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Tensor and scalar perturbations from dilaton-induced gauge fields

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We study the primordial scalar and tensor perturbations in inflation scenario involving a spectator dilaton in addition to the conventional inflaton field. In our setup, the rolling dilaton causes a tachyonic instability of gauge fields, leading to a copious production of gauge fields in the superhorizon regime, which generates additional scalar and tensor perturbations through gravitational interactions. Our major concern is the possibility to enhance the tensor to scalar ratio "r" relative to the standard result from vacuum fluctuations, while satisfying the observational constraints. For such possibility, the dilaton field is allowed to be stabilized before the end of inflation, but after the CMB scales exit the horizon. We show that for the inflaton slow roll parameter "epsilon" > 10^-3, the tensor to scalar ratio in our setup can be enhanced only by a factor of O(1) compared to the standard result. However, for smaller epsilon, a much larger enhancement can be achieved, so that our setup can give rise to r > 0.01 even when epsilon « 10^-3. The tensor perturbation sourced by the spectator dilaton can have a strong scale dependence, and is generically red-tilted.

Presenter: CHOI, Kiwoon (KAIST, Republic of Korea)

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