
Chechelnitsky A.M.

**SUPERLUMINAL VELOCITIES:
FROM THE MONUMENTAL INTERDICTION –
TO REAL EXISTENCE**

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141980, Dubna 3, Moscow Region, Russia;

E'mail: ach@thsun1.jinr.ru, ach@arcor.de

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Chechelnitzky Albert Michailovich -

is an astrophysicist, cosmologist,

expert in space research, theoretical physics, theory of dynamic systems, automatic control, optimization of large systems, econometrics, constructive sociology, anthropology;

COSPAR Associate: Member of International organization - Committee on Space Research (COSPAR) - Member of B, D, E Scientific Commissions.

(COSPAR - most competent international organization, connected with fundamental interdisciplinary investigations of Space).

Author of the (Mega) Wave Universe Concept.

ABSTRACT

As far as is it fair and stable a fundamental Interdiction of standard (astro) physics and cosmology - the Barrier of speed of light? Whether are there in the Nature the superluminal velocities or it only seems to critically adjusted researchers both persevering observers and experimenters? The obvious intense opposition of the theory and observations can be extend to occurrence of a new critical situation: On the basis of the alternative theory the predictions can be made, and new effects, new facts (which cannot be interpreted simply and naturally within the framework of the conventional theory) are open in observations. Such unambiguous - exact quantitative predictions are given with the Wave Universe Concept (WU Concept) (Chechelnitsky 1980-2004). It predicts, in particular, the existence of effect of discreteness, quantization of velocities of any scales. As this effect is fair not only for subluminal, but also for superluminal velocities (and it proves to be true by observations) there is no artificial barrier between them -Barrier of speed of light. WU Concept asserts - superluminal velocities really exist in the Universe! When in observations the physically distinguished (dominant) superluminal velocities, for example, $v = 8.45 c$ or $v=10.06 c$ are detected, it is in fact the physical reality, instead of seeming effect or illusion, as the conventional theory asserts..

Key words: superluminal velocities: cosmology: active galaxies: individual (M67) – galaxies.

INTRODUCTION: Hypothesis, Opinion, Declaration.

Modern standard Cosmology essentially is based upon of some fundamental statements which, generally speaking, are rather vulnerable for criticism.

One of such statements is the following (we show it in the extremely brief form, not changing its fundamental essence) [see, for instance, Superluminal Radio Sources,1987; Radio Astronomy at the Fringe,2003; etc.].

Hypothesis (Postulate) (Barrier of speed of light).

Real superluminal velocities in the Nature are impossible.

There is rather dramatic history of the occurrence, becoming, strengthening (if it is possible so to be expressed, - becoming it as bronze monument) of this opinion, postulate, It was born in days when did not exist absolutely any experience - experimental, observational evidences in its advantage.

Arisen in the beginning of the last century as only conceptual declaration, nowadays this opinion became a unshakable canon of the theory.

This evolution is in itself so interesting and instructive, that deserves a separate examination.

Alternative

Not distracting on certainly interesting details, we at once shall designate

the alternative position following from advanced system of representations - the Wave Universe Concept (WU Concept) [Chechelnitsky 1980 - 2004].

Proposition (Velocities - Outside of Barriers)

In the Universe there is no top restriction of velocities - the Barrier of speed of light: Superluminal velocities really exist.

Arguments of the Theory and Observation

Certainly, would be incorrect to replace one statement - declaration by another, not resulting by some deciding arguments.

The wide experience of a history of a science and own researches shows, that in developed (we shall directly tell, - deadlock) situations, minimal, but nevertheless preferable chances

on favorable understanding have not reasons of any theory, but convincing, whenever possible - simple, arguments of observations and experiments.

The best opportunity for this purpose is given with astrophysical observations. Break in this area can be connected to use of new technologies in astrophysics and interpretation of results of purposefully planned experiments and observations within the framework of the alternative concept

WAVE UNIVERSE CONCEPT

Many extremely important aspects of the Problem "Cosmos-Earth-Man", Physics of the Universe and Cosmology, questions about relation between objects of Micro and Megaworld have the answers in framework of the **Wave Universe Concept (WU Concept)** [Chechelnitsky,(1978)1980-2004].

