

BD-R LTH type

Product introduction

Company Confidential

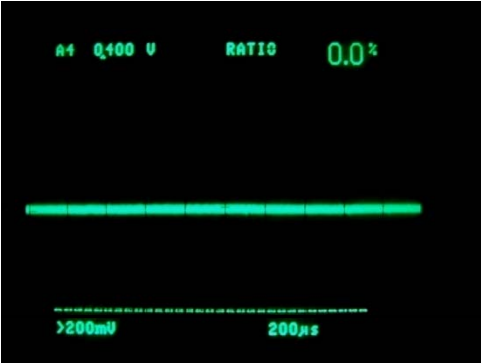
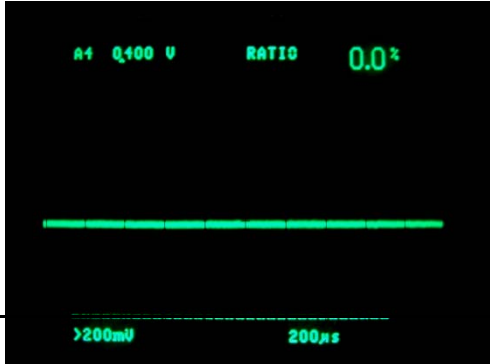
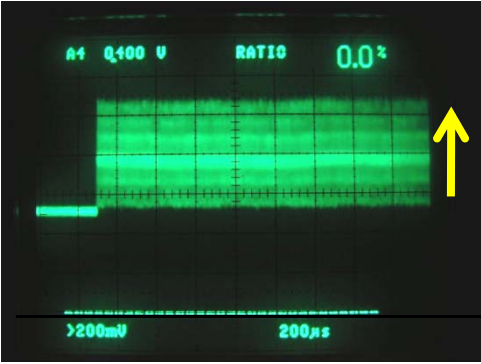
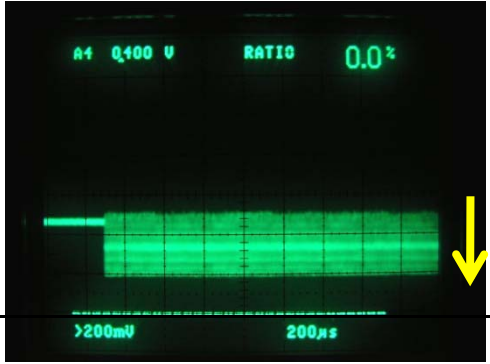


What is BD-R LTH type?

- It is just another type of BD-R,
specified in Spring 2008 by Blu-ray Disc Alliance
- Recording layer is different:
- First type of BD-R is made of inorganic material
- Signal changes polarity from High-to-Low (HTL)
- AZO BD-R is made of organic material
- Signal changes polarity from Low-to-High (LTH)
- BDA states mandatory use of wording
„BD-R LTH type“
on packaging and disc label

What is LTH and HTL?

- ❑ Low to High(LTH) and High to Low(HTL) correspond to the reflectivity change by recording, resulting the opposite signal polarity.
- ❑ LTH and HTL are based on a nature of the inorganic and organic recording layer material, respectively.

	LTH(Organic dye BD-R)	HTL(Inorganic BD-R/RE)	
Unrecorded	 <p>A1 Q100 U RATIO 0.0%</p> <p>>200mV 200µs</p>	 <p>A1 Q100 U RATIO 0.0%</p> <p>>200mV 200µs</p>	GND
Recorded	 <p>A1 Q100 U RATIO 0.0%</p> <p>>200mV 200µs</p> <p>Yellow arrow pointing up</p>	 <p>A1 Q100 U RATIO 0.0%</p> <p>>200mV 200µs</p> <p>Yellow arrow pointing down</p>	

What does LTH type mean?

- The polarity of the signal changes
- This is like having either

white letters on black background

or

black letters on white background

- If you got a camera reader, you would just need to reprogramme it (= Firmware update) to read both options.

- **New drives are compatible because this has already been implemented in firmware**
- **Older drives need a firmware update for Read/Write compatibility**
- **We cooperate with the drive manufacturers**
- **All BD drives are affected: Players and ROM-drives, PC burners and videorecorders**
- **Playstation 3 is compatible with update from 03/2008**

LTH BD-R support by BD burners

Maker	Model	BD Write Speed	BD-R LTH Type 2x SL
SONY	BWU-300S	8X	2X
LITE-ON	DH-4B1S	4X	2X (need to FW up to 7P5B)
Buffalo	BRHC-6316U2	6X	2X (need to FW up to XJ04)
LG	GBW-H10N	4X	NO
LG	GGW-H20N, L	6X	2X (need to FW up to XL04,YL04)
LG	BE06LU10	6X	2x (need to FW up to YE05)
LG	BH08NS20,LS20	8X	2X (need to FW up to EL02-04)
LG	WH08LS20	8X	2X (need to FW up)
LG	BH10NS30	10X	2X
Panasonic	SW-5582	2X	2X (need to FW up to BBF4)
Panasonic	SW-5583	4X	2X (need to FW up to 1.02)
Panasonic	SW-5584	8X	2X
Panasonic	UJ-210,215	1X	NO
Panasonic	UJ-220,225	2X	NO
Pioneer	BDR-101A	2X	NO
Pioneer	BDR-202	4X	NO
Pioneer	BDR-203	8X	2X
Pioneer	BDR-205	12X	2X
LaCie	301856U	8X	2x

