DJ0IP's "Almost a Test" of the EH-Antenna

Why "Almost" a Test:

"Real" tests should be conducted in wide open spaces (i.e., "Antenna Field Test Grounds"). Instead, this test was conducted in my own front and back yard, with two antennas in the front yard, the EH-Antenna in the back yard, and a house in between. The two antennas in the front yard were already permanently installed. I chose the next best possible location for the EH-Antenna. To be fair, I should have swapped the location of the antennas and run the tests again because perhaps one location is more favorable than the other. I did not (and will not) do that.

If you are looking for a professionally conducted test of the EH-Antenna including measurements using precision measuring equipment, then please look elsewhere. If you are interested in one ham's experience, on the air using his transceiver's S-meter for measurements, then by all means, read on…

Why Test At All:

We hams are always searching for a "better" antenna. "Better" can be measured in many different ways, including performance, size, appearance, cost, reliability, bandwidth, etc. No antenna can be the best at all of these criteria. All antennas have strengths and weaknesses. The purpose of my test was to determine when, where, and for whom the EH-Antenna makes sense.

Location:

I live in the country, just south of Munich, Germany. When examining my results in the spreadsheet, please keep in mind that some "DL" stations could be as far away as 1000 km (600 miles) while some Italian stations could be as close as 200 km (120 miles). The same is true for OE and OK stations. Munich is located in a time zone that is GMT + 1. Darkness currently occurs around 16:00 GMT. Munich is a high-tech city but does not have a lot of heavy industry. It has a lower noise level than most other large German cities. My country location is even quieter than in Munich. As a result, one of the things which I was not able to test is "if" the EH-Antenna is quieter than other antennas. This is "claimed" by many but hey – if I have little or no noise to begin with, how can I test it?

Test Methodology:

All tests were performed using a Ten-Tec Argosy or Ten-Tec Omni VI+. For strong signals, I used attenuation on the front end to reduce signals such that they were mid-range on the S-meter. The AGC was switched to "fast".

Most tests were simple SWL tests (receive-only) because they are performed much more quickly than 2-way (QSO) tests. Occasionally I worked a few stations for a

sanity-check to be sure that the antenna works as well on transmit as it does on receive. It does.

In most cases I was unable to ascertain the exact QTH of the other station because I did not listen to the frequency long enough. In some (SSB) cases the full call sign is missing because I do not speak the language that the call was given in.

I repeated each test several times to be sure I was measuring a trend and not a peak. If I was uncertain, or got conflicting results – which was often (especially during grey hours) – I simply did not log the event.

Reproducible Results:

I can assure everyone that the results I have obtained and present here are true and reproducible here at my QTH. I can not guarantee anyone that they will achieve the same results at their QTH.

Antennas Tested and Compared:

For the low bands, the "Horizontal vs. Vertical" polarization differences are pretty well established. The vertical antenna is typically better for long haul (DX) activity, and the horizontal antennas (dipoles) are better for local, rag-chew activities (especially when mounted at heights of less than one quarter wavelength). One popular term these days is "NVIS". Clearly the horizontally polarized antennas make better NVIS antennas.

I conducted my EH-Antenna tests against both a horizontal and a vertical antenna. These are my standard antennas which have been chosen as a result of 40 years of trying litterly everything that the industry has suggested.

Of course a 5 element mono-band beam mounted one wavelength above a good earth is a fantastic antenna and will out-perform all of the antennas I tested. However, at frequencies of 7 MHz and below, who of us has this possibility? Certainly not I, sir!

My "Horizontal Dipole" runs north-east to south-west. It favors the U.S. and penalizes Asiatic Russia. It's total length is 40m (about 130 ft.) and its height at the feed point is 13m (about 40 ft.). Both ends are at about 10m (30 ft.). This antenna is fed with 450 ohm open wire feed line. I have been using this antenna whenever possible (instead of coax-fed) since seeing a "live" presentation from the late Lew McCoy (W1ICP) in 1963. It works great on ALL bands but I typically switch to my vertical for 20m and above.

