WG2 - B/D/K decays

4th Meeting, October 9-11 2006

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what's new in this meeting

- updates in the summer conference
  Belle, BaBar, CLEO-c, D0, ...
- progress in Flavour prospects for the LHC experiments
  B/Charm studies at ATLAS, CMS, LHCb
- reports on future Flavour facilities
  SuperKEKB, "ILC-inspired" SuperB, LHCb upgrade
- advances in theoretical studies

- tools, flavour benchmarks, CMS benchmark analysis :
  see the slides by Heinemeyer, Schmitt in Tuesday afternoon

Tools: survey with all WG1/WG2 ~ 10 answers with some variety

- codes for: low-energy observales
  high-energy observables
  the calculation of amplitudes
  passing parameters/results from one code to another

 # 1 $K\bar{K}$ mixing, $B_{(s)}\bar{B}_{(s)}$ mixing, $b \to s\gamma$, $b \to s\, l^+ l^-$ in NMFV MSSM

 # 2 low-energy flavor observables in the (N?)MFV MSSM

 # 3 rare B and K decays in/beyond SM

 # 4 FCNC observables in MSSM

 # 5 squark/gluino production at LO for NMFV MSSM

 # 6 FCNC Higgs decays in NMFV MSSM

 # 7 Higgs/EWPO phenomenology in the (N)MFV MSSM

 # 8 FC Higgs/top decays in 2HDM I/II

 # 9 (arbitrary) one-loop corrections in (N)MFV MSSM

#10 read/write SLHA2 data, i.e. NMFV/RPV/CPV MSSM, NMSSM

Flavour benchmarks:

4. Conclusions

- Benchmarks are an essential tool for collider studies
- Our idea here: study collider phenomenology in (SUSY) models:
  - agreement with direct experimental searches
  - agreement with flavor physics constraints
  - agreement with precision observables constraints
- Two step process:
  - identify such points
  - combine tools to a master tool (especially for experimentalists)
- One approach: SPS 1a (ATLAS)
- Second approach (CMS):
  - model: MFV MSSM (later: NMFV MSSM)
  - to fulfill b physics: large $\tan\beta$, large M_{SUSY}, ...
  - to check Higgs, precision observables

  $\Rightarrow$ currently under study in CMS

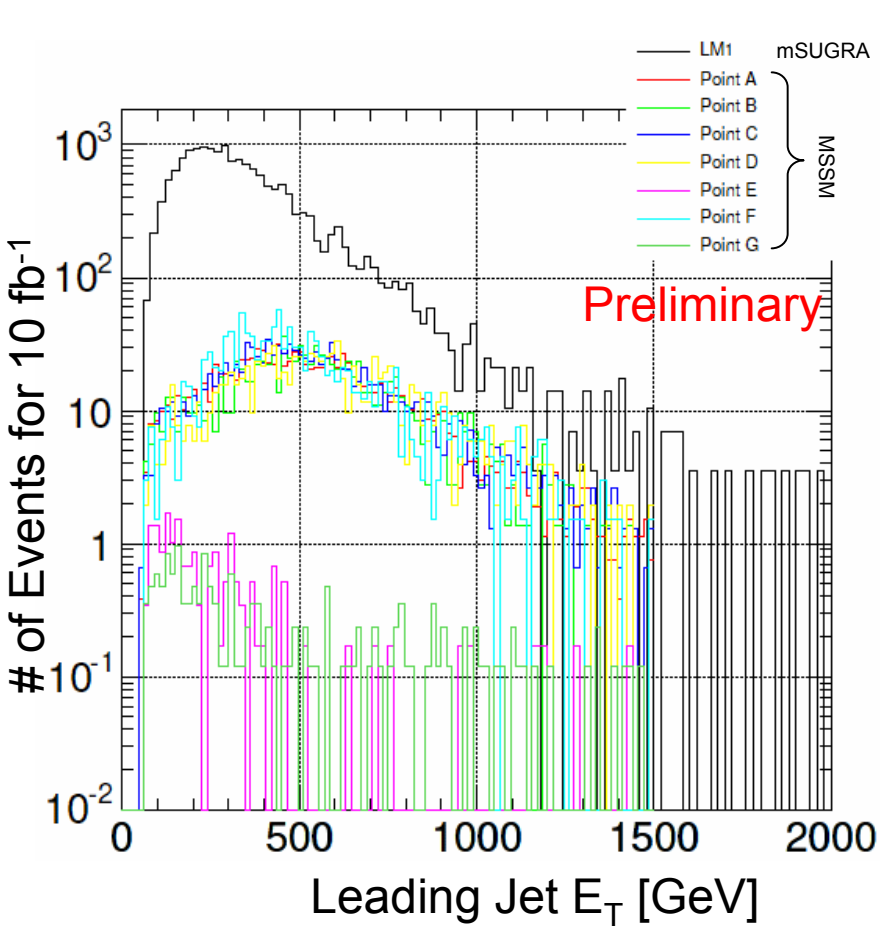
(flavour of) initial study by CMS:

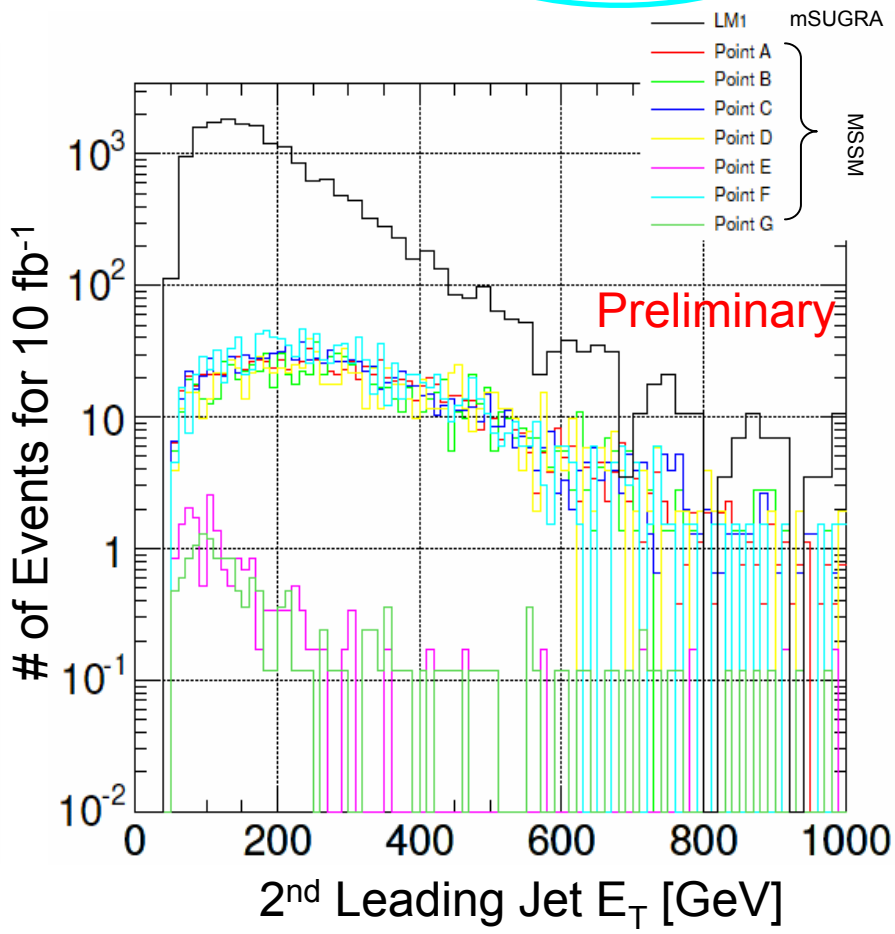
Model of our choice: MFV MSSM

Starting point: hep-ph/0605012 [*Gino Isidori, Paride Paradisi*]

