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Testing Deca-TeV Unified Compositeness at the 4 TeV $\mu^+\mu^-$ Colliders

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Abstract: In the framework of the unified compositeness of leptons, quarks and Higgs bosons, the hidden local symmetry $\hat{H}_{loc} = SU(2)_L \times U(1)_Y$ with the heavy composite vector bosons, in addition to the SM gauge bosons, is briefly described. Supplementary hypothesis of the vector boson dominance (VBD) of the SM gauge interactions is considered. It is argued that this should produce the universal dominant residual interactions of the SM composite particles, i.e., all of the fermions and Higgs bosons. Restrictions on the universal residual fermion-fermion, fermion-boson and boson-boson interactions due to the VBD are investigated. Manifestations of the residual interactions at the 4-TeV $\mu^+\mu^-$ collider are studied. It is shown that at 95% C.L. the unified substructure could be investigated at the collider in the processes $\mu^+\mu^- \rightarrow \bar{f}f$ up to the compositeness scale $\mathcal{O}(150 \text{ TeV})$, in the processes $\mu^+\mu^- \rightarrow ZH$, W^+W^- up to $\mathcal{O}(100 \text{ TeV})$ and in the process $\mu^+\mu^- \rightarrow ZHH$ up to $\mathcal{O}(40 \text{ TeV})$, which lie in the naturally preferable Deca-TeV region.

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