Supporting Information:

Correlation Ion Mobility Spectrometry (CIMS)

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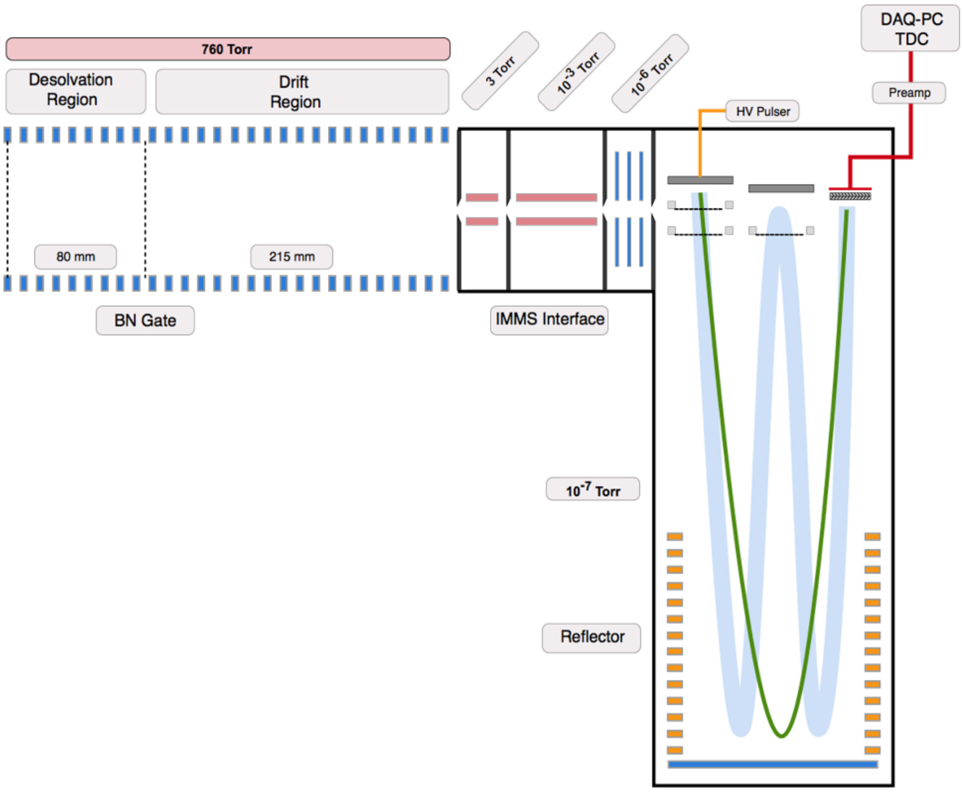
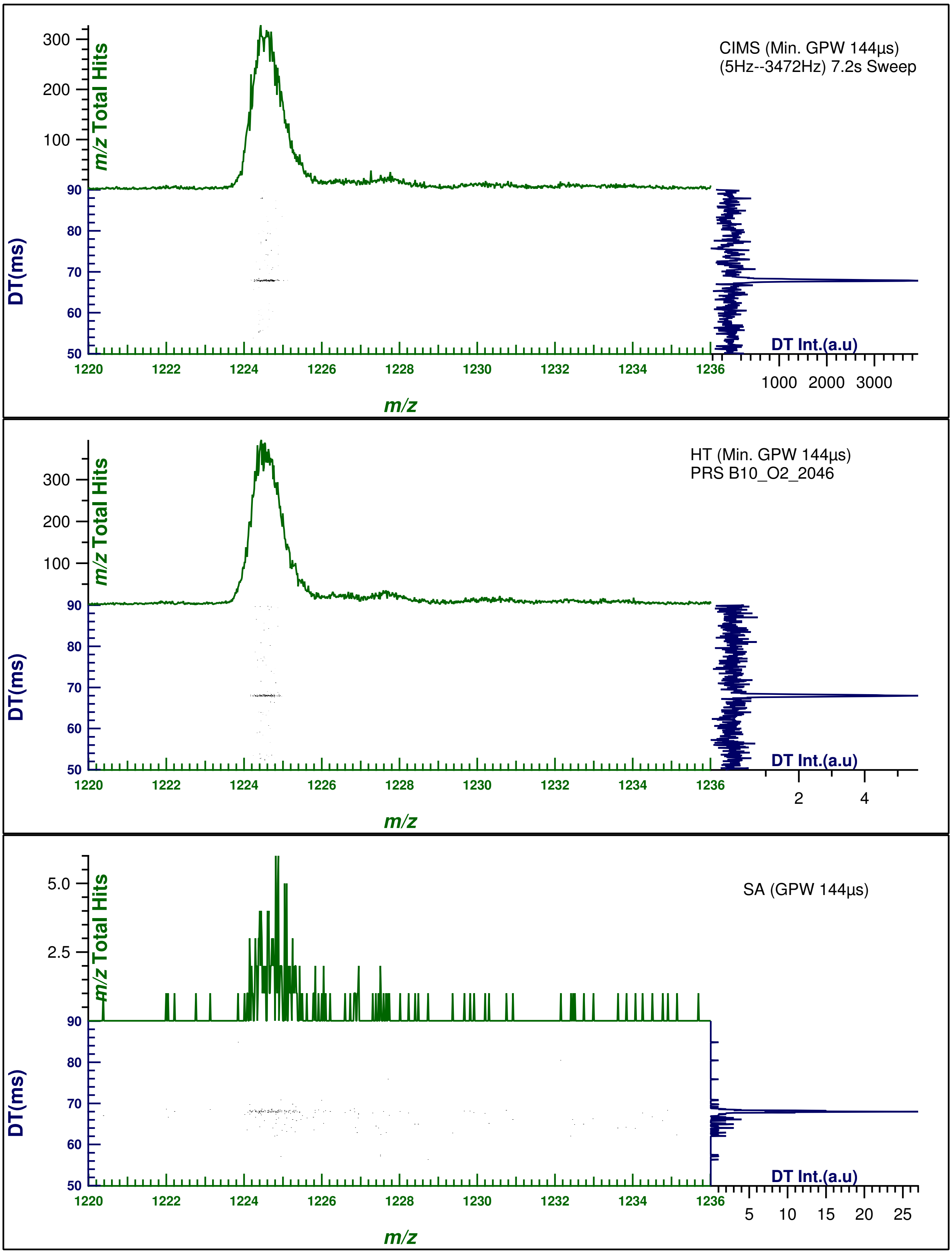


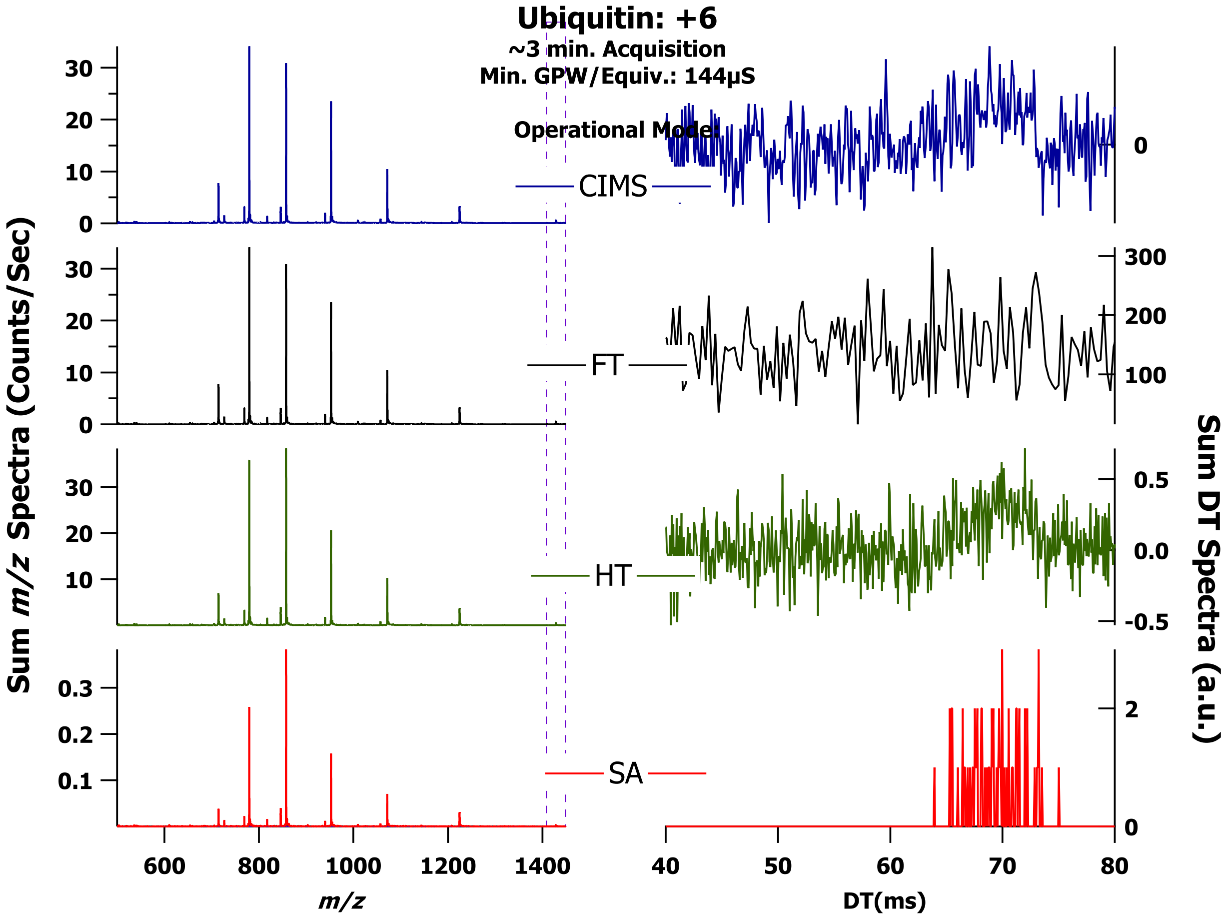
Supplementary Figure 1: Instrument schematic for the custom drift tube coupled to a commercial time-of-flight (TOF) mass spectrometer available through TOFWERKS

Adjust End Freq.					Rp			Rp Error		S/N	
Ion	Start Freq(Hz.)	End Freq(Hz.)	Sweep(s)	Min. GPW(μs)	CIMS	FT	Theory	CIMS	FT	CIMS	FT
T3A	0	500	5	1000	35.2	8.3	34.0	0.6	0.6	88.8	12.6
T3A	0	1000	5	500	66.9	33.2	62.4	1.1	2.0	181.6	17.7
T3A	0	2500	5	200	124.3	60.2	107.9	0.9	1.7	102.8	18.2
T3A	0	5000	5	100	133.6	62.7	127.5	1.2	1.8	44.6	11.7
T3A	0	10000	5	50	127.4	61.5	134.4	1.8	1.5	28.1	6.3
T5A	0	500	5	1000	46.7	*	45.0	0.9	*	62.9	*
