

**Practical Experiment on Digital
Terrestrial Broadcasting in Japan
Tokyo Pilot Project**

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(DiBEG)

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Biography

- in 1964, entered TV-Asahi (commercial broadcaster)
- was assigned Broadcasting Operation and worked camera (color) control.
- in 1978, transferred to engineering division, planning and building new studio systems
- from 1992, engaged in the research and development of new media (Multimedia)
- member of DiBEG(Digital Broadcasting Experts Group)

Tokyo Pilot Project

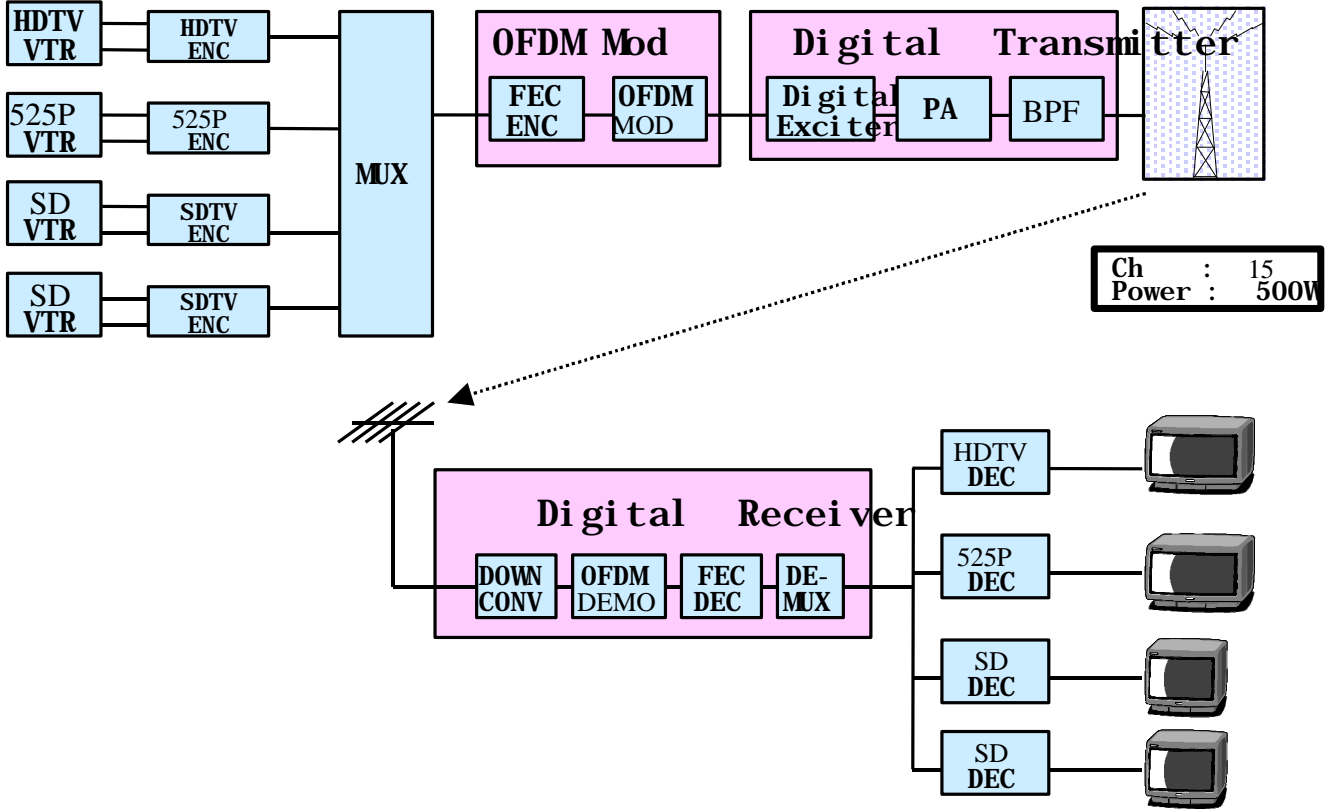
- composed of 71 participants, they are broadcasters, telecom operators, equipment manufacturers, universities and the others.
- aim to implement DTTB and experiment digital new services.
- trial was started November 1998, will continue until March 2002.

