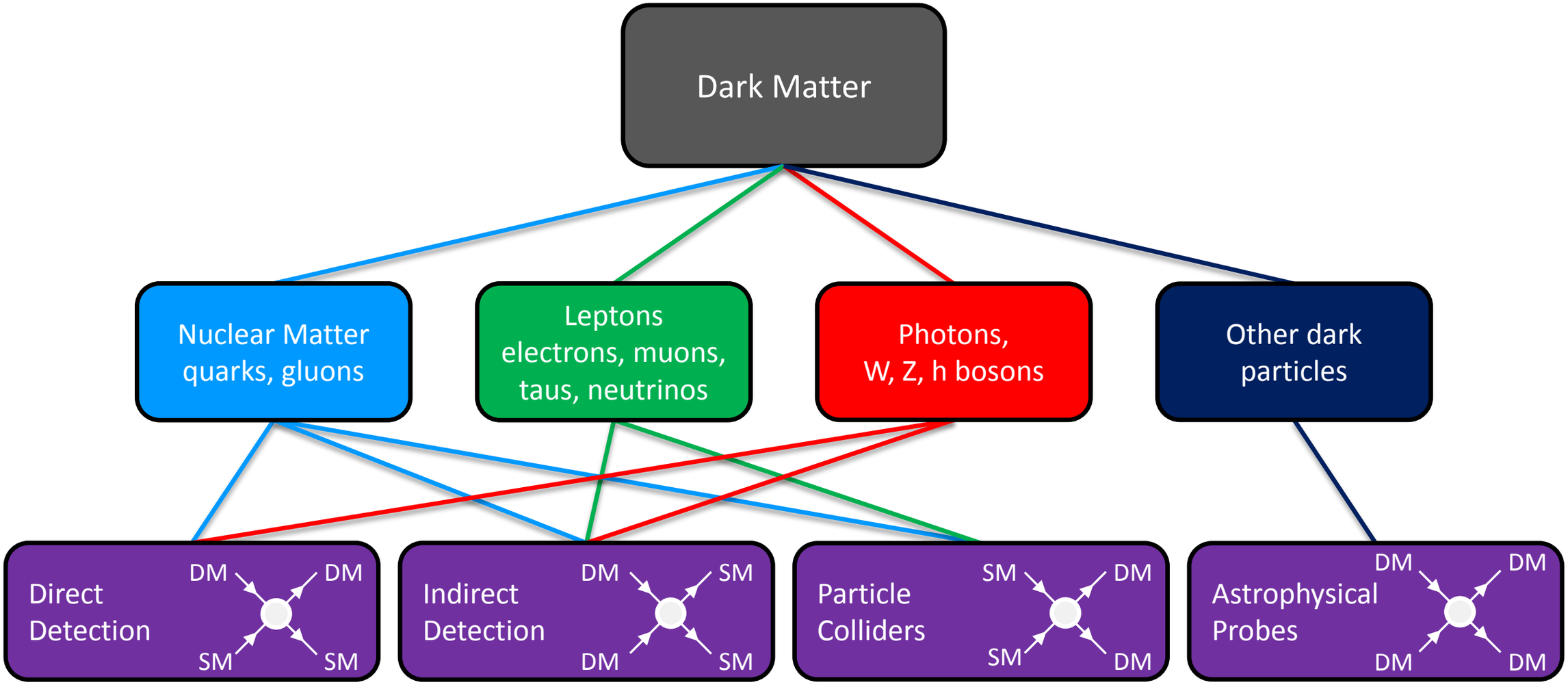
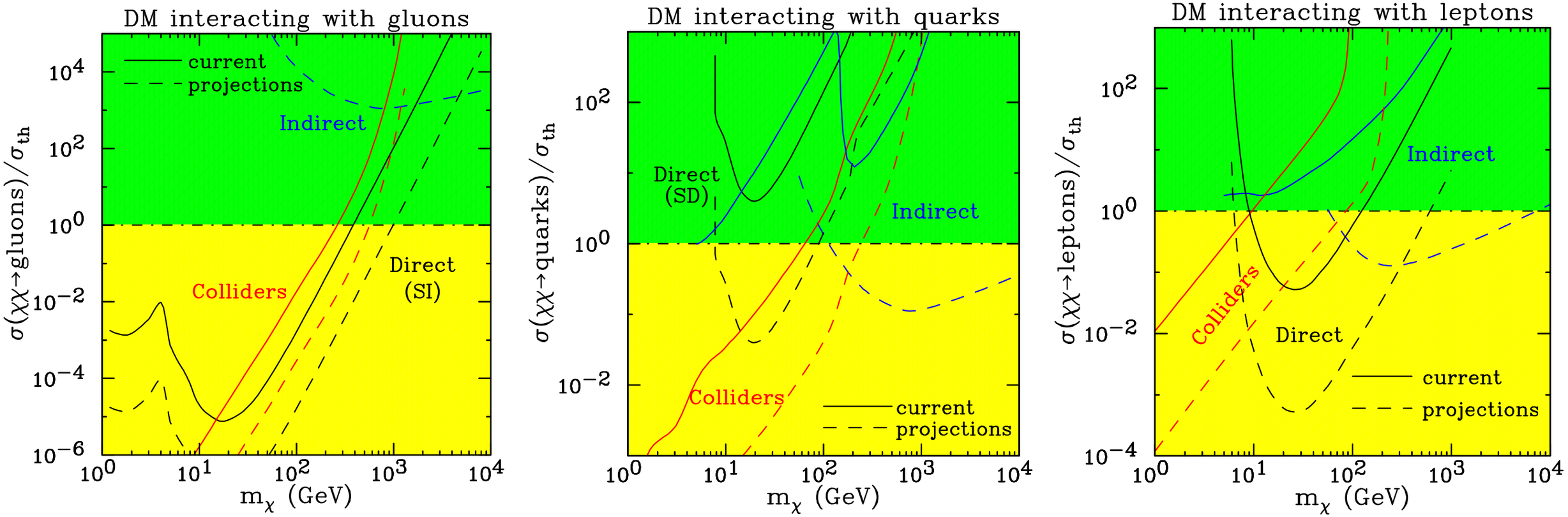
Complementarity



