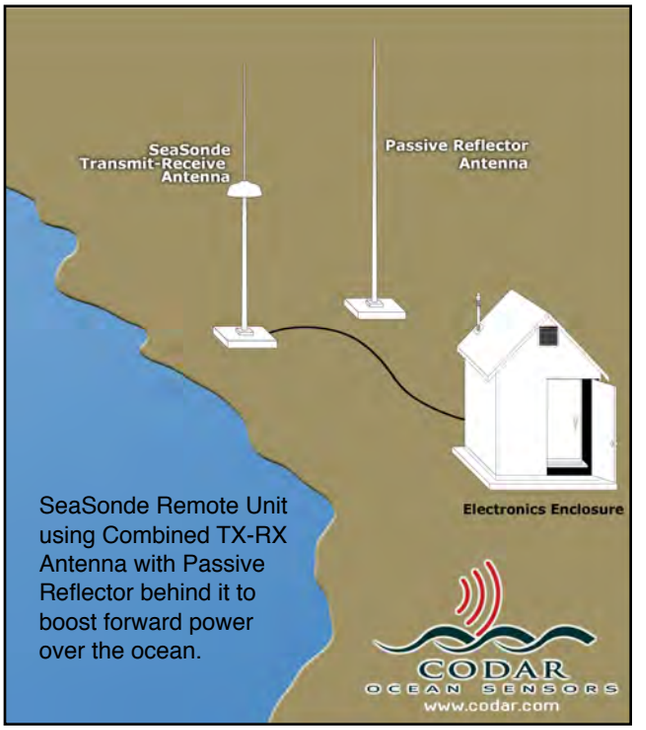
Double Your Forward Power with a Simple Pole?

What if someone told you that you could more than double your effective radiated power over the sea by simply sticking a post in the ground behind your combined transmit/receive SeaSonde antenna? No wires, cables, nothing! All with a special kind of "magic" post.
Well, read on -- CODAR has done it!

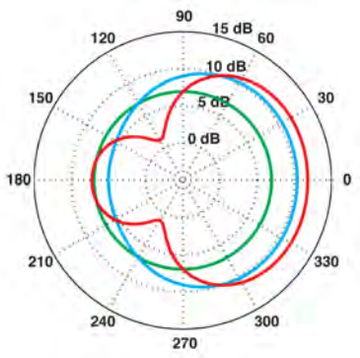


The normal SeaSonde transmit antenna is a monopole or dipole, which has an omnidirectional pattern. That means power back over land, where you don't need it. One way to focus power out over the sea is to use a second array element. We've done that before, and it works. But there's the messy cables, and the complicated tuners and calibration.

The Yagi antenna is frequently used to focus power in a preferred direction. The old VHF TV antenna on your rooftop was a Yagi. That's our basic concept.
- In a 2-element Yagi, the dipole you drive or feed has a passive reflector element close behind it, but not electrically connected -- a "parasite".
- Its spacing and length determines how much power is focused forward. This is what we are doing here.

But do we have a special problem with the combined antenna?
- We want a focused directional pattern on transmit, but an omnidirectional pattern on receive -- how are both possible?
- In addition, we don't want the closely spaced reflector to distort the patterns of the receive loops -- can this be done?

Here's how we solve the above problem.
- The passive reflector dipole behind the standard combined antenna needs to be tuned. So we put a tuning coil where the feed point would have been.
- We also insert a diode to break the circuit when the forward element is not transmitting. When cut in two like this, it can't draw current and hence no longer interacts with the forward element during the receive cycle. This means it does not distort the loop or forward dipole patterns.
- Hence the two are directive on transmit, but the receive antenna patterns needed for bearing determination are intact because the rear element becomes invisible when the transmitter is off.

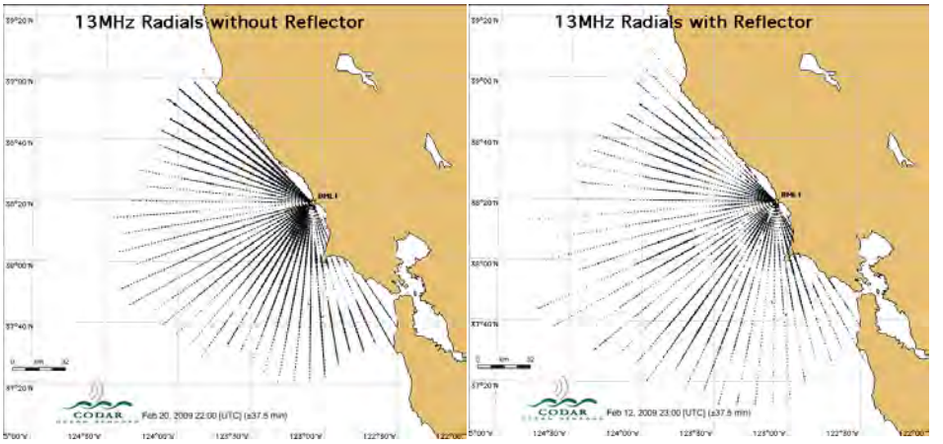


Transmit antenna patterns

Examples of the transmit patterns are shown here. The green curve is the original omnidirectional pattern of a single dipole. The red and blue curves are the result of different length/spacing combinations with the rear element in place. We want to beam energy out to sea, which is to the right in the figure. However, in most cases we also want good shore-to-shore (North-South) coverage. The blue curve does that best. It increases the seaward field strength nearly 4 dB, for a predicted distance increase greater than 10 km at 13 MHz.

How Well Does It Work in Practice?

To answer that, we did tests over two months at BML. We alternated between rear reflector in place and operating for a few days, then removing it for a few days. We compared distance coverage by looking at the retrieved radial vector span alternating between the two states. A long period of time was desired, so we could average out short-term weather and current-related variations. The results are shown to the right.



In fact, the two-month comparison shows a nice 13 km coverage gain when the reflector post is in place, a bit more than predicted. This is a great alternative to have in your toolbox, for cases when you have the space available and want to push your coverage out further, without the hassle and expense of increasing your radiated power by 150%. We need to do more testing and burn-in on the diode switch that makes it electrically invisible on receive, and then it will become a standard product.