

# Customized MCPs for Analytical Instruments

**PHOTONIS**  
Scientific Detectors

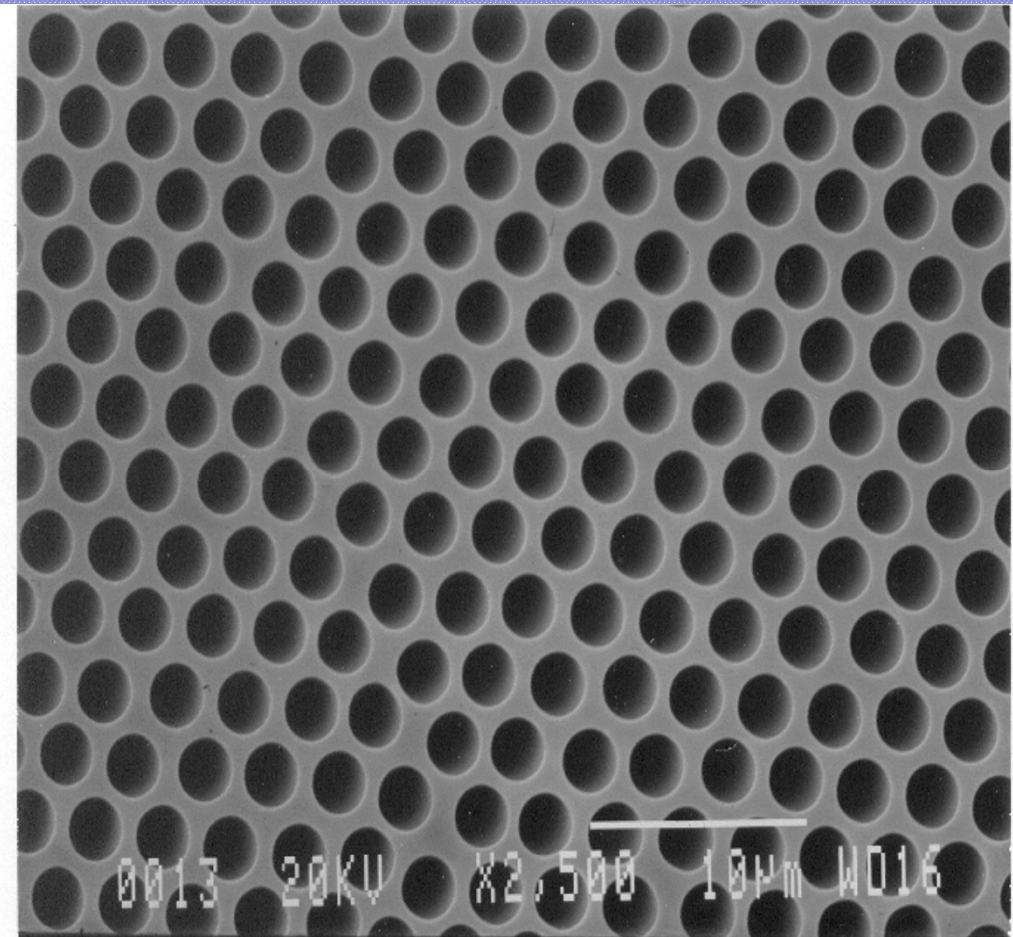
An MCP for every application



# What are Microchannel Plates? (MCPs)

- Microchannel plates (MCPs) are solid-state detectors consisting of parallel arrays of tiny single-channel electron multipliers, fused together in a parallel array.
- Channel densities are typically 1-10 million channels per cm<sup>2</sup>
- MCPs can be made in a wide range of shapes and sizes to fill specific application needs
- MCPs can be used to detect ions, electrons, UV Photons and both soft and hard X-Rays

Photomicrograph of a 2 micron pore MCP.

