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Digital Information Consumer Electronics

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2. Feature of Terrestrial Digital Broadcasting (ISDB-T)
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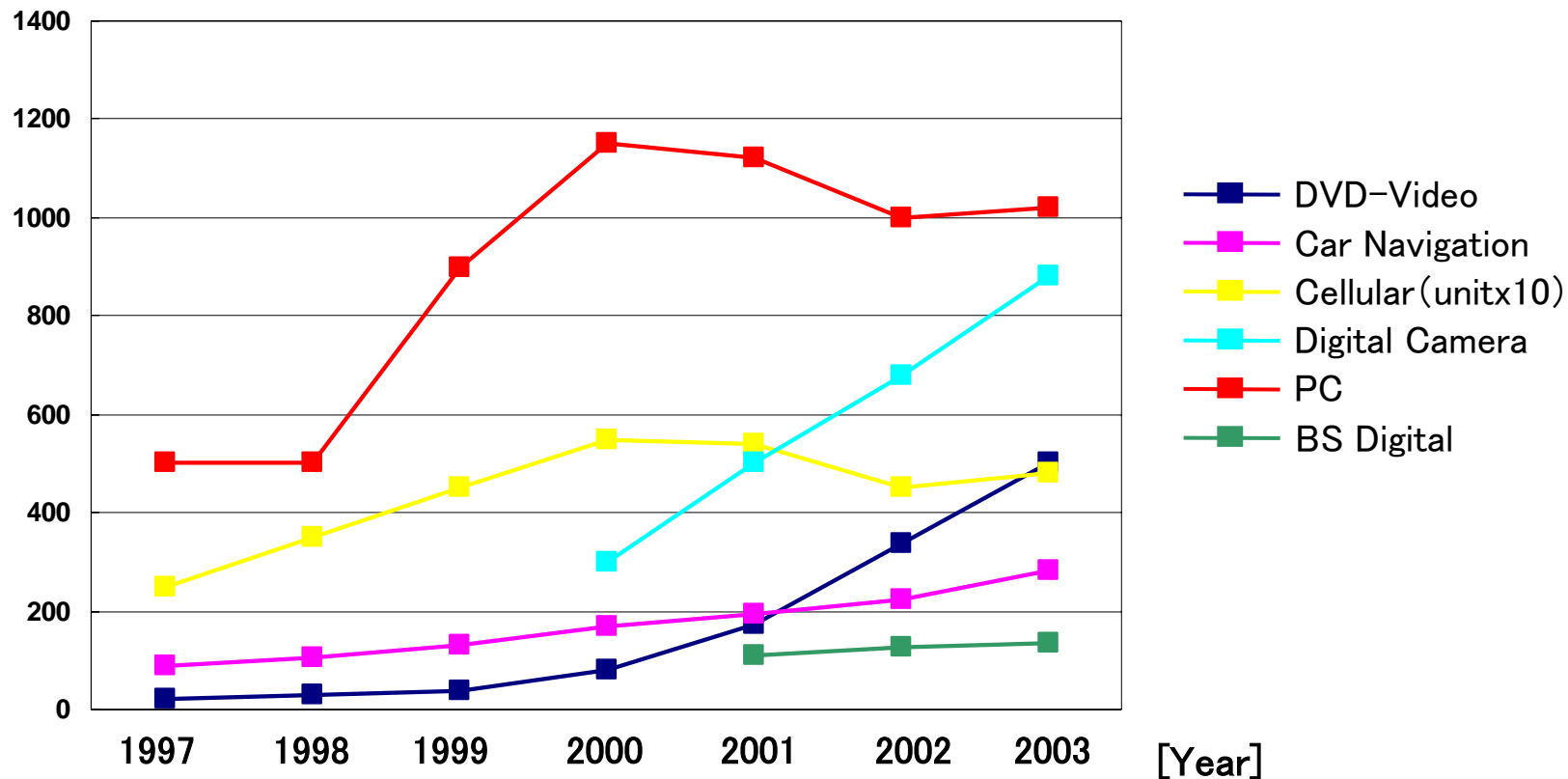
1. Market Volume of Digital Information Consumer Electronics



(2) Volume of shipments/digital information consumer electronics in Japan

Unit [x1000]

