SSCA Discussion on Backstay Antenna Length - 41 posts

Original Post URL

1 Choosing a backstay antenna length

by **W5PAD** » Fri Apr 16, 2010 6:46 am

I've read here and many other places on the internet, that whenever someone ask how long should they make the backstay for an HF antenna, the answers generally come back between 23 ft and 45 ft, or as long as you can make it with the top insulator being 3-4 ft from the mast. What I find lacking in the replies is no mentioning of the fact that no matter what length is used, it will most likely be a compromise on all bands or all but one band. A single antenna can only perform optimally on a single frequency (or narrow band of frequencies). Pick a frequency away from an antenna's optimum and performance will degrade. The further away in frequency, the more degradation occurs. I define optimum performance as the best in achieving long distance communications. If this is not someone else's objective, then their definition of optimum may be different. For example, if someone only cares if the tuner can tune all bands, then any length that a tuner will tune satisfies the request. But what's missing with this approach is knowledge of the beam pattern. An antenna that can be tuned on all bands doesn't necessarily place most of its radiation power in a direction which achieves long distance contacts on all bands. To achieve long distance contacts, the beam needs to be low to the horizon. When the signal wavelength is "short" compared to the antenna's length, high angle beams are created which sends most of the power up to the clouds. When the signal wavelength is "long" compared to the antenna's length, it is not a very efficient antenna. Although more power is low to the horizon than is up in the sky, less power gets out of the antenna because it is not efficient. Only when the signal wavelength (e.g. frequency) is correct for a given antenna length will most power be transmitted low to the horizon.

Given that I will most likely only have one backstay antenna, I would like to get the most out of it. So, if I had to pick one frequency that will be optimized, what frequency is this? To help answer this question without any first hand cruising experience, I resorted to internet research. I've read a few times that the 20 meter band is the work horse for cruisers. I created a histogram which counts how many stations are on which frequencies. The list includes 510 PACTOR stations (both winlink and sailmail), maritime nets, cruises nets, and weather stations from around the world. Bottom line, my analysis agrees with the statement that the 20 meter band is to most useful band for cruisers. The image below (hopefully I've posted it correctly) shows the results. The top 3 bands in rank order are 20, 40, and 30 meters with 92, 74, and 61 stations, respectively. These 3 bands have over 40% of the stations! The 20 meter band has almost 20% of all stations.

[img]C:\Users\Silhouette\Desktop\histo.jpg[/img]

The best length for a vertical antenna to achieve long distance communications is 5/8 wavelength, and for all practical purposes a backstay antenna is a vertical antenna, only with a slope to it. The best length to achieve long distance communications on 20 meters using a 5/8 wl vertical antenna is 13.3 meters, or 43.6 feet. This figure can be varied somewhat and no one will notice any difference on the other end of the communications channel. How much can it vary you ask, surprisingly quite a bit. Using a model for a vertical antenna without any interfering structures, I computed that any length between 9.4 m (30.8 ft) and 14 m (45.9 ft) will all perform within 1 dB of the optimum length. However, one must also avoid 1/2 wl to keep the tuner happy. For 20 meters, this is 10.6 m (34.8 ft), which falls within the above range. A better range for backstay lengths would be on the order of 11 m (36 ft) to 14 m (45.9 ft). The model indicates that 12.6 m (41.3 ft) actually out performs a true 5/8 wl of 13.3 m (43.6 ft) by 0.18 dB when measured at 10 deg above the horizon.

My analysis supports the recommendations that a good length for a backstay or alternate backstay antenna is around 12.5 meters (41 ft), with the caveat that this length favors the popular 20 meter band. If the user is not interested in the 20 meter band, than a different length will better meet his or her needs.
Phil

W5PAD Posts: 64 Joined: Thu Mar 25, 2010 2:09 am Vessel Name: Silhouette

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2 Re: Choosing a backstay antenna length

by **syoder** » Fri Apr 16, 2010 5:32 pm

Thanks for your research and the post, Phil. Very helpful. Well, except for the fact that the backstay on my 28 footer is only about 35' overall. Dang!

-Steve

- -Steve Yoder s/v Siempre Sabado Westsail 28 - KJ4STN

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3 Re: Choosing a backstay antenna length

by **W5PAD** » Fri Apr 16, 2010 6:19 pm

Steve,

You should be OK with anything between 30 and 33 ft and only lose 1 dB (or 20%). Just remember the antenna starts at the tuner's output. You don't want this length to be 1/2 wl, or 35 ft.
Phil

W5PAD - Posts: 64 - Joined: Thu Mar 25, 2010 2:09 am - Vessel Name: Silhouette

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4 Re: Choosing a backstay antenna length

by **btrayfors** » Fri Apr 16, 2010 6:45 pm

Phil,

You've included a lot of theory in your discussion of backstay length, much of which I tend to agree with.

However, let's now get down to practical matters.

1. **Is 20 meters the band you should optimize for?** If you're a ham (General Class or higher) and your primary interest is in long-distance communication (over 500 miles or so), then 20 meters is indeed the most useful band. Depending on time of day and propagation conditions, you can potentially communicate with stations 2, 5, or even 10,000 miles away. HOWEVER, if you indeed wish to do so, you'd be much better served with a **dedicated vertical dipole antenna** tuned for the 20-meter band. This will outperform an end-fed backstay hands down.

2. **What if you're a coastal cruiser?** If most of your cruising is, say, from Maine to the Bahamas -- then the 40-meter band is probably much more useful for communicating with nets, other boats, and shore stations. This is a good band to shoot for, but optimizing a backstay for 40 meters -- while retaining the ability to tune well on all bands, as a backstay antenna should be able to do -- is quite difficult in practice. Not only do you have the factors of **feedline length** (the feedline from the tuner is a part of the total length of the antenna) and the **velocity factor** of the antenna and feedline material being used, but you've got the problem of interaction with the standing rigging, the mast, boom and, of course, the type and orientation of RF ground being used. All of these combine to affect the radiation pattern, both vertical and horizontal. Modeling this on any particular boat is extremely difficult and, in my experience, not very instructive.

What, then, to do?

In my experience (44 years as a ham doing MM operation and many years installing SSBs on boats professionally), I think the best thing you can do with the length of a backstay antenna is:

1. install the tuner as close to the base of the antenna as you can, in order to keep the GTO-15 feedline length short;
2. cut the average s/s backstay antenna to around 40 feet;
3. if feasible, put just one insulator high up on the backstay; feed the backstay from belowdecks, near the tuner. (If you're worried about RF "burns", put some nylon or poly tubing around the lower part of the backstay).

4. If you want to optimize the lower bands, say below 8 mHz, make the antenna somewhat longer if you have the room; if you want to optimize the higher bands (10mHz and above), cut the antenna a bit shorter. Total length should be a minimum of 23', however.

And, very important, pay very close attention to the manner of RF grounding, since the RF ground is an integral part of the antenna system and will determine in large measure how good the installation is.

JMO,

Bill - WA6CCA - Bill - S/V Born Free - WA6CCA **btrayfors**

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5 Re: Choosing a backstay antenna length

by **syoder** » Fri Apr 16, 2010 7:11 pm

How critical is the distance from the mast to the upper end of the backstay antenna? Mine is definitely less than 3-4', more like 6". Including lead-in length I'd guess my overall antenna to be about 41-43 feet. I'm using a large Dynaplate for a ground connected to the tuner with 1-1/2" wide copper foil. I get pretty decent reception but have yet to make a contact with an Winlink MBO (I can hear activity on their various frequencies but have not had any of my transmissions acknowledged yet). I am in a marina. I'm not actually using my backstay but rather am using a spare inner forestay wire (1/4" SS), connected to, but insulated from the top of the mast with nylon line. The other end is attached to the stern pulpit (pulpit is not grounded) again using nylon line and is about 2 horizontal feet away from the bottom end of the backstay (which is also not grounded).

