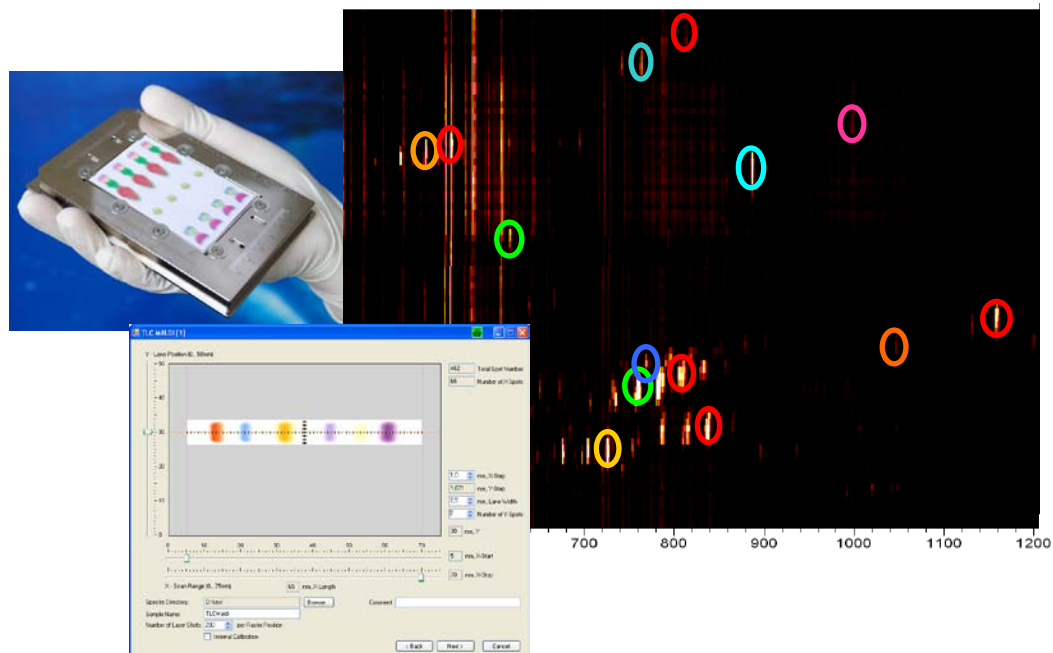


# HPTLC-MALDI Mass Spectrometry

## A new path to direct molecular readout in HPTLC

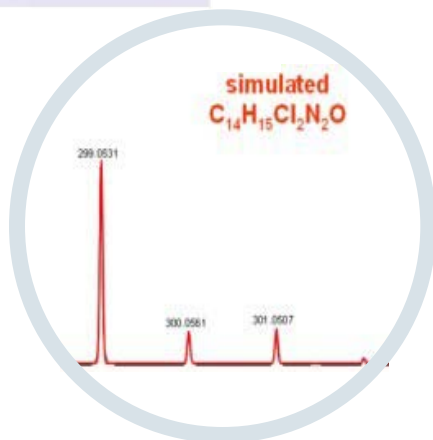
Martin Schürenberg, Bruker Daltonik



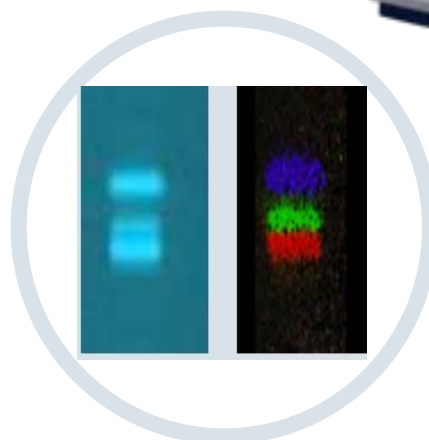
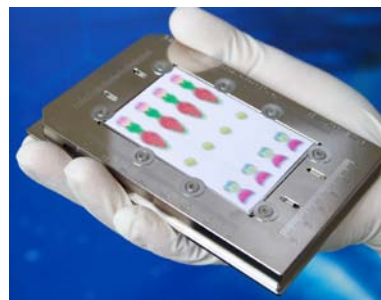
# Two different TLC-MS Platforms



## Extractor + ESI



## TLC MALDI



# TLC-MALDI workflow



Coat the TLC plate with MALDI matrix

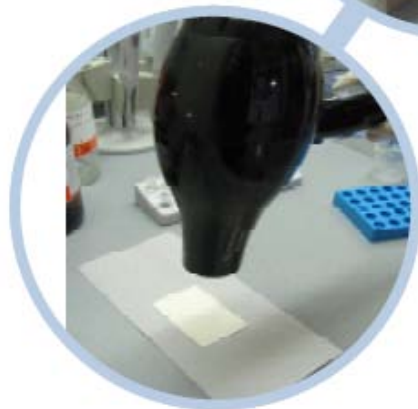
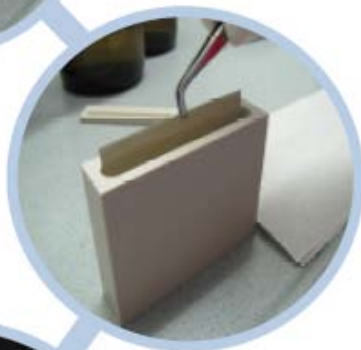
**Use 75 x 50 mm aluminium backed TLC silica gel plates**

e.g. Merck TLC Silica gel 60 F254

(Merck Part No 105549)

HPTLC Silica gel 60 F254

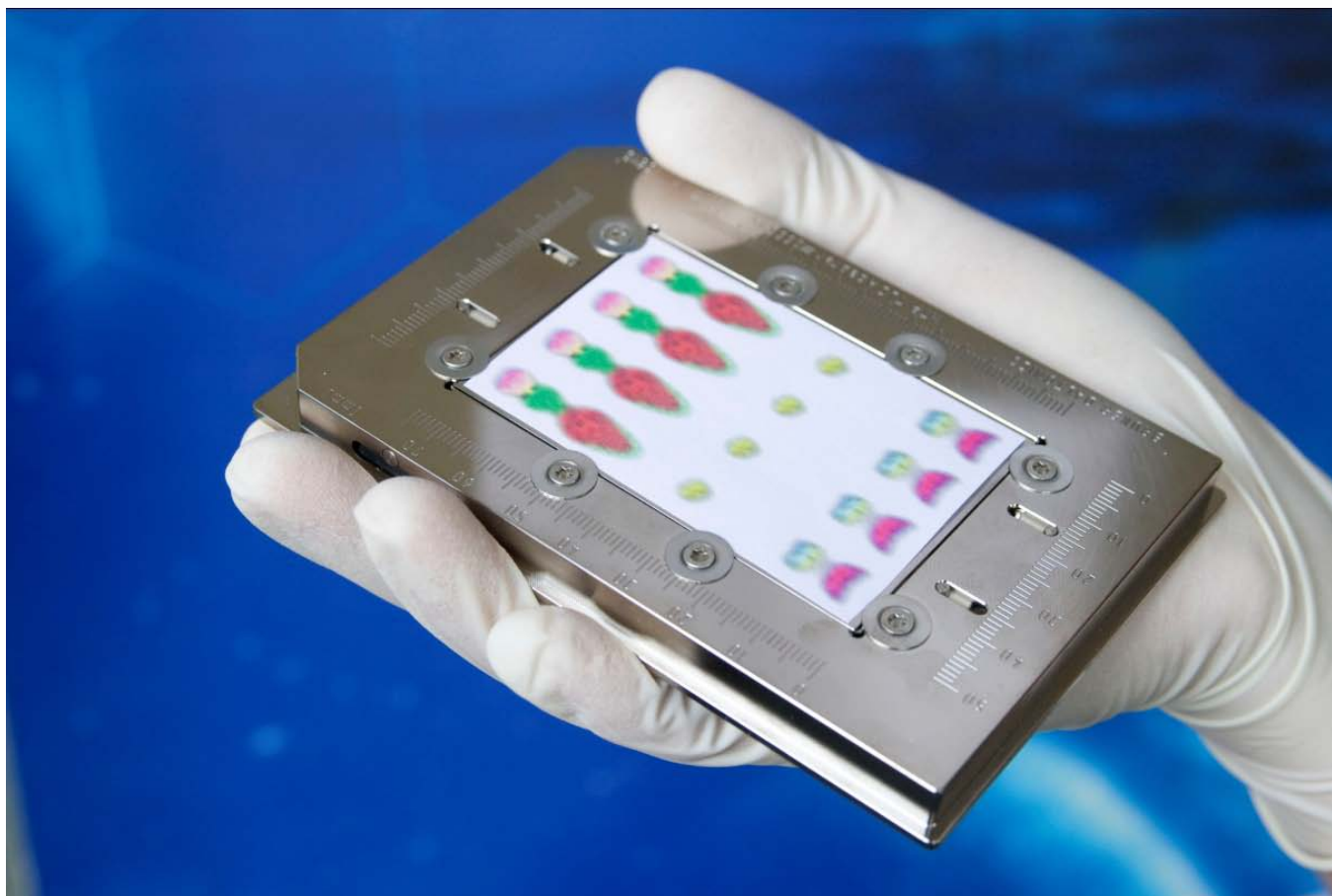
(Merck Part No 105556)



