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Dealing with Dark Matter in Astronomer's Practice

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Abstract

Astronomers believe in the existence of Dark Matter in galaxies (GDM), a hypothetical form of gravitating substance devoid of atomic and nuclear structure. The problem is complicated by the appearance of Dark Matter entities in the Lambda-CDM Big Bang Cosmology. We conducted a critical analysis of current phenomenological GDM models in comparison with Newton's physics. Attention was focused on a controversial criterion of the possible existence of GDM in "Keplerian" vs "non-Keplerian" galaxies. As a result, we suggest an Alternative in the Newtonian Gravitation framework. It ensures a GDM-free treatment of galactic observations, provided the interaction of Core and disc appropriately accounted and some concepts of Galactic Dynamics reviewed. We also studied the interfacing of GDM with "Dark entities" (Cold Dark Matter and Dark Energy) in the Lambda-CDM Cosmology and concluded that they were introduced for different reasons and our criticism of GDM conception does not essentially affect the Lambda-CDM status. A success of the Newtonian Galactic Dynamics is illustrated in examples of the Milky Way and other galaxies. We state that the work contains novelties of fundamental importance, among them is the main one: the proof of GDM being fictitious.

Contents

1 Introduction

1.1 Dark Matter advent

The last Century brought to Newton's Mechanics and Dynamic a great long-lasting misfortune: an apparent inability to treat astronomical observations of galaxies and their hierarchy in terms of Kepler's laws. In particular, astronomers encountered the problem of discrepancy between observations and prediction of rotation curves (RC). To explain it, they suggested the existence of hypothetical substance called Galactic Dark Matter (further GDM) in the form of Halo, which envelops a galactic disc. This is a phenomenological model with fitting parameters, which is claimed to be consistent with Newton's physics, but is it?

Besides GDM Halo, another competing phenomenological model was suggested, called Modified Newtonian Dynamics (MOND). Their supporters blame Newton's Physics for failure to describe observations, also, they assume that the Dark Matter phenomenon does not exist at all. We state that both phenomenological models break Newtonian conservation laws without a solid proof of Newton's physics deficiency.

Meanwhile, an air of crisis about Dark Entities is rising among the Astronomic and Cosmological communities at a time of unprecedented successes in observational technologies, so a certainty in choosing GDM model is in request (Banik and Zhao, 2022). How long should phenomenological GDM and MOND compete each with other? Those issues and the very GDM existence are discussed in the next sections.

1.2 The Goal

Thus, we are in a position of having two competing phenomenological models formally "explaining" the GDM puzzle: GDM Halo and MOND. The first one admits Newton's Physics and physical existence of unknown Dark Matter phenomenon, while the second stands for the opposite. We are going to prove that a formulation of the GDM Halo model is ill-posed, and the explanation of GDM phenomenon is flawed. We reject it for denying Newton's physics without a proved cause. As for the MOND model, we similarly denied it while pursuing physical theory rather than parameterized phenomenology. Newtonian gravitational dynamics is based on the fundamental space-time symmetries leading to the conservation of total energy and angular momentum in gravitational bounded isolated systems, such as galaxies. It is hard to acknowledge its failure in physics of galaxies.

There are other models deserving discussions and further studies, for example, "Superfluid Dark Matter" (Mistele et al., 2023). They are types of GDM parameterized phenomenology, in which fundamental physical laws of conservation are inevitably broken. The same is true for other "Newtonian modifications".

The challenging goal of this work is to demonstrate that the puzzle of galactic Dark Matter (GDM) is resolvable in the framework of Newtonian Gravitation, albeit the Alternative would be against the societal assurance of the physical reality of the GDM phenomenon. So far, our work is the first proven exposure of Galactic Dark Matter conception in favor of Classical Physics since it appeared in Astronomy.

Next, we briefly review classical Newtonian gravitation abandoned in astronomers practice and restored back in our work.

2 Newtonian Gravitation Dynamics of Galaxies

2.1 Physics of Kepler's laws, and concept of standard test particle

Before the GDM topic, let us present the basics of Newtonian Gravitation mechanics and dynamics with some extensions. There, a reader may find noticeable novelties in our presentation of elliptic orbits. Instead of geometrical parameters,– semi-major axis and eccentricity, we use one physical parameter in dimensionless form σ. Here, the notion of standard test particle (STP) at rest $m\,c^2$ is included in equations of motion, as a first approximation of Special Relativity Dynamics. It significantly simplifies orbit classification and enriches the physical interpretation of problem solutions.

Kepler's laws have great historical and pedagogical values in presenting planetary orbits in the elliptic form for potential $1/R$ in terms of two geometrical parameters,– eccentricity and semi-latus rectum. It is a phenomenological reflection of Newton's Universal Gravitational Law without the equations of motion. Kepler's laws do not define Classical Gravitation Dynamics governed by the conservation laws for total energy and angular momentum in gravitational bounded isolated systems of material bodies moving in space and time. Those laws are formulated in terms of physical parameters and substantiated by the famous Space-Time Symmetry Theorem by Emmy Noether. On top of it, there is the so-called Virial Theorem related to the dynamic stability of complex N-body systems. Actually, we use Kepler's laws to describe orbital motions of the standard test particle

(STP) in One-Body approximation. The equations of motion are applied to a complex problem such as Galactic Dynamics. As shown further, the model works very well. When needed, the N-body problem must and can be applied. However, classical treatment of groups and clusters of galaxies remains a challenge.

The equations of motion are constrained by the laws expressing conservation of total energy ϵ_0 and angular momentum l_0. The type of orbit depends on initial conditions, which are given below along with conservation laws and equations of motion: $r = r_0, \beta = \beta_0, \theta = 0$.

$$\epsilon_0^2 = 1 - 2\frac{r_g}{r} + \beta_r^2 + \frac{l_0^2}{r^2}\,, \quad l_0 = r\beta_\theta = r_0\beta_0\,, \tag{1}$$

$$(\mathrm{d}\xi/\mathrm{d}\theta)^2 = 1 - 2\,\sigma + 2\,\sigma\xi - \xi^2\,, \tag{2}$$

$$r(\theta)/r_0 = (\sigma + (1-\sigma)\,\cos\theta)^{-1}\,, \tag{3}$$

Denotations:

- radial speed $\beta_r = \mathrm{d}r/\mathrm{d}t$;
- angular speed β_θ;
- angle of rotation θ;
- radial (inverted) coordinate $\xi = r_0/r$;
- mass of source M;
- gravitational radius $r_g = G\,M/c_0^2$;
- parameter of orbit type $\sigma = (r_g/r_0)/\beta_0^2$.

Given initial conditions, the equations of STP motion describe all possible classical orbits in the Newton's One-Body approximation. The one-parameter classification is illustrated in the Fig. 1. There are 5 types of them ranked by β_0 in the picture: a circle (2), $\sigma = 1$, elliptic sub-circle (1), $1 < \sigma < \infty$ and over-circle (3), $0.5 < \sigma < 1$, parabolic (unstable) (4), $\sigma = 0.5$, and hyperbolic (unbounded) (5), $\sigma < 0.5$. We recommend astronomers to abandon Kepler's geometrical orbits in favor of the above physical one-parameter equations.

