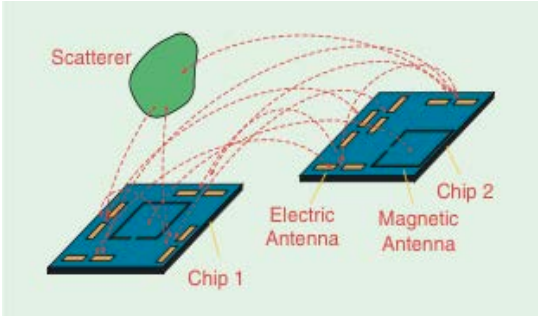
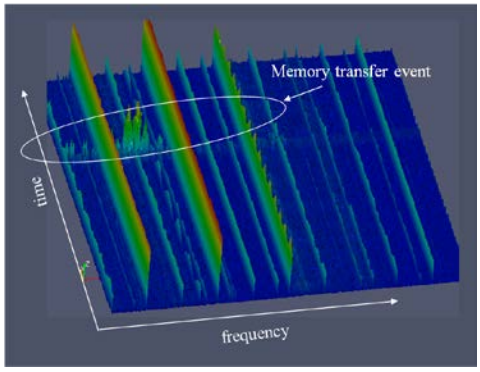
Noisy Electromagnetic Fields - A Technological Platform for Chip-to-Chip Communication in the 21st Century - NEMF21

A Future Emerging Technology funded by the European Union - Horizon 2020



Electronic devices of the future will use wireless communication down to the chip level. An interdisciplinary, Nottingham-led, consortium of mathematicians, physicists and electrical engineers from the University of Nottingham, the University of Nice Sophia-Antipolis, the Technical University Munich, the Institut Supérieur de l'Aeronautique & de l'Espace, Toulouse, IMST GmbH, Germany, NXP Semi-conductors and CST AG, Germany, will provide the design tools for wireless Chip-to-Chip (C2C) communication, which will be essential for this future technology. The scientific challenges will be tackled with the help of substantial funding from Horizon 2020, amounting in total to 3.4 Mio Euros.

Wireless C2C communication and wireless links between printed circuit boards operating as Multiple-Input Multiple-Output devices will become dominant features of future generations of integrated circuits and chip architectures. This will help in overcoming the information bottleneck due to wired connections and will lead to a new era of chip architectures. The design of wireless C2C networks can, however, not be done with today's engineering software tools. New, efficient modelling strategies for describing and exploiting noisy electromagnetic fields in complex environments are necessary to take into account input signals of modern communication systems being modulated, coded, noisy and eventually disturbed by other signals and the environment and thus extremely complex. Device modelling and chip optimization procedures need to be based on the underlying physics, that is, the electromagnetic fields, including accurate noise models and complex interference pattern.



Recent advances in Nottingham both in mathematical physics (Drs Gregor Tanner and Stephen Creagh) and electrical engineering (Prof Dave Thomas) in handling complex – chaotic – wave fields will play an important part in addressing these challenges. Wireless C2C technology needs increasingly sophisticated physical models of wireless interconnects and associated signal-processing strategies provided by the partners. New insights into wave modelling in complex environments based on dynamical systems and random matrix theory are needed to envisage wireless communication on a chip level. Electromagnetic field shaping will enable efficient energy transfer between antennas in complex networks of chips subject to strong interference. This opens up new pathways for chip design, for carrier frequency ranges as well as for energy efficiency and miniaturisation.