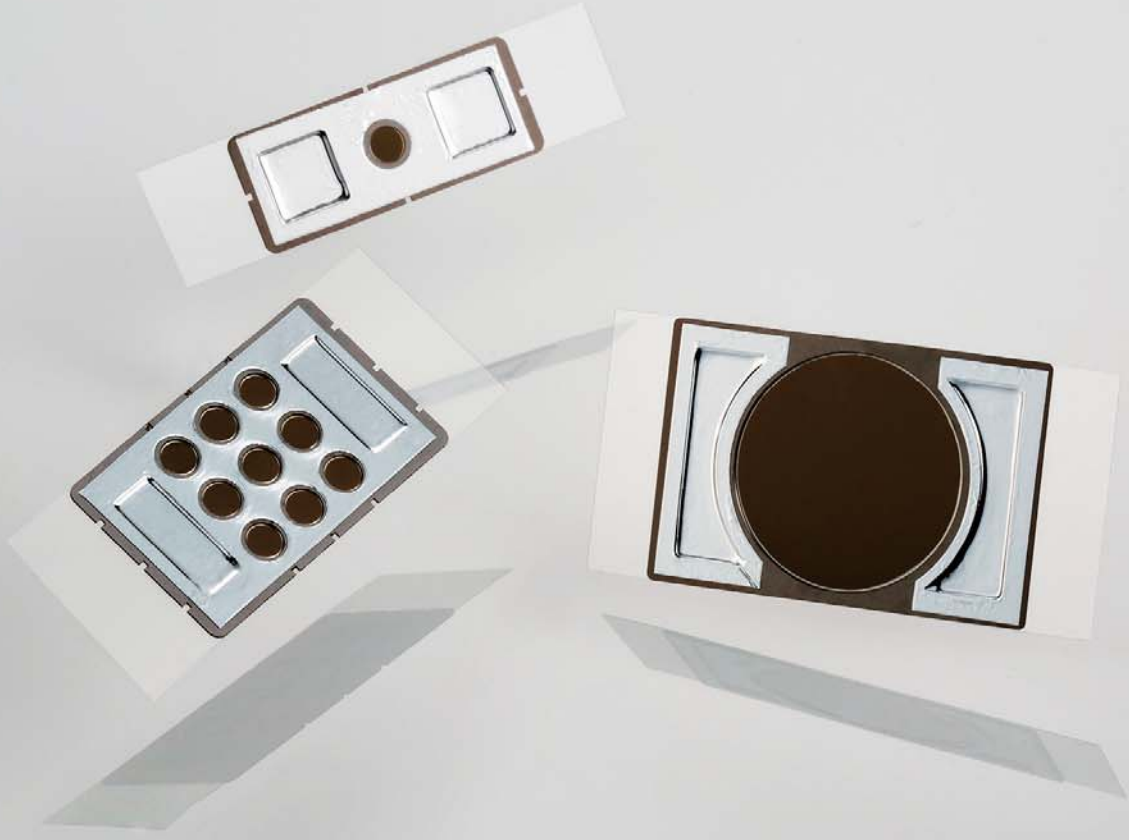
Ionization-assisting substrates

Desorption Ionization Using Through Hole Alumina MEmbrane

DIU THAME™

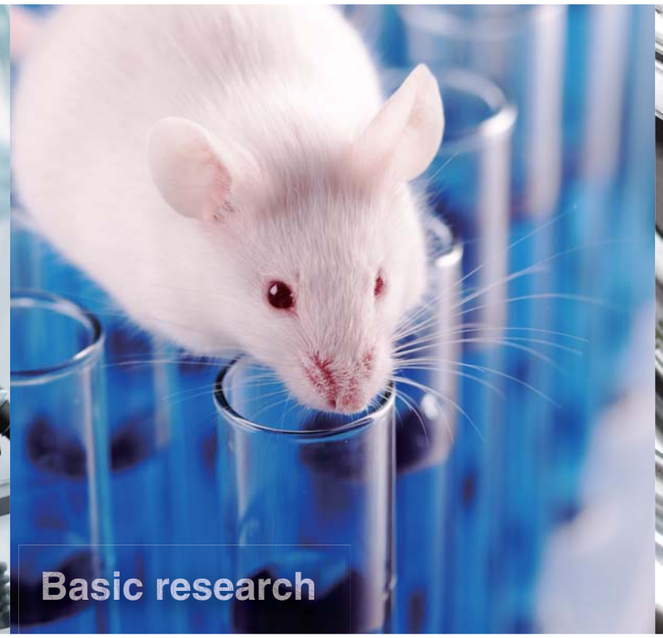


HAMAMATSU

PHOTON IS OUR BUSINESS

