CH-3/4 (for Amateur)

No.	Item	Unit	CH-3 (VHF-Up)	CH-4 (UHF-Down)	Comment	
			I	I		
	Modulation / Format		F1D /Original	F1D /WSJT		
	Bit rate (BR)	bps	10	2		
(1)	Transmission frequency	MHz	145	437		
(2)	Transmission power	dBm	47.0	26.0	50W for Up 0.8W/2 for Down each user Conversion gain=142.5dB	
(2b)	Bandwidth	kHz	3.0	3.0		
(2c)	Maximum power density	dBW/Hz	−17.8	−38.8	=(2)−[10log(2b)−60	
(3)	Transmitter feeder loss	dB	3.0	0.5		
(4)	Transmitter antenna gain	dBi	17.0	0.0		Note (C)
(5)	EIRP	dBm	61.0	25.5	=(2)−(3)+(4)	
(6)	Polarization loss	dB	3.0	3.0		
(7)	Communication distance	km	1,153,200	1,153,200	CH-3,4/I earth-moon distance*3	Note (B)
(8)	Elevation Angle	deg	5	5		
(9)	Transmission loss in free space	dB	196.9	206.4	=32.4+20log(f[MHz]) +20log(d[km])	
(10)	Ionospheric absorption loss	dB	0.5	0.5		
(11)	Rainfall loss	dB	0.1	1.0		
(12)	Antenna pointing loss	dB	0.2	0.2		
(13)	Receiver antenna gain	dBi	0.0	20.0		Note (C)
(14)	Receiver feeder loss	dB	0.5	1.0		
(15)	Receiver input signal power	dBm	−139.7	−166.1	=(5)−(6)−(9)−(10)−(11)−(12)+(13)−(14)	
(16)	Receiver noise power density	dBm/Hz	−164.8	−164.8	−123 dBm(Typ)@3kHz	
(17)	C/N0 (Expected)	dBHz	25.1	−1.3	=(15)−(16) −10*log10(BW/3kHz)	
(19)	Loss in mod/demod proc.	dB	0.4	−20	Gain is shown by minus.	
(19)	Noise bandwidth	dBHz	10.0	3.0	=10log(BR)	
(20)	S/N0	dB	13.9	−6.5	BER=1.0E-11 for Up & Down WSJT BE rate=1.0E-4 for Down A1A	
(21)	C/N0 (Required)	dBHz	23.9	−3.5	=(19)+(20)	
(22)	Link margin	dB	1.2	2.2	=(17)−(21)	

Notes

(A) Direction of Communication

CH-3/I and 4/I: Earth-> Shin-en2, CH-3/II and 4/II : Shin-en2t -> Earth

(B) Communication distance

The distance of 384,480 km is correcponding to earth-moon distance. Shin-en2 arrives to this point in a halif day.

The distance of 1,153,200 km is correcponding to 3 x earth-moon distance. Shin-en2 arrives this point within two days

(C) In cases of CH-3/I and II (up-link), Yagi-antenna of 17-dB gain is used as ground-base antennas..

In cases of CH-4/I and II (down-link), Yagi-antenna of 20-dB gain is used as groud-base antennas.

(D) Receiver noise power density listed in this table is that of existing on-board receiver developed by Nishi-musen Co. Ltd, Japan.