Just in case there's any confusion, my antenna is not actually a forestay wire, it's the wire that used to be used as an inner forestay before I updated my rigging. It's now a spare.

Are any huge obvious problems jumping out at any of you?

Thanks,
Steve
KJ4STN -Steve Yoder s/v Siempre Sabado Westsail 28

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6 Re: Choosing a backstay antenna length

by **btrayfors** » Fri Apr 16, 2010 7:19 pm

No, Steve, seems OK. If you mean that the spare s/s cable you're using for an antenna is only 6" from the truck of the mast, I think I'd trim it a bit....certainly for a permanent installation.

Making connections via WinLink can be very frustrating for the first few times you do it, until you get all the settings right. Especially from a marina.

I remember on one install we were able to get SailMail connections solid each and every time, but couldn't connect via WinLink. I'm sure it was the config because the transmitter was putting out full power, but I'm no Pactor expert and didn't have time to play with it.

You're a general class ham. Why don't you check into the nets via SSB and be sure the rig and antenna system are getting out OK? If they are, you'll know it's the config or something else amiss with the WinLink setup.

73,
Bill **btrayfors** Posts: 1182 Vessel Name: Born Free Vessel Make and Model:Golden Wave 42

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7 Re: Choosing a backstay antenna length

by **syoder** » Fri Apr 16, 2010 7:31 pm

Thanks, Bill.
I've only been a General class Ham for a couple of weeks and haven't logged on to any nets yet. But there is one that I hear every morning about 11:00 PST. Maybe I'll try checking in tomorrow and see how good my signal is. Then, if it's anything less than stellar, I'll climb up and lengthen the distance from the truck to the top end of the antenna.

Thanks, again.

- - Steve Yoder

8 Re: Choosing a backstay antenna length

by **Auspicious** » Fri Apr 16, 2010 8:37 pm

Hi Steve,

There are way too many variables in a marina. Multipath (which is frequency dependent) and shielding are both huge problems. Don't spend too much time, energy, or money until you get out of the marina and into a more open space. Test there and consider your options at that point.
dave
S/V Auspicious
AuspiciousWorks.com

9 **Re: Choosing a backstay antenna length**

by **W5PAD** » Fri Apr 16, 2010 11:34 pm

btrayfors wrote:

Phil,

You've included a lot of theory in your discussion of backstay length, much of which I tend to agree with.

True, I'm at the theory stage and plan on getting experience in a couple years.

btrayfors wrote:1. **Is 20 meters the band you should optimize for?** If you're a ham (General Class or higher) and your primary interest is in long-distance communication (over 500 miles or so), then 20 meters is indeed the most useful band. Depending on time of day and propagation conditions, you can potentially communicate with stations 2, 5, or even 10,000 miles away. HOWEVER, if you indeed wish to do so, you'd be much better served with a **dedicated vertical dipole antenna** tuned for the 20-meter band. This will outperform an end-fed backstay hands down.

I agree that a dipole will perform very well, but I would like to ensure that my backstay (or alternate backstay, I haven't made a final decision here) will perform reasonably well if I don't get around to installing dipoles.

btrayfors wrote:2. **What if you're a coastal cruiser?** If most of your cruising is, say, from Maine to the Bahamas -- then the 40-meter band is probably much more useful for communicating with nets, other boats, and shore stations. This is a good band to shoot for, but optimizing a backstay for 40 meters -- while retaining the ability to tune well on all bands, as a backstay antenna should be able to do -- is quite difficult in practice. Not only do you have the factors of **feedline length** (the feedline from the tuner is a part of the total length of the antenna) and the **velocity factor** of the antenna and feedline material being used, but you've got the problem of interaction with the standing rigging, the mast, boom and, of course, the type and orientation of RF ground being used. All of these combine to affect the radiation pattern, both vertical and horizontal. Modeling this on any particular boat is extremely difficult and, in my experience, not very instructive.

I agree here as well. My plans are for offshore, that's why I'm favoring the 20 meter band. The point here that I think is of most value to anyone considering a HF installation is that there is not ONE solution that is best for all situations. All boats are different, and these differences will affect the radiation pattern differently. Also, even on identical boats, if the purpose is different (coastal vs. offshore), then the solution will most likely be different. Regarding modeling; I'm hoping that

this exercise will be instructive. I realize that it is impractical to model everything that's conductive on a boat. To be 100% accurate (to within a models capability) I would need to include every piece of standing rigging, mast, boom, stancions, lifelines, pullpit, and pushpit. Not only these, but I'd need to include everything below decks, such as wiring, engine, metal tanks, etc and anything above deck, such as bimini frame, solar panels, etc. This is where reality kills theory. But, I think the models would show the general beam pattern peaks and nulls. In other words, is there more gain off the stern, off one side, or forward? I have no delusion that a beam pattern generated by the model will be accurate, but I do believe it will show gross features like is the beam low to the horizon or is it up 40 - 60 degrees. And with this information I should be able to create something that is more likely to work than not work.

> **btrayfors wrote:**In my experience (44 years as a ham doing MM operation and many years installing SSBs on boats professionally), I think the best thing you can do with the length of a backstay antenna is:
>
> 1. install the tuner as close to the base of the antenna as you can, in order to keep the GTO-15 feedline length short;
> 2. cut the average s/s backstay antenna to around 40 feet;
> 3. if feasible, put just one insulator high up on the backstay; feed the backstay from belowdecks, near the tuner. (If you're worried about RF "burns", put some nylon or poly tubing around the lower part of the backstay).
> 4. If you want to optimize the lower bands, say below 8 mHz, make the antenna somewhat longer if you have the room; if you want to optimize the higher bands (10mHz and above), cut the antenna a bit shorter. Total length should be a minimum of 23', however.

I agree with all of these, especially #3. If I decide to cut the backstay, I see no need to put an insulator at the bottom. First, there is no difference in performance if the connection is made below deck versus above a lower insulator. Second, by attaching the GTO-15 to the chain plate below deck keeps an electrical connection out of the weather. Which is a good thing.

I'm not one who does things a certain way just because everyone else does it a that way. Most of the time I want to know why. Especially things electrical, but when it comes to chemical things (resins, epoxies, etc) I do defer to the experts. 

Phil

W5PAD

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10 Re: Choosing a backstay antenna length

by **W5PAD** » Fri Apr 16, 2010 11:49 pm

Steve,

If I understand you correctly, your antenna is basically an alternate backstay made of 1/4" SS from an unused inner forestay. This wire runs parallel to your backstay and is about 2 feet away at the bottom. The backstay is also not grounded.

Just for kicks, you could try grounding and un-grounding the backstay to see if it makes performance better or worse. If un-grounded is better, then leave it that way. If grounded is better, then you have to decide if you want to leave it grounded or have the capability to temporarily ground it when using the radio. The decision to ground it or not is a whole other topic concerning lightning protection and such.
Phil **W5PAD**

- 11 **Re: Choosing a backstay antenna length**

by **syoder** » Sat Apr 17, 2010 6:21 pm

Thanks Phil & Dave. Yes, Phil, you've got my antenna pictured perfectly. However, yesterday I was poking around and found a huge coil of excess lead-in wire between the "backstay" and the tuner. In deciding to eliminate this coil I also decided to eliminate the "backstay" and just run a continuous antenna wire from a few feet below the masthead directly to the tuner. Any suggestions on the best wire for the job. I'll also go back and study my AARL General Class study manual but I value all of your guys' input as well.

