Fundamental Physical Constants — Atomic and nuclear constants

Quantity	Symbol	Value	Unit	Relative std. uncert. u_r
		General		
fine-structure constant $e^2/4\pi\epsilon_0\hbar c$	α	$7.297\,352\,5693(11)\times 10^{-3}$		1.5×10^{-10}
inverse fine-structure constant	α^{-1}	$137.035\,999\,084(21)$		1.5×10^{-10}
Rydberg frequency $\alpha^2 m_e c^2/2h = E_h/2h$	cR_∞	$3.289\,841\,960\,2508(64)\times 10^{15}$	Hz	1.9×10^{-12}
energy equivalent	$hc\,R_\infty$	$2.179\,872\,361\,1035(42)\times 10^{-18}$	J	1.9×10^{-12}
		$13.605\,693\,122\,994(26)$	eV	1.9×10^{-12}
Rydberg constant	R_∞	$10\,973\,731.568\,160(21)$	$[\mathrm{m}^{-1}]^*$	1.9×10^{-12}
Bohr radius $\hbar/\alpha m_e c = 4\pi\epsilon_0\hbar^2/m_e e^2$	a_0	$5.291\,772\,109\,03(80)\times 10^{-11}$	m	1.5×10^{-10}
Hartree energy $\alpha^2 m_e c^2 = e^2/4\pi\epsilon_0 a_0 = 2hcR_\infty$	E_h	$4.359\,744\,722\,2071(85)\times 10^{-18}$	J	1.9×10^{-12}
		$27.211\,386\,245\,988(53)$	eV	1.9×10^{-12}
quantum of circulation	$\pi\hbar/m_e$	$3.636\,947\,5516(11)\times 10^{-4}$	$\mathrm{m^2\,s^{-1}}$	3.0×10^{-10}
	$2\pi\hbar/m_e$	$7.273\,895\,1032(22)\times 10^{-4}$	$\mathrm{m^2\,s^{-1}}$	3.0×10^{-10}
		Electroweak		
Fermi coupling constant†	$G_F/(\hbar c)^3$	$1.166\,3787(6)\times 10^{-5}$	GeV^{-2}	5.1×10^{-7}
weak mixing angle‡ θ_W (on-shell scheme)				
$\sin^2\theta_W = s_W^2 \equiv 1-(m_W/m_Z)^2$	$\sin^2\theta_W$	$0.222\,90(30)$		1.3×10^{-3}
		Electron, e^-		
electron mass	m_e	$9.109\,383\,7015(28)\times 10^{-31}$	kg	3.0×10^{-10}
		$5.485\,799\,090\,65(16)\times 10^{-4}$	u	2.9×10^{-11}
energy equivalent	$m_e c^2$	$8.187\,105\,7769(25)\times 10^{-14}$	J	3.0×10^{-10}
		$0.510\,998\,950\,00(15)$	MeV	3.0×10^{-10}
electron-muon mass ratio	m_e/m_μ	$4.836\,331\,69(11)\times 10^{-3}$		2.2×10^{-8}
electron-tau mass ratio	m_e/m_τ	$2.875\,85(19)\times 10^{-4}$		6.8×10^{-5}
electron-proton mass ratio	m_e/m_p	$5.446\,170\,214\,87(33)\times 10^{-4}$		6.0×10^{-11}
electron-neutron mass ratio	m_e/m_n	$5.438\,673\,4424(26)\times 10^{-4}$		4.8×10^{-10}
electron-deuteron mass ratio	m_e/m_d	$2.724\,437\,107\,462(96)\times 10^{-4}$		3.5×10^{-11}
electron-triton mass ratio	m_e/m_t	$1.819\,200\,062\,251(90)\times 10^{-4}$		5.0×10^{-11}
electron-helion mass ratio	m_e/m_h	$1.819\,543\,074\,573(79)\times 10^{-4}$		4.3×10^{-11}
electron to alpha particle mass ratio	m_e/m_α	$1.370\,933\,554\,787(45)\times 10^{-4}$		3.3×10^{-11}
electron charge to mass quotient	$-e/m_e$	$-1.758\,820\,010\,76(53)\times 10^{11}$	$\mathrm{C\,kg^{-1}}$	3.0×10^{-10}
electron molar mass $N_A m_e$	$M(e), M_e$	$5.485\,799\,0888(17)\times 10^{-7}$	$\mathrm{kg\,mol^{-1}}$	3.0×10^{-10}
