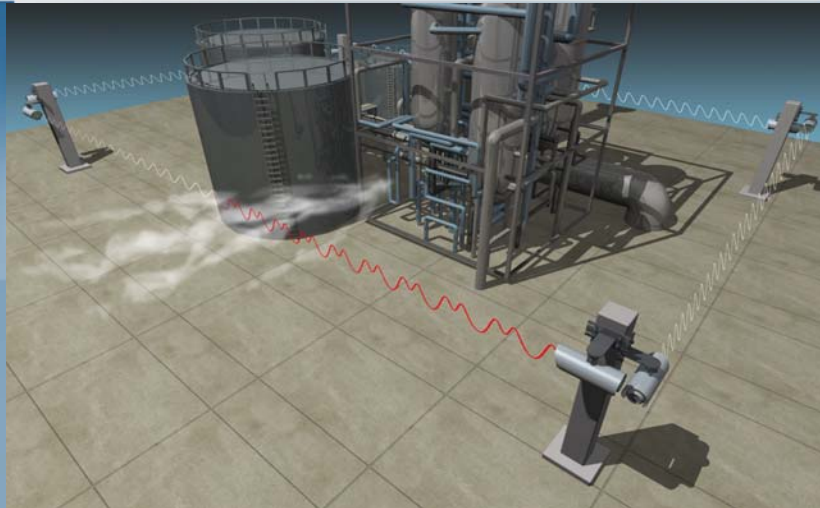



## SenseLine ELDS OPGD:

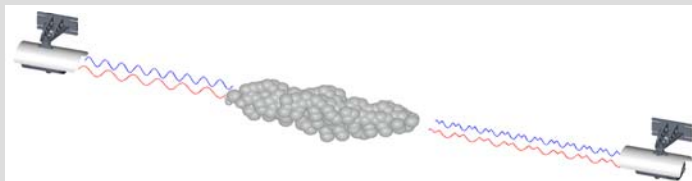
*"Fulfilling the promise of open path gas detection"*



 SenseLine

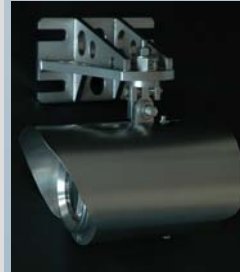
## Current Gas Sensing Technology

- **Only Minimal Protection**
  - **1970's (Toxic and Flammable)**
    - Only Point Detectors
  - **1980's (Flammable only):**
    - Line-of-Sight up to 650 ft.
    - Poor sensitivity and Non-selective



## Enhanced Laser Diode Spectroscopy: How does it work?

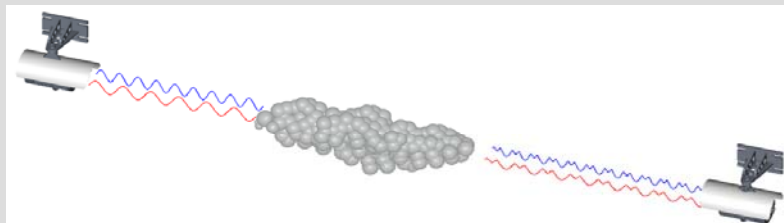
- Laser beams illuminate a monitored path
- Absorption of laser light by target gas produces a Harmonic Fingerprint
- Patented technology makes ELDS sensitive and robust
- Simulates Gas for Remote Functional Testing



 Senscient

## Enhanced Laser Diode Spectroscopy (ELDS™)

- ELDS™ is the first laser based gas detection technology that is both sensitive and robust
- ELDS finally enables laser based gas detection to be used in critical applications and harsh environments

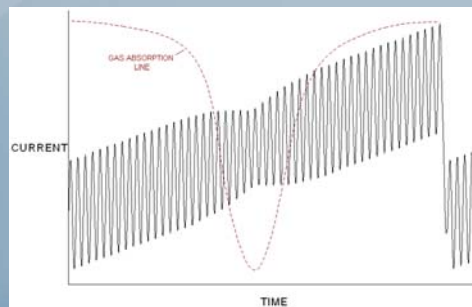


- The techniques that make ELDS sensitive and robust are patented

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## Laser Diode Spectroscopy (LDS)

- In conventional LDS, the wavelength of a laser diode is current tuned across an absorption line of a target gas



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## Conventional LDS: Limiting Factors

