

EUVL Solves All the Problems in Lithography

EUVA

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Problems in Lithography

1. Complicated process
2. CD control
3. Cost

Origin of Lithography Problems

year		2004	2007	2010	2013	2016
Technology node		90	65	45	32	22
Exposure	NA	Process factor (k1)				
ArF	0.85	0.40	0.29	0.20		
	0.92	0.43	0.31	0.21		
ArF-I	1.07		0.36	0.25	0.18	
	1.30		0.44	0.30	0.22	
	1.48			0.35	0.25	
EUVL	0.25			0.83	0.59	0.41

$$R = k_1 \times \lambda / NA$$

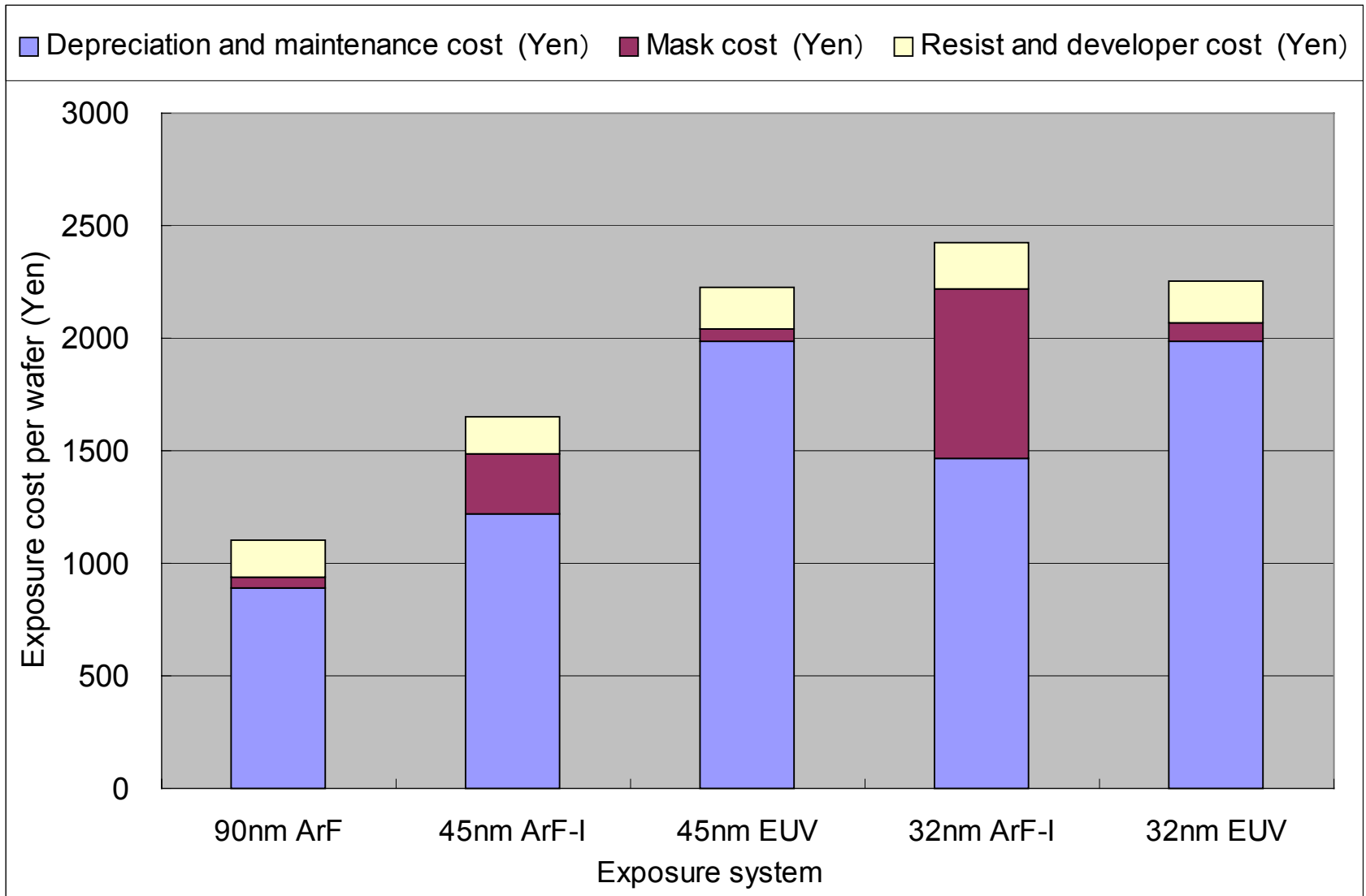
R: Resolution
 K1: Process factor
 λ: Exposure wavelength
 NA: Numerical aperture

