Passive guided wave imaging with Fiber Bragg Gratings: composite application

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Abstract. In this communication are presented imaging results of defects in composite CFRP panels using guided wave imaging algorithms such as Delay and Sum (DAS) and Excitelet. Guided wave imaging is commonly applied to active data: each sensor acts successively as a source whereas other sensors measure the propagated signals. In this work, the imaging is obtained from passive data, that is, the signal corresponding to each emitter-receiver couple is reconstructed thanks to the cross-correlation of the ambient noise measured simultaneously by every couple of sensors. The passive imaging approach allows the use of sensors unable to generate guided waves, namely Fiber Bragg Gratings (FBG) in optical fibers. FBG present a much smaller intrusiveness compared to traditional piezoelectric sensors, while allowing dense multiplexing and being robust to harsh environment. Results are shown for two instrumentations, the first one uses piezoelectric transducers while the second uses FBG sensors only. The imaging results presented here show the feasibility of passive imaging in composite panels and the possibility of using FBG at ultrasonic frequencies, reducing the intrusiveness of the sensors integrated on the structure in the context of Structural Health Monitoring (SHM).