

# Antenna Measurement Spreadsheet

## How to interpret this data:

The column headers should be self explanatory with the possible exception of the last column, "dBm Comparison," so let me explain. Each set of tests is divided so that an apples-to-apples comparison can be examined easily. For example, the first test utilizes the Scorpion SA6-160E mounted mid-bed in my pickup as depicted by the picture below, then three additional iterations of that setup were tested: 1) with a 102" whip, then 2) with the Scorpion Capacity Hat, and finally 3) with a 49" three-spoke capacity hat. Those measurements are shown in the Signal Measurement column.

Using the first scenario as the baseline (as that is what is standardly shipped) and assigning a 0 dBm value, the rest of the scenarios are then compared to the baseline by converting the measured values to a dBm measurement since dB naturally is a ratio of measurements. So from the first set of tests, you will see that a 102" whip yielded a +1.19 dBm stronger signal in the near field than the standardly shipped 6 foot whip.

Subsequent tests may or may not show a picture of the test setup, but the "Antenna Mount Position" column should adequately give you a good idea of that specific test scenario. It should be pointed out that in EVERY case, mounting scenarios that placed the exposed part of the coil well above the roof line ALWAYS outperformed scenarios that did not. This fact has been tested on other types of vehicles and ALWAYS holds true. The closer the coil is to the roof-line of a vehicle, the poorer the performance.

In addition, capacity hats should be mounted well above the coil – optimally at 60 inches. We realize that this is not always practical as in many cases, this puts the top of the antenna over the Federal Interstate height limit of 13 feet, 6 inches, hence the 4 foot and 37" masts we used in the tests. Even at that height, a couple of the test scenarios exceeded this limit. The 102" whip always exceeded the height limit, but usually yielded the highest scores. Of course you could use a piece of heavy-weight mono-filament fishing line and tie the tip down so you're under the max height limit as this seems to have little effect, if any, on performance, but don't blame us if you're mistaken for an over-sized "Bumper Car." That's nothing to worry about – you will also be regularly accused of being a base station even though you are mobile!!!

**This is the Scorpion SA6-160E (Extended) Antenna mounted mid bed in my Dodge RAM 1500 pickup. Also installed is the Scorpion Top Hat on a 4 foot mast. I have run this setup for hundreds of miles at Interstate speeds without a problem.**



| Antenna Model | Antenna Configuration | Whip Length | Cap Hat Configuration and Size | Overall Height | Antenna Mount Position | Signal Measurement | dBm Comparison | Inches of Exposed Coil |
|---------------|-----------------------|-------------|--------------------------------|----------------|------------------------|--------------------|----------------|------------------------|
|---------------|-----------------------|-------------|--------------------------------|----------------|------------------------|--------------------|----------------|------------------------|

|          |              |      |                              |              |         |      |              |         |
|----------|--------------|------|------------------------------|--------------|---------|------|--------------|---------|
| SA6-160E | Antenna Only | 6'   | None                         | 14' 4 11/16" | Mid-Bed | 909  | Ø dBm        | 2 1/16" |
| SA6-160E | Antenna Only | 102" | None                         | 16' 9 5/8"   | Mid-Bed | 1195 | 1.188040221  | 1 5/8"  |
| SA6-160E | Antenna Only | 4'   | Scorpion Cap Hat             | 12' 2"       | Mid-Bed | 1209 | 1.238624176  | 1 1/2"  |
| SA6-160E | Antenna Only | 37"  | 49" Diameter 3-Spoke Cap Hat | 11' 4 5/16"  | Mid-Bed | 1140 | 0.9834096811 | 1 5/16" |
| SA6-160E | Antenna Only | 60"  | 49" Diameter 3-Spoke Cap Hat | 13' 3 3/16"  | Mid-Bed | 1265 | 1.435266423  | 1 3/16" |