Ceremony of DTTB Trial ‘Tokyo Pilot Project’

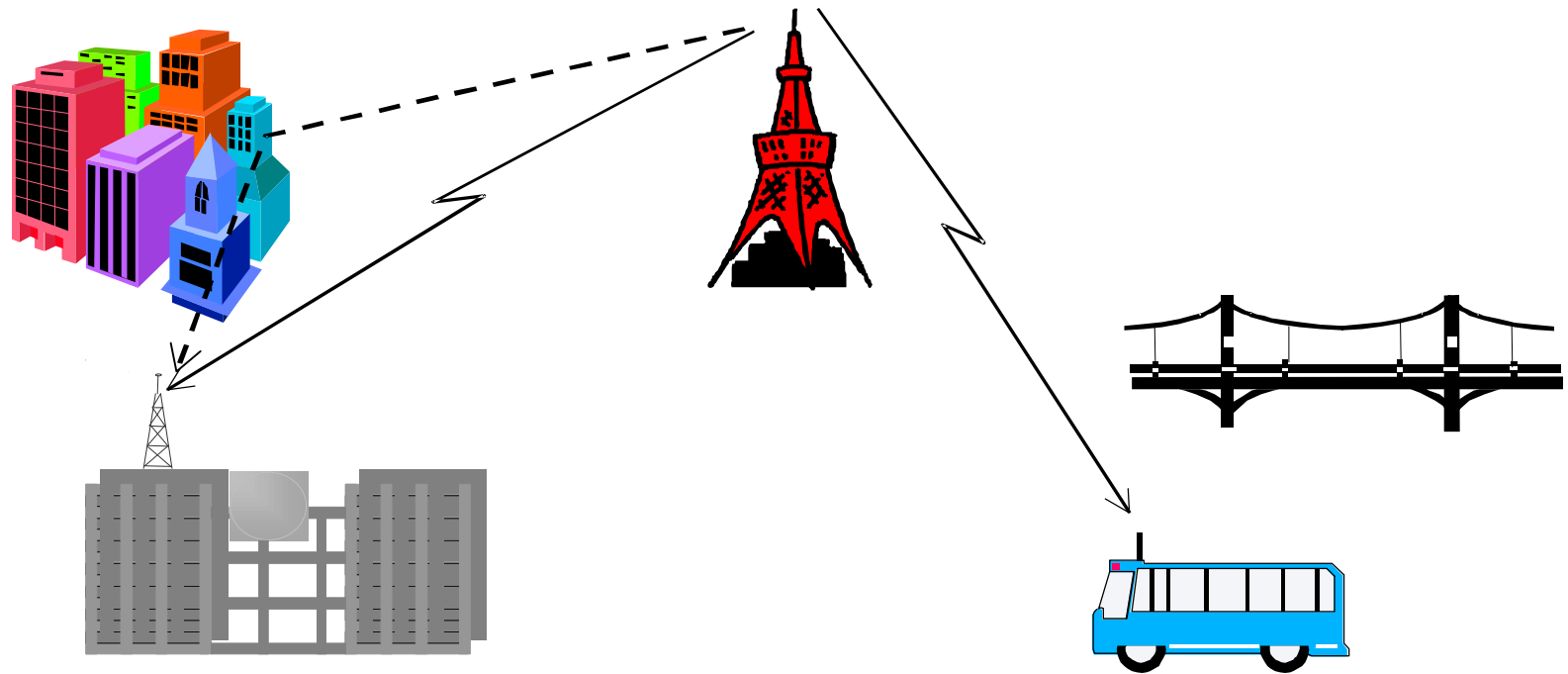
Nov. 11, 1998



Block Diagram



Experimental DTTB Trial Image



Experimental Broadcasting in Japan

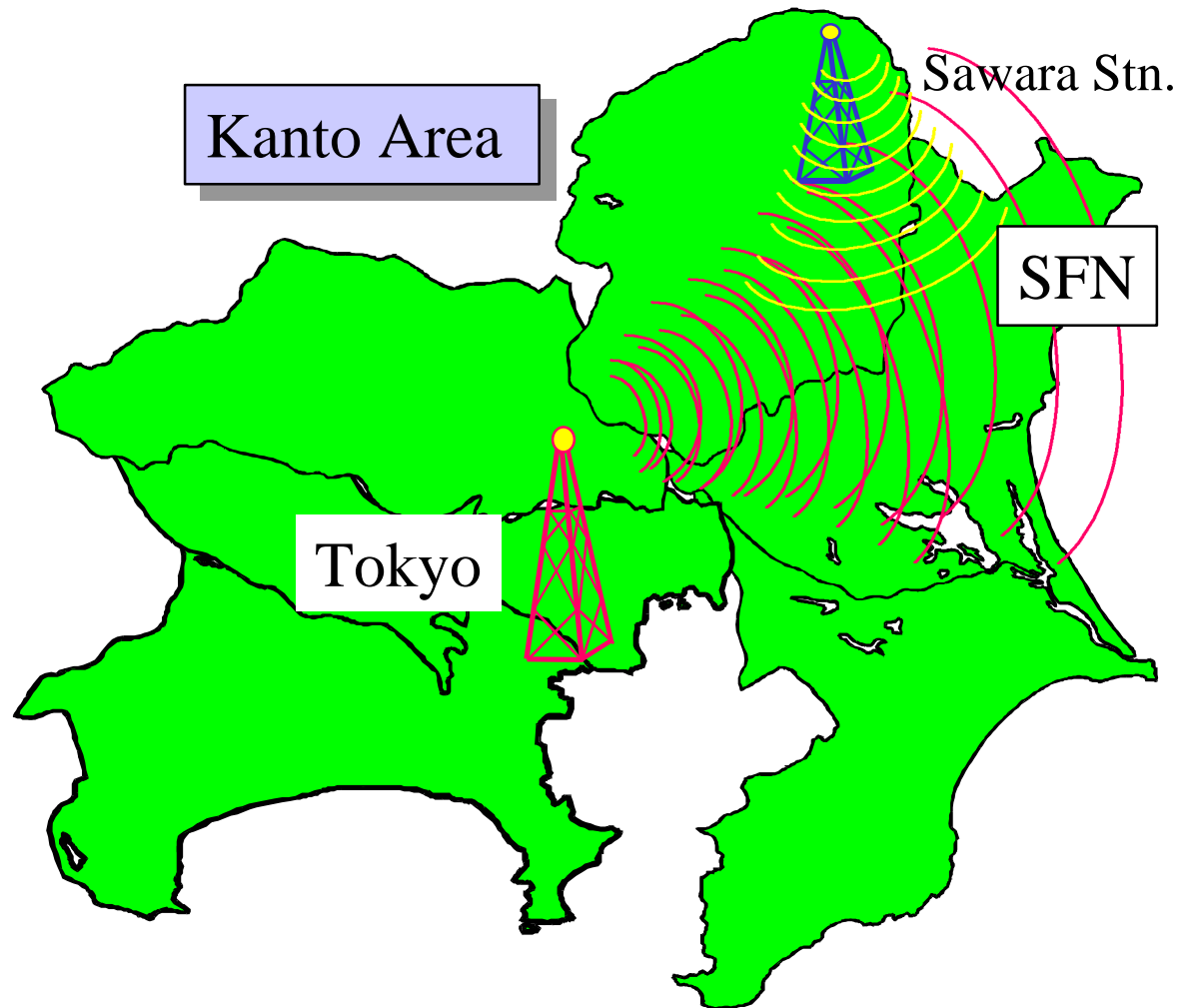
for System finalization of ISDB-T

Transmitting started
since Oct.'98

Tokyo Tower
Height 210m
CH UHF-15
Power 500W

Existing Analog TV

Ch-14 10kW
Ch-16 50kW



Transmission Parameters

Program	Source Coding Bit Rate	Hierarchical Layer(s)	Segment (s)	Carrier Modulation	Inner Code Rate	Time-Interleaving
HDTV	19.1Mbps	1	13	64QAM	7/8	I=8 =0.22sec
480p	10.0Mbps	1	13	64QAM	7/8	
480i(1)	6.5 Mbps	2	12 (Layer1)	64QAM	7/8	
480i(2)	6.5 Mbps		1 (Layer2)	DQPSK	3/4	
Partial Reception	256 Kbps 2ch Audio					
480i(3)	5.1 Mbps	1	13	DQPSK	3/4	I=16 =0.5sec

Mode 1(2K FFT),Guard Interval = 1/8

Result of Experimental Test Fixed Reception (phase 1)

Result of questionnaire survey

- HDTV Picture Quality :
 - 70% evaluators answered 'excellent'
 - 15% evaluators answered 'fair'
 - 10% evaluators answered 'poor'

Multi-program transmission in several video formats:

- HDTV is 1 channel for 19Mbps.
- 480p is 2 channels for 10Mbps each program.
