15 Industrial PhD Student Positions on Non-Terrestrial Antenna Systems for 6G

Domain: Antennas, integrated circuits and signal processing

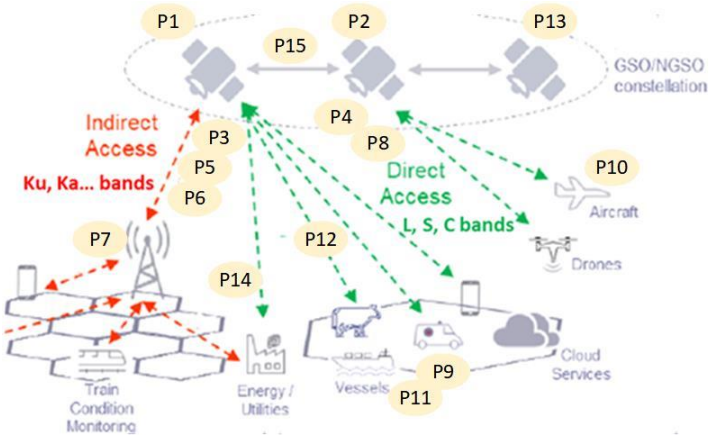
Are you looking for a high impact PhD position in close collaboration with industry?

The European Doctoral Network 'ANTERRA' offers 15 fully funded industrial PhD student positions in the area of antennas, integrated circuits and signal processing, starting in the autumn of 2022. ANTERRA is focussed on Antenna Systems for 6G Non-Terrestrial Networks. The consortium consists of 14 leading European R&D laboratories from universities, industries, and technology institutes in the domain of satellite communication and wireless infrastructure which are located in The Netherlands, France, Sweden, Italy and Belgium.

Research:

Our society is on the brink of a new age with the development of new visionary concepts such as internet of things, smart cities, autonomous driving, smart mobility, and coverage everywhere. This stimulates the use of new deployment concepts, such as extreme densification or Non-Terrestrial Networks (NTN), to support the wireless communication evolution. For 6G, a key use case which stands unaddressed by prior telecommunication generations, is that of **coverage everywhere.** One of the major reasons for not addressing this use case thus far is the **lack of expertise about non-terrestrial communication in the classical (terrestrial) telecommunication industry**. **The European research project** ANTERRA addresses this issue by **training 15 PhD students on antenna systems for NTN**, one of the key aspects to successfully implement coverage everywhere.

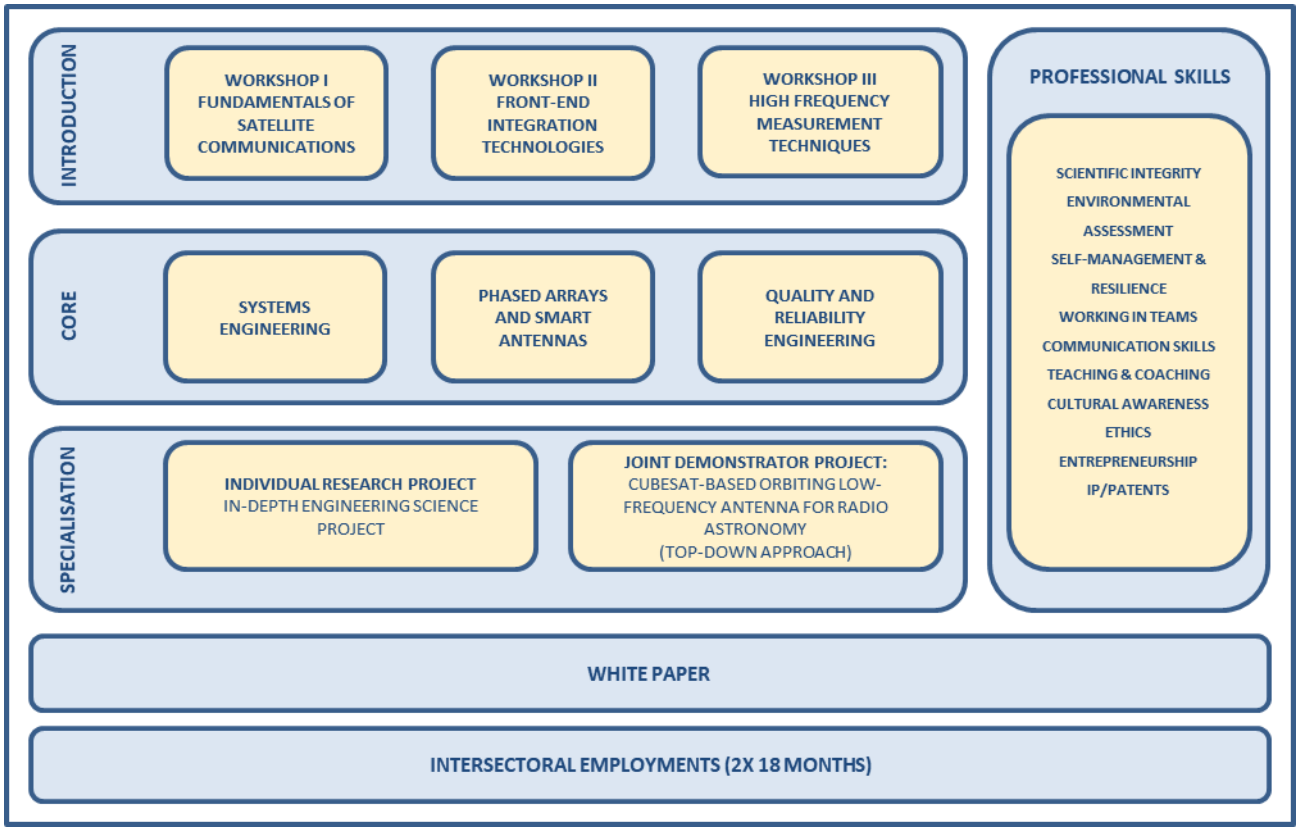
In ANTERRA, the research fellows will investigate particular aspects of the system concept shown in the figure below. For this, they will take a **system view** by investigating architectural needs and constraints from which they will develop novel multi-functional high-gain antenna architectures that exhibit a large coverage. Moreover, innovations in energy efficient highly integrated radio front-ends is a key enabler towards more efficient, high performance radio-access hardware for satellite nodes. Research in novel synchronization and beam-finding techniques will lead to stable integration of all network nodes into one global 6G NTN. All concepts will be optimized to meet the requirements of NTN antenna systems.



