

THE BLACK HOLE



ARRL SS Unlimited Team Champs 2000, 2001, 2002

Official Journal of The Society of Midwest Contesters

Volume XVI Issue VIII

October 2008

2008 Sweepstakes – 30 days to go!

By Kevin Kaufold, W9GKA

I want to shift gears a bit and begin this pre-contest report by itemizing all the great things that the Society of Midwest Contesters has accomplished recently. As we head toward the November sweeps, we could use some perspective on what makes us a great contest organization.

- We have a club reflector that distributes hundreds of messages every year to many hundreds of people.
- KM9M is doing a wonderful job at maintaining and updating the membership roster as well as being the point man for the treasury.
- Brian, K9QQ, has been masterful at keeping the Black Hole newsletter on a regular schedule and producing a great finished product.
- Many of the articles that first appeared in the BH were then accepted for publication in CQ, NCJ, and CQ VHF. Congrats to all

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Contest Calendar

NA Sprint RTTY	Oct 12	00Z-04Z
CQWW DX SSB	Oct 25-28	00Z-24Z
CQWW DX CW	Nov 29-30	00Z-24Z

ARRL Sweepstakes 2008

CW November 1st—3rd

SSB November 15th—17th

The Antenna Tilt Debate

By Joe Fleagle W0FY@ARRL.net

There have been suggestions made that tilting a six meter beam upward might improve performance in certain situations. To examine this, a typical six meter beam (M squared 6M5 because the author happens to own one) was modeled at various heights using EZNEC+. Heights of 18, 50, and 100 feet were chosen to show what might happen for a portable operation, an average home installation, and a large tower. The model used real ground of average conductivity and the same antenna model was used for all runs. Two cases were run – one with the antenna parallel to the ground, and one with it tilted upward 10 degrees.

What is the vertical angle of arrival of typical 6 meter signals? Elsewhere on the FFMA site there is a chart showing angle of arrival of signals versus distance. The chart assumes specular

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Membership in **The Society of Midwest Contesters** is open to all persons with a bona-fied interest in amateur radio contesting. The club doesn't collect annual dues, but instead funds everything through member donations. For more information contact one of the following officers:

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SMC Needs Your Financial Support

As one of the top contest clubs in the nation, we continue to sponsor plaques for a number of major contests including Sweepstakes, ARRL DX, CQWW, and CQWPX, as well as make monetary donations in the interest of promoting radio sporting.

A few years ago we decided to eliminate the formal dues of \$10 per year, and instead maintain funds through member donations. We encourage all members to consider making an annual donation to the club. Your generous donations allow us to continue to expand our support of radio sporting.

You can make your donation two ways:

1. Checks or money orders made payable to SMC:

SMC

c/o Zig Markowski - KM9M
50 E. Eureka Drive
Lemont, IL 60439-3970

2. Use Paypal and email your donation to donation@w9smc.com.

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SMC Stuff

To get your SMC stuff, see the last page of the newsletter or visit the SMC website, <http://w9smc.com/merchandise.htm>



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Shirts

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reflection from the ionosphere at a height of 65 miles – the approximate height of the E layer. It’s been suggested that the E layer does not always produce specular reflections – some other mechanism also refracts radio waves. The author won’t argue this – casual experience over many years on the 6 meter band has convinced me that there are indeed other mechanisms of propagation that are not yet fully understood – but for purposes of this discussion we’ll assume that the reflection is indeed specular.

For meteor propagation, the reflections are truly specular. Other than the fact that the meteors may create trails at lower altitudes than the E layer - shortening the distances a bit - the chart should provide a good feel for the vertical angle of arrival versus distance between stations.

