TOSHIBA

Presentation 5

ISDB-T Fixed & One-Seg Receivers /Broadcasting Station Facility

25th. July. 2007

Caracas, Venezuela

DiBEG JAPAN

Rafael Perez Cruz

(TOSHIBA)

Contents

1. Service Configuration of ISDB-T

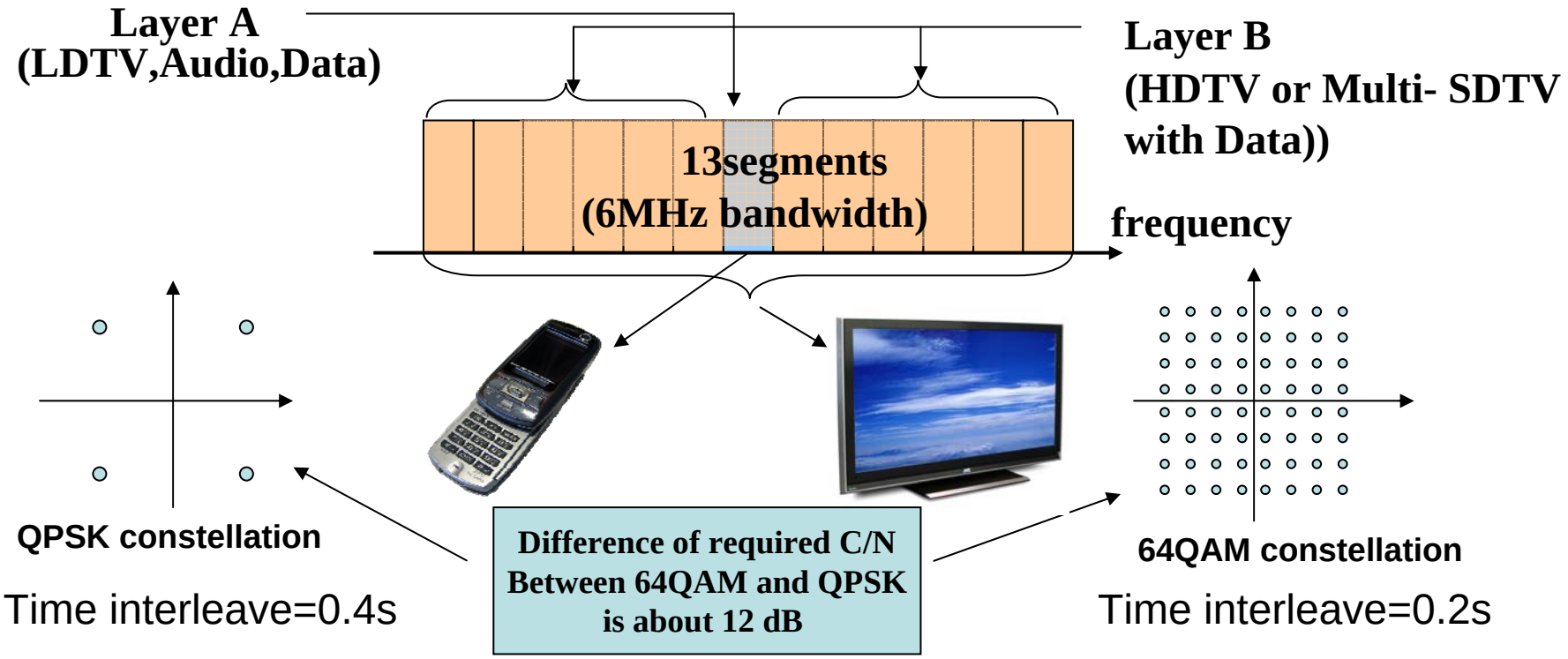
As explained in forward seminar, ISDBT has a priority for service variation by making use of its hierarchical transmission technology.

At first, show a relations between service type and hierarchical transmission system

Image of ISDB-T transmission system performance

Transmission system; Segmented OFDM with Time interleave

(Example; 1seg + 12 seg)



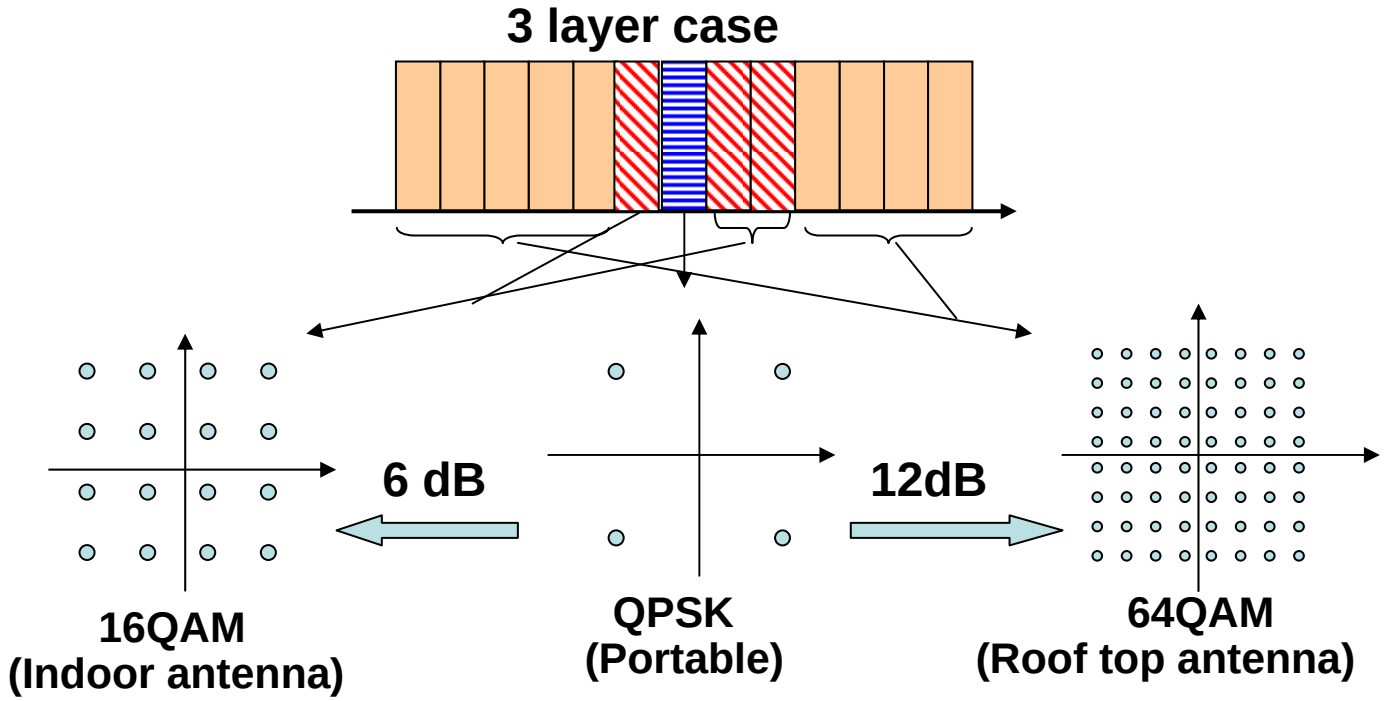
***13 segments are divided into layers, maximum number of layers is 3.**

***Any number of segment for each layers can be selected (totally 13 segment)**

***Transmission parameter sets of each layer can be set independently**
(In above example, modulation index of each layer are different)

Examples of Hierarchical transmission system

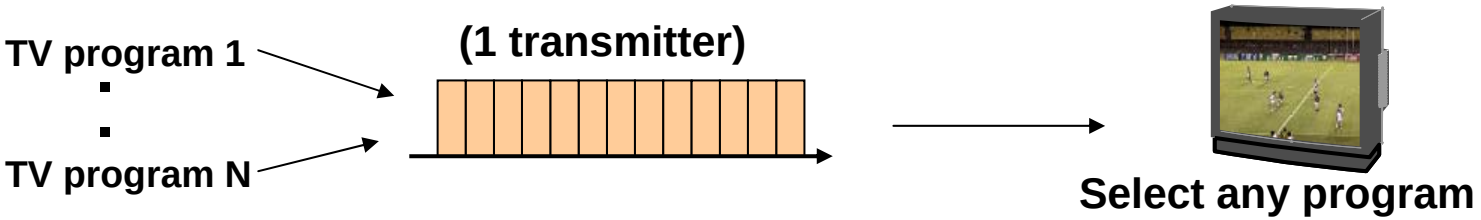
- Hierarchical transmission



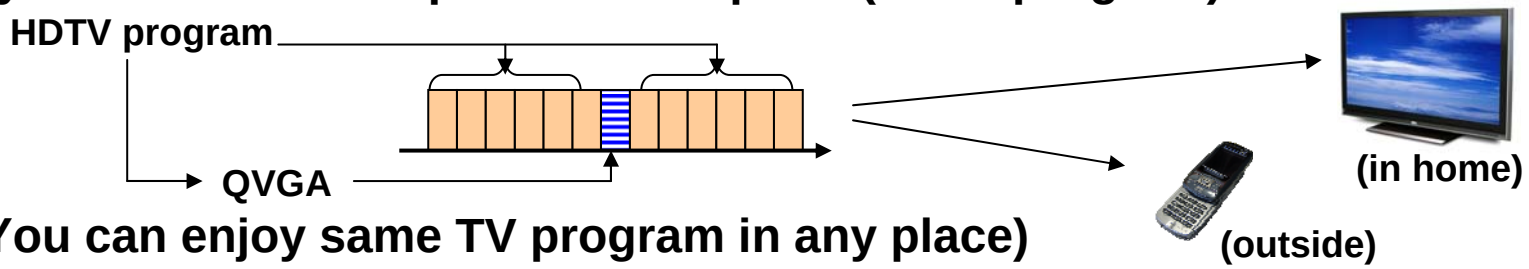
As shown above, ISDB-T transmission system supports maximally 3 reception style.
Therefore, any of transmission system can be arranged according to the service concept in one frequency channel and one transmitter

Examples of Service Configuration of ISDB-T

(1) Single layer multi-program for stationary reception

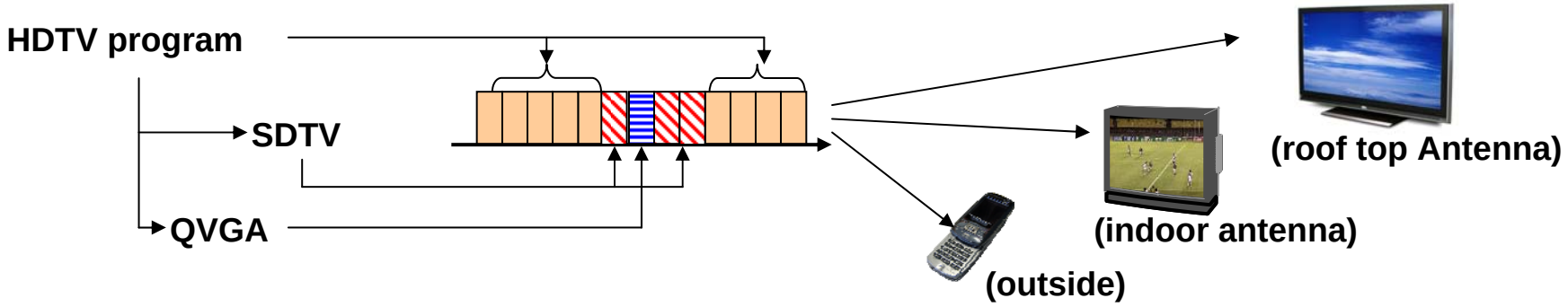


(2) 2 layers for HDTV and portable reception (same program)



(You can enjoy same TV program in any place)

(3) 3 layers for HDTV , SDTV and portable reception (same program)



Current service in Japan is case (2) shown above.