LTH BD-R support by ROM drives / players

Type	Maker	Model	Media		
			BD-R LTH Type 2x SL Play*	BD-R HTL type 2x SL Play*	
BD combo (BD read only)	SONY	BDUX10S	YES	YES	
	LG	GGC-H20L	YES	YES	
	LITE-ON	iHES206	NO	YES	
	PLDS/Plextor	PX-B310SA	NO	YES	
BD player And PS3	SONY	BDP-S350	YES	YES	
	SONY	BDP-S360	YES	YES	
	SONY	BDP-S500ES	YES	YES	
	SONY	Playstation 3	YES(FW ver2.20-)	YES	
	SAMSUNG	BD-P1500	YES	YES	
	SAMSUNG	BD-P1600	NO	YES	
	Panasonic	DMP-BD35K	YES	YES	
	Panasonic	DMP-BD60	YES	YES	
	Panasonic	DMP-BV100	YES	YES	
	Sharp	BD-HP1	NO	TES	
	Sharp	BD-HP21	YES	YES	
	Pioneer	BDP-LX70	NO	NO	
		BDP-LX80	YES	YES	
		BDP-LX71,91	YES	YES	
		BDP-LX52	YES	YES	
		BDP-120,320	YES	YES	
		LG	BD370	NO	YES
		SYLVANIA	NB500SL9	NO	YES
	MAGNAVOX	NB530MGX	YES	YES	

*Disc recorded with BD-MV format was confirmed.

- Some of leading web-site to get new FW

<http://www.cdrinfo.com/Sections/Firmware/Home.aspx>

<http://drivers.softpedia.com/get/FIRMWARE/>

<http://www.firmwarehq.com/>

For details, ask drive manufactures about LTH support

Where can you get the latest FW for LTH?

BD Writers			Verbatim Media	Web site	comments
Maker	Model	BD Write Speed	BD-R LTH Type 2x SL		
SONY	BWU-300S	8X	2X		
LITE-ON	DH-4B1S	4X	2X (need to FW up to 7P5B)	http://www.liteonit.com/global/index.php?option=com_wrapper&Itemid=154	
Buffalo	BRHC-6316U2	6X	2X (need to FW up to XJ04)	http://buffalo.jp/download/driver/hd/brhc-6316_fw.html	Japanese Web site but just click "download", base drive: LG GGW-H20N
LG	GBW-H10N	4X	NO		
LG	GGW-H20N, L	6X	2X (need to FW up to XL04, YL04)	http://www.cdinfo.com/Sections/Firmware/SingleModel.aspx?Driveld=1634 ,	LG officially doesn't release any firmware update because these drives are for OEM model. Need to ask drive maker directly.
LG	BE06LU10	6X	2x (need to FW up to YE05)	http://www.cdinfo.com/Sections/Firmware/SingleModel.aspx?Driveld=1667	
LG	BH08NS20,LS20	8X	2X (need to FW up to EL02-04)	http://www.firmwarehq.com/LG/BH08NS20/files.html	
LG	WH08LS20	8X	2X (need to FW up)	coildn't find...	
LG	BH10NS30	10X	2X		
Panasonic	SW-5582	2X	2X (need to FW up to BBF4)	http://buffalo.jp/download/driver/hd/br-h2_fw.html	This model is for OEM. Need to ask third party to get the latest FW. But Buffalo JPN release the new one for Buffalo BR-H2 series. Don't know if that FW meets other OEM makers model. (Japanese
Panasonic	SW-5583	4X	2X (need to FW up to 1.02)	http://buffalo.jp/download/driver/hd/br-416_fw.html	This model is for OEM. Need to ask third party to get the latest FW. But Buffalo JPN release the new one for for buffalo BR-416 series Don't know if that FW meet other OEM makers model (Japanese Web site
Panasonic	SW-5584	8X	2X		
Panasonic	UJ-210,215	1X	NO		
Panasonic	UJ-220,225	2X	NO		
Pioneer	BDR-101A	2X	NO		
Pioneer	BDR-202	4X	NO		
Pioneer	BDR-203	8X	2X		
Pioneer	BDR-205	12X	2X		
LaCie	301856U	8X	2x		

Note) not guarantee over write speed. Some OEM drive/ PC (ex.Dell, HP etc.) may have the same model#. But the function and writing speed depends on their FW.