- 5 min dip-coating protocol
- staining not required

# TLC-MALDI workflow

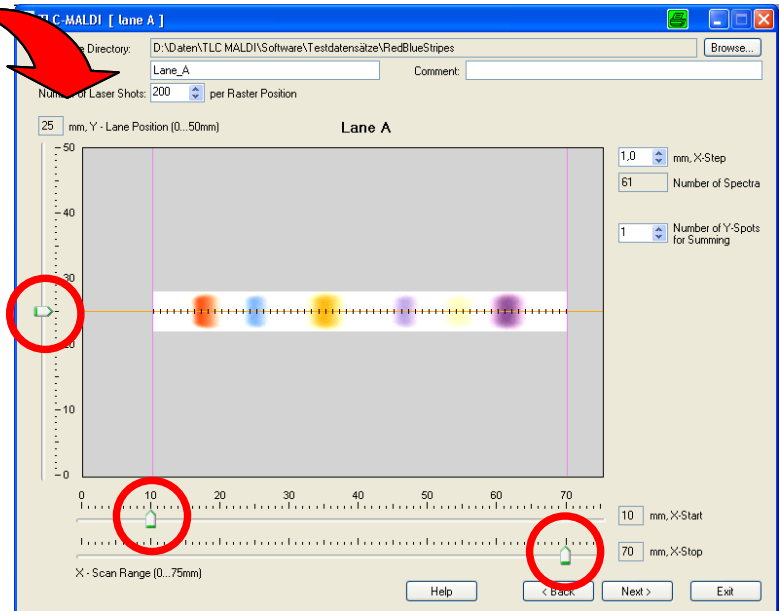
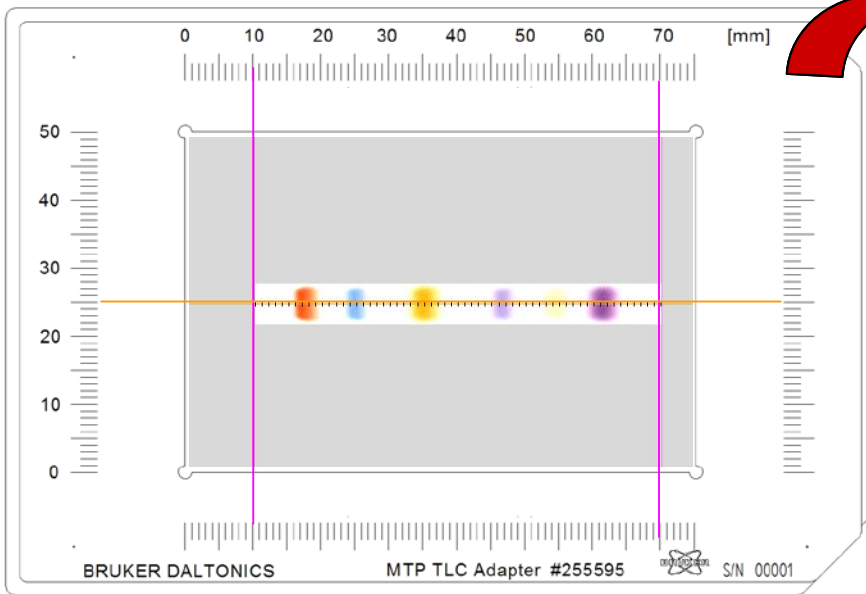
Insert the TLC plate into dedicated adapter target



# TLC-MALDI workflow

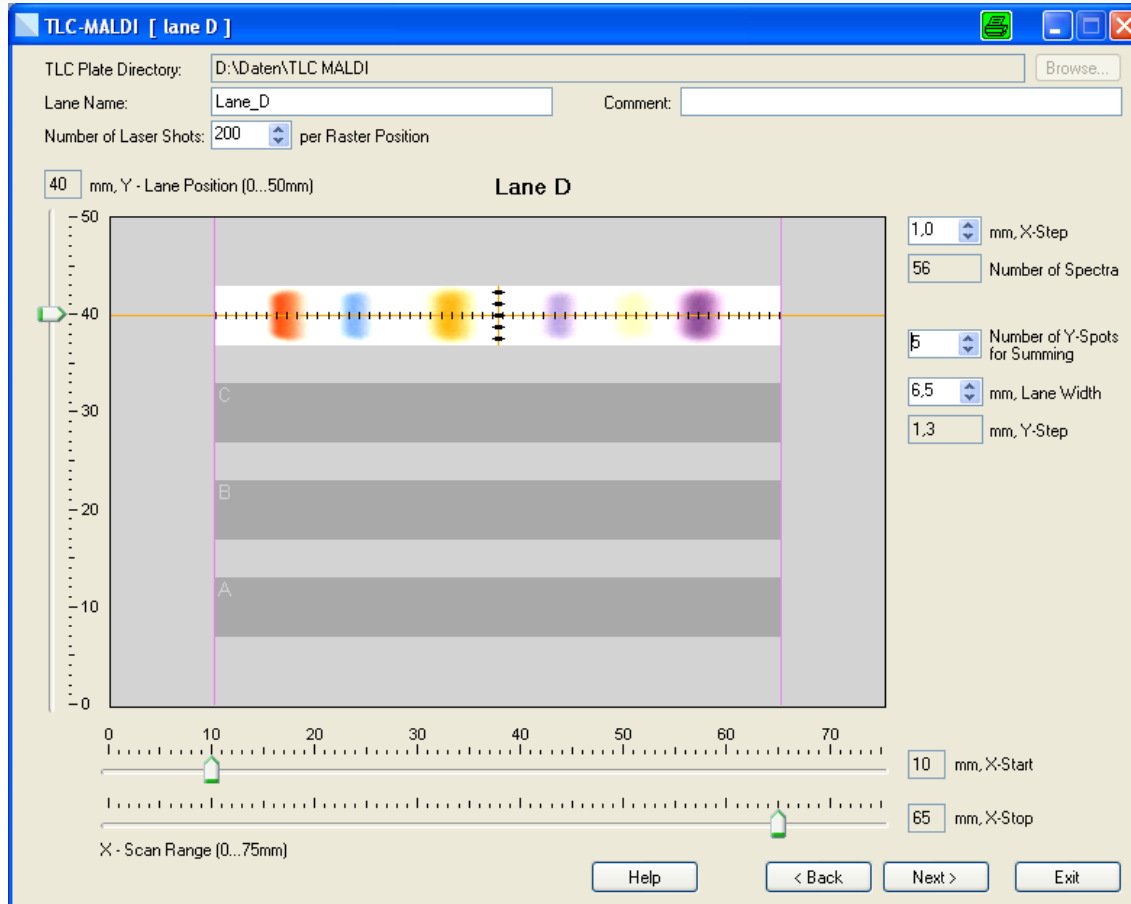


Define the lane positions in TLC MALDI software



# TLC-MALDI workflow

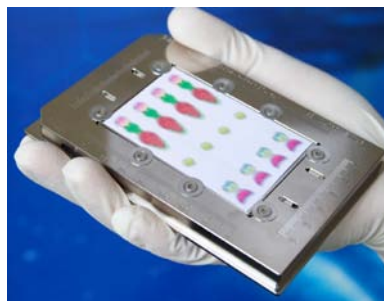
## MALDI experiment set-up



- Intuitive GUI
- Wizard-guided
- No expert knowledge needed
- Multiple lanes
- Experiment set-up in 2 min

# TLC-MALDI workflow

Readout the TLC plate with MALDI-TOF MS



- Scan lanes with desorption laser
- Fully automated spectra acquisition
- 100 $\mu$ m spatial resolution
- 10 min per lane

# How MALDI-TOF MS works



**Laser**

**Stopwatch**



**Sample**



**Detector**



**Race track**



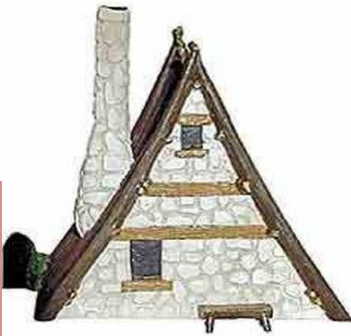
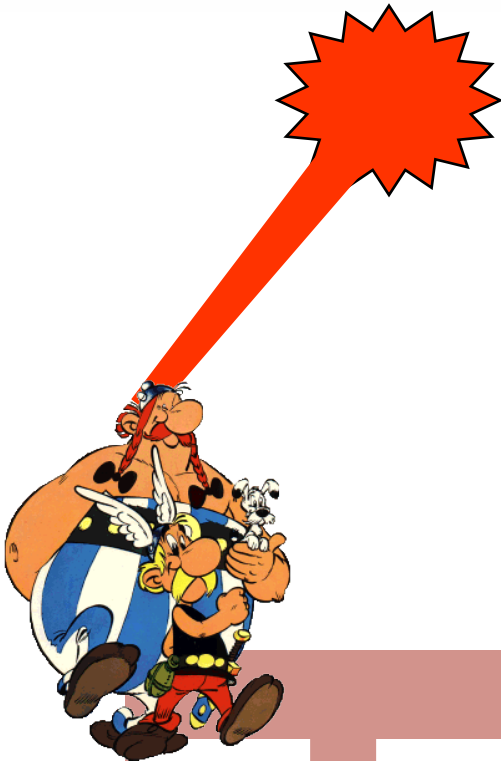


