

## Section 4

# Technical background of 1 segment partial reception (One-Seg)

June, 2007

Yasuo TAKAHASHI

DiBEG

(Toshiba)

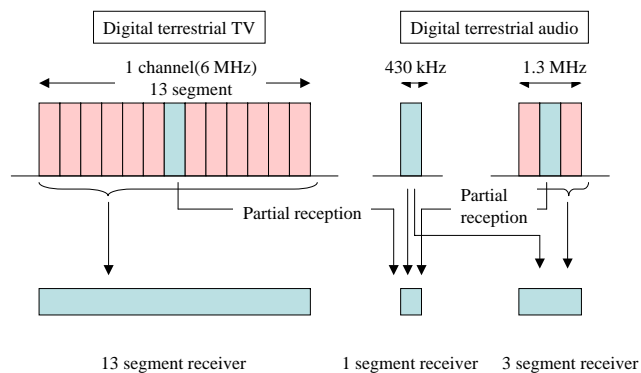
## Contents

1. Technical back ground of RF signal process
  - ◆ What is partial reception
  - ◆ Signal process of wide/narrow reception
  - ◆ Relations between wide/narrow transmission and wide/narrow reception
2. Reception control for partial reception
  - ◆ Unique rules for partial reception
  - PSI transmitted with partial reception layer
  - Rule of PCR transmission
3. Summary

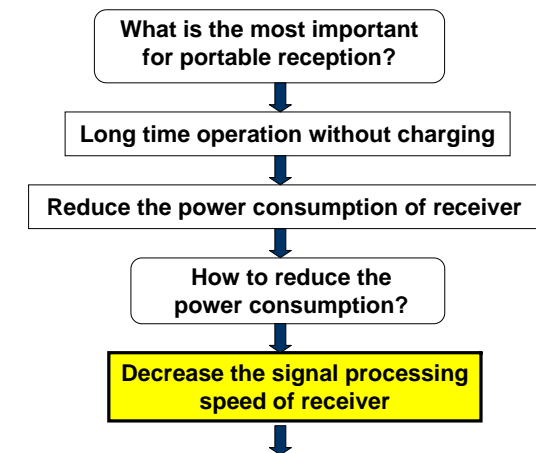
### 1. Technical back ground of RF signal process

## What is partial reception (One-Seg service)

- Partial reception (one-seg) service
  - In TV band, 1 segment service is available with fixed reception service

