

Abstract

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A new hybrid FBG with a π phase shift for temperature sensing in overhead high voltage transmission lines

Temperature monitoring in overhead high voltage transmission lines (OHV TLs) on continuous basis have become a subject of much interest and research in recent years. Since the transmission lines are subjected to various harsh meteorological and geographical conditions such as high temperature, this can cause disastrous effects on the lines such as flashovers, line breakings, and even tower collapsing. For this aim, a distributed on-line temperature monitoring system based on a new hybrid fiber Bragg grating (FBG) technology is proposed in this paper, since the development of the FBG sensing technology became prominent for the monitoring of temperature on the power lines for having several unique advantages compared to the traditional electronic sensors. The new proposed hybrid FBG consists of two apodized fiber Bragg gratings: one Nuttall and one Cos8 separated by a π phase shift. This showed an optimum remarkable performance in terms of the evaluation parameters including the peak reflectivity, full width at half maximum, side lobes analysis and ripple factor as well. Moreover, it has shown a stable operation over the increased temperature when subjected to temperature variation, under the variation of the controlling parameters such as the grating length and the refractive index modulation amplitude. The proposed hybrid is compared to the traditional uniform FBGs in terms of the evaluation parameters showing its superiority as a best temperature sensor in OHV TLs.