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TACHYON INFLATION WITH A GENERALIZED T-MODE POTENTIAL IN THE FRAMEWORK OF THE HOLOGRAPHICS BRANEWORLD COSMOLOGY

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Abstract. *We consider inflation scenario in the holographic framework with a tachyon fluid occupying the brane at the holographic boundary of an asymptotic AdS_5 space. We calculate numerically the observational parameters of inflation, the scalar spectral index (n_s) and the tensor-to-scalar ratio (r) for a generalized T-mode potential and confront the results with observational data. We determine a range of values for the free parameters of the model that are in good agreement with the observational constraints.*

Key words: *DBI Lagrangians, tachyon cosmology, holographic cosmology*

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1. INTRODUCTION

Cosmological inflation proposes a very short period of extremely rapid expansion of the early Universe (Guth, 1981). During this period the Universe expanded almost exponentially, meaning that the scale factor of the Universe increased by an enormous factor (about $e^{60} \approx 10^{26}$) in a very short amount of time. This rapid expansion would have smoothed out all irregularities in the early Universe providing a very good explanation why the Universe appears so homogeneous and isotropic on large scales. During inflation fluctuations in the density of matter and energy are generated, which later gave rise to the large-scale structure observed in the Universe today. Besides, inflation explains creation of the specific patterns in the cosmic microwave background radiation.

The physical mechanisms that govern inflation are still subject to speculation. One of the promising candidates, the scalar field responsible for the inflation, is a tachyon field, originating in the string theory. The use of the tachyon field in inflationary models and cosmology was inspired by Sen (Sen, 1999), where it was suggested that the tachyon field might be responsible for the mechanism that drives inflation. Dynamics of the tachyon field θ is described by a non-standard Dirac–Born–Infeld (DBI) type Lagrangian (Sen, 2002)

$$\mathcal{L} = -\ell^{-4} V(\theta/\ell)\sqrt{1 - g^{\mu\nu}\theta_{,\mu}\theta_{,\nu}}, \tag{1}$$

where the constant ℓ has the dimension of length. The potential V is arbitrary function that satisfy the properties $V(0) = \text{const}$, $V_{,\theta}(\theta > 0) < 0$and $V(|\theta| \to \infty) \to 0$, where the subscript $,\theta$ denotes a derivative with respect to θ. Various potentials, derived in the string theory literature, have been investigated in inflationary models (Steer and Vernizzi, 2004). The exponential attenuation potential is one of the most studied potentials in a cosmological context.

Apart from the standard tachyon inflation, the model with the tachyon field has been considered in the framework of modified holographic cosmology. The model is based on the effective four-dimensional Einstein equations on the holographic boundary obtained using the anti-de Sitter/conformal field (AdS/CFT) conjecture (Bilić, 2016). A model of tachyon inflation has been considered in the framework of holographic cosmology for some specific choices of potential. It has been shown that for an exponential potential (Bilić at el., 2019) and for an inverse hyperbolic cosine potential (Milošević at el., 2020) a good agreement of model's predictions with observations can be achieved for larger values of the number of e-folds ($N > 60$). In this paper, our goal is to extend the previous consideration to the new type of the tachyon potential

$$V = V_0\left(1 - \tanh^2\left(\frac{\omega\theta}{\ell}\right)\right), \tag{2}$$

where V_0 and ω are free dimensionless parameters. The potential (2), named a generalized T-mode potential, has been investigated in the scenario of inflation with the tachyon field in the frame of $f(R,T)$ cosmology (Mohammadi and Kheirandish, 2023).

The paper is organized as follows. In Section 2, dynamics of the model is studied in detail. In the following section we analyze the tachyon inflation with the potential (2), using the slow-roll approximation, in the holographic braneworld (Bilić at el., 2019). In Section 4 we present the results of the observational parameters of inflation. Conclusion is given in Section 5.

