

A 6 Patch Near Field Antenna for Conveyor Bottom Read in RFID Sortation Application

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In our another paper (Z. M. Liu, R. R. Hillegass, "A 3 Patch Near Field Antenna for Conveyor Bottom Read in RFID Sortation Application", submitted to 2006 IEEE AP-S International Symposium), we presented a 3 patch near field antenna design for the OTC (Over the Conveyor) bottom read. In this paper, we present a 6 patch near field antenna design for the same application.

The following figure to the left shows the layout of this antenna. It has 3 pairs of patches, each pair is fed by a quadrature hybrid. Numbers in the figure show the relative phases at hybrid ports. The arrow on a patch shows the CP (circular polarization) direction of that patch. Patch corner truncating and array feeding network are designed in a way that, 1) the two patches in a pair are truncated at different corners to achieve the optimum CP ratio for that pair, 2) the electric current phases on two patches in a pair are the same, 3) the CP directions of the two patches in a pair are the same, 4) the CP directions of the two outer pairs are the same while that of the center pair is opposite, 5) the power feeding magnitudes to all patches are the same and, 6) the feeding phases to the two outer pairs have 180 degree difference so that the radiated fields from them cancel each other in far field at the conveyor up and down stream directions.

The following figure to the right shows the simulated far field gain pattern of this antenna. The same as the 3 patch near field design, this design also has two beams. Its major advantage over the 3 patch design is that, while it still uses same size PCB, it doubles the number of patches and so increases the chances of reading tags at the bottom of boxes particularly for high speed conveyor. The other advantage is that, the beam is narrower in the cut plane parallel to the conveyor travel, and thus it is good for RFID singulation. The disadvantage is that its gain is 3dB higher than that of 3 patch design, and thus the power it can use must be 3dB lower to meet the FCC regulation. The work in this paper is included in a patent application.

