



Features of ISDB-T and Activities to spread watching DTV in Japan

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Jakarta, Indonesia

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DiBEG

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What is DiBEG?

- **The Digital Broadcasting Experts Group (DiBEG)** was founded in September 1997 for the key forces to promote the Japanese Digital Terrestrial Broadcasting System ISDB-T and ISDB-T_{SB} into the world.
- Today, **DiBEG** has 25 members, including broadcasters, broadcast equipment manufacturers and consumer electronics manufacturers etc.
- **DiBEG** is now one committee of ARIB (Association of Radio Industries and Businesses)

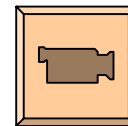


Features of ISDB-T



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 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

Market Requirements for ISDB-T

- HDTV
- Multi SDTV
- Mobility
- Portability
- Data Broadcasting
- Effective Spectrum Utilization
- Flexibility



The Correct Design of the System

Technical Specifications

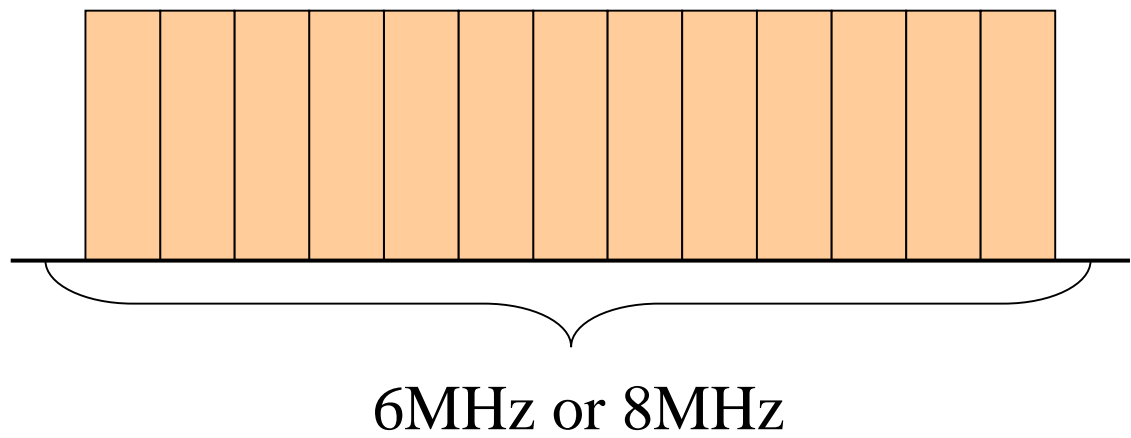
- OFDM
 - Robustness, SFN (Single Frequency Network)
- Segmented Structure
 - Extensible, Partial Reception
- Time Interleaving
 - Mobile Reception, Indoor Reception
- TMCC (Transmission and Multiplexing Configuration Control)
 - Flexible, Versatile

Transmission Scheme

- Band Segmented Transmission OFDM
 - Bandwidth of an OFDM-Segment:
 - $6/14\text{MHz}$ (428.6kHz) or $8/14\text{MHz}$ (571.4kHz)
 - Number of OFDM Segments: 13



Segmented Structure and Partial Reception

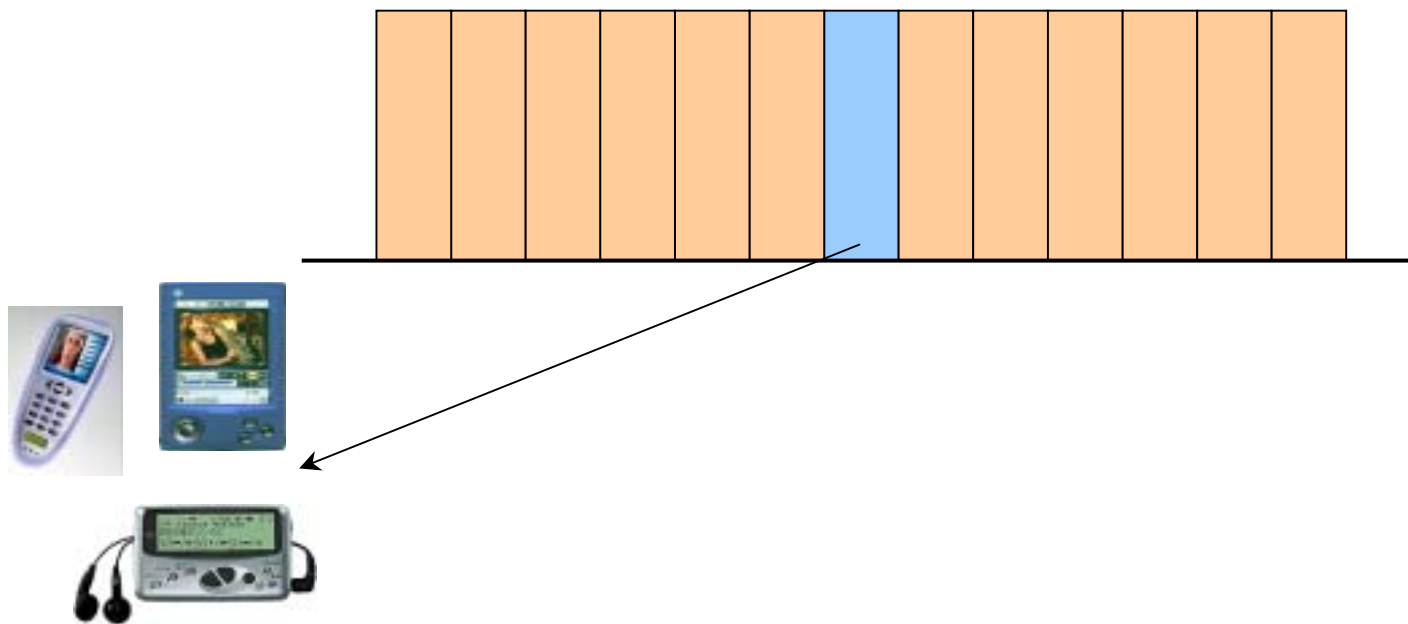


Transmission Scheme

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 - One-segment ISDB-T receiver can receive a centered segment of ISDB-T signal.



