Physics Summary

John Walsh
INFN, Pisa

SuperB Collaboration Meeting
Isola d' Elba, June 2012

<u>Outline</u>

1. Physics meeting
2. Physics WG Reviews
3. Physics contributions
4. Physics Tools
5. Joint Det-Phys session on BG
6. Conclusions

INFN Istituto Nazionale di Fisica Nucleare
SEZIONE DI PISA

SuperB

SuperB Physics Meeting

- One day meeting held May 31, i.e. just before this CM
- Good turnout: ~30 particpants, 13 talks (8 theorists + 5 experimentalists) and about 15-20 SuperB folks
- Guest talks from LHCb (2), CMS and BES-III
- Special topic: V_{ub} – several talks covering theoretical and experimental issues ⇒ interesting discussion
- Other topics covered as well: Charm, B physics from LHC
- This was the 2nd in a continuing series. Next: December in Frascati.
- See Jim Olsen's detailed summary from Friday

Physics Working Group Reviews

- Decided to take stock at this meeting and requested 30 minute reviews from each of the Physics Groups
- 4 of the 5 Groups were able to contribute:
  1. Tau WG – Alberto Lusiani
  2. Spectroscopy WG – Antonello Polosa
  3. Charm WG – Nicola Neri
  4. $B_{u,d}$ WG – JW
- Review of B_s WG postponed until next meeting
- Some highlights...

Tau WG – Lusiani

without polarization

Update on $\tau \to \mu\gamma$ sensitivity

- extrapolate from final *BABAR* result **expected upper limit**
  - *BABAR* bkg estimates, 2σ box cut & count
  - assume improved Super*B* tracking reduces $\Delta m - \Delta E$ box to 65% of *BABAR* size
  - assume photon efficiency improves by 20%
    (no significant gain possible on loose muon PID used in this analysis)

sensitivity without using beam polarization

```
Valencia limits
  tau -> mu gamma
    efficiency          = 7.40%
    expected background = 200
    upper limit 90% CL  = 1.84e-09
    3sigma evidence     = 4.16e-09
```

```
SuperB limits
  tau -> mu gamma
    efficiency          = 7.32%
    expected background = 335
    upper limit 90% CL  = 2.39e-09
    3sigma evidence     = 5.44e-09
```

beam pol. doesn't seem to significantly improve sensitivity. Can be useful in distinguishing among NP models.

Update on $\tau \to \mu\gamma$ sensitivity with beam polarization

- using A.Cervelli May 2011 (Elba) presentation on $\tau \to \mu\gamma$ vs. $\tau \to \pi(\rho)\nu$ simulated with FastSim
- **using most natural SUSY LFV $\tau \to \mu\gamma$ production mode**
- assuming cuts have same effect on all tau hadronic decays in tag side
- assuming we use only hadronic decays on tag side
  (actually, with some degradation leptonic decays can be used as well)

```
SuperB, hadronic tags, 2D Fastsim helicity cuts
  tau -> mu gamma
    efficiency          = 1.60%
    expected background = 27
    upper limit 90% CL  = 3.35e-09
    3sigma evidence     = 7.09e-09
```

```
SuperB limits with 1D helicity cut on MC truth
  tau -> mu gamma
    efficiency          = 5.12%
    expected background = 167
    upper limit 90% CL  = 2.44e-09
    3sigma evidence     = 5.50e-09
```

with polarization

Tau WG – Lusiani

These τ measurements benefit from beam polarization

Experimental measurement of tau $g-2$ at Super*B*

improved estimate of Δa_τ

- MC study on simulated events with **KK generator** and **Tauola** (simulate complete spin correlation density matrix of the initial and final state)
- Super*B* at 75 fb^{-1}, 80% ± 1% e^- beam polarization
- estimate real conditions effects
  - 80% geometrical acceptance in polar angle
  - (uneven) track reconstruction efficiency 97.5% ± 0.1%
- use all tau decay channels (paper only uses $\tau \to \pi\nu, \rho\nu$)
- combine two proposed measurement methods for Re F_2
- prelim. MC studies for tau EDM show detector systematics ≈ 10% of stat. error
  measurements exploiting tau polarization less affected by detector systematics
- $\Delta a_\tau = [1.0 - 2.4]\cdot 10^{-6}$ (uncertainty depends on how well we can exploit all tau decay modes)

Experimental measurement of tau EDM

- tau EDM can be measured from spin-angle differential cross-section $e^+e^- \to \tau^+\tau^-$
  (arXiv:0707.1658 [hep-ph])
- polarized beams improve Super*B* sensitivity
- assuming perfect detector, 100% polarized electron beam: $\Delta\left(\mathrm{Re}\{d_\tau^\gamma\}\right) = 7.2\cdot 10^{-20}\ e\,\mathrm{cm}$

- estimate real conditions effects
  - 80% geometrical acceptance in polar angle
  - (uneven) track reconstruction efficiency 97.5% ± 0.1%
- Super*B* sensitivity estimated at $\approx 10\cdot 10^{-20}\ e\,\mathrm{cm}$

- extrapolate result on tau EDM by Belle from 29.5 fb^{-1} to 75 ab^{-1}
- Super*B* sensitivity estimated at $\approx [17 - 34]\cdot 10^{-20}\ e\,\mathrm{cm}$ not systematically limited

Super*B* can much reduce tau EDM exp. uncertainty although "natural" SUSY NP effects too small

Spectroscopy WG – Polosa

- Very complete review of XYZ theory, here focus on just one topic: the nature (and spin) of the X(3872)

X : CHARMONIUM OR 'EXOTIC'?

- From the beginning it was realized that the radiative decay of $X \to J/\psi\,\gamma$ was way too small in comparison with $J/\psi+\rho$ to fit a standard charmonium picture as $2\,^3P_1$ (Eichten, Lane and Quigg)
- $J/\psi+\rho$ and $J/\psi+\omega$ channels have very similar rates (isospin violation) - unexpected for a cc*!
- The mass of the X is almost *exactly* equal to the sum of the masses of D and D* open charm mesons
- The mass of the X does *not fit* with the expected accuracy *any of the predicted charmonium levels.*

