# SKYPROBES

***The long range antenna specialists for Handhelds, Base Stations, FCC Part 15 and other RF devices for over 30 years.***

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## How anyone can easily prevent errors when comparing handheld antennas to high gain replacement antennas.

An antenna when transmitting produces an electric field, which is what makes communications possible, also produces a magnetic field. This magnetic field, if you do not have the units separated properly, will show that the short rubber duck antenna that came with the handheld is just as good as than our high gain 36.5" Titanium antenna.

This magnetic field is strong near the antenna but drops off dramatically in intensity about 10 wavelengths away. However for accurate measurements you need to space your test units at 100 wavelengths apart or your test will give inaccurate results.

To calculate the wavelength in feet we use the following formula:

985 divided by the Test Frequency = wavelength in feet

For 170 Mhz., 985/170 = the wavelength is 5.794 feet, we will use 5.8 feet

For 460 Mhz., 985/460 = the wavelength is 2.141 feet, we will use 2.14 feet

For optimum results we need to be 100 wavelengths apart. At 170 Mhz. we need to be 580 feet apart at 170 Mhz. and 214 feet apart for 460 Mhz.

You can test at 10 wavelengths apart, 58 feet at 170 Mhz. and 21 feet at 460 Mhz., however you will only have an accuracy of 85%.

For the non-professional, outdoor measurements are a given for VHF and almost a given for UHF because we want to eliminate reflections that can occur from walls, ceiling etc. Specially designed rooms called RF Anechoic chambers eliminate these reflections for the professionals.

Since radio waves are reflected by the earth we need to have the test units at least one wavelength above the ground to minimize the fact that the earth when not connected to the antenna is giant reflector. They should be preferably rigidly mounted to eliminate any variables about position.

Now we need a calibrated receiver, or you could use your service monitor or rent one for the day. One way is disconnect your base station antenna and use that connected to the service monitor. The other way is to use an antenna that you know works, rubber duck, whip of any kind for the frequency under question.

Because we will be testing only the difference of gain between your current antenna and our high gain antennas, the transmitting antenna characteristics are of no concern as long as you do not change that antenna during the test.

We need to place one person for a 170 Mhz. test in line of sight and at least 58 feet or preferably 580 feet away with the radio we will use as the test radio and a selection of the antennas to be tested. We will call this person OP2. The other person, OP1, at the service monitor and has a Handheld to contact the person with the antennas to be tested.

OP2 holds the initial test antenna which came with the radio and radio at 5.8 feet off the ground in the vertical position as close to 90 degrees to the ground. This must be a repeatable angle and height so we do not add any variables into the test.

OP1 calls OP2 and says start transmitting using a slow count from 1 to 10. (called a ten count) OP1 adjusts the scope or attenuation control to midscale. This is the reference point. OP1 records this gain/attenuation position.

OP1 then has OP2 change to the antenna to be tested, then assumes the previous position of the radio at 5.8 feet and does the ten count.

OP1 adjusts the attenuation so that the meter or scope is in the mid position again and records the position.

If the attenuation is greater than that of the antenna that came with the radio, the second antenna has gain. If the first setting was 5 dB for the reference antenna and the second antenna had 11 dB to achieve the midpoint setting, then the gain of the second antenna is 11 dB minus 5 dB equals 6 dB gain over the reference antenna.

Remember if you test at only 10 wavelengths rather than 100 wavelengths you will not see the full gain capability of the antenna. In addition make sure the radio height and angle are the same for each test.

If you have questions about this procedure please call our engineering department at 1-888-526-6316.