Segmented Structure and Partial Reception





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- Hierarchical Transmission
 - Three layers
 - Modulation, Coding rates, Length of Time interleaving

Segmented Structure and Partial Reception

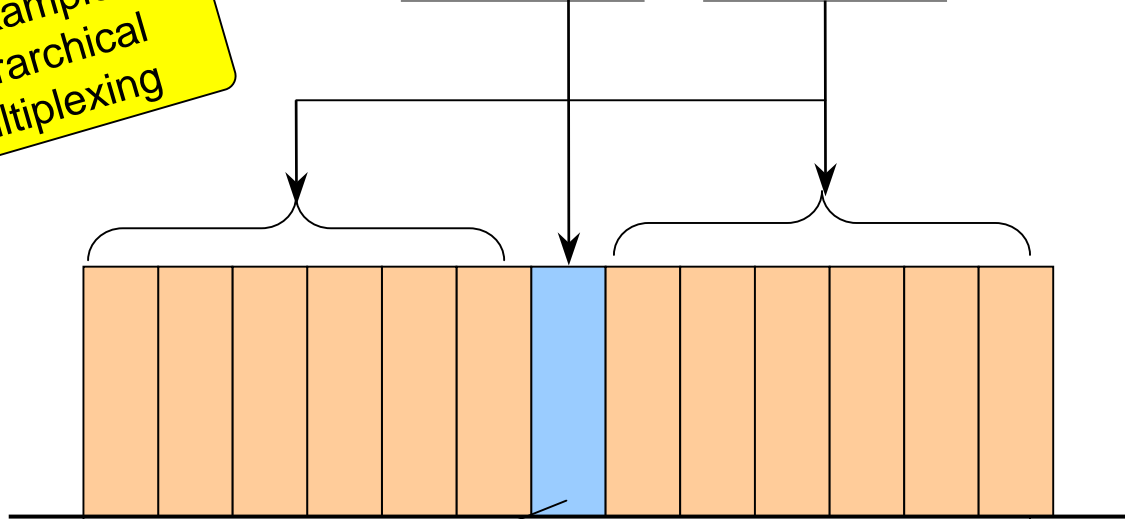
An Example of Hierarchical Multiplexing

Sound / Data

Layer A

HDTV

Layer B



	64QAM	16QAM
Parameter	3/4	1/2
	12 segments	1 segment
Bit rate	16.9 Mbps	630 kbps





Three Mode of ISDB-T

	Mode1(2K)	Mode2(4K)	Mode3(8K)
DQPSK	Mobile SDTV	Mobile & Fixed	Fixed HDTV/SDTV
QPSK			
16QAM			
64QAM			

TMCC can change the mode any time to any combination.



Parameters of ISDB-T

(6MHz Bandwidth)

<i>ISDB-T Mode</i>	<i>Mode 1</i>	<i>Mode 2</i>	<i>Mode 3</i>
No. 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	DQPSK, QPSK, 16QAM, 64QAM		
Active Symbol Duration	252 μ sec	504 μ sec	1,008 μ sec
Guard Interval Duration	1/4 , 1/8 , 1/16 , 1/32 of Active Symbol Duration		
No. of Symbols per Frame	204		
Time Interleaving	0, 0.125, 0.25, 0.5sec		
Inner Coding	Convolutional Code (1/2, 2/3, 3/4, 5/6, 7/8)		
Outer Coding	RS(204, 188)		
Useful Bit Rate	3.65Mbps ~ 23.23Mbps		
Hierarchical Transmission	up to Three Layers		



Parameters of ISDB-T

(8MHz Bandwidth)

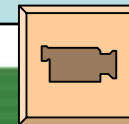
<i>ISDB-T Mode</i>	<i>Mode 1</i>	<i>Mode 2</i>	<i>Mode 3</i>
No. of OFDM Segment	13		
Useful Bandwidth	7.434MHz	7.431MHz	7.430MHz
Carrier Spacing	5.291kHz	2.645kHz	1.322kHz
Total Carriers	1405	2809	4992
Modulation	DQPSK, QPSK, 16QAM, 64QAM		
Active Symbol Duration	189 μ sec	378 μ sec	756 μ sec
Guard Interval Duration	1/4 , 1/8 , 1/16 , 1/32 of Active Symbol Duration		
No. of Symbols per Frame	204		
Time Interleaving	0, 0.125, 0.25, 0.5sec		
Inner Coding	Convolutional Code (1/2, 2/3, 3/4, 5/6, 7/8)		
Outer Coding	RS(204, 188)		
Useful Bit Rate	4.87Mbps ~ 30.98Mbps		
Hierarchical Transmission	up to Three Layers		



