CMB and BBN constraints on light thermally coupled WIMPs

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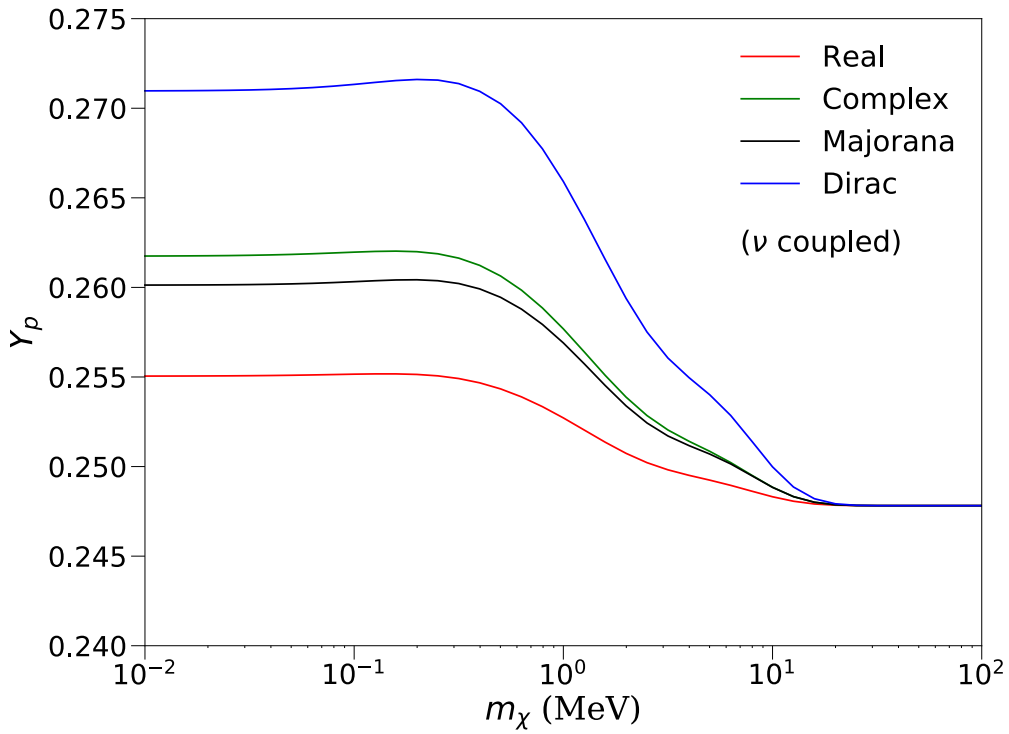
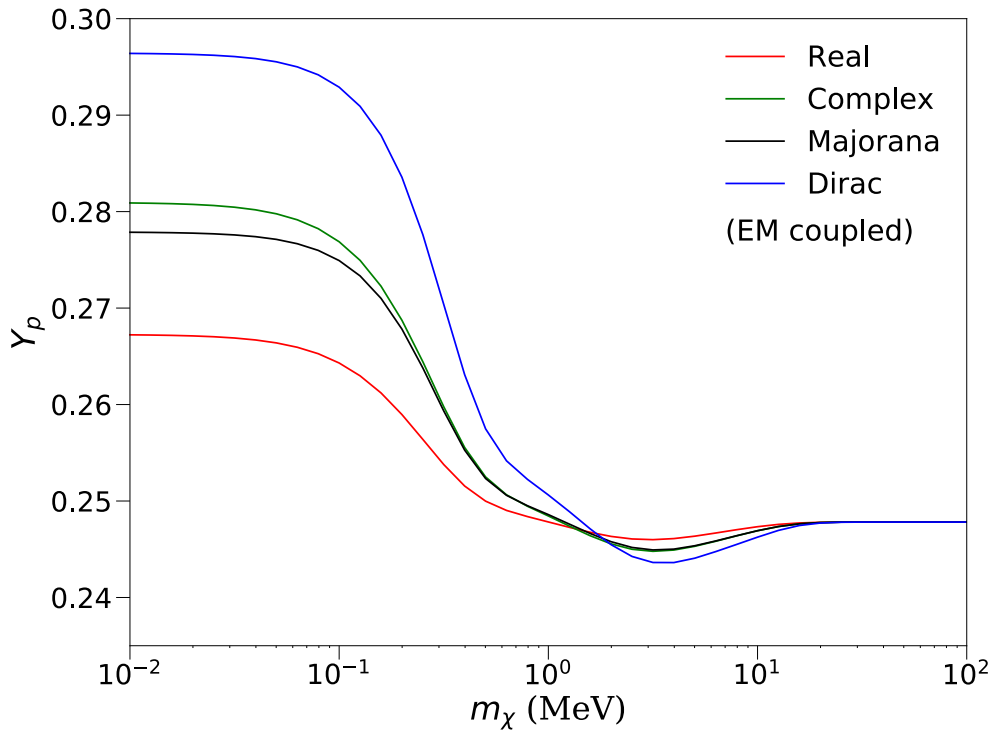
BBN in WIMP scenarios