**This is the Scorpion SA6-160 Antenna mounted mid bed in my Dodge RAM 1500 pickup. Also installed is the Scorpion Top Hat on a 4 foot mast.**



|         |  |      |                              |               |  |      |              |          |
|---------|--|------|------------------------------|---------------|--|------|--------------|----------|
| SA6-160 | Antenna Only                                   | 6'   | None                         | 12' 7 5/8"    | Mid-Bed                                    | 705  | Ø dBm        | 2 1/8"   |
| SA6-160 | Antenna Only                                   | 102" | None                         | 15' 1 5/8"    | Mid-Bed                                    | 925  | 1.179526157  | 1 5/8"   |
| SA6-160 | Antenna Only                                   | 4'   | Scorpion Cap Hat             | 10' 7"        | Mid-Bed                                    | 835  | 0.7349735849 | 1 1/2"   |
| SA6-160 | Base of antenna raised with a 1 foot extension | 6'   | None                         | 13' 7 5/8"    | Mid-Bed                                    | 718  | Ø dBm        | 2 1/16"  |
| SA6-160 | Base of antenna raised with a 1 foot extension | 102" | None                         | 16' 1 5/8"    | Mid-Bed                                    | 960  | 1.261467888  | 1 5/8"   |
| SA6-160 | Base of antenna raised with a 1 foot extension | 4'   | Scorpion Cap Hat             | 11' 7"        | Mid-Bed                                    | 882  | 0.8934414089 | 1 1/2"   |
| SA6-160 | Base of antenna raised with a 1 foot extension | 37"  | 49" Diameter 3-Spoke Cap Hat | 10' 7 11/16"  | Mid-Bed                                    | 880  | 0.8835822791 | 1 5/16"  |
| SA6-160 | Base of antenna raised with a 2 foot extension | 6'   | None                         | 14' 7 5/8"    | Mid-Bed                                    | 890  | Ø dBm        | 2 1/8"   |
| SA6-160 | Base of antenna raised with a 2 foot extension | 102" | None                         | 17' 1 5/8"    | Mid-Bed                                    | 1100 | 0.9200267851 | 1 5/8"   |
| SA6-160 | Base of antenna raised with a 2 foot extension | 4'   | Scorpion Cap Hat             | 12' 7"        | Mid-Bed                                    | 1044 | 0.6931049202 | 1 1/2"   |
| SA6-160 | Base of antenna raised with a 2 foot extension | 37"  | 49" Diameter 3-Spoke Cap Hat | 11' 7 11/16"  | Mid-Bed                                    | 1055 | 0.7386245299 | 1 5/16"  |
| SA6-160 | Base of antenna raised with a 3 foot extension | 6'   | None                         | 15' 7 5/8"    | Mid-Bed                                    | 1050 | Ø dBm        | 2 1/8"   |
| SA6-160 | Base of antenna raised with a 3 foot extension | 102" | None                         | 18' 1 5/8"    | Mid-Bed                                    | 1250 | 0.7572071394 | 1 5/8"   |
| SA6-160 | Base of antenna raised with a 3 foot extension | 4'   | Scorpion Cap Hat             | 13' 7"        | Mid-Bed                                    | 1100 | 0.2020338609 | 1 1/2"   |
| SA6-160 | Base of antenna raised with a 3 foot extension | 37"  | 49" Diameter 3-Spoke Cap Hat | 12' 7 11/16"  | Mid-Bed                                    | 1105 | 0.2217297895 | 1 5/16"  |
| SA6-160 | Antenna Only                                   | 6'   | None                         | 13' 10 9/16"  | Driver's Side Bed Rail Directly Behind Cab | 950  | Ø dBm        | 2 1/16"  |
| SA6-160 | Antenna Only                                   | 102" | None                         | 16' 4 3/16"   | Driver's Side Bed Rail Directly Behind Cab | 1118 | 0.7071819826 | 1 11/16" |
| SA6-160 | Antenna Only                                   | 4'   | Scorpion Cap Hat             | 11' 10"       | Driver's Side Bed Rail Directly Behind Cab | 1038 | 0.3847374822 | 1 1/2"   |
| SA6-160 | Antenna Only                                   | 37"  | 49" Diameter 3-Spoke Cap Hat | 11' 10 13/16" | Driver's Side Bed Rail Directly Behind Cab | 1095 | 0.6169051389 | 1 5/16"  |
| SA-680  | Antenna Only                                   | 6'   | None                         | 14' 1 1/8"    | Driver's Side Bed Rail Directly Behind Cab | 1150 | Ø dBm        | 4 5/8"   |

