



Revision 00 – June 2019

Product Support
Life Science Mass Spectrometry

Orbitrap Exploris 480 Platform Introduction

- **Introduction of the Orbitrap Exploris 480**

- Q Exactive Series – the legacy product platform
- Markets and Applications
- Model Differentiation
- Timelines
- New Mechanics

Orbitrap Exploris 480

Positioning statement

Maximum Performance
for rapid and deep
analysis – Superior
data quality



Options: IC, BioPharma Option

Customers

- High End core labs in academia
- Academic research
- (Bio)Pharma industry
- High End CRO (some method development)

Applications

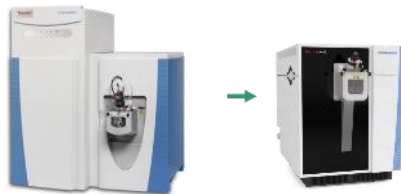
- Discovery proteomics
- Translational proteomics
- Lipidomics
- Untargeted Metabolomics
- Structural Biology
- Characterization of Biologics
- FoodOmics
- Petrochemicals

Workflows

- Peptide/Protein ID
- PTM
- Peptide quan (relative/absolute)
- Targeted/untargeted metabolomics
- mAb/subunits/ADC/intact/proteins
- Native MS
- Top-down proteomics

Orbitrap Exploris 480 : New Platform Characteristics

Hardware:
Smaller Footprint
versus
Q Exactive Series



Performance:
Less detection time
for same resolving
power:
D20 Orbitrap



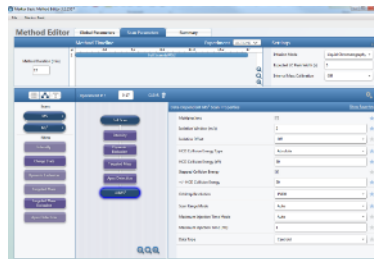
GUI:
Harmonized
Orbitrap Exploris Tune
Method Editor



Serviceability:
Customer can
exchange/clean the
quadrupole; quick ion
optics access



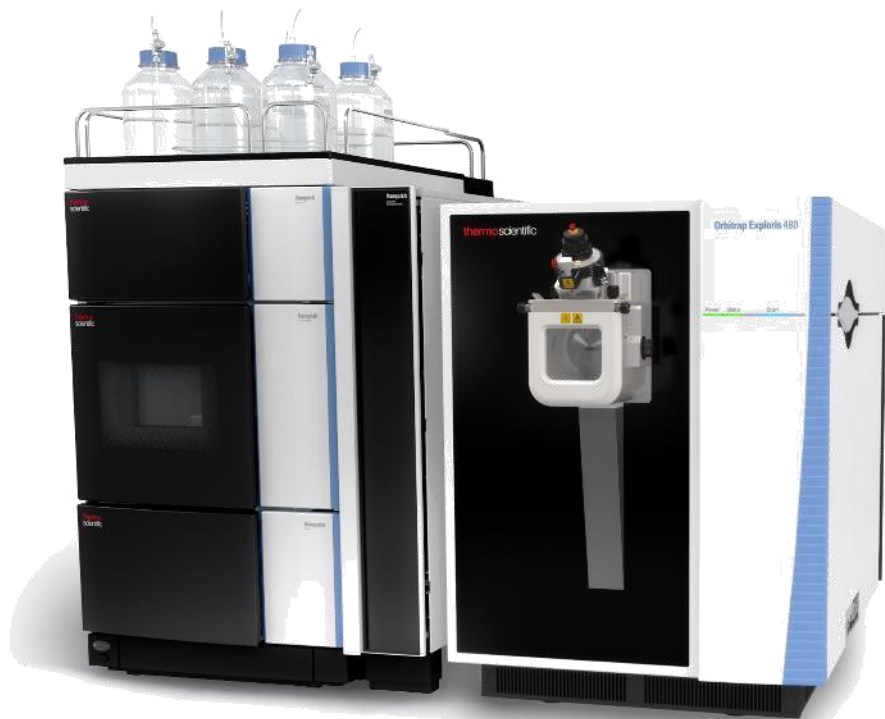
Method Setup:
Higher Flexibility
versus
QE Focus;
TSQ view



Reliability:
Example (Pfeiffer):
Turbo pump
Long-term robustness
testing at suppliers' side



Orbitrap Exploris 480 next to Vanquish LC System

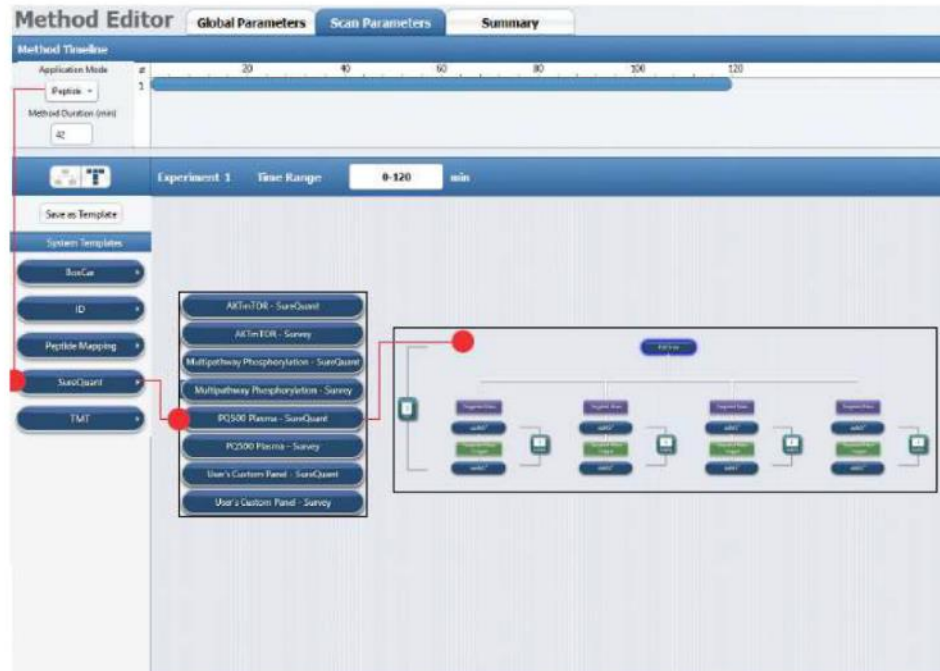


Pre-defined Method Set-up

Focus On Your Science, Not On Instrument Setup

One-Click Method Set-up

- Common instrument method interface as Orbitrap Tribrid and next generation TSQ Triple Quadrupole MS systems
- Customize interface based on user preferences
- Application mode with best-practice default parameters
- Library of application specific method templates for standard methods and easy set up
- Easy to use with method flexibility
- Method transferability between instrument types



Designed for Maximum Uptime to Deliver Everyday High-Throughput

Robust

Advanced technology to maximize uptime for high throughput labs



Advanced Quadrupole Technology (AQT) With Patented Configuration Switch Mode (CSM)



Robust Ion Optical Lens Design

Quality

Rigorous testing at every stage of the manufacturing process



Convenience

Variety of service levels to maintain MS sensitivity, precision & accuracy



User Operated Diagnostics For Predictability And Convenience



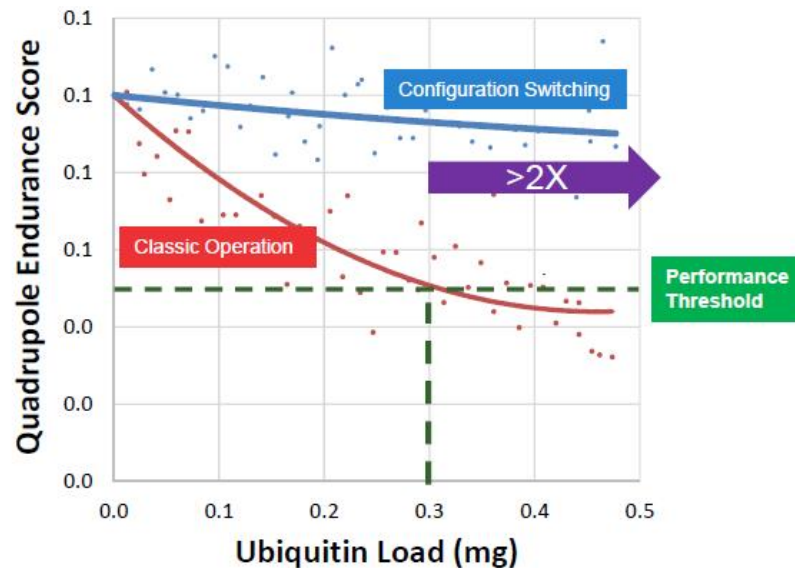
Intelligence-driven To Automatic Bake-out When Unplanned Power Failures Occur

Prolonged Robustness with Configuration Switching on Advanced Quadrupole

Configuration Switching: Application of alternating Quadrupolar DC field splits the deposition of contaminants on both rod sets.



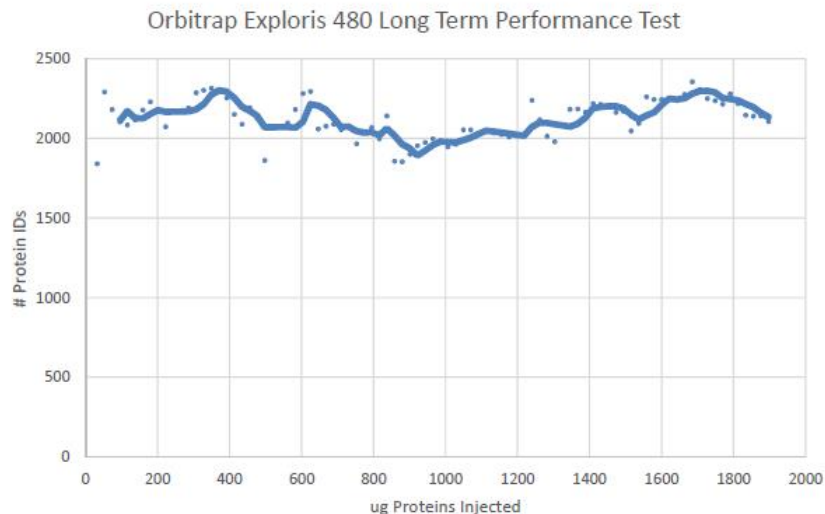
Quadrupole Endurance Testing



Configuration Switching Drives a >2X increase in Robustness vs Classical Quadrupole Operations

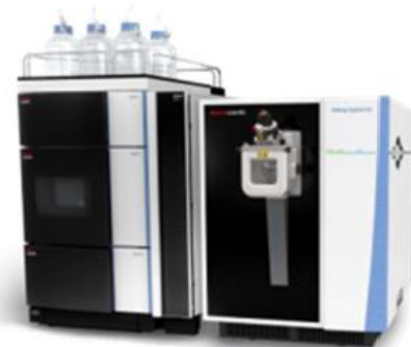
Interval between Performance Maintenance study on Orbitrap Exploris 480

Robust By Design



Typical User Experience:

- ~ 2000 µg injected into system
- Experiment stopped before performance limit reached



- Novel optics design yield improved robustness towards amount of injected material
- With typical high throughput workflows, users should expect to be able to load ~ 2000 µg between performance based maintenance
- Performance maintenance can be accomplished directly by the user or through a performance maintenance contract.