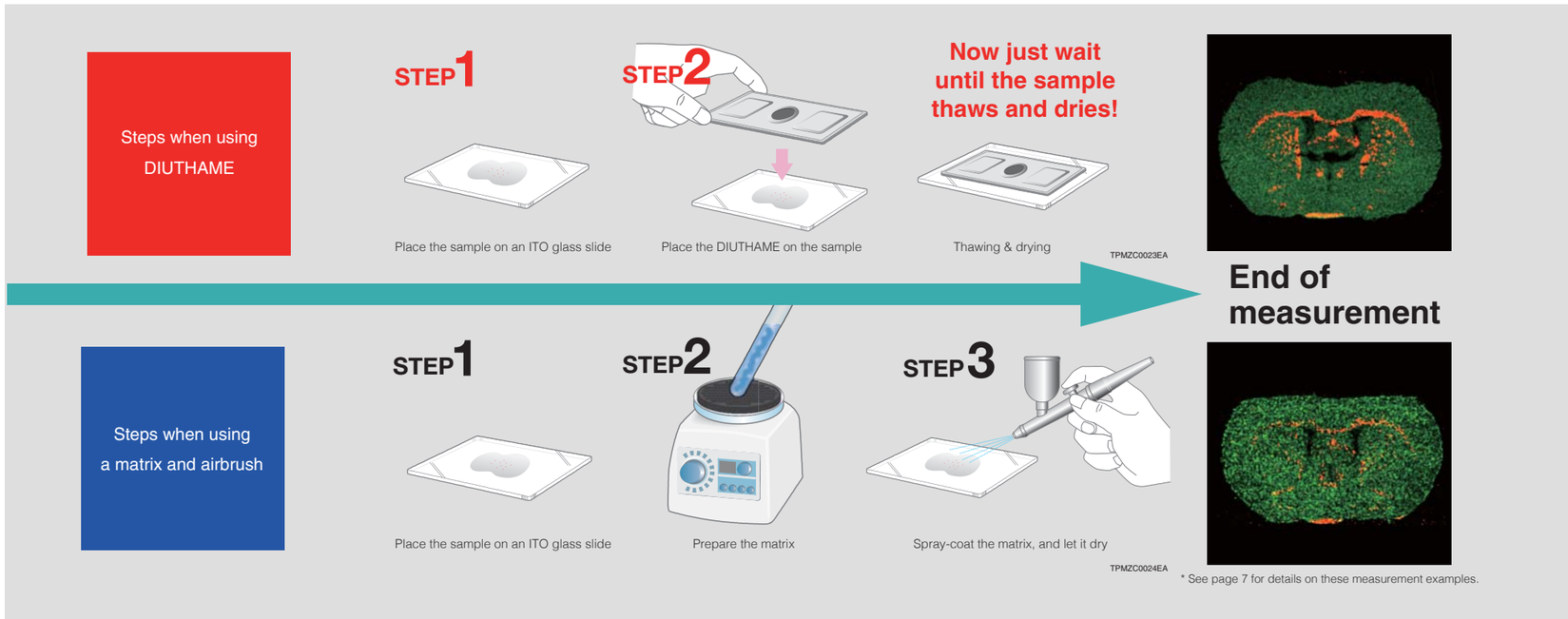
DIUTHAME is an acronym for “Desorption Ionization Using Through Hole Alumina Membrane”

DIUTHAME ensures high repro ducibility and accuracy in your mass spectrometry tasks!



