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Geological Survey
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GEM Systems, Inc
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GEM Systems
ADVANCED MAGNETOMETERS

NEW ULTRASENSITIVE MAGNETIC GRADIOMETER

For Long Term Monitoring, Isolation and Identification of Different Phenomena in the Geomagnetic Field

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Isorad, backed by the Israeli research and development institutes - Soreq NRC, the Geological Survey of Israel & the Survey of Israel, together with Canadian firm GEM Systems, offer a new sophisticated and advanced magnetic system for precise geomagnetic field observations worldwide.

Over the past decade the Soreq Nuclear Research Center, the Geological Survey of Israel and the Survey of Israel accumulated substantial experience in applying modern and advanced technologies in earth sciences.

The Canadian firm GEM Systems has designed and started to manufacture the leading-edge total field potassium gradiometers of GSMP-20 family. GEM Systems optically pumped Potassium technology represents the highest performance total field magnetometer instrumentation on the market today. These instruments are the highest sensitivity total magnetic field measuring devices ever developed. Their outstanding features enable to offer

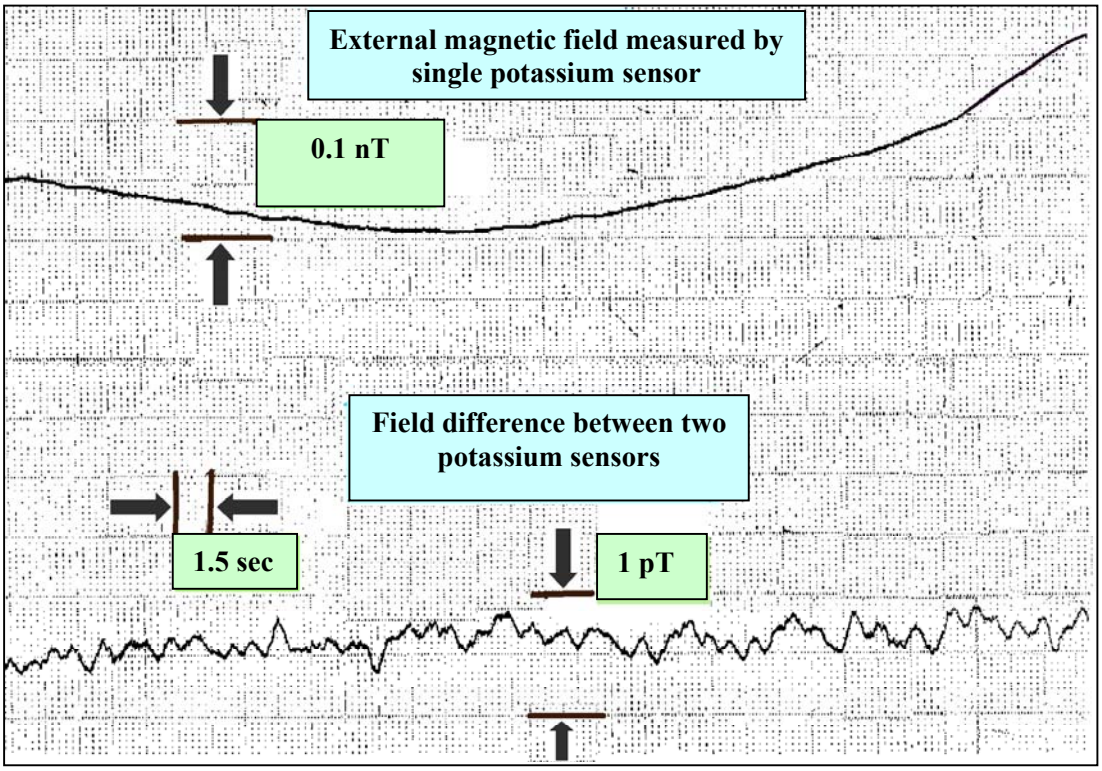
Resolution	0.001 pT for up to 20 readings per second
Intrinsic noise spectral density @ 1 Hz	0.05 pT/√Hz
Absolute accuracy	0.2 nT. Time base stability 0.01 ppm over -40°C to +55°C. Long term stability is better than 1 pT/day
Sampling rate	20 samples/sec
Tuning	Wide band system, no tuning
Range	10,000 to 100,000 nT
Sensor orientation	45 ± 35 degrees off the magnetic field direction
Temperature range	-40°C to +55°C
Power requirements	22-32 V, 12 W average, 40 W max

The extreme sensitivity and long term stability of the system allow geophysicists to apply short base gradiometric approach to measure, determine, separate and eliminate the different patterns of the geomagnetic field perturbation contributed by:

- Magnetosphere and ionosphere phenomena
- Processes from upper mantle and crust
- Magnetic variations originating from shallow parts of the earth
- Artificial (man made) disturbances such as underground explosions

At the present the above contributions to geomagnetic field cannot be identified with accuracy required in several important applications. New ultrasensitive magnetic gradiometer allows very high spatial resolution unattainable so far.

