What’s in the box
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LCMS SQ & TQ R&D Manager
June 6, 2017
Typical LC/TQ Lab Layout

6 feet
1.83 meters
Typical LC/TQ Lab Layout

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Typical LC/TQ Lab Layout

6 feet
1.83 meters
LC/TQ Instrumentation

Vacuum $\sim 10^{-5}$ torr
LC/TQ Instrumentation

Vacuum $\sim 10^{-5}$ torr

Source & Ion Transfer Optics
LC/TQ Instrumentation

Vacuum $\sim 10^{-5}$ torr

Source & Ion Transfer Optics

Quadrupoles
LC/TQ Instrumentation

Vacuum $\sim 10^{-5}$ torr

Source & Ion Transfer Optics

Quadrupoles
LC/TQ Instrumentation

Vacuum $\sim 10^{-5}$ torr

Source & Ion Transfer Optics

Quadrupoles

Collision Cell

Detector
LC/TQ Instrumentation

Vacuum $\sim 10^{-5}$ torr

Source & Ion Transfer Optics

Quadrupoles

Collision Cell

Detector

Electronics
Ultivo Ion Optics, Mass Analyzer and Detector
Ultivo Ion Optics, Mass Analyzer and Detector
Ultivo Ion Optics, Mass Analyzer and Detector
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Quick Change Ion Injector

Fast Ion Injector exchange without system venting

Ion Injector Tool  VacShield

Easy to use, increased throughput, less downtime for maintenance
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Ion Injector Tool  VacShield

Easy to use, increased throughput, less downtime for maintenance
Pre MS1 Ion Beam Compressor – “Cyclone Ion Guide”

Shorter than octopole.

Transport ions through multiple Vacuum stages

Transport Ions with minimal ion losses

Twisted and tapered

Reduce ion beam size
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![Cyclone Transmission vs m/z – outer rods off](image)
Pre MS1 Ion Beam Compressor – “Cyclone Ion Guide”

Shorter than octopole.

Transport ions through multiple Vacuum stages

Transport Ions with minimal ion losses

Twisted and tapered

Reduce ion beam size
Virtual Pre/Post Filters

20x thinner than traditional pre/post filters

Reversed polarity U+/U- DC only, no RF required.

Noding is eliminated

Consistent tuning with improved instrument performance
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Older Prefilter

New Virtual Prefilter

5% transmission at 0.7 resolution
13,000 counts

30% transmission at 0.7 resolution
300,000 counts!
Redesigned Hyperbolic Quadrupole

A quadrupole’s performance are defined by the following:

1. Electrode shape (H
2. Radius (r
3. Length (l
4. Frequency (f
5. Voltage (V

Redesigned Hyperbolic Quadrupole

A quadrupole’s performance are defined by the following:

1. Electrode shape (Hyperbolic)
2. Radius
3. Length
4. Frequency
5. Voltage
Redesigned Hyperbolic Quadrupole

A quadrupole’s performance are defined by the following:

1. Electrode shape (Hyperbolic)
2. Radius (Smaller)
3. Length (‘)
4. Frequency (I)
5. Voltage (I)
Redesigned Hyperbolic Quadrupole

A quadrupole’s performance are defined by the following:

1. Electrode shape (Hyperbolic)
2. Radius (Smaller)
3. Length (Shorter)
4. Frequency (Increased)
5. Voltage (Increased)
Redesigned Hyperbolic Quadrupole

A quadrupole’s performance are defined by the following:

1. Electrode shape *(Hyperbolic)*
2. Radius *(Smaller)*
3. Length *(Shorter)*
4. Frequency *(Increased)*
5. Voltage *(I)*
Redesigned Hyperbolic Quadrupole

A quadrupole’s performance are defined by the following:

1. Electrode shape (Hyperbolic)
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A quadrupole’s performance are defined by the following:

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5. Voltage (Increased)

Agilent’s Next Gen hyperbolic Quadrupoles operate at a higher frequency and voltage which allows a smaller sized quadrupole to perform with exceeding performance.
Traditional Collison Cell

- Consists of multiple parallel rods held at alternating positive or negative voltage
- Controls orientation before electron transfer
- Uses gas (N$_2$, argon) to stimulate collisions
- Design criteria:
  - Simple and reliable design
  - High ion transmission - Improved
  - Broad mass range transmission - Improved
  - Short ion transmission time - Improved
  - Exiting beam conditions indistinguishable between MS and MS/MS
  - Compress ion beam for improved Q2 acceptance
Collision Cell Results

Significantly shorter (60 mm less) collision cell affords reduced bench space

Compresses ion beam to improve transmission into smaller diameter quads

Operates at multifrequency for broad range transmission

Nearly equivalent MS/MS spectra compared to 6420/60
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6460 30 eV (Reserpine)

Ultivo 30 eV (Reserpine)
Easy Change Detector Assembly
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Easy Change Detector Assembly
Easy Change Detector Assembly