



# PhD in INGEGNERIA DELL'INFORMAZIONE / INFORMATION TECHNOLOGY - 39th cycle

## Research Area n. 4 - Telecommunications

### PNRR 117 Research Field: MODEL FOR INTERFERENCE AND FREQUENCY MANAGEMENT IN TERRESTRIAL AND NON-TERRESTRIAL RADIO SYSTEMS

#### Monthly net income of PhDscholarship (max 36 months)

**€ 1400.0**

In case of a change of the welfare rates during the three-year period, the amount could be modified.

#### Context of the research activity

##### Motivation and objectives of the research in this field

The main objective of the research is the development of a propagation channel for the base stations of 5G/6G systems, which allows the estimation of the interference towards satellite systems operating at the same frequencies. The model will work in a wide frequency range (at least 5-30 GHz) and will consider the effect of polarization, of reflectivity of the different materials (buildings and ground), and of the statistics of the height and distance of the buildings in the different cities. It will also have to consider the effect of diffuse scattering due to the roughness of the materials surface. The developed model will be used to estimate the aggregate interference, net of the system radiation pattern. Finally, the impact of atmospheric effects will be evaluated in the model.

##### Methods and techniques that will be developed and used to carry out the research

Monte Carlo statistical simulation of the propagation loss of the rays radiated by 5G/6G base stations.  
Mathematical programming models, simulation, algorithm development, etc.  
Support the interference estimation by simulating the radiated power in aggregated base stations.  
Validation of the proposed proposed model in different scenarios by using an independent tool (ray tracer).

##### Educational objectives

Become an expert on high-frequency propagation channel



	for 5G/6G systems Acquire a sensitivity on interference of the various model parameters Define radiation limits to avoid harmful interference between different systems.
<b>Job opportunities</b>	R&D positions in manufacturers of telecommunication technologies R&D positions in telco operators
<b>Composition of the research group</b>	1 Full Professors 2 Associated Professors 2 Assistant Professors 1 PhD Students
<b>Name of the research directors</b>	Carlo Giuseppe Riva

<b>Contacts</b>	
E-mail: Carlo.riva@polimi.it, Phone: +39-02-2399.3659, <a href="https://riva.faculty.polimi.it/">https://riva.faculty.polimi.it/</a>	

<b>Additional support - Financial aid per PhD student per year (gross amount)</b>	
<b>Housing - Foreign Students</b>	--
<b>Housing - Out-of-town residents (more than 80Km out of Milano)</b>	--

<b>Scholarship Increase for a period abroad</b>	
<b>Amount monthly</b>	700.0 €
<b>By number of months</b>	6

<b>National Operational Program for Research and Innovation</b>	
<b>Company where the candidate will attend the stage (name and brief description)</b>	Huawei Technologies Italia Srl
<b>By number of months at the company</b>	6
<b>Institution or company where the candidate will spend the period abroad (name and brief description)</b>	ESTEC / European Space Agency
<b>By number of months abroad</b>	6

<b>Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other information</b>
EDUCATIONAL ACTIVITIES (purchase of study books and material, including computers, funding for participation in courses, summer schools, workshops and conferences): financial aid per PhD student.



TEACHING ASSISTANTSHIP: (availability of funding in recognition of supporting teaching activities by the PhD student) There are various forms of financial aid for activities of support to the teaching practice. The PhD student is encouraged to take part in these activities, within the limits allowed by the regulations.

COMPUTER AVAILABILITY: individual use

DESK AVAILABILITY: individual use