

**A Report on “Flavour in  
the Era of the LHC”  
Workshop at CERN**

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# Goal of the Workshop says

- The goal of this Workshop is to outline and document a programme for flavour physics for the next decade, addressing in particular the complementarity and synergy between the LHC and the flavour factories vis a vis the discovery and exploration potential for new physics.
- The format of the Workshop will follow the standard CERN experience, with an opening meeting with plenary sessions and with the start of the WG activities, followed by 2-3 meetings of the WG's to take place during the following year, and a final plenary meeting at the end.

# Working Groups

- Working Group

- WG1 : Collider Aspects of Flavour Physics at High Q

- WG2 : B/D/K Decays

- WG3 : Flavour in the Lepton Sector, EDM's,  $g-2$ , etc

- Schedule

- Nov. 7 - 10, 2005

- Feb. 6 - 8, 2006

- May 25 - 27, 2006

- Oct. 2006 (Dec. 2006 ?)

## Monday 07 November 2005

### Plenary I (2005-11-07 09:00->13:00)

**Description:** VRVS Virtual room: ROCK

**Chairperson:** Stone, Sheldon

**Room:** [Main Auditorium](#)

09:00 **Welcome (05')**

09:05 **Introduction to the Workshop (10')** ( [transparencies](#) )

[Mangano, M.](#)  
(CERN)

09:15 **Exploring BSM phenomena with B physics (45')** ( [more information](#) )

[Yosef Nir](#)  
(Weizmann Institute)

10:00 **Future prospects for B factories (45')** ( [transparencies](#) )

[Masashi Hazumi](#)  
(KEK, Tsukuba)

10:45 Coffee break

### Plenary II (2005-11-07 11:15->12:45)

**Description:** VRVS virtual room: ROCK

**Chairperson:** Giorgi, Marcello

**Room:** [Main Auditorium](#)

11:15 **B physics prospects at the LHC (45')** ( [transparencies](#) )

[Olivier Schneider](#)  
(EPFL, Lausanne)

12:00 **Probing BSM phenomena with charm physics (45')** ( [more information](#) )

[Ikaros Bigi](#)  
(Notre Dame University)

12:45 Lunch break

### Plenary III (2005-11-07 14:00->16:45)

**Description:** VRVS virtual room: ROCK

**Chairperson:** Cooper, Peter

**Room:** [Main Auditorium](#)

14:00 **Exploring BSM phenomena with K physics (45')** ( [more information](#) )

[Gino Isidori](#)  
(LNF)

**14:45 Future prospects for K-decay experiments (45')** ( [transparencies](#) )

**[Laurence Littenberg](#)**  
(BNL)

**15:30** Coffee break

**Plenary IV** (2005-11-07 16:45->18:30)

**Description:** VRVS virtual room: ROCK  
**Chairperson:** Buras, Andrzej

**Room:** [Main Auditorium](#)

**16:00 Flavour phenomena in the lepton sector (45')** ( [transparencies](#) )

**[Andrea Romanino](#)**  
(SISSA)

**16:45 LFV, status and prospects (45')** ( [transparencies](#) )

**[Toshinori Mori](#)**  
(Tokyo University)

**17:30 Prospects for future measurements of muon g-2 and EDMs of muon, deuteron and neutron (45')** ( [more information](#) )

