ITU-T

International Telecommunication Union

Broadband access technology and standardization for integrated cable TV networks

Naoyoshi NAKAMURA

Japan Broadcasting Corporation

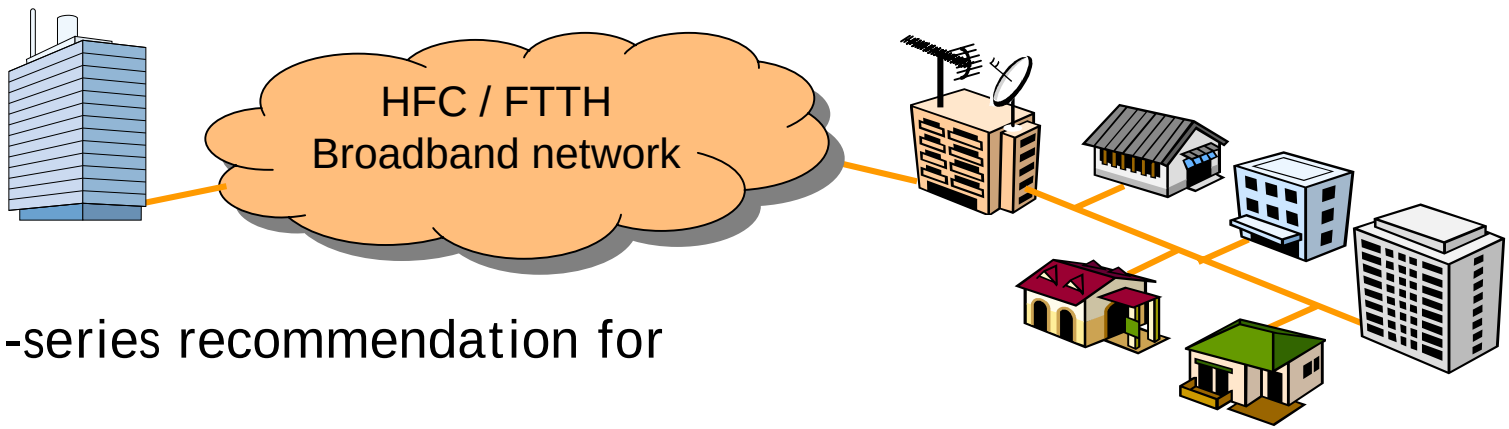
NHK (Nippon Hoso Kyokai)

ITU-T Workshop "NGN and its Transport Networks"
Kobe, 20-21 April 2006

SG 9 area of responsibility

ITU-T

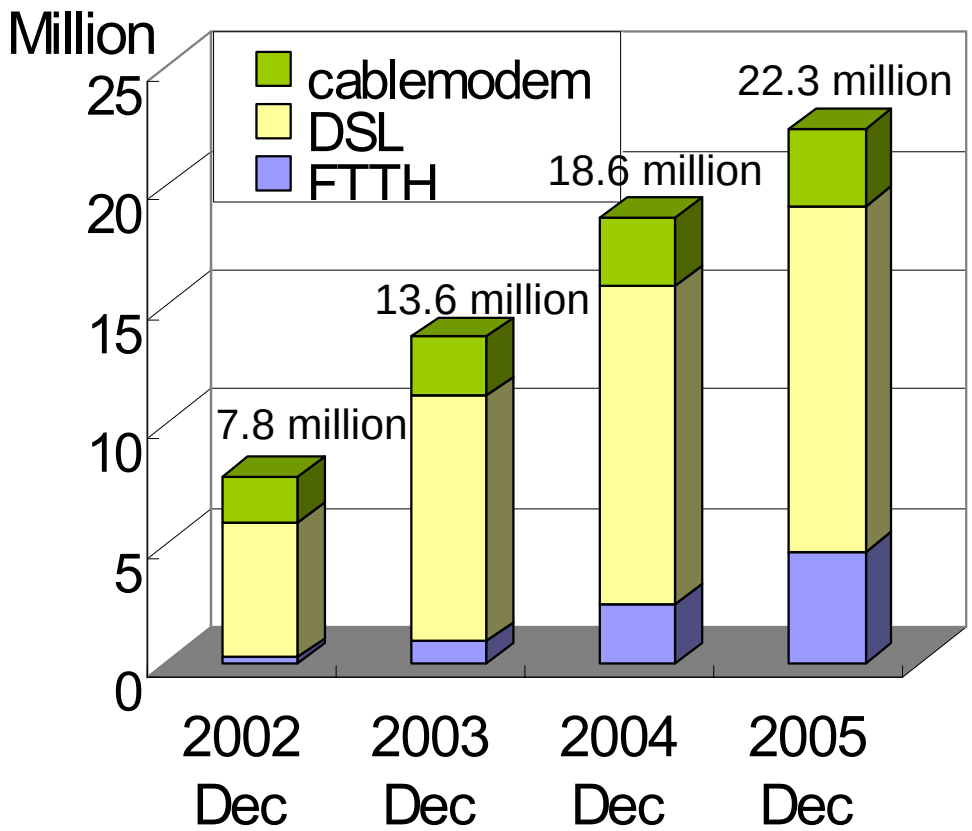
- *Lead Study Group on integrated broadband cable and television networks.*



