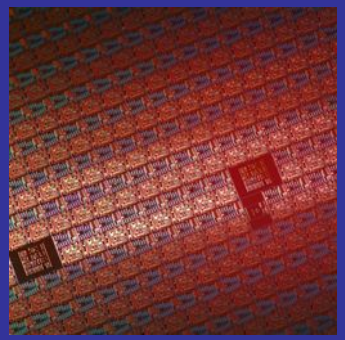
Accelerating the next technology revolution

IEUVI Source TWG - Summary
02 Oct 2008



Frank Goodwin

Masashi Ogawa

Outline

- TWG Update of DPP technical challenges ranking and gap analysis
- TWG Update of LPP technical challenges ranking and gap analysis
- TWG Update of development gaps were fundamental understanding or engineering development required
- Technical challenges scorecard
- Technical challenges scorecard – when do DPP technical challenges need to be addressed
- Technical challenges scorecard – when do DPP technical challenges need to be addressed
- Ownership of addressing DPP technical challenges
- Ownership of addressing DPP technical challenges
- Summary

Source TWG:
TWG Ranking of DPP Technical Challenges

Ranking (02Oct08)	Technical Challenge (previous ranking from May08 survey)	Gap Analysis
1	Power at IF (1)	
2	Collector lifetime (2)	
3	Reliability and Stability (10)	Changed from red/green to red
4	Debris mitigation (3)	Changed from yellow to red
5	Thermal loading of DMS and Collector (4)	Changed from yellow to red
6	Scalability (9)	Changed from red to red/yellow
7	Cost of ownership (5)	
8	Conversion efficiency (6)	
9	Higher efficiency collector designs (7)	
10	Spectral purity (8)	

For HVM Implementation of EUVL

Manufacturable solutions exist, and are being optimized
Manufacturable solutions are known but needing further development
Manufacturable solutions are not known.

Source TWG:
TWG Ranking of LPP Technical Challenges

Ranking (02Oct08)	Technical Challenge (previous ranking from May08 survey)	Gap Analysis
1	Power at IF (1)	
2	Debris mitigation (2)	
3	No Integrated System (10)	
4	Cost of ownership (3)	
5	Collector lifetime (4)	Changed from red to red/yellow
6	Laser Power (5)	
7	Spectral purity (9)	Changed from green to red/yellow
8	Conversion efficiency (6)	
9	Thermal loading of DMS and Collector (7)	
10	Scalability (8)	

For HVM Implementation of EUVL

Manufacturable solutions exist, and are being optimized	
Manufacturable solutions are known but needing further development	
Manufacturable solutions are not known.	

Source TWG: Development Gaps

- Fundamental Understanding Needed
  - Debris mitigation of LPP sources
  - Power scaling of sources
  - Reliability and stability
  - *Accurate source / plasma modeling
  - *Maintainability and reasonable downtimes
  - *Understanding out of band emission from plasma
  - *Impact of out of band on resist imaging and contamination rates
- Engineering Development Needed
  - LPP source/collector/DMS integration
  - Improved debris mitigation and handling of fuel of DPP sources
  - Improvement of source component designs/materials/lifetimes
  - Solutions for spectral filtering, particularly IR
  - Design optimization of illuminator
  - Improved cost of ownership
  - ^Efficiency of power transmission to IF (moved from fundamental understanding)
  - *Environmental Safety – particularly on DMS and purge gases (new)
  - *Stability and Reliability (new)
  - *Collector lifetimes as power is scaled up

