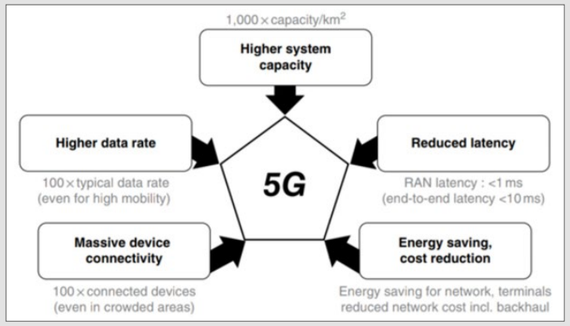
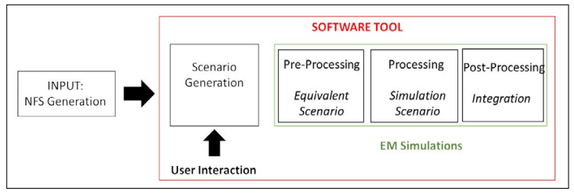
The transition to 5G involves the installation of new antennas (phased array antennas) on new sites or on existing ones.
The coverage and connectivity requirements of the 5G network and the need to share the same site (co-siting) by multiple operators implies the installation of an increasing number of antennas on the same infrastructure (pole/tower).
The reduced available space and the mechanical constraints can determine an increase in electromagnetic coupling (i.e. the reduction of isolation) among antennas with the consequent degradation of the performance of the overall system.
The aforementioned problem, as a matter of fact, determines the maximum number of antennas that can be installed on the same support and their separation distances. Therefore, the isolation assessment is a crucial task that affects the 5G wireless network deployment. Nowadays, this problem can be addressed by means of electromagnetic full-wave simulations or by measurements campaigns; both these approaches have drawbacks: the first, needs huge hardware resources due to the use of mm Waves; the second, needs a very long time due to the large number of the antennas beams directions to be tested.
The purpose of this project is to develop a novel electromagnetic method able to compute the isolation between multiple 5G antennas in order to minimize the use of full-wave simulations and measurement campaigns. The method will be implemented in a dedicated software tool to be used by RF engineers and antenna designers to analyze and to assess various antennas configurations before their installation in real environment.

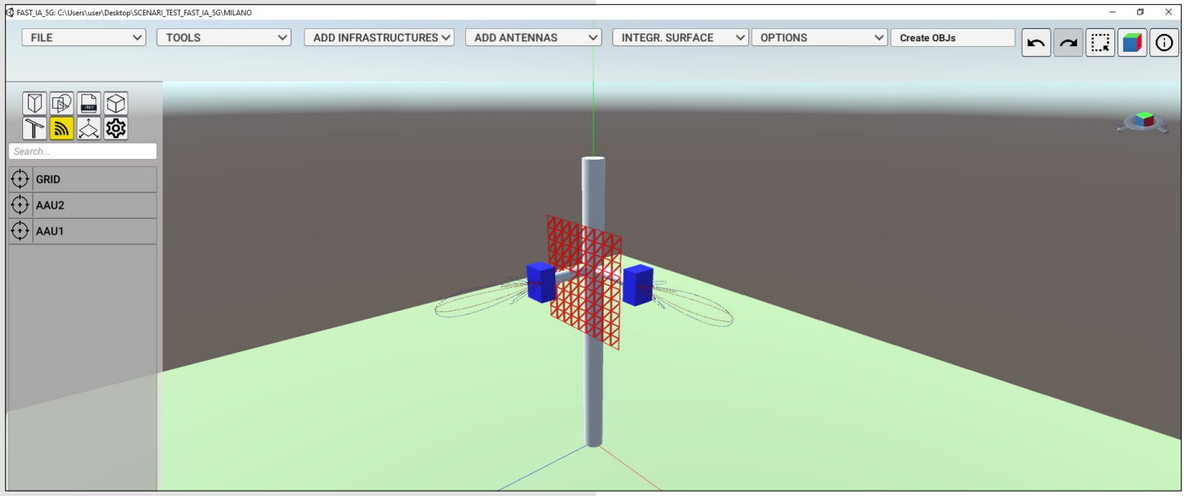
Technical Sheet
Funding institution:
Huawei Technologies Italia Srl
Project partners
University of Pisa, Netfarm srl
Project duration
June 2020 - June 2021
Involved countries
Italy



