

Standardization for Cable Television (JCTEA Standard)

Jan. 24th 2011

Japan Cable Television Engineering Association
(JCTEA)

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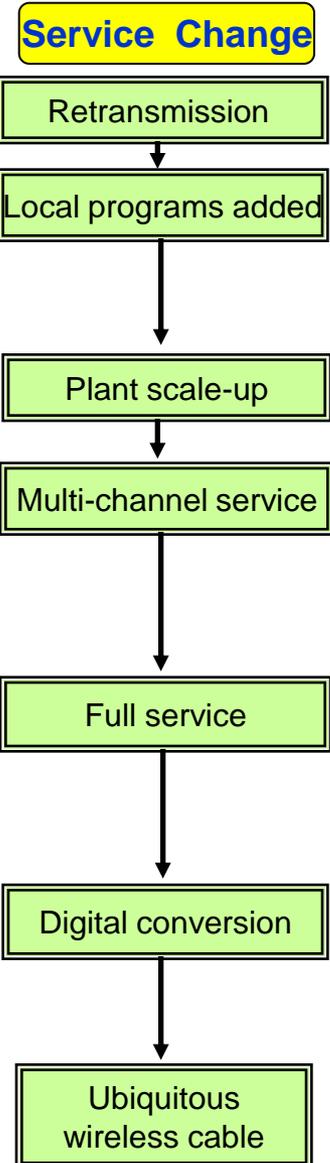
- **An Overview of Japanese Cable Television**
- **Progress of Broadcasting and CATV**
- **CATV Services**
- **Standardization for CATV**
- **Review of JCTEA**
- **Current Topics**

An Overview of Japanese Cable Television

A History of Japanese CATV
Cable Television Subscribers
Internet Development
IP Multi-cast Broadcasting

A Brief History of Japanese CATV: Upgrades and Full Service

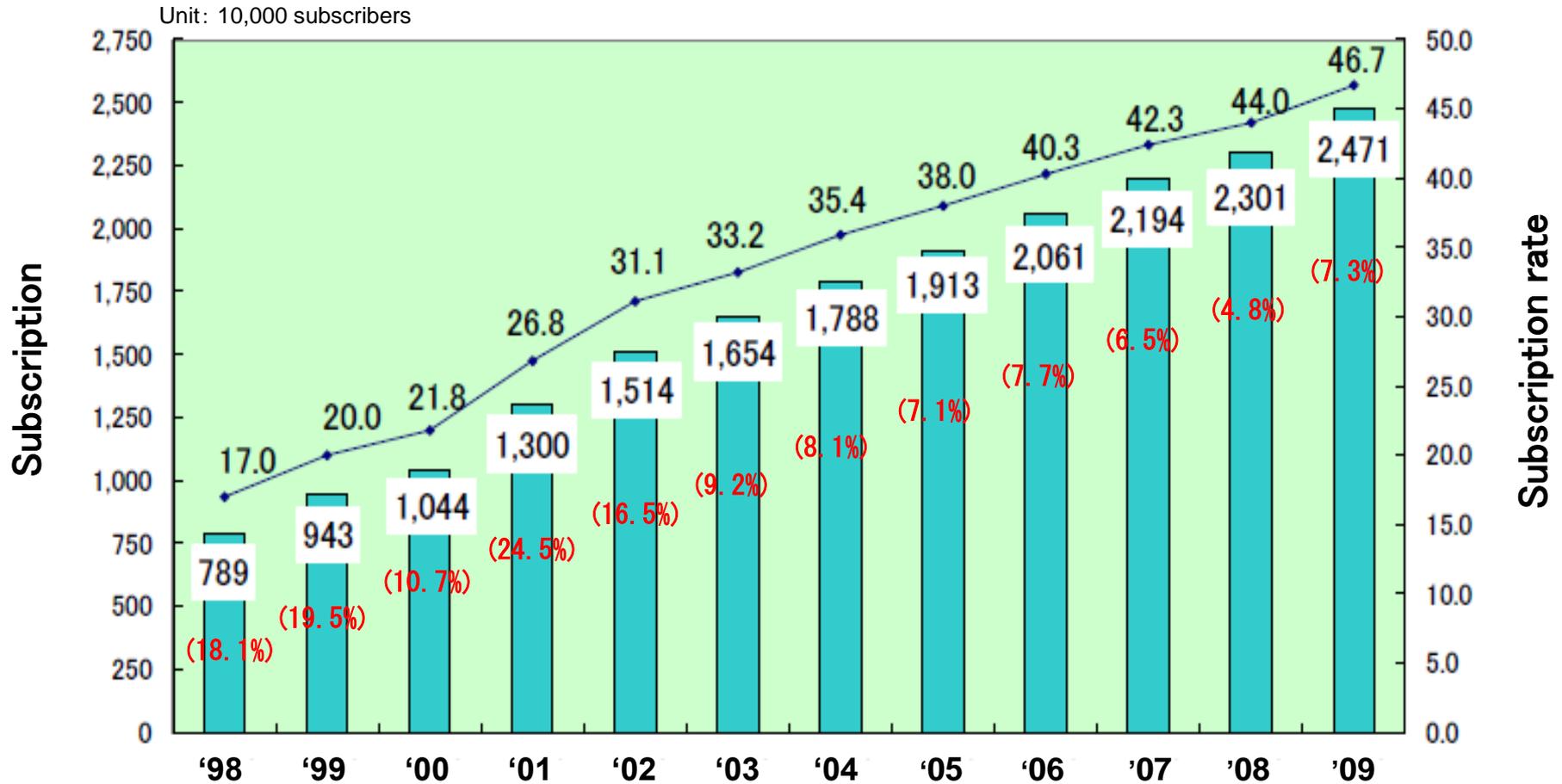
- 1953—◆ TV broadcast service starts in Japan
- 1955—◆ First CATV starts in “Ikaho Spa.” (TV retransmission service starts)
- 1962—◆ The Building Standard Law is revised. High-rise buildings appear and largely introduce CATV to deal with TV radio wave shadow.
- 1963—◆ “Gujou-hachiman CATV” first begins to broadcast locally produced programs.
- 1972—◆ The “Cable Television Broadcast Law” is established.
- 1984—◆ Satellite broadcasts start. (Broadcasting Satellite)
- 1987—◆ “Tama Cable Network” first opens an urban-type large-scale CATV station.
- 1989—◆ The private communication satellite JC-SAT is launched.
 - ◆ “Space Cable Net” (named for the satellite distribution of TV programs) begins. (Multi-channel service starts)
- 1996—◆ CS digital broadcasting services start. (Communication satellite)
 - ◆ “Musashino-Mitaka Cable Television” begins the first cable internet service.
- 1997—◆ “Titus Communications” & “Suginami Cable Television” start a CATV telephone service. (Not IP telephone) (Telephone service starts)
- 2000—◆ The BS digital broadcasting service starts (Broadcasting Satellite).
(Full-scale digital multi-channel service is introduced)
- 2001—◆ The “Law Concerning Broadcast on Telecommunications Service” is established.
(Cable operators using telecom fiber come into existence)
- 2003—◆ Terrestrial digital broadcasts start. (Digital channels further increase)
- 2005—◆ FTTH regulations are added to the Cable Television Law.
- 2006—◆ The “:COM” group begins the first mobile telephone service in CATV..
- 2007—◆ “I-CAST” begins the first IP retransmission service for terrestrial digital broadcast programs. (TV broadcasting programs are transmitted by IP technology)
- 2008—◆ Gap-filler systems are introduced as a measure for dealing with bad digital TV reception
 - ◆ WiMAX wireless services are introduced by cable operators.



From MIC data

Cable Television Subscribers

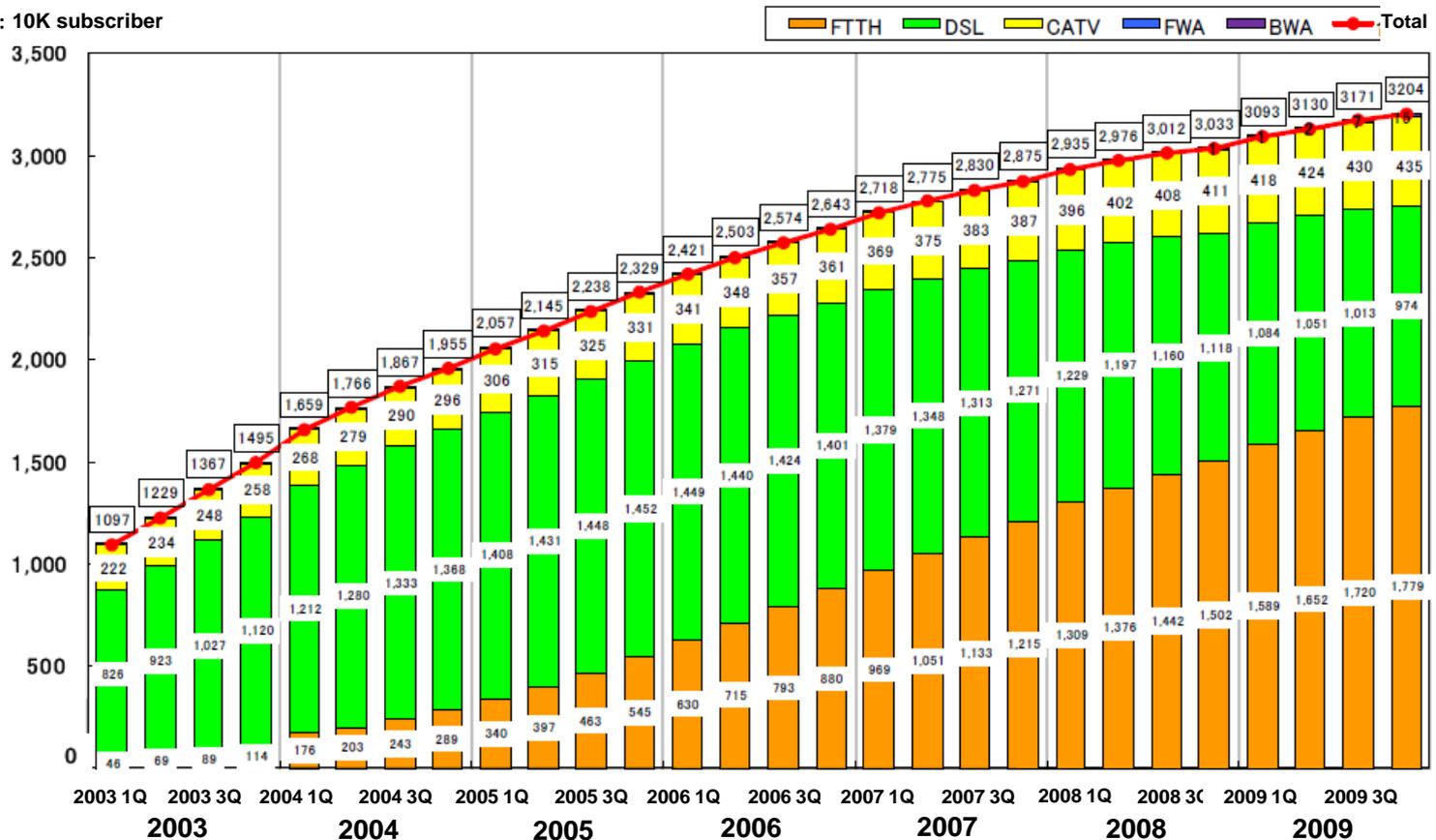
Subscriptions: 24.71 million households at the end of March 2010; subscription rate: 46.7%



Broadband Subscribers

- At the end of March, broadband subscribers had reached **32.04 million**; the number of cable internet subscribers reached **4.35 million** (13.6% of all broadband subscribers).
- Cable internet service drove the market early on, followed by DSL. Today, FTTH service leads the way.
- The number of cable internet subscribers is still increasing, but that of DSL subscribers began to decrease in the 1st quarter of 2006 (fiscal year).

