HF Update

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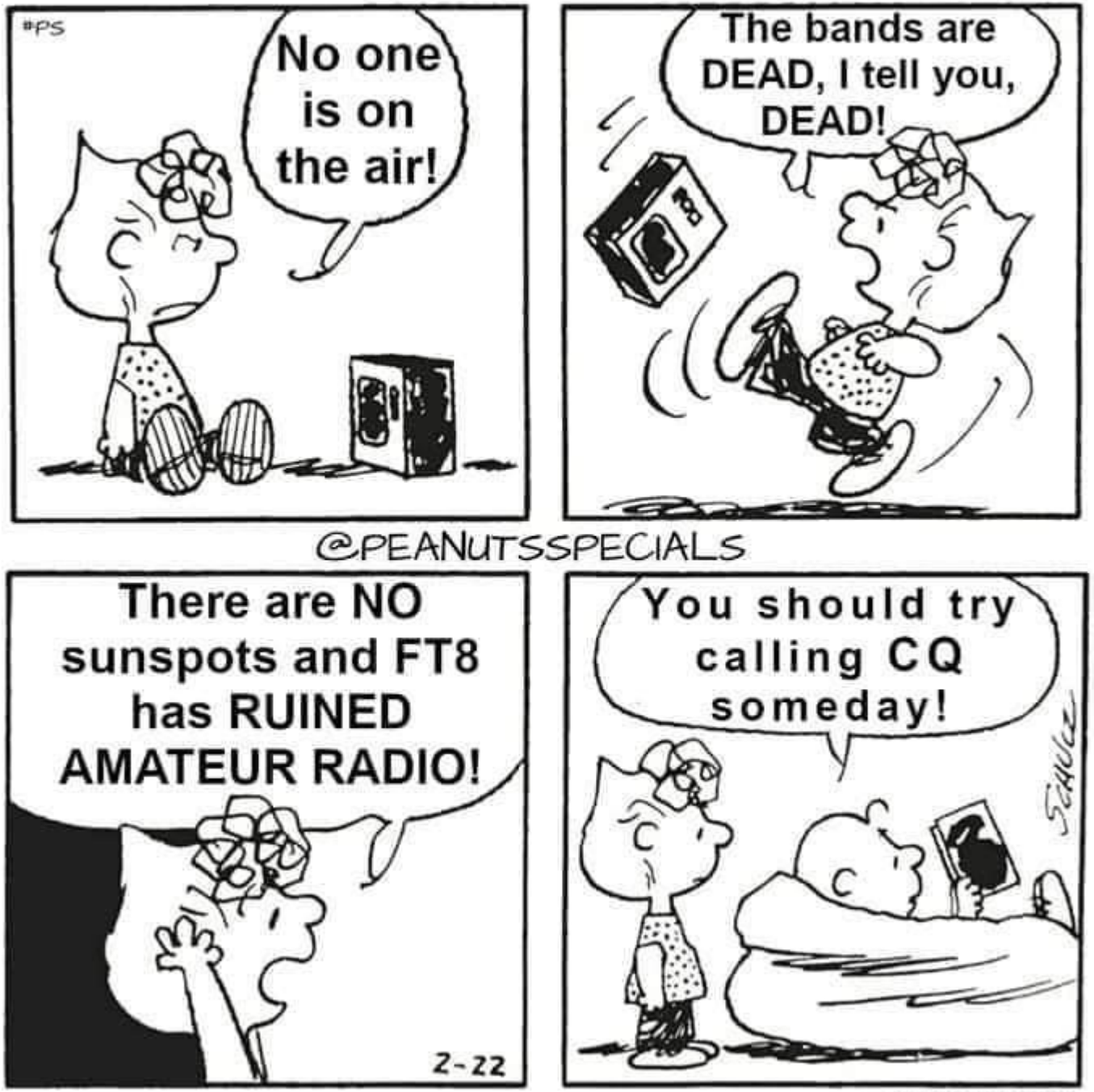
