# Technology evaluation of low loss all-fiber fanouts for multicore fibers

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Space division multiplexing (SDM) has been widely investigated for over a decade [1]. Hence, the attainment of SDM was fulfilled through several different approaches, such as single mode (SM) multicore fibers (MCF), few-mode fibers, coupled MCFs, or few-mode MCFs. However, the SM MCFs seem to be the closest to become fully industrialized and enter the market for multiple reasons, including compatibility with transceivers or other network components that are universally used in the present. The only additional components needed for SM MCF deployment are multicore fiber connectors and fanouts, which enable non-intrusive integration of MCFs with the current (optical) infrastructure. Although for numerous years, fanouts were considered a bottleneck of the MCF technology, they have recently become significantly more accessible and reliable due to increasing number of research performed by diverse institutions and companies [2, 3]. Therefore, the crucial next step for fanout technology is to undergo a set of tests and experiments in order to determine its reliability and readiness for massive deployment in the telecommunication industry.

In this work we present our fanout technology based on specialty fiber postprocessing and results of its evaluation. The all-fiber fanouts were secured in two dedicated housing types – small foot print packaging for splice tray applications and more robust black box housing for plug and play. The population of tested components were characterized by broadband operation ($2^{nd}$ and $3^{rd}$ telecom window), Insertion Loss <1 dB, Back Reflection <-55 dB and Cross Talk <-45 dB. The samples were evaluated for environmental and mechanical performance according to procedures and criteria of international fiber component standards and recommendations (e.g. TIA/EIA, Telcordia/Ericsson). The performed experiments and tests have proven high maturity of the developed fanout technology, thus its readiness for field tests and commercial deployments.

[1] B. J. Puttnam, G. Rademacher, and R. S. Luís, *Space-division multiplexing for optical fiber communications*, *Optica* 8, 1186-1203 (2021).

[2] R. R. Thomson, H. T. Bookey, N. D. Psaila, A. Fender, S. Campbell, W. N. Macpherson, J. S. Barton, D. T. Reid, and A. K. Kar, "*Ultrafast-laser inscription of a three dimensional fan-out device for multicore fiber coupling applications*," Opt. Express 15, 11691–11697 (2007).

[3] V. I. Kopp, J. Park, J. Singer, D. Neugroschl, and A. Gillooly, "*Low Return Loss Multicore Fiber-Fanout Assembly for SDM and Sensing Applications*," in Optical Fiber Communication Conference (OFC) 2020, OSA Technical Digest (Optica Publishing Group, 2020), paper M2C.3.

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