

The Mathematical and Algorithmic Sciences Lab of Huawei's Paris Research Center is offering a three-year CIFRE PhD position with a gross monthly salary of 2500€ in the domain of waveform design and analysis for wireless communications over fast-changing time-varying channels.

Fast-changing time-varying channels are typically used to model wireless propagation effects on transmitted signals in case of high mobility of the receiving device with respect to the wireless transmitter. The design of waveforms for such channels is a challenging problem. One crucial requirement that should be met when solving this problem is the need for the spectrum of the waveform in the frequency domain (or in some other transform domain relevant for data transmission over time-varying channels) to have sufficiently steep edges so that the large Doppler frequency spreads characteristic of high-mobility wireless links cannot give rise to high levels of multi-user interference. The waveform should also be compatible with efficient pilot schemes that can allow tracking the channel variations with acceptable levels of pilot overhead and estimation complexity especially in the multiple-input multiple-output (MIMO) case. Another emerging requirement for waveform design for high-mobility scenarios is compatibility with joint communications and sensing, a feature that is particularly relevant for vehicular communications.

Research activities during the PhD will focus on the conception and performance analysis of signals that are well-localized in the time-frequency domain or in other relevant transform domains for use as waveforms for low multi-user interference in high-mobility propagation scenarios. Special attention will be paid to the performance analysis of thus obtained waveforms, including asymptotic analysis in the large signal length regime. Moreover, waveforms that transmit data in domains other than the frequency domain using transforms other than the Fourier transform will be considered. The performance of these waveforms in terms of data transmission reliability, throughput, compatibility with joint communications and sensing, etc. will be analyzed and the optimization of their design parameters with respect to these, and possibly other, performance criteria will be addressed.

The PhD will be supervised by Philippe Ciblat (Professor), Télécom ParisTech & Institut Polytechnique de Paris, 91477 Palaiseau and Nassar Ksairi (Senior Researcher), Mathematical and Algorithmic Sciences Lab, Huawei's Paris Research Center, 92100 Boulogne-Billancourt.

To apply send a CV to Nassar Ksairi at nassar.ksairi@huawei.com. A strong mathematical background is required and a background in signal processing and wireless communications is preferred. Familiarity with programming in MATLAB (or Octave) is also required and notions of programming in C is a plus.