

Cosmological Distances And Hubble Tension In Einstein-Cartan Theory

Saboura Zamani , Siamak Akhshabi

Cosmology From Home

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Friedmann EQ

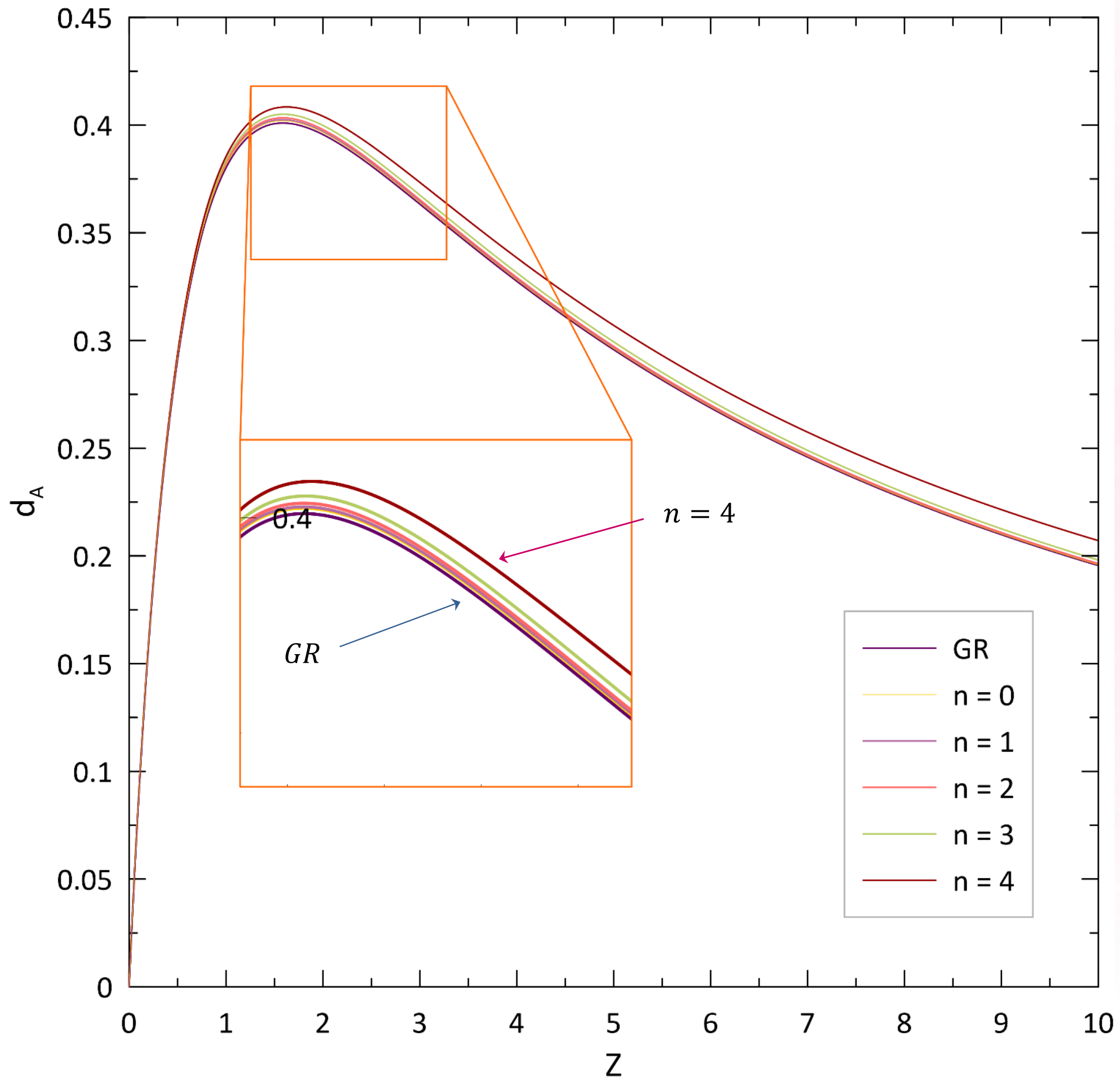
$$\left(\frac{\dot{a}}{a}\right)^2 = \frac{1}{3}\kappa\rho - \frac{K}{a^2} + \frac{1}{3}\Lambda - 4\varphi\left(\varphi - \left(\frac{\dot{a}}{a}\right)\right)$$

$$\frac{\ddot{a}}{a} = -\frac{1}{6}(\rho + 3p) + \frac{1}{3}\Lambda - 2\left(\dot{\varphi} - \left(\frac{\dot{a}}{a}\right)\varphi\right)$$

