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Relativistic stars in Starobinsky gravity with matched asymptotic expansion

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We study the structure of relativistic stars in R+alpha*Rˆ2 theory using the method of matched asymptotic expansion to handle the higher order derivatives in field equations arising from the higher order curvature term. We find solutions, parametrized by α, for uniform density stars matching to the Schwarzschild solution outside the star. We obtain the mass-radius relations and study the dependence of maximum mass on alpha. We find that M_{max} is proportional to alphaˆ(-3/2) for values of alpha larger than 10 kmˆ2. For each alpha the maximum mass configuration has the biggest compactness parameter (eta = GM/Rcˆ2) and we argue that the general relativistic stellar configuration corresponding to alpha=0 is the most compact among these.

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