SPACE COMMUNICATIONS AND NAVIGATION SYMPOSIUM (B2)
Poster Session (P)

Author: Dr. Jie Yin
China Academy of Space Technology (CAST), China, kingjack333333@gmail.com

Prof. Hua Lu
China Academy of Space Technology (CAST), China, nngucast@gmail.com
Prof. Tao Liu
China Academy of Space Technology (CAST), China, tommyto163@163.com
Prof. Zijing Cheng
China Academy of Space Technology (CAST), China, linuxdemo@126.com
Prof. Yong Jiang
China Academy of Space Technology (CAST), China, jiangyong_hengxing@126.com

ULTRA-WIDEBAND AND MILLIMETER WAVEBAND RADIO-OVER-FIBER SYSTEMS FOR ADVANCED SPACE COMMUNICATION APPLICATION

Abstract

With the rapid development of the aerospace industry and the emergence of all sorts of new demands, the telecommunications between two distant locations on the earth, satellite-to-satellite, satellite-to-earth, space station inside, have the requirements of larger bandwidth, higher security level and lower cost. Therefore, various kinds of RF frequencies are needed to be processed within very limited on-board space with traditional RF equipments and co-axis cables, which will occupy more mass, volume and power consumption and generate hard resolved EMC problem. Compared with co-axis cables, optical fiber has the advantages of large signal bandwidth, low average weight and excellent EMC quality. In the 1980s the USA demonstrated the space optical signal transmission experiment on fiber and obtained satisfying results. Subsequently, optical fiber communication technology was widely employed in the International Space Station. Nowadays, NASA and ESA show a lot of interest in the research of Microwave Photonics, developing relevant products with special characteristics. And detailed evolution route has been established. Based on the obvious advantages of Radio-over-Fiber(one kind technology of Microwave Photonic), integrated with China's space developing trend and future mission requirements, there are urgent demands that researches of space optical generated UWB and millimeter waveband Radio-over-Fiber systems should be carried out, preparing for the future space programs. In this thesis, at first, the characteristics of the Radio-over-Fiber and the necessity of our country's space application of microwave photonic technology are illustrated. Secondly, the latest international space Radio-over-Fiber research situation is introduced, which includes microwave photonic LO distribution, photonic RF mixing, photonic frequency conversion and photonic RF switching. Then four novel Radio-over-Fiber schemes are demonstrated (1. optical DPSK signal delivering in a radio-over-fiber platform based on heterodyne detection, 2. 2.5Gb/s optical PSK signal and the ASK wireless transmission based on heterodyne detection, 3.a novel scheme to generate multiband millimeter Wave Signals for 40-GHz full Duplex Radio Over Fiber System, 4. All-optical UWB pulse generation and pulse shape modulation by using dual-in dual-out Mach-Zehnder modulator). In the end, this paper is concluded with future prospects.