



# GPS Options for Magnetometers

**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.

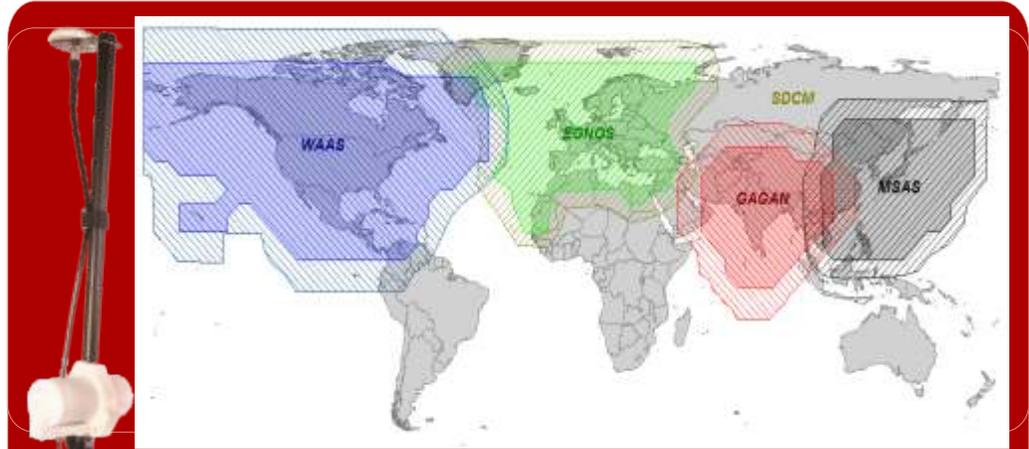
**Proven reliability based on R+D since 1980.**

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 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

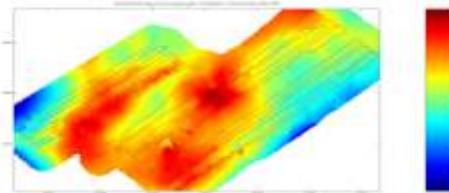
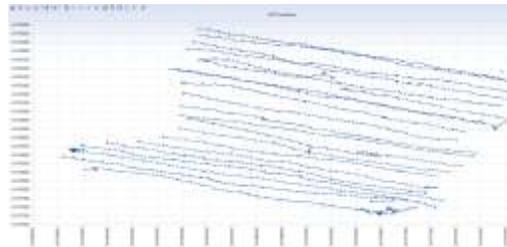
**Your key to success** in applications from Archeology, Volcanology and UXO detection to Exploration and Magnetic Observation **Globally.**



**Global "SBAS" Coverage areas. Integrated GPS with GEM's advanced magnetometers provide approx. 70cm accuracy in SBAS Regions. SBAS comprises WAAS, EGNOS and MSAS satellite systems and soon will include Africa, Russia and South America.**

## **GPS for accurate survey positioning and real time navigation**

Magnetics are an **increasingly** key investigative method for many applications from Exploration to Archaeological and Engineering studies. Integrated GPS makes magnetic data easy to plot and easy to use.



Survey tracking and path is produced in the field the same day as the survey. When surveying in SBAS regions, GEM standard positional accuracy is to within 70cm.

## **About GPS**

In the past, geophysical surveying tools, such as magnetometers, relied on time-consuming manual positioning options, usually via a grid-based system of staked lines. However, the development of Global Positioning via satellite communications in the late 1980's provided a quick means for positioning. Since then, vast improvements have occurred to the technology and methodology of collecting GPS information. Today GNSS (Global Navigational Satellite Systems) incorporates a variety of Satellite information from different networks of Satellites. (Glonass, Galileo, Beidou, GPS, etc.) to provide better accuracy across the globe. The design of the receivers today are focused on utilizing combinations of different satellite configurations to improve results.

Today positioning accuracy can be achieved at the cm accuracy level via differential global positioning systems (DGPS) Accurate Real-Time information is used to navigate in remote regions and record positioned survey data to sub metre accuracy. With an integrated system to collect the data at the same time as the magnetometer readings, end users benefit from having access to free positioning for global applications.

