The Perfect Fluid Vacuum Unified Gravitation Vortex Model and Non-Euclidean Spherically Symmetric Metrics

By
Robert Louis Kemp

Super Principia Mathematica
The Rage to Master Conceptual & Mathematical Physics

www.SuperPrincipia.com

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Abstract

This paper postulates a “Dark Matter Force and Pressure” and also gives a conceptual and mathematical description for the reason for choosing a “Vacuum Energy Perfect Fluid” model, and using the Schwarzschild Metric over the Einstein Metric, based on the concept of whether there is “Zero Pressure” impressed upon the surface of the Black Hole Event Horizon; And likewise, whether the “Volume Mass Density” and the curvature of space, space-time, or the gravitational field, surrounding a matter source is normal throughout the gradient of a gravitational field, or whether it is rarefied/condensed through the gradient of a gravitational field, and eventually becomes normal far away from the matter source.

In this paper a general introduction into the basic concepts of a “Perfect Fluid” gravitation theory, and this bodes for the necessity of Non-Euclidean “Curved-Space” Geometry, and Spherically Symmetric Metrics, used for describing causality for “Gravitational” interaction of mass with space or “isotropic aether” space-time, and mass interaction with mass.

Keywords: General Relativity, Special Relativity, Einstein Field Equation, Gravitational Field, Heat Radiation Gravitation, Dark Energy Gravitation, Black Hole Event Horizon, Spherically Symmetric Metric, Euclidean Geometry, Non-Euclidean Geometry, Minkowski Metric, Einstein Metric, Schwarzschild Metric

Contents

1. Introduction

This work is written to physicists that are interested in understanding from a conceptual view, the rationale for selecting "Flat Geometry" Euclidean Space, or selecting a "Curved Geometry" Non-Euclidean Space; as causality for gravity.

Likewise this work is written to physicists that are interested in understanding why a Schwarzschild Spherically Symmetric Metric is preferred over the Einstein Spherically Symmetric Metric of space, space-time, or the gravitational field; which is based on a particular choice of "pressure" and "density".

A "Spherically Symmetric Metric" is used for describing the **Differential Geometry of Space, Time, & Surfaces**, of a "Vacuum Energy Perfect Fluid" model, of spherically symmetric space, space-time, or gravitational field.

In this paper, I do weave ***some of my own theory, ideas, and mathematics*** into these well established physics concepts and mathematics; therefore, this work is written for those that have a very good basis and understanding, of the concepts of differential geometry, and General Relativity; to be able to distinguish what is newly proposed, and what is being discussed in general throughout this paper.

For example, I present a new idea of "Constituent Forces and Pressures" of Gravitation, and the "Composite Forces and Pressures" of Gravitation. I specifically differentiate between a Newtonian or Self Gravitational Force, and an Isotropic Aether Gravitational Force.

In this paper, I introduce a new equations and conceptual rationale for an "***Isotropic Rarefaction Force and Pressure of Gravitation***", that is postulated to exist, for any and every gravitational interaction system in the universe.

My goal is to bring the concepts of "Gravitation Force and Pressure" and the concept of Non-Euclidean curvature described by the differential geometry of the ***"Spherically Symmetric Metric"*** (ds^2) of space, space-time, or a gravitational field, and due to the presence of mass or matter as the source of a gradient gravitational field, in a localized region of the universe, into correlation.

Furthermore, the ***"Spherically Symmetric Metric"*** (ds^2) can describe the geometry of space, space-time or a gravitational field, of or surrounding the: universe, stars, planets, galaxies, quasars, electrons, protons, neutrons, atoms, molecules, photons, etc…

1.1. *The Vacuum Energy “Perfect” Fluid Mechanical Model – Constituent & Composite Gravitational Forces and Pressures Equations – Used For Describing Non-Euclidean Metrics*

The **Schwarzschild** and the **Einstein “Non-Euclidean” Metrics** (ds^2) describes the gravitational interaction, causality, and geometry of the curvature of space, space-time, and the gravitational field, and is used in conjunction, with a fluid mechanical model, ***Perfect Fluid “Static or Dynamic” Vacuum Energy Solution*** for the causality gravitation. The proposed model is the ***Unified Gravitation Vortex Theory***.

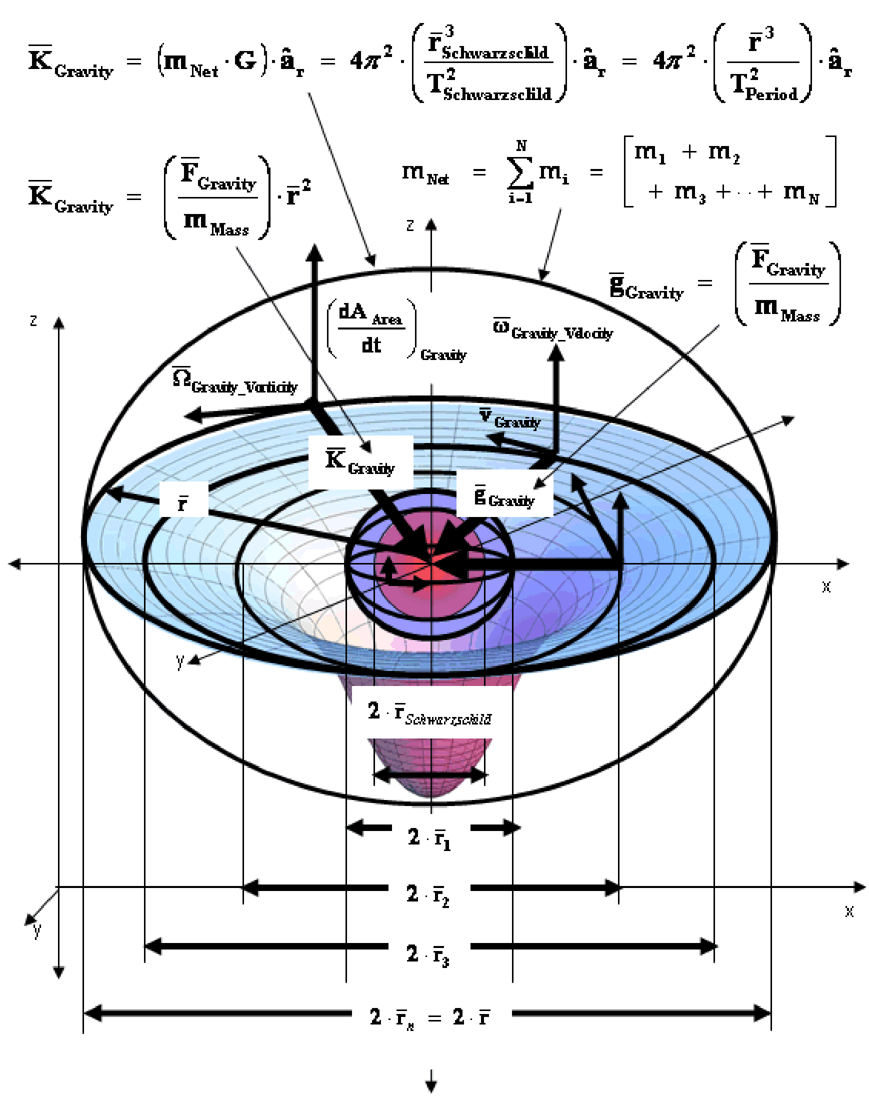


Figure: Inertial Mass “Aether” Gravitation Vortex in vector (direction) representation

This ***Unified Gravitation Vortex Theory*** describes a closed solution for cosmological and quantum mechanical effects, of matter in motion throughout the universe; and which a few components of the model will be described below.

A fluid mechanical, perfect fluid "vacuum energy" solution to gravitation, makes that claims that the "Single Newtonian Gravity Force - Only" solution to gravitation is abandoned; in favor of a gravitation theory, that describes "constituent" and "composite": "forces", "pressures" and "energies"; into a more unified theory of gravitation.

In this perfect fluid "vacuum energy" model there are **constituent** ***Gravitational Forces and Pressures:*** There is the ***Inertial Mass "Self" Gravitational Attraction Force & Pressure (*** $\mathrm{P}_{\text{Inertial-Gravity-Pressure}} = \dfrac{\mathrm{F}_{\text{Self-Gravity-Force}}}{\oint dA_{Area}}$ ***)***, and there is the ***Isotropic Aether Gravitational Attraction Force & Pressure (*** $\mathrm{P}_{\text{Aether-Gravity-Pressure}} = \dfrac{\mathrm{F}_{\text{Light-Force}}}{\oint dA_{Area}}$ ***)***.

The physics of the **composite** ***Gravitational Force and Pressure*** is responsible for the ***Dark Matter***, phenomena, and is known as the ***Isotropic Rarefaction Pressure of Gravitation*** ($\Delta\mathrm{P}_{\text{Rarefaction-Pressure}} = \dfrac{\Delta\mathrm{F}_{\text{Rarefaction-Force}}}{\oint dA_{Area}}$), which describes the ***rarefying/condensing inhomogeneous and isotropic pressure****, that is acting upon each and every one of the individual, infinite series of gradient spherical shell, energy potentials, of space, space-time, or gravitational field*; where there is localized gravitational interaction, condensed matter, mass, and energy.

The ***Isotropic Rarefaction Pressure of Gravitation*** ($\Delta\mathrm{P}_{\text{Rarefaction-Pressure}}$), and the ***Rarefaction Force of Gravitation*** ($\Delta\mathrm{F}_{\text{Rarefaction-Force}} = \Delta\mathrm{P}_{\text{Rarefaction-Pressure}} \cdot \oint dA_{Area}$), is a measure of the pressure and density difference between the ***"Isotropic Aether towards Mass Gravitational Attraction"*** and twice the ***"Inertial Mass towards Mass Gravitational Attraction"***; where there is localized gravitational interaction, condensed matter, mass, and energy.

The ***Dark Matter***, phenomena is postulated to be a result of this force, pressure and density difference, given by the ***Isotropic Rarefaction Pressure of Gravitation*** ($\Delta\mathrm{P}_{\text{Rarefaction-Pressure}}$), which is defined as the ratio of the ***Rarefaction Force of Gravitation*** ($\Delta\mathrm{F}_{\text{Rarefaction-Force}}$), divided by the gradient field, spherical surface area ($\oint dA_{Area} = 4\pi \cdot \bar{\mathrm{r}}^2$) of each of the infinite series of concentric, *gradient spherical shells, of energy potentials, of space, space-time, or gravitational field*.

The ***Schwarzschild*** fluid mechanical model, ***Perfect Fluid "Dynamic" Vacuum Energy Solution*** for the causality ***Dark Matter***, phenomena of gravitation, is given by the "composite" ***Isotropic Rarefaction Pressure of Gravitation*** ($\Delta P_{\text{Rarefaction-Pressure}}$), which is equal to the **Isotropic Aether Gravitational Field Pressure** ($P_{\text{Aether-Gravity-Pressure}}$) subtracted from twice (2) the **Inertial** ($2 \cdot P_{\text{Inertial-Gravity-Pressure}}$) **Mass Gravitational Field Pressure**.

1.1

$$\Delta P_{\text{Rarefaction-Pressure}} = \frac{\Delta F_{\text{Rarefaction-Force}}}{\oint dA_{Area}} = \left[\begin{array}{l} P_{\text{Aether-Gravity-Pressure}} \\ \quad - \; 2 \cdot P_{\text{Inertial-Gravity-Pressure}} \end{array} \right] \rightarrow {kg}/{m \cdot s^2}$$

$$\Delta P_{\text{Rarefaction-Pressure}} = \frac{\Delta F_{\text{Rarefaction-Force}}}{\oint dA_{Area}} = \left[\frac{F_{\text{Light-Force}}}{\oint dA_{Area}} - 2 \cdot \left(\frac{F_{\text{Self-Gravity-Force}}}{\oint dA_{Area}} \right) \right]$$

The "constituent" **Isotropic Aether Gravitational "Attraction" Field Pressure**

1.2

$$P_{\text{Aether-Gravity-Pressure}} = \frac{F_{\text{Light-Force}}}{\oint dA_{Area}} = \frac{1}{3} \cdot \left(\rho_{\text{Net}} \cdot \bar{c}^2_{\text{Light}} \right) \rightarrow {kg}/{m \cdot s^2}$$

The "constituent" **Inertial Mass Gravitational "Attraction" Field Pressure**

1.3

$$P_{\text{Inertial-Gravity-Pressure}} = \frac{F_{\text{Self-Gravity-Force}}}{\oint dA_{Area}} = \frac{1}{6} \cdot \left(\rho_{\text{Net}} \cdot \bar{c}^2_{\text{Light}} \right) \cdot \left(\frac{\bar{r}_{\text{Schwarzschild}}}{\bar{r}} \right) \rightarrow {kg}/{m \cdot s^2}$$

The ***Schwarzschild*** solution, predicts the following equation for the ***Isotropic Rarefaction Pressure of Gravitation*** ($\Delta P_{\text{Rarefaction-Pressure}}$).

1.4

$$\Delta P_{\text{Rarefaction-Pressure}} = \frac{\Delta F_{\text{Rarefaction-Force}}}{\oint dA_{Area}} = \frac{1}{3} \cdot \left(\rho_{\text{Net}} \cdot \bar{c}^2_{\text{Light}} \right) \cdot \left(1 - \frac{\bar{r}_{\text{Schwarzschild}}}{\bar{r}} \right) \rightarrow {kg}/{m \cdot s^2}$$

Substituting the Inertial Volume Mass Density – ($\rho_{\text{Net}} = \frac{m_{\text{Net}}}{V_{\text{ol}}} = \frac{m_{\text{Net}}}{\frac{4\pi}{3} \cdot \bar{r}^3}$)

1.5

$$\Delta P_{\text{Rarefaction-Pressure}} = \frac{\Delta F_{\text{Rarefaction-Force}}}{\oint dA_{Area}} = \frac{1}{4\pi} \cdot \left(\left[\frac{m_{\text{Net}}}{\bar{r}^3} \right] \cdot \bar{c}^2_{\text{Light}} \right) \cdot \left(1 - \frac{\bar{r}_{\text{Schwarzschild}}}{\bar{r}} \right)$$

The ***Isotropic Rarefaction Pressure of Gravitation*** ($\Delta P_{\text{Rarefaction-Pressure}}$), is a measure of the pressure and density difference between the ***"Isotropic Aether towards Mass Gravitational Attraction"*** ***(*** $P_{\text{Inertial-Gravity-Pressure}} = \frac{1}{3} \cdot \left(\rho_{\text{Net}} \cdot \bar{c}^2_{\text{Light}}\right)$***)*** and the two (2) times the ***"Inertial Mass towards Mass Gravitational Attraction"*** ***(*** $2 \cdot P_{\text{Aether-Gravity-Pressure}} = \frac{1}{3} \cdot \left(\rho_{\text{Net}} \cdot \bar{c}^2_{\text{Light}}\right) \cdot \left(\frac{\bar{r}_{\text{Schwarzschild}}}{\bar{r}}\right)$***)***; where there is localized gravitational interaction, condensed matter, mass, and energy

The ***Schwarzschild*** **"Non-Euclidean" Metric** (ds^2) describes a ***"dynamic"*** geometry and geodesic line element (ds), that describes the curvature of space, space-time, and the gravitational field; and must be used in conjunction, with a fluid mechanical model, ***Perfect Fluid "Dynamic" Vacuum Energy Solution*** for the causality gravitation, as described above.

The ***Schwarzschild*** solution, predicts that the following equation for the ***Isotropic Rarefaction Pressure of Gravitation*** ($\Delta P_{\text{Rarefaction-Pressure}} \neq 0$), is non-zero in the gradient of the gravitational field; except at the "Black Hole Event Horizon" ($\bar{r} = \bar{r}_{\text{Schwarzschild}} = 2 \cdot \frac{m_{\text{Net}} \cdot G}{\bar{c}^2_{\text{Light}}}$), and when the distance away from the center, of the localized gradient gravitational field, is infinite ($\bar{r} = \propto$); there the ***Isotropic Rarefaction Pressure of Gravitation*** ($\Delta P_{\text{Rarefaction-Pressure}} = 0$), is zero.