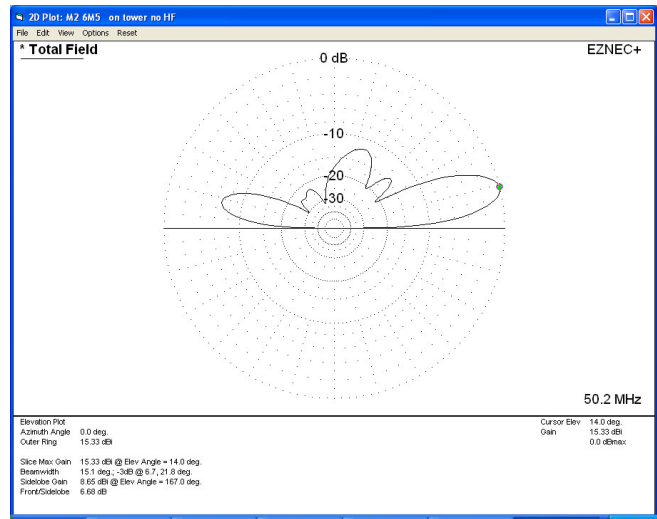
If we accept that the chart correctly predicts the angle of arrival of DX signals, then a casual examination of the chart shows that nearly all of the desired signals arrive at an elevation angle of 10 degrees or less. This means we want to know how the antenna performs at low vertical angles of incidence.

Antenna performance is modified from its free space value by the ground reflected wave. The direct ray and ground reflected wave combine in space in vector fashion, producing both addition and cancellation effects. The vertical radiation pattern produced by an antenna over real ground is mostly dependent on the height above ground in terms of wavelength and whether the wave is vertically or horizontally polarized. Practically speaking, the length of a 6 meter antenna has little effect on the vertical antenna pattern. The author has also modeled shorter and longer boom length beams mounted horizontally at various heights. The vertical angle of the main lobe is pretty much independent of antenna length – it depends only on antenna height. This is not surprising – practical six meter beams all have vertical beam widths much larger than 20 degrees so the ground reflection doesn’t change significantly even with very long boom antennas. At microwave frequencies where antenna beam widths are much smaller and antennas are much higher above ground in wavelength terms this is not true.

Following are a series of EZNEC elevation pattern plots run for the test cases.

6M5 18 ft height, no tilt elevation antenna pattern. This might be typical antenna pattern for a portable setup with a low antenna. Note that the center of main lobe is at 14 degrees elevation and the lower -3 dB point is at 6.7 degrees. There is no RF down near the horizon.

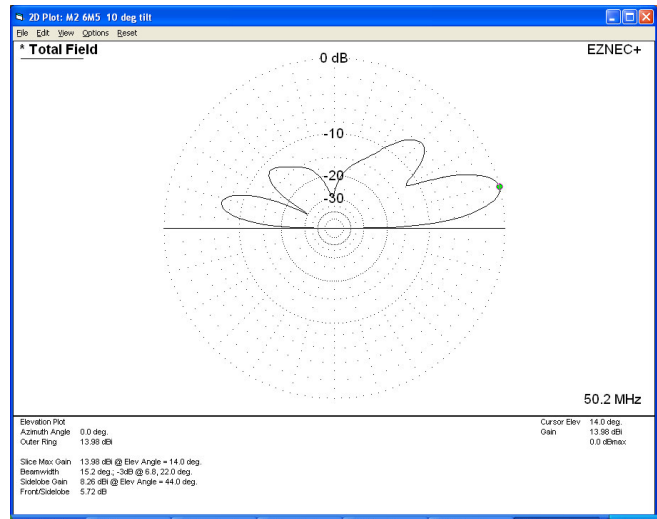
6M5 10 degree upward tilt at 18 ft. Note that the main lobe is still centered at 14 degrees, the calculated gain has dropped from 15.3 to 13.98 dBi, and the lower -3 dB point is still at 6.8 degrees. Note that the lobe at about 45 degrees



6M5 18 ft height, no tilt elevation antenna pattern

has become much larger, otherwise there is little difference in the overall pattern.

