Fundamental Information from Combined Analysis of Nuclear Data and Particle Masses

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Empirical observations of the Standard Model parameters which are unexpectedly manifested simulteniousely in the prominent maxima in spacing distributions of nuclear excitations [1] and stable intervals in total distribution of particle mass differences allow us to conclude that their combined analysis demonstrate the universal character of the parameters $\delta = 16m_e$ and m_e.

Table 1: Comparison of the number of fermions in the central field (top line, N^{ferm}) with numbers N in a representation $N \cdot \delta$ of masses m_μ, f_π, $m_{\pi^\pm}$, ΔM_Δ and ratios m_e/M_q, m_μ/M_Z, $f_\pi/(2/3)m_t$, $\Delta M_\Delta/M_{H^0}$.

N^{ferm}16	16·13-1=L	16·16	16·17+1	16·18
N(δ) N = 1	13	16	17	18
Part. δ	m_μ	f_π	$m_{\pi^\pm}$	ΔM_Δ
Value in MeV	106.0	130	140	147
Ratio. m_e/M_q	m_μ/M_Z	f_π/M'_H		$\Delta M_\Delta/M_{H^0}$
Value $\alpha/2\pi$	$115.87 \cdot 10^{-5}$	$114 \cdot 10^{-5}$		$117 \cdot 10^{-5}$
Comm.	hole in 1p	filled shells	valence	
ECQM		$M^\omega{}_q = 3f_\pi$		$M_q = 3\Delta M_\Delta$

In Table 1 numbers of fermions in the central field (top, N_{ferm}) are compared with numbers N in a representation $N \cdot \delta$ of the masses m_μ, f_π, $m_{\pi^\pm}$, ΔM_Δ and ratios m_e/M_q, m_μ/M_Z, $f_\pi/(2/3)m_t$, $\Delta M_\Delta/M_{H^0}$. Boxed are hole configuration in $1p$ shell ($1s^4_{1/2}$, $1p^8_{3/2}$, $1p^{1/2}$) and valence configuration over the shells $1s^{1/2}_4$, $1p^{3/2}_8$, $1p^{1/2}_4$ (n=N in Table 3, center).

Table 2: Particle masses (in MeV) of different generations (families).

Particle	Lepton	Mass	Quark Q=2/3	Mass	Quark Q=-1/3	Mass
1 fam.	e	0.511	u-quark	2.16(49)	d	4.67(48)
		m_e	($3m_e$)	(1.53) [6]	$9m_e$	4.60
2 fam.	μ	105.658	c	1270(20)	s	93(11)
			$9m_\pi$	1256		
3 fam.	τ	1776.86(12)	t	172900	b	4180(30)
$2m_\mu + 4M_q^\omega$		1776.62(24)			$9M_q =$	3959
$2m_\mu + 192\delta$		1781,108				
$2m_{K^*}$		1783.52(150)				

Table 3: Representation [2] of particle masses (3 top sections) and nuclear data (bottom) by the expression n·16m$_e$$(\alpha/2\pi)^X$M with QED correction to the mass $\alpha/2\pi$, where X is the degree and M is the factor. Boxed values m$_\mu$, M_Z, M_{H°, δ°, δ, δ', δ'' and $\Delta M_\Delta = m_s$, m$_e$/3 are considered in [2]. Double boxed are the constituent quark masses. Intervals in nuclear binding energies (X=0) and fine structure in nuclear states are considered elsewhere.

X	M	n = 1	n = 13	n = 16	n = 17	n = 18
-1	3/2			m$_t$=173.2		
GeV	1	$16M_q=\delta^\circ$	M_Z=91.2	M'_H=115		M_{H°=125
0	1	$16m_e=2m_d-2m_e$	m_μ=106	f_π=130.7	m_π, Λ_{QCD}	ΔM_Δ=147
MeV	1	ΔE_B	106	130	140	147
	2		212	262		296
	3	NRCQM		M_q^ω=391		M_q=441
	4	Radial excit.			$(b\tilde{b})$=563.0	$(c\tilde{c})$=589.1
	6			m_ω=782		$2M_q$=882
	9				m_c=1270(20)	
	10	$m_\Lambda = 19m_\pi$			1390-1407	
	12	$m_\Omega = 12m_\pi$			1671-1688	
	60	Fig. 7 [3]				8848
	64	$\eta_b(1S)$, $\Upsilon(1S)$				9399-9460
1	1	$16m_e=\delta=8\varepsilon_\circ$			$k\delta$-m$_n$-m$_e$=161.651	170 = m$_e$/3
keV	$8{,}8 \cdot 4$	CODATA	3936	δm_N=1293.3		
1	1	$9.5=\delta'=8\varepsilon'$	123	152	Δ^{TF}=161	170 (Sn)
keV	2		247 (^{91}Zr)		322 (^{33}S)	340 (^{100}Mo)
2	1, 4	$11=\delta''=8\varepsilon''$	143 (As)		749 (Br, Sb)	Neutron
eV	4, 8		570 (Sb)		1500 (Sb, Pd)	reson.