*New – added during IEUVI Source TWG 02Oct2008

^Moved – moved from fundamental understanding needed to engineering development

Score Card – Technical Challenges

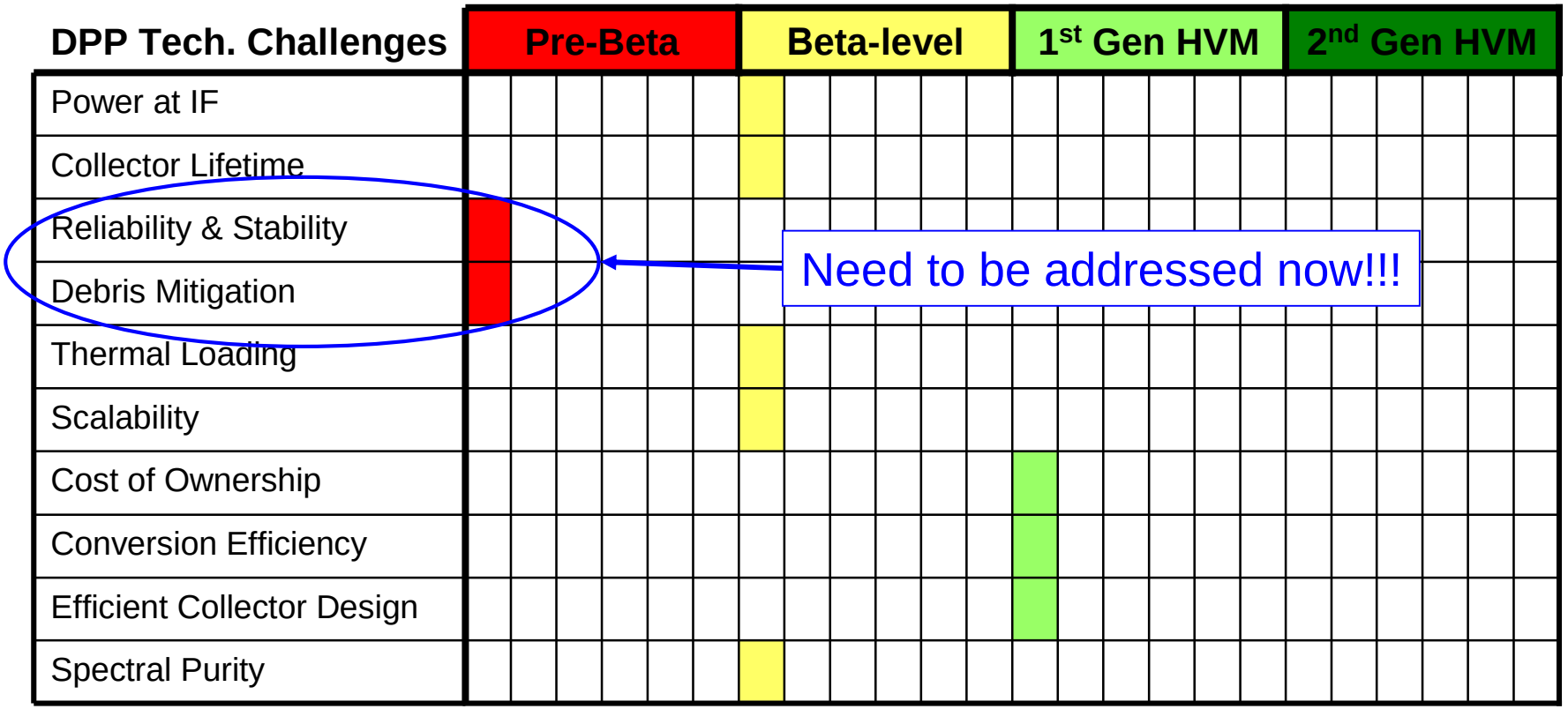
- Two Objectives
  - When do these need to be resolved
  - Does a solution need to be known and demonstrated prior to HVM introduction

DPP Tech. Challenges	Pre-Beta	Beta-level	1st Gen HVM	2nd Gen HVM
Power at IF				
Collector Lifetime				
Debris Mitigation				
Thermal Loading				
Cost of Ownership	X			
Conversion Efficiency				
Efficient Collector Design				
Spectral Purity				
Scalability				
Reliability & Stability				

