Rare B-Decays to Test The Standard Model and Beyond

Becker C., Piscopo M.L., Vlahos C.

Supervisors: Krauss F., Maitre D., Pecjak B., Lenz A.

28.06.2018

The Theoretical framework

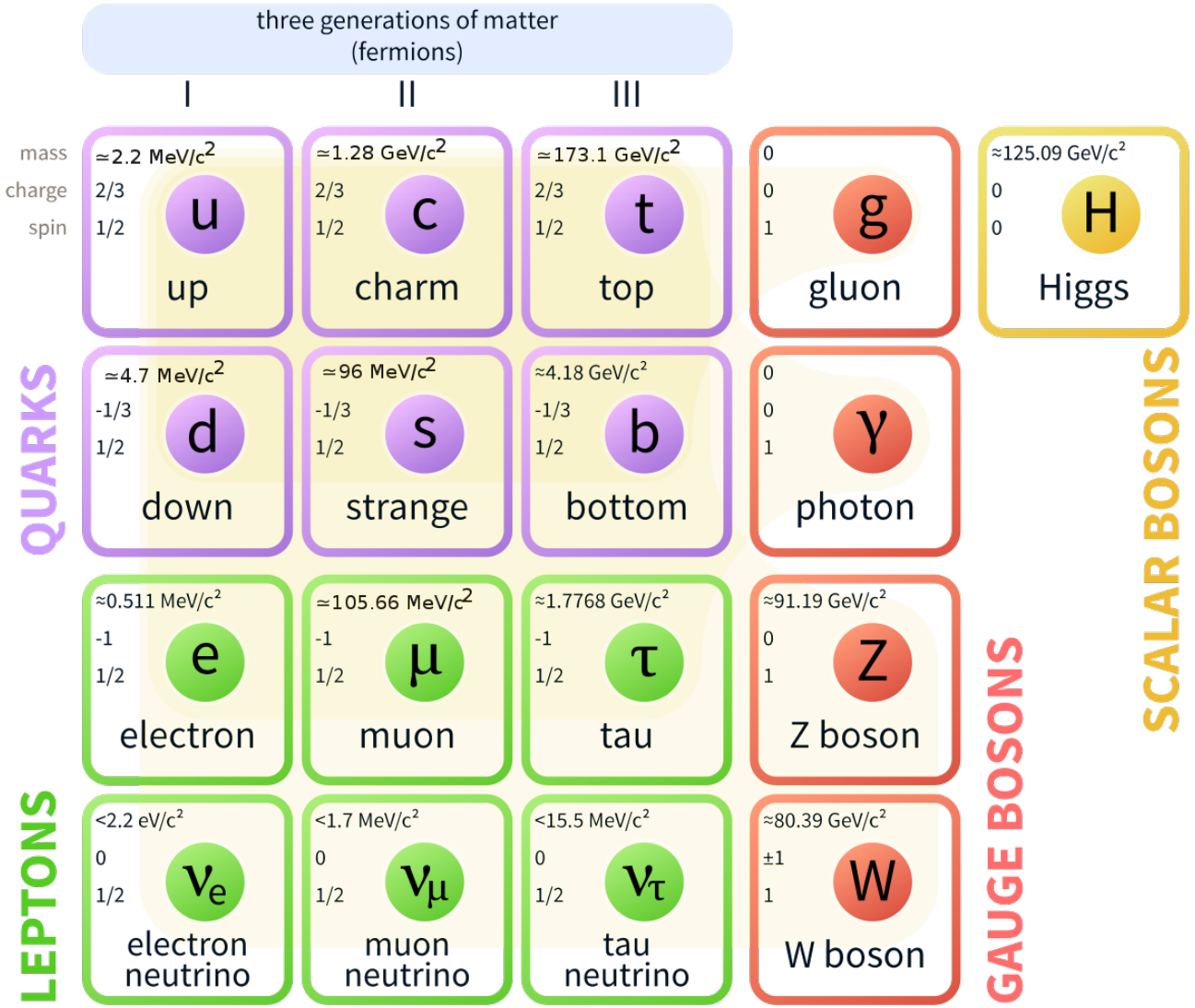
The Standard Model (SM) is an elegant and successful theory, though not complete:

- The mathematical description stops to be well defined at very high energy scale (experimentally unaccessible).
- New Physics is also expected at much lower scales, like the ones that the Large Hadron Collider (LHC) is currently (and in future) probing.
- Discrepancies between theoretical predictions and experiments give a great opportunity to understand the underlying patterns of SM physics and investigate possible new scenarios.
- Anomalies have already been found and many more might hide in the huge amount of data that still need to be analyzed.

