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IBIS-S

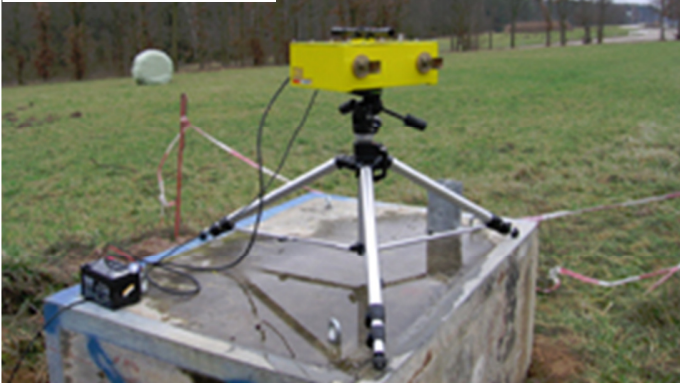
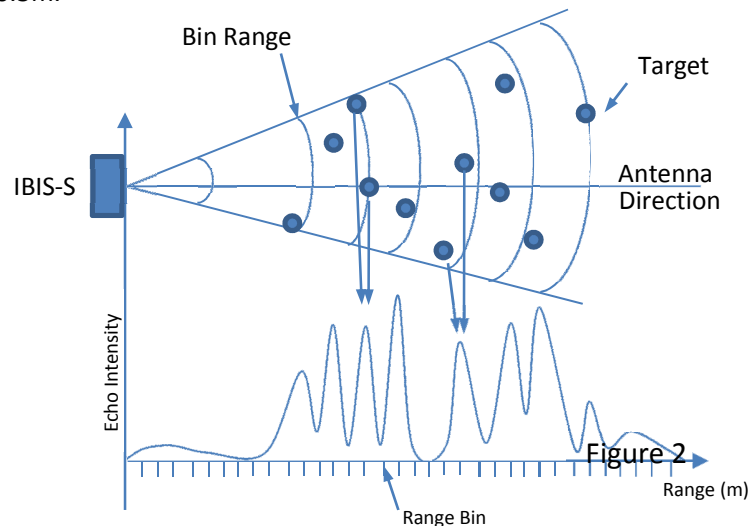


Figure 1. IBIS-S system with Tripod

TECHNOLOGY

The **IBIS-S** uses microwave interferometry, which is a new technology for remote static and dynamic monitoring of structures and/ or soil displacements. The **IBIS-S** is the fruit of a long term research activity performed in collaboration by IDS and University of Florence. The instrument can operate remotely, with no contact required whatsoever with the target to be monitored and that it can supply practically continuous deformation maps (not just punctual information as provided by current contact sensors), all with an unprecedented measurement speed and accuracy compared to current technology.

The radar beam from the **IBIS-S** illuminates the entire scenario to be investigated; the radar receiver then measures the signal reflected. The high resolution capacity over distance provided by the radar produces a displacement map showing the displacement of many targets over the entire range; in fact, the **IBIS-S** can sample the target as close as 0.5m. In principle this is as if a vast number of sensors were applied to the target, one every 0.5m.



In reality, the radar samples the target displacements, "detecting" even very small changes between scans. If the objective is to sample the displacement of predefined points, passive radar reflectors can be applied to the points of interest if required.

Thanks to the microwave technology used, the **IBIS-S** can detect displacements of each point on the target up to an

INTRODUCTION

The modern conceptual design of civil engineering structures often includes the specification of the tests required for the Structural Health Monitoring (SHM) of the structure and sometimes the design of permanently installed monitoring system. Among the different techniques of experimental testing and monitoring, ambient vibration tests have recently become the main experimental method available for assessing the dynamic behaviour of full-scale structures.

Ambient vibration testing of full-scale structures is generally performed using piezoelectric or accelerometers since these sensors are relatively inexpensive, accurate and have adequate technical characteristics (i.e. bandwidth etc).

However, these devices exhibit well-known problems, especially related to mounting and hardwiring from the transducer to the data acquisition system. When dealing with large structures, the effort associated with mounting and wiring the accelerometers is typically the most time-consuming task associated with the test.

Also, accelerometers do not provide a direct measurement of displacement, which is often of interest for the SHM of a structure in operational conditions. Within this context, the use of innovative non-contact systems for vibration measurement appears to be very attractive and especially applications of laser-based systems. Introducing the **IBIS-S** which is such a system.

Papworths Construction Testing Equipment- Australia's leading Concrete NDT Equipment Supplier



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oscillation frequency of 50 Hz and with a detection limit of less than 0.01 mm.

