Next steps

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This is not a summary after the two complete summaries of U.Wienands and D.Leith

The 2 projects: SuperB and SuperKEKB appear now more similar than in the past.

GOOD NEWS!

Possibility of crab waist also in SuperKEKB

Updated SuperKEKB (Onishi san)

SuperKEKB	Crab crossing		Crab waist		
E (LER/HER)	3.5 / 8.0				GeV
I (LER/HER)	10 / 4.4				A
N (LER/HER)	1.26×10^{11} / 5.5×10^{10}				
n_b	5000				
ε_x	18	9.0	6.0	6.0	nm
ε_y	0.18	0.045	0.06	0.06	nm
β_x^*	20	20	10	5	cm
β_y^*	3	3	1	0.5	mm
σ_z	3	3	6	6	mm
θ_x	0 (30)	0 (30)	30	30	mrad
ν_s	0.025	0.025	0.01	0.01	
ξ_{x0} *1	0.196	0.395	0.042	0.022	
ξ_{y0} *1	0.267	0.758	0.197	0.169	
L (W.S*2)	6.1	8.0	6.7	10	$\times10^{35}$ cm^{-2}s^{-1}
L (S.S*3)	6.0	8.3	4.8	9.0	$\times10^{35}$ cm^{-2}s^{-1}

*1nominal tune shift *2Weak-Strong simulation *3Strong-Strong simulation

M. Biagini April 2006

	SBF 4 GeV	SBF 7 GeV
C (m)	3006.	3006.
B_w (T)	1.6	1.6
L_{bend}(m)	5.6	11.2
B_{bend} (T)	0.078	0.136
Uo (MeV/turn)	4.6	7.8
N. wigg. cells	8	4
τ_x (ms)	17.5	18.
τ_s (ms)	8.8	9.
ε_x (nm)	0.54	0.54
σ_E	1.1×10^{-3}	1.45×10^{-3}
I_{beam} (A)	2.5	1.4
P_{beam}(MW)	11.5	10.9

cm $\sigma_E = 0.9 \times 10^{-3}$

Total Wall Power (66% transfer eff.): 34 MW

AC efficiency = 50% ?

=(65% klystron+90% power supply + 15% off klystron peak for stability)

Approximate SBF Site Power (3 km ring)

- Campus +detector = 5 MW
- Linac and e+ at 30 Hz = 10 MW
- Magnets (~1.5 x PEP-II) = 10 MW
- RF (4 x 7 GeV) (2.5 A x 1.4 A) = 22.4 x 2=45 MW
- Total = ~70 MW

From my introduction 2 days ago

Preliminary evaluation of need for special runs on tau and charm Evaluation of needs for special runs symmetric, at c.m. energies even lower than 10 GeV.

Evaluation of benefits with one polarized beam

Better definition of a single machine design

fix one minimum circumference of the machine

Study of the interaction region and Background

Beam pipe preliminary design

(to move on to a realistic design of vertex-tracker with an adequate R&D)

Tau-charm task force (D.Hitlin report)

A lot of work has been made.

To take a decision on the flexibility of the mchine to run below 10 Gev , more data on cost risk, complication in the project must be entered in the matrix.

However for most channels seems that the running as SuperB can do the job.

Measurement of EDM for taus doesn't appear easy

J. Bernabéu,
G.A. González-Sprinberg,
J. Vidal

$$\sigma_R^{\mp} = \int_0^{2\pi} d\phi_{\pm} \left[\int_0^{2\pi} d\phi_{\mp} \frac{d^2\sigma^S}{d\phi_- d\phi_+} \Big|_{Pol(e^-)} \right]$$

Polarized beam limits	*BABAR*+Belle Total (2 fb^{-1})	Super*B* 1 year	Super*B* 5 years
$\lvert \Re e(d_T^\gamma) \rvert$ e-cm	<10^{-19}	<3.4x10^{-20}	<1.5x10^{-20}

Tau-charm task force (D.Hitlin report)

- BEPCII $\mathcal{L}=10^{33}$ SBF $\mathcal{L}=10^{36}$ SBF(4GeV) $\mathcal{L} \cong 10^{35}$
- FOM for measuring CPV in τ decay (Tsai):
  z component of τ polarization averaged over cross section:

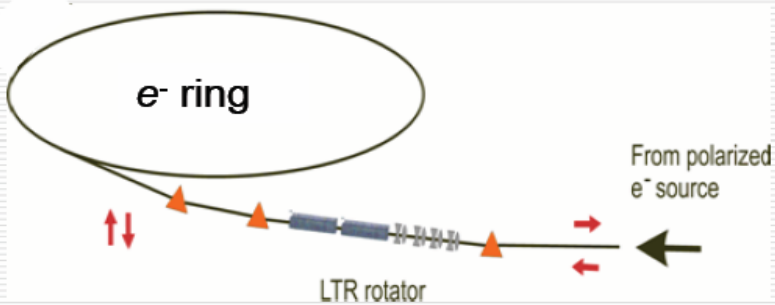
$$\mathrm{FOM}=\mathcal{L}\times(w_{e^-}+w_{e^+})\times\sqrt{1-a^2}\,a^2(1+2a),\ \text{where } a=2m_\tau/\sqrt{s}$$

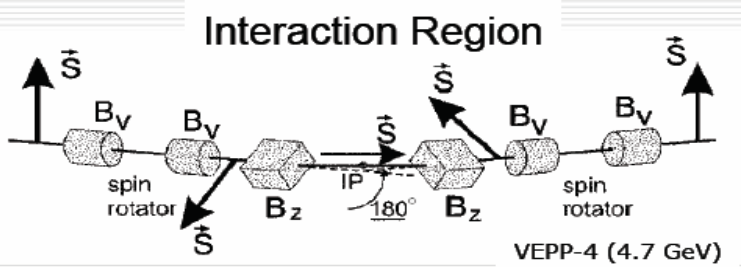
- For equal longitudinal polarization

Machine	FOM/FOM BEPCII
BESIII@ $\sqrt{s}$ =4 GeV	1
SBF @ $\Upsilon(4S)$	178
SBF @ $\sqrt{s}$ =4 GeV	100

Longitudinal polarization at the IP

- Producing longitudinal polarization at the IP requires a series of systems, which must be designed in from the start
  - Longitudinally polarized e^- source (90% polarization)
  - Rotate e^- spin to vertical and inject into e^- ring
  - Lattice must be designed to avoid depolarizing resonances
  - Rotate e^- spin to longitudinal before IP and restore to transverse after IP





See presentation by I. Koop

On the beam pipe and the interaction region

Contributions from

M..Sullivan,G.Calderini,K.Skarpass, N.Neri

Working option

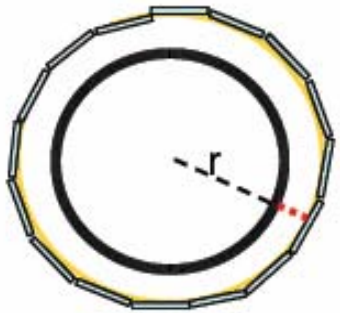
If we maintain as workiong option :

7 GeV+4 GeV

A beam pipe of 1.5 cm radius seems to match the requirements of time dependent analyses see N.Neri

Beam-pipe scenarios

- **conservative scenario:**
  - beam pipe radius 1.5cm
  - hit resolution z,ϕ side = 10 μm
  - Radial material = 0.50%X_0