Unit: 10K subscriber



From MIC data

DOCSIS 3.0 Ultra High-Speed CATV Internet

**Thirty-one CATV operators introduced or are introducing DOCSIS wideband cable modem system(ultra high speed), complied with or based on DOCSIS 3.0, among 379 CATV internet operators. (Jun 2010)
More operators will introduce it soon(2011).**

1. DOCSIS 3.0 features

The DOCSIS 3.0 system provides ultra high-speed internet service.

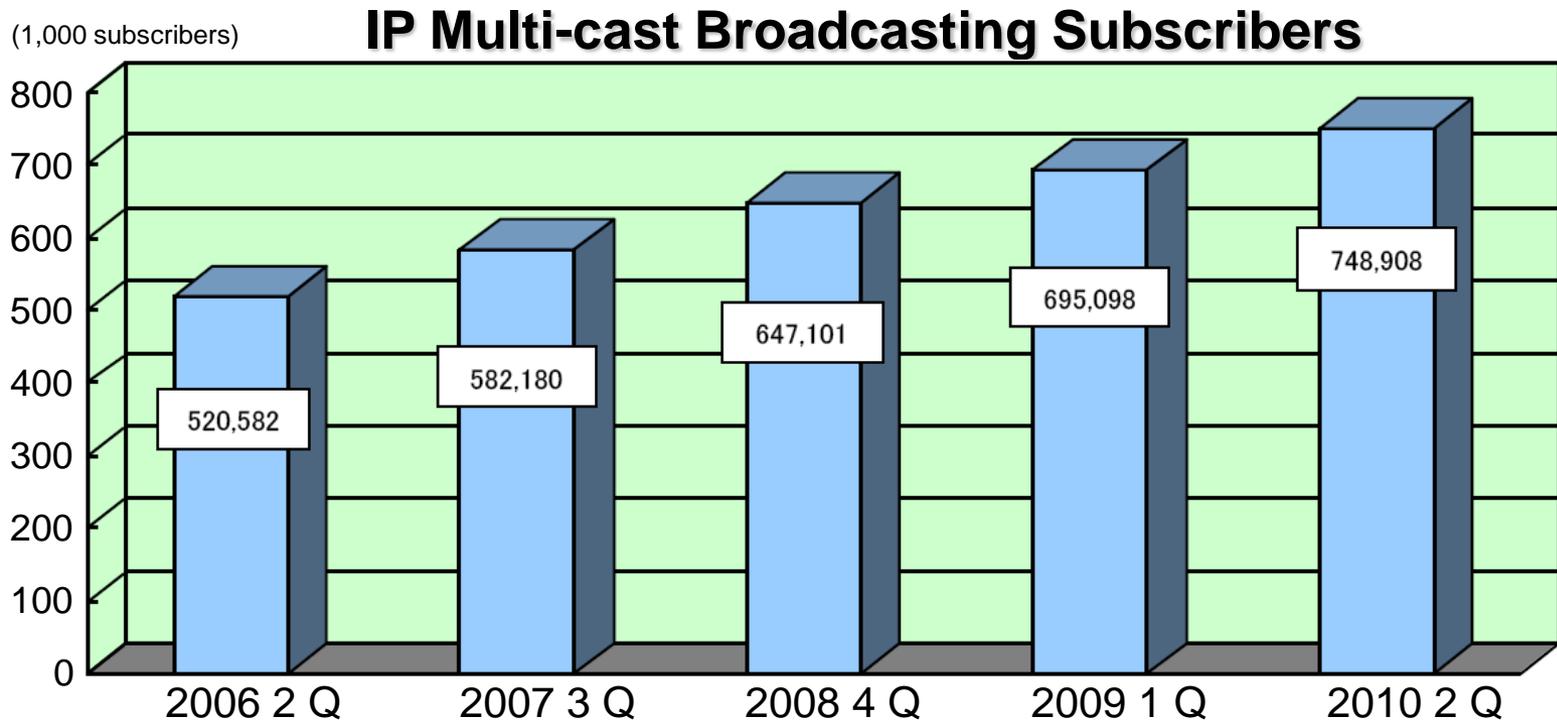
- Some channels having 30 to 40 Mbps (per 6 MHz) are bonded up to 120M to 1.2G bps over the HFC system with channel-bonding technology.**
- It has as same speed as GE-PON over FTTH.**

2. DOCSIS 3.0 advantages

- Separate channels can be bonded; effective use of spare channels is available.**
- Conventional DOCSIS modems can be used together in the network.**
- Change of CATV network infrastructure is not necessary (for example: to FTTH).**
- Service speed can be made higher by increasing the number of bonding channels according to the customer's requirements**

Changes in IP Multi-Cast Broadcasting Subscribers

- Penetration reached 749,000 subscribers in 2010 (calendar year; excludes subscribers of VOD only)



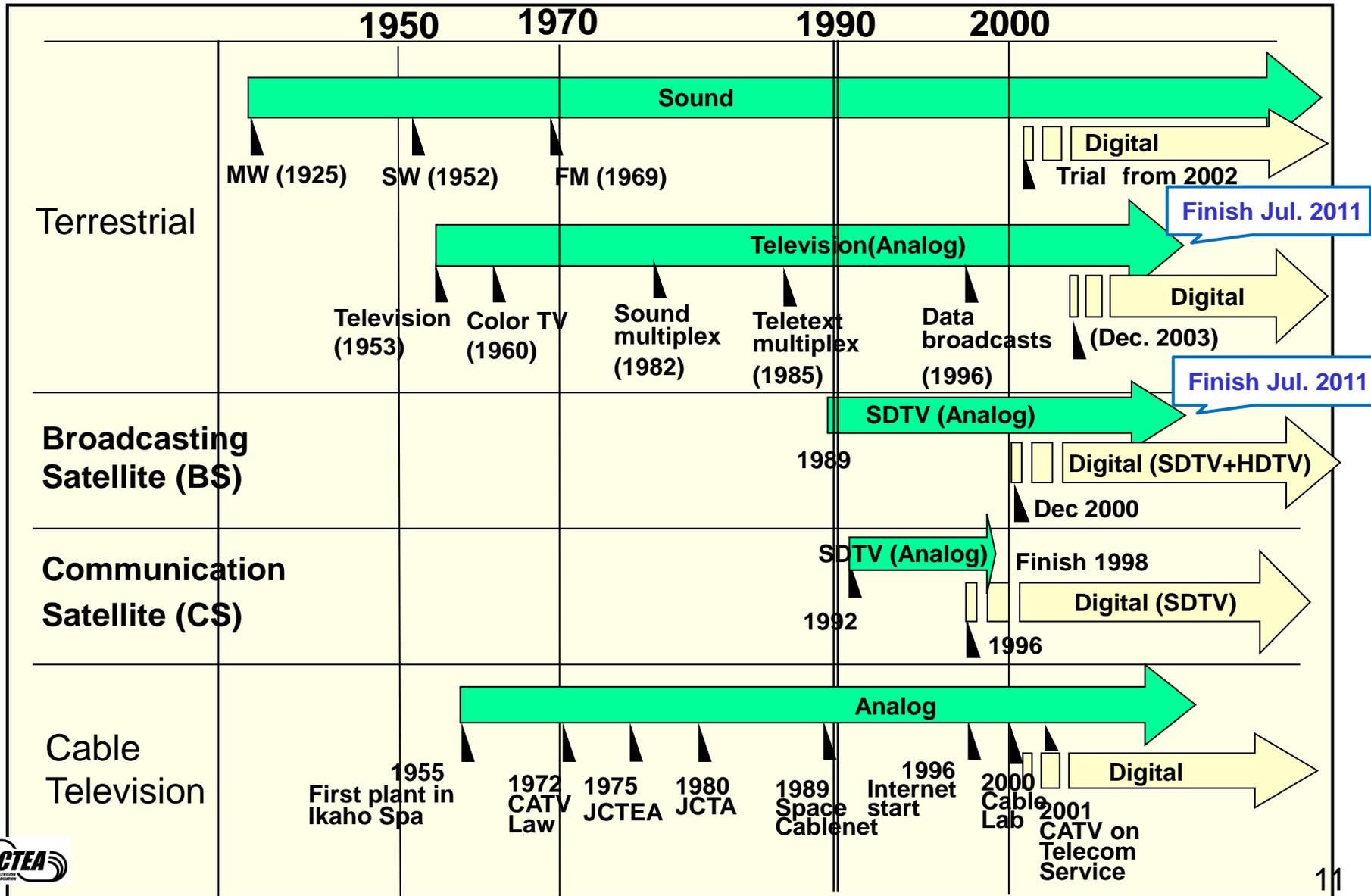
* Summations of subscriber data of five TV broadcast operators using IP multi-casting systems among TV broadcast operators providing telecommunications service.

