SuperB Accelerator

Overview and Lattice

M. E. Biagini, LNF-INFN

for the SuperB Accelerator Team

ICFA08 Workshop

Novosibirsk, Apr. 14-16, 2008
Outline

• The SuperB project
• Luminosity and new concepts
• Transparency conditions
• Beam-beam studies
• Beam dynamics studies
• Lattice
• Conclusions
SuperB project

• SuperB aims at the construction of a very high luminosity (\(10^{36} \text{ cm}^{-2} \text{ s}^{-1}\) at least) asymmetric \(e^+e^-\) Flavour Factory, with possible location at the campus of the University of Rome Tor Vergata, near the INFN Frascati National Laboratory.

• Attempts to design a Super B-Factory date to 2001. The initial approach at SLAC and KEK had much in common: they were extrapolations of the very successful B Factory designs, with increased bunch charge, more bunches, and crab cavities to correct for the crossing angle at the Interaction Point.

• These proposed designs reached luminosities of 5 to 7 x \(10^{35} \text{ cm}^{-2} \text{ s}^{-1}\) but had wall plug power of the order of 100 MW. This daunting power consumption was a motivation to adapt linear collider concepts from SLC and ILC to the regime of high luminosity storage ring colliders.
The SuperB Process

- 2005
  - 2nd Joint Japan-US SuperB Factory Workshop, Hawaii, US
  - International SuperB Study Group formed
  - 1st SuperB Workshop, LNF, Italy
  - International SuperB Steering Committee established

- 2006
  - 3rd SuperB Workshop, SLAC, US
  - 1st Accelerator Retreat, SLAC, US
  - 2nd Accelerator Retreat, LNF, Italy
  - 4th SuperB Workshop, Villa Mondragone, Italy
  - CDR writing started
  - CDR published

- 2007
  - 5th SuperB Workshop in Paris, France
  - CDR presented to INFN Management
  - International Review Committee setup
  - 6th SuperB Workshop, Villa Mondragone, Italy
  - 2nd IRC meeting, Rome, Italy

- 2008
  - SuperB meeting, Daresbury, UK
  - 1st IRC meeting, LNF, Italy
  - Physics retreat at Valencia, Spain
  - Accelerator test started at DAFNE, LNF, Italy
  - Detector R&D workshop, SLAC, US
  - ICAF08 Workshop at BINP, Russia
  - 2nd IRC meeting, Rome, Italy
  - SuperB Meeting in Elba, Italy
  - Machine Advisory Committee, CERN, Italy
  - CERN strategy group presentation

Month

- 2005: 4 9 11
- 2006: 3 4 6 9 11 12
- 2007: 3 5 5 7 7 9 11 12
- 2008: 1 2 4 4 6 6
The SuperB CDR

“Conceptual Design Report” (450 pp), March 2007
www.pi.infn.it/SuperB/?q=CDR

- 320 CDR signatures
- 85 Institutions
- 239 Experimentalists

200 pages on Accelerator

Participants

- Accelerator physicists 12%
- Theorists 13%
- Experimentalists 75%

Countries

- USA, 70
- Italy, 137
- France, 21
- Germany, 11
- Israel, 2
- Russia, 18
- ROC, 3
- Norway, 1
- Japan, 4
- Spain, 12
- Switzerland, 4
- UK, 24
- Slovenia, 5
- Canada, 7
- Australia, 1
SuperB Accelerator CDR Contributors

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Basic concepts

• B-Factories (PEP-II and KEKB) reached very high luminosity (>10^{34} \text{s}^{-1} \text{cm}^{-2}), but to increase L of ~ two orders of magnitude borderline parameters are needed, such as:
  – Very high currents
  – Smaller damping time
  – Shorter bunches
  – Crab cavities for head-on collision
  – Higher power

• SuperB exploits an alternative approach, with a new IP scheme:
  – Small beams (ILC-DR like)
  – Large Piwinsky angle and “crab waist”
  – Currents comparable to present Factories
How to increase $L$?