r=1.5cm

Be beam-pipe
Kapton foil
50 μm Silicon pixel

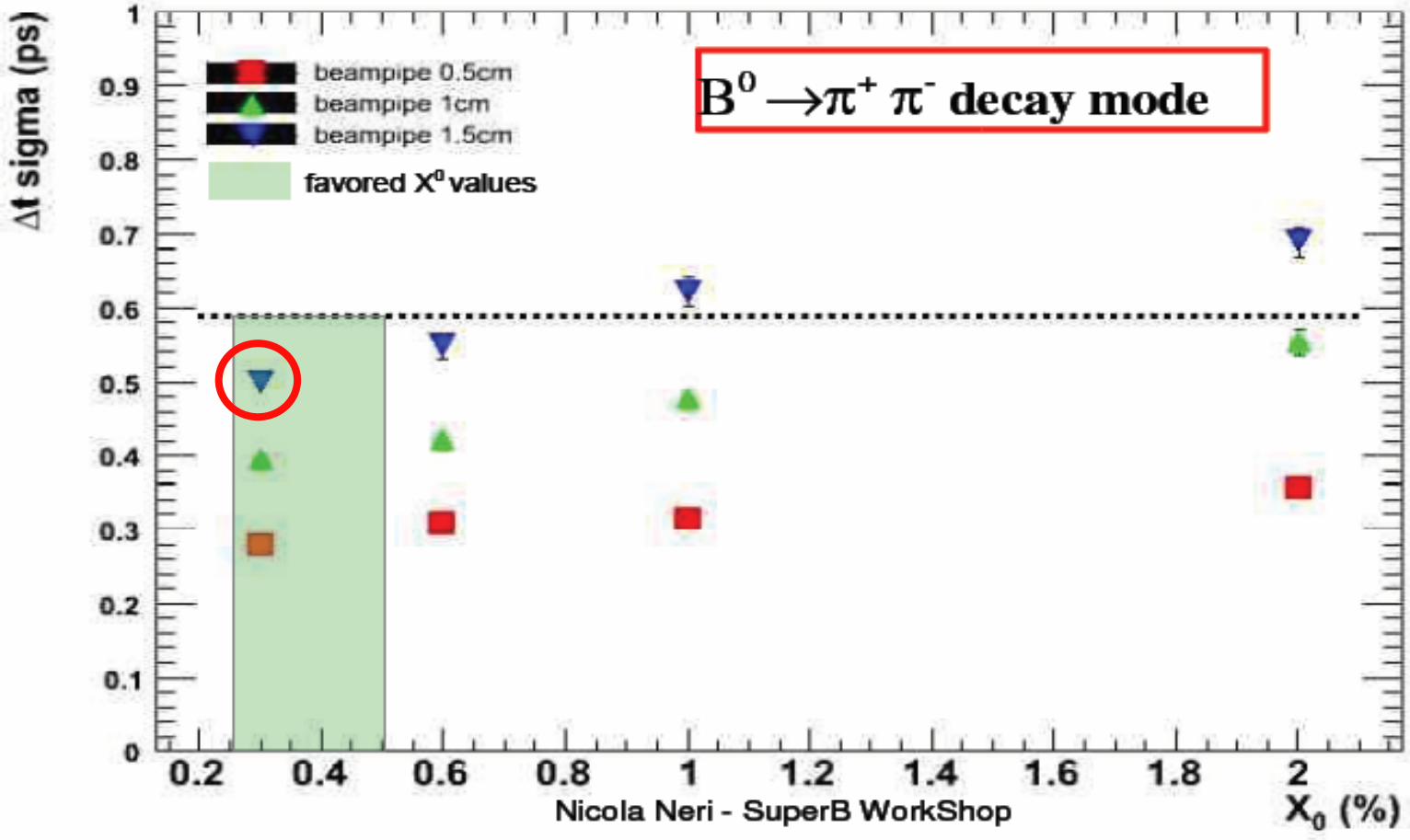
- **most likely scenario:**
  - beam pipe radius 1.0cm
  - hit resolution z,ϕ side = 10 μm
  - Radial material = 0.39% X_0

