Section 2
Structure of ISDB-T system

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Digital Broadcasting Expert Group (DiBEG)
Japan
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1. Structure of Digital Broadcasting

- Fixed/mobile service
- Source coding (any of service are available)
- Common interface (Transport Stream interface)
- Multiplex
- Common interface (Framed Transport Stream interface)
- Transmission coding

- Multiplex (Based on MPEG-2 systems)
- MPEG-2 Video coding
- MPEG-AAC Audio coding
- Data coding (note)
- H.264 video coding

- Single carrier
  - 8-PSK/PSK (satellite)
  - 64QAM (cable)
- Segmented OFDM QAM/DQPSK With time interleave (terrestrial)

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

2. Digital Broadcasting Standard in Japan

- Video/Audio Coding (STD-B32)
- Data Broadcasting (STD-B31)
- Multiplex (STD-B24)
- Satellite TV (STD-B20)
- Terrestrial TV (STD-B21)
- Terrestrial Audio (STD-B29)
- Satellite Audio (STD-B41)
- Cable TV (JCL SPC-001)
- RMP (STD-B25)
- Satellite/ Terrestrial TV (STD-B30)
- Satellite Audio (STD-B42)
- Cable TV (JCTEA STD-004)

Source coding and MUX systems are common for each system

Transmission systems are different

Note: Cable transmission system standards are defined at another consortium.
2. Digital Broadcasting Standard in Japan (continued)

<table>
<thead>
<tr>
<th>Digital Television</th>
<th>Digital Sound</th>
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</thead>
<tbody>
<tr>
<td>BS / wCS</td>
<td>Terrestrial</td>
</tr>
<tr>
<td>System</td>
<td>STD-B20</td>
</tr>
<tr>
<td>Multiplex</td>
<td>Coding &amp; Multiplexing</td>
</tr>
<tr>
<td>Service Information</td>
<td>STD-B10</td>
</tr>
<tr>
<td>Source coding</td>
<td>Coding &amp; Multiplexing</td>
</tr>
<tr>
<td>Data Broadcasting</td>
<td>Presentation Engine (BML)</td>
</tr>
<tr>
<td>CAS</td>
<td>Conditional Access</td>
</tr>
<tr>
<td>Home servers</td>
<td>System based on Home Servers</td>
</tr>
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<td>Receivers</td>
<td>STD-B21</td>
</tr>
<tr>
<td>Operational Guidelines</td>
<td>TR-B15</td>
</tr>
</tbody>
</table>

3. Outline of ARIB Standards

<table>
<thead>
<tr>
<th>Name</th>
<th>Outline</th>
<th>note</th>
</tr>
</thead>
<tbody>
<tr>
<td>Video/Audio coding (STD-B32)</td>
<td>-Based on MPEG-2 video coding</td>
<td>-Cover 1080i,720p,480p,480i</td>
</tr>
<tr>
<td></td>
<td>-Based on MPEG AAC audio coding</td>
<td>-Up to 5.1 Stereo audio</td>
</tr>
<tr>
<td></td>
<td>-Based on MPEG systems multi-plex</td>
<td></td>
</tr>
<tr>
<td>Data Broadcasting (STD-B24)</td>
<td>-Data broadcasting description</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-Data transmission format</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-Small size Video coding(MPEG-4,H.264)</td>
<td></td>
</tr>
<tr>
<td>Program line-up information (STD-B10)</td>
<td>-PSI/SI description</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-EPG description</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-Necessary for program selection</td>
<td></td>
</tr>
</tbody>
</table>

3. Outlines of Standards (continued)

<table>
<thead>
<tr>
<th>Name</th>
<th>Outline</th>
<th>note</th>
</tr>
</thead>
<tbody>
<tr>
<td>Satellite TV (STD-B20)</td>
<td>-Slot structure</td>
<td>2 HDTV programs are multi-plexed into 1 transponder</td>
</tr>
<tr>
<td></td>
<td>-Trellis+RS(Concatenated coding)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-Single carrier 8 PSK modulation</td>
<td></td>
</tr>
<tr>
<td>Terrestrial TV (STD-B31)</td>
<td>-Segment structure</td>
<td>1 segment transmission is available</td>
</tr>
<tr>
<td></td>
<td>-Viterbi+RS (Concatenated coding)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-Multi-carrier(OFDM) transmission</td>
<td></td>
</tr>
<tr>
<td>Terrestrial Audio (STD-B29)</td>
<td>-1 and 3 segment transmission</td>
<td>1 segment system is compatible to 1 segment of TV</td>
</tr>
<tr>
<td></td>
<td>-Others are almost same as STD-B31</td>
<td></td>
</tr>
<tr>
<td>Satellite Audio (STD-B42)</td>
<td>-Multiplex 64 CDM channel</td>
<td>Adopt “AAC+SBR” 2.6GHz Band</td>
</tr>
<tr>
<td></td>
<td>-Viterbi+RS (Concatenated coding)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-CDM-BPSK/QPSK transmission</td>
<td></td>
</tr>
</tbody>
</table>
3. 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

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Abstract

As you know, Brazilian DTT standard, named SBTVD-T, is based on Japanese DTT standard, named ISDB-T. But, Brazil introduces several difference points from ISDB-T because of following reasons,

(1) Adopt new technologies
(2) difference based on culture, regulation, broadcast service, etc

But, essentially almost same, so these are family standards.

