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High Frequency GPR enhanced by microwave tomography for Westminster Abbey survey

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Westminster Abbey is famous throughout the world as the site of the British Coronations. The Abbey also houses the shrine dedicated to its founder, Saint Edward the Confessor, several royal burials and many burials and memorial stones related to important historical personages.

As part of a restoration programme, the Dean and Chapter commissioned a series of Ground Penetrating Radar (GPR) surveys of the 13th Century mosaic, known as the Cosmati Pavement, which forms the floor of the Sanctuary in front of the High Altar. These surveys were intended to investigate the structure and composition of the mosaic, to determine areas of delamination and also to investigate earlier structures beneath the mosaic [1]. A 4GHz antenna was used for the first of these surveys. These revealed not only the intricate structure of the mosaic but also the location of two tombs, one to the North and the other to the South of the Sanctuary. The details obtained indicated a range of grave goods still present and also suggested that partial human remains may be present. Modelling using a Finite Difference Time Domain approach (GPRMAX 2D and 3D) provided indications about the possible existence of a chalice and paten [1] in the northern tomb.

At the conference, we will show the results of the microwave tomographic approach [2] with the aim to re-investigate the tomb to the North side of the Sanctuary, that of Richard de Ware, the Abbot who brought both the masons and the stones from Rome. The analysis, comparing the results of a migration approach with that of a microwave tomographic one, is ongoing with the end to draw any further conclusions about the tomb contents.

[1] Utsi, E., "Improving definition: GPR investigations at westminster abbey," GPR 2006, the Proceedings of the 11th International Conference on Ground Penetrating Radar, J. J. Daniels and C. Chen, Eds., Ohio State University, Columbus, Ohio, Jun. 19–22, 2006.

[2] Pettinelli, E.; Di Matteo, A.; Mattei, E.; Crocco, L.; Soldovieri, F.; Redman, J.D.; Annan, A.P., "GPR Response From Buried Pipes: Measurement on Field Site and Tomographic Reconstructions," Geoscience and Remote Sensing, IEEE Transactions on , vol.47, no.8, pp.2639,2645, Aug. 2009