MOTION, UNIVERSALITY OF VELOCITIES, MASSES IN WAVE UNIVERSE. TRANSITIVE STATES (RESONANCES) - MASS SPECTRUM

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ABSTRACT

Wave Universe Concept (WU Concept) opens new wide possibilities for the effective description of Elementar Objects of Matter (EOM) hierarchy, in particular, of particles, resonances mass spectrum of subatomic (and HEP) physics.

The special attention to analysis and precise description of wide and important set - *transitive states* (resonances) of EOM is payed.

Its are obtained sufficiently precise representations for mass values, cross relations between masses of wide set objects of particle physics - metastable resonances - (fast moving) *transitive states* - in terms of representations of Wave Universe Concept (WU Concept).

Wide set of observed in experiments effects and connected with its resonances (including - Darmstadt effect, ABC effect,etc.) may be effectively interpreted in WU Concept and described with use of mass formula - as manifestation of rapidly moving, physically distinguished transitive states (resonances).

DISCRETENESS, COMMENSURABILITY, QUANTIZATION of WAVE DYNAMIC SYSTEMS (WDS)

According to ideas of Wave Universe Concept (WU Concept) [Chechelnitsky, 1980-1998], (any) arbitrary real objects of micro (atoms, particles) and megaworld (astronomical systems) represent principally - the w*ave dynamic systems* (WDS).

In that case the following assertion is valid.

Proposition

Internal structure, geometry, dynamics, physics of WDS are essentially connected with observated effects *of discreteness, commensurability, quantization* of its dynamical parameters.

That, first of all, relates to discreteness, commensurability, quantization of two sets conjugated values (parameters)

- Sectorial velocities (circulations) $L=L_N^{[s]}$,
- Keplerian (orbital) velocities $v=v_N^{[s]}$.

Nature "prefers" to manifest (it's activity) at some *dynamically, physically distinguished* (with most probability observed) values of dynamical parameters, - first of all, at *elite (dominant)* values of (sectiorial and keplerian) velocities.

These special states are the most simple, easily detectable ones - even at preliminary heuristic analysis of discreteness and commansurability. By its - usually and first of all - having physical intuition researchers "come across" in their search investigations.

TRANSITIVE STATES (RESONANCES)

Motion Factor

Motion of *transitive state* (resonance) may naturally arise in framework of following simple intuitive consideration.

Let some (being a *stationary* at rest) state - stable particle, for instance, π - meson with (table) mass M, *moves* with high ("relativistic") velocity v.

Is that *moving* object (dynamic system, wave configuration) - the *same* particle ?

Or it represents arbitary (some another) quasistable state $\pi^{\wedge}$?

Situation gets out from indeterminancy and doubts, if we take into account the following important consequence of WU Concept - the existance of physycally distnguished $v_N^{[s]}$ *elite (dominant)* velocities and connected with its phenomenon of *discreteness, commensurability* of elite velocities .

Reality of these circumstances signifies, that particles by virtue of fundamental laws of nature *"prefer"* (with most probability) to move (only) with *specific, physycally distinguished elite (dominant) velocities* $v=v_N^{[s]}$.

In such case moving mass configuration, indeed, represents some (quasistable), will be say, the *transitive*

(moving) state (resonance) $\pi^{\wedge}$ with *fixed* energy, momentum (impulse) and, probable, $M^{\wedge}$ mass.

"Complex" ("Compaund") States (Resonances). Reconstruction of states

Notion of *transitive* may be extended at more wide class of objects.

Let some ("complex") state (resonance) disintegrates into a few moving (stationary) states.

Using conservation laws (of energy, etc.) it may be restored, *reconstructed* the initial "complex" (occasionally, slowly moving or resting) state (resonance).

For this initial state it may be saved *"transitive"* term *(transitive state, resonance)*, taking into account the way of it's reconstruction - by scuttering, moving decay products, with essential regarding for its velocities.

Transitive States (Resonances). Mass Formulae

Using the standard representations of (relativistic) kinematics it is not difficult to receive the representation for the transitive state (resonance) mass in the form

$$M = M_{\#}(1+z)^{1/2} = M_{\#}(1+\beta^2)^{1/2},\ z=\beta^2,\quad \beta=v/c,$$

where c - light velocity.

