Dark Matter Gravity Generated by the S(4,0) Tensor [?]

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Abstract

Dark matter gravity generated by the S(4,0) tensor, the part of the Riemann curvature tensor R(4,0) defined as g(il)g(jk) - g(ik)g(jl), new Total Energy T(4,0) and energy tensors are defined to complete the General Relativity field equations. The Ricci decomposition is a way of breaking up the Riemann curvature tensor into three orthogonal tensors, Z(4,0), Weyl tensor C(4,0) and S(4,0), S tensor generates the dark matter gravity observed, galaxies in our universe are rotating with such speed that the gravity generated by their observable matter could not possibly hold them together

Conformal energy U defined as a combination of C and the Hodge dual of C, dark matter energy D defined as a combination of S and the Hodge dual of S, similar definitions for V/Z and T/R

The Ricci decomposition is a way of breaking up the Riemann curvature tensor into three orthogonal tensors, **Z** , Weyl tensor **C** and **S**, **S** tensor generates the dark matter gravity

$$R_{ijkl} = Z_{ijkl} + C_{ijkl} + S_{ijkl}$$

$$S_{ijkl} = \frac{1}{12} R \left(g_{il} g_{jk} - g_{ik} g_{jl}\right)$$

$$Y_{jk} = R_{jk} - \frac{1}{4} R g_{jk},\ Z_{ijkl} = \tfrac{1}{2}\left(Y_{il} g_{jk} - Y_{jl} g_{ik} - Y_{ik} g_{jl} + Y_{jk} g_{il}\right)$$

where R_{abcd} is the Riemann tensor, R_{ab} is the Ricci tensor, R is the Ricci scalar (the scalar curvature)

The conformal energy tensor **U** can be defined as a combination of **C** and the Hodge dual of **C** [1]

$$U_{abcd} = 1/8\pi(C_{amcd}C^m_{bcd} + *C_{amcd}*C^m_{bcd} + C_{abcn}C^n_{abd} + *C_{abcn}*C^n_{abd})$$

The new dark matter energy tensor **D** can be defined as a combination of **S** and the Hodge dual of **S**

$$D_{abcd} = 1/8\pi(S_{amcd}S^m_{bcd} + *S_{amcd}*S^m_{bcd} + S_{abcn}S^n_{abd} + *S_{abcn}*S^n_{abd})$$

The new energy tensor **V** can be defined as a combination of **Z** and the Hodge dual of **Z**

$$V_{abcd} = 1/8\pi(Z_{amcd}Z^m_{bcd} + *Z_{amcd}*Z^m_{bcd} + Z_{abcn}Z^n_{abd} + *Z_{abcn}*Z^n_{abd})$$

The new Total Energy tensor **T** can be defined as a combination of the Riemann tensor **R** and the Hodge dual of **R**

$$T_{abcd} = 1/8\pi(R_{amcd}R^m_{bcd} + *R_{amcd}*R^m_{bcd} + R_{abcn}R^n_{abd} + *R_{abcn}*R^n_{abd})$$

Hodge dual definitions

The Hodge dual definition for Electromagnetic tensor and Weyl tensor [2]

$*F_{ab} = \frac{1}{2}\varepsilon_{abln}F^{ln}$

$*C_{abcd} = \frac{1}{2}\varepsilon_{abln}C^{ln}_{\ \ cd}$

The Hodge dual definition for dark matter S tensor, Z and R tensors

$*S_{abcd} = \frac{1}{2}\varepsilon_{abln}S^{ln}_{\ \ cd}$, $*Z_{abcd} = \frac{1}{2}\varepsilon_{abln}Z^{ln}_{\ \ cd}$, $*R_{abcd} = \frac{1}{2}\varepsilon_{abln}R^{ln}_{\ \ cd}$

Weyl tensor C(4,0) is related to the new Conformal Energy tensor U(4,0). Dark matter tensor S(4,0) is related to the new dark matter energy tensor D(4,0). Z(4,0) tensor is related to the new energy tensor V(4,0). Riemann tensor R(4,0) is related to the new Total Energy tensor T(4,0)

Complete General Relativity field equations

The complete field equations are described by a new T(4,0) tensor for Total Energy, the new conformal energy tensor U(4,0), the new energy tensor V(4,0) and the new dark matter energy tensor D(4,0)

$Z_{ab} - \frac{1}{2}Zg_{ab} + \Lambda_z g_{ab} = -k_z V_{ab}$

$C_{ab} - \frac{1}{2}Cg_{ab} + \Lambda_c g_{ab} = -k_c U_{ab}$

$S_{ab} - \frac{1}{2}Sg_{ab} + \Lambda_s g_{ab} = -k_s D_{ab}$

$R = Z + C + S$

$\kappa T = k_z V + k_c U + k_s D$

$\Lambda = \Lambda_z + \Lambda_c + \Lambda_s$

$\kappa T_{abcd} = k_z V_{abcd} + k_c U_{abcd} + k_s D_{abcd}$

In the general theory of relativity the Einstein field equations relate the geometry of spacetime to the distribution of matter. [3]

$R_{\mu\nu} - \frac{1}{2}Rg_{\mu\nu} + \Lambda g_{\mu\nu} = -\kappa T_{\mu\nu}$

References

[1] Jesus Delso Lapuerta, https://vixra.org/abs/2012.0093, "On the conformal energy tensor defined as a combination of Weyl tensor and the Hodge dual of Weyl tensor"

[2] See Chapter 32, 32.2 in: Roger Penrose, "The Road to Reality", Jonathan Cape, London 2004

[3] See Page 175 in: Albert Einstein, "El significado de la relatividad" / "The meaning of relativity" , Planeta - De Agostini, Barcelona 1985