Smart Technologies & Investment Ltd.

Application
For
Certification
(FCC ID: N9KSMARTECRF1257)

Transceiver

0716642
BH/ SL
August 16, 2007

Intertek Testing Services Hong Kong Ltd.
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LIST OF EXHIBITS

INTERTEK TESTING SERVICES

MEASUREMENT/TECHNICAL REPORT

Smart Technologies & Investment Ltd. - MODEL: SMARTEC RF-1257 GTO/PRO F4100MBC

FCC ID: N9KSMARTECRF1257

August 16, 2007

This report concerns (check one:) Original Grant X Class II Change

Equipment Type: Low Power Transmitter(924.750 - 927.600MHz) and Remote Control Transmitter(318MHz) (example: computer, printer, modem, etc.)

Deferred grant requested per 47 CFR 0.457(d)(1)(ii)? Yes No X

If yes, defer until: _____ date

Company Name agrees to notify the Commission by: _____ date

of the intended date of announcement of the product so that the grant can be issued on that date.

Transition Rules Request per 15.37? Yes No X

If no, assumed Part 15, Subpart C for intentional radiator - the new 47 CFR [04-05-05 Edition] provision.

Report prepared by:

Ho Wai Kin, Ben
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Test Report	Test Report	report.pdf
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Test Setup Photo	Conducted Emission	conducted photos.doc
Test Report	Conducted Emission Test Result	conducted.pdf
Test Report	Bandwidth Plot	bw.pdf
Test Report	Bandedge Plot	be.pdf
External Photo	External Photo	external photos.doc
Internal Photo	Internal Photo	internal photos.doc
Block Diagram	Block Diagram	block.pdf
Schematics	Circuit Diagram	circuit.pdf
ID Label/Location	Label Artwork and Location	label.pdf
User Manual	User Manual	manual.pdf
Test Report	Timing Diagram	timing.pdf

EXHIBIT 1

GENERAL DESCRIPTION

1.0 General Description

1.1 Product Description

The Equipment Under Test (EUT) consists of two transmitter portions and one receiver portion which is operating at 924.750 - 927.600MHz, 318MHz and 902.400 - 905.250MHz respectively. The EUT is powered by 6V d.c. (4 x 1.5V "C" size batteries) and/or AC-AC adaptor 120VAC 60Hz input, 24VAC 600mA output. It is a keypad unit of Wireless Gate Entry System with Intercom function. After pressing a "Call" key, it can work as a 900MHz intercom to talk/listen to the base unit. The base unit can transmit 900MHz acceptance signal to the EUT to allow the visitor pressing a key such that a 318MHz control signal from the EUT can be sent out to the receiver of door opener for opening the door.

For 924.750 - 927.600MHz and 902.400 - 905.250MHz bands, there are 20 channels for both transmission and reception. Details of frequency channels are provided on the technical description (see descri.pdf). One of the frequency channels can be used in each intercom system. It is pre-selected by the factory and could not be altered by user.

The 318MHz transmitter incorporates a switch which will cease transmission within 1s of being released the switch.

The Model: GTO/PRO F4100MBC is the same as the Model: SMARTEC RF-1257 in hardware aspect. The difference in brand name and model number serves as marketing strategy.

Antenna Type : Internal, Integral (924.750 – 927.600 MHz)
Internal, Integral (318 MHz)

For electronic filing, the brief circuit description is saved with filename: descri.pdf.

1.2 Related Submittal(s) Grants

This is an application for certification of a transmitter portion (924.750 to 927.600MHz) and 318MHz transmitter. The receiver portion (902.400 to 905.250MHz) was subjected to FCC Part 15 Verification Procedure.

The base unit, associated with this EUT, has FCC ID: N9KSMARTECRF1252I and has been granted.

1.3 Test Methodology

Radiated emission measurements were performed according to the procedures in ANSI C63.4 (2003). All measurements were performed in Open Area Test Sites. Preliminary scans were performed in the Open Area Test Sites only to determine worst case modes. For each scan, the procedure for maximizing emissions in Appendices D and E were followed. All Radiated tests were performed at an antenna to EUT distance of 3 meters, unless stated otherwise in the **"Justification Section"** of this Application.

1.4 Test Facility

The open area test site and conducted measurement facility used to collect the emission data is located at Garment Centre, 576 Castle Peak Road, Kowloon, Hong Kong. This test facility and site measurement data have been fully placed on file with the FCC.

EXHIBIT 2

SYSTEM TEST CONFIGURATION

2.0 System Test Configuration

2.1 Justification

The system was configured for testing in a typical fashion (as a customer would normally use it), and in the confines as outlined in ANSI C63.4 (2003).