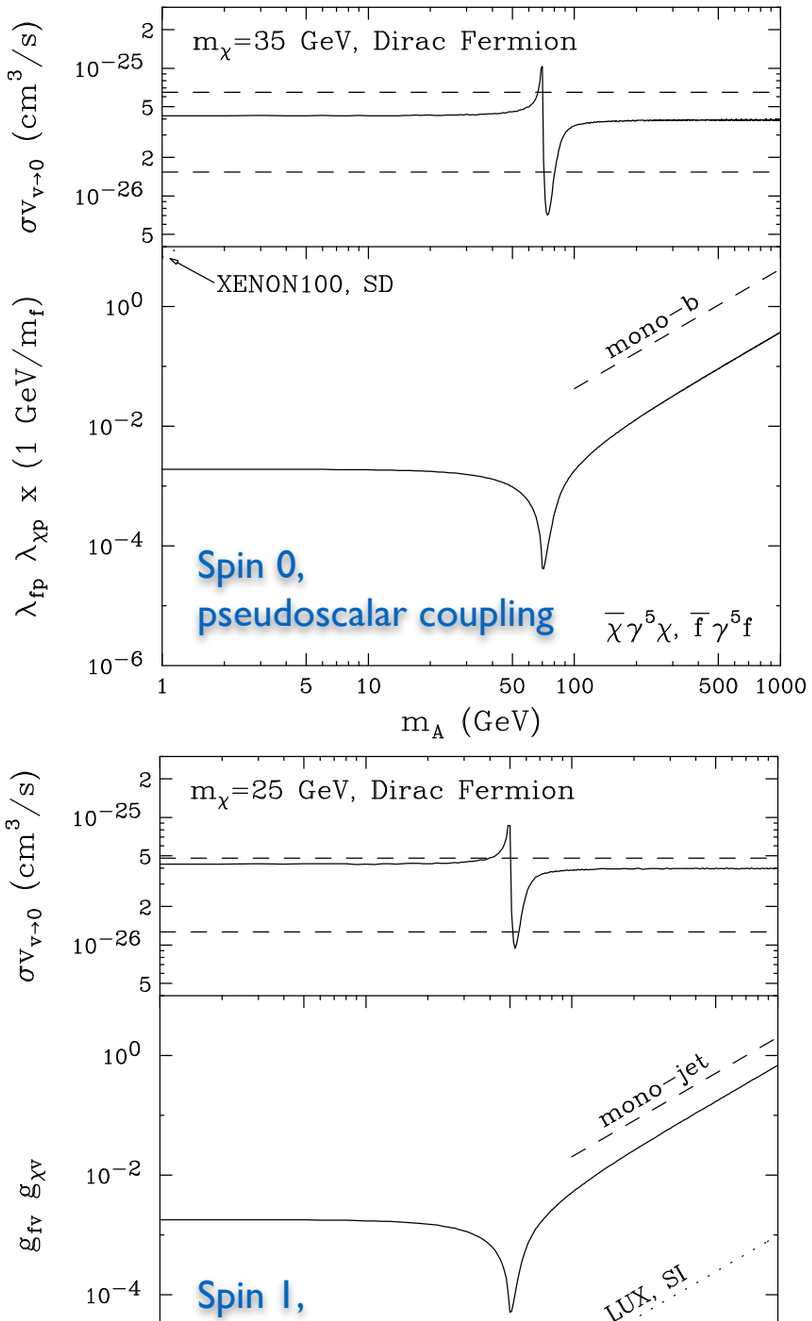
- So far spoke basically only about first box
- More details tomorrow

