

Studies for Real Vector DM & Characterization analysis

Adil Jueid (Konkuk University)

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Cross Sections at LO

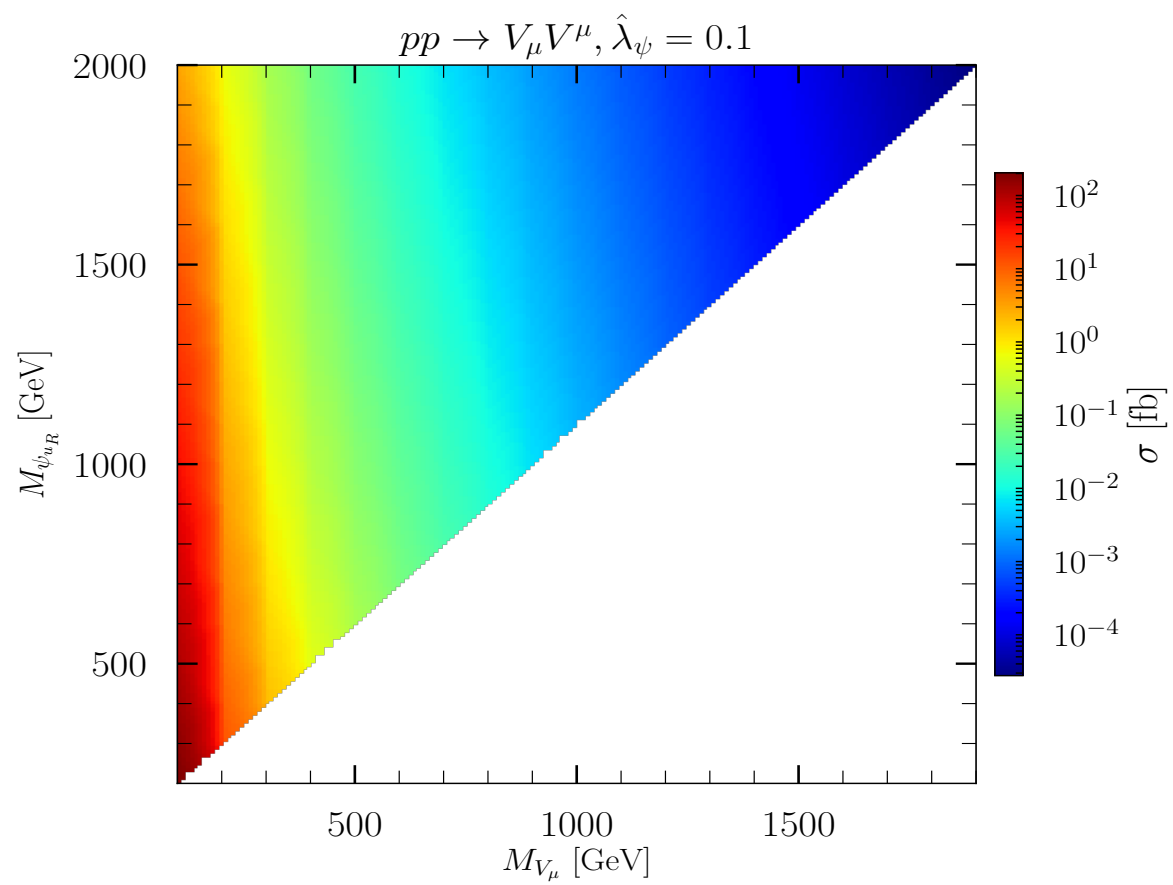
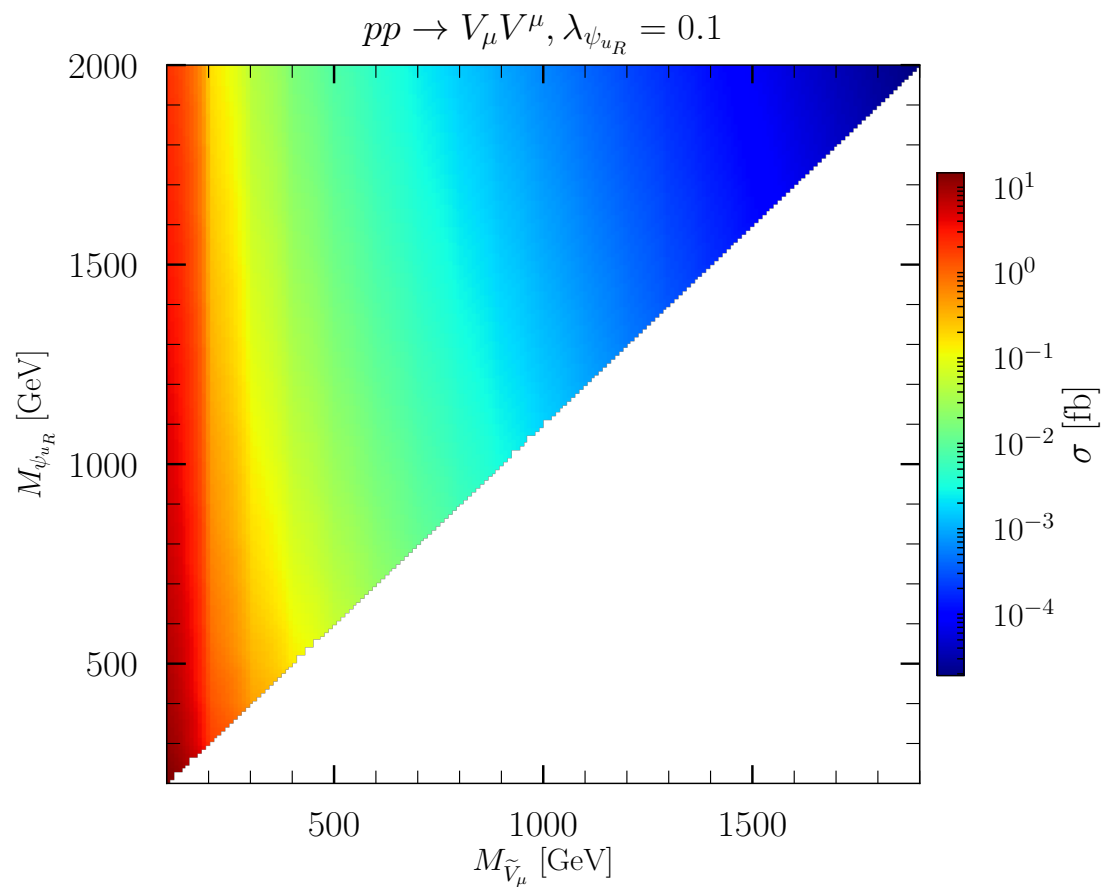
- I started with the computation of LO cross sections for various processes; DM pair production, DM+mediator production, and mediator pair production (t-channel & QCD only) for both the real vector DM and the complex vector DM.
- I used the standard setup:

NNPDF31@LO with $\alpha_s(M_Z^2) = 0.118$.

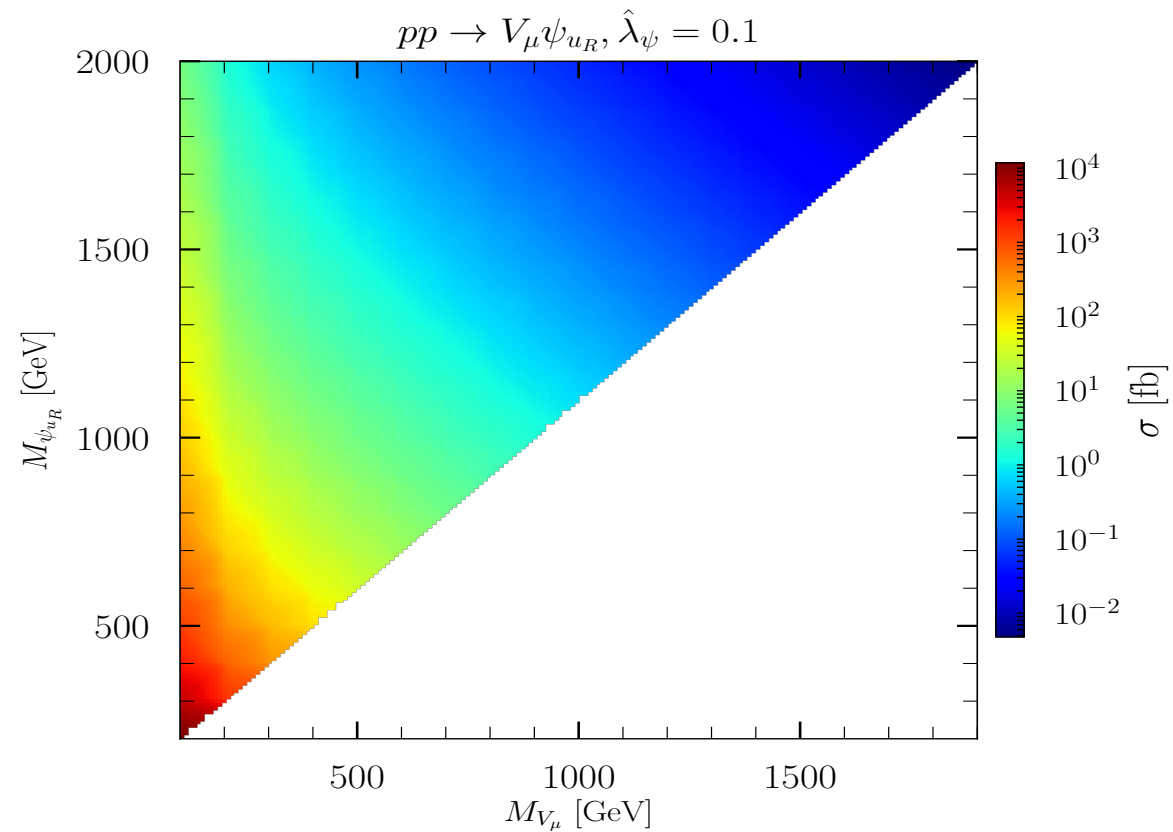
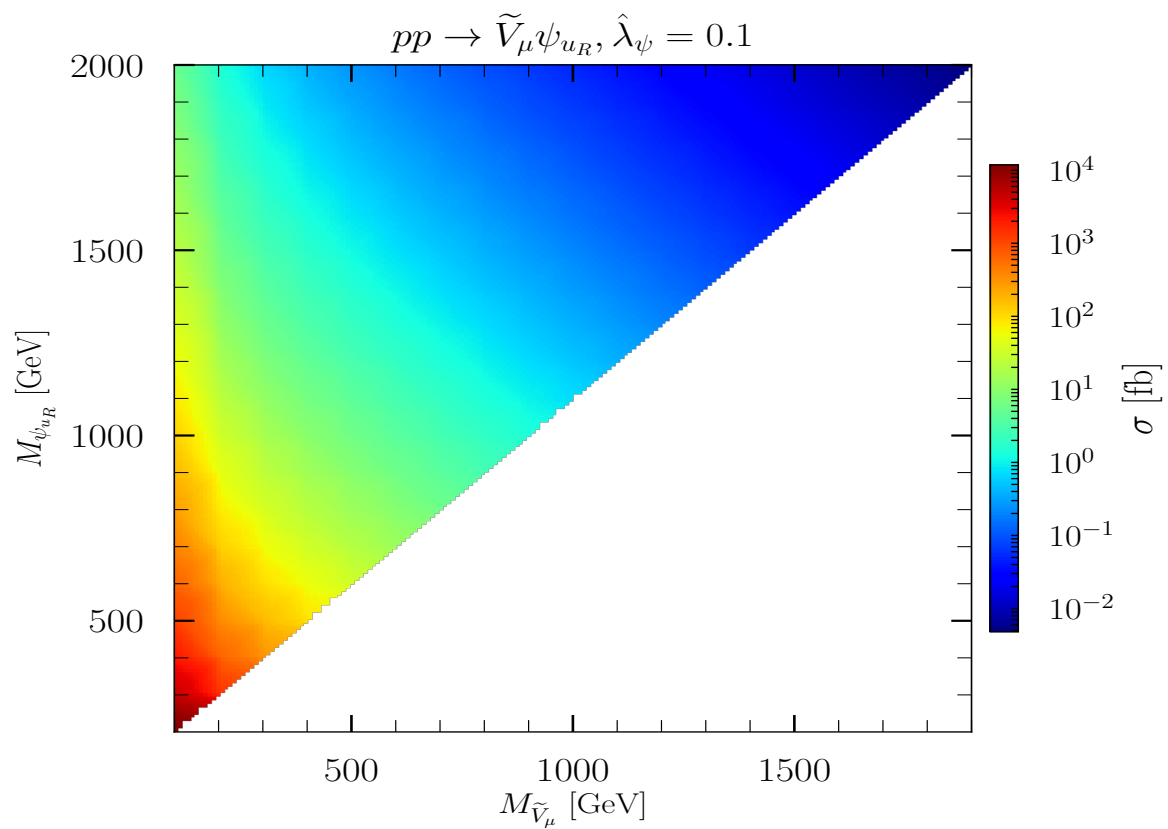
Renormalization & Factorization scales equal to the sum of the transverse masses of the final state particles.

