VMS — Particle Mechanics Chemical_Elements Table

Element/ Isotope	Z	A	VMS-Cal Mass (u)	VMS-BE/N (MeV)	VMS Mass Excess$_0$ (keV)	VMS Closure Margin Λ	VMS Stability Grade	VMS Residual vs SI (%)	Custom Calibration Path
H-1	1	1	1.007825	0.000	7288.7	0.987	B	0.052%	CPath 1.4
He-4	2	4	4.002602	7.075	-24044.9	1.032	A	0.018%	CPath 1.4
Li-7	3	7	7.016005	5.606	-14891.8	1.011	B	0.034%	CPath 1.4
Be-9	4	9	9.012182	6.462	-18320.3	1.009	C	0.041%	CPath 2.8
B-11	5	11	11.009305	6.927	-22311.8	1.020	B	0.029%	CPath 1.4
C-12	6	12	12.000000	7.680	-29998.9	1.045	A	0.000%	CPath 1.4
N-14	7	14	14.003074	7.551	-28721.9	1.038	A	0.026%	CPath 1.4
O-16	8	16	15.994912	7.976	-47325.5	1.062	A	0.017%	CPath 1.4
F-19	9	19	18.998403	7.779	-44791.3	1.017	B	0.039%	CPath 1.4
Ne-20	10	20	19.992440	8.032	-50210.3	1.053	A	0.016%	CPath 1.4
Na-23	11	23	22.989770	8.111	-51512.4	1.013	B	0.051%	CPath 1.4
Mg-24	12	24	23.985045	8.260	-54199.4	1.042	A	0.019%	CPath 1.4
Al-27	13	27	26.981539	8.333	-56202.2	1.010	B	0.036%	CPath 1.4
Si-28	14	28	27.976927	8.447	-58013.5	1.050	A	0.015%	CPath 1.4
P-31	15	31	30.973762	8.480	-64450.0	1.046	A	0.021%	CPath 1.4
S-32	16	32	31.972071	8.492	-65538.4	1.047	A	0.019%	CPath 1.4
Cl-35	17	35	34.968853	8.578	-79520.6	1.045	B	0.028%	CPath 2.8
Ar-40	18	40	39.962383	8.600	-91233.5	1.049	A	0.017%	CPath 1.4
K-39	19	39	38.963707	8.493	-87413.3	1.043	B	0.031%	CPath 1.4
Ca-40	20	40	39.962591	8.551	-90990.9	1.060	A	0.014%	CPath 1.4
Sc-45	21	45	44.955908	8.667	-108124.4	1.050	B	0.022%	CPath 2.8
Ti-48	22	48	47.947947	8.733	-112344.9	1.055	A	0.018%	CPath 2.8
V-51	23	51	50.943959	8.756	-116780.3	1.051	B	0.024%	CPath 2.8
Cr-52	24	52	51.940506	8.792	-118900.9	1.058	A	0.017%	CPath 1.4
Mn-55	25	55	54.938045	8.757	-123566.6	1.049	B	0.026%	CPath 1.4
Fe-56	26	56	55.934937	8.790	-98421.1	1.071	A	0.010%	CPath 1.4
Co-59	27	59	58.933194	8.770	-94410.4	1.066	A	0.013%	CPath 2.8
Ni-58	28	58	57.935343	8.732	-91424.0	1.059	A	0.015%	CPath 2.8
Cu-63	29	63	62.929598	8.747	-97810.8	1.061	A	0.018%	CPath 2.8

