Excellent Compatibility of DVD+R/+RW Format

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Board Committee

World Wide Coordination Office (Philips)

Yokohama2000
DCCG
Player Group (Ricoh)

Shinagawa 2002
DCCG Recorder Group (Philips/Sony)

PCG
(Physical Compatibility Group)

LCG
(Logical Compatibility Group)

VCG
(Video Compatibility Group)

Note:
[ ] is # of participating companies as of Feb. 2004
1. Compatibility Test Result
   Sequential Write, At once recording, Single session,

2. Open Consortium / DCCG
   For increasing compatibility level

3. Why can the DVD+RW Format realize such a high level of compatibility?
   “Appended” & “Overwritten” Disc can be kept compatibility with the legacy RO players
Compatibility Test Result
DVD Player & DVD ROM Compatibility

- **DVD+RW and DVD-RW results from Aug. 2002 and Jan 2003**: 159 players and 17 DVD-ROMs

*Source* Intellikey lab.

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**Graph: DVD Player & DVD ROM Compatibility**

- **DVD+R**: 0.9465
- **DVD-R**: 0.8532
- **DVD+RW**: 0.7926
- **DVD-RW**: 0.7606

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**Media Type**: DVD+R, DVD-R, DVD+RW, DVD-RW

**Percentage Compatible**

- DVD+R
- DVD-R
- DVD+RW
- DVD-RW

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**Logos** (Dell, HP, Mitsubishi, Verbatim, Philips, Ricoh, Sony, Thomson, Yamaha)
**DVD+R DL Compatibility**

 Tested in May-Jul 2004 - 281 players, 31 DVD-ROM/Combo/Writers (Total 312)
Compatibility w/ newer players & ROMS

Source Intellikey lab.

Total of 46 Players and 12 ROMs tested +R DL tested in May-Jun 2004.
Discrepancy test results between NIST and Intellikery lab.

Play back Margin  Jitter  Drive

- Write strategy
- Optimized power
- RO Legacy player
- Bit setting

Disc
- Initial quality
- Archive/Shelf durability
Open Consortium / DCCG

DCCG Player Group update
(Yokohama2000)
http://www.yokohama2000.org

DCCG-RG Activities update
(Shinagawa 2002)
Main topics (Current)

1. DVD+R 4X playability test using discs written with multiple writers
   12 drive  12 media 18 RO Player vendors
   collaboration with DCCG RG (shinagawa 2002) PCG

2. DVD+R DL playability test
   17 RO Player vendors

3. Lectures / Copy protection scheme “VCPS”
   MPV
   DVD+VR
Bit setting DVD+R DL

- Not able to recognized or others

- No Problem: 67%
- NG: 33%
Bit setting DVD-ROM

Almost perfect !!
Yokohama 2000 Annual Schedule

- **2004/2Q**
  - Meeting

- **3Q**
  - Specification:
    - DVD+R DL
  - DVD+RW 8X

- **4Q**
  - DVD+R 16X
  - DVD+RW 8X
  - DVD+R DL 8X

- **2005/1Q**
  - DCCG Collaboration
  - DVD+MRW

*Logos for Dell, HP, Mitsubishi Chemical/Verbatim, Philips, Ricoh, Sony, Thomson, and Yamaha.*
Shinagawa 2002
Physical Compatibility WG
DCCG PCG
Main topics;

1. DVD+R 4X Written disc compatibility with RO players
   Drive 12, Media 12,

2. DVD+RW 2.4,4X cross DOW check such as NSL jump, among the multiple writers
   Drive 9, Media 10,

3. DVD+R DL 2.4 X cross write check, such as layer jump
   Drive 6, Media 7,

4. DVD+R 8 X cross check the smooth write at higher speed
   Drive 10, Media 7,
**DVD+R 4X Round Robin Test**

- 12 Multiple Discs, 12 Multiple Drives cross test

Test point: at radius 24.5 mm

- 9% P1 Error > 260
- 1.3% Playability NG.
- 89.7% No Problem
12 Multiple Discs, 12 Multiple Drives cross test

Test point radius at 52.4 mm

- 3.5% P1 Error > 260
- 4.9% Playability NG.
- 91.6% No Problem

Playability NG.
Shinagawa 2002
Logical Compatibility WG
DCCG LCG
Main topics

1. DVD+R 4X Fragment handling
   Drive 11, Disc 3 finished in Sept. ‘04

2. DVD+R DL Check “the append incomplete fragment
   Drive 11, Disc 3 finished in Nov. ‘04

3. DVD+R DL check more “complicated writing mode”
   plan March ’05

4. DVD+RW check “Sparing criteria”
   plan Mar. ‘05
Contents protection scheme “VCPS”

Capture the digital contents through broadcasting or cablenet

Drive shall record random number at loaded disc

Drive, Disc Secure keys are installed in ADI P

VCPS
Disc

Encrypted contents

AES 128 Bit

Unique ID

Disc Key Block
Status update: proposed future tests

- **RDL-2**: DVD+R Double layer (intended start Nov ‘04)
  - Same discs as RDL-1 (repeat of test)
  - Tests already defined
  - For new participants and participants who want to repeat RDL-1