- 480i is 3 channels for 6Mbps each program.

Mobile Reception Parameters

Mode	Guard interval	Modulation	Inner code rate	Time- interleaving	Source Coding Bit-rate
1	1/8	DQPSK	1/2	I=16(=0.5sec)	4.06Mbps
1		DQPSK	2/3	I=16(=0.5sec)	5.41Mbps
1		DQPSK	3/4	I=16(=0.5sec)	6.09Mbps
2		16QAM	1/2	I=16(=0.5sec)	8.11Mbps

Receiving root	Highway and road of KANTO area, radius of 75km.
Receiving antenna	$1/2\lambda$ standard Di-pole antenna, Vertical polarization
Antenna Height	About 3m height (top of mobile roof)

Result of Experimental Test Mobile Reception

- DQPSK-1/2: possible field strength was 40dB μ V.
In the central area of town, there were rare cases of frozen pictures.
- DQPSK-2/3: field strength was about 45dB μ V.
Sometimes the picture froze in the central area of town and shadow areas.
- DQPSK-3/4: field strength was about 50dB μ V.
In the central area of town, it could not receive. In the suburbs or good locations, it could receive mostly.
- 16QAM-1/2: freeze began at about 50dB μ V.
Same as DQPSK-3/4

Mobile Receiving

Digital

Analog



Experiment by the Tokyo Pilot Project

Phase 2

From April '99 to March 2000
We had 21 experiment reports.

