

Supplementary Information

Implementing visible 473 nm photo-dissociation in a Q-Exactive mass spectrometer: towards specific detection of cysteine-containing peptides

Marion Girod^{a, b,†}, Jordane Biarc^{a, b*}, Quentin Enjalbert^{a, b, c}, Arnaud Salvador^{a, b},*

Rodolphe Antoine^{a, c}, Philippe Dugourd^{a, c}, Jérôme Lemoine^{a, b}

^a Université de Lyon, F-69622, Lyon, France ;

^b CNRS et Université Lyon 1 UMR 5280, ISA

^c CNRS et Université Lyon 1, UMR5306, ILM

* These authors contributed equally to this work

[†]To whom correspondence should be addressed:

Marion Girod: marion.girod@univ-lyon1.fr

XIC= 671.82 m/z (AVMDDFAAFVEK)

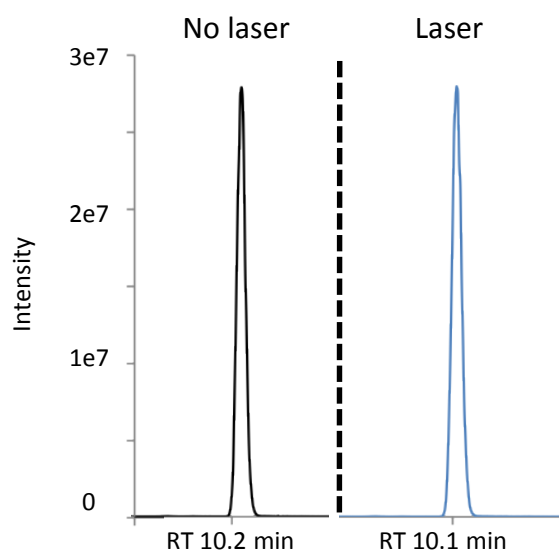
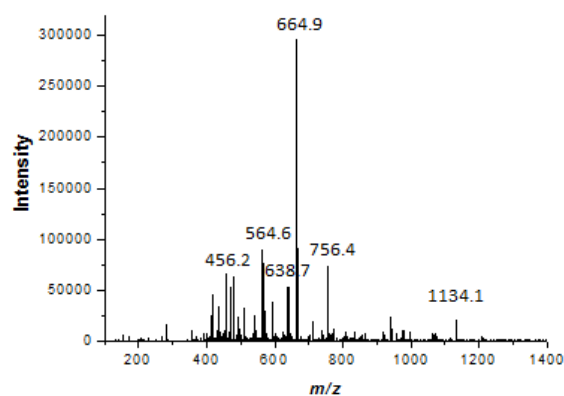
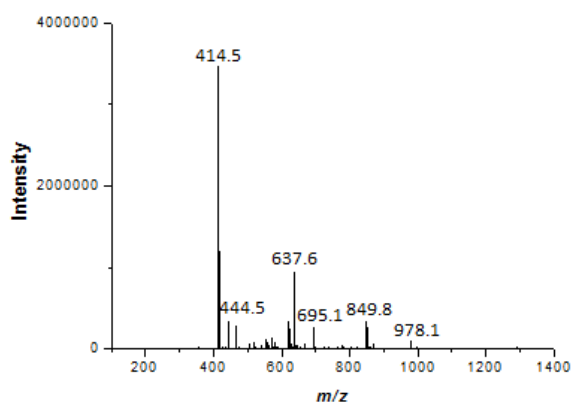


Figure S1: Extracted chromatogram of the doubly protonated AVMDDFAAVEK m/z 671.82, with (blue) or without (black) laser.

