

IM3 MINIMIZATION IN A TRANSMITTING ANTENNA ARRAY WITH MATCHING

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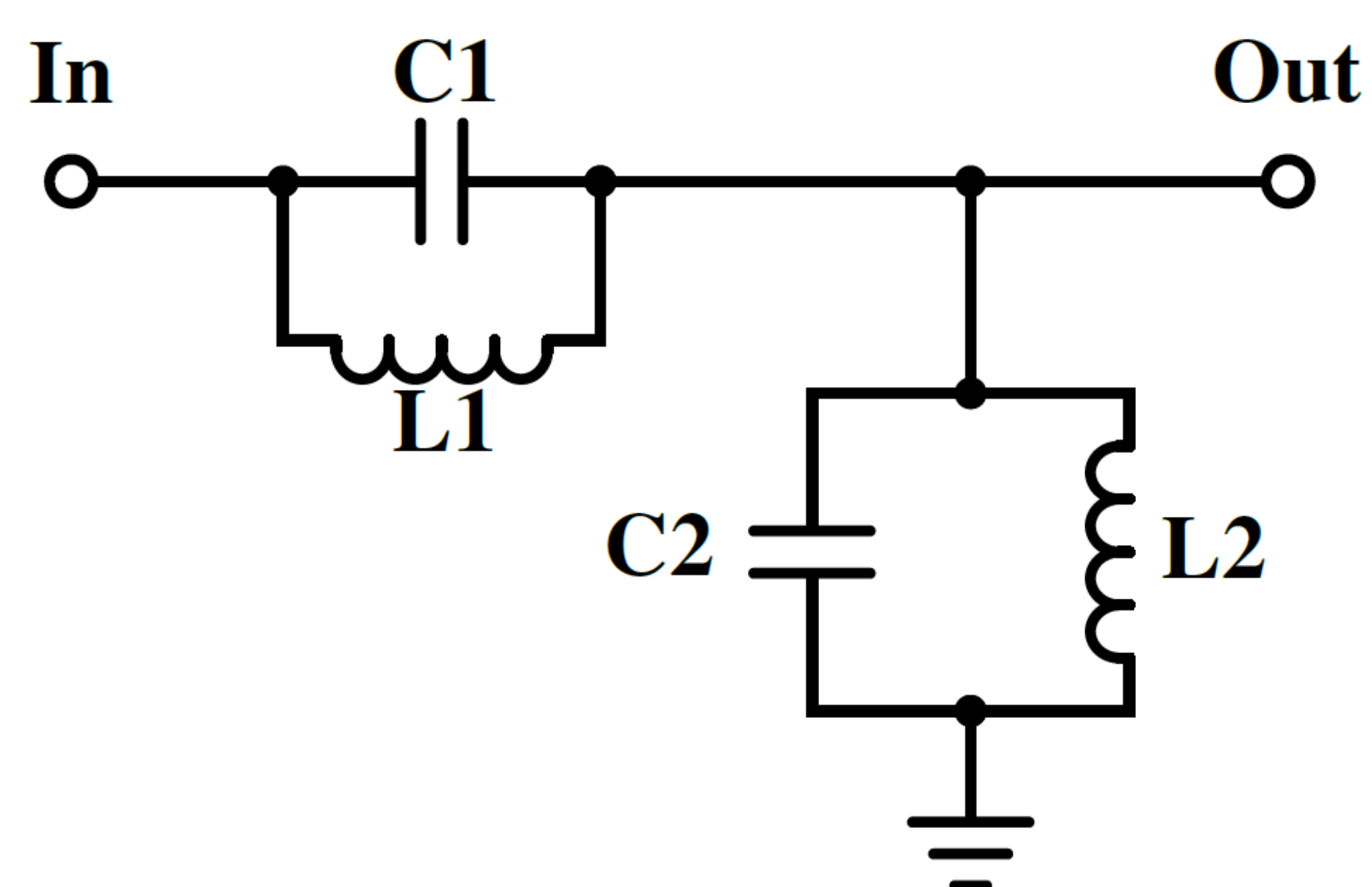
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Introduction