Hamamatsu offers ionization-assisting substrates called DIUTHAME that support ionization in mass spectrometry in place of matrix that is currently used for MALDI (Matrix-Assisted Laser Desorption/Ionization) and also eliminate the cumbersome sample pretreatment process. DIUTHAME brings high reproducibility and ease-of-handling to mass spectrometry by serving as a completely new tool that can readily be used by all MALDI mass spectrometer users.

●Example: Difference in preparations for frozen section measurements of mouse brain



* See page 7 for details on these measurement examples.

Ionization-assisting substrates DIUTHAME

Features

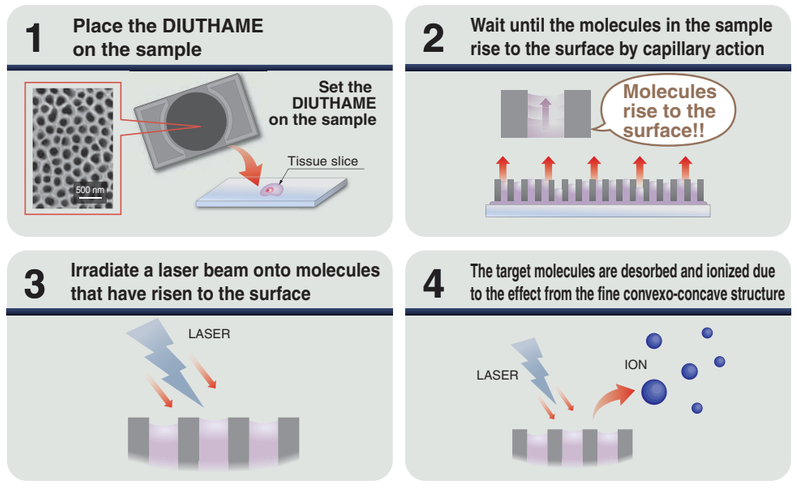
NO matrix required

- NO matrix background noise
- High reproducibility with minimal variation no matter who does the measurement
- NO sample pretreatment required
- High spatial resolution in imaging mass spectrometry ensured by nanometer-order structure

How DIUTHAME differs from conventional MALDI

Item	DIUTHAME	MALDI
Background noise	None	Matrix noise appears
Ease of handling	Easy	Expertise is required
Reproducibility	High	Not so high
Spatial resolution	High	Not so high
Measurement of high molecules	Possible depending on samples	Possible

Ionization process using DIUTHAME



TPMZC0025EA

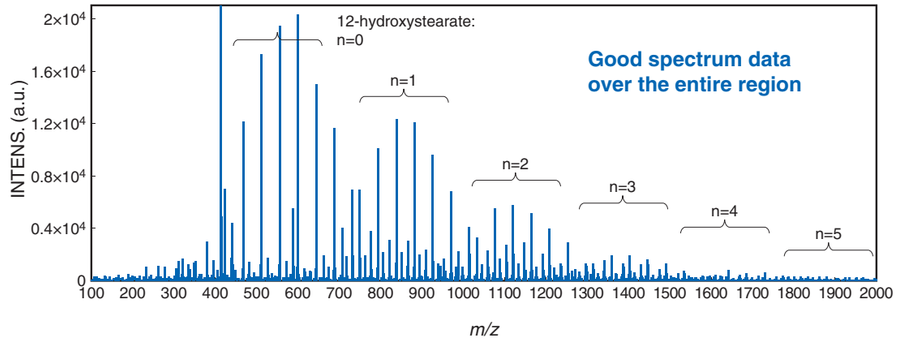
Mass spectrum measurement example

Measurements were carried out in cooperation with Dr. Hiroaki Sato, Polymer Chemistry Group of the Research Institute for Sustainable Chemistry, National Institute of Advanced Industrial Science and Technology (AIST).

