$(g\text{-}2)_\mu$, B-anomalies and DM: A loop model tale

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based on arXiv:2103.09835, 2104.03228 in collaboration with:

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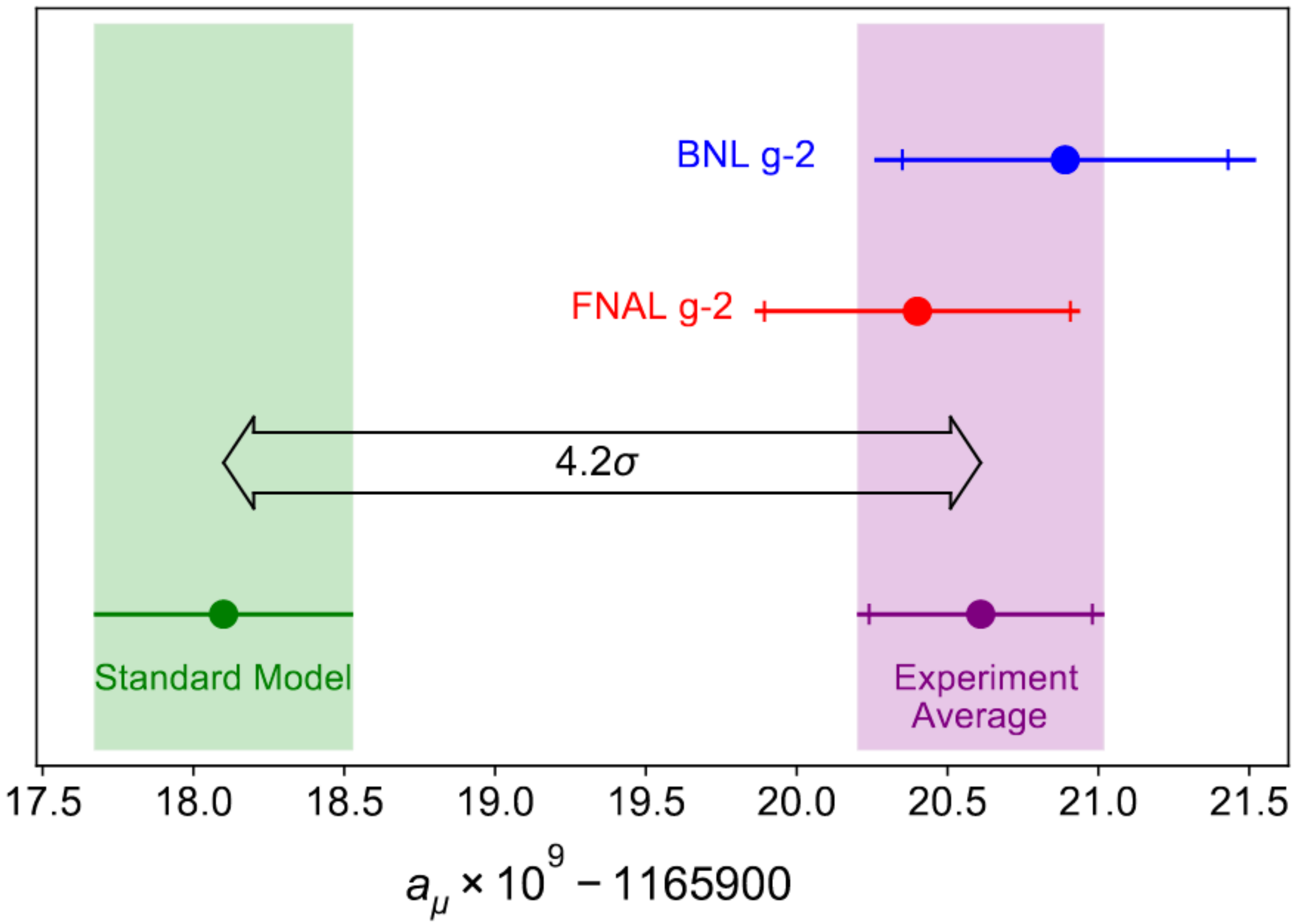
The anomalous muon (g-2)

Striking discrepancy among Theory recommended value and exp. measurements



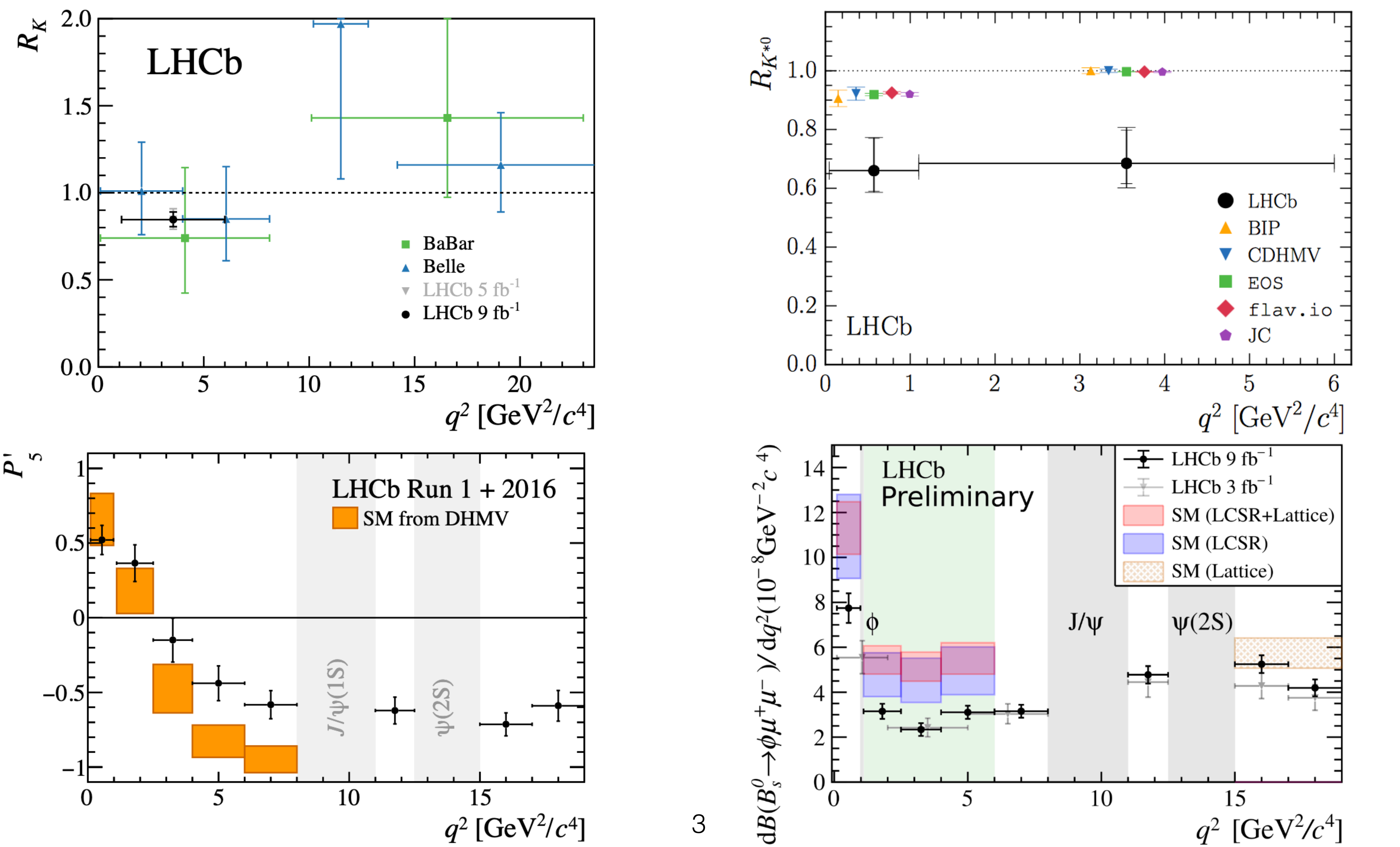
Potentially the single most striking cry for NP observed so far!