J-series recommendation for

- Primary / Secondary program distribution
- Audio-visual quality measurement
- API for interactive TV applications
- Set-top box technology, Home networking interface
- Transmission system, LSDI, Real-time video and audio, VoIP

Broadband access rapidly increasing in Japan



As of Dec. 2005,

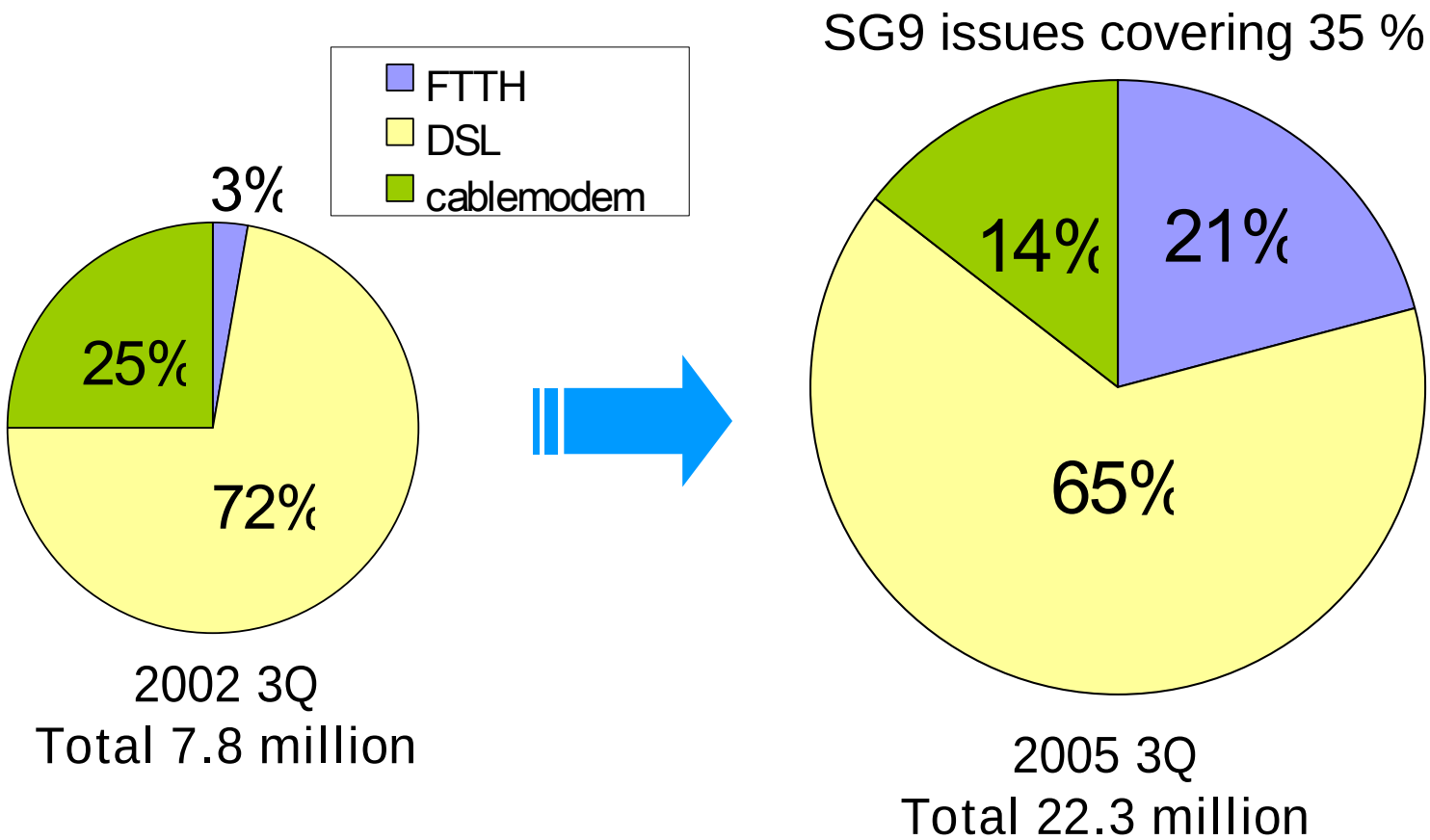
Cable 3.2 million

DSL 14.4 million

FTTH 4.6 million

22 million subscribers, around 44 % of households, enjoy broadband Internet application.

Trend of Broadband Internet connection in Japan



The ratio of FTTH users has become almost 7 times (3 % --> 21 %) within a period of 3 years.

