To make an appointment this week, call Randy Pedder at (412) 607-4213

Ardara Technologies L.P.

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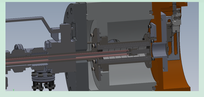
Research Components

Electron impact Ionizers

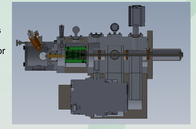
- Axial Molecular Beam (0.56 inch i.d. ion volume)
- Jumbo Molecular Beam (0.9 inch i.d. ion volume)
- Closed EI Ion Source for GC/MS
- Cross Beam Deflector for condensable beams

Glow Discharge Ion Source



- Configurable Glow Discharge Volume.
- Gate Valve for easy sample insertion.
- Thin Gate Valve for easy source maintenance.
- Mates to the same ion guide chamber as our Electrospray ion source.

Electrospray Ion Source and Ion Funnels



- Removable sprayer
- Heated Stainless Steel Capillary with various internal diameters for higher throughput
- Ion Funnel Chamber design supports KF50 or KF25 pumping ports for higher throughput.
- Optional Thin Gate Valve
- 3 – stage differentially pumped rectilinear quadrupole ion guide.
- Split flow turbomolecular pump.
- Custom configurations available.

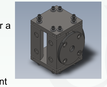
Quadrupole Mass Filters

- We have extensive experience in designing and manufacturing quadrupole mass filters.

From top to bottom:

- Short (10 cm) quarter inch quadrupole for a compact instrument.
- ~20 cm long 9.25 mm round rod quadrupole with pre-filter for high mass operation.
- Standard 20 cm long 12 mm quadrupole.
- Special 30 cm long 12mm rod diameter quadrupole for the ultimate in abundance sensitivity and resolution, without sacrificing sensitivity.
- We can customize our designs for your OEM application!

Quadrupole Deflector Energy Filters



- Quadrupole deflectors are useful tools to separate ions in vacuum from a molecular beam, especially useful when the molecular beam includes condensibles.
- Quadrupole deflectors are also useful for coupling multiple ion sources to a single analyzer.
- Quadrupole deflectors allow for more compact systems since they rotate the direction of the ion beam by a right angle.
- Ardara Technologies has two standard size quadrupole deflectors with 4 cm and 6 cm square profiles, suitable for centering in either a 6 inch ConFlat chamber or 8 inch Conflat chamber respectively.
- The large shiny deflector in the picture has deflector dimensions of 8 inches in each direction with a two inch gap between adjacent poles, and was custom designed to be part of a free electron laser system

Custom Systems

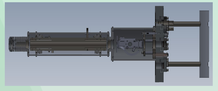
Our design team is experienced at pushing ions around!

Flange Mounted Mass Filter Systems

A simple custom system might be a flange mounted mass filter, where the quadrupole mass filter is the terminus of the experiment.

The customer can mix and match ionizers, from axial molecular beam to cross molecular beam, or a closed EI ionizer, coupled to a quadrupole (6, 9.25, 12, or 20 mm rod diameter), selected for optimal performance, all mounted onto a Conflat flange with an electron multiplier detector.

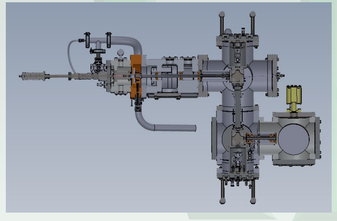
Similarly the control electronics can be selected for optimal sensitivity, mass resolution and mass range.



Custom Systems

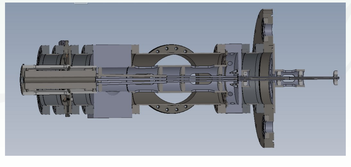
Shown below is a custom system that starts with a glow discharge ionization source, coupled through a thin gate valve to our split flow vacuum chamber with RF-only ion guide, which directs the ions to a quadrupole deflector, which can deflect the ions to the 'north' electron multiplier detector, or through the 9.25 mm quadrupole to the 'south' deflector , which can deflect the ions to either the linear ion trap to the right, or the 'south' electron multiplier.

With judicious selection of pulsed voltages, the system allows the trapping of mass selected ions in the linear ion trap, where some chemical reaction occurs, followed by mass analysis by sending the product ions backwards through the quadrupole to the north detector.



In the following example, we coupled a 19 mm round rod quadrupole through four trapezoidal quadrupole ion guides to use phase space compression, effectively closing in the ion guide along the radial direction, allowing for the diffuse ion beam exiting the 19 mm quadrupole to be squeezed into a 2.5 mm profile for injection into a tiny quadrupole at the entrance to a SIFT injection flange for a flow tube. Transmission was a remarkable 60-70% transmission through each of the trapezoidal ion guides. (Each trapezoidal ion guide has an upstream inscribed diameter that is 8/5 of the downstream inscribed diameter. Remarkably, minimal smearing of z axis velocity vector was observed.

