

## Ambient Mass Spectrometry Imaging / Synapt G2S

<https://search.researchequipment.wur.nl/SearchDetail.aspx?deviceid=6f448d18-c774-4e3b-86a0-78891d472c9c>

### **Brand**

Waters

### **Type**

Synapt G2-S HDMS 4k traveling



### **Contact**

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### **Organisation**

Agrotechnology & Food Sciences Group

### **Department**

Organic Chemistry

### **Description**

The Ambient Mass Spectrometry Imaging system can image sample surfaces under ambient native conditions, without sample preparation, and generate accurate localized mass spectra. This technology is ideal for studying the composition of non-homogeneous surfaces. It enables researchers to see where molecules of interest are located on surfaces.

The Synapt G2S mass spectrometer is equipped with a versatile ion source front, allowing to connect several ionization sources. The main feature is the nanoelectrospray ionization (LAESI) source, equipped with a 2940 nm mid-infrared laser and an X-Y sample stage that can be thermostated from -10 to +60 °C, features a spatial resolution of 20- 500 microns. The LAESI can be used for both small and large molecules having medium to high polarity. The DART source, that ionizes with excited helium gas, is equipped with an X-Y sample stage, which allows ionization of small molecules amenable for having low to medium polarity.

Principle of LAESI

Biological tissues and aqueous samples are readily analyzed using a mid-infrared laser (2940 nm) in Laser Ablation Electrospray Ionization Mass Spectrometry (or LAESI-MS). The wavelength corresponds to the frequency of the O-H bond vibrations in water, therefore it results in the strong absorption of this wavelength by the water. Gas phase particles are created from the ablation of the sample due to this absorption of the mid-IR energy. These particles are subsequently ionized through interactions with an electrospray ionization (ESI) plume located above the sample at ambient pressure. The ions are sampled and analyzed by the mass spectrometer after interaction with the ESI plume.

### **Technical Details**

Mass spectrometer: Waters Synapt G2-S HDMS 4k traveling wave ion mobility TOF

- Mass range: 20 – 40,000 Da
- Resolution: 40,000
- Mass accuracy: <1 ppm

Ion Sources

- For imaging of surfaces: LAESI DP-1000 (Laser Ablation Electrospray Ionization) from Protea Biosciences
- smallest spatial resolution (pixel size of the image): 200 m
- For objects: Direct Analysis in Real Time (DART) from IonSense
- smallest spatial resolution (pixel size of the image): 5 mm
- For UPLC: Electrospray ionization (ESI)

Available Ultra-performance liquid chromatography (UPLC) for solutions

- Waters nanoAcquity UPLC
- Waters Trizaic / Ion Key microfluidic LC system

## ***Applications***

LAESI-MS supports a broad range of applications in the fields of pharmaceutical and biological research, surgical and molecular pathology, clinical diagnostics, chemical and biological defense, forensics, agriculture, food process monitoring, and many others.

Examples of applications of ambient imaging MS with LAESI

Spatial distribution profiling (2D and 3D imaging) of biomolecules in tissues or living cells is relevant in various research areas, such as:

- Plant sciences: plant metabolomics – by studying the composition of plant tissues such as leaves and stems.
- Food quality and safety: spatial distributions of food contaminants, residues and biotoxins on food surfaces.
- Microbiology: microbial chemical signaling studies of cell colonies on petri dishes.
- Animal and medical sciences: imaging of lipids, sugars and proteins in tissue sections.

## ***Publications***

Macroscopic and microscopic spatially-resolved analysis of food contaminants and constituents using laser-ablation electrospray ionization mass spectrometry imaging , Michel W. F. Nielen, Teris A. van Beek , Analytical and Bioanalytical Chemistry , <http://link.springer.com/article/10.1007/s00216-014-7948-8#>