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Innovative Magnetic Mirror Concepts[1] THOMAS SIMONEN, MIRROR STUDY GROUP COLLABORATION — In the past two decades, while magnetic mirror research in the US was curtailed, several innovations have been proposed and many have been demonstrated in Japan and Russia in the Gamma 10 and GDT experiments. These advances have led to new scientific understanding, means of overcoming previous short comings, and reconsideration of magnetic mirror systems as a modest size material testing neutron source or as a fusion- fission hybrid system. Compared to toroidal systems, the linear geometry of mirror systems has the significant advantages of easing construction, operation and maintenance, but has a less developed data base. The recent innovations include reliance on axi-symmetric mirror coils, suppression of energetic-ion cyclotron-modes with potential confined warm plasma, and sheared ExB flow stabilization of drift waves. To enable increased electron temperature, the magnetic field expansion ratio from the mirror to the end wall is increased beyond the square root of the ion to electron mass ratio. This expansion inhibits electron thermal conduction, reduces the incident wall power flux to low levels, and isolates plasma-wall interactions far from the confined plasma.

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