EUV Light Source Development at Energetiq

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Electrodeless Z-Pinch™ Plasma

Energetiq's EUV light sources are the industry standard source for EUV infrastructure R&D, inspection, resist development, outgassing, mirror testing, and more.

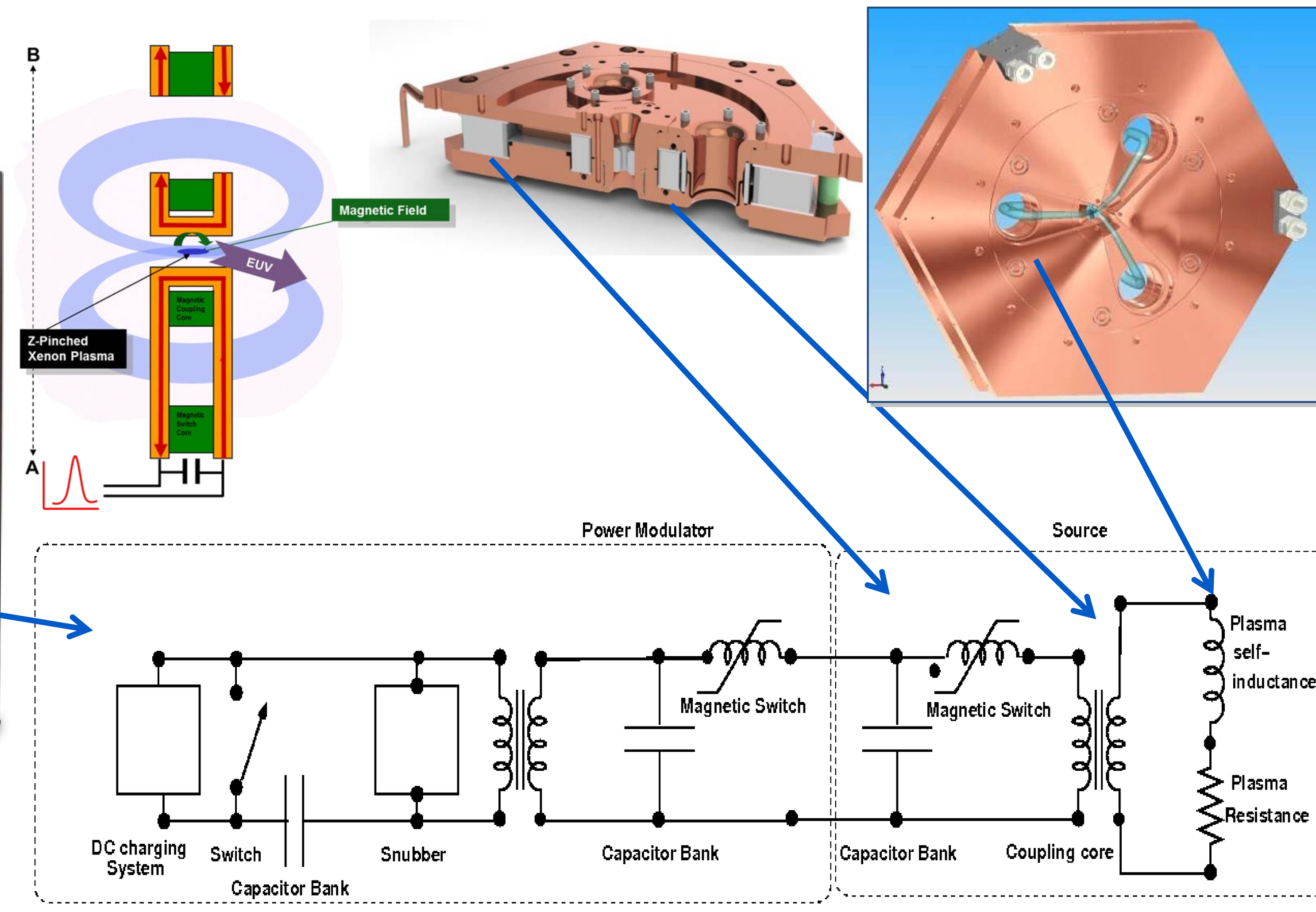
The Electrodeless Z-Pinch™ EUV Source is a reliable and stable source of EUV photons and is being operated in the field 24/7 with consistent operation over many years.

