Passport

Accelerating facility with colliding electron-positron beams «Super Charm-Tau Factory»

Location: Budker Institute of Nuclear Physics (BINP), Novosibirsk, Russia
Initiating organization: Budker Institute of Nuclear Physics
Contact: Iouri Tikhonov, professor, Budker Institute of Nuclear Physics RAS, Iouri.Tikhonov@cern.ch
Project web-site: https://ctd.inp.nsk.su/c-tau/
Period of project implementation: 2017-2023
Cost of the mega-science project. Preliminary estimation: 37 billion rubles (in the prices of 2017)

Brief description, the primary purpose of the construction. The «Super Charm-Tau Factory» is an electron-positron collider facility operating in the center-of-mass energy range from 2 GeV to 5 GeV (Figure 1). The project is aimed at solving fundamental problems of particle physics:

- Study of CP symmetry violation in the charm quark and tau lepton sectors;
- Test of the Standard Model of particle physics by precision measurement of charmed particle and tau lepton decays and search for phenomena beyond the Standard Model;
- Study of production mechanisms of the charm quark and tau lepton and search for «exotic» hadrons, hybrid state particles and glueballs.

The accelerating facility will also be used as a bright source of synchrotron radiation for various fundamental studies and industrial applications.

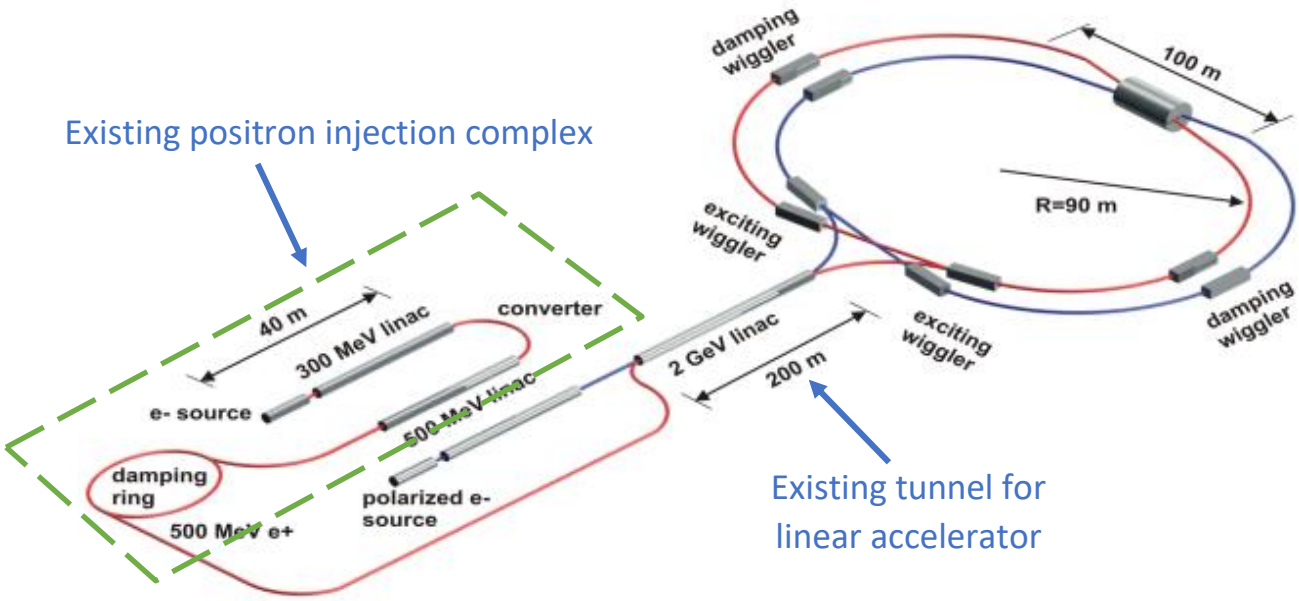

Figure 1. Scheme of the «Super Charm-Tau Factory». The already existing objects are specified that will become a part of the future facility.

