RF TEST REPORT

Test report No.:	**EMC- FCC- R0037**
FCC ID:	**NLMSSA-R2001V**
Type of equipment:	**RFID Reader**
Basic Model:	**SSA-R2001V**
Applicant:	**SAMSUNG TECHWIN CO., LTD**
FCC Rule Part(s):	**FCC Part 15 Subpart C**
Frequency Range:	**13.5605 MHz**
Test result:	**Complied**

The above equipment was tested by EMC compliance Testing Laboratory for compliance with the requirements of FCC Rules and Regulations.
The results of testing in this report apply to the product/system which was tested only. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

Date of test: August 23, 2010 ~ September 7 , 2010

Issued date: September 28 , 2010

Tested by: SON, MIN GI

Approved by: KIM, CHANG MIN

480-5 Shin-dong, Yeongtong-gu, Suwon-city, Gyunggi-do, 443-390, Korea,
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1. Client information

Applicant : SAMSUNG TECHWIN CO., LTD
Address : #28 Seongju-Dong, Changwon-si, Kyungsangnam-do, Korea
Telephone number : +82-70-7147-8376
Facsimile number : +82-31-8018-3717
Contact person : Kang Je Soon / js2002.kang@samsung.com

Manufacturer: IDTECH Co.,Ltd.
Address : 5F,Ace Techno Tower B/D, 684-1 Deungchon-Dong, Gangseo-Gu,Seoul 157-030,Korea

2. Laboratory information

Address
EMC Compliance Ltd.
480-5 Shin-dong, Yeongtong-gu, Suwon-city, Gyunggi-do, 443-390, Korea
Telephone Number: 82 31 336 9919 Facsimile Number: 82 31 336 4767

Certificate
CBTL Testing Laboratory, KOLAS NO.: 231
FCC Filing No.: 793334
VCCI Registration No.: C-1713, R-1606, T-258

SITE MAP

3. Description of E.U.T.

3.1 Basic description

Applicant :	SAMSUNG TECHWIN CO., LTD
Address of Applicant:	#28 Seongju-Dong, Changwon-si, Kyungsangnam-do, Korea
Manufacturer:	IDTECH Co.,Ltd.
Address of Manufacturer:	5F,Ace Techno Tower B/D, 684-1 Deungchon-Dong,Gangseo-Gu,Seoul 157-030,Korea
Type of equipment:	Stand-alone radio equipment
Basic Model:	SSA-R2001V
Serial number:	Engineering Sample

3.2 General description

Frequency	13.5605 MHz
Type of Modulation	ASK
Number of Channels	1 channel
Type of Antenna	Integral (PCB Loop antenna)
Power supply	DC 12 V / Max.150mA
Extreme Power supply	Lower voltage: DC 10.2 V, Upper voltage: DC 13.8V
Operating temperature	-30 ℃ ~ 50 ℃
Dimension	47*122*26 (W*H*D(mm))
Weight	140g
Reading Time(card)	30ms
Input port	2ea (External LED control , External buzzer control)
Output port	34bit Wiegand
LED indicator	2 Color LED Indicators (Red and Green)
Beeper	Piezo buzzer

3.3 Test frequency

	Frequency
Low frequency	**-**
Middle frequency	**13.5605 MHz**
High frequency	**-**

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4. Summary of test results

4.1 Standards & results

Rule Reference	Parameter	Status
15.225 (a)	**In-band Emission**	**C**
15.225 (b)	**In-band Emission**	**C**
15.225 (c)	**In-band Emission**	**C**
15.225 (d) 15.209	**Out-of –band Emission**	**C**
15.225 (e)	**Frequency Stability Tolerance**	**C**
15.207	**Conducted Emissions**	**NA***

Note: C=complies
NC= Not complies
NT=Not tested
NA=Not Applicable

*The test is not applicable since the EUT is not the device that is designed to be connected to the public utility(AC) power line.

