EUV blank development status update and Fiducial Mark proposal

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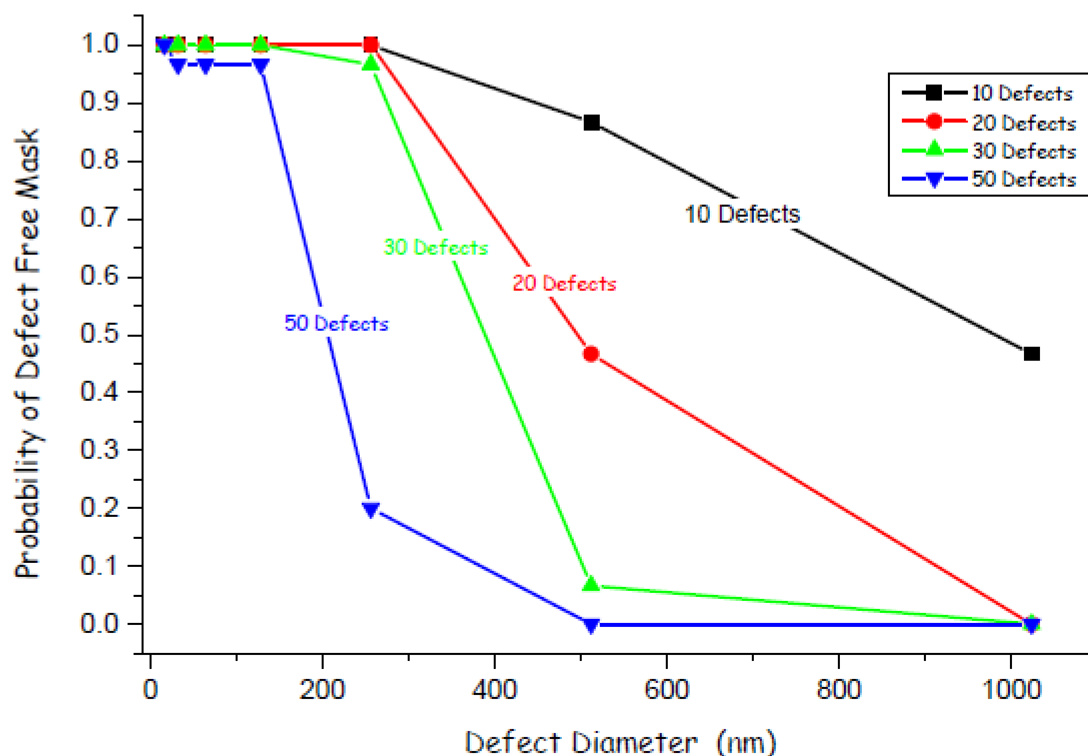
Critical performances of champion defect blanks

AGC has been continuously reducing the ML blank defects so that defect free mask can be realized by shifting pattern with fiducial marks.

		2010Q3	2011Q3	2012Q3
LTEM substrate	Mean CTE	-2.1 ppb/K	1.9 ppb/K	1.3 ppb/K
	CTE Variation	3.9 ppb/K	4.5 ppb/K	3.6 ppb/K
	Flatness	Front 75nm Back 69nm	Front 89nm Back 75nm	Front 40nm Back 56nm
ML blank	Defect @ 27nm SEVD	43 defects	28 defects	12 defects
	Peak EUV%R	66.2 %	63.2 %	64.6%
	Centroid EUV-WL to target	+0.025 nm	-0.002nm	+0.007nm
Full blank	Absorber defect @ 63nm SEVD	12 defects	4 defects	9 defects

Defect avoidance: pattern shift

- Explore the effect of blank defects on mask yield with pattern shift on the same contact design data
  - Up to 16um pattern shift in x or y
- *Large defects will impact yield*
- *~30 defects is the upper limit for reasonable yield*
- Feasible!



