**Mechanisms and Sources of Passive Intermodulation in Printed Circuits**

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Modern wireless systems are expected to operate in multiple frequency bands and support diverse communications standards to provide the high volume and speed of data transmission. Today's major limitations of their performance are imposed by interference, spurious emission and noise generated by high-power carriers in antennas and passive components of the RF front-end. Passive Intermodulation (PIM), which causes the combinatorial frequency generation in the operational bands, presents a primary challenge to signal integrity, system efficacy and data throughput.

Emerging adaptive and active RF front-end architectures increasingly employ antenna arrays which extensively rely on PCB technology as platform for assembly and integration of beamforming networks, radiating elements and other passive and active componentry. As a result the high-power carriers travel along large boards that causes not only localized but also distributed PIM generation.

Detection of PIM sources and mitigation of PIM impact on the performance of distributed printed circuits present enormous challenges for the antenna designers. The dominant mechanisms and sources of PIM generation in PCB assemblies critically depend on the layout of printed conductors as well as on the laminate internal construction, processing and finishing (protective coating). Location of PIM sources and magnitude of the generated PIM products may also vary with carrier frequencies due to redistribution of near-field patterns, migration of hot-spots and phase deviations in complex distributed circuits. Interplay of these competing factors determines the overall PIM performance of the antenna array, and often it becomes impossible to separate individual PIM sources in large multi-element arrangements.

In this talk, we will discuss the principal mechanisms and sources of PIM generation in PCB materials and structures based on our experimental observations and theoretical models. The features of distributed PIM production in microstrip lines and coplanar waveguides will be addressed and illustrated by the simulation and measurement results. The issues of PIM measurements with the two-port setup and near-field probing of the PIM product distributions in printed circuits will be discussed.