Opportunities with Semi-Leptonic B Decays

No tree-level flavour changing neutral currents (FCNC) in the SM

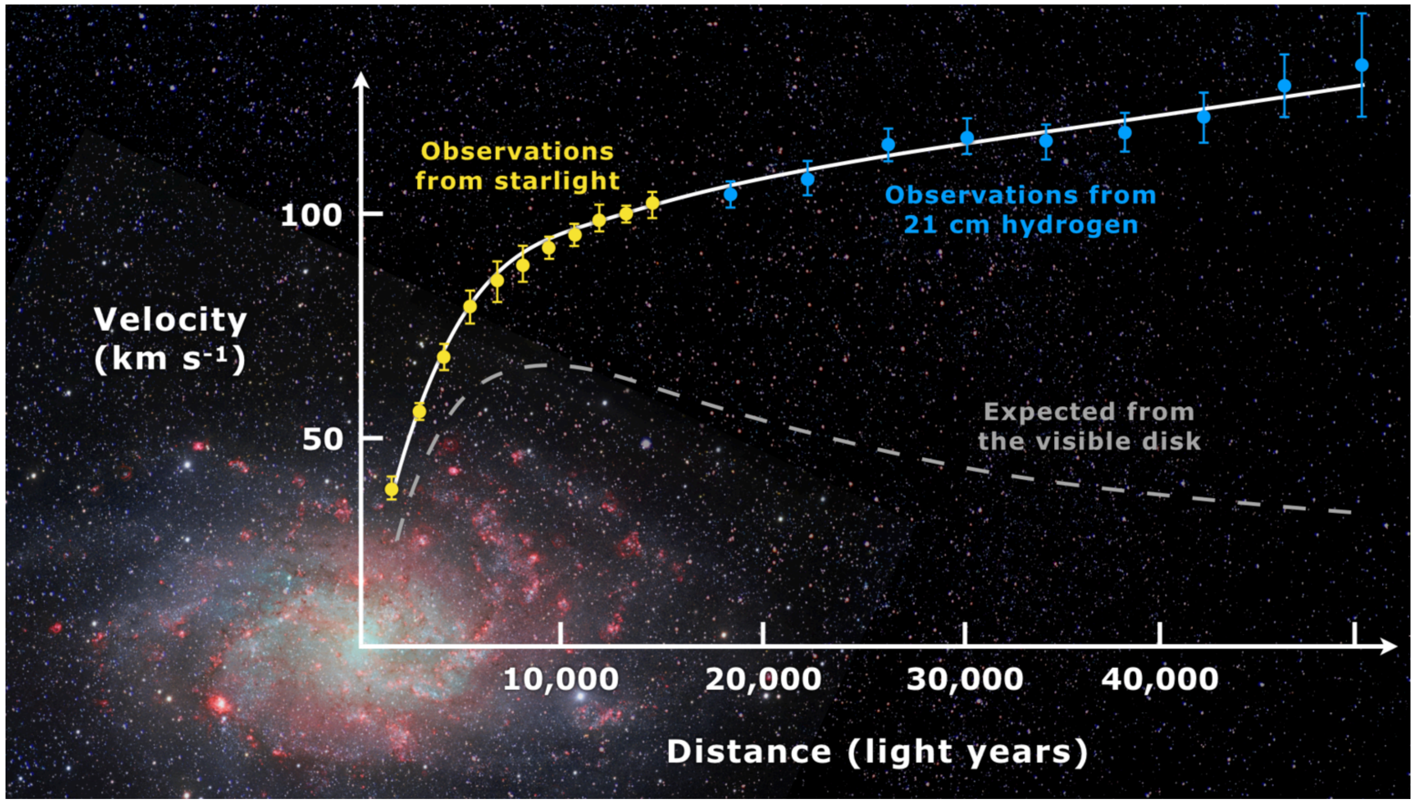
&

Intriguing set of “Anomalies” in data of exclusive B rare Decays

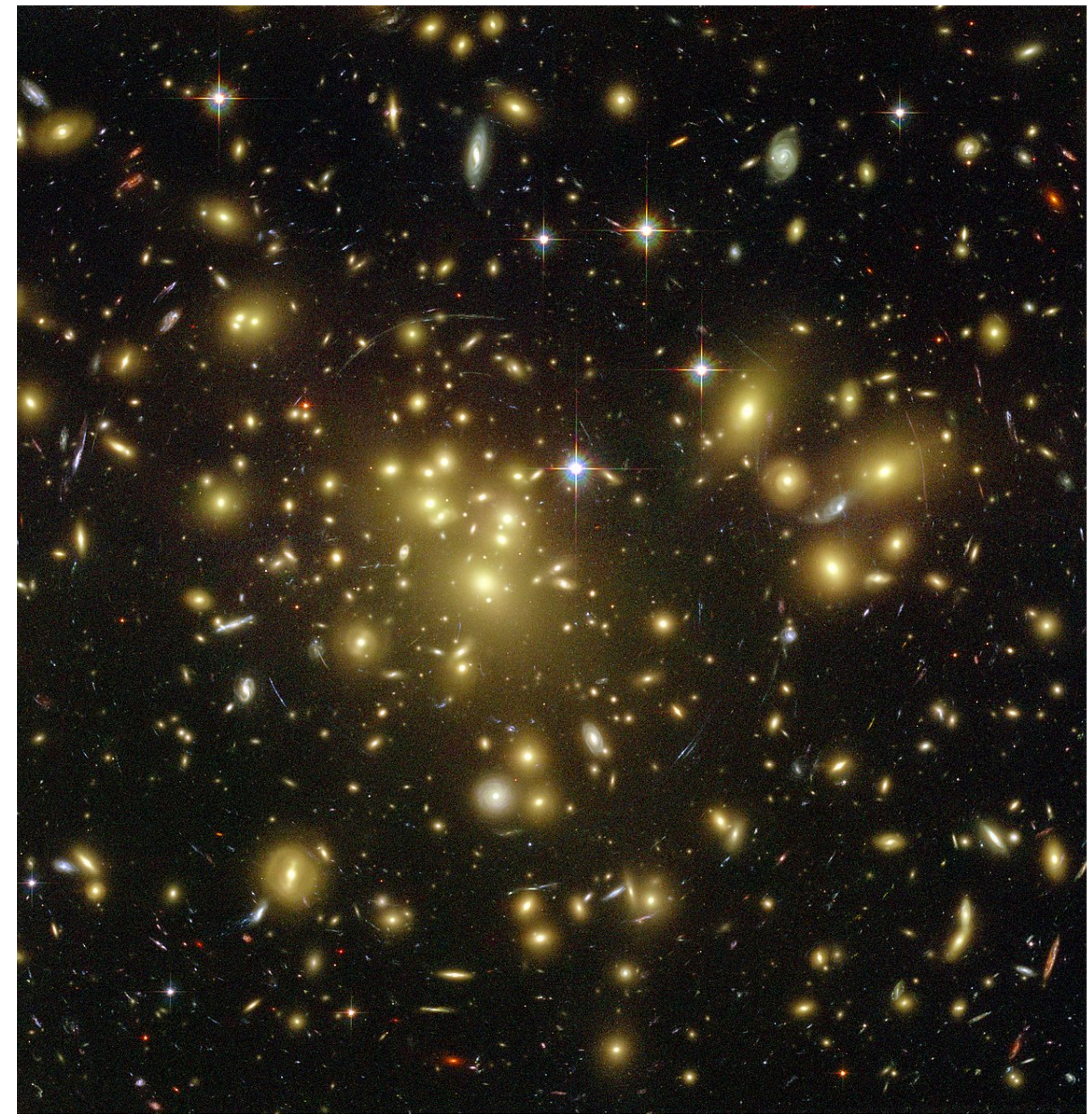


Evidence of DM in the Universe

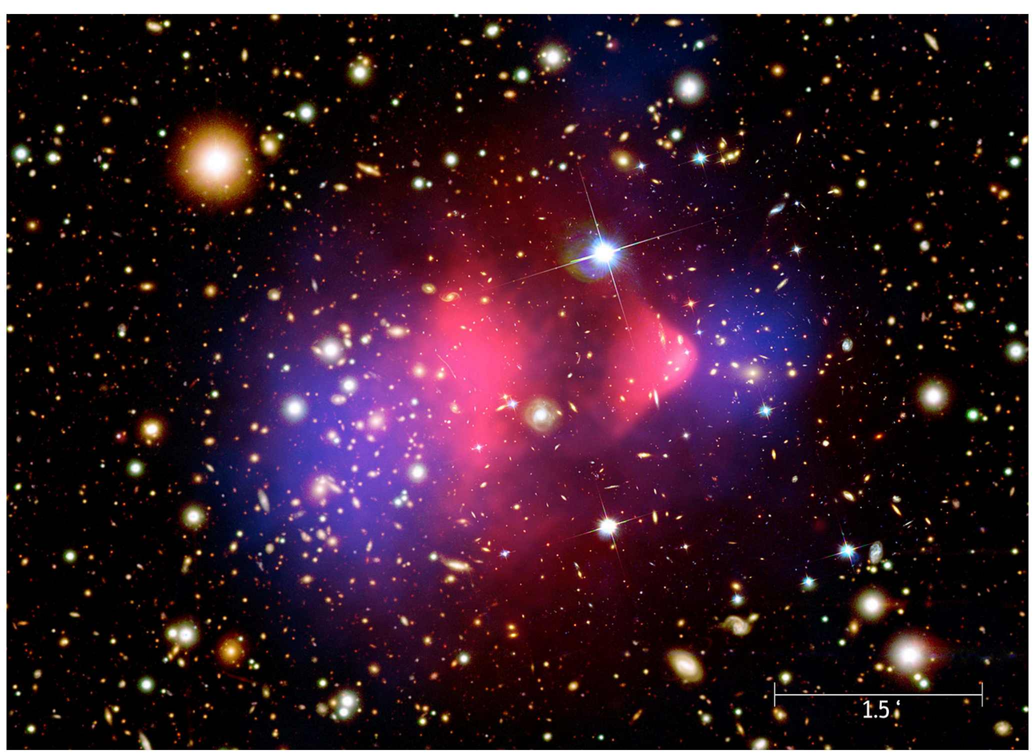
Multiple evidences of presence of DM from Astrophysical observations



Galaxy rotation curves



Gravitational lensing



Bullet Cluster

What kind of NP could be cut for the job?

- g-2

NP coupling to Muons; couplings with both Muon chirality is preferred, inducing also coupling to the SM Higgs to exploit chiral enhancement

$\Longrightarrow$ Leptoquark, or fermion(s) and scalar(s) (allowing for chirality flip)

- $b \to s\mu\mu$

NP coupling to Muons;

$\Longrightarrow$ Leptoquark and/or Zprime, or 2 fermions (1 fermion) and 1 scalar (2 scalars) with the single particle acting as mediator between the sectors

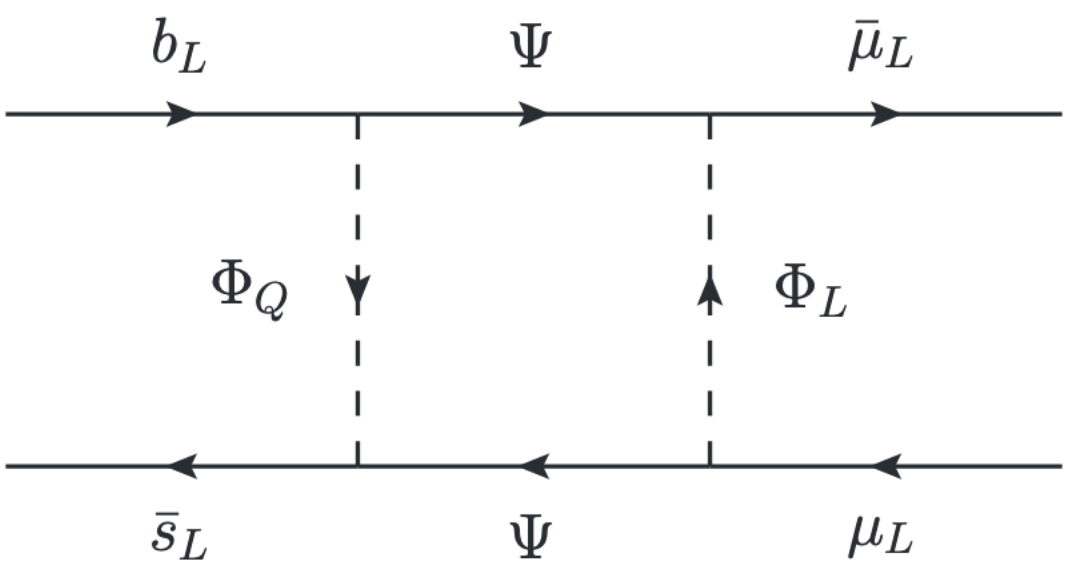
- DM

Stable candidate, neutral and colour singlet; possibly connected to the SM by means of a Dark Sector

$\Longrightarrow$ Axions, ALPs, fermions, scalars…

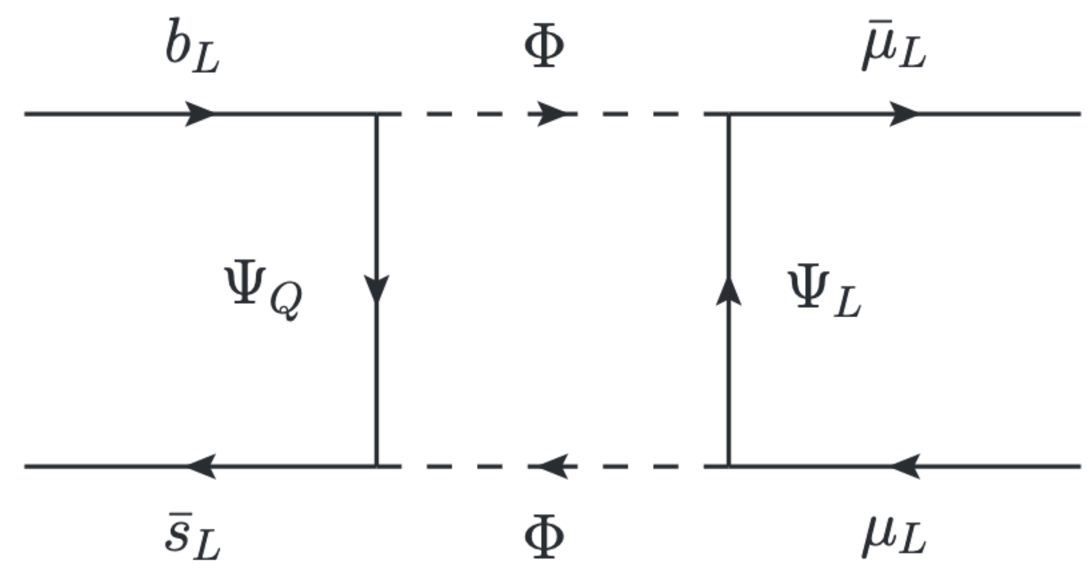
Systematic Studies of All Minimal Loop Models - I

We start by considering B anomalies and DM, so we need 3 fields



$Class\ \mathcal{F}$ – Fermion mediator

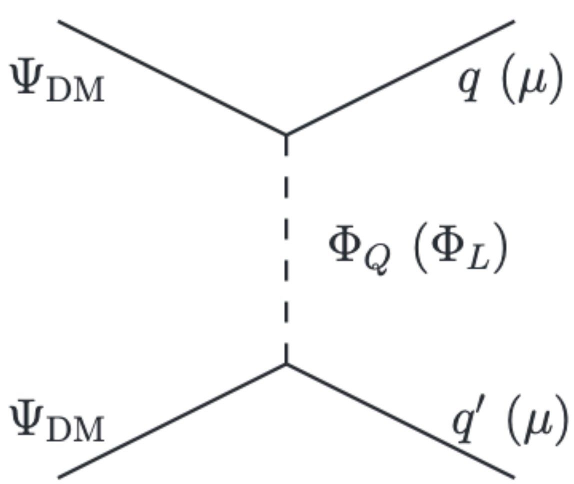
$$\mathcal{L}_\mathcal{F} \supset \Gamma_i^Q \, \bar{Q}_i \, P_R \Psi \, \Phi_Q + \Gamma_i^L \, \bar{L}_i \, P_R \Psi \, \Phi_L + \text{h.c.}$$