WU Concept suggests that arbitrary systems not only of Microworld, but and giant astronomical systems of Megaworld possess by the general fundamental aspect (property)-all these dynamic systems, of principle, are the **WAVE** dynamic systems (WDS). If the Quantum Wave Mechanics describe the wave structure of microscopic scales objects, then the **Megaquantum Wave Astrodynamics** analyse and emphasize the **MEGAWAVE** structure of giant astronomical systems-presence of waves and rhythms of large length and periods in these planetary and galaxies systems. The fundamental, of principle new approach argue its effectiveness in many Hot Points of Physics and Cosmology [see **physics/0102036**] - from analysis and discovery of the mass spectrum of neutrino [**physics/0103066**] - to the redshift spectrum of extremely far quasars [**physics/0102089**]. The true physical structure of the Universe at small and large scales can be understand only in context of the **Wave Hierarchy, discreteness, commensurability, quantization** "In Small" and "In Large" of WDS structure, velocities, redshifts, existence of very large astronomical objects, Unity and Universality of wave structure of arbitrary objects of the Universe [**physics/0102008**].

Discreteness, Quantization of velocities and redshifts. Normalized (on c) elite (dominant) velocities

In the researches connected with velocities close to speed of light, the following normalized (by speed of light $c=299792.458 \text{ km s}^{-1}$) $\beta = v/c$ representations for physically distinguished - *elite dominant*) velocities in $G^{[s]}$ Shells ($s=...,2, 1, 0,-1,-2,...$) of wave dynamic (in particular, astronomical) systems (WDS) is represented convenient [Chechelnitsky 1980-1986; see also Chechelnitsky 2000]

$$\beta_N^{[s]} = v_N^{[s]} / c = \beta_*^{[s]} (2\pi)^{1/2} / N, \quad s=...,2, 1, 0,-1,-2,..., \\ \beta_*^{[s]} = C_*^{[s]} / c = (C_*^{[1]} / c) \chi^{-(s-1)} = (0.5149776 \cdot 10^{-3}) \chi^{-(s-1)},$$

here $C_*^{[1]} = 154.3864 \text{ km} \cdot \text{s}^{-1}$ is the calculated value of sound velocity in $G^{[1]}$ Shell of wave dynamic (and, in particular, astronomical) systems (WDS) which is confirmed with observations in the Solar system, $\chi = 3.66(6)$ - Fundamental parameter of hierarchy (Chechelnitsky number) [Chechelnitsky (1978)1980 - 1986];

s - counting parameter of $G^{[s]}$ Shells, $s=...,2, 1, 0,-1,-2,...$,
 N - main (mega) quantum numbers of elite states.

Expressions for them and concrete N values are represented in the Tables 1-5 in conformity with two models giving close results. Its are -

* *Micro-Mega Analogy* (including, - with the observational data on Solar - planetary system; from here -the terms corresponding to planetary - dominant orbits),

* *Generalized Dichotomy Law* (the extrapolation of the Titius – Bode Law on the any astronomical systems considered as wave dynamic system (WDS)).

The *Generalized Dichotomy Law* gives the following representation for $N = N_v$ numbers of dominant states v

$$N = N_v = N_{v=0} \cdot 2^{v/2}, \quad N_{v=0} = 6.5037, \quad v=k/2, \quad (k = 0, 1, 2, 3,...)$$

Two fundamental parameters.

Both fundamental parameters - dimensional $C_*^{[1]}=154.3864 \text{ km} \cdot \text{s}^{-1}$ and nondimensional $\chi = 3.66(6)$, - are *physical invariants*, specifying "the Ladder of velocities", essentially determine the spatial and temporal structure of wave dynamic systems (WDS) of any scales, and, thus, and the Hierarchical structure of the Universe. These

fundamental parameters for the first time have been found out at the analysis such initial WDS, as Solar system [Chechelnitsky (1978)1980 -1986].

Dominant superluminal velocities: Predictions of the Theory.

It can be show in an obvious kind the numerical values of dominant - subluminal and superluminal velocities, following from model - the *Generalized Dichotomy Law* (for $G^{[s]}$ Shells, $s = -6, -7, -8$) (see. Tables 1-5).

(in $G^{[-6]}$ Shell) $\beta=v/c$: 1.77; 1.48; 1.25; 1.05; 0.88; 0.74; 0.62; 0.52; 0.44;

($G^{[-7]}$ Shell) $\beta=v/c$: 6.48; 5.45; 4.58; 3.85; 3.24; 2.72; 2.29; 1.92; 1.62;

($G^{[-8]}$ Shell) $\beta=v/c$: 23.79; 20.00; 16.82; 14.14; 11.89; 10.00; 8.41; 7.07;

5.95

It is necessary to expect in astrophysical observations the manifestation of namely these (or close to them) values of dominant velocities predicted by the theory.

UNIVERSAL SPECTRUM OF ELITE VELOCITIES IN THE UNIVERSE.

The Megaworld and Microworld (From Quasars Up to Elementary Particles).

