
HD DVD

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Maciek Brzeski

VP, Marketing, Toshiba Storage Device Division



Why Do We Need A New DVD?

- DVD was introduced in 1997 (USA)
- HDTV was Introduced in 1998 (USA)
- DVD Technology is insufficient For HDTV
- DVD Copy Protection was worthless by 1999
- HDTV Receiver sales are WAY up
- HDTV Content is increasingly available
- Most TVs over 30" are already HD
- FCC: All TVs over 25" must *receive* HDTV



How Do We “HD” DVD? (Idea 1)

- Original DVD Specification completed in 1996.
- Video Codec = MPEG2 Only
- With MPEG2, HD requires 5 – 6 times the capacity to:
 - Record HD-TV broadcasting
 - Playback Pre-recorded HD-Video Discs
- Possible Solution: Use a Blue Laser Diode
 - 650nm Wave Length
 - Blue Laser Diode: 405nm Wave Length

Theoretically, capacity will increase 2.6 times when changing from Red Laser to Blue Laser.

Requirement is 5-6 times more capacity

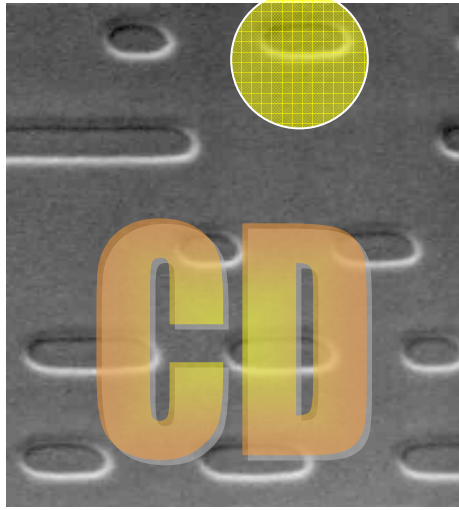

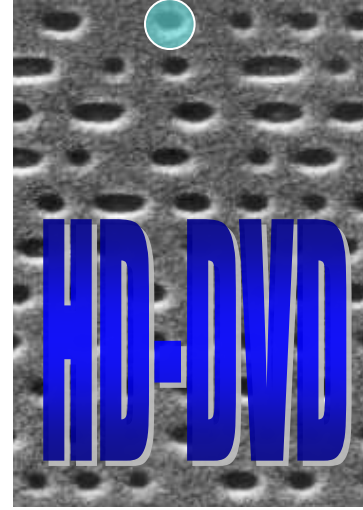


Disc Details

Read Beam Spot
 $\phi 1.42\mu\text{m}$

Read Beam Spot
 $\phi 0.89\mu\text{m}$

Read Beam Spot
 $\phi 0.51\mu\text{m}$