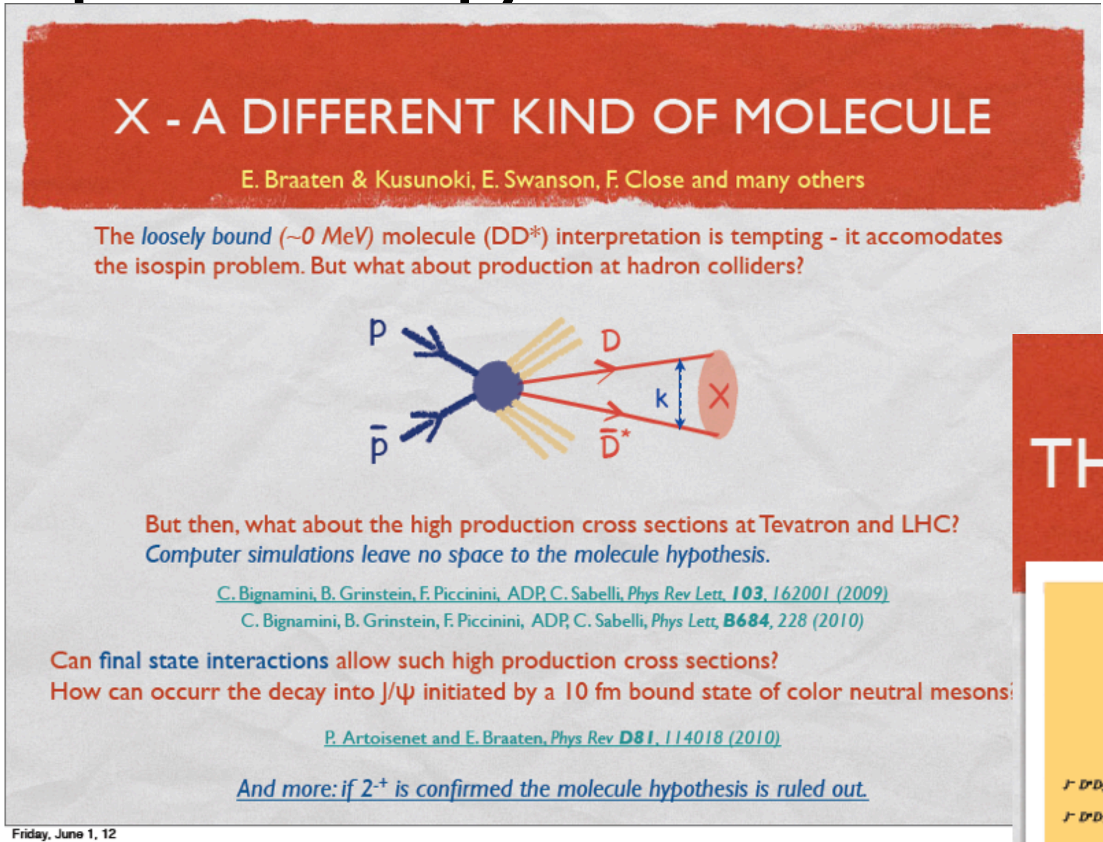
For a rather long time the X has been supposed to be a 1^{++} state.
We are now in the puzzling situation that data could (re)open the 2^{-+} option ...

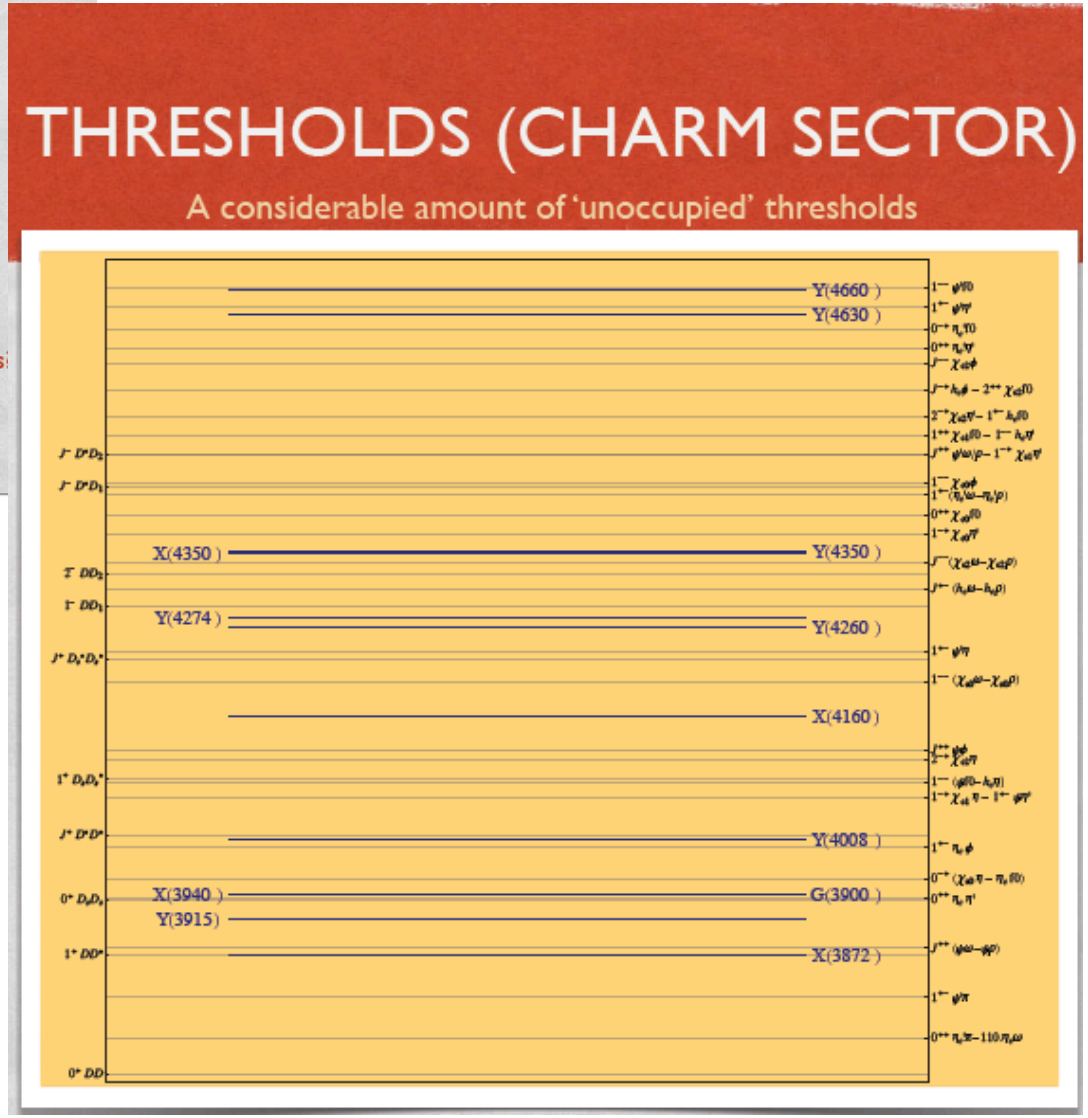
R. Faccini, F. Piccinini, A. Pilloni, and ADP, *'On the Spin of the X(3872)'*, arXiv:1204.1223

