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Multi-Wire Signaling for In-Package Data Transfer

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Abstract – Optical communication is becoming the mainstream mechanism to transfer data over long distances, including package-to-package links. Over very short distances, however, still copper wireline transceivers are attractive due to their compatibility to the conventional CMOS and FinFET technologies, as well as very low level of power dissipation. As a conclusion, copper wireline has been widely used for in-package data transfer. This work studies potentials of orthogonal multi-wire signaling to achieve very high data throughputs. Based on this analysis, a combination of orthogonal multi-wire signaling together with the conventional pulse-amplitude modulation (PAM) makes it possible to achieve very good link performance at 112 Gb/s and above. While four level PAM (PAM4) is very sensitive to the channel bandwidth limitation, orthogonal multi-wire signaling can be employed to reduce the overall symbol rate, and hence minimize the effect of bandwidth limitation. High level simulations show that very simple equalization schemes will be sufficient to implement low-power in-pacakge links.

Bio – Armin Tajalli (S'04–M'10–SM'18) received the B.S. degree from Sharif University of Technology, Tehran, Iran (1997), and Ph.D. degree from Swiss Federal Institute of Technology (EPFL), Lausanne, Switzerland (2010). He was a Postdoctoral Fellow in the Algorithmic Mathematics Lab., EPFL, Switzerland (2012). He was with Kandou Bus, Lausanne, Switzerland as a Senior Analog Architect (2011-2017). He is currently an Assistant Professor of the Electrical and Computer Engineering at the University of Utah, Salt Lake City, UT, USA. His research interests are wideband communciations, freqeuncy synthesizers and phase-locked loop, ultra low-power integrated systems. He has published 80+ journal and conference papers, and holds 30+ patents. He has received EPFL PhD Thesis Award (2010), CICC/AMD Scholarship Award (2010), and Designcon Best Paper Award (2016).