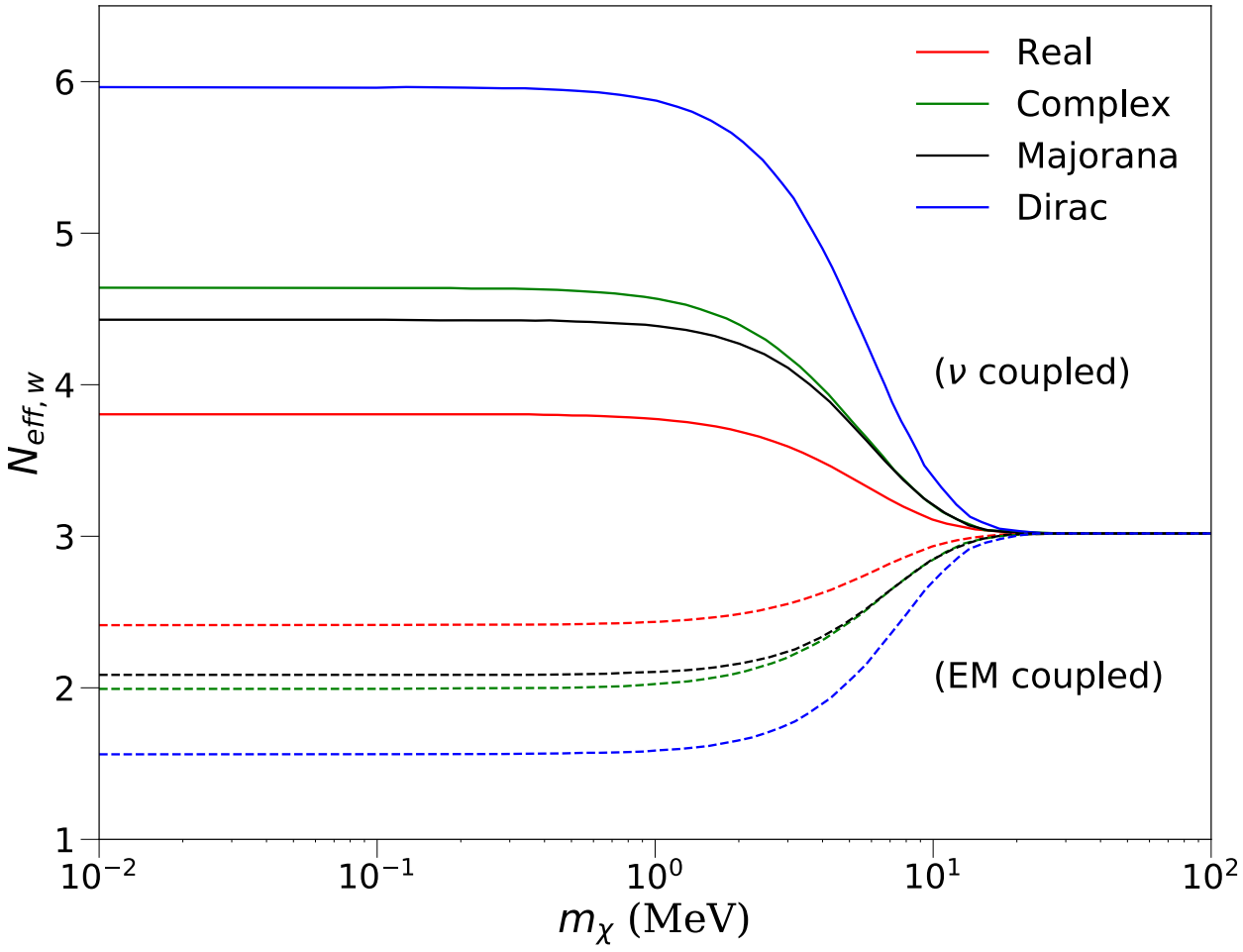
WIMP mass: 0.01Mev~100MeV

Types of particle: Real Scalar, Complex Scalar, Majorana Fermion, Dirac Fermino

Types of coupling: WIMPs annihilating to neutrinos (υ coupled) or photons and $e^{\pm}$ pairs (EM coupled)





