Flavour anomalies and leptoquarks at future colliders

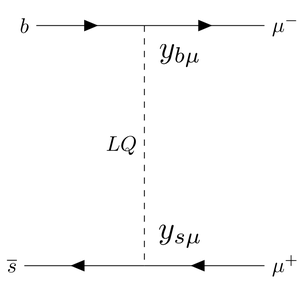
Maeve Madigan
University of Cambridge
with B.C Allanach, T. Corbett, T. You

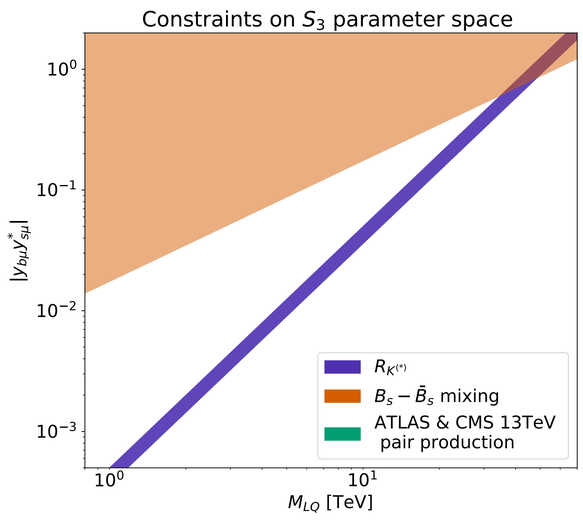
Introduction

We estimate the sensitivity of **future hadron colliders** to scalar leptoquark pair production.

HL-LHC at 14 TeV **HE-LHC** at 27 TeV **FCC-hh** at 100 TeV

Leptoquark model S_3 with couplings determined by fits to $R_{K^{(*)}}$:

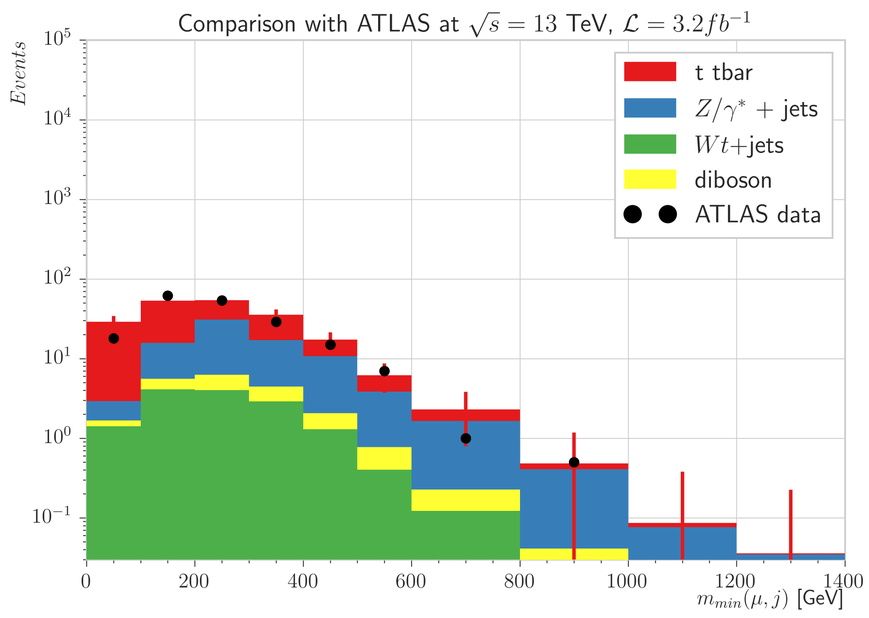


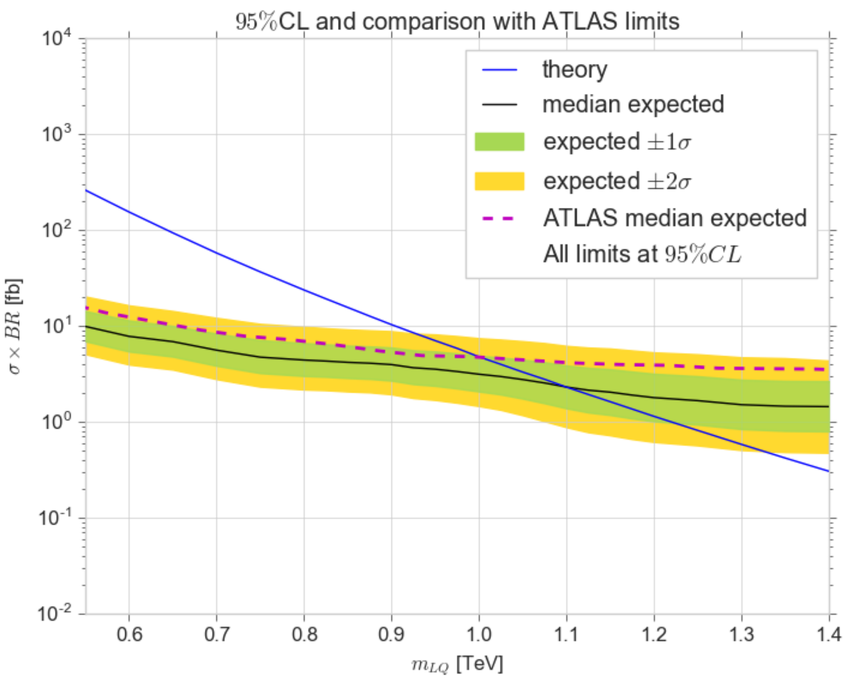


Methods & Validation

Simulate the standard model background using
- `mg5_aMC@NLO`
- `Pythia8`
- `Delphes 3`