T5A	0	1000	5	500	84.9	37.7	78.3	1.2	1.9	354.0	22.1
T5A	0	2500	5	200	130.0	53.5	118.7	0.4	1.9	195.4	17.6
T5A	0	5000	5	100	128.0	59.8	131.6	0.6	1.8	94.4	12.1
T5A	0	10000	5	50	126.1	62.0	135.5	0.9	1.3	74.7	6.8
T12A	0	500	5	1000	76.3	45.6	72.8	1.1	2.3	58.8	13.5
T12A	0	1000	5	500	114.8	58.7	107.1	0.6	2.7	181.2	14.6
T12A	0	2500	5	200	121.7	60.5	130.5	0.6	2.0	59.8	8.9
T12A	0	5000	5	100	121.8	58.5	135.2	0.9	1.7	29.5	7.2
T12A	0	10000	5	50	118.6	62.4	136.5	1.4	1.9	26.0	4.2
Adjust Sweep Time					Rp			Rp Error		S/N	
Ion	Start Freq(Hz.)	End Freq(Hz.)	Sweep(s)	Min. GPW(μs)	CIMS	FT	Theory	CIMS	FT	CIMS	FT
T3A	0	10000	0.05	50	130.5	36.7	134.4	5.6	11.0	20.6	0.3
T3A	0	10000	0.25	50	130.9	76.8	134.4	2.9	6.2	39.1	1.8
T3A	0	10000	0.5	50	124.8	69.1	134.4	2.3	3.6	24.0	2.5
T3A	0	10000	2.5	50	123.5	63.5	134.4	1.7	2.7	44.5	4.8
