ИНСТИТУТ ЯДЕРНОЙ ФИЗИКИ СО АН СССР

A.A. Zholents

NOVOSIBIRSK B-FACTORY

PREPRINT 90-56

НОВОСИБИРСК

Novosibirsk B-Factory*)

A.A. Zholents *

Institute of Nuclear Physics
630090, Novosibirsk, USSR

ABSTRACT

Brief information about the B-factory, which is under the active study in the Institute of Nuclear Physics in Novosibirsk is presented.

*) Report on Workshop on Beam Dynamics Issues of High-Luminosity Asymmetric Collider Rings, Berkeley, February 12—16, 1990.

PROJECT DESCRIPTION

There are two major parts in the B-factory project in the Institute of Nuclear Physics in Novosibirsk. They are the injector for such a collider and the B-factory itself.

According to our plans the injector should consist of three main units. The first is a set of conventional linear pre-accelerators, which we will use for positron production and for the initial acceleration of electrons and positrons to the 510 MeV. The second is the damping ring with the nominal beam energy of 510 MeV. The third is the high gradient main linear accelerator, capable to accelerate the particles up to 8.5 GeV. The latter accelerator will based on new technology being developed for the linear collider VLEPP at the Institute of Nuclear Physics in Novosibirsk.

The design goals for the B-factory collider are high luminosity and small centre-of-mass energy spread of e^+e^- collisions. We consider a facility, consisting of two equal circumference storage rings with nominal beam energies of 6.5 GeV and 4.3 GeV. The main parameters of this machine are presented in the Table 1.

Our approach to the realization of this parameter list was already presented in June, 1989 at the B-Factory Workshop in Blois, France [1]. After the Workshop no principal changes in the design were made with the exception of the synchrotron radiation masking scheme.

Our new masking scheme is based on the idea of vertical separation of flat synchrotron light beams in the vicinity of the interac-

Table 1

Parameters of Novosibirsk B-factory

	Low-energy ring	High-energy ring
Energy, E [GeV]	4.3	6.5
Circumference, C [m]	655	655
Number of bunches, k_B	156	156
Particles per bunch, N_b [10^{10}]	9	6
Total current, I [A]	1	0.7
Longitudinal threshold impedance, $\left\|\frac{Z}{n}\right\|$ [Ω]	0.2	0.5
Emittance		
horizontal, ε_x [nm·rad]	8	6.5
vertical, ε_z [nm·rad]	0.25	0.25
Bunch length, σ_l [mm]	7.5	7.5
Energy spread, σ_e [10^{-3}]	1	1
Energy loss/turn, [MeV]	1.2	2.7
Damping time, [ms]	17	13
Momentum compaction, α	0.002	0.002
Betatron tunes		
horizontal, Q_x	29	26
vertical, Q_z	20	13
Synchrotron tune, Q_s	0.028	0.028
RF parameters		
frequency, f_{rf} [MHz]	500	500
voltage, V_{rf} [MV]	8.8	15
Beta functions at IP		
horizontal, β_x [cm]	60	60
vertical, β_z [cm]	1	1
Horizontal dispersion function at IP, ψ [cm]	−40	40
Beam sizes at IP		
horizontal, σ_x [mm]	0.4	0.4
vertical, σ_z [mm]	0.0016	0.0016
Nominal beam-beam tune shift		
horizontal, ξ_x	0.012	0.012
vertical, ξ_z	0.05	0.05
Centre-of-mass energy spread, σ_W [MeV]	1.2	
Luminosity, L [$cm^{-2}s^{-1}$]	5×10^{33}	

tion point (IP). Two masks with slits at different vertical position are placed symmetrically with respect to the IP (see Fig. 1). A light beam approaching the IP is primary absorbed by the mask