In fact, taking into account the admissible spectrum of $v=v_N^{[s]}$ elite (dominant) velocities, this mass representation converts in following explicit form

$$M_N^{[s]} = M_{\#}(1+z)^{1/2} = M_{\#}(1+\beta^2)^{1/2},$$
$$M \Rightarrow M_N^{[s]},\quad \beta \Rightarrow \beta_N^{[s]} \Rightarrow v_N^{[s]}/c.$$

Decay Processes.

Resonance "Reconstruction". Binary Decay

The simplest situation - resonance decay into two identifical with equal m_0 masses and equal P=mv - momenta (impulses) (m-mass, v-vellocity) - gives a possibility to obtain the simplest representation for the mass of disintegreting resonance

$$M = M_{\#}(1+z)^{1/2} = M_{\#}(1+\beta^2)^{1/2} \qquad \text{with } M_{\#} = 2m_0$$

Of course, similar representation is justify when taking into account all circumstances of decay, that correspond to conservation of energy law.

Expanding of this approach to more composite cases of decay, in general, is not difficult.

Principally it remains the central moment - accounting *velocities* of moving particles - of decay products must be close to physically distinguished $v=v_N^{[s]}$ *elite (dominant)* velocities.

Binary Collisions

In collaiders experiments where *collision* of identical particles takes places, evidently, it may be expected the appearance of transitive states (resonances) in the indicated above sense (as generating by *collading, moving* particles).

And then, as in the case of reconstruction by *moving components* in mass formula, it may be used as $M_{\#}$ the value

$$M_{\#} = 2m_0,$$

where m_0 - (table, at rest) mass of collading particles.

Transitive Resonances. Many-Particles Decays

Very wide class of observing in the subatomic world objects (states) is connected with the follwing typical picture.

The short-living state (resonance) with the effective mass M decays to some more stable - let speek - *stationary states*, having the table masses (of rest) $m_{o,i}$.

If at process of decaing its move with velocities v_i (momenta $P_i=m_{o,i}v_i$), than by force of the standard (relativistic) kinematics it is valid the representation for, let speek, *effective mass* m_i of each component of decay

$$m_i = m_{o,i}(1+z_i)^{1/2} = m_{o,i}(1+v_i^2/c^2)^{1/2},$$

where $z_i = \beta_i^2 = v_i^2/c^2$, $\beta_i = v_i/c$, c - the light velocity.

Than, by force of mass - energy retaining low, effective mass of initial decaing state (resonance) is equal

$$M = \Sigma m_i = \Sigma m_{o,i}(1+z_i)^{1/2}$$

By force of close connection such mass with movement of decay products with *none-zero* velocities (moreover, this mass is wholly born by movement), let name initial state the *transitive resonance.*

Binary decays

The most simple and often the decay is, when two identical particles (n=2) with identical velocities are obtained.

In such case for mass of transitive resonance it is valid the representation

$$M = 2m_o(1+z)^{1/2}$$

In connection with that it is represntating the possibility of observation of following transitive resonances.

Di-proton resonances (at $m_o = m_p$ - proton mass)

$$M = 2m_p(1+z)^{1/2}$$

Di-pion resonances (at $m_o = m_\pi$ - pion mass)

$$M = 2m_\pi(1+z)^{1/2}$$

Di-muon resonances (at $m_o = m_\mu$ - muon mass)

$$M = 2m_\mu(1+z)^{1/2}$$

Di-electron resonances (at $m_o = m_e$ - electron mass)

$$M = 2m_e(1+z)^{1/2}$$

General Case: Transitive States (Resonances)
Mass Spectrum of Transitive States (Resonances)

The central idea of following examination may be breafly formulated in form of the

Proposition

Mass Spectrum of transitive states (resonances) is characterized by preferable, physically distinguished values of mass - it is *discrete*, (not continuous), *commensurable, quantized.*

This *discrete mass spectrum* is generated by *discrete spectrum* of preferable, physically distinguished - *elite* (most brightly - *dominant*) *velocities* - by the *Universal spectrum of velocities* (of Universe - micro- and megaworld) $v_N^{[s]}$.

This assertion, may be seeming unusual, extraordinary for the ultimate standard theory of particles, representes as evident and natural in the framework of base ideas of Wave Universe Concept.

VELOCITIES HIERARCHY AND UNIVERSALITY

Hierarchy and Spectrum of Elite Velocities.

