Resolving the discrepancy between direct and inverse cosmic distance ladder through a New Cosmological Model

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A new cosmological model is presented, which derives from a new physics within a theory of everything. It introduces, beyond radiation and baryonic matter, a unique and new ingredient, which is the substance of the universe, and which can be assimilated to the cold dark matter of the standard cosmology. The new model, although profoundly different from the ΛCDM model, exhibits the same metric and an almost identical distance scale. So it shares the same chronology and the same theory of nucleosynthesis, but solves the problem of the horizon, the flatness of space and the homogeneity of the distribution of matter in a natural way, without having to resort to an additional theory like that of inflation and without dark energy. Eventually it resolves the tension between the direct and the inverse cosmic distance ladder.

Meaning of symbols: $\diamond$ and $\blacklozenge$ indicate both a length or an angle or an operator on a path of light; R° and $R_\bullet$ indicate respectively the electrical and the gravitational Radius.

1 Introduction

The standard Big-Bang model of cosmology provides a successful framework in which to understand the thermal history of our Universe and the growth of cosmic structure, but it is essentially incomplete. It requires very specific initial conditions. It postulates a uniform cosmological background, described by a spatially-flat, homogeneous and isotropic Robertson-Walker (RW) metric, with scale factor R(t). Within this setting, it also requires an initial almost scale-invariant distribution of primordial density perturbations as seen, for example, in the cosmic microwave background (CMB) radiation, on scales far larger than the causal horizon at the time the CMB photons last scattered. To overcome the aforementioned requirements, it is necessary the introduction of the ad hoc hypothesis of inflation. Furthermore, according to the model, only few percent of the density in the Universe is provided by normal baryonic matter. The ΛCDM model requires two additional ad hoc components: a non-baryonic cold dark matter (CDM)and an even more mysterious dark energy, which makes up the rest.

The problem is that the crucial function of theories such as dark matter, dark energy and inflation —each in its own way tied to the big bang paradigm— is not to describe known empirical phenomena but rather to maintain the mathematical coherence of the framework itself while accounting for discrepant observations.

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The model, which is remarkably successful on scales larger than a few Megaparsecs, faces challenges on smaller scales. The most difficult ones are related with the rotation in the inner parts of spiral galaxies. In recent months, new measurements of the Hubble constant, the rate of universal expansion, suggested major differences between two independent methods of calculation which have huge implications for the validity of cosmology's current standard model at the extreme scales of the cosmos.

The new model, presented here, which is profoundly different from the standard one, presumes to keep all the successes of the standard model and to solve all its failures in a natural way. It is extremely simple since all its properties derive from a simple geometric scheme. Nevertheless it is extremely difficult since it imposes a complete change of paradigm and concepts.

2 The Intention Physics

The new cosmology originates from a new physics within a Theory of Everything [22] which we will briefly summarize in this section.

We define Intention the unique and universal Interaction between two Individuals which is composed by the cyclical alternation of two moments. In the Consummative moment, as result of a decision, the individual donates/receives a part of self to/from its other, which is its universal. In the Mirroring moment, which is the potentiality period between two Consummative acts, the individual mirrors in itself and is mirrored by its other.

Every individual is characterized by only a radius R (its own Schwarzschild radius $R_\bullet$ and the electrical radius R°, reflex of the gravitational radius of the conjoined other $R^\circ_{_A} = R^{-1}_{\bullet_B}$), which represents all the energy that has and can donate, and that turns in a spin ω, such that $\omega \equiv 1/R$, in a finite three dimensional space that represents all the potency of the relation, whose period depends on the distance between the two conjoined individuals, according to the schema of fig. 4.

The decision, which lies in the live true time, is the only jump from a state to a new state, the only newness that changes the world. Now, since all that exists, it exists in the intention, and the nesting of intentions gives place to new reflective intentions of higher level, the sole principle of intention physics is not limited to the bottom intentions, but it extends to whichever intention to whichever reflective level it could emerge. Indeed, no one only process of our everyday life is not governed by it.

We call Reflection what emerges as a new and higher layer which takes form quantitatively from the huge number of consummative acts below. Reflection flourishes from Consummation and gives place to a new level of reality and so on since the individuals of every new level too relate each other through consummation.

Each individual is in relation with each other individual and the nesting of relations gives place to emergent reflective individuals of higher level. Each individual is part of another individual more complex, in it finds its own place and a role, and so on until the universe, which is itself an individual.

Just as the reflection is opposed to consummation, so the historical time (which is spatial in nature and all present in the photo of an instant) is opposed to the true living time that flows. The physics of intention presupposes consummation, but it is outside it. The consummation in se, that takes place in the living true time, is an existential and is therefore outside the range of physics. Indeed all the datum is in the snapshot of a single instant of an individual (in the act of receiving or in the act of donating). It contains the totality of the potency of the present and the totality of the memory. We have nothing else but what is given in the present instant. The previous instant and the next instant are not given.

The point of view of classical Physics is that of a generic external observer abstract from any particular intention. Abstract from its natural seat, time must be the time external and common to all possible or real relations and then per se and continuum, and analogously space. They become two separate dimensions of a same reflective spacetime which is not, anymore, an attribute of a particular intention but acquires an artificial identity in self, it becomes the scenario of the independent events.

The point of view of Intention Physics is consummative, that of the relation of a concrete individual with its other, characterized by the cyclical instantaneous exchange of energy, which describes all the past and the future as it appears mirrored in the present instant. Limited to the scope of a concrete intention, all present in an instant, there are not events neither therefore the continuum of the spacetime but only two conjoined individuals and the nesting of exchange of their substances which link them forming a geometrical progression originated from the frequency of intention. The metric is consequently linear, the disentangling of a unique path. The instantaneousness of exchange and the angle between the temporal axes of two conjoined individuals in intention shrinks the world (the potency) in a receiving and a donating side.

Because the observer and the observed as individuals are mirrors, each one reflects and is reflected by the other recursively.
On the path of light, at every reflection, we have an increment of the scale factor exponent:

$$s_n^{\diamondsuit} = k s_{n-1}^{\diamondsuit}$$

From the image present in the snapshot of an instant, it is therefore possible recognize a geometrical progression n ..,., 1, K, K^2 , .,..

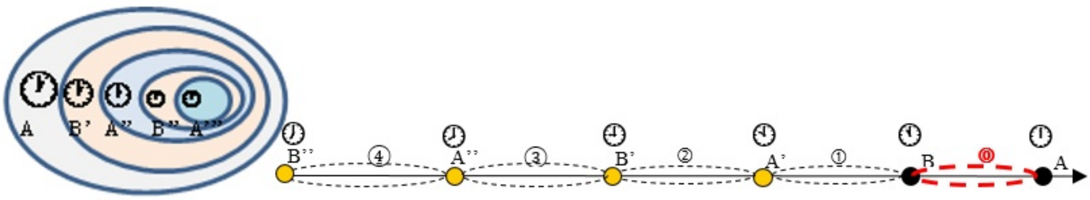


Figure 1: Recursive mirroring: two mirrors facing each other are reflected recursively. If there is a clock on each of them, from the reflected image present in every instant it is possible to reconstruct distances historically and therefore the velocities and accelerations over time, as far as the reflection allows.

Indicating with s_0 the distance now on the spatial axis between A and B we have that:

$$T_a^{\diamondsuit} = \frac{s_0^{\diamondsuit}}{1-k} = s_0^{\diamondsuit}\left(1 + k + k^2 + k^3 + ...\right) = s_0^{\diamondsuit} + s_1^{\diamondsuit} + s_2^{\diamondsuit} + s_3^{\diamondsuit} + ...$$

Therefore

$$\Delta\lambda^{\diamondsuit} = T^{\diamondsuit} - T_{-1}^{\diamondsuit} \quad \text{and} \quad V^{\diamondsuit} = \frac{\Delta\lambda^{\diamondsuit}}{T^{\diamondsuit}} = \frac{\overline{AB}}{\overline{0A}} = 1 - k$$

Since the act is instantaneous, the speed of light is instantaneous and the intention gives rise to a linear space-time metric characterized by $\sin^{\diamondsuit} x + \cos^{\diamondsuit} x = 1$.
It is the geometry of the act where time is spatialized: *time* $\equiv$ *space*. Later we will show also that *space* $\equiv$ *mass*.

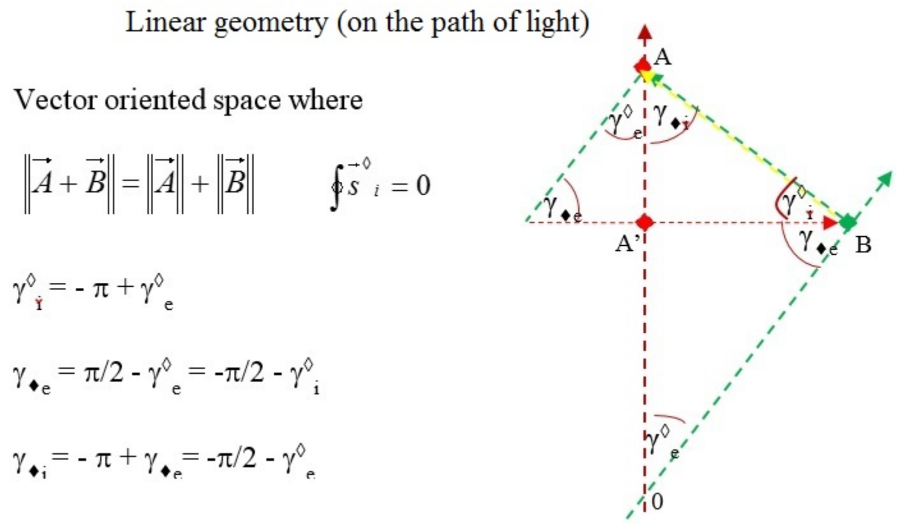


Figure 2: Linear spacetime of the act (on the path of instantaneous light): It is a Linear vector oriented space. The angles are γ_e between two vectors in concordant direction, vice versa γ_i, and they alternate each other.

In referring to the linear space-time plane, where the linear geometry applies, we will adopt the convention of using the symbols: $^{\diamond}$ and $_{\blacklozenge}$ which can be placed indifferently on the operator and on the angle, or only on the operator or only on the angle: $\cos^{\diamond}\gamma^{\diamond} \equiv \cos^{\diamond}\gamma \equiv \cos\gamma^{\diamond}$.
The relations between quadratic (without $^{\diamond}$ and $_{\blacklozenge}$) and linear trigonometric functions are:

$$\begin{bmatrix} \cos\gamma^{\diamond} = \cos\gamma & \sin\gamma^{\diamond} = 1 - \cos\gamma^{\diamond} = 1 - \cos\gamma \\ \cos\gamma_{\blacklozenge} = 1 - \sin\gamma_{\blacklozenge} = 1 - \sin\gamma & \sin\gamma_{\blacklozenge} = \sin\gamma \end{bmatrix} \tag{1}$$

$$\begin{bmatrix} \dfrac{d\left(1-\cos\gamma^{\diamond}\right)}{d\gamma^{\diamond}} = \left(1-\cos\gamma^{\diamond}\right) & \dfrac{d\cos\gamma^{\diamond}}{d\gamma^{\diamond}} = -\left(1-\cos\gamma^{\diamond}\right) \\[2ex] \dfrac{d\left(1-\sin\gamma_{\blacklozenge}\right)}{d\gamma_{\blacklozenge}} = \left(1-\sin\gamma_{\blacklozenge}\right) & \dfrac{d\sin\gamma_{\blacklozenge}}{d\gamma_{\blacklozenge}} = -\left(1-\sin\gamma_{\blacklozenge}\right) \end{bmatrix} \tag{2}$$

In Intention physics the time is defined only in the points of act A,B,A',B', ... since, between a point of act and the next one, the period of potency extends. Analogously space is defined only on the segments AB ecc.
These points and these segments are the only in act, the only real, and therefore absolute, and therefore are the only one that must have an equivalent representation (isomorphic) in whichever representation of the reality (isomorphism).
We can therefore represent the recursive mirroring between A and B in the schema on the right and compare it with Minkowski schema used by relativistic physic on the left (see fig. 3).
It is necessary to pay attention to the suffix $_e$ (between two vectors in concordant direction) and $_i$ (between two vectors in discordant direction) of the linear angles, which alternate each other in the scheme:

$$\overline{AB} \equiv \sigma^{\diamond} = t^{\diamond} - \tau^{\diamond} = t^{\diamond}(1-\cos\gamma^{\diamond}) \qquad \text{or} \quad V_e = \sin\gamma_e^{\diamond} = 1 - \cos\gamma_e^{\diamond} = 1 - \cos\gamma^{\diamond}$$

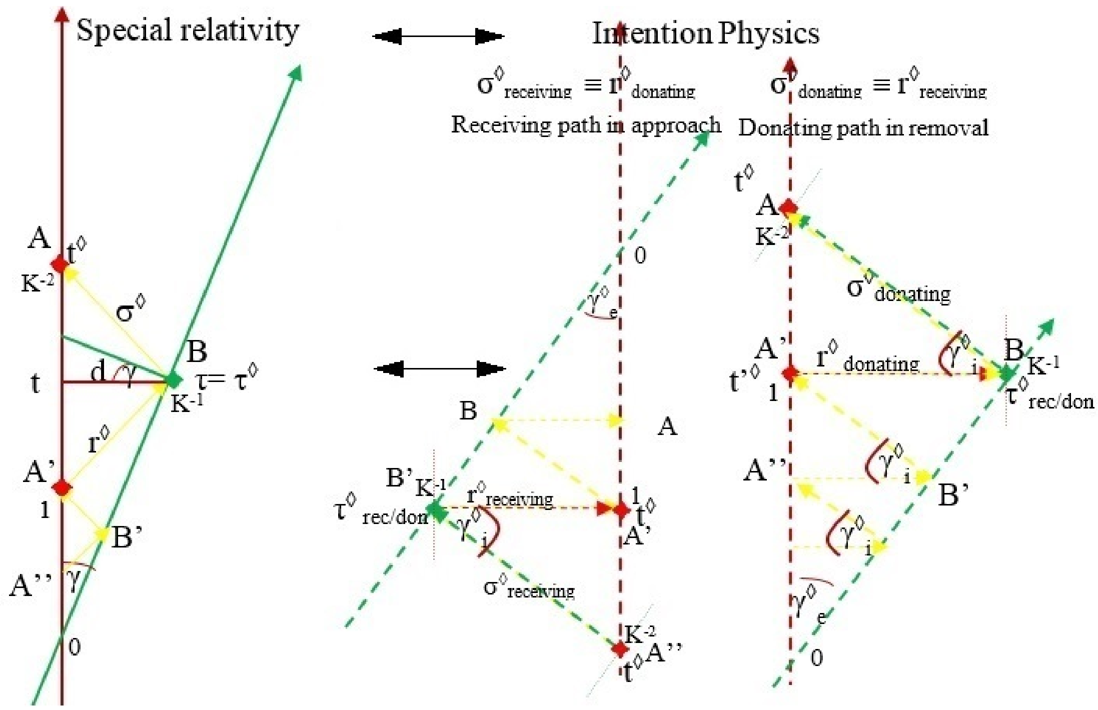


Figure 3: isomorphism: the representation of the temporal and spatial distances between the real points A,B,A',B',A",B", ... in the Minkowski spacetime, on the left, is equivalent to the representation in the Intention historical plane, on the right, with the conversion $v = \tanh\gamma \to V = 1 - \cos\gamma^{\diamondsuit}$ and $e^{-\gamma} \to \cos\gamma^{\diamondsuit}$. The difference is that while the Intention historical plane defines only these points as the unique real, and the spatial distances, therefore, represent the corrispondence between $t^{\diamondsuit}$ and $\tau^{\diamondsuit}$ that are therefore joined instantly at every act of donation/receiving, the Minkowski spacetime defines all the intermediate points too (that are in potency and therefore not real in the intention) and establishes a correspondence between each point on t axis and τ axis (be it real or imaginary) making the speed of light finite and traveling in the spacetime. As it is shown in (Peluso 13 jan 2019 [22]) the Intention historical plane is the primitive space where General Theory of Relativity and Quantum Mechanics are reconciled.

