Certification of Compliance

CFR 47 Part 15 Subpart C

Test Report File No. :	11-IST-0481	**Date of Issue**	:	May 13, 2011

Model(s)	:	DE-EPASS10
Kind of Product	:	Passport Reader
FCC ID	:	SWUDE-EPASS10
Applicant	:	DUALi Inc.
Address	:	#505, Samsung Technopark, 471, Woncheon-Dong, Yungtong-Gu, Suwon-Si, Gyeonggi-Do, Korea
Manufacturer	:	DUALi Inc.
Address	:	#505, Samsung Technopark, 471, Woncheon-Dong, Yungtong-Gu, Suwon-Si, Gyeonggi-Do, Korea

Test Result ■ **Positive** □ **Negative**

Reviewed By

S.J.CHO / EMC Group Manager

Approved By

B.S.KIM / Chief

Comment(s)

- Investigations requested : Measurement to the relevant clauses of FCC rules and regulations Part 15 Subpart C.
- The test report is consists of 16 pages.
- The test result only responds to the tested sample.
- It is not allowed to copy this report even partly without the allowance of IST EMC Laboratory.
- This equipment as for has been shown to be capable of continued compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in ANSI C63.4

I assume full responsibility for accuracy and completeness of these data.

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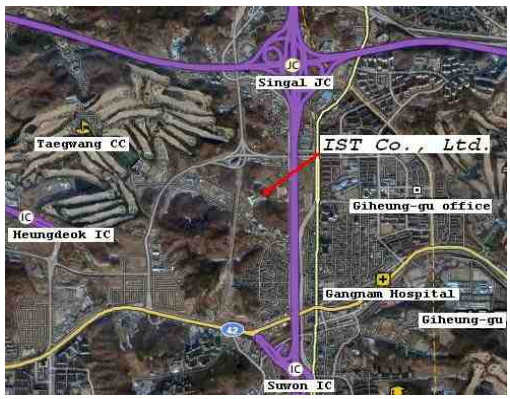
Note:

INFORMATIONS OF TEST LABORATORY

EMC LABORATORY of IST Co., Ltd.
400-19, Singal-dong, Giheung-gu, Yongin-si, Kyonggi-Do, 449-860, Korea
TEL : +82 31 326 6700 FAX : +82 31 326 6797



- VCCI Registration No. : 1739
- FCC Registration No. : 400603
- KCC Registration No. : KR0018
- FCC MRA Registration No. : 801060
- KOLAS Registration No. : KT118

ENVIRONMENTAL CONDITIONS

Temperature 19.5 ℃ Humidity 45 %
Atmospheric pressure 1018 mbar

POWER SUPPLY SYSTEM USED

Power supply system AC 120V / 60 Hz (Refer to the product information)

PRODUCT INFORMATION

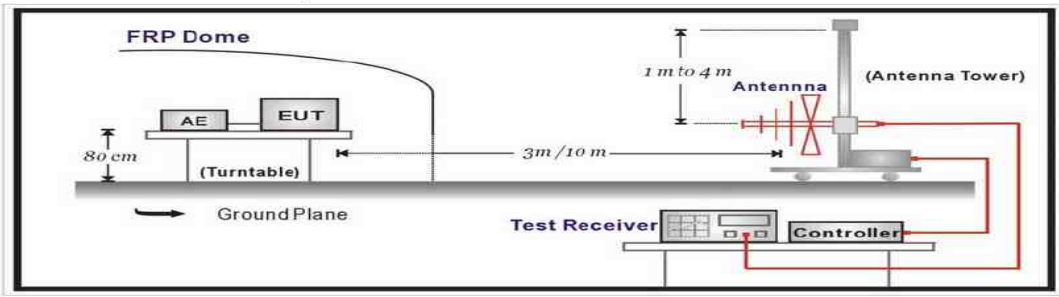
OCR Reader	Window Size	130 mm x 60 mm
	Window Glass	4 mm glass
	Image Resolution	350 dpi
	Color Depth	24 bits/pixel RGB
	Output Image format	BMP,JPEG,JPEG2000,PNG
	Illuminations	White light(default),IR(optional)
	OCR Reading Speed	Capture 0.1sec,Processing 0.9sec
	MRZ processing	Supporting(ISO 1073/1 OCR B1)
RF Reader	Readable ICs	ISO/IEC 14443 Type A & B(106,212,424,848kbps)
	Data structure and read protocol	Comply to ICAO 9303 Part 1
	Access/Authentication	BAC,PA supporting,(AA,EAC-Optional)
	Auto-detection Doc.	Supporting
	Dimension	179 mm x 172 mm x 94 mm