T. Burns, F Piccinini, ADP, C. Sabelli, *'The 2^{-+} assignment for the X(3872)'*, *Phys. Rev. D 2010*

Friday, June 1, 12

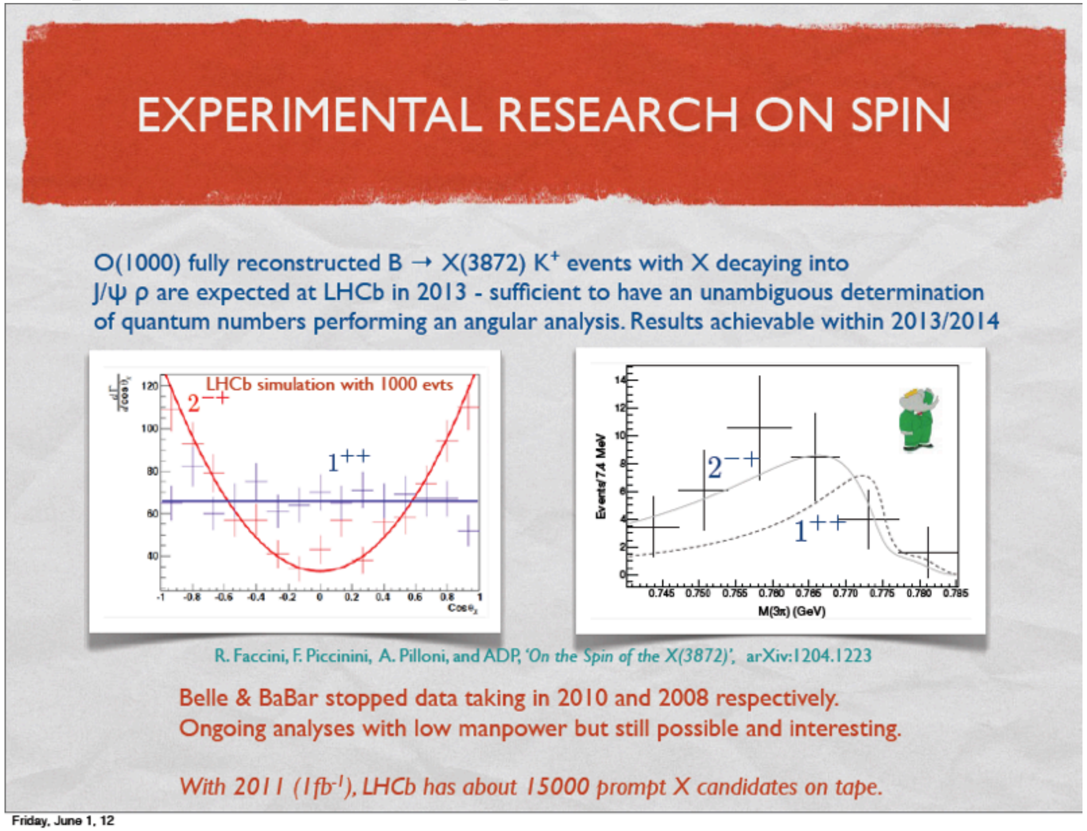
Spectroscopy WG – Polosa





<u>If loosely bound molecule</u>:
expect loosely bound states at various thresholds. "A considerable amount of unoccupied thresholds."

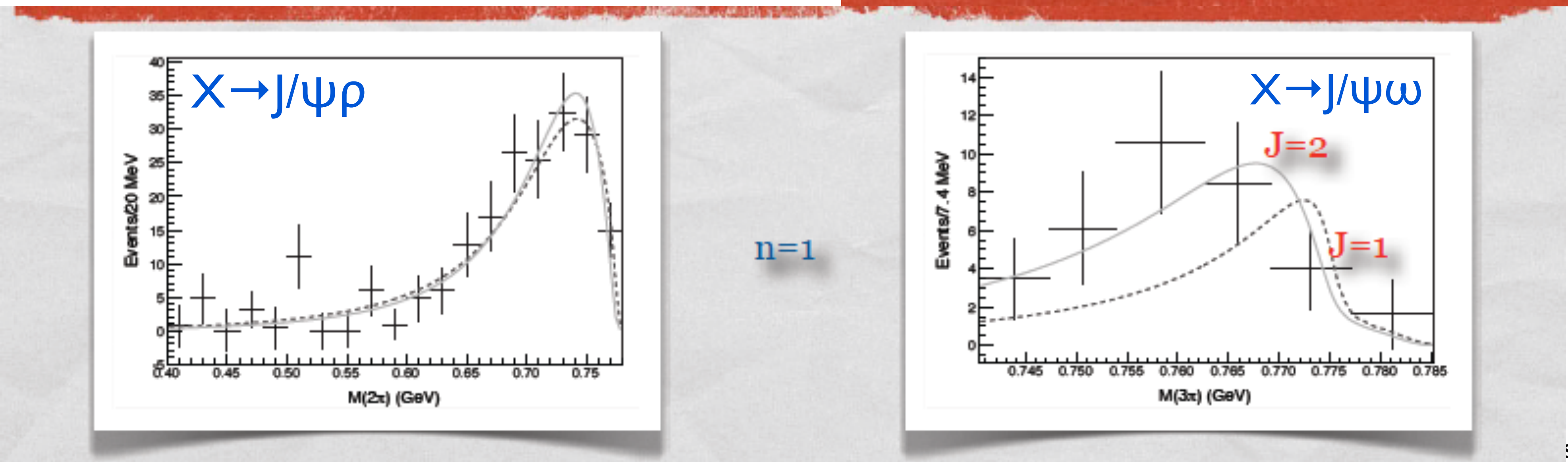
Spectroscopy WG – Polosa



Perform simultaneous fit
to X→J/ψρ and X→J/ψω channels

J=2^{-+} favored over 1^{++} assignment

R. Faccini, F. Piccinini, A. Pilloni, and ADP, arXiv:1204.1223



Charm WG – Neri

- Many interesting highlights from Charm 2012 conference

Measurement of ΔA_{CP} from LHCb

A. Carbone at Charm 2012

Kinematic binning	0.02%
Fit procedure	0.08%
Peaking background	0.04%
Multiple candidates	0.06%
Fiducial cuts	0.01%
Sum in quadrature	0.11%

Several of the systematic uncertainties have a statistical component -- should come down as data sample grows.

$$\Delta A_{CP} = [-0.82 \pm 0.21(\text{stat.}) \pm 0.11(\text{sys.})]\,\%$$

Significance: 3.5σ

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Result from CDF

- Total samples in $10\,fb^{-1}$ (after D*tag):
  - 1.21M KK
  - 0.55M ππ

Aobs(KK) - Aobs(ππ) = (-2.33 ± 0.14)% - (-1.71 ± 0.15)% =

G. Punzi at Charm 2012

$$\Delta A_{CP} = (-0.62 \pm 0.21\ (\text{stat}) \pm 0.10\ (\text{syst}))\%$$

CDF Public note 10784

Search for direct CPV at SuperB

- No ongoing studies for determining sensitivity to direct CP violation (AFAIK) in charm decays at SuperB. Several modes are better reconstructed at B factories than at hadron colliders (and some at charm threshold):
  - $D^0 \to \pi^+\pi^-\pi^0$, $2\pi^0$, K_SK_S, $D^0 \to V\gamma$, ...
  - $D^+ \to \pi^+\pi^0$,....
- Feasibility of the analysis at Υ(4S) and at charm threshold:
  - establish optimal experimental technique;
  - bkg studies;
  - evaluation of systematic errors (?);
  - sensitivity.
- Good place where to contribute. List of golden channel to study from theorists.

