Future trend for the digital terrestrial broadcasting services

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Digital Broadcasting Expert Group (DiBEG)

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7. Internet TV
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Future plan and prospect for new DTTB services

- **Enlargement of service area**
  - Digital terrestrial television services will start all over the country from 2006.
  - Analog television broadcasting will come to an end on July 2011.

- **Prospect for new DTTB services**
  - Mobile reception services: HD, SD, Data
  - Interactive services
  - Home-server Broadcasting services
Mobile reception services

Background

ISDB-T (Japan’s Digital terrestrial television transmission system) has time interleaving function.

In addition, the research and development of space diversity technology has been done, and evaluated in field test.

As a result, HDTV reception in car become available.
HDTV mobile reception (1)

HDTV mobile reception for bigger screen in buses and trains

Broadcasting station

Direct Wave

Reflection Wave

Mobile Receiver
HDTV mobile reception (2)

Adaptive Array Antenna on the vehicle's window

4 Branch adaptive diversity antenna mixer

Antenna Gain Control Technique

HD receiver
Comparison test for HD mobile reception

Digital Broadcasting

Analog Broadcasting
Toyota Central Lab demonstrated HDTV Mobile Reception with Adaptive Array Antenna on 29th Jan. 2003.

- **UHF 15ch (whole segment reception)**
- **Mode 3, 64QAM, 3/4**
- **Guard interval: 1/8 (128 μs)**

**Pole type antenna** (conventional) vs. **Adaptive Array Antenna** (attached on car wind shield)

Reference: [http://ne.nikkeibp.co.jp/DTV/2003/01/1000016922.html](http://ne.nikkeibp.co.jp/DTV/2003/01/1000016922.html)
The demonstration is expected to see at ITS World Conference in Nagoya on October 2004.
Mobile reception in a train (1)

Experimental test result for mobile reception on train

**Indoor test result**
- QPSK, FEC=1/2, GI=1/4, Mode3,
- Max Speed=494km/h

**Field test result**
- Tohoku Shin kansen (bullet train)
- At Sendai city, Miyagi prefecture
- Constant speed 275km/h
- Mode2, FEC=1/2, GI=1/4, T.I=0.43ms, SFN
- Percentage of success reception rate (without tunnel area)
  - QSPK 90.3%
  - 16QAM 74.5%
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.
Portable reception on cellular phone (1)

History of Development by KDDI

Phase 1 (May 2003)
- Wireless LAN (to emulate Digital TV broadcasting)
- cdmaOne or PHS
- Contents Server

【Phase 1 Development】
- PDA based
- Broadcasting emulated by W-LAN
- HTML browser
- Links to communications server

Phase 2 (May 2004)
- GPS
- UHF Antenna & tuner
- OFDM demodulator
- GPS chip
- BML browser
- Contents to demonstrate interactive broadcast-communication services

TV Mobile Phone

CDMA2000 1X (or EVDO)

Digital terrestrial TV broadcasting
Specifications of TV Mobile Phone

<table>
<thead>
<tr>
<th></th>
<th>miniSD</th>
<th>OFDM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prototype</td>
<td>W11H</td>
<td></td>
</tr>
<tr>
<td>Weight</td>
<td>130g</td>
<td>140g</td>
</tr>
<tr>
<td>Size</td>
<td>50mm(W)×100mm(H)×38mm(D) Not Including OFDM Tuner</td>
<td></td>
</tr>
<tr>
<td>Battery</td>
<td>2-2.5 Hour</td>
<td>2 Hour</td>
</tr>
<tr>
<td>CPU</td>
<td>SH-Mobile</td>
<td></td>
</tr>
<tr>
<td>RAM</td>
<td>64 MB</td>
<td></td>
</tr>
<tr>
<td>LCD</td>
<td>QVGA</td>
<td></td>
</tr>
<tr>
<td>Memory</td>
<td>64MB (miniSD)</td>
<td></td>
</tr>
</tbody>
</table>

*MiniSD type terminal stores broadcast contents in its MiniSD memory card to emulate broadcast reception when RF signals are not available over the air.
# Specifications of the Software