reduced Compton wavelength $\hbar/m_e c = \alpha a_0$	$ƛ_C$	$3.861\,592\,6796(12)\times 10^{-13}$	m	3.0×10^{-10}
Compton wavelength	λ_C	$2.426\,310\,238\,67(73)\times 10^{-12}$	[m]*	3.0×10^{-10}
classical electron radius $\alpha^2 a_0$	r_e	$2.817\,940\,3262(13)\times 10^{-15}$	m	4.5×10^{-10}
Thomson cross section $(8\pi/3)r_e^2$	σ_e	$6.652\,458\,7321(60)\times 10^{-29}$	$\mathrm{m^2}$	9.1×10^{-10}
electron magnetic moment	μ_e	$-9.284\,764\,7043(28)\times 10^{-24}$	$\mathrm{J\,T^{-1}}$	3.0×10^{-10}
to Bohr magneton ratio	μ_e/μ_B	$-1.001\,159\,652\,181\,28(18)$		1.7×10^{-13}
to nuclear magneton ratio	μ_e/μ_N	$-1838.281\,971\,88(11)$		6.0×10^{-11}
electron magnetic moment anomaly $\|\mu_e\|/\mu_B - 1$	a_e	$1.159\,652\,181\,28(18)\times 10^{-3}$		1.5×10^{-10}
electron g-factor $-2(1+a_e)$	g_e	$-2.002\,319\,304\,362\,56(35)$		1.7×10^{-13}
electron-muon magnetic moment ratio	μ_e/μ_μ	$206.766\,9883(46)$		2.2×10^{-8}
electron-proton magnetic moment ratio	μ_e/μ_p	$-658.210\,687\,89(20)$		3.0×10^{-10}
electron to shielded proton magnetic moment ratio (H_2O, sphere, 25 °C)	μ_e/μ'_p	$-658.227\,5971(72)$		1.1×10^{-8}
electron-neutron magnetic moment ratio	μ_e/μ_n	$960.920\,50(23)$		2.4×10^{-7}
electron-deuteron magnetic moment ratio	μ_e/μ_d	$-2143.923\,4915(56)$		2.6×10^{-9}
electron to shielded helion magnetic				

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moment ratio (gas, sphere, 25 °C)	μ_e/μ'_h	$864.058\,257(10)$		1.2×10^{-8}
electron gyromagnetic ratio $2\lvert\mu_e\rvert/\hbar$	γ_e	$1.760\,859\,630\,23(53) \times 10^{11}$	$s^{-1}\,T^{-1}$	3.0×10^{-10}
		$28\,024.951\,4242(85)$	$MHz\,T^{-1}$	3.0×10^{-10}
		Muon, μ^-		
muon mass	m_μ	$1.883\,531\,627(42) \times 10^{-28}$	kg	2.2×10^{-8}
		$0.113\,428\,9259(25)$	u	2.2×10^{-8}
energy equivalent	$m_\mu c^2$	$1.692\,833\,804(38) \times 10^{-11}$	J	2.2×10^{-8}
		$105.658\,3755(23)$	MeV	2.2×10^{-8}
muon-electron mass ratio	m_μ/m_e	$206.768\,2830(46)$		2.2×10^{-8}
muon-tau mass ratio	m_μ/m_τ	$5.946\,35(40) \times 10^{-2}$		6.8×10^{-5}
muon-proton mass ratio	m_μ/m_p	$0.112\,609\,5264(25)$		2.2×10^{-8}
muon-neutron mass ratio	m_μ/m_n	$0.112\,454\,5170(25)$		2.2×10^{-8}
muon molar mass $N_A m_\mu$	$M(\mu), M_\mu$	$1.134\,289\,259(25) \times 10^{-4}$	$kg\,mol^{-1}$	2.2×10^{-8}
reduced muon Compton wavelength $\hbar/m_\mu c$	$\lambda\!\!\!^{-}_{C,\mu}$	$1.867\,594\,306(42) \times 10^{-15}$	m	2.2×10^{-8}
muon Compton wavelength	$\lambda_{C,\mu}$	$1.173\,444\,110(26) \times 10^{-14}$	[m]*	2.2×10^{-8}
muon magnetic moment	μ_μ	$-4.490\,448\,30(10) \times 10^{-26}$	$J\,T^{-1}$	2.2×10^{-8}
to Bohr magneton ratio	μ_μ/μ_B	$-4.841\,970\,47(11) \times 10^{-3}$		2.2×10^{-8}