Table 4. Parameters of the particles from the PDG-2022 compilation.

No	No	mass MeV	uncert. MeV	part.	prop.	Comm.
1		leptons				
	1	0.51099895		e	1/2	
	2	105.6583755		μ	1/2	
	3	1776.86	0.12	τ	1/2	
2		light	unflavored	mesons		
	4	134.9768	0.0005	π°	$1^-(0^{-+})$	
	5	139.57039	0.00018	$\pi^\pm$	$1^-(0^-)$	
	6	547.862	0.017	η	$0^+(0^{-+})$	
	7	775.26	0.23	$\rho(770)$	$1^+(1^{--})$	
	8	782.66	0.13	$\omega(782)$	$0^-(1^{--})$	
	9	957.78	0.06	$\eta'(958)$	$0^+(0^{-+})$	
	10	1019.461	0.016	$\phi(1020)$	$0^-(1^{--})$	
	11	1166	6	$h_1(1170)$	$0^-(1^{+-})$	
	12	1229.5	3.2	$b_1(1235)$	$1^+(1^{+-})$	
	13	1275.5	0.8	$f_2(1270)$	$0^+(2^{++})$	
	14	1281.9	0.5	$f_1(1285)$	$0^+(1^{++})$	
	15	1294	4	$\eta(1295)$	$0^+(0^{-+})$	
	16	1318.2	0.6	$a_2(1320)$	$1^-(2^{++})$	
	17	1408.8	2.0	$\eta(1405)$	$0^+(0^{-+})$	
	18	1416	8	$h_1(1415)$	$0^-(1^{+-})$	
	19	1426.3	0.9	$f_1(1420)$	$0^+(1^{++})$	
	20	1475	4	$\eta(1475)$	$0^+(0^{-+})$	
	21	1506	6	$f_0(1500)$	$0^+(0^{++})$	
	22	1517.4	2.5	$f_2'(1525)$	$0^+(2^{++})$	
	23	1661	11	$\pi_1(1600)$	$1^-(1^{-+})$	
	24	1617	5	$\eta_2(1645)$	$0^+(2^{-+})$	

No	No	mass MeV	uncert. MeV	part.	prop.	Comm.
	25	1667	4	$\omega_3(1670)$	$0^-(3^{--})$	
	26	1670.6	2.9	$\pi_2(1670)$	$1^-(2^{-+})$	
	27	1688.8	2.1	$\rho_3(1690)$	$1^+(3^{--})$	
	28	1704	12	$f_0(1710)$	$0^+(0^{++})$	
	29	1810	9	$\pi(1800)$	$1^-(0^{-+})$	
	30	1854	7	$\phi_3(1850)$	$0^-(3^{--})$	
	31	1842	8	$\eta_2(1870)$	$0^+(2^{-+})$	
	32	1936	12	$f_2(1950)$	$0^+(2^{++})$	
	33	1967	16	$a_4(1970)$	$1^-(4^{++})$	
	34	2018	11	$f_4(2050)$	$0^+(4^{++})$	
	35	2162	7	$\phi(2170)$	$0^-(1^{--})$	
3		strange	mesons			
	36	493.677	0.016	$K^\pm$	$1/2(0^-)$	
	37	497.611	0.013	K°	$1/2(0^-)$	
	38	891.67	0.26	$K^*(892)^{*\pm}$	$1/2(1^-)$	
	39	895.55	0.20	$K^*(892)^{*\circ}$	$1/2(1^-)$	
	40	1253	7	$K_1(1270)$	$1/2(1^+)$	
	41	1403	7	$K_1(1400)$	$1/2(1^+)$	
	42	1414	15	$K^*(1410)$	$1/2(1^-)$	
	43	1427.3	1.5	$K_2^*(1430)^\pm$	$1/2(2^+)$	
	44	1432.4	1.3	$K_2^*(1430)^\circ$	$1/2(2^+)$	
	45	1773	8	$K_2(1770)$	$1/2(2^-)$	
	46	1779	8	$K_3^*(1780)$	$1/2(3^-)$	

Table 4. Continued.

