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Anomalous gauge U(1), 't Hooft mechanism, and "invisible" axion from string

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We can consider two continuous parameters, one is the MI-axion direction
and the other the phase of anomalous U(1) gauge transformation. If the anomalous U(1) gauge boson obtains mass by absorbing the MI-axion at the compactification scale, one continuous parameter remains, which describes a global symmetry. This corresponds to the 't Hooft mechanism in gauge theory that if one scalar VEV breaks both a gauge symmetry and a global symmetry then the gauge symmetry is broken and a global symmetry survives. This is a good PQ symmetry and can give the axion decay constant around 10^{11} GeV, without any gravity spoil of the PQ symmetry.

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