to nuclear magneton ratio	μ_μ/μ_N	$-8.890\,597\,03(20)$		2.2×10^{-8}
muon magnetic moment anomaly				
$\lvert\mu_\mu\rvert/(e\hbar/2m_\mu) - 1$	a_μ	$1.165\,920\,89(63) \times 10^{-3}$		5.4×10^{-7}
muon g-factor $-2(1 + a_\mu)$	g_μ	$-2.002\,331\,8418(13)$		6.3×10^{-10}
muon-proton magnetic moment ratio	μ_μ/μ_p	$-3.183\,345\,142(71)$		2.2×10^{-8}
		Tau, τ^-		
tau mass§	m_τ	$3.167\,54(21) \times 10^{-27}$	kg	6.8×10^{-5}
		$1.907\,54(13)$	u	6.8×10^{-5}
energy equivalent	$m_\tau c^2$	$2.846\,84(19) \times 10^{-10}$	J	6.8×10^{-5}
		$1776.86(12)$	MeV	6.8×10^{-5}
tau-electron mass ratio	m_τ/m_e	$3477.23(23)$		6.8×10^{-5}
tau-muon mass ratio	m_τ/m_μ	$16.8170(11)$		6.8×10^{-5}
tau-proton mass ratio	m_τ/m_p	$1.893\,76(13)$		6.8×10^{-5}
tau-neutron mass ratio	m_τ/m_n	$1.891\,15(13)$		6.8×10^{-5}
tau molar mass $N_A m_\tau$	$M(\tau), M_\tau$	$1.907\,54(13) \times 10^{-3}$	$kg\,mol^{-1}$	6.8×10^{-5}
reduced tau Compton wavelength $\hbar/m_\tau c$	$\lambda\!\!\!^{-}_{C,\tau}$	$1.110\,538(75) \times 10^{-16}$	m	6.8×10^{-5}
tau Compton wavelength	$\lambda_{C,\tau}$	$6.977\,71(47) \times 10^{-16}$	[m]*	6.8×10^{-5}
		Proton, p		
proton mass	m_p	$1.672\,621\,923\,69(51) \times 10^{-27}$	kg	3.1×10^{-10}
		$1.007\,276\,466\,621(53)$	u	5.3×10^{-11}
energy equivalent	$m_p c^2$	$1.503\,277\,615\,98(46) \times 10^{-10}$	J	3.1×10^{-10}
		$938.272\,088\,16(29)$	MeV	3.1×10^{-10}
proton-electron mass ratio	m_p/m_e	$1836.152\,673\,43(11)$		6.0×10^{-11}
proton-muon mass ratio	m_p/m_μ	$8.880\,243\,37(20)$		2.2×10^{-8}
proton-tau mass ratio	m_p/m_τ	$0.528\,051(36)$		6.8×10^{-5}
proton-neutron mass ratio	m_p/m_n	$0.998\,623\,478\,12(49)$		4.9×10^{-10}
proton charge to mass quotient	e/m_p	$9.578\,833\,1560(29) \times 10^{7}$	$C\,kg^{-1}$	3.1×10^{-10}
proton molar mass $N_A m_p$	$M(p), M_p$	$1.007\,276\,466\,27(31) \times 10^{-3}$	$kg\,mol^{-1}$	3.1×10^{-10}
reduced proton Compton wavelength $\hbar/m_p c$	$\lambda\!\!\!^{-}_{C,p}$	$2.103\,089\,103\,36(64) \times 10^{-16}$	m	3.1×10^{-10}
proton Compton wavelength	$\lambda_{C,p}$	$1.321\,409\,855\,39(40) \times 10^{-15}$	[m]*	3.1×10^{-10}
proton rms charge radius	r_p	$8.414(19) \times 10^{-16}$	m	2.2×10^{-3}

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Quantity	Symbol	Value	Unit	Relative std. uncert. u_r
proton magnetic moment	μ_p	$1.410\,606\,797\,36(60) \times 10^{-26}$	J T^{-1}	4.2×10^{-10}
to Bohr magneton ratio	μ_p/μ_B	$1.521\,032\,202\,30(46) \times 10^{-3}$		3.0×10^{-10}
to nuclear magneton ratio	μ_p/μ_N	$2.792\,847\,344\,63(82)$		2.9×10^{-10}
proton g-factor $2\mu_p/\mu_N$	g_p	$5.585\,694\,6893(16)$		2.9×10^{-10}