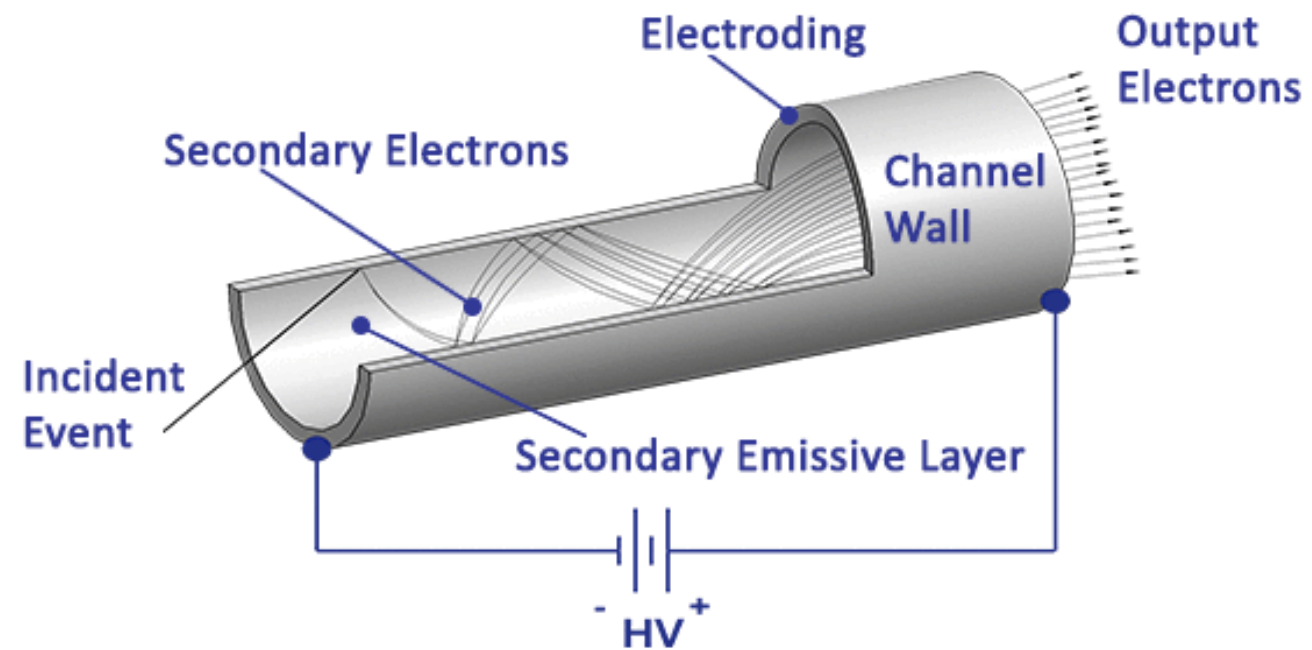


# Electron Multiplication

- An input event (ion, electron or photon) impinging on the focal plane will trigger an avalanche of electrons resulting in an amplification factor of up to 100,000
- The cascading effects of a second or third array can result in an amplification factor of up to 100,000,000 with less than 1 count/second/cm of added noise

[LEARN MORE](#)

The multiplication process shows a single electron cascading into secondary or tertiary electrons for increased amplification in each single channel.



# Photonis LongLife™ Microchannel Plates

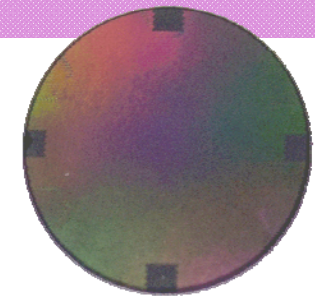
- TruFlite™ MCPs have been specially manufactured to be ultra-flat to  $\pm 5\mu\text{m}$ 
  - Ideally suited for Time of Flight applications to reduce time jitter variance by up to 15%.
- MountingPad™ MCPs are patented rimless MCPs that have rigid areas to attach to a housing without damaging pores
  - The rimless MCP prevents cracking and warping due to temperature and humidity
  - The rigid areas provide a gap between the active channels and mounting hardware to allow gas to vent, eliminating noise
  - Air stable

All Photonis LongLife™ MCPs are specially designed to provide longer lifetime with superior detection capability with pore sizes as small as  $2\mu\text{m}$ .

All Photonis MCPs can be ordered with an exclusive Extended Dynamic Range option that increases detection up to ten times versus traditional MCPs.



TruFlite™ MCP

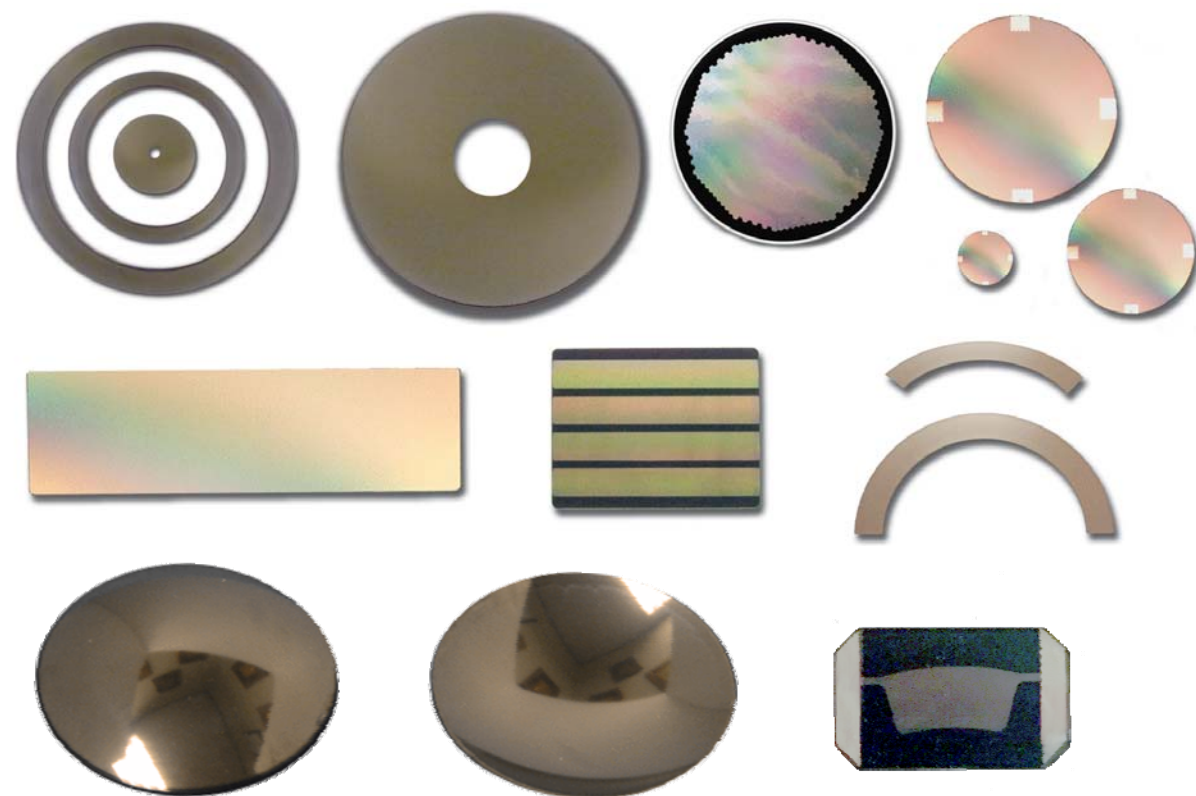


MountingPad™ MCP

[Download the Brochure](#)

