Abstract

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FBG performance enhancement for sensing and EDFA gain flattening applications

The importance of fiber Bragg gratings (FBGs) is rapidly increasing due to their wide variety of applications. We present herein a full analytical study related to a simple optimization of the performance of FBGs for sensing applications and erbium-doped fiber amplifier (EDFA) gain flattening. In sensing applications, such as strain and temperature change detection, the most important issues are the sensitivity of the sensing process and the maximum value that can be sensed before saturation. Here, we optimized the FBG parameters to obtain the best sensing performance. EDFA gain flattening is performed using one long-period fiber grating and one uniform tilted fiber Bragg grating to compensate the narrow and wide peaks in the EDFA gain variation with input signal wavelength for an Al/P-silica EDFA, respectively. Two different input signal powers are used, applying our flattening technique in each case. The best peak-to-peak value reached is 0.87 dB, corresponding to a flattening efficiency of 81.17%. The validity of this flattening technique is also evaluated through an intensive comparison with other types of EDFAs, where the flattening efficiency is illustrated and compared in each case. We thus optimize FBG performance in a new and simple way for application in sensing and gain flattening applications.