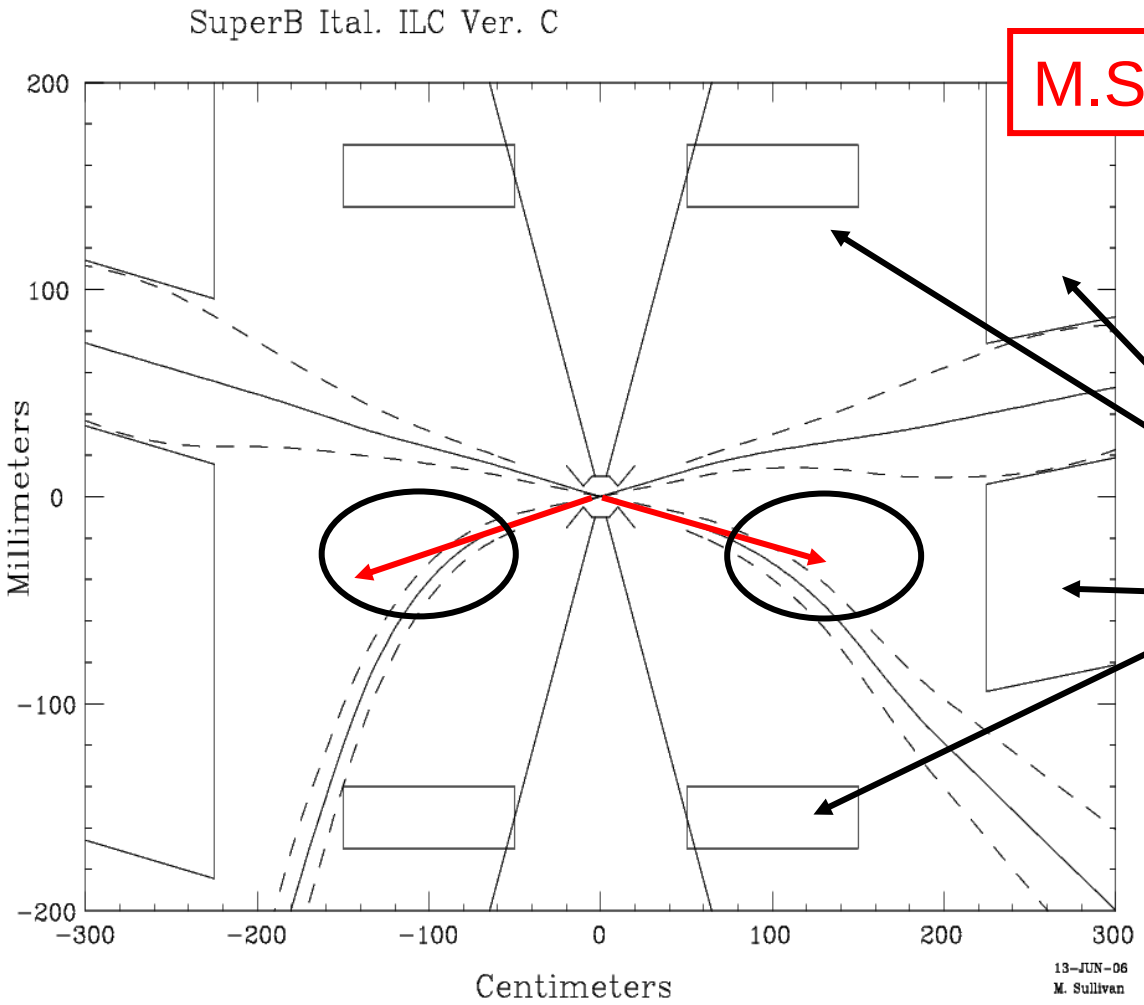
r=1cm

- **aggressive scenario:**
  - beam pipe radius 0.5cm
  - hit resolution z,ϕ side = 5 μm
  - Radial material = 0.24%X_0

r=0.5cm

Δt resolution in B decays *vs* $X_0(\%)$ with a boost of $\beta\gamma$ 0.28





Bent orbits might be necessary to accommodate FF quads

It becomes a problem with bent orbits

The downstream region will need to be modeled carefully

Tools preparation

Already in production:

- γ production (Beamsstrahlung) from Guinea Pig
- pairs production in beam-beam

Still at the design phase:

- radiative BhaBhas interaction in the downstream region of the pipe
- bremmstrahlung in the incoming beams

these two are extremely important but have been postponed since require a detailed layout of the IR

In layer1

Bx = 600 MHz

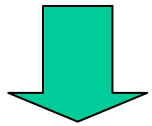
Area = 62.8 cm^2

Pitch = 50um x 50um

= 4 10^4 channels/cm^2

Readout window = 1us

O(1.4 hits/BX)