DTTV System Selection Guideline

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

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

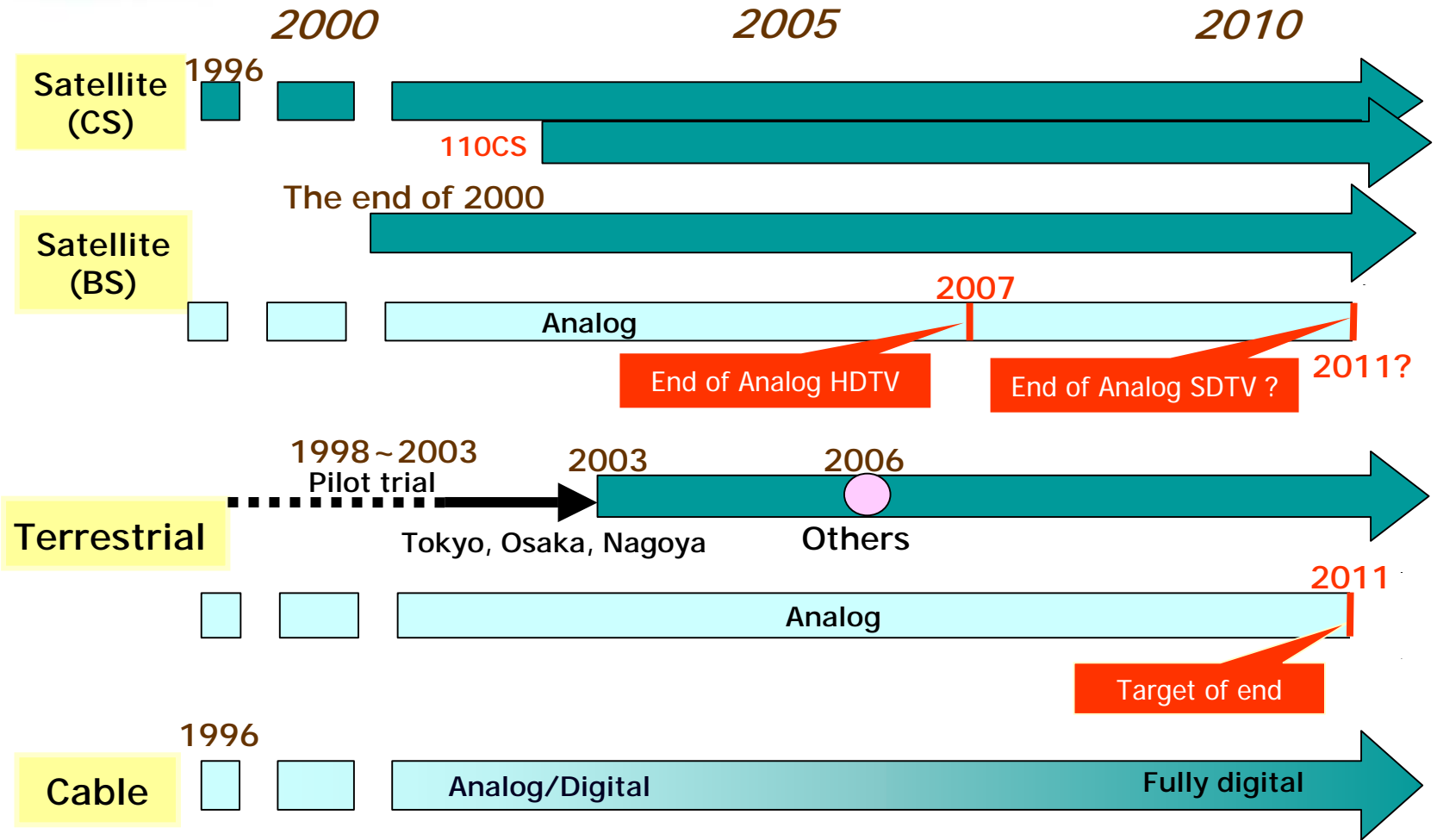




Activities to spread watching DTV in Japan

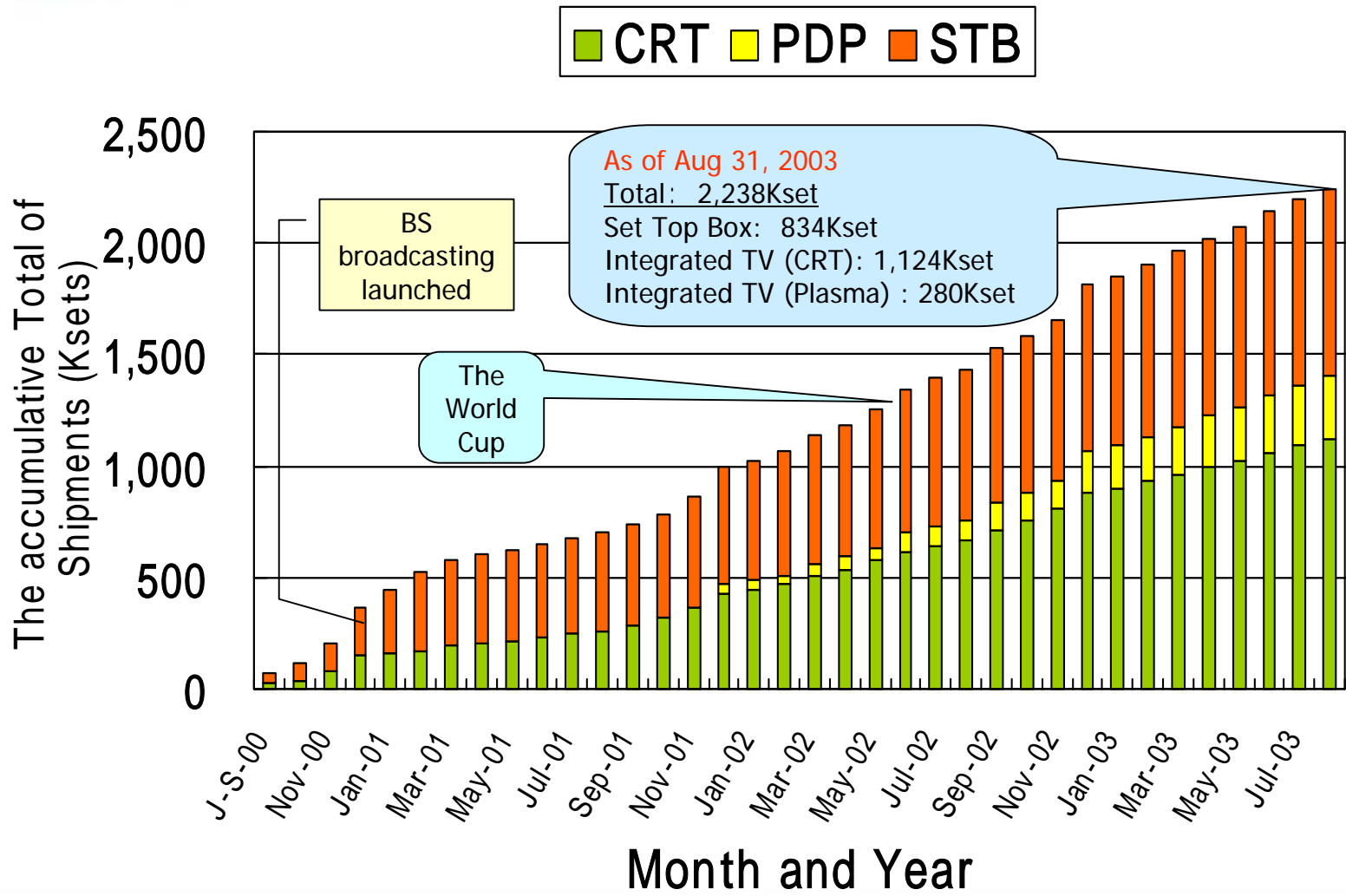


Schedule of Digital Broadcasting in Japan



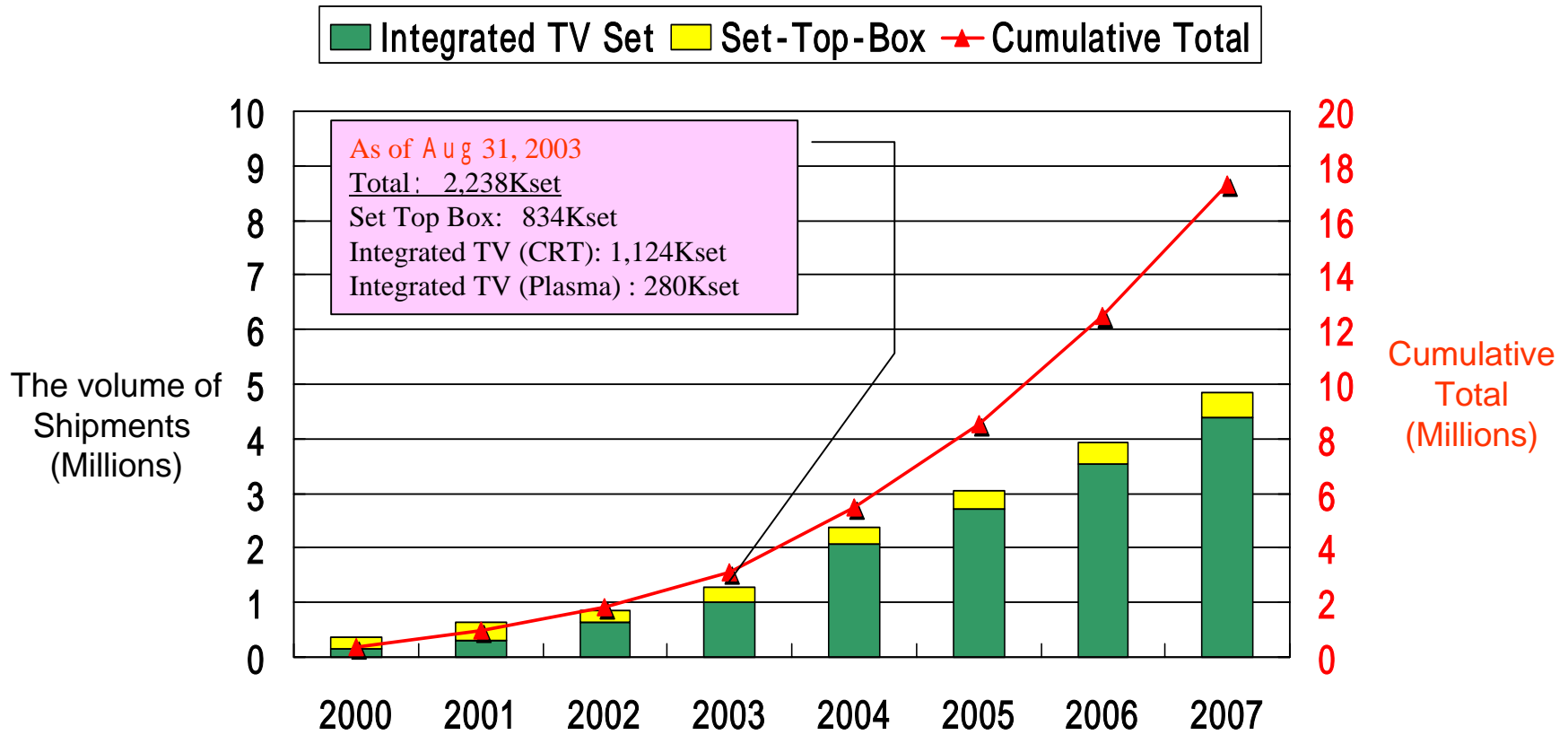


Cumulative Total of shipments of BS Digital Receiver



Volume of Shipments of Digital TV Sets and Set-Top-boxes