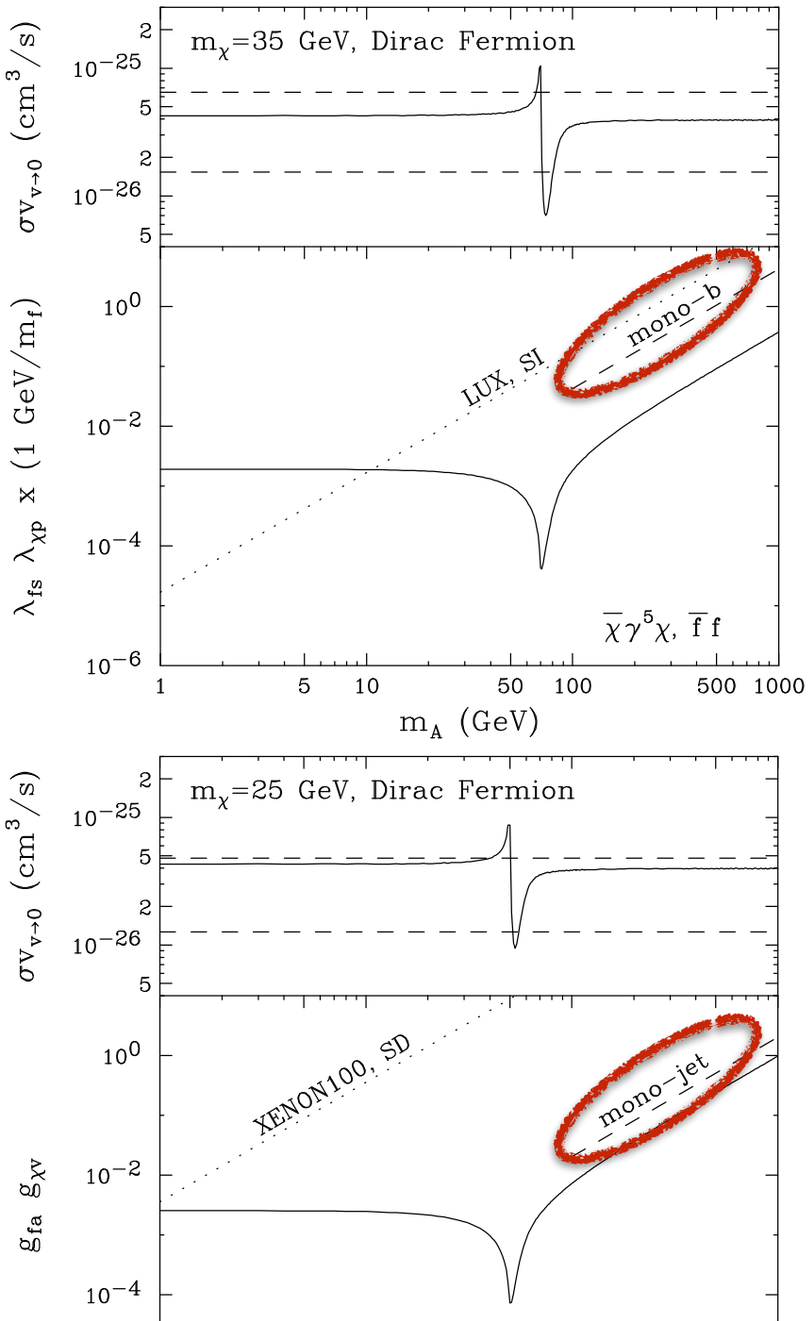
$$\frac{1}{M_q^2}\ \bar{\chi}\gamma^\mu\gamma_5\chi\sum_q \bar{q}\gamma_\mu\gamma_5 q + \frac{\alpha_S}{M_g^3}\ \bar{\chi}\chi G^{a\mu\nu}G^a_{\mu\nu} + \frac{1}{M_\ell^2}\ \bar{\chi}\gamma^\mu\chi\sum_\ell \bar{\ell}\gamma_\mu\ell\ .$$

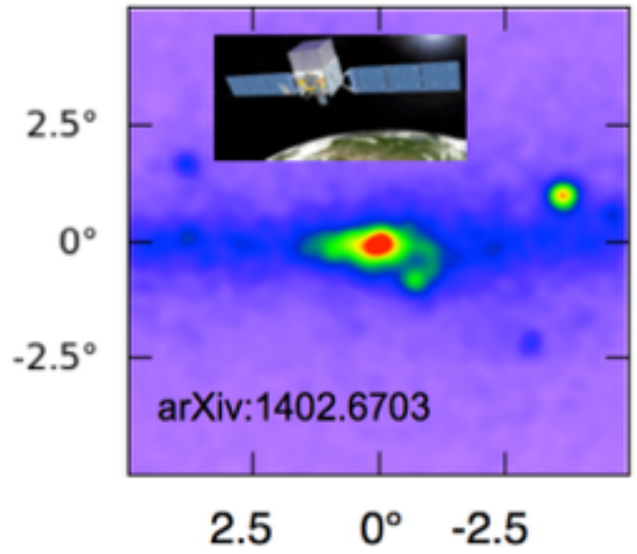


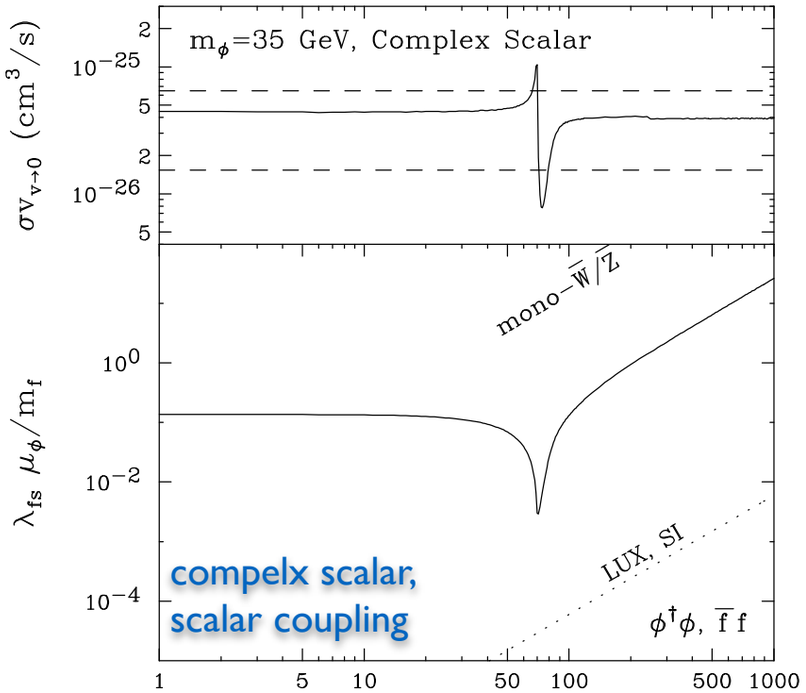
- Parametrized as toy model with spin 1/2 DM and democratic couplings to various models
- Makes collider look a bit too good. One particular model/representation of course
- Have seen similar plots expressing the opposite this morning