Performance Specifications

Orbitrap Exploris 480

Mass Range for Full Scans	m/z 40–6000 (8000 with BioPharma option) The following mass range limitations apply: - If first mass is $\geq m/z$ 150, set last mass $\leq 15 \times$ first mass. - If first mass is $50 \leq m/z < 150$, set last mass $\leq 10 \times$ first mass. - If first mass is $40 < m/z < 50$, set last mass $\leq 5 \times$ first mass.
Precursor Ion Selection	$40 < m/z \leq 400$ $400 < m/z \leq 700$ $700 < m/z \leq 1000$ $1000 < m/z \leq 1500$ $1500 < m/z \leq 2000$ $2000 < m/z \leq 2500$ $2500 < m/z \leq 6000$ (8000) Any isolation widths between m/z 0.4 and full scan Any isolation widths between m/z 0.7 and full scan Any isolation widths between m/z 1.0 and full scan Any isolation widths between m/z 1.5 and full scan Any isolation widths between m/z 2.0 and full scan Any isolation widths between m/z 3.0 and full scan No precursor ion selection.
Mass Resolution	7500 at m/z 200 at a scan rate of 40 Hz 15000 at m/z 200 at a scan rate of 22 Hz 30000 at m/z 200 at a scan rate of 12 Hz 45000 at m/z 200 at a scan rate of 10 Hz 60000 at m/z 200 at a scan rate of 7 Hz 120000 at m/z 200 at a scan rate of 3 Hz 240000 at m/z 200 at a scan rate of 1.5 Hz 480000 at m/z 200 at a scan rate of 0.7 Hz
Mass Accuracy	<3 ppm with external calibration (under defined conditions) <1 ppm using internal standard, lock masses (under defined conditions)
Polarity Switching	One full cycle in < 1 sec (one full scan positive mode and one full scan negative mode at resolution setting of 60000)
Dynamic Range	>5000 within a single scan
Sensitivity	MS/MS: 50 fg reserpine on column S/N 100:1 SIM: 50 fg reserpine on column S/N 150:1

Q Exactive HF-X

Mass Range for Full Scans	m/z 50–6000 (Scan range: last mass $\leq 15 \times$ first mass)
Precursor Ion Selection	$50 < m/z \leq 400$ $400 < m/z \leq 700$ $700 < m/z \leq 1000$ $1000 < m/z \leq 2000$ $2000 < m/z \leq 2500$ $2500 < m/z$ Any isolation widths between 0.4 amu and full scan Any isolation widths between 0.7 amu and full scan Any isolation widths between 1.0 amu and full scan Any isolation widths between 2.0 amu and full scan Any isolation widths between 3.0 amu and full scan No precursor ion isolation
Mass Resolution	7500 at m/z 200 at a scan rate of 40 Hz 15000 at m/z 200 at a scan rate of 20 Hz 30000 at m/z 200 at a scan rate of 12 Hz 45000 at m/z 200 at a scan rate of 10 Hz 60000 at m/z 200 at a scan rate of 7 Hz 120000 at m/z 200 at a scan rate of 3 Hz 240000 at m/z 200 at a scan rate of 1.5 Hz
Mass Accuracy	<3 ppm with external calibration (under defined conditions) <1 ppm using internal standard, lock masses (under defined conditions)
Polarity Switching	One full cycle in < 1 sec (one full scan positive mode and one full scan negative mode at resolution setting of 60000)
Dynamic Range	>5000 within a single scan
Sensitivity	S/N of a flow injection of Buspirone for the selected mass chromatogram of the $[M+H]^+$ ion ($m/z = 386.2551$): Full Scan: 200 fg on column 100:1 SIM: 20 fg on column 100:1

Purchasable Options

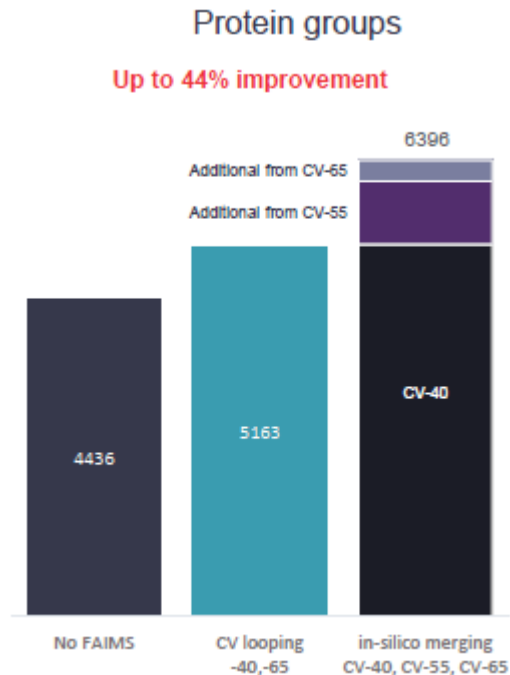
- Internal calibration (EASY-IC™)
- BioPharma option
- FAIMS Pro

- Orbitrap Exploris 480 BRE725532
- Orbitrap Exploris 480 w/ EASY-IC BRE725533
- BioPharmaOption Orbitrap Exploris 480 factory installed BRE725539
- EASY-IC for Orbitrap Exploris 480 field upgrade BRE725538 Aligned with IC-field upgrade option for Tribrid

FAIMS Pro

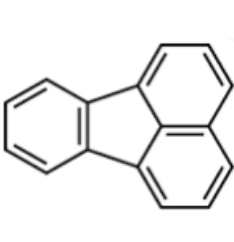


- Increases the number of unique peptides identified and quantified
- Increased accuracy of TMT peptide quantitation



Orbitrap Exploris 480 Option: Internal Calibration

- Like in Orbitrap Fusion
- Additional mass calibration with one mass ($m/z = 202$, Fluoranthene)
- Fluoranthene is already filled in and will last for 1 year
- Has to be calibrated in the end (after positive calibration of inject filter and complete negative calibration)



Irritant

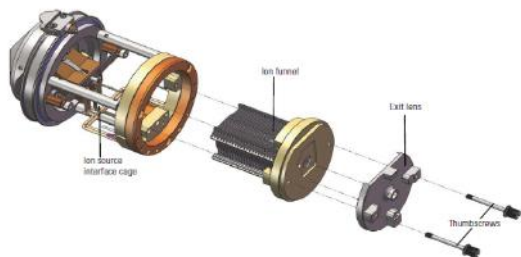


Environmental
Hazard

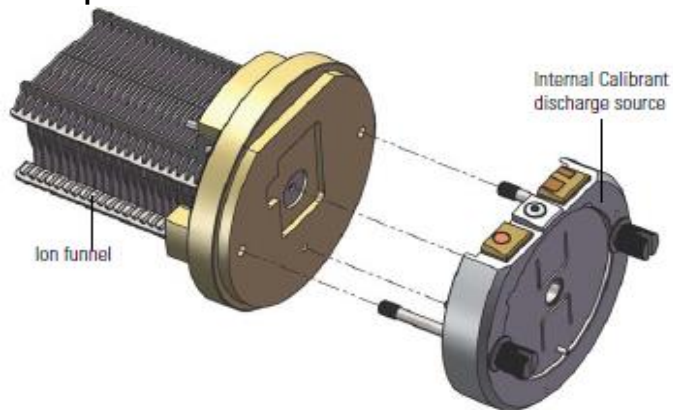


Internal Calibration Module

w/o internal calibration (IC) option



with IC option



Internal calibrant discharge source



Activate the ICS (current)

- Controlled through Instrument Configuration (or SDT)
- Should work with default settings
- The oven may take >15 min to reach the set temperature!
 - Settling time is printed at the bottom of the instrument tree

Status Tree		IC Source - Temperature Supervision
Instrument		
Tree Tools		
Current Scan		
Control		
Define Scan		
Application/Method		
Components		
General		
Vacuum System		
Analyzer Temperature Control		
Ion Source		
Atmospheric Interface		
Injection Filter		
Ion Transfer		
Precursor Isolation		
Injection Control		
Ion Trapping		
Timing and Settling Times		
IC Ion Source		
ICS Operation Mode *	On	
ICS HV current trimmer adjustm	0.0	
ICS active HV current (μA) #	5.0	
ICS idle HV current (μA) #	0.05	
ICS Make-up Gas (psi) #	15.0	
ICS timing		
ICS Bump HV current (μA) #	5.0	
ICS Bump Duration (ms) #	1.0	
ICS Switch on Delay (ms) #	7.0	
ICS Switch off Delay (ms) #	8.0	
ICS Oven Temperature (°C) #	65.0	
ICS Split Temperature (°C) #	130.0	
ICS Calibration m/z #	202.0777	
IC Source		Temperature Supervision - Actual Ove
Status	On	
Settling Time	7.5 min	
IC AGC Status	Disabled	
Temperature Supervision		Actual Oven Heater Temperature - 47
Actual Oven Heater Temperature	47.6 °C	
Actual Split Heater Temperature	129.8 °C	
Alerts		

Calibrate the ICS

- Under Procedures ▶ By Sequence
▶ Internal Calibrant Source
- Following calibration must first be calibrated:
 - Positive-mode Inject Filter (at least)
 - Negative mode

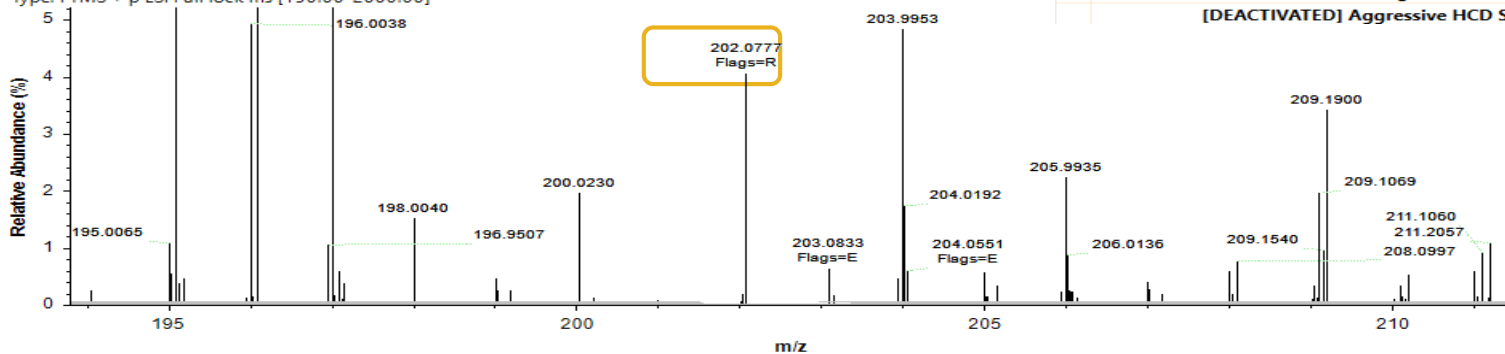
Status Tree	
▲ Procedures	
▶ Calibrant Masses	CalMix
▶ Custom Masses	CalMix
▶ Pre-Conditions	
▶ By Functionality	1;;By Functionality
▲ By Sequence	1;;By Sequence
▶ User	1;;User
▲ Factory	1;;Factory
▶ Initial Calibrations	1;;Initial Calibrations
▶ Positive Ion Mode Calibrations	1;;Positive Ion Mode Calibrations
▶ Positive Ion Mode Evaluations	1;;Positive Ion Mode Evaluations
▶ Negative Ion Mode Calibrations	1;;Negative Ion Mode Calibrations
▶ Negative Ion Mode Evaluations	1;;Negative Ion Mode Evaluations
▶ Full System Evaluations	1;;Full System Evaluations
▲ Internal Calibrant Source	1;;Internal Calibrant Source
▲ Calibrations (neg)	1;;Calibrations (neg)
ICS Calibration Defaults	1;;ICS Calibration Defaults
ICS Make-up Flow Calibrat	1;;ICS Make-up Flow Calibration
ICS HV Current Trimmer C	1;;ICS HV Current Trimmer Calibration
ICS Active HV Current Cali	1;;ICS Active HV Current Calibration
ICS Switch-on HV Current	1;;ICS Switch-on HV Current Calibration
▲ Evaluations (pos)	1;;Evaluations (pos)
ICS Switch-on Time Evalua	1;;ICS Switch-on Time Evaluation (pos)
ICS Switch-off Time Evalua	1;;ICS Switch-off Time Evaluation (pos)
▲ Evaluations (neg)	1;;Evaluations (neg)
ICS Switch-on Time Evalua	1;;ICS Switch-on Time Evaluation (neg)
ICS Switch-off Time Evalua	1;;ICS Switch-off Time Evaluation (neg)
Instrument Snapshot	1;;Instrument Snapshot
▶ Service	1;;Service
▶ Development	1;;Development
▶ Supplier	1;;Supplier
AutoTune	1;;AutoTune
✓ ▶ IC Source	
✓ ▶ Alerts	

