SuperB Design and Update

M. Sullivan
for
the SuperB team

Thomas Jefferson National Accelerator Facility
Newport News, Virginia
January 26, 2010
Outline

• Some of the physics
• Accelerator Design
  – Basic concepts
  – Ring
  – Injector
  – Lattice – IR optics
  – Collision and crab waist
  – DAΦNE results
• IR Design
  – Parameters
  – Layout
  – QD0
  – Backgrounds
• Summary
Physics

• The success of the recent B-factories (KEKB and PEP-II) has led to interest in a super B-factory: one with 50 times more luminosity ($1 \times 10^{36}$ cm$^{-2}$s$^{-1}$)

• A super B-factory would be able to integrate 15 ab$^{-1}$ per year and collect 75 ab$^{-1}$ in 5 years

Physics Program in two sentences

SuperB Physics Program is such that:

* if NP particles are discovered at LHC then SuperB can study the flavour structure of the NP
* SuperB can explore a NP scale beyond the LHC reach

KEKB delivered 1 ab$^{-1}$ in 10 yrs, PEP-II ~0.5 ab$^{-1}$ in 8 yrs

$\delta_{bq}$

$\Lambda_{\text{eff}}$

$L \sim 10^{34}$ cm$^{-2}$ s$^{-1}$ ↔ EW scale ~100 GeV
$L \sim 10^{36}$ cm$^{-2}$ s$^{-1}$ ↔ TeV scale

EW scale ~100 GeV
CP violation in the Standard Model

CKM matrix parameters

SM remains intact

SuperB+Lattice improvements

SM inconsistent -> NP

Today

\[ r = 0.0028 \]
\[ h = 0.0024 \]
\[ \rho = 0.163 \pm 0.028 \]
\[ \eta = 0.344 \pm 0.016 \]

Error reduction

Improving CKM is crucial to look for NP

\[ \rho = 0.0028 \]
\[ \eta = 0.0024 \]

Taken from the Physics Introduction at the SLAC workshop
New physics reach

• **Dark Sector**
  – New theory about dark forces at the 1 GeV scale
  – High luminosity e+e- colliders will have a chance to look in this region for new physics
  – All low energy high luminosity machines??
  – Triggers have to be redesigned
  – Example:
    • Sit on the Upsilon 3S and look for events with only 2 pions in the final state that reconstruct to the mass difference between the 3S and the 1S. Then you have made a 1S that disappeared. You can now count the number of 1S events that decay invisibly. The SM has a prediction for this number. You look to see if the value you get is different. Some new physics models have a prediction for this number.
SuperB Accelerator

- Luminosity of $1 \times 10^{36}$ cm$^{-2}$s$^{-1}$ on the Upsilon 4S
- How?
  - Same beam currents as now (~2 A)
  - About the same number of bunches (1000-1200)
    - PEP-II had 1750
  - Bunch length a little shorter but very similar (~5mm)
  - Low emittance beams (2-3 nm in X, ~4 pm in Y)
    - PEP-II emittances (20-50 nm in X, ~2000 pm in Y)
    - Modern light sources are in this range
  - Very low beta*s (2-3.5 cm in X, 0.2-0.35 mm in Y)
    - PEP-II beta*s (25-40 cm in X, ~10 mm in Y)
  - Give up luminosity because beta* Y is much shorter than the bunch length (lose factor of ~20)
  - Improve the collision with a Crab Waist (gain a factor of ~3)
- Polarized electrons (>80%)
- Able to go to the other Upsilon resonances
- Able to go down to the Tau-Charm region
- Use a large fraction of the PEP-II accelerator and detector hardware
Indico links to the last four workshop presentations

- **February 2009 (Orsay, France)**
  - [http://agenda.infn.it/conferenceDisplay.py?confId=959](http://agenda.infn.it/conferenceDisplay.py?confId=959)

- **June 2009 (Perugia, Italy)**
  - [http://agenda.infn.it/conferenceDisplay.py?confId=1161](http://agenda.infn.it/conferenceDisplay.py?confId=1161)

- **October 2009 (SLAC)**
  - [http://agenda.infn.it/conferenceDisplay.py?confId=1742](http://agenda.infn.it/conferenceDisplay.py?confId=1742)

- **December 2009 (Frascati, Italy)**
  - [http://agenda.infn.it/conferenceDisplay.py?confId=1165](http://agenda.infn.it/conferenceDisplay.py?confId=1165)
Super-B Accelerator Interested Contributors (Fall 2009)