T5A	0	10000	0.05	50	139.0	*	135.5	9.2	*	10.0	*
T5A	0	10000	0.25	50	128.7	63.3	135.5	2.3	4.5	43.1	2.1
T5A	0	10000	0.5	50	130.3	66.2	135.5	2.2	3.0	33.1	2.8
T5A	0	10000	2.5	50	125.5	61.2	135.5	1.2	2.2	151.3	5.7
T12A	0	10000	0.05	50	147.5	*	136.5	10.2	*	12.6	*
T12A	0	10000	0.25	50	127.4	96.4	136.5	3.8	15.9	38.7	0.6
T12A	0	10000	0.5	50	122.9	72.3	136.5	3.0	6.0	18.2	1.0
T12A	0	10000	2.5	50	116.0	66.5	136.5	1.4	2.8	83.4	2.8
Adjust Start Freq.					Rp			Rp Error		S/N	
Ion	Start Freq(Hz.)	End Freq(Hz.)	Sweep(s)	Min. GPW(μs)	CIMS	FT	Theory	CIMS	FT	CIMS	FT
T3A	5	10000	5	50	134.2	66.6	134.4	1.9	1.9	21.5	6.5
T3A	10	10000	5	50	130.9	62.3	134.4	2.0	1.8	18.6	6.4
T3A	50	10000	5	50	138.7	65.0	134.4	2.8	1.8	17.9	6.3
T3A	100	10000	5	50	143.5	65.9	134.4	3.6	2.2	19.3	7.0
T3A	200	10000	5	50	153.7	67.7	134.4	4.6	2.0	18.5	7.4