1. Video Transmission WG

- TG1: Video Transmission
- TG2: New Video Services
- TG3: CATV Transmission
- TG4: Delivering by Satellite
- TG5: Captioning Program Service

Experiment by the Tokyo Pilot Project

Phase 2

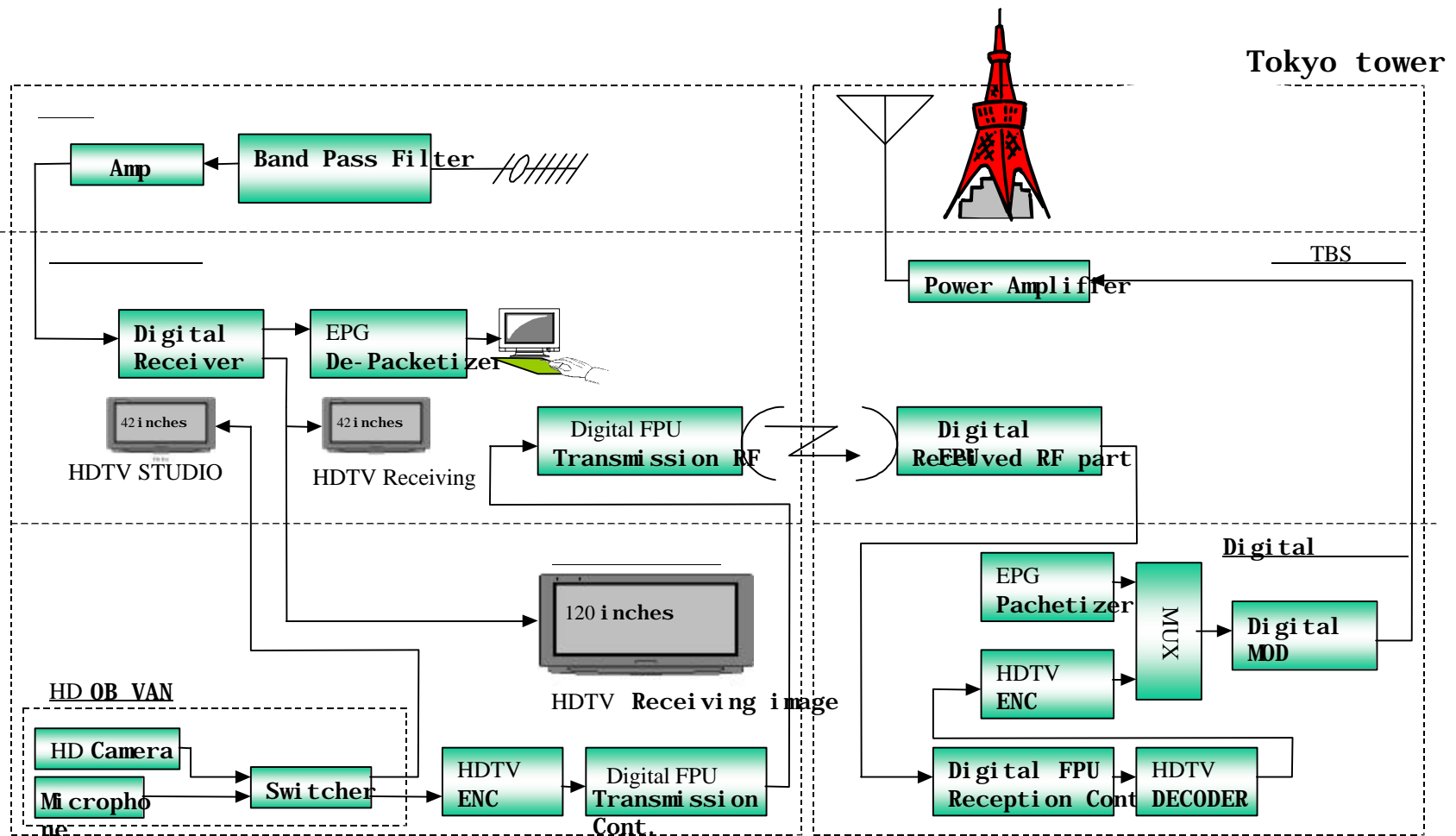
2. EPG·Data Transmission WG

- TG1: EPG Service
- TG2: Data Broadcasting
- TG3: Mobile Reception
- TG4: Interactive Service
- TG5: Operability of EPG Terminal