The EUT was powered from 4 x 1.5V new "C" size batteries. and/or AC-AC adaptor 120VAC 60Hz input, 24VAC 600mA output.

For maximizing emissions, the EUT was rotated through 360°, the antenna height was varied from 1 meter to 4 meters above the ground plane, and the antenna polarization was changed. This step by step procedure for maximizing emissions led to the data reported in Exhibit 3.0.

The unit was operated system and placed in the rear of the turntable.

The equipment under test (EUT) was configured for testing in a typical fashion (as a customer would normally use it). The EUT was placed on turntable, which enabled the engineer to maximize emissions through its placement in the three orthogonal axes. For simplicity of testing, the unit was wired to transmit continuously.

The frequency range from 9kHz to 9.3GHz was searched for spurious emissions from the device. Only those emissions reported were detected. All other emissions were at least 20 dB below the applicable limits.

2.2 EUT Exercising Software

There was no special software to exercise the device. Once the button is depressed, the unit transmits the typical signal. For simplicity of testing, the unit was wired to transmit continuously.

2.3 Special Accessories

There are no special accessories necessary for compliance of this product.

2.4 Equipment Modification

Any modifications installed previous to testing by Smart Technologies & Investment Ltd. will be incorporated in each production model sold/leased in the United States.

No modifications were installed by Intertek Testing Services Hong Kong Ltd.

2.5 Measurement Uncertainty

When determining the test conclusion, the Measurement Uncertainty of test has been considered.

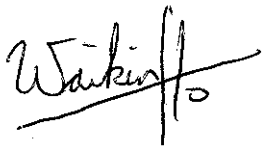
2.6 Support Equipment List and Description

This product was tested in a system configuration.

All the items listed under section 2.0 of this report are

Confirmed by:

Ho Wai Kin, Ben
Supervisor
Intertek Testing Services Hong Kong Ltd.
Agent for Smart Technologies & Investment Ltd.



_____Signature

August 16, 2007 Date

EXHIBIT 3

EMISSION RESULTS

3.0 **Emission Results**

Data is included worst case configuration (the configuration which resulted in the highest emission levels). A sample calculation, configuration photographs and data tables of the emissions are included.

3.1 Field Strength Calculation

The field strength is calculated by adding the reading on the Spectrum Analyzer to the factors associated with preamplifiers (if any), antennas, cables, pulse desensitization and average factors (when specified limit is in average and measurements are made with peak detectors). A sample calculation is included below.

FS = RA + AF + CF - AG + PD + AV

where FS = Field Strength in dBµV/m
RA = Receiver Amplitude (including preamplifier) in dBµV
CF = Cable Attenuation Factor in dB
AF = Antenna Factor in dB
AG = Amplifier Gain in dB
PD = Pulse Desensitization in dB
AV = Average Factor in -dB

In the radiated emission table which follows, the reading shown on the data table may reflect the preamplifier gain. An example of the calculations, where the reading does not reflect the preamplifier gain, follows:

FS = RA + AF + CF - AG + PD + AV

Assume a receiver reading of 62.0 dBµV is obtained. The antenna factor of 7.4 dB and cable factor of 1.6 dB is added. The amplifier gain of 29 dB is subtracted. The pulse desensitization factor of the spectrum analyzer was 0 dB, and the resultant average factor was -10 dB. The net field strength for comparison to the appropriate emission limit is 32 dBµV/m. This value in dBµV/m was converted to its corresponding level in µV/m.

RA = 62.0 dBµV
AF = 7.4 dB
CF = 1.6 dB
AG = 29.0 dB
PD = 0 dB

AV = -10 dB

FS = 62 + 7.4 + 1.6 - 29 + 0 + (-10) = 32 dBµV/m

Level in µV/m = Common Antilogarithm [(32 dBµV/m)/20] = 39.8 µV/m

3.2 Radiated Emission Configuration Photograph

Worst Case Radiated Emission
at
2774.250 MHz (924.750 – 927.600 MHz)
1590.375 MHz (318MHz)

For electronic filing, the worst case radiated emission configuration photograph is saved with filename: radiated photos.doc.

3.3 Radiated Emission Data

The data on the following page lists the significant emission frequencies, the limit and the margin of compliance. Numbers with a minus sign are below the limit.

