

# Digital TV Broadcasting in Japan

*19 Nov.,2007  
Caracas, Venezuela*

*DiBEG JAPAN  
ARIB  
Kiyoshi SEKIGUCHI*

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- **Merits of Digital Broadcasting**
- **Advanced Features of ISDB-T**
- **Digital TV in Japan**
- **Schemes for Expanding DTTB**
- **Summaries**

# **Merits of Digital Broadcasting**

# Merits of Digital Broadcasting

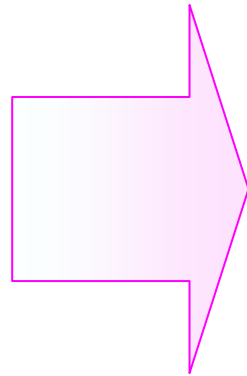
- 1. High information capacity**
- 2. Robustness against multi-path and noise**
- 3. Easy to add new services**
- 4. Effective use of frequency**
- 5. Affinity to other ICTs**

# Merits of Digital Broadcasting

## 1. High information capacity



**Analog TV**



...



**Multi-channel SDTV**

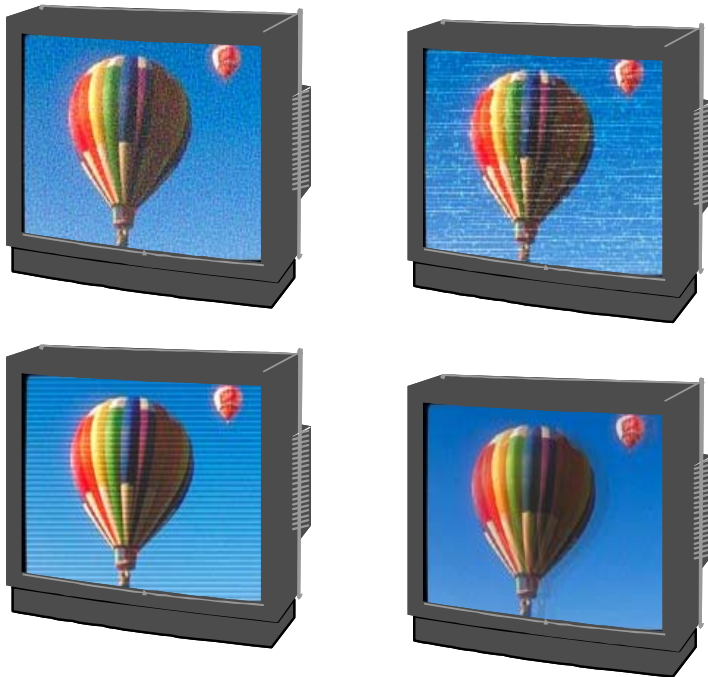


**HDTV**

# Merits of Digital Broadcasting

## 2. Robustness against multi-path and noise

Analog TV



Ghost and Noise

Digital TV



High quality image and sound

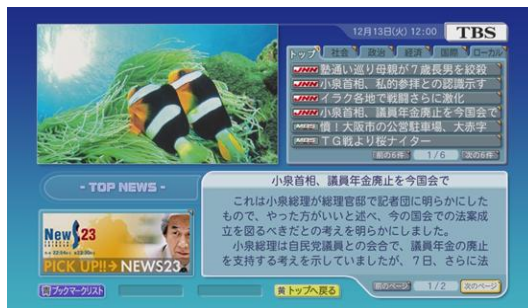
# Merits of Digital Broadcasting

## 3. Easy to add new services

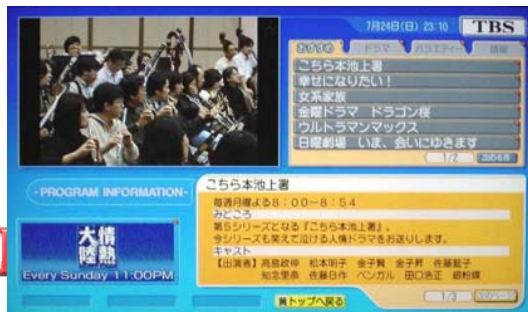
### Data Broadcasting



*Weather forecast*



*News*



*Information linked to on-air program*

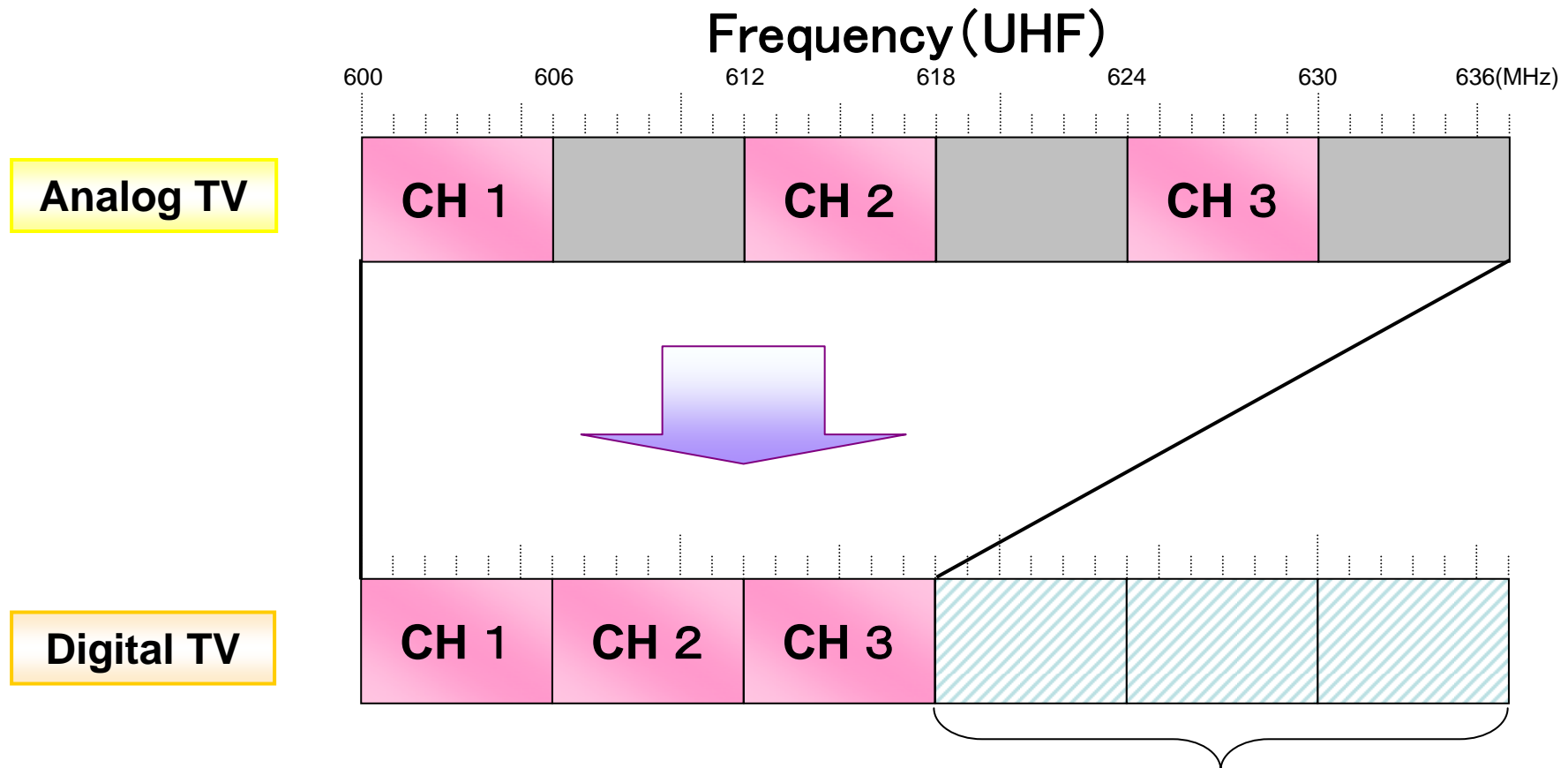
### Interactive TV, e.g. interactive shopping



You can see the products and you can buy them directly.