NTN system architecture. The individual research projects (P1 to P15) are shown in a system context.

Training programme:

ANTERRA will provide the PhD students with a comprehensive set of theoretical and practical skills relevant for innovation and long-term employability in a rapidly growing sector. This highly innovative training will cover several inter-disciplinary areas as shown in the figure below. Each PhD student will be enrolled in a doctoral programme and will have two official employers, one from academia and one from industry. Highly qualified personnel from both employers will jointly coach the PhD student.



Requirements:

Applicants should have, or expect to receive, a Master of Science degree or equivalent in a relevant electrical engineering or applied physics discipline and should not have more than four years of research experience. In addition to the formal Research Fellow qualifications, selection is also based on the performance of the candidates in other works (e.g. thesis and advanced level courses), as well as through interviews and assignments. Besides good subject knowledge, emphasis will be on creative thinking, motivation, ability to cooperate, initiative to work independently and personal suitability for research training. Previous experience in the area of antennas, electronics and signal processing as well as proficiency in using scientific and engineering software packages such as Matlab, ADS, etc. are advantageous. For the PhD positions the EU '*Mobility rules*' apply. This means that candidate students cannot have resided for more than 12 months during the period of 3 years immediately before the start of the PhD, in the prospective first host country (Example: a candidate who has stayed in The Netherlands for more than 12 months in the last 3 years cannot be hired for the position where the first placement is at the university in The Netherlands).

Applications for the position must be submitted via the application systems of the host organisations. The links are provided below.

Contact:

Further information can be obtained by using the contact addresses for the individual PhD projects (see table below).

Short description of the 3 PhD positions (mainly) hosted in Italy:

	Project	Host 1	Host 2	Secondment	Contact	Apply via
P8	**Advanced Manufacturing for high frequency feed systems:** Additive manufacturing (AM) of high-frequency feed-systems is an emerging technological solution in the NTN communication domain since it can lead to a higher level of antenna-subsystems miniaturization and integration. AM of feed systems exhibit some criticalities in terms of dimensional accuracy and repeatability, surface roughness, and electrical conductivity. These criticalities will be addressed in this project by both improving the manufacturing processes and designing smart antenna-subsystem layouts that are customized to AM. Other advanced machining technologies, including e.g. silicon and metal micromachining, will be considered as viable solutions, also addressing future millimeter-wave and subTHz satellite payloads.	(Italy)	(Italy)		Giuseppe Addamo: giuseppe.addamo@ieiit.cnr.it Davide Maiarelli: davide.maiarelli@thalesaleniaspace.com	
P10	**3D radiating elements integrated with RF/digital BFN on board:** Nowadays, several 3D array elements are being developed in the millimetre wave bands. The development of a wide angle impedance matching (WAIM) layer in front of the array shall be evaluated in order to assure good matching at any scanning angle. Hybrid solutions of dual-polarized waveguide-based radiating elements will be developed to assure a high radiation efficiency. Besides optimizing the waveguide structures, a high aperture efficiency will be achieved by implementing proper director geometries in front of the waveguide apertures. In this way, sparse array solutions could be investigated to trade-off array complexity and scan angle capabilities (field-of-view). Both analog and digital beam forming strategies will be considered to achieve an integrated array building block with excellent RF, power, EMC, thermal and mechanical characteristics for future space applications.	(Italy)	(Italy)		Dr. Giuseppe Virone: giuseppe.virone@ieiit.cnr.it Giovanni Gasparro: giovanni.gasparro@thalesaleniaspace.com	
P15	**Inter-satellite communication and synchronisation:** To avoid discontinuity in the service of UEs, there is a need for a seamless handover, whenever the UE moves from one LEO-satellite beam to another. Cooperation between NTN nodes becomes then essential, and it can be attained only by a reliable and efficient inter-satellite communication. Inter-satellite communications present a series of challenges that need to be addressed in this project, i.e. flexibility, autonomy and self-organization due to time-varying topology, new physical-layer paradigms using mm-wave, THz and optical bands and synchronization to achieve seamless handover between satellites.	(Italy)	(Sweden)	(Italy)	Alberto Tarable: alberto.tarable@ieiit.cnr.it Behrooz Makki: behrooz.makki@ericsson.com	