$$d_A = \frac{1+z}{\sqrt{\Omega_m(1+z)^3 + \Omega_k(1+z)^2 + \Omega_\Lambda + \Omega_\varphi(1+z)^n}}$$

$$\Omega_\Lambda = \frac{\Lambda}{3H^2} \quad \Omega_m = \frac{\kappa\rho}{3H^2} \quad \Omega_k = \frac{-k}{a^2H^2}$$

$$\Omega_\varphi = -4 \left(1 + \frac{\varphi}{H}\right) \frac{\varphi}{H}$$



$$\Omega_m = 0.32$$

$$\Omega_\lambda = 0.689$$

$$\Omega_\varphi = -0.01$$

$$\Omega_k = 0$$

$$\Omega_R = 10^{-5}$$

$$\Omega_\varphi \propto (1+z)^n$$

Radiation

Matter

GR

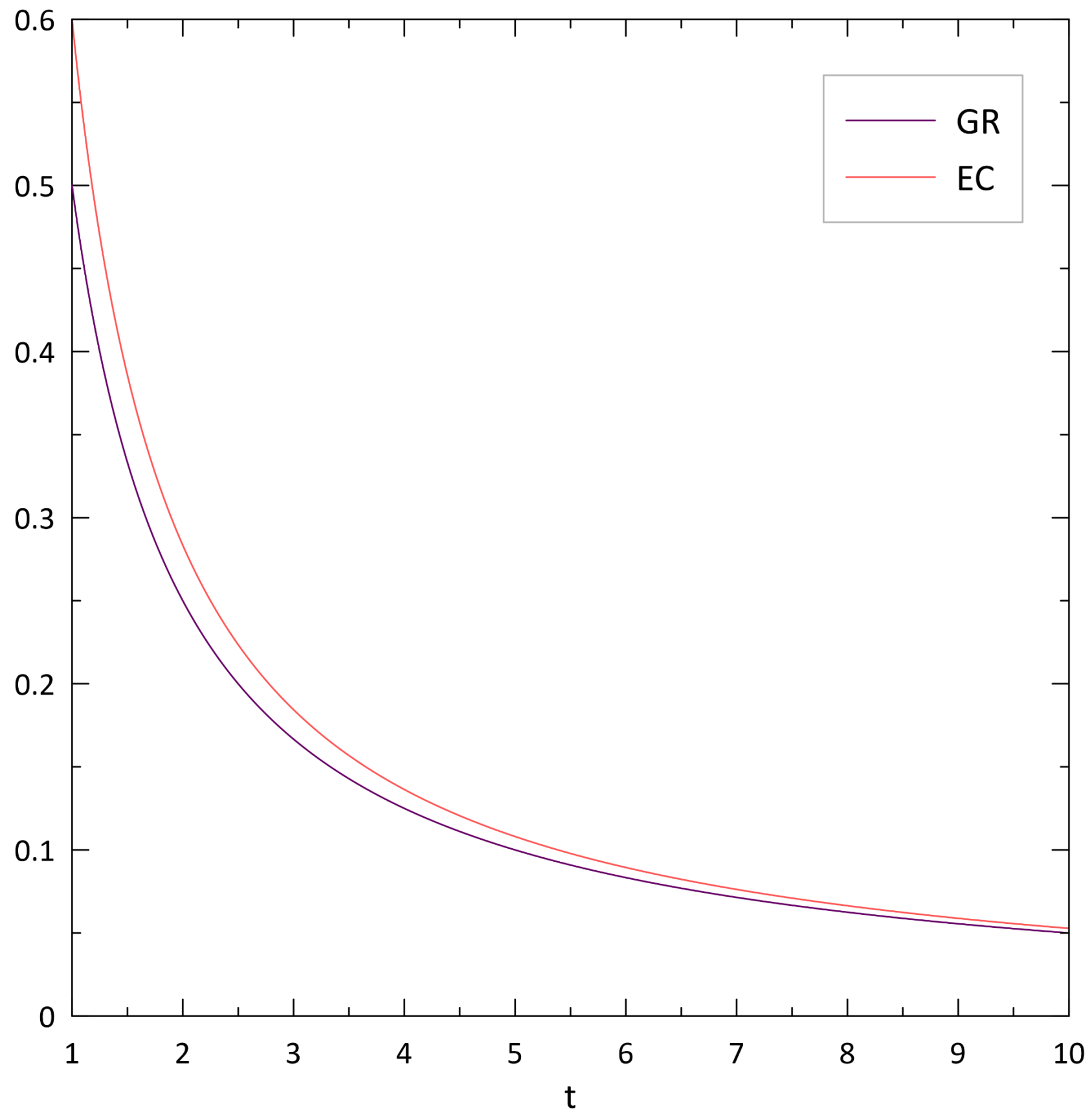
$$H = \frac{1}{2t}$$

$$H = \frac{2}{3t}$$

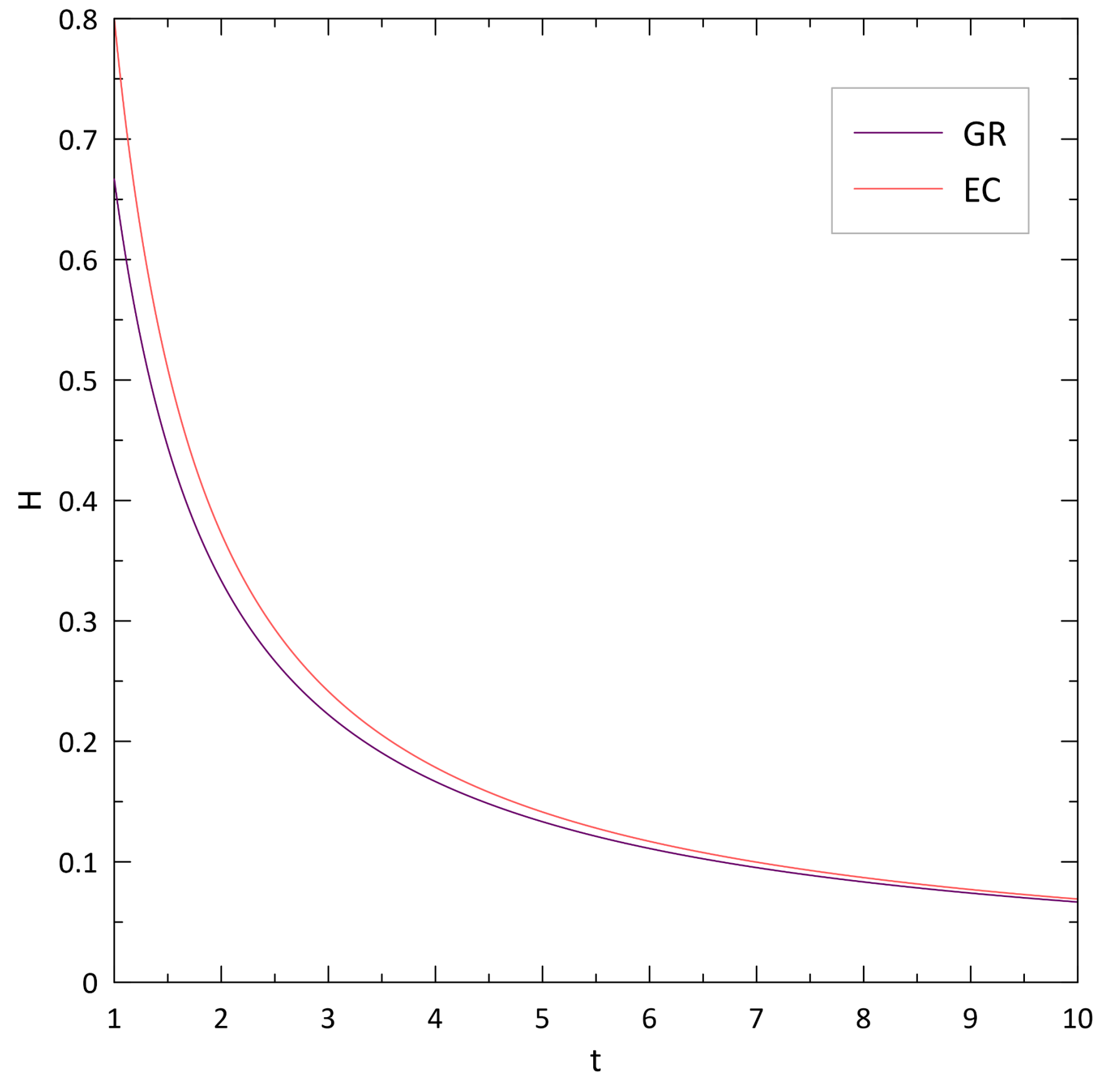
EC

$$H = \frac{1}{2} \left(t - \frac{\sqrt{t}}{6} \right)^{-1}$$

$$H = \frac{2}{3} \left(t - \frac{t^{1/3}}{6} \right)^{-1}$$