- Please refer to user's manual.

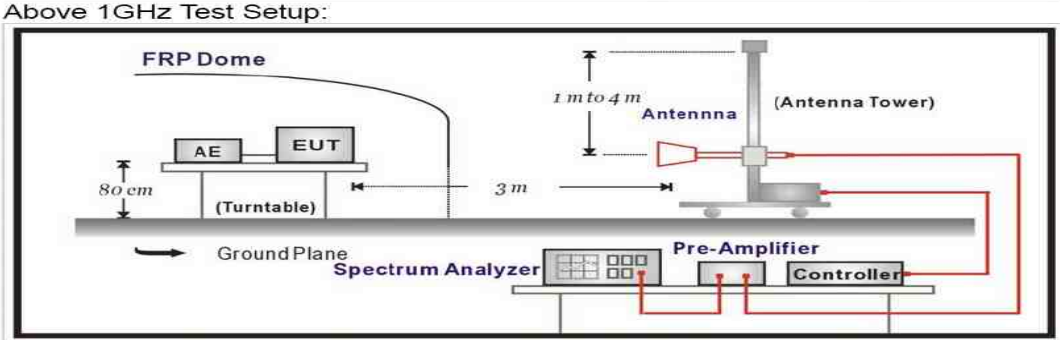
Radiated Emissions:

The measurement was performed over the frequency range of 30MHz to 1GHz using antenna as the input transducer to a Spectrum analyzer or a Field Intensity Meter. The measurement was made with the detector set for "quasi-peak" within a bandwidth of 120kHz.
Procedure of Test
Preliminary measurements were made at 3 meter using bi-log antennas, and spectrum analyzer to determine the frequency producing the max. emission in anechoic chamber. Appropriate precaution was taken to ensure that all emission from the EUT were maximized and investigated. The system configuration, mode of operation, turn-table azimuth and height with respect to the antenna were noted for each frequency found. The spectrum was scanned from 30MHz to 1000MHz using bi-log antenna. Above 1GHz, linearly polarized double ridge horn antennas were used. Final measurements were made at open site with 3-meters test distance using bi-log antenna or horn antenna. The OATS have been verified in regular for its normalized site attenuation. The test equipment was placed on a wooden table. Sufficient time for the EUT, peripheral equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. Each frequency found during pre-scan measurements was re-examined by manual. The detector function was set to CISPR quasi-peak mode and the bandwidth of the receiver was set to 120kHz or 1MHz depending on the frequency of type of signal. The EUT, peripheral equipment and interconnecting cables were re-configured to the set-up producing the max. emission for the frequency and were placed on top of a 0.8-meter high nonmetallic 1 x 1.5 meter table. The EUT, peripheral equipment, and interconnecting cables were re-arranged and manipulated to maximize each emission. The turntable containing the system was rotated; the antenna height was varied 1 to 4 meters and stopped at the azimuth or height producing the maximum emission. Each emission was maximized by: varying the mode of operation to the EUT and/or peripheral equipment and changing the polarity of the antenna, whichever determined the worst-case emission.(The bandwidth below 1GHz setting on the field strength meter is 120KHz and above 1GHz is 1MHz.)

