

**IEEE AWPL Special Cluster 2025 on  
“Terahertz Antennas for 6G and Beyond: Innovative Design, Manufacturing, and Advanced Applications”**

From 3G, 4G to 5G communications, the working frequency band of the antennas has gradually increased from microwave to millimeter-wave and is expected to reach terahertz (THz) in the future 6G and beyond for more channel capacities. While the research and product manufacturing process of millimeter-wave antennas serving 5G communications is becoming more and more mature, the research of THz antennas used in the future 6G and beyond is progressing slowly. The design, fabrication and measurement of THz antennas face significant challenges. Traditional manufacturing technologies used in the lower microwave and millimeter-wave bands, such as printed circuit board (PCB) technology and metal milling technology, cannot be applied to micron-sized THz antennas. Instead, the emerging micro-nano manufacturing technologies, including 3D printing, semiconductor lithography, micro-nano imprint and deep silicon etching technologies, will be used for THz antennas. In addition, the dielectric loss of substrates and ohmic loss of the metallic materials become severe in the THz band. The research and development of new materials with low-loss characteristics and the corresponding micro-nano manufacturing process are the keys to promoting the development of THz antennas.

This special cluster will mainly focus on the research of the THz antennas in the range of 0.1 to 10 THz. They are able to achieve terabit-per-second (Tb/s) data rate and ultra-broad bandwidth for future 6G communications and beyond. Its focus will break down the barriers between THz antenna designs and device manufacturing technologies. This special cluster will also promote a wide range of exchanges between global scholars and experts in the areas of THz technologies, paving a pathway for the development of THz antennas. The potential topics include but are not limited to the following:

- Silicon-based THz antennas;
- 3D printed THz antennas;
- THz metasurfaces and metamaterials;
- THz on-chip antennas;
- THz beam-scanning antennas;
- THz horn, reflector, lens, and photoconductive antennas;
- THz reconfigurable antennas based on tunable materials, such as liquid crystal, VO<sub>2</sub>, graphene, and MEMS;
- THz passive and active phased arrays;
- Machine-learning method for THz antennas;

The Guest Editors of this Special Cluster are:

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Prospective authors are encouraged to contact the Guest Editors for any questions or to determine the suitability of their contribution for this special cluster. Papers should be prepared following the same submission instructions as for regular IEEE AWPL manuscripts (four-pages technical content maximum and one reference page, double-column, IEEE format), available via the [Information for Authors website](#). The authors should indicate in the cover letter to the Editor-in-Chief that the manuscript is being submitted in response to the Call for Papers for the focused cluster. Prospective authors should refer to the timeline below for key dates.

**Key dates:**

- Submission deadline: **March 31, 2025**
- First decision: May 15, 2025
- Revised manuscripts deadline: June 15, 2025
- Final decision: July 30, 2025
- Final manuscripts due by: September 1, 2025
- Online publication: Shortly after final manuscript submission
- Cluster publication: November (or December) 2025 issue of AWPL