# Wide Range of Shapes and Sizes

- MCPs can be manufactured in a wide range of shapes and sizes to fit a specific application or instrument
- Sizes range from 2mm to 160mm plates
  - Round
  - Square or rectangle
  - Center hole or ring
  - Trapezoidal
  - Arc segments
  - Cylindrically curved to match a focal plane



# Applications for MCPs

# Mass Spectrometers

- Photonis' MCPs are ideal for a wide range of analytical instruments, including mass spectrometers.
- Photonis is the leading supplier of MCPs to manufacturers of mass spectrometers across the globe.
- MCPs can be provided in complete electro-optic housings to facilitate assembly and service of the instrument
  - Sizes from 4mm to 120mm
  - Fastest TOF Detectors, including BiPolar

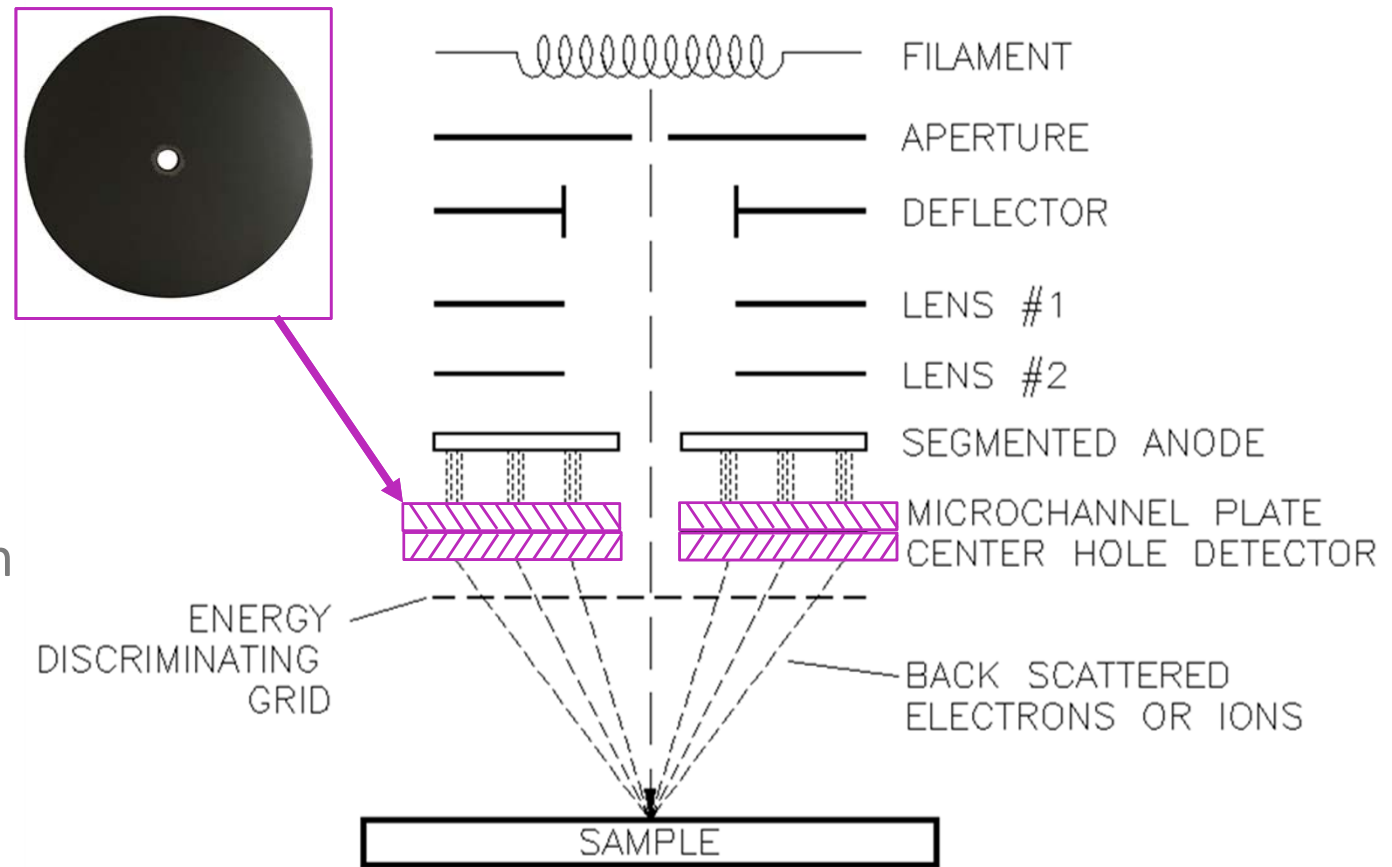
Photonis is the world's largest manufacturer of custom MCPs



[Learn more about complete MCP assemblies](#)

# Scanning Electron Microscopes and Focused Ion Beams

- Center-hole MCPs are ideal for use in Scanning Electron Microscopes (SEM) and Focused Ion Beam (FIB) applications.
- MCPs can use low 200v beam energy
- Accurate measurement and edge detection
  - In SEM applications, Photonis detectors assist in the output of high resolution imaging through non-destructive testing.
  - In FIB systems, our detectors are used to amplify the ions and produce a large enough sample to analyze.