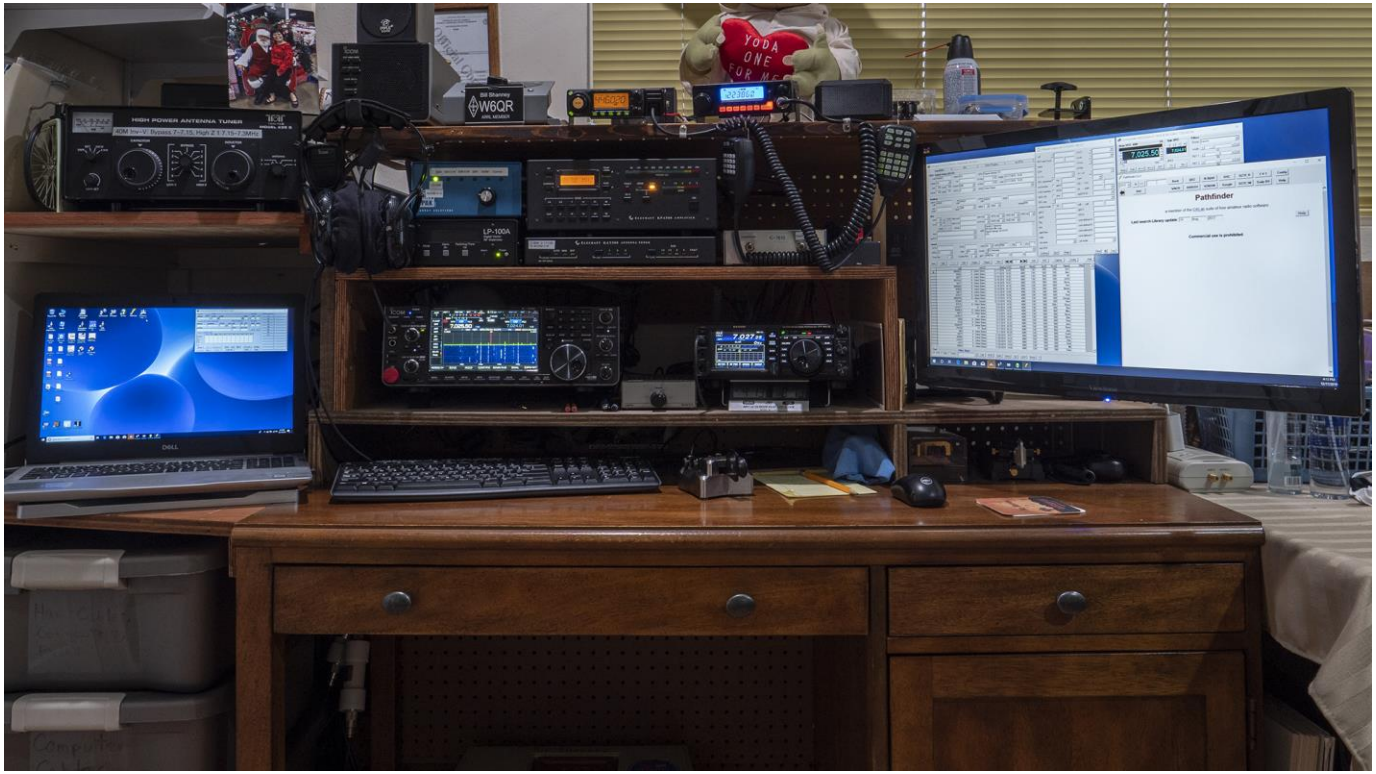
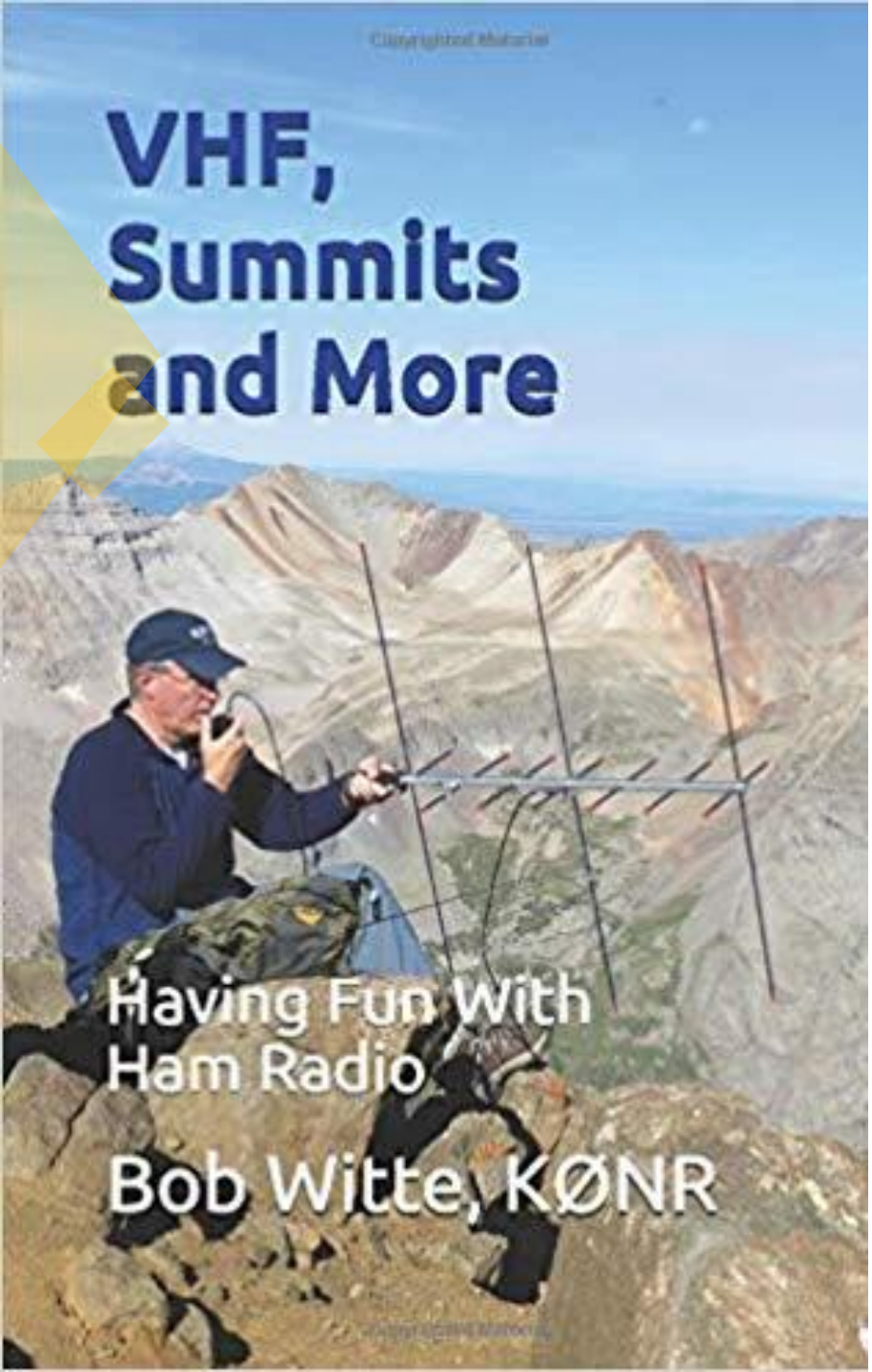
April 2020