This super-procedure performs all calibrations relating to the internal calibrant source, in negative mode. Positive mode needs no further calibrations.

Use the ICS lockmass

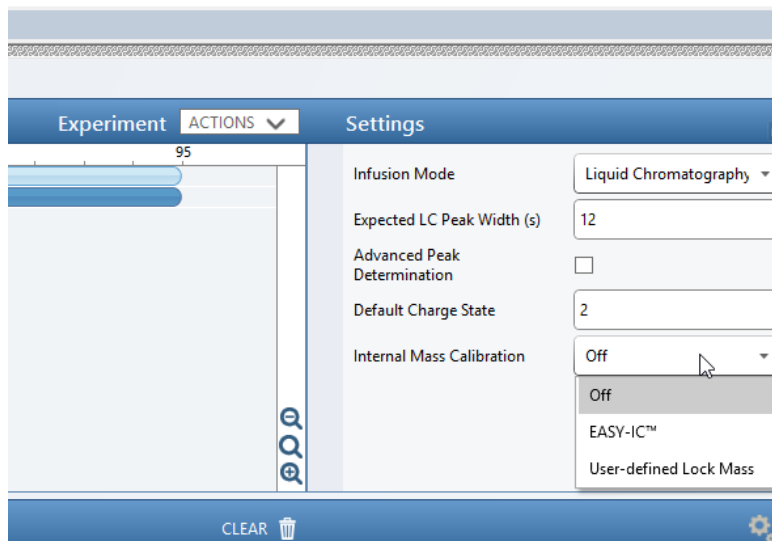
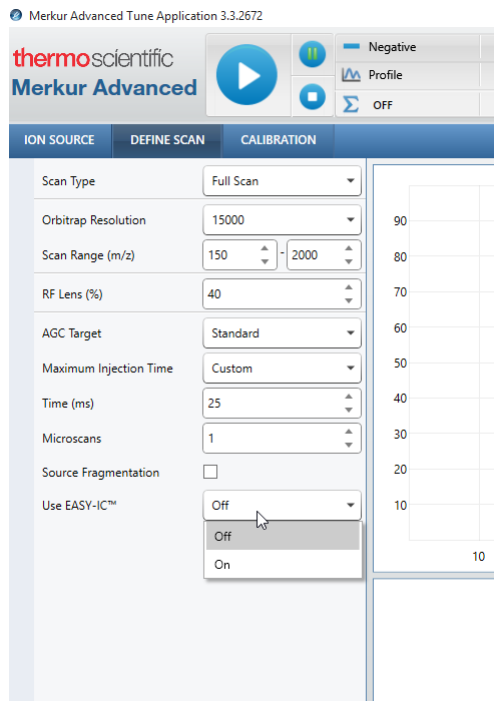
- Tick EasyIC box in Method Editor
- SDT allows to choose for which mode(s) to use ICS lockmass
 - Added as separate, last injection
- Ensure ICS AGC mode = On
 - Typical ICS IT < 0.5 ms for S/N 75

Scan: #5902 μ S: 1 IT: 9.46 NL: 5.84E7
Type: FTMS + p ESI Full lock ms [150.00-2000.00]



Status Tree		Performance - Affected: System Calib
Instrument		
Tree Tools		
Current Scan		
Control		
Define Scan		
Application/Method		
LC peak width (FWHM)*		15.0
AGC Details		
Application mode (requested)		Standard
Application mode (actual)		Standard
Bigmass Application mode (actual)		Off
Bigmass Calibration Index (actual)		ix0
Trapping gas pressure setting *		1.0
Lockmass Details		
Analyte Lockmass injection *		Off
IC Lockmass injection *		Off
ICS (max) inject time (ms) *		5.0
ICS AGC mode *		On
ICS AGC target (s/n) *		75
Lockmass inj iso width (m/z) *		2.5
Lockmass inj target *		2000.0
Lockmass tolerance * (ppm)		15
Multi-Lockmass Logic		Best Peak
[DEACTIVATED] Aggressive HCD Sc		On

EASY-IC setup up in Method editor (Orbitrap Exploris Tune)

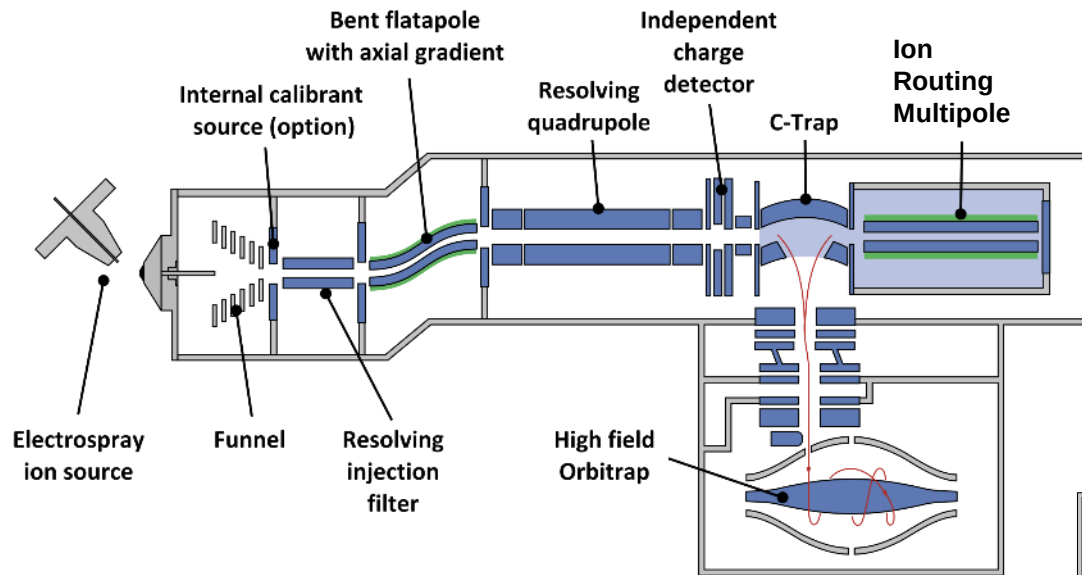


Orbitrap Exploris 480 : Key Technologies

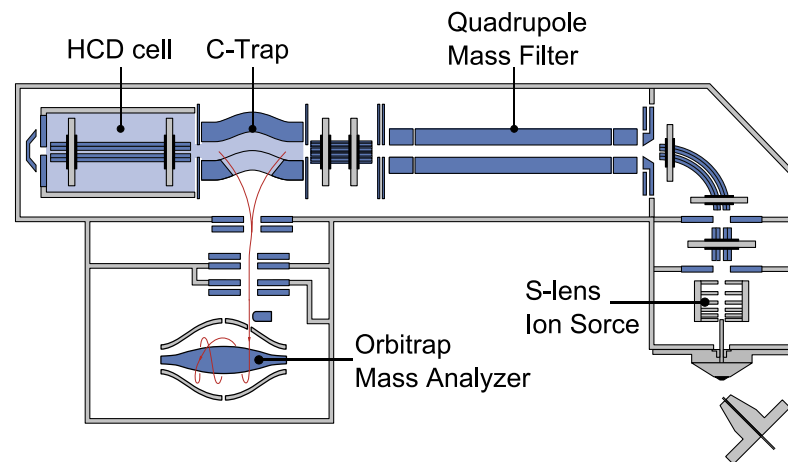
Key technology concepts are similar to current QE, but entirely redesigned

- **Cost-, service- and volume-optimized mechanics and electronics**
 - One 6-stage turbo molecular pump (instead of two 3-stage TMP in Q Exactive)
 - Shorter quadrupole vs. Q Exactive Plus
 - Consolidation of boards and cables
 - Significantly smaller and lighter than QE
- **Performance improvement / New Features**
 - D20 high-field Orbitrap in all models
 - Enhanced Resolution (480K)
 - EASY-IC™: Internal Calibration unit
 - FAIMS Pro support
- **Harmonization with TNG platform (Orbitrap Exploris Tune)**
 - Same ion source concept
 - Same industrial design concept
 - Same instrument software GUI

