UltraTech
Group of Labs

March 7, 2000

THOMSON CONSUMER ELECTRONICS, INC.
Audio & Communications Product Develop. 101 West 103rd. Street
Indianapolis, IN
USA, 46290

Attn.: **Mr. Grahame Watts**

Subject: **FCC Certification Application Testing under FCC PART 15, Subpart C, Sec. 15.247 – Frequency Hopping Spread Spectrum Transmitters operating in the frequency band 2402 - 2482 MHz, Peak Output Power & Effective Radiated Power (EIRP).**

Product: **Digital Spread Spectrum Cordless Phone**
Model No.: **27730GE2**

Dear Mr. Watts,

The product sample, as provided by you, has been tested according to **FCC PART 15, Subpart C, Sec. 15.247 - Frequency Hopping Spread Spectrum Transmitters operating in the frequency band 2402 - 2482 MHz, Peak Output Power & Effective Radiated Power (EIRP).**

Enclosed you will find the measurement data. If you have any queries, please do not hesitate to contact us.

Yours truly,

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Encl

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ENGINEERING TEST REPORT

Digital Spread Spectrum Cordless Phone
Model No.: 27730GE2

Applicant: **THOMSON CONSUMER ELECTRONIC, INC.**
Audio & Communications Product Develop. 101 West 103rd. Street
Indianapolis, IN
USA, 46290

In Accordance With

FEDERAL COMMUNICATIONS COMMISSION (FCC)
PART 15, SUBPART C, SEC. 15.247
Frequency Hopping Spread Spectrum Transmitters
operating in the frequency band 2402 - 2482 MHz
Peak Output Power & Effective Radiated Power (EIRP)

UltraTech's File No.: TCE1-FTX

This Test report is Issued under the Authority of Tri M. Luu, Professional Engineer, Vice President of Engineering UltraTech Group of Labs …… Date: ……	
Report Prepared by: Mr. Dan Huynh, BASc. ……	Tested by: Mr. Hung Trinh, EMI/RFI Technologist ……
Issued Date: March. 7, 2000	Test Dates: March 6, 2000

The results in this Test Report apply only to the sample(s) tested, and the sample tested is randomly selected.

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TABLE OF CONTENTS

EXHIBIT 1. PEAK OUTPUT POWER & EFFECTIVE RADIATED POWER (EIRP) @ FCC 15.247(B) AND RF EXPOSURE LIMIT FCC 1.1310

1.1. LIMITS

- **FCC 15.247(b)(1):** Maximum peak output power of the transmitter shall not exceed 1 Watt.
- **FCC 15.247(b)(3):** If the antenna of directional gain greater than 6 dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.
- **FCC 15.247(b)(3)(i):** Systems operating in the 2400 - 2483.5 MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi provided the maximum peak output power of the intentional radiator is reduce by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi..
- **FCC 1.1310:**- The criteria listed in the following table shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified in 1.1307(b).

LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm^2)	Average Time (minutes)
(A) Limits for Occupational/Control Exposures				
300-1500	...	...	F/300	6
1500-100,000	...	...	5	6
(B) Limits for General Population/Uncontrolled Exposure				
300-1500	...	...	F/1500	6
1500-100,000	...	...	1.0	30

F = Frequency in MHz

1.2. METHOD OF MEASUREMENTS

Refer to Exhibit 2 of this test report, FCC 15.247(b)(1)&(3), ANSI C63.4:1992, FCC @ 1.1310 & OST Bulletin No. 65-October 1985