The *Fundamental wave equation* [Chechelnitsky, 1980], described of Solar system (similarly to the atom system), separates the spectrum of physically distinguished, stationary - *elite* - orbits, corresponding to mean quantum numbers N, including the spectrum of permissible *elite* velocities v_N.

It is the follow representation for the physically distinguished - elite dominant velocities v_N in $G^{[s]}$ Shells of wave dynamical (in particular, astronomical) systems [Chechelnitsky, 1986]

$$v_N^{[s]} = C_*^{[s]}(2\pi)^{1/2}/N, \quad s=...,-2,-1,0,1,2,...$$

$$C_*^{[s]} = (1/\chi^{s-1})\cdot C_*^{[1]}.$$

Here

$C_*^{[1]} = 154.3864$ km·s^{-1} is the calculated value of *sound velocity* of wave dynamic system (WDS) in the $G^{[1]}$ Shell, that was made valid by observations,

χ - the *Fundamental parameter of hierarchy - Chechelnitsky Number χ = 3.66(6)* [Chechelnitsky, 1980 - 1986],

s - the countable parameter of Shells,

N - (Mega)Quantum numbers of *elite states*,

a) Close to

$$N_{Dom} = 8; 11; 13; (15.5)16; (19,5); (21,5)\ 22,5 -$$

for the *strong elite (dominant) states* (orbits);

b) Close to

N - Integer, Semi-Integer - for the *week elite (recessive)* states (orbits).

In the wave structure of the Solar System for planetary orbits of Mercury (ME), Venus (V), Earth (E), Mars (MA), we have, in particular, $N = (2\pi a/a_*)^{1/2}$ (a - semi-major axes of planetary orbits, $a_*^{[1]}=8R_\odot$ - semi-major axis of $TR_*^{[1]}$ - *Transsphere*, $R_\odot$ - radius of Sun) [Chechelnitsky, 1986]

N = 8.083; 11.050; 12.993; 16.038, close to *integer*

N = 8; 11; 13; 16.

Taking into account Ceres (CE) orbit and transponated in $G^{[1]}$ (from $G^{[2]}$) planetary orbits of Uranus - (U), Neptune - (NE), Pluto - (P), it can be received the general representation for observational *dominant* N

	TR_*	ME	TR	V	E	(U)	MA	(NE)	CE	(P)
N=	$(2\pi)^{1/2}$=2.5066	8.083	$(2\pi)^{1/2}\chi$=9.191	11.050	12.993	15.512	16.038	19.431	21.614	22.235

It may be show, that $N = N_* = (2\pi)^{1/2} = 2.5066$ (critical - transspheric value)
and

$$N_{TR} = \chi(2\pi)^{1/2} \cong 9.191$$

also are physically distinguished (*dominant*) N values [Chechelnitsky, 1986].

Extended Representation

It is possible, in principle, to examine the following substitution

$$1/N \to \varsigma / N^{\#} \text{ or } N \to N^{\#}/\varsigma$$

and to extend formula for elite velocities

$$v_N[s] = C_*^{[s]}(2\pi)^{1/2}(\varsigma / N^{\#}), \qquad s=...,-2,-1,0,1,2,...$$

ς , $N^{\#}$ - *integer.*

In this case, for instance, the previouns condition N - semi - integer will be indicated (for the set of integer numbers) by the condition

$$\varsigma = 2,\ N^{\#} \text{ - } integer,$$

and thus, - the substitution $N \to N^{\#}/2$.

General Dichotomy

Very close (to discussed above) variant of description of physically distinguished states may be possible with using of effective approximation, proposing by *the General Dichotomy Law* [Chechelnitsky, 1992]. Connected with it compact representation for the N quantum numbers have the explicit form

$$N_\nu = N_{\nu=0} \cdot 2^{\nu/2}, \qquad N_{\nu=0} = 6.5037$$

that is depended from countable parameter

$$\nu = k/2, \quad k=0,1,2,3,...$$

It follows to, in particular, exponential, (power) dependence for a semi-major axes

$$a_\nu^{[s]} = a_{\nu=0}^{[s]}\, 2^\nu,$$
$$a_{\nu=0}^{[s]} = a_*^{[s]}\, (N_{\nu=0})^2/2\pi,$$

In the some sense - this is the expansion and generalization to all WDS of Universe of the well-known Titius-Bode Law for the planetary orbits.

Such idealazing model representation - the *General Dychotomy Law* (GDL) - gives approximate, but easy observed description of the set of distinguished (dominant) orbits.

