Space Taper: A Spatially Tapered Phased Array Antenna for Future Space Communications

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The previous progress report mentioned the importance of the mutual coupling (MC) effect in irregularly spaced arrays. To tackle this challenge, an ANN-based methodology has been developed to predict the embedded element patterns (EEPs) of the antenna elements in the whole visible space for a flexible non-uniform array topology. The model has been trained and tested for the circular sub-array structure. Excellent agreement has been obtained between the full-wave simulated and ANN-predicted EEPs [1]. Since the methodology focuses on the elements within the sub-array structure, the MC effects between the sub-arrays must be considered. Therefore, the proposed method is currently being improved to have more generalized applicability.

Another challenge of this project is the design of the feeding network for the irregularly spaced array. With an MSc student, a parametrized circular sub-array structure has been designed. Since the realization of the active array requires IC placement, a 1:4 power divider was designed and integrated for these sub-arrays to verify the proposed methodology. Furthermore, an external 1:9 power divider will be used to feed the sub-array structures.

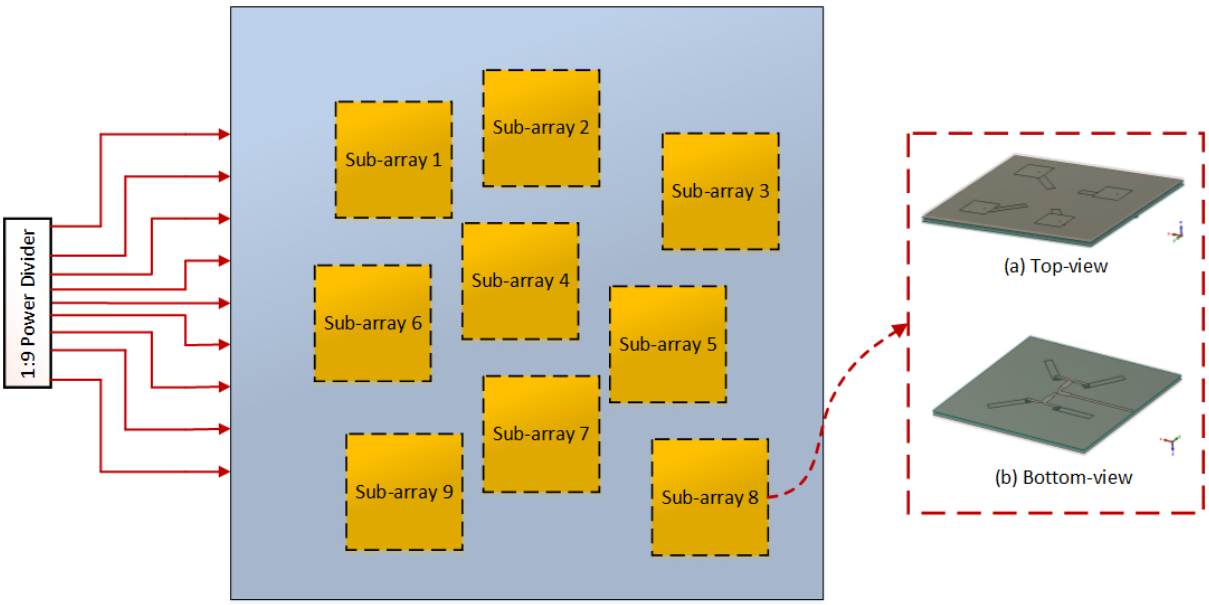

Figure: Array diagram with the designed sub-array example.

[1] N.B. Onat, I. Roldan, F. Fioranelli, A. Yarovoy, Y. Aslan, "…", *submitted to Proc. 17th European Conference on Antennas and Propagation (EuCAP),* Florence, Italy, March, 2023.