My Vertical Antenna is a less-known antenna that has worked excellently for me for the past 10 years. It is a **"Vertical Dipole"**, also fed with 450 ohm open wire feed

line. The total length of this antenna is 12 meters (about 37 ft.). 14 meters total length would have been slightly better for 40m but at the expense of performance on 10m. I find the 12m length to be the best compromise. Since this antenna is fully symmetrical, there is no need for radials. My tests over the years show this antenna to out-perform simple quarter wave verticals using 2 or 3 radials. Of course one "could" use 50 or 100 radials, but hey, I live in a house with 3 other people, 2 dogs and 1 cat. I can't just go running wires all over the place! I originally got the idea for this antenna from Karl Hille, DJ1VU, back in 1992. I tried it and have never been without it since then. I use it on all of my contest ex-peditions. I highly recommend it to anyone that wants a Ferrari for the price of a Ford.

BEAM ANTENNAS: Yes, I had many beams and quads over the years - beams at 25m (75 ft.) height and beams at just 10m (30 ft.). During the past 20 years, all of my beams and quads have been at 10m height which is the maximum permitted under German law without obtaining a "building permit" for the tower. Except for the front-to-back ratio, the difference in gain between my vertical dipole and these low-installed trap beams is really "peanuts". As a result, my tower and beam have been laying on the roof of my garage for nearly 4 years now.

Feeding 450 ohm open wire antennas: Yes, you "can" use an external balun and a "T" matchbox, but I have had bad experience with this configuration at power levels greater than 100 watt. AND, I have tried the balun on both the input and the output side of the "T". A true symmetrical antenna matchbox is far superior to any "T" configuration (for feeding open wire). I use symmetrical matchboxes on both of my antennas. The horizontal is matched with a high-power version of the (German) Annecke symmetrical matchbox, and the vertical is matched with a (English) Decca KW Ezee Match matchbox. Both add significant additional pre-selection which helps explain why my antennas are "quiet".

RESULTS of the Tests:

You may examine the results of my tests in the accompanying spread sheet. Although the spread sheet had foreseen 2-way contacts, most of the data logged was receive-only. You might expect this to be simple and clear. It's not. It's highly complex. Hey, each time I tested 3 antennas, I got 4 results!

Well, not quite that bad. The bottom line is, conditions change and results change. They are distinctly different between day and night, but the real challenge is trying to measure something during the grey periods (dawn and dusk) where conditions seem to be changing 48 times per second!

I think the best way to evaluate the test results is to summarize the results in these three categories: daytime, nighttime, and grey periods (dawn and dusk). I have a good feeling for the accuracy of my results during the day and during the night. It

was pretty clear-cut. The results I show for the grey periods should be taken with a grain of salt.

Daytime Results:

During this time period, DX is out of the question. Local (for me, DL, I, & OE) QSO's are the most predominant. Here, the (expected) classical results were obtained. The horizontal was typically 4 or 5 S-Units better than the vertical. The EH-Antenna was typically 1 S-Unit better than the vertical – sometimes 2 or more S-Units. This was pretty much "All the time" and reproducible. Conclusion: In addition to the typical low-angle (vertical) radiating pattern, the EH-Antenna also exhibits a fair amount of high-angle radiation, making it a better NDIS antenna than the vertical. Although the vertical, compared to the other two, was a pretty poor performer during the day, signal strengths of these local stations are typically strong enough to be worked anyway.

Nighttime Results:

At night, the vertical was typically 2 S-Units better than the horizontal (except for very close stations) – and sometimes even 3 S-Units better. This truly marked the difference between Q5 copy or not (see JA4AHV & the last entry for JA5PL). The EH-Antenna was typically 1 S-Unit down compared to the vertical, yet still 2 or more S-Units better than the horizontal. I conclude that the EH-Antenna performs more closely to a vertical-polarized antenna than to a horizontal polarized antenna.

GreyLine Results:

During this period, all antennas were similar in performance. I was unable to say which antenna (for sure) was better. During this time period, you can hear both local and dx stations. I "perceived" the DX to be an S-Unit stronger on both the EH and the vertical dipole than on the horizontal but it is difficult to be sure. Like I stated earlier, I could usually test 3 different times and get 4 different results! Although I spent a lot of time listening during these periods, I didn't manage to log many tests.

Assumptions:

The low height of the horizontal dipole should cause it to be (in theory) an omni-directional radiating antenna. However, the fact that it was sometimes a lot stronger than the EH and sometimes just a little stronger leads me to believe that directivity played at least a contributing role. Unfortunately I did not take the time and effort to put up a second dipole at 90 degrees to the first to confirm this.