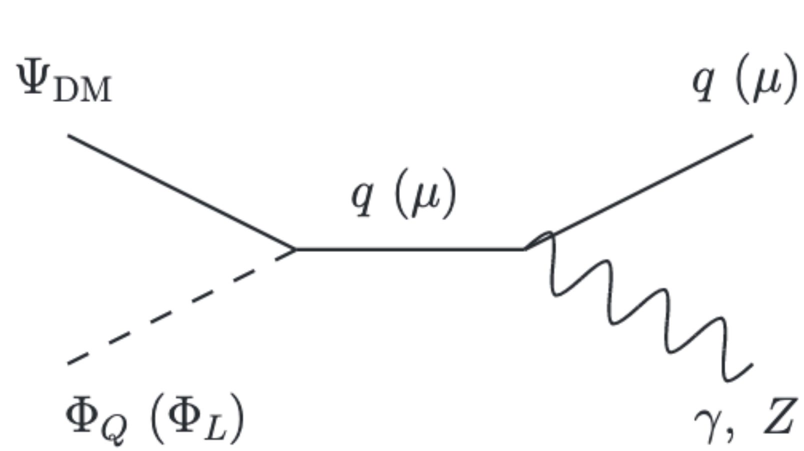


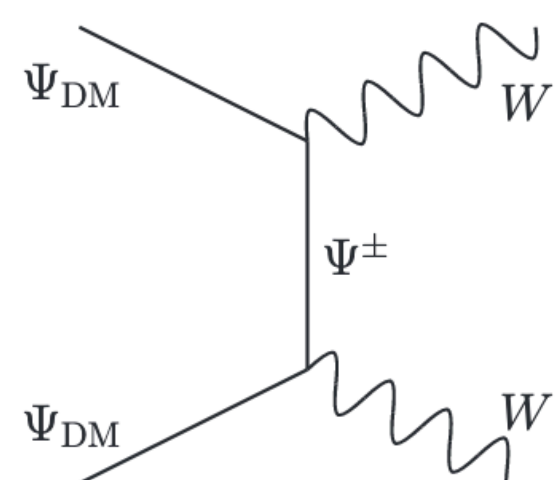
$Class\ \mathcal{S}$ – Scalar mediator

$$\mathcal{L}_\mathcal{S} \supset \Gamma_i^Q \, \bar{Q}_i \, P_R \Psi_Q \, \Phi + \Gamma_i^L \, \bar{L}_i \, P_R \Psi_L \, \Phi + \text{h.c.}$$

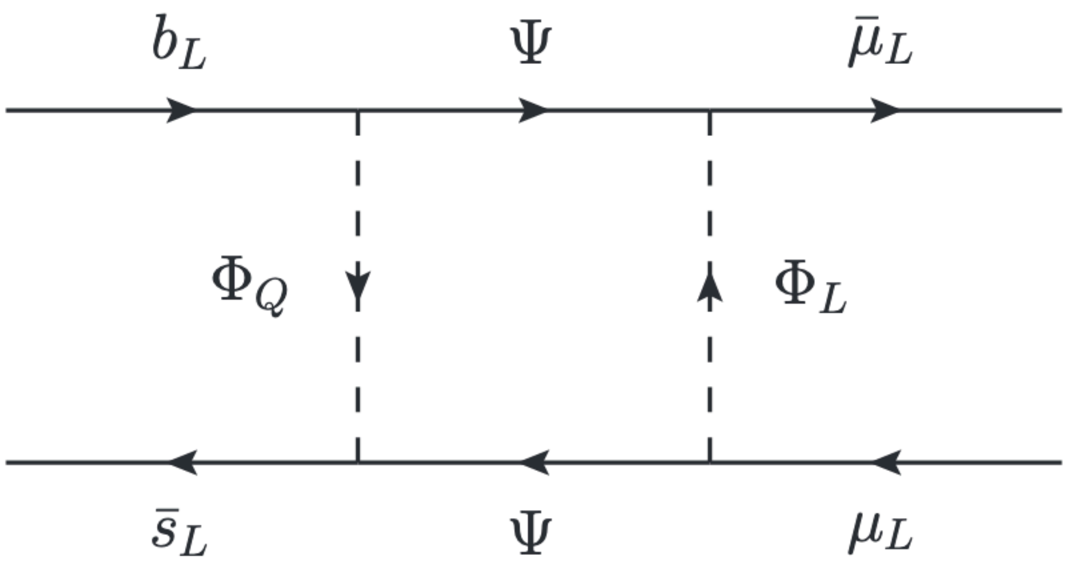
We want a viable DM candidate, which has to be stable and must not be over-abundant (ideally reproducing the relic density)



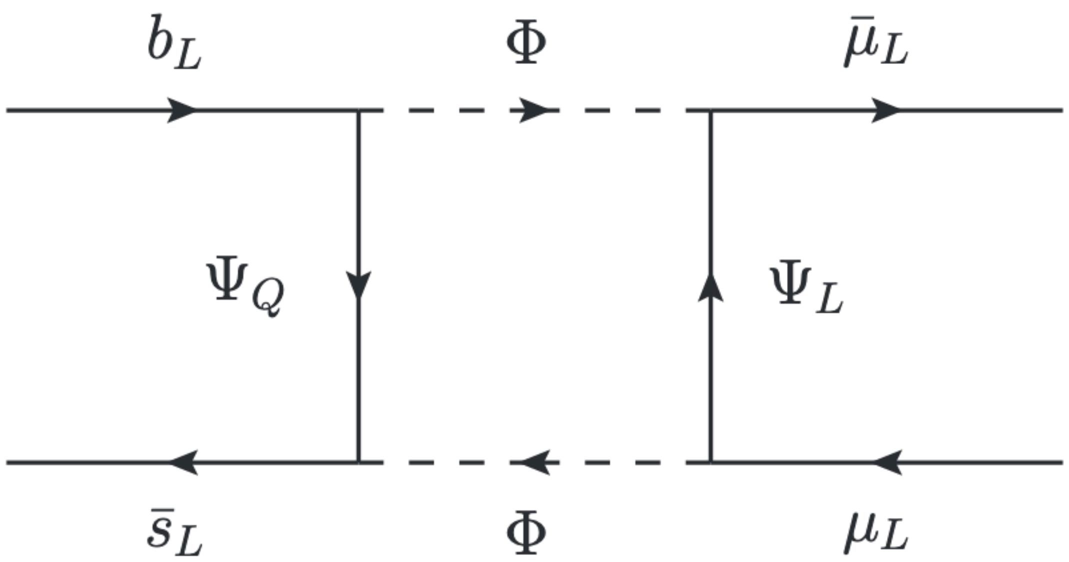




Allowed representations



Class $\mathcal{F}$ – Fermion mediator



Class $\mathcal{S}$ – Scalar mediator

$SU(3)_c$	Φ_Q, Ψ_Q	Φ_L, Ψ_L	Ψ, Φ
A	**3**	**1**	**1**
B	**1**	$\bar{\mathbf{3}}$	**3**

$SU(2)_L$	Φ_Q, Ψ_Q	Φ_L, Ψ_L	Ψ, Φ
I	**2**	**2**	**1**
II	**1**	**1**	**2**
III	**3**	**3**	**2**
IV	**2**	**2**	**3**
V	**3**	**1**	**2**
VI	**1**	**3**	**2**

$U(1)_Y$	Φ_Q, Ψ_Q	Φ_L, Ψ_L	Ψ, Φ
	$1/6 - X$	$-1/2 - X$	X

- X chosen so that there is a neutral state (DM candidate)
- Fermionic DM only allowed for SU(2) singlet or triplet (doublet would require the presence of a additional Majorana fermions)
- Scalar DM allowed for any SU(2) rep. (doublet allowed by suitable mass splitting between CP-even and CP-odd, i.e. Inert Doublet - more details on this later)

Allowed representations

Label	Φ_Q	Φ_L	Ψ
$\mathcal{F}_{\mathrm{IA};-1}$	$(\mathbf{3},\mathbf{2},7/6)$	$(\mathbf{1},\mathbf{2},1/2)^\star$	$(\mathbf{1},\mathbf{1},-1)$
$\mathcal{F}_{\mathrm{IA};0}$	$(\mathbf{3},\mathbf{2},1/6)$	$(\mathbf{1},\mathbf{2},-1/2)^\star$	$(\mathbf{1},\mathbf{1},0)^\star$
$\mathcal{F}_{\mathrm{IB};-1/3}$	$(\mathbf{1},\mathbf{2},1/2)^\star$	$(\bar{\mathbf{3}},\mathbf{2},-1/6)$	$(\mathbf{3},\mathbf{1},-1/3)$
$\mathcal{F}_{\mathrm{IB};2/3}$	$(\mathbf{1},\mathbf{2},-1/2)^\star$	$(\bar{\mathbf{3}},\mathbf{2},-7/6)$	$(\mathbf{3},\mathbf{1},2/3)$
$\mathcal{F}_{\mathrm{IIA}}$	$(\mathbf{3},\mathbf{1},2/3)$	$(\mathbf{1},\mathbf{1},0)^\star$	$(\mathbf{1},\mathbf{2},-1/2)$
$\mathcal{F}_{\mathrm{IIB}}$	$(\mathbf{1},\mathbf{1},0)^\star$	$(\bar{\mathbf{3}},\mathbf{1},-2/3)$	$(\mathbf{3},\mathbf{2},1/6)$
$\mathcal{F}_{\mathrm{IIIA};-3/2}$	$(\mathbf{3},\mathbf{3},5/3)$	$(\mathbf{1},\mathbf{3},1)^\star$	$(\mathbf{1},\mathbf{2},-3/2)$
$\mathcal{F}_{\mathrm{IIIA};-1/2}$	$(\mathbf{3},\mathbf{3},2/3)$	$(\mathbf{1},\mathbf{3},0)^\star$	$(\mathbf{1},\mathbf{2},-1/2)$
$\mathcal{F}_{\mathrm{IIIA};1/2}$	$(\mathbf{3},\mathbf{3},-1/3)$	$(\mathbf{1},\mathbf{3},-1)^\star$	$(\mathbf{1},\mathbf{2},1/2)$
$\mathcal{F}_{\mathrm{IIIB};-5/6}$	$(\mathbf{1},\mathbf{3},1)^\star$	$(\bar{\mathbf{3}},\mathbf{3},1/3)$	$(\mathbf{3},\mathbf{2},-5/6)$
$\mathcal{F}_{\mathrm{IIIB};1/6}$	$(\mathbf{1},\mathbf{3},0)^\star$	$(\bar{\mathbf{3}},\mathbf{3},-2/3)$	$(\mathbf{3},\mathbf{2},1/6)$
$\mathcal{F}_{\mathrm{IIIB};7/6}$	$(\mathbf{1},\mathbf{3},-1)^\star$	$(\bar{\mathbf{3}},\mathbf{3},-5/3)$	$(\mathbf{3},\mathbf{2},7/6)$
$\mathcal{F}_{\mathrm{IVA};-1}$	$(\mathbf{3},\mathbf{2},7/6)$	$(\mathbf{1},\mathbf{2},1/2)^\star$	$(\mathbf{1},\mathbf{3},-1)$
$\mathcal{F}_{\mathrm{IVA};0}$	$(\mathbf{3},\mathbf{2},1/6)$	$(\mathbf{1},\mathbf{2},-1/2)^\star$	$(\mathbf{1},\mathbf{3},0)^\star$
$\mathcal{F}_{\mathrm{IVB};-1/3}$	$(\mathbf{1},\mathbf{2},1/2)^\star$	$(\bar{\mathbf{3}},\mathbf{2},-1/6)$	$(\mathbf{3},\mathbf{3},-1/3)$
$\mathcal{F}_{\mathrm{IVB};2/3}$	$(\mathbf{1},\mathbf{2},-1/2)^\star$	$(\bar{\mathbf{3}},\mathbf{2},-7/6)$	$(\mathbf{3},\mathbf{3},2/3)$
$\mathcal{F}_{\mathrm{VA}}$	$(\mathbf{3},\mathbf{3},2/3)$	$(\mathbf{1},\mathbf{1},0)^\star$	$(\mathbf{1},\mathbf{2},-1/2)$
$\mathcal{F}_{\mathrm{VB};-5/6}$	$(\mathbf{1},\mathbf{3},1)^\star$	$(\bar{\mathbf{3}},\mathbf{1},1/3)$	$(\mathbf{3},\mathbf{2},-5/6)$
$\mathcal{F}_{\mathrm{VB};1/6}$	$(\mathbf{1},\mathbf{3},0)^\star$	$(\bar{\mathbf{3}},\mathbf{1},-2/3)$	$(\mathbf{3},\mathbf{2},1/6)$
$\mathcal{F}_{\mathrm{VB};7/6}$	$(\mathbf{1},\mathbf{3},-1)^\star$	$(\bar{\mathbf{3}},\mathbf{1},-5/3)$	$(\mathbf{3},\mathbf{2},7/6)$
$\mathcal{F}_{\mathrm{VIA};-3/2}$	$(\mathbf{3},\mathbf{1},5/3)$	$(\mathbf{1},\mathbf{3},1)^\star$	$(\mathbf{1},\mathbf{2},-3/2)$
$\mathcal{F}_{\mathrm{VIA};-1/2}$	$(\mathbf{3},\mathbf{1},2/3)$	$(\mathbf{1},\mathbf{3},0)^\star$	$(\mathbf{1},\mathbf{2},-1/2)$
$\mathcal{F}_{\mathrm{VIA};1/2}$	$(\mathbf{3},\mathbf{1},-1/3)$	$(\mathbf{1},\mathbf{3},-1)^\star$	$(\mathbf{1},\mathbf{2},1/2)$
$\mathcal{F}_{\mathrm{VIB}}$	$(\mathbf{1},\mathbf{1},0)^\star$	$(\bar{\mathbf{3}},\mathbf{3},-2/3)$	$(\mathbf{3},\mathbf{2},1/6)$