Service lineup of ISDB-T in Japan

ISDB-T has powerful applications

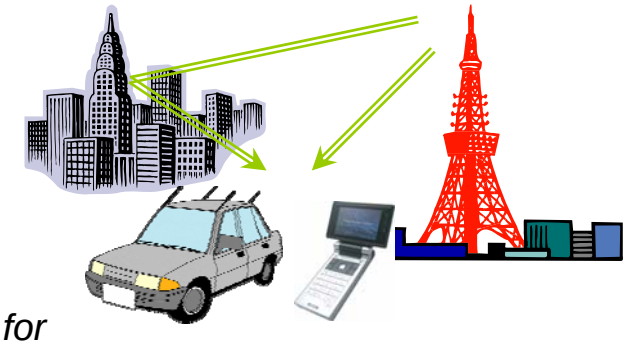
HDTV

- *High quality image on wide screen and CD quality sound.*

Data broadcasting

- *Local news and weather forecast for viewers at any time.*

Mobile accesses

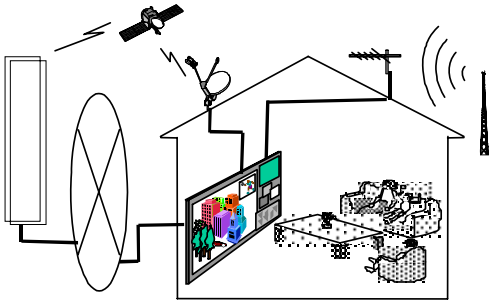


- *Transmission service to Mobile accesses*

Multi-channel program

- *Standard quality multi-channel service*

Interactive TV



- *Offers Interactive service*

DiBEG
Digital Broadcasting Experts Group

2. ISDB-T Receivers

As described in section 1., ISDB-T gives various kinds of broadcast service.

According to service type, many kinds of receiver are now on market in Japan.

ISDB-T receivers in Japanese market are categorized as follows;

(1)Receivers for fixed reception
(2)Receivers for mobile reception
(3)Receivers for portable reception (note)

(note) To save power dissipation, One-Seg receivers are main trend.

Part 1　Examples of receivers for Fixed Reception (Full Segment)

As described section 1., Digital Broadcasting service in Japan is mainly “HDTV(12 segment)+One-Seg(1 segment)”.

Fixed reception type receivers are mainly for HDTV reception, categorized as shown below.

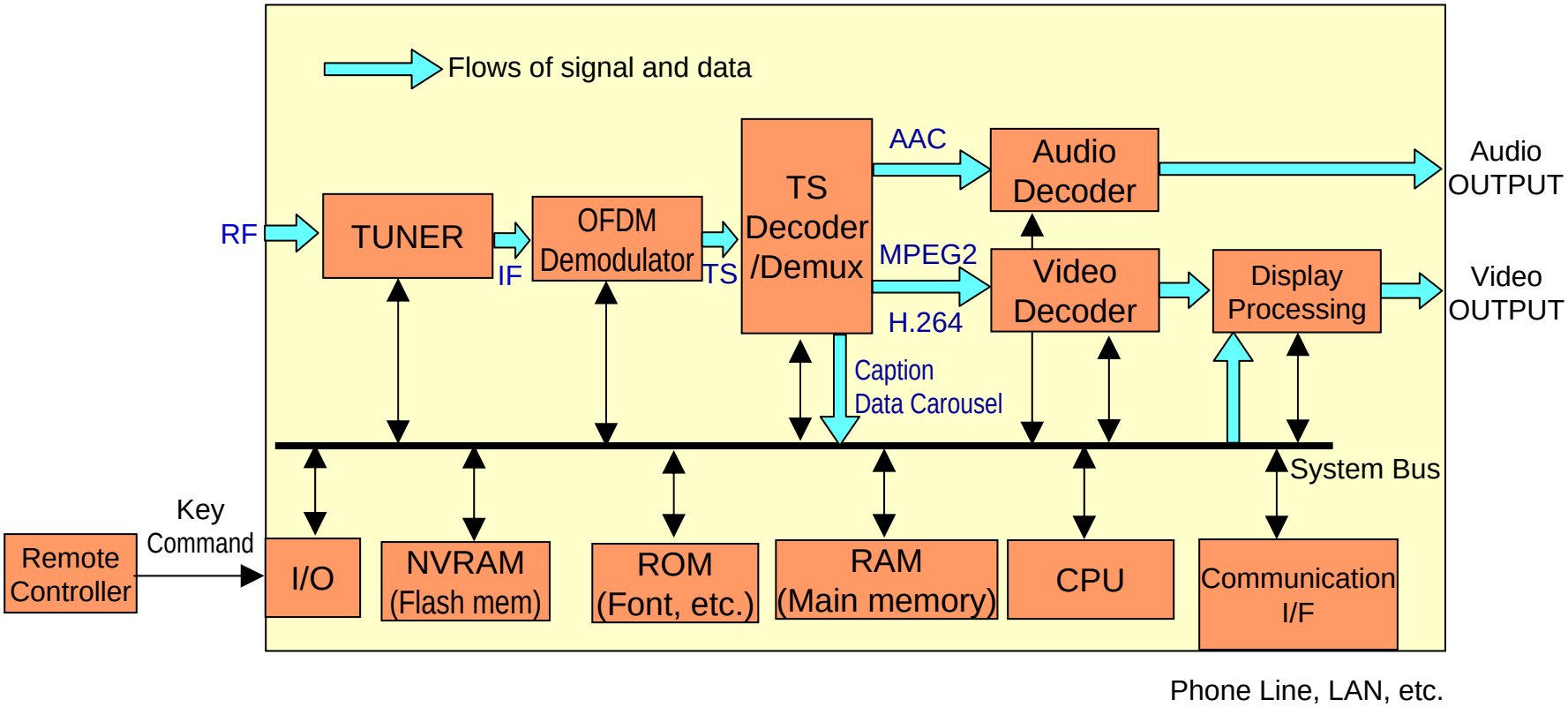
(1)Wide flat panel TV (including tuner)

(2)STB, DVD type(not include Display panel)

(3)PC type (note)

(note) some kinds of mobile PC has only One-Seg tuner to save power consumption.

Hardware Components of a Basic Receiver



Between a Full-Seg receiver and a One-Seg receiver, the basic configurations are about the same, though there are some differences such as a tuner, video decoder, resolution of display and so on.

RF : Radio Frequency
IF : Intermediate Frequency
TS : Transport Stream
Demux : Demultiplexer
NVRAM : Non-volatile RAM

■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

■Fixed Receivers(Cont.)

