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Laser Based Gas Leak Detection

ALMA & SELMA

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SELMA Vehicle-based Methane Detection

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ALMA Airborne Methane Detection

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SELMA Data Acquisition

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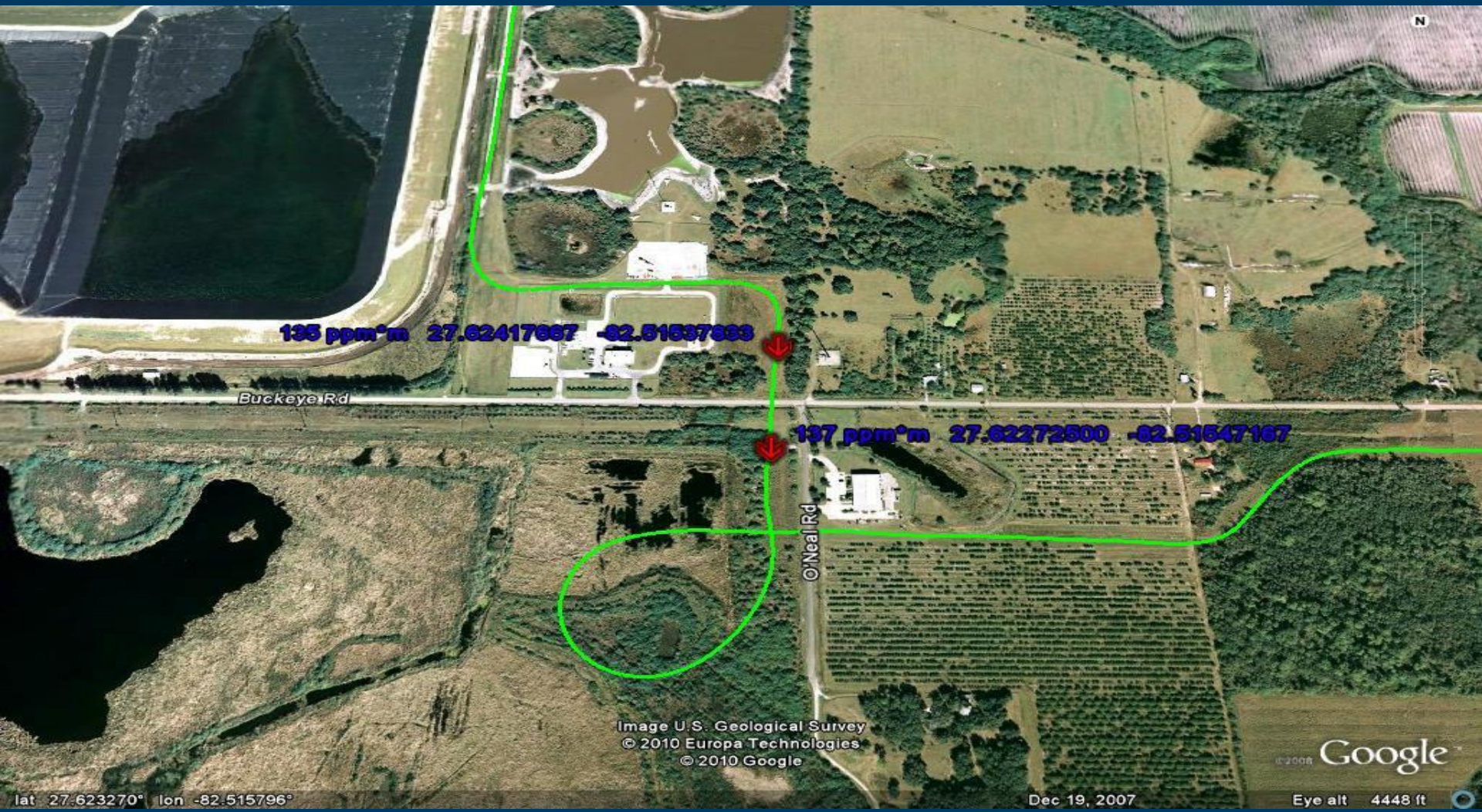
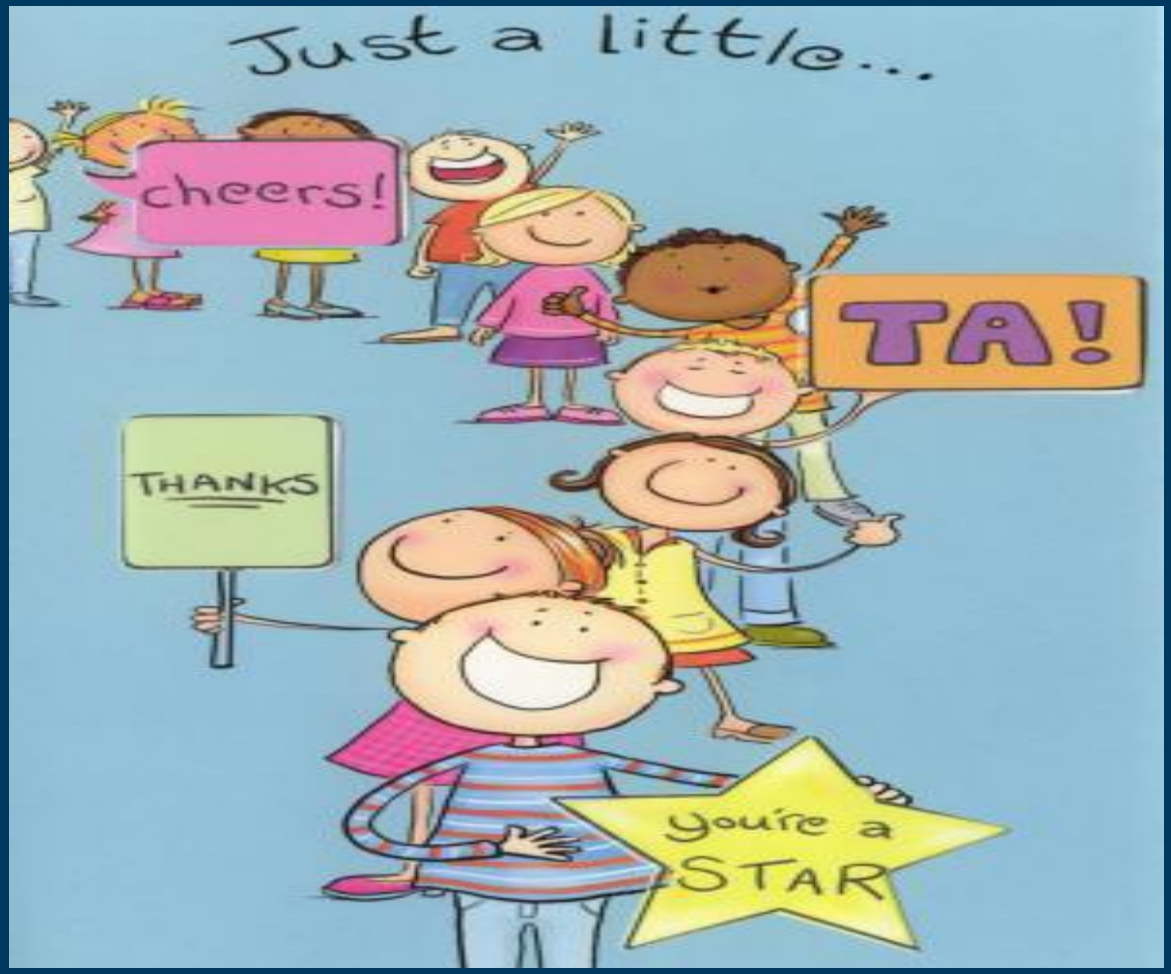
ALMA G2 Data Acquisition



