

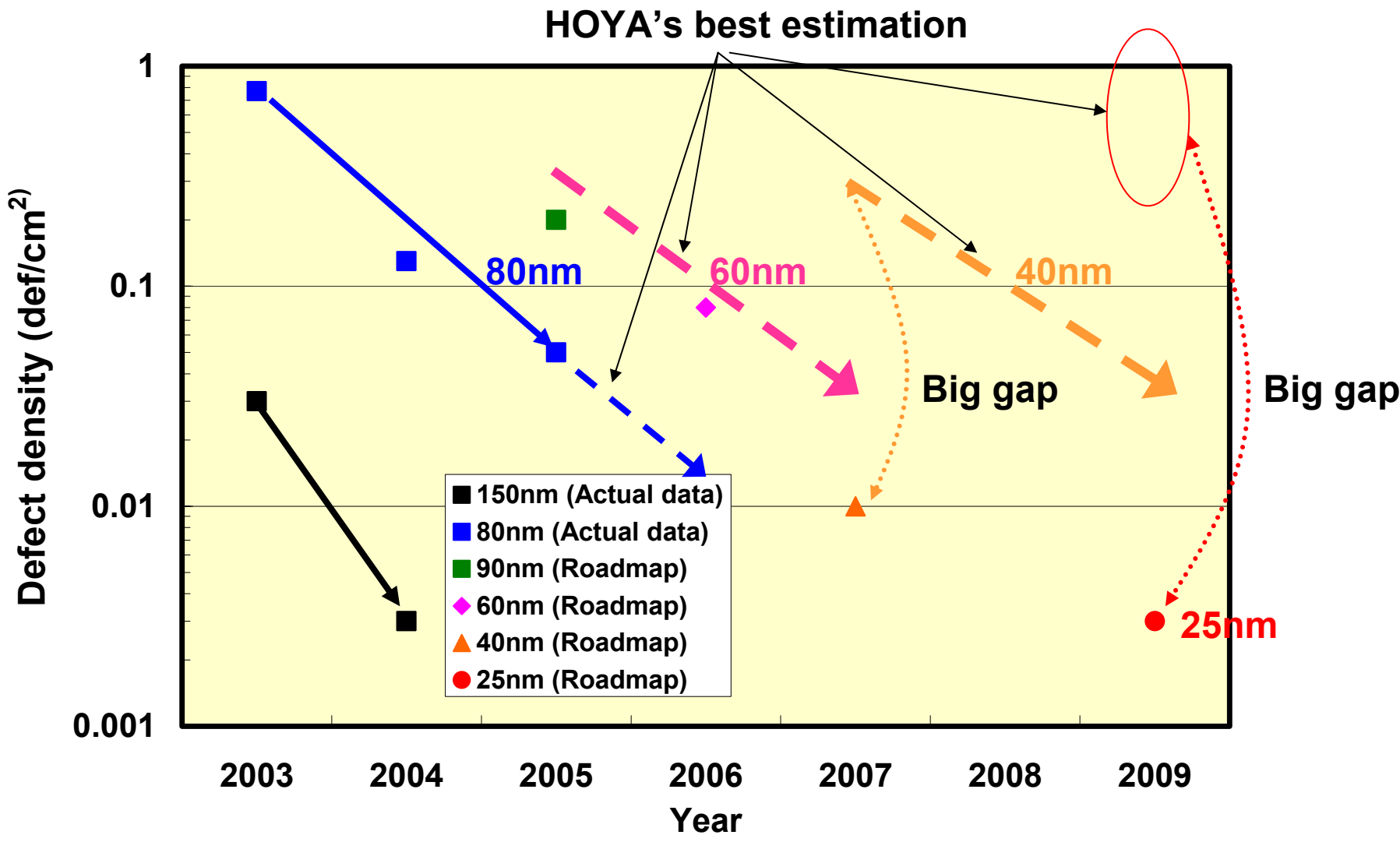
Panel#2: The Mask Blank

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- ✓ **Introduction: Trend of defect reduction**
- ✓ **Topic #1: Critical issue of defect spec.**
- ✓ **Topic #2: Realistic spec. on defects**
- ✓ **Topic #3: Absorber and Buffer layers**

Trend and road map in ML blank defect reduction



Most critical issue: Defect free ML

HOYA's best estimation (not target)

	Current status (Best)	β -blanks		Production blanks		Production spec (Routine)
		Best	Routine	Best	Routine	
Year	2005	2007	2007	2009	2009	2009
Sub. Mat.	QZ	QZ/LTEM	QZ/LTEM	LTEM	LTEM	LTEM
EUV ref.	63%	64%	64%	66%	66%	67%
Defect density (def/cm ²)	0.05	0.03	0.2	0.03	0.2	0.003
PSL sensitivity	80nm	60nm	60nm	40nm	40nm	25nm
Inspection tool	M1350	M1350		Next tool		?

- Defect reduction is progressing, but zero at 25 nm is very tight in 2009.
- Not realistic to inspect and guarantee the defects at 25 nm size in 2009
- There are big gap:
 - Current status vs. Production spec.
 - Best capability vs. Routine performance
 - EUV ML blanks defect spec and Photomask blanks defect spec for 32 nm node

Make realistic spec for ML defects

Defect spec.
on Mo/Si ML

- **Make realistic defect spec**
 - Spec. based on experimental exposure results
 - Definition of critical defect size (not PSL size)
 - Allow 10 or 20 defects on ML blank
 - Impossible to guarantee zero defects in HVM

⇒ **Need to correct ML defects in mask process**

Additional
defect mitigation

- **Never use in HVM**
 - Impossible to perfectly repair or mitigate real defects
 - generate newly defects and increase cost

⇒ **Simple process is best for lower defects**

Actinic
defect
inspection

- **Very useful for ML blanks development**
 - Needs to verify performances, such as higher sensitivity, higher throughput, required in HVM

Absorber and buffer stack

- **Absorber and buffer stacks should be standardized**
 - Accelerate mask making process development and tool (mask inspection and mask repair) development
- **Definition and spec of EUV contrast should be clarified based on experimental exposure results**
 - Decide thickness of absorber stack