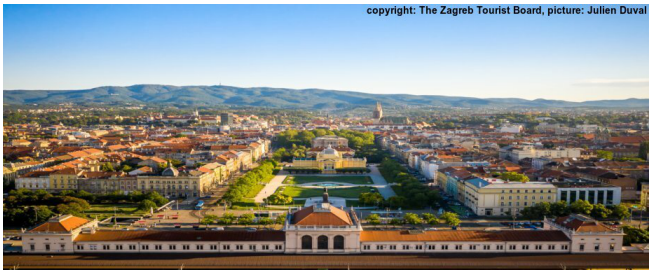

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Composite Higgs states in the top-bottom condensation model

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Abstract
We use the Schwinger-DeWitt approach to address the four-fermion composite Higgs effective model proposed by Miransky, Tanabashi and Yamawaki (MTY). The surprising
benefit of such an approach is that it is possible to ascribe to a SM type Higgs a quark-antiquark structure of predominantly bottom flavor with a small top admixture, which in turn yields a Higgs mass compatible with the observed value of 125 GeV. We discuss in detail this result, as it goes against the common belief that this model and akin composite descriptions should predict a Higgs mass of the order of twice the top quark mass, contrary to empirical evidence. A further aspect of this approach is that it highlights the link of the SU(2)L X U(1)R symmetric four-fermion MTY model interactions of the heavy quark family to a specific two Higgs doublet model (2HDM), and the necessity to go beyond the one Higgs doublet to obtain the empirical Higgs mass within composite models. By appropriately fixing the symmetry defining interaction parameters, we show that the resulting CP preserving spectrum harbors the following collective states at the electroweak scale 246 GeV: a light scalar to which the standard Higgs is associated; a heavier neutral state preconized as the Nambu partner of the standard Higgs within the Nambu sum rule; the expected triplet of Goldstone bosons associated with the longitudinal polarizations of the electroweak massive bosons; and a neutral pseudoscalar state that in the limit of a global U(1)A symmetry would be a Goldstone mode. The anomalous breaking of this axial symmetry is a subleading effect in a large Nc counting scheme and we discuss how it modifies the leading order Nambu sum rule result and its relevance for the qualitative description of the spectrum.

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