3D-printing for high-frequency topologies: advances and challenges
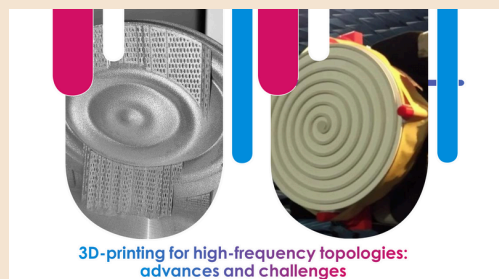

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Abstract

The focus will be on the latest advancements, practical applications, and emerging challenges associated with 3D-printed topologies in high-frequency contexts. The scope is to cover different technologies, using dielectric and metallic materials, starting from the more "low-cost" FFF techniques, engineered resin materials (commercial and developed), towards more complex technologies such as SLM/LPBF and DED. The motivation is to discuss what is the actual state of the art of those different 3D-printing technologies on the antenna/microwave domain, and assess the challenges for the technologies in terms of frequency, losses, resolution and future applications.

Workshop outline

The workshop will have a format of 5 key presentations targeting different applications and technologies of 3D-printing. Each speaker have the expertise of using different 3D-printing technologies for antennas and microwave applications, in which they will expose their results and challenges encountered by using that specific technology.
At the end of each presentation it will be time for short discussion regarding the specific technology. At the end of the last presentation, it will be a panel discussion regarding the future and challenges of these technologies.

Speakers

Álvaro F. Vaquero (Member, IEEE) received his B.Sc., M.Sc., and Ph.D. in telecommunications engineering from Universidad de Oviedo (UO), where he currently is an Adjunct Associate Professor. His research focuses on analysis and optimization of spatially fed periodic structures (reflectarray, transmitarray, and metasurface) for shaping mm-Wave coverage, plane wave, and scanning applications using conventional and additive manufacturing processes. He has published 60 papers and holds one patent application. Recognized with the 2022 Outstanding Ph.D. Thesis Award at UO, he also won the 2021 National Award for Best Ph.D. Thesis in 5G Innovation and the IEEE APS Fellowship in 2023.

Jose Luis Masa-Campos (Madrid, Spain, 1974). Ph.D. in Telecommunication Engineering from the Universidad Politécnica de Madrid (UPM) in 2006. From 1999 he was engineer & director of the R&D department in RYMSA, designing antennas for mobile and satellite systems. In 2005 he founded the Group of RadioFrecuency, Circuits, Antennas and Systems (RFCAS) at Universidad Autonoma de Madrid (UAM) as Chief of the Antennas Section. Since 2023 he is Associate Professor at the Radiation Group of UPM. In 2016 he was Technical Chairman of the Spanish URSI 2016 Conference where since 2018 he is organizing a special session in additive manufacturing techniques applied to RF devices and antennas. His main current research interests are in design, manufacturing, measurement and applications of planar array antennas.

Francisco Pizarro, IEEE Senior Member, Associate Professor at the School of Electrical Engineering, Pontificia Universidad Católica de Valparaíso (PUCV), Chile. He received his Electronic Engineering degree from PUCV Chile (2010), a M.Sc. in Communication Engineering from the Politecnico di Torino, Italy (2010), and Ph.D. in Electromagnetics and High-Frequency Systems, Plasma Engineering from the Institut Supérieur de l'Aéronautique et de l'Espace, Toulouse, France (2014). His interests include 3D-printed antennas, metamaterials, and plasma/microwave interaction. He has served as Principal Investigator on public and industry-funded projects on the topic of 3D-printed high-frequency topologies, including projects supported by the Office of Naval Research Global.

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Omar Orgeira received the B.Sc. degree in telecommunications engineering from the University of Oviedo, Spain, in 2019, and the M.Sc. degree in electromagnetics, fusion, and space engineering from the KTH Royal Institute of Technology, Stockholm, Sweden, in 2022. From 2018 to 2020, he joined the ArcelorMittal Global R&D New Frontier Research Center, Asturias, Spain, where he worked as a Research Engineer in the Additive Manufacturing Department. From 2022 to 2024 he worked as an antenna engineer at Fraunhofer FHR. In 2024 he joined Northern Waves as CTO.

Romain Pascaud (Member, IEEE) received the engineer and Ph.D. degrees from the Institut National des Sciences Appliquées, Rennes, France, in 2004 and 2007, respectively. Since 2008, he has been an Associate Professor with the Institut Supérieur de l'Aéronautique et de l'Espace, Toulouse, France. His current research interests include plasma based microwave antennas and circuits, and 3D-printed antennas.