

Small Field Exposure Tool (SFET) LPP Light Source Status

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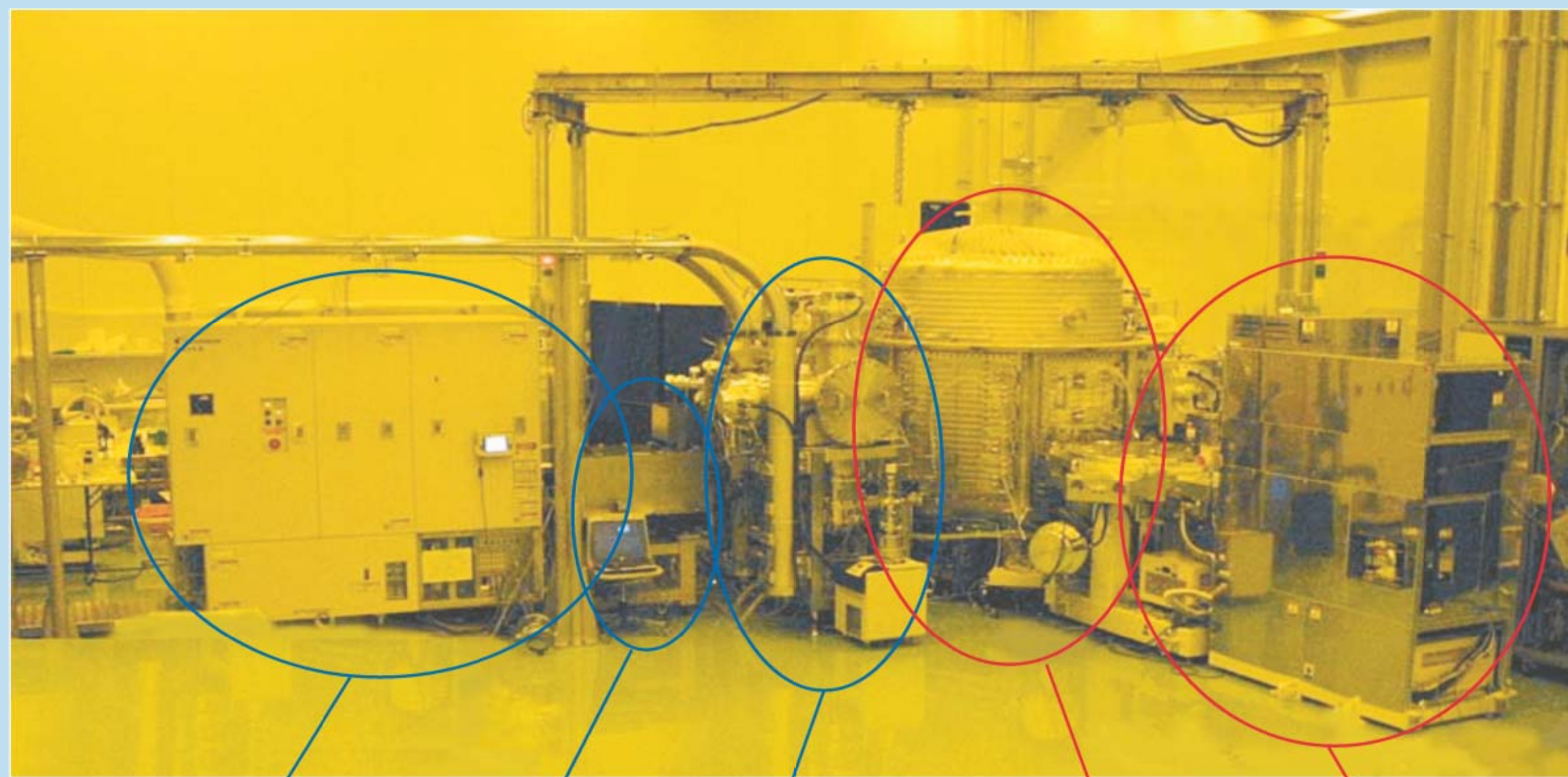
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Abstract

