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Natural dark matter in the pMSSM

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We evaluate the fine-tuning of the phenomenological minimal supersymmetric standard model (pMSSM). We show that, contrary to common believe, that the fine-tuning of the pMSSM is not large yet, nor under pressure by LHC searches. Low sbottom, stop and gluino masses turn out to be less relevant for low fine-tuning than commonly assumed. Fine-tuning arguments point to models with a dark matter candidate yielding the correct dark matter relic density: a bino-higgsino particle with a mass of 35–155 GeV. Some of these candidates are compatible with recent hints seen in astrophysics experiments such as Fermi-LAT and AMS-02. We argue that upcoming direct search experiments, such as XENON1T, will test all of the most natural solutions in the next few years.

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