Willits Amateur Radio Society

The objectives of the Willits Amateur Radio Society are:

- to promote interest in fellowship and fun in Amateur Radio;
- to further the cooperation between Mendocino County Amateur Radio Operators;
- to provide emergency or public service communications when normal means of communications are disrupted;
- to advance the state of the Amateur Radio art through individual and collective research;
- to conduct programs and activities so as to increase the general interest and welfare of Amateur Radio in the community including classes and testing;
- to support lawful, responsible conduct by its members and the amateur fraternity in general.

WARS OFFICERS for 2007

PRESIDENT: Tim Hanna, WB9NJS
SECRETARY: John Lemmer, W6FQX
TREASURER: Dean Durbin, KE6COB
WEBMASTER: Danny Richardson, K6MHE
TRUSTEE OF W6MMM, Tim Hanna, WB9NJS
NEWSLETTER EDITOR: John Lemmer, W6FQX

WEB PAGE: http://www.k6mhe.com/wars
MAIL TO: P.O BOX 73, WILLITS, CA 95490

The Willits Amateur Radio Society meets at 7:00 PM on the fourth Monday (not the last Monday) of each month except for December. The normal meeting location is the Brooktrails Fire Station on Birch Street in Brooktrails.

There is a weekly informal breakfast meeting held every Tuesday morning starting at 9 AM at Perko's Restaurant in Willits.

On the coast, there is also a weekly Koffee Klatch starting at 10:30 AM on Tuesdays at the Tradewinds Restaurant in Fort Bragg and a informal breakfast meeting held every Friday starting at 8:30 AM at Perko's Restaurant in Fort Bragg.

From the prez – August 2007

Unfortunately due to vacation and working schedules, the prez of the Willits Amateur Radio Society was unable to make the publishing deadline for his column this month.

LAST MEETING

The last meeting on July 23 had a number of seldom seen members show up including Bob KH6AS all the way from Hawaii and Danny K6MHE with his XYL Bonnie all the way from Fort Bragg. Bob comes from Hawaii to vacation in Mendocino County. Danny and Bonnie come over to warm up.

We had a meaningful discussion about the status of Emergency Communications in Mendocino County including the need for individual communities to form local nets on simplex frequencies to avoid jamming up the few repeaters in the event of a wide spread disaster. Although this is being done in a few communities, most of county amateur radio operators have not organized nor participate in such nets.

The meeting included a presentation by President Tim Hanna of photographs taken on his recent trip to London. I guess Tim had business in London but he still managed to visit a number of the tourist spots. However, he did not take an HT so he did not manage to make any QSOs in G land. His HT probably did not have the tone burst mode in it so it is possible that he could not open up a repeater there anyway. I understand that some American hams have developed the talent to whistle up the 1700 Hz tone burst to open up the European repeaters but that seems like a really lame scheme.

NEXT MEETING

The next regular meeting of the Willits Amateur Radio Society will be held on August 27, 2007 starting at 7 PM. As usual, it will be held in the Brooktrails Fire Station on Birch Street in Brooktrails.

In addition to the usual notices of upcoming events and a report of what was past, there will be a demonstration of a draft web page describing the evolving amateur radio emergency communications system in the county. Your comments on this plan are invited and will be considered for inclusion or even deletions to the plan.

McHam Group Report

The McHam group continued with it's monthly meeting with the sheriff to try to establish an amateur radio emergency communications system in the county. The editor of this newsletter has submitted a written plan and a candidate for an informational web page for consideration by the group. After review by those that had expressed an interest in participating, the plan as modified will be posted for general comments.

The key item is for each community to form simplex nets to get acquainted with each other and with the simplex propagation challenges in each community. This is being done in the Fort Bragg, Mendocino-Albion, Gualala-Point Arena, and Brooktrails areas so far but, as far as we know, not elsewhere.

The sheriff mentioned that some funds derived from the drug asset seizure program may be available for purchase of ham radio equipment for installation in the various fire stations around the county. This seems to make sense to a number of us as a possible net control location for some communities and, in fact, what we have been doing in the Brooktrails area. The fire chief in the City of Mendocino is very supportive of this effort but some other chiefs are not so sure.

A suggestion was made that some area nets be establish to practice communications between communities. As some community nets have been conducted at 7 PM on Wednesdays, a logical time for these area nets might be 7:30 PM. Perhaps only the net control stations for each community net would participate in the individual area nets. Other stations can monitor.