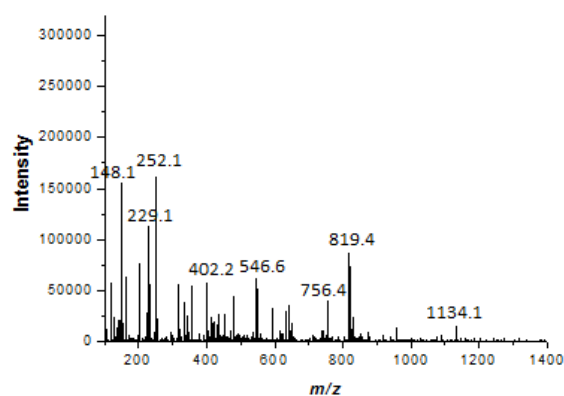
a) RT=22.0 min no laser_AIF



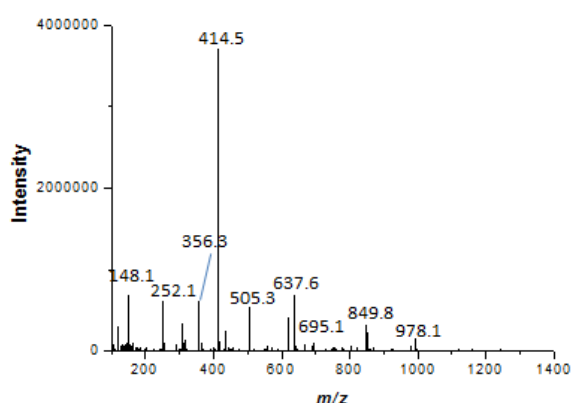
d) RT=18.7 min no laser_AIF



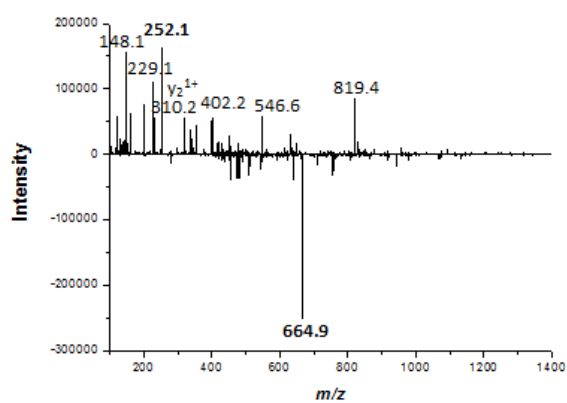
b) RT=22.0 min laser_AIF



e) RT=18.7 min laser_AIF



c) RT=22.0 min (laser-no laser) _AIF
QNC*ELFEQLGEYK



f) RT=18.7 min (laser-no laser) _AIF
ASYLDC*IR

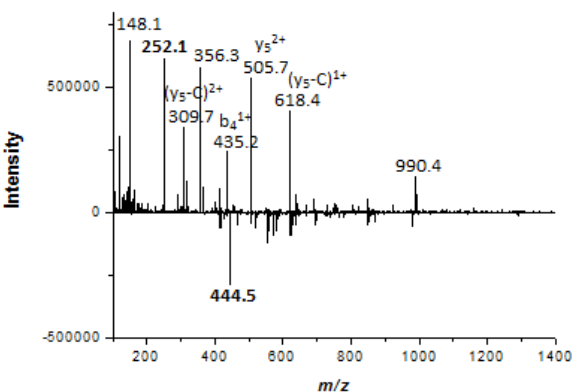
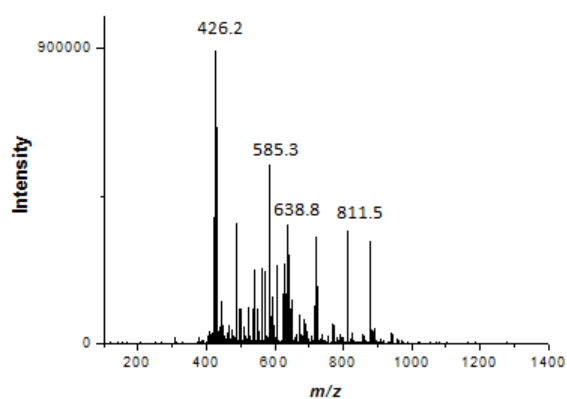
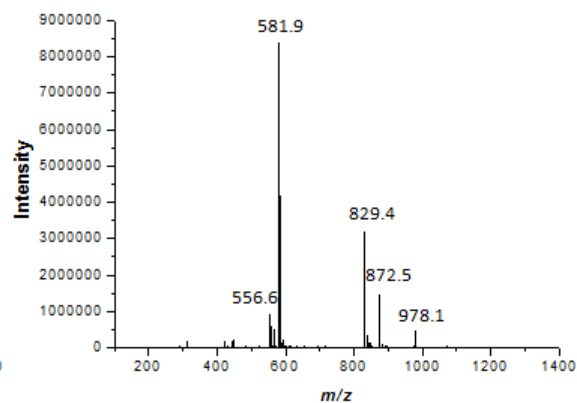


Figure S2. AIF spectra at RT= 22.0 min a) without laser and b) with laser. c) Subtract laser-no laser AIF spectrum at RT= 22.0 min. AIF spectra at RT= 18.7 min d) without laser and d) with laser. f) Subtract laser-no laser AIF spectrum at RT= 18.7 min.

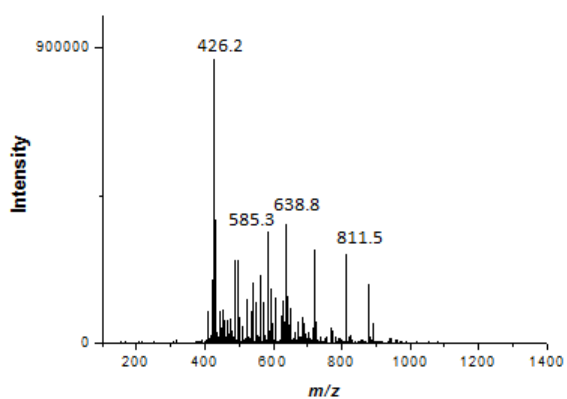
a) RT=1.9 min no laser_AIF



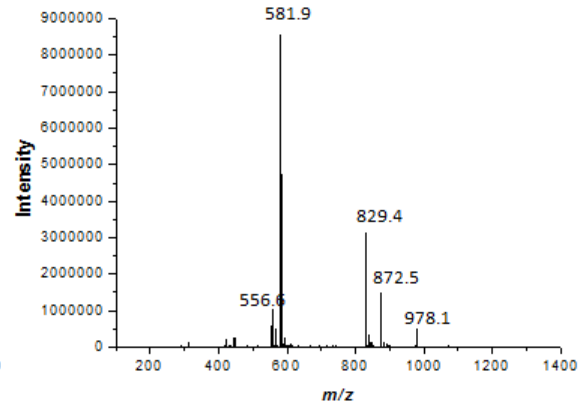
d) RT=17.9 min no laser_AIF



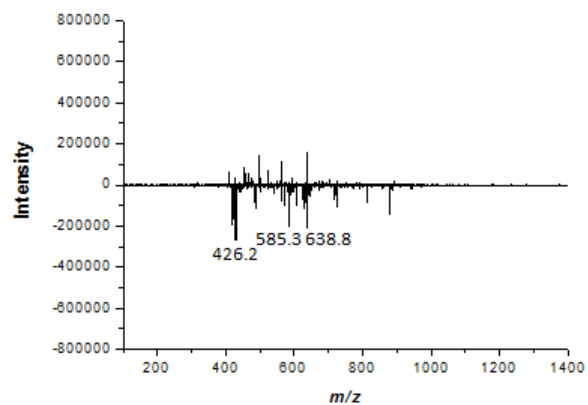
b) RT=1.9 min laser_AIF



e) RT=17.9 min laser_AIF



c) RT=1.9 min (laser-no laser)_AIF



f) RT=17.9 min (laser-no laser)_AIF

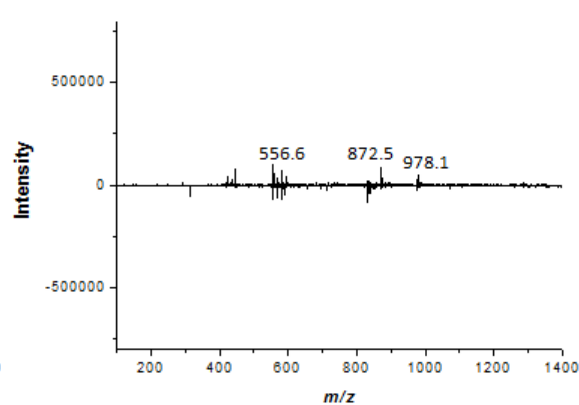


Figure S3. AIF spectra at RT= 1.9 min a) without laser and b) with laser. c) Subtract laser-no laser AIF spectrum at RT= 1.9 min. AIF spectra at RT= 17.9 min d) without laser and d) with laser. f) Subtract laser-no laser AIF spectrum at RT= 17.9 min.