No	No	mass MeV	uncert. MeV	part.	prop.	Comm.
	47	1819	12	$K_2(1820)$	$1/2(2^-)$	
	48	2048	8	$K_4^*(2045)$	$1/2(4^+)$	
4		charmed		mesons		
	49	1864.84	0.05	D°	$1/2(0^-)$	
	50	1869.66	0.05	$D^\pm$	$1/2(0^-)$	
	51	2006.85	0.05	$D^*(2007)^\circ$	$1/2(1^-)$	
	52	2010.26	0.05	$D^*(2010)^\pm$	$1/2(1^-)$	
	53	2343	10	$D_0^*(2300)$	$1/2(0^+)$	
	54	2422.1	0.6	$D_1(2420)$	$1/2(1^+)$	
	55	2412	9	$D_1(2430)^\circ$	$1/2(1^+)$	
	56	2461.10	0.8	$D_2^*(2460)$	$1/2(2^+)$	
	57	2763.1	3.2	$D_3^*(2750)$	$1/2(3^-)$	
5		charmed,		strange	mesons	
	58	1968.35	0.07	$D_s^\pm$	$0^+(0^-)$	
	59	2112.2	0.4	$D_s^{*\pm}$	$0(?^?)$	
	60	2317.8	0.5	$D_{so}^*(2317)^\pm$	$0(0^+)$	
	61	2459.5	0.6	$D_{s1}(2460)^\pm$	$0(1^+)$	
	62	2535.11	0.06	$D_{s1}(2536)^\pm$	$0(1^+)$	
	63	2569.1	0.8	$D_{s2}^*(2573)$	$0(2^+)$	
	64	2714	5	$D_{s1}^*(2700)^\pm$	$0(1^-)$	
6		bottom		mesons		
	65	5279.34	0.12	$B^\pm$	$1/2(0^-)$	
	66	5279.66	0.12	B°	$1/2(0^-)$	
	67	5324.71	0.21	B^*	$1/2(1^-)$	
	68	5725.9	2.7	$B_1(5721)^+$	$1/2(1^+)$	

No	No	mass MeV	uncert. MeV	part.	prop.	Comm.
	69	5726.1	1.3	$B_1(5721)^\circ$	$1/2(1^+)$	
	70	5737.2	0.7	$B_2^*(5747)^+$	$1/2(2^+)$	
	71	5739.5	0.7	$B_2^*(5747)^\circ$	$1/2(2^+)$	
	72	5964	5	$B_J(5970)^+$	$1/2(?^?)$	
	73	5971	5	$B_J(5970)^\circ$	$1/2(?^?)$	
7		bottom,		strange	mesons	
	74	5366.92	0.10	B_s°	$0(0^-)$	
	75	5415.4	1.5	B_s^*	$0(1^-)$	
	76	5828.70	0.20	$B_{s1}(5830)^\circ$	$0(1^+)$	
	77	5839.86	0.12	$B_{s2}(5640)^\circ$	$0(2^+)$	
8		bottom,		charmed	mesons	
	78	6274.47	0.32	B_c^+	$0(0^-)$	
	79	6871.2	1.0	$B_c(2S)^\pm$	$0(0^-)$	
9		$c\bar{c}$	mesons			
	80	2983.9	0.4	$\eta_c(1S)$	$0^+(0^{-+})$	
	81	3096.900	0.006	$J\psi(1S)$	$0^-(1^{--})$	
	82	3414.71	0.30	$\chi_{c0}(1P)$	$0^+(0^{++})$	
	83	3510.67	0.05	$\chi_{c1}(1P)$	$0^+(1^{++})$	
	84	3525.38	0.11	$h_c(1P)$	$0^-(1^{+-})$	
	85	3556.17	0.07	$\chi_{c2}(1P)$	$0^+(2^{++})$	
	86	3637.5	1.1	$\eta_c(2S)$	$0^+(0^{-+})$	
	87	3686.10	0.06	$\psi(2S)$	$0^-(1^{--})$	
	88	3773.7	0.4	$\psi(3770)$	$0^-(1^{--})$	
	89	3823.7	0.5	$\psi_2(3823)$	$0^-(2^{--})$	

Table 4. Continued.

