Advanced Airborne Systems

Optically Pumped Potassium GSMP-35A is the most Advanced Airborne Sensor today.

It offers a number of benefits for towed and fixed wing configurations, including:

All weather, highest sub-pico Tesla sensitivity (i.e. highest signal-to-noise) for enhanced resolution of geological and cultural features in a variety of applications.

Highest absolute accuracy (varying by no more than +/- 0.1 nT between sensors)

Faster sampling

Insensitivity to microphonics

Lowest maintenance (no re-alignments)

Complete Systems are Available:

- ✔ **Bird**
- ✔ **Radar Altimeter**
- ✔ **GPS (20 Hz)**
- ✔ **Data Acquisition**

As well, GEM offers advanced base station capabilities, such as:

Potassium & Overhauser

3 modes for flexible base station scheduling

Magnetometer, Vertical / Horizontal Gradiometer and Tri-Axial Gradiometer offerings based on the latest GSMP-35A high resolution sensor.

The worldwide application of airborne magnetic and gradiometric data is growing -- driven by the increasing demand for high-resolution data for mineral and oil exploration; UXO; and other requirements.

Major industry requirements for airborne mapping include durability, accuracy, and sensitivity.

GEM is pleased to offer a family of magnetic-based solutions featuring the highest resolution magnetometer / gradiometer airborne system available.

Standard configurations in GEM's family include:

* Airborne magnetometers
* Vertical and horizontal gradiometers
* Tri-axial gradiometers

And GEM also offers complete configuratons of airborne solutions, such as:

* Bird
* Radar Altimeter
* GPS
* Data Acquisition

And, moreover, the company also supports both fixed-wing and helicopter applications with a range of systems already implemented.

Airborne Magnetometer Systems

The GSMP-35A magnetometer is the core of GEM's airborne solutions. The technology is based on a unique optically pumped Potassium sensor - offering an order-of magnitude increase in resolution over other systems. It also provides:

- Reduced "heading" errors
- Highest absolute accuracy
- Decreased maintenance costs

These advantages -- plus GEM's reputation as a proven supplier of advanced technologies -- make the GSMP-35A a key solution to consider for your next airborne installation.

Key Components

The GSMP technology comprises:

- Sensor head
- Radio Frequency (RF) pre-amplifier and drive electronics module
- Cable (1 to 10m - standard 4m) to separate sensor and electronics for noise elimination
- Optional signal processor / console and cable

The sensor deploys as a single unit, or in combination with other sensors.

Vertical / Horizontal Gradiometer

Benefits of Gradiometer:

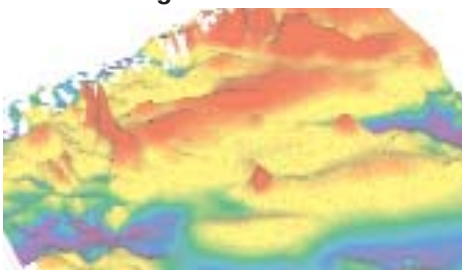
* Freedom from diurnal effects and noise

* "Real" analytic signal computed from measured gradients can be used for more accurate track positioning

* Improved definition of structures that are non parallel to survey lines

GEM's vertical and horizontal gradiometers are designed to fit the requirements of those needing high sensitivity, high accuracy magnetic results.

Tri-Axial Magnetic Gradiometer



GEM's Tri-Axial Gradiometer was the first 4-sensor gradiometer developed in the world back in early 1980's. In this configuration, four Potassium units can be installed in a special "bird" with two fins at the tips of an imaginary tetrahedron to allow for measurement of Total Magnetic Field and the gradients in three directions:

- Vertical gradient
- Horizontal gradient (along-the-track)
- Horizontal gradient (across-the-track)

Horizontal gradient measurements are increasingly popular for providing details about the lateral extent of subsurface anomalies located between survey lines. Vertical gradients can assist significantly in identifying geologic / structural contacts and near-surface targets (such as UXO).

Other benefits include: providing a very stable and noise-free platform for acquiring high resolution data; delivers information for reducing of positioning errors using onboard GPS, and no magnetic compensation required.

Airborne Base Station Configurations

Another area of application for GEM's advanced magnetometers is in airborne base station monitoring. Our customers have the choice of working with GSMP-35A or Overhauser (GSM-19) units.

The GSMP-35A implementation offers advantages for surveys where very high resolution durnal corrections are needed. GSM-19 implementations deliver good resolution and economical pricing.

Both implementations share a number of advanced features (introduced in GEM's v7.0 firmware release), including:

- Precise time synchronization of field and base station units using a built-in GPS option. This capability is particularly important for working in noisy magnetic conditions and provides the highest accuracy possible.
- Flexible scheduling (up to 30 on / off periods). Simply define a series of intervals and the base station will turn itself on as you need. This mode provides the greatest flexibility for longer surveys where leaving your base station on increases efficiency. Immediate start and daily modes are also provided.

Benefitting from the Natural Properties of Potassium Optical Pumping

With more than a decade of experience with Potassium technologies, we feel confident that your next survey will benefit in many ways, including acquisition of:

- Highest sensitivity data (reflecting Potassium spectrum characteristics and high natural frequency of 7 Hz/nT)
- Highest absolute accuracy (a variation of only +/- 0.1 nT between sensors makes the GSMP-35A an ideal choice for gradiometer installations)
- Data with minimal heading errors (reflecting the insensitivity of Potassium to aircraft / bird orientation)
- Data that is not affected by phonics (low frequency vibration in the audio range)

As well, maintenance costs are minimal in comparison with other systems as key components can be replaced in the field.

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GSMP-35A Specifications

Performance

Sensitivity: 0.0025 nT RMS @ 1 Hz*

* High Sensitivity (0.0007 nT) Option Available

Resolution: 0.0001 nT

Absolute Accuracy: +/- 0.1 nT

Dynamic Range: 20,000 to 100,000 nT*

Gradient Tolerance: >30,000 nT/m

Sampling Rate: 1, 5, 10, 20 Hz

* High Field (350,000 nT) Option Available

Orientation

Sensor Angle: Optimum angle 30° between sensor head axis & field vector.

Orientation: 10° to 80° & 100° to 170°

Heading Error: +/- 0.05 nT between 10° to 80° and 360° full rotation about axis.

Environmental

Operating Temperature: -20°C to +55°C **

Storage Temperature: -70°C to +55°C

Humidity: 0 to 100%, splashproof

** Optional to -40°C

Dimensions & Weights

Sensor: 141mm x 64mm (external dia.) and 1.3 kg

Electronics Box: 310mm x 75mm x 90mm and 1.6 kg

Power

Power Supply: 22 to 32 V DC

Power Requirements: Approx. 50 W at start up, dropping to 12 W after warm-up

Power Consumption: 12 W typical at 20°C

Warm-up Time: <15 minutes @ -40°C

Outputs

20 Hz RS-232 output with comprehensive Windows Personal Computer (PC) software for data acquisition and display.

Outputs UTC time, magnetic field, lock indication, heater, field reversal, latitude and longitude, GPS altitude, # of satellites and differential GPS

Components

Sensor, pre-amplifier box, 5m sensor / pre-amplifier cable, manual & ship case.