Sparse array synthesis for wireless power transmission

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Abstract

The implementation of solar power plants Orbital is one of the new technology options for clean energy on a large scale and with very low environmental risks. The key advantage that this type of plants can provide compared to traditional solar power plants is linked to the fact that it can receive uninterrupted sunlight (they are in geostationary orbit), and that the intensity of solar radiation received in orbit is much higher than one received on the ground (as they do not suffer due to the absorption from the atmosphere). The performance of these systems, however, poses many technological challenges in terms of collecting energy, weight and size of the system to be put in orbit, size of the collection system of the radiation on the ground, and the cost of energy produced. In fact, these plants require solar energy transmission from space to earth through a thin beam of microwave radiation, which must be conveyed to the ground in a very low (a few square kilometers) than at present for Information transmission system by satellite (which has footprint of several hundred kilometers). For this reason, the realization of a solar power is vital to the antenna system for energy transmission from the satellite, placed in geostationary orbit (GEO), the central post to the earth. Given the size of the antennas involved (several hundred meter aperture), using arrays of radiator (antenna arrays) is the only choice for the realization of such systems. To save weight, cost and consumption of such antennas, the use of sparse architectures (e.g. methods for reducing the number of elements while maintaining the radiant properties of the array) is essential. The choice of method in this case should focus in particular the efficiency of the technique of sparsening, given the very large antennas at hand.

Consequently, the objective of the activity is to assess a methodology for designing large arrays for applications in energy transmission by satellite. More in detail, the sparsening of linear arrays of different size and with arbitrary pattern shapes will be considered through the Bayesian Compressive Sampling approach.

Reference Bibliography: Compressive Sensing [1]-[5], [14]-[23]; Array Synthesis [1]-[5], [24]-[83]; Wireless Power Transmission [6]-[13].


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