

Job Title	<b>Postdoc:</b> <i>Physical Layer Security for Cyber-Physical Systems and Internet of Things (PLS4CPS&amp;IoT)</i>
Main Research Field	<i>Information Science and Engineering (ENG)</i>
Sub Research Field	<i>Signal Processing for Wireless Communications</i>
Key words	<i>Signal processing, IoT, Error Correcting Codes, Jamming Signals, Cyber-Physical Systems, Physical Layer Security</i>
Job Description	<p><i>The advent of the Internet of Things (“IoT”) allows for the extension or access of the internet to the physical world by the means of more and more numerous sensors, actuators or inter-connected equipment. This evolution operates equally well in the industrial domain (factory of the future or 4.0, transport, energy, ...), as in the public domain (health, automation,...) and thus concerns all socio-economic partners. To summarize, IoT is a network of networks which needs to be able to identify and interconnect without ambiguity with physical devices connected with or without wires, in order to recover, to store, to transfer and process seamlessly the relevant data between the virtual and physical worlds. As a consequence of this definition, it is indispensable to ensure integrity throughout the chain of transmission between two connected objects, or between an object and a data and/or application server, whether this is from the point of view of transmitted data, or with respect to the objects identity connected to the network.</i></p> <p><i>In this very topical, constantly evolving context aimed at securing the Internet of Things, very few studies have been undertaken to conceive how in practice, at the physical layer, robust processing can address emerging security issues. Studies to date have generally been limited to improving the errors correcting powers of the transmitted data in order to combat the effects of the propagation channel, but not to ensure, for example, a feedback of useful information to higher-level layers (for mechanisms which concern intrusion detection, the routing of information...), the identification of sensors or connected objects, their geographic location at the heart of the network, the detection and/or localization of the presence of potential nearby jammers, etc.</i></p> <p><i>In such context, the Université de Bretagne Occidentale (UBO), through his Institut Brestois du Numérique et des Mathématiques (IBNM), has decided to support a 4 years chair of excellence to be started in September 2018 which is principally oriented towards the field of Cyber-Physical systems and processing.</i></p> <p><i>The Marie-Curie fellowship aims at strengthen human resources on the project by potentially bringing new and original visions on the project and consolidate the financial resources that will be allocated to it.</i></p>

	<p><i>The main challenge on which the fellow will work on concerns the development of robust error-correcting codes in the presence of interference capable of detecting the presence of a jammer by calculating a suitable metric during the decoding procedure. These codes must have properties that allow a good resistance to eavesdropping, jamming and fault injection. Furthermore, they will be optimized by integrating closer to the source, modulation scheme(s) most adapted to this context of combating jamming and eavesdropping. The search for such codes is not trivial and requires new criteria for evaluating the performance of codes and new metrics in order to take into account in the decoding process the detection of an attempt at interference.</i></p> <p><i>In this proposal we do not wish to present a complete state-of-the-art of the area and of the techniques currently used, but the recent article [1] (August 2016) entitled "The Role of Physical Layer Security IoT: A Novel Perspective ", includes a good comparable state-of-the-art on the various techniques of securing transmissions for IoT and demonstrates the value of our approach in this field together with its potential.</i></p> <p><i>[1] T. Pecorella, L. Brilli and L. Mucchi. "The Role of Physical Layer Security in IoT: A Novel Perspective". MDPI Information, 7, 49, 08/2016 ; doi:10.3390/info7030049</i></p>
<p>Supervisor(s)</p>	<p><i>Roland Gautier received the M.Sc degree from the University of Nice-Sophia Antipolis, France, in 1995 and the Ph.D degree in electrical engineering in 2000. From 2000 to 2001, he was Assistant Professor with Polytech'Nantes, the engineering school of the University of Nantes. Since September 2001, he has worked with the University of Brest, as an Assistant Professor of electronic engineering. His current research focuses on digital communication interception, analysis, and blind parameters recognition, Multiple-Access and Spread Spectrum transmissions, Cognitive and Software Radio. From 2007 to June 2012, he was assistant manager of the Signal Processing Group, within the Laboratory for Science and Technologies of Information, Communication and Knowledge (Lab-STICC - UMR CNRS 6285). Since July 2012, he has been the manager of the Intelligence and Furtiveness of Communications Group, within the Lab-STICC.</i></p> <p><i>K. Hassan, R. Gautier, I. Dayoub, M. Berbineau et E. Radoi. "Multiple-Antenna Based Blind Spectrum Sensing in the Presence of Impulsive Noise". IEEE Transactions on Vehicular Technology (3/2013), DOI: 10.1109/TVT.2013.2290839.</i></p> <p><i>Y. Zrelli, R. Gautier, E. Rannou, M. Marazin et E. Radoi. "Blind Identification of Code Word Length for Non-Binary Error-</i></p>

	<p><i>Correcting Codes on Noisy Transmission". EURASIP Journal on Wireless Communications and Networking 2015.1 (3/2015), DOI: 10.1186/s13638-015-0294-5.</i></p> <p><i>M. Candau, R. Gautier, J. Huisman, "Convolutional block codes with cryptographic properties over the semi-direct product <math>Z/NZ \rtimes Z/MZ</math>" , Springer Journal on Designs, Codes and Cryptography, volume 80, Issue 2, pp 395–407, August 2016, <a href="https://doi.org/10.1007/s10623-015-0101-7">https://doi.org/10.1007/s10623-015-0101-7</a>.</i></p> <p><a href="https://www.labsticc.fr/en/directory/228-gautier-roland.htm">https://www.labsticc.fr/en/directory/228-gautier-roland.htm</a></p>
<p>Department/Research:</p>	<p><i>Lab-STICC CNRS 6285</i> <a href="https://www.labsticc.fr/en/index/">https://www.labsticc.fr/en/index/</a></p>
<p>Suggestion for interdisciplinary / intersectoral secondments</p>	<p><i>International collaboration:</i> <i>Université de Bretagne Occidentale, Brest, France</i> <i>Memorial University, St. John's, Newfoundland, Canada</i></p>
<p>Skills Requirements (optional) :</p>	<p><i>Fluent in English</i> <i>Publications: at least 1 per year since the Ph.D. completion, as 1<sup>st</sup> author</i></p>