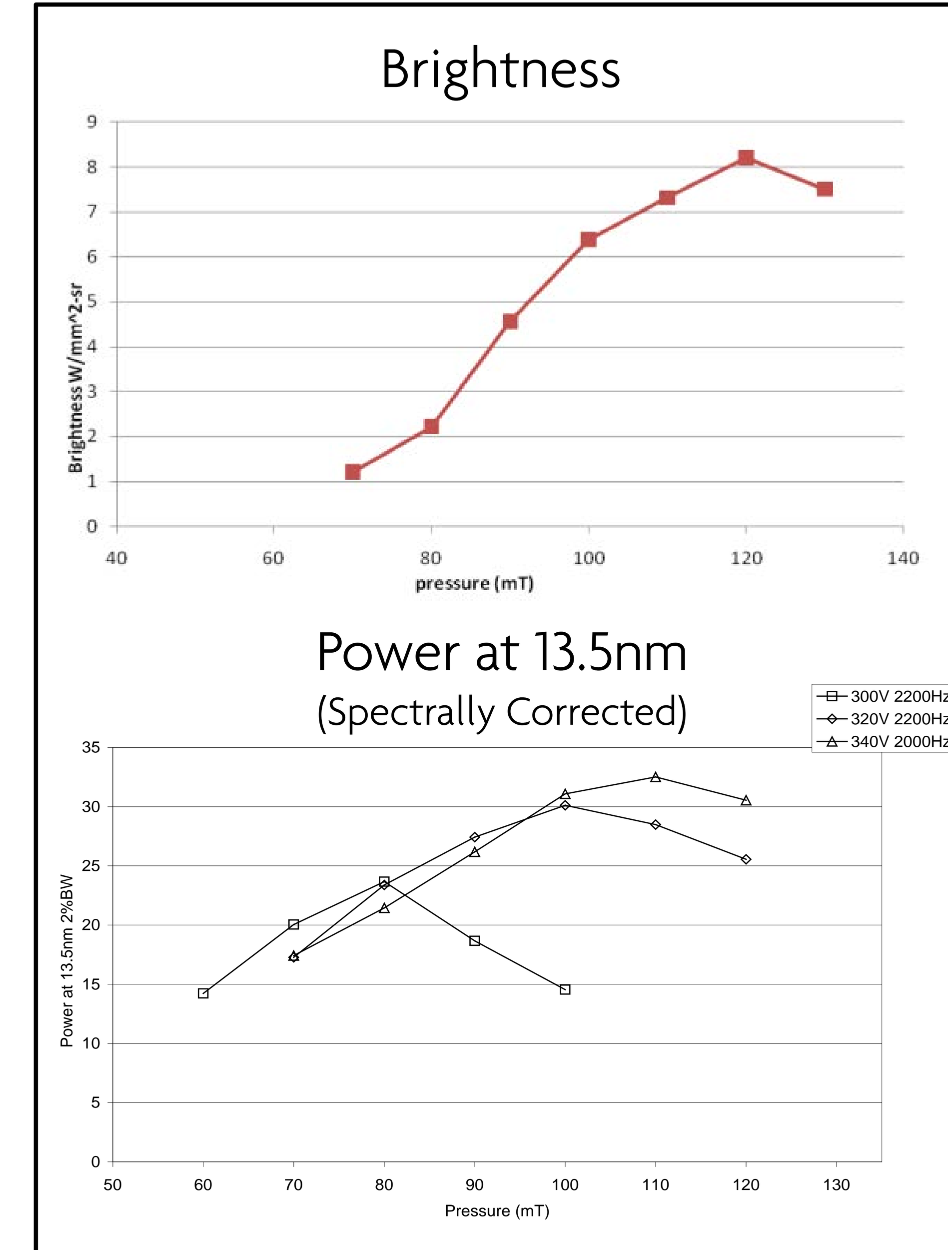
Key Features:

- 20 W of 13.5nm ±1% Power in 2π
- ~8 W/mm2-sr brightness
- >95% uptime; 24/7 stable operation
- Low cost of ownership