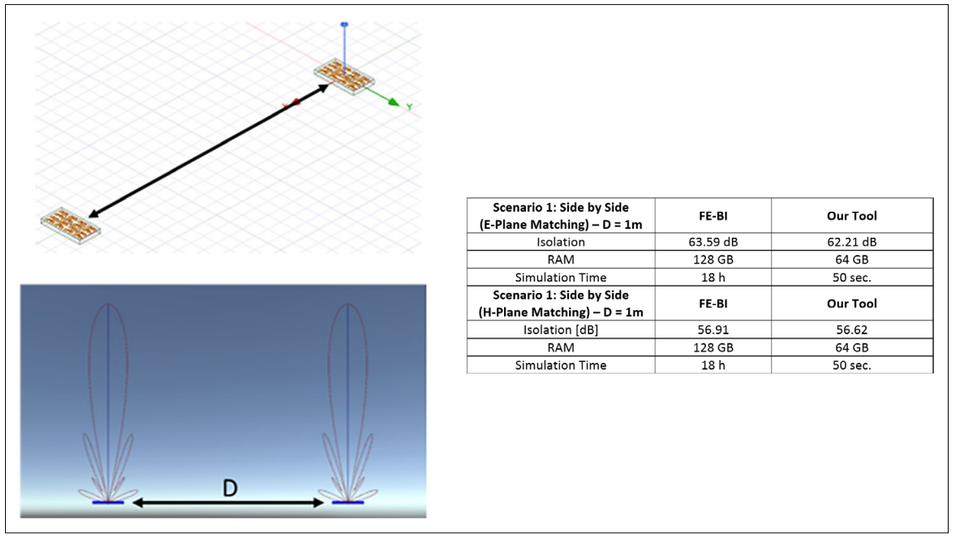
(a) Example of isolation between two horn antennas (26GHz) measured in the anechoic chamber and computed by means of the Tool Most relevant targets of the 5G mobile network;



(b) Application of the proposed computational method

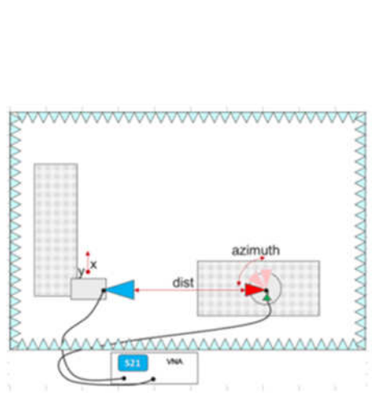


(c) Example of a scenario created by means of the Graphical User Interface of the software tool: two 5G antennas placed on the same pole



Scenario 1: Side by Side (E-Plane Matching) – D = 1m	FE-BI	Our Tool
Isolation	63.59 dB	62.21 dB
RAM	128 GB	64 GB
Simulation Time	18 h	50 sec.
Scenario 1: Side by Side (H-Plane Matching) – D = 1m	**FE-BI**	**Our Tool**
Isolation [dB]	56.91	56.62
RAM	128 GB	64 GB
Simulation Time	18 h	50 sec.

(d) Example of isolation between two array (X band) in side by side configuration computed by means of fullwave simulation and the Tool



Polarization Antenna Tx	Polarization Antenna Rx	Azimuth SGH2650 [deg]	Isolation (Measured) [dB]	Isolation (HFSS) [dB]	Isolation (Our Tool) [dB]	Error (Measure vs Our Tool) [dB]
H	H	0	-15.0	-15.1	-15.0	0.0
V	V	0	-14.7	--	-15.1	0.4

(e) Example of isolation between two horn antennas (26GHz) measured in the anechoic chamber and computed by means of the Tool