HF Update

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No one is on the air!

The bands are DEAD, I tell you, DEAD!

There are NO sunspots and FT8 has RUINED AMATEUR RADIO!

You should try calling CQ someday!
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**

**Table 1: Dynamic Range by Radio**

<table>
<thead>
<tr>
<th>2 kHz Spacing DR3</th>
<th>Signal Level Causing 3rd Order IMD = Noise Floor*</th>
<th>Radios in This Class</th>
</tr>
</thead>
<tbody>
<tr>
<td>55 dB</td>
<td>S9</td>
<td>FT-757</td>
</tr>
<tr>
<td>60</td>
<td>S9+5 dB</td>
<td>FT-101E</td>
</tr>
<tr>
<td>65</td>
<td>S9+10 dB</td>
<td>KWM-380</td>
</tr>
<tr>
<td>70</td>
<td>S9+15 dB</td>
<td>TS-830</td>
</tr>
<tr>
<td>75</td>
<td>S9+20 dB</td>
<td>IC-756 Pro II/III</td>
</tr>
<tr>
<td>80</td>
<td>S9+25 dB</td>
<td>Ten-Tec Omni VI+/VII</td>
</tr>
<tr>
<td>85</td>
<td>S9+30 dB</td>
<td>R9500</td>
</tr>
<tr>
<td>90</td>
<td>S9+35 dB</td>
<td>Ten Tec Eagle</td>
</tr>
<tr>
<td>95</td>
<td>S9+40 dB</td>
<td>Ten-Tec Orion II</td>
</tr>
<tr>
<td>100 dB</td>
<td>S9+45 dB</td>
<td>Elecraft K3, KX3, TS-890</td>
</tr>
</tbody>
</table>

*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.**
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 1\textsuperscript{st} 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
<table>
<thead>
<tr>
<th>Radiation Angle (degrees)</th>
<th>Single Hop Distance (miles)</th>
<th>Antenna Gain (dB)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>f1 layer</td>
<td>f2 layer</td>
</tr>
</tbody>
</table>
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

\( \lambda/4 \) Vertical

\( \lambda/4 \) Counterpoise  \( \lambda/4 \) Counterpoise

Balun

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
“Folded Skeleton Sleeve” from May 2011 QST
### Folded Skeleton Sleeve Antenna Dimensions (Figure 1A)

<table>
<thead>
<tr>
<th>Bands (Meters)</th>
<th>A (Feet)</th>
<th>B (Feet)</th>
<th>Gap (Inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>160/75</td>
<td>210</td>
<td>114</td>
<td>24</td>
</tr>
<tr>
<td>80/40</td>
<td>111.4</td>
<td>61.5</td>
<td>12</td>
</tr>
<tr>
<td>80/30</td>
<td>104</td>
<td>43.2</td>
<td>4.8</td>
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<tr>
<td>80/10</td>
<td>96</td>
<td>15.4</td>
<td>9.6</td>
</tr>
<tr>
<td>75/60</td>
<td>110.6</td>
<td>81.4</td>
<td>3.6</td>
</tr>
<tr>
<td>75/40</td>
<td>107</td>
<td>60.8</td>
<td>7.2</td>
</tr>
<tr>
<td>74/41 (MARS)</td>
<td>100.2</td>
<td>59.8</td>
<td>7.2</td>
</tr>
<tr>
<td>40/30</td>
<td>58</td>
<td>43</td>
<td>6</td>
</tr>
<tr>
<td>40/20</td>
<td>56.3</td>
<td>30.8</td>
<td>4</td>
</tr>
<tr>
<td>30/20</td>
<td>42</td>
<td>30.7</td>
<td>7.8</td>
</tr>
<tr>
<td>30/17</td>
<td>40.8</td>
<td>24.08</td>
<td>5.5</td>
</tr>
<tr>
<td>20/17</td>
<td>30.6</td>
<td>24</td>
<td>4.2</td>
</tr>
<tr>
<td>20/15</td>
<td>29.6</td>
<td>20.5</td>
<td>9.1</td>
</tr>
<tr>
<td>20/10</td>
<td>27.6</td>
<td>15.4</td>
<td>3.6</td>
</tr>
<tr>
<td>17/15</td>
<td>24.3</td>
<td>20.5</td>
<td>9.0</td>
</tr>
<tr>
<td>17/12</td>
<td>23.6</td>
<td>17.4</td>
<td>9.6</td>
</tr>
<tr>
<td>17/10</td>
<td>23.2</td>
<td>15.3</td>
<td>10</td>
</tr>
<tr>
<td>15/10</td>
<td>20</td>
<td>15.3</td>
<td>4.2</td>
</tr>
<tr>
<td>10/6</td>
<td>14.4</td>
<td>8.3</td>
<td>5.6</td>
</tr>
<tr>
<td>6/2 (CW/SSB)</td>
<td>7.4</td>
<td>3.0</td>
<td>3.6</td>
</tr>
<tr>
<td>6/2 (FM)</td>
<td>7.1</td>
<td>2.9</td>
<td>4.2</td>
</tr>
<tr>
<td>4/2 (UK)</td>
<td>5.4</td>
<td>3.0</td>
<td>2.25</td>
</tr>
</tbody>
</table>
Unfolded Skeleton Sleeve Antenna Dimensions (Figure 1B)

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

*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 YouTube tutorials
All Band Ladder Line Fed Doublet

Doublet length 96’ (analysis example)
Ladder Line Feed

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 arrester
  • 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