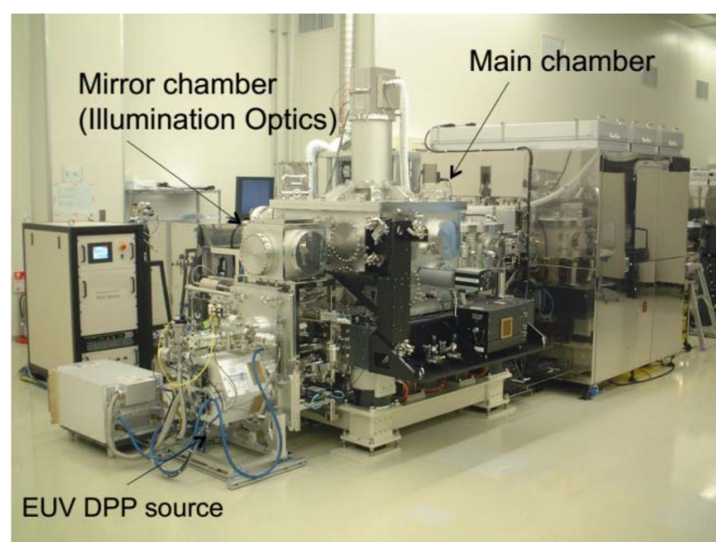
Patented Electrodeless Z-Pinch™

Inductively driven, Electrodeless Z-Pinch™ – integrated magnetic switch.

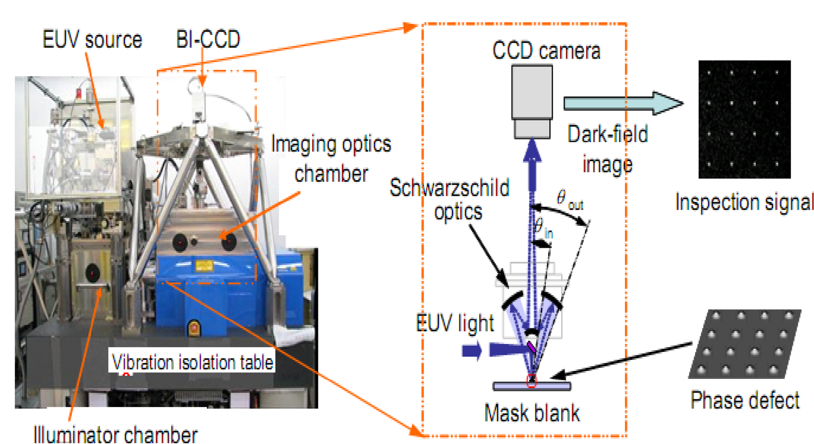




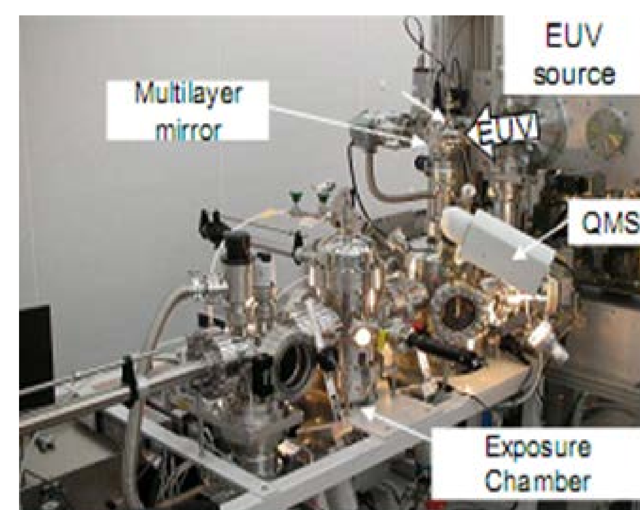
Applications and Installations (>30 units delivered)

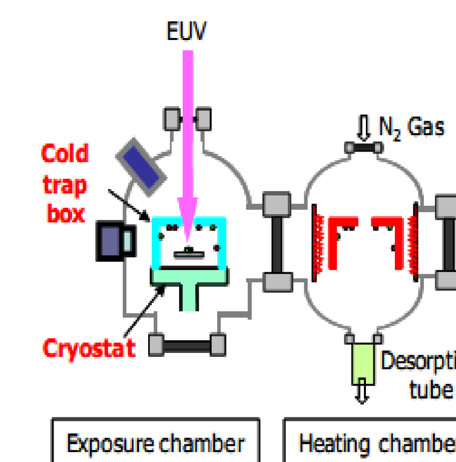


Lasertec/EIDEC mask inspection tool [2, 3]