Notice a remarkable feature of the σ criterion symmetry $G\,M/r = V^2$: a proportionality $M \propto r$ gives the same solution with the orbiting speed V unchanged (flat RC). Interestingly, this property was pointed out years ago as a hint to GDM

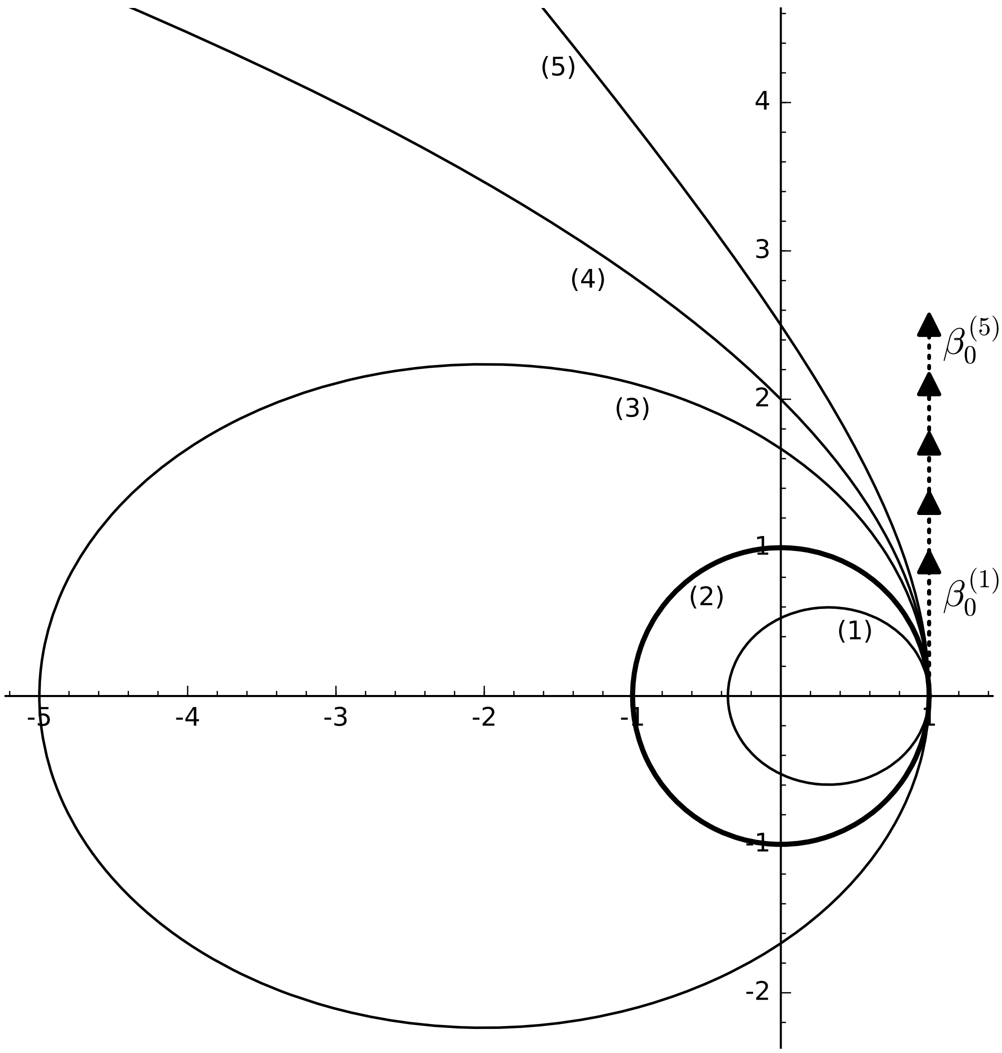

Figure 1: Five possible classical orbits in the framework of One-Body Newtonian Gravitation.

non-existence (De Mees, 2015). Also, see GDM-free Mestel disc in GR dynamics, which is widely used in the GDM Halo model (Mestel, 1963).

The theorems and laws altogether constitute the basis of Classical Gravitational Dynamics. As noted, in the advanced form it can be extended to the Special Relativity Dynamics (SRD) in Minkowski space. Using the SRD, one can assess the relativistic effects of high speed and strong field. Sadly, the SRD is almost forgotten or ignored in Modern Physics.

2.2 Concepts of rings, self-sustained rotation, and standard test particle

Bearing in mind that the radial disc density on average is smooth, let us consider an integral mass distribution $M(r_i)$. Here, we use a composition of R_i-rings of thickness Δr. Each ring contains all kinds of galactic materials rotating with the same speed $V_i(r)$ in accordance with the Equivalence Principle. Corresponding differential mass distribution will be $\Delta M(r_r)/\Delta r$.

By definition, a rotation of any R_i-ring is due to its source M_i that is, an inner mass $M_R(r_i)$ for $r < R_i$, provided being significantly greater than the fixed Core mass. In other words, the whole disc consists of huge number of R_i-rings each having its own source $M_R(r_i)$. We call it the Self-Sustained Rotating Disc provided being energized by the Core mass. A slight influence of the outer part of the disc at $r > R$ on the rotation of inner rings can be neglected to the next-order precision. This is true because adding or removing some edge rings does not influence density distribution and stability of the disc rotation.

We can choose $\Delta M(r_r) \ll M_R(r_i)$ so that the R_i can be considered the standard test particle (STP), according to Newton's gravity, its mass must be however small regardless of value (1,2, 3). More details are given further.

2.3 The Core and the Disc

Observations of the Core with central SBH are usually well treated by astronomers in the Newtonian approach, however, serious complications can arise with galactic structure, particularly, in the determination of mass and density distributions. The MW galaxy is a barred spiral one having a bulge and central SBH. The bulge is much heavier than that of the central SBH SgrA*. Its shape looks like two eggs, back-to-back glued and bar-connected. The SBH and bulge constitute a galactic Core, the zone of transition from spherical geometry to a disc in polar or cylindrical coordinates. Strictly speaking, this is N-body problem requiring a numerical simulation of conditions of transition from spherical to cylindrical geometry, that is a topic of separate study. However, we can assess a role of the Core in RC empirically seeing its flattening, specifically, at some point about $R_1 = 1$ kpc at the speed of rotation about $V_1 = 240$ km/s with a critical mass about $M_c = 5 \times 10^{10} M_\odot = 1 \times 10^{41}$ kg.

2.4 Black Holes and the Principle of Ultimate Gravitational Compression

Astronomers used to notice but did not paid much attention to that the average density of a black holes inside the Schwarzschild sphere is inversely proportional to the square of its mass (Baaquie and Willeboordse, 2015). However, this happens under special condition of the Event Horizon in non-rotating black hole: the greater size and mass, the lesser density. Let us call it the *Principle of ultimate compression*, which tells us that the critical (nuclear) density, say, $d_{\rm cr} \approx 1 \times 10^{19}$ kg/m^3 cannot be physically exceeded. Ideally, it occur when a natural radius of solid sphere with an observed border R approaching a theoretical radius $r_g = G\,M/c_0^2$, while the speed of STP approaches infinity. Notice, we are actually work with the Gravitational radius r_g, which is half the Schwarzschild radius. This brings us to the interesting result.