$$\overline{AA'} \equiv t^{\diamondsuit} - t'^{\diamondsuit} = \sigma^{\diamondsuit} + r^{\diamondsuit} = \sigma^{\diamondsuit}(1 + \cos\gamma^{\diamondsuit}) \quad \text{or} \quad V_i = \sin\gamma_i^{\diamondsuit} = 1 - \cos\gamma_i^{\diamondsuit} = 1 + \cos\gamma^{\diamondsuit}$$

We can see that, since $\tau = \tau^{\diamond}$, it is possible an isomorphic representation of the reality, represented by the intention schema, defining $t \equiv t^{\diamond} - d$ and $d \equiv (\sigma^{\diamond} + r^{\diamond})/2$ so that to the linear metric of the intention physics corresponds the vectorial metric in the Minkowski spacetime of classic physics.

$$\begin{cases} \text{RELATIVISTIC MINKOWSKI SPACETIME} \\ i\vec{\tau} = i\vec{t} + \vec{d} \end{cases} \leftrightarrow \begin{cases} \text{LINEAR INTENTION SPACETIME} \\ t^{\diamondsuit} = t + d = \tau^{\diamondsuit}/\cos\gamma^{\diamondsuit} \\ t'^{\diamondsuit} = t - d = \tau^{\diamondsuit}\cos\gamma^{\diamondsuit} \end{cases}$$

Or

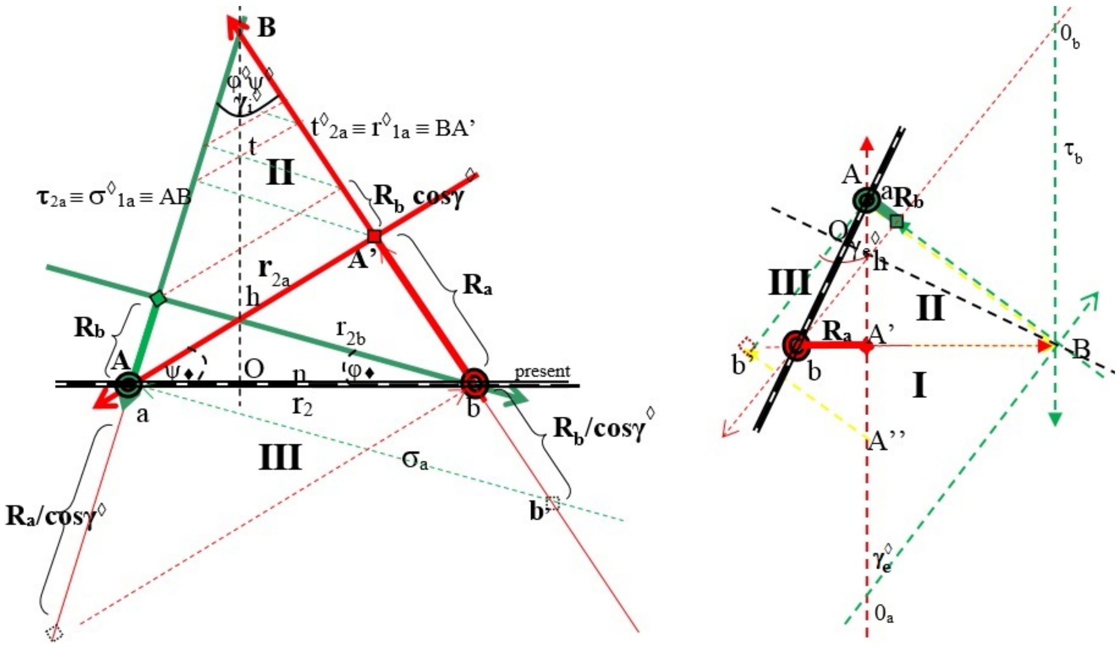


Figure 4: The whole relation is enfolded and unfolds from the Radii of the two conjoined individuals. The schema of intention is recursive since to every angle follows its opposite. Each side of the fig. is the sum of a geometric series $\sum_{i=0}^{n} Rf^i\left(\gamma^\diamond\right) = \sum R\left\{1 + f\left(\gamma^\diamond\right) + f^2\left(\gamma^\diamond\right) + f^3\left(\gamma^\diamond\right) + ...\right\}$ where R is the total radius of the individual $R_{Tot_a} = R_a \cos\gamma^\diamond + R_b$ and $R_{Tot_b} = R_b \cos\gamma^\diamond + R_a$.
Therefore $l_a = R_{Tot_a} \sum_{i=1}^{n} k^{i-1} = R_{Tot_a} \dfrac{1-k^n}{1-k}$ and since from the point of view of the barycenter $R_{Tot} = R_a + R_b = \dfrac{R_{Tot_a} + R_{Tot_b}}{1+\cos^\diamond \gamma}$, we have, from the point of view of the barycenter: $l = \dfrac{l_a + l_b}{1+\cos^\diamond \gamma}$ and $\dfrac{l_{1_a}}{l_{2_a}} = \dfrac{l_{1_b}}{l_{2_b}} = \dfrac{l_1}{l_2}$
In the case of inertial evolution, it's easy to find that the only constraint is $\gamma^\diamond$ constant. Vice versa, in the intention, the angle $\gamma^\diamond$ varies, but we know from Newton law that $V = \sin\gamma^\diamond = \dfrac{M}{r} = \dfrac{R_\bullet}{r_2}$, were $R_\bullet$ is the Schwarzschild radius and r corresponds to $\dfrac{1}{2}r_2$. The Intention Schema, which emerges reflectively, represents all the possible knowledge on the relation and it is just a knowledge representation. Indeed, contrarily to the above schema, in every instant the receiving side of an individual face the parallel donating side of the other. Therefore, the intention schema, composed from the juxtaposing of homologue sides (donating-donating or receiving-receiving) of the two conjoined individuals, is only a construction for needs of knowledge representation. It is the begin of reflective knowledge which demands the determination of the angle γ of the relation given by the homologue side time of both individuals.

$$i\tau\cosh\gamma\hat{t} + \tau\sinh\gamma\hat{d} = i\tau\hat{\tau} \quad \leftrightarrow \quad \begin{cases} \tau\cosh\gamma - \tau\sinh\gamma = \tau\cos\gamma^\diamond \\ \tau\cosh\gamma + \tau\sinh\gamma = \tau/\cos\gamma^\diamond \end{cases} \tag{3}$$

and

$$e^{-\gamma} \quad \leftrightarrow \quad \cos\gamma^\diamond \tag{4}$$

Replacing $\tau^\diamond$ with the mass m, it's easy to identify the vectorial sum on the left with the

Dirac's free particle Equation, and the linear sum on the right with the definition of sinh and cosh since $\cos\gamma^{\diamond} \leftrightarrow e^{-\gamma}$.
The metric of reality, in other words the unique absolute metric, must depend only on geometry and therefore only on angles and distances. Both an inertial relationship and an intention relationship must be equally characterized by distances and angles: the relative velocity v for the first and the potential V for the other.

The Absolute Metric must, therefore, be founded on the Lorentz transformation where the angles are fixed and vary only the distances:

$$\begin{cases} x_1^{'} = x_1 \cos\gamma - x_4 \sin\gamma \\ x_4^{'} = x_1 \sin\gamma + x_4 \cos\gamma \end{cases} \quad \leftrightarrow \quad \begin{cases} x^{\diamondsuit} = \sigma^{\diamondsuit}(1 - V_i) - t_e^{\diamondsuit} V_e \\ \tau_e^{\diamondsuit} = -\sigma^{\diamondsuit} V_i + t_e^{\diamondsuit}(1 - V_e) \end{cases}$$

In the inertial reflection, where space and time are independent variables,
Setting $x_1 = x$ and $x_4 = ict$ and $v = \tanh\gamma = \sqrt{1 - \dfrac{1}{\cosh^2\gamma}}$ we have:

$$\begin{cases} \sigma = \dfrac{x - vt}{\sqrt{1 - v^2}} \\ \\ \tau = \dfrac{t - vx}{\sqrt{1 - v^2}} \end{cases} \quad \leftrightarrow \quad \begin{cases} \sigma^{\diamondsuit} = \dfrac{x^{\diamondsuit} + V_e t_e^{\diamondsuit}}{1 - V_i} \\ \\ \tau_e^{\diamondsuit} = (1 - V_e) t_e^{\diamondsuit} - V_i \sigma^{\diamondsuit} \end{cases}$$

And the metric:

$$d\tau^2 - d\sigma^2 = dt^2 - dx^2 \quad \leftrightarrow \quad d\tau^{\diamondsuit} - dx^{\diamondsuit} = dt^{\diamondsuit} - d\sigma^{\diamondsuit}$$

Still, since $x = v_{translation} t + r$ we can equally put

$$\begin{cases} \sigma = \dfrac{r}{\sqrt{1 - v^2}} \\ \\ \tau = \sqrt{1 - v^2}\, t - v_{translation} \sigma \end{cases} \quad \leftrightarrow \quad \begin{cases} \sigma^{\diamondsuit} = \dfrac{r^{\diamondsuit}}{1 - V_i} \\ \\ \tau_e^{\diamondsuit} = (1 - V_e) t_e^{\diamondsuit} - V_i \sigma^{\diamondsuit} \end{cases}$$

While in the inertial case the $v\sigma$ term is variable and doesn't cancel in the differentials, in the Intention it is constant and therefore cancels differentiating.
In other words, differently from the inertial system, in the intention, the relation's time and distances are indeed constant, since the geometrical configuration of the relation depends only on R, which is constant, and on V, which is constant since dV must cancel in the immediate vicinity of the individuals.
Therefore, the relational time t or τ, being constant, does not depend on spatial distance but only on angles.
In the immediate vicinity of the individuals, since $dd = (v_{translation} d\sigma) = 0$, $d\tau/dt$ becomes equal to $d\tau^{\diamondsuit}/dt^{\diamondsuit}$ and therefore $d\sigma/dr = d\sigma^{\diamondsuit}/dr^{\diamondsuit}$.

$$\begin{cases} \text{GENERAL RELATIVITY} \\ \\ d\sigma = \dfrac{dr}{\cos\gamma^{\diamondsuit}} \\ \\ d\tau = dt \cos\gamma^{\diamondsuit} \end{cases} \quad \leftrightarrow \quad \begin{cases} \text{INTENTION RELATIONSHIP} \\ \\ d\sigma^{\diamondsuit} = \dfrac{dr^{\diamondsuit}}{\cos\gamma^{\diamondsuit}} \\ \\ d\tau^{\diamondsuit} = dt^{\diamondsuit} \cos\gamma^{\diamondsuit} \end{cases} \tag{5}$$

In other words, in the intention relationship, the time measurements and the spatial measurements are independent of each other since, given the radius R, they depend only on the angle γ which is assumed, by definition, constant in the measurement.
Therefore, whichever distance, must be decomposed in a pure time distance and a pure spatial distance. The metric in the Minkowski spacetime, which is quadratic, extends artificially to the non real points too.
The relation manifests itself according to the scheme of fig. 4. We can identify the potential V with $\sin\gamma_e^\diamondsuit$, so that $Vr_2^\diamondsuit = Vr = R_{Tot}$ must be a constant of the intention, and where $V = \sin\gamma_e^\diamondsuit = 1 - \cos\gamma^\diamondsuit$.
From this schema descend directly the results summarized in Tab. 1 which shows a synthetic view of the different areas of the Intention relationship.

r	γ	$V = \sin^\diamondsuit \gamma$	R	$t = 1/a$
$>R_{ind}$	$< \pi/2$	R_K/r_k	R_K	$r_k^2/R_K = R_K/V^2$
$= R_{ind}$	$= \pi/2$	1	R_{ind}	R_{ind}
$<R_{ind}$	$> \pi/2$	$r_i/R_{ind} = R_I/r_i$	${r_i}^2/R_{ind} = R_{ind}V^2$	R_{ind}

Table 1: a synthetic view of the different areas of the Intention relationship. In the area outside to the radius $r >> R$ takes place the Coulomb/Newton interaction, on the border $r \simeq R$ takes place the strong interaction, in the area inside the Radius $r << R$ takes place the weak interaction. R_K is the gravitational (mass) or electrical radius of an agglomerate individual (a sum of elementary R_{ind}). The distance r_K is the "reduced circumference" or the gravitational/electrical distance where work the electrogravitational laws. R_{ind} is the radius of an individual as elementary. R_I and r_i are the cold dark matter component of radius and distance $r = \sqrt{r_k^2 + r_i^2}$. It is noteworthy that, in the transition between outside and inside, the V is reversed and R and t exchange their roles.