No No	mass MeV	uncert. MeV	part.	prop.	Comm.
90	3842.71	0.20	$\psi_3(3842)$	$0^-(3^{--})$	
91	3871.65	0.06	$\chi_{c1}(3872)$	$0^+(1^{++})$	
92	3887.1	2.6	$Z_c(3900)$	$1^+(1^{+-})$	
93	3921.7	1.8	$X(3915)$	$0^+(0^{++})$	
94	3922.5	1.0	$\chi_{c2}(3930)$	$0^+(2^{++})$	
95	4024.1	1.9	$X(4020)^{\pm}$	$1^+(?^{?-})$	
96	4039	1	$\psi(4040)$	$0^-(1^{--})$	
97	4146.5	3.0	$\chi_{c1}(4140)$	$0^+(1^{++})$	
98	4191	5	$\psi(4160)$	$0^-(1^{--})$	
99	4222.7	2.6	$\psi(4230)$	$0^-(1^{--})$	
100	4286	8	$\chi_{c1}(4274)$	$0^+(1^{++})$	
101	4372	9	$\psi(4360)$	$0^-(1^{--})$	
102	4421	4	$\psi(4415)$	$0^-(1^{--})$	
103	4630	6	$\psi(4660)$	$0^-(1^{--})$	
10		$b\bar{b}$	mesons		
104	9398.7	2.0	$\eta_b(1S)$	$0^+(0^{-+})$	
105	9460.30	0.26	$\Upsilon(1S)$	$0^-(1^{--})$	
106	9859.44	0.42	$\chi_{b0}(1P)$	$0^+(0^{++})$	
107	9892.78	0.26	$\chi_{b1}(1P)$	$0^+(1^{++})$	
108	9899.3	0.8	$h_b(1P)$	$0^-(1^{+-})$	
109	9912.21	0.26	$\chi_{b2}(1P)$	$0^+(2^{++})$	
110	10023.26	0.31	$\Upsilon(2S)$	$0^-(1^{--})$	
111	10163.7	1.4	$\Upsilon_2(1D)$	$0^-(2^{--})$	
112	10232.5	0.4	$\chi_{b0}(2P)$	$0^+(0^{++})$	

No No	mass MeV	uncert. MeV	part.	prop.	Comm.
113	10255.46	0.50	$\chi_{b1}(2P)$	$0^+(1^{++})$	
114	10259.8	1.2	$h_b(2P)$	$0^-(1^{+-})$	
115	10268.65	0.50	$\chi_{b2}(2P)$	$0^+(2^{++})$	
116	10355.2	0.5	$\Upsilon(3S)$	$0^-(1^{--})$	
117	10513.4	0.7	$\chi_{b1}(3P)$	$0^+(1^{+}+)$	
118	10524.0	0.8	$\chi_{b2}(3P)$	$0^+(2^{++})$	
119	10579.4	1.2	$\Upsilon(4S)$	$0^-(1^{--})$	
120	10607.2	2.0	$Z_b(10610)$	$1^+(1^{+-})$	
121	10652.2	1.5	$Z_b(10650)$	$1^+(1^{+-})$	
122	10885.2	2.6	$\Upsilon(10860)$	$0^-(1^{--})$	
123	11000	4	$\Upsilon(11020)$	$0^-(1^{--})$	
11	baryons				
124	938.272	0.000	p	$1/2(1/2^+)$	
125	939.565	0.000	n	$1/2(1/2^+)$	
126	1660	5	$N(1675)5/2^-$	$1/2(5/2^-)$	
127	1232	2	$\Delta(1232)3/2^+$	$3/2(3/2^+)$	
128	1115.683	0.006	Λ	$0(1/2^+)$	
129	1405.1	1.3	$\Lambda(1405)1/2^-$	$0(1/2^-)$	
130	1519	1	$\Lambda(1520)3/2^-$	$0(3/2^-)$	
131	1674	4	$\Lambda(1670)1/2^-$	$0(1/2^-)$	
132	1690	5	$\Lambda(1690)1/2^-$	$0(1/2^-)$	
133	1820	5	$\Lambda(1820)5/2^+$	$0(5/2^+)$	
134	1825	5	$\Lambda(1830)5/2^+$	$0(5/2^+)$	

Table 4. Continued.