Proposition

Spectrum of physically distinguished *elite (dominant)* velocities $v_N^{[s]}$ and of quantum numbers N of real systems (wave dynamic systems - WDS) has some universal property. It practically is *identical* - is *universal (identical)* for all known observable systems of the Universe (of Micro and Megaworld).

For example, the spectrum of velocities of the experimentally well investigated Solar planetary system and of satellite systems of planets practically coincides for observable planetary and satellite - *dominant* orbits that appropriate to dominant values of quantum numbers N_{Dom} .

The researches show, that the spectrum of *elite (dominant-planetary)* velocities of Solar system (well identified in observation) can be effectively used as quite representative, in particular, *internal (endogenic)* - spectrum of physically distinguished *elite (dominant)* velocities of such *far* astronomical systems of the Universe (in

particular, as quasars) [Chechelnitsky, 1986, 1997] and such wave dynamic systems (WDS), as elementary objects (particles) of subatomic physics.

Astronomical Systems - New World of Megaquantization.

It is clear, *Megaquantization* (quantization “in the Large”), observed *megaquantum effects* are not monopole privilege of only Solar system.

Megawave Genesis of Redshifts. Hierarchy of Redshifts.

The Wave Universe Concept ascertains existence of direct relations between real velocity v and redshift z as $z=(v/c)^2$.

As it was specified in the previous researches [Chechelnitsky 1997,2002], this relation is checked carefully up and proved experimentally (on the Earth (Pound and Rebka experiment [Pound and Rebka, 1960]) and in space - from the Sun (Brault experiment [Brault, 1963])).

Thus, representation for physically distinguished - elite (dominant) redshift is fair also

$$z_N^{[s]} = [v_N^{[s]} / c]^2 = z_*^{[s]} 2\pi/N^2, \quad s=...,2, 1, 0,-1,-2,...,$$
$$z_*^{[s]} = [C_*^{[s]} / c]^2 = (C_*^{[1]} / c)^2 \chi^{-2(s-1)} = (0.265202 \cdot 10^{-6}) \chi^{-2(s-1)}$$

Superluminal beam velocities, extreme redshifts, record quasars - Discreteness, quantization.

In the Table 1, alongside with the observationally proved predictions of record (physically distinguished – *dominant*) redshifts, it are resulted and the *dominant velocities* corresponding to them by virtue of a representation $z^{1/2} = \beta = v/c$.

As observations of redshifts are connected to spectroscopic measurements of *the beam* velocities, it would be naturally to count the velocities represented in the Table 1, at least, as *real beam* velocities.

Let's note also the basic fact. The relation between some velocity \tilde{v} and z redshift $\tilde{v} = c z$, dictated by the conventional theory is widely applied in astrophysics

It radically contradicts the mentioned above relation $z = (v/c)^2$, carefully checked up by the experiments.

Thus, simply any way postulated once $\tilde{v} = c z$ relation does not correspond to a reality. Appreciating developed tradition, in the WU Concept \tilde{v} velocity carries the name *formal velocity* (as the allowable only mathematical value which is not having real physical

sense). It is possible to consider it as a dimensional (velocity) synonym of $z = \tilde{v}/c$ redshift.

Superluminal transversal velocities - Discreteness, quantization

In the Table 2 -5 for comparison with observations of *transversal* (in a picture plane) velocities the direct relations for (*elite*) *dominant* velocities by virtue of two representations of WU Concept are used - *Micro-Mega Analogy and Generalized Dichotomy Law*.

Predictions of the theory and astrophysical observations.

For comparison of the theory (WU Concept) predictions with the data of astrophysical observations we shall take advantage of last results of several independent groups of researchers in hope that time inevitably brings also increase of accuracy of measurements. The choice of these groups, generally speaking, is any - on their place basically there can be the results of any other groups possessing advanced accuracy.

The data of Piner and Edwards, 2003, astro-ph/0309547; Gomez et al., astro-ph/0110133 for 3C120 are used for comparison with predicted physically distinguished – *dominant* transversal velocities in $G^{[-6]}$, $G^{[-7]}$ Shells of astronomical systems (Table 2).

Data Bach et al. astro-ph/0309404 for Blasar 0716+714; Gomez et al., astro-ph/0110133 for 3C120; Jorstad et al., 2001, astro-ph/0101570 are involved for comparison with predictions of already only dominant *superluminal velocities* in $G^{[-7]}$ Shell (quasars and BL Lac). (Table 3).

For verification of predictions of *extreme superluminal velocities* in $G^{[-8]}$ Shell the observations of Jorstad et al., 2001, astro-ph/0101570; Bach et al. astro-ph/0309404 for Blasar 0716+714 are used (Table 4, 5).

