STATUS OF THE BEPC

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We are much pleased to have this opportunity to present status of the BEPC. The original plan of China's first high energy accelerator was a 50 GeV proton synchrotron. However, during the readjustment of our national economy, it was realized that development of high energy physics along the route of proton synchrotron with increasing higher energies is not consistent with our economy. So we switched over to the $e^{\pm}$ collider. For us, in order to do significant fundamental high energy physics research with a rather limited investment, it is obvious that an $e^{\pm}$ collider would be the best solution.

According to the available financial support, we plan to build an $e^{\pm}$ collider of 2 × 2.2/2.8 GeV at Beijing, on the site of our institute, called Beijing Electron Positron Collider (BEPC). As a first step in our experimental efforts, a general purpose magnetic detector of nearly 4π solid angle will be built. The emphasis will be put on charmed meson and τ heavy lepton physics. Later we will do some work on charmed baryons. Since we are focusing our attention to fine measurements in such a field which has been scanned, the luminosity of this collider is very important. The design goal of the luminosity of BEPC at 2.8 GeV per beam is about 1.7×10^{31} cm^{-2} sec^{-1}.

Another justification of the BEPC project is that it can be used parasitically or dedicatedly as a synchrotron radiation light source. Finally, the injector linac of BEPC can also be used for stationary target experiments in high energy nuclear physics.

General Layout

The general layout of BEPC is shown in Fig. 1. It consists of four major systems, i.e., injector, storage ring, detector and synchrotron radiation laboratory. The injector is a linac that provides positron or electron beam of 1.1/1.4 GeV for half energy injection into the storage ring. The injector consists of three parts, i.e., a 30 MeV pre-injector to shape the beam to narrow bunches, a 120 MeV electron linac with a retractable tungsten target at its end, followed by pulsed focusing field and accelerating section for positron production, and a 1.1/1.4 GeV $e^{\pm}$ linac for final accelerator. The total length of the injector is about 200 M. The main design parameters of the linac system are as follows:

$e^{\pm}$ energy:	1.1 - 1.4 GeV
e beam current:	1-2A (for positron production)
	~0.2A (for electron injection)
Pulse duration:	2.5 ns
Pulse repetition rate:	variable (50 pps max)
Operating frequence:	2856 MHz
Number of klystron:	16
RF power/klystron:	16 MW
Number of accelerating tubes:	55

In order to offer the adequate luminosity in the range of energies 2.2 - 2.8 GeV, the storage ring has been designed to optimize the luminosity at 2.8 GeV. At that nominal energy the peak luminosity is 1.7×10^{31} cm^{-2} sec^{-1} and RF system power is ~200 KW, corresponding to 66 mA circulating current per beam. It is of race track shape with two long straight sections and two arcs totalling 240 M in circumference (Fig. 2). There are two experimental areas with 5 M long interaction region. At the middle of the arcs, there are two straight sections of 5 M long for the $e^{\pm}$ injection and feedback system. Four wiggler magnets are located at the missing bending magnet locations around the ring to keep the emittance constant so that luminosity varies as energy squared can be realized.

About lattice option, a separated function FODO lattice consisting of low beta insertions, dispersion suppressors, regular cells, and symmetry sections has been adopted as shown in Fig. 3. There are 40 dipoles and 60 regular quadrupoles. The typical beam aperture in the regular arc is 58 mm vertical and 120 mm horizontal.

For detector, we adopt a general purpose magnetic spectrometer at one of the interaction region as first step. The main parts of this spectrometer are drift chamber, time of flight counter, shower counter, moun identifier, a conventional magnetic solenoid, etc. The spectrometer should have good charged particle identification as well as good spatial and momentum resolution. It should have good detector efficiency, and good spatial and energy resolution for low energy photons. The layout of the spectrometer is shown in Fig. 4.

Present Status

The plan of BEPC project has been formally approved by our government. The BEPC would be put into operation in 1988. For the present, preliminary design has been finished and the detailed design is under way. A 30 MeV electron linac for preinjector was built in Sept. 1983. The main parameters of this preinjector are given as following:

Energy:	29.8 MeV
Output power of klystron:	14.4 MW
Pulse current:	>340 mA
Half width of energy spectrum:	±1.7 %
Beam capture efficiency:	73 %
Operating frequence:	2856 MHz
Operating mode:	$2\pi/3$

We shall expand the energy of the preinjector to 90 MeV within this year. A section of storage ring vacuum system with 7 meter length and 2.5×10^{-10} torr pressure has been tested. Two prototype quadrupole magnets have been made. Three power supplies of magnet system have been made. Two of them are for quadrupole magnet of beam transport system. The other is for quadrupole magnet of the storage ring. RF cavities and transmitters are under manufacturing. Models of various detectors are in the process of testing. Civil engineering construction is expected to start within this year.