1. HDTV and EPG Transmission ‘Media Parade’ by “TBS”

- May ‘99, TBS tested HDTV and EPG
- By the 64QAM, the bit-rate was;
Video : 17.7Mbps, Audio : 192kbps×2ch
EPG : 1Mbps
- HDTV is transmitted to Tokyo Tower by Digital FPU.
- Signal delayed about 2 seconds by HD Cord-Dec.
- EPG was perfect received and confirmed behavior
MUX and packetizer

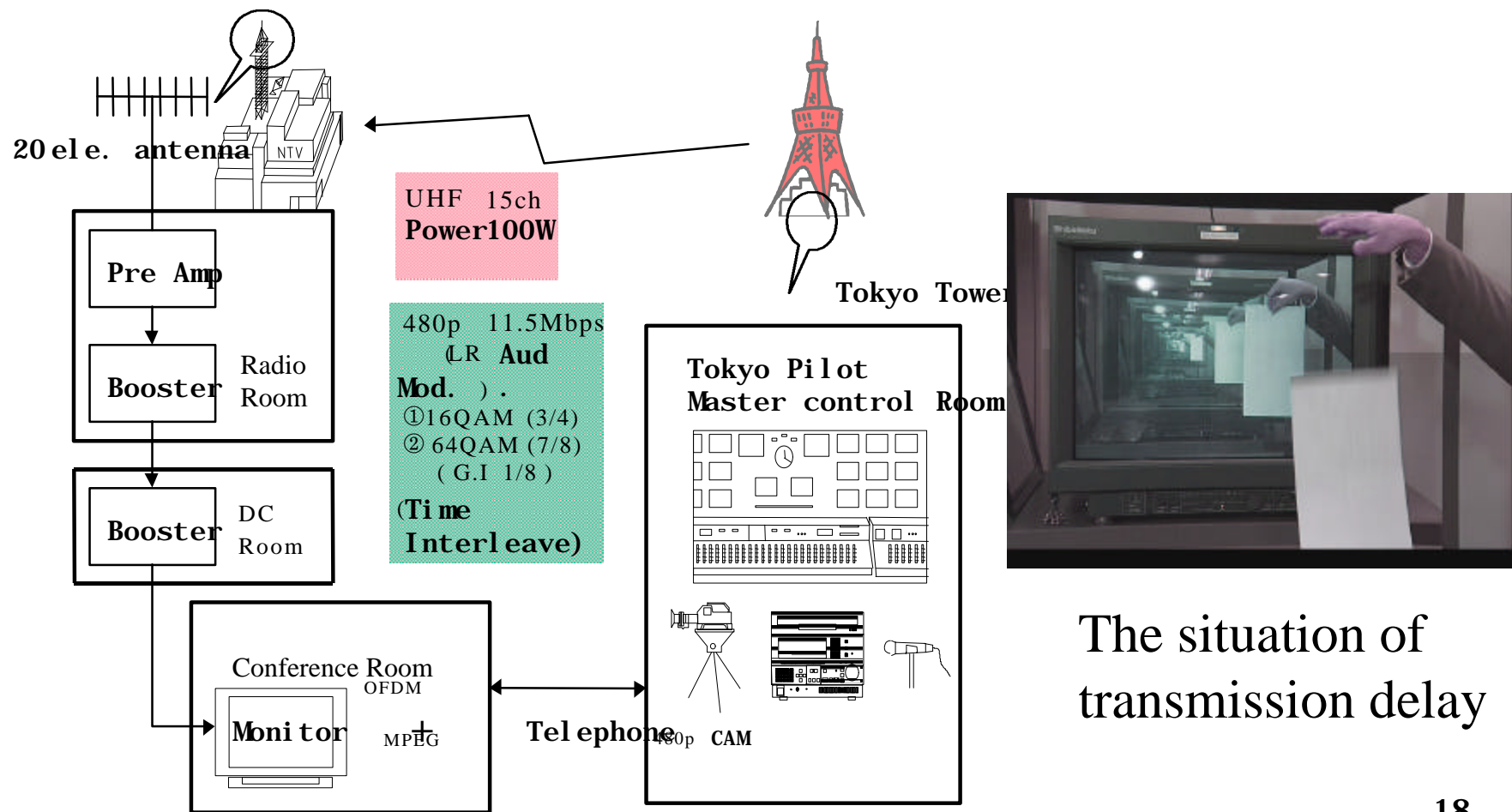
1. TBS Media Parade Figure of Experimental Broadcasting