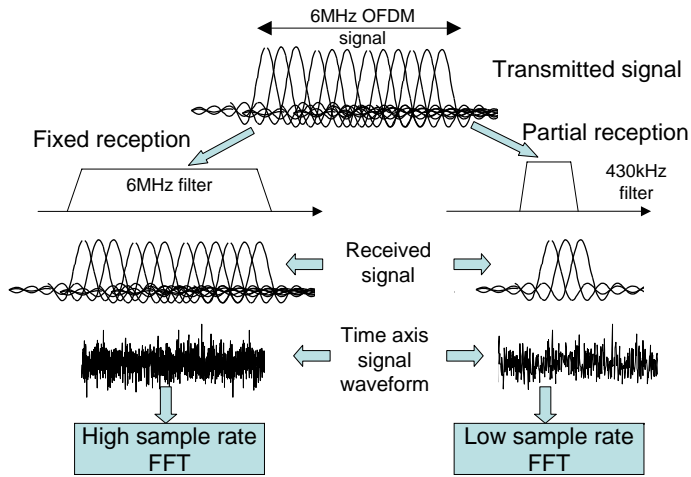


## What is the purpose of partial reception?



See next page

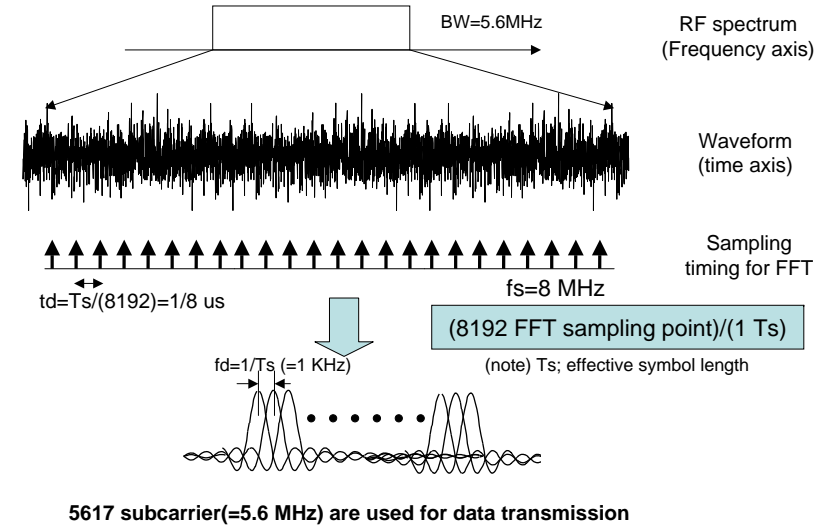
### Outline of receiver signal process



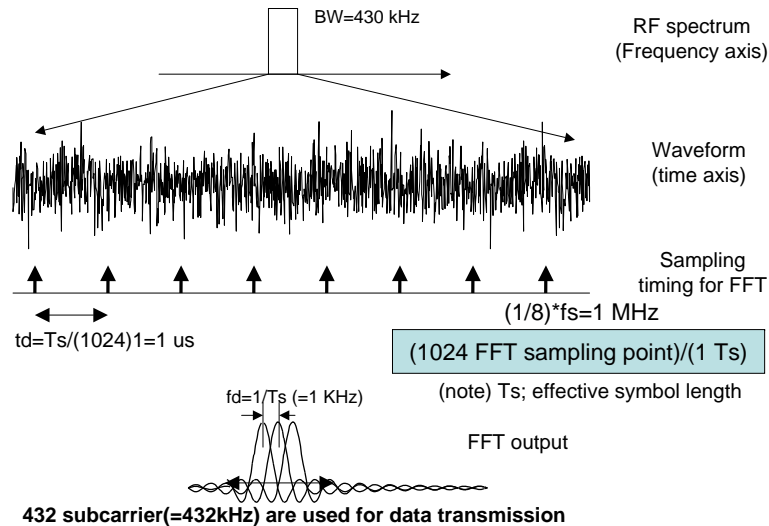
As shown above, narrow band reception signal speed is low, therefore, signal sampling rate can be decreased

### 1. Technical back ground of RF signal process

### Signal processing for 13 segment reception(mode 3)



### Signal processing for one segment reception(mode 3)



### Summary 1

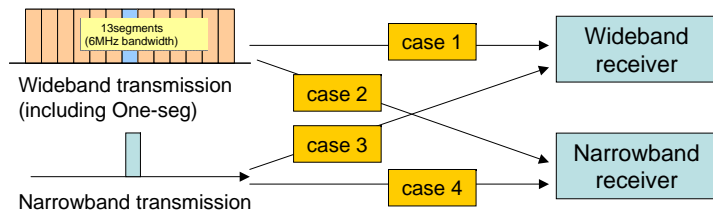
- For partial reception, signal processing speed is reduced to 1/8 of wideband reception (6MHz full band)
- Therefore, power consumption is extremely reduced.
- Of course, video/audio signal speed is also very low compared to wideband reception service.
- As a result, portable receiver is realized.

(note) DVB-H system adopt "time slicing" technology, time division multiplexing of video/audio data. But, demodulation portion is same as DVB-T(wideband reception), so, power consumption of demodulator is not reduced.

In next stage, explain the relationship between narrow band transmission/reception and wideband transmission/reception

1. Technical back ground of RF signal process

Relation between transmission BW and receiver BW

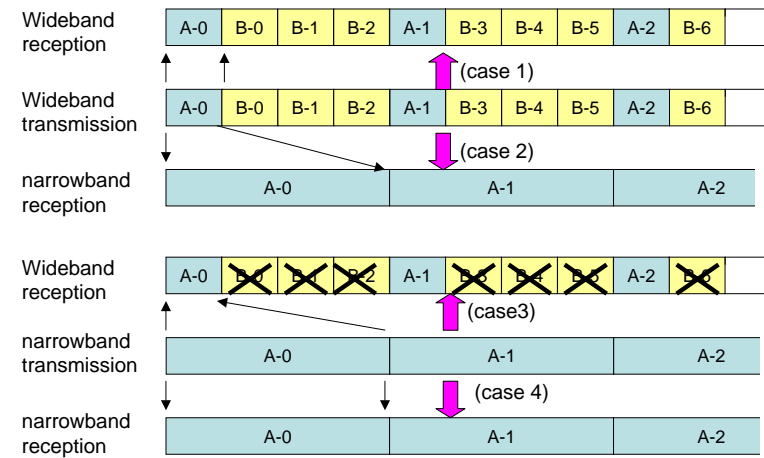


| case   | transmitting BW | receiving BW | possible ? | Service type               |
|--------|-----------------|--------------|------------|----------------------------|
| case 1 | wide            | wide         | yes        | TV fixed reception         |
| case 2 | wide            | narrow       | yes        | partial reception, (note)  |
| case 3 | narrow          | wide         | yes        | none                       |
| case 4 | narrow          | narrow       | yes        | 1 segment radio (ISDB-Tsb) |

(note) Consecutive segment transmission of digital terrestrial audio broadcasting is also another case.