From the intention schema follow the most general relations :

$$\text{part of relationship} \qquad R_{part} : r_k = r_k : R_{whole} \tag{6}$$

$$\text{thread relationship} \qquad \tau - \sigma = R \quad (\neq 0) \tag{7}$$

The first establishes the spatial boundary of influence of the individual "part of" within its whole. The second has heavy consequences on the metric, since the intention is never pure reflection and therefore R is never zero.
Since the sole universe thread is sequential, without loops, the time axes of different individuals never intersect each other. Therefore, in the intention relationship, the $\mathrm{r}_x\mathrm{t}_x$ planes of two any individuals are never parallel. The axis of the nodes r is the intersection of the $\mathrm{r}_x\mathrm{t}_x$ planes of the two individuals.
Perpendicular to the r axis of nodes, there is the time axis t along the local direction of the temporal axis t in the universe.
In the space of the relationship, therefore, we can identify an rt plane of the relation with respect to which the $\mathrm{r}_x\mathrm{t}_x$ planes of the two individuals are rotated respectively by an angle φ e ψ where $\varphi^\diamondsuit +^\diamondsuit \psi^\diamondsuit = \gamma^\diamondsuit$
The two reference frames must moreover twist around the axis of the nodes r forming the two angles of nutation ϑ_a and ϑ_b where $\vartheta_a^\diamondsuit +^\diamondsuit \vartheta_b^\diamondsuit = \vartheta^\diamondsuit$ according to the fig. 5,
where:

$$\sin^\diamondsuit \vartheta = \frac{\overline{hO}^\diamondsuit}{\overline{0O}^\diamondsuit} = \frac{\mu}{\tau + \mu} = \frac{\mu}{\frac{(R_{tot})\left(1 - \sin\gamma_\blacklozenge^\diamondsuit\right)}{\sin^2\gamma_\blacklozenge^\diamondsuit} + \mu} = \frac{\frac{\mu}{R_{tot}}\sin^2\gamma_\blacklozenge^\diamondsuit}{\left(1 - \sin\gamma_\blacklozenge^\diamondsuit\right) + \frac{\mu}{R_{tot}}\sin^2\gamma_\blacklozenge^\diamondsuit} \tag{8}$$

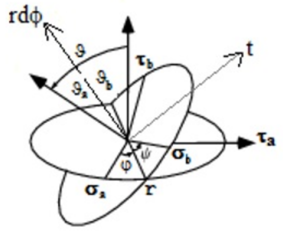


Figure 5: Torsion: Since the sole universe thread is sequential, without loops, the time axes of different individuals never intersect each other. Therefore, the two reference frames must moreover twist around the axis of the nodes r forming the two angles of nutation ϑ_a and ϑ_b where $\vartheta_a^{\diamondsuit} +^{\diamondsuit} \vartheta_b^{\diamondsuit} = \vartheta^{\diamondsuit}$

where $\overline{hO}^{\diamondsuit} \equiv \mu = \dfrac{R_a R_b}{R_a + R_b}$ is an absolute of the relation. The torsion, doesn't affect the metric but the charge of individuals in the strong interaction and the configuration of the relation. Inside the baryon, the $\sin^{\diamondsuit}\vartheta$ potential corresponds to a kind of V_{Yukawa} potential with the origin translated on the circle $r_c = R_\epsilon^\circ$. The $\sin^{\diamondsuit}\vartheta$ potential, otherwise negligible, grows up asymptotically on $r \simeq R_\epsilon^\circ$ and constitutes, in concomitance with the Pauli exclusion principle, the cause of the formation of baryons from three homologous individuals. Inside the Universe, viceversa, the torsion of the radiation energy is the seat of the Big-Bang nucleosynthesis.

The linear geometry of the act (consummation) must be fused and harmonized with the quadratic (elliptical, Euclidean, hyperbolic) geometry of space of potentiality in a global metric. To merge the historical plan of act (consummation) with the spatial plan of potentiality (evolution), we must resort to isomorphism between the historical plan of consummation and the Minkowski space-time, defining the metric in the latter. The metric is therefore defined in the Minkowski space-time : Therefore, the metric of universe is

$$-\,id\tau\vec{\tau} \equiv \frac{\overrightarrow{\mathrm{r}}\,dr}{V_i - 1} + \overrightarrow{\mathrm{t}}\,\{-idt\,(1-V_e)\cos\vartheta + rd\phi\sin\vartheta\} + \overrightarrow{\mathrm{L}}\,\{idt\,(1-V_e)\sin\vartheta + rd\phi\cos\vartheta\} \quad (9)$$

Where $\overrightarrow{\mathrm{r}}$, $\overrightarrow{\mathrm{t}}$ and $\overrightarrow{\mathrm{L}}$ are the versor of the local proper distance, proper time and orthogonal axis. The torsion, which becomes appreciable when $\gamma \simeq \pi/2$ in the radiation era, doesn't affect the distances The norm is therefore all the same:

$$-\,d\tau^2 = -dt^2\,(1-V_e)^2 + \frac{dr^2}{(V_i-1)^2} + r^2 d\phi^2 \quad (10)$$

The relation between gravitation and electricity is that they are each the mirror of the other: $R^\circ{}_a = 1/R_{\bullet b}$.
The Intention demands that the period of the two individuals in intention be the same (see fig. 4).
From the De Broglie relation $\lambda = h/p$
Imposing $p_a = p_b$ and then $\lambda_a = \lambda_b$ we have:

$$\begin{aligned} \lambda_a = \quad & 2\pi\frac{R^\circ{}_b}{\sin_\blacklozenge\varphi} && = \lambda_b = 2\pi\frac{R^\circ{}_a}{\sin_\blacklozenge\psi} && = 2\pi r \quad \text{(from intention schema)} \\ \lambda_a = \quad & 2\pi\frac{\alpha^{-1}}{p_a} && = \lambda_b = 2\pi\frac{\alpha^{-1}}{p_b} && = 2\pi r \quad \text{(from De Broglie relation)} \end{aligned} \quad (11)$$

And therefore (the term α^{-1} depends on the unit of measure adopted see. eq. 12 and 13) :

$$p_a = m_a \sin_\blacklozenge \varphi = {R^\circ}_b^{-1} \sin_\blacklozenge \varphi \quad \text{or} \quad R_{\bullet a} = {R^\circ}_b^{-1}$$

$$p_b = m_b \sin_\blacklozenge \psi = {R^\circ}_a^{-1} \sin_\blacklozenge \psi \quad \text{or} \quad R_{\bullet b} = {R^\circ}_a^{-1}$$

What's more, from the schema of the universal relation we have $\dfrac{\sin_\blacklozenge \psi}{\sin_\blacklozenge \varphi} = \dfrac{R_a}{R_b}$. if the relationship is universal, then the radius R must be able to represent both the gravitational radius $R_\bullet$ and the electric radius R°

Therefore we must have:

$$\frac{R_{\bullet b}}{\sin_\blacklozenge \psi} = \frac{R_{\bullet a}}{\sin_\blacklozenge \varphi} \quad \text{in the gravitational case}$$

$$\frac{{R^\circ}_b}{\sin_\blacklozenge \psi} = \frac{{R^\circ}_a}{\sin_\blacklozenge \varphi} \quad \text{in the electrical case}$$

More precisely, the gravitational radius mirror itself in the other as $R^\circ = 1/R_\bullet$. In the same location where is placed the individual A, we have therefore the gravitational radius $R_{\bullet a}$, corresponding to the energy that the individual has and can donate, and the electrical radius ${R^\circ}_a = 1/R_{\bullet b}$, corresponding to the energy that the individual can receive. Exactly, we affirm that the unification of gravitational and electromagnetic interactions, always joined and each mirror of the other, passes through the unification of mass and electric charge, being both reducible to a length.

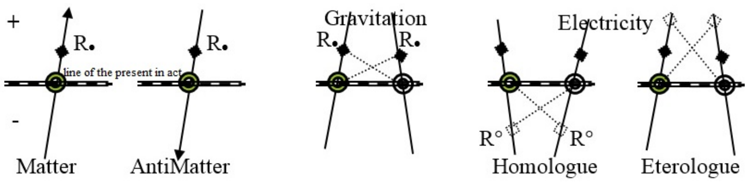


Figure 6: The sign of acceleration: The $R_\bullet$ is advanced and therefore positive for matter. The mirror R°, being reflected on other, appears on the opposite side if the two conjugated individuals in the intention are homologue, on the same side elsewhere. Therefore, from the matter point of view, the acceleration is always attractive (polar axes converge toward the future) for gravitation, while repulsive or attractive depending on the sign of the polar axes for electromagnetism. All is reversed from the negative matter point of view

In the intention absolute system of measures, which contemplates as only measure the distance, it's advantageous to introduce the two constants:

$$\Theta = \frac{Qc^2}{(4\pi\varepsilon_0 G)^{1/2}} = 1.671001..\text{x}10^{08} \text{ joule} \quad \text{and} \quad K = \Theta 2\frac{G}{c^4} = 2.761312..\text{x}10^{-36}\ meters \quad (12)$$

whence

$$K\Theta = 2\frac{Q^2}{4\pi\varepsilon_0} \quad \text{and} \quad \frac{K}{\Theta} = 2\frac{G}{c^4}$$

and to impose $K = \Theta = 1$ i.u (where i.u. is the **i**ntention **u**nit measure), so that, at last, we get the universal relation:

$$R_\bullet R^\circ = -K^2 = -1 i.u.^2 \quad (\ 2\alpha \text{ in Planck Unit}) \quad (13)$$

Consequently it follows that $c = 1$, $G = 1/2$ and $\hbar = 1/2\alpha^{-1}\mathbf{i.u.}^2$.
We can recognize that $K = 2\alpha^{1/2} l_p$ and $\Theta = \alpha^{1/2} m_p c^2$ and $Q = \sqrt{\alpha/2} q_p$ where l_p , m_p and q_p are the Planck length, mass and charge.

3 The Intention Cosmology

The mirroring function $\mathrm{Re}(R) = 1/R$, where $R^\circ = 1/R_\bullet$, is the condition necessary and sufficient for the equilibrium of a mirroring universe, i.e. a universe where every individual makes itself mirror of whichever other, be it simple or composed in every way, and all the universe mirrors itself in every individual and every individual mirror itself in the entire universe. The Universe R_ω has a mirror, we name it the Amorone R_α. Since the universe is the maximum, the amorone is the minimum. Indeed, the amorone, being the conjugated of the Universe, verify $R_\alpha R_\omega = -1$, and mirrors all the Universe which reflects in it. The amorone is the unit of measure of universe.

The frequency of consummations between Universe and Amorone is R_ω^2. Indeed it happens $\frac{R_\omega}{R_\alpha}$ times during the apparent age of the Universe R_ω .

The interaction between the Universe and the Amorone is the union of gravitation and electricity since the Universe coincides with the mirror of the Amorone in it and equally the Amorone coincides with the mirror of the Universe in it. The Amorone consummates with a period R_ω (i.e. the age of the universe); the Universe, vice-versa, consummates with a period R_α. In the period of a single Amorone, therefore, the Universe consummates $\aleph = \frac{R_\omega}{R_\alpha} = R_\omega^2$ times, keeping in existence all the $\aleph = R_\omega^2$ amoroni. The amoroni are therefore all in potency except one at a time.

The physics of Universe is the physics of the interior of a black hole and of whichever simple particle as electrons. From tab. 1, or equivalently from the part of relation 6, inside an elementary individual, i.e. the Universe, arises a Radius $R_I = \frac{r^2}{R_\omega}$ The substance of this Radius can be assimilated to the cold dark matter, and consists of amoroni. Indeed $R_I = \sum U_i = \sum V_i m_i = \int_{r=A}^{B} \frac{r}{R_\omega} dr = \int_{r=A}^{B} V dr$, is the work performed by the local potential $V(r)$ along the distance r due to an acceleration $1/t = 1/R_\omega$ constant and directed between the two points A and B. The above formulas show that $m_I = r = \sum_{r=A}^{B} R_\alpha$ while $R_I = m_I V$. We find, at last, that in the lineaar spacetime metric of universe $Space \equiv Time \equiv Mass$.

While the Dialogue is the relation between two individuals, the Communion is the relation "part of" between each part and the emergent composite individual.
The amorone $R_\alpha = R_\omega^{-1}$ is the unique elementary individual and the communion of amoroni gives rise to only two emergent compound individuals: the Electron and the Universe.
Indeed, amoroni attract each other immensely because each one sees in the other the entire universe, until the resulting agglomerate, which is the electron, is such that its reflection in every single amorone member, added for the number of all the members, equals the energy of the universe R_ω.

$$R_\omega : {R_\epsilon}^\circ = {R_\epsilon}^\circ : R_{\bullet\epsilon} = R_{\bullet\epsilon} : R_\alpha \tag{14}$$

All the gravitation and the mirroring is between and by means of amoroni. The composite (gravitationally) elementary (electrically) individual R_ϵ is the sole individual that is in equilibrium with universe. Indeed, it is the sole individual whose gravitational radius corresponds to the $R_\bullet$ which emerges from the space enclosed by its electrical radius and vice versa. It is the sole stable individual. To enlarge the electrical radius implies to enlarge the emergent gravitational

radius $R_\bullet = \dfrac{R^{\circ 2}}{R_\omega}$ but this is in contradiction with the smaller gravitational radius requested by $R_\bullet = 1/R^\circ$ and vice versa.
Every relation finds its place inside an individual more complex of which it is a part of.
Therefore, apart from leptons and universe, the proportion $R_\omega : R_{whole} = R_{whole} : R_{part}$, starting from $R_{part} = R^\circ_\epsilon$, applies recursively through $R_{whole} \rightarrow R_{part}$, providing all the mirroring universe scale giving rise to stars $R_{\bullet s}$ and galaxies $R_{\bullet g}$ and clusters and so on.
The principle of reason claims that the present is based on the historical reconstruction of the past up to a starting point started R_ω years ago, this starting point is what we known as the Big Bang (see fig. 7). However, the radius and therefore the age of the universe is constant, and therefore the Big Bang is not an event, but it is a part of a continuous process (see fig. 8). In every instant the universe, looks like as, and is, the result of a Big bang that took place R_ω years ago.

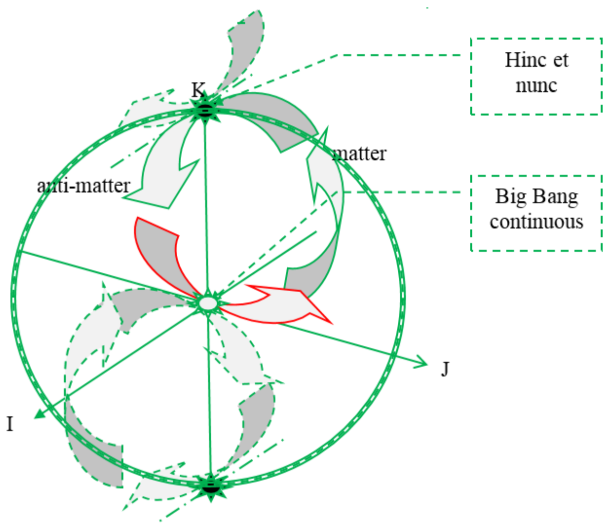


Figure 7: The Big Bang continuous: The radius and therefore the age of the universe is constant, and the Big Bang is not an event, but it is a pat of a continuous process. The principle of reason claims that the present is based on the historical reconstruction of the past up to a starting point known as the Big Bang. The line of the present, on the opposite side, is the set of the points where matter coming from the Big Bang, after a travel lasted R_ω years, reverses and begins his return journey as antimatter. The line of the present is the place where matter meets anti-matter and forms the baryonic matter (ordinary matter). The center of the line of the present, on the opposite side, is the point where all energy meets the anti-energy and gives rise to the Big Bang. Therefore, inside the universe, the total amount of energy is positive and equal to R_ω , while all matter is exactly canceled out by antimatter.