A. Wagner, unpublished, 2011

E. Gallagher et al. "EUV masks: Ready or not?"

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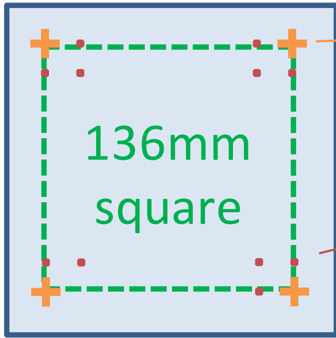
FM proposal at 2012/July Fiducial workshop

AGC proposes the different FM from the current SEMI standard due to :
(1) Same mark for both eb-writer and defect inspection tool to utilize FM strategy,
(2) Smaller ,Fewer, and shallower marks to minimize the marking contamination.

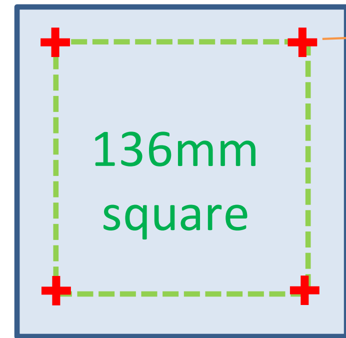
<u>Current SEMI standard</u>



4 large crosses for eb-writer

11 small crosses for defect inspection tool

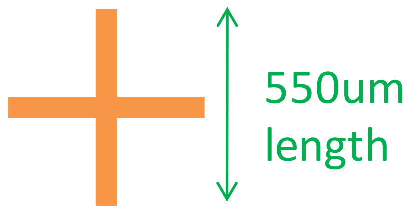
<u>AGC proposal</u>



4 large crosses for both eb-writer and defect inspection tool

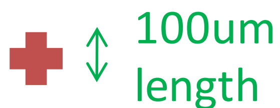
<u>large cross</u>

5um width

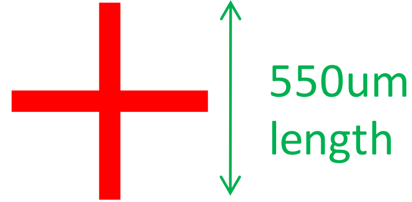


<u>small cross</u>

5um width



1um width

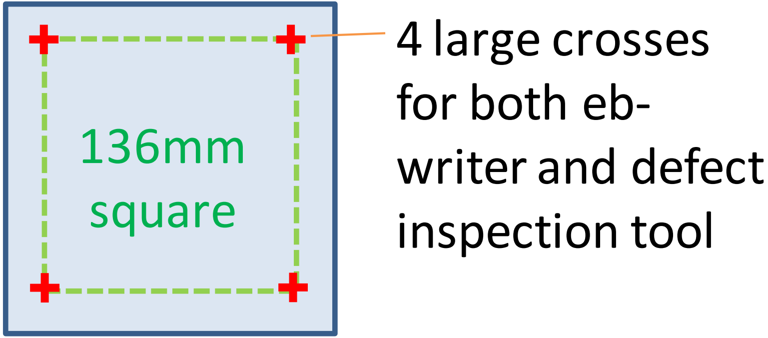


Modified FM proposal

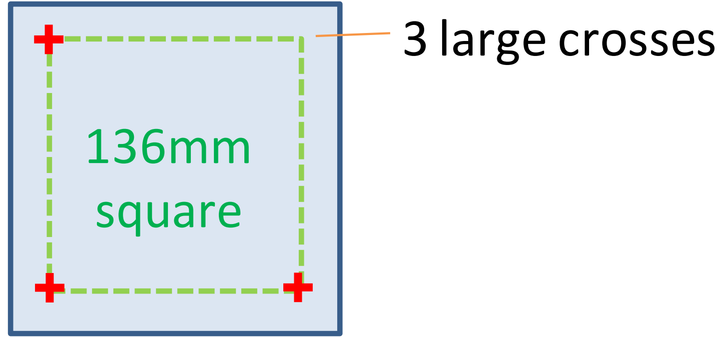
Only central 10um area of the 550 um cross is commonly used for precise alignment in both eb-writer and ML blank defect inspector.

If you need to identify the plate orientation by using fiducial mark, AGC proposes either 3 large crosses or 3 large cross + 1 variant cross.

Modified proposal



If you identify the plate orientation,



or