T3A	500	10000	5	50	172.4	52.9	134.4	7.9	1.8	14.2	5.9
T3A	1000	10000	5	50	207.1	49.0	134.4	12.7	1.9	12.2	4.0
T5A	5	10000	5	50	130.6	62.9	135.5	1.4	1.4	38.7	6.6
T5A	10	10000	5	50	133.0	64.6	135.5	1.5	1.5	28.4	7.1
T5A	50	10000	5	50	136.2	63.6	135.5	2.1	1.2	26.5	8.7
T5A	100	10000	5	50	142.4	60.8	135.5	2.9	1.4	30.2	10.0
T5A	200	10000	5	50	155.4	56.2	135.5	4.2	1.4	28.7	9.2
T5A	500	10000	5	50	186.7	50.8	135.5	7.9	1.4	20.2	7.3
T5A	1000	10000	5	50	223.7	40.8	135.5	10.9	1.9	15.6	3.4
T12A	5	10000	5	50	122.4	63.2	136.5	1.3	1.8	20.8	3.9
T12A	10	10000	5	50	123.7	60.4	136.5	1.4	1.9	16.0	3.9
T12A	50	10000	5	50	135.9	68.3	136.5	3.1	1.6	11.2	4.7
T12A	100	10000	5	50	145.8	68.5	136.5	4.3	1.8	10.3	4.0
T12A	200	10000	5	50	164.2	52.5	136.5	6.5	1.8	10.2	3.5
T12A	500	10000	5	50	202.3	50.5	136.5	10.4	2.7	6.5	1.8
T12A	1000	10000	5	50	162.1	*	136.5	7.7	*	3.9	*

