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Supervisor Expression of Interest
MSCA - Marie Sklodowska Curie Action - (PF) Postdoctoral Fellowship 2021

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Link pagina docente:	https://www.deib.polimi.it/ita/personale/dettagli/60424 https://www.deib.polimi.it/ita/personale/dettagli/262990
Department Name:	Dipartimento di Elettronica, Informazione e Bioingegneria
Research topic: (https://www.polimi.it/en/scientific-research/research-at-the-politecnico/departments/)	
MSCA-PF Research Area Panels:	☐ CHE_Chemistry ☐ ECO_Economic Sciences ☐ **ENG_Information Science and Engineering** ☐ ENV_Environmental and Geosciences ☐ LIF_Life Sciences ☐ MAT_Mathematics ☐ PHY_Physics ☐ SOC_Social Sciences and Humanities
Politecnico di Milano Areas:	☐ Cultural Heritage ☐ Smart Cities ☐ Horizon Europe Missions ☐ Health ☐ Industry 4.0
Brief description of the Department and Research Group (including URL if applicable):	The DEIB (https://www.deib.polimi.it)was born officially at the Politecnico di Milano in 2013, from the merger of three previous departments: Bioingegneria, Elettronica e Informazione, and Elettrotecnica. Although the Dipartimento di Elettronica e Informazione (DEI) was officially established in 1992, its history dates back to the year 1928, when the Institute of Electrical Engineering was founded at the Politecnico di Milano. The Italian tradition in computer engineering started in

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	1954 right here, when Prof. Luigi Dadda brought from the U.S. one of the first CRC computers. The pioneering work in numerical computing and in the design of programming languages and hardware originated from these events. Since then the Department has been recognized as a world-class scientific institution that contributes to key achievements in computer engineering, telecommunications, industrial automation, electronics and microelectronics. Research in the field of bioengineering was started by Prof. Biondi, and led in 1991 to the creation of the Dipartimento di Bioingegneria, now again connected with DEI. The historic Dipartimento di Elettrotecnica, founded in 1886, has common roots with the DEI in the principles and theories of electromagnetism, at the base of electrical engineering, electronics, computer science and telecommunications. In the past few decades the exponential growth of ICT has boosted an impressive expansion of DEIB's researchers and activities. Despite the variety of its interests, however, the Department has been able to preserve a unique scientific identity. Here cross-fertilization is a working reality and our ICT researchers and specialists are eager to tackle extremely complex and diverse problems in many technical, economic, and social fields. Today our Department counts 235 faculty members and about 418 short-term researchers and PhD students. It is organized in six distinct scientific areas: Bioengineering, Computer Science and Engineering, Electrical Engineering, Electronics, Systems and Control, and Telecommunications. DEIB is also a key node of many research networks, and is a widely recognized gateway to a highly qualified know-how and expertise. DEIB's research environment is not bounded within its own walls, as it also includes the industrial consortium CEFRIEL and several spin-offs. With such initiatives, DEIB's activities end up involving nearly 1000 ICT professionals, which makes our Department able to deal with an ever-growing variety of intellectual challenges. DEIB's mission is to: • Push the boundary of ICT development by fostering ground-breaking technological research, forging innovative ideas, and gaining international recognition; • Educate young generations of engineers with a solid scientific background, a strong problem-solving mindset, and a truly multi-disciplinary approach. Courses offered by our faculty cover the full spectrum of ICT within a rich variety of curricula. Undergraduate and graduate degree in Automation Engineering, Biomedical Engineering, Electrical Engineering, Electronic Engineering, Computer Engineering and Telecommunication Engineering, and doctoral programs in Information Technology and Bioengineering are open to national and international students.

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Title and brief project description: **(max 1 page)**	The project scope is the development of research activities for **Big Data, Internet of Things and Sensing the World, based on ICT technologies.** More specifically, the research activity can be mainly developed in the following area: **-quantum communications** Quantum communications are a new field of optical communications where instead of carrying "bits" through photons, the photons themselves are used as quantum bits or qu-bits. The most important application of quantum communications is cryptographic applications where a key of quantum origin is generated and shared between a transmitter and a receiver. Through a protocol known as BB84 (from the name of the two inventors Charles Bennet and Giles Brassard) by using a single photon it is possible to share an encrypted key of any length. This key is unconditionally secure and cannot be attacked and revealed by any computing power and any algorithm. The DEIB optical communications lab (PoliCom) proposed the use of this key by building and testing a complete quantum communications network across the city of Milan. The quantum key is generated and shared between numerous pairs of transmitters and receivers between users of different types: financial, administrative and military. With this project (called POLIQI Politecnico di Milano Quantum Information) the DEIB aims to experiment with the most advanced cyber-security technologies in practical applications . At the DEIB PoliCom lab, POLIQI quantum nodes will be built and tested, new quantum technologies for the manipulation of qu-bits and single photon transmitters and receivers will be explored and new security protocols based on quantum cryptography will be developed. DEIB faculty provides Courses of Optical Communications, Quantum Communications (since 3 years) and Course of Introduction to Quantum mechanics for ICT students. Moreover, the PoliCom lab works closely with specialist in cryptography as well specialist in electronics for single photon generation and detection of the DEIB.