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Mitigating transmitter non-linearity and fiber impairments in radio over fiber technology

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Single mode fibers are typically used in WAN, MAN and also find applications in radio over fiber (RoF) architectures supporting data transmission in fiber to the home (FTTH), remote antenna units (RAUs), etc. Multi-mode fibers (MMFs) with low cost, ease of installation and low maintenance are predominantly (85% to 90%) deployed in in-building networks providing data access in LANs. The transmission of MMW signals through the SMF in WAN and MAN, along with the reuse of MMF in in-building networks will not levy fiber reinstallation cost. The transmission of the millimeter waves experiences signal impairments due to the transmitter non-linearity and modal dispersion of the MMF. The MMF exhibiting large modal dispersion limits the bandwidth-length product of the fiber. The second and higher-order harmonics present in the optical signal fall within the system bandwidth. This causes an unwanted radiation of power at the RAU. The power of these harmonics is proportional to the non-linearity of the transmitter and the modal dispersion of the MMF. In this research work, a mathematical model is developed for Second-order Harmonic Distortion (HD2) generated due to non-linearity of the transmitter and chromatic - modal dispersion of the SMF-MMF. The model consists of a MZM that generates two m-QAM OFDM Single Sideband (SSB) signals based on phase shift of the hybrid coupler (90° and 120°). Our results show that the SSB signal with 120° hybrid coupler suppresses the higher-order harmonics and makes the system more robust against the HD2 in the SMF-MMF optic link.

Biography

Dhananjay Manohar Patel received his Bachelor's degree in Electronics from VJTI Mumbai, Mumbai University, India in the year 2007. He received Master's in Technology (MTech) in Communication Systems from Sardar Vallabhbhai National Institute of Technology (SVNIT), Gujarat, India in 2013 and is currently working towards his PhD in Optical Communication from SVNIT, Surat. He was also working as an Assistant Professor at Don Bosco Institute of Technology in Mumbai for 5 years. His research interests include generation and fiber-optic transmission of millimeter-wave signals, optical modulators and Radio over Fiber (RoF) technology. He has published 6 papers in reputed journals and 2 international conference proceedings while working towards his PhD degree.

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