



## Planar reflector configurations for beam steering in high power microwave applications

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Beam steering is a required feature in outdoor High-Power Microwave (HPM) applications where the device under test (DUT) is moved during the evaluation, especially if the source have limited maneuverability. In traditional applications, the system's radiation pattern can be changed by mechanically rotating or reorientating the antenna. Contrarily, in modern systems, phased array systems change the relative phase between the array's individual elements to control the beam orientation. However, in HPM systems, both approaches remain challenging, as individual systems are bulky, and phase shifters require precise synchronization between the respective sources.

An alternative approach consists of using multi-reflector antennas, where a single source (for instance, a horn antenna) illuminates a steerable set of reflectors. The change in the relative orientation between the reflectors and the source permits a certain degree of beam steering. The main challenge consists, however, of maintaining the performance of the radiating pattern. Such design's efficiency is directly linked to the fast re-orientation of the electromagnetic beam towards the DUT.

Different types of antennas have been proposed in the literature [1,2] to reach a maximum coverage with energy maximization at the DUT level. The reflectors' curvature plays a paramount role in the design, permitting a more focused radiation pattern. However, they offer higher aerodynamic resistance and are complex to manufacture.

On the other hand, planar reflectors are maneuverable and easy to manufacture but tend to reduce the radiator's overall gain and produce important side lobes. Interestingly, the Dragonian dual reflector is an intermediate solution in directivity, mechanical performance, and dimensions. It has been observed that it offers a high degree of freedom with full mechanical control in azimuth and elevation, allowing a quick re-direction of the beam while the primary source antenna can be kept in a static position.

A numerical electromagnetic assessment on the planar reflector and dual Dragonian configurations for beam steering in high power microwave applications is presented in this paper. The antenna setup uses a stationary high power microwave directive antenna illuminating a set of metallic reflectors mounted on a rotating system, allowing high-power microwave emission at long-range and making it an attractive solution for long-range beam steering applications. Electromagnetic simulations show tune the radiation to a desirable position in space by mechanically adjusting the position between the reflectors.

### References

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- [2] S. K. Sharma, S. R., and L. Shafai, *Handbook of Reflector Antennas and Feed Systems: Theory and Design of Reflectors*, Vol. 1, Artech House, Boston, 2013.