

**Supplemental Information for:
The Global Identification of tRNA Isoacceptors by Targeted Tandem Mass Spectrometry**

Collin Wetzel and Patrick A. Limbach*

Rieveschl Laboratories for Mass Spectrometry, Department of Chemistry, PO Box 210172,
University of Cincinnati, Cincinnati, OH 45221-0172

Abstract

Transfer ribonucleic acids (tRNA) are a biologically significant class of non-coding ribonucleic acids (ncRNAs) that pose unique analytical challenges for complete characterization. Here we present a robust and simple method for the consistent and accurate identification of individual tRNAs from a pool of total tRNA obtained from cell lysate. Through this method individual isoacceptor tRNAs are identified by the detection of unique oligonucleotide sequences which arise from a single enzymatic digestion. These unique sequences can be detected by monitoring specific transitions from precursor to product ions. Thus, for any pool of known tRNA sequences including posttranscriptional modifications, targeted tandem mass spectrometry can be used for monitoring these specific transitions. The proposed method was developed and validated using a set of known tRNAs from *Escherichia coli*. This approach was found to identify 41 ± 2 of the predicted 47 isoaccepting tRNAs in *E. coli* from targeted tandem mass spectrometry using only 24 precursor m/z values. This method should be easily adapted to other bacterial systems for both genomic and posttranscriptional analysis of tRNAs, and is likely suitable for future clinical applications.