Table S1:

Peptides and proteins identified in the 3 protein mixture by CID.

m/z	charge	DB Peptide	Variable Modification	Cysteine	Score	Expectation value	Protein Name
714.8293	2	FESNFNTQATNR		0	45.1	1.90E-10	Lysozyme C
440.7248	2	AEFAEVSK		0	30	4.60E-06	Serum albumin
613.8086	2	FKDLGEENFK		0	35.6	2.70E-07	Serum albumin
820.4739	2	KVPQVSTPTLVEVSR		0	53.7	8.30E-10	Serum albumin
746.384	2	SKEFQLFSSPHGK		0	42.1	6.30E-11	Serotransferrin
598.2813	2	DSGFQMNQLR		0	36.8	1.20E-07	Serotransferrin
575.3112	2	LVNEVTEFAK		0	42.1	1.70E-08	Serum albumin
564.8529	2	KQTALVELVK		0	39.1	4.20E-06	Serum albumin
539.2792	3	HSTIFENLANKADR		0	33.2	5.30E-07	Serotransferrin
689.355	2	KSASDLTWDNLK		0	48.9	2.00E-08	Serotransferrin
637.3302	2	HSTIFENLANK		0	44.5	4.10E-10	Serotransferrin
756.4262	2	VPQVSTPTLVEVSR		0	51.6	1.60E-10	Serum albumin
642.2871	2	EGYYGYTGAFR		0	42.6	1.60E-09	Serotransferrin
607.3021	3	KIVSDGNGMNAWVAWR	Oxidation@9	0	16.5	7.30E-04	Lysozyme C
464.2517	2	YLYEIAIR		0	30.4	8.60E-06	Serum albumin
480.7852	2	FQNALLVR		0	37.2	2.30E-07	Serum albumin
485.7733	4	DLLFKDSAHGFLKVPPIR		0	46.5	3.90E-10	Serotransferrin
877.4201	2	NTDGSTDYGIQINSR		0	58.5	1.20E-11	Lysozyme C
500.8053	2	QTALVELVK		0	35	1.40E-06	Serum albumin
426.2148	3	EFQLFSSPHGK		0	25.8	1.00E-07	Serotransferrin
625.3058	2	SASDLTWDNLK		0	39.7	1.60E-07	Serotransferrin
571.3503	2	KLVAASQAALGL		0	27.8	5.70E-07	Serum albumin
586.6431	3	EDPQTFYYAVAVVKK		0	39.1	8.90E-09	Serotransferrin
745.9037	2	DLLFKDSAHGFLK		0	29.9	1.90E-08	Serotransferrin
450.556	3	KSC*HTAVGR		1	19.1	3.80E-05	Serotransferrin
507.3028	2	LVAASQAALGL		0	21.3	6.00E-08	Serum albumin
846.4032	2	IVSDGNGMNAWVAWR	Oxidation@8	0	30.2	5.50E-08	Lysozyme C
747.8698	2	MYLGYEYVTAIR	Oxidation@1	0	34.8	1.90E-10	Serotransferrin
527.7901	4	SKEFQLFSSPHGKDLLFK		0	35.2	3.60E-09	Serotransferrin
679.8183	2	AVMDDFAAFVEK	Oxidation@3	0	32.9	1.00E-09	Serum albumin
489.9532	3	RHPDYSVLLLR		0	41.9	3.60E-07	Serum albumin
902.455	2	KIVSDGNGMNAWVAWR		0	39.6	3.30E-10	Lysozyme C
721.6145	4	KPVDEYKDC*HLAQVPSHTVVAR		1	15.4	1.50E-06	Serotransferrin
815.4118	2	EDPQTFYYAVAVVK		0	25.4	6.10E-08	Serotransferrin
407.8574	3	SC*HTAVGR		1	21.8	1.40E-05	Serotransferrin
492.2912	2	QTALVELVK	Gln->pyro-Glu@1	0	24.2	4.90E-05	Serum albumin
739.8711	2	MYLGYEYVTAIR		0	32.8	1.90E-11	Serotransferrin
656.3728	2	HPDYSVLLLR		0	27.9	6.10E-09	Serum albumin
491.2237	4	ADDKETC*FAEEGKK		1	19.8	3.40E-05	Serum albumin