(note) Japanese engineers do not know the details of SBTVD-T. So, it is better that Brazilian relatives should present the details of Brazilian standard including background and concept.

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The relationship between ISDB-T(Japan) and SBTVD-T(Brazil)

Topics; Brazil and Japan agreed as follows in 2nd Joint WG held on 10th -12th, April 2007.

(1) Use common name as international standard
(2) Brazil and Japan customize their own specifications which are harmonized to broadcasting service of each country within the range of international standard described above.

(note) Brazilian Digital Terrestrial TV standard(SBTVD-T) is now on standardization process. This presentation is based on Draft version of SBTVD-T, therefore, contents will be changed after SBTVD-T concreted.
### Figure 1-1  Digital Broadcasting Standard in Japan

- **Source coding**
  - Video/Audio Coding (STD-B32)
  - Data Broadcasting (STD-B24)
- **Transmission coding**
  - Satellite TV (STD-B20)
  - Terrestrial TV (STD-B31)
  - Terrestrial Audio (STD-B29)
  - Satellite Audio (STD-B41)
  - Cable TV (JCL SPC-001)
- **Receiver**
  - Satellite/ Terrestrial TV (STD-B21)
  - Terrestrial Audio (STD-B30)
  - Satellite Audio (STD-B42)
  - Cable TV (JCTEA STD-004)

Source coding and MUX systems are common for each system.

Transmission systems are different.

Note: Cable transmission system standards are defined at another consortium.

### Table 1-1 Comparison of ISDB-T and SBTVD-T

<table>
<thead>
<tr>
<th>Area</th>
<th>ISDB-T</th>
<th>SBTVD-T</th>
<th>note</th>
</tr>
</thead>
<tbody>
<tr>
<td>Terrestrial transmission</td>
<td>ARIB STD-B31</td>
<td>SBTVD No.1</td>
<td></td>
</tr>
<tr>
<td>Audio/Video coding</td>
<td>ARIB STD-B32</td>
<td>SBTVD No.2</td>
<td>(note 1)</td>
</tr>
<tr>
<td>Multiplexer</td>
<td>ARIB STD-B10/ STD-B32</td>
<td>SBTVD No.3</td>
<td>(note 2)</td>
</tr>
<tr>
<td>Receiver</td>
<td>ARIB STD-B21</td>
<td>SBTVD No.4</td>
<td></td>
</tr>
<tr>
<td>Digital Right Management</td>
<td>ARIB STD-B25</td>
<td>SBTVD No.5</td>
<td></td>
</tr>
<tr>
<td>Data coding</td>
<td>ARIB STD-B24</td>
<td>SBTVD No.6</td>
<td></td>
</tr>
<tr>
<td>Return channel</td>
<td>ARIB TR-B14</td>
<td>SBTVD No.7</td>
<td></td>
</tr>
</tbody>
</table>

(note 1) Specification of LDTV is defined in ARIB STD-B24 (in Japan)
(note 2) parts of signal structure and format are defined in STD-B32, parts of control table/information are defined in STD-B10 (in Japan)

### 1. Transmission system

**The Brazilian standard is essentially adherent to ARIB standard**

That is: (1) segment transmission with Time Interleave
(2) stationary/mobile/portable reception service in one channel
(3) One-seg service is available
(4) SFN is also possible

**Difference points are;**

(1) Channel; Japan:470-770MHz, Brazil: 174-216MHz & 470-806MHz
(2) IF frequency; Japan; 57MHz, Brazil; 44MHz (same as analog TV)
(3) Spectrum mask of transmission; Brazil specified 3 types

As described above, both Japan and Brazil system have almost same performances.
2. Video/Audio coding system

(1) Video coding system
   (a) Video compression; Japan; MPEG-2, Brazil; H.264
   (b) Video format; 480i, 480p, 720p and 1080i (same Japan and Brazil)
      (note) Compression system is different, but video format is same, so,
      both system support SDTV and HDTV

(2) Audio coding system
   (a) Audio compression; MPEG-AAC (same as Japan and Brazil)
   (b) Audio format; Monaural, stereo, multichannel stereo (3/1, 3/2,
      3/2+LFE) (same as Japan and Brazil)

(3) Portable service system (note)
   Both Japan and Brazil adopt H.264 (MPEG-4 AVC), but for profile/level,
   Brazil specified up to 30 frame per second (level 1.3)
   This system is used for One-seg service
   (note) the specification of this system is written in STD-B24 (Japan)

3. Multiplex system

• The Brazilian standard is essentially adherent to ARIB standard

• Difference points are;
  (1) In Brazil system, Age screening is introduced because of regulation
  (2) Program Categoly; Brazilian system is essentially adherent to
      ISDB table, but adapted to Brazilian cultural practices.
  (3) Other several points are different because of the difference of
      operation, culture, etc

As described above, from technical aspect, Japan and Brazil systems are
Same, differences are only based on culture/operation difference

4. Receiver

• Basically adherent to ARIB standard B-21

• At several points, differ from Japanese standard because of
  culture, regulation and service style, not because of technical
  reasons

• Support 3 types of receiver, fixed/mobile/portable

5. DRM (Digital Rights Management)

• Japanese system uses B-CAS card

• Brazilian system is now on standardization process
6. Data casting

- Japan; 2 types of Data casting are specified
  - ARIB STD-B24: Presentation Engine (PE) base.
  - But, B23 is not used now, only B24 is service in.

- Brazil; now on standardization process based on GINGA

END of Seminar #2

Thank you for your attention