

Performance analysis of Brillouin optical time domain reflectometry

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Analytical signal-to-noise ratio (SNR) models of Brillouin optical time-domain reflectometry (BOTDR) is established, by comprehensively taking into account nearly all non-negligible signal and noise terms with substantial impact on the sensing performance. The accuracy and generality of the proposed model are experimentally validated, supported by the fact that under various experimental conditions all experimental results are in good quantitative agreement with theoretical calculations. Serving as a theoretical tool, the established model makes it possible to accurately anticipate and comprehensively interpret the SNR behavior of the BOTDR under any given measurement condition, without the need to construct an experimental system or carry out experiments. It also enables theoretically quantifying the SNR difference between BOTDR and other distributed optical fiber sensors that already have mature SNR models. The analysis provides guidelines on optimizing system parameters towards the highest possible SNR with minimized energy consumption.



Short Bio:

Zhisheng Yang received the Ph.D. degree in communication and information system from the Beijing University of Posts and Telecommunications (BUPT), Beijing, in 2016. After graduation, he joined the Group for Fibre Optics (GFO), Swiss Federal Institute of Technology of Lausanne (EPFL), Switzerland, as a Postdoctoral

Researcher. In 2021, he joined BUPT as a professor. His main research interests include optical fiber sensing. He has authored or co-authored more than 90 refereed journal and international conference publications.