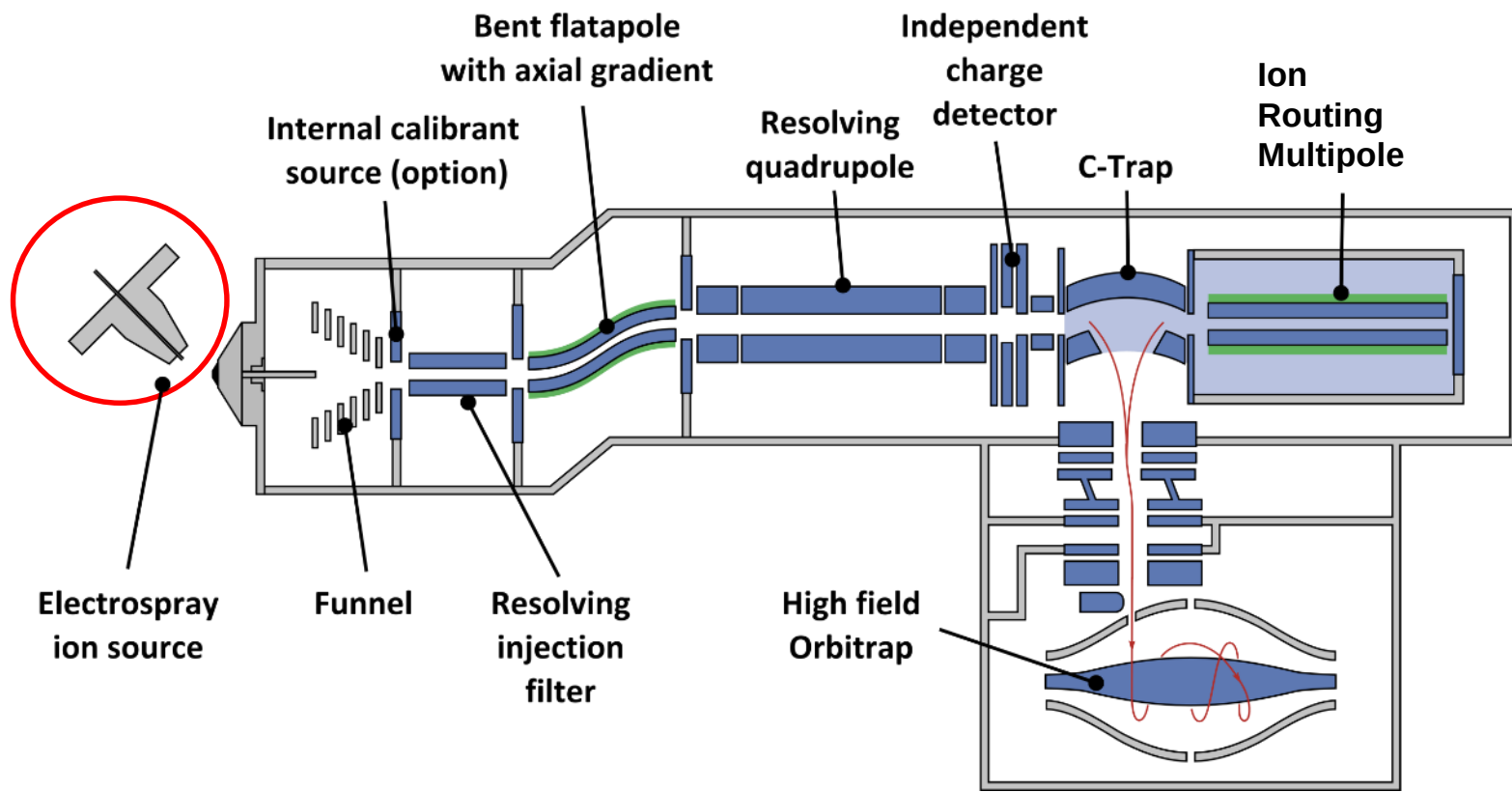
Orbitrap Exploris 480 scheme



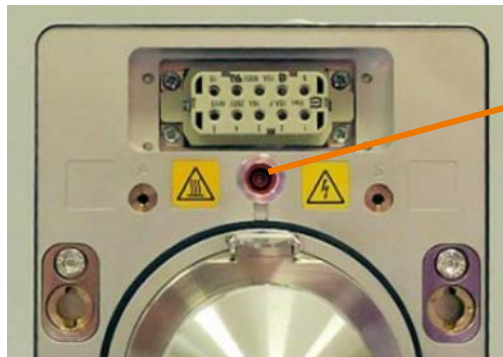
Q Exactive Plus/HF:



OptaMax source: ion generation



Optamax Source (BRE0014002)



HV connector
Spray voltage

Be careful when removing
the Ion source –
Capillary can be hot!

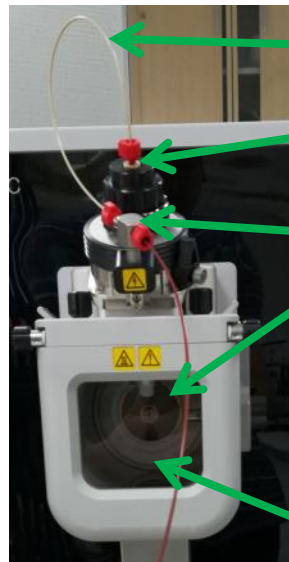
Optamax Source (BRE0014002)

High flow application



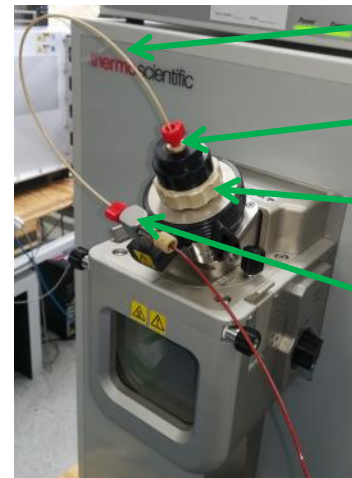
- Red short PEEK tubing
- High flow needle insert
- Grounding union
- Spray cone (suitable version)
- Drain Insert

Low flow application



- Beige long PEEK tubing
- Low flow needle insert „L“
- Grounding union
- Spray cone (optional)
- No Drain Insert

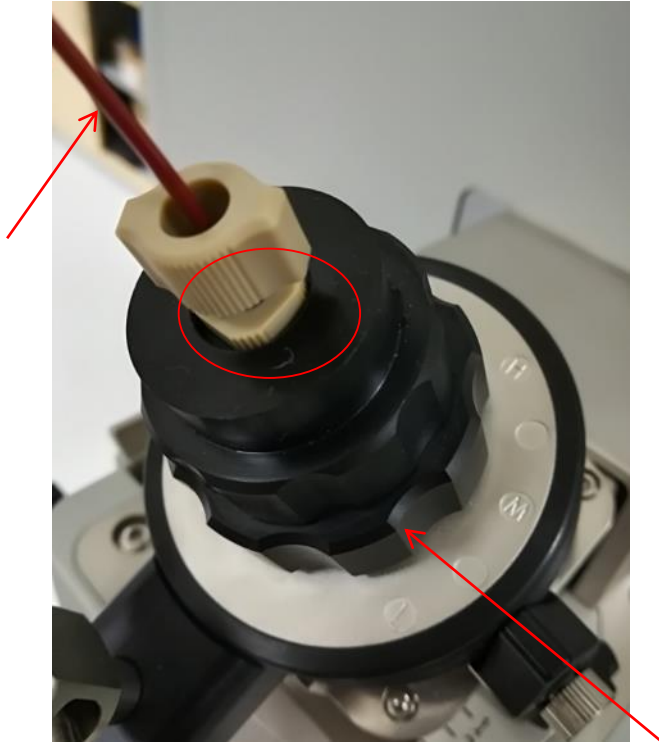
Calibration only



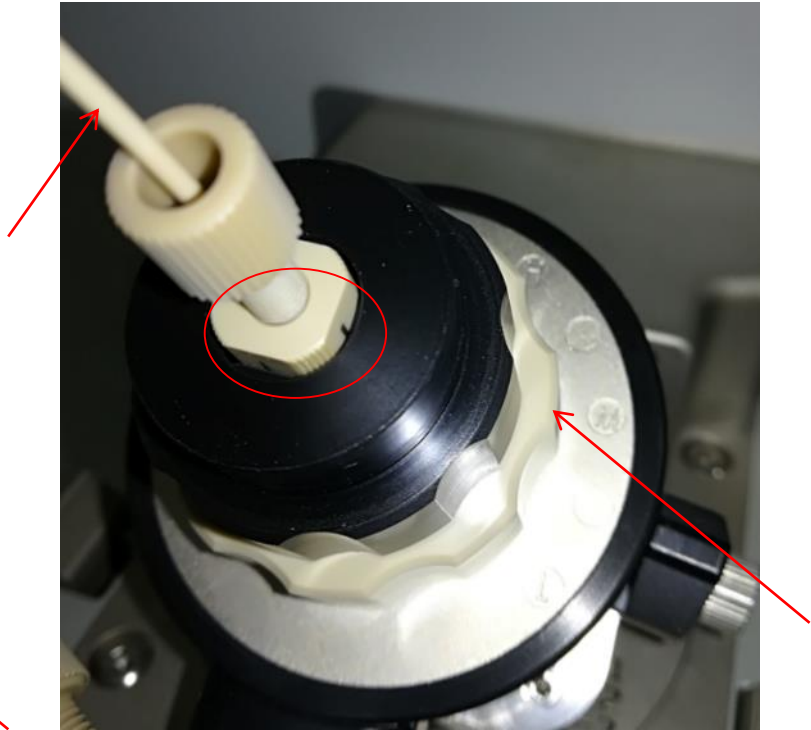
- Beige long PEEK tubing
- Low flow needle insert „L“
- ESI calibration probe (beige nut)
- Grounding union
- No Spray cone
- No Drain Insert