Low cost and High efficiency of LTH disc production based on experience

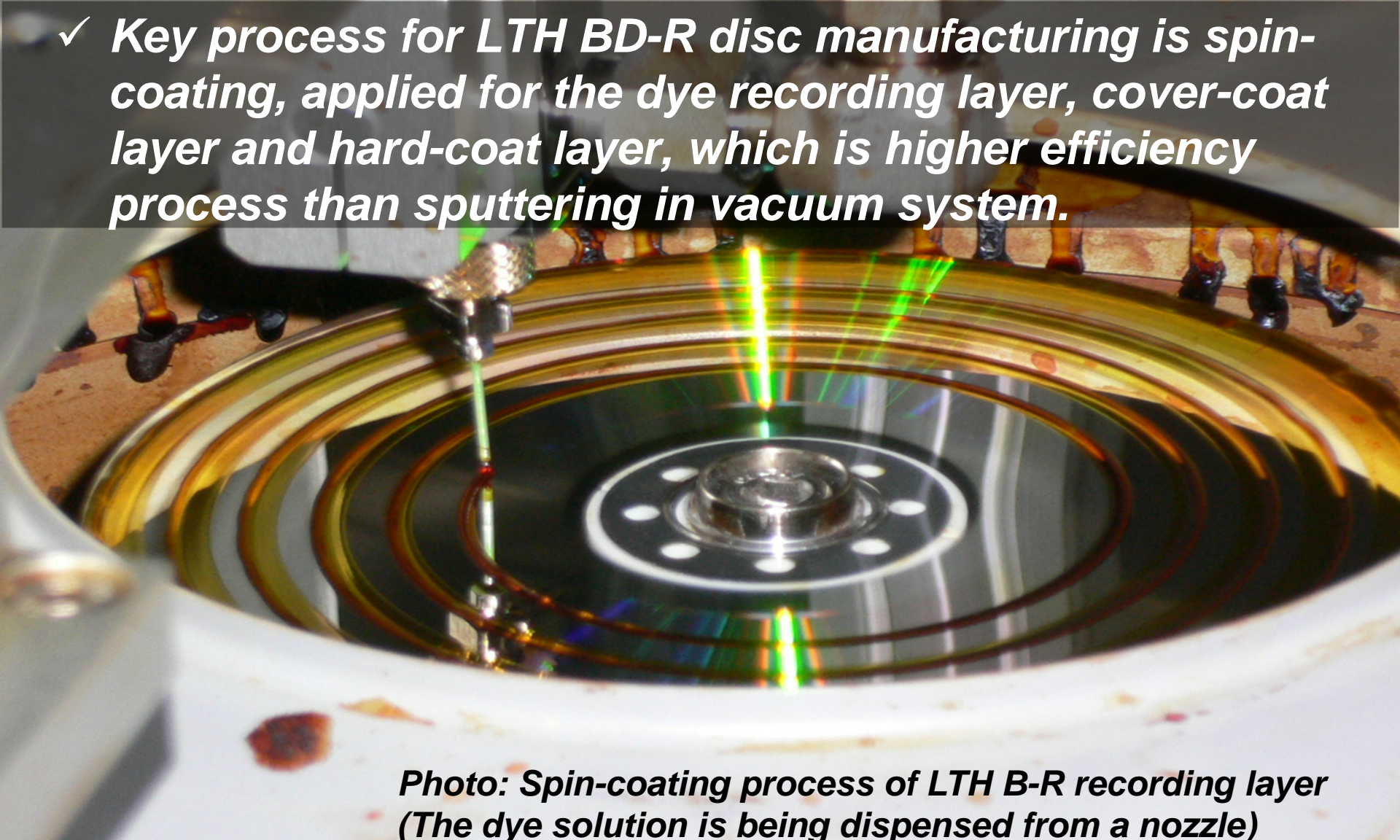


- Key difference in manufacturing is in formation process of the recording layer
- The cost difference in HTL vs. LTH will finally be similar to that in RW vs. R in CD/DVD era. More than 50% higher production efficiency is expected for LTH(dye) disc than HTL(inorganic) disc.

	HTL BD-R	LTH BD-R
Recording layer Material	Inorganic alloy or composite	Organic dye
Manufacturing process	Sputtering	Spin-coating
	Vacuum process Sequential operation	Air ambient Easy parallel operation
Products with similar process	CD-RW DVD-RAM DVD+-RW MO BD-RE	CD-R DVD+R,-R

Spin-coating technology

- ✓ *Key process for LTH BD-R disc manufacturing is spin-coating, applied for the dye recording layer, cover-coat layer and hard-coat layer, which is higher efficiency process than sputtering in vacuum system.*



