National Aeronautics and Space Administration

Sensors

High Precision Electric Gate for Time-of-Flight Ion Mass Spectrometers

Provides precise timing of an ion entering the instruments time-of-flight section to help study the magnetosphere of planetary bodies

NASA's Goddard Space Flight Center has developed a high precision electric gate (HPEG) time-of-flight (TOF) mass spectrometer to study the magnetosphere of Jupiter and Europa. The HPEG can provide a precise "start" pulse when an ion enters the TOF section of an Ion Mass Spectrometer (IMS) to provide a very high mass resolution capability. The design uses a row of very thin parallel aligned wires that are pulsed in sequence so the ion can pass through the gap of two parallel plates, which are biased to prevent passage of the ion.

BENEFITS

- Thin parallel aligned wires—a row of these wires are pulsed in sequence so the ion can pass through the gap of two parallel plates which are biased to prevent passage of the ion
- Small & efficient operation—smaller and requires less power than current state of the art designs
- High mass resolution capability—this design by itself can provide a high mass resolution capability and a very precise start pulse for an ion mass spectrometer. Furthermore, the ion will only pass through the chamber if it is within a wire diameter of the first wire when it is pulsed and has the right speed so it is near all other wires when they are pulsed

technology solution

THE TECHNOLOGY

The High Precision Electric Gate for a time of Flight mass spectrometer offers several advantages over the current state of the art. It is precise enough to get a mass resolution of greater than 10,000 M/dm when used in conjunction with a time of flight mass spectrometer. Also, it is small and light which make it ideal for spaceflight or portable mass-spec applications and can be built on a chip which makes it inexpensive to mass produce. For spaceflight applications it can also act as a velocity filter. For lower precision applications, M/dM ~1000, it can act alone as a tiny mass spectrometer.

Installation of the Neutral Gas and Ion Mass Spectrometer

APPLICATIONS

The technology has several potential applications:

- Chromatography
- Analytical measurements

PUBLICATIONS

U.S. Patent 8,035,081

More Information

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NP-2014-08-1097-HQ

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GSC-15771-1