#PS
No one is on the air!
The bands are DEAD, I tell you, DEAD!
@PEANUTSSPECIALS
There are NO sunspots and FT8 has RUINED AMATEUR RADIO!
2-22
You should try calling CQ someday!
Schulz
02221986

Today’s Topics

- HF Antennas for Home and Portable Operating
- Transceiver Update
- Setting up a Station





Book Recommendation

- A Good read for all hams, especially for new folks
- Some really good philosophical discussions

- *"The universal purpose of ham radio is to have fun messing around with radios"*

HF Antennas for Home and Portable Operating

- I recommend the new ARRL Book *HF Dipole Antennas*
  - Space efficient designs
  - Portable designs
  - Some new ideas not previously published
  - Many ideas that can be built upon
- My portable recommendations have not changed for the present solar minimum conditions
  - End or center fed dipoles work well when short skip is open
  - Verticals with as many radials as possible do well for the longer distances
- For portable work many local parks do not allow wires in the trees
  - Use a telescoping mast of some sort to get the center of your dipole up >25’

Transceiver Needs

- Rob Sherwood has long advocated that the average ham only needs 85-90dB Third Order Dynamic Range (DR3)
- There is a DR3 contest going on among the major manufacturers right now. They are on a “more is better” campaign….Don’t fall for it.
- There are plenty of good radios with >85dB DR3 available today. Pick one that has the features you want, fits your budget and has ergonomics you feel comfortable with.
- Beginners should not buy a high-end radio. The learning curve is steep, even for experienced Hams. You may get discouraged by the complexity. Operating should be fun, not frustrating.
- Today’s radios are so good you don’t have to tweak every knob to have a good signal-to-noise ratio (SNR).

Receiver Performance Summary

**Res.
QRN

40M

20M

10M

Ref. Sig. Level

Table 1: Dynamic Range by Radio				
2 kHz Spacing DR3	Signal Level Causing 3rd Order IMD = Noise Floor*	Radios in This Class		
55 dB	S9	FT-757		
60	S9+5 dB	FT-101E		
65	S9+10 dB	KWM-380	FT-2000	FT-1000D
70	S9+15 dB	TS-830	FTdx1200	IC-761
75	S9+20 dB	IC-756 Pro II/III TS-850	IC-7410/7600 /7700	FT-950 FT-450D IC-781
80	S9+25 dB	Ten-Tec Omni VI+/VII	IC-7800 IC-765	FTdx3000
85	S9+30 dB	R9500	TS-990/590S	FTdx9000
90	S9+35 dB	Ten Tec Eagle Ten Tec Orion I	FLEX 6400	TS-590SG
95	S9+40 dB	Ten-Tec Orion II	IC-7300 IC-7610	Flex 6600 /6700
100 dB	S9+45 dB	Elecraft K3, KX3, TS-890	FTdx5000, FTdx101D IC-7851	Apache ANAN 7000DLE

CW needs

Vertical or Low Dipole

Yagi up >50'

Big East Coast Contest Station

*Receiver Noise = -128dBm in a 500Hz BW. Chart Format copied from Rob Sherwood, NC0B
**Dynamic Range requirements are reduced by atmospheric noise at your location.

New Transceivers

The new Kenwood TS-890 is a single receiver radio to fill in the middle of their product line ($4K). I don't think the TS-990 is selling well. Rob Sherwood thinks highly of it for a contest radio

-TS-590sg is still a bargain

New Transceivers

The new Yaesu FTdx101MP/D is an outstanding performer. It is an analog design based on the FT-5000 (9MHz 1st IF) with a built in SDR for the display. It has an improved synthesizer which helps both RMDR and transmit noise.

-MP version is 200W with power supply, ~$5K

-D version is 100W, ~$4K

Dual receivers make it a good choice for a DXer

Transceiver Choices

- If you live in an area with lots of hams running high power, you may be better off with the new Yaesu or Kenwood analog radios. All digital radios saturate at a lower input power.
- Some hams just prefer a particular brand. Today you can't go wrong, although a serious DXer might not be happy with the TS-890 and its single receiver. The TS-890 is a favorite of contesters because of its flexible spectrum scope.
- More budget minded hams or those with more modest needs will be very happy with the IC-7610 (or IC-7300)
- FLEX continues to round out their 6000 series with the 6400 and 6600. They learned a lot and have a better-balanced feature set along with lower prices
- Those who must have all the features and Elecraft fans may want the K4. You can get a very good deal on a used K3s these days.

