The strategy of Accelerator based High Energy Physics of China

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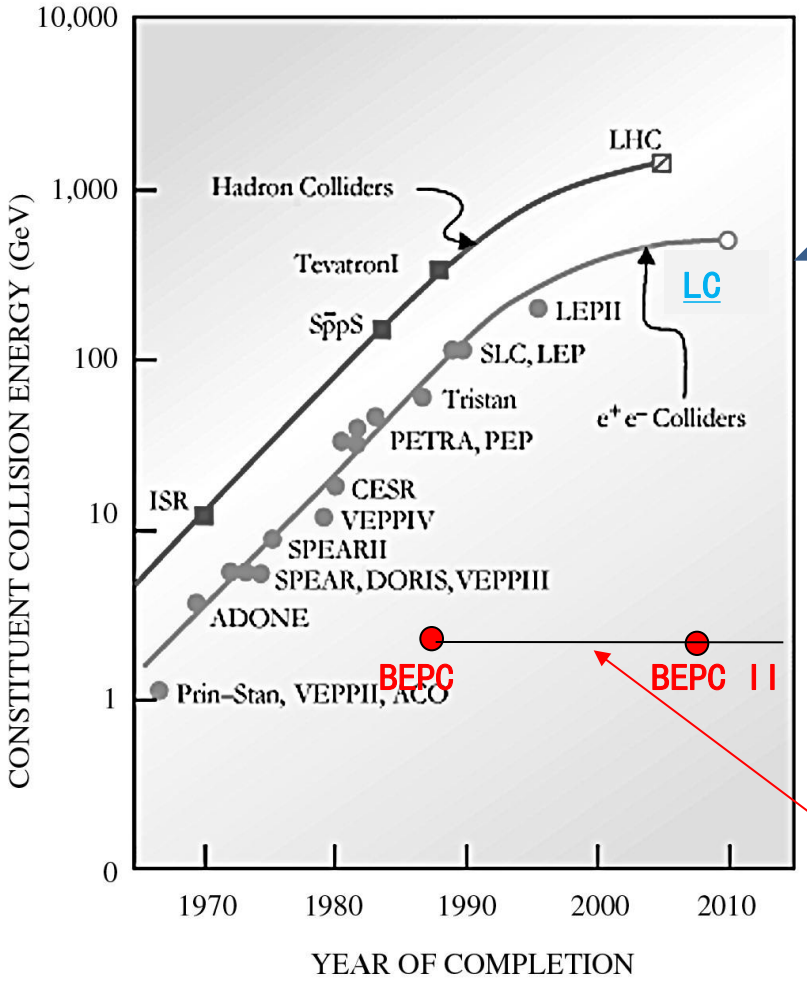
Lepton and Hadron Colliders' History and China Accelerator based High Energy Physics Development in the Future



Old picture!

CEPC+SppC

CEPC: Ecm=240GeV e+e- Circular Collider

SppC: Ecm=50-100TeV pp Collider

CEPC+SppC will be constructed with international collaboration and participation

HIEPAF: High Intensity Electron Positron Accelerator Facility

History of BEPC and BEPC II

Strategy on Future High Energy Colliders of China

1) On "The 464th Fragrant Hill Meeting", Chinese High Energy Physics Community arrived at the following consensus:

a) China supports ILC and will participate to ILC construction with in-kind contributions and requests R&D fund from government

b) After the discovery of Higgs, as next collider after BEPCII in China, a circular e+e- Higgs factory（CEPC）and a Super proton-proton Collier (SppC) afterwards in the same tunnel is an important option and historical opportunity.

2) During the meeting of Chinese High Energy Physics Association on "China High Energy Physics based on Particle Accelerators", Feb. 28, 2014, it was concluded that: "Circular e+e- Circular Higgs Factory(CEPC) +Super pp Collider (SppC) is the first choice for China's future high energy physics accelerator.

