Pellicle HVM specifications

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Pellicle TWG 2016, San Jose CA

2-21-2016

Preliminary EUV pellicle requirements

Specifications shown at SPIE Advanced Lithography, 2014

	Item	Requirement
Pellicle material requirements	Pellicle film EUV transmission	90% single pass (81% double pass)
	EUV transmission spatial non-uniformity	< 0.2%
	EUV transmission angular non-uniformity	< 300 mrad max. local pellicle angle
	EUV intensity in scanning slit @ pellicle	5 W/cm^2 (250W EUV source equivalent)
	Lifetime	~315 hrs (production hours in a EUV+H_2 environment)
Pellicle + frame requirements	Standoff distance during exposure	2 ± 0.5 mm
	Max. acceleration	100 m/s^2 during scanning
	Max. ambient pressure rate of change	< 3.5 mbar/s (peak during pump-down/ vent in the load lock)
	Reticle reserved area for pellicle assembly (centered on substrate)	110.7 mm x 144.1 mm: inner 118.0 mm x 150.7 mm: outer

Preliminary EUV pellicle requirements
Update on 2014 specifications

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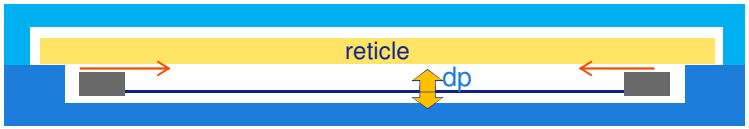
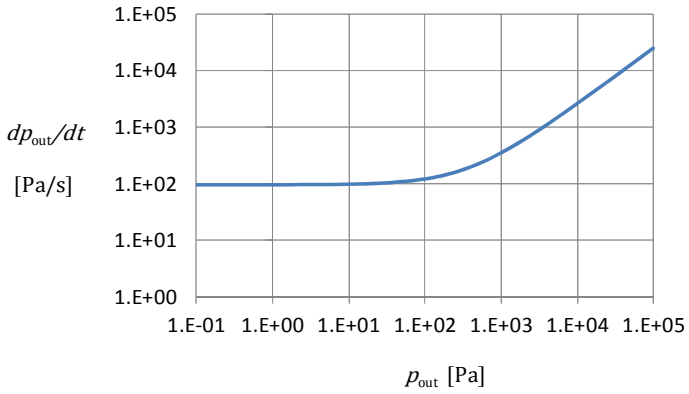
Max. ambient pressure rate of change

- While in the load lock, the gas in the pellicle volume needs to be removed (pump down) or filled (vent).
- The gas needs to pass the micro gap between the reticle and the pellicle frame, creating a flow resistance.
- This flow resistance creates a pressure differential over the film, which may not deflect more than 0.5 mm over the full cycle.
- For the NXE pellicle, ASML has modified the load lock curve to limit the differential pressure over the film to < 2 Pa.
  At this differential pressure, the film may not deflect more than 0.5 mm





