ultraFAIMS Pre-separator

A new dimension in Mass Spectrometry

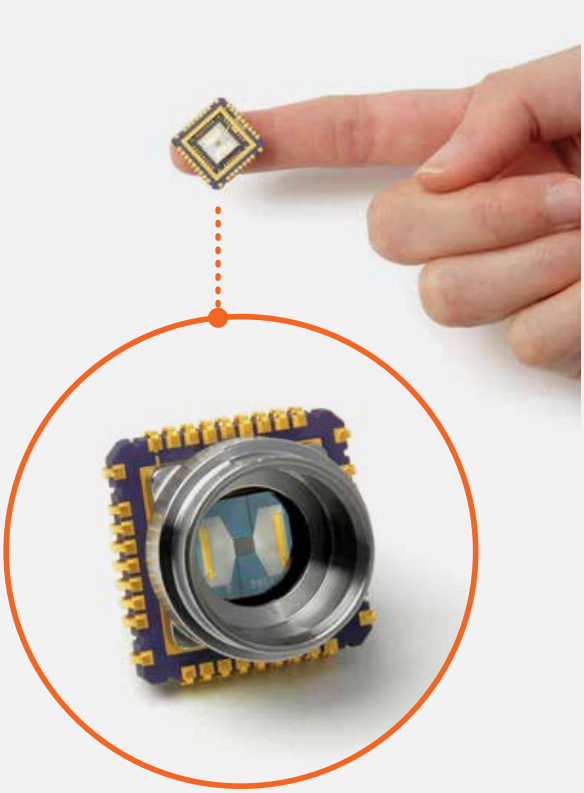
What Is ultraFAIMS?

The ultraFAIMS microchip is a miniaturized ion mobility device that interfaces with a mass spectrometer inlet to provide additional in-source separation of ions.

The core of the Owlstone Medical system is a microchip-sized FAIMS spectrometer that allows the selective transmission of ions based on differences in the way their mobility varies in a changing electric field. In FAIMS-MS, the FAIMS system is used as a tunable filter, allowing certain ions to be transmitted to the mass spectrometer while blocking others. Since FAIMS separation is highly orthogonal to LC, IMS or MS, the addition of a FAIMS pre-separator helps separate ions of interest from the chemical background.

FAIMS has been shown to separate many types of ion, including:

- Isobaric analytes
- Protein and peptide charge states
- Large and small proteins
- Isomers and conformers



APPLICATIONS

- **Reduces chemical background noise**
- **Enables increased identification of low abundance analytes**
- **Improves level of quantitation**
- **Enhances protein and peptide identification**
- **Improves accurate mass measurement**
- **Allows pre-selection prior to in-source CID**

How Does FAIMS Work?

FAIMS separates ions based on the differences in ion mobility of specific species at strong and weak fields. FAIMS devices selectively transmit ion species by applying an asymmetric high-frequency separation field that causes ions to drift towards the electrodes, and then superimposing a constant compensation field that allows a specific subset of ions to pass through the device. Scanning the compensation field over a range of values produces a spectrum of ions separated by their differential mobilities.

The ultraFAIMS Difference

Due to the novel chip-based design and advanced micro-manufacturing techniques, ultraFAIMS chips have an analytical gap width of only 100µm. This allows extremely high separation fields to be applied without running into electrical breakdown limits, and these extreme fields enable the device to separate a wider range of analytes more quickly, without compromising transmission or peak capacity.

Higher fields

Reaching these extreme dispersion fields increases the range of analytes that can be separated. This is because the access to higher fields leads to greater scope for changes in mobility between the high- and low-field portions of the cycle, which increases the likelihood of the ion of interest being separable from other ions present.

Faster separation

Full FAIMS separation sweeps can be carried out in under a second, allowing real-time LC-FAIMS-MS analysis.

The extreme fields enable separation times of less than 250µs, which is ~100 times faster than the fastest previous FAIMS devices. This means the ultraFAIMS device is fast enough to be combined with LC separation in real time, eliminating the need for multiple optimization experiments.

In addition, fields can be rapidly stepped through selected values with millisecond response times to allow filtering to be synchronized with MRM transitions.

Reliability and ease of use

The interface is designed to allow easy removal of the chip for cleaning or for replacement. The system has a small footprint and requires no additional gas supply. Separation can be enhanced if needed with the use of solvent vapors added to the carrier gas supply. The system can also be set to non-FAIMS mode, allowing all species to be transmitted simultaneousl

KEY FEATURES:

- High-speed separation, compatible with UHPLC and MRM timescales
- Orthogonal to LC, MS and IMS separation
- Ultra-high dispersion fields increase likelihood of distinguishing analytes
- Easy to install and remove
- Compatible with the use of solvent modifiers for enhancing peak capacity
- Chips can be cleaned or easily replaced
- Non-FAIMS mode allows simultaneous transmission of all species

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