ITU-T

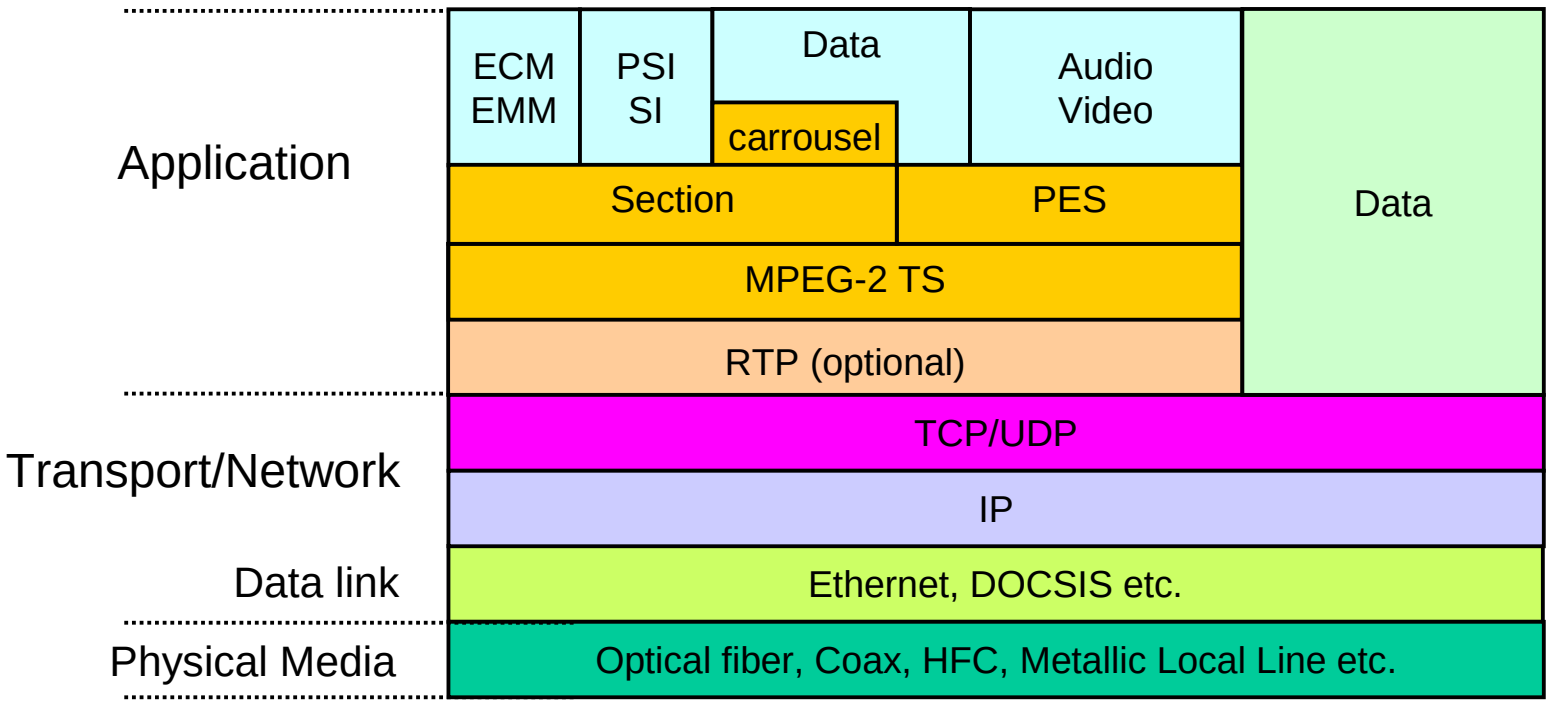
Broadband services

“Triply Play”

- High speed Internet connection
- Voice over IP (VoIP), IP video telephony
- Broadcasting Program distribution , Video on Demand(VoD)
  - MPEG-2 TS over IP packet

Set-top box should play the key role as a virtual gateway to the home network.

Protocol stack of multi-channel video distribution system over IP network



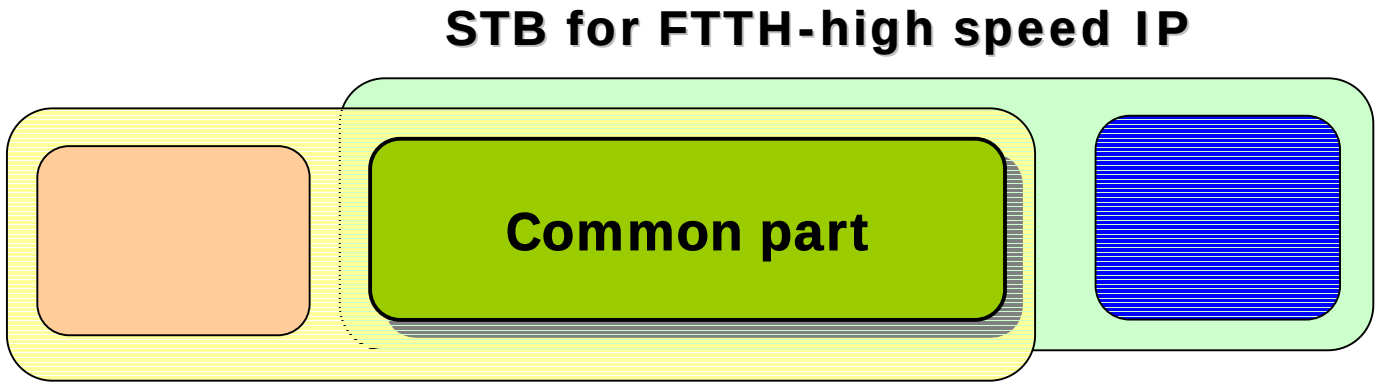
Transport technology in cable network

ITU-T

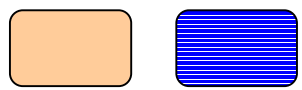
- Cable TV on HFC/coax
  - J.83
    - MPEG-2 TS on 64/256QAM
    - Digital broadcasts modem
  - J.112
    - IP over TS on QAM
    - QPSK/16QAM for US
    - DOCSIS 1.1
  - J.122
    - QPSK/16QAM/64QAM for US
    - DOCSIS 2.0
- IP over FTTH system
  - G.983 series
    - Physical layer
  - J.281
    - Requirement for multichannel video transmission
  - J.mcvif-arch
    - Architecture of multichannel video transmission

- J.stb-core-arch
  - Core architecture of IP based set-top box

Discussion on STB technology



Common part including
- Video, Audio codecs
- APIs
- Conditional Access System
- Transport packet format
- QoS scheme (In home network)
- Service Information
- Downloadable functionality



