



Japan Broadcasting Corp.

ITU-R SG6
ENG Seminar



Spectrum Usage and Operation of Terrestrial Electronic News Gathering (ENG) in Japan

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Nomadic Digital TV Links

- User Requirement
- Link Budget
- Features



Digital Radio Microphones

- User Requirement
- Developing new system



Narrowband Talkbacks

- User Requirement
- New standard in Japan



Migration to digital

Currently shift from analog SDTV system to digital HDTV system is progressing in Japan.

e.g. 30% of the transmitters and receivers are digital systems @NHK.

ARIB developed two standards for nomadic digital TV links

STD B-11 (1997) STD B-33 (2002)

Required bit rate - Video & Audio + FEC

Video bit rate

Required bitrates from subjective quality assessment using the DSCQS are :

HDTV : 52 Mbit/s (MPEG2 422P @HL) ^{*1}
27 Mbit/s (MPEG2 MP @HL) ^{*2}
SDTV : 15 Mbit/s (MPEG2 MP @ML) ^{*1}

***1: For high quality**

***2: For regular quality**

Audio bit rate

Required bitrates are :

768 kbit/s (48kHz 16bit LPCM) / ch

180 kbit/s (MPEG1 Layer II) / ch ^{*1}

***1: derived from ITU-R Rec. BS.1115**

Required bit rate - Video & Audio + FEC

3 typical transmission rates

MPEG2-TS rate with RS(204,188) code:

HDTV : 60 Mbit/s (422P@HL, for High quality)

(Video 52 Mbit/s Audio 3 Mbit/s FEC 5 Mbit/s)

HDTV : 32 Mbit/s (MP@HL, for Regular quality)

(Video 27 Mbit/s Audio 2Mbit/s FEC 3 Mbit/s)

SDTV : 16 Mbit/s (MP@ML, for High quality)

(Video 15 Mbit/s Audio+FEC 1 Mbit/s)

User Requirement – Latency

Required latency :

As short delay as possible ...

Technical parameter :

About 500 msec (GOP = 15)

User Requirement – Transmission distance

LOS : 50 km (typical)

NLOS : 4 km (typical)

Two standards in Japan

- ARIB STD-B11 for LOS (line of sight) transmission
- ARIB STD-B33 for NLOS (not LOS) transmission

STD-B11

- The successor to conventional analog FM system
- Single carrier system (BPSK, QPSK, 16/32/64QAM)
- For fixed / airborne transmission


STD-B33

- OFDM system (BPSK, QPSK, 16/32/64QAM)
- For mobile transmission



Frequency allocation for ENG/TVOB (LOS/NLOS)

Japanese Frequency Bands	Frequency (MHz)	Available channels In future	Bandwidth (MHz)
800 MHz	770 - 806	4	9
B band	5,850 – 5,925	0 of 4	18
C band	6,425 – 6,570	6 of 8	18
D band	6,870 – 7,125	7 of 14	18
E band	10,250 – 10,450	8 of 11	18
F band	10,550 – 10,680	7 of 7	18
G band	12,950 – 13,250	0 of 16	18


Link budget for LOS system (B11) (fixed/airborne)

	Fixed wind link	Fixed link to base station	Airborne link to base station
Frequency	7 GHz	7 GHz	7 GHz
Tx power	1.5 watts	1.5 watts	1.5 watts
Tx antenna	0.6 mφ dish	0.6 mφ dish	0.2 mφ dish
Rx antenna	0.6 mφ dish	1.2 mφ dish	1.2 mφ dish
Modulation	64QAM 5/6	64QAM 5/6	64QAM 5/6
Distance	100 km	120 km	80 km
Features			




Parameters for LOS system (fixed/airborne)

	Parameter	Receiver	Transmitter
CH bandwidth	18 MHz		
Tx power	1.5 watts		
Bandwidth	13.35403 MHz		
Roll off	30 % root cosine		
Modulation	64QAM5/6 (32QAM,16QAM,QPSK, and analog FM available)		
TS+FEC bitrate	60 Mbit/s (High quality)		
Required C/N	22 dB		




Features for LOS system (fixed/airborne)

	Parameter	Receiver	Transmitter
Baseband I/F	HD-SDI		
TS I/F	DVB-ASI		
IF frequency	130 MHz		
Size	RF unit : 180Wx100Hx350D Control unit : 180Wx100Hx350D		
Weight	RF unit : 7 kg Control unit : 5 kg		
Power consumption	AC100V/DC12V 180 watts		




