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Potassium Magnetometers as a Tool for Non-Destructive Testing (NDT)

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Optically pumped magnetometers, including Potassium are widely used in the Earth's field measurements for geophysical and archeological exploration, environmental studies, long term monitoring at Magnetic Observatories, UXO detection and other defense purposes.

Characteristics of the magnetometers of this type are very high resolution, up to 1 part per billion and, in case of potassium, absolute accuracies to 0.2 parts per million. Geometrical dependence of readings is, however, one order of magnitude worse.

Due to very high sensitivity and the relatively large sensor dimensions the magnetometers will register subtle changes in magnetic field, field gradients and alternate magnetic fields of any significance.

Any tests are therefore limited to isolated, magnetically quiet places or magnetically shielded chambers with artificial magnetic field. Gradiometric configuration though can greatly alleviate interfering influences of far magnetic sources, including diurnal magnetic variations of the Earth's magnetic field.

Detection of ferromagnetic particles and/or impurities can be effective for as small quantities as fractions of milligrams of iron and/or nickel. This allows for effective detection of UXO's and mines with even traces of ferromagnetic impurities or parts. As part of its Research and Development program, GEM has designed a hand-held potassium gradiometer for this purpose (as well as for archaeological surveys).