“Brute force”
- Increase beam currents
- Decrease $\beta_y^*$
- Decrease bunch length

But...
- HOM in beam pipe
  - overheating, instabilities, power costs
- Detector backgrounds increase
- Chromaticity increases
  - smaller dynamic aperture
- RF voltage increases
  - costs, instabilities
A new idea for L increase

P. Raimondi’s: to focus more the beams at IP and have a “large” crossing angle \( \Rightarrow \) large Piwinski angle

- Ultra-low emittance (ILC-DR like)
- Very small \( \beta^* \) at IP
- Large crossing angle
- “Crab Waist” scheme

- Small collision area
- Lower \( \beta \) is possible
- NO parasitic crossings
- NO synchro-betatron resonances due to crossing angle

Test at DAΦNE now !!!
Higher luminosity with same currents and bunch length:
- Beam instabilities are less severe
- Manageable HOM heating
- No coherent synchrotron radiation of short bunches
- No excessive power consumption

Lower beam-beam tune shifts
- Relatively easier to make small $\sigma_x$ with respect to short $\sigma_z$
- Parasitic collisions becomes negligible due to higher crossing angle and smaller $\sigma_x$
Large crossing angle, small x-size

Short bunches
aspect ratio $\sigma_y/\sigma_x \sim 1/3000$

Long bunches
aspect ratio $\sigma_y/\sigma_x \sim 1/300$

A large crossing angle “swaps” x with z

Large Piwinski angle:

$$\Phi = \tan(\theta)\sigma_z/\sigma_x$$

E. Paoloni
Beams distribution at IP

Crab sextupoles OFF

waist line is orthogonal to the axis of one bunch

Crab sextupoles ON

waist moves to the axis of other beam

All particles from both beams collide in the minimum $\beta_y$ region, with a net luminosity gain
SuperB transparency condition (1)

- To have equal tune shifts with asymmetric energies in PEP-II and KEKB the “design” beam currents ratio is:
  \[ \frac{I^+}{I^-} \sim \frac{E^-}{E^+} \]

- Due to SuperB large crossing angle, new conditions are possible: LER and HER beams can have different emittances and \( \beta^* \) and equal currents.

\[ \xi^+ = \xi^- \iff \frac{N^+}{N^-} = \frac{E^-}{E^+} \]

\[ \xi^+ = \xi^- \iff \frac{\beta^+_y}{\beta^-_y} = \frac{E^+}{E^-} \]

Present B-factories

SuperB
Transparency condition (2)

\[ \xi^+ = \xi^- \iff \frac{\beta_y^+}{\beta_y^-} = \frac{E^+}{E^-} \]

• LER sees a shorter interaction region, \((4/7)\) of the HER one
• LER has a smaller \(\beta_y^*\), easier to achieve in the Final Focus
• LER has larger emittance, 2.8 nm, better for Touscheck effect and tolerance to instabilities
Both beam lifetimes are increased (larger emittances), injection rates reduced.

Beam-beam simulations show good results, no blow up is seen for HER, 1-3% for LER, but some more optimization is possible: tunes, crabbing ($L=10^{36}$ is predicted).

Upgrade parameters can be implemented in any order:
- decrease the emittances first, or...
- increase the bunch charge, or...
- increase the number of bunches, or...
- decrease the bunch length