2. TACHYON DYNAMICS IN THE HOLOGRAPHIC BRANEWORLD

In this section we briefly review some necessary results given in (Bilić at el., 2019). The scenario with a brane located at the holographic boundary of the higher dimensional space is referred to as the holographic braneworld. We consider a 4-dim brane with an effective tachyon field in the 5-dim asymptotically anti-de Sitter space-time (AdS_5), with the curvature radius ℓ. For a spatially flat Friedmann-Lemaitre-Robertson-Walker (FLRW) geometry on the holographic brane

$$ds^2 = g_{\mu\nu}dx^\mu dx^\nu = dt^2 - a^2(t)(dr^2 + r^2 d\Omega^2), \tag{3}$$

where $a(t)$ is the scale factor, the holographic Friedmann equation, obtained from the effective four-dimensional Einstein equations on the holographic boundary, is of the form (Bilić, 2018)

$$H^2 - \frac{\ell^2}{4}H^4 = \frac{8\pi G_{\rm N}}{3}\rho + \frac{4\mu}{a^4}. \tag{4}$$

The Hubble expansion rate is defined by $H = \dot{a}/a$ and the overdot denotes a derivative with respect to time t measured in units of ℓ. The parameter μ, which appears in the term referred to as "dark radiation," is related to a black hole in the bulk. As noted in (Bratt at el., 2002), this term is irrelevant for inflation, and we can set $\mu = 0$. Combining (4) and the energy conservation equation

$$\dot{\rho} + 3H(\rho + p) = 0, \tag{5}$$

leads to the second holographic Friedmann equation

$$\dot{H}\left(1 - \frac{\ell^2}{2}H^2\right) = -4\pi G_{\rm N}(\rho + p). \tag{6}$$

The pressure p and the energy density ρ of the inflation fluid are described by

$$p = -\ell^{-4}V\sqrt{1 - \dot{\theta}^2}, \tag{7}$$

$$\rho = \frac{\ell^{-4}V}{\sqrt{1-\dot{\theta}^2}}. \tag{8}$$

Following (Bilić, 2018) we introduce a dimensionless expansion rate h

$$h \equiv \ell H. \tag{9}$$

Now, the holographic Friedmann equations (4) and (6) take the form

$$h^2 - \frac{1}{4}h^4 = \frac{\kappa^2}{3}\ell^4\rho, \tag{10}$$

$$\dot{h}\left(1 - \frac{1}{2}h^2\right) = -\frac{\kappa^2}{2}\ell^3(p+\rho), \tag{11}$$

where κ is the fundamental dimensionless coupling defined as

$$\kappa^2 = \frac{8\pi G_{\rm N}}{\ell^2}. \tag{12}$$

In the limit $h \ll 1$, equations (10) and (11) reduce to the standard Friedmann equations. In that case, the solution to equation (10) has the form

$$h^2 = 2\left(1 - \sqrt{1 - \frac{\kappa^2}{3}\ell^4\rho}\right), \qquad h \ll 1. \tag{13}$$

It follows that the dimensionless expansion rate is a monotonously decreasing function of time with physically acceptable values in the interval $0 < h < h_{max}$, where $h_{max} = \sqrt{2}$. Note that near and at the end of inflation $h \ll 1$.

The dynamics of inflation can be described using the Hamilton's equations

$$\theta_{,\mu} = \frac{\partial \mathcal{H}}{\partial \pi_\theta^\mu}, \tag{14}$$

$$\dot{\pi}_\theta + 3\frac{h}{\ell}\pi_\theta = -\frac{\partial \mathcal{H}}{\partial \theta}, \tag{15}$$

where $\pi_\theta^\mu = \partial\mathcal{L}/\partial\theta_{,\mu}$ is the conjugate momentum and $\pi_\theta = \sqrt{g_{\mu\nu}\pi_\theta^\mu\pi_\theta^\nu}$ is its magnitude. The Hamiltonian density may be derived from $\mathcal{H} = \dot{\theta}\pi_\theta - \mathcal{L}$. Using (1), one finds

$$\dot{\theta} = \frac{\eta}{\sqrt{1+\eta^2}}, \tag{16}$$

$$\dot{\eta} = -\frac{3h\eta}{\ell} - \frac{V_{,\theta}}{V}\left(\sqrt{1+\eta^2} + \frac{\eta^2}{\sqrt{1+\eta^2}}\right), \tag{17}$$