I fix $\hat{\lambda}_\psi = 0.1$.

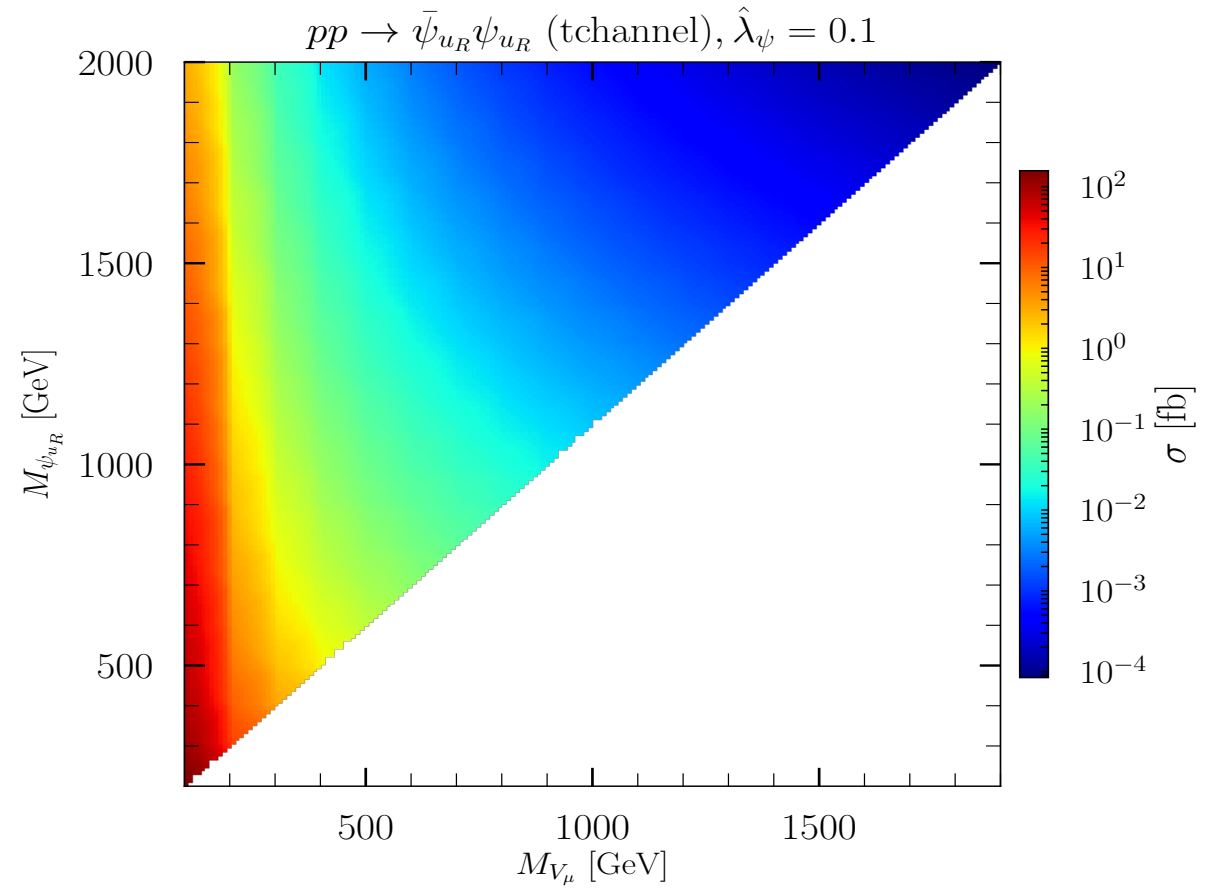
