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Implications of the weak gravity conjecture in anomalous quiver gauge theories

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We argue a smallness of gauge couplings in abelian quiver gauge theories, taking the anomaly cancellation condition into account. In theories of our interest there exist chiral fermions leading to chiral gauge anomalies, and an anomaly-free gauge coupling tends to be small, and hence can give a non trivial condition of the weak gravity conjecture. As concrete examples, we consider U(1)^{k} gauge theories with a discrete symmetry associated with cyclic permutations between the gauge groups, and identify anomaly-free U(1) gauge symmetries and the corresponding gauge couplings. Owing to this discrete symmetry, we can systematically study the models and we find that the models would be examples of the weak coupling conjecture. It is conjectured that a certain class of chiral gauge theories with too many U(1) symmetries may be in the swampland. We also numerically study constraints on the couplings from the scalar weak gravity conjecture in a concrete model. These constraints may have a phenomenological implication to model building of a chiral hidden sector as well as the visible sector.

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