PBS&T

What Gas Concentrator Does in Focused Ion Beam System?

Applicable to Focused Electron Beam Systems and Broad-Beam Apparatus

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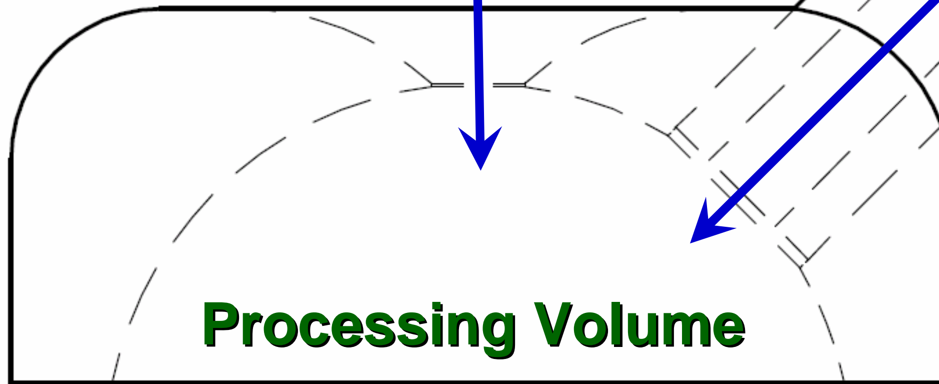
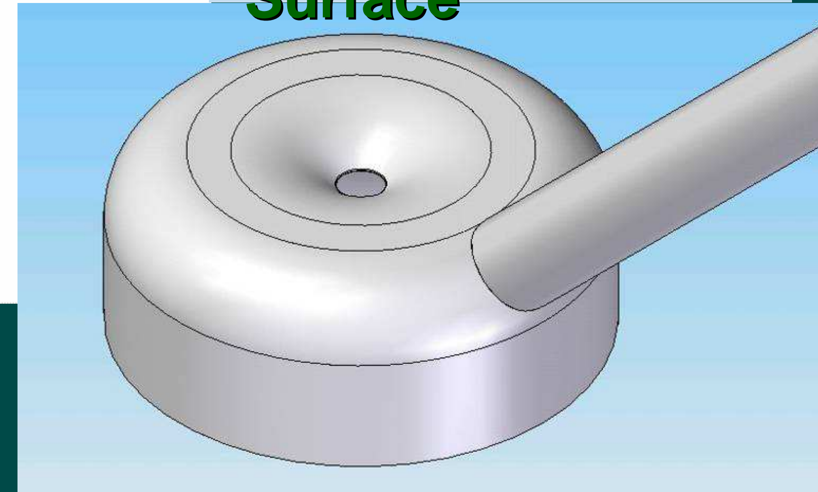
Outline

- Gas pressure considerations
- Electron optics considerations
- Endpoint detection considerations
- References