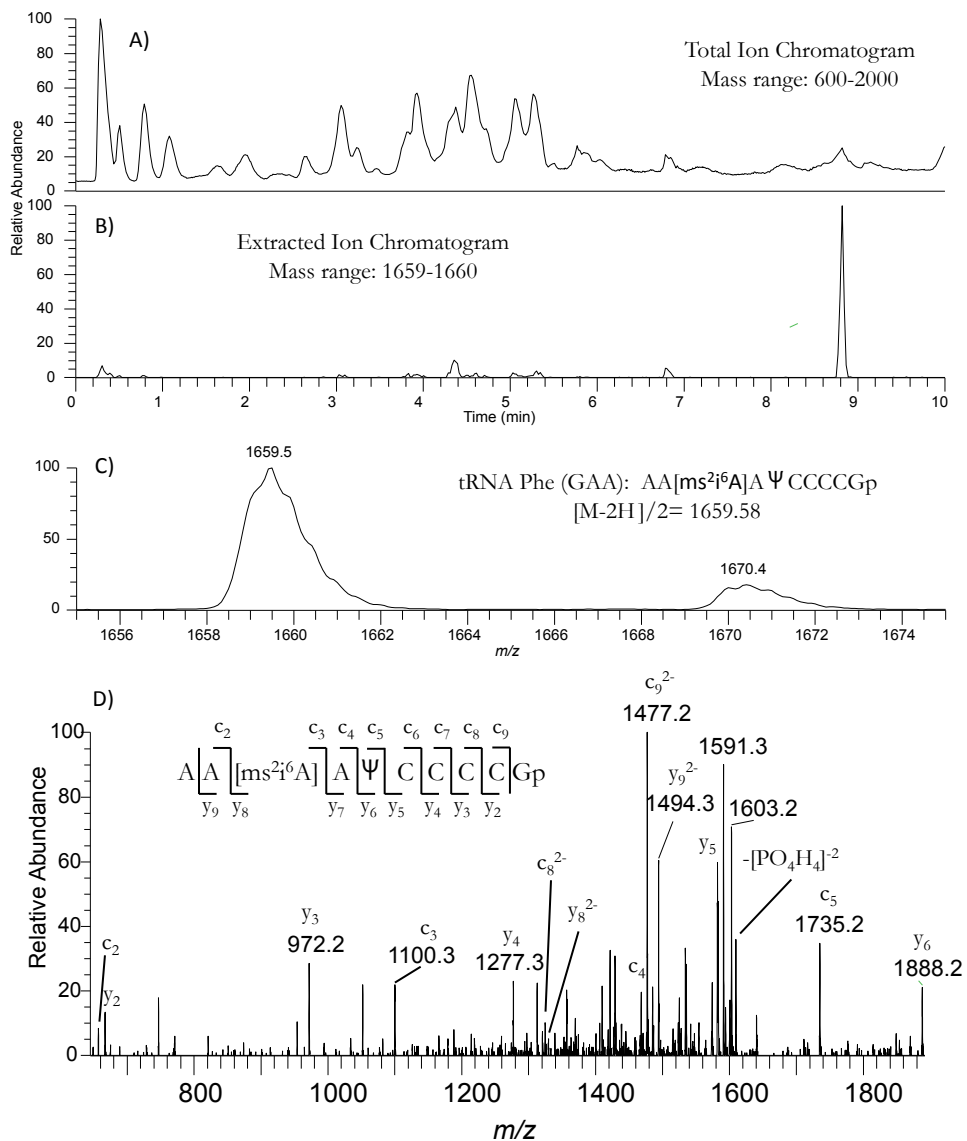
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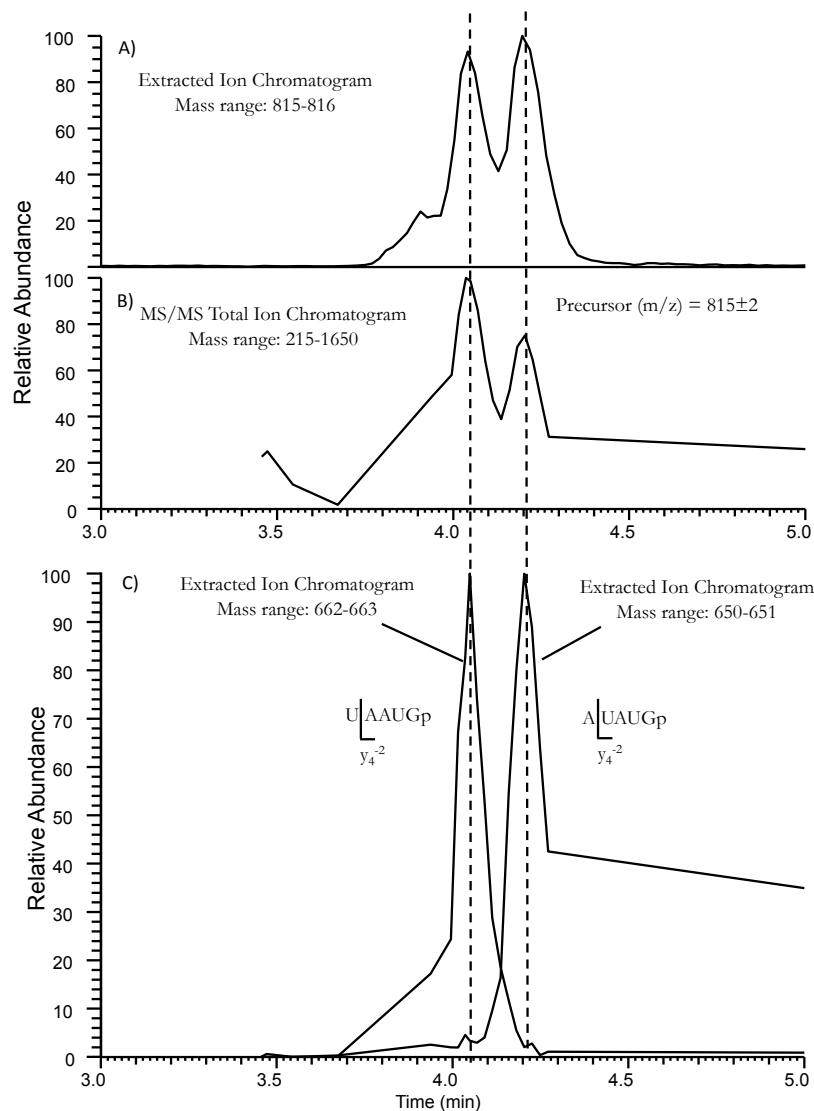
Supplemental Figure S2

Supplemental Table S1

Supplemental Table S2



Supplemental Figure S1. A) Representative total ion chromatogram. B) Extracted ion chromatograms (XICs) for m/z range 1659-1660. C) Mass spectrum of the unique Phe (GAA) RNase T1 digestion product at m/z 1659.6. D) CID tandem mass spectrum and sequence assignment of the tRNA Phe (GAA) unique digestion product.