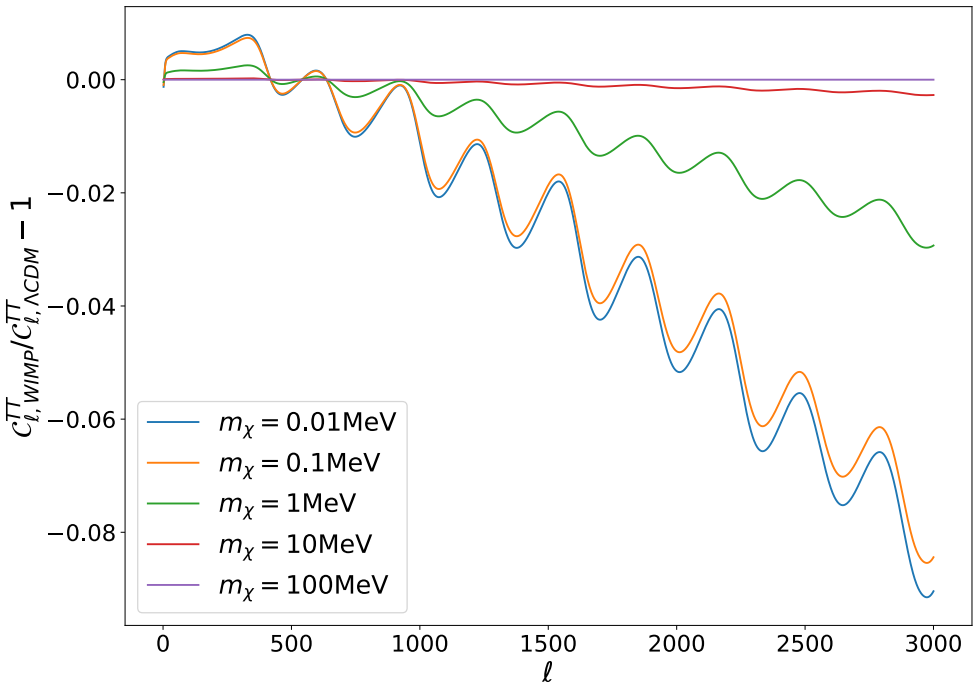


$$N_{eff} = N_{eff,w}\left(1 + \frac{\Delta N_\upsilon}{3}\right)$$

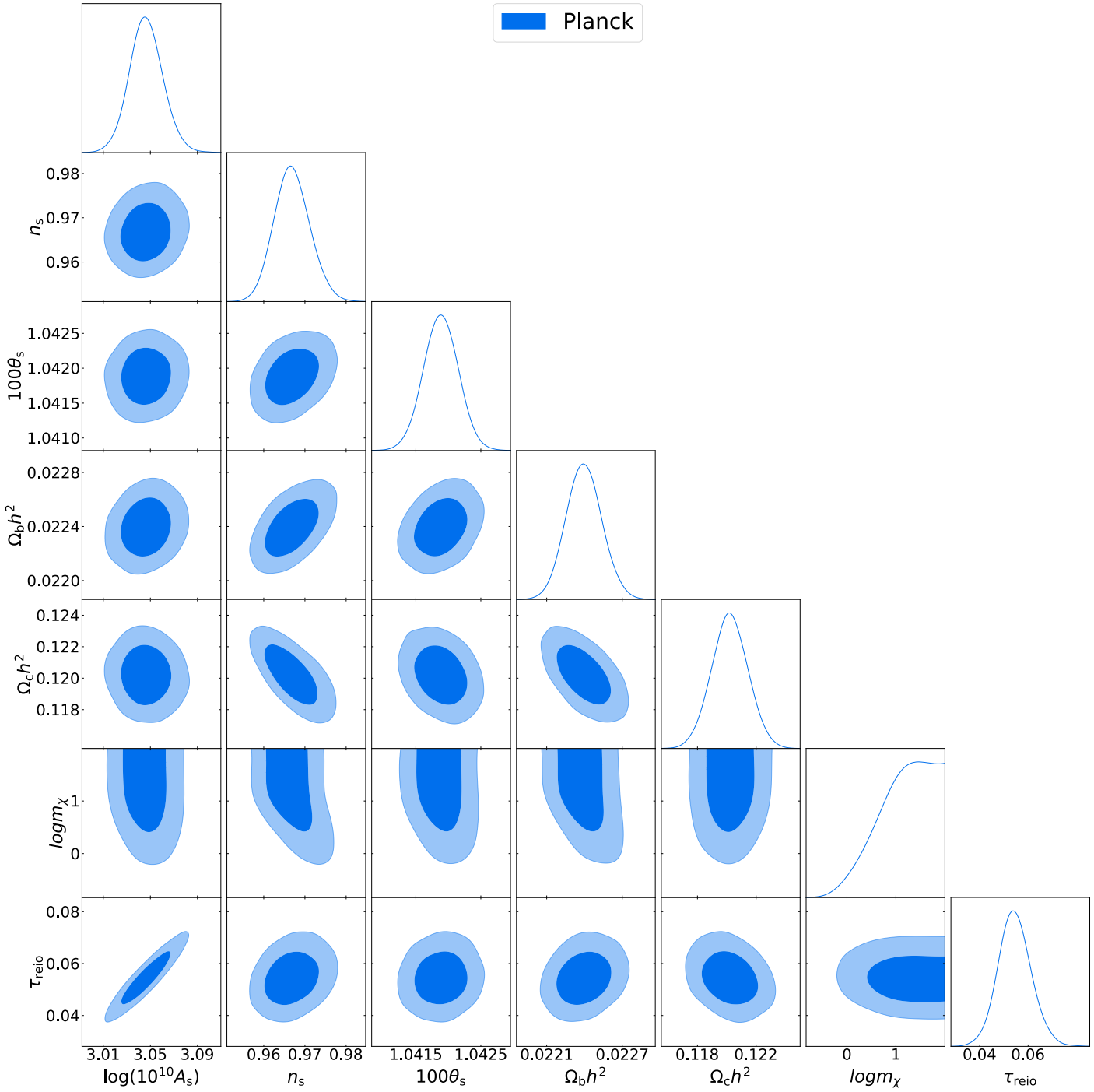
$N_{eff,w}$: $3[\frac{11}{4}(\frac{T_\upsilon}{T_\gamma})_0^3]^{4/3}$, altered by WIMPs

