Radiative & Electroweak Penguins

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Meeting between book editors and section editors on 20/5/11

- Slow progress by section editors due to other commitments
- Apologies for not having anything in svn by this meeting, but we have been writing…
- Should have time to get stuff into svn after this meeting

Section Outline

- Theory (4 pages)
- Inclusive $b \to s\gamma$ (6 pages)
- Exclusive $b \to s\gamma$ (4 pages)
- Time-dependent CP violation in $b \to s(d)\gamma$ (3 pages)
- Exclusive & inclusive $b \to d\gamma$ (3 pages)
- Exclusive & inclusive $b \to s l^+ l^-$ (6 pages)
- Exclusive $b \to s \nu \bar{\nu}$ (2 pages)
- Other decays ($\phi\gamma$, $\gamma\gamma$, $\pi l^+ l$) (2 pages)

Theoretical Introduction

Nothing written explicitly for this book yet, but …

- Hurth & Nakao (arXiv: 1005.1224)
  includes ~ 18 pages of theory at a rather complete level of detail

Nakao to consult with Hurth about producing a 4 page summary at a level suitable for the B factory book.

Expect we need to explain relevant aspects of the OPE, plus something about perturbative and non-perturbative uncertainties (particularly for inclusive $b \to s\gamma$)

Don't need to cover constraints on New Physics models since there is a separate section on these?

Inclusive $b \to s\gamma$

- Some text exists from Nakao (1 page), Playfer (2 pages)
- Not committed to svn yet. Needs merging, and increasing to ~ 6 pages.
- Awaiting final BaBar results on lepton-tagged and sum of exclusives. Definitely want to include these!
- Work still ongoing to understand spectral shape and extrapolation factors to lower E_γ thresholds.
- New world average when BaBar results available. Methodology needs discussion with HFAG.

Exclusive $b \to s\gamma$

- Some text exists from Nakao (1 page), Playfer (2 pages)
- Not committed to svn yet. Needs merging.
- Covers branching fractions and time-integrated CP and isospin asymmetries (asymmetries also for inclusive).
- Not aware of any significant experimental updates to come, so world averages are done.
- Ongoing theoretical work on asymmetries:

  G.Paz, ArXiv:1106.4589 (hep-ph)

Time-dependent CP studies

- Short introduction written by Nakao (0.5 pages). Needs more pedagogy.
- Need to summarize results and discuss their significance (3 pages)
- Final Belle results on $\phi K_s \gamma$ available.
- Some BaBar analyses still in progress: $\phi K_s \gamma$, $\rho K_s \gamma$, $\rho \gamma$ (not clear if we will wait for these).

Exclusive and inclusive $b \rightarrow d\gamma$

- Some text exists from Playfer (1 page)
- Needs expanding to ~3 pages
- Covers branching fractions, and time-integrated asymmetries.
- Both experiments have completed exclusive $\rho/\omega\gamma$ analyses with (almost) full data sets.
- Only BaBar has done an inclusive analysis (on full data sample). Do we expect anything from Belle?
- Agreed that interpretation of results in terms of Vtd/Vts is in a separate section (K.Flood)

Inclusive b→ sll

- Not much written yet (expect 1-2 pages)
- Published inclusive sll results from BaBar & Belle are based on only 20% of final datasets (82/fb and 140/fb)
- Belle (Iijima) presented new preliminary result on inclusive sll at Lepton/Photon 2009 based on 600/fb. *No documentation? Needs finalising and publishing.*
- BaBar update of inclusive sll still in progress.
- This is a very significant measurement which will not be done at the LHC!
- *Do we wait to have this measurement updated to the full datasets for the legacy book?*

Exclusive $b \to sll$

- Some text written by Playfer (1 page)
- Needs expanding to ~4 pages
- Covers branching fractions, rate asymmetries and angular analysis of K*ll.
- Both experiments have published results on a large fraction of their data. Unfortunately with different q^2 binnings from each other, and from the theorists.
- Updates to larger datasets are ongoing by both collaborations.
- LHCb already has more K*ll events than the B factories combined!
- Do we include something about CDF and LHCb?
- Theoretical developments continue at a rapid pace. High q^2 region now thought to be understood better.

Exclusive $b \to s\nu\bar{\nu}$

- Nothing written yet (expect 2 pages)
- Only upper limits, but for a variety of decays and BRECO tags.
- Not clear how to express combined knowledge gained from all analyses.
- Updated analyses still in progress. How many of these will make the cut?

Other decays

- Nothing written yet (expect 1-2 pages)
- $B_s \to \phi\gamma$ from Belle (and LHCb?)
- $B_d \to \gamma\gamma$ searches
- $B \to \pi ll$ searches
- Rare charm is in charm decays section

Summary

- About 25% available (8/30 pages).
- Needs merging and committing to svn. Hope to do this in next couple of weeks.
- Some important results still to come. Particularly inclusive $s\gamma$ (BaBar), and sll (both experiments).
- Need theory input from Tobias Hurth.
- Nakao and I will be seeking volunteers to help write & review drafts of subsections.