C-thrue
Dual-polarized, high-frequency GPR
In June 2020 it became necessary to verify the presence of steel tie-rods (chains) inside the walls of the Church.

For this purpose C-thru, a high frequency GPR, was used, suitable for identifying metal elements in structural elements.
The results were divided according to the scheme shown in the picture.
The portion of the wall that has been scanned through the GPR is located, on the inner right side of the central nave, at a height of about 4.5m from the floor. The scans were carried out using the scaffolding, mounted to support the internal vaults of the Church.
Acquisitions with C-thru have been made starting from a height of 1.0m with respect to the plane of the internal scaffolding, moving the GPR downwards.

The pictures describes the movement scheme of the C-thru on the wall.
C-thru Survey in San Donato Church (Pisa)
Survey – Wall A

In the pictures is shown the portion of the area investigated with the C-thru on wall A of the Church.
The GPR tomographic pictures highlight the areas of focus of the electromagnetic signal, in red, to be correlated to the presence, inside the part, of the metal tie-rod. The depth of this element has been estimated around 15cm with respect to the scan plane.
The wall B is located on the left internal side of the Church.

Likewise the wall A, the areas straddling the position of the tie-rod have been detected, in order to verify its continuity within the masonry.
As it has been observed on wall A, the analysis of the GPR tomographies relating to wall B show a focus of the electromagnetic signal, in a position similar to the detections of wall A. We can see the presence and continuity of the long metal tie-rod the whole 5.23m wall. The depth of this element has been estimated around 15cm with respect to the scan plane.
Scans carried out on walls C and D did not reveal elements of continuity in the tomographic images, such as to suggest the presence of metal tie rods; in analogy to what is shown on walls A and B.
C-thru surveys were carried out on the scaffolding set up inside the chapel and the scanned areas were selected with the aim of detecting the presence, continuity and termination of the tie-rod visible on the facade of the Church.
The tomographic images obtained from the surveys of two portions of the wall made it possible to identify the position of the tie-rod, visible on the facade of the Church. The subsequent single scans, carried out with C-thru in various positions of the masonry, allowed to locate the termination of the metal element, the presence of which was confirmed by direct investigation. The position of the anchor plate is about 3m from the door jamb that connects the Church to the Chapel.
C-thru Survey in San Donato Church (Pisa)
Survey – Wall E

Anchor plate

Tie-rod
C-thru Survey in San Donato Church (Pisa)

Conclusions

Surveys carried out with C-thru have made it possible to:

• identify the presence, within the walls called A and B, of the tie-rods visible on the facade and to confirm their continuity along the entire light of both walls;

• accomplish the analysis of GPR tomographies relating to walls C and D that allow to exclude anomalies to hypothesize a continuity of the tie-rods detected in walls A and B;

• locate the tie-rod visible on the facade of the Church and to locate its termination on the brickwork of the chapel with the prospecting carried out on wall E.
Thank you!

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