

GPR Diagnostics of columns in archaeological contexts

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In the last decade the use of Ground Penetrating radar (GPR) applied to cultural heritage has been strongly increasing thanks to both technological development of sensors and softwares for data processing and cultural reasons such as the increasing awareness of conservators and archaeologists of the benefits of this method in terms of reduction of costs and time and risk associated with restoration works. This made GPR a mature technique for investigating different types of works of art and building elements of historical interest, including masonry structures, frescoes, mosaics [1-3], in the context of scientific projects, decision support activities aimed at the diagnosis of decay pathologies, and educational activities.

One of the most complex building elements to be investigated by GPR are the columns both for the geometry of the object and for the several expected features to be detected including fractures, dishomogeneities and metallic connection elements. The work deals with the Ground Penetrating Radar diagnostic surveys at the prestigious archaeological site of Pompei. In particular, GPR surveys were carried out in two different areas, Palestra Grande and Tempio di Giove.

The first campaign was carried out also as educational activity of the "International School "GEOPHYSICS AND REMOTE SENSING FOR ARCHAEOLOGY". The School aimed at giving the opportunity to scholars, PhD students, researchers and specialists in Geophysics, Remote Sensing and Archaeology to deepen their knowledge and expertise with geophysical and remote sensing techniques for archaeology and cultural heritage documentation and management. This survey was carried on two kinds of columns, with circular and rectangular section in order to detect possible hidden defects affecting their integrity. The second survey was carried out at Tempio di Giove, on request of the Soprintendenza Pompei, in order to gain information about the presence of reinforcement structures, which may be put inside the columns during a previous work carried out about thirty years ago and whose memory documentation was lost.

Both the GPR surveys were carried out by using the K2-RIS IDS system equipped with a high frequency antenna, working at the central frequency of 2GHz. Moreover, the imaging results have been obtained by processing the raw data by means of the end-user friendly software interface designed at the Institute for Electromagnetic Sensing of the Environment – National Research Council of Italy. This interface was some years ago to make possible a simple management of 2D and 3D microwave tomographic approaches based on the Born approximation [4-6]. The GPR surveys have confirmed the presence of metallic elements inside few of the investigated columns.

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