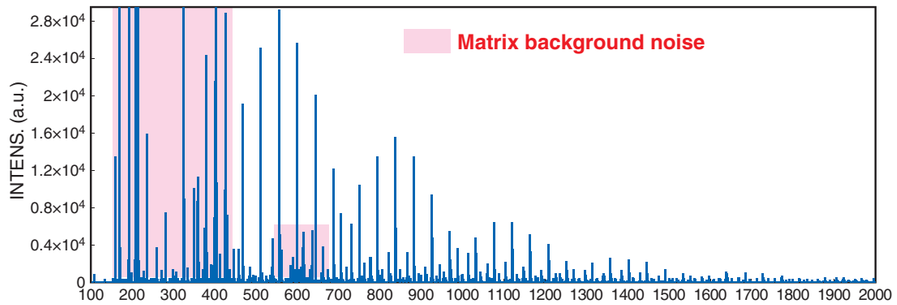
● PEO-hydrogenated castor oil

Measurement sample: Cosmetic raw material (Hydrogenated castor oil)

●Measurement example of PEO-hydrogenated castor oil using DIUTHAME



●Measurement example of PEO-hydrogenated castor oil using MALDI



Measurement method

The mixed sample was dropped from above the DIUTHAME.

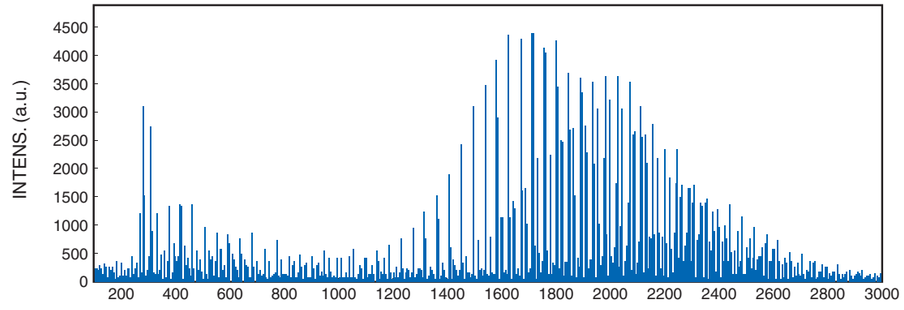
Measurement sample details

The sample was dissolved in THF at a concentration of 1 mg/mL.
NaTFA was used as the cationizing agent and dissolved in THF at a concentration of 1 mg/mL.
The sample was mixed with the cationizing agent at a ratio of 1:10 (v/v).

TPMZB0030EA

● PEO-monostearate

Measurement sample: Industrial surfactant (PEO monostearate)



Measurement method

The mixed sample was dropped from above the DIUTHAME.

Measurement sample details

The sample was dissolved in THF at a concentration of 1 mg/mL.
NaTFA was used as the cationizing agent and dissolved in THF at a concentration of 1 mg/mL.
The sample was mixed with the cationizing agent at a ratio of 1:10 (v/v).

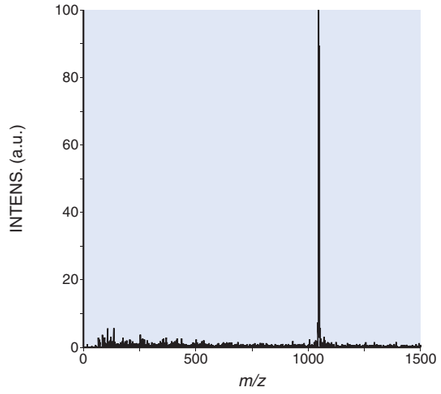
TPMZB0031EA

Mass spectrum measurement example

●Mass spectrum measurement example
Measurements were carried out in cooperation with Associate Professor Yasuhide Naito, The Graduate School for the Creation of New Photonics Industries

● Angiotensin II

Measurement sample: Angiotensin II ([M+H]$^+$, *m/z* 1046.5): 1 µM
Measurement conditions: Linear, positive ion mode



Measurement method

The mixed sample was soaked up from below the DIUTHAME.

