

# Time Transfer Through Optical Fiber over a 166 km on Two Telecommunication Network Fibers

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The accuracy of atomic clocks is constantly becoming more precise. At the same time, it is necessary to develop high-precision fiber optic time transfer technology that matches its accuracy[1-3]. Accurate timing should not be limited to laboratories, but also to engineering and practical applications[4-6]. When conducting time transfer with different wavelengths on the two telecommunication network fibers, the system adopts a bidirectional time comparison method. And it needs to consider factors such as dispersion to further eliminate uncertainty in the fiber optic transmission process, to achieve extremely high precision time synchronization and clock source comparison[7-9]. This article uses 8 optical fiber time transfer devices, starting from National Time Service Center in Lintong, on two different optical fibers on the same path, passing through Xi'an and Xianyang to reach Tongchuan City. For the first time, the fiber dispersion self-correction scheme is used. And two different optical fiber paths are compared using the comparison method to achieve on-site comparison of optical fiber time transfer systems on different optical fibers on the same route over a 166.3km long on-site fiber optic link, which can provide time tracing services for the cesium clock group of Tongchuan. The experimental measurement results show that the fluctuation is 24 ps in standard deviation. The peak-to-peak value of fluctuation is 69ps, and the transfer stability TDEV is 7ps@ 1s. This article provides new ideas and methods for high-precision fiber optic time transfer comparison and indicator verification.

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