Charm WG – Neri

G. Casarosa at Charm 2012

Mixing and CPV with Lifetime Ratio Analysis

➔ Other experimental observables sensitive to mixing and to *CP* Violation:

Mixing & CPV observables

$$y_{CP} = \frac{\Gamma(CP+)}{\Gamma_D} - 1 \quad \& \quad \Delta Y = \frac{\Gamma(CP+)}{\Gamma_D} A_\Gamma$$

$\Gamma(CP+) = [\,\Gamma(D^0 \to CP+) + \Gamma(\bar{D}^0 \to CP+)\,]/2$

$$A_\Gamma = \frac{\Gamma(D^0 \to CP+) - \Gamma(\bar{D}^0 \to CP+)}{\Gamma(D^0 \to CP+) + \Gamma(\bar{D}^0 \to CP+)}$$

$\Gamma(CP+)$ = effective D^0 width for decays to CP+ eigenstates

➔ In terms of the mixing & CPV parameters:

$$y_{CP}^{hh} = y\cos\phi_{hh} + \frac{1}{2}\left[A_M + A_D^{hh}\right] x\sin\phi_{hh} - \frac{1}{4}A_M A_D^{hh}\, y\cos\phi_{hh}$$

$$\Delta Y^{hh} = -x\sin\phi_{hh} + \frac{1}{2}\left[A_M + A_D^{hh}\right] y\cos\phi_{hh} + \frac{1}{4}A_M A_D^{hh}\, x\sin\phi_{hh}$$

direct CPV:

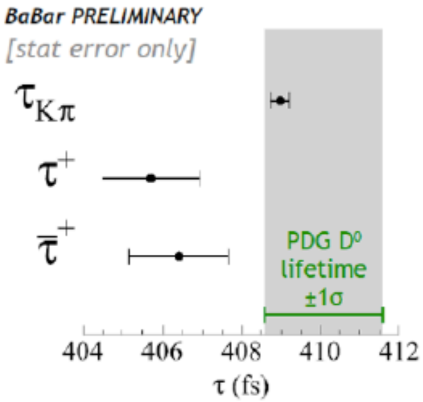
$$A_D^{hh} = \frac{|A_{hh}/\bar{A}_{hh}|^2 - |\bar{A}_{hh}/A_{hh}|^2}{|A_{hh}/\bar{A}_{hh}|^2 + |\bar{A}_{hh}/A_{hh}|^2}$$

CPV in mixing:

$$A_M = \frac{r_m^2 - r_m^{-2}}{r_m^2 + r_m^{-2}}$$

- in general, both observables depend on the final state
- sensitivity to direct CPV ~ 10^{-4}, below our current experimental precision [J.Phys.G G39, 045005 (2012)]
- in the SM, φ is the same for all the final states to a very good approximation [PRD 80, 076008 (2009)]
- in

Lifetime Fit Results & Interpretation



BaBar PRELIMINARY

$$y_{CP} = [0.720 \pm 0.180(\text{stat}) \pm 0.124(\text{syst})]\%$$

$$\Delta Y = [0.088 \pm 0.255(\text{stat}) \pm 0.058(\text{syst})]\%$$

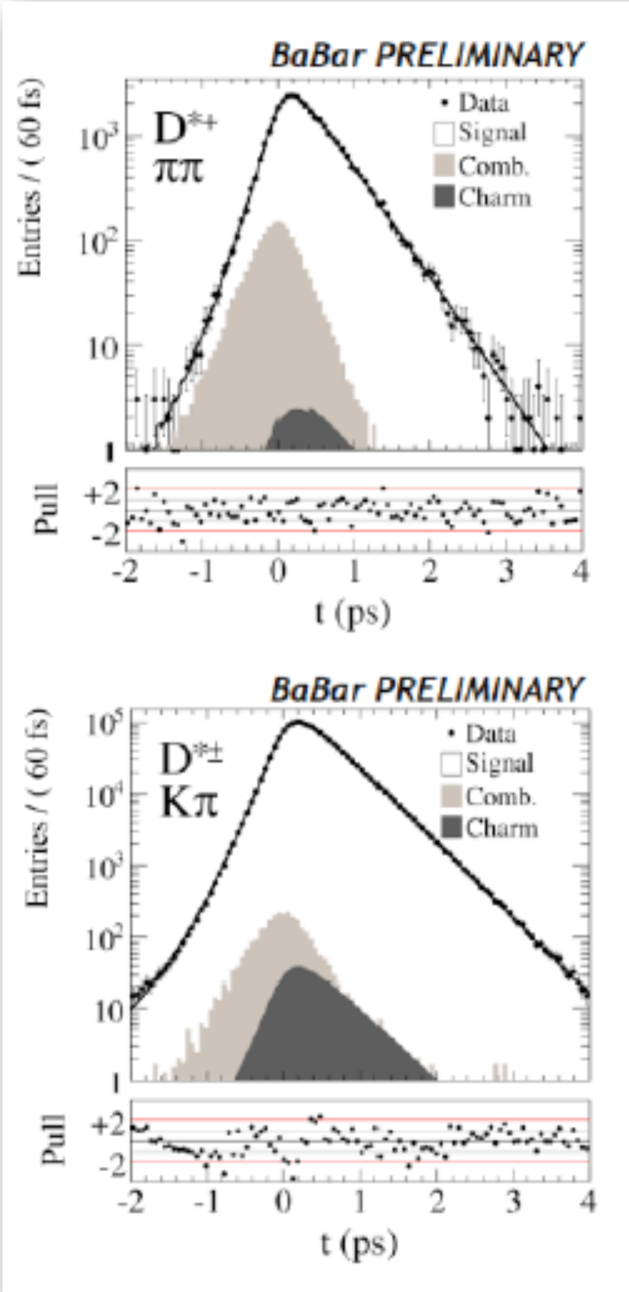
➔ exclude no-mixing hypothesis @ 3.3σ

➔ no CPV observed

HFAG y averages

(HFAG) direct

HFAG average

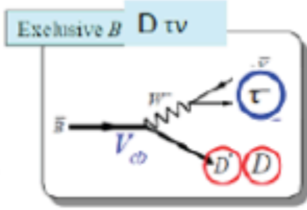


$B_{u,d}$ Physics WG – Walsh

Recent results,
status within SuperB

B→D(*)τν from BaBar

Can we explain the excess events?



- A charged Higgs (2HDM type II) of spin 0 coupling to the τ will only affect H_t

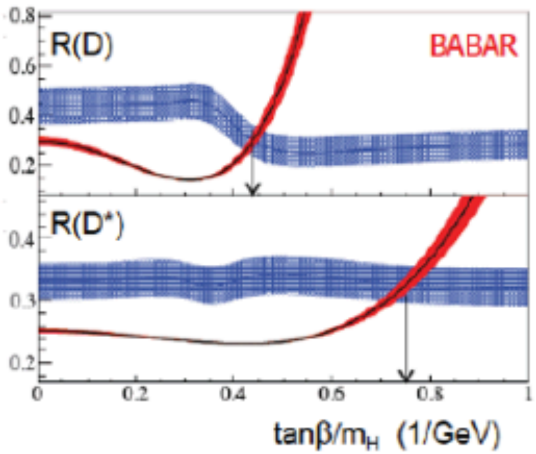
$$H_t^{2HDM} = H_t^{SM} \times \left(1 - \frac{\tan^2\beta}{m_{H\pm}^2} \frac{q^2}{1 \mp m_c/m_b}\right)$$

- for Dτν
+for D*τν

PRD 78, 015006 (2008)
PhD 85, 094025 (2012)

This could enhance or decrease the ratios R(D*) depending on $\tan\beta/m_H$

- We estimate the effect of 2DHM, accounting for difference in efficiency, and its uncertainty
- The data match 2DHM Type II at
  $\tan\beta/m_H = 0.44 \pm 0.02$ for R(D)
  $\tan\beta/m_H = 0.75 \pm 0.04$ for R(D*)
- The combination of R(D) and R(D*) excludes the Type II 2HDM in the full $\tan\beta$-m_H parameter space with a probability of >99.8%, provided M_H>10GeV !