From JEITA, CIPA, TCA, NHK





2. Feature of Terrestrial Digital Broadcasting (ISDB-T)

Feature of ISDB-T

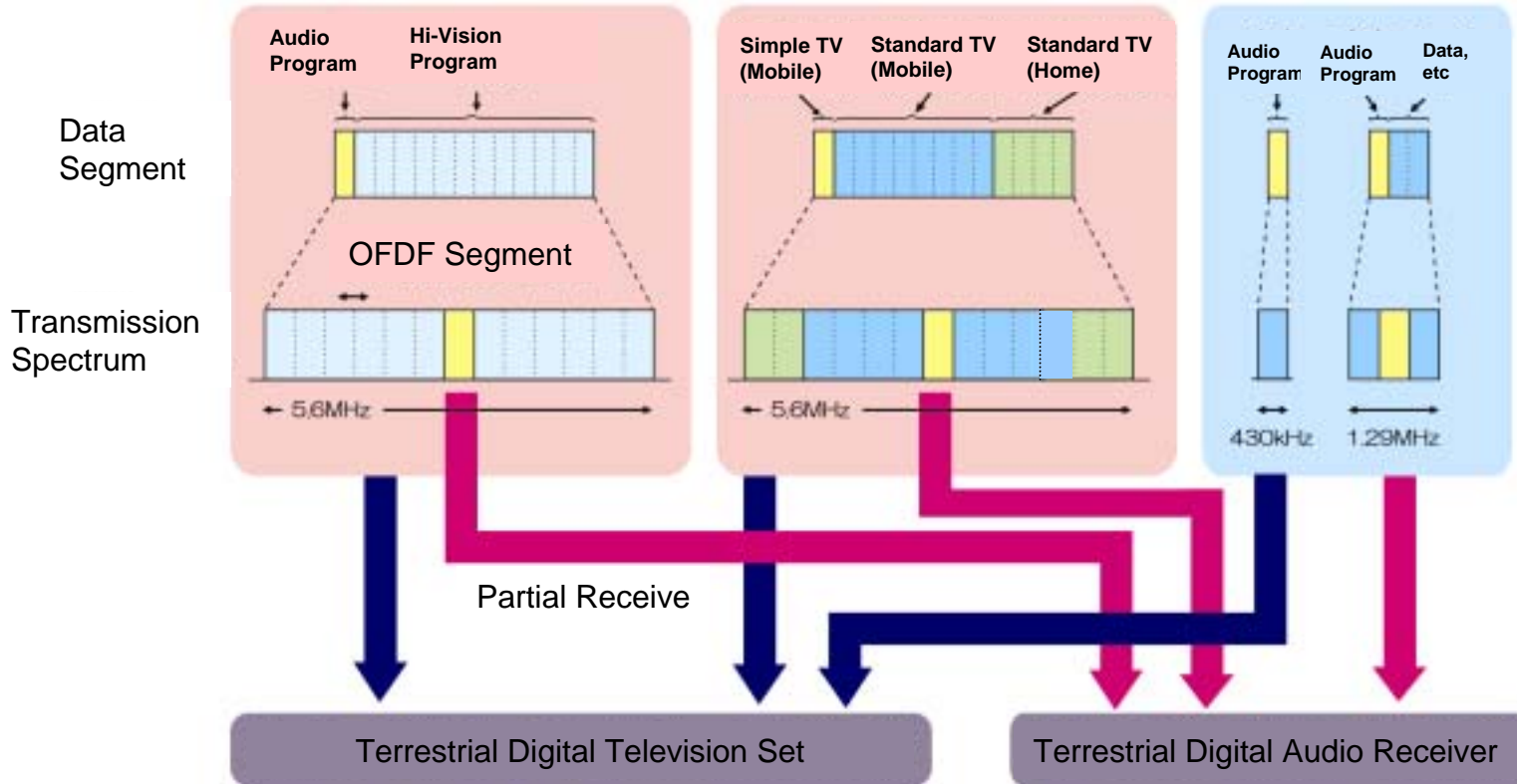
- System Flexibility
- Mobile and Portable Reception
- Single Frequency Network



(1) HDTV/SDTV Digital Broadcasting

Television Broadcast

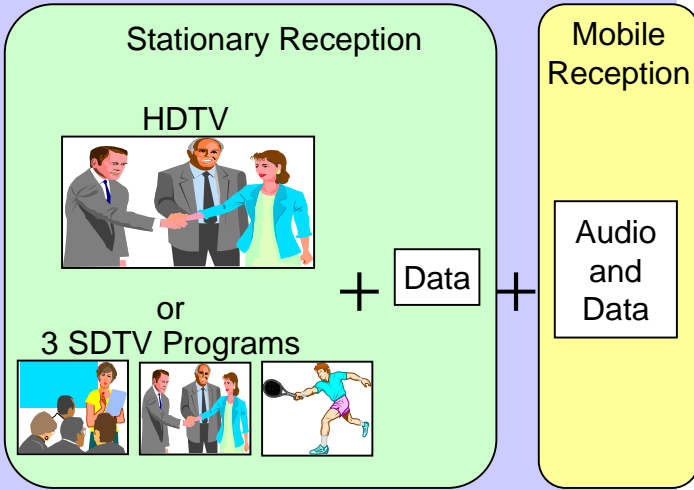
Audio Broadcast



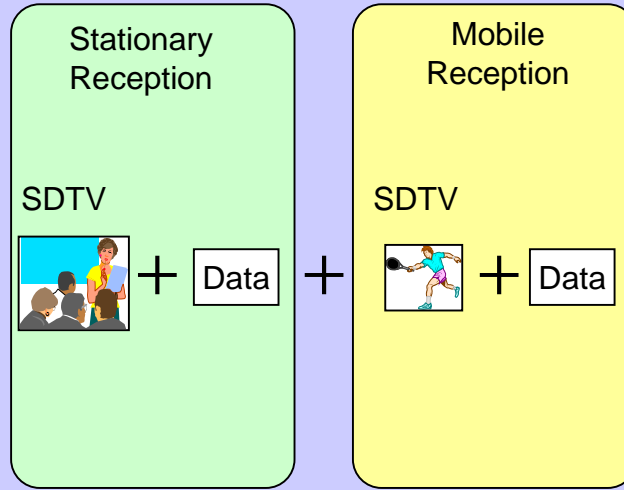


(2) Mobile Broadcasting

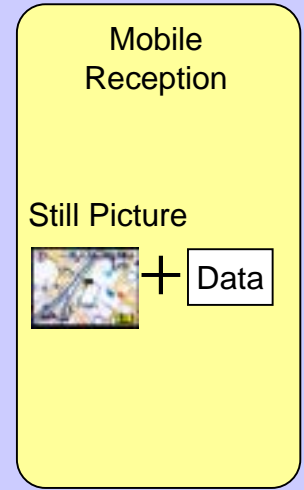
Example 1



Example 2



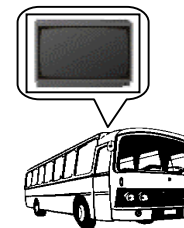
Example 3



Integrated Receiver
(all services)