## **GEM Systems, Inc.**

135 Spy Court Markham, ON Canada L3R 5H6

Phone: 905 752 2202 • Fax: 905 752 2205

Email: info@gemsystems.ca • Web: www.gemsystems.ca

**Our World is Magnetics.**



**GEM's GSM-19 system with integrated GPS option. This system provides a light weight, low cost solution for walking use. It includes a "Walking" mode that enables continuous readings as well as navigation resulting in high productivity surveys.**

## SBAS Support

Positioning technologies include new options for working around the world as well as for working in Canada, USA, and Mexico. DGPS (differential GPS) is now provided in certain regions around the globe. SBAS GPS coverage (Satellite Based Augmentation Systems (SBAS)), is automatically supplied differential GPS. Users of integrated GEM / GPS systems benefit with roughly 70 cm positional accuracy when in SBAS regions. (see map for SBAS regions)

SBAS supports wide-area or regional augmentation through the use of a satellite-broadcast message. Such systems are commonly composed of multiple ground stations, which take measurements concerning the networks' accuracy, reliability, and availability, and one or more satellites, which broadcast the information to the receivers.

SBAS is freely available to GEM magnetometer users through its integrated positioning support. Where SBAS does not exist, typically users can still achieve positioning accuracy to roughly 1.5 metres with our antennas which obtain information from the standard GPS satellite as well as GLONASS satellites.

## Improved Positioning Accuracy

GEM Magnetometer systems can be upgraded to include a GPS module which can take advantage of the Novatel "Correct" service. This service provides additional accuracy through a paid subscription for DGPS. Two services are currently available (40 cm and 4 cm). In addition, these units can also be configured for RTK corrections which can provide cm accuracy.

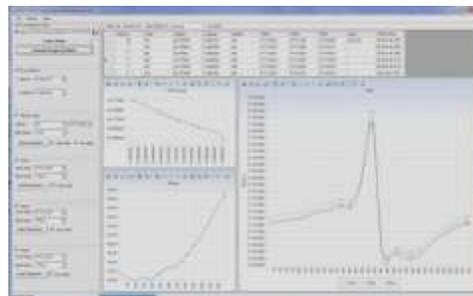
## GPS and Navigation

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 data visualization needed by the geoscientist to quickly assess data quality in the field. The software provides diurnal correction, profile plotting, line path maps, coordinate transformations and some basic mapping and modeling functions. Files can also be imported / exported to Google kmz format.



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

## Available GPS Enhance positioning resolution.

### 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)
- 1cm accuracy with RTK
- Consult GEM for availability

Correct is a paid subscription service offering resolution of less than 0.1 m horizontal and vertical. SBAS comprises the US-based WAAS, European EGNOS, and Japanese MSAS systems.

Standard GPS offer benefits that include:

- Superior performance in foliated conditions

## Magnetometer Specifications

### Overhauser Performance

Sensitivity: 0.022 nT / $\sqrt{\text{Hz}}$   
Resolution: 0.01 nT  
Absolute Accuracy: 0.1 nT  
Range: 20,000 to 120,000 nT  
Gradient Tolerance: > 10,000 nT/m  
Samples at: 60+, 5, 3, 2, 1, 0.5, 0.2 sec.  
Operating Temperature: -40°C to +55°C

### Dimensions & Weights:

Console: 223 x 69 x 240 mm, 2.1 kg  
Sensor: 175 x 75 mm dia. cylinder, 1.0 kg

### Potassium Performance

Sensitivity: 0.0002 nT @ 1 Hz  
Resolution: 0.0001 nT  
Absolute Accuracy: 0.1 nT  
Range: 20,000 to 120,000 nT  
Low/High Field Options: 3000 to 350,000 nT  
Gradient Tolerance: 50,000 nT/m  
Heading Error: +/- 0.05 nT between 10° to 80° and 360° full rotation about axis.  
Samples at: 1, 5, 10, 20 Hz  
Operating Temperature: -40°C to +55°C

### Dimensions & Weights:

Electronics box: 229 x 56 x 39 mm; 0.63 kg  
Sensor: 112 x 64 mm external dia., 0.9 kg

**All components are backed by GEM's industry leading**

**GEM**  
SYSTEMS

**GEM Systems, Inc.**

135 Spy Court Markham, ON Canada L3R 5H6

Phone: 905 752 2202 • Fax: 905 752 2205

Email: info@gemsystems.ca • Web: www.gemsystems.ca