STAGE DE MASTER II 2022

Digital modulations Schemes for future Beyond 5G (B5G) THz wireless Communications

Wireless Terabits per second (Tbps) link is needed for the new emerging data-hungry applications in Beyond 5G (B5G) (e.g., high capacity broadband, enhanced hotspot, 3D extended reality, etc.). Besides, the sub-THz/THz bands are the next frontier for B5G due to scarce sub-GHz spectrum, and insufficient bandwidth for wireless Tbps link in5G millimeter wave bands. Even though a wider bandwidth and large-scale MIMO are envisioned at sub-THz bands, but the system and waveform design should consider the channel characteristics, technological limitations, and high RF impairments.

Based on these challenges, in 2020, in [1], a novel Index Modulation (IM) domain, has been proposed. It is called filter IM domain that generalizes most existing SISO IM schemes. Within the filter IM domain, a novel modulation scheme has been proposed. It is called Filter Shapes IM (FSIM). This new modulation has been completely analyzed in [1], and its extension to MIMO is studied in [2].

Up to now, this modulation considers a linear filter bank both at the transmitter and the receiver. The objective of this work is to study a new modulation in the filter IM domain where the filter bank is composed of non-linear filters.

The work will start with the simple case of two Non Linear filters and depending on the results will be extended to more filters. The combination of two banks (linear and non-linear in serial) to increase the spectrum efficiency will also be investigated.

[1] M. Saad, J. Palicot, F. Bader, A. C. A. Ghouwayel and H. Hijazi, "A Novel Index Modulation Dimension Based on Filter Domain: Filter Shapes Index Modulation," in IEEE Transactions on Communications, vol. 69, no. 3, pp. 1445-1461, March 2021, doi: 10.1109/TCOMM.2020.3039842. https://ieeexplore.ieee.org/abstract/document/9266097

[2] M. Saad, N. Al Akkad, H. Hijazi, A. C. Al Ghouwayel, F. Bader and J. Palicot, "Novel MIMO Technique for Wireless Terabits Systems in Sub-THz Band," in IEEE Open Journal of Vehicular Technology, vol. 2, pp. 125-139, 2021. doi: 10.1109/OJVT.2021.3054737. https://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=9336209

Other information:

The stage will be held in the IETR Lab and in the CentraleSupélec premises in Rennes; Some travel to Patras University should be planned. The stage will be paid.

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Contacts

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