This plan is evolving and will be presented at the next meeting of WARS and may be posted on-line soon for further comments.

2007 REMAINING CALENDER OF EVENTS

MONTH/DATE	EVENT	CONTACT or INFO
	WARS Picnic	Open
September 7-9	SW Division Convention, LA	www.hamcon.org
September 8-10	VHF Contest from Walker Ridge	WB9NJS or WA6OEM
September 14-16	WARS Noyo River Campout	Tilley Camp?
	http://www.noyopacific.com/camponejacksonstate.html	
September 28-29	TEN-TEC Factory HamFest	http://radio.tentec.com
October 19-21	Pacific Div. Conv., San Ramon	www.pacificon.org
October 28	Hospital Disaster Drill	W6FQX
December ?	WARS Holiday Dinner	Open

Anyone with additional information about any activity is encouraged to contact the editor of this newsletter with this information for inclusion in a future edition of this newsletter.

The activities shown as open below indicate an opportunity for you to step up and organize something. The significant opportunities are as follows:

WARS Picnic. We didn't have a WARS picnic last year so maybe we should have one this year. It can be at a private home or in a park. Who wants to organize this? Please volunteer.

WARS Campout. How about a campout in the Noyo River area. Check out the web site www.fire.ca.gov/rsrc-mgt_content/downloads/jd_brochure_detail.pdf and find the Tilley Camp. No wagonmaster, no organization, just show up. 145.130 does work down into there if you are using a mobile, not an HT.

WARS Holiday Dinner. Charlie and Arlene Davison (W6FXO and KG6CTJ) have done this for several years now. I think that they have done an excellent job. Maybe they want a rest or maybe someone else wants to organize the event. Maybe you can help. Please volunteer and contact Charlie or Arlene.

TESTING SCHEDULES

The following is a schedule of the known ham testing sessions in the northern California area in the next few months. Call or email for info or appointment. Some of these PM testing sessions have a brief class in the AM.

PLACE	WHEN	INFORMATION
Sonoma	August 25, 9 AM	Joel Nadler 545-1782 jlnadler@sbcglobal.net
Napa	September 2, 1 PM	Richard Rau 252-6276 ko6fr@arrl.net
Santa Rosa	September 8 (or 15)	Brian Torr, N6IIY n6iiy@arrl.net
St. Helena	September 12, 7 PM	Paul L Phelps 415-663-9429 phelps@verizoncable.com
Lakeport	September 15 8:30 AM September 15 2:00 PM	Technician Class Review Testing Session Dale Westerterp 762-9414 wb6tms@arrl.net
Petaluma	October 13, 2 PM	Dale Westerterp 762-9414 dalewestretrp@juno.com

Napa	November 11, 1 PM	Mark Evans 494-6534 ke6o@napasars.org
Novato	November 17, 9 AM	(415)-382-8135 members@k6bw.org
Sonoma	December 1, 9 AM	Joel Nadler 545-1782 jlnadler@sbcglobal.net
Mill Valley	December 8, 9 AM	Alan Weisman (510-237-1978 alweisman@juno.com

If you know of more, please let the editor of this newsletter know.
If a group of six or more wishes to have a testing session in Willits, it may be possible to bring together a testing team. Please contact Jay Haegele K6AFL to register your interest.

Technical Article

At the end of this newsletter, please find a technical article by our resident antenna expert, K6MHE, analysizing 1/4 wave and 5/8 wave VHF antenna as mounted on various size and shape vehicles. You may be amazed.

Based on Danny's analysis, there is not as much difference between 1/4 wave and 5/8 wave antennas as the advertising might suggest. Again based on the analysis, the radiation patterns are considerably more complex than you might think.

This was an article published in CQ magazine some time ago so you may recognize it. Danny assures me that he has the copyright to the article and has given permission to reproduce here for your information.

Check into Danny's main web page, k6mhe.com, for more interesting information.

Powers of Two

This a challenge to all you amateur genealogists out there. What is the solution to the conundrum posed herein?

We all have two parents, four grandparents, eight great-grandparents, etc. The rule for the number of ancestors is thus the number 2 raised to the power representing the number of generations back. Mathematically:

$2^1 = 2$; $2^2 = 4$; $2^3 = 8$; $2^4 = 16$; $2^5 = 32$; etc.

