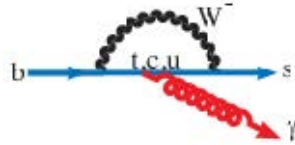


# Flavor Physics – Exercise Sheet 8 – SomSem 2015

Discussion: 03/07 during the tutorial

## Exercise 1: Rare $b \rightarrow s\gamma$ transition

The amplitude for the rare  $b \rightarrow s\gamma$  transition



can be written as the sum of the contributions from the 3 quarks:

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

The amplitudes  $\mathcal{A}_i = \Lambda_i f_i$  are proportional to a CKM factor  $\Lambda_i$  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  $\mathcal{A}(b \rightarrow s\gamma)$  as function of the CKM elements.
2. Exploit the unitarity of the CKM matrix to eliminate  $\Lambda_u$ .
3. Discuss the size of the t and c contributions to the total amplitude.
4. Discuss the amplitude  $\mathcal{A}(c \rightarrow u\gamma)$  - what is different?