Supplemental Figure S2. A) Extracted ion chromatogram (XIC) for m/z range 815-816. B) Total ion chromatogram for MS/MS spectra using a precursor m/z of 815 ± 2 . C) Overlaid XICs, one for m/z 662-663 and the other for m/z 650-651 illustrating the early eluting peak corresponds to RNase T1 digestion products with 5'-pyrimidines and the later eluting peak corresponds to RNase T1 digestion products with 5'-adenosines.

Supplemental Table S1. Complete list of all unique RNase T1 Digestion Products for *E. coli* tRNAs

tRNA Isoacceptor	Digestion product	mass	z	m/z
Ala1	7UCUGp	1639.211	-2	818.598
Ala1	CAUAGp	1632.227	-2	815.106
Ala1	CUUVGp	1660.173	-2	829.08
Ala2	CUUAGp	1609.200	-2	803.592
Ala2	CAUGp	1303.175	-2	650.580
Ala2	7UCAGp	1662.238	-2	830.11
Arg1	AAUCCUCCCGp	3159.900	-3	1052.292
Arg1	UACUCGp	1914.241	-2	956.113
Arg1	%UICGp	1626.023	-2	812.00
Arg1	/ACCGp	1645.259	-2	821.62
Arg2	A[D]AGp	1329.202	-2	663.593
Arg2	KAGp	1051.172	-1	1050.16
Arg2	CC%UCCGp	2210.264	-3	735.75
Arg2	7UCUCAGp	2273.304	-2	1135.64
Arg3	CCCUUAGp	2219.282	-2	1108.633
Arg3	AUAGp	1327.186	-2	662.585
Arg3	AC%U{CU6AGp	3389.161	-3	1128.71
Arg4	UCCUCUUAGp	2831.332	-2	1414.658
Arg4	UUAAAUGp	2268.289	-2	1133.137
Arg4	CUAAUUGp	2244.277	-2	1121.131
Arg4	AUUCCUGp	2220.266	-2	1109.125
Arg4	ACACCA	1840.323	-2	919.154
Arg4	ADAUAACGp	2597.582	-2	1297.78
Arg4	CCCCUCCU6AGp	3610.202	-3	1202.39
Asn	UCAGp	1303.175	-2	650.580
Asn	pUCCUCUGp	2276.221	-2	1137.10
Asn	UAU7UCACUGp	3215.924	-3	1070.97
Asn	ACUQUU6APCCGp	4107.566	-3	1368.18
Asp	AAUACCUGp	2572.346	-2	1285.165
Asp	UUCCGp	1585.189	-2	791.587
Asp	CCUQUC/CGp	3010.904	-2	1504.44
Cys	ACUCCGp	1913.257	-2	955.621
Cys	DDAUGp	1614.215	-2	806.10
Cys	CCUCCA	1793.285	-2	895.63
Cys	CA*APCCGp	2685.412	-2	1341.70
Cys	U4AACAAGp	2942.859	-2	1470.42
Gln1	CAUUCCUGp	2830.348	-2	1414.166
Gln1	AAUCCAGp	2266.321	-2	1132.153
Gln1	UJU\$UGp	2011.238	-2	1004.61
Gln2	AAUCCUCGp	2548.334	-2	1273.159
Gln2	CAUUCCGp	2219.282	-2	1108.633
Gln2	A[U _m]UCUGp	1929.241	-2	963.613
Gln2	[m ² A][ψ][ψ]CCGp	1928.257	-2	963.121
Gln2	/PACCGp	1951.284	-2	974.63
Glu	UAACAGp	1961.280	-2	979.632
Glu	ACACCGp	1936.284	-2	967.134
Glu	CCCAGp	1607.232	-2	802.608
Glu	UCCCCUUCGp	2806.337	-2	1402.16