--Sales Achievements and Projections--

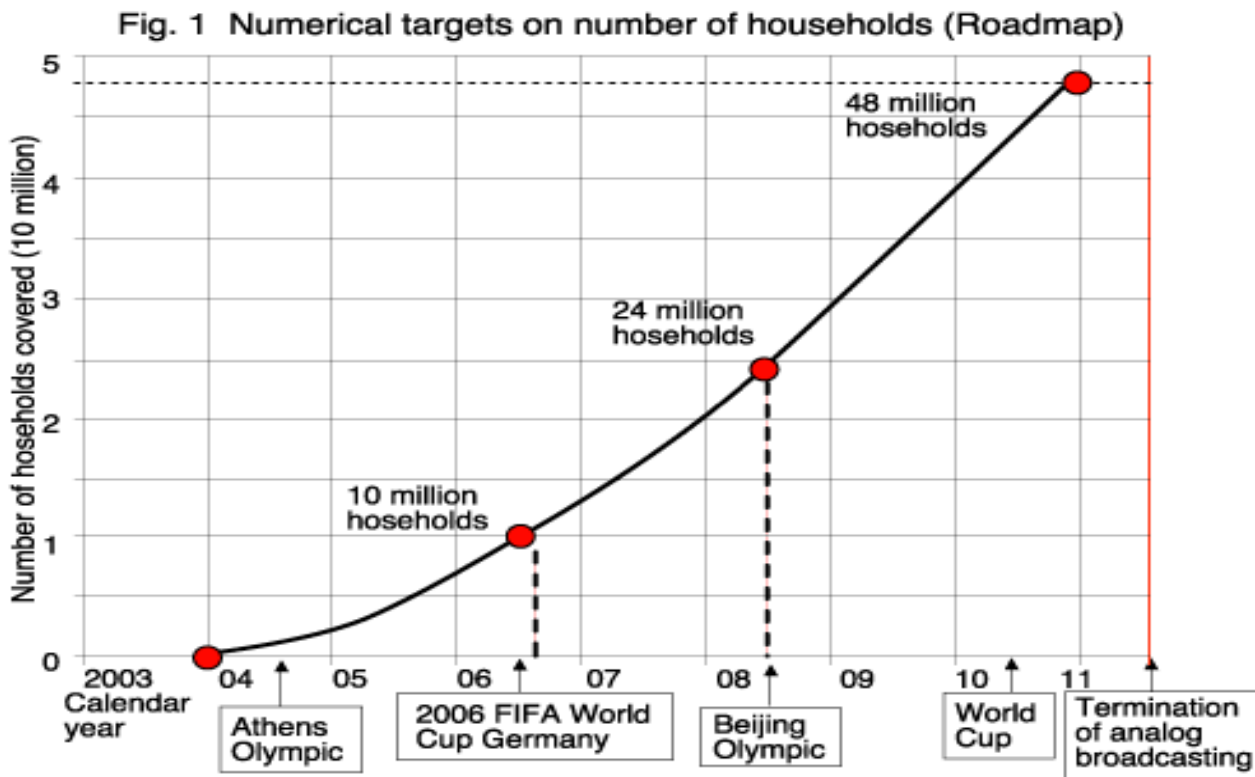


Source: JEITA Electronics and Statistics Committee AV Forecast Working Group



Targets of Diffusion of Digital Terrestrial TV receiver units

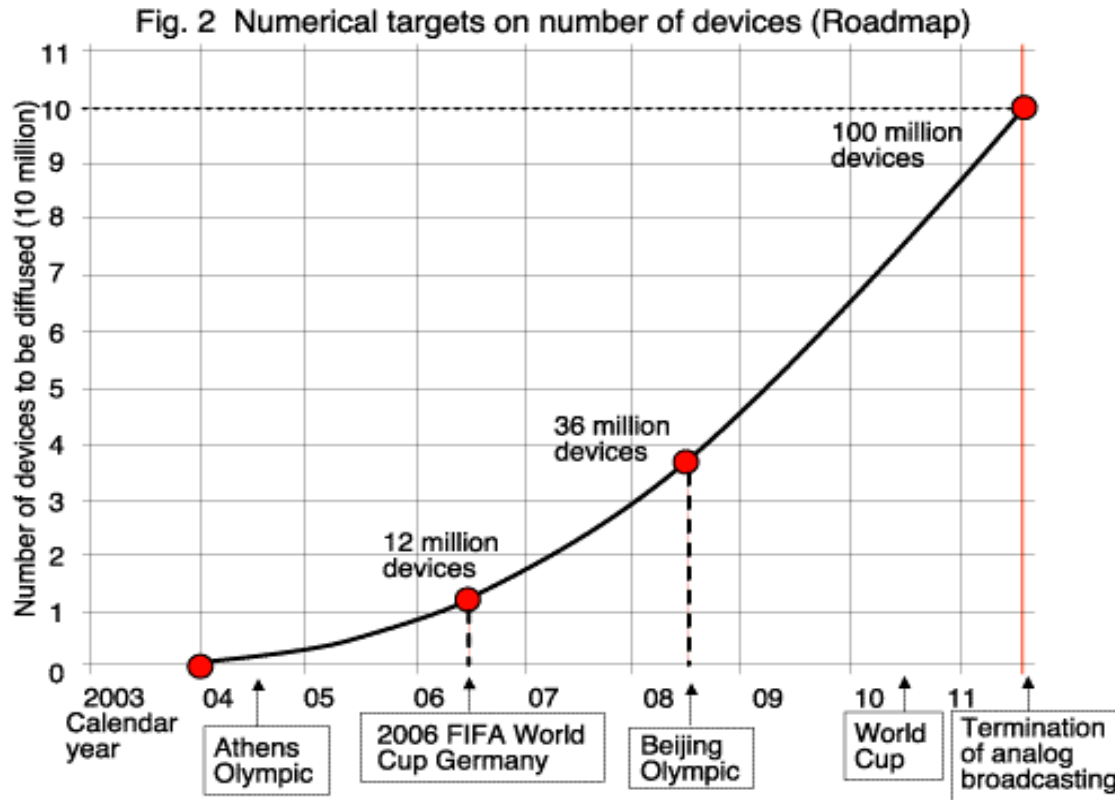
Roundtable Conference on the Future Aspects of Broadcasting in the Broadband Age formulated the Targets of diffusion of terrestrial digital TV receiver units on April 15.