6M5 @50 ft no tilt Note that the antenna pattern has developed many lobes in the vertical plane. The main lobe is now at 5 degrees elevation with a lower -3 dB point of 2.7



6M5 10 degree upward tilt at 18 ft

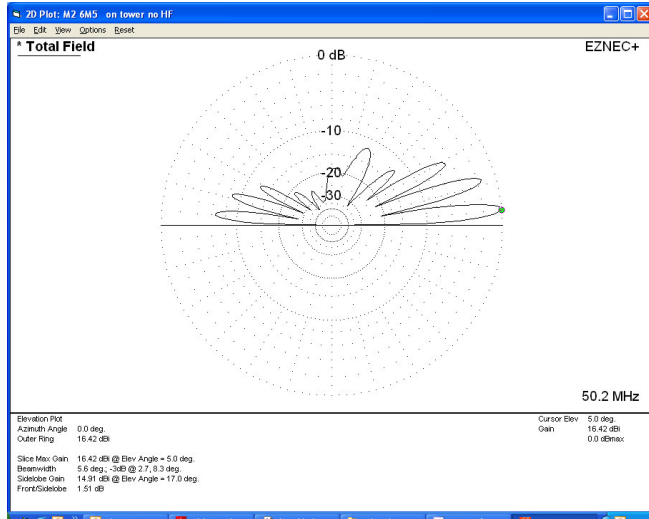
degrees. The first null in the vertical pattern is at 13 degrees and has a gain of minus 2.25 dBi. The next large lobe is at 20 degrees elevation.

6M5 10 degree uptilt @50 feet The main lobe is still at 5 degrees with the lower -3dB point at 2.7 degrees, but the calculated gain at 5 degrees has dropped nearly 2 dB. The high sidelobes around 45 degrees have increased substantially. The null didn’t move.

6M5 100 ft no tilt Now the main lobe is centered at 3

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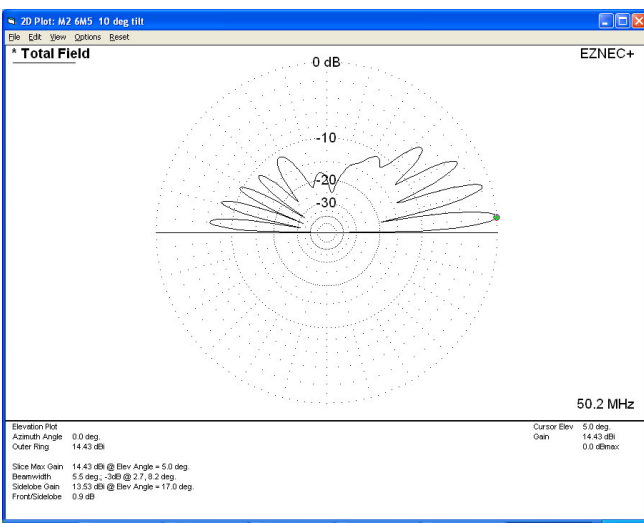


6M5 @50 ft no tilt

grees, but it is very narrow. The -3 dB points are 1.5 and 4.1 degrees and the first null is at 6 degrees with a gain of only 3 dBi. The second sidelobe is at 8 degrees elevation and is quite narrow as well.

6M5 10 degree uptilt @100 ft The gain in the main lobe drops over 2 dB and the higher side lobes increase as before but in the critical 0 to 10 degree angle of arrival range there isn't any other significant change.