Glu	AAUCCCCUAGp	3182.428	-2	1590.21
Glu	CCCUSUC/CGp	3208.424	-2	1603.20
Gly1	CUCUAUACGp	2854.359	-2	1426.172
Gly1	CUUCCCAAGp	2853.375	-2	1425.680
Gly1	UUCAAUGp	2244.277	-2	1121.131
Gly1	AUCCCCUUCGp	3136.373	-3	1044.45
Gly2	UAUAAUGp	2268.289	-2	1133.137
Gly2	AUUCCCGp	2219.282	-2	1108.633
Gly2	CAUCGp	1608.216	-2	803.100
Gly2	CCU{CCAAGp	2897.784	-2	1447.88
Gly2	CUAUUACCUCAGp	3794.478	-3	1263.82
Gly3	UUUCCCGp	2196.255	-2	1097.120
Gly3	ACCUUGp	1914.241	-2	956.113
Gly3	AAUAGp	1656.239	-2	827.11
His	CCACCCCA	2426.394	-2	1212.189
His	UU[m ⁷ G]UCGp	1945.236	-2	971.610
His	CCCUGp	1584.205	-2	791.095
His	CUA4AGp	1954.23	-2	976.11
His	AUUQUGp	2081.299	-2	1039.64
His	/PPCCAGp	2257.309	-2	1127.65
Ile1	UCCACPCAGp	2853.375	-2	1425.680
Ile1	CACCCCUGp	2523.339	-2	1260.662
Ile1	AU6AGp	1801.276	-2	899.63
Ile1	CCUACCA	2122.337	-2	1060.16
Ile2	CCCCU[s ⁴ U]AGp	2540.300	-2	1269.142
Ile3	CCCUU[s ⁴ U]AGp	2541.284	-2	1269.634
Leu1	UCCUUACGp	2525.307	-2	1261.646
Leu1	CUUCAGp	1914.241	-2	956.113
Leu1	CUAGp	1303.175	-2	650.580
Leu1	UCCCCCCCCUCGp	3722.218	-3	1239.73
Leu2	CCCAAUAGp	2571.362	-2	1284.673
Leu2	UUCUUACGp	2526.291	-2	1262.138
Leu2	CUACCUUGp	2525.307	-2	1261.646
Leu2	CUUACGp	1914.241	-2	956.113
Leu2	UCCUCGp	1890.230	-2	944.107
Leu2	ACACGp	1631.243	-2	814.614
Leu3	AAADD[Gm]Gp	2325.358	-2	1161.671
Leu3	CCUCCCGp	2194.287	-2	1096.136
Leu3	[m ² G]UUCUGp	1945.236	-2	971.610
Leu3	AUUUAGp	1939.236	-2	968.610
Leu3	CACCAGp	1936.284	-2	967.134
Leu4	ACACAAGp	2289.348	-2	1143.666
Leu4	CUCCGp	1584.205	-2	791.095
Leu4	UUCGp	1280.148	-2	639.066
Leu4	AADC#Gp	1993.306	-2	995.65
Leu4	APU)AA*APCCCUCGp	4976.168	-4	1243.03
Leu5	AAADC[Gm]Gp	2322.358	-2	1160.171
Leu5	AAAUACGp	2290.332	-2	1144.158
Leu5	ACACAGp	1960.296	-2	979.140
Leu5	CCUUCGp	1890.230	-2	944.107

