Electronic Supplementary Material (ESI) for Analyst.

Supporting Information

An atmospheric pressure ion funnel with a slit entrance for enhancing signal and resolution in high resolution differential ion mobility mass spectrometry

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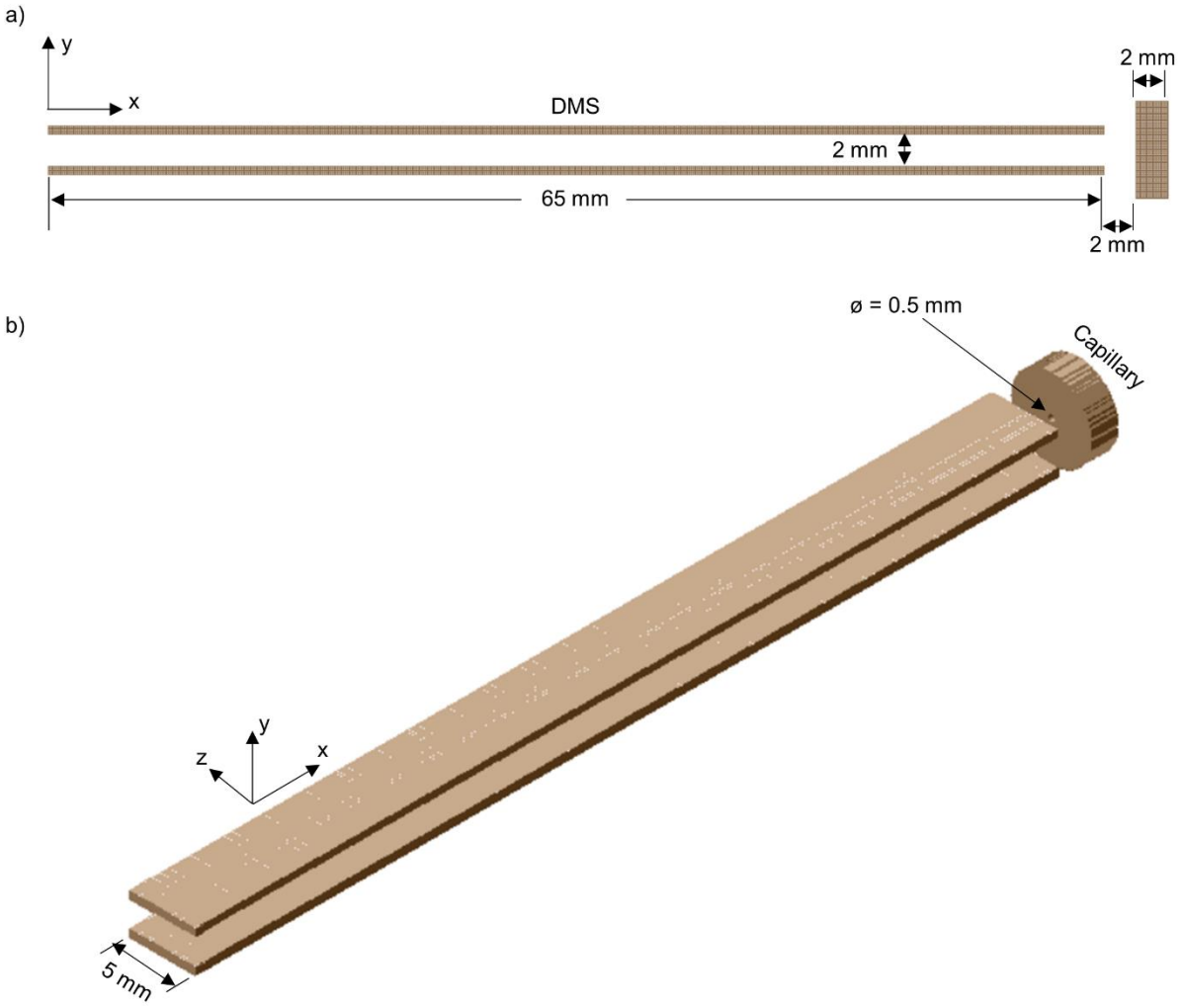

Figure S1: a) Cross-sectional and b) three dimensional views of a DMS-capillary interface.