Label	Ψ_Q	Ψ_L	Φ
$\mathcal{S}_{\mathrm{IA}}$	$(\mathbf{3},\mathbf{2},1/6)$	$(\mathbf{1},\mathbf{2},-1/2)$	$(\mathbf{1},\mathbf{1},0)^\star$
$\mathcal{S}_{\mathrm{IIA};-1/2}$	$(\mathbf{3},\mathbf{1},2/3)$	$(\mathbf{1},\mathbf{1},0)^\star$	$(\mathbf{1},\mathbf{2},-1/2)^\star$
$\mathcal{S}_{\mathrm{IIA};1/2}$	$(\mathbf{3},\mathbf{1},-1/3)$	$(\mathbf{1},\mathbf{1},-1)$	$(\mathbf{1},\mathbf{2},1/2)^\star$
$\mathcal{S}_{\mathrm{IIB}}$	$(\mathbf{1},\mathbf{1},0)^\star$	$(\bar{\mathbf{3}},\mathbf{1},-2/3)$	$(\mathbf{3},\mathbf{2},1/6)$
$\mathcal{S}_{\mathrm{IIIA};-1/2}$	$(\mathbf{3},\mathbf{3},2/3)$	$(\mathbf{1},\mathbf{3},0)^\star$	$(\mathbf{1},\mathbf{2},-1/2)^\star$
$\mathcal{S}_{\mathrm{IIIA};1/2}$	$(\mathbf{3},\mathbf{3},-1/3)$	$(\mathbf{1},\mathbf{3},-1)$	$(\mathbf{1},\mathbf{2},1/2)^\star$
$\mathcal{S}_{\mathrm{IIIB}}$	$(\mathbf{1},\mathbf{3},0)^\star$	$(\bar{\mathbf{3}},\mathbf{3},-2/3)$	$(\mathbf{3},\mathbf{2},1/6)$
$\mathcal{S}_{\mathrm{IVA};-1}$	$(\mathbf{3},\mathbf{2},7/6)$	$(\mathbf{1},\mathbf{2},1/2)$	$(\mathbf{1},\mathbf{3},-1)^\star$
$\mathcal{S}_{\mathrm{IVA};0}$	$(\mathbf{3},\mathbf{2},1/6)$	$(\mathbf{1},\mathbf{2},-1/2)$	$(\mathbf{1},\mathbf{3},0)^\star$
$\mathcal{S}_{\mathrm{IVA};1}$	$(\mathbf{3},\mathbf{2},-5/6)$	$(\mathbf{1},\mathbf{2},-3/2)$	$(\mathbf{1},\mathbf{3},1)^\star$
$\mathcal{S}_{\mathrm{VA};-1/2}$	$(\mathbf{3},\mathbf{3},2/3)$	$(\mathbf{1},\mathbf{1},0)^\star$	$(\mathbf{1},\mathbf{2},-1/2)^\star$
$\mathcal{S}_{\mathrm{VA};1/2}$	$(\mathbf{3},\mathbf{3},-1/3)$	$(\mathbf{1},\mathbf{1},-1)$	$(\mathbf{1},\mathbf{2},1/2)^\star$
$\mathcal{S}_{\mathrm{VB}}$	$(\mathbf{1},\mathbf{3},0)^\star$	$(\bar{\mathbf{3}},\mathbf{1},-2/3)$	$(\mathbf{3},\mathbf{2},1/6)$
$\mathcal{S}_{\mathrm{VIA};-1/2}$	$(\mathbf{3},\mathbf{1},2/3)$	$(\mathbf{1},\mathbf{3},0)^\star$	$(\mathbf{1},\mathbf{2},-1/2)^\star$
$\mathcal{S}_{\mathrm{VIA};1/2}$	$(\mathbf{3},\mathbf{1},-1/3)$	$(\mathbf{1},\mathbf{3},-1)$	$(\mathbf{1},\mathbf{2},1/2)^\star$
$\mathcal{S}_{\mathrm{VIB}}$	$(\mathbf{1},\mathbf{1},0)^\star$	$(\bar{\mathbf{3}},\mathbf{3},-2/3)$	$(\mathbf{3},\mathbf{2},1/6)$

DM multiplets marked by *, highlighted models studied in detail in the paper

Flavour bounds

Not only B-anomalies, but also B_s-$B_s$bar mixing!

$$\left(\delta C_\mu^9\right)_\mathcal{F} = -\left(\delta C_\mu^{10}\right)_\mathcal{F} = \frac{\sqrt{2}}{4 G_F V_{tb} V_{ts}^*} \frac{\Gamma_Q |\Gamma_\mu^L|^2}{32\pi\alpha_{\rm EM} M_\Psi^2} \left(\eta F\left(x_Q, x_L\right) + 2\chi^M \eta^M G\left(x_Q, x_L\right)\right),$$

$$\left(\delta C^{B\bar{B}}\right)_\mathcal{F} = \frac{\Gamma_Q^2}{128\pi^2 M_\Psi^2} \left(\eta_{BB} F\left(x_Q, x_L\right) + 2\chi^M \eta^M G\left(x_Q, x_L\right)\right),$$

$$\left(\delta C_\mu^9\right)_\mathcal{S} = -\left(\delta C_\mu^{10}\right)_\mathcal{S} = -\frac{\sqrt{2}}{4 G_F V_{tb} V_{ts}^*} \frac{\Gamma_Q |\Gamma_\mu^L|^2}{32\pi\alpha_{\rm EM} M_\Phi^2} \left(\eta - \chi^M \eta^M\right) F\left(y_Q, y_L\right),$$

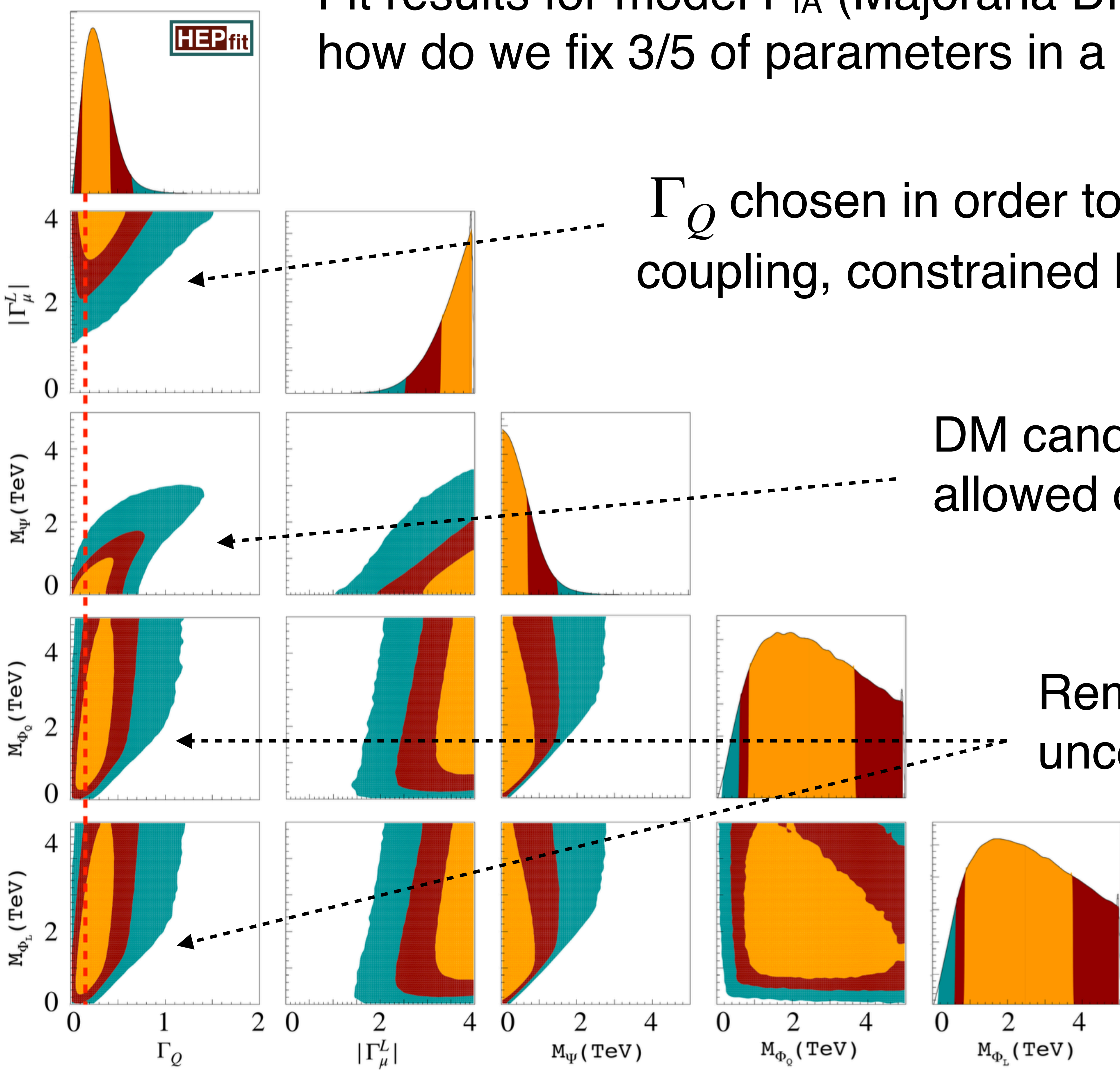
$$\left(\delta C^{B\bar{B}}\right)_\mathcal{S} = \frac{\Gamma_Q^2}{128\pi^2 M_\Phi^2} \left(\eta_{BB} - \chi^M \eta^M\right) F\left(y_Q, y_L\right),$$

We start by making a combined fit to Flavour anomalies and B_s-$B_s$bar mixing, in order to extract allowed ranges for 3 masses and 2 couplings

- We require that the DM candidate has to be the lightest NP state
- We allow the remaining masses to be as heavy as 5 TeV
- We allow the lepton coupling in the range [0, 4], while for the quark coupling [0, 2] in models of class F and [-2, 0] in models of class S, in order to reproduce the desired sign in C9 (no effect on B_s-$B_s$bar mixing)

Flavour bounds

Fit results for model F_{IA} (Majorana DM) to extract benchmarks: how do we fix 3/5 of parameters in a 2D plot?



