

# Technical Features of ISDB-T

28<sup>th</sup>-29<sup>th</sup> August, 2006

In Caracas

DiBEG JAPAN

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# Contents

- What is ISDB-T?
- Comparison of 3 DTTB systems
- Structure of ISDB-T Standard
- Technical details of ISDB-T
- Commonality of ISDB-Tsb (note)

(note) Digital Terrestrial Sound Broadcasting of ISDB

# 1. What is ISDB-T?

# ISDB-T is . . . .

- **ISDB-T** system was developed by the Association of Radio Industries and Businesses (ARIB) in Japan.
- **ISDB** (Integrated Digital Services Digital Broadcasting) is a new type of digital broadcasting intended to provide audio, video, and multimedia services. **T** is Terrestrial.
- **ISDB-T** is one of ISDB family.
- **ISDB-T** uses a modulation method referred to as Band Segmented Transmission (BST) OFDM

ISDB-T Demo

# Requirements for Digitalization

**Multimedia-service**

**High-Quality TV/ Multi-Channels**

**Flexible/Versatile**

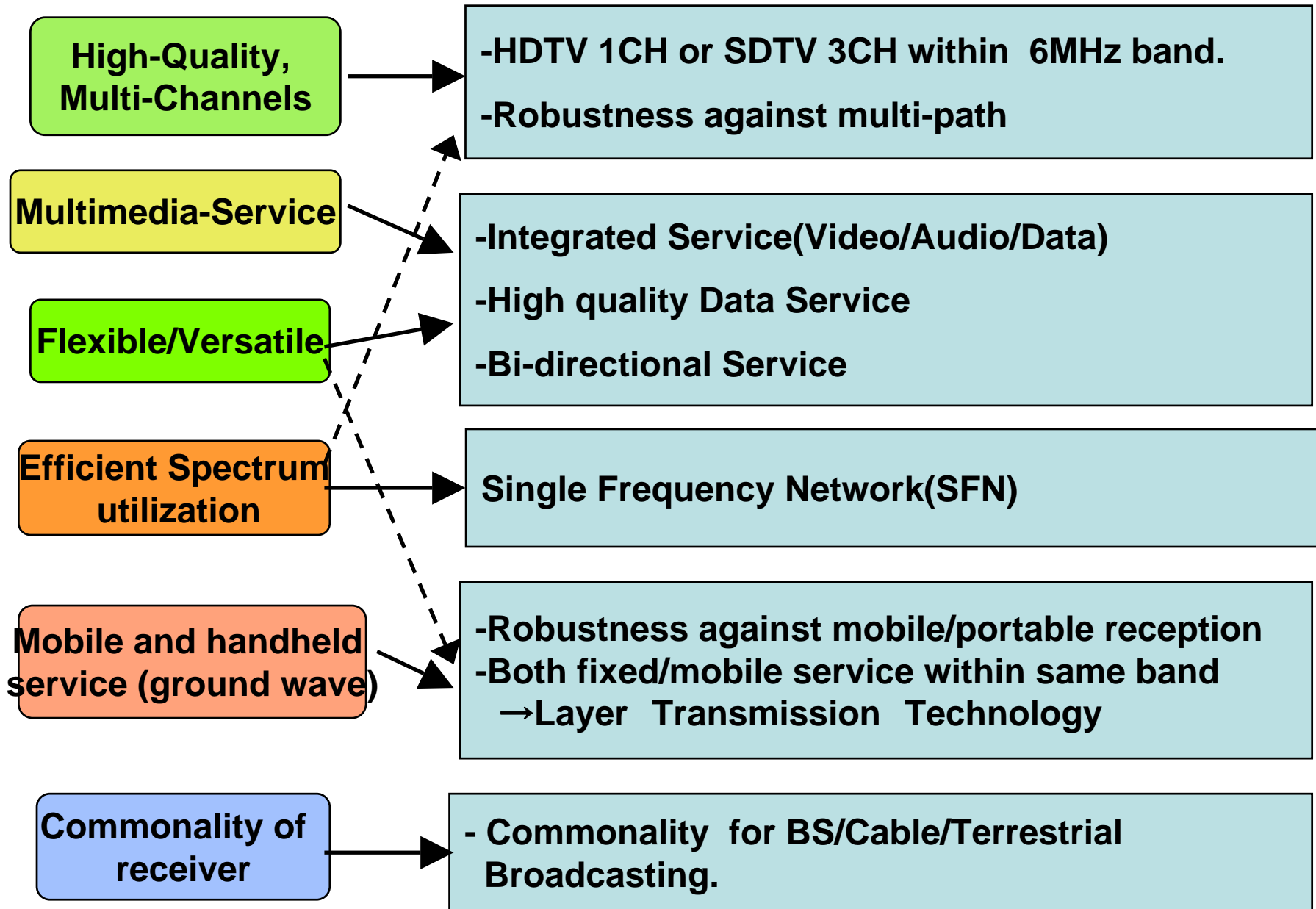
**Effective frequency utilization**

**Mobile and handheld service (ground wave)**

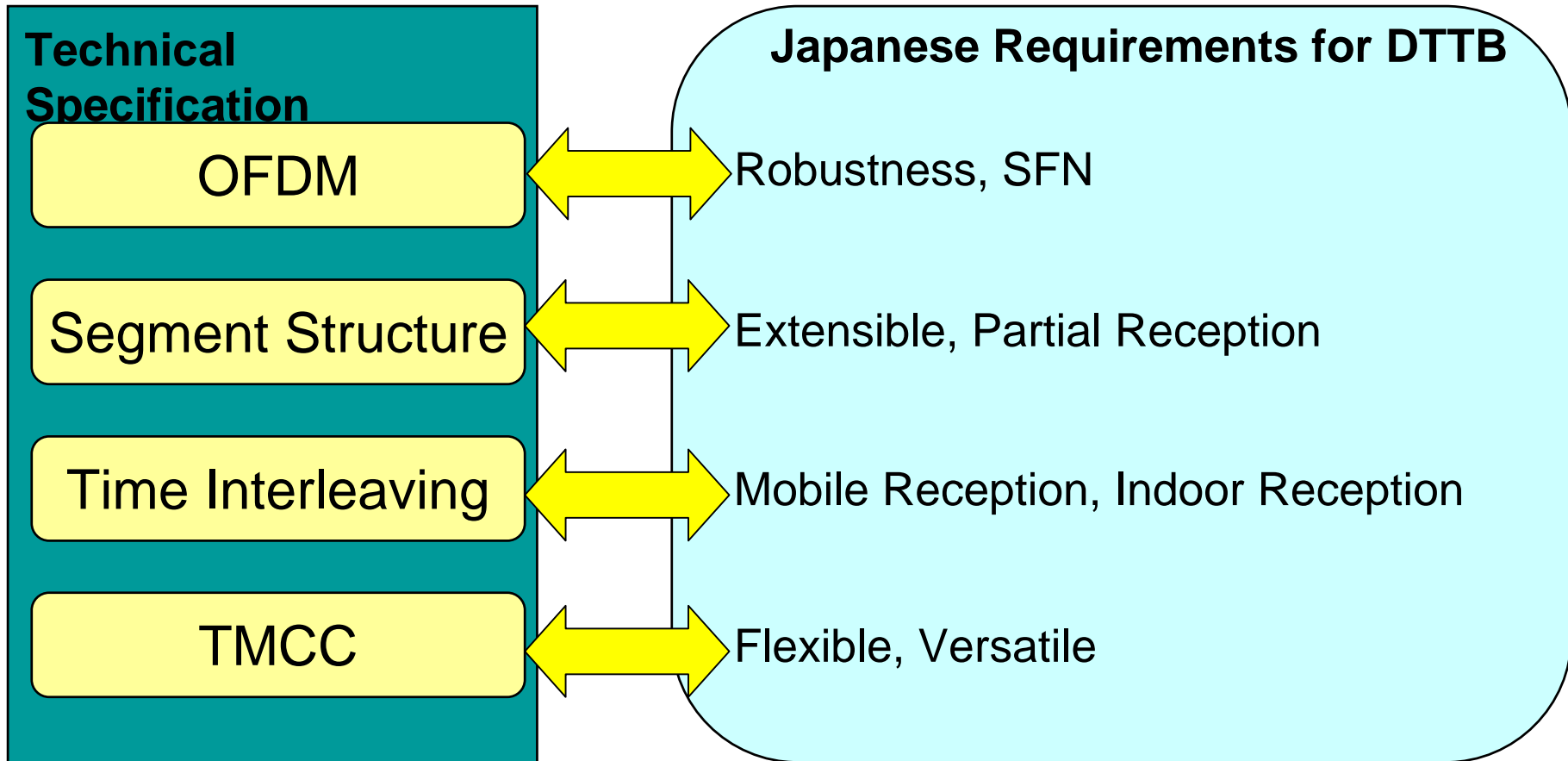
**Commonality of receiver**

At first, the requirement of digital broadcasting should be established.  
The requirements described above are for digitalization in Japan.

# Requirements for Digitization → Solutions

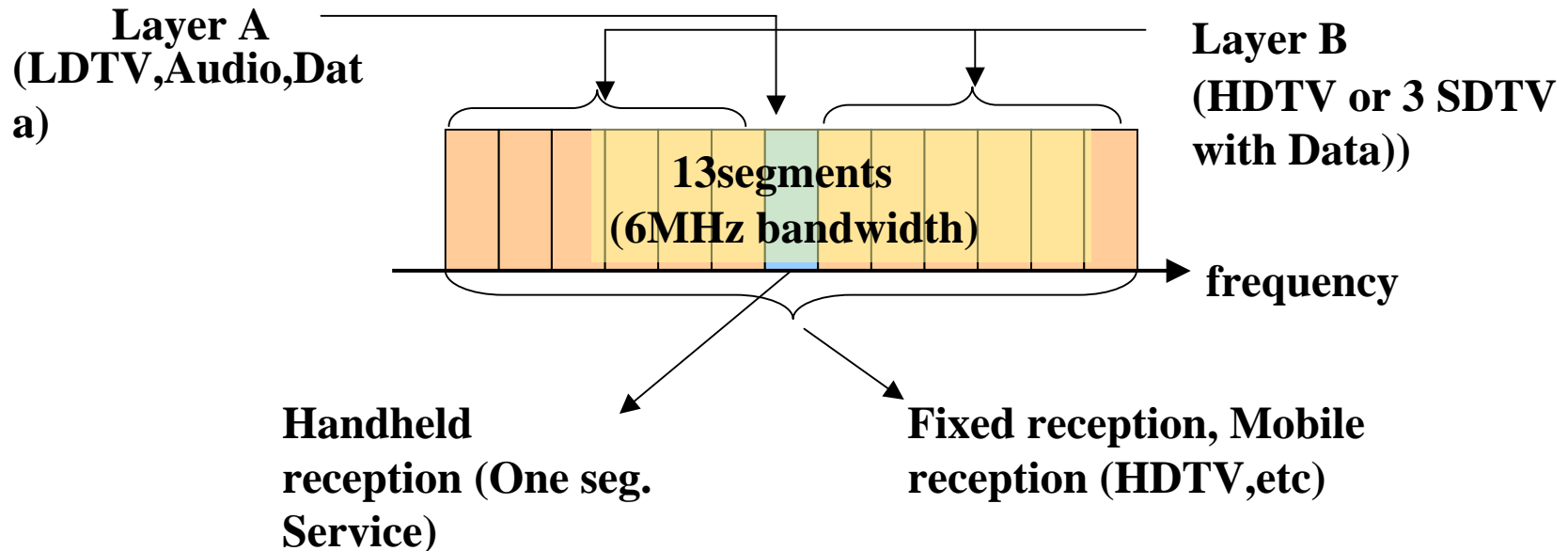


# Features of ISDB-T



# What is Band Segmented OFDM with time interleave?

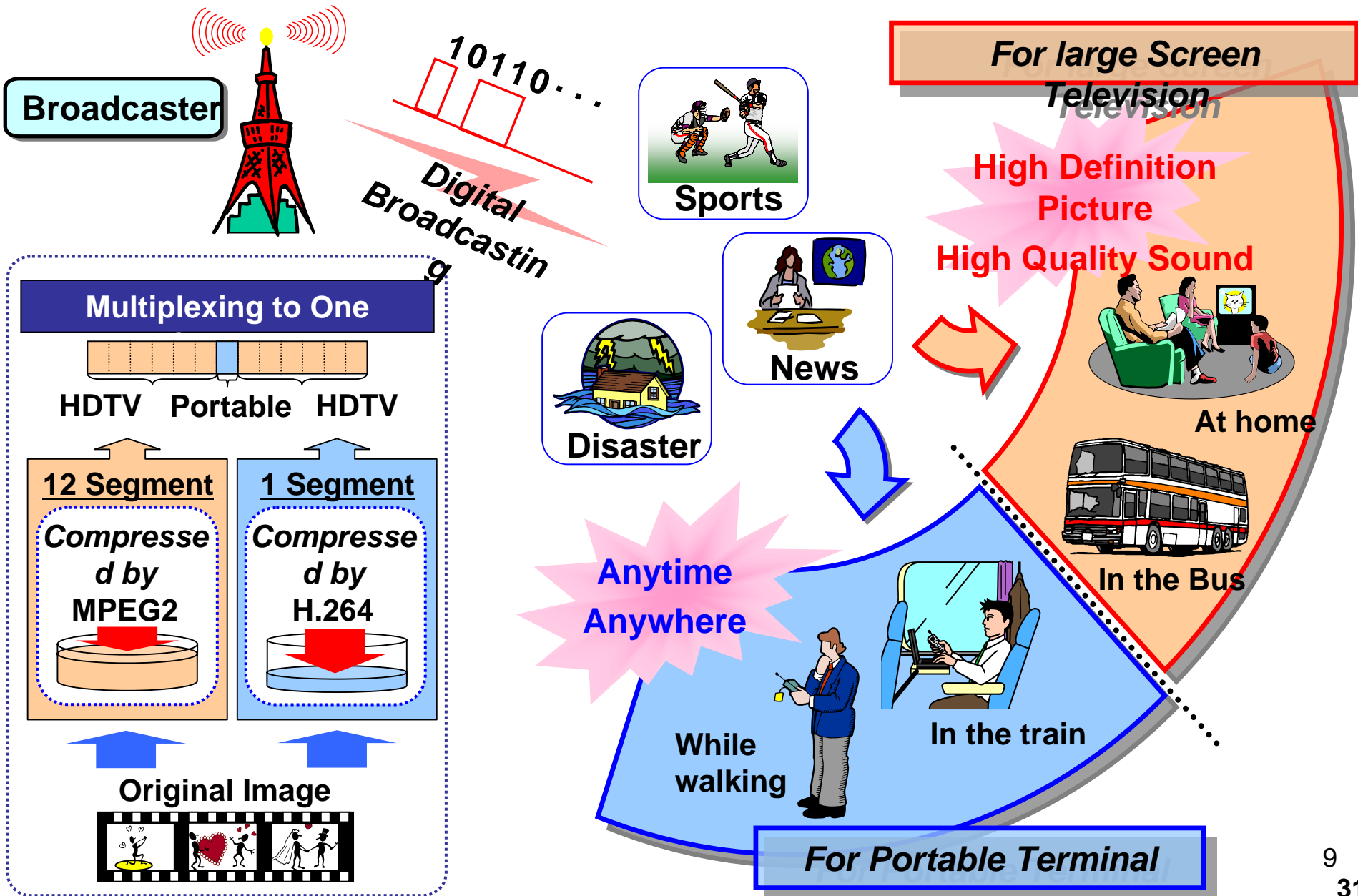
(Example; 1seg + 12 seg)



- **Segmented OFDM**; Possible to support fixed/mobile/handheld reception service
- **Time interleave**; reduce impulse noise and reduce the degradation caused by fading (tested in Brazil by Mackenzie and TV GLOBO)



# Service Image of ISDB-T in Japan



## 2. Comparison of 3 DTTB Systems

- Comparison of 3 DTTV systems
- Results of comparison test in Brazil
- Summary of comparison

# Broadcasting Services

<i>System</i> <i>Item</i>	<i>ATSC</i>	<i>DVB-T</i>	<i>ISDB-T</i>
HDTV/ SDTV Fixed reception	⊙	⊙	⊙
Data broadcasting	⊙	⊙	⊙
SFN	×	⊙	⊙
HDTV Mobile reception	×	×	⊙
		(○ SDTV)	
Portable reception with cellular phone	×	△	⊙
Internet access	×	△	⊙

# Technical Detail of DTTV Systems - 1

System		ATSC	DVB-T	ISDB-T
Launch		1/Nov/1998	Sep/1998	1/Dec/2003
Video coding		MPEG-2 Video(ISO/IEC 13818-2)		
Audio coding		Dolby AC-3	MPEG-2 BC	MPEG-2 AAC
Data broadcasting	Presentation engine	Dase-1	(DVB HTML)	BML (XHTML), ECMAScript
	Execution engine	ACAP	DVB MHP	ARIB B 23
Multiplex		MPEG-2 Systems (ISO/IEC 13818-1)		
Conditional access		DES / NRSS	CSS / DVB CA	Multi 2 / ARIB B 25
Error correction	Outer	(207,187) Reed-Solomon code	(204,188) Reed-Solomon code	
	Inner	2/3Trellis Code	Conv.code(1/2-7/8)	

# Technical Details of DTTV Systems - 2

System		ATSC	DVB-T	ISDB-T
Modulation		8VSB	<b>COFDM</b> (QPSK, 16QAM,64QAM)	<b>SegmentedCOFDM</b> (DQPSK,QPSK, 16QAM,64QAM)
Inter-leaving	Bit/Symbol	Yes	Yes	Yes
	Frequency	-	Yes	Yes
	time	-	-	<b>0.1s,0.2s,0.4s,0.8s</b>
Excess Bandwidth/ Guard Interval		11.5%	1/4,1/8,1/16,1/32	1/2, 1/4, 1/8,1/16,1/32
<b>TMCC</b>		-	-	<b>Yes</b>
Information bit rate		19.39 Mbps	3.69 -23.5Mbps	3.65 -23.2 Mbps
Channel bandwidth		6/7/8 MHz	6/7/8 MHz	6/7/8 MHz

# Effect of Time Interleaving

- As the experimental result, time interleaving improve required CN ratio about 7 dB in mobile environment on 16QAM.
- Diversity system improve about 7dB on 16QAM.
- Time interleaving (time diversity) work independently from space diversity.
- That is the reason for advantage of ISDB-T in mobile environment.
- Time interleaving improve robustness against impulse noise interference that come from power line and motor cycle engine.