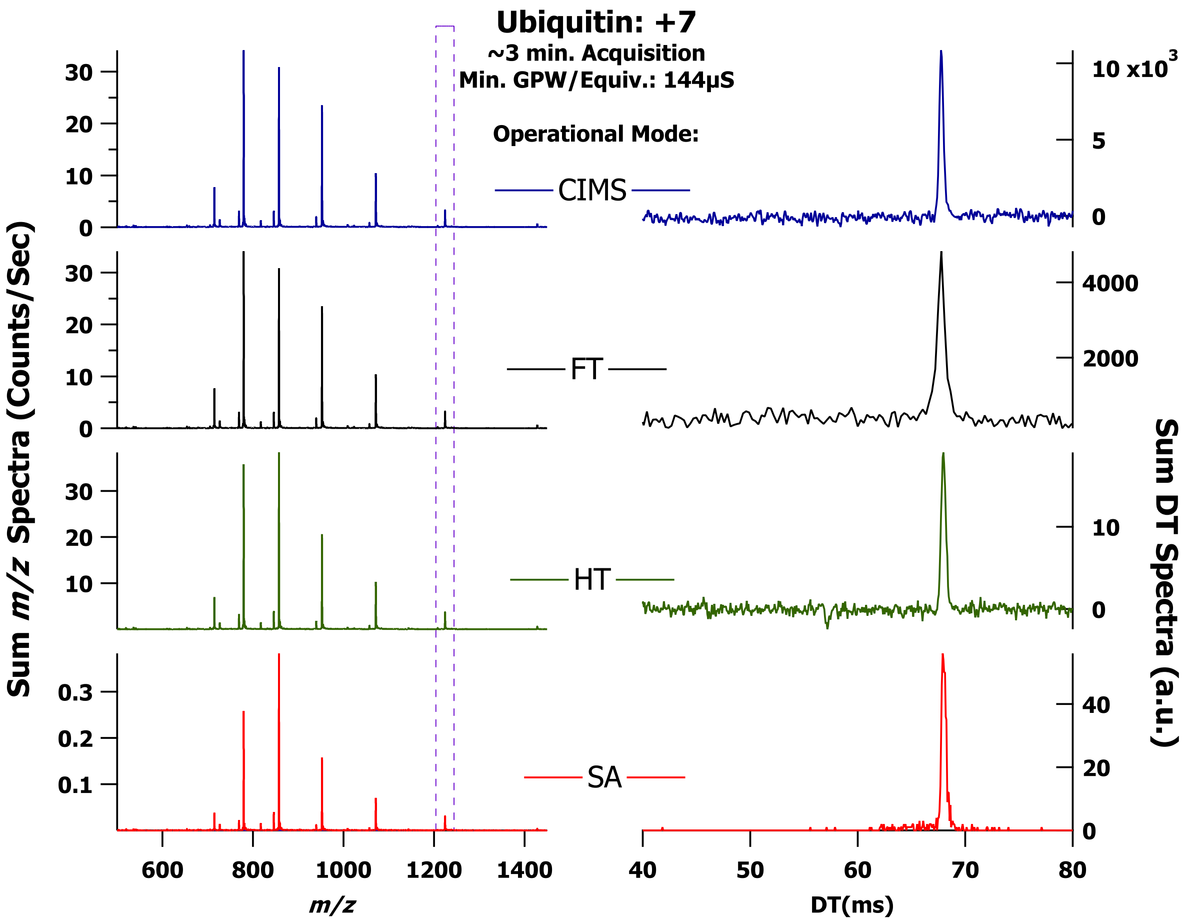
Supplementary Table 1: A table comparing the effect of altering different sweep parameters. These different sweep parameters include altering the sweep time, starting frequency, and ending frequency of the linear chirp.



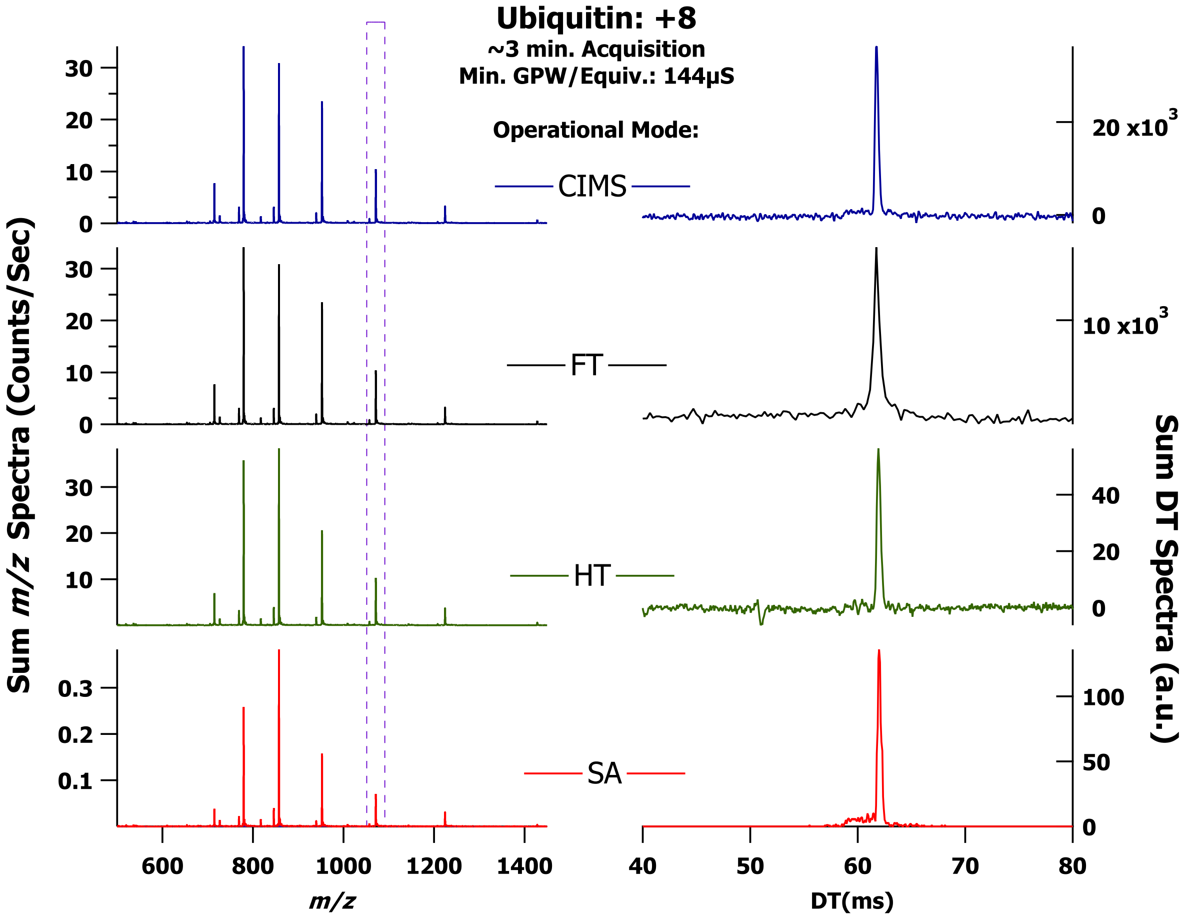
Supplementary Figure 2: A comparison of the different common multiplexing modes of operation for ubiquitin. Each mobility spectrum corresponds to the +7 charge state of Ubiquitin. Acquisition time was 3 minutes for each experiment.



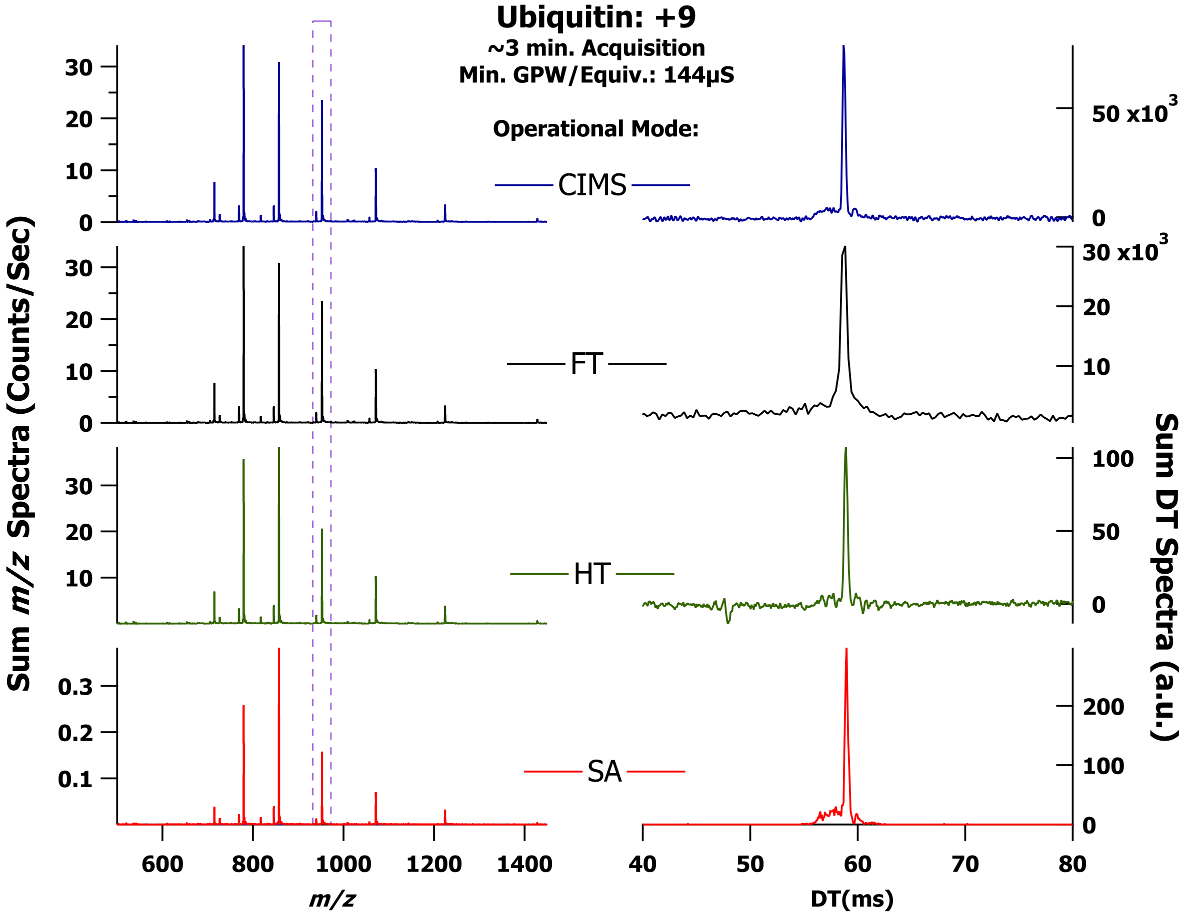
Supplementary Figure 3: A comparison of the different common multiplexing modes of operation for ubiquitin. Each mobility spectrum corresponds to the +6 charge state of Ubiquitin. Acquisition time was 3 minutes for each experiment.



