



Debate over Chinese Supercollider Goes Open

By XIN Ling

Debates over if China should start building the world's biggest particle collider went public and have drawn much attention in the past few months. Proposed in 2012 as a "Higgs factory" twice the size of LHC (Large Hadron Collider) and costing at least several billion dollars, the Circular Electron Positron Collider (CEPC) was expected to start construction in 2022 but now came under the question of senior scientists including Nobel laureate Chen-Ning Yang.

Long hidden controversies over the project, mainly due to its sky-high price tag, was brought to light by mathematician Shing-Tung Yau's recent publicity of CEPC, first with his co-authoring book *From the Great Wall to the Great Collider*, then at an international conference in Beijing in August. In early September, strongly opposing views appeared in *The Intellectual*, an online platform dedicated to communicating science and "evoking independent thinking" among Chinese readers.

In his article "A Super Collider Is Not for Today's China", Chen-Ning Yang estimated the cost of CEPC to be at least \$20 billion and possibly end up as "a bottomless pit" with lessons drawn from the Superconducting Super Collider (SSC) project, which was cancelled by the US government in 1993 due to budget problems. Such a luxurious machine is "inappropriate for a developing country still struggling with more acute issues like economic development and environment protection", Yang said. He also expressed concerns over the science of CEPC as it is just out of "a guess of physicists", being ill-grounded without guaranteed results. "Even if they see something with the machine, it's not going to benefit the life of Chinese people any sooner," he remarked.

"I am not against the future of high energy physics," Yang wrote, "but the timing is really bad for China to build such a super collider."

Yang's article was responded within 24 hours by WANG Yifang, director general of the Institute of High Energy Physics (IHEP) of CAS, who is known for leading the Daya Bay neutrino experiment and now representing the CEPC team.

Refuting Yang's arguments one by one, WANG claimed that based on solid calculation, the real budget of CEPC is "some 40 billion RMB (6 billion dollars) including 30% international contribution". "SSC was the victim of political struggles and bad management," he noted. "With experiences

from BEPC and Daya Bay, we are confident that the planning of CEPC is mature and the implementation will go smoothly".

Citing Yang's misunderstanding of CEPC's science goals, WANG reiterated the importance of Higgs research and commented that "we experimental physicists will not rely too much on theoretical predictions".

He was also convinced that the building of such a collider would drive major technical boosts for China from precision machinery to data acquisition and processing.

"I respect Professor Yang, but I respect science and rationality more," WANG wrote.

"Everyone knows that Yang is against CEPC," said a researcher from IHEP, who is not directly involved in the project and insists to remain anonymous. "It makes no sense to compare CEPC with SSC. Besides, the money for CEPC over China's entire research expenditure is much smaller than what BEPC had cost China in the 1980s," he mentioned.

When young physicists went on to express their earnest desire for such a collider, Yang is by no means the only one who is vetoing it. "Opinions are polarized even within the high energy community, and some older people never hide their objection", said the anonymous insider.

Such a tit-for-tat argument is a rare thing in China, and should be seen as "a big step forward towards more open and outspoken discussions on science and social issues", said LI Xiaoming, editor of *The Intellectual*. "It helps to raise public awareness and understanding of the science itself, and at the same time cultivates a free expression and debate spirit."

This year, a preliminary research proposal on CEPC from IHEP was rejected by the National Development and Reform Commission. However, their work has won support from CAS and the Ministry of Science and Technology of China.

Designed with a 53.6 km circumference and 2×120 GeV center-of-mass energy, CEPC will use tenfold the precision of LHC to better measure the properties of Higgs and reveal more fundamental physics behind the Standard Model. Since long time ago, the Chinese high energy community has been looking for the next big science to pursue after BEPC's retirement around 2020. If CEPC finally gets a nod from the Chinese government, it will most likely be built at the closest port city Qinhuangdao, which is 300 km east of Beijing. CEPC could be upgraded later to a high energy proton-proton collider with physics potential far beyond the Higgs factory.