **Fig06**, the energy radiates symmetrically around the wire. Compare **Fig06** to **Fig07** where the ground reflections distort the elevation radiation pattern.

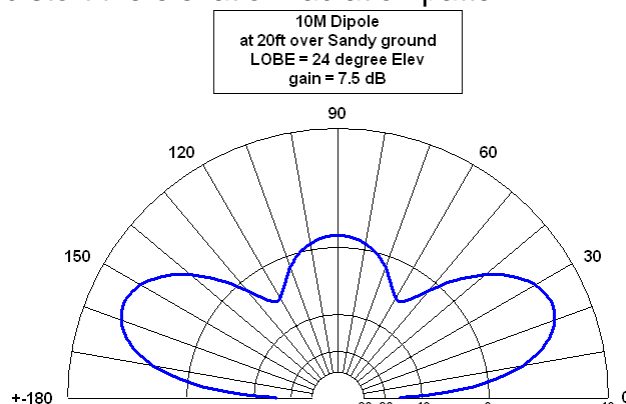


Fig 7 – Elevation Radiation Pattern of 10M Dipole at 20FT over Sandy Soil (looking down the wire)

The maximum power in **Fig07** is radiated at 24 degrees above the horizon when the 10M dipole is mounted at 20 ft. of height.

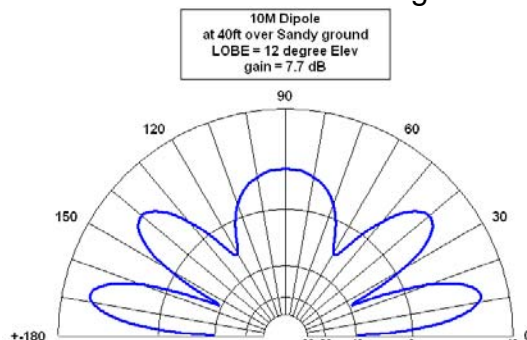


Fig 8 – Maximum Radiation of 10M Dipole at 40FT over Sandy Soil is 12 degrees above the Horizon

The final elevation radiation pattern (as shown in **Fig 9**) is for a 10M 2-ele beam that is mounted only 16 feet high.

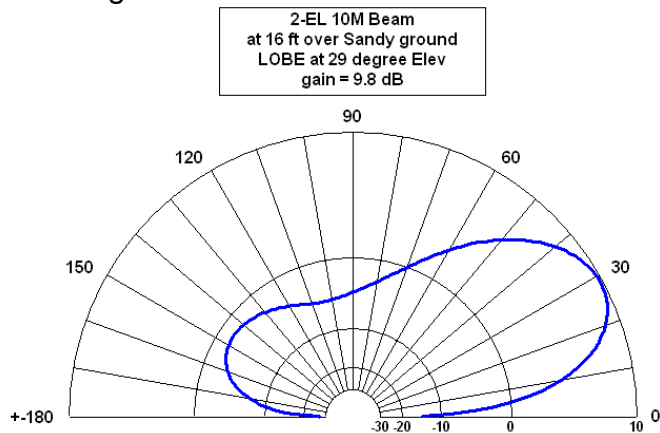


Fig 9 – Maximum Radiation of 10M Beam at only 16FT over Sandy Soil is 29 degrees above the Horizon

It can be clearly seen in **Fig09** that the beam has a created a reasonable front-to-back ratio of more than 10 dB.

The Antenna Modeling software will also display the azimuth radiation pattern of an antenna (that is: looking down from above the antenna).