Leu5	APUBAA*APCAACCGp	4935.169	-3	1644.05
Lys	ACCCACCA	2450.405	-2	1224.19
Lys	ACUSUU6APCAAUUGp	4967.077	-3	1654.68
Met	AAUCCCGp	2242.309	-2	1120.147
Met	CUACGp	1608.216	-2	803.100
Met	DD#Gp	1338.201	-2	668.09
Met	CCACCA	1816.312	-2	907.15
Met	7XCACAGp	2397.379	-2	1197.68
Met	CACAUCACUMAU6APG	5276.227	-3	1757.73
Phe	A4AGp	1343.164	-2	670.57
Phe	U7XCCUUGp	2657.349	-2	1327.67
Phe	AA*APCCCCGp	3321.174	-2	1659.58
Pro1	CACUUCGp	2219.282	-2	1108.633
Pro1	[Um]UCGp	1294.163	-2	646.074
Pro1	AU4Gp	1320.136	-2	659.06
Pro1	KACGp	1356.213	-2	677.10
Pro1	AAUCCUCUAUCACCGp	4735.84	-3	1577.61
Pro2	UCAUGp	1609.200	-2	803.592
Pro2	TPCAAAUCCUCUCGp	4421.643	-3	1472.87
Pro3	ACCAGp	1631.243	-2	814.614
Pro3	UUUGp	1281.132	-2	639.558
Pro3	KACCAGp	1991.248	-2	994.62
Pro3	AAUCCUCUCUCGp	3772.238	-3	1256.40
Sec	ACUCCUGp	2219.282	-2	1108.633
Sec	AUCUUGp	1915.225	-2	956.605
Sec	UCUCCGp	1890.230	-2	944.107
Sec	pAAGp	1101.127	-2	549.56
Sec	ACUUCA+AUCCAGp	4216.631	-3	1404.54
Ser1	AAUCUCUGp	2549.318	-2	1273.651
Ser1	UUCCAGp	1914.241	-2	956.113
Ser1	CUUCCGp	1890.230	-2	944.107
Ser1	ACCCGp	1607.232	-2	802.608
Ser1	UBUVGp	1674.189	-2	836.09
Ser1	A*AACCG	2403.398	-2	1200.69
Ser2	ACCGp	1302.191	-2	650.088
Ser2	CAACUCUACCGp	3489.109	-3	1162.03
Ser2	AAAUCCCCCUCUCUC	6253.732	-4	1562.43
Ser3	AAUCCCGp	2547.350	-2	1272.667
Ser3	CCUCACCGp	2523.339	-2	1260.662
Ser3	UCAAAAGp	2290.332	-2	1144.158
Ser3	UAUGp	1304.159	-2	651.072
Ser3	CU6AGp	1777.265	-2	887.62
Ser3	CUCCC%UGp	2516.289	-2	1257.14
Ser4	UAUACGp	1938.252	-2	968.118
Ser4	CAACGp	1631.243	-2	814.614
Ser4	UAUCGp	1609.200	-2	803.592
Ser4	AAUCCCCCCCUCACCG	5015.029	-3	1670.67
Thr1	UAUCAGp	1938.252	-2	968.118
Thr1	ACUCUGp	1914.241	-2	956.113
Thr1	7UCCCCAGp	2578.575	-2	1288.28

Thr2	CAUUCGp	1914.241	-2	956.113
Thr2	UAAUGp	1633.211	-2	815.598
Thr2	ACUCCUAUUAUCGp	4102.432	-3	1366.47
Thr3	CCUAUCAGp	2548.334	-2	1273.159
Thr3	AAUCUGp	1938.252	-2	968.118
Thr3	AUAUGp	1633.211	-2	815.598
Thr3	U[m ⁶ t ⁶ A]AGp	1586.239	-2	792.112
Thr4	UAAUCAGp	2267.305	-2	1132.645
Thr4	ACUUAGp	1938.252	-2	968.118
Thr4	ACUVGp	1683.2	-2	840.59
Thr4	7UCACCAGp	2601.372	-2	1299.68
Trp	CCCCUGp	1889.246	-2	943.615
Trp	U[m ⁷ G]UUGp	1640.195	-2	819.090
Trp	UCUCUCCGp	2501.296	-2	1249.64
Trp	UUCAADDGp	2554.334	-2	1276.16
Trp	UBUCCA*AACCGp	3944.587	-3	1313.85
Tyr1	UCAUCGp	1914.241	-2	956.113
Tyr2	UCACAGp	1937.268	-2	967.626
Val1	AU4AGp	1649.189	-2	823.59
Val1	UCAUCACCCACCA	4003.497	-3	1333.49
Val1	CACCUCCCCUVAC=AGp	4820.644	-3	1605.87
Val2	UCCACUCGp	2524.323	-2	1261.154
Val3	UCCAAUUGp	2549.318	-2	1273.651
Val3	UUCA4AGp	2260.255	-2	1129.12

Supplemental Table S2. Complete list of poolable T1 digestion products theoretically obtained from *E. coli* total tRNA

