

Optical Monitoring of Optical OFDM Signals in Bandwidth-Flexible Optical Transport Networks

Calvin C K Chan, and Kam-Hon Tse

Department of Information Engineering, The Chinese University of Hong Kong, Shatin, N.T., Hong Kong

ckchan@ie.cuhk.edu.hk

Optical orthogonal frequency division multiplexing (OFDM) has recently been widely considered and adopted as a robust optical modulation format for optical transmission in future bandwidth-flexible optical transport networks, due to its superior tolerance in both fiber chromatic dispersion and polarization mode dispersion as well as its high bandwidth efficiency and flexibility in various networking applications. Its practicality in the realization of optical transmitters and receivers is further enabled by the recent advances in high-speed electronic digital processors. In order to assure the signal integrity and reliability of the flexible optical transport networks network and performance monitoring of the optical OFDM signals are indispensable. This work aims at designing simple low-cost yet effective optical schemes to monitor the passband adjustment status of the bandwidth-variable wavelength selectable switches (BV-WSS) resided at each optical cross-connects along the lightpath as well as to retrieve its signal quality parameters without requiring the costly coherent receivers. A few code-assisted orthogonal optical subcarriers are proposed to be added to strategic spectral locations within the optical OFDM signal to facilitate simple in-line performance monitoring. By examining the low-bit-rate codes carried by these monitoring subcarriers via simple filtering of the optical OFDM signal together with common code recognition technique, various different kinds of signal quality parameters of the optical OFDM signal can be estimated and the possible malfunctioning of the BV-WSS can also be detected promptly. Hence, the practicality of optical OFDM signals employed in next generation spectrum efficient and flexible optical transport networks could be greatly enhanced.