Direct Optimization of Printed Reflectarrays for Contoured Beam Satellite Antenna Applications - DTU Orbit (13/12/2018)

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An accurate and efficient direct optimization technique for the design of contoured beam reflectarrays is presented. It is based on the spectral domain method of moments assuming local periodicity and minimax optimization. Contrary to the conventional phase-only optimization techniques, the geometrical parameters of the array elements are directly optimized to fulfill the contoured beam requirements, thus maintaining a direct relation between optimization goals and optimization variables, and hence resulting in more optimal designs. Both co- and cross-polar radiation patterns of the reflectarray can be optimized for multiple frequencies, polarizations, and feed illuminations. Several contoured beam reflectarrays, that radiate a high-gain beam on a European coverage, have been designed and compared to similar designs obtained using the phase-only optimization technique. The comparisons show that the designs obtained using the proposed direct optimization technique are superior in performance, both for multi-frequency and dual-polarization designs. A reflectarray breadboard has been manufactured and measured at the DTU-ESA Spherical Near-Field Antenna Test Facility to validate the proposed technique. An excellent agreement of the simulated and measured patterns is obtained.

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