

## EMITTANCE MEASUREMENTS OF THE SEMEQUIP ION SOURCE

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The emittance of an ion beam plays a major role in determining its transmission properties. The source design and operating characteristics are solely responsible for the emittance, since no lossless optical manipulation of the beam can improve it once the beam has been extracted from the ion source. Beams extracted from Bernas-style arc discharge sources are quite noisy, and have a relatively large emittance. Furthermore, ion beams extracted from Bernas sources with indirectly-heated cathodes have been reported to have an even larger emittance.<sup>1</sup> As the scaling of IC's drives the energy of the implants down, it concurrently drives the doses up. This combination exerts enormous pressure on the implant industry to deliver low energy, high current beams to the wafers. Since the emittance largely determines how much beam will be lost during transport, this inherent property of the ion source increasingly imposes fundamental limits on the productivity of ion implanters.

We will describe a new "cold" ion source that has up to an order of magnitude better emittance than sources currently in use. The SemEquip source also exhibits low noise characteristics, typically 1% rms. The emittance data from this new source has been collected over a wide range of energies and species. We will show emittance data for all of the popular n and p dopants at energies from 100 eV to 40 keV. In addition to emittance, we will show beam profile data for beams generated by this new source and transmitted through an implanter beam line.

1. S. Povall et al. "Emittance considerations in ion source design and operation", Ion Implantation Technology-IIT2000 International Conference, Alpbach, Austria, September 2000.