Dave, I think your advice is probably very good and, other than running my new antenna I think I will do as you suggest and just wait until I get away from the marina.

Thanks again,
- Steve Yoder

- 12 **Re: Choosing a backstay antenna length**

by **W5PAD** » Sun Apr 18, 2010 1:33 am

Steve,

Any wire can function as an antenna. The decision you need to make is more of a mechanical issue than an electrical issue. If you use copper it won't last as long as stainless steel and will only have a negligible performance improvement. If the excess lead wire is GTO-15 and it is long enough to reach the mast head, you could use it. But I'd be concern about it's breaking strength when tension enough to

keep it from flapping around in heavy wind and seas . In the long run you might get more longevity staying with your stainless steel alternate backstay.
Phil **W5PAD**

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13 Re: Choosing a backstay antenna length

by **fairbank56** » Sun Apr 18, 2010 2:57 am

- Stainless steel is generally considered a poor choice for antenna wire. It has some 43 times the resistance of copper. Hard drawn copper or copper clad steel antenna wire is a much better choice. Even plain old 14 gauge insulated stranded soft copper wire works very well although it will stretch some under a lot of tension. I have a 65' long 40 meter dipole made from this cheap 14 gauge wire, strung between two trees in my back yard and it's been there for over five years without breaking from the many many wind storms we've had. It has stretched considerably requiring me to trim it to bring it back to resonance a couple times but that wouldn't be neccessary when using an auto-tuner.

Eric

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14 Re: Choosing a backstay antenna length

by **btrayfors** » Sun Apr 18, 2010 12:16 pm

I agree with W5PAD. The difference in radiated signal between copper and stainless steel has been proven to be -- for all practical purposes -- negligible. My experience supports that statement, as does some "controlled" research on antenna types.

Besides, the real issue on a boat is longevity in the harsh marine environment, including rough offshore passages. That's why MOST antennas on boats are s/s (the backstay). Alternate backstays made of s/s lifeline are equally robust. Mine has been up for about 20 years and has survived FIVE hurricanes with winds over 100 knots in the marina.

When I first started building vertical dipole antennas for sailboats some 40 years ago I used 14gauge stranded copper "antenna" wire. Put the first one up on a chartered sloop in the BVI. It lasted less than 2 weeks before corroding and breaking. That set me to looking for better materials.

On land, I now use either s/s or, almost as good and cheaper, THHN. Went recently from 12gauge to 10 gauge THHN, as the 12gauge broke in a windstorm after about 6 years. This is standard household/commercial wire you can find at Home Depot or on line. Very tough outer jacket, stranded copper. Handy stuff.
Bill
S/V Born Free WA6CCA

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1 Re: Choosing a backstay antenna length

by **fairbank56** » Sun Apr 18, 2010 1:55 pm

btrayfors wrote:I agree with W5PAD. The difference in radiated signal between copper and stainless steel has been proven to be -- for all practical purposes -- negligible.

Except for those who insist on squeezing every ounce of performance out of their system. It's true that say for example, the difference between a 40 meter dipole made of #14 copper vs comparable size SS would be about .6db Negligible for most of us for sure but it is about a 12% loss of power. Just pointing out the rather significant difference in resistance between copper and stainless steel. Much less of a concern with backstay antenna's because of the large physical size of the backstay.

Eric

-

2 Re: Choosing a backstay antenna length

by **btrayfors** » Sun Apr 18, 2010 3:12 pm

Yes, and an excellent point it is Eric. Particularly about the relative sizes of the radiator. Here's an approximation:

Diameter---MM------Circum.------Notes
5/64"-------1.98------6.22-------AWG14
1/8"--------3.18------9.99-------AWG10
1/4"--------6.35------19.95
5/16"-------7.94------24.94
3/8"--------9.53------29.94

So....it would appear that the typical 3/8" s/s backstay has a circumference of about 5 times that of AWG14 wire and, therefore, a surface area nearly 5 times greater!

If I did the math correctly 

Bill
S/V Born Free
WA6CCA

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3 Re: Choosing a backstay antenna length

by **W5PAD** » Sun Apr 18, 2010 6:16 pm

Eric,

If we want to quibble over tenths of dB's, it think your 0.6 dB (12.9%) improvement for copper is too large. From my computations the difference in Cu vs SS is much less. For the same size wire (3/8") copper is 0.08 dB (1.8%) better than SS. But #14 AWG copper is 0.4 dB (8.8%) worse than 3.8" SS.

But none of these differences are noticeable to either the sender or the receiver on HF, the signal fades and increases much more than tenths of a dB as it bounces off the ionosphere and earth's surface on its way to the receiver.

Phil

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4 Re: Choosing a backstay antenna length

by **fairbank56** » Sun Apr 18, 2010 11:09 pm

W5PAD wrote:, it think your 0.6 dB (12.9%) improvement for copper is too large.

My information comes from a study done by L.B. Cebik, W4RNL. As a ham, I'm sure you know of him. I'm not quibbling over a few tenths of a db. Just informing readers of the significant difference in resistance between copper and stainless steel wire. Most people that I tell of this, are astonished to hear it.

Eric

-

5 Re: Choosing a backstay antenna length

by **MidLandOne** » Sun Apr 18, 2010 11:12 pm

A risk with ss is if it is magnetic in which case the loss will depend on the extent that it is so. Such losses can be very, very high.

Even though 304 and 316 ss are ordinarily regarded as being non magnetic they can become so when worked (e.g. perhaps when drawn into wire?). I have on a couple of occasions checked odd bits of lifeline wire (not known if 304 or 316) and found them to be not detectably magnetic with a simple magnet test but it is something I would always check if using such wire for an antenna. I would suspect they are always slightly magnetic and that would incur a loss greater than a straight resistivity calculation would give.

However, in the end for me over 13 years ago when my boat was first built I used approx 10m of

insulated stranded copper wire - I don't recall the gauge but it is no more than 5mm dia over the insulation so quite small - and wondered how long it would last. It is still up and the only change in it that I can see is that the insulation is now more pinkish than the original red .

MidLandOne

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5.1 Re: Choosing a backstay antenna length

by **fairbank56** » Mon Apr 19, 2010 12:00 am

I just dug out a DOS program that I have that calculates the RF skin loss in ohms per meter of various types of antenna wire. For 14 gauge SS, it's 7.1716 ohms per meter at 10Mhz and 10.1422 at 20Mhz. For the same size copper wire, it's .1614 at 10Mhz and .2282 at 20Mhz.

Eric

-

6 Re: Choosing a backstay antenna length

by **MidLandOne** » Mon Apr 19, 2010 12:28 am

I suspect those skin losses assume some magnetic properties, but I don't know. I also don't know if the surface of the wires strands making up ss wire are more magnetic than the inner as a result of the mechanical working in wire forming process, but if it is so then a simple magnet test will not give any idea of how magnetic the material is as seen by rf propagating in the skin and so could be very lossy even though a magnet test indicates the wire is not magnetic.

However, ss is widely used for VHF and UHF antennas (maritime and land mobile VHF, cellullar, etc) where I would have thought losses would be very large if skin losses were important - maybe they ignore them?

For myself, I originally used copper in preference to ss for a halyard supported antenna because the performance of ss seemed to me to be at large due to the unknowns and uncertainties that have been mentioned and the difficulty (impossibility?) of proving that the installed antenna is not suffering from any of them. Whereas copper's performance is well known and consistant. So a cop out decision on my part, maybe?