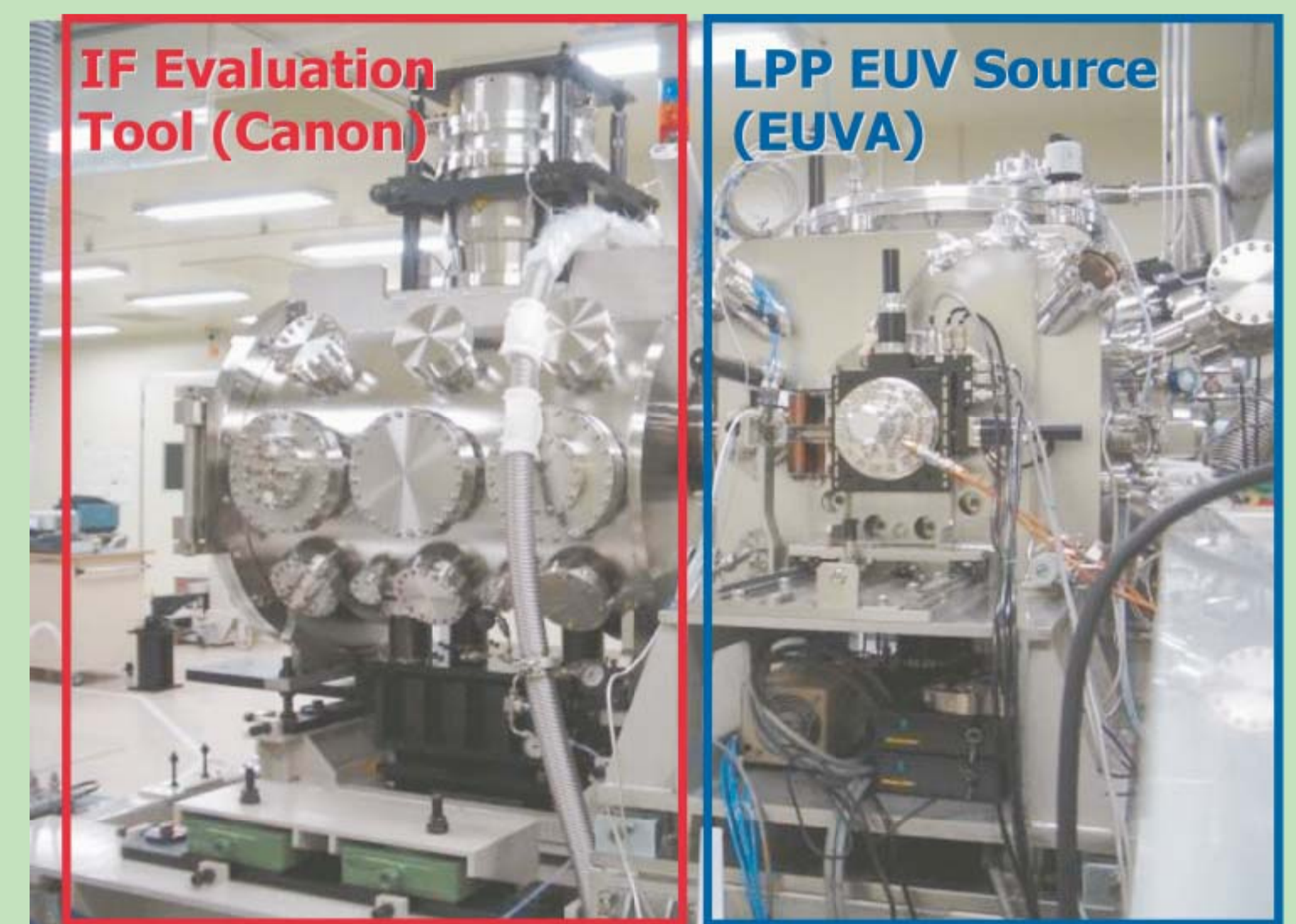
A small field exposure tool (SFET) has been developed in Japan by EUVA and Canon Inc. EUVA, in cooperation with Komatsu Ltd. and Gigaphoon Inc., developed the light source, which is a xenon plasma driven by a KrF excimer laser. The main characteristics of the light source - now in operation at SFET - are briefly presented.