4.2 Test Procedure

- ANSI C63.4-2003

4.3 Uncertainty

Measurement Item	Combined Standard Uncertainty Uc	Expanded Uncertainty U = KUc (K = 2)
Conducted RF power	± 0.272 dB	± 0.544 dB
Radiated disturbance	± 1.943 dB	± 3.886 dB
Conducted disturbance	± 1.265 dB	± 2.53 dB

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5. Test results

5.1 In-band Emission (15.225 (a))

5.1.1 Minimum Standard

15.225 (a) The field strength of any emission within the band 13.553-13.567 MHz shall not exceed 15,848 microvolts/meter at 30 meters.

5.1.2 Measurement Procedure

Test Procedure The Radiated Electric Field Strength intensity has been measured on semi anechoic chamber with a ground plane and at a distance of 3m.

Frequency : From 9kHz to 30MHz at distance 3m The EUT was rotated a full revolution in order to obtain the maximum value of the electric field intensity. The measurements were performed for both vertical and horizontal antenna polarization.

Frequency : From 30MHz to 1GHz at distance 3m The measuring antenna height varied between 1 and 4m and EUT was rotated a full revolution in order to obtain the maximum value of the electric field intensity. The measurements were performed for both vertical and horizontal antenna polarization.

Measurements were performed with a QP, PK, and AV detector. The radiated emission measurements were made with the following detector function of the test receiver (below 1GHz).

Freq'	9-90kHz	90-110kHz	150-490kHz	490kHz-30MHz	30MHz-1GHz
Detecter type	PK/AV	QP	PK/AV	QP	QP
IF bandwidth	200Hz	200Hz	9kHz	9kHz	120kHz

* Part 15 Section 15.31 (f)(2) (9kHz-30MHz)
[Limit at 3m]=[Limit at 300m]-40 x log(3[m]/300[m])
[Limit at 3m]=[Limit at 30m]-40 x log (3[m]/30[m])

5.1.3 Test Result

- Complies

EUT	RFID Reader		
Operating Frequency	13.5605 MHz	**Model Name**	SSA-R2001V
Operating Mode	Transmitter Mode	**Modulation Technology**	ASK
Environmental Condition	23℃/45%	**Test Channel**	1ch
Tested By	Mingi Son	**Power Rate**	12V DC

Frequency	Reading (dBuV)	Correction Factor	field strength dBμV/m at 3 m
13.5605 MHz	59.3	-10.84	48.49
Maximum Level(dBμA/m)			48.49
Limit(dBuV/m) at 3m			124 dBuV/m
margin			75.51
Uncertainty			±3.8dB

Note: Field strength limit was calculated with 40dB/dec

5.2 In-band Emission (15.225 (b)(c))

5.2.1 Regulation

15.225 (b) With in the bands 13.410-13.553 MHz and 13.567-13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters.

15.225 (c) With in the bands 13.110-13.410 MHz and 13.710-14.010 MHz, the field strength of any emissions shall not exceed 106 microvolts/meter at 30 meters.

5.2.2 Test Result

- Complied

Measurement Distance: 3m

Frequency [MHz]	Receiver Bandwidth [kHz]	Reading [dB(μV)]	Pol. [V/H]	Factor [dB]	Limit [dB(μV/m)]	Result [dB(μV/m)]	Margin [dB]
QP DATA							
13.55	9	21.03	V	-10.84	80.51	10.19	70.32
13.57	9	23.57	H	-10.84	80.51	12.73	67.78
13.41	9	24.23	V	-10.84	90.47	13.39	77.08
13.83	9	30.34	H	-10.84	90.47	19.50	70.97

Margin (dB) = Limit – Actual
[Resultl = Reading – Amp Gain + Attenuator + AF + CL]
1. H = Horizontal, V = Vertical Polarization
2. ATT = Attenuation (10dB pad and/or Insertion Loss of HPF), AF/CL = Antenna Factor and Cable Loss

* The spurious emission at the frequency does not fall in the restricted bands.
** The measured result is within the test standard limit by a margin less than the measurement uncertainty; it is therefore not possible to state compliance based on the 95 % level of confidence. However, the result indicates that compliance is more probable than non-compliance.

NOTE: All emissions not reported were more than 20 dB below the specified limit or in the noise floor.

