



Smart Technologies & Investment Ltd.

Application
For
Certification
(FCC ID: N9KSMARTECRF1252T)

900MHz Transceiver

05044331
TL/ Ann Choy
April 22, 2005

- The test results reported in this test report shall refer only to the sample actually tested and shall not refer or be deemed to refer to bulk from which such a sample may be said to have been obtained.
- This report shall not be reproduced except in full without prior authorization from Intertek Testing Services Hong Kong Limited.
- For Terms And Conditions of the services, it can be provided upon request.
- The evaluation data of the report will be kept for 3 years from the date of issuance.

INTERTEK TESTING SERVICES

LIST OF EXHIBITS

INTRODUCTION

<i>EXHIBIT 1:</i>	General Description
<i>EXHIBIT 2:</i>	System Test Configuration
<i>EXHIBIT 3:</i>	Emission Results
<i>EXHIBIT 4:</i>	Equipment Photographs
<i>EXHIBIT 5:</i>	Product Labelling
<i>EXHIBIT 6:</i>	Technical Specifications
<i>EXHIBIT 7:</i>	Instruction Manual
<i>EXHIBIT 8:</i>	Miscellaneous Information

INTERTEK TESTING SERVICES

MEASUREMENT/TECHNICAL REPORT

Smart Technologies & Investment Ltd. - MODEL: RF-1252
FM-136
F3100
FCC ID: N9KSMARTECRF1252T

April 22, 2005

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

Equipment Type: DXT - Low Power Transceiver (example: computer, printer, modem, etc.)

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

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

If no, assumed Part 15, Subpart C for intentional radiator - the new 47 CFR [12-08-03 Edition] provision.

Report prepared by:

Tommy Leung
Intertek Testing Services
2/F., Garment Center,
576, Castle Peak Road,
Kowloon, Hong Kong.
Phone: 852-2173-8538
Fax: 852-2741-1693

INTERTEK TESTING SERVICES

Table of Contents

1.0 <u>General Description</u>	2
1.1 Product Description	2
1.2 Related Submittal(s) Grants	2
1.3 Test Methodology	3
1.4 Test Facility	3
2.0 <u>System Test Configuration</u>	5
2.1 Justification	5
2.2 EUT Exercising Software	5
2.3 Special Accessories	5
2.4 Equipment Modification	6
2.5 Measurement Uncertainty	6
2.6 Support Equipment List and Description	6
3.0 <u>Emission Results</u>	8
3.1 Field Strength Calculation	9
3.2 Radiated Emission Configuration Photograph	11
3.3 Radiated Emission Data	12
3.4 Conducted Emission Configuration Photograph	15
3.5 Conducted Emission Data	16
4.0 <u>Equipment Photographs</u>	18
5.0 <u>Product Labelling</u>	20
6.0 <u>Technical Specifications</u>	22
7.0 <u>Instruction Manual</u>	24
8.0 <u>Miscellaneous Information</u>	26
8.1 Bandedge Plot	27
8.2 Discussion of Pulse Desensitization	28
8.3 Calculation of Average Factor	29
8.4 Emissions Test Procedures	30

INTERTEK TESTING SERVICES

List of attached file

Exhibit type	File Description	filename
Test Report	Test Report	report.pdf
Operation Description	Technical Description	descri.pdf
Test Setup Photo	Radiated Emission	config photos.doc
Test Setup Photo	Conducted Emission	config phtoos.doc
Test Report	Conducted Emission Test Result	conduct.pdf
Test Report	Bandedge Plot	bw.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

INTERTEK TESTING SERVICES

EXHIBIT 1

GENERAL DESCRIPTION

INTERTEK TESTING SERVICES

1.0 General Description

1.1 Product Description

The Equipment Under Test (EUT) is a transceiver operating at 924.750MHz to 927.600MHz. The EUT is powered by 8-24Vac/dc (external power source) and/or 6Vdc (4 x 1.5V "AA" battery). It is a keypad unit of Wireless Gate Entry System with Intercom function. After a "Call" request, it transmits or receives a home user's voice at the corresponding intercom unit with a 900MHz signal in half duplex. Also, it transmits a 318MHz control signal to the corresponding receiver after entering a valid code. The gate connected to the receiver will be opened accordingly if the dip switches settings are the same.