The following chart demonstrates the unsurpassed sensitivity of the potassium gradiometer.



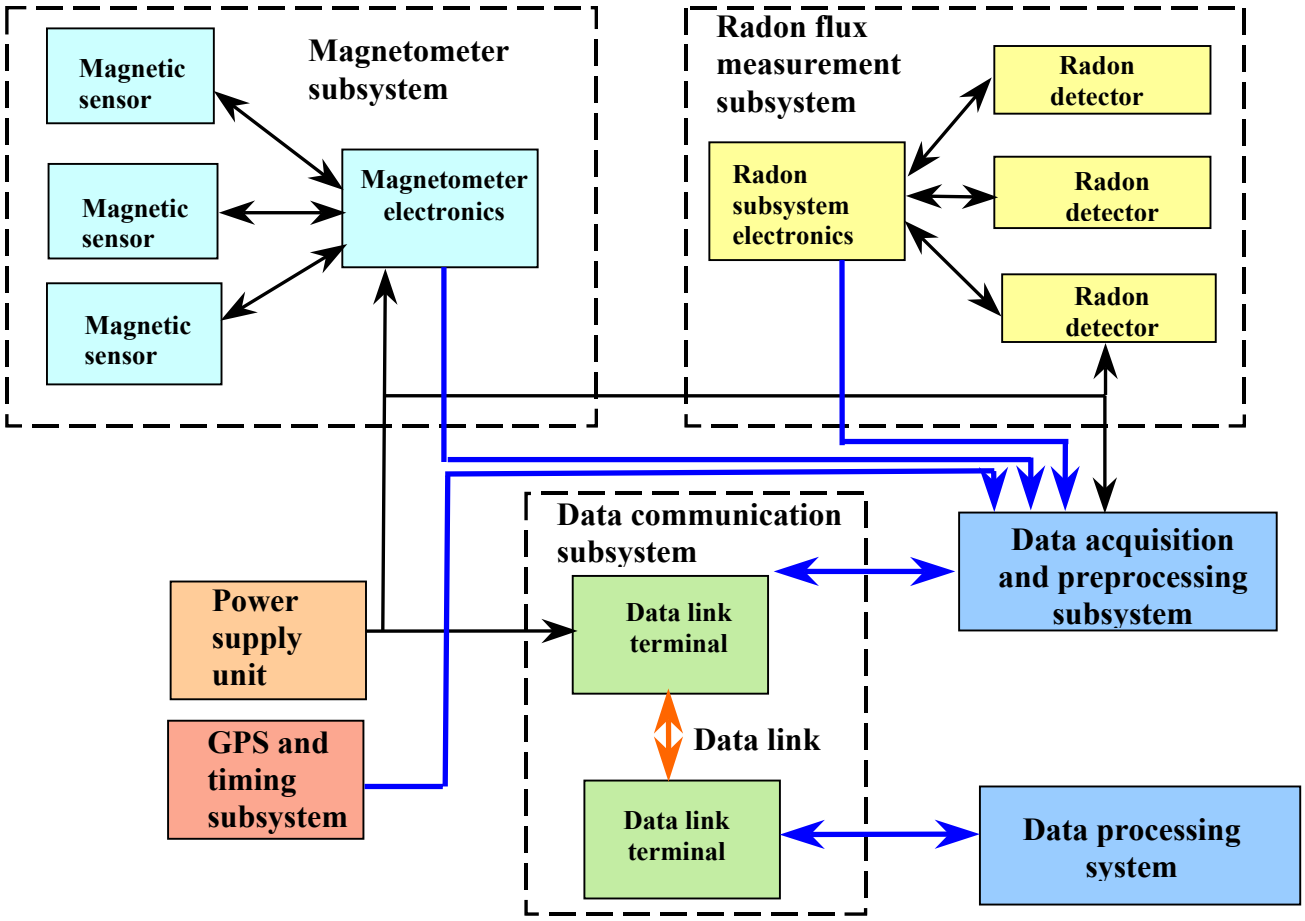
The introduction of the super-gradiometric system will enable:

1. Extraction of magnetic signals originating from solar wind in order to predict magnetic storms, which disturb world communication and influence weather and cosmic observation satellites. Definition of the space geomagnetic signatures improves the counter measure protection (pre-warning) of sensitive electronic systems on satellites, in world communication systems, Global Positioning System (GPS), centers of electric power grids voltage control, and oil and energy industry (pipelines).
2. Definition of geomagnetic patterns accompanying geodynamic activity such as earthquakes and volcanic eruptions.

   Theoretical considerations and existing geophysical observations indicate that such magnetic effects exist. The new system will allow extraction of the relevant variations, their definition and thereby may lead to reliable early prediction.
3. Following and monitoring of man-made geomagnetic disturbances such as underground nuclear explosions. Development of the super-grad

technology may place it in the frame of the CTBT world observation network.

An example of SuperGradiometer application



Combined multi-sensor magnetic & radon system for earthquake prediction