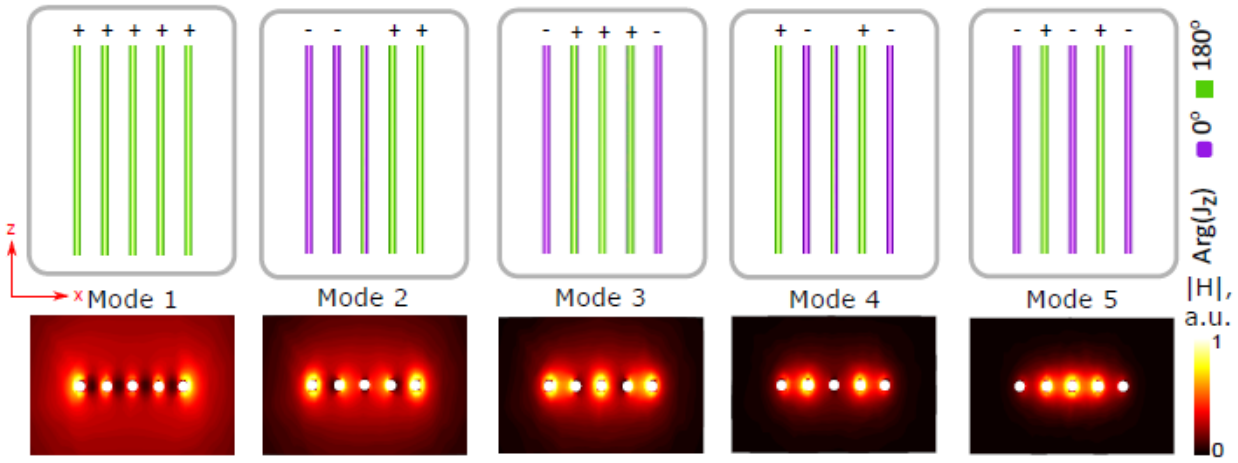
Dipole antenna arrays for and ultra-high-field MRI



Phased antenna arrays of dipole elements are widely used in ultra-high field (UHF) magnetic resonance imaging (MRI) for creating the controllable radio-frequency (RF) magnetic field distributions in a human body. Due to safety and imaging quality reasons each individual channel of the array should be decoupled – electromagnetically isolated from the others. The required number of channels is large and in some techniques the dipole antennas should be located in the close proximity of the human body. Their ultimately dense arrangement leads to a very strong mutual coupling and makes the conventional decoupling structures inefficient. This coupling needs to be suppressed without a significant distortion of RF fields in the imaged area of the human body. In our group, we have proposed and (with our Russian and French colleagues) studied a novel decoupling technique for UHF transceiver on-body dipole antennas. The decoupling is performed by a metasurface raised over the dipole antennas. This metasurface operates as a high-quality resonator strongly coupled to the antennas and weakly coupled to the body.

Bio

Constantin R. Simovski has worked in both industry and academy in several countries. He defended his PhD thesis in 1986 in the Polytechnic University of Leningrad (USSR) and the Habilitation thesis in 2000 in the same university. In 2001 he became a full professor of the ITMO University, St. Petersburg, Russia. Since 2008, he has been with Helsinki University of Technology, now – Aalto University (full professor since 2012). Current research areas: metamaterials for optical sensing and energy harvesting, thin-film solar cells, radiative heat transfer in nanostructures, homogenization and electromagnetic characterization of metamaterials and metasurfaces.