



## **Experimental methodology to determine the radiation pattern in GPR antennas**

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The knowledge of the properties of the radiation pattern of the GPR antennas is one of the main factors in order to obtain accurate interpretations using ground-penetrating radar (GPR) data. In civil engineering studies is quite important this evaluation in order to improve the non destructive testing techniques. The results of this experimental calibration allow us to determine the minimal distance between reinforcement elements embedded in a concrete structure that the antenna is able to distinguish, hence, it allows to estimate the resolution of each antenna in the different studied media. Usually, the main GPR radiation is emitted into the ground in an elliptical lobe with its apex is located at the center of the transmitting antenna; but other part of the energy is emitted in several secondary lobes around the main one. The information provided by the GPR data is an average of the ground properties of the illuminated area, where the reflection occurs. To determine the external shape of this pattern a laboratory experience has been designed and performed. The objective of this experience is to describe the external envelopment of the radiation pattern from the reflection of the energy in small metallic sheets that GPR antenna is able to detect. The measurements are taken in planes placed at different distances of the antenna, obtaining finally a volumetric description of the radiation pattern lobes. A 1.6 GHz centre frequency antenna was used in this study, due to it is an appropriate antenna to perform testing in concrete. Experimental results are compared with the results found in the literature.