HDD/DVD Recoder

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

STB-Cable

TZ-DCH1800

Panasonic

■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

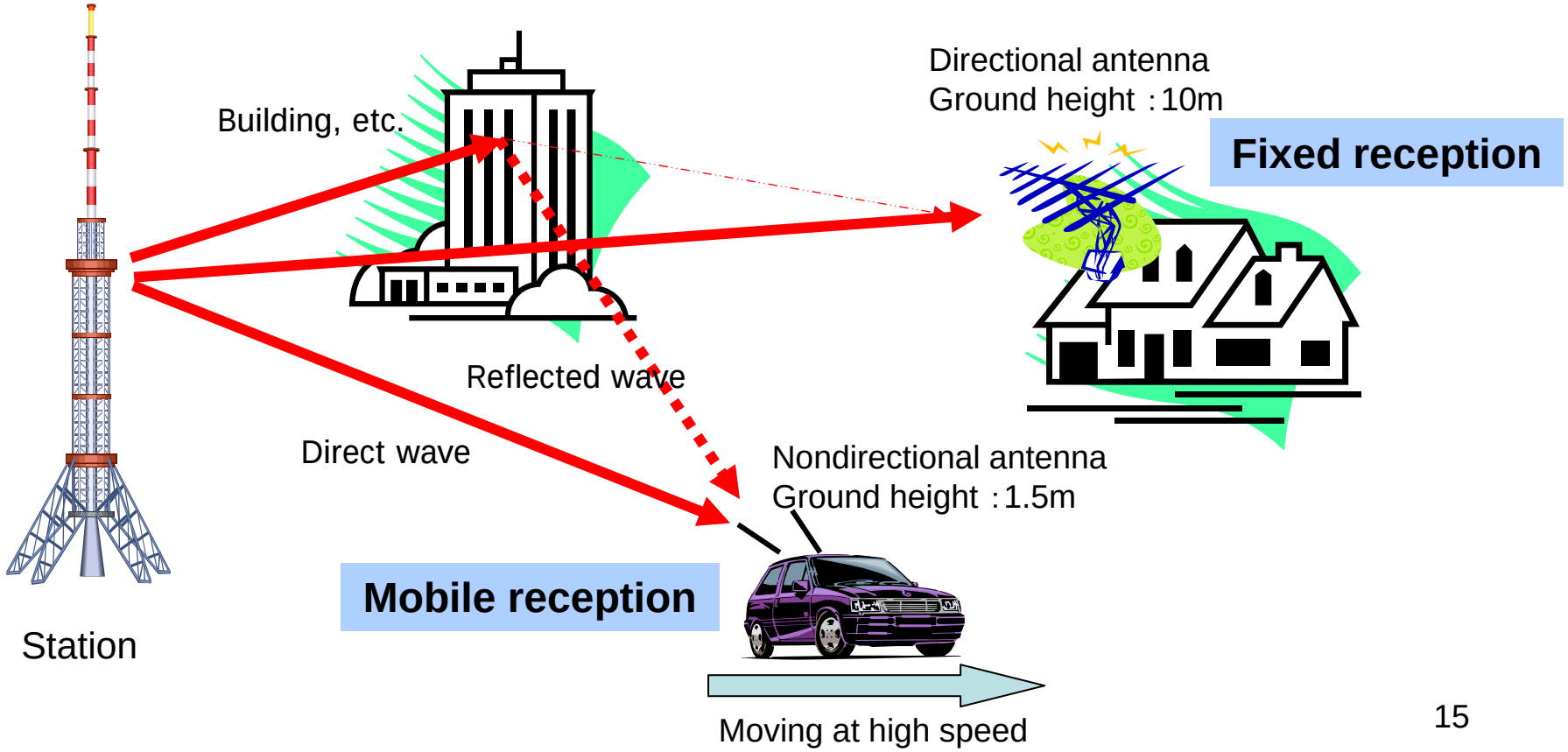
Part 2　Examples of In Car Receiver

Because of following reasons, ISDB-T receiver are able to be used under mobile and portable condition.
(1) “Time Interleave function” (ISDB-T only).
(2) Diversity reception Technology

Many kinds of “In car receiver” are now on market in Japan.

■ Mobile Reception Environment

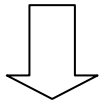
1. **Lower electric field strength because of low antenna height (Approx. 10dB down)**
2. **Smaller antenna gain because of a nondirectional antenna (Approx. 10dB down)**
3. **Greatly affected by multipath fading because of mobile reception**
4. **Doppler shift because of high-speed movement**



DiBEG
Digital Broadcasting Experts Group

■ Improvement of Reception Performance

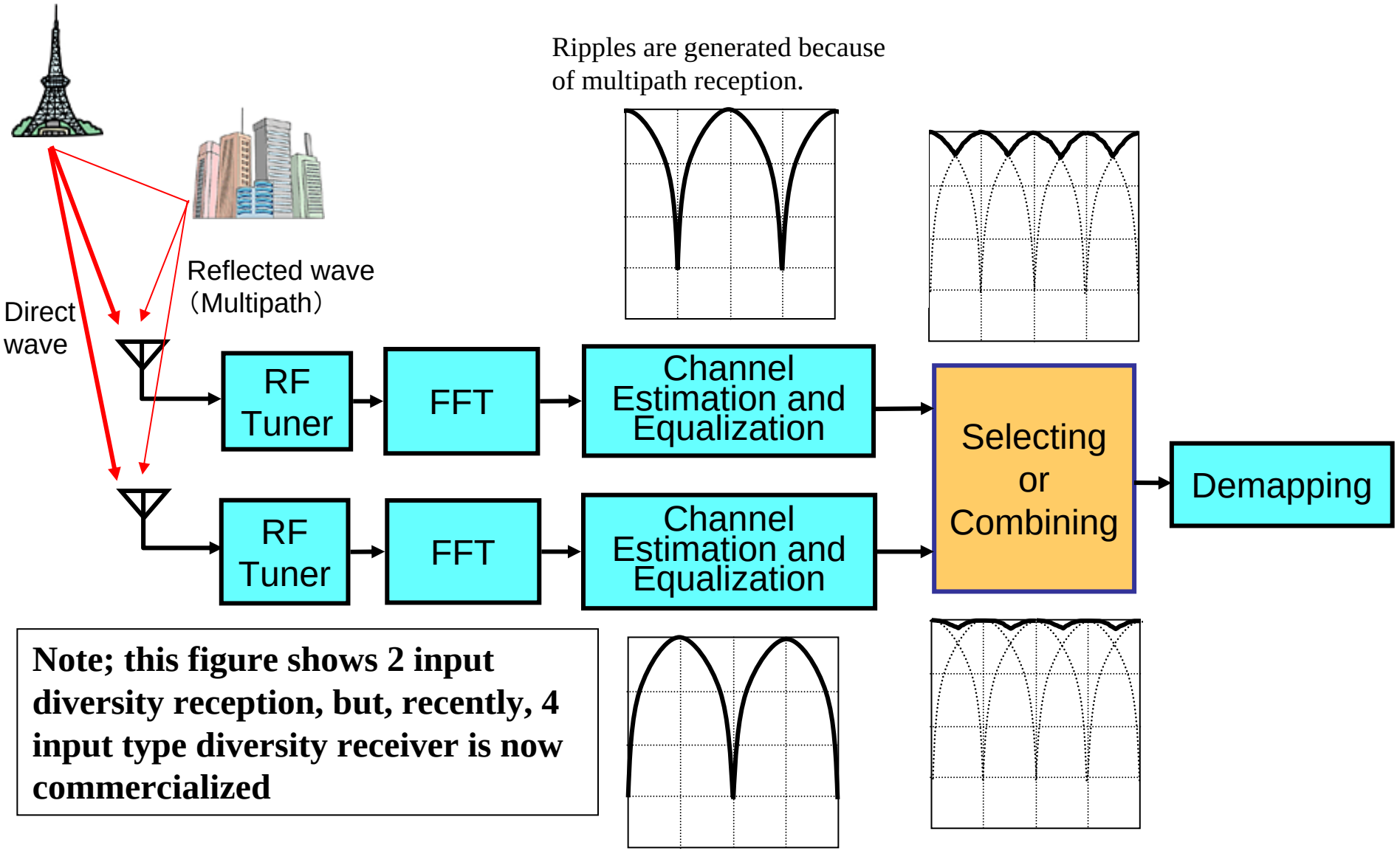
Improvement of a reception sensitivity with a single antenna almost reaches the limit.



Diversity reception techniques are expected to improve total reception sensitivity.

In fixed reception, diversity effect is 3dB at maximum.
But in mobile reception, e.g. in-car TVs or cell phone TVs in a car or train, the effect reaches 6 - 8 dB.

■Overview of Diversity System



Note; this figure shows 2 input diversity reception, but, recently, 4 input type diversity receiver is now commercialized

■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

Part 3　Examples of receivers for Portable Reception (One-Seg)

As described in forward seminar, “One-Seg” is very unique service in ISDB-T. This service enables following advantages;

(1)Plural types of service in one channel(fixed/portable); it saves both frequency resource and Transmitter cost.

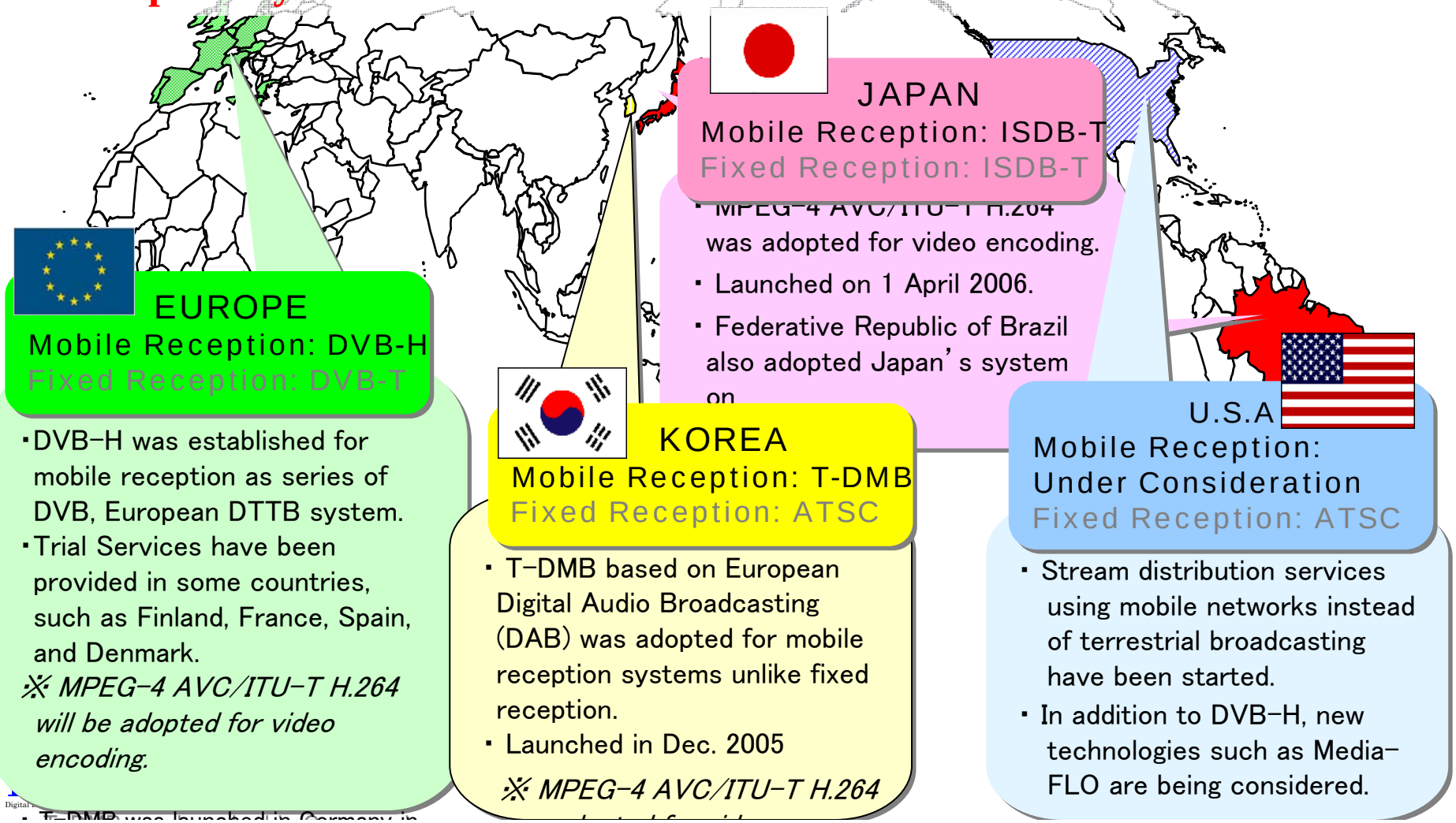
(2)Low power consumption terminal (note)

(note) Partial reception technology is used to save power consumption, this technology is unique for ISDB-T

In this part, show several kinds of portable receiver.