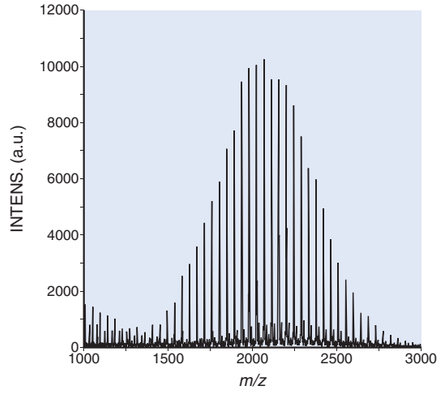
Measurement sample details

Angiotensin II: DHC : CitAc : ACN=1 : 1 : 1 : 1
Angiotensin II: 1 µM
DHC (Diammonium hydrogen citrate): 0.2 M
CitAc (Citric acid): 0.2 M
ACN: Acetonitrile

TPMZB0032EA

● Polyethylene glycol 2000

Measurement sample: Polyethylene glycol 2000: 1mM in acetone
Measurement conditions: Linear, positive ion mode



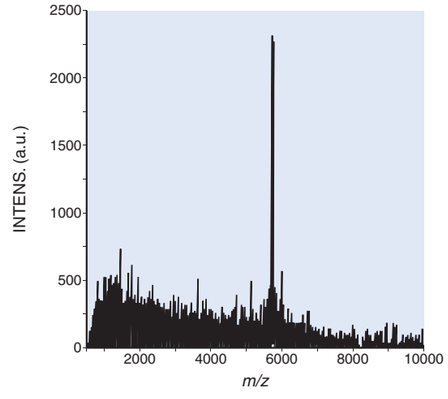
Measurement method

The mixed sample was dropped from above the DIUTHAME.

TPMZB0033EA

● Insulin

Measurement sample: Insulin ([M+H]$^+$, *m/z* 5733.6): 0.5 mM
Measurement conditions: Linear, positive ion mode



Measurement method

The mixed sample was soaked up from below the DIUTHAME.

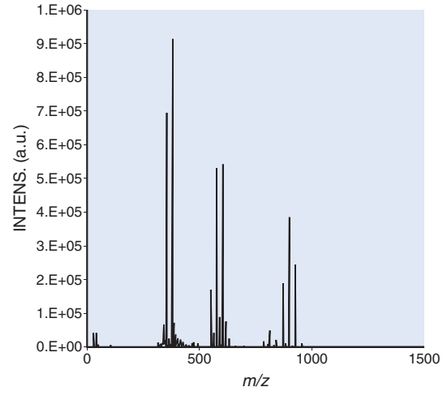
Measurement sample details

Insulin: DHC : CitAc : ACN=1 : 1 : 1 : 1
Insulin: 0.5 mM
DHC (Diammonium hydrogen citrate): 0.2 M
CitAc (Citric acid): 0.2 M
ACN: Acetonitrile

TPMZB0034EA

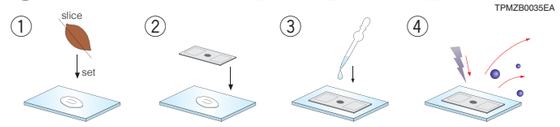
● Cocoa raw bean (Triglycerides)

Measurement sample: Triglycerides in cocoa raw beans
Measurement conditions: Linear, positive ion mode



Measurement method

①Set a slice of cacao raw bean on an ITO glass slide.
②Place the DIUTHAME on the sliced bean.
③Drop 2 µL of acetone from above the DIUTHAME to extract the components of interest.
④Irradiate a laser beam onto the DIUTHAME to cause ionization.

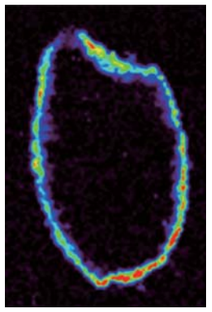


TPMZB0035EA
TPMZC0026EA

Measurement examples using imaging mass spectrometry

●Imaging mass spectrometry measurement example
Measurements were carried out in cooperation with Designated Assistant Professor Keiko Kuwata, The Institute of Transformative Bio-Melecules Nagoya University

● Black rice



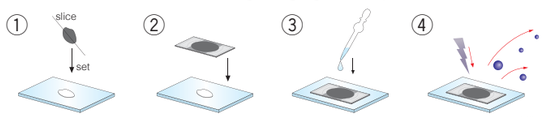
<Microscopic image>

m/z 920 (Phosphatidylcholine)
Measurement conditions:
Linear, positive ion mode
Laser pitch: 50 µm

* After making measurements using imaging mass spectrometry, a microscopic image was captured from above the DIUTHAME by using a microscope.