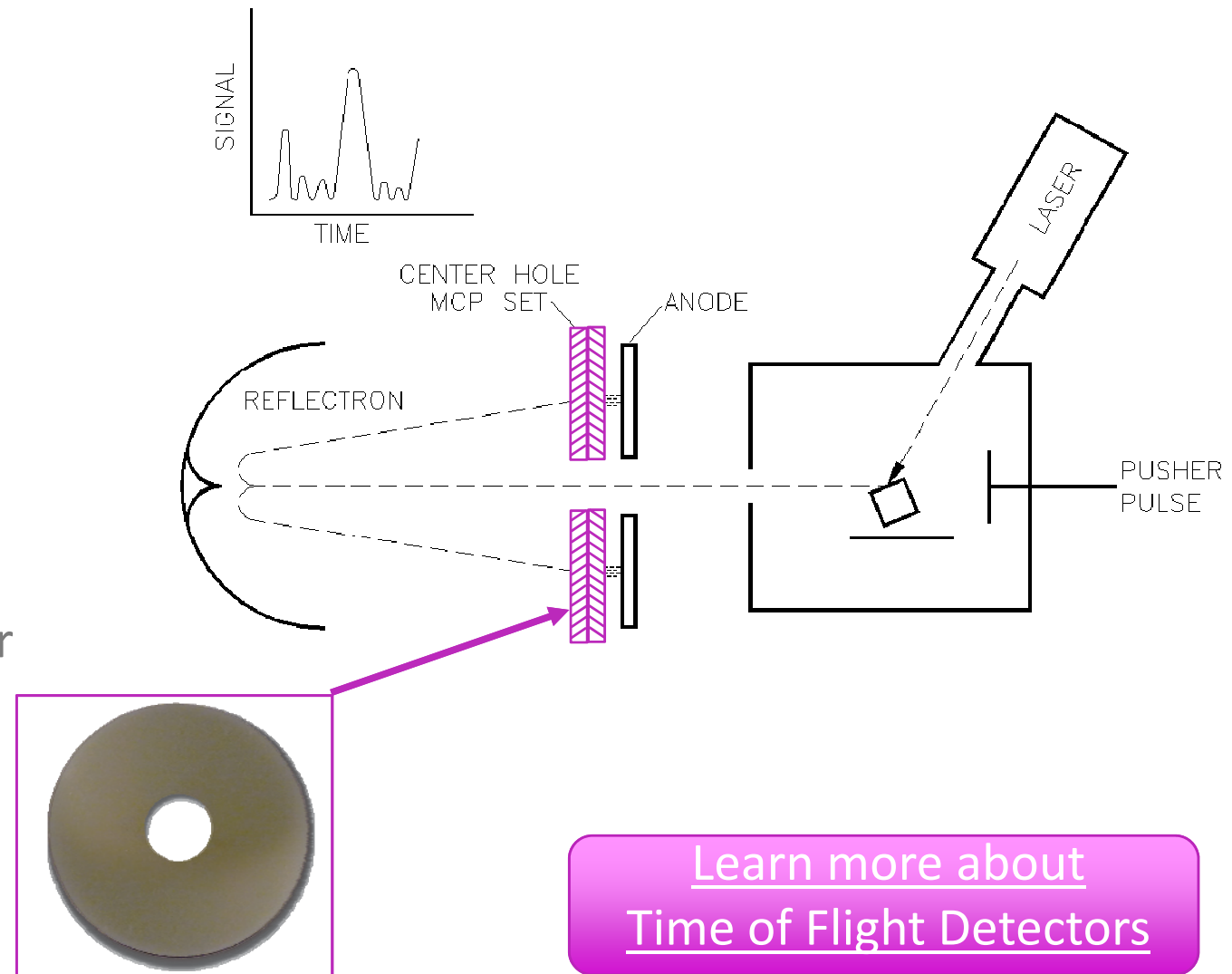
[Read more on FIB and SEM applications using MCPs](#)



# Linear Reflectron Time of Flight Mass Spectrometer

- Center-hole MCPs are used in Linear Reflectron Time of Flight Mass Spectrometry.
- The laser is pulsed through the MCP's center hole, while the outer edges capture the reflected ions for measurement.
- MCPs can be made ultra-flat ( $\pm 5$  micron) for up to 15% reduction in time jitter error
- 2 micron pore sizes increase mass resolution up to 10%

