

Future circular colliders: What's happening in China

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For more details, see

<http://indico.cern.ch/event/282344/session/1/contribution/65/material/slides/1.pdf>

<http://indico.ihep.ac.cn/getFile.py/access?contribId=39&sessionId=6&resId=0&materialId=slides&confId=4068>

March 24, 2014

In the last 1.5+ years

- Started “talking about it” in 2012.
- Workshop in August 2013, a road map started to emerge.
- Things are happening fast since then
 - ▶ Several meetings, workshops.
 - ▶ Working groups, studies being organized in China.
 - ▶ Established Center for Future High Energy Physics (CFHEP): international collaboration in the study of physics case.
 - ▶ Broad conversation happening within Chinese physics community.



Tuesday, 18 March 2014	
18:30 - 21:00	CEPC-SppC Steering Committee & Conveners Meeting 2h30' (8410)
Wednesday, 19 March 2014	
08:30 - 09:00	Registration 30'
09:00 - 10:15	Opening Session Convener: Prof. Xinchou Lou (IHEP, Beijing)
09:00	Welcome and Introduction 30' Speaker: Prof. Yifang Wang (IHEP)
09:30	Global Efforts for High Energy Accelerators 45' Speaker: Dr. Weiren Chou (FNAL)
10:15 - 10:35	Photo session and coffee break
10:35 - 12:15	Accelerator Session Convener: Dr. Qing QIN (Institute of High Energy Physics)
10:35	Lattice design for CEPC 20' Speaker: Ms. Huijing Geng (Institute of High Energy Physics) Material: Slides
10:55	Final focus design for CEPC 20' Speaker: Dr. Dou Wang (IHEP) Material: Slides
11:15	Beam-beam simulations for CEPC 20' Speaker: Mr. Yuan Zhang (IHEP, Beijing) Material: Slides

