

# LARGE STRAIN MEASUREMENT METHOD BASED ON DYNAMIC REFERENCE IN DISTRBUTED OPTICAL FIBER

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**Abstract:** Distributed optical fiber systems based on optical frequency domain reflectometry (OFDR) have received extensive attention in the field of structural health monitoring. By calculating the spectral offset by cross-correlation analysis of the reference Rayleigh backscattering spectrum (RBS) and the measured RBS, it is converted into the strain of the structural. The system based on OFDR has high spatial resolution and strain measurement accuracy. However, when the fiber is subjected to large strain (more than  $5000\mu\epsilon$ ), the amplitude of the RBS signal will be sharply attenuated. Further, the cross-correlation analysis failed and the strain could not be demodulated. In this paper, a large-strain demodulation method for OFDR distributed fiber is proposed. The dynamic reference RBS of sub-region is used to replace the traditional fixed reference RBS to break the limitation of large strain measurement. The large strain measurement of the tensile test of composite laminates shows that the fiber strain demodulation method proposed in this paper can measure the large strain above  $10000\mu\epsilon$  stably and reliably.