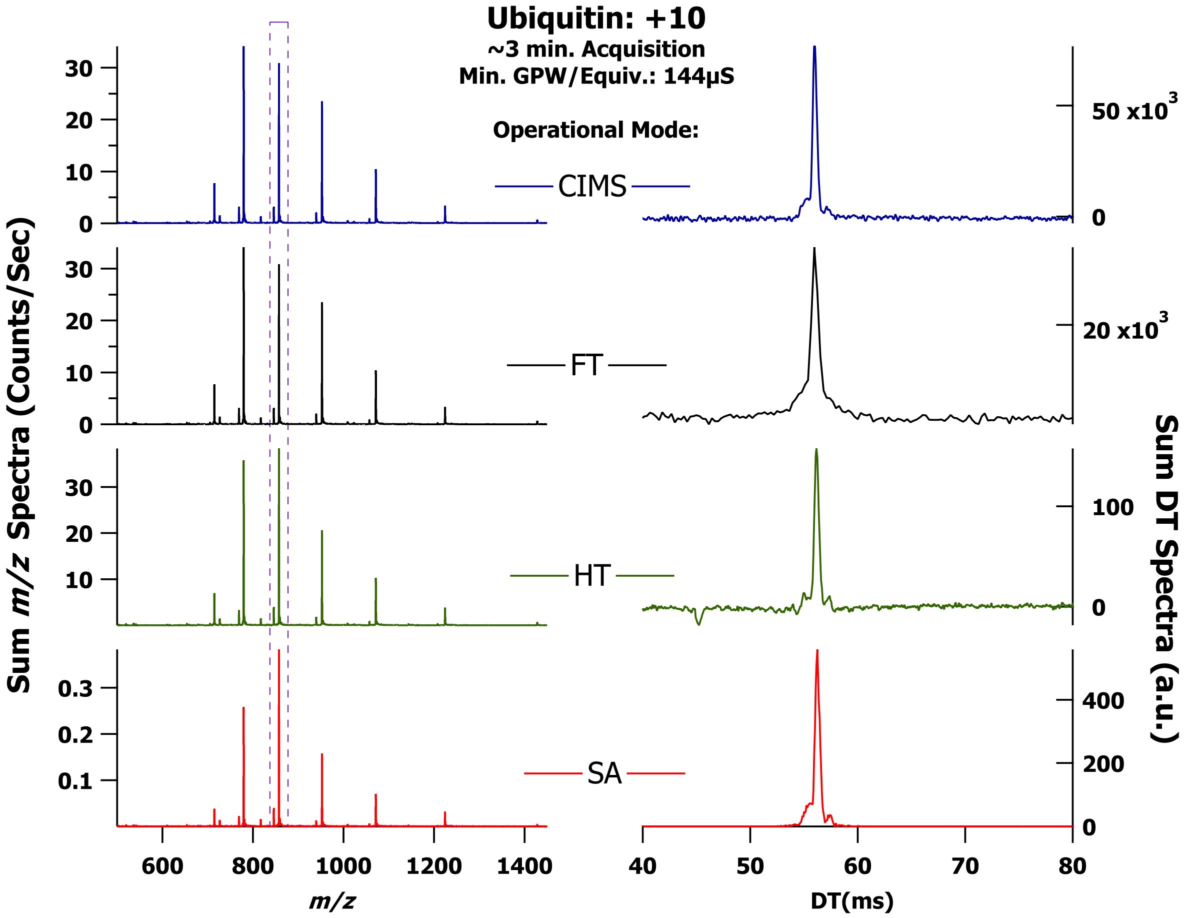
Supplementary Figure 4: A comparison of the different common multiplexing modes of operation for ubiquitin. Each mobility spectrum corresponds to the +7 charge state of Ubiquitin. Acquisition time was 3 minutes for each experiment.