The ***Isotropic Rarefaction Pressure of Gravitation*** ($\Delta P_{\text{Rarefaction-Pressure}}$), is zero at the Black Hole surface, of a gravity vortex system body, and becomes approximately equal to the **Isotropic Aether Gravitational** ($P_{\text{Aether-Gravity-Pressure}}$) **Field Pressure** at distances far away from the Black Hole Event Horizon, and into the infinity of space, relative to the center of the gravity vortex system body.

The following limits of integration apply to the ***Isotropic Rarefaction Pressure of Gravitation*** ($\Delta P_{\text{Rarefaction-Pressure}}$);

$$\begin{bmatrix} \Delta P_{\text{Rarefaction-Pressure}} & = & \infty & \text{when} & \bar{r} = 0 \\ \Delta P_{\text{Rarefaction-Pressure}} & = & 0 & \text{when} & \bar{r} = \bar{r}_{\text{Schwarzschild}} \\ \Delta P_{\text{Rarefaction-Pressure}} & > & 0 & \text{when} & \bar{r}_{\text{Schwarzschild}} < \bar{r} \leq \infty \\ \Delta P_{\text{Rarefaction-Pressure}} & = & 0 & \text{when} & \bar{r} = \infty \end{bmatrix}$$

1.2. The Vacuum Energy "Perfect" Fluid Mechanical Model – Rarefaction/Condensing Pressure and Density Conditions – For Describing Non-Euclidean Metrics

The ***Einstein*** **"Non-Euclidean" Metric** (ds^2) describes a ***"static"*** geometry and a line element, that describes the curvature of space, space-time, and the gravitational field; and must be used in conjunction, with a fluid mechanical model, ***Perfect Fluid "Static" Vacuum Energy Solution*** for the causality gravitation.

The ***Einstein*** solution, predicts the following equation for the "constituent" ***Isotropic Aether Gravitational Field Attraction Pressure*** $(\mathrm{P}_{\text{Aether-Gravity-Pressure}})$

1.6

$$\mathrm{P}_{\text{Aether-Gravity-Pressure}} = \frac{\mathrm{F}_{\text{Light-Force}}}{\oint dA_{Area}} = \frac{1}{3}\cdot\left(\rho_{\text{Net}}\cdot\bar{\mathrm{c}}_{\text{Light}}^{2}\right) \rightarrow {kg}\big/{m\cdot s^2}$$

Aether "Light" Gravitational "Aether to Mass" Attraction Force (Magnitude)

1.7

$$\mathrm{F}_{\text{Light-Force}} = \mu_{\text{L\_Density}}\cdot\bar{\mathrm{c}}_{\text{Light}}^{2} = \frac{\mathrm{m}_{\text{Net}}\cdot\bar{\mathrm{c}}_{\text{Light}}^{2}}{\bar{\mathrm{r}}} \rightarrow {kg\cdot m}\big/{s^2}$$

Substituting the Inertial Volume Mass Density – $\left(\rho_{\text{Net}} = \frac{\mathrm{m}_{\text{Net}}}{\mathrm{V}_{\text{ol}}} = \frac{\mathrm{m}_{\text{Net}}}{\frac{4\pi}{3}\cdot\bar{\mathrm{r}}^{3}}\right)$

The ***Isotropic Aether Gravitational Field Attraction Pressure*** $(\mathrm{P}_{\text{Aether-Gravity-Pressure}})$

1.8

$$\mathrm{P}_{\text{Aether-Gravity-Pressure}} = \frac{\mathrm{F}_{\text{Light-Force}}}{\oint dA_{Area}} = \frac{1}{4\pi}\cdot\left(\left[\frac{\mathrm{m}_{\text{Net}}}{\bar{\mathrm{r}}^{3}}\right]\cdot\bar{\mathrm{c}}_{\text{Light}}^{2}\right) \rightarrow {kg}\big/{m\cdot s^2}$$

The ***Einstein*** solution, predicts that the "constituent" ***Isotropic Aether Gravitational Field "Attraction" Pressure*** varies in direct proportional to one third the ***Inertial Volume Mass Density*** of the gradient gravity field.

$$\mathrm{P}_{\text{Aether-Gravity-Pressure}} \propto \frac{1}{3}\cdot\rho_{\text{Net}} \propto \left[\frac{\mathrm{m}_{\text{Net}}}{\bar{\mathrm{r}}^{3}}\right]$$

The ***Einstein*** solution, predicts the following equation for the ***Isotropic Aether Gravitational Field Pressure*** ($P_{\text{Aether-Gravity-Pressure}} \neq 0$); is non-zero; except at the infinite distance in the gradient gravitational field, away from the "Black Hole Event Horizon" ($\bar{r} = \infty$), there the ***Isotropic Aether Gravitational Field Pressure*** ($P_{\text{Aether-Gravity-Pressure}} = 0$) is equal to zero.

The ***Newton*** solution, predicts the following equation for the "constituent" ***Inertial Mass Gravitational Field "Attraction" Pressure*** ($P_{\text{Inertial-Gravity-Pressure}}$);

1.9

$$P_{\text{Inertial-Gravity-Pressure}} = \frac{F_{\text{Self-Gravity-Force}}}{\oint dA_{Area}} = \frac{1}{6} \cdot \left(\rho_{\text{Net}} \cdot \bar{c}^{2}_{\text{Light}}\right) \cdot \left(\frac{\bar{r}_{\text{Schwarzschild}}}{\bar{r}}\right) \rightarrow {kg}/{m \cdot s^2}$$

Newtonian "Self" Gravitational "Mass to Mass" Attraction Force – (Magnitude Only)

1.10

$$F_{\text{Self-Gravity-Force}} = \mu^{2}_{\text{L\_Density}} \cdot G = \frac{m^{2}_{\text{Net}} \cdot G}{r^{2}} \rightarrow {kg \cdot m}/{s^2}$$

Substituting the Inertial Volume Mass Density – ($\rho_{\text{Net}} = \frac{m_{\text{Net}}}{V_{\text{ol}}} = \frac{m_{\text{Net}}}{\frac{4\pi}{3} \cdot \bar{r}^{3}}$)

The ***Inertial Mass Gravitational Field "Attraction" Pressure*** ($P_{\text{Inertial-Gravity-Pressure}}$);

1.11

$$P_{\text{Inertial-Gravity-Pressure}} = \frac{F_{\text{Self-Gravity-Force}}}{\oint dA_{Area}} = \frac{1}{4\pi} \cdot \left(\left[\frac{m^{2}_{\text{Net}}}{\bar{r}^{4}}\right] \cdot G\right) \rightarrow {kg}/{m \cdot s^2}$$

The ***Newton*** solution, predicts that the "constituent" ***Inertial Mass Gravitational Field "Attraction" Pressure*** varies in direct proportional to one sixth the ***Inertial Volume Mass Density*** and multiplied by the distance ratio relative to the Black Hole Event Horizon ($\left(\frac{\bar{r}_{\text{Schwarzschild}}}{\bar{r}}\right)$), of the gradient gravity field.

$$P_{\text{Inertial-Gravity-Pressure}} \propto \frac{1}{6} \cdot \rho_{\text{Net}} \cdot \left(\frac{\bar{r}_{\text{Schwarzschild}}}{\bar{r}}\right) \propto \left[\frac{m^{2}_{\text{Net}}}{\bar{r}^{4}}\right]$$

The following limits of integration apply to the ***Isotropic Aether Gravitational Field Pressure*** ($P_{\text{Aether-Gravity-Pressure}}$);

$$\begin{bmatrix} P_{\text{Aether-Gravity-Pressure}} & = & \infty & \text{when} & \bar{r} = 0 \\ P_{\text{Aether-Gravity-Pressure}} & = & 2 \cdot P_{\text{Inertial-Gravity-Pressure}} & \text{when} & \bar{r} = \bar{r}_{\text{Schwarzschild}} \\ P_{\text{Aether-Gravity-Pressure}} & > & 2 \cdot P_{\text{Inertial-Gravity-Pressure}} & \text{when} & \bar{r}_{\text{Schwarzschild}} < \bar{r} \leq \infty \\ P_{\text{Aether-Gravity-Pressure}} & = & 0 & \text{when} & \bar{r} = \infty \end{bmatrix}$$

The ***"Schwarzschild"*** Spherically Symmetric Metric (ds^2) corresponds to a gradient gravitational vortex system, where the, "Refraction/Condensing Pressure" ($\Delta P_{\text{Rarefaction-Pressure}} = 0$) is zero, on the exterior surface, of the Black Hole Event Horizon; ($\bar{r} = \bar{r}_{\text{Schwarzschild}}$).

The **"Schwarzschild Metric"** Spherically Symmetric gradient gravitational field vortex system body, describes a ***dynamic*** "Refraction/Condensing Pressure" ($\Delta P_{\text{Rarefaction-Pressure}}$), which changes in direct proportion to one third, the Inertial Volume Mass Density ($\frac{1}{3} \cdot \rho_{\text{Net}} \cdot \left(1 - \frac{\bar{r}_{\text{Schwarzschild}}}{\bar{r}}\right)$), of the gradient gravitational vortex system body.

Isotropic Rarefaction Pressure of Gravitation ($\Delta P_{\text{Rarefaction-Pressure}}$) at **Black Hole Event Horizon** ($\bar{r} = \bar{r}_{\text{Schwarzschild}}$)

1.12

$$\Delta P_{\text{Rarefaction-Pressure}} = \frac{\Delta F_{\text{Rarefaction-Force}}}{\oint dA_{Area}} = \begin{bmatrix} P_{\text{Aether-Gravity-Pressure}} \\ - \; 2 \cdot P_{\text{Inertial-Gravity-Pressure}} \end{bmatrix} = 0$$

$$\Delta P_{\text{Rarefaction-Pressure}} = \frac{1}{3} \cdot \left(\rho_{\text{Net}} \cdot \bar{c}^2_{\text{Light}}\right) \cdot \left(1 - \frac{\bar{r}_{\text{Schwarzschild}}}{\bar{r}}\right) = 0$$

Substituting the Inertial Volume Mass Density – ($\rho_{\text{Net}} = \frac{m_{\text{Net}}}{V_{\text{ol}}} = \frac{m_{\text{Net}}}{\frac{4\pi}{3} \cdot \bar{r}^3}$)

Isotropic Rarefaction Pressure of Gravitation $(\Delta \mathrm{P}_{\text{Rarefaction-Pressure}})$ at **Black Hole Event Horizon** $(\bar{\mathrm{r}} = \bar{\mathrm{r}}_{\text{Schwarzschild}})$

1.13

$$\Delta \mathrm{P}_{\text{Rarefaction-Pressure}} = \frac{1}{4\pi} \cdot \left(\left[\frac{\mathrm{m}_{\text{Net}}}{\bar{\mathrm{r}}^3} \right] \cdot \bar{\mathrm{c}}_{\text{Light}}^2 \right) \cdot \left(1 - \frac{\bar{\mathrm{r}}_{\text{Schwarzschild}}}{\bar{\mathrm{r}}} \right) = 0$$

Substituting the Gradient Gravity Field – Black Hole Event Horizon - Semi-Major Radius – $(\bar{\mathrm{r}} = \bar{\mathrm{r}}_{\text{Schwarzschild}})$

1.14

$$\Delta \mathrm{P}_{\text{Rarefaction-Pressure}} = \frac{1}{4\pi} \cdot \left(\left[\frac{\mathrm{m}_{\text{Net}}}{\bar{\mathrm{r}}_{\text{Schwarzschild}}^3} \right] \cdot \bar{\mathrm{c}}_{\text{Light}}^2 \right) \cdot \left(1 - \frac{\bar{\mathrm{r}}_{\text{Schwarzschild}}}{\bar{\mathrm{r}}_{\text{Schwarzschild}}} \right) = 0$$

The ***"Einstein"*** Spherically Symmetric Metric (ds^2) corresponds to a gradient gravitational vortex system, where the, "Refraction/Condensing Pressure" $(\Delta \mathrm{P}_{\text{Rarefaction-Pressure}} \neq 0)$ on the exterior surface, of the Black Hole Event Horizon, is non zero; $(\bar{\mathrm{r}} = \bar{\mathrm{r}}_{\text{Schwarzschild}})$.

Isotropic Aether Gravitational Field Pressure $(\mathrm{P}_{\text{Aether-Gravity-Pressure}})$ at **Black Hole Event Horizon** $(\bar{\mathrm{r}} = \bar{\mathrm{r}}_{\text{Schwarzschild}})$

1.15

$$\mathrm{P}_{\text{Aether-Gravity-Pressure}} = 2 \cdot \mathrm{P}_{\text{Inertial-Gravity-Pressure}} \rightarrow {kg}/{m \cdot s^2}$$

$$\frac{\mathrm{F}_{\text{Light-Force}}}{\oint dA_{Area}} = \frac{2 \cdot \mathrm{F}_{\text{Self-Gravity-Force}}}{\oint dA_{Area}} \rightarrow {kg}/{m \cdot s^2}$$

$$\frac{1}{3} \cdot \left(\rho_{\text{Net}} \cdot \bar{\mathrm{c}}_{\text{Light}}^2 \right) = \frac{1}{2\pi} \cdot \left(\frac{\mathrm{m}_{\text{Net}}^2 \cdot \mathrm{G}}{\bar{\mathrm{r}}^4} \right) = \frac{1}{4\pi} \cdot \left(\mathrm{m}_{\text{Net}} \cdot \bar{\mathrm{c}}_{\text{Light}}^2 \right) \cdot \left(\frac{\bar{\mathrm{r}}_{\text{Schwarzschild}}}{\bar{\mathrm{r}}^4} \right)$$

Next substituting the Gradient Gravity Field Inertial Volume Mass Density – $\left(\rho_{\text{Net}} = \frac{\mathrm{m}_{\text{Net}}}{\mathrm{V}_{\text{ol}}} = \frac{\mathrm{m}_{\text{Net}}}{\frac{4\pi}{3} \cdot \bar{\mathrm{r}}^3} \right)$, into the above equation; yields the following.

Isotropic Aether Gravitational Field Pressure ($P_{\text{Aether-Gravity-Pressure}}$) at **Black Hole Event Horizon** ($\bar{r} \;=\; \bar{r}_{\text{Schwarzschild}}$)

1.16

$$P_{\text{Aether-Gravity-Pressure}} \;=\; 2 \cdot P_{\text{Inertial-Gravity-Pressure}} \;\rightarrow\; {kg}/{m \cdot s^2}$$

$$\frac{1}{4\pi} \cdot \left(\frac{m_{\text{Net}} \cdot \bar{c}_{\text{Light}}^2}{\bar{r}^3} \right) \;=\; \frac{1}{2\pi} \cdot \left(\frac{m_{\text{Net}}^2 \cdot G}{\bar{r}^4} \right) \;=\; \frac{1}{4\pi} \cdot \left(m_{\text{Net}} \cdot \bar{c}_{\text{Light}}^2 \right) \cdot \left(\frac{\bar{r}_{\text{Schwarzschild}}}{\bar{r}^4} \right)$$

Next substituting the Gradient Gravity Field – Black Hole Event Horizon - Semi-Major Radius ($\bar{r} \;=\; \bar{r}_{\text{Schwarzschild}} \;=\; \left(\frac{2 \cdot m_{\text{Net}} \cdot G}{c_{\text{Light}}^2} \right)$), into the above equation; yields the following.