Beginners Transceiver Requirements - Cost

- I mention cost, since it is sometimes a deal breaker.
- There are very good new beginner's radios available for <$1500
  - FTdx1200 ($880) (81dB DR3, rudimentary spectrum scope, lowest cost)
  - IC-7300 ($1100) (95dB DR3, excellent spectrum scope, no front-end filters)
  - TS-590SG ($1400) (94dB DR3, excellent front-end filters, no spectrum scope)
- There are many transceivers available for <$1000. They are not designed to be used on crowded bands but are otherwise good radios:
  - IC-718 ($640)
  - IC-7200 (portable) ($720)
  - FT-450 (mobile) ($680)
  - TS-480SAT (mobile) ($850)
  - Alinco DX SR9T ($570)
- HF/VHF/UHF multi-mode radios worth considering
  - IC-7100 ($770) (68dB DR3)
  - FT-991A ($1100) (75dB DR3, improved spectrum scope)
- Last generation used radios can usually be had for 25-30% less

Beginners Station – Rag Chewing

- Technician License holders will have SSB privileges on 15/40/80M soon (200W power limit)
- The IC-7300 continues to be my recommendation for a beginner's station
  - Full featured
  - High performance
  - Great ergonomics, fun to use
- Resonant antennas for 20/40M or 15/40M
  - Multi-dipole
    - Including Skeleton Sleeve dipole
  - Off Center fed 40M dipole
  - Verticals work well during the solar minimum

Beginners Station - Contesting

- The Kenwood TS-590SG analog radio is more bullet proof in a big signal environment
  - Provisions for an external SDR spectrum scope
  - Very high performance
  - Kenwood has great audio
- Three element Yagi as high as you can get it for 20M
  - Up 35-50’ for state side and local contests
  - Spatial rejection is significant
  - Adds 1 s-unit to Tx/Rx signal levels
- 40M dipole as high as you can get it
- Antennas are a big discriminator for contesting
- Remember you can’t compete with the big boys

Station Accessories

- SSB operation
  - A good quality MIC plus a foot switch and comfortable headphones or a good quality headset plus a foot switch
    - A MIC needs to be held close to your mouth to reduce room noise
  - Comfort can not be over emphasized for headphones
  - Decide for yourself, don’t choose because your friend has one
- CW operation
  - Comfortable headphones
  - A key you are comfortable using. It took me many years to find a key I liked to use
  - An external keyer can be used with multiple radios. Each keyer has its own personality (i.e.: timing) and changing can affect your error rate

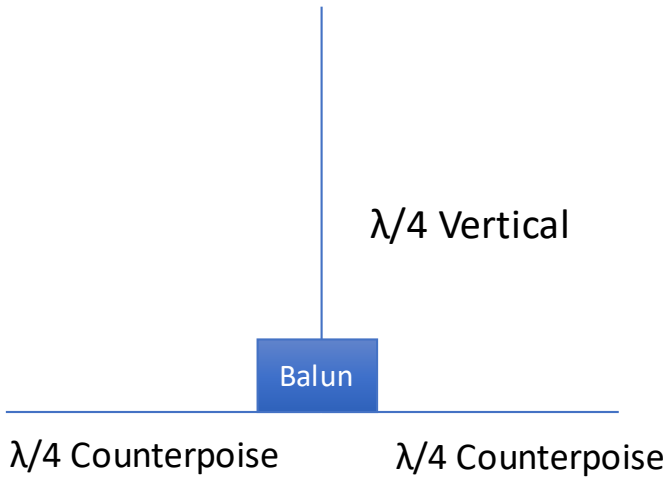
Station Accessories

- Power Supplies
  - Analog supplies are bigger and heavier but have lower noise
  - Switching Supplies are small and light, but some models have high RF noise that can interfere with reception
  - A 13.8V, 25A supply is fine for a modest station. A 35A supply may be required for a more complex set-up
  - Batteries may not have enough voltage when DC wiring IR drop is considered. A voltage booster should be used (West Mountain Radio Super Booster has low noise).
- Computers/Monitors
  - I was a holdout for many years
  - Today I like computer logging and looking up a station on QRZ.com during a contact.
  - I find a modest laptop meets my needs
  - I use a larger monitor for logging and QRZ reading
  - Beginners should keep operating programs to a minimum