The present, on the opposite side, is the point where matter coming from the Big Bang, after a travel lasted R_ω years, reverses and begins his return journey as antimatter. The present is the place where matter meets anti-matter and forms the baryonic matter (ordinary matter). The age and the radius of universe is constant.
Therefore, inside the universe, the total amount of energy is positive and equal to R_ω, while all matter is exactly canceled out by antimatter.
We define:

$$c/H_0 \ = R_{\omega||} \ \simeq \alpha^{-1} e^{(\alpha^{-1})} = 1.23574..10^{(26)} mt \quad \text{and} \quad R_{\omega\perp} = 2\pi R_{\omega||} \ \ = 7.7644..10^{(26)} mt$$

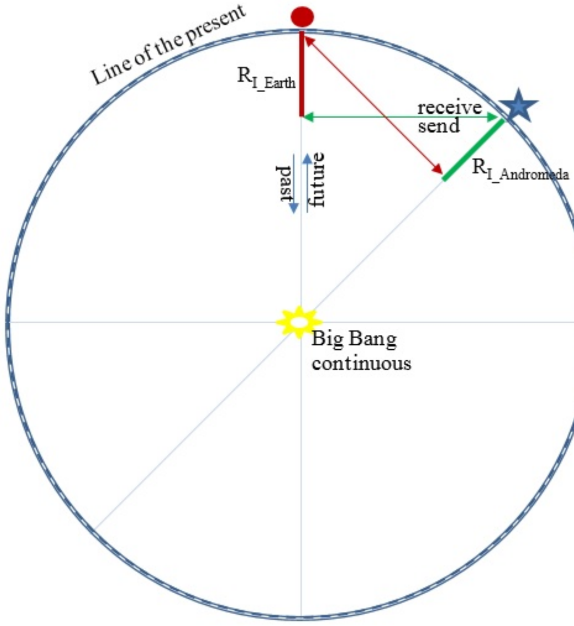


Figure 8: Intention Earth-Andromeda: The present, which comes from the Big Bang continuous as an approaching future, as soon as it surfaces, it submerge as past (antimatter) that move away to go towards the continuous Big Bang, and in this descent informs of itself the future (matter) that ascend in the opposite direction. In this way the past does not vanish but endures as it forms the future.

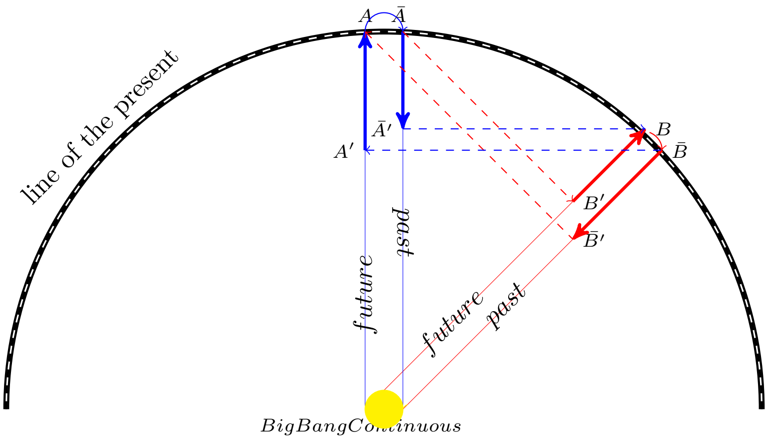


Figure 9: The path of universe intention: The cosmological intention between two individual A and B consists of two overlapping paths (in the figure they were separated to highlight each of them). The path of the present of A: 1) $\bar{B}' \to A$, 2) $Ae^{i0} \to e^{i\pi}\bar{A}$, 3) $\bar{A} \to \bar{B}'$, 4) $\bar{B}' \to B$, 5) $Be^{i0} \to e^{i\pi}\bar{B}$, 6) $\bar{B} \to \bar{B}'$. Analogously for the path of the present of B. Note that only on the line of the present and in the Big Bang the matter converts in antimatter. In the intention, the sending and receiving take place from the present of the individual who sends/receives, not to the present of the other individual, but to his embryonic potentiality (which approaches ascending from the Big Bang). This is why we, on the Earth, cannot communicate with distant alien civilizations. In fact we can not receive from (see) the present in which only they live and act, but from the embryonic potentiality. Equally we can not send to their present in act, but only to the embryonic potentiality of their future present.

we must use $R_\omega = R_{\omega||}$ when the motion between the two conjoined individuals is radial; $R_\omega = R_{\omega\perp}$ when it is tangential.
Therefore we must use $R_{\omega||}$ everywhere in cosmology, since the motion is always radial, while, for example in the rotation curves of galaxies (see sec. 3.1.1), we must use $R_{\omega\perp}$ for the tangential component of the motion, while $R_{\omega||}$ for the radial component. The mass of universe is $R_{\omega\perp}$ and from 14, $\frac{R_\epsilon{}^\circ}{R_{\bullet\epsilon}} R_\epsilon{}^\circ = \left| R_\epsilon{}^{\circ 3} \right| mt = 7.5719..10^{(26)} mt \simeq R_{\omega\perp}$ where $R_\epsilon{}^\circ = \frac{R_{electron}{}^\circ}{\pi} = 1.794..10^{-15} mt$ or $R_{\bullet\epsilon} = \pi R_{\bullet electron}$.

Therefore it arises an electron every $\pi R_e^{\circ 2}$ area uniformly distributed on the surface of universe $\pi R_{\omega||}^2$. The baryonic matter is therefore $m_b = \frac{1}{2} \frac{\pi R_{\omega||}^2}{\pi R_e^{\circ 2}} \cdot R_{\bullet e} = \frac{1}{2} \frac{R_{\omega||}^2}{R_{\omega\perp}}$. The baryonic density is at last

$$\rho_b = \frac{m_b}{R_{\omega\perp}} = \frac{1}{2\pi^2} \tag{15}$$

The three ingredients of universe are: Cold Dark Matter (Amoroni), baryonic matter and radiation. In parallel, each of these ingredients corresponds to a component of the spatial distance $r = \sqrt{r_i^2 + r_k^2 + r_j^2}$ and the radii R_I, R_K and R_J in the usual general relativity coordinate system (τ, σ, t, r) . Analogously each of these ingredients corresponds to a component of the spatial distance $DM = \sqrt{DM_{cdm}^2 + DM_b^2 + DM_r^2}$ and of the density ρ_{cdm}, ρ_b and ρ_r in the cosmic coordinate system (T, D_M). In the next three sections we will analyze in sequence:

1. the case of a universe composed of only cold dark matter $r = r_i$;
2. the case of a large-scale aggregate of matter, such as galaxies and clusters and filaments, etc., where cold dark matter plays an important role $r = \sqrt{r_k^2 + r_i^2}$;
3. In the third case we will finally analyze the case of the universe without neglecting any ingredient.

3.1 First approximation: The pure Dark Matter metric

The study of the pure Dark Matter Intention model is preparatory to the study of the complete model. Hereafter we will see that, in the era dominated by matter, even neglecting baryonic matter and radiation, the spatial and temporal distances scale of the pure dark matter Intention model are a good approximation of the complete Intention model and of the standard ΛCDM model too.
This will give us the opportunity to analyze the impact of dark matter, the most important component of the universe, in the simplest way possible. Indeed, since radiation and baryonic matter generate a torsion of the Radius of the universe R_ω, their role, primary in the age of radiation, are negligible in that of matter.

Hereafter we shall use both the usual general relativity coordinate system (τ, σ, t, r), observer dependent, which correspond to an "accelerated" frame, like that of an observer held at a fixed spatial point in the surrounding spacetime, that the cosmic coordinate system (T, D_M), universal, which correspond to the frame of an observer falling freely. In a pure matter universe, we have $cd\tau(a) = R_\omega da$ and therefore $c\tau = aR_\omega$.
The relation has an absolute limit in the Universe Radius R_ω (see fig. 10).

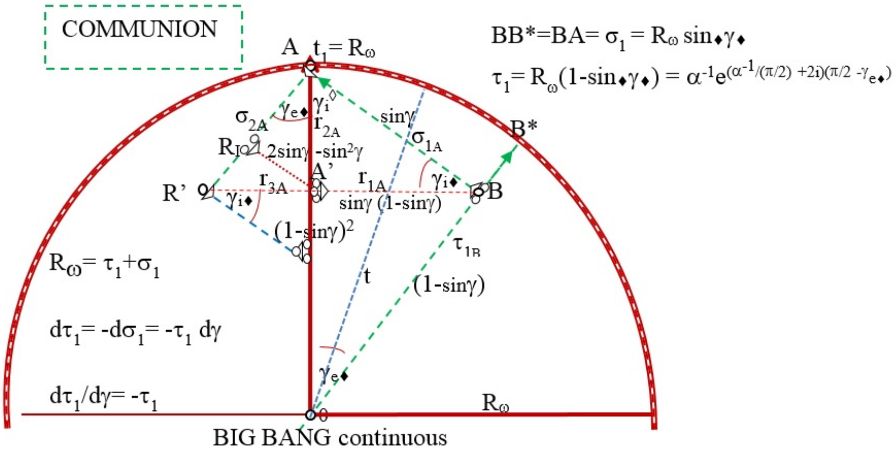


Figure 10: Communion: the relation has an absolute limit in the Universe Radius R_ω

While outside the radius of an elementary individual the $\gamma^\diamondsuit$ angle extends between $\pi/2$, in the immediate vicinity of the Whole, to 0 toward the most large distance, inside the radius, vice-versa, the $\gamma_\blacklozenge$ angle extends between 0, in the immediate vicinity of the part (i.e. the observer), to $\pi/2$ toward the most large distance (i.e. the Big Bang).
In the communion, therefore, we have $V_e = \sin_\blacklozenge \gamma = \sin\gamma$ and $V_i = 2 - V_e$.

Furthermore, the intention relationship and the constancy of $t_1 = R_\omega$ constrain directly the matter of the Universe.
Below, since in the universe of pure cold dark matter $r_i = r$, for brevity we will omit the suffix $_i$ which must therefore, only in this section, be considered implied.
From $M_v\left(r\right) = \int 4\pi r^2 \rho_{v(r)} dr \equiv \frac{c^2}{G}\frac{r^2}{R_\omega}2$ we derive $\rho_{v(r)} = \frac{c^2}{8\pi G}2\left(\frac{4}{rR_\omega}\right)$
and since $p_\nu = \frac{M_v A}{4\pi r^2}$ where $A = c^2\frac{dV}{dr} = c^2\frac{1}{R_\omega}$ we have $p_\nu = \frac{c^4}{8\pi G}2\frac{1}{R_\omega^2}$

$$T^{ik} = \begin{pmatrix} \rho_\nu & 0 & 0 & 0 \\ 0 & p_\nu & 0 & 0 \\ 0 & 0 & p_\nu & 0 \\ 0 & 0 & 0 & p_\nu \end{pmatrix} = \begin{pmatrix} \frac{c^4}{8\pi G}2\frac{4}{rR_\omega} & 0 & 0 & 0 \\ 0 & \frac{c^4}{8\pi G}2\frac{1}{R_\omega^2} & 0 & 0 \\ 0 & 0 & \frac{c^4}{8\pi G}2\frac{1}{R_\omega^2} & 0 \\ 0 & 0 & 0 & \frac{c^4}{8\pi G}2\frac{1}{R_\omega^2} \end{pmatrix}$$

since $T_i^i = \rho - 3p$ then $T = \dfrac{c^4}{8\pi G} 2 \dfrac{4}{rR_\omega} - 2\dfrac{c^4}{8\pi \; G} \dfrac{3}{R_\omega^2}$ and therefore

$$T_0^{0*-} = T_0^0 - \frac{1}{2} T = \frac{c^4}{8\pi G} \frac{4}{rR_\omega} - 3\frac{c^4}{8\pi \; G} \frac{1}{R_\omega^2}$$
$$T_1^{1*} = T_1^1 - \frac{1}{2} T = -\frac{c^4}{8\pi G} \frac{4}{rR_\omega} + 3\frac{c^4}{8\pi \; G} \frac{1}{R_\omega^2}$$

To find the universe metric, we put initially $d\theta = 0$ $d\phi = 0$ and start from:

$$ds^2 = e^\nu c^2 dt^2 - r^2 \left(d\theta^2 + \sin^2 \theta d\phi^2\right) - e^{-\lambda} dr^2$$

which gives:

$$\begin{cases} e^{-\lambda}\left(\dfrac{\nu'}{r} + \dfrac{1}{r^2}\right) - \dfrac{1}{r^2} = \dfrac{8\pi G}{c^4} T_1^{1*} \\ e^{-\lambda}\left(\dfrac{\lambda'}{r} - \dfrac{1}{r^2}\right) + \dfrac{1}{r^2} = \dfrac{8\pi G}{c^4} T_0^{0*} \\ \overset{\bullet}{\lambda} = 0 \end{cases}$$

Since $\lambda = -\nu$ and $T_0^{0*} = -T_1^{1*}$ we reduce to the only equation:

$$e^{-\lambda}\left(\frac{\lambda'}{r} - \frac{1}{r^2}\right) + \frac{1}{r^2} = \frac{4}{rR_\omega} - \frac{3}{R_\omega^2} \tag{16}$$

which admits one solution $e^{-\lambda} = \left(1 - \dfrac{r}{R_\omega}\right)^2$

Therefore, the metric of universe in the usual general relativity coordinate system (τ, σ, t, r), observer dependent, which correspond to an "accelerated" frame, like that of an observer held at a fixed spatial point in the surrounding spacetime, is:

$$dl^2 = \left(1 - \frac{r}{R_\omega}\right)^2 c^2 dt^2 - \frac{dr^2}{\left(1 - \frac{r}{R_\omega}\right)^2} - r^2 d\theta^2 - r^2 \sin^2 \theta \; d\phi^2 \tag{17}$$

Or, since $R_I/r = r/R_\omega$

$$dl^2 = \left(1 - \frac{R_I}{r}\right)^2 c^2 dt^2 - \frac{dr^2}{\left(1 - \frac{R_I}{r}\right)^2} - r^2 d\theta^2 - r^2 \sin^2 \theta \; d\phi^2 \tag{18}$$

The above equations, in cosmology, besides being unsuitable given that they take the point of view of an observer in a very distant and inertial reference system, are moreover only very poor approximations since they consider the thread dl as a pure reflection and don't take care of the emerging radius R_I.

In the free fall reference system, instead, where we have to consider the left side of the thread equation corresponding to the proper time and proper distance of the observer, we correct this error using the thread relation 7 which is never reflection (which is only an abstraction), but always consummation:

$$d\vec{l} = cd\vec{\tau} - d\vec{\sigma} = d\vec{R_{I_\sigma}} \quad \text{or} \quad d\vec{l} = cd\vec{\tau} - d\vec{\sigma}(1 + \sin_\blacklozenge \gamma)$$

Since $d\sigma = \dfrac{dr}{1-\sin_{\blacklozenge}\gamma}$ and $dr = dR_{\omega}\sin_{\blacklozenge}\gamma = R_{\omega}\left(1-\sin_{\blacklozenge}\gamma\right)d\gamma$ it follows $d\sigma = R_{\omega}d\chi$.