Isotropic Aether Gravitational Field Pressure ($P_{\text{Aether-Gravity-Pressure}}$) at **Black Hole Event Horizon** ($\bar{r} \;=\; \bar{r}_{\text{Schwarzschild}}$)

1.17

$$P_{\text{Aether-Gravity-Pressure}} \;=\; 2 \cdot P_{\text{Inertial-Gravity-Pressure}} \;\rightarrow\; {kg}/{m \cdot s^2}$$

$$P_{\text{Aether-Gravity-Pressure}} \;=\; \frac{1}{4\pi} \cdot \left(\frac{m_{\text{Net}} \cdot \bar{c}_{\text{Light}}^2}{\bar{r}_{\text{Schwarzschild}}^3} \right) \;=\; \frac{1}{32\pi} \cdot \left(\frac{\bar{c}_{\text{Light}}^8}{m_{\text{Net}}^2 \cdot G^3} \right)$$

The **“Einstein Metric”** Spherically Symmetric gradient gravitational field vortex system body, describes a ***static*** “Refraction/Condensing ($\Delta P_{\text{Rarefaction-Pressure}}$) Pressure”, which changes in direct proportion to one third, the Inertial Volume Mass Density ($\frac{1}{3} \cdot \rho_{\text{Net}}$), of the gradient gravitational vortex system body.

The **“Schwarzschild Metric”** Spherically Symmetric gradient gravitational field vortex system body, describes a ***dynamic*** “Refraction/Condensing Pressure” ($\Delta P_{\text{Rarefaction-Pressure}}$), which changes in direct proportion to one third, the Inertial Volume Mass Density ($\frac{1}{3} \cdot \rho_{\text{Net}} \cdot \left(1 \;-\; \frac{\bar{r}_{\text{Schwarzschild}}}{\bar{r}} \right)$), of the gradient gravitational vortex system body.

Schwarzschild solution, for the ***Isotropic Rarefaction Pressure of Gravitation*** ($\Delta \mathrm{P}_{\text{Rarefaction-Pressure}}$)

1.18

$$\Delta \mathrm{P}_{\text{Rarefaction-Pressure}} = \frac{\Delta \mathrm{F}_{\text{Rarefaction-Force}}}{\oint dA_{Area}} = \frac{1}{3} \cdot \left(\rho_{\text{Net}} \cdot \bar{\mathrm{c}}^{2}_{\text{Light}} \right) \cdot \left(1 - \frac{\bar{\mathrm{r}}_{\text{Schwarzschild}}}{\bar{\mathrm{r}}} \right)$$

$$\Delta \mathrm{P}_{\text{Rarefaction-Pressure}} = \frac{1}{4\pi} \cdot \left(\left[\frac{\mathrm{m}_{\text{Net}}}{\bar{\mathrm{r}}^{3}} \right] \cdot \bar{\mathrm{c}}^{2}_{\text{Light}} \right) \cdot \left(1 - \frac{\bar{\mathrm{r}}_{\text{Schwarzschild}}}{\bar{\mathrm{r}}} \right) \rightarrow {}^{kg}\!/_{m \cdot s^{2}}$$

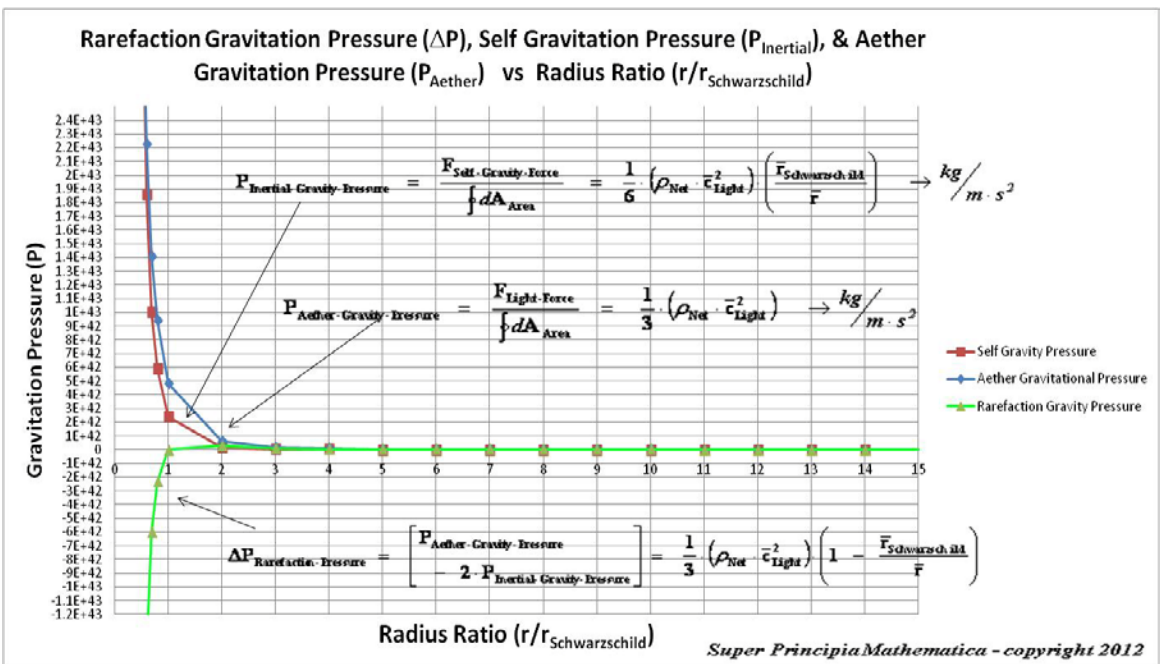
Therefore I believe that the Schwarzschild Solution is the correct solution where the, "Refraction/Condensing Pressure" ($\Delta \mathrm{P}_{\text{Rarefaction-Pressure}} = 0$) on the exterior surface, of the Black Hole Event Horizon, is zero; ($\bar{\mathrm{r}} = \bar{\mathrm{r}}_{\text{Schwarzschild}}$); and is non-zero everywhere else.

The ***Isotropic Rarefaction Pressure of Gravitation*** ($\Delta \mathrm{P}_{\text{Rarefaction-Pressure}}$) is a fluid mechanical, ***rarefying/condensing "Dark Matter Isotropic Pressure Force"***, in an inhomogeneous gradient gravitational field, which reduces the pressure, forces, and densities, on individual spherical gradient gravitational energy potential surfaces; nearer to the surface of the Black Hole event horizon; and the rarefying densities and pressures, of the infinite series of surfaces, return to normal, located an infinite distance away from the black hole source of gravity.

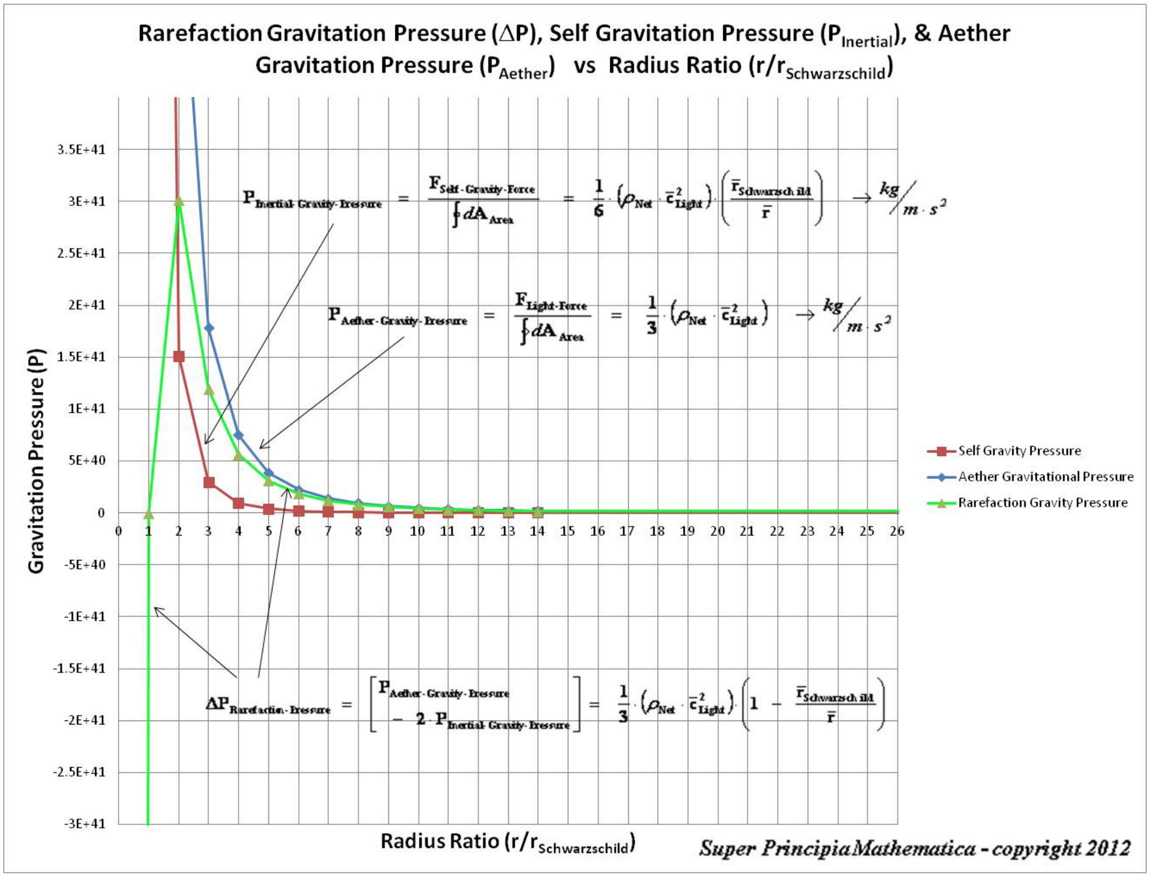
$$\begin{bmatrix}
\Delta \mathrm{P}_{\text{Rarefaction-Pressure}} = \infty & \text{when} \quad \bar{\mathrm{r}} = 0 \\
\Delta \mathrm{P}_{\text{Rarefaction-Pressure}} = -\mathrm{P}_{\text{Aether-Gravity-Pressure}} = -\mathrm{P}_{\text{Inertial-Gravity-Pressure}} \,; & \text{when} \quad \bar{\mathrm{r}} = \dfrac{\bar{\mathrm{r}}_{\text{Schwarzschild}}}{2} \\
\Delta \mathrm{P}_{\text{Rarefaction-Pressure}} = 0 & \text{when} \quad \bar{\mathrm{r}} = \bar{\mathrm{r}}_{\text{Schwarzschild}} \\
\Delta \mathrm{P}_{\text{Rarefaction-Pressure}} = \dfrac{1}{3} \cdot \left(\rho_{\text{Net}} \cdot \bar{\mathrm{c}}^{2}_{\text{Light}} \right) \cdot \left(1 - \dfrac{\bar{\mathrm{r}}_{\text{Schwarzschild}}}{\bar{\mathrm{r}}} \right) & \text{when} \quad \bar{\mathrm{r}}_{\text{Schwarzschild}} < \bar{\mathrm{r}} < \infty \\
\Delta \mathrm{P}_{\text{Rarefaction-Pressure}} = \dfrac{1}{3} \cdot \left(\rho_{\text{Net}} \cdot \bar{\mathrm{c}}^{2}_{\text{Light}} \right) & \text{when} \quad \bar{\mathrm{r}} < \infty \\
\Delta \mathrm{P}_{\text{Rarefaction-Pressure}} = 0 & \text{when} \quad \bar{\mathrm{r}} = \infty
\end{bmatrix}$$

The ***Isotropic Rarefaction Pressure of Gravitation*** ($\Delta P_{Rarefaction\text{-}Pressure}$) is responsible for the phenomena known as "Dark Matter" and is a ***rarefying pressure***, decreasing and normalizing the gravitational densities, forces, and pressures, experienced by a test mass body (m_{Test}), in the gradient gravitational field of a Net Inertial Mass/Matter (m_{Net}) source, as it is moved "outward" through the gradient gravitation field, and is far away from the Black Hole Event Horizon, reaching into infinite distances of space.

And likewise the ***Isotropic Rarefaction Pressure*** ($\Delta P_{Rarefaction\text{-}Pressure}$) ***of Gravitation*** is responsible for the phenomena known as "Dark Matter" and is a ***condensing pressure***, increasing the gravitational densities, forces, and pressures, experienced by a test mass body (m_{Test}), in the gradient gravitational field of a Net Inertial Mass (m_{Net}) source, as it is moved "inward" through the gradient gravitation field, from infinite distance, and towards the surface of the Black Hole Event Horizon, and center of the gravity field.



The graphs below give a closer zoomed in view of the area surrounding the Black Hole Event Horizon.


Rarefaction Gravitation Pressure (ΔP), Self Gravitation Pressure ($P_{Inertial}$), & Aether Gravitation Pressure (P_{Aether}) vs Radius Ratio ($r/r_{Schwarzschild}$)
Gravitation Pressure (P)
Radius Ratio ($r/r_{Schwarzschild}$)
$P_{Inertial\text{-}Gravity\text{-}Pressure} = \frac{F_{Self\text{-}Gravity\text{-}Force}}{\oint dA_{Area}} = \frac{1}{6}\cdot(\rho_{Net}\cdot\bar{c}^2_{Light})\cdot\left(\frac{\bar{r}_{Schwarzschild}}{\bar{r}}\right) \rightarrow kg/m\cdot s^2$
$P_{Aether\text{-}Gravity\text{-}Pressure} = \frac{F_{Light\text{-}Force}}{\oint dA_{Area}} = \frac{1}{3}\cdot(\rho_{Net}\cdot\bar{c}^2_{Light}) \rightarrow kg/m\cdot s^2$
$\Delta P_{Rarefaction\text{-}Pressure} = \left[P_{Aether\text{-}Gravity\text{-}Pressure} - 2\cdot P_{Inertial\text{-}Gravity\text{-}Pressure}\right] = \frac{1}{3}\cdot(\rho_{Net}\cdot\bar{c}^2_{Light})\cdot\left(1-\frac{\bar{r}_{Schwarzschild}}{\bar{r}}\right)$
Self Gravity Pressure
Aether Gravitational Pressure
Rarefaction Gravity Pressure
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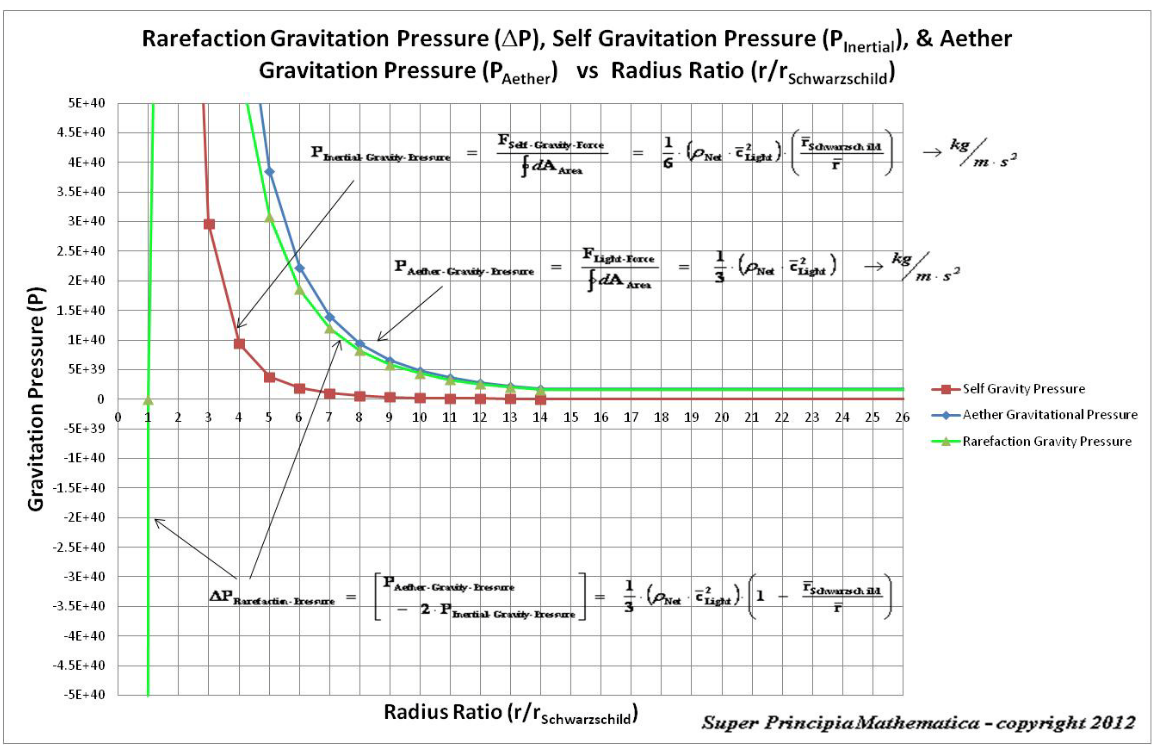