General feature: large $\tan\beta$, large M_{SUSY}

Comparison Between mSUGRA LM1 and MSSM Points





WG2 Yellow Book Write-up

- groups were organized in the May meeting.
- deadline for 1st draft: September

discussions ⇨ updates

- special "SuperB" part, prepared separately

- **Chapter 1 New Physics Scenarios** 32pages

  - overview [WG2 conveners] 2 pages

  - model-independent approach [Isidori] 4 pages
    discussions on MFV/nonMFV < viewpoint of Flavour >

  - SUSY models [(Silvestrini, Isidori) -->] (4x4=)16 pages
    1. MSSM [tba]
    2. non-MSSM [tba]
    3. SUSY-GUT [Okada]
    4. brief introduction to benchmarks [Silvestrini, Isidori]

  - non-SUSY models [(Buras) -->] 5 pages
    1. ExtraDim [tba]
    2. LittleHiggs [tba]

  - Tools [Heinemeyer, Silvestrini, Parodi] 5 pages

Chapter 2: Hadronic Uncertainties (~20p.)

- Overview (WG2 Conveners)
- Non-perturbative input from lattice QCD
- Non-perturbative input from QCDSR
- Exclusive decays

(Buchalla + contrib)

⇒ some iterations for write-up ⇒

- Overview
- Charmless two-body B decays
  - theory
  - Higher-order QCD corrections
  - QED corrections to hadronic B decays
- Light-cone QCD sum rules
- Lattice QCD

Chapter 3: New Physics in Benchmark Channels (~100p.)

122 pages

- Prospects for existing and future facilities (WG2 Conveners + contrib) (10 p.)
- Benchmark channels: SuperB, LHC, Kaon, ...
  - Radiative penguin decays (Gambino, Golutvin + contrib) (10 p.)
  - Electroweak penguin decays (Feldmann, Berryhill + contrib) (10 p.) 15 pages
  - Neutrino modes (Grossman, Iijima + contrib) (10 p.)
  - Very rare decays (Nierste, Smizanska + contrib) (10 p.) 12 pages
  - UT angles (tree-dominated) (Soni, Bona, Trabelsi, Wilkinson + contrib) (10 p.) 15 pages
  - B_s mixing (Lubicz, van Hunen + contrib) (10 p.)
  - $b \to s$, $b \to d$ hadronic decays (Ciuchini, Muheim + contrib) (10 p.)
  - K decays (Buras, Komatsubara + contrib) (10 p.)
  - Charm decays (Fajfer, Asner + contrib) (10 p.) 20 pages

- Study Group contact persons
  + " interested people " (theorists, experts from each experiment)
  + presentations in the four meetings

- updates, with new results in this summer
  and including LHC studies, SuperB studies, ...

example of a draft of write-up:

Contents

request for more pages

because there are so many hot topics in the fields.

guideline: as concise as possible

- **Chapter 4 Assessments** 40pages

  - flavor benchmark points: (5 x 3=)15 pages
    * NMFV points close to SPS1a [Silvestrini]
    * MFV large tanβ [Isidori]
    * SUSY-GUT including lepton physics [Okada, Silvestrini]

  - collider phenomenology with flavor benchmarks
    (studies with Tools at CMS,ATLAS)
    [Heinemeyer, Polesello, Buchmueller] 20 pages

  - Conclusions - discrimination of NP models [all] 5 pages

from WG2: 214 pages in total

deadline: by the end of the year

finish the write-up before March

message from WG2 conveners

- We would not make this FlavLHC workshop to be "another flavour workshop/conference".

- We would step beyond the existing "working reports" of the past workshops; new approaches for interplay/synergy should be investigated.