Small Field Exposure Tool



KrF laser beam delivery light source SFET wafer unit

LPP EUV Light Source with IF Evaluation Tool from Canon



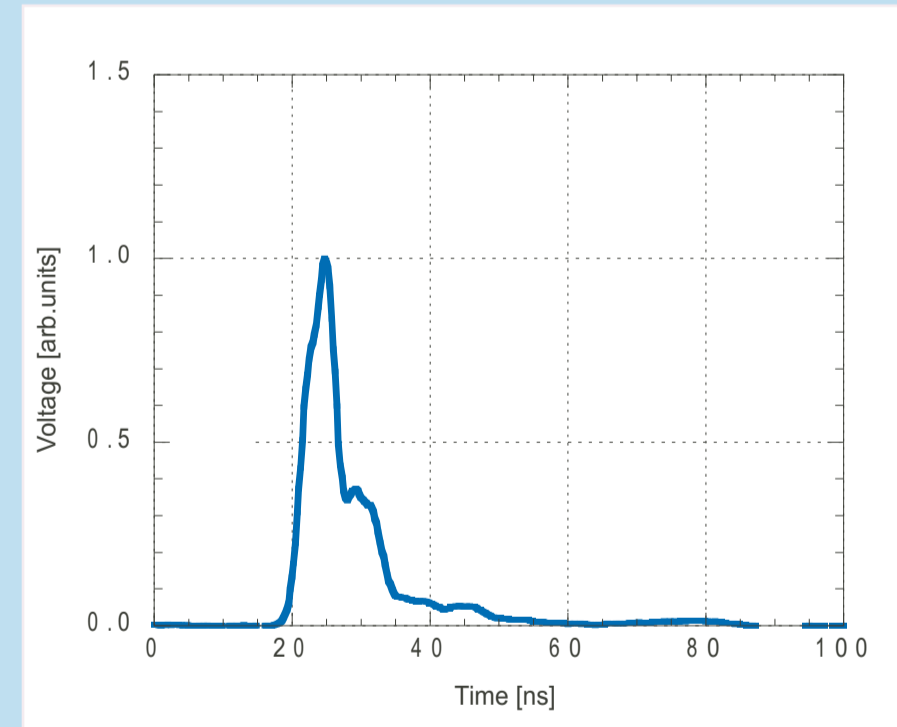
LPP Light source specifications

EUV power	0.5 W at IF
target material	Xenon (jet)
drive laser	KrF (248 nm)
max. repetition rate	4 kHz
collector mirror lifetime	> 150 Mpls