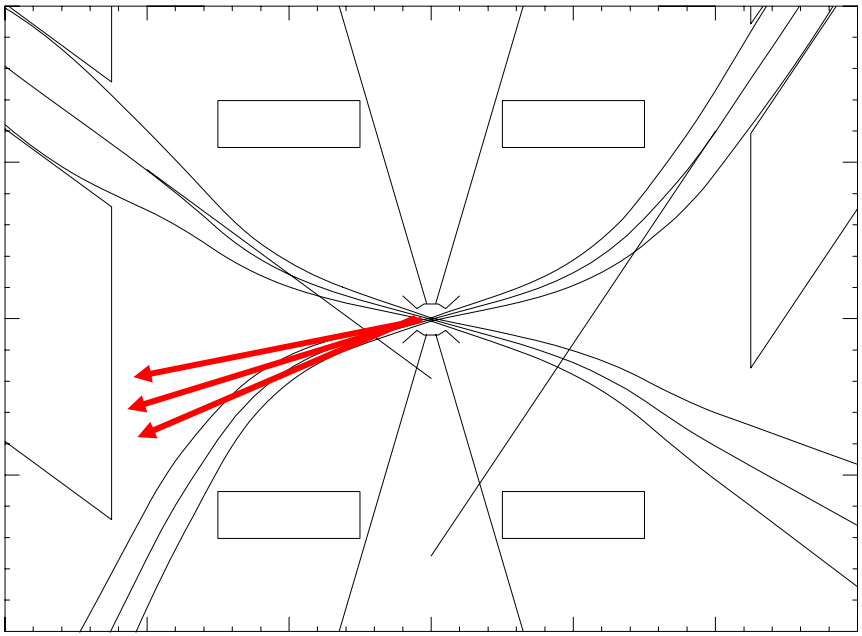
O(14 MHz/cm^2)

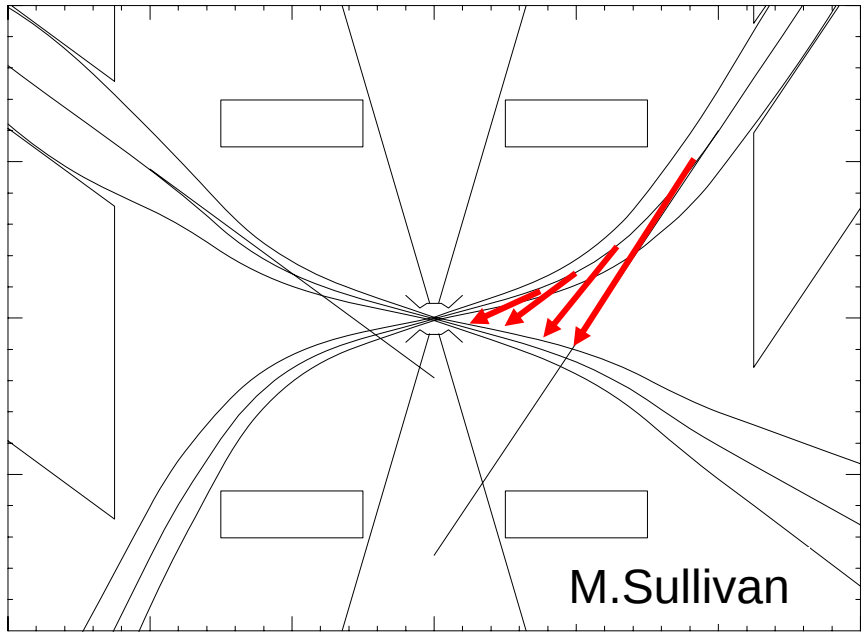
O(350 Hz/chann)

Occupancy=3.5 10^{-4}

To do next:

evaluation of radiative BhaBha effects on the detector
evaluation of incoming bremmsstrahlung





These studies need a more defined layout interaction region

What about the site?