Ion source – OptaMax

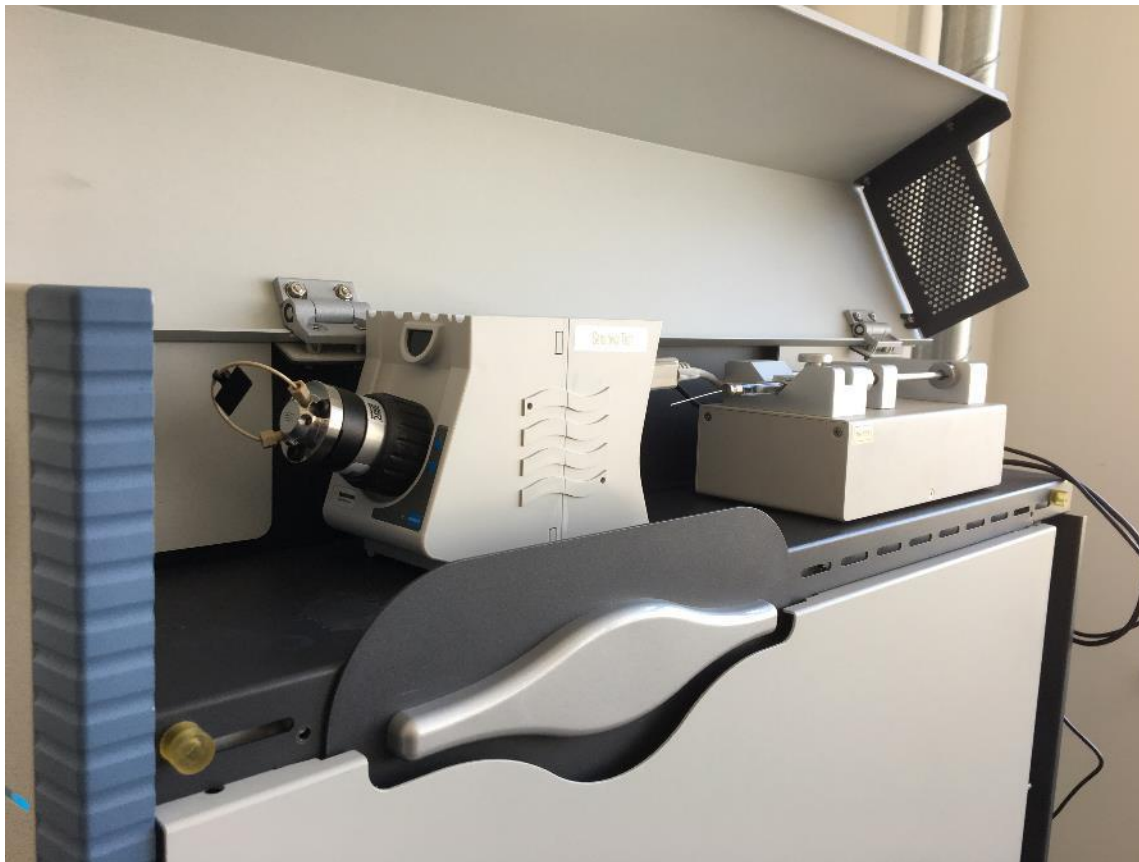
High flow



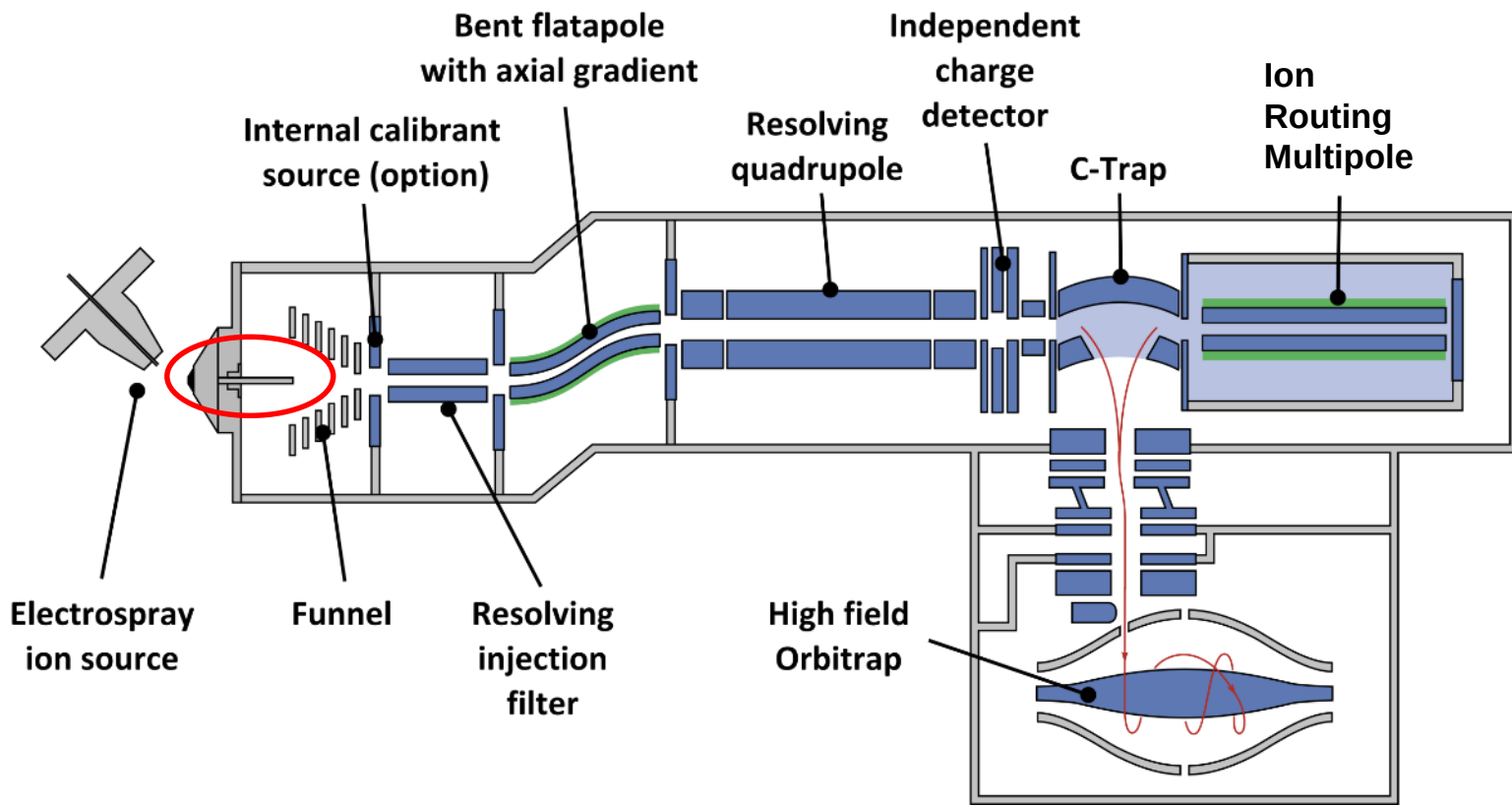
Low flow



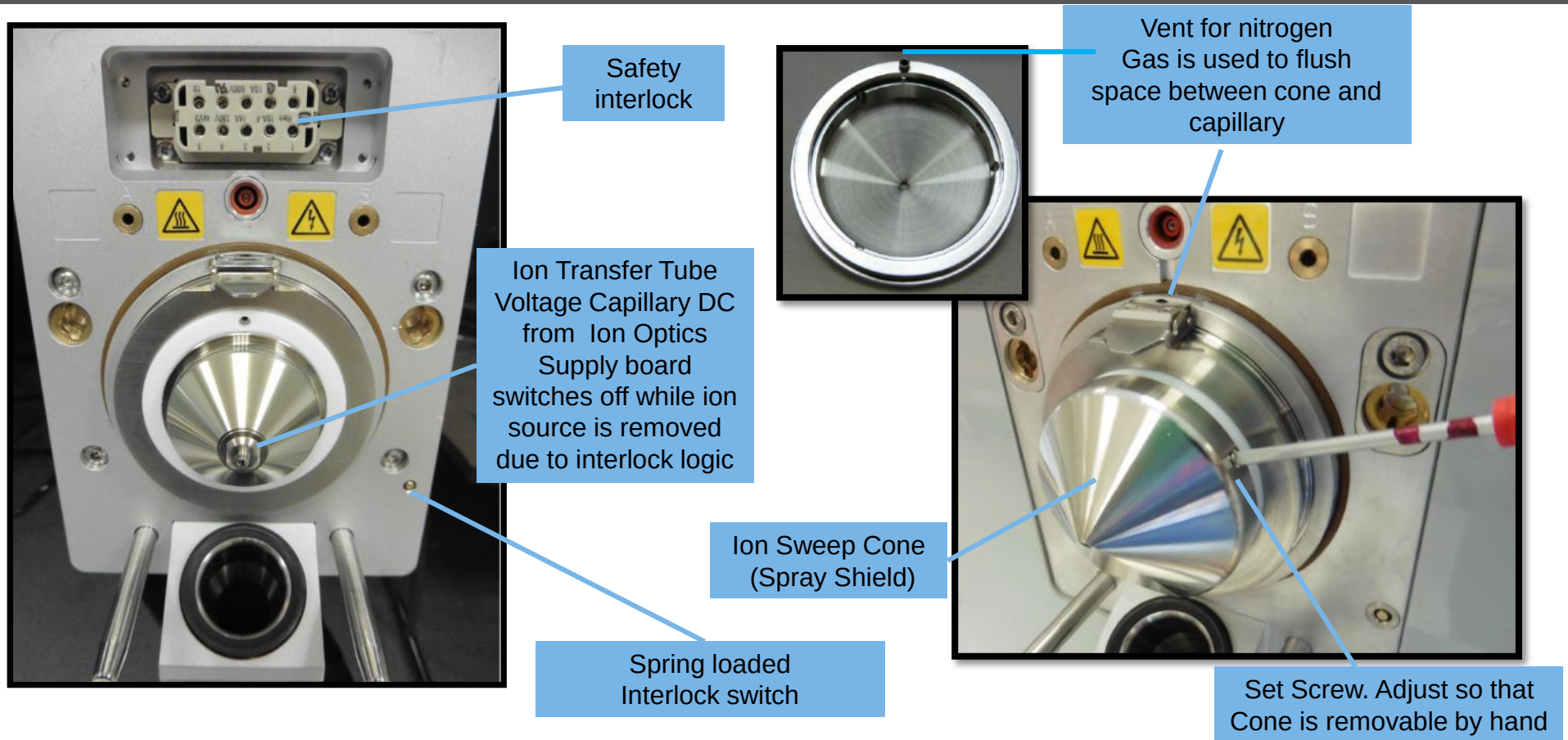
Storage for Syringe Pump and Divert Valve