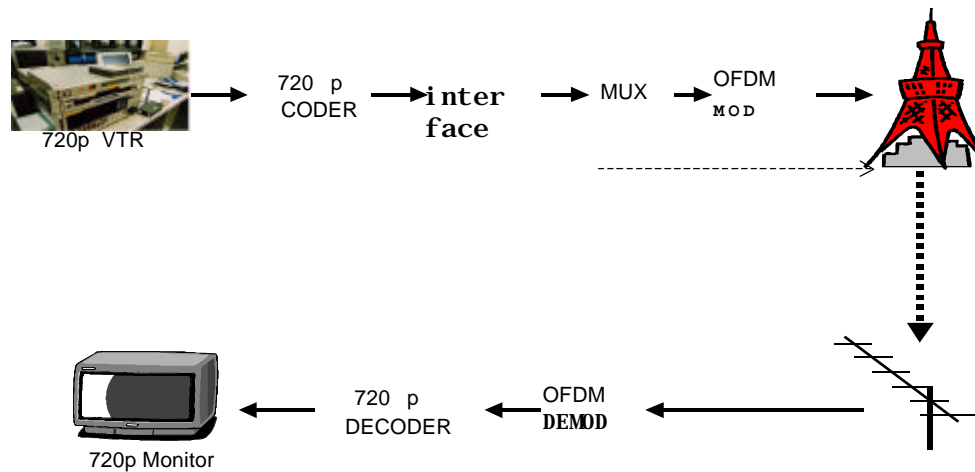
2. Digital TV fundamental experiment by “NTV”

- on July '99, transmission-delay experiment
The delay is 1 second and 29 frames.
at Mode-1, 64QAM, image format : 480P
- on Oct '99, Stereoscopic television is transmitted
using 480p system
The bit rate of Stereoscopic TV is 9Mbps
- 2 program transmission is checked by
**720P is 14Mbps, 480P is 8Mbps with
0.5Mbps data programs.**

2. Experiment system figure of NTV



2. Experiment of 720P



Relation between the bit rate and quality of image

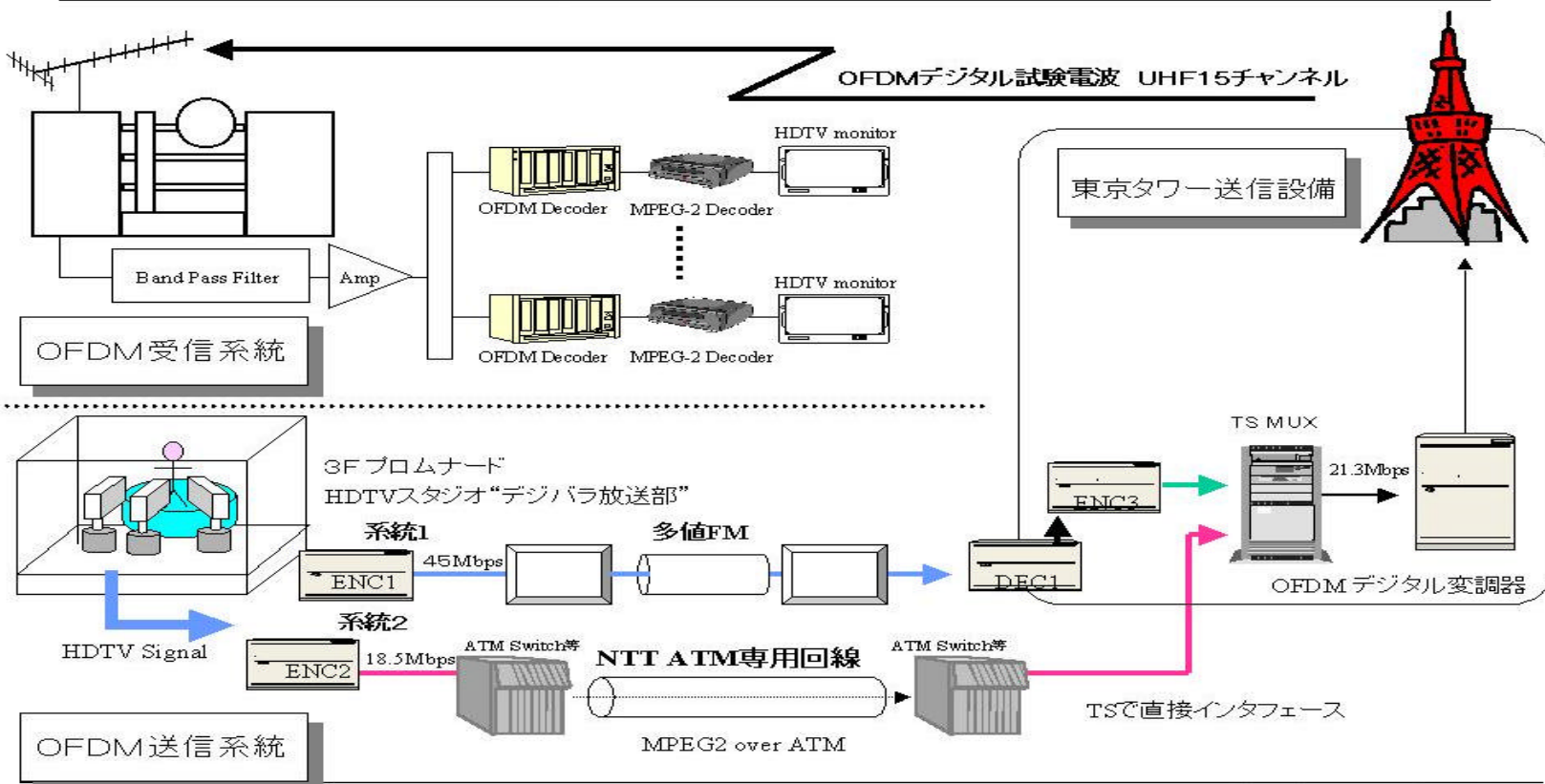
BIT RATE (Mbps)	Quality	Comments
8	Breakdown	Stop Motion or freezing
10	2	It is weak to a scene and light change.
12	2.5	It is block distortion to the upper part.
14	3	
15	3.2	The permissible limit of compression.
16	3.5	
18	4	
20	4.2	
22	4.3	