Γ_Q chosen in order to minimise the lepton coupling, constrained by B_s-$B_s$bar mixing

DM candidate mass allowed only up to ~ 1 TeV

Remaining masses largely unconstrained at the 2σ level

Main LHC constraints

A pair of heavy NP candidates can be produced ad LHC by QCD / EW Drell-Yann mediated processes, sequently decaying in jets/leptons + DM

- DM coupling to both heavy states (e.g. scalar DM in class S)

$$pp \to \Psi_Q \Psi_Q \to q q' + \not{E}_T$$

$$pp \to \Psi_L \Psi_L \to \mu^+ \mu^- + \not{E}_T$$

- DM coupling to only 1 heavy state (e.g. fermion DM in class S)

$$pp \to \Phi\Phi \to q q' + \not{E}_T$$

$$pp \to \Psi_L \Psi_L \to \mu^+ \mu^- + \Phi\Phi \to \mu^+ \mu^- + q q' + \not{E}_T$$

or

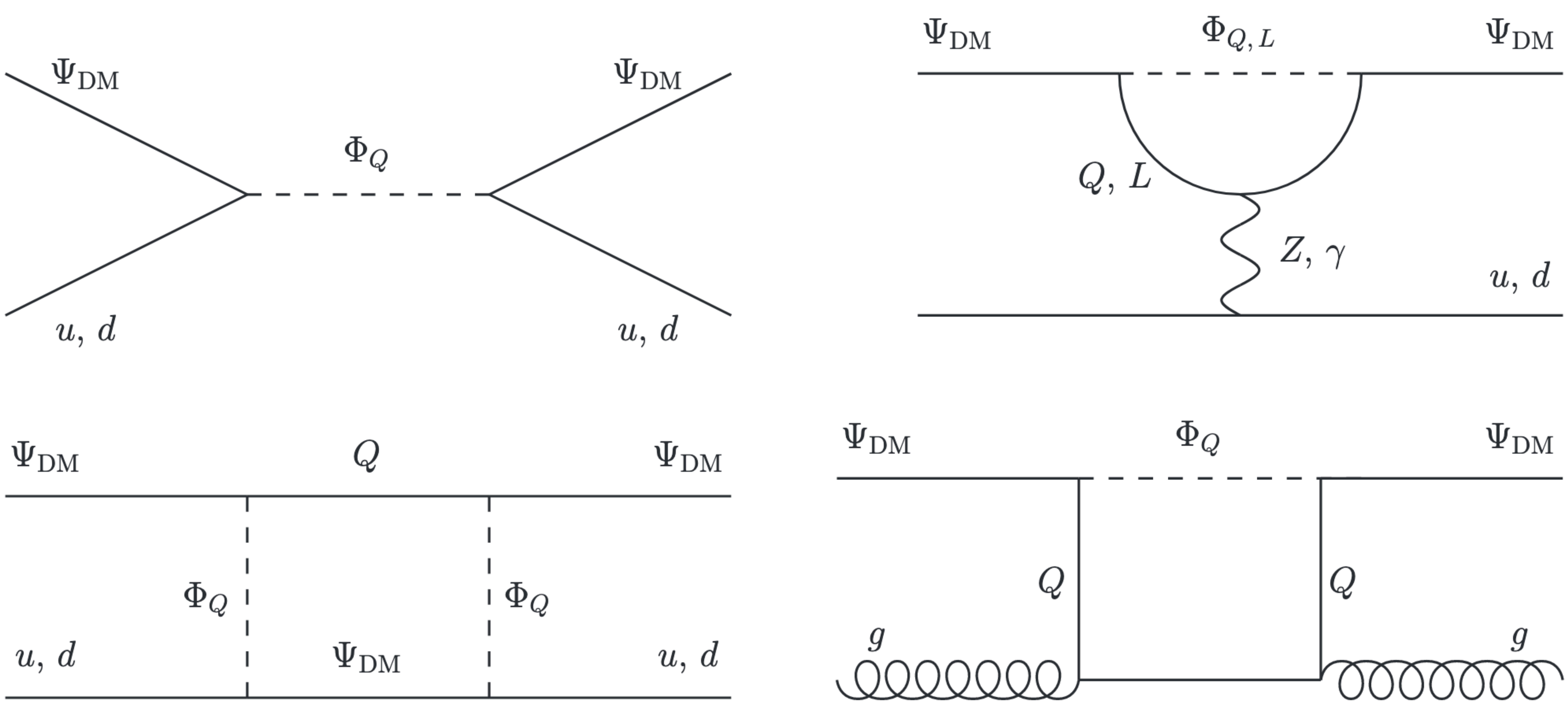
$$pp \to \Phi\Phi \to \mu^+ \mu^- + \not{E}_T$$

$$pp \to \Psi_Q \Psi_Q \to q q' + \Phi\Phi \to q q' + \mu^+ \mu^- + \not{E}_T$$

We will recast LHC SUSY searches of jets and/or leptons + ME

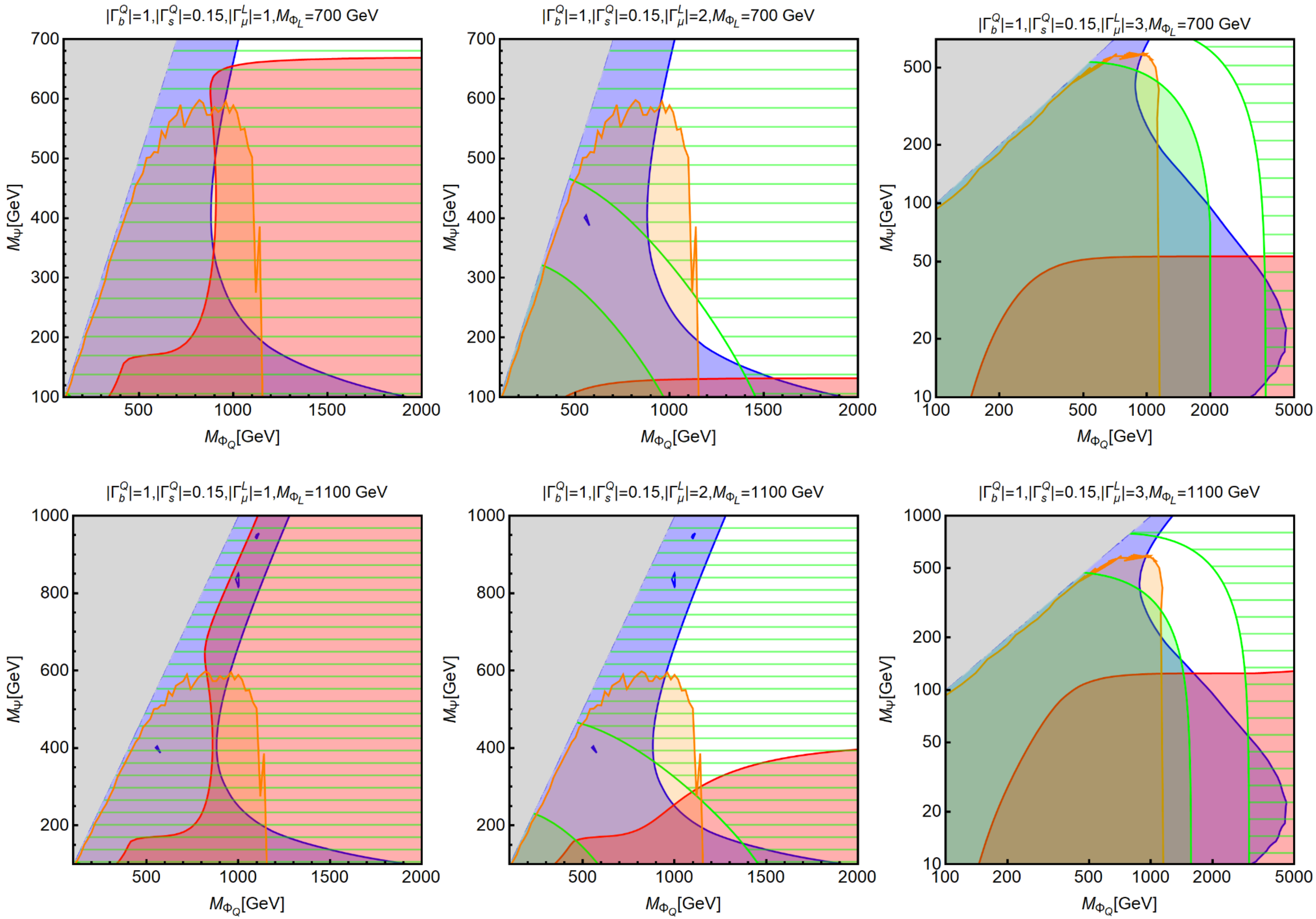
Main DM constraints

- DM should reproduced the measured relic density $\Omega_{\rm DM}h^2 = 0.1199 \pm 0.0022$ (or at most be under-abundant)
- DM should evade DD constraints, where non-relativistic DM scatters with nucleons in an atom. Principal constrains come from Xenon1T experiment



F_{IA} with Majorana DM

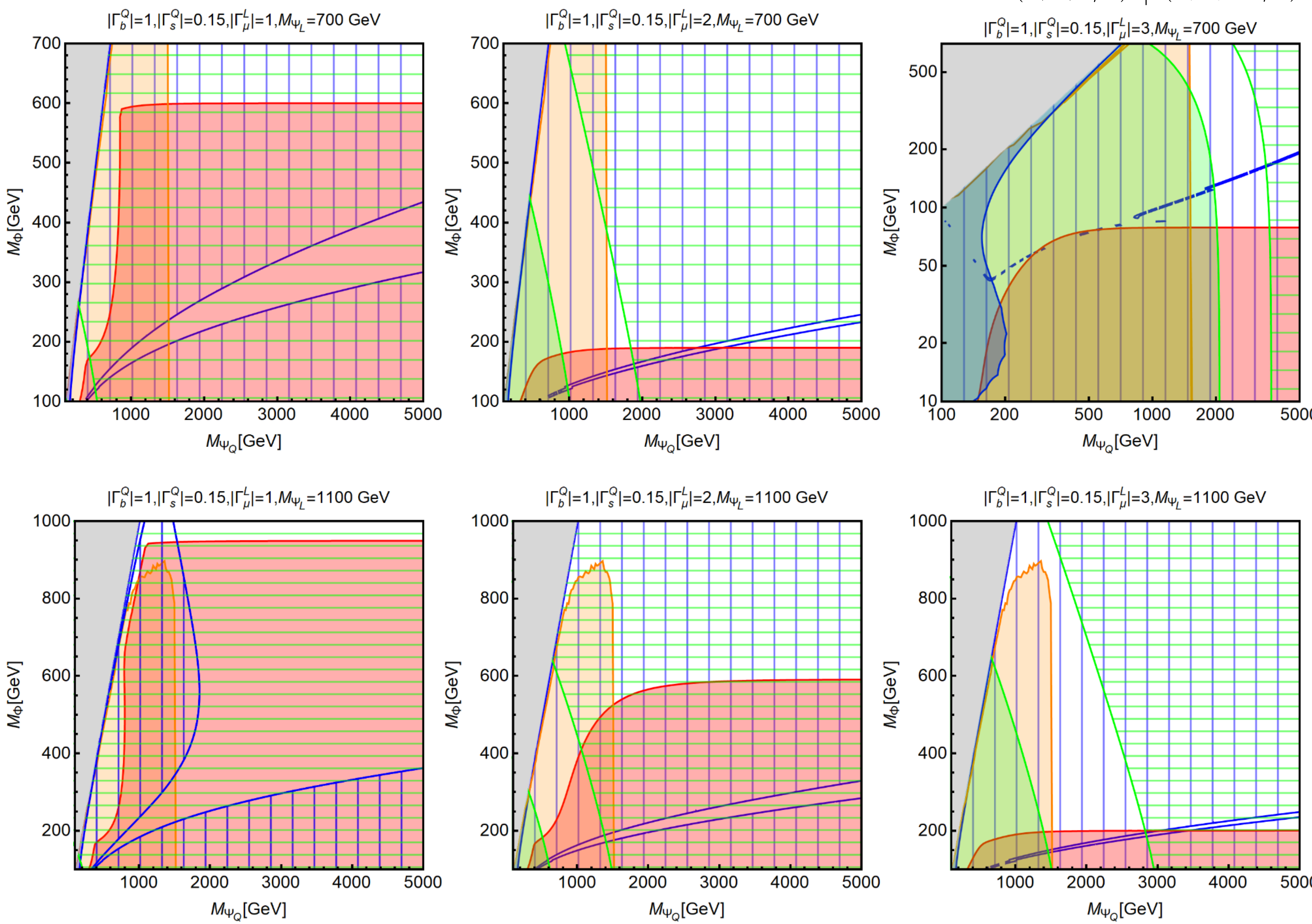
Φ_Q	Φ_L	Ψ
$(\mathbf{3},\mathbf{2},1/6)$	$(\mathbf{1},\mathbf{2},-1/2)$	$(\mathbf{1},\mathbf{1},0)^\star$