- A. Bogomiagkov, S. Karnaev, I. Koop, E. Levichev, S. Nikitin, I. Nikolaev, I. Okunev, P. Piminov, S. Siniatkin, D. Shatilov, V. Smaluk, P. Vobly (BINP, Russia)
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- F. Meot, N. Monseu (Grenoble, France)
- F. Bosi, E. Paoloni (Pisa University, Italy)
# Machine Parameters

SuperB Parameters July 22 2009

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Units</th>
<th>Super-B</th>
<th>Super-B</th>
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<tr>
<td>Tor Vergata</td>
<td>LNF</td>
<td>1-Mar-09</td>
<td>22-Jul-09</td>
</tr>
</tbody>
</table>

### E HER (positrons) GeV
- 6.0
- 6.7

### E LER (electrons) GeV
- 4.06
- 4.18

### Energy ratio
- 1.70
- 1.00

### r0 cm
- 2.83E-13
- 2.83E-13

### X-ANGLE (full) mrad
- 60
- 60

### Betax HER cm
- 2
- 2

### Beta Y HER cm
- 0.037
- 0.032

### Coupling (high current) %
- 0.0025
- 0.0025

### Emittance HER mm
- 1.6
- 1.6

### Emittance Y HER mm
- 0.04
- 0.04

### Bunch length HER cm
- 0.5
- 0.5

### Betax LER cm
- 3.5
- 3.2

### Beta Y LER cm
- 0.021
- 0.02

### Coupling (high current) %
- 0.0025
- 0.0025

### Emittance HER cm
- 2.8
- 2.59

### Emittance Y HER mm
- 0.007
- 0.0064

### Bunch length LER cm
- 0.5
- 0.5

### I HER mA
- 2200
- 2120

### I LER mA
- 2200
- 2120

### Circumference m
- 2105
- 1313

### N. Buckets distance
- 2
- 2

### Gap
- 0.97
- 0.97

### Frf Hz
- 4.76E+06
- 4.76E+06

### Fturn Hz
- 1.43E+06
- 2.28E+06

### Fcoll Hz
- 2.31E+08
- 2.31E+08

### Num Bunch
- 1619
- 1011

### Sieg HER
- 5.96E+10
- 5.74E+10

### SIGHER Her mitrons
- 5.657
- 5.657

### SIGHER HER mitrons
- 0.038
- 0.036

### Sieg Y HER
- 0.036
- 0.036

### Sieg HER LER mitrons
- 26.52
- 26.52

### Sieg HER LER mitrons
- 15.15
- 15.15

### Sieg HER LER mitrons
- 150.15
- 150.15

### Sieg HER LER mitrons
- 150.37
- 150.32

### Sieg HER LER mitrons
- 0.066
- 0.066

### Cap Sig X mitrons
- 11.402
- 10.673

### Cap Sig Y mitrons
- 0.054
- 0.051

### Cap Sig Her X mitrons
- 212.15
- 212.13

### Lumi calc /nm2/s
- 1.02E+36
- 1.02E+36

### Tune Shift x HER
- 0.0016
- 0.0017

### Tune Shift Y HER
- 0.1271
- 0.1170

### Tune Shift x LER
- 0.0052
- 0.0045

### Tune Shift y LER
- 0.1220
- 0.1170

### Damping long HER msec
- 21
- 14.5

### Damping long LER msec
- 20.9
- 22.0

### Uo HER MeV
- 2.3
- 2.03

### Uo LER MeV
- 1.40
- 0.83

###alfa c HER
- 3.56E-04
- 4.04E-04

###alfa c LER
- 3.20E-04
- 4.24E-04

### sigma E HER
- 5.80E-04
- 6.15E-04

### sigma E LER
- 8.20E-04
- 6.57E-04

### CM sigma E
- 1.00E-03
- 5.00E-04

### SR power loss HER MW
- 5.06
- 4.30

### SR power loss LER MW
- 3.08
- 1.76

### Touschek lifetime HER min
- 32
- 36

### Touschek lifetime LER min
- 17
- 16

### Luminosity lifetime HER min
- 5.20
- 4.95

### Luminosity lifetime LER min
- 5.20
- 4.95

### Total lifetime HER min
- 4.49
- 4.34

### Total lifetime LER min
- 3.98
- 3.78

### RF plug power MW
- 18.28
- 12.13
Latest Ring Layout

Lattice Systems

- **Two Arcs**
  - Provide the necessary bending to close the ring.
  - Optimized to generate the design horizontal emittance.
  - Correct arc chromaticity and sextupole aberrations.

