
Joint Round Robin Test for DVD-R/-RW/-RAM

CeBIT Conference Seminar
March 11, 2005

RW Products Promotion Initiative
Recordable DVD Council

RWPPI

RW Products Promotion Initiative

RDVDC Recordable
DVD Council

About Joint Round Robin Test (JRT)

RWPPI

RW Products Promotion Initiative

RRT DVD-R/RW

Physical WG

Writer WG

Recorder WG

Playback WG

+

RDVDC Recordable
DVD Council

CWG DVD-RAM

SWG1

SWG2

SWG3

Joint compatibility evaluation
of DVD products

RWPPI/RRT



RDVDC/CWG

RWPPI

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2/40

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Joint Round Robin Test

- Brief History

2003		2004			2005	
DVD-R/-RW/-RAM = 4x/2x/3x					8x/4x/5x	

- Overview of Current JRT

- Tested samples: 8x DVD-R, 4x DVD-RW, 5x DVD-RAM related products
- Total participation: 142 products, 54 companies
- Total number of tested items: 449

JRT Participants

Manufacturers who participated in the joint round robin tests
(in alphabetical order):

Almedio Inc., Alpine Electronics, Inc., AMC Co., Ltd., B.H.A Corporation, CMC Magnetics Corporation, CyberLink Inc., Daxon Technology Inc., DENON Ltd., Digion Inc., Fuji Photo Film Co., Ltd., Funai Electric Co., Ltd., Gigastorage Corporation, Hitachi, Ltd., Hitachi-LG Data Storage, Inc., Hitachi Maxell, Ltd., InterVideo Japan Inc., Kenwood Corporation, Lead Data Inc., LG Electronics Inc., Matsushita Electric Industrial Co., Ltd., Matsushita Kotobuki Electronics Industries, Ltd., MedioStream Inc., Mitsubishi Electric Corporation, Mitsubishi Kagaku Media Co., Ltd., MJC (Singapore) Pte Ltd, Moser Baer India Ltd, Nan Ya Plastics Corporation, NEC Corporation, Nero AG, NewSoft Technology Corporation, New Star Digital Co., Ltd., New Star Digital Japan Co., Optodisc Technology Co., Orion Electric Co., Ltd., Panasonic Communications Co., Ltd., Pioneer Corporation, Princo Corporation, Prodisc Technology Inc., RITEK Corporation, Samsung Electronics Co., Ltd., Sanyo Electric Co., Ltd., Sharp Corporation, Shinano Kenshi Co., Ltd.(Plextor), SKC Co., Ltd., Sony Corporation, Taiyo Yuden Co., Ltd., TDK Corporation, TEAC Corporation, Toshiba Corporation, Toshiba Samsung Storage Technology Corporation, Ulead Systems, Inc., UmeDisc Ltd., Victor Company of Japan, Limited, Yamaha Corporation

Reports by RRT* /RWPPPI

DVD-R and DVD-RW related products

* RRT stands for the Round Robin Test



- Participants
- Progress
- Test Reports by Working Group
 - Physical Format WG
 - Test M6
 - Logical Format Writer WG
 - Test W4
 - Logical Format Recorder WG
 - Test R4
 - Playback Compatibility WG
 - Test P8-1, P8-2, P9