ΔN_υ: the number of equivalent neutrinos beyond the standard model

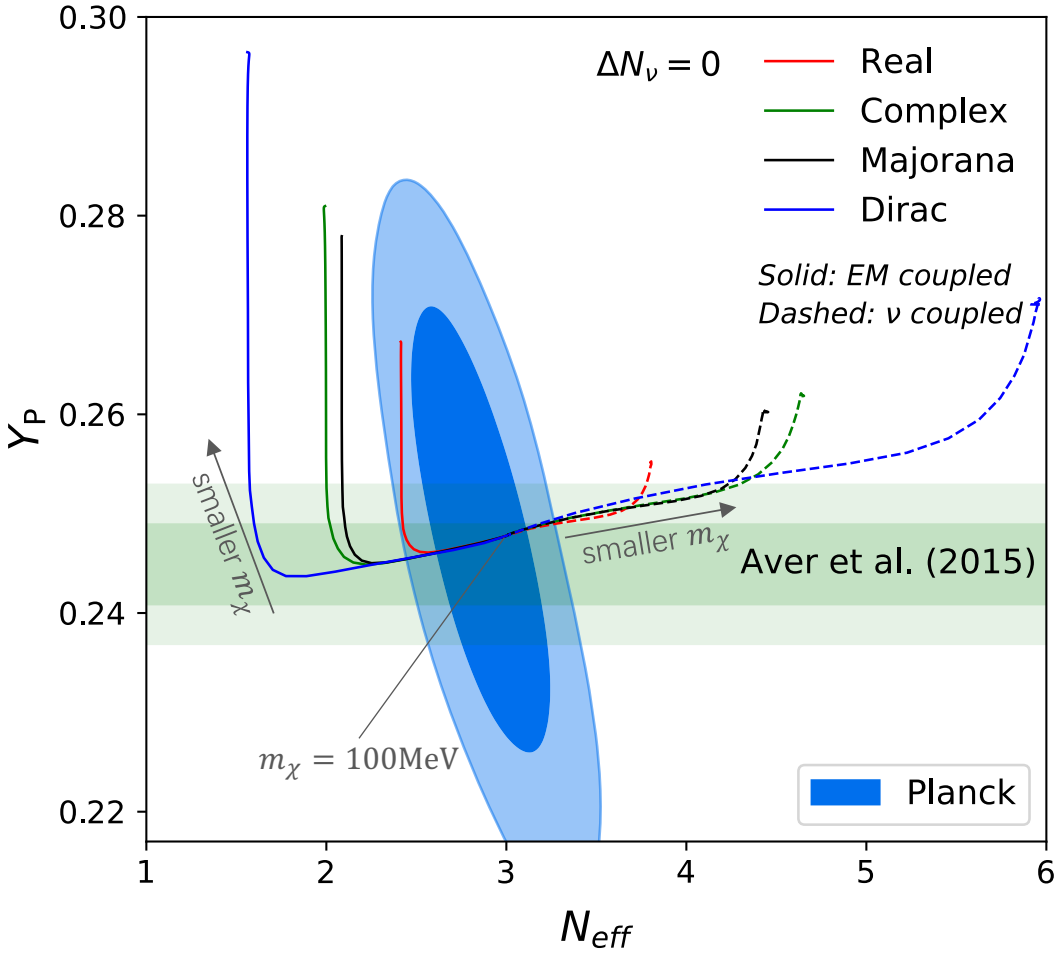