Rarefaction Gravitation Pressure (ΔP), Self Gravitation Pressure ($P_{Inertial}$), & Aether Gravitation Pressure (P_{Aether}) vs Radius Ratio ($r/r_{Schwarzschild}$)
Gravitation Pressure (P)
Radius Ratio ($r/r_{Schwarzschild}$)
$P_{Inertial\text{-}Gravity\text{-}Pressure} = \frac{F_{Self\text{-}Gravity\text{-}Force}}{\oint dA_{Area}} = \frac{1}{6}\cdot(\rho_{Net}\cdot\bar{c}^2_{Light})\cdot\left(\frac{\bar{r}_{Schwarzschild}}{\bar{r}}\right) \rightarrow kg/m\cdot s^2$
$P_{Aether\text{-}Gravity\text{-}Pressure} = \frac{F_{Light\text{-}Force}}{\oint dA_{Area}} = \frac{1}{3}\cdot(\rho_{Net}\cdot\bar{c}^2_{Light}) \rightarrow kg/m\cdot s^2$
$\Delta P_{Rarefaction\text{-}Pressure} = \left[P_{Aether\text{-}Gravity\text{-}Pressure} - 2\cdot P_{Inertial\text{-}Gravity\text{-}Pressure}\right] = \frac{1}{3}\cdot(\rho_{Net}\cdot\bar{c}^2_{Light})\cdot\left(1-\frac{\bar{r}_{Schwarzschild}}{\bar{r}}\right)$
Self Gravity Pressure
Aether Gravitational Pressure
Rarefaction Gravity Pressure
Super Principia Mathematica - copyright 2012

1.3. Vacuum Energy "Perfect" Fluid Mechanical Model – Rationale for using the Rarefaction/Condensing Linear Mass Density and Gravitational Potential Energy Differential Equations – For Describing Non-Euclidean Metrics

A space-time continuum is where matter, space, and time become inherently intertwined or inseparable; and the speed of light ($\mathbf{c}_{\mathbf{Light}}$) is constant, isotropic, and homogenous for all observers.

The **"Mass-Energy Equivalence"** in **Special Relativity (SR)**, refers to the "Inertial Mass" of a system body; and is the concept that the mass of a body is a measure of its energy content, ($E_{Energy} = m_{Mass} \cdot c^2_{Light}$). And likewise, makes the claims that, whenever any type of energy (E_{Energy}) is removed from a system, the mass (m_{Mass}) associated with the energy (E_{Energy}) is also removed, and the system therefore loses mass (m_{Mass}).

The **"Mass-Energy Equivalence"** in **Special Relativity (SR)**, which describes an "Inertial Mass" (m_{Net}) system body, with the "Rest Energy" content, ($E_{Rest\text{-}Energy} = m_{Mass} \cdot c^2_{Light}$), means that if a system body gives off the energy in the form of electromagnetic heat radiation mass-energy, it's "Inertial Mass" (m_{Net}) also diminishes.

1.19

$$\mathbf{m}_{\mathbf{Net}} = \frac{\mathbf{E}_{\mathbf{Rest\text{-}Energy}}}{\mathbf{c}^2_{\mathbf{Light}}} = \textbf{Inertial Mass}$$

The "**Principle of Equivalence**" in **General Relativity (GR)**, which describes a "Gravitational Mass" (m_{Net}) system body, means that if a system body gives off the "gravitational field" energy in the form of electromagnetic heat radiation mass-energy, it's "Gravitational Mass" (m_{Net}) and "gravitational field" also diminishes.

1.20

$$\mathbf{m}_{\mathbf{Net}} = \frac{\mathbf{g}_{\mathbf{Gravity}} \cdot \mathbf{r}^2}{\mathbf{G}} = \textbf{Gravitational Mass}$$

Thus, the **"Mass-Energy Equivalence"** of **Special Relativity (SR)**, combined with the "Equivalence Principle" of General Relativity (GR), makes the claims that the "gravitational" mass and the "inertial" mass are identical, or the same, for every object in nature.

$$\mathbf{m}_{\mathbf{Net}} = \textbf{Gravitational Mass} = \textbf{Inertial Mass}$$

Therefore, the **"Mass-Energy Equivalence"** of **Special Relativity (SR)**, combined with the **"Equivalence Principle"** of **General Relativity (GR)**, results in the prediction that all forms of energy contribute to the gravitational field, created by an object with mass or energy. And a space-time continuum is where matter, space, and time become inherently intertwined or inseparable.

In this concept, mass is a property of all energy, and energy is a property of all mass, and the two properties of "Mass" ($\mathrm{m}_{\mathrm{Mass}}$) and "Energy" ($\mathrm{E}_{\mathrm{Energy}}$), are connected, by the product of the "Gravitational Field Acceleration" ($\mathrm{g}_{\mathrm{Gravity}}$), and the geometric "Area" ($\mathrm{A}_{\mathrm{Area}} = 4\pi \cdot \mathrm{r}^2$) of space; equal to the square of the distance (r^2), measured relative to the center of mass of the system.

1.21

$$\mathbf{m}_{\mathbf{Net}} = \frac{\mathbf{E}_{\mathbf{Rest\text{-}Energy}}}{\mathbf{c}^2_{\mathbf{Light}}} = \frac{\mathbf{g}_{\mathbf{Gravity}} \cdot \mathbf{r}^2}{\mathbf{G}}$$

Furthermore, **Mass-Energy Equivalence"** of **Special Relativity (SR)**, combined with the **"Equivalence Principle"** of **General Relativity (GR)**, results in the prediction that the "gravitational field" energy, propagating in the form of "electromagnetic heat radiation" energy, is also a form of mass-energy.

$$\mathbf{m}_{\mathbf{Net}} \propto \mathbf{E}_{\mathbf{Rest\text{-}Energy}} \propto \mathbf{g}_{\mathbf{Gravity}} \cdot \mathbf{r}^2$$

The proof of this is the observational fact, due to the gravitational attraction, of "electromagnetic heat radiation" in the form of "light" bending, as it passes by the sun. This bending of light, where there is large mass/matter and gravitational field energy, was observed; and confirmed that the energy carried by "light" is indeed, equivalent to a gravitational mass.

There is also the observational fact that the frequency ($f_{Frequency}$) and the energy of photons increases when they fall in the gravitational field ($\mathrm{g}_{\mathrm{Gravity}}$) of the earth. The energy, and therefore the gravitational mass ($\mathrm{m}_{\mathrm{EM\text{-}Mass}}$), of photons are proportional to their frequency ($f_{Frequency}$) as given by the Einstein/Planck electromagnetic energy ($\mathrm{E}_{\mathrm{Energy}} = h_{Planck} \cdot f_{Frequency}$) relation.

1.22

$$\mathbf{m}_{\mathbf{EM\text{-}Mass}} = \frac{\boldsymbol{h}_{\boldsymbol{Planck}} \cdot \boldsymbol{f}_{\boldsymbol{Frequency}}}{\mathbf{c}^2_{\mathbf{Light}}} = \frac{\mathbf{g}_{\mathbf{Gravity}} \cdot \mathbf{r}^2}{\mathbf{G}}$$

Where,

$$\mathbf{m}_{\mathbf{EM\text{-}Mass}} \propto \boldsymbol{f}_{\boldsymbol{Frequency}} \propto \mathbf{g}_{\mathbf{Gravity}} \cdot \mathbf{r}^2$$

Net Inertial Mass – Localized Gravitational Field Source

1.23

$$\mathbf{m}_{\mathbf{Net}} = \mathbf{N} \cdot \mathbf{m}_{\mathbf{Net\_Atom}} = \sum_{\mathbf{i}=1}^{\mathbf{N}} \mathbf{m}_{\mathbf{i}} = \left[\mathbf{m}_1 + \mathbf{m}_2 + \mathbf{m}_3 + \cdots + \mathbf{m}_{\mathbf{N}}\right] \rightarrow \boldsymbol{kg}$$

The **Net Inertial Linear Mass Density** ($\mu_{\mathbf{L\_Density}} = \frac{\mathbf{m}_{\mathbf{Net}}}{\bar{\mathbf{r}}}$), of a localized gravitational field source, is a measure of the "inhomogeneous gravitational field" linear mass density of the gradient gravitational field; and is defined as the Net Inertial Mass ($\mathbf{m}_{\mathbf{Net}}$), divided by the Semi-Major Radius ($\bar{\mathbf{r}}$) distance relative to the center of the inhomogeneous gradient gravitational field, vortex system body.

The **Net Inertial Linear Mass Density** ($\mu_{\mathbf{L\_Density}} = \frac{\mathbf{m}_{\mathbf{Net}}}{\bar{\mathbf{r}}}$), is a measure of rarefaction or condensing in the linear mass density of the "inhomogeneous" gradient gravitational field, which is comprised of an infinite series of "spherical shell potentials" relative to the center of the gradient gravitational field, vortex system; and exterior to the Black Hole Event Horizon.

The **Net Inertial Linear Mass Density** ($\mu_{\mathbf{L\_Density}} = \frac{\mathbf{m}_{\mathbf{Net}}}{\bar{\mathbf{r}}}$), is a direct measure of the localized "linear mass density" of the gradient gravitational field, space-time continuum in a vacuum of space-time, relative to a Black Hole, Event Horizon, and the center of the gradient gravitational field system mass body.

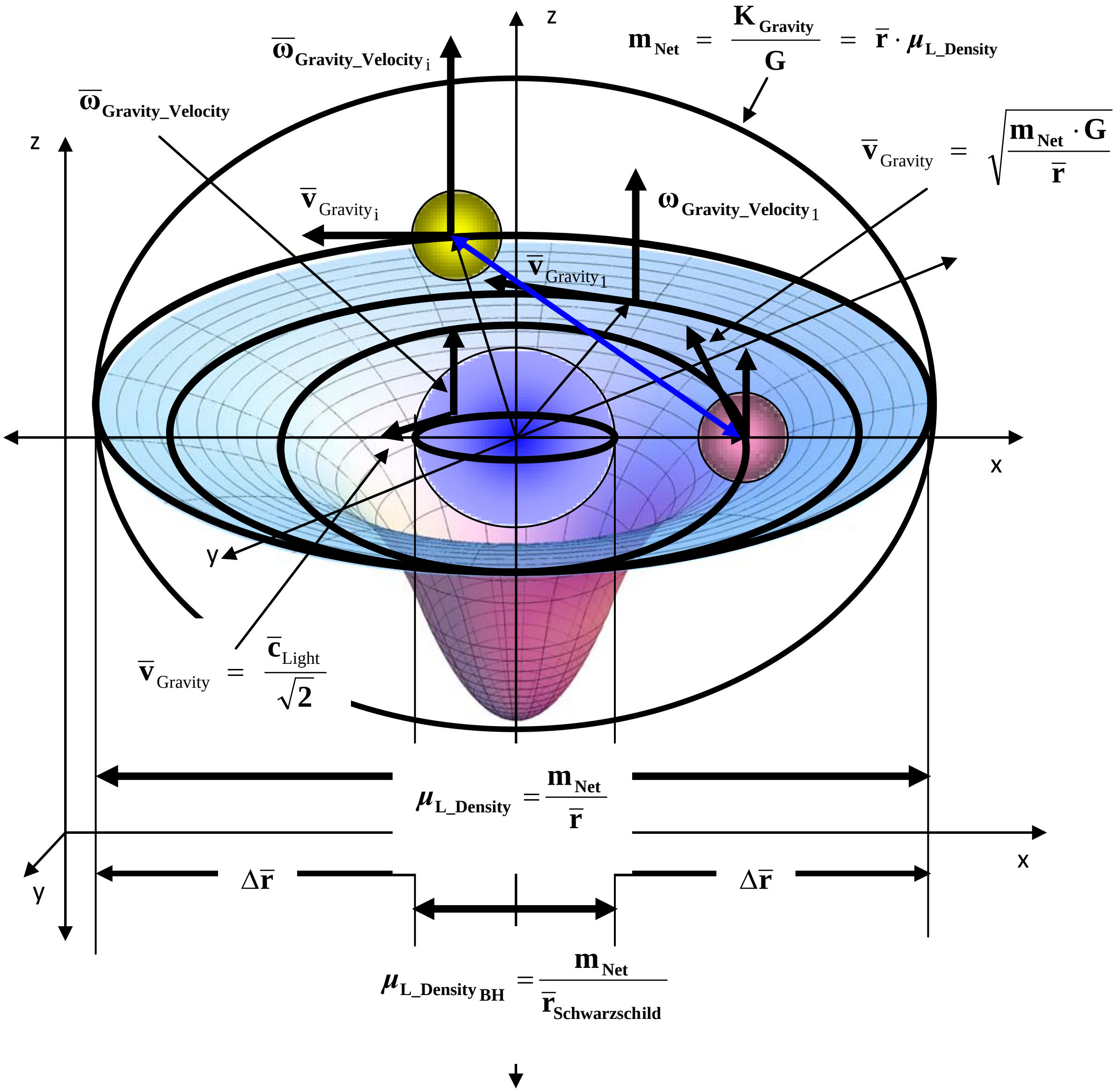
In this "Gradient Vortex Gravitational Field" model, the **Net Inertial Linear Mass Density** ($\mu_{\mathbf{L\_Density}} = \mu_{\mathbf{Black\text{-}Hole}} = \boldsymbol{Maximum} = \boldsymbol{Constant}$) is a ***"maximum"*** linear density at the Black Hole Event Horizon" origin source, of the gravitational gradient field; and where ($\bar{\mathbf{r}} = \bar{\mathbf{r}}_{\mathbf{Schwarzschild}}$).

Furthermore, the **Net Inertial Linear Mass Density** ($\mu_{\mathbf{L\_Density}}$) is ***"condensed"*** in close proximity to the Black Hole Event Horizon" gravity source; and is ***"rarefied"*** far away from the gravity source.

The **Net Inertial Linear Mass Density** ($\mu_{\mathbf{L\_Density}} = \frac{\mathbf{m}_{\mathbf{Net}}}{\bar{\mathbf{r}}} = \boldsymbol{Minimum}$) is a ***"minimum"*** linear density, of the gradient gravitational field, when the **Semi-Major Radius** ($\bar{\mathbf{r}}$), is greater than the Black Hole Event Horizon **Schwarzschild Radius** ($\bar{\mathbf{r}} > \bar{\mathbf{r}}_{\mathbf{Schwarzschild}} = 2 \cdot \left(\frac{\mathbf{m}_{\mathbf{Net}} \cdot \mathbf{G}}{\mathbf{c}_{\mathbf{Light}}^2}\right) \cdot \hat{\mathbf{a}}_{\mathbf{r}}$), of the gradient gravitational field.