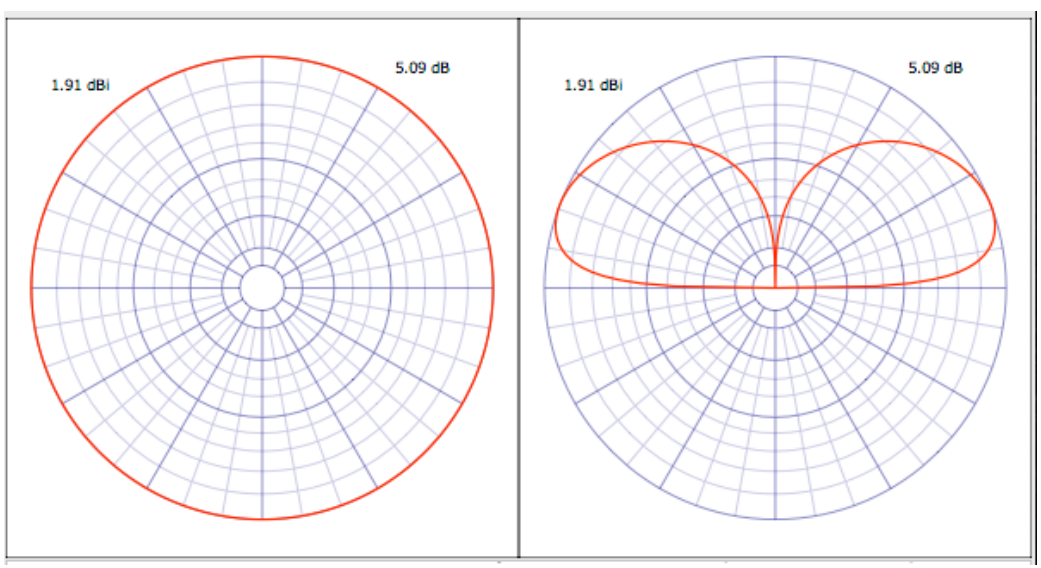
Skip Distances

Radiation Angle	Single Hop Distance (miles)		Antenna Gain (dB)	
(degrees)	f1 layer	f2 layer	Vertical on Gnd	Dipole @ λ/4
5	1200	2300	-2	-8
10	800	2000	1	-3
20	500	1200	2	2
30	300	800	2	5
40	240	650	0	6
50	200	500	-2	7
60	200	400	-4	7

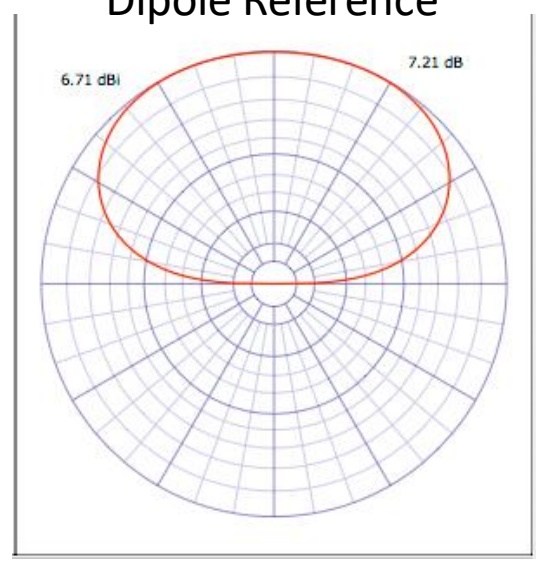
Quarter Wave Vertical



- The analysis shows 40M performance with 16 counterpoise wires
- Lower gain than a dipole
- Lower radiation angles, omnidirectional
- Less high angle radiation, poor for local contacts