Measurement method

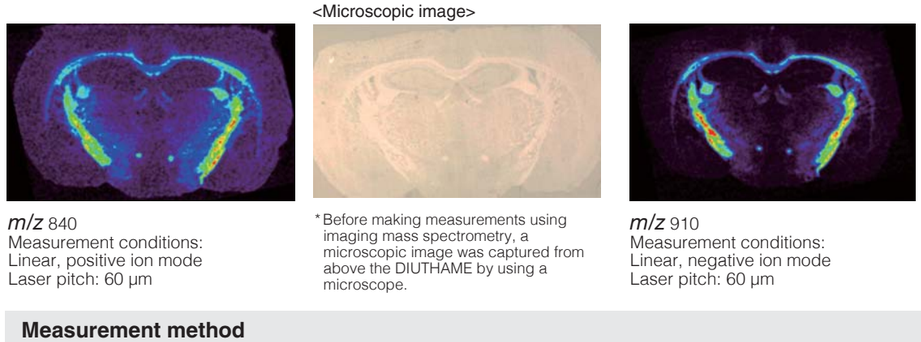
①Set a slice of black rice on an ITO glass slide.
②Place the DIUTHAME substrate on the sliced black rice.
③Drop 2 µL of “70 % AcCN / 30 % H20” solution from above the DIUTHAME to extract the components of interest.
④After the sample dries, make measurements using imaging mass spectrometry.



TPMZC0027EA

● Mouse brain

<Microscopic image>



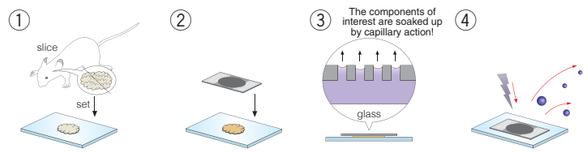
m/z 840
Measurement conditions:
Linear, positive ion mode
Laser pitch: 60 µm

* Before making measurements using imaging mass spectrometry, a microscopic image was captured from above the DIUTHAME by using a microscope.

m/z 910
Measurement conditions:
Linear, negative ion mode
Laser pitch: 60 µm

Measurement method

①Set a slice of frozen mouse brain on an ITO glass slide.
②Place the DIUTHAME on the mouse brain slice before it thaws.
③After the brain slice thaws, the components derived from the sample are soaked up by capillary action.
④After the sample dries, make measurements using imaging mass spectrometry.

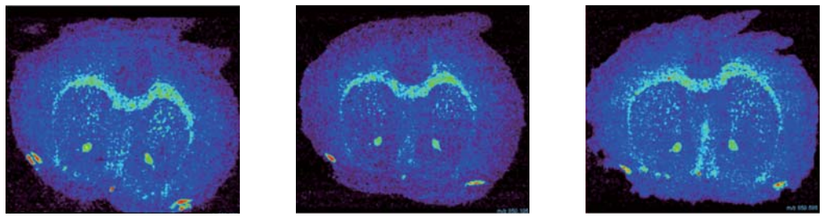


TPMZC0028EA

● Reproducibility of serial slices of mouse brain (near *m/z* 850)

Good reproducibility DIUTHAME

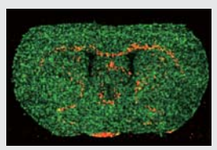
Mouse brain slice thickness: 50 µm
Laser pitch: 50 µm



First time | Second time | Third time

● Comparison between MALDI and DIUTHAME using mouse brain (*m/z* 848)

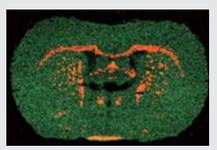
MALDI



Tissue section has contracted somewhat

<Conditions>
■Mouse brain slice thickness 10 µm
■Matrix conditions
DHB 50 mg/ml,
50 % ACN
Spray coating
■Measurement conditions
Reflectron,
positive ion mode
■Laser pitch
50 µm

