Renormalization Without Counterterms

The FDR Vacuum vs DR/$\overline{MS}$

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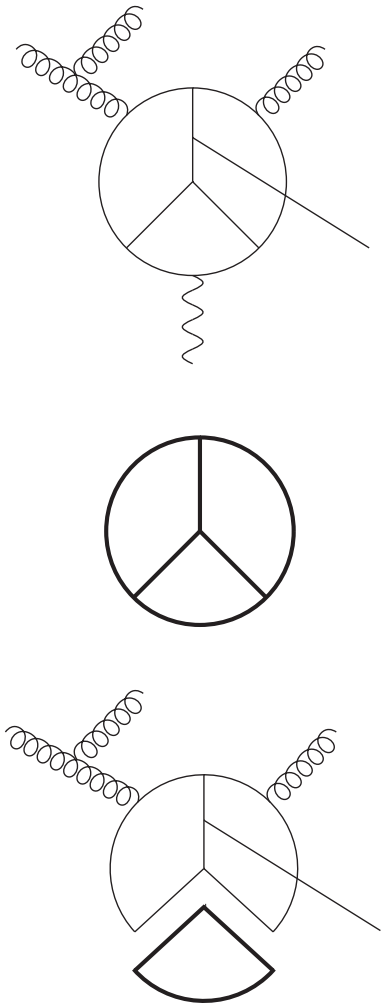
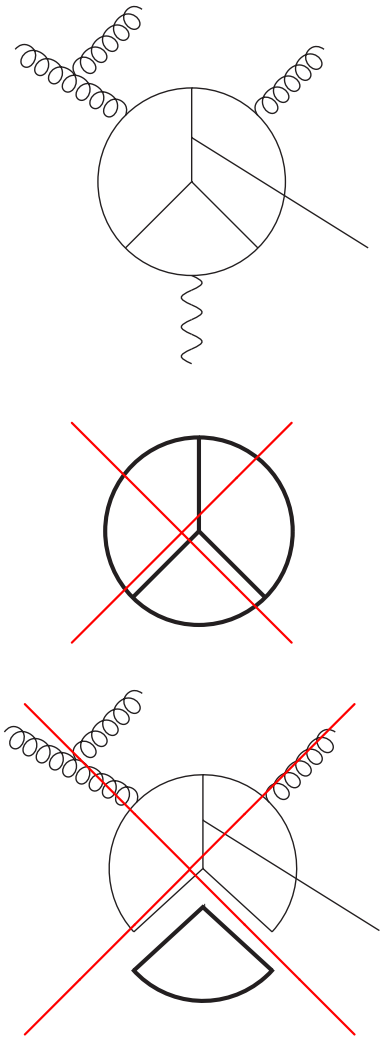
Four Dimensional Regularization (FDR)

- Integrals diverge at large momenta.
- FDR separates into a "vacuum" and finite part.
- (In a gauge and shift invariant way.)



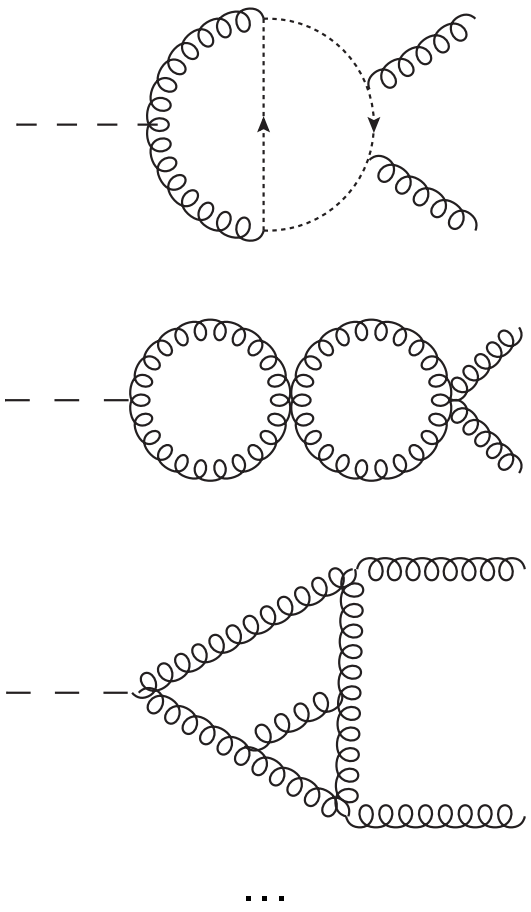
Four Dimensional Regularization (FDR)

- Integrals diverge at large momenta.
- FDR separates into a "vacuum" and finite part.
- (In a gauge and shift invariant way.)
- We discard the vacuum.
- The integral is then defined as the finite remainder.



Our Work - Towards H $\rightarrow$ gg @ 2-Loop

- H $\rightarrow$ gg @ 2-loops in an EFT with an infinite top mass.
- We need α_S renormalization.
- Shortcut: DR/$\overline{MS}$ result.
- How does α_S in FDR relate?



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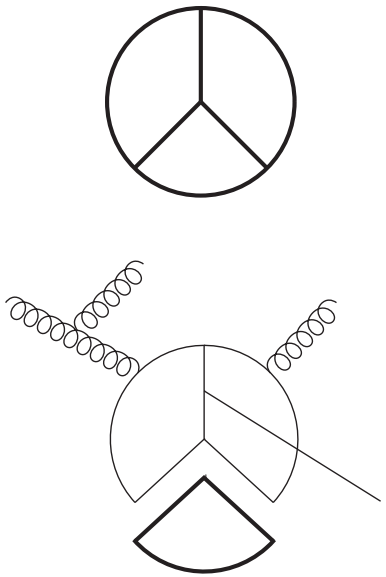
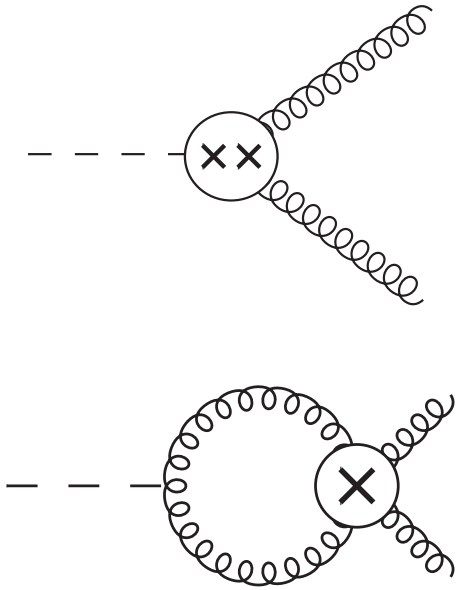
The Renormalization Difference - Vacuum vs Counterterms

Related by the potentially different subtraction that occurs between:





FDR - global and sub vacua.

DR/$\overline{MS}$ - order by order counterterms.

Calculate and compare!

In Summary - FDR Killed the CT Star? (Yes)

- FDR is a finite renormalization scheme, devoid of counterterms.
- It implements renormalization by dropping vacuum configurations.
- We can calculate the renormalization of α_S by comparing the FDR vacuum to DR/$\overline{MS}$ counterterms.
- The calculation is underway.
- More investigation into the properties of the integral in the future!

Relevant Papers: arXiv:1208.5457, arXiv:1307.0705, arXiv:1311.3551

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