TEST REPORT

Report No : DRTFCC1510-0211

Pages:(1) / (31) page

DT&C Co., Ltd.

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-321-2664, Fax : 031-:

1. Customer

- Name : IDRO Co., Ltd.
- Address : (I-ui-dong, 305, (Iui-dong, Guangkyo Business Center)), 305, 156, Gwanggyo-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, Korea
- 2. Use of Report : FCC Original Grant
- 3. Product Name (Model): RFID Module (IDRO900MI)
- 4. Date of Test : 2015-08-02 ~ 2015-08-27
- 5. Test Method Used : FCC Part 15 Subpart C 247
- 6. Testing Environment : See appended test report
- 7. Test Result : 🛛 Pass 📋 Fail

The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This Test Report cannot be reproduced, except in full.

Affirmation	Tested by Name : KwiCheol, Yeom	(Gignature)	Technica Name :	al Manager Geunki Son (Signature)		
	2015 . 10 . 21 .					
	DT&C Co., Ltd.					
			1. ⁴			





Test Report Version

Test Report No.	Date	Description
DRTFCC1510-0211	Oct. 21, 2015	Initial issue



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1.General Information

1.1 Testing Laboratory

DT&C Co., Ltd.

42, Yurim-ro, 154beon-gil, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea, 449-935 <u>www.dtnc.net</u> Telephone : +82-31-321-2664

FAX	:	+ 82-31-321-1664

1.2 Details of Applicant

Applicant	:	IDRO Co., Ltd.
Address	:	(I-ui-dong, 305, (Iui-dong, Guangkyo Business Center)), 305, 156, Gwanggyo-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, Korea
Contact person Phone No.		Jong-Sung Park + 82-01-225-7883
	•	

1.3 Description of EUT

Product	RFID Module
Model Name	IDRO900MI
Serial Number	Identical prototype
Power Supply	DC 4.0 V
Frequency Range	902.75 ~ 927.25 MHz
Modulation Technique	A1D
Number of Channels	50(Channel Spacing 500kHz)
Antenna Type	Patch Antenna
Antenna Gain	Max. PK 1.76 dBi

1.4. Declaration by the manufacturer

- N/A



1.5. Test Equipment List

Туре	Manufacturer	Model	Cal.Date (yy/mm/dd)	Next.Cal.Date (yy/mm/dd)	S/N
	Agilent	NOODA	14/09/15	15/09/15	NV/50000004
MXA Signal Analyzer		N9020A	15/09/14	16/09/14	- MY50200834
DIGITAL MULTIMETER	Agilent	34401A	15/01/06	16/01/06	US36099541
DC Power Supply	SM techno	SDP30-5D	15/01/06	16/01/06	305DLJ204
50W 10dB ATT	SMAJK	SMAJK-50-10	14/10/21	15/10/21	3-50-10
Vector Signal Generator	Rohde Schwarz	SMBV100A	15/01/06	16/01/06	255571
Signal Generator	Rohde Schwarz	SMF100A	15/06/29	16/06/29	102341
Thermohygrometer	BODYCOM	BJ5478	15/05/08	16/05/08	120612-2
Low Noise Pre Amplifier	tsj	MLA-010K01-B01- 27	15/04/09	16/04/09	1844538
PreAmplifier	Agilent	8449B	15/02/26	16/02/26	3008A00370
LOOP Antenna	Schwarzbeck	FMZB1513	14/04/29	16/04/29	1513-128
TRILOG Broadband Test- Antenna(30MHz-1GHz)	Schwarzbeck	VULB 9160	14/04/30	16/04/30	3358
Double-Ridged Guide Antenna	ETS	3117	14/05/12	16/05/12	140394
	Wainwright	WHKX12-935-	14/10/17	15/10/17	7
Highpass Filter (1GHz) Instruments		1000-15000-40SS	15/09/23	16/09/23	- 7
EMI TEST RECEIVER	R&S	ESR7	14/10/21	15/10/21	101109
EMI TEST RECEIVER	R&S	ESCI	15/02/25	16/02/25	100364
SINGLE-PHASE MASTER	 		14/09/11	15/09/11	2040254420222
	NF	4420	15/09/09	16/09/09	3049354420023
ARTIFICIAL MAINS NETWORK	Narda S.T.S. / PMM	PMM L2-16B	15/06/26	16/06/26	000WX20305