DIUTHAME

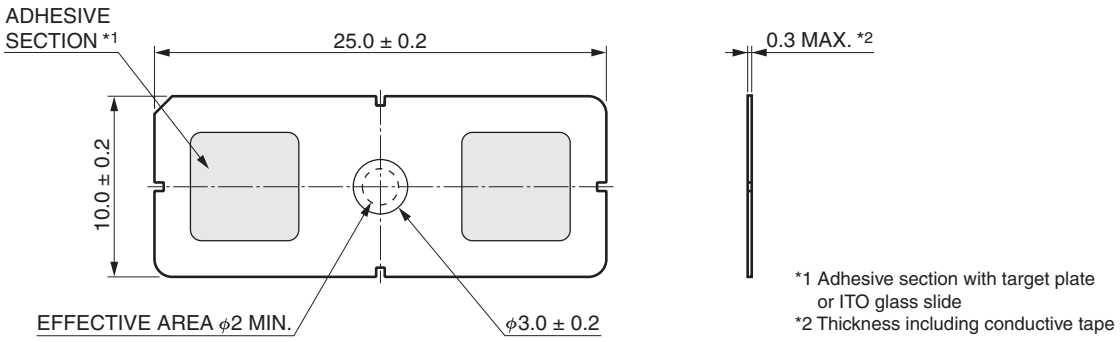


- Good spatial resolution
- Maintains shape of tissue section

<Conditions>
■Mouse brain slice thickness 50 µm
■DIUTHAME size
Effective diameter: 18 mm
■Measurement conditions
Reflectron,
positive ion mode
■Laser pitch
50 µm

Dimensional outlines (unit: mm)

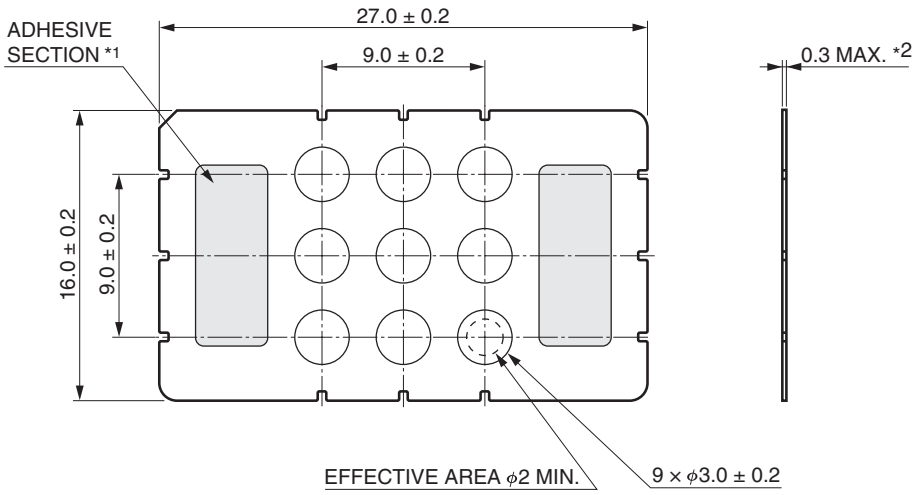
A13331-3-1 (3 mm diameter)
For mass spectrum



*1 Adhesive section with target plate or ITO glass slide
*2 Thickness including conductive tape