Now consider going back 10 generations. $2^{10} = 1024$

Not too bad but a little tough to represent on a family tree chart. Assuming that the average age of parents for each new generation to be born to be 25, this 10 generations covers only about 250 years. Less for younger birthing ages.

Now consider 20 generations or about 500 years. $2^{20} = 1, 485, 576$

Would you like to try 40 generations or about 1000 years. $2^{40} = 1.09951 \times 10^{12}$

Written in another way, this is over 1 thousand billion (US billion, not European) which is more than the total number of humans on the earth ever – for all time. And that is just for that particular generation, double it for the total.

It gets a lot more mind numbing the further back you go. Here are some examples:
2000 years or about 80 generations $2^{80} = 1.2089 \times 10^{24}$

6000 years or about the time of the earliest Egyptian civilization 240 generations back.
$2^{240} = 1.76684 \times 10^{72}$

These are numbers that are truly astronomical in scope and defy all comprehension. The fossil records even suggest that the human race existed many hundreds of thousands of years before cultural evidence began to be preserved. I won't even try to calculate that number.

It has been said that we are all related to one another at one level or another but the numbers defy comprehension. If you had all the data, I suppose that you could trace back either your paternal or maternal line on a single trace through 240 generations but how do you account for all the others that contributed their DNA to yours? How could you have as many ancestors as the numbers show with the total far exceeding the total numbers of people ever?

The best answer or essay contributed to the editor of this newsletter will be published in the next edition.

VHF Mobile Antenna Performance

The other half of the story

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Did you know that what size car you drive can and does have a profound effect upon how your antenna performs? You might be surprised at the variations in an antenna's pattern and gain depending if it is installed on a full-size or mid-sized passenger car. Let alone a pickup truck or SUV.

I had been trying to resolve for myself the many claims and counter-claims regarding the 3-dB gain attributed to the 5/8-wavelenght monopole when used in VHF mobile applications. In that pursuit, using computer modeling, I soon discovered that depending upon what vehicle was used made a noticeable difference in performance– sometimes profound.

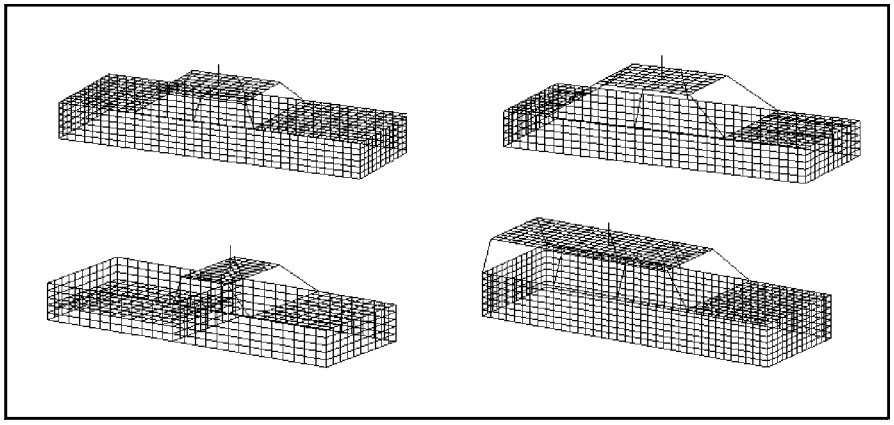


Figure 1 – Wire-grid vehicle structures used in the NEC analysis described in the text.

Antenna Modeling

The availability of antenna modeling software has provided an excellent tool for predicting antenna performance, however, until recently modeling mobile antenna systems has been a major pain. Calculating and entering all the geometric data - without errors - for a wire-grid models of vehicles such as those shown in Figure 1 can take many hours of tedious work. Fortunately, the recent availability *NEC Win-Synth*[1], a software tool, that makes creating wire grid models of vehicles (and other structures) a snap that problem has been eliminated.

Using *NEC Win-Synth* generated vehicle models with *NEC2* I analyzed the three most widely used VHF mobile antennas (1/4, 1/2 and 5/8-wavelength monopoles) each installed on four different vehicles (a full and a mid-sized passenger car, a small pickup truck and an SUV).

The models themselves (Figure 1) are rather boxy reminiscent of the Volvos of years past and do not truly portray the droopy-snooted-high-back cars they are making now. They do, however, provide a reasonable approximation of the overall dimensions and, I felt, would be sufficient for making the antenna comparisons.

