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Titre Thèse	NOMA for 5G and M2M networks – modeling and mitigating impulsive – dependent interference.		
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Résumé du sujet : Interference will not exhibit the traditional Gaussian behavior that is usually assumed in IoT/M2M heterogeneous networks but could rather be impulsive [1]. This impulsiveness will have a major impact on future networks [2] and it is important to understand its real impact on the expected performance of the system, and especially on short packets for which a single, or a couple, of strong pulses can drastically degrade the performance. Based on the clear separation of short-term and long-term effects, we can establish the short term statistics of the interference. The α-stable distributions offer a very attractive framework for studying the interference variations related to these short term variations: they have a theoretical justification; they are the only stable distributions (generalized central limit theorem); they are parametric; their heavy tails allow an accurate representation of impulsive (rare and large) events. But they do not have a closed form expression and have infinite moments for orders such as $p \geq \alpha$. Consequently the theoretical limits under additive α-stable noise is not known [3,4] and the analysis cannot rely on second order statistics, so that, for instance, new solutions for dependence modeling are required [5]. Most of the classical digital communication tools have to be adapted, or completely revised, at physical layer as well as at MAC layer. We will study Non Orthogonal Multiple Access schemes [6] that introduce some non-conventional dependence structure.

The PhD objectives will be to contribute on three aspects:

- Study NOMA solutions for uplink M2M communications.
- Modelling interference and essentially the dependent case. Many works have dealt with independent interference samples but this can critically reduce the validity of the model. The general framework of copulas offer a nice tool for modeling the dependence structure.
- Define adapted metrics for the performance evaluation of bursty communications. Spectral efficiency, energy and latency can be critical. This will lead to multi-objective optimization to find the best adapted solutions.

References

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