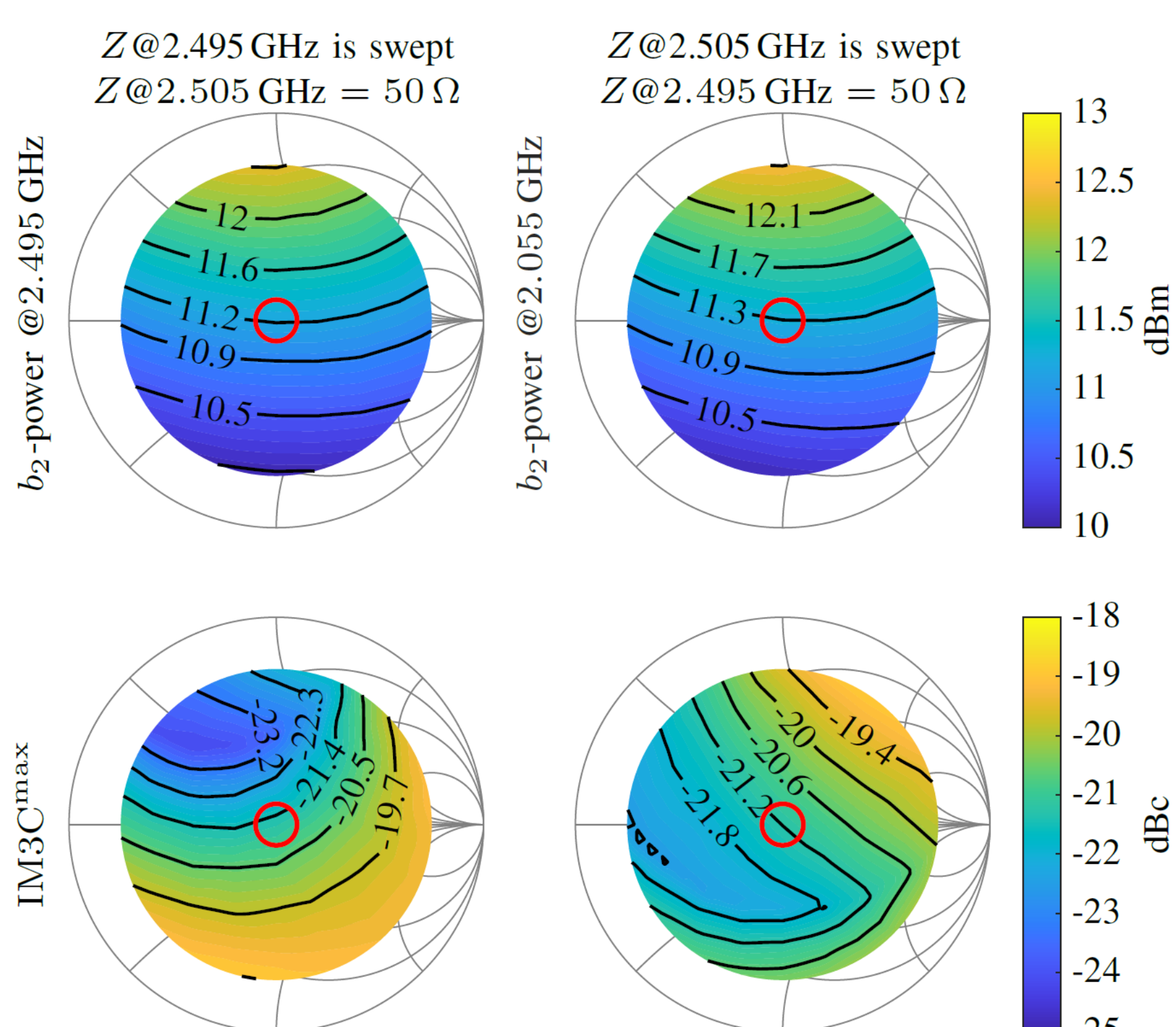
Active impedance of antenna arrays changes with beam-steering, which affects the output of the feeding amplifiers. By utilizing co-simulations the matching of the antenna in an amplifier-antenna array can be designed to minimize IM3 levels during operation.