This great sensitivity in detecting displacements is due to the use of interferometry, measuring the phase differences of the radar waves reflected from each point. Each sub-millimetric displacement gives rise to a phase difference of the reflected wave, detectable by the **IBIS-S**.

APPLICATIONS

Static

- Structural load testing
- Structural displacement and collapse hazards
- Cultural heritage preservation

Dynamic

- Structural resonance frequency measurement (figure 3 and 4 show typical data output)
- Structural modal shape analysis
- Real time monitoring of deformation

ADVANTAGES OVER OTHER TECHNIQUES

- Remote sensing at a distance of up to 1 km.
- Displacement accuracy up to 0.01 mm.
- Real-time simultaneous mapping of deformations
- Fast installation and operation
- Static and dynamic monitoring
- Structural vibration sampling up to 100 Hz
- Operates day-night, in all weather conditions
- Provides direct displacements, not derived quantities

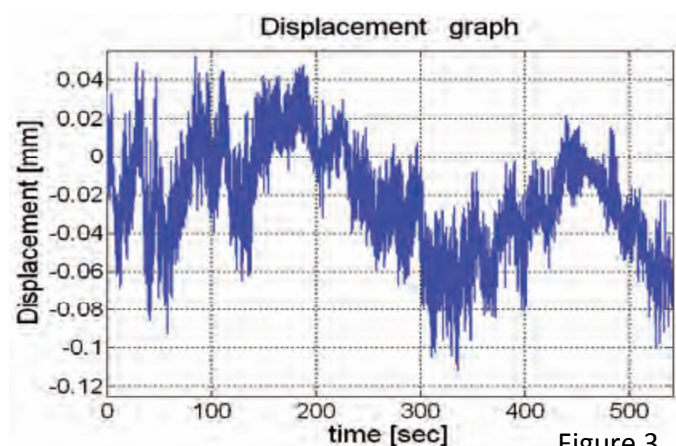


Figure 3

EQUIPMENT

The **IBIS-S** radar system consists of a sensor module, a control PC and a power supply unit. The sensor module (see figure 1) is a coherent radar generator, which transmits

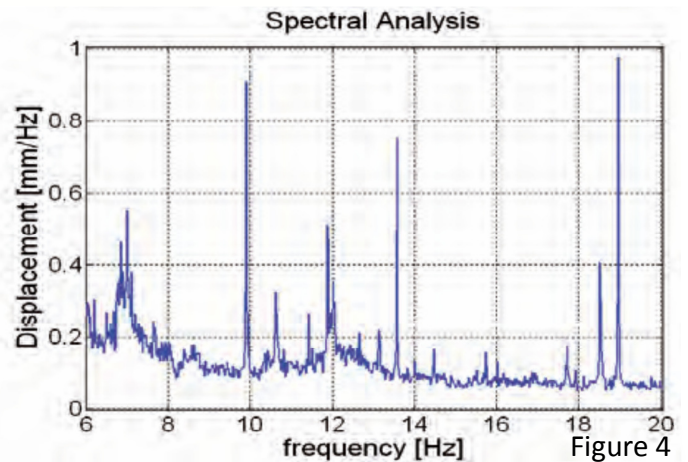


Figure 4

and receives the electromagnetic signals. The **IBIS-S** radiates at a central frequency of 16.75 GHz with a maximum bandwidth of 300 MHz. The sensor module is installed on a tripod equipped with a rotating head, allowing the sensor to be orientated in the desired direction. The module has a USB interface for connection with the control PC and an interface for the power supply module. The control PC is provided with the software for the system management and is used to configure the acquisition parameters, store the acquired signals, process the data and view the initial results in real time. The power supply unit is a 12 V battery unit.

ABOUT PCTE

PCTE have over 30 years experience in the measurement and testing of concrete. With experience in research, consulting and construction they are able to assist you in reviewing the issues and developing solutions. PCTE can provide more than just the equipment. They can provide leading technical support for your business.

OTHER EQUIPMENT

The IDS range includes the **IBIS-S**, **Aladdin GPR** for concrete structures and **RIS GPR** for utility and pavement applications.

The Olson Instrument range also includes the **NDE360**, **CTG**, **Freedom Data PC** and **DAS** as well as the resonance tester. The full Proceq range of equipment is available for in situ non destructive concrete measurement, including Schmidt Hammers, Covermeters, Half Potentials, Resistivity, Ultrasonics and Permeability.

We also supply **Intelli-Rock** maturity, temp and humidity logging systems, corrosion rate monitoring equipment, Ground Penetrating Radar.

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