Advantages of the EH-Antenna:

1. Size

2. Appearance (may be disguised to not look like an antenna)
3. Efficiency
4. Omni-directional
5. Broad-banded, low SWR
6. Novelty (It's fun working people with such a small antenna and hearing their comments)

Disadvantages of the EH-Antenna:

1. Single Band
2. Expensive (if you buy one)
3. Difficult to construct for non-technical hams
4. Needs to be high and free-standing to be highly effective

Summary:

During the day, the horizontal was the clear winner, being consistently as much as 4 or 5 S-Units stronger than the other antennas. The EH-Antenna was almost always 1 or 2 S-Units stronger than the vertical.

At night the vertical was always 2 or 3 S-Units stronger than the horizontal, and the EH-Antenna was typically 1 S-Unit down on the vertical.

A lot of what I heard during the "gray" periods is not recorded in my chart because I was unable to determine which antenna was better – due to rapidly changing conditions. QSB is rapid and can easily swing 4 or 5 S-Units. What I did learn is that using two different antennas and a receiver with true "Diversity Reception" will surely be more effective than simply using one antenna.

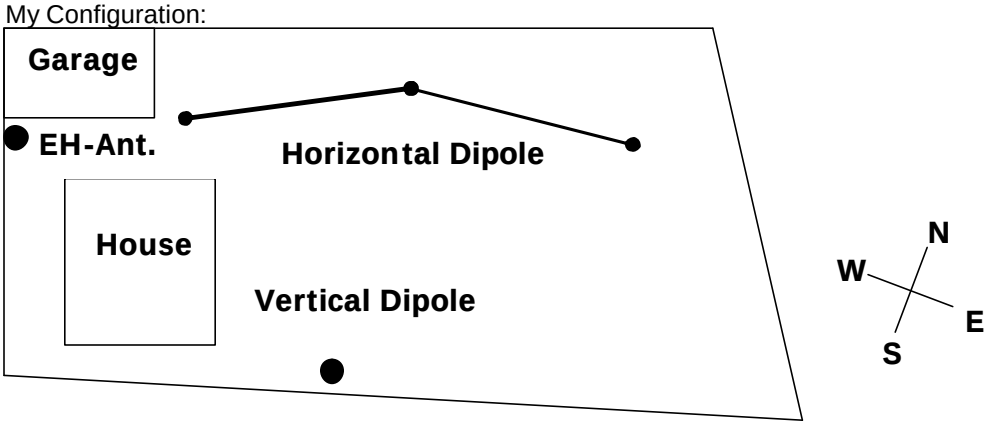
Conclusions:

1. At my home QTH, there really is no need to have the 40m EH-Antenna in addition to my existing horizontal and vertical antennas.
2. If I could only have just one antenna for 40m, then I would choose the EH-Antenna. It is better than the dipole for nighttime DX and during the day, although it is not as good as the dipole, the signals are typically all strong enough (59++) anyway.
3. For portable operations (e.g., camping with my motor-home or perhaps with a caravan) the 40m EH-Antenna will enable me to have an excellent antenna without disturbing other campers.
4. Excellent antenna for hams restricted by zoning rules.
5. I need to test the 80m and 160m versions of the EH-Antenna. I have no vertical for these bands. I assume they would greatly out-perform my (low) horizontal dipole for DX contacts – especially with stations off the ends of my dipole.