Effects of WIMPs on CMB

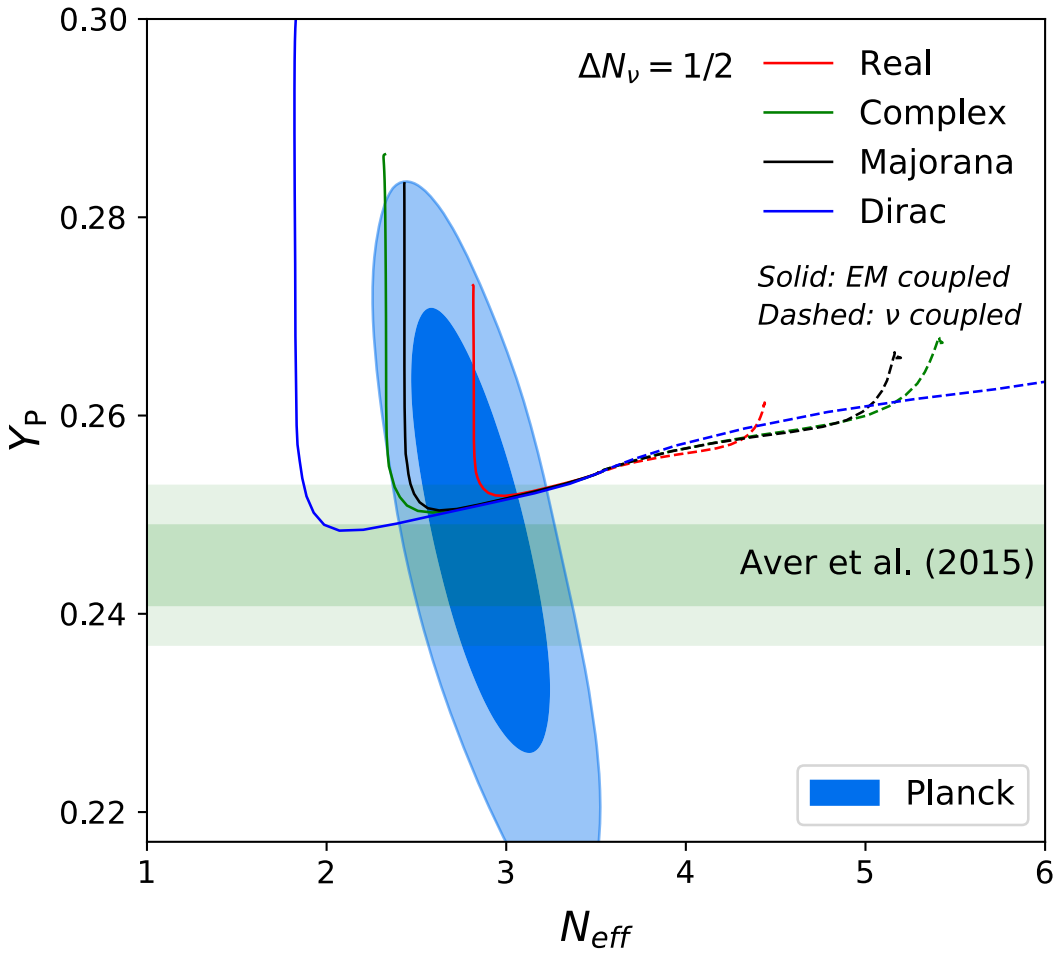


(EM coupled Majorana WIMP)



CMB and BBN constraints





Thanks!