A viable model capable to address B-anomalies while evading LHC bounds and DM Direct Detection, providing also the observed relic density! Allowed only with Majorana, since Dirac interactions with Z/γ induces strong constraints from DD

S_{IA} with complex DM

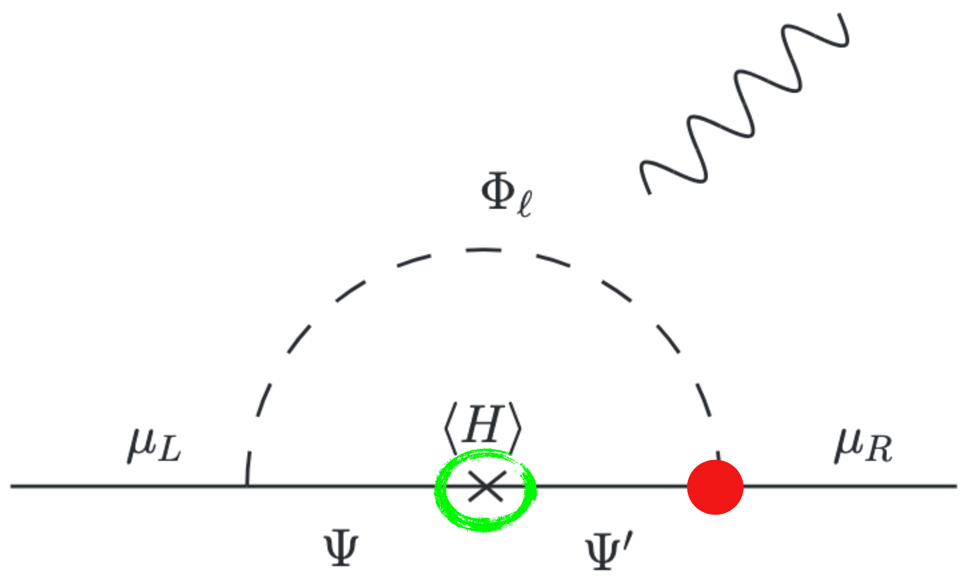
Ψ_Q	Ψ_L	Φ
$(\mathbf{3},\mathbf{2},1/6)$	$(\mathbf{1},\mathbf{2},-1/2)$	$(\mathbf{1},\mathbf{1},0)^\star$

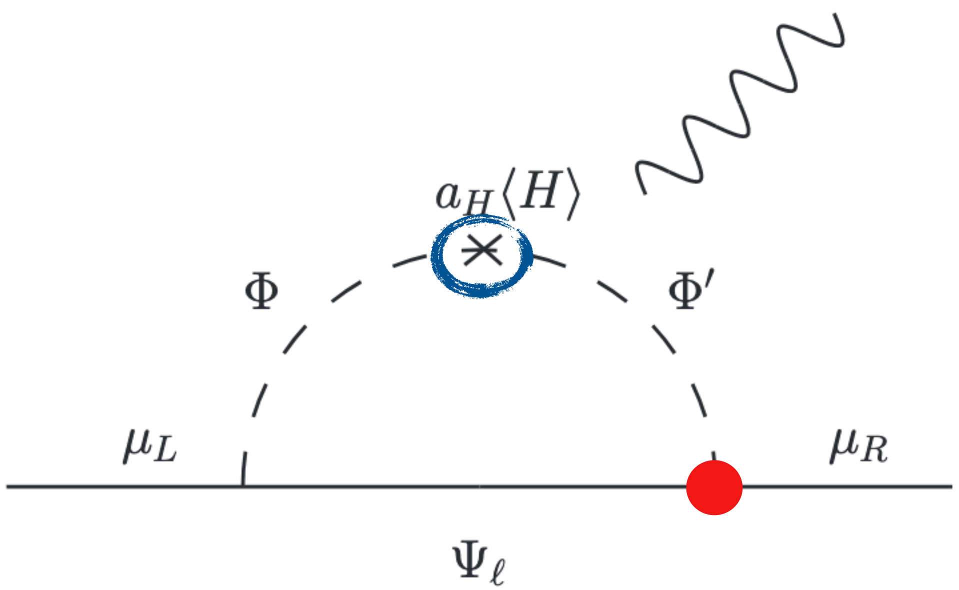


Viable model only if O(100KeV) mass splitting is assumed between CP-even and CP-odd DM comp. (avoiding DD constr. due to non-relativistic scattering)

Systematic Studies of All Minimal Loop Models - II

We're adding also the muon (g-2), so we allow also muon RH couplings (only 4 fields)





- Fermion flavour mediator

$$\mathcal{L}_{\mathcal{F}}^{\Phi_\ell\Phi'_\ell} \supset \Gamma_i^Q\,\bar{Q}_i\,P_R\Psi\,\Phi_q + \Gamma_i^L\,\bar{L}_i\,P_R\Psi\,\Phi_\ell + \Gamma_i^E\,\bar{E}_i\,P_L\Psi\,\Phi'_\ell + a_H\Phi_\ell^\dagger\Phi'_\ell\,H + \text{h.c.}$$

$$\mathcal{L}_{\mathcal{F}}^{\Psi\Psi'} \supset \Gamma_i^Q\,\bar{Q}_i\,P_R\Psi\,\Phi_q + \Gamma_i^L\,\bar{L}_i\,P_R\Psi\,\Phi_\ell + \Gamma_i^E\,\bar{E}_i\,P_L\Psi'\,\Phi_\ell + \lambda_{HL}\bar{\Psi}\,P_L\Psi'\,H + \lambda_{HR}\bar{\Psi}P_R\Psi' H + \text{h.c.}$$

- Scalar flavour mediator

$$\mathcal{L}_{\mathcal{S}}^{\Phi\Phi'} \supset \Gamma_i^Q\,\bar{Q}_i\,P_R\Psi_q\,\Phi + \Gamma_i^L\,\bar{L}_i\,P_R\Psi_\ell\,\Phi + \Gamma_i^E\,\bar{E}_i\,P_L\Psi_\ell\,\Phi' + a_H\Phi^\dagger\Phi'\,H + \text{h.c.}$$

$$\mathcal{L}_{\mathcal{S}}^{\Psi_\ell\Psi'_\ell} \supset \Gamma_i^Q\,\bar{Q}_i\,P_R\Psi_q\,\Phi + \Gamma_i^L\,\bar{L}_i\,P_R\Psi_\ell\,\Phi + \Gamma_i^E\,\bar{E}_i\,P_L\Psi'_\ell\,\Phi + \lambda_{H1}\bar{\Psi}_\ell\,P_R\Psi'_\ell\,H + \lambda_{H2}\bar{\Psi}_\ell\,P_L\Psi'_\ell\,H + \text{h.c.}$$

Allowed representations

We start from the models that we know fit B-anomalies and DM, and add a fourth field inducing RH muon couplings

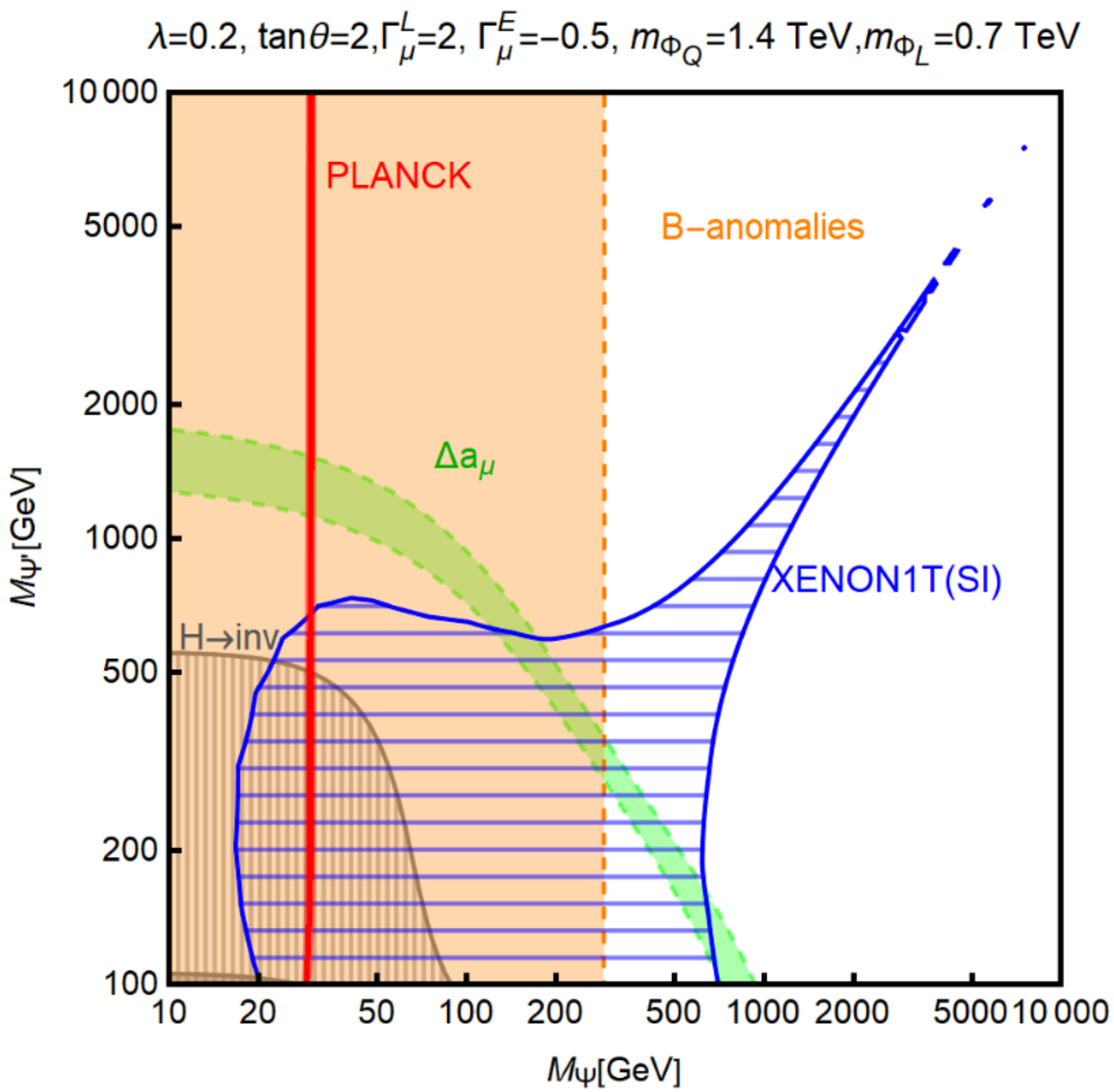
Label	Φ_q/Ψ_q	Φ_ℓ/Ψ_ℓ	Ψ/Φ	Φ'_ℓ/Ψ'_ℓ	Ψ'/Φ'
$\mathcal{F}_{\rm Ia}/\mathcal{S}_{\rm Ia}$	$(\mathbf{3},\mathbf{2},1/6)$	$(\mathbf{1},\mathbf{2},-1/2)$	$(\mathbf{1},\mathbf{1},0)$	$(\mathbf{1},\mathbf{1},-1)$	–
$\mathcal{F}_{\rm Ib}/\mathcal{S}_{\rm Ib}$	$(\mathbf{3},\mathbf{2},1/6)$	$(\mathbf{1},\mathbf{2},-1/2)$	$(\mathbf{1},\mathbf{1},0)$	–	$(\mathbf{1},\mathbf{2},-1/2)$
$\mathcal{F}_{\rm Ic}/\mathcal{S}_{\rm Ic}$	$(\mathbf{3},\mathbf{2},7/6)$	$(\mathbf{1},\mathbf{2},1/2)$	$(\mathbf{1},\mathbf{1},-1)$	$(\mathbf{1},\mathbf{1},0)$	–
$\mathcal{F}_{\rm IIa}/\mathcal{S}_{\rm IIa}$	$(\mathbf{3},\mathbf{1},2/3)$	$(\mathbf{1},\mathbf{1},0)$	$(\mathbf{1},\mathbf{2},-1/2)$	$(\mathbf{1},\mathbf{2},-1/2)$	–
$\mathcal{F}_{\rm IIb}/\mathcal{S}_{\rm IIb}$	$(\mathbf{3},\mathbf{1},2/3)$	$(\mathbf{1},\mathbf{1},0)$	$(\mathbf{1},\mathbf{2},-1/2)$	–	$(\mathbf{1},\mathbf{1},-1)$
$\mathcal{F}_{\rm IIc}/\mathcal{S}_{\rm IIc}$	$(\mathbf{3},\mathbf{1},-1/3)$	$(\mathbf{1},\mathbf{1},-1)$	$(\mathbf{1},\mathbf{2},1/2)$	–	$(\mathbf{1},\mathbf{1},0)$
$\mathcal{F}_{\rm Va}/\mathcal{S}_{\rm Va}$	$(\mathbf{3},\mathbf{3},2/3)$	$(\mathbf{1},\mathbf{1},0)$	$(\mathbf{1},\mathbf{2},-1/2)$	$(\mathbf{1},\mathbf{2},-1/2)$	–
$\mathcal{F}_{\rm Vb}/\mathcal{S}_{\rm Vb}$	$(\mathbf{3},\mathbf{3},2/3)$	$(\mathbf{1},\mathbf{1},0)$	$(\mathbf{1},\mathbf{2},-1/2)$	–	$(\mathbf{1},\mathbf{1},-1)$
$\mathcal{F}_{\rm Vc}/\mathcal{S}_{\rm Vc}$	$(\mathbf{3},\mathbf{3},-1/3)$	$(\mathbf{1},\mathbf{1},-1)$	$(\mathbf{1},\mathbf{2},1/2)$	–	$(\mathbf{1},\mathbf{1},0)$

