ION CYCLOTRON RESONANCE HEATING IN THE VASIMR

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The production of upward moving ion conics and ion heating are significant features in auroral processes. It is believed that ion cyclotron heating plays a role in these processes, but laboratory simulation of these auroral effects is difficult due to the fact that the ions involved only pass through the acceleration region once. In the Variable Specific Impulse Magnetoplasma Rocket (VASIMR) we have successfully simulated these effects. The current configuration of the VASIMR uses a helicon antenna with up to 20kW of power to generate plasma then uses an RF booster stage that uses left hand polarized slow mode waves launched from the high field side of the resonance. The current setup for the booster uses 2Mhz to 3Mhz waves with up to 1.5kW of power. This is similar to the ion cyclotron heating in tokamaks, but in the VASIMR the ions only pass through the resonance region once. The rapid absorption of ion cyclotron waves has been predicted in recent theoretical studies and these theoretical predictions have been confirmed with several independent measurements. The ion cyclotron resonance heating (ICRH) should show an increase in ion velocity perpendicular to the magnetic field. This increase should take place in the resonance region where the ion cyclotron frequency is equal to the frequency on the injected RF waves. Downstream of the resonance region the perpendicular velocity boost should be converted to axial flow velocity through the conservation of the first adiabatic invariant as the magnetic field decreases in the exhaust region of the VASIMR.

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2. H - Waves in Plasma
3. (a)
4. C - Contributed Paper
5. No special instructions