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## Requirements for High Voltage Power Modulator for Long-Pulse Plasma Immersion Ion Implantation

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Long-pulse plasma immersion ion implantation (PIII) has a number of advantages compared to conventional short-pulse PIII, for example, better energy monotonicity, higher power, and time efficiency. In typical PIII experiments, the pulse width of the sample high voltage is limited by the chamber dimensions and plasma parameters. We are proposing a novel idea to overcome this limitation. A grounded conducting grid positioned between the wafer stage and plasma radio-frequency (RF) source is used to block the plasma sheath expansion. In this way, long-pulse PIII experiments can be conducted in a normal PIII system. This new method is especially useful for separation by plasma implantation of oxygen (SPIMOX).

In this paper, the typical experimental parameters and results pertaining to long-pulse PIII will be described. The voltage and current waveforms will be discussed. Our experimental results indicate that under the long-pulse mode, the current is quite small and the pulse tail is very long. This will introduce more ions with lower impact ions and is bad news for energy monotonicity. The usual way to reduce this voltage tail is to add a resistor, but the power wasted is too large in the long-pulse PIII mode. We propose to use another switch tube in the high voltage modulator to pull down this tail.

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