Free measurement point selection using fiber optic BOCDA sensor with two random code phase modulaions

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Distributed fiber optic sensing technique is very attractive to get strain information distributed on structures. Some conventional techniques use the scanning from the starting point to the ending point of the measurement points on the sensing fiber line by modulating the frequency of the lights. This scanning is not easy to assign the measurement points through the optical fiber line. Therefore, we developed a new fiber optic BOCDA sensor, which can assign the measurement points very easiliy. Our system is operatded with two lights, which are traveling from two ends of the sensing optical fiber. These pumping and probe lights was modulated as PRBS (Pseudo Random Binary Sequence) code patterns with time difference. When these two lights meet at one point in the fiber, the phase of two lights is always coincedence with each other, however the phase is not matched always at other points. Therefore, the Brillouin frequency of the sensing fiber, which is proportional to strain at the phase matching point, can be found from the back Brillouin scattering power. After finding the Brillouin frequency, the measurement point can be changed by chaigng the time diffrence between the PRBS codes. Therefore, when we want to chanhge the measurment point, we need to change the time difference bet the codes. In this study, we demonstrate the strain measurement distributed on a simply supported steel beam. From the distributed strain measurement, the maximum strain point can be easily found and measured with high accuracy.