and

$$\eta = \ell^4 V^{-1}\pi_\theta. \tag{18}$$

In the following, we will study the model with the potential given by (2). It is convenient and allowed by (10) and (11), to rescale the constant κ in such a way to include the free parameter V_0, i.e. $\kappa^2 V_0 \to \kappa^2$ (Milošević at el., 2020). As a consequence, the potential of the model can be written in a form with only one free parameter

$$V = 1 - \tanh^2\left(\frac{\omega\theta}{\ell}\right). \tag{19}$$

Unfortunately, the properties of the potential (19) do not allow us to eliminate dependence on the fundamental parameter κ from dynamical equations, as was the case with the exponential potential (Bilić at el., 2019). In the following, we treat κ, besides ω and an initial $h_i \leq h_{max}$, as an additional free parameter of the model.

3. THE SLOW-ROLL INFLATION

As in the standard scalar field inflation, the slow-roll tachyon inflation is based upon the slow evolution of the field

$$\dot{\theta}^2 \ll 1, \qquad |\ddot{\theta}| \ll 3\frac{h}{\ell}\dot{\theta}, \tag{20}$$

resulting in a major simplification of the dynamical equation, which in some cases can provide the analytical solution (Sami, 2002). For example, in the slow-roll regime the equation (13) takes the form

$$h^2 \simeq 2(1 - \sqrt{1 - \kappa^2 V/3}). \tag{21}$$

The elegant description of the inflationary dynamic may be achieved using the slow-roll parameters, which can be defined hierarchically

$$\varepsilon_* \equiv \frac{h_*}{h}, \qquad \varepsilon_{j+1} = \frac{\ell\dot{\varepsilon}_j}{h\varepsilon_j}, \qquad j \geq 0, \tag{22}$$

where h_* is the expansion rate at an arbitrarily chosen time. The slow-roll parameters are assumed to be much smaller than unity throughout the slow-roll regime. Inflation ends when the parameter ε_1 exceeds unity. From the definition (22), by using the equations (10) and (11), in the slow-roll approximations one obtains (Bilić at el., 2019)

$$\varepsilon_1 \simeq \frac{4-h^2}{12h^2(2-h^2)}\left(\frac{\ell V_{,\theta}}{V}\right)^2, \tag{23}$$

$$\varepsilon_2 \simeq 2\varepsilon_1\left(1 - \frac{2h^2}{(2-h^2)(4-h^2)}\right) + \frac{2\ell^2}{3h^2}\left[\left(\frac{V_{,\theta}}{V}\right)^2 - \frac{V_{,\theta\theta}}{V}\right]. \tag{24}$$

The terms on the right-hand side of (23) and (24) are the functions of the potential. In particular, for the potential (19) we find

$$V_{,\theta} = -\frac{2\omega}{\ell}\left(1 - \tanh^2\frac{\omega\theta}{\ell}\right)\tanh\frac{\omega\theta}{\ell}, \tag{25}$$

$$\left(\frac{V_{,\theta}}{V}\right)^2 = \frac{4\omega^2}{\ell^2}\tanh^2\frac{\omega\theta}{\ell}, \tag{26}$$

$$\left(\frac{V_{,\theta}}{V}\right)^2 - \frac{V_{,\theta\theta}}{V} = \frac{2\omega^2}{\ell^2}\left(1 - \tanh^2\frac{\omega\theta}{\ell}\right). \tag{27}$$

Using equations (25)-(27), the expressions (23) and (24) take the form

$$\varepsilon_1 \simeq \frac{\omega^2(4-h^2)}{3h^2(2-h^2)}\tanh^2\frac{\omega\theta}{\ell}, \tag{28}$$

$$\varepsilon_2 \simeq 2\varepsilon_1\left(1-\frac{2h^2}{(2-h^2)(4-h^2)}\right)+\frac{4\omega^2}{3h^2}\left(1-\tanh^2\frac{\omega\theta}{\ell}\right). \tag{29}$$