No No	mass MeV	uncert. MeV	part.	prop.	Comm.
135	1189.37	0.07	Σ^+	$1(1/2^+)$	
136	1192.642	0.024	Σ°	$1(1/2^+)$	
137	1197.449	0.030	Σ^-	$1(1/2^+)$	
138	1382.83	0.34	$\Sigma(1385)3/2^+$	$1(3/2^+)$	
139	1383.7	1.0	$\Sigma(1385)3/2^\circ$	$1(3/2^+)$	
140	1387.2	0.5	$\Sigma(1385)3/2^-$	$1(3/2^+)$	
141	1775	5	$\Sigma(1775)5/2^-$	$1(5/2^-)$	
142	1314.86	0.20	Ξ°	$1/2(1/2^+)$	
143	1321.71	0.07	Ξ^-	$1/2(1/2^+)$	
144	1531.80	0.32	$\Xi(1530)^\circ$	$1/2(3/2^+)$	
145	1535.0	0.6	$\Xi(1530)^-$	$1/2(3/2^+)$	
146	1690	10	$\Xi(1690)$	$1/2(?^?)$	
147	1823	5	$\Xi(1820)3/2^-$	$1/2(3/2^-)$	
148	2025	5	$\Xi(2030)$	$1/2(\geq 5/2^?)$	
149	1672.45	0.29	Ω^-	$0(3/2^+)$	
150	2012.4	0.9	$\Omega(2012)^-$	$0(?^-)$	
151	2252	9	$\Omega(2250)^-$	$0(?^?$	
152	2286.46	0.14	Λ_c^+	$0(1/2^+)$	
153	2592.25	0.28	$\Lambda_c(2595)^+$	$0(1/2^-)$	
154	2628.11	0.19	$\Lambda_c(2625)^+$	$0(3/2^-)$	
155	2856.1	2.3	$\Lambda_c(2860)^+$	$0(3/2^+)$	
156	2881.63	0.24	$\Lambda_c(2880)^+$	$0(5/2^+)$	
157	2939.6	1.5	$\Lambda_c(2940)^+$	$0(3/2^-)$	

No No	mass MeV	uncert. MeV	part.	prop.	Comm.
158	2453.97	0.14	$\Sigma_c(2455)^{++}$	$1(1/2^+)$	
159	2452.65	0.22	$\Sigma_c(2455)^+$	$1(1/2^+)$	
160	2453.75	0.14	$\Sigma_c(2455)^\circ$	$1(1/2^+)$	
161	2518.41	0.22	$\Sigma_c(2520)^{++}$	$1(3/2^+)$	
162	2517.4	0.7	$\Sigma_c(2520)^+$	$1(3/2^+)$	
163	2518.48	0.20	$\Sigma_c(2520)^\circ$	$1(3/2^+)$	
164	2801	6	$\Sigma_c(2800)^{++}$	$1(?^?)$	
165	2792	14	$\Sigma_c(2800)^+$	$1(?^?)$	
166	2806	7	$\Sigma_c(2800)^\circ$	$1(?^?)$	
167	2467.71	0.23	Ξ_c^+	$1/2(1/2^+)$	
168	2470.44	0.28	Ξ_c°	$1/2(1/2^+)$	
169	2578.2	0.5	$\Xi_c'^+$	$1/2(1/2^+)$	
170	2578.7	0.5	$\Xi_c'^\circ$	$1/2(1/2^+)$	
171	2645.10	0.30	$\Xi_c(2645)^+$	$1/2(3/2^+)$	
172	2646.16	0.25	$\Xi_c(2645)^\circ$	$1/2(3/2^+)$	
173	2791.9	0.5	$\Xi_c(2790)^+$	$1/2(1/2^-)$	
174	2793.9	0.5	$\Xi_c(2790)^\circ$	$1/2(1/2^-)$	
175	2816.51	0.25	$\Xi_c(2815)^+$	$1/2(3/2^-)$	
176	2819.79	0.30	$\Xi_c(2815)^\circ$	$1/2(3/2^-)$	
177	2964.3	1.5	$\Xi_c(2970)^+$	$1/2(3/2^-)$	
178	2967.1	1.7	$\Xi_c(2970)^\circ$	$1/2(3/2^-)$	
179	3055.9	0.4	$\Xi_c(3055)$	$?(?^?)$	
180	3077.2	0.4	$\Xi_c(3080)^+$	$1/2(?^?)$	
181	3079.9	1.4	$\Xi_c(3080)^\circ$	$1/2(?^?)$	