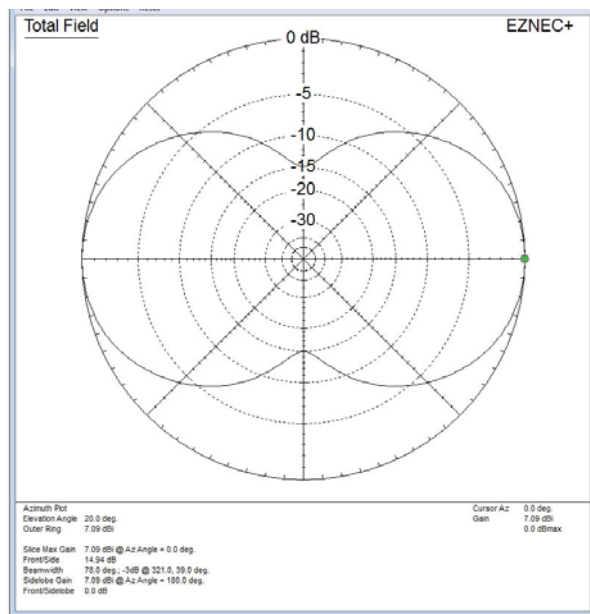


Fig 10 – Azimuth Radiation pattern for typical 12M dipole (courtesy Bernard Huth W4BGH)

Fig10 illustrates the radiation pattern of a typical dipole is strongest “broadside” and is fairly weak off the ends of the dipole. As mentioned earlier in the article, Fig06 illustrates the azimuth radiation pattern for a 6 element 29M beam that has terrific front-to-back ratio.

Designing a Shortened 30M Antenna

A normal 30M dipole is almost 45 feet long. I wanted something much smaller...so I set a goal of about 14ft...literally 66% shorter in length. **Fig11** shows the basic results my NEC-Win model program calculations.

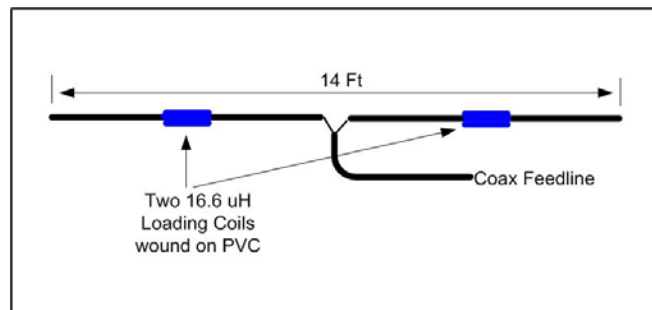


Fig 11 – Concept of 14ft-long Shortened 30M Dipole using Four Pieces of Aluminum Tubing

This concept in **Fig11** looks pretty simple. But, my first question is really...how well will it perform??? I don't want to go to a lot of effort on this project, so I made up my mind that I wanted to stick this up in the air on a 10 or 12 ft piece of wood (cheap tower). But, I recognized that 12 Ft elevation is not a lot of distance above ground for a 30M antenna. A good rule of thumb for a horizontal 30Meter antenna is $\frac{1}{2}$ wavelength above ground...and my plans are only 12 ft. In **Fig12** let's look at the radiation angle of attack using a NEC-Win elevation output for this 30M horizontal antenna at 12 foot of height.

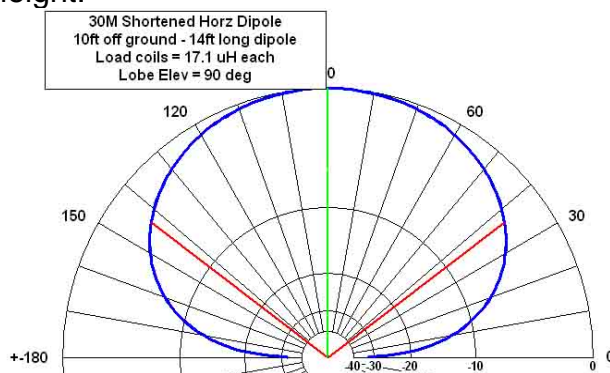


Fig 12 – Elevation Plot of 30M Shortened Horizontal Dipole at 10 Ft above Ground

In **Fig12**, the strongest radiation is STRAIGHT UP when a horizontal dipole is only 10 ft above ground. Most of the radiation energy is going straight up!!! But, I did not want a “cloud warmer” antenna!! There is

not too much DX straight up in the air!!! Even for local stations, very little radiation from **Fig12** is pointed near the horizon.