# Merits of Digital Broadcasting

## 4. Efficient use of frequency

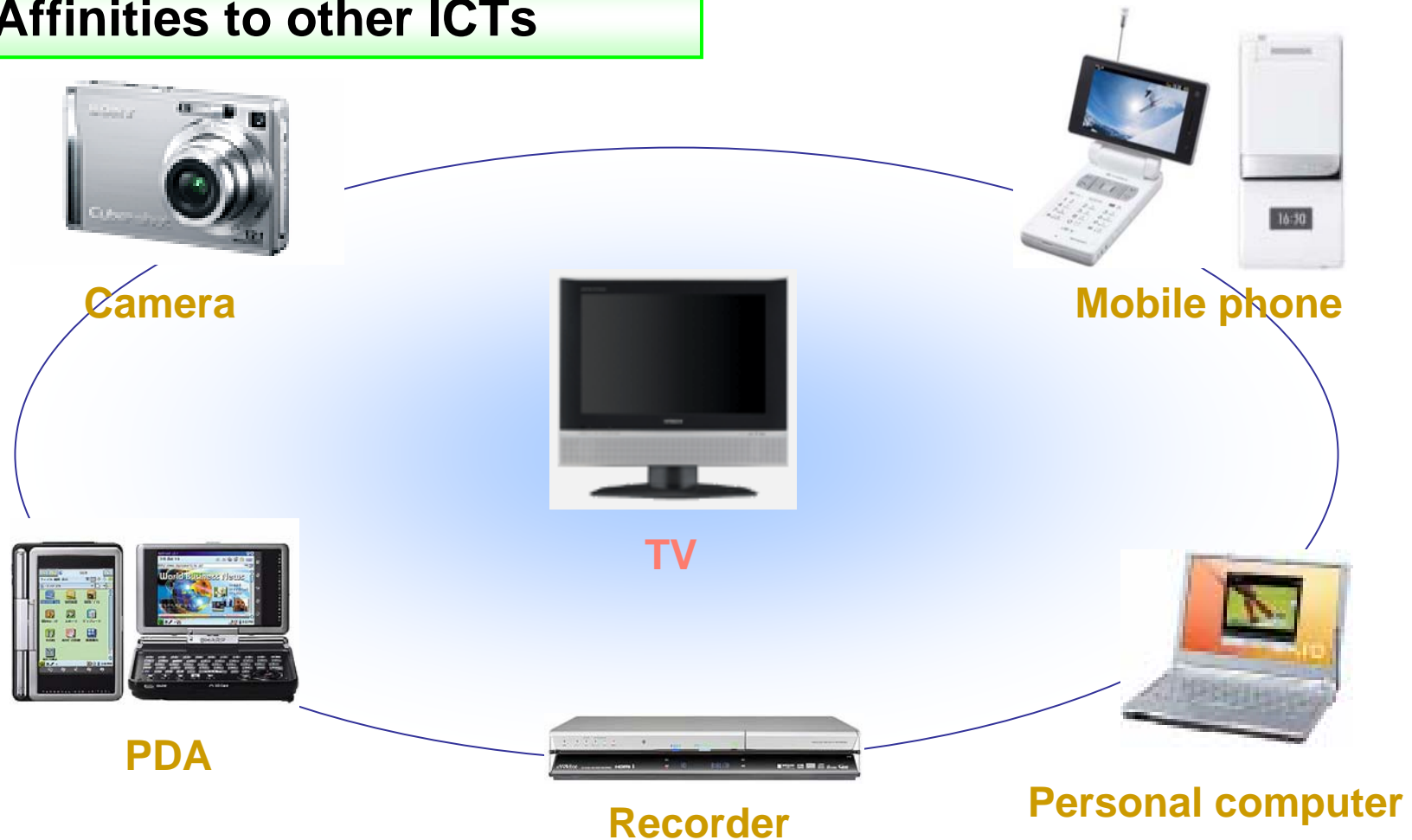


**Another system can use this bandwidth.**



# Merits of Digital Broadcasting

## 5. Affinities to other ICTs



# **Advanced Features of ISDB-T**

# Outline of ISDB-T

*For Large-screen Television*

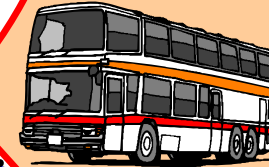


10110...  
Digital  
Broadcasting

High-Definition  
Multi-channel



At home



In the car

Anytime  
Anywhere



In the train

While  
walking



*For Portable Terminals*



News



Disasters

*Data Broadcasting*

**DiBEG**

Digital broadcasting experts group

# Services by ISDB-T

## HDTV



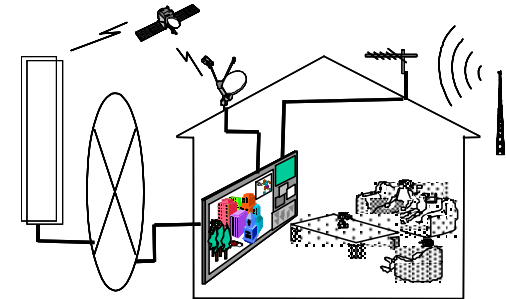
High quality image and sound service

## Multi-Channel Service



Realization of multi-SDTV program service on 1ch bandwidth (6MHz)

## Interactive TV



Communication linked services with TV

## High quality image



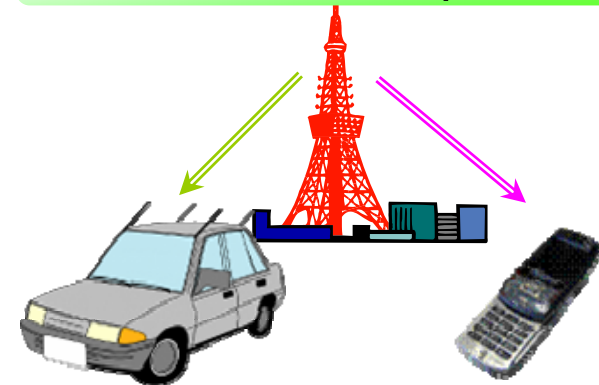
High Robustness to ghost image interference

## Data Broadcasting



Simple retrieval of program and information at any time

## Mobile Reception



TV service to In-car DTTB Receiver and cell-phone

**DiBEG**

Digital broadcasting experts group

# Advanced features of ISDB-T

*ISDB-T adapted the latest technology*

**1. System flexibility**

*Segment structure*

**2. Robustness against Multi-path and noise**

*OFDM, time and frequency interleave*

*Mobile HDTV, Portable services (One-seg)*

**3. Effective use of frequency**

*SFN*

**4. Disaster Warning**

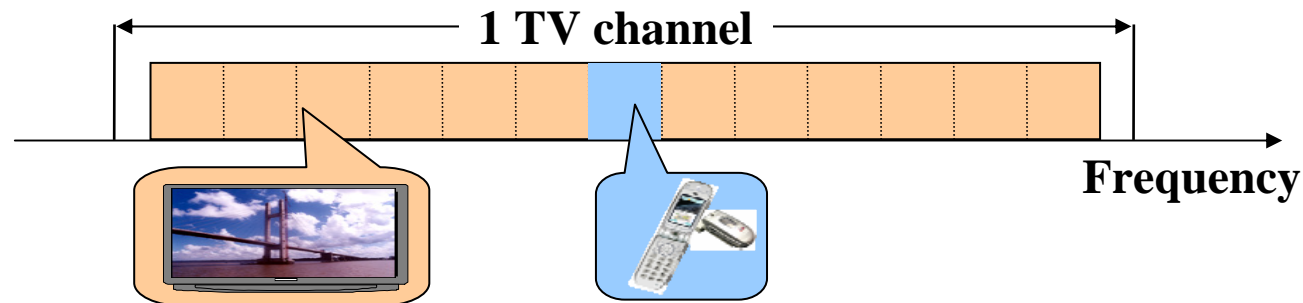
# History of Digital TV

- 1997**   ▪ Technical Standards for DTTB were established in E.U (DVB-T) and U.S.(ATSC)
- 1998**   ▪ DTTB started in E.U (DVB-T) and U.S.(ATSC)
- 1999**   ▪ **Technical Standards for DTTB were established in Japan (ISDB-T).**
  - Support center for R&D of DTTB in Japan opened.  
(Shared use of facility, Organization of Communications and Broadcasting)
- 2000**   ▪ Technical standards for Digital Terrestrial Sound Broadcasting were established in Japan.
  - Planning of DTTB station channels.
- 2001**   ▪ Development of institutions for digitization of Terrestrial Television Broadcasting.  
(Revised part of Basic Plan Popularization of Broadcasting and Use of Broadcasting Frequency)
- 2003**   ▪ **DTTB started in Japan** (in three metropolitan areas).
  - Start of trials for practical application of Digital Terrestrial Sound Broadcasting in part of Kanto and Kinki areas.

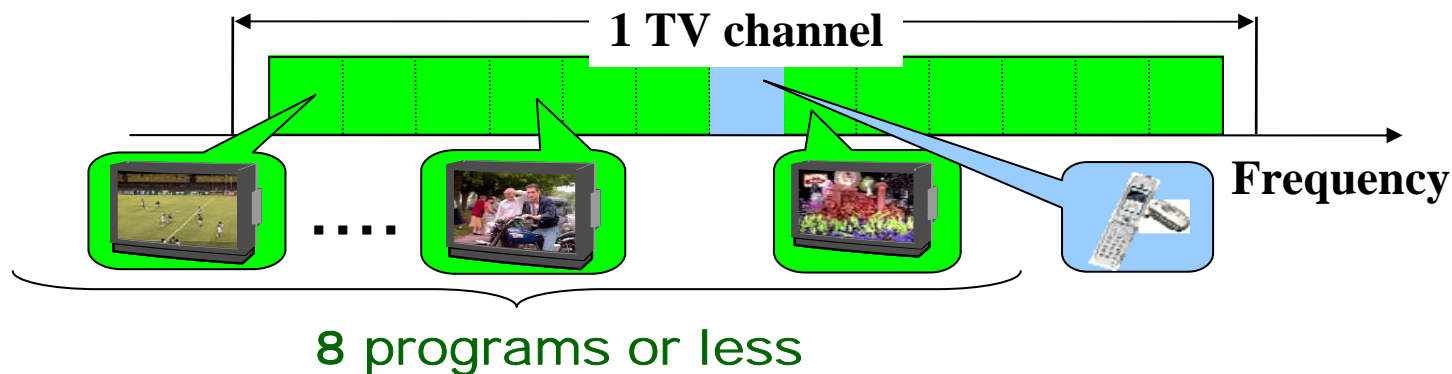
ISDB-T is the newest DTTB system and as such includes the latest technology