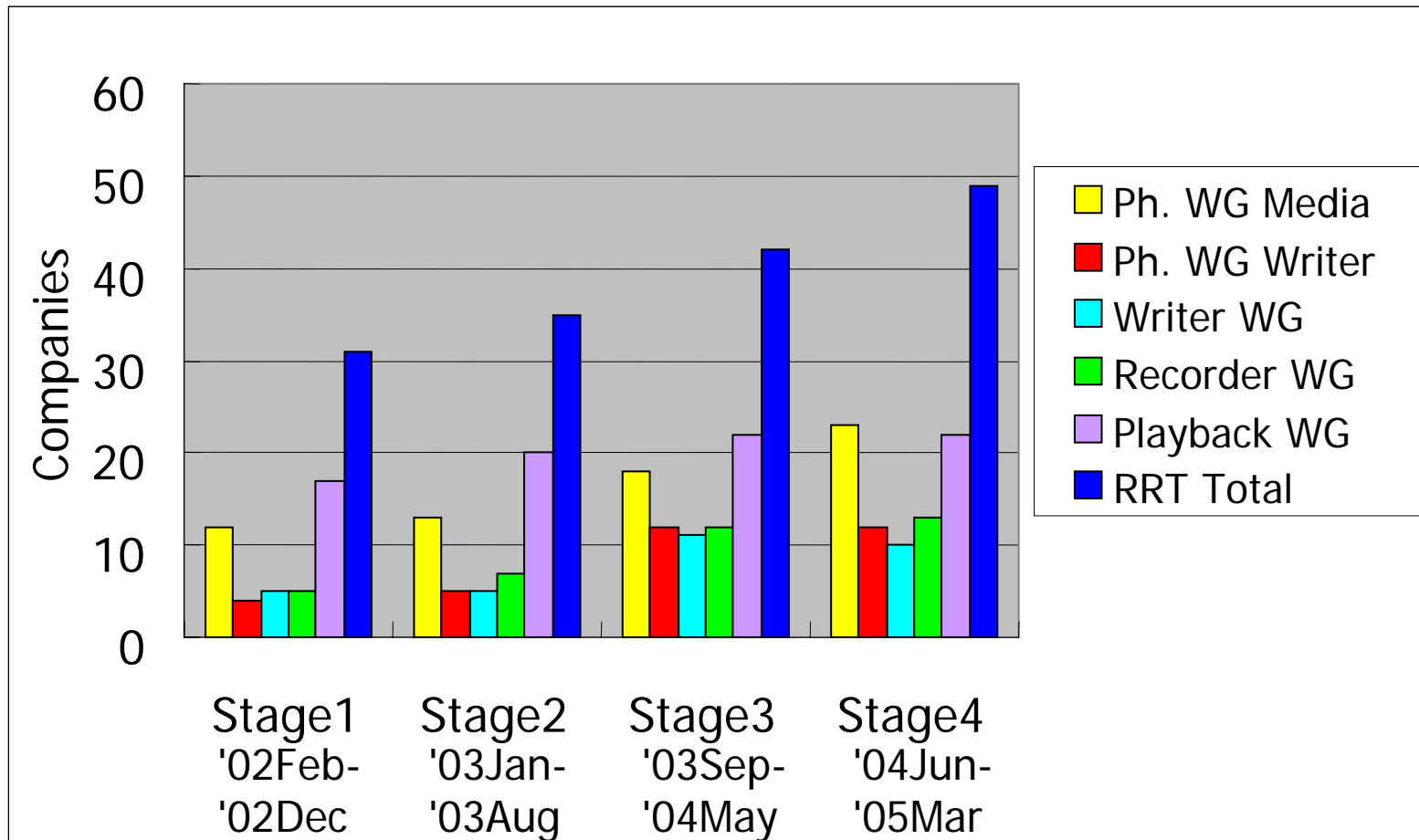
RWPPPI's RRT carried out the Stage-4 Round Robin Test for 8x DVD-R and 4x DVD-RW products.

49 companies from around the world participated in the tests.

Total world market shares of participating companies:

- DVD-R/RW discs: 90%
- DVD-R/RW writers: 70%
- DVD-R/RW recorders: 81%

- Number of DVD-R/RW RRT Participants



- **Test M6 Outline**

- The "Test M6" performed compatibility evaluations on 1x to 8x speed writing using 24 8x DVD-R discs from 22 manufacturers and 12 writers from 12 manufacturers.
- At the same time, compatibility evaluations on 2x and 4x speed writing was performed using 8 4x DVD-RW discs from 8 manufacturers and 12 writers from 12 manufacturers.
- The number of media company participants increased to 23, up from the 18 who participated in the previous tests. The DVD-R market share of participants approached 91%, while DVD-RW market share was 85%.

- Test M6 Schedule

Sample preparation:

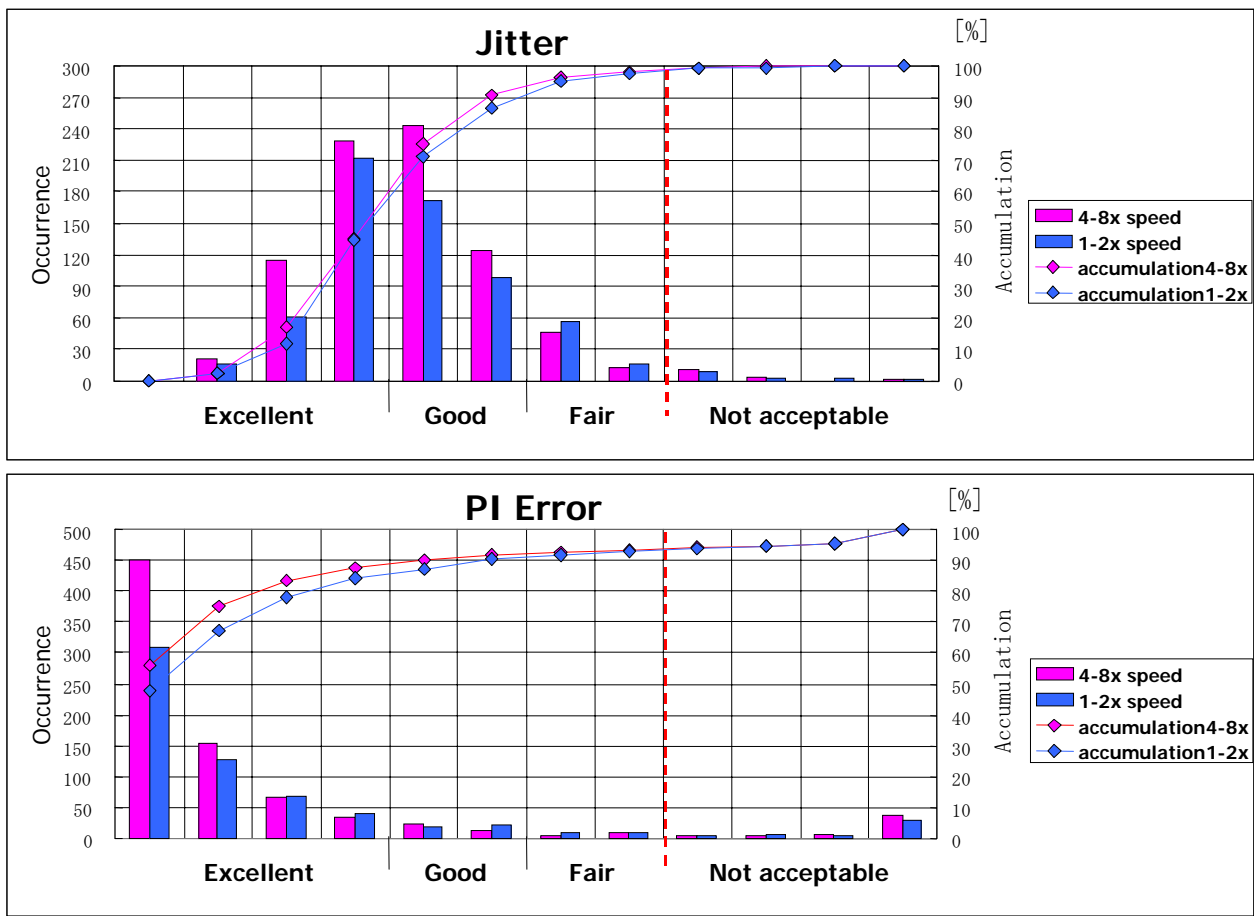
July-August, 2004

Writing tests by each participant:

September-December, 2004

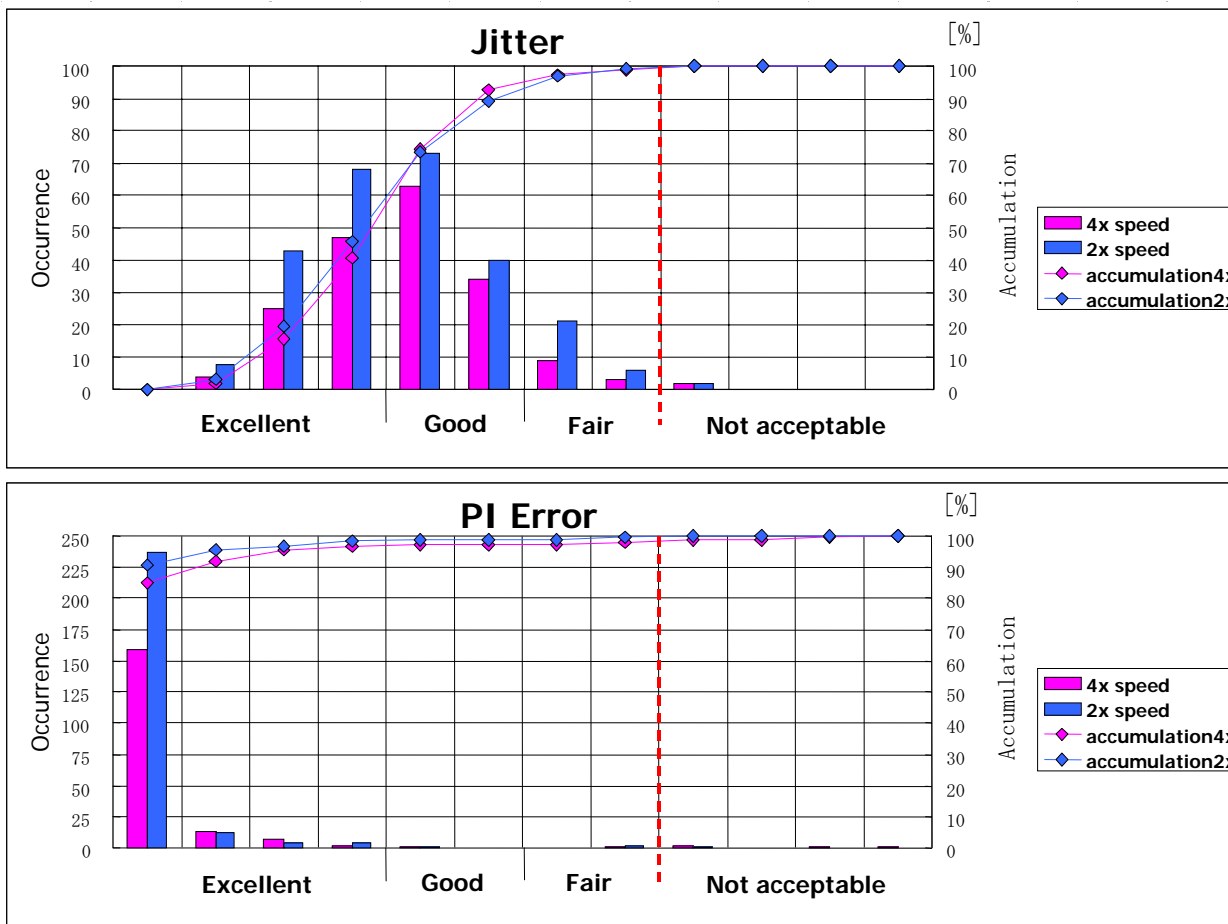


• Fig.1 8x DVD-R Disc Test Results





• Fig.2 4x DVD-RW Disc Test Results



- Summary of Test M6 Results

8x DVD-R Disc

- Confirmation of disc and writer compatibility exceeded 95%. This included major characteristic tests such as Jitter and PI error.
- There were some combinations that showed poor compatibility. However, this was not because of fundamental writer or disc defects. This can be improved by adjusting the writing strategies associated with discs.

4x DVD-RW Disc

- Good compatibility was obtained for almost all disc and writer combinations.
- In the DOW results, however, adjustment of writing strategies was insufficient in certain combinations. This issue needs to be addressed.

- **Scope of Writer WG:**
 - Logical structures specified in the DVD-R/RW Specifications Part 1.
- **Purpose of Test W4:**
 - To confirm and improve the logical compatibility between writers through the execution of fundamental and important functions regarding recording on DVD-R/RW discs. This testing was undertaken to ensure that discs could be used comfortably with various writers.
- **Products for Test W4:**
 - Tested Discs: 8x DVD-R, 4x DVD-RW
 - Writers: One model per manufacturer. These included pre-production devices.

- **Test W4 Items**

- Recording model test

- Current widely-used commercial packet writing software was employed for DVD-R Incremental Recording and DVD-RW Restricted Overwrite tests.
 - A special test application was used to test DVD-RW Incremental Recording. This is one of the fundamental recording modes, however, it is rarely used.

- Marginal test

- Evaluation of DVD-R disc compatibility after repeated recordings by different writers in situations where little RMA remains.
 - Using six different kinds of amplitude, readability tests regarding NBCA signal amplitude (which is necessary for CPRM) were conducted.

- **Test W4 Results**

- The total number of combinations in the Round Robin Tests was 324.
- There were three issues reported.



0.09%

- One physical issue.
- One logical issue.
- One test environment issue.

- These problems have been solved through analyses and improvement measures.

- **Summary of Test W4 Results**
 - A high degree of compatibility among participating writers was achieved on all test items for the recording models used with DVD-R/RW.
 - It was confirmed that issues raised in previous tests have been resolved and improvements noted.
 - Causes of newly-raised issues were investigated and disclosed to participants.
 - All drives were able to read the DVD-R NBCA of one or more test media.
 - It seems that there were no logical problems reading NBCA.
 - Some drives were not able to read NBCA on test media recorded using marginal “NBCA signal amplitude” values. This physical issue is scheduled to be resolved in the future.
 - The tests helped develop common understanding regarding interpretation of format specifications.

Test R4 Items

- Confirm high-speed disc, PAL and copy-once content using CPRM.
 1. NTSC Video mode on 8x DVD-R disc using CPRM
13 companies participated.
 2. PAL Video mode on 8x DVD-R disc
10 companies participated.
 3. NTSC VR mode with CPRM content on 4x DVD-RW
11 companies participated.



Result 1: NTSC Video Mode

Media: 8x DVD-R Disc with CPRM

Evaluating Company

		Evaluating Company												
		A	B	C	D	E	F	G	H	I	J	K	L	M
Recording Company	A		●	●	●	●	●	●	●	●	●	●	●	●
	B	●		●	●	●	●	●	●	●	●	●	●	●
	C	●	●		●	●	●	●	●	●	●	○	●	●
	D	●	●	●		●	●	●	●	●	●	●	●	●
	E	●	●	●	●		●	●	●	●	●	●	●	●
	F	●	●	●	●	●		●	●	●	●	●	●	●
	G	●	●	●	●	●	●		●	●	●	●	●	●
	H	○	●	●	●	●	●	●		●	○	○	○	○
	I	●	●	●	●	●	●	●	●		●	●	●	●
	J	○	●	●	●	●	●	●	●	●		●	●	●
	K	●	●	●	●	●	●	●	●	●	●		●	●
	L	●	●	●	●	●	●	●	●	●	●	●		●
	M	●	●	●	●	●	●	●	●	●	●	●	●	

● : OK

○ : Problem was solved in re-test phase.



