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Endfire mode synthesis using convex optimization for very large array antennas

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Abstract

We have developed an in-house MoM code, capable of full-wave simulations of array antennas with thousands of elements. For an antenna with N ports, the output of the simulation is an $N \times N$ scattering matrix at each fixed frequency, and N embedded element patterns (EEP, one for each individual port excitation). We typically consider cases with a few thousand ports. When using the antenna in endfire mode, the result is usually a very bad overall matching, measured by the total active reflection coefficient (TARC). Using the exported scattering matrix and EEP:s, a convex optimization problem for the port excitations can be set up to improve the matching while maintaining (or improving) the endfire mode. Since the optimization is run separately for each individual frequency, there is no guarantee that the resulting port excitation vectors are smooth functions of frequency. In this contribution, we present different approaches to regularizing this problem, and reducing the dynamic range of the amplitudes of the port feeds.