The form of the potential (19) allows us to express ε_1 and $\varepsilon_2$in terms of them. During the slow-roll regime, using (8) and (10), the potential can be approximated by

$$V \simeq \frac{3}{\kappa^2}h^2\left(1-\frac{h^2}{4}\right). \tag{30}$$

Using (19) and (30), we can write the first two slow-roll parameters

$$\varepsilon_1 \simeq \frac{\omega^2(4-h^2)}{3h^2(2-h^2)}\left(1-\frac{3}{\kappa^2}h^2(4-h^2)\right), \tag{31}$$

$$\varepsilon_2 \simeq 2\varepsilon_1\left(1-\frac{2h^2}{(2-h^2)(4-h^2)}\right)+\frac{\omega^2}{\kappa^2}(4-h^2). \tag{32}$$

An important quantity that characterizes inflation is the number of e-folds N defined as

$$N=\int_{t_{\rm CMB}}^{t_{\rm f}} H\,dt \simeq -3\int_{\theta_{\rm i}}^{\theta_{\rm f}}\frac{h^2V}{\ell^2V_{,\theta}}d\theta, \tag{33}$$

where t_{CMB} and t_f denote the cosmic time at the beginning and at the end of inflation, respectively. For a successful solution of some problems in the early Universe, like the horizon problem and the flatness problem, the number of e-folds should be around $N \simeq 60$.

Using the criteria for the end of inflation ($\varepsilon_{1f}=1$), the value of the expansion rate at the end of inflation h_f can be found ($h_f \ll 1$). From (31) one finds

$$\omega^2 \simeq \frac{3h_{\rm f}^2}{2}, \tag{34}$$

which implies that the parameter ω is small compared to one.

The conditions (20) are equivalent to

$$\eta \ll 1, \qquad |\dot{\eta}| \ll \frac{3h}{\ell}\eta, \tag{35}$$

and from (17) one finds an approximate expression

$$\dot{\theta} \simeq -\frac{\ell V_{,\theta}}{3hV}, \tag{36}$$

that can be easily integrated, yielding cosmic time t as a function of h

$$t=\frac{\kappa^2\ell}{2\omega^2}\left(\ln\frac{(2+h)(2-h_{\rm i})}{(2-h)(2+h_{\rm i})}+\sqrt{2}\ln\frac{(\sqrt{2}-h)(\sqrt{2}+h_{\rm i})}{(\sqrt{2}+h)(\sqrt{2}-h_{\rm i})}\right). \tag{37}$$

4. Scalar Spectral Index and Tensor to Scalar Ratio

The essential observational parameters of inflation are the scalar spectral index (n_s) and the tensor-to-scalar ratio (r). The calculations for the observational parameters for a general k-essence inflation in the holographic braneworld were carried out in (Bertini at el., 2020). It is shown that at linear order in the slow-roll parameters ε_i, the expressions for n_s and r agree with the expressions obtained in the standard scalar field inflation with the tachyon field (Steer and Vernizzi, 2004)

$$n_{\rm s} \simeq 1 - 2\varepsilon_1 - \varepsilon_2, \tag{38}$$

$$r \simeq 16\varepsilon_1. \tag{39}$$

Based on analytical calculation, a rough estimate of the observational parameter can be obtained in the following way. Using new variable x, defined as

$$x \equiv 1 - h^2/2 = \sqrt{1 - \kappa^2 V/3}, \tag{40}$$

the definition for the numbers of e-fold (33) takes the form

$$N = \frac{3}{\omega^2}\int_{x_{\rm i}}^{x_{\rm f}} \frac{x dx}{(1+x)(1-\frac{3}{\kappa^2}(1-x^2))}. \tag{41}$$

Let's assume that $\kappa^2 = 3$. In this case the numbers of e-folds can be easily calculated

$$N = \frac{3}{\omega^2}\int_{x_{\rm i}}^{x_{\rm f}} \frac{dx}{x(1+x)} dx = \frac{3}{\omega^2}\ln\frac{x}{1+x}\Big|_{x_{\rm i}}^{x_{\rm f}} = \frac{3}{\omega^2}\ln\frac{x_{\rm f}}{1+x_{\rm f}}\frac{1+x_{\rm i}}{x_{\rm i}}, \tag{42}$$

where

$$x_{\rm i} = 1 - \frac{h_{\rm i}^2}{2}, \tag{43}$$

$$x_{\rm f} = 1 - \frac{h_{\rm f}^2}{2} \simeq 1 - \frac{\omega^2}{3}. \tag{44}$$

