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# Looking at the impacts of the 2-light-2-heavy WCs on ttbar

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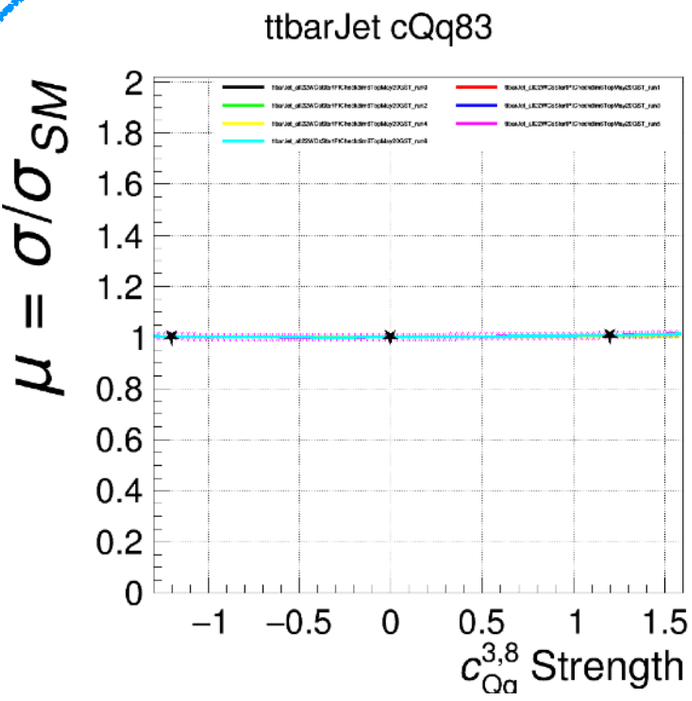
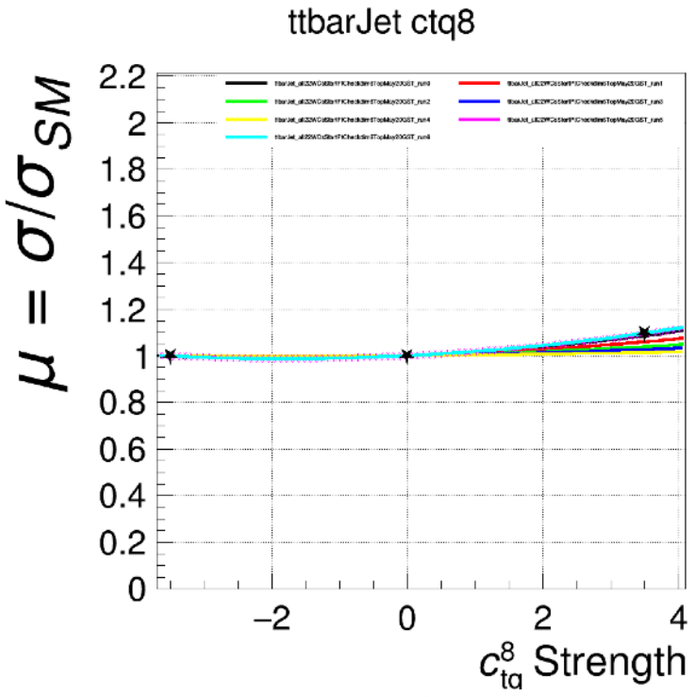
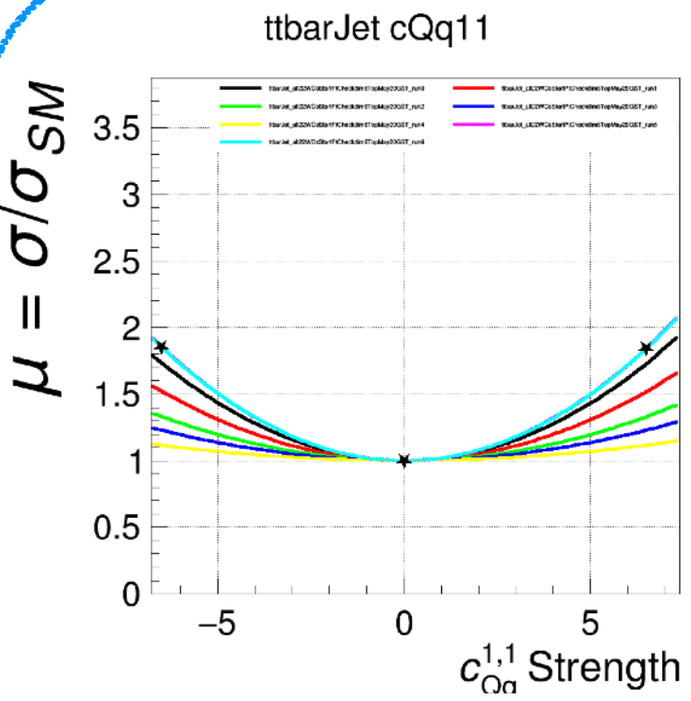
# Background info