Assuming that BH mass M is measured, one can calculate theoretical values of the other two parameters d and R. We have

$$R = r_g = r = \frac{G\,M}{c_0^2}\,, \quad d = \frac{3\,c_0^2}{4\,\pi\,G\,R^2}\,, \tag{4}$$

where $R \sim M$, $M \sim R^3\,d$, and $d \sim R^{-2}$. The equality $R = r_g$ imposes a constraint on the 3 parameters R, M, d. Given any of them, the other two can be calculated using the above proportionality rules. If you double the mass, radius is doubled too, volume jumps cubic, hence, density falls in square. Such a scheme of mass compression in BH is physically meaningful in a certain range of masses above the Solar mass $M_\odot$. The smallest one is the Neutron star (NS), which can be considered the lightest stellar BH.

The proposed Principle of Ultimate Gravitational Compression to the critical density $d_{\rm cr}$ is principally different from the conventional conception of gravitational collapse, and it changes our understanding of Galactic Dynamics.

In the case of Milky Way, measured mass of SgrA* is $M = 4.1 \times 10^6\, M_\odot$. Then, the calculation gives values of

- $R = 6.0 \times 10^9$ m and
- $d = 6.0 \times 10^6\, \mathrm{kg/m^3}$;
- the actually measured radius is about $R = 2.4 \times 10^{10}$ m.

In another example of galaxy NGC 1052-DF2 of Ultra Diffuse type, the measured SBH of mass is $M = 1.5 \times 10^8\, M_\odot$. The calculated values are:

- $R = 2.3 \times 10^{11}$ m
- $d = 6000\, \mathrm{kg/m^3}$

that is, the mass density drastically drops.

The heaviest SBH is identified in the center of Messier 87 galaxy at the distance about 16 Mpc with the measured BH mass about $M = 6 \times 10^9\, M_\odot$ (1500 times heavier than SgrA*). One can imagine "devouring monster". Surprisingly, by the above proportionality rules, the calculated quantities are $R = 9 \times 10^{12}$ m, and density of the monster comes to level of air $d = 1.2 \times 10^3\, \mathrm{kg/m^3}$. This is the consequence of UGC Principle, when Supermassive Black Holes can hardly exist in a stable spherical form, it is rather flattened by rotation while bounded. If so, observations and treatments of them could be confusing and misinterpreted.

Back to the Neutron Star. Assume that the measured parameters of SgrA* are reasonably true, particularly, mass density $d_{\mathrm{sgr}} = 9.0 \times 10^6\, \mathrm{kg/m^3}$. Then, one can assess the NS parameters by take one of them given and finding the rest using the proportionality rule. For example, let us take the critical density $d_{\mathrm{cr}} = 1.0 \times 10^{19}\, \mathrm{kg/m^3}$ to compare it with d_{sgr}. From the square proportionality factor $k^2 = 1.1 \times 10^6$, the values of radius and mass of the Neutron Star follow $R = 5.67 \times 10^3$ m, $M = 3.84\, M_\odot$, what is physically reasonable. In our approach, one can assess any BH and NS case individually or in comparison.

3 Newton's application to Galactic Dynamics

3.1 Preliminary notes

Thus, we introduced new concepts in Galactic Dynamics, such as R_i-rings playing the role of STP in One-Body approximation, self-sustained disc rotation, finally, the Principle of Ultimate Compression of BH mass in the Core. They are basics in our methodology of treating galactic observations in the Newtonian Gravitation framework applied to the GDM problem. We need to construct algorithms for determination and calculations of main characteristics of galactic disc, namely, the integral and differential radial mass distributions $M(r)$ and $\Delta M(r_i)$, also the mass density distributions $D(r)$, provided disc thickness H and orbiting velocities $RC(r)$ being measured at a reference point R_0. The study of brightness and mass-luminosity ratio is not needed at this stage.

In treatment of galactic observations, we have to pay the attention to methodological issues. One of them is a bottom-up evolution of galaxy. The subject of interest is a physical process of forming a bounded system of matter rotating about the center of mass. The other subject is galaxies' ages. A born "baby galaxy" may contain a stellar Black Hole. Further evolution crucially depends on the amount of matter in surrounding space, or Halo. As we realized, mature spiral galaxies have SMBH of masses in the restricted range. Heaviest ones are flattened by rotation leading to complications in the structure Core, as the main determinant of galactic evolution.

There are other morphological issues related to interaction of galaxies in a variety of environments. A large galaxy can be hit in an accidental collision with some heavy object leading to producing "strange" galaxies, like irregular dwarf and others. The stochastic nature of galactic evolution should be reflected as irregularities and abnormalities in the radial mass density distribution $D(r)$ in a galactic disc. On the other side, scarce environments may produce mass-deficient galaxies lacking spirals and visible discs. They could be of elliptic or "irregular" types, which are difficult in defining a degree of gravitational bound. We shall return to this issue further. Having been aware of the above issues, we are ready to discuss algorithms of Newton's probing the alleged GDM presence in galactic structure.

3.2 RC unfolding algorithms

Talking about STP in the potential $\Phi(r) \sim 1/r$ due to a single source of mass M, we refer to the parameter σ in a physical dimensionless form applied to equation of STP motion in a dimensional form. Recall, this parameter in (3) describe all types of orbits including the sub-circle, which is not recognized in geometrical classification.

In Galactic Dynamics, one has to deal with a disk composed of multiple R-rings, the sources $M(r_i)$ for STPs. The purpose is to calculate the integral radial mass distribution using measured RC velocities $V(r_i)$. As noted, empirical RC data include a set of numbers, which generally cannot be approximated by simple smooth functions. Hence, output calculations might be also a set of numbers.

$$M(r_i) = \frac{1}{G}\,[r_i\,(V(r_i)^2] \tag{5}$$

We have to determine and express empirical data in terms of Newton's physics of galaxy. As noted, the mass m on both sides of equation represents the STP of any $m \ll M_i$. The differential radial mass distribution, by definition, should be a plot of $\Delta M(r_i)/\Delta r$ consistent with the equation (5). Then, the distribution of mass density $D(r_i)$ can be derived.

$$\frac{\Delta M(r_i)}{\Delta r} = 2\,\pi\,H\,D(r_i)\,r_i = \frac{1}{G}\,[V(r_i)^2 + 2\,r_i\,V(r_i)]\,\frac{\Delta V(r_i)}{\Delta r} \tag{6}$$

$$D(r_i) = \frac{(1/G)\,[V(r_i)^2 + 2\,r_i\,V(r_i)\,\Delta V(r_i)/\Delta r_i]}{2\,\pi\,H\,r_i} \tag{7}$$

Those equations guide using empirical RC data to unfold the whole physical information about galactic strictures in the Newtonian Gravitation Framework. Lets us demonstrate Dynamics of galaxies.