The dimensions for models were obtained by measuring four vehicles as follows; Dodge Intrepid (full-size car), Ford Tarsus (mid-size car), short bed Toyota pickup (pickup truck) and a Dodge Durango (SUV).

All modeling was done at a frequency of 146 MHz utilizing average ground parameters (conductivity 0.005 s/m – relative permitivity 13). The antennas were located a top dead center of the vehicle's roof in each model.

Divergence

I had anticipated that there would be some irregularities in radiation patterns between dissimilar vehicles but I truly didn't expect them to be so great among similar vehicles such as a full-sized and a mid-sized passenger car! The full-size and mid-size car models are fairly comparable in shape. The dimensions of roof sections are within a couple of inches of one another, the main difference being the overall length where there is a 12-13% variance.

NEC generated comparison plots for the cars with the three antennas are illustrated in Figure 2. The front of the vehicles is oriented at 0º azimuth for all plots. To better illustrate differences, each plot has been normalized consequently the dB reference value for outer ring (0 dB) varies from plot to plot and is not given. We'll discuss gain a little later.

Examining these patterns (Figure 2) we can find only few consistent traits between the cars. One is the greatest variations occur using the 1/4-wave whip and least with the 5/8-wave. Another apparent characteristic is that the maximum variances exist in a plane that follows the vehicle's length. From this we can see that the car's body is playing a significant influence in the antenna's performance. Why so much for similar vehicles?

