

Two Lectures on Mobile Radio Access for 5G Communications

Speaker: Dr. Behrooz Makki

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Place: iTEAM Meeting room, Building 8G, access D, 4th floor - Universitat Politècnica de València, Camino de Vera s/n, 46022 Valencia.

- **Date:** Wednesday 7 September, 2016; **Hour:** 10:00-10'40 h

Title: On the performance of large-but-finite MIMO systems: HARQ and Scheduling

Abstract: We investigate the performance of the multiple-input-multiple-output (MIMO) systems in the presence of a large but finite numbers of antennas at the transmitters and/or receivers. Considering the cases with and without hybrid automatic repeat request (HARQ) feedback, we determine the minimum numbers of the transmit/receive antennas that are required to satisfy different outage probability constraints. Also, with and without interference cancelation, we derive the maximum achievable throughput of the MIMO broadcast channels using optimal scheduling. Our results are obtained for different fading conditions and the effect of the power amplifiers efficiency/feedback error probability on the performance of the MIMO systems is analysed. Then, we use some recent results on the achievable rates of finite block-length codes, to analyse the effect of the codewords lengths on the system performance. Moreover, we derive closed-form expressions for the asymptotic performance of the MIMO systems when the number of antennas increases. Our analytical and numerical results show that different quality-of-service requirements can be satisfied with relatively few transmit/receive antennas.

- **Date:** Thursday 8 September, 2016; **Hour:** 10:00-10'40 h

Title: On the performance of hybrid RF-FSO system with and without HARQ

Abstract: We study the performance of hybrid radiofrequency (RF) and free-space optical (FSO) links assuming perfect channel state information (CSI) at the receiver. Considering the cases with and without hybrid automatic repeat request (HARQ), we derive closed-form expressions for the message decoding probabilities as well as the throughput and the outage probability of the RF-FSO setups. We also evaluate the effect of adaptive power allocation, different channel conditions, imperfect power amplifiers as well as pointing errors on the throughput and the outage probability. The results show the efficiency of the RF-FSO links in different conditions.

Short Bio: Dr. Behrooz Makki was born in Tehran, Iran. He received the B.Sc. degree in Electrical Engineering from Sharif University of Technology, Tehran, Iran, and the M.Sc. degree in Bioelectric Engineering from Amirkabir University of Technology, Tehran, Iran, respectively. Behrooz received his PhD degree in Communication Engineering from Chalmers University of Technology, Gothenburg, Sweden. Since 2013, he is working as a Postdoc at Chalmers University. Behrooz is the recipient of VR Research Link grant, Sweden, 2014, and the Ericsson's Research grant, Sweden, 2013-2016. Also, he is a member of European Commission 5G project "mm-Wave based Mobile Radio Access Network for 5G Integrated Communications." His current research interests include partial channel state information (CSI) feedback, hybrid automatic repeat request, Green communication, millimeter wave communication, free-space optical communication and finite block-length analysis.

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