Judgement: Passed by 6.1 dB (924.750 – 927.600 MHz)
Passed by 16.2 dB (318MHz)

TEST PERSONNEL:

Signature

Mark Cheung, Compliance Engineer
Typed/Printed Name

August 16, 2007
Date

Applicant: Smart Technologies & Investment Ltd. Date of Test: July 23, 2007
Model: SMARTEC RF-1257
Mode: TX (924.750 – 927.600 MHz)

Table 1

Radiated Emissions

Polarization	Frequency (MHz)	Reading (dBμV)	Antenna Factor (dB)	Pre-Amp Gain (dB)	Net at 3m (dBμV/m)	Limit at 3m (dBμV/m)	Margin (dB)
Channel 01							
H	924.750	68.9	33.0	16	85.9	94.0	-8.1
H	1849.500	51.4	27.2	33	45.6	54.0	-8.4
H	2774.250	50.5	30.4	33	47.9	54.0	-6.1
H	3699.000	45.9	33.3	33	46.2	54.0	-7.8
H	4623.750	42.9	34.9	33	44.8	54.0	-9.2
H	5548.500	39.6	36.6	33	43.2	54.0	-10.8
Channel 20							
H	927.600	70.2	33.0	16	87.2	94.0	-6.8
H	1855.200	51.0	27.2	33	45.2	54.0	-8.8
H	2782.800	49.8	30.4	33	47.2	54.0	-6.8
H	3710.400	45.8	33.3	33	46.1	54.0	-7.9
H	4638.000	42.9	34.9	33	44.8	54.0	-9.2
H	5565.600	39.6	36.6	33	43.2	54.0	-10.8

Notes: 1. Peak Detector Data unless otherwise stated.

2. All measurements were made at 3 meter. Harmonic emissions not detected at the 3-meter distance were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other harmonic emissions than those reported were detected at a test distance of 0.3-meter.

3. Negative value in the margin column shows emission below limit.

4. Horn antenna is used for the emission over 1000MHz.

Test Engineer: Mark Cheung

Applicant: Smart Technologies & Investment Ltd. Date of Test: July 23, 2007
Model: SMARTEC RF-1257
Mode: TX (318MHz)

Table 2

Radiated Emissions

Polarization	Frequency (MHz)	Reading (dBμV)	Antenna Factor (dB)	Pre-Amp Gain (dB)	Average Factor (-dB)	Net at 3m (dBμV/m)	Limit at 3m (dBμV/m)	Margin (dB)
H	318.075	46.6	23.0	16	3.1	50.5	75.8	-25.3
H	636.150	29.6	29.0	16	3.1	39.5	55.8	-16.3
H	954.225	22.4	33.0	16	3.1	36.3	55.8	-19.5
H	1272.300	48.3	26.1	33	3.1	38.3	55.8	-17.5
H	*1590.375	46.7	27.2	33	3.1	37.8	54.0	-16.2
H	1908.450	46.0	27.2	33	3.1	37.1	55.8	-18.7
H	*2226.525	43.2	29.4	33	3.1	36.5	54.0	-17.5

Notes: 1. Peak Detector Data unless otherwise stated.

2. All measurements were made at 3 meter. Harmonic emissions not detected at the 3-meter distance were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other harmonic emissions than those reported were detected at a test distance of 0.3-meter.

3. Negative value in the margin column shows emission below limit.

4. Horn antenna is used for the emission over 1000MHz.

5. '*' Emissions within restricted band fulfil the requirement of Section 15.209.

Test Engineer: Mark Cheung

3.4 Conducted Emission Configuration Photograph

Worst Case Line-Conducted Configuration

For electronic filing, the worst case line-conducted configuration photograph are saved with filename: conducted photos.doc.

3.5 Conducted Emission Data

For electronic filing, the graph and data table of conducted emission is saved with filename: conducted.pdf.

Judgement: Passed by at least 20 dB

TEST PERSONNEL:

Signature

Mark Cheung, Compliance Engineer
Typed/Printed Name

August 16, 2007
Date

EXHIBIT 4

EQUIPMENT PHOTOGRAPHS

4.0 **Equipment Photographs**

For electronic filing, the photographs of the tested EUT are saved with filename: external photos.doc & internal photos.doc.

EXHIBIT 5

PRODUCT LABELLING

5.0 **Product Labelling**

For electronic filing, the FCC ID label artwork and the label location are saved with filename: label.pdf.

EXHIBIT 6

TECHNICAL SPECIFICATIONS

6.0 Technical Specifications

For electronic filing, the block diagram and schematics of the tested EUT are saved with filename: block.pdf and circuit.pdf respectively.

EXHIBIT 7

INSTRUCTION MANUAL

7.0 Instruction Manual

For electronic filing, a preliminary copy of the Instruction Manual is saved with filename: manual.pdf.

This manual will be provided to the end-user with each unit sold/leased in the United States.

EXHIBIT 8

MISCELLANEOUS INFORMATION

8.0 **Miscellaneous Information**

This miscellaneous information includes details of the measured bandwidth and bandedge, the test procedure and calculation of factors such as pulse desensitization and averaging factor.