Monopoles/Ground-Planes

To work an end fed monopole must

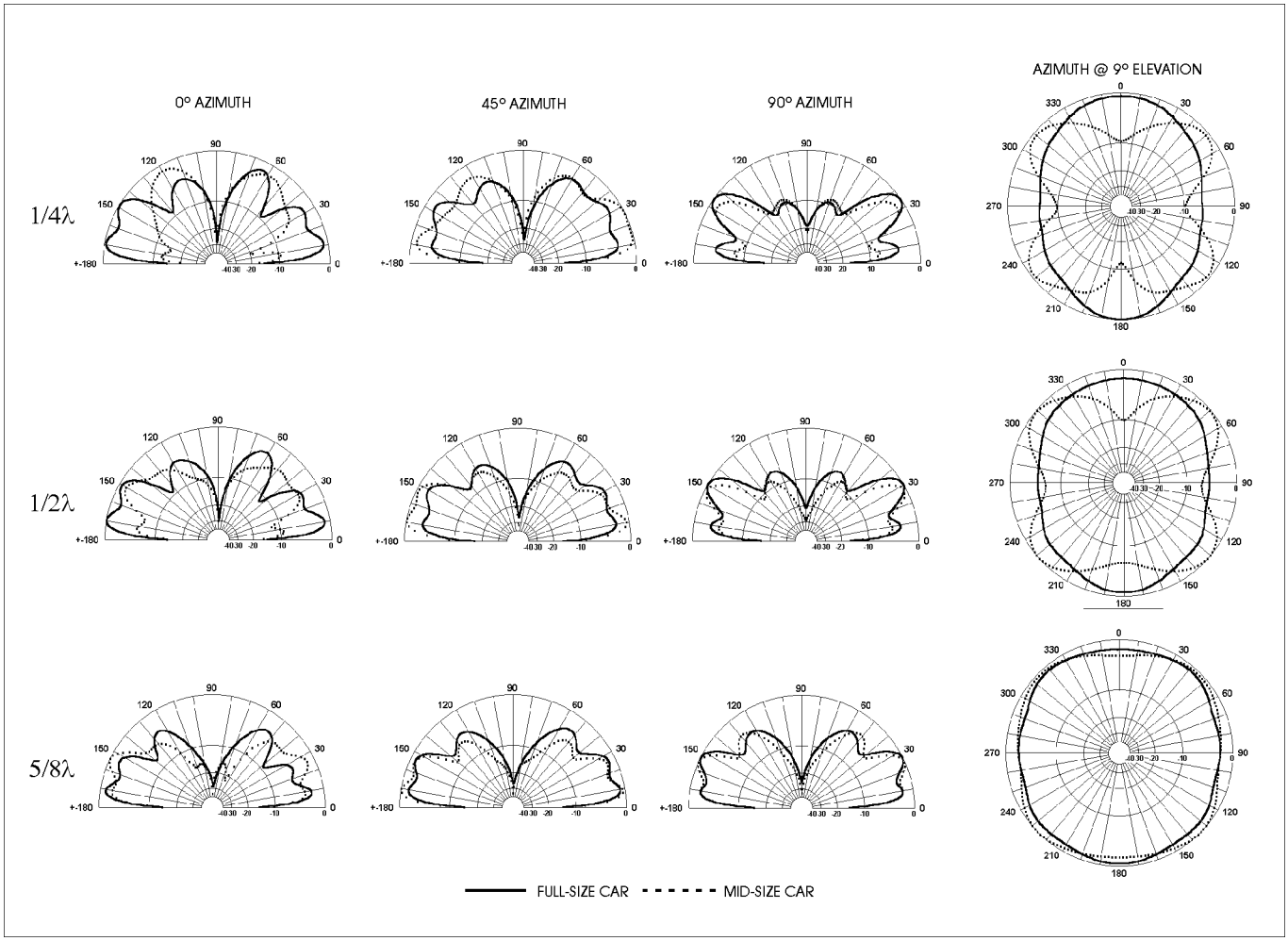


Figure 2 – Elevation and azimuth patterns showing the comparison between the full and mid-sized cars for the three most popular VHF mobile antennas

have something to work against. In ground-mounted HF systems this is the ground they are mounted upon. If they are elevated as are most VHF installations some form of counterpoise (usually a ground plane consisting of several ¼ or ½-wavelength radials) is used. A properly built ground-plane does not radiate only the monopole portion of the antenna system does which produces an even omni-directional azimuth pattern. For VHF mobile installations there is a misperception that a vehicle's roof serves as the ground-plane and doesn't radiate therefore the antenna radiates in the same fashion as conventional ground-plane. This is not true which I will now explain.

It's Not A Monopole

Although the car's roof section does provide an area for a monopole to work against there are some important details we need to look at. First, the roof is rectangular in shape and does not have the even disk-like form of a radial system used on a conventional ground-plane. This in itself will cause some skewing of the azimuth pattern. However, a more significant point is that the RF energy is not confined to just the roof area. There is nothing preventing it from flowing down the supporting columns to the doors, finders, hood and trunk lid. (This can be easily confirmed by examining the segment currents within the models reported by *NEC*.) The result being that the whole vehicle is radiating and is actually one half of a dipole antenna system - the other half being the roof-mounted vertical element. Granted, this is geometrically and electrically a very lop-sided dipole but, a dipole nonetheless. We know that changing the size and/or shape of one arm (half) of a dipole will certainly affect its pattern and gain. This is why we have the substantial differences between the antenna patterns for two cars although their roof dimensions are nearly identical.

Okay, now that we have a better picture of what's happening let's move on and take a look at the rest of our vehicle-dipole combinations.

The Results

To save you the drudgery of examining a multitude of antenna plots requiring many pages of magazine space let me give you a summary of a couple items that were similar in a majority of all the models.

Generally (about 80% or more of the time – there were exceptions) the 1/4-wave whip had the highest high angle radiation component. Elevation plots for the 1/4-wave revealed that the most of the energy being launched between 7º and 80º. The 1/2-wave

antenna's was slightly lower (7º - 70º) with the 5/8-wave the lowest (7º - 60º).

In all the elevation plots the lowest significant lobe was about 9º. In most cases it was not the most significant lobe in amplitude, however, it is the most significant for long-range towards the horizon communications hence I used a 9º elevation angle for creating a series of azimuth antenna pattern comparisons.

I made two groups of azimuth plots. The first (Figure 3) displays the variations resulting when the different length antenna elements are placed on the same vehicle. The second (Figure 4) displays how the vehicles compare with one another using the same length antenna element. For best display all plots are normalized however, the outer ring's dBi value is shown for each plot.

I found it a real eye opener to see the amount of variations between the models. A noteworthy exception was the 5/8-wavelength element that consistency produced the best omni-direction pattern. An additional expanded linear plot for the 5/8-wave vehicle combinations in Figure 5 and provides a bit better view.

