

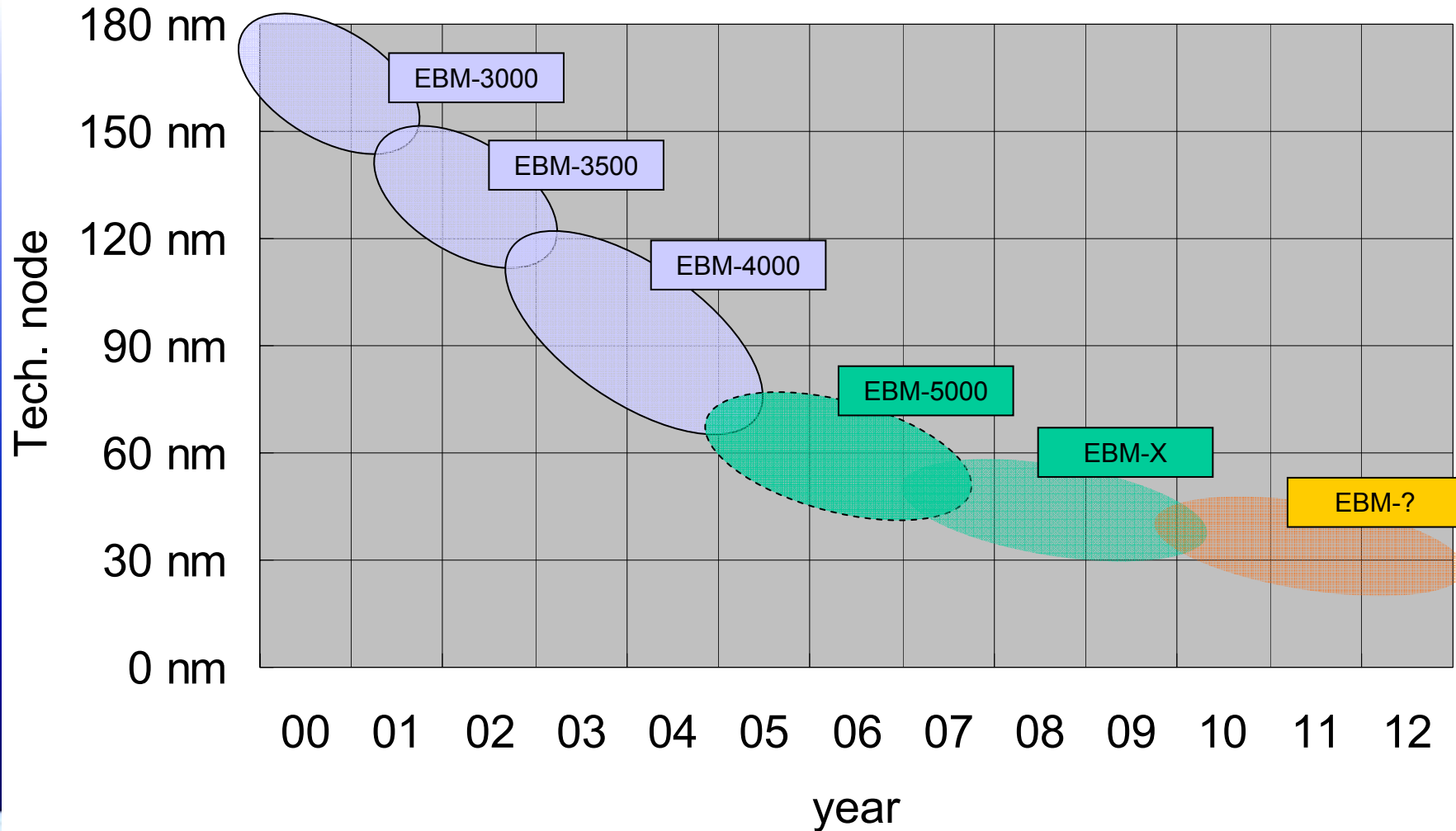
EUV Mask Technical Session – Panel  
Discussion Series

# Panel #3: The EUV Patterned Mask

NuFlare Technology Inc.

