GEM - VLF SYSTEM
Portable fast shallow EM & resistivity solutions

NEW!

Since 1980
Developing Leading Geophysical Technology

GEM Systems is the global leader in the manufacture and sale of high precision magnetometers.

GEM Systems is the only commercial manufacturer of Overhauser magnetometers, that are accepted and used at Magnetic Observatories over the world.

Our Potassium Magnetometers are the most precise magnetometers in the world.

Our Proton sensors are considered the most practical and robust magnetometers for general field use.

Proven reliability based on R+D since 1980.

We deliver fully integrated systems with GPS and additional survey capability with VLF-EM for convenience and high productivity.

Today we are creating the absolute best in airborne sensors and are leading the way with smaller and lighter sensors for practical UAV applications.

GEM Systems large potassium sensors offer the highest sensitivity (20-50 fT) for use in natural hazard research and global ionospheric studies.

Our Leadership and Success in the World of Magnetics is your key to success in applications from Archeology, Volcanology and UXO detection to Exploration and Magnetic Observations Globally.


Robust GEM Systems GSMV-19W Walking VLF shown with optional GPS.

Portable Walking VLF System

GEM Systems GSMV-19W portable VLF system is a robust tool for environmental and exploration purposes.

Walking VLF

This new evolved system builds off our proven airborne technology. GEM Systems VLF takes **true** measurements of the Vertical in-phase & Out-of-phase components as % of total field within the VLF frequency range of 15 - 30kHz. Many older systems only measure the total field and quadrature components of the field. Like the airborne system it features two 3-coil sensors and acquires data from 2 VLF transmitting stations simultaneously without sensor orientation and without stopping.
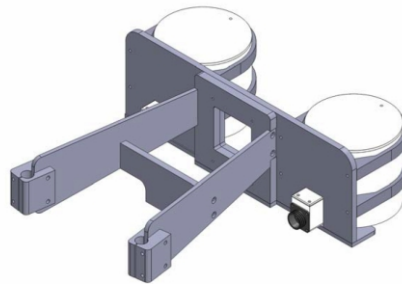
3 light weight Orthogonal Air Coils provide reduced noise and allow true in-phase and quadrature data to be gathered for more accurate results.

The GSMV-19W also has a correction for the tilt level of the VLF sensor for up to 25° from the horizontal plane plus pitch roll and yaw measurements are recorded.

VLF Theory

The VLF-EM survey method is a passive electromagnetic system that utilizes distant, globally positioned, transmitters broadcasting at frequencies in the range of 15kHz and 30kHz. (in some cases a private/custom transmitter may be utilised in regions with sparse transmitters) In a VLF investigation, the magnetic field components of the transmitted signal, which are effected by local ground conditions, are measured.
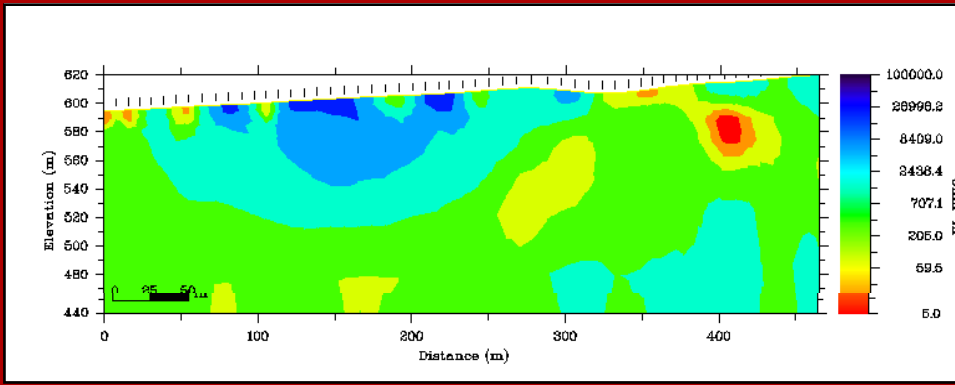
Applications are many;
• Resistivity imaging and bedrock mapping
• Delineate contrasts in conductivity at depth
• Map geological contacts, faults
• Search for mineralized bodies
• Water exploration
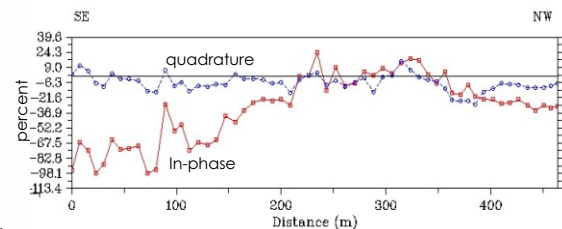
In-phase and quadrature VLF data
(Transmitter 24.0 kHz. Cutler Maine, data used to produce the resistivity section above)

Our World is **Magnetics.**

Map resistivity up to 100 metres
Inversion model produced with EMTOMO software

WHY USE VLF

VLF surveying has been utilized since 1964 as a rapid means to find large linear conductive features to provide information about the subsurface for geological mapping. Large area surveys have provided regional structural information but due to a lack of quantitative information such as depth to structure information the method had been marginalized until quite recently. In 2007, the Geological Survey of Sweden demonstrated that not only could VLF data be rapidly and efficiently collected it could provide excellent structure and resistivity information to depths of 100 m and theoretically to over 200 m.

Advances in both technology to collect VLF data properly and advances in computer technology and mathematical inversion techniques have provided the industry with a new cost-effective means for imaging the top 100 metres of the earth.

The robust GEM multi frequency GSMV-19W VLF system, provides the user with a practical way to collect meaningful resistivity information in a very cost effective manner. In addition, the VLF system can be easily combined with GEM magnetometers for additional subsurface insight.


Global VLF frequency transmitter stations.

GEM/EMTOMO - VLF Resistivity

GEM uses the **VLF2DMF** Software platform created by EMTOMO ™. This program provides 2D inversion of multi-frequency VLF-EM data.

The package includes a map module for display of the survey, the selection of profiles for inversion and displays the survey results. The program can also be used for modeling studies. The user can build a complex resistivity model and calculate its VLF-EM response. Features include;

• 2d resistivity sections
• Resistivity depth plan slices
• Forward Modeling
• Fraser Filter
• Karous-Hjelt Filter (current density sections)

The inversion procedure used in **VLF2DMF** is two-dimensional (2-D) and is based on the Occam technique (e.g. DeGroot and Constable 1990, Sasaki 1989, Sasaki 2001).The forward modelling of **VLF2DMF** program is based on the finite-element method.
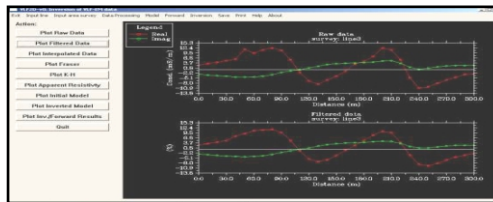
VLF2DMF 2D inversion software interface.