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Results inconsistent with both SM and 2HDM-II

- SuperB: certainly can measure this channel.
- Little focus so far, but perhaps we should increase priority!
- Only at SuperB (Belle 2)

$B_{u,d}$ Physics WG – Walsh

$B \to X_s l^+ l^-$

- Important part of SuperB rare decays program:
  - high sensitivity to NP
  - many observables
- LHCb can make very good measurements for a subset of the observables: $B^0 \to K^{*0}\mu^+\mu^-$
  - see next page
- However, much can only be done at e+e- (with high precision):
  - electron channel ⇒ μ/e ratio sensitive to NP (e.g. NMSSM)
  - Isospin asymmetry (requires reco of $K^{*+} \to K_s\pi^+, K^+\pi^0$
  - Inclusive channel: $B \to X_s \ell^+ \ell^-$
- SuperB:
  - current sensitivities extrapolated from BaBar
  - identified interested analysts (Robertson, Walsh)

SuperB Sensitivities

$B \to K^* l^+ l^-$

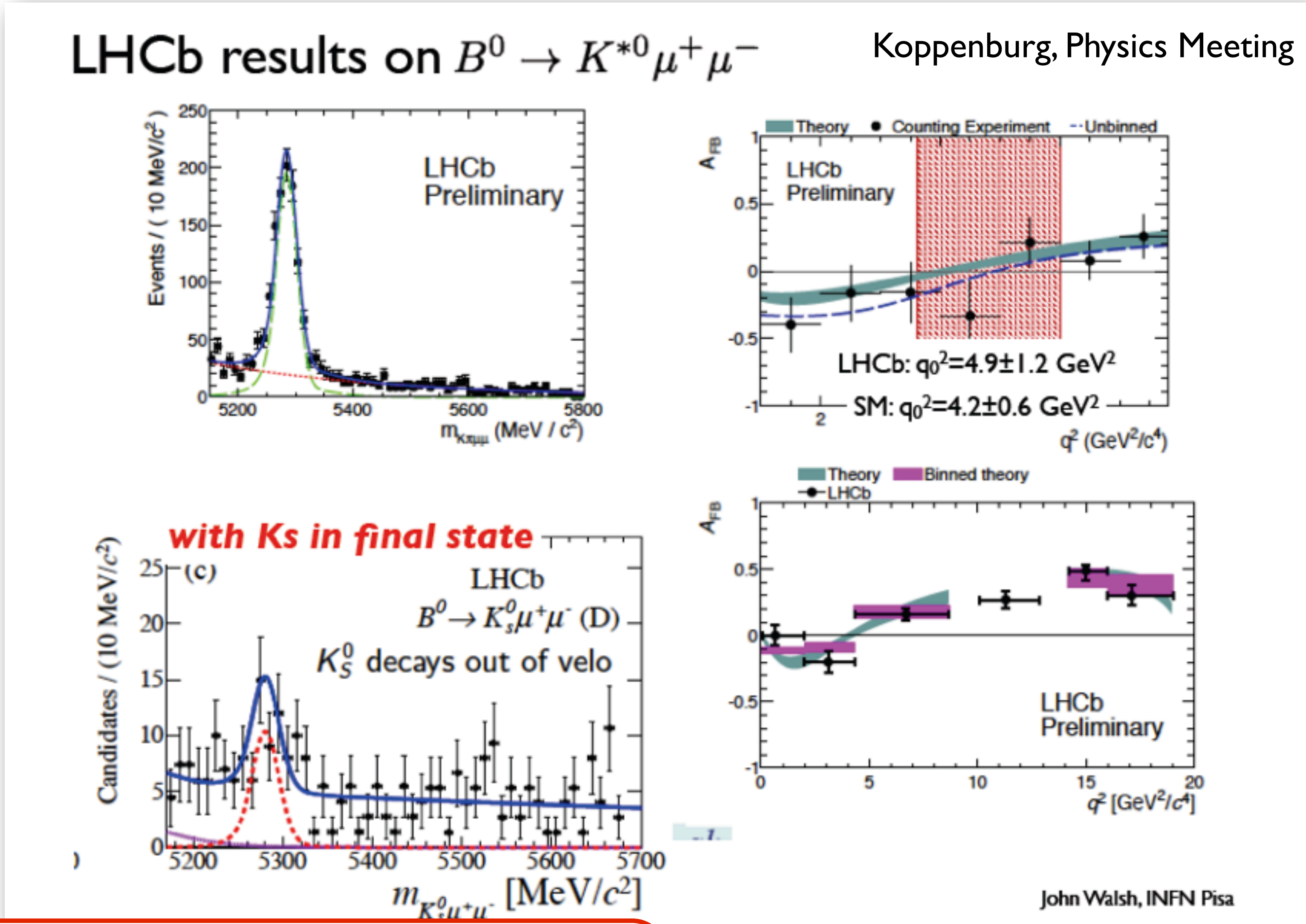
Observable	q^2 region [GeV^2/c^4]	BABAR (425 fb^{-1}) Stat.	BABAR (425 fb^{-1}) Sys.	SuperB (75 ab^{-1}) Stat.	SuperB (75 ab^{-1}) Sys.
$\sigma\mathcal{B}/\mathcal{B}$	all	0.162	0.063	0.01	0.032-0.048
$\sigma\mathcal{B}/\mathcal{B}$	0.1–7.02	0.23	0.070	0.014	0.035-0.053
$\sigma\mathcal{B}/\mathcal{B}$	10.24–12.96 and > 14.06	0.24	0.071	0.015	0.036-0.054
$\mathcal{R}_{K*}$	all	0.34	0.07	0.02	0.035-0.048
$\mathcal{A}_{CP}$	all	0.15	0.01	0.009	0.008-0.01
$\mathcal{A}_I$	0.1–7.02	0.17	0.03	0.01	0.015-0.023
$\mathcal{F}_L$	0.1–4	0.15	0.04	0.011	0.02-0.03
$\mathcal{F}_L$	4–7.84	0.14	0.04	0.011	0.02-0.03
$\mathcal{A}_{FB}$	0.1–4	0.14	0.05	0.011	0.025-0.038
$\mathcal{A}_{FB}$	4–7.84	0.14	0.05	0.011	0.025-0.038

- (Careful) extrapolations from BaBar
- Need SuperB simulation
  - Especially for fully inclusive analysis