CUPOLA Gas Concentrator



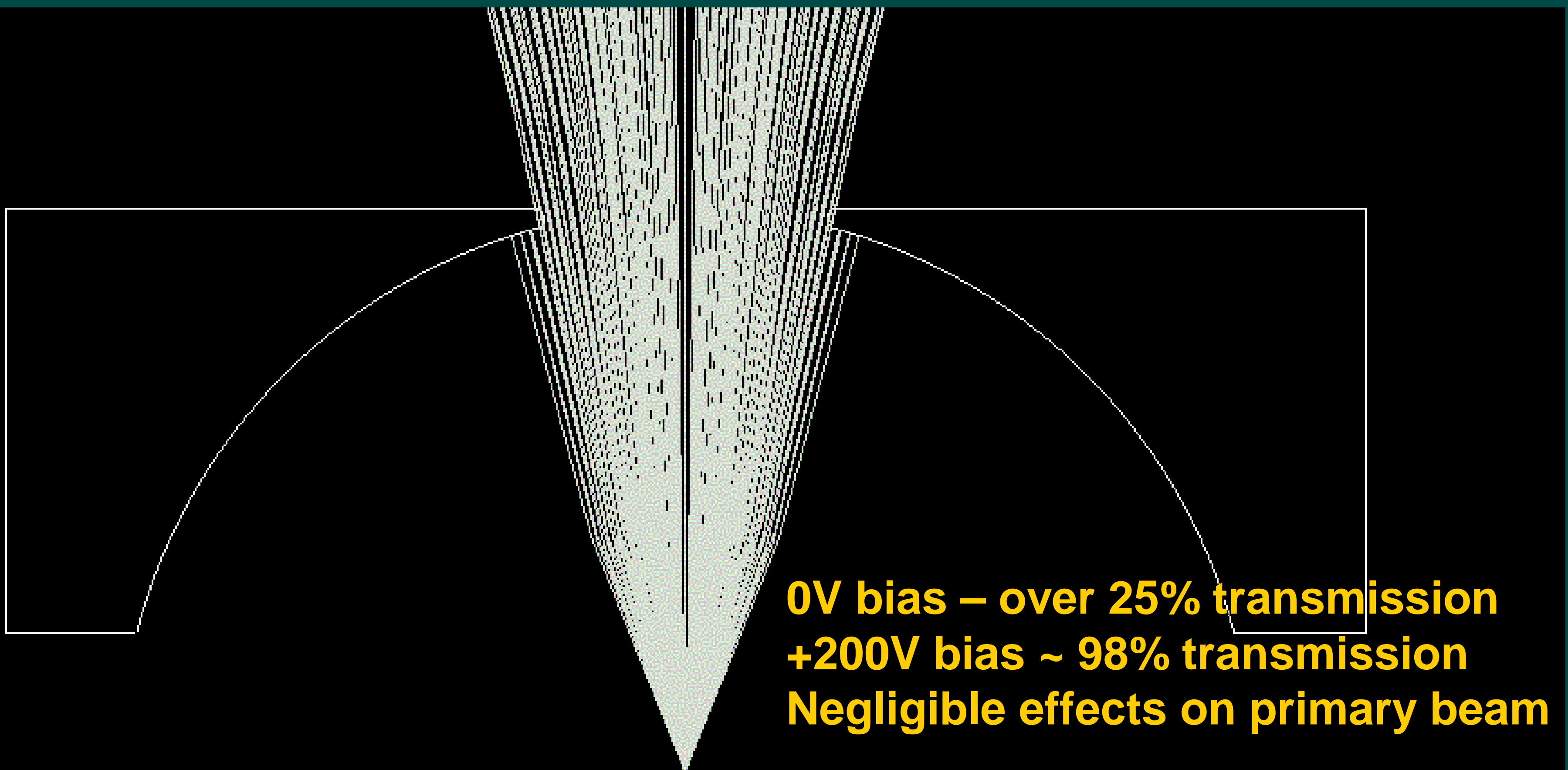


Gas Pressure Considerations

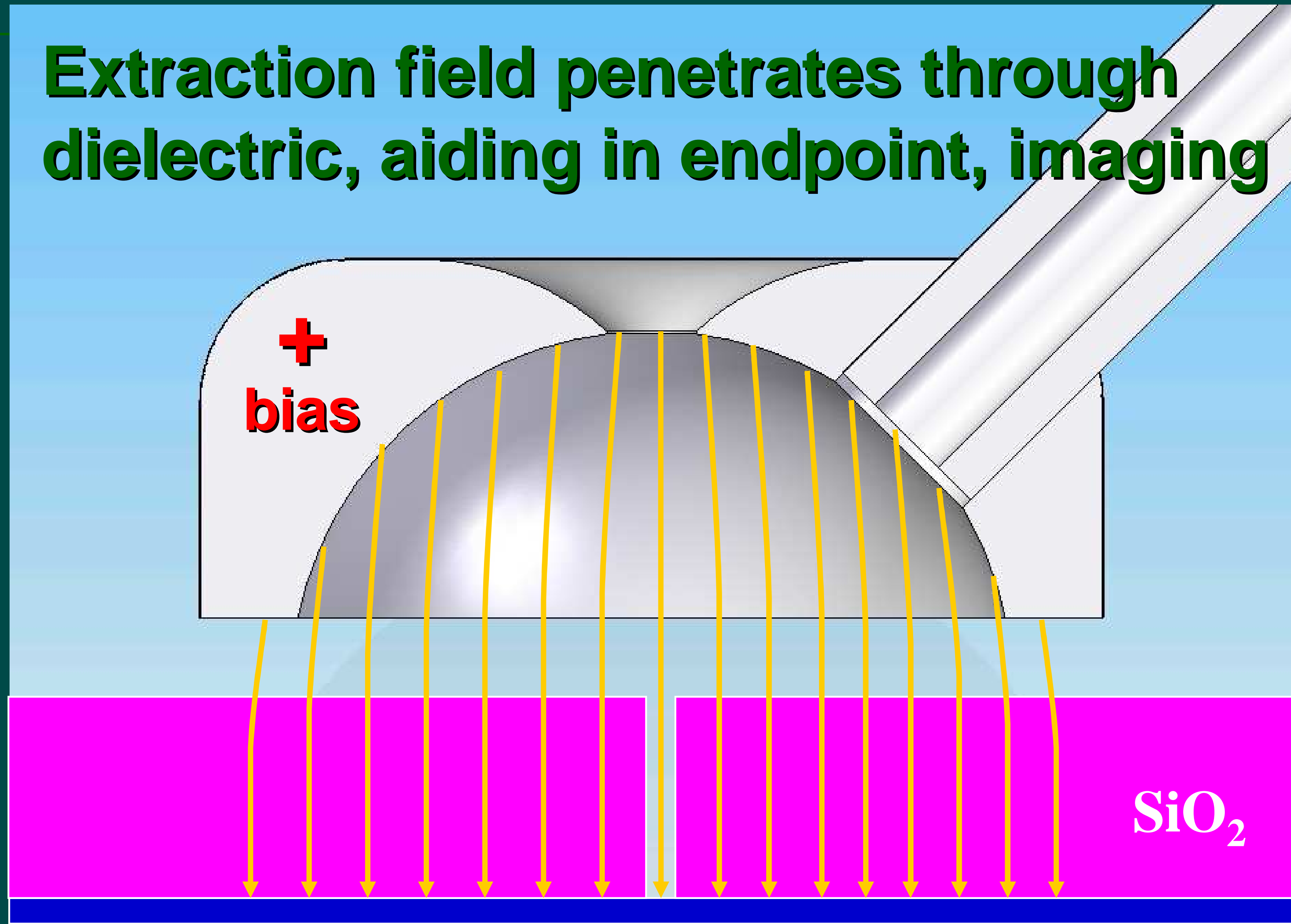
- Pressure in low mTorr range within ~2 mm^3 process volume, optimal for GAE and deposition
  - » Beam path in high pressure ambient minimized and scattering of the primary beam is reduced
- System chamber maintained at ~ 10E-6 Torr
  - » Reduced damage to main chamber components by the reactive process gases