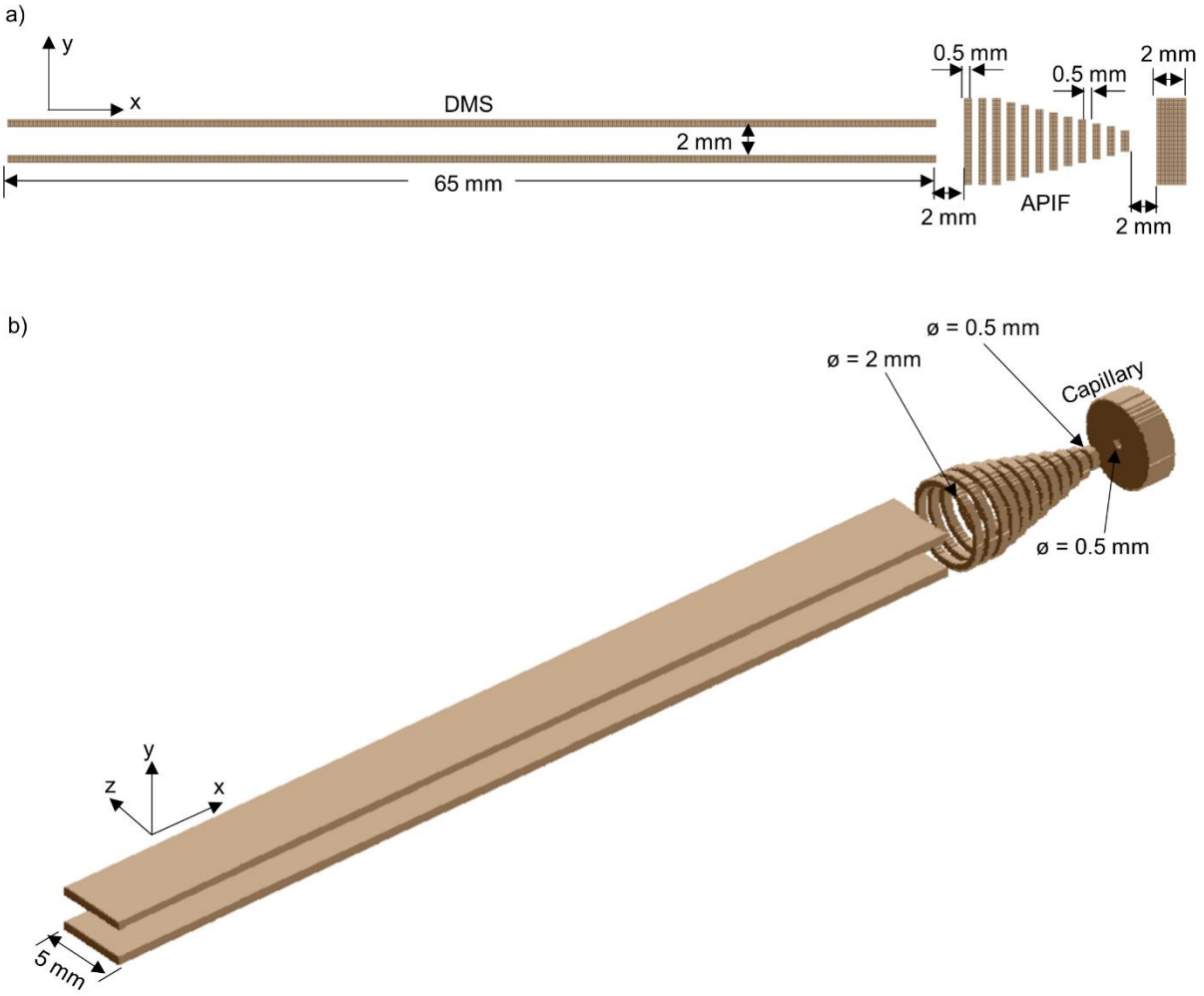

Figure S2: a) Cross-sectional and b) three dimensional views of a DMS-APIF interface.