|        |              |      |                              |             |  |      |              |        |
|--------|--------------|------|------------------------------|-------------|--|------|--------------|--------|
| SA-680 | Antenna Only | 102" | None                         | 15' 6 1/4"  | Driver's Side Bed Rail Directly Behind Cab | 1365 | 0.7443481102 | 3 3/4" |
| SA-680 | Antenna Only | 4'   | Scorpion Cap Hat             | 11' 11 7/8" | Driver's Side Bed Rail Directly Behind Cab | 1296 | 0.5190716118 | 3 3/8" |
| SA-680 | Antenna Only | 37"  | 49" Diameter 3-Spoke Cap Hat | 11' 1/2"    | Driver's Side Bed Rail Directly Behind Cab | 1310 | 0.565734553  | 2 7/8" |

|         |              |        |                              |              |                               |      |              |         |
|---------|--------------|--------|------------------------------|--------------|-------------------------------|------|--------------|---------|
| SA6-160 | Antenna Only | 6'     | None                         | 9' 5 1/8"    | Driver's Side Rear Bed Corner | 761  | ∅ dBm        | 2 1/8"  |
| SA6-160 | Antenna Only | 102"   | None                         | 14' 10 3/4"  | Driver's Side Rear Bed Corner | 915  | 0.800364373  | 1 3/4"  |
| SA6-160 | Antenna Only | 4'     | Scorpion Cap Hat             | 10' 4 1/2"   | Driver's Side Rear Bed Corner | 815  | 0.2977295197 | 1 1/2"  |
| SA6-160 | Antenna Only | 37"    | 49" Diameter 3-Spoke Cap Hat | 9' 5 3/8"    | Driver's Side Rear Bed Corner | 843  | 0.4444291785 | 1 3/8"  |
| SA6-160 | Antenna Only | 7' 6"  | Scorpion Cap Hat             | 13' 10 3/16" | Driver's Side Rear Bed Corner | 1308 | 2.352230872  | 1 3/16" |
| SA6-160 | Antenna Only | 14' 6" | Scorpion Cap Hat             | 20' 9 7/8"   | Driver's Side Rear Bed Corner | 1475 | 2.874073635  | 7/8"    |

|        |              |      |                              |              |                               |      |               |          |
|--------|--------------|------|------------------------------|--------------|-------------------------------|------|---------------|----------|
| SA-680 | Antenna Only | 6'   | None                         | 12' 6 3/16"  | Driver's Side Rear Bed Corner | 1030 | ∅ dBm         | 4 11/16" |
| SA-680 | Antenna Only | 102" | None                         | 14' 11 3/16" | Driver's Side Rear Bed Corner | 1115 | 0.3443764268  | 3 11/16" |
| SA-680 | Antenna Only | 4'   | Scorpion Cap Hat             | 10' 4 7/8"   | Driver's Side Rear Bed Corner | 1048 | 0.07524057943 | 3 3/8"   |
| SA-680 | Antenna Only | 37"  | 49" Diameter 3-Spoke Cap Hat | 9' 5 3/8"    | Driver's Side Rear Bed Corner | 1070 | 0.1654655298  | 2 7/8"   |

|        |              |      |                              |            |         |      |              |        |
|--------|--------------|------|------------------------------|------------|---------|------|--------------|--------|
| SA-680 | Antenna Only | 6'   | None                         | 12' 9 1/8" | Mid-Bed | 1055 | ∅ dBm        | 4 5/8" |
| SA-680 | Antenna Only | 102" | None                         | 15' 1 1/4" | Mid-Bed | 1303 | 0.9169195608 | 3 3/4" |
| SA-680 | Antenna Only | 4'   | Scorpion Cap Hat             | 10' 7 7/8" | Mid-Bed | 1150 | 0.3744538072 | 3 3/8" |
| SA-680 | Antenna Only | 37"  | 49" Diameter 3-Spoke Cap Hat | 9' 8 3/8"  | Mid-Bed | 1190 | 0.5229450176 | 2 7/8" |