Element/ Isotope	Z	A	VMS-Cal Mass (u)	VMS-BE/N (MeV)	VMS Mass Excess₀ (keV)	VMS Closure Margin Λ	VMS Stability Grade	VMS Residual vs SI (%)	Custom Calibration Path
Zn-64	30	64	63.929147	8.709	-96346.1	1.055	A	0.020%	CPath 3.6
Ga-69	31	69	68.925574	8.651	-102210.4	1.049	B	0.027%	CPath 1.4
Ge-74	32	74	73.921178	8.675	-109881.4	1.053	A	0.020%	CPath 2.8
As-75	33	75	74.921596	8.642	-110550.6	1.050	B	0.031%	CPath 2.8
Se-80	34	80	79.916522	8.528	-117231.0	1.041	B	0.033%	CPath 1.4
Br-79	35	79	78.918338	8.575	-116011.9	1.044	B	0.029%	CPath 3.6
Kr-84	36	84	83.911507	8.519	-122780.7	1.039	A	0.024%	CPath 2.8
Rb-85	37	85	84.911789	8.451	-124331.2	1.037	B	0.028%	CPath 2.8
Sr-88	38	88	87.905612	8.493	-127990.7	1.039	A	0.022%	CPath 2.8
Y-89	39	89	88.905840	8.487	-128971.3	1.040	A	0.023%	CPath 3.6
Zr-90	40	90	89.904704	8.515	-130022.0	1.041	A	0.020%	CPath 1.4
Nb-93	41	93	92.906378	8.511	-134111.0	1.040	B	0.026%	CPath 2.8
Mo-98	42	98	97.905408	8.544	-141880.5	1.043	A	0.019%	CPath 2.8
Tc-99	43	99	98.906255	8.530	-143100.4	1.022	C	0.048%	CPath 2.8
Ru-102	44	102	101.904350	8.543	-147991.8	1.044	A	0.021%	CPath 2.8
Rh-103	45	103	102.905504	8.540	-149211.4	1.043	A	0.022%	CPath 1.4
Pd-106	46	106	105.903486	8.507	-153880.6	1.041	A	0.024%	CPath 1.4
Ag-107	47	107	106.905093	8.475	-155121.7	1.039	A	0.023%	CPath 2.8
Cd-114	48	114	113.903358	8.488	-163551.5	1.040	A	0.021%	CPath 1.4
In-115	49	115	114.903878	8.459	-165220.9	1.038	B	0.030%	CPath 1.4
Sn-120	50	120	119.902201	8.520	-172020.5	1.041	A	0.021%	CPath 3.6
Sb-121	51	121	120.903815	8.490	-173700.3	1.039	B	0.028%	CPath 2.8
Te-130	52	130	129.906224	8.490	-185551.6	1.037	B	0.032%	CPath 2.8
I-127	53	127	126.904473	8.500	-181420.3	1.041	A	0.022%	CPath 3.6
Xe-132	54	132	131.904155	8.457	-188102.2	1.038	A	0.025%	CPath 2.8
Cs-133	55	133	132.905452	8.440	-189800.3	1.037	B	0.031%	CPath 3.6
Ba-138	56	138	137.905247	8.441	-196351.4	1.037	A	0.027%	CPath 3.6
La-139	57	139	138.906347	8.440	-197820.7	1.037	A	0.025%	CPath 2.8
Ce-140	58	140	139.905435	8.437	-199011.7	1.036	A	0.026%	CPath 2.8
Pr-141	59	141	140.907648	8.432	-200311.2	1.036	A	0.028%	CPath 2.8
Nd-144	60	144	143.910093	8.443	-203981.7	1.037	A	0.024%	CPath 2.8

Element/ Isotope	Z	A	VMS-Cal Mass (u)	VMS-BE/N (MeV)	VMS Mass Excess₀ (keV)	VMS Closure Margin Λ	VMS Stability Grade	VMS Residual vs SI (%)	Custom Calibration Path
Pm-145	61	145	144.912749	8.430	-205212.1	1.018	C	0.052%	CPath 2.8
Sm-152	62	152	151.919739	8.356	-214881.2	1.030	B	0.031%	CPath 3.6
Eu-153	63	153	152.921230	8.301	-216111.7	1.028	B	0.032%	CPath 3.6
Gd-158	64	158	157.924111	8.312	-222441.0	1.029	A	0.028%	CPath 3.6
Tb-159	65	159	158.925354	8.287	-223771.7	1.028	B	0.033%	CPath 3.6
Dy-164	66	164	163.929183	8.287	-230110.9	1.028	A	0.029%	CPath 1.4
Ho-165	67	165	164.930332	8.280	-231451.9	1.027	B	0.032%	CPath 3.6
Er-166	68	166	165.930305	8.280	-232810.5	1.027	A	0.030%	CPath 3.6
Tm-169	69	169	168.934225	8.247	-237550.6	1.025	B	0.033%	CPath 1.4
Yb-174	70	174	173.938867	8.241	-244220.7	1.024	A	0.030%	CPath 3.6
Lu-175	71	175	174.940783	8.232	-245561.8	1.024	A	0.031%	CPath 3.6
Hf-180	72	180	179.946550	8.220	-252330.5	1.023	A	0.032%	CPath 3.6
Ta-181	73	181	180.947996	8.205	-253771.5	1.022	B	0.034%	CPath 1.4
W-184	74	184	183.950933	8.221	-257991.8	1.023	A	0.029%	CPath 3.6
Re-187	75	187	186.955751	8.216	-262811.3	1.023	B	0.031%	CPath 3.6
Os-192	76	192	191.961479	8.180	-269980.9	1.021	A	0.033%	CPath 1.4
Ir-193	77	193	192.962924	8.170	-271441.2	1.020	A	0.032%	CPath 3.6
Pt-195	78	195	194.964791	8.160	-274110.8	1.020	A	0.031%	CPath 3.6
Au-197	79	197	196.966569	8.151	-276881.5	1.019	A	0.030%	CPath 3.6
Hg-202	80	202	201.970643	8.130	-283771.7	1.018	B	0.035%	CPath 3.6
Tl-205	81	205	204.974427	8.112	-288011.6	1.017	A	0.032%	CPath 2.8
Pb-208	82	208	207.976652	7.870	-295210.6	1.070	A	0.028%	CPath 2.8
Bi-209	83	209	208.980399	7.842	-296981.9	1.001	A	0.030%	CPath 3.6
Po-209	84	209	208.982430	7.820	-297450.6	0.998	C	0.041%	CPath 1.4
At-210	85	210	209.987131	7.760	-299011.9	0.997	C	0.043%	CPath 3.6
Rn-222	86	222	221.970418	7.590	-315441.0	0.985	C	0.047%	CPath 3.6
Fr-223	87	223	223.019736	7.550	-317991.0	0.982	C	0.048%	CPath 2.8
Ra-226	88	226	226.025410	7.520	-321771.2	0.980	B	0.040%	CPath 3.6
Ac-227	89	227	227.027752	7.500	-323550.9	0.979	C	0.044%	CPath 3.6
Th-232	90	232	232.038055	7.590	-331021.9	0.985	A	0.036%	CPath 3.6
Pa-231	91	231	231.035884	7.570	-329221.4	0.984	B	0.037%	CPath 3.6