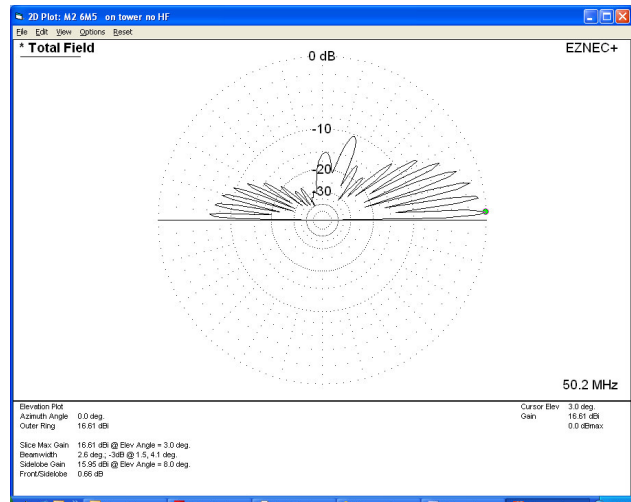
6M5 @50 ft vertically polarized – This is just presented for information to show what would happen if we used vertically polarized antennas. Note the much less defined vertical side lobe structure. This results from the fact that vertically polarized waves are reflected from the ground differently than horizontally polarized waves.



6M5 10 degree uptilt @50 feet

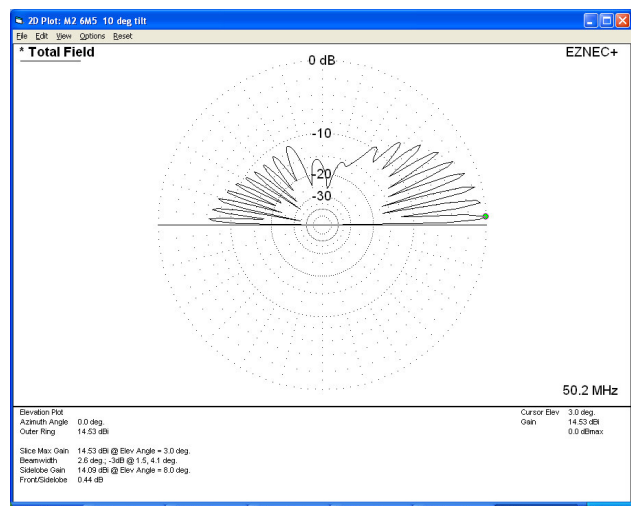
6M5 @100 ft vertically polarized

So where does this leave us? Per W7EL, the EZNEC model uses a simplified ray tracing algorithm to calculate the effects of ground reflections on the antenna pattern. It assumes that the ground plane beneath the antenna is uniform in properties and infinite in extent. Reality is much more complicated than this! The ground around most stations is not uniform and may tilt up or down so the real vertical antenna pattern will depend on the azimuth direction of the



6M5 100 ft no tilt

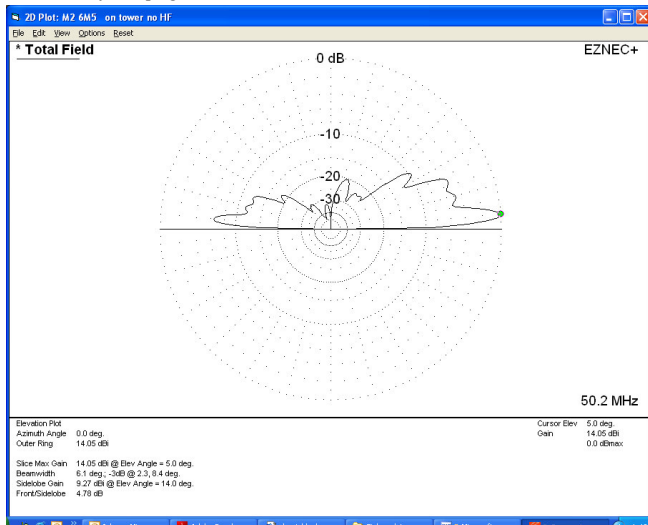
antenna as well. That said, the model is still telling us some things about the performance of our antennas. It appears that tilting the antenna upward 10 degrees provides no benefit. The tilt does increase radiation at very high angles but those are basically useless for long distance propagation if our current understanding of propagation is correct.