838.4041	2	IVSDGNGMNAWVAWR		0	55.5	4.40E-11	Lysozyme C
480.9838	4	KPVEEYANC*HLAR		1	45.2	9.50E-09	Serotransferrin
407.8578	3	SC*HTGLGR		1	19.1	1.10E-04	Serotransferrin
743.3489	4	QEPERNEC*FLQHKDDNPNLPR		1	21.3	1.10E-07	Serum albumin
531.9418	3	TAGWNIPMGLLYNK	Oxidation@8	0	22	2.80E-07	Serotransferrin
474.0034	4	EFQLFSSPHGKDLLFK		0	20.3	1.00E-06	Serotransferrin
725.6759	3	IMNGEADAMSLDGGFVYIAGK	Oxidation@2=16	0	16.7	8.10E-06	Serotransferrin
671.8219	2	AVMDDFAAFVEK		0	36.5	1.90E-10	Serum albumin
1080.011	2	IMNGEADAMSLDGGFVYIAGK		0	34.7	9.10E-10	Serotransferrin
405.6038	5	DC*HLAQVPSHTVVAR		1	29.4	1.40E-08	Serotransferrin
1023.0511	2	VFDEFKPLVEEPQNLIK		0	36.9	4.10E-11	Serum albumin
739.0918	4	QEPERNEC*FLQHKDDNPNLPR	Gln->pyro-Glu@1	1	27.9	6.00E-09	Serum albumin
583.5249	4	NEC*FLQHKDDNPNLPR		1	32.9	7.60E-08	Serum albumin
685.7003	3	RHPYFYAPELLFFAKR		0	33.6	3.70E-10	Serum albumin
415.1902	3	C*ELAAAMK	Oxidation@7	1	19.4	2.20E-06	Lysozyme C
413.6879	4	WC*AVSEHEATK		1	19.4	5.60E-05	Serotransferrin
461.8935	3	C*ELAAAMKR		1	30.2	3.50E-08	Lysozyme C
526.6091	3	TAGWNIPMGLLYNK		0	26.1	1.50E-08	Serotransferrin
550.9688	3	AEFAEVSKLVTDLTK		0	22.4	2.50E-07	Serum albumin
429.21	4	C*LKDGA GDVAFVK		1	15	7.90E-05	Serotransferrin
626.507	5	LVRPEVDVMC*TAFHDNEETFLKK	Oxidation@9	1	20.1	4.80E-07	Serum albumin
475.5045	4	HPYFYAPELLFFAKR		0	30.5	2.30E-09	Serum albumin
633.6696	3	RHPYFYAPELLFFAK		0	45	1.60E-08	Serum albumin
583.9583	3	SVIPSDGPSVAC*VK		1	29.2	8.40E-08	Serotransferrin
425.4728	4	C*LVEKG DVAFVK		1	27.4	1.30E-06	Serotransferrin
556.6097	3	C*KGTDVQAWIR		1	26.6	2.50E-07	Lysozyme C
409.86	3	C*ELAAAMK		1	20.5	9.00E-07	Lysozyme C
930.4569	3	SMGGKEDLIWELLNQAQEHFGKDK	Oxidation@2	0	18.9	5.50E-07	Serotransferrin
820.3951	2	DVFLGMFLYEYAR	Oxidation@6	0	32	2.40E-09	Serum albumin
510.7297	4	FDEFFSEGC*APGSKK		1	16.2	3.90E-05	Serotransferrin
925.1262	3	SMGGKEDLIWELLNQAQEHFGKDK		0	39.4	1.90E-10	Serotransferrin
423.2249	3	LC*TVATLR		1	16.4	6.10E-05	Serum albumin
581.6371	3	HPYFYAPELLFFAK		0	33.2	1.10E-08	Serum albumin
749.0302	3	RPC*FSALEVDETYVPK		1	20.1	7.80E-05	Serum albumin
572.525	4	NLNEKDYELLC*LDGTR		1	38	1.40E-07	Serotransferrin
554.7616	4	ADRDQYELLC*LDNTR		1	24.9	1.00E-06	Serotransferrin
849.4166	3	SMGGKEDLIWELLNQAQEHFGK	Oxidation@2	0	30.5	1.70E-08	Serotransferrin
694.9386	5	HSTIFENLANKADRDQYELLC*LDNTR		1	36.4	6.20E-09	Serotransferrin
444.5439	3	ASYLDC*IR		1	16.9	4.60E-05	Serotransferrin
778.8802	4	LVRPEVDVMC*TAFHDNEETFLKK		1	35.1	1.30E-09	Serum albumin
1265.6202	2	SMGGKEDLIWELLNQAQEHFGK		0	45.2	2.10E-11	Serotransferrin
576.6669	5	EFNAETFTFHADIC*TLSEKER		1	19.1	1.90E-05	Serum albumin
454.0424	5	SLHTLFGDKLC*TVATLR		1	31.6	9.40E-08	Serum albumin
579.0418	4	EDLIWELLNQAQEHFGKDK		0	27.9	1.10E-07	Serotransferrin

812.3974	2	DVFLGMFLYEYAR		0	37.8	8.00E-10	Serum albumin
989.2602	4	AIAANEADAVTL DAGLVYDAYLAPNNLKPVVAEFYGSK		0	33	2.40E-09	Serotransferrin
768.1078	4	GYSLGNWVC*AAKFESNFNTQATNR		1	33.8	1.60E-10	Lysozyme C
597.6873	5	LVRPEVDVMC*TAFHDNEETFLK		1	35.9	7.30E-11	Serum albumin
553.93	3	GYSLGNWVC*AAK		1	34	1.60E-08	Lysozyme C
664.6386	3	QNC*ELFEQLGEYK		1	23.4	4.00E-07	Serum albumin
690.6833	3	EDLIWELLNQAQEHFGK		0	40	3.00E-10	Serotransferrin
827.8787	4	SHC*IAEVENDEMPADLPSLAADFVESK		1	24.6	1.00E-09	Serum albumin
978.4862	3	QNC*ELFEQLGEYKFQNALLVR		1	33.5	1.70E-10	Serum albumin
804.9998	5	LVRPEVDVMC*TAFHDNEETFLKKYLYEIAR		1	24.7	5.40E-09	Serum albumin
658.9614	3	QNC*ELFEQLGEYK	Gln->pyro-Glu@1	1	20.4	4.30E-07	Serum albumin
972.812	3	QNC*ELFEQLGEYKFQNALLVR	Gln->pyro-Glu@1	1	37.5	1.60E-11	Serum albumin
835.7521	3	SAGWNIPIGLLYC*DLPEPR		1	31.5	1.60E-09	Serotransferrin

C* indicates that the cysteine residue is modified with the dabcyI chromophore

Document providing hyperlinks to all spectra and search results of top10 analyses. All spectra and searches of peptides listed in supplemental table S1 can be viewed using the viewer file available at http://prospector2.ucsf.edu/prospector/cgi-bin/mssearch.cgi?report_title=MS-Viewer&search_key=jks8ddhlnc&search_name=msviewer

Table S2:

Peptides quantified by Skyline for the experiments with no laser (column 4 and 6) and with laser (column 5 and 7). Column 8: dissociation ratio (area in AIF_laser experiment/area in AIF_no laser experiment).