Result 2: PAL Video Mode

Media: 8x DVD-R Disc

Evaluating Company

		Evaluating Company									
		A	B	C	F	H	I	J	K	L	M
Recording Company	A		⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙
	B	⊙		⊙	⊙	⊙	⊙	⊙	○	⊙	⊙
	C	⊙	⊙		⊙	⊙	⊙	⊙	⊙	○	⊙
	F	⊙	⊙	⊙		⊙	⊙	⊙	⊙	○	⊙
	H	○	⊙	⊙	⊙		○	○	○	○	○
	I	⊙	⊙	⊙	⊙	⊙		⊙	⊙	⊙	⊙
	J	○	⊙	⊙	⊙	⊙	⊙		⊙	⊙	⊙
	K	⊙	⊙	⊙	⊙	⊙	⊙	⊙		○	⊙
	L	⊙	⊙	⊙	⊙	○	⊙	⊙	⊙		⊙
	M	⊙	⊙	⊙	⊙	○	⊙	⊙	⊙	⊙	

⊙ : OK

○ : Problem was solved in re-test phase.



Result 3: NTSC VR Mode with CPRM

Media: 4x DVD-RW Disc with CPRM

Evaluating Company

Recording Company		A	B	C	D	G	H	I	J	K	L	M	
	D	⊙	⊙	⊙	■	⊙	○	⊙	⊙	⊙	⊙	⊙	⊙
	G	⊙	⊙	⊙	⊙	■	○	⊙	⊙	⊙	⊙	⊙	○
	I	⊙	⊙	⊙	⊙	⊙	○	■	⊙	⊙	⊙	⊙	⊙
	J	⊙	○	⊙	⊙	⊙	○	○	■	○	⊙	⊙	⊙
	K	⊙	⊙	⊙	⊙	⊙	○	⊙	⊙	■	⊙	⊙	⊙
	L	⊙	⊙	⊙	⊙	⊙	○	⊙	⊙	⊙	■	○	○

⊙ : OK

○ : Problem was solved in re-test phase.

Summary of Test R4 Results

Test R4:

- ◆ 316 combinations tested in Test R4.
 - 256 combinations tested in Video mode.
 - 60 combinations tested in VR mode.

Test Results:

- ◆ Video Mode
 - 236 combinations passed without re-test. (92%)
 - 20 combinations had some issues. (8%)

- ◆ VR Mode
 - 49 combinations passed without re-test. (82%)
 - 11 combinations had some issues. (18%)

31 combinations with issues were analyzed and fixed in the re-test phase.
Through Test R4, high compatibility for R/RW was achieved.

• Test P8-1 Summary

Purpose:

- Checking symptoms that may occur using 4x DVD-RW (ver1.2) Class 1 discs
- Checking fatal errors on players/drives

Test Discs:

4 kinds of NTSC Video mode (finalized) discs.

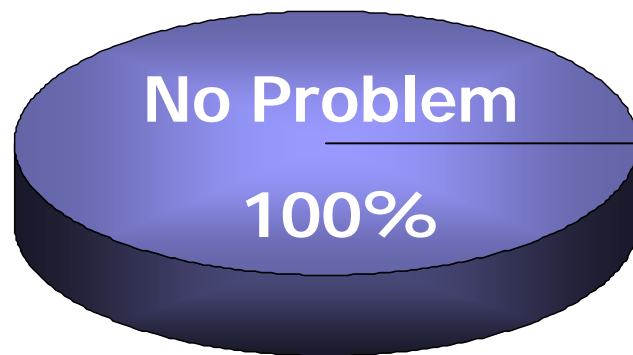
Test Item:

Disc recognition, normal playback.

Results:

All testers reported

NO Problem Items.