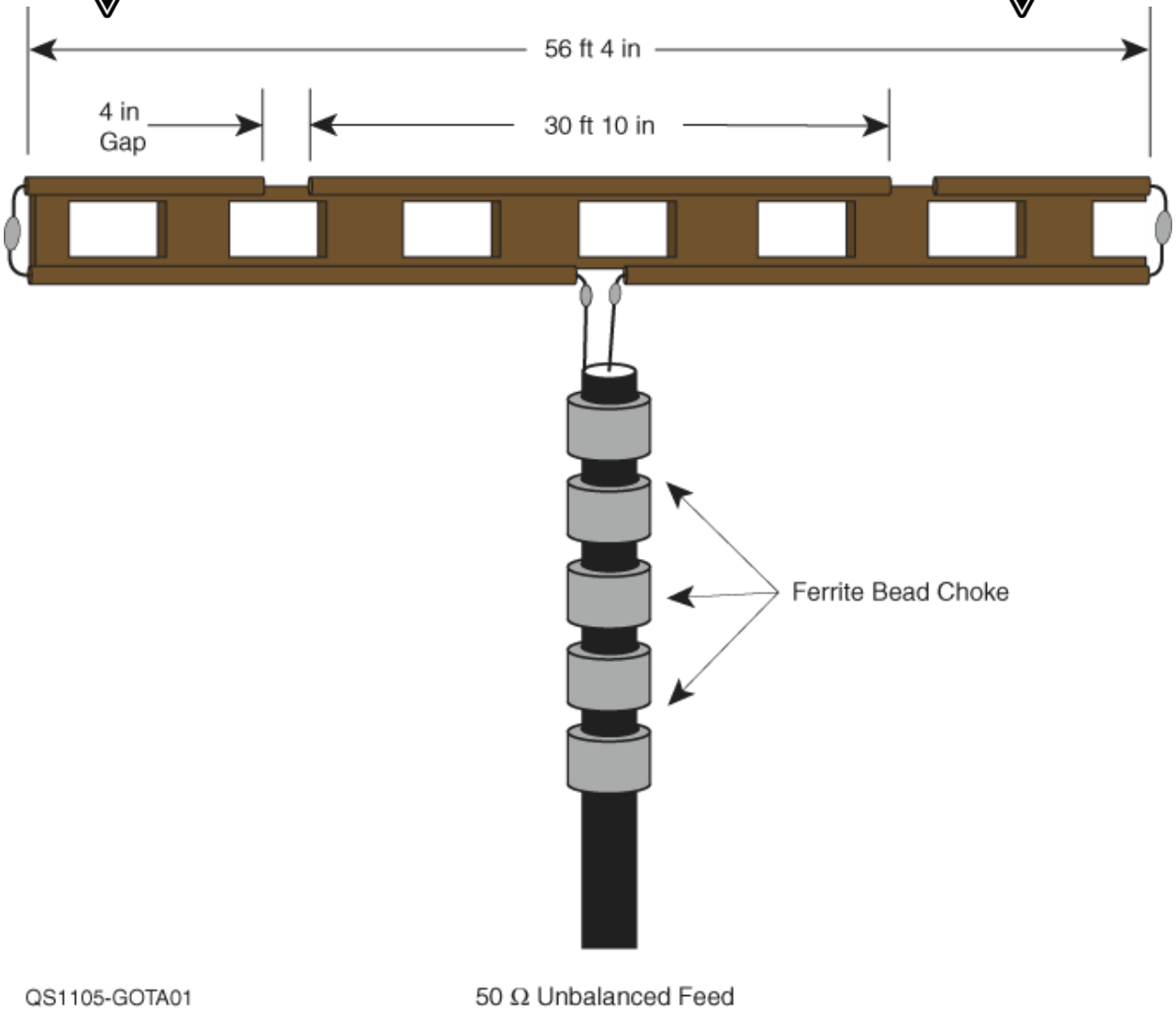
Dipole Reference



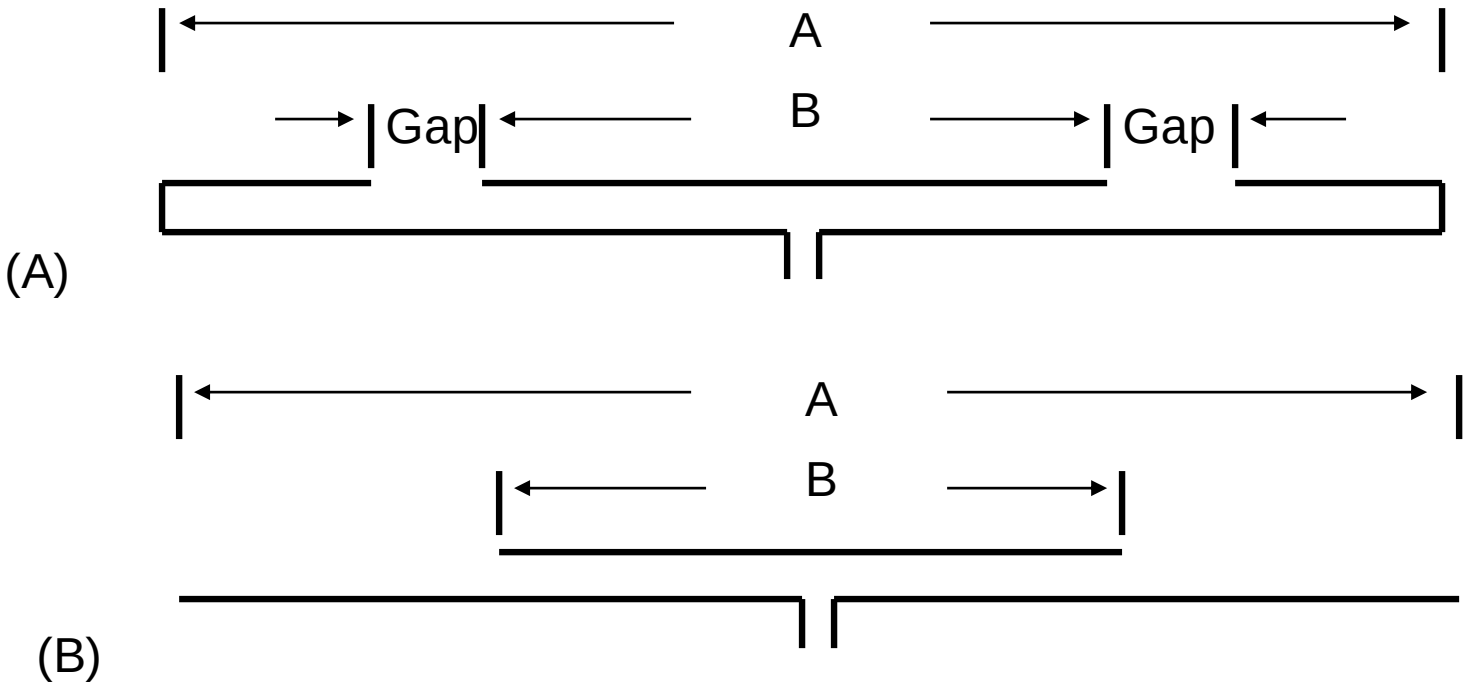
Dual Band Resonant Antennas – 40/20 Meters

- No radial vertical
  - Not the 80M models
- Multi-dipole
  - 2-3 bands with a common feed-point
- ZS6BKW doublet (40/20/17/10M)
- Offset fed dipole
  - Commercial models work well
- Skeleton Sleeve dipole
  - See next charts
- End fed half wave
  - Popular due to Face Book Group…not recommended for beginners
  - May be fussy in some configurations
  - Transformer must be properly made, layout critical
  - OK for portable OPs with an antenna tuner

The American Radio Relay League



"Folded *Skeleton Sleeve*" from May 2011 QST


A
B
Gap
Gap
(A)
A
B
(B)

Folded Skeleton Sleeve Antenna Dimensions (Figure 1A)