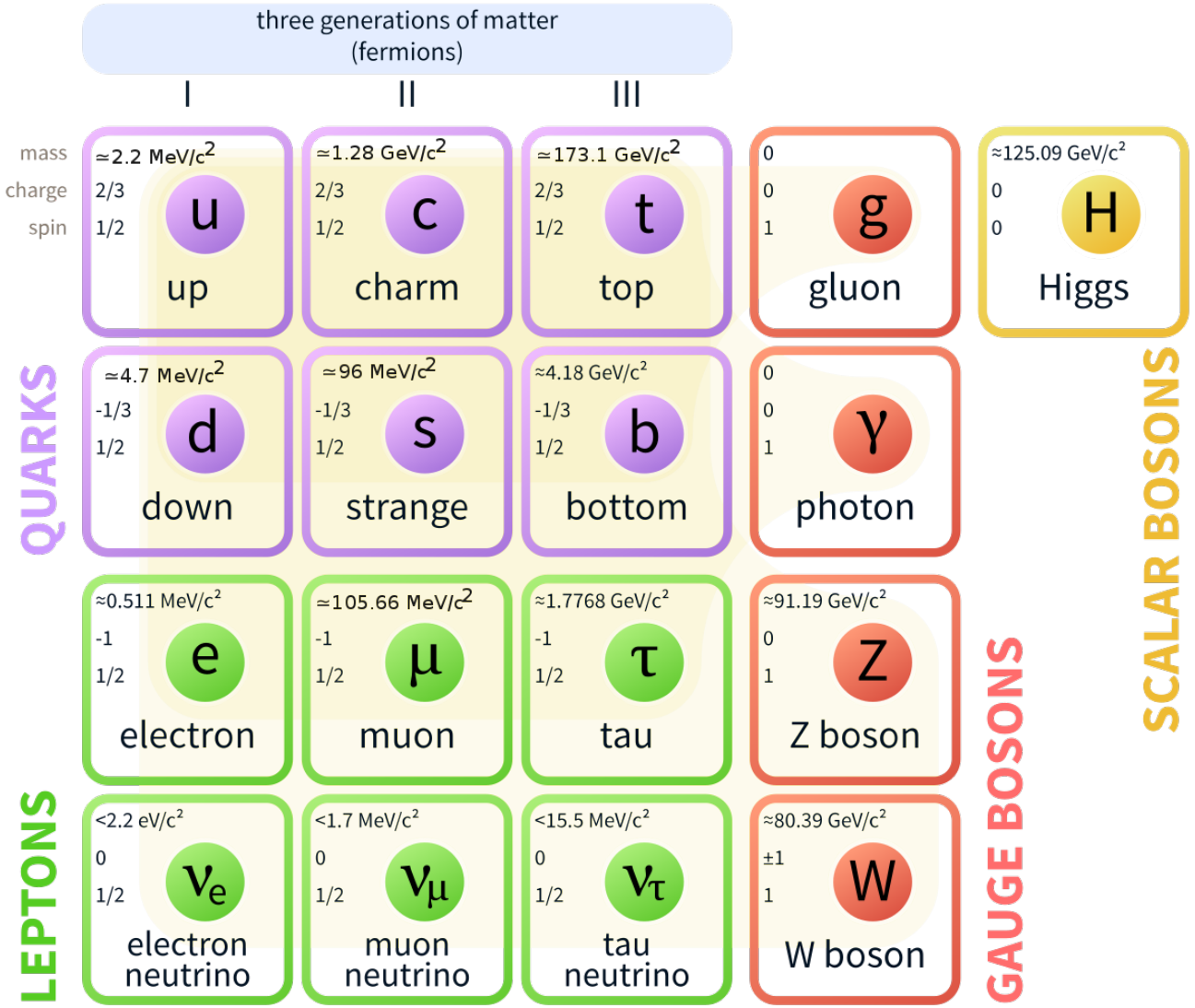
The Theoretical framework

- The central question is how to describe the interaction between two or more particles!?
- It turns out that there's no analytical finite solution, even in the simplest case..
- but it also turns out that most of the time are satisfied conditions that allow to treat this very complex problem as a sum of smaller and more tractable processes.
- This leads to a series expansion, in which each of the pieces is supposed to be less and less relevant $\rightarrow$ the series can be truncated at the desired order (at a hopefully little cost).

