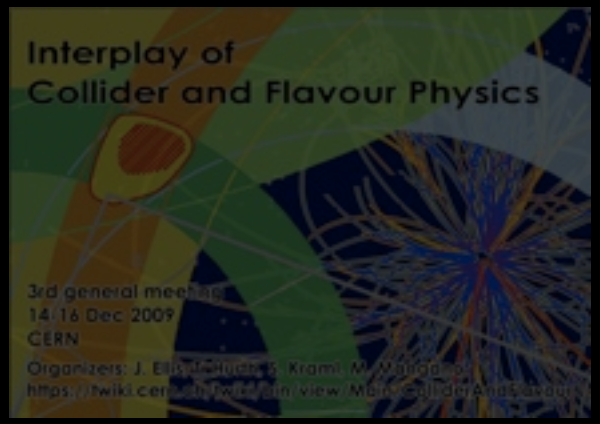

Tools for the Interplay of Collider and Flavour Physics

Uli Haisch, Sven Heinemeyer, *Frederic Ronga**

3rd Interplay Workshop – December 15, 2009

*ETH Zurich

Tools: a reminder

ETH Institute for Particle Physics

- Where we came from
  - 2006/2007 Workshop "Flavour in the Era of the LHC"
    - working groups 1 ("Collider aspects of flavour physics at high Q^2") and 2 ("B, D and K decays") had dedicated tools subgroups to
      - get an **overview** of existing tools
      - develop ideas for **integration** of tools
      - facilitate the **interplay** of high Q^2 and low-energy B-physics
- Goals of the "Working group on Tools"
  - are still the same:
    - collect tools
    - integrate B-Physics and low/high-energy codes
    - also: explore model-independent approaches
    - others?

Organisation

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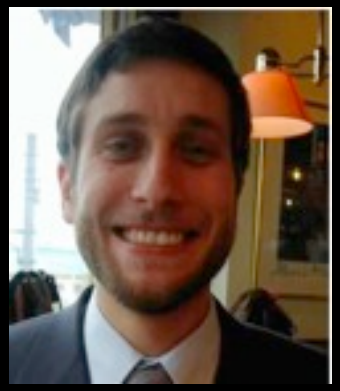
- The three contact persons


Uli Haisch


Sven Heinemeyer


Frederic Ronga

- The twiki (with contents!) [ColliderAndFlavour ➟ ToolsAndBenchmarks]

Working Group on the Interplay between Collider and Flavour Physics:

Tools and Benchmarks

Conveners:

- Sven Heinemeyer, `Sven.Heinemeyer[AT]cern.ch`
- Frederic Ronga, `Frederic.Ronga[AT]cern.ch`
- Uli Haisch, `uhaisch[AT]physik.unizh.ch`

Disclaimer

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- From the twiki
  - We do not attempt to provide yet another database with tools. We simply put a list of existing tools. Most of them are available here.
  - Note: only flavour observable related tools are listed here.
  - If you want to add something to this list, send an e-mail to Sven.Heinemeyer@cern.ch
  - General questions that should be answered:
    - What is still missing? Are all relevant topics covered?
    - How can it be ensured that a code/calculation is useful/usable for others?
    - Can experimentalists make use of them?
    - What are the wishes of the experimentalists?
    - Interaction between theory and experiment?

Collecting "tools" (I)

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- Table on twiki (roughly ordered by availability)

Webpage + available

Name	Author(s)	Description	Availability
CKMFitter	Charles, *et al.*	CKM fits (Frequentist), (mostly) in SM	yes (webpage)
CPSuperH	Lee, Pilaftsis, *et al.*	Higgs phenomenology and B physics observables in the MFV complex MSSM	***Updated 09/2009***
FeynArts/FormCalc	Hahn	(Arbitrary) one-loop corrections in the NMFV MSSM	***Updated 10/2009*** manual)
FeynHiggs	Hahn, Heinemeyer, Hollik, Rzehak, Weiglein	Higgs/EWPO phenomenology and some B physics observables in the (N)MFV (complex) MSSM	yes (webpage, manual)
FCHDECAY	Bejar, Guasch	FCNC Higgs decays in the NMFV MSSM	yes (webpage)
MicrOMEGAs	Belanger, Boudjema, Pukhov, Semenov	CDM density, some B physics observables in the MFV MSSM	***Updated 11/2009*** manual)
SLHALib2	Hahn	Read/write SLHA data (NMFV/RPV/CPV MSSM, NMSSM)	yes (webpage, manual)
SoftSusy	Allanach	Evaluates NMFV MSSM parameters from GUT input	***Updated 10/2009*** manual)
Spheno	Porod	evaluates NMFV MSSM parameters from GUT input	***Updated 12/2009*** manual)
SuperBayeS	Ruiz, Trotta, Feroz	SUSY fits and flavor predictions	yes (webpage)
SuperIso	Mahmoudi	Isospin asymmetries and other flavor observables in the MFV MSSM	***Updated 09/2009***
SusyBSG	Degrassi, Gambino, Slavich	NLO calculation of BR[B→Xsγ] in the MSSM with Minimal Flavor Violation	***Updated 08/2009***

Collecting "tools" (II)

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- Table on twiki (roughly ordered by availability)

Not available publicly (yet)

UTfit	Bona, *et al.*	Unitarity Triangle fits (Bayesian) in SM and beyond	planned (webpage)
SuFla	Isidori, Paradisi	Low energy flavor (B and K) observables in the MFV MSSM	partially
XSusy	Bozzi, Fuks, Herrmann, Klasen	Masses, production cross sections, BRs in the NMFV MSSM	partially
no name	Silvestrini	KK mixing, BB mixing, b→sγ, b→sll	planned
no name	Bobeth, Ewert, Haisch	Rare B and K decays in/beyond the SM	planned
no name	Chankowski, Jäger, Rosiek	FCNC observables in the MSSM	planned
no name	Bejar, Guasch	FC Higgs/top decays in the THDM I/II	planned

Integrating "tools"

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- SLHA(2)
  - The way to ensure consistency ("integrating" tools)
    - More on that later
  - Example (heavy) use of SLHA and integration
    - http://cern.ch/mastercode

- FLHA ***NEW!***
  - The way to ensure consistency of *flavo**u**r codes*
  - Recent (long-awaited) outcome of the working group!
  - We wish as much success as the SUSY Les Houches Accord
    - All details later

A word about "benchmarks"

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- Benchmarks: a set of well-chosen parameter points in a model (beyond SM)
  - mapping out the *characteristics* of the parameter space
  - useful to study *in details* the complementarity and synergy between low- and high-energy experiments
  - required to do meaningful experimental studies
  - benchmark points should not be already ruled out...
  - Examples:
    - good old SPS (and their ATLAS and CMS flavours)
    - NUHM
    - More?

Today's agenda

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- SuFla [Gino Isidori and Paride Paradisi]
  - Gino will tell us all about this flavour Physics' Swiss army knife
- SPICE [G. Engelhard, J.L. Feng, I. Galon, D. Sanford, F. Yu]
  - Making Flavour an integral part of Collider Physics in the simulation
- Spheno [W. Porod]
  - News about this ever-improving spectrum generator & more
- SLHA2 [collective]
  - Thomas Hahn maintains only existing SLHA library I know of... (SLHALib)
- FLHA [collective]
  - Status and **discussion** about the new accord