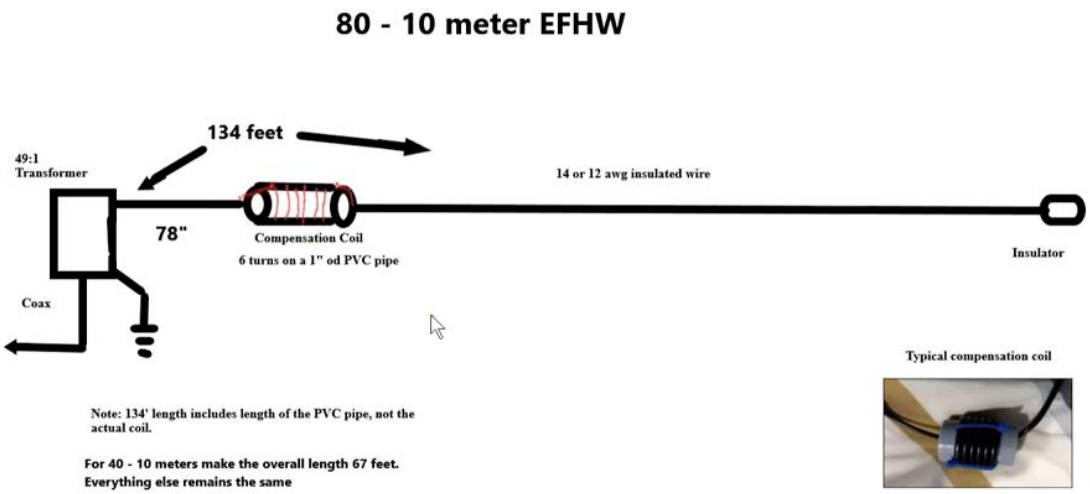
Bands (Meters)	*A (Feet)*	*B(Feet)*	*Gap (Inches)*
160/75	210	114	24
80/40	111.4	61.5	12
80/30	104	43.2	4.8
80/10	96	15.4	9.6
75/60	110.6	81.4	3.6
75/40	107	60.8	7.2
74/41 (MARS)	100.2	59.8	7.2
40/30	58	43	6
40/20	56.3	30.8	4
30/20	42	30.7	7.8
30/17	40.8	24.08	5.5
20/17	30.6	24	4.2
20/15	29.6	20.5	9.1
20/10	27.6	15.4	3.6
17/15	24.3	20.5	9.0
17/12	23.6	17.4	9.6
17/10	23.2	15.3	10
15/10	20	15.3	4.2
10/6	14.4	8.3	5.6
6/2 (CW/SSB)	7.4	3.0	3.6
6/2 (FM)	7.1	2.9	4.2
4/2 (UK)	5.4	3.0	2.25

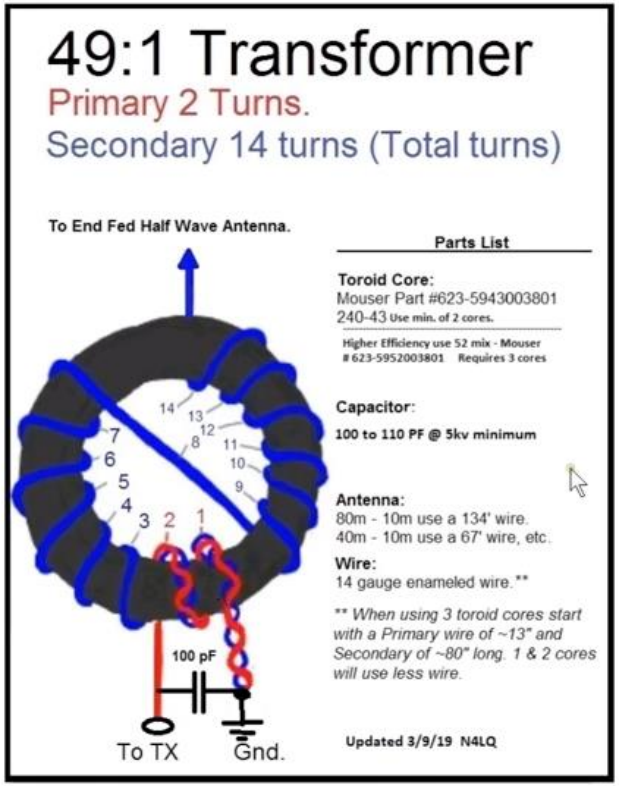
Unfolded Skeleton Sleeve Antenna Dimensions (Figure 1B)

Bands (meters)	*A (Feet)*	*B(Feet)*
75/60	*121*	*81*
40/20	*64**	*30.8*
30/17	45.6	24.3
20/17	*32*	*24*
20/15	*32.3*	*20.5*
17/12	*25.3*	*17.4*
17/10	*25.3*	*15.3*
15/12	*21.4*	*17.3*
15/10	*21.3*	*15.3*
12/10	*18.24*	*15.14*
6/2 (CW/SSB)	8.9	3.0
6/2 (FM)	8.6	2.9
4/2 (UK)	6.3	3.0
2/70 cm (FM)	3.0	11 inches

*64 feet for uninsulated 40 meter extension,
63.4 if window line used for full length (recommended).

