Equilibrium of a rotating mirror plasma – I

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Isothermal, axisymmetric equilibrium in a rotating mirror experiment is derived and the results are compared with data. In contrast to earlier papers, our formalism determines (1) the two-dimensional structure of the electrostatic potential, which is nonlinearly coupled to the rotation; and (2) the nature and quality of the resulting confinement. We find that the plasma is confined into a toroidal ring shape by centrifugal and electrostatic forces, and has a "spatial loss cone" along the axis. We discuss the limits of validity and possible applications of our results to centrifugally confined fusion plasmas and ion mass filters.