Flavor Physics – Exercise Sheet 9 – SomSem 2014

Exercise 1: Rare $b \to s\gamma$ transition

The amplitude for the rare $b \to s\gamma$ transition
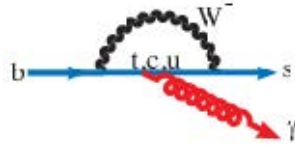
can be written as the sum of the contributions from the 3 quarks:

$$\mathcal{A}(b \to s\gamma) = \mathcal{A}_u + \mathcal{A}_c + \mathcal{A}_t$$

The amplitudes $\mathcal{A}_i = \Lambda_i f_i$ are proportional to a CKM factor Λ_i and the effect f_i of the internal quarks described by the Inami-Lim function which is proportional to m_i^2/M_W^2 with m_i being the quark masses.

1. Rewrite $\mathcal{A}(b \to s\gamma)$ as function of the CKM elements.

2. Exploit the unitarity of the CKM matrix to eliminate Λ_u.

3. Discuss the size of the t and c contributions to the total amplitude.

4. Discuss the amplitude $\mathcal{A}(c \to u\gamma)$ - what is different?