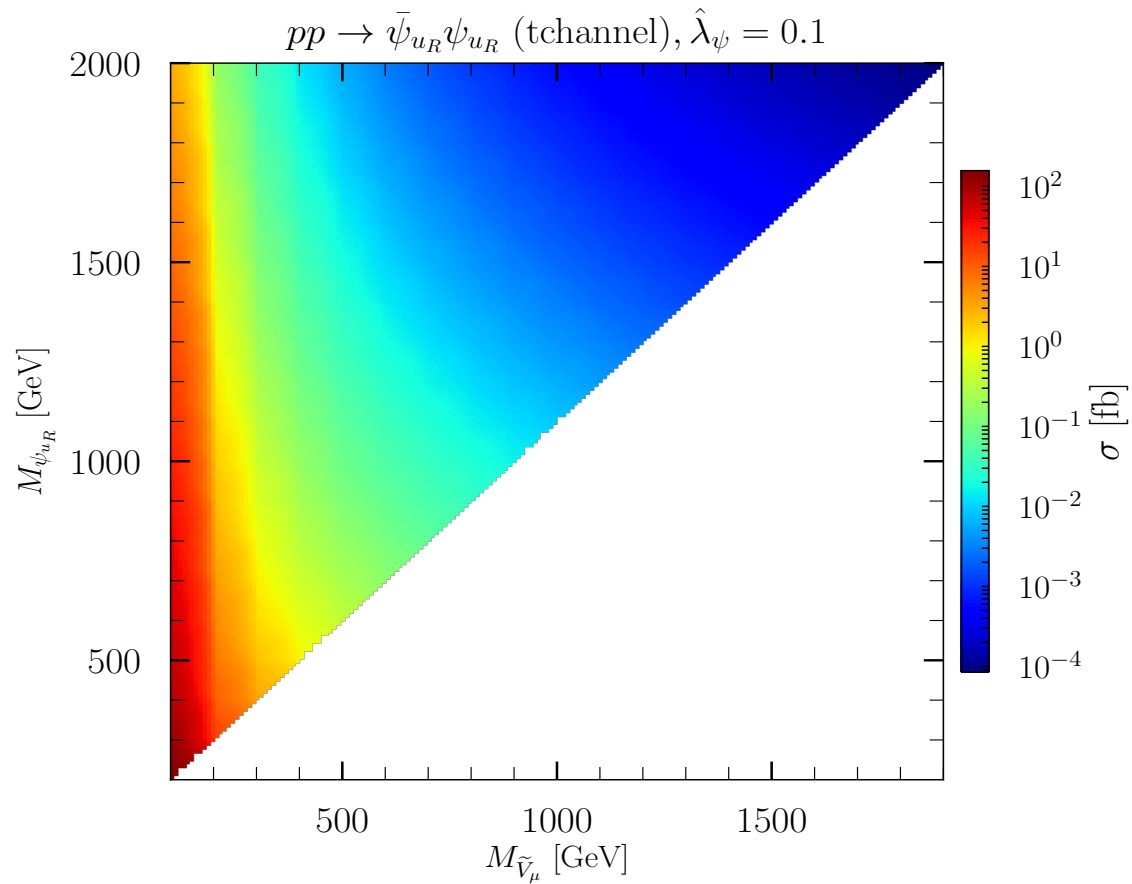
$pp \rightarrow V_\mu V^\mu @ LO$



