TARC-Based Radiation Efficiency and Its Relation to the Port Termination for MIMO Antenna Systems

Po-Chuan Hsieh and Fu-Chiarng Chen*
Department of Electrical Engineering
National Chiao Tung University, Hsinchu, Taiwan

How to efficiently make good use of the limited frequency spectrum is one of the main issues in the whole communication systems. Multiple-input–multiple-output (MIMO) antennas technology offers an effective solution to achieve the goal of maximal spectral efficiency with multiple antennas at both transmitter and receiver ends. MIMO shows the potential as the solution for the next generation communication systems. Radiation efficiency is an important issue when referring to the performance of multiple antennas systems in desire for high power efficiency. Realizing multiple antennas systems in radio channels becomes challenging because of the unavoidable mutual coupling effect between multiple antennas in portable devices. Mutual coupling effect distorts the antenna far-field patterns and therefore has great impact on how much power radiates without reflection resulting from impedance mismatch and absorption by adjacent antenna elements. We therefore proposed the newly defined radiation efficiency, which is based on total active reflection coefficient (TARC) in this work. The TARC-based radiation efficiency can take into account the effect when ports of the multiple antennas system are fed with signals of different phases simultaneously. Moreover, the survey of how port termination networks impact on radiation efficiency is conducted as the gauge to judge if a given multiple antennas system is well designed and further helps how we may improve the performance of the MIMO antennas systems.

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