## Broadcast Contents

<table>
<thead>
<tr>
<th>Multiplexing Type</th>
<th>MPEG-2 TS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Video</td>
<td>MPEG-4 Visual Simple Profile</td>
</tr>
<tr>
<td>Audio</td>
<td>MPEG-2 AAC LC</td>
</tr>
<tr>
<td>Data</td>
<td>BML Cellular Phone Profile (based on ARIB STD B24 Appendix 4) + KDDI Profile</td>
</tr>
<tr>
<td>Raster Picture</td>
<td>PNG</td>
</tr>
<tr>
<td>Vector Graphics</td>
<td>SVG</td>
</tr>
<tr>
<td>Sound</td>
<td>SMAF</td>
</tr>
</tbody>
</table>

## Data Communication Contents

<table>
<thead>
<tr>
<th>Communication Contents</th>
<th>XHTML Basic+CSS2 subset+ECMA Script + KDDI Profile</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raster Picture</td>
<td>PNG</td>
</tr>
<tr>
<td>Vector Graphics</td>
<td>SVG</td>
</tr>
<tr>
<td>EVDO Streaming Data</td>
<td>MPEG-2 TS (MPEG-4 Visual + MPEG-2 AAC)</td>
</tr>
<tr>
<td>Sound</td>
<td>SMAF</td>
</tr>
</tbody>
</table>
Portable reception on cellular phone (4)

Network topology of TV Mobile Phone

- Broadcast Server (TV Contents)
- OFDM Transmitter
- TV Contents Streaming Server
- Internet
- AU (KDDI) packet network (CPA/EVDO)
- SMS Push Server
- SMS: Short Message Service
- TV Mobile Phone
- Digital Terrestrial TV OFDM signal
- Wake-up call
- SMS messages

Portable reception on cellular phone (4)
Portable reception on cellular phone (5)

Implementation Schedule toward portable reception

- Service will start by the end of next year.
- Video compression system: MPEG4 AVC/H.264
- Patent agreed in March 2004
- Prototype receivers already developed by manufacturers
Portable reception on cellular phone (6)

Sample of prototype of receivers

- **SANYO**
- **NEC**
- **KDDI** (developed with NHK)
- **PANASONIC**
Portable reception on cellular phone (May, 2004)

Prototype of cellular phone receiver (May, 2004)

Example of parameters:
- Modulation: 16QAM
- Rate of convolution encoder: 1/2
- Guard interval: 1/4
- Bit rate per second: 630 kbps

One segment

13 segments (6MHz)

TV program
BML data
Panasonic announced ISDB-T one-segment front-end module for cellular phone and PDA.

- RF tuner circuit and OFDM demodulator are installed in this module.

- Specifications;
  - Size; 20mm × 28mm × 2mm
  - VHF 7ch, UHF 13～53ch
  - Length of the antenna; 50mm
  - Power Consumption; 200mW
  - Modulation; DQPSK and QPSK and 16QAM
Portable reception on cellular phone (9)

Examples of cellular phone services (1)

File Download (Music, Picture, Video)

1. Tune the favorite broadcast station.
2. Select the download list.
3. Certificate and storage via communication links.
4. Download on the table of contents lists.
5. Reproduce on the terminal.
Portable reception on cellular phone (10)

Examples of cellular phone services (2)

Download of Electronic Program Guide (EPG)

1. Tune the favorite broadcast station.
2. Select EPG.
3. If you want more details of program information.
4. Download EPG on EPG list via communication links.
Ticket sales/ TV shopping

1. Tune the favorite broadcast station.
2. Select the Ticket sales site.
3. Access to Ticket sales site via communication links.
4. Purchase, certificate and storage.
Portable reception on cellular phone (12)

Examples of cellular phone services (4)

Answer a Questionnaire

1. Tune the favorite broadcast station.
2. Watch the program and notice the Questionnaire.
3. Fill the questionnaire table.
4. Send your answer of questionnaire via communication link.

