Lepton Number Violation

$0\nu\beta\beta$ Decay, LHC & Baryogenesis

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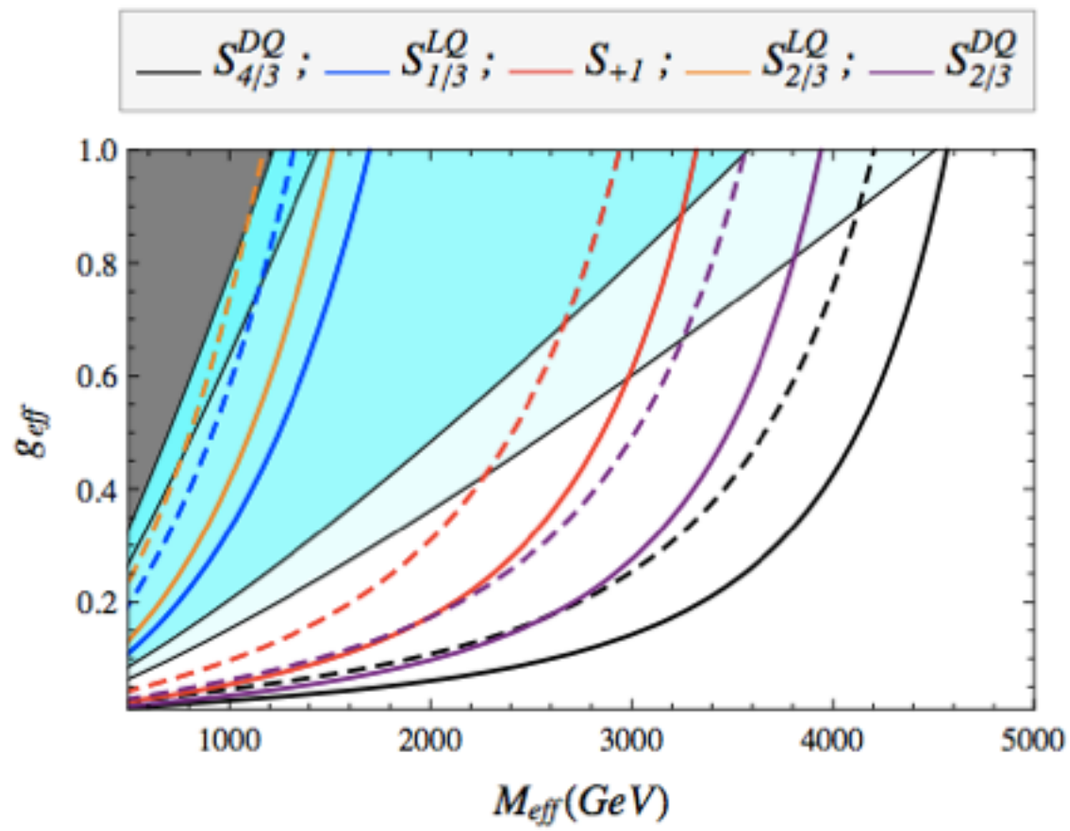
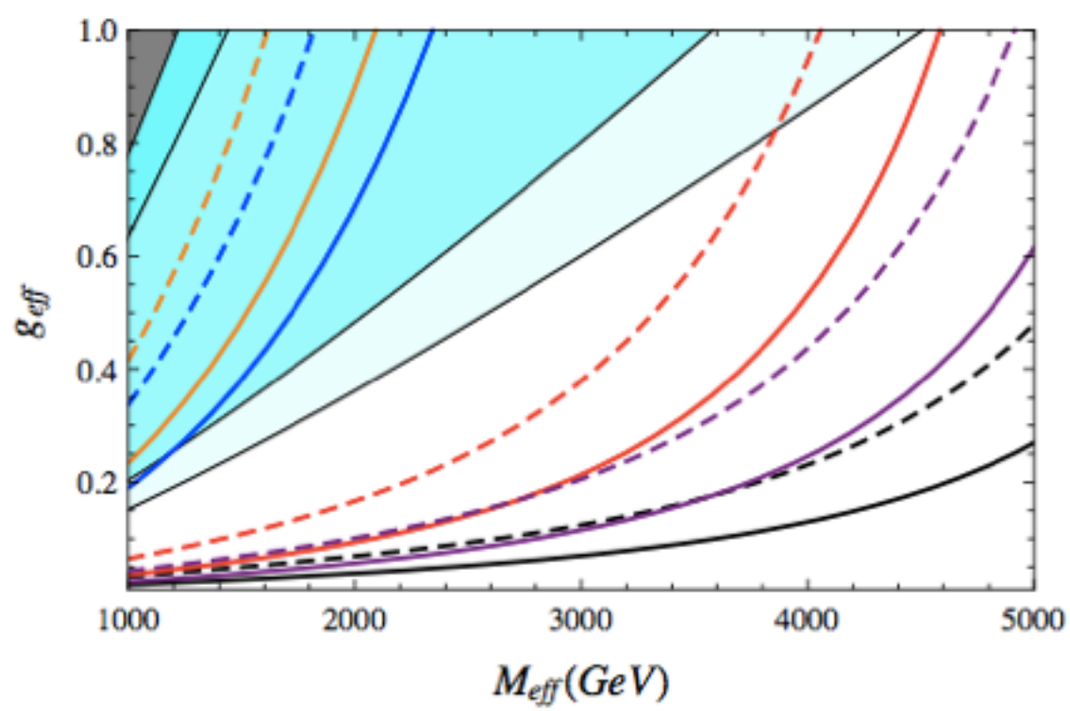
0νββ versus LHC SSD at $\sqrt{s}$ = 14 TeV

