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Neutrinoless Double Beta Decay Experiments and Leptogenesis Scenario of Early Universe

Since neutrinos are neutral particles, they are possible to have the nature un-distinguishable between particles and their own anti-particles, which we call Majorana nature. If Majorana nature exists in neutrinos, neutrinoless double beta decay (0nu-DBD) takes place. The Majorana nature is also required as Majorana mass term in the so-called Seesaw mechanism, which can naturally describe the reason why the neutrino masses are so light in comparison with other charged lepton and quark masses. Leptogenesis, which is a hopefull scenario of early universe, is the theory on the basis of the seesaw mechanism. Therefore the discovery of 0nu-DBD is not only the evidence of the Majorana nature but also the strong supports of Seesaw mechanism and Leptogenesis.

A detector called Drift Chamber Beta-ray Analyzer (DCBA) is being developed at KEK to search for 0nu-DBD. DCBA can detect the 3-D track of individual beta ray and measure both momentum and kinetic energy of the beta ray. Since 0nu-DBD experiments require a lot of decay source amount, a future project temporarily called Magnetic Tracking Detector (MTD) is planed on the basis of DCBA. Another large project called SuperNEMO is in progress in Europe on the basis of NEMO3, which is now in the operation at LSM. Because both DCBA and NEMO groups have common interests in the techniques of background rejection and improving energy resolution, collaboration is in progress under the program of France Japan Particle Physics Laboratory (FJPPL). We will present the status of DCBA and NEMO collaborations together with the relation of 0nu-DBD and Leptogenesis.

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