CHIST-ERA Call 2015 Pre-announcement

The CHIST-ERA Call 2015, to be published in October 2015, will target research in the following topics:

- User-Centric Security, Privacy and Trust in the Internet of Things (SPTIoT)
- Terahertz Band for Next-Generation Mobile Communications Systems (TMCS)

The details of the research targeted in the call have been defined by the research community during the CHIST-ERA Conference 2015, an event that was open to all interested researchers.

The present Call 2015 Pre-announcement gives an overview of the research themes that have emerged during the conference (see the following pages).

Anticipated Call deadline: 13th of January 2016

Researchers are encouraged to start discussing possible projects with prospective partners. The call will require that projects are submitted by international consortia with partners in at least three participating countries. Additional partners from other countries may be part of a consortium if they can secure their own funding. The list of countries and funding organisations which have shown preliminary interest in participating in the Call 2015 is provided below.

Country	Funding organisation	Participation per Call topic	
		SPTIoT	TMCS
Austria	FWF	Yes	Yes
Belgium	FNRS and FWO	Yes	Yes
France	ANR	Yes	Yes
Ireland	IRC	Yes	Yes
Latvia	VIAA	Yes	Yes
The Netherlands	NWO	Yes	No
Poland	NCN	Yes	Yes
Portugal	FCT	Yes	No
Romania	UEFISCDI	Yes	Yes
Spain	MINECO	Yes	Yes
Switzerland	SNSF	Yes	Yes
Turkey	TÜBITAK	Yes	Yes
United Kingdom	EPSRC	Yes	Yes

Please note that this pre-announcement is for information purposes only. It does not create any obligation for the CHIST-ERA consortium nor for any of the participating funding organisations. The official call announcement, to be published later, shall prevail. The contact point of your funding organisation remains at your disposal for any further information (see Consortium).

1st **Topic:** Security and Privacy in Internet of Things

The Internet of Things (IoT) vision, which benefits from the steady advances in microelectronics, communications and information technology, seems within reach. However, technical flaws in data security, both real and perceived, threats of intrusions and lack of transparency might significantly lower the uptake and benefits of the new technologies. Current techniques are insufficient to promote trust and guarantee users' security and privacy within a future of unlimited interconnection. For users to be confident in their interactions with the IoT, one must consider how they will be supported to understand how their data is collected, used, processed, accessed and kept safe. By providing users with this information, we empower them to understand and make their own decisions regarding their data, which is essential in gaining informed consent and in ensuring the take-up of IoT technologies.

Target Outcomes

Projects should address one or more of the following research challenges, ensuring they include co-design with users to address the key, fundamental, but inter-related and interdisciplinary aspects of privacy, security and trust.

- Methods for data anonymization
- Technical mechanisms to increase trustworthiness when data is shared between different providers
- Intrusion detection methods
- Authentication using trusted computing (lightweight hardware and software security)
- Dynamic security to allow systems to adapt to varying users
- Tools for supporting preferences and priorities of culturally diverse users
- Natural language for expressing data access/usage policy
- Data visualisation for increasing user awareness of privacy issues
- Empowering users with risk evaluation tool for their data and contacts
- Assistive technology/techniques to encourage more secure behaviour and awareness of users

Expected Impact

Projects are expected to:

- Cross traditional boundaries between disciplines in order to strengthen the community involved in tackling these new challenges. A broad range of disciplines needed to cover the breadth of this topic should be considered and could include expertise and skills in hardware and software, data analytics, cryptography, machine learning, big data visualisation, data analysis, business models, user interfaces, user behaviour and human-computer interaction.
- Have short-term impact on the development of designs, algorithms and prototypes that will contribute to the longer term impact of a more user-centric and trustworthy IoT.

2nd **Topic:** Terahertz Band for New-Generation Mobile Communication Systems

Within a decade a 1000-fold increase in wireless communication traffic volume is expected, requiring increased throughput and data rates. The Terahertz (THz) band, which remains largely unexplored, offers new possibilities. Spectrum frequencies over 275 GHZ are as yet unallocated and those over 200 GHz still present important opportunities to fulfil the demand for wireless data transmission. Exploring the spectrum at these frequencies offers new possibilities for employing large bandwidths for high-speed wireless communications. The development and fabrication of cutting-edge low-cost THz devices has recently started, and new network concepts have the potential to cover the connectivity requirements of 5G systems and beyond. However, further research on Terahertz band devices, models, networking techniques and (potential) applications are required in order to realise efficient and practical THz Band communication networks. In particular, the following research areas are particularly important:

(a) THz device and/or system fabrication and integration

- New fabrication and integration techniques to enable the integration of photonic and electronic THz components
- Techniques to reduce individual component size (relative to microwave technologies)
- New/improved components capable of operating over wide bandwidth at THz frequencies
- 3D printing techniques for THz components (e.g. lenses, reflectors)
- Device and/or system packaging to minimise signal losses
- Integrating multiple functions on a chip, e.g. transmitters and receivers

(b) THz power generation

- High power, low-noise THz amplifiers for transmitters and receivers
- Signal amplitude loss caused by interconnects between system components
- Spatial power combination through antenna arrays

Target Outcomes

Projects must deliver against one or more of the following outcomes for frequencies above 275 GHz, or at least above 200 GHz:

- Address novel component design and fabrication of THz devices and/or systems. Consideration should be given to the packaging and/or integration of components.
- Develop components for THz power generation (e.g. sources, novel high power, low-noise THz amplifiers for transmitters and receivers). New architectures that have these features should assist in overcoming the high path-loss at THz frequencies and lead to communications systems with much higher data rates.
- Push current emitted continuous-wave powers, up to 100 mW.
- Develop new interconnection schemes between systems and modules capable of efficiently transferring THz power around the system while minimising signal losses and interference.
- Spatial and temporal tuning of power output (e.g. phased-arrays to allow active control of beam spatial profiles and emission characteristics, as well as beam-steering).

In all cases, applicants should aim to produce a working, demonstrable THz device and/or system that can be validated in its intended application environment for mobile communications.

Proposals addressing THz power generation for mobile THz communication systems are encouraged to provide estimates of expected power consumption and dissipation of each component in the system.

Expected Impact

Projects are expected to significantly advance the state-of-the-art by achieving two or more of the following objectives:

- Build and strengthen the community of researchers in novel component design and fabrication. Research across the breadth of the above-mentioned research area (a) will require and bring together skills, expertise and facilities in a subset of the following areas: fabrication, packaging, co-integration (photonics and electronics), components, electromagnetics and materials.
- Build and strengthen the community of researchers in THz power generation. Research across the breadth of the above-mentioned research area (b) should aim to bring together bring together skills and expertise in a subset of the following areas: high-speed electronics, III-V semiconductors, THz-compatible dielectric materials, THz photonic generation, antennas, waveguides.
- Enable the emergence of innovative devices and /or systems for THz communications.
- Identify new opportunities fostered through these technologies and possibly the transfer of these technologies from laboratories to industries.
- Develop novel techniques to integrate components, including THz sources, antennae, and receivers to form a THz communication system.
- Demonstrate higher bandwidth operation than is available from existing microwave frequency-range communication systems, over useful distances.