An Investigation of Techniques to Achieve Multi-Frequency Operation of a Bazooka Balun

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In antenna applications, a balun is required to reduce undesirable common mode current on the feed cable and to balance the antenna current. Balun chokes like the bazooka balun are commonly used in antenna testing. However, these types of baluns are not wideband and often cater only to one operational frequency. Hence, for wider frequency bands, multiple baluns with different operating frequencies have to be used. This presents a major problem, especially in broadband antenna testing. To this end, an investigation of possible designs of a bazooka balun has been performed to balance current over multiple frequencies.

The design is based on the quarter-wave bazooka balun. The balun is designed to be open at the end of the antenna and shorted to the cable's outer jacket one quarter wavelength from termination. At the design frequency, the input impedance becomes very high and most of undesirable leaked cable current is rejected. Several models have been investigated, all of which share the use of resonant LC circuits within the balun structure. In all cases, the circuits are placed between the outer shield of the coaxial cable and the inner wall of the balun. These are intended to create short circuits terminations within the balun at different design frequencies. The variables considered in the study included circuit placement, circuit spacing and circuit quality factor Q.

Simulations in Agilent ADS were performed to study the S_{11} parameter of the different proposed configurations. Additionally, Ansys HFSS was used to study current densities in model baluns. Results and comparisons on the efficiency of performance between proposed designs will be presented.