



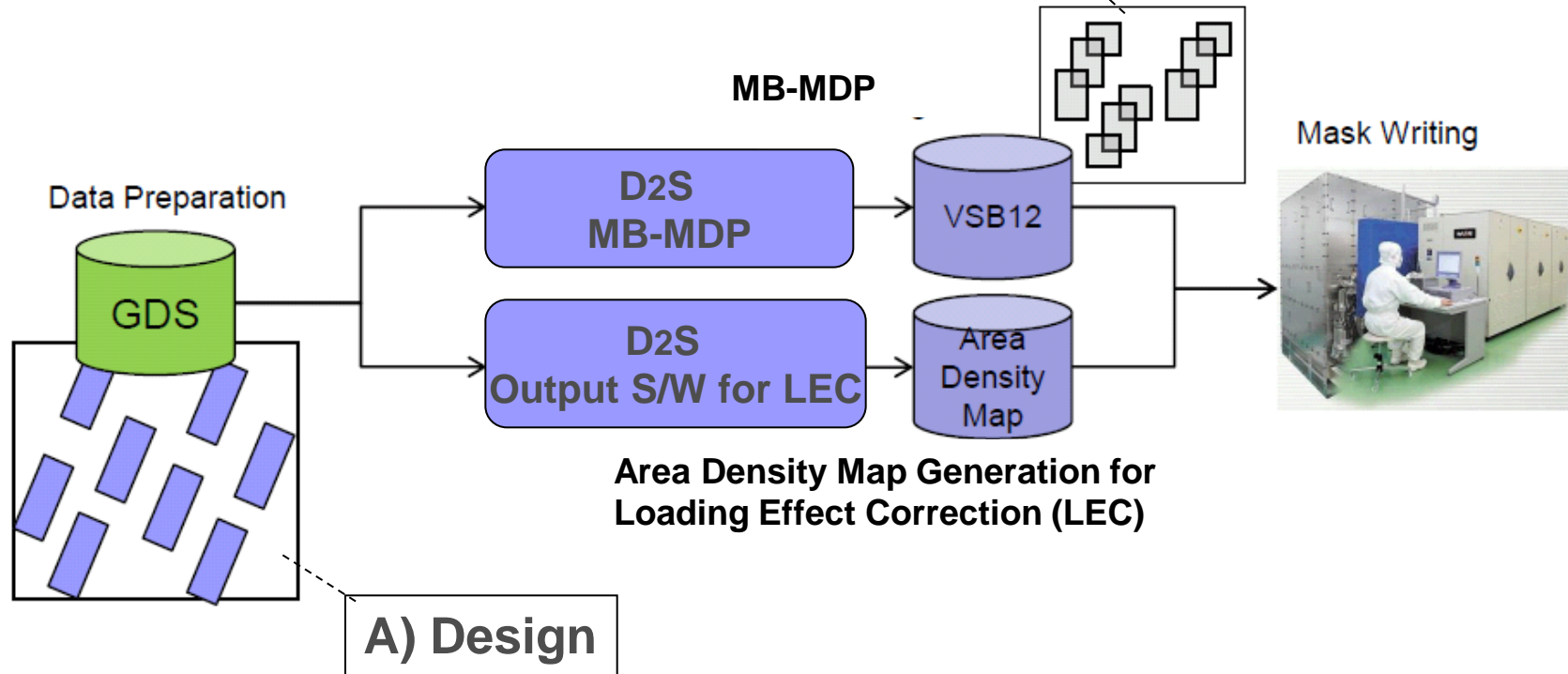
**Beam**  
**Initiative**

# NuFlare EBM-7000 Support for MB-MDP

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# NuFlare EBM-7000 Supports MB-MDP