# Results of Brazilian Tests

- Comparison testing of three DTTB systems
  - ATSC, DVB-T, ISDB-T
- Carried out from Aug. 1999 to April 2000
- Laboratories tests
  - AWGN, impulse noise, multipath interference
- Field tests
  - Coverage, indoor reception

# Evaluation of C/N

- Interferer = White Noise

ATSC	DVB-2K	DVB-8K	ISDB
14,6 dB	19,0 dB	16,9 dB	18,6 dB

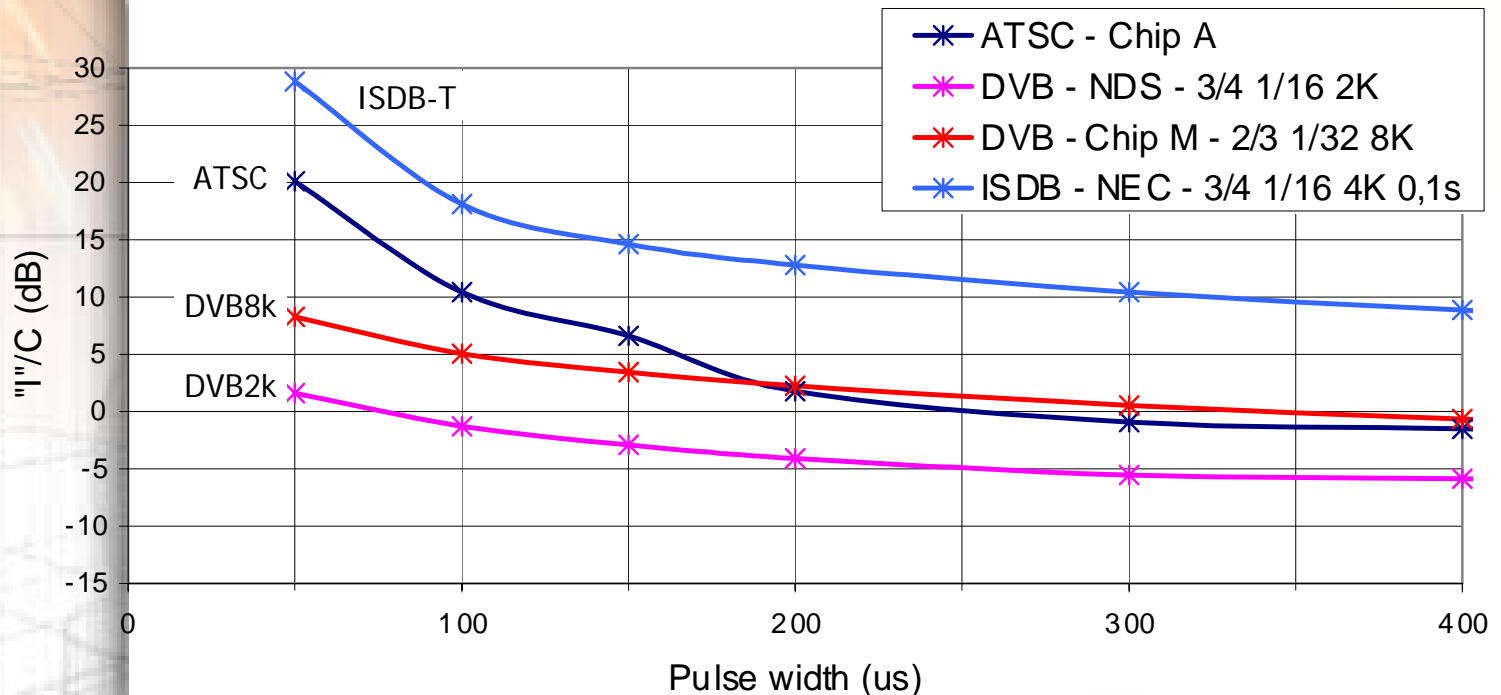
- ATSC: 8VSB FEC=2/3 (19,39 Mbits)
- DVB & ISDB: Choice of parameters define C/N
  - DVB-2K: 64 QAM FEC=3/4 GI=1/16 2K (19,75 Mbits/s)
  - DVB-8K: 64 QAM FEC=2/3 GI=1/32 8K (18,09 Mbits/s)
  - ISDB: 64 QAM FEC=3/4 GI=1/16 4K 0,1s (19,33 Mbit/s)

(From the presentation of the Brazilian SET/ABERT study group at NAB2000)



# Impulse Noise

Relation between the noise pulse width & interference to signal ratio

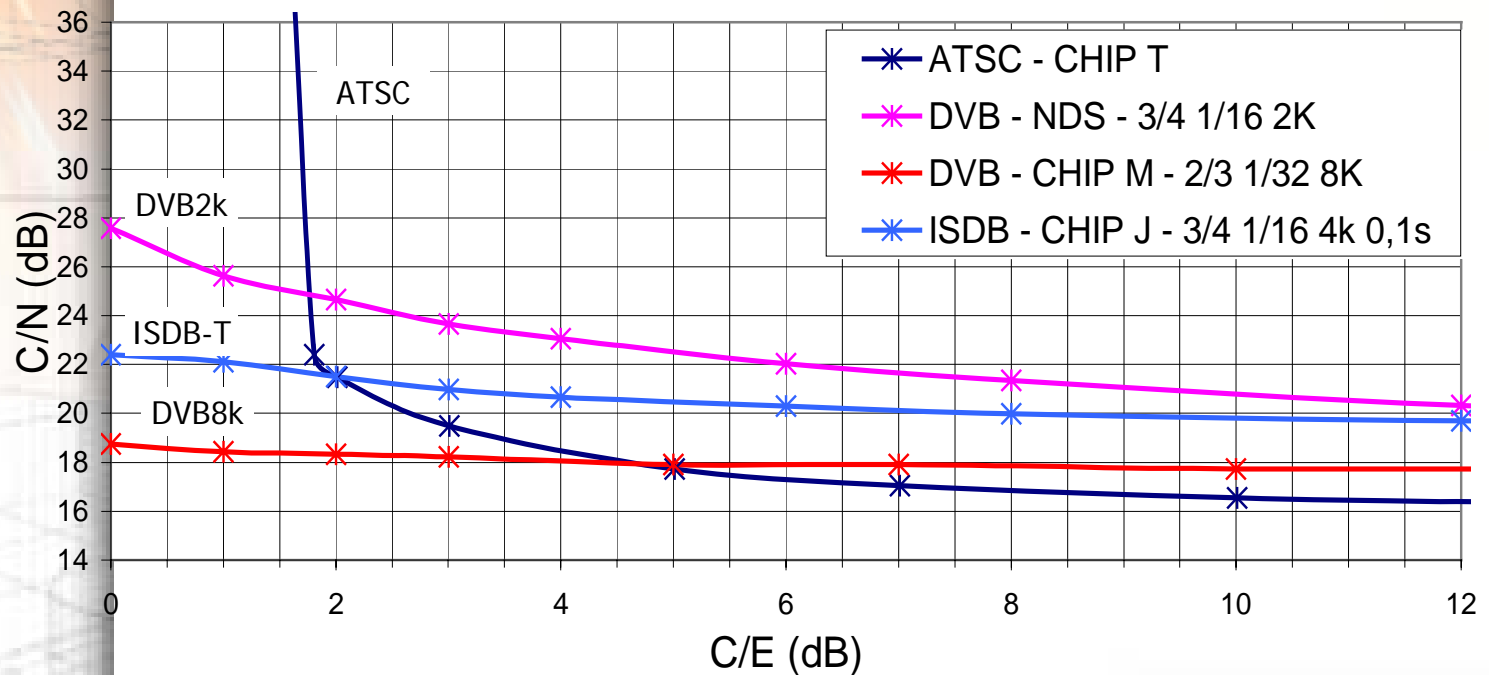


- Better performance of the ISDB-T system, by introducing time interleaving

(From the presentation of the Brazilian SET/ABERT study group at NAB2000)

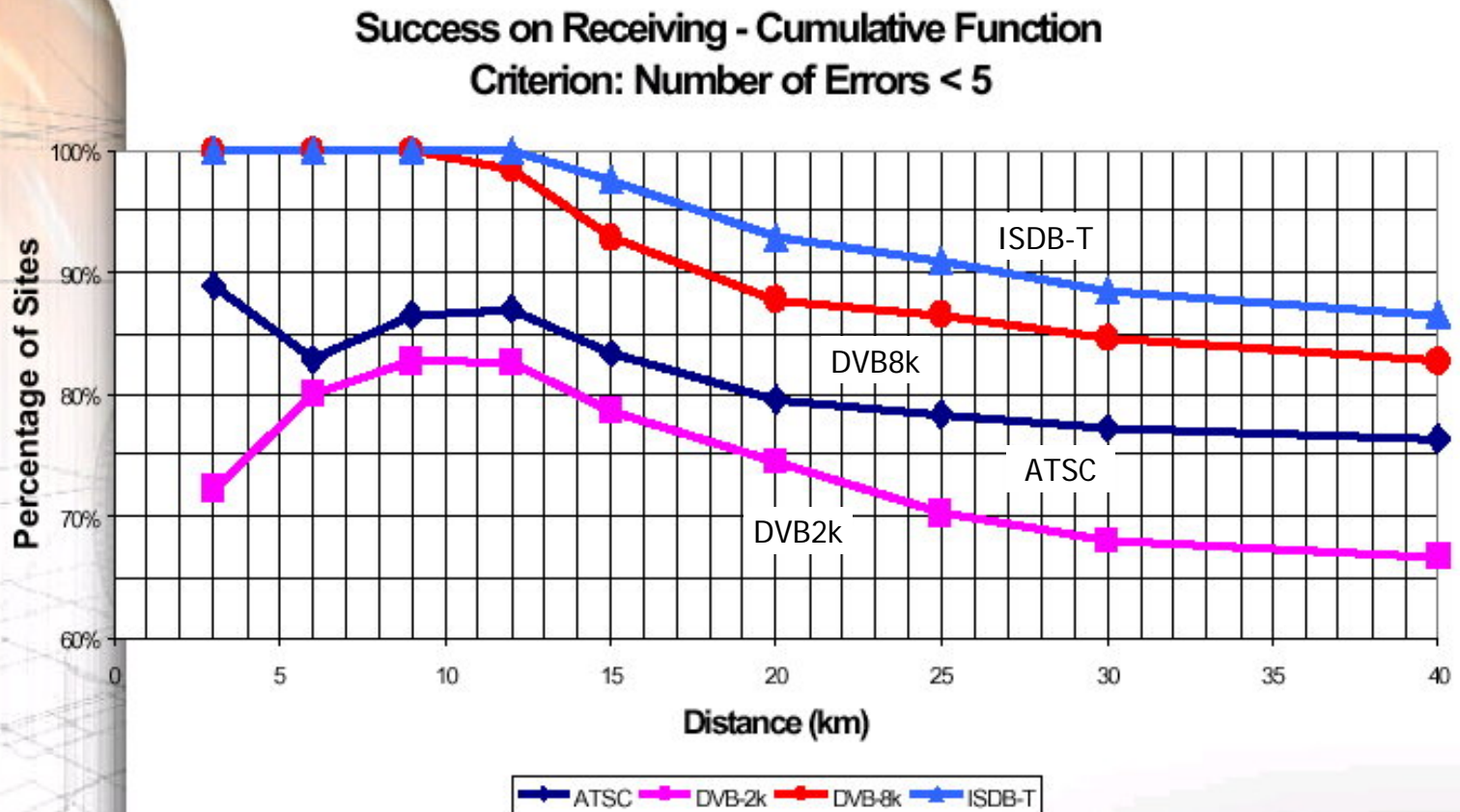
# Static Multipath

Carrier to noise ratio as a function of carrier to echo ratio  
Comparison at post-echo = 8 $\mu$ s



(From the presentation of the Brazilian SET/ABERT study group at NAB2000)

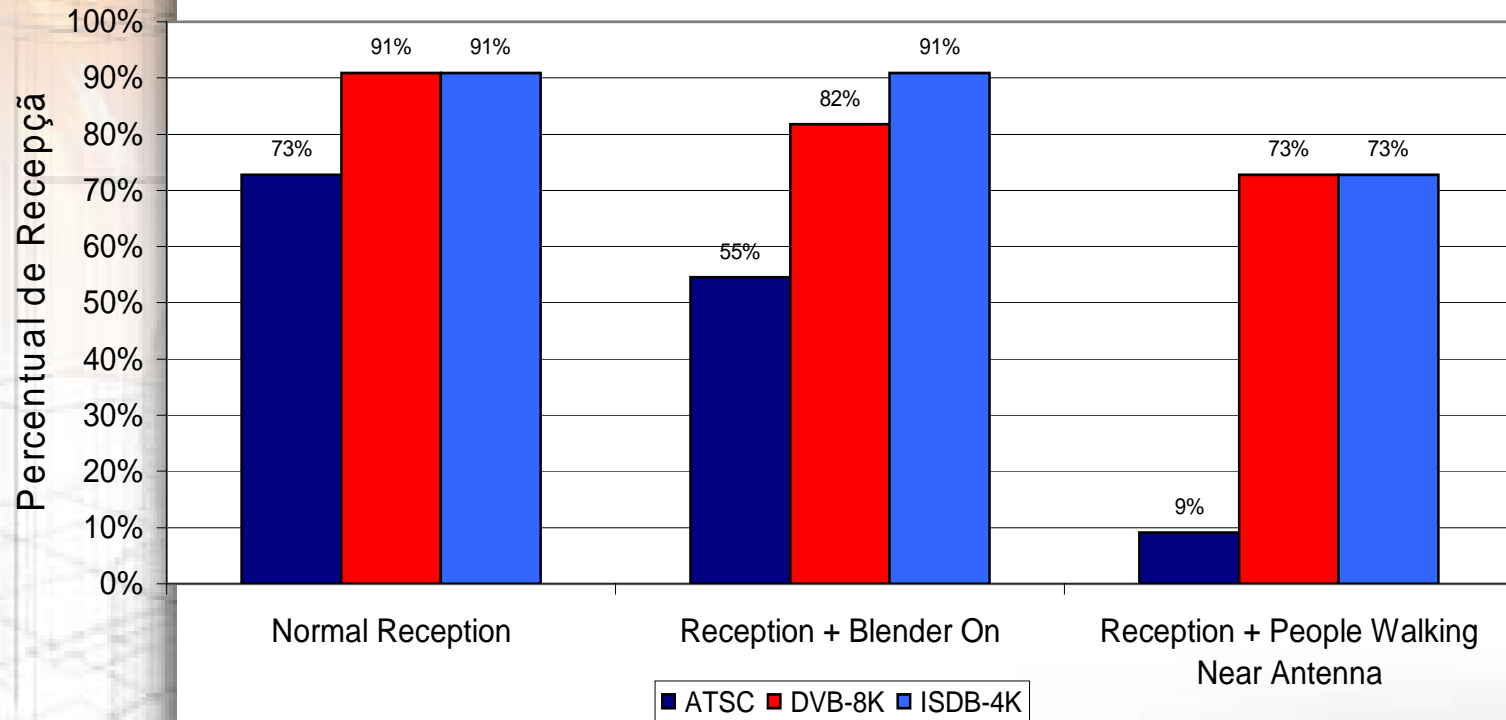
# Outdoor: Coverage



(From the presentation of the Brazilian SET/ABERT study group at NAB2000)

# Indoor Reception

Indoor Reception: Sites Where the Three Systems Were Tested in the Same Condition



(From the presentation of the Brazilian SET/ABERT study group at NAB2000)

# Summary of Comparison(1/2)

Any improvement of digital receiver was not considered to make the table below.

Requirements	System conform to requirements
Maximum bit rate under Gaussian noise environment	ATSC
Robustness against multi-path distortion	DVB-T, ISDB-T
Robustness against impulse noise	ISDB-T
Wide area single frequency network (SFN) operation	DVB-T, ISDB-T

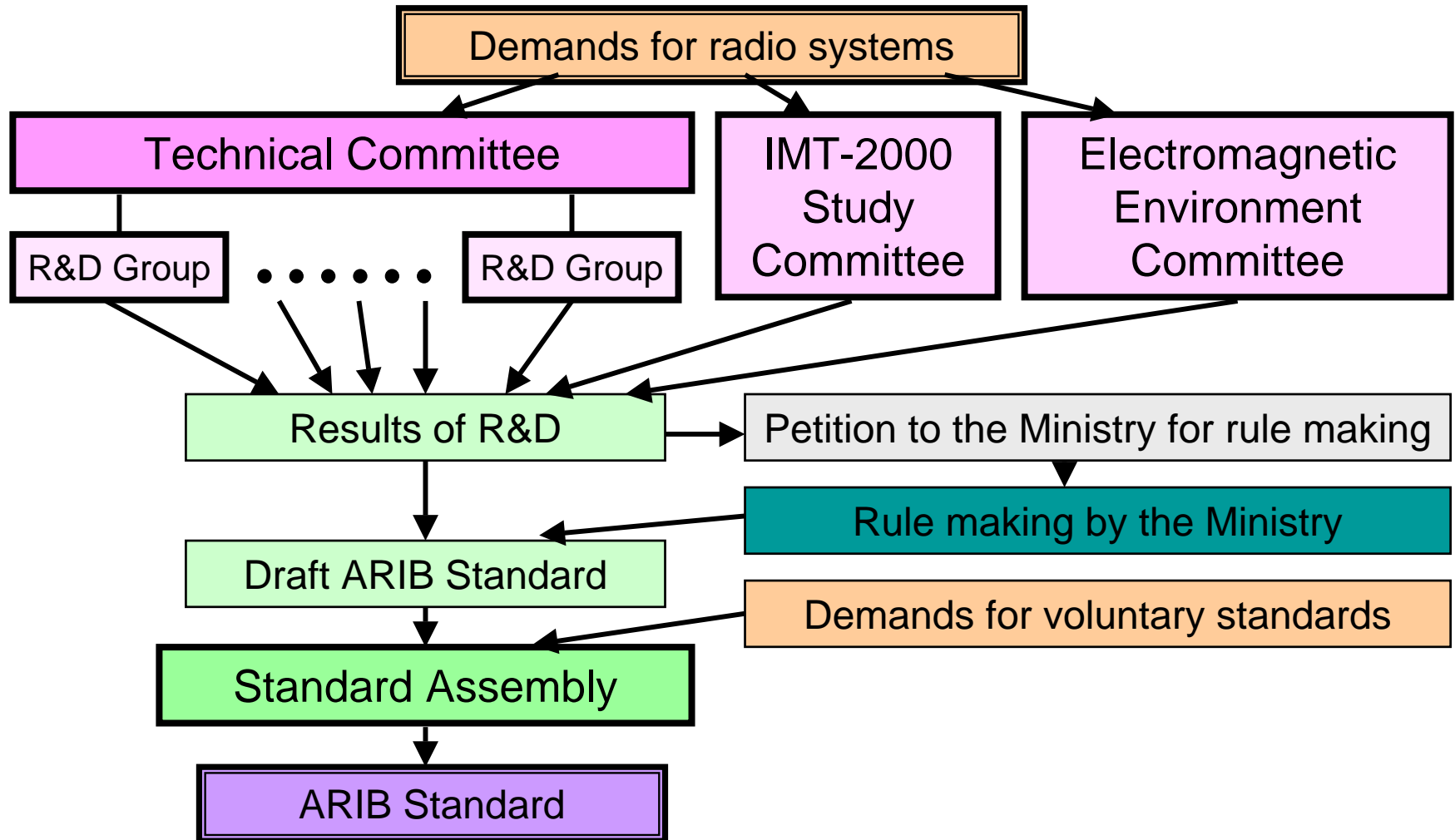
# Summary of Comparison(2/2)

Any improvement of digital receiver was not considered to make the table below.