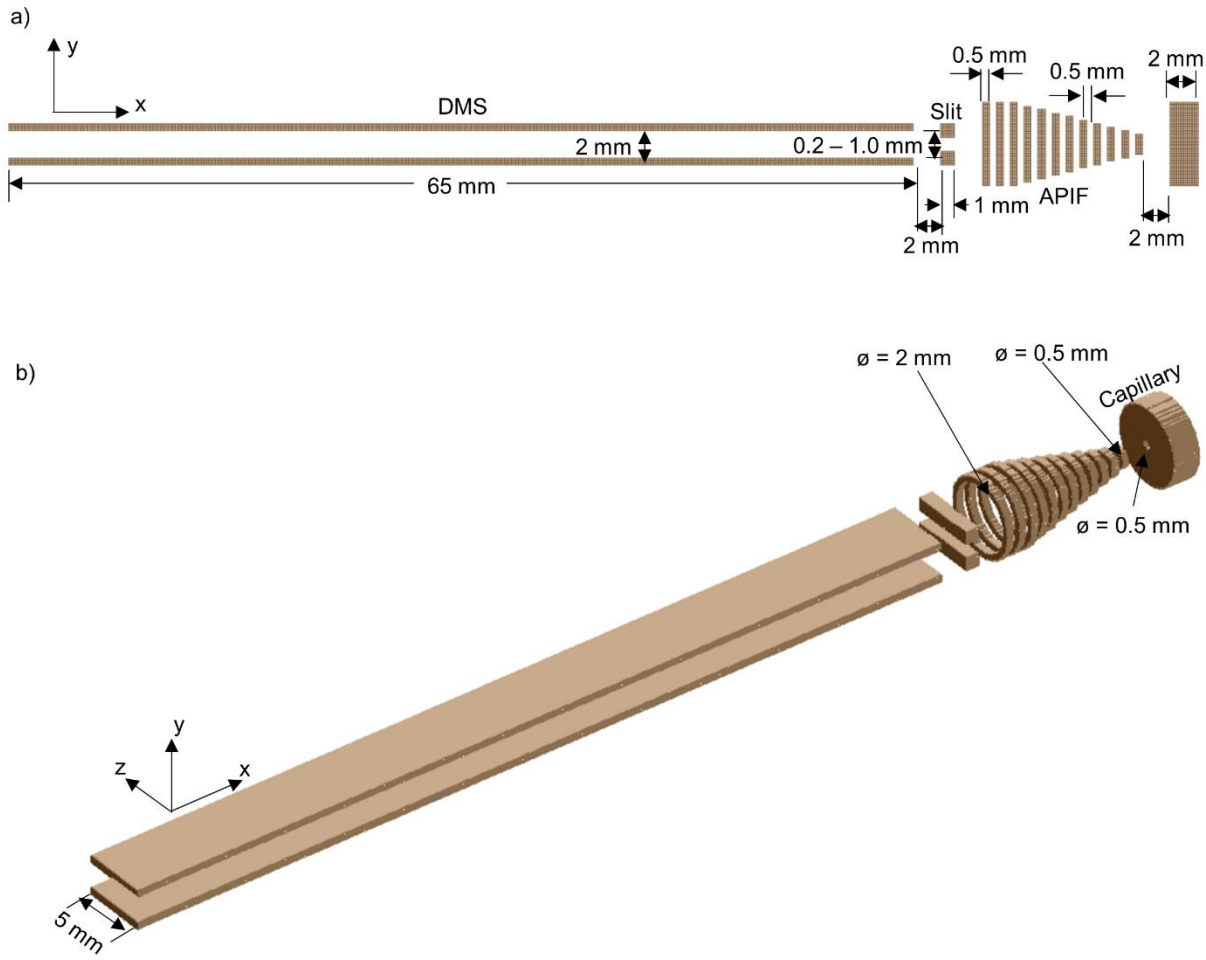

Figure S3: a) Cross-sectional and b) three dimensional views of a DMS-Slit-APIF interface.