Worldwide Trend of Mobile Digital TV Reception

Importance of mobile reception is recognized worldwide.
Europe and U.S.A developed additional system for mobile reception.
Broadcasters need additional investment for mobile TV reception except in the case of Japan's system.



EUROPE
Mobile Reception: DVB-H
Fixed Reception: DVB-T

- DVB-H was established for mobile reception as series of DVB, European DTTB system.
- Trial Services have been provided in some countries, such as Finland, France, Spain, and Denmark.

※ *MPEG-4 AVC/ITU-T H.264 will be adopted for video encoding.*

JAPAN
Mobile Reception: ISDB-T
Fixed Reception: ISDB-T

- MPEG-4 AVC/ITU-T H.264 was adopted for video encoding.
- Launched on 1 April 2006.
- Federative Republic of Brazil also adopted Japan's system on

KOREA
Mobile Reception: T-DMB
Fixed Reception: ATSC

- T-DMB based on European Digital Audio Broadcasting (DAB) was adopted for mobile reception systems unlike fixed reception.
- Launched in Dec. 2005

※ *MPEG-4 AVC/ITU-T H.264*

U.S.A
Mobile Reception: Under Consideration
Fixed Reception: ATSC

- Stream distribution services using mobile networks instead of terrestrial broadcasting have been started.
- In addition to DVB-H, new technologies such as Media-FLO are being considered.

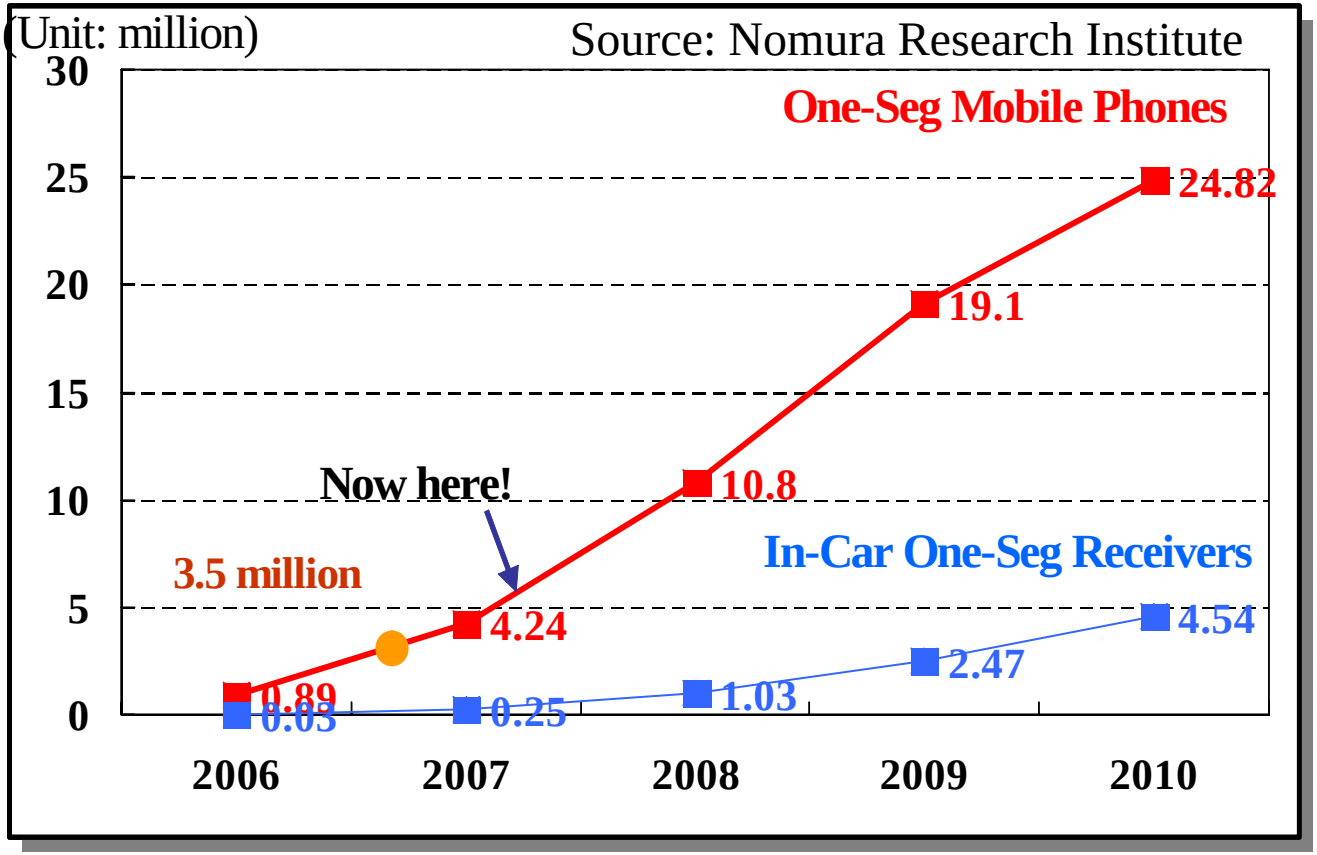
Comparison of Mobile Reception Systems

	Japan	Other Countries
Transmission system	ISDB-T (One-segment)	- T-DMB (KOR) - DVB-H (EU) - Media-FLO (U.S.A)
Service application	Video/Audio/Data	Video/Audio/Data
Assignment of new frequency bandwidth	Not necessary	Necessary
Additional license	Not necessary	Necessary
Service provider	Broadcaster (Free Service)	Broadcaster/Carrier/ Other company (Pay Service)
Emergency Warning Broadcasting System	Implementable	Cannot implement
Thrifty Power Consumption	Excellent	Depend on systems

Obviously ISDB-T is excellent system for mobile reception.

One-Seg Receiver Market

- *One-Seg is abbreviation for "one segment service" .*
- *One-Seg launched on April 1,2006 .*
- *More than 7 million cell phones with One-Seg service have been sold in the market according to JEITA statistics of End of April,2007.*



DiBEG
Digital Broadcasting Experts Group

■Portable Receivers

Cell Phone One-Seg Only

W51SA

P903iTV

911SH

W52T

D903iTV

911T

au

14 models are available
at the end of May, 2007

NTT DoCoMo

4 models are available
at the end of May, 2007

Softbank

3 models are available
at the end of May, 2007

■Portable Receivers(Cont.)

One-Seg Only

DVD Player

DVD-LX87

Panasonic

DVD-HP700ND

SANYO

Laptop

VAIO type T

SONY

Adapters(USB, etc.)

Many products are on sale.

BUFFALO, I・O DATA, etc.

Audio Player

gigabeat V30E

TOSHIBA

Dictionary

Papyrus PW-TC900

SHARP

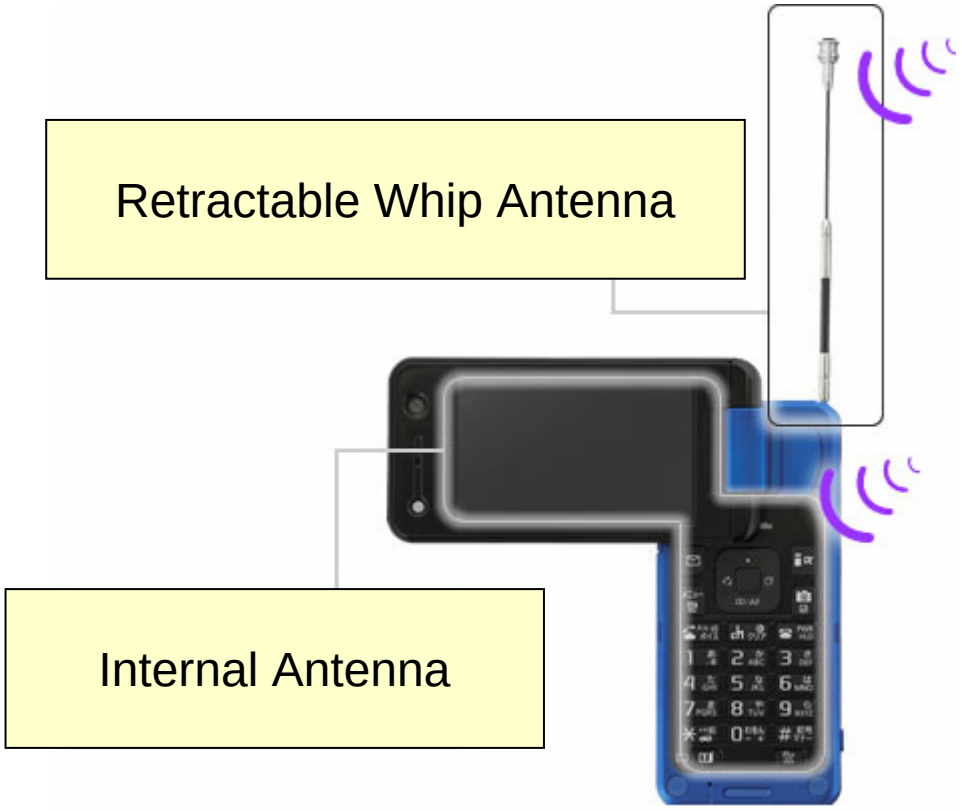
Portable TV

XDV-100

SONY

■ Diversity Reception System for Cell Phones

Diversity systems are applicable to cell phones as well as in-car receivers.
Now, only one product, P903iTV, is equipped with diversity system.
It has two antennas for One-Seg, a whip antenna and an internal antenna.



