

Transversal Modulation Ion Mobility Spectrometry (TMIMS)

Key features

- Continuous filtration of mobility selected ions.
- Operates at atmospheric pressure.
- Add on architecture: it can be easily coupled with Thermo Fisher Mass Spectrometers upstream the inlet capillary. It fits just like an ion source.
- Compatible with Thermo Fisher Ion sources.
- Provides temperature control and a desolvation stage.
- **TMIMS is the mobility equivalent to the quadrupole.**

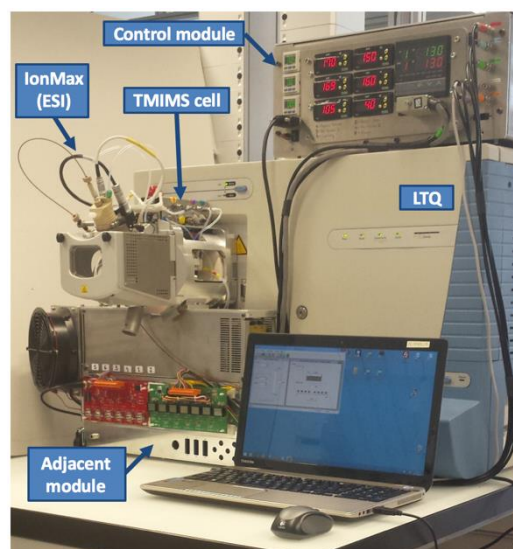
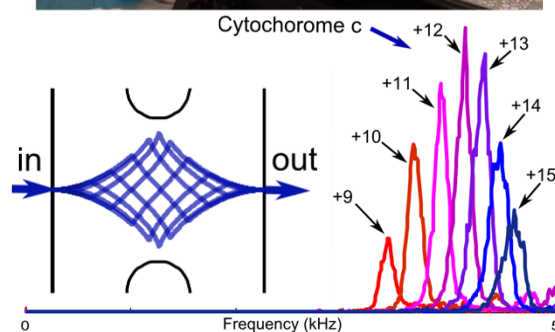
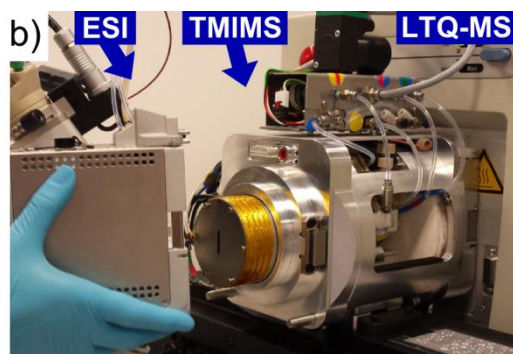
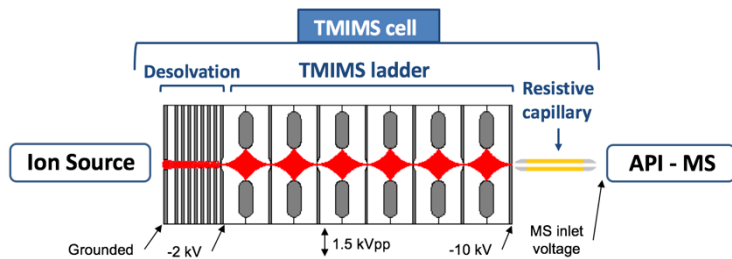
Concept of operation:

TMIMS combines an axial and steady electric field and a transversal and oscillating field. When the time of residence of the ions within the TMIMS equates with the period of the oscillating fields, the ion trajectories are focused at the outlet of the device, and the ions are outputted. By choosing the frequency of the oscillating field, the user can select which mobility is transferred.

System description:

The TMIMS includes three main sub-systems:

- **TMIMS cell:** It includes a desolvation stage, a six stages TMIMS that maximize resolving power and reduces the required voltages, and a resistive capillary.
- **Control module:** temperature, gas flow and voltage control.
- **Adjacent module:** It provides the oscillating voltages.



Performances:

The TMIMS is a prototype in progress. It currently qualifies as Technology Readiness Level **TRL6**. It can be coupled with the LTQ-XL, the LTQ-Orbitrap and the Orbitrap Exactive (Thermo Fisher) families.

- **Resolving power:** Above **30**, with Tetraheptylammonium.;- **Transmission:** above **1%**, with ultramark (Calmix)

Applications:

Ideal for ESI-IMS-MS. Its continuous output greatly facilitates the integration with FT-MS instruments that require a flexible MS scan rate or a flexible IMS scanning strategy.

Key references & Patents:

- Method and apparatus to produce steady beams of mobility selected ions via time-dependent electric fields, USPTO 8,378,297 B2
- Transversal modulation ion mobility spectrometer with reduced voltage and improved robustness and resolving power, USPTO 62/114,601,
- Method and apparatus to generate beams of ions with controlled ranges of mobilities, 62/077,412 (UPSTO).
- Vidal-de-Miguel, G.; Macía, M.; Cuevas, J. Transversal Modulation Ion Mobility Spectrometry (TM-IMS), a new mobility filter overcoming turbulence related limitations.; Anal. Chem., Just Accepted Manuscript; DOI: 10.1021/ac301127u; August 27, 2012
- Barrios-Collado, C.; Vidal-de-Miguel, G.; Numerical algorithm for the accurate evaluation of ion beams in transversal modulation ion mobility spectrometry: Understanding realistic geometries; IJMS Volume 376, Pages 97–105, 15 Jan 2015
- Vidal-de-Miguel, G.; Macía, M.; Barrios, C.; Cuevas, J.; Transversal Modulation Ion Mobility coupled with Mass Spectrometry: Exploring the IMS-IMS-MS Possibilities of the Instrument; Analytical Chemistry, Just Accepted Manuscript, Jan 2015

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