6M5 10 degree uptilt @100 ft

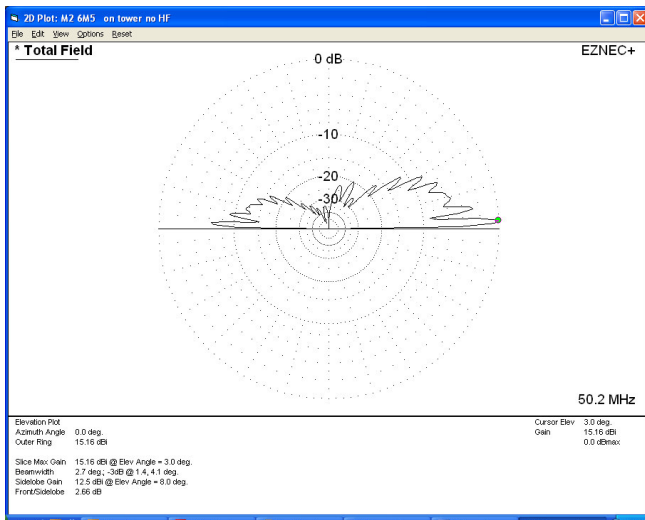
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6M5 @50 ft vertically polarized

The modeling also shows what every amateur already knows – get the antenna up as high as you can to get the RF down as close to the horizon as possible! For portable operation where you might be stacking multiple antennas on a single mast, put the 6 meter antenna on top of the stack. The higher bands will still be more wavelengths off the ground than the 6 meter antenna despite being physically



6M5 @100 ft vertically polarized

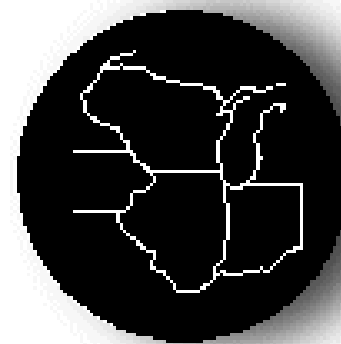
lower. 18 feet is one wavelength at 6 meters but nearly 3 wavelengths at 2 meters. Based on other modeling not presented here, you really want to get your portable 6m antenna up 15 feet or more. The main lobe elevation angle changes fairly rapidly in the 10 to 30 foot height range so every extra foot helps get the RF down closer to the horizon.

From EZNEC's perspective, tilting the antenna upward is the same as tilting the ground plane downward. If you set up

your portable station on the side of a hill or mountain with a long down slope in your most desired direction of propagation, you should be able to get RF much closer to the horizon. If the down slope is about 10 -15 degrees the 18 foot height antenna pattern looks really great in the downhill direction! Unfortunately, most of us want to have 360 degree coverage and the slope will sure hurt the uphill direction coverage! A really long steep slope will cost you all of the ground gain (6 dB max) but should allow RF right at the horizon.

If you have the luxury of being able to stack two antennas vertically at carefully chosen heights, you should be able to minimize the nulls in the vertical antenna pattern caused by ground reflections. This implies that a vertically stacked pair of shorter boom beams will be superior to a single long boom yagi simply because the vertically stacked pair will have less nulls in the vertical radiation pattern. One antenna can fill in the nulls from the other. This is especially true for the 100 foot height case where the elevation lobes are quite narrow and there are several nulls in the elevation range of interest. Unfortunately, the antennas probably need to be spaced fairly far apart vertically – perhaps 15 -20 feet – to make this work well.

During WWII, the British Chain Home radar stations, which operated in the upper HF frequencies actually used operator selectable receiving antennas at different heights to overcome the vertical radiation pattern issue so this is not exactly a new concept! Hope this writeup has provided some food for thought and discussion until the band opens again!



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of the writers who have made the content of the BH so great.