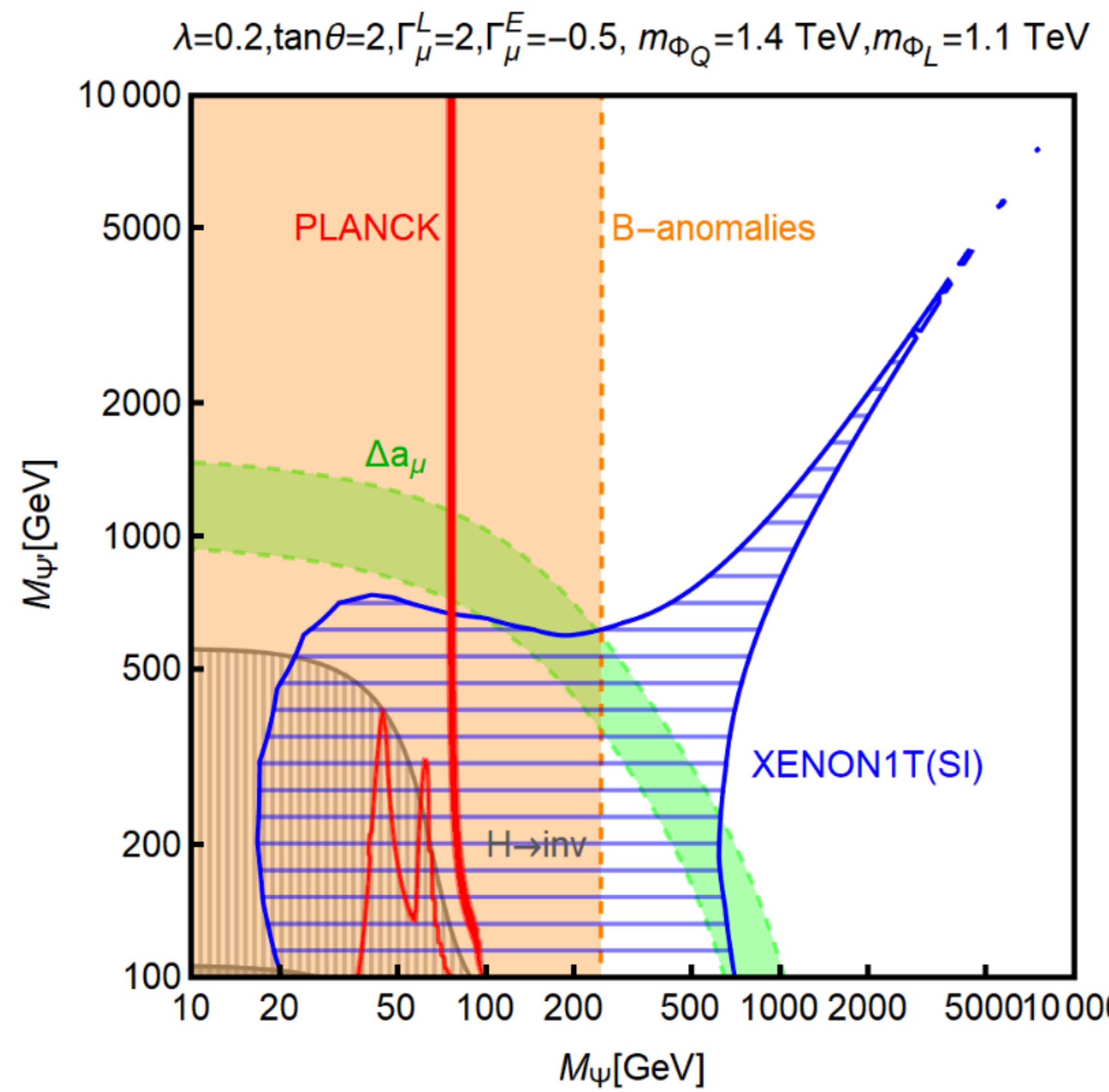
Singlet DM

Singlet-Doublet mixed DM

F_{IB} with singlet-doublet DM

Φ_Q	Φ_L	Ψ	Ψ'
$(\mathbf{3},\mathbf{2},1/6)$	$(\mathbf{1},\mathbf{2},-1/2)$	$(\mathbf{1},\mathbf{1},0)^\star$	$(\mathbf{1},\mathbf{2},-1/2)^\star$

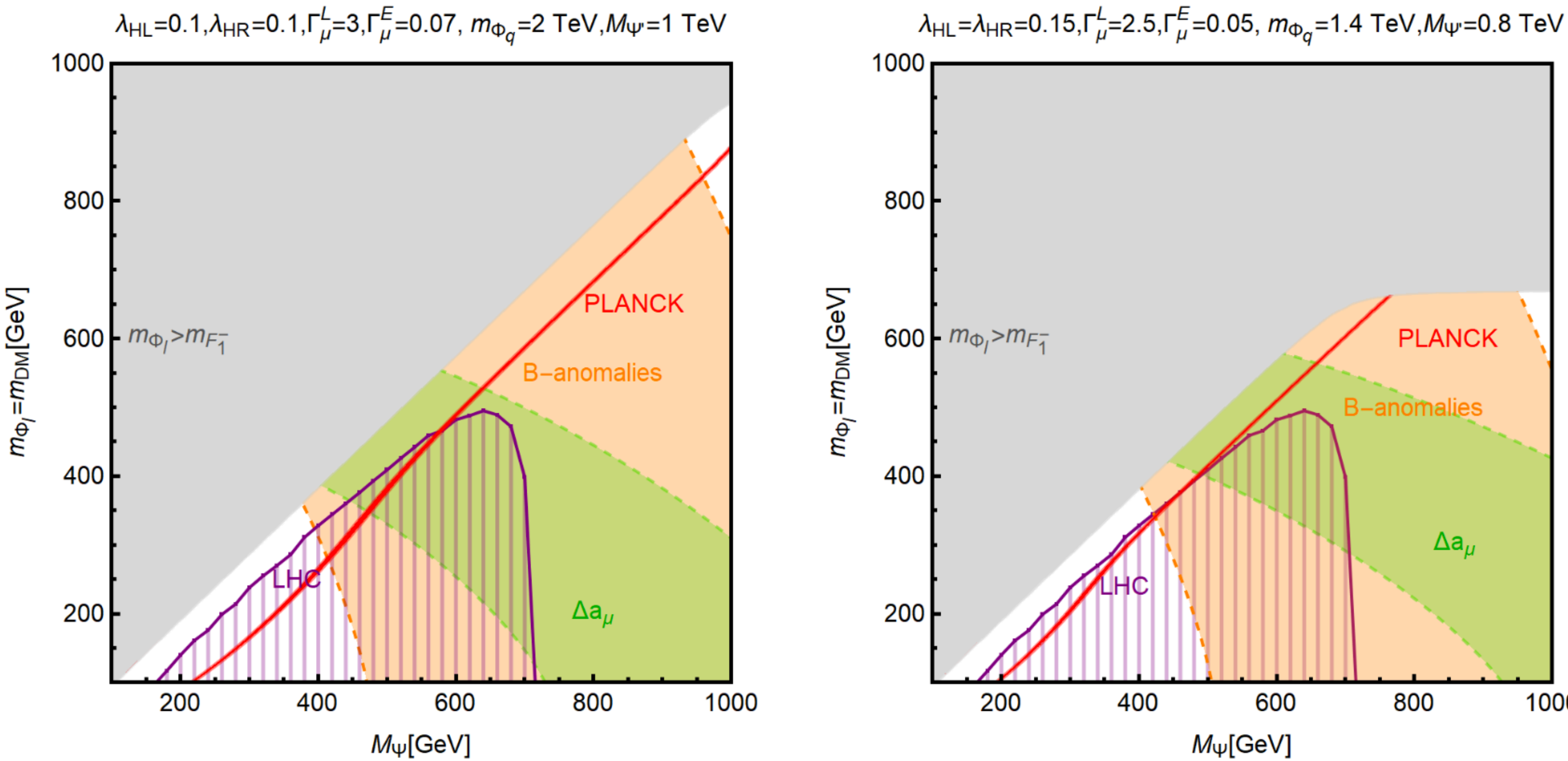




Viable model to address everything simultaneously!

F_{IIB} with singlet DM

Φ_Q	Φ_L	Ψ	Ψ'
$(\mathbf{3},\mathbf{1},2/3)$	$(\mathbf{1},\mathbf{1},0)^\star$	$(\mathbf{1},\mathbf{2},-1/2)$	$(\mathbf{1},\mathbf{1},-1)$



Viable model to address everything simultaneously!

