Radiation Science Center

Applied Research Laboratory KEK

The Radiation Science Center is concerned with the radiation safety for the high energy accelerators, management work of more than 6000 radiation workers, radiation monitoring at the experimental places and boundary of the institute, and the chemical waste disposal safety in KEK. The Radiation Science Center promotes the research and development studies of radiation protection from the accelerators and environmental chemistry related to the accelerators. The Radiation Science Center plays a leading role in the radiation protection study and work for high energy accelerators in the world.

Radiation Physics

Radiation detector development and research for radiation measurements required for radiation physics, radiation shielding, radiological, and health physics purposes. Recent researches are in space dose monitoring and international collaboration of secondary radiation measurement of high

energy proton at CERN.





Spallation fragments detector

Dose monitoring system in the International Space Station

Radio-chemistry Radioactivity detection and analysis in high-intensity accelerator facility for variety of projectiles and incident energies bombarding with various components of accelerator of different metals, cooling water, concrete and air. Recent researches are evaluating quantities for de-commissioning of

accelerator, use of Gamma-camera for accelerator activity study, and short-lived isotope productions.





Direct activation analysis In accelerator facility

Gamma imaging of accelerator magnet

Radiation Shielding

Theoretical research on radiation shielding problem, development of Monte Carlo codes and evaluation various quantities related to radiation physics, radiological study and health physics. Recent researches are high energy physics improvement in PHITS, secondary radiation study in accelerator facility.



sight through Accelerators.

EK 2021



And secondary radiation

Muon pair creation implementation represent the experimental data

Analytical Chemistry

In the cooling water of accelerator facility, measurement, analysis and new method is developed for activity and status of radioactive nuclei, corrosion of metal, and chemical behavior. Also in order to contribute the next generation accelerator cavity used in LHC and ILC, R&D for chemical analysis support is performed find the best conditions for electropolishing.



Size of colloid containing Fe In colling water



Q kek50th anniversary

Computing Research Center

KFK The Computing Research Center (CRC) provides computational resources, networks, and software supports for research activities in KEK. Recent international collaborative projects require worldwide distributed computer systems with grid or cloud techniques, which have been successfully implemented in the Large Hadron Collider (LHC) experiments. These systems are constructed on a global network environment as well as by using computer resources, such as CPU and data storage. CRC is proceeding its research and development of activities concerning computational science.

Central Computing system

For KEK staff and users the large computing system is available. The system consists of 15,000 core CPUs, 25.5 Pbyte storages, and 100 Pbyte tape library.



Research

Geant 4: Most famous general purpose Monte Carlo gMocren: 3D CT view with Geant 4 code. CRC provides improvement of physical models and advanced research in health physics of micro dosimetry using Geant 4.

Monte Carlo results tool which is actually used in the treatment facilities in Japan.

GRACE: Contains various cross sections of elementary particle interactions. It is widely used to determine the interaction events which required for the analysis of the large collider experiments in high energy physics.



of E-Mail, Web, Wiki, Storage, Meeting services, and security check and educations

> Manyo-lib: is the data analysis software for neutron experiment of material structure science. Manyo-lib is based on the Object-Oriented Programing, in which development and use by multiple people are available including the long term support. Related development of neutron scattering data analysis simulator in the polymer materials.

Applied Research

Laboratory



 R kek50th anniversary

PPARCE TERA





Besides KEK internal network, the

KEK Network





Cryogenics Science Center

KEK Cryogenic science, liquid helium and superconductor devices play an important role in recent researches of high energy physics, radiation science and so on. Cryogenics Science Center (CSC) has a helium liquefaction system which can liquify helium of more than 300 L per hour and supplies liquid helium (LHe) to research groups in KEK for supporting their activities. Research activities of CSC are R&D of superconducting magnet for high energy accelerators and particle detectors, Research of cooling by superfluid helium, R&D of cryogenic instruments, Basic study of mechanical and electrical characteristics of materials at very low temperature.

Research and Development



CSC has been made also outstanding contribution to international collaborations. At CERN-LHC project, CSC provided superconducting quadrupole magnets at the 4 different collision positions in order to focus the beam.



The world first multi-magnetic fields (dipole and quadrupole) superconducting magnet system is developed in CSC for the T2K, accelerator-based long baseline neutrino oscillation experiment. The combined function magnet contributes to save land and cost.



After the success of the observation of the decay of Higgs boson, the CERN-LHC has now been upgraded. CSC is developing the D1 superconducting dipole magnet. Again It is one of most important devise since it will be installed in the final focusing section at the collision point.

Anniversary Since 1971

Insight through Accelerators.

The COMET experiment at J-PARC searches for coherent neutrino-less conversion of muon to an electron. CSC developed an indirect cooling type superconducting solenoid magnet, which can be used in high intensity secondary radiation fields.

The g-2/EDM experiment at J-PARC aims to measure muon's anomalous magnetic moment and electric dipole moment. Due to using ultra-cold muon beam, magnetic field uniformity is required to 1 ppm

Supplying LHe

CSC maintain large liquid helium (LHe) systems both in Tsukuba and Tokai campus of KEK and provide LHe for various researches. Since the cost of Helium is very high, most of the evaporated He gas is collected and recycled into the LHe systems.







Applied Research

Laboratory



Mechanical Engineering Center

The Mechanical Engineering Center (MEC) provides manufacturing and engineering support for the projects, promoted by the KEK, and for the development of experimental equipment. MEC also performs research and development in the field of mechanical engineering, such as processing, design, measurement, as well as mechatronics and material science, which are fundamental for technological applications. Furthermore, we are also responsible for providing education and for human resource development, by conduction training courses on mechanical technology.

Cavity manufacturing technology R&D

In order to manufacture superconducting accelerator cavity from material, MEC has been performed R&D on the various technics such as deformation processing, surface finishing, et al.





Electropolishing for cavity



Design of cryomodule



Press machine



Seamless cavity by hydraulic forming

Radiation detector R&D







Belle II Silicon Vertex Detector (SVD) structure design



Development of electron track Detector for a-2/EDM experiment









Development of sample changer For He chamber

Applied Research Laboratory KFK

Ultra precision machining for cavity cell

The precision is sub-micron to manufacture the accelerator cavity cell.







Cavity cell

X band cavity

RF aun

High precision shape measurement



Rotating mechanism for continuous inversion measurement





Differential of positive and opposite

gyro angle signals

Development of sample changer For X-ray Absorption Spectroscopy