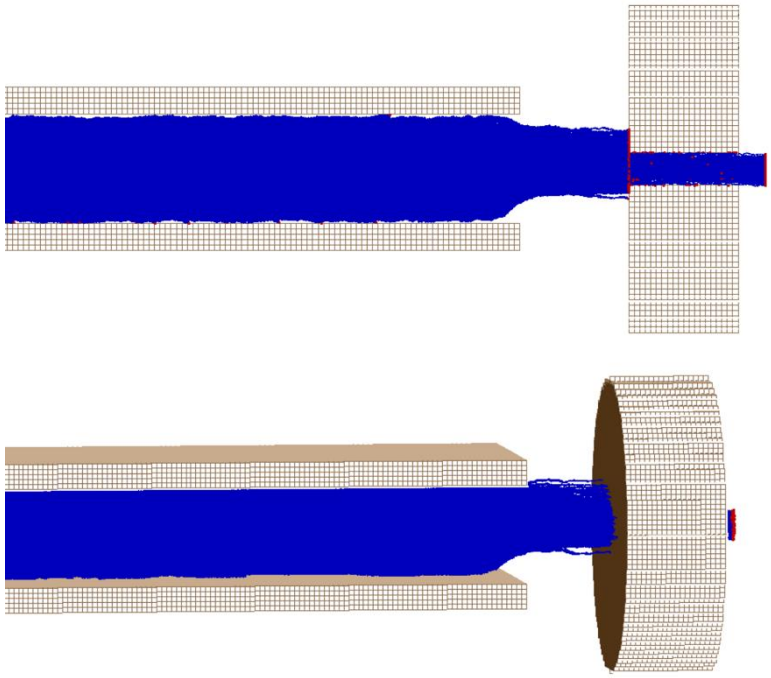

Figure S4: Magnified view of simulated ion trajectories in a DMS-capillary interface for [DMMP+H]+ at a CV of -19.3 V. A carrier gas flow rate, dispersion voltage and APIF RF amplitude of 4.0 L/min, 5.0 kV and 750 V were used.

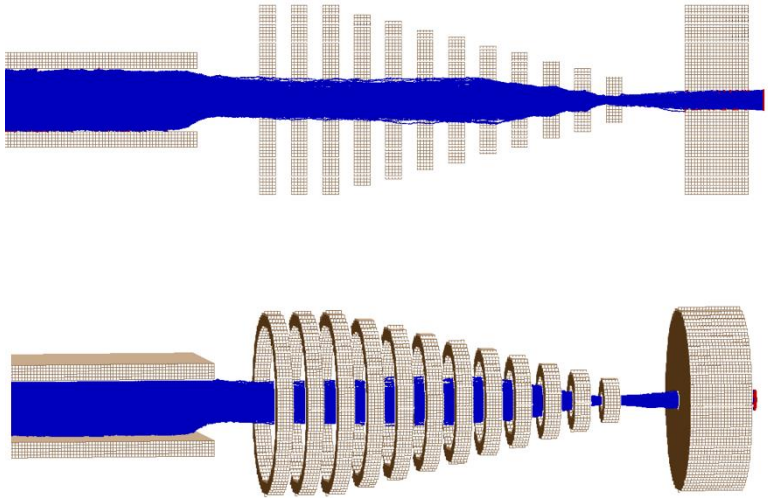

Figure S5: Magnified view of simulated ion trajectories in a DMS-APIF interface for [DMMP+H]+ at a CV of -19.3 V. A carrier gas flow rate, dispersion voltage and APIF RF amplitude of 4.0 L/min, 5.0 kV and 750 V were used.