3.3 Milky Way

Here, we demonstrate the power and elegance of Newton's physics in the simplified example of Milky Way (MW) Galactic Dynamics. Before numerical calculations of MW characteristics, we define the differential mass increment

$$\Delta M(r) = 2\pi\,H\,r\,D(r)\,\Delta\,r \tag{8}$$

From the concept of R_i-ring as the standard test particle, we know that ΔM is constant in the RC flat region of maximal stability. There the source mass $M(r)$ increases with r: $M(r) \sim r$ to make $G\,M(r)/r$ = Cont. Then, the average density of matter $D(r)$ must decrease inversely proportional to radius $D(r) \sim 1/r$, what is a natural proportionality for a radial density distribution in cylindrical geometry.

From observations in the RC flat region of Milky Way, for example, at the Solar place, we have measured speed V_0 at $r = R_0$, as the reference quantities. Also, we measure the disc thickness H.

Having this done and using the above proportionality rules in the formulas, one can define and calculate all quantities in the flatness range, including gravitational radius r_g, total and kinetic energies, and angular momentum of any part of galaxy. The mean mass density can be roughly assessed from proportionality $D(r) = R_c\, D_c/r$ with respect to the starting point in the Core area. Using the data for $R_0 = 8\,\mathrm{kpc}$, let us take the mass increment per $\Delta M \Delta r \approx M_0/R_0$, here ΔM is a familiar quantity in the concept of R_i-ring as the standard test particle. We have $\Delta M/\Delta R_0$. The volume containing this quantity is $Vol_0 = 2\pi H R \Delta R$, where $\Delta R = 1\,\mathrm{m}$. Therefore, the local density is $D_0 = \Delta M_0/Vol_0$. Giving those illustrative numbers, we do not pay attention to their real accuracy of estimations.

So we have

- $R_0 = 8\,\mathrm{kpc} = 2.47 \times 10^{20}\,\mathrm{m}$;
- $V_0 = 2,40 \times 10^5\,\mathrm{m/s}$;
- $M_0 = 2.16 \times 10^{41}\,\mathrm{kg} = 1.0 \times 10^{11}\,M_\odot$;
- $H = 0.3\,\mathrm{kpc} = 9.3 \times 10^{18}\,\mathrm{m}$;
- $D_0 = 5.5 \times 10^{-19}\,\mathrm{kg/m} = 8\,M_\odot/\mathrm{pc}^3$
- $r_g = 1.6 \times 10^{14}\,\mathrm{m}$.

The density of matter in the MW on average is extremely low and favorable for collisionless motion of stars. Hence, the concept of test particle is justified.

The extrapolation to $R_1 = 1\,\mathrm{kpc}$ gives $M_1 = 2.7 \times 10^{40}\,\mathrm{kg} = 1.3 \times 10^{10}\,M_\odot$. This is consistent with observations and the requirement of Core engagement in self-supporting disc rotation: its mass and density in the Core area should grow with radius faster than in the RC flat region.

Having measured V_0 and H and using the above proportionality rules, one can calculate other galactic quantities in the range of RC flatness. In particular, one can calculate a time period P of orbit rotation at any radius r. This quantity implicitly reveals the 3d Kepler's law $P^2 \sim r^3$. At Sun's position $r = R_0$, the period is $P_0 = 2.3 \times 10^8$ per year. Using the law $P^2 \sim R^3$, one can calculate $P(R)$ at any R in comparison with P_0.

The relationship $P^2 \sim r^3$ is the consequence of formula $G\,M_0/R_0 = V_0^2$, which reflexes the Virial Theorem statement that in a circular gravitation orbit of particle of mass $m \ll M$, the potential energy $\Phi \sim 1/R$ is a doubled kinetic energy $K = m\,V^2/2$. At the same time, the period of rotation $P = 2\,\pi\,R/V$ is, equivalently, $P = (R^3/G\,M)^{3/2}$. In elliptic orbits, one should use the semi-major axis a instead of radius R. The RC flatness is only one of the physical features of

Keplerian orbits. One should be aware that all types of them in the gravitational potential $1/r$ are Keplerian.

3.4 Dynamic instability

In reality, the MW has no distinct boundary. In particular, the thickness of disc likely increases, the density decreases faster and the RC, after reaching a maximal point, monotonously declines. One of factors is an interaction of the disc with a large physical Halo, which could have much greater mass than a disc. Here, we assume the galactic disc isolated from the Halo, what is an approximation. With a radius increase, there could be the problem of quasi-stationary galactic dynamics of galaxy evolution involving the spiral structure. More precise solution of the problem in Newtonian framework requires a development of numerical model.

Let us consider galactic Kinematics of large disc like in MW. It is remarkable that the potential function at the rings in a flat RC area is constant,

$$\Phi = r_g/R = 6.48 \times 10^{-7} = \text{const} \tag{9}$$

At the same time, the acceleration $g(R)$ (the force) on the ring surface decreases with the radius, $g(R) = V_0^2/R$. Consequently, instability increases leading to developing of spiral arms, when orbits become over-circle or hyperbolic ($\sigma < 0.5$), Then disc material will flow out through the spiral arms. This phenomenon related to worsening ratio of angular momentum $L(r) \propto r^2$ vs the constant rotation energy, while a local acceleration decreases $g(r) \propto 1/r$. This factor characterizes a growth of velocity dispersion. Astronomers used this effect for identifying ages of stars and other physical properties depending on angular momentum $L(r)$ (Sharma et al., 2021).

Besides orbital motion, a radial stream about disc and inside is important. It was noted that the radial force at $R = 8\,\text{kpc}$ is $g = 2.3 \times 10^{-10}\,\text{m/s}^2$. It is locally very small, nevertheless, in a cosmic distance scale a relativistic radial motion of matter can develop. Because the MW galaxy is fairly transparent, a heavy galactic material entering from the Halo can be sucked in and strike the Core with a high radial speed. As a results, astronomers may observe different kind of huge energy explosion and electromagnetic emission.

To sum up, the results of Milky Way treatment in the Newtonian Gravitational framework brings the proof of GDM being fictitious,- the product of abstract minding. In the preceding sections, we present various arguments that the GDM conception of undetectable substance is ill-posed and inherently contradicting.

Different phenomenological models based on fitting parameterization of observational data cannot be accepted because of their inconsistency with conservation laws. However, the employment of GDM entity in other parts of Modern Physics makes us obligated to continue discussions of the problem in a broader viewing.

4 Understanding of abuse of Kepler's laws

4.1 Astronomers' disagreement with Newton

In the above, we showed that Newton's flat RC treatment demonstrates the GDM non-existence. In the work by Professor Peebles (1993) on Dark Matter in galaxies, he noted that misapplying of Newtonian gravitation is possible (Peebles, 1993) (page 418). We are fully agree with that and state it has happened.

We learned that supporters of Modified Newton's Dynamics (MOND) deny a physical existence of the Dark Matter phenomenon and blame Newton's Physics laws for alleged deficiency on a galactic scale. They try to explain the GDM puzzle by introducing a new physical fundamental feature a in addition to the universal gravitational constant G. Having this said, they proclaim a crisis in Astronomy and Cosmology. Indeed, the crisis seems to be true but the idea about breakage of classical heritage is akin a great but unnoticed revolution in physics. Actually, the quantity a must play role of a model parameter in the treatment of observations in comparison with the multi-parametric GDM Halo model. Definitely, MOND is not consistent with the conservation laws. Unfortunately, this reality was too easily among Physical Community.