proton-neutron magnetic moment ratio	μ_p/μ_n	$-1.459\,898\,05(34)$		2.4×10^{-7}
shielded proton magnetic moment (H_2O, sphere, 25 °C)	μ'_p	$1.410\,570\,560(15) \times 10^{-26}$	J T^{-1}	1.1×10^{-8}
to Bohr magneton ratio	μ'_p/μ_B	$1.520\,993\,128(17) \times 10^{-3}$		1.1×10^{-8}
to nuclear magneton ratio	μ'_p/μ_N	$2.792\,775\,599(30)$		1.1×10^{-8}
proton magnetic shielding correction $1 - \mu'_p/\mu_p$ (H_2O, sphere, 25 °C)	σ'_p	$2.5689(11) \times 10^{-5}$		4.2×10^{-4}
proton gyromagnetic ratio $2\mu_p/\hbar$	γ_p	$2.675\,221\,8744(11) \times 10^{8}$	s^{-1} T^{-1}	4.2×10^{-10}
		$42.577\,478\,518(18)$	MHz T^{-1}	4.2×10^{-10}
shielded proton gyromagnetic ratio $2\mu'_p/\hbar$ (H_2O, sphere, 25 °C)	γ'_p	$2.675\,153\,151(29) \times 10^{8}$	s^{-1} T^{-1}	1.1×10^{-8}
		$42.576\,384\,74(46)$	MHz T^{-1}	1.1×10^{-8}
		Neutron, n		
neutron mass	m_n	$1.674\,927\,498\,04(95) \times 10^{-27}$	kg	5.7×10^{-10}
		$1.008\,664\,915\,95(49)$	u	4.8×10^{-10}
energy equivalent	$m_n c^2$	$1.505\,349\,762\,87(86) \times 10^{-10}$	J	5.7×10^{-10}
		$939.565\,420\,52(54)$	MeV	5.7×10^{-10}
neutron-electron mass ratio	m_n/m_e	$1838.683\,661\,73(89)$		4.8×10^{-10}
neutron-muon mass ratio	m_n/m_μ	$8.892\,484\,06(20)$		2.2×10^{-8}
neutron-tau mass ratio	m_n/m_τ	$0.528\,779(36)$		6.8×10^{-5}
neutron-proton mass ratio	m_n/m_p	$1.001\,378\,419\,31(49)$		4.9×10^{-10}
neutron-proton mass difference	$m_n - m_p$	$2.305\,574\,35(82) \times 10^{-30}$	kg	3.5×10^{-7}
		$1.388\,449\,33(49) \times 10^{-3}$	u	3.5×10^{-7}
energy equivalent	$(m_n - m_p)c^2$	$2.072\,146\,89(74) \times 10^{-13}$	J	3.5×10^{-7}
		$1.293\,332\,36(46)$	MeV	3.5×10^{-7}
neutron molar mass $N_A m_n$	$M(n), M_n$	$1.008\,664\,915\,60(57) \times 10^{-3}$	kg mol^{-1}	5.7×10^{-10}
reduced neutron Compton wavelength $\hbar/m_n c$	$\lambda\!\!\!^{-}_{C,n}$	$2.100\,194\,1552(12) \times 10^{-16}$	m	5.7×10^{-10}
neutron Compton wavelength	$\lambda_{C,n}$	$1.319\,590\,905\,81(75) \times 10^{-15}$	[m]*	5.7×10^{-10}
neutron magnetic moment	μ_n	$-9.662\,3651(23) \times 10^{-27}$	J T^{-1}	2.4×10^{-7}
to Bohr magneton ratio	μ_n/μ_B	$-1.041\,875\,63(25) \times 10^{-3}$		2.4×10^{-7}
to nuclear magneton ratio	μ_n/μ_N	$-1.913\,042\,73(45)$		2.4×10^{-7}
neutron g-factor $2\mu_n/\mu_N$	g_n	$-3.826\,085\,45(90)$		2.4×10^{-7}
neutron-electron magnetic moment ratio	μ_n/μ_e	$1.040\,668\,82(25) \times 10^{-3}$		2.4×10^{-7}
neutron-proton magnetic moment ratio	μ_n/μ_p	$-0.684\,979\,34(16)$		2.4×10^{-7}
neutron to shielded proton magnetic moment ratio (H_2O, sphere, 25 °C)	μ_n/μ'_p	$-0.684\,996\,94(16)$		2.4×10^{-7}
neutron gyromagnetic ratio $2\|\mu_n\|/\hbar$	γ_n	$1.832\,471\,71(43) \times 10^{8}$	s^{-1} T^{-1}	2.4×10^{-7}