# How MALDI-TOF MS works

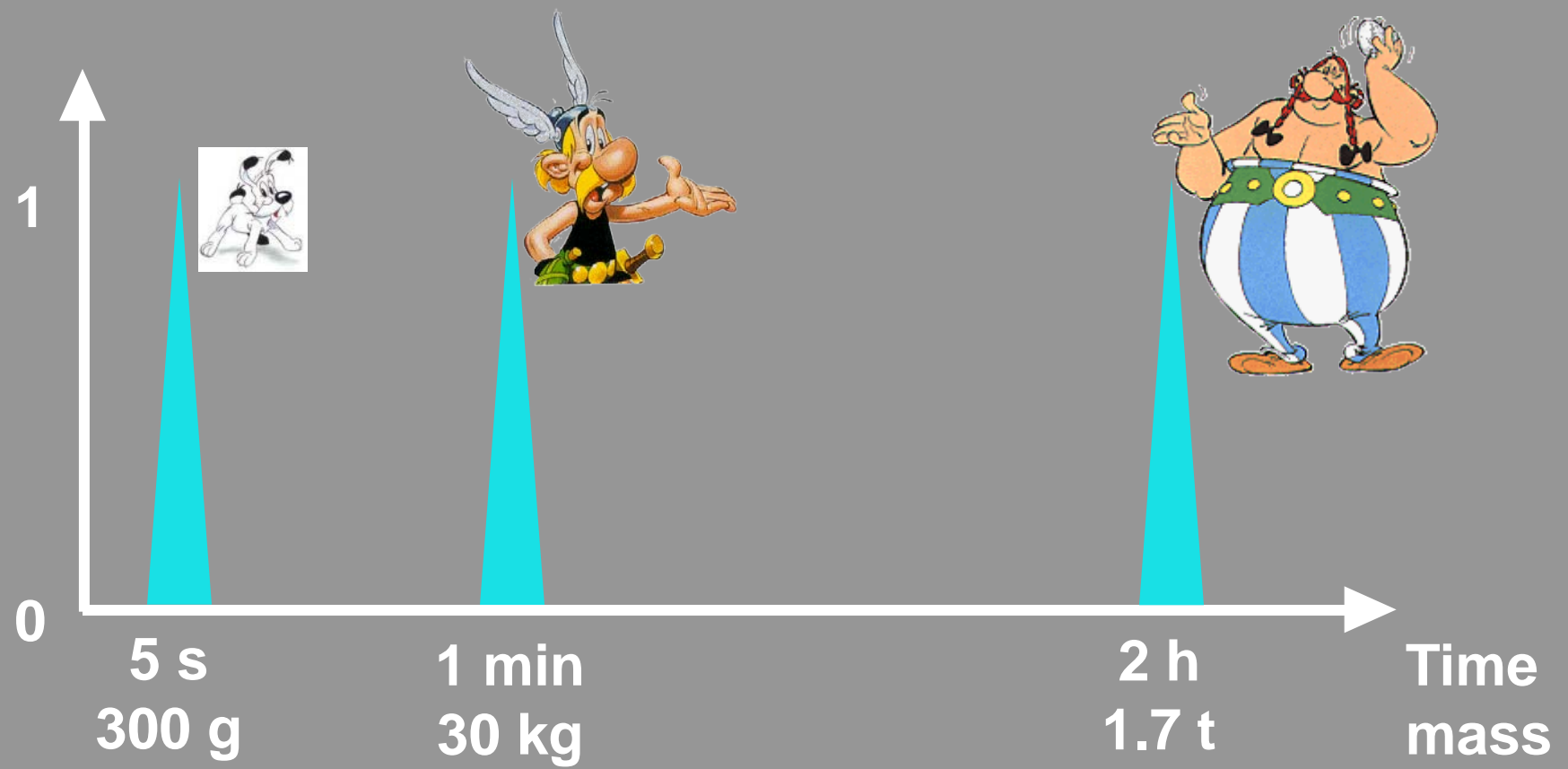


Laser

Stoppuhr

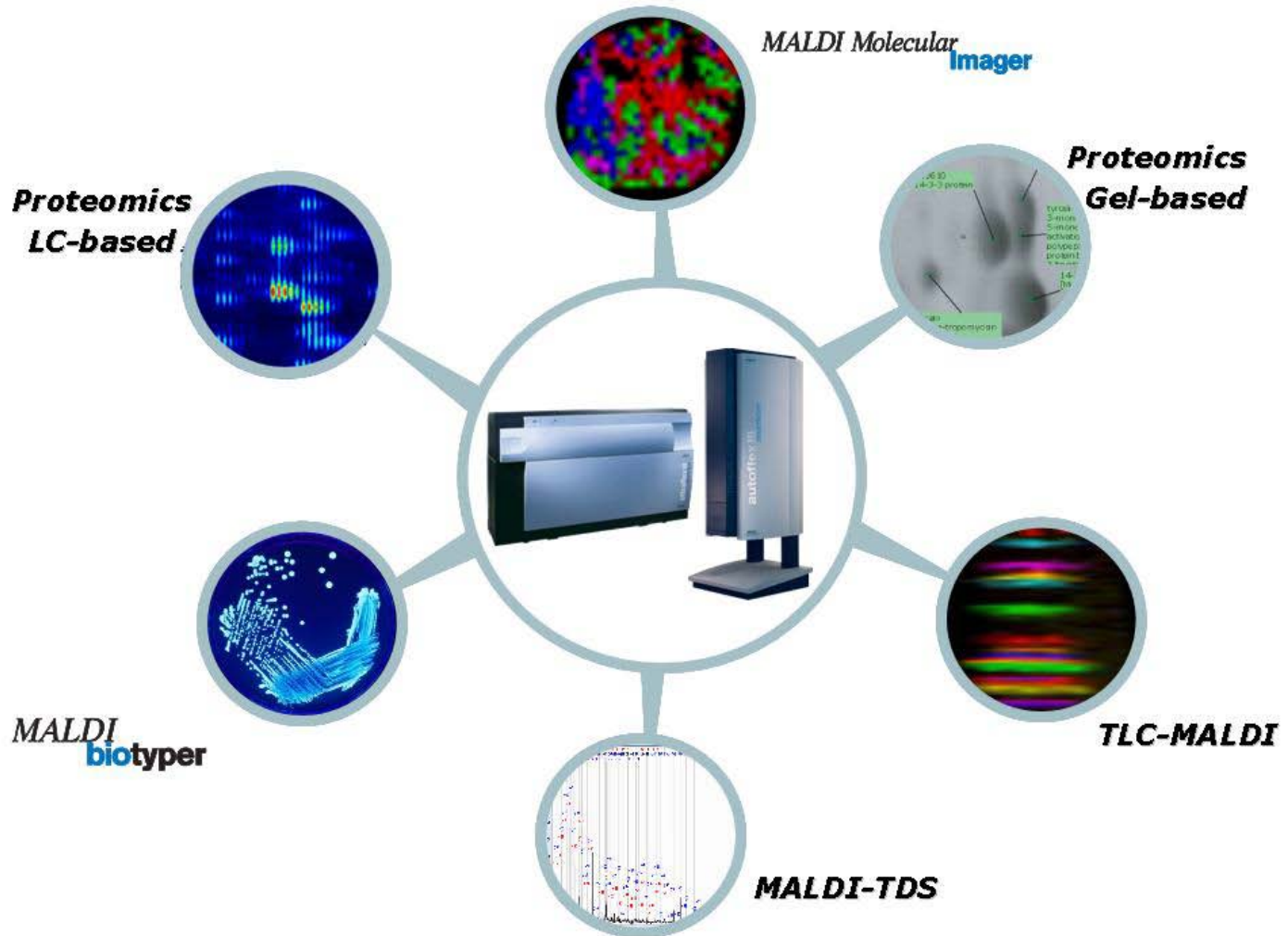


# How MALDI-TOF MS works



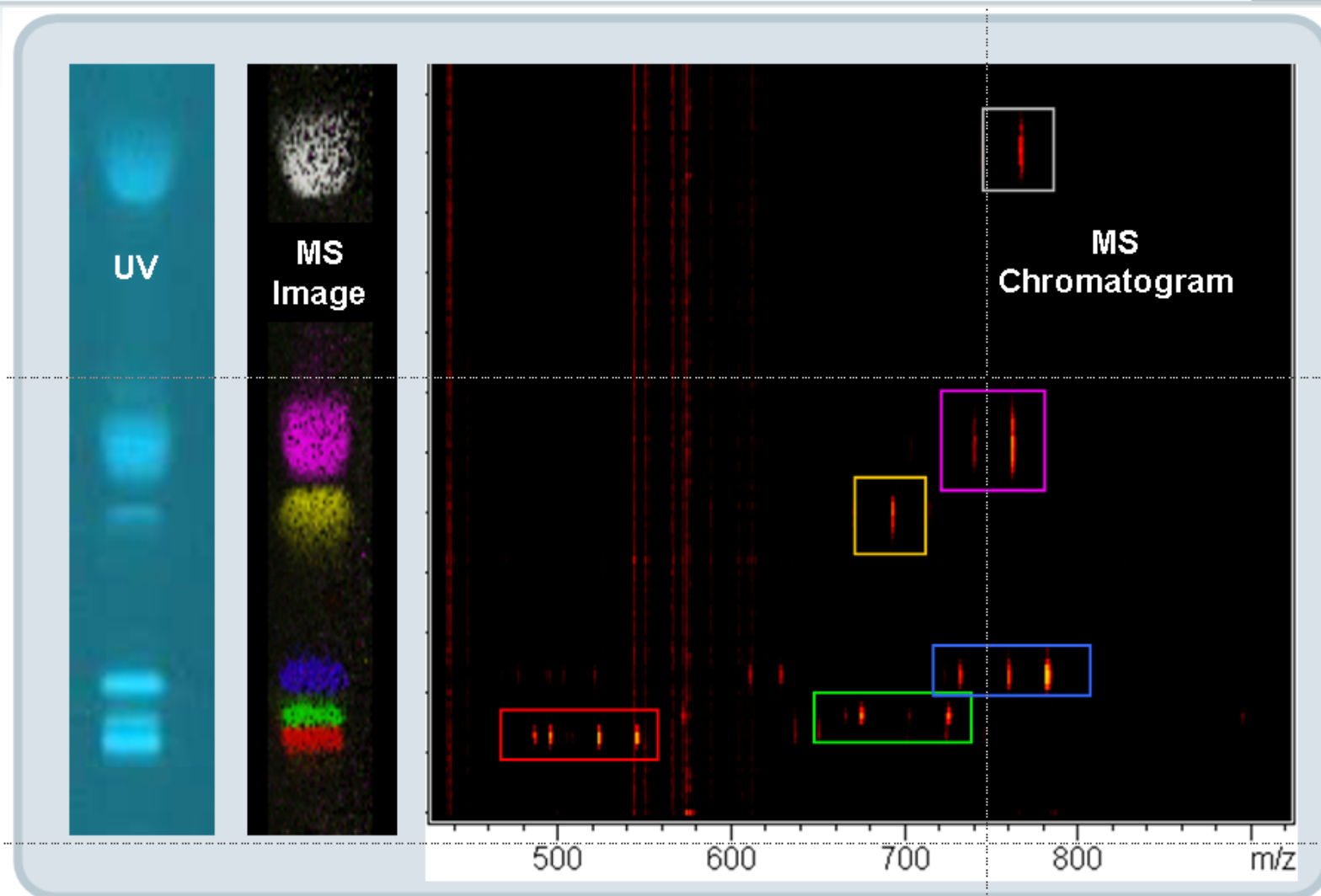
# TLC-MALDI workflow

MALDI-TOF spectrometers are multi-purpose instruments



# TLC-MALDI workflow

Display and interpret data in dedicated viewer



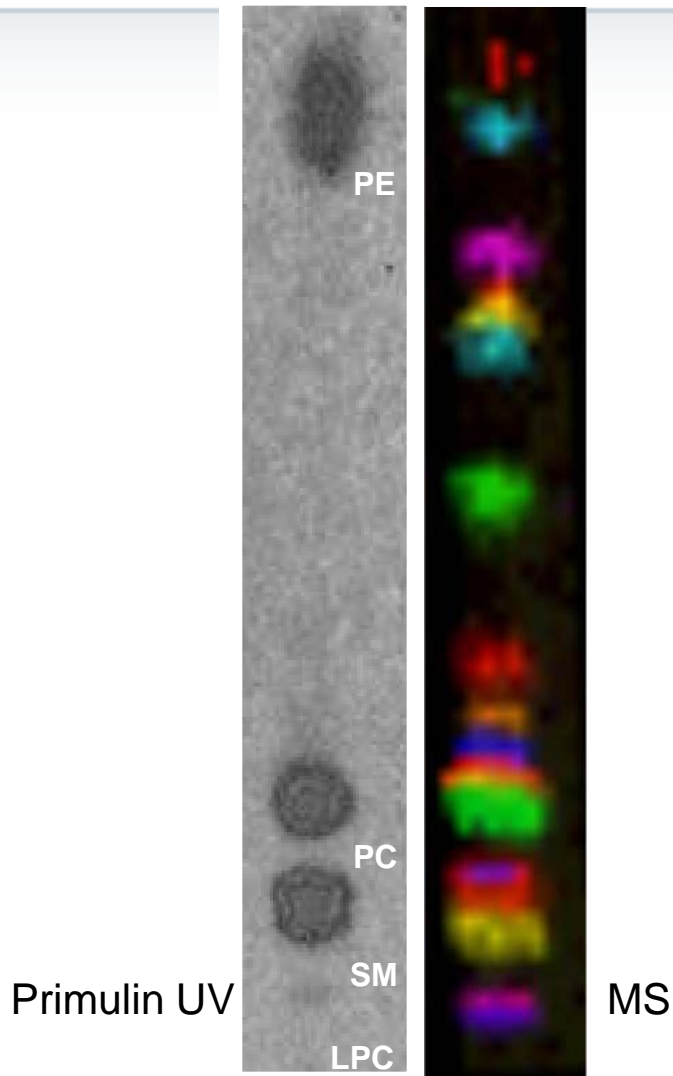