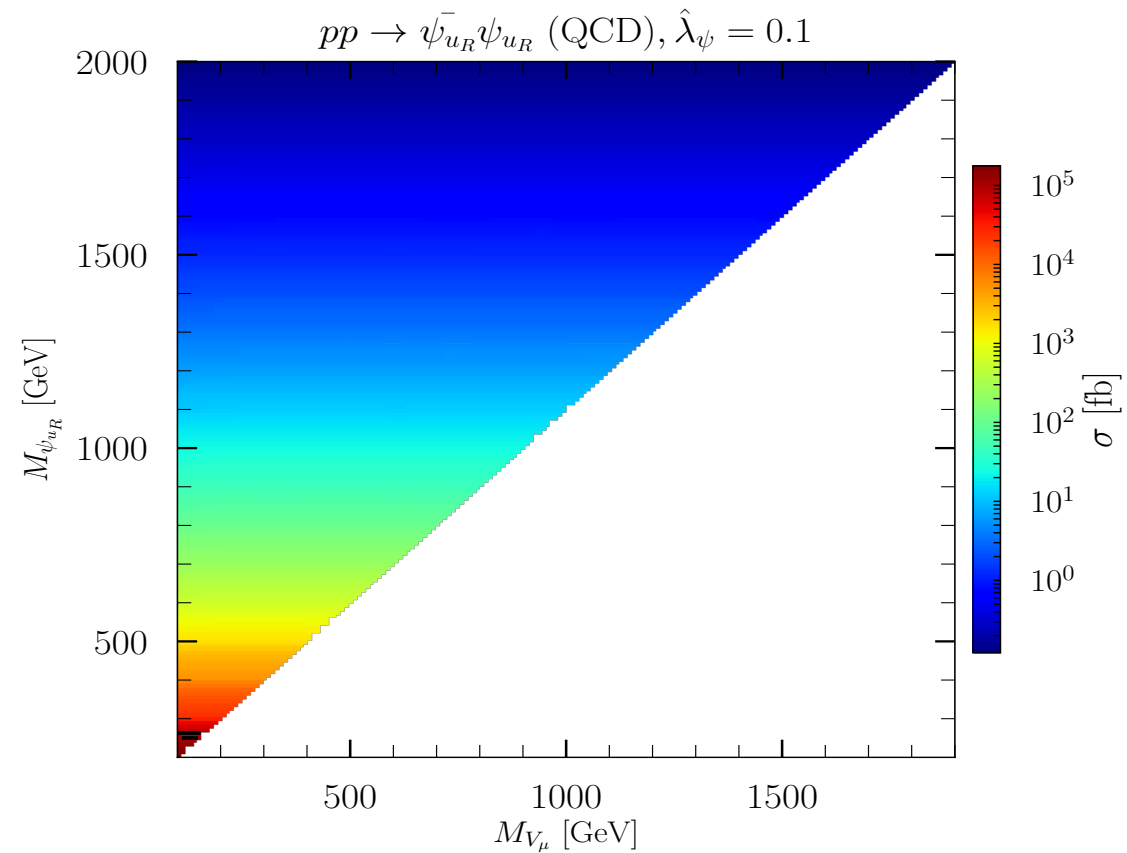
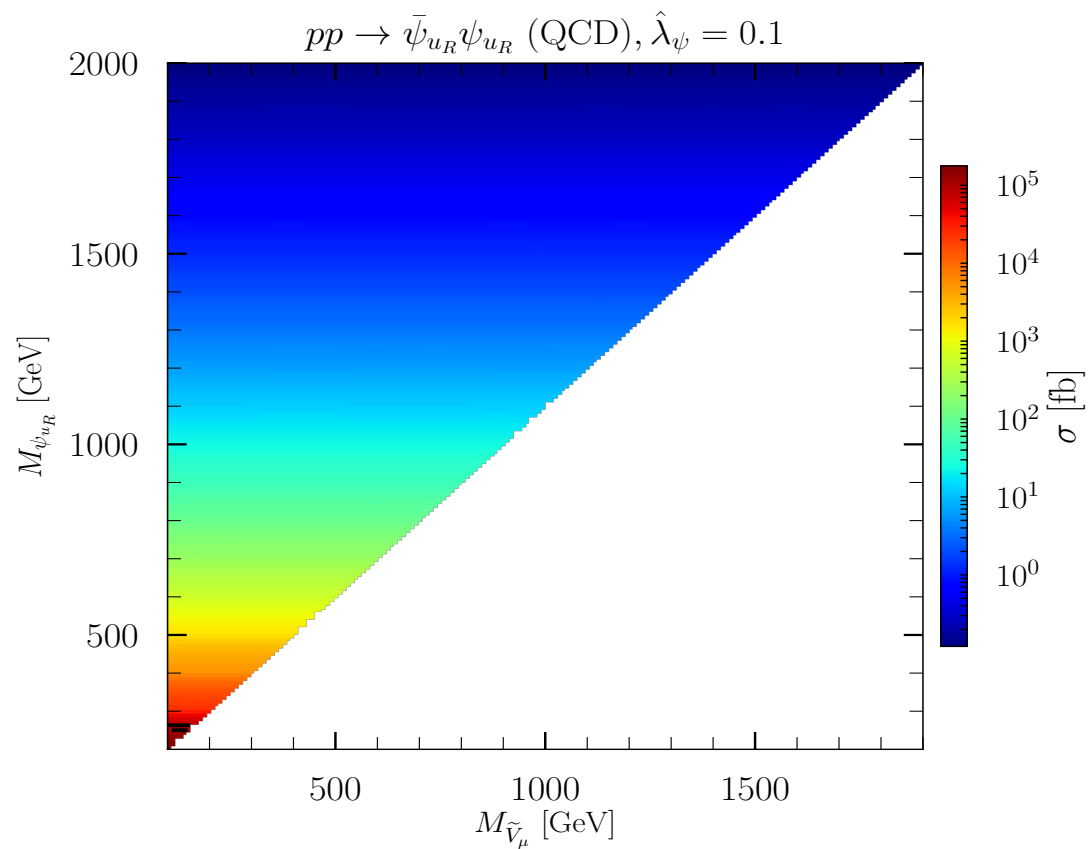
$$pp \rightarrow V_\mu \psi_{uR} + \text{H.c.} @ \text{LO}$$