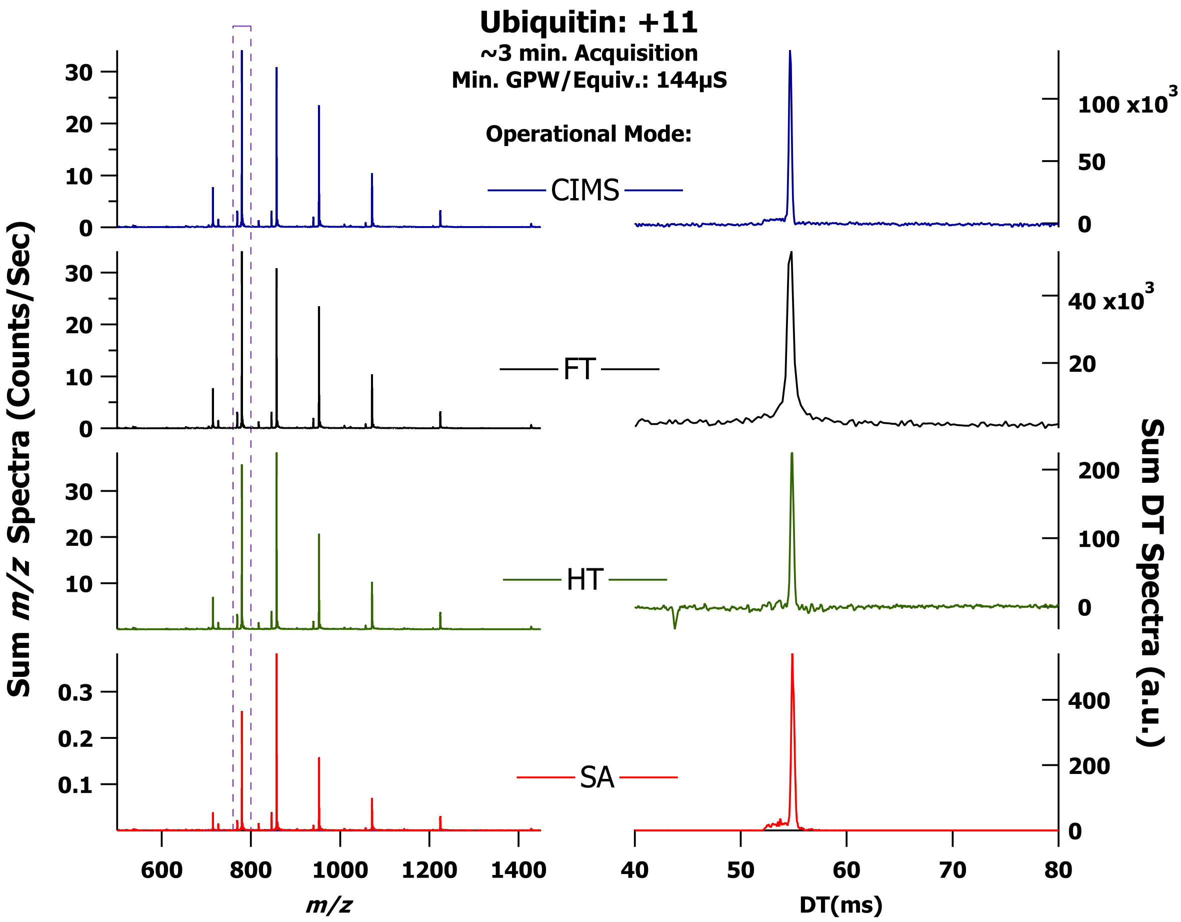
Supplementary Figure 5: A comparison of the different common multiplexing modes of operation for ubiquitin. Each mobility spectrum corresponds to the +8 charge state of Ubiquitin. Acquisition time was 3 minutes for each experiment.



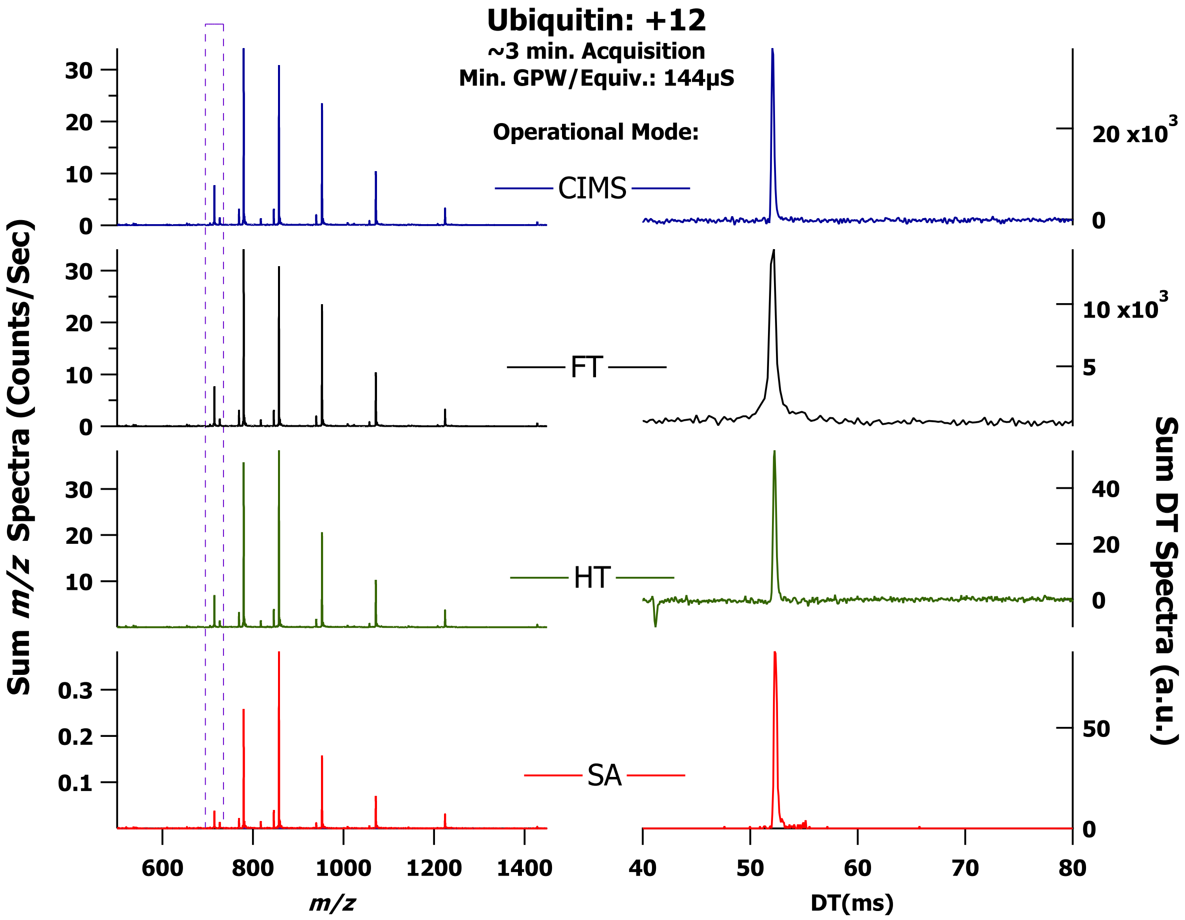
Supplementary Figure 6: A comparison of the different common multiplexing modes of operation for ubiquitin. Each mobility spectrum corresponds to the +9 charge state of Ubiquitin. Acquisition time was 3 minutes for each experiment.