3. Long-term Broadcast Experiment of HDTV by “Fuji-Television”

- '99 July-Aug. HDTV have been broadcast for 41 days. It is 12 hours per day by Fuji-TV.
- HDTV signal transmitted to tower by FPU and ATM circuit using multi value FM.
- We checked the receiver of all the makers that are manufacturing in Japan.
- 1,130,000 person came to this event. Result of questionnaire is STB is less than 20,000yen and HD receiver is less than 300,000yen.

3. Long-term Broadcast Experiment System Figure

フジテレビ Bang Park デジタル放送実験信号系統図



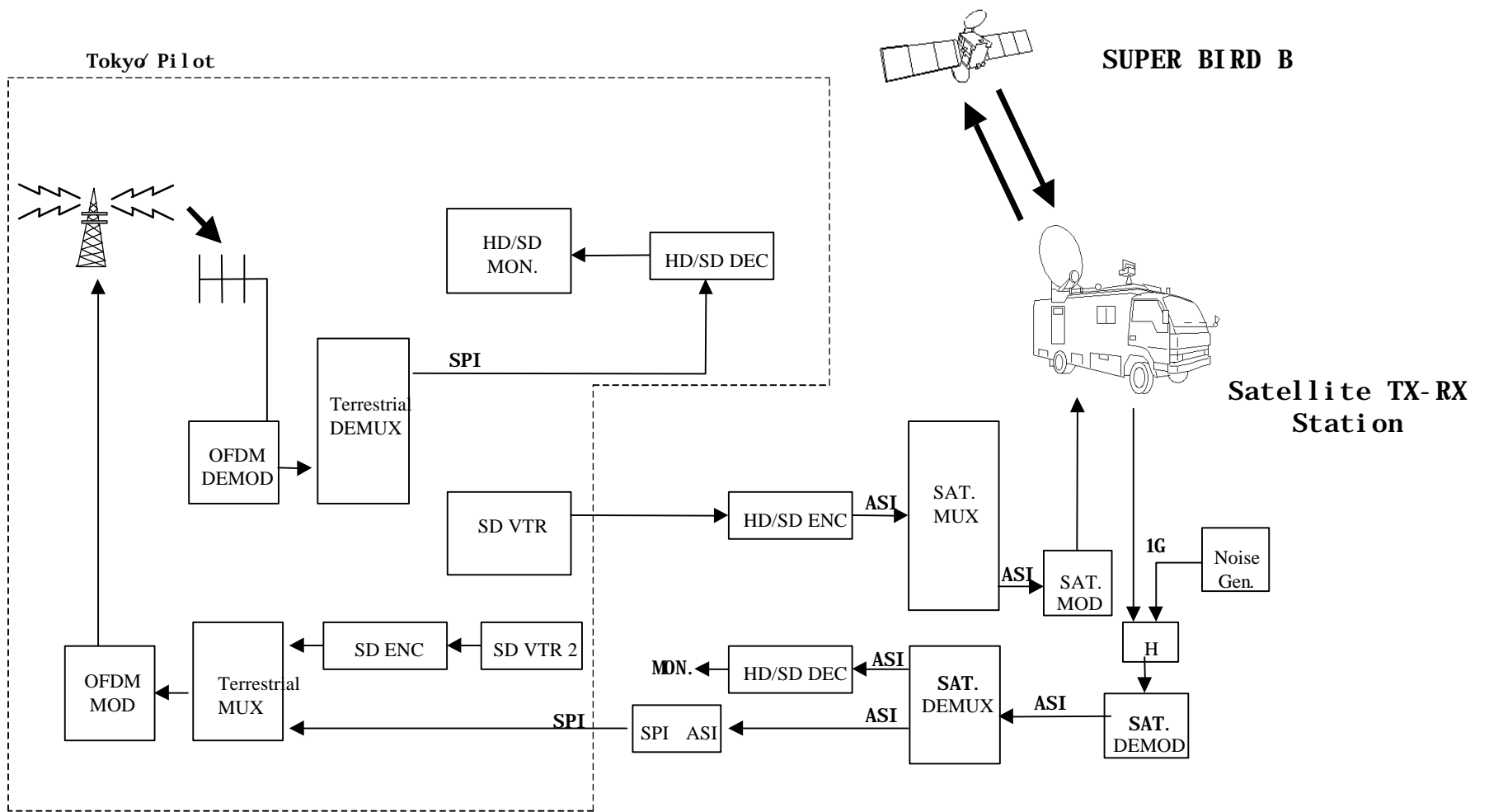
4. Satellite Distribution Experiment by “SCC”