Requirements	System conform to requirements
Mobility and Portability	ISDB-T >> DVB-T
Hierarchical transmission (Multiple modulation systems simultaneously in the same channel is possible)	ISDB-T >> DVB-T
System commonality with digital terrestrial sound broadcasting (One segment receiver is available)	ISDB-T

# 3. Structure of ISDB-T Standard

# ARIB's R&D and Standardization





# Standardization for Broadcasters / Receivers

## (Broadcasters)

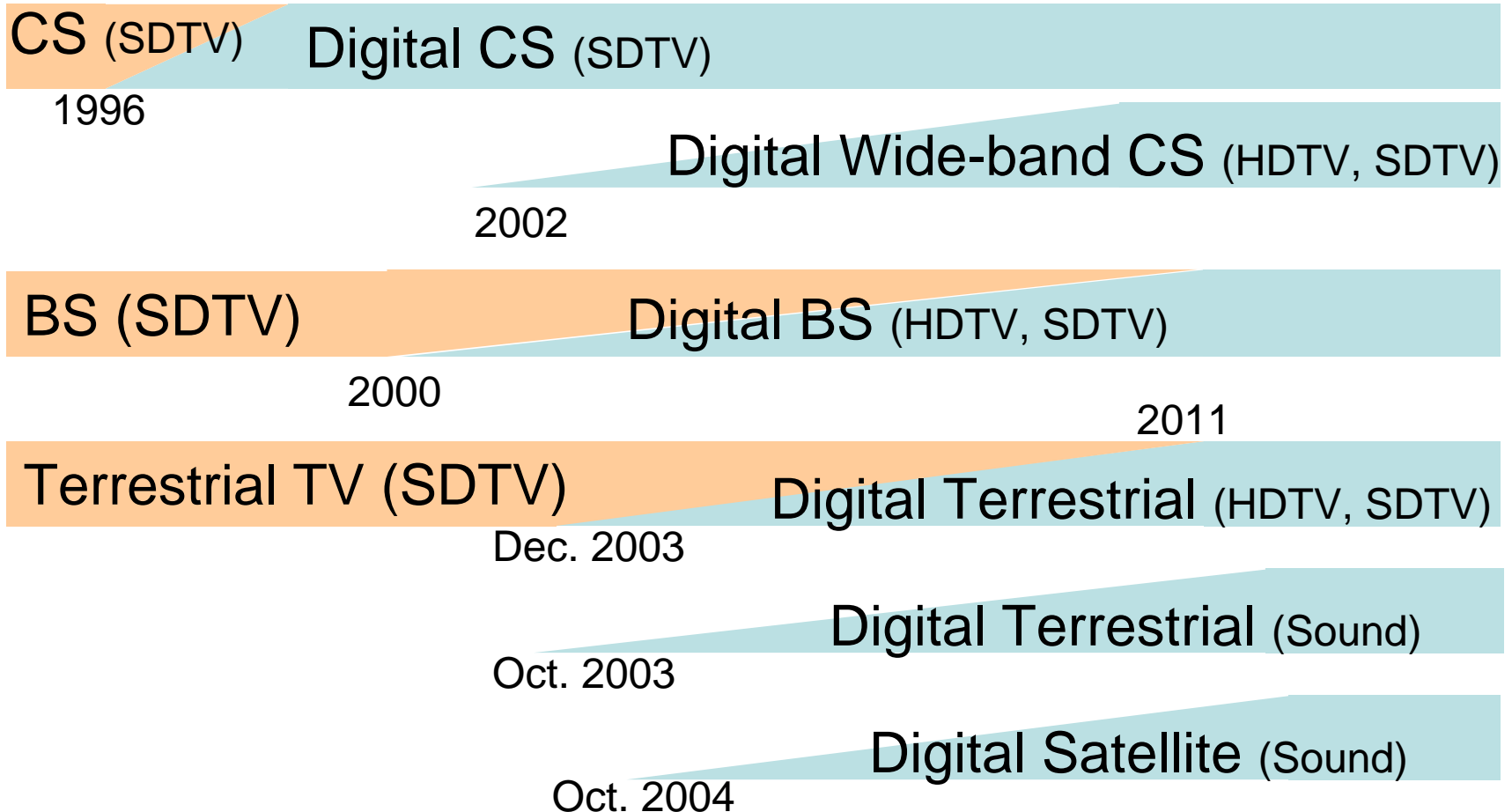
- Service contents
- Segment utilization
- Transmission parameters
- SI
- CAS
- Network configuration
- Down load data
- Test stream



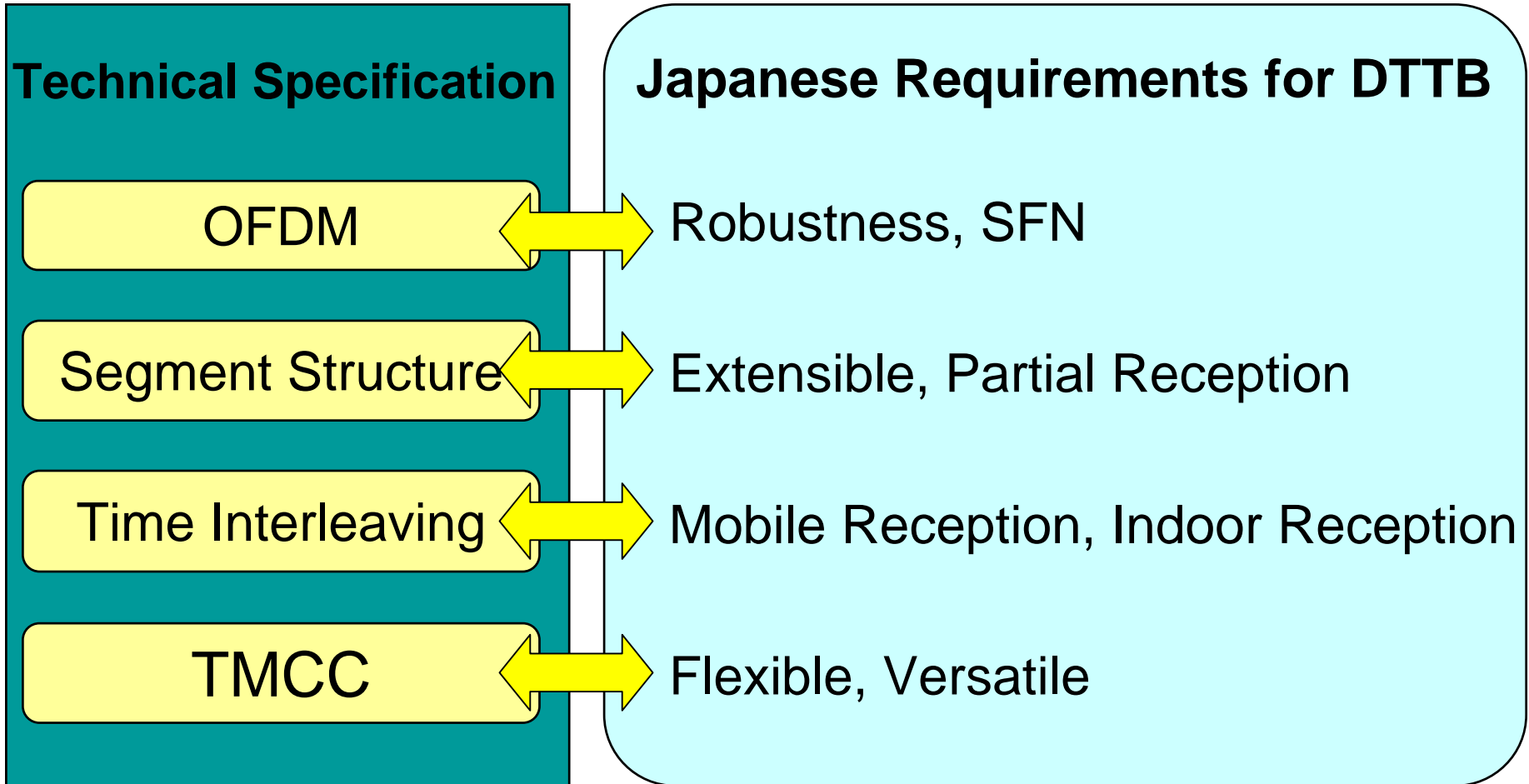
## (Receivers)

- Signal Interface
- Tuner characteristic
- EPG
- Copy-right treatment
- Hardware size
- Interactive link
- Human interface

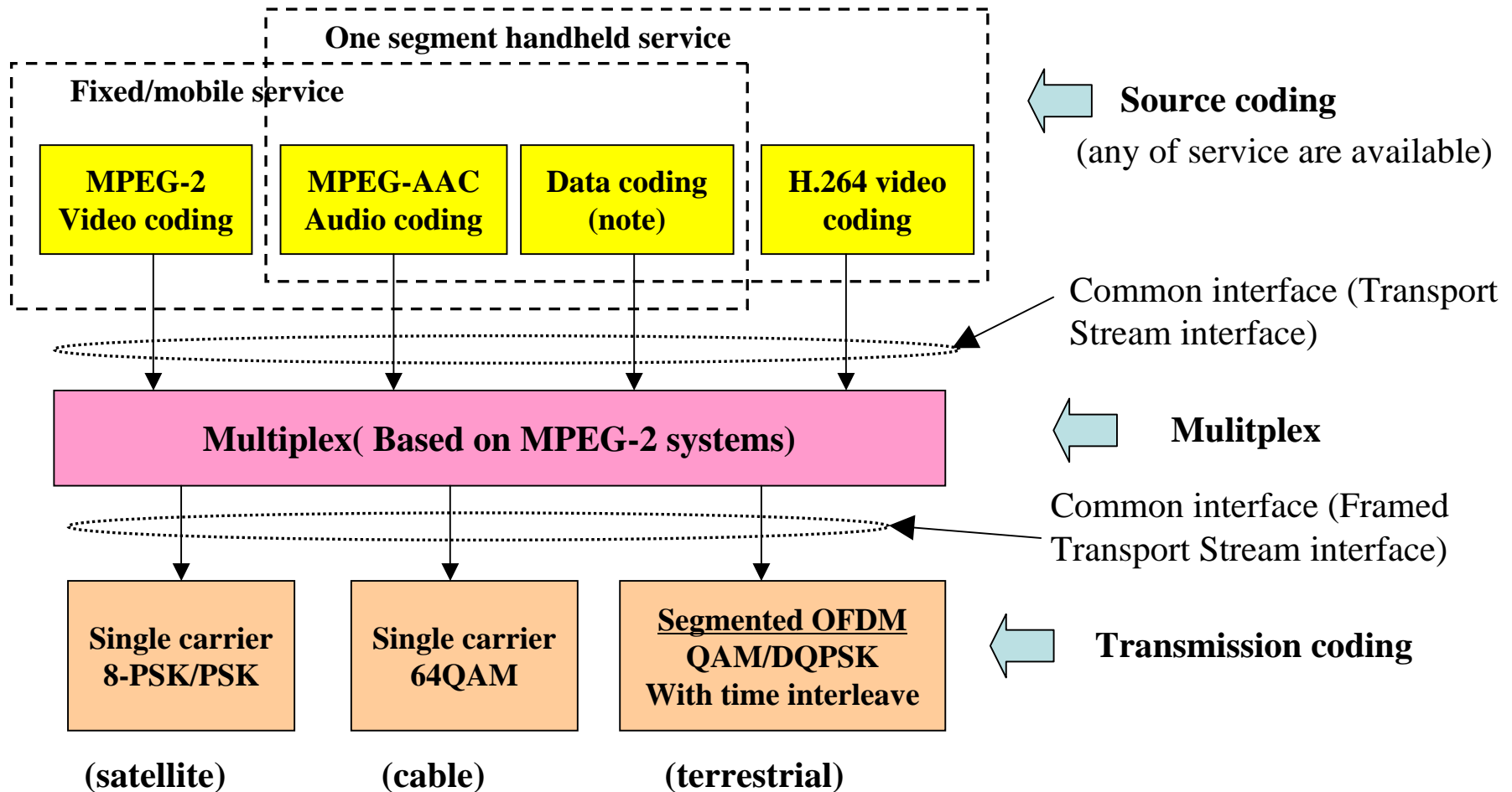
# Toward Digital Broadcasting in Japan



# Features of ISDB-T



# Structure of Japan's Digital Broadcasting system

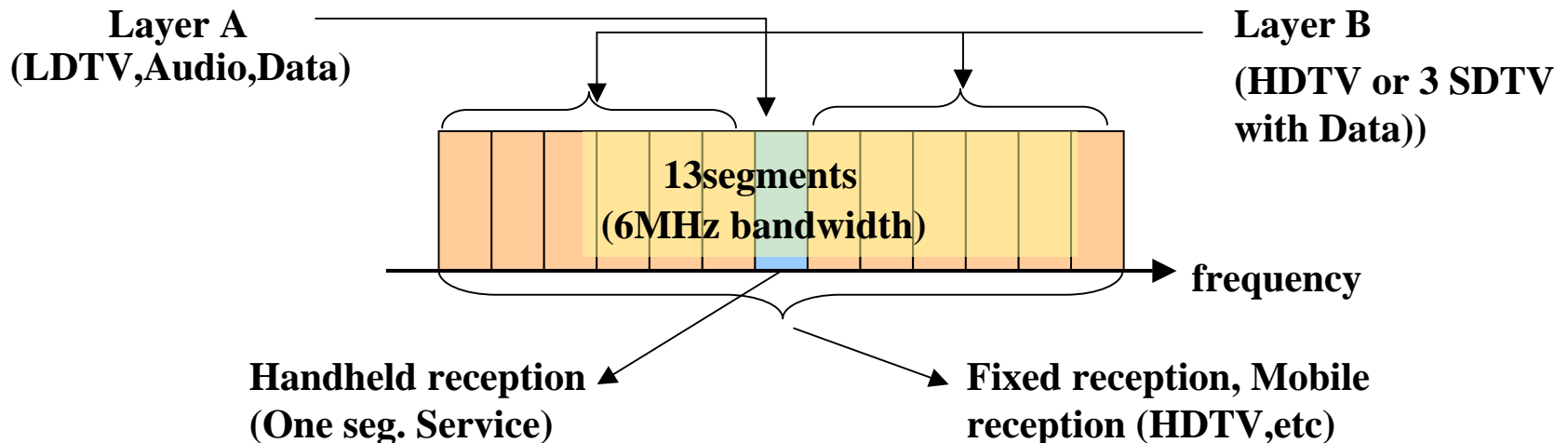


(note) both BML and MHP are available,  
But in Japan now BML is only service in.

## Feature of Japan's Digital Broadcasting system

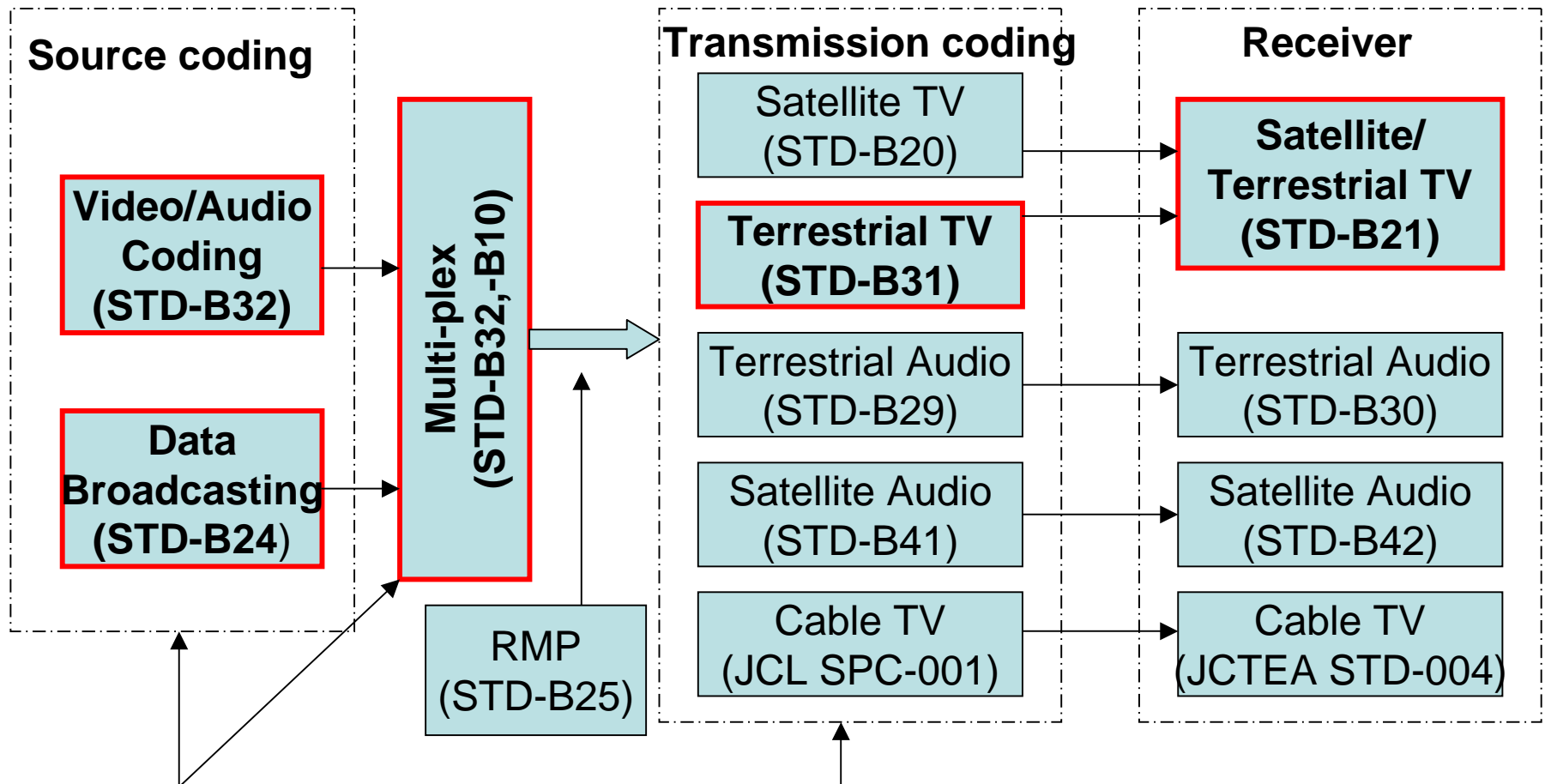
- (1)**Flexibility of service:** Interface between source coding and Multiplex is common interface (Transport Stream interface), so, any contents based on TS can be available.
- (2)**Flexibility of transmission media:** Optimized to each transmission media..
- (3)**Terrestrial transmission system;** For any reception type, such as fixed/mobile/handheld, adopt Segmented OFDM with time interleave (see next page)

### What is Segmented OFDM with time interleave?



- Segmented OFDM;** Possible to support fixed/mobile/handheld reception service
- Time interleave;** reduce impulse noise and reduce the degradation caused by fading (tested in Brazil by Mackenzie and TV GLOBO)

# Digital Broadcasting Standard in Japan



Source coding and MUX systems are common for each system

Transmission systems are different

Note: Cable transmission system standards are defined at another consortium

# Outline of ARIB Standards

## Source coding & Multi-plex

Name	Outline	note
<b>Video/Audio coding (STD-B32)</b>	<ul style="list-style-type: none"><li>-Based on MPEG-2 video coding</li><li>-Cover 1080i,720p,480p,480i</li><li>-Based on MPEG AAC audio coding</li><li>-Up to 5.1 Stereo audio</li><li>-Based on MPEG systems multi-plex</li></ul>	
<b>Data Broadcasting (STD-B24)</b>	<ul style="list-style-type: none"><li>-Data broadcasting description</li><li>-Data transmission format</li><li>-Small size Video coding(MPEG-4,H.264)</li></ul>	
<b>Program line-up information (STD-B10)</b>	<ul style="list-style-type: none"><li>-PSI/SI description</li><li>-EPG description</li><li>-Necessary for program selection</li></ul>	

# Outlines of Standards (continued)

## Transmission coding

Name	Outline	note
<b>Satellite TV (STD-B20)</b>	<ul style="list-style-type: none"><li>-Slot structure</li><li>-Trellis+RS(Concatenated coding)</li><li>-Single carrier 8 PSK modulation</li></ul>	<b>2 HDTV programs are muliti-plexed into 1 transponder</b>
<b>Terrestrial TV (STD-B31)</b>	<ul style="list-style-type: none"><li>-Segment structure</li><li>-Viterbi+RS (Concatenated coding)</li><li>-Multi-carrier(OFDM) transmission</li></ul>	<b>1 segment transmission is available</b>
<b>Terrestrial Audio (STD-B29)</b>	<ul style="list-style-type: none"><li>-1 and 3 segment transmission</li><li>-Others are almost same as STD-B31</li></ul>	<b>1 segment system is compatible to 1 segment of TV</b>
<b>Satellite Audio (STD-B42)</b>	<ul style="list-style-type: none"><li>-Multiplex 64 CDM channel</li><li>-Viterbi+RS (Concatenated coding)</li><li>-CDM-BPSK/QPSK transmission</li></ul>	<b>Adopt “AAC+SBR” 2.6GHz Band</b>



# Outlines of Standards (continued)

## What is the operational guideline?

All the technical elements required are written in ARIB STD. But, the details for operation of broadcasting are defined separately, even though based on ARIB STD. These documents are called “Operational Guideline”