IPTV in Other Countries

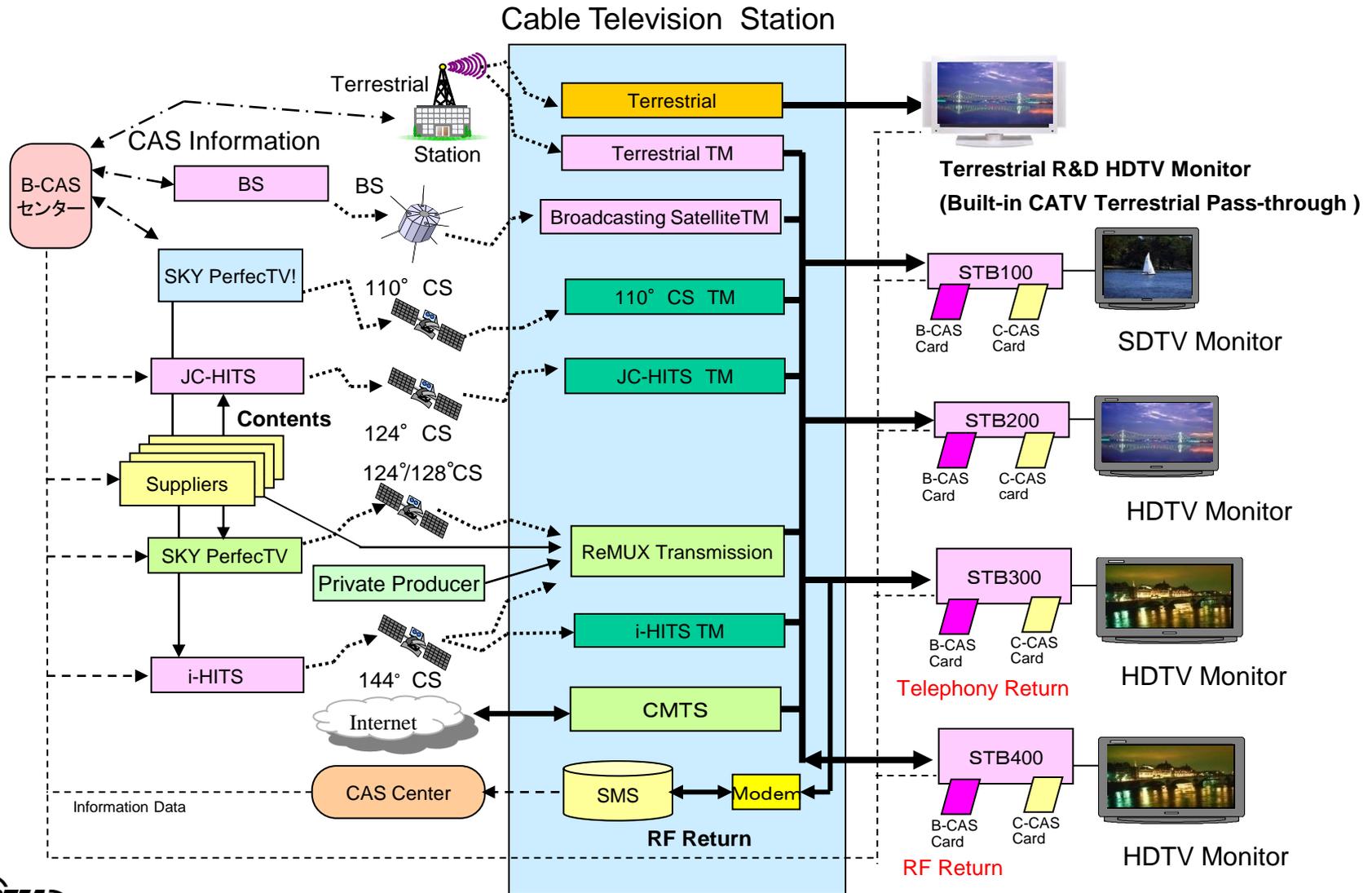
	No. of subscribers (million)	Background	Reason
Europe	France: 9.4 Germany: 1.6 Belgium: 0.9 Spain: 0.8 Italy: 0.8	<ul style="list-style-type: none"> • The multi-ch video market remains immature • CATV is not popular in some countries 	<ul style="list-style-type: none"> • CATV is not well developed • IPTV service entry of a German telecom • Government subsidization (Italy, France) • Time-shifted TV (Italy, UK, France) • IPTV is supplemented with BB
USA	6.5 (Verizon: 3.2 AT&T: 2.5)	<ul style="list-style-type: none"> • CATV has superiority in multi-ch video services • Multi-ch video services are saturated • RF video on FTTH 	<ul style="list-style-type: none"> • Telecom carriers fight hard against CATV • Same service level as CATV in price, HD video, digital only. (Triple-play service)
ASIA	China: 6.8 South Korea: 2.9 Hong Kong: 1.2	<ul style="list-style-type: none"> • China: Increase of four operators • Hong Kong & South Korea: CATV has spread broadly and multi-ch video requirements are high • CATV & telecom carriers are fierce competitors 	<ul style="list-style-type: none"> • China: Subscriber increase of BesTV of SGM origin • Hong Kong: Service strategy gets the backing of subscribers • South Korea: Telecom carriers are aggressive in securing subscribers
JAPAN	2.0	<ul style="list-style-type: none"> • FTTH has spread rapidly (Internet) • Multi-ch subscriber penetration of CATV is about 31% 	<p>Future factors</p> <ul style="list-style-type: none"> • IP retransmission of terrestrial broadcast programs • Giving advantage of IP service in No. of VOD program titles and service rate. • Increase of HD content

Progress of Broadcasting and CATV

Cable Television Development in Japan



Digital TV retransmission Services of CATV



Single TS & Multiple TS Multiplexer

TS: Transport Stream PSI: Program Specific Information SI: Service Information PID: Packet Identifier EPG: Electronic Program Guide

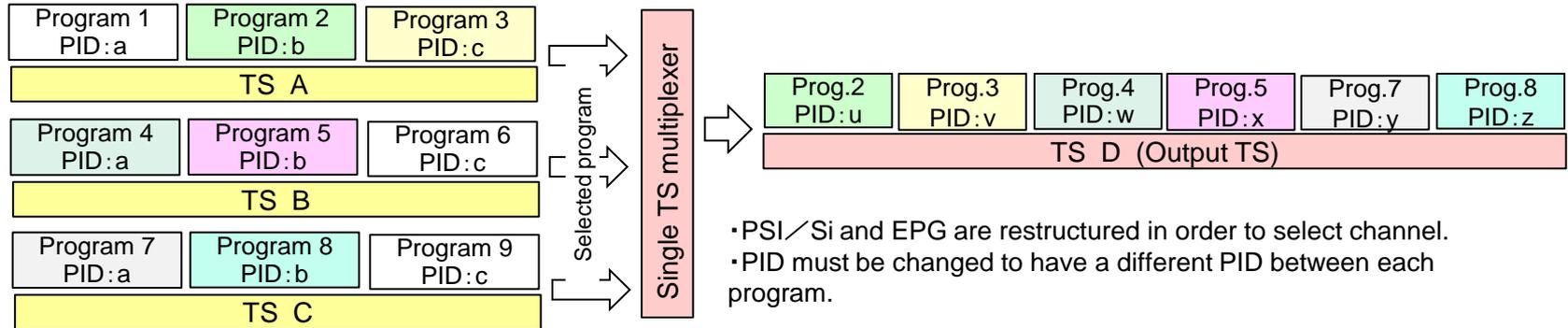


Fig. 1 Conceptual illustration of single TS multiplexer

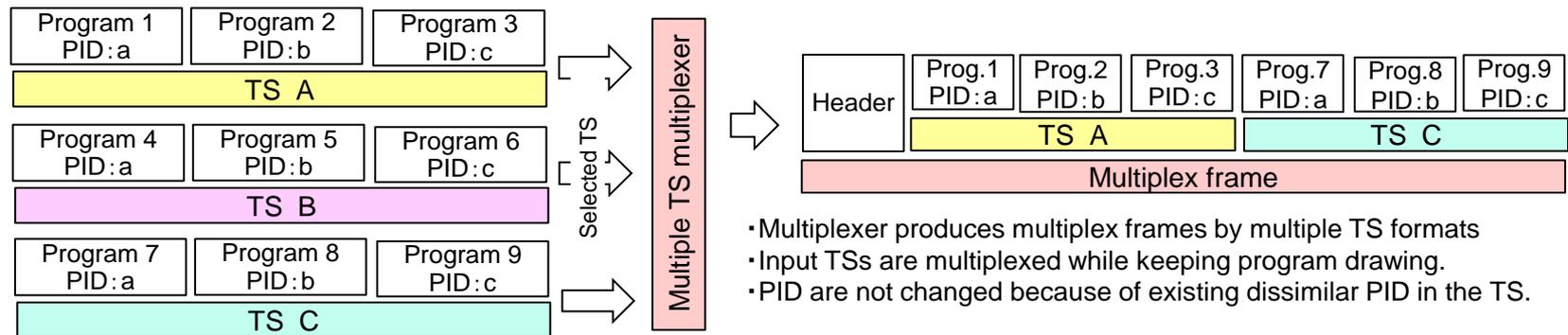


Fig.2 Conceptual illustration of multiple TS multiplexer
 (For terrestrial digital TV signal and digital BS signal retransmission)

CATV Services

Cable TV Services In Japan

1. TV video service

1) Resending TV broadcast programs

- Terrestrial TV broadcast programs (analog and digital)
- BS broadcast TV programs (analog and digital)

2) Resending CS-distributed TV programs

- Many specialized programs (news, movies, sports, anime, etc.)

3) Locally produced programs

- Local pick-up news, local government news, local emergency information (disasters, accidents), etc.

4) Other video services

- Special program VOD, ITV video transmission

2. Internet service providing

3. Telephone services (Triple-play)

- Fixed telephone

4. Mobile telephone (Quad-play)

5. Others

- Emergency earthquake notices, karaoke, local information

CATV Service Signals

Many RF Signals go through the Cable Transmission Line

Television Broadcasting Services

- 1) 90 - 770 MHz
 - NTSC-VSB-AM, 64 QAM (256 QAM), OFDM
- 2) 1035.05 MHz - 1484.95MHz
 - BS-IF (Analog & Digital)
- 3) 1595.75MHz ~ 2070.25MHz
 - Broadband CS-IF (digital)

Other Telecommunications

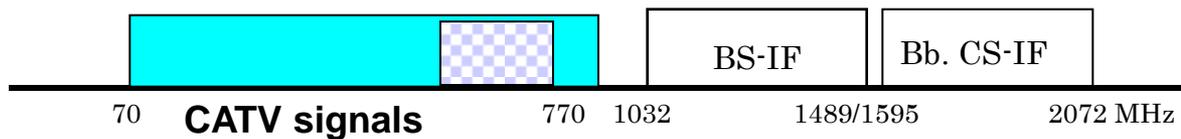
- 1) Telecommunication
 - Cable internet
 - IP telephone
 - Mobile telephone
 - Video on demand
 - WiMAX etc.
- 2) Others
 - Emergency earthquake notices
 - Karaoke
 - Public announcements
 - Locally produced TV uplinks
 - Surveillance ITV
 - Other control systems etc.

Frequency Allocation of CATV Signals (Example)

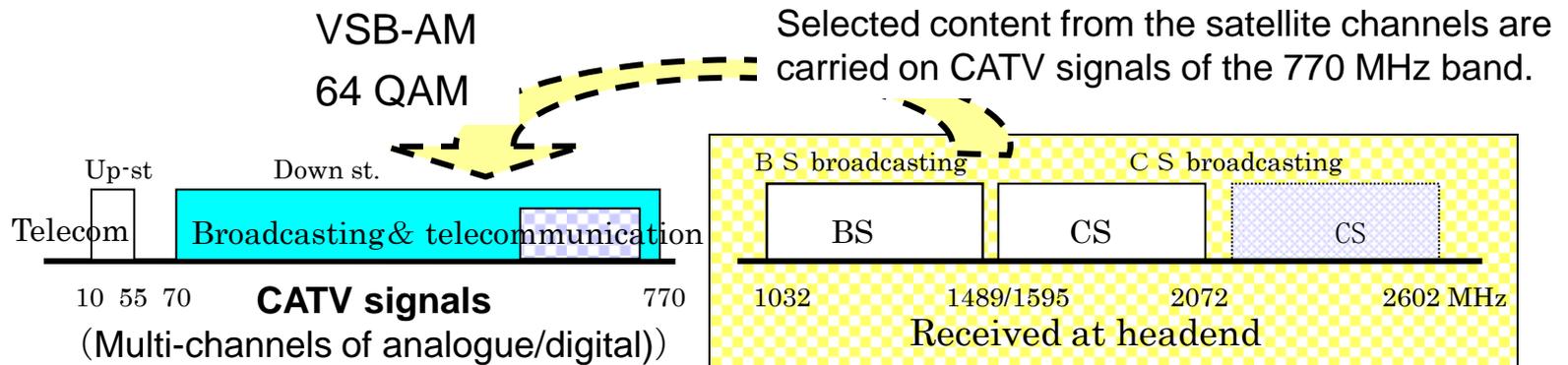
Typical CATV Freq. Band
 Terrestrial Digital TV Broadcasting