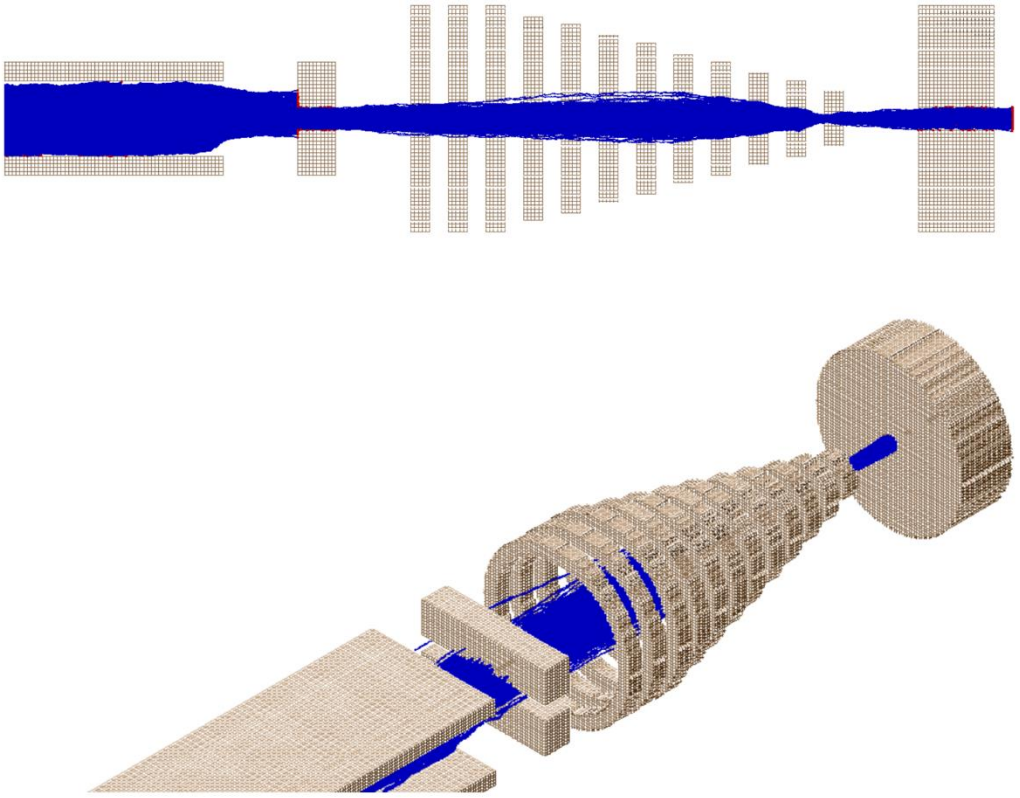

Figure S6: Magnified view of simulated ion trajectories in a DMS-Slit-APIF interface for [DMMP+H]+ at a CV of -19.3 V. A carrier gas flow rate, dispersion voltage and APIF RF amplitude of 4.0 L/min, 5.0 kV and 750 V were used.

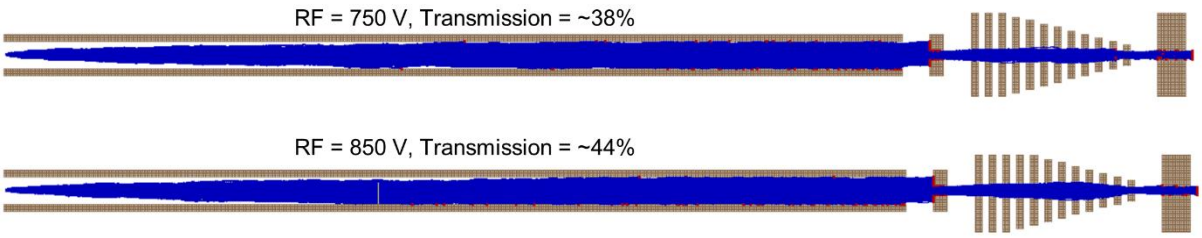

Figure S7: Simulated ion trajectories in a DMS-Slit-APIF interface for [ubiquitin+12H]$^{12+}$ at a CV of 13.5 V using different APIF RF amplitudes of 750 and 850 V. A carrier gas flow rate and dispersion voltage of 4.0 L/min and 5.0 kV were used.