Antenna Type : Integral, External

The Model: FM-136 and F3100 is the same as the Model: RF-1252 is in hardware aspect. The difference in model number serves as marketing strategy.

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 operating at 900MHz. The receiver, associated with this transmitter which is the intercom unit, has FCC ID: N9KSMARTECRF1252R and has been filed at the same time. The receivers of the transceivers are subject to the verification authorization process, in accordance with 15.101(b). A verification report has been prepared for the receiver section of this device. On the other hand, a 318MHz transmitter, a composite device subject to an additional equipment authorization, has the same as this FCC ID: N9KSMARTECRF1252T and has been filed at the same time.

INTERTEK TESTING SERVICES

1.3 Test Methodology

Both AC mains line-conducted and radiated emission measurements were performed according to the procedures in ANSI C63.4 (2001). 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.

INTERTEK TESTING SERVICES

EXHIBIT 2

SYSTEM TEST CONFIGURATION

INTERTEK TESTING SERVICES

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 (2001).

The EUT could be powered by 8-24V a.c./d.c. power supply. It has been verified that the change of the supply voltage would not change the emission result by more than 1-2 dB. During the test the EUT was powered from AC 120V 60Hz input, DC 9V 300mA output adaptor (Model: AD35-09003, supplied by Cleint).

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 standalone and placed in the center 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.

All relevant operation modes have been tested, and the worst case data is included in this report.

The frequency range from the lowest radio frequency signal generated in the device which is greater than 9kHz to 10GHz 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.

INTERTEK TESTING SERVICES

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.

2.5 Measurement Uncertainty

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

2.6 Support Equipment List and Description

This product was tested in a standalone configuration.

All the items listed under section 2.0 of this report are

Confirmed by:

*Tommy Leung
Assistant Manager
Intertek Testing Services Hong Kong Ltd.
Agent for Smart Technologies & Investment Ltd.*



Signature

April 22, 2005

Date

INTERTEK TESTING SERVICES

EXHIBIT 3

EMISSION RESULTS

INTERTEK TESTING SERVICES

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.

INTERTEK TESTING SERVICES

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 dB μ V/m

RA = Receiver Amplitude (including preamplifier) in dB μ V

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:

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

INTERTEK TESTING SERVICES

3.1 Field Strength Calculation (cont'd)

Example

Assume a receiver reading of 62.0 dB μ V 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 dB μ V/m. This value in dB μ V/m was converted to its corresponding level in μ V/m.

$$RA = 62.0 \text{ dB}\mu\text{V}$$

$$AF = 7.4 \text{ dB}$$

$$CF = 1.6 \text{ dB}$$

$$AG = 29.0 \text{ dB}$$

$$PD = 0 \text{ dB}$$

$$AV = -10 \text{ dB}$$

$$FS = 62 + 7.4 + 1.6 - 29 + 0 + (-10) = 32 \text{ dB}\mu\text{V/m}$$

$$\text{Level in } \mu\text{V/m} = \text{Common Antilogarithm } [(32 \text{ dB}\mu\text{V/m})/20] = 39.8 \mu\text{V/m}$$

INTERTEK TESTING SERVICES

3.2 Radiated Emission Configuration Photograph

Worst Case Radiated Emission
at
924.750 MHz

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

INTERTEK TESTING SERVICES

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 5.1 dB

TEST PERSONNEL:



Signature

Jess Tang, Engineer
Typed/Printed Name

April 22, 2005
Date

INTERTEK TESTING SERVICES

Company: Smart Technologies & Investment Ltd. Date of Test: March 21-April 4, 2005

