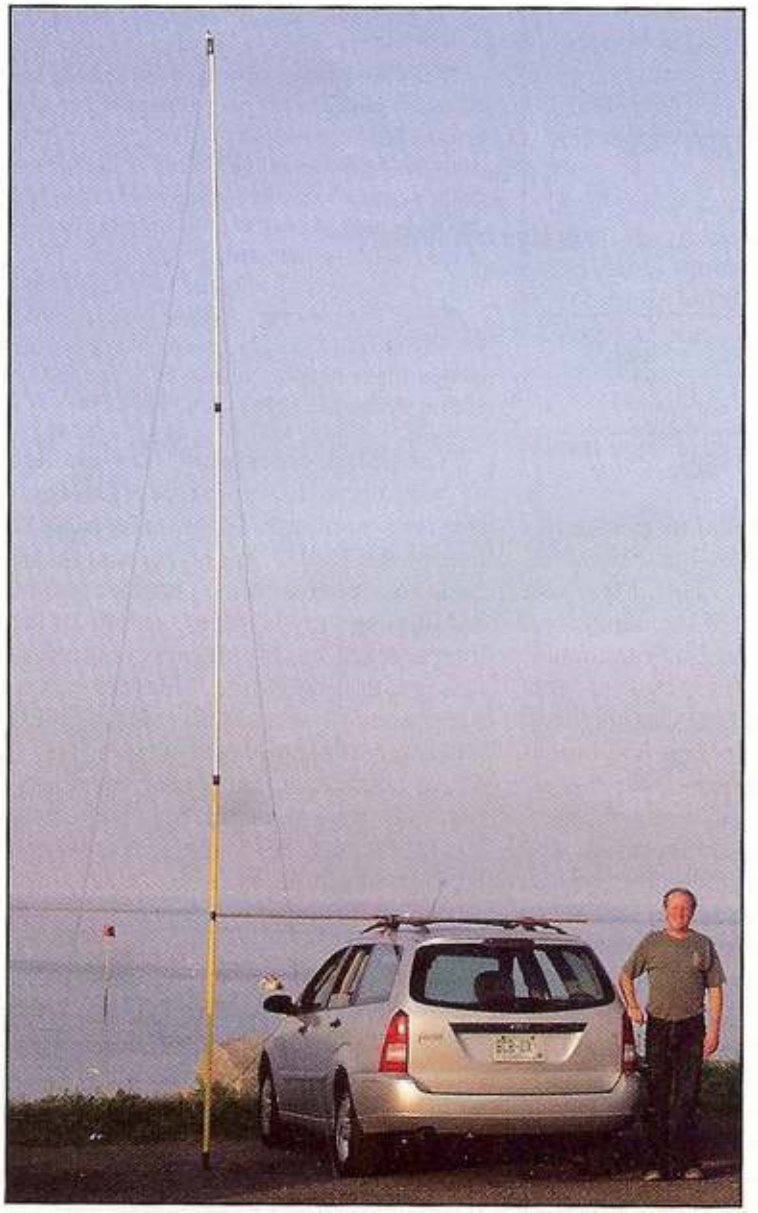
Kazaross also modeled the Split Delta on EZNEC. In describing the design, he offers the following:

The Split Delta clearly represents an advancement of the state-of-the-art for Flag-type antennas since, like the DHDL, the pattern is superior to a single cardioid. When compared to a Flag, the beam width is more narrow, the back null wider, and side nulls superior. The DHDL has better patterns; i.e. more narrow beam width and wider back nulls, but not drastically so.

A notable deficiency of the DHDL and Split Delta configurations was broadband performance in comparison to the basic Delta loop. Both Kazaross and I had determined that the backside nulling at the low frequency end of the broadcast band was below the Delta standard.

"I still am not entirely pleased with the broadbandedness of the DHDL as I'd prefer it to be a little better for 530 kHz," reported Kazaross. "The DHDL seems to need to be longer to work well for the low end. The DHDL I built has a 34-m base (111.8 ft) whereas my modeled Split Delta has only an 80-ft base and works fine at 530 kHz. I need to do a bit more modeling work to get a DHDL just right for 530 to 1700 kHz."



"Broadcast Technology" columnist Bruce Conti stands by his Delta antenna supported by a 23-foot collapsible painter's pole.