$B \to X_s l^+ l^-$

Observable	q^2 region [GeV^2/c^4]	BABAR (425 fb^{-1}) Stat. SE	Sys. SE	Stat. RM	Sys. RM	SuperB (75 ab^{-1}) Stat. SE	Sys. SE	Stat. RM	Sys. RM
$\sigma\mathcal{B}/\mathcal{B}$	all	0.11	0.056	0.26	0.06	0.008	0.03-0.05	0.019	0.03-0.05
$\sigma\mathcal{B}/\mathcal{B}$	0.1–1	0.29	0.07	0.69	0.07	0.022	0.04-0.06	0.052	0.04-0.06
$\sigma\mathcal{B}/\mathcal{B}$	1–4	0.23	0.06	0.53	0.06	0.017	0.03-0.05	0.040	0.03-0.05
$\sigma\mathcal{B}/\mathcal{B}$	4–7.84	0.18	0.06	0.43	0.06	0.014	0.03-0.05	0.032	0.03-0.05
$\sigma\mathcal{B}/\mathcal{B}$	10.24–12.96	0.31	0.07	0.73	0.07	0.024	0.04-0.06	0.055	0.04-0.06
$\sigma\mathcal{B}/\mathcal{B}$	>14.06	0.29	0.07	0.69	0.07	0.022	0.04-0.06	0.052	0.04-0.06
$\mathcal{R}_{X_s}$	all	0.21	0.06	0.50	0.06	0.016	0.03-0.05	0.038	0.03-0.05
$\mathcal{R}_{X_s}$	0.1–7.84	0.25	0.06	0.58	0.06	0.019	0.03-0.05	0.044	0.03-0.05
$\mathcal{A}_{CP}$	all	0.06	0.01	0.14	0.01	0.004	0.005-0.008	0.011	0.005-0.008
$\mathcal{A}_{CP}$	0.1–7,84	0.07	0.01	0.16	0.01	0.005	0.005-0.008	0.012	0.005-0.008
$\mathcal{A}_I$	all	0.05	0.06	0.12	0.06	0.004	0.03-0.05	0.009	0.03-0.05
$\mathcal{A}_I$	0.1–7.84	0.06	0.06	0.14	0.06	0.005	0.03-0.05	0.011	0.03-0.05
$\mathcal{H}_L$	0.1–1	0.17	0.04	0.40	0.04	0.013	0.02-0.03	0.030	0.02-0.03
$\mathcal{H}_L$	1–4	0.17	0.04	0.40	0.04	0.013	0.02-0.03	0.030	0.02-0.03
$\mathcal{H}_L$	4–7.84	0.13	0.04	0.27	0.04	0.009	0.02-0.03	0.021	0.02-0.03
$\mathcal{H}_A$	0.1–1	0.22	0.06	0.51	0.06	0.016	0.03-0.05	0.039	0.03-0.05
$\mathcal{H}_A$	1–4	0.22	0.06	0.51	0.06	0.016	0.03-0.05	0.039	0.03-0.05
$\mathcal{H}_A$	4–7.84	0.15	0.06	0.35	0.06	0.011	0.03-0.05	0.026	0.03-0.05

$B_{u,d}$ Physics WG – Walsh



- However, much can only be done at e+e- (with high precision):
  - electron channel ⇒ μ/e ratio sensitive to NP (e.g. NMSSM)
  - Isospin asymmetry (requires reco of $K^{*+} \to K_s\pi^+, K^+\pi^0$
  - Inclusive channel: $B \to X_s\ell^+\ell^-$

Search for Deeply Bound Kaon States @ SuperB

Search of Deeply Bound Kaon States @ SuperB

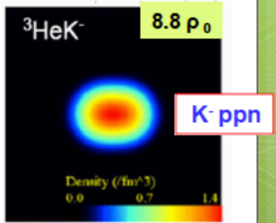
Simonetta Marcello
Francesca De Mori
Alessandra Filippi
Torino University and INFN

Deeply Bound Kaon States

Existence of states with a $\bar{K}$ deeply bound to a few nucleons predicted by Akaishi-Yamazaki PLB535(2002)

phenomenological $\bar{K}$-N potential constructed by exp results →

- $\bar{K}$ N scattering length
- Kaonic Hydrogen X-Ray
- Energy and width of $\Lambda(1405)$



- $\bar{K}$N strongly attractive interaction (I = 0)

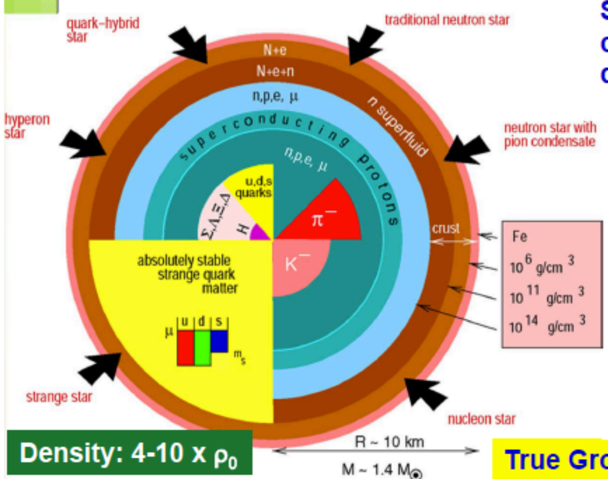
  ⇒ Nuclear states strongly bound (~ 100 MeV)
- Very dense systems: $\rho > 3\rho_0$
- Clustering-structure → Strange Nuclear structure

3

S.Marcello, La Biodola, June 1, 2012

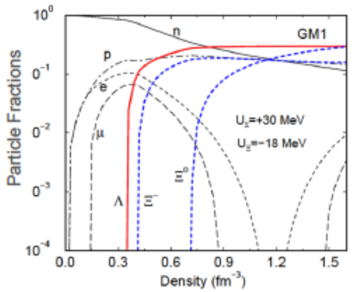
Motivations

Neutron Stars or Strange Stars ?



Strangeness/Baryon ratio ~ 1

Strangeness expected both confined (hyperons and kaons) and deconfined (strange quark matter)



J. Schaffner-Bielich, , astro-ph/0703113

Density: 4-10 x ρ_0

True Ground State of the Strong Interaction

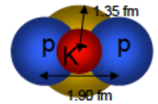
Search of DBKS @ SuperB

$e^+e^- \rightarrow \Upsilon(1S) \rightarrow (K^- pp) + X$

$K^- pp \rightarrow \Lambda\, p$

$\rightarrow \Sigma^0 p \rightarrow \Lambda \gamma p$

$\Upsilon(1S)$ Strong Decays ~ 80% through ggg hadronization



I = 0 Strong attractive potential

Very compact system

- Λ p Invariant Mass spectrum
  - Search for Mass m ~ 2.25 GeV/c^2 and narrow width Γ < 100 MeV
- Check Λ p Angular correlations

We rely in the high performance of the SuperB detector

- At least as frequent as Hypernucleus formation ($^3{}_\Lambda$H, $^4{}_\Lambda$H, $^4{}_\Lambda$He)
- No medium → different FSI → Identification easier than in HI exp

Two theory talks

$\sin^2\theta_W$ @ SuperB – Oscar Vives (Valencia)

Conclusions

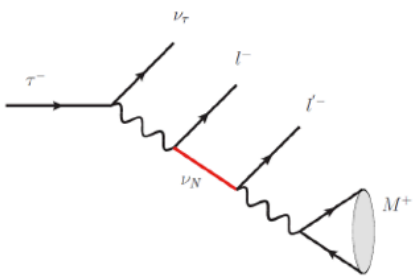
Electroweak measurements possible at **SuperB** with polarized beams.