Well, I decided to use the modeling program to look at using a shortened **vertical** antenna instead. The solution for a better antenna could be rotating the dipole into a vertical orientation because vertical antennas do not have the same “above ground” radiation patterns as horizontal antennas. Now a classic 1/4 – wave vertical requires “messy/awkward” radials. But, if I rotate the dipole to become vertical, the lower half of the dipole works exactly like a well laid out set of radials. So, no “messy” radials to worry about.

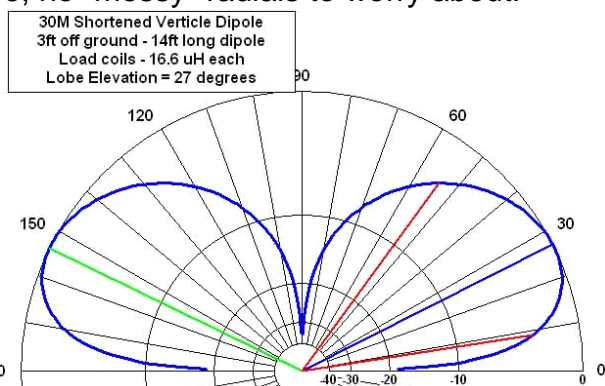
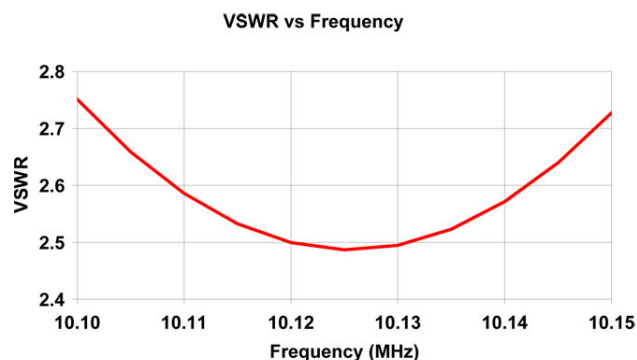


Fig 13 - Elevation Plot of 30M Shortened Vertical-Dipole with bottom at only 3 Ft off Ground.

Fig13 shows what the radiation elevation plot looks like for the 30M dipole that has been turned vertical. This is a much better radiation pattern than shown in **Fig12** using the **same** antenna!!! The main radiation lobe is 27 degrees above the horizon. There is no radiation going “straight up” at 90 degrees.

The SWR analysis prediction plot for the shortened 30M Vertical-Dipole using the modeling software came out extremely close to the results of the real antenna that I built. I only had to add



— 30m-ultra-short vert-dipole-rev06 16.5 uH extended 0.9-in each side

Fig 14 - SWR Plot of shortened 30M Vertical-Dipole As predicted by the modelling software

about 2.0 inches of wire to each end to allow the SWR dip to be centered on the 30M band.



Fig 15 – Finished Construction of shortened 30M Vertical-Dipole using 4-pcs of tubing

Conclusion

I have found that Antenna Modeling software like EZNEC can really help you design or improve antennas. But you need to invest time to learn how to use the software program. One surprise about antennas that I learned was the grounding system at the station/antenna does NOT affect performance for beam antennas. It is mainly for electrical safety.

Other Modeling Software Information

- **NEC2** – was designed by Lawrence Livermore Labs
- **EZNEC** - uses NEC2 “core” software with Windows GUI
 - by Roy Lewallen, W7EL
 - www.eznec.com
- **NEC-Win** – uses NEC2 “core” SW with GUI
 - by L. B. Cebik, W4RNL (SK)
 - **NO LONGER SOLD**
- **MINI-NEC** – simplified NEC2 to run on slow PCs
 - fairly obsolete and inaccurate
- PowerPoint presentation file on Antenna Modeling Software by Ken W6HHC
 - see www.W6ZE.org/Newsletter/ITEMS-of-INTEREST/ITEMS-of-INTEREST-index.html

Short Circuit Protection

Follow-up to "Lightning Protection"
by Corey Miller KE6YHX

Covered in the Winter 2013 RF article series was my rig's outer layer of protection, "Lightning Protection." There is also an inner layer, Short-Circuit Protection. To ground the rig against short-circuits, the grounding wires that come from each device (antenna switch, antenna tuners, transceivers, power supply, etc.) must be electrically connected to the ground of the corresponding breaker panel. In my rig, I screwed the ground from each device to an aluminum plate that is attached to the underside of the rig table as a Ground Bus, using tongue-ring lugs. Then the plate has a single, stranded 10-gauge insulated wire attached the same way (see Fig 1 below), and runs through a hole in the floor and out through a crawlspace vent, to the ground on the air conditioner circuit panel less than a foot away; this runs straight back to the breaker panel.

