

Flavor Physics – Exercise Sheet 4 – SomSem 2014

Discussion: 23/05 during the tutorial

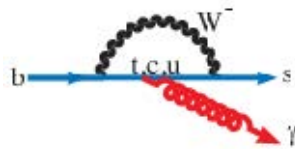
Exercise 1: The Unitarity Triangle

The Unitarity Triangle (UT) is defined as the following triangular relation:

$$V_{ud}V_{ub}^* + V_{cd}V_{cb}^* + V_{td}V_{tb}^* = 0$$

- Show that the tip of the resized (i.e. length of basis = 1) unitarity triangle is at $\bar{\rho} + i\bar{\eta}$ with $\bar{\rho} = \rho(1 - \frac{\lambda^2}{2})$ and $\bar{\eta} = \eta(1 - \frac{\lambda^2}{2})$.
- Calculate the area of the original (not resized) triangle in terms of the Wolfenstein parameters.

Exercise 2: GIM cancellation in loops



The figure shows the Feynman diagram of the loop-suppressed decay $b \rightarrow s\gamma$. This diagram contributes for example to the decay $B^0 \rightarrow K^*\mu^+\mu^-$. Show that for massless quarks the sum of the amplitudes with internal u, c and t-quark is exactly zero. Hint: Exploit the unitarity of the CKM matrix.