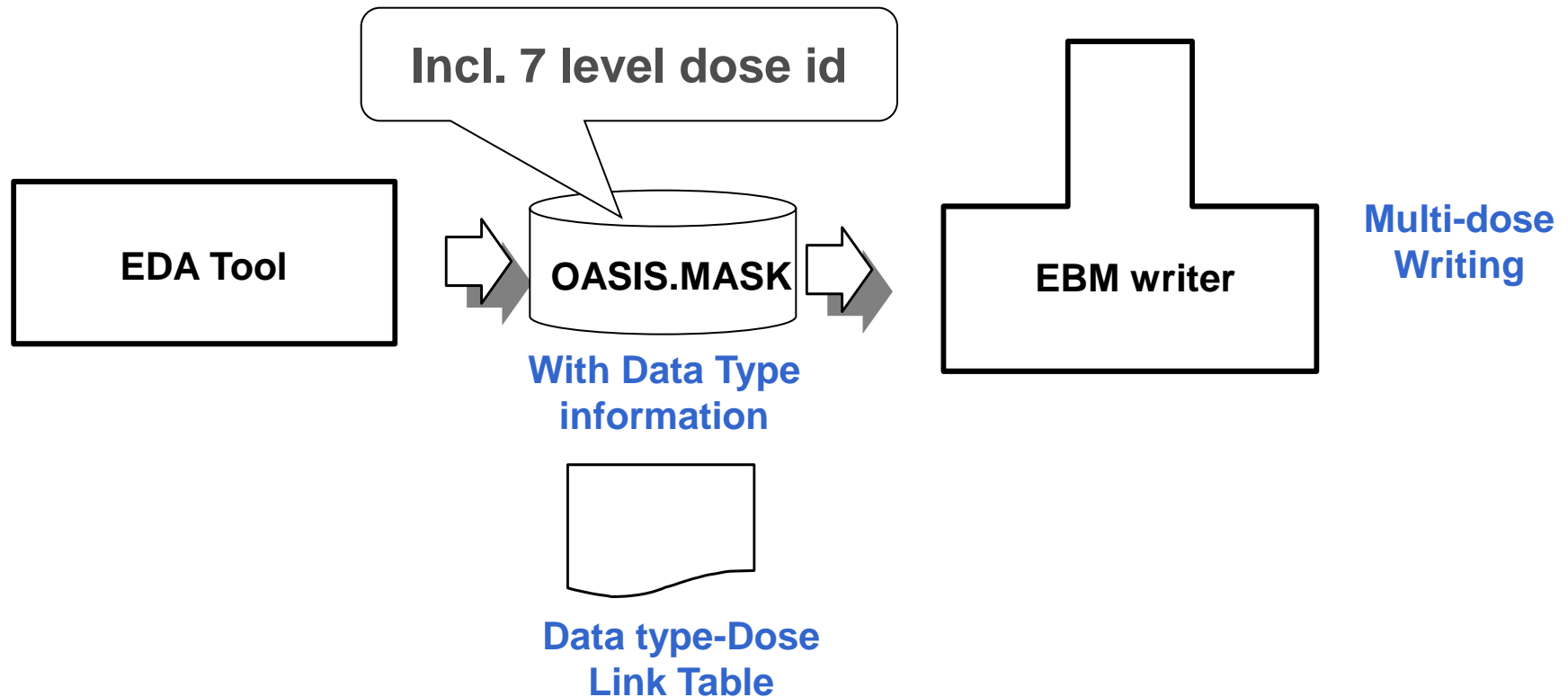
## B) Overlapped Shots from D2S (EBM format = VSB-12)



- ✓ PEC/FEC (Dose) is calculated using B) with NuFlare EBM
- ✓ LEC (Area density) is calculated using A) by D2S and passed to EBM

# NuFlare's New Function: 7 Level Dose Input

## For more accurate CDU control with overlapped shots



\* OASIS.MASK based multi-file will be used in addition to supports for single OASIS.MASK.