⇓

- In the absence of **beam polarization**, A_{FB} measures only axial couplings, g_A^f
- In the absence of **beam polarization**, only τ polarization can measure, g_V^l and g_V^b.
- With **polarized electron beam**, A_{LR} can measure g_V^l and g_V^b with high precision, at the level of **LEP** measurements.

LNV in τ and B decays – Gabriel Lopez Castro (Cinvestav, Mexico)

4-body decays of τ's



$$\sim G_F^2 V_{lN} V_{l'N} F_{RES} V_M^{CKM} f_M$$

Advantages:

- Access to V_{lN}^2 contrary to 3-body decays ($\sim V_{\tau 4} V_{l4}$)
- Leptonic couplings other than VτN and compare to meson decays
- Absence of loop contributions

Quintero & GLC, PRD85, 076006 (2012)

12

Physics Tools

Matteo Rama

4th SuperB Collaboration Meeting – May 31st / June 5th 2012 – La Biodola (Isola d'Elba)- ITALY

D^0 Reconstruction and Vertexing

02/06/2012

Gianluca Inguglia
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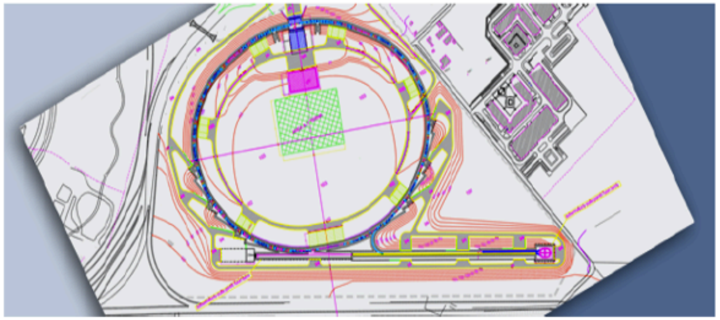

Queen Mary University of London — SuperB — CABIBBO LAB Laboratorio Nicola Cabibbo

dE/dx simulation in FastSim

- $\langle dE/dx \rangle_{hit}$ is computed with the Bethe Bloch function and then smeared according to $\sigma(\langle dE/dx \rangle_{hit})$
  (Gaussian smearing) — built-in in FastSim
- $\sigma(\langle dE/dx \rangle_{hit})$ is parameterized as

$$\sigma\left(\frac{dE}{dx}\right) = \alpha\left(\frac{dE}{dx}\right)^{\beta} dx^{\gamma}$$

where α, β, γ parameters are chosen as:

α = tuned on Babar data
β = 1
γ = tuned on Babar data

step 1:determine γ — tuned according to fit in backup slide
step 2:determine α — tuned according to Babar K/pi separation

- $\langle dE/dx \rangle_{track}$ is measured as a 'random' truncated average of $\langle dE/dx \rangle_{hits}$

If the trunc_frac =70% then 30% of $\langle dE/dx \rangle_{hits}$ are removed randomly. $\langle dE/dx \rangle_{track}$ is the weighted mean

EMC in FastSim

Chih-hsiang Cheng
Caltech

SuperB Collaboration Meeting
La Biodola (Isola d'Elba), Italy, 2012/05/31–06/04

Elba SuperB Collaboration Meeting
Physics Tools Parallel session Jun. 2nd 2012

Background frames for fastsim

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Elba SuperB Collaboration Meeting

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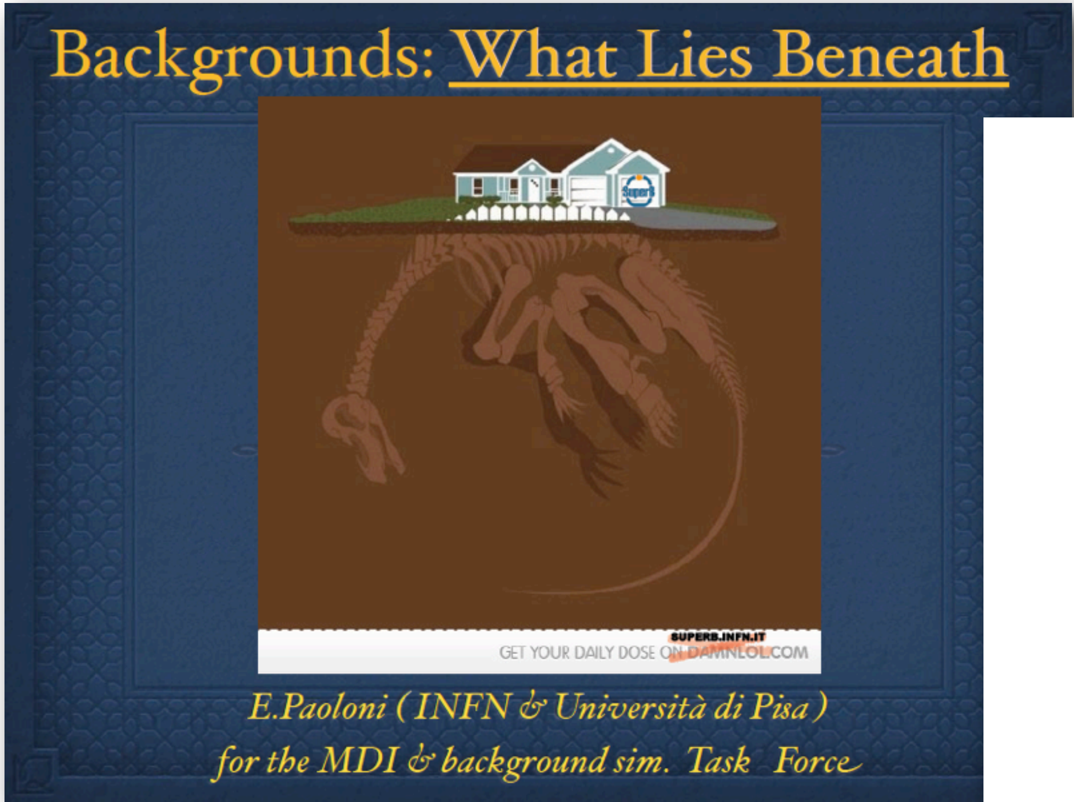
Detector-Physics: Effect of BG on Physics Reach

- Idea: bring Detector and Physics (and MDI) folks together to discuss this important topic
- Two presentations, the initial goal is to stimulate discussion and formulate the right questions, rather than provide the answers (which we don't have at this point)