Conclusions

- To address B-anomalies and DM via loop models, we need at least 3 fields, with the DM either being a SU(2) singlet or doublet

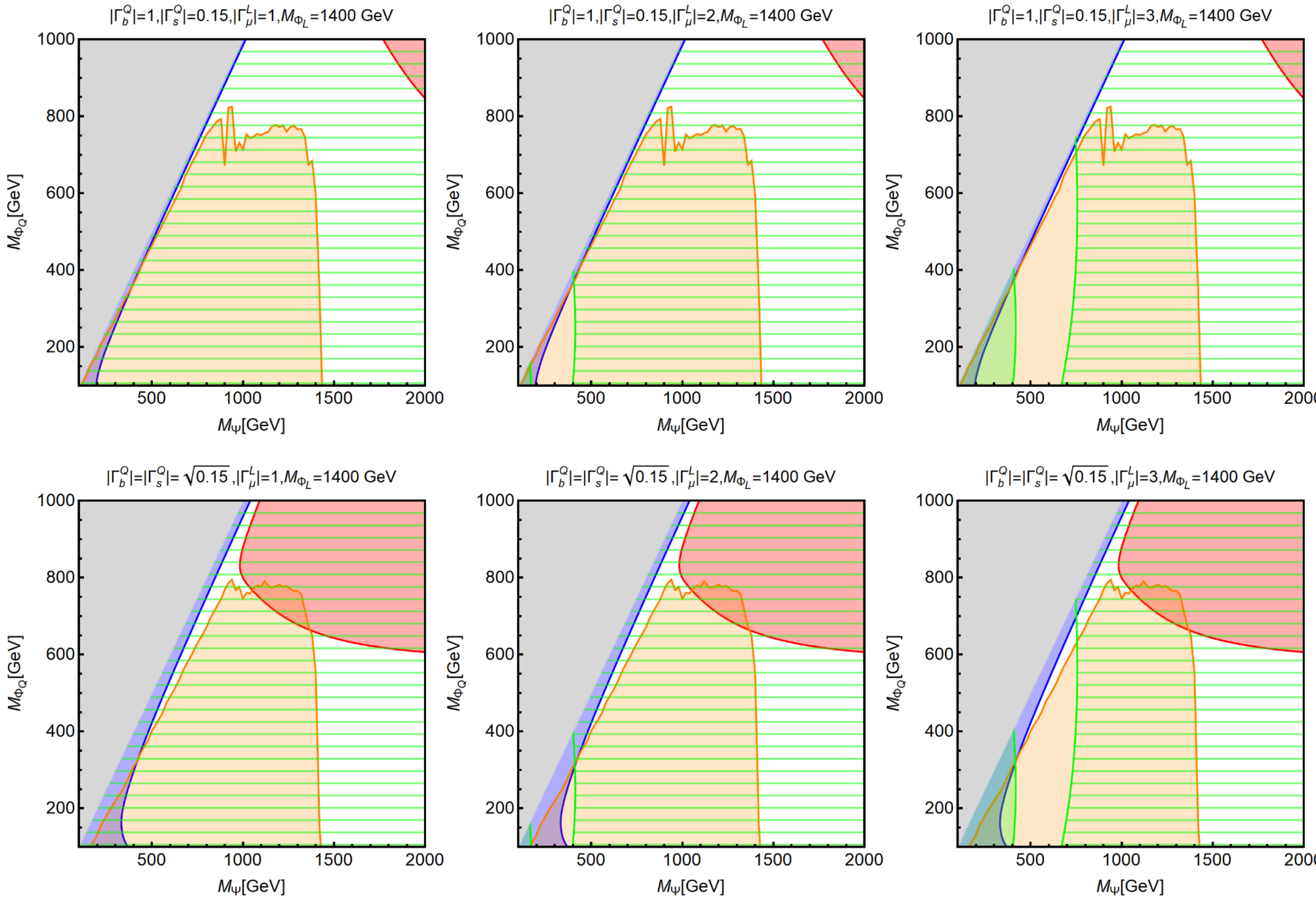
- To address g-2 as well via loop models, we need at least 4 fields, with coupling to RH muons allowed and the DM either being a SU(2) singlet or doublet

- This is actually doable! Constraints from LHC and DM searches are complementary, and allowed models can be further test with the advent of new data in both fields!

Back-up Slides

F_{IB} with real DM

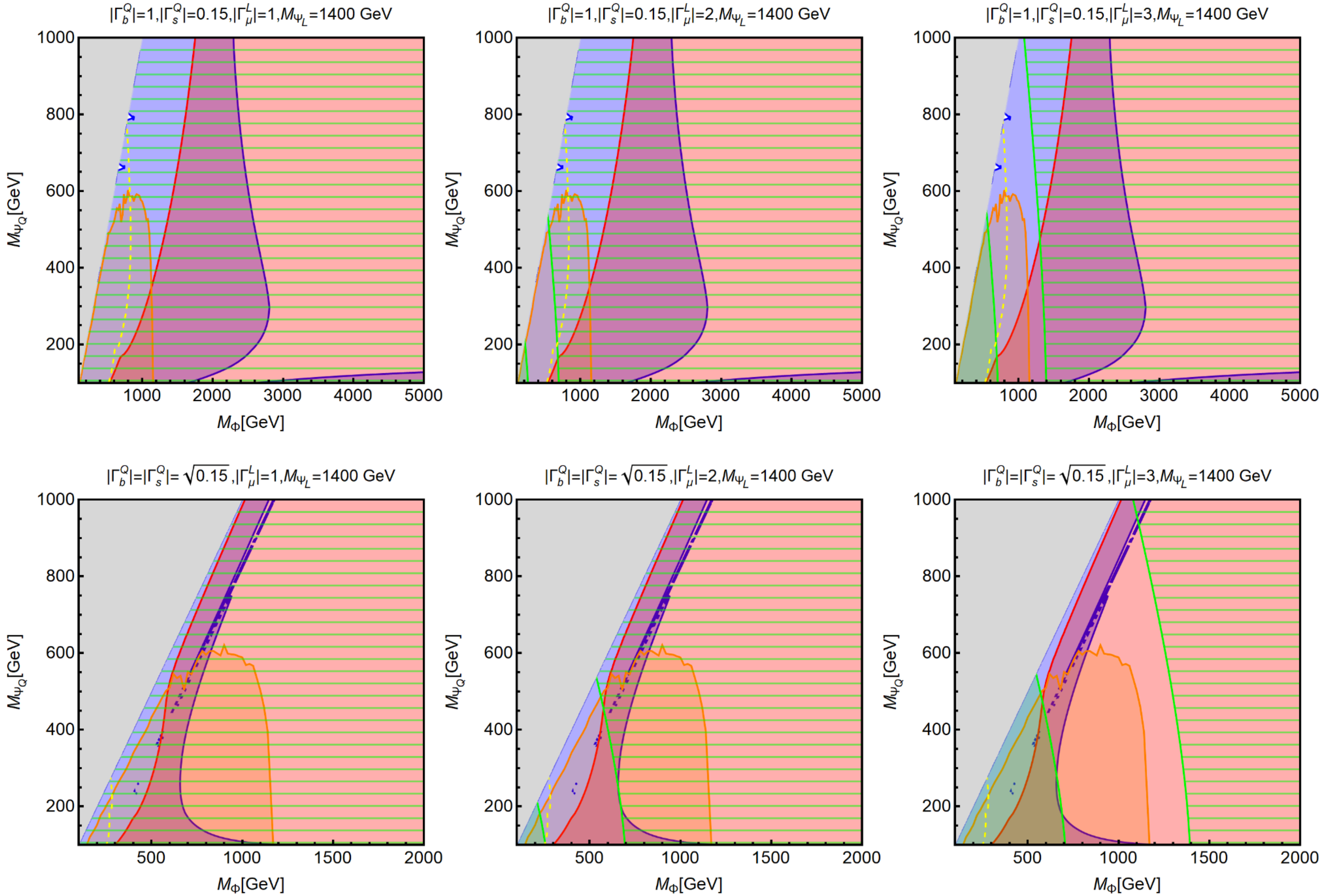
Φ_Q	Φ_L	Ψ
$(\mathbf{1},\mathbf{2},1/2)^\star$	$(\bar{\mathbf{3}},\mathbf{2},-1/6)$	$(\mathbf{3},\mathbf{1},-1/3)$



Requires mass splitting between CP-even and CP-odd DM comp. Either an under-abundant DM is produced, or a not-good-enough contribution to B-anomalies

S_{IIB} with Dirac DM

Ψ_Q	Ψ_L	Φ
$(\mathbf{1},\mathbf{1},0)^\star$	$(\bar{\mathbf{3}},\mathbf{1},-2/3)$	$(\mathbf{3},\mathbf{2},1/6)$

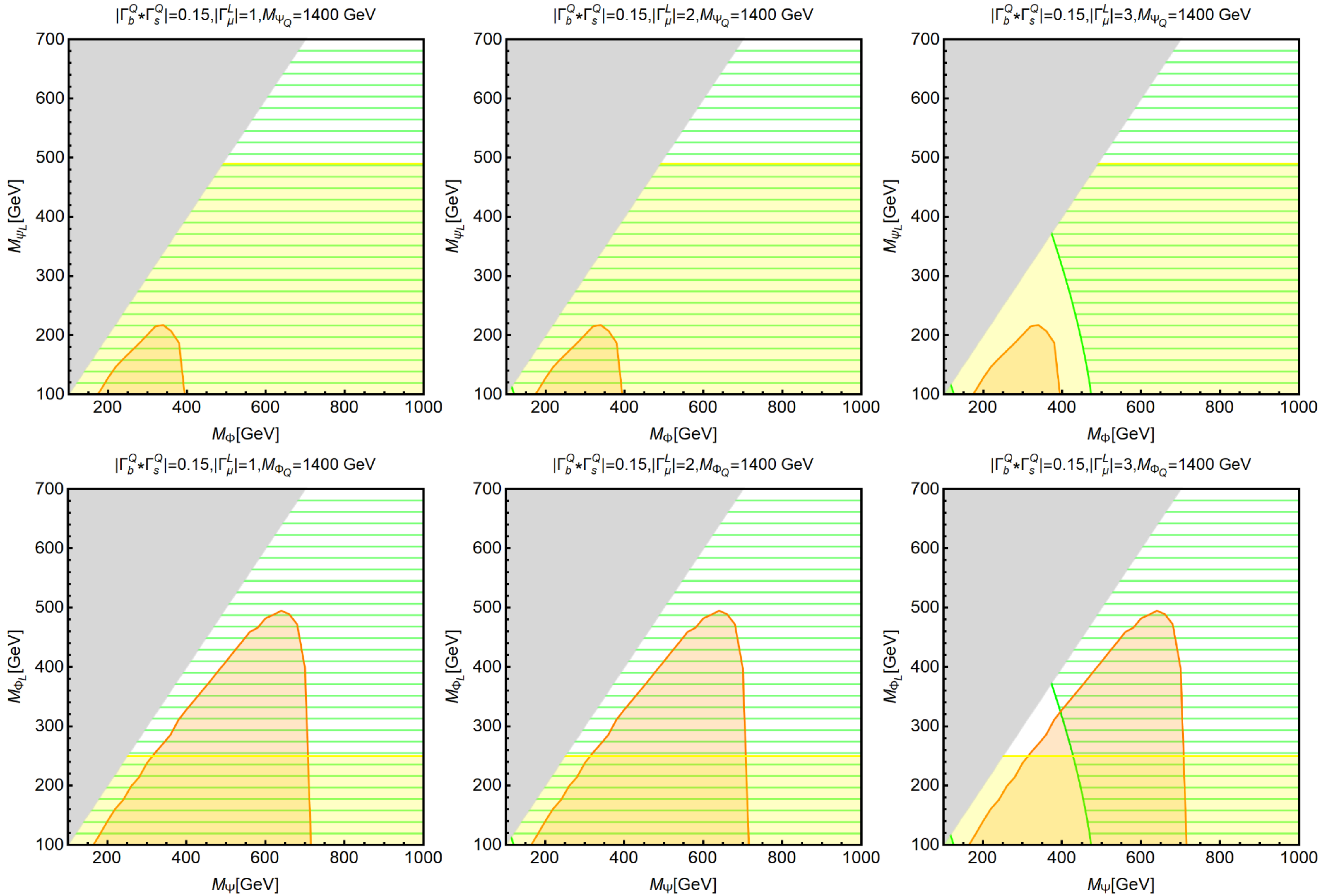


Model excluded by DM bounds!

Ψ_Q	Ψ_L	Φ
$(\mathbf{3},\mathbf{3},2/3)$	$(\mathbf{1},\mathbf{3},0)^\star$	$(\mathbf{1},\mathbf{2},-1/2)^\star$

S_{IIIA} and F_{IIIA}: triplet DM

Φ_Q	Φ_L	Ψ
$(\mathbf{3},\mathbf{3},2/3)$	$(\mathbf{1},\mathbf{3},0)^\star$	$(\mathbf{1},\mathbf{2},-1/2)$



Models strongly constraint by LHC disappearing tracks,
DM strongly under-abundant!