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7 Re: Choosing a backstay antenna length

by **Draco** » Mon Apr 19, 2010 1:47 am

I agree on using SS for the boat antenna and regular stranded copper for the home antenna.

Just a minor clarification on one of the posts - if you go shopping for wire, "THHN" refers to a type of insulation, not to the wire within it.
THHN is available over solid copper or over stranded wire, so you have to specifically ask for stranded wire.
(Obviously, solid copper wire is not a good idea for an antenna as it will work harden and fail from continual flexing in the breeze.)

One minor problem with THHN is it often has a thin clear plastic outer sleeve which will break down in the sunlight and begin to peel off in pieces. However, this is just visually annoying and has no effect on the heavy underlying thermoplastic insulation, or on the antenna performance - the antenna wire doesn't even need to be insulated at all.

And, as long as we're discussing fractions of a dB, one advantage not mentioned for the larger size SS (regardless of differences in total resistance or skin resistance) is its larger diameter will provide slightly greater bandwidth compared to thinner copper (i.e., a fraction of a dB better performance at the edges of the band, or at the boundaries of a particular tuner setting). And, like the differences in resistance, this is probably not something you will ever quantify in actual use.

Otherwise, good info here.

Have fun -
Frank
S/V Draco

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8 Re: Choosing a backstay antenna length

by **W5PAD** » Mon Apr 19, 2010 2:10 am

This is all very informative and I hope to learn something from this discussion.

Taking a look at Eric's data at only 10 MHz and #14 AWG: SS is 7.1716 ohm/m and Cu is 0.1614 ohm/m. The ratio between these two values is 16.4 dB [10*log10(7.1716/0.1614)]. 16.4 dB is very significant. I get the same ratio for conductivity of Cu and 316 SS used in NEC2. However, the losses in a 17.6 meter dipole is 2.3 Watts for Cu and 14.98 Watts for SS with 150 Watts input (no transmission line losses). These losses heat up the wire and take away from the transmitted RF. The ratio of the transmitted power is -0.4 dB [10*log10(135/147.7)], so the received signal strength at a distance receiver would only be 0.4 dB less when #14 SS is used instead of #14 Cu.

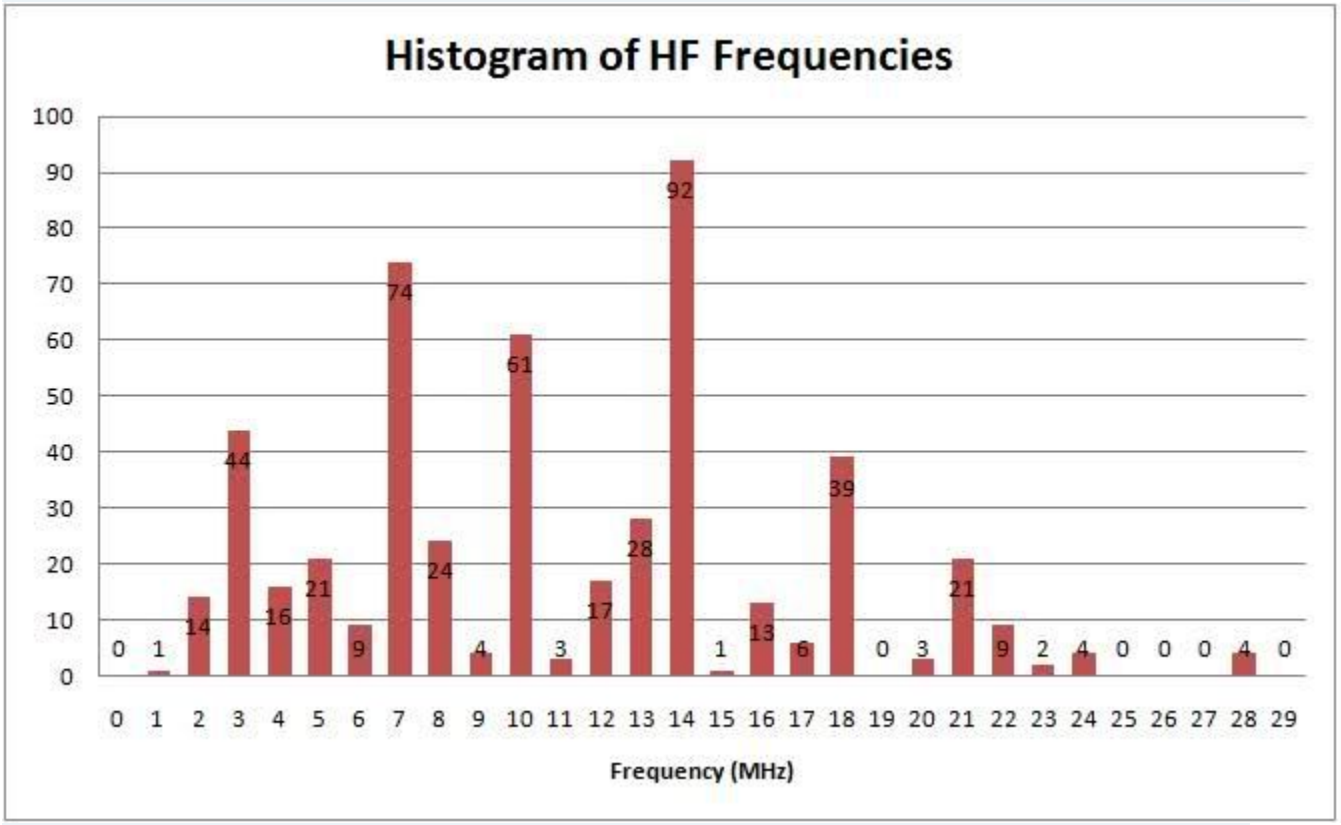
The resistivity difference between SS and Cu is significant when used as a transmission line, but insignificant when used as an antenna.

Phil

9 Re: Choosing a backstay antenna length

by **W5PAD** » Mon Apr 19, 2010 5:16 am

Here's the histogram I tried to show at the beginning of this post.



Phil

10 Re: Choosing a backstay antenna length

by **ka4wja** » Mon Apr 19, 2010 4:39 pm

1) There is usually nothing wrong with a backstay antenna length of 40' - 45'.....but there is a LOT more to this than what's been posted here.....a LOT more.....so much that I haven't the time to even come close.....but, if you're truly interested in the "whys", here are some brief facts that will help get you started....

2) I wasn't going to respond to this thread at all, but since Eric mentioned Cebik, I thought what the heck I'll try to add some sense.....
Many years ago, when I was teaching classes on radio wave propagation and antenna design, and how to build an efficient antenna system, I spoke with L.B. about using some of his tutorials.....and he said "no problem", as long as I don't try to sell anything....

So, in his memory I'd like to point some of you to some work he did many years ago, on "sloping verticals" (such as our backstays) and "5/8-wave" antennas.....
I think if you actually read all of what he wrote (it WILL take you a while!), you'll see that trying to get a 5/8-wave length backstay length might prove to be a waste of your time / effort, as the performance vs. a 1/4 wave vertical in the real world (even sea water isn't the theoretical "perfect" ground, only "very good") isn't much different (typically within a 1/10 of a db or so.....and especially considering the take-off angles of even slightly sloping antennas (whether 1/2-wave dipoles or end-fed 1/4 - 5/8 wave wires) is not "at the horizon".....
Please note that there is NOTHING wrong with trying to optimize your antennas system (I did this on my boat, but I was trying for 3.6mhz rather than 14mhz), and looking to get to a 5/8-wave antenna, in and of itself, is also not a bad thing.....but, you should all realize that it isn't the great panacea that it is touted as in many books....