# System Flexibility

## Segment structure



**Ex.1** One HDTV and Mobile Reception.

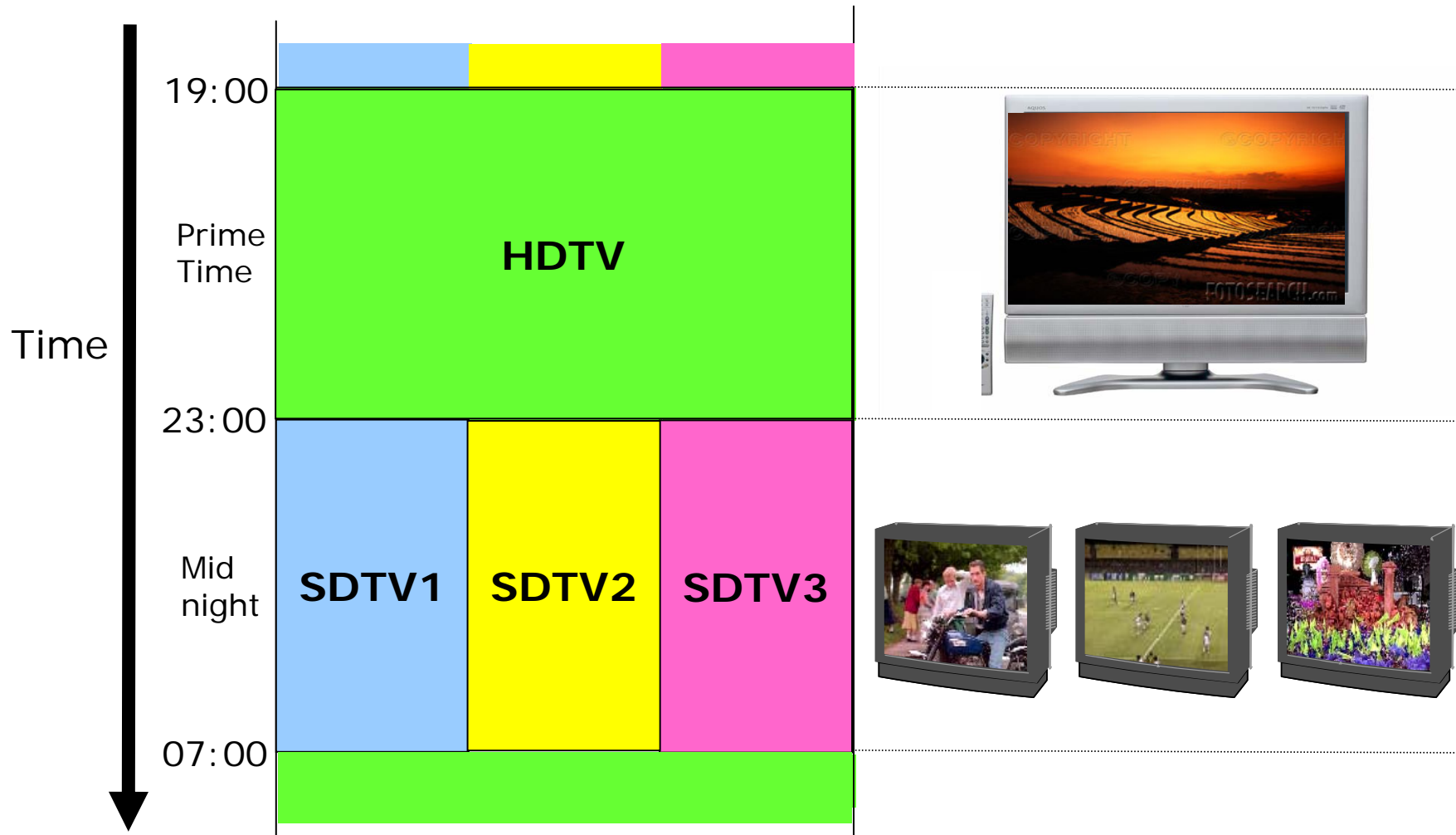


**Ex.2** 3 SDTV and Mobile Reception.

**The segment structure is unique system of ISDB-T.**



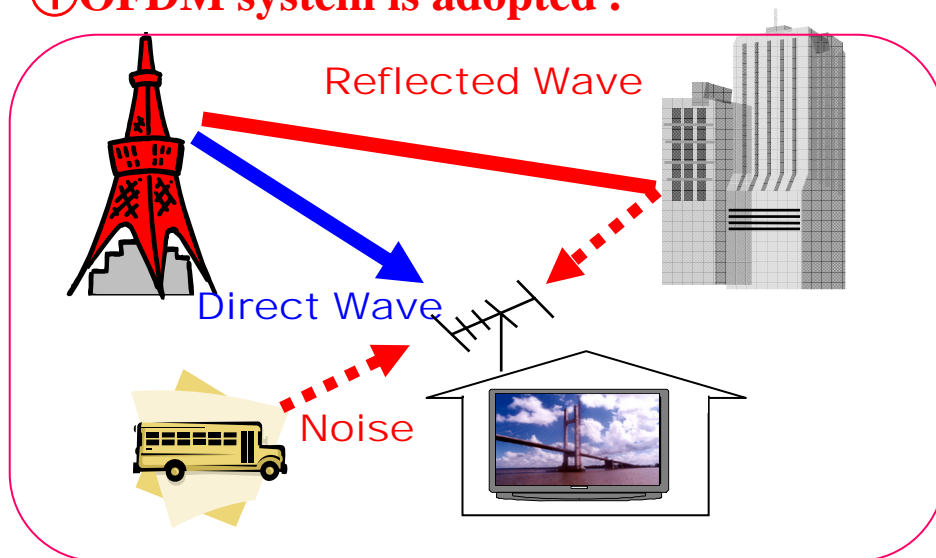
# *Flexible Programming*



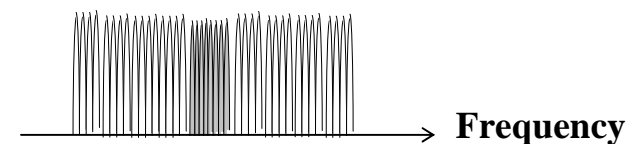


# Robustness against multi-path and noise

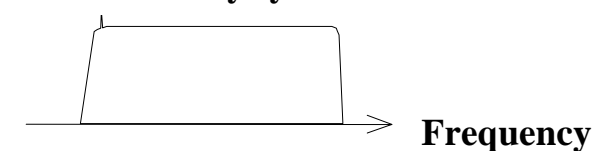
## ① OFDM system is adopted .



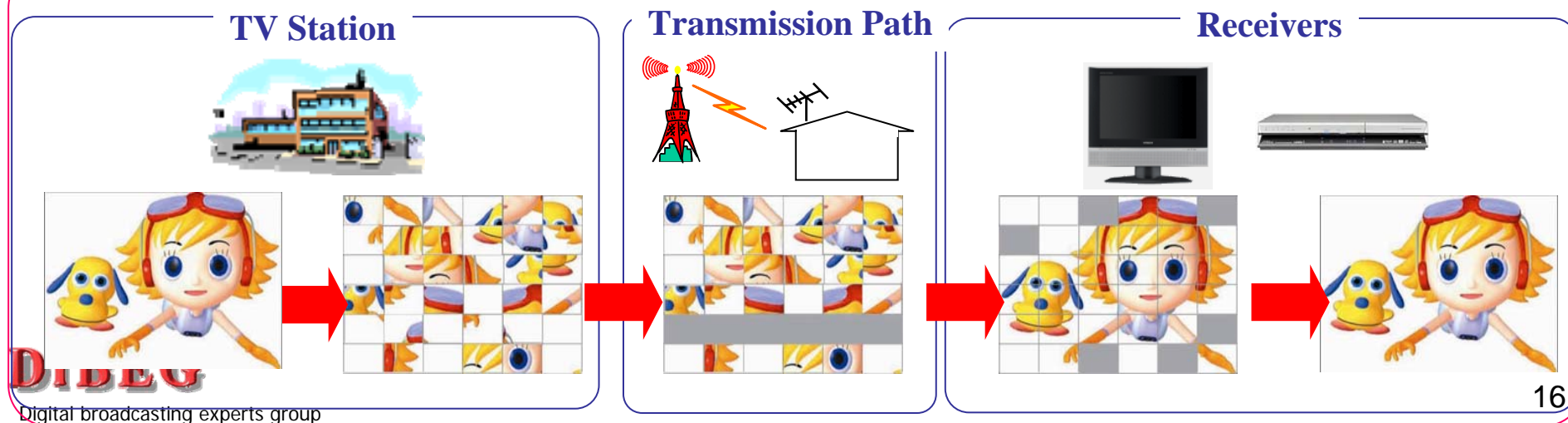
OFDM: Orthogonal Frequency Division Multiplex