$pp \rightarrow \bar{\Psi}_{u_R} \Psi_{u_R}$ @ LO (t-channel only)



$pp \rightarrow \bar{\psi}_{uR} \psi_{uR}$ @ LO (QCD only)



LO vs NLO: case of real vector DM

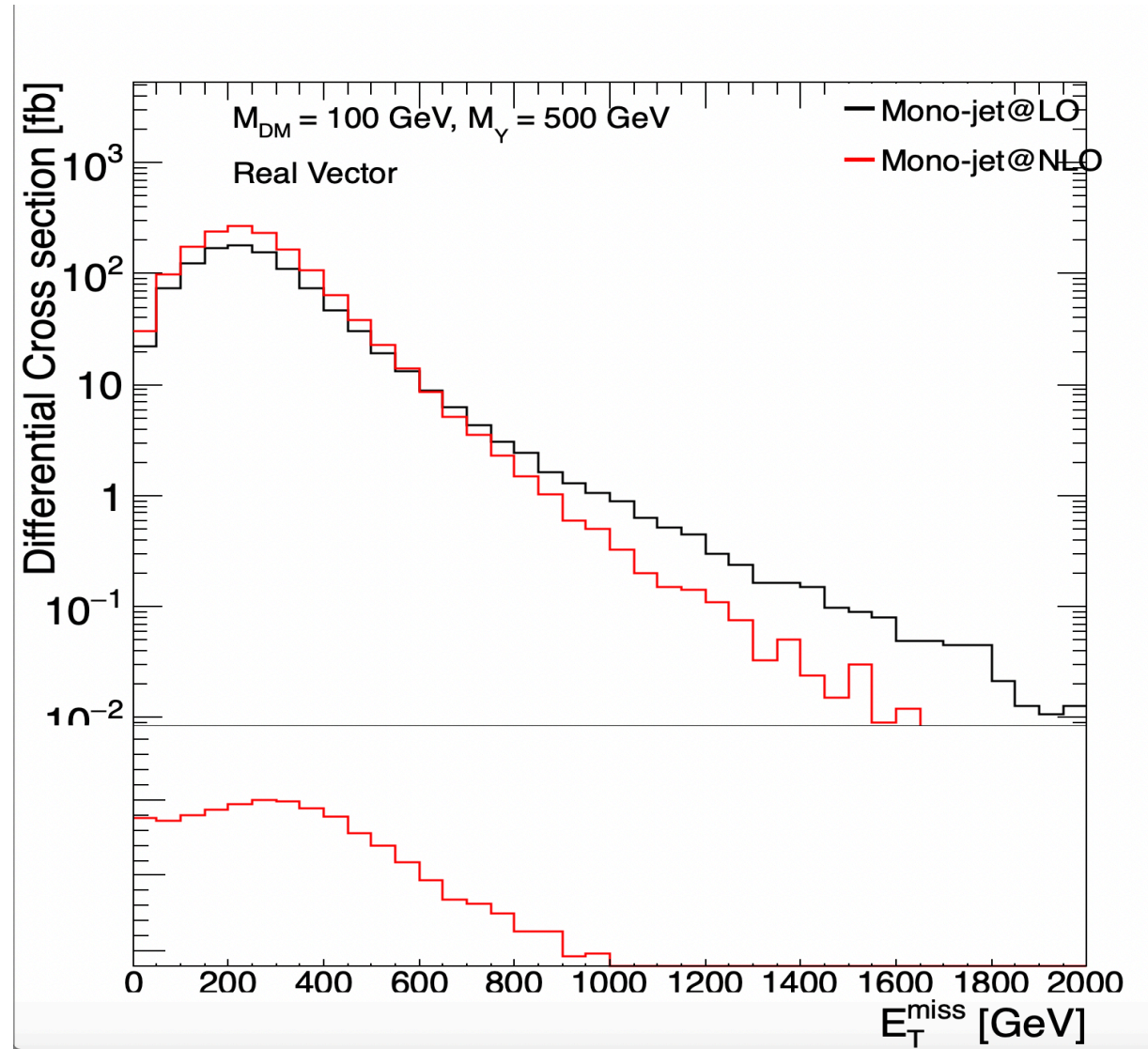
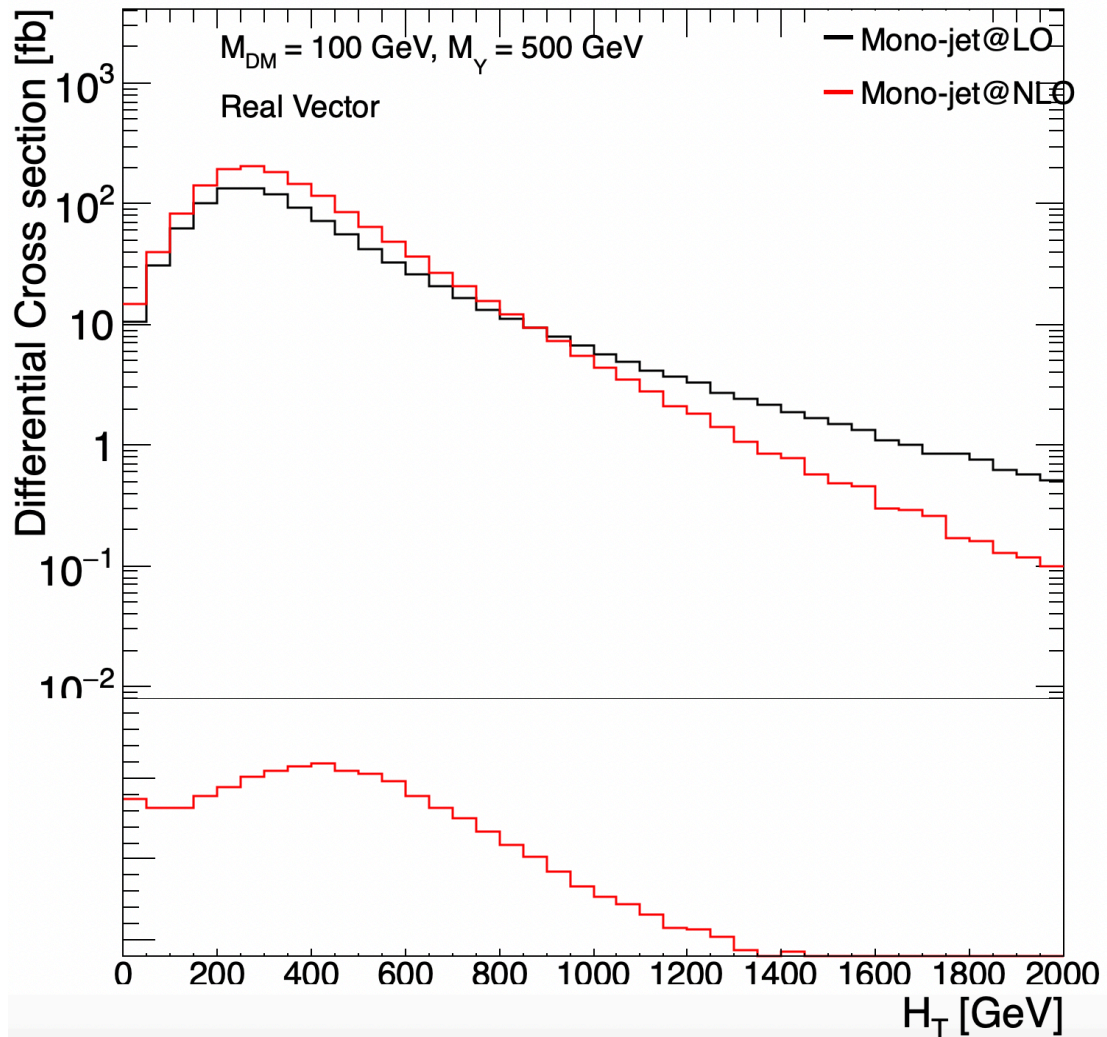
- I studied the difference between LO and NLO predictions in various distributions for mono-jet production in the real-vector DM case with $\hat{\lambda}_\psi = 0.1$.

	M_{DM} [GeV]	M_Y [GeV]
BP1	100	500
BP2	500	1000

- Cross sections:

	σ_{LO} [pb]	σ_{NLO} [pb]	K -factor
BP1	1.06	1.49	1.4
BP2	0.006	0.009113	1.5

$M_{DM} = 100 \text{ GeV}$ and $M_{\gamma} = 500 \text{ GeV}$



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