1) FTTH CATV downstream

(Analog multi-chs + dig. multi-chs + BS-IF + broadband CS-IF)



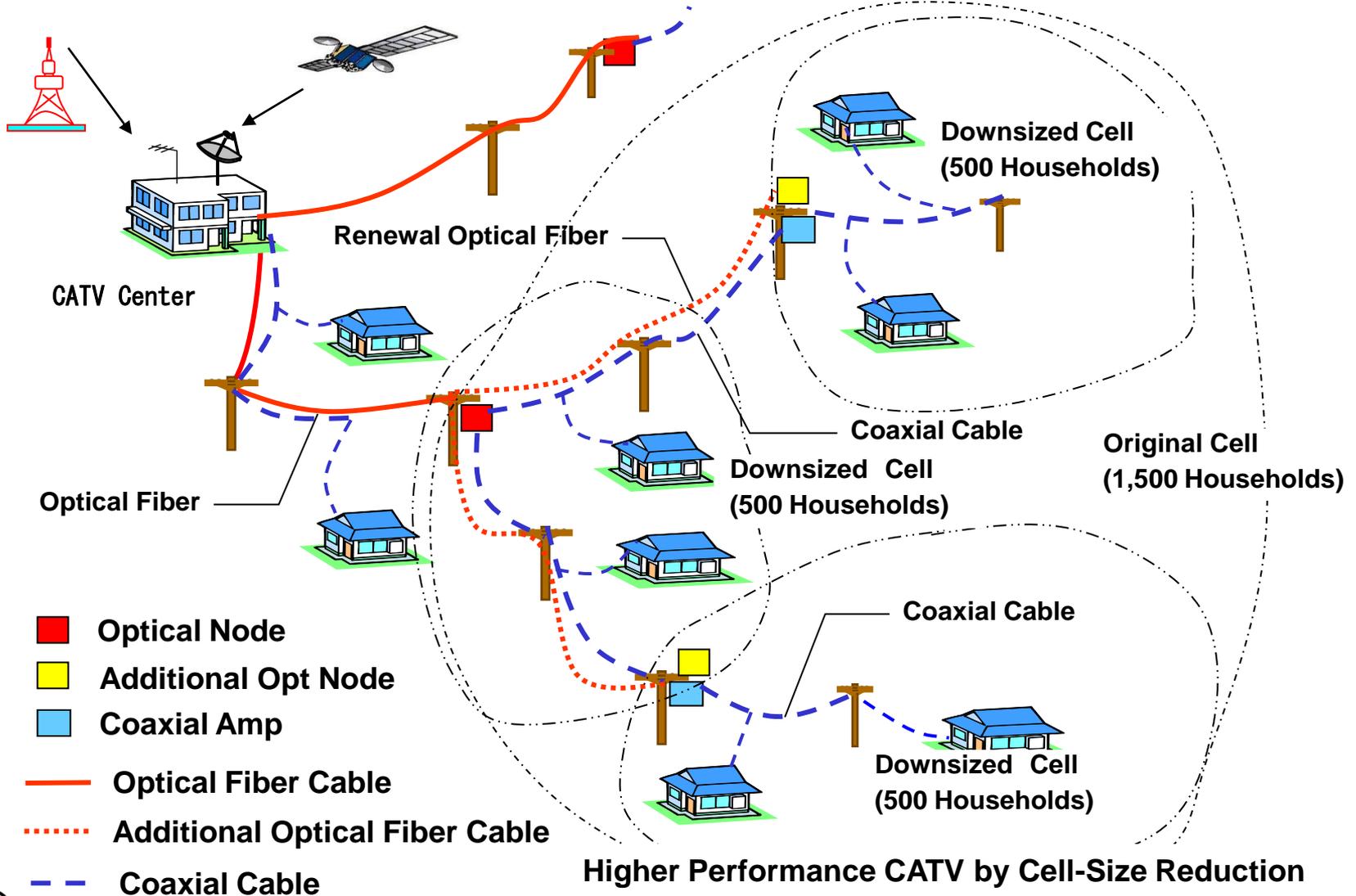
2) HFC CATV signals (analog multi-ch + digital multi-ch + others)



Transmission Signals of FTTH or HFC

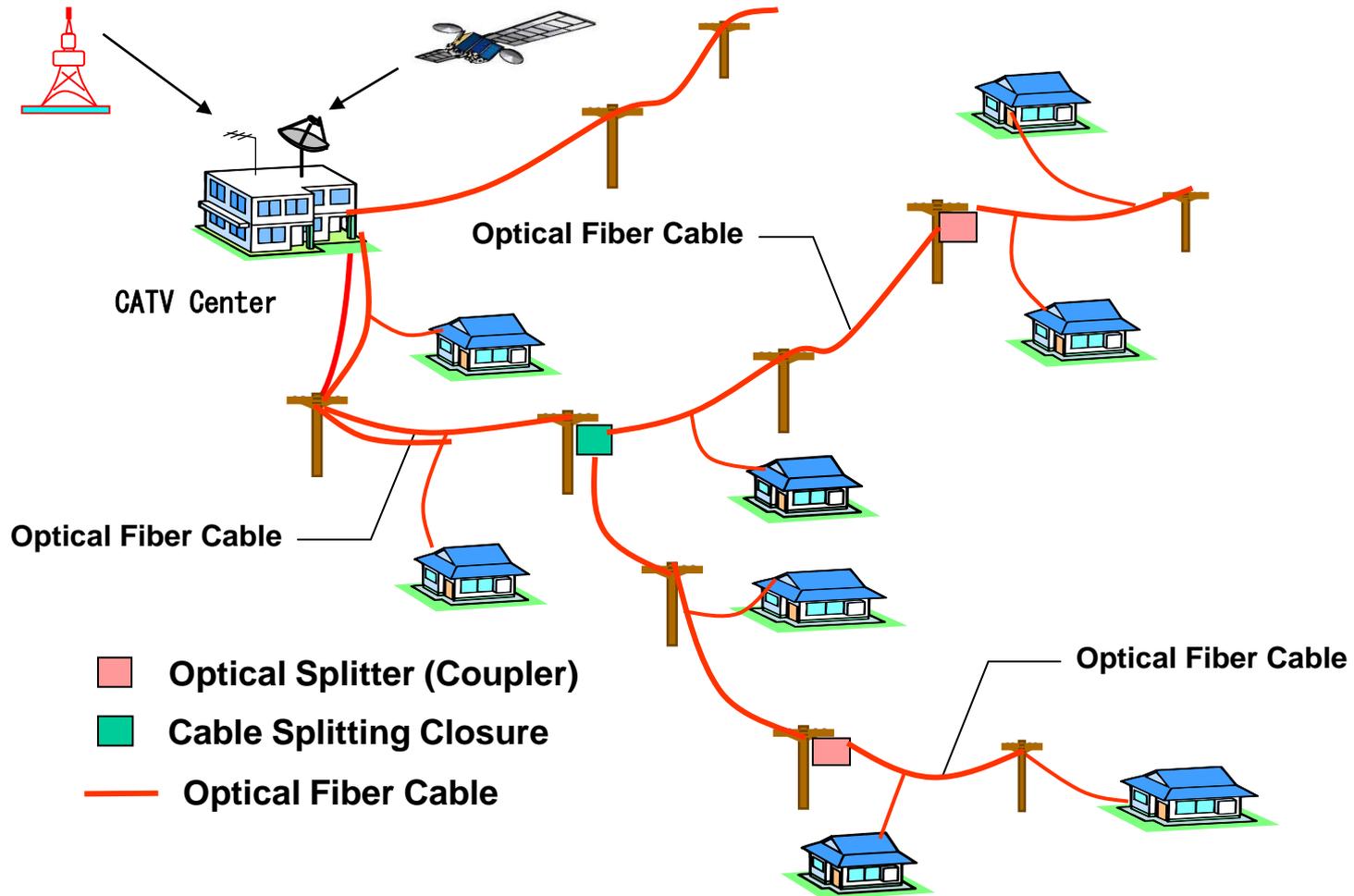
Television Signal	Modulation	Freq. Band		
Standard Television Broadcasting (Analog Television)	NTSC-VSB-AM	90- 770 MHz	H F C	F T T H
Std. Digital Television Broadcasting (Terrestrial Digital Television)	OFDM			
Digital Cable Television Broadcasting	64 QAM 256 QAM			
Std. Satellite Broadcasting Television (12GHz Band) (BS Analog Television)	FM	BS-IF (1035-1332-1484MHz) BS1 - BS15 - BS23	—	
Std. Satellite Broadcasting Digital Television (BS Digital Television) (12GHz Band)	TC8PSK			
Broadband Transmission Digital Television (CS Broadband Digital TV) (12GHz Band)	QPSK	Broadband CS-IF (1595-2071MHz) * (2126-2602MHz)		

A Typical CATV Network in Japan HFC (Hybrid Fiber and Coaxial) System



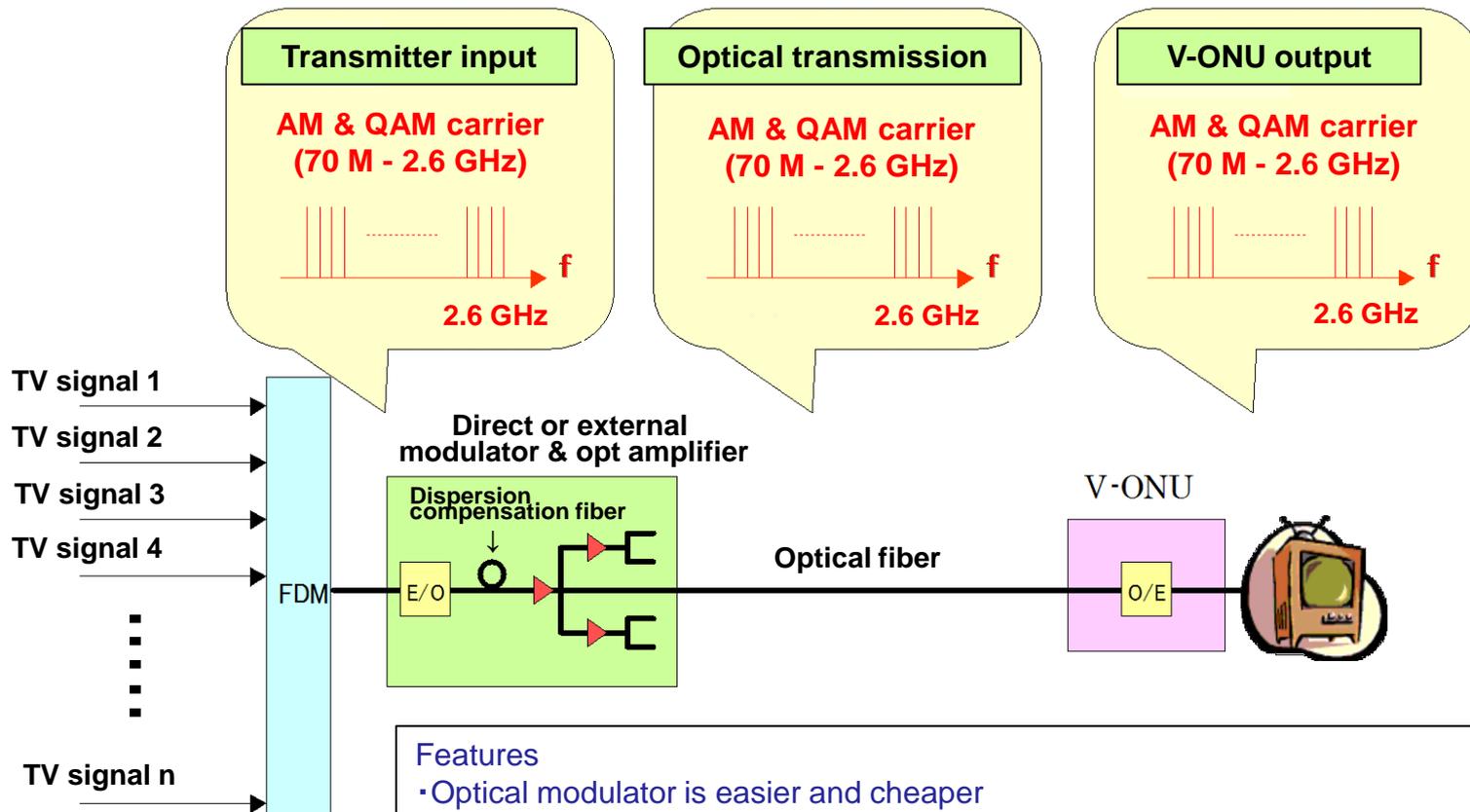
Higher Performance CATV by Cell-Size Reduction

