

## **An apparatus for maintaining throughput and resolution in a miniaturized mass spectrograph**

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### **Value Proposition**

Mass spectrometers are the gold standard for chemical detection and identification. The size and cost of traditional mass spectrometers have typically limited their application to laboratory settings. Magnetic sector mass analyzers in particular, while noted for their high mass accuracy, suffer from large size, weight, and power requirements. Miniaturization of mass spectrometers will enable their use in a wide variety of field applications and low-analyte-volume uses. However, miniaturization often forces the instrument designer to confront a tradeoff between instrument throughput (and associated signal-to-background-ratio (SBR)) and spectral resolution.

### **Technology**

In collaboration with the Brady and Gehm groups, the Nanomaterials and Thin-films Laboratory have developed a mass spectrograph design intended to minimize losses in signal intensity often present in mass spectrometry miniaturization efforts. This is intended to create miniaturized mass spectrometers with improved resolution for applications such as trace explosive detection and airport security, space exploration, environmental monitoring, and point-of care medical applications. This was achieved by applying the principles of spatially coded apertures to magnetic sector mass spectrometry. This technology has been verified using a commercially available miniature Mattauch-Herzog instrument.

### **Advantages**

- Allows miniaturization of mass spectrometers

### Duke File (IDF) Number

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### Patent Information

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Patent #: 11,081,331  
Patent Title: MASS SPECTROMETERS HAVING  
SEGMENTED ELECTRODES AND ASSOCIATED  
METHODS  
Country United States of America

### Meet the Inventors

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### Department

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Electrical & Computer Engineering (ECE)

### Publication(s)

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### External Link(s)

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- [Project description at the Nanomaterials and Thin Films Lab website](#)
- [From the lab of Dr. Jeffrey Glass](#)
- [From the lab of Dr. Michael Gehm](#)
- [From the lab of Dr. David Brady](#)

while minimizing the sacrifice to throughput and spectral resolution

- Order of magnitude gains in signal intensity reported
- Has been demonstrated using a commercial instrument
- The first application of spatial aperture coding to the Mattauch-Herzog mass spectrograph

