Contribution ID: **172** Type: **Poster**

Study of traversable wormhole in $f(R)$ gravity

Tuesday 13 December 2022 14:00 (1 hour)

Here in this work we have carried out the study of traversable wormhole in $f(R)$ gravity with the function $f(R) = R + \alpha R^n$, where α and n are arbitrary constants. The $f(R)$ gravity is a reputed alternative gravity theory in which the Ricci scalar R in the Einstein-Hilbert gravitational Lagrangian is replaced by a general function of R. We have chosen the shape function of the form $b(r) = r\exp(1 - \frac{r}{r_0})$, where r_0 is the radius of the wormhole throat. We have considered a spherically symmetric and static wormhole metric and derived field equations. We have also checked the necessary energy conditions such as null, weak, strong and dominant energy conditions near the throat region with a throat radius r_0. For this we have chosen some different types of redshift functions, $\phi = constant$, $\beta ln(\frac{r}{r_0})$, $\frac{1}{r}$, $\exp(-\frac{r_0}{r})$ and $\exp(-\frac{r_0}{r} - \frac{r_0^2}{r^2})$, where β is any arbitrary constant. Finally we have also tried to calculate the amount of the exotic matter near the wormhole throat.

Session

Astroparticle Physics and Cosmology

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Session Classification: Poster - 2