Pool #	tRNA Isoacceptor	Digestion product	mass	z	m/z	Unique fragment (m/z)	5' terminal y
1	Arg1	AAUCCUCCGp	3159.900	-3	1052.292	963.121	942.113
	Val2/3	CACCACCUUGp	3158.416	-3	1051.797	1243.167	950.117
2	Gly1	CUCUAUACGp	2854.359	-2	1426.172	667.090	1273.651
	Gly1	CUUCCCAAGp	2853.375	-2	1425.680	1526.165	1273.159
	Ile1	UCCACPCAGp	2853.375	-2	1425.680	1607.208	1272.667
3	Gln1	CAUUCCCUgP	2830.348	-2	1414.166	1245.135	1261.645
	Arg4	UCCUCUUAAGp	2831.332	-2	1414.658	1303.151	1261.645
4	Asp	AAUACCUGp	2572.346	-2	1285.165	1292.174	1120.639
	Leu2	CCCAAUAGp	2571.362	-2	1284.673	1243.167	1132.152
5	Ser3	AAUCCCCGp	2547.350	-2	1272.667	1582.213	1108.141
	Gln2	AAUCCUCGp	2548.334	-2	1273.159	1583.197 *	1108.633
	Ser1	AAUCUCUGp	2549.318	-2	1273.651	1584.181 *	1109.125
	Thr3	CCUAUCAGp	2548.334	-2	1273.159	609.074	1120.639
	Gln1/2	UACCCCAAGp	2547.350	-2	1272.667	634.069	1119.655
	Val3	UCCAAUUGp	2549.318	-2	1273.651	1573.203	1120.639
6	Ile2	CCCCU[s ⁴ U]AGp	2540.300	-2	1269.142	1525.181	1116.622
	Ile3	CCCUU[s ⁴ U]AGp	2541.284	-2	1269.634	1526.165 *	1117.114
7	Leu2	UUCUUACGp	2526.291	-2	1262.138	1528.133 *	1109.125
	Leu1	UCCUUACGp	2525.307	-2	1261.646	1527.149	1108.633
	Leu2	CUACCUUGp	2525.307	-2	1261.646	939.110	1109.125
	Thr1/3	CACCCUUGp	2524.323	-2	1261.154	1889.222 *	1108.633
	Val2	UCCACUCGp	2524.323	-2	1261.154	1607.208	1108.141
	Ile1	CACCCUUGp	2523.339	-2	1260.662	1888.238	1108.141
	Ser3	CCUCACCGp	2523.339	-2	1260.662	1220.140	1108.141
8	Ala1/2	CUCCACCA	2427.378	-2	1212.681	1205.222	1060.160
	His	CCACCCCA	2426.394	-2	1212.189	1181.211	1059.668
9	Leu3	AAADD[Gm]Gp	2325.358	-2	1161.671	1337.193	997.145
	Leu5	AAADC[Gm]Gp	2322.358	-2	1160.171	1334.193	995.645
10	Leu5	AAAUACGp	2290.332	-2	1144.158	986.149	979.632
	Leu4	ACACAAGp	2289.348	-2	1143.666	962.137	979.140
	Ser3	UCAAAAGp	2290.332	-2	1144.158	1349.206	991.145
11	Gln1	AAUCCAGp	2266.321	-2	1132.153	1607.208	967.626
	Thr4	UAAUCAGp	2267.305	-2	1132.645	1631.219	979.632
	Gly2	UAUAAUGp	2268.289	-2	1133.137	1632.203 *	980.124
	Arg4	UUAUAAUGp	2268.289	-2	1133.137	1655.231	980.124
12	Met	AAUCCCGp	2242.309	-2	1120.147	972.131	955.620
	Arg2, Lys	AAUCCUGp	2243.293	-2	1120.639	973.115 *	956.112
	Arg4	CUAAUUGp	2244.277	-2	1121.131	939.110	968.610
	Gly1	UUCAUUGp	2244.277	-2	1121.131	1326.178	968.118
13	Sec	ACUCCUGp	2219.282	-2	1108.633	1244.151	944.107 **
	Gly2	AUUCCCGp	2219.282	-2	1108.633	1277.172	944.107
	Arg4	AUUCCUGp	2220.266	-2	1109.125	1856.201	944.599
	Pro1	CACUUCGp	2219.282	-2	1108.633	938.126	956.112
	Gln2	CAUUCCGp	2219.282	-2	1108.633	1244.151 *	956.112 **
	Arg3	CCCUUAGp	2219.282	-2	1108.633	914.115	956.112
14	Gly3	UUUCCCGp	2196.255	-2	1097.120	917.067	944.107
	Leu3	CCUCCCGp	2194.287	-2	1096.136	915.099	943.615
15	Leu5	ACACAGp	1960.296	-2	979.140	962.137	814.614
	Thr2/3	AUAUAGp	1962.264	-2	980.124	1269.146	815.598
	Tyr1/2	CCAAAGp	1960.296	-2	979.140	938.126	826.619
	Glu	UAACAGp	1961.280	-2	979.632	1597.215	826.619
16	His	UU[m ⁷ G]UCGp	1945.236	-2	971.610	611.042	971.610
	Leu3	[m ² G]UUCUGp	1945.236	-2	971.610	664.079	945.091
17	Thr3	AAUCUGp	1938.252	-2	968.118	657.096	803.592
	Glu	ACACCGp	1936.284	-2	967.134	972.131	802.608
	Thr4	ACUUAGp	1938.252	-2	968.118	939.110	803.592 **
	Leu3	AUUUAGp	1939.236	-2	968.610	1246.119 *	804.084
	Pro3/Thr4	CAACUGp	1937.268	-2	967.626	962.137	815.106 **
	Leu3	CACCAgP	1936.284	-2	967.134	1243.167	814.614
	Ala1/2	CUAUAGp	1938.252	-2	968.118	1326.178 *	815.598