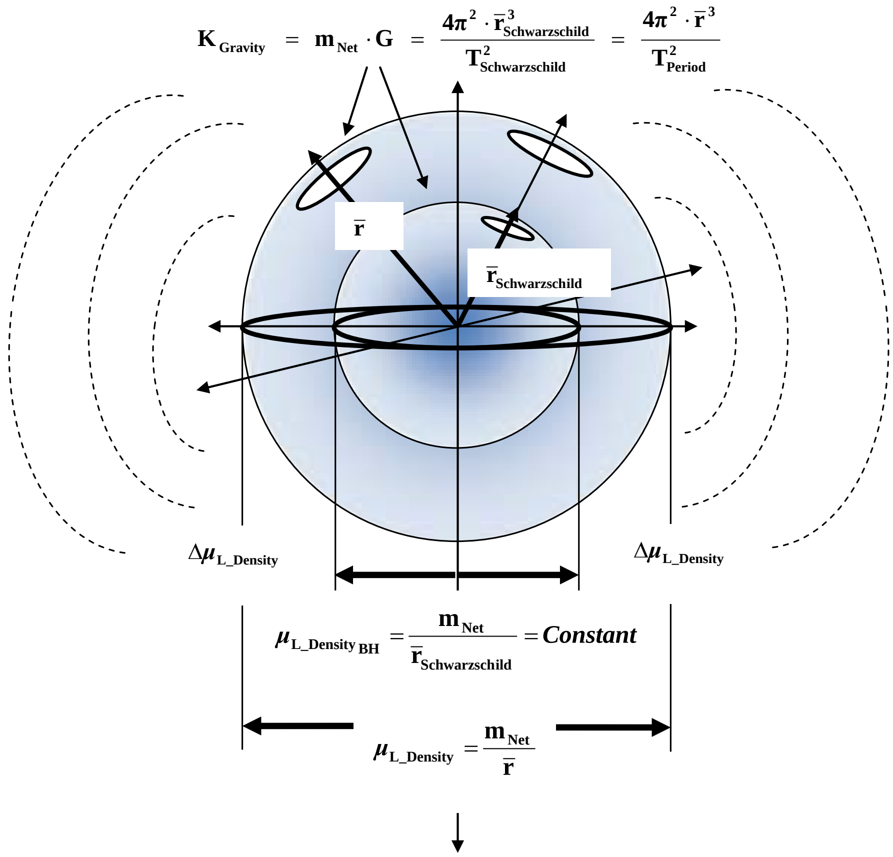
The most minimum spatial "Volume" ($\mathbf{V}_{\text{ol Black-Hole}} = \frac{4\pi}{3} \cdot \bar{\mathbf{r}}^3_{\text{Schwarzschild}}$) and space distance, of the *"Gravitational Vortex"* "homogenous" gradient gravitational field is the **Black Hole Event Horizon - *Schwarzschild Radius*** ($\bar{\mathbf{r}}_{\text{Schwarzschild}}$).

At this most minimum volume and distance of the *"Gravitational Vortex"* gradient gravitational field, the ***Black Hole Event Horizon - Inertial Linear Mass Density*** ($\mu_{\text{L\_Density}} = \mu_{\text{L\_Black-Hole}} = 6.73297478332358 \times 10^{+26} \, kg/m$) is maximum, and is a universal constant.



The ***"Black Hole"* Net Inertial Linear Mass Density** ($\mu_{L\_Black\text{-}Hole}$), is a ***universal constant*** for every mass body, in the universe.

The **Inertial Linear Mass Density** ($\mu_{L\_Density} = \mu_{L\_Black\text{-}Hole} = \boldsymbol{Maximum}$) is maximum and constant for every mass body in the universe, when the Semi-Major Radius distance, relative to the center of the vortex gradient gravity field, is equal to the Schwarzschild radius ($\bar{\mathbf{r}} = \bar{\mathbf{r}}_{Schwarzschild}$) of the gradient gravitational field.



Located at the Black Hole Event Horizon and source of the gravitational field, the space-time continuum in a vacuum, is where the matter, mass, and energy, denoted by the **Net Inertial Mass** ($\mathbf{m}_{Net} = \frac{\mathbf{E}_{Rest\text{-}Energy}}{\bar{\mathbf{c}}^2_{Light}}$), is intertwined, and varies in direct proportion to the smallest "space or distance" which is condensed at the center of the gradient gravitational field, and is denoted by the **Schwarzschild Radius** ($\bar{\mathbf{r}}_{Schwarzschild} = \frac{\mathbf{m}_{Net}}{\mu_{L\_Black\text{-}Hole}} \cdot \hat{\mathbf{a}}_r$); there matter warps, and curves the space and time, in the local vicinity of the mass.

The ***"Black Hole"* Net Inertial Linear Mass Density** ($\mu_{L\_Black\text{-}Hole}$) universal constant, is a measure of the "maximum" linear mass density and "source" of the "Black Hole - homogeneous" gradient gravitational field, and is a direct measure space-time continuum in a vacuum at that location.

A space-time continuum is where matter, space, and time become inherently intertwined or inseparable.

In this "Gradient Vortex Gravitational Field" model, the ***"Black Hole"* Net Inertial Linear Mass Density** ($\mu_{L\_Black\text{-}Hole}$) is a constant value, that is spatially located at the Black Hole Event Horizon" origin source, of the gravitational gradient field;

The ***"Black Hole"* Net Inertial Linear Mass Density** ($\mu_{L\_Black\text{-}Hole}$), is a constant of nature, defined as the ratio of the, **Net Inertial Mass** ($\mathbf{m}_{Net}$) divided by the **Schwarzschild Radius** ($\bar{\mathbf{r}}_{Schwarzschild}$), of the Black Hole Event Horizon, of the gradient gravitational vortex field.

Net Inertial Linear Mass Density – Black Hole Event Horizon

1.24

$$\mu_{L\_Black\text{-}Hole} = \frac{\mathbf{m}_{Net}}{\bar{\mathbf{r}}_{Schwarzschild}} = \frac{1}{2} \cdot \frac{\bar{\mathbf{c}}^2_{Light}}{\mathbf{G}} = 6.73297478332358 \times 10^{+26} \; kg/m$$

The ***"Black Hole"* Net Inertial Linear Mass Density** ($\mu_{L\_Black\text{-}Hole}$) universal constant, is the "vacuum energy" binding proportionality between "Matter/Mass" and the "Space" of the "Vacuum of Space-time"; and can be modeled as a "fabric continuum" or "vacuum energy" that permeates throughout the entire universe.

Now, that the constituent "linear mass densities", the **Net Inertial Linear Mass Density** ($\mu_{L\_Density} = \frac{\mathbf{m}_{Net}}{\bar{\mathbf{r}}}$), and the ***"Black Hole"* Net Inertial Linear Mass Density** ($\mu_{L\_Black\text{-}Hole}$) have been described and discussed, the composite "linear mass density" ($\Delta\mu_{L\_Rarefaction}$) can be expressed as a differential.

1.4. *Vacuum Energy "Perfect" Fluid Mechanical Model – Rationale for using Kepler's Third Law of Motion (*Evolutionary Attraction Rate*) – For Describing Non-Euclidean Metrics*

In this ***"Inertial Mass Gravity Vortex"*** model we combine the concept of Newtonian gravitational attraction, where ***mass is attracted to mass***, with the Isotropic Aether gravitational attraction, where ***aether is attracted to mass*** with the concept of Kepler's Third Law, which describes the gradient gravitational field vortex, as an infinite series of spherical gradient gravitational potentials, which extend outward relative to the center of the vortex.

The Kepler's Third Law **Inertial Mass Evolutionary Attraction Rate – Magnitude ($\mathbf{K}_{\text{Gravity}} = \mathbf{m}_{\text{Net}} \cdot \mathbf{G}$)**, is a measure of the evolutionary attraction of "mass towards mass", and towards the center of the gravitational vortex system; and is a local constant whose value is directly proportional the Net Inertial ($\mathbf{m}_{\text{Net}}$) Mass, of an isolated gradient gravitational field system.

$$\mathbf{K}_{\text{Gravity}} \propto \mathbf{m}_{\text{Net}}$$

Kepler's Third Law - Inertial Mass Evolutionary Attraction Rate – Magnitude ($\mathbf{K}_{\text{Gravity}}$)

1.25

$$\mathbf{K}_{\text{Gravity}} = \mathbf{m}_{\text{Net}} \cdot \mathbf{G} = \frac{4\pi^2 \cdot \bar{\mathbf{r}}^3}{\mathbf{T}^2_{\text{Period-Gravity}}} = \frac{3\pi \cdot \mathbf{V}_{\text{ol}}}{\mathbf{T}^2_{\text{Period-Gravity}}} = \textbf{Constant} \rightarrow {kg \cdot m^3}/{s^2}$$

The Kepler's Third Law **Isotropic Aether Evolutionary Attraction Rate – Magnitude ($\mathbf{K}_{\text{Aether}} = \mathbf{c}^2_{\text{Light}} \cdot \bar{\mathbf{r}}$)**, is a measure of the evolutionary attraction of "aether towards mass", and towards the center of the gravitational vortex system; and is a variable whose value is directly proportional the Semi-Major Radius ($\bar{\mathbf{r}}$) and distance, as measured relative to the center of an isolated gradient gravitational field system.

$$\mathbf{K}_{\text{Aether}} \propto \bar{\mathbf{r}}$$

Kepler's Third Law – Isotropic Aether Evolutionary Attraction Rate – Magnitude ($\mathbf{K}_{\text{Aether}}$)

1.26

$$\mathbf{K}_{\text{Aether}} = \mathbf{c}^2_{\text{Light}} \cdot \bar{\mathbf{r}} = \frac{4\pi^2 \cdot \bar{\mathbf{r}}^3}{\mathbf{T}^2_{\text{Period-Light}}} = \frac{3\pi \cdot \mathbf{V}_{\text{ol}}}{\mathbf{T}^2_{\text{Period-Light}}} = \textbf{Variable} \rightarrow {kg \cdot m^3}/{s^2}$$

The concept of Kepler's Third Law also describes a composite ***"Rarefaction" Evolutionary Attraction Rate*** ($d\mathbf{K}_{\text{Rarefaction}} \rightarrow \Delta\mathbf{K}_{\text{Rarefaction}}$), and is a differential and measure of change "inhomogeneous gravitational field" Evolutionary Attraction Rate of the gradient gravitational field, relative to the center of the gravitational field gradient, or the Black Hole Event Horizon, of a localized gradient gravitational field.

The Kepler's Third Law ***"Rarefaction" Evolutionary*** ($\Delta\mathbf{K}_{\text{Rarefaction}}$) ***Attraction Rate***, is a measure of the evolutionary attraction of "Dark Matter" phenomena; and is a variable whose value is directly proportional the difference between **Isotropic Aether Evolutionary Attraction Rate – Magnitude (**$\mathbf{K}_{\text{Aether}} = \mathbf{c}^2_{\text{Light}} \cdot \overline{\mathbf{r}}$ **)**, and subtracted from twice (2) the **Inertial Mass Evolutionary Attraction Rate – Magnitude (**$2 \cdot \mathbf{K}_{\text{Gravity}} = 2 \cdot (\mathbf{m}_{\text{Net}} \cdot \mathbf{G})$**)**.

Kepler's Third Law – *"Rarefaction" Evolutionary Attraction Rate*
($\Delta\mathbf{K}_{\text{Rarefaction}}$)

1.27

$$\Delta\mathbf{K}_{\text{Rarefaction}} = \left[\mathbf{K}_{\text{Aether}} - 2 \cdot \mathbf{K}_{\text{Gravity}}\right] = \left[\mathbf{c}^2_{\text{Light}} \cdot \overline{\mathbf{r}} - 2 \cdot \mathbf{m}_{\text{Net}} \cdot \mathbf{G}\right]$$

$$\Delta\mathbf{K}_{\text{Rarefaction}} = \mathbf{c}^2_{\text{Light}} \cdot \left[\overline{\mathbf{r}} - 2 \cdot \left(\frac{\mathbf{m}_{\text{Net}} \cdot \mathbf{G}}{\mathbf{c}^2_{\text{Light}}}\right)\right] \rightarrow kg \cdot m^3 / s^2$$

Kepler's Third Law – *"Rarefaction" Evolutionary Attraction Rate*
($\Delta\mathbf{K}_{\text{Rarefaction}}$)

1.28

$$\Delta\mathbf{K}_{\text{Rarefaction}} = \left[\mathbf{K}_{\text{Aether}} - 2 \cdot \mathbf{K}_{\text{Gravity}}\right]$$

$$\Delta\mathbf{K}_{\text{Rarefaction}} = \mathbf{c}^2_{\text{Light}} \cdot \left[\overline{\mathbf{r}} - \overline{\mathbf{r}}_{\text{Schwarzschild}}\right] \rightarrow kg \cdot m^3 / s^2$$

$$\Delta\mathbf{K}_{\text{Rarefaction}} = \mathbf{c}^2_{\text{Light}} \cdot \overline{\mathbf{r}} \cdot \left[1 - \frac{\overline{\mathbf{r}}_{\text{Schwarzschild}}}{\overline{\mathbf{r}}}\right]$$

Kepler's Third Law – *"Rarefaction" Evolutionary Attraction Rate*

$(\Delta \mathbf{K}_{\text{Rarefaction}})$

1.29

$$\Delta \mathbf{K}_{\text{Rarefaction}} = 4\pi^2 \cdot \bar{\mathbf{r}}^3 \cdot \left[\frac{1}{\mathbf{T}^2_{\text{Period-Light}}} - \frac{2}{\mathbf{T}^2_{\text{Period-Gravity}}} \right] \rightarrow kg \cdot m^3 / s^2$$

$$\Delta \mathbf{K}_{\text{Rarefaction}} = \bar{\mathbf{r}}^3 \cdot \left[\overline{\omega}^2_{\text{Aether\_Velocity}} - 2 \cdot \overline{\omega}^2_{\text{Gravity\_Velocity}} \right]$$

Kepler's Third Law – *"Rarefaction" Evolutionary Attraction Rate*

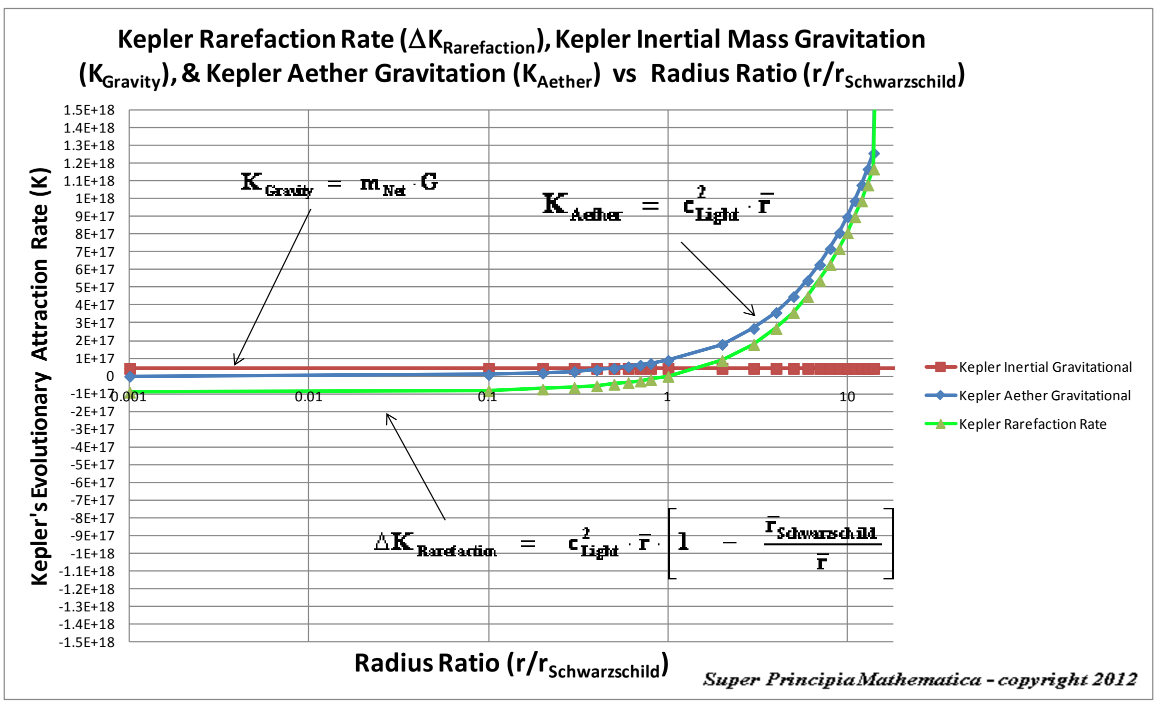
$(\Delta \mathbf{K}_{\text{Rarefaction}})$