• Test P8-2 Summary

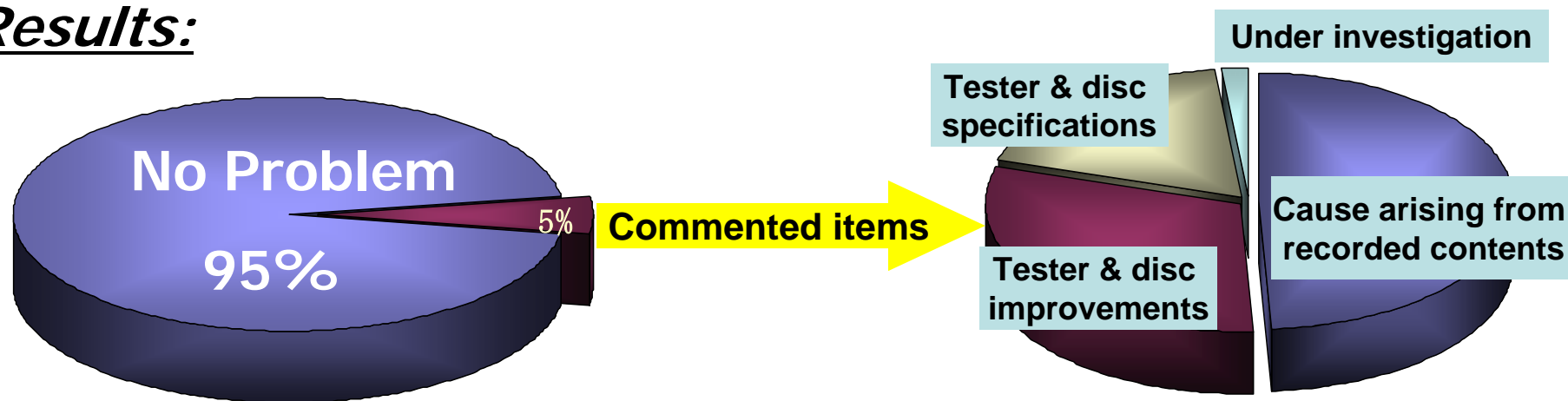
Purpose:

Playback compatibility check between following devices and discs.

Devices: Players and PC drives with playback applications

Discs: Finalized Video on DVD-R with CPRM, PAL Video on DVD-R, and CPRM contents (VR mode) on DVD-RW from Recorder WG

Results:



The 5% of items on which comments were made have already been resolved through analyses and improvement measures. Almost 100% compatibility was achieved for Test P8-2.

- Test P9 Summary

Purpose:

Playability check using marginal signal quality discs (“Not Acceptable” area)

DVD-R (Write speed: 2x, 4x and 8x)

DVD-RW (Write speed: 4x)

Results:

Only a few problems were reported within the “Not Acceptable” area
(6/190 ~ 3%)



These problems occurred under combined conditions of high jitter and low asymmetry within “Not Acceptable” area.

Report of Product Compatibility for DVD-RAM Related Products

CeBIT Conference Seminar

March 11, 2005

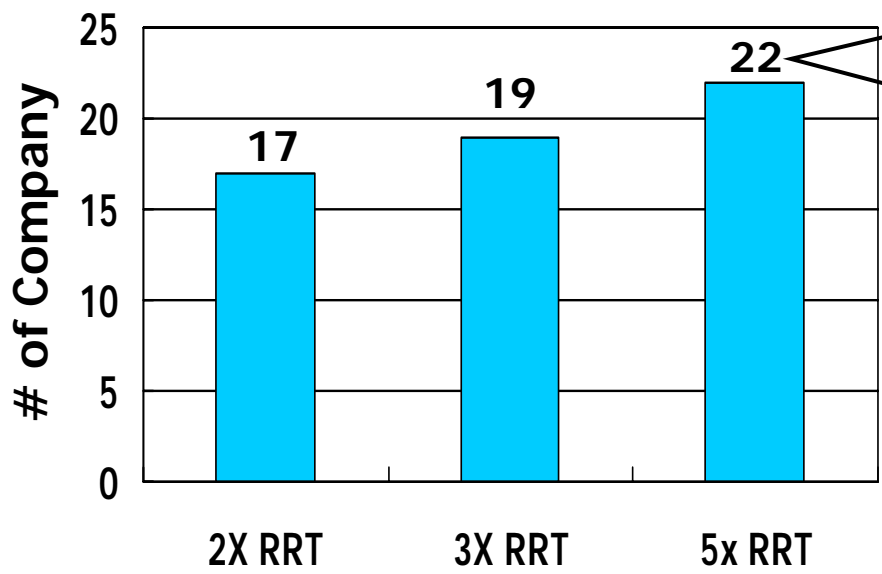
Director : Yong-chaе Jeong (Samsung)

A. Director : Hiroyuki Yamaguchi (Matsushita)

- Participants
- Test Results
 - Test items and results
 - Forward and Backward Compatibility
 - Playability and Recordability of marginal discs
 - VR Mode Compatibility with CPRM
- Merits of activity
- Summary

● Total 22 worldwide companies participated in Round Robin Test.

The Number of DVD-RAM RRT Participants



SWG1* (testers): 6 companies
SWG2 (discs & burners): 12 companies
SWG3 (VR mode): 11 companies
※ Some companies participated in more than two SWG activities.