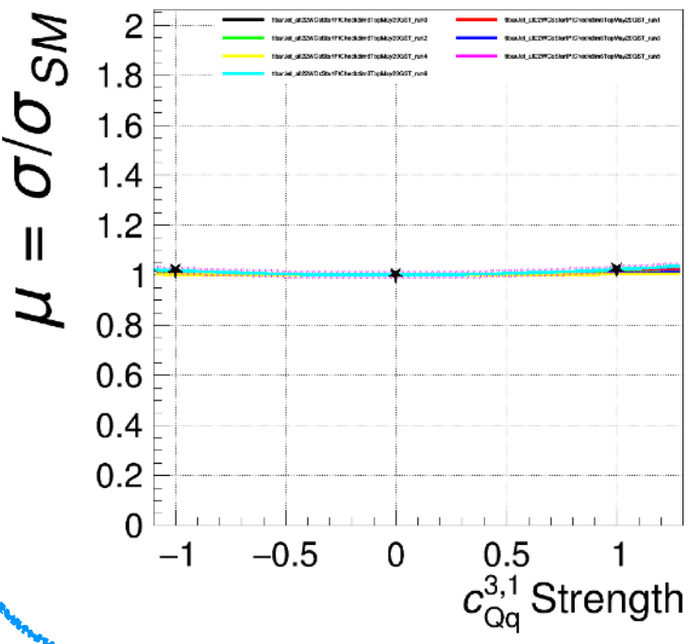
- The problem: The 2-light-2-heavy WCs could potentially impact ttbar, which is problematic because we assume our backgrounds do not depend on the WCs
- One way to check this:
  - If we know ttbar xsec to ~5%, we can assume that someone would have already noticed if the ttbar xsec was more than about three times different from the SM
  - So if the WC values required to scale ttbar by 1.15 are comparable to (or smaller than) our asimov limits, then what we're doing might not make sense (since the WCs would be better constrained by ttbar)
- For the 2-light-2-heavy WCs, our asimov limits (for signal only with most systematics included) are around ±0.1 to ±0.8
- So let's look at ttbar and see what values of the WCs will scale the xsec by 1.15
  - Turns out we made ttbar+jet samples for these WCs last year
  - Apparently we were having issues finding a good starting point, so we generated 1d scans as well
  - Plots (from March 16, 2021) shown on the next page

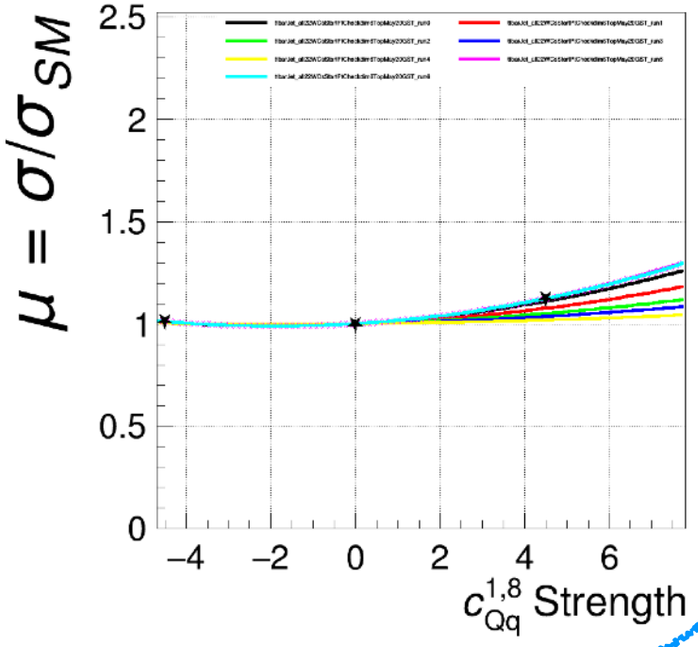
# ttbar+jet plots scaled to SM (from March 26, 2021)

