SUPER GRADIOMETER

Precise Earth Monitoring Solutions

GEM SYSTEMS

Celebrating 35 Years
Leading the World of Magnetics

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

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

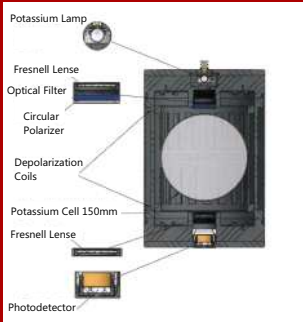**Our Potassium Magnetometers are the most precise magnetometers in the world.**

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

Proven reliability based on 35 years of R&D

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 in super sensitive potassium sensors specially designed for highly sensitive studies with super large sensors for research of Natural Hazards globally and now smaller and lighter sensors for practical UAV applications.

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 Observation **Globally.**

Potassium Lamp
Fresnell Lense
Optical Filter
Circular Polarizer
Depolarization Coils
Potassium Cell 150mm
Fresnell Lense
Photodetector

The resolution of the GEM 3D-Super Gradiometer lies in the range of femto Tesla for the geomagnetic field. This corresponds to a resolution of 2mm on a measuring tape around the equator.

The SuperGradiometer utilises GEM Potassium sensor technology and provides enhanced sensitivity to small disturbances in the gradient field in the picoTESLA range for specialized stationary applications.

GEM - SuperGradiometer System

The GEM Super Gradiometer GSMP-20S3 was designed to provide extremely precise gradient measurements of the Earth's magnetic.

Technically Superior

The GSMP-20S3 System is comprised of a dedicated data acquisition receiver and 3 very large high precision Potassium magnetometers configured to measure gradients across variable distances in different directions.

100 - 300 metre cable

SuperGrad Max system with 3 separate super high sensitivity Potassium magnetometers and dedicated Data acquisition system provide upto 3 gradient measurements in XY and Z. SuperGrad Max provides sensitivity to .03 picoTESLA.

S2
140m
100m
S3 100m 100m S1
Computer
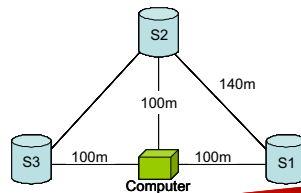
SuperGrad sensor configuration
100 metre sensor cable shown

SuperGrad - Observation and Earthquake Research

The GSMP-20S3 was developed with the Russian research group of Dr. E. Alexandrov in response to the **United State Geological Survey's (USGS)** requirement for an ultra-high sensitivity magnetic gradiometer. It is the highest sensitivity total field measuring device ever developed with a 0.05 pT root-mean-square (rms) sensitivity at a sampling rate of 20 Hz (averaged over a 1 sec. interval). This ultra-high sensitivity is well over an order-of-magnitude more sensitive than any other system. GEM's new SuperGradiometer is designed to improve detection of subtle responses and potentially lower the threshold of detectable earthquakes.

For earthquake research, the GSMP-20S3 can achieve gradient sensitivities of 1fT/m (10-15 T/m) with a sensor spacing of 50m - a major advantage over traditional long-baseline measurements (i.e. total field with reference station for removal of diurnals) which have sensitivities on the order of 1nT. The GSMP-20S3 also minimizes cultural noise (i.e. from nearby infrastructure), and minimization of 1 / f noise that typically degrades results from other types of measurements (ex. Electromagnetic). Note that f is the frequency of the piezomagnetic signal from the event.
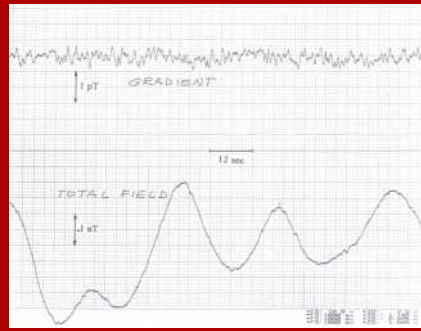
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Our World is **Magnetics.**

SuperGradiometer MAX installed near Eilat, geophysical laboratory Israel. Sensors and mounting platforms are shown. (<1pTesla noise level)

Global Applications

CONRAD Earth Observation Observatory, Trafleberg in Lower Austria

SuperGrad Features:
- High Sensitivity (.03pT or .05pT @1 Hz
- Long term stability for accuracy and reliability of measurements
- Unsurpassed immunity to temperature changes and aging of materials
- High speed vector measurements using Potassium technology
- Optimized signal to noise ratio through advanced Potassium design
- Rapid data output using custom Windows-based display software
- Efficient remote control operation / interrogation using RS-232 and USB
- Flexibility to enable real-time transmission via RS-232 and modem to satellite/phone
- Internet-based upgrades (from the office or field)

SuperGrad Standard system (.05 picoTesla sensitivity @ 1Hz., sensor weight 3kg.)

GEM SYSTEMS LEADING technology developments

"Gem Systems has, from its beginnings, strived to develop and make useable top technologies for measurement of Earth's magnetic field. Decades ago it developed and popularized Overhauser and Potassium Optical Magnetometers that are still unique GEM Systems products. Most sensitive Potassium magnetometers, having very narrow Electron Spin Resonance spectral lines about 0.1nT and very high signal to noise ratio up to 10000:1 reached some 50fT sensitivities and excellent absolute accuracy. For some time we had no applications for the system, it was too sensitive for either Geophysical Surveys or Magnetic Observatories.

GEM then started a novel method of gradiometric Earthquake Research with the installation over a decade ago of "Supergrads" – 3 sensor gradiometers in Israel and Mexico. Some magnificent precursors have been detected in Southern Mexico. The GEM Super Gradiometer installation in Israel has worked uninterrupted for some 13 years, collecting 20 readings every second.

This proven technology has now been installed at the brand new CONRAD Observatory in Austria.
– GEM thanks to the efforts of the visionary Peter Melichar and his associates. We are very happy and proud to contribute to the CONRAD Observatory a pioneer in the most sensitive observatory measurements of the Earth's magnetic field not yet seen in the World."

11/13/2015