According to (44), the choice of the parameter ω is restricted by $\omega < \sqrt{3}$. For $\kappa^2 = 3$, $\omega = 0.011$, and for several initial values of h_i in the range $0.009 < h_i^2 < 0.013$, using (42), we obtain the number of e-fold in the range $55 < N < 80$. For this choice of the parameters, using (38) and (39), the following set of observational parameters is obtained:

$$n_s = 0.965 \text{ and } r = 0.139 \text{ (for } N \simeq 55) \tag{45}$$

and

$$n_s = 0.976 \text{ and } r = 0.095 \text{ (for } N \simeq 80). \tag{46}$$

The acceptable agreement of the model predictions for n_s and r, obtained for $\kappa^2 = 3$, with constraints from Planck Collaboration 2018 (Akrami at el., 2020)

$$n_{\rm s} = 0.9649 \pm 0.0042, \tag{47}$$

$$r = 0.056, \tag{48}$$

is a motivation to calculate the values of the observational parameters for different values of the parameter κ in the given range. In the following calculations, we apply the same procedure as in (Milošević at el., 2019) and (Milošević at el., 2020).

The system of the Hamilton's equations, (16) and (17), can be integrated numerically following the procedure described in detail in (Bilić at el., 2019) and (Dimitrijević at el., 2018). For arbitrary chosen values of initial conditions and free parameters there is no guarantee that obtained solution will be inflationary. The slow-roll conditions lead to the attractor behavior of the model. Because of that, the attractor behaviour can be used to determine the initial conditions for the model's free parameters. Using the condition (35), equation (17) turns out to be

$$\eta_{\rm i} \simeq -\frac{(\ell V_{,\theta}/V)_{\rm i}}{\sqrt{9h_{\rm i}^2-4(\ell V_{,\theta}/V)_{\rm i}^2+3\sqrt{9h_{\rm i}^4-4h_{\rm i}^2(\ell V_{,\theta}/V)_{\rm i}^2}}}. \tag{49}$$

Substituting the potential (19) into (49) one finds

$$\tanh^2\left(\frac{\omega\theta_{\rm i}}{\ell}\right) = \frac{9h_{\rm i}^2}{16\omega}\frac{1+\frac{1}{2\eta_{\rm i}^2}}{(1+\frac{1}{4\eta_{\rm i}^2})^2}. \tag{50}$$

Equation (10) now can be rewritten as

$$\left(1-\frac{h_{\rm i}^2}{2}\right)^2 = 1-\frac{\kappa^2}{3}V(\theta_{\rm i})\sqrt{1+\eta_{\rm i}^2}. \tag{51}$$

Inserting (19) and (50) in (51) we obtain

$$\left(1-\frac{9h_{\rm i}^2}{16\omega^2}\frac{1+\frac{1}{2\eta_{\rm i}^2}}{(1+\frac{1}{4\eta_{\rm i}^2})^2}\right)\sqrt{1+\eta_{\rm i}^2} = \frac{3}{\kappa^2}h_{\rm i}^2\left(1-\frac{h_{\rm i}^2}{4}\right). \tag{52}$$

In the slow-roll regime the factor $\sqrt{1+\eta_i^2}$ can be omitted yielding

$$1-\frac{9h_{\rm i}^2}{16\omega^2}\frac{1+\frac{1}{2\eta_{\rm i}^2}}{(1+\frac{1}{4\eta_{\rm i}^2})^2} \simeq \frac{3}{\kappa^2}h_{\rm i}^2\left(1-\frac{h_{\rm i}^2}{4}\right). \tag{53}$$