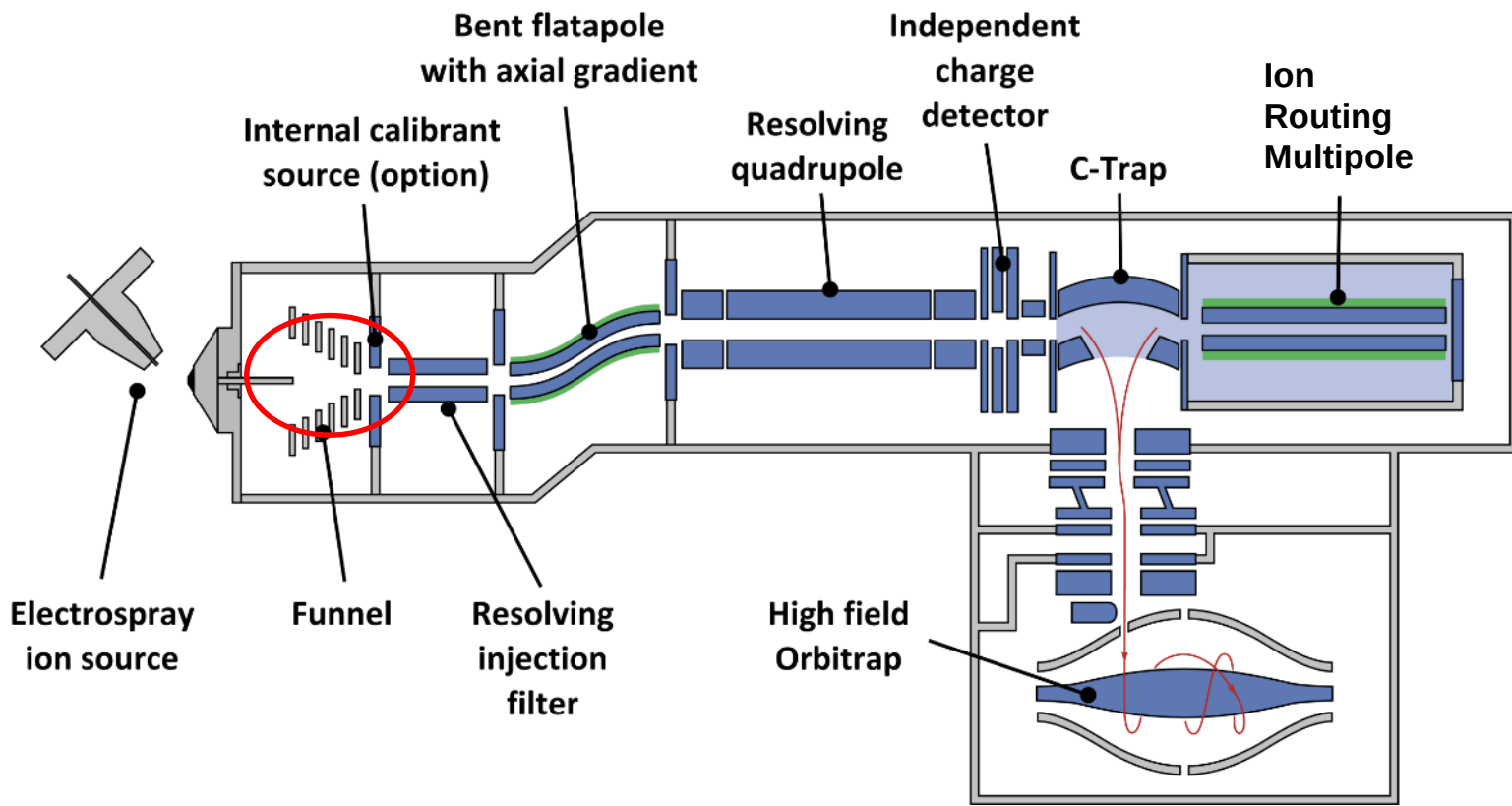
Ion Transfer Tube: Desolvation



Ion Transfer Tube



Funnel: ion focusing



Funnel injection logic for broader mass range

- Depending on requested mass range one or two RF amplitudes are used

Funnel RF
amplitude



multiple injections

m/z

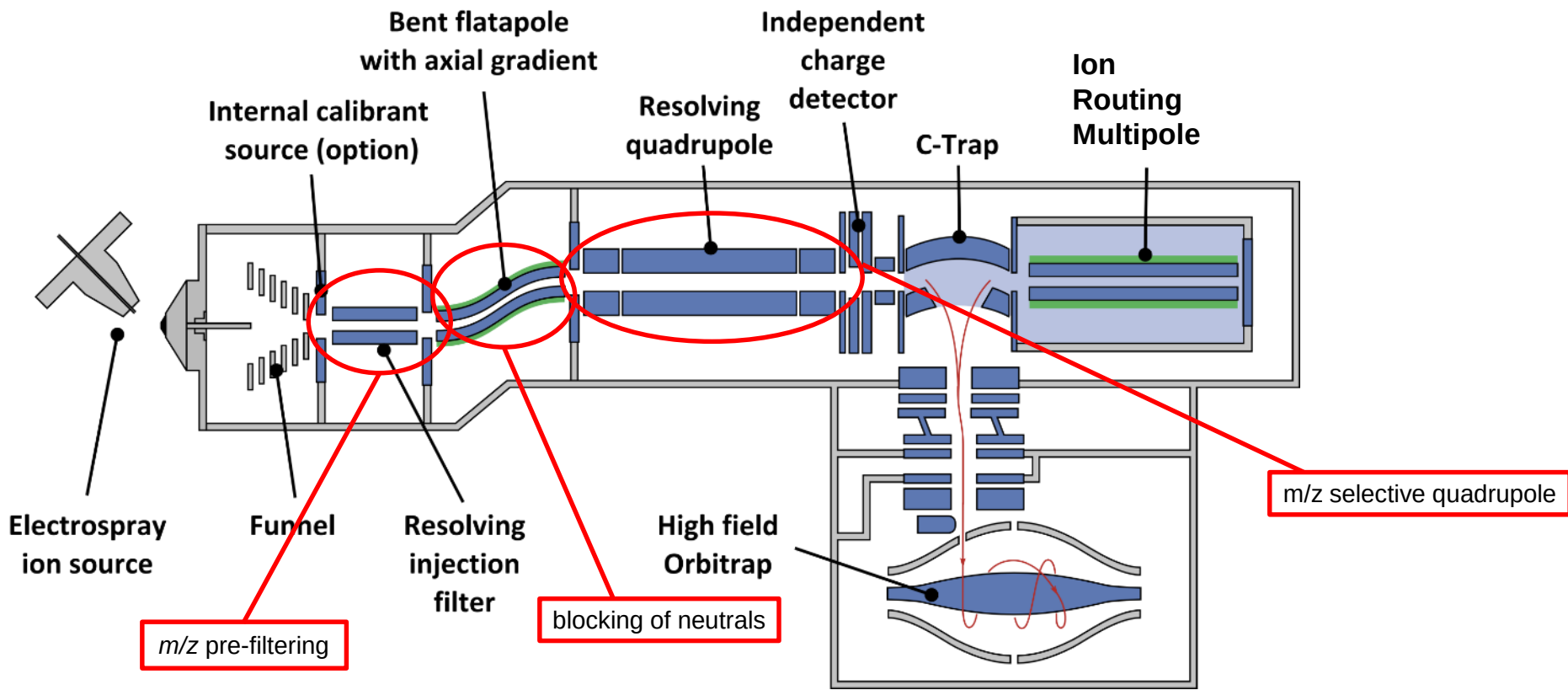


- If last mass is more than 4x higher than first mass, a second injection using another amplitude is performed based on:

$$V_{SlensRF} = P_{SlensLevel} \cdot 0.1 \cdot \sqrt{\text{last mass} / 4} \quad [V_{pp}]$$

- Sequence is from high m/z to low m/z

Ion pathway: inject filter, bent flatapole and quadrupole analyzer

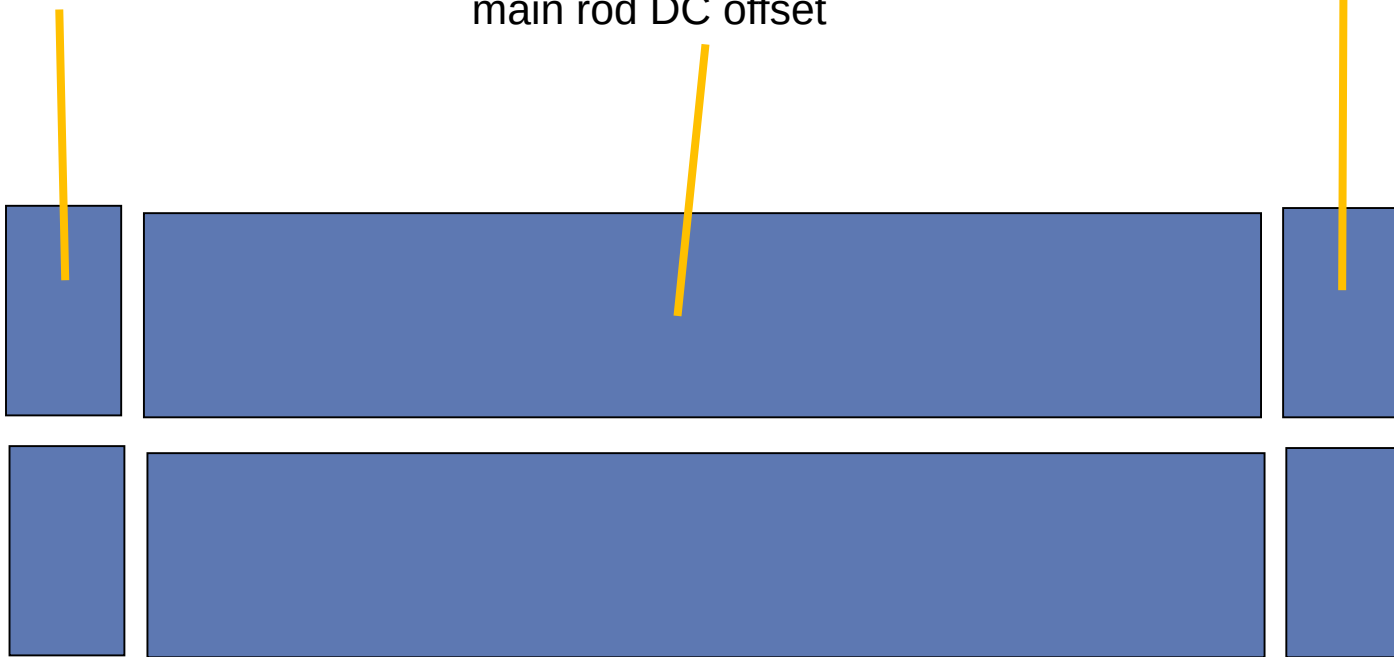


Segmented Quad is used as in QE Plus/HF

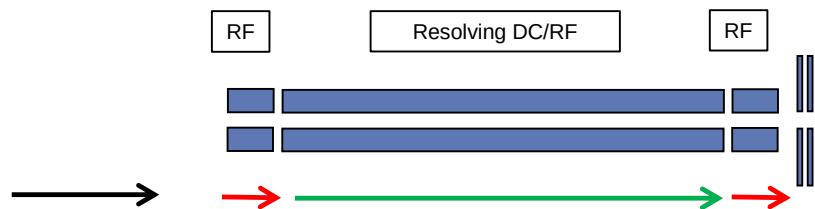
RF-only, reduced amplitude with
end-segment DC offset

RF + resolving DC with
main rod DC offset

RF-only, reduced amplitude with
end-segment DC offset

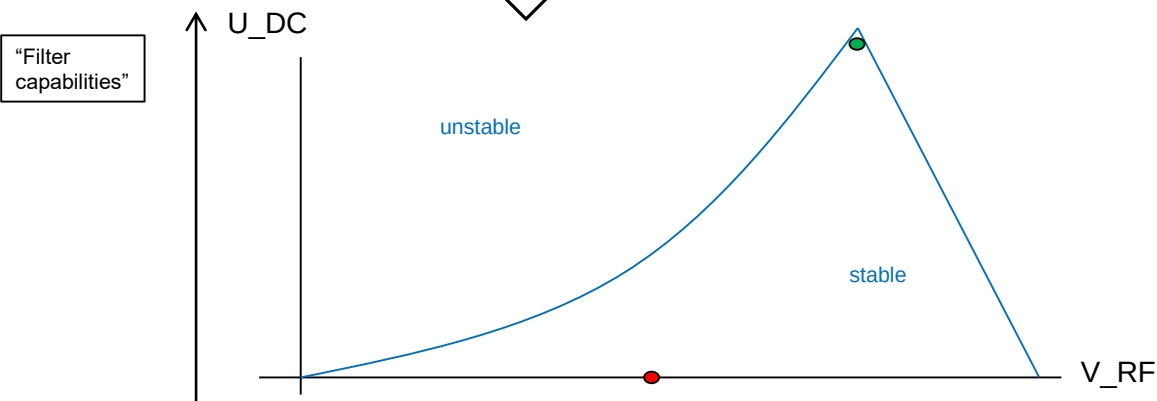


Segmented quadrupole: operating principle



For the isolation of a defined mass range in the resolving part of the quad, the calibrated DC/RFs are set as static values.

The more narrow the defined isolation window, the more the settings are reaching the “tip” of the stable region.