Denoting with:

$$b\left(\gamma\right) = \frac{1+2z}{1+z} = 2 - \frac{\tau}{R_{\omega}} = \left(1+\frac{R_I}{r}\right) = \left(1+\frac{r}{R_{\omega}}\right) = \left(1+\sin_{\blacklozenge}\gamma\right)$$

where the distance factor $b(\gamma)$ depends only on the distance between sender and receiver,

$$d\vec{l} = cd\vec{\tau} - d\vec{\sigma} - d\vec{R_{I_{\sigma}}} = cd\vec{\tau} - b(\gamma)d\vec{\sigma}$$

or more generally $d\vec{l} = cd\vec{\tau} - b(\gamma)d\vec{\Sigma}$
where $d\Sigma^2 = d\sigma^2 + \sigma^2 d\theta^2 + \sigma^2\sin^2(\theta)d\phi^2 = R_{\omega}^2[d\chi^2 + \chi^2(d\theta^2 + \sin^2(\theta)d\phi^2)]$
and at last the universe metric, expressed in the cosmological coordinate system (T, D_M), universal, which correspond to the frame of an observer falling freely, becomes :

$$dl^2 = c^2 d\tau^2 - b\left(\gamma\right)^2\left(R_{\omega}^2 d\chi^2 + R_{\omega}^2\chi^2 d\theta^2 + R_{\omega}^2\chi^2\sin^2\theta d\phi^2\right) \tag{19}$$

Or, introducing the scale factor

$$a\left(t\right) = \frac{1}{1+z} = \frac{\tau}{R_{\omega}} = \left(1-\frac{R_I}{r}\right) = \left(1-\frac{r}{R_{\omega}}\right) = \left(1-\sin_{\blacklozenge}\gamma\right)$$

and denoting with $dT = a\left(t\right)d\tau$ and with $dD_{M_{cdm}} = b\left(\gamma\right)R_{\omega}d\chi$

$$dl^2 = c^2\frac{dT^2}{a\left(t\right)^2} - \left(dD_{M_{cdm}}^2 + D_{M_{cdm}}^2 d\theta^2 + D_{M_{cdm}}^2\sin^2\theta d\phi^2\right) \tag{20}$$

Now, (see fig. 11), every point of the linear spacetime of the observer represents a spherical surface in the quadratic threedimensional space.
With $\dfrac{c}{H_0} \equiv R_{\omega}$ and since $\gamma = \arcsin\left(\dfrac{z}{1+z}\right)$ we have $d\gamma = \dfrac{1}{\left(z+1\right)^2\sqrt{1-\frac{z^2}{(z+1)^2}}}dz$
or since $z = \dfrac{\sin\gamma}{1-\sin\gamma}$ we have $dz = \dfrac{\cos\gamma}{(1-\sin\gamma)^2}d\gamma$.

Therefore we have:

$$D_{M_{cdm}} = (1+\sin\gamma)\int_0^{\gamma} R_{\omega}d\chi = \frac{c}{H_0}\cdot(1+\sin\gamma)\gamma \quad = \frac{c}{H_0}\cdot\left(1+\frac{z}{z+1}\right)\arcsin\left(\frac{z}{z+1}\right) \tag{21}$$

$$D_{A_{cdm}} = aD_{M_{cdm}} = \frac{c}{H_0}\cdot\left(1-\sin^2\gamma\right)\gamma \quad = \frac{c}{H_0}\cdot\frac{(2z+1)}{\left(z+1\right)^2}\arcsin\left(\frac{z}{z+1}\right) \tag{22}$$

$$D_{L_{cdm}} = \frac{D_{A_{cdm}}}{a^2} = \frac{c}{H_0}\cdot\frac{1+\sin\gamma}{1-\sin\gamma}\gamma \quad = \frac{c}{H_0}\cdot(2z+1)\arcsin\left(\frac{z}{z+1}\right) \tag{23}$$

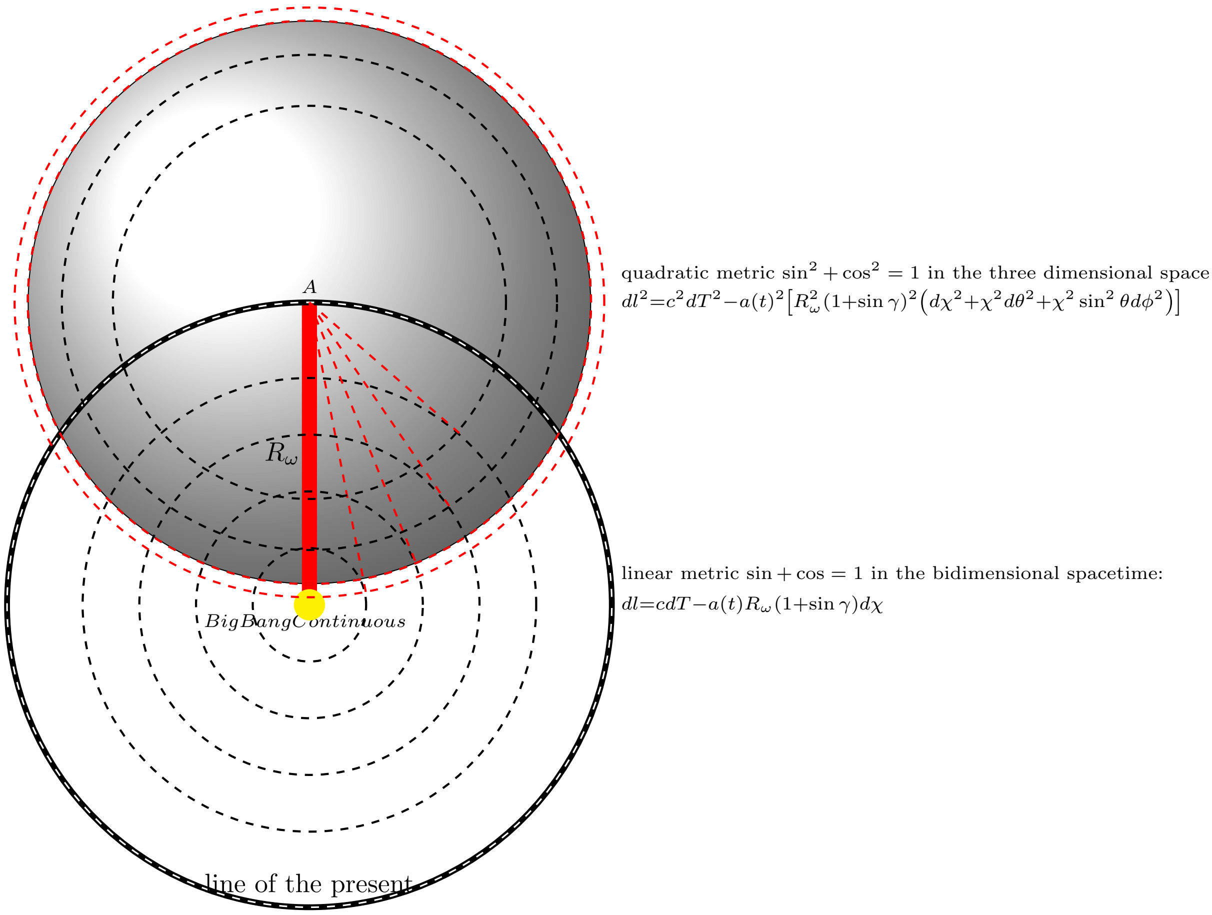
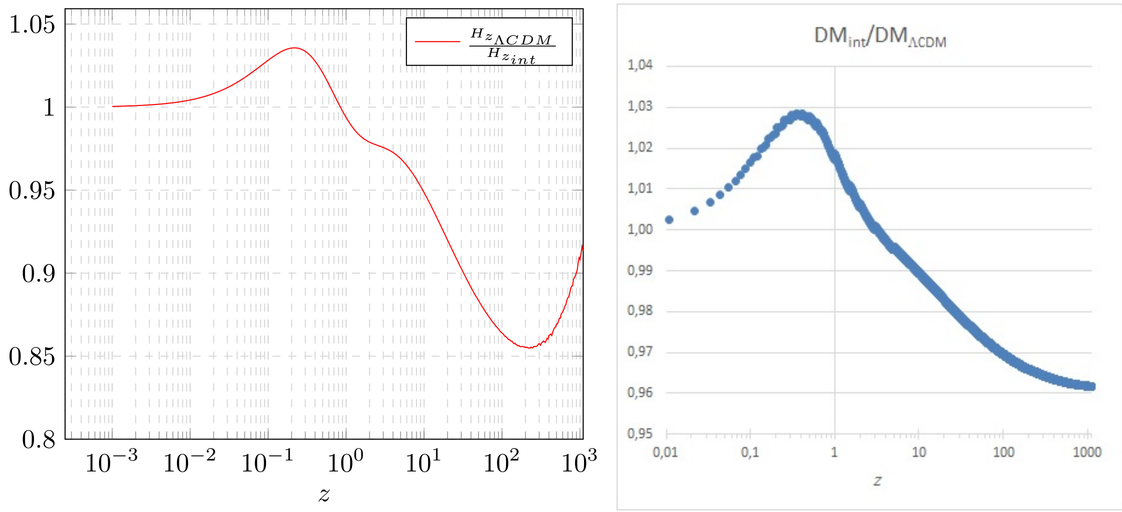


Figure 11: each individual on the line of the present has his own point of view on the universe Radius R_ω. For each individual, every point in the universe Radius R_ω represents a distance $\sigma+\tau=R_\omega$ in the linear spacetime that turns in the isomorphic spherical surface of equidistant points in the three-dimensional quadratic space of potentiality. The space of potentiality, interposed between the big bang and the line of the present in progress, is three-dimensional and flat.In the present model all space-time is in potency, with the exception of the Big Bang and the line of the present in act, and every instant is all new and all present. Every instant the whole universe recurs unfolding itself from the Radius all interconnected.

$$\rho_{cdm}=\sin^{\diamondsuit}{}_{cdm}=\frac{(1+\sin\gamma)}{(1+\sin\gamma+\gamma\cos\gamma)^2}=\frac{\left(1+\dfrac{z}{z+1}\right)}{\left(1+\dfrac{z}{z+1}+\arcsin\left(\frac{z}{z+1}\right)\sqrt{1-\frac{z^2}{(z+1)^2}}\right)^2} \tag{24}$$

$$H_{cdm}(z)=\frac{dz}{dD_{M_{cdm}}}=H_0E_{cdm}(z)=H_0\cdot\frac{\cos\gamma}{(1-\sin\gamma)^2(1+\sin\gamma+\gamma\cos\gamma)}=H_0\cdot\sqrt{\sin^{\diamondsuit}{}_{cdm}a^{-3}} \tag{25}$$

$$T_\omega=\int_0^\gamma\frac{a}{H_{cdm}(z)}dz=\frac{1}{H_0}\cdot\frac{\cos\gamma(\sin\gamma+4)-2\gamma(\sin\gamma-1)^2+5\gamma}{4}$$
$$=\frac{1}{H_0}\cdot\left(\arcsin\sqrt{\frac{z+1/2}{z+1}}-\frac{\pi}{4}+\frac{(3z^2+6z+1)\arcsin\left(\frac{z}{z+1}\right)+\sqrt{2z+1}\,(5z+4)}{4\,(z+1)^2}\right) \tag{26}$$



(a) (b)

Figure 12: in the plot a comparison of H and D_M between the ΛCDM (with $\Omega_\Lambda \simeq 0.69933$ and $\Omega_m \simeq 0.30067$) and the present model.

From above we see that the $D_{M_{cdm}}$ depends on the dark matter R_I. Now, we have that, given an intermediate point C between two points A and B, $D_{M_{cdm}}(A \to B) \neq D_{M_{cdm}}(A \to C) + D_{M_{cdm}}(C \to B)$ since $R_I(A \to B) \neq R_I(A \to C) + R_I(C \to B)$.
Now, for the age of the universe, we have

$$T_{\omega_{age}} = \lim_{z\to\infty} T_\omega - \lim_{z\to 0} T_\omega = \left(\frac{5\pi}{8} - 1\right)\frac{1}{H_0}$$

On the other hand, in the minimal 6-parameter Lambda-CDM model, where it is assumed that curvature Ω_k is zero and $w = -1$, neglecting the radiation density ($\Omega_{\text{rad}} \sim 10^{-4}$), we have, for the Age of universe

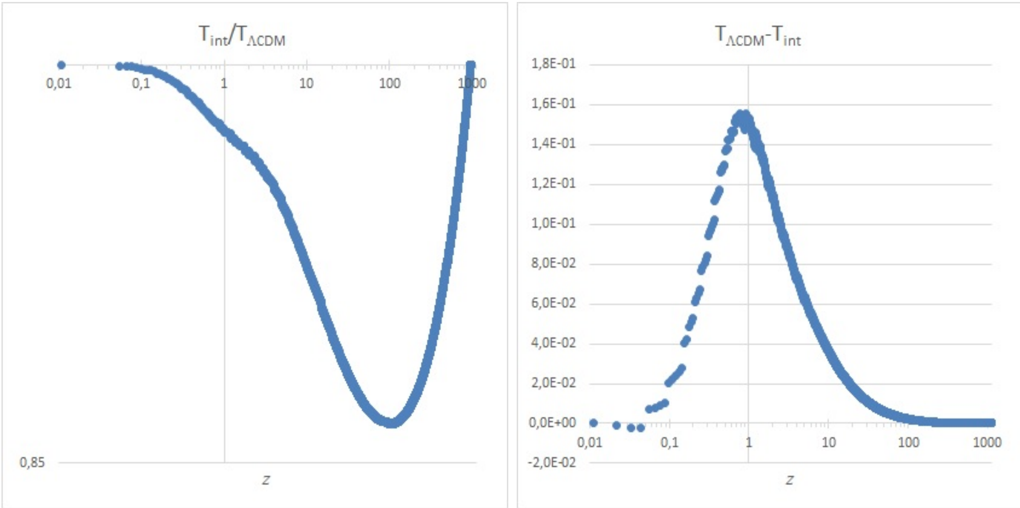
$$T_{\omega_{age}\Lambda CDM} = \frac{2}{3H_0\sqrt{\Omega_\Lambda}} \operatorname{arsinh}\sqrt{\left(\frac{\Omega_\Lambda}{\Omega_m}\right)}$$

Therefore, equating the two limits, we have that $T_{\omega_{age}} = T_{\omega_{age}\Lambda CDM}$ when $\Omega_\Lambda \simeq 0.69933$ and $\Omega_m \simeq 0.30067$. These are in fact the best values that fit the experimental data.

The above distances agree very well with the experimental data of observations (see Fig. 12 , 13, 14).

3.1.1 Gravitation between complex individuals

The study of gravitation between complex individuals is also preparatory to the study of the complete model of the universe. It gives us the possibility to introduce the difference between the gravitational and the cosmological component of distance.
Analogously, in the gravitational intention between two individuals, we have a limit $t_{1Max} = R_\omega$ (see fig. 15)



(a) (b)

Figure 13: in the plot a comparison between $T_{\Lambda CDM}$ and T_{int}.