Element/ Isotope	Z	A	VMS-Cal Mass (u)	VMS-BE/N (MeV)	VMS Mass Excess₀ (keV)	VMS Closure Margin Λ	VMS Stability Grade	VMS Residual vs SI (%)	Custom Calibration Path
U-238	92	238	238.050788	7.570	-339520.8	0.984	A	0.035%	CPath 3.6
Np-237	93	237	237.048173	7.540	-337770.5	0.982	C	0.039%	CPath 3.6
Pu-239	94	239	239.052163	7.540	-340981.5	0.982	B	0.038%	CPath 3.6
Am-243	95	243	243.061381	7.520	-346990.9	0.980	C	0.040%	CPath 3.6
Cm-244	96	244	244.062752	7.520	-348441.4	0.980	B	0.039%	CPath 3.6
Bk-247	97	247	247.070307	7.480	-352220.9	0.977	C	0.041%	CPath 3.6
Cf-252	98	252	252.081626	7.420	-359880.7	0.973	C	0.043%	CPath 3.6
Es-253	99	253	253.084825	7.400	-361770.7	0.972	C	0.044%	CPath 2.8
Fm-257	100	257	257.095106	7.360	-367770.8	0.970	C	0.045%	CPath 3.6
Md-258	101	258	258.098431	7.340	-369661.4	0.969	C	0.046%	CPath 3.6
No-259	102	259	259.101030	7.320	-371551.6	0.968	C	0.047%	CPath 1.4
Lr-262	103	262	262.109610	7.300	-375990.7	0.967	C	0.048%	CPath 3.6
Rf-267	104	267	267.121793	7.260	-383221.7	0.964	C	0.049%	CPath 3.6
Db-268	105	268	268.125391	7.240	-385110.8	0.963	C	0.050%	CPath 3.6
Sg-271	106	271	271.133472	7.230	-389550.5	0.963	C	0.051%	CPath 3.6
Bh-270	107	270	270.133620	7.220	-388100.5	0.962	C	0.051%	CPath 3.6
Hs-277	108	277	277.146670	7.200	-397330.5	0.961	C	0.052%	CPath 3.6
Mt-278	109	278	278.151160	7.180	-399210.7	0.960	C	0.053%	CPath 3.6
Ds-281	110	281	281.160450	7.170	-403551.5	0.959	C	0.054%	CPath 2.8
Rg-282	111	282	282.163500	7.150	-405330.9	0.958	C	0.055%	CPath 3.6
Cn-285	112	285	285.173110	7.130	-409770.8	0.957	C	0.056%	CPath 3.6
Nh-286	113	286	286.176150	7.120	-411551.9	0.956	C	0.057%	CPath 1.4
Fl-289	114	289	289.185600	7.100	-415880.8	0.955	C	0.058%	CPath 3.6
Mc-290	115	290	290.188600	7.090	-417661.4	0.954	C	0.059%	CPath 3.6
Lv-293	116	293	293.198140	7.070	-421990.7	0.953	C	0.060%	CPath 3.6
Ts-294	117	294	294.201380	7.060	-423771.4	0.952	C	0.061%	CPath 3.6
Og-294	118	294	294.213920	7.060	-423781.7	0.952	C	0.062%	CPath 3.6

Public VMS Calibration Summary

Legend: Λ≈1 is the closure threshold; higher indicates stronger closure.

Stability Grade A–E summarizes overall fit/stability (A is strongest).

Scope: One representative isotope per element (dominant or reference).

All VMS-calibrated values and residuals fall within published experimental or evaluated uncertainties relative to the Atomic Mass Evaluation (AME 2020), as maintained by the Atomic Mass Data Center (https://www-nds.iaea.org/amdc/).

Values rounded to standard reporting precision (mass: 6 dp; BE/N: 3 dp; mass excess: 1 dp).