m_ψ = 200 GeV



m_ψ = 1 TeV



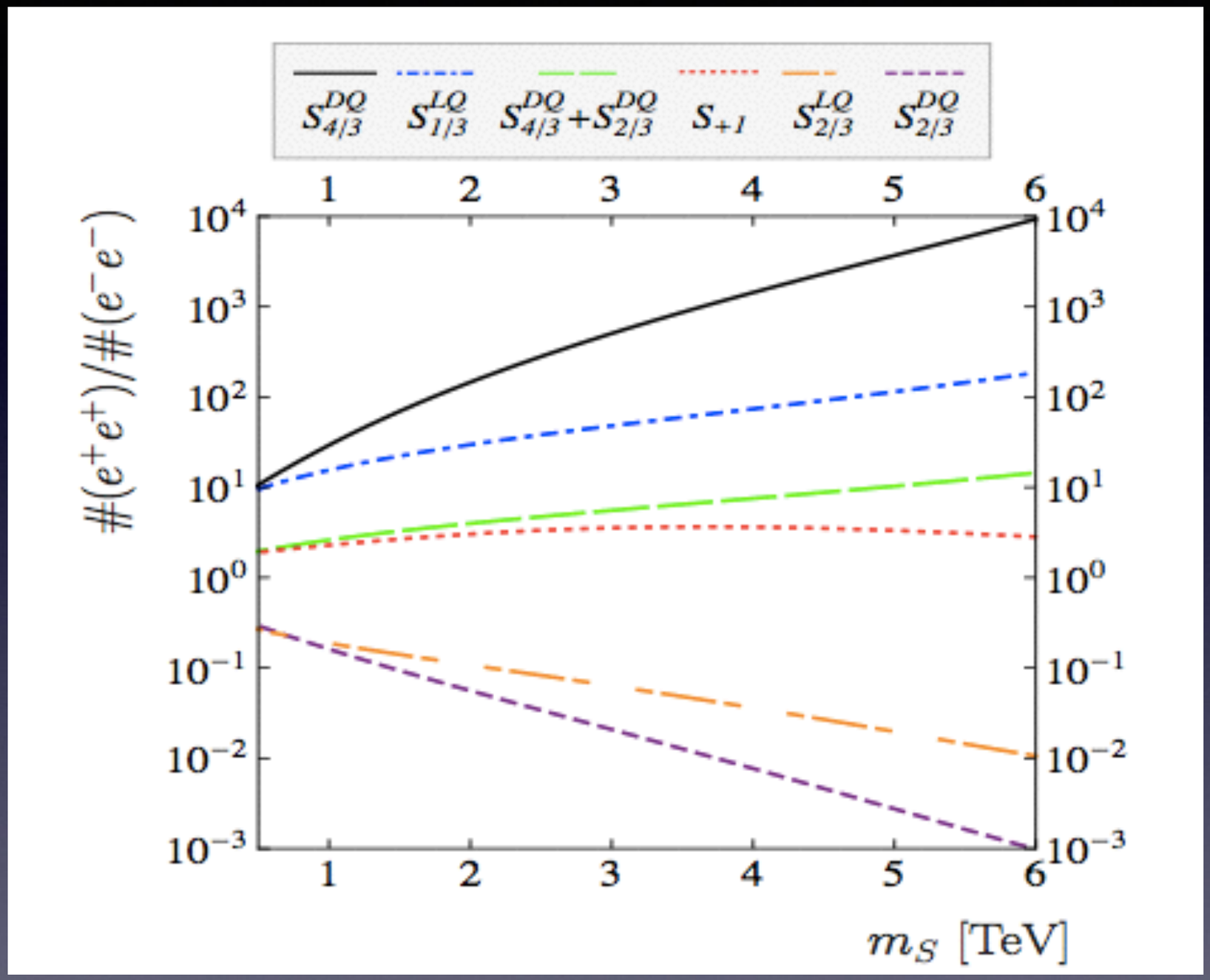
0νββ - grey & blue areas: present bound, $T_{1/2}>10^{26}$y (smallest rate operator)