# Navigating an HPTLC-MALDI dataset

Example: Erythrocyte Phospholipids

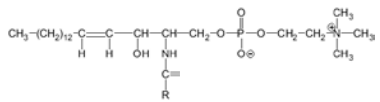


# Navigating an HPTLC-MALDI dataset

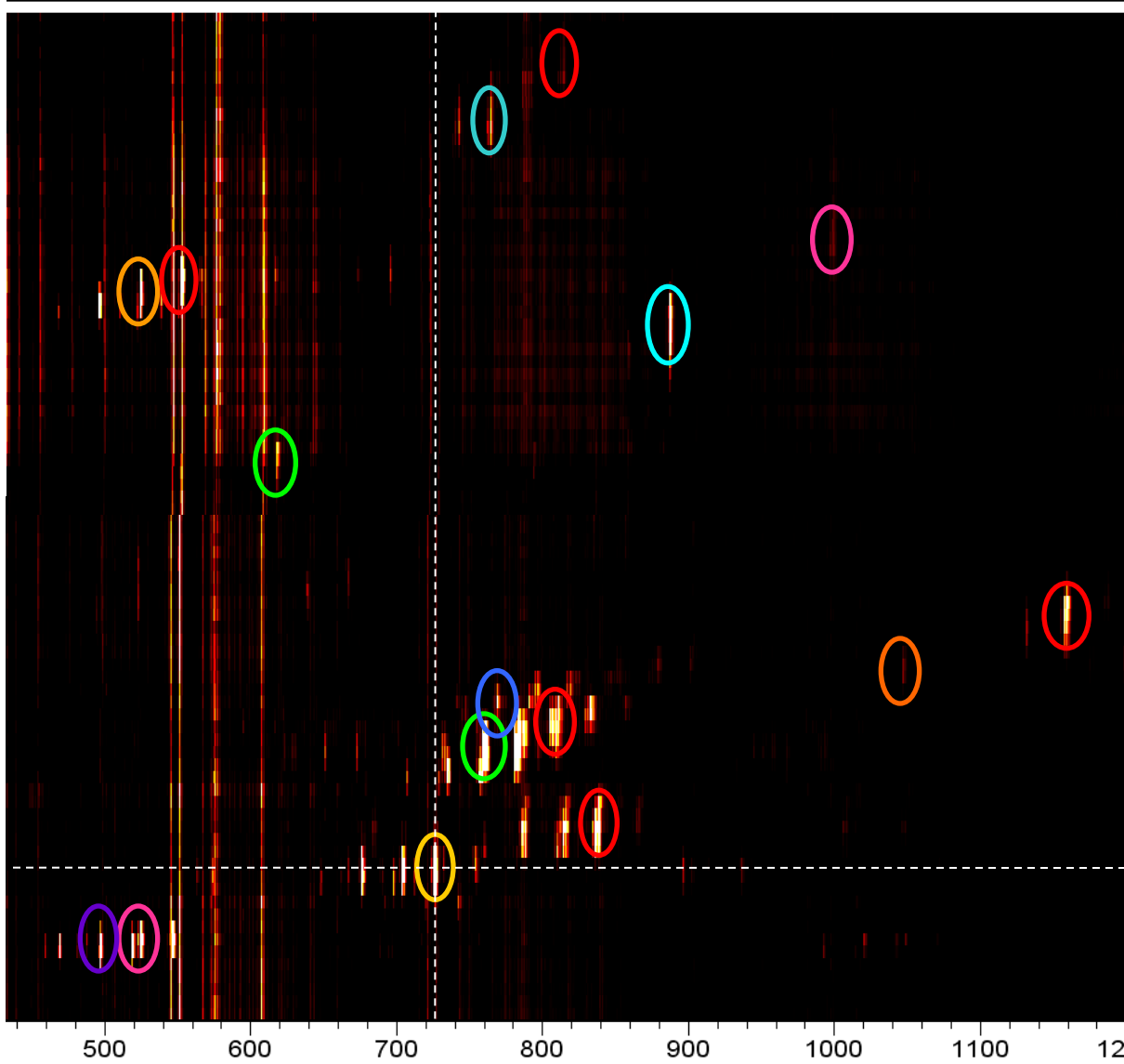
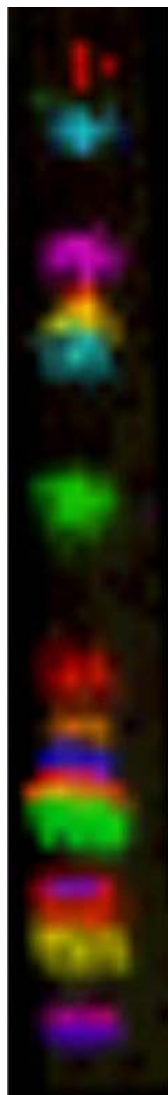
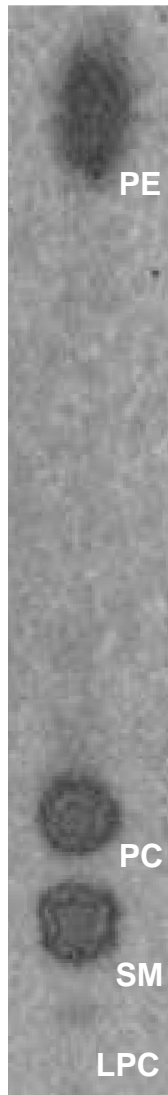
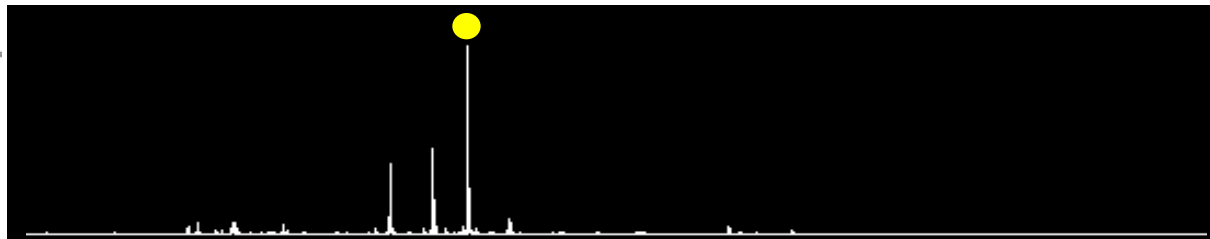
Example: Erythrocyte Phospholipids