1.30

$$\Delta \mathbf{K}_{\text{Rarefaction}} = 2 \cdot \mathbf{G} \cdot \bar{\mathbf{r}} \cdot \Delta\mu_{\text{L\_Rarefaction}} \rightarrow kg \cdot m^3 / s^2$$

$$\Delta \mathbf{K}_{\text{Rarefaction}} = 2 \cdot \mathbf{G} \cdot \bar{\mathbf{r}} \cdot \left[\mu_{\text{L\_Black-Hole}} - \mu_{\text{L\_Density}} \right]$$

$$\Delta \mathbf{K}_{\text{Rarefaction}} = 2 \cdot \mathbf{G} \cdot \bar{\mathbf{r}} \cdot \left[\frac{\mathbf{c}^2_{\text{Light}}}{2 \cdot \mathbf{G}} - \frac{\mathbf{m}_{\text{Net}}}{\bar{\mathbf{r}}} \right]$$



1.5. Vacuum Energy "Perfect" Fluid Mechanical Model – Gravitational Potential Energy Differential Equations – For Describing Non-Euclidean Metrics

The composite "linear mass density" is known as the ***"Rarefaction"* Net Inertial Linear Mass Density** ($\boldsymbol{d\mu}_{\text{L\_Rarefaction}} \rightarrow \Delta\boldsymbol{\mu}_{\text{L\_Rarefaction}}$), and is a measure of the change "inhomogeneous gravitational field" linear mass density of the gradient gravitational field, relative to the center of the gravitational field gradient, or the Black Hole Event Horizon, of that gravity field.

The ***Change in the Gravitational Potential Energy*** ($dU_{\text{Potential-Energy}}$), is directly proportional to changes in the ***"Rarefaction"* Net Inertial Linear Mass Density** ($d\mu_{\text{L\_Rarefaction}}$), and is a measure of the Keplerian gradient gravitational field ($\Delta \text{K}_{\text{Rarefaction}} = \text{c}_{\text{Light}}^2 \cdot \bar{\text{r}} \cdot \left[1 - \frac{\bar{\text{r}}_{\text{Schwarzschild}}}{\bar{\text{r}}} \right]$), which is comprised of an infinite series of "spherical shell "energy" potentials" relative to the center of the gradient gravitational field, vortex system.

Differential – Gravitational Potential Energy ($dU_{\text{Potential-Energy}}$) – function of Differential – "Radial Distance" ($d\text{r}$) Space – Gradient Gravitational Field

1.31

$$-\frac{dU_{\text{Potential-Energy}}}{\text{m}_{\text{Test}}} = -\frac{dU_{\text{Self-Potential-Energy}}}{\text{m}_{\text{Net}}} = \left(\text{m}_{\text{Net}} \cdot \text{G}\right) \cdot \left(\frac{d\text{r}}{\text{r}^2}\right) \quad \rightarrow kg \cdot m^2 / s^2$$

The ***"Rarefaction"* Net Inertial Linear Mass Density** ($d\mu_{\text{L\_Rarefaction}}$), is a differential and is a measure of the Keplerian gradient gravitational field, which is comprised of an infinite series of "spherical shell "linear mass density" potentials" relative to the center of the gradient gravitational field, vortex system; and is a direct measure space-time continuum in a vacuum.

"New" – Differential – Condensing/Rarefaction Linear Mass Density ($d\mu_{\text{L\_Rarefaction}}$) – function of Differential – "Radial Distance" ($d\text{r}$) Space – Gradient Gravitational Field

1.32

$$d\mu_{\text{L\_Rarefaction}} = \text{m}_{\text{Net}} \cdot \left(\frac{d\text{r}}{\text{r}^2}\right) \quad \rightarrow kg / m$$

$$d\mu_{\text{L\_Rarefaction}} = \frac{1}{2} \cdot \left(\frac{\bar{\text{c}}_{\text{Light}}^2}{\text{G}}\right) \cdot \left(\frac{\bar{\text{r}}_{\text{Schwarzschild}}}{\text{r}^2}\right) \cdot dr = \mu_{\text{L\_Black-Hole}} \cdot \left(\frac{\bar{\text{r}}_{\text{Schwarzschild}}}{\text{r}^2}\right) \cdot dr$$

Next, using the calculus or integration for the differential ***"Rarefaction"*** **Net Inertial Linear Mass Density** $(d\mu_{L\_Rarefaction} \rightarrow \Delta\mu_{L\_Rarefaction})$

1.33

$$\int d\mu_{L\_Rarefaction} = m_{Net} \cdot \int_{r_{Schwarzschild}}^{r} \frac{dr}{r^2} = m_{Net} \cdot \left[\frac{1}{r_{Schwarzschild}} - \frac{1}{r} \right] \rightarrow {kg}/{m}$$

$$\Delta\mu_{L\_Rarefaction} = \left[\mu_{L\_Black\text{-}Hole} - \mu_{L\_Density} \right] = \left[\frac{m_{Net}}{r_{Schwarzschild}} - \frac{m_{Net}}{r} \right]$$

1.34

$$\Delta\mu_{L\_Rarefaction} = \left[\frac{1}{2} \cdot \left(\frac{\bar{c}^2_{Light}}{G} \right) - \left(\frac{\bar{v}^2_{Gravity}}{G} \right) \right] = \left[\sqrt{\frac{F_{Dark\text{-}Force}}{G}} - \sqrt{\frac{F_{Self\text{-}Gravity\_Force}}{G}} \right]$$

"Rarefaction" **Net Inertial Linear Mass Density** $(\Delta\mu_{L\_Rarefaction})$ relative to the Black Hole Event Horizon **Linear Mass Density** $\left(\mu_{L\_Black\text{-}Hole} = \left(\frac{m_{Net}}{r_{Schwarzschild}} \right) \right)$

1.35

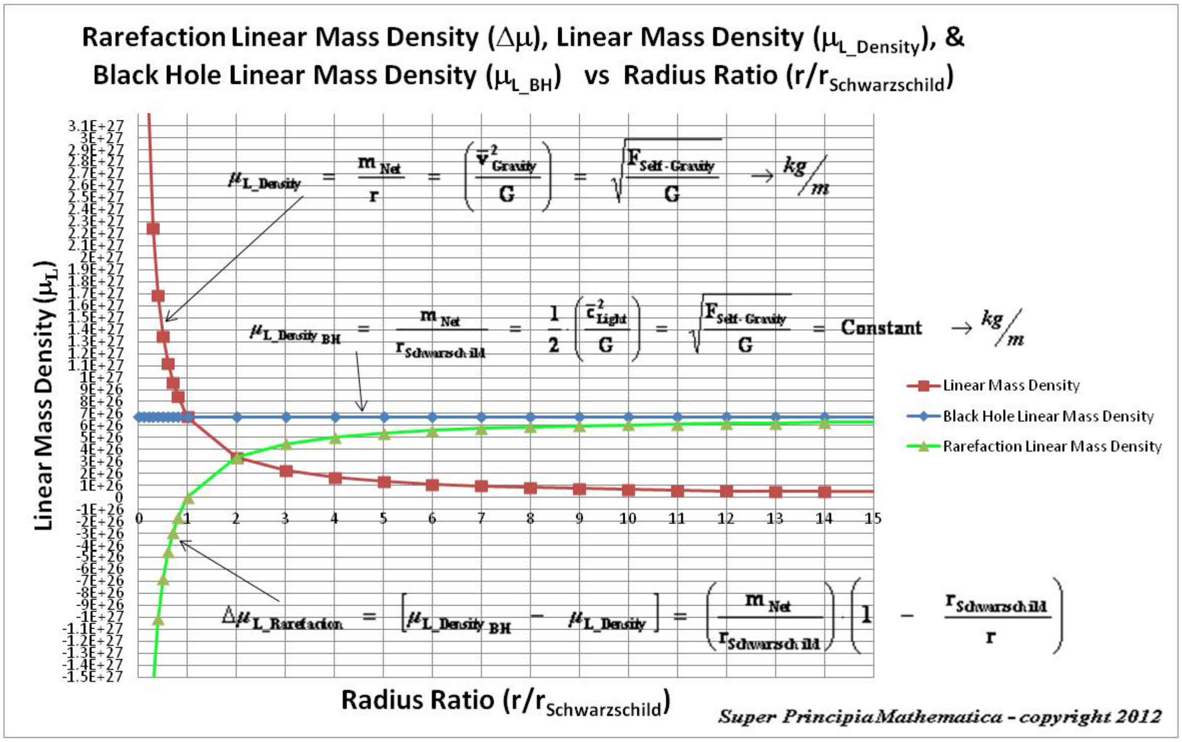
$$\Delta\mu_{L\_Rarefaction} = \mu_{L\_Black\text{-}Hole} \cdot \left(1 - 2 \cdot \left(\frac{\bar{v}^2_{Gravity}}{\bar{c}^2_{Light}} \right) \right) \rightarrow {kg}/{m}$$

$$\Delta\mu_{L\_Rarefaction} = \frac{1}{2} \cdot \left(\frac{\bar{c}^2_{Light}}{G} \right) \cdot \left(1 - \frac{r_{Schwarzschild}}{r} \right)$$

$$\Delta\mu_{L\_Rarefaction} = \left(\frac{m_{Net}}{r_{Schwarzschild}} \right) \cdot \left(1 - \frac{r_{Schwarzschild}}{r} \right)$$

1.36

$$\Delta\mu_{L\_Rarefaction} = \sqrt{\frac{F_{Dark\text{-}Force}}{G}} \cdot \left(1 - 2 \cdot \left(\frac{\bar{v}^2_{Gravity}}{\bar{c}^2_{Light}} \right) \right) \rightarrow {kg}/{m}$$



The ***"Rarefaction"*** **Net Inertial Linear Mass Density** ($d\mu_{L\_Rarefaction}$), is a differential measure of the Keplerian gradient gravitational field, and is directly proportional to the following differentials.

- Differential Potential Energy – ($dU_{Self\text{-}Potential\text{-}Energy}$)
- Differential Vacuum Force – ($dF_{Vacuum\text{-}Force}$)
- Differential "Space" Distance – (dr)

"New" – Differential – Condensing/Rarefaction Linear Mass Density ($d\mu_{L\_Rarefaction}$) – function of Differential – Vacuum Energy Force ($dF_{Vacuum\text{-}Force}$) – Gradient Gravitational Field

1.37

$$d\mu_{L\_Rarefaction} = \left(\frac{2}{\bar{c}^{2}_{Light}}\right)\cdot dF_{Vacuum\text{-}Force} = m_{Net}\cdot\left(\frac{dr}{r^{2}}\right) \rightarrow {kg}/{m}$$

$$d\mu_{L\_Rarefaction} = -\left(\frac{1}{m_{Net}\cdot G}\right)\cdot dU_{Self\text{-}Potential\text{-}Energy}$$

"New" – Differential – Gravitational "Self" Potential Energy ($U_{\text{Self-Potential-Energy}}$) – function of Linear Mass Density ($d\mu_{\text{L\_Rarefaction}}$), Vacuum Energy Force ($d\text{F}_{\text{Vacuum-Force}}$), and "Radial Distance" ($d\text{r}$) Space – Gradient Gravitational Field

1.38

$$-dU_{\text{Self-Potential-Energy}} = (\text{m}_{\text{Net}} \cdot \text{G}) \cdot d\mu_{\text{L\_Rarefaction}} \rightarrow kg \cdot m^2 / s^2$$

$$-dU_{\text{Self-Potential-Energy}} = -2 \cdot \left(\frac{\text{m}_{\text{Net}} \cdot \text{G}}{\bar{\text{c}}^2_{\text{Light}}} \right) \cdot d\text{F}_{\text{Vacuum-Force}}$$

"Classical" –

$$-dU_{\text{Self-Potential-Energy}} = \left(\frac{\text{m}^2_{\text{Net}} \cdot \text{G}}{\text{r}^2} \right) \cdot dr = \text{F}_{\text{Self-Gravity\_Force}} \cdot d\text{r} \rightarrow kg \cdot m^2 / s^2$$

"New" – Differential – Gradient Gravitational Field **Gravitational "Self" Potential Energy ($dU_{\text{Self-Potential-Energy}}$)**
$$-\frac{dU_{\text{Self-Potential-Energy}}}{d\mu_{\text{L\_Rarefaction}}} = \text{K}_{\text{Gravity}} = \text{m}_{\text{Net}} \cdot \text{G} = \frac{4\pi^2 \cdot \bar{\text{r}}^3}{\text{T}^2_{\text{Period-Gravity}}} \rightarrow m^3 / s^2$$
$$\frac{dU_{\text{Self-Potential-Energy}}}{d\text{F}_{\text{Vacuum-Force}}} = \bar{\text{r}}_{\text{Schwarzschild}} = 2 \cdot \left(\frac{\text{m}_{\text{Net}} \cdot \text{G}}{\bar{\text{c}}^2_{\text{Light}}} \right) \rightarrow m$$
$$-\frac{dU_{\text{Self-Potential-Energy}}}{dr} = \text{F}_{\text{Self-Gravity-Force}} = \frac{\text{m}^2_{\text{Net}} \cdot \text{G}}{\text{r}^2} \rightarrow kg \cdot m / s^2$$

1.6. *Unified Gravitational Vortex Theory – Constituent Gravitational Forces – Inertial Mass Gravitational Attraction Force & Aether Gravitational Attraction Force*

In this section it will be discussed the **constituent** ***Gravitational Forces – Inertial Mass "Self" Gravitational Attraction Force (*** $F_{\text{Self-Gravity-Force}}$ ***)*** and the ***Aether Gravitational Attraction Force (*** $F_{\text{Light-Force}}$ ***)***.

In the Super Principia Unified Gravitation Theory, the ***Newtonian "Self" Force of Gravitation*** ($F_{\text{Self-Gravity-Force}}$) is responsible for the *"attraction of mass towards mass"* and towards a center of a gravity source system.

