Full day Short course at the 2006 APS Symposium

Title:
EBG Surfaces, Artificial Magnetic Conductors and Soft-Hard Surfaces

Presenters (in alphabetic order):
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In recent years there has been a lot of attention to using periodic structures in antenna design. These structures are nowadays referred to as photonic or electromagnetic bandgap structures or simply by their acronyms PBG or EBG structures. When such structures are used to obtain high-impedance surfaces, they are related to the transversely corrugated surface, that 15 years ago was generalized into a concept of soft and hard surfaces, based on a terminology used in acoustics and diffraction theory.

The course will relate the present PBG/EBG work to artificial magnetic conductors as well as to artificially soft and hard surfaces. The theory of ideal magnetic conductors and soft and hard surfaces will be explained in detail, as well as how to implement these theoretical models in existing software based on numerical methods such as GO, UTD, FDTD, FEM and moment method. We will also show how magnetic conductors and soft and hard surfaces can be realized artificially in practice, and how to analyze these realizations without having to model each detail of the periodic structure. This can be done by using unidirectional current grids, asymptotic boundary conditions for strip grids and corrugations, homogenized boundary conditions, or impedance boundary conditions. The limitations of the different analysis models as well as surface realizations will be discussed with particular attention to diffraction effects, dispersion, surface waves, leaky waves, and bandgap properties.

The work will be presented in relation to specific applications most of which have already been published in scientific journals. Examples of applications are: ground planes, low-profile antennas, reduction of coupling, removal of parallel-plate noise in multilayer circuit boards, reduction of far out sidelobes, antenna gain enhancement, effective waveguide apertures, quasi-TEM waveguides, compact horn antennas, reduction of blockage from cylindrical objects, grid amplifiers, and infinite array simulators (realized in rectangular waveguide) for broadside radiation and dual polarization. The course will also cover related tunable surfaces used for beam steering and adaptive antennas.

Copies of presentation slides and journal articles will be provided in electronic form.