Upon further investigation I determined that the overall performance over the entire AM band is best when following the 2.1 to 1 ratio rule of thumb for antenna height versus width. (This rule applies to all four basic terminated broadband loop antennas.) Using the rule of thumb, the standard 23-foot-tall Delta has a calculated base dimension of 48 feet (23 X 2.1 = 48.3). Therefore, a 23-foot-tall Split Delta should have two split horizontal wires at the base of the antenna measuring 24 feet each.

Longer and shorter horizontals appeared to compromise broadband performance to some degree. For a Split Delta at ground level (or as close to ground as EZNEC would allow) a termination resistance of 620 ohms provided the best performance across the band, although the maximum null at the back (180 degrees) still lost about 15 dB at 550 kHz. This was the best I was able to get in terms of "broadbandedness" of the null. Of course, the null at lower frequencies could be improved by adjusting the termination resistance, but then the null at 1500 kHz suffered. In comparison a basic Delta achieved 30 to 35 dB back null across the band without adjusting the termination resistance (900 ohms typical), but the max null width is narrow.

End-Fired Delta Array

Highly directional phased arrays of terminated broadband loop antennas have proven to emulate, and in some instances outperform, the classic Beverage antenna. DX antenna experimenter Dallas Lankford was the first to design and successfully implement an end-fire array of four Delta antennas, which became known as the Quad Delta Flag Array (QDFA). The superior array performance was recently field tested during DXpeditions at Grayland, Washington, and Kongsfjord, Norway.

An end-fire array consists of multiple loop antennas arranged in a straight line aimed toward a specific target, firing a very narrow beam off the end of the array, thus the end-fire terminology. However such a phased array can be rather tedious to construct and fine tune. A complicated set of electronic phasing circuitry, amplification, and grounding schemes have been required to achieve optimal performance. This has inspired the investigation of simpler designs.

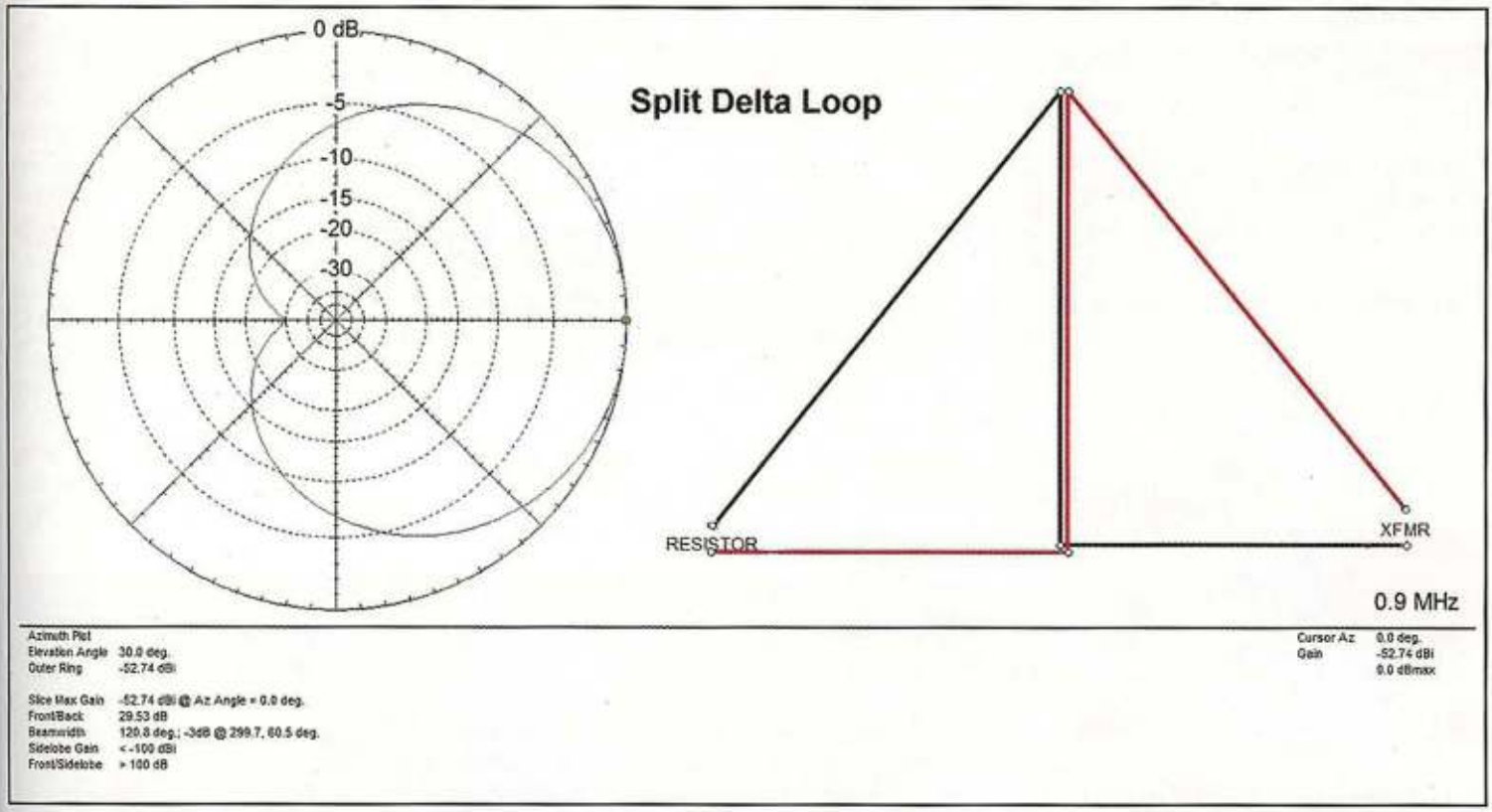
"An end-fire array of two DHDL antennas produces stunning model results," concluded Kazaross from his initial

