SUPER GRADIOMETER

Precise Earth Monitoring Solutions

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 with smaller and lighter sensors for practical UAV applications. We are also making very large sensors with the best sensitivity (30-50fT) 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 Observation **Globally.**

"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."

CONRAD Earth Observation Observatory, Trafleberg in Lower Austria

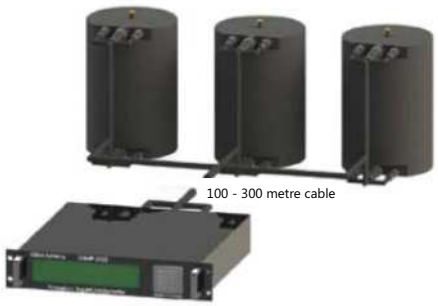
The SuperGradiometer utilises GEM Potassium sensor technology and provides enhanced sensitivity to small disturbances in the gradient field in the picoTESLA range for specialized stationary applications.

GEM - SuperGradiometer System

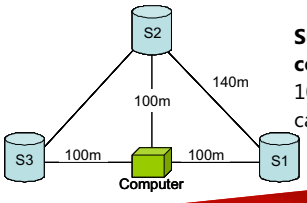
The GEM Super Gradiometer GSMP-20S3 was designed to provide extremely precise gradient measurements of the Earth's magnetic field.

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.



SuperGrad system with 3 separate super high sensitivity Potassium magnetometers and dedicated Data acquisition system provide upto 3 gradient measurements in XY and/or Z. SuperGrad provides sensitivity to .03 or .05 picoTESLA depending on sensor size. (large, 150mm sensor shown)



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 0.03 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 provide new magnetic data from a variety of large gradient measurements aimed at the detection of subtle changes in the earth's field and potentially lower the threshold of detectable earthquakes.

For earthquake research, the GSMP-20S3 can achieve gradient sensitivities better than 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 only 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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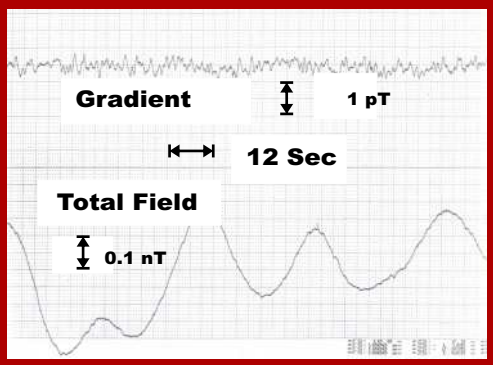
12/23/2015



SuperGradiometer installed near Eilat, geophysical laboratory Israel. Sensors and mounting platforms are shown. (Sample data Total Field and Gradient with <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)

SuperGradiometer - Mini (80mm small sensor 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 advanced technologies for the measurement of the Earth's magnetic field. Decades ago it developed and commercialized Overhauser and subsequently Potassium Optically pumped Magnetometers to bring increased sensitivity and reliability to the fields of Archeology and Exploration. The Overhauser technology was quickly accepted as a standard for Observatory Total Field measurements. Now with advances in large sensor sensitivity, researchers and observatories can benefit through increased knowledge about the subtleties and nuances never before noticed in the magnetic field of the Earth and how it relates to Solid Earth Physics, Earthquake research and studies of the Ionosphere.

In 2003, GEM started a novel and unique method of gradiometric measurements utilising large never before seen – 3 sensor gradiometers in Israel and Mexico. The GEM Super Gradiometer installation in Israel has worked uninterrupted for some 15 years, collecting 20 readings every second, providing a vast database for magnetic research.

Three complete SuperGrad systems have recently been installed at the brand new CONRAD Observatory in Austria due to the efforts of the visionary Peter Melichar and his associates. "We are very happy to contribute to the CONRAD Observatory a pioneer in the most sensitive observatory measurements of the Earth's magnetic field." Ivan Hrvoic, President GEM Systems.

Specifications

Performance / Sensor
SuperGRAD and SuperGRAD Mini

SuperGrad Sensitivity: 0.03 pT @ 1Hz
Gradient sensitivity: 1 fT/m
with 50m sensor spacing
SuperGrad Mini Sensitivity: 0.05 pT @ 1Hz
Gradient sensitivity: 10 fT/m
with 50m sensor spacing

Resolution: 0.001 pT for up to 20 readings /sec.
Absolute Accuracy: 0.1 nT
Time Base Stability: 0.01 ppm over -40°C to +55°C
Long Term Stability: better than 10 pT / year
Dynamic Range: 20,000 to 100,000 nT
Operating Temperature: -40°C to +55°C
Power Consumption: 22-60 V
80 W average, 250 W maximum
Tuning: wideband system auto tuning
Sensor Orientation: 45 +/- 35 degrees off the magnetic field direction

Sampling rate
1 to 20 samples / second

Output
Digital: serial RS232C
Analog: 4 programable channels
Visual: alphanumeric LCD
adjustable scales

Dimensions & Weights
SuperGrad Console: 48x9x41cm (19 x 3.5 x 16 in)
4.5 kg (10 lb)
Standard Sensor: 20.3 x 10.2 cm (8 x 4 dia in)
3.0 kg / 6.6 lb
Larger Sensor: 26.3 x 23dia cm (12 x 8.25dia in)
6.0 kg (13.2lb)
Sensor Electronics: 10 x 5 x 10 cm (4x2x4in)
Super Grad Cable Lengths: User-specified, (100 - 300m)
Super Grad Mini Cable Length: 50m

Standard Components
GSMP-20S3 console, Power Supply Unit
3 Large Potassium sensors
with 3 sets of 50 or 100m cabling, GSMP-20S3 software, RS-232 cable and instruction manual.
Optional GPS for precise time values.
GEM also provides a Radon option for SuperGrad.

The GEM Super Gradiometer GSMP 20S3 & 20S3M systems comes complete with an industry leading three year warranty

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