- **Interaction Region**
  - Provides the necessary focusing for required small beam size.
  - Corrects FF chromaticity and sextupole aberrations.
  - Provides the necessary optics conditions for Crab cavities.

- **Dogleg**
  - Provides crossing on the opposite to IR side of the ring.

- **LER Spin Rotator**
  - Includes solenoids in matched sections adjacent to the IR.

- **RF system**
  - Up to 24 HER and 12 LER cavities in the long straight section opposite to IP.
SuperB at the Frascati Labs

Circumference = 1.35 Km

- RF buildings
- Cooling Towers
- Klystron PS
- Collider hall
Collider Hall

Electrical Substation upgradable up to 2x63MVA transformers

area for cooling towers

Existing Building Guesthouse

2 “SLAC type buildings” (20x35m) housing 6 klystrons each plus magnet power supplies
Injection process in 3 phases, to avoid simultaneous acceleration of high-charge e- bunches and damped e+ bunches in the linac B.

No fast kickers required

Rings filled every 60 msec (16.66 Hz)
DAΦNE: LINAC, Storage Rings and damping Ring
Super-B damping ring

compact structure (51 m) for storing alternatively electrons and positrons

small equilibrium emittance: 23 nm @ 1 GeV

short betatron damping time: 7.3 ms

small momentum compaction: $5.7 \times 10^{-3} \Rightarrow$ short bunch length

large dynamic aperture: $\pm 20$ mm horizontal, $\pm 15$ mm vertical for $-2\% < \Delta p/p < +2\%$
Arc Lattice

- Arc cell: flexible solution is based on decreasing the natural emittance by increasing $\mu_x$/cell, and simultaneously adding weak dipoles in the cell drift spaces to decrease synchrotron radiation.
- All cells have: $\mu_x=0.75$, $\mu_y=0.25 \rightarrow$ about 30% fewer sextupoles.
- Better DA since all sextupoles are at $-I$ in both planes (although x and y sextupoles are nested).
- Distances between magnets compatible with PEP-II hardware.
- All quads-bends-sextupoles in PEP-II range.
IR Optics

IR quadrupoles are rematched, but more optimization of chromatic correction is needed.

LER Spin Rotators need to be updated.

Additional IR correcting sextupoles are proposed for better dynamic aperture, but not yet included.
Final Focus 4D dynamic aperture

All sextupoles in the arcs are switched off
The black curve shows original DA (50 sigma_x X 80 sigma_y)
The red curve shows DA optimized by correction sextupoles (250 sigma_x X 750 sigma_y)

E. Levichev, P. Piminov et al.  Presentation from last June (below) and see presentation at SLAC workshop
http://agenda.infn.it/materialDisplay.py?contribId=31&amp;sessionId=10&amp;materialId=slides&amp;confId=1161
Crab Waist Advantages

1. Large Piwinski angle

\[ \Phi = (\tg) \theta \sigma_z / \sigma_x \cong \theta \sigma_z / \sigma_x \]

2. Vertical beta comparable with overlap area

\[ \beta_y \sigma_x / \theta \cong \]

3. Crabbed waist transformation

\[ y = xy'/(2\theta) \]

a) Luminosity gain with N
b) Very low horizontal tune shift

a) Geometric luminosity gain
b) Lower vertical tune shift
c) Vertical tune shift decreases with oscillation amplitude
d) Suppression of vertical synchro-betatron resonances

a) Suppression of X-Y betatron and synchro-betatron resonances
b) Geometric luminosity gain

Paper by Raimondi, Shatilov, and Zorbov
http://arxiv.org/abs/physics/0702033
Crab Waist Scheme
Crab Waist Scheme

- $e^+$
- $e^-$
- $\beta_Y$
- $2\sigma_x/\theta$
- $\theta$
- $2\sigma_z$
- $2\sigma_x^*/\theta$

Crab Waist Scheme
Beam Blowup and Tails in SuperB

Bunch Current

Crab Sextupoles Off

Crab Sextupoles On
The crab waist in DAΦNE

• In 2007-2008 DAΦNE was upgraded to include a crabbed waist

• There were some additional (conventional) improvements as well
  – Improved injection
  – Improved impedance reduction
  – Improved feedback systems

