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# SuperB

- Introduction
- Le projet
- Activité au LPNHE

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### The Super Flavor Factory "SuperB" in brief

- A very high luminosity (>~10<sup>36</sup>cm<sup>-2</sup> sec<sup>-1</sup>) asymmetric e<sup>+</sup> e<sup>-</sup> flavor factory  $\Rightarrow$  (BaBar)  $\times \sim 100$ ; integrated luminosity of 75 ab<sup>-1</sup>; peak:  $10^{36}$  cm<sup>-2</sup> s<sup>-1</sup> thanks to a new accelerator scheme ("crab waist")
- B-factory-like detector, optimized for some key measurements.
- Two such projects were approved:
  - the Italian "SuperB"
  - the Japanese "Belle II" in KEK
- A few points about the SuperB design
  - Different energy thresholds (B $\overline{B}$   $\tau$ -charm..) Unique to SuperB
  - Polarized e<sup>-</sup> beam (at 80%)
  - Comparing to the first generation B-factories (BaBar and Belle)
    - The detector is more "hermetic"
    - Smaller boost and better vertex detector
    - Need to cope with much higher luminosity and backgrounds

Optimized to measure rare decays

### A discovery machine? In the LHC era?



LHC: search for NP @ ~ 1 TeV

Flavor factory :		
10 <sup>34</sup>	$\leftrightarrow$	EW scale ~100GeV
10 <sup>36</sup>	$\leftrightarrow$	TeV scale

- If NP particles are discovered by the LHC, SuperB will study the flavor structure of the NP
- SuperB explores the NP scale in a complementary way to (and sometimes beyond the reach of...) the LHC.

#### Eli Ben-Haim

#### CS du LPNHE, 18 novembre 2009

#### Golden modes: comparison to other experiments (I)



#### Golden modes: comparison to other experiments (II)

#### For CKM parameters:



#### More in a seminar (coming soon)

### **Project: status and news (I)**

- 2010: 3 SuperB progress reports accelerator, detector, physics
- December 2010: project approbation in Italy
- May 2011: "Kick-off" meeting in Elba
- Last week: first SuperB collaboration meeting in London The collaboration is created...

"INFN and the University of Tor Vergata had signed an agreement and written a governance document to form a Consortium, and will be joined by IIT and the Science Ministry. This Consortium will manage a new laboratory – the Nicola Cabibbo Laboratory – to design and build a high luminosity electron-positron collider, and support an exciting science program of High Energy Physics and Photon Science."

#### **Project: status and news (II)**





The civil engineering company under contract to the university will undertake the initial work, and expect to be awarded the contract to proceed with the actual ground-breaking. There will have to be a validation of the collider footprint and machine design, before ground-breaking can start. Eli Ben-Haim SuperB au LPNHE

### **Project: status and news (III)**

- Minister of Science now needs to sign the Governance document, and then the Council can propose the Directorate members, to be appointed by the Minister.
- Then there will be a management in place, the budget becomes available, and activities can proceed.
- Presentation to the IN2P3 Scientific Council October 20<sup>th</sup>.
- April 2011- Accelerator and detector <u>Technical Design Report (TDR)</u> (Computing TDR ~a year later)
- First collisions expected for 2016 or 2017

#### Au LPNHE

#### Participants: M. Dhellot, Y. Guo, H. Lebbolo, (S. Sitt), EBH

Participation aux activités du TDR: conseil scientifique de novembre 2009



• Contribution au TDR de physique ( $B^0 \rightarrow K_S K_S K_S$ ) (S. Sitt, EBH)

#### SuperB au LPNHE

# **Prospectives for B^0 \rightarrow K\_S K\_S K\_S (I)**S. Sitt, EBH

- The study was done with simulated SuperB events.
- It included:
  - A study of the effect of beam backgrounds
  - Comparison of the measurement with different detector geometries
  - Study of the effect of the reduced boost (wrt BaBar) of feasibility of the time-dependent measurement
  - Estimation of the SuperB uncertainty (next pages...)

# **Prospectives for B^0 \rightarrow K\_S K\_S K\_S (II)**S. Sitt, EBH

- Right now the statistical error dominates the total uncertainty. With increased statistics (~20 x BaBar), the systematic uncertainty will dominate.
- We use toy studies to estimate how the total error can be reduced at luminosities expected at SuperB
- The most **straight-forward way** to reduce systematic uncertainties is to **free parameters** that have been fitted on simulation or are taken from other measurements (This increases the statistical error).
- Systematics from backgrounds from B decays can be reduced by better knowledge of their BF and CP content (we assume 10%-measurements for the exclusive contributions in the future). For sizable contributions (in particular the generic component) the S and C parameters can be allowed to vary in the fit.

# **Prospectives for B**<sup>0</sup> $\rightarrow$ K<sub>S</sub> K<sub>S</sub> K<sub>S</sub> (III) <sup>S. Sitt, EBH</sup>



#### SuperB au LPNHE



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