Under 1GHz Test Setup:



Above 1GHz Test Setup:



Radiated Emissions Test, 9 kHz to 30 MHz(Magnetic Field Test)

1. The preliminary radiated measurements were performed to determine the frequency producing the maximum emissions at a distance of 3 meters according to Section 15.31(f)(2).
2. The EUT was placed on the top of the 0.8-meter height, 1 x 1.5 meter non-metallic table.
3. Emissions from the EUT are maximized by adjusting the orientation of the Loop antenna and rotating the EUT on the turntable. Manipulating the system cables also maximizes EUT emissions if applicable.
4. To obtain the final measurement data, 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 with specified bandwidth.

Measurement Uncertainty Calculations

The measurement uncertainties stated were calculated in accordance with the requirements of NIST Technical Note 1297 and NIS 81 (1994).

TYPE	Contribution	Probability Distribution	Uncertainty	Remark
B	**AMN**			
	Impedance	Triangular	+2.6/-2.7 dB	CISPR
	Voltage Division Factor	normal(k=2)	±0.2	
	Attenuation : AMN to Receiver	normal(k=2)	±0.1	
	Receiver(ESCI(S/N:100374))			
	Sine-Wave Voltage Accuracy	normal(k=2)	±1.0 dB	CISPR
	Pulse Amplitude Response	Rectangular	±1.5 dB	
	Pulse Repetition Rate Response	Rectangular	±1.5 dB	
	Mismatch AMN to Receiver	U-Shaped	+0.7/-0.8 dB	CISPR
	Reading	normal(k=1)	±0.1	
Combined Standard Uncertainty		normal	**± 1.8 dB**	
Expanded Uncertainty U		normal(k=2)	***± 3.6 dB***	**95 %**

U = -3.70 / +3.42 (k=2, 95.45% confidence level)

TYPE	Contribution	Probability Distribution	Uncertainty	Remark
B	**Antenna**			
	AF factor	Normal(k=2)	±0.56	CAL.
	AF frequency interpolation	Rectangular	±0.30 dB	CISPR
	AF height deviations	Rectangular	±0.50 dB ±0.30 dB	CISPR
	directivity difference	Rectangular	+1.0/-0.0 dB	CISPR
	phase center location(3 m)	Rectangular	±1.0 dB	CISPR
	phase center location(10 m)		±0.30 dB	
	Receiver			
	Sine Wave Voltage Accuracy	Normal(k=2)	±0.20 dB	CAL.
	Pulse Amplitude Sensibility	Normal(k=2)	±0.40 dB	CAL.
	Pulse Frequency Response	Normal(k=2)	±0.57 dB	CAL.
	Random Noise	Normal(k=2)	±0.35 dB	CAL.
	Mismatch : Antenna - receiver	U-Shaped	+0.9/-1.0 dB	CISPR
	Table height	Normal(k=2)	±0.01 dB	CISPR
	Separation distance(3 m) Separation distance(10 m)	Rectangular	±0.30 dB ±0.10 dB	CISPR
Combined standard Uncertainty		Normal	**± 1.13**	
Expanded Uncertainty U		Normal(k=2)	***± 2.26 dB***	**95 %**

U = ±2.26 (k=2, 95% confidence level)

Equipment Under Test

EUT Type :

■ Table-Top. ☐ Floor-Standing.

☐ Table-Top and Floor-Standing(Combination).

☐ Built-in

Operation – mode of the E.U.T. :

The equipment under test was operated during the measurement under following conditions :

☐ Standby Mode

■ Operational Condition : Continue Transmitting

SUMMARY

Test Descriptions	
■ Conducted Emission	PASS
- Conducted Emission Result	
■ Radiated Emission-15.225(a)	PASS
- Radiated Emission Result	
■ Radiated Electric Field Emission-15.225(b)(c)	PASS
- Test result	
■ Radiated Electric Field Emission-15.109, 15.225(d)	PASS
- Test result	
■ Frequency Stability -15.225(e)	PASS
Test Result	

Note :

- ■ means that the test is applicable,
- □ means that the test is not applicable.