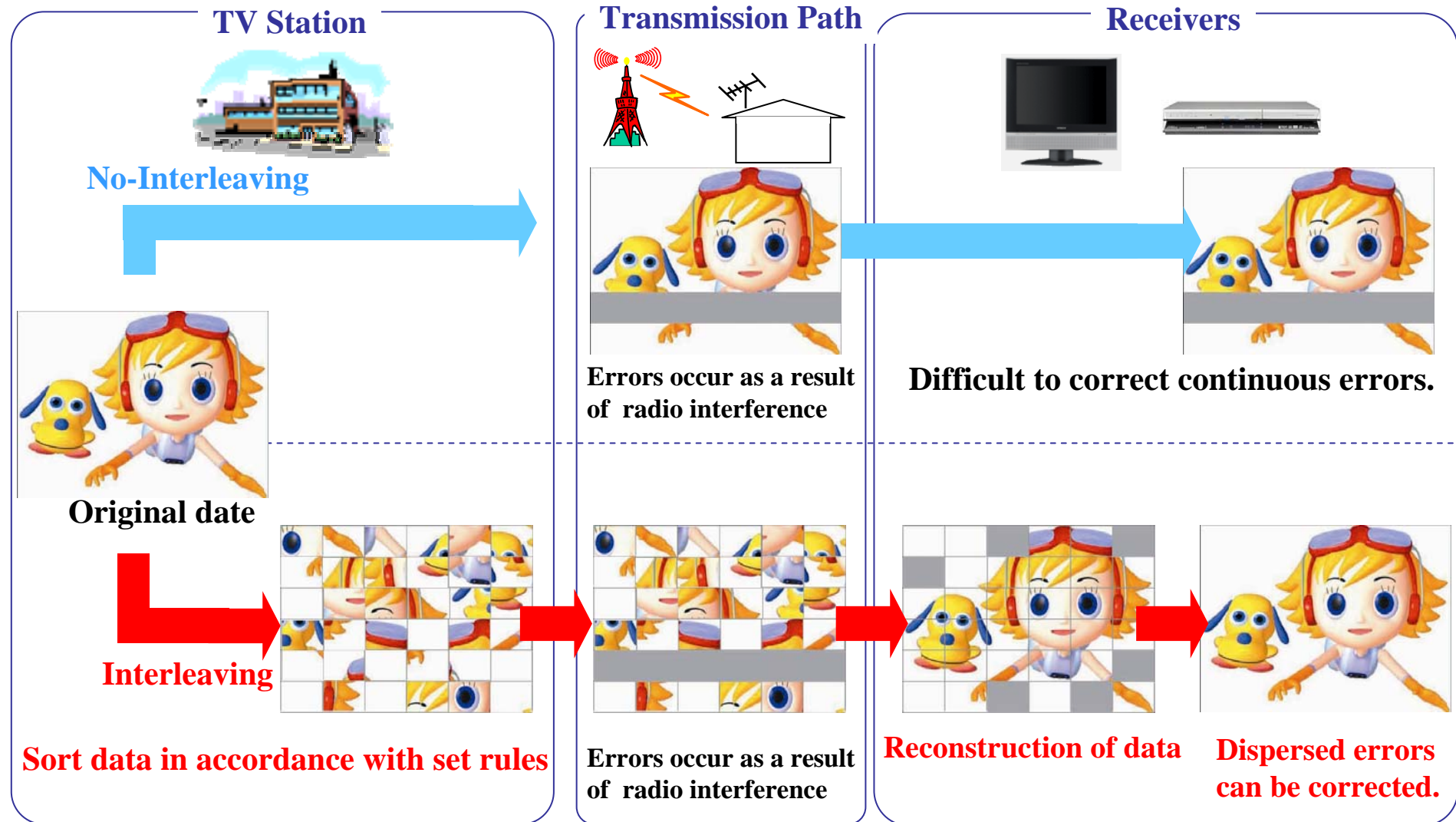
Ordinary system



## ② Frequency and Time Interleaving



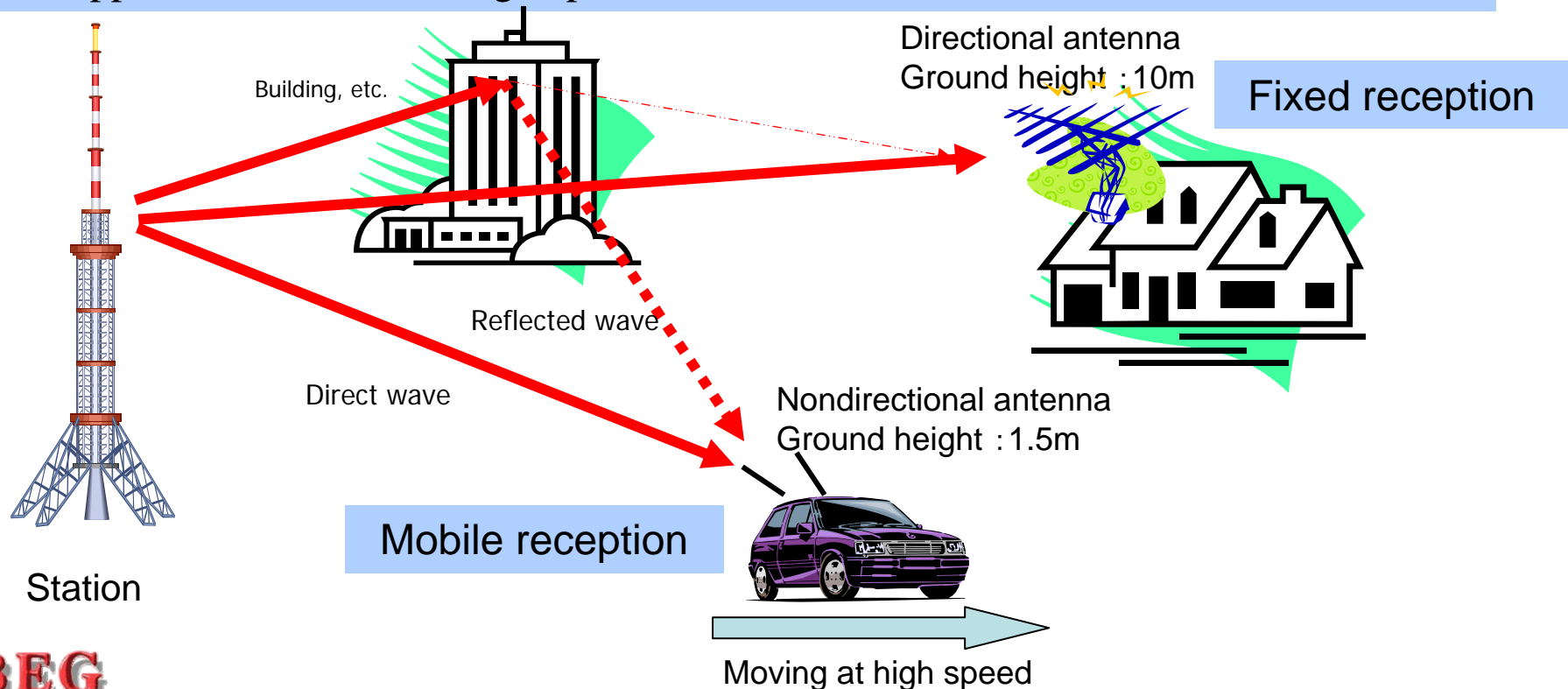
[Reference]  
Comparison of Interleaving and No-Interleaving



# Mobile Reception of ISDB-T

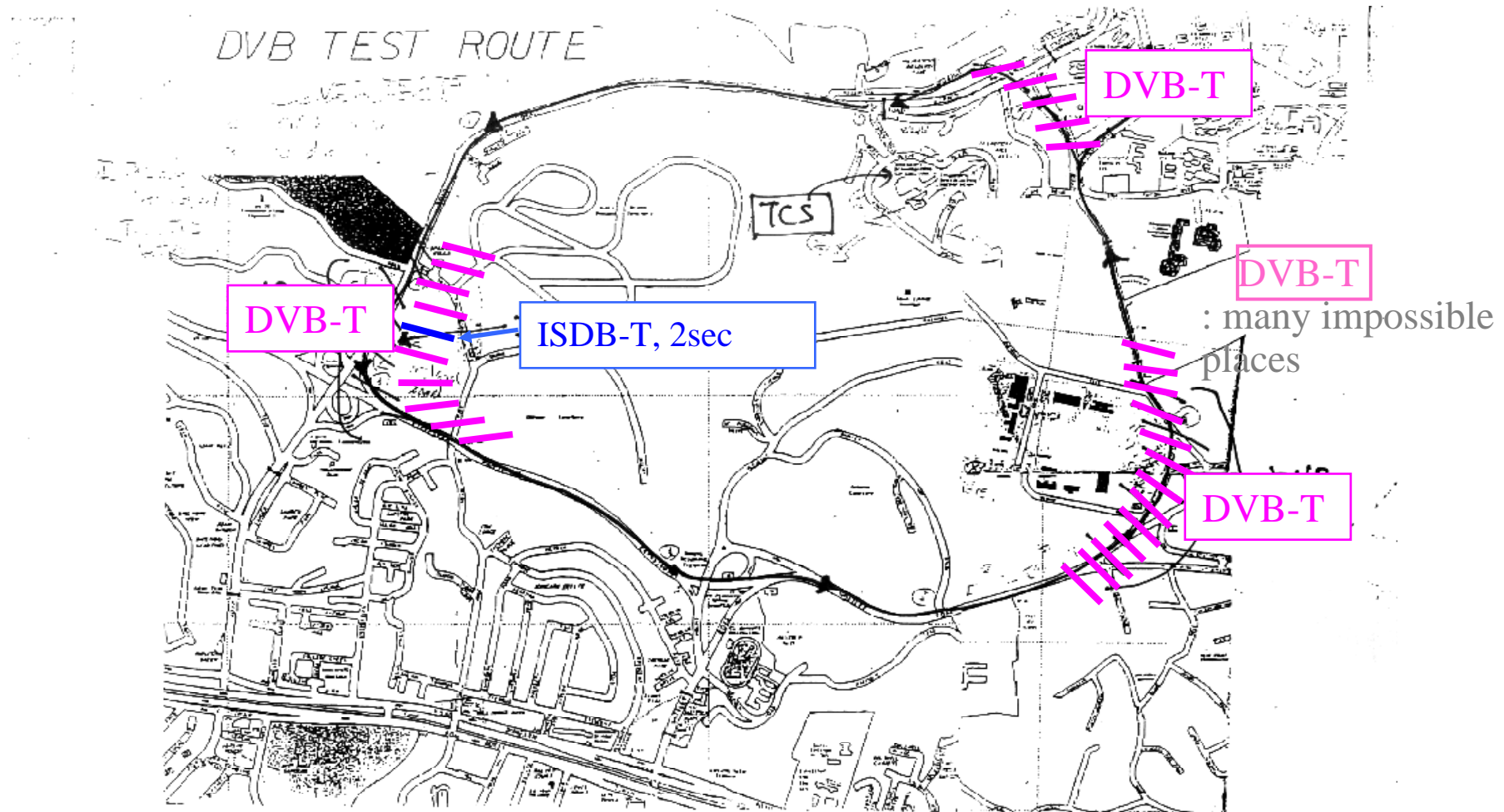
## Reception Environment

1. Lower electric field strength because of low antenna height (Approx. 10dB down)
2. Smaller antenna gain because of a nondirectional antenna (Approx. 10dB down)
3. Greatly affected by multipath fading because of mobile reception
4. Doppler shift because of high-speed movement



# Results of Mobile Reception in Singapore

## Comparison tests between DVB-T and ISDB-T

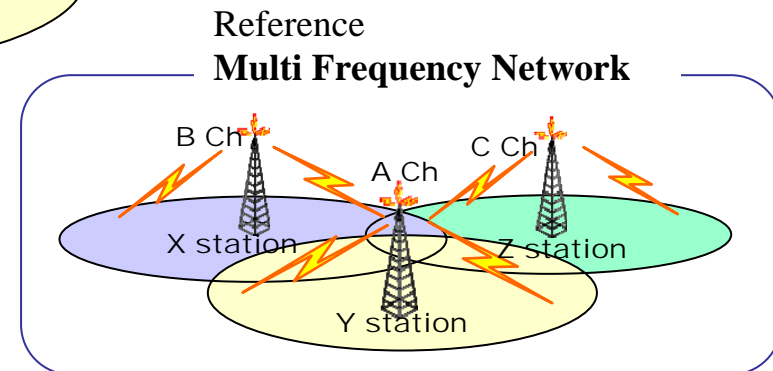
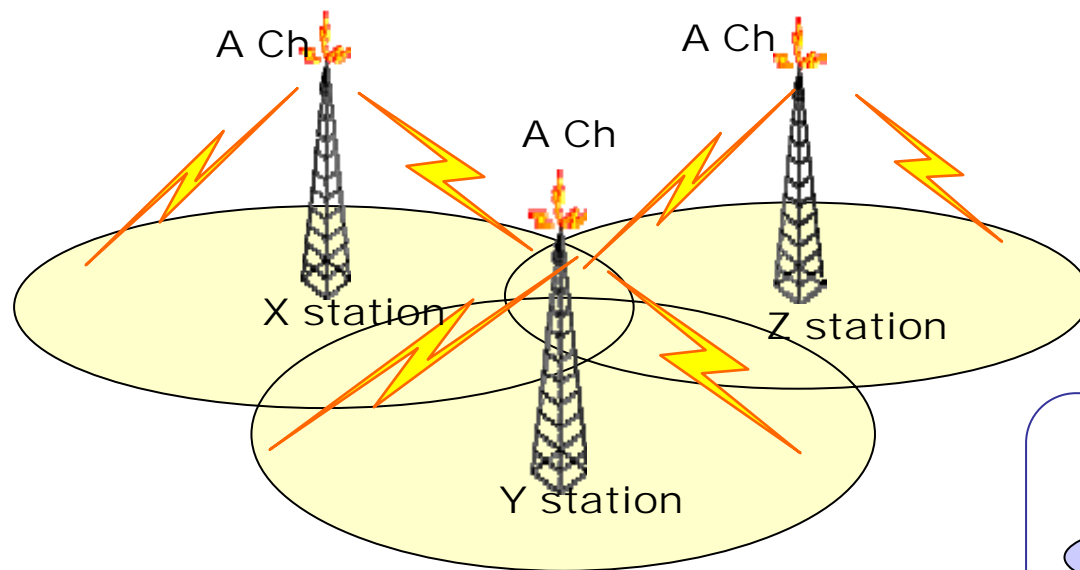


# Single Frequency Network (NFS)

## Realization of Single Frequency Network

### Effective Utilization of Radio Frequency

Over 10,000 stations can be set up using 40 Ch in Japan



# Disaster Warning System

## Text

Possibility of ●● river flooding has increased. Residents near the river should evacuate. Areas affected are as follows.