On the other side, supporters of GDM Halo admit the correctness of Newtonian Physics with Kepler's laws, at the same time, they proclaim Newtonian Physics failure to describe observations, in particular, "non-Keplerian" flat RC. "To explain" such a discrepancy, they postulate the existence of GDM phenomenon, which "disturbs" galactic orbits through gravitation, albeit it has gravitational properties identical with the ordinary matter. Also, we know that GDM does not absorb, emit, or scatter light but its physical nature remains mysterious. Analyzing the observed RC, we do not need to see GDM by eyes, we see its presence in the RC. Again, the question arises how astronomers decided that GDM affects Keplerian orbital motion in galaxies through gravity, while having gravitation properties identical to the ordinary matter.

In other words, there is evidently broken logic in statement that Kepler's laws explain galactic rotation of usual matter, say, of Keplerian (white) color, but gravitational ‘identical” matter, say, non-Keplerian (dark) color disables Newton’s Physics. The only resolution of the puzzle should be a statement that GDM Halo model is inconsistent with Kepler’s laws: the original postulate on the gravitational identity of dark and ordinary matter is wrong. They should blame the postulate rather than Newton’s gravity.

This is the issue for Philosophers in Modern Physics, first of all, in part of Epistemology, questions about true new knowledge from observations, or “are we closer to the truth”? Their activity seems to fade with the severity of questions growing. The professional work (Martens, 2021) gives a deplorable philosophical picture of Dark entities in modern physics. Our point is that the idea of GDM existence historically began as hypothetical, and it gradually fastened as “a strong evidence”, in particular, by the criterion of “non-Keplerian” (flat) RC. In this way, the criterion was imprinted in people’s minds as a basic definition of “GDM existence”.

4.2 GDM Halo Model in astronomers’ practice: examples

By Professor Sofue (Sofue, 2020), the GDM Halo model is aimed “to assess” the amount of physically existing GDM of unknown physics, specifically, its mass and density distributions with respect to the ordinary matter. Notably, most studies are allegedly conducted in the non-MOND Newtonian gravitation framework. The is a controversial pretext of GDM presence about galaxies. In practice, astronomers, having no theoretical guide, rely on their creativity and fantasy in probing different models of GDM Halo, which could go beyond Newton’s physics.

To reiterate, consider Milky Way in flat RC range at $R_0 = 8\,\text{kpc}$, where astronomers correctly measured $V_0 = 2,40 \times 10^5\,\text{m/s}$ and calculate $M_0 = 2.16 \times 10^{41}\,\text{kg}$. They called R and M galaxy constants known as Virial radius and mass related to Newton’s potential

$$\Phi(r_i) = G\,M_i r_i = V(r_i)^2 \tag{10}$$

It is seen that, in RC flat area, the mass M_i is accumulated within the radius r_i proportionally. The input data are sufficient to calculate mass density $D(r_i)$, which is inversely proportional to radius, so, no GDM. This is Newton’s physics based on conservation laws.

Back to probing different types GDM Halos. Regardless of models, those Halo’s have mysterious ability to embrace galaxies against all conservation laws. This fact gives astronomers freedom in fitting GDM function to observations. With

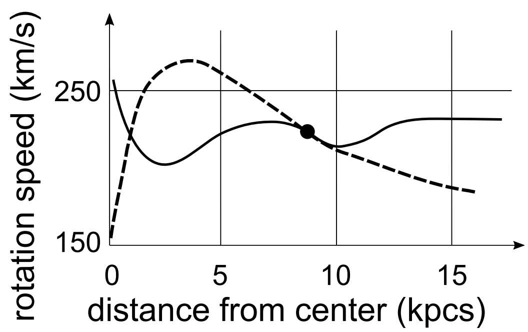

Figure 2: RC Keplerian (dashed line) and non-Keplerian

this, they try to simulate a distribution of GDM in a spherical coordinate system. The purpose is to probe GDM distribution $M_{dm}(r)$ with the corresponding potential $\Phi_{dm}(r)$ to make test particles rotate faster with radius, resulting in non-Keplerian (flat) RC. It is nor clear which parts of Halo participate in disc rotation, and how GDM parts could be resting upon skies. Recall, GDM being optically invisible, is allegedly seen in the observed RC. We have to conclude that formulation of the CDM Halo problem is ill-posed.

In the illustrative Fig. 2, the ideal predicted (Keplerian) RC and the GDM affected observation are shown. It seems obvious that, in GDM Halo model, there is no a unique "predicted" curve "explaining" the observed "non-Keplerian" one. In Newton's theory, such transition can be simulated as a galaxy evolution process under conservation laws with no GDM at all. Again, the question arises why do astronomers necessarily need GDM either about disc or, specifically, in Halo for their explanation of "non-Keplerian" orbits.

From Newton's viewpoint, the very introduction of GDM conception has no physical sense. Again, a scientific curiosity question arises why the Halo must be made of GDM but not the ordinary matter when both are not distinguishable in gravitation.

Next, some examples of other galaxies in Newton's view are discussed.

5 Newton's Physics of other galaxies

5.1 Non-flat RC

The majority of galaxies seem to have non-flat RCs. Our explanation is the following. Large galaxies, like the MW, usually have super-heavy central BH, large Halo, spiral arms, and no distinct edge. They could be mature, bounded systems in an environment rich in material. Our analysis of RC formation looks like an imitation of "bottom to top" evolution,– the large, the older. But accidental events could happen. Theoretically, cutting off some outer part of a large disc would leave the galaxy stable. Galaxies as giant as the MW can host inside a smaller ring galaxy, most likely, as a result of galactic collision. A similar observed phenomenon is known as Hoag's object (Finkelman et al., 2011). The variety of environment is a good reason for the diversity of galaxies, particularly, in their morphology. Some examples are given next.

5.2 Spiral galaxy Messier-33

The galaxy M-33 is one among others revealing their stage of cosmological evolution. It is half the size of MW and presents puzzles: it does have neither a visible SBH nor a Bulge. The RC measured in the range up to about 15 kpc shows the proportionality $V(r) \sim r^{1/2}$ that is,

$$V(r) = \left(\frac{G\,M(r)}{r}\right)^{1/2} \tag{11}$$

According to the above discussed proportionality rules, the disc density must be constant, what makes the mass proportional to the square of r, $M(r) \sim r^2$. How could it be possible with no SBH?

Our explanation goes to the *Principle of Ultimate Gravitational Compression*. Suppose, the galaxy should have a rotating SBH of mass somehow greater than in the MW. If so, the density becomes so low that such the SBH cannot exist as a sphere. By rotation, it must flatten down to the density of solid matter similar to the Disc of very large radius.

From assessment based on the proportionality rules, the approximate value of M at $R = 8\,\text{kpc}$ is $M = 5 \times 10^{10}\,M_{\odot}$, about half that in MW. One can expect that the RC above $R > 15\,\text{kpc}$ will approach a maximal value and then slowly decline without forming a large SSD. Based on the current RC data, astronomers decided a need for the GDM Halo in this galaxy.