LINEAR REFLECTRON TIME OF FLIGHT

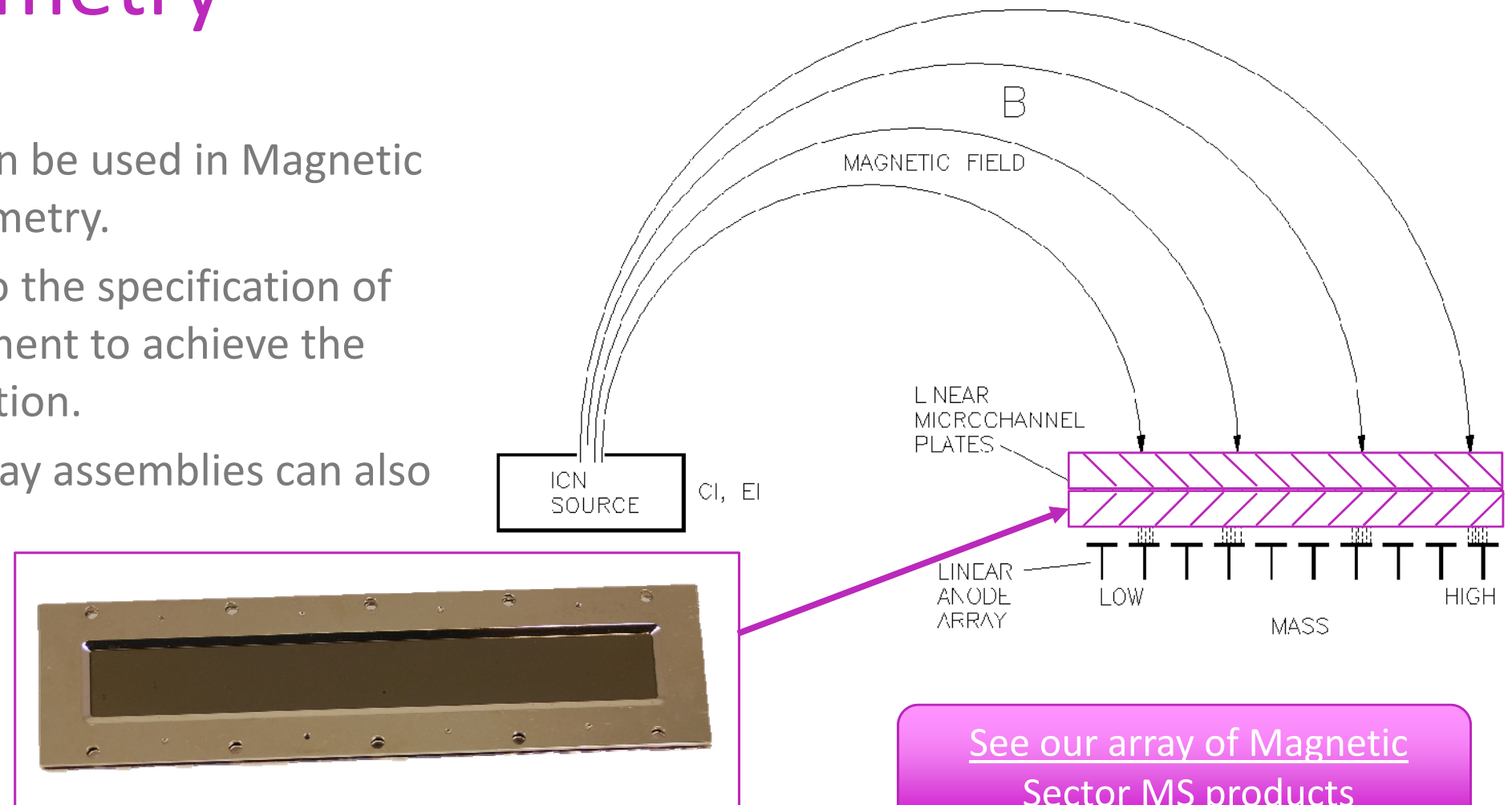


[Learn more about Time of Flight Detectors](#)

# Magnetic Sector Mass Spectrometry

- Rectangular MCPs can be used in Magnetic Sector Mass Spectrometry.
- MCPs can be made to the specification of the particular instrument to achieve the superior mass resolution.
- Complete plug and play assemblies can also be provided.

MAGNETIC SECTOR MASS SPECTROMETER



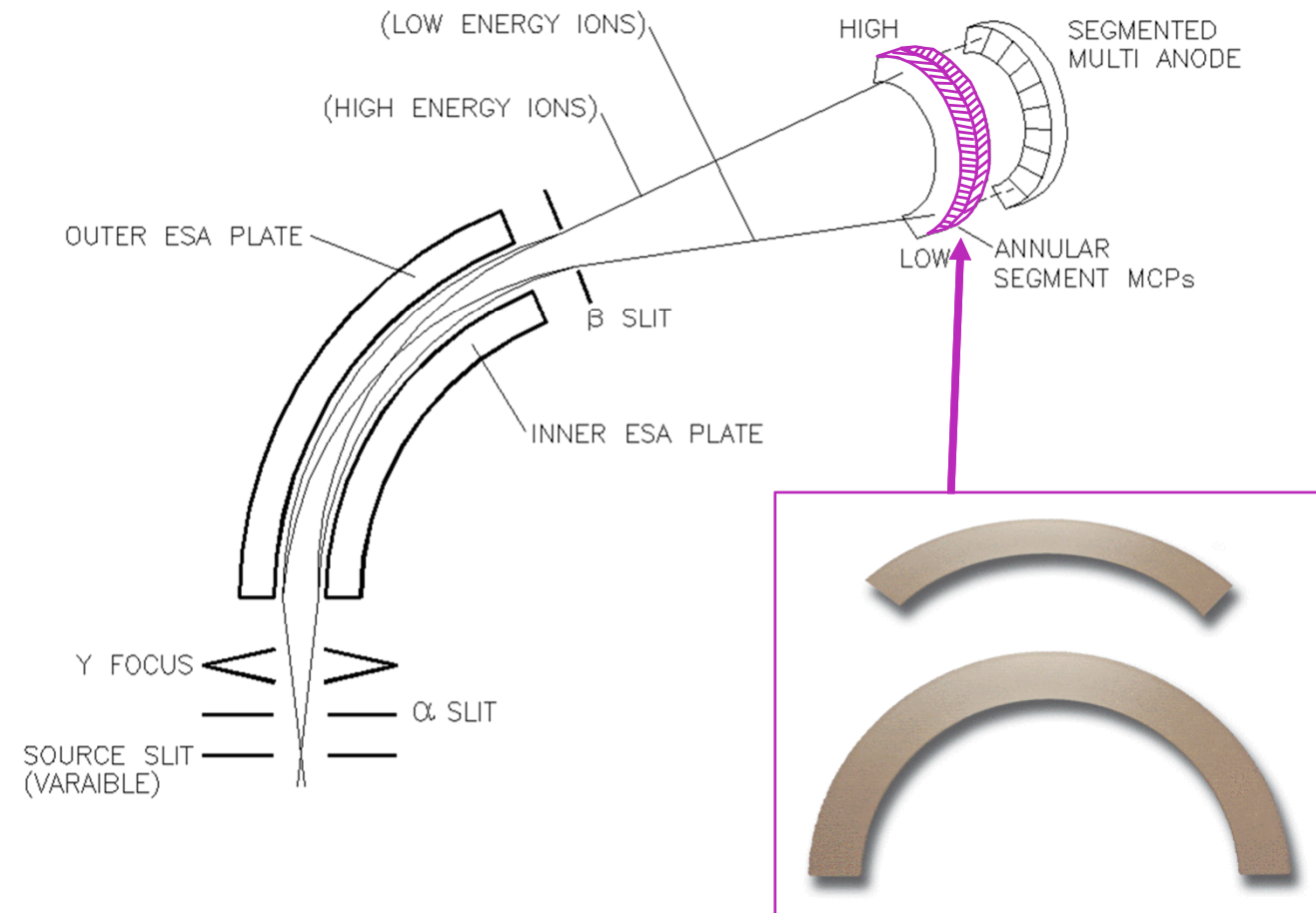
[See our array of Magnetic Sector MS products](#)

