

LHCb Future Dark-Sector Sensitivity Projections for Snowmass

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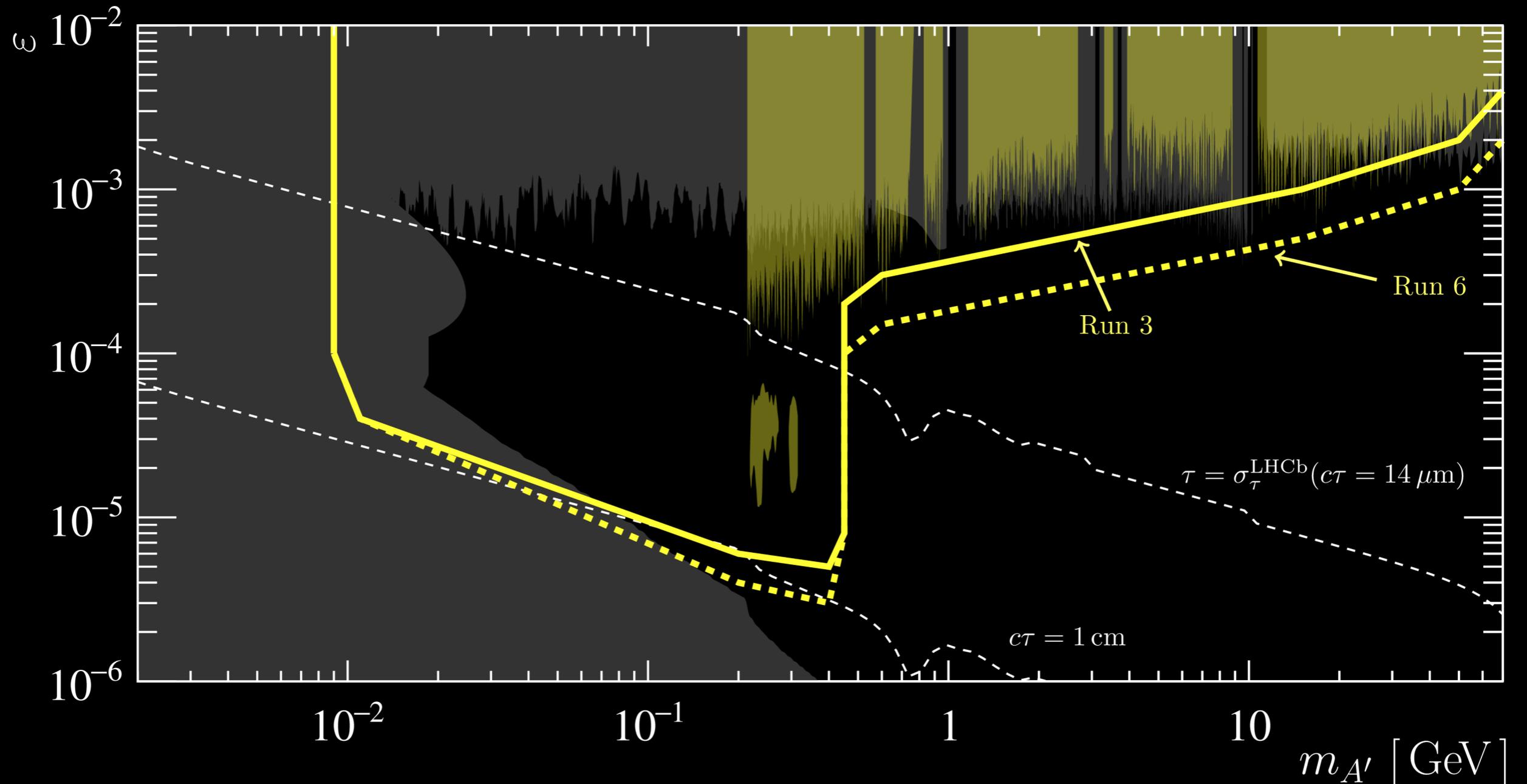
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Based on Craik, Ilten, Johnson, MW [2203.07048]