## Image



**Activation Control by Broadcasting**  
Non-congested communication  
Power-saving feature is necessary

Meteorological Agency

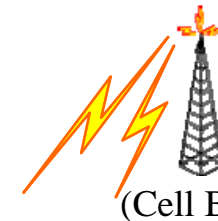
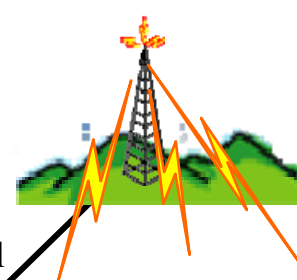


TV Station



Activation control signal  
&  
Text and image

**Master Room  
(on-air button)**

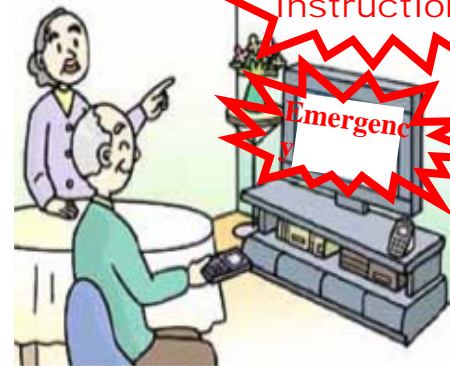


(Cell Base Station)

**Activate !**

Evacuation  
Instructions

Emergency



Both in and outside the home<sub>21</sub>

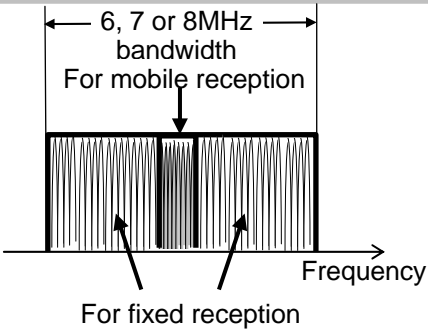
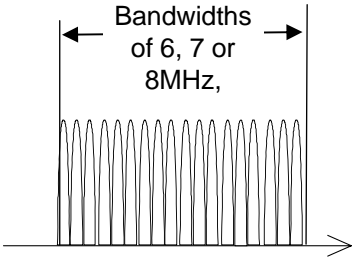
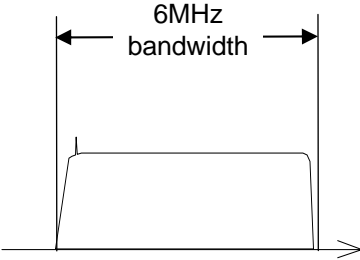
**DiBEG**

Digital broadcasting experts group



# Comparison of Three DTTB System (1)

Results of fair evaluation by a third country (Federative Republic of Brazil )

System Items	Japan (ISDB-T)	EU (DVB-T)	U.S (ATSC)
Robustness to ghost image interference	Effective against ghost image interference using advanced technique. ◎	Effective against ghost image interference. ○	The same degree of analog TV broadcasting. △
Feasibility of Single Frequency Network (SFN)	A channel plan including SFN has already been prepared. ◎	Some countries such as Germany, Australia, and Singapore, are operating this. ◎	Being tested in the U.S. and Canada. However, no prospect for commercialization has emerged. ×
Feasibility of portable reception	<u>One channel</u> can carry portable reception service simultaneously with HDTV service. ◎	DVB-H, <u>another channel</u> is necessary for portable reception. △	Portable reception is not available in the current system. Other systems are not being considered. ×
Transmission system	 <p>It is possible to designate the modulation system of the segment group unit according to the service purpose.</p>		 <p>Improved system based on analog TV broadcasting system.</p>

## Comparison of Three DTTB System (2)

System Features	Japan (ISDB-T)	EU (DVB-T)	U.S. (ATSC)
HDTV reception while moving	<b>possible</b>	<b>impossible (only SDTV)</b>	<b>impossible</b>
Portable reception using the same system as fixed reception	<b>possible</b>	<b>impossible</b>	<b>impossible</b>
Emergency Warning Broadcasting System	<b>possible</b>	<b>impossible</b>	<b>impossible</b>



## **Brazil adopted ISDB-T**

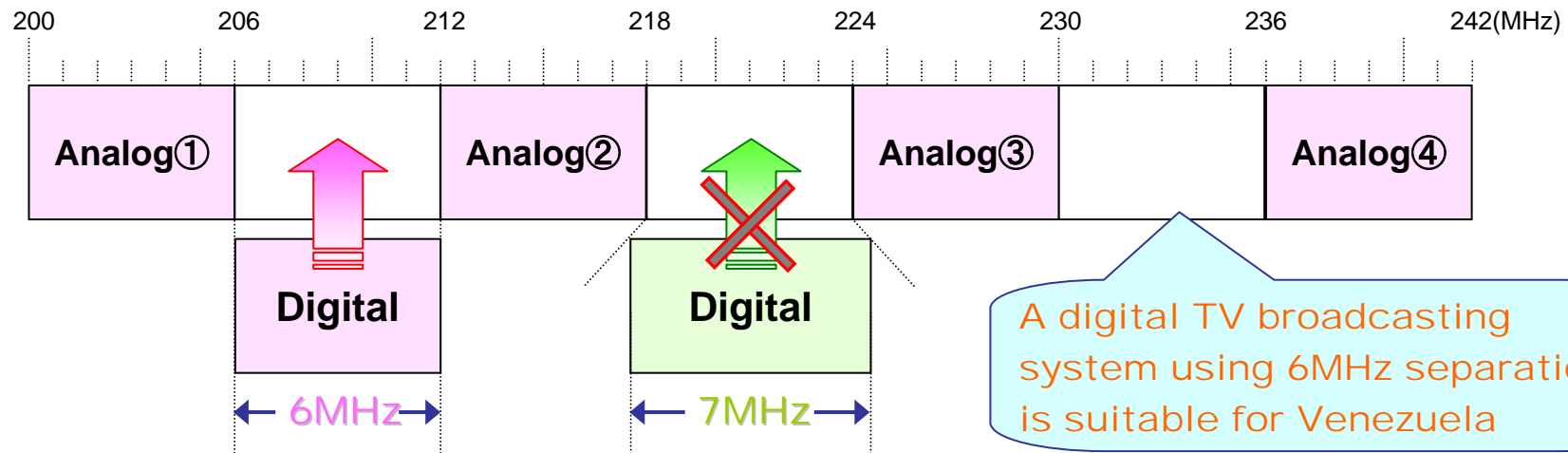
### **Reason for adopting ISDB-T in Brazil**

- **Brazil confirmed the advantage of ISDB-T by fair technical tests.**
- **ISDB-T has the highest robustness to interference and can provide a mobile reception service.**
- **Only ISDB-T can provide stationary and mobile reception services using the same TV channels and transmitters.**
- **The channel separation of Brazil is 6MHz.**

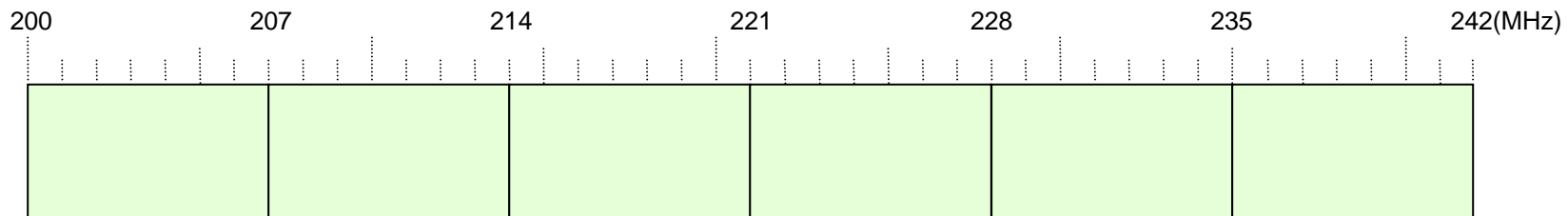
# TV Channel Separation

- The analog TV broadcasting system of Venezuela is M / NTSC.
- The bandwidth of one analog TV channel in Venezuela is 6MHz.

6MHz Separation : South American countries, Japan, USA, Philippines etc.