The reason that necessitates this arrangement is the fact that when a device experiences a short circuit, the fuse or circuit breaker there to protect it needs the amperage running through the power to the ground to be greater than its rating, which is commonly around 30A. If the rig's ground connection runs only to an actual ground rod, the current has to run through the earth to the breaker panel to complete the short circuit, and its resistance can be enough to prevent the breaker from tripping. This potentially lethal arrangement is often overlooked, and sometimes regulations prohibit this solution.

Since my antenna switch is grounded to both the breaker and the coax shields, the PolyPhaser panel and the ground rod are also electrically connected to this ground. As recommended by Dennis Kidder in his presentation at the OCARC, the entire rig has a common ground. Coming up in my next article, Lightning Protection Checklist...

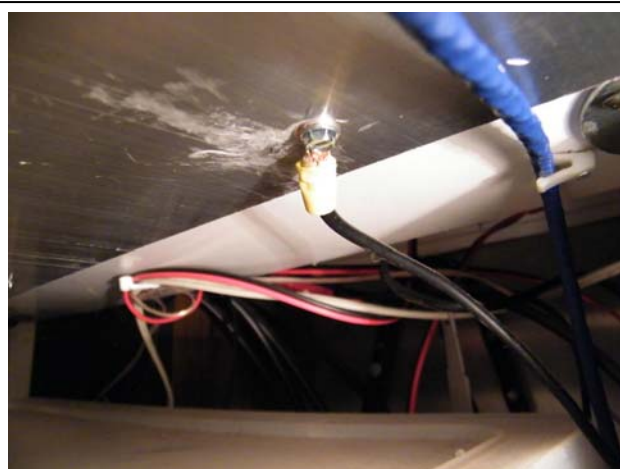


Figure 01 - The 10-gauge insulated ground wire (black, I did not have any green on-hand) connects to the aluminum ground bus with a tongue-ring lug.



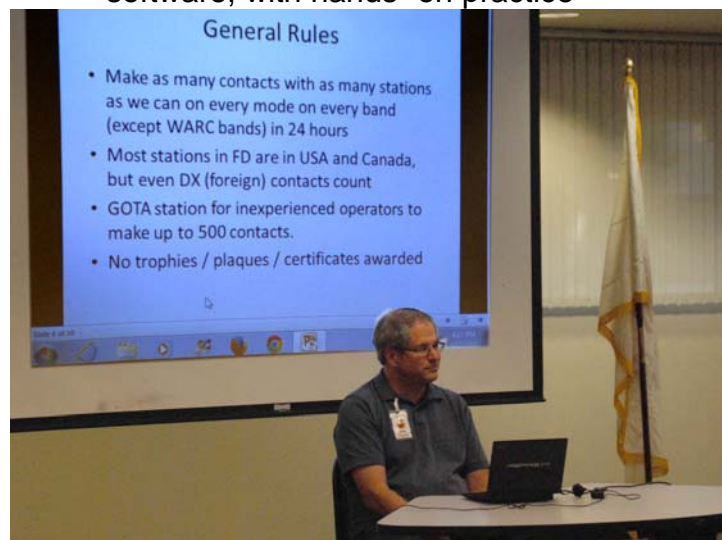
Figure 02 – Black ground wire is seen here coming in the bottom-right of the air conditioner circuit panel. The blade connector and plastic cover are removed in this photo.

OCARC General Meeting MINUTES 2015-04-17

The OCARC General Meeting was held at the Red Cross Complex on April 17th 2015. The meeting was called to order at 7:01 PM. There were a total of 28 members and visitors in attendance.