# Ion or Electron Energy Analyzers

- Arc-shaped MCPs are ideal for ion or electron energy analyzers
- Detects both high and low energy ions
- Radius and size can be custom-specified
- High speed and superior resolution provide accurate results for researchers and instrument designers

[Download our brochure on Analytical Instruments](#)

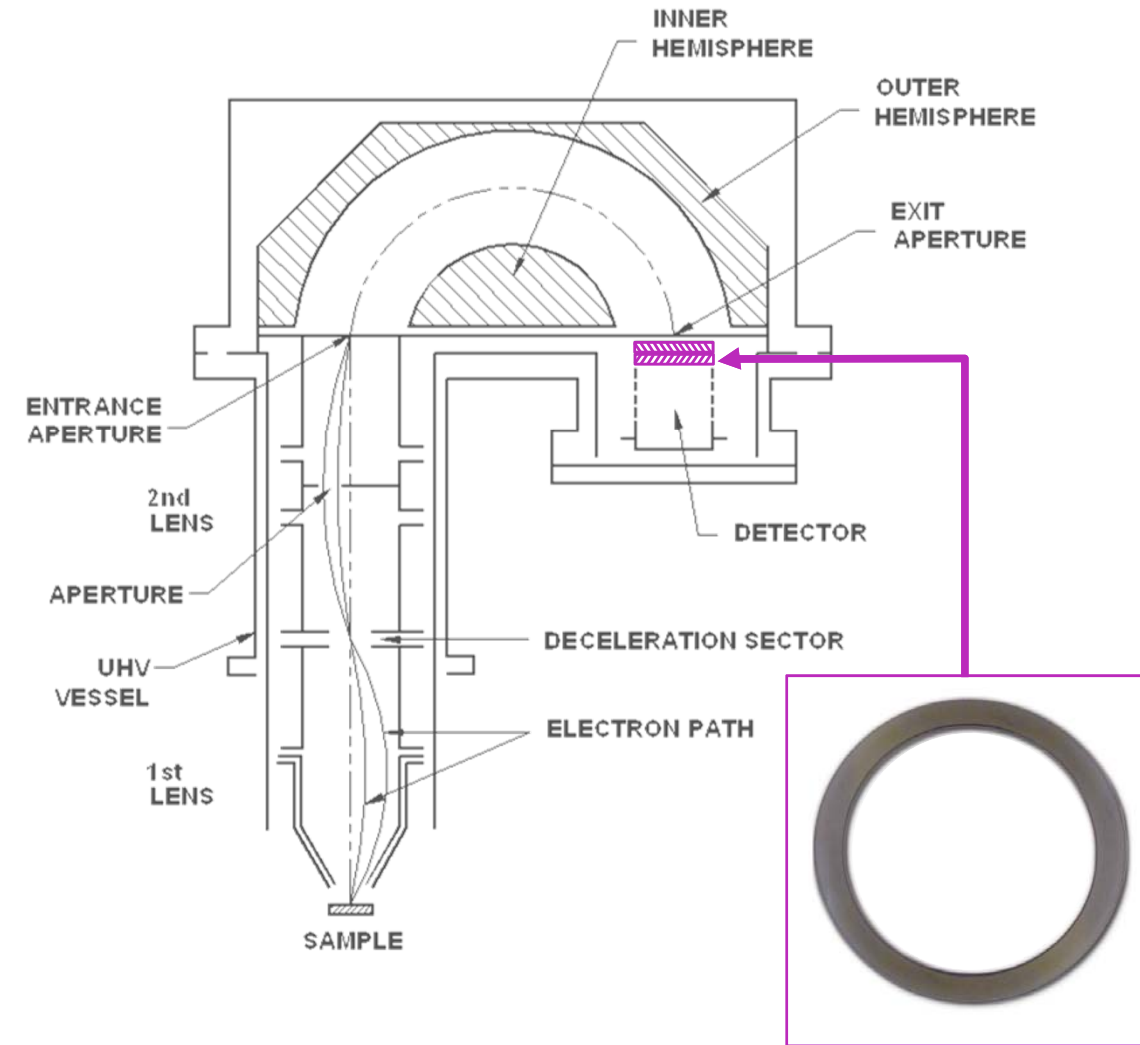
## ION ENERGY ANALYSIS



# Hemispherical Energy Analyzers

- Annular Ring-Shaped MCPs can be used in Hemispherical Energy Analyzers
- The MCP can be manufactured to the size required by the instrument to most effectively capture electrons or ions
- MCPs can be specified to pitch and pore sizes for the most effective detection.

