

Joachim Oberhammer (KTH): THz MEMS -
Micromachining enabling new solutions at millimeter and submillimeter frequencies

Abstract: When RF MEMS switches appeared more than 20 years ago, micromechanics has attracted huge attention for enabling near-ideal microwave devices. Since then, MEMS switches and MEMS-switch based circuits went through different development stages and are currently proving themselves commercially, among others for mobile-phone antenna tuners. But micromachining can do much more than "just" MEMS switches for planar transmission-line technology. Three-dimensional micromachining allows also for new microwave devices with unprecedented performance, and has the potential to become an enabling technology for volume-manufacturable sub-THz systems. This talk gives an overview of 3D silicon micromachining capability and examples of innovative microwave devices enabled by this technique and developed at KTH, including W-band phase shifters, tuneable capacitors and couplers, and near-ideal V-band waveguide switches based on MEMS-tuneable surfaces. Then, the state of the art of micromachined waveguide systems up to 2.9 THz is given, including a 1 THz filter and a 340 GHz 8-pixel imaging radar developed at JPL. Finally, the potential of MEMS-tuneable micromachined-waveguide systems is outlined, given the examples of recent work at KTH on THz MEMS devices operating at 500-750 GHz, including a 3.3 bit MEMS phase shifter and a waveguide switch.

Bio: Joachim Oberhammer, born in Italy in 1976; M.Sc. EE from Graz University of Technology, Austria, in 2000; Ph.D. from KTH Royal Institute of Technology in Stockholm, Sweden, in 2004. Post-doctoral research fellow at Nanyang Technological University, Singapore, in 2004, and at Kyoto University, Japan, in 2008. Since 2005 leading radio-frequency/microwave/terahertz micro-electromechanical systems research at KTH; Associate Professor at KTH in 2010; Professor in Microwave and THz Microsystems at KTH since 2015. Guest researcher at Nanyang Technological University, Singapore, in 2007; guest researcher at NASA-Jet Propulsion Laboratory, USA, in 2014.

He is author and co-author of more than 100 reviewed research papers and holds 4 patents. In 2004, 2007, and 2008 he got an award by the Ericsson Research Foundation, a grant by the Swedish Innovation Bridge, and a scholarship by the Japanese Society for the Promotion of Science, respectively. The research work he is heading received six Best Paper Awards (five of which at IEEE conferences), and four IEEE Graduate Fellowship Awards (by MTT-S and by AP-S) since 2009. He served as TPRC member of IEEE Transducers 2009 and 2015, IEEE International Microwave Symposiums 2010-2016, IEEE Micro Electro Mechanical Systems 2011 and 2012, and IEEE Radio and Wireless Week 2015 and 2016. Dr Oberhammer is Steering Group member of the IEEE MTT-S and AP-S Chapters Sweden since 2009. In 2013, he received an ERC Consolidator Grant by the European Research Council. Since 2014 he is Steering Group Member of the Young Academy of Sweden.