Thank you very much for your attention !



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ALMA

PERGAM TECHNICAL SERVICES

Natural Gas Leak Detection Services

Airborne Based Gas Leak Detection

ALMA offers a dramatic change to the conventional natural gas leak inspection methods used by natural gas companies. Utilizing a laser, ALMA can quickly and efficiently detect natural gas leaks while the helicopter based system flies the transmission pipeline. ALMA consists of three components; a laptop, an optical laser unit and an electronic unit. Depending on the needs of the pipeline operator, ALMA can be mounted to a variety of helicopter platforms. Using pipeline waypoints, the helicopter flies the natural gas pipeline system recording any detected natural gas leaks in addition to tracking the helicopter's route through GPS navigation. ALMA's sensitivity is achieved by utilizing a pulsed diode laser directed at the target, which is then reflected back to a receiving mirror and analyzed by the onboard electronic unit. When a leak is detected, a portion of the laser light will be absorbed in proportion to the concentration of methane along the measuring path. ALMA contains a video camera and an optional infrared camera. On board monitors provide the operator with both visual and audio feedback of leak survey progress. The PC based software allows for real time monitoring and provides for detailed post survey reporting in addition to a complete leak survey audit trail. ALMA has proven to be highly sensitive, economical and reliable, while improving public safety.