Universal Spectrum of Elite Velocities in the Universe.
Megaworld and Microworld (Quasars and Particles).

Proposition.

The spectrum of physically distinguished *elite* velocities $v_N^{[s]}$ and quantum numbers N of arbitrary wave dynamic systems (WDS) has the some *universal* peculiarity. It is practically identical - *universal (invariant)* for all known observed systems of Universe (of *megaworld and microworld*).

In particular, velocities spectrum of experimentally well investigated Solar and satellite systems practically coincides for observed planetary and satellite - *dominant* orbits, corresponding to some (dominant) values of quantum numbers N_{Dom}. Thus it may be expected, that spectrum of *elite (dominant* - planetary) velosities of the Solar system (well identificated by observations) may be effectivelly used as quite representive - *internal (endogenic)* - spectrum of physically distinguiched, well observed - *elite (dominant)* velocities, for example, *of far* astronomical systems of Universe [Chechelnitsky, 1986, 1997] and of wave dynamic systems (WDS) - *elementary objects* of subatomic physics.

Quantization of Circulation and Velocity.

We once more repit in the compact form the important conclusion which was obtained in the monograph (Chechelnitsky, 1980) and repeatedly underlined afterwards.

Proposition (Quantization of Velocities).

In the frames of Wave Universe Concept and Universal wave dynamics

The fundamental properties of discreteness, quantization of *wave dynamic systems (WDS)* - objects both *mega* and *microworld* - are connected not only with discreteness, quantization of

i) Kinetic momentum (angular momentum) $K_m = mva$,

ii) And momentum (impuls) $P = mv$ (as that is discrabed in well known formalism of quantum mechanics),

But - on the fundamental level - are connected with discreteness, quantization of

v) *Sectorial velocity* (circulation)

$L = K_m/m = va$, $(L_* = \xi d^- = \xi h^-/m)$, ξ - nondimensial coefficient,

vv) And *(Keplerian) velocity* $v = P/m$.

vvv) Together with the relating to its sizes (lengths) - a - semi - major axes of orbits and T - periods (frequencies).

Universality of observed, physically distinguished velocities

From the point of view of experimental investigations of real systems of Universe the Law of Universality of Elite (Dominant) velocities may be briefly formulated as follows

Proposition (Universality of Elite - Dominant Velocities in Universe)

Detectable in *experiments and observations* velocities of real systems of Universe - from objects of microworld (subatomic physics) to objects of megaworld - astronomical systems - with the *most probability belong to the Universal Spectrum of elite (dominant) velocities* of Universe.

This Universal Spectrum of Velocities in the sufficient approximation may be represented in the form:

$$v_N^{[s]} = C_*^{[s]}(2\pi)^{1/2}/N, \quad s=...,-2,-1,0,1,2,...$$

$$C_*^{[s]} = (1/\chi^{s-1})\cdot C_*^{[1]}.$$

General Gomological Series of Sound Velocities

Once more let pay our attention to the hierarchy of *sound velocities*, that is definded by the recurrence relation

$$C_*^{[s]} = (1/\chi^{s-1})\cdot C_*^{[1]} \qquad s=...,-2,-1,0,1,2,...$$

In view of its special important significance and possibility of following generalizations we will name it "The *General Gomological Series* (GGS) of sound velocities". By the quality of generative member in that series essentially it is used, for instance, the

$$C_*^{[1]}=154.3864 \text{ km}\cdot\text{s}^{-1}$$

- value of sound velocity in $G^{[1]}$ Shell of WDS.

As a matter of fact, this is *primary source (eponim)* of that series.

Of course, in the role of primary source any member of that series may be used.

Testimony (Evidence) for that is only most knowlege reliability of that value - its experimental definiteness (determination).

THEORY, OBSERVATIONS, EXPERIMENTS

Two problems will lie in field of our attention below.

If are known, fixed in observations and experiments any facts, that prove argue a reality of existence of theory effects of velocities discreteness, commensurability, quantization?

How much effective, in frame of theory (WU Concept), is the description of mass spectrum of transitive resonances objects, that are close connected with consequant decay to rapidly moving components?

Phenomenon of Velocities Discreteness

Effects of velocities discreteness in experiments of subatomic phisics, apparently, appeared long ago, but, indeed, *conceptually* its were not "observed" till now.

This is the situation, which is typical for science.