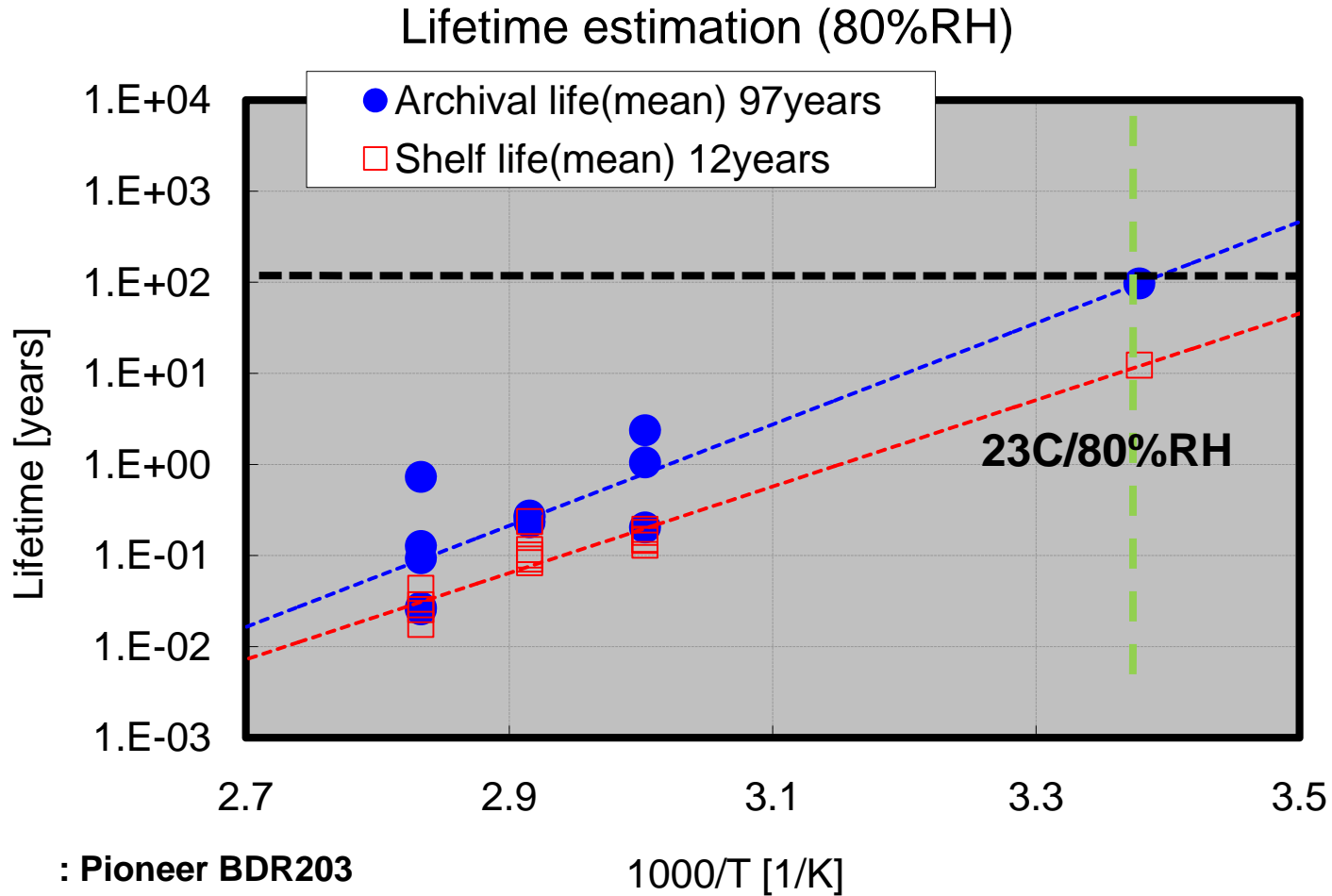
*Photo: Spin-coating process of LTH B-R recording layer
(The dye solution is being dispensed from a nozzle)*

- ✓ *More than 80% material in a LTH BD-R disc manufacturing process is recycled, especially in the spin-coating process*
- ✓ *Especially recycling of the recording material, i.e., organic dye in spin coating process, is unique against inorganic material usage/waste in sputtering process for HTL media.*

Economy and Eco-friendly

***Photo: Spin-coating process of LTH B-R recording layer
(Dispensed dye is spread by spinning)***

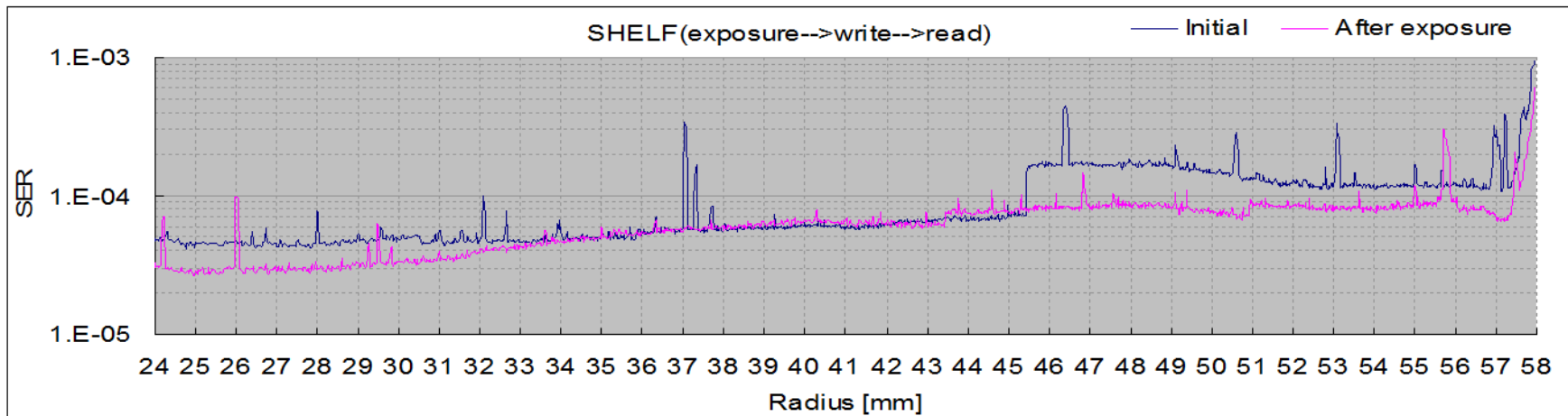
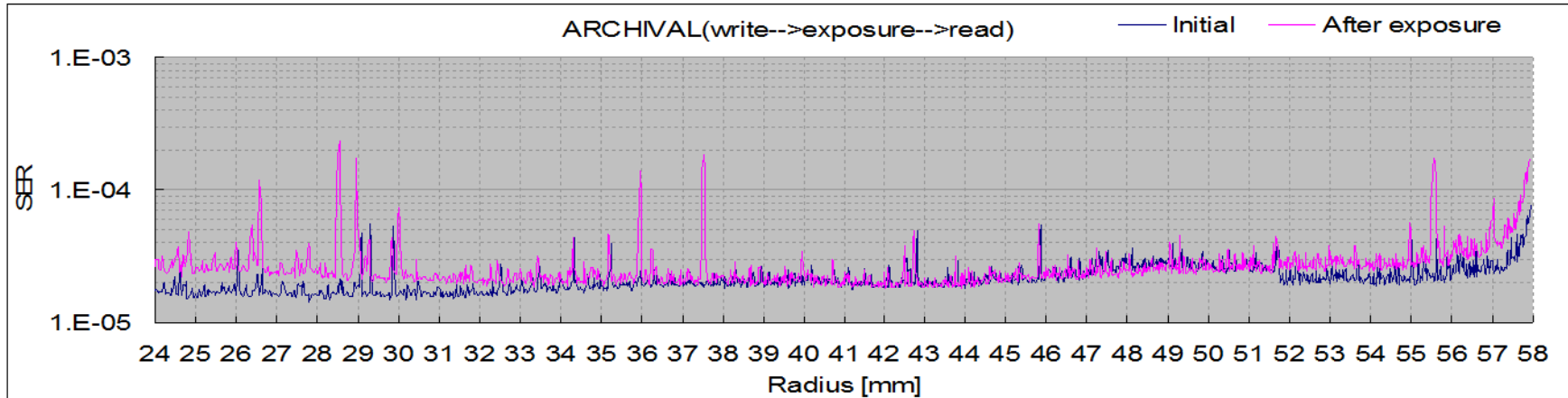
Evidence of reliability: >50years archival life expected