Drive Laser



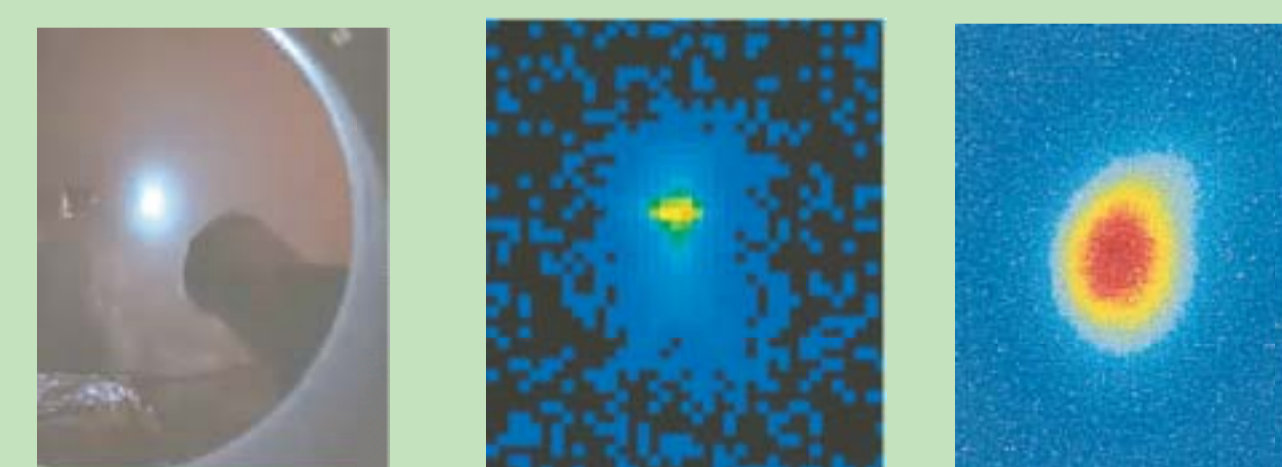
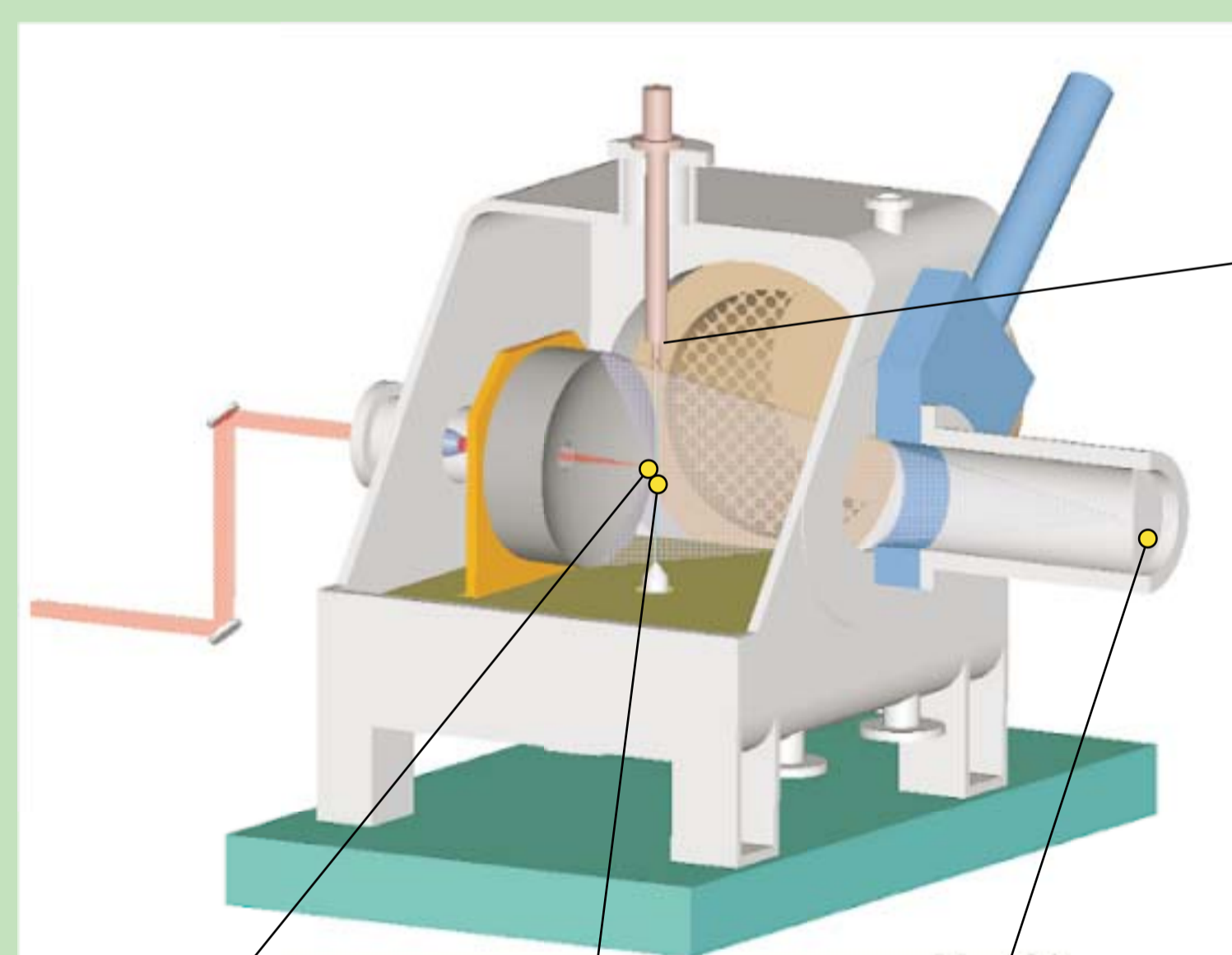
temporal pulse shape



excimer laser	KrF
wavelength	248 nm
max. pulse energy	145 mJ
max. rep.rate	4 kHz
max power	580 W
pulse length	15 ns