{AND, please do NOT forget that he didn't figure any antenna coupling/tuning loss into his models/discussions.....and these tuning losses can be quite high, when our backstay / antenna becomes significantly short (< 1/8 wave), so if you're looking at the higher end of the HF spectrum when trying to come up with optimum lengths, please do not forget that the tuner losses can be quite high on the lower freqs, if you choose a too short length.....in actuality these tuner losses can be so high (sometimes > 4 - 6db) that many cruisers find that even though they can communicate just fine on 14mhz, or even 8mhz, they can't even talk 100 - 500 miles on 4mhz.....
A few years ago, I saw a friend running a 40m dipole on 80m at Field Day....the "tuner" allowed the radio to "see" a decent swr and output its rated 100watts.....but the tuner was HOT to the touch....and this was NOT a cheap "300 watt" tuner, but rather a big "3KW" Dentron "super-tuner"....he'd been hard at it transmitting for a few hours, and I figure about half of his 100watts of transmitter power was going into heating the tuner.....and another 40% - 45% was heating the coax (due to high swr on the coax), and he was struggling to actually radiate 5 - 10 watts!!!!
So, please, when trying to design an antenna system, remember the entire "system"....as well as considering "where", "when", and on "what frequency" do you wish to communiccate!!!! }

W5PAD wrote: To achieve long distance contacts, the beam needs to be low to the horizon. When the signal wavelength is "short" compared to the antenna's length, high angle beams are created which sends most of

the power up to the clouds. When the signal wavelength is "long" compared to the antenna's length, it is not a very efficient antenna. Although more power is low to the horizon than is up in the sky, less power gets out of the antenna because it is not efficient. Only when the signal wavelength (e.g. frequency) is correct for a given antenna length will most power be transmitted low to the horizon.

3) While somewhat awkwardly worded, this isn't too bad of a simple explanation.....but....
But, be careful about assumptions.....

4) We need to remember a few very important points here....
a) even though W5PAD's desire might be to optimize his antenna system for 14mhz, we should all remember that this is supposed to be a wide-band / multi-band antenna system that is more than just "usable" from 2mhz thru 25 / 28 mhz.....
b) in addition to the frequencies used most often, we should all remember what path lengths were most often used on those frequencies.....and on what frequencies are we most likely to "need" the more efficient antenna system???? (heck when 20m/15m/10m are open, you can work the world with a coat hanger.....I've done it with a vhf/uhf scanner antenna.....but getting thru the noise on the lower frequencies, even with a cooperating ionosphere, can take a very effective antenna.....)
{The 20m band (14mhz), by happenstance has a few unique features for many of us.....
In addition to the antenna lengths (whether 1/2-wave dipole or end-fed backstay), being practical for most modest-sized sailboats, even when the sunspot cycle is near the bottom, it is still "usable" for long-distance comms.....and with many hams using this band worldwide, daily, as well as the MMSN, it has become the "band-to-use" by many.....BUT, it is not the only band to use.....and we should all remember that....}
c) others may wish to optimize for other frequencies, as well....

W5PAD wrote: The best length for a vertical antenna to achieve long distance communications is 5/8 wavelength, and for all practical purposes a backstay antenna is a vertical antenna, only with a slope to it.

5) These 2 assumptions are somewhat true, but like all things in the real world (not on paper), the actual numbers (gain figures and take-off angles) do not correspond to the "theory".....
Please read over these detailed tutorials, and you'll see the "facts" that we deal with everyday aren't always what we think they are.....

http://www.cebik.com/content/a10/wire/sloper.html

http://www.cebik.com/content/gp/58.html
http://www.cebik.com/content/gp/58-1.html

http://www.cebik.com/content/gp/58-3.html

6) Please understand that while I majored in physics, and took some EE classes, I am NOT an EE.....and I do NOT design antennas for a living, I just do it as a hobby.....and while I'm good at it, compared to the late L.B. Cebik we are all ignorant !!!!

Oh, and please remember that NEC-4.1 is what you'd need to use to model most of these situations we post about here....and I do not have that program....

7) One last point....
About 8 (?) years ago, I contacted Cebik again....this time inquiring about the possibility of him modeling "backstay" antennas.....
I described the typical set-up (a slightly sloping end-fed wire, on a boat with an alum mast, and multiple SS rigging wires, etc.) and his response was brief.....
He wrote back to me that:
a) the modeling would be time consuming.....
b) so many variables, that every boat would require a different model to be designed / run....
c) there is likely to be only slight improvements (if any) that could be made, since the antenna is secondary to the primary purpose of holding up the mast, etc.....

And, as of a few years ago, I've not seen anyone actually design / run some NEC4.1 models of multiple backstay antennas.....
But, if anyone wishes to do so, PLEASE forward them to me, as I'd love to see them....

EDIT:
While I did mention that I tried to optimize for 3.6mhz - 3.8mhz, I forgot to mention what my backstay antenna length is..... ~ 64' - 65'
Giving me a full-size 1/4-wave on 3.6 - 3.8 mhz.....a half-wave end-fed on 7.2mhz.....9/16-wave on 8.3mhz.....and a 5/8-wave at 9.1mhz (Wefax).....and yes, just shy of a full-wave end-fed at 14.3mhz (not optimum, but very usable).....
With the typical take-off angles of our sloping wires (whether backstays or 1/2-wave dipoles) not less than 15 - 20 degrees, and sometimes even higher, the higher angles I produce on 12mhz - 25 mhz (30 - 45 degree main lobe, but only a few db down at 15 degrees) are not optimum for high signal strengths on long multi-hop paths, but I find optimizing my counterpoise compensates for the higher take-off angles on these higher frequencies.....
I truly love my system's performance on the low bands.....80m dx is great.....
Ahh, but how about 14mhz, you ask????
My personal tests (while sailing across the Atlantic and in the EU and Carib) comparing my backstay

(~64' - 65') with a 1/2-wave vertical (sloping) dipole, on 20m (14.300mhz), I found the backstay to be better about 40% of the time (by ~ 3db at most), there to be no measurable difference about 30% of the time, and the dipole to be better (~ 3 db or so) about 30% of the time.....
This was primarily over paths of 2000 - 5000 miles, daytime or early evening on the eastern end.....
This does NOT mean that my antenna design is what you should do!!!!! NOT at all.....
This does NOT mean that 1/2-wave dipoles aren't any good!!!! They ARE!!!!
What is does mean, in my opinion, is that squeezing the last 1/10 of a db out your antenna might not be worth your time.....although, if you do wish to optimize your system for a specific band/freq, **Go For It!!!!!**

Fair winds to all...

John

-

11 Re: Choosing a backstay antenna length

by **SoonerSailor** » Mon Apr 19, 2010 6:44 pm

I for one would really enjoy being able to play around with an NEC model of a sailboat. While I don't doubt that absolute numbers and radiation patterns would have to be considered suspect, I think you could still learn quite a bit by seeing what kinds of things happen to radiation patterns when you ground/unground different parts of the rig and lifelines, use and don't use top and bottom insulators, etc. etc.

Chip - AE5KA

-

12 Re: Choosing a backstay antenna length

by **W5PAD** » Tue Apr 20, 2010 6:39 am

John,

Thanks for the info, very informative.

I have read some of Cebik's work, the ones I've read were very instructive. It's too bad his work is not so easy to get to any more. I will take the time to read the links you provided.