To be specified

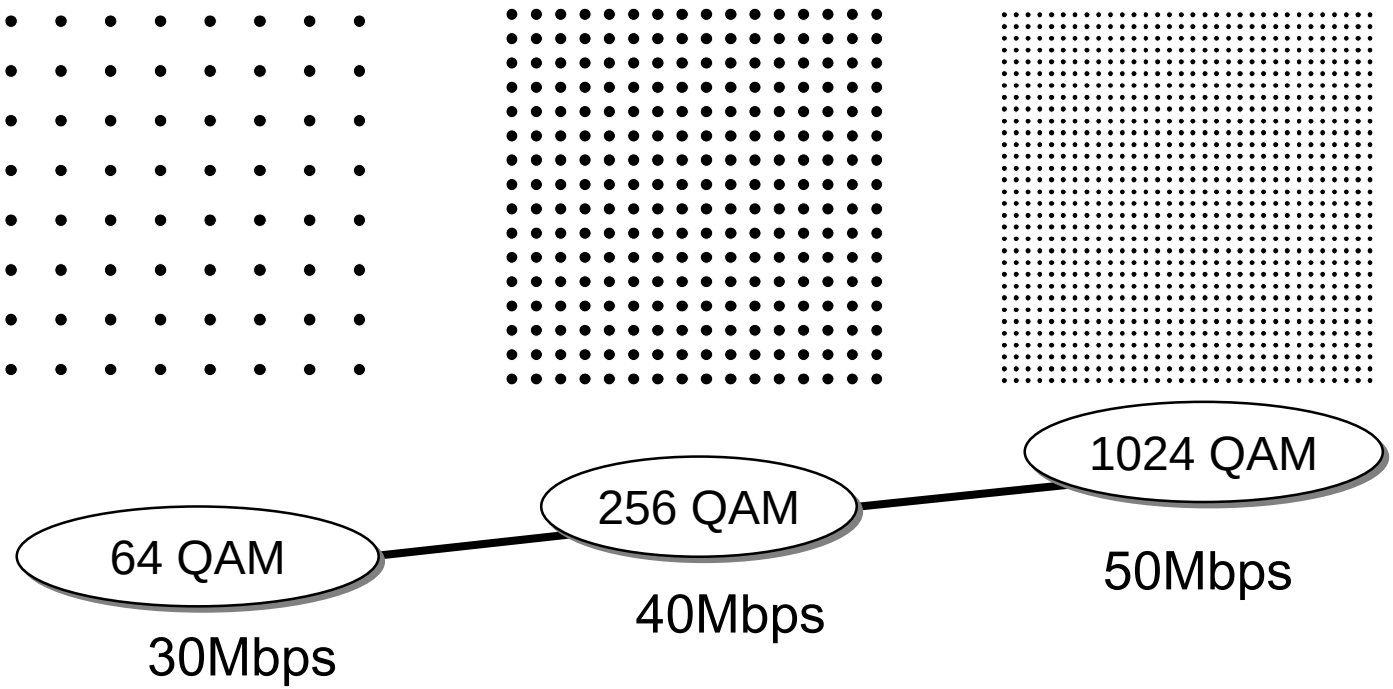
ITU-T

Recommendations approved and work in progressing in SG9 for video signal distribution over IP-based network

J.241	Quality of service ranking and measurement methods for digital video services delivered over broadband IP networks (Approved in 2005-04)
J.281	Requirements for multichannel video signal transmissions over IP-based fiber network (Approved in 2005-03)
J.mcvif-arch	Architecture of multi-channel video signal distribution over IP-based network
J.stb-core-a	Core architecture functionality of next-generation STB
J.stb-mi-a	Core architecture functionality of a next generation STB that is not dependent on the transport media
J.stb-cable-a	Cable network architecture component of the next-generation STB

