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A new data processing for GPR surveys of columns

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Investigation of columns or circular pillars is a topic of particular interest for noninvasive diagnostic of historical buildings [1-3] but possibly also for modern structures or even natural cylindrical structures as tree logs [4]. The curvature of the surface to be investigated arises a problem with regard to the data processing. In particular, classical migration algorithms [5] cannot be applied because the diffraction hyperbolas [6] are distorted. An inversion algorithm accounting for the curvature of the surface of the column is needed. This has been set up making use of a 2D model and of a homogeneous background medium, which led to a Green's function proportional to Hankel function [7]. The primary sources were approximated by filamentary currents, which drove to an incident field also proportional to a Hankel function. The algorithm has been tested vs. experimental data on two concrete columns containing several anomalies inserted on purpose during their construction. The two columns constitute also a test site available for further investigations on request, and inserted in the international catalogue of the available test sites in the world implemented within the European Cost Action TU1208 [8]. The results will show that the algorithm is able to focus targets internal to the columns. However, there is a problem of inaccurate positioning of the antennas, due to the not fully correct working of the metric wheel of the antennas, which will deserve some further attention in the future.

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