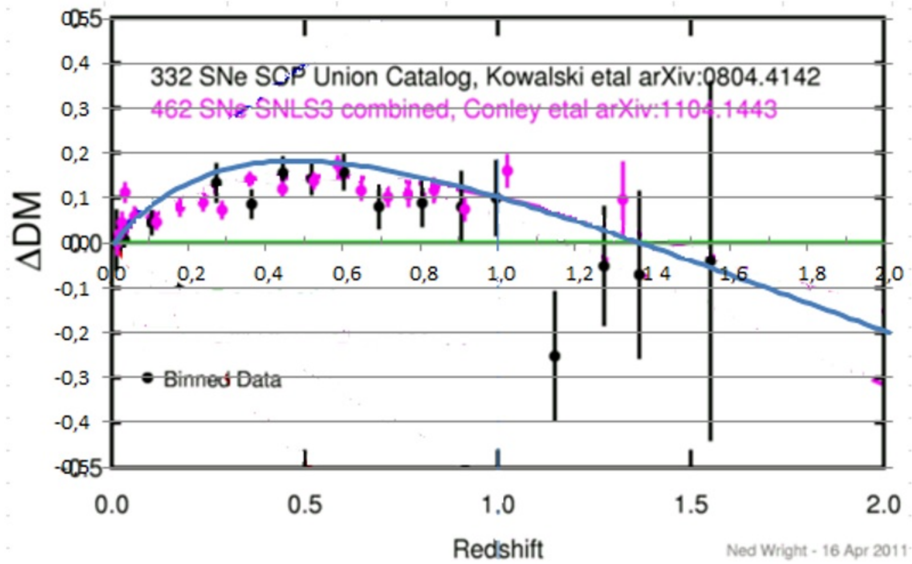


Figure 14: In the figure above, the brightness or faintness of distant supernovae relative to the empty Universe model is plotted vs redshift. Here, $\Delta(DM) = 5\log_{10}\left(\frac{D_L}{R_\omega z\,(1+\frac{z}{2})}\right)$ is the difference between the distance modulus determined from the computed flux D_L (see eq. 23) and the distance modulus computed from the redshift in the empty Universe model, and sigma is the standard deviation of the $\Delta(DM)$. The result are in good agreement with the observed data.

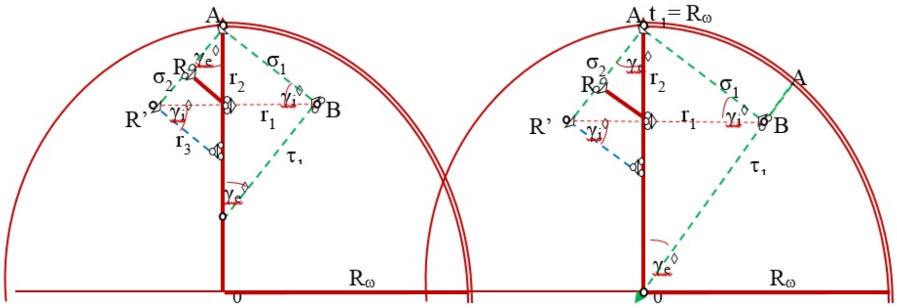


Figure 15: in the gravitational intention between two individuals, we have a limit $t_{1Max} = R_\omega$

From Tab. 1 we have

$$t_{max} = R_\omega = \frac{r^2_{k_{max}}}{R_K} \quad \text{or equivalently} \quad r_{k_{max}} = \sqrt{R_\omega R_K} \tag{27}$$

where we denote with R_K the gravitational mass and with r_k the gravitational distance. Now, t has a limit in R_ω, therefore $r_k = \sqrt{R_K t}$ has a limit in $r_{k_{max}} = \sqrt{R_K R_\omega}$. In other words, the gravitational mass of the individual delimits its space to an $r_{k_{max}} = \sqrt{R_K R_\omega}$. This is the space of Newton law and of general relativity. Nevertheless the measured distance, using light flux or angles etc., is r. Therefore, in the Dialogue relation ($\pi/2 > \gamma^\diamond > 0$), it holds the equation:

$$r^2 = r_k^2 + r_i^2 \tag{28}$$

, where r_k is the gravitational component of the distance while r_i is the cosmological one. To find the metric outside a massive body in the gravitational space, we start from:

$$ds^2 = e^\nu c^2 dt^2 - r_k^2\left(d\theta^2 + \sin^2\theta d\phi^2\right) - e^{-\lambda} dr_k^2$$

which gives:

$$\begin{cases} e^{-\lambda}\left(\dfrac{\nu'}{r_k} + \dfrac{1}{{r_k}^2}\right) - \dfrac{1}{{r_k}^2} = -\dfrac{8\pi G}{c^4}\left[T^1_{b1} + T^1_{v1}\right] \\ e^{-\lambda}\left(\dfrac{\lambda'}{r_k} - \dfrac{1}{{r_k}^2}\right) + \dfrac{1}{{r_k}^2} = \dfrac{8\pi G}{c^4}\left[T^0_{b0} + T^0_{v0}\right] \\ \dot{\lambda} = 0 \end{cases}$$

Where T_b is the baryonic mass while T_v is the residual intention energy in the vacuum. Now, in the case of central symmetry in the vacuum, T_b cancels but T_v does not.

$$\begin{cases} e^{-\lambda}\left(\dfrac{\nu'}{r_k} + \dfrac{1}{r_k^2}\right) - \dfrac{1}{r_k^2} = \dfrac{8\pi G}{c^4} T_1^{1*} \\ e^{-\lambda}\left(\dfrac{\lambda'}{r_k} - \dfrac{1}{r_k^2}\right) + \dfrac{1}{r_k^2} = \dfrac{8\pi G}{c^4} T_0^{0*} \end{cases}$$

Letting $\lambda = -\nu$ and $T_0^{0*} = -T_1^{1*} = \dfrac{c^4}{8\pi G}\left(\dfrac{4}{rR_\omega} - \dfrac{3}{R_\omega^2}\right)$ we reduce to the only equation:

$$e^{-\lambda}\left(\frac{\lambda'}{r_k} - \frac{1}{{r_k}^2}\right) + \frac{1}{{r_k}^2} = \frac{4}{rR_\omega} - \frac{3}{R_\omega^2} \tag{29}$$

Therefore, outside r_{kmax}, in the vacuum, $r = R_\omega$ and

$$e^{-\lambda}\left(\frac{\lambda'}{r_k} - \frac{1}{r_k^2}\right) + \frac{1}{r_k^2} = \frac{1}{(R_\omega)^2} \tag{30}$$

which admits two solutions:

$$e^{-\lambda} = \left(1 - \frac{k_0}{r_k}\right)^2 \quad and \quad e^{-\lambda} = 1 - \left(\frac{k_0}{r_k}\right)^2 \tag{31}$$

for both we get :

$$\frac{k_0^2}{r_{k\,\max}^4} = T_0^0 = \frac{1}{R_\omega^2} \tag{32}$$

where replacing k_0 with R_K, we have

$$c^2 d\tau^2 = \left(1 - \frac{R_K}{r_k}\right)^2 c^2 dt^2 - \frac{dr_k^2}{\left(1 - \frac{R_K}{r_k}\right)^2} - r_k^2 d\phi^2 \tag{33}$$

And

$$\frac{R_K^2}{r_{k\,\max}^4} = \frac{1}{R_\omega^2} \quad \text{from which} \quad r_{k\,\max} = \sqrt{R_K R_\omega} \tag{34}$$

To find the relation between the terms of the equation $r_k^2 + r_i^2 = r^2$, we can set, as well as $t = \dfrac{r_k^2}{R_K}$, the analogous equation $t = \dfrac{r_i^2}{R_I} = \dfrac{r_i^2}{r^2} R_\omega$ and therefore:

$$t = \frac{r_k^2}{R_K} = \frac{r_i^2}{r^2} R_\omega \qquad \text{or} \qquad \frac{r_k^2}{R_K} - \frac{r_i^2}{r^2} R_\omega = 0$$

$$\text{or} \qquad \frac{r_k^2}{R_K} - \frac{r^2 - r_k^2}{r^2} R_\omega = 0 \qquad \text{or} \qquad \frac{1}{R_K} + \frac{1}{R_I} = \frac{R_\omega}{r_k^2}$$

$$\text{and at last} \qquad r_k = \sqrt{\frac{R_K}{R_K + R_I}}\, r \qquad \text{and} \qquad r_i = \sqrt{\frac{R_I}{R_K + R_I}}\, r$$

and defining $\sin\xi = \sqrt{\dfrac{R_K}{R_K + R_I}} = \dfrac{\rho_b}{\sqrt{{\rho_b}^2 + {\rho_{cdm}}^2}}$ and $\cos\xi = \sqrt{\dfrac{R_I}{R_K + R_I}} = \dfrac{\rho_{cdm}}{\sqrt{{\rho_b}^2 + {\rho_{cdm}}^2}}$ we have:

$$r_k = r\sin\xi \quad \text{and} \quad r_i = r\cos\xi$$

Therefore $A = A_K = \dfrac{R_K}{r_k^2} = A_I = \dfrac{R_I}{r_i^2} = A_K \sin^2\xi + A_I \cos^2\xi = \dfrac{R_K + R_I}{r^2}$

At last, since $A_{K\_centrifugal} = \dfrac{v_{centrifugal}^2}{r_k} = A_{K\_gravitational} = \dfrac{R_K}{r_k^2} = \dfrac{R_K + R_I}{r^2}$

We have

$$v_{centrifugal} = \sqrt[4]{\frac{R_K + R_I}{r^2} R_K} \tag{35}$$

and the limits

$$r_{K\infty} = \lim_{r\to\infty} \sqrt{\frac{R_K}{R_K + R_I}}\, r = \sqrt{R_K R_\omega} \qquad v_\infty = \lim_{r\to\infty} \sqrt[4]{\frac{R_K + R_I}{r^2} R_K} = \sqrt[4]{\frac{R_K}{R_\omega}}$$

On radial orbits, stars plunging in and out of the galactic center, $R_\omega = cH_0^{-1}$, while on circular orbit $R_\omega = 2\pi c H_0^{-1}$. In motion of satellite galaxies around normal galaxies at distances 50-500 kpc reported in Klypin A. & Prada F. 2009 [14], the rotation curves are considerably affected by the radial component of the motion which gradually decreases as moving away from the host galaxy. The radial component is instead usually negligible in the galaxy rotation curves of stars.

We find that the predictions for the galaxy rotation curves from Intention physics, MSTG and Milgrom's Mond agree remarkably for all of the 101 galaxies reported in J.R.Brownstein and J.W.Moffat 2005 [9]. In particular, we adopted the mass distribution model $R_K(r) = R_{K_{Tot}}\left(\frac{r}{r_c + r}\right)^{3\beta}$ of a spherically symmetric galaxy, where r_c is the inner core and $\beta = 1$ for HSB galaxies and 2 for LSB and Dwarf galaxies, and used the $R_{K_{Tot}}$ and r_c of the MSTG solution, with no need of any further parameter. It is relevant that the Newton velocity, once replaced the total distance r with the distance r_k along the K axis, agrees exactly with the experimented values everywhere. In the figure 16 and figure 17 below, we have $r_k = f(r)$ where r_k, at first close to r, approaches asymptotically $r_{k_{max}}$ increasing r.

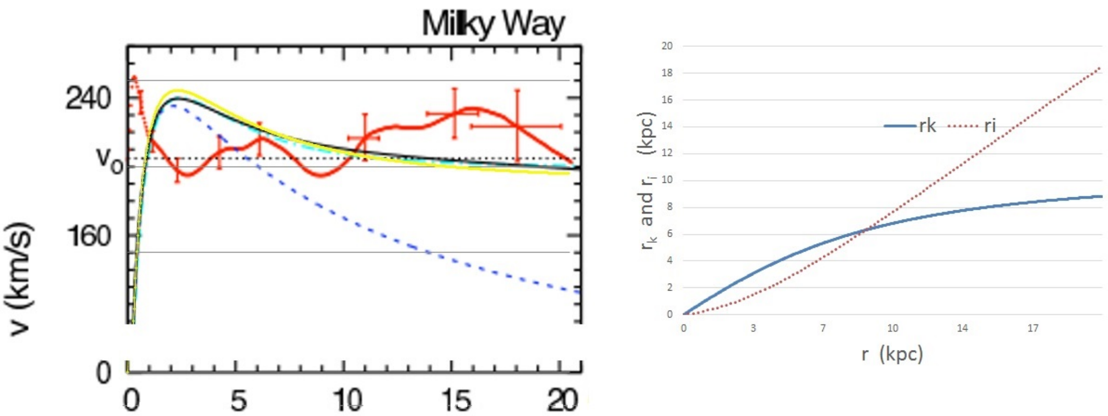


Figure 16: Rotation curve for the Milky Way. The red points (with error bars) are the observations. The solid yellow line is the rotation curve determined from Intention Physics (eq. 35), the short dashed blue line is the Newtonian galaxy rotation curve. Both rotation curves are the best fit to a parametric mass distribution (independent of luminosity observations) a two parameter fit to the total galactic Mass, $M = 9.12\ 10^{10}\ M_{\odot}$, and a core radius $r_c = 1.04$ kpc and $\beta = 1$. On the right the trend of r_k and r_i

At last, since

$$V = \frac{R_K}{r_k} = \frac{R_K}{r}\frac{1}{\sqrt{\frac{R_K}{R_K+R_I}}} = \frac{R_K}{r}\sqrt{1+\frac{R_I}{R_K}} = \frac{R_K}{r}\sqrt{1+\frac{r^2}{r_{k_{max}}^2}} \tag{36}$$

and therefore

$$L = g_{00} = (1-V)^2 \tag{37}$$

the dark matter R_I gives reason of orbital velocity in galaxies and lensing.
Very interesting is the determination of the barycentre. From

$$\sum_{i=1}^{n}(M_{K_i}\ddot{r}_{k_i}) = M_{K_{Tot}}\ddot{r}_k$$

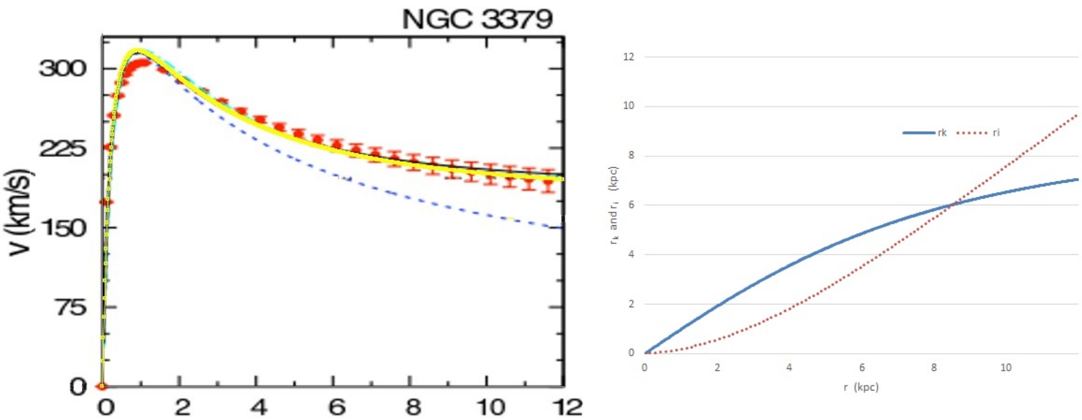


Figure 17: Rotation curve for the elliptical galaxy NGC 3379. The red points (with error bars) are the observations. The solid yellow line is the rotation curve determined from Intention Physics (eq. 35), the short dashed blue line is the Newtonian galaxy rotation curve. Both rotation curves are the best fit to a parametric mass distribution (independent of luminosity observations) a two parameter fit to the total galactic Mass, $M = 6.99\ 10^{10}\ M_{\odot}$, and a core radius $r_c = 0.45$ kpc and $\beta = 1$. On the right the trend of r_k and r_i

we have the barycentre coordinates:

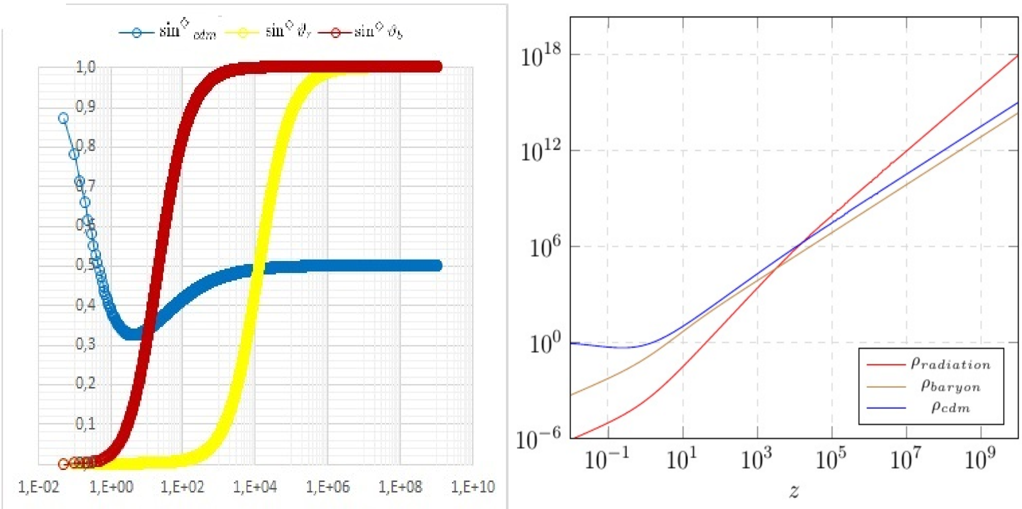
$$r_k = \frac{\sum_{i=1}^{n} M_{K_i} r_{k_i}}{M_{K_{Tot}}} = \frac{\sum_{i=1}^{n} \frac{M_{K_i}^{3/2}}{\sqrt{M_{K_i} + \frac{r_i^2}{R_\omega}}} r_i}{M_{K_{Tot}}} = \sum_{i=1}^{n} \frac{M_{K_i} r_{k_{max_i}}}{M_{K_{Tot}}} \frac{r_i}{\sqrt{r_{k_{max_i}}^2 + r_i^2}} \tag{38}$$

Where the barycenter, outside the $r_{k_{max}}$ perimeter of any attractor, where the Acceleration becomes constant and equal to $1/R_\omega$, reduces to a gradient which emerges from and reveals a contour plane.
A huge quantity of mass, fractioned in little parts far away, is negligible with respect to a much smaller quantity of mass concentrated in bigger parts.

At last, the presumed direct proof of Dark matter [*Clowe et al. 2006*] , given by the recent observed collision of two clusters of galaxies (”bullet cluster” 1E0657-56), where it is shown that the sources of gravity in the cluster are not located where the ordinary matter is located, can be explained by the correct determination of the barycentre. Intention physics, indeed, predicts the irrelevance of the huge quantity of dominant tiny matter component, that is the X-ray plasma clouds, with respect to the very more large masses constituted by the galaxy clusters.The barycentre gives reason also of the large structure of universe.

3.2 The complete Universe metric

We are now ready to analyze the complete Universe metric, that is dark matter with the add on of baryonic matter and radiation. In particular, in the radiation era, the radiation component produces an almost identical distance scale to that of the ΛCDM model. Since radiation (and baryonic matter) generates a torsion of the Radius of the universe R_ω, its role, primary in the age of radiation, is negligible in that of matter.
The whole universe is enfolded and unfolds from the radius R_ω . In it are enfolded and from it unfold amorones (dark matter), baryonic matter and radiation. For any individual it is as if the radius of the universe $R_\omega(a) = \tau(a)$ had grown from zero, at the time of the Big Bang,



(a) (b)

Figure 18: on the left panel the trend of the sin of the cosmic torsion angle for radiation and baryon matter and of the sin of the cosmic angle for CDM. On the right panel the trend of the density for radiation, baryon matter and CDM.

to its current value R_ω, twisting gradually (ϑ torsion) due to radiation and baryonic matter components.
While in the external gravitational interaction between two individuals and far from the Radius we have neglected the torsion, this can no longer be neglected in cosmology. Therefore we have to generalize the pure dark matter metric of sec. 3.1.
At last, since for radiation and baryonic matter :

$$\frac{\mu_r}{R_{tot}} = \Omega_r \left(1 - \Omega_r\right) = \Omega_r' \tag{39}$$

$$\frac{\mu_b}{R_{tot}} = \Omega_b \left(1 - \Omega_b\right) = \Omega_b' \tag{40}$$

From the 8, we have the torsion potentials:

$$\sin^\diamondsuit \vartheta_r = \frac{\Omega_r' \sin^2\gamma}{(1 - \sin\gamma) + \Omega_r' \sin^2\gamma} = \frac{\Omega_r' \left(z/(1+z)\right)^2}{1/\left(1+z\right) + \Omega_r' \left(z/(1+z)\right)^2} \tag{41}$$

$$\sin^\diamondsuit \vartheta_b = \frac{\Omega_b' \sin^2\gamma}{(1 - \sin\gamma) + \Omega_b' \sin^2\gamma} = \frac{\Omega_b' \left(z/(1+z)\right)^2}{1/\left(1+z\right) + \Omega_b' \left(z/(1+z)\right)^2} \tag{42}$$

$$\tag{43}$$

and from 24

$$\sin^\diamondsuit{}_{cdm} = \frac{(1 + \sin\gamma)}{(1 + \sin\gamma + \gamma\cos\gamma)^2}$$

defining :

$$\rho_r = \sqrt{\Omega_r \sin^\diamondsuit \vartheta_r \,(1+z)^4} \tag{44}$$

$$\rho_b = \sqrt{\Omega_b \sin^\diamondsuit \vartheta_b \,(1+z)^3} \tag{45}$$

$$\rho_{cdm} = \sqrt{\left(1 - \Omega_r \sin^\diamondsuit \vartheta_r - \Omega_b \sin^\diamondsuit \vartheta_b\right) \cdot \sin^\diamondsuit{}_{cdm} (1+z)^3} \tag{46}$$

Since from $H_{cdm}(a) \equiv \dfrac{\dot{a}}{a}$ we have $d\tau(a) = \dfrac{c}{H_{cdm}(a)} \dfrac{da}{a}$.
We arrive at last to:

$$H_{cdm}(a) = H_0 \sqrt{{\rho_r}^2 + {\rho_b}^2 + {\rho_{cdm}}^2} = H_0 E_{cdm} \tag{47}$$

$$D_{M_{cdm}} = \int_0^z \frac{dz}{H_{cdm}(z)} \tag{48}$$

$$T_\omega = \int_\infty^z \frac{a}{H_{cdm}(z)} dz \tag{49}$$

and

$$\cos\xi = \frac{\sqrt{\rho_{cdm}^2}}{\sqrt{{\rho_r}^2 + {\rho_b}^2 + {\rho_{cdm}}^2}} \tag{50}$$

$$\sin\xi_b = \frac{\sqrt{{\rho_b}^2}}{\sqrt{{\rho_r}^2 + {\rho_b}^2 + {\rho_{cdm}}^2}} \tag{51}$$

$$\sin\xi_r = \frac{\sqrt{{\rho_r}^2}}{\sqrt{{\rho_r}^2 + {\rho_b}^2 + {\rho_{cdm}}^2}} \tag{52}$$

$$D_M^2 = D_{M_{cdm}}^2 + D_{M_b}^2 + D_{M_r}^2 = D_M^2 \cos^2\xi + D_M^2 \sin^2\xi_b + D_M^2 \sin^2\xi_r \tag{53}$$

at last

$$D_M = \frac{D_{M_{cdm}}}{\cos\xi}$$

therefore

We must distinguish between:

1. the radiation-dominated era, when $\rho_r >> \rho_b + \rho_{cdm}$ where the time and distances scales with the redshift are indistinguishable from the ΛCDM model and likewise all epochs except that of inflation, unnecessary in the present model ,

2. and the matter-dominated epoch, when $\rho_b + \rho_{cdm} >> \rho_r$, which includes all the remaining eras of the ΛCDM model. The time and distances scale with the redshift of the ΛCDM model and of the present model are only very slightly different.

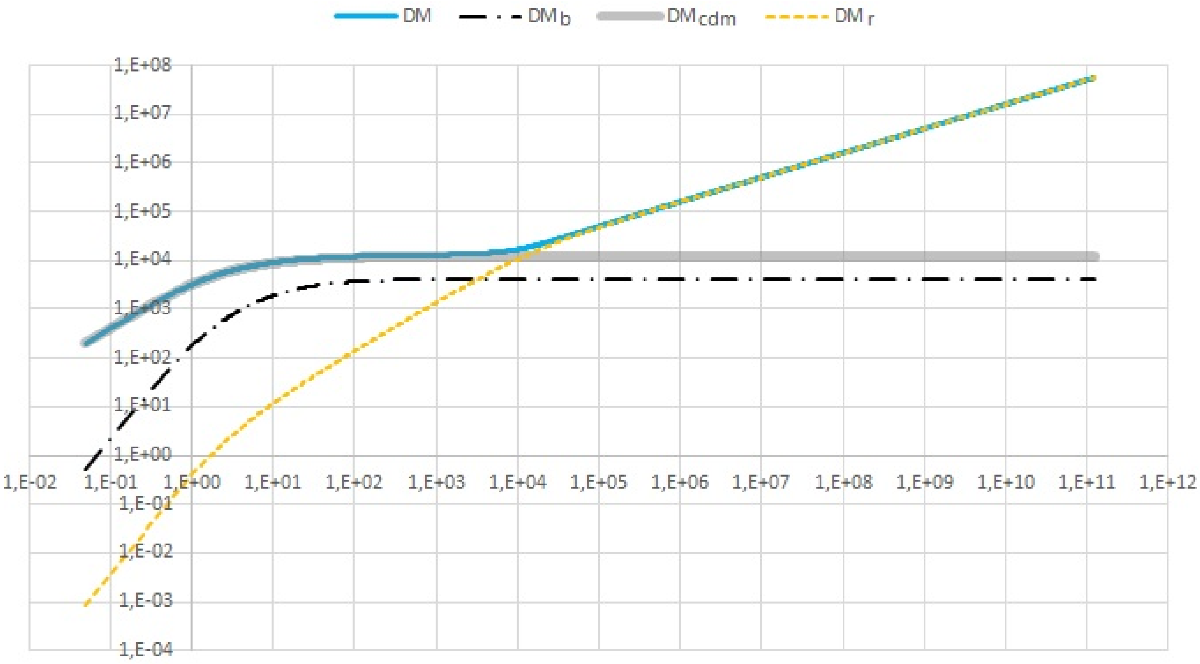


Figure 19: in the plot the trend of the D_M components with redshift. The D_M , which corresponds to the distance that is measured by observing the cosmos, foresees an inflationary era immediately downstream of the Big bang.

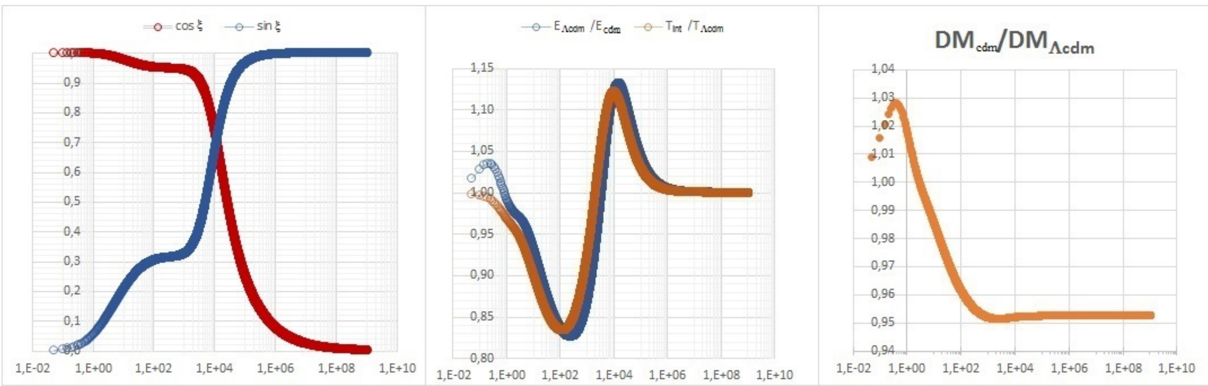


Figure 20: in the plot a comparison between time and distances in the ΛCDM model and the present model.

3.2.1 The Radiation-dominated era

In the Radiation-dominated epoch, where takes place the Big-Bang nucleosynthesis (BBN), we have $cd\tau(a) \simeq R_\omega \dfrac{ada}{\sqrt{\Omega_r \sin\vartheta_r}}$ and therefore $c\tau \simeq \dfrac{R_\omega}{\sqrt{\Omega_r}} \displaystyle\int \dfrac{ada}{\sqrt{\sin\vartheta_r}}$ where $\sin^\diamond\vartheta_r \simeq 1$. The ΛCDM model and the present model are indistinguishable in this era. The present model therefore shares the same nucleosynthesis theory as the ΛCDM model.