Test Date

Begin of Testing : May 03, 2011 - End of Testing : May 11, 2011

Prepared By

U.H. Ryu / Senior Engineer

Radiated Spurious Emission

[Applicable]

◆ Test Equipment Used

Name	Type	Manufacturer	Calibration. Date	Serial Number
ESCS30	EMI Receiver	Rohde & Schwarz	Sep. 17, 2010	100171
SPECTRUM ANALYZER	R3273	ADVANTEST	May 21, 2010	110600587
Loop Antenna	HFH2-Z2	Rohde & Schwarz	Oct. 23, 2010	8620771017
Log-bicon Antenna	VULB9161SE	Schwarz beck	Jul. 21, 2009	4089
HORN-Antenna	3115	EMCO	Dec. 22, 2009	9012-3602
HORN-Antenna	SAS-571	A.H. SYSTEMS	Dec. 22, 2009	500
PRE AMPLIFIER	8449B OPT H02	Rohde & Schwarz	Oct. 13, 2010	3008A0530

Note : *1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to RRL, KRISS, KTL and HCT.*

2. The calibration interval of horn ant, and loop ant. is 24 months

Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. For the limit is employed average value, therefore the peak value can be transferred to average value by subtracting the duty factor. The basic equation with a sample calculation is as follows:

Peak = Reading + Corrected Factor

Where

Corr. Factor = Antenna Factor + Cable Factor - Amplifier Gain (if any)

Limit

Emissions radiated outside of the specified bands, shall be according to the general radiated limits in 15.209 as following:

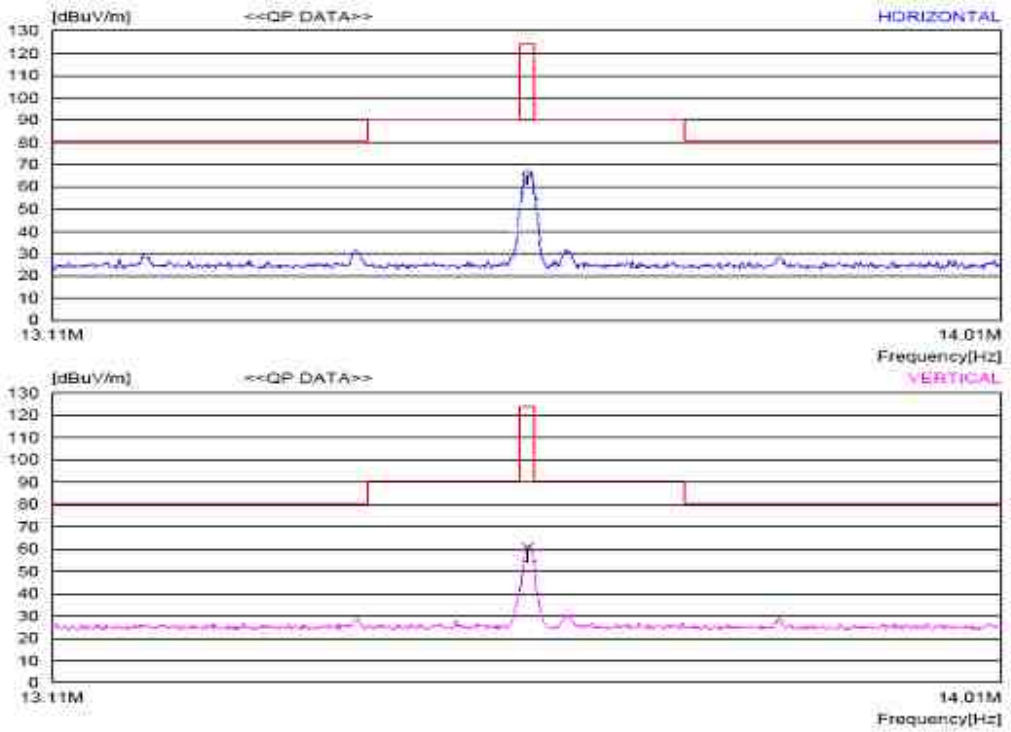
Frequencies(MHz)	Field Strength(microvolt/meter)	Measurement Distance(meter)
0.009 ~ 0.490	2400/F(kHz)	300
0.490 ~ 1.750	24000/F(kHz)	30
1.750 ~ 30.0	30	30
30 ~ 88	100	3
88 ~ 216	150	3
216 ~960	200	3
Above 960	500	3