Car Receiver
(Audio and Data)



Mobile Receiver
(SDTV, Audio and Data)



Pocket-size Receiver
(Audio and Data)

(3) Portable Broadcasting



Prototype at NHK STRL Open House 2004
by NHK and KDDI (left), NHK and SANYO (above)



Comparison of 3 standards in Brazil

Experiment of field mobile in Brazil

| Standard | Parameter | | | | Transmission Rate (Mbps) | Errors (Times) |
|----------|------------|-------------|--------------|---------|--------------------------|--------------------|
| | Modulation | Convolution | Guard Length | Carrier | | |
| ISDB-T | 16QAM | 2/3 | 1/16 | 2k | 11.45 | 0 |
| | 64QAM | 2/3 | 1/16 | 2k | 17.18 | 6 |
| | 16QAM | 2/3 | 1/16 | 4k | 11.45 | 0 |
| DVB-T | QPSK | 1/2 | 1/16 | 2k | 4.39 | 1 |
| | QPSK | 2/3 | 1/16 | 2k | 5.85 | Many |
| | QPSK | 1/2 | 1/32 | 8k | 4.52 | Many |
| ATSC | 8VSB | | | | 19.39 | Out of measurement |

From DiBEG



3. Penetration of TV Receiver

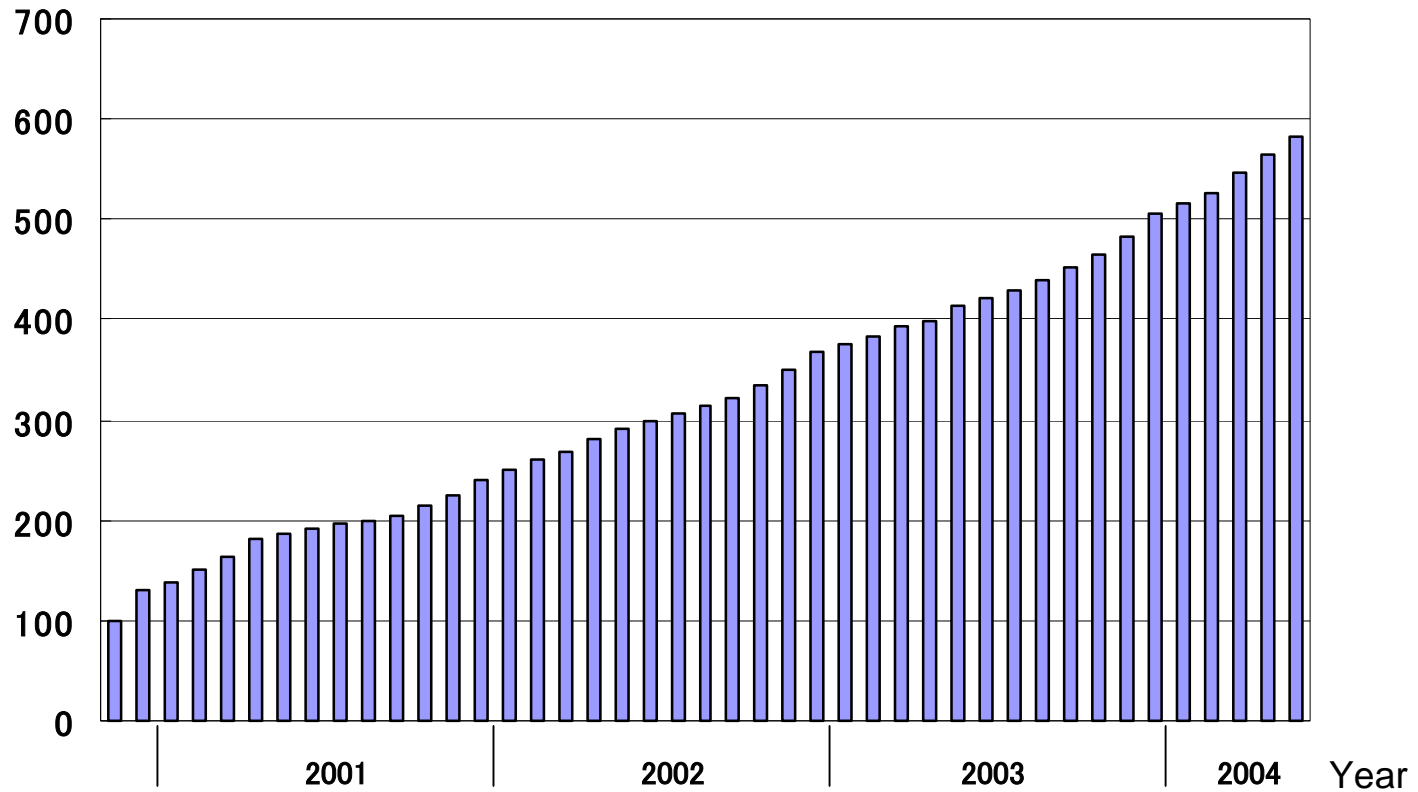
(1) Penetration of Digital TV Receivers

- BS (ISDB-S)
6,024,000 (2000 .12 – 2004.6)
- Terrestrial(ISDB-T)
1,393,000 (2003 .12 – 2004.6)



(1) The number of BS Digital Broadcasting

Cumulative Total of
Households [x10000]



