

СТАТЬЯ В Q1

IEEE COMMUNICATIONS LETTERS, VOL. 27, NO. 5, MAY 2023

1457

QAM Constellations With Fractional Entropy to Gain in Margin Maximization for Frequency Selective Channels

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Abstract— This letter proposes two approaches to increase the energy gain for the procedure of bit and power allocation in the frequency selective channels. The first one is the use of QAM constellations with optimal probabilistic shaping (PS) instead of the conventional QAM constellations. The second approach is the use of an extended set of QAM constellations with fractional entropy, which is named FQAM. These FQAM constellations are first offered in this work. As the channel examples, we used ADSL channel, fiber optic channel with Bessel filter, and the one with chromatic dispersion. It is shown that for the observed use cases the use of QAM with PS provides the energy gain in the

channel. Usually, two types of optimization problems are considered: rate maximization (RM) and energy gain (margin) maximization at a fixed information transfer rate (Margin Maximization, MM) [7]. In fact, maximizing the energy margin is equivalent to minimizing the transmitted power.

The Greedy algorithm (GA) is the optimal solution for both RM and MM [7]. A limitation of the GA is the requirement to use signal constellations with a fixed step of entropy. For

В мае 2023г в журнале IEEE Communications Letters (Q1) вышла статья «QAM Constellations With Fractional Entropy to Gain in Margin Maximization for Frequency Selective Channels»

Статья (doi: [10.1109/LCOMM.2023.3260444](https://doi.org/10.1109/LCOMM.2023.3260444)) была подготовлена в соавторстве директора ВШПФикТ Александра Гельгора, двух его аспирантов Данилы Пузько и Юрия Батова, а также представителя компании ООО «Техкомпания Хуавей» Дмитрия Долгих. Статья написана по результатам выполнения договора «Разработка алгоритмов модуляции/демодуляции и оптимизация их сложности. Оптимизация частотно-временной структуры сигнала для волоконно-оптических телекоммуникационных систем».