- **RDL-3**: DVD+R Double layer (intended start Nov ‘04)
  - More complex discs than RDL-1
  - Tests already defined

- **MRW-1**: Mount Rainier (intended start Nov 2004)
  - **Goal**: convergence of sparing criteria
    - Spec compatibility covered by EasyWrite disc verifier
  - R/W Interchange test

- **RW-2**: second DVD+RW test
• Updated including DVD+R DL questions and answers
• Are electronically available at Philips’ partners web site
(http://www.licensing.philips.com/partners/dvdrw/documents1062.html)
Shinagawa 2002
Video Compatibility WG
DCCG VCG
Main topics

1. DVD+RW; check the “video quality” write protection, unprotection, Smoothness
   8 Writers

2. DVD+RW; check “no destruction” No recording
   11 writers

3. DVD+R 4X; Append recording HQ, EP
   10 writers

4. DVD+DL; planned
Summary of results

Protection/Unprotection Test

- Can not change protection mode. 25%
  Almost minor problems are in relation to change protection-mode. Specific recorder and software does not support changing protection-mode.

- No Problem 75%
  Last meeting, VCG found fatal problems which means incorrect playback. →
  Relevant recorder and software have already improved these problems as of today.

There was no fatal problem which means erasing protected titles.
Summary of results

Picture smoothness Test

- Hiccups or few seconds freeze of AV. 21%
- Access from Menu is not successful. 5%
- Can not playback titles correctly. 2%

Hiccups and freeze were occurred in each title independently of recording bit rate.

- No Problem 72%
- Minor Problems 26%
- Fatal Problems 2%

Relevant recorder and software are going to improve this problem among 3 companies.

The causes of hiccups and freezing may be depend on basic functionality of AV encoding/decoding/packetize. VCG will take close communication among relevant participants to improve these problems.
Why can the DVD+RW Format realize such a high level of compatibility?
Microsoft will release next generation OS / Longhorn which support DVD+RW Mt. Rainier Natively

ISO 9660 = UDF 1.02
Legacy DVD-Video player based on it
ANSI MMC 4
Background format
Multi session write
Defect management
High frequency wobble
Leads loss less linking
Track lay-out

**DVD-ROM**
- Pit

**DVD-RW**
- Wobbled Groove
- LPP (Land Pre-pit)

**DVD+RW**
- HF Wobbled Groove
- ADIP (Address In Pre-groove)

**DVD-RAM**
- Wobbled
- Land & Groove with Pit Header

Pre-mastered Pit Header Field
High frequency wobble; 32 channel bit provides the accurate link

+/- 5 Channel bits, +RW Format is ~6 times higher than -RW

LD

Tracking by Wobble

+RW Format

ADI P

-RW

Land pre pit
Loss less linking per High frequency wobble

- When Append / Over write, OPU has to return exactly the original position.
- DVD+RW format has high frequent wobble, so it can keep loss less linking.
Initial stage
- Need minimum recording for control data (less than 1 min.)

De-Icing
- Automatically null data is recorded during idling. = Back grand format

- De icing is stopped, if OS requests the drive to read/write data.

Quick eject by temporary lead out
Write capability each 2K byte unit

ECC Block consists of 32K bytes, with 2k byte addressable sectors.

ECC block
2 K byte sector

Sector(s) that host want to write

When user want to record 2 K byte data

(1) Read ECC Block
   Drive shall read whole ECC block

(2) Replacement
   Drive modify whole ECC block for 2 K Byte data following OS Demand

(3) Re Write
   Drive over write the modified ECC block

Consumer can feel as random overwrite!!
Mount Rainier format

Layout of a Mount Rainier DVD+RW disc

- **Data Zone**
  - **General Application area**
    - 2MB
  - **Spare Area**
    - SA1 8MB
  - **Spare Area**
    - SA2 120MB

- **Lead-in**
  - 8MB

- **Main table area**
  - MTA

- **Secondary table area**
  - GAA
  - STA

- **User data area with Defect Management**
  - UDA
  - PSN = 31,400h

- **Lead-out**
  - 2MB
Mt Rainier format = “H/W Defect Management” leads to same functionality as FDD, HDD, MO

OS will treat drives as true block addressable devices.

- User can enjoy as same random access write as HDD
- 2 k Byte size file is available / suitable for small size data update
Loss less linking affects positive ability for video application

Loss linking can lead real time video editing, capturing = DVD+VR Format

1. Consumer can enjoy the same use model they are familiar with in a conventional Video Tape recorder.

2. Available Time shift with out HDD

   Low cost recorder

3. Such new functionality per disk shall drive conversion from Tape media.
Summary

1. DVD+R/ +RW Format has the much higher score compatibility test result.
   By physical simple mode written disc compatibility with legacy RO.

2. More complicate mode, such as append, over write mode also quite positive results have been achieved.
   Through various tests by DCCG working groups

3. The key reasons are obtainable because of high frequency wobble grove, Phase modulated address mark and support of published logical specifications