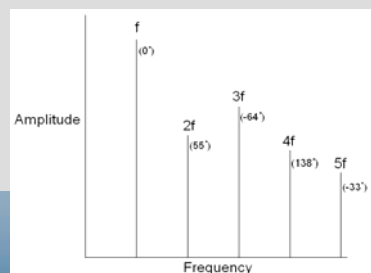
- Noise
- Absorption by atmospheric gas species
- Coherent interference / fringe effects

Senscient developed ELDS specifically to overcome the limitations of conventional LDS for safety applications

 Senscient

## ELDS vs. Atmospheric Absorption

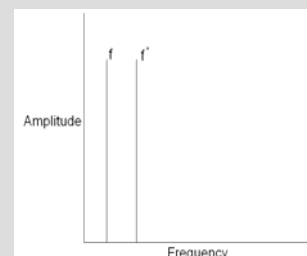
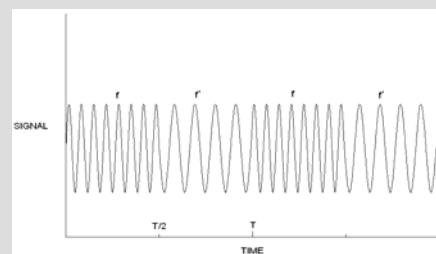
- The laser diodes in an ELDS system are operated with conditions that generate a specific 'harmonic fingerprint' when their radiation is absorbed by target gas



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## ELDS vs. Noise

- ELDS employs modulation and demodulation at multiple electrical frequencies



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## ELDS vs. Coherent Interference Effects

### Dual Laser, Multi-Frequency ELDS



## Open Path Gas Detection Applications

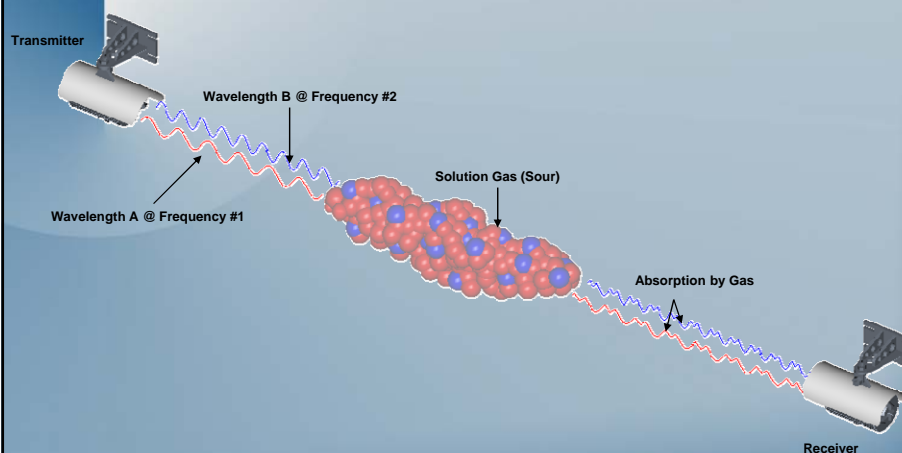
- **Hazardous Area for Flammable and Toxic Gases**
  - Ambient Area and Perimeter Monitoring
  - Sour Gas, Refinery Alkylation
  - Rail, Truck, & Ship Loading
- **Specialty Applications**
  - HVAC Ducting
  - Compressor/Turbine Enclosures

## ELDS: Detectable Gases

TOXIC GASES:	FLAMMABLE GASES:
Hydrogen sulphide	Methane
Hydrogen fluoride	Ethane
Hydrogen chloride	Propane
Hydrogen bromide	Butane
Hydrogen iodide	Ethylene
Hydrogen cyanide	Propylene
Ammonia	Acetylene
Carbon monoxide	Methanol
Carbon dioxide	VCM
Oxygen	EDC

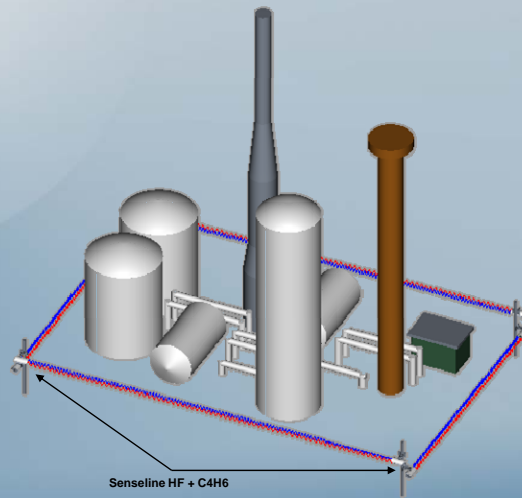
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## Multi-Gas ELDS: Sour Solution Gas