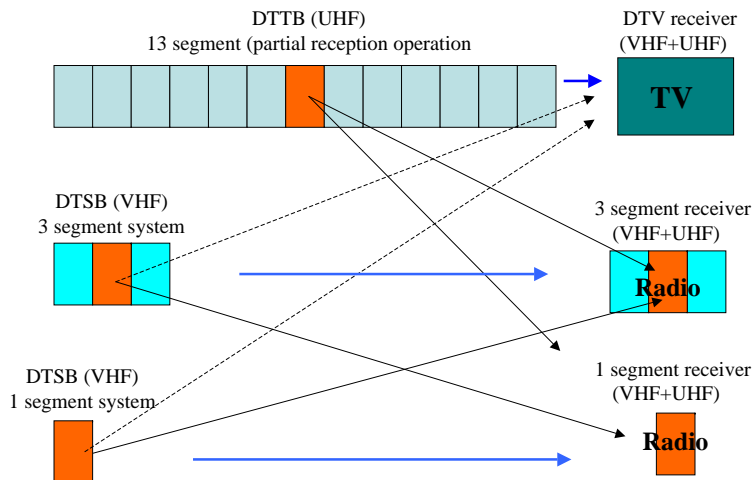
1. Technical back ground of RF signal process

Transmission rate of TS for wide/narrow transmission and wide/narrow reception

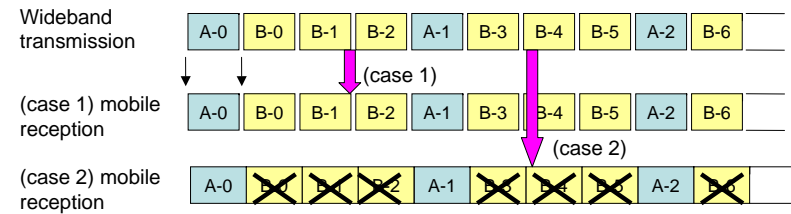


As shown above, output TS rate of narrow band receiver is lower than wideband receiver (in general, 1/8 of wideband receiver)

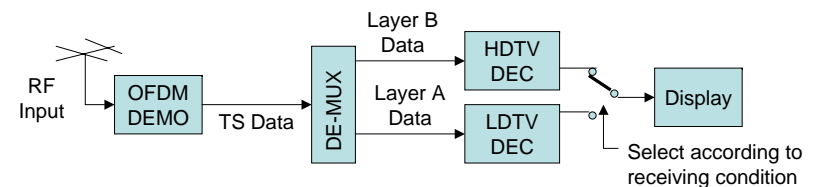
Digital radio/digital TV compatible receiver



Mobile receiver operation



(case 1) good receiving condition, (case 2) bad receiving condition  
As shown above, mobile receiver (wideband type) select any of B layer data (HDTV) or A layer data (LDTV) according to receiving condition. If program of A layer and B layer are same, mobile receiver can continue to give a TV service, even though receiving condition changes.



Operation image of Mobile Receiver

## Summary 2

●As shown in forward pages, narrowband receiver can receive following signals

- Wideband transmission which imply one segment service
- Narrow band transmission (one segment ISDB-Tsb)

↓

Commonality of "One-Seg" digital TV and digital audio receiver

## 2. Reception control for partial reception

### PSI/SI transmitted by partial reception layer (1/3)

#### a. Rule of partial reception

In partial reception operation, center 1 segment has 2 features,  
 (1) One of 1 segment for 13 segment  
 (2) It should be complete stream without other segment support

↓

**Key control information such as PSI should be transmitted within partial reception segment**

But, data capacity of 1 segment is few, therefore, it is desirable to decrease the data capacity of control information

See next page ←

↓

**How to harmonize these counter requirement**

## 2. Reception control for partial reception

### PSI/SI transmitted by partial reception layer (2/3)

#### Hierarchical Layers for Transmitting PAT, NIT, and CAT

| Condition |  | Hierarchical layer for transmitting PAT, NIT, and CAT*1   |
|-----------|--|---|
| 1         | Broadcasting with no partial reception | Multiplexed into the robustest layer*2  |
| 2         | Broadcasting with partial reception    | (1) Multiplexed into the layer for partial reception*2  |
|           |  | (2) Multiplexed into not only the layer for partial reception but also another layer if this layer is robuster than the layer for partial reception*2 |

\*1:CAT is required for conditional access service.