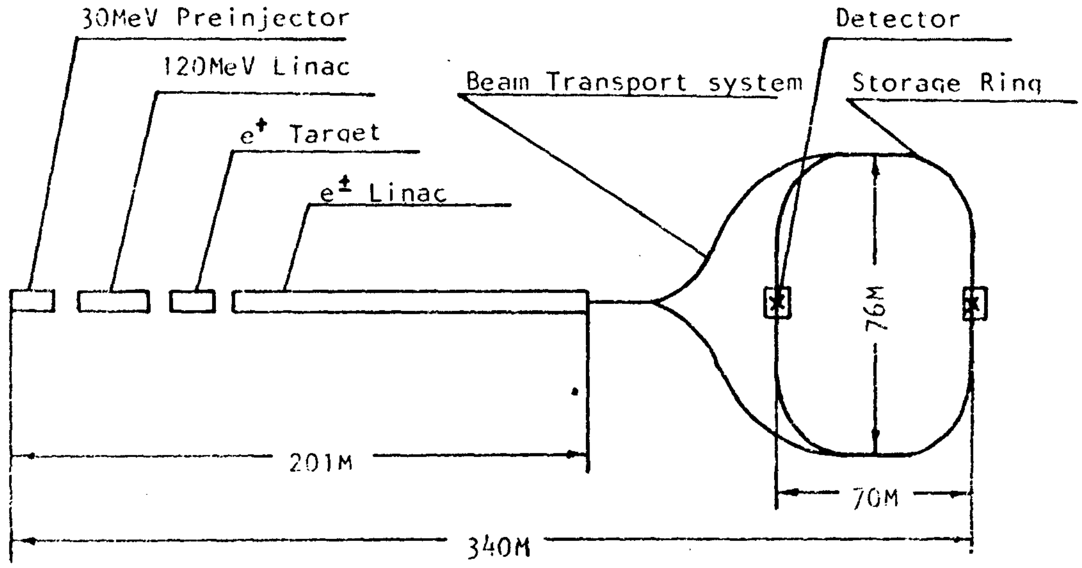

Fig.1 Schematic Diagram of BEPC

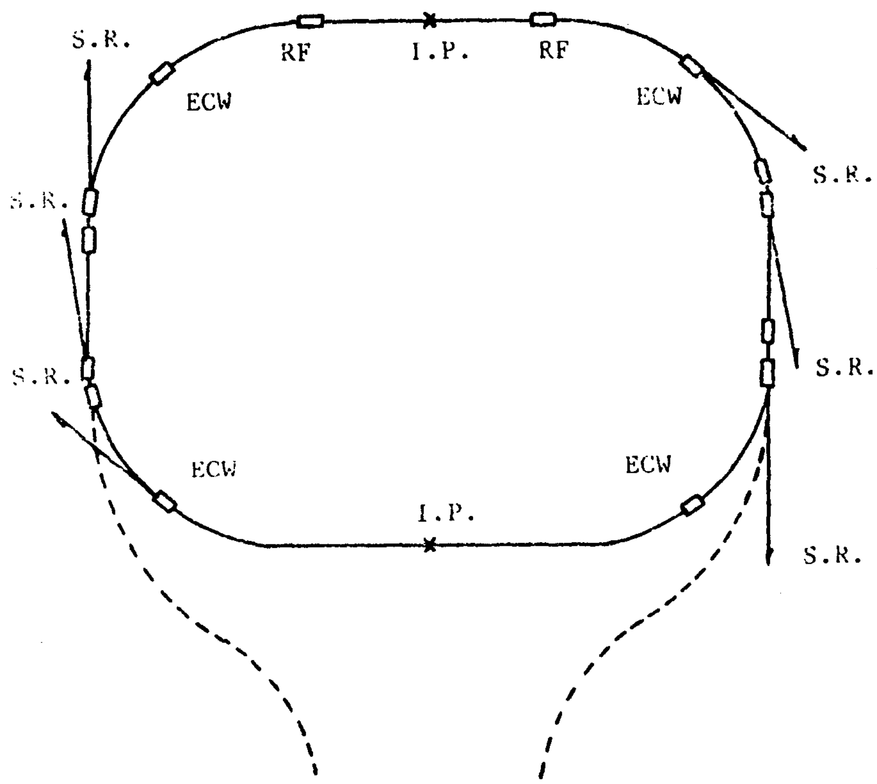