Prior to the General Meeting beginning, **professor Tim N6GP** conducted an hour-long Field Day University class to train hams-new-to-FD what goes on at FD and how to correctly perform certain aspects of operating at FD. The agenda covered by this FD University class included:

- Introduction to Field Day – What is it?
- How to call CQ
- What is “Search and Pounce”, and when to use it
- Use of Phonetics
- Use of the N3FJP Field Day logging software, with hands- on practice



**Professor Tim N6GP explains FD Philosophies
During Field Day University**

Our speaker for the evening was OCARC member **Ken Konechy W6HHC** talking on:

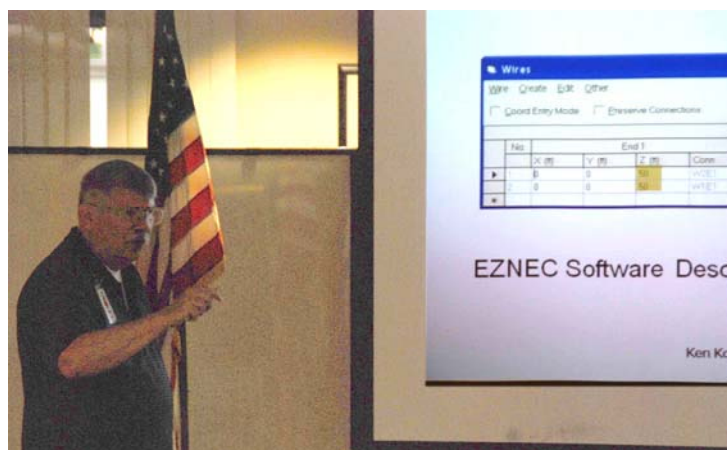
"Antenna Modeling Software..."

Ken W6HHC explained that Antenna Modeling software can:

- Teach you more about antennas
- How to design better antennas

- how to predict antenna performance
- how to “tune” for performance

Ken reported that the most popular ham-grade modeling software today is called EZNEC by W7EL (cost around \$85). See www.EZNEC.com



**Ken W6HHC explains how to
describe an antenna using EZNEC**

Ken's PowerPoint file from the presentation can be found on the OCARC web site www.W6ZE.org under **ITEMS of INTEREST** (on the left-hand side of the front page),

OLD BIZ

There was a quorum of directors present at the business meeting, with only one director absent, Roland WW6RK.

• Field Day

- Don N6XBP reported on the current list of Band Captains for FD
- Greg W6ATB volunteered to store the clubs aluminum tower sections until FD.
- Agenda planned for next FD University class by Tim N6GP is:
 - How to CQ and hold a frequency
 - How to deal with pileups
 - Radio Features you need to know (RIT, etc.)
 - How to set your audio level
 - Difficult ARRL Section Names
 - Advanced tips on N3FJP software
 - Hands-On logging Practice
- Club is seeking a sponsor for FD food.
- Next FD planning meeting is scheduled for May 7

Respectfully submitted by:
Ken W6HHC - secretary

OCARC BOARD MEETING MINUTES

2015-05-02

The OCARC Board meeting was held at the Marie Callender's Restaurant on Grand Ave in Santa Ana on May 02 and called to order at 8:10 AM. There were a total of 7 directors and members attending. There was a quorum of Directors with Doug K6PGH, Robbie KB6CJZ, Don N6XBP and Roland WW6RK absent.

DIRECTOR REPORTS:

- **Treasurer** – Greg W6ATB reported that he has set-up the clubs financial records on Windows version of Quicken. It turns out that Mac version of Quicken looks/functions very differently and would take a huge investment of time to come up to speed.
- **Membership** – Don N6XBP was not present, but the board noted that a Membership Roster for 2015 needs to be published soon.