## Examples

ARIB TR-B13; Terrestrial Audio broadcasting operational guideline

ARIB TR-B14; Terrestrial TV broadcasting operational guideline

ARIB TR-B15; BS/wideband CS broadcasting operational guideline

ARIB TR-B26; Satellite Audio broadcasting operational guideline

# 4. Technical Details of ISDB-T

4.1 Structure of Japan's Digital Broadcasting System

4.2 ISDB-T Transmission System

4.3 ISDB-T Multiplex system

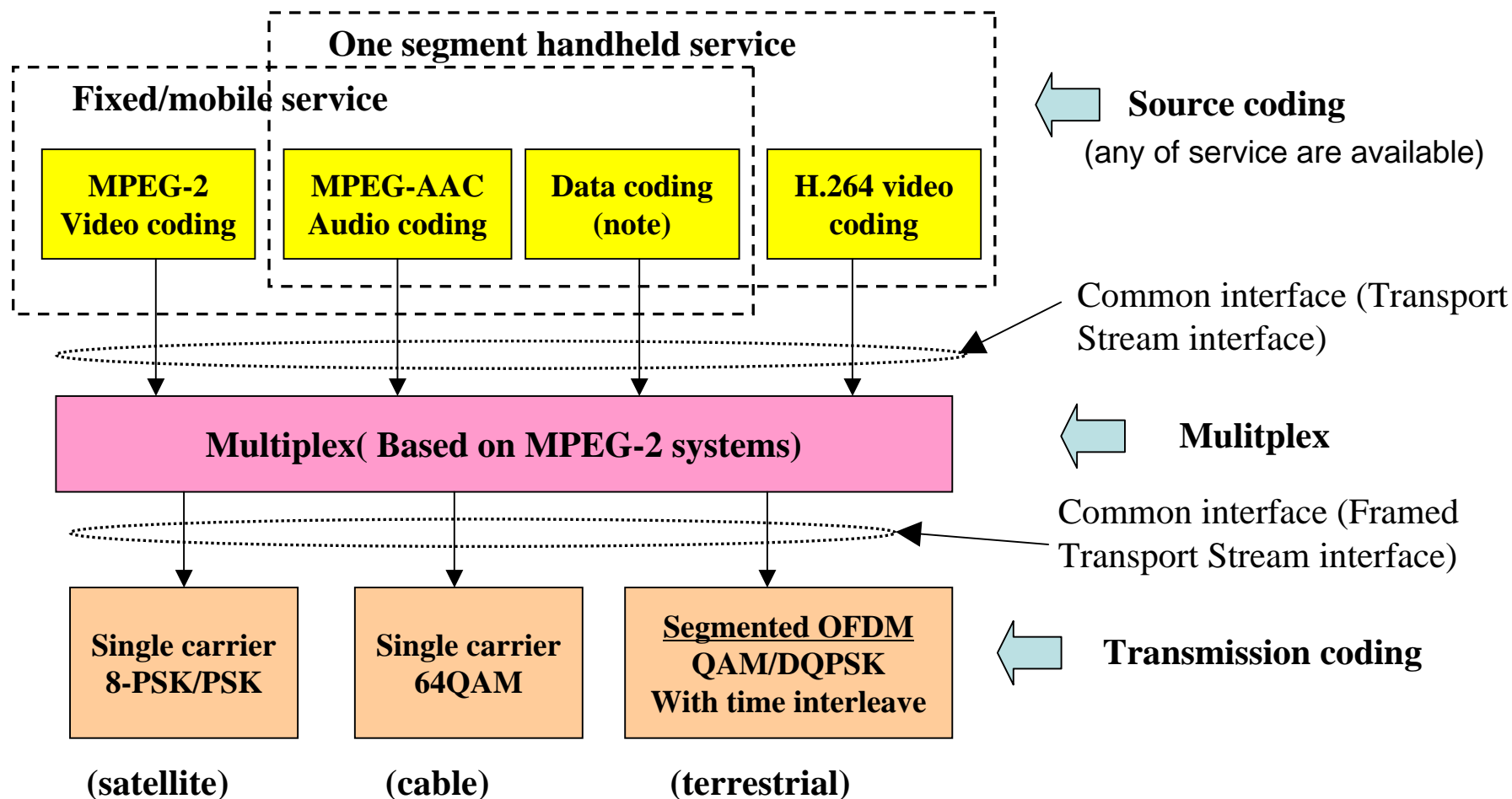
4.4 Video Coding

4.5 Audio Coding

4.6 Data casting

4.7 Video Coding for One-seg service

# 4.1 Structure of Japan's Digital Broadcasting system

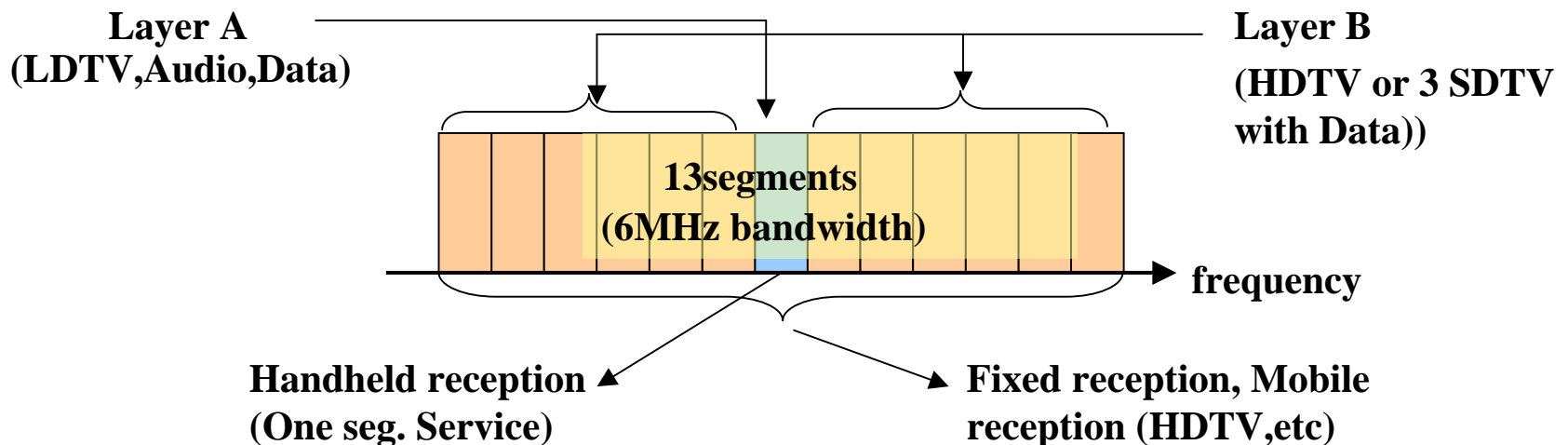


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## Feature of Japan's Digital Broadcasting system

- (1)Flexibility of service: Interface between source coding and Multiplex is common interface (Transport Stream interface), so, any contents based on TS can be available.
- (2)Flexibility of transmission media: Optimized to each transmission media..
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### What is Segmented OFDM with time interleave?



- Segmented OFDM; Possible to support fixed/mobile/handheld reception service
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## 4.2 ISDB-T transmission system

### •Features of transmission system

#### 1. Efficient frequency utilization

- (1) Adopt OFDM transmission system; SFN operation
- (2) Adopt hierarchical transmission; service for different type of reception in one frequency channel

#### 2. Mobile/ handheld service in one transmission standard

- (1) Time interleave; Improve mobile reception quality
- (2) Partial reception; handheld service in same channel

#### 3. Robustness against interference

- (1) Adopt concatenated error correction with plural interleave
- (2) Time interleave; very effective for impulse noise (urban noise)

#### 4. Flexibility for several type of service/ reception style

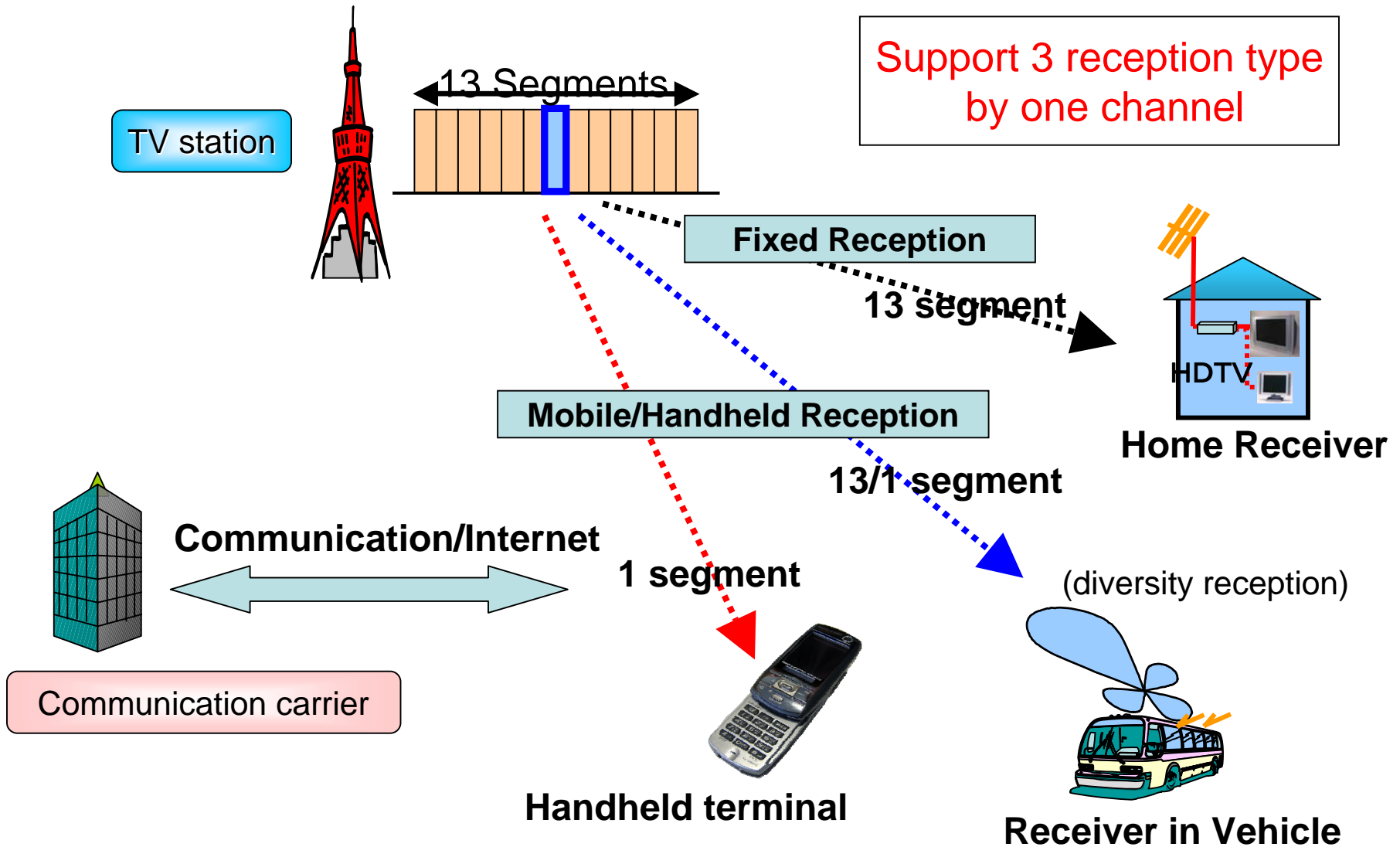
#### 5. Commonality of TV/audio transmission standard

#### 6. Auxiliary (AC) channel can be used for transmission network management

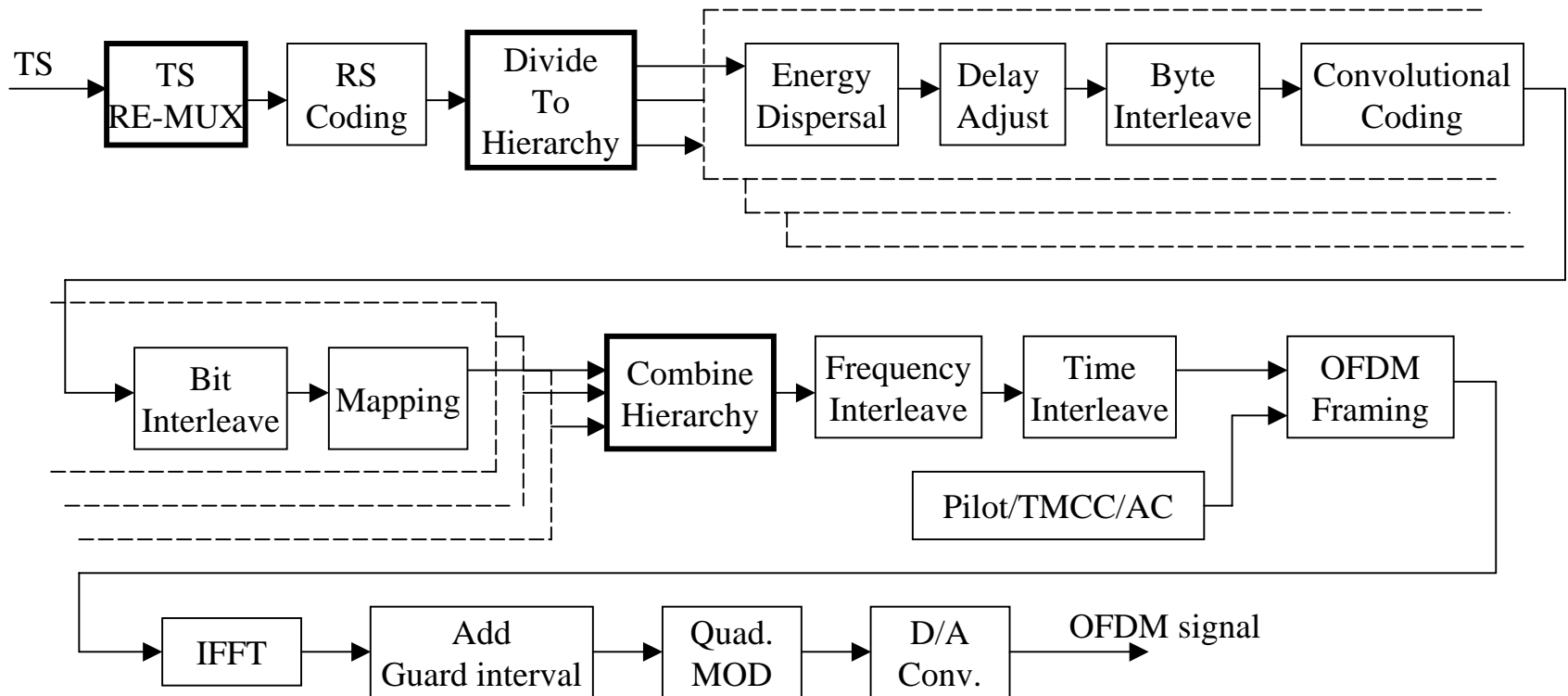
## Parameters of ISDB-T (6MHz Bandwidth)

ISDB-T mode	Mode 1 (2k)	Mode 2 (4k)	Mode 3 (8k)
Number of OFDM segment	13		
Useful bandwidth	5.575MHz	5.573MHz	5.572MHz
Carrier spacing	3.968kHz	1.984kHz	0.992kHz
Total carriers	1405	2809	4992
Modulation	QPSK , 16QAM , 64QAM , DQPSK		
Number of symbols / frame	204		
Active symbol duration	252 $\mu$ s	504 $\mu$ s	1.008ms
Guard interval duration	1/4 , 1/8 , 1/16 , 1/32 of active symbol duration		
Inner code	Convolutional code (1/2 , 2/3 , 3/4 , 5/6 , 7/8)		
Outer code	RS (204,188)		
Time interleave	0 ~ 0.5s		
Useful bit rate	3.651Mbps ~ 23.234Mbps		

# Feature of Japanese DTTB system



# (1) Hierarchical transmission

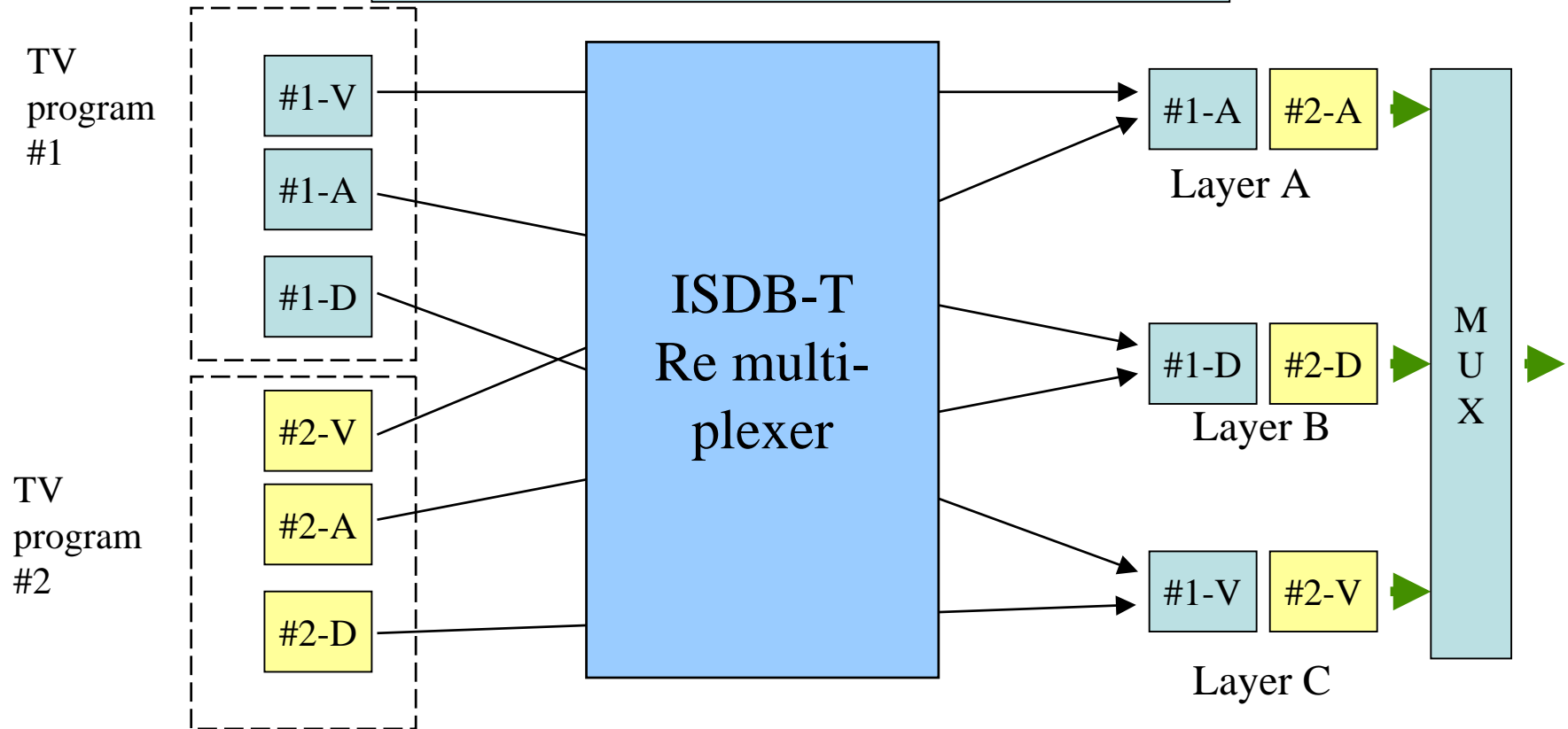


- Maximally 3 Layer transmission in one Transport Stream
- Any combination of transmission parameter is available for each layer

