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EA96334

Attn.:	Joseph Dichose, Electronics Engineer
Re:	FCC ID: ACJ96NKX-TG2200
Applicant:	Matsushita Electric Industrial Co., Ltd.
Correspondence Ref:	12531
731 Confirmation No:	EA96334
FCC E-Mail Date:	03/06/2000
Product Type:	FHSS 2.4~2.5 GHz Cordless Telephone Base and Handset System

Dear Mr. Dichose:

This is in response to your issued comments, please note following answers in the order of your given comments:

1. Pseudorandomly Frequency Hopping Sequence Explanation
Under separate cover we will file Appendix B that contains confidential product description report which describes full details of the employed FHSS protocol and associated specifications. Refer to attached explanation from design engineer. Please keep both Appendix A and B as confidential and not subject to general public review.

2. Section 15.247(a) Compliance Explanation Input B/W During Transmitted Packet Signals
Same answer as provided in above item 1.

3. Full Schematic Diagram of Base Unit
The provided full schematic diagram of the base unit in Appendix A was filed under confidentiality as it contained circuitry subject to both patent pending issues and other confidential information not normally subject to general release. The partial schematic diagram of the base unit in Exhibit F1 and the full schematic diagram of handset unit in Exhibit F2 may be subject to general release.

4. Antenna Gain
This system uses omni-directional permanently attached dipole antenna with peak gain of 2.15dBi. Refer to the attached explanation for recalculated output power using the antenna gain and power density.

5. RF Safety Requirements / 92 Channel FHSS Transmission 2401.056 ~ 2479.680 MHz
The maximum rated RF output for the base unit is 270 mW and the handset unit is 176 mW. Considering the antenna gain and power density, this may be recalculated to base unit as 165mW and the handset unit as 108mW.

In accordance with Sections 2.1091 and 2.1092, the base unit is classified as a mobile device and the handset unit is classified as a portable device. Upon review of: (1) FCC Parts 2 and 15, (2) FCC OET Bulletins 56 and 65; and (3) ANSI IEEE C95.1-1991 – we understand both the base and handset units may be categorically excluded from routine environmental evaluation for RF exposure. As such, it is our present understanding, based upon the intended usage, operating frequency and low power, the base unit need not be tested for MPE and the handset need not be tested for SAR. If you disagree, for our better understanding, please advise specific rule part(s) that would require MPE measurement for base unit and SAR measurements for handset unit. After your confirmation, if necessary, we will request PCTest to perform these additional tests within the next few days.

I will now await your response to the above given answers to your comments. Thank you for your attention in this matter.

Sincerely yours,

Richard Mullen
Manager

cc: K. Nawata / KME-KM4
Randy Ortanez / PCTest FCC ID ACJ96NKX-TG2200

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(1)The Pseudo Random Hopping Sequence

(1)-1.
The system operates the pseudo randomly hopping sequence that is given by random hopping sequence table. A dummy bearer that has broadcast information uses a table generated hop sequence.
The sequences are generated by the following formula.

fx(i)=(Fo(i) + x)mod 75

The sequence index "i" in the above formula is incremented (mod 75) each frame.
The value "x" is used to select the required pattern.
Obviously because of "the modulus", there are 75 unique patterns.

(1)-2.
Traffic bearers that have voice and data information use a pseudo-random number generated hop sequence. The random number generator (RNG) shall be a Linear Congruential Generator (LCG). The general form of an LCG is :

Y(n+1)=a*Y(n)+c (mod 75)

A channel number in the range that is 0 to 71.

chan=(72*Y(n))/m

In the above formula, integer division is used.

In the case that is LCG(m,a,c,Yo), The proposed RNG of this system is LCG(3000, (2*3*4*5*7+1)=841, 787, Yo).

This is full period generator, with a period of 3000 which is 30 seconds and is also a multiple of 75. As such all channel are used equally, and all channel are used equally over a 30 second period.

Refer to separate filed Appendix B for further description on pages 7 to 10 and pages 19 to 29.

(2)Section 15.247(a).1

The receiver of this system has PLL synthesizer too. And also the PLL synthesizer of receiver operates following the frequency table and protocol that are same as transmitter. (The PLL PLL synthesizer synchronization time of receiver and transmitter is 300usec max.) But PLL synthesizer frequency of receiver is shifted 110.592MHz to upper side. Because of IF of receiver is 110.592MHz.

The system has two type filter on receiving circuit. One is de-electrical Band-Pass Filter that has center frequency 2.45GHz and bandwidth 83MHz . Anther is SAW Band-Pass Filter that has center frequency 110.592MHz, 3dB bandwidth 700kHz and 30dB bandwidth 1.9MHz. Therefore receiver input bandwidth is 700kHz. This width is nearly equal 20dB bandwidth of transmitter. (The channel separation of this system is 864kHz and adjacent channel spacing is +/- 864kHz=1.728MHz)

(4)Section 15.247(b)

This system use a dipole type antenna with a peak gain of 2.15dBi.
Then I recalculated output power using the antenna gain. The power density in direction
S=(P*G)/(4*PI*r^2)

Here,Units of S is (mW/m^2), P is conducted power level , G is antenna gain.
S=(E^2)/(120*PI).
Then I can get P=((E^2)*(r^2))/(30*G)

(4)-1
On Base : antenna gain is 2.15dBi=1.64

(0ch)
E=-20.35dBm+31.8dB+107dB=118.45dBuV/m=836565.60uV/m
P=((836565.60u^2)*(3^2))/(30*1.64)=0.128020W=21.07dBm

(46ch)
E=-19.45dBm+32.0dB+107dB=119.55dBuV/m=949511.00uV/m
P=((949511.00u^2)*(3^2))/(30*1.64)=0.164922W=22.17dBm

(91ch)
E=-19.80dBm+32.1dBm+107dB=119.30dBuV/m=922571.43uV/m
P=((922571.43u^2)*(3^2))/(30*1.64)=0.155696W=21.92dBm

Max. RF Output Power (Base) : 165mW (22.17dBm)

(4)-2
On Handset : antenna gain is 2.15dBi=1.64

(0ch)
E=-21.10dBm+31.8dB+107dB=117.70dBuV/m=767361.49uV/m
P=((767361.49u^2)*(3^2))/(30*1.64)=0.107715W=20.32dBm

(46ch)
E=-21.85dBm+32.0dB+107dB=117.15dBuV/m=720277.75uV/m
P=((720277.75u^2)*(3^2))/(30*1.64)=0.094902W=19.77dBm

(91ch)
E=-22.10dBm+32.1dBm+107dB=117.00dBuV/m=707945.78uV/m
P=((707945.78u^2)*(3^2))/(30*1.64)=0.091681W=19.62dBm

Max. RF Output Power (Handset) : 108mW (20.32dBm)