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Systematic Wavelength Shifts of the MOI si425 Sensing Interrogator at Low Signal Intensities

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For the investigation of the performance of elastic rail pads several FBG sensors were embedded into these very small structures (195 x 150 x 7 mm³). The elastic pads are used in railway engineering as damping elements in between the rail and the sleeper. They are deformed during the passage of a train by 3 % in the horizontal direction and 10 % in the vertical direction.

In field investigations with an embedded FBG temperature sensor, atypical signals with wavelength changes of about 5 nm within a fraction of a second were observed. But as the sensor is not able to follow such fast temperature changes, these signals must be affected. Changes of the signal intensity depending on the applied load and the pad's compression were identified as one possible error source.

For the interrogator used there is no information available about the wavelength stability in the case of varying signal intensity. Thus a laboratory experiment was carried out, where the signal intensities were artificially attenuated. Several commercially available FBG sensors of different manufacturers were used in the experiment.

The wavelengths were found to be unaffected over a rather wide dynamic range. However, at very low signal intensities, systematic wavelength shifts of up to 20 pm were observed. These are correlated to the signal intensity and thus it is possible to model them and to correct affected data.

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Ключевые слова:

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Abstract

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2. Motivation: An experience from a field experiment

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Acknowledgements

References