No No	mass MeV	uncert. MeV	part.	prop.	Comm.
182	2695.2	1.7	Ω_c°	$0(1/2^+)$	
183	2765.9	2.0	$\Omega_c(2770)^\circ$	$0(3/2^+)$	
184	3000.41	0.22	$\Omega_c(3000)^\circ$	$?(?^?)$	
185	3050.19	0.13	$\Omega_c(3050)^\circ$	$?(?^?)$	
186	3065.54	0.26	$\Omega_c(3065)^\circ$	$?(?^?)$	
187	3090.1	0.5	$\Omega_c(3090)^\circ$	$?(?^?)$	
188	3119.1	1.0	$\Omega_c(3120)^\circ$	$?(?^?)$	
189	3621.6	0.4	Ξ_{cc}^{++}	$?(?^?)$	
190	5619.60	0.17	Λ_b°	$0(1/2^+)$	
191	5912.19	0.17	$\Lambda_b(5912)^\circ$	$1/2^-$	
192	5920.09	0.17	$\Lambda_b(5920)^\circ$	$3/2^-$	
193	6072.3	2.9	$\Lambda_b(6070)^\circ$	$1/2^+$	
194	6146.2	0.4	$\Lambda_b(6146)^\circ$	$3/2^+$	
195	6152.5	0.4	$\Lambda_b(6152)^\circ$	$5/2^+$	
196	5810.56	0.25	Σ_b^+	$1(1/2^+)$	
197	5815.64	0.27	Σ_b^-	$1(1/2^+)$	

No No	mass MeV	uncert. MeV	part.	prop.	Comm.
198	5830.32	0.27	Σ_b^{*+}	$1(3/2^+)$	
199	5834.74	0.30	Σ_b^{*-}	$1(3/2^+)$	
200	6095.8	1.7	$\Sigma_b(6097)^+$	$?^?$	
201	6098.0	1.8	$\Sigma_b(6097)^-$	$?^?$	
202	5797.0	0.6	Ξ_b^-	$1/2(1/2^+)$	
203	5791.9	0.5	Ξ_b°	$1/2(1/2^+)$	
204	5935.02	0.05	$\Xi_b'(5935)^-$	$1/2^+$	
205	5952.3	0.6	$\Xi_b(5945)^\circ$	$3/2^+$	
206	5955.33	0.13	$\Xi_b(5955)^-$	$3/2^+$	
207	6100.3	0.6	$\Xi_b(6110)^-$	$3/2^+$	
208	6227.9	0.9	$\Xi_b(6227)^-$	$?^?$	
209	6226.8	1.6	$\Xi_b(6227)^\circ$		
210	6045.2	1.2	Ω_b^-	$0(1/2^+)$	
211	4311.9	7.0	$P_c(4312)^+$		
212	4440	4	$P_c(4440)^+$		
213	4457.3	4	$P_c(4457)^+$		

In the previous works, integer relations between the maxima in the mass- difference distributions of all particles known with uncertainty less than 10 MeV were discussed.