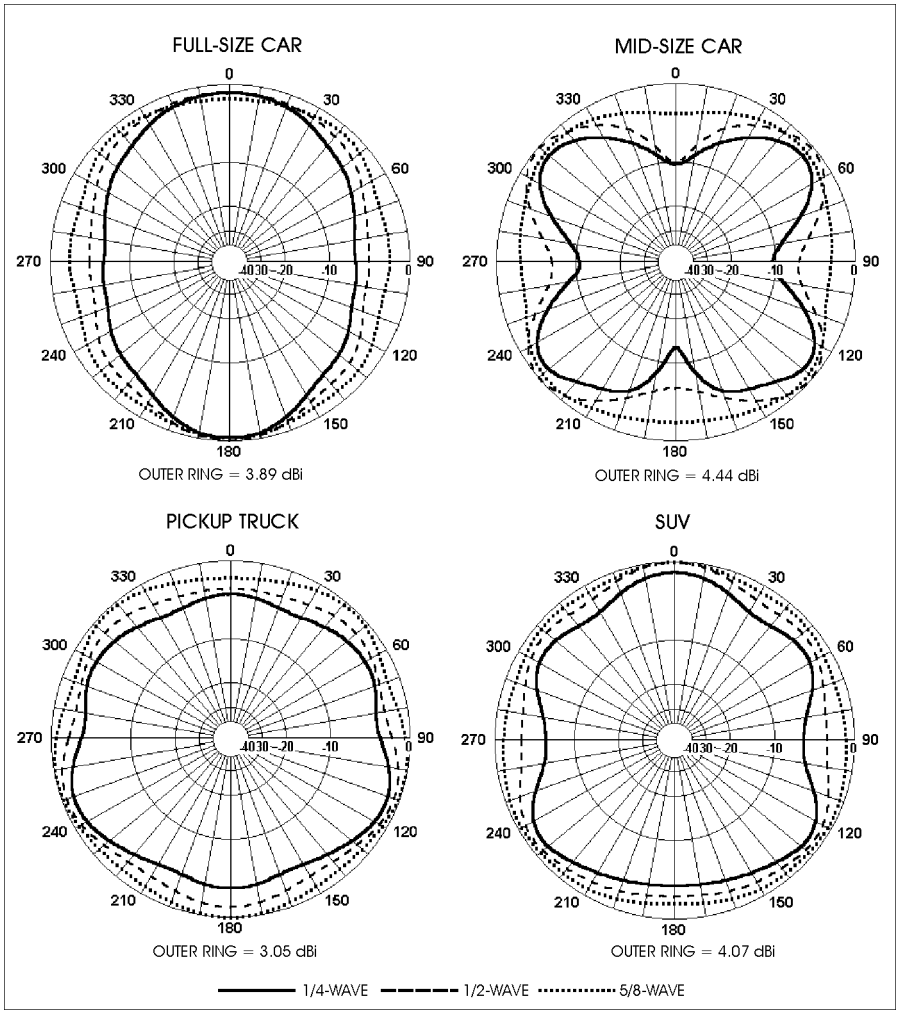
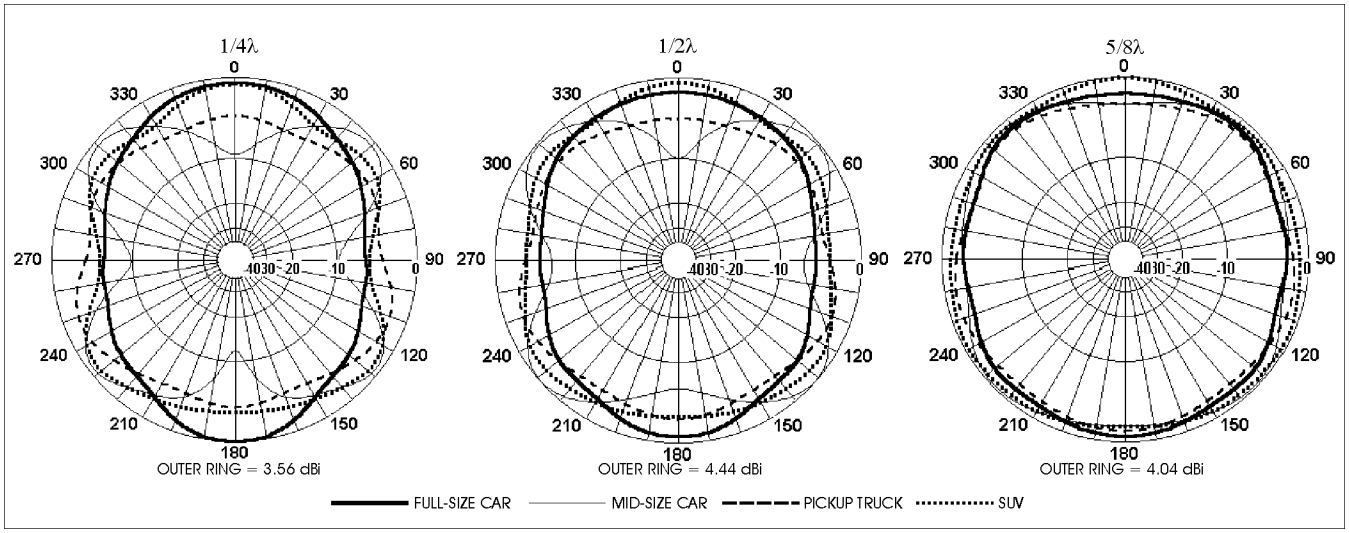


