5G Non-Terrestrial Networks:  
Physical Layer Design and Assessment  
Research project plan  
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The activity is focused on the study, design, and assessment of physical layer techniques for the Non-Terrestrial Network Component of the 5G System.

The 3GPP standardization group has recently approved a number of study items related to the design and evaluation of a non-terrestrial network component to be fully integrated into the future 5G system architecture. In this framework, the proposed research activity shall address the design and assessment of physical layer techniques for the NTN component in the specific scenarios identified by the 3GPP standardization group and already described in 3GPP TR 38.821 “Solutions for NR to support non-terrestrial networks (NTN) ”.

The activity will focus on the design and adaptation of data detection, and parameter estimation and synchronization algorithms to the peculiarities of the SatCom channel and architecture.

The Research Fellowship activity will entail

- the definition of representative system scenarios;
- the analysis of the state of the art of 5G terrestrial and satellite air interface and architecture;
- the selection of promising techniques and approaches and the design of innovative and original ones;
- the assessment of the benefits by means of theoretical tools and numerical simulation in scenarios setups characterized by increasing complexity and adherence to the actual working conditions of future systems, e.g., from AWGN channels to highly non-linear mobile interference limited channels;
- the production of scientific contributions to conferences, journals, reports, and standardization bodies;
- the participation in collaborative research projects (meeting, teleconference, etc).

The activity will be carried out in the framework of funded international research projects currently ongoing for the Digicomm Research group of the Department of Electrical, Electronic, and Information Engineering (DEI) at the University of Bologna. The research environment is international and challenging. It is expected a strong interaction with several ongoing European Space Agency initiatives.

The candidates shall have a background on ICT engineering with a focus on Communications theory. C++ and Matlab programming skills are required.

The working language is English.