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STOR-M tokamak research program—A four-decade long Journey

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STOR-M tokamak design was conceived in early 1980s in the Plasma Physics Laboratory (PPL) at the University of Saskatchewan, and the first discharge was achieved in 1987. It is currently the only tokamak in Canada. STOR-M has accumulated more than 360000 discharges and remains active for the purpose of research and training. STOR-M has made many original contributions to tokamak confinement studies and to technology development. STOR-M pioneered alternating current (AC) tokamak operation mode which takes advantage of efficient current drive and ohmic heating. AC operation was later repeated in many other large tokamaks, such as JET and the HT-7 superconducting tokamak. STOR-M team was involved during the early stage of development of direct central fueling technology using compact torus (CT) injectors for magnetically confinement fusion reactors. CT injection triggered improved confinement (H-mode like) in STOR-M. PPL also initiated bursting repetitive CT operation at 10 Hz. Other significant contributions from STOR-M include turbulent heating by superimposing a sharp current pulse on the plateau of the plasma current, studies of improved confinement triggered by various techniques including electrode biasing, CT injection, resonant magnetic perturbations, and turbulent heating. Recently, PPL has also expanded the research areas to studies of (a) plasma-dust interaction by introducing spherical micro-tungsten dust into the STOR-M discharge and by evaluation of the dragging force on the dust in the rotating STOR-M plasma, (b) magnetohydrodynamic instability precursors leading to disruptions using internal magnetic probe arrays, and (c) damages of the first-wall material(tungsten) in tokamaks using intense energetic ion beam produced in a 2-kJ dense plasma focus device.

Keyword-1

Tokamak

Keyword-2

Compact torus injector

Keyword-3

Plasma confinement

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