Results of comparison.

The general result of these comparisons (Tables 2 -5), at least, is rather symptomatic and encourages: Despite of still insufficient accuracy of the measurements, many dominant peaks of velocities are shown in observations with encouraging definiteness. It is necessary to expect, that in due course, the new data of future astrophysical observations even more will confirm predicted expectations.

Some examples.

But already now the carried out comparison is interesting also to that specifies the some theoretically predicted states having the tendency to be shown with the greatest persistence in resulted observations.

The state $v=3.0$ in $G^{[-8]}$ Shell - velocity $\beta=v/c = 8.45$ is observed as

$$\beta_{\text{obs}} = v/c = 8.5^{\pm 1.1} [0528+134]; 8.4^{\pm 2.0} [0851+202]; 8.9^{\pm 1.0} [1156+295]; \\ 8.6^{\pm 0.9} [1622-297]; 8.6^{\pm 3.1} [1730-130]; 8.6^{\pm 0.3} [2230+114]$$

The state $v=2.5$ in $G^{[-8]}$ Shell - velocity $\beta=v/c = 10.06$ is observed as

$$\beta_{\text{obs}} = v/c = 9.9 \pm 2.4 [0219+428]; 10.3 \pm 1.9 [1127-145]; \\ 10.4 \pm 1.0 [1633+382]; 10.1 \pm 1.2 [2251+158];$$

$$10.5; 10.3 \text{ [Bach et al. astro-ph/0309404 Blasar0716 +714]}$$

Hoping that accuracy of measurements of astrophysical velocities (and distances up to objects) will be improved, already now it is possible to ascertain encouraging conformity of the observational data and predictions of the theory.

Superluminal velocities – as the Reality Astrophysical observations of Superluminal velocities - Discreteness, quantization .

(In the near future - confident, convincing) *Detection of effect of superluminal velocities - Discreteness, quantization* means, that

- * The world of superluminal velocities submits to the same laws, as the world of subluminal velocities,

- * In that case there is the uniform general law which is not doing {making} distinctions between these by two worlds.

- * Thus, there is no barrier between them,

- * And the same as obviously there is a world of subluminal velocities - really there is also its natural uninterrupted continuation - the world of superluminal velocities

Spherical Symmetry of superluminal velocities distribution.

The conventional theory with special persistence ascertains surprising asymmetry of the Universe: *Directions on a beam of sight for some reason sharply differ under the physical maintenance} from transversal (in a plane of sky) directions. And it is clear why - only in*

such artificial image and with use extremely speculative shifts it is possible to try to justify the Barrier of speed of light.

And so - and this ad hoc-asymmetry in the Universe *does not exist.*

Detection of effect of discreteness, quantization of superluminal velocities

- * As for *transversal* (in plane of sky) directions.

- * And for *beam* directions (and here it undoubtedly exists - just as effect of *discreteness*, quantization of redshifts)

- * Means and indicate, that the law of *discreteness*, *quantization* of superluminal velocities does not do distinction between beam and transversal directions

- * And thus, there is the quite expected and natural *spherical symmetry* of velocities distribution.

What is price in that case to all these numerous models of conventional astrophysics (such as narrow long tubes -the beams directed only aside of the observer, "light echo", etc.) ?

Problem of distances up to galaxies.

Reliability of the given astrophysical observations of superluminal velocities depends on many factors. One of essential is the uncertainty connected to detection of distance up to object.

Even for objects with known redshifts the difficulty do not come to an end (for example, the choice of the Hubble constant yet does not guarantee accuracy of the received distance) [Chechelnitzsky 2002,2003]..

Here the theory can come on a meeting, offering {suggesting} an unexpected way to the decision of a problem

Method of distances determination.

Let's assume that observations of some group of the galaxies with similar morphology, will confirm an existence of the distinguished value (peak) of transversal dominant velocity. Obviously, at observation of new object of the same morphology it is necessary to expect demonstration of the same peak (the same distinguished superluminal velocity). In that case the distance up to object should be selected such to receive exact (close to theoretical) value of the distinguished dominant velocity.

Astrophysical observations: Demonstrations of the Multiplier.