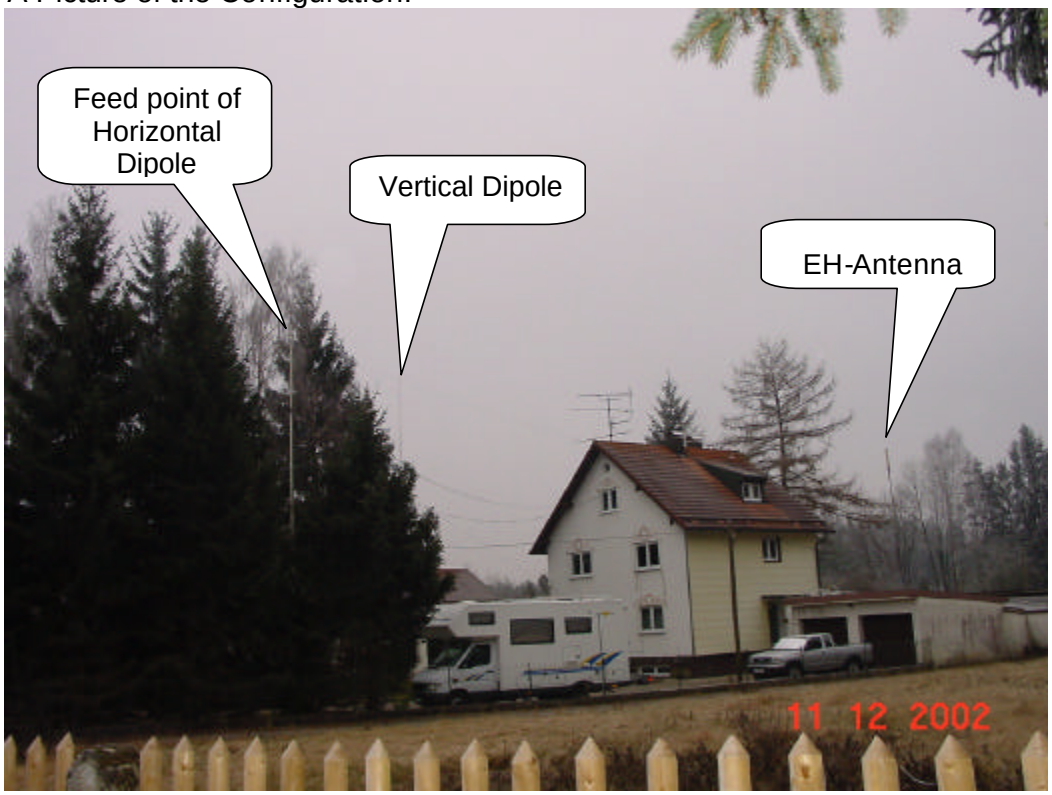
Future Tests:

1. What effect does "height" have on the antenna? How well will it work if it is only 3m (~10 ft.) off the ground?
2. How well will it work indoors?
3. How well will it work with it's base sitting just above the roof of my motor-home?
4. How does it compare to a well-designed magnetic loop antenna?
5. Is there a negative interaction when mounting two EH-Antennas (for two different bands) in close proximity of each other?

My Configuration:



A Picture of the Configuration:



EH Antenna Tests

	Received			Sent / Heard			GMT		
Call	**Zepp**	**EH**	**VerDi**	**Zepp**	**EH**	**VerDi**	**Time**	**QTH**	**Comments**
DL7NT	S9	S7~8	S6	S9	S8	S7	16:35	Berlin	He was sometimes 3 S-units stronger on the Zepp (heavy QSB)
DJ3UC	S9	S7	~	~	~	~	16:45	Collogne	I didn't compare his signal on different antennas
CT3/DJ2AA				S5	S7	S8	6:40		
7X4AN				S5	S6	S7	6:42		
7X4AN				S9	S8	S9	6:45		QSB and rapidly changing conditions. Difficult to obtain exact measurements
EA6AEI				S5	S3	S5	6:47	Menorca	
EA6AEI				S7	S7	S7	7:18		
I ?				S9	S7	S8	7:32		
I ?				S8	S6	S7	7:33		
EA5AUR				S7	S7	S8	7:35		
GM3SW				S7	S7	S3	10:05		Reproduced same results several times. VerDi was weaker!
OK2PRM				S3	S2	S2	10:10		
HB9LE				S8	S7	S5	10:25		
DL ?				S9	S6	S5	10:26		
G4BWG				S6	S4	S3	10:28		
F5EBY				S9	S8	S7	10:30		
F ?				S8	S8	S8	10:30		
DJ2XJ				S9	S8	S8	10:32		
DK2JO				S9	S6	S6	10:33		
DL3DJ				S9	S8	S6	10:38	Neu Brandenburg	
DL ?				S9	S7	S7	10:39	Burgwald near Marburg	
DL5DM				S8	S7	S5	10:42		
EA8…				S3	S8	S8	21:41		
W1UK				S4	S5	S5	21:43		
4X4FC				S4	S7	S8	21:45		
UR4MOJ				S6	S7	S8	Lugansk		
BBC London				S3	S6	S7	23:20		
EA6AEI				S9	S7	S8	6:45		
G3MOM				S8	S8	S7	7:23		
IP4JPK	S9	S9					7:28		Fred in Northern Italy
UR5FEQ				S1	S3	S4	17:57		