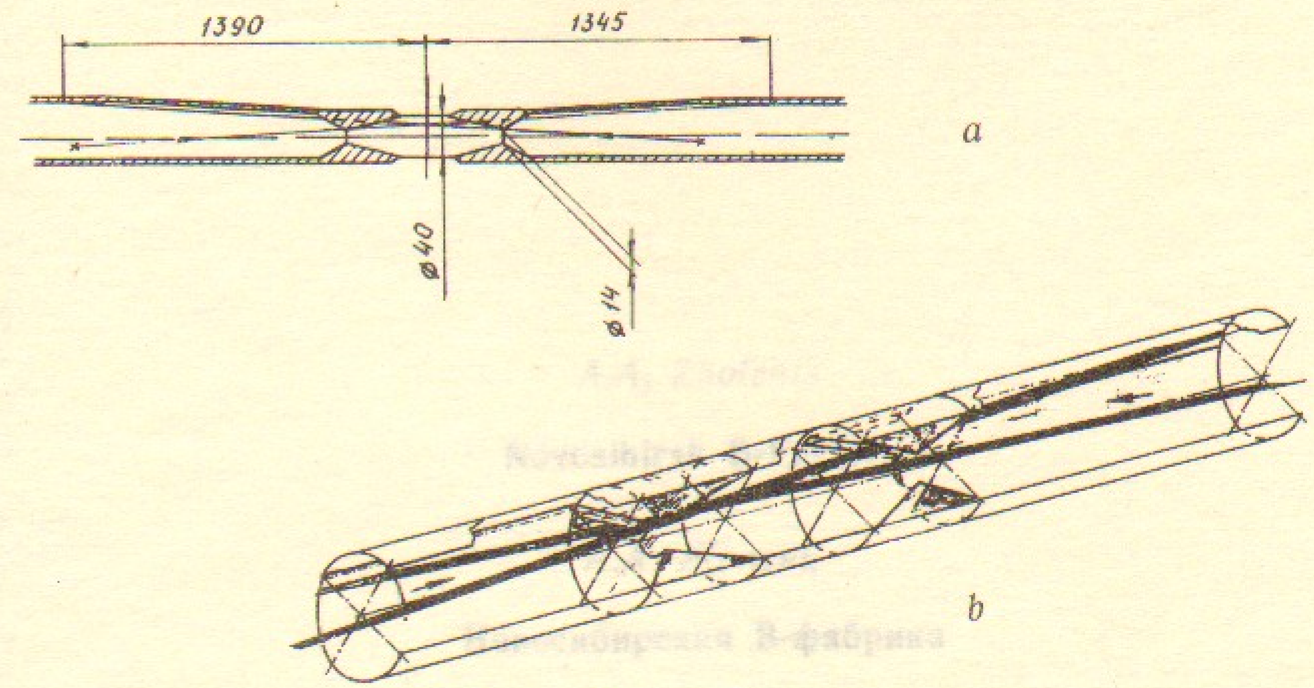

Fig. 1. The masking scheme:
a — the horizontal cross-section, *b* — an artistic view (all dimensions in mm).

before the IP (whose slit lies above or below the beam). The remaining light which passes through the aperture of this mask can pass through the slit of the second mask. Thus, this radiation is absorbed far from the IP. With two such masks we can shield the vertex vacuum pipe from the direct synchrotron light as well as from the secondary scattering photons. In this scheme, photons have the possibility of hitting the vertex vacuum pipe only after second scattering. This helps greatly to reduce the background from the synchrotron radiation.

To produce the vertical separation for synchrotron light beams we plan to employ an *S*-bend in the vertical plane of the beam orbits. We can do this with a small tilt in the opposite directions of the first bending magnets in our separation scheme.

Acknowledgements. The author thanks all the members of *B*-factory group in Novosibirsk for their contributions to this work. He also wish to thank A. Dubrovin, V. Lebedev, A. Skrinsky and A. Vlasov for many useful discussions and G. Travish for his help in the preparation of this article.

REFERENCES

1. *A.N. Dubrovin, A.M. Vlasov, A.A. Zholents.* Interaction Region of 4×7 GeV Asymmetric *B*-Factory.— Preprint INP 89-97. Novosibirsk, 1989.

A.A. Zholents

Novosibirsk B-Factory

А.А. Жоленц

Новосибирская B-фабрика

Ответственный за выпуск С.Г.Попов

Работа поступила 19 апреля 1990 г.
Подписано в печать 26.04 1990 г. МН 08577
Формат бумаги 60×90 1/16 Объем 0,3 печ.л., 0,2 уч.-изд.л.
Тираж 250 экз. Бесплатно. Заказ № 56

Набрано в автоматизированной системе на базе фотонаборного автомата ФА1000 и ЭВМ «Электроника» и отпечатано на ротапринте Института ядерной физики СО АН СССР,
Новосибирск, 630090, пр. академика Лаврентьева, 11.