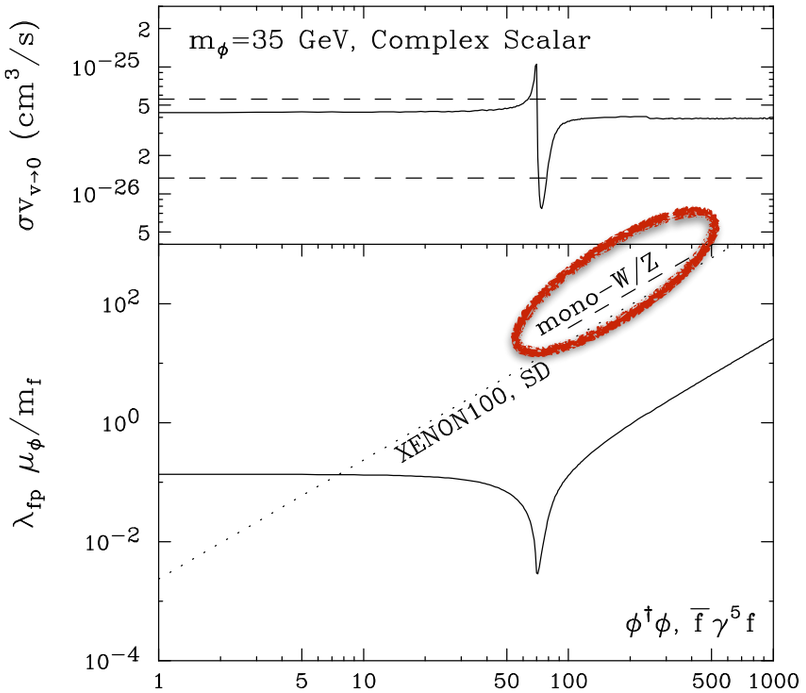
- More specifically comparison to GC excess:

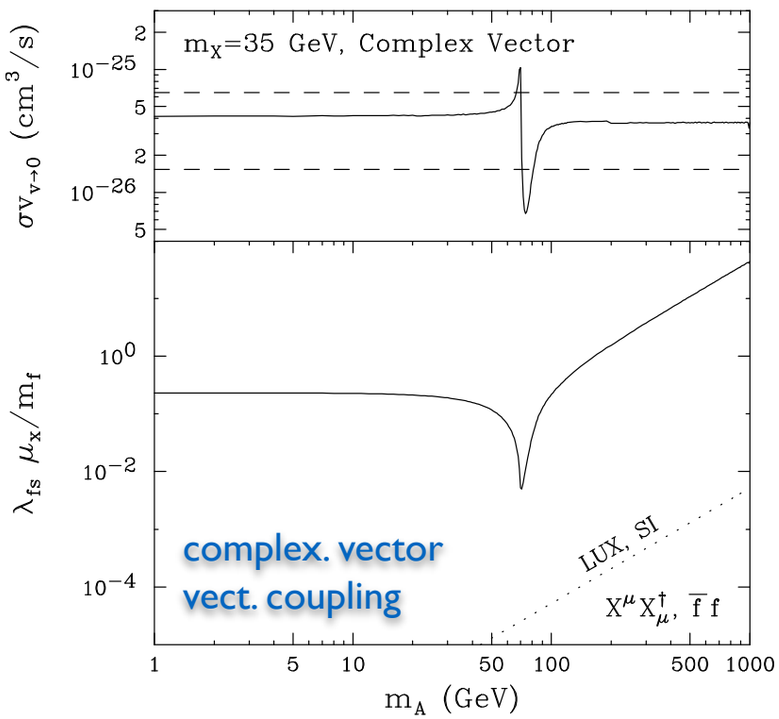


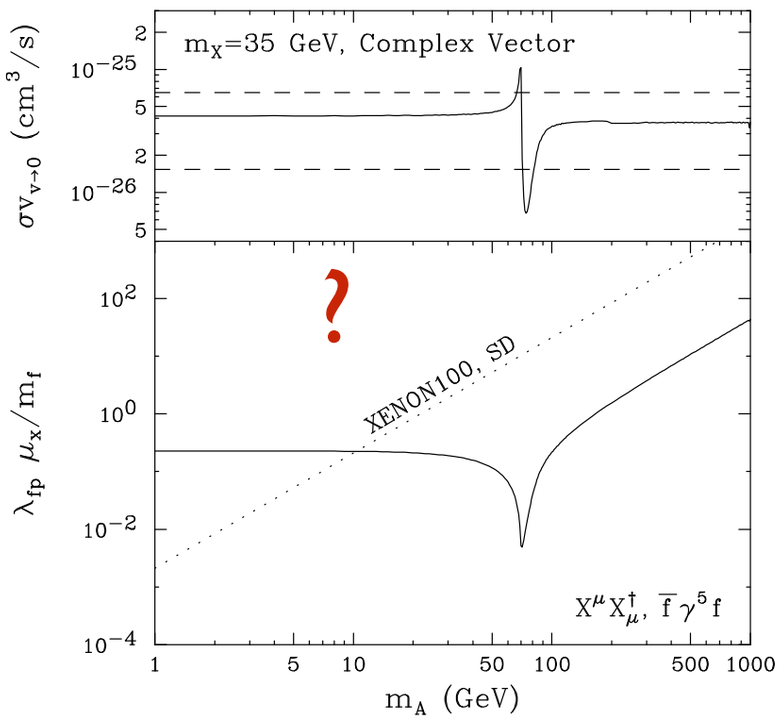


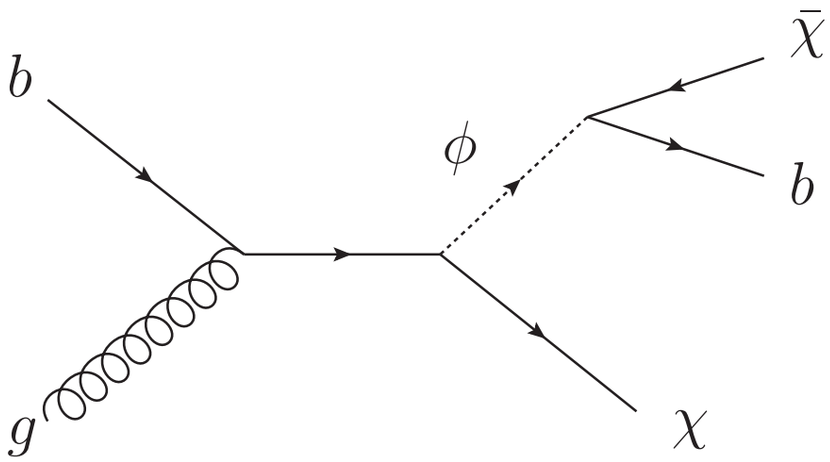


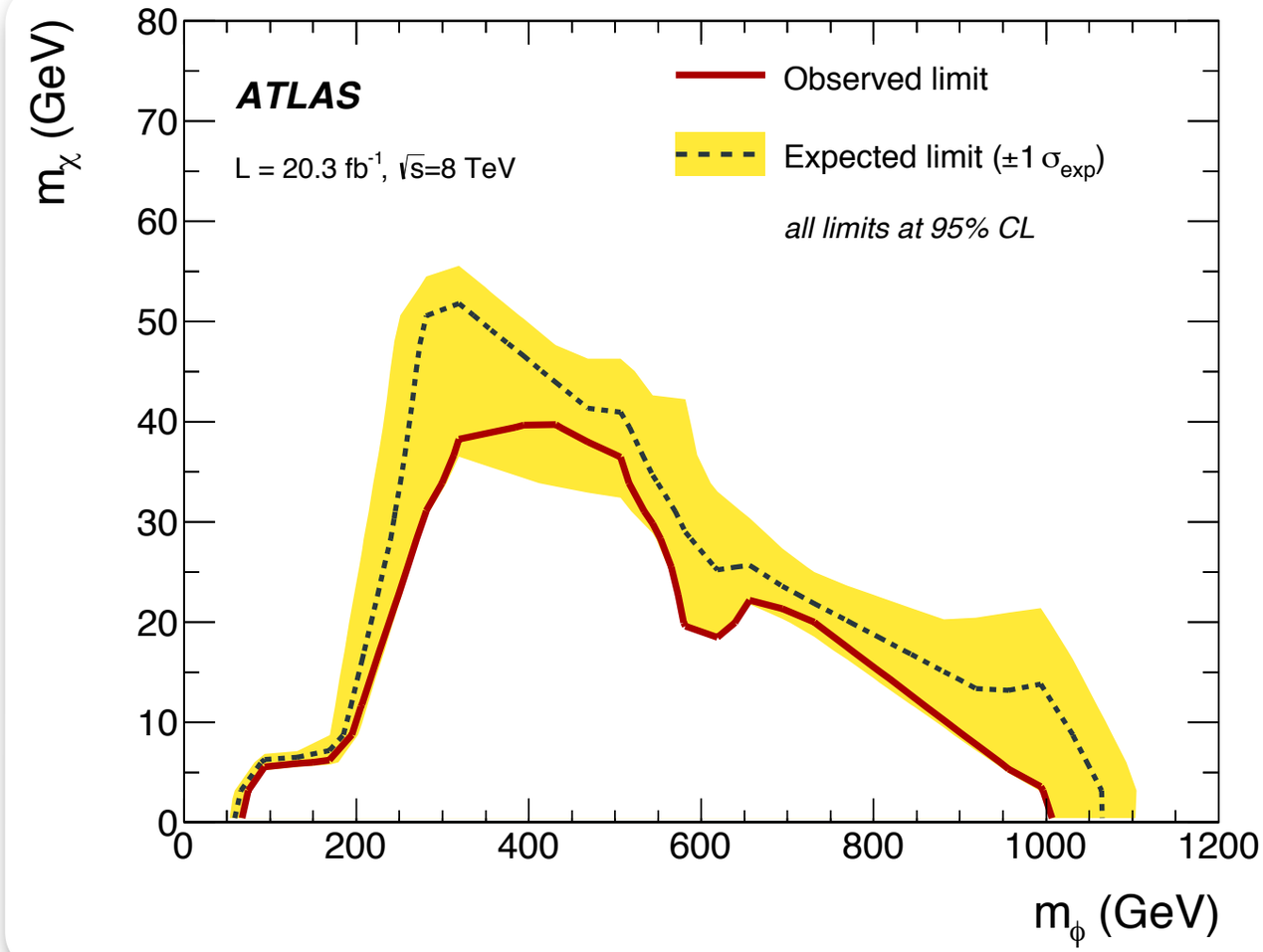

m_ϕ=35 GeV, Complex Scalar
$\sigma v_{v\to 0}$ (cm^3/s)
$\lambda_{fs}\ \mu_\phi/m_f$
mono-$\overline{W}/\overline{Z}$
LUX, SI
compelx scalar,
scalar coupling
$\phi^\dagger\phi,\ \overline{f}\,f$
m_A (GeV)