	Ser4	UAUACGp	1938.252	-2	968.118	1269.146	815.106
	Thr1	UAUCAGp	1938.252	-2	968.118	none	815.106
	Tyr2	UCACAGp	1937.268	-2	967.626	1244.151	814.614 **
18	Gln2	A[Um]UCUGp	1929.241	-2	963.613	328.044	799.086
	Gln2	[m ² A][ψ][ψ]CCGp	1928.257	-2	963.121	342.060	792.078
19	Gly3	ACCUUGp	1914.241	-2	956.113	938.126 *	791.586 **
	Cys	ACUCCGp	1913.257	-2	955.621	none	791.094
	Thr1	ACUCUGp	1914.241	-2	956.113	none	791.586
	Tyr1/2	ACUUCGp	1914.241	-2	956.113	none	791.586
	Ala1/2/Val1	AUCCCGp	1913.257	-2	955.621	1277.172	791.094
	Sec	AUCUUGp	1915.225	-2	956.605	1551.16 *	792.078
	Phe/Thr4	AUUCCGp	1914.241	-2	956.113	940.094 *	791.586
	Arg1, Ser3	CAUCCGp	1913.257	-2	955.621	1244.151	803.1 **
	Thr2	CAUUCGp	1914.241	-2	956.113	1279.14 *	803.592 **
	Leu2	CUUACGp	1914.241	-2	956.113	none	803.592
	Leu1	CUUCAGp	1914.241	-2	956.113	none	803.592
	Arg1	UACUCGp	1914.241	-2	956.113	634.069 *	803.1 **
	Tyr1	UCAUCGp	1914.241	-2	956.113	none	803.100
	Ser1	UUCAGp	1914.241	-2	956.113	611.042 *	803.100
20	Leu2	UCCUCGp	1890.230	-2	944.107	none	791.094
	Leu5	CCUUCGp	1890.230	-2	944.107	1279.14 *	791.586
	Sec	UCUCCGp	1890.230	-2	944.107	none	791.094
	Ser1	CUUCCGp	1890.230	-2	944.107	none	791.586
	Trp	CCCCUGp	1889.246	-2	943.615	1525.181 *	791.094
21	fMet1/2	CCCCCGp	1888.262	-2	943.123	1277.172	790.602
	Arg4	ACACCA	1840.323	-2	919.154	1510.263	754.627
22	fMet1/2	CAACCA	1840.323	-2	919.154	1534.275	766.633
	Trp	U[m ⁷ G]UUUGp	1640.195	-2	819.090	305.017 *	666.077
23	Ala1	[m ⁷ G]UCUGp	1639.211	-2	818.598	973.115	639.066
	Leu2	ACACGp	1631.243	-2	814.614	667.090	650.087 **
24	Val2/3	ACAUGp	1632.227	-2	815.106	1268.162 *	650.579 **
	Pro3	ACCAGp	1631.243	-2	814.614	938.126	650.087 **
	Thr3	AUAUGp	1633.211	-2	815.598	1269.146 *	651.071 **
	Ser4	CAACGp	1631.243	-2	814.614	962.137	662.093 **
	Ala1	CAUAGp	1632.227	-2	815.106	939.11 *	662.585 **
	Gln1/2, Gly3	CCAAGp	1631.243	-2	814.614	1020.153	662.093 **
	Thr2	UAAUGp	1633.211	-2	815.598	963.121*	662.585 **
25	Ser1	ACCCGp	1607.232	-2	802.608	1277.172	638.082
	More than 3	CACCGp	1607.232	-2	802.608	938.126	650.087
	Gly2	CAUCGp	1608.216	-2	803.100	none	650.579
	Glu	CCCAGp	1607.232	-2	802.608	914.115	650.087
	Met	CUACGp	1608.216	-2	803.100	none	650.579
	More than 3	CUCAGp	1608.216	-2	803.100	none	650.579
	Ala2	CUUAGp	1609.200	-2	803.592	1303.151 *	651.071
	Ser4	UAUCGp	1609.200	-2	803.592	634.069 *	650.579
	Pro2	UCAUGp	1609.200	-2	803.592	668.074 *	650.579
	Ile2/3, Asn	UCCAGp	1608.216	-2	803.100	none	650.087
	Cys, Glu	UCUAGp	1609.200	-2	803.592	none	650.579
26	Asp/Asn	UUCAGp	1609.200	-2	803.592	611.042 *	650.579
	Thr3	U[m ⁶ t ⁶ A]AGp	1586.239	-2	792.112	893.122	639.099
	Asp	UUCCGp	1585.189	-2	791.587	611.042 *	638.574
	Gly2, Leu3, Ser2	UCUCGp	1585.189	-2	791.587	none	638.574
	More than 3	UCCCGp	1584.205	-2	791.095	1277.172	638.082
	His	CCCUg	1584.205	-2	791.095	609.074	638.574
27	Leu4	CUCCGp	1584.205	-2	791.095	none	638.574
	Leu4, Leu2	UACCA	1512.255	-2	755.120	611.042 *	602.107
28	More than 3	CACCA	1511.271	-2	754.628	610.058	602.107
	Arg2	A[D]AGp	1329.202	-2	663.593	999.142	499.067
29	More than 3	AACGp	1326.202	-2	662.093	657.096	497.567
	Arg3	AUAGp	1327.186	-2	662.585	963.121 *	498.059 **
	Ala2, Leu3, Ile3	CAAGp	1326.202	-2	662.093	633.085	509.573
	Gln1/2	[D]AAGp	1329.202	-2	663.593	636.085	509.573 **
30	Ser2	ACCGp	1302.191	-2	650.088	938.126	972.131