Peptide+modification	Cysteine	charge	area AIF_no laser	area AIF_laser	(total charge) area no laser	(total charge) area laser	ratio (total area laser/no laser)
C[+391.2]ELAAAM[+16]K	1	2	330494	32146	91335004	8017959	0.088
C[+391.2]ELAAAM[+16]K	1	3	3919469	501305			
C[+391.2]ELAAAM[+16]K	1	4	0	0			
C[+391.2]ELAAAMK	1	2	10520145	64596	87085041	7484508	0.086
C[+391.2]ELAAAMK	1	3	76564896	7419912			
C[+391.2]ELAAAMK	1	4	nd	0			
C[+391.2]ELAAAMKR	1	2	3054686	233804	36567248	1685204	0.046
C[+391.2]ELAAAMKR	1	3	33484736	1450048			
C[+391.2]ELAAAMKR	1	4	27826	1352			
C[+391.2]KGTDVQAWIR	1	2	267988	167402	12561882	1375136	0.109
C[+391.2]KGTDVQAWIR	1	3	4826047	113743			
C[+391.2]KGTDVQAWIR	1	4	7467847	1093991			
C[+391.2]LKDGAGDVAFAVK	1	2	28305	16830	1627938	84682	0.052
C[+391.2]LKDGAGDVAFAVK	1	3	226128	13257			
C[+391.2]LKDGAGDVAFAVK	1	4	1373505	54595			
C[+391.2]LVEKGDVAFAVK	1	2	63835	134789	5148028	770369	0.150
C[+391.2]LVEKGDVAFAVK	1	3	997667	59957			
C[+391.2]LVEKGDVAFAVK	1	4	4086526	575623			
DC[+391.2]HLAQVPSHTVVAR	1	2	88568	115564	8044739	420902	0.052
DC[+391.2]HLAQVPSHTVVAR	1	3	1108818	20251			
DC[+391.2]HLAQVPSHTVVAR	1	4	6847353	285087			
LC[+391.2]TVATLR	1	2	403096	19322	3814481	266270	0.070
LC[+391.2]TVATLR	1	3	3411385	246948			
LC[+391.2]TVATLR	1	4	0	0			
SC[+391.2]HTAVGR	1	2	896447	210569	6063143	253346	0.042
SC[+391.2]HTAVGR	1	3	5166696	42655			
SC[+391.2]HTAVGR	1	4	0	122			
SC[+391.2]HTGLGR	1	2	1274022	12287	12373136	176358	0.014
SC[+391.2]HTGLGR	1	3	11098775	164071			
SC[+391.2]HTGLGR	1	4	339	0			
WC[+391.2]AVSEHEATK	1	2	nd	114298	14244719	1626803	0.114
WC[+391.2]AVSEHEATK	1	3	2968491	nd			
WC[+391.2]AVSEHEATK	1	4	11276228	1512505			
KSC[+391.2]HTAVGR	1	2	5325321	2822012	6313711	3139942	0.497

KSC[+391.2]HTAVGR	1	3	988390	317930			
KSC[+391.2]HTAVGR	1	4	0	0			
NEC[+391.2]FLQHKDDNPNLPR	1	2	1543	6063	2192244	107994	0.049
NEC[+391.2]FLQHKDDNPNLPR	1	3	259230	51730			
NEC[+391.2]FLQHKDDNPNLPR	1	4	1931471	50201			
Q[-17.1]NC[+391.2]ELFEQLGEYK	1	2	59715	1904	3091000	21937	0.007
Q[-17.1]NC[+391.2]ELFEQLGEYK	1	3	110324	749			
Q[-17.1]NC[+391.2]ELFEQLGEYK	1	4	nd	0			
Q[-17.1]NC[+391.2]ELFEQLGEYKFQNALLVR	1	2	nd	2915	9301307	1257734	0.135
Q[-17.1]NC[+391.2]ELFEQLGEYKFQNALLVR	1	3	638968	61960			
Q[-17.1]NC[+391.2]ELFEQLGEYKFQNALLVR	1	4	445785	65749			
QNC[+391.2]ELFEQLGEYK	1	2	73024	5707	3091000	21937	0.007
QNC[+391.2]ELFEQLGEYK	1	3	2785945	1538			
QNC[+391.2]ELFEQLGEYK	1	4	61992	12039			
QNC[+391.2]ELFEQLGEYKFQNALLVR	1	2	6702	13474	9301307	1257734	0.135
QNC[+391.2]ELFEQLGEYKFQNALLVR	1	3	816661	804785			
QNC[+391.2]ELFEQLGEYKFQNALLVR	1	4	7393191	308851			
RPC[+391.2]FSALEVDETYVPK	1	2	225786	333890	23387948	2086218	0.089
RPC[+391.2]FSALEVDETYVPK	1	3	5429480	66158			
RPC[+391.2]FSALEVDETYVPK	1	4	17732682	1686170			
SHC[+391.2]IAEVENDEMPADLPSLAADFVESK	1	3	474181	252139	4781610	474388	0.099
SHC[+391.2]IAEVENDEMPADLPSLAADFVESK	1	4	4307429	222249			
ASYLDC[+391.2]JR	1	2	290625	10831	4262635	240948	0.057
ASYLDC[+391.2]JR	1	3	3972010	230117			
ASYLDC[+391.2]JR	1	4	nd	0			
ADDKETC[+391.2]FAEEGKK	1	2	44982	41738	2922949	143779	0.049
ADDKETC[+391.2]FAEEGKK	1	3	421712	10114			
ADDKETC[+391.2]FAEEGKK	1	4	2456255	91927			
Q[-17.1]EPERNEC[+391.2]FLQHKDDNPNLPR	1	2	332	0	2385172	1934701	0.811
Q[-17.1]EPERNEC[+391.2]FLQHKDDNPNLPR	1	3	58724	84901			
Q[-17.1]EPERNEC[+391.2]FLQHKDDNPNLPR	1	4	777664	316384			
QEPERNEC[+391.2]FLQHKDDNPNLPR	1	2	0	0	1548452	1533416	0.990
QEPERNEC[+391.2]FLQHKDDNPNLPR	1	3	0	0			
QEPERNEC[+391.2]FLQHKDDNPNLPR	1	4	1548452	1533416			
FDEFFSEGC[+391.2]APGSKK	1	2	nd	35514	6007187	739649	0.123
FDEFFSEGC[+391.2]APGSKK	1	3	829198	16437			
FDEFFSEGC[+391.2]APGSKK	1	4	5177989	687698			
GYSLGNWVC[+391.2]AAK	1	2	3878611	34916	77578633	2423012	0.031
GYSLGNWVC[+391.2]AAK	1	3	73362112	2339103			
GYSLGNWVC[+391.2]AAK	1	4	337910	48993			
GYSLGNWVC[+391.2]AAKFESNFNTQATNR	1	3	27060	9379	521535	15315	0.029
GYSLGNWVC[+391.2]AAKFESNFNTQATNR	1	4	494475	5936			

