Recent Advances in Fiber-optic Distributed Acoustic Sensor (DAS) Based on Time-gated Digital Optical Frequency Domain Reflectometry

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The fiber-optic distributed acoustic sensor (DAS) can detect vibrations along the whole sensing fiber and quantitatively retrieve the amplitude, frequency and phase information. To overcome the trade-off between spatial resolution and sensing distance in the common phase-sensitive optical time domain reflectometry technology, a novel DAS based on time-gated digital optical frequency domain reflectometry (TGD-OFDR) is developed. The recent advances in high performance TGD-OFDR based DAS are reviewed, including the fading-free phase demodulation method with enhanced spatial resolution, response bandwidth, long sensing distance, and the intensity demodulation method using non-matched filter and interference pattern. The field experiment of pipeline leak detection is also introduced.

Keywords: fiber-optic sensor, distributed acoustic sensor, time-gated digital optical frequency domain reflectometry

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