

# GEM SYSTEMS

# Overhauser Magnetometers

Magnetometer - Walking Magnetometer GSM-19/19W

Gradiometer - Walking Gradiometer GSM-19G/19GW

Since 1980

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 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 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.**



**GEM Overhauser Magnetometer system. It can be configured with additional survey sensors for simultaneous gradiometer readings as well as VLF. System configurations can also include walking mode and gps.**

## GEM - Overhauser Magnetometers

The GEM GSM-19 Overhauser total field magnetometer and the GSM-19G Gradiometer provide improved data quality and greater absolute accuracy than Proton magnetometers, while providing a robust and comparable system to costlier Cs magnetometers for ground applications.

### Technically Superior

The GSM-19 Overhauser instrument is the total field magnetometer / gradiometer of choice in today's earth science environment. GEM Overhauser technology provides a unique blend of physics, chemistry and engineering. Sophisticated system design and solid experience in the field of magnetics help to clearly differentiate it from other quantum magnetometers.

The GSM-19 is a standard in many fields, including:

- Mineral exploration
- Environmental and engineering
- Pipeline mapping
- Airborne basestation
- Unexploded Ordnance Detection
- Archaeology
- Magnetic observatory measurements
- Volcanology and earthquake prediction

## Taking Advantage of the Overhauser Effect

Overhauser effect magnetometers are essentially proton precession devices - except that they produce an order-of magnitude greater sensitivity.

The Overhauser effect occurs when a special liquid (with unpaired electrons) is combined with hydrogen atoms and then exposed to secondary polarization from a radio frequency (RF) magnetic field. The unpaired electrons transfer their stronger polarization to hydrogen atoms, thereby generating a strong precession signal that is **ideal for very high sensitivity total field measurements.**

In comparison with proton precession methods, RF signal generation also keeps **power consumption to an absolute minimum.** RF frequencies are well out of the bandwidth of the precession signal and they do not impair the sensitivity i.e. polarization and signal measurement can occur simultaneously - which enables **faster, sequential measurements** and increased cycling rates (i.e. sampling speeds). Measurements can therefore be near continuous.

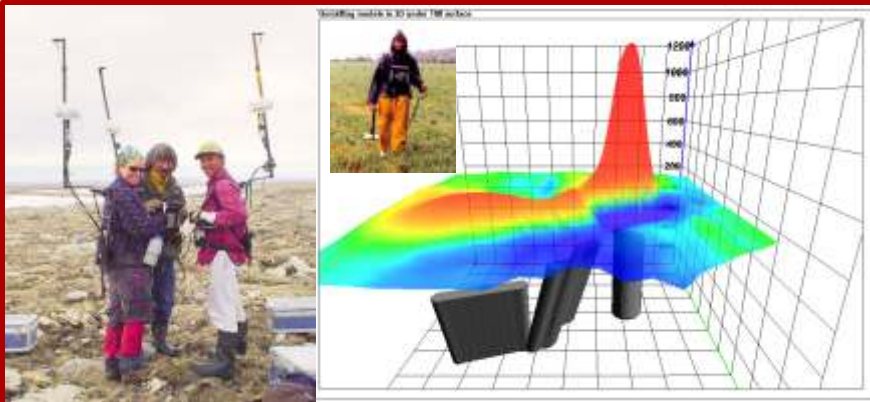
Our World is **Magnetics.**

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**Single sensor and gradiometer modes provide flexibility and fast sampling and are used for detecting changes in the magnetic field. Applications include; alteration mapping, structural geology, archeology and UXO applications**

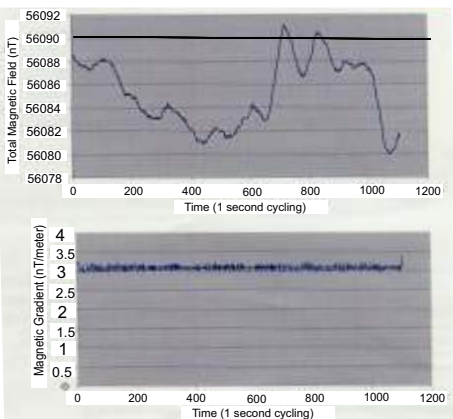
## GEM Overhauser Sensor Technology

GEM's sensors represent a **proprietary innovation** that combines advances in electronics design and quantum magnetometer chemistry. Each sensor head houses a **proprietary** hydrogen-rich liquid solvent which is combined with free electrons (free radicals) in the GEM laboratory to increase the signal intensity under RF polarization.



