Q: Why is plasma voltage during time b negative?

Ans: recall that we split the voltage into two parts based on current, the on and off pulse. We then averaged the on and off pulse. The negative part is the off pulse. Depending on when the division occurs, it can sometimes be positive, or negative.

Recall in the physics, the system is modelled as having an on and off pulse, per Lieberman. Electrons cannot flow to the negatively charged plate, as they cannot overcome the potential barrier. Positively charged particles are accelerated into the negatively charged plate. The opposite plate has no significant sheath. This plate received both protons and electrons.

The result is that the sheaths are rectifying for electrons. Protons flow in both cases.

The sheath is calculated (see calculations) based on the voltage in the plasma. This is added to the energy of the He+ to find the energy lost from the system. When the sheath is negative, this will sometimes appear as energy gained, which is not physical. This is a direct result of the division. This error is small and can be neglected.

These points could be removed, for a loss of 53 data points out of 165 for the packed case. This would be an acceptable loss.