**[Yannis Semertzidis](#)**  
(BNL)

**18:15** Adjourn

**Tuesday 08 November 2005**

**Plenary V** (2005-11-08 09:00->13:00)

**Description:** VRVS virtual room: ROCK

**Chairperson:** Rueckl, Reinhold

**Room:** [Main Auditorium](#)

**09:00 Flavour studies and BSM searches at the Tevatron (40')** ( [transparencies](#) )

**[Rolf Oldeman](#)**  
(Univ. of Liverpool)

**09:40 Flavour studies and BSM searches at the LHC (50')** ( [transparencies](#) )

**[Giacomo Polesello](#)**  
(INFN, Pavia)

**10:30** Coffee break

15:10	<b>Rare Charmless Decays and Measurements of alpha and beta in Penguins (15')</b> ( <a href="#">transparencies</a> )	(Univ. of Warwick) <b>Maurizio Pierini</b> (Madison, Wisconsin)
15:30	<b>Photos (15')</b> ( <a href="#">transparencies</a> )	<b>Elisabetta Barberio</b> (Melbourne)
15:50	<b>B<sub>0</sub><sub>s</sub> mass difference Delta m<sub>s</sub> and mixing phase phi<sub>s</sub> at LHCb (20')</b> ( <a href="#">transparencies</a> )	<b>Luis Fernandez</b> (EPFL Lausanne)
16:15	Coffee break	
16:45	<b>Charm Physics Experimental (20')</b> ( <a href="#">more information</a> )	<b>Sheldon Stone</b> (Syracuse)
17:10	<b>Null Tests of the SM (15')</b> ( <a href="#">more information</a> )	<b>Amarjit Soni</b> (BNL)
17:30	<b>Topics on Nonleptonic Bs Decays (15')</b> ( <a href="#">transparencies</a> )	<b>Pietro Colangelo</b> (INFN/Bari)
17:50	<b>Probing Flavour Structure in Supersymmetric Theories (15')</b> ( <a href="#">more information</a> )	<b>Shaaban Khalil</b> (Cairo)
18:10	<b>Next to Minimal Flavour Violation (15')</b> ( <a href="#">more information</a> )	<b>Michele Papucci</b> (UC Berkeley/LBNL)

**WG3, session 1** (2005-11-08 14:00->16:20)**Chairperson:** [Andries van der Schaaf](#)**Room:** [40-S2-C01](#)

- 14:00 **Introduction by the convenors (10')** ( [more information](#) )
- 14:10 **The neutron EDM and CryoEDM experiments at ILL (20')** ( [more information](#) )

**Plamen Iaydjiev**  
(INR&NE, Sofia)

An experimental search for a neutron EDM has been carried out at the Institut Laue Langevin (ILL) Grenoble. It used a "cohabiting" atomic-mercury magnetometer to measure and compensate for the magnetic field fluctuations. The experiment has been taking data over a period of six years and has subsequently been running for one year devoted to systematic studies related to the experiment. These systematic studies have now been completed.

The next-generation experiment to measure the neutron EDM, in which ultra-cold neutrons (UCN) are produced and stored in superfluid He-4 (superthermal source) is under construction at ILL H53 beam and first data taking runs will start in 2006.

**14:35 Towards a neutron EDM experiment at the PSI ultra-cold neutron source (20')** ( [more information](#) )

**[Klaus Kirch](#)**  
(PSI, Villigen)

An improved search for the neutron electric dipole moment is planned for the new high intensity UCN source at PSI.

**15:00 The deuteron EDM at the  $10^{-29}$  e cm level with the Storage Ring Method (15')** ( [more information](#) )

**[Yannis Semertzidis](#)**  
(BNL)

In the Storage Ring Resonant-EDM Method several ions, like the deuteron, proton,  $^3\text{He}$ , etc. can be probed in a sensitive way. The deuteron EDM at  $10^{-29}$  e cm would be the best sensitivity experiment regarding  $\theta_{\text{qcd}}$ , quark and quark\_colour EDM over present or planned experiments.

**15:20 Higgs mediated LFV (15')** ( [more information](#) )

**[Paride Paradisi](#)**  
(Univ. of Rome "Tor Vergata" and INFN)

We study the phenomenology of Higgs-mediated lepton flavour violation, both in tau decays and in deviations from e-mu lepton flavour universality in purely leptonic kaon decays.

**15:40 Seesaw in SO(10) and split SUSY (15')**

**[Borut Bajc](#)**  
(J. Stefan  
Institute,  
Ljubljana)

Models with radiatively generated neutrino mass favour a split supersymmetric scenario with a very large sfermion mass. I will describe the simplest flavour sector, that is potentially realistic, show the main predictions and where it could fail.