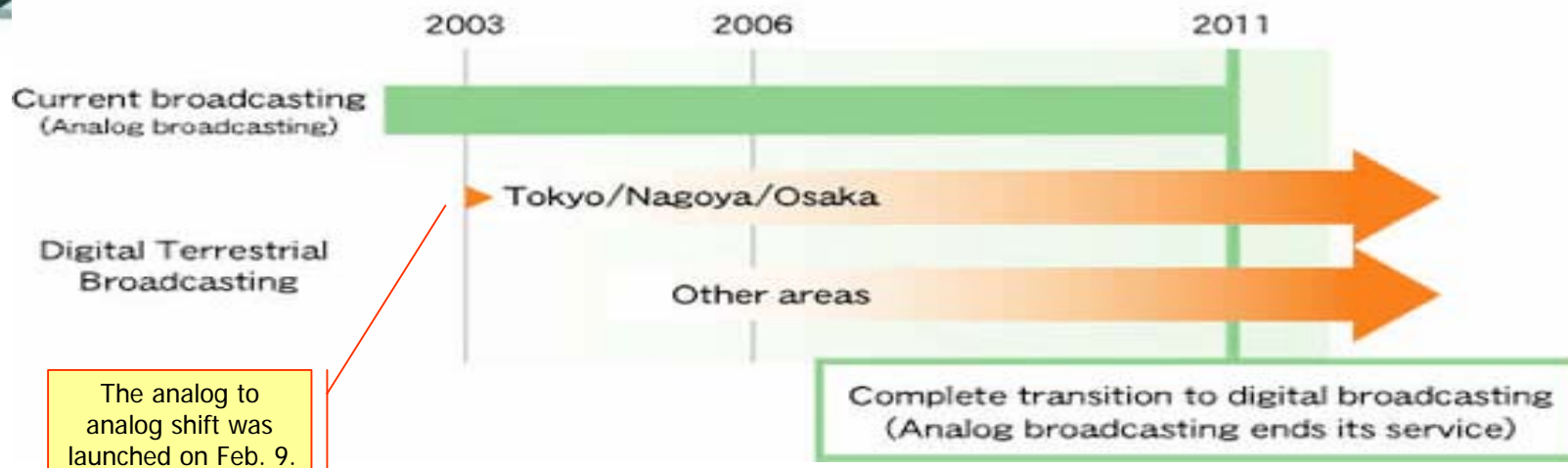


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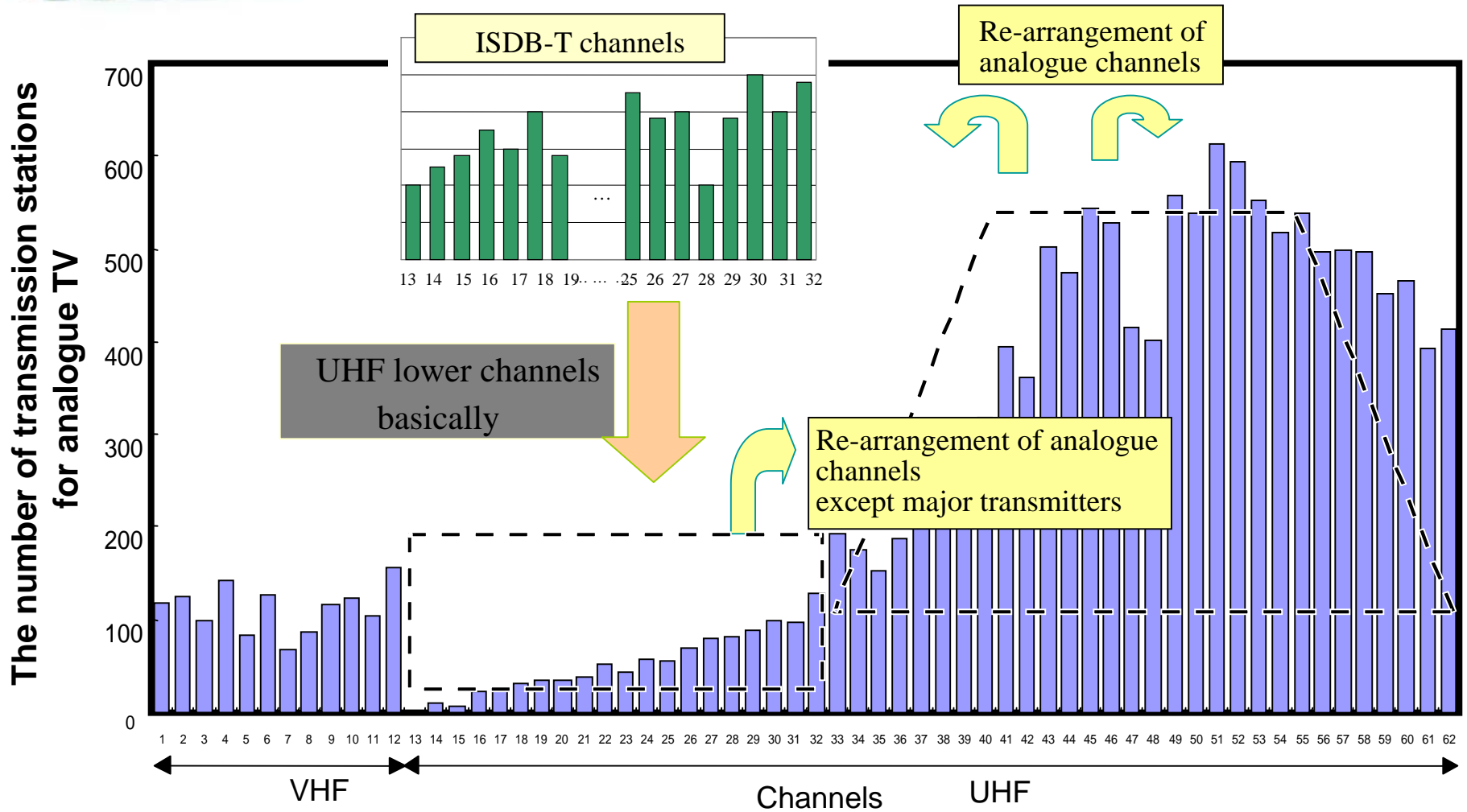
Schedule for Roll-Out of Digital Terrestrial TV Broadcasting



- Digital terrestrial broadcasting will begin in the three major metropolitan areas of Tokyo, Osaka, and Nagoya in **December 2003**.
- The government's plan describes a schedule for broadcasting to have started in all major cities by the **end of 2006**, and for current analog broadcasts to have been completely replaced with digital broadcasting by **July 2011**.
- In view of the launch of digital terrestrial broadcasting, **an analog-to-analog shift** (Re-arrangement of analogue TV channels) has already started last February. This shift changes the frequencies used by analog terrestrial broadcasting to secure the channels needed for digital broadcasting.



Frequency Circumstance in Japan and Analogue Channel Re-arrangement





DTTV License Policy

Sept. 27, 2002

Programme

- $2/3$ of DTTV programs are same with programs of analog TV broadcasting a day.
- HDTV programs should be televised at more than **50%** of broadcasting hours a week.
- Broadcasters must televise more than 10% educational programs and more than 20% cultural programs a week.