Advanced CATV System FTTH (Fiber To The Home) System



Intensity Modulation Transmission Over FTTH

Mainly using CATV operators

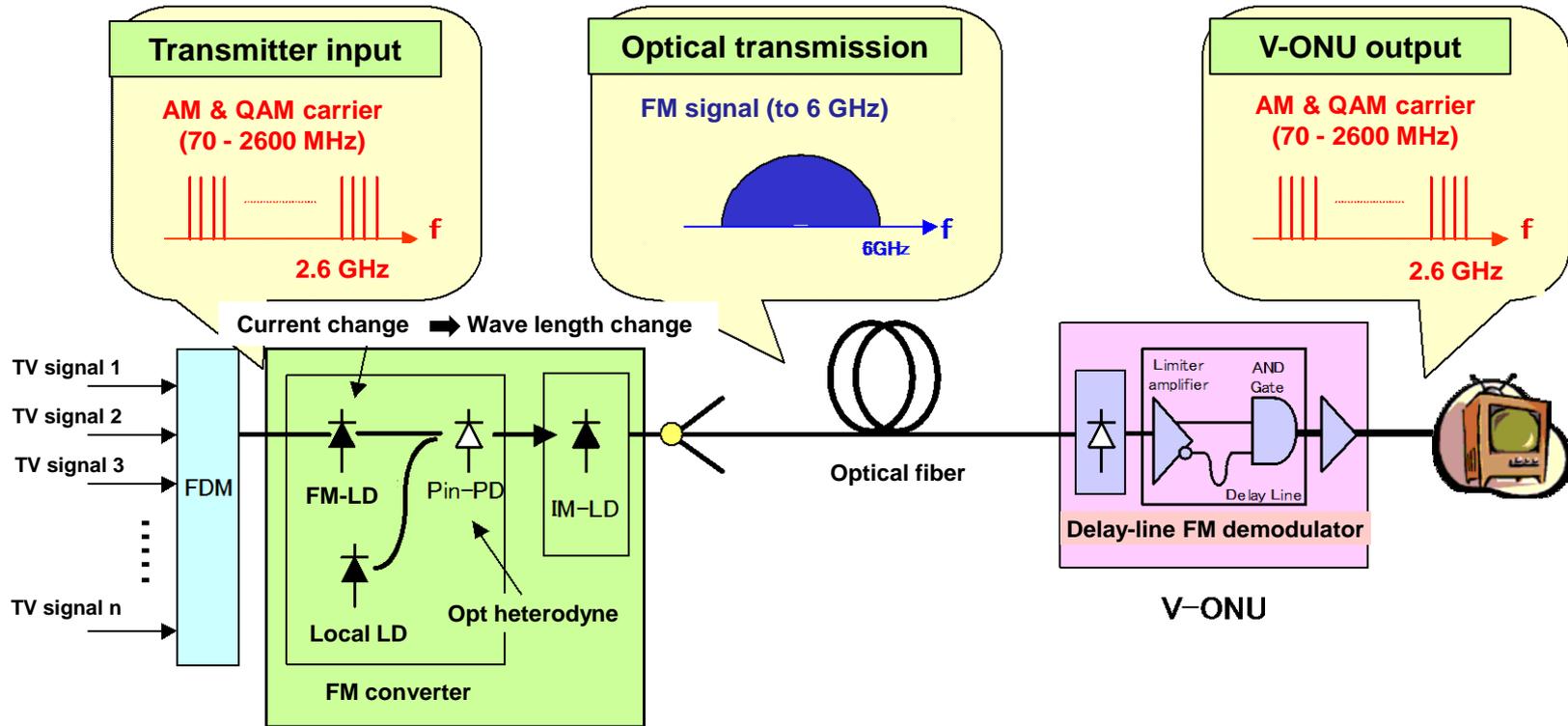


Features

- Optical modulator is easier and cheaper
- Weak against noise for wave dispersion, opt-reflection, amplifier noise
- Low sensitivity of opt-receiver

FM Conversion Transmission Over FTTH

Mainly using NTT



FM conversion transmitter

Features

- Circuits of transmitter and receiver are more complicated, more expensive.
- Strong against noise for wave dispersion, opt-reflection, amplifier noise
- Higher sensitivity of opt-receiver

Digital Conversion for Terrestrial Broadcast

Digital Conversion Of CATV

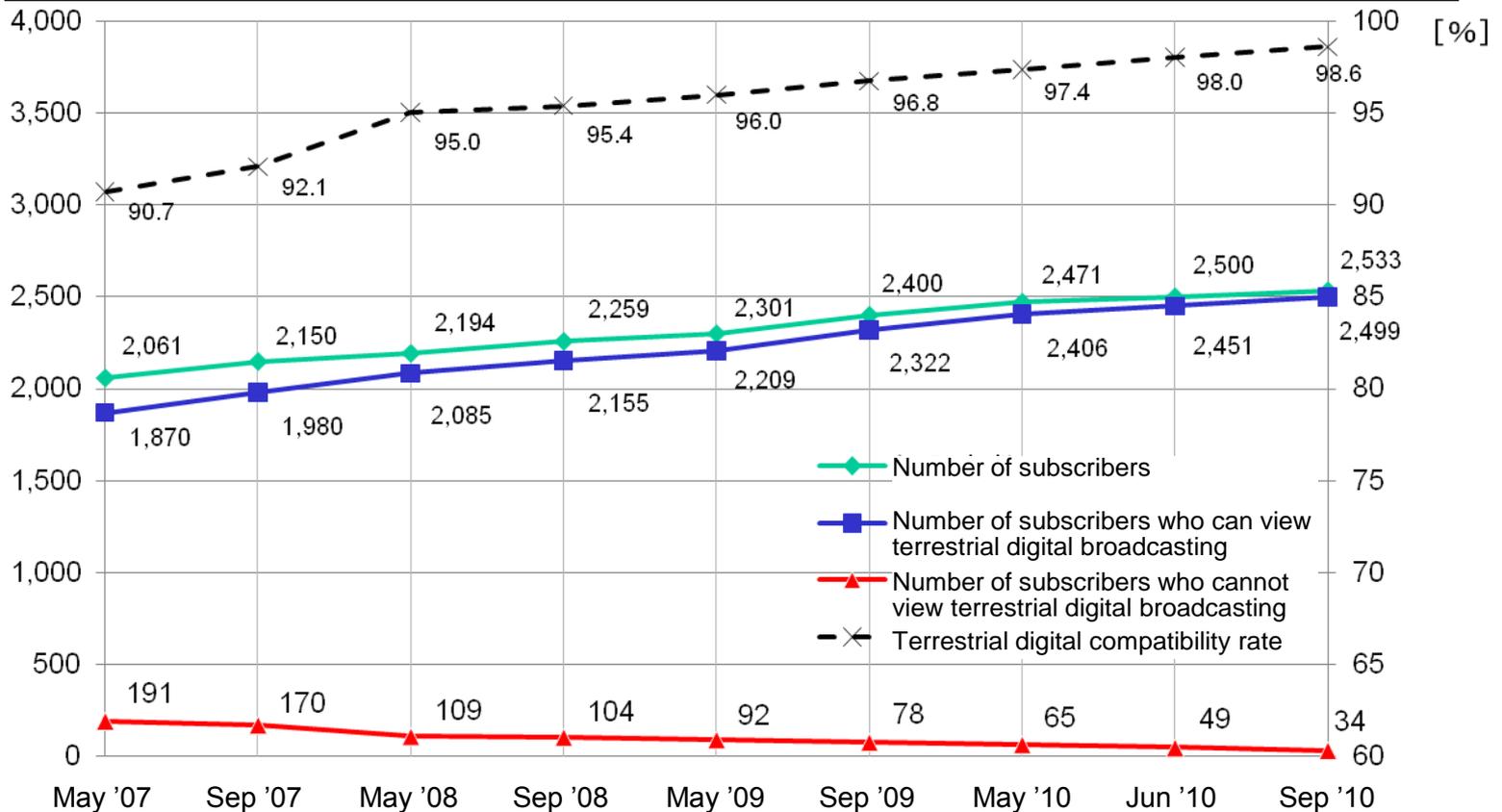
- Gap filler for digital conversion
- Introduction of provisional conversion from digital signal broadcasts to analog signal broadcasts for analog televisions

