Lithography Optics Division

Optical Design Limits for EUV scanners

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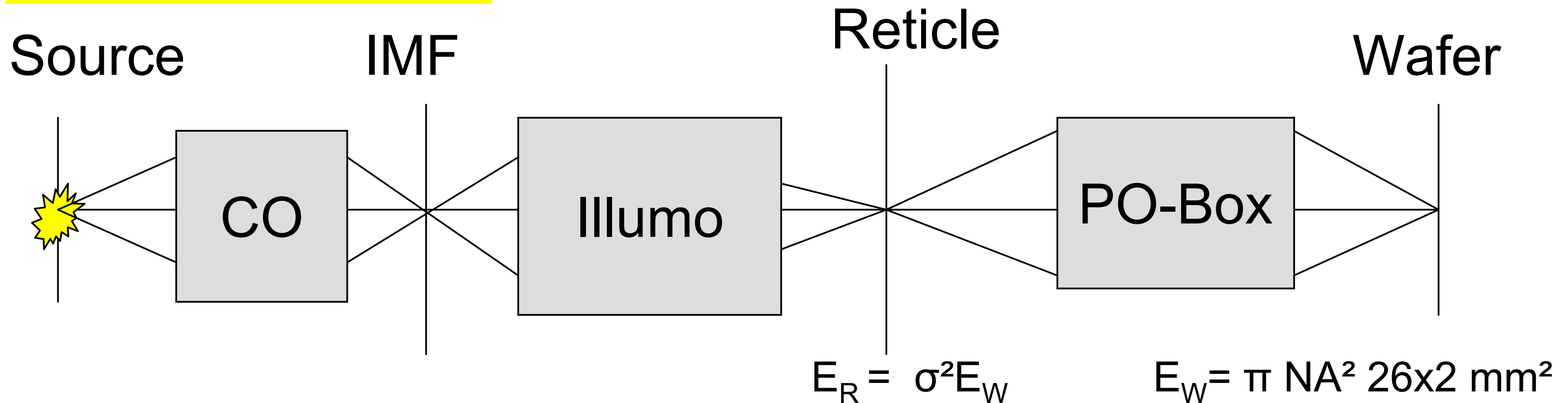
Etendue within EUVL system

Etendue=π NA² A



Source diameter for source etendue of 3 mm^2 and two collection angles:

NA \ σ	0.8	0.
0.25	6.5	0.
0.35	12.8	1.

collection angle / °	max. source diameter / mm
50	1.4
70	1.2

E = 3 mm^2 sr is a good etendue target for the source

higher etendue can be used in some settings

Throughput optimization process

- Optimal case:
  - source power maximized for minimized source size
  - sufficiently small etendue for all settings
  - no design restrictions to optical train
- „Large source“ case:
  - source power maximized for larger source size
  - light loss due to too large source etendue for some settings
  - throughput optimization
    - identify most important settings for which system throughput should be optimal
    - find source and collection parameters to maximize throughput for most important settings
    - minimize light loss for other settings

⇒ close collaboration between source and optics suppliers needed

Günther Derra and Wolfgang Singer: Collection efficiency of EUV sources; SPIE 2003