3.2.2 The Matter-dominated era

The time and distances scale with the redshift of the ΛCDM model and of the present model are only very slightly different in the matter-dominated era. Therefore, as in the ΛCDM model we have $r_{s_{drag}} = \int_z^{\infty} \frac{c_s(z)}{H(z)} dz$, where $c_s(z)$ is the sound speed,

$$c_s(z) = \frac{c}{\sqrt{3}} \frac{1}{\sqrt{1 + \frac{3\Omega_b}{4\Omega_\gamma} a}}$$

The acoustic oscillations in l seen in the CMB power spectra correspond to a sharply-defined acoustic angular scale on the sky, given by:

$$\theta_* = \frac{r_s^*}{D_M}$$

where r_s^* is the comoving sound horizon at recombination quantifying the distance the photon-baryon perturbations can influence, D_M is the comoving angular diameter distance that maps this distance into an angle on the sky, $\cos\xi \simeq 0.94311 + (1090 - z) \cdot 0.00001$ in the neighbourhood of Z=1090, represents the cosmic component (as opposed to the baryonic one $\sin\xi$) of the D_M .
Planck measures:
$100\theta_* = 1.04109 \pm 0.00030$ (68%, TT,TE,EE+lowE), a measurement with 0.03% precision.
It is the CMB analogue of the transverse baryon acoustic oscillation scale r_{drag}/D_M measured from galaxy surveys, where r_{drag} is the comoving sound horizon at the end of the baryonic-drag epoch. The BAO measurement constraint can be expressed as a approximate relation between r_{drag} and h as:

$$\left(\frac{r_{drag}h}{\text{Mpc}}\right)\left(\frac{0.3}{\Omega_m}\right)^{0.4} = 101.056 \pm 0.036 \quad \text{(with the scale ladder of the standard model see. [21])}$$

$$\left(\frac{r_{drag}h}{\text{Mpc}}\right) = 101.766 \pm 0.036 \quad \text{(with the scale ladder of the present model)}$$

Therefore from the two constraints:

$$\frac{r_s^*}{D_M} = \theta_* \simeq 0.0104109 \tag{54}$$

$$r_{s_{drag}} h \simeq 101.766 Mpc \tag{55}$$

and the scale ladder of the present model, we find the following useful approximate formulas:

$$r_s^* \simeq \frac{100.13}{h} Mpc \tag{56}$$

$$r_{s_{drag}} \simeq \frac{101.766}{h} Mpc \tag{57}$$

$$z^* \simeq 1126.002 - 6336\Omega_b + 379.5h \tag{58}$$

$$z_{drag} \simeq 1099.956 - 5140\Omega_b + 293h \tag{59}$$

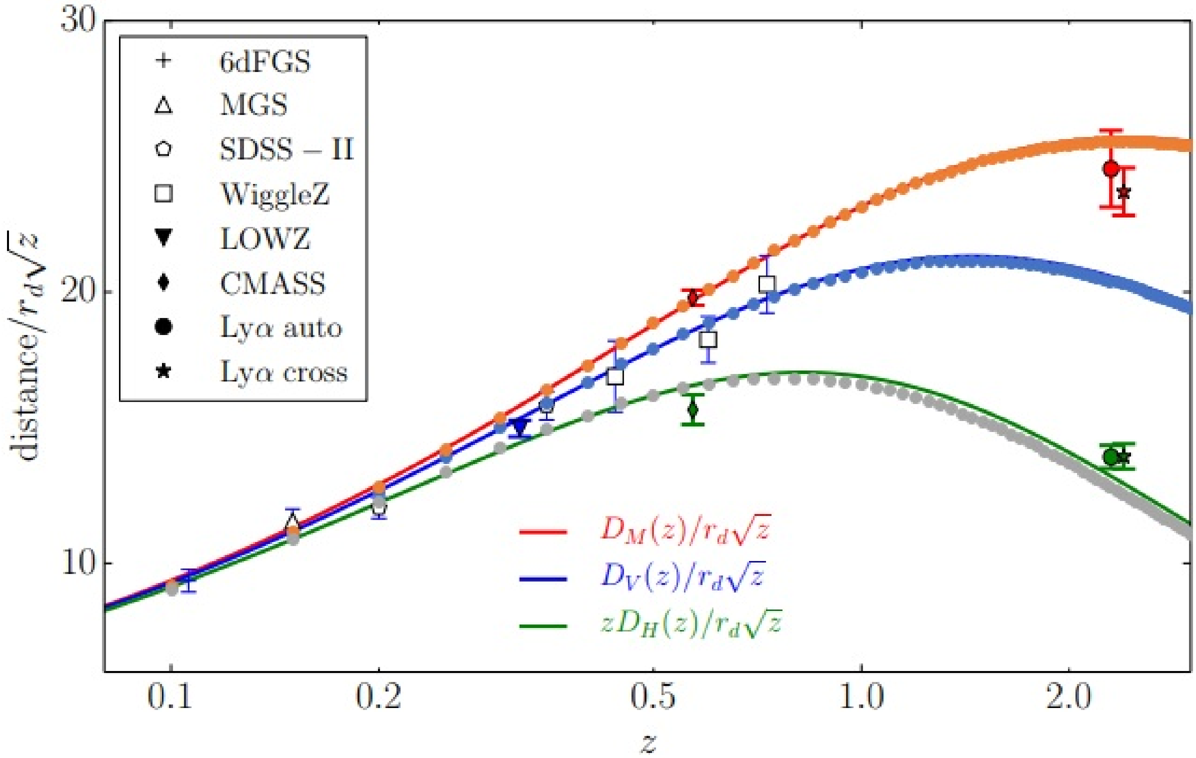


Figure 21: The BAO "Hubble diagram" (Aubourg É. et al. 2014 [3]) from a world collection of detections. Blue, red, and green points show BAO measurements of D_V/r_d, D_M/r_d, and zD_H/r_d, respectively, from the sources indicated in the legend. These can be compared to the correspondingly colored lines, which represents predictions of the fiducial Planck ΛCDM model (with $m = 0.3183$, $h = 0.6704$) and the prediction of the Intention model (dotted line) when $r_{s_{drag}} = 101.766/h$ Mpc. The scaling by $\sqrt{z}$ is arbitrary, chosen to compress the dynamic range sufficiently to make error bars visible on the plot. Filled points represent BOSS data, which yield the most precise BAO measurements at $z < 0.7$ and the only measurements at $z > 2$. For visual clarity, the $Ly\alpha$ cross-correlation points have been shifted slightly in redshift; auto-correlation points are plotted at the correct effective redshift.

and by imposing the two further constraints:

$$z^* \simeq 1090$$

$$z_{drag} \simeq 1060$$

we find the approximate

$$\Omega_b \simeq 0.0056 + 0.06h \tag{60}$$

At last, by imposing the further constraints on the baryonic density given by the formula eq. 15, we find $H_0 = 74.8$, which is consistent with $BAO + SN + H_0$. Incidentally we find that it corresponds to $R_\omega = \alpha e^{\alpha^{-1}}$.

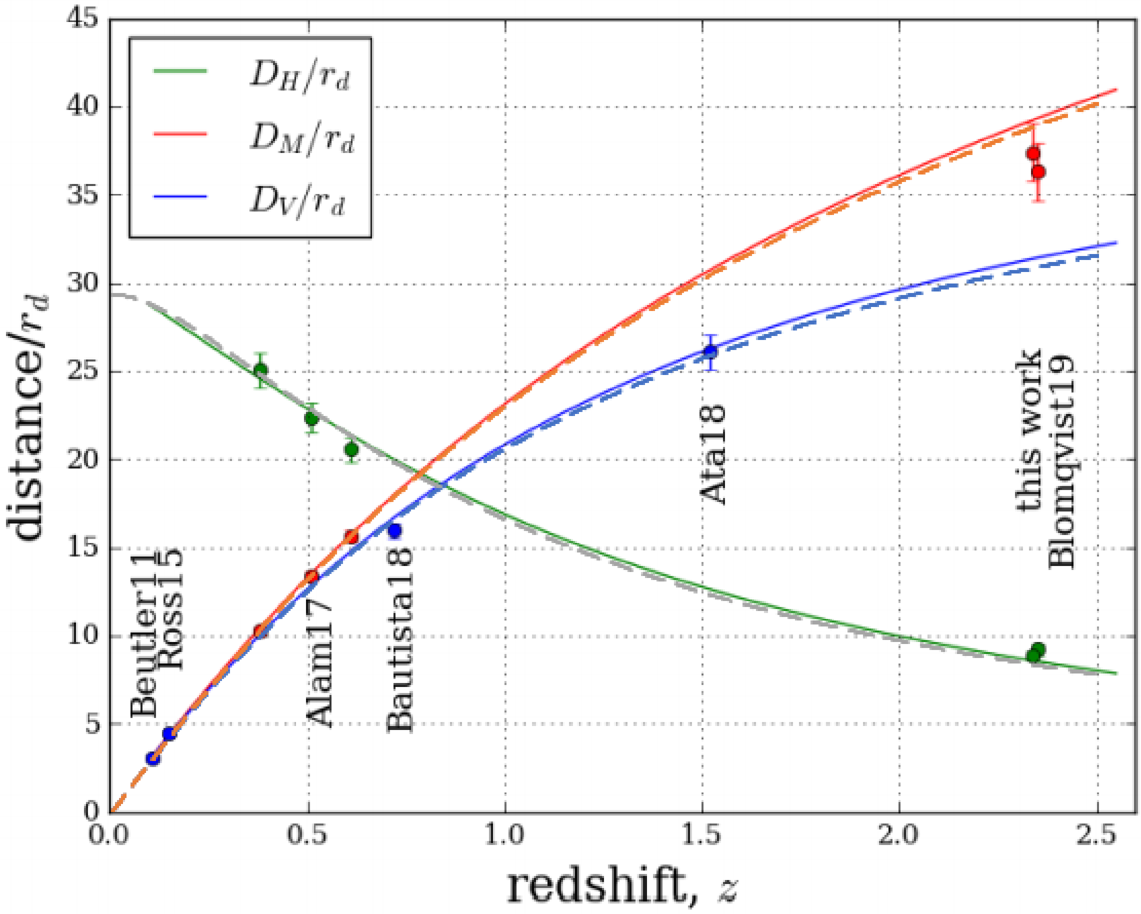


Figure 22: BAO measurement (Agathe VS. et al. 2019[1]) of D_H/r_d andD_M/r_d using BOSS galaxies (Alam et al. 2017), $Ly\alpha$ absorption in BOSS-eBOSS quasars (Agathe et al. 2019) and correlation between BOSS-eBOSS quasars and $Ly\alpha$ absorption (Blomqvist et al. 2019). Other measurements give D_V/r_d, with $D_V = D_M^{2/3}(zD_H)^{1/3}$, using galaxies (Beutler et al. (2011), Ross et al. (2015), Bautista et al. (2018)) and BOSS-eBOSS quasars (Ata et al.2018). Solid lines show the Pl2015 values (Planck Collaboration et al.2016). These can be compared to the correspondingly colored lines, which represents predictions of the fiducial Planck ΛCDM model (with $m = 0.3183$, $h = 0.6704$) and the prediction of the Intention model (dashed lines) when $r_{s_{drag}} = 101.766/h$ Mpc.

4 Conclusion

In the present cosmology, the Big Bang is part of a continuous process where all space-time is in potency, with the exception of the Big Bang and of the line of the present in act, and every instant is all new and all present. Every instant the whole universe recurs unfolding itself from the all interconnected Radius. It naturally provides the very specific initial conditions which, in the standard model, make the ad hoc hypothesis of inflation necessary. The Amoroni, indeed, in se indistinguishable from each other, all in potency, are the substance of the Radius $R_\omega \equiv Time \equiv Space \equiv Matter$ of the universe and are the foundation of the uniform cosmological background and of the initial almost scale-invariant distribution of primordial density perturbations as seen,

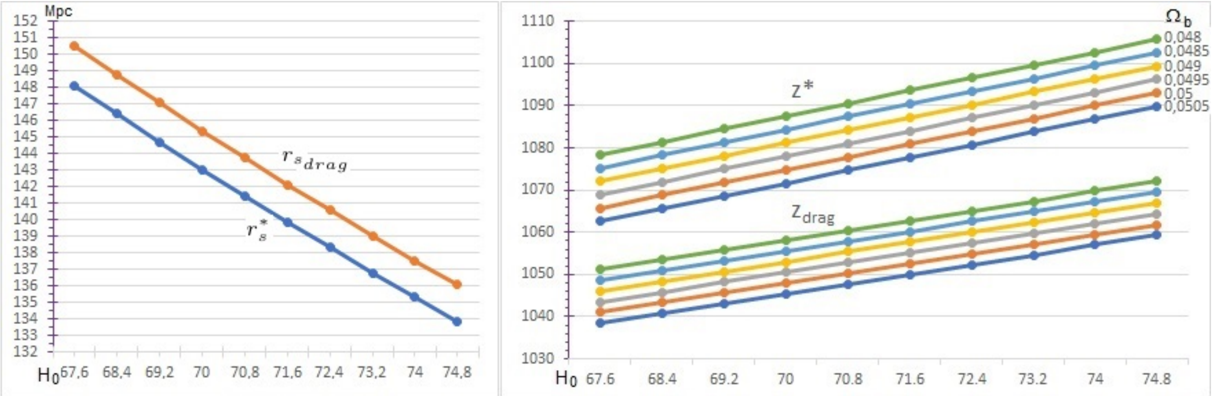


Figure 23: Sound Horizon: in the plot the comoving sound horizon at recombination r_s^* and the comoving sound horizon at the baryon drag epoch with the relative redshifts

for example, in the cosmic microwave background (CMB) radiation, on scales far larger than the causal horizon at the time the CMB photons last scattered.

The present model, which exhibits an identical distance scale of the ΛCDM model in the radiation era, and an almost identical distance scale in the following ones, shares its successes and corrects its mistakes solving the problem of the rotation in the inner parts of spiral galaxies and the problem of the discrepancy between inverse and direct BAO Calibration and H_0 measurement between these two opposite approaches.

In summary it explains:

1. Homogeneity problem: The Amoroni, in se indistinguishable from each other, all in potency, are the substance of the Radius $R_\omega \equiv Time \equiv Space \equiv Matter$ of the universe and are the foundation of the uniform cosmological background and of the initial almost scale-invariant distribution of primordial density perturbations. Furthermore, from the "part of relationship" 6, it arises an electron every $\pi R_\epsilon^{\circ 2}$ area and the matter rises uniformly distributed in the universe.

2. Isotropy problem: in the matter formation process, every direction is equivalent.

3. Horizon problem: it is not a problem since the entire Universe is a manifestation of the point of the Radius which, from time to time, is enacted through the Big Bang manifesting itself in the entire Universe.

4. Flatness problem: depends on the metric adopted. In the FLRW metric, which adopts the point of view of a reference system in free fall, the acceleration vanishes and the universe is flat. In the Schwarzschild metric, which adopts the point of view of a fixed reference system in a gravitational field, the universe is closed, has a radius equal to R_ω.

5. matter-antimatter asymmetry problem: the asymmetry matter-antimatter is only apparent. It is the same as the arrow of time. The matter emerges on the line of the present in act and then recedes as antimatter. In the conversion, which takes place only on the line of the present in act and in the Big Bang, we have the coexistence between matter and antimatter.

6. total mass problem: the matter horizon coincides with the cosmic horizon ad therefore all the matter of universe is observable and must be $R_\omega \simeq \alpha^{-1}e^{\alpha^{-1}}$

7. Structure formation problem: the extra energy R_I and the barycenter favors the formation of large structure. Furthermore, apart from leptons and universe, the proportion 6 $R_\omega : R_{whole} = R_{whole} : R_{part}$, starting from $R_{part} = R_\epsilon^\circ$, applies recursively through $R_{whole} \rightarrow R_{part}$, providing all the mirroring universe scale giving rise to stars $R_{\bullet s}$ and galaxies $R_{\bullet g}$ and clusters and so on.

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