KPVDEYKDC[+391.2]HLAQVPSHTVVAR	1	2	nd	nd	3620292	3522518	0.973
KPVDEYKDC[+391.2]HLAQVPSHTVVAR	1	3	415204	590934			
KPVDEYKDC[+391.2]HLAQVPSHTVVAR	1	4	3205088	2931584			
KPVEEYANC[+391.2]HLAR	1	2	548764	456849	21286534	2143873	0.101
KPVEEYANC[+391.2]HLAR	1	3	3106504	69478			
KPVEEYANC[+391.2]HLAR	1	4	17631266	1617546			
ADRDQYELLC[+391.2]LDNTR	1	2	61504	82843	2497433	332869	0.133
ADRDQYELLC[+391.2]LDNTR	1	3	508794	168598			
ADRDQYELLC[+391.2]LDNTR	1	4	1927135	81428			
LVRPEVDVM[+16]C[+391.2]TAFHDNEETFLKK	1	3	8178	45600	8328212	9134725	1.097
LVRPEVDVM[+16]C[+391.2]TAFHDNEETFLKK	1	4	173814	243935			
LVRPEVDVMC[+391.2]TAFHDNEETFLK	1	2	0	0	1011989	472503	0.467
LVRPEVDVMC[+391.2]TAFHDNEETFLK	1	3	76954	160766			
LVRPEVDVMC[+391.2]TAFHDNEETFLK	1	4	935035	311737			
LVRPEVDVMC[+391.2]TAFHDNEETFLKK	1	3	847617	1569906	8328212	9134725	1.097
LVRPEVDVMC[+391.2]TAFHDNEETFLKK	1	4	7298603	7275284			
LVRPEVDVMC[+391.2]TAFHDNEETFLKKLYEIAR	1	3	8119	6059	75401	92861	1.232
LVRPEVDVMC[+391.2]TAFHDNEETFLKKLYEIAR	1	4	67282	86802			
NLNEKDYELLC[+391.2]LDGTR	1	2	65961	114310	10005890	503661	0.050
NLNEKDYELLC[+391.2]LDGTR	1	3	2354286	38338			
NLNEKDYELLC[+391.2]LDGTR	1	4	7585643	351013			
SLHTLFGDKLC[+391.2]TVATLR	1	2	217445	365659	23620280	2506763	0.106
SLHTLFGDKLC[+391.2]TVATLR	1	3	4124389	102683			
SLHTLFGDKLC[+391.2]TVATLR	1	4	19278446	2038421			
SVIPSDGPSVAC[+391.2]VK	1	2	2424589	134632	53258706	1807152	0.034
SVIPSDGPSVAC[+391.2]VK	1	3	49241828	1375143			
SVIPSDGPSVAC[+391.2]VK	1	4	1592289	297377			
SAGWNIPIGLLYC[+391.2]DLPEPR	1	2	172699	172750	6480304	240033	0.037
SAGWNIPIGLLYC[+391.2]DLPEPR	1	3	5457241	40246			
SAGWNIPIGLLYC[+391.2]DLPEPR	1	4	850364	27037			
EFNAETFTFHADIC[+391.2]TLSEKER	1	2	0	2205	163444	7393	0.045
EFNAETFTFHADIC[+391.2]TLSEKER	1	3	9007	0			
EFNAETFTFHADIC[+391.2]TLSEKER	1	4	154437	5188			
HSTIFENLANKADRDQYELLC[+391.2]LDNTR	1	3	137083	219027	764863	578433	0.756
HSTIFENLANKADRDQYELLC[+391.2]LDNTR	1	4	627780	359406			
AEFAEVSK	0	2	2188687	2848483	2188687	2848483	1.301
AEFAEVSK	0	3	nd	nd			
AEFAEVSK	0	4	nd	nd			
AEFAEVSKLVDLTk	0	2	2851320	2701359	12623928	15320957	1.214
AEFAEVSKLVDLTk	0	3	9772608	12619598			
AEFAEVSKLVDLTk	0	4	nd	nd			
AIAANEADAVTLdagLVYDAYLAPNNLKPVVAEFYGSK	0	3	353855	358571	1665457	1298245	0.780