4. Facilities of Broadcaster in Japan

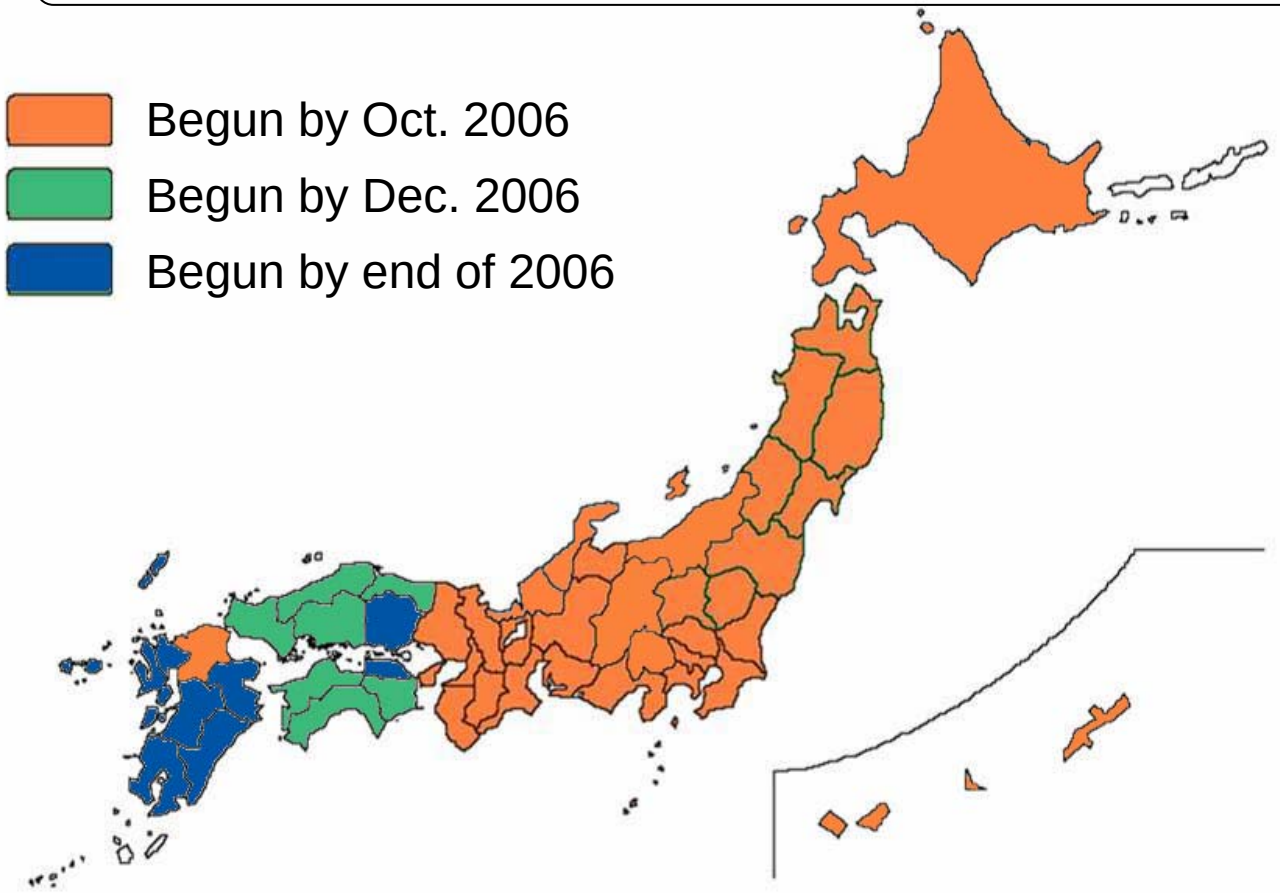
Digital Terrestrial Broadcasting has start from Dec.,2003 in 3 metropolitan area.

And from Dec. 2006, Digital Terrestrial Broadcasting has been in service in all prefecture.

In this section, show the several examples of Broadcaster's facilities, both studio system and transmission system.