From NHK

(2) Manufacturers of ISDB Receiver

DX Antenna

Fujitsu General

Funai

Hitachi

JVC

Maspro Denkoh

Matsushita

Mitsubishi

NEC

Nihon Antenna

Pioneer

Sanyo

Sharp

Sony

Toshiba

Total 15 manufacturers at the end of 2003



4. Flat Panel Display(FPD)



(1) Comparison of Flat Panel Display

| | pro Larger Size | Higher Resolution | pro Thin Display | Emission Efficiency | Viewing angle | Response | Color display | Issues |
|---------------|------------------|-------------------|------------------|---------------------|---------------|----------|---------------|---|
| PDP | ○ 32~60 inch | △ | ○ | △ 1.8 lm/W | ◎ | ○ | ○ | Cost cutting |
| LCD | △ 1.3~54 inch | ○ | ○ | △ 1.8 lm/W | ▲ | ▲ | ○ | Viewing angle dependence, ever on backlight power consumption |
| FED | △ | ○ | △ | △ | ◎ | ○ | ○ | need to establish reliability |
| OELD | ▲ 1.1~20 inch | ○ | ◎ | ○ 5.4 lm/W | ◎ | ○ | ○ | Longer life |
| Inorganic ELD | ▲ | ○ | ○ | △ | ◎ | ○ | ▲ | High voltage operation Blue materials need to be improved |

◎:Excellent ○:Good △:Average ▲: Relatively Poor

“pro Larger Size ” : Prototype panel size inclusive

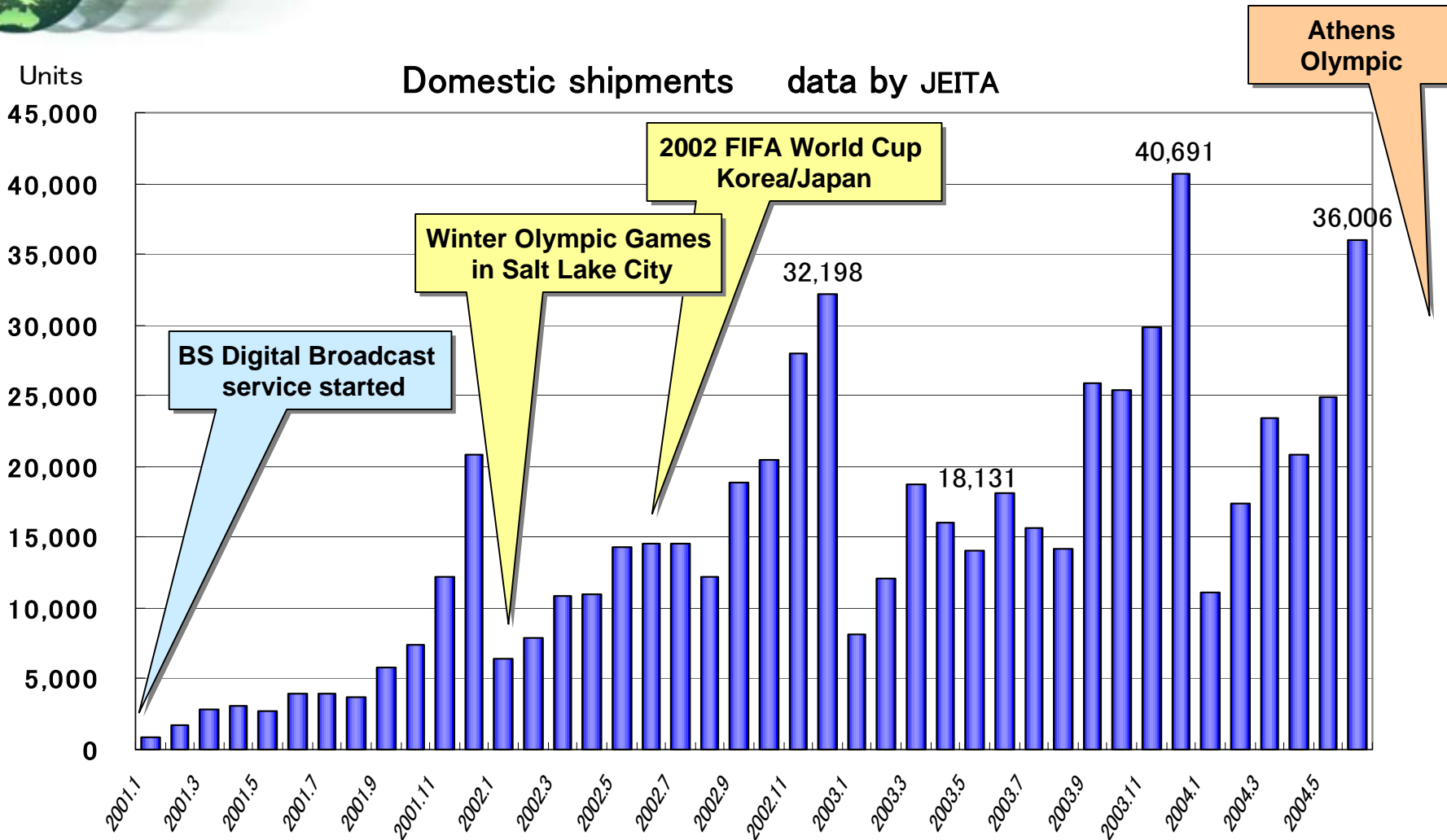
• **Emission efficiency:** OELD’s case assumes use of phosphorescent materials