Less RF Voltage is needed.
<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>Nominal</th>
<th>Upgrade</th>
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<tbody>
<tr>
<td>Energy (GeV)</td>
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<td>4</td>
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<tr>
<td>Luminosity x 10^{38}</td>
<td>1.0</td>
<td>2.0</td>
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<tr>
<td>Circumference (m)</td>
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<td>1800</td>
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<tr>
<td>Revolution frequency (MHz)</td>
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<td>RF frequency (MHz)</td>
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<tr>
<td>Momentum spread (x10^{-4})</td>
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<td>5.6</td>
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<tr>
<td>Momentum compaction (x10^{-4})</td>
<td>3.2</td>
<td>3.8</td>
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<tr>
<td>RF Voltage (MV)</td>
<td>5</td>
<td>8.3</td>
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<tr>
<td>Energy loss/turn (MeV)</td>
<td>1.16</td>
<td>1.94</td>
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<tr>
<td>Number of bunches</td>
<td>1251</td>
<td></td>
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<tr>
<td>Particles per bunch (x10^{10})</td>
<td>5.52</td>
<td></td>
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<tr>
<td>Beam current (A)</td>
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<tr>
<td>Beta y^0 (mm)</td>
<td>0.22</td>
<td>0.39</td>
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<tr>
<td>Beta x^0 (mm)</td>
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<td>20</td>
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<tr>
<td>Emit y (pm-rad)</td>
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<td>4</td>
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<tr>
<td>Emit x (nm-rad)</td>
<td>2.8</td>
<td>1.6</td>
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<tr>
<td>Sigma y^+ (microns)</td>
<td>0.039</td>
<td>0.039</td>
</tr>
<tr>
<td>Sigma x^+ (microns)</td>
<td>9.9</td>
<td>5.66</td>
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<tr>
<td>Bunch length (mm)</td>
<td>5</td>
<td>4.3</td>
</tr>
<tr>
<td>Full Crossing angle (mrad)</td>
<td>48</td>
<td></td>
</tr>
<tr>
<td>Wiggler s (#) 20 meters each</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Damping time (trans/long)(ms)</td>
<td>40/20</td>
<td>40/20</td>
</tr>
<tr>
<td>Luminosity lifetime (min)</td>
<td>6.7</td>
<td>3.35</td>
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<td>Touschek lifetime (min)</td>
<td>13</td>
<td>20</td>
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<tr>
<td>Effective beam lifetime (min)</td>
<td>4.5</td>
<td>5.1</td>
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<tr>
<td>Injection rate pps (x10^11) (100%)</td>
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<td>2.3</td>
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<tr>
<td>Tune shift y (from formula)</td>
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<tr>
<td>Tune shift x (from formula)</td>
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<td>0.0025</td>
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<tr>
<td>RF Power (MW)</td>
<td>17</td>
<td>25</td>
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</table>
SuperB beams are focused in the y-plane 100 times more than in the present factories, thanks to:
- small emittances
- small beta functions
- larger crossing angle

Tune shifts and longitudinal overlap are greatly reduced

<table>
<thead>
<tr>
<th></th>
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<th>SuperB</th>
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<tr>
<td>I (A)</td>
<td>1.7</td>
<td>2.</td>
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<tr>
<td>$\beta_y^*$(mm)</td>
<td>6</td>
<td>0.22/0.39</td>
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<tr>
<td>$\beta_x^*$(mm)</td>
<td>300</td>
<td>22/39</td>
</tr>
<tr>
<td>$\sigma_y^*$(\textmu m)</td>
<td>3</td>
<td>0.039</td>
</tr>
<tr>
<td>$\sigma_x^*$(\textmu m)</td>
<td>80</td>
<td>10/6</td>
</tr>
<tr>
<td>$\sigma_z$(mm)</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>$L$ (cm$^{-2}$s$^{-1}$)</td>
<td>$1.7\times10^{34}$</td>
<td>$1.0\times10^{36}$</td>
</tr>
</tbody>
</table>

Here is Luminosity gain
Beam-beam Luminosity Tune Scan
(crab=0.8/θ, σz = 7 mm; 3x10^{10} particles)

$L_{\text{max}} = 2.2 \times 10^{36} \text{ cm}^{-2} \text{ s}^{-1}$

2D and 3D surface luminosity plots. The red color on the contour plot corresponds to the highest luminosity while the blue is the lowest. Each contour line corresponds to a 10% luminosity reduction.

D. Shatilov, M. Zobov, IV SuperB Workshop
Luminosity and emittances vs \( N_{\text{part}} \)

- Luminosity linear up to 2 x design \( N_{\text{part}} \)
- No blow-up in emittances up to 1.6 x \( N_{\text{part}} \)

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D. Shatilov, M. Zobov, IV SuperB Workshop
**Beam tails and Luminosity vs Crab sextupole strength**

<table>
<thead>
<tr>
<th>Stage \ crab</th>
<th>0.4</th>
<th>0.6</th>
<th>0.8</th>
<th>1.0</th>
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<td><img src="image2" alt="Graphs" /></td>
<td><img src="image3" alt="Graphs" /></td>
<td><img src="image4" alt="Graphs" /></td>
</tr>
<tr>
<td>upgrade</td>
<td><img src="image5" alt="Graphs" /></td>
<td><img src="image6" alt="Graphs" /></td>
<td><img src="image7" alt="Graphs" /></td>
<td><img src="image8" alt="Graphs" /></td>
</tr>
</tbody>
</table>

- $\xi_y = 0.183$
- $\tau_s = 16 \text{ msec}$
- $\xi_y = 0.212$
- $\tau_s = 12 \text{ msec}$