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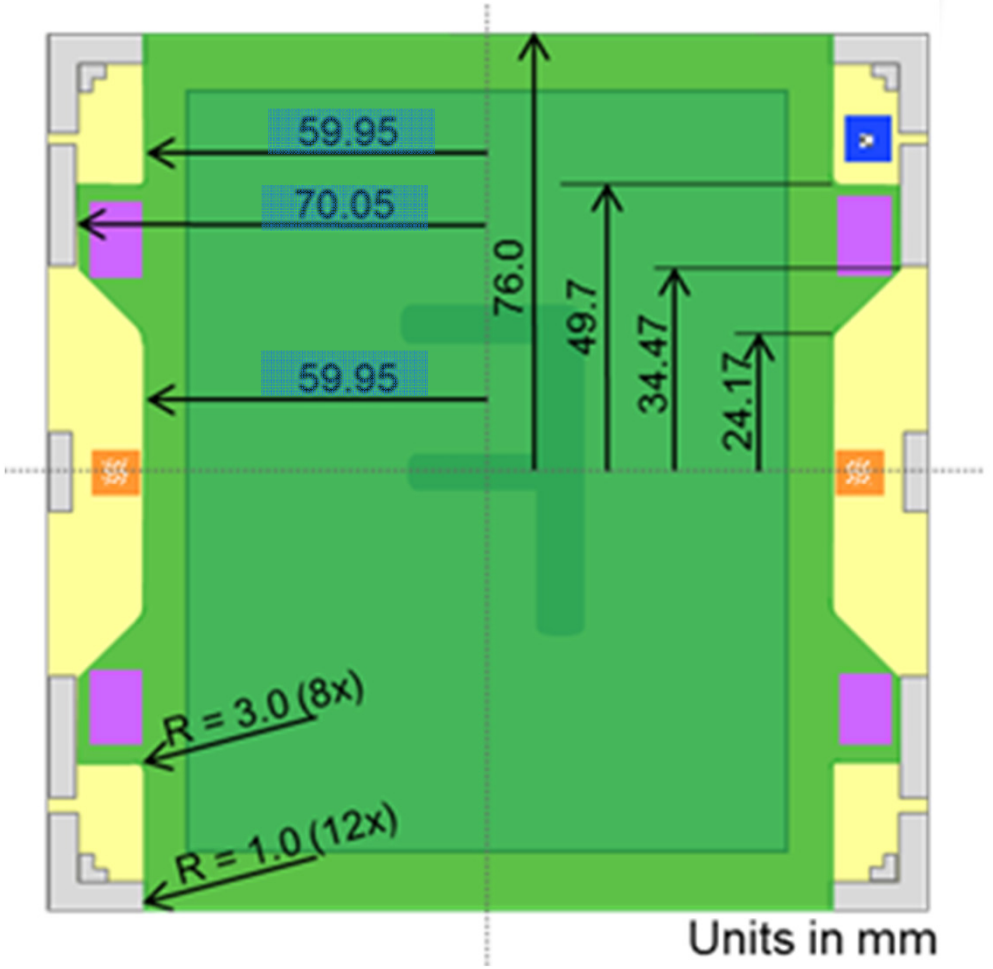
NXE pellicle reserved area

Area for pellicle on the reticle

Note: highlighted values are updated compared to RDM V11



NXE pellicle volume claim

Pellicle reserved volume (irt external tooling)

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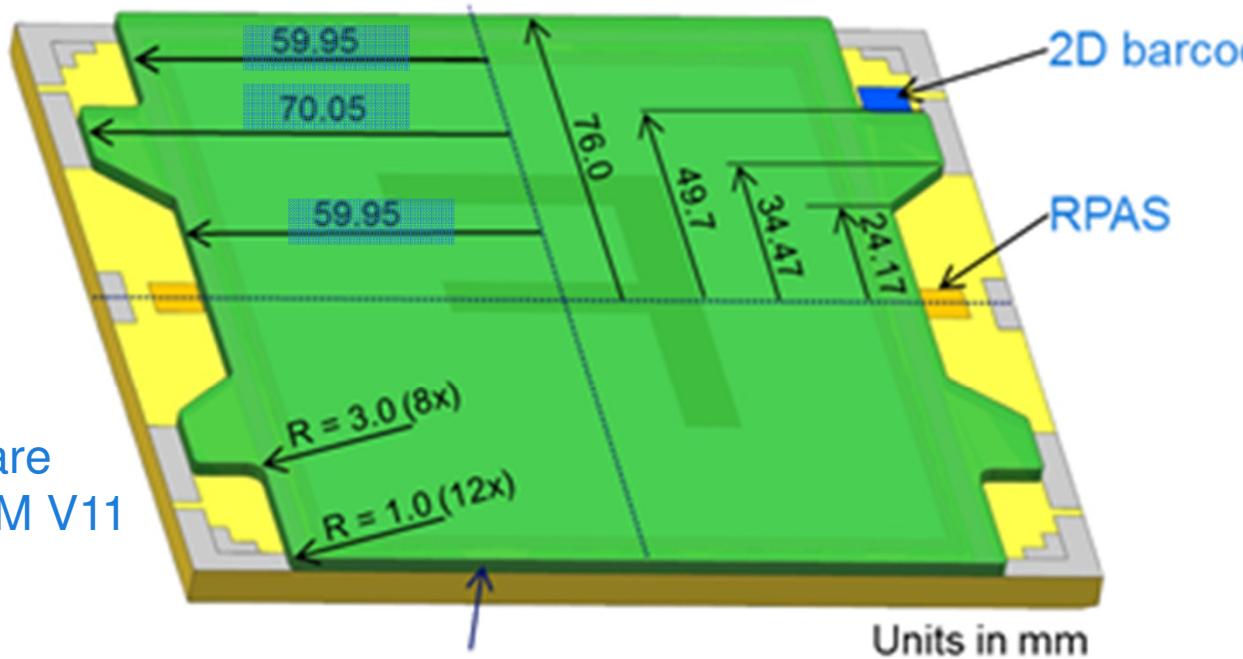


