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A versatile multi-cusp plasma device for confining contact ionized alkali ions: source for the experimental studies

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The confinement by multi-cusp magnetic field configuration is being revisited in prospect of developing a Negative Ion Beam source for heating the plasma in fusion devices. For this, an experimental device namely the Multi-cusp Plasma Device (MPD), has been constructed to study the physics of plasma confinement in a multi-cusp configuration. In this experiment alkali ions of low ionization potential will be produced by contact ionization and will be confined in the multi-cusp magnetic field configuration. The cesium ions will be produce by impinging a collimated neutral cesium atoms on an ionizer consisting of a hot tungsten plate. The temperature of the tungsten plate will be made high enough (˜2700^{0}K) such that it will also be contributing electrons to plasma. Hence the design of hot plate ionizer is very crucial. For heating the tungsten plate hot cathode technique will be used. Thermionic electron emission from tungsten plate is exponentially proportional to the temperature of the plate. A gradient of very little value in the temperature of the hotplate, might cause a large temperature gradient and hence large potential difference in plasma which will result in drift thus affecting the experiment. So it is desired to keep the hot plate temperature to be uniform within 1%. The tungsten plate is so hot that the direct contact method for the temperature measurements can't be used. To measure the thermal contours of the ionizer hot plate non-contact method will be used and characterized.

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