Using high refractive index liquid

- Conventional (K1>0.5)
- Weak RET (k1>0.4)
- Strong RET (k1>0.25)
- Beyond Resolution limit

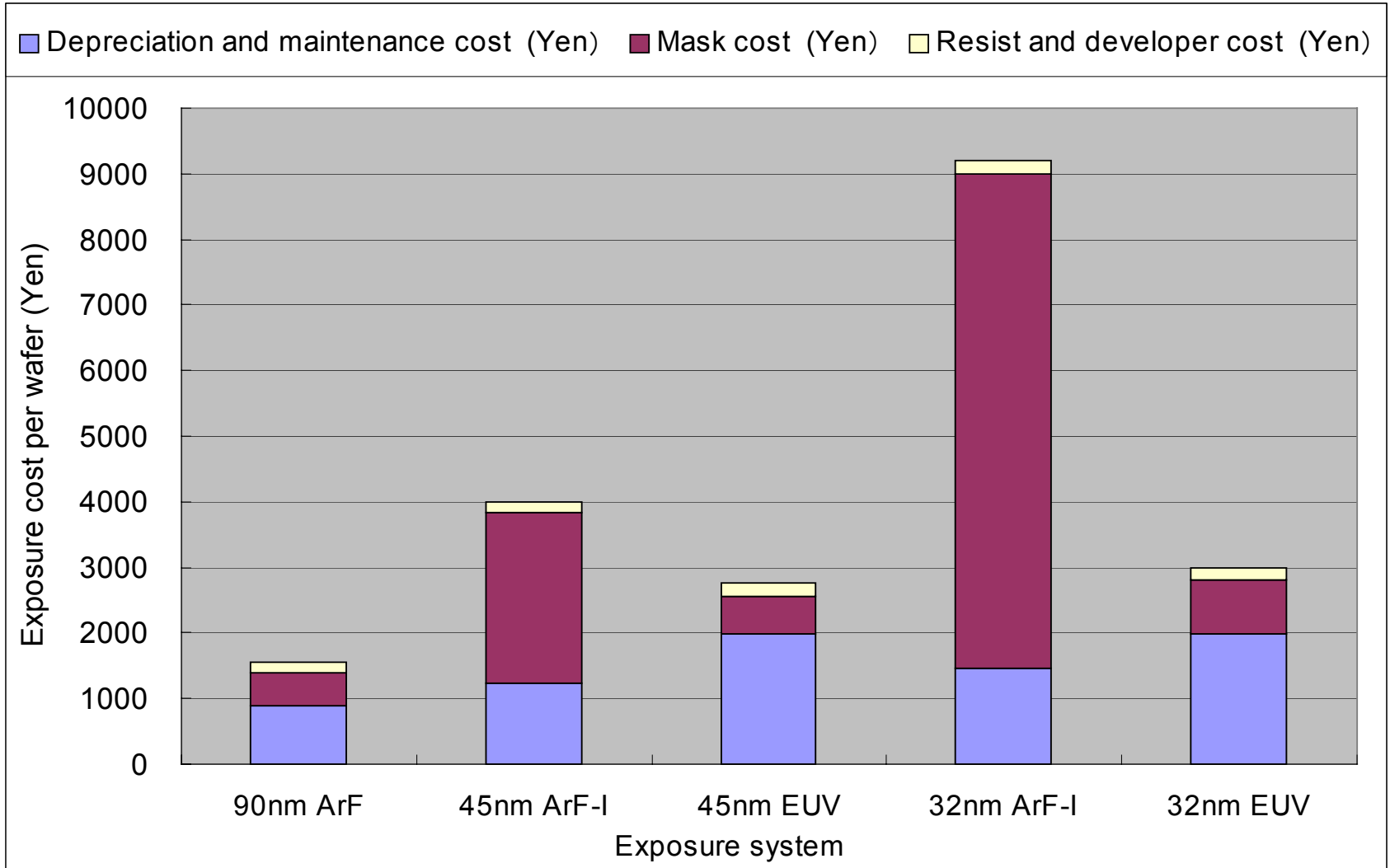
Exposure cost (100000 wafers/mask)