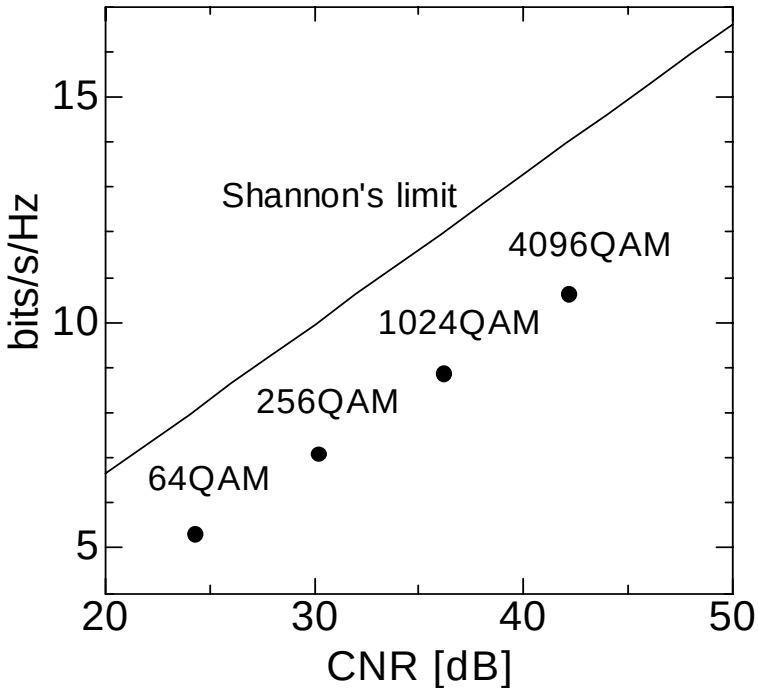
High speed technology for cable TV and feasibility study

- High density modulation in the same bandwidth

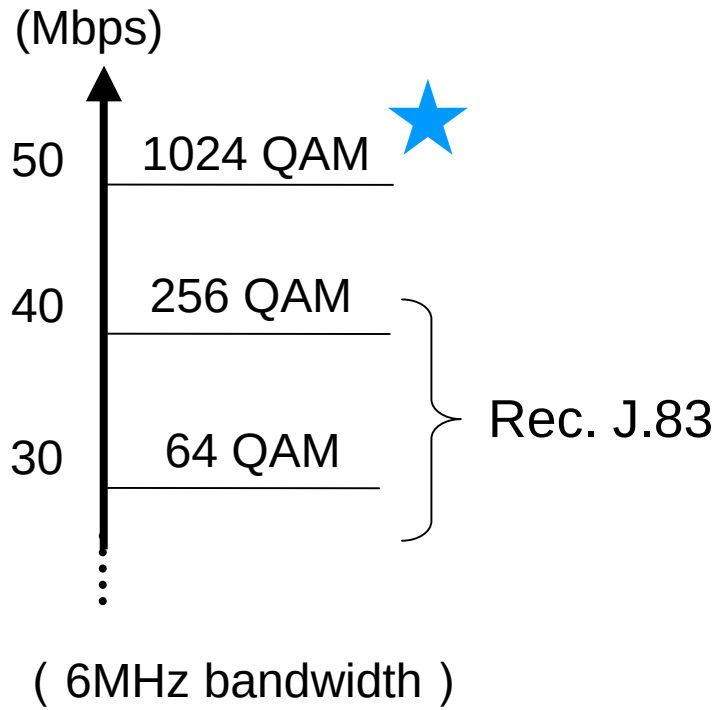


High density modulation for expanding channel capacity

ITU-T



Required CNR and spectrum efficiency.
(BER = 1E-4 and rolloff is 0.13.)



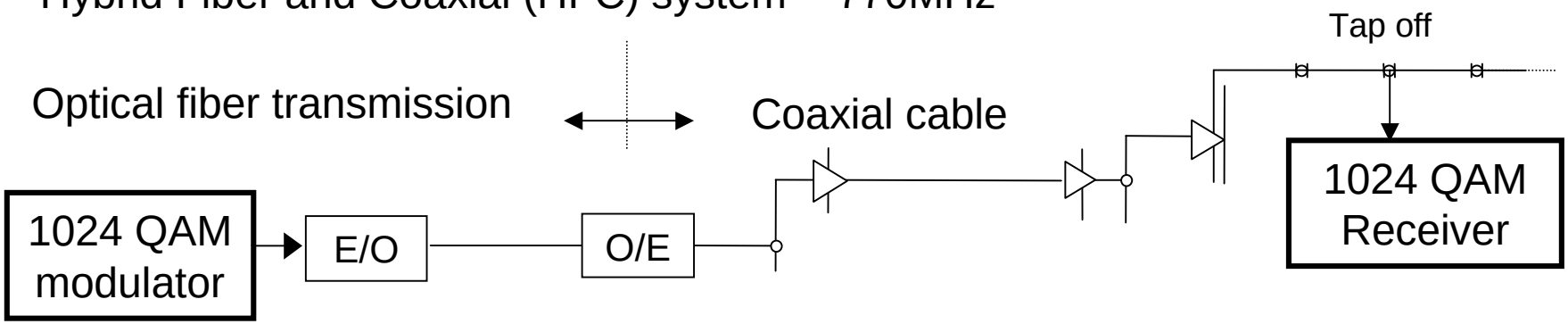
(6MHz bandwidth)

After the analog broadcast channels are switched off,
the capacity can be increased by high density QAM.