5.3 Elliptical galaxy Messier-87

The considered above M-87 galaxy has some similarity with M-33. As shown, it has the estimated heaviest SBH of mass about 1500 times that of SgrA* mass calculated density is about the Earth's air one. Similarly to the case of M-33, the SBH of such a low density cannot exist as a spherical mass. Instead, it should be flattened by rotation to the ellipsoidal shape containing significantly suppressed mass. If so, we observe a solid galactic Core, which visible size extends up to 200 kpc of diameter.

The M-87 galaxy is approximately double in size that of the MW, and it has the substantially larger mass. It is considered elliptic, possibly surrounded by a huge matter Halo. Obviously, it cannot be characterized by the RC. This is the case when numerical simulations of observations are needed. Anyway, some astronomers tries to find signs of the GDM existence in the hypothetical Halo there (Murphy et al., 2011).

Recently, NASA astronomers demonstrated new breakthrough images of SBH in the M-87 and MW galaxies from the Event Horizon Telescope (EHT), which is actually a system of several telescopes at different locations. The project cost dozens of millions dollars before starting. The idea is a reconstructing virtual image of the BH using information from many images (Akiyama et al., 2022). *The Event Horizon* is a hypothetical phenomenon when gravity about Black Hole is so strong that nothing can escape, not even light. According to General Relativity, it is *the apparent horizon* unlike *the absolute event horizon* in the Cosmology. They say, "notion of a horizon in General Relativity is subtle and depends on fine distinctions".

According to (Miyoshi et al., 2022), the BH images turned out to be not true, rather the result of incorrect reconstruction procedure. This is not surprising in view of our treatment of the M-87 galaxy and its SBH.

5.4 Ultra-diffuse galaxies

To astronomers' surprise, they observe galaxies apparently lacking the GDM, in particular, in ultra-diffuse galaxies (UDG) having low density. Often, they have an elliptic form and a non-flat RC looking "Keplerian", meaning no GDM. In terms of Newtonian Dynamics, their disc rotation is not self-sustained due to the Core mass smallness. The mass and its density are not sufficient to keep the disc rotation at the maximal speed reached in the Core zone. Consequently, the RC(r) is going down with the radius. Unfortunately, observations of the Core with a central BH in such galaxies is aggravated by extremely low luminosity of UDGs.

In very recent observations of the gas-rich ultra-diffuse galaxy AGC 114905 (Mancera Piña et al., 2022), the authors managed to get high resolution precision allowing them to determine parameters of RC and the Halo. They concluded that the galaxy most definitely does not have the GDM. This is not an exclusion from a long list of UDF galaxies lacking GDM. We believe that our approach would reveal more information about the UDF structure from currently available data, including by WEB.

Newton's treatment of galactic groups and clusters require more sophisticated Newtonian models. With the above examples, our task to demonstrate the GDM-free Newtonian Dynamics of galaxies is accomplished.

5.5 GDM and Dark entities in Lambda-CDM Cosmology

Experts in the field believed that there is a lot of interfacing between GDM and Dark Entities in the Lambda-CDM Cosmology. So, our critique of GDM on a local scale should be extended to cosmological observations on the largest cosmic scale in the context of appearing Cold (optionally warm) Dark Matter in Early Universe. Specifically, we are talking about the role of CDM in birth and evolving galaxies during metric space expansion and expanded acceleration since appearance of Dark Energy. An important issue is adjusting the cosmic density Ω to the right proportion of ED, CDM, and ordinary matter to match measured database with the flat expanding Universe. The benchmark observations include Cosmic Microwave Background (specifically, temperature fluctuation), and galactic lensing. Experts in the field believed that those observations contain "strong evidence" revealing a timeline of GDM evolution till now, in particular, the GDM Halo origination.

We agree with this view only partly and argue in the following ways:

- Cosmological evidence is superficial comparing with direct galactic data;
- It was introduced for reasons different to GDM;
- CDM can be optionally cold, warm, or fuzzy, that means different physical properties compared to GDM;
- Disputes are premature in view of revolutionary new observations coming from Webb telescope.

Indeed, those potential objections to our work seem to be premature in view of new Webb deep-field images of Early Universe about 400-600 M yrs after Big Bang (dark ages). The images show rich structure containing super-heavy Black Holes and large galaxies about mass $1 \times 10^{11}\ M_{\odot}$, like Milky Way. Those things could not be there in the existing Lambda-CDM Cosmology Model (Labbé et al., 2023; Ferreira et al., 2022; Boylan-Kolchin, 2023; Comerón et al., 2023). Therefore, the current scenario of Early Universe must be revisited.

Besides, there are numerous explanatory failures and poor parametric fittings (tensions) in the Model, which are related to the Big Bang conception itself and its GR counterpart. In our critique of GDM and Lambda-CDM conceptions, we emphasize their inner inconsistency and incompleteness, what makes them scientifically not refutable. Moreover, we suggest alternative physical interpretations of used observations. All things considered. we express an opinion that it the right time for big changes in Cosmology. Therefore, we decided to briefly review of the observations Lambda-CDM supporting, as follows.

6 Galactic Dark Matter in Lambda-CDM Model

6.1 GDM versus CDM/DE in Lambda-CDM

To reiterate, we state that the mystic notion of GDM in Astronomy is the result of misapplying classical Newtonian Physics to Dynamics of galaxies, while CDM and DE were introduced for different reasons. This mean that our criticism of the GDM should not directly relate to Cosmology, albeit cosmologists could disagree. They argue that first galaxies were born and grew in circumstances of Cold Dark Matter (CDM) forming "clumps" consistently with the scenario of Early Universe. So, the CDM could be embedded in space as an attractor of massive materials, and all galaxies must have Dark matter, but it is not clear if young galaxies do have.

Anyway, the Lambda-CDM scenario of Early Universe deserves more concrete, critical attention of astronomers and physicists. The so-called self-gravitating Cold DM (low speed) was introduced as a parameter in the Big Bang beginning at the time of plasma clumping. Ultimately, clumps must merge to form a growing structure of more massive objects, first stars, and galaxies at an optimal rate. For some reason, the GDM motion must be collisionless. We know that bounded matter systems, like "clumps" and galaxies, are formed to obey conservation laws. They can grow bounded by capturing additional material during elastic and non-elastic scatterings. If so, collisionless Dark Matter cannot form bounded system, and all talking about Keplerian vs non-Keplerian orbits became meaningless. Moreover, CDM collisionless particles must fly through the whole Universe without friction, what looks fantastic...

On the other side, the CDM along with DE are needed in contemporary Cosmological Λ-CDM Model for phenomenological parametric treatment of observations on the largest space-time scale of Observable Universe. The GDM must work in unison with CDM and the Dark Energy (DE). The latter is a pure space agent, which is responsible for accelerated expansion of Universe started Billions years after the Big Bang event. Theoretically, it is related to the Cosmological Constant Λ in Einstein's field equation in association with the energy of vacuum. However, this idea encounters the "vacuum catastrophe": calculation gives a number 120 orders of magnitude higher than measurements. Thus, Cosmologists with no theoretical guide have to deal with phenomenological fitting parameter Λ of unknown physics, similarly to the GDM in combination with other parameters of observed Universe.