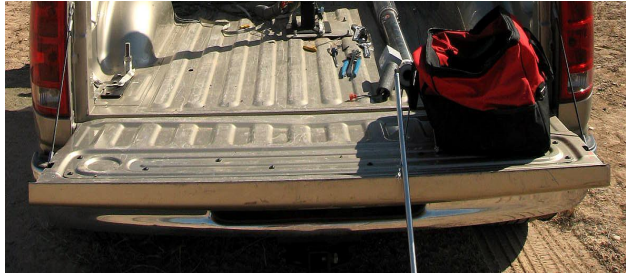
|        |  |      |                              |            |         |      |              |        |
|--------|--|------|------------------------------|------------|---------|------|--------------|--------|
| SA-680 | Base of antenna raised with a 1 foot extension | 6'   | None                         | 13' 9 1/8" | Mid-Bed | 1251 | ∅ dBm        | 4 3/4" |
| SA-680 | Base of antenna raised with a 1 foot extension | 102" | None                         | 16' 1 1/4" | Mid-Bed | 1422 | 0.556422867  | 3 3/4" |
| SA-680 | Base of antenna raised with a 1 foot extension | 4'   | Scorpion Cap Hat             | 11' 7 7/8" | Mid-Bed | 1300 | 0.1668604261 | 3 3/8" |
| SA-680 | Base of antenna raised with a 1 foot extension | 37"  | 49" Diameter 3-Spoke Cap Hat | 10' 8 3/8" | Mid-Bed | 1341 | 0.3017146816 | 2 7/8" |

|        |  |      |                              |            |         |      |              |         |
|--------|--|------|------------------------------|------------|---------|------|--------------|---------|
| SA-680 | Base of antenna raised with a 2 foot extension | 6'   | None                         | 14' 9 1/8" | Mid-Bed | 1338 | Ø dBm        | 4 3/4"  |
| SA-680 | Base of antenna raised with a 2 foot extension | 102" | None                         | 17' 1 1/4" | Mid-Bed | 1523 | 0.562437899  | 3 3/4"  |
| SA-680 | Base of antenna raised with a 2 foot extension | 4'   | Scorpion Cap Hat             | 12' 7 7/8" | Mid-Bed | 1454 | 0.3610829309 | 3 7/16" |
| SA-680 | Base of antenna raised with a 2 foot extension | 37"  | 49" Diameter 3-Spoke Cap Hat | 11' 8 3/8" | Mid-Bed | 1472 | 0.4145169657 | 2 7/8"  |

|        |  |      |                              |            |         |      |              |        |
|--------|--|------|------------------------------|------------|---------|------|--------------|--------|
| SA-680 | Base of antenna raised with a 3 foot extension | 6'   | None                         | 15' 9 1/8" | Mid-Bed | 1450 | Ø dBm        | 4 5/8" |
| SA-680 | Base of antenna raised with a 3 foot extension | 102" | None                         | 18' 1 1/4" | Mid-Bed | 1584 | 0.3838717502 | 3 5/8" |
| SA-680 | Base of antenna raised with a 3 foot extension | 4'   | Scorpion Cap Hat             | 13' 7 7/8" | Mid-Bed | 1518 | 0.1990376932 | 3 3/8" |
| SA-680 | Base of antenna raised with a 3 foot extension | 37"  | 49" Diameter 3-Spoke Cap Hat | 12' 8 3/8" | Mid-Bed | 1513 | 0.1847092579 | 2 7/8" |