	Cys, Phe1, Pro1	A[ψ]CGp	1304.159	-2	651.072	none	973.115
	Met, Sec	AUCGp	1303.175	-2	650.580	none	973.115
	More than 3	CACGp	1302.191	-2	650.088	667.090	996.142 **
	Ala2	CAUGp	1303.175	-2	650.580	none	997.126
	Leu1	CUAGp	1303.175	-2	650.580	none	997.126
	Ser3	UAUGp	1304.159	-2	651.072	634.069 *	997.126 **
	Asn	UCAGp	1303.175	-2	650.580	none	996.142
	Lys1, Leu1, Ile3	UUAGp	1304.159	-2	651.072	611.042 *	997.126
29	More than 3	[m ⁵ U][ψ]CGp	1294.163	-2	646.074	none	974.000
	Pro1	[Um]UCGp	1294.163	-2	646.074	none	974.000
30	Pro3	UUUGp	1281.132	-2	639.558	917.067 *	974.099
	More than 3	CUUGp	1280.148	-2	639.066	none	974.099
	Leu4	UUCGp	1280.148	-2	639.066	none	974.000
	More than 3	CCUGp	1279.164	-2	638.574	none	974.000
	More than 3	UCCGp	1279.164	-2	638.574	none	972.131
	fMet1/2	CUCGp	1279.164	-2	638.574	none	974.000
	More than 3	CCCGp	1278.180	-2	638.082	914.115	972.131

* potential m+1 isotopic overlap
** baseline resolution of 5' A and 5'U/C is necessary