$A_x = (0 : 20)\sigma_x \quad A_y = (0 : 50)\sigma_y$

D. Shatilov, M. Zobov, IV SuperB Workshop
Luminosity and blow-up vs damping time and $N_p$

Nominal damping: 10msec/3Km rings

2.5 times longer

5 times longer

$N_p = 2.5 \times 10^{10}$
$A_x \times A_y = 15 \sigma_x \times 20 \sigma_y$

$N_p = 5.0 \times 10^{10}$
$A_x \times A_y = 25 \sigma_x \times 80 \sigma_y$

D. Shatilov, M. Zobov, IV SuperB Workshop
Beam-beam blow up with new transparency parameters

Crab=0.8 Geom_Crab

No blow up is seen for HER, 1-3% for LER, but some more optimization is still possible: tunes, crabbing...

Crab=0.9 Geom_Crab

D. Shatilov

L=10^{36} \text{ cm}^{-2} \text{ s}^{-1}
IntraBeam Scattering

- IBS is associated with Touschek effect: while single large-angle scattering between particles in a bunch leads to loss of particles (Touschek lifetime), multiple small-angle scattering leads to emittance growth.
- Usually IBS has long growth rates, but for machines that operate with high bunch charges and very low vertical emittance (ILC-DR), the IBS growth rates can be large enough that significant emittance increase can be observed.
- IBS growth rates decrease rapidly with increasing energy → LER problem only.
- Depend on $\varepsilon$ and $N_{\text{part}}$, better with new LER parameters.

SuperB LER (A. Wolski)

Blue: $\beta$-tron coupling makes a 10% contribution to $\varepsilon_y$, with $\eta_y$ contributing 50%.
Red: $\beta$-tron coupling and $\eta_y$ make equal contributions.
### RF power estimate

Including synchrotron radiation, HOMs and RF power with 50% klystron efficiency

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#### Total klystron power

**A. Novokhatski**

<table>
<thead>
<tr>
<th>Total klystron power (LER+HER)</th>
<th>MW</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;Old&quot;</td>
<td>22.84</td>
</tr>
<tr>
<td>Nominal</td>
<td>16.96</td>
</tr>
<tr>
<td>Upgrade</td>
<td>25.23</td>
</tr>
<tr>
<td>Ultimate</td>
<td>58.22</td>
</tr>
</tbody>
</table>
Lattice overview

• The SuperB lattice as described in the Conceptual Design Report is the result of an international collaboration between experts from BINP, Cockcroft Institute, INFN, KEKB, LAL/Orsay, SLAC

• This collaboration is very important for the completion of the Technical Design Report

• Simulations were performed in many labs and with different codes:
  – LNF, BINP, KEK, LAL, CERN

• The design is flexible but challenging and the synergy with the ILC Damping Rings which helped in focusing key issues, will be important for addressing some of the topics

• Further studies after CDR completion led to new lattice
Evolution of lattice (1)

• Several accelerator issues have been addressed after completion of the CDR. In particular:
  – Power consumption
  – Costs
  – Site requirements
  – Crab waist compensation
  – Optimization of ring cell and Final Focus
  – QD0 quadrupole design (see Paoloni’s talk)
  – Touschek backgrounds (see Paoloni’s talk)
  – Polarization schemes (see Koop’s talk)

• The evolution of the lattice design is a consequence of the effort in minimizing costs and power consumption.
Evolution of lattice (2)

- Natural emittance decreases further by increasing the arc cell $\mu_x$, and nominal values can be obtained even without inserting wigglers.
- Dynamic aperture shrinks with larger $\mu_x$, but is still large enough (Final Focus is the dominant factor).
New layout (1)

- Reduced length and symmetry to:
  - 4 “arcs”, 14 cells/arc
  - Only 2 wiggler straights, 40 m long, empty in Phase I
  - Final Focus
  - One long straight for RF, injection (beams will be vertically separated here)
  - 2 sections will be devoted to polarization scheme

- No “emittance” wigglers used in Phase 1

- Arcs further optimized in order to:
  - improve chromatic properties
  - increase dynamic aperture
  - decrease intrinsic emittance
New layout (2)

- Alternating sequence of two different arc cells: a $\mu_x = \pi$ cell, that provides the best dynamic aperture, and a $\mu_x = 0.72$ cell with much smaller intrinsic emittance which provides phase slippage for sextupoles pairs, so that one arc corrects all phases of chromaticity. Then:
  - chromatic function $W_x < 20$ everywhere
  - $\beta$ and $\alpha$ variation with particle momentum are close to zero
  - larger dynamic aperture

