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Potential and current structures of auroral-like plasma terminating on neutral gas[1] CHRISTOPHER COOPER, WALTER GEKELMAN, UCLA — The 3-D potential and current structures of a quiescent (δn/n <5%), magnetized plasma terminating on a neutral gas have been measured and compared to theory. A thermally emissive LaB6 cathode biased <400 V ionizes a background helium gas. The 30 m plasma is not terminated by an electrode so there are no net currents in it. There are, however, complicated auroral-like closed-current structures. Hot electrons carry a field aligned currents and ions carry a cross field current to closure currents in the low density plasma halo around the plasma. Probes are used to measure the plasma's electric fields, currents, and basic plasma properties. A strong field-aligned neutral collision dominated double layer ($\Delta\phi/\mathrm{kT}_e \sim 1$) terminates the auroral structure where the plasma pressure matches the neutral pressure. In this region, electric fields and neutral-collision dominated conductivities create comparable cross field and field aligned currents, closing the current loop. The experiment was carried out at the ETPD at UCLA, a large toroidal device (major radius = 5 m, 2 m wide, 3 m tall) with a pulsed (1 Hz) DC plasma discharge (t_d ~20 ms, B_t ~250 G, and B_v <6G, R_{plasma}=10cm, n_e <10^{13}cm^3, T_e <10eV, and T_i ~T_e).

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