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# Resist Heating Questions about MB-MDP

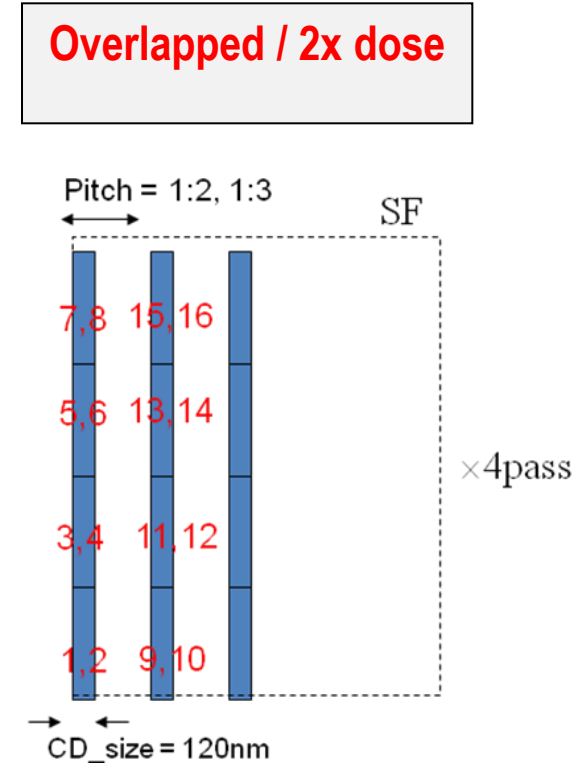
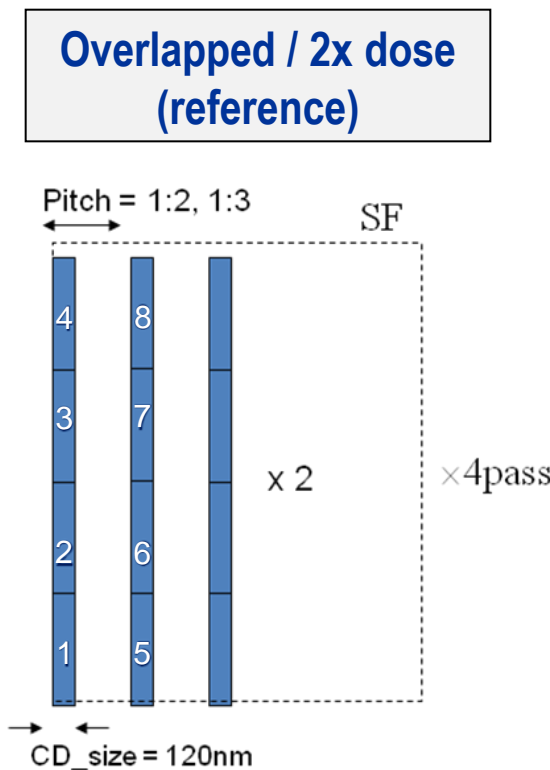
- 500nm square shot has far more power output than a triple overdose of a 100nm square shot on top of each other
  - MB-MDP overlap is typically only two shots
  - Conceptually, MB-MDP with small amounts of overlap should have no worse behavior due to resist and substrate heating than conventional fracturing with large shots with critical dimensions
  - Proof points constructed to address:
    - There is no risk of resist vaporization from overlapping shots
    - CDU change due to subfield heating is a dose density/time issue
    - CDU does not change due to overlapping
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# Resist Heating Experiment Set Up for CDU

- Question: Does MB-MDP cause CDU issues?
- Set up: Line-space patterns written with 2 different shot sequences