**More compounds  
are visible in the MS image**



SM 16:0

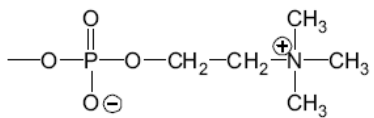


m/z 727

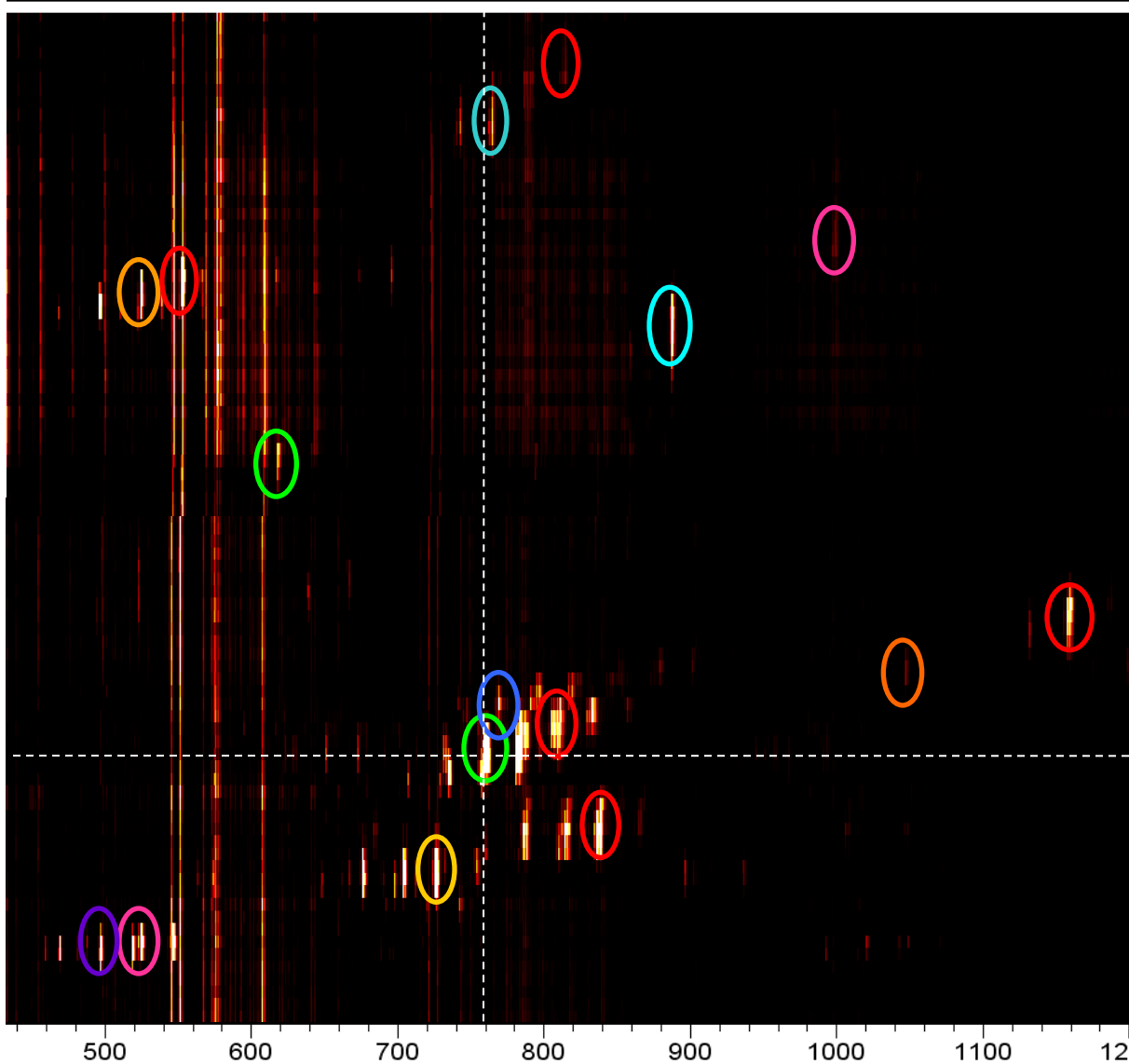
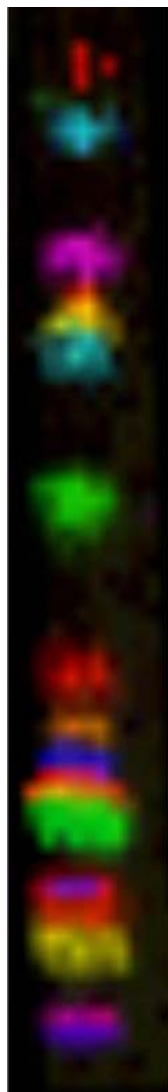
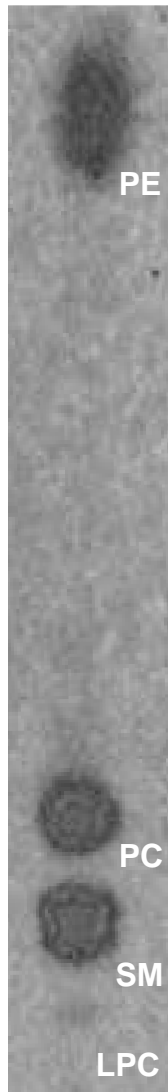
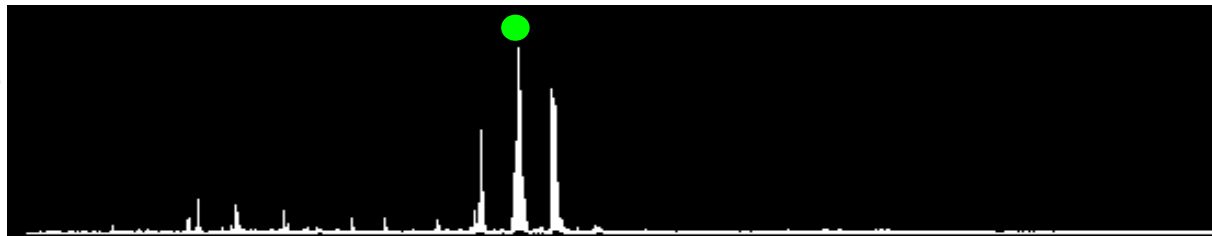
TLC Lane

MS Image

500 600 700 800 900 1000 1100 1200



PC



m/z 760

500

600

700

800

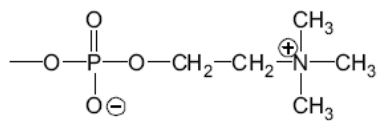
900

1000

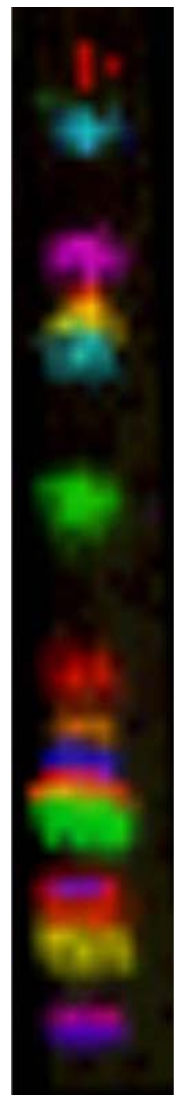
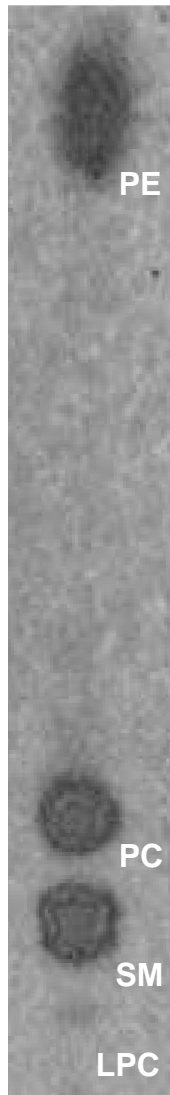
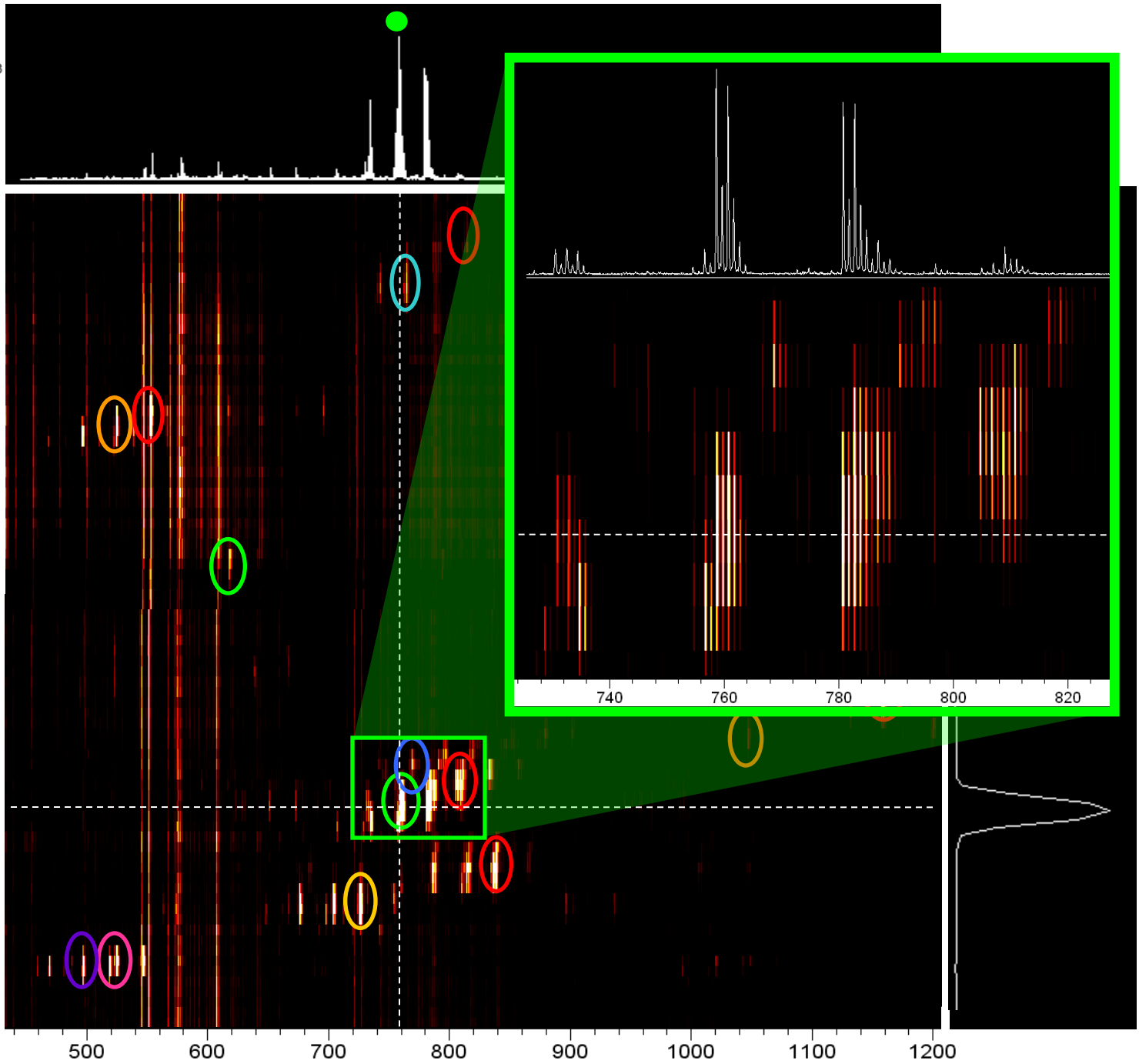
1100