Radiation



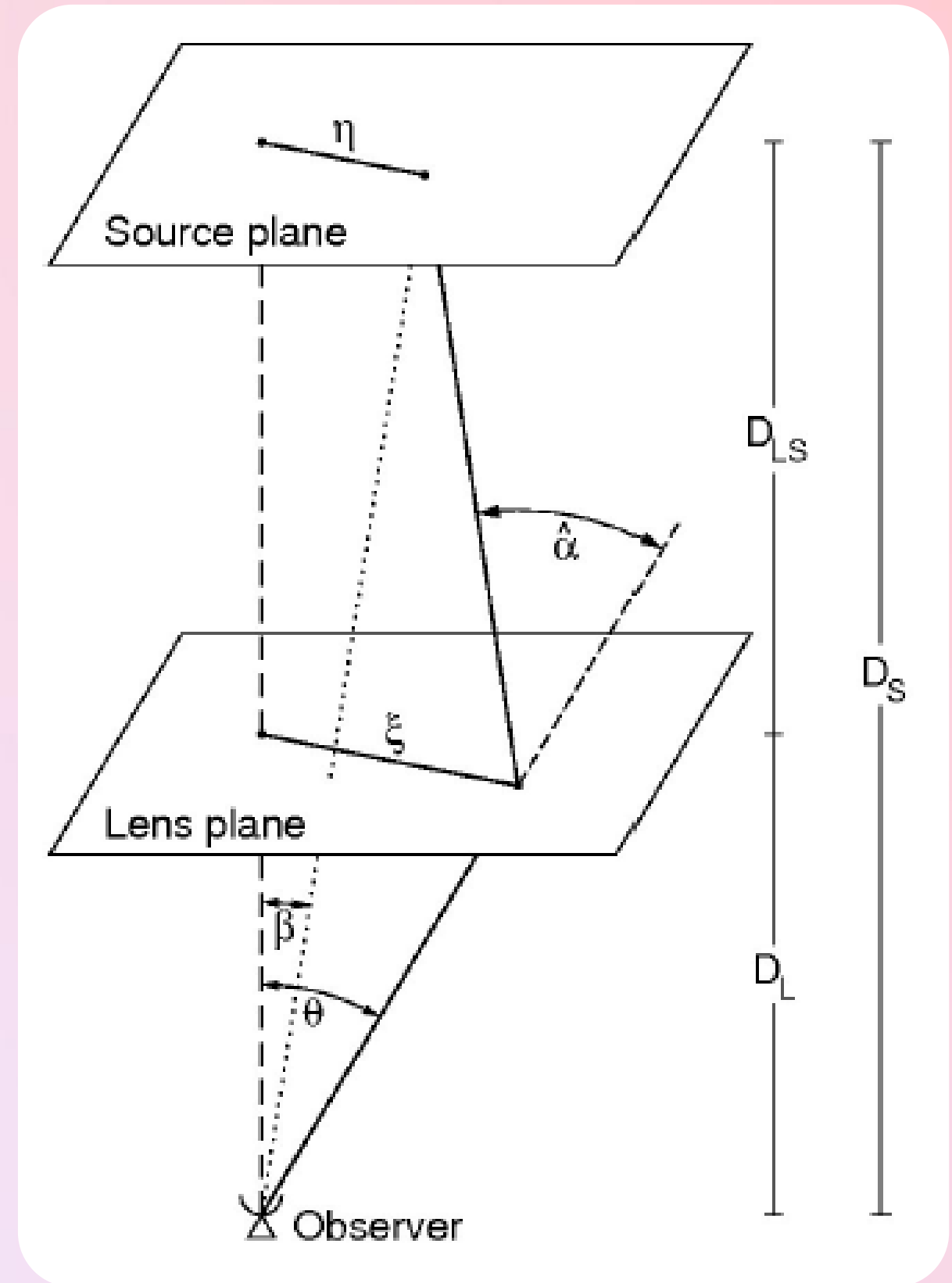
Matter

Ongoing

$$c\Delta t = (1 + z_d) \left[\frac{D_l D_s}{2D_{ls}} (\vec{\theta} - \vec{\beta})^2 - \Psi(\vec{\xi}) \right] + \text{const.}$$

Redshift of the lens

Gravitational potential of the lens





THANK YOU!

Saboura Zamani: saboura.zamani@gmail.com

Siamak Akhshabi: s.akhshabi@gu.ac.ir