Writer : Pioneer BDR203
Reader : Expert BDT-SD1
EOL : 4.3e-3(SER)

1000/T [1/K]

Evidence of reliability: Good light exposure resistance

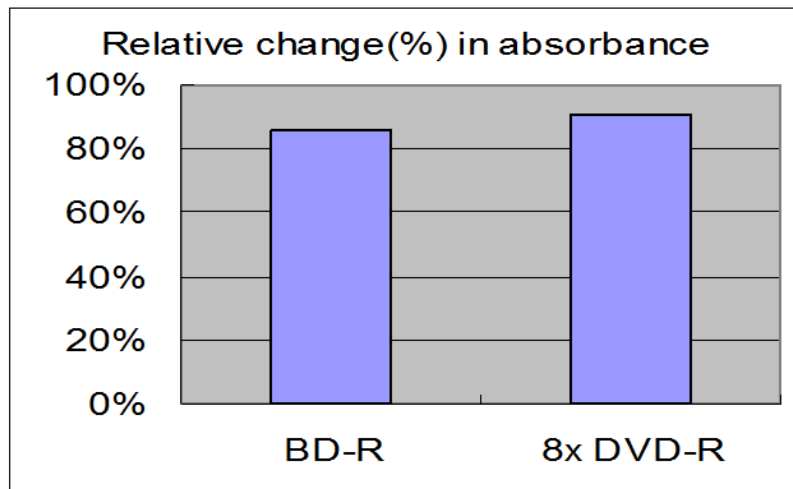
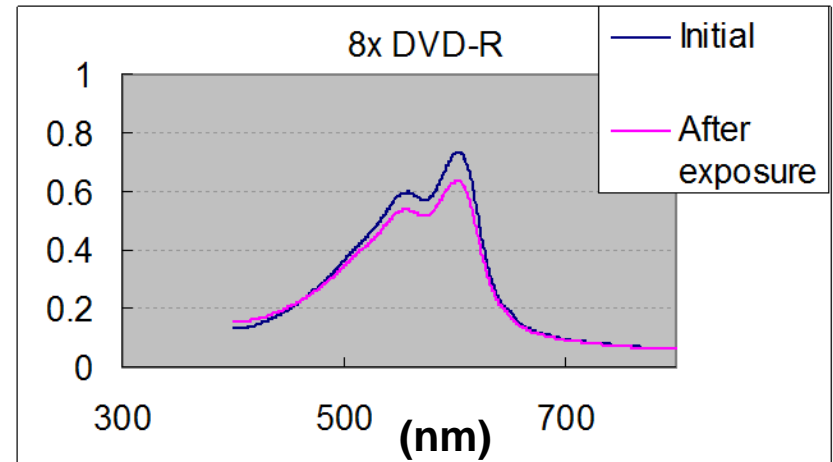
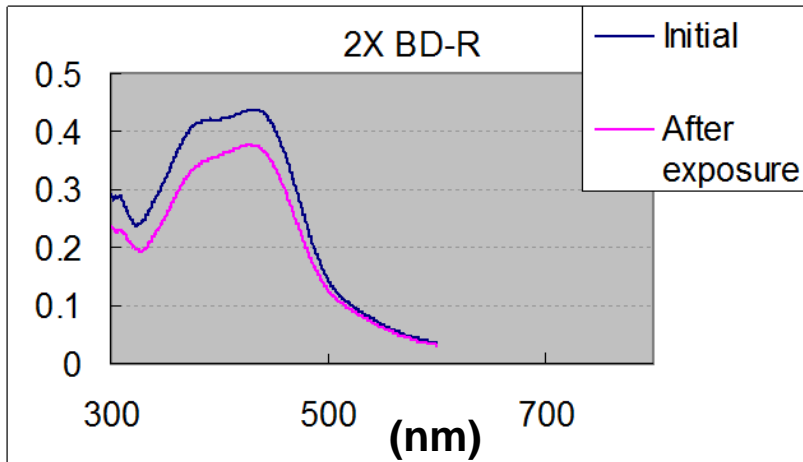