Dark Photons

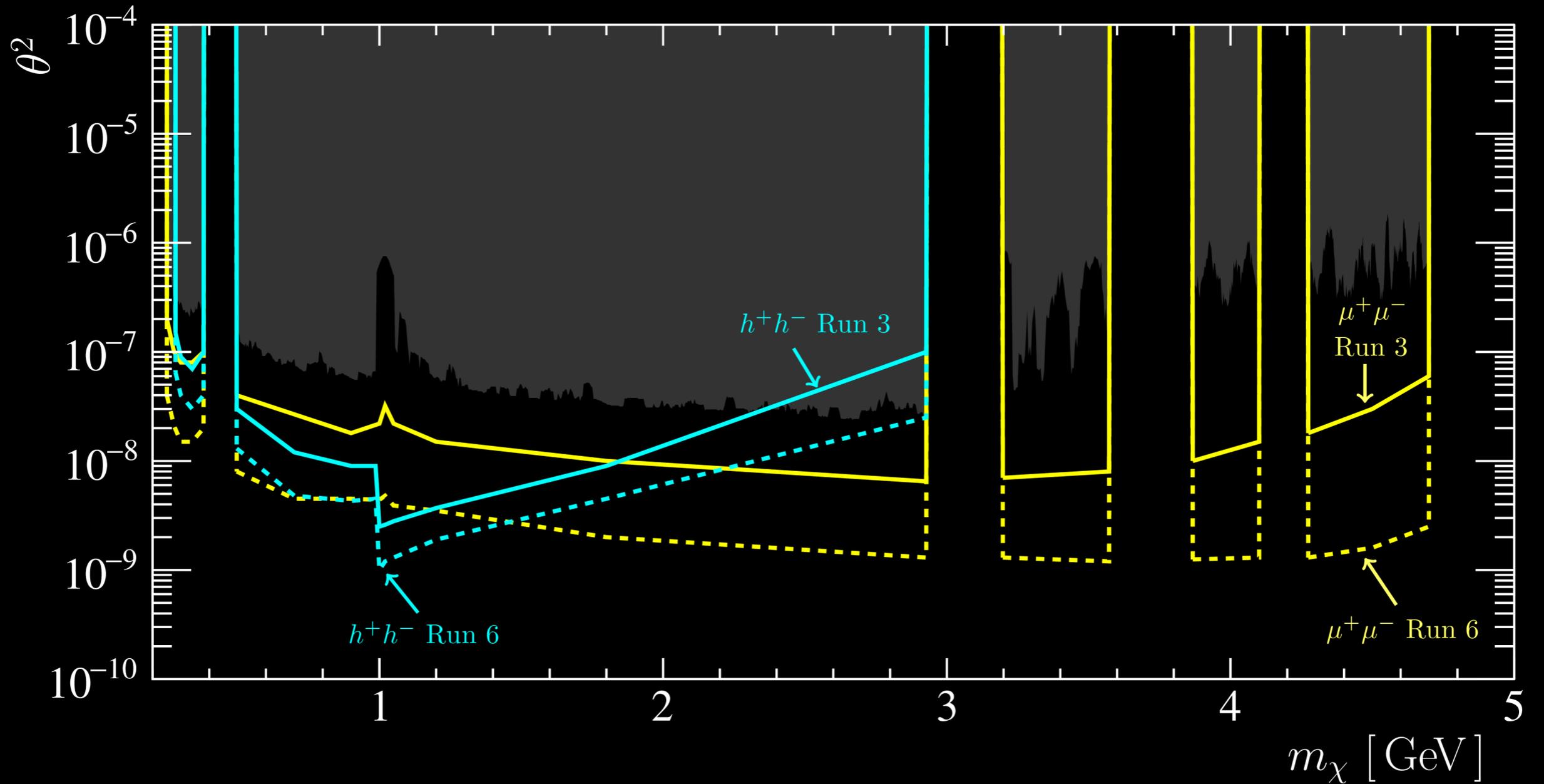
LHCb Run 2 dimuon results [1] are consistent with our predictions [2], hence we leave these unchanged. We proposed using charm decays to search for $A' \rightarrow e^+e^-$ to get through the trigger [3]; however, recent advances in the LHCb trigger make it possible to do an inclusive dielectron search.



