Measurement of the beam slowing-down time at neutral beam heated KSTAR deuterium plasma

Jong-Gu Kwak[1], Y.S. Lee[1]

[1] *National Fusion Research Institute, Daejeon, Korea*

Fusion product alpha particle whose energy is about 3.5 MeV is used to sustain the fusion reaction after the ignition, so behaviour of the fast ion confinement is one of key issues at the burning fusion plasma. As the KSTAR plasma performance is improved with neutral heating power(~5 MW) and operational boundary of the H-mode discharge is extended over MHD no-wall limit(β_N~4) with higher stored energy region, the confinement of fast ions with injected energy of 100 keV neutral beam is also important as well as increasing thermal ion confinement with the plasma current. Recent KSTAR experimental campaign also showed the fully non-inductive discharge with high betap(β_p ~3), which is one of promising candidate scenarios of steady state operation at KSTAR. It is explained by the enhancement of fast ion confinement with reducing TAE(Toroidal Alfen Eigenmode) activity. In addition, because there is a lot of production of fast neutrons coming from via D(d,n)^{3}He reaction in neutral beam heated plasma, the neutron flux could be used for characterizing the confinement time of energetic particle at deuterium plasma by applying blip beam or measuring the absolute flux value, but in this study, the blank beam with 10 msec which is routinely used for other plasma diagnostic is used for estimating the confinement time of energetic particle. In this presentation, we also report on the estimating beam slowing down time at various KSTAR discharges including ITB(Internal Transport Barrier) and high betap using blank beam method as well as its feasibility test of blank beam method.