Results of experiments, at first, must be *comrehended* in frame of any *theoretical representations*, of arbitrary *conceptual expectations* in order to that facts, properly, will be taken into consideration.

Otherwise its remain unnoticed and sink in array of suppress by its volume information.

It is very important, that only on the base of some *expectation* any successful experiments may be constructed.

This theme is interesting by itself and we hope, may be, to return to it afterwards (later or subsequently).

Let us point out (indicate) only several facts and investigations of last time.

Observations in Space

Quantizations of Velocities and Redshifts of Astronomical Systems

Information about existence of distinguished velocities spectrum most brightly, evidently, (as that often occur in the history of science) for a long time enters from area of study of megasystem - beside from close - Solar system [Chechelnitsky, 1980-1998], but from distant - galaxies, quasars [Burbidge, 1967, 1968; Tifft and Cocke, 1984; Arp et al, 1990; Chechelnitsky, 1997].

In fact, namely in the world of astronomical systems, frequantly, important phenomena in particular descriptive, unmuddy form are fixed.

The question is about observations of preferable velocities of not only celestial bodies, but also of plasma, that is high speed particles flows inside astronomical systems. The last is evident from the fact, that the

discreteness phenomena are connected with velocities, that essentially exceed all conceivable admissible limits of velocities of large celestial bodies.

By such high (subluminal) velocitites only motions of plasma, highenergetic particles may be characterized.

So, even only on the base of similar facts and its comrehend in the frame of WU Concept we can regard, that real objects, components of its decay *"prefer"* to move with some physical distinguished - *elite (dominant) velocities* [Chechelnitsky, 1997].

Particles and Quasars

It is interesting to point that above mentioned representation $z=v^2/c^2$ describes (in megaworld) the *redshifts* of quasars and galaxies [Chechelnitsky, 1997].

It may be shown - this is not accidental coincidence.

Experiments on the Earth

But, it is clear, of course, that it is interesting to detect the effects of velocities discreteness, commensurability, quantization not so far - in Space, but - in immediate nearness, at a short distance - at the Earth, in physical laboratories.

Already now, even without of specially oriented, purposeful experiments it may be suggested, that in physical experiments effects were fixed, which may be interpreted as phenomena of velocities discreteness, commensurability.

Undoubtedly, this topic deserves of the special investigation in history of science (physics).

Effects of Discreteness, Commensurability in Decay Reactions
"Well forgotten" old. Radioactive decay.

Still the pioneers - investigators of radioactivity remarked a set of interesting peculiarities, by which the radioactive decay was characterized, in particular, it was remarked [Dorfman, 1979]:

"It was shown, that *all* α - particles, thrown by one radioactive radiation, *have identical run length* and *identical for this radiative velocity* [Reserford, 1905] ".

In particular, Reserford [Reserford, 1972, p.77] remarked: "We see, that issuing velocity of α-particles of differ radioactive matters lay in *enough narrow* interval, between $1.59\cdot10^9$ and $2.25\cdot10^9$ cm/s". (P.75): "All initial issuing velocities of products of radioactive elements lay between $1.59\cdot10^9$ and $2.25\cdot10^9$ cm/s, that is the maximal issuing velocity is only *in 1.44 times* larger than the minimal velocity."

This Reseford observation finds an interesting comment in this discussed approach of WU Concept.

The observating limits of velocities correspond to the dominant values in Shell $G^{[-4]}$, and really are close to the characteristic value $2^{1/2}$ =1.414 of such velocities in frames of *Generalized Dichotomy* [Chechelnitsky, 1997].

There are many another important results of interesting.

Such brilliant experiments passed as unremarked by theory, proved to be out of mainstream of fundamental representations of standard science.

Evidently, generally accepted representations possess by special selection.

We discovered for ourselves the results of such buried experiments, becouse *looked for namely these effects*.

One way or another, the effects of velocitites discreteness, commensurability, quantization must appear itselves in more wide circle of occurrences.

"Unremarked" New

Let us point results only one experiment conducted in Dubna [Avdeychikov, Nikitin, 1987,1988]:
"...In range of low kinematic energy of the E_f - fragment the endow of source with limit velocity β_1*=0.02c dominates*, in range of high energy - with β_2=0.08 c, where c - the light velocity. The pointed values β_1 and β_2 are characteristic *for all z* - fragments and energies of a beam."

This observations of experimentators are extraordinary and a'priori - far not evident.