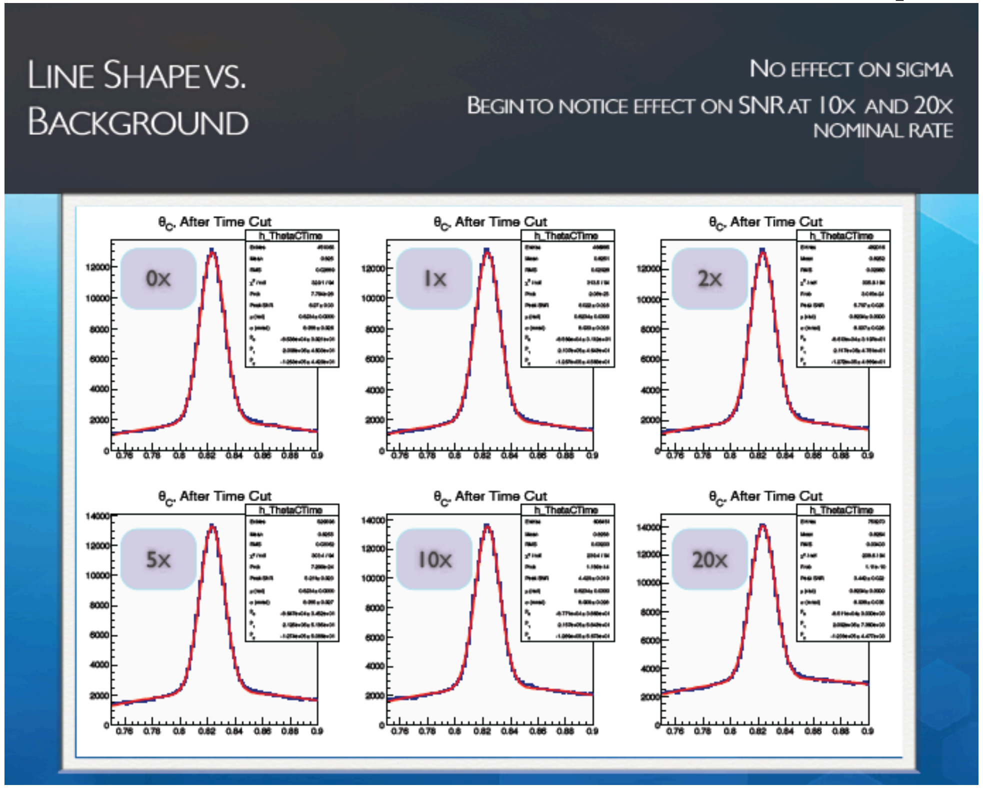
(how we can evaluate the) SuperB physics reach in presence of background

Matteo Rama

Laboratori Nazionali di Frascati

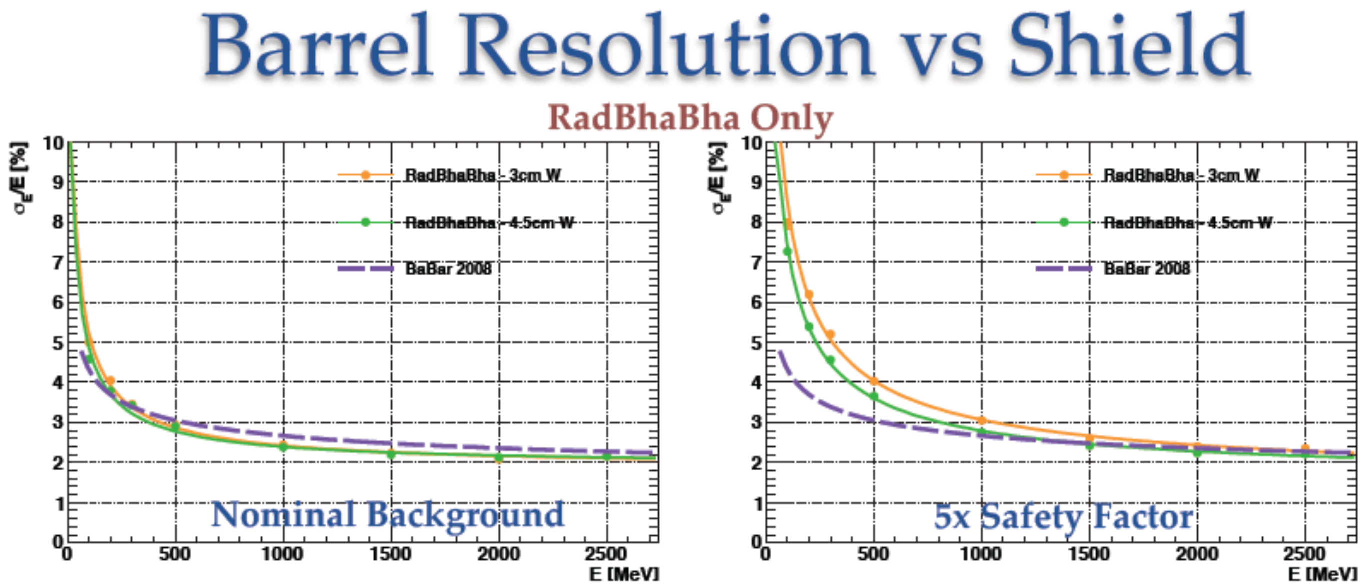
3 June 2012

Effect of BG on detector performance – Paoloni



fDIRC, θ_C resolution

EMC energy resolution



Tools to evaluate effect on Physics – Rama

Implications for tracking

Legend:
FS=FastSim; **pat rec**=pattern recognition
green: available; **orange**: available but work needed; **red**: not available

-)<physical/geometric effect> **-)<impact on performance>**	**tool to estimate the impact on performance**
-) smaller DCH trajectory sagitta, less reco hits -) p measurement degradation -) lower tracking efficiency	 FS FS
-) less DCH dE/dx measurement hits -) DCH dE/dx measurement degradation	 FS
-) larger distance between DCH and SVT -) larger error in matching the DCH and SVT tracks, impact on pat. rec.	 pat rec N/A
-) reduced DCH occupancy -) better pat. recognition performance, higher tracking efficiency -) better track reconstruction quality -) benefits on trigger performance (seem small)	 Hit merging/confusion with FS, pat rec N/A Hit merging/confusion with FS, pat rec N/A Hit merging/confusion with FS, pat rec N/A
-) reduced SVT occupancy -) better standalone pat. rec. for low pt tracks, higher tracking efficiency -) better low pt track reconstruction -) better measurement of d0,z0 track parameters (improved vertexing)	 Hit merging/confusion with FS, pat rec N/A Hit merging/confusion with FS, pat rec N/A Hit merging/confusion with FS, pat rec N/A

Conclusions

- FastSim allows to estimate the sensitivity of even complex SuperB physics analyses as a function of the detector configuration
- But it has not been designed to include the kind of machine background we know today
  - Background simulations were not available at that time
- It's possible to deal with background properly, but some development is needed, concerning all subsystems
- Pattern recognition is out of FastSim scope. We need a SuperB full reconstruction

Conclusions

- From the physics viewpoint, it has been a productive and enjoyable week
- The Physics Meeting was a success and we plan to have the next one in December
- The WG reviews proved very useful as a way to take stock of the achievements in Physics and where resources are needed going forward
- We have initiated work with the detector and MDI folks to characterize the effect of physics reach of the expected backgrounds

Extra slides

$B_{u,d}$ Physics WG – Walsh

Analysis opportunities

- $B \to D^{(*)} \tau \nu$
- V_{ub}/Semileptonic decays
- $B \to X_s \gamma$, especially A_{CP}
- Precision mode for α, β or γ (benchmark)
- Inclusive $B \to K^{(*)} l^+ l^-$ modes
- Any analysis using SL tags
- Gluonic penguins