

# Top-philic Vector-Like Portal to Scalar Dark Matter

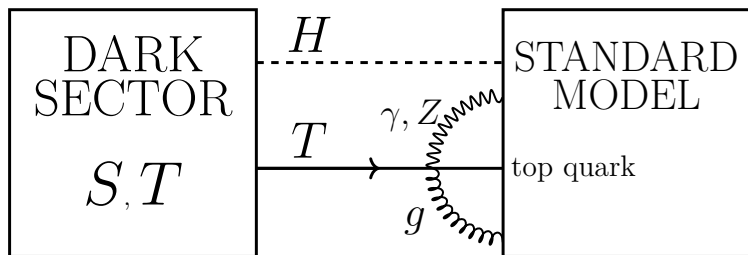
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Based on arXiv:1804.05068 (Accepted in PRD), arXiv:1805.10173  
in collaboration with S. Colucci, B. Fuks, F. Giacchino, L. Lopez Honorez and M.  
H. G. Tytgat

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## Simplified Models?



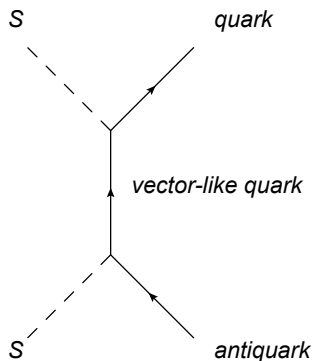
Dark Matter :  $S$ , scalar singlet

Mediator with the SM :  $T$ , coloured vector-like right-handed fermion

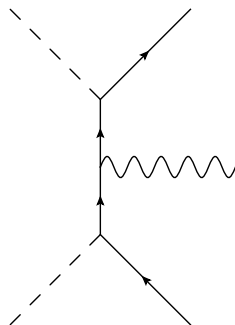
Parameters :  $m_S$ ,  $m_T$  and Yukawa coupling  $\tilde{y}_t$

$$\mathcal{L} = \mathcal{L}_{\text{SM}} + \bar{T} (i\not{D} - m_T) T + \frac{1}{2} \partial_\mu S \partial^\mu S - \frac{1}{2} m_S S^2 + \left[ \tilde{y}_t S \bar{T} P_R t + \text{h.c.} \right] - \frac{1}{2} \lambda S^2 H^\dagger H$$

## Radiative corrections : A necessity

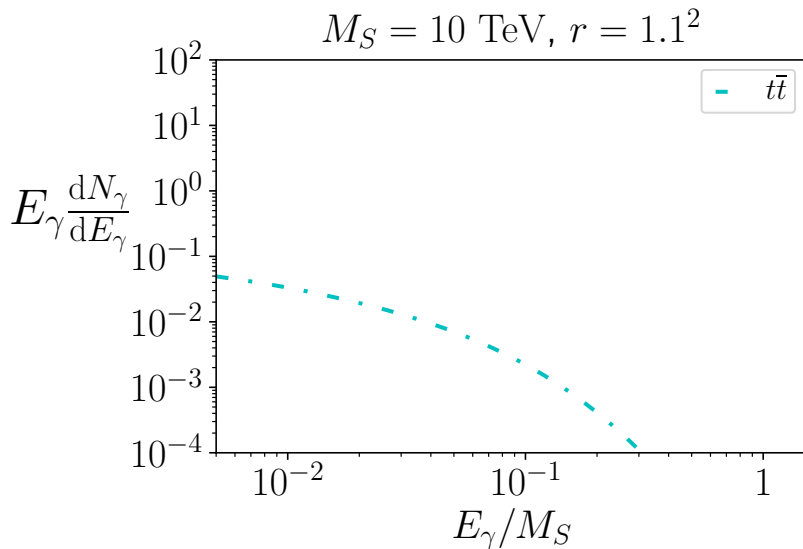


Cross section  $\propto v^4$ , very inefficient! (assuming  $m_{\text{quark}} \ll M_{DM}$ )