Oh, and there is a thin gate valve in between the second and third trapezoidal ion guide.



Electronics

Filament Power Supply for EI and CI Ionizers

- 80 Watts, up to 8 volts and 10 amps filament current
- 15 to 250 eV Electron Energy
- +/-250 Volts Ion Region Potential

Optics Power Supply

- Digitally controlled 10 output channels with +/-400 Volt range up to 2 mA current
- Front panel LCD display showing real-time readbacks for all ten channels

Isolated Optics Power Supply

- Digitally controlled 10 output channels with +/-400 Volt range up to 2 mA current
- Rated to +/-2,500 volts of isolation using external DC float supply.
- Great for powering the upstream

Pulsed Optics Power Supply

- Three independent channels, each with +/-250 V output, which can be pulsed using an external TTL timing signal.
- ~1 microsecond rise time
- Can also be used as a broadband amplifier, with frequency range to 100 kHz

Isolated Pulser

- High speed switch (~20 nS rise time) allowing for up to +/-500 volts DC between low and high state, with both states isolated from earth ground by up to 2,500 VDC
- Optional Isolated +/-500 Volt power supply allows for generation of second isolated voltage when coupled to an external float supply

RF Power Supplies and Quadrupole Power Supplies

- A variety of configurations are possible from narrow to Mega-Dalton mass ranges
- See next column for more detail.

Detector Power Supply for Quadrupoles

- Dynode power supply with +/-5 kV range coupled with -3kV multiplier power supply

Tempus Data Acquisition System for Quadrupoles

- High speed Microsoft Windows computer controlled quadrupole data acquisition system.
- Full digital control of quadrupole mass spectrometer.
- Any of our RF power supplies can be coupled to our Quadrupole Power Supply Controller, allowing for virtually any custom mass range from high resolution systems.

MS-100 Ionizer Controller

- Filament and optics power supplies combined with detector power supply in single 2U (3.5 inch tall) 19 inch rack mounted enclosure, with full digital control

Quadrupole Controller with Integrated Tempus Data Acquisition

Digitally controlled quadrupole power supply controller combined with integral data acquisition and control electronics with software in single 2U enclosure

Time-of-Flight Controller

- Includes three temperature stable +/-5kV high voltage power supplies for High speed Microsoft Windows computer controlled quadrupole data acquisition system
- Includes Pulse Delay generator with software

Isolated Detector Power Supply

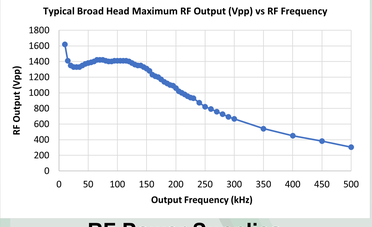
- Detector entrance acceleration is powered by a +/-5 kV high voltage power supply
- Detector gain is controlled by a separate electrically isolated 5 kV power supply, with the signal anode capacitively coupled to a ground referenced preamplifier

Tempus Data Acquisition System for Time-of Flight Mass Spectrometers

- High speed Microsoft Windows computer controlled quadrupole data acquisition system

Mega-Dalton Mass Spectrometry

- As targeted system mass ranges extend to mass-to-charge ratios of millions of Daltons and beyond, lower frequency RF power supply designs are required.
- Ardara Technologies has developed a novel Broadband RF power supply that can operate as low as 10 kHz, to as high as 500 kHz using an external frequency source.
- This power supply design has been used to transmit ions with ranges from m/z in the hundreds of thousands to hundreds of millions of Daltons, through both ion funnels and RF-only ion guides, representing a range of capacitive loads.
- The following figure shows typical peak-to-peak output voltages:



RF Power Supplies

RF Power Supplies

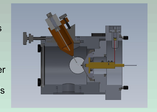
- All designs can be configured for single outputs (ion trap) or dual outputs (180 degrees out of phase from each other.)
- Broadband Model operates from 10 to 500 kHz, inclusive, from external function generated sine wave.
  - Up to 1,400 Vpp output from 10 to 150 kHz
  - 300 Vpp at 500 KHz
- Self-Oscillating power supplies from 400 kHz to 4 MHz
- Stable Crystal driven or external function generator driven fixed frequency stable power supply from 200 kHz to 8 MHz.
- Stable Triple-Jumper configuration to allow for up to 7 distinct frequencies in one power supply by changing internal jumpers to change inductance.
  - Typically configured for 2.5, 4.5 and 5.5 MHz, plus variations between.
  - Great for varying operating frequency of ion guide for extended mass ranges.
- Stable Octo-Jumper Configuration to allow for up to 255 distinct frequencies
  - Typically configured for 900 kHz to 8 MHz.
  - Great for characterization of miniaturized quadrupoles and quadrupole ion traps at a wide range of frequencies.