• **Product (as TV receivers) introduction timing in the marketplace**

PDP,LCD: on sale now **FED:** 2004 ? **OEL:** 2005 or later

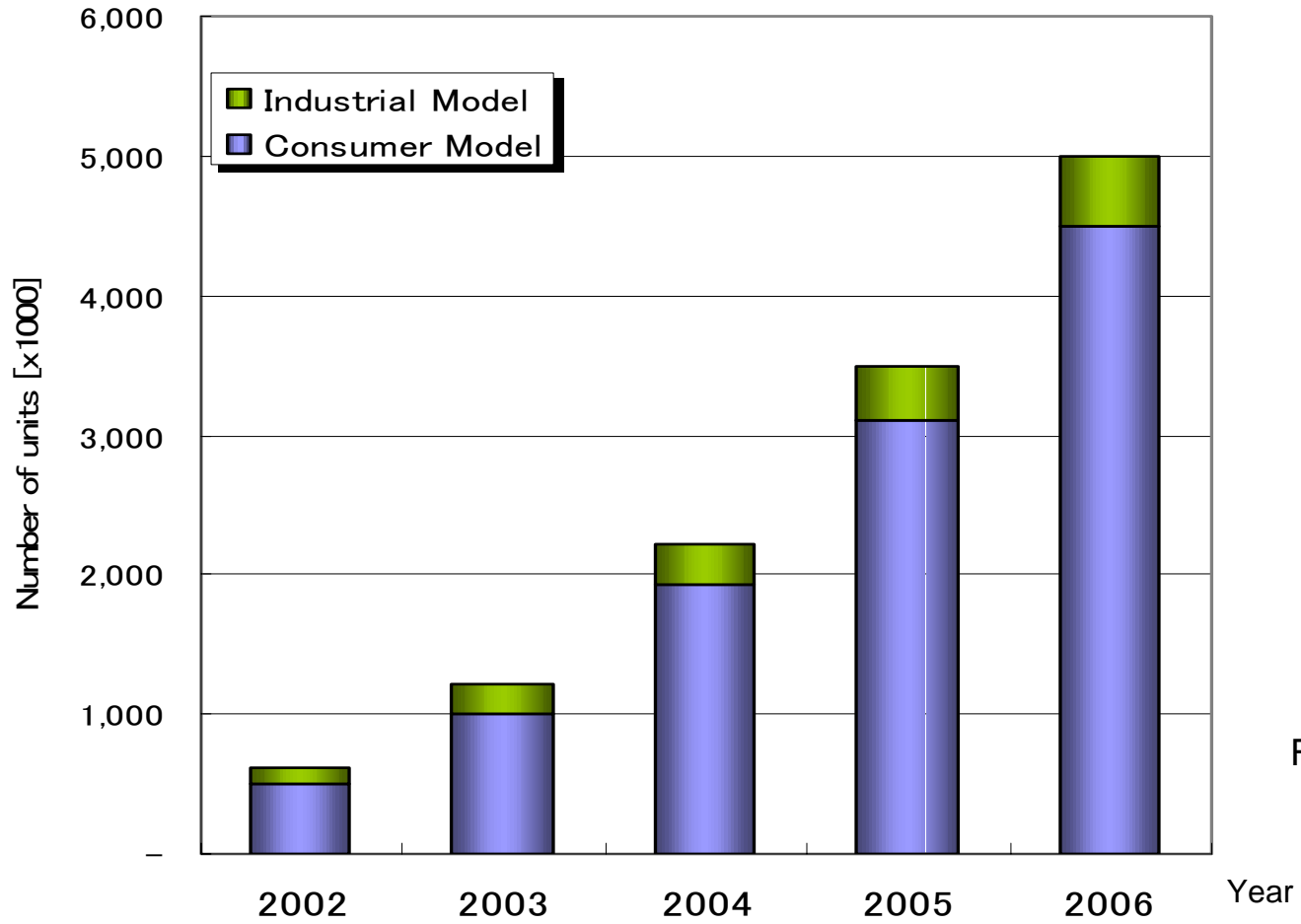


(2) Volume of Shipments / PDP





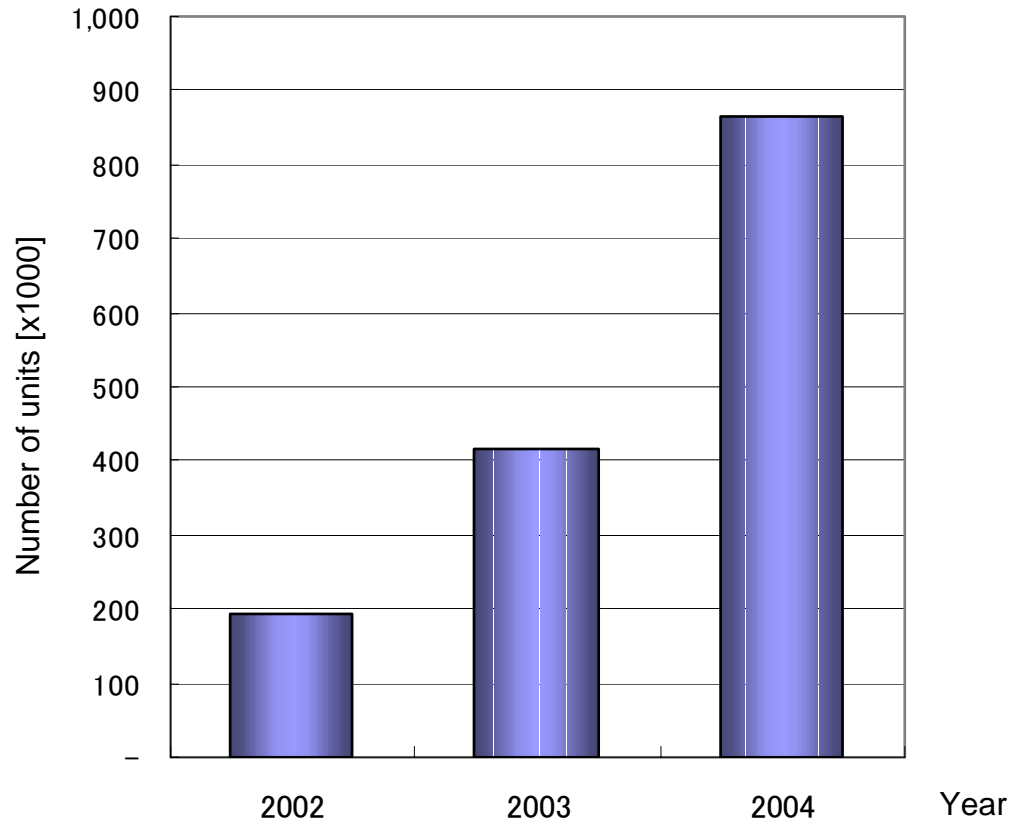
(3) PDP Market Forecast



From Pioneer



(4) PDP Market in USA



From Pioneer



Pioneer's 50" PureVision Plasma Television PRO-1110HD (in the US market)





(4) Volume of Shipments / LCD

Domestic shipments From JEITA

Units

250,000

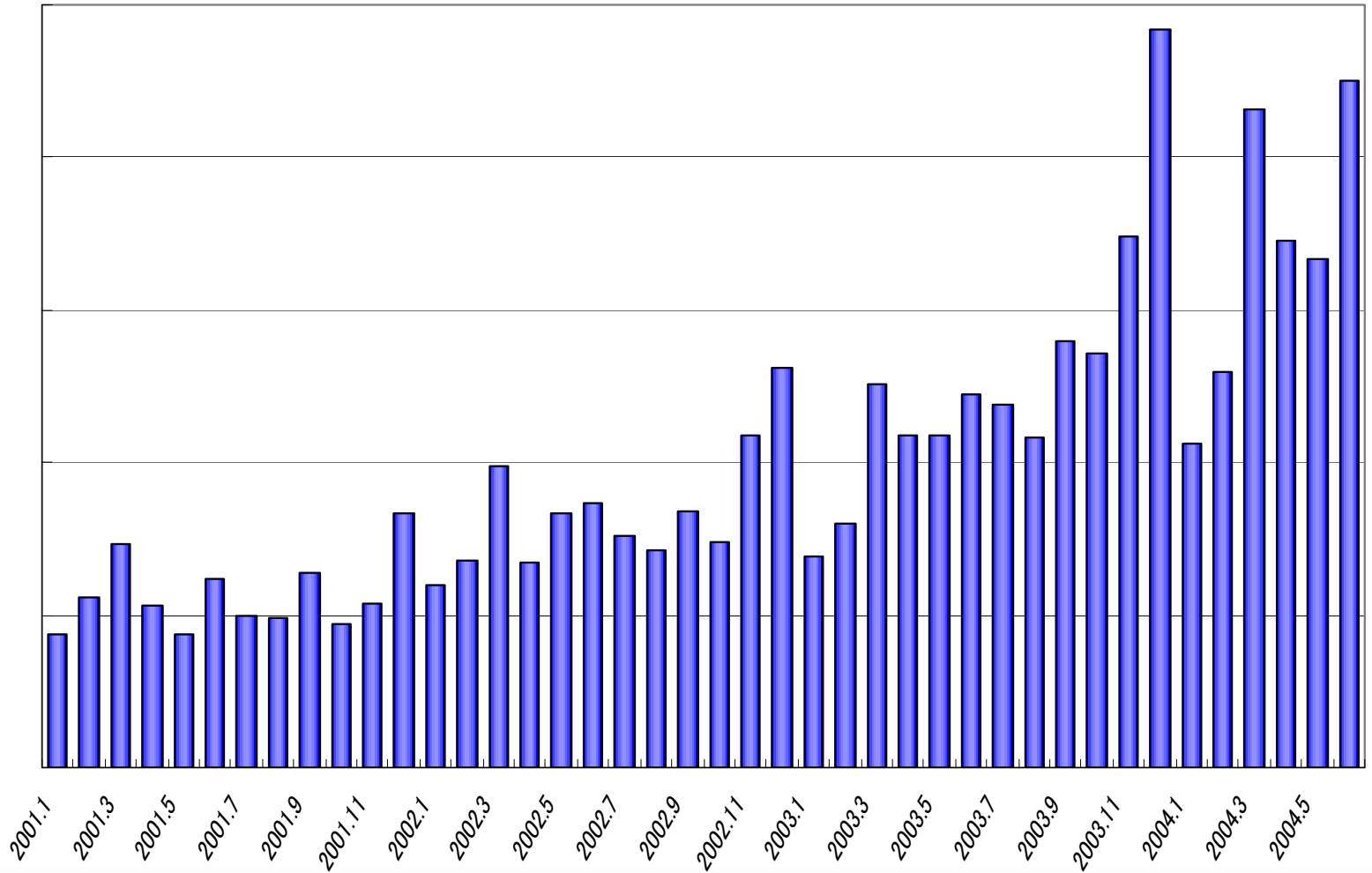
200,000

150,000

100,000

50,000

0



(5) Technical Issues of OLED

- **Lifetime**
 - Close the lifetime gap between colors
- **Luminance**
 - Augmenting emission efficiency
(internal quantum efficiency, light extraction efficiency)
- **Display quality**
 - Color purity, luminance uniformity
- **Power consumption**

OLED Example 1



FH-P919MDR

By PIONEER

OLED Example 2



3.2 inch Full Color Film OLED (prototype)

By PIONEER



OLED Example 4



The models : The Matsuyama Ballet

By PIONEER

OLED Example 3



2.4 inch Active Matrix Full Color Film OLED (prototype)