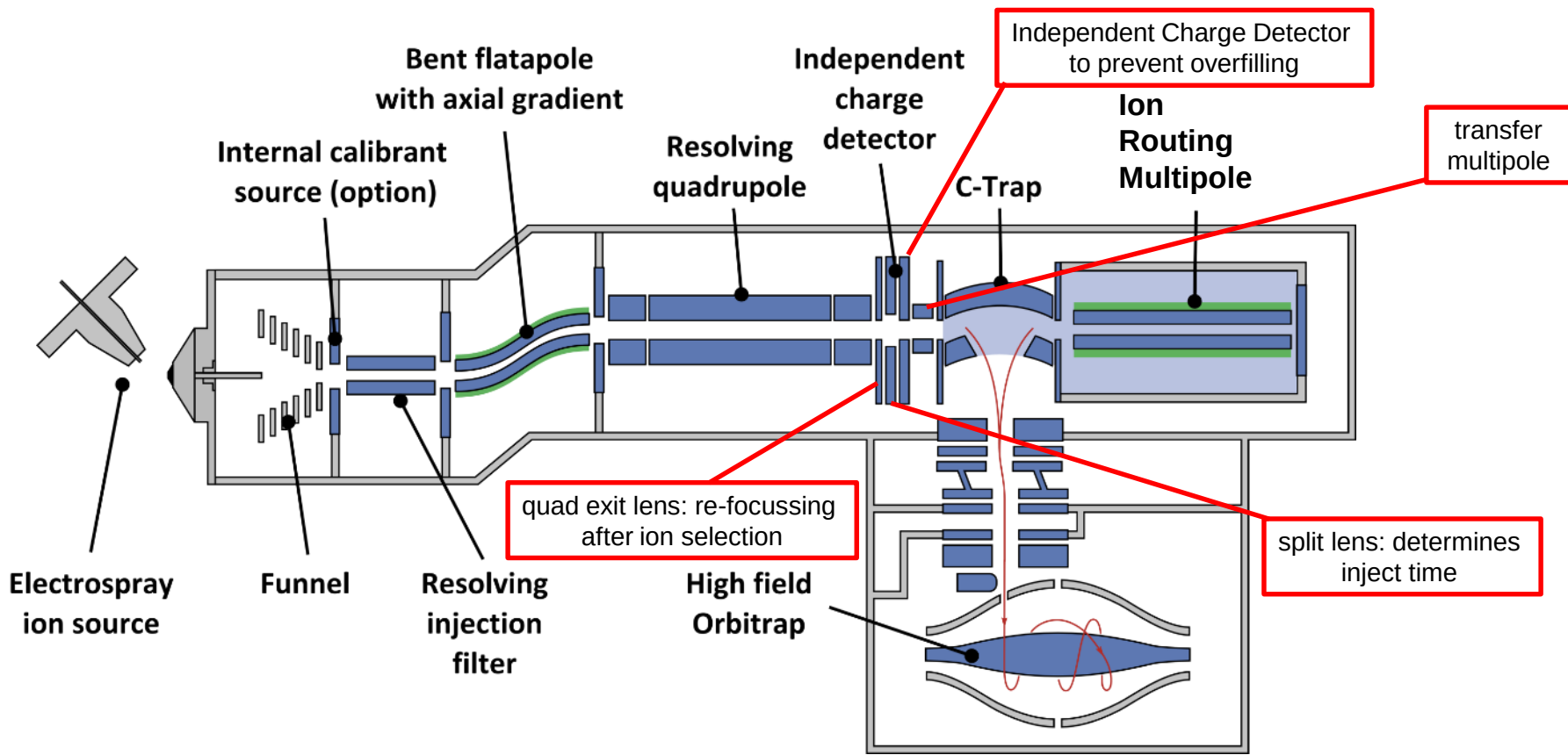


- 1) Ions entering the quad through RF only segment
No DC applied.
- 2) Ion Beam is focused, no divergence. Ions are pulled into the stable region and do have well stabilized trajectories → minimized loss of transmission and a more rectangular isolation shape
- 3) DC is applied as soon as ions are entering the resolving part of the quad
- 4) Ions are remaining in the stable region
- 5) RF only guide at quadrupole exit reduces energy spread again for optimal transmission to C-Trap

● DC/RF for stable transmission at narrow isolation widths

● Ions are well settled in the stable region
→ increased transmission efficiencies
→ more discrete edges (rectangular isolation shape)

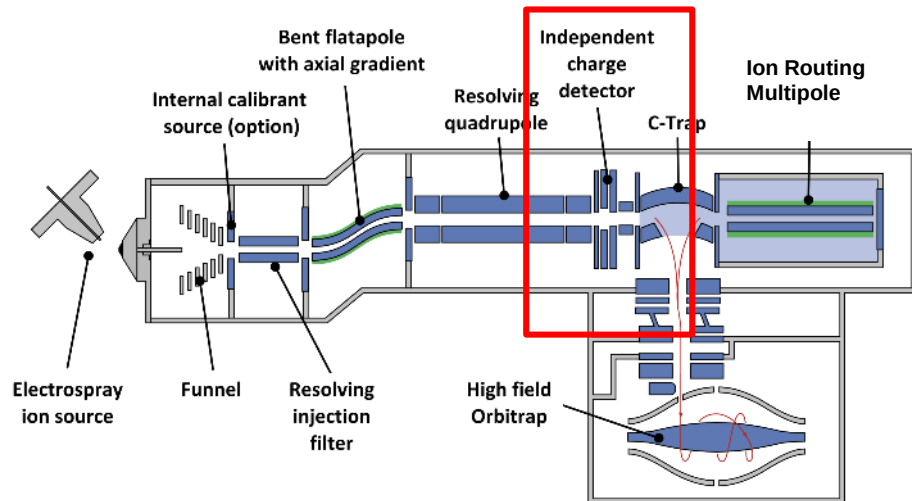
Ion pathway: quadrupole to CLT



Independent charge detector (ICD) vs Exactive Electrometer

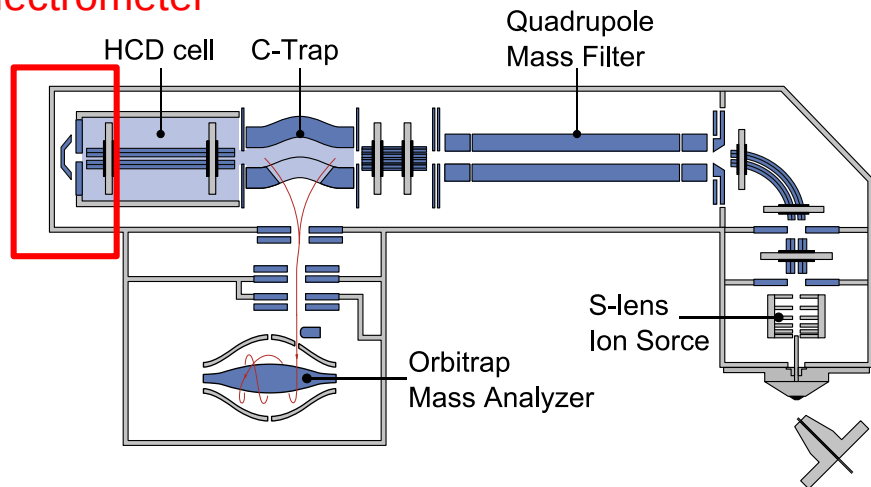
Orbitrap Exploris 480:

Independent
charge detector:



Exactive:

Electrometer



Independent charge detector (ICD) vs Exactive Electrometer

Characteristics	Orbitrap Exploris 480 ICD	Exactive EM
Physical Position	• Integrated into split lens assembly after the quad • Measurements of ion current are more characteristic of the ions trapped in the C-trap/analyzed in the Orbitrap. • Can be used for coarse localization of charging.	• End-cap of HCD cell. • Ion losses due to travel through C-trap and HCD cell can skew ion current measurements.
Sensitivity	• Higher • ProSA functions with 1 injection of < 2.5 ms each.	• Lower • CTCD required ~8-16 injections of <= 2.5 ms each.
Speed	• Functionally, slower. • 50 ms integration time is required for signal measurement. Injection of ions concurrent with integration. • 50 ms integration time is required for blank measurement (<i>hopefully soon optional</i>). • Not hidden, i.e. entire measurement period shows up as “coffee breaks” in RAW file (50-100 ms)	• Functionally, faster. • 50 ms integration time is required for signal (and blank) measurement. • Except for ion injection periods (8-16x * max 2.5 ms (<= 20-40 ms), the measurement is hidden (i.e. other scans are possible during this time. In practice, injection time is ~0.5 ms per injection (4-8 ms “coffee breaks”).
Complexity	• Higher complexity due to position in system. • Requires calibration.	• Lower complexity. • No calibration.

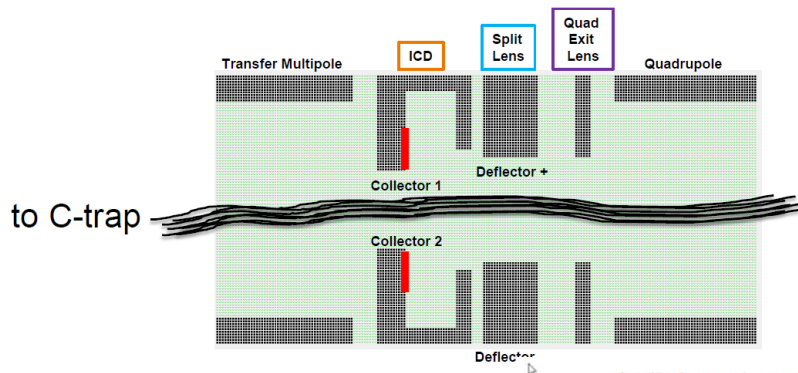
PrOSA: New name for an old concept

- The ICD can operate in three modes:
 - **PrOSA** (default)
 - **REIM-Beam** (diagnostic)
 - **REIM-Chop** (diagnostic)
- **PrOSA** or “**Proportional Orbitrap Signal Adjustment**” is the former CTCD mode. This is the default operating mode of the ICD.
- **REIM-Beam** and **REIM-Chop** are pure ICD modes of operation (having no influence on the Orbitrap signal). **REIM** stands for “**Rudimentary Electrometer Ion Mode**”. These are diagnostic-only modes.

How does ICD work?

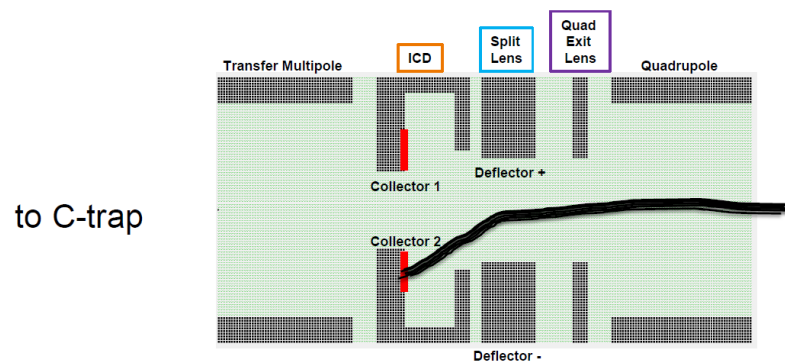
Split lens has three modes:

- 1. To C-trap (Deflector + = Deflector - = QExL)



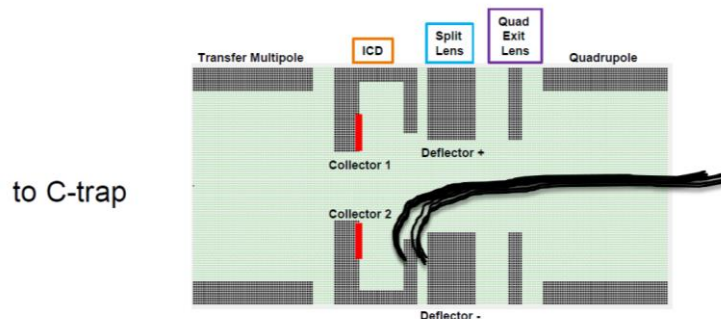
Split lens has three modes:

- 2. To ICD (Deflector - ~ -125 V)



Split lens has three modes:

- 3. Closed (Deflector - ~ -350 V)



PrOSA must be calibrated/ What is the PrOSA process

- The ICD PrOSA Scaling Factor is the ratio between the signal detected by the ICD and the signal detected by the Orbitrap under "clean" cal-mix conditions, where it is assumed that all ions injected into the Orbitrap are also detected by the Orbitrap
- This factor is used when PrOSA is enabled to support automatic gain control.

