The conceptual design of the High Energy Photon Source (HEPS). With an energy beam of 6 GeV and emittance of 60 pm•rad, HEPS will become one of the world's brightest synchrotron radiation facilities to study the structure and properties of materials in a range of disciplines. (Image: Institute of High Energy Physics, Chinese Academy of Sciences)

New Synchrotron Facility to Be Constructed in Suburban Beijing

By XIN Ling (Staff Reporter)

Scientists from the Institute of High Energy Physics, Chinese Academy of Sciences (IHEP) have got the green light from the Chinese government to build one of the world's brightest X-ray sources to feed the nation's ever increasing research needs. The approval came in mid December from the National Development and Reform Commission, and construction will begin late 2018 in the northern suburbs of Beijing.

Upon completion around 2024, the High Energy Photon Source – or HEPS, with its design performance of 6 GeV beam energy and 60 pm·rad emittance – will run neck to neck with existing top-level devices of its kind such as Japan's Super Photon ring-8 (SPring-8), the European Synchrotron Radiation Facility (ESRF), and the upgraded Advanced Photon Sources (APS) of the US.

When electrons are accelerated to nearly the speed of light, they will emit strong electromagnetic radiation which can be used as an excellent probe to peep into the microscopic world. From physics to structural biology, materials sciences, geoscience and archaeology, synchrotron radiation has played a critical role in many disciplines to reveal previously unseen microstructures.

At present, China has three synchrotrons running at medium or low energies: the Hefei Synchrotron Radiation Facility (800 MeV), the Beijing Synchrotron Radiation Facility (2.5 GeV), and the Shanghai Synchrotron Radiation Facility (3.5 GeV). However, the demand for such facilities keeps increasing. In a list released by the National Development and Reform Commission in February 2017, HEPS is one of the ten big research infrastructures to be supported during China's 13th Five-Year Plan (2016-2020).

QIN Qing, IHEP deputy director and head of the HEPS test facility, said that the estimated cost is about 4.8 billion yuan (735 million US dollars). It will be one of the most expensive big science facilities China has ever built.

"As a member of the international synchrotron radiation community, I'm delighted to know that HEPS has moved one key step forward," said Esen Ercan Alp, a senior scientist of APS at the Argonne National Laboratory, Illinois. "HEPS will put China among the leaders in the world for hard X-ray storage rings."

One main advantage for HEPS, he said, is that it is a "green field" facility. It means the designers of the storage ring will have a free hand in choosing the diameter, other accelerator parameters and the injector systems without the restrictions of the existing infrastructure. They will have the opportunity to design the beam lines and choose optics with all the benefits of existing experience accumulated in other facilities.

However, there are key technical challenges to tackle, including the development of a high-precision beam position monitor, the on-axis injection kicker magnets, and state-of-the-art injection skills, said JIANG Xiaoming, a former IHEP researcher and now director of the Beijing Advanced Sciences and Innovation Center under CAS.

In terms of number of potential scientific users and the breadth of the scientific disciplines, there is no doubt that the HEPS is a very important initiative — it will pave the way for young Chinese scientists to excel and contribute in many different scientific fields, said Alp.

"Currently, many Chinese scientists visit synchrotron facilities in the US, Europe and Japan. After HEPS, they'll have an increased chance to realize their dreams, make their discoveries, and create new knowledge *in China* for the benefit of the Chinese people as well as for the world-wide scientific community," he said.