The exact solution to (53) is of the form

$$\eta_{\rm i} = \frac{1}{2}\sqrt{\frac{\sqrt{A}}{\sqrt{A+B-1}}-1}, \tag{54}$$

where

$$A \equiv \frac{9h_{\rm i}^2}{16\omega^2}, \qquad B \equiv \frac{3}{\kappa^2}h_{\rm i}^2\left(1-\frac{h_{\rm i}^2}{4}\right) \tag{55}$$

are functions of the free parameters of the model (κ,ω,h_i). Using equation (50), the initial value θ_i in terms of η_i is given by

$$\theta_{\rm i} = \frac{\ell}{\omega}\,\mathrm{arctanh}\sqrt{A\,\frac{1+\frac{1}{2\eta_{\rm i}^2}}{(1+\frac{1}{4\eta_{\rm i}^2})^2}}. \tag{56}$$

The form of equation (53) restricts the value of the parametear κ

$$\kappa^2 > 3h_{\rm i}^2\left(1 - \frac{h_{\rm i}^2}{4}\right). \tag{57}$$

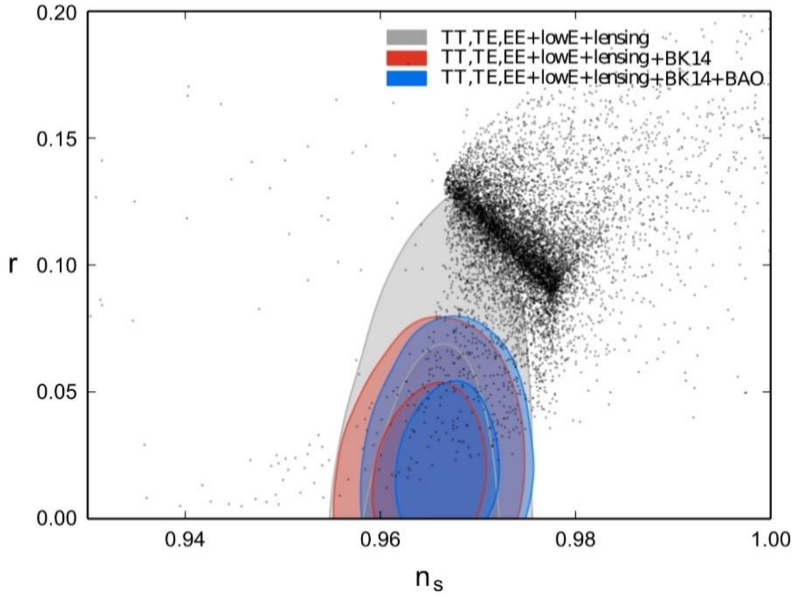

Fig. 1 Observational parameters for $V = 1 - tanh^2(\frac{\omega\theta}{\ell})$ with observational constraints from Planck mission (Akrami at el., 2020). The dots are obtained numerically for a randomly chosen number of e-folds $60 < N < 90$ and the free parameters of the model are: $0 < \omega < 0.3$, $0 < h_i < \sqrt{2}$ and $0 < \kappa^2 < 5$ restricted by (57).

The system of the Hamilton's equation is integrated numerically, using the initial conditions (54) and (56), starting from $t = 0$ up to some t large enough to provide the end of inflation in t_f $(\varepsilon_{1f}(t_f) = 1,\ t_f < t)$. The differential equation for $N(t)$ is solved simultaneously, using $dN/d\theta = h/(\ell\dot{\theta})$, from $N(0) = 0$. The time at the beginning of inflation t_{CMB} is determined from $N(t_{CMB}) - N(t_f) = N$, where N is the chosen number of e-folds. Then, t_{CMB} is used to find $\varepsilon_{ii} = \varepsilon_i(t_{CMB})$ and observational parameters $n_s(\varepsilon_{ii})$ and $r(\varepsilon_{ii})$. The dots on the Fig. 1 represent the numerical data for randomly chosen N ranging between 60 and 90, ω between 0 and 0.3 and h_i^2 between 0 and 2. The parameter κ is randomly chosen in the interval $0 < \kappa^2 < 5$, restricted by (57). A comparison of the computed results with Planck data shows that the model predictions are in good agreement with the observational constraints.