\*2:If the transmission in the hierarchical layers shown above is difficult, exceptional operations are also admitted. In this case, however, detailed operational provisions shall be set separately to ensure that services in each layer will be received successfully.

**(ARIB STD-B31, Appendix, section 3.2.1)**

## 2. Reception control for partial reception

### PSI/SI transmitted by partial reception layer (3/3)

#### Hierarchical Layers for Transmitting PMT

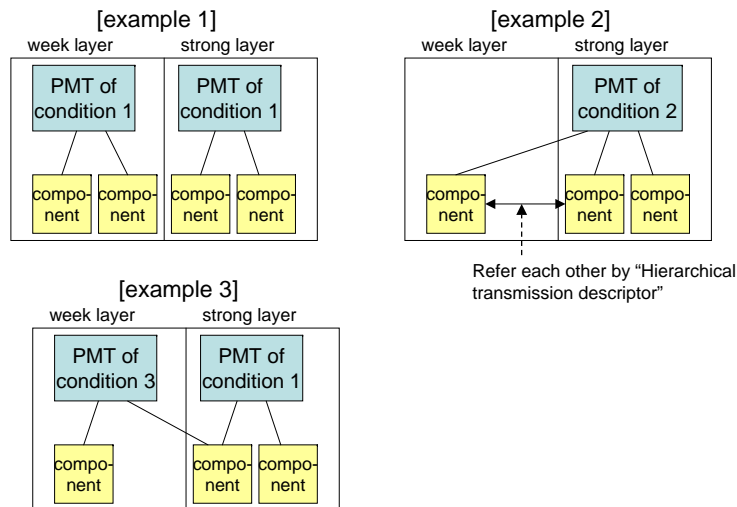
| condition |  | Hierarchical layer for transmitting PMT  |
|-----------|--|--|
| 1         | Partial-reception service  | Transmitted with the hierarchical layer for partial reception  |
| 2         | When a hierarchical transmission descriptor is used within PMT*1 | PMT should be transmitted at the robustest layer among those transmitting elementary streams (hereinafter referred to as "ESs"). However, PMT may be transmitted with the other hierarchical layer if it has robuster ranking of the layer than the layer specified above. |
| 3         | Service other than the above                                     | PMT should be transmitted with one of the hierarchical layers transmitting ESs. It may also be transmitted with another hierarchical layer if it has robuster ranking of the layer .   |

\*1:Services such as those in which video and other service qualities are changed in steps, in accordance with the reception status

**(ARIB STD-B31, Appendix, section 3.2.3)**

2. Reception control for partial reception

Image of layer construction of PMT and ES(component)



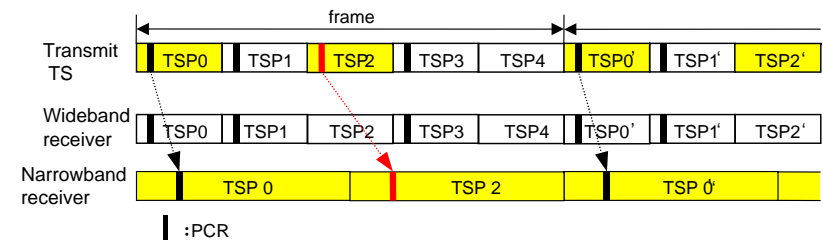
2. Reception control for partial reception

Rule of PCR transmission for partial reception

PCR (Program Clock Reference) is indispensable information for decoding program component.

For this requirement, the position of TSPs which include PCR should be located in fixed position. And also minimum number of PCR packet transmission in Multi-frame is also specified in operational guideline.

→ as a result, it is possible to receive one-seg service by narrow band receiver with low clock rate (details are shown separately)



Summary( final)

1. As shown in page 5 to page 7, narrow band receiver has a narrow band filter and low sampling rate FFT (in general, 1/8 of wideband receiver)
2. According to lower sample rate, the TS output transmission rate of demodulator portion is also 1/8 of wideband receiver
3. Decrease the sampling rate, and decrease the power dissipation. This is the mandatory requirement for mobile/handheld receiver
4. In addition above, by making use of partial reception technology, 2 type of service (fixed and mobile) can be available within one channel.
5. One-seg service is complete program stream even though a part of 13 segment. So, Key PSI should be transmitted in partial reception segment.
6. The position of TSPs which include PCR should be fixed to be able to be decoded PCR from partial reception segment only.

Thank you