

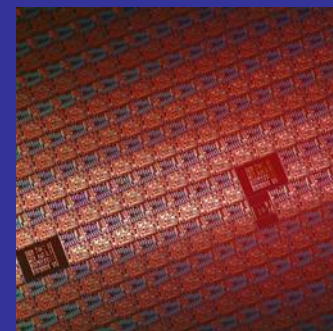


Accelerating the next technology revolution

# P48 Fiducial Standard Update

IEUVI Mask TWG

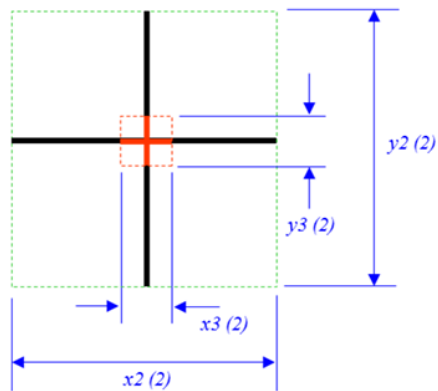
February 24, 2014, San Jose, CA



# Revision And Status

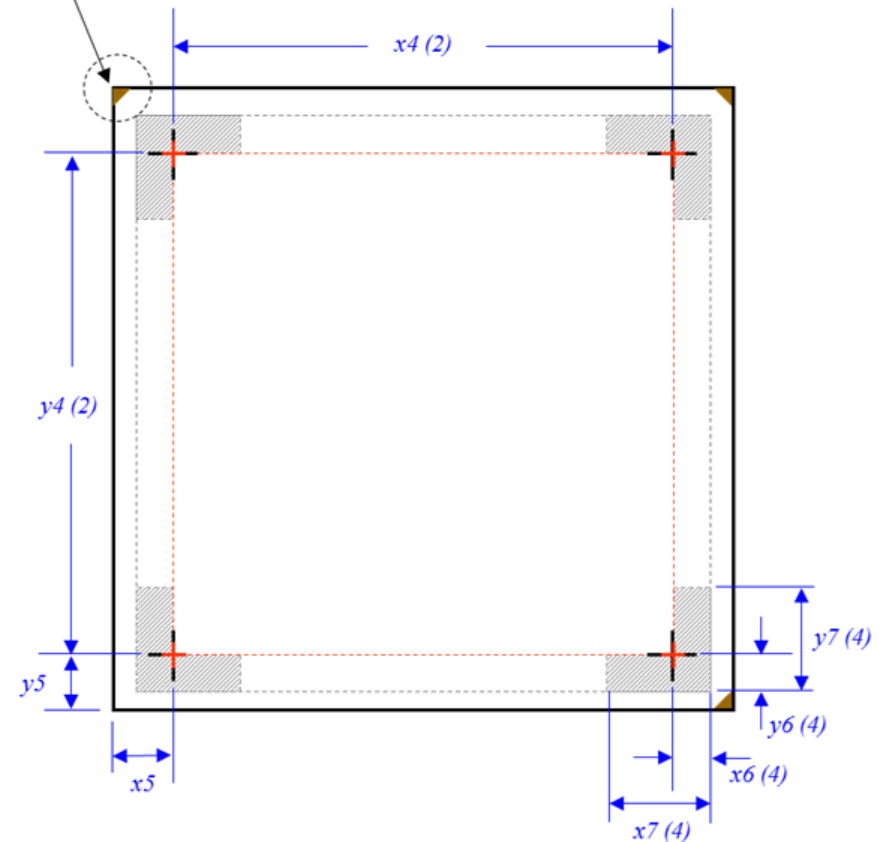
## Agreement reached for three (3) changes:

1. Define where vertically in the film stack to pattern markers
2. Remove all small crosses
3. Update current P48 placeholders with proven specifications



**New Marker**

Bevel on back (3)



**New layout, with a partial marker at the unbeveled corner.**

## Fiducial development

- Optimize mark line specifications through contrast and positioning accuracy tests

Completion date: end of Q1, 2013 (???)

Owner: Fiducial team / stakeholders

## Standard revision

- New ballot drafted with placeholders of requirements
- Submit ballot, once workable specifications become available

Targeted Yellow Ballot submission: July, 2013, but pending on completion of fiducial development

Owner: SEMI Fiducial TF

# Draft Line-Item Ballot



— P48 Revision Working Document —

— P48 Revision Working Document —

## LineItem 1: Fiducial Mark Vertical Location

5.1.1.1. Fiducial marks are fabricated on the ~~frontside~~ frontside of EUV mask blanks prior to absorber deposition, onto ~~either the substrate or multilayer capping and alternating film stack of multilayer.~~

## LineItem 2: Fiducial Mark Specification

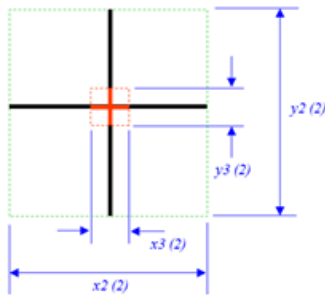


Figure 1. Cross marker

The center of the cross is aligned to that of the imaginary square as defined by  $x_2$  and  $y_2$ . The central region of the cross, in red, is defined with enhanced patterning requirements.