Radiated Field Emission-15.225(a)

Frequency(MHz)	Field Strength of Fundamental uV/m	Field Strength of Fundamental dBuV/m(30m)	Field Strength of Fundamental dBuV/m(3m)
13.553 - 13.567	15,848	83.9	123.9

[Applicable]

Freq. [MHz]	Reading [dBuV]	Height [m]	Antenna Factor [dB/m]	Cable Loss [dB]	Polar. [H/V]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]
13.5600	49.4	1	18.3	0.1	H	67.8	123.9	56.1
13.5600	44.9	1	18.3	0.1	V	63.3	123.9	60.6



Note :

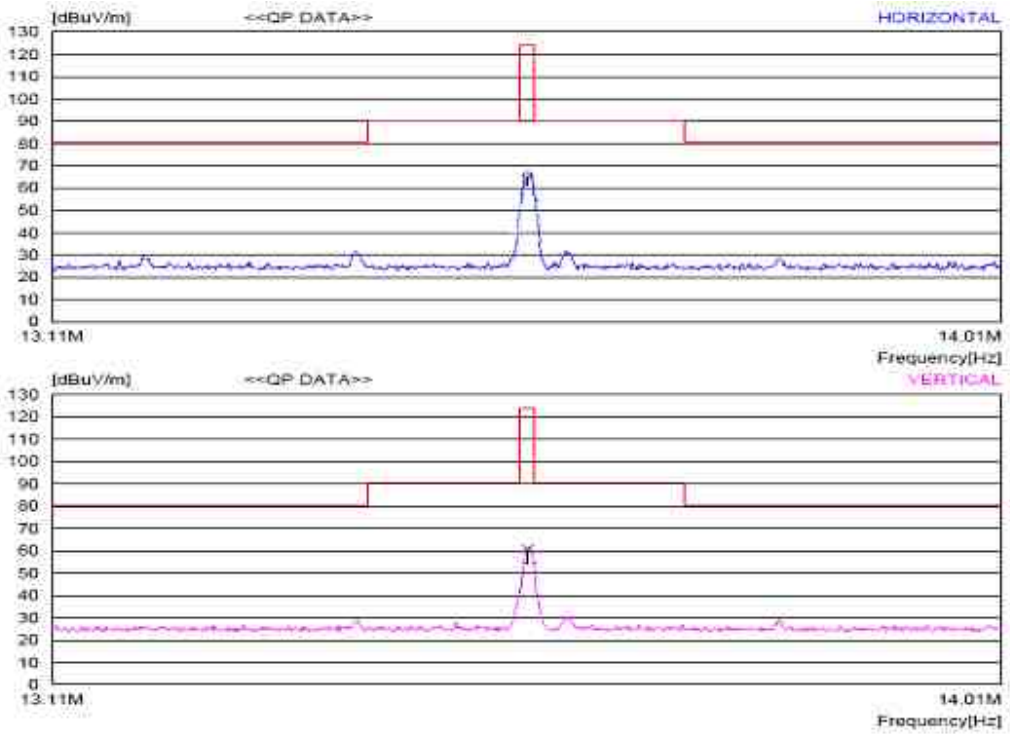
Radiated Electric Field Emission-15.225(b)(c)

Frequency (MHz)	Field Strength of Fundamental uV/m	Field Strength of Fundamental dBuV/m(30m)	Field Strength of Fundamental dBuV/m(3m)
13.110 - 13.410	106	40.5	80.5
13.410 - 13.553	334	50.4	90.4
13.567 - 13.710	334	50.4	90.4
13.710 - 14.010	106	40.5	80.5

[Applicable]

Freq. [MHz]	Reading [dBuV]	Height [m]	Antenna Factor [dB/m]	Cable Loss [dB]	Polar. [H/V]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]
-	-	-	-	-	-	-	-	-

Note : Other emission don't exceed the level 20dB below the applicable limit.



