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Improved Model of Primordial Black Hole Formation after Starobinsky Inflation

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A new (improved) model of inflation and primordial black hole (PBH) formation is proposed by combining the Starobinsky model of inflation, Appleby–Battye–Starobinsky (ABS) model of dark energy, and a quantum correction in the modified *F(R)* gravity. The energy scale parameter in the ABS model is taken to be close to the inflationary scale, in order to describe double inflation instead of dark energy. The quantum correction is given by the term quartic in the spacetime scalar curvature *R* with a negative coefficient (-δ) in the *F(R)* function. It is demonstrated that very good agreement (within 1σ) with current measurements of the cosmic microwave background (CMB) radiation can be achieved by choosing the proper value of δ, thus solving the problem of low values of the tilt of CMB scalar perturbations in the earlier proposed ABS model. A large (by a factor of 10^{7} against CMB) enhancement in the power spectrum of scalar perturbations is achieved by fine tuning the parameters of the model. It is found by numerical analysis that it can lead to formation of asteroid-size PBHs with masses up to 10^{20} g, which may form dark matter in the current universe.

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