AIAANEADAVTLDAGLVYDAYLAPNNLKPVVAEFYGSK	0	4	1311602	939674			
AVM[+16]DDFAAFVEK	0	2	9249218	16257838	356364536	372406406	1.045
AVM[+16]DDFAAFVEK	0	3	1820198	2033804			
AVM[+16]DDFAAFVEK	0	4	0	0			
AVMDDFAAFVEK	0	2	3.08E+08	315695776	345295120	354114764	1.026
AVMDDFAAFVEK	0	3	36889168	38418988			
AVMDDFAAFVEK	0	4	nd	nd			
DLLFKDSAHGFLK	0	2	1197933	1781045	8621877	11143588	1.292
DLLFKDSAHGFLK	0	3	7412324	9362543			
DLLFKDSAHGFLK	0	4	11620	0			
DLLFKDSAHGFLKVPPR	0	2	16333	20438	1891128	1880525	0.994
DLLFKDSAHGFLKVPPR	0	3	377862	440820			
DLLFKDSAHGFLKVPPR	0	4	1496933	1419267			
DSGFQMNQLR	0	2	12105384	9705003	12108110	9714054	0.802
DSGFQMNQLR	0	3	nd	9051			
DSGFQMNQLR	0	4	2726	0			
DVFLGM[+16]FLYEYAR	0	2	1275749	1335925	8655154	5314390	0.614
DVFLGM[+16]FLYEYAR	0	3	603564	524702			
DVFLGM[+16]FLYEYAR	0	4	nd	0			
DVFLGMFLYEYAR	0	2	4311581	2206412	6775841	3453763	0.510
DVFLGMFLYEYAR	0	3	2464260	1247351			
DVFLGMFLYEYAR	0	4	nd	nd			
EDLIWELLNQAQEHFGK	0	2	1132245	1517030	17142894	14864995	0.867
EDLIWELLNQAQEHFGK	0	3	15129593	12830356			
EDLIWELLNQAQEHFGK	0	4	881056	517609			
EDLIWELLNQAQEHFGKDK	0	2	114072	114095	10556471	8602199	0.815
EDLIWELLNQAQEHFGKDK	0	3	2601776	2522261			
EDLIWELLNQAQEHFGKDK	0	4	7840623	5965843			
EDPQTFYYAVAVVK	0	2	4322888	3875067	7937050	6543372	0.824
EDPQTFYYAVAVVK	0	3	3589621	2661006			
EDPQTFYYAVAVVK	0	4	24541	7299			
EDPQTFYYAVAVVKK	0	2	5265609	5828749	6938567	10111135	1.457
EDPQTFYYAVAVVKK	0	3	1550599	4006844			
EDPQTFYYAVAVVKK	0	4	122359	275542			
EFQLFSSPHGK	0	2	8910070	10609613	44731922	47674693	1.066
EFQLFSSPHGK	0	3	35821852	37065080			
EFQLFSSPHGK	0	4	0	nd			
EFQLFSSPHGKDLLFK	0	2	474771	550404	17700517	16982801	0.959
EFQLFSSPHGKDLLFK	0	3	4145807	4073475			
EFQLFSSPHGKDLLFK	0	4	13079939	12358922			
EGYYGYTGAFR	0	2	1284891	1069637	1451596	1115968	0.769
EGYYGYTGAFR	0	3	166705	46331			

EGYYGYTGAFR	0	4	0	0			
FESNFNTQATNR	0	2	12422005	9764729	12833210	9947625	0.775
FESNFNTQATNR	0	3	411205	182896			
FESNFNTQATNR	0	4	nd	nd			
FKDLGEENFK	0	2	764967	922547	4610592	5308856	1.151
FKDLGEENFK	0	3	3845625	4386309			
FKDLGEENFK	0	4	nd	nd			
FQNALLVR	0	2	21880114	30665094	21890602	30665094	1.401
FQNALLVR	0	3	nd	nd			
FQNALLVR	0	4	10488	nd			
HPDYSVVLRL	0	2	11908379	14757934	54574775	59711678	1.094
HPDYSVVLRL	0	3	42666396	44953744			
HPDYSVVLRL	0	4	nd	nd			
HPYFYAPELFFAK	0	2	14805864	19458412	98759131	105514930	1.068
HPYFYAPELFFAK	0	3	83744832	85837536			
HPYFYAPELFFAK	0	4	208435	218982			
HPYFYAPELFFAKR	0	2	17295368	22055644	356086968	352523260	0.990
HPYFYAPELFFAKR	0	3	1.54E+08	153704944			
HPYFYAPELFFAKR	0	4	1.84E+08	176762672			
HSTIFENLANK	0	2	6669360	7789033	13224703	13533094	1.023
HSTIFENLANK	0	3	6555343	5744061			
HSTIFENLANK	0	4	nd	0			
HSTIFENLANKADR	0	2	157547	196433	3482567	3331742	0.957
HSTIFENLANKADR	0	3	3048675	2933168			
HSTIFENLANKADR	0	4	276345	202141			
IM[+16]NGEADAMSLDGGFVYIAGK	0	2	122356	201710	22764479	19061753	0.837
IM[+16]NGEADAMSLDGGFVYIAGK	0	3	595626	703204			
IM[+16]NGEADAMSLDGGFVYIAGK	0	4	5261	8249			
IMNGEADAMSLDGGFVYIAGK	0	2	6359473	5738180	22041236	18148590	0.823
IMNGEADAMSLDGGFVYIAGK	0	3	15610125	12382133			
IMNGEADAMSLDGGFVYIAGK	0	4	71638	28277			
IVSDGNGM[+16]NAWVAWR	0	2	4628017	7993138	246099886	233825097	0.950
IVSDGNGM[+16]NAWVAWR	0	3	4698056	6444697			
IVSDGNGM[+16]NAWVAWR	0	4	2051	4038			
IVSDGNGMNAWVAWR	0	2	1.26E+08	118599520	236771762	219383224	0.927
IVSDGNGMNAWVAWR	0	3	1.11E+08	100783704			
IVSDGNGMNAWVAWR	0	4	75466	nd			
KIVSDGNGM[+16]NAWVAWR	0	2	71234	179911	54994099	56091788	1.020
KIVSDGNGM[+16]NAWVAWR	0	3	2329253	3650287			
KIVSDGNGM[+16]NAWVAWR	0	4	21509	56771			
KIVSDGNGMNAWVAWR	0	2	3247323	3914849	52572103	52204819	0.993
KIVSDGNGMNAWVAWR	0	3	48629096	47691868			