Manifestations of effect of discreteness, quantization of superluminal velocities in observations can be investigated, bypassing the uncertainty, connected with determination of distances. For this purpose it is possible to use the initial data on apparent proper motion μ (mas·yr⁻¹) of transversal movements. Ratio $R = \mu_i / \mu_j$ of these values, as well as ratio of velocities, are dimensionless values (it is possible to build and histograms of these values). Among these ratios it is necessary to expect the manifestation of the numbers close to $R = M^n$, where $M = 2^{1/4} = 1.1892$ is Multiplier, and $n = 1, 2, 3, \dots$. Manifestations of R ratio close to 2, $2^{1/2} = 1.4142$, also characteristic for the Generalized dichotomy law, is especially symptomatic. It is probable convenient to work and with histograms of logarithms of these ratios $\log R = n \log M = n \cdot 0.07525$, characterized by an uniform scale.

Superluminal velocities - Evidences of the preferable objects.

Special interest is represented with comparisons of predictions of the theory (WU Concept) and observations of some special objects. They can be extracted by virtue of some factors - affinity to the observer, rather exact knowledge of distance, good observability, accuracy of the data, etc.

Galaxy M87.

In connection with a problem of distances the astrophysical observations of superluminal velocities of objects with reliably certain distances have a special interest.

It is difficult to overestimate the importance of observations of superluminal velocities in the galaxy M87 [Biretta et al., 1999]. This is – one from closest objects with the well determined distance. Authors clearly observe the superluminal velocities of the component (jet of M87) with $v \sim 6c$. This value in accuracy coincides with the predicted value $\beta = v/c = 5.97$ of state $v=4.0$ from $G^{[-8]}$ Shell (see Table 4).

Velocities of others components ($v \sim 5.4c$) also correspond to predictions of WU Concept: $\beta = v/c = 5.48$ for $v = 0.5$ state of $G^{[-7]}$ Shell [Table 3].

More detailed analysis and comparison to the original data of observations would have doubtless value.

It is interesting to note the comment of the author to this extremely interesting work:

[Biretta Press, 1999]:

“The term ‘superluminal motion’ is something of a misnomer. While it accurately describes the speeds measured, scientists **still believe** the actual speed falls just below the speed of light.”

This is the traditional ritual tribute and expression of fidelity to a reigned paradigm

Object in our Galaxy: GRS 1915+105.

Under standards of cosmological distances this object is absolutely close. It is considered [Mirabel and Rodriguez, 1994], that the distance up to it is equal to $d = 12.5 \pm 1.5$ kpc. These authors see the following velocities of GRS 1915+105 components $\beta = v/c = 1.25 \pm 0.15$ and $\beta = 0.65 \pm 0.08$

They in accuracy correspond to the predicted dominant velocities in $G^{[-6]}$ Shell: $\beta = 1.25 \pm 0.15$ is comparable with $\beta = v/c = 1.25$ for $v = 1.0$ state,

$\beta = 0.65 \pm 0.08$ - with $\beta = v/c = 0.62$ for $v = 3.0$ state: Distracting from a problem of distance determination, it is possible to ascertain, that the Multiplier here is shown, because the relation of apparent proper motions $\mu_a = 17.6 \pm 0.4$ mas d^{-1} and $\mu_r = 9.0 \pm 0.1$ mas d^{-1} is equal to $R = \mu_a / \mu_r = 1.955(\pm)$ ($= 1.890 \dots 2.022$), i.e. approximately to $R = \mu_a / \mu_r = 2$. Thus, here, evidently, the effect of discreteness, quantization of superluminal velocities is really observed.

Superluminal velocities really Exist!

Let's represent the simple enough reasons proving (already now!), that superluminal velocities in the Universe are not seeming phenomena, but its are - an objective reality

Microworld and Megaworld – Superluminal zones.

The Wave Universe Concept brings special to a focus to some regions in the Universe where superluminal velocities undoubtedly exist and participate in realization of steady structure of real - wave dynamic systems (WDS) - atoms and galaxies.

Atoms: the Superluminal zone.

Model of Bohr's Atom (for example, of hydrogen), represented as the standard Kepler-Newton model (simply speaking, - as planetary model), is characterized by the Main dynamic parameter (with dimension $\text{cm}^3 \text{s}^{-2}$) - Kepler's parameter $K = e^2/m$ and potential $U = -K/a$; here e - an elementary charge, m - electron mass, a - semi-major axes of orbits. The Barrier of speed of light $v_c=c$ is achieved at keplerian velocity $v_c = c = (K/a_c)^{1/2}$ at the distance $a_c=K/c^2 = e^2/m c^2 = 2.817 \text{ fm}$. Then in a zone $a < a_c=2.817 \text{ fm}$ there are real keplerian velocities *exceeding speeds of light*. The *superluminal zone* (i.e. a zone, free from the Barrier of speed of light) includes also a nucleus of Bohr's atom of radius $a_R=R \sim 0.7 \text{ fm}$, where R - radius of a nucleus surface.