- Nov. '99, a Satellite and Terrestrial digital broadcasting docked transmission experiment was performed.
- Exp.1 : Quality check by satellite circuit
26.7Mbps are checked by QPSK and 8PSK.

Transmission Mode	Total C/N [dB]	Margin [dB]
Mode 1 (QPSK)	17,0 (18,0)	13.8 (14,8)
Mode 2 (8PSK)	14.2 (15.0)	6.8 (7.6)

4. Satellite Distribution Experiment

- Exp.2 : Multi-point simultaneous distribution
It is completely possible in MPEG TS.
- Exp.3, 4 : Multiplexed material is re-multiplexed to another TS at the terrestrial broadcasting.
- Exp.5 : Transmission delay
Sat. delay : 280ms, Whole delay : 3sec5frames



Transmission and reception system figure

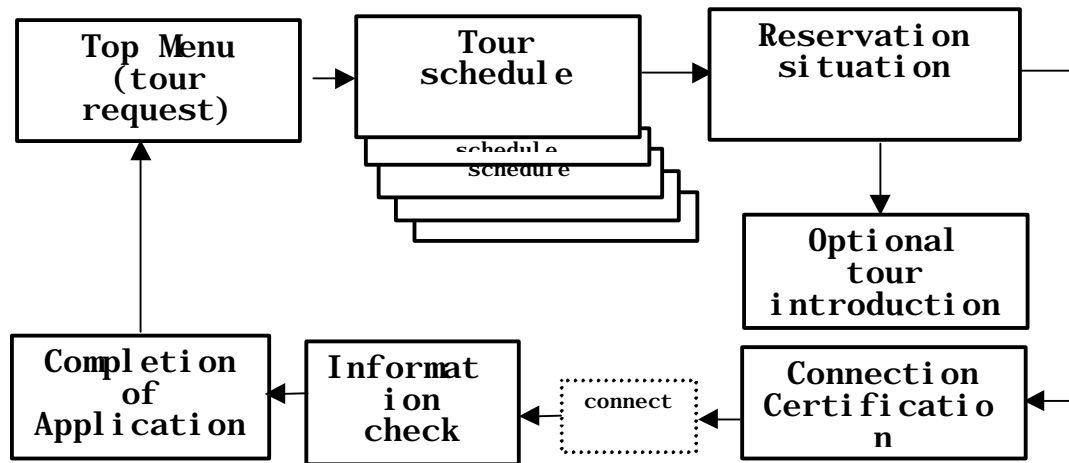
**5. In a medium and high-rise building area,
Fixed reception investigation of
terrestrial broadcasting
“NHK”**

- Sep. and Oct. '99, In the city central part. it experiment in the fixed reception (point where analog reception difficult)
- Survey of field strength in the city area
- Bit error rate to field strength

6. The Experiment of suspected Interactive Data Broadcasting by “Fujitu”

- Nov. '99, Open reception is carried out.
- The contents of XML base was transmitted on Data Carousel Form
- It transmitted HDTV(18.05Mbps) with data.(0.5Mbps)
- The actual proof of data transmission and reception. The questionnaire result was popular because the conspicuousness of contents, etc.

6. Interactive Data Broadcasting Carousel of Image



Travel Tour Data Carousel of Image

7. Multi-program Broadcasting and Interactive Data Broadcasting by “TV-Asahi”

- Jan.’2000, an experiment of an image and data is conducted simultaneously.
- Using HDTV1 program or SDTV3 program transmitted as a case of drama program with data.
- An experiment of the information program supposing the type of server receiver.
- Interactive data is broadcasted on the assumption that using set-top box or a pocket terminal.

The drama which a story can choose by liking

Outline

- A channel is controlled by VC (visual code) inserted into the program.
- VC of zapping prohibition is inserted in SD channel so that it cannot move to other channels.

The outline of story deployment of a drama

