Feed System Description for the N7CL Array

The new N7CL version of the two element driven array has been described (incorrectly) as being essentially an HB9CV antenna. While the N7CL driven array antenna is definitely in the same class of antenna as the HB9CV (also confused with the ZL-Special), the N7CL Array is not technically very similar to either of the above versions of the two element driven array. The primary differences are in the element lengths, element spacing, and the method of feeding and controlling the phase of the current in the elements.

The HB9CV and the ZL-Special are typically fed and phased with high impedance open wire transmission line with a velocity factor in the high ninety percent range. Matching for the ZL-Special is by means of a shorted stub located some distance towards the generator from the antenna's feedpoint. "T" matches at each element are used in the HB9CV design. Element spacing for the original HB9CV is typically 0.125 wavelengths.

Some other feed systems have from time to time been applied to the two element driven array. Some of those feed systems have been based on ordinary coax. But the modifications that must be made to the basic HB9CV design to accommodate these feed systems also prevent these antennas from being accurately classified as an HB9CV array.

The Cal-Av LABS 2D series antennas incorporating the N7CL feed system have been issued U.S. Patent No. 6,411,264. This feed system combines element stagger, shorted feedline stubs, and coax fed inside one arm of shorted open-wire transmission line stub to produce a feed system with the following characteristics:

1. Physical spacing of the elements significantly less than 0.125 wavelengths for increased forward gain (and, conveniently, a compact boom). The actual spacing used in the N7CL arrays produced by Cal-Av Labs is 0.11 wavelengths. So the array is more properly characterized as a "close-spaced" driven array.
2. The feed system uses phasing line with a velocity factor in the 0.66 range. This permits the use of common coax to form the bulk of the phasing line. This allows the phasing lines to be placed inside a metallic boom.
3. The feed system permits setting the accuracy of the match to 50 ohm feedline and the array operating frequency independently using two separate adjustable "hairpin" shunt inductors.
4. These hairpin inductors are adjusted by sliding shorts. The arrangement of the hairpins on the boom brings the matching and tuning adjustments inboard towards mast. This makes the adjustments reachable from a position on the antenna support tower. Thus final adjustments to the antenna can be easily made with the antenna in place on the tower while the antenna is mounted at its intended operating height above earth.

5. The array dimensions and feed system are configured so that the pattern optimization is coincident with system resonance and match to 50 ohms. When adjustment is made to the tuning hairpin to compensate the array for its mounted height, site clutter, etc., the good pattern characteristics of the array are maintained.
6. The design of the feed system rigidly enforces precise electrostatic balance for the array. Balance is maintained with regard both to the feedline connection and to the connection to the tower. This makes the antenna much quieter on receive and eliminates the need for a separate BALUN or coil of coax in the feedline to the transmitter. This balancing and matching scheme can handle virtually unlimited (in amateur radio terms) amounts of power without any non-linear effects or failure due to heating. It will loaf along at 5 kW CCS even on a full-carrier mode such as radio teletype.
7. The feed system connects the elements to local RF ground (the support boom) for low frequencies and DC. This feature permits the array to drain off static charges, survive lightning hits, and provide useful non-radiative top loading of the tower structure if required.
8. Feed system provides a high quality DC short across the feedpoint at the antenna end of the feedline.

A schematic representation of the N7CL feed system for the two element driven array is shown below in Figure 1.

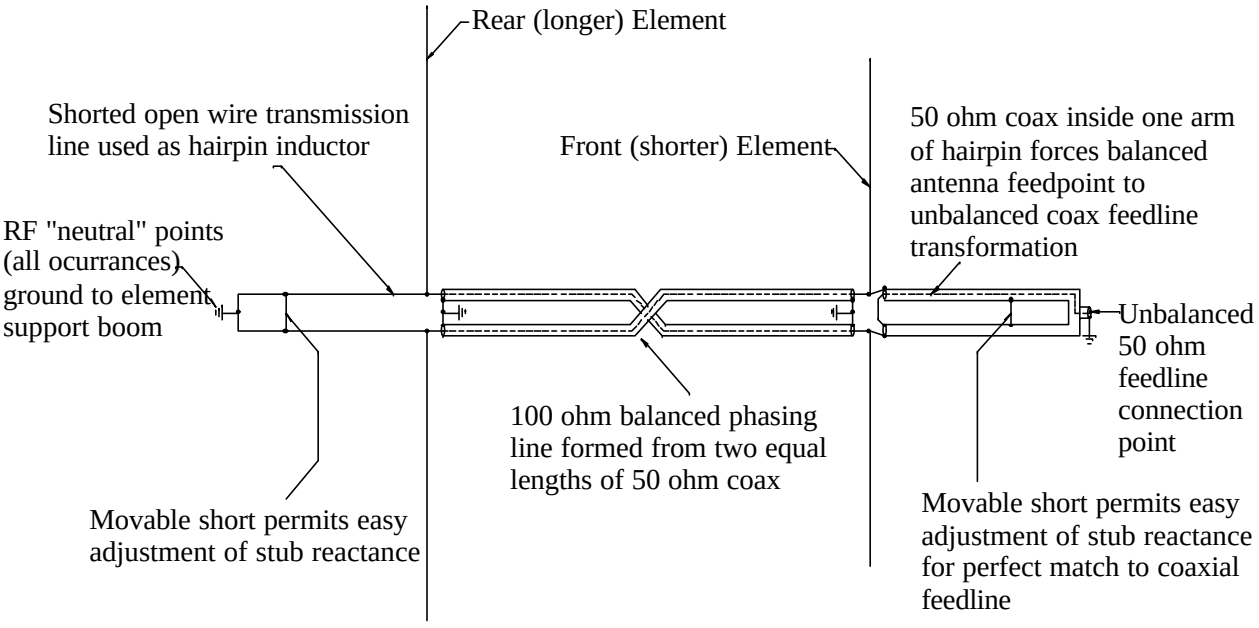

Figure 1