There is an agreement between Cosmologists that the Observed Universe is open and exists in almost flat space characterized by the space metric expansion (Friedmann' solution) with acceleration (GR Lambda parameter) accompanied by Hubble's receding of galaxies due to Big Bang (Lemaître's) cosmological redshift, unlike due motion in SR. The acceleration has started several Billion years ago with a mysterious advent of Dark Energy in proportions DE 68 %, CDM 27 % with the ordinary matter only 5 %. As previously noted, this must make the average relative density of all matter/energy about $\Omega \approx 1$. Since then, galaxies must be seen moving away from each other progressively faster in space and time. It is an exponential expansion, eventually with a relative speed faster than light, when galaxies became vanishing from view line (Cosmic Horizon). Actually, the Model explains and predicts nothing meaningful in classical physics.

Our strong opinion is that Lambda-CDM phenomenological parameterized model operates with imaginary abstractions like "Big Bang", "Inflation", "Dark Matter", "Planck Era prior to 1×10^{-43} sec after the "Big Bang", and so forth. Once more, we emphasize its irrelevance to observations vaguely justified by fictitious fitting, which makes the Model non-refutable by established theoretical means. Somebody can call it "new physics" on the time scale 1×10^{-43} with no ticking clocks. In fact, the Model is even more complicated due to numerous parameters accounting for "tensions" between observations and theory, particularly for Hubble constant. There is no consensus among Cosmologists about the ultimate fate of the Universe. Variants are Big Freeze, or Thermal Death. Sadly, "Dark matter" was not theoretically predicted at all. The fundamental problems of cosmic rays and matter dominance having been hot topics in the past, are swept under rugs, forgotten, and silenced.

From this brief outlook into parameterized Cosmology, it follows that the GDM should not be mixed up with the CDM because of their conceptual and functional difference. Falsification of the GDM does not necessarily disprove the CDM concept. We respect Cosmologists' disagreement with us and want to look into it in more detail and find real physics in observations.

6.2 GDM and Cosmic Microwave Background (CMB)

In the scenario of Early Universe, the observed CMB is thought a remnant of primeval radiation appeared after the Big Bang. A supporting observation was conducted by astronomers in 1964 as a thermal radiation from cosmic space with average temperature about 2,7 K and wavelength 2 mm, called Black Body radiation. Later on, it was carefully measured in the whole sky with attention to temperature (or wavelength) fluctuation within precision about 5×10^{-4}. It could be thought a roughness in uniformity as a function of angular scale, usually presented on the so-called power spectrum. There are several peaks, three of them are the main: "acoustic" showing the Universe being flat (no curvature); "baryonic" showing the ordinary matter (only 5%); the DM "evidence CDM" about 27%, the rest is Dark Energy, no more our comments.

Putting the above GDM/CMB evidence in the Big Bang aside, consider CMB history in textbook physics. Before Lambda-CDM model was accepted and independent of it, scientific history of Black-body radiation was marked by revolutionary Planck's discovery in 1900. Planck's law explained existing at that time ultra-violet "catastrophe" by quantum nature of energy. In Classical Physics, the thermal radiation was known long ago as a microwave field in thermodynamic quasi-equilibrium with surrounding bodies. The theory includes Stefan-Boltzmann law,– dependence of radiated total energy on temperature $E = sT^4$, also Vien Law giving pick wavelength shift inversely proportional to the temperature $\Lambda \propto \text{const}/T$. Both laws can be derived from the Planck's law. Later on, the discovery of Sunyaev-Zeldovich physics effect allows us better understand physical nature of thermal radiation and its interaction with charged particles outside the Big Bang. High-energy Cosmic Rays also can contribute to the effect, (Birkinshaw, 1999; Erler et al., 2018).

So, instead of imaginable abstractions, we have a real CDM physics, which tells us that there is no such a thing as "empty space",– there exists a quantum field in equilibrium state of minimal energy density D_{en} and temperature: $T = 2.7\,\text{K}$ and $D_{en} = 4.2 \times 10^{-14}\,\text{j/m}^3$, correspondingly, the equivalent mass density $D_{en}/c^2 = 1 \times 10^{-31}\,\text{kg/m}^3$. This gives us a challenging problem of "equilibrium" in cycles of conversing massive matter into light and back. Otherwise, the CMB field would be in "quasi-equilibrium state" with temperature T monotonously either rising or cooling. We think that this problem, as many others, could be resolved in alternative Cosmology of united matter-antimatter. We are ready to suggest such Alternative, its idea is presented later.

6.3 GDM lensing

The idea of detecting the invisible GDM by gravitational lensing is simple. One has to observing how the gravity of massive galaxy clusters containing dark matter bends the light of more-distant galaxies located behind the cluster. A trick is that the observer must have some prior information about position and construction of both, in particular, the presence of Dark Matter and its amount. Besides, the observer should have a theoretical guidance for simulation, - a theory of light bending by gravitational field. Otherwise, the observer can use intuition. Assume, the observed distant galaxy looks unusually bright, then she/he may decide on assumed lensing. In reality, there are several physical theoretic approaches to be discussed.

The bending effect was tested in observations of light propagating close to the Sun or planet's surface. It was the first classical General Relativity test, treatment of which is based on Einstein's equations describing the space-time curvature with a constant speed of light, c = const. The GR 4th test was performed by Shapiro, who measured the time delay of radar pulses sent to a planet and reflected back, when light passing near the Sun (Shapiro et al., 1968). Actually, this is a modification of the first test, the bending effect due to changing speed on light in the field, provided the frequency is preserved as a mystification of total energy and angular momentum conservation. Specifically, the light speed depends on electric permittivity ϵ and magnetic permeability μ: $c^2 = \epsilon\,\mu$. In space free of forces, they are constants: $c_0^2 = \epsilon_0\,\mu_0$ but in gravitational or electric fields, the light speed decreases due to changes in permittivity and permeability of space. This phenomenon is known in the SR Dynamics.

There is another important aspect of light bending by gravitational force. The ratio of light speed in "empty" space and in a field $n = c_0/c(r) > 1$ is known in Classical Electricity as the refractive index determining the light bending in transparent media such as air, water, optical glass etc. Also, it is widely used in fiber-optic technology. There, the effects are much greater than in gravitational field but they all have the same physical nature related to the change of permittivity and permeability in media comparing with "empty" space, that is free of gravitational and electric forces. The lensing measurements in galactic environment are considered the strong evidence of GDM existence, what is actually not true. Our point is that the bending of light by gravitation field means an interaction between electromagnetic wave and gravitating matter. This is contrarily to the statement that Dark Mater does not interact with light and not collide with matter. Otherwise, the light can pass through Dark Matter walls like in vacuum with no "lensing", what again looks fantastic.

There could be GR treatment, which is left to readers able to understand and share its physics there from literature.