5.3 Out-of-band Emission (15.225 (d),15.209)

5.3.1 Regulation

15.225 (d) The Field Strength of any emissions appearing outside of the 13.110-14.010 MHz band shall not exceed the general radiated emission limits in 15.209

Frequency (MHz)	Field Strength (uV/m)	Measurement distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30(29.54dBuV/m)	30
30.0-88.0	100(40 dBuV/m)	3
88-216	150(43.5 dBuV/m)	3
216-960	200 (46 dBuV/m)	3
Above 960	500 (53.98 dBuV/m)	

5.3.2 Measurement Procedure

The spurious emissions from the EuT will be measured on an 10m Anechoic chamber in the frequency range of 9 kHz to 30 MHz using a tuned receiver and a shielded loop antenna.
The antenna was positioned 3, 10 or 30 meters horizontally from the EuT.
Measurements have been made in all three orthogonal axes and the shielded loop antenna was rotated to locate the maximum of the emissions.
In the case where larger measuring distances are required the results will extrapolated based on the values measured on the closer distances according to Section 15.31 (f) (2) [2].

The final measurement will be performed with an EMI Receiver set to Quasi Peak detector except for the frequency bands 9 kHz to 90 kHz and 110 to 490 kHz where an average detector will be used according to Section 15.209 (d) [2].

The final level, expressed in dBµV/m, is arrived at by taking the reading from the EMI receiver (Level dBµV) and adding the antenna correction factor and cable loss factor (Factor dB) to it. This result then has to be compared with the relevant FCC limit. The resolution bandwidth during the measurement is as follows:
9 kHz – 150 kHz: ResBW: 200 Hz
150 kHz – 30 MHz: ResBW: 9 kHz

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The preliminary radiated measurements were performed to determine the frequency producing the maximum emissions in an anechoic chamber at a distance of 3 meters.

The EUT was placed on the top of the 0.8-meter height, 1 × 1.5 meter non-metallic table. To find the maximum emission levels, the height of a measuring antenna was changed and the turntable was rotated 360°.

The antenna polarization was also changed from vertical to horizontal. The spectrum was scanned from 30 to 1000 MHz using the BILOG antenna.

To obtain the final measurement data, the EUT was arranged on a turntable situated on a 10m chamber. The EUT was tested at a distance 3 meters.

Each frequency found during preliminary measurements was re-examined and investigated. The test-receiver system was set up to average, peak, and quasi-peak detector function with specified bandwidth.

5.3.3 Test Result
-Complied

Measurement Distance: 3m

-Above 30MHz

Frequency [MHz]	Receiver Bandwidth [kHz]	Reading [dB(μV)]	Pol. [V/H]	Factor [dB]	Limit [dB(μV/m)]	Result [dB(μV/m)]	Margin [dB]
QP DATA.							
67.26	120	47.6	V	-16.30	40.0	31.30	8.70
152.00	120	47.9	V	-12.40	43.5	35.50	8.00
210.13	120	48.1	V	-15.80	43.5	32.30	11.20
215.66	120	46.9	V	-15.40	43.5	31.50	12.00

Margin (dB) = Limit – Actual
[Resultl = Reading – Amp Gain + Attenuator + AF + CL]
1. H = Horizontal, V = Vertical Polarization
2. ATT = Attenuation (10dB pad and/or Insertion Loss of HPF), AF/CL = Antenna Factor and Cable Loss

* The spurious emission at the frequency does not fall in the restricted bands.
** The measured result is within the test standard limit by a margin less than the measurement uncertainty; it is therefore not possible to state compliance based on the 95 % level of confidence. However, the result indicates that compliance is more probable than non-compliance.

NOTE: All emissions not reported were more than 20 dB below the specified limit or in the noise floor.

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5.4 Frequency tolerance (15.225 (e))

5.4.1 Regulation

15.225 (e) The frequency tolerance of the carrier signal shall be maintained within ±0.01% of the operating frequency over a temperature variation of −20 degrees to +50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