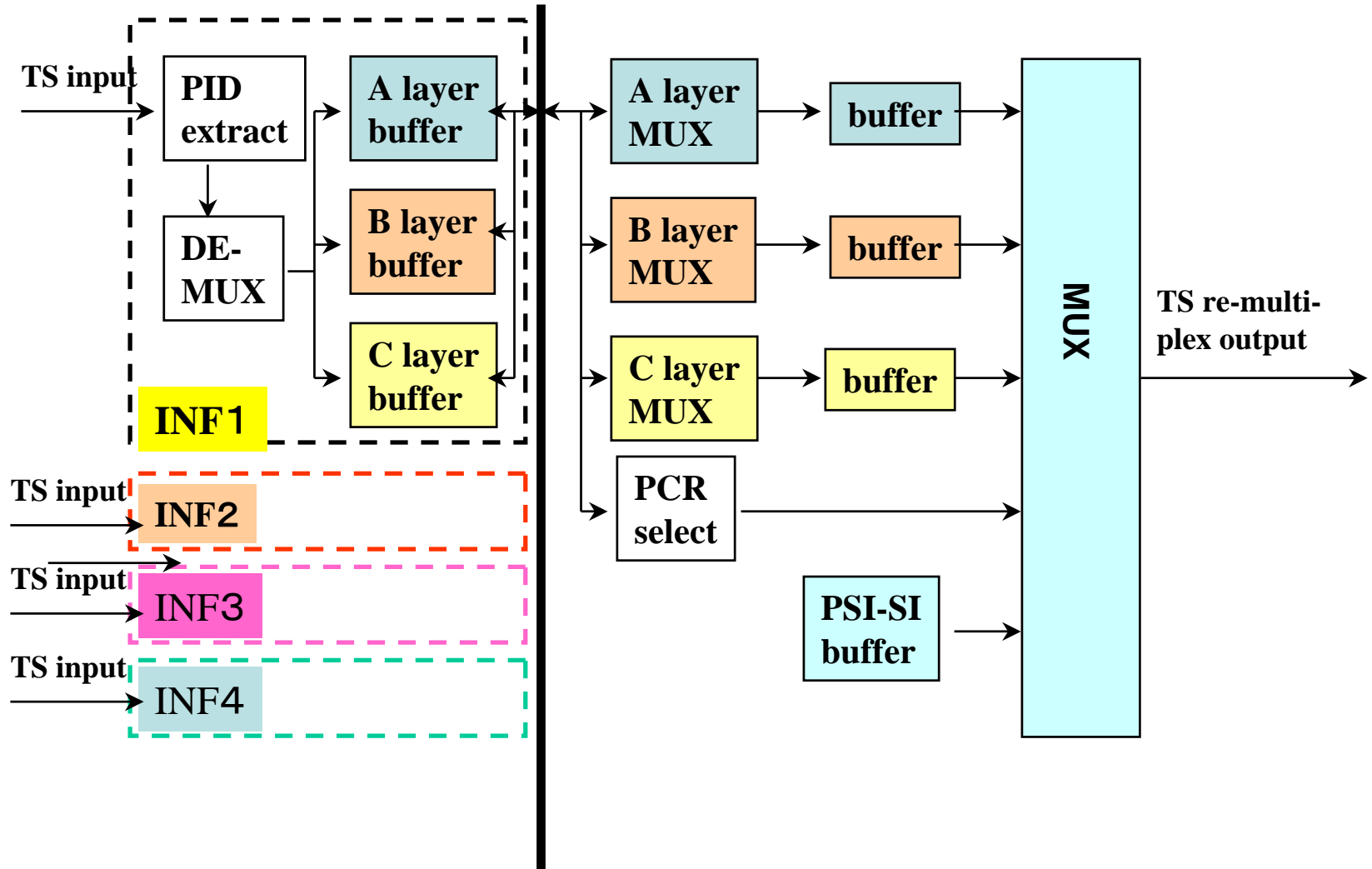


# Image of multiple layer transmission

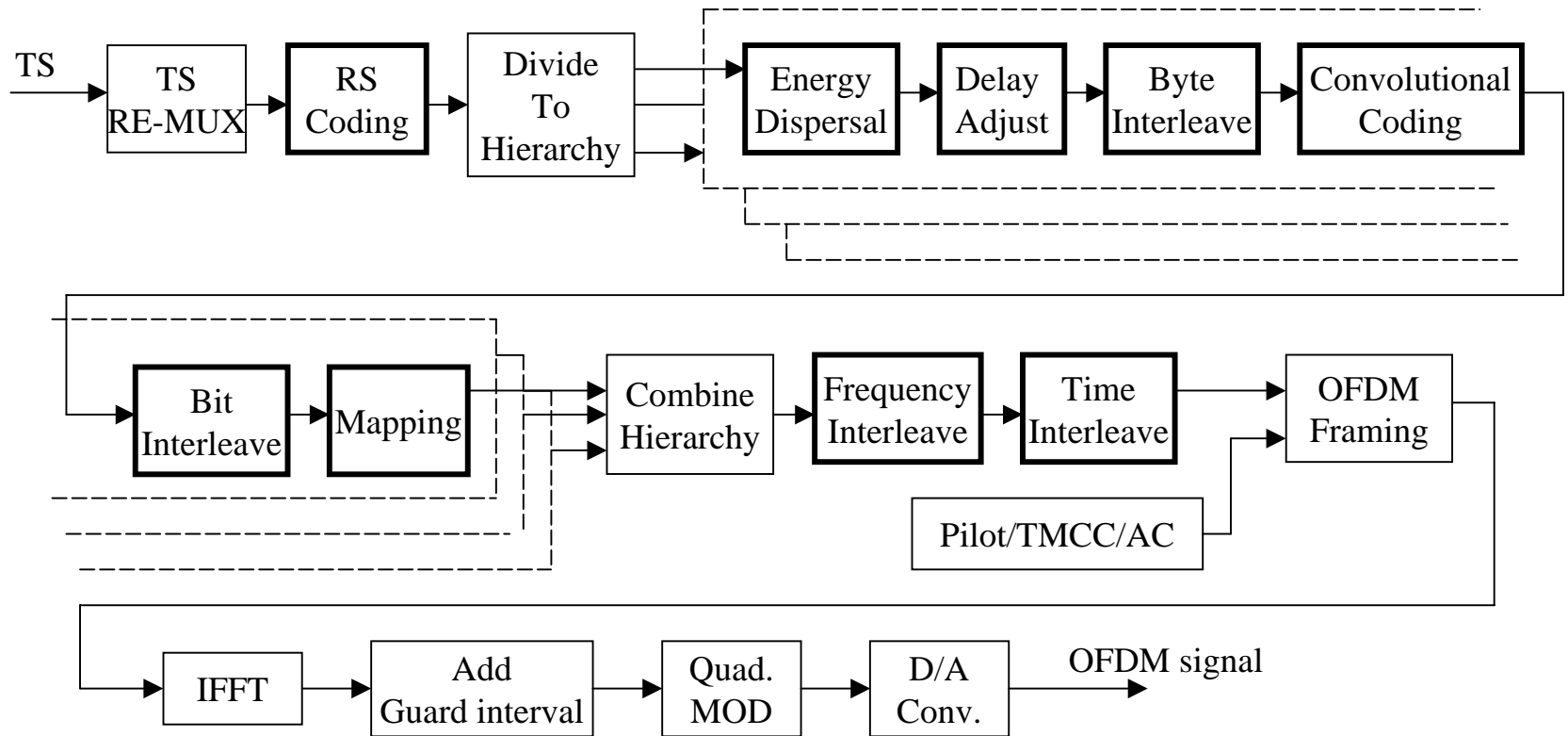
## Example of 2 programs into 3 layers



# Blockdiagram of TS re-multiplexer



## (2) Transmission coding



- **Concatenated Error Correction System; Convolutional+Reed-Solomon**
- **4 kinds of Interleave; Byte/Bit/Time/Frequency**
- **4 kinds of Modulation Parameters; QPSK/DQPSK/16QAM/64QAM**

Any kinds of coding rate and modulation parameters can be set for each layer independently

## Kind of interleave and these effect



### Byte interleave

Byte interleave is located between outer coder and inner coder. Randomize the burst error of Viterbi decoder output

### Bit interleave

Bit interleave is located between convolutional coding and mapping. Randomize the symbol error before Viterbi decoding

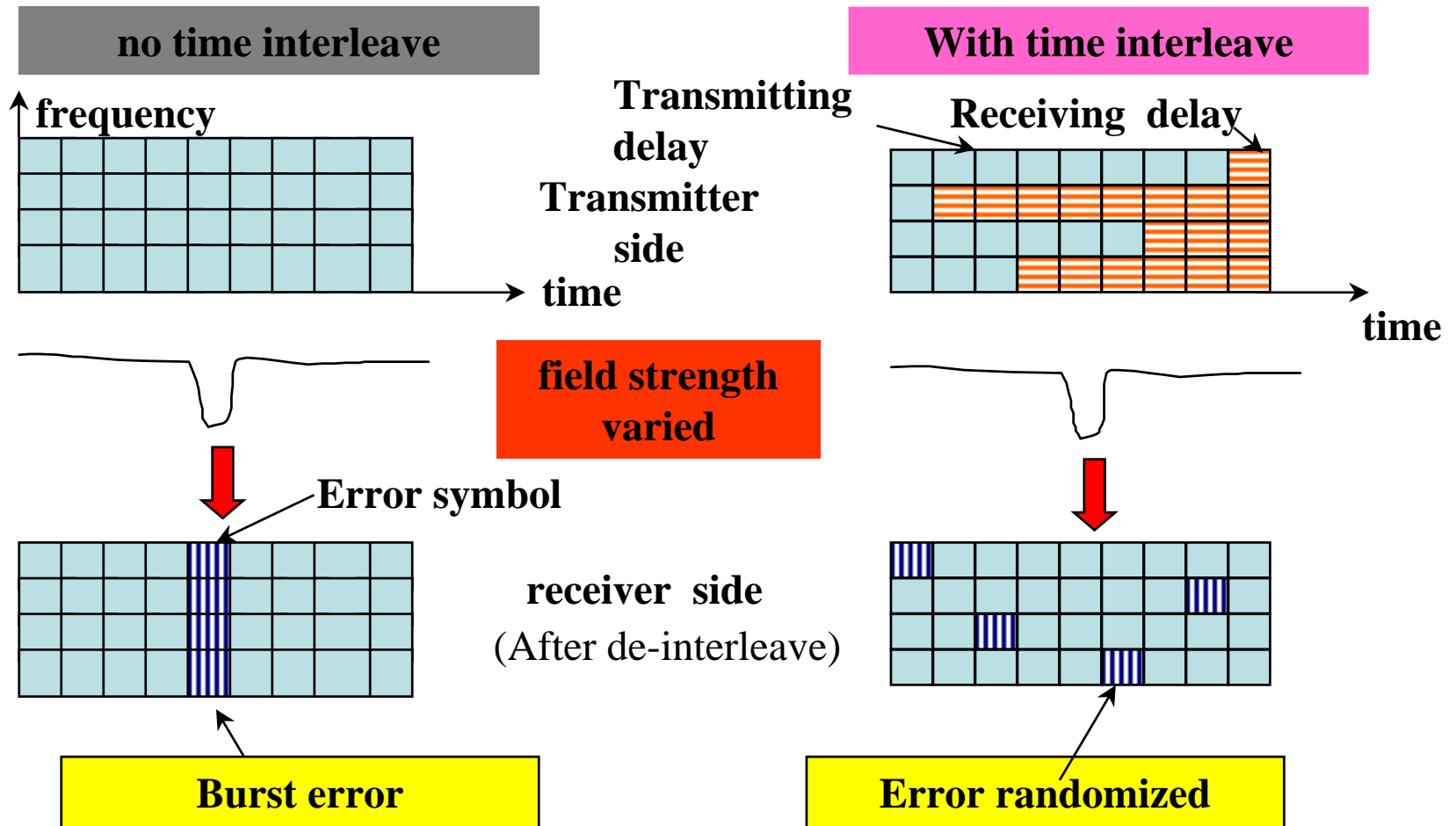
### Time interleave

Frequency interleave is located at the output of frequency interleaver. Randomize the burst error of time domain which is mainly caused by impulse noise, fading of mobile reception, etc.

### Frequency interleave

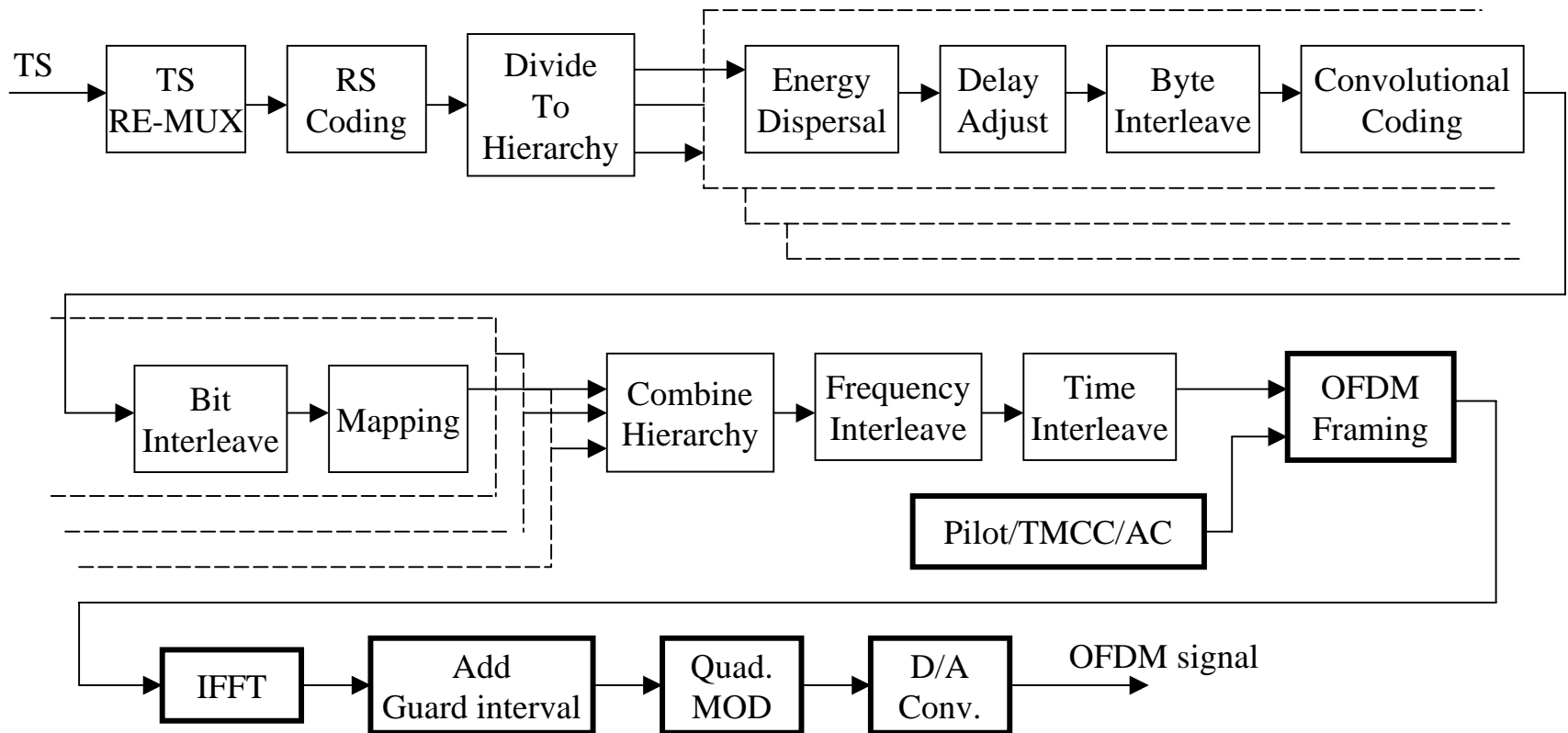
Frequency interleave is located at the output of mapping. Randomize the burst error of frequency domain which is mainly caused by multi-path , carrier interference, etc.

# Effect of time interleave

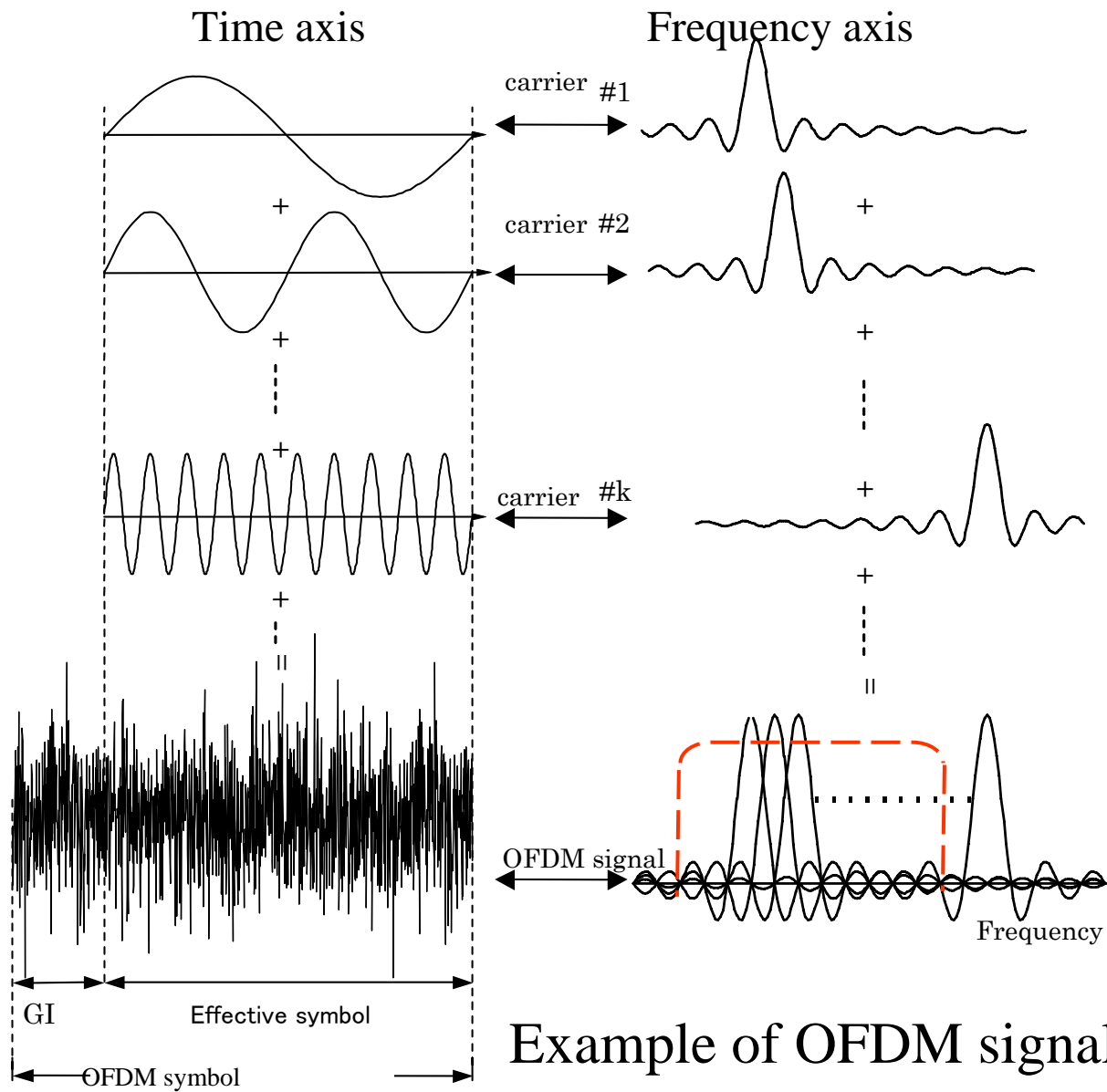


Time Interleave is effective not only for signal level fluctuation but also for impulse interference

### (3) OFDM Modulation

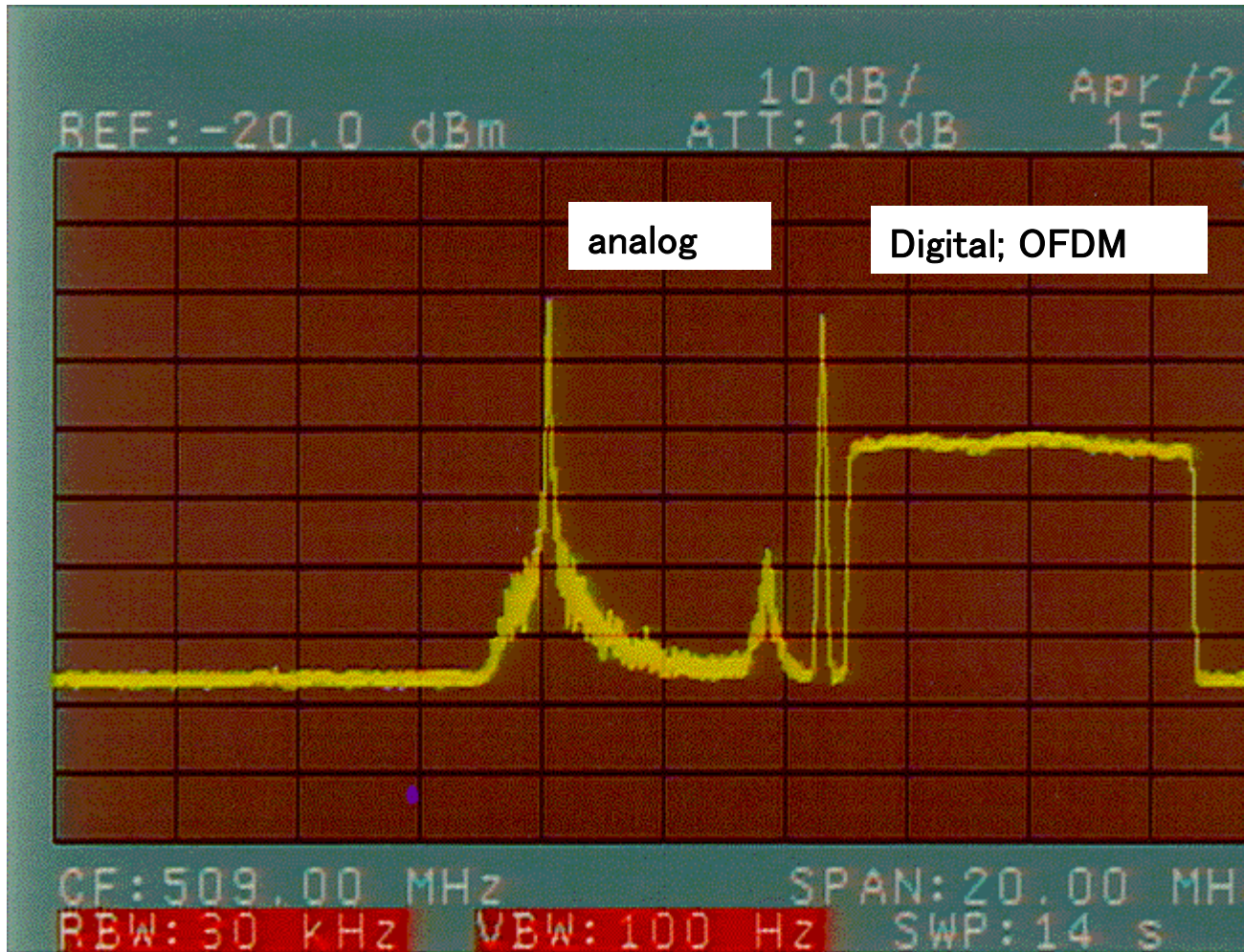


- 3 kinds of OFDM Modulation; 2k, 4k, 8k
- 4 Kinds of Guard Interval Length; 1/32, 1/16, 1/8, 1/4