PrOSA must be calibrated/ What is the PrOSA process

- Every 5 - 10 s, an ICD measurement is conducted before or after a full-scan measurement.

Example: ICD 160 pA Orbitrap 20 pA

- The ratio of ICD to Orbitrap current is determined and compared to the expected ratio from the PrOSA Scaling Calibration.

Example: ICD-to-OT Ratio = $160/20 = 8$

M PrOSA Scaling Factor (Calibration Value) = 5

PrOSA Scaling (last) = $8/5 = 1.6$

- The correction to the Orbitrap injection times is highly averaged so as to avoid huge measurement-to-measurement changes, but still follow trends.

Example: PrOSA Scaling (avg) = 1.4

PrOSA must be calibrated/ What is the PrOSA process

- If the PrOSA Scaling (avg) is different from 1, injection times to the Orbitrap are adjusted accordingly to prevent overfilling or underfilling of the C-trap and Orbitrap, and incorrect adjustment of mass accuracy for Orbitrap space charge.

Example: PrOSA Scaling (avg) = 1.4

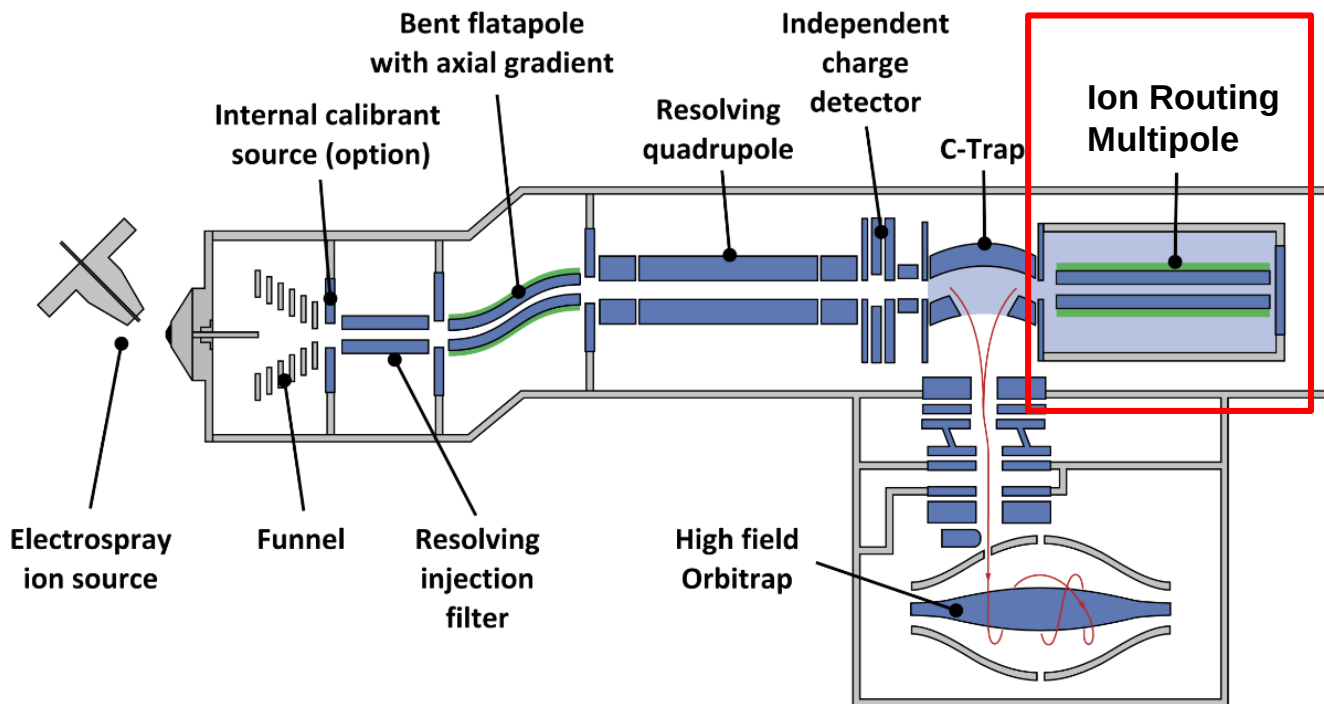
i.e. many more ions than expected are detected by the ICD than by the Orbitrap (e.g. partially resolved isotopic clusters).

Pure OT injection time from AGC calculation = 5 ms

Corrected OT injection time = $5/1.4 = 3.6$ ms

- Notes:
 - PrOSA adjustments are only made to full scans!
 - The adjustment is scaled based on the proportion of the full scan mass range falling the critical region of m/z 300-1000.
 - The mass accuracy correction based on space charge is additionally adjusted with the PrOSA Scaling (avg) result.

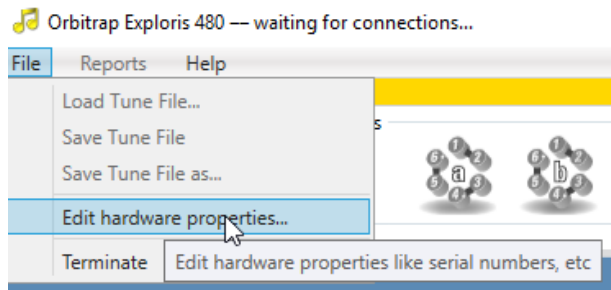
Rename of HCD cell and new scan behavior



- MS1 ions are *passed through* to Ion Routing Multipole for collisional cooling and trapping.
- Due to this change the “HCD cell” is now called “Ion Routing Multipole” in all customer facing communications.
- Part descriptions in SAP and voltages on electronic boards are still called “HCD...”

Serial number tracking capabilities

- Every PCB stores component specific data, like serial number, calibration coefficients, and revision level
- Digital ID for ion sources
- Mechanical parts can be tracked with minimal effort
- To modify part entries that are not “auto-detected” use the hardware property editor in SDT:



✓	HW Parts ID & Tracking	
✓	Ion Optics	
	API stack assy	Manually maintained
	Inj flat assy	Manually maintained
✓	ICS	
	Bent flatpole assy	Manually maintained
✓	Quadrupole	
	Quadrupole	Manually maintained
	Part Number	1365150
	HW Rev Level	1
	Eco Flags	
	Serial Number	RMA0165
	Board in System ID	0
	Spare Field	n/a
	Extra info (manual)	-
	Comment (manual)	-
	= Last Change =	2017-09-06 18:41:58
	Quadrupole (secondary num	Manually maintained
	Quadrupole holder	Manually maintained
	SL/ICD/TM assy	Manually maintained
✓	Orbitrap	
	HCD cell	Manually maintained
✓	Hardware	
✓	Electronics	
✓	Feedthrough PCBs	
✓	Boards	
	Base Plane PCBA	Manually maintained
	Instrument Control Board	Auto-detected
	Embedded FTPCU	Auto-detected
	Ion Optics Board	Auto-detected
	Source Board	Auto-detected
	LED Panel	Auto-detected
	Data Acquisition Board	Auto-detected
	Pre-Amplifier	Auto-detected
	PCBA Orbitrap Supply	Auto-detected
	PCBA Orbitrap Pulser	Auto-detected
	Quad Board	Auto-detected
	C-Trap Board	Auto-detected
	= Config Hash =	35808ea5de652a69d719637491cbc98b2014708e

Before pumping down: Enter SN of new parts into software

After any hardware change:

Fill in the new Serial Number information in “Hardware Property Editor”!

(most electronic boards do this automatically and are not shown in the editor)

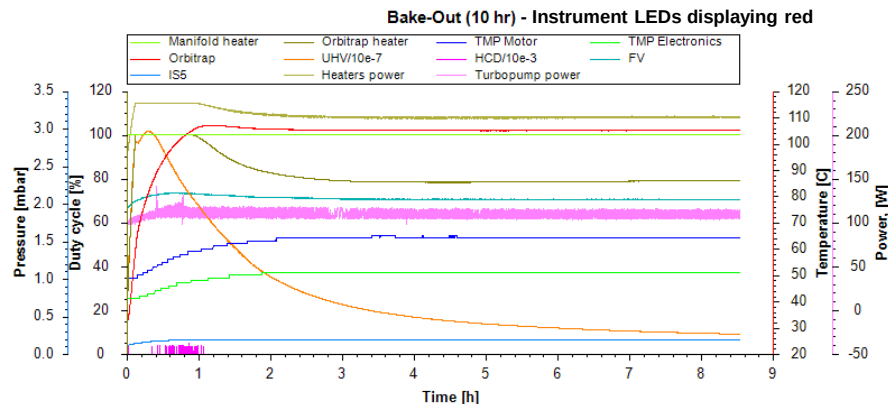


Hardware Property Editor

Reload **Save**

Hardware Item	SerNum	PartNr	EcoFlg	RevLev	
API stack assy	DIS-00-08180018	80500-60040	-	-	
Base Plane PCBA	X13780025	2163930	-	04	
Bent flatapole assy	V-020	BRE0009886	-	-	
Feedthrough PCB: Quadrupole	---	BRE0003409	-	-	
HCD cell	VDL-565228/013	BRE0008100	-	-	
IC: Internal calibration module assy	BTC-70-10170 124	80011-60067	-	-	
IC: Make-up gas pres. ctrller	KD 00586 AIA	00108-01-00045	-	-	
Inj flat assy	V 034	BRE0010223	-	-	
Orbitrap block	V-0019-HHZ	BRE0008593	-	-	
Quadrupole	V 00059	1365150	-	-	
Quadrupole holder	---	BRE0006434	-	-	
SL/ICD/TM assy	V 058	BRE0008179	-	-	
Source manifold	VDL 35691/10	BRE0007898	-	-	
VAC: Fore vacuum pressure gauge	44671713	1366920	-	-	
VAC: Fore vacuum pump	---	1302380	-	-	
VAC: HCD pressure gauge	44671705	1366920	-	-	
VAC: IS5 pressure gauge	44665847	1366920	-	-	
VAC: Turbo pump	16934447	Please enter PN	-	-	
VAC: UHV pressure gauge	44655449	1181380	-	-	
Vacuum chamber	V-0023-SAX	BRE0008641	-	-	

Bake out now temperature regulated and automated



Post-bake Vacuum

Vacuum Gauges	
UHV Pressure (act.)	5.02e-10 mbar
HCD Cell Pressure (act.)	1.10e-02 mbar
Fore-vacuum Pressure (act.)	3.62e+00 mbar
IF Region Pressure (act.)	1.90e-01 mbar
IS5 Region Pressure (filtered)	0.189 mBar

