

Ham 15 – Hand-held Antennas
 Dr. Marc & Lt.Col. Dan © 220404

1. VHF/UHF handi-talkie ham radios are extremely popular in some segments of the amateur community, while others seldom use one. That is the nature of amateur radio. The price of the radios has dropped to the point that the no-name units are displacing the long-established brands. Quality of the inexpensive design has improved to the point that Radioddity and other upgrades to the ubiquitous Baofeng UV5 meet FCC specifications.
2. The challenge is the radios just do not have enough umph to trigger distant repeaters. The 5-watt units are minimal at best, but the 8-watt rigs are more solid performers. Still, both units suffer from the infamous sub-6” rubber-ducky antenna.
3. My location is distant from any repeaters, so the signal is poor. We recently began working with a large group of newly minted Technician class operators, so we wanted to recommend a decent first radio that does not bust the budget.
4. We set about to compare antennas to replace the stubby OEM devices. The first thing that most hams want to do is measure SWR. Although that is a good thing, SWR is just an efficiency-type number based on reactive inductor and capacitor components. The resistive losses and the radiated power resistance are equally important. The effective radiated power is a better indicator, if the radio survives the reflected heat of high SWR.
5. We completed electrical performance measurements on six antenna designs. We used both a Comet 500II analyzer and RigExpert Stick-Pro to sweep the SWR across the 2-meter VHF band on all the antennas. The two instruments were within 0.5 units, which is rather amazing itself.
6. What was the best SWR antenna? The lowest SWR was on the OEM Baofeng stubby antenna at 1.3. The highest SWR was on the Nagoya NA-771 at 4.5. Which do you want? The first law of thermodynamics assures there is no free lunch, all designs involve trade-offs.
7. Next, we used a field strength meter to measure the relative field strength from the radiating antennas on the same radio. We set up an arrangement so the antennas and meter were the same each time. We did not add a ground-plane since that does not exist in normal operation. We started with the OEM, but the best performer ran the meter off-scale. Then we repeated the tests by separating the sensor and radio further and reducing the sensitivity so the best performer read at the top of the scale.
8. That value was 10, then the relative value dropped to 3.5 for the OEM. All the other radiators were between those two. The best correlation to performance is length. Similar length antennas performed similar, short was poor, longest was best. That is not a surprise, since length and elevation are key parameters to any antenna design.
9. The table gives the performance criteria for the antennas. The 42.5” Abbree was off-the-scale compared to the others. Keep it in your backpack for when you need to reach out and touch someone. But the long, metal tape unit is unwieldy for normal communications. The Comet and the Shengda were very similar performance and more practical size. Either is an excellent everyday choice. The Shengda is a tri-band design.
10. When obtaining antennas, the connector must match the transceiver. All are SMA (SubMiniature A) size connectors. A male has a pin in the middle of an internal threaded barrel. A female has a receptacle in the middle of an externally threaded barrel. The Japanese use a male connector on the antenna while the Chinese use a female. Our tests used the appropriate high-quality gold adapters, so their losses are already in the tests.



Brand	Model	Length inches	Best SWR	High SWR	Field Strength	Price \$	Observe
Abbree	Tactical	42.5	2.1	2.4	10	33	unwieldy
Comet	SMA 24	15 7/8”	2.9	3.2	6	26	flimsy
Shengda	SRH-17	13 3/8	2.0	2.8	5.5	25	solid
Nagoya	NA-771	15.6	3.5	4.5	4.5	20	over-rated
TYT	OEM	6.5	2.0	2.4		0	just there
Baofeng	OEM	5.7	1.3	1.8	3.5	0	stubby



11. Then the real assessment came, when we tried the better antennas on the same hand-held transceiver. We hit the repeater!
12. The gyst is the inexpensive radio performs quite well with longer, better antennas. The better radiators add about \$25 to the price. In the analysis, the least expensive, decent radio system is the inexpensive hand-held with a 16+” quality antenna. This quite-adequate performer is about \$50, upgrade to 8-watts and the unit is still under \$100.
13. Life is good. Enjoy.