Xenon lamp, 550W, duration=40hours. There is no significant increase of SER.

Write Pioneer BDR203 Read: Pulstec SD1

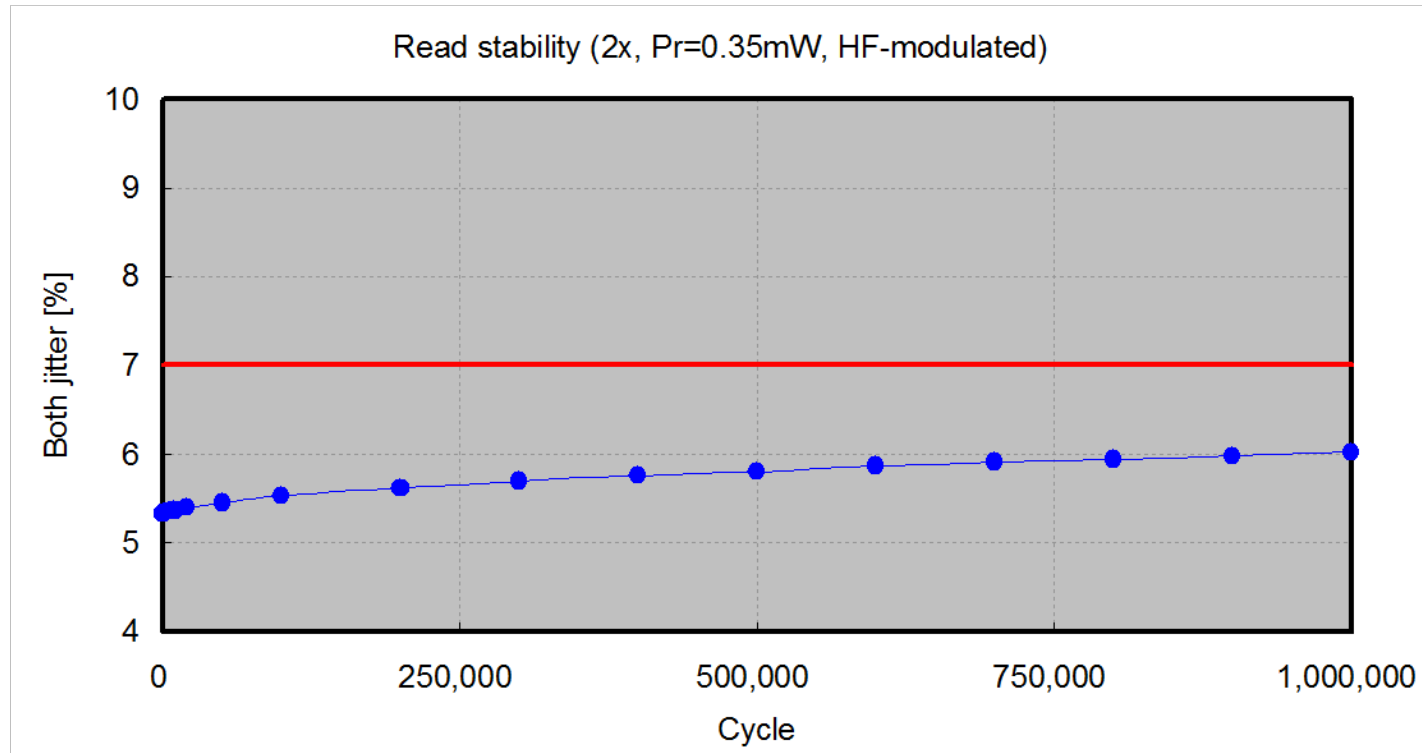
Evidence of the reliability:

Good light exposure resistance based on stable absorbance of the AZO dye itself



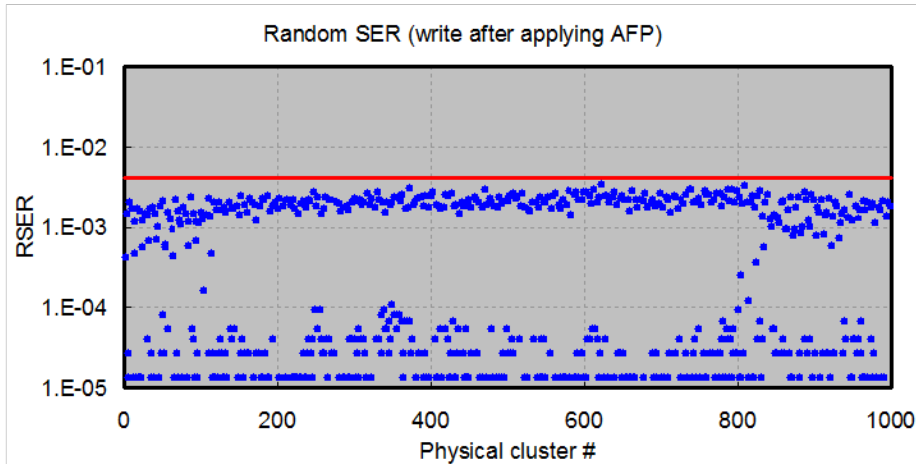
Stable as DVD-R dye

Evidence of reliability: over 1million cycle read stability



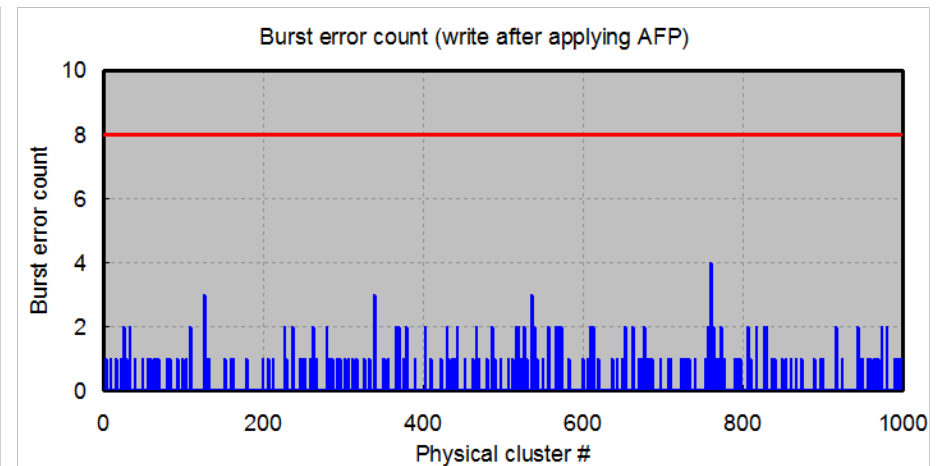
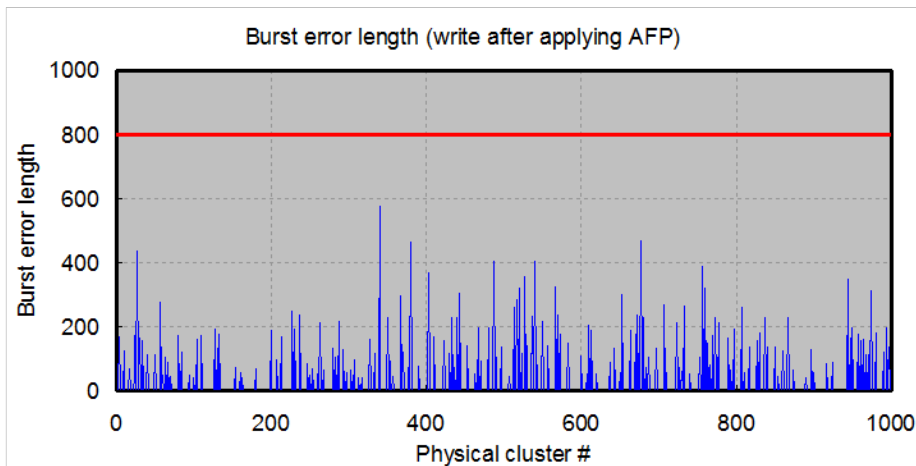
Jitter (also SER) is maintained well within book spec after 1e+6 times of continuous reading.

Evidence of reliability: Stain-resistance(artificial finger print)



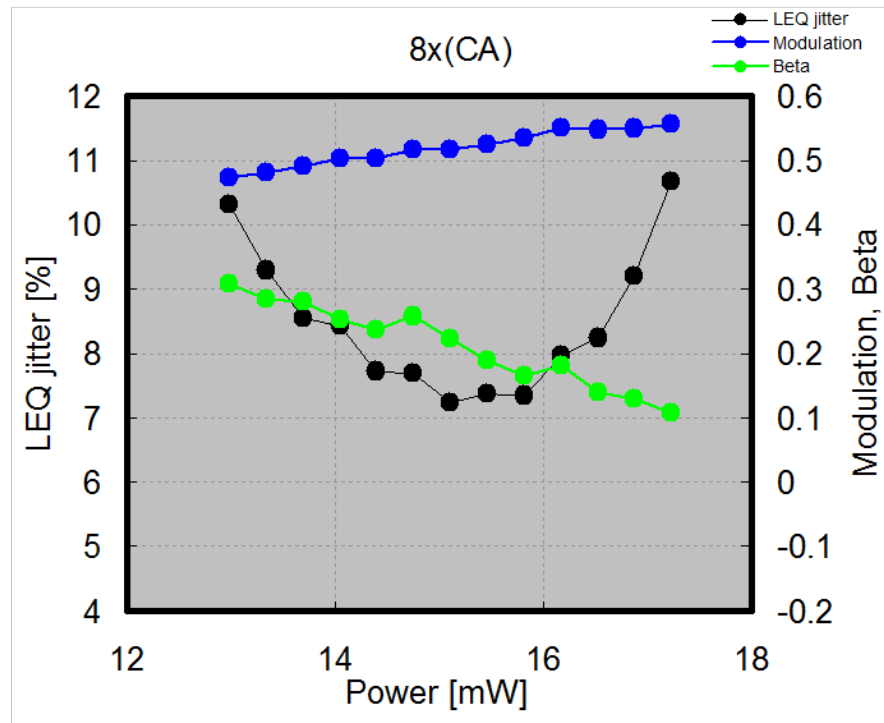
Write/read was performed after applying AFP.