- Cell #1: $L=20$ m, $\mu_x = 0.72$, $\mu_y = 0.27$
- Cell #2: $L=21$ m, $\mu_x = 0.5$, $\mu_y = 0.2$
- New cell layout (double-cell wrt CDR lattice):
  QF/2-QD-B-B-QF-B-B-QD-QF/2
New layout (3)

- HER: $\varepsilon_x = 1.6$ nm, $\tau_s = 19.8$ msec
- LER: $\varepsilon_x = 2.8$ nm, $\tau_s = 19.5$ msec
- HER cells host 2 x 5.4 m long PEP-II dipoles
- LER cells host 4 x 0.45 m long PEP-II dipoles
- Final Focus sections have 18 HER-type bends (16 in CDR)
- 2 straights between cells can host wigglers if needed
- 2 new sections, about 200 m long, will be added for the polarization scheme (not included in present lattice)
- Total length ~ 1800 m including spin rotator
Arc cells layout

Cell #1

LER

Cell #2

HER

Cell #1

Cell #2
The Rings

- HER, 7 GeV
- LER, 4 GeV

Same length and similar lattice

- Rings cross in one Interaction Point with a 48 mrad horizontal crossing angle
- Ultra low emittance lattice: inspired by ILC Damping Rings
- Circumference scaled down to shortest possible
- Rings lattice based on recycling PEP-II hardware (save a lot of money!)
- Maximize Luminosity keeping low wall power:
  - Total power: 17 MW, lower than PEP-II
Final Focus Optimization

- FF design complies all the requirements in terms of high order aberrations correction, needs to be slightly modified for LER to take care of energy asymmetry
- Chromaticity locally corrected
- Design based on ILC/FFTBLike Final Focus. Increased crossing angle to $2^\times24$ mrad (was $2^\times17$ mrad)
- Increased L* = 0.4 m (was 0.3 m)
- Horizontal beam separation at QD0: 2 cm, about $180 \sigma_x$
- Increased QF1 length to 0.7 m in order to decrease its synchrotron radiation. If necessary it could be lengthened further
- Radiative Bhabhas hitting the IR beam pipes are a lot
- Sychrotron radiation power is large
- A possible solution with a septum QD0 is being studied: SC array of wires placed in the middle of QD0 to shift the magnetic center, opposite for the 2 beams, to get no net steering from QD0 (see Paoloni’s talk). Overall thickness $\sim$ 8 mm, leaving about $60 \sigma_x$ of beam stay-clear
Final Focus optical functions ($\sqrt{\beta}$)

LER: $\beta_x^* = 35$ mm, $\beta_y^* = 220$ $\mu$

HER: $\beta_x^* = 20$ mm, $\beta_y^* = 390$ $\mu$
Avoid backgrounds in detector by over-bent off-energy particles in QD0: novel QD0 design based on SC “helical-type” windings. Overall thickness ~ 8mm
Example of QD0 design

S. Bettoni, E. Paoloni
See Paoloni’s talk
Rings optical functions

LER

HER

No spin rotator here
Chromatic functions (zoom)

Ring with FF, Sextupoles ON
TITLE: SuperB FF
Win32 version 8.51/15
12/11/07 21.55.53

W

\( W_x \quad D_s' \quad W_y \)

\[ \frac{dX}{d\delta} (m) \]

s (m)
Dynamic Aperture
(no optimization yet)

With crab sextupoles

• DA represents stability area of particles over many turns
• Lifetimes depend on it

Crab sextupoles reduce DA by 30%
Lattice layout, PEP-II magnets reuse

Total length 1800 m

Dipoles

Quads

Sexts

All PEP-II magnets are used, dimensions and fields are in range
RF requirements are met by the present PEP-II RF system
Lattice summary

- New cell layout more flexible in terms of emittance
- Rings are shorter and cheaper
- Longer Tousheck lifetime in LER (x2.3)
- Lower vertical tune shift (13%)
- More relaxed LER parameters
- Lower currents (20%)
- Longer damping times (20%)
- Possible to run Phase #1 without wigglers
- Upgrade parameters possible with wiggler installation
Polarization

- Polarization of one beam is included in SuperB
  - Either energy beam could be the polarized one
  - The LER would be less expensive, the HER easier
- Longitudinal polarization times and short beam lifetimes indicate a need to inject vertically polarized electrons
- There are several possible IP spin rotators:
  - Solenoids look better at present (vertical bends give unwanted vertical emittance growth)
- Expected longitudinal polarization at the IP of about 87\%(inj) \times 97\%(ring)=85\%(effective)
- Polarization section implementation in lattice: in progress
Example of spin rotators (1)

The solutions with vertical bends introduce unwanted vertical emittance.