[1] LHCb 1710.02867,1910.06926; [2] MW+ 1603.08926; [3] MW+ 1509.06765

Higgs Portal

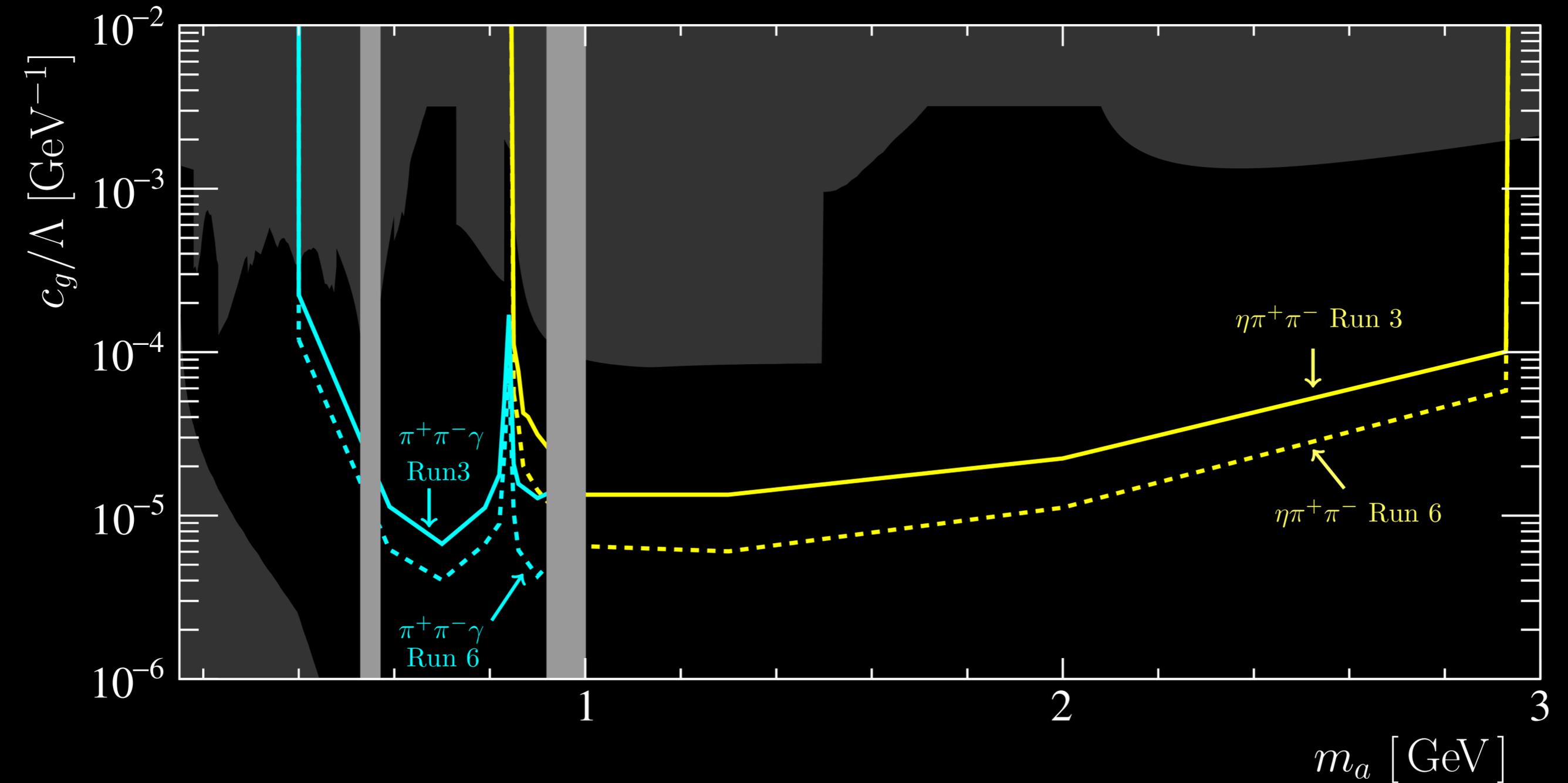
We updated the published Run 1 results [1] to use a more modern scalar-hadronic coupling model, and produced future projections that properly account for the strong lifetime dependence (i.e. we do not just scale the Run 1 results by some LUMI factor). We also include new hadronic projections [2].



[1] LHCb 1508.04094, 1612.07818; [2] bkgd estimate based on LHCb 1608.01478

ALPs

LHCb has not yet produced results for ALPs coupled to gluons. We predict the sensitivity for several hadronic modes based on the theory in [1] and backgrounds (very conservatively) estimated from [2].



[1] Aloni, Soreq, MW 1811.03474; [2] LHCb 1612.08110

Summary

- We produced updated LHCb dark-sector sensitivity projects for Snowmass [2203.07048].
- **Dark Photons:** LHCb has world-leading results in the dimuon final state which confirm our previous predictions, hence no update needed. For lower-mass e^+e^- decays, advances in the LHCb trigger allow doing inclusive $A' \rightarrow e^+e^-$ searches.
- **Higgs Portal:** Published Run 1 results updated to use a more modern scalar-hadronic coupling model. Our future projections properly account for lifetime dependence and include new hadronic decay modes.
- **ALPs:** For ALPs coupled to gluons, sensitivity predicted for several hadronic modes (with very conservative background estimates).