

# PDID: Pulsed-Discharge Ionization Detector

## A New Detector for Medical Diagnosis

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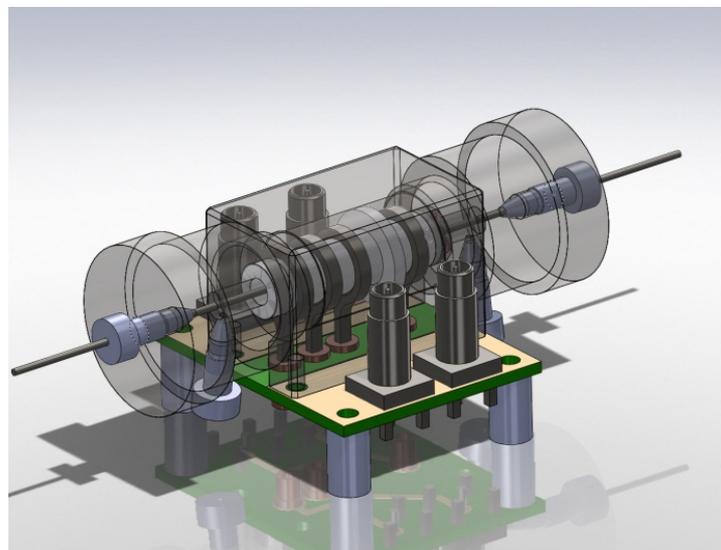
MicroSystems Enabled Detection  
Department 01716

# Sandia's Volatile Organic Compound (VOC) Biomarker Detection Technology



Photons emitted from a miniaturized helium plasma source ionize chemical compounds.

- Detect everything except Neon.
- Extremely high sensitivity- sub ppb.
- Detect VOC biomarkers which are indicative of disease or infection in humans, plants, and animals.



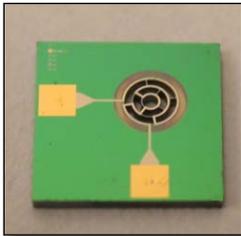
# MicroChemlab Gas Phase Detection Technologies



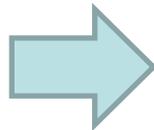
Sandia's proven MicroChemlab sensor system:

- Field-tested/rugged
- Inexpensive
- 1-2 minute analysis time
- New detector now allows for medical applications
- Hand-portable
- Push button automation

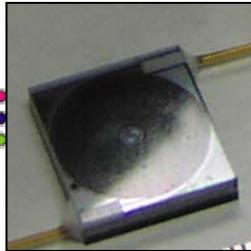
## Preconcentration Stage



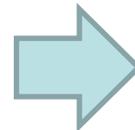
- Collects analyte
- Reduces false alarms



## Chromatography Stage



- Separates complex chemical mixtures
- Increases analysis confidence



## PDID Detection Stage



- Sub ppb sensitivity (1  $\mu\text{g}/\text{kg}$ )
- Near universal detector

# MicroChemlab VOC Biomarker Diagnosis Advantages

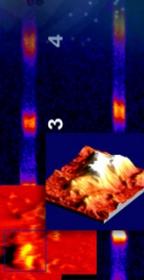
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## Radical shift in diagnosis methodology

- Non-invasive diagnosis from breath or the headspace of biological fluids.
- VOC biomarkers are indicative of disease (cancer, irritable bowel syndrome, asthma, etc.) and infection (tuberculosis, smallpox, avian influenza, etc.) in humans, plants, and animals.
- Rapid results from untrained users decrease treatment costs and diagnosis cycle times.

## Inexpensive and Portable

- Our system has similar detection limits to gold standard VOC analyzers but at a fraction of the size and cost.
- Hand-portable and can operate on batteries for remote, telemedicine, bedside, and point of care usage.



# Comparison Between MicroChemlab and Gold Standard VOC Detection Technology

## Commercial GCxGC-MS



- Refrigerator size
- Analysis time: 5-30 minutes
- Power ~ 2000 W
- Cost ~ \$250,000
- Sensitivity ~ ppb-ppt
- Skilled user requirements
- Research instrument in academia and industry.

## Estimates for Sandia's GCxGC handheld VOC analyzer



- Brick size
- Analysis time: 30 sec -2 minutes.
- Power ~ 2W, runs on batteries
- Cost ~ \$3,000
- Sensitivity ~ ppb-ppt
- Push button operation
- Tuned to specific VOC biomarkers to perform diagnosis.

# Commercial Applications

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## Human, plant, and animal health screening and monitoring.

- VOC biomarkers or patterns of biomarkers known for a variety of diseases and causative agents.
- Monitor wound health for infection.
- Sepsis diagnosis.
- Neonatal health monitoring.
- Screening at airports or commercial/transit hubs.

## Food safety

- Rapid detection of bacterial contamination.
- Identify source of contamination and causative agent.

## Active VOC biomarker discovery efforts underway

- FDA-approved breath tests.
- IP on VOC-based diagnosis of specific diseases issued.

# Licensing/How to Work with Us

You can bring your target VOC biomarker to us and we will assemble an analyzer solution for you.

Or, Sandia has the expertise to perform VOC biomarker discovery for you.

- Experience in biology, chemistry, and statistical analysis.
- Partnerships with universities, hospitals, and research institutions.

**Sandia has the key, enabling technologies to make the VOC diagnostic system happen:**

- PDID
- Two-dimensional MicroGC separation
- Microfabricated PCs and GCs



No MicroChemlab IP is encumbered in the medical application area.