Really, why the *whole set* of fragments, that essentially differ by charges and energies, must have *the same velocities* of issuing?

From the formed standard ("probable") representations such conclusion does not follow.

But in frame of (WU Concept) representations about universality of velocities spectrum - of its discreteness, commensurability, quantization, presence of physically distinguished states - such effect is *quite expected.*

Moreover, it is really correct from the point of view of theory, because of the observated velocities correspond to the theoretically calculated values

$$v_V^{[-4]} = 0.0774c = 23210 \text{ km/s}, \qquad v_V^{[-3]} = 0.0211c = 6330 \text{ km/s},$$

$$v_{\nu=1.5}^{[-4]} = 0.0782c = 23448 \text{ km/s}, \quad v_{\nu=1.5}^{[-3]} = 0.0213c = 6395 \text{ km/s}.$$

It is not difficult to show also, that the observating velocities concern as $\beta_2/\beta_1=4=2^2$, that is its belong for all that to the velocities set of the Generalized Dihotomy.

It is interesting to mark, that the detected by modern methods physically distinguished velocity $\beta_2=0.08c$ corresponds to the velocity, that Reserford observed as close to the upper limit of velocities at α - decay.

Another New

It is interesting point, that information about the same velocity $v \le 0.02$ c, generating the $e^+ e^-$ resonances, is mentioned in [Koinig, 1993].

Another information [Pokotilovsky, 1993]:

"...Data testify that mass center of probable decaying e^+e^- system move in center-of- mass of collision ions with little velocity, not exceeding 0.03 - 0.05 c."

Latent Possibilities of RPP (Review of Particle Physics)

Meanwhile, wide possibilities and reason (cause) for reflections and investigations the most known compendium of experimental data of Particle Physics (RPP) allows, especially when in it the data concerning to momenta (impulses) of decay modes of particles were ublished.

Lying at a surface and detecting at purposeful search, the effect of P - momenta (impulses) discreteness and commensurability (together with masses discreteness) naturally leads to discovery of v - *velocities discreteness, commensurability*.

Investigations of Gareev's Group

Recently, to the indicated by the Wave Universe Concept universal effects of (sectorial and Keplerian) velocities discreteness, commensurability (in micro - and megaworld) Gareev pays special attention [Gareev et al, 1996]. Possessing by developed physical intuition and conducting wide work with using of RPP experimental data, Gareev and his co-workers made convinced in validity of expectations of WU Concept for objects of subatomic world too.

Indeed, in a wide array of particles decays the effect of *velocities discreteness, commensurability* is observed, exists, brightly manifests.

Information (in RPP) about experimentally observed P mass momenta (impulses) and connected with its v velocities opens the possibilities to calculate the potentially virtual masses spectrum of resonances by semi - empirical way.

Correlation of computations and experimentally known data is impressionable.

In any case, such coinciding is a challenge to the standard theory and a stimulus for further purposeful investigations.

What is further?

But the heuristic analysis exhausts itself even as the following questions arize:

From where these physically distinguished velocities?

What must we do without RPP by the hand - i.e. *without information about empirical* values of velocities (of particles decays)?

Why these velocities, but *not another*?

If exist for its (velocities) any *theoretical* representations?

Answers to these questions the Wave Universe Concept gives, in particular, by the Proposition (Theorem) about *Universality of (physically preferable) elite (dominant) velocities spectrum* - for real systems of Universe (micro - and megaworld).

Integer Commensurability

Simplest integer commensurability of observed in experiments (in RPP) velocities

$$v_i/v_j = N_j / N_i \quad N_i, N_j \text{ - Integer}$$

is entirely evident in frame of WU Concept and directly follows from the principal representation for elite velocities

$$v_N^{[s]} = C_*^{[s]}(2\pi)^{1/2}/N, \quad N \text{ - Integer (semi - Integer)}$$

At the Begining of Way

If the history experience learns to something, then it is relevant to note, that with the comprehension (by a wide circle of physicists - professionals) of real existence of velocities discreteness, commensurability, quantization effects, the subatomic physics fixes itself at the stage, which corresponds (roughly) to the time of Roy and Ovenden publication [Roy and Ovenden, 1954], concerning world of megasystems.

In that paper at wide material the presence of commensurability in motions of Solar system celestial

bodies is convincingly stated, although separate phenomena was known for a long time [see review at Chechelnitsky, 1980]. In front of that we yet have much work in theoretical conceiveness and fundamental comprehension of these phenomena.