**This is the Scorpion SA6-160 Shorty Antenna mounted mid bed in my Dodge RAM 1500 pickup. Also installed is the 49" Diameter, Three Spoke Capacity Hat on a 37" mast.**





|               |              |      |                              |            |  |      |              |        |
|---------------|--------------|------|------------------------------|------------|--|------|--------------|--------|
| SA-680 Shorty | Antenna Only | 6'   | None                         | 12' 8 5/8" | Driver's Side Bed Rail Directly Behind Cab | 940  | Ø dBm        | 2 1/8" |
| SA-680 Shorty | Antenna Only | 102" | None                         | 15' 2 1/4" | Driver's Side Bed Rail Directly Behind Cab | 1239 | 1.199434528  | 1 3/4" |
| SA-680 Shorty | Antenna Only | 4'   | Scorpion Cap Hat             | 10' 8"     | Driver's Side Bed Rail Directly Behind Cab | 1045 | 0.4598843685 | 1 1/2" |
| SA-680 Shorty | Antenna Only | 37"  | 49" Diameter 3-Spoke Cap Hat | 9' 8 7/8"  | Driver's Side Bed Rail Directly Behind Cab | 1091 | 0.6469689699 | 1 3/8" |

|               |              |      |                              |            |         |      |              |        |
|---------------|--------------|------|------------------------------|------------|---------|------|--------------|--------|
| SA-680 Shorty | Antenna Only | 6'   | None                         | 11' 6 5/8" | Mid-Bed | 960  | Ø dBm        | 2 1/8" |
| SA-680 Shorty | Antenna Only | 102" | None                         | 14' 1/4"   | Mid-Bed | 1280 | 1.249387366  | 1 3/4" |
| SA-680 Shorty | Antenna Only | 4'   | Scorpion Cap Hat             | 9' 6"      | Mid-Bed | 1045 | 0.3684505741 | 1 1/2" |
| SA-680 Shorty | Antenna Only | 37"  | 49" Diameter 3-Spoke Cap Hat | 8' 6 7/8"  | Mid-Bed | 1090 | 0.551552649  | 1 3/8" |

|               |  |      |                              |            |         |      |              |          |
|---------------|--|------|------------------------------|------------|---------|------|--------------|----------|
| SA-680 Shorty | Base of antenna raised with a 1 foot extension | 6'   | None                         | 12' 6 5/8" | Mid-Bed | 995  | Ø dBm        | 2 1/8"   |
| SA-680 Shorty | Base of antenna raised with a 1 foot extension | 102" | None                         | 15' 1/4"   | Mid-Bed | 1320 | 1.227508505  | 1 11/16" |
| SA-680 Shorty | Base of antenna raised with a 1 foot extension | 4'   | Scorpion Cap Hat             | 10' 6"     | Mid-Bed | 1130 | 0.5525536274 | 1 1/2"   |
| SA-680 Shorty | Base of antenna raised with a 1 foot extension | 37"  | 49" Diameter 3-Spoke Cap Hat | 9' 6 7/8"  | Mid-Bed | 1190 | 0.7772388065 | 1 5/16"  |

|               |  |      |                              |            |         |      |              |        |
|---------------|--|------|------------------------------|------------|---------|------|--------------|--------|
| SA-680 Shorty | Base of antenna raised with a 2 foot extension | 6'   | None                         | 13' 6 5/8" | Mid-Bed | 1090 | Ø dBm        | 2 1/8" |
| SA-680 Shorty | Base of antenna raised with a 2 foot extension | 102" | None                         | 16' 1/4"   | Mid-Bed | 1370 | 0.9929406922 | 1 3/4" |
| SA-680 Shorty | Base of antenna raised with a 2 foot extension | 4'   | Scorpion Cap Hat             | 11' 6"     | Mid-Bed | 1230 | 0.524786135  | 1 1/2" |
| SA-680 Shorty | Base of antenna raised with a 2 foot extension | 37"  | 49" Diameter 3-Spoke Cap Hat | 10' 6 7/8" | Mid-Bed | 1284 | 0.7113852579 | 1 3/8" |

|               |  |      |                              |            |         |      |              |        |
|---------------|--|------|------------------------------|------------|---------|------|--------------|--------|
| SA-680 Shorty | Base of antenna raised with a 3 foot extension | 6'   | None                         | 14' 6 5/8" | Mid-Bed | 1265 | Ø dBm        | 2 1/8" |
| SA-680 Shorty | Base of antenna raised with a 3 foot extension | 102" | None                         | 17' 1/4"   | Mid-Bed | 1570 | 0.938091269  | 1 3/4" |
| SA-680 Shorty | Base of antenna raised with a 3 foot extension | 4'   | Scorpion Cap Hat             | 12' 6"     | Mid-Bed | 1475 | 0.667014948  | 1 1/2" |
| SA-680 Shorty | Base of antenna raised with a 3 foot extension | 37"  | 49" Diameter 3-Spoke Cap Hat | 11' 6 7/8" | Mid-Bed | 1513 | 0.7774840251 | 1 3/8" |