Example of OFDM signal waveform

# TV signal spectrum



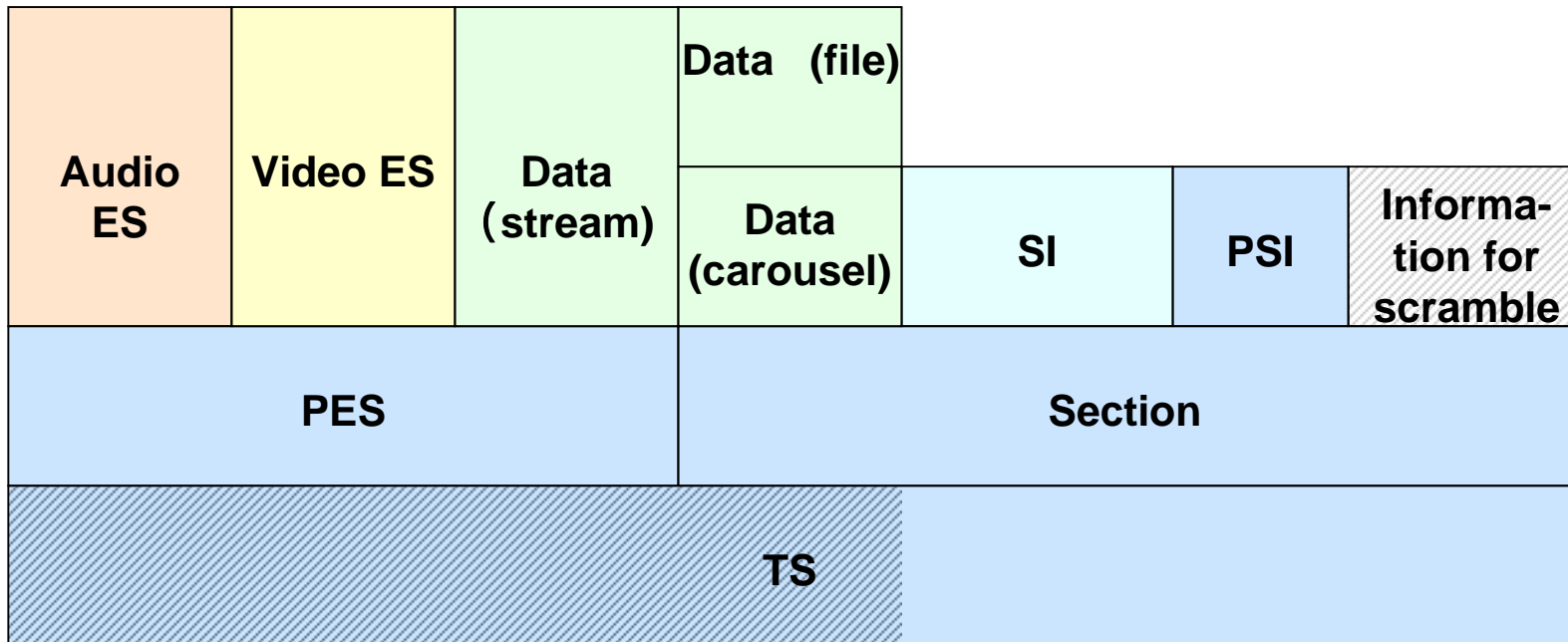


## 4.3 Multiplex system

- Functions
  - **Function of Multiplex**
    - Multiplex plural services/program/component on transmission
    - Signal format is common for any kind of service, program and component
    - Free from transmission media
  - **Function of synchronization**
    - Synchronization between transmission side and receiving side
    - Synchronization between program component( video, audio)
  - **Function of selection**
    - Service information for selection of service and program
- Features
  - **Flexibility**
    - Support any service, program and component
  - **Expandability**
    - Applicable for new program component

# Digital broadcasting & Multiplex system

## Signal format of digital broadcasting

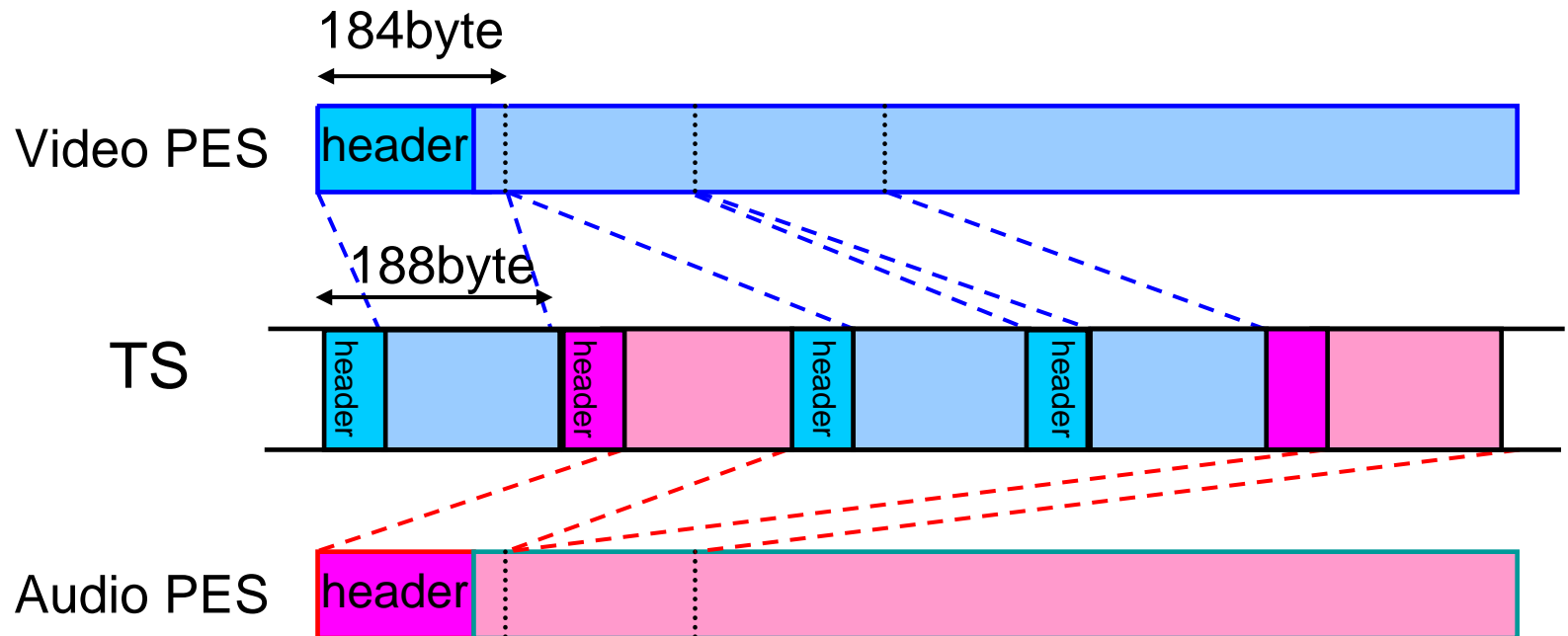


(note) signal format of PES, TS and Section area is defined in ARIB STD-B32, based on MPEG-2 systems

(note) PSI is defined in both STD-B32 and STD B10. In STD-B32, only outline related to MPEG -2 systems is defined

# MPEG-2 Systems

## TS multiplexing method



# PSI/SI

## relationship between PSI and SI

	PSI	SI
function	Signal selection from MPEG-2 TS	Support the program selection
Support plural TS	Identify by TS_id only	yes(broadcasting for plural TS)
Time schedule support	none	yes(program)
Information format	table	table
Signal format	section	section
Transmission style	Transmit repeatedly	Transmit repeatedly
specification	ISO/IEC 13818-1	ARIB STD-B10
reference	-	ISO/IEC 13818-1
scope	Used for any media	broadcasting

PSI

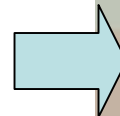
Based on PSI, extend for  
broadcast service

SI

# Function of SI

- Supplement of PSI, control the receiver
- Function of EPG( Electronic Program Guide); see below

BS-hi		
BS-2		
BS-1		
時刻	番組名	番組の説明
10:00 + 30	ドラマ「〇〇〇」	第3章「菓子どころ」
10:30 + 30	趣味講座	ハンドクラフト
11:00 + 50	歌のヒットパレード	出演:〇×娘、XXX、ほか
11:50 + 10	お昼のニュース	地下鉄事故、 警察不祥事、ほか
12:00 + 1:00	お昼のバラエティ	今日のテーマ: 出演:◇◇◇夫、△△△子



Example of BS digital Broadcasting, for DTTB EPG is given by each broadcaster separately

## 4.4 Video Coding System

In Japan, HDTV had been developed since 1980's, and analog HDTV trial service, named MUSE, has already started. Because of this situation, video coding system for DTV should support many video format and has capability of video format change according to display aspect ratio.

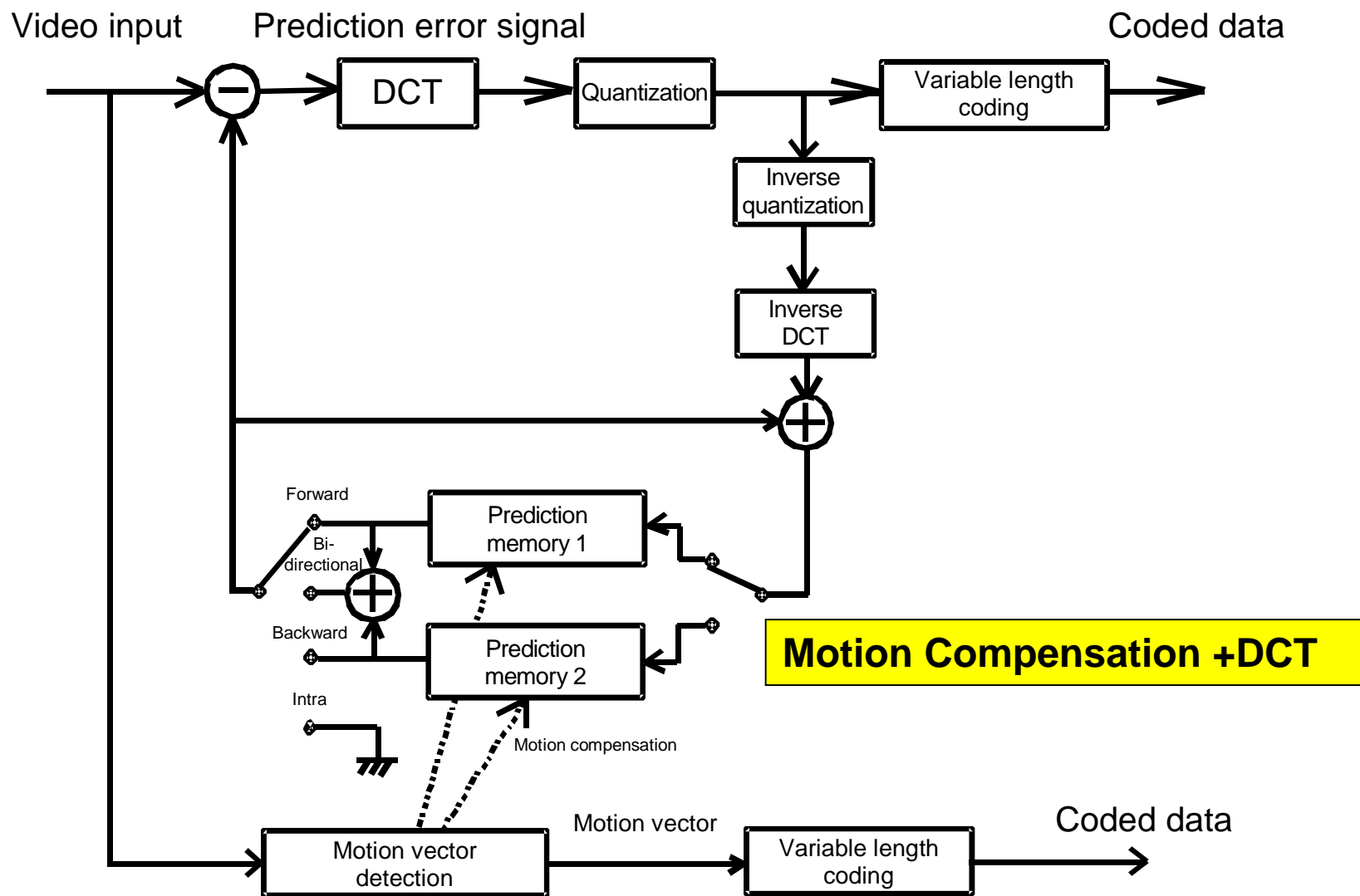
because of above reasons, specifications of video coding should have following features

- (1) Video coding system; adopt most popular system MPEG2
- (2) Support many types of video format; 480i/480p/1080i/720p
- (3) Specify the relationship of video source and display aspect ratio

Video coding system is specified in ARIB STD-B32 Part 1(note)

(note) Video coding system for LDTV is specified in ARIB STD-B24 separately

# Video compression, coding block diagram



(ARIB STD-B32 Part 1, chapter 4.1 )

## (a) Outline of video coding

(1) Compression system; MPEG2(MP@HL)

(2) Video format

No. of line	No. of pixel	quality
1080i	1920*1080	HDTV (interlace)
720p	1440*720	HDTV (progressive)
480p	720*480	SDTV (progressive)
480i	720*480	SDTV (interlace)

D terminal: D1:480i, D2:480p, D3:1080i, D4:720p



## (b)Actual video bit rate

No. of line	profile	actual bit rate
1080i	MP@HL	BS:12-24Mbps DTTB:8-20Mbps
720p	MP@H-14	
480p	MP@H-14	BS:4-24Mbps DTTB : 4-20Mbps
480i	720*480	1.5-15Mbps
240p	720*480	0.2-4Mbps

# 4.5 Audio Coding System

## (a) Audio Input Format

Parameter	Restriction
Audio mode      Possible audio modes	Monaural, stereo, multichannel stereo (3/0, 2/1, 3/1, 2/2, 3/2, 3/2+LFE) <sup>(Note 1)</sup> , 2-audio signals (dual monaural), multi-audio (3 or more audio signals) and combinations of the above
Recommended audio mode	Monaural, stereo, multichannel stereo (3/1, 3/2, 3/2+LFE) <sup>(Note 2)</sup> , 2-audio signals (dual monaural)
Emphasis	None

(Note 1)    Number of channels to front/rear speakers:

Example: 3/1 = 3 front + 1 rear  
            3/2 = 3 front and 2 rear

(Note 2)    LFE = Low frequency enhancement channel

ARIB STD-B32 part 2 Chapter 5.1

## (b) Main parameters of audio coding

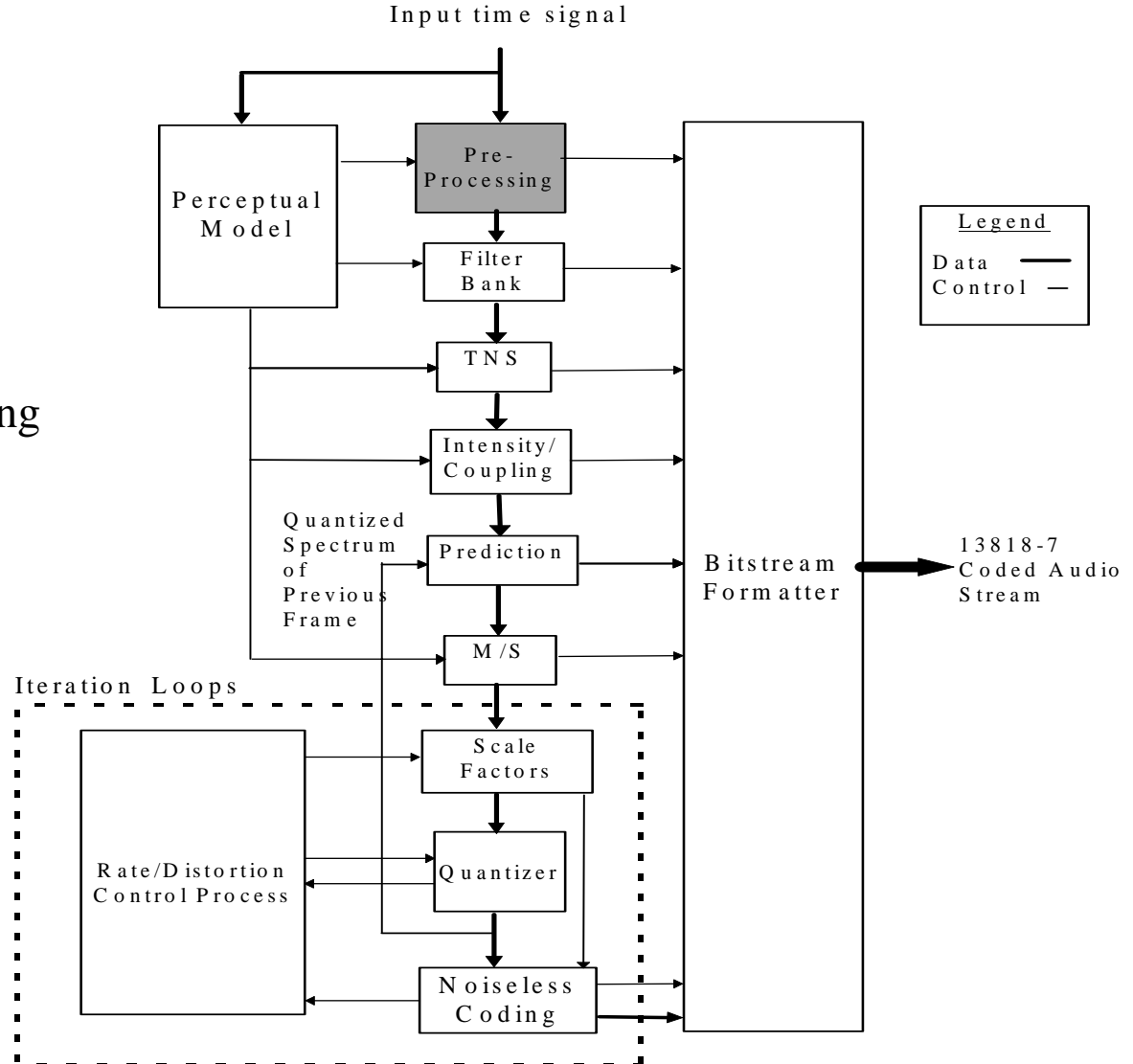
Parameter	Restriction
Bit stream format	AAC Audio Data Transport Stream (ADTS)
Profile	Low Complexity (LC) profile
Max. number of coded channels	5.1 channels <sup>(Note)</sup> max. per ADTS
Max. bit rate	As per ISO/IEC 13818-7