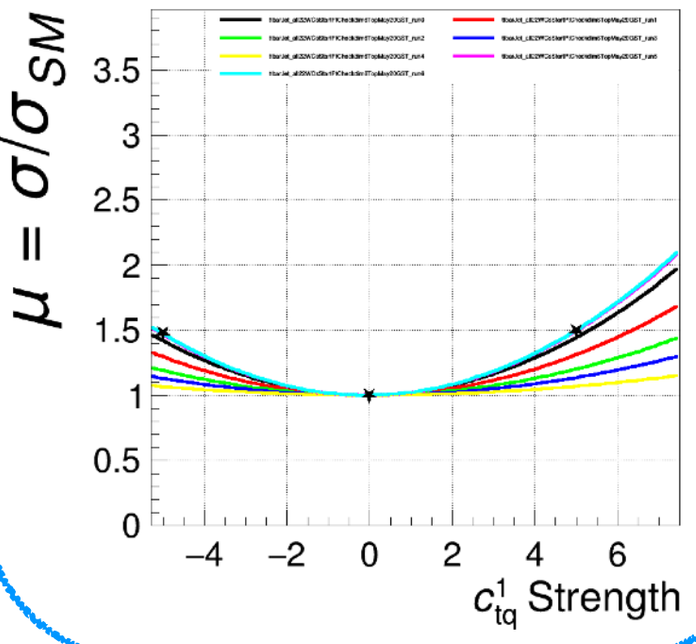


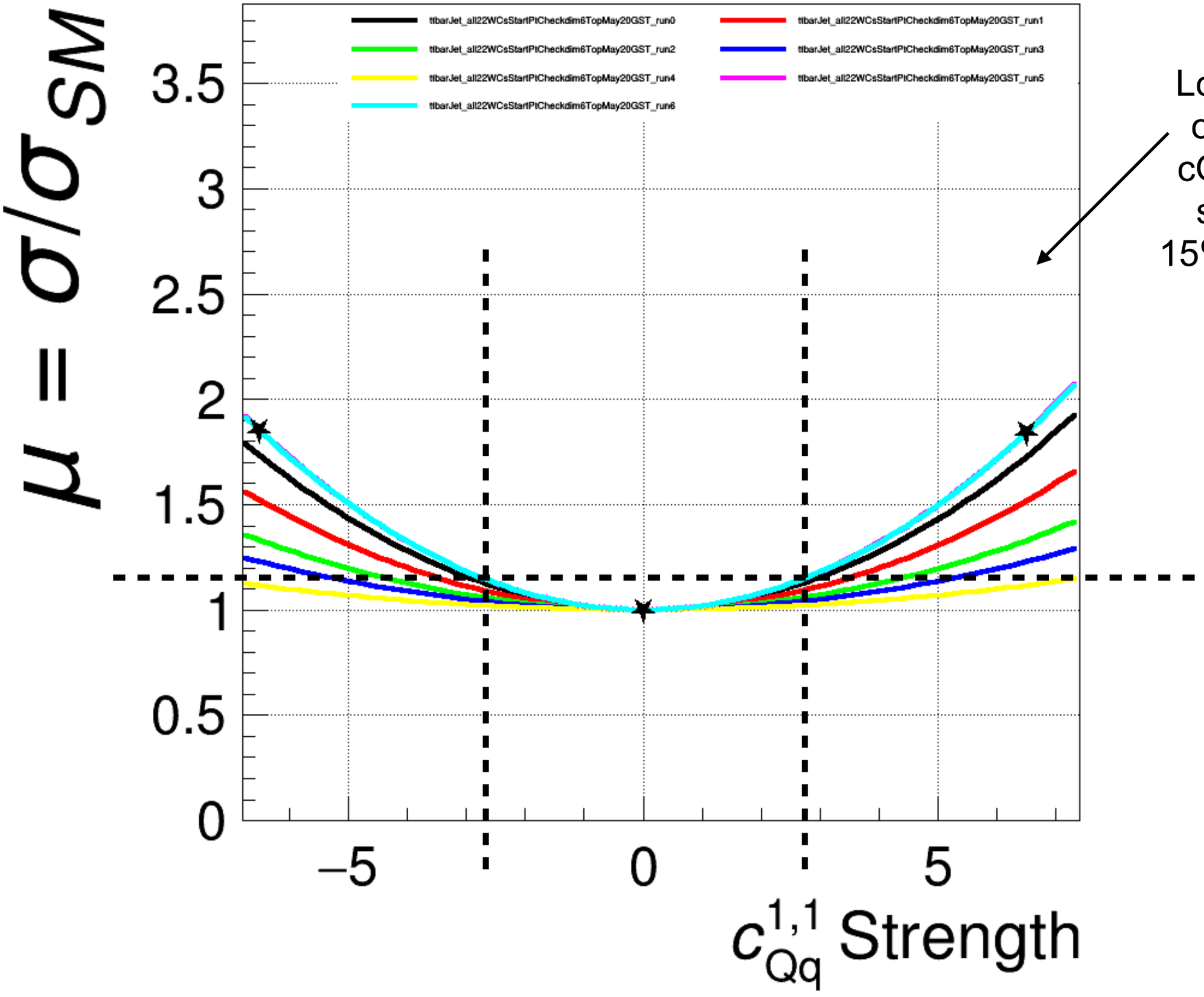




These 4 definitely don't scale ttbar by anything close to 1.15 anywhere near our limits