• The predicted luminosity increase was about a factor of 3 (from $1.6 \times 10^{32}$ to $5 \times 10^{32}$)
DAΦNE Upgrade Team


(INFN LNF, Frascati)

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S.Bettoni (CERN, Geneva)

K. Ohmi (KEK, Ibaraki)

D. Teytelman (SLAC)

P. Valente (INFN-Rome, Rome)

P.Branchini (University Rome3, Rome)

E.Paoloni (University of Pisa and INFN, Pisa)

M.Esposito (Rome University “La Sapienza”, Rome)
Data averaged on a full day

$\beta_y = 9\text{mm}, P_w_{angle} = 1.9$

$\beta_y = 18\text{mm}, P_w_{angle} = 0.6$

$\beta_y = 25\text{mm}, P_w_{angle} = 0.3$

LPA alone gives more luminosity

Presented June 2009 by P. Raimondi
Specific Luminosity $[10^{28} \text{ cm}^{-2} \text{s}^{-1}]$

- $\beta_y=9\text{mm}, P_{w\_angle}=1.9$
- $\beta_y=18\text{mm}, P_{w\_angle}=0.6$
- $\beta_y=25\text{mm}, P_{w\_angle}=0.3$

Same beam sizes and specific luminosity at low current with and without Crab Sextupoles

Presented June 2009 by P. Raimondi
Transverse Beam Profile Measurements

CRAB OFF

\[ \sigma^+_{y} = 398 \, \mu m \]

CRAB ON

\[ \sigma^+_{y} = 143 \, \mu m \]

Nov. 2nd 2009

103 colliding bunches
SuperB IR Design

• This is one of the more difficult parts of the SuperB design
• The very low $\beta_y^*$ means we must get as close as we can to the IP with our final focus magnets
• The very low emittance beams means that we cannot bend the beams very much
• Initially we tried a shared magnet ala PEP-II and KEKB but the crossing angle forces too much of a bend in either one or both of the beams and we were forced to abandon the idea (even if we lowered the crossing angle)
• We have since been concentrating on a dual quad design using SC magnets that are wound so that the fringe field of the nearby quad is cancelled
• In order to get these magnets in as close as possible we have opened the crossing angle to 60 mrad
• In order for this design to work the quad strengths are locked together (the ratio must be constant)
General IR Design Features

• Crossing angle is +/- 30 mrad
• Cryostat has a complete warm bore
  – For synchrotron radiation reasons
  – Both QD0 and QF1 are super-conducting
• PM in front of QD0
• Soft upstream bend magnets
  – Further reduces SR power in IP area
• BSC to 30 sigmas in X and 140 sigmas in Y (10 sigma fully coupled)
• Detector beam pipe radius 1 cm

Do NOT want to design out upgrades
## Parameters used in the IR

<table>
<thead>
<tr>
<th>Parameter</th>
<th>HER</th>
<th>LER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy (GeV)</td>
<td>7</td>
<td>4</td>
</tr>
<tr>
<td>Current (A)</td>
<td>2.12</td>
<td>2.12</td>
</tr>
<tr>
<td>Beta X (mm)</td>
<td>20</td>
<td>32</td>
</tr>
<tr>
<td>Beta Y (mm)</td>
<td>0.32</td>
<td>0.20</td>
</tr>
<tr>
<td>Emittance X (nm-rad)</td>
<td>1.60</td>
<td>2.56</td>
</tr>
<tr>
<td>Emittance Y (pm-rad)</td>
<td>4.0</td>
<td>6.4</td>
</tr>
<tr>
<td>Sigma X (μm)</td>
<td>5.66</td>
<td>5.66</td>
</tr>
<tr>
<td>Sigma Y (nm)</td>
<td>36</td>
<td>36</td>
</tr>
<tr>
<td>Crossing angle (mrad)</td>
<td>+/- 30</td>
<td></td>
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</table>
The Present Design