**16:00 LFV in MSSM based on the minimal SO(10) model (15')** ( [transparencies](#) )

**[Amon Ilakovac](#)**  
(Univ. of Zagreb)

**16:20** Coffee break

**Joint WG1+WG3, Session 1** (2005-11-08 16:15->18:30)

**Description:** VRVS virtual room: WAVE

**Chairperson:** [Martti Raidal](#)

Room: [40-SS-D01](#)16:50 **Minimal lepton flavour violation (20')** ( [more information](#) )**[Gino Isidori](#)**  
(INFN - Frascati)17:15 **Slepton flavour violation (20')** ( [more information](#) )**[Reinhold Rueckl](#)**  
(University of  
Wuerzburg)

I outline slepton flavour violation in SUSY seesaw models and assess the prospects of experimental tests.

17:40 **Tests of R-parity violation (20')** ( [transparencies](#) )**[Aldo Deandrea](#)**  
(IPNL)

We present collider and low energy tests of R-parity violation and discuss the connection between LFV and collider physics.

18:05 **LFV in scenarios with stau NLSP (20')** ( [more information](#) )**[Alejandro Ibarra](#)**  
(IFT, Madrid)

In this talk we discuss prospects to detect lepton flavour violation in future colliders, in scenarios where the gravitino is the LSP and the stau is the next-to-LSP.

**Wednesday 09 November 2005****WG1, session 2** (2005-11-09 09:00->12:30)**Description:** VRVS virtual room: WAVE**Chairperson:** W. Porod**Room:** [40-SS-D01](#)09:00 **Search for isosinglet quarks with the ATLAS detector (20')** ( [transparencies](#) )**Unel, G.**  
(University of California)09:30 **Extra dimensions flavour physics (20')** ( [more information](#) )**Burdman, G.**10:00 **Search for Supersymmetric electroweak effects in top production at the LHC (20')****Verzegnassi, C.**  
(Trieste, INFN and University)

(LBL)

**WG3, session 2** (2005-11-09 09:00->12:45)**Chairperson:** Raidal & van der Schaaf**Room:** [40-S2-C01](#)**09:00 Global analysis of neutrino data and implications for future experiments (15')** ( [transparencies](#) )**[Marco Picariello](#)**  
( *INFN Milano* )**09:20 Leptogenesis and low energy observables (20')****[Gustavo Branco](#)**  
( *TUM* )**09:45 Improving the mu -> e gamma sensitivity, MEG and beyond (20')** ( [more information](#) )**[Alessandro Baldini](#)**  
( *INFN - Pisa* )**10:10 Dynamical generation of fermion masses by large Yukawa couplings (15')****[Jiri Hosek](#)**  
( *NPI, Rez*  
( *Prague* ) )

In a model with Abelian chiral symmetry not very different Yukawa couplings of two massless fermion fields with a massive scalar carrying axial charge generate dynamically vastly different fermion masses.

**10:30 A High-Intensity, High-Luminosity Muon Source PRISM and Search for Muon to Electron Conversion (15')** ( [transparencies](#) )**[Yoshitaka Kuno](#)**  
( *Osaka*  
*University* )

A project in Japan to construct a high-intensity high-luminosity muon source (called PRISM) and an ultimate future search for muon to electron conversion in a muonic atom with PRISM at a sensitivity of  $10^{-18}$  are described.

**10:50** Coffee break**11:20 A test of CP symmetry in positronium (15')** ( [more information](#) )**[Marta Felcini](#)**  
( *UCLA* )

An experiment studying the decay of orthopositronium could test CP symmetry in the charged lepton sector. The motivation and the experimental status will be reviewed, and a proposal for a new experiment will be presented.

**11:40 Measurements of muon dipole moments (20')** ( [transparencies](#) )

**Gerco Underwater**  
(KVI)

The completed and future measurement of the anomalous magnetic moment at BNL will be described. An overview of the possibilities to measure the muon EDM will be given.