6.4 Criticism and alternatives: sum-up

There are increasingly numerous works criticizing the Standard Model of Cosmology, authors of which rightly point out to physical aspects of its deficiency at the fundamental level,– in the inherent inconsistency, and in observational "tensions", particularly, related to the CDM and Dark Energy. In addition, all flaws of General Relativity directly or superficially are to be accounted for in analyses of the Standard Cosmological Model, (Křížek, 2018; Křížek et al., 2014, 2016; Křížek and Somer, 2016) with references, and more.

A special critical attention of physicists and philosophers in Modern Physics is focused on the problem of superficial phenomena, like Dark Energy and all kind of Dark Matter. Do they exist as a physical reality or they are purely created by human mind? Often, it could be abstract mathematical constructions applied to mysterious observations, typically disconnected from Physical Heritage and not physically measurable. In this case, they are called hypothetical "New Physics". In reality, it became a fashion gradually evolving in three steps: suspicion, belief, finally, truly real, though remained unexplained 'New Physics". Some called it crisis, and it is indeed.

However, the crisis could not be free, people should pay for secrets and mysteries of Nature. As an example, the US Department of Energy approved the costly international project of detecting the DM WIMPS, the LZ experiment (Akerib et al., 2021). Since the beginning of measurements in 2020, there were no signs of any detection, - with no surprise. In July 2023, NATO launched a long waited Euclid telescope mission to study Dark Matter in the whole cosmic space (Scaramella et al., 2022). Luckily, the mission could be reoriented for something worthy. On the surface Earth, GDM experts assessed about half weight of our bodies being GDM, people should worry about it.

In our view, the contemporary Lambda-SDM Big Bang is overwhelmed by

"New Physics" not tolerable anymore. GDM, CDM, DE, and Big Bang with Inflation and Early Universe are examples. The Model is thought anyway adjustable, therefore, not falsifiable. This is a good pretext to abort all Alternatives. The Model is supported by qualified reviewers in different specialities, all composing the mainstream of common thinking and short memory. For example, the real fundamental problems of matter-dominated Observable Universe and "a mystery" of Cosmic Rays with ultra-high energy are forgotten. Another problem is the explosions releasing unimaginable amount of energy have been observed but actually not attended, and much more.

There is a sociological issue noticed by Professor Planck. Based on his experience, he suggested a sociological principle, which says that "new scientific truth does not triumph by convincing its opponents and making them see the light, but rather because its opponents eventually die and a new generation grows up that is familiar with it (Luder, 1950).

In our opinion, Professor Planck was only partially right, because "the new generation" can be zombied by the mainstream of common thinking in old false science. For interested readers, issues of criticism and alternatives are discussed in numerous literature, also see our works (Vankov, 2010, 2008, 2016), and elsewhere.

This work is not intended to falsify or refute the Big Bang, however, we should be clear to readers about our critical opinion defending our main result: the refutation of GDM conception on both small and cosmic scales. Doing this, we always suggest alternative interpretations of observations. In work (Vankov, 2017), the Alternative Cosmology is presented, called "the Grand Universe", GU (though it needs an update). It resolves existing problems, such as Big Bang, cosmic rays, matter dominance, and others. It explains Webb images, which continue to come out revealing pictures impossible in the Lambda-CDM Model.

A physical idea is simple: the Grand Universe (GU) is infinite in space and time. It consists of Typical Universes symmetrically made of matter and anti-matter (TU-m and TU-a multiverse). They are floating in the space of GU Background (GUB) and interacting with it and each other. The GUB is filled with microwave field of very low temperature, baby TUs, and debris. Also, it is filled with Cosmic Rays having no causality connection with their origin at infinity.

There are random collisions of two same-matter TUs combining the total mass. At the same time, there are matter-antimatter collisions leading to mass annihilation. TUs are destroyed and evolved in eternal cycles of renewal so that the GU as a whole exists in a steady state. A mature TUs must have angular momentum, horizon-free boundary, and the form of flattened spheroid due to rotation. Therefore, a thought observer could view its anisotropy. We are ready to propose the corresponding Webb project proposal of annihilating collision scenario in 3-D observations, assuming that we live in our Observed Universe after an annihilating collision, “Big Bump”.

In this thought scenario lasing hundreds Billions years, the TU-m of a bigger size lost a large part of mass making it unbounded and slowly disintegrating (“expansion”). Initially, it contained galaxies, which we roughly view back in time as isotropic receding. We do not see yet the boundaries, so may assume our location is being close to the center of mass at the time of collision. We can expect that the Observed Universe is anisotropic and preserve a rotational moment, hence, there is a potential possibility to detect its unisotropy and boundaries.

We observe receding galaxies with high gravitational physics redshift due to high density at that epoch and tendency of redshift higher with look-back time. This is because a density of matter dropped during the annihilation. Currently, we live in the matter dominated Universe but have anti-matter in amount greater than usually thought.

Indeed, in Milky Way, we clearly observe, but not recognized yet, results of annihilation and presence of anti-matter leftovers, consequently, there is a variety of unusual matter-structures and explosions. In particular, there are objects steadily or explosively releasing huge amount of energy, high-energy flashes and pulses, also, large-scale structures after burned anti-matter, and a great diversity of galaxy types. Most likely, the Milky Way was also hit and survived in decaying state. Likely, the Tunguska event in 2008 was a fall large fragments of annihilating explosion. Yet, there are real observations of UFO/UPA phenomena, and many other “puzzles”, which could be explained.

The GU Cosmology is radically different from Big Bang, especially, in naturality, simplicity, and harmonic complexity yet to be learned. In practice, it has a great explanatory and predictive power, it is the source of Scientific Project proposals.

At this moment, we have no Dictionary to translate our work into the Lambda-CDM language. Hopefully, right decoding of Webb’s images will resolve the problem. Many terms should be excluded, for example, “120 order high vacuum catastrophe” with Lambda-CDM and GR-DE, clock measurements to the precision $\Delta t = 1 \times 10^{-43}$ s after BB, and so forth.

7 Summary and Conclusion

The primary purpose of this work is to explain the longstanding Galactic DM puzzle of apparently “strange” RC behavior in galaxies. Our breakthrough explanation is straightforward using Newtonian Gravitation framework, albeit the technique is far from trivial. We present new fundamentally important physical ideas and concepts needed for theoretical analysis and treatment of galactic observations on the basis of space-time symmetries and corresponding conservation laws. Concerning the SBH, we principally revised their conventional understanding with the emphasis on Neutron Star unique role in the phenomenon of Ultimate Gravitation Compression.

One can argue that such phenomena as GDM and Cosmological (Cold) DM are similar, both physically unexplained and should have the same explanation, however, we disagree with that. Unlike GDM, the CDM was introduced for a “high-precision” treatment of the Observed Early Universe and its evolution in the Lambda-CDM Cosmological Model. Therefore, a falsification of CDM does not necessarily affect the cosmic role of CDM in the Model. We express our critical understanding of Lambda-CDM Big Bang Model and suggested the Alternative.

To sum, we state the proof of GDM physical non-existence, which resolves the centennial problem of CDM. This makes a precedent for more critical studies in Physics Frontiers pursuing Alternatives. Meanwhile, Webb revolutionary images continue questioning whether Big Bang happened.

Any comments from agreeing and disagreeing readers are greatly appreciated.

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