This Month In Broadcast History

75 Years Ago (1935)—The Magnetophon magnetic tape recorder using reel-to-reel ribbon developed at BASF in Germany was introduced at the Berlin Radio Fair.

50 Years Ago (1960)—A plan for the first-ever televised debate between presidential candidates was being formulated. CBS was the first to announce opposition to sponsorship of the debates. "The Twist" by Chubby Checker topped the 77 WABC New York music survey.

25 Years Ago (1985)—The BBC World Service was silenced for the first time in its history due to a workers' strike protesting the decision not to broadcast an interview with Sinn Féin politician and former IRA leader Martin McGuinness.



Preliminary EZNEC model of the antenna pattern for the proposed Split Delta with a 620-ohm termination resistance at 900 kHz.

research. "A similar array of two Split Deltas is nearly as good when modeled 100-ft apart center to center."

Conclusions And Recommendations

The original four 'tennas and the new "split loop" configurations should be evaluated based upon real estate constraints, desired directions of reception, and form factors. First consider the physical aspects when selecting a configuration. The Delta is best if limited to only one support, such as a single flagpole or tree. A SuperLoop is easy to conceal in an antenna restrictive neighborhood with vertical sections tacked to tree trunks or the frame of an outbuilding. Amateur radio operators have constructed Flag and Pennant antennas with a wooden frame installed on a rotating antenna mast for an adjustable beam direction. Use your imagination in deciding which configuration is an ideal fit for your situation.

Next, consider how the antenna will be used. If a deep and narrow null width is desired to reduce interference from a specific direction, then one of the basic four configurations might be the best choice. For wider nulling capability in a general direction, the DHDL and Split Delta are worth consideration. On a basic 23-foot-tall Delta, the deepest back null is easily 35 dB typical. The best I could get with the 23-foot Split Delta is -30 dB typical. On a standard 23-foot-tall Delta, the side nulls (+/- 90 degrees) are -5 dB typical. On a 23-foot Split Delta, the sides are -7 dB typical but can be adjusted to slightly deeper side nulls at the expense of some of the back null deepness.

For More Info...

To learn more about the basic four terminated broadband loop antennas, please consult "Broadcast Technology" in the August 2008 and October 2009 editions of *Popular Communications* magazine where construction was covered in greater detail. Further info can be found online at www.bamlog.com in the antenna section, or by googling "Flag antenna," etc., specifically for additional resources. Initial reports about DHDL construction and performance are available online from the inaugural implementation of the antenna at the TX3A DXpedition. Google "TX3A DHDL" to find the links. EZNEC antenna modeling software by Roy Lewallen, W7EL, is available for download at www.eznec.com. More experimentation with various split loop configurations is sure to follow as the concept of the DHDL has really opened the door to some interesting possibilities. Stay tuned right here for further developments.

Until next time, 73 and Good DX!