KIVSDGNGMNAWVAVR	0	4	695684	598102			
KLVAASQAALGL	0	2	21036352	23286800	21036352	23286800	1.107
KLVAASQAALGL	0	3	nd	nd			
KLVAASQAALGL	0	4	nd	nd			
KQTALVELVK	0	2	5749277	5596557	5762116	5596557	0.971
KQTALVELVK	0	3	12839	nd			
KQTALVELVK	0	4	nd	nd			
KSASDLTWDNLK	0	2	2194326	2623439	10363421	11966599	1.155
KSASDLTWDNLK	0	3	8169095	9343160			
KSASDLTWDNLK	0	4	nd	nd			
KVPQVSTPTLVEVSR	0	2	14647606	18236294	93787153	103381044	1.102
KVPQVSTPTLVEVSR	0	3	78799528	84942024			
KVPQVSTPTLVEVSR	0	4	340019	202726			
LVAASQAALGL	0	2	4.8E+08	535013856	479824064	535013856	1.115
LVAASQAALGL	0	3	nd	nd			
LVAASQAALGL	0	4	nd	nd			
LVNEVTEFAK	0	2	60196604	66478204	60196604	66482247	1.104
LVNEVTEFAK	0	3	0	0			
LVNEVTEFAK	0	4	0	4043			
M[+16]YLGYEYVTAIR	0	2	1876508	2108555	63015861	57293449	0.909
M[+16]YLGYEYVTAIR	0	3	640358	607388			
M[+16]YLGYEYVTAIR	0	4	0	0			
MYLGYEYVTAIR	0	2	45472704	42366972	60498995	54577506	0.902
MYLGYEYVTAIR	0	3	15026291	12210534			
MYLGYEYVTAIR	0	4	nd	nd			
NTDGSTDYGILQINSR	0	2	1.2E+08	128181000	252881424	249817798	0.988
NTDGSTDYGILQINSR	0	3	1.33E+08	121189248			
NTDGSTDYGILQINSR	0	4	nd	447550			
Q[-17.1]TALVELVK	0	2	1809901	1230550	64314904	69858262	1.086
Q[-17.1]TALVELVK	0	3	0	0			
Q[-17.1]TALVELVK	0	4	1431	0			
QTALVELVK	0	2	62503572	68627712	62503572	68627712	1.098
QTALVELVK	0	3	nd	nd			
QTALVELVK	0	4	nd	nd			
RHPDYSVVLRLR	0	2	25616510	33127554	294977566	318502123	1.080
RHPDYSVVLRLR	0	3	2.69E+08	285369120			
RHPDYSVVLRLR	0	4	nd	5449			
RHPYFYAPELFFAK	0	2	17295368	22055644	356086968	352523260	0.990
RHPYFYAPELFFAK	0	3	1.54E+08	153704944			
RHPYFYAPELFFAK	0	4	1.84E+08	176762672			
RHPYFYAPELFFAKR	0	2	592611	843737	75759790	77733971	1.026
RHPYFYAPELFFAKR	0	3	7978419	9034242			

RHPYFYAPELLFFAKR	0	4	67188760	67855992			
SASDLTWDNLK	0	2	55302336	53269792	58158902	55377803	0.952
SASDLTWDNLK	0	3	2856566	2108011			
SASDLTWDNLK	0	4	nd	nd			
SKEFQLFSSPHGK	0	2	730369	717035	5371958	5688196	1.059
SKEFQLFSSPHGK	0	3	4631255	4968713			
SKEFQLFSSPHGK	0	4	10334	2448			
SKEFQLFSSPHGKDLLFK	0	2	688595	1003054	1741659	1977858	1.136
SKEFQLFSSPHGKDLLFK	0	3	0	29604			
SKEFQLFSSPHGKDLLFK	0	4	1053064	945200			
SM[+16]GGKEDLIWELLNQAQEHFGK	0	2	56785	233763	166102063	168141619	1.012
SM[+16]GGKEDLIWELLNQAQEHFGK	0	3	3005443	4476320			
SM[+16]GGKEDLIWELLNQAQEHFGK	0	4	8817857	10834651			
SM[+16]GGKEDLIWELLNQAQEHFGKDK	0	2	41922	8595	56301271	49330806	0.876
SM[+16]GGKEDLIWELLNQAQEHFGKDK	0	3	449978	774997			
SM[+16]GGKEDLIWELLNQAQEHFGKDK	0	4	3463758	4331947			
SMGGKEDLIWELLNQAQEHFGK	0	2	1626238	1972741	166102063	168141619	1.012
SMGGKEDLIWELLNQAQEHFGK	0	3	45049228	52151200			
SMGGKEDLIWELLNQAQEHFGK	0	4	1.08E+08	98472944			
SMGGKEDLIWELLNQAQEHFGKDK	0	2	151603	184410	56301271	49330806	0.876
SMGGKEDLIWELLNQAQEHFGKDK	0	3	7540726	6725065			
SMGGKEDLIWELLNQAQEHFGKDK	0	4	44653284	37305792			
TAGWNIPM[+16]GLLYNK	0	2	3076311	4511467	170092104	151440459	0.890
TAGWNIPM[+16]GLLYNK	0	3	2736429	3023389			
TAGWNIPM[+16]GLLYNK	0	4	24564	23257			
TAGWNIPMGLLYNK	0	2	1.15E+08	89259608	164254800	143882346	0.876
TAGWNIPMGLLYNK	0	3	49583432	52747392			
TAGWNIPMGLLYNK	0	4	nd	1875346			
VFDEFKPLVEEPQNLIK	0	2	42264092	46231684	469759615	439006686	0.935
VFDEFKPLVEEPQNLIK	0	3	4.19E+08	387111808			
VFDEFKPLVEEPQNLIK	0	4	8179331	5663194			
VPQVSTPTLVEVSR	0	2	11525135	12296273	19660966	20096638	1.022
VPQVSTPTLVEVSR	0	3	8135831	7800365			
VPQVSTPTLVEVSR	0	4	nd	nd			
YLYEIAR	0	2	1.27E+08	128999680	127011688	128999680	1.016
YLYEIAR	0	3	nd	nd			
YLYEIAR	0	4	nd	nd			