Unique character (main advantages). Collisions of electrons and their antiparticles positrons are studied at flavor (beauty or charm-tau) factories. Although the collision energy at flavor factories is about 1000-10000 times lower than at the Large Hadron Collider at CERN, the high luminosity

(collision rate) of flavor factories gives an opportunity to make very precise measurements, to study rare processes and to look for processes forbidden within the framework of Standard Model.

Two electron-positron collider factories exist now (in Japan and China). The Russian facility will provide the record luminosity 100 times larger than the current state-of-art value in their energy range. It will be achieved without significant increase of the beam intensity and collider size and without decrease of the bunch length. That luminosity provides an about 2 orders of magnitude larger number of events needed for the analysis than that available today allowing to study rare phenomena of great interest.

Scientific and practical importance. Implementation of the project will allow:

- To produce new generation of accelerators for radiative chemistry and physics, defectoscopy, medicine etc.
- To develop the particle detection technologies that are applicable in medical equipment, industrial devices, security tools etc.
- To improve the methods of proton and ion therapy of cancer.

Implementation of the Super Charm-Tau Factory will lead to significant extension of cooperation between national and foreign scientific groups and BINP, allowing undergraduate and PhD students to participate in high-level research activity.

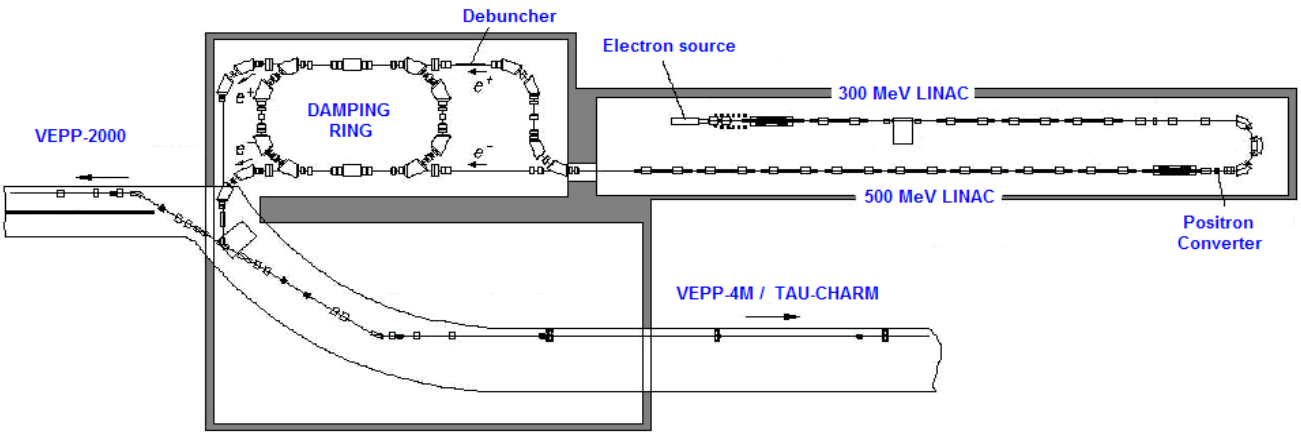

Figure 2. Scheme of the positron injection complex

Current state. The conceptual design report and road map of the «Super Charm-Tau Factory» have been prepared; the activity on refining these documents is ongoing. The project «Requirements for the computing infrastructure of the Super Charm-Tau Factory» has been completed. Development of the particle identification system for the Super Charm-Tau Factory detector is in progress. The project of social and engineering infrastructure for the Super Charm-Tau Factory has been completed. The positron injection complex for the Super Charm-Tau Factory (Figure 2) was built and commissioned in 2016. The injection complex serves now for the existing colliders VEPP-2M and VEPP-2000 at BINP.