OLD BIZ:

• Newsletter Editors

- May – Greg W6ATB
- Jun - Tom W6ETC
- Jul - Nicholas AF6CF
- Aug - Tim N6TMT
- Sept - Paul W6GMU
- Oct - ??
- Nov - Greg W6ATB

• Program Speakers for Club Meetings

VP Tom W6ETC announced:

- May will be Nicholas AF6CF on "small portable HF station"
- June will be Chip K7JA - probably on "Radio Telescope in Puerto Rico".
- July will be Bill K6ACJ - probably on "Raspberry Pi computer"

• Field Day 2015

- Tim N6GP reported that he has told School District he will turn in forms by Mid May.
- Greg W6ATB reported he will request "FD Insurance Rider" this

• Field Day 2015 – cont'd

- Food Chair Tim N6TMT has set the meal donation levels at \$30 per weekend (four meals) or \$7.50 per meal. This increase will allow for the rising cost of food. Tim N6TMT will emphasize that this price should be considered a "donation"...and that members should donate "what they can afford".
- The Board agreed that we should allow both Boy Scout Troops to attend OCARC FD if they want. Tim N6TMT will be the point-of-contact for Troop 788 (Redondo Beach) and confirm their commitment. Tom W6ETC will be the point-of-contact for the CARA-associated Scout Troop 440 and will confirm their commitment.
- Ken W6HHC reported that he had set up a **OCARC-FD** Yahoo group forum for OCARC usage. Ken will broadcast the availability of this club Yahoo Forum and invite club members to subscribe to get FD info.
- The Board agreed that a Field Day budget needs to be approved by the club membership. It will be best if the FD budget can be prepared and voted upon by the May meeting. Ken W6HHC said he will e-mail out a copy of 2014 FD Budget to board members to use as a template.
- The next FD planning meeting is planned to be held on Thursday May 7.
- **Location of Future Board Mtg** – The Board of Directors agreed to hold **ALL** future Board meetings (and breakfast) on the first Saturday, at Marie Callender's Restaurant at 1821 N. Grand Ave, in Santa Ana (North of 17th Street).

GOOD OF CLUB:

Low-power Portable Equipment – Nicholas AF6CF discussed some philosophy to be considered for choosing low-power rigs and equipment for portable field operation. This discussion was a preview of what will be covered during his program at the OCARC May general meeting.

Respectfully submitted by:
Ken W6HHC - secretary

Estate Sale of Phil KI6VEN (sk)

If anyone is interested in any of these items,

Please contact me at 714-573-2965 or N6HC@aol.com

Thank you, Arnie N6HC

Yaesu FTdx5000.....	\$3,800
Yaesu SM-5000 station monitor.....	\$ 275
Yaesu Speaker & filters.....	\$ 100
Yaesu DMU-2000 data management unit...	\$ 725
Ameritron AL-80B with Grid overload protection Boar...	\$1,050
Yaesu FT-2000D...	\$2,200
Yaesu MH31B8 Microphone...	\$ 45
Yaesu SP-2000 External Speaker...	\$ 100
Yaesu Remote Control Keypad...	\$ 65
Yaesu FP-2000 power supply...	\$ 350
Yaesu FT-301D ...	\$ 150
Yaesu FP-301 power supply...	\$ 50
Kenwood TS-850S ...	\$ 650
Kenwood SP-31 Speaker ...	\$ 50
Drake R4B and MS-4 Speaker ...	\$ 230
Drake R4C and MS-4 Speaker ...	\$ 370
Astron RS-12A ...	\$ 50
Astron RS-50A...	\$ 200
Timewave DSP-59+ ...	\$ 175
Hallicrafter S82 FM 30-50 MHz receiver...	\$ 50
Vertex MLS-100 mobile speaker...	\$ 45
GE 40 channel CB radio station Help 34-5908, 4 watts ...	\$ 40
Palstar AT-2K antenna tuner ...	\$ 400
Dentron Jr. antenna tuner ...	\$ 40
Dentron Super Super antenna tuner AT-3KW (10-160M) ...	\$ 175
MFJ 945-D antenna tuner (30-300W) ...	\$ 60
LDG memory tuner AT-200-Pro (5-200W) 6-160M ...	\$ 150
MFJ 1700-C 6 position antenna switch / surge protector ...	\$ 60
Heil Headset with microphone ...	\$ 100
Sony Stereo Headphones MDR-V700 ...	\$ 200
Telex C-1320 headset (20 ohm) ...	\$ 30
Telex C-610 headset (16 ohm) ...	\$ 30
MFJ-392B headset ...	\$ 15
Coby Headphones CV-195 noise cancelling ...	\$ 35
MFJ 462B multi-reader...	\$ 100
Signalink – Tigertronics Radio Interface & Sound card with Yaesu cable ...	\$ 60
Heathkit HO 1416 code practice oscillator ...	\$ 20
QSA-805 Dynamic microphone ...	\$ 100
Labtec AM-22 microphone ...	\$ 4
Panasonic microphone ...	\$ 4
Astatic D-104 with T-UGB stand ...	\$ 75
Astatic DN-HZ microphone ...	\$ 145