I. Koop

HER ~7GeV

H-bends

V-bends

H-bends

P. Raimondi

The solutions with vertical bends introduce unwanted vertical emittance.
Example of spin rotators (2)

Solenoids (2.5 T) + dipoles (.21 T)

Not a solution, but illustrates match to low-ε dipole cell

No V-emittance growth.
Maybe possible to incorporate into lattice using the Final Focus bends to provide the spin rotation.
Work in progress

HER Spin Rotator

- Solenoid + Dipole scheme (90° + 90°)
  - Zholents-Litvinov decoupling & spin match
- \( G \approx 0.001, 7 \text{ GeV} \Rightarrow \gamma G = 15.89, B\rho = 23.35 \text{ Tm} \)
- Solenoid:
  - \( \vartheta_{spin} = (1 + G)\gamma B L / (B\rho) \Rightarrow 18.32 \text{ Tm for 45° spin rot.} \)
  - 5 T field \( \Rightarrow \) 3.66 m length, 15E6 Amp turns
- Dipole
  - \( \vartheta_{spin} = (1 + \gamma G) B L / B\rho \Rightarrow 2.3 \text{ Tm, } 5.7° \text{ orbit for 90° spin} \)
  - use 2 HER dipoles + 2 low-field dipoles
  - optics needed in between these to match dispersion
SuperB footprint on Tor Vergata site

- SuperB Ring (about 1800m)
- SPARX
- SuperB Injector (about 400m)
- Roman Villa
- SuperB Main Building
## Accelerator & site cost estimate

<table>
<thead>
<tr>
<th>WBS</th>
<th>Item</th>
<th>EDIA mm</th>
<th>Labor mm</th>
<th>M&amp;S kEuro</th>
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Note: site cost estimate not as detailed as other estimates.
Schedule

- Overall schedule dominated by:
  - Site construction
  - PEP-II/Babar disassembly, transport, and reassembly

- We consider possible to reach the commissioning phase after 5 years from $T_0$. 

Figure 5-1. Overall schedule for the construction of the SuperB project.
**Topics to study for the TDR**  
(*most were covered in CDR*)

- Machine-Detector interface:
  - IR design
  - Background remediation (
  - in progress)
- Tolerances and orbit correction for low emittance beams
- Magnet tolerances
- FF tuning for high luminosity operation
- Beam-beam with real lattice (ex. Shatilov’s code)
- Dynamic aperture optimization with errors (ex. Piminov’s code)
- Polarization scheme into lattice (*in progress*), and effect beam-beam performances (see Nikitin’s talk)
- IBS and Touscheck for new parameters (should be better with larger emittances, *in progress*)
- Instabilities with new parameters:
  - e-cloud (*in progress*)
  - Fast ion
  - HOMs
  - Wakefields
  - CSR (should be better with larger emittances)
Conclusions (1)

• SuperB is a new machine that can exploit novel very promising design approaches:
  – large Piwinski angle scheme allows for peak luminosity $\geq 10^{36} \text{ cm}^{-2} \text{ s}^{-1}$ well beyond the current state-of-the-art, without a significant increase in beam currents or shorter bunch lengths
  – "crab waist" sextupoles used for suppression of dangerous resonances
  – low current design presents reduced detector and background problems, and affordable operating costs
  – a polarized electron beam can produce polarized $\tau$ leptons, opening an entirely new realm of exploration in lepton flavor physics

• The principle of operation is being tested at DA$\Phi$NE
Conclusions (2)

• A CDR is being reviewed by an International Review Committee, chaired by J. Dainton (UK)
• In case of positive answer a TDR will be ready by 2010
• SuperB studies are already proving useful to the accelerators and particle physics community
• The baseline lattice, based on the reuse of all PEP-II hardware, fits in the Tor Vergata University campus site, near Frascati
• We hope to gather in the enterprise as many labs and institutions as possible...

Please join us!