In the mean time, some comments.:

I understand the tuner/coupler losses (as well as transmission line losses) can be devastating to

expected performance if someone forgets to take these into account. You are correct, or should I say, I believe in the systems approach to HF communications. The antenna is not the only thing to be concerned with. Unduly long or poor coax cable from the transceiver to the coupler can make an otherwise good antenna perform poorly. All of these elements plus others make up the entire system and each needs to be chosen in balance with each other.

Regarding choosing operation frequencies; you state

> supposed to be a wide-band / multi-band antenna system that is more than just "usable" from 2mhz thru 25 / 28 mhz.....

and

> on what frequencies are we most likely to "need" the more efficient antenna system????

Can you elaborate on what frequencies you are referring to and why they are needed?
One of my objectives with this thread is to get confirmation (or rejection) of my analysis and research from experience maritime HF users. I gravitated to 14 MHz to be the sweet spot for the antenna while accepting the natural roll off in performance the further away I operated from the sweet spot. While studying antenna lengths I did notice antenna impedance steadily increasing at the lower frequencies. I have an idea to compensate for this, but not sure if it's feasible, that is to switch from feeding the "14 MHz antenna" to feeding the entire rigging when operating on the lower frequencies. This could be accomplished with an "alternate backstay" for the upper bands and the real backstay for the lower bands. Like I said, it's an idea that's floating around in my head.

Regarding modeling; If I don't become discouraged in this endeavor, I plan to complete the model I've begun and share the results here. And maybe with some good feedback install an HF system that meets my needs.

Phil

-

13 Re: Choosing a backstay antenna length

by **ka4wja** » Tue Apr 20, 2010 7:11 pm

Phil,
I'm working at a client's facility this week, so I don't have too much time, but I can at least give you some brief answers....

W5PAD wrote:I have read some of Cebik's work, the ones I've read were very instructive. It's too bad his work is not so easy to get to any more.

1) Actually, all of his papers are available on the website.....although AntennaX is selling CD's of everything, it's still all available to hams / hobbyists on-line.....but, you must register and verify that you are in fact an individual ham and not a design engineer, etc....

W5PAD wrote: Unduly long or poor coax cable from the transceiver to the coupler can make an otherwise good antenna perform poorly.

2) Not really.....(and in the case of our modest-sizes sailboats, it's not really possible to have more than 50' of coax between the rig and tuner.....)
Although, "unduly long" coax runs would add unnecessary loss to the system, this loss is a known factor (db / ft) and since the swr should be low (< 1.5:1) between the transceiver and the coupler/tuner, there would be no additional losses.....

W5PAD wrote: Regarding choosing operation frequencies; you state

supposed to be a wide-band / multi-band antenna system that is more than just "usable" from 2mhz thru 25 / 28 mhz.....

and

on what frequencies are we most likely to "need" the more efficient antenna system????

Can you elaborate on what frequencies you are referring to and why they are needed?

Yes, I'd be happy to elaborate.....since most offshore sailors and long-range cruisers find their HF radio comms to be a "safety" feature on-board, rather than a hobby device, being able to communicate in an emergency ("May Day"), or when an urgency ("Pan Pan") occurs, or for "Securite"....or even for just "getting weather", or checking into "cruisers' nets", etc.....are all considered a higher priority than rag chewing with fellow hams....so, while I've been a ham since I was a teenager, and truly love ham radio, my personal requirements for rig, antenna, and HF comms in general are different at sea, than they are at home.....

And, as for what frequencies you'd need a more efficient antenna system???
That's easy.....

a) the bands that are "noise limited" rather than "signal-strength limited".....which are the lower HF bands.....
b) the bands that antenna lengths are typically compromised...which are the lower HF bands....
c) the bands where "radials" or other counterpoise systems are too large to be highly effective.....which are the lower HF bands.....

As I wrote earlier, when the higher bands are "open" you can work-the-world on a coat hanger, but working 5000 miles on 3.6mhz with 150 watts take a decent antenna system.....

3) While I already specified a few reasons why the 20m ham band has become "the" band for many maritime mobile hams....

{The 20m band (14mhz), by happenstance has a few unique features for many of us.....
In addition to the antenna lengths (whether 1/2-wave dipole or end-fed backstay), being practical for most modest-sized sailboats, even when the sunspot cycle is near the bottom, it is still "usable" for long-distance comms.....and with many hams using this band worldwide, daily, as well as the MMSN, it has become the "band-to-use" by many.....BUT, it is not the only band to use.....and we should all remember that....}

....additionally it has been the one ham band that had all of these criteria:
a) Worldwide International Exclusive Amateur Radio allocation...
b) Typically usable for F2 layer ionospheric propagation during daylight hours, year in and year out (regardless of sunspot activity), and during years of higher sunspot activity, it's usable almost 24 hours a day.....
c) Voice communications allocated worldwide, and plenty of spectrum to find an empty spot for comms.....
These 3 criteria do NOT apply to other ham bands.....30m is a small band, without voice comms for most hams.....40m is just now becoming a worldwide int'l excl amateur radio band, with voice comms allocated, but due to D-layer absorption isn't a worldwide "daytime band".....17m and 15m, can be unusable during low sunspot activity, and 17m being a "small band" doesn't have a great deal of empty spaces when it's wide open.....and the skip-zones can be quite long for these higher bands as well, meaning short-skip (~ 600 - 1000 miles) can be difficult.....
The answer to why the 20m band is "the" band for many maritime mobile hams, is very similar to why it's "the" band for "DX", etc.....
It's because it can be "open" to "somewhere" almost anytime, except for when deep in the low end of the sunspot cycle.....
But, for maritime comms, we've got 12mhz and 16mhz bands straddling the 14mhz/20m ham band.....as well as 2mhz, 4mhz, 6mhz, 8mhz, 18mhz, 22mhz, 25mhz marine bands.....and also the "shared" 4mhz and 8mhz freqs.....

4) Worldwide Maritime MF/HF freqs run from 1.6mhz thru 26.2mhz (Have a look here, and follow the links for specifics.... http://www.navcen.uscg.gov/marcomms/hig ... efault.htm)

5) Worldwide, most maritime MF/HF comms take place from 4mhz thru 12mhz.....although I suspect that we will also see 16mhz used more as the sunspot cycle moves upward....
(And, in years past, when there was more use of HF coast stations, we saw a good deal of 16mhz and some 22mhz use during years of high solar activity.....)
When contacting WLO, USCG, etc. I've found 8mhz to be the most often used band....with 12mhz being 2nd in contacting WLO....and my most often used HF WeFax freqs are (in order) 8mhz, 6mhz, and 12mhz.....(with 12mhz used only from 3000 - 4000+ miles away)
When looking for long range, Atlantic Crossing weather from Herb, I've found 12mhz (12.359mhz) and secondarily 8mhz (8.294mhz).....
Caribbean weather is mostly on 4mhz and 6mhz.....and some on 8mhz....

{In the late 1970's I made Hi-Seas radiotelephone calls on 8mhz, 12mhz, and 16mhz, from the Eastern Med (Greece,Turkey, etc) via WOM, Miami/Ft. Laud and WOO, New Jersey, since it was cheaper, quicker, and easier than going into shore in the dinghy, searching for the "telephone office" and waiting for an int'l line to call the US.....AT&T Hi-Seas service was $5/min back then, and that was "cheap"...}

6) GMDSS rules require ALL SOLAS ships and RCC centers monitor the HF DSC freqs.....
Actually requirements vary somewhat, but ALL are required to monitor 2187.5khz, 8414.5khz, and "one other HF-DSC freq", which is typically 4207.5.....and as such any comms with any vessels in your area (whether DSC and/or voice) should be initiated on those bands (2mhz, 4mhz, or 8mhz) depending on the distance to be communicated and time of day....

