4 - Sensor

Gradiometer (GSM-19GW4 v7.0)

GEM's unique Overhauser system combines data quality, survey efficiency and options into an instrument that matches costlier optically pumped caesium capabilities.

And the latest v7.0 technology upgrades provide even more value:

Integrated GPS option
<1.5m standard GPS for high resolution surveying
<1.0m OmniStar GPS
<0.7m for newly introduced CDGPS

25% increase in sensitivity over GEM's v6.0 system

Enhanced memory (increased by 32 times to 32 MB standard)

Programmable base station (for scheduling base stations in one of three modes)

Optional DGPS real-time and post-time processing (for metre to sub-metre positioning accuracy)

Rapid data transfer (using the advanced GEMLinkW software)

And all of these technologies come complete with the most attractive prices and warranty in the business!







Multi-sensor configurations can be implemented on various platforms. These platforms take advantage of GEM's 4-channel "true simultaneous" capabilities.

The GSM-19 v7.0 Overhauser instrument is the heart of GEM's unique 4 Sensor gradient magnetometer -- representing a unique blend of physics, data quality, operational efficiency, system design and options that clearly differentiate it from other quantum magnetometers.

With data quality exceeding standard proton precession and comparable to costlier optically pumped cesium units, the GSM-19 is a standard (or emerging standard) in many fields, including:

- Mineral exploration (ground and airborne base station)
- Environmental and engineering
- Pipeline mapping
- Unexploded Ordnance Detection
- Archeology
- 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. These "supercharged" quantum magnetometers also deliver high absolute accuracy, rapid cycling (up to 5 readings / second), and exceptionally low power consumption.

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 and eliminates noise (i.e. generating RF frequencies are well out of the bandwidth of the precession signal).

In addition, polarization and signal measurement can occur simultaneously -- which enables faster, sequential measurements. This, in turn, facilitates advanced statistical averaging over the sampling period and/or increased cycling rates (i.e. sampling speeds).

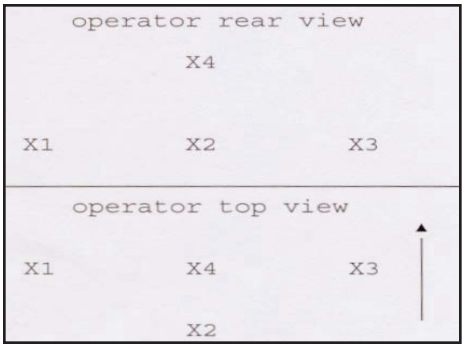
These advantages, combined with the use of 4 precisely timed, highly accurate sensors, provides a measuring system that is without comparison in the industry.

Configurations

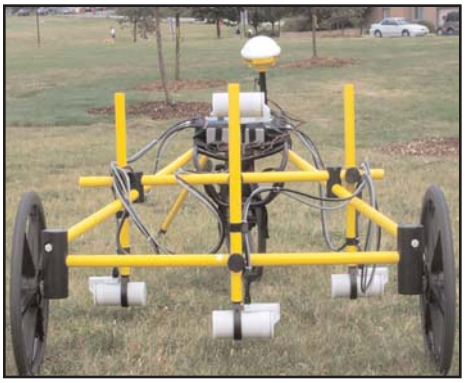
Key components that differentiate the GSM-19GW4 from other systems on the market include the sensor and data acquisition console. Specifications for components are provided on the right side of this page. In addition, the GSM-19GW4 can be configured in one of two arrays: 3D and Planar.

3D Configuration

With the 3D configuration, sensors are arranged in a "wedge-type" array with a leading (or trailing) sensor that is on a different elevation than the other sensors. The following diagram shows this configuration.



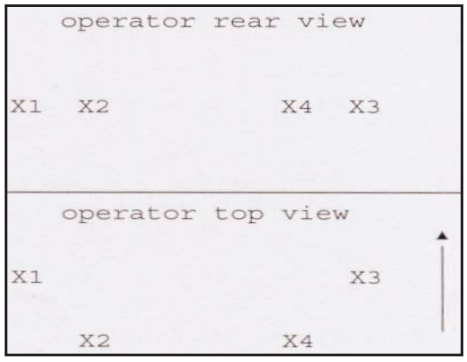
As we can see from the above image, sensor X4 is located at a different level than the other sensors in order to derive the 3D vertical gradient. Output values are determined automatically using the GEM system console.



This image of a cart-borne system shows the 3D array in operation. Note that an external GPS is also provided for highly accurate positioning of the survey results.

Planar Configuration

With the planar configuration, sensors are arranged in-line as shown in the following diagram.

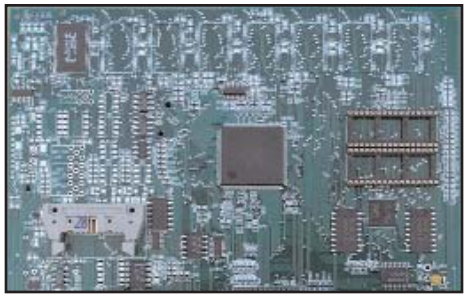


From a physical perspective, the sensor is a small size, light-weight assembly that houses the Overhauser detection system and fluid. A rugged plastic housing protects the internal components during operation and transport.

All sensor components are designed from carefully screened non-magnetic materials to assist in maximization of signal-to-noise. Heading errors are also minimized by ensuring that there are no magnetic inclusions or other defects that could result in variable readings for different orientations of the sensor.

Optional omni-directional sensors are available for operating in regions where the magnetic field is near-horizontal (i.e. equatorial regions). These sensors maximize signal strength regardless of field direction.

Data Acquisition



Specifications

Performance

Sensitivity:	0.022 nT / √Hz
Resolution:	0.01 nT
Absolute Accuracy:	+/- 0.1 nT
Range:	15,000 to 120,000 nT
Gradient Tolerance:	< 10,000 nT/m
Samples at:	60+, 5, 3, 2, 1, 0.5, 0.2 sec
Operating Temperature:	-40C to +50C

Operating Modes

Manual: Coordinates, time, date and reading stored automatically at minimum 3 second interval.

Base Station: Time, date and reading stored at 3 to 60 second intervals.

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

Input / Output: RS-232 or analog (optional) output using 6-pin weatherproof connector.

Storage - 32 MB (# of Readings)

Mobile:	1,198,372

# of readings assumes 4 fields with 4 bytes per field plus 8 bytes for GPS and 4 bytes for time value

Dimensions

Console:	223 x 69 x 240 mm
Sensor:	175 x 75mm diameter cylinder

Weights

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

Standard Components

GSM-19 console, GEMLinkW software, batteries, harness, charger, 4 sensors with cable, RS-232 cable, staff, instruction manual and shipping case.

Optional VLF

Frequency Range: Up to 3 stations between 15 to 30.0 kHz

Parameters: Vertical in-phase and out-of-phase components as % of total field. 2 components of horizontal field amplitude and total field strength in pT.

Resolution: 0.1% of total field

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