5. CONCLUSIONS

We have studied the tachyon inflation in the holographic braneworld with the potential given by (19). Using the slow-roll approximation, we obtained the slow-roll parameters. We numerically solved the exact dynamical equations using the initial conditions obtained in the slow-roll approximation. We have shown that the model predictions of observational parameters n_s and r, obtained numerically, are consistent with the observational data for some values of the free parameters. We obtained a better agreement with Planck data for the desired e-fold number $N \simeq 60$, than the agreement obtained for the model with exponential and inverse cosine hyperbolic potential (Bilić at el., 2019; Milošević at el., 2020). It is interesting to compare the predictions of this model with the predictions of another braneworld model (e.g., Randall–Sundrum model (Randall and Sundrum, 1999)) with the tachyon field with the same potential, as well as the reheating problem (Bilić at el., 2017). The issue will be investigated in our future research.

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REFERENCES

Akrami, Y., et al., 2020 Astron. Astrophys. **641,** A10. doi:10.1051/0004-6361/201833887

Bertini, N. R., Bilic, N., Rodrigues, D. C., 2020. Phys. Rev. D **102** (12), 123505. doi:10.1103/PhysRevD.102.123505

Bilić, N., 2016. Phys. Rev. D **93** (6), 066010. doi:10.1103/PhysRevD.93.066010

Bilic, N., Domazet, S., Djordjevic, G. S., 2017. Phys. Rev. D **96**, 083518. doi:10.1103/PhysRevD.96.083518

Bilić, N., 2018. Int. J. Mod. Phys. A **34**, 1845004. doi:10.1142/S0217751X18450045

Bilić, N., Dimitrijevic, D.D., Djordjevic, G.S., Milosevic, M., Stojanovic, M., 2019. JCAP **08** (034). doi:10.1088/1475-7516/2019/08/034

Bratt, J. D., Gault, A. C., Scherrer, R. J., Walker T. P., 2002. Phys. Lett. B **545**, 19-22. doi:10.1016/S0370-2693(02)02637-0

Dimitrijević, D. D., Bilić, N., Djordjević, G. S., Milošević, M., Stojanović, M., 2018. Milošević, M., Milošević, M., Int. J. Mod. Phys. A **33**, 1845017. doi:10.1142/S0217751X18450173

Guth A., 1981. Phys. Rev. D **23**, 347 – 356. doi:10.1103/PhysRevD.23.347

Milošević, M., Bilić, N., Dimitrijević, D. D., Djordjević, G. S., Stojanović, M., 2019. AIP Conf. Proc. **2075**, 090009. doi:10.1063/1.5091223

Milošević, M., Stojanović, Dimitrijević, D.D., M., Djordjević, G.S., 2020 Ann. U. Craiova Phys. **30**, 196-203.

Mohammadi, A., Kheirandish, F., 2023. Phys. Dark Univ. **42**, 101362. doi:10.1016/j.dark.2023.101362

Randall, L., Sundrum R., 1999. Phys. Rev. Lett. **83**, 4690-4693. doi:10.1103/PhysRevLett.83.4690

Sami, M., Chingangbam, P., Qureshi, T., 2002. Phys. Rev. D **66**, 043530. doi:10.1103/PhysRevD.66.043530

Sen A., 1999. JHEP **10**, 048. doi:10.1088/1126-6708/1999/10/008

Sen A., 2002. JHEP **04**, 008. doi:10.1088/1126-6708/2002/04/048

Steer, D.A., Vernizzi, F., 2004. Phys. Rev. D **70, 043527**. doi:10.1103/PhysRevD.70.043527

TAHIONSKA INFALCIJA SA GENERALIZOVANIM T-MOD POTENCIJALOM U OKVIRU HOLOGRAFSKE KOSMOLOGIJE SVETA NA BRANI

Razmatramo inflaciju u holografskom pristupu sa tahionskim poljem na brani, na holografskoj granici asimptotskog AdS_5 *prostora. Numerički izračunavamo opservacione parametre inflacije, skalarni spektralni indeks* (n_s) *i odnos tenzora i skalara* (r)*, za generalizovani T-mod potencijal i upoređujemo numeričke rezultate sa opservacionim podacima. Određujemo interval vrednosti slobodnih parametara za koje su predviđanja modela u skladu sa opservacionim ograničenjima.*

Ključne reči: *Lagranžijani DBI tipa, tahionska kosmologija, holografska kosmologija*