Shusuke Yoshitake

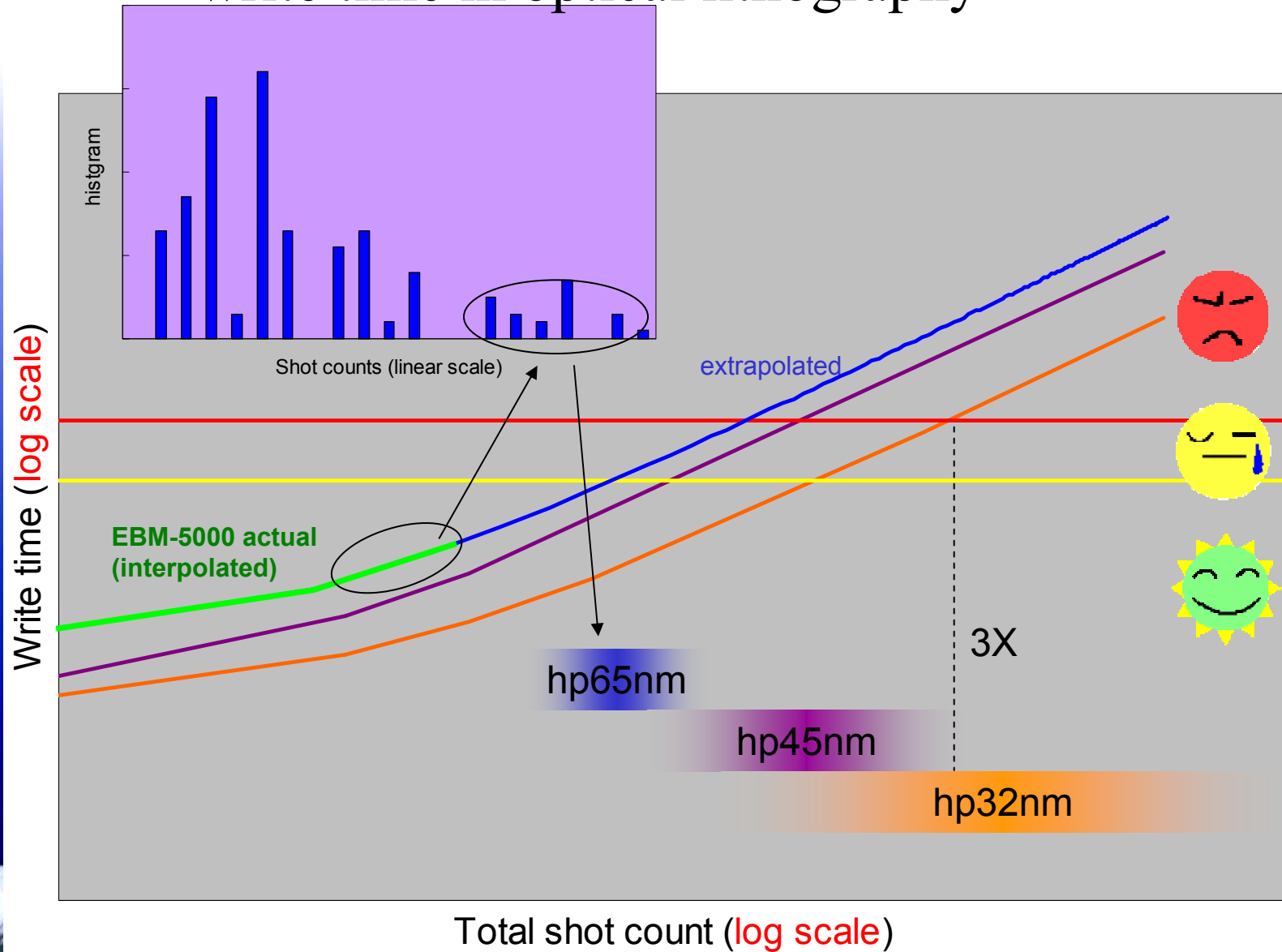
# EBM Product Roadmap



# Challenging of pattern generator

- CD uniformity
  - Local area ( ~ field size )
    - Improvement of beam blur (high resolution electron optics)
    - Improvement dose (exposure time) and beam size control accuracy
    - Metrology (good repeatability and/or high speed measurement)
  - Global area ( ~ entire mask )
    - Provision of the process error correction functionality
    - Stable process is required.
- Write time
  - Shorter shot cycle time
    - Shot cycle time = Shot time + Shot settling time
    - Shot time = Dose / Current density
  - Shot count
    - Design of EUV mask should be more simple than optical mask.

# Prediction of shot count increases and write time in optical lithography



# Summary of challenges for pattern generator

- CD specification will be difficult, but manageable
  - The pattern generator has corrected ‘other’ error sources and is therefore closely involved into process. Stable process should be required for successful correction. Process quality and metrology are keys to realizing capability.
  - No surprise for EUV mask will be existing to meet CD specification as compared with optical mask.
- Positioning accuracy will be manageable and extendable with current mask holding technique,
  - NFT proposes to remove “the mask pattern generator and the pattern placement metrology tool” to achieve good repeatability from the description of SEMI P-40 requirements referenced below;  
*2.1.1 The mounting requirements in this standard apply to the exposure tool, the mask pattern generator and the pattern placement metrology tool.*
- Write times have the greatest uncertainty for optical mask.
  - Write time depend on incoming data volume for VSB, which is out of the pattern generator manufacturer’s control. Pattern generator needs to carefully manage the shot count increase due to OPC and OPC accelerating technologies such as immersion lithography.
  - Design of EUV mask should be more simple than optical mask.

**Based on today’s worst case data and predicted future data trends,  
NFT has a good roadmap through 32nm hp.**