Actually, this reason could be specified and about centuries ago. But it is not known, that it appeared ever as counter-argument to the Barrier of speed of light.

Galaxies: the Superluminal zone.

The world of huge astronomical systems shows impressing similarity to the world of atoms (see, in particular, in [Chechelnsky 1980]: Section Micro-Mega Analogy).

The model of a galaxy, representing (similarly to planetary system in which Kepler-Newton laws dominate) as wave dynamic system (WDS), can be described with use of the Main dynamic parameter $K = GM$, where G is gravitational constant, M - mass of central body (CB) of a galaxy [Chechelnsky 2001]

The zone $a < a_c$, bounded by the value $a_c = K/c^2$, is a *Zone of superluminal velocities* - the Zone, really free from the Interdiction (the Barrier of speed of light).

Spiral galaxies. Masses of Central Bodies (CB) of spiral galaxies can be estimated appreciated by value $10^8 M_\odot$, where M_\odot - is mass of the Sun [Chechelnsky 2001].

The Barrier of speed of light is on distance $a_c = K/c^2$ - in several astronomical units (AU) from the center of galaxy..

The zone of superluminal velocities can exist inside the Central Body of a galaxy. In that case a manifestation of *superluminal velocities* occurs at emission from it (from interior of CB) bunches of high-temperature plasma ("a galactic wind"), moving with *superluminal velocities*.

Elliptic galaxies. Masses of CB of huge elliptic galaxies considerably exceeds those for spiral galaxies. By virtue of it *the Zone of superluminal velocities* for them reaches from value $a_c = K/c^2$ up to CB surface. That is the the Zone free and real keplerian *superluminal velocities* - in many respects is similar those for atom.

Conclusion for Astrophysics.

Consequences of such analysis for observational astrophysics are obvious and unambiguous:

Observe galaxies in the central and *superluminal* zones (i.e. in the area closely adjoining to CB) and you will see various manifestations and consequences of *superluminal velocities*. Actually, like this and its occurs, according to the data of astrophysical observations.

Discussion Revelation or Dogma?

Barrier of speed of light – is the fundamental Interdiction of conventional cosmology.

As a result of long tradition of speculative exercises of the theory, it for a long time already became, more likely, the Symbol of Faith, than the rational fact strictly proved by observations and experiments. In our opinion, confrontation of the theory and observations will proceed till a critical epoch, when a prediction of the alternative theory, essentially distinguished from habitual representations, do not become as incontestable fact of new precision observations. In astrophysics it there can be, in particular, observations of *superluminal velocities* in the centers (active) galaxies.

This epoch of clearness and definiteness can be approached substantially if, in particular, purposefully to find out in observations the predicted effect of discreteness, quantizations of *superluminal velocities*

It will mean also, that the detected already now *superluminal* movements in the centers of galaxies is not seeming effect, not illusion, - but ineradicable manifestation of *superluminal velocities* really existing in the Universe.

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Table 1

**QUASARS AND GALAXIES
REDSHIFTS AND SUPERLUMINAL VELOCITIES QUANTIZATION :
SPECTRUM OF STATIONARY STATES - $G^{[-7]}$ SHELL**

T H E O R Y								OBSERVATIONS
Micro – Mega (MM) Analogy				General Dichotomy Law				Obsrevational Data
States	Quantum Number N	Redshift $z = z_*(2\pi/N^2)$ $z_* = 286.4$	Velocity $z^{1/2} = \beta = v/c$	States v	Quantum Number $N=N_v = N_{v=0}2^{v/2}$, $N_{v=0}=6.503$	Redshift $z = z_*(2\pi/N^2)$ $z_* = 286.4$	Velocity $z^{1/2} = \beta = v/c$	References: [Hi] = http://www.oso.chalmers.se/~highz/left_frame.htm
TR*	2.5066	$z_*=286.4$	16.9		2.5066	$z_*=286.4$	16.9	
				v=0.	6.5037	42.5	6.52	
ME	8.083	27.54	5.24	0.5	7.734	30.08	5.48	
TR	9.191	21.30	4.61	1.0	9.197	21.27	4.61	
V	11.050	14.73	3.84	1.5	10.938	15.04	3.87	
E	12.992	10.66	3.26	2.0	13.007	10.63	3.26	
(U)	15.512	7.47	2.73	2.5	15.468	7.52	2.74	Z= 6.97, Q2203+29 G79, Dodonov et al.
MA	16.038	6.99	2.64					
	16.5	6.61	2.57					
	17.5	5.87	2.42					Z= 5.80, [Fan X., astro-ph/0005414] Z= 5.74, galaxy SSA22-HCM1, [Hi]
	18.5 19.0	5.25 4.98	2.29 2.23	3.0	18.395	5.31	2.30	Z= 5.18, Quasar discovered by <i>Chandra</i> [Barger et al.,2002] Z= 5.34, galaxy HDF 3-951.0, [Hi] Z= 4.93, Quasar discovered by <i>Chandra</i> [Silverman et al.,2002]
(NE)	19.431 19.5	4.76 4.73	2.18 2.17					
CE	21.614	3.85	1.96	3.5	21.876	3.76	1.94	Z= 3.78, Quasar PKS 2000-330
(P)	22.235	3.64	1.91	4.0	26.015	2.66	1.63	Z= 3.53, Quasar OQ172 Z= 2.565, galaxy SMM J14011+0252, [Hi] Z= 2.723, galaxy MS1512+36-cB58, [Hi]