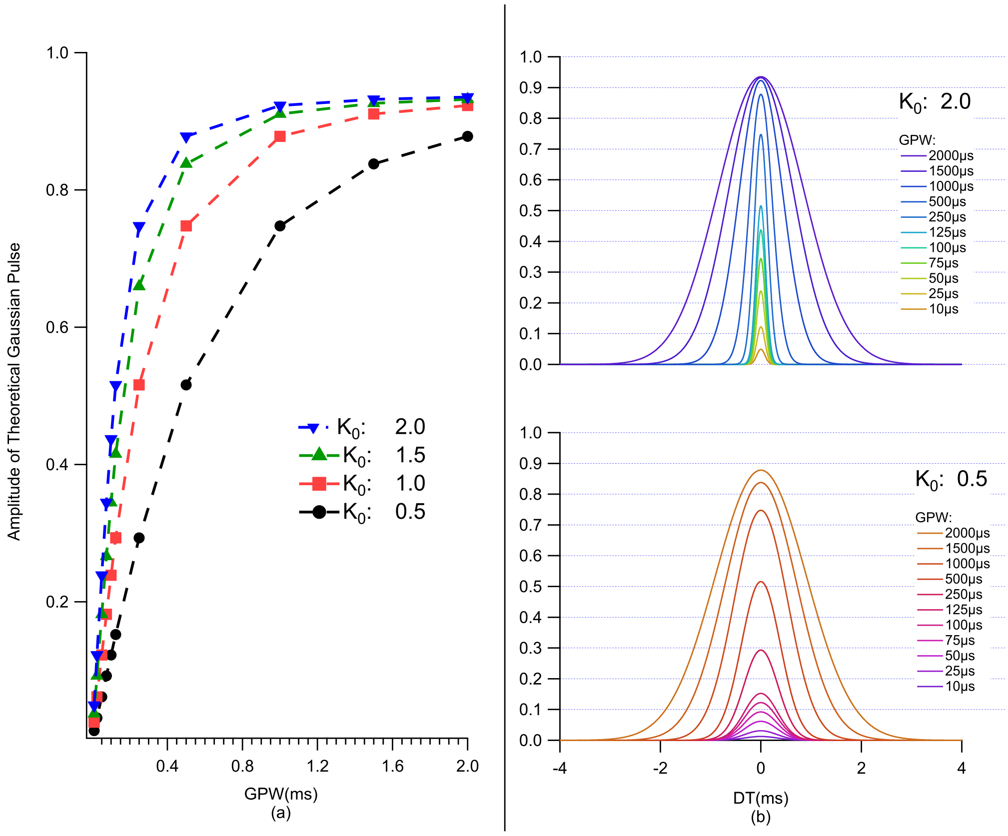
Supplementary Figure 7: A comparison of the different common multiplexing modes of operation for ubiquitin. Each mobility spectrum corresponds to the +10 charge state of Ubiquitin. Acquisition time was 3 minutes for each experiment.



Supplementary Figure 8: A comparison of the different common multiplexing modes of operation for ubiquitin. Each mobility spectrum corresponds to the +11 charge state of Ubiquitin. Acquisition time was 3 minutes for each experiment.



Supplementary Figure 9: A comparison of the different common multiplexing modes of operation for ubiquitin. Each mobility spectrum corresponds to the +12 charge state of Ubiquitin. Acquisition time was 3 minutes for each experiment.



Supplementary Figure 10: The assumptions regarding the following figure include the peak width at half-maximum(FWHM) of an ion observed at the detector is equal to the $\sqrt{t_{gpw}^2 + t_{diff}^2}$. The area of the theoretical Gaussian peak was adjusted to equal the applied gate pulse width. The drift time of the peak was offset so the theoretical Gaussian spectra pulse is centered at 0ms. (a) The peak amplitude measured for a theoretical ion with a specific reduced mobility value. (b) A plot of the the theoretical Gaussian profiles for ions with reduced mobilities of 2.0 and 0.5. Amplitude saturation is observed at lower gate pulse widths for ions of higher mobility than the amplitude saturation observed for low mobility ions. The greater contribution of diffusional broadening to resolving power at lower gate pulse widths is mobility dependent and can serve to bias higher mobility ions after transformation using CIMS.