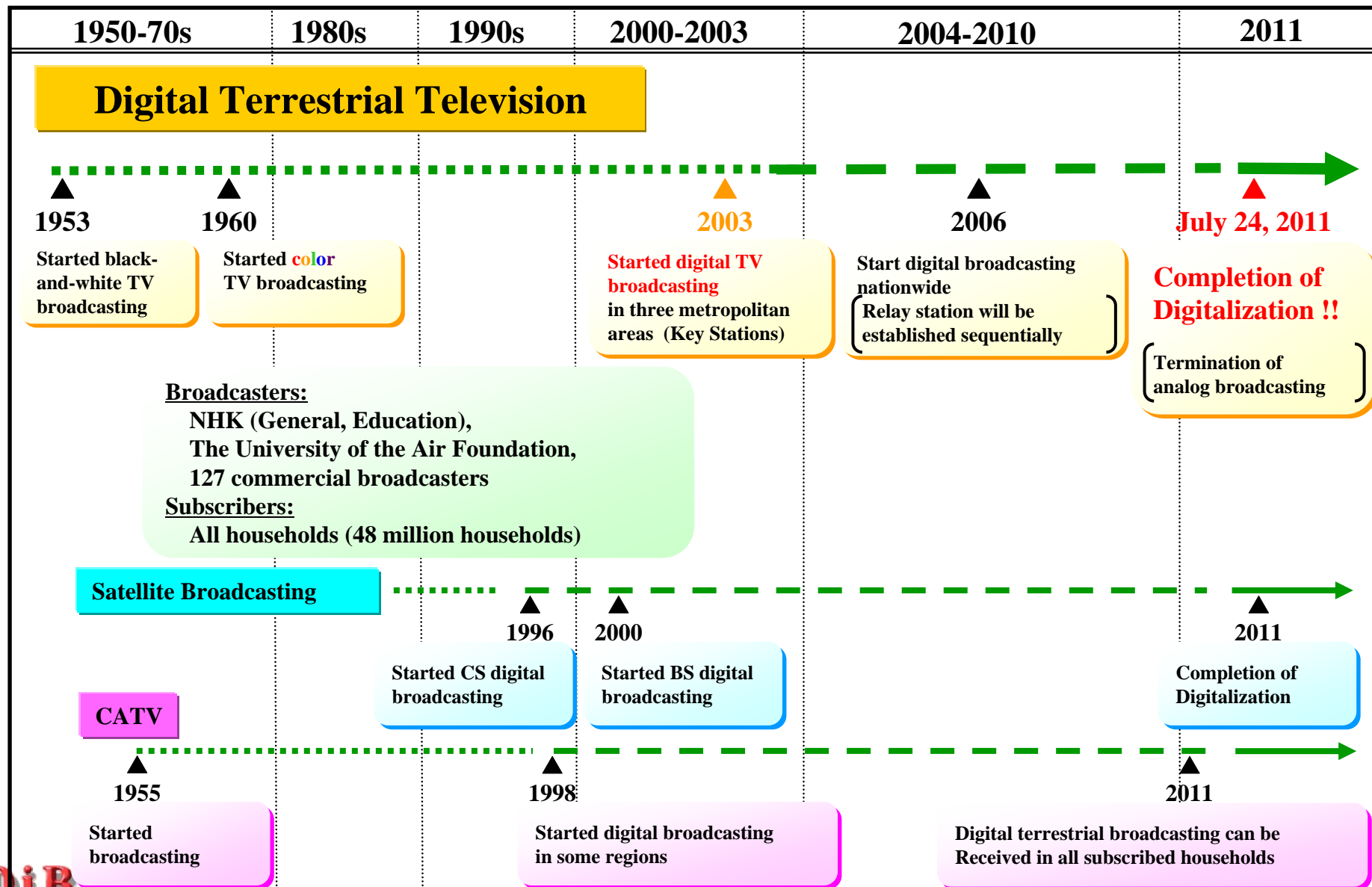


7MHz Separation : Europe (DVB-T) etc.



# Digital TV in Japan

# Schedule for Digital Broadcasting in Japan



# Expansion Schedule for DTTB in Japan

 already started by Dec. 2004

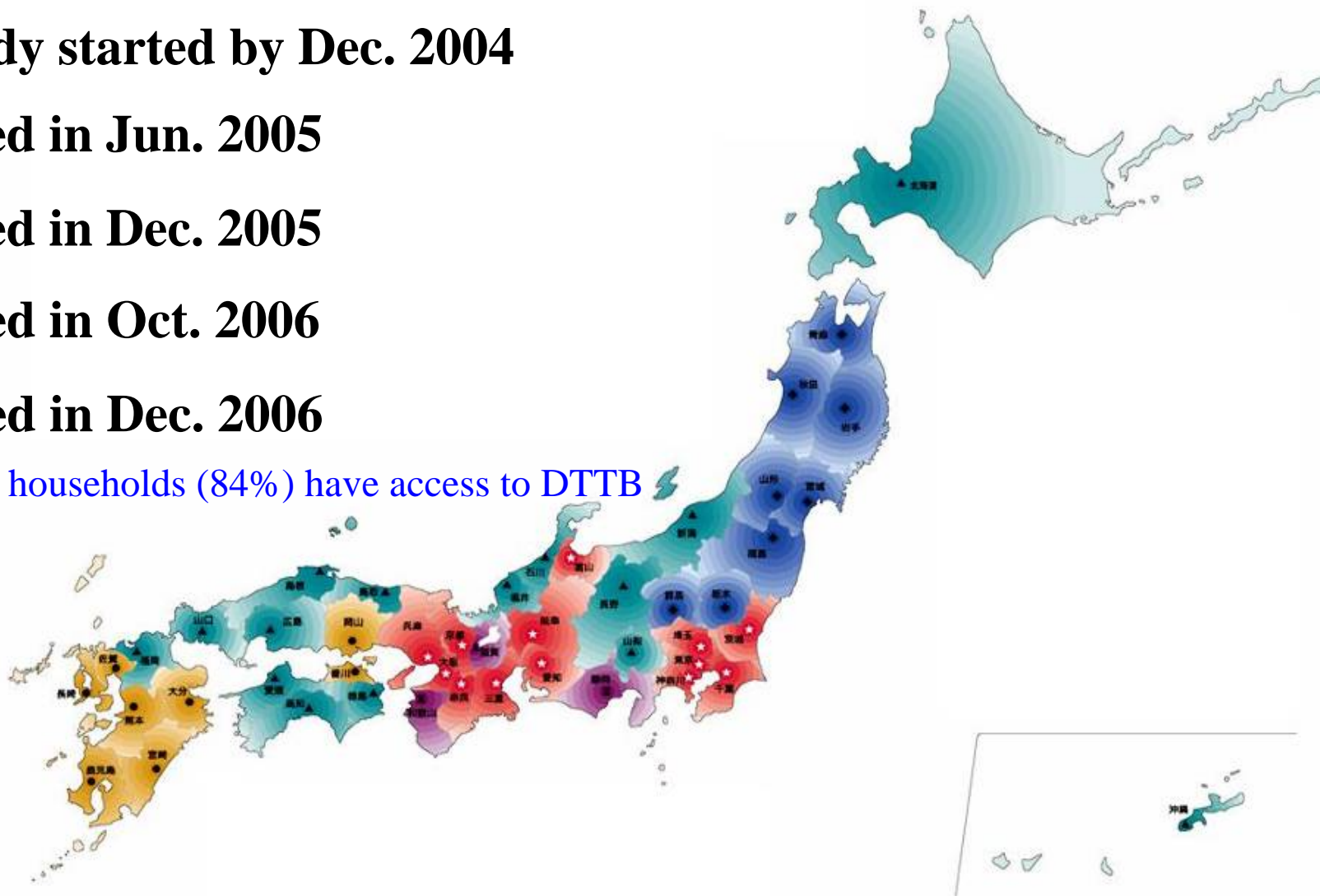
 started in Jun. 2005

 started in Dec. 2005

 started in Oct. 2006

 started in Dec. 2006

39.5 million households (84%) have access to DTTB



# Diffusion of Digital TV Receivers

## Digital Terrestrial Broadcasting Receiver Shipments

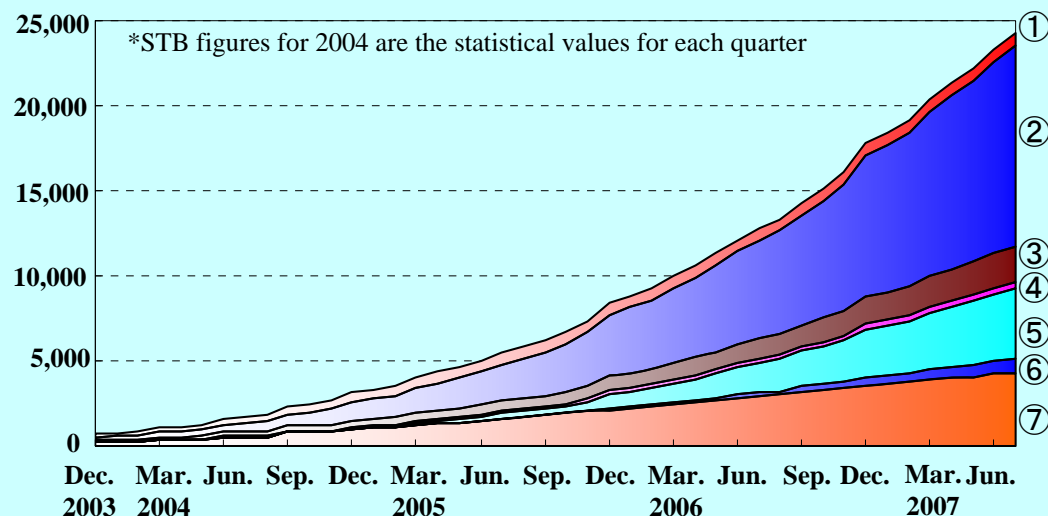
24,150,000

Source: Japan Electronics and Information Technology association (JEITA), Japan Cable Laboratory

(Unit: thousand)

① CRT	720 (± 0)
② LCD	11,807 (+ 550)
③ PDP	2,082 (+ 74)
④ Tuner	349 (+ 7)
⑤ Digital Recorder	4,176 (+ 201)
⑥ Personal Computer	788 (+ 23)
⑦ CATV STB	4309 (+ 94)

(Unit: thousand)



## Access to Digital Broadcasting Satellite

27,470,000

Jun 2007 Source: NHK

## Digital Broadcasting Satellite Receiver Shipments

25,930,000

CRT	1,860 (± 0)
PDP & LCD	14,420 (+ 62)
Tuner (including Digital Recorder)	5,370 (+ 25)
CATV STB	4,280 (+ 9)

## Access to Digital Broadcasting Satellite using CATV

1,540,000 households

## One-Seg Mobile Phone Shipments

11,780,000

Jul 2007

## In-car DTTB Receiver Shipments

650,000

Jun 2007

Source: Japan Electronics and Information Technology association (JEITA)