Key Benefits of ALMA

- **Greatly increased survey speed**
- **Data logging of leak levels and route**
- **Downloadable post-survey report**
- **Enhanced pipeline integrity**
- **Reduced operations and maintenance costs**

System Specifications

Operating Speed	**55 knots**
Maximum Altitude	**300 ft**
Sensitivity	**30 ppm*m**
Laser Power	**15 mW**
Laser Wavelength	**1.65 µm**

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SELMA

PERGAM TECHNICAL SERVICES

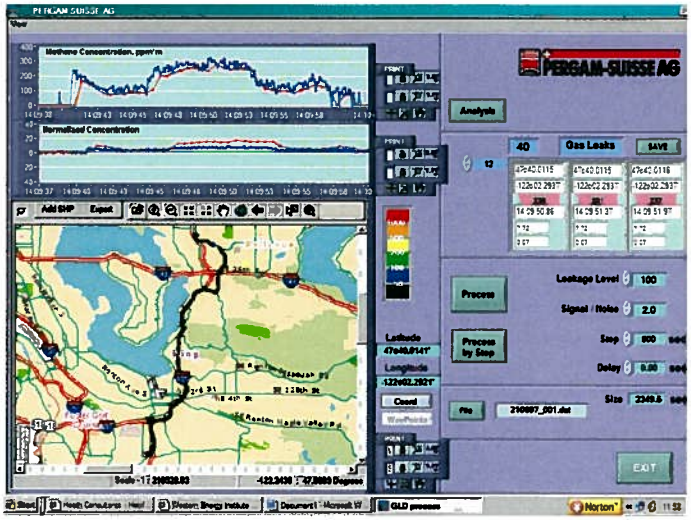
Natural Gas Leak Detection Services

Vehicle Based Gas Leak Detection

SELMA offers a dramatic change to the conventional natural gas leak inspection methods used by natural gas companies. Utilizing a laser, SELMA can quickly and efficiently detect natural gas leaks up to 100 feet away while the operator drives the distribution or transmission pipeline. Unlike commonly used leak detectors such as the FID (flame ionization detector), SELMA does not need to be in the gas plume in order to detect a leak providing for enhanced operator safety and enabling remote leak detection at hard to reach or inaccessible areas. SELMA consists of two independent laser detection systems; the roof mounted unit for sideways inspection and the bumper mounted unit for roadway inspection. Depending on the needs of the utility, SELMA can be either permanently or temporarily mounted to a variety of vehicle platforms. Once installed, the host vehicle drives the natural gas pipeline system recording any detected natural gas leaks in addition to tracking the vehicle's route through GPS navigation. SELMA's sensitivity is achieved by utilizing a pulsed diode laser directed at the target, which is then reflected back to a receiving mirror and analyzed by the onboard electronic unit. When a leak is detected, a portion of the laser light will be absorbed in proportion to the concentration of methane along the measuring path. SELMA contains a video camera and laser pointer to allow the operator to pan and scan for leaks on special natural gas facilities such as regulator stations and meter stations further expanding the unit's capabilities. On board monitors provide the operator with both visual and audio feedback of leak survey progress. The PC based software allows for real time monitoring and provides for detailed post survey reporting in addition to a complete leak survey audit trail. SELMA has proven to be highly sensitive, economical and reliable.

Key Benefits of SELMA

- **Greatly increased survey speed**
- **Data logging of leak levels and route**
- **Downloadable post-survey report**
- **High sensitivity**
- **Reduced operations and maintenance costs**



System Specifications

Maximum Operating Speed	**30 mph**
Maximum Distance	**100 ft**
Sensitivity — Roof	**20 ppm*m**
Sensitivity — Bumper	**0.5 ppm**
Laser Wavelength	**1.65 µm**

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