		$29.164\,6931(69)$	MHz T^{-1}	2.4×10^{-7}
		Deuteron, d		
deuteron mass	m_d	$3.343\,583\,7724(10) \times 10^{-27}$	kg	3.0×10^{-10}
		$2.013\,553\,212\,745(40)$	u	2.0×10^{-11}
energy equivalent	$m_d c^2$	$3.005\,063\,231\,02(91) \times 10^{-10}$	J	3.0×10^{-10}
		$1875.612\,942\,57(57)$	MeV	3.0×10^{-10}
deuteron-electron mass ratio	m_d/m_e	$3670.482\,967\,88(13)$		3.5×10^{-11}

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deuteron-proton mass ratio	m_d/m_p	$1.999\,007\,501\,39(11)$		5.6×10^{-11}
deuteron molar mass $N_A m_d$	$M(d), M_d$	$2.013\,553\,212\,05(61) \times 10^{-3}$	kg mol^{-1}	3.0×10^{-10}
deuteron rms charge radius	r_d	$2.127\,99(74) \times 10^{-15}$	m	3.5×10^{-4}
deuteron magnetic moment	μ_d	$4.330\,735\,094(11) \times 10^{-27}$	J T^{-1}	2.6×10^{-9}
to Bohr magneton ratio	μ_d/μ_B	$4.669\,754\,570(12) \times 10^{-4}$		2.6×10^{-9}
to nuclear magneton ratio	μ_d/μ_N	$0.857\,438\,2338(22)$		2.6×10^{-9}
deuteron g-factor μ_d/μ_N	g_d	$0.857\,438\,2338(22)$		2.6×10^{-9}
deuteron-electron magnetic moment ratio	μ_d/μ_e	$-4.664\,345\,551(12) \times 10^{-4}$		2.6×10^{-9}
deuteron-proton magnetic moment ratio	μ_d/μ_p	$0.307\,012\,209\,39(79)$		2.6×10^{-9}
deuteron-neutron magnetic moment ratio	μ_d/μ_n	$-0.448\,206\,53(11)$		2.4×10^{-7}
		Triton, t		
triton mass	m_t	$5.007\,356\,7446(15) \times 10^{-27}$	kg	3.0×10^{-10}
		$3.015\,500\,716\,21(12)$	u	4.0×10^{-11}
energy equivalent	$m_t c^2$	$4.500\,387\,8060(14) \times 10^{-10}$	J	3.0×10^{-10}
		$2808.921\,132\,98(85)$	MeV	3.0×10^{-10}
triton-electron mass ratio	m_t/m_e	$5496.921\,535\,73(27)$		5.0×10^{-11}
triton-proton mass ratio	m_t/m_p	$2.993\,717\,034\,14(15)$		5.0×10^{-11}
triton molar mass $N_A m_t$	$M(t), M_t$	$3.015\,500\,715\,17(92) \times 10^{-3}$	kg mol^{-1}	3.0×10^{-10}
triton magnetic moment	μ_t	$1.504\,609\,5202(30) \times 10^{-26}$	J T^{-1}	2.0×10^{-9}
to Bohr magneton ratio	μ_t/μ_B	$1.622\,393\,6651(32) \times 10^{-3}$		2.0×10^{-9}
to nuclear magneton ratio	μ_t/μ_N	$2.978\,962\,4656(59)$		2.0×10^{-9}
triton g-factor $2\mu_t/\mu_N$	g_t	$5.957\,924\,931(12)$		2.0×10^{-9}
		Helion, h		
helion mass	m_h	$5.006\,412\,7796(15) \times 10^{-27}$	kg	3.0×10^{-10}
		$3.014\,932\,247\,175(97)$	u	3.2×10^{-11}
energy equivalent	$m_h c^2$	$4.499\,539\,4125(14) \times 10^{-10}$	J	3.0×10^{-10}
		$2808.391\,607\,43(85)$	MeV	3.0×10^{-10}
helion-electron mass ratio	m_h/m_e	$5495.885\,280\,07(24)$		4.3×10^{-11}
helion-proton mass ratio	m_h/m_p	$2.993\,152\,671\,67(13)$		4.4×10^{-11}
helion molar mass $N_A m_h$	$M(h), M_h$	$3.014\,932\,246\,13(91) \times 10^{-3}$	kg mol^{-1}	3.0×10^{-10}