# ■ Fixed Receivers

## PDP TV



VIERA TH-42PZ700SK  
**Panasonic**



Wooo P42-HR01  
**HITACHI**



PDP-A427HX  
**Pioneer**

## LCD TV



REGZA 42H3000  
**TOSHIBA**



AQUOS LC-42RX1W  
**SHARP**



VIERA TH-20LX70  
**Panasonic**



BRAVIA KDL-40V2500  
**SONY**



LCD-32HR100  
**SANYO**



AQUOS LC-16E1  
**SHARP**

## SDTV

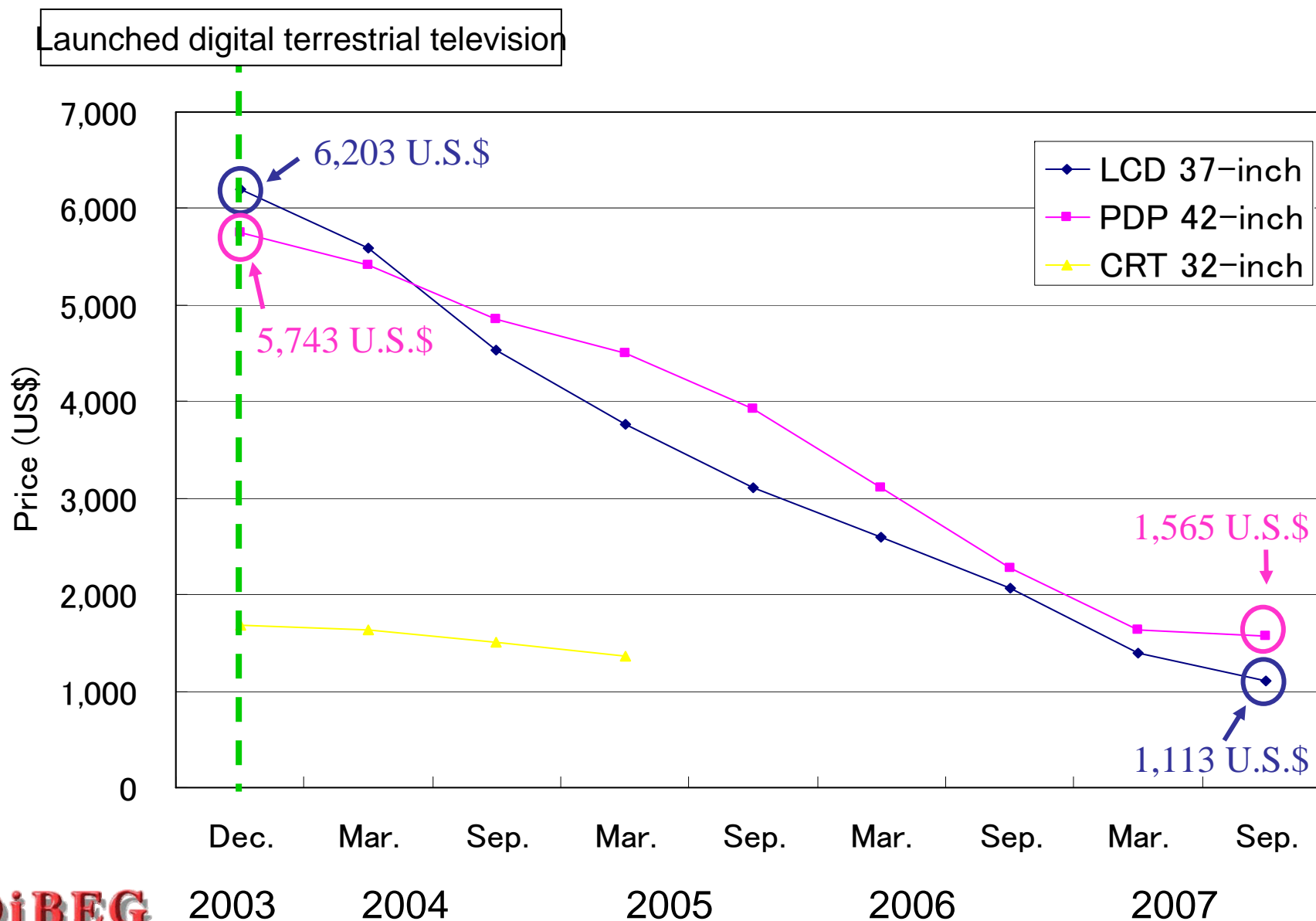


VIERA TH-15LD70  
**Panasonic**



AQUOS LC-13SX7  
**SHARP**

# Change in Price of Major Flat Panel Displays (FPD)





## [Reference] Price of DTTB Receivers

- There is no difference in price of the television receivers among DTTB systems.

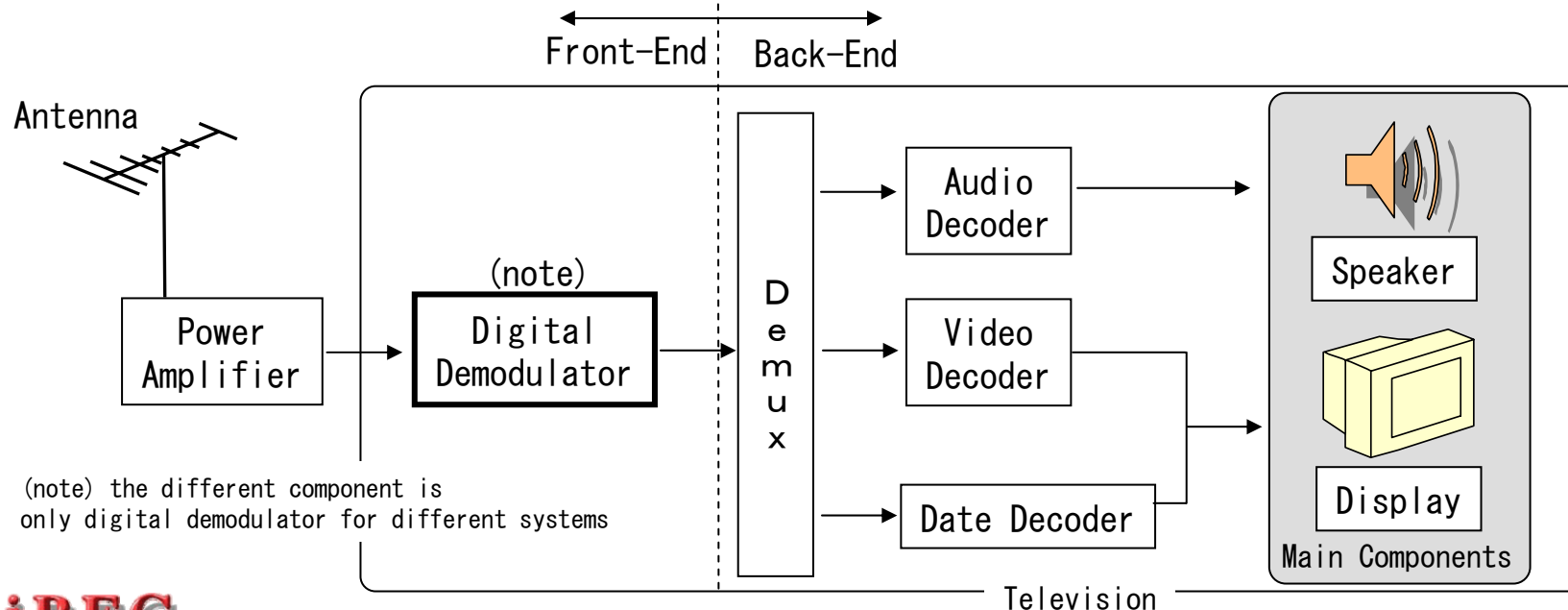
Because almost component of digital television receivers are same.

As for the difference depend on DTTB systems is just modulation part which is negligible against price of TV set.

As proof, price of the television receivers are same among PAL, NTSC and SECAM.

- Price of the television receivers is depend on functions.

e.g. High Definition TV, Multi SD, Data broadcasting, interactive function. etc



# ■ Fixed Receivers (Cont.)

## HDD/DVD Recorder



RDZ-D800  
**SONY**



DIGA DMR-XW51  
**Panasonic**



VARDIA RD-S600  
**TOSHIBA**



DVR-DV635  
**MITSUBISHI**

## Blu-ray



BDZ-V9  
**SONY**



DIGA DMR-BW200  
**Panasonic**

## STB



TU-MHD600  
**Panasonic**



DT400  
**MASPRO**

## Cable STB



TZ-DCH1800  
**Panasonic**

# Very Low Price and Small Converter

**This converter is now under developing !**



[main spec]

Item		Spec
Signal output	Video	Video; Standard Definition Audio; (L, R) two devices (close-captioned)
	Audio	
Frequency band		VHF and UHF
Electric power		21W
Size		H100 × W25 × D131 (mm)



## ■ Fixed Receivers (Cont.)

### Desktop PC



20 inch  
(1680x1050)

VALUESTAR S VS770/JG  
**NEC**



20.1 inch  
(1680x1050)

FMV-DESKPOWER LX70W/D  
**FUJITSU**



20.1 inch  
(1680x1050)

Prius One type W AW37W5U  
**HITACHI**

### Notebook PC (medium-large size)



15.4 inch  
(1280x800)

LaVie L LL970/HG  
**NEC**



17 inch  
(1440x900)

FMV-BIBLO NX95W/D  
**FUJITSU**



17 inch  
(1920x1200)