Actinic mask inspection tool at Selete [4]





EUV technology outgassing tool at IMEC [6]

Flood exposure system at Osaka University [5]

LithoTech outgassing tool at Selete [7]

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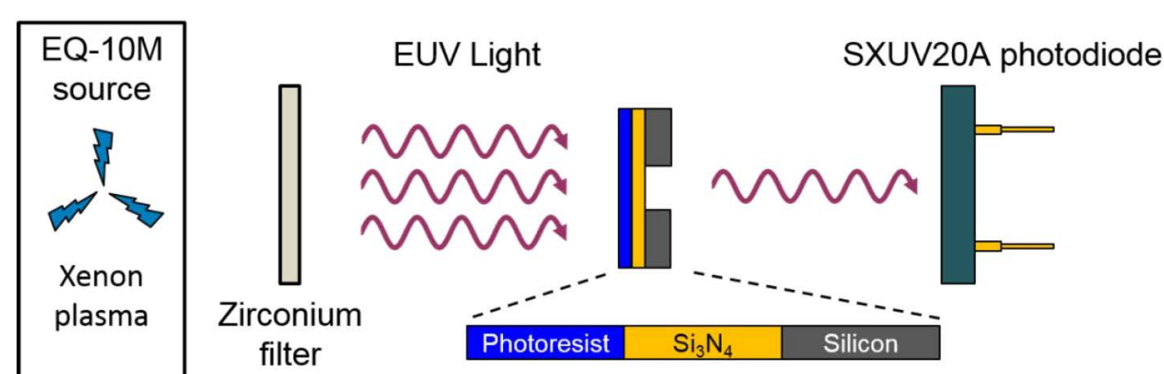
Actinic mask inspection with AIMS™ [8]



Resist reactivity at SUNY Poly at Albany [9]

References

1. Matthew J. Partlow ; Matthew M. Besen ; Paul A. Blackborow ; Ron Collins ; Deborah Gustafson, et al. "Extreme-ultraviolet light source development to enable pre-production mask inspection", J. Micro/Nanolith. MEMS MOEMS. 11(2), 021105 (May 21, 2012).
2. Tchikoulaeva, Anna, et al. "EUV actinic blank inspection: from prototype to production." SPIE Advanced Lithography. International Society for Optics and Photonics, 2013.
3. Takehisa, Kiwamu, et al. "Defect review capability enhancement for actinic blank inspection tool.", 2016 International Symposium on Extreme Ultraviolet Lithography, Hiroshima, Japan, October 2016.
4. Terasawa, Tsuneo, et al. "Development of actinic mask blank inspection technology at Selete." 2008 EUVL Symposium, http://www. sematech. org/meetings/archives/litho/8285/pres/ME-02-Terasawa. pdf. 2008.
5. Sekiguchi, A., et al. "Study on photochemical analysis system (VLES) for EUV lithography." Advanced Lithography. International Society for Optics and Photonics, 2007.
6. Pollentier, I., et al. "Characterization of EUV optics contamination due to photoresist related outgassing." SPIE Advanced Lithography. International Society for Optics and Photonics, 2010.
7. Santillan, Julius Joseph, Shinji Kobayashi, and Toshiro Itani. "EUV resist outgassing analysis in Selete." SPIE Advanced Lithography. International Society for Optics and Photonics, 2008.
8. Dirk Hellweg ; Markus Koch ; Sascha Perlitz ; Martin Dietzel and Renzo Capelli. " Actinic review of EUV masks: performance data and status of the AIMS EUV system ", Proc. SPIE 10143, Extreme Ultraviolet (EUV) Lithography VIII, 101430J (March 24, 2017); doi:10.1117/12.2261662
9. Steven Grzeskowiak ; Amrit Narasimhan ; Michael Murphy ; Lee Napolitano ; Daniel A. Freedman, et al. " Reactivity of metal-oxalate EUV resists as a function of the central metal ", Proc. SPIE 10146, Advances in Patterning Materials and Processes XXXIV, 1014605 (March 27, 2017); doi:10.1117/12.2258151;

ENERGETIQ

Patent Numbers
US: 8143790; 7948185
Other patents pending

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