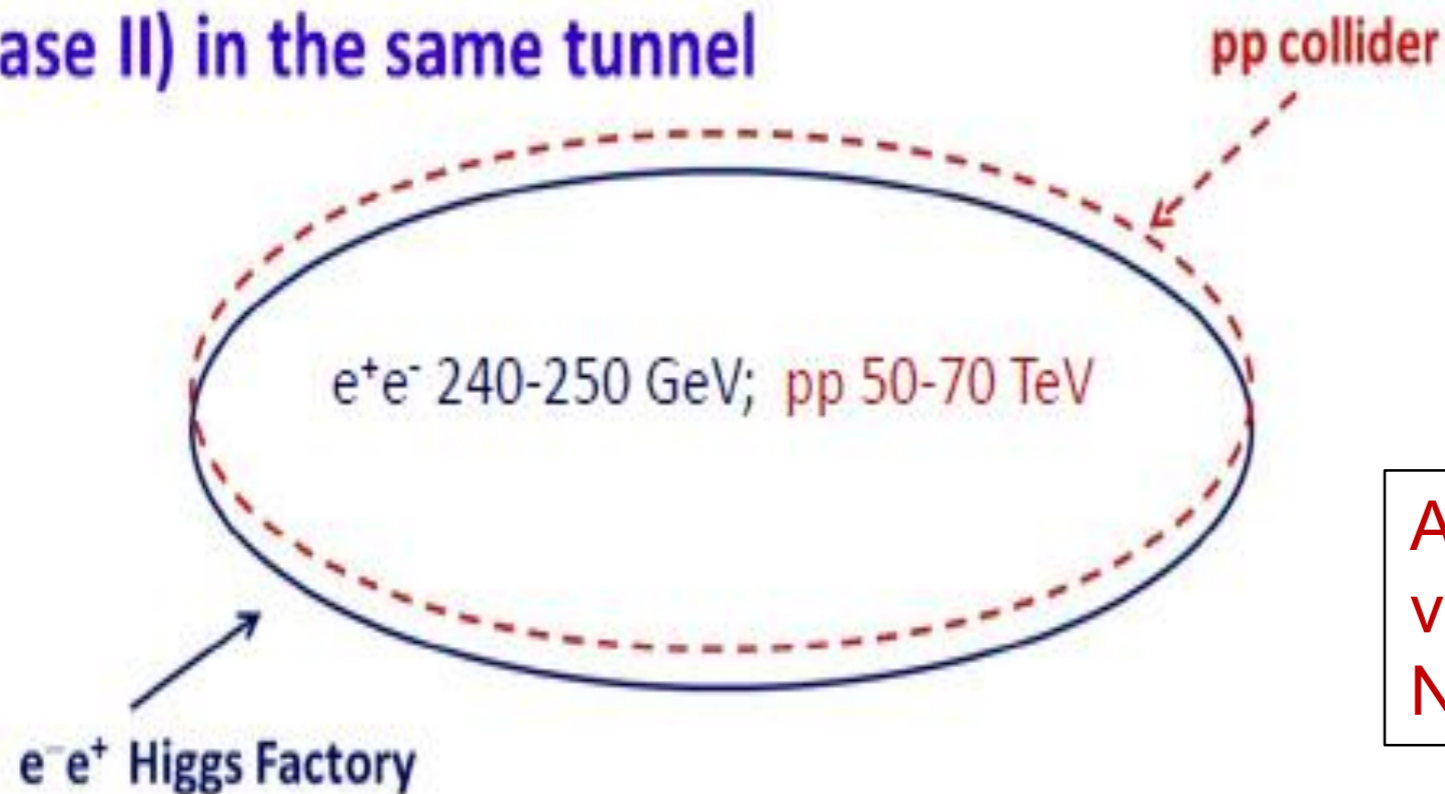
Center for Future High Energy Physics



- Coordinate studies of physics case.
- Coordinate international collaboration:
 - ▶ Currently, 5-10 intl. visitors every week.
- Writing pre-TDR by the end of this year.

Under consideration now:

- Circular Electron Positron Collider (CEPC).
- Super Proton Proton Collider (SPPC)
- **Circular Higgs factory (phase I) + super pp collider (phase II) in the same tunnel**



A 50-70 km tunnel is
very affordable in China
NOW

Yifang Wang, director of IHEP

Main parameters of CEPC at 50km

Parameter	Unit	Value	Parameter	Unit	Value
Beam Energy	GeV	120	Circumference	km	50
Number of IP		2	$L_0/IP (10^{34})$	$cm^{-2}s^{-1}$	2.62
No. of Higgs/year/IP		1E+05	Power(wall)	MW	200
e+ polarization		0	e- polarization		0
Bending radius	km	6.2	$N_e/bunch$	1E10	35.2
$N_b/beam$		50	Beam current	mA	16.9
SR loss	(GeV/turn)	2.96	SR power/beam	MW	50
Critical energy of SR	MeV	0.6	$\epsilon_{x,n}$	mm-mrad	1.57E+06
$\epsilon_{y,n}$	mm-mrad	7.75E+03	$\beta_{IP} (x/y)$	mm	200/1
Trans. size (x/y)	μm	36.6/0.18	Bunch length	mm	3
Energy spread SR	%	0.13	Full crossing angle	mrad	0
Lifetime due to Bhabha	sec	930	Damping part. No. (x/y/z)		1/1/2
b-b tune shift x/y		0.1/0.1	Syn. Osci. tune		0.13
RF voltage V_{rf}	GV	4.2	Mom. compaction	1E-4	0.4
Long. Damping time	turns	40.5	Ave. No. of photons		0.59
dB beam-beam	%	0.014			

Main Parameters of SppC

Parameter	SppC-1	SppC-2
Beam energy (TeV)	25	45
Circumference (km)	49.78	69.88
Number of IPs	2	2
SR loss/turn (keV)	440	4090
N_p /bunch (10^{11})	1.3	0.98
Bunch number	3000	6000
Beam current (mA)	0.5	0.405
SR power /ring (MW)	0.22	1.66
B_0 (T)	12	19.24
Bending radius (km)	6.9	7.8
Momentum compaction (10^{-4})	3.5	2.5
β_{IP} x/y (m)	0.1/0.1	0.1/0.1
Norm. trans. emit. x/y ($\mu\text{m}\cdot\text{rad}$)	4	3
ξ_y /IP	0.004	0.004
Geo. luminosity reduction factor F	0.8	0.9
Luminosity /IP ($10^{35}\text{cm}^{-2}\text{s}^{-1}$)	2.15	2.85

Circle is on the map



- QinHuangDao (秦皇岛), 300 km from Beijing, 1hr by train.
- Good geological condition.
- Strong local support. Thinking about building a science city around it.

Beautiful Place for a Science Center

Best beach & cleanest air
Summer capital of China



Starting point of the Great Wall



Wine yard



The Chinese Dream

- **CPEC**

- Pre-study, R&D and preparation work
 - Pre-study: 2013-15
 - Pre-CDR by the end of 2014 for R&D funding request
 - R&D: 2016-2020
 - Engineering Design: 2015-2020
- Construction: 2021-2027
- Data taking: 2028-2035

- **SppC**

- Pre-study, R&D and preparation work
 - Pre-study: 2013-2020
 - R&D: 2020-2030
 - Engineering Design: 2030-2035
- Construction: 2035-2042
- Data taking: 2042 -

Yifang Wang at FCC kick off meeting

They say:

- Very long road, very difficult, but extremely exciting.
- Within China:
 - ▶ Good timing: BEPC to end in 2020. Time to plan the future. And in general, “in the mood” for something big.
 - ▶ Need to reach consensus (this year).
 - Not guaranteed, but excitements are building (and faster than expected)
 - ▶ Money.
 - ▶ Many technological hurdles.
 - ▶ Need many more (and new) people.
 - So far, young people seem to be fired up.

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 - ▶ Will rely heavily on international collaboration for technology, man power...
 - ▶ Play an active role in global efforts: ILC and FCC.
 - ▶ Competing proposals and multiple machines are healthy ingredients of our community.
 - ▶ Even if this does not happen in China, the effort will help.

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- This is part of the global effort to ensure a bright future for high energy physics. Let's all work for that goal!