

# Electron-Free Plasma for ESD Sensitive Samples

As its name would imply, *electron-free plasma* is achieved by removing all the electrons from the plasma state, leaving only positively charged ions in the vicinity of the substrate being processed.

To review the mechanism of creating an electron-free plasma, let us consider that at any given instant in an ac plasma, electrons and ions are generated together with an assortment of other sub-atomic particles. As they occur, each of the charged species accelerates to surfaces of opposing polarities within the plasma chamber.

To understand how an electron-free plasma is created, let's look at the operating principal of a Mass Spectrometer (*Figure 1*). Here we see ions of varying mass being accelerated through a magnetic field. Particles of high mass are deflected very little from their initial trajectory while ions of lighter mass are deflected more.

Let us now apply this same principal to the ions and electrons being generated in a plasma. Here we see that the plasma gas ions (high mass) pass directly through a perforated electrode at ground potential (*Figure 2a*). Electrons on the other hand, having no mass, are all taken to *ground* (*Figure 2b*) leaving only ions on the far side of the grounded electrodes (*Figure 2c*).

Substrates positioned on a floating tray in this ion field see no electron radiation and will be plasma treated without electrostatic damage.

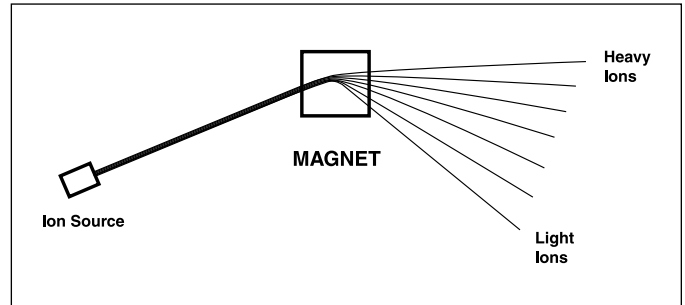


Figure 1. Operating principle of Mass Spectrometer

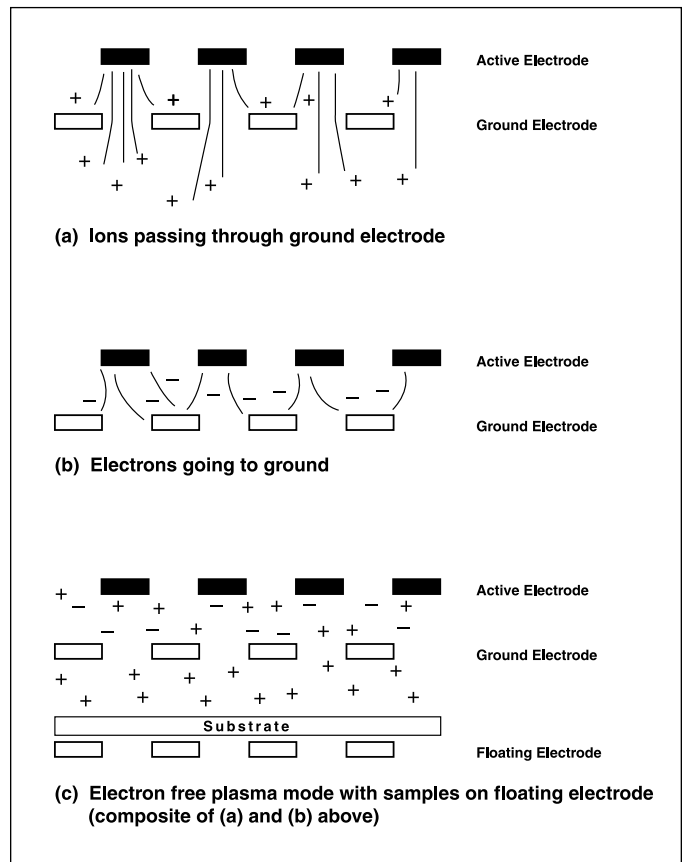


Figure 2.



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