Qosmio G40/95C  
**TOSHIBA**

# ■ In-car Receivers

## Navigation System Full-Seg/One-Seg



Tuner separated model

Strada CN-HDS965TD  
**Panasonic**



AVIC-VH099G  
**Pioneer**

All-in-one model



HS706D-A  
**NISSAN/SANYO**

## One-Seg Only

※Full-Seg is Optional



GORILLA NV-HD830DT  
**SANYO**

## Portable Navigation Device

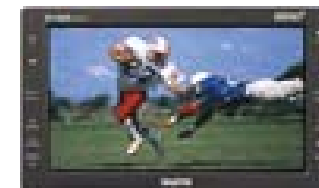
### One-Seg Only



Mini GORILLA  
NV-SD10DT  
**SANYO**

## In-Car TV

### One-Seg Only

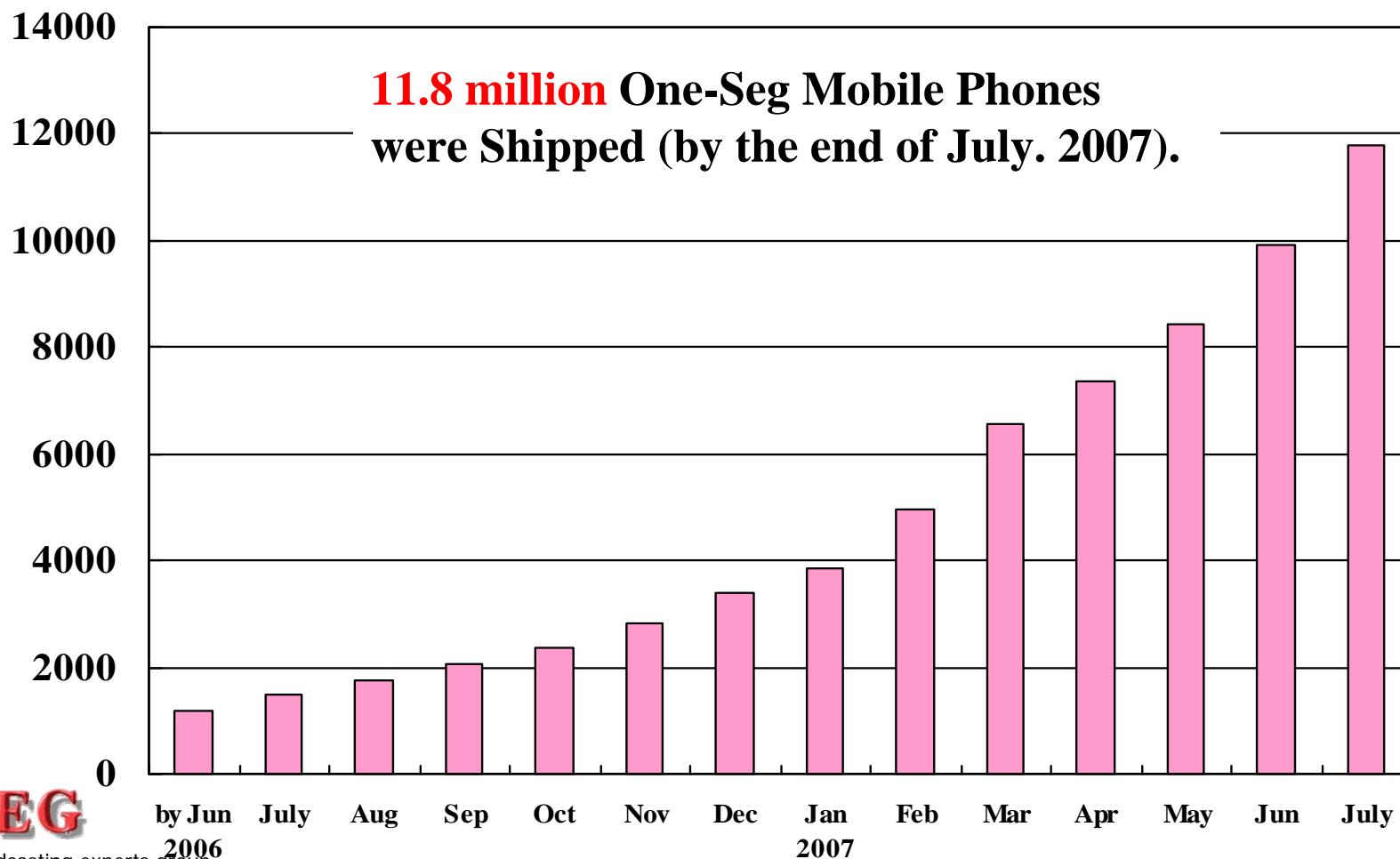


CAV-TD85D1  
**SANYO**

# Diffusion of Digital One-seg Receivers

- One-Seg service started in April 2006.
- One-Seg Mobile Phone Shipments have been expanded and reached 500,000 for the first time in Dec 2006.

(Unit: thousand)



# ■ One-Seg Receivers (1/3)

## Mobile Phones



W33SA  
(Dec 2005)



W41H  
(Feb 2006)



W33SA II  
(Jun 2006)



W43H  
(Sep 2006)



W43SA  
(Oct 2006)



W44S  
(Dec 2006)  
Usable also as digital radio



W43H II  
(Jan 2007)



MEDIA SKIN  
(Jan 2007)



W51CA  
(Jan 2007)



W51K  
(Jan 2007)



W51SA  
(Jan 2007)



W51SH  
(Jan 2007)  
Usable also as digital radio



W51T  
(Jan 2007)  
Usable also as digital radio



W52T  
(Jan 2007)  
Usable also as digital radio

**KDDI**



P901iTV  
(Mar 2006)



D903iTV  
(Jun 2007)



D903iTV  
(2007)



P903iTV  
(2007)



SH903iTV  
(2007)

**NTTDoCoMo**



905SH  
(May 2006)



911SH  
(Nov 2006)

**SoftBank**

**DiBEG**

Digital broadcasting experts group

Each company's press released merchandise in Japan



## ■ One-Seg Receivers (2/3)

### Personal Computers



VGN-TX91PS, etc.  
(from Jan 2006)

**Sony**



LesanceNB  
CL206GW-GT/TV etc  
(from Jul 2006)

**Aro System**



PC Card  
(Mar 2006 OEM Supply)

**PIXERA**



USB connective Tuner  
(DH-ONE/U2)  
(Oct 2006)

**BUFFALO**



PC Card  
MonsterTV 1D  
(Nov 2006)

**SKnet**



T70S/V, etc.  
(from Apr 2006)

**Fujitsu**



LavieA (LA700/GD)  
(Sep 2006)

**NEC**



USB connective Tuner  
(LDT-1S100U)  
(Sep 2006)

**Logitech**



SDIO Tuner  
(2007 OEM supplied)

**ZENTEK**



Express Card  
MonsterTV 1D for DELL  
(Nov 2006)

**DELL**



USB connective Tuner  
PCTV-hiwasu (LOG-J100)  
(Dec 2006)

**LOGFARM**



USB connective Tuner  
VGA-TV1S  
(Dec 2006)

**SanwaSupply**



USB connective Tuner  
SEG CLIP (GV-1SG/USB)  
(Dec 2006)

**I.O.Data**



USB connective Tuner  
DigiTVe (LC-1SEGU)  
(Dec 2006)

**Live Creator**



USB connective Tuner  
QOT-W100  
(Dec 2006)

**Quick Sun**



USB connective Tuner  
DT-007  
(Dec 2006)

**TRYWIN**



USB connective Tuner  
K-ONESEG/U2  
(2007)

**KEIAN**



USB connective Tuner  
W-one (GH-1ST-U2K)  
(Dec 2006)

**GREEN HOUSE**



USB connective Tuner  
ON TIME TV (IM-1ST0001U/S)  
(Dec 2006)

**IMJ**

**DIBEG**

Digital broadcasting experts group

Each company's press released merchandise in Japan



# ■One-Seg Receivers (3/3)

## Portable DVD Players



DVD-LX97  
(Mar 2006)  
**Panasonic**



SD-P90DT  
(Dec 2006)



SD-P50DT  
(Dec 2006)

**TOSHIBA**



ROSSINI RPD7100SN-SV  
(Nov 2006)

**NAGASE**



axion  
AXN6709TD  
(Dec 2006)

※ One-Seg tuner  
only for portable DVD player



SD-PDT1  
(Jul 2006)  
**TOSHIBA**



DVF-DTV100  
(Aug 2006)

**SANYO**

## Electronic Dictionary



Papyrus  
PW-TC900  
(Dec 2006)

**SHARP**

## Game Terminal



Nintendo DS  
(scheduled in 2007)

**Nintendo**

## Digital Audio Player



gigabeat V30T  
(Jul 2006)



gigabeat V30E & V60E  
(Nov 2006)

**TOSHIBA**

## Exclusive Terminals, etc.

※Usable also as  
digital radio



BTV-400K  
(Feb 2007)

**BLUEDOT**



One-segment unit  
Produced by Wilcom  
(Dec 2006)

**PIXERA**



Prodia  
(Sep 2006)

## Others

### Radio



XDV-100  
(Apr 2007)

**SONY**



Super One-seg TV Watch  
(campaign prize)  
**Asahi Beer**



Original One-seg TV  
(G I Challenge campaign prize)  
**Georgia**

**DiBEG**

Digital broadcasting experts group

Each company's press released merchandise in Japan

# GSM+3G Phones Correspond to One-Seg\*

\*Japan's Mobile TV Reception Service is called “One-Seg”.

GSM+3G and One-Seg can be combined.  
One-Seg has no relation with mobile phone systems.



<http://www.nttdocomo.com/pr/2007/001372.html>

In fact, these GSM phones correspond to One-Seg will go on sale in this November.

These phones can be used in over 140 countries.

# Schemes for Expanding DTTB in Japan

## Implementing Scheme for Expanding Digital TV

### ➤ **The National Council for Promotion of Terrestrial Digital Broadcasting (Broadcasters and MIC)**

- Studying challenges (both institutional and technical) involved in the transition to digital television broadcasting

### ➤ **The National Conference for Promotion of Terrestrial Digital Broadcasting (broadcasters, manufactures, electrical appliance shops, consumer organizations, local governments, MIC, etc.)**

- Updating/revising “Action Plan for Promotion of Digital Broadcasting,” describing items to be implemented by its members and the schedule thereof
- Developing/updating and publicizing “Roadmap of Construction of Broadcasting Stations” with the cooperation of the above mentioned Council
- Driving forward the activities for promoting digital broadcasting by announcing December 1st as “Digital Broadcasting Day”

### ➤ **The Association for Promotion of Digital Broadcasting (Dpa) (broadcasters, Manufactures, etc.)**

- Publicizing broadcasting areas
- Responding to questions and inquiries from viewers

# Outline of Seventh Action Plan to Promote Digital Broadcasting

- All parties concerned work together based on this action plan. “National Conference on Promoting Terrestrial Digital Broadcasting” (Established in May 2003) promotes this plan. The Conference finalized the “Seventh Action Plan for Promotion of Digital Broadcasting” on December 2006.

## Specific efforts by concerned organizations

### ■ Terrestrial TV Broadcasters

#### ○ Development of a road map for DTTB Stations.

- ① This road map indicates a schedule for the construction of as many DTTB stations as possible, including small scale stations.  
This road map shows when access becomes possible and in which areas.
- ② TV broadcasters make sure they can meet this schedule

#### ○ Diffusion and promotion of the unique DTTB service

- ① TV Broadcasters try to increase the ratio of HDTV programs.
- ② Clarification of plans to provide enhanced services, such as a DTTB service for mobile reception.

### ■ Receiver Manufactures and Shops ..etc

- Promotion of development and diffusion of cheaper, more varied DTTB receivers.
- Response to enhanced services such as DTTB for mobile reception and server-type broadcasting.
- Promotion of development of easy-to-use DTTB receivers for all users.
- Training for shop clerks ..etc

### ■ Government

- Clarification and publication of specific policy to ensure realization of the road map for DTTB Station and establishment of technical standards that enable swift and easy building of broadcasting stations.
- Publication of accurate information and schedule about DTTB in a way ordinary people can easily understand.

# Official Supports for Broadcasters

**Support by the “Extraordinary Law for Measures to Promote the Construction of Advanced TV Broadcasting Facilities” etc.**

- **Preference for the national tax (corporate tax)**
- **Preference for the local tax (fixed property tax, real-estate acquisition tax)**
- **Supply of low- or super-low-interest funds by the Development Bank of Japan**

**Financial support for the implementation of broadcasting stations in disadvantaged areas**

# Summaries



## Summeries

- Digitizing broadcasting consists of not only upgrading existing analog TV systems but also achieving attractive broadcasting service is the key to expand digital terrestrial TV for viewers.
  - ISDB-T makes it possible to receive SDTV or HDTV while moving and provides the chance for enjoying new broadcasting service to users.
  - ISDB-T can provide a “free” mobile TV reception service like ordinary TV broadcasting.
- ISDB-T can be the most suitable system for expanding digital terrestrial TV .

# Support for Introduction of Digital Broadcasting

## Technical Cooperation

JICA has existence schemes for dispatching engineers for transfer of technologies to promote implementation of digital broadcasting.

JICA: Japan International Cooperation Agency

URL: <http://www.jica.go.jp/english/index.html>

## Human Resource Development

JICA has existence schemes for dispatching experts and receiving trainees in the field of Information and Communications Technology.

## Financing Plan

JBIC has existence schemes for financial support to import facilities which accompanies the implementation of digital broadcasting.

# Gracias !

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