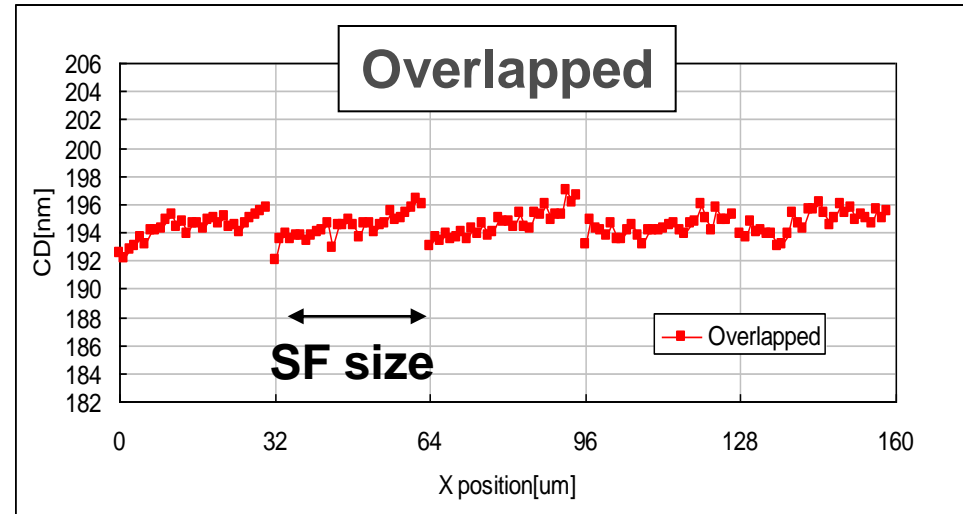
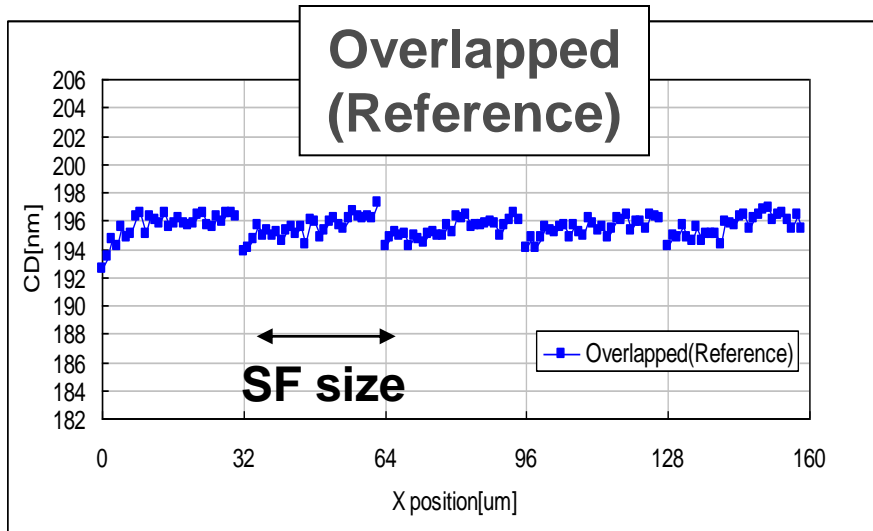
- “Overlapped (reference)” = reference pattern written twice sequentially (long time between overlapping shots)

- “Overlapped” = reference pattern written with just the blanking time between overlapping shots

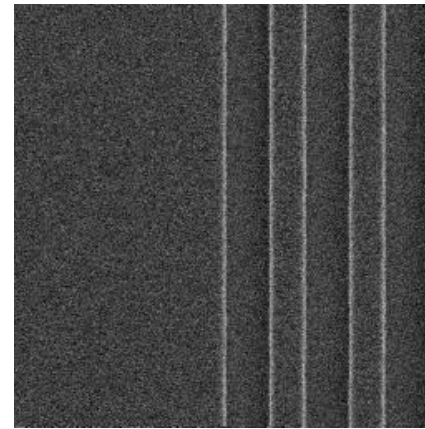
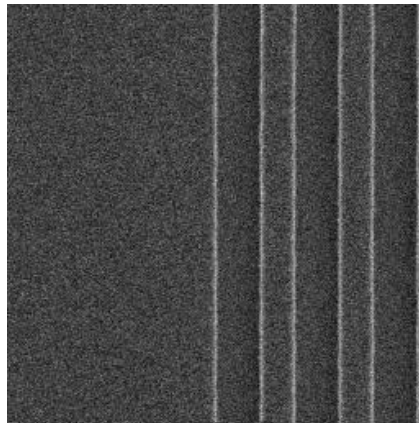


# Resist Heating Experimental Results

## Two Overlapping Shots “2x dose”



SEM image



# Conclusion

- Overlapping shots and shot sequence is not an issue
  - MB-MDP does not produce dose density of  $>2X$  so no CDU issues either
  - Overlapping reduces shot count for complex shapes
  - Overlapping helps resolve  $<100\text{nm}$  mask shapes
  - MB-MDP is available on NuFlare EBM-7000 and with extra option
    - ✓ **Area density map I/F**
    - ✓ **7 level dose input**
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