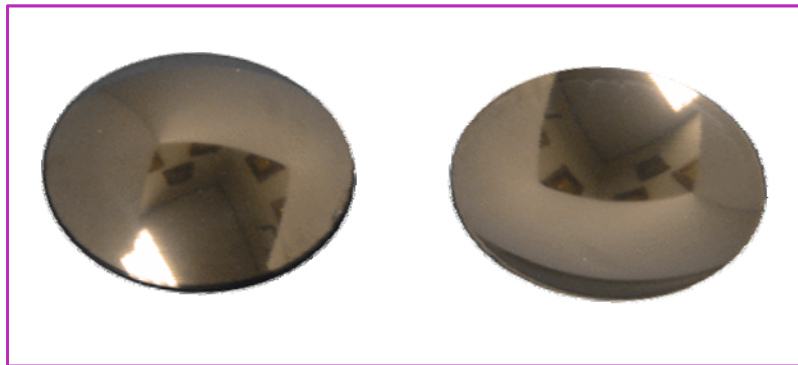
HEMISPHERICAL ANALYZER WITH RETARDING FIELD LENS



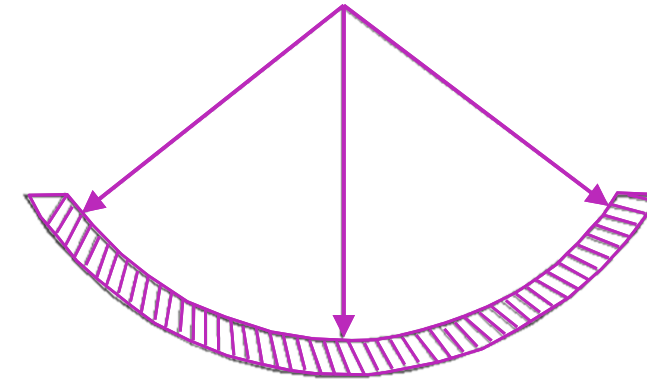
# VUV Spectroscopy

- MCPs can be made to curve spherically or cylindrically to match the focal plane of an instrument
- Ideally suited for Vacuum Ultraviolet Spectroscopy
- The MCP curve can be made to match the Roland Circle

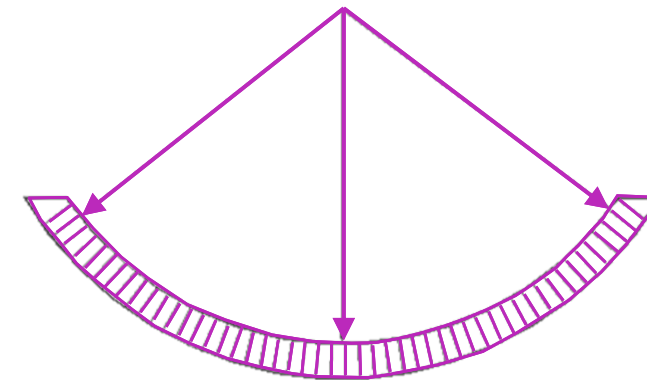
[Learn more about our Spectroscopy products](#)