Current situation in Japan

Digital Broadcasting Service

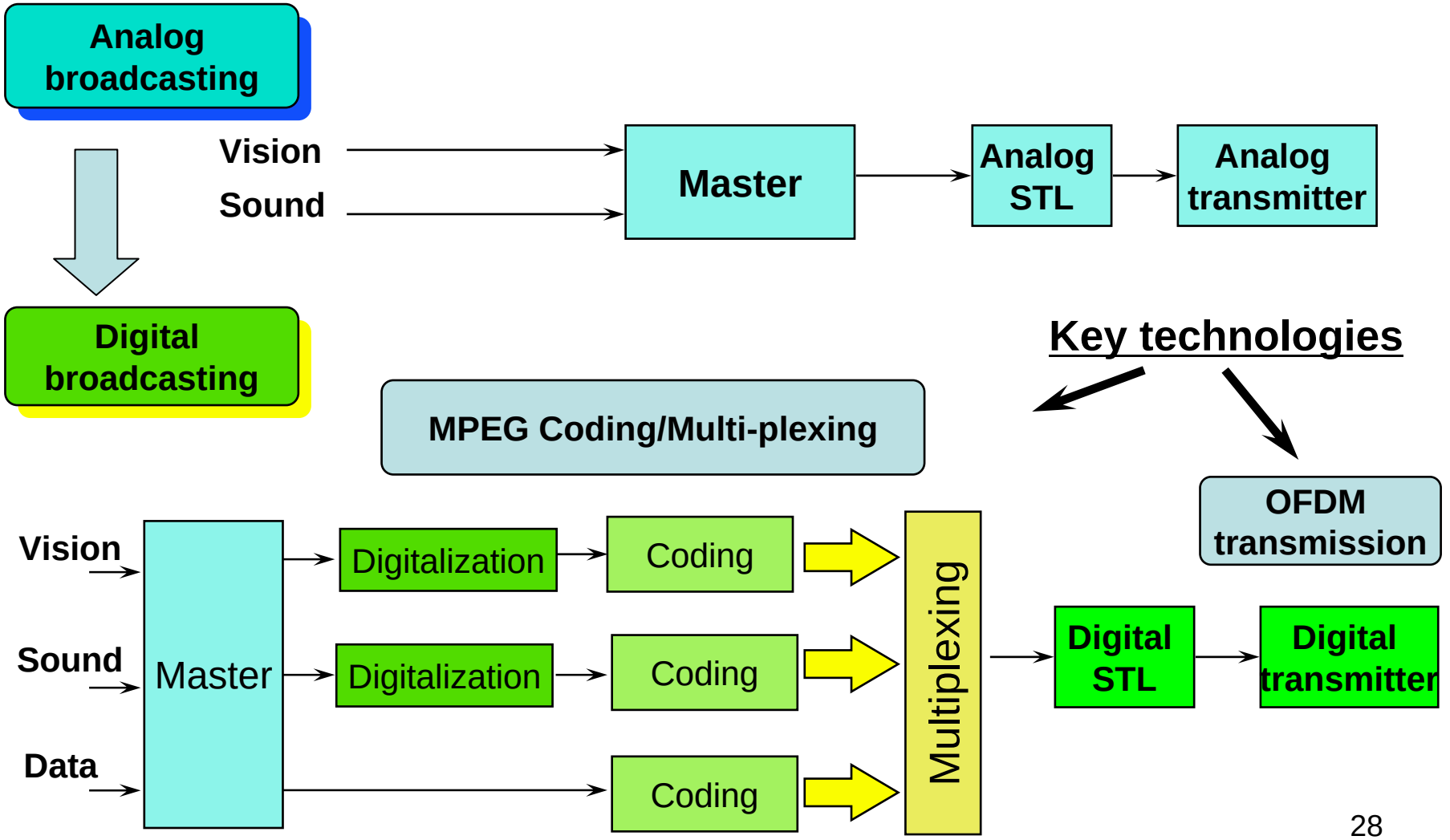


As shown below, Digital Terrestrial Broadcasting has started In all Prefecture

DiBEG
Digital Broadcasting Experts Group

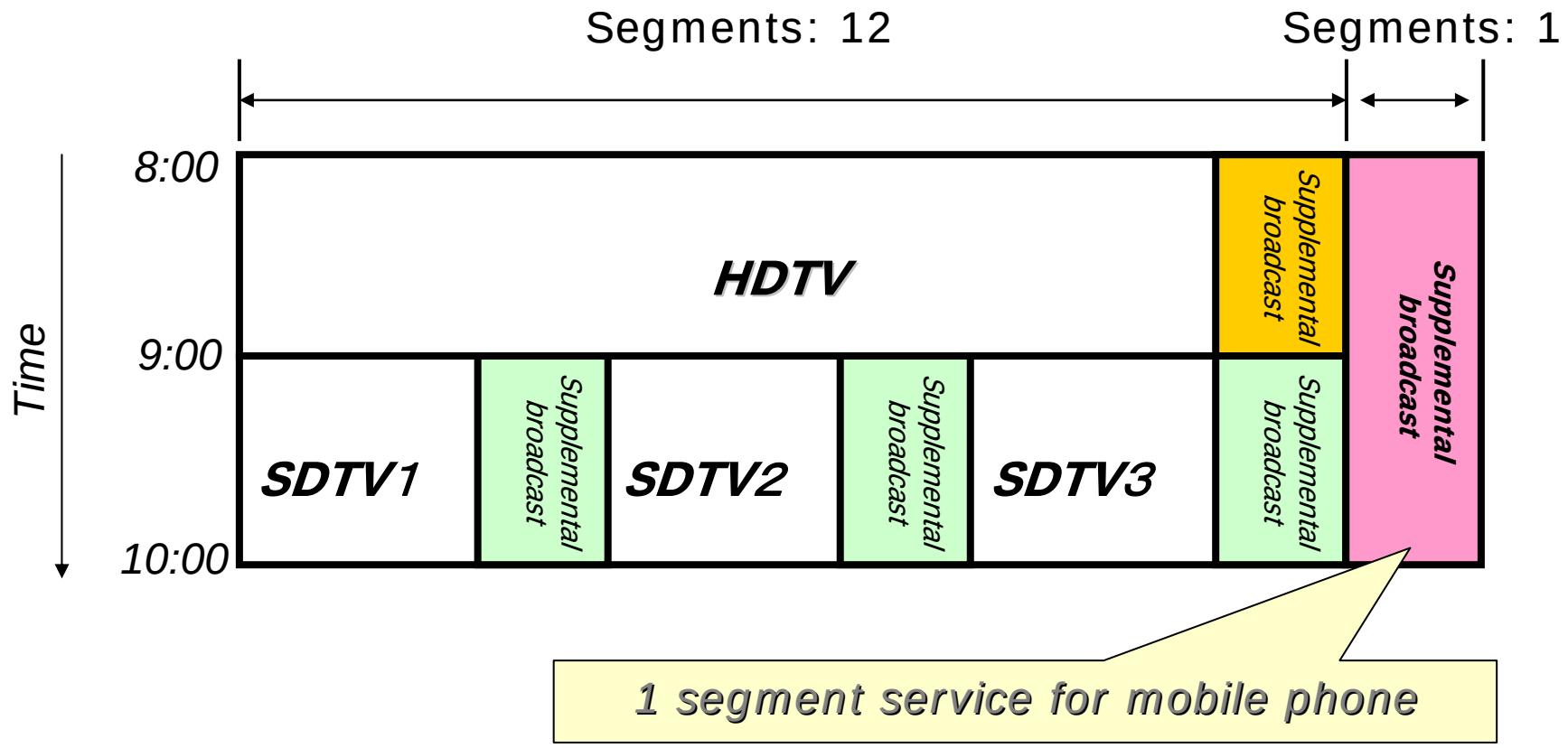
Analog to Digital

Differences Between Analog and Digital Broadcasting



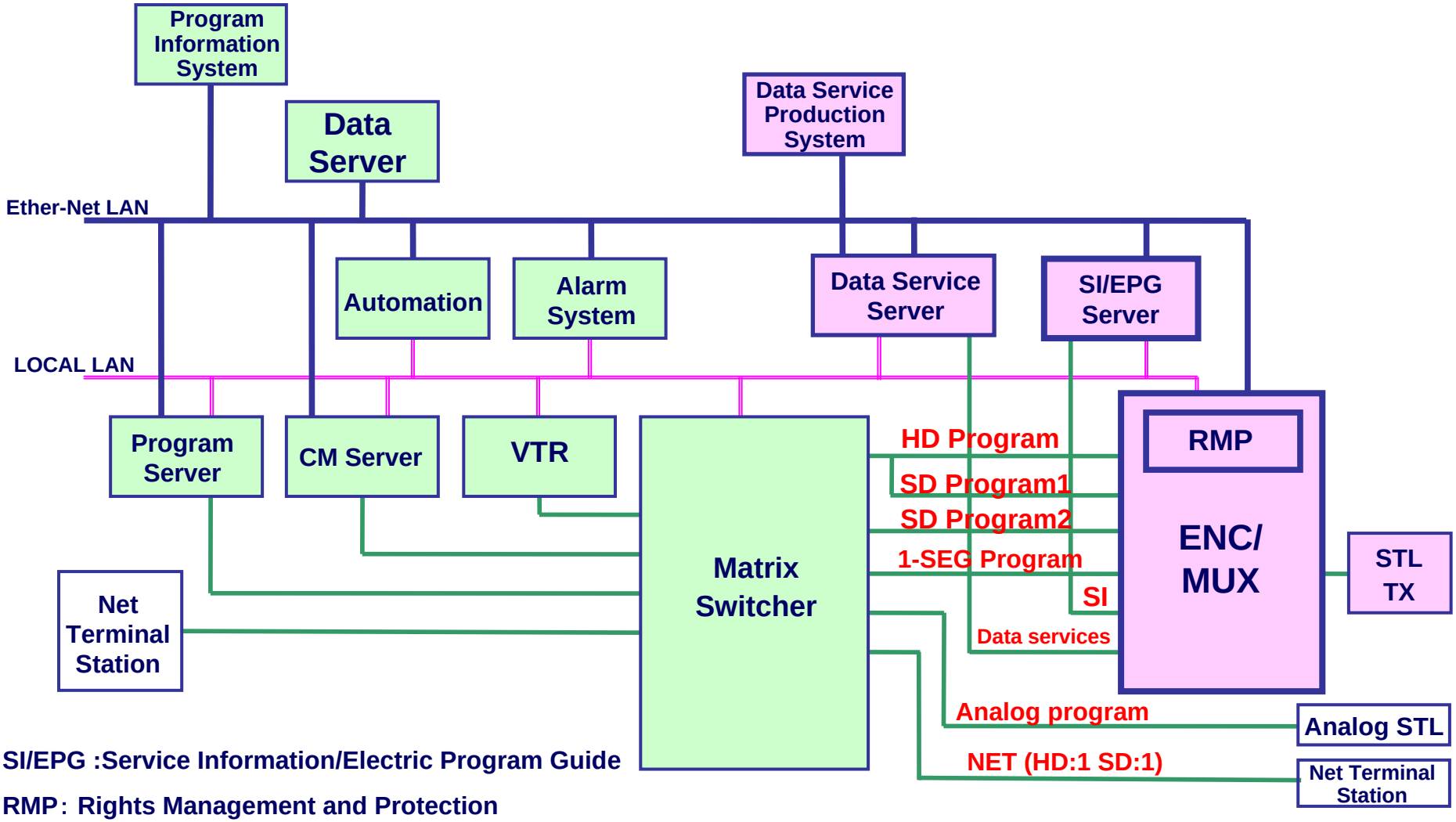
DiBEG
Digital Broadcasting Experts Group

Applications



DiBEG
Digital Broadcasting Experts Group

Overall Block Diagram



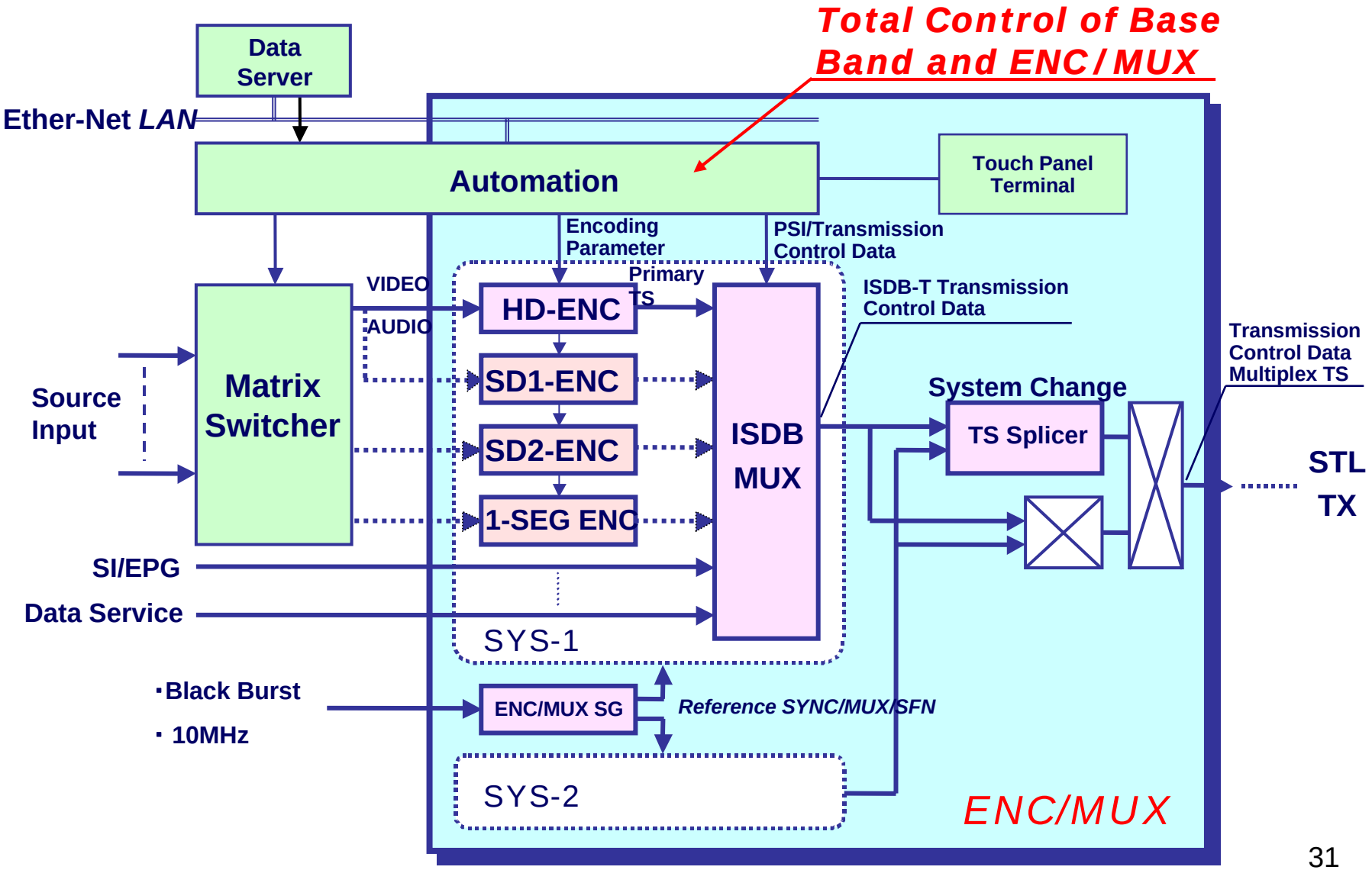
SI/EPG :Service Information/Electric Program Guide

RMP: Rights Management and Protection

ENC/MUX: Encoder / Multiplexer

DiBEG
Digital Broadcasting Experts Group

Block diagram of ENC/MUX



DiBEG
Digital Broadcasting Experts Group

Example of Master system (TV Tokyo)

- **-Operation by few clues**
- **-Efficient positioning**
- **-Multi-view and/or selection on wide screen LCD,PDP**
- **-Use touch panel for operation**
- **-monitoring another line at monitoring booth**

Example of Master system (TV-asahi)