Digital Conversion Of CATV

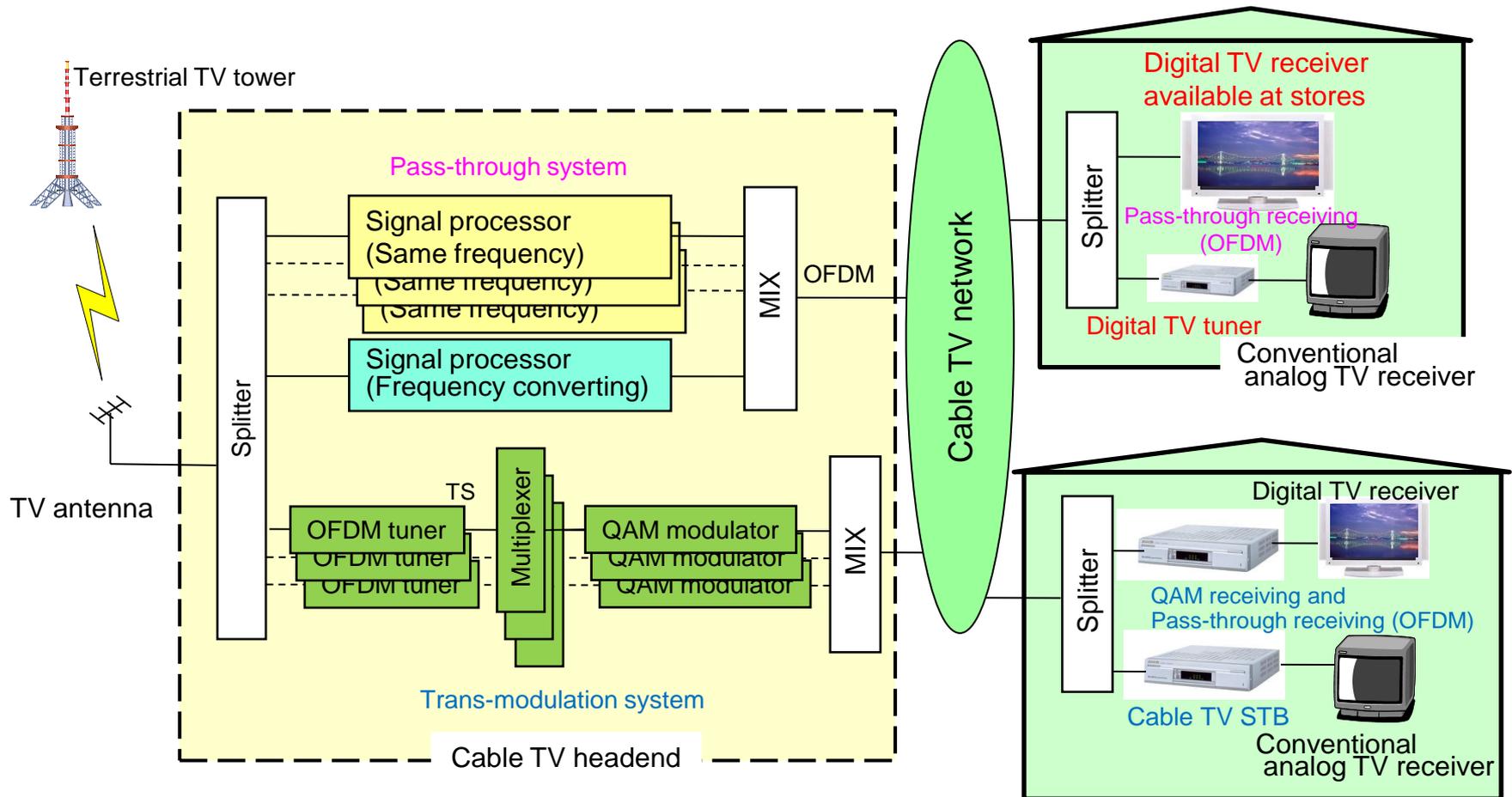
Shifts in the number of CATV subscribers and terrestrial digital compatibility rate

- The number of CATV subscribers has been increasing every year; at the end of September 2010, there were 25.33 million subscribers.
- Based on the number of subscribers, the terrestrial digital compatibility rate with CATV is 98.6%.

(10,000 households)



Retransmission over the cable-television system for terrestrial broadcast



- A digital TV receiver provides a terrestrial OFDM tuner, BS tuner, and CS tuner
- An STB provides a terrestrial OFDM tuner, QAM tuner, and hard disk memory

Function Blocks For Multiplexing TS

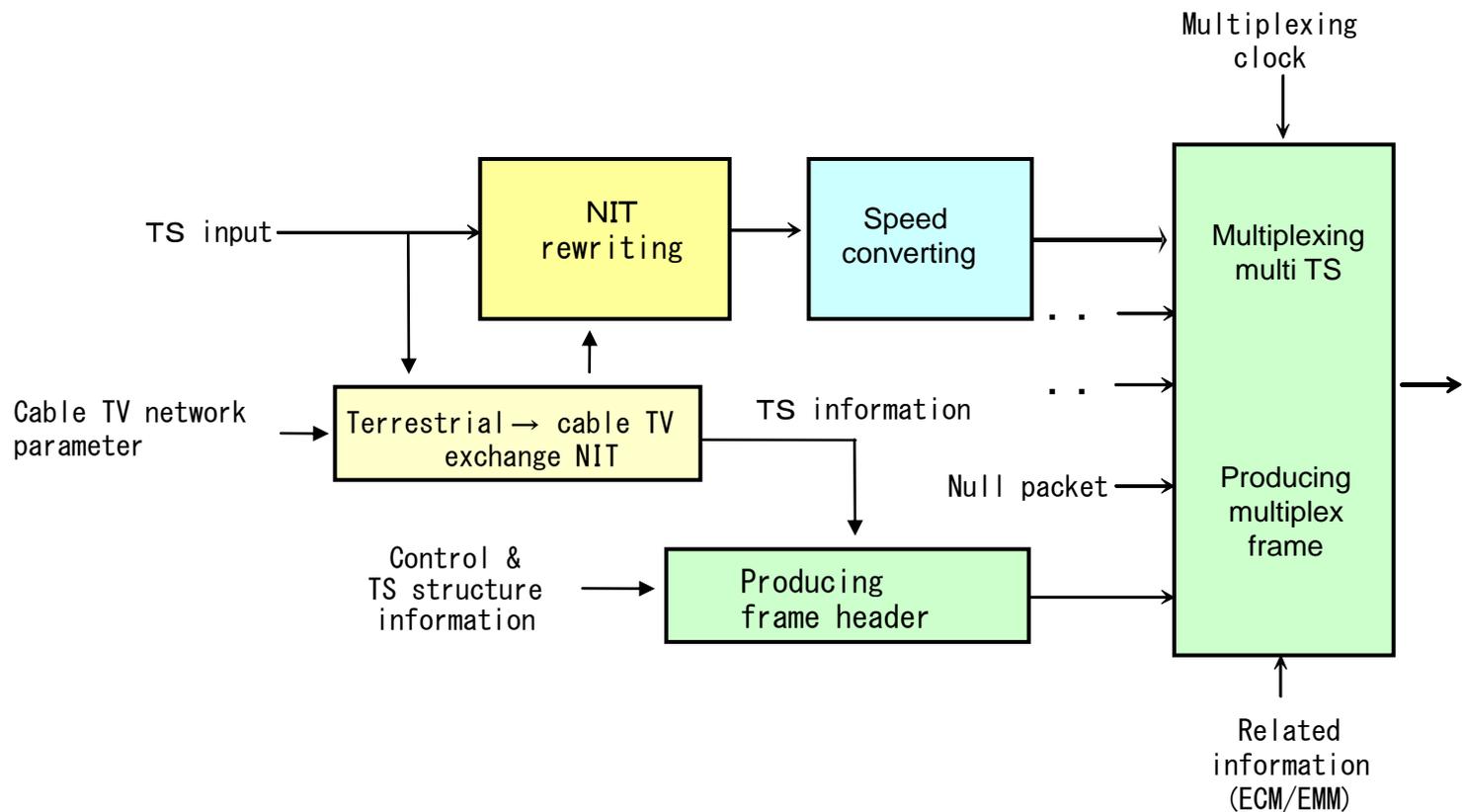
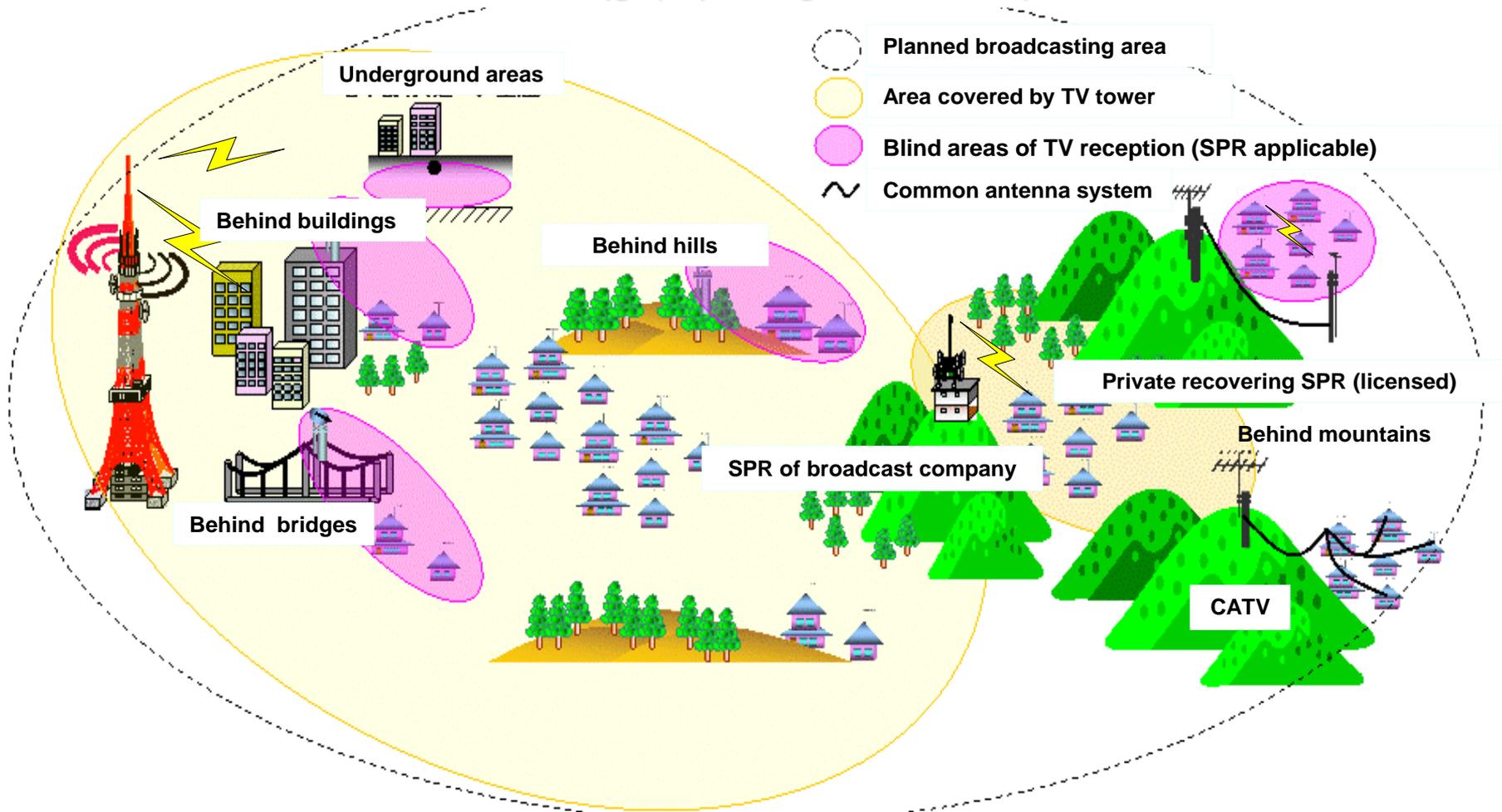


Fig. Configuration of trans-modulation for terrestrial broadcast signal

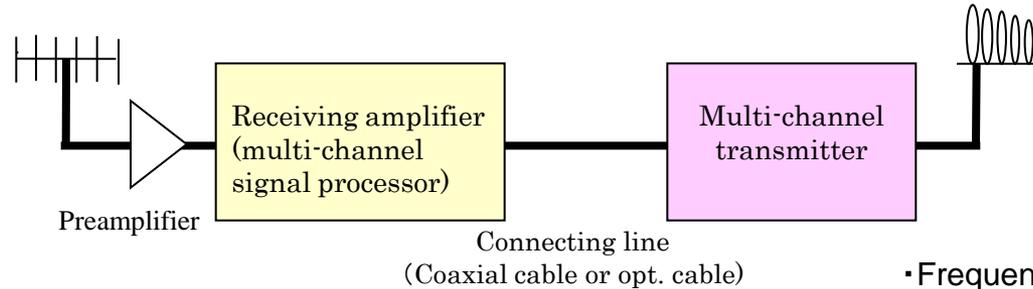
Gap Fillers for Digital Conversion

Locational image of small power broadcasting repeaters (gap fillers) to recover blind areas (gaps) in digital TV reception