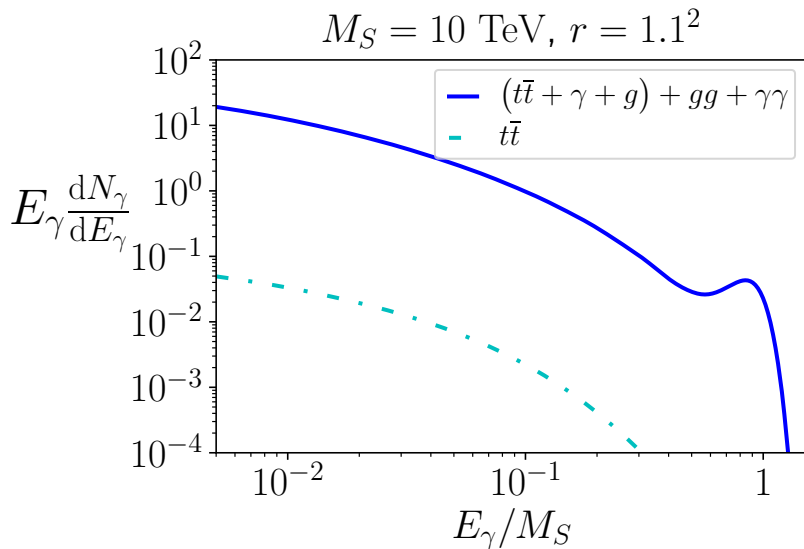


Lifting of the suppression :  $\sigma_{V^3 \text{ body}} \gg \sigma_{\text{tree-level}}$

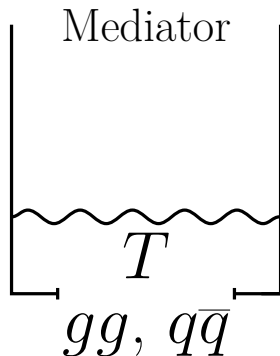
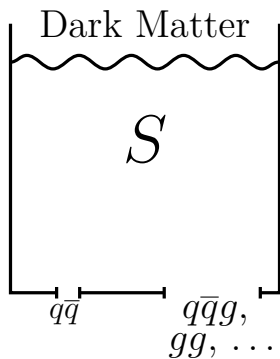
# Effect of Radiative Corrections on the $\gamma$ spectrum



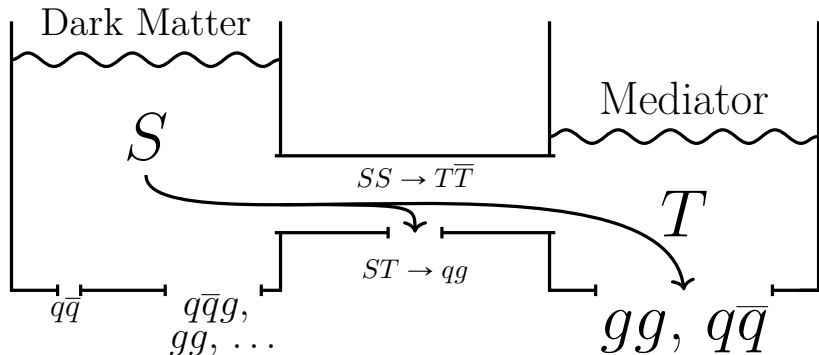
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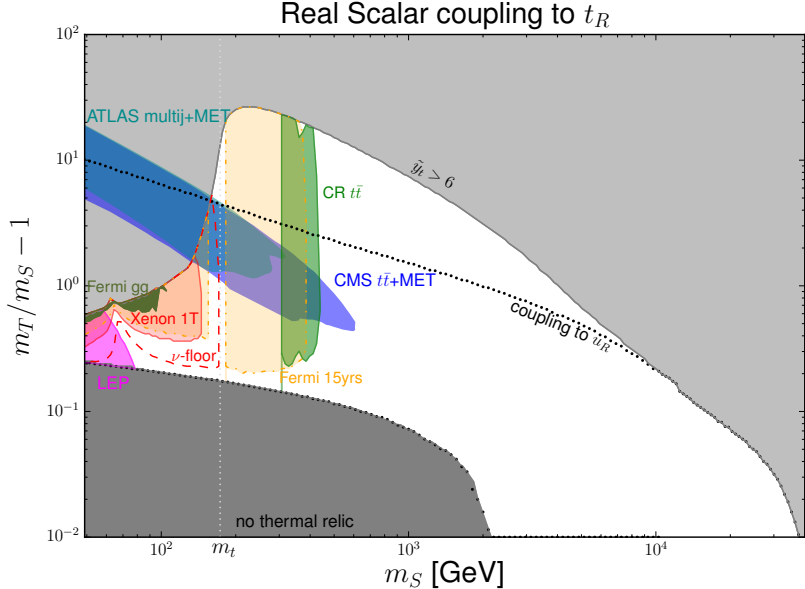
## Annihilation in the Early Universe : DM is alone



# Mass Degeneracy : it co-annihilates with its friend !



# Extensive phenomenological study : Results





Thank you !