Transitive States (Resonances)
Spectrum of Masses. Theory and Observations

We shall bring only some results of calculation and comparision with experimental data.

Its concern of *Transitive states* (Resonances) spectrum, connecting with *dominant* velocities only by some $G^{[s]}$ Shells.

Mentioned data correspond to states, reconstructed by *binary* decays.

Transitive (T)$G^{[-5]}$ Shell
Transitive States (Resonances). Spectrum of Masses

In Table 1 are cited the data of theory and comparison its with avialable experimental information for three families of transitive resonances

*Di - electron Family.*

Set of transitive resonanes of this family is generated by mass

$$M_{\#} = 2m_e = 1.022 \text{ Mev/c}^2,$$

where m_e = 0,511 Mev/c^2 - electron mass.

Observed in experiments values of resonances masses are taken from [RPP - Review of Particles Physics; Pokotilovsky, 1993; Ganz et al., 1996 and review Gareev et al., 1996, 1997 (E4-97-183)].

*Di-pion Family.*

Masses spectrum of transitive resonances is generated by mass

$$M_{\#} = 2m_{\pi} = 279.14 \text{ Mev/c}^2,$$

where m_{π} = 139,56995 Mev/c^2 - mass of $\pi^{\pm}$ - meson.

Experimental data in this range of masses are not known (to us). Calculation is adduced for the orientation of experimentators.

*Di-proton Family.*

Masses spectrum of transitive states (resonances) is generated by mass

$$M_{\#} = 2m_p = 1876.5446 \text{ Mev/c}^2,$$

where m_p = 938.27231 Mev/c^2- proton mass.

In experiment sufficient developed spectrum of masses is observed. Experimental data are taken from [RPP; Troyan et al., 1991; Troyan, Pechonov, 1993; Tatischeff, 1990,1994, 1997; Edogorov, 1991; Andreev, 1987; Gareev et al, 1996].

Transitive (T)$G^{[-6]}$ Shell

Comparision of theory and experiments for Di-electron,Di-pion, Di-proton cites in Table 2.

Experimental data

For the Di-electron family are taken from [Ganz et al., 1996; Pokotilovsky, 1993; Gareev et al., 1997].

For the Di-pion family are taken from [Troyan, 1993; Troyan et al., 1991, 1996; Codino, Plouin, 1994; Gareev, 1996,1997], (m = 447.49 Mev/c^2) - from [Troyan et al., 1997].

For the Di-proton family - from RPP, and also - from [Ball et al., 1994; Ohashi et al., 1987; Tatischeff et al., 1990,1994, 1997; Gareev et al., 1996].

As cause for reflections also comparision of theoretical spectrum with wide class of resonances from RPP is adduced.

Transitive States (Resonances) and Multi - Particle Decays

It is possible the analysis and comparison with experiment of transitive states (resonances), which decay, in general case, in several different particles with m_i masses. With this it is used the indicated above general representation for the M mass of transitive state (resonance)

$$M = \Sigma m_i = \Sigma m_{0,i}(1+z_i)^{1/2}$$

$$z_i = \beta_i 2, \quad \beta_i = v_i/c, \; v_i \Rightarrow v_N^{[s]}, \; c \text{ - the light velocity.}$$

DISCUSSION

Estimating the situation, which fully formed in connection with known early interpretation of masses, it is inevitably come to conclusion, that the theory is situated at the very origin of way. It is fully possible, that discussed above approach will be stimulate more effective advance on that way.

So two directions represent as actual

Investigations of conformities of *elite velocities universality* in Universe - in micro - and megaworld,

Investigations of fundamental conformities of resonances and dynamical spectrum origin.

With respect to resonances spectrum even available by this time new data permit to suggest the following.

∗ Detectable in experiments states (resonances) *are not phantoms, fancies,*

∗ To its *real physics* and *wave dynamics* correspond,

∗ Its place, status, role in order of another, more known states may be comprehended in frame of WU Concept.

Wide set of observed in experiments effects and connected with its resonances (including - Darmstadt effect [see review Pokotilovsky, 1993], ABC effect [see review Codina, Plouin, 1994], effects discussed by Gareev [see review Gareev, Kazacha, 1996; Gareev et al., 1997]) can effectively interpreted in WU Concept and described with use of mass formula - as manifestation of rapidly moving, physically distinguished *transitive states (resonances).*

Purposeful experiments, stimulated by theory, can brighten up many important details of *Universality of elite velocities* in the Universe (including - in microworld), and also can broaden the spectrum of observed resonances.

