Performance Improvement of Stimulated Brillouin Scattering Distributed for Fibre Sensing System

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Abstract

The aim of this paper is to improve a distributed fiber sensing system based on Stimulated Brillouin scattering (SBS) effect In the experiment, we introduced the measuring principle of distributed fiber sensing system and defined the importance of parameters. While the spatial resolution was affected by the reference frequency and the sideband component suppressed in the probe. Among choosing the reference frequency from 0.125MHz to 5 MHz, we found that the accurate data could be obtained when the reference frequency was set at 0.125 MHz.
In the original experimental setup, the fiber Fabry-Perot (FFP) tunable filter was used before the lock-in amplifier (LIA) in order to prevent the power from getting too high. We also adjusted the sensitivity of the lock-in amplifier so we could read the data correctly without FFP-tunable filter and optimize the input signal quality. Afterward, we replace the new DFB-LD with better output power and narrower linewidth because it was useful for single side band modulation. Moreover, by replacing the signal generator, the operation time on the frequency sweep would be faster; while the speed increased more than two times from 11.66 points/min to 24.07 points/min. As for the modulation amplitude, it was selected from the original 100 mV unit as small as 1 mV so the modulation depth of the selection could be more accurate. Finally, we successfully achieved the measurement range to 313 m with 3 m spatial resolution.

Keywords—*Stimulated Brillouin scattering (SBS), Distributed fiber sensing, Brillouin optical correlation domain analysis*

Professional Biography

Shien-Kuei (Peter) Liaw received double doctorate degrees from National Chiao-Tung University in photonics engineering and from National Taiwan University in mechanical engineering, respectively. Prof. Liaw joined the National Taiwan University of Science and Technology (NTUST) in 2000. He has since been the Director of both the Optoelectronics Research Center and the Technology Transfer Center there. He was a visiting researcher at Bellcore (now Telcordia), USA in 1996 for six months and a visiting Professor at University of Oxford, UK for three months in 2011.
He has forty U.S./Taiwan patents and more than 250 journal articles and international conference presentations. He has been actively contributing for many conferences as technical program chair, international advisory committee and/or keynote speaker. Currently, Dr. Liaw is a distinguished Professor at National Taiwan University of Science and Technology, President of the Optical Society (OSA) in Taiwan Chapter and the Secretary-General of the Taiwan Photonic Society.



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