Simulation study

The study is done at 2.5 GHz. The used antenna is a four-element linear patch array with a matching network composed of two resonators. The used amplifier is Freecell MMG3815BT1.



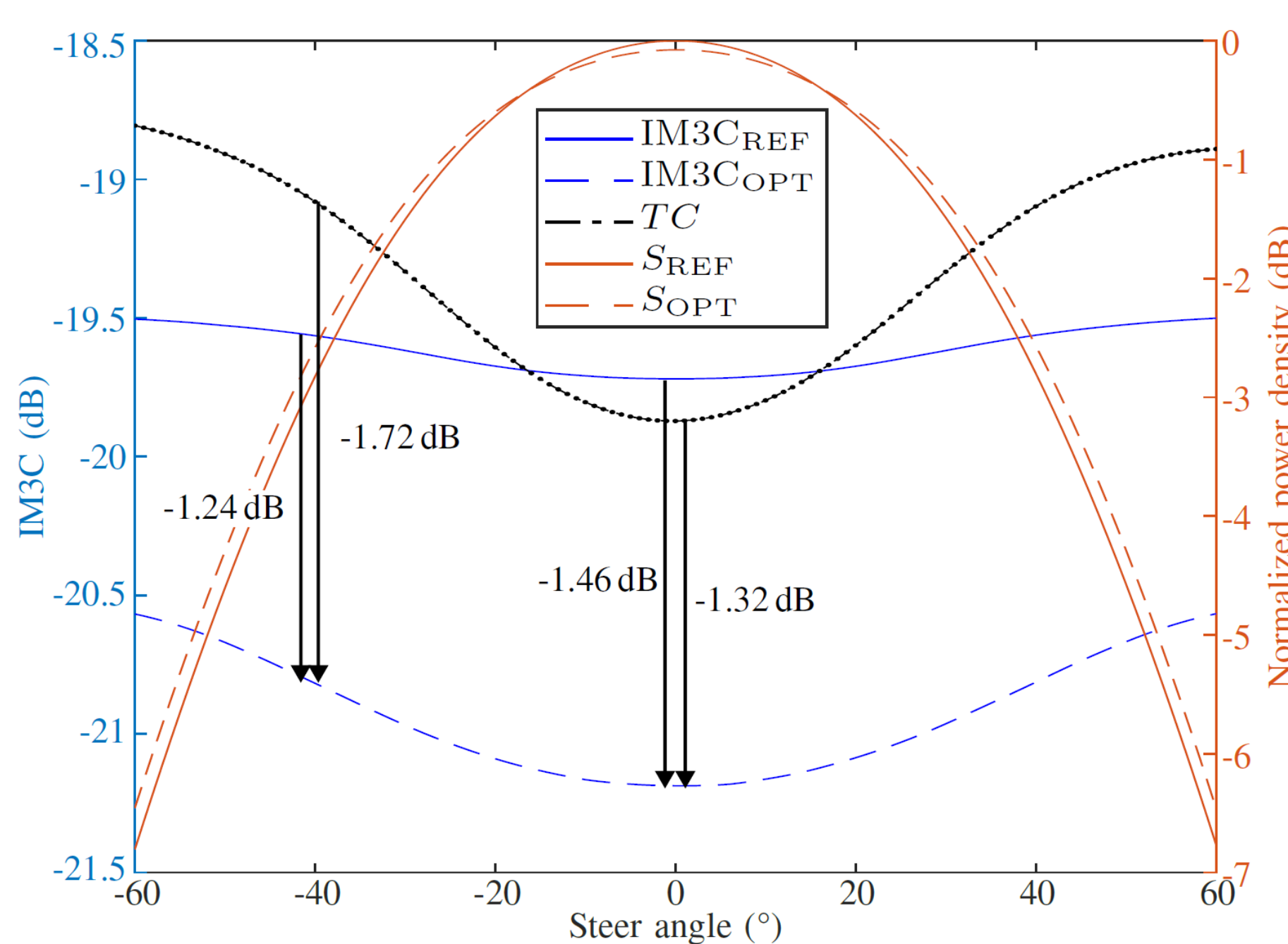
The matching network topology



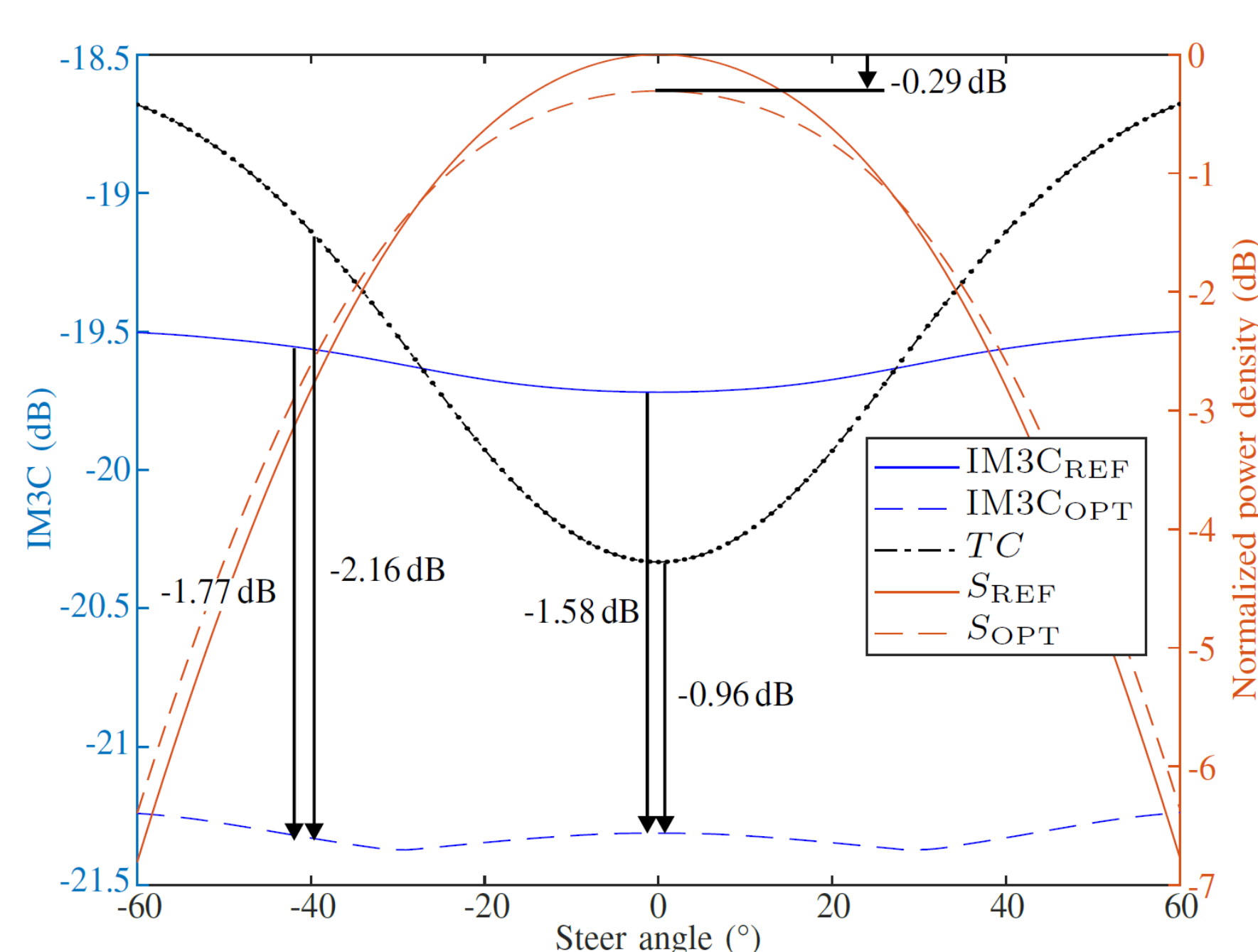
Amplifier load-pull with two-tone excitation with one tone being a constant 50 Ω