There are the serious bases to regard, that results of such experiments will be foreseeing and succesful. The Wave Universe Concept gives such bases.

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TABLE 1 **MASS SPECTRUM: TRANSITIVE STATES - (T)G[-5] Shell**

State	Quantum Number N	Redshift $z=\beta^2$ ($\beta=v/c$)	Mass $M=2m_e(1+z)^{1/2}$ $2m_e=1.022$ [Mev/c^2]	Mass (Exp) M [Mev/c^2]	Mass $M=2m_\pi(1+z)^{1/2}$ $2m_\pi=279.14$ [Mev/c^2]	Mass (Exp) M [Mev/c^2]	Mass $M=2m_p(1+z)^{1/2}$ $2m_p=1876.5446$ [Mev/c^2]	Mass (Exp) M NN [Mev/c^2]	Mass (Exp) M $N\bar{N}$ (RPP) [Mev/c^2]	Mass (Exp) M (RPP) [Mev/c^2]
TR*	2.5066	1.57								
ME	8.083	0.151	1.0964	1.1	299.46		2013.2	2017 ± 3 2016 2008 ± 3	2022 ± 6	Ξ(2030) Σ(2030) f_2(2010) 2007 ± 10
TR	9.191	0.116	1.0796	1.077	294.88		1982.3	1980 ± 2		Σ(2000) 1975 ± 1
V	11.050	0.0806	1.0623	1.062	290.17		1950.7	1956 ± 3 1955 ± 2	1949 ± 10 1943 ± 5	X(1950) Ξ(1950)
E	12.993	0.0583	1.0513		287.16		1930.47	1932 ± 3	1930 ± 2	Σ(1940)
(U)	15.512	0.0409	1.0426		284.79		1914.53	1918 ± 3 1916 ± 2	1920	1919 ± 3 Σ(1915)
MA	16.038	0.0383	1.0413	1.043	284.43		1912.1			X(1910)
(NE)	19.431	0.0261	1.0352		282.75		1900.8	1902		
CE	21.614	0.0211	1.0327		282.06		1896.2	1898 ± 1	1897 ± 1	1897 ± 1
(P)	22.235	0.0199	1.0321		281.9		1895.1	1892		Λ(1890) Σ(1880)

TABLE 2

MASS SPECTRUM: TRANSITIVE STATES - (T)G[-6] Shell

State	Quantum Number N	Redshift $z=\beta^2$ ($\beta=v/c$)	Mass M= $2m_e(1+z)^{1/2}$ $2m_e=1.022$ [Mev/c^2]	Mass (Exp) M [Mev/c^2]	Mass M= $2m_\pi(1+z)^{1/2}$ $2m_\pi=279.14$ [Mev/c^2]	Mass (Exp) M [Mev/c^2]	Mass M= $2m_p(1+z)^{1/2}$ $2m_p=$ 1876.5446 [Mev/c^2]	Mass (Exp) M NN [Mev/c^2]	Mass (Exp) M $N\bar{N}$ (RPP) [Mev/c^2]	Mass (Exp) M (RPP) [Mev/c^2]
TR$_*$	2.5066	21.1								
ME	8.083	2.02	1.776	1.782	485.09	470± 7	3261.0			X (3250)
TR	9.191	1.57	1.638	1.662	447.49	447	3008.3			Σ (3000)
V	11.050	1.08	1.473	1.496	402.58	397; 400	2706.4	2735	2710±20	
E	12.993	0.784	1.365		372.83		2506.4		≈ 2500	f_b (2510) Ξ (2500)
(U)	15.512	0.550	1.272		347.52	354; 350±10	2336.2	2350	2380	f_2 (2340) Λ (2350) Λ (2325)
MA	16.038	0.514	1.257	1.250	343.46		2308.9		2307± 6	f_2 (2300) f_4 (2300)
(NE)	19.431	0.350	1.187		324.33		2180.3	2194 2172± 5	2180± 10	f_2 (2150)
CE	21.614	0.283	1.157		316.15		2125.5	2122		Ξ (2120) Σ (2100)
(P)	22.235	0.268	1.150		314.32	313± 3	2113.1	2106± 2	2110± 10	2112.4 π_2 (2100) Λ (2110)