|               |  |      |                              |            |                |      |              |        |
|---------------|--|------|------------------------------|------------|----------------|------|--------------|--------|
| SA-680 Shorty | Base of antenna raised with a 3 foot extension | 6'   | None                         | 12' 8 5/8" | Hitch Receiver | 1225 | Ø dBm        | 2 1/8" |
| SA-680 Shorty | Base of antenna raised with a 3 foot extension | 102" | None                         | 15' 2 1/4" | Hitch Receiver | 1509 | 0.9055315108 | 1 3/4" |
| SA-680 Shorty | Base of antenna raised with a 3 foot extension | 4'   | Scorpion Cap Hat             | 10' 8"     | Hitch Receiver | 1345 | 0.4058619564 | 1 1/2" |
| SA-680 Shorty | Base of antenna raised with a 3 foot extension | 37"  | 49" Diameter 3-Spoke Cap Hat | 9' 8 7/8"  | Hitch Receiver | 1405 | 0.5954023554 | 1 3/8" |

**This is the Scorpion SA-680 Standard Antenna mounted at the rear corner in my Dodge RAM 1500 pickup. Also installed is the Scorpion Top Hat on a 4 foot mast.**





|          |  |      |                              |              |                |      |              |          |
|----------|--|------|------------------------------|--------------|----------------|------|--------------|----------|
| SA-680   | Antenna Only                                   | 6'   | None                         | 13' 11 1/8"  | Hitch Receiver | 1665 | Ø dBm        | 4 5/8"   |
| SA-680   | Antenna Only                                   | 102" | None                         | 15' 1 1/8"   | Hitch Receiver | 1930 | 0.6414307117 | 3 5/8"   |
| SA-680   | Antenna Only                                   | 4'   | Scorpion Cap Hat             | 11' 9 7/8"   | Hitch Receiver | 1730 | 0.1663186529 | 3 3/8"   |
| SA-680   | Antenna Only                                   | 37"  | 49" Diameter 3-Spoke Cap Hat | 10' 10 7/16" | Hitch Receiver | 1765 | 0.2533047188 | 2 15/16" |
| SA6-160  | Base of antenna raised with a 3 foot extension | 6'   | None                         | 13' 9 9/16"  | Hitch Receiver | 1310 | Ø dBm        | 2 1/16"  |
| SA6-160  | Base of antenna raised with a 3 foot extension | 102" | None                         | 15' 2 3/16"  | Hitch Receiver | 1545 | 0.7165718811 | 1 11/16" |
| SA6-160  | Base of antenna raised with a 3 foot extension | 4'   | Scorpion Cap Hat             | 11' 9"       | Hitch Receiver | 1445 | 0.4259655144 | 1 1/2"   |
| SA6-160  | Base of antenna raised with a 3 foot extension | 37"  | 49" Diameter 3-Spoke Cap Hat | 10' 9 13/16" | Hitch Receiver | 1495 | 0.57369897   | 1 5/16"  |
| SA6-160E | Antenna Only                                   | 6'   | None                         | 12' 11 9/16" | Hitch Receiver | 1179 | Ø dBm        | 2 1/16"  |
| SA6-160E | Antenna Only                                   | 102" | None                         | 15' 5 1/8"   | Hitch Receiver | 1505 | 1.060226948  | 1 5/8"   |
| SA6-160E | Antenna Only                                   | 4'   | Scorpion Cap Hat             | 10' 11"      | Hitch Receiver | 1418 | 0.8016242575 | 1 1/2"   |
| SA6-160E | Antenna Only                                   | 37"  | 49" Diameter 3-Spoke Cap Hat | 9' 11 13/16" | Hitch Receiver | 1450 | 0.8985419714 | 1 5/16"  |