m_ϕ=35 GeV, Complex Scalar
$\sigma v_{v\to 0}$ (cm^3/s)
$\lambda_{fp}\ \mu_\phi/m_f$
mono-$\overline{W}/\overline{Z}$
XENON100, SD
$\phi^\dagger\phi,\ \overline{f}\,\gamma^5 f$
m_A (GeV)

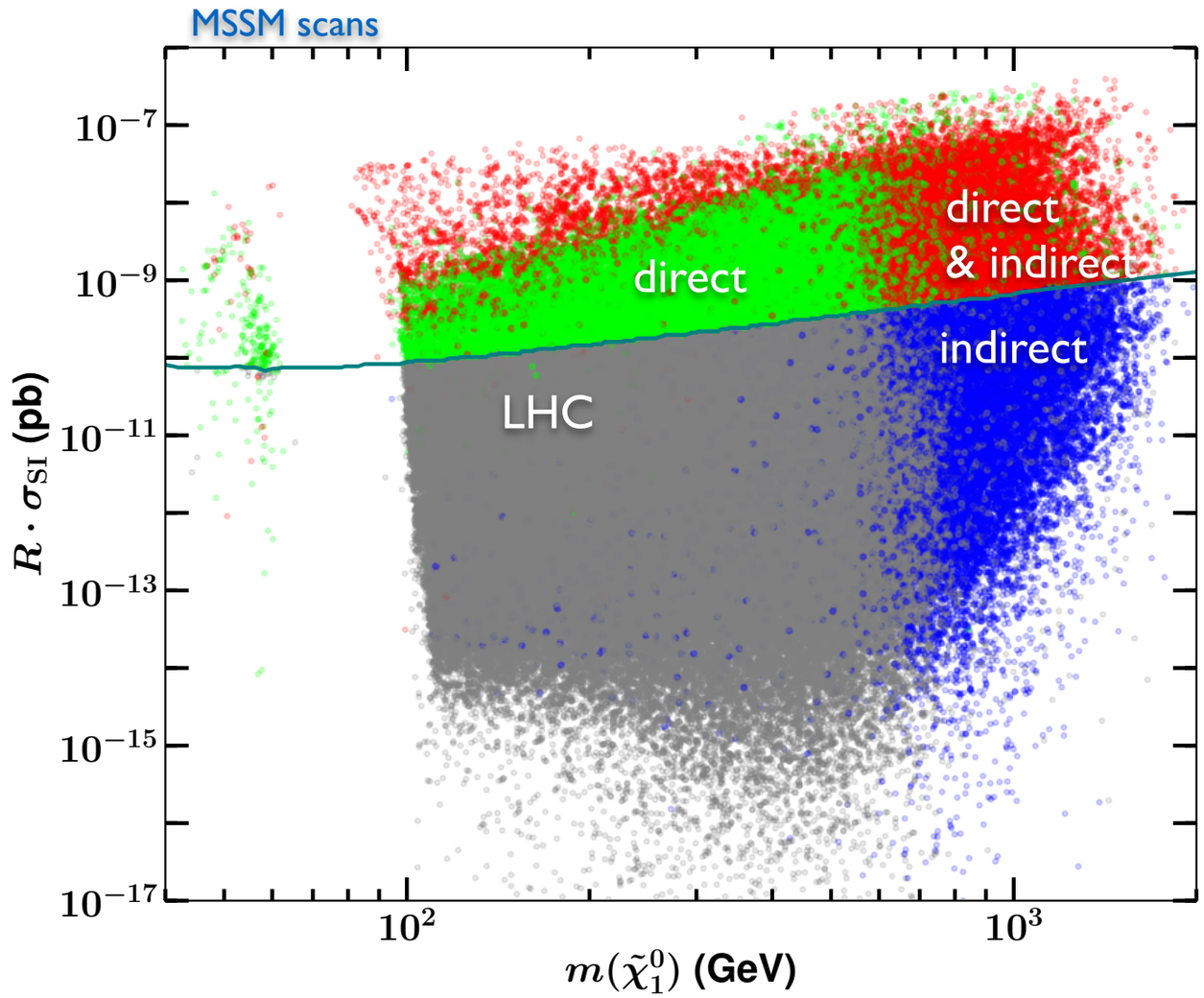

m_X=35 GeV, Complex Vector
$\sigma v_{v\to 0}$ (cm^3/s)
$\lambda_{fs}\ \mu_x/m_f$
LUX, SI
complex. vector
vect. coupling
$X^\mu X^\dagger_\mu,\ \overline{f}\,f$
m_A (GeV)