.....DRAM, MPU, FLASH



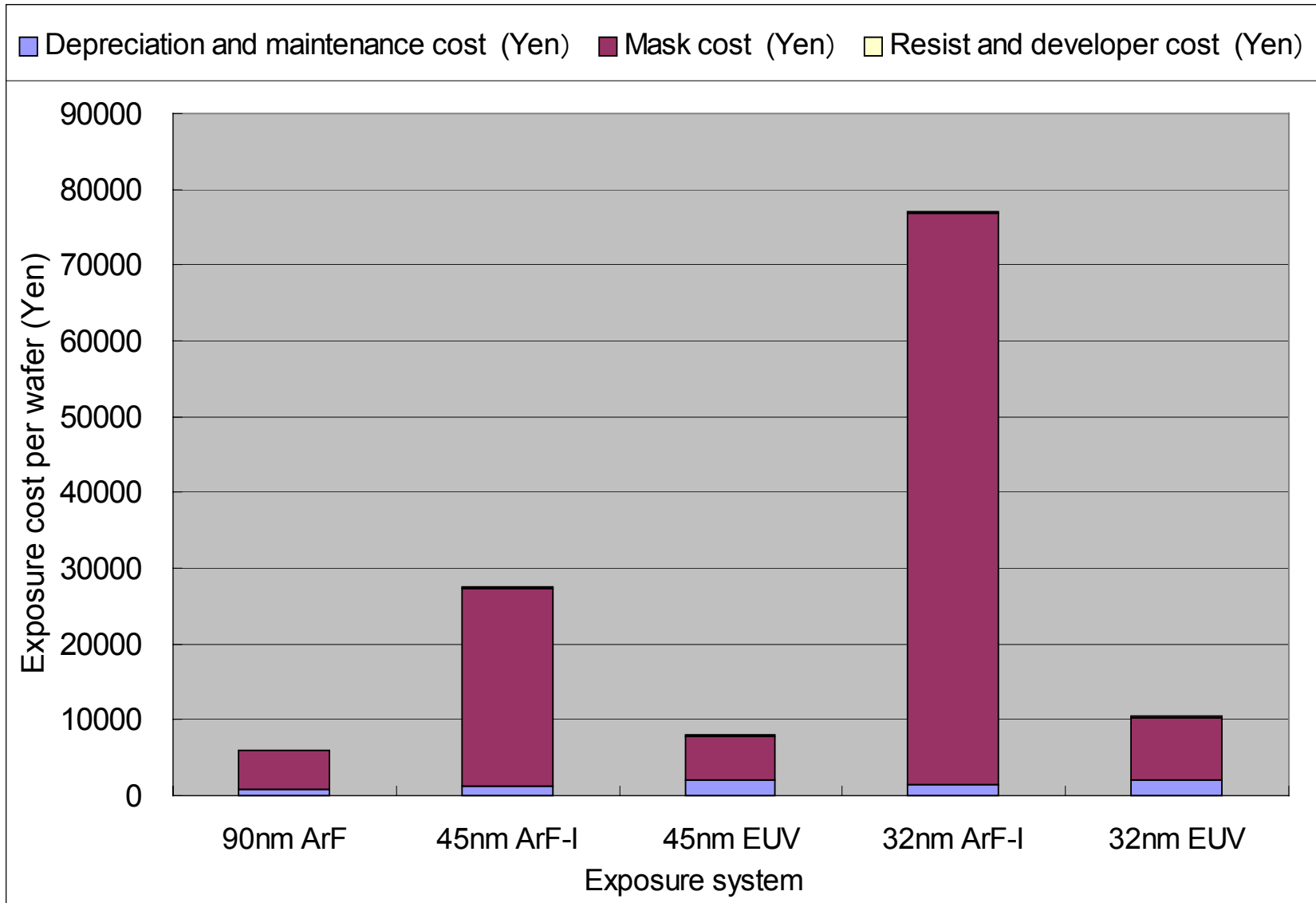
Exposure cost(10000 wafers/mask)

