IEEE AWPL Special Cluster 2027 on

"Emerging Multibeam Antenna and Beamforming Technologies for 6G Communications and Sensing"

Multibeam beamforming antenna technologies are emerging as a key enabler for next-generation wireless communications and sensing systems supporting simultaneous and adaptive spatial coverage for high-capacity cellular networks, satellite and non-terrestrial networks (NTNs), UAV-enabled connectivity, and integrated sensing and communication (ISAC), among others. By generating and independently controlling multiple beams, these technologies provide new opportunities for efficient exploitation of spatial and spectral resources, enabling unprecedented flexibility in coverage and connectivity. As wireless systems advance towards increasingly complex and diverse deployment scenarios, breakthrough multibeam solutions are urgently required to overcome critical challenges in beam control, bandwidth, interference mitigation, hardware efficiency, system integration, and reliable operation in dynamic environments.

This special cluster aims to highlight recent breakthroughs and emerging developments in multibeam antennas, array architectures, and beamforming technologies for 6G wireless communications and sensing. It will provide a timely forum for presenting pioneering concepts, practical antenna and array designs, advanced synthesis and optimisation methods, enabling technologies, and experimental demonstrations. By bringing together theoretical and applied research, the cluster seeks to stimulate new ideas, foster collaboration, and accelerate progress towards more capable and efficient communication and sensing systems. Original contributions addressing, but not limited to, the following topics are especially welcome:

- Multibeam antenna design and optimization
- Phased array multiple beamforming technologies
- Analogue, digital, and hybrid multibeam beamforming networks
- Multibeam synthesis for multi-user communications and multi-target sensing
- Multibeam technologies for ISAC
- Reconfigurable, programmable, and wideband multibeam antennas
- Metasurface, reflectarray, and transmitarray multibeam systems
- Millimetre-wave and terahertz multibeam technologies
- AI-assisted multibeam synthesis, optimisation, and control
- Multibeam measurement, calibration, prototyping, and experimental validation

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 this special cluster. Prospective authors should refer to the timeline below for key dates.

Key Dates:

- Submission deadline: **March 31, 2027**
- First decision: May 15, 2027
- Revised manuscripts deadline: June 15, 2027
- Final decision: July 30, 2027
- Final manuscripts due by: September 1, 2027
- Online publication: Shortly after final manuscript submission
- Cluster publication: November 2027 issue of AWPL