Biography of Per-Simon Kildal

Per-Simon Kildal grew up and got his PhD in Norway, and he has been a Professor at Chalmers University of Technology, Gothenburg, Sweden since 1989. Kildal is Fellow of IEEE since 1995, and he has received two IEEE best journal article awards. His textbook "Foundations of Antennas" has been well received.

Kildal has designed and analyzed two very large antennas using his own methods and computer codes: The EISCAT VHF parabolic cylinder, and the Gregorian dual-reflector feed of the Arecibo radiotelescope operated by Cornell University. He has three inventions related to antenna feeds: the hat feed (www.comhat.se), the dipole-disk feed with beam-forming ring, and the recent decade bandwidth "Eleven antenna" being a candidate for future wideband radio telescopes.

The last ten years Kildal's research group has pioneered the development of the reverberation chamber into an accurate tool for OTA measurements of antennas and wireless terminals subject to Rayleigh fading (www.bluetest.se).

Kildal is the originator of the concept of soft and hard surfaces in electromagnetics through which he and his coworkers preceded some of the recent research on electromagnetic bandgap surfaces and metamaterials. Recently this research resulted in a new local so-called ridge gap waveguide appearing in the gap between parallel metal plates, useful for applications above 30 GHz.

"OTA measurements of wireless stations in reverberation chamber (RC) versus anechoic chamber (AC): from accuracy models to testing of MIMO systems."

ABSTRACT: The presentation will explain the fundamental differences between the propagation environments emulated by the AC and the RC. The AC emulates free space, representative for antennas mounted on rooftops or masts with Line-Of-Sight (LOS), whereas the RC emulates a rich isotropic multipath environment with Rayleigh fading, representative for mobile wireless stations in urban and indoor environments with Non-Line-Of-Sight (NLOS). The paper will go through the fundamental differences of these two types of measurement chambers, in order to conclude that the RCs means the same to antennas in multipath environments as the ACs do to antennas in free-space-like environments. They enable an objective and repeatable antenna characterization. Thereby, the RC and AC complement each other. They are both needed.

In particular, it will be explained how the RC can be used to quantitatively determine performance of terminals and systems with antenna diversity and MIMO (Multiple Input Multiple Output) capability. The main parameter that can be uniquely determined in an AC is the realized antenna gain, and in a RC it is the total radiation efficiency. For diversity and MIMO systems the radiation efficiency becomes the classical embedded efficiencies of the array elements. Embedded element efficiencies represent an advanced theoretical concept for traditional phased arrays, hardly used and known to normal array antenna designers, where as they are the determining performance measure for diversity and MIMO arrays.

Per-Simon Kildal

Chalmers University of technology,
41296 Gothenburg, SWEDEN
per-simon.kildal@chalmers.se