$T_{1/2}>10^{26}$y, $T_{1/2}>10^{27}$y (largest rate operator)

LHC: curved lines
dashed: $Br^{eff}(S\rightarrow eejj)=10^{-2}$
solid: $Br^{eff}(S\rightarrow eejj)=10^{-1}$

[J.C. Helo, M. Hirsch, S. Kovalenko, HP PRD88 (2013) 1 011901]

Discriminating 0νββ mechanisms: Charge Asymmetry



[J.C. Helo, M. Hirsch, S. Kovalenko, HP PRD88 (2013) 1 011901]

“Falsifying Leptogenesis at the LHC”

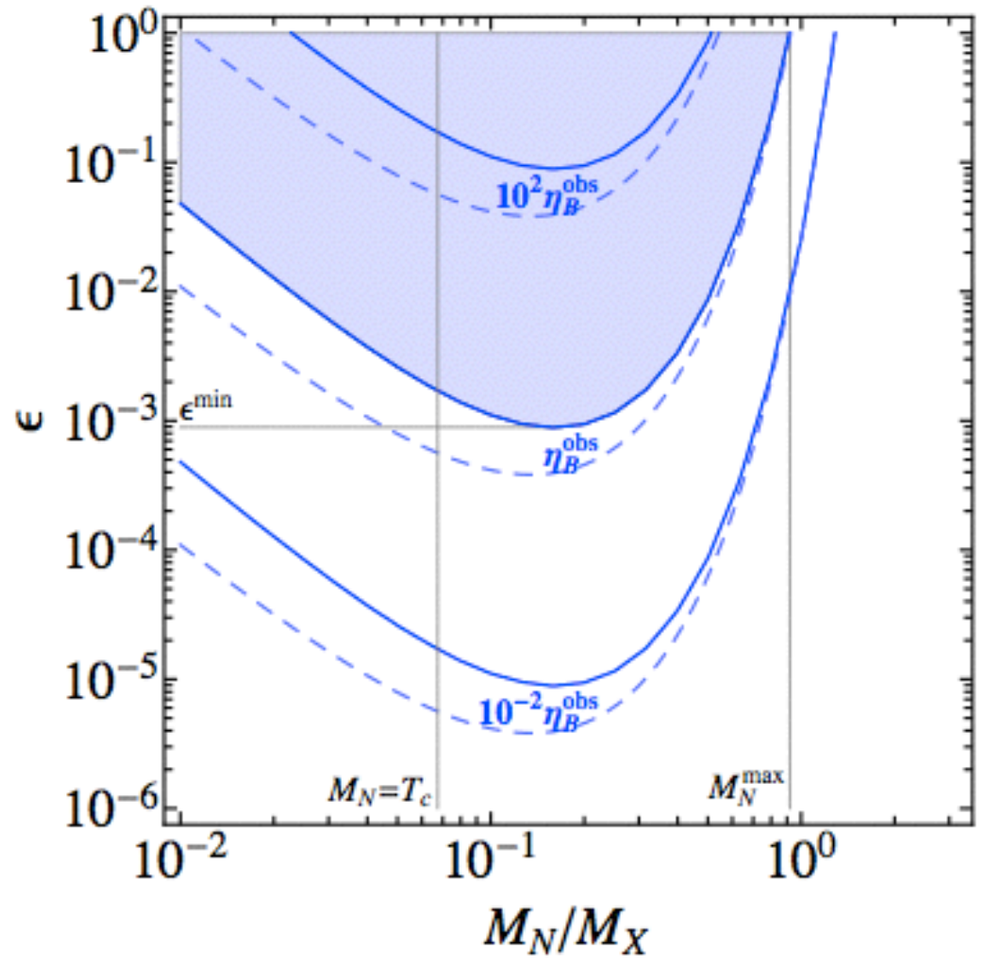


FIG. 4: Baryon asymmetry η_B as a function of M_N/M_X and ϵ for $M_X = 2$ TeV and $\sigma_{\rm LHC} = 0.1$ fb (solid contours). The intermediate contour corresponds to the observed value $\eta_B^{\rm obs}$, the other two contours give 100 times higher and lower values, respectively. Correspondingly, the dashed contours are determined using the approximation Eq. (11).

[F. Deppisch, J. Harz, M. Hirsch, PRL 112 (2014) 221601]