1.6. Summary of Test Results

FCC Part Section(s)	Parameter	Limit (Using in 2400~ 2483.5MHz)	Test Condition	Status Note 1
	Carrier Frequency Separation	>= 20dB BW or >= Two- Thirds of the 20dB BW		С
15.247(a)	Number of Hopping Frequencies	>= 15 hops		С
13.247 (d)	20 dB Bandwidth	None		С
	Dwell Time	=< 0.4 seconds	Conducted	С
15.247(b)	247(b) Transmitter Output Power =< 1Watt , if CHs >= 7 Others =<0.125W		Conducted	С
	Band-edge /Conducted	The radiated emission to		С
15.247(d)	Conducted Spurious Emissions	any 100 kHz of out-band shall be at least 20dB below the highest in-band spectral density.		С
15.205, 15.209	Radiated Spurious Emissions	FCC 15.209 Limits	Radiated	C Note.2
15.207	AC Conducted Emissions	FCC 15.207 Limits	AC Line Conducted	С
15.203	Antenna Requirements	FCC 15.203	-	С
Note 1: C=Comply NC=Not Comply NT=Not Tested NA=Not Applicable Note 2: This test item was performed in each axis. And the worst case data were reported. Semi anechoic chamber registration Number : 165783 Note 3 : The sample was tested according to the following specifications : - ANSI C63.10-2013				



1.7 Conclusion of worst-case and operation mode

The field strength of spurious emission was measured in three orthogonal EUT positions(X-axis, Y-axis and Z-axis).

Tested frequency information,

- Hopping Function: Enable

	TX Frequency(MHz)	RX Frequency(MHz)	
Hopping Band	902.75 ~ 927.25	902.75 ~ 927.25	

- Hopping Function: Disable

	TX Frequency(MHz)	RX Frequency(MHz)
Lowest Channel	902.75	902.75
Middle Channel	915.25	915.25
Highest Channel	927.25	927.25



2. Radiated Spurious Emissions and Conducted Spurious Emission

2.1. Test Setup

Refer to the APPENDIX I.

2.2. Limit

According to \$15.247(d), in any 100 kt bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kt bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement , provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval , as permitted under paragraph(b)(3) of this section , the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in section \$15.209(a) is not required. In addition, radiated emission which in the restricted band, as define in section \$15.205(a), must also comply the radiated emission limits specified in section \$15.209(a) (see section \$15.205(c))

According to § 15.209(a), except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table

Frequency (MHz)	Limit (uV/m)	Measurement Distance (meter)
0.009 - 0.490	2400/F(KHz)	300
0.490 – 1.705	24000/F(KHz)	30
1.705 – 30.0	30	30
30 ~ 88	100 **	3
88 ~ 216	150 **	3
216 ~ 960	200 **	3
Above 960	500	3

** Except as provided in 15.209(g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88MHz, 174-216MHz or 470-806MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g. 15.231 and 15.241.