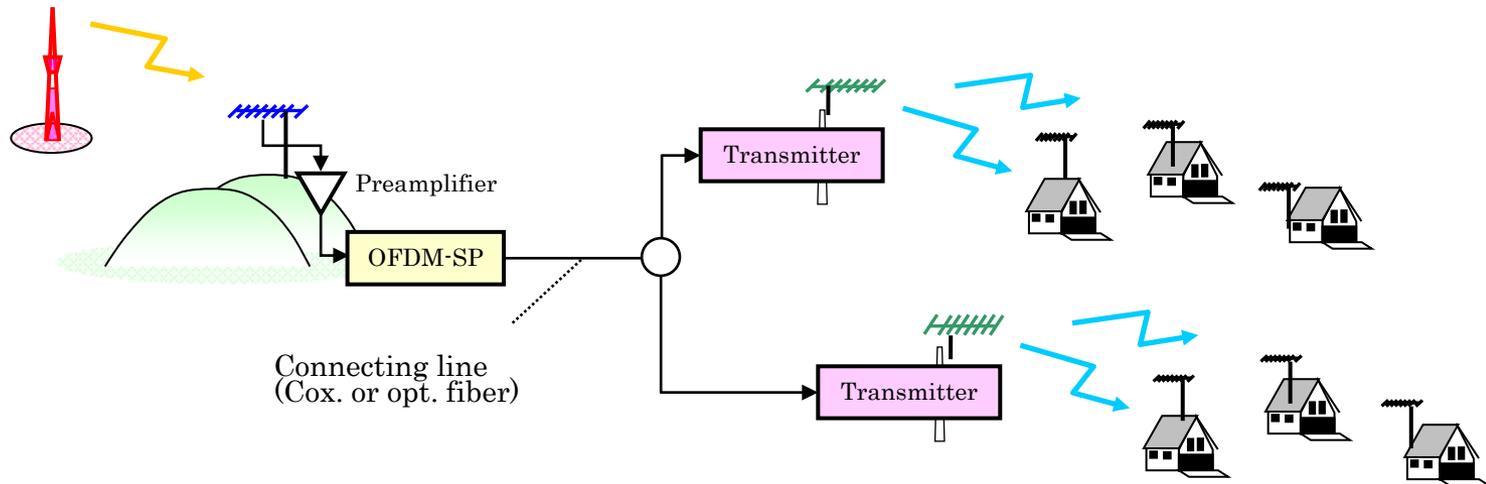
SPR: Small Power Repeater (gap filler of less the 50 mW/ch)

Gap-Filler System



Configuration of the gap-filler system

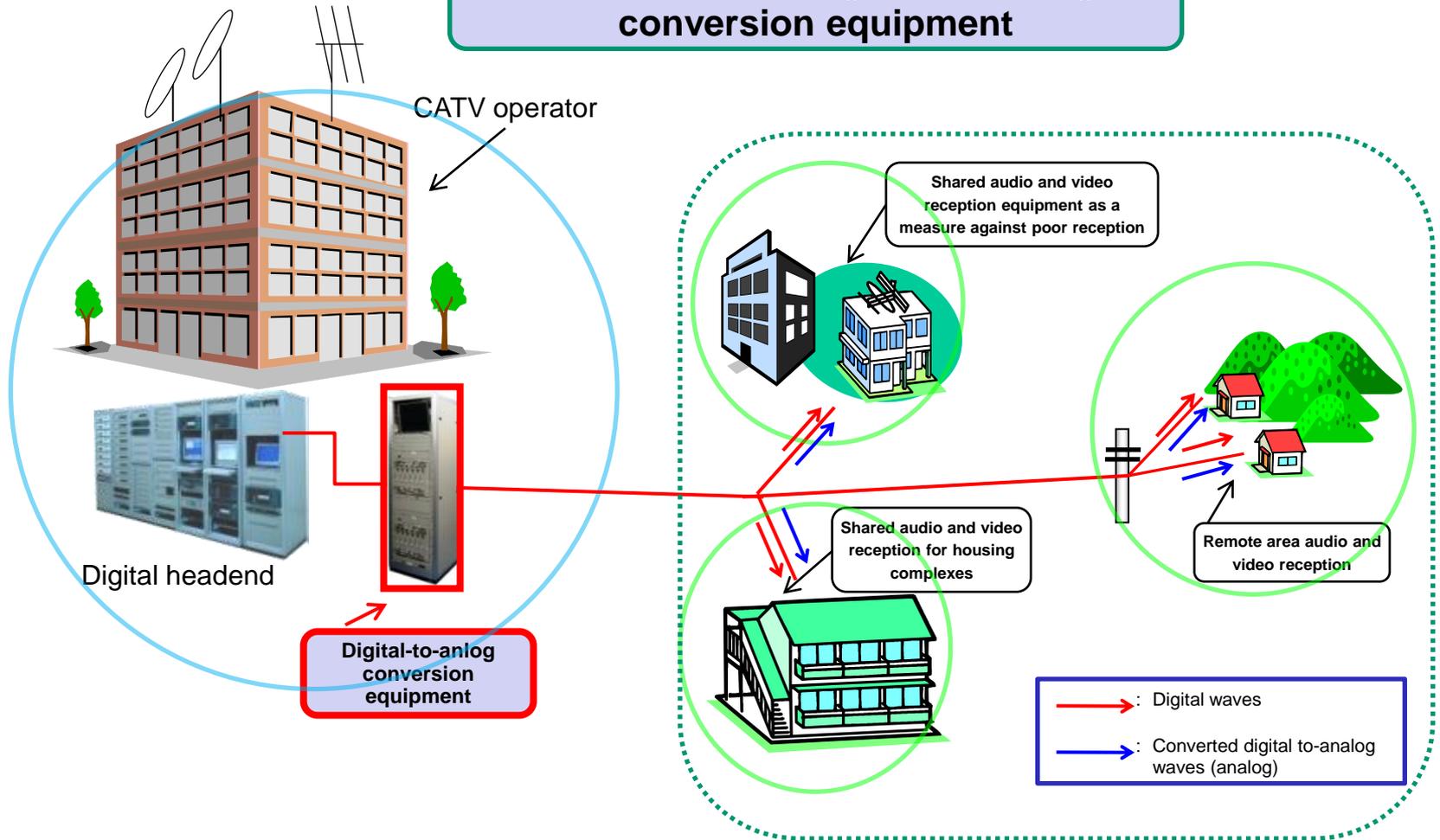
- Frequency deviation : $\pm 20\text{kHz}$
- Delay time : $120\mu\text{s} \geq$
- Antenna power : $50 \text{ mW} \geq$
- Spectrum mask:



Conceptual image of covering TV reception in blind reception areas behind mountains with gap-fillers (small power transmitters)

Digital-to-Analog Conversion

Introduction of digital-to-analog conversion equipment



Digital-to-Analog Conversion for Remaining Analog TVs (Provisional)

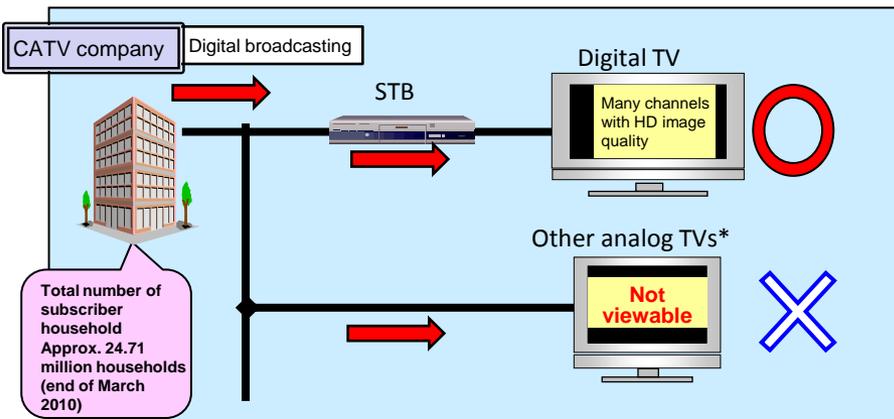
Terrestrial digital TV broadcasting is converted to analog format at the headend for CATV and resent.

- Requests by viewers to continue using usable analog receivers even after terrestrial analog broadcasting ends
- Equalization of the burden of viewers that need to replace analog receivers, including second and third receivers
- Equalization of disposal/recycling of analog receivers

Thus, digital-to-analog conversion will be promoted as a provisional measure until the end of March 2015.

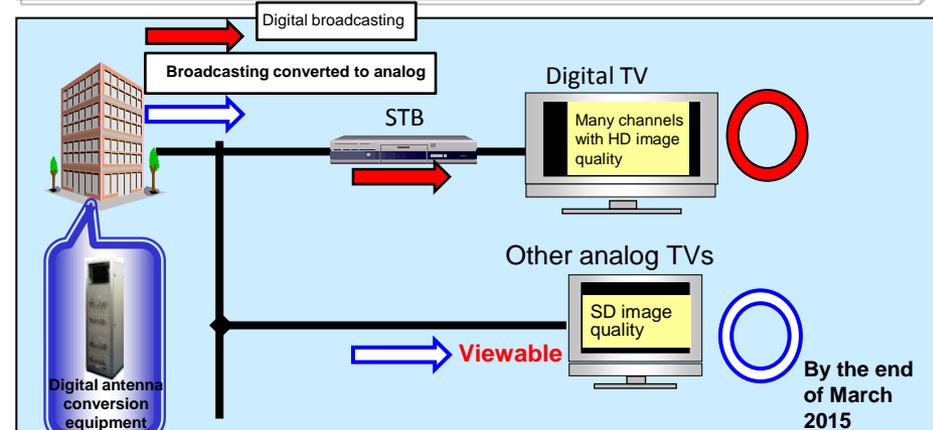
After the end of terrestrial analog broadcasting

Since only digital broadcasts are resent to subscribers via cable, digital broadcasting cannot be viewed on analog TVs other than those that are connected to an STB



Provisional introduction of digital -to-analog conversion

Having cable TV operators convert terrestrial digital broadcasting to analog broadcasting as a provisional measure will make it possible to view terrestrial digital broadcasting even on analog TVs for a certain period of time