Quadrupole Power Supplies

- Any of our RF power supplies can be coupled to our Quadrupole Power Supply Controller, allowing for virtually any custom mass range from high resolution systems with mass range from 0 to 5 amu (for helium / deuterium studies) to MegaDalton mass ranges.
- Our Quadrupole Power Supply Controller features
  - Two Resolving DC Rod Drivers
  - Dual front panel low and high mass resolution controls
  - Front panel manual mass command knob or external mass command
  - Front panel and external Pole Bias controls with front panel Pole Bias Meter.
- Switchable for full computer control including mass command, pole bias and mass resolution.

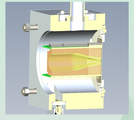
Electrospray • Ion Funnel • Ion Mobility

Sprayer and Heated Stainless Steel Capillary



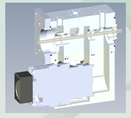
- Sprayer has X, Y and Z adjustment with sight glasses on three sides and KF 25 drain port on bottom.
- Heated Stainless Steel capillary has removable capillary.
- Optional larger bore capillaries are available for higher throughput
- Downstream face of Stainless Steel Capillary flange is ISO-100 compatible

Ion Funnels



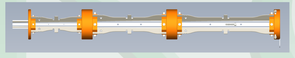
- Ion funnel design licensed from PNNL.
- Ion Funnel Housing has ISO-100 compatible entrance and exit flanges.
- Ion Funnel Housing can be configured for KF25 pumping port or KF50 pumping port for higher throughput.
- Low capacitance.
- Works with any of our RF power supplies for wide mass range bandpass.

Rectilinear Ion Guides in Split Flow Vacuum Chamber

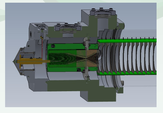


- Three Stages of differential pumping on one continuous ion guide.
- Ion guide can be segmented for trapping experiments.
- Ion guide can be fitted with asymptotic field shaping electrodes to allow for continuous reduction in potential along z axis to keep ions from stalling out at higher pressures.

Tandem Rectilinear Ion Guides For Multi-Stage Ion Trapping Experiments



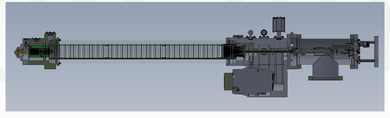
Ion Funnel with Hourglass Ion Trap



- Ion funnel can be configured at the front of an ion mobility system to have an hourglass trap directly after the upstream ion funnel

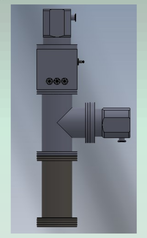
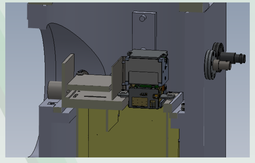
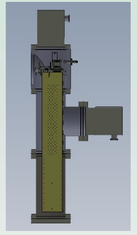
Ion Mobility System

- Custom ion mobility systems can be configured with ion funnels, hourglass trap, downstream ion funnel, and rectilinear quadrupole in a split flow vacuum chamber, with either a quadrupole or a TOF detector.



Add-On TOF-MS

- Wiley-McClaren Geometry with Dual stage Reflectron
- 0.5 meter and 1 meter flight tubes with PC board construction for excellent mechanical alignment
- ETP discrete dynode electron multiplier detector with capacitively coupled anode for positive or negative ion detection
- Tempus TOF Data Acquisition system with up to 1 GHz sample rate
- Resolution to 6,000 (m / Δm, FWHM)
- Flight tube differentially pumped from orthogonal extraction source, which has a conductance-limited collimator aperture for differential pumping from upstream optics
- TOF controller has three digitally controlled stable +/- 5kV Flight Tube / Reflector power supplies, and pulse delay generator with control software
- Isolated Detector Power Supply features an isolated +5kV Multiplier gain power supply, floating on a separate +/- 5 kV Multiplier Entrance Acceleration power supply
- Ready to bolt onto your custom instrument

OEM GC/MS • Benchtop Gas Analyzer

Integrated plate-mounted analyzer train

- Heated Capillary Inlet
- Heated closed EI ion source
- 12 mm quadrupole mass filter
- Electron Multiplier Detector with housing
- Extruded aluminum vacuum housing
- 80 L/second Turbomolecular Pump

Compact Electronics

- Ionizer controller with filament, optics and two heater power supplies, plus detector power supply
- Tempus Quadrupole Data Acquisition system, with Quadrupole Controller, and RF power supply and analog preamplifier