High Speed Multi Tester for Blu-ray™
(BD-R, RE and ROM)
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About PULSTEC

➢ The position of Our system

Evaluation system for R&D division (ODU-1000)
• All of Testing Center and Class A Lab adopted ODU system
  (It is industry standard for optical disc system)

DVD standard Drive unit (SDP-1000)
• SDP drive is integrated for DVD CATS and DaTARIUS.
  This drive was designed and manufactured at Pulstec
About PULSTEC

➢ Line up (for Blu-ray Disc)
  For R&D and QA ➔ ODU-1000
  For QA and Production ➔ MASTER
  For Device Inspection ➔ i-MLSE unit
**BD (SL/DL) & BDXL(TL/QL)**

### Difference between BD & BDXL on the Book Spec

- More Capacity · · · · · · · · · · · · ·
- 33GB/Layer
- Higher playback speed
  - (Transfer Late) · · · 2x
- Channel bit length is smaller · · · · · ·

<table>
<thead>
<tr>
<th>Main parameters</th>
<th>BD SL/DL</th>
<th>BDXL TL/QL</th>
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</thead>
<tbody>
<tr>
<td>Single sided disc</td>
<td>SL or DL</td>
<td>TL or QL</td>
</tr>
<tr>
<td>Nominal wobble frequency at Reference Velocity</td>
<td>956.522 kHz</td>
<td>1913.043 kHz (2x)</td>
</tr>
<tr>
<td>Channel bit rate at Reference Velocity</td>
<td>66.0 Mbit/s</td>
<td>132.0 Mbit/s (2x)</td>
</tr>
<tr>
<td>User Data transfer rate at Reference Velocity</td>
<td>35.965 Mbit/s</td>
<td>71.93 Mbit/s (2x)</td>
</tr>
<tr>
<td>User Data capacity 120 mm</td>
<td>25GB (SL) 50GB (DL)</td>
<td>100GB (TL) 128GB (QL)</td>
</tr>
<tr>
<td>Channel bit length</td>
<td>74.50 nm 74.50 nm</td>
<td>55.87 nm 58.25 nm</td>
</tr>
<tr>
<td>Data bit length</td>
<td>111.75 nm 111.75 nm</td>
<td>83.81 nm 87.39 nm</td>
</tr>
<tr>
<td>Nominal wobble length</td>
<td>5.1405 um 5.1405 um</td>
<td>3.8553 um 4.0200 um</td>
</tr>
<tr>
<td>Reference Velocity</td>
<td>4.917 m/s 4.917 m/s</td>
<td>7.376 m/s (2x) 7.690 m/s (2x)</td>
</tr>
</tbody>
</table>

2T mark length is over the optical limits, therefore high-frequency signal qilty is deteriorated compared with BD SL/DL.
BD (SL/DL) & BDXL(TL/QL)

Difference in the actual signal quality

BDXL HF signal with 2x playback

BD(SL,DL)HF signal

※ It is difficult to cross especially 2T mark & space by slicer. Impossible to use Limit-EQ for jitter measurement.
**BD (SL/DL) & BDXL(TL/QL)**

- New function is needed instead of current Limit-EQ

New function: PR (1,2,2,2,1)

Measurement items by using

- PR (1,2,2,2,1) for BDXL(TL/QL) Spec
  - i-MLSE
  - R-SER (Viterbi)
  - L-SEAT
New measurement items for BDXL (i-MLSE, R-SER)

- PULSTEC system support all new items
  - i-MLSE
  - R-SER (Viterbi)
  - Write strategy adjustment
New measurement items for BDXL (i-MLSE)

- Difference binarized method for BD (SL/DL) & BDXL(TL/QL)

**BD SL/DL**

- HF signal
- C-EQ
- Limit-EQ
- Auto-slicer
- Binary
- Decord (R-SER)

**BDXL TL/QL**

- HF signal
- Digital EQ (PR)
- Viterbi decoder (ML)
- Binary
- Decord (R-SER)
New measurement items for BDXL (i-MLSE)

- Dependence on binarized method difference

Measured signal;
- BD 25GB different asymmetry
- i-MLSE, Jitter

- Result -
Two methods have different relationship with asymmetry and respectively.
New measurement items for BDXL (i-MLSE)

- i-MLSE vs RSER (Viterbi), Jitter vs RSER (binarize)

Both i-MLSE vs RSER (viterbi) and Jitter vs RSER have close correlation
**New measurement items for BDXL (i-MLSE)**

- **How to measure i-MLSE**
  - The easiest way · · · (i-MLSE unit)
  
  i-MLSE unit is very user friendly like Jitter meter

- Complete test including i-MLSE · · · (ODU/MASTER)

  ODU BDXL-Tester → all in one system
  (Write and read)

  MASTER → Playback only
Write strategy Adjustment

➢ **Edge shift Measurement**

To quantify shift between reference position of edge and recorded mark (or space) edge. Both edge shift and variance of edges can be measured.

WS is optimized by using Edge shift measurement
Write and Read function (MASTER)

Writing and reading with MASTER

- MASTER is possible to connect with writer (drive)

- Write power margin
- Write strategy optimize
- Write speed
- OPC ON/OFF

Write→Meas Setting (MASTER)

Handling system

Consumer drive

Measurement (MASTER)

MediaTech in Macau  March 16th 2011
Write and Read function (MASTER)

Setup for power margin measurement

① position, width
   【e.g.】
   width = 0.200 mm
   blank = 0.000 mm
   bands = 8 bands

② write power variable range of observations
   【e.g.】
   raise Power = 11.00 mW
   fall Power = 18.00 mW
   (Step = 1.00 mW)

③ Write strategy
   【e.g.】
   Drive recommend setting
Write and Read function (MASTER)

➢ Power margin

- PwSwp (11mW ~ 18mW) (WS=Drive recommend)
- Write: Consumer Drives
- Measurement: MASTER
Each pulses and Write power can be modified by Write strategy Editor.
BD 2x Measurement (MASTER)

- 2x measurement with MASTER

- **Target Media**
  - BD-R (SL,DL)
  - BD-RE (SL,DL)
  - BD-ROM (SL,DL)
  - BDXL BD-R (TL,QL)
  - BDXL BD-RE (TL)

- BD(SL/DL) 2x items
  - 2x HF signal
  - 2x Servo signal
  - 2x Jitter signal
  - 2x RSER

※ It is possible to show you both 2x and 1x data and possible to compare.
※ 3point Optimize + Full surface measurement is finished by 1.95x
BD 2x Measurement (MASTER)

- BD-ROM 1x and 2x correlation

- 3point optimize
High speed Multi Tester for Blu-ray Disc™

High speed multi testers for all kinds of Blu-ray Disc™ are available.

PULSTEC offers the highest quality performance.

Thanks for your attentions!!