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Dynamical String Tension Theories with Target Space Scale Invariance SSB and Restoration

Abstract

The string and brane tensions do not have to be put in by hand, they can be dynamically generated, as in the case when we formulate string and brane theories in the modified measure formalism. Then string and brane tensions appears, but as an additional dynamical degree of freedom. It can be seen however that these string or brane tensions are not universal, but rather each string and each brane generates its own tension, which can have a different value for each string or brane. The consequences of this for the spectrum of these string and brane theories is profound both in the ultraviolet behavior as in the low energy physics. There should be also a considerable effect for the effective gravity theories derived from these theories. We consider new background fields that can couple to these new types of extended objects, one of them, the "tension scalar" is capable of changing locally along the world sheet the value of the tension of the extended object. When many strings probing the same region of space are considered this tension scalar is constrained by the requirement of quantum conformal invariance. For the case of two strings probing the same region of space with different dynamically generated tensions, there are two

different metrics, associated to the different strings, that have to satisfy vacuum Einstein's equations and the consistency of these two Einstein's equations determines the tension scalar. The universal metric, common to both strings generically does not satisfy Einstein's equation. The problem is analyzed in the case of a Schwarzschild background and for the cosmological case of a Kasner type solution. In the case of the flat space for the string associated metrics, in the Milne representation, for the case of two types of string tensions, there are solutions with negative string tension at the early universe that whose tension approaches zero in the late universe and a positive string tension type of strings appears for the late universe with its tension approaching a constant value at the late universe. The universal metric is not flat, instead it represents a non singular bounce cosmology. The case in a warped space time where positive and negative string tensions are separated by a spontaneously generated wall is also studied, the construction of dynamical tension string theories, where the string tension appears as an integration constant. We also find that the construction of brane world scenarios in the context of these dynamical tension string theories, we discuss avoidance of the Hagedorn temperature possible relaxation of string swampland constraints in dynamical tension string theories, and that the dynamical string theories can bridge between the low and high energy quantum gravity effects, The dynamical modified string theory has target space scale invariance and this target space scale invariance can be restored at the points where the string tension approaches infinity. These models suggest the swampland constraints could be avoided.