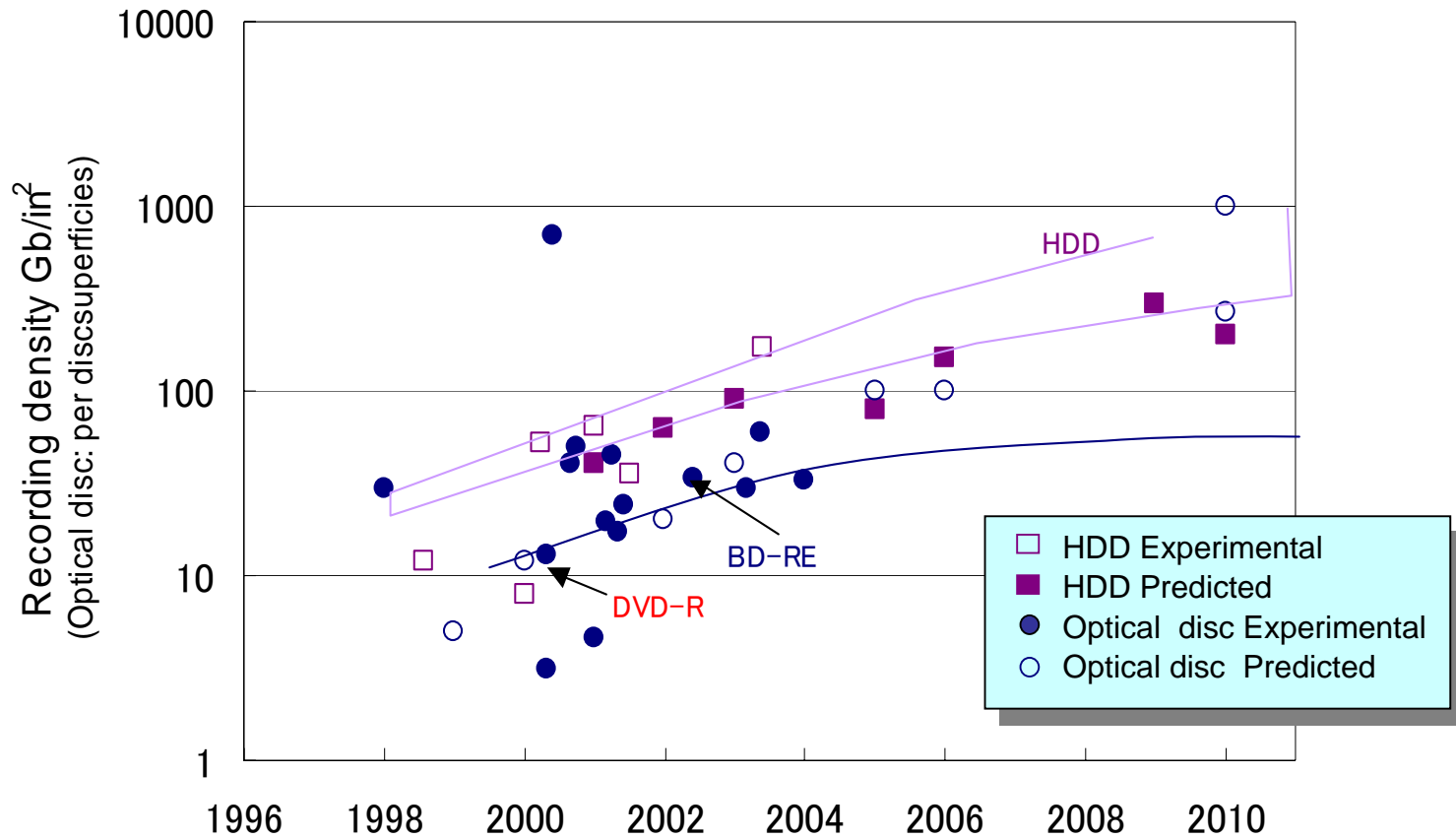
By PIONEER



5. Recording Devices



(1) Trend on Recording Devices





(2) Optical Discs (Red)

| | Rewritable Disc | | | Write-once-read-many Disc | |
|--------------------------|--|---|---------------------------------------|---|---------------------------------------|
| | DVD-RAM | DVD-RW | +RW | DVD-R | +R |
| Diameter | 12 cm/8 cm | 12 cm/8 cm | 12 cm/8 cm | 12 cm/8 cm | 12 cm/8 cm |
| Thickness | 1.2 mm | 1.2 mm | 1.2 mm | 1.2 mm | 1.2 mm |
| Capacity | 4.7 GB/1.26 GB | 4.7 GB/1.26 GB | 4.7 GB/1.26 GB | 4.7 GB/1.26 GB | 4.7 GB/1.26 GB |
| Recording media | Phase change layer | Phase change layer | Phase change layer | Dye layer | Dye layer |
| Addressing scheme | Addressing data pits are recorded in header area between data recording area | Addressing data pits are distributed as Land Pre-pits | Phase modulation of the Groove Wobble | Addressing data pits are distributed as Land Pre-pits | Phase modulation of the Groove Wobble |
| Groove type | Land & Groove | Groove | Groove | Groove | Groove |
| Catridge | Optional | Optional | None | Optional | None |
| Defect Management | by Drive | by File formatting | by File formatting | by File formatting | by File formatting |



