Contribution ID: **29** Type: **Invited Poster**

Stable RF transmission using PLL over long-distance optical fiber

Stable frequency standards have important applications in gravitational wave detection, precise navigation timing, and verification of relativity principles. Effectively utilizing the present fiber network resource to construct the stable radio frequency (RF) transfer system has been explored by many researchers. As the transmission distance is extended, the noise induced by the fiber link affects the frequency stability of the receiver signal. Phase-locked loop (PLL) is an efficient method to filter out noise and obtain the synchronous frequency signal at the receiver. In this paper, we test the performance of the frequency transfer system over long-distance optical fiber link and compare the effect of PLL on the frequency stability.
As shown in Fig.1, the experiment is carried out on a 480 km optical fiber link constructed from the cascade of 80 km fiber spools. The transmitter and receiver of the transfer system are placed at ei-ther end of the link, and bi-directional erbium-doped fiber amplifiers (Bi-EDFAs) are placed at the fiber link. The experimental results are shown in Fig. 2, when the PLL is turned off, the frequency stability of the transfer system is 4.65E-14@ 1 s and 4.66E-17@ 10,000 s. When the PLL is turned off, the frequency stability of the transfer system is 1.54E-13@ 1 s and 1.17E-16@ 10,000 s. Experimental results show that the frequency stability of the transfer system is significantly im-proved by the PLL for long-distance frequency transmission. The frequency stability of the synchronous frequency signal recovered from the receiver is better than that of the cesium clock, which meets the demand of long-distance frequency transmission.

Primary authors: GAO, Hao (Beijing University of Posts and Telecommunications School of Optoelectronic Information); Prof. LUO, Bin (Beijing University of Posts and Telecommunications School of Optoelectronic Information)

Co-authors: Ms LIU, Chenxia (North China Electric Power University); Prof. SHANG, Jianming (Beijing University of Posts and Telecommunications School of Optoelectronic Information); Prof. CHEN, Ziyang (Peking University); Prof. YU, Song (Beijing University of Posts and Telecommunications School of Optoelectronic Information); Prof. GUO, Hong (Peking University)

Presenter: GAO, Hao (Beijing University of Posts and Telecommunications School of Optoelectronic Information)

Track Classification: Time and Frequency Transfer