

Metrology for RF exposure from Massive MIMO 5G base station: Impact on 5G network deployment (5GRFEX)

Overview

Current radiofrequency electromagnetic field (RF-EMF) exposure limits have become a critical concern for fourth generation (4G) and fifth generation (5G) mobile network deployment across Europe. Regulation is not harmonised and in certain countries and regions goes beyond the guidelines set out by the International Commission on Non-Ionizing Radiation Protection (ICNIRP). This project produce specific RF-EMF exposure measurement guidance for 5G massive multiple-input-multiple-output (mMIMO) base stations (BSs) which will be disseminated to technical, business and regulatory communities to support the development of effective regulation and enable 5G implementation that balances performance with public safety.



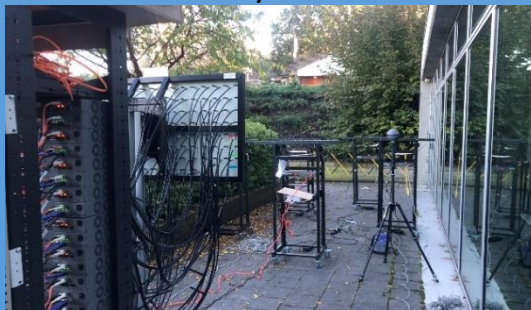
Traceable measurement testbed and environments:

- Surrey 128 mMIMO transmitter and 4-antenna-element receiver software defined radio systems
- Keysight Fieldfox spectrum analyser and AGOS probe
- Indoor/outdoor measurement campaigns

Indoor: Surrey mMIMO testbed



Outdoor: Surrey mMIMO testbed



Outdoor: 5G-VINNI BS

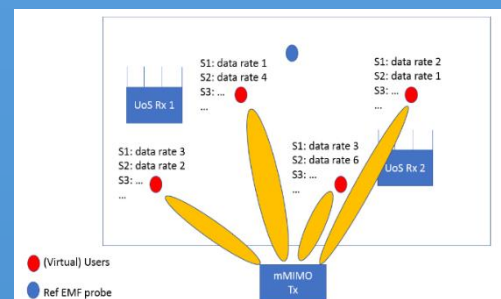
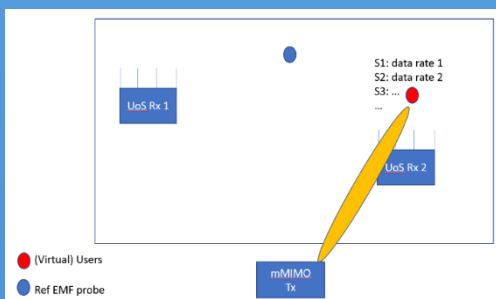


Measurement techniques:

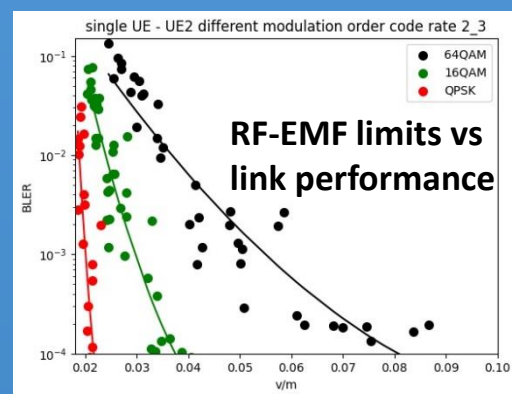
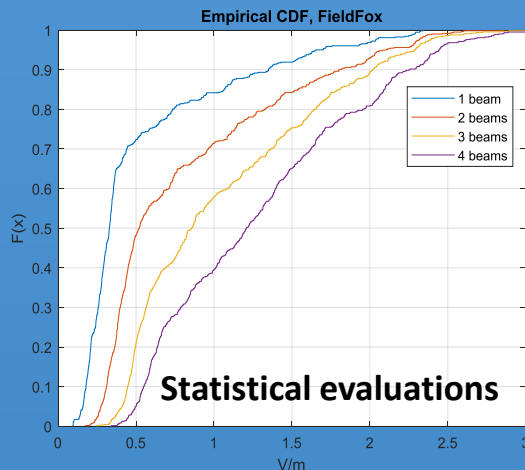
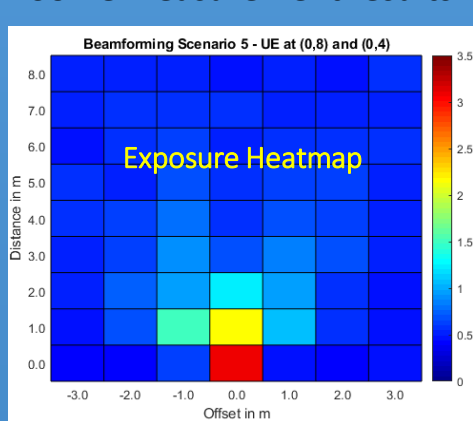
- Field strength
- Synchronization signal block (method proposed by IEC)

Varying factors:

- Number of active mMIMO antennas
- Number of active users
- Position of active users
- Data traffic pattern
- Modulation and coding scheme



Some measurement results:



Project website: <http://empir.npl.co.uk/5grfex/> and [EURAMET link](#)