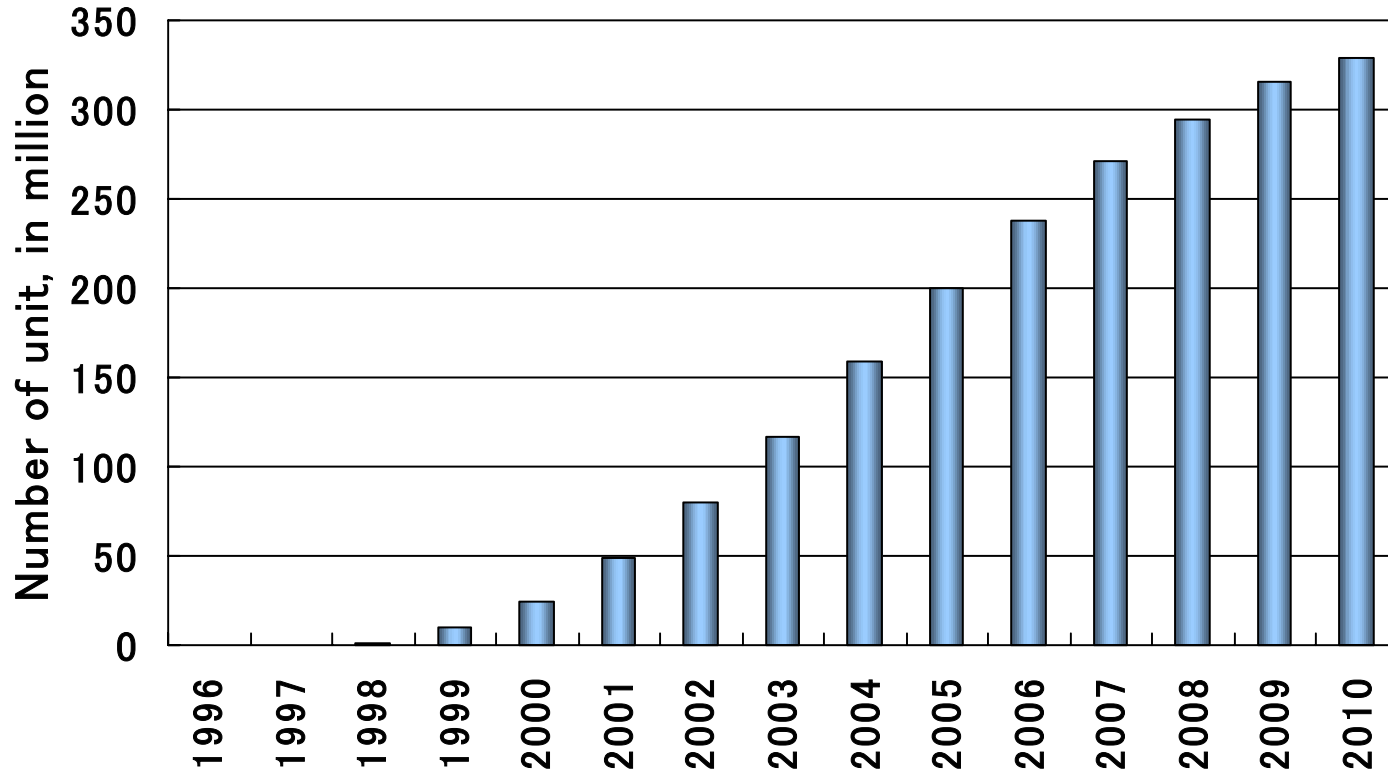
(3) Optical Discs (Blue)

| | Blu-ray Disc | | HD-DVD | | DVD (Ref.) |
|---------------------------------|--------------|------------------------|---------------|-----------|------------|
| | Rewritable | Read-only / Write-once | Rewritable | Read-Only | |
| Capacity (Single layer) | 23.3/25/27GB | Same as Rewritable | 20GB | 15GB | 4.7GB |
| Capacity (Double layer) | 46.6/50/54GB | | 40GB | 30GB | 8.5GB |
| Laser wave length | 405nm | | 405nm | 405nm | 650nm |
| Lens NA | 0.85 | | 0.65 | 0.65 | 0.6 |
| Substrate thickness | 0.1mm | | 0.6mm | 0.6mm | 0.6mm |
| Average data transfer rate (1X) | 36Mbps | | 36Mbps | 36Mbps | 11.08Mbps |
| Recording track | Groove | Pit | Land & Groove | Pit | |



DVD Penetration Forecast

Number of households adopted



Source: SRIC Digital Futures “DVD-Video : Sunset for VHS Movies” (May 2001)



6. Digital Home Networking



DLNA

(Digital Living Network Alliance)

- A group having more than 100 members from CE, PC, telecom, and semiconductor industries (established June, 2003)
- Focused on delivering an interoperability framework of design guidelines based on open industry standards to complete the cross-industry digital convergence
- DLNA Interoperability Guidelines v1.0 has been released



The DLNA Vision

Mobile



Broadcast

Broadband



Consumers want their devices to work together any time, any place



Media





7. Conclusion



1. Digital information consumer electronics, such as Digital TV, FPD, DVD, Car Navigation, Mobile Phone, Digital Camera, and PC, are best seller products in Japan.
2. ISDB-T has been developed focusing on mobile reception.
3. FPDs are the most important common technology for digital information consumer electronics, but there are still some items to be improved.
4. Blue ray optical disc recorders are necessary to record HDTV broadcasting programs at home.
5. Digital networking among various digital AV equipment is very important for users.



PIONEER DO BRASIL LTDA(PBL) Outside and inside of the factory





Mount



Assembly



Inspection



Manufacture



Packaging



Finished Goods



Shipment Inspection



Shipment



DEH-P1Y

Total 7 models



DEH-P5680MP



DEH-P7680MP



DEH-P2680



DEH-P4680MP



DEH-1680



DEH-1680A