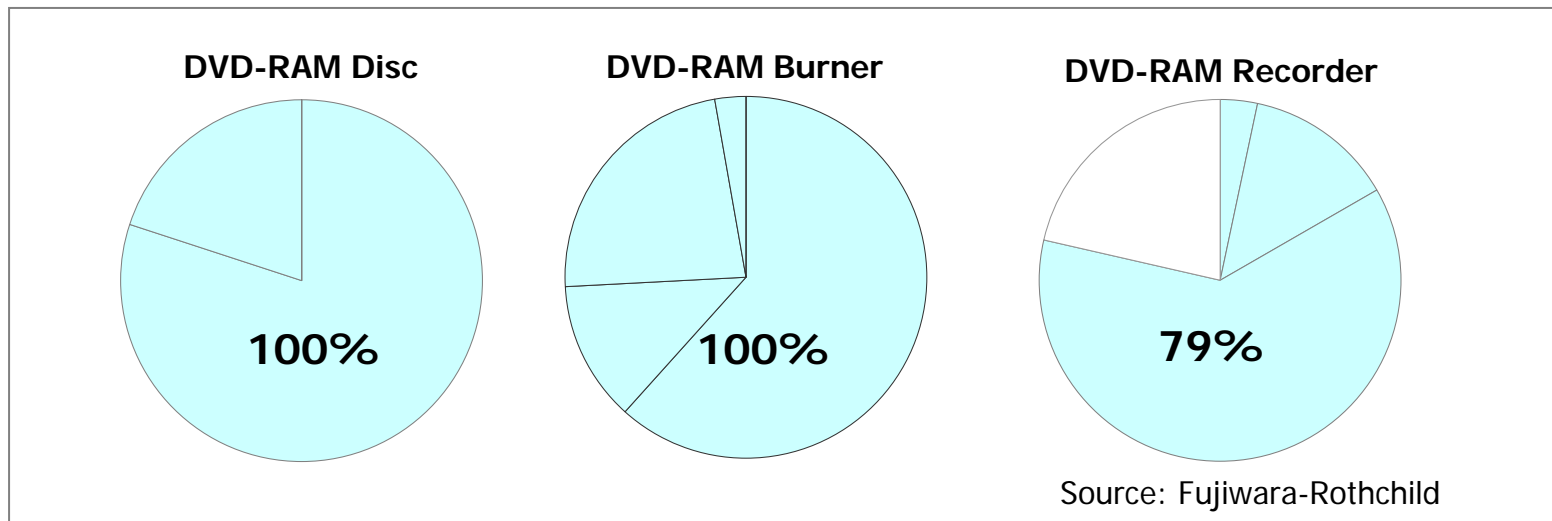
*SWG: Sub Working Group

● The worldwide market share of participants:

DVD-RAM Disc: 100%

DVD-RAM Burner: 100%

DVD-RAM Recorder: 79%



Market shares of participants shows high coverage of DVD-RAM disc, DVD-RAM burner and DVD-RAM recorder market.

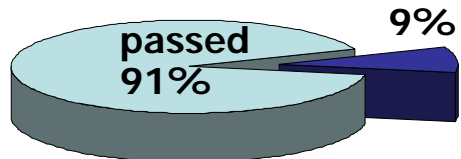
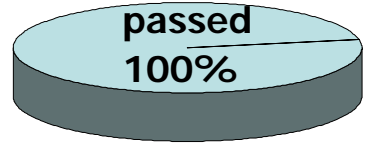
● Test Results Outline

Total 148 items were tested over 30 product models and each SWG has archived following results.

- SWG1(testers): compatibility of developing tool
64 items, 6 testers, pass ratio= 97%
- SWG2(discs/burners): compatibility of physical and logical layer
34 items, 14 models, 100% pass ratio
- SWG3(VR mode) : compatibility of application layer
50 items, 16 models, pass ratio= 91%



Related product is not released into the market yet, or little effect to compatibility



Related product is not released into the market yet, or soft ware will be updated through Web-site

● Test Method

Check cross speed recording compatibility on 2x or 3x or 5x speed burner using 5x DVD-RAM discs.

● Test Results

Backward Compatibility Test

Cross Recording Speed			2X burner		3X burner				5X burner	
			2X Write		3X Write				5X Write	
			A	B	C	D	E	F	G	H
2x burner	2X OW*	A	pass	pass	pass	pass	pass	pass	pass	pass
		B	pass	pass	pass	pass	pass	pass	pass	pass
3x burner	3X OW	C	pass	pass	pass	pass	pass	pass	pass	pass
		D	pass	pass	pass	pass	pass	pass	pass	pass
		E	pass	pass	pass	pass	pass	pass	pass	pass
		F	pass	pass	pass	pass	pass	pass	pass	pass
5x burner	5X OW	G	pass	pass	pass	pass	pass	pass	pass	pass
		H	pass	pass	pass	pass	pass	pass	pass	pass

*OW: Over-write

● Results

- The overwrite compatibility of 5x speed recorded disc by 2x and/or 3x speed burners is confirmed. (Backward compatibility)
- The overwrite compatibility of 2x or 3x speed recorded disc by 3x or 5x speed burners is also confirmed. (Forward compatibility)
- The 5x DVD-RAM discs can be used without worry about recording speed of your burners.