GE regulated Power Supply Model 5-1210, 13.8V – 2.5A ...	\$ 40
P3 International Kill A Watt Electronic usage monitor ...	\$ 10
Yaesu – YSK-7800, Separation Kit ...	\$ 6
Vertex Standard CT-119 programming cable ...	\$ 30
Pace P-5453 dual meter (SWR, Field strength,...)	\$ 25
Micronta triple meter (SWR, Field strength, modulation) 21-522 ...	\$ 25
Tektronix Oscilloscope T-922 ...	\$ 150
Alliance dual speed rotator controller ...	\$ 28
Cushcraft MA-5 B antenna ...	\$ 250
Cushcraft R-7 Vertical ...	\$ 100
Rohn Tubular mast...	\$ open
Ronard “Y” type chimney mount No. 15-1218 ...	\$ 15
Polyester antenna rope 100 ft 3/32” ...	\$ 8/ea
Longines Symphonic Portable Short Wave radio ...	\$ 25
Grundig 4070 U AM/FM/Short Wave radio (circa 1964) ...	\$ 200
Harbor Freight 580 Pc terminal set ...	\$ 5
Guardian camp lantern GN-60115 with AM/FM radio ...	\$ 10
Osaka Koha Voltage adjuster Model IV-300N ...	\$ open
Bushnell Citation Insta Focus binoculars ...	\$ 15
Drill Master Cordless Drill with Flashlight 18V # 69652 ...	\$ 15
Sony Infrared Receiver PCVA-IR8U ...	\$ 5
HP 20” Flatscreen LCD W2071D with LED backlight ...	\$ 75
Viewsonic 19” LCD flatscreen VX1962WM ...	\$ 100
Western Digital “My Book Essential” external 3 TB hard drive ...	\$ 75
RT Systems USB-63 (USB to DB9 interface cable) ...	\$ 15
Shaxon USB 2.0 AM-AF cable – 6 ft - ...	\$ 2
I dot connect USB 3.0 AM-AM cable – 10 ft - ...	\$ 5
Sabrent USB – floppy disk drive Model SBT-UFDB ...	\$ 10
Diamond multimedia Wireless-N USB adapter ...	\$ 15

HAMCON 2015

HAMCON 2015

The 2015 ARRL Southwestern Division Convention is September 11-13, 2015, at the Torrance Marriott South Bay Hotel, 3635 Fashion Way, Torrance, CA 90503.

Check our website at:

www.hamconinc.org

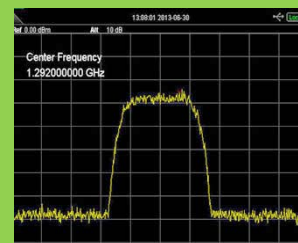




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- RF output level up to 10 dBm (min) all bands (DVB-S)
- Software Defined Radio (SDR) architecture allows many variations of IQ modulations
- "Software-Defined" allows new features to be added over the next few years, without changing the hardware board
- As extra bonus, the team has been able to get the board to transmit DVB-T 2K mode, however we cannot guarantee the performance of that protocol. Caveat Emptor!
- Requires PC or ODROID running Ubuntu Linux (see User Guide)
- Price is US\$300 + shipping – order using PayPal



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