

## Fluxgate, Caesium Vapour and Excavation: Establishing the Validity of High Sensitivity and High Sample Density Magnetic Measurements

An extensive fluxgate gradiometer survey was undertaken on a large housing development at Northampton, England. The results, based on a 1.0 x 0.5 sample density, were unambiguous, with evidence for clear settlement foci. However, it was felt that some of the detail, especially for individual dwellings was missing. A research design was formulated to see if the missing elements could be located. In particular the strategy was aimed at establishing the differences, if any, between two magnetic instruments (fluxgate gradiometer and caesium vapour gradiometer) of different sensitivity on "typical" British soils and to establish what variation an increased sample density achieves.

Firstly, two enclosures and a "ring" ditch were re-surveyed using the Geoscan FM 36 and data collected on a 0.5 x 0.125 m grid. The area was then surveyed using a Scintrex Smartmag SM-4G on the same nominal sample intensity. The results were analysed to highlight:

- 1) The differences between the two fluxgate gradiometer surveys.
- 2) The interpretable differences between the fluxgate and caesium vapour data.

This study benefits from two further factors. Firstly, a "blank" area was surveyed to analyse soil noise in an effort to understand true levels of identifiable anomalies. Secondly, all areas were then stripped and archaeologically excavated. As a result, direct comparison has been made between the instruments and the physical reality of the buried evidence and not simply a qualitative "analysis" between greyscales. This work has far reaching implications about how we go about survey, both in terms of strategy and instrumentation.



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## Application of a 3D Probabilistic Multimethodological Tomography to Cultural Heritage

We present the results of a new 3D tomographic multimethodological procedure using a probability function, which allows the inference of the presence of anomalous sources in an optimum way without a priori constraints. In particular, we use Self Potential and Geoelectrical data, showing that the 3D tomographic reconstruction of sources, generated by both a natural electric field and an artificial one, can improve the information about prospected targets. As a matter of fact, the 3D Self Potential tomography aims at defining the charge distribution across

electric discontinuities and the 3D Geoelectric tomography aims at contouring the volumetric distribution of the resistivity. Therefore, the two tomographic procedures complement each other giving a more complete and reliable interpretation. We discuss the results from the study of the state of preservation of the Axum Stele (Rome, Italy). The 3D tomographic procedure allowed us to identify missing materials, microfaults and linking bronze dowels implanted inside the Stele between the overlaid blocks.