Minimum B mirror with expander aimed for transmutation and energy production

OLOV ÅGREN, Uppsala University, V.E. MOISEENKO, IPP NSC KhIPT, Kharkov, KLAUS NOACK, ANDERS HAGNESTål — A comparatively simple fusion driven fission device may be developed for industrial transmutation and energy production from spent nuclear waste [1-2]. This opportunity stems from the large fission to fusion power production ratio, $P_{\text{fis}} / P_{\text{fus}} \approx 150$, in a subcritical fusion device surrounded by a fission mantle with the neutron multiplicity $k_{\text{eff}} = 0.96$. Power production is predicted if the electron temperature exceeds 700 eV. The expanders may improve the electron temperature by a formation of an ambipolar potential. Theoretical studies include RF heating, magnetic coil designs, fission mantle kinetics and some basic plasma investigations. A 20 m long mirror with a 40 cm plasma radius could be sufficient for an electric power production of 500 MW. [1] S. Taczanowski, “Premises for development of fusion-fission hybrid systems” in IAEA-RC-870.3, TWG-FR/132, Chennai, India 15 – 19 January 2007. [2] O. Ågren, V.E. Moiseenko, A. Hagnestål, “The straight field line mirror concept and applications”, Problems of atomic science and technology 6. Series: Plasma Physics, 8 (2008).