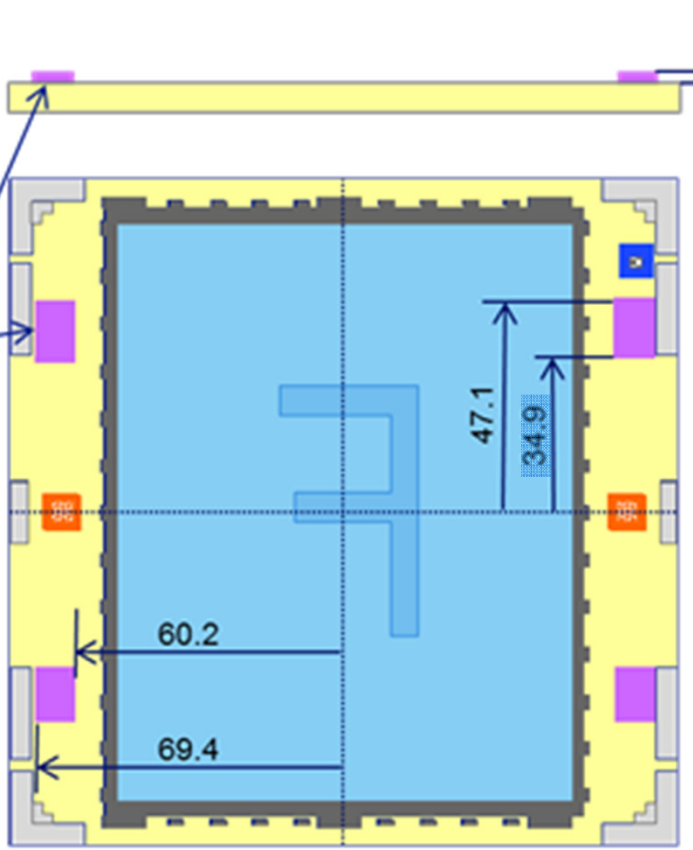
Pellicle volume height from reticle surface < 2.7mm

NXE pellicle stud reserved area

Areas reserved for studs

Frame mount reserved volume (4)
9.2mm x 12.2mm x 2.5mm

Mounting hardware is located in these 4 volumes



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Preliminary EUV pellicle requirements for HVM insertion

Update 2016: summary

ASML

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	EUV transmission spatial non-uniformity	**< 0.4% Half range**
	EUV transmission angular non-uniformity	< 300 mrad max. local pellicle angle
	EUV intensity in scanning slit @ pellicle	5 W/cm^2 (250W EUV source equivalent)
	Lifetime	**under investigation**
Pellicle + frame requirements	**Standoff distance during exposure**	**2.5 mm**
	Max. acceleration	100 m/s^2 during scanning
	Max. ambient pressure rate of change	**Pressure gradient according to LDLK curve** **Film: deflection at 2Pa dP < 0.5 mm**
	Reticle reserved area for pellicle assembly (centered on substrate)	**See drawings**

Update 2016: summary

- Pellicles will continued to be tested inside and outside of the NXE Scanner. This new learning will enable more accurate target setting for pellicles
- A more elaborate update on the requirements is expected at BACUS2016

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