Model: RF-1252

Mode: TX - Channel 1

Table 1

Radiated Emissions

Polarization	Frequency (MHz)	Reading (dB μ V)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dB μ V/m)	Limit at 3m (dB μ V/m)	Margin (dB)
V	924.750	71.9	16	33.0	88.9	94	-5.1
V	1849.500	53.0	34	27.2	46.2	54	-7.8
V	*2774.250	49.4	34	30.4	45.8	54	-8.2
V	*3699.000	44.3	34	33.3	43.6	54	-10.4
V	*4623.750	42.1	34	34.9	43.0	54	-11.0
V	5548.500	39.0	34	36.6	41.6	54	-12.4

Notes: 1. Peak detector is used for the emission measurement.

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.

* Emission within the restricted band fulfil the requirement of Section 15.209.

Test Engineer: Jess Tang

INTERTEK TESTING SERVICES

Company: Smart Technologies & Investment Ltd. Date of Test: March 21-April 4, 2005

Model: RF-1252

Mode: TX - Channel 20

Table 2

Radiated Emissions

Polarization	Frequency (MHz)	Reading (dB μ V)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dB μ V/m)	Limit at 3m (dB μ V/m)	Margin (dB)
V	927.600	70.6	16	33.0	87.6	94	-6.4
V	1855.200	53.1	34	27.2	46.3	54	-7.7
V	*2782.800	48.8	34	30.4	45.2	54	-8.8
V	*3710.400	45.2	34	33.3	44.5	54	-9.5
V	*4638.000	42.6	34	34.9	43.5	54	-10.5
V	5565.600	40.4	34	36.6	43.0	54	-11.0

Notes: 1. Peak detector is used for the emission measurement.

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.

* Emission within the restricted band fulfil the requirement of Section 15.209.

Test Engineer: Jess Tang

INTERTEK TESTING SERVICES

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: config photos.doc.

INTERTEK TESTING SERVICES

3.5 Conducted Emission Data

The data on the following pages list the significant emission frequencies, the limit, and the margin of compliance.

Judgement: Passed by more than 20 dB

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

TEST PERSONNEL:



Signature

Jess Tang, Engineer
Typed/Printed Name

April 22, 2005
Date

INTERTEK TESTING SERVICES

EXHIBIT 4

EQUIPMENT PHOTOGRAPHS

INTERTEK TESTING SERVICES

4.0 Equipment Photographs

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

INTERTEK TESTING SERVICES

EXHIBIT 5

PRODUCT LABELLING

INTERTEK TESTING SERVICES

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

INTERTEK TESTING SERVICES

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

INTERTEK TESTING SERVICES

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.

INTERTEK TESTING SERVICES

EXHIBIT 8

MISCELLANEOUS INFORMATION

INTERTEK TESTING SERVICES

8.0 Miscellaneous Information

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

INTERTEK TESTING SERVICES

8.1 Bandedge Plot

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

INTERTEK TESTING SERVICES

8.2 Discussion of Pulse Desensitization

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

Pulse desensitivity is not applicable for this device since the transmitter transmits the RF signal continuously.

INTERTEK TESTING SERVICES

8.3 Calculation of Average Factor

The emission limits are specified using spectrum analyzers or receivers which incorporate quasi-peak detectors. Typical measurements are made using peak detectors, however, emissions which approach the respective emission limit are measured using a quasi-peak detector.

For measurements above 1 GHz, spectrum analyzers or receivers using average detectors are employed, or the appropriate average factor can be applied.

Measurements using spectrum analyzers with filters other than peak detectors are recorded in the data table section of this report.

Since this device is a transmit signal continuously, it is not necessary to apply average factor to the measurement results.

INTERTEK TESTING SERVICES

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 - 2001.

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.

INTERTEK TESTING SERVICES

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 - 2001.

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.