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Baryogenesis and gravitational waves from domain walls

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Axionic domain walls, as they sweep through the early universe plasma, can generate a net baryon and lepton number through the mechanism of spontaneous baryogenesis, provided there is a coupling between the axion and the lepton or baryon current. In this paper, we study systematically the baryon asymmetry produced by these domain walls, within different realisations of the L- or B violating sector. We find that the baryon number is maximised when the DW collapse more or less at the moment when the L or B violating interaction decouples. We study a model of minimal leptogenesis, a model of cogenesis, a model of baryogenesis and finally the possibility that the baryon asymmetry is produced by sphalerons themselves. We finally discuss the expected gravitational wave signal from these domain walls and the prospects for detecting it. We however emphasize that in typical realisations of the DW baryogenesis scenario, there is a suppression induced by the cancellation between the "opposite"asymmetry created by "opposite"(clockwise and counter-clockwise) domain walls. We quantify the level of this cancellation and discuss possible ways to avoid it.

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