

Non-standard randomized multiple access transmission protocols: stability and optimization

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Abstract. I plan to introduce two new multiple access systems:

- systems with energy harvesting and
- systems with multiple departure.

In the systems of the first type, each transmission attempt (successful or not) needs a unit of energy that comes from a constrained source. We show that energy restrictions may increase the stability region of randomized transmission protocols.

In the systems of the second type, there is a geographic spread of users, and neighbouring users provide similar information, so given a successful transmission of a user message, not only this user, but also all its neighbours leave the system. We consider three types of transmission protocols: centralized protocols, decentralized protocols with ternary feedback (empty slot/success/collision) and decentralized protocols with unusual binary feedback (success/non-success). We analyze stability conditions and optimize protocol parameters.

The talk is based on joint papers [1] and [2] with Andrey Turlikov and Maxim Grankin (St.-Petersburg) and with Dmitriy Kim (Almaty).

Keywords: random multiple access, stability, energy harvesting, multiple departure.

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References

1. *Foss S., Kim D., Turlikov A.* Stability and instability of a random multiple access model with adaptive energy harvesting // Siberian Electronic Mathematical Reports. — 2016. — Vol. 13, no. 1. — P. 16–25.
2. *Foss S., Grankin M., Turlikov A.* Spatial random multiple access with multiple departure // Proceedings of 2017 IEEE International Symposium on Information Theory (ISIT). — P. 2728–2731. — arxiv.org/abs/1704.07155.