Fig.2 Schematic Layout of Storage Ring

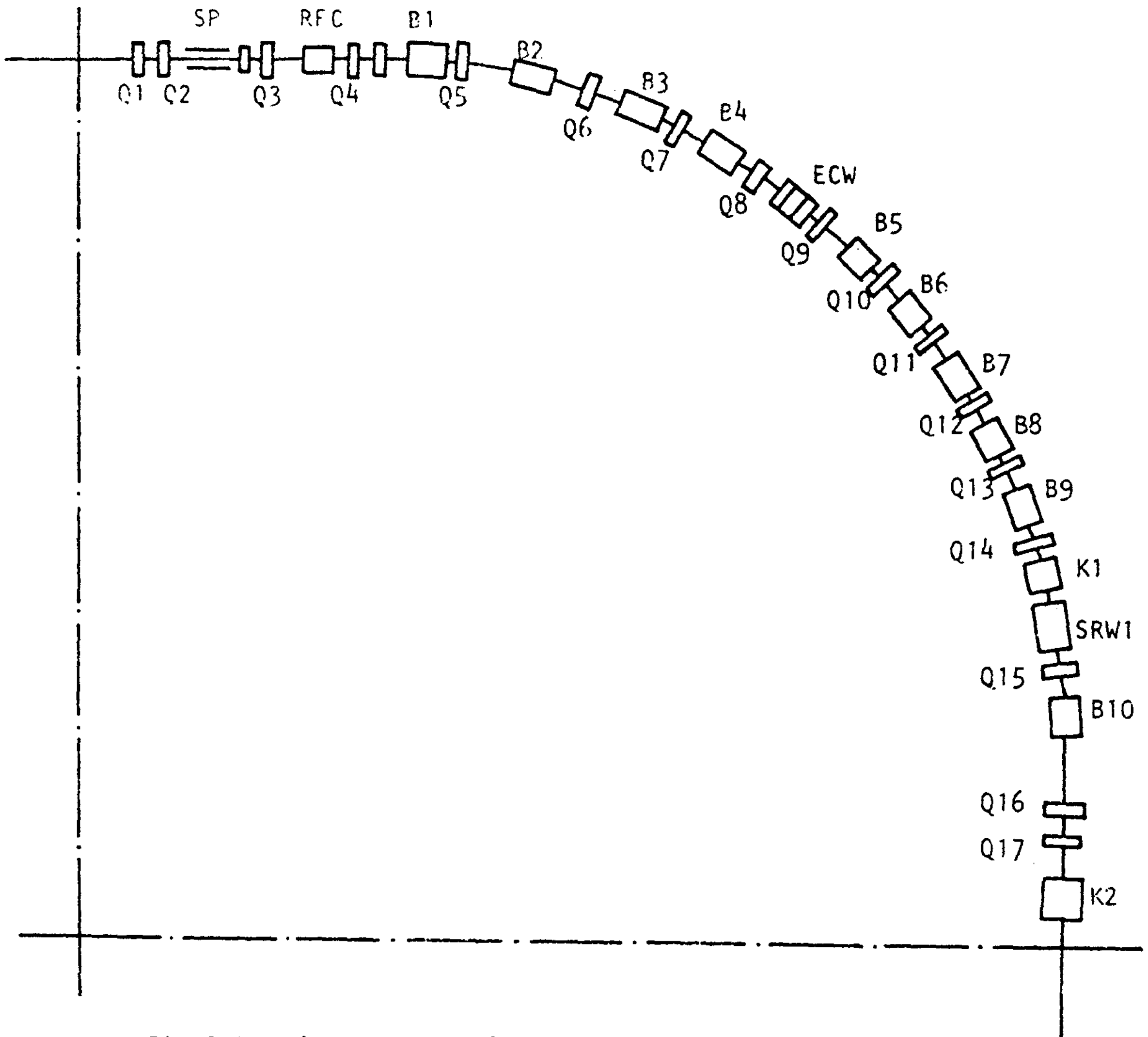

Fig.3 Lattice Layout