



Monitoring by holographic radar systems

Ilaria Catapano, Lorenzo Crocco, Antonio Affinito, Gianluca Gennarelli, and Francesco Soldovieri

Istituto per il Rilevamento Elettromagnetico dell'Ambiente, Consiglio Nazionale delle Ricerche, Napoli, Italy
(soldovieri.f@irea.cnr.it, +39 081 5705734)

Nowadays, radar technology represents a significant opportunity to collect useful information for the monitoring and conservation of critical infrastructures. Radar systems exploit the non-invasive interaction between the matter and the electromagnetic waves at microwave frequencies. Such an interaction allows obtaining images of the region under test from which one can infer the presence of potential anomalies such as deformations, cracks, water infiltrations, etc. This information turns out to be of primary importance in practical scenarios where the probed structure is in a poor state of preservation and renovation works must be planned.

In this framework, the aim of this contribution is to describe the potentialities of the holographic radar Rascan 4/4000, a holographic radar developed by Remote Sensing Laboratory of Bauman Moscow State Technical University, as a non-destructive diagnostic tool capable to provide, in real-time, high resolution subsurface images of the sounded structure [1]. This radar provides holograms of hidden anomalies from the amplitude of the interference signal arising between the backscattered signal and a reference signal.

The performance of the holographic radar is appraised by means of several experiments. Preliminary tests concerning the imaging below the floor and inside wood structures are carried out in controlled conditions at the Electromagnetic Diagnostic Laboratory of IREA-CNR. After, with reference to bridge monitoring for security aim, the results of a measurement campaign performed on the Musmeci bridge are presented [2].

Acknowledgments

This research has been performed in the framework of the “Active and Passive Microwaves for Security and Sub-surface imaging (AMISS)” EU 7th Framework Marie Curie Actions IRSES project (PIRSES-GA-2010-269157).

REFERENCES

- [1] S. Ivashov, V. Razevig, I. Vasilyev, A. Zhuravlev, T. Bechtel, L. Capineri, The holographic principle in subsurface radar technology, International Symposium to Commemorate the 60th Anniversary of the Invention of Holography, Springfield, Massachusetts USA, October 27-29, pp. 183-197, 2008.
- [2] I. Catapano, L. Crocco, A. F. Morabito, F. Soldovieri, “Tomographic imaging of holographic GPR data for non-invasive structural assessment: the Musmeci bridge investigation”, Nondestructive testing and evaluation, vol. 27, pp. 229-237, 2012.