m_X=35 GeV, Complex Vector
$\sigma v_{v\to 0}$ (cm^3/s)
$\lambda_{fp}\ \mu_x/m_f$
?
XENON100, SD
$X^\mu X^\dagger_\mu,\ \overline{f}\,\gamma^5 f$
m_A (GeV)

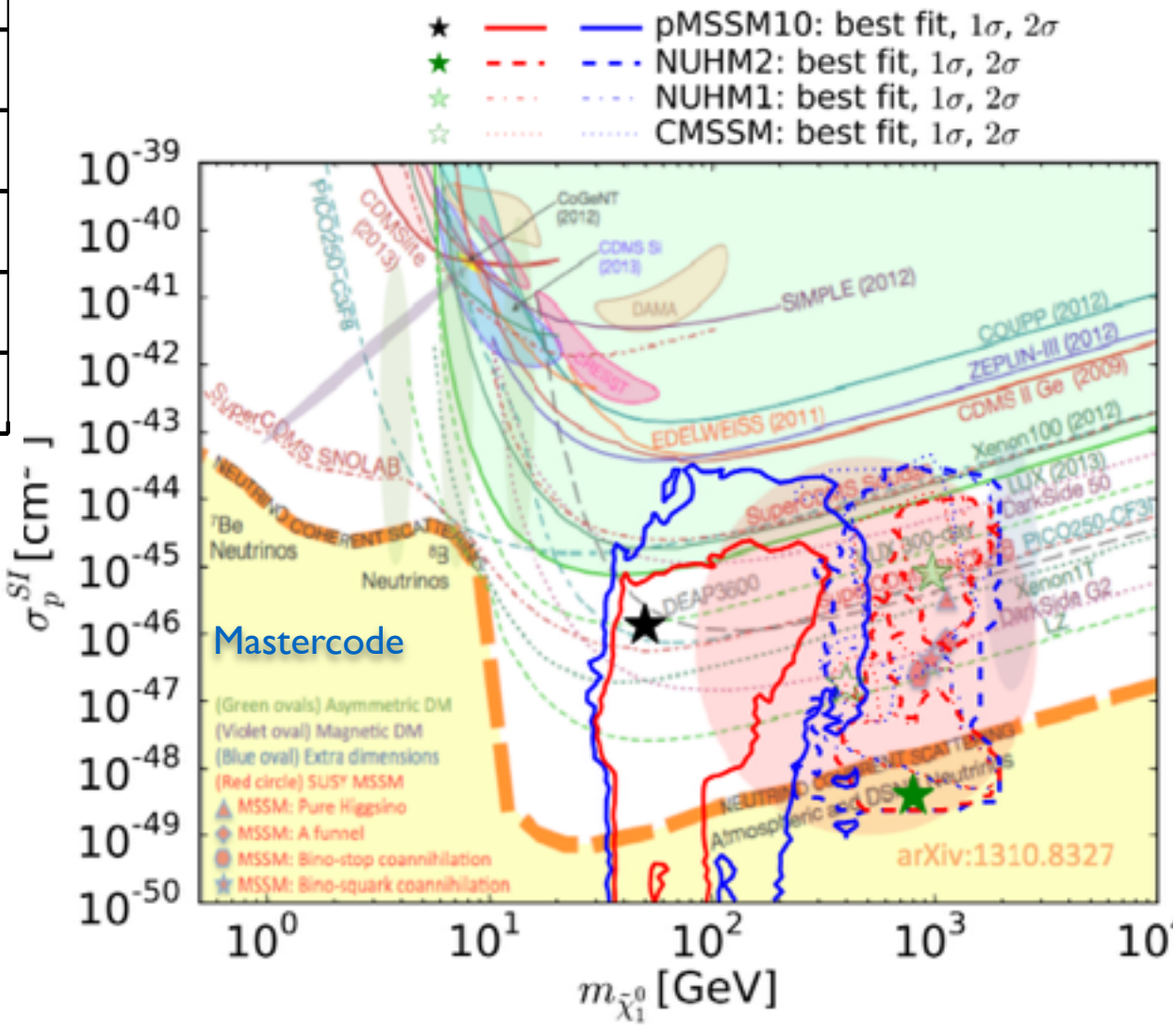




- Set first limits on some of these models with 8 TeV
- Well motivated by recent finding (including Fermi-LAT)
- With upcoming run can exclude scenarios and probe new ones



- MSSM scan plot on the left shows nicely complementarity



- However, I am missing how the plot on the right translates into an analysis recipe.