of Storage Ring in a Quadrant

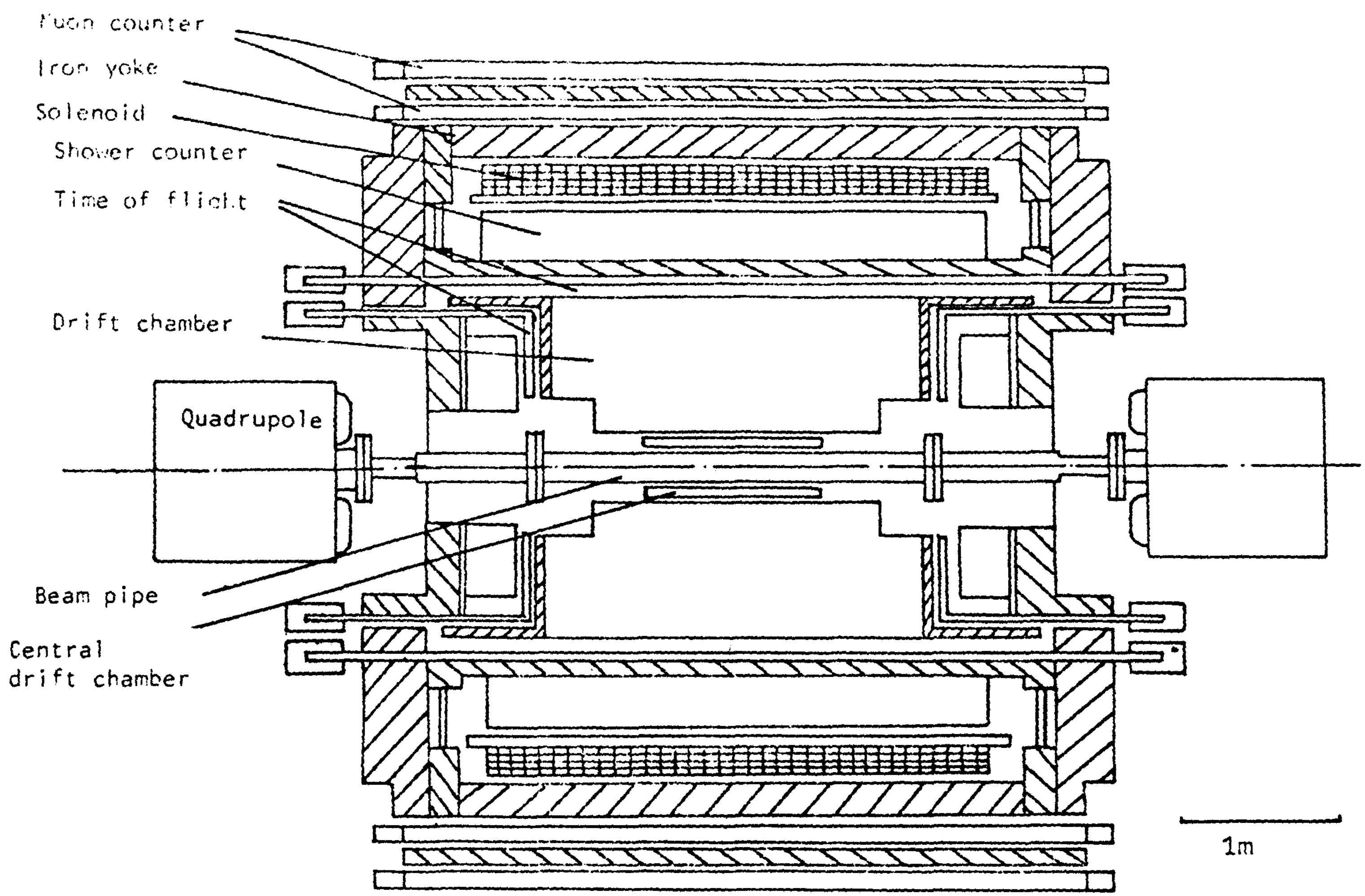

Fig.4 Schematic Drawing of Spectrometer