Examples of Transmission System

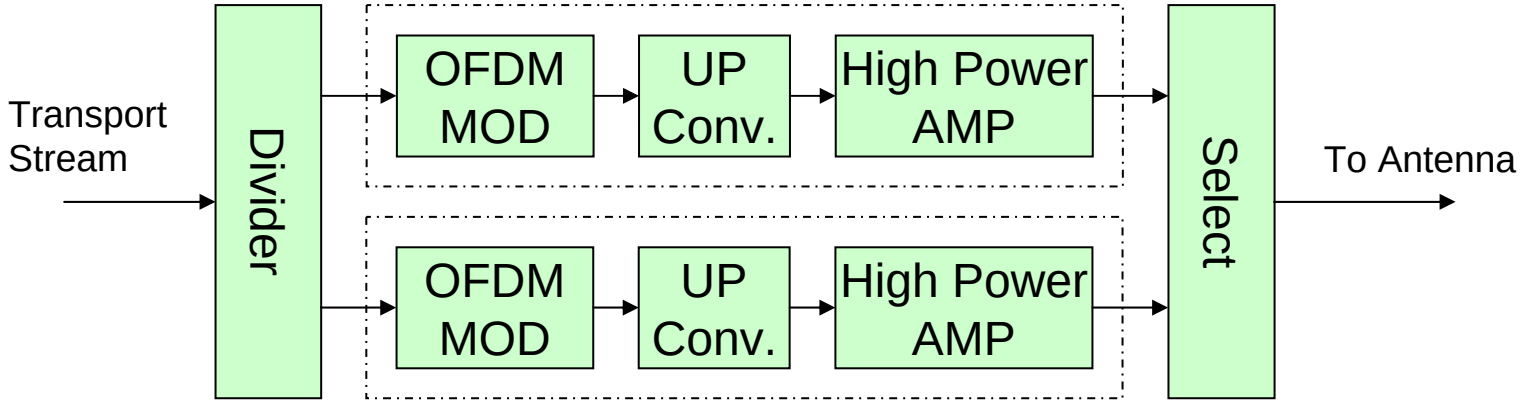
(1)High Power Digital Transmitter System

(2)Micro-wave Links of Digital Terrestrial Broadcasting

(3)Trans-poser of Digital Terrestrial Broadcasting

(1) High Power Digital Transmitter system

(a) An Example of Conceptual block diagram (Full redundant system)



(b) Power Line-up in Japan

Area	Digital TX	Analog TX	note
Tokyo	UHF 10 kW	VHF 50 kW	wide area key station
Osaka	UHF 3 kW	VHF 10 kW	same as above
Nagoya	UHF 3 kW	VHF 10kW	same as above

(c) Examples of Hardware; see following pages

Examples of High Power Digital Transmitter (Toshiba)

0032

10 kW digital Transmitter(2/3 type)

3 kW digital transmitter rack

008

1 kW digital transmitter rack

Output power series;

-10kW(2/3) type; for Kanto area

-3kW dual type; for Kansai and Chukyo

-1kW dual type; for medium cover area

Feature;

-Any of cooling type (water or air)

-Equipped high performance non-linear distortion compensator

Examples of Digital Transmitter (NEC)

Features

1) **Both liquid cooling / air cooling available**
2) **Compact size / Minimized footprint**
3) **Adaptive Digital Corrector to maintain optimal signal quality**
4) **Color LCD to monitor detailed parameters**

3kW Air Cooled
UHF Digital TV Transmitter
(in operation at Osaka & Nagoya stations)

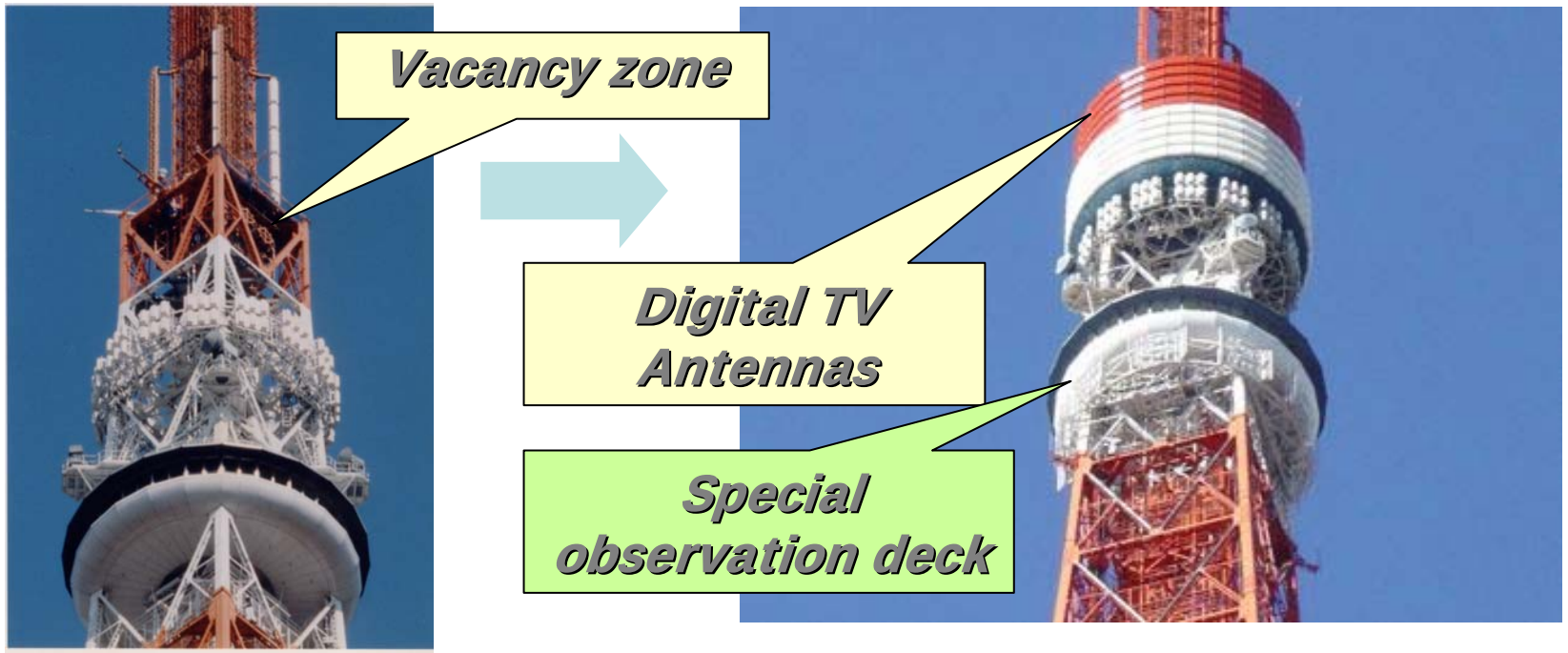
10kW Water Cooled
UHF Digital TV Transmitter
(in operation at Tokyo station)

Antennas(1)

A number of analog TV antennas were already mounted on the optimum position of Tokyo Tower .

Antennas(2)

- Vacancy zone is around 250m of Tokyo tower, There are no appropriate space except there. Digital antennas were designed , compact size, 6 meters in width and 12 meters in height.

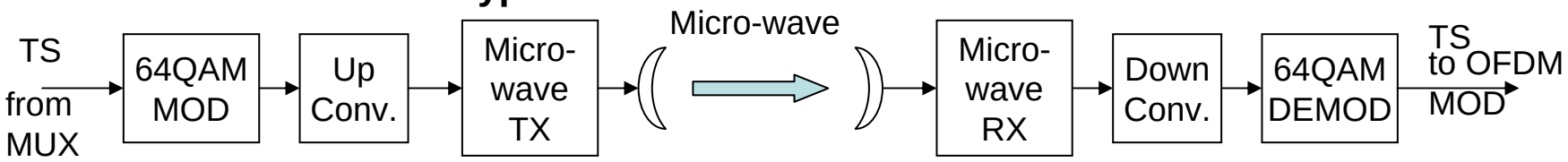


(2) Micro-wave Transmission Link

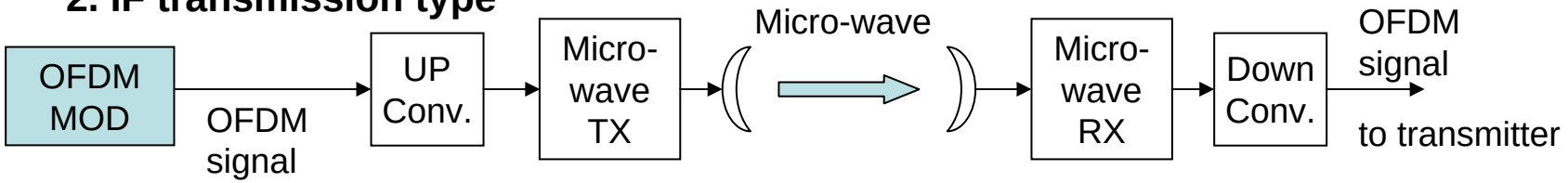
(a) STL(studio transmitter link) and TTL(transmitter transmitter link)

2 transmission types described below are available(can be applied to fiber transmission)