Urgent ← → **Less Urgent**

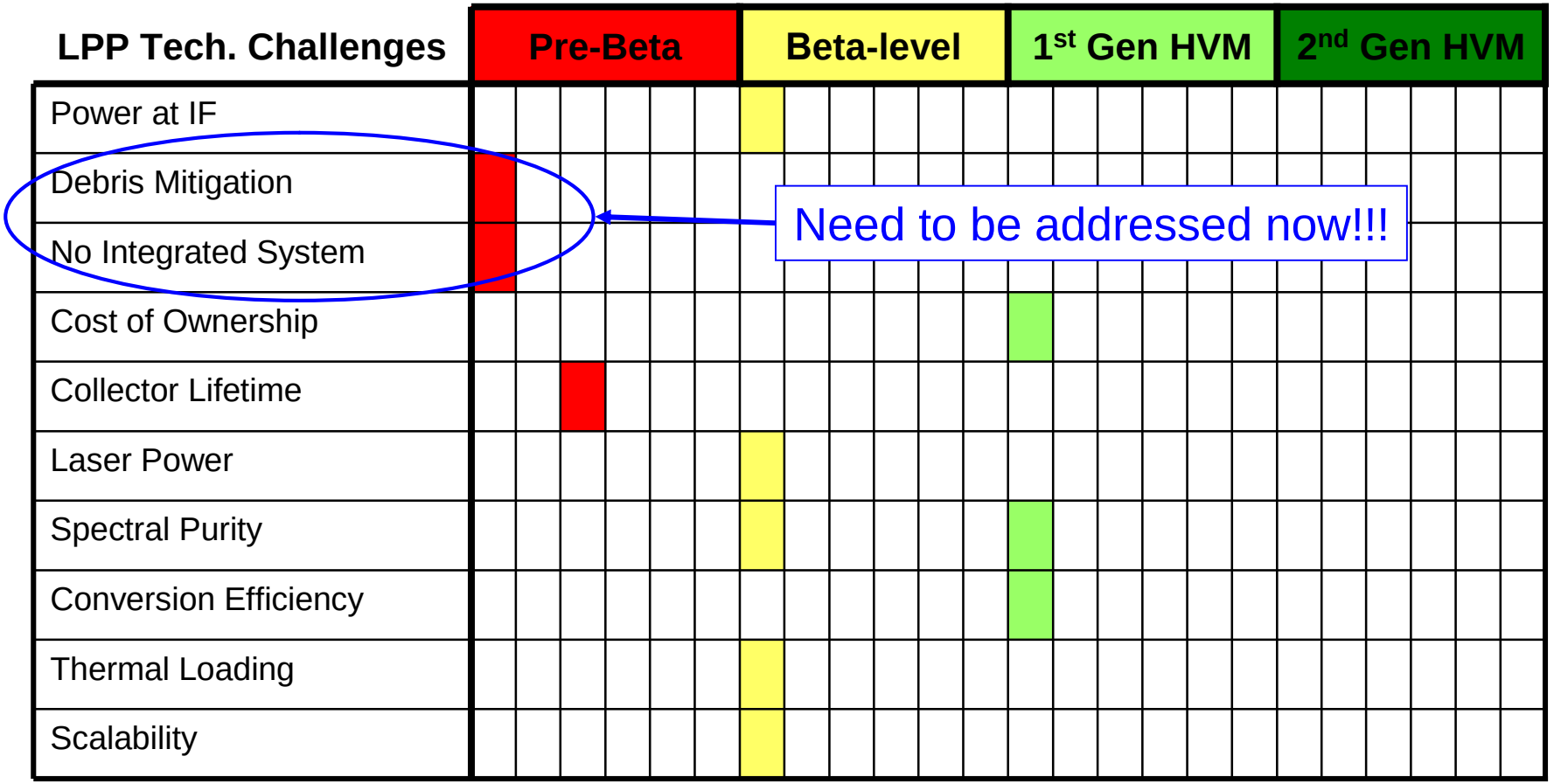
Score Card - DPP Technical Challenges

- Two Objectives
  - When do these need to be resolved
  - Does a solution need to be known and demonstrated prior to HVM introduction



Score Card - LPP Technical Challenges

- Two Objectives
  - When do these need to be resolved
  - Does a solution need to be known and demonstrated prior to HVM introduction



DPP Ownership Voting

Ownership - total responses received: 25

DPP Technical Challenges	Exposure tool Manu	Source manu	End User	Consortia
Power at IF	3	20	2	3
Collector Lifetime	2	21	1	2
Debris Mitigation	2	23		1
Thermal Loading	3	22	1	1
Cost of Ownership	10	18	2	2
Conversion Efficiency		23	1	1
Efficient Collector Design	4	22	1	
Spectral Purity	16	19	2	1
Scalability	1	22	1	3
Reliability $ Stability	6	21	2	2
Optics contamination	18	16	1	2

LPP Ownership Voting

Ownership - total responses received: 25

LPP Technical Challenges	Exposure tool Manu	Source manu	End User	Consortia
Power at IF	4	22	1	2
Debris Mitigation		24		1
Cost of Ownership	10	18	4	1
Collector Lifetime	4	21	1	2
Laser Power	1	24	1	
Conversion Efficiency	1	24		1
Thermal Loading	4	22		1
Scalability	2	24	1	1
Spectral Purity	15	20	2	1
No Integrated System	9	18	3	4
Optics contamination	20	15	1	3

Summary

- Technical challenges
  - Received updates on ranking and gap analysis of DPP and LPP sources
  - Reliability and Stability need to be immediately addressed
- Development gaps
  - Updated items that require fundamental understanding or engineering development
  - Accurate modeling of source / plasma and understanding of OOB immersion were specifically highlighted
- Score Cards
  - Challenges that need to be resolved prior to beta tool timing
    - DPP
      - Debris Mitigation
      - Reliability and Stability
    - LPP
      - No integrated system
      - Debris Mitigation
      - Collector Lifetime –but less of a priority to an integrated system and debris mitigation performance
  - Ranking of technical challenges and priority on when to resolve do not completely align
    - The critical need is for reliable sources on the alpha tools
- Ownership of leading resolution of the technical challenges
  - The results from the meeting survey show that most believe that the source manufacturers own the responsibility of resolving the top ten issues limiting the performance and availability of EUV sources with support from exposure tool manufacturers to address cost of ownership, spectral purity and optics contamination.