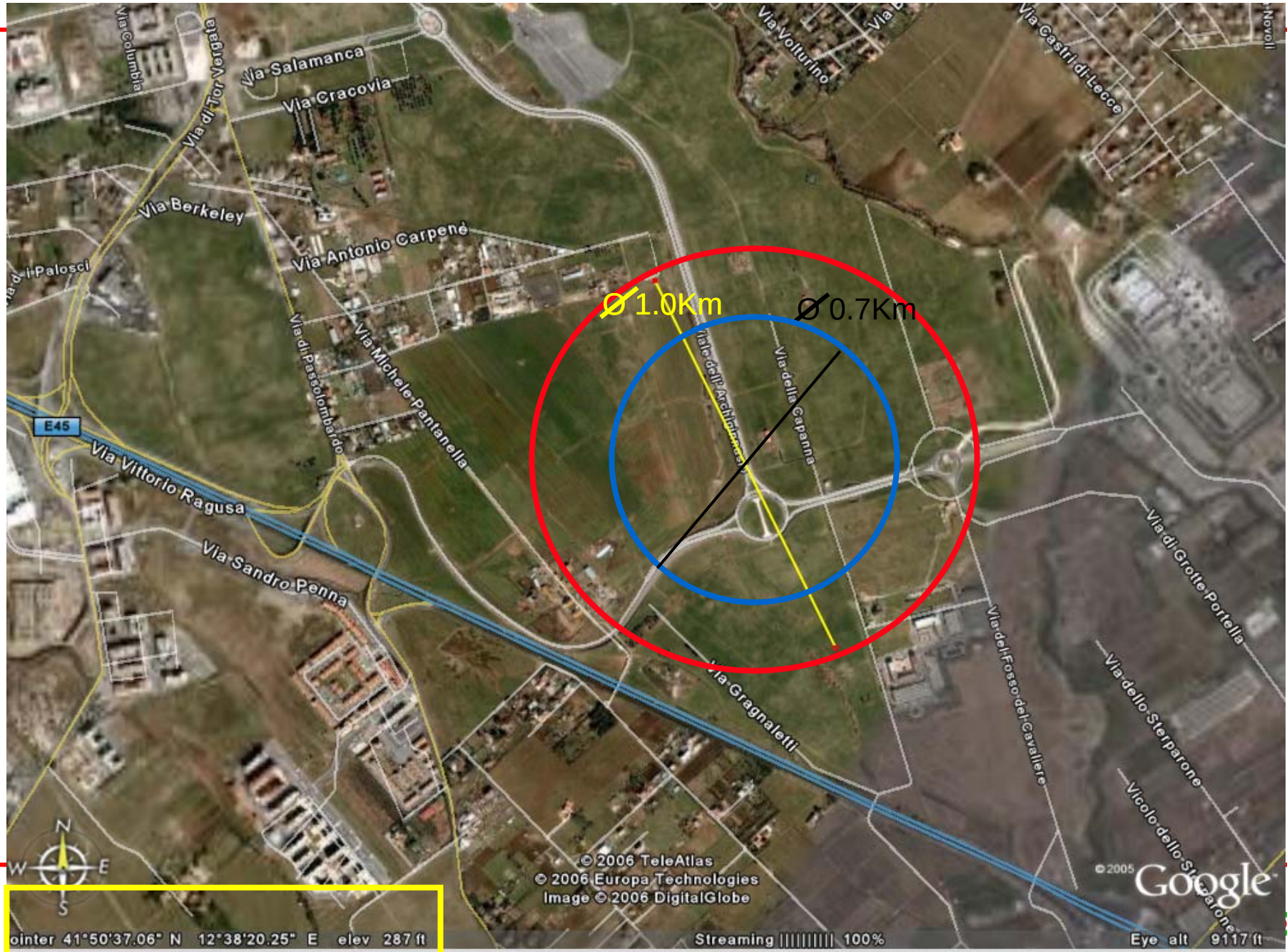
I repeat:

ANY SITE IN PRINCIPLE GOOD

SLAC,KEK,DESY,FERMILAB

If a new site : TOR VERGATA near ROME

Tor Vergata site between 3.0 Km and 2.2 Km



Next activity

Beam Pipe and iteraction region

Continue the simulations of Background to define the radius, the minimum thickness

(0.5% rad length)

Detector:

- Refine the design of SVT (including Maps)
- PID optimization

Tau charm task force:

Complete the tables and exams of various channels requiring special runs

Evaluate the cost benefit for the machine.