8.1 Bandedge Plot (924.750 – 927.600 MHz)

For electronic filing, the plot shows the fundamental emission when modulated with 1kHz (Test level: 100 dB SPL measured at 10cm from the microphone) is saved with filename: be.pdf. From the plot, the field strength of any emissions appearing between the band edges and up to 10 kHz above and below the band edges are attenuated at least 50dB below the level of the unmodulated carrier. It fulfil the requirement of 15.249(d).

Measured Bandwidth (318MHz)

For electronic filing, the plot shows the fundamental emission when modulated is saved with filename: bw.pdf. From the plot, the bandwidth is observed to be 352 kHz, at 20 dBc where the bandwidth limit is 795 kHz.

Therefore, the unit meets the requirement of section 15.231(c).

Figure 8.1 Bandwidth/ Bandedge

8.2 Discussion of Pulse Desensitization (318MHz)

The determination of pulse desensitivity was made in accordance with Hewlett Packard Application Note 150-2, *Spectrum Analysis ... Pulsed RF.*

The effective period (T_{eff}) was approximately 3.88 ms for a digital "1" bit, as shown in the plots of Exhibit 8.3. With a resolution bandwidth (3 dB) of 100 kHz, the pulse desensitivity factor was 0 dB.

8.3 Calculation of Average Factor (318MHz)

Averaging factor in dB = 20 log (duty cycle)

The specification for output field strengths in accordance with the FCC rules specify measurements with an average detector. During testing, a spectrum analyzer incorporating a peak detector was used. Therefore, a reduction factor can be applied to the resultant peak signal level and compared to the limit for measurement instrumentation incorporating an average detector.

The time period over which the duty cycle is measured is 100 milliseconds, or the repetition cycle, whichever is a shorter time frame. The worst case (highest percentage on) duty cycle is used for the calculation. The duty cycle is measured by placing the spectrum analyzer in zero scan (receiver mode) and linear mode at maximum bandwidth (3 MHz at 3 dB down) and viewing the resulting time domain signal output from the analyzer on a Tektronix oscilloscope. The oscilloscope is used because of its superior time base and triggering facilities.

After studying the code pattern of different keys and data diagram provided by client, the worst case would be set all the DIP switches to “+”.

The duty cycle is simply the on-time divided by the period:

The duration of one cycle = 100 ms
Effective period of the cycle = (18x3.88) ms = 69.84 ms

DC = 69.84 ms / 100 ms = 0.7

Therefore, the averaging factor is found by $20 \log_{10} 0.7 = -3.1$ dB

For electronic filing, the plot shows the transmission timing is saved with filename: timing.pdf.

8.4 Emissions Test Procedures

The following is a description of the test procedure used by Intertek Testing Services in the measurements of transmitters operating under Part 15, Subpart C rules.

The test set-up and procedures described below are designed to meet the requirements of ANSI C63.4 - 2003.

The transmitting equipment under test (EUT) is placed on a wooden turntable which is four feet in diameter and approximately one meter in height above the ground plane. During the radiated emissions test, the turntable is rotated and any cables leaving the EUT are manipulated to find the configuration resulting in maximum emissions. The EUT is adjusted through all three orthogonal axes to obtain maximum emission levels. The antenna height and polarization are varied during the testing to search for maximum signal levels. The height of the antenna is varied from one to four meters.

Detector function for radiated emissions is in peak mode. Average readings, when required, are taken by measuring the duty cycle of the equipment under test and subtracting the corresponding amount in dB from the measured peak readings. A detailed description for the calculation of the average factor can be found in Exhibit 8.3.

The frequency range scanned is from the lowest radio frequency signal generated in the device which is greater than 9 kHz to the tenth harmonic of the highest fundamental frequency or 40 GHz, whichever is lower. For line conducted emissions, the range scanned is 150 kHz to 30 MHz.

8.4 Emissions Test Procedures (cont'd)

The EUT is warmed up for 15 minutes prior to the test.

AC power to the unit is varied from 85% to 115% nominal and variation in the fundamental emission field strength is recorded. If battery powered, a new, fully charged battery is used.

Conducted measurements are made as described in ANSI C63.4 - 2003.

The IF bandwidth used for measurement of radiated signal strength was 100 kHz or greater when frequency is below 1000 MHz. Where pulsed transmissions of short enough pulse duration warrant, a greater bandwidth is selected according to the recommendations of Hewlett Packard Application Note 150-2. A discussion of whether pulse desensitivity is applicable to this unit is included in this report (See Exhibit 8.2). Above 1000 MHz, a resolution bandwidth of 1 MHz is used.

Transmitter measurements are normally conducted at a measurement distance of three meters. However, to assure low enough noise floor in the forbidden bands and above 1 GHz, signals are acquired at a distance of one meter or less. All measurements are extrapolated to three meters using inverse scaling, unless otherwise reported. Measurements taken at a closer distance are so marked.