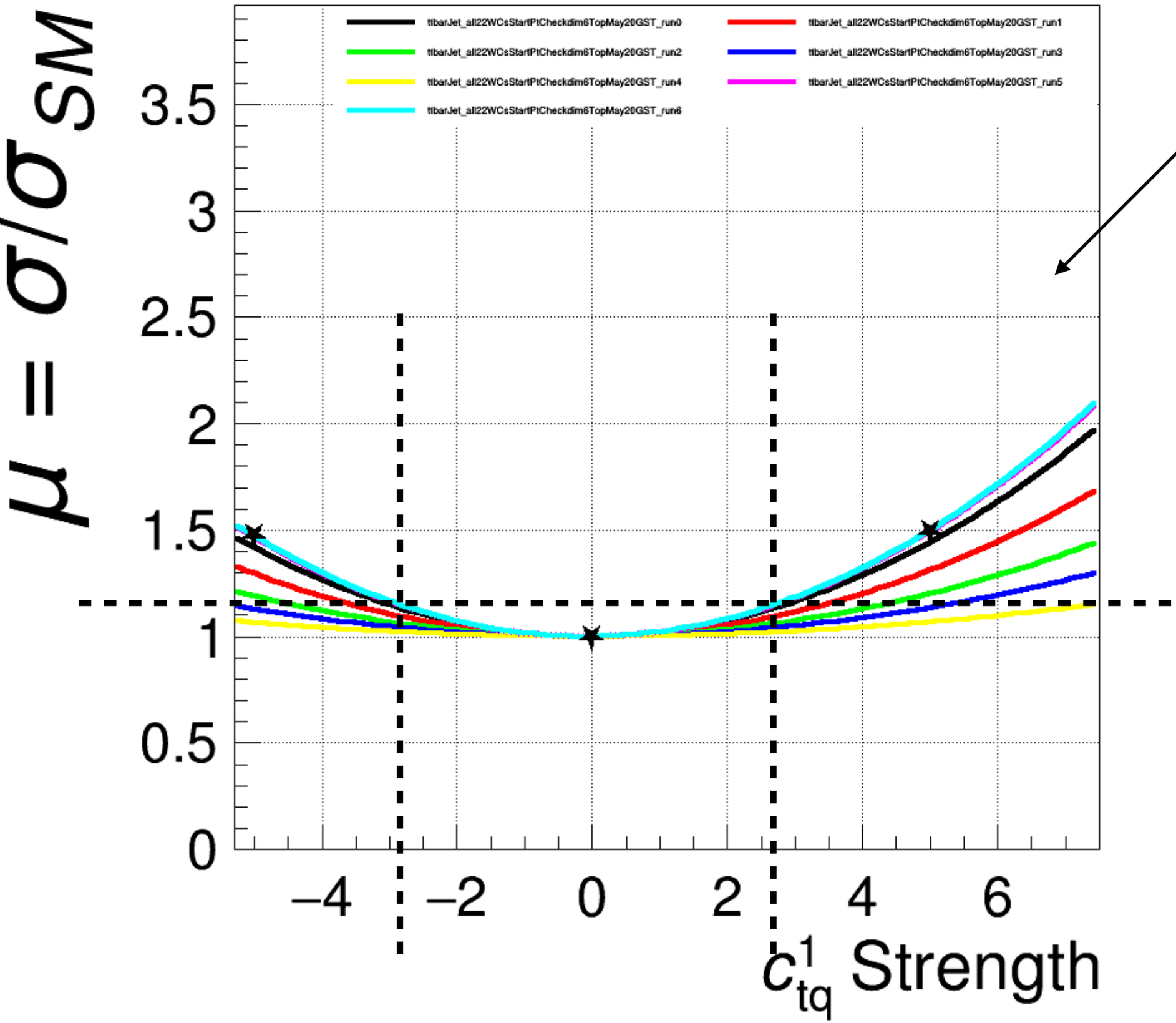
These 2 might be worth a closer look

# ttbarJet cQq11




Looks like we're ok here, since cQq11 does not scale ttbar by 15% till around ±3

# ttbarJet ctq1




Looks like we're ok here too, since ctq1 does not scale ttbar by 15% till around ±3

# Summary

- It seems that in oder to scale ttbar by around 15%, the 2-heavy-2-light WCs would have to be at least around ±3
- Our limits are roughly an order of magnitude smaller than that (as our asimov limits are about ±0.1 to ±0.8)
- However, the limits I was using are for signal only, and not all of the systematics (just the ones outlined here)
- So once we have our full analysis in place, might want to evaluate this again, but as long as the limits don't get worse by an order of magnitude, it seems like we will probably be ok