According to § 15.205(a) and (b), only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	MHz	GHz	GHz
0.009 ~ 0.110	8.41425 ~ 8.41475	108 ~ 121.94	1300 ~ 1427	4.5 ~ 5.15	14.47 ~ 14.5
0.495 ~ 0.505	12.29 ~ 12.293	123 ~ 138	1435 ~ 1626.5	5.35 ~ 5.46	15.35 ~ 16.2
2.1735 ~ 2.1905	12.51975 ~ 12.52025	149.9 ~ 150.05	1645.5 ~ 1646.5	7.25 ~ 7.75	17.7 ~ 21.4
4.125 ~ 4.128	12.57675 ~ 12.57725	156.52475 ~	1660 ~ 1710	8.025 ~ 8.5	22.01 ~ 23.12
4.17725 ~ 4.17775	13.36 ~ 13.41	156.52525	1718.8 ~ 1722.2	9.0 ~ 9.2	23.6 ~ 24.0
4.20725 ~ 4.20775	16.42 ~ 16.423	156.7 ~ 156.9	2200 ~ 2300	9.3 ~ 9.5	31.2 ~ 31.8
6.215 ~ 6.218	16.69475 ~ 16.69525	162.0125 ~ 167.17	2310 ~ 2390	10.6 ~ 12.7	36.43 ~ 36.5
6.26775 ~ 6.26825	16.80425 ~ 16.80475	167.72 ~ 173.2	2483.5 ~ 2500	13.25 ~ 13.4	Above 38.6
6.31175 ~ 6.31225	25.5 ~ 25.67	240 ~ 285	2655 ~ 2900		
8.291 ~ 8.294	37.5 ~ 38.25	322 ~ 335.4	3260 ~ 3267		
8.362 ~ 8.366	73 ~ 74.6	399.90 ~ 410	3332 ~ 3339		
8.37625 ~ 8.38675	74.8 ~ 75.2	608 ~ 614	3345.8 ~ 3358		
		960 ~ 1240	3600 ~ 4400		

The field strength of emissions appearing within these frequency bands shall not exceed the limits shown in §15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in §15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in §15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in §15.35 apply to these measurements.



2.3. Test Procedures

2.3.1. Test Procedures for Radiated Spurious Emissions

- The EUT is placed on a non-conductive table. For emission measurements at or below 1 GHz, the table height is 80 cm. For emission measurements above 1 GHz, the table height is 1.5 m. The table was rotated 360 degrees to determine the position of the highest radiation.
- 2. During performing radiated emission below 1 GHz, the EUT was set 3 meters away from the interference receiving antenna, which was mounted on the top of a variable-height antenna tower. During performing radiated emission above 1 GHz, the EUT was set 3 meter away from the interference-receiving antenna.
- 3. The antenna is a broadband antenna, and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- 4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the table was turned from 0 degrees to 360 degrees to find the maximum reading.
- 5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- 6. If the emission level of the EUT in peak mode was 10 dBlower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10 dBmargin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

NOTE ;

- 1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kllzfor Quasi-peak detection (QP) at frequency below 1 Glz.
- 2. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1 Mz for Peak detection and frequency above 1 Gz.
- 3. The resolution bandwidth of test receiver/spectrum analyzer is 1 Mathematical Ma

2.3.2. Test Procedures for Conducted Spurious Emissions

- 1. The transmitter output was connected to the spectrum analyzer.
- 2. The **reference level** of the fundamental frequency was measured with the spectrum analyzer using RBW=100 kHz, VBW=300 kHz.
- 3. The conducted spurious emission was tested each ranges were set as below.

Frequency range: 9 kHz ~ 30 MHz RBW= 100kHz, VBW= 300kHz, SWEEP TIME = AUTO, DETECTOR = PEAK, TRACE = MAX HOLD, SWEEP POINT: 10001

Frequency range: 30 MHz ~ 10 GHz

```
RBW= 100kHz, VBW= 300kHz, SWEEP TIME = AUTO, DETECTOR = PEAK, TRACE = MAX HOLD, SWEEP POINT: 10001
```

LIMIT LINE = 20 dB below of the reference level of above measurement procedure Step 2. (RBW = 100 kHz, VBW = 300 kHz)



2.4. Test Results

Ambient temperature	:	23 °C
Relative humidity	:	49 %

2.4.1. Radiated Emission

9kHz ~ 10GHz Data

Lowest Channel

Frequency (MHz)	ANT Pol	The worst case EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	D.C.F. (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
2708.370	V	Y	PK	47.19	3.48	NA	50.67	74.00	23.33
2708.250	V	Y	AV	39.43	3.48	NA	42.91	54.00	11.09
3610.840	Н	Х	PK	46.24	6.61	NA	52.85	74.00	21.15
3610.930	Н	Х	AV	38.02	6.61	NA	44.63	54.00	9.37
4513.415	V	Y	PK	48.74	8.68	NA	57.42	74.00	16.58
4513.785	V	Y	AV	41.77	8.68	NA	50.45	54.00	3.55