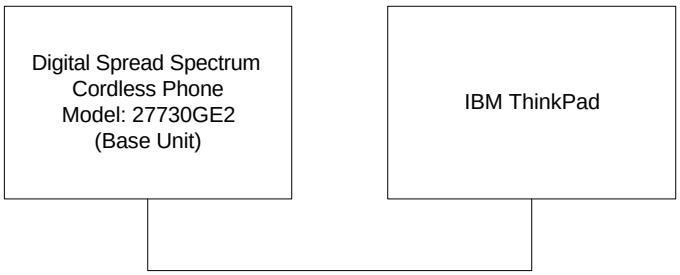
$S = PG/4\Pi r^2 = EIRP/4\Pi r^2$

Where: P: power input to the antenna in mW
EIRP: Equivalent (effective) isotropic radiated power.
S: power density mW/cm^2
G: numeric gain of antenna relative to isotropic radiator
r: distance to centre of radiation in cm

$r = \sqrt{PG/4\Pi S}$

FCC radio frequency exposure limits may not be exceeded at distances closer than r cm from the antenna of this device

1.3. TEST ARRANGEMENT



1.4. TEST EQUIPMENT LIST

Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range
Spectrum Analyzer/ EMI Receiver	Hewlett Packard	HP 8593EM	3412A00103	9 kHz – 26.5 GHz
Peak Power Meter & Peak Power Sensor	Hewlett Packard	8900 8481A	2131A00124 2551A01965	0.1-18 GHz 50 Ohms Input
Microwave Amplifier	Hewlett Packard	HP 83017A		1 GHz to 26.5 GHz
Horn Antenna	EMCO	3155	9701-5061	1 GHz – 18 GHz
Horn Antenna	EMCO	3155	9911-5955	1 GHz – 18 GHz

1.5. TEST DATA

EIRP MEASUREMENTS – SUBSTITUTION METOD

- Spectrum 99% BW: B = 1.14 MHz
- Duty Cycle: X = 10*log(0.036) = -14.4 dB

Frequency (MHz)	E-Field E1 in 1 MHz BW @ 3m (dBµV/m)	Antenna Polarization (V/H)	E-Field E in 99% BW @ 3m E = E1 + 20*log(B) (dBµV/m)	Power from Signal GEN. S (dBm)	Substitution Antenna Gain G (dBi)	Measured Total Peak EIRP = S+G (dBm)	Total Average EIRP= Peak EIRP+X (dBm)	*Safety Distance Limit (cm)
2402	120.7	V	121.8	16.4	8.2	24.6	10.2	0.9
2402	116.1	H	117.2	13.2	8.2	21.4	7.0	0.6
2442	122.7	V	123.8	17.4	8.2	25.6	11.2	1.0
2442	122.3	H	123.4	15.8	8.2	24.0	9.6	0.9
2482	120.0	V	121.1	15.6	8.2	23.8	9.4	0.8
2482	117.7	H	118.8	11.9	8.2	20.1	5.7	0.5

Note:

*** RF EXPOSURE DISTANCE LIMITS: $r = (PG/4\Pi S)^{1/2} = (EIRP/4\Pi S)^{1/2}$**

For mobile or base transmitters, the minimum RF safety distance of 20 cm from the transmitting antenna to the body of a user shall be maintained. The user's manual shall contain the RF exposure warning as follows:

RF EXPOSURE

WARNING: For compliance with the RF exposure requirements regulated by the FCC (Federal Communications Commission), the transmitter's antenna is contained within the equipment enclosure and an additional separation distance of 20 cm shall be maintained between the transmitter enclosure, and any part of the user's body.

EXHIBIT 2. MEASUREMENT METHODS

2.1. EFFECTIVE RADIATED POWER

- The following shall be applied to the combination(s) of the radio device and its intended antenna(e).
- I f the RF level is user adjustable, all measurements shall be made with the highest power level available to the user for that combination.
- The following method of measurement shall apply to both conducted and radiated measurements.
- The radiated measurements are performed at the Ultratech Calibrated Open Field Test Site.
- The measurement shall be performed using normal operation of the equipment with modulation.

