

Dynamic Impedance Matched Antenna System for RFID Application

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Radio Frequency Identification (RFID) systems have been described and proposed over the years as a system capable of reading hundreds of tags at a time. RFID finds numerous applications in various areas from supply chain management to asset tracking to authentication of frequency counterfeited pharmaceuticals. One of the biggest challenges of implementing such a system is to take into account the overall changes that could occur in an environment. For some applications such as medical tracking with cabinets, the loading or the resonant cavities (metal drawer's size) could vary drastically. Moreover, there is a zero tolerance for non-read tags or misidentification. The fact that the tags also have linearly polarized antennas and are placed randomly makes it even more complex.

In such a highly reflective and unpredictable environment we have developed an antenna system focusing on dynamic impedance matching. The system can function effectively in a highly reflective environment (like a metal cabinet). The dynamically matched antennas are designed to be compatible for use in the ISM 915 MHz (902.5 MHz to 927.5 MHz) frequency band, and can be used for EPC RFID measurement systems. The proposed antenna solution includes four patch antennas of dimension 140 x 140mm each along with two folded monopoles in order to cover the entire upper hemispherical space where items with RFID tags are placed and can be scanned by the system with an onboard microprocessor. The overall dimension of the proposed system is 390 x 320mm. The dynamic impedance matching is achieved using Ethertronics EtherChip 1.0 which is a 16 state tunable capacitor with tuning range from 0.72 pF to 3.62 pF. The design will be presented through simulations in CST Microwave Studio and validated through prototyping and measurements. A picture of the proposed system is shown in Figure 1.

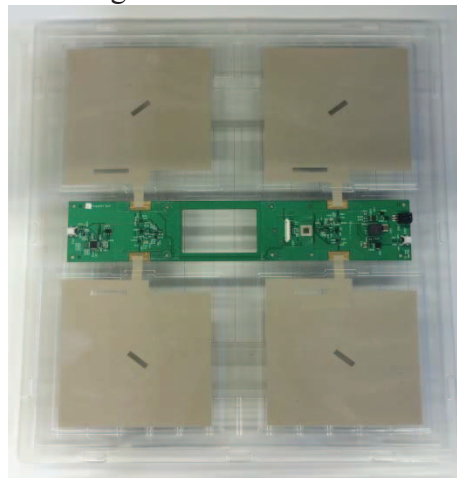


Figure 1: Dynamic Impedance Matching Antenna System using EtherChip 1.0