Middle Channel

Frequency (MHz)	ANT Pol	The worst case EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	D.C.F. (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
2745.790	V	Y	PK	48.91	3.72	NA	52.63	74.00	21.37
2745.840	V	Y	AV	39.81	3.72	NA	43.53	54.00	10.47
3661.855	Н	х	PK	46.73	6.88	NA	53.61	74.00	20.39
3660.845	Н	Х	AV	38.63	6.88	NA	45.51	54.00	8.49
4576.655	V	Y	PK	48.46	8.83	NA	57.29	74.00	16.71
4576.245	V	Y	AV	42.07	8.83	NA	50.90	54.00	3.10

Highest Channel

Frequency (MHz)	ANT Pol	The worst case EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	D.C.F. (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
2781.720	V	Y	PK	49.67	3.74	NA	53.41	74.00	20.59
2781.705	V	Y	AV	42.78	3.74	NA	46.52	54.00	7.48
3708.940	Н	Х	PK	45.21	6.99	NA	52.20	74.00	21.80
3709.055	Н	Х	AV	36.10	6.99	NA	43.09	54.00	10.91
4635.885	V	Y	PK	48.52	9.20	NA	57.72	74.00	16.28
4636.225	V	Y	AV	41.75	9.20	NA	50.95	54.00	3.05

Note.

1. No other spurious and harmonic emissions were reported greater than listed emissions above table.

2. Above listed point data is the worst case data.

3. Sample Calculation.

Margin = Limit – Result / Result = Reading + T.F + DCF / T.F = AF + CL – AG Where, T.F = Total Factor, AF = Antenna Factor, CL = Cable Loss, AG = Amplifier Gain, DCF = Duty Cycle Correction Factor

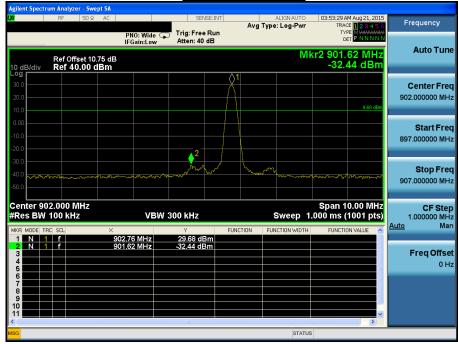
4. EUT had its hopping function disabled at the highest, middle and the lowest available channels.