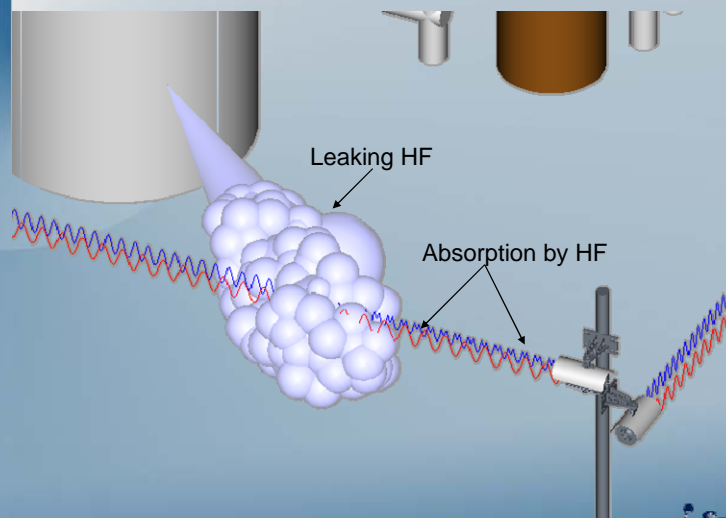
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## Multi-Gas ELDS: HF Alkylation



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## Multi-Gas ELDS: HF Alkylation



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## **Simu-Gas™**

- **Remote, on-command, functional testing of gas detectors**
- **A small retained sample of target gas in the ELDS transmitter is used to maintain 'harmonic fingerprint' lock and enable electronic synthesis of absorption by target gas**



## **Simu-Gas™ Benefits**

- **Detector testing can be performed remotely and automatically w/ no calibration gas or test filters needed!**
- **Increased safety integrity, can be repeated at any desired frequency.**
- **Significantly reduced preventative maintenance costs**



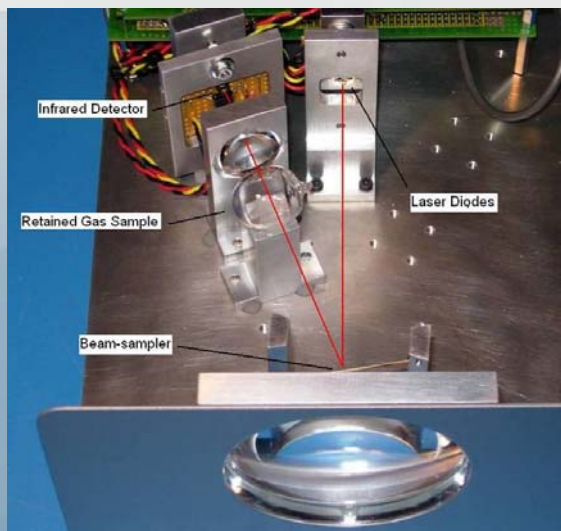


## New Standards & Guidelines: FM ISA CSA ATEX and IEC

- Hazardous Area Instruments NRTL certified
- Explosion-proof vs. Performance
  - ISA Standard 12.13.4 for Combustible OPGD to January, 2007 (FM 6325)
  - Toxic OPGD in Draft (FM 6326)
- FM+ISA+NEC+CSA+ATEX = IEC!
  - One submittal for all USA certifications, 6-week Hazardous Testing by FM
- Performance certified by FM = Lower Risk Assessment = Lower Insurance Premiums!



## SenseLine Optical Path: (Prototype)




## SenseLine Demonstration Unit:



 SenseLine

## Bracket w/ Integral Mount:



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## SenseLine w/ Integral Junction Box:



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## Advantages of ELDS-based OPGD for Safety:

- **Reliable, open-path detection of both toxic and flammable gases @ very low ppm's**
- **Remote, on-command, functional testing of gas detectors using Simu-Gas™**
- **Simultaneous Multi-gas detection and discrimination capabilities**
- **Reduced capital, installation and maintenance costs for comprehensive gas detection systems**

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