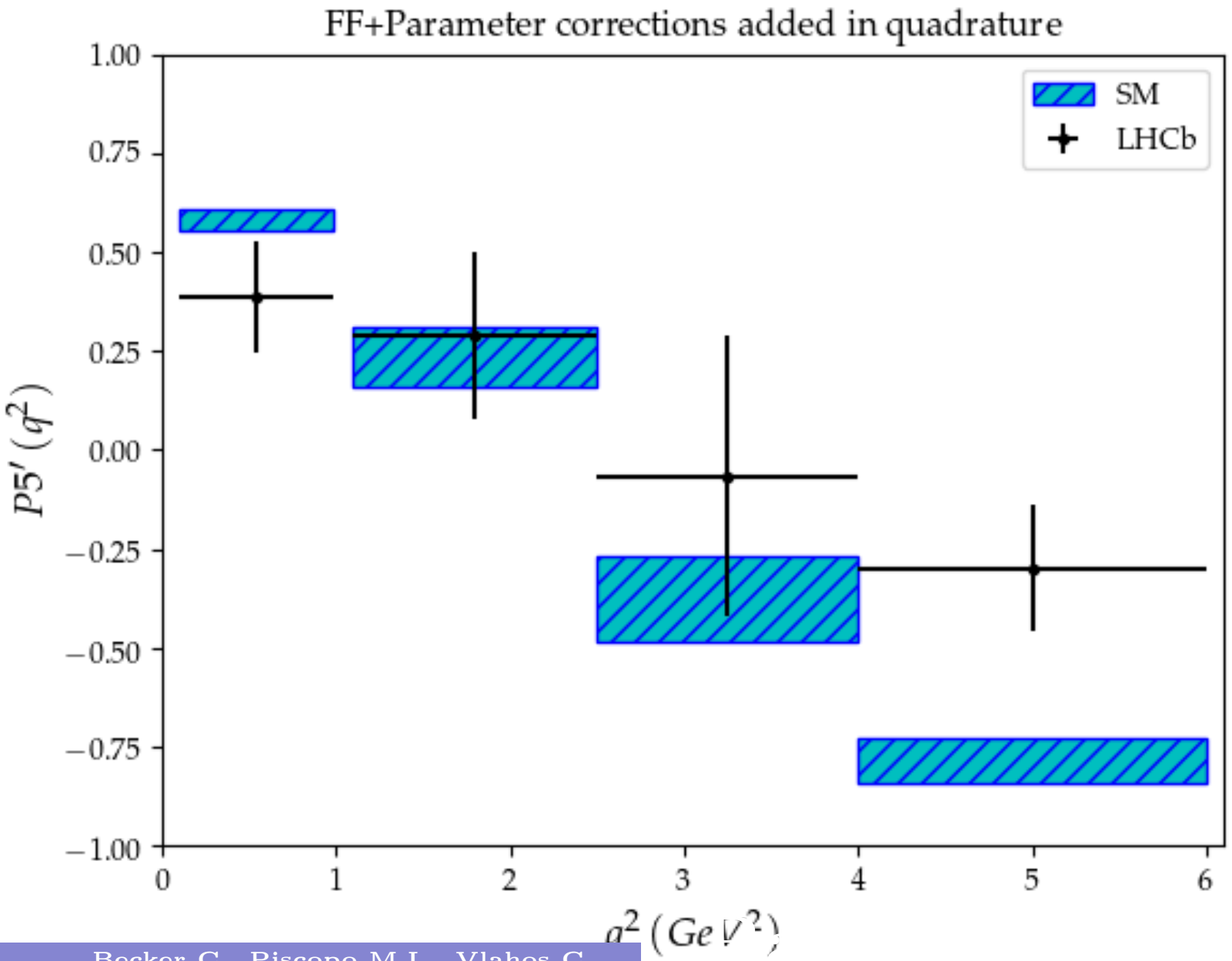
The Standard Model of particle physics



The Standard Model of particle physics



The Theoretical framework


FF+Parameter corrections added in quadrature
SM
LHCb
1.00
0.75
0.50
0.25
0.00
−0.25
−0.50
−0.75
−1.00
$P5'(q^2)$
0
1
2
3
4
5
6
$q^2\ (GeV^2)$