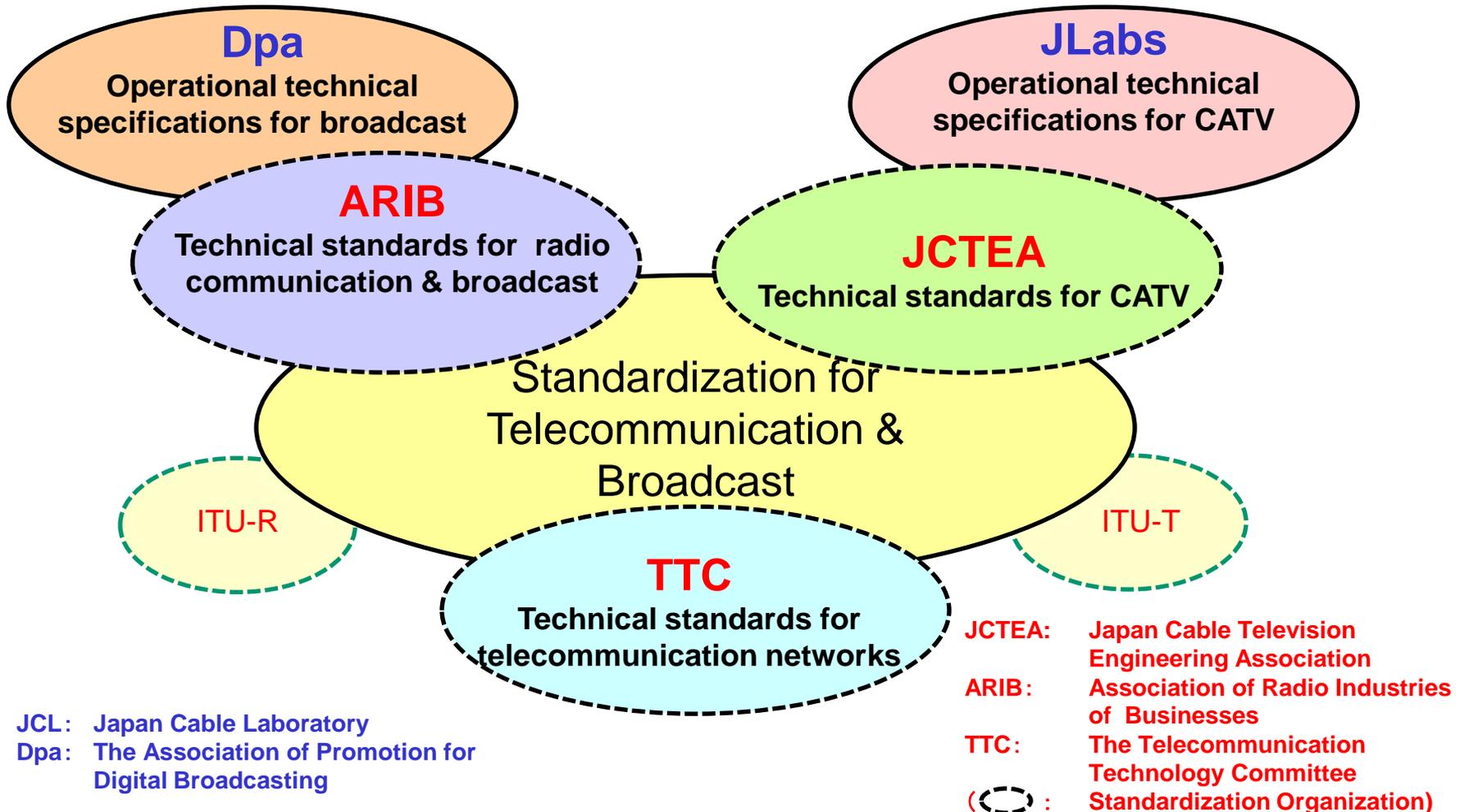
(Note) "Digital -to-analog conversion" service comes with the following kinds of limitations.

- (1) Images are letterbox size and of SD image quality.
- (2) Data broadcasts cannot be received.
- (3) EPG (electronic program guide) cannot be used.
- (4) The number of times that broadcasts can be recorded is "copy once."

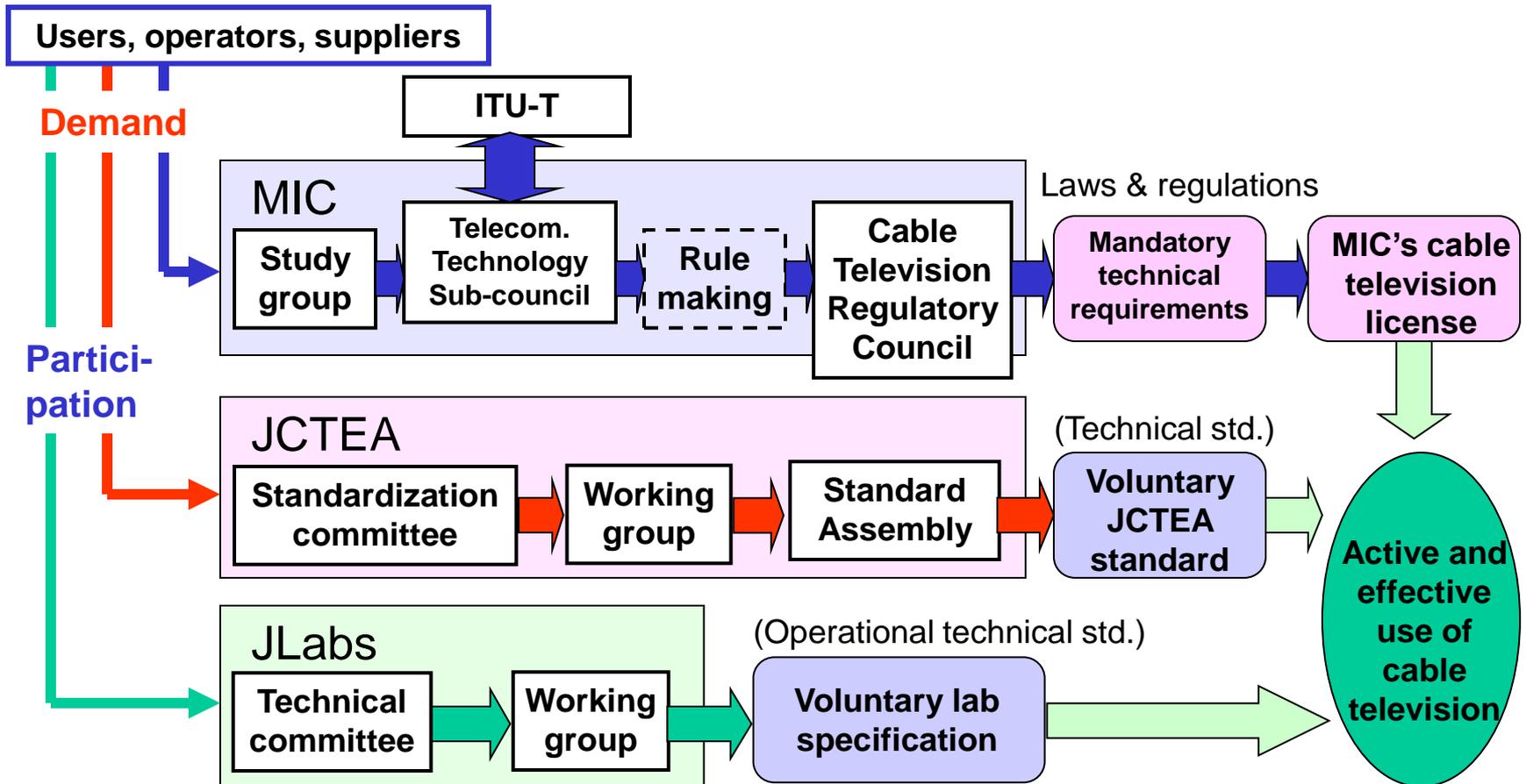
Standardization for CATV

Government Regulations and
Voluntary Consensus Standards

Standardization Organization for Telecommunication



CATV Standardization Process in Japan



Note: MIC = Ministry of Internal Affairs and Communications

Government Regulations and JCTEA Standards for Cable Television

	Government Regulations	JCTEA Standards
Nature	Mandatory	Voluntary (Industrial)
Purpose	<ul style="list-style-type: none"> ◆ To promote efficient use of frequencies ◆ To avoid interference ◆ To protect consumers (minimum quality) 	<ul style="list-style-type: none"> ◆ To ensure common interface ◆ To ensure suitable quality (higher quality)
Technical items	<ul style="list-style-type: none"> ◆ Frequency band ◆ Carrier-to-noise ratio ◆ Bit error rate 	<ul style="list-style-type: none"> ◆ Carrier-to-noise ratio ◆ Communication protocol ◆ Sensitivity ◆ Measurement methods

JCTEA Standard Committee

- **Establishment:** 1996

Members: 65 (as of Dec. 2010)

- Open to any company, organization, or person
- No limitation on nationality
- Independent from JCTEA membership

- **Organization:**

Publication and maintenance of JCTEA standards

Standard Assembly

Chairman

Members

8 working groups + 2 committees

- **Standardization activities**

- Discussion and drawing of standards for technology and measurement
- Publication of standards books
- Certification of standards conformity

JCTEA Standards concerning Networks, Equipment, STB & Measuring Methods for Digital, FTTH, & Internet

Only the Japanese edition is available now.

- STD-001 Conditional Access for Digital Cable Television
- STD-002 Multiplexing for Digital Cable Television
- STD-003 Service Information for Digital Cable Television
- STD-005 Data Transmission Equipment for Cable Television Network
- STD-006 Symbol Marks for Design of Cable Television
- STD-007 Receiver for Digital Cable Television
- STD-008 BS Digital Broadcasting Pass-Through System for Cable Television
- STD-009 Method of Measurement for Cable Modem
- STD-010-OFDM Method of Measurement for OFDM Signal
- STD-010-PSK Method of Measurement for PSK Signal
- STD-010-QAM Method of Measurement for QAM Signal
- STD-011 Terrestrial Digital Retransmission System for Cable Television
- STD-012 Retransmission System of Terrestrial Digital Broadcasting for Cable
- STD-013 Transmission System of MDU Inside
- STD-014 Optical Network and using Equipment for FTTH Cable Television System
- STD-015 Method of Measurement for FTTH Cable Television System
- STD-016 Method of Interference Measurement for Cable Television Signal Transmission System
- STD-017 Examination Facilities Equaled with Actual Cable Television Network for Cable Television Signal Transmission System
- STD-018 Optical Network Specification for FTTH Cable Television System
- STD-019 Gap-Filler System and its Equipment for Digital Terrestrial Television Broadcasting
- STD-020 Method Of Measurement for Gap-Filler System and its Equipment
- STD-021 18 GHz Band Wireless Access System

Review of JCTEA

Summary of JCTEA

- **Establishment:** Organized in 1975
- **Number of members:** 660 (Sep. 2010)
- **Objective**

JCTEA aims to contribute to the smooth and sound development of a highly networked information society through

- The improvement and spread of CATV technology
- The realization of good television reception

Activities of JCTEA

- **Research and development of CATV network technology**
- **Standardization of CATV network technology**
 - Discussion and drawing of standards for technology and measurement
 - Publication of standards books
 - Certification of standards conformity
- **Certification of “CATV broadcast” engineers**
- **Technical consultation on television reception (digital & analog)**
 - Support for terrestrial TV digital conversion
 - Research on television reception interference caused by buildings, etc.
- **Workshops and lectures on CATV technology**

Current Major Topics

- FTTH for outside plant and building wiring
- Ultra high-speed internet system (DOCSIS 3.0)
- IPTV (IP broadcasting, storage-type broadcasting)
- Home networks (high-speed house wiring for Internet, high-definition TV signal exchange)
- Smooth digital conversion for terrestrial TV broadcasting (complete conversion to digital TV broadcasting from analog TV broadcasting in July 2011)
- Broadband wireless cable systems (WiMAX, etc.)
- Small power broadcasting repeaters (gap-fillers) for terrestrial digital TV
- Introduction (2011-2015) of temporary conversion from digital signal broadcasts to analog signal broadcasts
- Area-based one-segment broadcasting