Error level is maintained within book spec.

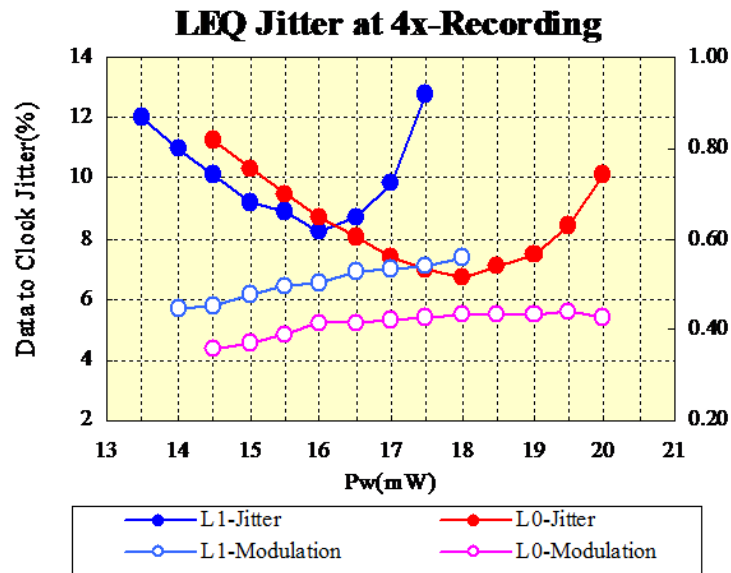


Roadmap: High speed recording

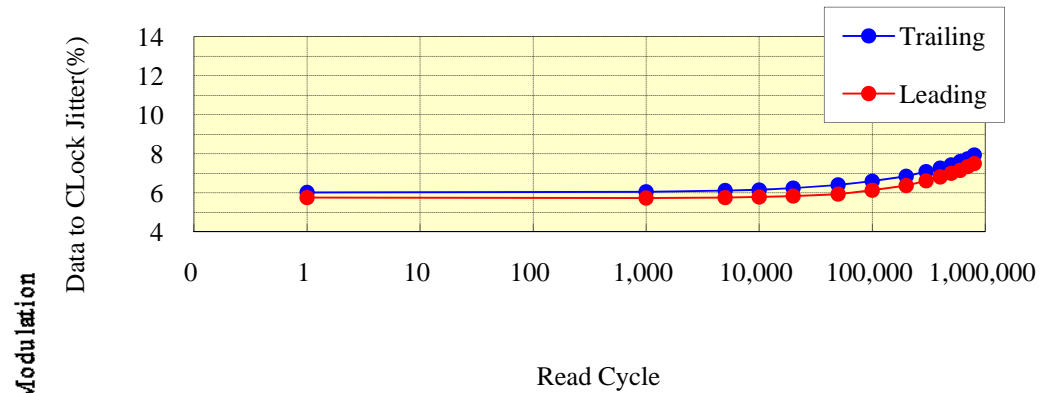
□ 1-6X BD-R media is specified in Ver1.3 BD-R book and actually commercialized from MKM in Japan in Oct. 2009. Over 8X speed recordable media is feasible and under development for mass production



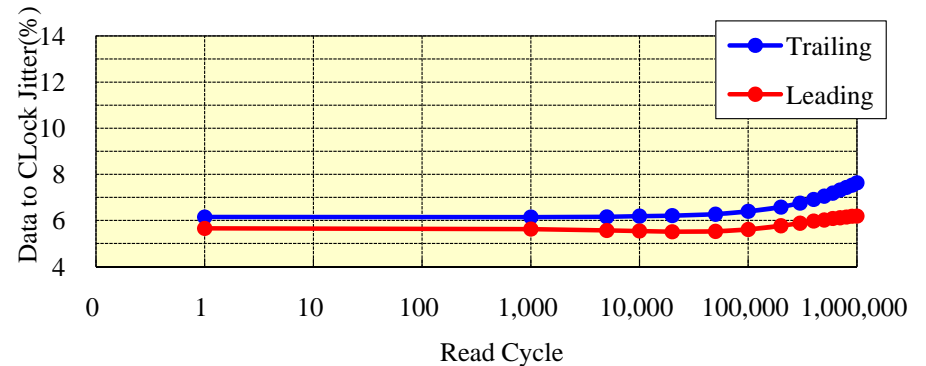
LTH Dual layer: feasibility confirmed



L0 Read Stability (HF 0.7mW 2x Recording & Reading)



L1 Read Stability (HF 0.7mW 2x Recording & Reading)



Thank you
for your attention

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