CAPT'N KEVO'S Boating Tips

BY KEVIN O'LEARY

Broadband Radar

When we bought our boat, *Her Way*, it came with radar and GPS. The GPS was so old it was useless; however, the radar was very accurate and I found no difficulty interpreting what I saw on the screen to what was really out there. Problem was the radar dome was located directly behind and at the same level as my head.

To this day my wife, The Admiral, claims she could see the outline of my skull on the screen. (She never would reveal if there was anything between my ears, but I guess that's a "woman's prerogative.") HA!

Seriously, the inland waters of the Bay and Delta areas are fraught with danger when navigating in restricted visibility. Many radar consumers are very interested in the "range" of the system. I can understand this as it is a sign of a powerful and probably very sophisticated radar system.

However, if you are planning on navigating within 8 miles offshore in the Bay or on the Delta, a BR24 broadband radar system, available from Lowrance, Simrad and Northstar, may be an option for you to explore. I found little (actually none!) empirical data on this system, but from what I've read, and if it works, it seems ideal for Bay and Delta yachtsmen – be it power or sail.

How Does It Work?

Conventional pulse radar uses a magnetron to generate a pulsed microwave signal that is transmitted from the rotating radar antenna. This "bang" of microwave energy is reflected off targets that it hits and returns to the radar; the time it takes determines the range and bearing.

Simrad Broadband BR24 Radome.

This type of radar transmission is, in layman's terms, like shouting loudly in one direction and then listening to see if you hear an echo, turning and then repeating.

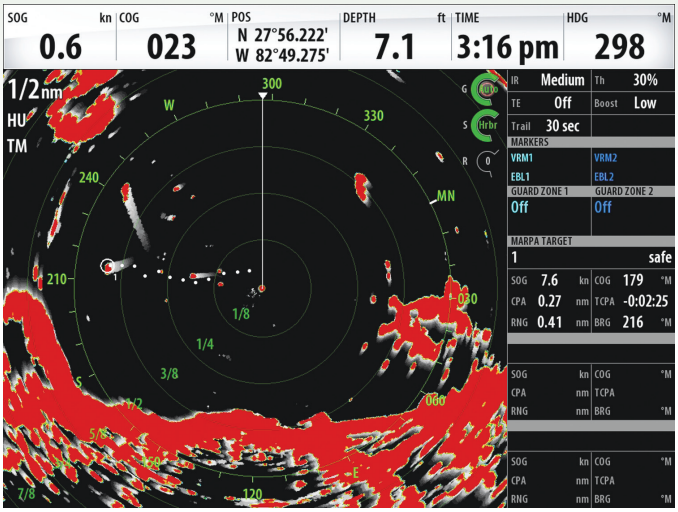
Broadband radar uses a different type of technology, allowing the radar to send out a continuous radar signal with a changing tone or frequency at a very much lower power and listen for the change in that signal, also continuously. This is more like whispering continuously and listening at the same time for the echo.

The change in the tone of the transmitted radar signal determines the time taken for the signal to reach the target and return. This time determines the range and the bearing.

There is a distinct advantage in sending out a much lower signal. The distortion in a normal radar transmission that is likened to a shout gets distorted at close ranges. This is often referred to as "main bang" interference and appears on the screen as a sunburst in the center of the screen. At short ranges this noise covers up any close-in targets, reducing the effectiveness of the radar at short range. Many types of radar suppress this pulse and hide the noise; this also hides any short-range targets, effectively blinding the radar to close-by targets.

With the broadband radar only sending out a "whisper," the noise and distortion is just not there; hence, there is no noise in the center of the screen and also no need for noise or main bang suppression. The benefit of this is that close-up targets are not lost or hidden, and the radar is able to show targets right up until they are alongside the boat. This short-range performance has never before been seen.