1200





PC

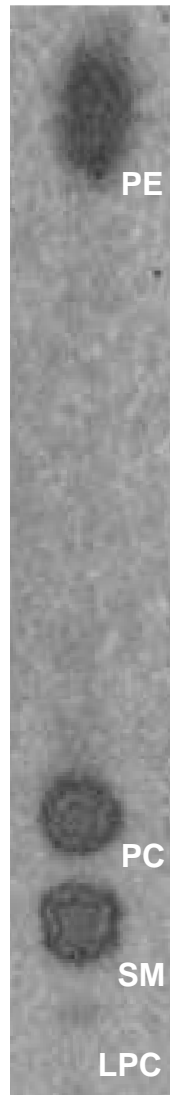


TLC Lane

MS Image

500 600 700 800 900 1000 1100 1200

unknown

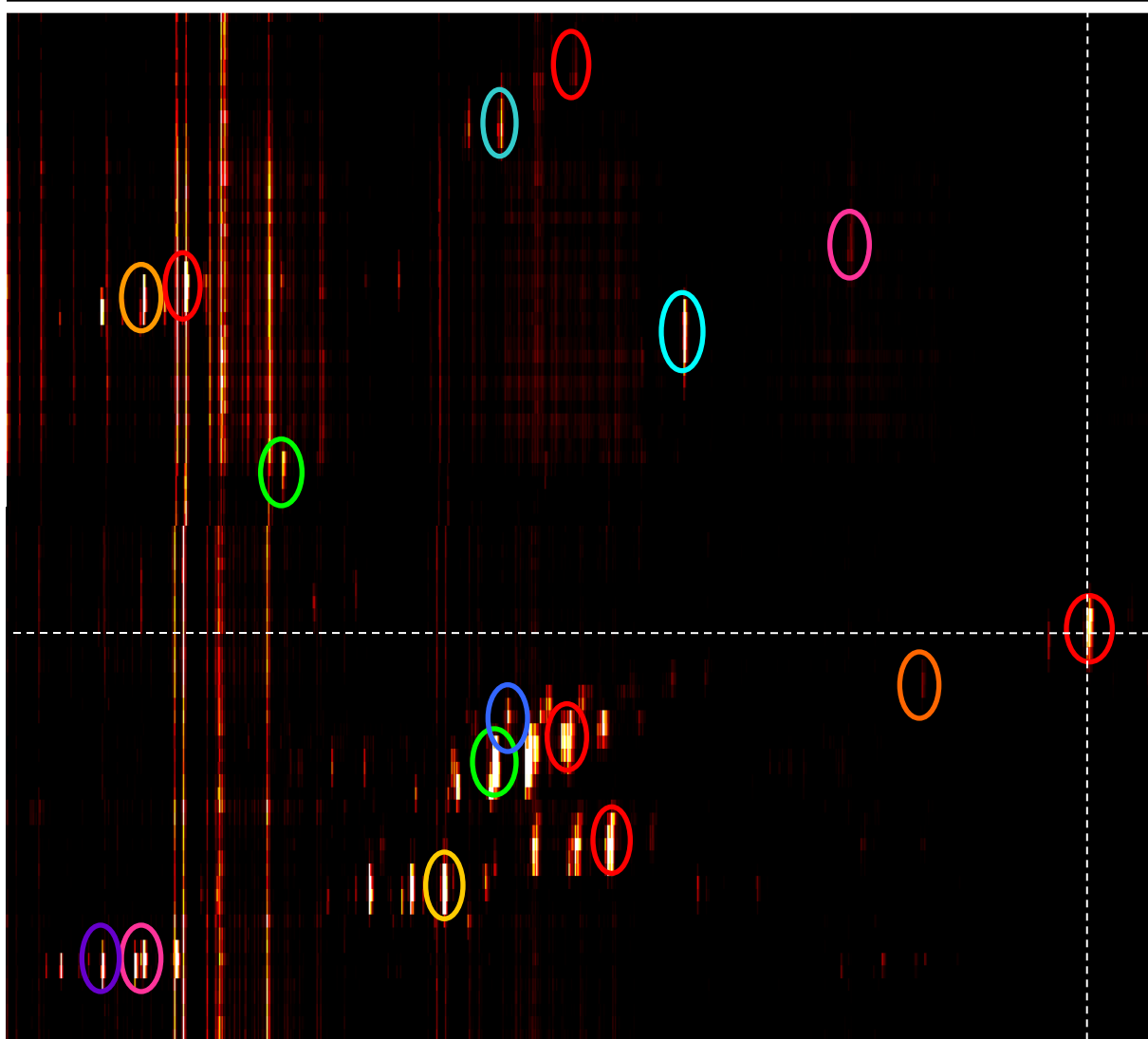
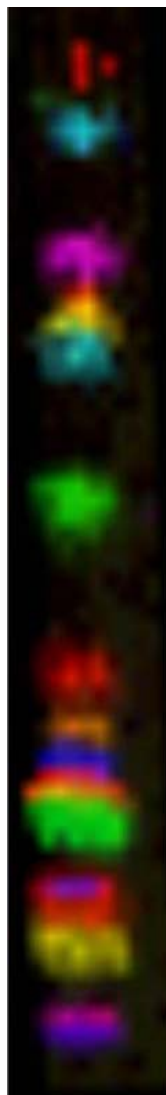


PE

PC

SM

LPC



m/z 1158

TLC Lane

MS Image

500

600

700

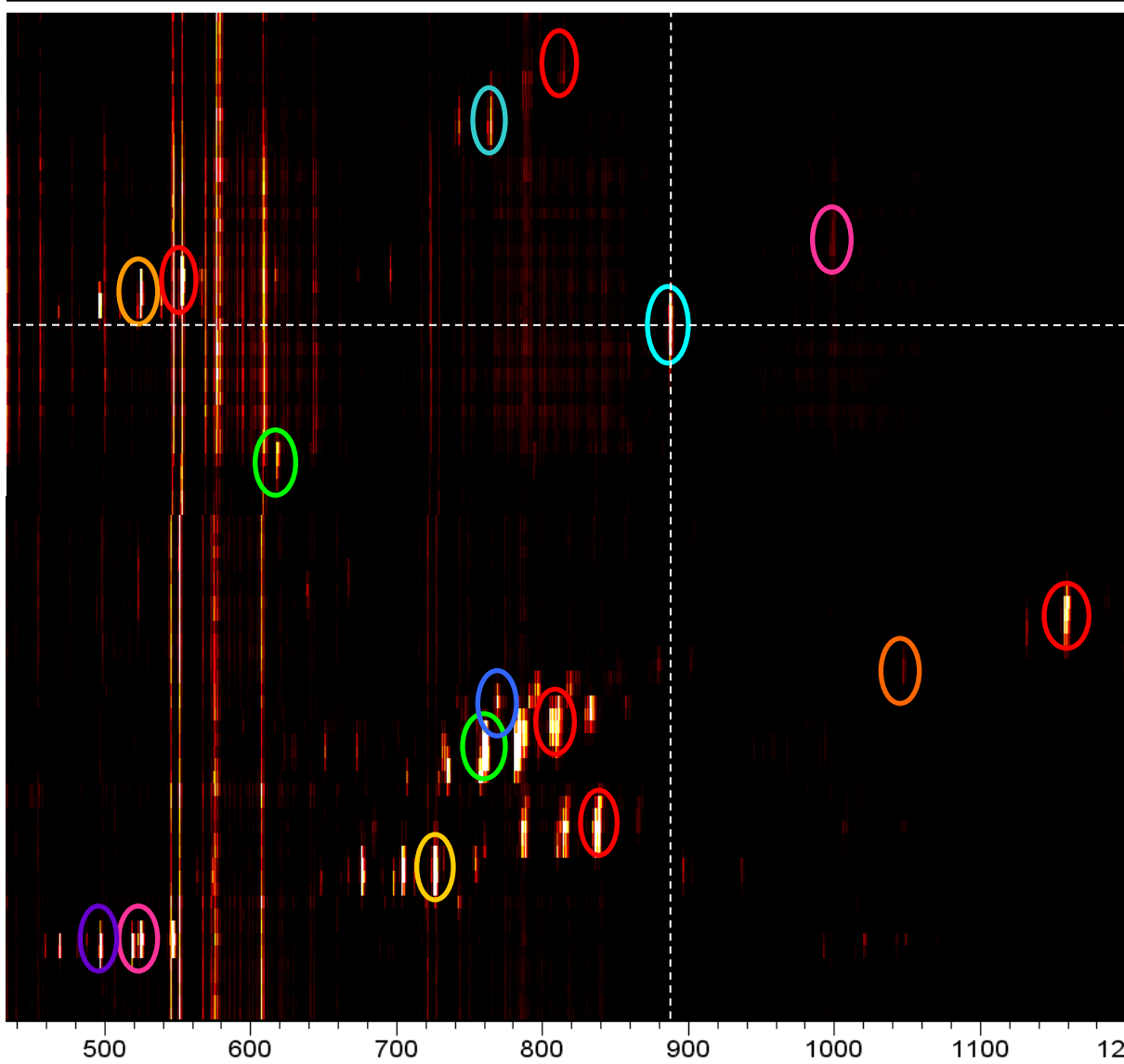
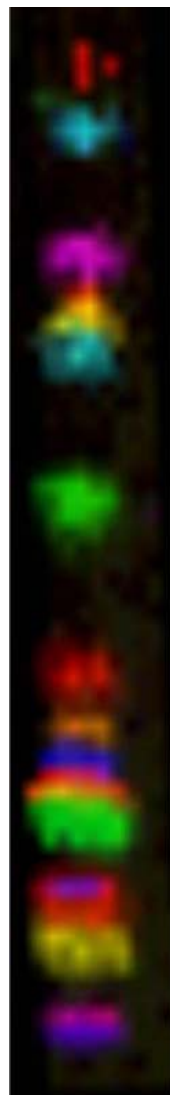
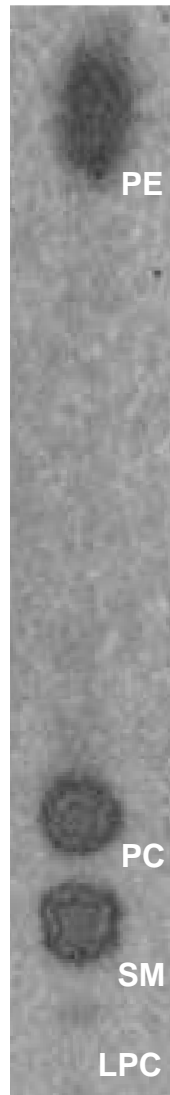
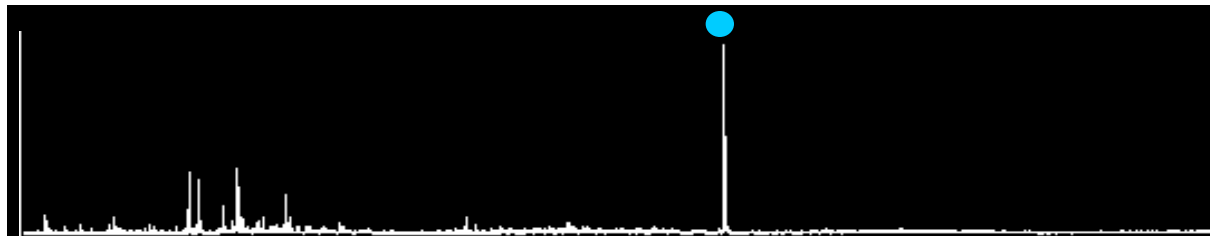
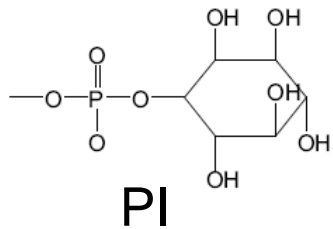
800

