



## Viterbi Faculty Directory

Andreas Molisch



Solomon Golomb - Andrew and Erna Viterbi Chair, and Professor of Electrical and Computer Engineering

**Education**

- 1999, Doctoral Degree, Mobile Communications, Tech. University of Vienna (Wien)

- Doctoral Degree, Electrical Engineering, Tech. University of Vienna (Wien)
- Master's Degree, Electrical Engineering, Tech. University of Vienna (Wien)
- , Other Communication, Tech. University of Vienna (Wien)

## Biography

Andy Molisch received his degrees (Dipl.Ing. 1990, PhD 1994, Habilitation 1999) from the Technical University Vienna, Austria. He spent the next 10 years in industry, most recently as Chief Wireless Standards Architect at Mitsubishi Electric Research Labs. In 2009 he joined the University of Southern California (USC) in Los Angeles, CA, as Professor, and founded WiDeS. In 2017, he was appointed to the Solomon Golomb – Andrew and Erna Viterbi Chair.

His research interests revolve around wireless propagation channels, wireless systems design, and their interaction. He is particularly interested in wireless channel measurement and modeling for 5G and beyond 5G systems, wireless video distribution, hybrid beamforming, UWB/TOA based localization, caching at the wireless edge, and novel modulation/multiple access methods. Overall, he has published 4 books (among them the textbook "Wireless Communications", currently in its second edition), 20 book chapters, 250 journal papers, and 350 conference papers. He is also the inventor of 60 granted (and more than 20 pending) patents, and co-author of some 70 standards contributions. He retains a strong interest in bridging academic research and practical applications, real-world standards and products.

Dr. Molisch has been an Editor of a number of journals and special issues, General Chair, Technical Program Committee Chair, or Symposium Chair of multiple international conferences, as well as Chairman of various international standardization groups. He is a Fellow of the National Academy of Inventors, Fellow of the AAAS, Fellow of the IEEE, Fellow of the IET, an IEEE Distinguished Lecturer, and a member of the Austrian Academy of Sciences. He has received numerous awards, among them the IET Achievement Medal for Wireless Communications, the Technical Achievement Awards of both the IEEE Vehicular Technology Society (Evans Avant-Garde Award) and the IEEE Communications Society (Edwin Howard Armstrong Award), as well as the Technical Field Award of the IEEE for Communications, the Eric Sumner Award.

## Research Summary

Dr. Molisch's current research interests concentrate on the following areas:

**WIRELESS PROPAGATION:** As new wireless technologies are introduced, it is vital to understand and model the properties of the wireless propagation channel that are relevant for those channels. The well-known conventional channel models (Rayleigh fading, Hata pathloss model) are therefore not sufficient for designing and analyzing modern broadband systems. Dr. Molisch is interested in measurement and fundamental modeling techniques for propagation channels for wireless broadband systems – from massive MIMO channels, to vehicle-to-vehicle propagation, ultrawideband channels, to mm-wave and THz channels. Hallmark of his work in the area is a holistic approach that pays equal attention to conducting measurement campaigns (including construction of required equipment), advanced signal processing for evaluating the measurement results, and innovative channel modeling.

**ULTRAWIDEBAND COMMUNICATIONS AND LOCALIZATION:** UWB transmission is a physical-layer communication technique that has received enormous interest that is of great importance for both high-speed wireless communications and precision localization. Emphasis is on simplified transceiver structures, and localization techniques based on time of arrival, including multi-target identification, single-anchor localization, and NLOS identification.

**MULTIPLE ANTENNA TECHNIQUES:** Multiple-antenna (MIMO) systems are the best and most efficient way to providing the high data rates and high spectral efficiencies that are required for next-generation cellular systems and wireless internet. Dr. Molisch's research concentrates on

- (i) reducing costs through hybrid beamforming, a technique he invented in 2003, and which is now widely used especially for massive MIMO.
- (ii) improving spectral efficiency and robustness through cooperation between base stations.

**NOVEL MODULATION/MULTIPLE ACCESS METHODS:** While MIMO/OFDM/OFDMA has become the standard modulation/multiple access method for modern wireless systems, and they are optimum under certain conditions, there are situations in which alternatives are preferable. Dr. Molisch investigates novel approaches ranging from novel multi-carrier schemes to multiplexing via Orbital Angular Momenta.

**WIRELESS VIDEO DISTRIBUTION:** the emergence of wireless video services puts an extra strain on cellular networks. A highly promising method for increasing capacity is caching of popular video files either in dedicated helper nodes ("femtocaching") that replace backhaul with storage, and/or caching in the mobile devices themselves, and exchanging them via device-to-device communication when requested. Aspects ranging from physical-layer device-to-device communications to application-layer video considerations are being investigated.

## Awards

- 2018 IEEE Communications Society Edwin H Armstrong Achievement Award
- 2017 IEEE Communications Society IEEE Distinguished Lecturer (Communications Society)
- 2017 IET Achievement Medal for contributions to wireless communications
- 2015 Fellow of the National Academy of Inventors
- 2015 USC Viterbi Viterbi Award for Use-Inspired Research
- 2015 IEEE Neal Shepherd Memorial Award of the IEEE Vehicular Technology Society
- 2015 IEEE IEEE Distinguished Lecturer (Vehicular Technology Society)
- 2013 Hungarian Scientific Association for Infocomm (HTE) Puskas Tivadar Award
- 2013 AAAS (American Association for the Advancement of Science) Fellow of the AAAS
- 2012 IEEE Eric Sumner Award
- 2011 Radio Communications Committee of the IEEE Communications Society Distinguished Service Award
- 2011 IEEE Donald G. Fink Prize Paper Award
- 2011 Austrian Academy of Sciences Member of the Austrian Academy of Sciences
- 2010 Okawa Foundation 2010 Okawa Research Grant
- 2010 IEEE Vehicular Technology Society James R. Evans Avant-garde Award
- 2010 Beihang University Honorary Guest Professor
- 2009 IEEE Communications Society Best paper award, IEEE Globecom 2009
- 2009 Global Wireless Education Consortium Wireless Educator of the Year Award
- 2008 IET (Institute of Engineering and Technology) Fellow of the IET
- 2007 Mitsubishi Electric Hatsuhon-Award
- 2006 IEEE Vehicular Technology Society Neal Shepherd Memorial Award
- 2005 IEEE Fellow of the IEEE
- 2001 Swedish Strategic Research Foundation INGVAR award
- 1999 Kardinal-Innitzer foundation Kardinal-Innitzer-Award
- 1991 Austrian Society of Electrical Engineering GIT award

## Appointments

- Ming Hsieh Department of Electrical and Computer Engineering - Systems

## Office

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Contact Information

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Links

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