Newtonian "Self" Gravitational "Mass to Mass" Attraction Force – (Magnitude Only)

1.39

$$F_{\text{Self-Gravity-Force}} = \mu_{\text{L\_Density}}^2 \cdot G = \frac{m_{\text{Net}}^2 \cdot G}{r^2} \rightarrow kg \cdot m / s^2$$

$$F_{\text{Self-Gravity-Force}} = m_{\text{Net}} \cdot g_{\text{Gravity}} = \frac{m_{\text{Net}} \cdot v_{\text{Gravity}}^2}{r} = m_{\text{Net}} \cdot r \cdot \omega_{\text{Gravity}}^2$$

Newtonian "Self" Gravitational Force – Differential – Gravitational Potential Energy ($\frac{dU_{\text{Potential-Energy}}}{dr}$ **) – with Differential "Radial Distance" (** dr **) Space – Gradient Gravitational Field – (Magnitude Only)**

1.40

$$F_{\text{Self-Gravity-Force}} = -\left(\frac{dU_{\text{Potential-Energy}}}{dr}\right) = \frac{m_{\text{Net}}^2 \cdot G}{r^2} \rightarrow kg \cdot m / s^2$$

$$F_{\text{Self-Gravity-Force}} = \left(m_{\text{Net}} \cdot G\right) \cdot \left(\frac{d\mu_{\text{L\_Rarefaction}}}{dr}\right) = \mu_{\text{L\_Density}}^2 \cdot G$$

$$F_{\text{Self-Gravity-Force}} = -2 \cdot \left(\frac{m_{\text{Net}} \cdot G}{\bar{c}_{\text{Light}}^2}\right) \cdot \left(\frac{dF_{\text{Vacuum-Force}}}{dr}\right) = \frac{m_{\text{Net}}^2 \cdot G}{r^2}$$

The ***Aether "Light" Force of Gravitation*** ($F_{\text{Light-Force}}$) is responsible for the *"attraction of the gaseous aether towards mass"* and towards a center of a gravity source system.

The aether gas, is also described by the isotropy of space-time, given by the square of the "Speed of Light" ($c^2_{\text{Light}} = \left(\frac{dr^2_{\text{Light}}}{dt^2}\right) = \left(\frac{dr^2}{d\tau^2}\right) = -\left(\frac{ds^2}{d\tau'^2}\right)$), of the vacuum of space-time.

Aether "Light" Gravitational "Aether to Mass" Attraction Force (Magnitude)

1.41

$$F_{\text{Light-Force}} = \mu_{\text{L\_Density}} \cdot \bar{c}^2_{\text{Light}} = \frac{m_{\text{Net}} \cdot \bar{c}^2_{\text{Light}}}{r} \rightarrow kg \cdot m/s^2$$

$$F_{\text{Light-Force}} = m_{\text{Net}} \cdot g_{\text{Aether}} = \frac{m_{\text{Net}} \cdot \bar{c}^2_{\text{Light}}}{r} = m_{\text{Net}} \cdot r \cdot \omega^2_{\text{Aether}}$$

Aether "Light" Gravitational Force - Differential – ($\left(\frac{dU_{\text{Potential-Energy}}}{\left(\frac{dr}{r}\right)}\right)$) Gravitational Potential Energy – Isotropic Space – Gradient Gravitational Field – (Magnitude Only)

1.42

$$F_{\text{Light-Force}} = -2 \cdot \left(\frac{dF_{\text{Vacuum-Force}}}{\left(\frac{dr}{r}\right)}\right) = \frac{m_{\text{Net}} \cdot \bar{c}^2_{\text{Light}}}{r} \rightarrow kg \cdot m/s^2$$

$$F_{\text{Light-Force}} = -\bar{c}^2_{\text{Light}} \cdot \left(\frac{d\mu_{\text{L\_Rarefaction}}}{\left(\frac{dr}{r}\right)}\right) = \mu_{\text{L\_Density}} \cdot \bar{c}^2_{\text{Light}}$$

$$F_{\text{Light-Force}} = -\left(\frac{\bar{c}^2_{\text{Light}}}{m_{\text{Net}} \cdot G}\right) \cdot \left(\frac{dU_{\text{Potential-Energy}}}{\left(\frac{dr}{r}\right)}\right) = \frac{m_{\text{Net}} \cdot \bar{c}^2_{\text{Light}}}{r}$$

The constituent ***Gravitational Forces – Inertial Mass "Self" Gravitational Attraction Force (***$\mathrm{F}_{\text{Self-Gravity-Force}}$***)*** and the ***Aether Gravitational Attraction Forces (***$\mathrm{F}_{\text{Light-Force}}$***)***, are also described as fluid dynamical forces shown below.

In the Super Principia Unified Gravitation Theory, the ***Newtonian "Self" Force of Gravitation*** $(\mathrm{F}_{\text{Self-Gravity-Force}})$ is described as a fluid responsible for the *"attraction of mass towards mass"* and towards a center of a gravity source system.

Newtonian "Self" Gravitational "Mass to Mass" Attraction Force – (Magnitude Only)

1.43

$$\mathrm{F}_{\text{Self-Gravity-Force}} = \mathrm{P}_{\text{Inertial-Gravity-Pressure}} \cdot \oint dA_{Area} \quad \rightarrow \quad kg \cdot m / s^2$$

$$\mathrm{F}_{\text{Self-Gravity-Force}} = \frac{1}{6} \cdot \left(\rho_{\text{Net}} \cdot \overline{\mathrm{c}}_{\text{Light}}^2\right) \cdot \left(\frac{\overline{\mathrm{r}}_{\text{Schwarzschild}}}{\overline{\mathrm{r}}}\right) \cdot \oint dA_{Area}$$

The ***Aether "Light" Force of Gravitation*** $(\mathrm{F}_{\text{Light-Force}})$ is described as a fluid responsible for the *"attraction of the gaseous aether towards mass"* and towards a center of a gravity source system.

Aether "Light" Gravitational "Aether to Mass" Attraction Force (Magnitude)

1.44

$$\mathrm{F}_{\text{Light-Force}} = \mathrm{P}_{\text{Aether-Gravity-Pressure}} \cdot \oint dA_{Area} \quad \rightarrow \quad kg \cdot m / s^2$$

$$\mathrm{F}_{\text{Light-Force}} = \frac{1}{3} \cdot \left(\rho_{\text{Net}} \cdot \overline{\mathrm{c}}_{\text{Light}}^2\right) \cdot \oint dA_{Area}$$

1.7. *Unified Gravitational Vortex Theory – Composite Gravitational Force – Rarefaction/Condensing Force of Gravitation*

In this section it will be discussed the **composite** ***Gravitational Force – Rarefaction Force of Gravitation*** ($\Delta F_{\text{Rarefaction-Force}}$).

In the *Super Principia Unified Gravitation Theory*, the ***Rarefaction Force of Gravitation*** ($\Delta F_{\text{Rarefaction-Force}}$) is a "Dark Matter "Isotropic Pressure" Force" equal to the difference between the ***Aether "Light" Force of Gravitation*** ($F_{\text{Light-Force}}$), and twice (2) the ***Newtonian "Self" Force of Gravitation*** ($2 \cdot F_{\text{Self-Gravity-Force}}$); and is related to the "Time" (dt^2) component or term, described in the Schwarzschild Metric (ds^2).

"New" – Rarefaction/Condensing Gravitational *"Dark Matter"* Force (Magnitude Only)

1.45

$$\Delta F_{\text{Rarefaction-Force}} = \left[F_{\text{Light-Force}} - 2 \cdot F_{\text{Self-Gravity-Force}} \right] \rightarrow kg \cdot m / s^2$$

$$\Delta F_{\text{Rarefaction-Force}} = \left[\mu_{\text{L\_Density}} \cdot \bar{c}^2_{\text{Light}} - 2 \cdot \mu^2_{\text{L\_Density}} \cdot G \right]$$

$$\Delta F_{\text{Rarefaction-Force}} = \left[\frac{m_{\text{Net}} \cdot \bar{c}^2_{\text{Light}}}{\bar{r}} - 2 \cdot \frac{m^2_{\text{Net}} \cdot G}{\bar{r}^2} \right]$$

The ***Rarefaction Force of Gravitation*** ($\Delta F_{\text{Rarefaction-Force}}$) is a ***rarefying force***, normalizing the gravitational densities and pressures, experienced by a test mass body, in the gradient gravitational field of a Net Inertial (m_{Net}) Mass/Matter source, as it is moved "outward" through the gradient gravitation field, and is far away from the Black Hole Event Horizon, reaching into infinite distances of space.

And likewise the ***Rarefaction Force of Gravitation*** ($\Delta F_{\text{Rarefaction-Force}}$) is a ***condensing force***, decreasing the gravitational densities and pressures, experienced by a test mass body, in the gradient gravitational field of a Net Inertial Mass (m_{Net}) source, as it is moved "inward" through the gradient gravitation field, from infinite distance, and towards the surface of the Black Hole Event Horizon, and center of the gravity field.

The ***Rarefaction Force of Gravitation*** ($\Delta F_{\text{Rarefaction-Force}}$), is further derived below and defined as the product of the Inertial ***Linear Mass*** ($\mu_{\text{L\_Density}} = \frac{m_{\text{Net}}}{\bar{r}}$) ***Density***, multiplied by the difference in the square of the Speed of Light ($\bar{c}^2_{\text{Light}}$), subtracted from two times the square of Inertial Mass Gravitational Tangential Velocity ($2 \cdot v^2_{\text{Gravity}}$).

"New" – Rarefaction/Condensing Gravitational *"Dark Matter"* Force

1.46

$$\Delta F_{\text{Rarefaction-Force}} = \left(\frac{m_{\text{Net}}}{\bar{r}}\right) \cdot \left[\bar{c}^2_{\text{Light}} - 2 \cdot v^2_{\text{Gravity}}\right] \rightarrow kg \cdot m \big/ s^2$$

$$\Delta F_{\text{Rarefaction-Force}} = \left(\frac{m_{\text{Net}} \cdot \bar{c}^2_{\text{Light}}}{\bar{r}}\right) \cdot \left(1 - 2 \cdot \left(\frac{\bar{v}^2_{\text{Gravity}}}{\bar{c}^2_{\text{Light}}}\right)\right)$$

$$\Delta F_{\text{Rarefaction-Force}} = \left(\frac{m_{\text{Net}} \cdot \bar{c}^2_{\text{Light}}}{\bar{r}}\right) \cdot \left(1 - \frac{\bar{r}_{\text{Schwarzschild}}}{\bar{r}}\right)$$

The ***Rarefaction Force of Gravitation*** ($\Delta F_{\text{Rarefaction-Force}}$), predicts that due to the presence of matter, and the curvature of space, space-time, and the gravitational field, the Inertial Linear Mass Density ($\mu_{\text{L\_Density}} = \frac{m_{\text{Net}}}{\bar{r}}$) varies according to the proportionality below.

$$\Delta F_{\text{Rarefaction-Force}} \propto \left(\frac{m_{\text{Net}}}{\bar{r}}\right) \cdot \left(1 - \frac{\bar{r}_{\text{Schwarzschild}}}{\bar{r}}\right)$$

The ***Rarefaction Pressure Force of Gravitation*** ($\Delta P_{\text{Rarefaction-Pressure}}$), of a Spherically Symmetric gradient gravitational field vortex system body, describes a ***static*** "Refraction/Condensing ($\Delta P_{\text{Rarefaction-Pressure}}$) Pressure", which changes in direct proportion to one third, the reduced and rarefying Inertial Volume Mass Density ($\frac{1}{3} \cdot \rho_{\text{Net}} \cdot \left(1 - \frac{\bar{r}_{\text{Schwarzschild}}}{\bar{r}}\right)$), of the gradient gravitational vortex system body.

1.47

$$\Delta P_{\text{Rarefaction-Pressure}} = \frac{\Delta F_{\text{Rarefaction-Force}}}{\oint dA_{Area}} = \frac{1}{3} \cdot \left(\rho_{\text{Net}} \cdot \bar{c}^2_{\text{Light}}\right) \cdot \left(1 - \frac{\bar{r}_{\text{Schwarzschild}}}{\bar{r}}\right) \rightarrow kg \big/ m \cdot s^2$$

The ***Rarefaction Pressure Force of Gravitation*** ($\Delta P_{\text{Rarefaction-Pressure}}$), predicts that due to the presence of matter, and the curvature of space, space-time, and the gravitational field, the Inertial Volume Mass Density varies according to the proportionality below: ($\frac{1}{3} \cdot \rho_{\text{Net}} \cdot \left(1 - \frac{\bar{r}_{\text{Schwarzschild}}}{\bar{r}}\right)$).

$$\Delta P_{\text{Rarefaction-Pressure}} \propto \left(\frac{m_{\text{Net}}}{\bar{r}^3}\right) \cdot \left(1 - \frac{\bar{r}_{\text{Schwarzschild}}}{\bar{r}}\right) \propto \frac{1}{3} \cdot \rho_{\text{Net}} \cdot \left(1 - \frac{\bar{r}_{\text{Schwarzschild}}}{\bar{r}}\right)$$

The ***Rarefaction Force of Gravitation*** ($\Delta F_{\text{Rarefaction-Force}}$) is a fluid mechanical, ***rarefying/condensing*** ***"Dark Matter Isotropic Pressure Force"***, in an inhomogeneous gradient gravitational field, which reduces the pressure, forces, and densities, on individual spherical gradient gravitational energy potential surfaces; nearer to the surface of the Black Hole event horizon; and the rarefying densities and pressures, of the infinite series of surfaces, return to normal, located an infinite distance away from the black hole source of gravity.

1.48

$$\Delta F_{\text{Rarefaction-Force}} = \Delta P_{\text{Rarefaction-Pressure}} \cdot \oint dA_{Area} = \Delta P_{\text{Rarefaction-Pressure}} \cdot 4\pi \cdot r^2$$

$$\Delta F_{\text{Rarefaction-Force}} = \begin{bmatrix} F_{\text{Light-Force}} \\ - 2 \cdot F_{\text{Self-Gravity-Force}} \end{bmatrix} = \begin{bmatrix} P_{\text{Aether-Gravity-Pressure}} \\ - 2 \cdot P_{\text{Inertial-Gravity-Pressure}} \end{bmatrix} \cdot \oint dA_{Area}$$

$$\Delta F_{\text{Rarefaction-Force}} = -2 \cdot \left[\left(\frac{dF_{\text{Vacuum-Force}}}{\left(\frac{dr}{r}\right)}\right) - \left(\frac{dU_{\text{Potential-Energy}}}{dr}\right)\right] \rightarrow kg \cdot m / s^2$$

$$\Delta F_{\text{Rarefaction-Force}} = -\left[\left(\frac{d\mu_{\text{L\_Rarefaction}}}{\left(\frac{dr}{r}\right)}\right) \cdot \bar{c}^2_{\text{Light}} - 2 \cdot \left(\frac{dU_{\text{Potential-Energy}}}{dr}\right)\right]$$

$$\Delta F_{\text{Rarefaction-Force}} = -\left(\frac{d\mu_{\text{L\_Rarefaction}}}{dr}\right) \cdot \left[\left(\bar{c}^2_{\text{Light}} \cdot r\right) - 2 \cdot \left(m_{\text{Net}} \cdot G\right)\right]$$

"New" – *Rarefaction Force of Gravitation* ($\Delta F_{\text{Rarefaction-Force}}$) expressed as fluid mechanical **"Dark Matter Bulk Density" "Compression"** differential

1.49

$$\Delta F_{\text{Rarefaction-Force}} = -\bar{c}^2_{\text{Light}} \cdot \left(\frac{d\mu_{\text{L\_Rarefaction}}}{\left(\frac{dr}{r}\right)} \right) \cdot \left[1 - \frac{r_{\text{Schwarzschild}}}{r} \right] \rightarrow kg \cdot m / s^2$$

$$\Delta F_{\text{Rarefaction-Force}} = -2 \cdot \left(\frac{dF_{\text{Vacuum-Force}}}{\left(\frac{dr}{r}\right)} \right) \cdot \left[1 - \frac{r_{\text{Schwarzschild}}}{r} \right] \rightarrow kg \cdot m / s^2$$

$$\Delta F_{\text{Rarefaction-Force}} = -\left(\frac{\bar{c}^2_{\text{Light}}}{m_{\text{Net}} \cdot G} \right) \cdot \left(\frac{dU_{\text{Potential-Energy}}}{\left(\frac{dr}{r}\right)} \right) \cdot \left[1 - \frac{r_{\text{Schwarzschild}}}{r} \right] \rightarrow kg \cdot m / s^2$$

The above ***Rarefaction Force of Gravitation*** ($\Delta F_{\text{Rarefaction-Force}}$) fluid mechanical, ***rarefying/condensing "Dark Matter Isotropic Pressure Force"***, equations are very interesting; and tell us a lot about how the curvature and the gradient gravitational field is created or formed.