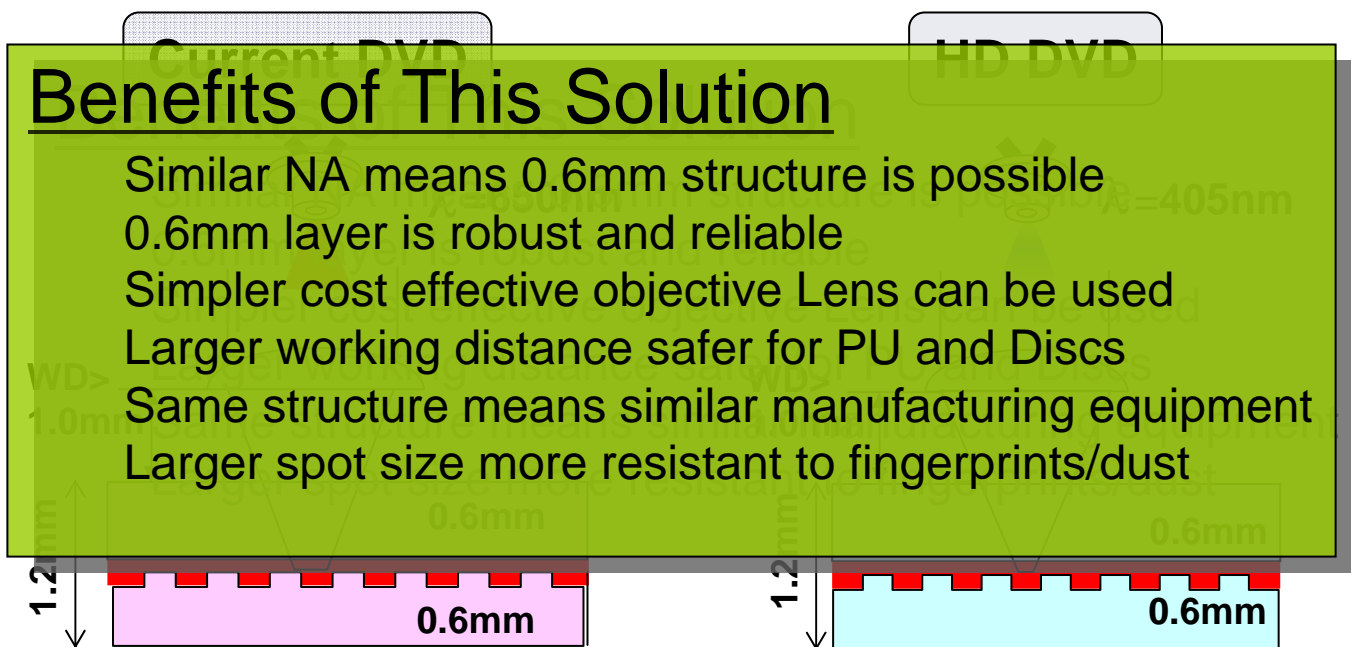
Disc Surface Image			
Track Pitch	1.6 μm	0.74 μm	0.40 μm
Pit Length (Min)	0.9 μm	0.4 μm	0.204 μm
Read λ	780 nm	650 nm	405 nm
NA	.45	.60	.65



How Do We “HD” DVD? (Idea 2)

■ HD DVD:

- Use Blue Laser
- Increase NA slightly ($0.60 > 0.65$) to achieve 3X capacity
- Use more efficient Codecs to achieve further 2X increase
- Could achieve 6 times capacity



Optical ROM Disc Format Overview

	DVD				HD DVD			Hybrid	
Capacity	4.7	8.5	15	17	15	30	30	Hybrid	15
Capacity (HD)								15+4.7	
Capacity (SD)								2	
Layers	1	2	2	2	1	2		1 + 1	
Laser	Red	Red	Red	Red	Blue	Blue		R & B	
Time	SD 2 Hrs	SD 4 Hrs	SD 6 Hrs	SD 8 Hrs	HD 4 Hrs	HD 8 Hrs		SD 4 HD 4	

4-8 Hours is usually Enough, but...

- Movie compilations
- Super Bit HD Titles
- HDTV Series Season(s)
- Interactive Titles
- "License it Later" content



Optical ROM Disc Format Overview

	DVD				HD DVD			Hybrid	
	DVD 5	DVD 9	DVD 14	DVD 18	HD 15	HD 30	HD 45	Hybrid 1	
					15	30	45	19.7	
					1	1	1	2	
					1	2	3	1 + 1	
Laser	Red	Red	Red	Red	Blue	Blue	Blue	R & B	
Time	SD 2 Hrs	SD 4 Hrs	SD 6 Hrs	SD 8 Hrs	HD 4 Hrs	HD 8 Hrs	HD 12 Hrs	SD 4 HD 4	

6 - 12 Hrs is more than enough!