End Fed Half Wave Wire

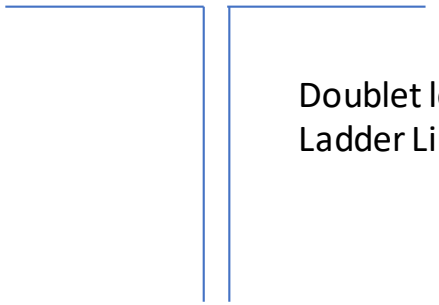




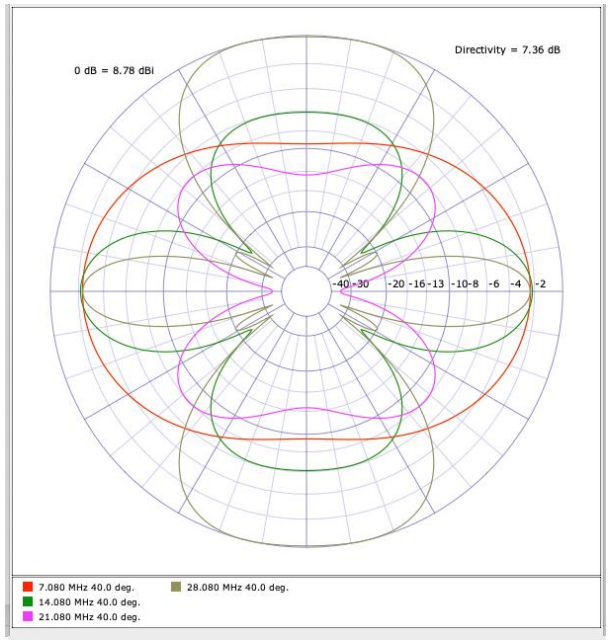
- 40/20M design is 67’ long
- Compensation coil improves 20M resonance
- 49:1 transformer physical layout important for high power
- 40M pattern is a dipole
- 20M pattern is a cloverleaf, Inv-V or Inv-L fills in nulls
- I suggest buying a transformer if you are a beginner

Steve Ellington, N4LQ, has excellent You Tube tutorials

All Band Ladder Line Fed Doublet



Doublet length 96’ (analysis example)
Ladder Line Feed



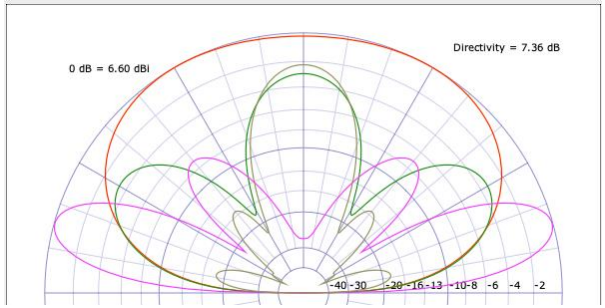


Table 1 Recommended Antenna and 300 Ω Ladder Line Feedline Length for Shortened Multi-Band Dipoles for easier tuning		
Frequency Range (MHz)	**Shortened Dipole (Ft.)**	**Make feedline an Odd Multiple of this length in Feet (x 1, 3, 5, etc.)**
1.8 - 30	220	60.1
3.5 - 30	110	30.9
5.3 - 30	76	20.4
7 - 30	55	15.4
10.1 - 30	41	10.7
14 - 30	29	7.7
18 - 30	22	6
21 - 30	19	5.2

W8JI Recommendations

Many of us older OPs have used variations of this antenna. When installed as an Inv-V the nulls get filled in. For casual operation it is a great antenna, but you do need a balanced antenna tuner. Tuning may be difficult on some bands, adjust the feedline length for best tuning.

Grounding

- You should have a safety ground in your shack
  - All equipment should be grounded to a common point
  - The common point should be connected to an outside 6’ ground rod
- All antenna feedlines should be protected by a lightning arrestor
  - Grounded to a 6’ rod or two
  - This also shorts any RF on the feedline before entering your shack
- If you encounter RF on your equipment you probably have common mode currents on your feedlines or interconnect cables.
  - Most shacks are in the near field of the antennas (i.e.: the antennas are close to the house on a city lot)
  - A line isolator (1:1 balun) in your shack on the coax from each antenna blocks ground currents
  - Winding long DC and data cables on a ferrite toroid
  - K9YC has good info on his website
- ARRL “Grounding and Bonding” book is excellent

K4 Impression

- First off, I'm an IC-7610 fan. I don't have a sophisticated station with multiple rig control and logging programs, complex antenna switching and rotor control. My needs are simple and the 7610 fills them nicely at a very modest price, $3K
- My first impression of the K4 was a bit negative. An Elecraft product will be a high performer, but a K4 that does what my $3K IC-7610 does costs $5.1K.
- I've been reading the Elecraft News and Reflector and have a different opinion today. Remember this is only my opinion, we have not had radios delivered yet. I also have no regrets about the 4 years I used a K3/P3
- I'm enthusiastic about this radio for high end users

K4 Impressions – cont'd

- Elecraft knows they are late to market an all digital radio. They also know they can't compete with a large radio manufacturer like Icom on price.
- They have adopted a familiar modular approach; you buy the features you want
- They have advertised more spectrum scope display options for those using a separate monitor.
- They plan to offer VHF/UHF converters later
- They have included more interfaces for peripheral equipment
- They are designing the K4 to be more compatible with popular software
- So, buyers can decide if the extra $2K is worth it for their needs
- OH Yes, there is also the FTdx101D and TS-890s for $4K