PEP-II Support tube

300 mrad

200 mrad

Solenoids

QF1

QF1

HER

LER

PM

Solenoids

QD0

300 mrad

200 mrad

Cryostat

PEP-II     
Support tube

0 1 2 3

mm

m

3-Oct-09                        
M. Sullivan    
SB_I_ILC_R3_SR_3M
QF1
QF1

HER

LER

PM

Solenoids

QD0

300 mrad

200 mrad

Cryostat

PEP-II     
Support tube

0 1 2 3

mm

m

3-Oct-09                        
M. Sullivan    
SB_I_ILC_R3_SR_3M
QF1
QF1

HER

LER

PM

Solenoids

QD0

300 mrad

200 mrad

Cryostat

PEP-II     
Support tube

0 1 2 3

mm

m

3-Oct-09                        
M. Sullivan    
SB_I_ILC_R3_SR_3M
QF1
QF1

HER

LER

PM

Solenoids

QD0

300 mrad

200 mrad

Cryostat

PEP-II     
Support tube

0 1 2 3

mm

m

3-Oct-09                        
M. Sullivan    
SB_I_ILC_R3_SR_3M
QF1
QF1

HER

LER

PM

Solenoids

QD0

300 mrad

200 mrad

Cryostat

PEP-II     
Support tube

0 1 2 3

mm

m

3-Oct-09                        
M. Sullivan    
SB_I_ILC_R3_SR_3M
QF1
QF1

HER

LER

PM

Solenoids

QD0

300 mrad

200 mrad

Cryostat
# Improvement details

<table>
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<tr>
<th></th>
<th>Old</th>
<th>New</th>
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<td></td>
<td>HER/LER</td>
<td>HER/LER</td>
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<tr>
<td>QD0</td>
<td></td>
<td></td>
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<tr>
<td>R inside (mm)</td>
<td>24.0/31.5</td>
<td>22.5/32.5</td>
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<tr>
<td>R outside (mm)</td>
<td>28.0/35.5</td>
<td>28.5/38.5</td>
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<tr>
<td>Length (m)</td>
<td>0.40</td>
<td>0.40</td>
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<tr>
<td>Dist to IP (m)</td>
<td>0.58</td>
<td>0.60</td>
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<tr>
<td>Gradient (T/cm)</td>
<td>-1.192/-0.522</td>
<td>-1.025/-0.611</td>
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<tr>
<td>Field at inside radius (T)</td>
<td>2.80/1.61</td>
<td>2.31/1.99</td>
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<tr>
<td>Maximum $\beta_y$ (m) (sqrt)</td>
<td>1970(44)/2193(47)</td>
<td>1550(39)/2566(51)</td>
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<tr>
<td>QF1</td>
<td></td>
<td></td>
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<td>R inside (mm)</td>
<td>50.0</td>
<td>50.0</td>
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<tr>
<td>R outside (mm)</td>
<td>56.0</td>
<td>60.0</td>
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<td>Length (m)</td>
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<tr>
<td>Dist to IP (m)</td>
<td>1.60</td>
<td>1.80</td>
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<tr>
<td>Gradient (T/cm)</td>
<td>0.726/0.399</td>
<td>0.640/0.358</td>
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<tr>
<td>Field at inside radius (T)</td>
<td>3.48/1.92</td>
<td>3.20/1.79</td>
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<tr>
<td>Maximum $\beta_x$ (m) (sqrt)</td>
<td>580(24)/200(14)</td>
<td>799(28)/486(22)</td>
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</table>
Vertical View – same as before

300 mrad

Version P3
M. Sullivan
Jan. 24, 2009

300 mrad

Version P3
M. Sullivan
Jan. 24, 2009
QD0 design

Self-compensating windings
Magnetic field ratios are fixed
Beam sizes in QD0

Beams in the PM slices

BSC envelopes at Z = 0.360 m.

BSC envelopes at Z = 0.420 m.

BSC envelopes at Z = 0.600 m.

45 mm dia.

65 mm dia.
QF1 cross-sections

View is looking at the IP.
Collision axis reference frame.
Angle wrt collision axis = 36.000 mrad.

BSC envelopes at Z = 1.800 m.
View is looking at the IP.

Collision axes reference frame.
Angle wrt collision axis = 30.000 mrad.

BSC envelopes at Z = 1.875 m.

BSC envelopes at Z = 1.950 m.

BSC envelopes at Z = 2.025 m.