5.4.2 Test Result

- Complied

VOLTAGE (%)	POWER (V)	TEMP (°C)	FREQ (Hz)	FREQ.DEV (Hz)	Deviation (%)	Limit (%)
100	12	20	13560654	-54	-0.00040%	±0.01%
		-20	13560653	-53	-0.00039%	±0.01%
		-10	13560685	-85	-0.00063%	±0.01%
		0	13560689	-89	-0.00066%	±0.01%
		10	13560678	-78	-0.00058%	±0.01%
		20	13560673	-73	-0.00054%	±0.01%
		25	13560669	-69	-0.00051%	±0.01%
		30	13560665	-65	-0.00048%	±0.01%
		40	13560657	-57	-0.00042%	±0.01%
		50	13560548	52	0.00038%	±0.01%
85	10.2	20	13560650	-50	-0.00037%	±0.01%
115	13.8	20	13560652	-52	-0.00038%	±0.01%

5.5 Conducted Emission- N/A

5.4.1 Regulation

According to §15.207(a), for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50μH/50Ω line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

Frequency of emission (MHz)	Conducted limit (dBμV)	
	Qausi-peak	Average
0.15 – 0.5	66 to 56 *	56 to 46 *
0.5 – 5	56	46
5 – 30	60	50

* Decreases with the logarithm of the frequency.

According to §15.107(a), for unintentional device, except for Class A digital devices, line conducted emission limits are the same as the above table.

5.4.2 Measurement Procedure

1. The EUT was placed on a wooden table of size, 1 m by 1.5 m, raised 80 cm in which is located 40 cm away from the vertical wall and 1.5m away from the side wall of the shielded room.
2. Each current-carrying conductor of the EUT power cord was individually connected through a 50Ω/50μH LISN, which is an input transducer to a Spectrum Analyzer or an EMI/Field Intensity Meter, to the input power source.
3. Exploratory measurements were made to identify the frequency of the emission that had the highest amplitude relative to the limit by operating the EUT in a range of typical modes of operation, cable position, and with a typical system equipment configuration and arrangement. Based on the exploratory tests of the EUT, the one EUT cable configuration and arrangement and mode of operation that had produced the emission with the highest amplitude relative to the limit was selected for the final measurement.
4. The final test on all current-carrying conductors of all of the power cords to the equipment that comprises the EUT (but not the cords associated with other non-EUT equipment is the system) was then performed over the frequency range of 0.15 MHz to 30 MHz.
5. The measurements were made with the detector set to PEAK amplitude within a bandwidth of 10 kHz or to QUASI-PEAK and AVERAGE within a bandwidth of 9 kHz. The EUT was in transmitting mode during the measurements.

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6. Test equipment used for test

	Description	Manufacture	Model No.	Serial No.	Next Cal Date.
■	Temp & humidity chamber	taekwang	TK-04	TK001	10.12.11
□	Power Meter	Agilent	E4416A	GB41292365	10.10.30
□	Frequency Counter	HP	53150A	US39250565	11.09.13
■	Spectrum Analyzer	Agilent	E4407B	US39010142	10.10.30
■	Signal Generator	HP	E4432B	GB39340611	10.10.30
□	Modulation Analyzer	HP	8901B	3538A05527	10.11.07
□	Function Generator	Agilent	33250A	MY4006432	11.02.01
□	Audio Analyzer	HP	8903B	3729A19213	10.10.30
□	AC Power Supply	KIKUSUI	PCR2000W	GB001619	10.10.30
□	DC Power Supply	Tektronix	PS2521G	TW53135	10.10.30
■	DC Power Supply	Tektronix	PS2520G	TW50517	11.02.18
□	Dummy Load	BIRD	8141	7560	11.08.20
□	Dummy Load	BIRD	8401-025	799	11.08.20
□	EMI Test Receiver	R&S	ESCI	100710	10.12.01
■	EMI Test Receiver	R&S	ESCI	100001	11.08.17
□	Attenuator	HP	8494A	2631A09825	10.11.03
□	Attenuator	HP	8496A	3308A16640	10.11.03
□	Attenuator	R&S	RBS1000	D67079	10.11.04
□	Attenuator	HP	11581A	29738	11.01.09
□	Power sensor	Agilent	E9321A	US40390422	10.11.03
□	Power sensor	Agilent	E9325A	US40420186	10.11.03
■	LOOP Antenna	EMCO	6502	9205-2745	11.05.22
■	BILOG Antenna	Schwarzbeck	VULB 9168	375	10.11.30
□	HORN Antenna	ETS	3115	00062589	10.12.22
□	Power Divider	HP	11636A	05441	11.08.21

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