(Note) 5 channels + LFE channel

ARIB STD-B32 part 2 Chapter 5.2

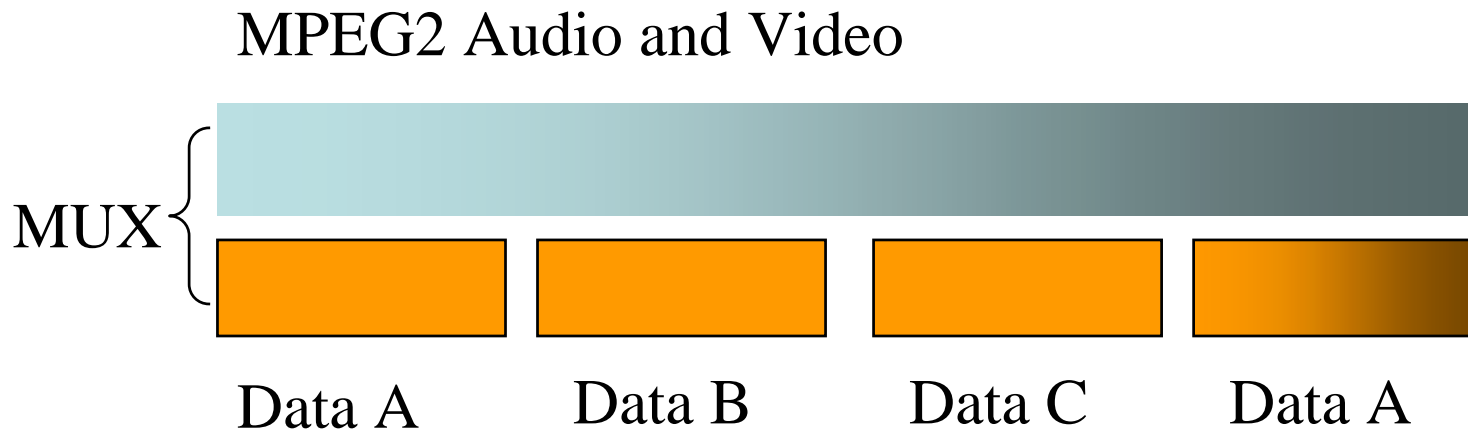
# AAC encoder Block Diagram

AAC: advanced audio coding

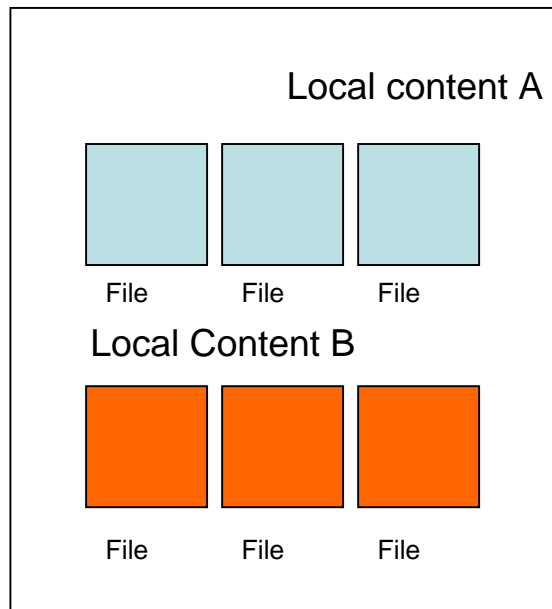


# 4.6 Data casting

## Data Composition

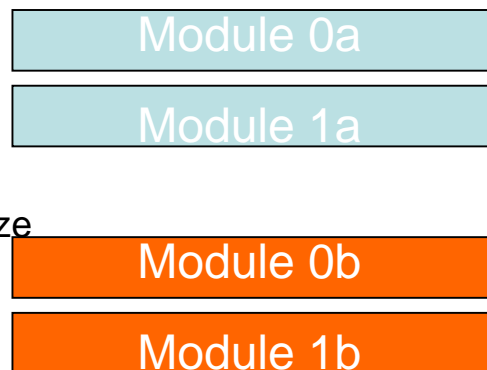


Each data broadcast as module repeatedly.  
Same module will appear in some period.  
(MPEG / DSM-CC Data Carousel)

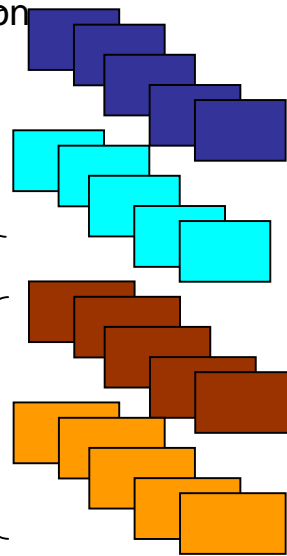


a BML application

Modularize

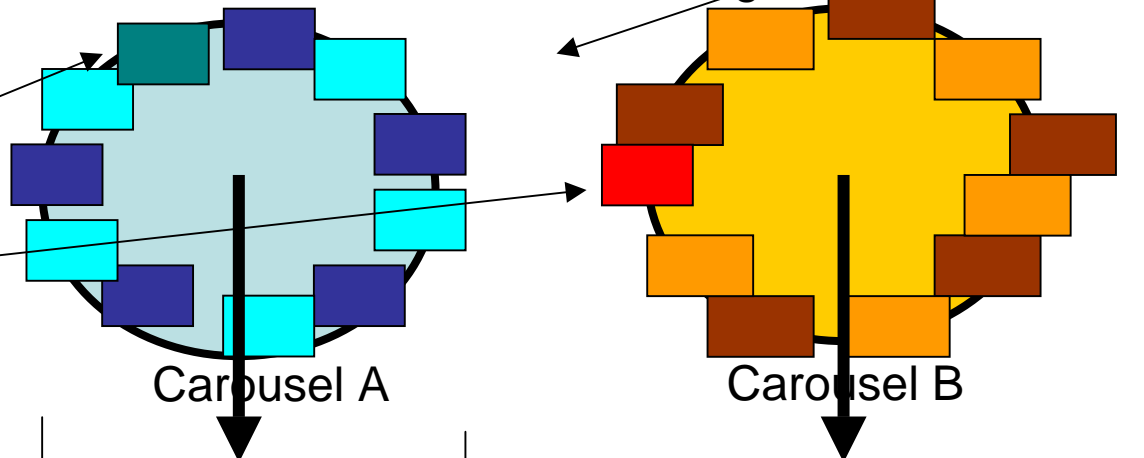


Make DDB Section

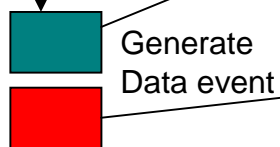


DDB:  
download  
data  
block

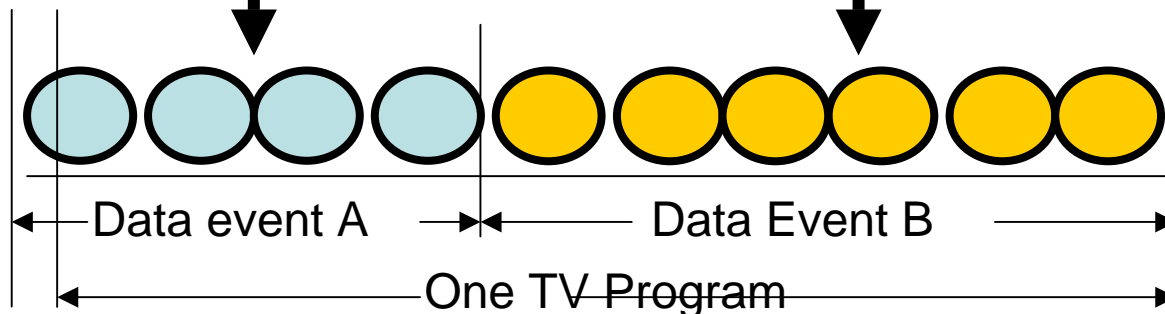
Making Carousel



DII Data exaction



DII:  
download  
information  
indicator



# Data Broadcasting

**All DTTB Broadcasters** and BS Broadcasters providing Data broadcasting (datacast) now

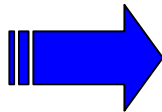
**Program related information**  
**Weather information**

**Anytime news**  
**Report of sports game etc,**

Currently the description language is BML format

Based on

**XHTML**



**BML**

Functions for  
Broadcasting

**XHTML**

## Features

**Easy creation of contents**

**Facilitate convergence  
of internet**

**Additional capability**

# Example for Datacasting(1)

## Top menu

**データ放送 首都圏**

ニュース  
首都圏の気象  
首都圏くらしガイド  
放送中番組データ  
かんたん登録

**気象情報** 東京都 渋谷区

気象警報が出ています

最高気温	30℃(-10)	21時	0	3	6	9	12	15
最低気温	25℃(-13)		☀	☀	☁	☁	☁	☀
降水確率	50%	20(℃)	20	18	25	27	22	22

**お知らせ**

首都圏くらしガイドがスタート  
美術館や博物館の催事予定や行楽  
情報、番組情報や健康体操まで！  
生活にお役立ち情報満載です！！



# Example for Datacasting(2)

## Weather news



# Example for Datacasting(3)

## Program related data

**大リーグ オールスターゲーム 2003**

投手 ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

投球数 100  
被安打 10 奪三振 11

打者 ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

①安打 ②三振 ③三振

●ストレート ▲カーブ ◀スライダー  
▶ツーシーム ■フォーク ▼シンカー  
◆チェンジアップ ◆カットボール ★その他

次ページ 1 2 3 4 5 6 7 8 9 計

ナ・リーグ	1	0	0	0	0	0	0	0		4
ア・リーグ	1	2	1	0	0	0	0	0		6

選手情報 スコア メンバー表 日本人選手 NHKトップ

# ARIB STD-B24

- B24 consist of three volumes (four books)
  - Volume 1: Mono media
  - Volume 2 (book1/book2): BML
  - Volume 3: Transmission
- Volume 2 consist of six parts
  - Main context (Standard)
  - Appendix 1 (Supplement of standard)
  - Appendix 2 (Basic profile)
  - Appendix 3 (Advanced profile)
  - Appendix 4 (Profile for Mobile phone)
  - Appendix 5 (Profile for Vehicle)

# Overview of datacasting services

See STD B24 Vol.1 Informative explanation 1

- Example of services
  - EPG : TV Program selection
  - Index: Choice of TV program, contents
  - Subtitle: Synopsis subtitle, multi-language
  - Commentary audio: for vision-impaired
  - Program supplemental information: Additional information of TV Program (ex. brief)
  - Multi-view television (Multi angle)
  - User interaction program: Shopping, Questionnaire

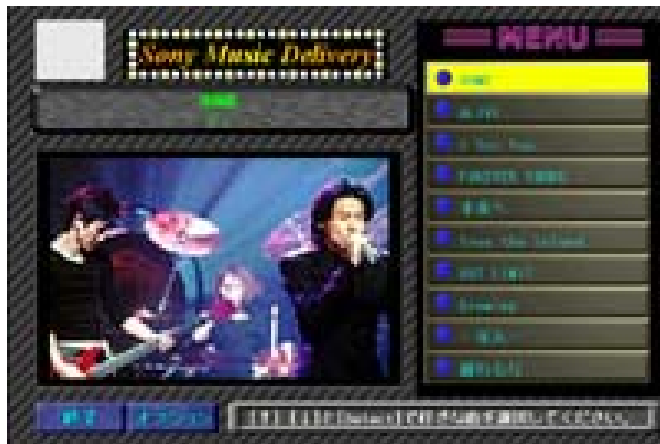
# BML

- Multimedia data representation coding scheme for Digital broadcasting
  - Specified in XML
  - Textual notation
  - Extension for broadcasting feature
- XHTML1.0 + ECMAScript + CSS1/2 + DOM1+ Broadcast Extension
  - All component defined by W3C, which is main stream for the internet content specification.
  - difference between broadcast content and internet content
    - bi-directional communication
    - hardware platform (CE vs PC)

# Difference between BML and HTML

Sample

BML



Suitable operation for TV

HTML



Feature

- Few hyperlinks per one screen
- Intuitive providing information by using bitmap and video
- Scroll is optional
- Update latest information automatically
- Synchronize between TV and Radio program

- Many hyperlinks in one screen
- Text centric information providing by small letter presentation
- Suppose to scroll functionality
- Need to push "reload" button for retrieving latest information generally



## 4.7 Video Coding for “One-seg” Service

- Video coding system; H.264/AVC( ITU-T Rec. H264|ISO/IEC 14496-10)
- Specified in ARIB-STD-B24, as one of Mono-media coding system
- Specified in Operational Guideline(TR-B14), as Video coding system for “One Seg” service

## EXAMPLE

### Recommended Operational Guideline for Baseline Profile (ARIB STD-B24 ANNEX G)

- Associated service requirement
  - (1) **Bitrate ; 64 – 384 Kbps**
  - (2) **Video format; SQVGA, 525QSIF, QCIF, QVGA, 525SIF, CIF**
  - (3) **Frame rate; 5,10, 12, 15, 24, 30 Hz (\*1000/1001), no limitation for frame skip**
  - (4) **Aspect ratio of picture; 4:3, 16:9**
- Operation level; any of level 1, 1.1, 1.2

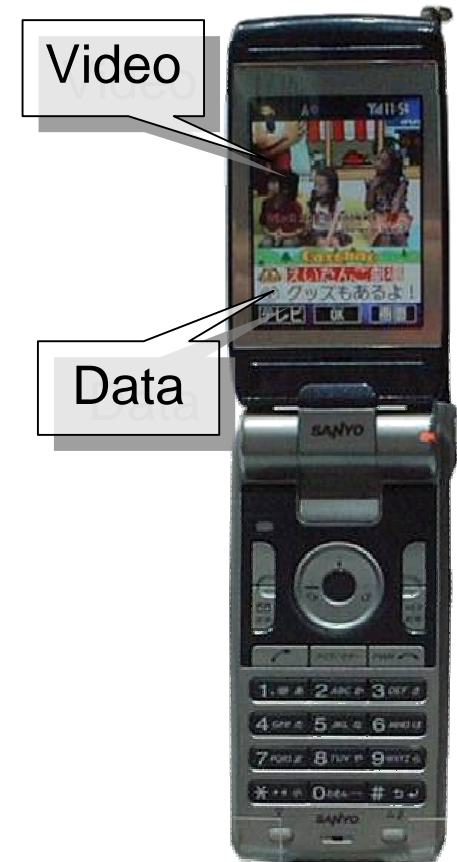
Parameter set of One-Seg broadcasting service



## One Seg Service video coding parameter set

parameter	Specification
<b>Coding system</b>	<b>H264/AVC</b>
<b>Profile/level</b>	<b>Baseline profile, level 1.2</b>
<b>Video format</b>	<ul style="list-style-type: none"><li>•320 Pixel * 240 line, or 320 pixel * 180 line</li><li>•Aspect ration of pixel; 1:1</li><li>•Minimum frame period; 1/15 second (video source; 30fps, or 24 fps)</li></ul>
<b>others</b>	<b>Compatible to ARIB STD-B24</b>

(specified in ARIB TR-B14)



# 5. Commonality with Narrow-band ISDB-T(ISDB-Tsb) (ARIB STD-B29)

1. ISDB-Tsb Transmission System
2. Consecutive Transmission System
3. Experimental Broadcasting Infrastructure
4. Examples of Prototype Receiver and Service

# 1. ISDB-T<sub>SB</sub> transmission system

## (1) What is ISDB-T<sub>SB</sub>

ISDB-TSB transmission system is unique in ISDB-T family. This transmission system has been standardized for narrow band ISDB-T transmission system, which is focused to audio and data service, therefore, called ISDB-TSB.

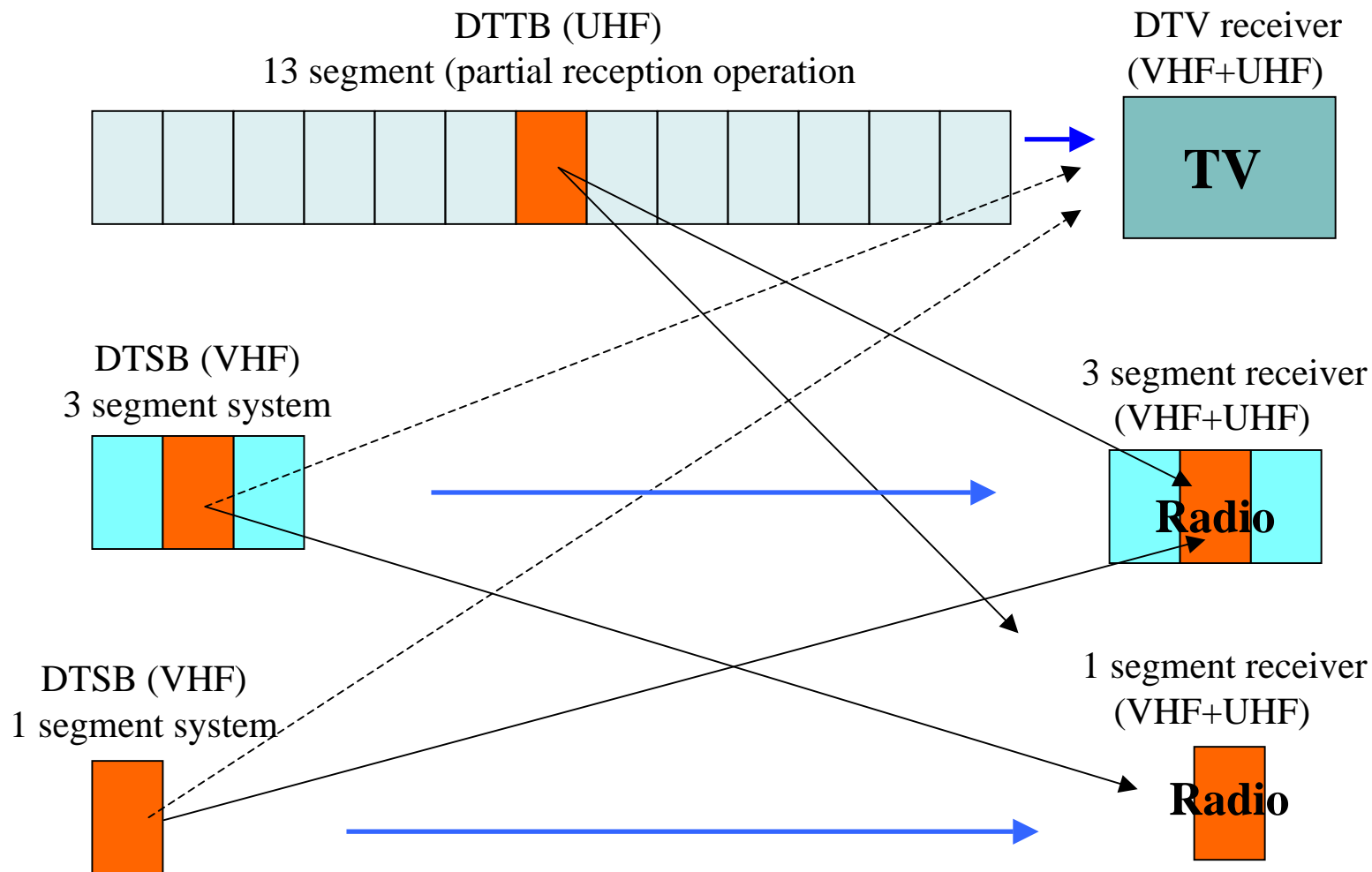
## (2) Commonality with ISDB-T

- (a) Same segment transmission construction. But ,considering narrow band reception, only 1 segment and 3 segment transmission systems are standardized
- (b) Adopt same transmission parameters as ISDB-T.
- (c) Commonality of 1 segment receiver with ISDB-T partial reception

## (3) Efficient use of frequency resource

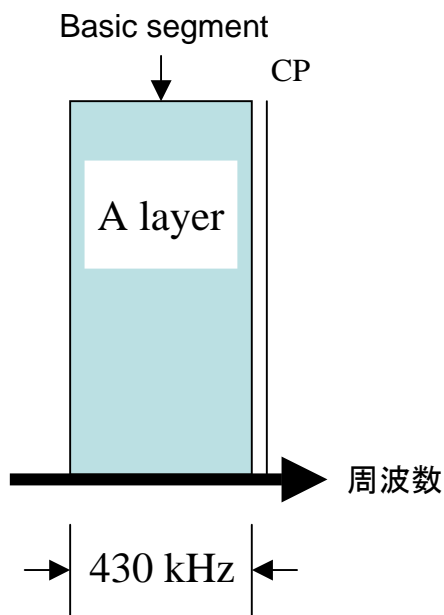
- (a) Consecutive transmission system. This system is unique for ISDB-TSB, this transmission system is to transmit plural channel without guard band
- (b) To achieve consecutive transmission, phase compensation technology at transmitter side is adopted