Further requirements

- Broadcasters build relay stations without hesitating.
- Broadcasters positively televise programs for sight and hearing handicapped persons.
- Broadcasters are able to make engineering services.

National Organizations for Promoting

Organization	Setup	Representative	Members	Functions
Terrestrial Digital Broadcasting Promotion Headquarters, MPHPT	Aug 2003	Mr. Katayama Minister, MPHPT (Head)	Minister, MPHPT Vice-Minister, MPHPT Secretary General, MPHPT Executives, MPHPT	The smooth implementation of DTTB
The association for promotion of digital broadcasting (D-PA)	Aug 2003	Mr. Kitagawa (Chairman)	NHK, 127 commercial TV broadcasters, 153 Receiver - Manufacturers etc.	Enforcement of RX/TX std. Operation of ES RMP
National Conference for promotion of terrestrial digital broadcasting	May 2003	Mr. Yamaguchi (Chairman)	NHK, 127 commercial TV broadcasters, Government (MPHPT), Manufacturers, Retailers Consumers society	Follow-up of the action plan for digital migration
National Council for Promotion of digital terrestrial broadcasting	July 2001	Mr. Kitagawa (President)	NHK, 127 Commercial TV broadcasters, Government (MPHPT)	Analogue channel shifts & publicity



Recently announced DTTV products

Toshiba Launched the Sale of New TV Sets

April 21

- Four tuners (ISDB-T, ISDB-S for BS, ISDB-S for CS110, Analog terrestrial) are installed.
- Equips LAN terminal for interactive TV
- Upgraded software can be installed by a customer .



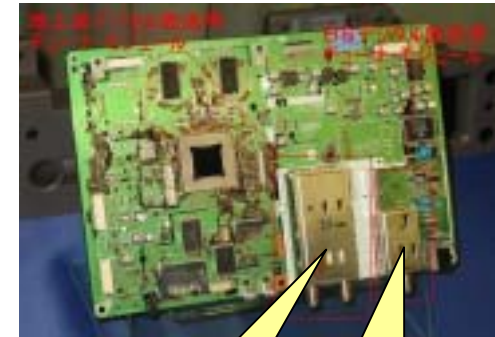
Reference: http://www.toshiba.co.jp/about/press/2003_04/pr_j2101.htm

Sharp Launched the Sales of New LCD TV Sets on July 9

- **LC-37AD1 and LC-37AD2**
 - 37" LCD display
 - For HDTV (1366 × 768 pix)
 - Separated tuner (NTSC analog, ISDB-S and ISDB-T)
- **LC-30AD1 and LC-30AD2**
 - 30" LCD display
 - For HDTV (1280 × 768 pix)
 - Display is provided with tuner
- **LC-22AA1**
 - 22" LCD display
 - For wide TV (854 × 480 pix)



Installed Video processing Board



LC-37AD1 and LC-30AD1



LC-37AD2 and LC-30AD2



Sanyo Announced the sales of New TV Sets

Aug 6

- PDP(42", 37") and LCD (30")
- Four tuners (ISDB-T, ISDB-S for BS, ISDB-S for CS110, Analog terrestrial) are installed.
- Pixel
 - PDP 1024 × 1024
 - LCD 1280 × 768
- Sanyo will launch the sales on Oct. 1



<http://www.sanyo.co.jp/koho/hypertext4/0308news-j/0806-2.html>

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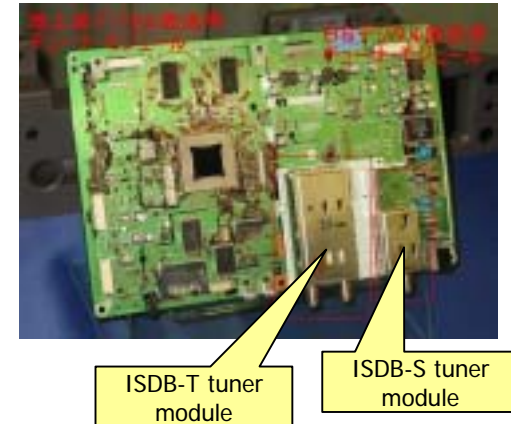
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Installed Video processing Board



LC-37AD1 and LC-30AD1



LC-37AD2 and LC-30AD2



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Sony announced ISDB-T STB

Aug 7

- For ISDB-T and ISDB-S (BS +CS110)
- Though open-priced, the STB is likely to be sold for about 600\$.
- Sony will launch the delivery on October 21.



Panasonic Launched the Sale of New TV Sets on Sep. 1

Aug 8

- Three types: TH-36D50 (36"), and TH-32D50(32") and TH-28D50 (28")
- Four tuners (ISDB-T, ISDB-S for BS, ISDB-S for CS110, Analog terrestrial) are installed.
- Equips LAN terminal (10BASE-T) for
- [Tnavi](#)
- Browser for **Tnavi** is installed.
- EPG for all tuners is installed.



Panasonic Announced the Sale of New PDP and LCD TV Sets

Aug 21

- ISDB-T tuner are installed in 37", 42", 50" PDP TV and 32", 26", 22" LCD TV.
- Panasonic will launch the sales from Sep. to Oct.



PDP TV



Tuner and MPEG-2 Decoder

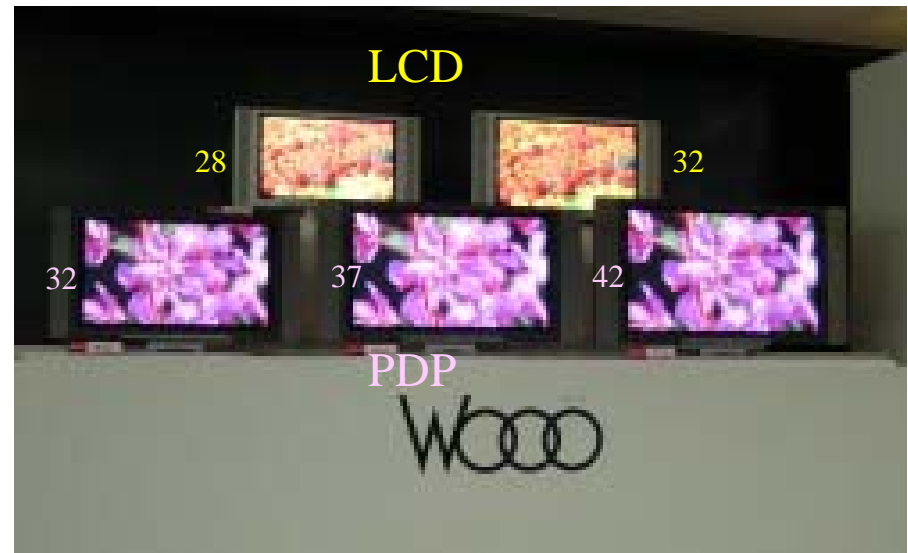


LCD TV

Hitachi Announced the Sale of New PDP and LCD TV Sets

Aug 20

- ISDB-T tuner are installed in 37", 42", 50" PDP TV and 32", 26", 22" LCD TV.
- Hitachi will launch the sales on Sep 25.