helion magnetic moment	μ_h	$-1.074\,617\,532(13) \times 10^{-26}$	J T^{-1}	1.2×10^{-8}
to Bohr magneton ratio	μ_h/μ_B	$-1.158\,740\,958(14) \times 10^{-3}$		1.2×10^{-8}
to nuclear magneton ratio	μ_h/μ_N	$-2.127\,625\,307(25)$		1.2×10^{-8}
helion g-factor $2\mu_h/\mu_N$	g_h	$-4.255\,250\,615(50)$		1.2×10^{-8}
shielded helion magnetic moment (gas, sphere, 25 °C)	μ'_h	$-1.074\,553\,090(13) \times 10^{-26}$	J T^{-1}	1.2×10^{-8}
to Bohr magneton ratio	μ'_h/μ_B	$-1.158\,671\,471(14) \times 10^{-3}$		1.2×10^{-8}
to nuclear magneton ratio	μ'_h/μ_N	$-2.127\,497\,719(25)$		1.2×10^{-8}
shielded helion to proton magnetic moment ratio (gas, sphere, 25 °C)	μ'_h/μ_p	$-0.761\,766\,5618(89)$		1.2×10^{-8}
shielded helion to shielded proton magnetic moment ratio (gas/H_2O, spheres, 25 °C)	μ'_h/μ'_p	$-0.761\,786\,1313(33)$		4.3×10^{-9}
shielded helion gyromagnetic ratio $2\lvert\mu'_h\rvert/\hbar$ (gas, sphere, 25 °C)	γ'_h	$2.037\,894\,569(24) \times 10^{8}$	s^{-1} T^{-1}	1.2×10^{-8}
		$32.434\,099\,42(38)$	MHz T^{-1}	1.2×10^{-8}
		Alpha particle, α		
alpha particle mass	m_α	$6.644\,657\,3357(20) \times 10^{-27}$	kg	3.0×10^{-10}
		$4.001\,506\,179\,127(63)$	u	1.6×10^{-11}

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energy equivalent	$m_{\alpha}c^2$	$5.971\,920\,1914(18)\times10^{-10}$	J	3.0×10^{-10}
		$3727.379\,4066(11)$	MeV	3.0×10^{-10}
alpha particle to electron mass ratio	$m_{\alpha}/m_{\mathrm{e}}$	$7294.299\,541\,42(24)$		3.3×10^{-11}
alpha particle to proton mass ratio	$m_{\alpha}/m_{\mathrm{p}}$	$3.972\,599\,690\,09(22)$		5.5×10^{-11}
alpha particle molar mass $N_{\mathrm{A}}m_{\alpha}$	$M(\alpha), M_{\alpha}$	$4.001\,506\,1777(12)\times10^{-3}$	kg mol^{-1}	3.0×10^{-10}

[*] The full description of m^{-1} is cycles or periods per meter and that of m is meter per cycle (m/cycle). The scientific community is aware of the implied use of these units. It traces back to the conventions for phase and angle and the use of unit Hz versus cycles/s. No solution has been agreed upon.

[†] Value recommended by the Particle Data Group (Tanabashi, *et al.*, 2018).

[‡] Based on the ratio of the masses of the W and Z bosons $m_{\mathrm{W}}/m_{\mathrm{Z}}$ recommended by the Particle Data Group (Tanabashi, *et al.*, 2018). The value for $\sin^2\theta_{\mathrm{W}}$ they recommend, which is based on a variant of the modified minimal subtraction ($\overline{\mathrm{MS}}$) scheme, is $\sin^2\hat{\theta}_{\mathrm{W}}(M_{\mathrm{Z}}) = 0.231\,22(4)$.

[§] This and other constants involving m_{τ} are based on $m_{\tau}c^2$ in MeV recommended by the Particle Data Group (Tanabashi, *et al.*, 2018).