Name	Interaction Structure	σ_{SI} suppression	σ_{SD} suppression	s-wave?
F1	$\bar{X}X\bar{q}q$	1	$q^2v^{\perp 2}$ (SM)	No
F2	$\bar{X}\gamma^5X\bar{q}q$	q^2 (DM)	$q^2v^{\perp 2}$ (SM); q^2 (DM)	Yes
F3	$\bar{X}X\bar{q}\gamma^5q$	0	q^2 (SM)	No
F4	$\bar{X}\gamma^5X\bar{q}\gamma^5q$	0	q^2 (SM); q^2 (DM)	Yes
F5	$\bar{X}\gamma^\mu X\bar{q}\gamma_\mu q$ (vanishes for Majorana X)	1	$q^2v^{\perp 2}$ (SM) q^2 (SM); q^2 or $v^{\perp 2}$ (DM)	Yes
F6	$\bar{X}\gamma^\mu\gamma^5X\bar{q}\gamma_\mu q$	$v^{\perp 2}$ (SM or DM)	q^2 (SM)	No
F7	$\bar{X}\gamma^\mu X\bar{q}\gamma_\mu\gamma^5q$ (vanishes for Majorana X)	$q^2v^{\perp 2}$ (SM); q^2 (DM)	$v^{\perp 2}$ (SM) $v^{\perp 2}$ or q^2 (DM)	Yes
F8	$\bar{X}\gamma^\mu\gamma^5X\bar{q}\gamma_\mu\gamma^5q$	$q^2v^{\perp 2}$ (SM)	1	$\propto m_f^2/m_X^2$
F9	$\bar{X}\sigma^{\mu\nu}X\bar{q}\sigma_{\mu\nu}q$ (vanishes for Majorana X)	q^2 (SM); q^2 or $v^{\perp 2}$ (DM) $q^2v^{\perp 2}$ (SM)	1	Yes
F10	$\bar{X}\sigma^{\mu\nu}\gamma^5X\bar{q}\sigma_{\mu\nu}q$ (vanishes for Majorana X)	q^2 (SM)	$v^{\perp 2}$ (SM) q^2 or $v^{\perp 2}$ (DM)	Yes
S1	$\phi^\dagger\phi\bar{q}q$ or $\phi^2\bar{q}q$	1	$q^2v^{\perp 2}$ (SM)	Yes
S2	$\phi^\dagger\phi\bar{q}\gamma^5q$ or $\phi^2\bar{q}\gamma^5q$	0	q^2 (SM)	Yes
S3	$\phi^\dagger\partial_\mu\phi\bar{q}\gamma^\mu q$	1	$q^2v^{\perp 2}$ (SM) q^2 (SM); $v^{\perp 2}$ (DM)	No
S4	$\phi^\dagger\partial_\mu\phi\bar{q}\gamma^\mu\gamma^5q$	0	$v^{\perp 2}$ (SM or DM)	No
V1	$B_\mu^\dagger B^\mu\bar{q}q$ or $B_\mu B^\mu\bar{q}q$	1	$q^2v^{\perp 2}$ (SM)	Yes
V2	$B_\mu^\dagger B^\mu\bar{q}\gamma^5q$ or $B_\mu B^\mu\bar{q}\gamma^5q$	0	q^2 (SM)	Yes
V3	$B_\nu^\dagger\partial_\mu B^\nu\bar{q}\gamma^\mu q$	1	$q^2v^{\perp 2}$ (SM) q^2 (SM); $v^{\perp 2}$ (DM)	No
V4	$B_\nu^\dagger\partial_\mu B^\nu\bar{q}\gamma^\mu\gamma^5q$	0	$v^{\perp 2}$ (SM or DM)	No
V5	$(B_\mu^\dagger B_\nu - B_\nu^\dagger B_\mu)\bar{q}\sigma^{\mu\nu}q$	$q^2v^{\perp 2}$ (SM)	1	Yes
V6	$(B_\mu^\dagger B_\nu - B_\nu^\dagger B_\mu)\bar{q}\sigma^{\mu\nu}\gamma^5q$	q^2 (SM)	$v^{\perp 2}$ (SM)	Yes
V7	$B_\nu^\dagger\partial^\nu B_\mu\bar{q}\gamma^\mu q$ or $B_\nu\partial^\nu B_\mu\bar{q}\gamma^\mu q$	$v^{\perp 2}$ (SM); q^2 (DM)	q^2 (SM); q^2 (DM)	No
V8	$B_\nu^\dagger\partial^\nu B_\mu\bar{q}\gamma^\mu\gamma^5q$ or $B_\nu\partial^\nu B_\mu\bar{q}\gamma^\mu\gamma^5q$	$q^2v^{\perp 2}$ (SM); q^2 (DM)	q^2 (DM)	$\propto m_f^2/m_X^2$
V9	$\epsilon^{\mu\nu\rho\sigma}B_\nu^\dagger\partial_\rho B_\sigma\bar{q}\gamma_\mu q$ or $\epsilon^{\mu\nu\rho\sigma}B_\nu\partial_\rho B_\sigma\bar{q}\gamma_\mu q$	$v^{\perp 2}$ (DM or SM)	q^2 (SM)	No
V10	$\epsilon^{\mu\nu\rho\sigma}B_\nu^\dagger\partial_\rho B_\sigma\bar{q}\gamma_\mu\gamma^5q$ or $\epsilon^{\mu\nu\rho\sigma}B_\nu\partial_\rho B_\sigma\bar{q}\gamma_\mu\gamma^5q$	$q^2v^{\perp 2}$ (SM)	1	No