.....ASSP, High volume ASIC



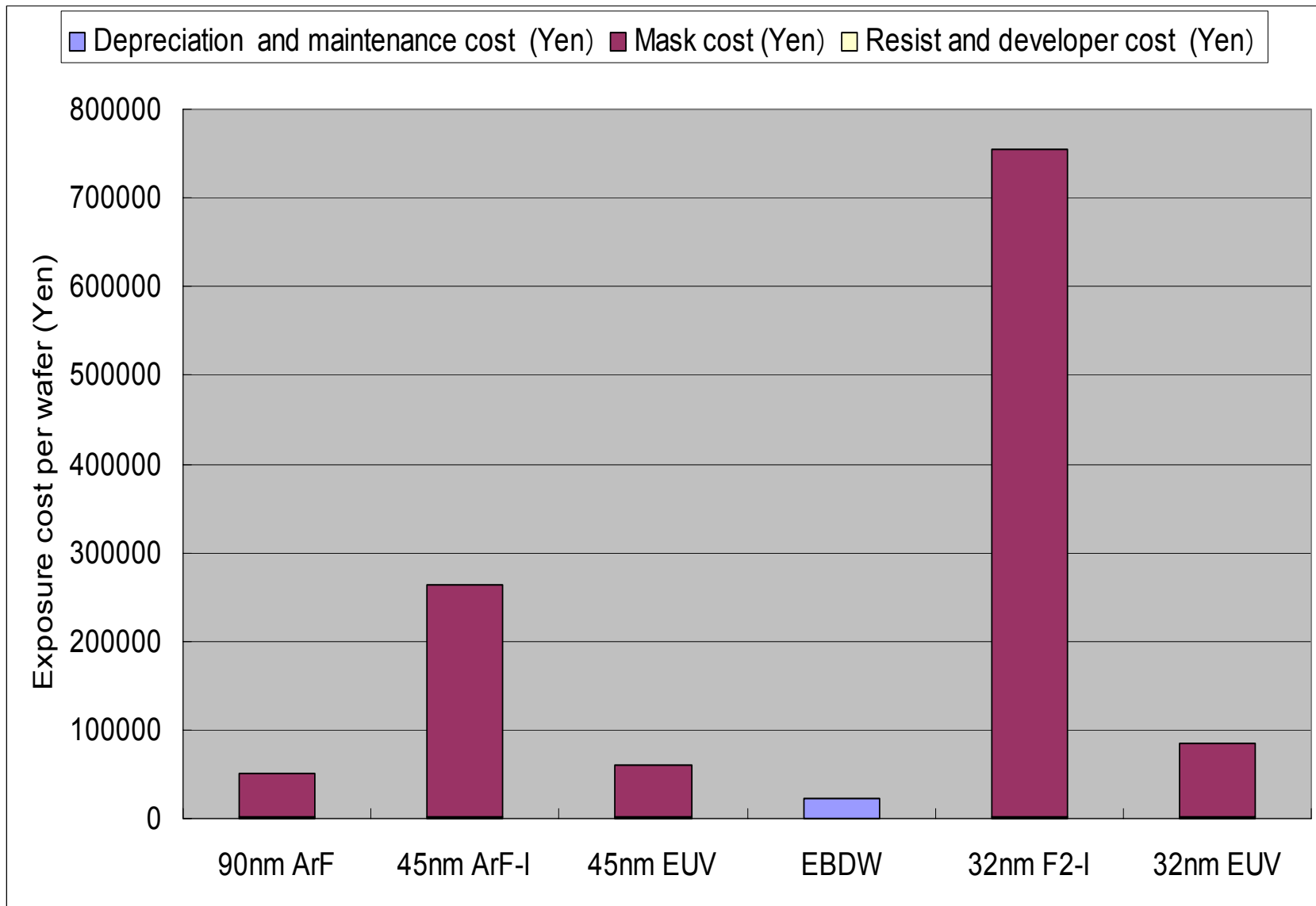
Exposure cost (1000 wafers/mask)

