

## **A New Topology of Top-Cross-Loop for Low-Profile Monopole UWB Antenna**

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Federal Communication Commission (FCC) allocated 3.1 GHz to 10.6GHz to short range (<10m) communication with acceptable EIRP in the beginning of this century. This adoption for radio reusability revived the research in Ultra Wideband (UWB) communication which dates back to the first commercial electromagnetic data communications more than 100 years ago by Marconi. UWB communication systems possess advantages of robustness against multipath and jamming, and potential high data rate capability (typically 100Mbps) over short range. These characteristics among others make UWB systems promising solutions for indoor navigations, intrusion detections and communications in entertainment, sports, medical and defense areas.

In latest UWB communication systems, several critical requirements make it demanding to design qualified UWB antennas. Firstly, antenna needs to be small in size to be compatible to portable UWB units. Secondly, azimuthal omnidirectional radiation is preferred to potentially communicate multiple targets. Finally, a low dispersive impulse response in time-domain is required for UWB communications especially impulse radio systems. Monopole antenna is one of few candidates that satisfy all the above three requirements. In our research, a new topology of top-cross-loop for low profile UWB monopole antenna is introduced based on capacitive loading for antenna miniaturization and bandwidth expansion. In addition, the new topology provides descent system signal fidelity through time domain analysis. Due to its bandwidth improvements, low dispersive characteristic, fabrication simplicity and low cost, this new topology addresses the needs of wide range of wireless systems.

A triangular shaped monopole with the new topology is proposed, fabricated and measured in comparison with conventional monopole of the same dimensions. It is shown that the new topology increase the bandwidth by nearly 2GHz. The radiation patterns show that it is linearly polarized with azimuthal omnidirectional radiation pattern and other unique characteristics. Additionally, the antenna under study shows radiation pattern consistency through wide range of frequencies. Thorough parametric studies have been conducted to show the effect of each parameter on return loss. Moreover, descent performance in time domain is observed in various radiation directions by checking system fidelity factor, which represents low dispersive characteristic of the proposed antenna. As a result the new topology is anticipated to find its wide applications in various UWB systems with more features yet to be explored and understood.