Sony Announced the Sale of New Digital TV Sets

Aug 28

- New models
 - PDP 61", 50", 42" 9models
 - LCD 42", 37", 32" 3models
 - CRT 28", 32", 28" 3models
- Sony will launch the sales of the digital TV sets next Oct. And next Nov.





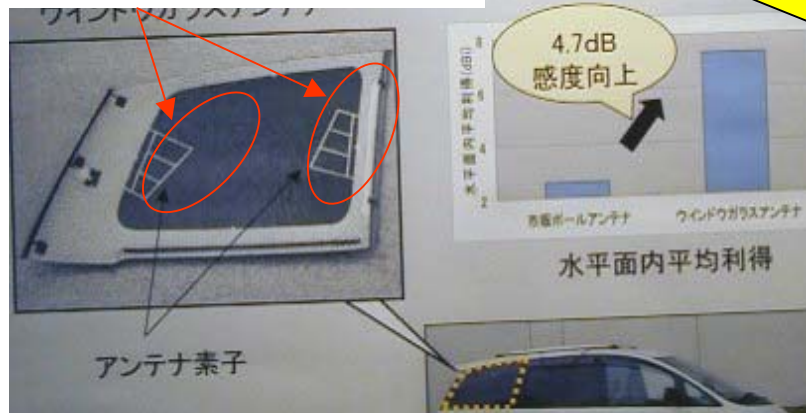
The Development of New Services

Toyota Central Lab demonstrated HDTV Mobile Reception using Adaptive Array Antenna

Jan 29, 2003



Adaptive Array Antenna



Pole type antenna
(conventional)

Adaptive Array Antenna
attached on wind shield

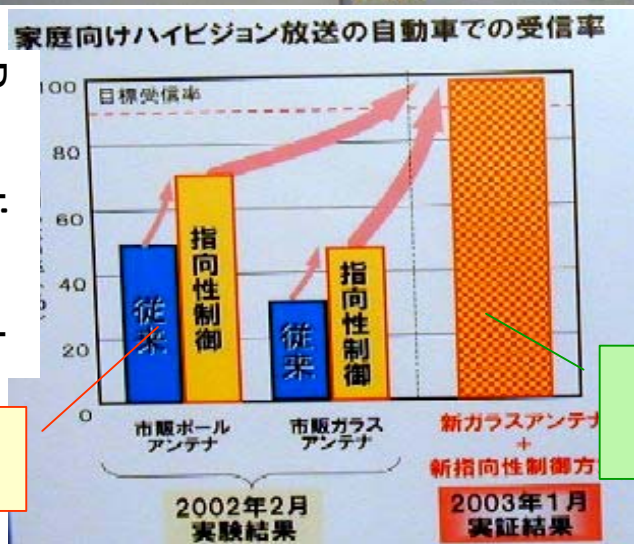
UHF 15ch (whole segment reception)

Mode 3, 64QAM, 3/4

Guard interval: 1/8(128 μ s)

Threshold C/N=20.1dB

Reception rate



Pole type antenna

Adaptive Array Antenna



Segmented Structure and Partial Reception

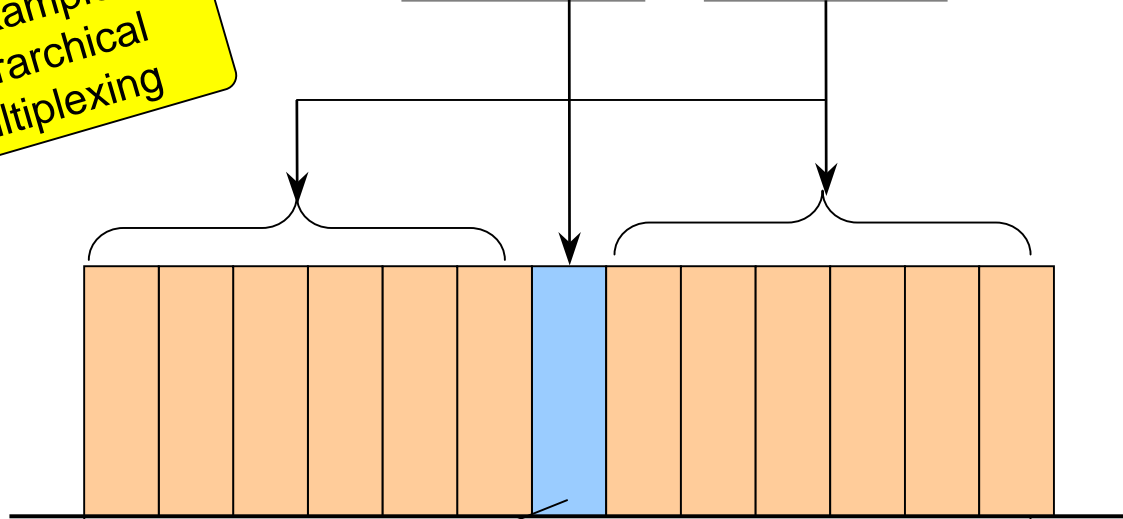
An Example of Hierarchical Multiplexing

Sound / Data

Layer A

HDTV

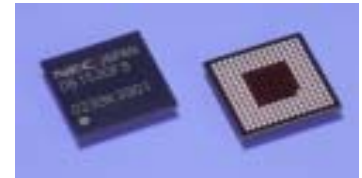
Layer B



Prototype of Cellular Phone with a ISDB-T one-segment receiver

- One-segment demodulator LSI announced last Oct. is installed in 3G cellular phone.
- Specifications;
 - UHF13 ~ 62ch
 - Multiplexing; MPEG-2 TS
 - Video coding; MPEG-4 simple profile *
 - Video resolution; SQVGA
4:3(160x120pix), 16:9(160x90), 15f/s
 - Audio coding; MPEG-2 AAC LC profile
 - Software for EPG and data broadcasting is not installed yet.
- NEC demonstrated at Telecom2003.

July 10



* Video coding system for ISDB-T one-segment broadcasting has not been decided yet. NEC temporarily used MPEG-4 SP for this demonstration.

Prototype of Cellular Phone with a ISDB-T One-Segment Receiver

- Sanyo announced one-segment receiver installed in cellular phone.
- Specifications;
 - Diversity reception
 - UHF13 ~ 53ch
 - Multiplexing; MPEG-2 TS
 - Video coding ; MPEG-4 Simple profile L1* , QVGA 15f/s
 - Audio coding; MPEG-2 AAC LC profile
 - Display; 176x200pix organic LE panel
 - Recordable on flash memory 128MB=30min
 - Weight; 150g
 - 960mAh lithium ion battery;
 - 420hours stand-by mode or 90minuites TV reception
- Sanyo demonstrated at CEATEC JAPN2003.

