HDTV Mobile Reception Performance for ISDB-T

SET 2006 CONGRESS
24th August, 2006

DiBEG JAPAN
Yasuo TAKAHASHI (Toshiba)
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What is ISDB-T?

• Integrated Service Digital Broadcasting – Terrestrial
• Standard system of Japanese DTDTV (Digital Terrestrial TV broadcasting)
• Based on Band segmented OFDM transmission technology
• Adopt the time interleaved technology for mobile reception
• Adopt MPEG2-Systems for Multiplexing

• Flexibility of reception style
  Fixed reception, Mobile reception, Portable reception within same channel
• Flexibility of service
  HDTV, SDTV, Small picture for portable receiver, data-casting, etc
• Inter-operability, etc.
What is Band Segmented OFDM with time interleave?

(Example; 1seg + 12 seg)

Layer A (LDTV, Audio, Data)

Layer B (HDTV or 3 SDTV with Data)

13 segments (6MHz bandwidth)

Handheld reception (One seg. Service)

Fixed reception, Mobile reception (HDTV, etc)

• **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)
Feature of Japanese DTTB system

- Fixed Reception: 13 segments
- Mobile/Handheld Reception: 13/1 segment
- Communication/Internet: 1 segment
- Home Receiver: 13 segments
- Receiver in Vehicle: (diversity reception)

Support 3 reception types by one channel.

Communication carrier and TV station connected to Handheld terminal.
Image of DTTV service in Japan

Broadcasters

Digital Broadcasting

10110...

Sports

News

Disaster

Anytime

Anywhere

While walking

In the train

In the bus

At home

For large Screen Television

High Definition Picture

High Quality Sound

Multiplexing to One Channel

HDTV Portable HDTV

12 Segment Compressed by MPEG2

1 Segment Compressed by H.264

Original Image

For Portable Terminal

For large Screen Television

Portable HDTV

Anytime

Anywhere

While walking

In the train

In the bus

At home

Compressed by MPEG2

Compressed by H.264

Original Image

For Portable Terminal
Why is mobile reception available?
What kinds of technologies are used?

1. Feature of transmission system
   - Time interleave (see next page)

2. Adopt new technology for reception
   - Space diversity reception

Space diversity reception technology for OFDM signal;
   Very unique technology is used, that is, “maximum ratio combining for each OFDM subcarriers”.
   This technology is very effective against frequency-selective fading
Effect of time interleave

**no time interleave**

Transmitter side

field strength varied

Transmitting delay

Receiver side

receiving delay

Error symbol

(Burst error)

(After de-interleave)

Error randomized

With time interleave
For diversity reception, quote NHK laboratory’s presentation

- Video on HDTV mobile reception
- Mobile reception environment
- Diversity technology for mobile reception

- Performance evaluation
  - Laboratory experiments
  - Mobile reception experiment in Nagoya
    - Experimental results of diversity receiver
    - Coverage prediction for the mobile reception
Receivers on the market

Digital Tuners of ISDB-T for car TV system

Panasonic TU-DTV100

Pioneer GEX-P7DTV

Alpine TUE-T300

These receivers use 2-branch carrier diversity.

Note: These pictures come from each company’s web site.
Thank You for Your Attention!

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