Electron Optics Considerations

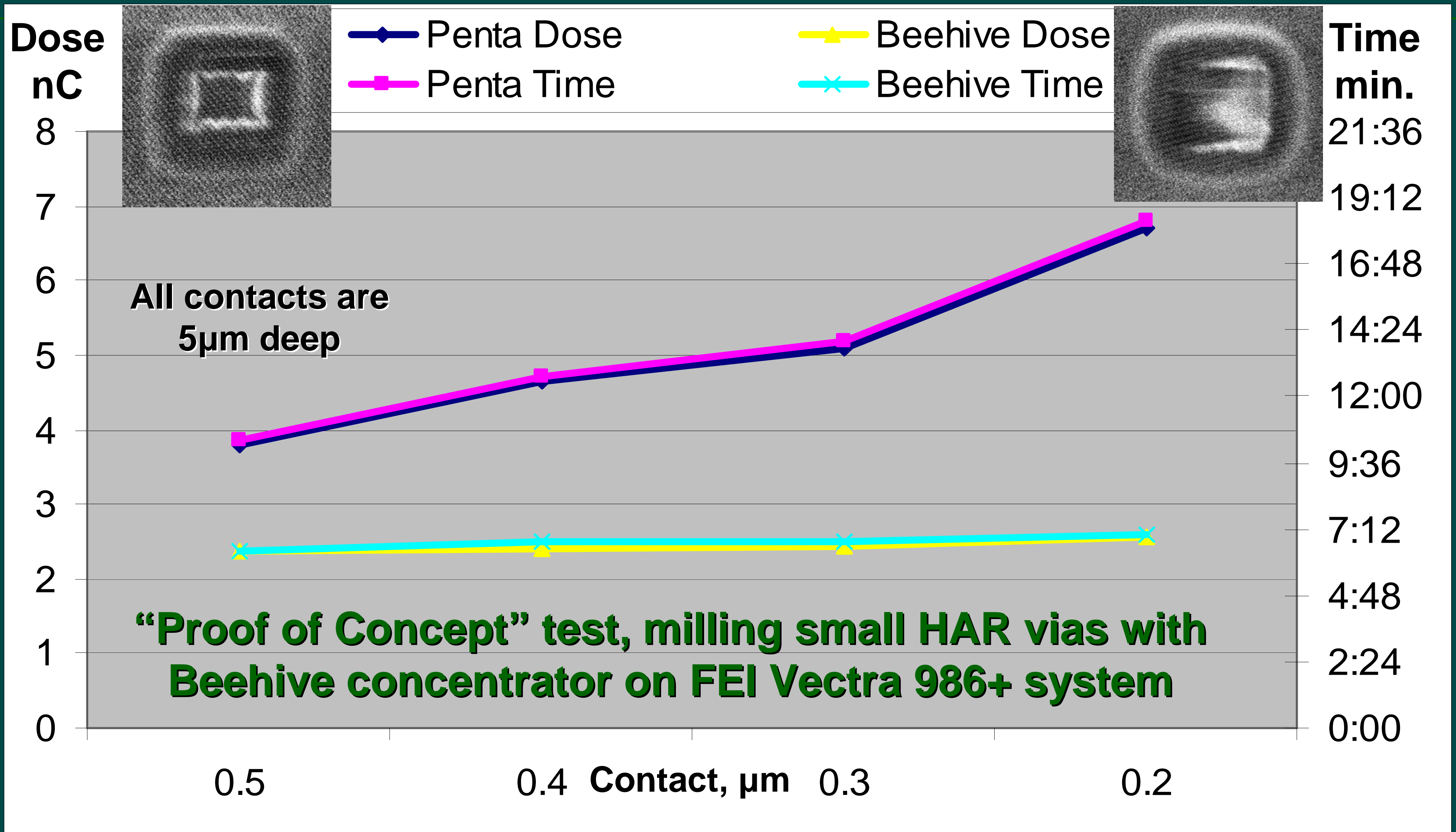
Concentrator effectively transmits secondary electrons



Endpoint Detection Considerations



Throughput Considerations



Summary

- Positively-biased gas concentrator in particle beam processing tool improves
  - » Gas pressure regime
  - » Imaging concurrent with processing
  - » Endpoint detection
  - » Enhances milling throughput

References

- V. Ray “Virtual process chamber…..” EIPBN 2004 and JVST B 2004
- V. Ray “High-throughput HAR via milling” EFUG and ISTFA 2005
- C. Rue et. al. “Backside circuit edit on full thickness Si devices” ISTFA 2008