BSC envelopes at Z = 2.100 m.
Initial Cryostat Design
SR backgrounds

• No photons strike the physics window
  – We trace the beam out to $20\sigma X$ and $45\sigma Y$
  – The physics window is defined as +/-4 cm for a 1 cm radius beam pipe

• Photons from particles at high beam sigmas presently strike within 5-6 cm downstream of the IP

• However, the highest rate on the detector beam pipe comes from a little farther away where the photon rate significantly increases on the local beam pipe

• Unlike PEP-II, the SuperB design is sensitive to the transverse beam tail distribution
SR from the upstream bends

B1 magnet $K_c = 4.0$ keV

B1 magnet $K_c = 0.7$ keV
SR power from soft bends

B0 magnet $K_c = 1.2$ keV

B0 magnet $K_c = 0.2$ keV

HER

LER

300 mrad

200 mrad

37 W

341 W

$K_c = 1.2$ keV

$K_c = 0.2$ keV
SR photon hits/crossing
SR photon hits/crossing on the detector beam pipe from various surfaces

After including the backscattering SA and absorption rate (3% reflected)
New Idea – Super-ferric QD0

- Pavel Vobly from BINP has come up with a new idea for QD0 (mentioned at the end of the workshop at SLAC in October)
  - Use Panofsky style quadrupoles with Vanadium Permendur iron yokes

- This new idea has some added constraints but it is still attractive because it is easier to manufacture and the precision of the iron determines the quality of the magnet
Two Panofsky style quads

Superconducting Coils

Hyperbolic chamfer

Permendur Yoke

No iron needed between quads
The quads can be on axis with the beams
Super-ferric QD0

- Extra constraints
  - Maximum field of no more than 2T at the pole tips
  - Equal magnetic fields in each quad
  - Square apertures

- Advantages
  - Easier to build
  - Self-shielding
  - If we can get enough space we can separate the magnets in z

- Both QD0 designs need a well cancelled detector field
  - We will use solenoid windings around the cold mass
Design constraints

• The requirement of the maximum field strength to be less than 2 T has forced us to move the magnets back from the IR, but this also makes the beam size increase which is one of the reasons the QF1 aperture is so large.

• The requirement of a square aperture does not seem to cause any problems so far. We seem to be dominated in aperture in the X plane instead of in the Y plane.
SR backgrounds for the Super-ferric QD0

- We tested the case of putting all of the magnet centers on beam axis which we can do in the super-ferric design.
- Unfortunately the straight on-axis solution generates SR photons from the high-sigma region of the beam profile that directly strike the detector beam pipe.
- These photons come from the beam rays with the steepest slope out of QF1.
- Both the current baseline design and the super-ferric design must have offset QD0 axes.
QD0 Summary

• The baseline “Italian style” design is still being pursued
  – The manufacture of this design is one of the most difficult parts – wire placement and stability are crucial
• The new Panofsky style QD0 shows promise and is being investigated
  – A very recent discovery (for me) is the existence of the rare earth Holmium
  – It has the highest magnetic moment of any element
  – The metal becomes ferric at 20° K and has a saturation field of ~3.8T
  – Vanadium Permendur saturation field is ~2.4T
  – Holmium is not as mechanically strong as iron so we will have to see if we can use it
• We have recently started work on re-optimizing the permanent magnet part of the design for both the Panofsky style QD0 and the “Italian style” QD0
Project Status

• The SuperB proposal is in the Agenda of CIPE (Inter-ministry Committee for Economic Planning)

• The proposal is supported by the Ministry of Education Science and Technology with a very high priority

• The President of INFN is closely in touch with the Ministry high level officers and with the Minister

From the presentation of Marcello Giorgi at the SuperB workshop Dec 1-5, 2009
Project Status (2)

• The status of SuperB was reported last November at the ECFA plenary meeting at CERN

• There were no objections or criticism of any kind from the audience

• The CERN planning committee has stated that this is a good regional project

• We are hoping to hear about funding next month

From the presentation of Marcello Giorgi at the SuperB workshop Dec 1-5, 2009
Summary

• In order to achieve a factor of 50 over present day B-factories we must:
  – Collide state-of-the-art low emittance beams and
  – Use very low $\beta^*$ values
  – This combination has never been done

• However, the design uses proven technology wherever possible
  – Bunch current, number of bunches, total current, bunch length

• The SuperB design is converging
• Polarization of the electron beam looks feasible
• The accelerator design has flexibility
Summary (2)

• The Italian government favors the proposal
• We hope to hear from the government this coming month
• We are in the midst of writing a white paper describing the physics, the detector and the accelerator
• This is a preliminary step toward a TDR which we hope to have finished by the end of this year (2010)
Conclusion

• The physics argument for a Super B-factory is compelling
  – Complimentary to the LHC
  – A higher new physics mass reach than the LHC

• The accelerator design is converging
  – All aspects are starting to look feasible

• As always, more work needs to be done

• We hope to hear soon about project funding