The following limits of integration apply to the ***Rarefaction Force of Gravitation*** ($\Delta F_{\text{Rarefaction-Force}}$) – **(Magnitude Only)**

$$\begin{bmatrix}
\Delta F_{\text{Rarefaction-Force}} = \infty & \text{when} & \bar{r} = 0 \\
\Delta F_{\text{Rarefaction-Force}} = -F_{\text{Light-Force}} = -F_{\text{Self-Gravity-Force}} & \text{when} & \bar{r} = \dfrac{\bar{r}_{\text{Schwarzschild}}}{2} \\
\Delta F_{\text{Rarefaction-Force}} = 0 & \text{when} & \bar{r} = \bar{r}_{\text{Schwarzschild}} \\
\Delta F_{\text{Rarefaction-Force}} = \left(\dfrac{m_{\text{Net}} \cdot \bar{c}^2_{\text{Light}}}{\bar{r}} \right) \cdot \left(1 - \dfrac{\bar{r}_{\text{Schwarzschild}}}{\bar{r}} \right) & \text{when} & \bar{r}_{\text{Schwarzschild}} < \bar{r} < \infty \\
\Delta F_{\text{Rarefaction-Force}} = \left(\dfrac{m_{\text{Net}} \cdot \bar{c}^2_{\text{Light}}}{\bar{r}} \right) & \text{when} & \bar{r} < \infty \\
\Delta F_{\text{Rarefaction-Force}} = 0 & \text{when} & \bar{r} = \infty
\end{bmatrix}$$

The Spherically Symmetric Space, Space-time, or Gravitational Field of the various gravitational forces, behaves like a "Perfect Fluid" around the Black Hole Event Horizon, of any Net Inertial Mass ($\mathrm{m_{Net}}$) and Gradient Gravitational Field are described by the Spherically Symmetric Metric equation below.

New Mathematical Formalism - Generalized Spherically Symmetric Metric

1.50

$$ds^2 = -\mathrm{c}^2_{\mathrm{Light}} \cdot d\tau'^2 = g_{\mu\nu} \cdot dx^{\mu} \cdot dx^{\nu} = \left\lfloor \kappa_{Curvature} \cdot d\mathrm{r}^2 + \mathrm{r}^2 \cdot d\Omega^2_{Map\,\theta\phi} \right\rfloor \rightarrow m^2$$

The graphs of the ***Rarefaction Force of Gravitation*** ($\Delta\mathrm{F_{Rarefaction\text{-}Force}}$) "Perfect Fluid" mechanical, ***rarefying/condensing "Dark Matter Isotropic Pressure Force"***, are show below.

The graphs below, demonstrate that there is a lot of gravitational interaction, around the Black Hole Event Horizon of any Net Inertial Mass ($\mathrm{m_{Net}}$) and Gradient Gravitational Field.

Within the surface of the Black Hole Event Horizon, and when the Semi-Major Distance is given by ($\bar{\mathrm{r}} \leq \frac{\bar{\mathrm{r}}_{\mathrm{Schwarzschild}}}{2}$), the magnitude of the ***Newtonian "Self" Force of Gravitation*** ($\mathrm{F_{Self\text{-}Gravity\text{-}Force}} = \frac{\mathrm{m^2_{Net}} \cdot \mathrm{G}}{\bar{\mathrm{r}}^2}$) is ***larger*** than the magnitude of the ***Aether "Light" Force of Gravitation*** ($\mathrm{F_{Light\text{-}Force}} = \frac{\mathrm{m_{Net}} \cdot \bar{\mathrm{c}}^2_{\mathrm{Light}}}{\bar{\mathrm{r}}}$).

The ***Rarefaction "Dark Matter" Force of Gravitation*** ($\Delta\mathrm{F_{Rarefaction\text{-}Force}}$) is dominated by ***mass gravitation towards mass attraction*** in this case.

Within the surface of the Black Hole Event Horizon, and when the Semi-Major Distance is given by ($\bar{\mathrm{r}} > \frac{\bar{\mathrm{r}}_{\mathrm{Schwarzschild}}}{2}$), the magnitude of the ***Newtonian "Self" Force of Gravitation*** ($\mathrm{F_{Self\text{-}Gravity\text{-}Force}} = \frac{\mathrm{m^2_{Net}} \cdot \mathrm{G}}{\bar{\mathrm{r}}^2}$) is ***smaller*** than the magnitude of the ***Aether "Light" Force of Gravitation*** ($\mathrm{F_{Light\text{-}Force}} = \frac{\mathrm{m_{Net}} \cdot \bar{\mathrm{c}}^2_{\mathrm{Light}}}{\bar{\mathrm{r}}}$).

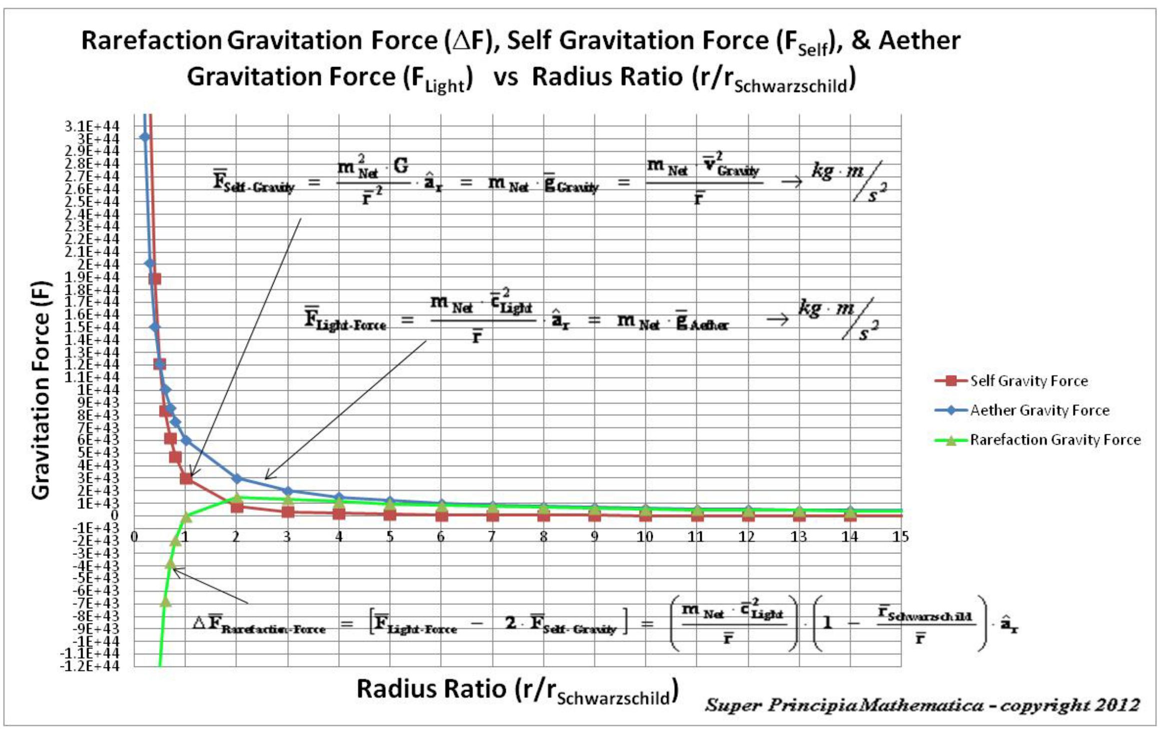
The ***Rarefaction "Dark Matter" Force of Gravitation*** ($\Delta\mathrm{F_{Rarefaction\text{-}Force}}$) is dominated by ***aether gravitation towards mass attraction*** in this case.

Within the surface of the Black Hole Event Horizon, and when the Semi-Major Distance is given by ($\bar{r} = \frac{\bar{r}_{Schwarzschild}}{2}$), the magnitude of the ***Newtonian "Self" Force of Gravitation*** ($F_{Self\text{-}Gravity\text{-}Force} = \frac{m_{Net}^2 \cdot G}{\bar{r}^2}$) is ***equal*** to the magnitude of the ***Aether "Light" Force of Gravitation*** ($F_{Light\text{-}Force} = \frac{m_{Net} \cdot \bar{c}_{Light}^2}{\bar{r}}$).

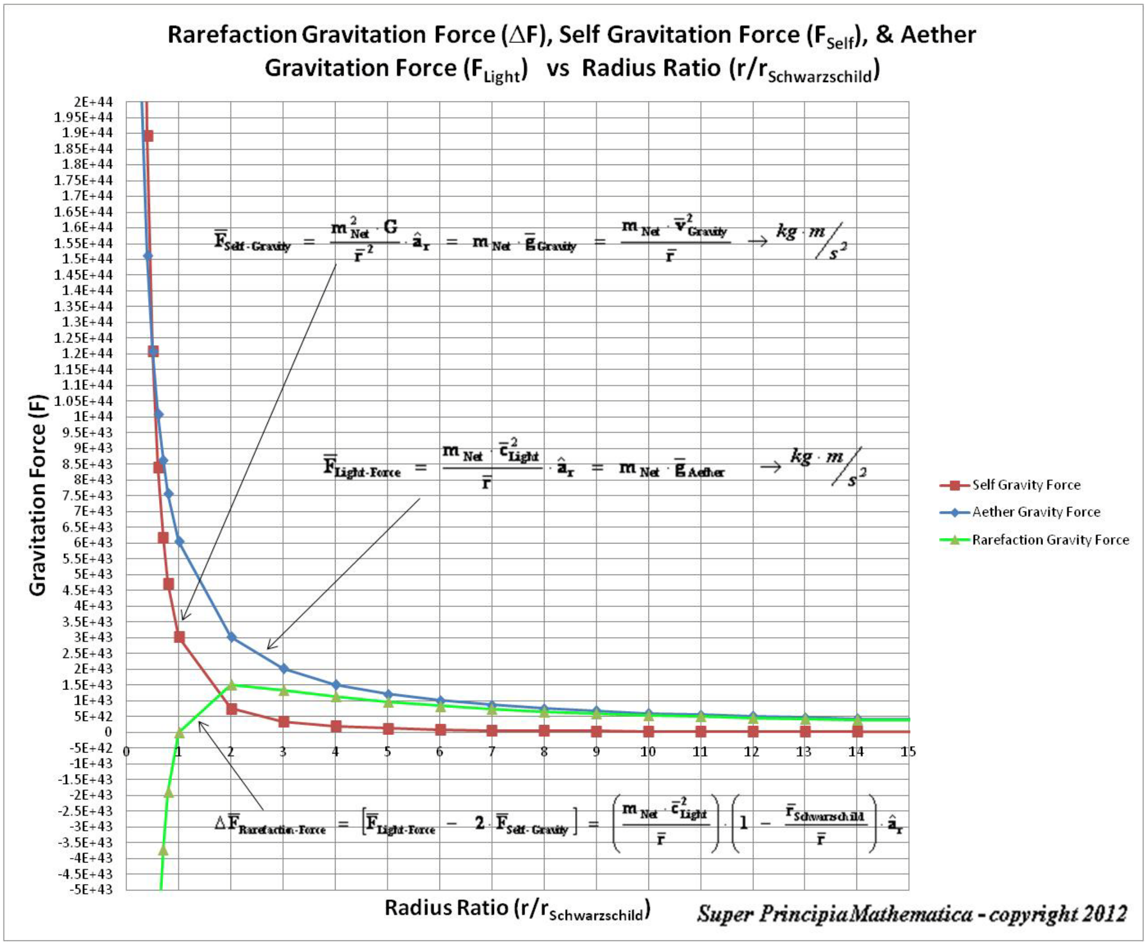
The ***Rarefaction "Dark Matter" Force of Gravitation*** ($\Delta F_{Rarefaction\text{-}Force}$) is in equilibrium with ***aether gravitation towards mass attraction*** and ***mass gravitation towards mass attraction*** in this case.

Rarefaction "Dark Matter" Force of Gravitation ($\Delta F_{Rarefaction\text{-}Force}$) is always becoming more, and more, like the ***Aether "Light" Force of Gravitation*** ($F_{Light\text{-}Force} = \frac{m_{Net} \cdot \bar{c}_{Light}^2}{\bar{r}}$), as the Semi-Major Distance ($\bar{r} \ggg \bar{r}_{Schwarzschild}$) is increased with great distance, far away from the Black Hole Event Horizon, and as the distance approaches infinity.

This means that the "isotropic aether" is attracted to "mass/matter" from long ranges, even as the inertial mass gravitation, mechanism, where "mass/matter" is attracted to "mass/matter" from long ranges is diminished.



The graph below give a closer zoomed in view of the area surrounding the Black Hole Event Horizon.



2. Conclusion

This work was written to physicists that are interested in understanding from a conceptual view, the rationale for selecting "Flat Geometry" Euclidean Space, or selecting a "Curved Geometry" Non-Euclidean Space; and whether to choose the Einstein Metric or the Schwarzschild Metric, as description for causality of gravity, or general motion in a gravitational field.

The **Schwarzschild** and the **Einstein "Non-Euclidean" Metrics** (ds^2) describes the causality and geometry of the curvature of space, space-time, and the gravitational field, and is used in conjunction, with a fluid mechanical model, ***Perfect Fluid "Static or Dynamic" Vacuum Energy Solution*** for the causality gravitation.

The proposed model in this work is the ***Unified Gravitation Vortex Theory***. This ***Unified Gravitation Vortex Theory*** describes a closed solution for cosmological and quantum mechanical effects, of matter in motion throughout the universe.

A fluid mechanical, perfect fluid vacuum energy solution to gravitation, makes that claims that the "Single Newtonian Gravity Force - Only" solution to gravitation is abandoned; in favor of a gravitation theory, that describes multiple or various "forces", "densities" "pressures" and "energies" into a more unified theory of gravitation.

This paper gave a conceptual and mathematical description for the reason for choosing to "Vacuum Energy Perfect Fluid" model, and using the Schwarzschild Metric over the Einstein Metric, based on the concept of whether there is "Zero Pressure" impressed upon the surface of the Black Hole Event Horizon.

And likewise, whether the "Volume Mass Density" and the curvature of space, space-time, or the gravitational field, surrounding a matter source is normal throughout the gradient of a gravitational field, or whether it is rarefied or condensed through the gradient of a gravitational field, and eventually becomes normal far away from the matter source.

Below are the topics that were discussed in this paper:

- ***1.1 Vacuum Energy "Perfect" Fluid Mechanical Model – Rarefaction/Condensing Pressure and Density Conditions – For Describing Non-Euclidean Metrics***

- ***1.2 The Vacuum Energy "Perfect" Fluid Mechanical Model – Rarefaction/Condensing Pressure and Density Conditions – For Describing Non-Euclidean Metrics***

- ***1.3 Vacuum Energy "Perfect" Fluid Mechanical Model – Rationale for using the Rarefaction/Condensing Linear Mass Density and Gravitational Potential Energy Differential Equations – For Describing Non-Euclidean Metrics***

- ***1.4 Vacuum Energy "Perfect" Fluid Mechanical Model – Rationale for using Kepler's Third Law of Motion (Evolutionary Attraction Rate) – For Describing Non-Euclidean Metrics***

- ***1.5 Vacuum Energy "Perfect" Fluid Mechanical Model – Gravitational Potential Energy Differential Equations – For Describing Non-Euclidean Metrics***

- ***1.6 Unified Gravitational Vortex Theory – Constituent Gravitational Forces – Inertial Mass Gravitational Attraction Force & Aether Gravitational Attraction Force***

- ***1.7 Unified Gravitational Vortex Theory – Composite Gravitational Force – Rarefaction/Condensing Force of Gravitation***

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