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IBIS-S SAR system for the remote survey of an armed concrete beam: the experiment of Montagnole (French Alpes) within ISTIMES project

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A ground-based Synthetic Aperture Radar (SAR), named IBIS-S system and developed by Ingegneria dei Sistemi (IDS), was applied to measure the frequency response of an armed concrete beam during a specific test.
The test was conducted at the Laboratoire Central des Ponts et Chaussées (LCPC) in Montagnole (French Alpes). The main purpose of this laboratory is to certify the potential of metallic protection nets which are used in mountains for preventing catastrophic rockslides, but it can also be used as a purely research-oriented facility to test any other system such as a concrete structure or an embankment.
The LCPC consists of a crane positioned on the top of a cliff, at about 80 m of eight, capable of lifting heavy loads that can be dropped from different heights.

An armed concrete beam was placed at the base of the cliff and was leaned on two bearing systems over two pillars in steel. The experiment, which lasted four days, regarded the study of the progressive damage of the beam caused by falling steel blocks of different load and from different heights. At the beginning the beam was affected by an indirect impact and only on the last day it was hit directly by the falling blocks.

The IBIS-S instrument was located 70 m far from the impact area and pointed toward the armed concrete beam. In order to improve the accuracy of its measurements a corner reflector was placed on the beam. The measurements, obtained by using a sampling frequency of 100 Hz, allowed us to obtain the frequency responses of the armed concrete beam to the different stresses generated during the experiment, without requiring any contact with the structure.

Analysis of results obtained will be proposed and discussed. Comparison with results obtained for first numerical simulation of a direct impact over the beam will presented and analysed.
Discussion will be focused on the frequency mode changing with damage evolution at structure level and also with the residual deformation after direct heavy mechanical impact onto the armed concrete beam.

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