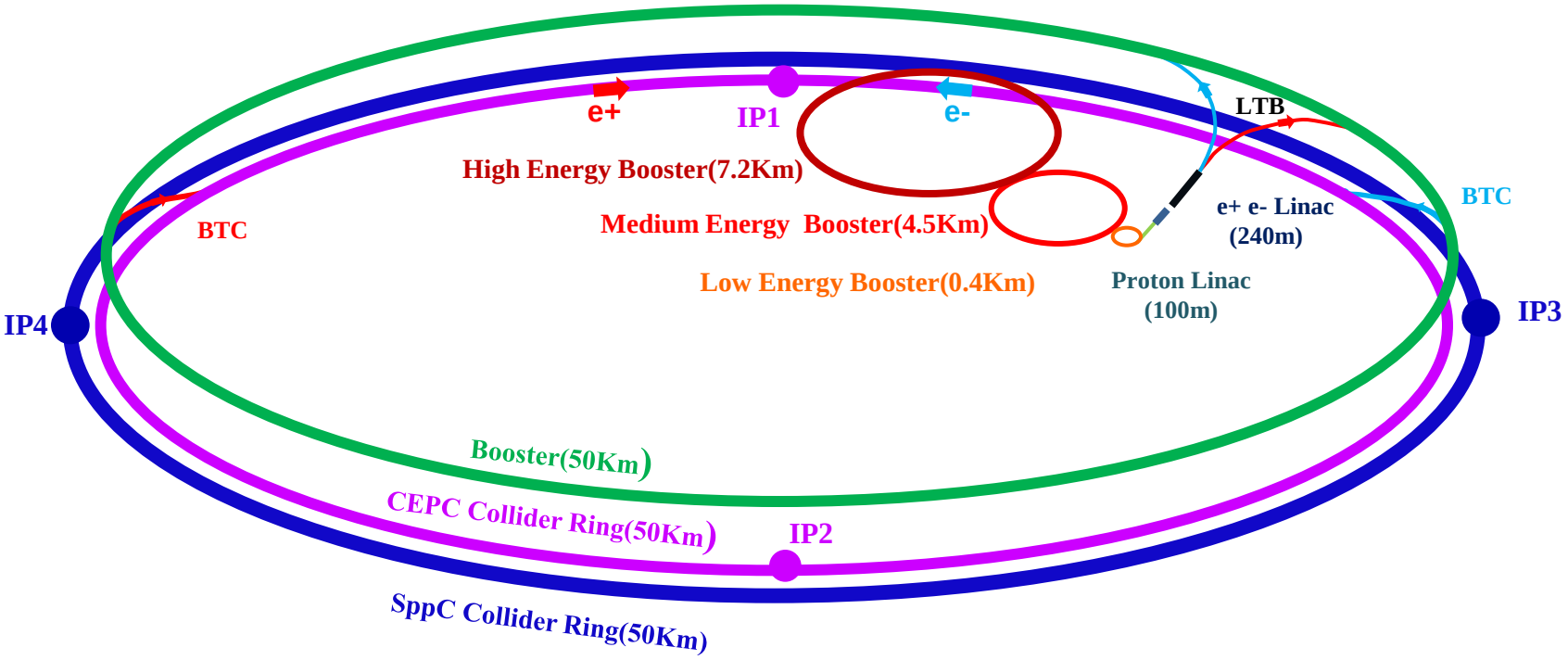
- It is considered that CEPC (250GeV upper limit) is *supplementary to ILC in terms of its energy range down to W and Z boson and to the number of detectors from both machines*
- *International collaboration and participation are necessary*

Main parameters for CEPC

Parameter	Unit	Value	Parameter	Unit	Value
Beam energy [E]	GeV	120	**Circumference [C]**	km	50.0
Number of IP[N_{IP}]		2	**SR loss/turn [U_0]**	GeV	2.96
Bunch number/beam[n_B]		50	**Bunch population [Ne]**		3.52E+11
SR power/beam [P]	MW	50	**Beam current [I]**	mA	16.89
Bending radius [ρ]	m	6200	**momentum compaction factor [α_p]**		4.00E-05
Revolution period [T_0]	s	1.67E-04	**Revolution frequency [f_0]**	Hz	5995.85
emittance (x/y)	nm	6.9/0.021	**β_{IP}(x/y)**	mm	800/1.2
Transverse size (x/y)	μm	74.30/0.16	**$\xi_{x,y}$/IP**		0.097/0.069
Beam length SR [$\sigma_{s.SR}$]	mm	2.12	**Beam length total [$\sigma_{s.tot}$]**	mm	2.42
Lifetime due to Beamstrahlung	min	80	**lifetime due to radiative Bhabha scattering [τ_L]**	min	53.98
RF voltage [V_{rf}]	GV	6.87	**RF frequency [f_{rf}]**	GHz	0.7*
Harmonic number [h]		116747	**Synchrotron oscillation tune [ν_s]**		0.196
Energy acceptance RF [h]	%	5.71	**Damping partition number [Jε]**		2
Energy spread SR [$\sigma_{\delta.SR}$]	%	0.13	**Energy spread BS [$\sigma_{\delta.BS}$]**	%	0.07
Energy spread total [$\sigma_{\delta.tot}$]	%	0.15	**n_γ**		0.21
Transverse damping time [n_x]	turns	81	**Longitudinal damping time [n_ε]**	turns	40
Hourglass factor	Fh	0.704	**Luminosity/IP [L]**	$cm^{-2}s^{-1}$	1.77E+34

*Main ring rf frequency is changed to 650MHz and booster rf frequency is set to 1.3Ghz
The injection linac frequency is chosen 2856MHz

CEPC+SppC Layout



LTB : Linac to Booster

BTC : Booster to Collider Ring

CEPC+SppC Schedule (Preliminary)

- **BEPC II** will stop in ~2020
- **CPEC**
  - Pre-study, R&D and preparation work
    - Pre-study: 2013-15 ➔ Pre-CDR by 2014
    - R&D: 2016-2020
    - Engineering Design: 2015-2020
  - Construction: 2021-2027
  - Data taking: 2030-2036
- **SPPC**
  - Pre-study, R&D and preparation work
    - Pre-study: 2013-2020
    - R&D: 2020-2030
    - Engineering Design: 2030-2035
  - Construction: 2036-2042
  - Data taking: 2042 -