Radiated Electric Field Emission-15.109, 15.225(d)

Frequency (MHz)	Field Strength of Fundamental uV/m	Field Strength of Fundamental dBuV/m(3m)
1.705 - 30.0	30	49.5
30 - 88	100	40
88 - 216	150	43.5
216 - 960	200	46
Above 960	500	54

[Applicable]

Freq. [MHz]	Reading [dBuV]	Antenna Factor [dB/m]	Cable Loss [dB]	Polar. [H/V]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]
17.22	13.89	18.35	0.66	V	32.9	49.50	16.6
19.99	5.84	18.40	0.69	H	24.9	49.50	24.6
23.33	3.96	18.41	0.70	V	23.1	49.50	26.4
24.39	5.18	18.41	0.70	H	24.3	49.50	25.2
75.54	12.1	9.09	1.42	H	39.10	22.61	16.49
122.882	10.5	11.46	1.82	V	43.50	23.78	19.72
180.35	9.4	11.02	2.20	H	43.50	22.62	20.88
230.998	15.7	10.48	2.53	H	46.40	28.71	17.69
249.991	16.7	11.12	2.65	H	46.40	30.47	15.93
446.252	9.5	16.47	3.48	V	46.40	29.45	16.95
520.15	10.2	17.90	3.82	V	46.40	31.92	14.48
593.994	8.9	19.42	4.07	H	46.40	32.39	14.01
693.242	5.4	20.46	4.35	V	46.40	30.21	16.19

Frequency Stability -15.225(e)

◆ Test Equipment Used

Name	Type	Manufacturer	Calibration. Date	Serial Number
R3273	SPECTRUM ANALYZER	ADVANTEST	May 21, 2010	110600587
PL-4SP	Temp&Humi Chamber	TABAI	Jun.04, 2010	13001512

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

[Applicable]

Table 1 : Frequency Tolerance

Reference Frequency : 13.5600 MHz, Limit : within ± 1356 Hz

Environment Temperature [°C]	Power Supplied [Vdc]	Carrier Frequency Measured with Time Elapsed							
		STARTUP		2 minutes		5 minutes		10 minutes	
		[MHz]	Err[Hz]	[MHz]	Err[Hz]	[MHz]	Err[Hz]	[MHz]	Err[Hz]
-20	12	13.559952	-48	13.559968	-32	13.560009	9	13.560040	40
-10	12	13.560019	19	13.560015	15	13.560031	31	13.560053	53
0	12	13.560021	21	13.560021	21	13.560027	27	13.560052	52
+10	12	13.560047	47	13.560031	31	13.560041	41	13.560038	38
+20	12	13.560020	20	13.560017	17	13.559887	-13	13.560023	23
+30	12	13.559900	-100	13.559974	-26	13.559982	-18	13.559939	-61
+40	12	13.559928	-72	13.559915	-85	13.559953	-47	13.559907	-93
+50	12	13.559830	-170	13.559876	-124	13.559863	-137	13.559857	-143

Table 2 : Frequency Tolerance

Reference Frequency : 13.5600 MHz, Limit : within ± 1356 Hz

Power Supplied [Vdc]	Carrier Frequency Measured with Time Elapsed							
	STARTUP		2 minutes		5 minutes		10 minutes	
	[MHz]	Err[Hz]	[MHz]	Err[Hz]	[MHz]	Err[Hz]	[MHz]	Err[Hz]
85%	13.560017	17	13.560025	25	13.560031	31	13.560048	48
100%	13.560017	17	13.560023	23	13.560030	30	13.560051	51
115%	13.560019	19	13.560025	25	13.560030	30	13.560049	49

Err[Hz] = Measured carrier frequency (MHz) – Reference Frequency (13.5600 MHz)

Antenna requirements

According to FCC 47 CFR 15.203

"an intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can be used with the device. The use of a permanently attached or an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section"

* the antenna of this EUT are permanently attached(PCB Loop Antenna).

* the EUT complies with the requirement of 15.203