Title: A Static Beam Placement and Beam Shaping Algorithm for Multibeam High Throughput Satellite Systems

Rubén Alinque, Juan Jose Garau Luis, Markus Guerster, Edward Crawley, Bruce Cameron
MIT Engineering Systems Laboratory, MA 02139, USA

The satellite communications market is growing and new generation of satellites will have unprecedented levels of flexibility and scalability: future multibeam High Throughput Satellites (HTS) are expected to be able to operate thousands of beams simultaneously. This poses new challenges when it comes to efficiently managing the increasing amount of resources. Two of these challenges are linked to the beam placement (i.e., defining the pointing direction for each beam) and beam shape (i.e., optimizing the gain distribution among covered users) problems. Optimizing these processes could reduce required RF power and enable the accommodation of new users into the system.

In this paper, we present an algorithm to address the joint beam placement and beam shape optimization. It consists of an iterative approach combining a placement heuristic and a gradient descent-based method. The algorithm decides the total number of beams needed and provides their pointing directions and shapes. We analyze the performance of this algorithm in a high-dimensional scenario based on realistic operational data, considering elliptical shapes with variable semi axes and relative rotation. We show this method provides higher gain to users and reduces satellite power consumption in comparison to other approaches from literature.

Biography

Rubén Alinque Dianez is a dual Bachelor Degree student in Aeronautics and Mathematics at the Higher Interdisciplinary Education Centre (CFIS) at the Universitat Politècnica de Catalunya (UPC), Barcelona, Spain. He is currently researching at the Massachusetts Institute of Tecnology (MIT) his degree thesis at the MIT Department of Aeronautics and Astronautics, under the supervision of Prof. Edward F. Crawley.

Presenting author details

Full name: Rubén Alinque Dianez
Contact number: (857) 320-9388
Twitter account: -
Linked In account: Rubén Alinque Dianez
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