My answer on the questionnaire

a. Yes
b. No
c. No
Portable reception on cellular phone (13)

Other example for mobile reception

Car navigation system

PDA
(Personal Digital Assistant)
Server-type broadcasting service (1)

Outline of Server-type broadcasting service

- **Broadcaster**
  - Encryption
  - Metadata

- **Contents**
- **Metadata**

- **Conditional Access**

- **Broadband Network**
  - Certification and storage via Network

- **Storage**
  - Storage of Encrypted contents

- **Viewer**
  - Server-type receiver
Outline of Server-type broadcasting system

Broadcast station

- TV program system
- Data program system

MUX ↔ MOD

CAS Platform

- Encrypt Server
- Contents Server
- Clients Management Server

Subscription information

Home

- Receive/Storage
- Decrypt
- BML/Video

Telecom

HDD

Subscription information
Server-type broadcasting service (3)

Server-type broadcasting service image

- Free information services
- Pay per view type services
- Fixed amount subscription type services
- Contents purchase type services

Home server with large amount of storage capacity

Have fun any time
Local government service on DTTB (1)

Background

(1) Integrated service of DTTB/Communication is expected for administrative service.

(2) In Gifu prefecture, central area of Japan, conducted experimental test started on Feb. 2004 to evaluate the effect of integrated service of DTTB/Communication for local government community services.

(3) Local government, local public body, communication carrier, broadcaster and MPHPT participated this experimental test.
Outline of local government information service on DTTB (Gifu prefecture in 2004)

- **Gifu Data Center**
- **Local government**
- **Internet**
- **Broadcaster**
- **DTTB**
- **Public Facility Reservation**
- **Library Information**
- **What's new**
- **Q&A**

Monitor households (approximately 150 households)
Local government service on DTTB (3)

Data editing flow & transmission image

Data editing & Pre-view

Authoring Terminal → Pre-view & Transmission → DTTB Tuner → Receiver

Image of data broadcasting transmission

Text data

Picture data

Packetize

Carousel Transmission

Receive all packets and decode

• Text data
• Picture data
• BML
Local government service on DTTB (4)

Top page of Data broadcasting

Data Broadcasting headline

DTTB video & audio screen

Weather forecast

News headline
Local government service on DTTB (5)

Data broadcasting carousel contents

Top page of Gifu city

Service Menu of Gifu city

Sight seeing Guide

DTTB video & Audio
Local government service on DTTB (6)

Data broadcasting carousel contents

Headline of local government information

Porter to communication contents

DTTB video & audio screen
Local government service on DTTB (7)

Data broadcasting carousel contents

1. Guide & reservation service of sports facilities
2. Guide & rental service of city library
3. Information of historical library
4. Information of foods market
5. Sightseeing guide
6. Questionnaire
7. Mini-game

Gifu city information page
(Top page of communication contents)
Local government service on DTTB (8)

Data broadcasting carousel contents

**Information Services**

Local government information services are more familiar with TV viewers.

**Details of services**

Detail information services are sent from servers dedicated for this test via internet and/or telephone line with data modem. Monitor household look for this information on the portal pictures which are transmitted through DTTB data broadcasting channel of local broadcaster.

**Facilities reservation services**

Reservation service for public facilities. Viewers will make reservation for facilities via internet and/or telephone with data modem and certificate by registered ID/Password.
Home doctor service

- Programs receive via broadcasting wave.
- Personal information receive via Internet.
Internet TV (1)

Portal Site

Character Input Button

Internet Button

Operation Button

Access to Favorite Site
Internet TV (2)

Internet Screen

One Screen Mode

Internet Screen

TV Mode

Dual Screen (TV + Internet) Mode
Internet TV (3)

EPG and T-navi Portal Site

T-navi:
Dedicated sites for TV internet viewers
Internet TV (4)

T-navi Menu List

- NEWS
- Travel
- Shopping
Digital sound radio service (1)

Outline of Digital sound radio receiver

**Functions**

- Digital sound radio Tuning
- LP Moving Picture (SQVGA/QVGA)
- EPG Display
- BML Contents Display
- Mode Select (Std./LP/BML)
- Communication Control

**Display**

- LP Moving Picture Area for SQVGA
  *For QVGA, the picture size is 1/4
- BML Display Area
  Sec. of BML display function is compatible with ARIB STD-B24/TR-B13
- Full Size Display QVGA
  LP Moving Picture
- BML Display
Digital sound radio service (2)

Prototype of PDA D-radio Receiver
Thank you for your attention!

END

Digital Broadcasting Experts Group

http://www.dibeg.org