● Test Procedure

- Created upper or lower limit disc on manufacturing process
 - (1) Radial & Tangential tilt
 - (2) Reflectivity
 - (3) Write sensitivity
 - (4) Axial runout
 - (5) Radial runout
- Write and read test at inner, middle and outer area of the marginal discs.

● Results

Marginal Disc	Number of discs	Test burner (write/Read)								
		A	B	C	D	E	F	G	H	I
Radial & tangential tilt	7	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
Reflectivity	6	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
Write sensitivity	5	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
Axial runout	4	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
Radial runout	4	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
Total	26									

- **All** drives passed the criteria and no problem reported.
- User can use 5x DVD-RAM discs without worry about its manufacturing dispersion.

OK

● Test Procedure

- Each CPRM supported equipment records copy once contents to make a test disc.
- The other CPRM supported equipment playback the test discs



● Results

- The compatibility of VR mode with CPRM was confirmed between 9 products of 7 companies

● Compatibility improved through activity

pass ratio	right after 1st test	after improvement *
SWG1	93%	97%
SWG2	100%	100%
SWG3	86%	91%
Total	98%	99%

* Pass ratio on March. 3rd 2005

● Offer various services for members

- Disclosure of the results on homepage
- Offer valuable tools for product design and development
 - Test Method and Criteria
 - Reference Disc and Test Disc lending service

<http://www.rdvdc.org>

주소(D) http://www.rdvdc.org/english/cwg/index.html

Recordable DVD Council

Organization
Operation Rules
Membership
Seminar
Compatibility WG
Press Release
Activity History
Related Products Information
Pamphlet
Application for Membership
Contact
Link
←HOME

- Activity Rule: [English](#) , [Japanese](#)
- Organization: [CWG](#)
- Forms: [Participation](#) , [NDA](#)
- Activity results
 - 2x DVD-RAM
 - RRT Summary: [Overview-2x](#) / [SWG1-2x](#) / [SWG2-2x](#) (*Member only)
 - Guideline: [Tester-2x](#) / [Drives & Discs-2x](#) (*Member only)
 - 3x DVD-RAM (JRT first stage)
 - RRT Summary: [Overview-3x](#) / [SWG1-3x](#) / [SWG2-3x](#) / [SWG3-1](#)
 - Guideline: [Tester-3x](#) / [Drives & Discs-3x](#) / [VR-mode-1](#) (*Member only)
 - JRT
 - 4x DVD-R/ 2x DVD-RW ([Link to RWPPI / RRT](#))
- Lending Service for Test discs:
 - [Application \(move to lending service page\)](#) (*Member only)
 - Operation rule (Require reading): [English](#) , [Japanese](#)
 - [Test discs check sheet](#) (*Member only)

Test Results

Test Guide Line

Disc Lending Service

- Confirmed and achieved high compatibility of 5X DVD-RAM related products including;
 - Forward and Backward compatibility
 - VR mode with CPRM
 - Marginal Manufactured Discs
- Compatibility improvement through our activity.
- CWG offers various member services.
 - Test Tools
 - Test Guideline
 - Disc Lending Services

Summary of JRT DVD-R/-RW/-RAM

**RW Products Promotion Initiative
Recordable DVD Council**

RWPPPI

RW Products Promotion Initiative

RDVDC Recordable
DVD Council

Summary

- JRT Summary

- Largest world wide recordable DVD compatibility test

- 142 products, 54 companies, 7 countries
- 449 test items

- Improve and confirm high compatibility of DVD-R, DVD-RW, DVD-RAM related products.

- DVD-R: 96%
- DVD-RW: 99%
- DVD-RAM: 99%

including,

Marginal Discs, VR mode with CPRM, PAL video recorders

Future Activities

- Continuation of RWPPPI and RDVDC relationship
 - Collaboration on JRT
 - Check and improve compatibility among DVD related products
 - Follow progress in DVD specifications
- Activity Plan (2005Q2 – 2006Q1)
 - Focusing On:
 - Compatibility of high-speed recording products
 - 16x speed DVD-R, 6x speed DVD-RW, 16x speed DVD-RAM
 - Compatibility of new specifications
 - Dual Layer DVD-R
 - Compatibility of new class products
 - Compatibility check of prospective and new DVD products
 - DVD recorders, cameras, burners, and PC application software

Thank you !

RWPPI

RW Products Promotion Initiative

RDVDC Recordable
DVD Council

- JRT Reports:

- Round Robin Test for 8x DVD-R, 4x DVD-RW
 - Mr. Fujiki: Physical Format WG Chair, RRT/RWPPPI
- Round Robin Test for 5x DVD-RAM
 - Mr. Jeong: Director, CWG/RDVDC
 - Mr. Yamaguchi: Co-Director, CWG/RDVDC