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# IEEE AP-S DISTINGUISHED LECTURE DAY

# ANTENNA, ARRAYS & ANTENNA CALIBRATION


**Prof. Dr. Levent SEVGİ**

Atlas University – Istanbul / TÜRKİYE

**IEEE AP-S Distinguished Lecturer (2020-2023)**


**Organized by:**

**IEEE Spain Section, Joint AP/MTT and AP Chapters**

IEEE SECCIÓN ESPAÑA

**POLYTECHNIC UNIVERSITY OF CARTAGENA**

Dept of Information & Comm

October 26, 2023

Salón de Grados de la ETSIT

11:30 – 13:00h

Universidad Politécnica de Cartagena

etsit escuela técnica superior de ingeniería de telecomunicación

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# ANTENNAS, ARRAYS & CALIBRATION:
## BEAM FORMING AND BEAM STEERING

## Abstract

The antenna is an electromagnetic (EM) radiator that emits radio frequency power. In other words, it is a transducer that converts voltage [V] to the electric field [V/m] (or vice versa). This IEEE AP-S DL talk will focus on electromagnetic radiators, antennas, antenna arrays and calibration. First, antenna as a transducer will be discussed and its circuit and electromagnetic models will be reviewed. Fundamental antenna terms and concepts will be summarized. Then, differences between communication and EMC antennas will be given. Finally, antenna calibration will be explained. In the second part, formation of antenna arrays will be presented and their beam forming and beam steering capabilities will be shown via a simple, MATLAB-based ARRAY virtual tool. Any 2D array (i.e., linear, planar, circular, etc.) may be designed by the user and its 2D and 3D radiation characteristics can be investigated using this tool. Beam forming capabilities for different locations, number of radiators, as well as for operating frequencies can be visualized. The package may be used as an educational tool in many undergraduate antenna lectures. It may also be used to validate and verify the finite-difference time-domain (FDTD) and method of moments (MoM) packages in public domain or, for example, the ones supplied in [3]. Moreover, the user may improve package and add novel features by using the supplied source codes.

## References

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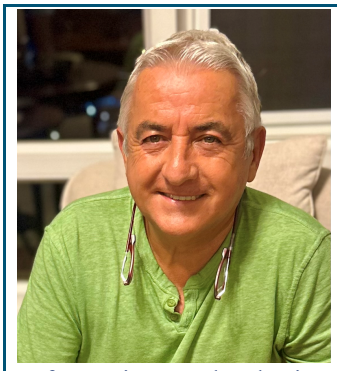

**Prof. Dr. Levent Sevgi** is a Fellow of the IEEE (since 2009) and the recipient of IEEE APS Chen-To Tai Distinguished Educator Award (2021). He received his B. Eng., M. Eng., and PhD degrees in Electronic Engineering from Istanbul Technical University (ITU) in 1982, 1984 and 1990, respectively. In 1987, while working on his PhD, he was awarded a fellowship that allowed him to work with Prof. L. B. Felsen at Weber Research Institute / New York Polytechnic University York for two years. His work at the Polytechnic concerned the propagation phenomena in non-homogeneous open and closed waveguides.

He was with Istanbul Technical University (1991–1998), TUBITAK-MRC, Information Technologies Research Institute (1999–2000), Weber Research Institute / NY Polytechnic University (1988–1990), Scientific Research Group of Raytheon Systems Canada (1998 – 1999), Center for Defense Studies, ITUV-SAM (1993 –1998 and 2000–2002) and with University of Massachusetts, Lowell (UML) MA/USA as a full-time faculty (2012 – 2013), with DOGUS University (2001-2014) and with Istanbul OKAN University (2014 - 2021). He has been with Istanbul ATLAS University since Sep 2022.

He has been an IEEE AP-S Distinguished Lecturer for the term 2020-2023. He served one-term in the IEEE AP-S AdCom (2013-2015) and one-term and as a member of IEEE AP-S Field Award Committee (2018-2019). He had been the writer/editor of the "Testing ourselves" Column in the IEEE AP Magazine (2007-2021), a member of the IEEE AP-S Education Committee (2006-2021), He slso served in several editorial boards (EB) of other prestigious journals / magazines, such as the IEEE AP Magazine (2007-2021), Wiley's International Journal of RFMiCAE (2002-2018), and the IEEE Access (2017-2019 and 2020 - 2022). He is the founding chair of the EMC TURKIYE International Conferences (www.emcturkiye.org).

He has been involved with complex electromagnetic problems and complex communication and radar systems for nearly three decades. His research study has focused on propagation in complex environments; electromagnetic scattering and diffraction; RCS prediction and reduction; EMC/EMI modelling, simulation, tests and measurements; multi-sensor integrated wide area surveillance systems; surface wave HF radars; analytical and numerical methods in electromagnetics; FDTD, TLM, FEM, SSPE, and MoM techniques and their applications; bio-electromagnetics. He is also interested in novel approaches in engineering education, teaching electromagnetics via virtual tools. He also teaches popular science lectures such as Science, Technology and Society.

He has given dozens of seminars, invited/keynote talks, organized/presented several tutorials, training sessions and short courses from half-day to three-days in universities/institutes all around the World. He has published more than a dozen special issues / sections in many journals as a guest editor and/or a co-guest editor.

He has published many books / book chapters in English and Turkish, over 180 journal/magazine papers / tutorials and attended more than 100 international conferences / symposiums. His three books *Complex Electromagnetic Problems and Numerical Simulation Approaches*, *Electromagnetic Modeling and Simulation* and *Radiowave Propagation and Parabolic Equation Modeling* were published by the IEEE Press - WILEY in 2003, 2014, and 2017, respectively. His fourth and fifth books, *A Practical Guide to EMC Engineering* (Sep 2017) and *Diffraction Modeling and Simulation with MATLAB* (Feb 2021) were published by ARTECH HOUSE.

His ***h-index*** is **37**, with a record of more than 4950 citations (source: *Google Scholar*, Apr 2023).