

The characteristics of presheaths near an electrically floating plate in weakly collisional argon multipole plasmas are investigated with a combination of data from laser induced fluorescence using a diode laser, Mach probes, emissive probes, and Langmuir probes. It is shown that ion-neutral collisions result in an increase in ion temperature from approximately room temperature in the bulk plasma to 0.13 eV, 0.5 cm from the plate, the location of the closest measurement. In addition, at that point, the presheath plasma potential drop is greater than  $T_e/2$ , and the drift velocity is equal to  $0.5 c_s$ , where  $c_s$  is the ion sound velocity. (C) 2001 American Institute of Physics.