1024 QAM field trial in commercial cable TV system in January 2003 (by NHK STRL and TAO)

ITU-T

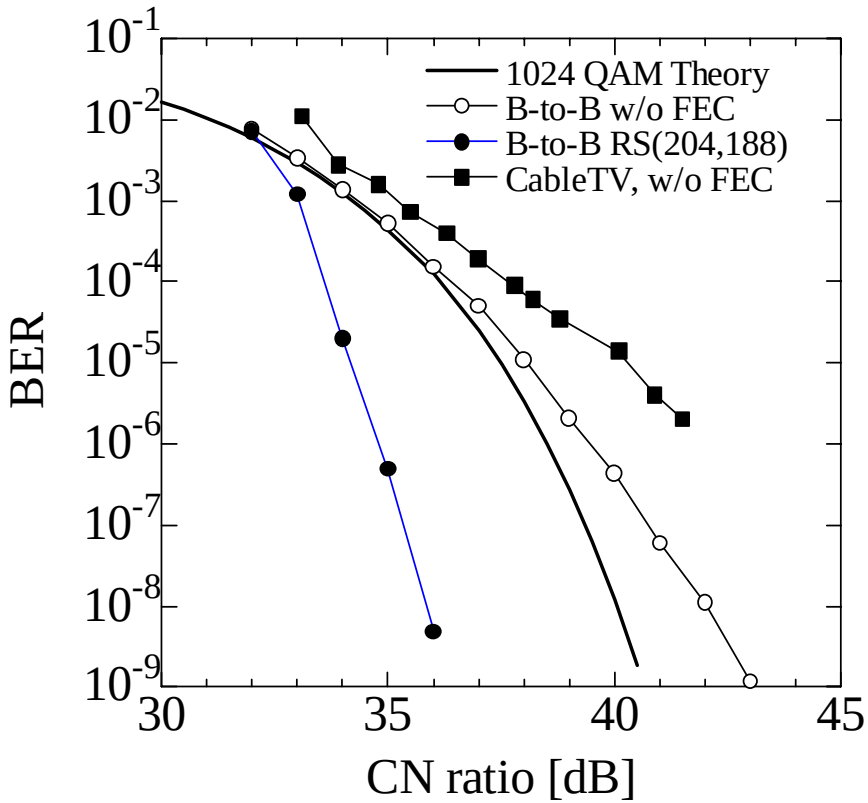
Hybrid Fiber and Coaxial (HFC) system - 770MHz



