

Multuser wireless channel simulation for communication systems with nonparametric reception *

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In digital communications it is typical to use reception techniques based on parametric hypothesis tests such as Neyman-Person test. This approach implies that the distributions of the decision statistics are known at the receiver side and the parameters of the corresponding distributions are known or at least can be estimated accurately. However in many scenarios of practical interest those assumptions do not hold. In such cases nonparametric reception techniques that combine distribution-free statistical tests and error-correcting codes are of great interest. In particular those reception techniques are very promising for Internet of Things (IOT) and Mashine –to-Mashine (M2M) communications. Unfortunately analytical investigation of communication systems that use nonparametric reception techniques is cumbersome since very little is known on the subject so far. Thus simulation remains the main tool for investigation and validation of the solutions proposed for the systems under discussion.

Unfortunately for the case that is of most practical interest i.e. the multuser communication scenarios the computational burden introduced by channel simulation can be very high. This paper is aimed at developing realistic model of single-user transmission via a multi-user channel with low computational complexity. In particular the case when each user uses coded Frequency Hopping OFDMA with nonparametric reception will be considered. Two models are introduced: the equivalent model in frequency domain that allows to avoid computationally expensive simulations of processes in time-domain and the reduced complexity “pessimistic” model in frequency domain. The applicability of those models is discussed and compared by simulation for several recently proposed nonparametric reception techniques. Problems of software implementation of the proposed models are addressed as well.

* The reported study was partially supported by the RFBR, research project No. 18-07-01409 A