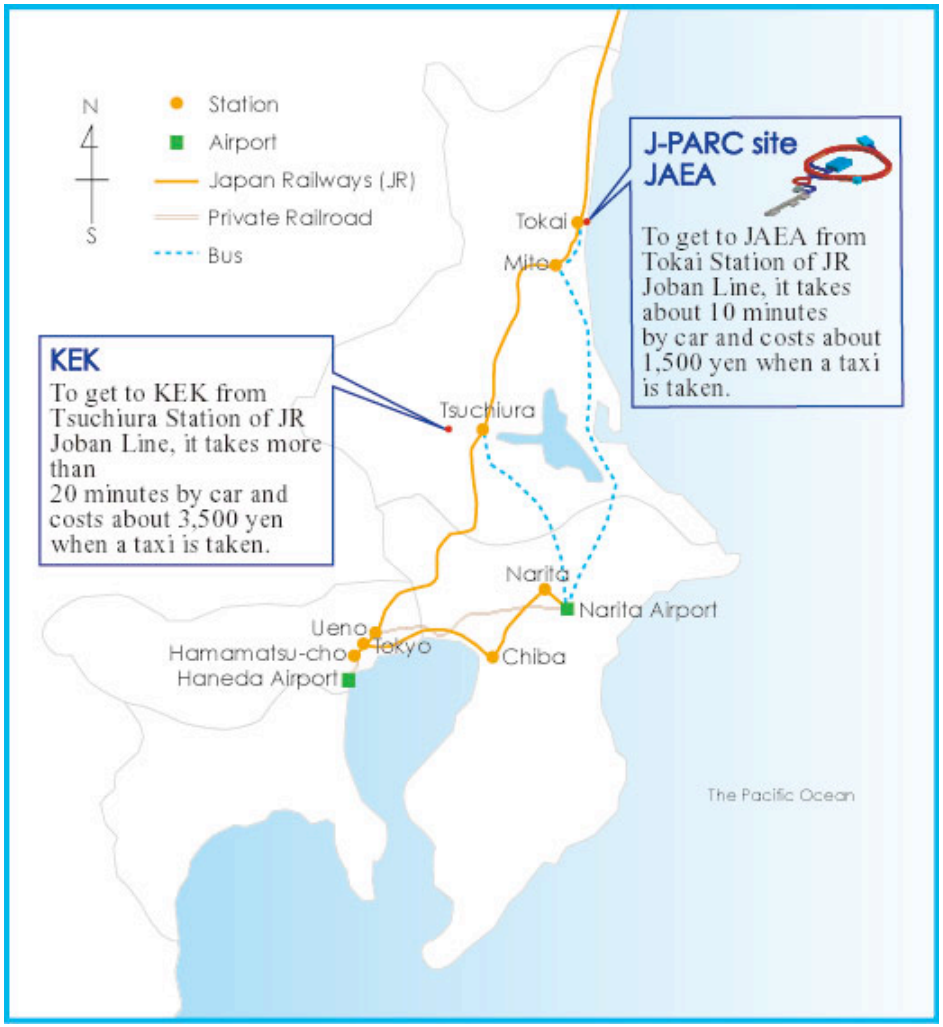
...Thank you.

advertisement
from a far-east country
(not shown in the presentation)

http://ckm2006.hepl.phys.nagoya-u.ac.jp/

news from J-PARC

http://j-parc.jp/index_e.html



- the 1st J-PARC PAC meeting June 30-July 2

  http://j-parc.jp/NuclPart/PAC_for_NuclPart_e.html

  - Stage2-approval experiments including

    P11: T2K long-baseline ν oscillation

  - Stage1 (scientific)-approval experiments including

    P06: T-violation in $\mathbf{K^+ \to \pi^0 \mu^+ \nu}$

    P14: $\mathbf{K_L^0 \to \pi^0 \nu \bar{\nu}}$

  * technical review (feasibility, impact, facility, ...) to the Stage2 and Stage1 experiments