"Smaller and Smarter - Architectures for Active Integrated Antennas"

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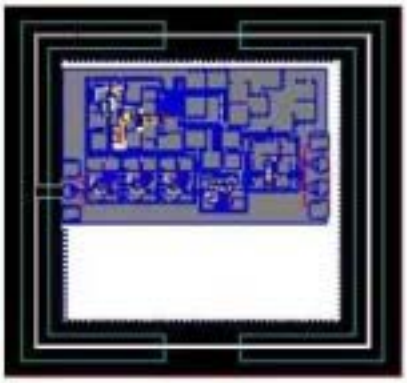
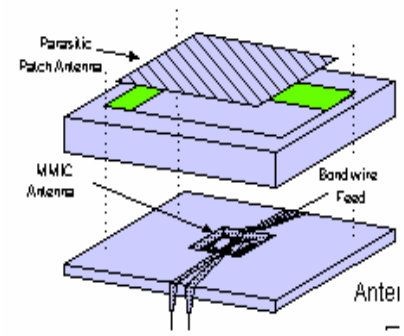
There is a drive amongst designers to make antennas smaller and smarter, to meet the needs of new communication systems, by integrating antennas with the RF front end. This drive comes from the need to make antennas both more functional and if possible smaller. For example cellphone handset designers are now contemplating integrating switches into the antennas, to get reconfiguration into additional bands, that gain them a competitive edge in what is traditionally an extremely cost sensitive market. At the other extreme of the communications technology spectrum, satellite antenna designers are looking for extra system capacity through highly adaptive active array antennas using integrated antenna front-ends.

"Active integrated antennas" are traditionally formed by the integration of active devices and other circuit components into or very close to an antenna. They can be used to form elements or small arrays possessing smartness, which can be defined as additional functionality, relating to reconfiguration, or transmit and receive operation, for communications radar or transponder applications. They can also have application either in grid or array configurations for millimetric power generation, or in quasi-optical beam processing. This workshop will concentrate on the former application area.



Slot-loop antenna integrated with 24 GHz SiGe HBT receiver (courtesy Universities of Uppsala and Ulm)

Whilst many of the fundamental possibilities and limitations have been identified, for planar integration techniques, attention is now being paid to the architecture that could be used, as a way to optimize the potential and mitigate the limitations. Whilst planar integration is important for use in monolithic microwave integrated circuits, multilayer operation gives some important operational benefits, particularly when circuit screening is needed. In both types, the interconnection between the components is crucial.



Packaged MMIC with integrated parasitic patch radiator (University of Birmingham)

In addition, several new terms are being used to describe the drive to smartness, that reveal some of the aspirations of designers. *Cognitive antennas* can sense their environment and respond to it, by some form of adaption or reconfiguration. U*biquitous antennas*, by a similar process of adaption, can make themselves useable in many different systems, and hence drive down the unit cost.

These exciting drivers and trends form the background to this workshop, in which the ways antennas and front-ends can be integrated will be reviewed. Techniques and their potential and limitations will be identified, the current position stated, and the needs of further work discussed.