Table 2

QUASARS AND GALAXIES
SUPERLUMINAL VELOCITIES QUANTIZATION :
SPECTRUM OF STATIONARY STATES - G^[-6] SHELL

T H E O R Y						O B S E R V A T I O N S				
Micro – Mega (MM) Analogy			General Dichotomy Law			Obsrevational Data				
States	Quantum Number N	Velocity $\beta = v/c = \beta_*(2\pi)^{1/2}/N$ $\beta_* = 4.615$	States v	Quantum Number $N=N_v = N_{v=0}2^{v/2}$, $N_{v=0} = 6.5037$	Velocity $\beta = v/c = \beta_*(2\pi)^{1/2}/N$ $\beta_* = 4.615$	Piner& Edwards,2003 astro-ph/0309547			Go mez et al ast ro- ph/ 011 013 3	
						Mrk 501	PKS 2155 -304	1ES 2344 +514	3C 120	
TR _*	2.5066	4.615		2.5066	4.615		4.37 ± 2.88			
			v=0	6.5037	1.77					
			0.5	7.734	1.49					
ME	8.083	1.42								
TR	9.191	1.25	1.0	9.197	1.25					
V	11.050	1.04	1.5	10.938	1.05			1.15 ±0.46		
E	12.992	0.89	2.0	13.007	0.89					
(U)	15.512	0.74	2.5	15.468	0.74					
MA	16.038	0.72								
	16.5	0.70								
	17.5	0.66								
	18.5	0.62	3.0	18.395	0.62					
	19.0	0.61								
(NE)	19.431	0.59								
	19.5	0.59								
CE	21.614	0.53	3.5	21.876	0.52	0.54 ± 0.14				
(P)	22.235	0.52	4.0	26.015	0.44			0.46 ±0.43		

Table 3

QUASARS AND GALAXIES
SUPERLUMINAL VELOCITIES QUANTIZATION :
SPECTRUM of STATIONARY STATES - $G^{[-\eta]}$ SHELL

T H E O R Y						O B S E R V A T I O N S					
Micro – Mega (MM) Analogy			General Dichotomy Law			Obsrevational Data					
States	Quantum Number N	Velocity $\beta = v/c = \beta_*(2\pi)^{1/2}/N$ $\beta_* = 16.923$	States v	Quantum Number $N=N_v = N_{v=0}2^{v/2}$, $N_{v=0} = 6.5037$	Velocity $\beta = v/c = \beta_*(2\pi)^{1/2}/N$ $\beta_* = 16.923$	Bach et al. astro-ph/0309404	Gomez et al astro-ph/0110133	Jorstad et al.,2001 astro-ph/0101570			
						Bla sar 0716 +714	Qua sar 3C 120	0202 +149	0829 +016	1219 +285	
TR_*	2.5066	16.923		2.5066	16.923						
			v=0	6.5037	6.52	6.9 6.1	5.82 ±0.13		6.4 ±1.7		
ME	8.083	5.24	0.5	7.734	5.48	5.3 5.1	5.38 ±0.09 5.10 ±0.14	5.2 ±0.3	5.4 ±0.7		
TR	9.191	4.61	1.0	9.197	4.61	4.4	4.29 ±0.10 4.12 ±0.06				
V	11.050	3.84	1.5	10.938	3.87	4.0	4.01 ±0.08				
E	12.992	3.26	2.0	13.007	3.26						
(U)	15.512	2.73	2.5	15.468	2.74				2.9 ±0.15	2.8	
MA	16.038	2.64									
	16.5	2.57									
	17.5	2.42									
	18.5 19.0	2.29 2.23	3.0	18.395	2.30					2.3 ±0.3	
(NE)	19.431 19.5	2.18 2.17								2.2 ±0.1	
CE	21.614	1.96	3.5	21.876	1.94						
(P)	22.235	1.91	4.0	26.015	1.63					1.5 ±0.2	