Figure 3 – Azimuth pattern variations (9º elevation) resulting with the different length antenna elements.

Gain

To the extent that the 5/8-wave produces more gain, well, that's another matter. Note that in Figure 5 the pattern for the 5/8-wave/SUV combination has an azimuth pattern that varies as much as 1½ dB. Adding to that you can also note that depending

Figure 4 – Azimuth patterns (9º elevation) displaying how the vehicles compare using the same length antenna element.



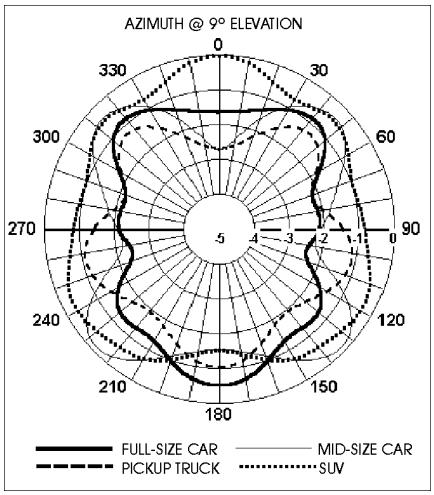


Figure 5 – Expanded linear azimuth pattern (9º elevation) for the 5/8-wave antenna mounted on the four vehicles.

upon the vehicle selected and what azimuth bearing is compared it is possible for a 5/8-wave to have 2½ dB gain over itself. You might also consider that the maximum gain figures shown for *all* the antenna and vehicle combinations in Figures 3 & 4 varied less than 1½ dB. So in the gain game it's your call.

Let's be realistic about gain. If you have ever operated mobile you know it is not at all unusual to observe a signal rapidly fluctuating 20 dB or more while driving. Under those conditions you aren't really going to distinguish any gains under 3 dB one way or the other. Possibly under marginal conditions with the vehicle at rest a 1 or 2 dB improvement may make a difference but it is highly doubtful, in normal mobile operation, such a small gain increase will be discernible.

Conclusion

As I stated at the onset I had originally plan to investigate the gain of a 5/8-wave monopole as used in UHF mobile operation. What I gleaned was that the 5/8-wave element was, in fact, operating as one arm of a dipole antenna system with the vehicle providing the other half. Subsequently the size and shape of a vehicle has a strong influence, sometimes very pronounced, on the radiation pattern regardless what length antenna element is used. Additionally, I found that it is not possible to accurately predict how a mobile antenna system will perform based upon some other mobile system – unless the vehicles and antenna installations are the same. To get any kind of meaningful estimation would require modeling each situation on a case by case bases.

Keep in mind that the models I have used are *approximate* and so are the findings. To have better accuracy requires more exacting models. Using CAD software to create wire-grid models that more closely conform to the vehicles actual form and size would generate more valuable results. *NEC Win-Synth* will import *AutoCad*® (*.dxf files).

Another item I did not considered here is the fact that some portions of vehicles today are constructed using composite materials thus the surfaces maybe more reflective than conductive. Which makes it highly problematic that accurate results could be obtained with *NEC* as one of the big cautions in *NEC* literature is not to try to model diffraction edges.

At this point, about the only thing I feel I can say with any certainty is that using a 5/8-wave *should* produce a better omni-directional pattern. Other than that all bets are off!

Footnote

1-NEC Win-Synth, Nittany Scientific, Inc., 1733 W 12600 S, Suite 420, Riverton, UT 84065 www.nittany-scientific.com