# Digital radio/digital TV compatible receiver

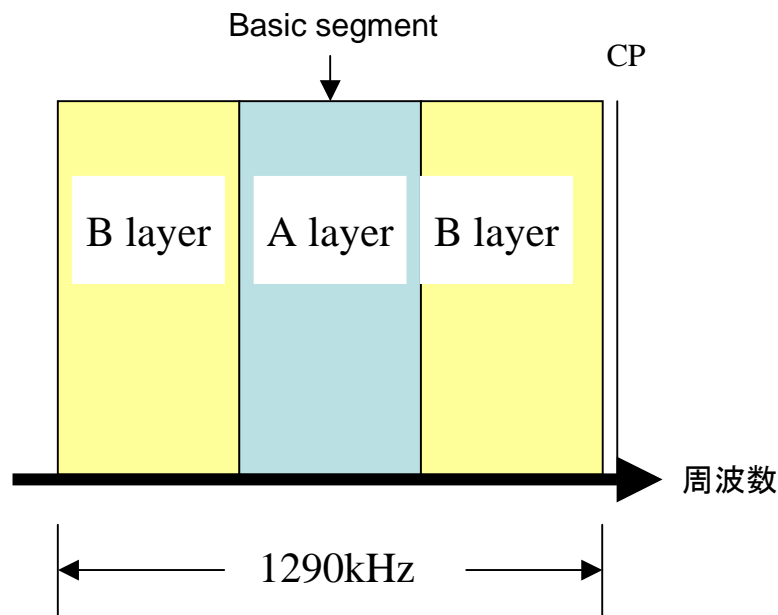


# Digital terrestrial broadcasting

## Spectrum of 1 segment system and 3 segment system



1 segment system



3 segment system

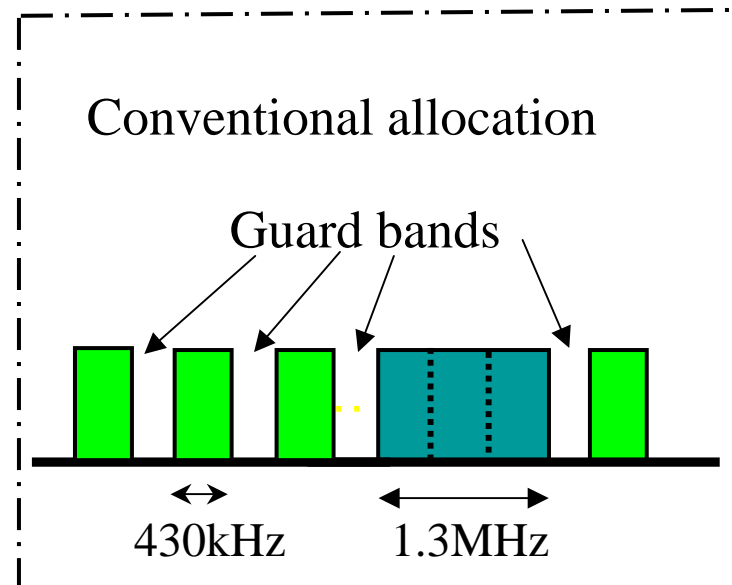
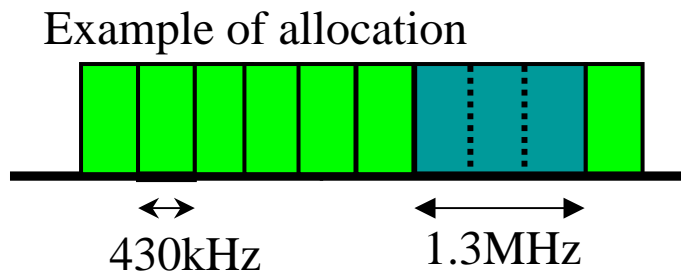
## Transmission parameters

Mode	1	2	3
Segment(s)	1 or 3		
Bandwidth	430kHz or 1.3MHz		
Carrier spacing	3.97kHz	1.98kHz	0.99kHz
Total carriers	109 / 325	217 / 649	433 / 1297
Data carriers	96 / 288	192 / 576	384 / 1152
TMCC,AC,CP, SP carriers	13 / 37	25 / 73	49 / 145
Modulation	QPSK, 16QAM, 64QAM, DQPSK		

## Spectrum utilization (2)

### Consecutive-segment Transmission of DSB channels

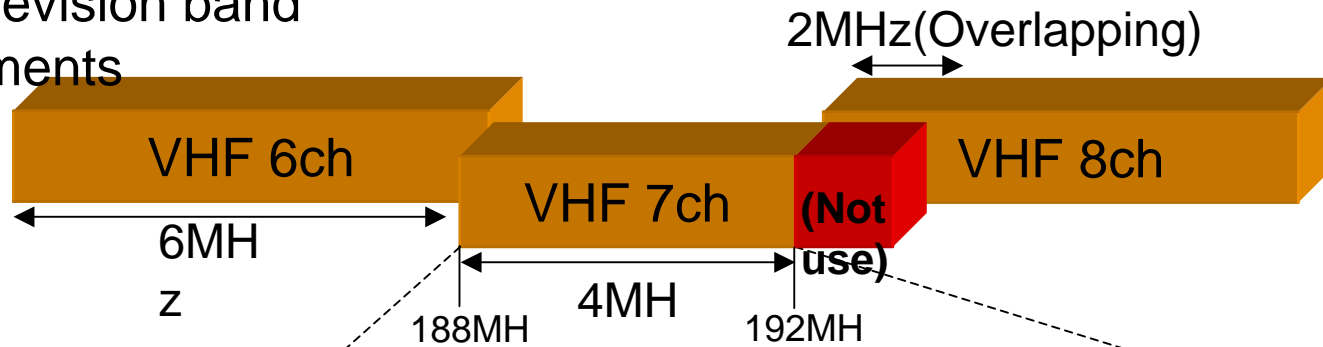
Transmission from single transmitter  
keeping OFDM -condition



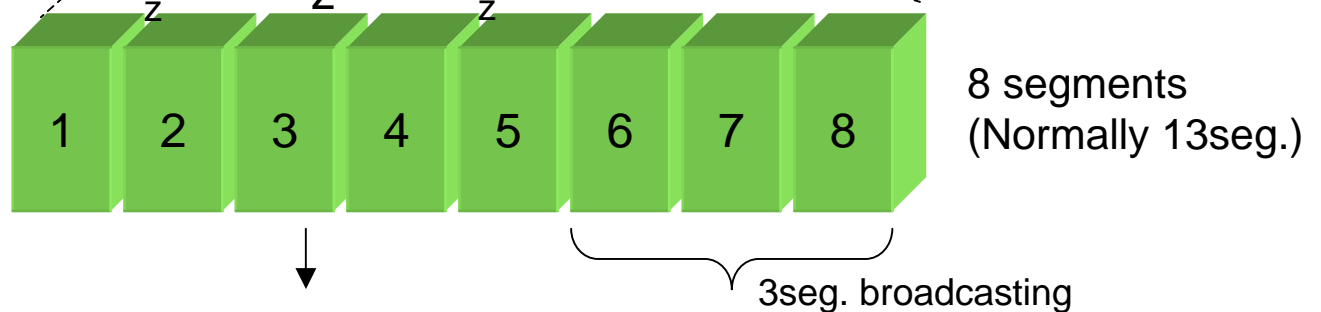
Frequency utilization efficiency will be improved up to 150%.

# Trial Services of DRP

VHF television band assignments



Segment structure



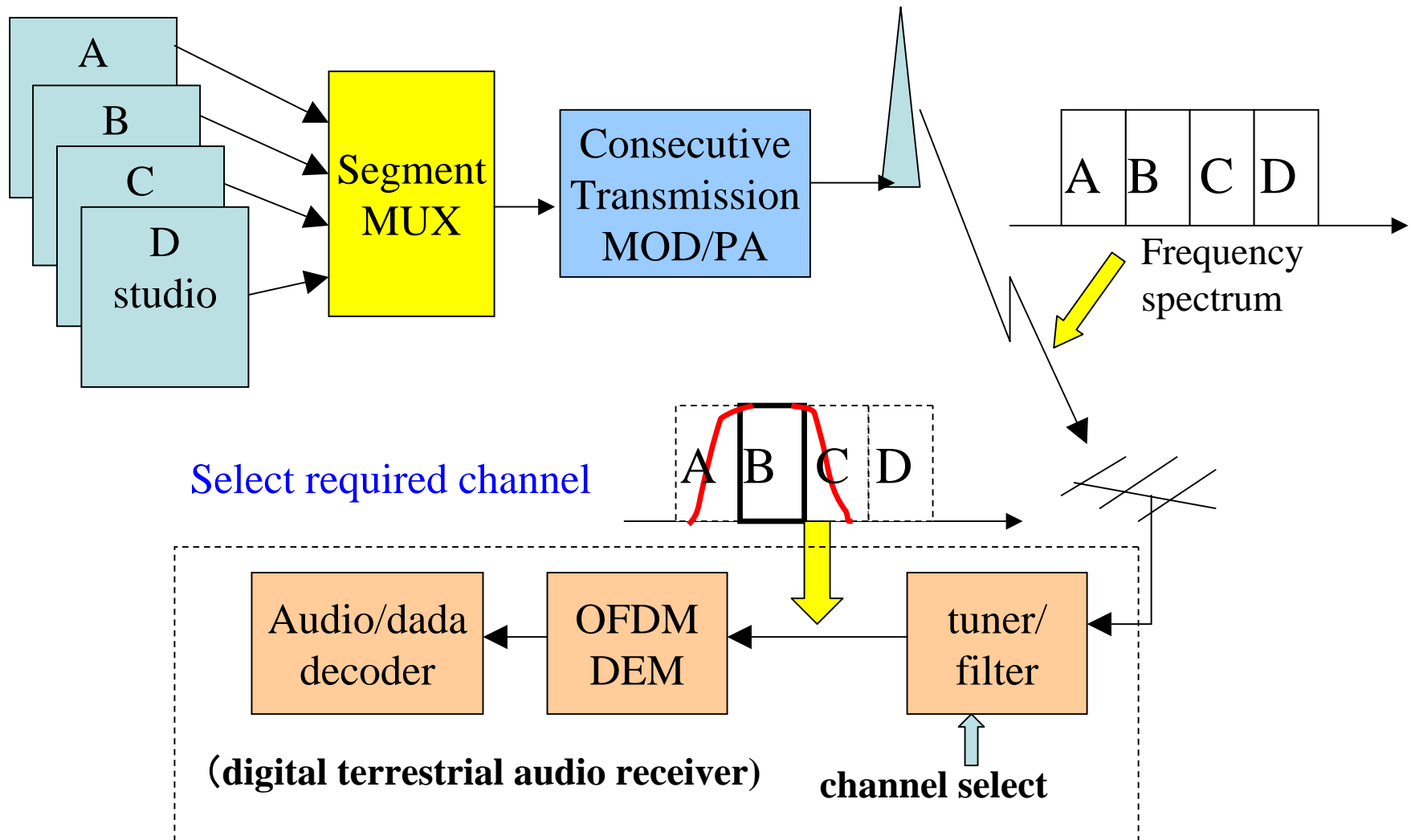
Broadcast programs



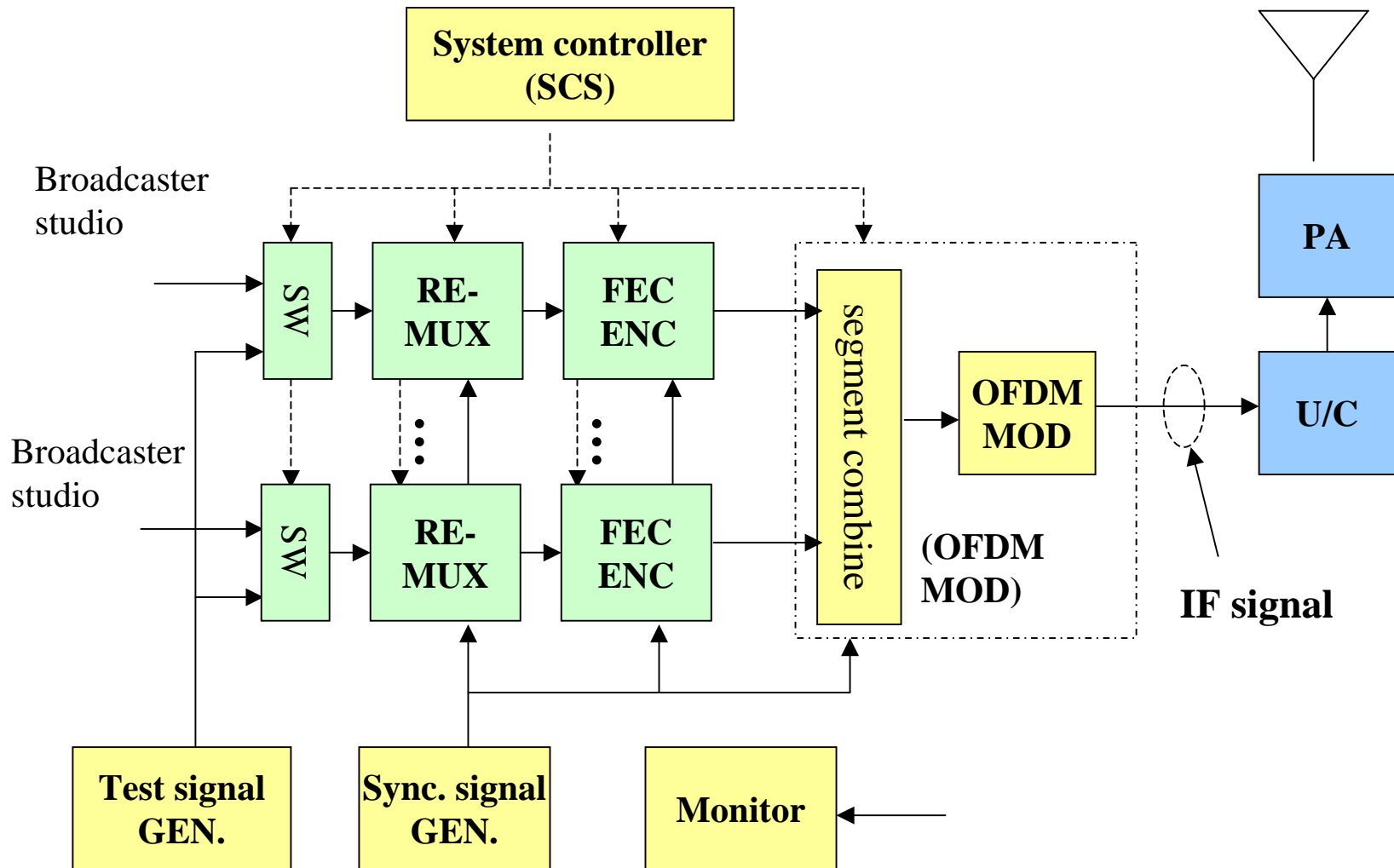
Above example is Tokyo station , Osaka's all programs are 1seg. broadcasting.



# Image of consecutive transmission and reception



# Details of ISDB-T<sub>SB</sub> transmitter block diagram



After RE-MUX , frame and clock of each channel are synchronized

## DRP Tokyo master rack room

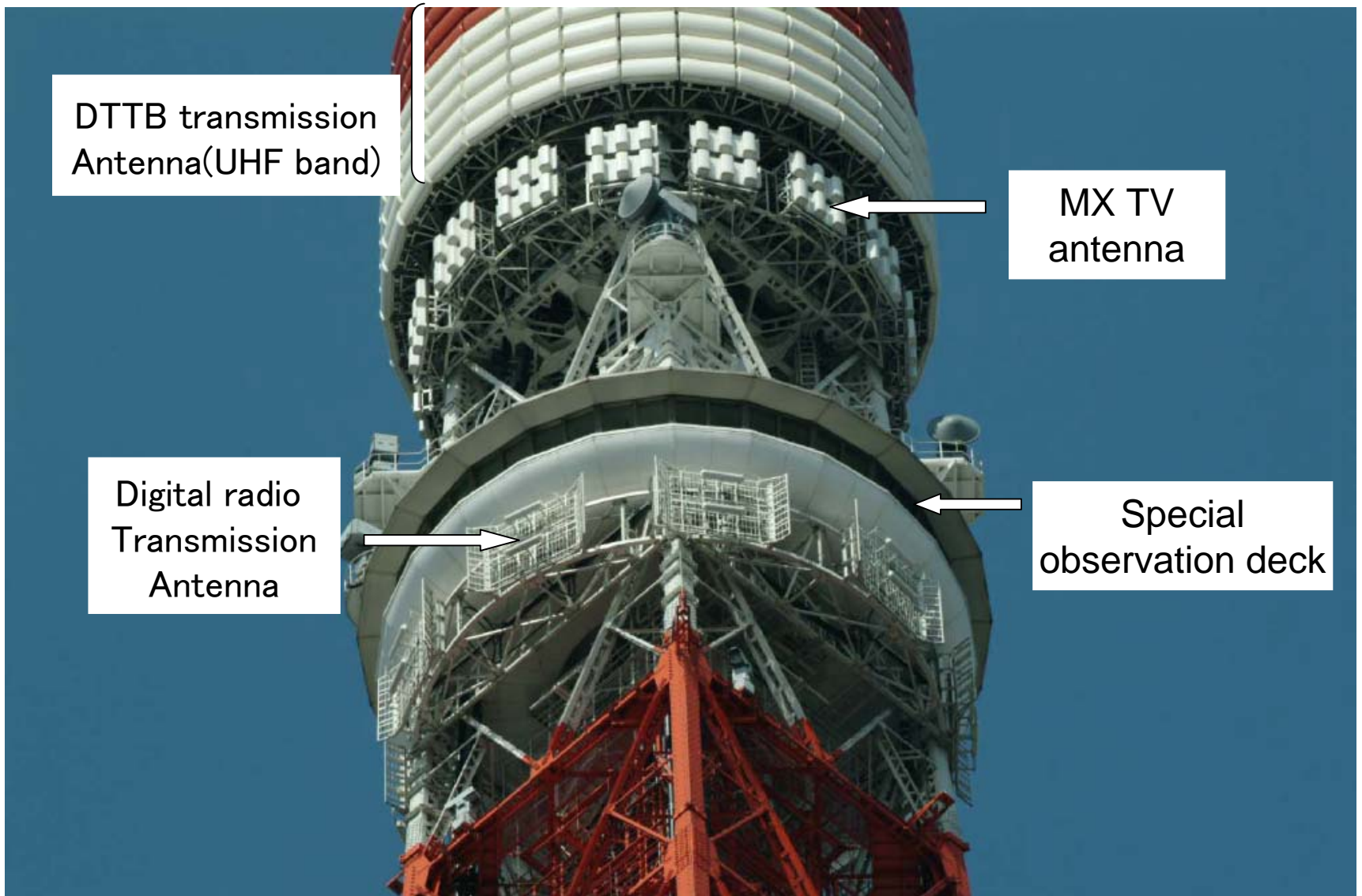


## DRP Tokyo digital radio transmitter room





## Antenna





DRP prototype receiver(1 segment)



PDA type prototype receiver (KDDI/TFM/Vitec)



**Pixela PC card type receiver**



# PC card type receiver (test product)



# <Digital radio trial broadcasting> Channel construction

## Tokyo


Apr. 1<sup>st</sup> 2004

<b>91</b> NHK VICS	<b>92</b> DR@ TOKYO92	<b>93</b> DigiQ+ N93	<b>94</b> DAZ94	<b>95</b> D95	<b>98</b> Digital Radio 98 The Voice
NHK VICS	FM Yokohama TBS radio & comunicati ons BAYFM Radio NIKKEI	NACK5 QR TV asahi (B member)	J-WAVE Mega-port Radio NIPPON	Ito-chu SONY	TOKYO FM NIPPON broadcasting JFNC (B member)

## DIGITAL BROADCASTING SYSTEM

Capy Radio Station

ON AIR



Rec


ON AIR

**『柴田玲のビタミンチャージ』**

TOKYO FM 柴田玲がメインパーソナリティーを務めるコーナー。  
ビタミンボイスでココロとカラダのリフレッシュ！！

番組のご意見ご感想は  
[readyaction@voice98.co.jp](mailto:readyaction@voice98.co.jp) まで。

「番組URL」  
<http://www.voice98.co.jp/readyaction/>  
もチェック。



DATA MENU

ON AIR

**10:00～11:00**  
**「READY ACTION」**  
今流行の情報をいち早く紹介。  
パーソナリティー：上柳まさひこ、柴田玲  
リクエストも受付中！

← OnAir EPG →

**PIXELA**  
corporation

PWR

1	2	3
4	5	6
7	8	9
*	0	#

C

◀ 98 ▶

◀ 01 ▶

Sound 1

EPG

SCAN

# Thank You for Your Attention

Digital Broadcasting Expert Group

**<http://www.dibeg.org/>  
mail; [info@dibeg.org](mailto:info@dibeg.org)**