### GEM GSM-19 Overhauser Magnetometer

Small and light weight. Rugged plastic housing protects the internal components during operation and transport.



#### Sample data

Gradiometer data shows very low noise level (<0.2nT. peak to peak)

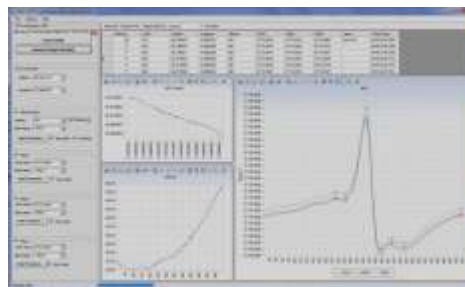
## GPS and Navigation

Along with basic GPS tracking, GEM provides a Navigation feature with real-time coordinate transformation to UTM and local grid. A survey "lane" guidance system with cross track display coupled with automatic end-of-line flag and guidance to the next line allows the operator to navigate seamlessly while carrying out the magnetic survey. Operators can define a complete survey on PC and download points to the magnetometer via RS-232 before leaving for the field.

### GEMLink+

#### Software for Processing Magnetic Data

**GEMLink+** processing software is provided with every GEM magnetometer system. **GEMLink+** provides all of the data visualization needed by the geoscientist to quickly assess the data quality in the field. The software provides diurnal correction, profile plotting, line path maps and some basic mapping and modeling functions. Files can be imported/exported to Google kmz format and coordinate transformations can be made.



**GEMLink+** Data QA/QC software with multi window data processing and plotting (screen shot)

## Specifications

### Performance

Sensitivity: Standard GSM 19 0.022 nT @ 1 Hz  
 GSM 19PRO 0.015 nT @ 1 Hz  
 Resolution: 0.01 nT  
 Absolute Accuracy: 0.1 nT  
 Dynamic Range: 20,000 to 120,000 nT  
 Gradient Tolerance: up to 10,000 nT/m  
 Samples at: 60+, 5, 3, 2, 1, 0.5, 0.2 sec  
 Operating Temperature: -40°C to +50°C

### Operating Modes

**Manual:** Coordinates, time, date and reading stored automatically at upto 0.2 sec.

**Base Station:** Time, date and reading stored at 1 to 60 second intervals.

**Remote Control:** Optional remote control using RS-232 interface.

**Input / Output:** Input/Output: RS-232 using 6-pin weatherproof connector with USB adapter.

### Memory - (# of Readings in millions)

Mobile: 1.4M, Base Station: 5.3M,  
 Gradiometer: 1.2M, Walking Mag: 2.6M

### Dimensions

Console: 223mm x 69mm x 240 mm  
 (8.7x2.7x9.5in)  
 Sensor: 175mm x 75mm diameter cylinder  
 (6.8in long by 3 in diameter)

### Weights

Console with Belt: 2.1 kg  
 Sensor and Staff Assembly: 1.0 kg

### Standard Components

GSM-19 console, GEMLink software, battery, harness, charger, sensor with cable, RS-232 cable and USB adapter, staff, instruction manual, and shipping case.

### Options

Gradient Magnetometer, Walking Mode, Multi sensor

### Available GPS

#### GPS Time Only (Option A)

#### Standard GPS (Option B):

- 0.7m SBAS (WAAS, EGNOS, MSAS)
- < 1.5m non-SBAS

#### Enhanced GPS (Option C):

- 0.6m SBAS (WAAS, EGNOS, MSAS), GLONASS, BeiDou, Galileo
- Consult GEM for availability

#### High resolution GPS (Option D):

- 0.6m SBAS (WAAS, EGNOS, MSAS), GLONASS, BeiDou, Galileo
- 40 cm or 4cm accuracy with NovaTel Correct (TerraStar Subscription required)
- Consult GEM for availability

**VLF Option :** Frequency Range: 15 to 30.0 kHz with up to 3 stations. Parameters: Vertical in-phase and out-of-phase components as % of total field.

**The GSM 19,19G,19W and 19GW systems come complete with an industry leading three year warranty**

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