Phased array antenna beamforming through numerical solution of the Optimal Transport problem

P. Angeletti [1], G. Toso [2], and R. Vitolo [3]

[1] European Space Agency - ESTEC, Nordwijk, The Netherlands
piero.angeletti@esa.int
[2] European Space Agency - ESTEC, Nordwijk, The Netherlands
giovanni.toso@esa.int
[3] Department of Mathematics and Physics "E. De Giorgi",
Università del Salento, Italy
raffaele.vitolo@unisalento.it

Phased array antenna beamforming is a technique used to form the radiation pattern of an antenna electronically by manipulating the phase and amplitude of signals sent to each antenna element. The asymptotic solution of the problem of phase synthesis of a phased array antenna with assigned amplitude satisfies the Optimal Transport problem with quadratic cost. The engineering model has been described in [1, 2], and the corresponding antenna design is covered by a world patent [3].

In this talk we address the problem of efficiently finding numerical solutions to the above problem, i.e. the Monge-Ampere equation with second boundary conditions. In contrast with methods that exist in literature, the methods that we derived make a relatively low use of computational resources, which is crucial for space applications.

References

[1] P. Angeletti, G. Toso and R. Vitolo, *Asymptotic Phase Synthesis by Transport Maps - Part I: Theory and Irrotational Linear Maps*, accepted for publication in IEEE Open Journal of Antennas and Propagation (2025).

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