...Medium volume ASIC

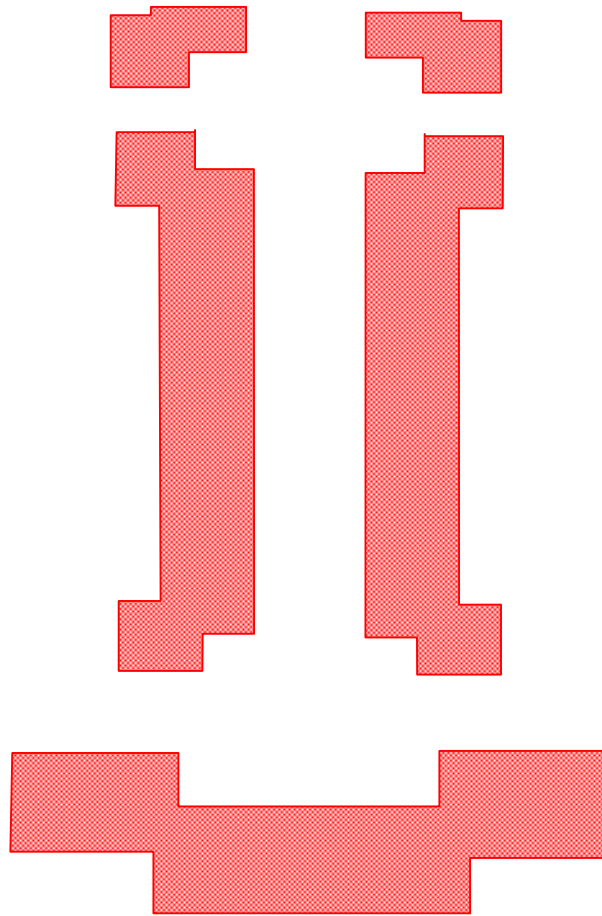


Exposure cost (100 wafers/mask)

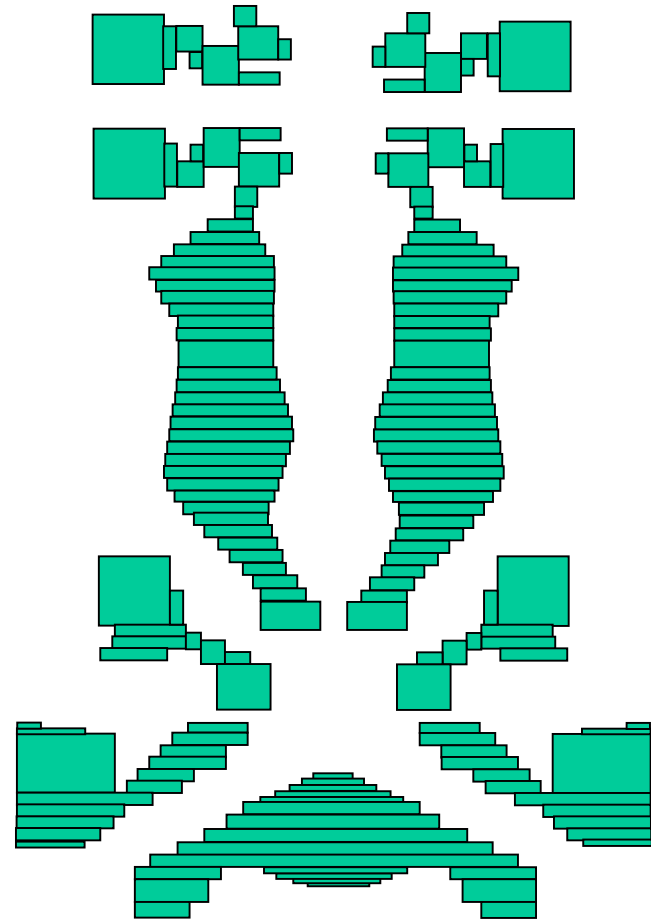
.....Small volume ASIC



OPC patterns in photo-lithography



Design patterns



OPC patterns on MASK

Conclusion

1. Photo-lithography have to use low-k1 process to delineate 45nmhp or 32nmhp patterns, and it causes several problems such as lack of CD control and cost.
2. Mask cost is increasing rapidly in photo-lithography due to the use of complicated OPC, and it will be a serious problem especially for ASIC business in hp45nm and hp32nm nodes.
3. EUVL can easily delineate 45nmhp and 32nmhp patterns using simple process, and therefore it is superior in CD control as well as cost.

**EUVL is essential for
ever lasting growth of
semiconductor business**

**Let's challenge
for EUVL!!**