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Optimizing Persistent Negative Hydrogen Beams from High-Power RF Plasma Sources MARTIN STOCKLI, BAOXI HAN, SYD MURRAY, TERRY PENNISI, CHIP PILLER, MANUEL SANTANA, ROBERT WELTON, Oak Ridge National Laboratory — High-power RF ion sources produce intense beams of negative H- ions for high-power accelerators using charge-changing injection schemes. The inductively induced RF plasma produces copious amounts of positive ions, electrons, and excited molecules. Energetic electrons rapidly destroy H- ions with their 0.75 eV electron affinity. A ∼250 G filter field reflects the energetic electron while the cold electrons, the ions, and the molecules can drift towards the outlet. There slow electrons colliding with highly excited vibrating molecules form H- ions that can be extracted. However, production yields suggest that most negative ions are formed on a conical Mo converter surface, which surrounds the outlet. This appears to be especially true when the surface is covered with a fractional layer of Cs. The persistence of the extracted H- beam suggests that the Cs layer is persistent, likely due to low levels of impurities and hydrogen being to light to sputter Cs atoms from the metallically clean surface. Experimental evidence, data, and simple models will be presented to support our findings.

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