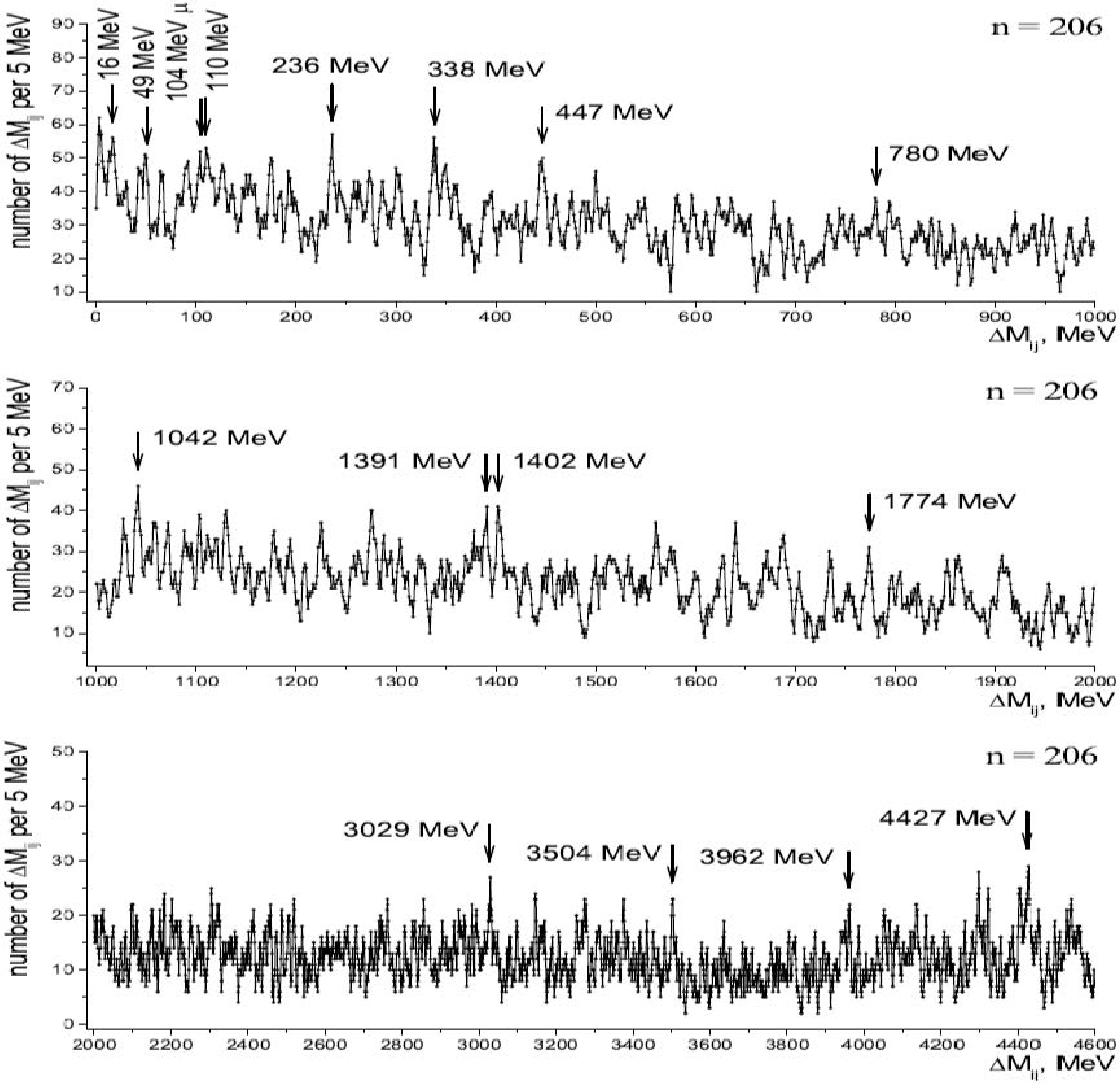

Figure 1: ΔM distribution of all differences between particle masses from PDG-2021 (av-eraging 5 MeV) the region 0–4600 MeV. Maxima at 16 MeV= 2δ, 49 MeV=6δ, 338 MeV$\approx m_\omega - M_q$, 447 MeV$\approx M_q$, 780 MeV=m_ω, 1042 MeV=$8f_\pi$, 1931-1402 MeV=$10m_\pi$ and 1774 MeV$\approx m_\tau$. Intervals 3504 MeV$\approx 8M_q = \delta^\circ/2$, 3962 MeV$\approx 9M_q$ and 4427 MeV$\approx 10M_q$ are considered in [2].

There are integer ralations between the positions of maxima at 16 MeV and 49 MeV (Fig. 1, top, ratio 3.06), at 780 MeV and 49 MeV (Fig. 1, top, ratio 15.92).

The parameter δ being determined from the positions of two first maxima in Fig. 1, top, and their ratio 1:3, is (16 MeV+49 MeV=65 MeV)/2(1+3=4)=8.125 MeV.

The position of maximum at 780 MeV (about 782 MeV, the mass of the omega meson) is exactly integer 6:1 to the well known pion parameter $f_\pi = 130.7 \pm 0.4$ MeV.