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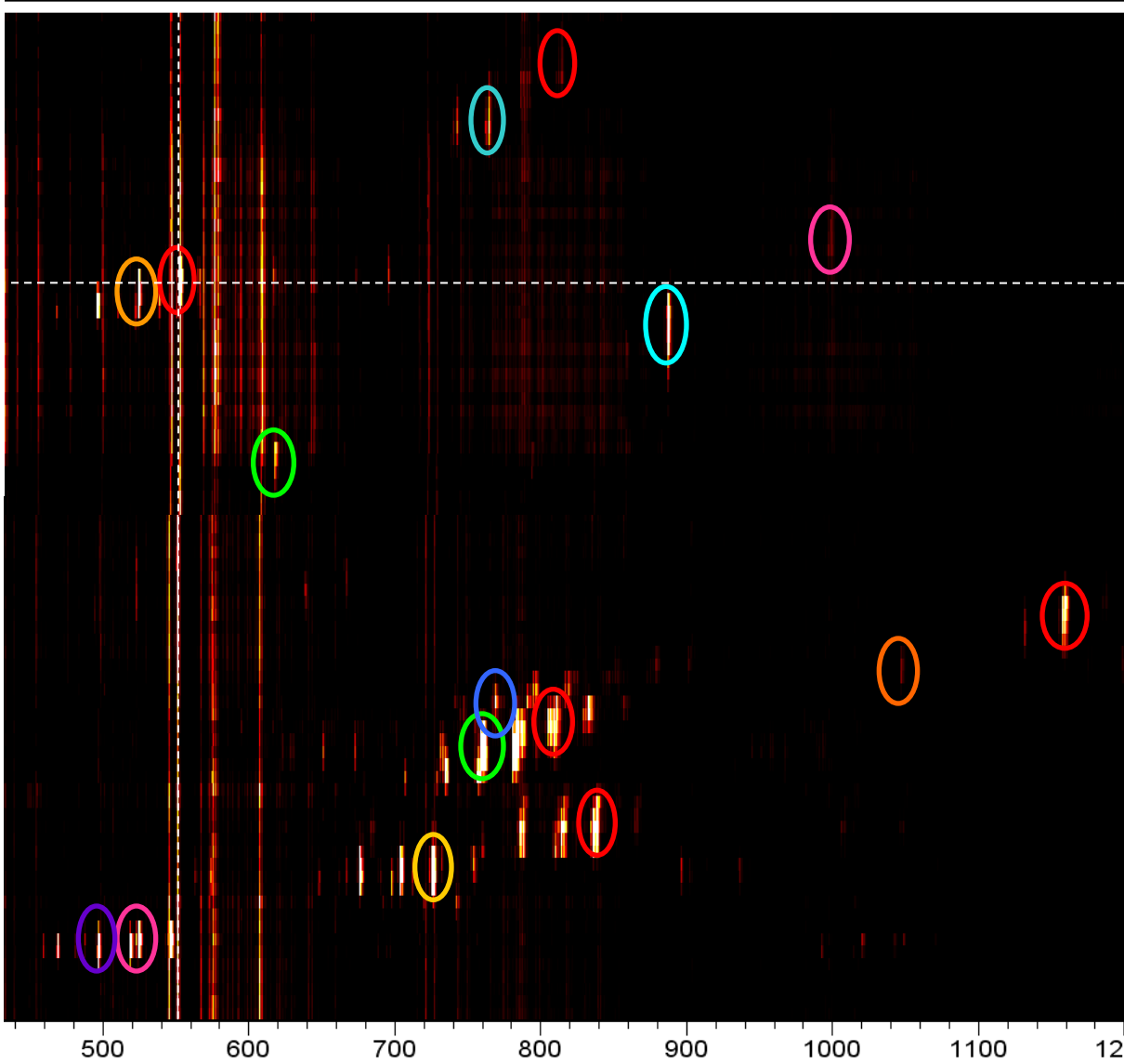
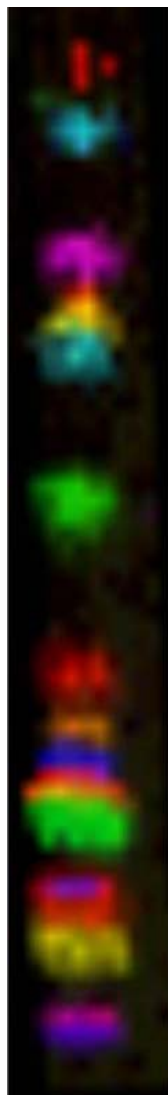
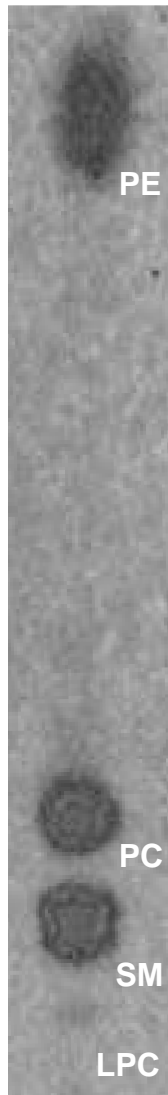
1000

1100

1200



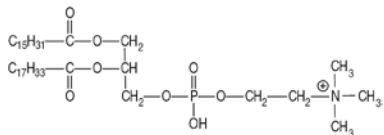
# PI Fragments



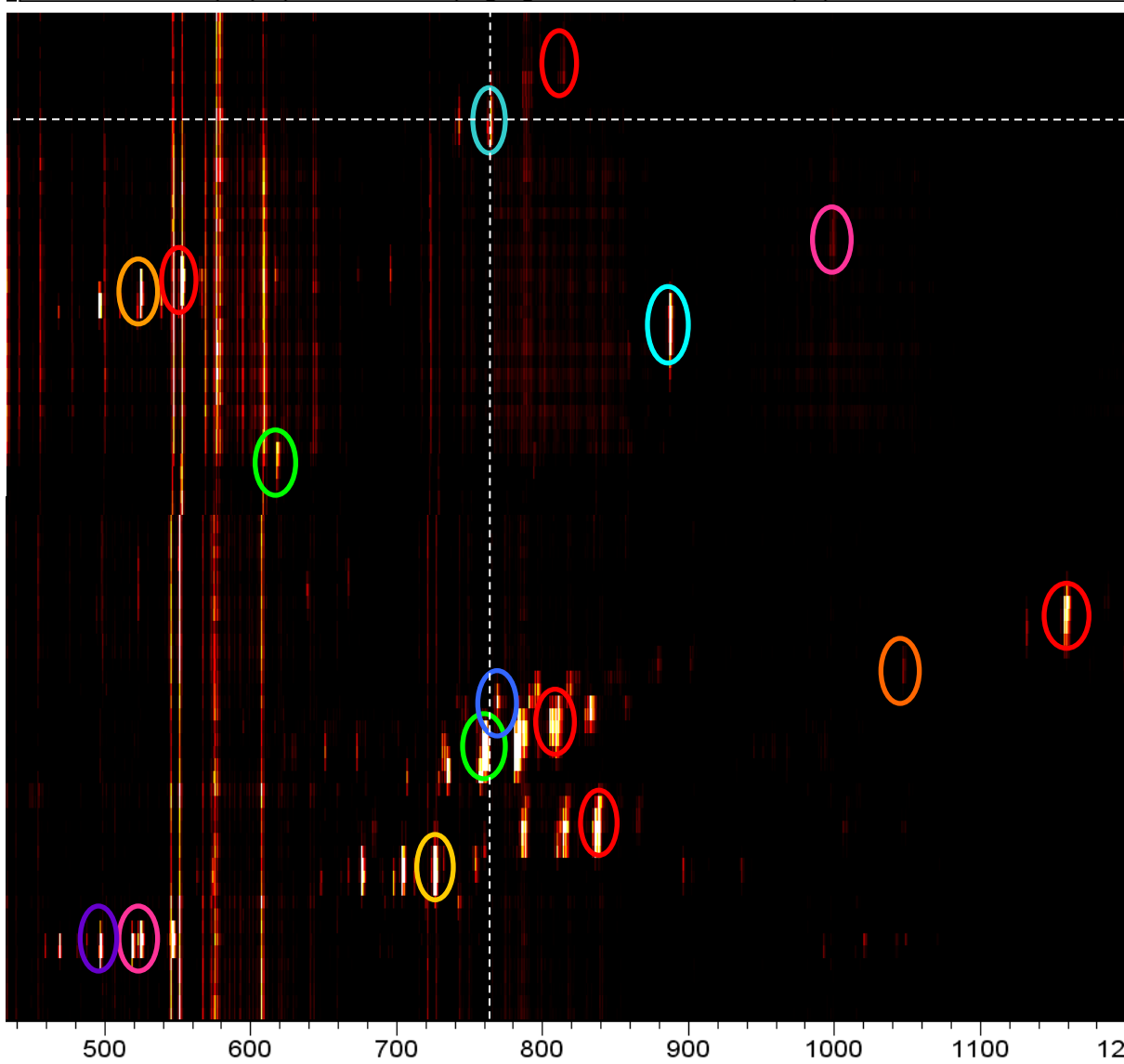
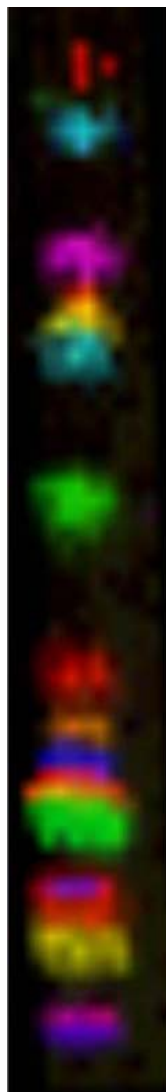
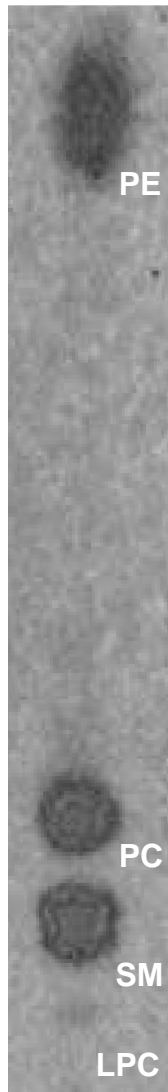
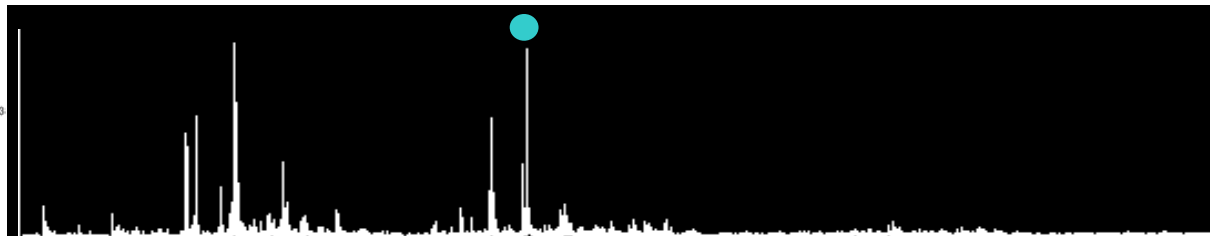
TLC Lane