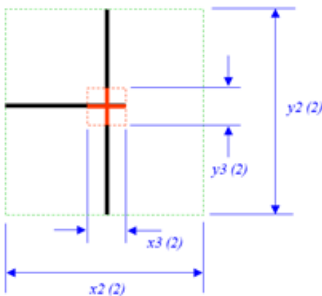


Figure 2. Partial cross marker

Identical to a (full) cross marker, except one arm is truncated to half of the dimension of  $x_3$  (or  $y_3$ , not shown here)

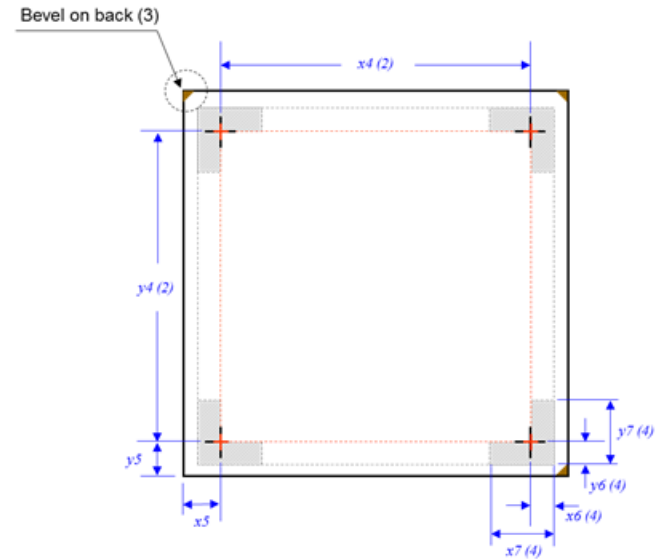


Figure 3. Fiducial Mark layout

Fiducial marks are placed on the ~~frontside~~ frontside of mask blanks, one cross at each beveled corner and a partial cross at the un-beveled corner.

# Draft Line-Item Ballot



— P43 Revision Working Document —

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Table 1 Fiducial Mark Specification

Symbol Used	Figure	Value (mm unless specified)	Tolerance (mm unless specified)	Reference Measured From	Feature Measured To
x1, y1	1	1.500	±0.010	Center of the large cross	Centers of small crosses
x2, y2	1, 2	0.550	±0.050	One line end of large crosses	The other line end of the large crosses
x3, y3	1, 2	0.100 0.015 (TBD)	±0.010 ±0.001	One line end of small Boundary of the central region of crosses as indicated in red	The other line end of the small Boundary of central region of the crosses, on the opposing side
x4, y4	2, 3	136.000	±0.010	Centers of large crosses	Centers of adjacent large crosses
x5, y5	2, 3	8.000	±0.050	Centers of large crosses	The two closest blank edges
x6, y6	2, 3	±2.700		Centers of large crosses	Outer lines of exclusion zones
x7, y7	2, 3	±2.700		Outer lines of exclusion zones	Inner / opposing lines of the zones
FMPS Orthogonality		±0.015/136.000 (±110 μrad)		Any one side of FMPS	Any adjacent side of FMPS
FMPS Parallelism		±0.200/136.000 (±14.7 μrad)		Any one side of FMPS	The closest edge of EUV blank
Cross line depth		100 ~ 200 nm (TBD)	TBD	Top of cross lines	Bottom of the cross lines
Cross line sidewall angle		TBD	TBD	Reference to the plane of mask blanks	
Reflectivity differential @193nm		>13% (TBD)		Delta between reflectivity from top and bottom of crosses	
Cross line CD		Avg. value ±0.004 and ±0.008 1 ~ 3 μm (TBD)	TBD	One side of lines	The other side of the lines
Large-Cross line LER (3σ) on both sides of the line	1, 2	±10.0 nm (on both sides of lines) (TBD)		Centers inside the central region of large crosses as defined by x3 and y3 (in red)	±100-nm-out-in-both directions-from-the-centers-of crosses
		±100.0 nm (on both sides of lines) (TBD)		±100-nm-in-both-directions from-the-centers-of-crosses Outside the central region of crosses as defined by x3 and y3 (in red)	Line-ends-of-crosses
Small-Cross LER (3σ)		±10.0-nm (on both sides of lines)		One-end-of-the-lines-of-small crosses	The-other-end-of-the-lines-of the-crosses
Cross Orthogonality		±0.5 degrees (±8.7 μrad)		See Section 5.2.3	
Cross Rotational Tolerance		±0.5 degrees (±8.7 μrad)		See Section 5.2.4	
Fiducial Mark		±0.5 degrees		See Section 5.2.5	

Rotational Tolerance		(±8.7 μrad)			
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