**12:05 Hadronic contributions to muon  $g-2$  (15')** (  [more information](#) )

**Gilberto Colangelo**  
(University of Berne)

**12:25 Massive neutrinos in a grounds-up approach (15')** (  [more information](#) )

**Amarjit Soni**  
(BNL)

**12:45 Lunch break**

### WG2, session 3 (2005-11-09 14:00->16:25)

**Description:** VRVS virtual room: ROCK

**Chairperson:** L. Silvestrini

**Room:** [Main Auditorium](#)

**14:00 K  $\rightarrow$  pi nu nubar, MFV and Beyond It (25')** (  [transparencies](#) )

**Andrzej Buras**  
(TU Munich)

**14:30 K $\rightarrow$ 3pi, Unveiling  $\epsilon_s'/\epsilon_s$  and pi-pi Scattering Lengths (15')** (  [transparencies](#) )


**Ignazio Scimemi**  
(Valencia)

**14:50 Future Kaon Program at CERN (20')** (  [transparencies](#) )

**Giuseppe Ruggiero**  
(CERN)

**15:15 Future Kaon Program at J-PARC (20')** (  [transparencies](#) )

**Takeshi Komatsubara**  
(KEK)

**15:40 A Model-Independent Analysis of New Physics Contributions in Delta F = 2 transitions (15')** (  [transparencies](#) )

**Arnaud Robert**  
(Clermont  
Ferrand)

**16:00 Constraining New Physics with the UT fit (20')** (  [transparencies](#) )

**Achille Stocchi**  
(LAL Orsay)

**16:25 Coffee break**

### Joint WG1+WG3, session 2 (2005-11-09 14:00->16:15)

**Description:** VRVS virtual room: WAVE

**Chairperson:** [Marti Raidal](#)

**Room:** [Council Chamber](#)

**14:00 Lepton flavour & number violation at the LHC (25')** ( [more information](#) )

**[Werner Porod](#)**  
(IFIC/CSIC, Univ. Valencia)

**14:35 Realistic models of flavour at LHC (20')** ( [more information](#) )

**[Oscar Vives](#)**  
(CERN)

Measuring the spectrum of the SUSY scalar sector at the LHC can provide useful information to determine the origin of flavour. We present two examples of flavour models generating symmetric or asymmetric Yukawa textures with very different phenomenology both at LHC and FCNC experiments.

**15:00 A study on mu (electron) - tau conversion in deep inelastic scattering (20')** ( [more information](#) )

**[Yoshitaka Kuno](#)**  
(Osaka University)

**15:25 Study of mu - tau conversion with high-intensity muon beams (20')** ( [transparencies](#) )

**[Giovanni Marchiori](#)**  
(University of Pisa  
and INFN)

We present some considerations about the feasibility of a mu->tau conversion experiment using a high intensity, high energy muon beam impacting on an active target. A conceptual detector design, some basic requirements, and the tools developed for its simulation are illustrated.

**15:50 CP effects in tau decays and some of tau production processes: aspects (20')** ( [more information](#) )

**[Zbigniew Was](#)**  
(INP, Cracow)

Observables for CP-like quantities require analysis of physics objects defined often with the help of multiple variable observables. To this end simultaneous inclusion of theoretical aspects of studied distributions including backgrounds options from the theory and selection criteria is indispensable. TAUOLA and its universal interface was found to be useful for such purposes. Program and its applications will be reviewed.

**16:15**

Coffee break

**Joint WG1+WG2+WG3** (2005-11-09 16:45->18:30)

**Description:** VRVS virtual room: ROCK

**Chairperson:** [Andries van der Schaaf](#)

**Room:** [Main Auditorium](#)

# Comments

- Flavour LHC WG3 (FL3) is rather theoretically oriented ?
- Coverage of FL3 is rather broader (deuteron, electron, tau, .....), but no neutrino physics.
- Timeline of their report is later than us.