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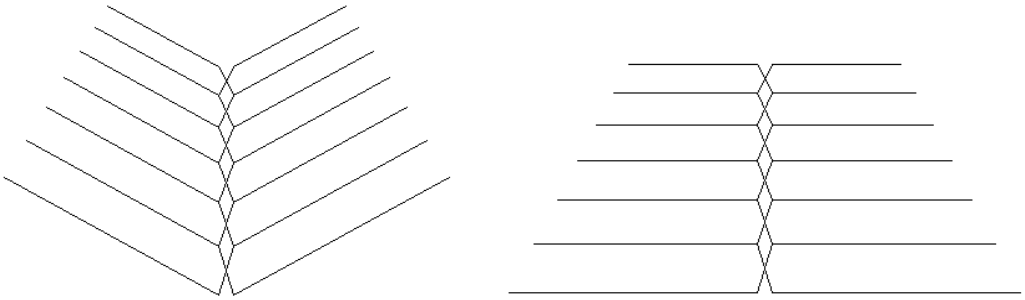
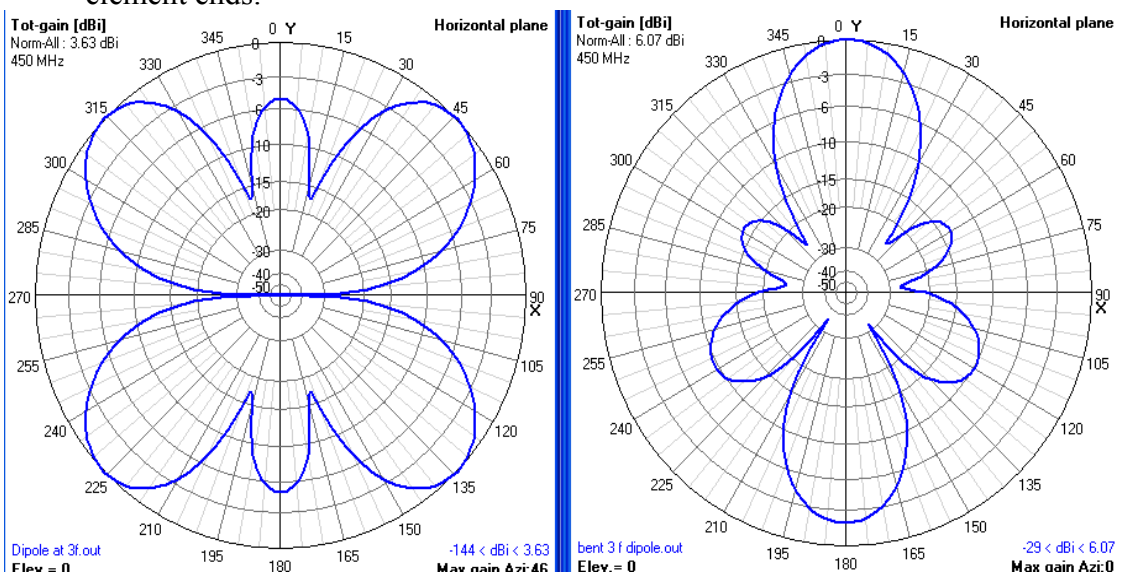
Vee shaped Elements vs Straight Elements



It is quite common to use elements in an LPDA that bend forward, forming a Vee shape in the plane of the antenna. Many TV antennas use this approach, as do some ham designs such as the Telerana. The Vee shape reduces the turning radius somewhat and improves the mechanical balance. In TV antennas it is done as a way of enhancing operation on the third harmonic. For example, a TV LDPA designed for 55 to 88 MHz can cover 165 to 264 MHz on its third harmonic. Thus, all of the VHF TV bands are covered with an LPDA design with as few as four elements. Further analysis of this type of TV antenna is included with one of the construction projects later in this chapter.

Third harmonic operation is also used in some other types of antennas such as the "boxkite". These antennas use geometry to cancel out part of the radiation from the center of the element so that it does not add out of phase with the radiation from the element ends. Another way to do this is to put a short element in the center of the longer element to cancel the out of phase radiation. Some LPDA TV antennas with straight elements use this approach for better third harmonic operation. The Vee beam LPDA, on the other hand, moves the physical location of the undesired currents so they are no longer collinear with the desired currents, thus reducing their tendency to cancel the desired radiation from the element ends.



These plots show the pattern of a three half waves dipole using a straight element vs a Vee element. With the Vee, the off axis lobes are suppressed, the main lobe is increased, and about 2 dB F/B appears. It is apparent that using this type of element in a LPDA will enhance the performance on the 3rd harmonic, while not affecting forward gain at the fundamental. There is a pattern change at the fundamental frequency with loss of the deep nulls off the sides of the pattern. Thus, an LPDA with straight elements will, like a yagi, have deep side nulls, whereas a Vee LDPA will not. In many applications, this is a small price to pay to get the enhanced operation on the 3rd harmonic or to simplify the mechanical construction.