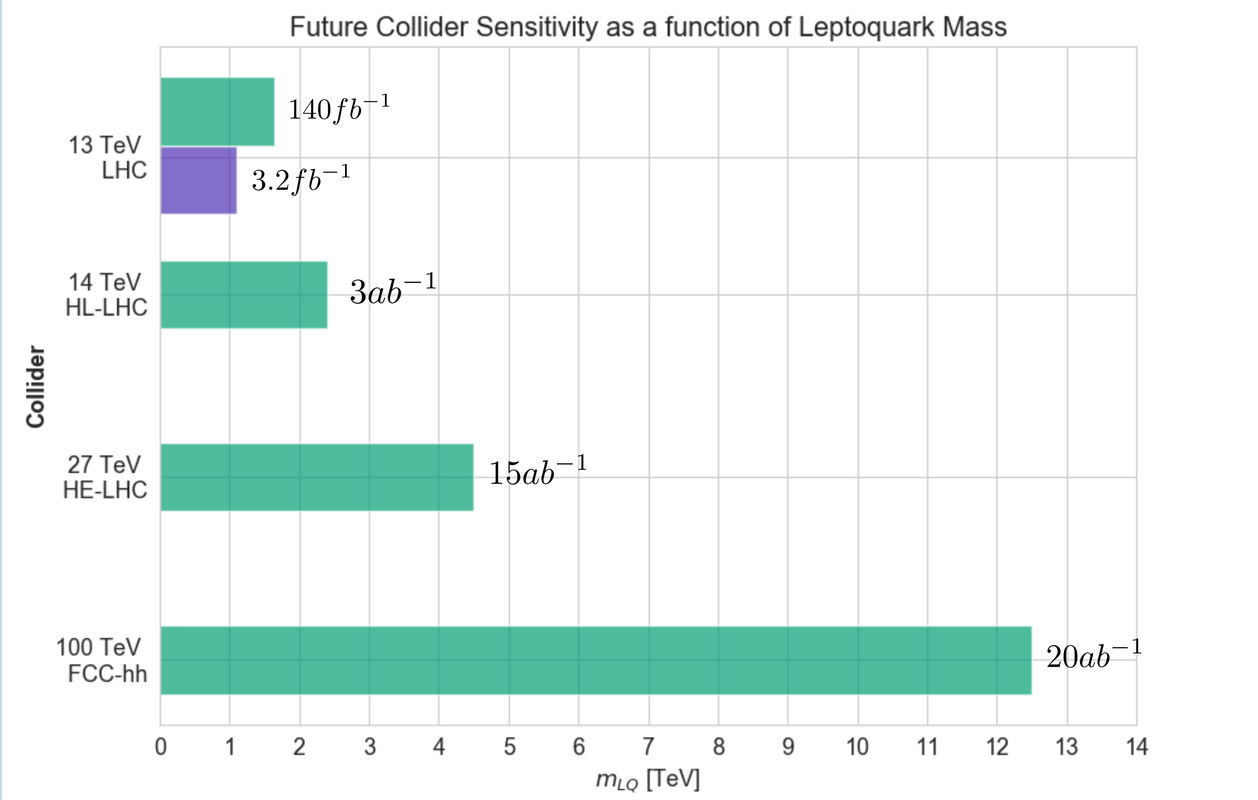
Validate by comparison with ATLAS search for 2nd generation leptoquarks at 13 TeV with $\mathcal{L} = 3.2\text{fb}^{-1}$:



