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Dynamical generation of the Peccei-Quinn scale in gauge mediation

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The Peccei-Quinn (PQ) mechanism provides an elegant solution to the strong CP problem. However astrophysical constraints on axions require the PQ breaking scale to be far higher than the electroweak scale. In supersymmetric models the PQ symmetry can be broken at an acceptable scale if the effective potential for the pseudo-modulus in the axion multiplet develops a minimum at large enough field values. In this work we classify systematically hadronic axion models in the context of gauge mediation and study their effective potentials at one loop. We find that some models generate a PQ scale comparable to the messenger scale. Our result may prove useful for constructing full realistic models of gauge mediation that address the strong CP problem. We also comment briefly on the cosmological aspects related to saxion and axino, and on the quality of the PQ symmetry.

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