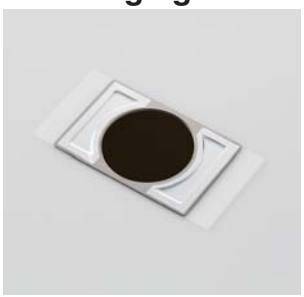
TPMZA0026EA

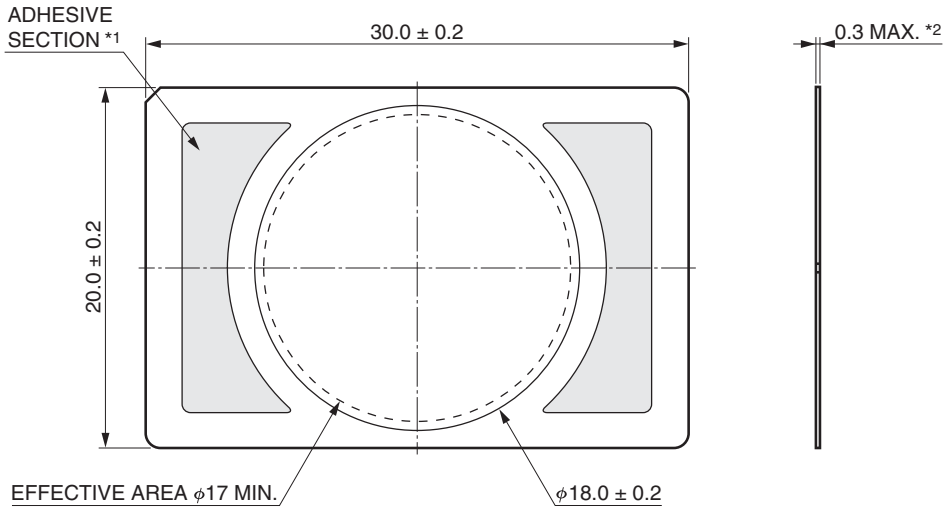
A14111-3-1 (3 mm diameter × 9 ch)
For mass spectrum



TPMZA0027EA

A13331-18-1 (18 mm diameter)
For imaging mass spectrometry





TPMZA0028EA

HAMAMATSU PHOTONICS K.K. www.hamamatsu.com

HAMAMATSU PHOTONICS K.K., Electron Tube Division
314-5, Shimokanzo, Iwata City, Shizuoka Pref., 438-0193, Japan, Telephone: (81)539/62-5248, Fax: (81)539/62-2205

U.S.A.: Hamamatsu Corporation: 360 Foothill Road, Bridgewater, NJ 08807, U.S.A., Telephone: (1)908-231-0960, Fax: (1)908-231-1218 E-mail: usa@hamamatsu.com
Germany: Hamamatsu Photonics Deutschland GmbH.: Arzbergerstr. 10, D-82211 Herrsching am Ammersee, Germany, Telephone: (49)8152-375-0, Fax: (49)8152-265-8 E-mail: info@hamamatsu.de
France: Hamamatsu Photonics France S.A.R.L.: 19, Rue du Saule Trapu, Parc du Moulin de Massy, 91882 Massy Cedex, France, Telephone: (33)1 69 53 71 00, Fax: (33)1 69 53 71 10 E-mail: infos@hamamatsu.fr
United Kingdom: Hamamatsu Photonics UK Limited: 2 Howard Court,10 Tewin Road, Welwyn Garden City, Hertfordshire AL7 1BW, UK, Telephone: (44)1707-294888, Fax: (44)1707-325777 E-mail: info@hamamatsu.co.uk
North Europe: Hamamatsu Photonics Norden AB: Torshamnsgatan 35 16440 Kista, Sweden, Telephone: (46)8-509 031 00, Fax: (46)8-509 031 01 E-mail: info@hamamatsu.se
Italy: Hamamatsu Photonics Italia S.r.l.: Strada della Moia, 1 int. 6, 20020 Arese (Milano), Italy, Telephone: (39)02-93 58 17 33, Fax: (39)02-93 58 17 41 E-mail: info@hamamatsu.it
China: Hamamatsu Photonics (China) Co., Ltd.: 1201 Tower B, Jiaming Center, 27 Dongsanhuan Beilu, Chaoyang District, 100020 Beijing, China, Telephone: (86)10-6586-6006, Fax: (86)10-6586-2866 E-mail: hpc@hamamatsu.com.cn
Taiwan: Hamamatsu Photonics Taiwan Co., Ltd.: 8F-3, No.158, Section2, Gongdao 5th Road, East District, Hsinchu, 300, Taiwan R.O.C. Telephone: (886)03-659-0080, Fax: (886)03-659-0081 E-mail: info@hamamatsu.com.tw

TPMZ1028E01
MAY 2018 IP