MS Image

500 600 700 800 900 1000 1100 1200

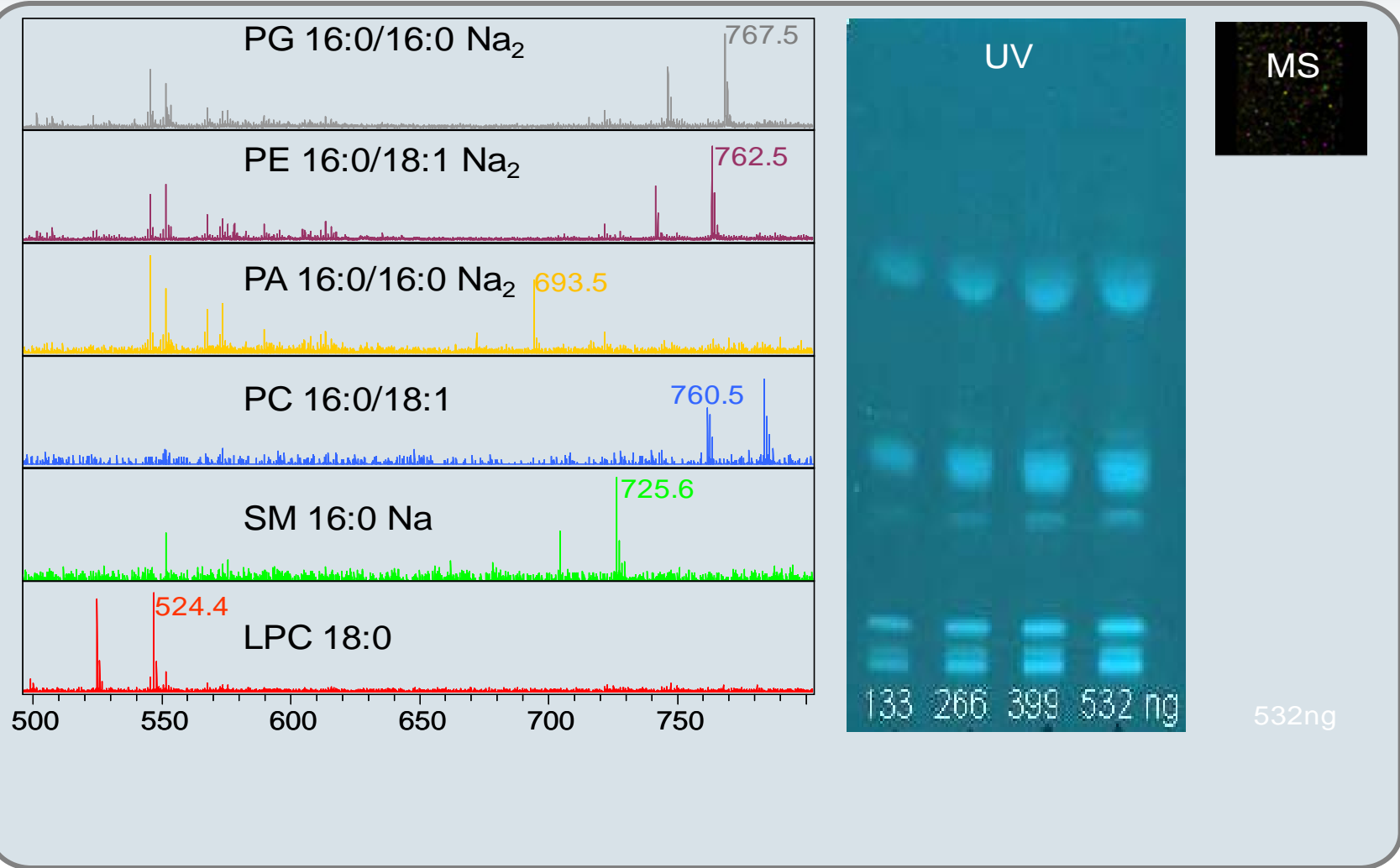


PE 16:0/18:1



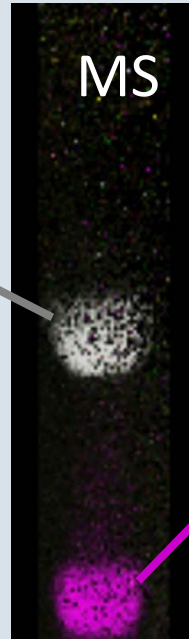
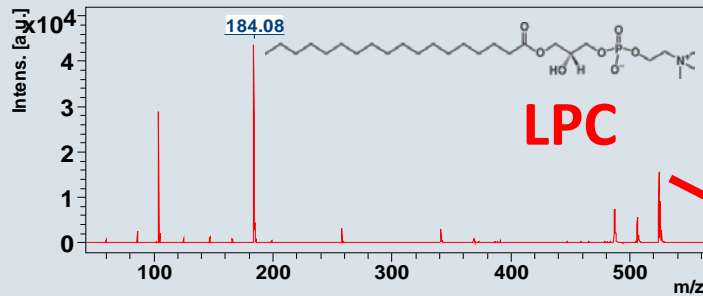
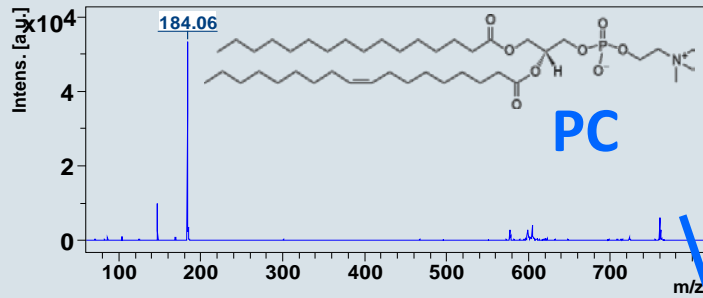
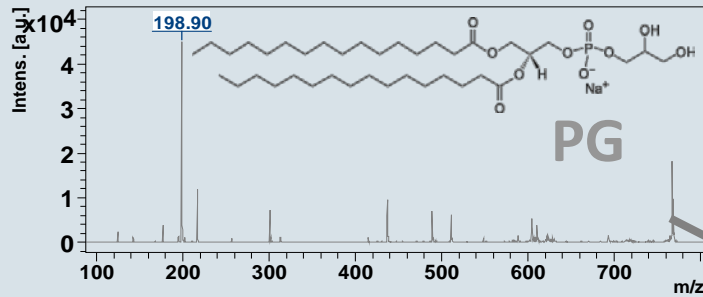
# TLC MALDI

Limit of detection: about 100ng for lipids

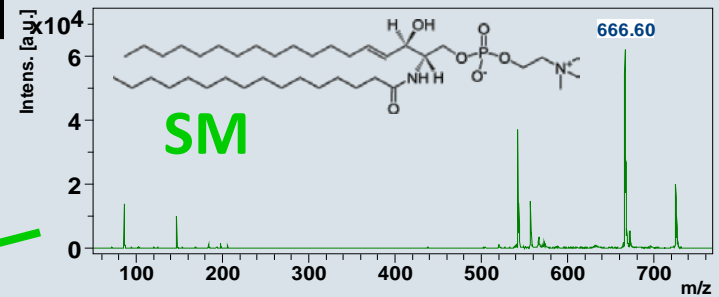
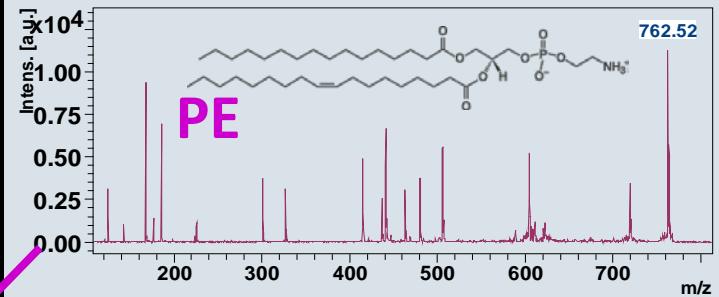


# TLC MALDI: Optional MS/MS

provides for additional structural information



## MS/MS Analyses right off the HPTLC plate



532 ng

# Summary



Two different TLC MS platforms

## TLC Extractor + ESI MS

- standard LC-ESI-MS system can be used
- **Quantification** on spots demonstrated
- **No matrix**
- **Smartformula** for Bruker ESI-OTOFs
- **Quick way from spot to formula**
- **Exhaustive 4 mm analysis**

## TLC-MALDI

- **TLC-MS scans**
- **Optical image/staining not required**
- **Resolution** 100  $\mu\text{m}$
- **Speed** 10 min per lane
- **No external robot**
- **Mature technology**
- **2 lipid technologies (TLC, tissue imaging) on single analysis platform**



# Acknowledgment



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