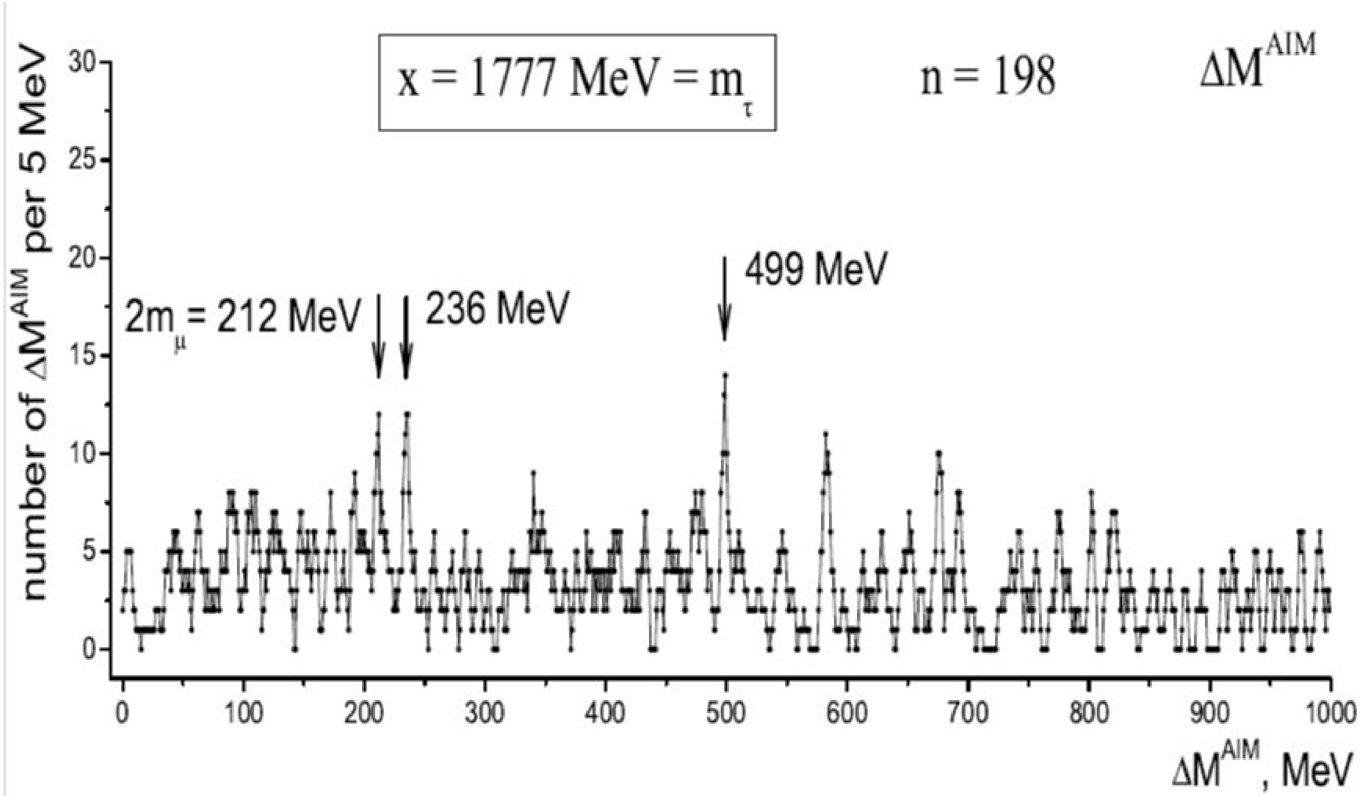

Figure 2: ΔM^{AIM} distribution of particle masses from PDG–2020 for the energy re-gion 0–1000 MeV adjacent to fixed intervals x. *Top:* $x = m_\tau$ =1777 MeV, maximum at 212 MeV=$2m_\mu$.

To check the systematic character of the observed grouping of the energy intervals the correlation Adjacent Interval Method (AIM) program was used. In this method, not all intervals were analyzed, but only those adjacent to previously selected states. The selection of states (to analyze the intervals between them or between them and other states of the spectrum) was made taking into account their participation in the formation of maxima in the total distribution of intervals (which corresponded to their distinguishing character). Fixing the intervals x in the full spectrum of states (which formed a maximum at this value x), the distribution of intervals from the ends of x intervals to all other states of the spectrum was analyzed. Such accompanying intervals were denoted as ΔM^{AIM}.

In Fig. 2 the distribution of intervals adjacent to 1777 MeV=m_τ=x is shown, and the maximum at 212 MeV=$2m_\mu$=m_τ-$2m_\omega$ in the response function of the AIM pro-gram is seen. This means that the value 1777 MeV is the sum of $2m_\mu$=212 MeV and $2m_\omega$=1564 MeV=2·782 MeV.

The equation (1), where m$_\tau$, m$_\mu$ and m$_e$ are the lepton masses, has the universal character.

$$m_\tau = 2m_\mu + 2m_\omega \approx 2 \cdot 13 \cdot 16 m_e - 2m_e + 2 \cdot 96 \cdot 16 m_e \tag{1}$$

Besides the distinguishing character of the electron rest mass we see that correlations in particle masses reflect general dynamics of all particle mass origin. not only leptons and constituent quarks. If we exclude the muon and τ-lepton masses from consideration, all maxima in total distribution (Fig. 1) will be preserved.

The manifestation of lepton masses demonstrates the fundamental character of corre-lations in nuclear data and particle masses.

Conclusions

In this work, for the first time, the possibility of the direct estimation of the period δ=8.176 MeV from the pion parameter f_π=130.7 MeV is shown: m_e(0.510998 MeV)$\times$16 $\times$ 16=130.81571 MeV. We see coincidense of two values 130.81571 MeV and 130.7 MeV$\pm$0.4 MeV. This means that particle masses are integers of one and the same value $\delta = 16m_e$. The value f_π is an initial mass of the pion and is equal to $17\delta + m_e$, and simultaneously, the muon mass is equal to 13δ - m_e, and additionally, the third lepton mass m_τ is also integer
of δ, namely 1774 MeV/8.176 MeV=216.977.

References

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