Table 4

QUASARS AND GALAXIES
SUPERLUMINAL VELOCITIES QUANTIZATION :
SPECTRUM OF STATIONARY STATES - G^[-8] SHELL

T H E O R Y						O B S E R V A T I O N S					
Micro – Mega (MM) Analogy			General Dichotomy Law			Obsrevational Data					
States	Quantum Number N	Velocity $\beta =v/c= \beta_*(2\pi)^{1/2}/N$ $\beta_* =62.05$	States v	Quantum Number N=N _v = N _{v=0} 2 ^{v/2} , N _{v=0} = 6.5037	Velocity $\beta =v/c= \beta_*(2\pi)^{1/2}/N$ $\beta_* =62.05$	Jorstad et al.,2001, astro-ph/0101570					
						0219 +428	0528 +134	0716 +741	0851 +202	11 27 -145	1156 +295
TR _*	2.5066	62.05		2.5066	62.05						
			v=0	6.5037	23.91		22.6±11.3				
ME	8.083	19.24	0.5	7.734	20.11	19.3 ±3.5	18.7 ±5.1			19.8 ±6.1	
TR	9.191	16.92	1.0	9.197	16.91						
V	11.050	14.08	1.5	10.938	14.22	14.2 ±0.5	14.7 ±5.7	14.8±2.5 13.6±1.9			14.1 ±2.3
E	12.992	11.97	2.0	13.007	11.95		10.8 ±1.1	11.1			
(U)	15.512	10.01	2.5	15.468	10.06	9.9±2.4				10.3 ±1.9	
MA	16.038	9.69									
	16.5										
	17.5										
	18.5 19.0		3.0	18.395	8.45		8.5 ±1.1		8.4 ±2.0		8.9 ±1.0
(NE)	19.431 19.5	7.99									
CE	21.614	7.19	3.5	21.876	7.11				6.8 ±0.7		
(P)	22.235	6.99	4.0	26.015	5.97				5.4		

Table 5

QUASARS AND GALAXIES
SUPERLUMINAL VELOCITIES QUANTIZATION :
SPECTRUM OF STATIONARY STATES - G^[-8] SHELL

T H E O R Y						O B S E R V A T I O N S					
Micro – Mega (MM) Analogy			General Dichotomy Law			Obsrevational Data					
States	Quantum Number N	Velocity $\beta = v/c = \beta_*(2\pi)^{1/2}/N$ $\beta_* = 62.05$	States v	Quantum Number $N=N_v = N_{v=0}2^{v/2}, N_{v=0}=6.5037$	Velocity $\beta = v/c = \beta_*(2\pi)^{1/2}/N$ $\beta_* = 62.05$	Jorstad et al.,2001, astro-ph/0101570					
						1611 +343	1622 -297	1633 +382	1730 -130	2230 +114	2251 +158
											Bach et al. astro-ph/0309404 Blasar 0716+714
TR*	2.5066	62.05		2.5066	62.05						
			v=0	6.5037	23.91	24 ⁺⁹ ₋₁					
ME	8.083	19.24	0.5	7.734	20.11	21 ^{±8}					
TR	9.191	16.92	1.0	9.197	16.91					15.7 ^{+0.6} _{-0.6}	
V	11.050	14.08	1.5	10.938	14.22	13.3 ^{+2.1} _{-2.1}					14.3
E	12.992	11.97	2.0	13.007	11.95		11.4 ^{+8.3} _{-8.3}			11.7 ^{+1.4} _{-11.3} ±0.3	
(U)	15.512	10.01	2.5	15.468	10.06			10.4 ^{+1.0} _{-1.0}		10.1 ^{+1.2} _{-1.2}	10.5 10.3
MA	16.038	9.69					9.7 ^{+1.1} _{-1.1}				
	16.5	9.42					9.3 ^{+1.8} _{-1.8}				
	17.5										
	18.5 19.0		3.0	18.395	8.45		8.6 ^{+0.9} _{-0.9}		8.6 ^{+3.1} _{-3.1}	8.6 ^{+0.3} _{-0.3}	
(NE)	19.431 19.5	7.99				7.7 ^{+0.9} _{-0.9}					
CE	21.614	7.19	3.5	21.876	7.11			7.3 ^{+0.5} _{-0.5}	7.1 ^{+0.6} _{-0.6}		7.3 7.2
(P)	22.235	6.99	4.0	26.015	5.97						6.9 6.1