

*A Proposal for a Short Course in EuCAP 2006, Nice, France, November 6-10, 2006.
Duration – Full- day, Expected Attendance – most conference attendees interested in microwave/mmW
photonics, novel materials/technology and applications.*

Advances in Microwave Photonics with Applications to MW/mmW Beam-forming and Steering of Large Phased-Array Antennas

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Abstract

R&D of high speed/microwave photonics conducted since early eighties produced many attractive terrestrial, undersea, and space/avionics applications, e.g., high speed data, telephone, and VoIP networks, multichannel CATV distribution, fiber optic feed network for wireless communications, onboard spacecraft signal processing, optical intersatellite links & networks, antenna remoting, and beam forming & steering of phased-array antenna and radar. Use of NLO polymer and semiconductor materials based OEICs developed in the nineties enhanced these photonics advantages by combining the benefits of device processing compatibility and multiple functionality such as optical generation, distribution, control, and detection of signals in a chip. Because of micro-miniaturization and novel properties, recently developed MEMS (Micro Electro-Mechanical Systems), MOEMS (Micro Opto-Electro-Mechanical Systems) nano-technology, nano-structures and meta-materials (EBG/PBG) are highly suitable for space-bourne communications systems. A marriage of diverse materials and technologies promises next-generation lightweight, ultra-compact, prime power efficient, high reliability microwave/millimeter wave (MW/mmW) photonic hardware.

An overview of this development with a critical assessment of capability and commercial feasibility will be presented. Emphasis will be placed on the use of photonics in MW/mmW beam forming and steering of large multibeam, multichannel phased array antennas. Also, optical generation, transmission, block conversion (up/down), and distribution of high dynamic range MW/mmW signals in an optical feed network will be discussed. State-of-the-art optical/MOEMS/Nano-technologies, subsystems, and systems relevant to MW/mmW photonics will be presented.