*URSI-B EMTS 2025, Bologna, 23–27 June*

# Anomalous refraction from infinite and finite all-dielectric binary metagratings

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Metagratings are an emerging and promising technology for manipulation of electromagnetic wavefronts with an almost-unit efficiency. Their design presents several advantages compared to traditional metasurfaces, which require a continuous and fast-varying gradient of surface impedance. Metagratings, in turn, are periodic arrays, obtained by embedding inclusions in a dielectric background. Furthermore, since their realization is fully dielectric, they provide low losses, and are good candidates for applications at millimeter waves, as well as in the optical frequency range.
Metagratings can be designed to achieve a steering of an incident beam with anomalous reflection or refraction. In the design approach, these anomalous phenomena are obtained on a unit cell, assuming a metagrating of infinite length. Among the possible approaches, the analysis through the semi-analytical volume-integral-equation approach has been proposed, which allows a rigorous calculation of the scattered field by the metagrating, under illumination by a plane-wave source [1]-[2]. Based on the results from the semi-analytical volume-integral-equation-approach, this work proposes a study to check the properties of finite-length metagratings [3]. In practical applications, indeed, the infinite layout must be truncated to a finite number of cells, while still providing a very good beam steering.
The analysis on finite-length metagratings is performed with a full-wave numerical solver, for the particular case of anomalous refraction. The results are developed for simple binary metagratings, presenting both low and high dielectric contrast between the inclusions and the background.

## References

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