Conventional radars emit a pulse, and this pulse varies in length depending on the range. This pulse length determines the ability of the conventional radar to distinguish between close targets on a similar bearing. Usually this can be as short



Broadband radar operating on the Simrad NSE multifunction display system.

as 90 feet at short ranges and up to 500 feet at longer ranges. Broadband radar, using the continuously transmitted signal, is able to see targets as close as 6 feet from the dome on the shortest scale and separate targets 30 feet apart in range on the scales used for navigation.

This short-range performance is also enhanced with the minimum range scales now going beyond the conventional 1/8th of a mile range down to 1/32nd of a mile. To help with the comprehension of these shorter ranges, the radar switches to feet for the shortest ranges: you can display 400 feet, 300 feet and 200 feet, with range rings of only 100 feet.

The outcome of this whisper technology is better short-range detection, better visibility of close-in targets and better target range resolution in comparison to conventional radar.

The better target range resolution also helps in reducing sea clutter. This is due to the radar being able to detect different targets at small-range difference much better than conventional radar. Radar echoes from waves are much easier to filter out as the returns are smaller, rather than several waves returning a single large echo that displays as one target. This helps keep a much clearer display and enables the detection of smaller floats or buoys in the water.

Crystal Clear Resolution

The images displayed on the screen are so clear and easy to understand due to the use of some amazing technology called Frequency Modulated Continuous Wave (FMCW). The signal sent from the radar is simply a range of frequencies; hence the term broadband. This signal is radiated from the rotating part of the antenna in much the same way as normal radar.

The real difference is in the way the radar looks out for the returned signal. Sending this signal out continuously and listening with a very sensitive receiver allows the radar to detect the change in frequency; from this change it is possible to calculate the range and bearing of the target. Broadband radar has two antennas inside: one transmitting all the time and the other dedicated to receiving the radar signals.

This clear signal back is what provides such a crystal clear image on the radar display, making it very quick and easy to understand the radar picture. It is also easy to operate and understand since there is no complicated tuning or learning curve.

Expert Advice

So I got in touch with Greg Konig, VP Product Management, Navico, to fill in some blanks for us:

Kevo: How is broadband radar different from traditional radar systems?

Greg: Broadband radar uses military technology to replace the traditional pulse radar's magnetron vacuum tube with solid-state X-band transistor drivers and precise oscillators. Traditional pulse radar technology is equivalent to vacuum tubes on past generations of televisions – while it was able to generate a reasonably acceptable image, they were inefficient, noisy, imprecise

and degrade over time – and are therefore now obsolete.

Kevo: So what does this mean for the radar user?

Greg: Continuously sending and receiving the signal via a transistor provides incredible advantages, namely, important safety and performance benefits. It completely eliminates the dangerous blind spot around the boat and provides superior target detection and resolution. Broadband's low power signal results in incredibly low electromagnetic emissions, so boaters don't have to worry about harmful radiation, and low power consumption saves energy and money.

There is also no warm-up time, eliminating the need for boaters to "stand by" when darkness, bad weather or thick fog suddenly descends. Finally, with broadband radar there is no wearing out of the magnetron.

Kevo: Why hasn't broadband radar been offered to recreational boaters in the past?

Greg: FMCW technology has been utilized in expensive military and defense applications for decades. More recently, systems for the regulated large ship market have been introduced, but they were also expensive and specialized. We began development in 2004, and just over a year ago introduced a recreational marine solution that balanced the technical advantages with the costs.

Kevo: Where do you see the technology going?

Greg: Broadband radar is the future of marine radar. Integration of more advanced features and continuing refinements to the technology will lead to an expansion in products for a variety of applications, and a replacement of existing radars in boats worldwide as quickly as we've transitioned away from the old tube TVs.

Kevo's Tip:

All areas of technology move at a lightning pace it seems. I think this particular one is worth looking into for Bay, Delta and near-shore use. Maybe Santa Claus will get me one for being such a good husband so I can do a "part II" on this subject. Hey, don't laugh. Could happen. HA!

Be safe & happy boating!

As always, feedback is appreciated. I can be reached at 925/890-8428 or kevo@yachtsmanmagazine.com.