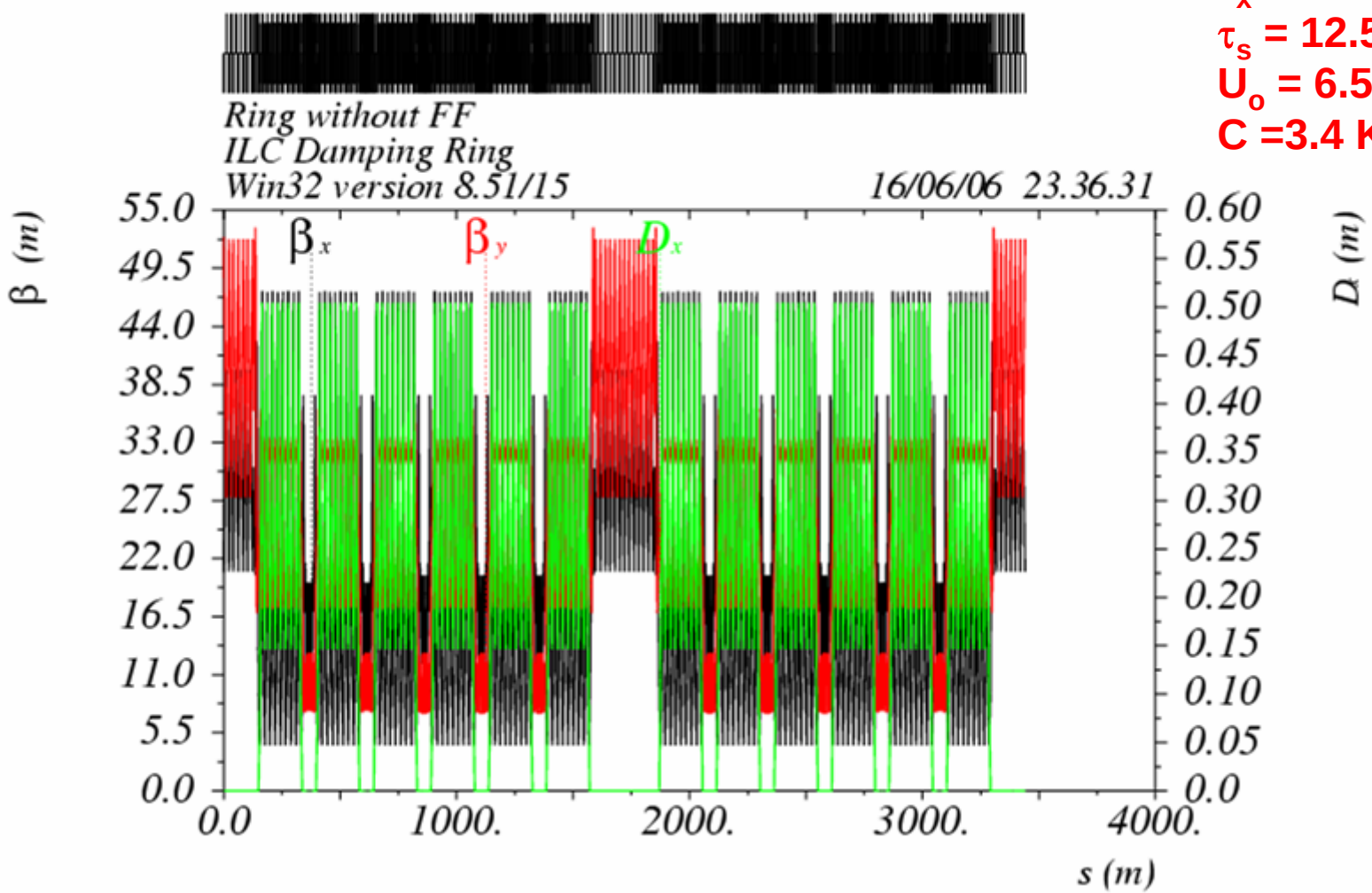
- Setup soon the editorial board for final Report and assign responsibilities.
- Evaluate carefully costs by considering new components and the possibility of using existing parts for machine and detector
- Define infrastructure needed (service buildings etc.)

Accelerator

- A full immersion of accelerator people is needed before the SuperB IV Wokshop.It is considered a full working week next September (Caltech seems to be an excellent venue).
- The IV Workshop will be in Rome (tbc) in November 16,17,18.

7 GeV ring with PEP-II dipoles & quadrupoles

ε_x = 0.55 nm
τ_s = 12.5 msec
U_o = 6.5
C =3.4 Km



Cell

2 HER dipoles
Side to side