Link budget for NLOS system (B33) (mobile)

	Mobile van	Portable wind link	Cordless camera
Frequency	800 MHz	7 GHz	7 GHz
Tx power	5+5 watts	0.1 watts	0.05 watts
Tx antenna	Colinear	Colinear	Colinear
Rx antenna	Yagi	0.15 mφ dish	0.15 mφ dish
Modulation	OFDM	OFDM	OFDM
Distance	4 km	500 m	300 m
Features			

Parameters for NLOS system (mobile)

	Mobile van	Portable wind link	Cordless camera
CH bandwidth	9 MHz x 2	18 MHz	18 MHz
Bandwidth	8.5 MHz	17.2 MHz	17.2 MHz
Subcarrier separation	20 kHz	20 kHz	20 kHz
Modulation	OFDM(DQPSK)	OFDM(16QAM)	OFDM(16QAM)
Total bitrate	32 Mbps	32 Mbps	32 Mbps
Features			

Features for NLOS system (mobile)

	Mobile van	Portable wind link	Cordless camera
Baseband I/F	HD-SDI	HD-SDI	HD-SDI
TS I/F	DVB-ASI	DVB-ASI	DVB-ASI
IF frequency	130 MHz	20.45 MHz	20.45 MHz
Size	RF / Control unit : 180Wx100Hx350D	115Wx70Hx210D	115Wx170Hx708D with lens & battery
Weight	RF unit : 7 kg Control unit : 5 kg	1.8 kg	10 kg
Power consumption	AC100V / DC12V 200 watts	DC12V 36 watts	DC12V 100 watts
Features			

Audio Bit Rate

Required bitrates from subjective quality assessment are :

192 kbit/s (SB-ADPCM 48 kHz) ^{*1}

128 kbit/s (SB-ADPCM 32 kHz) ^{*1}

^{*1} : evaluated based on Rec. ITU-R BS.1116



User Requirement – Latency

Required latency :

As short delay as possible ...

Technical parameter :

Within 6 msec

Now developing a new standard for 800 MHz system...

Type	A	B	C	D
Frequency	779 – 788 MHz 797 – 806 MHz	806 – 810 MHz	322 – 322.4 MHz	74.5 – 74.8 MHz
Bandwidth	Now : 110 kHz New : TBD	Now : 110 kHz New : TBD	30 kHz	60 kHz
RF power	10 mW	10 mW	1 mW	10 mW
Modulation	Now : FM New : digital	Now : FM New : digital	FM	FM
AF range	Now : - 15 kHz New : - 20 kHz	Now : - 15 kHz New : - 15 kHz	- 7 kHz	- 10 kHz

Audio Bit Rate

Audio bandwidth 300 to 3,400 Hz has been evaluated
Required bitrates from subjective quality assessment are :

8 kbit/s (CS-ACELP) ^{*1}

***1 Rec. ITU-T G.729**

User Requirement – Latency

Required latency :

As short delay as possible ...

Technical parameter :

Within 40 msec

New standard for 160 MHz system (ARIB STD-T62)

	Conventional*1	New standard
Frequency	↑ ↓ 140 - 170 MHz band	↑ 166.5 – 166.9 MHz ↓ 168.5 – 168.9 MHz
RF Bandwidth	16 kHz	6.25 kHz
RF power	↑ Handheld : 5 W ↑ Mobile : 10 W ↓ Base station : 50 W	↑ Handheld : 2 W ↑ Mobile : 4 W ↓ Base station : 20 W
Modulation	FM	RZ-SSB*2
Information bitrate	-	9.6 kbit/s*3
AF range	300 – 3,400 Hz	300 – 3,400 Hz

*1 Narrowband talkbacks are also in the 460 MHz band

*2 Real Zero Single Side Band

*3 ITU-T V.29 (16 QAM) is available as well as analog audio even in the mobile environment

Still remains...

Nomadic Audio Links (without Video)

	VHF	VHF	UHF	SHF
Frequency	38 MHz band	160 MHz band	460 MHz band	3,400 MHz band
RF Bandwidth	30 kHz	100 kHz	100 kHz	1 MHz
RF power	50 W	50 W	20 W	1 W
Modulation	FM	FM	FM	FM
AF range	Mono – 7,000 Hz	Mono – 10,000 Hz	Mono – 10,000 Hz	Stereo 30 – 17,000 Hz

Thank you for your attention