Study of an axisymmetric mirror-based volumetric neutron source\textsuperscript{1} J.K. ANDERSON, C.B. FOREST, V.V. MIRNOV, E.E. PETERSON, J. WALLACE, University of Wisconsin - Madison, R. HARVEY, Y. PETROV, CompX — A dedicated neutron source is required to develop and test materials with both a long lifetime and minimal activation when subjected to a high neutron flux. We revisit the long-studied magnetic mirror concept for this application, including recent breakthroughs in both physics (stable high $\beta$, high $T_e$ plasmas in the GDT) and technology (high fields produced by HTS coils). Stability is achieved by a combination of plasma escaping the mirror into a region of good magnetic curvature, sloshing fast ions, and non-paraxial end cell effects. Plasma heating and fueling is via neutral beam injection at modest energy (25kV); synergistic application of high-harmonic fast waves that damp primarily on the beam ions dramatically increases the fusion neutron yield. Electron temperature is a key parameter in fusion yield; studies of 110GHz ECH show complete absorption of fundamental X mode high field side launch. With the expected 2MW of available power, a large range of $T_e$ is available and allows fusion neutron flux exceeding $10^{13}$ n/s before $\beta = 1$ is reached. A higher field central cell is investigated for achieving materials-testing-relevant fusion flux levels.

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