1024 QAM transmission channel
center frequency 623 MHz

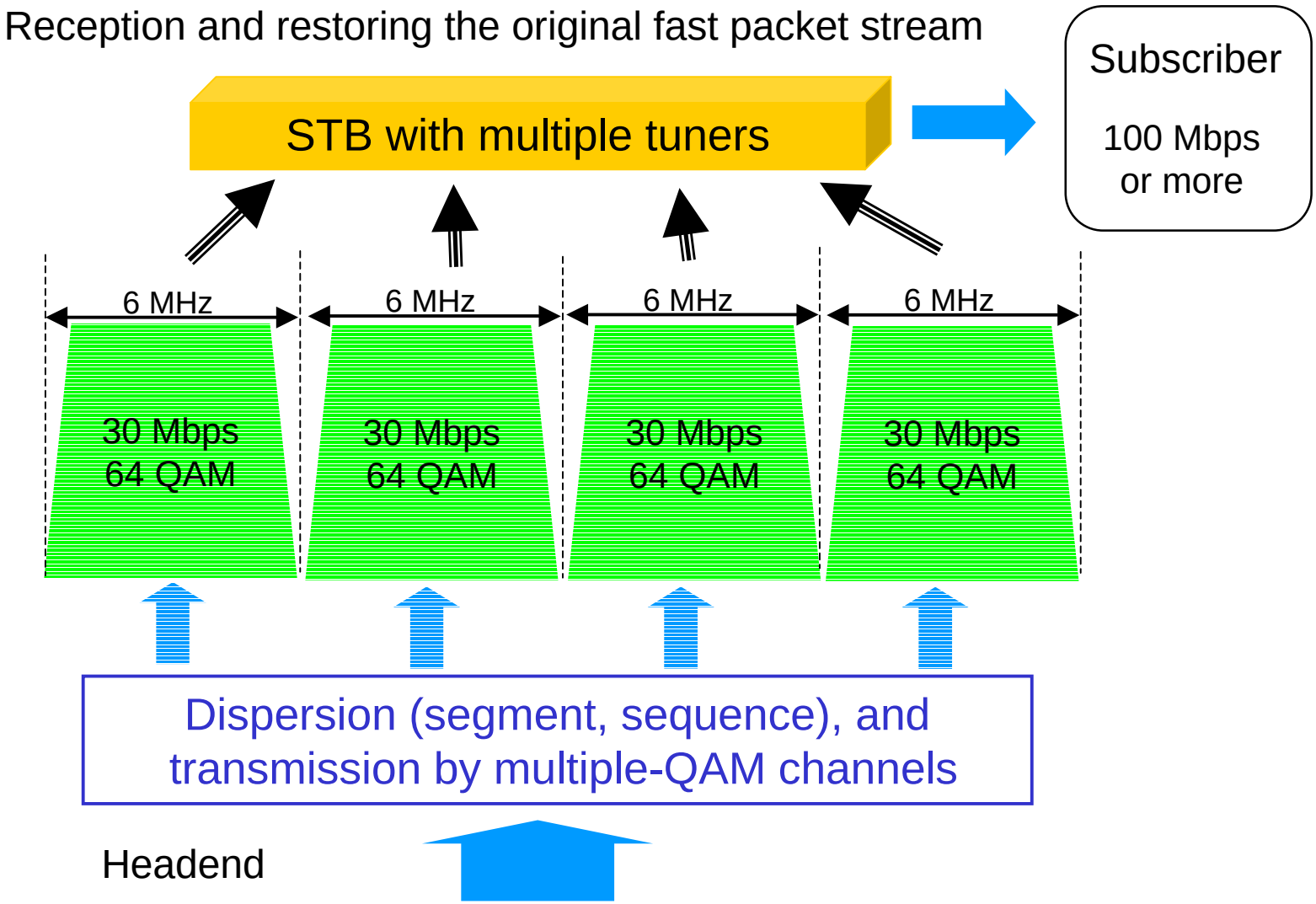
its communications Inc.
Kanagawa Japan

BER performance of 1024QAM transmission in cable TV systems



The results show that 1024 QAM cable TV transmission for video distribution can be achieved with the CN ratio of 38 dB or more at the consumer premises. (The STB was prototype receiver.)

On going draft specification for DOCSIS 3.0 multiple channels bonding technology



Summary

- Distribution of High Definition TV(HDTV) is a key role for future service via broadband access network
  - Cable TV system (traditional type, HFC is typical)
  - FTTH-high speed IP (Video distribution using TDM, Ethernet technology)
- Critical issues in Home Network and Transport
  - Domain control and Digital Rights Management (DRM)
  - Quality of Services (QoS) definition
- SG9 Standardization focusing on
  - Digital video distribution systems for broadcast services
  - Set Top Box technology in the integrated broadband cable networks

ITU-T

Related Questions in SG9

Questions on STB and transport issues 1 / 2

ITU-T

- **Question 5/9 -**How will broadcast and IP based service reception, via connection to the access network, be integrated into the next generation set-top box with connectivity to the home network ?
  - DNRs in progress are related to next generation STB architecture
    - J.stb-core-arch
    - J.stb-cable-arch
    - J.stb-mi-arch

Questions on STB and transport issue 2 / 2

ITU-T

- **Question 12/9 -**Which mechanism or interface can be used to coordinate digital video systems with optical access and core networks ?
  - DNRs in progress are
    - J.mcvif-arch
    - Architecture of multi-channel video signal distribution over IP-based network