Test procedure shall be as follows:

Step 1: Duty Cycle measurements

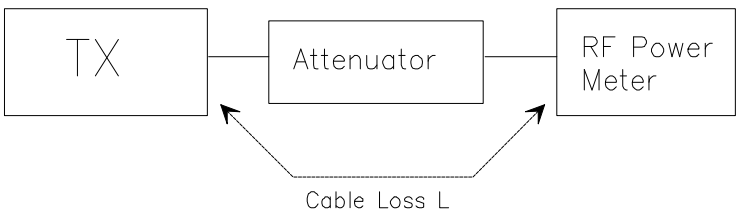
- Using a spectrum analyzer with the frequency span set to 0 Hz and the sweep time set at a suitable value to capture the envelope peaks and the duty cycle of the transmitter output signal;
- The duty cycle of the transmitter, x = Tx on / (Tx on + Tx off) with $0<x<1$, is measure and recorded in the test report. For the purpose of testing, the equipment shall be operated with a duty cycle that is equal or more than 0.1.

Step 2: Calculation of Peak and Average EIRP

- The peak output power of the transmitter shall be determined using a wideband, calibrated RF Peak Power Meter with the power sensor with an integration period that exceeds the repetition period of the transmitter by a factor 5 or more. The observed value shall be recorded as "P" (in dBm);
- The Average EIRP. shall be calculated from the above measured power output "A", the observed duty cycle x, and the applicable antenna assembly gain "G" in dBi, according to the formula:

Peak EIRP = P + G
Average EIRP = Peak EIRP + 10log(1/x)

Figure 1.



Step 3: Substitution Method. See Figure 2

(a) The measurements was performed in the absence of modulation (un-modulated)
(b) Test was performed at listed 3m open area test site (listed with FCC, IC, ITI, NVLAP, ACA & VCCI).
(c) The transmitter under test was placed at the specified height on a non-conducting turntable (80 cm height)
(d) The dipole test antenna was used and tuned to the transmitter carrier frequency.
(e) The spectrum analyzer was tuned to transmitter carrier frequency. The test antenna was lowered or raised from 1 to 4 meters until the maximum signal level was detected.
(f) The transmitter was rotated through 360^{o} about a vertical axis until a higher maximum signal was received.
(g) The test antenna was lowered or raised again from 1 to 4 meters until a maximum was obtained. This level was recorded.

(h) The substitution dipole antenna and the signal generator replaced the transmitter and antenna under test in the same position, and the substitution dipole antenna was placed in vertical polarization. The test dipole antenna was lowered or raised as necessary to ensure that the maximum signal is stilled received.
(i) The input signal to the substitution antenna was adjusted in level until an equal or a known related level to that detected from the transmitter was obtained in the test receiver. The maximum carrier radiated power is equal to the power supply by the generator.
(j) The substitution antenna gain and cable loss were added to the signal generator level for the corrected ERP level.
(k) Repeat steps (c) to (j) with the substitution antenna oriented in horizontal polarization.
(l) Actual gain of the EUT's antenna is the difference of the measured ERP and measured RF power at the RF port. Correct the antenna gain if necessary.

Figure 2

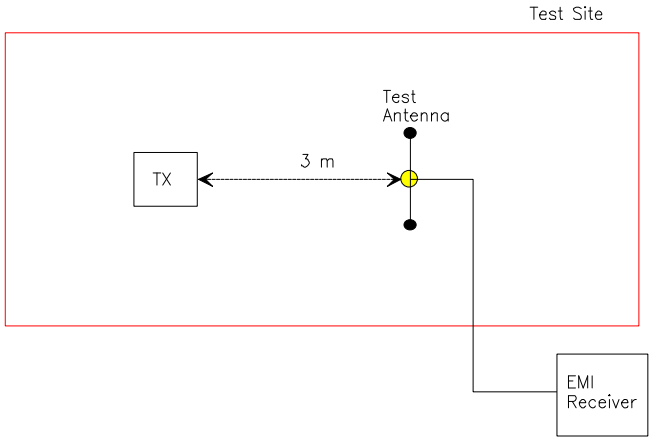


Figure 3