Simulation results

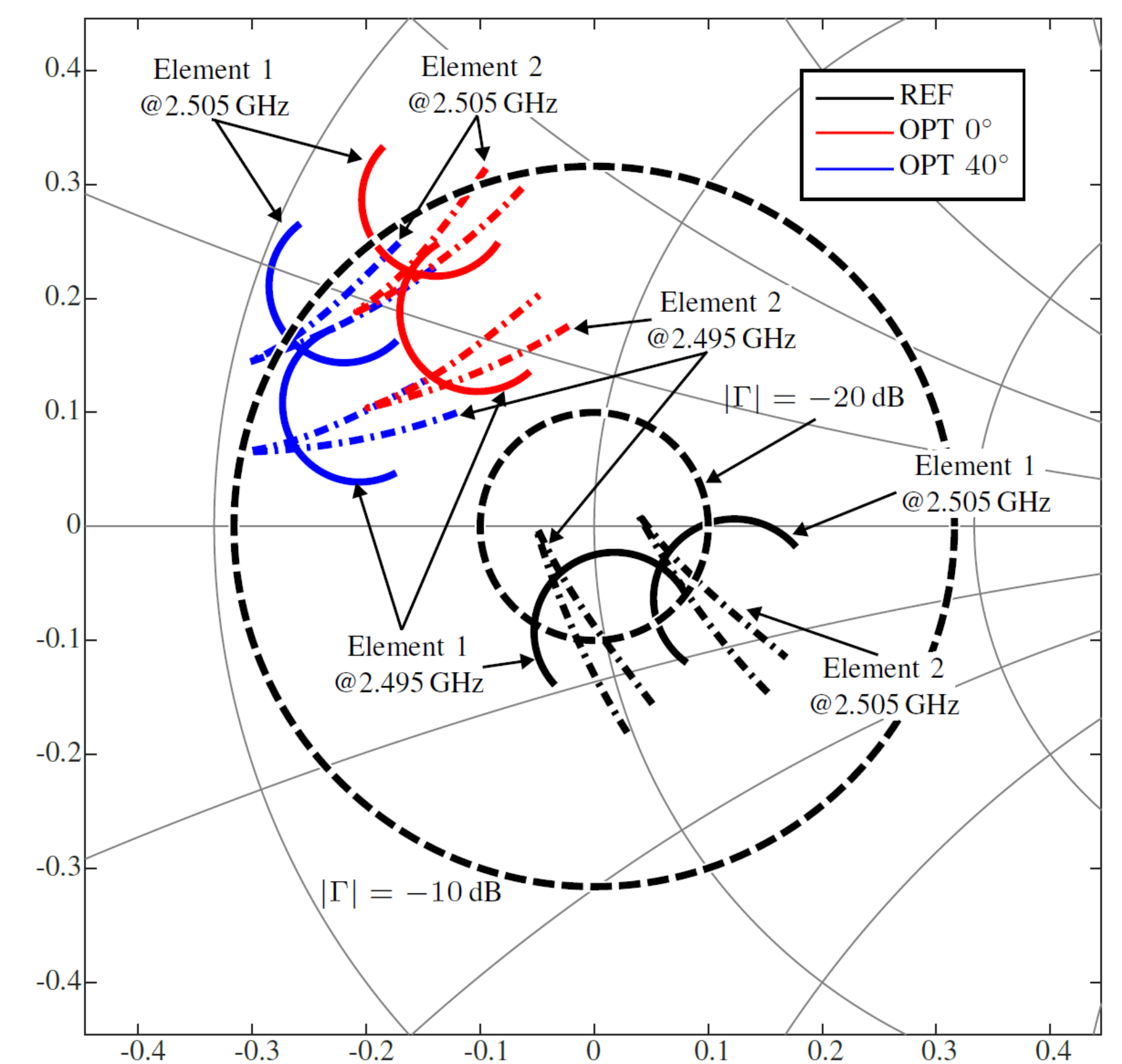
The reference case minimizes active reflection coefficient (ARC) when the beam is steered towards the broadside. With co-simulations two different IM3 minimizing matching networks were designed. One with beam towards broadside and one with beam towards 40°. IM3-to-carrier ratios (IM3C) have improved by more than 1 dB in both cases for all steer angles, while main tone power has only slightly decreased.