MICROCHANNEL PLATE FOCAL PLANE CAN BE CUSTOMIZED TO OPTIMIZE DETECTION EFFICIENCY



CONSTANT ANGLE OF INCIDENCE



FOCUSED CHANNELS

# Large Mosaic Detectors

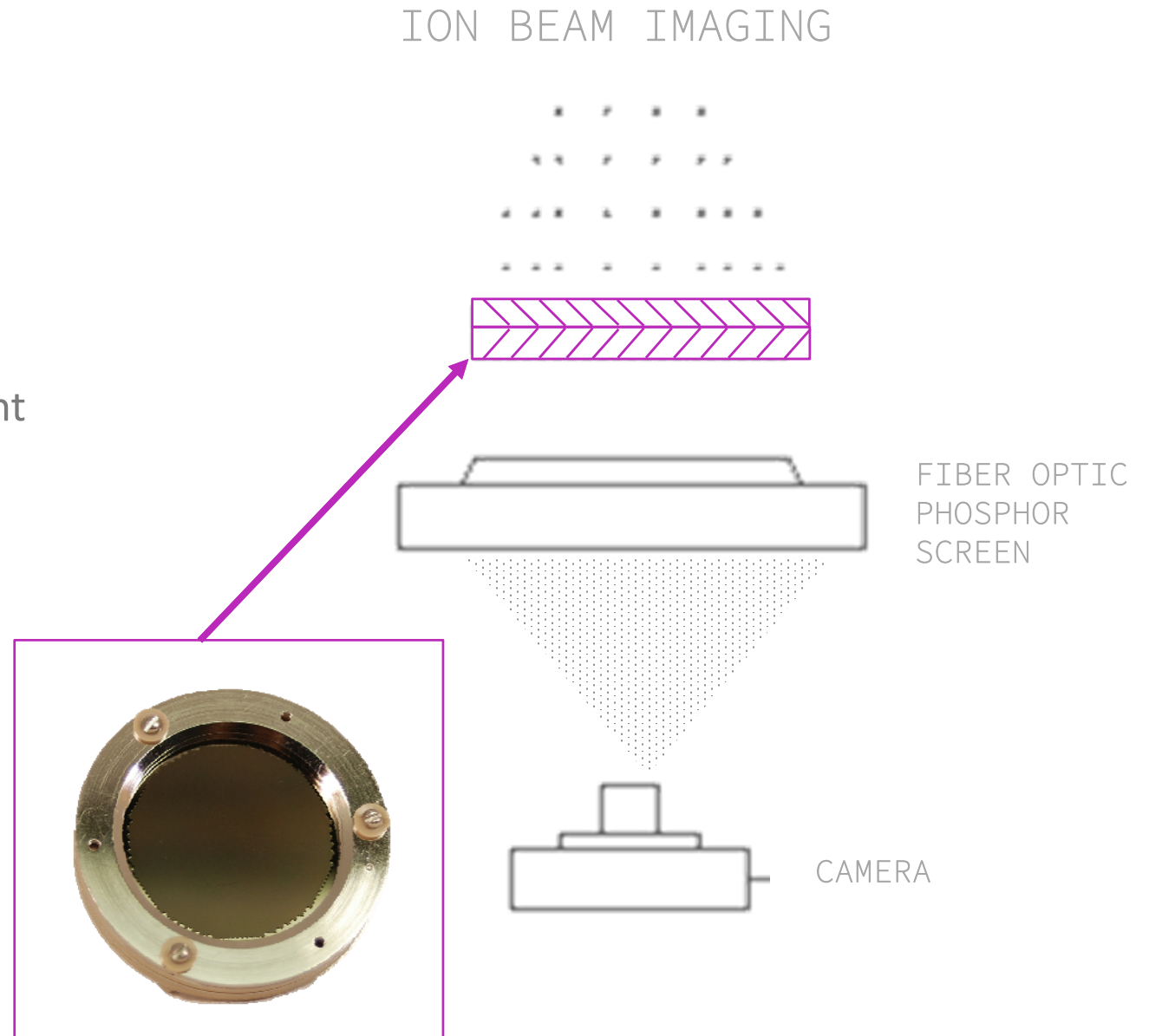
- Trapezoidal MCPs are ideal for tiling together to form a large mosaic detector.
- Specific angles and pitch/pore sizes can be ordered to capture the specific phenomena over a small or large area
- MCPs can be ordered with specific phosphor coatings or other finishing options.



# Ion Beam Imaging

- MCPs can be used to image ion beams
  - Ideally suited for instrument designers to validate the ion path's focus and alignment within an instrument
  - Ion beam imaging can also be used in physics research
- MCPs can also be mounted into electro-optic housing assemblies for plug-and-play operation.

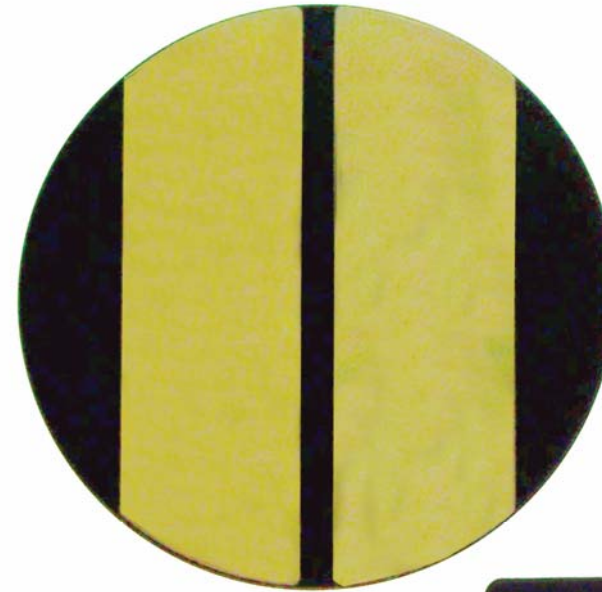
[Watch our video on how ion beam imaging can improve your analytical instrument](#)



# High Speed Sequential Imaging

- Stripline Microchannel Plates are used to capture extremely high speed sequential images through the use of an electrode strip manufactured on the back of each MCP.
- Ideal for diagnostic imaging in high speed physics research
- Each image can be captured as fast as the electrical charge can travel within the MCP

[Learn more about Stripline MCPs](#)





# Custom MCPs from Photonis

- Photonis is the world's largest supplier of custom Microchannel Plates
- Geometries, coatings, pitch/pore sizes, shapes and sizes
  - Laser milling enables custom shapes and sizes such as arc segments, wedges or center hole
  - Spherical or cylindrical curves can match the focal plane of a Roland circle.
- Sizes 2mm to 160mm
- Pore sizes 2 $\mu$ m to 25 $\mu$ m

- Photonis MCPs can be ordered with
  - TruFlight™ – ultra flat for TOF
  - Mounting Pad™ – rigid, inactive areas for mounting without cracking or bowing
  - Extended Dynamic Range – increases detection limits by a factor of ten
  - Rimmed or Rimless
  - With Electro-Optic housings for plug and play operation
  - Endspoiling Enhancement
  - OAR Enhancement
  - Enhancement Coatings:
    - ESI
    - KBR
    - CUI
    - Gold
    - MgFe



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