7) The majority of all calls to USCG via HF radio, either voice or DSC, are on 8mhz....

8) The majority of HF comms for "cruising nets", etc. are "regional" and therefore are done on freqs that allow for little or no skip-zone, and where NVIS is the norm, such as 4mhz, 6mhz and 8mhz.....

9) The Waterway net is on 7268mhz....etc. etc.....

W5PAD wrote: One of my objectives with this thread is to get confirmation (or rejection) of my analysis and research from experience maritime HF users. I gravitated to 14 MHz to be the sweet spot for the antenna while accepting the natural roll off in performance the further away I operated from the sweet spot.

10) Finding the "best" antenna (if there really is such a thing), MUST always start by the user determining the application.....
When teaching, I'm always asked "what's the best antenna".....and my answer is always: "it depends on your application...
Until you know what your application is, there is NOBODY that design an antenna for it....

11) Now, having wrote that, and I suppose most of what I posted above takes care of the highlights of "what frequencies" I was referring to, and a good deal about the "why they're needed"........
There ARE other reasons and specifics.....and it is these questions that you need to ask about your application, before you decide on what antenna would be best.....
a) "where" you're cruising / sailing / voyaging....
b) "where" you wish to communicate to.....
c) "what" time of day and time of year....
d) "what" mode you wish to use....
e) "who" do you wish to communicate with.....
BUT.....

BUT, before you run off trying to ascertain what your application is, PLEASE understand this.....
Assuming you've got a modest-sized monohull, you're going to have a remote coupler/tuner fed, backstay antenna.....that's almost 100% sure!!!!
Since this will be a wideband / multi-band antenna, and will work just fine for you....
And, if you wish to add a few additional antennas, perhaps a 1/2-wave dipole for your favorite band (if it will fit) would also be a good idea.....
I am NOT trying to get you to reinvent the wheel here!!!!
You're gonna' have a backstay antenna......and it's gonna' be about 40' - 65' long.....

What you want to know is, how long should it be????
And, that answer depends on the answers to the above questions.....
What I've done for my application has worked VERY well for me, but that isn't to say that this is what you should do.....that decision is yours, based on your applications/desires.....
While you might have started this thread looking for "confirmation", and while I think you got it (yes, 14mhz/20m is a very well used band), you also got some info that may have muddied the waters of that confirmation a little bit, and for that I'm sorry.....but, I wanted to answer your questions in detail.....

12) As for what length to make your backstay antenna.....my original thoughts still hold.....
I suspect that you'll have 40' - 45' long "backstay antenna".....(just wanting you to some facts to base

your decisions on...)

W5PAD wrote:...not sure if it's feasible, that is to switch from feeding the "14 MHz antenna" to feeding the entire rigging when operating on the lower frequencies. This could be accomplished with an "alternate backstay" for the upper bands and the real backstay for the lower bands. Like I said, it's an idea that's floating around in my head.

13) Whatever you do for alternative or additional antennas, please do NOT make things too complicated to operate.....and PLEASE do NOT restrict your "main" antenna's ability to communicate easily and effectively, especially on 4mhz thru 8mhz......since these are the likely freqs you would need in case of "Pan Pan" or "May Day", as well as the most often used for regional cruising nets.....(and 12mhz for Herb's weather, etc...)
a) Since I have twin backstays, I had thought of putting an insulator on my other backstay, making it my "high-band" antenna about 20' - 23' long, giving me a low take-off angle on freqs from 12mhz - 25mhz.....but I never found the need.....
And, since that would require another tuner ($$$ and space), and more "work" (one more thing to do, on-board).....I decided against it.....
b) I have built a few 1/2-wave dipoles for use on board (underway and at anchor), one for 14mhz, and one for 12mhz/14mhz.....and use a high-quality coax switch (Diawa or Alpha-Delta), to switch between the backstay (and tuner) and the dipoles....
It's an easy flick of a switch.....

W5PAD wrote: Regarding modeling; If I don't become discouraged in this endeavor, I plan to complete the model I've begun and share the results here. And maybe with some good feedback install an HF system that meets my needs.

I'm not big on antenna modeling.....just not my "thing".....but I'd like to see your results, so please do share your results.....

Sorry, if I didn't give you the exact answers you were looking for....but at least I tried.....
Good luck and Fair winds....

John

•

14 Re: Choosing a backstay antenna length

by **W5PAD** » Wed Apr 21, 2010 1:06 am

Thanks John,

For not much time you did include a lot of information. One item you mentioned, emergency communications, had slipped my mind. Although I knew the lower bands are primarily used for emergencies, I did not consider this fact when looking at desirable frequencies. IMO, emergency frequencies will not be used as often as the frequencies for nets and emails, but when you need to use one you want it to work. Now this gives me more to think about.

Regarding two antennas, you state that you had considered this and would use two couplers, if implemented. Would one coupler with a high voltage relay at the output of the coupler work? (something like this http://www.gigavac.com/products/relays/datasheets/g52/index.htm)

Phil

15 Re: Choosing a backstay antenna length

by **Goudurix** » Fri Apr 30, 2010 8:22 am

Hi folks I'm always keen to join in on this subject, having struggled quite a bit with optimal (alternative) backstay antenna length -largely due to my Yaesu FC-40 ATU's rather limited impedance matching range.
I have now set for about 9.2 meters of sloping wire length. I use insulated stranded copper ,the quality that used to be used for land based wire antenna's.

9.2 meters is a good length for all-band tuning. It is a half wave for about 16 Mhz.

It is about 5/8 lambda for the 15m band, and still about 1/4 wave for the 40m band.

So I guess I get good performance between 40m and 15m hence I cover all interesting DX-bands. It has given me very good DX performance on 17m last summer.

I do not use it for marine HF bands but it should be OK voor 8 and 12 Mhz.

BTW I use the same wire length at home for an all-band vertical along a fishing pole, with 4 elevated radials per band (40m-20m-17m-15m) at 3.5m high.

The only improvement I will try out htis summer is replacing the wire by a cage wire by having about 5 or 6 copper wires along 10 cm diameter plastic rings.

- Good winds!

Jan
ON3ZTT

16 Re: Choosing a backstay antenna length

by **la7qz** » Sun May 09, 2010 2:17 pm

W5PAD wrote: Regarding two antennas, you state that you had considered this and would use two couplers, if implemented. Would one coupler with a high voltage relay at the output of the coupler work? (something like this http://www.gigavac.com/products/relays/datasheets/g52/index.htm)

I had this on my 28 foot cutter. The two antennas were a homemade vertical whip and a sloping wire (alternate backstay). The whip was around 23 feet and the wire about 30 feet (from memory). Both antennas used #10 gauge tinned copper wire. Unfortunately, that boat is now at the bottom of the Atlantic after an unfriendly encounter with a 55000 ton bulk carrier and I no longer remember the details of the difference in performance between the two antennas. I seem to remember the longer wire gave me a couple of dB gain on 15 meters and a slight edge on 80 meters. Otherwise, performance was more or less the same. This is all from memory, as when I lost the boat, I also lost my notes and e-mails discussing the installation.

Edited to add: I also *seem* to remember that the whip was a couple of dB better than the wire on 20 meters. The Naomi J. also had a 20 meter vertical dipole which was even better on that band of course.

