



PPPI HS09

Exercise Sheet 9

ETH

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www-theorie.physik.uzh.ch/~nurhana/PPPI_HS09/

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Exercise 22 [A real cross section!]

The goal of this exercise is to calculate the cross section for the process $e^+ + e^- \rightarrow \mu^+ + \mu^-$, taking into account finite electron and muon masses. Please use the following recipe:

- (i) Draw all Feynman graphs that contribute to the process in the desired order (see below).
- (ii) Using the Feynman rules write down the amplitude for each graph.
- (iii) Take the square of the sum of all amplitudes (only one here).
- (iv) Sum over the outgoing spins and average over the incoming spins to transform the amplitude into a sum of traces (only one trace in this case).
- (v) Simplify the resulting expression using trace identities (lecture!).
- (vi) Multiply with the flux factor.
- (vii) Express the result in a specific coordinate frame (e.g. centre-of-mass frame).
- (viii) You're done!