1. TS transmission type



2. IF transmission type

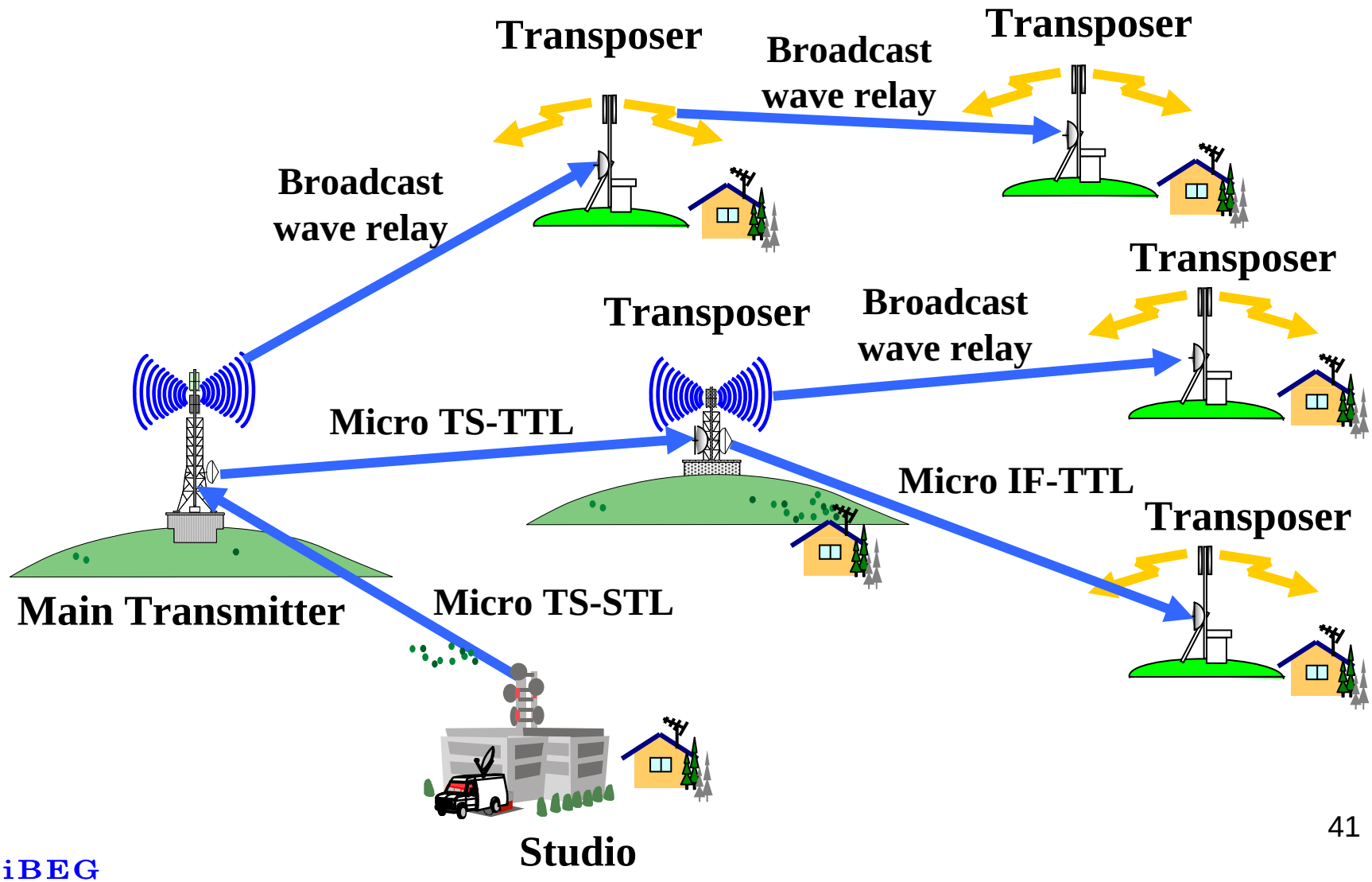


(b) FPU(Field Pick Up)

Field Pick Up is the outside program transmission system for news gathering and sports relay system, etc. Recently, digital modulation system such as single carrier QAM and OFDM are introduced.

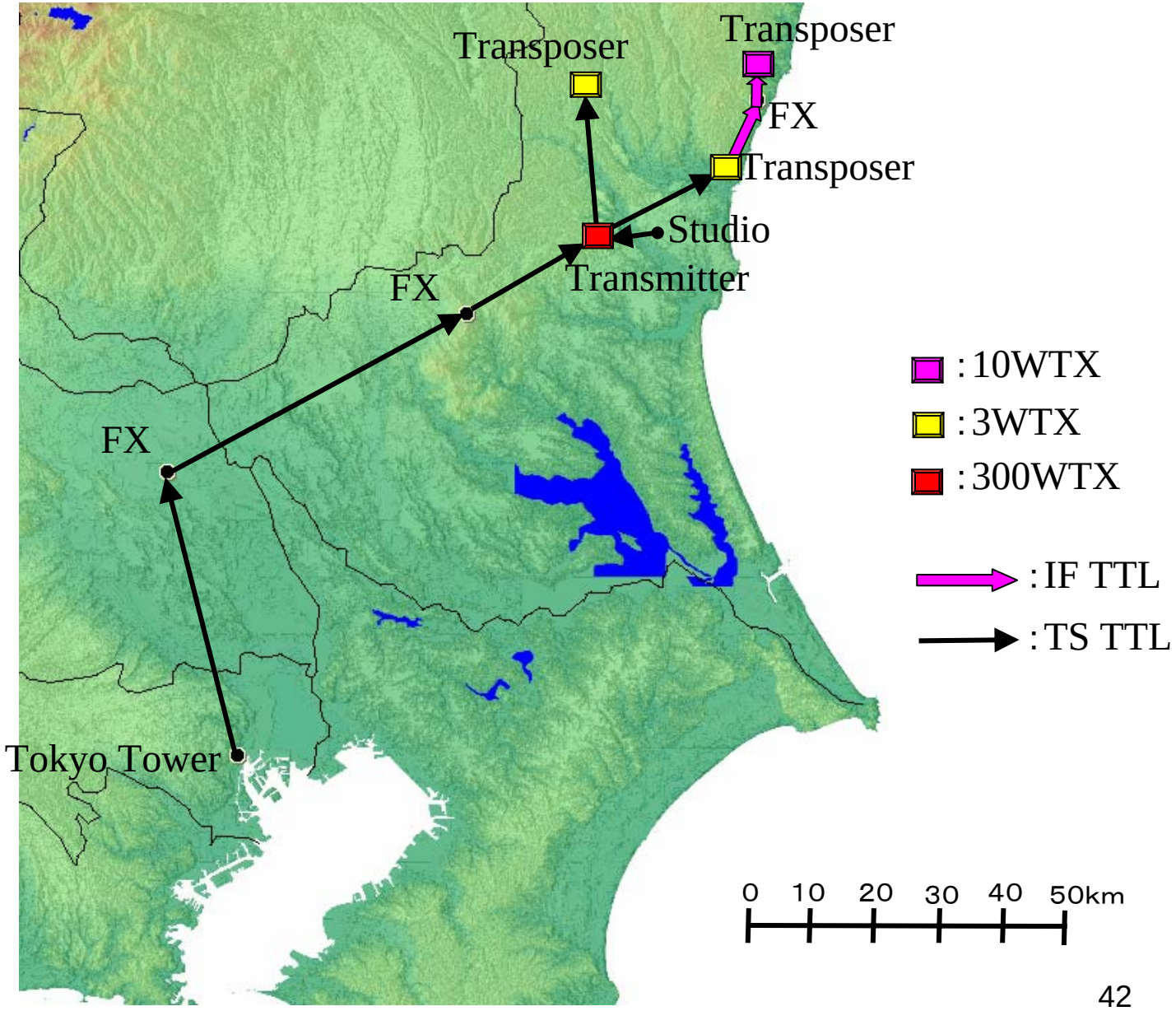
(c) Examples of Hardware; see following pages

An Image of transmission network chain

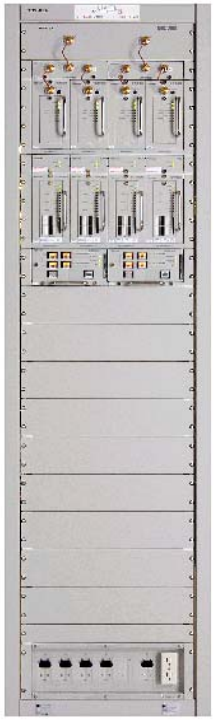


DiBEG
Digital Broadcasting Experts Group

Example of Wide KANTO area Network



Examples of Microwave STL/TTL (Toshiba)



TS STL/TTL TX TS STL/TTL RX

-Dual type, seamless switching

-DVB-ASI digital interface

-Equipped automatic multi-path equalizer

IF TTL TX/RX

-Dual type, TX/RX are installed in 1 rack

-OFDM IF signal interface

-Phase noise compensation technology with pilot signal

Examples of Digital Studio to Transmitter Link for TS Signal Transmission (Hitachi KokusaiElectric)

2 channels dual system

・Seamless SHF Output Signal Switching

・DVB-ASI Digital Signal Interface

・High-performance automatic equalizer diminishes multi-path distortion

Examples of Digital Transposer (NEC)

30W x 3-channels common amplification System

Features

1) Excellent IM (less than -50dB) using Feed-forward technology.

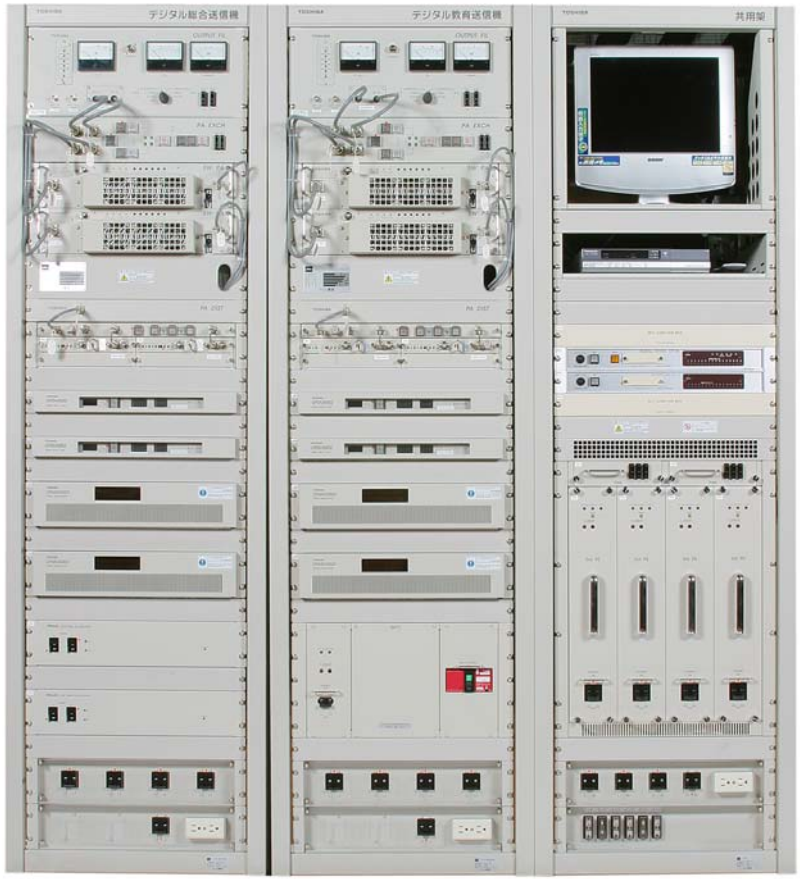
2) MCPA (Multi Channel Power Amplifier) is available.

   No required of Channel combiner, especially, in the case of adjacent channel transmitting.

3) END (Equivalent Noise Degradation) improving equipment for on air receiving system is provided.

   - Loop canceller
   - Diversity receiver
   - Noise reduction (Re-mapping) Equipment.

Examples of Digital Transposer (Toshiba)



TS-TTL 3W TX

TS-TTL 50W TX

END of Seminar #5

Thank you for your attention