Search for Proton Decay  

YUAN SUN — Proton is the backbone of atoms and hence matter. Whether proton decays is not only an interesting quiz but also an important problem both from the experimental and theoretical point of view. In the Standard Model proton cannot decay anyway because SM conserves baryon number while the proton is the lightest baryon among all the particles we know. However, as part of the effort of moving physics forward, some GUT theory (such as SU(5)) tries to unify strong interaction and electro-weak interaction. It happens to be that those theories require the proton to decay and their prediction of the lifetime of proton is the only way we can test those theoretical models now. A typical channel of this kind is that a proton decays into a pion and a positive electron via the new X boson. SUSY theory also comes into play and gives a more satisfying result of the proton lifetime than some ordinary GUT. Experiment searching for the proton decay is underway at superK. However, up until now, there is no direct evidence that proton decays.