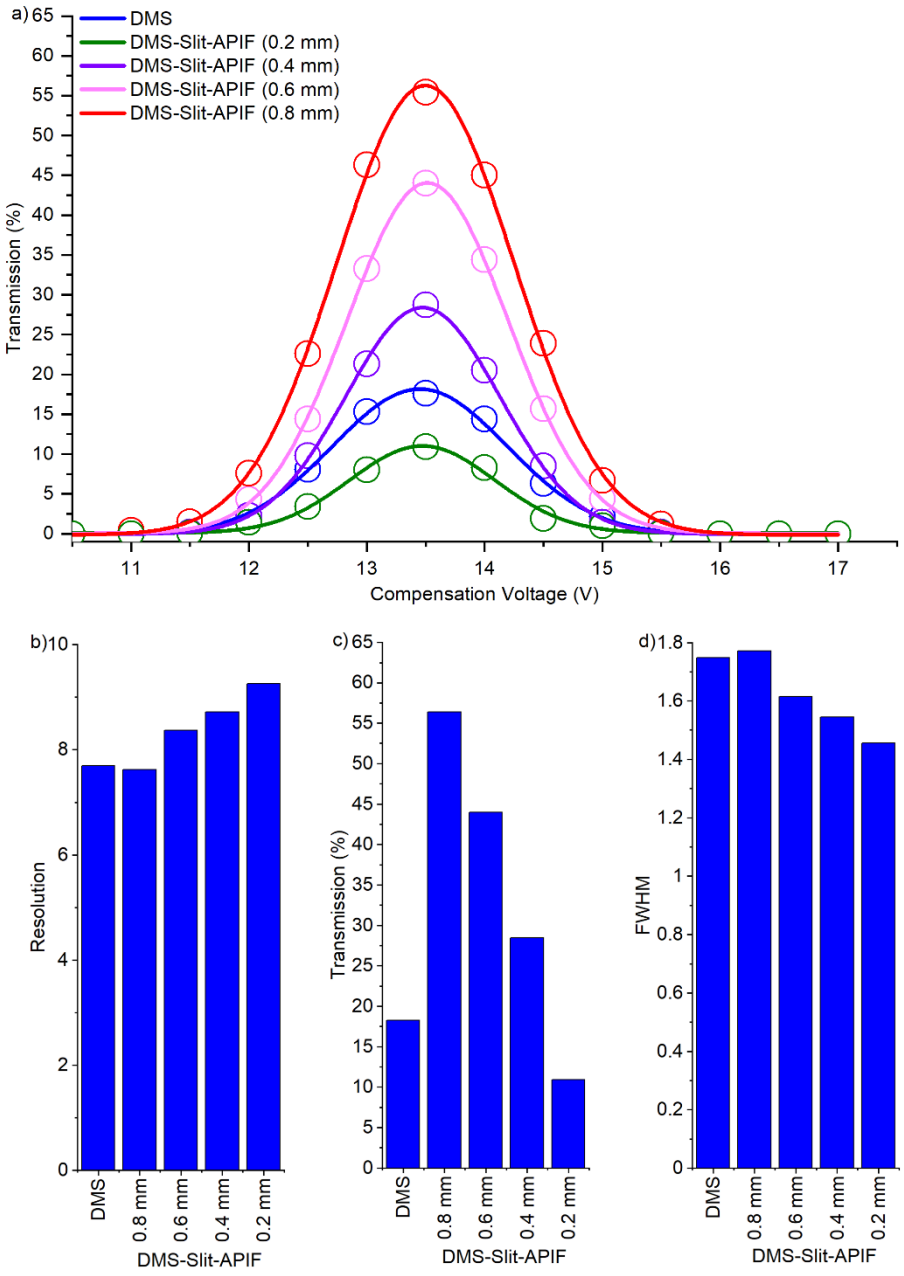

Figure S8: (a) Representative calculated DMS spectra and the resulting values for (b) resolving power, (c) ion transmission efficiency, and (d) FWHM for [ubiquitin+12H]$^{12+}$ in a DMS-Slit-APIF interface with different slit gap widths. A carrier gas flow rate, dispersion voltage and APIF RF amplitude of 4.0 L/min, 5.0 kV and 850 V were used.

Table S1: Electrical parameters used for simulations

Component	Parameter	Value
DMS	Dispersion voltage	4-5 kV
	Wave period	1 µs
	Duty cycle	0.33
	DC biasing voltage	60 V (DMS model) 125 V (DMS-APIF model) 135 V (DMS-Slit-APIF model)
APIF	RF amplitude	150 to 950 V
	RF frequency	0.7 MHz
	DC gradient	5 V/mm
Slit	DC biasing voltage	125 V
Capillary	DC biasing voltage	50 V

Table S2: Environmental parameters used for simulations

Parameter	Value
Pressure	760 Torr
Temperature	298.15 K
Gas velocity	3.33 to 6.66 m/s
Gas mass	28.94515 amu (N_2), 4.00 amu (He)
Collision gas diameter	0.366 nm (N_2), 0.260 nm (He)

Table S3: Ion mobility parameters of simulated ions

Analyte	Mass (u)	Diameter (nm)	Reduced mobility (k_0) ($10^{-4}m^2V^{-1}s^{-1}$)	Mobility constant, α (Td^{-2})	Mobility constant, β (Td^{-4})
$[DMMP+H]^+$	125.1	0.54	2.05	5.09E-6	-1.58E-10
$[Tryptophan+H]^+$	205.236	0.60	2.28	1.27E-6	1.8E-12
$[(2\text{-dodecanone})_2+2H]^+$	368.6	0.68	1.39	-2.16E-6	-0.84E-10
$[Ubiquitin+12H]^{12+}$	8600	0.76	1.31	-2.34E-6	-1.6E-12