The basic concept does work with a high voltage relay on the output of the tuner and two antennas and I found it useful enough that I would routinely switch antennas when switching bands. The fact that the two antennas were a whip and a sloping backstay antenna with their feedpoints close together and then separating by around 35-40 degrees meant that they did not detune each other enough to worry about. If you tried feeding two backstays from the same tuner with a horizontal run of GTO 15 belowdecks to one (or both), you would probably loose any advantage in that horizontal run.

PS. I note that the link above is a 24V relay while most (smaller) boats have only 12V available and most radio installations, even on 24V boats operate on 12V. If a latching relay could be found with similar specs, you would eliminate the coil current while operating one of the antennas and save some

battery power.

Owen, LA7QZ/MM
Sv Magic
St Maarten

17 Re: Choosing a backstay antenna length

by **Goudurix** » Sun May 09, 2010 6:25 pm

Well I have really been struggling with finding a good length that allowed easy tuning from 80-15m. My yaesu FC40 random wire atu has a fairly limited matching range.
Tried around 40-45 ft with and without a 4:1 and 9:1 UNUN. Tried parallel wires 13m+6.50m+3.25m held appart with plastic spreaders but connected together at the antenna base, with or without a 1:1 balun at the bottom.
Nothing worked well. Always difficulties to tune on 1 or more bands. Hell I even thought to make a cage-type fat wire but neverwent that far.

See http://g8jnj.webs.com/usingautotuners.htm

This opened my eyes.

I now moved the ATU directly at the through-deck isolated connector, so directly to the base of a 9.2m (30 ft) sloping alternate backstay wire, no balun or UNUN in between. The wire slopes down to an isolator fixed to the top of the pushpit and from there the inner lead of a RG213 coax down with isolator standoffs to keep it away from the pushpit vertical tubes. (I admit: no GTO15....please forgive me...).

It works it works it works!

Very easy tuning now on all HAM bands 80-10m!

I'm sure it behaves well since it is still about 1/4 wave on 40m but 5/8 on 15m so I should get good TA angles on those freqs.

Jan

18 Re: Choosing a backstay antenna length

by **W5PAD** » Sun May 09, 2010 7:45 pm

Owen,

Thanks for the confirmation that high voltage relays can be used successfully on the output of a coupler.

Re the high voltage relay, I didn't spend much time searching the internet and only stopped when I found the one I linked to. I'm sure they can be had in 12 volts.

Re positioning a single tuner for two antenna's, I agree that the best location is to put the tuner midway between the antennas or bias closer to the short antenna to keep the horizontal runs at a minimum. Horizontal runs contribute to the electrical length of an antenna but not the vertical height - vertical antenna elements contribute more to horizontal radiation and horizontal antenna elements contribute more to NVIS (or straight up) radiation.

Phil

19 Re: Choosing a backstay antenna length

by **la7qz** » Sun May 09, 2010 10:42 pm

> **Goudurix wrote:**and from there the inner lead of a RG213 coax down with isolator standoffs to keep it away from the pushpit vertical tubes.

The INNER lead? 

Owen

20 Re: Choosing a backstay antenna length

by **Goudurix** » Tue May 11, 2010 11:15 am

The INNER lead?

Yes!!!

I just peeled off the black outer insulation and the copper mantle of a stretch of RG-213 coax.

Left the inner lead (which is heavy copper) and its semi-transparent insulation. I guess this gives me a good high voltage-breakdown lead of about 0.7m untill the trhough-deck lead and the atu just below, instead of GTO15.

Why not?

Jan

- Jan De Smet - ON3ZTT

21 Re: Choosing a backstay antenna length

by **la7qz** » Tue May 11, 2010 12:17 pm

Goudurix wrote: The INNER lead?

Yes!!!

I just peeled off the black outer insulation and the copper mantle of a stretch of RG-213 coax.

OK, well that is important information. Once you removed the copper mantle, it is no longer coax, so no problem with that, except perhaps that the inner insulation may not be made of an UV resistant material? I just wanted to make sure nobody thinks you should use coax. I've seen this on a number of installations, and they didn't work well if at all.

Owen

-

22 Re: Choosing a backstay antenna length

by **Goudurix** » Wed May 12, 2010 9:30 pm

- Hi Owen,

no of course it is not coax anymore as I use it here - it WAS a coax

I am of course not located in lush (sub)tropical conditions as you are so here UV is less of a problem and afetr 1 year fully exposure it is still OK.

73's to you and Mrs the captain.

Jan De Smet - ON3ZTT

23 Re: Choosing a backstay antenna length

by **sunkosi** » Sat Jun 12, 2010 12:38 pm

Hi All, I'm new here and can;t seem to find the info I need after doing a search.

We're sailing a Cat 2 race and need to install a SSB radio and a suitable antenna.

We normally race Cat 3 and have no need for a long term installation of SSB.

We'd like to keep the weight down low as much as possible so a thin wire up the backstay or a whip antenna bolted to the transom are our options.

I'll install the radio near the nav table and we are using a Barrett 511 autotuner which I'll locate near the backstay at the back of the boat (12 feet away) with good 4" wide copper ground plane directly bolted to a keel bolt for our earth and I'll run a thick 5mm DC power feed to it.

Boat is a sloop rigged all timber yacht 40 foot long with aluminium mast, stainless rigging and a spectra backstay down to the deck.

If we used thin wire what is the lightest wire we can use and can we put it inside our spectra backstay and stop it 3 foot from the mast?

or are we better to strap it beside the backstay with cable ties etc?
Additional windage is another issue we are trying to avoid as we are a light but strong boat.

Will this cause issues of arcing and weakening the backstay if it's raining? It's highly likely to be wet during the race.

If we used a whip how different if the transmission distances, as we need to achieve 100nm to comply the safety audit - obviously I want the best I can achieve within our desired weight limits etc to be as safe as we possibly can be.

Look forward to some tips on what people think is the best option.

Many thanks in advance.
Steve

ps - We also need to carry a spare antenna for emergency use - suggestions?
Whip is obviously one of them.

24 Re: Choosing a backstay antenna length

by **SoonerSailor** » Sat Jun 12, 2010 1:46 pm

For a temporary antenna, attaching a thin wire (strength is the only real factor limiting wire diameter) to the spectra backstay with cable ties should work just fine. I guess if you are really really worried about a few square inches of extra windage, and have the time to do it, you could put it inside the spectra. If it only needs to last a week or two, bare copper may be ok, but it will corrode quickly in the sea environment. Better would be insulated copper wire. At 100 to 150 watt potential power levels, I seriously doubt there would be any effect on the spectra backstay, and if I were in the same situation wouldn't give it a second thought.

For a spare antenna, it could be just another length of wire with proper fittings that you could easily attach to a spare halyard and run up a distance.

Chip

25 Re: Choosing a backstay antenna length

by **Howard Keiper** » Sat Jun 19, 2010 2:08 pm

We have made very effective backstay antennas using Spectra. Many are not keen on the idea of using Spectra as a backstay in the first place, but that trepidation disappears fairly quickly. However, using it makes for good antennas in this application. The first thing I do is to strip a suitable length of RG-213...removing both the outer skin and the braid leaving just the core and it's insulation. The core conductor is equal to AWG 12 or so, and is tinned. The insulation is HD polyethylene or similar, a superb insulator in it's own right. The core and insulation is inserted into the coreless Spectra right up to a foot or so of the mast, and easily exits the the Spectra as far down as close to the tuner as is practical. There are no insulators required and the Spectra provides UV protection for the polyethylene. The Poly is rather thick...probably about .090, and is fairly stiff.
The other part of the 213, the braid, may also have use as a general purpose ground strap.
Howard Keiper
Berkeley