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The I(2+1)HDM with Z_3 soft breaking and the three posible DM scenarios.

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Within the context of the 3-Higgs Doublet Model with two inert doublets and one active doublet, known as the I(2+1)HDM, a Z_3 soft-breaking is allowed. Due to this soft-breaking term, three possible Dark Matter (DM) scenarios are presented. The first scenario consists of one stable DM particle and a second particle that could have a long lifetime, close to the age of the universe. The second scenario features a single DM candidate plus a particle that could have contributed to the late-time electromagnetic and hadronic energy injection in nucleosynthesis. Finally, the third scenario consists of one DM candidate and a particle that can decay inside the detector.

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