LPP Light Source Characteristics

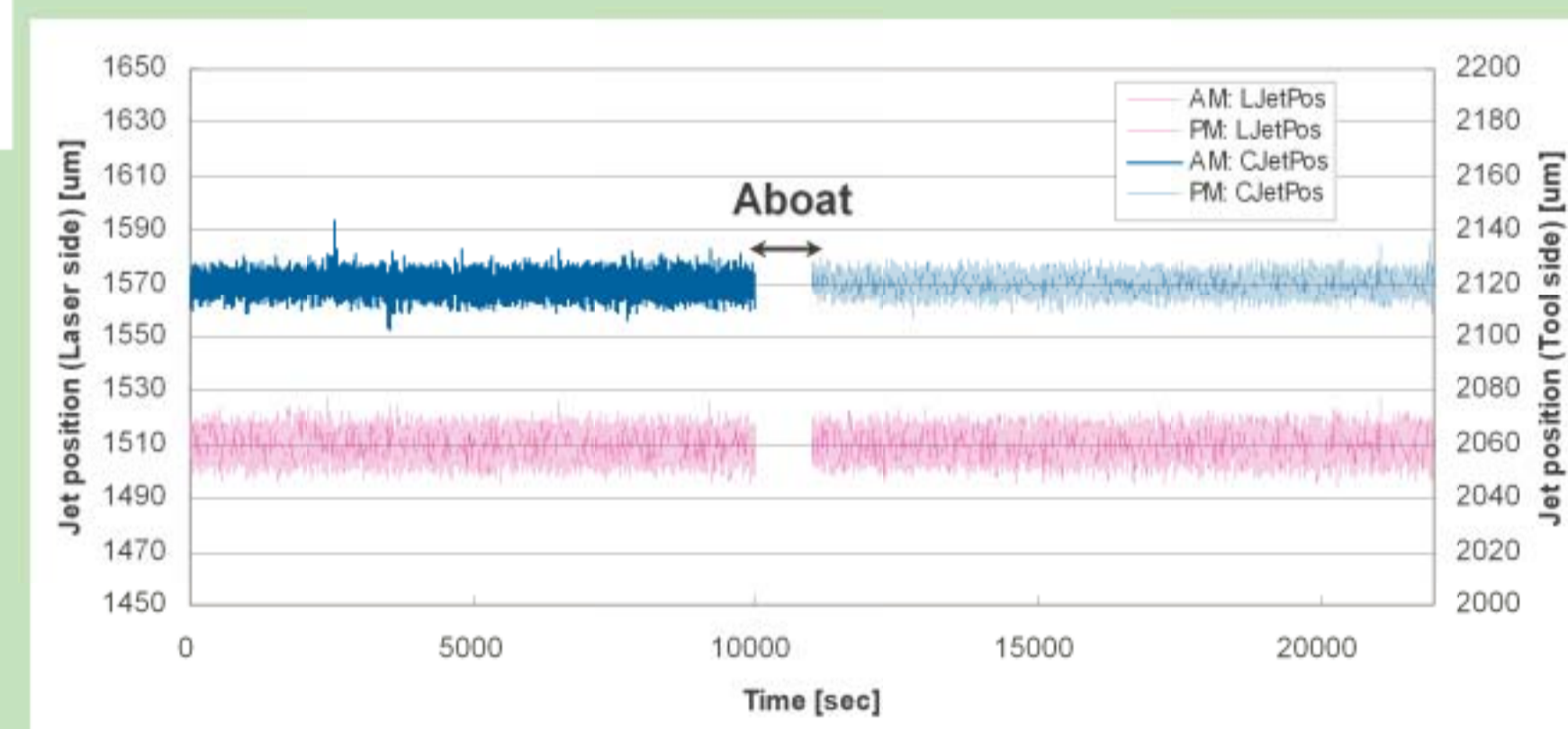
Plasma Size and Source Stability



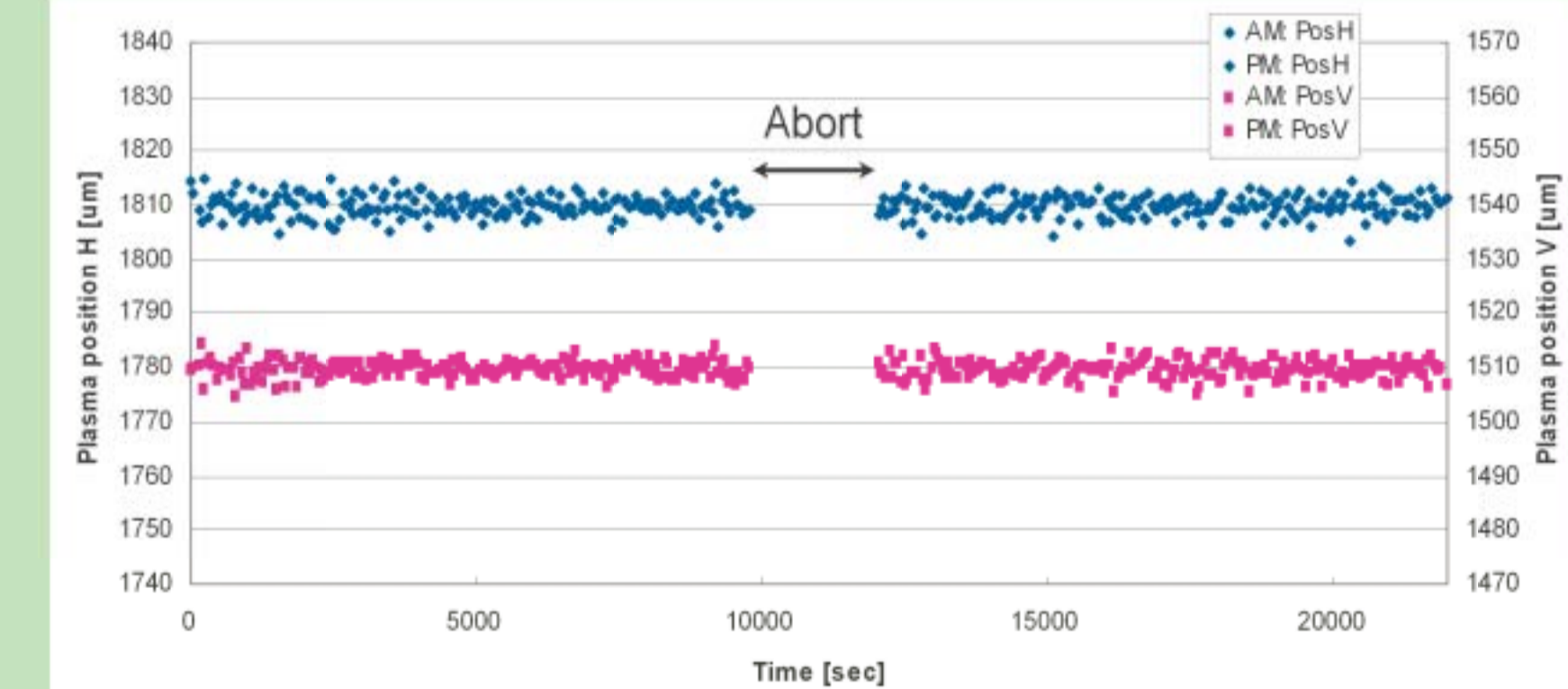
- A: xenon source plasma (VIS)
- B: laser spot size
vertical 65 μm , horizontal 53 μm (fwhm)
- C: in-band EUV at IF (measured by Canon)
vertical 65 μm , horizontal 53 μm (fwhm)



Xe Jet position stability



Plasma position stability



Summary

A small field exposure tool has been developed by EUVA and Canon Inc. The laser produced plasma light source is based on a a xenon jet. The drive laser is a KrF laser, which has been developed by EUVA, Komatsu Ltd. and Gigaphoton Inc. The exposure tool is currently operated by Canon Inc. and Selete (Semiconductor Leading Edge Technologies, Japan).

Acknowledgments

This work was supported by the New Energy and Industrial Technology Development Organization - **NEDO** - Japan. Part of the source evaluation was conducted by Canon.