- Trilogy Triumphant
- 24 30-min. Episodes
- Outtakes outtakes outtakes
- "License it Later" content



Optical ROM Disc Format Overview

	DVD				HD DVD			Hybrid	
	DVD 5	DVD 9	DVD 14	DVD 18	HD 15	HD 30	HD 45	Hybrid 1	
Cap. (GB)	4.7	8.5	13.5?	17	15	30	45	15 + 4.7	
Sides	1	1	2	2	1	1	1	2	
Layers	1	2	2 + 1	2	1	2	3	1 + 1	
Laser	Red	Red							
Time	SD 2 Hrs	SD 4 Hrs							

- >50% of all DVD's are DVD-9
- Consumers expect generous special features
- Creative new titles are possible
- So.....



Optical ROM Disc Format Overview

	DVD				HD DVD			Hybrid	
Capacity	4.7	8.5	15	17	15	15	15	Hybrid 1 15	Hybrid 2 15
Content	SD	SD	SD	SD	HD	HD	HD	SD + HD	30 + SD
Viewing titles	1	1	1	1	1	1	1	1	1
Price	Low	Low	Low	Low	High	High	High	High	High
Requirements	SD	SD	SD	SD	HD	HD	HD	SD	SD
Layers	1	2	2+1	2+2	1	1	1	1+1	2+2
Laser	Red	Red	Red	Red	Blue	Blue	Blue	R & B	R & B
Time	SD 2 Hrs	SD 4 Hrs	SD 6 Hrs	SD 8 Hrs	HD 4 Hrs	HD 8 Hrs	HD 12 Hrs	SD + HD 4	SD 8 HD 8

A Convenient Consumer Solution

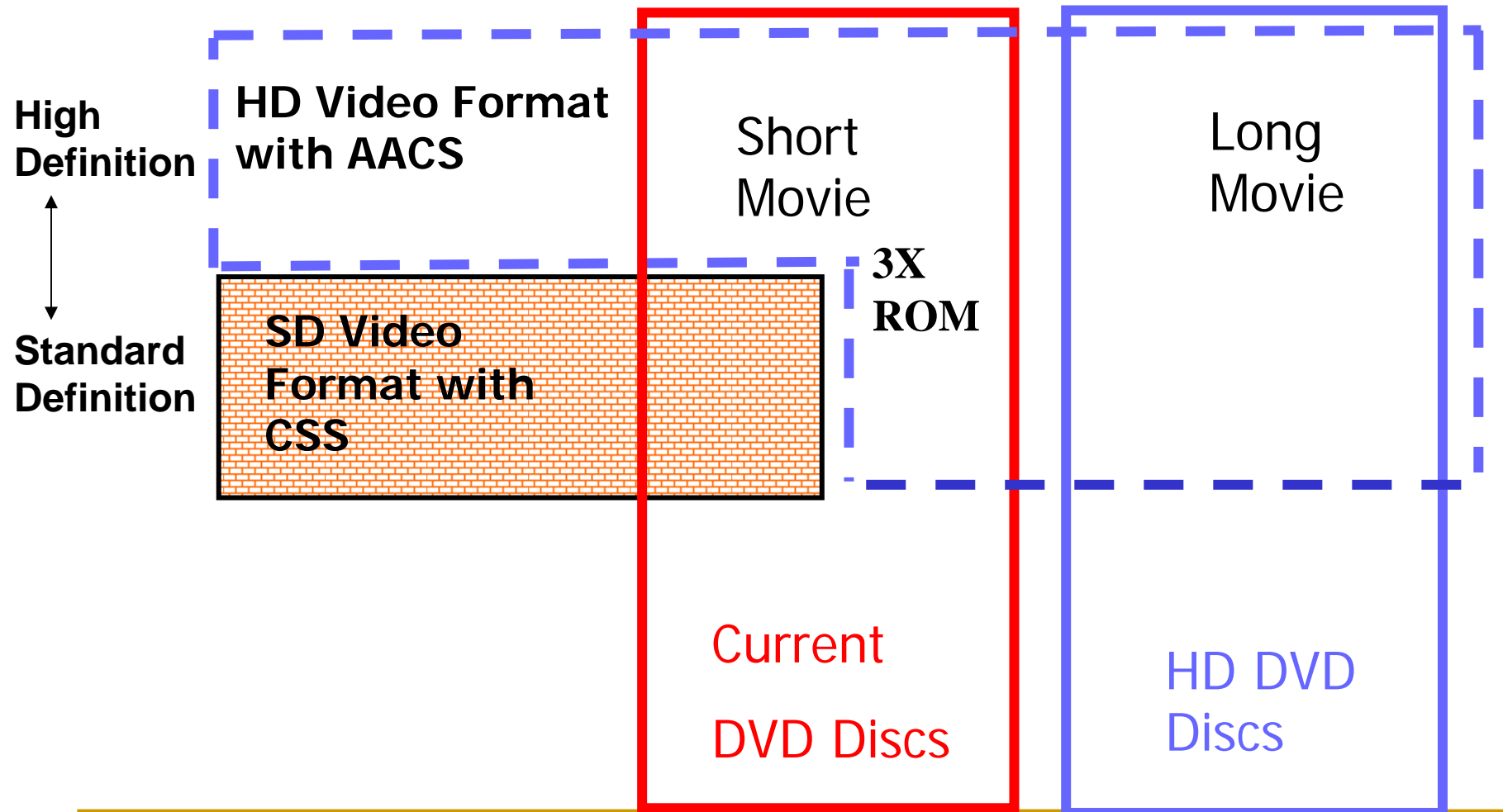
The same disc can offer:

- HD in the living room
- SD in the bedroom
- Movies in the car

ing titles
SD
holds



Basic Concept of HD DVD Video



Status of Specifications

■ Physical specification

- HD DVD-ROM : Ver. 1.0 15GB/30GB/45GB
- HD **DVD-RAM*** : Ver. 1.0 20GB
- HD DVD-R : Ver. 1.0/1.9 15GB/30GB(Dye media)
- HD DVD9 : defined as supplemental info.
- HD **DVD-RW*** : To be finalized within this year 15GB/30GB

■ Logical specification (File system)

- To be updated (need standardization in OSTA)

■ Application specification

- HD DVD-Video: Ver. 1.0 Interactive feature based on iHD
- HD DVD-Audio: To be included in Video
- HD DVD-Video Recording---to be Ver.1.0 in Oct

* Name is not officially decided yet, format is similar to DVD-RAM, RW



HD DVD recordable media

- Dual layer **HD DVD-R** with 30GB capacity is suitable for data and digital TV recording
- **HD DVD-RW** will be introduced and dual layer 30GB will be achieved
- **HD DVD-RAM** designed for random access capability and reliability
- HD DVD Recordable media family:
 - Based on well established HD DVD-ROM process
 - Manufacturing margin is very wide



HD DVD Recordable media

- Can be made using current DVD recordable media process
- HD DVD-R process uses dye media with spin coat machine
- HD DVD-R dual layer is very easy and process is already established
- Result:
 - Cost of HD DVD-R HD will be almost the same as current DVD-R soon after volume ramp
 - DVD-R will be the preferred format in the next generation recording devices



Current status in DVD Forum

- 110 companies now participating in HD DVD Promotion Group
- 84 companies are participating in WG-11 and they are committed to delivering HD DVD recordable devices and media
- China only format based on HD DVD format was proposed to WG-11 by OMNERC (Optical Memory National Engineering Research Center) in July
 - DVD Forum Steering Committee in Sept decided to find a way to incorporate it.



Summary

- HD DVD recordable media has right capacity for data and digital TV recording
- Current DVD recordable manufacturing line can be used
- HD DVD recordable media is easy to manufacture
- HD DVD-R cost will be comparable with current DVD-R
- Broad industry support guarantees compatibility



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