Results with optimization done with the broadside beam



Results with optimization done with the beam pointed towards 40°



ARCs of the three simulated cases when the beam is steered

Measurements

The simulations are planned to be verified with measurements conducted at Aalto University in the spring.

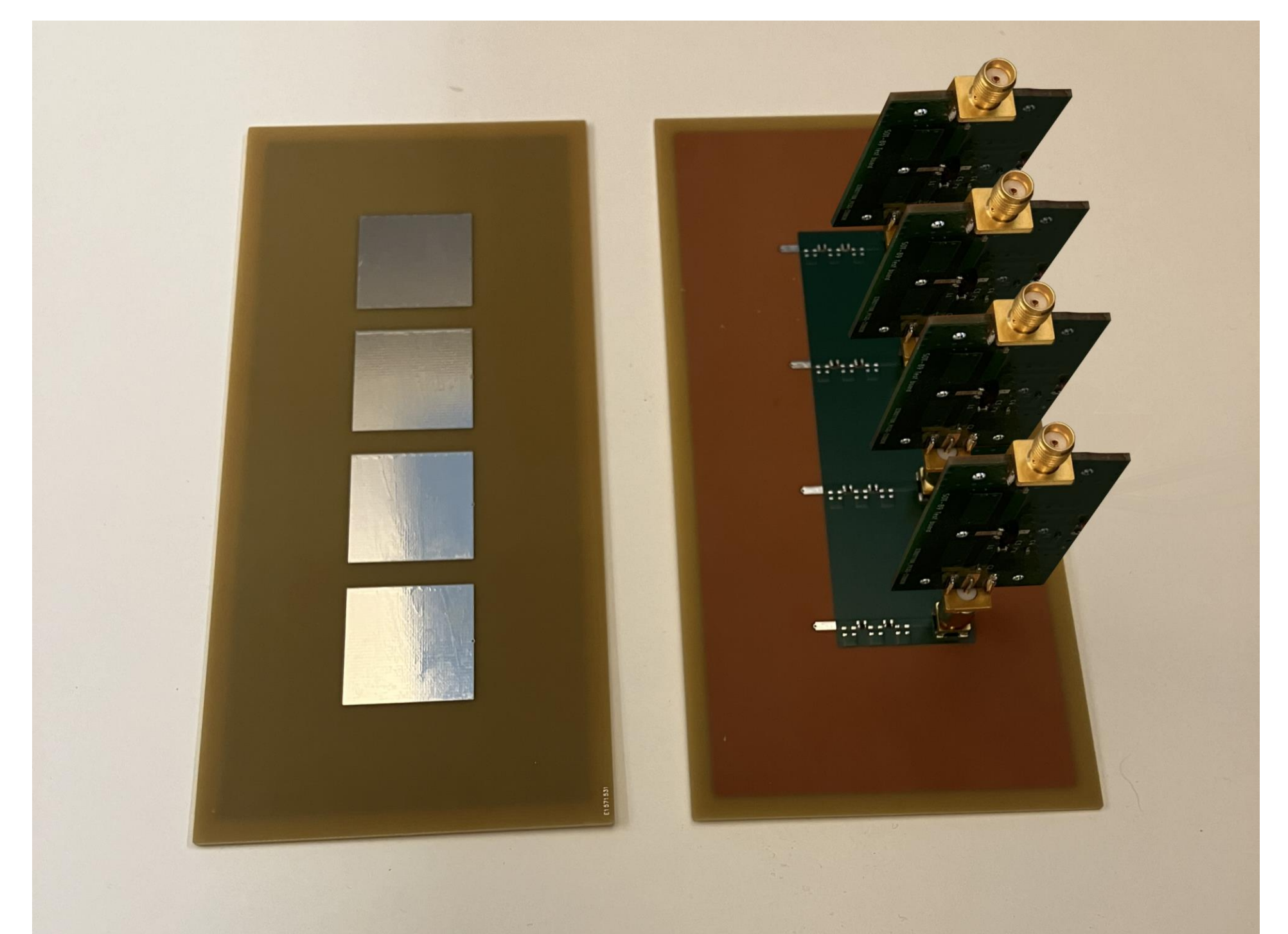


Illustration of the prototype to be measured