- We also have a wonderful web-site, thanks again to Brian, K9QQ on content, and KA9FOX for web-space.
- We have developed a VHF Ops List and are now developing a HF Ops List.
- We have methodically built up our VHF abilities since 2003. This resulted in us coming out of nowhere to win the unlimited in 2007 June, and we will likely win 2008 June as well.
- We also won the unlimited title in the 2007 ARRL 160 contest, and did so through natural participation of the members, without much pushing from the club.
- With these two wins, we accomplished something that no one else has done in the history of contesting (to our knowledge) – we are possibly the only club to ever win Unlimited titles in both VHF and HF contests. And we did it in the same year ! This is truly an amazing feat, something we should be proud of for a long time to come. It ranks right up there with our astounding 2000-2002 Sweeps victories.
- We even won a gavel in the Georgia QSO Party ! Another win through natural participation by great club contesters.
- We have been competitive in several other recent club events. Club members have been active in many individual contests, as well. Many members have won top national, division, and section awards.
- Pat, WW9R, has been so successful at lining up people for both Sprints and NAQP that he deserves a special round of applause. We fielded over 10 teams in one recent event. These are huge numbers by any stretch of the imagination.
- On very short notice and in a mad scramble to locate west of the 90th parallel, K9SD, N9JF, and K9CT / portable put W1AW / 9 on the air in the IARU HF World Championship held in July. Great job !
- Many of our members have been active in organizational or writing efforts beyond our club. W9GIG, KX9X, NN1N, W9XA, K9JK, K9LA, W9XT to name a few, are all very involved in ARRL or other organizational activities. I know I am missing some more calls. They all provide extra “value” to our club and to all of amateur radio by these services.
- The club has for many years sponsored plaques in various ARRL and CQ events. This is in spite of the gen-

eral low levels of income received by the club.

- We have had a no dues policy for the last several years. This was done to make it easy to become a member and enter a contest log. But it gives us heart-burn at times, when we run low on funds to cover plaques and things.
- Mike, AJ9C and the club Board of Directors are at least trying to address club contesting efforts as well as some monetary issues. Flack has been received from all sides, that’s for sure. Dialogue should continue in an intelligent manner, hopefully with consensus at some point. In the meantime, the choice is simple - Shall we divide among ourselves and refuse to help the club when asked? Or will we pull together to win contests as we figure things out some more?
- We continued the Hooters tradition at Dayton into 2008, while giving up on our own suite, with the advent of the super-suites. Thanks to KA9FOX, K9NW, K9PG and WE9V for running the SMC Hospitality Suite for something like 15 years.
- For many years, we have had a presence at the W9DXCC dinner, and many times have a get together there as well.
- We had great success with this year’s ZO fest and annual meeting. A great example of the club at its finest !!! Tnx to K9ZO and his wife for their fine hospitality.
- Looking towards the future, the club is a co-sponsor at the 2009 CS VHF conference in Chicago, and will be hosting a suite there. This will be a major undertaking for us, and we need your help. Please attend the conference and help out with the suite.
- Also being worked on is an internal awards program designed to recognize contest activity among our members. Please forward any thoughts you may have on an awards structure.

Now that I have outlined many of the things that bring value to the club and the members, let me turn to the topic at hand.

We are a great contest club. Our club members hopefully should have a desire to contest. We are now looking for people to get on Sweepstakes. Both small and large logs will be gratefully appreciated. We are doing pretty well so far on lining up stations, but could use far more. Our club goal this year is to have more logs than last year.

Will you please help out and get on either or both the 1st and 3rd weekends of November ??? We **need** you!!!

If you have not done so already, please send me a note on your planned activity levels.

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by NVSA

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Glendale, WI 53209

Ph: 414-228-8654
Fax: 414-228-8655

Be sure to note that it is for a "Black Hole" badge and please allow a couple weeks for delivery.

Member/New Member Information/ Update Form

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Call: _____

Address: _____

Phone: _____

E-mail: _____

Please send updates to:

Zig Markowski - KM9M
50 E. Eureka Drive
Lemont, IL 60439-3970

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The Society of Midwest Contesters

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