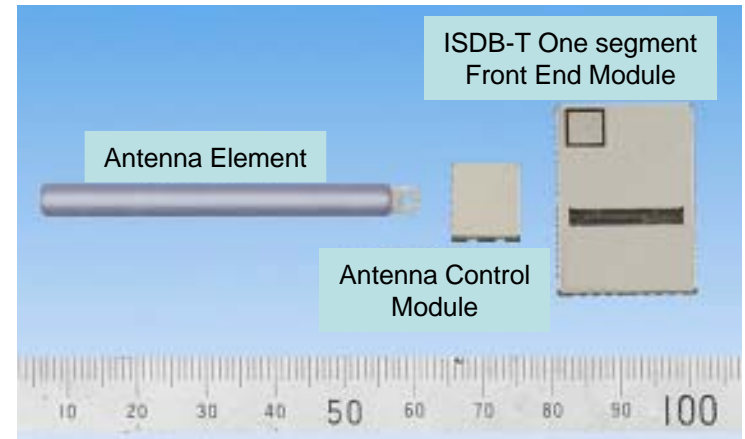


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ISDB-T One Segment Front-End Module and Antenna

July 17

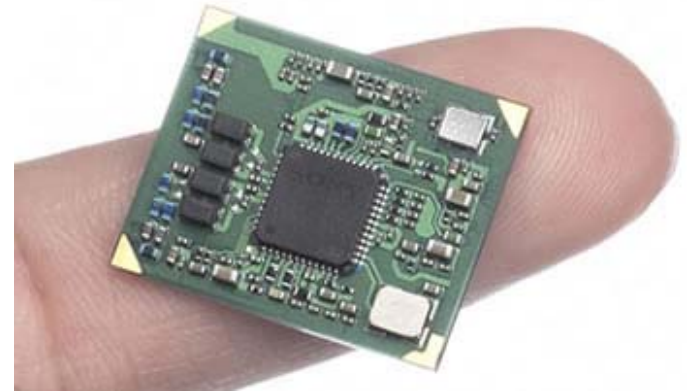
- Panasonic announced ISDB-T one-segment front-end module for cellular phone and PDA etc.
- RF tuner circuit and OFDM demodulator are installed in this module.
- Specifications;
 - Size; 20mm × 28mm × 2mm
 - VHF 7ch, UHF13 ~ 53ch
 - Power Consumption; 200mW
 - **Length of the antenna; 50mm**
 - Modulation; DQPSK and QPSK and 16QAM
- Product sample will be shipped from this autumn.



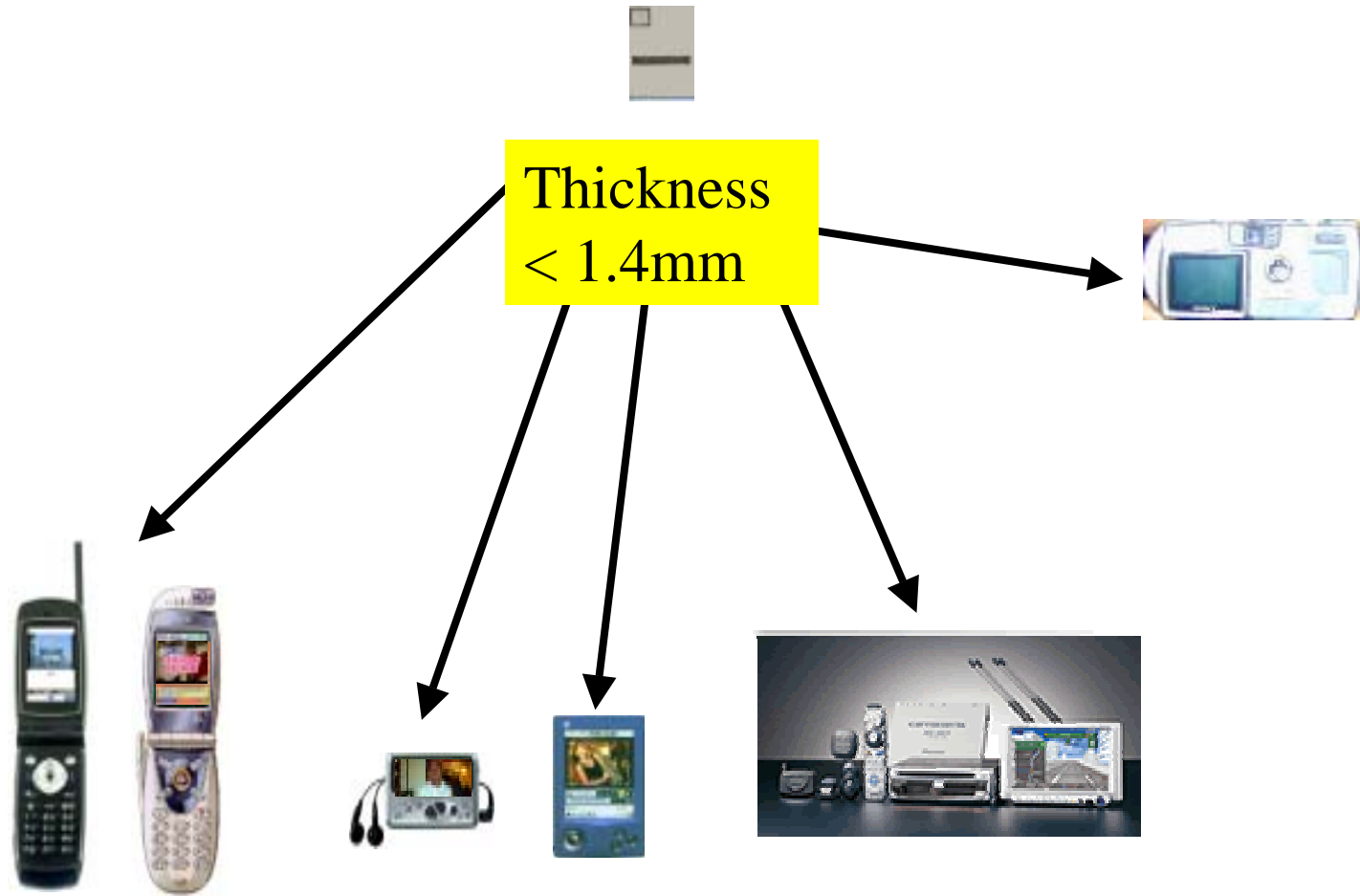
ISDB-T One Segment Tuner Module

Sep 24


- Sony announced ISDB-T one-segment tuner module for cellular phone and PDA etc.
- RF tuner circuit and OFDM demodulator are installed in this module.
- Specifications;
 - Size; 20mm × 16mm × 2mm
 - VHF 7ch, UHF13 ~ 62ch
 - Power Consumption; <150mW
 - Output; MPEG2 TS
- Product sample will be shipped from Dec. 2003.



Front End Module will be installed in all kinds of Portable Devices



Conclusions

- 
- **ISDB-T** showed the best results in Brazil's comparison tests. The similar results were obtained in Singapore and Hong Kong trials.
 - The system flexibility and the reliable mobile reception of **ISDB-T** make broadcasters more competent in the new wireless world.
 - **ISDB-T** is the most flexible system of the three DTTV standards. And so it will adapt to different circumstances of all countries.
 - The sales of Digital TV receivers reached more than two millions and will increase rapidly around 2006 in Japan.
 - Digital TV promotion is now operated jointly by governments and private sectors.
 - The analog channel re-arrangement is first big challenge.
 - All of consumer-manufacturers announced the sale of new TV sets.
 - Developments of ISDB-T one-segment receiver were announced recently in Japan. Mobile TV will be launched in the end of 2005.



Thank you
for your attention!

