A LOOK AT SOME OF THE PRINCIPLES OF MOBILE COMMUNICATION FROM A MAXWELLIAN VIEWPOINT

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ABSTRACT: There has been a large number of papers appearing in the scientific literature which claims that the antenna theory need to go through a revolution and new antenna theory of the future has tremendous potential under the guise of MIMO and smart antennas which is going to revolutionize electromagnetic theory and so on. Even systems are built to demonstrate those principles. However, to an ardent believer and a practitioner involved with Maxwell's theory this is rather surprising as Maxwell's equations are one of the few equations of mathematical physics that has not gone through any changes since Hertz put them in the appropriate scalar form and Heaviside in the vector form over one hundred and twenty five years ago. This is one of the rare theories that has withstood the erosion and corrosion of progress. Even the advent of relativity had no effect as it is built in. Hence, to such a person immersed in Maxwell's theory, it is rather surprising that new antenna theory is going to evolve or that the antenna should be treated as a channel rather than a device and so on. The objective of this presentation is to illustrate that an incomplete understanding of the Maxwellian physics can often lead to the wrong conclusions and could promise illusory designs. A few of them will be illustrated to start and initiate a dialog about the physical subtleties of a wireless communication system. One of the reason things gets rather fuzzy in analysis and design of a communication system is through the introduction of probability theory. In fact some of the problems can be directly attributed to the deficiencies of probability theory. Here, we present a partial list of some of the modern concepts to increase channel capacity for a wireless communication system and examine them under the century old Maxwellian concepts to see if they offer any new information or that are incompletely defining the parameters of the problem.

This presentation will involve not only the physics of the MIMO systems and their fundamental limitations but also will deal with propagation modeling of a wireless system. It is perhaps is quite possible that researchers are trying to model a dispersionless system! However, the artificial dispersion in their wireless channel models is due the incomplete understanding of a wireless system, as they do not take into account the effects of the transmit and the receiving antennas into account.

In recent times multi-input-multi-output (MIMO) antenna systems are becoming very popular. In this context, the goal is to direct an antenna beam towards a preselected receiving antenna by using an array of transmitting antennas. It is often claimed that in this communication mode one can increase the capacity of the system, by using an array of transmitting antennas. However, there are many assumptions that are involved in this methodology and one needs to critically analyze the situation to check the validity of the various concepts and methods used to achieve the desired goal.