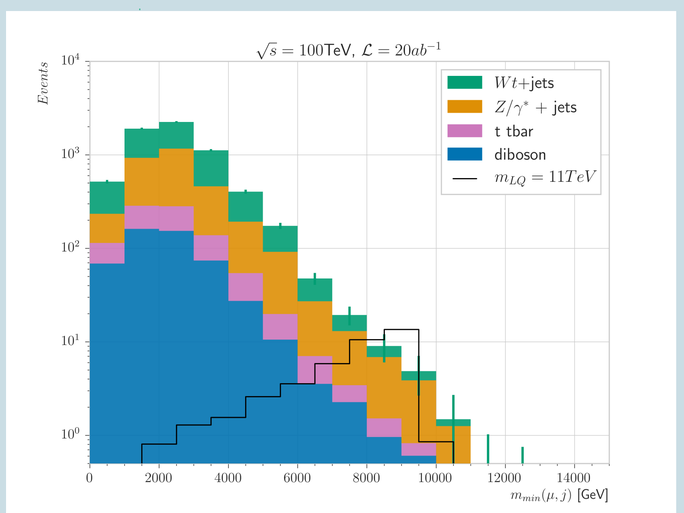


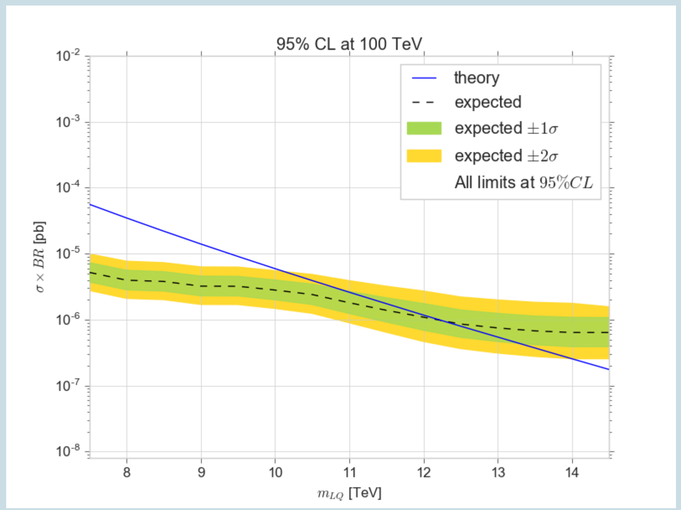
Results

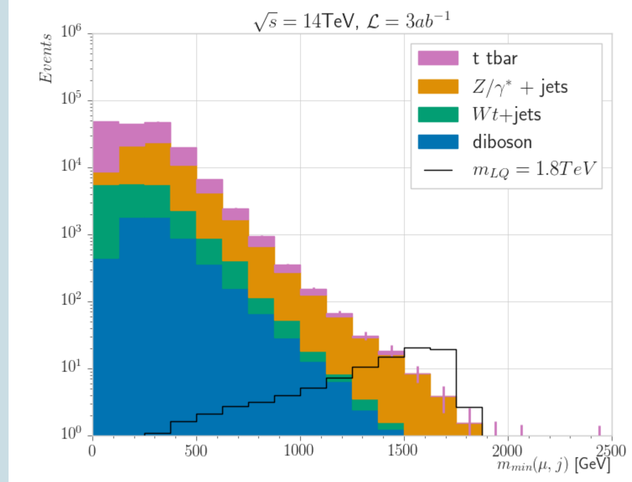
Assuming we observe no significant excess above the standard model background, we obtain 95% CL on the leptoquark signal and estimate the value of m_{LQ} which could be excluded by each future collider.

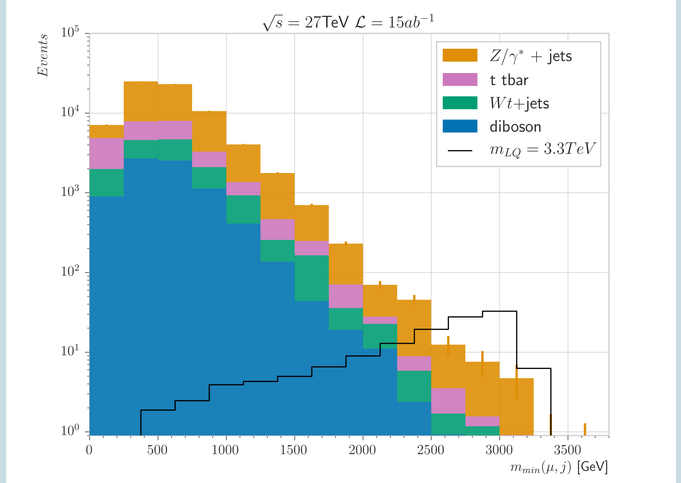


Details of standard model background and leptoquark signal simulations:









References

[1] B. C. Allanach, B. Gripaios and T. You, *The case for future hadron colliders from* B→K$^{(*)}$ μ$^+$ μ$^-$ *decays*, JHEP 03 (2018) 021 [1710.06363]
[2] ATLAS Collaboration, M. Aaboud et. al, *Search for scalar leptoquarks in pp collisions at* √s=13 TeV *with the ATLAS experiment,* New J. Phys. 18, 093016 (2016), [1605.06035]
[3] LHCb Collaboration, R. Aaij et. al, *Search for Lepton-Universality Violation in* $B^+ \to K^+ l^+ l^-$ *Decays,* Phys. Rev. Lett. 122, 191801 (2019), [1903.09252]
[4] I. Dorsner, A. Greljo, *Leptoquark toolbox for precision collider studies,* JHEP 05 (2018) 126 [1801.07641]

UNIVERSITY OF CAMBRIDGE
Department of Applied Mathematics and Theoretical Physics
mum20@cam.ac.uk