# SMART ANTENNAS

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**SUMMARY**: The objective of this presentation is to illustrate that an incomplete understanding of the Maxwellian physics can often lead to wrong conclusions and could promise illusory designs, particularly in the area of wireless communications. We start the presentation with the direct data domain least squares approach to adaptive processing without forming a covariance matrix. It is at least an order of magnitude faster than the stochastic methods. Examples will be presented for performing STAP processing using real measured data on an airborne platform called the MCARM data set. Then, how to perform adaptive processing using real conformal arrays will be described. Particularly, when they are operating in the presence of mutual coupling and other near field scatterers. It will be shown that one can get a perfectly dispersionless channel once attention is paid to the physics of the problem which is sadly lacking in the present methodologies. Impulse response of antennas in the time domain will also be discussed. It will be shown that one needs a new paradigm to look at antennas in the time domain as opposed to in the frequency domain. Examples of various wideband antennas including the *century bandwidth antenna*, *impulse radiating antenna* and others will be presented. Finally, the definition of channel capacity a la Shannon will be formulated for the vector electromagnetic problem. The power spectral density which provides the basis for the scalar acoustics problem really does not hold in electromagnetics as the power in electromagnetics is defined by both the voltage and the current and not exclusively by either one, which may hold only for special cases.

**Reference:** T. K. Sarkar, M. Wicks, M. Salazar-Palma and R. Bonneau, *Smart Antennas*, John Wiley & Sons, 2003].