Double-Zepp
Total Length 40 Meters
Up 13 Meters

EH Antenna
Feedpoint Up 9 Meters

Titanex Vertical Dipole
Total Length = 12 Meters
Feedpoint Up 9 Meeters

	Received			Sent			GMT		
Call	**Zepp**	**EH**	**VerDi**	**Zepp**	**EH**	**VerDi**	**Time**	**QTH**	**Comments**
UR5TA				S2	S4	S5	17:57		
F8DKS				S2	S3	S4	17:58		
UA4WJT				S1	S2	S3	18:08		
UR5IAP				S1	S3	S4	18:10		
JA ?				S2	S3	S4	18:18		
UA4JJC				S0	S3	S4	18:20		
F5NTT				S3	S5	S6	18:23		
G3MLN				S5	S7	S6	7:10		
LZ3PZ				S3	S7	S8	6:45		
7X4AN				S3	S4	S4	6:50		
F6GPE				S4	S4	S6	652		
S51OI				S7	S8	S8	7:18		
DL6UNF				S5	S7	S7	7:19		
YO5BEU				S5	S8	S9	7:22		
OK1AY				S9	S6	S6	7:22		
G4BWO				S5	S7	S7	7:24		
G3FLO				S5	S5	S5	7:24		
G0EVY				S5	S7	S7	7:26		
F(rance)				S4	S7	S7	7:28		
LX0LT	S9+20	S9+10		S8	S7	S7	7:35	Wiltz	Herman
F5MMX	S9+20	S9+10		S9	S8	S8	8:00	40 km south of Paris -	Name: Jean
DL6MQ				S9	S6	S4	11:25		
DJ4SZ(?)				S9	S5	S4	11:35		
HB9(?)				S9	S7	S5	11:36		
GERMAN HAM NEWS				S5	S4	S3	12:05		
DL6UEF				S6	S4	S4	12:06	Kassel	
DL2YJ				S8	S4	S2	12:06		
DL1AWB				S8	S5	S4	12:07		
DH8SBT	S9+25	S8		S9	S6	S6	12:40	Stuttgart	Freddy
F6KCW/P				S7	S6	S5	15:45	Soissons	Bernard
DF0GU				S5	S4	S4	15:52		

	Received			Sent			GMT		
Call	Zepp	EH	VerDi	Zepp	EH	VerDi	Time	QTH	Comments
JA4AHV				S0	S3	S3	15:55	Matsue	Saki (noise level vs. Q5 copy)
G4RCG				S7	S5	S5	15:55		In QSO with JA4AHV
JA7SSB				S0	S3	S3	16:16		(noise level vs. Q5 copy)
EA5KY				S4	S4	S5	17:54		
IK8SCN				S7	S4	S6	17:56		
JA5PL				S5	S6	S6	19:13	Kagawa	
3Z0PRK				S3	S4	S5	19:20		
HA5MK/7				S4	S7	S8	19:41		
Y02NAA				S4	S6	S8	19:42	Timisoara	Ady
G3RGD				S3	S4	S5	19:45	Birmingham	Ray
RK4FT				S2	S3	S4	16:10		
RW3DOX				S1	S3	S4	16:11		
SM7DZA				S3	S3	S3	16:12		
DL5ALI				S4	S1	S0	16:16		
DL5JF				S6	S4	S3	16:17		
OK1AY				S3	S1	S2	16:21		
DK5EQ				S8	S5	S5	16:21	Ennepetal	Willi
F6AVS				S4	S2	S2	16:24	Colmar	Francois
SM2LIY				S7	S4	S5	16:33		
DJ0SP				S8	S7	S5	16:36		
DA0GBW				S8	S6	S4	16:38	Frabow	Heinz
UA3DCZ				S0	S3	S4	17:57		(noise level vs. Q5 copy)
IZ7AVY				S4	S1	S4	18:33	Barletta	
JA5PL				S1	S3	S4	19:36	Kagawa	