2.4.2. Conducted Spurious Emissions

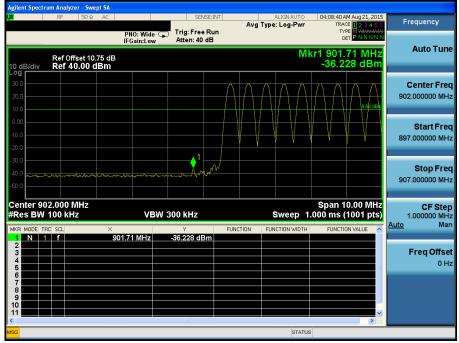
Low Band-edge

Lowest Channel



Low Band-edge

Hopping mode





Conducted Spurious Emissions

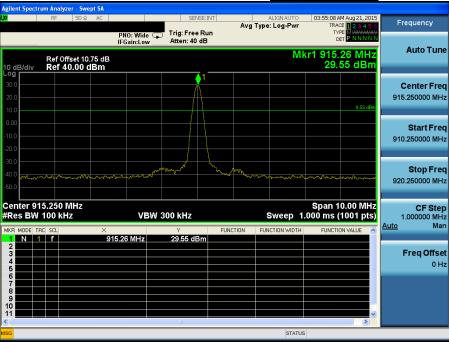
Lowest Channel

Agilent Spectrum											
L <mark>XI</mark>	RF 50	ጋ Ω 🧥 DC 📗		SEN	ISE:INT	Aug Typ	ALIGNAUTO e: Log-Pwr		M Aug 21, 2015	Frequenc	v
			PNO: Fast	👝 Trig: Free	Run	Avg typ	e. Log-r wi	TY	E M IABABABABA		-
			IFGain:Low	Atten: 40				D	PNNNN		
								Vikr1 28	70247	Auto	Tune
	Ref Offset	9.47 dB							97 dBm		
10 dB/div Log	Ref 39.4	/ dBm						-04.4	or ubiii		
29.5										Contor	Erec
										Center	
19.5										15.004500) MHz
9.47									9.68 dBm		
-0.53											
										Start	Freq
-10.5										9.00	0 kHz
-20.5											
-30.5 🍐 🖢 🛁 🛁											
-40.5										Stop	Freq
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-50.5											
								Ot 0			
Start 9 kHz) (D)	W 200 KU-					0.00 MHz		Step
#Res BW 10	JU KHZ		٧Ð	W 300 kHz		3	weep 3.3	533 ms (1	uuut pisj	2.999100	
MKR MODE TRC	SCL	X		Y	FUNC	TION FU	NCTION WIDTH	FUNCTIO	IN VALUE 🛛 🔼	Auto	Man
1 N 1	f	1	287.9 kHz	-34.97 dE	3m						
2										Freq O	ffset
4										11040	0 Hz
5									=		UHZ
6											
8											
9											
10											
<									>		
MSG							STATUS	DC Cou			
							STATUS		ipieu		_

Agilent Spectr	um Ana	lyzer - Swep	ot SA								
LXI	RF	50 Ω	AC		SEN	ISE:INT	0	ALIGNAUTO e: Log-Pwr		M Aug 21, 2015	Frequency
			F	PNO: Fast G Gain:Low	Trig: Free Atten: 36		Avgiyp	e: Log-Pwr	TY	28 1 2 3 4 5 6 Pe M MMMMM ET <mark>P N N N N N</mark>	
10 dB/div	Ref Ref	Offset 15.3 40.00 d	38 dB Bm					Mk	2 999.0 -32.	84 MHz 49 dBm	Auto Tune
Log 30.0 20.0 10.0										9.68 dBm	Center Freq 5.015000000 GHz
0.00 -10.0 -20.0	2										Start Freq 30.000000 MHz
-30.0 -40.0 -50.0											Stop Freq 10.000000000 GHz
Start 30 M #Res BW		κHz		VBW	300 kHz		s	weep 95	Stop 10 3.3 ms (1	.000 GHz 0001 pts)	CF Step 997.000000 MHz Auto Man
MKR MODE TR	f			'5 MHz	Y 34.18 dE	3m	CTION FU	NCTION WIDTH	FUNCTIO	IN VALUE	Auto Man
2 N 1 3 4 5 6			999.08	34 MHz	-32.49 dE	sm				=	Freq Offset 0 Hz
8 9 10											
11					Ш					×	
MSG								STATUS	3		



Reference for limit



Middle Channel



Conducted Spurious Emissions

Agilent Spectrum Analyzer - Swept SA					
🗶 RF 50 Ω 🧘 DC			ALIGN AUTO Type: Log-Pwr	04:12:39 AM Aug 21, 2015 TRACE 1 2 3 4 5 6	Frequency
Ref Offset 9.47 dB 10 dB/div Ref 39.47 dBm		g: Free Run en: 40 dB		TYPE MWWWW DET P NNNNN Vikr1 287.9 kHz -34.53 dBm	Auto Tune
29.5 19.5 9.47				9.55 dBm	Center Freq 15.004500 MHz
-0.53					Start Freq 9.000 kHz
-30.5 -40.5 -50.5	างกลร่างสี่ง _ไ ปเรียงไหว้เป็นไปประสาที่ของเป็นของ	islymmeterson	Karlanda, Panakana karakan dalaman dala	นะแห่งของไหญ่ เป็นแหม่งมหา 1,28632.3 ²⁷ 594.72	Stop Freq 30.000000 MHz
Start 9 kHz #Res BW 100 kHz	VBW 300 k	٢Hz	Sweep 3.3	Stop 30.00 MHz 333 ms (10001 pts)	CF Step 2.999100 MHz
MKR MODE TRC SCL X	287.9 kHz -34.	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE	<u>Auto</u> Man Freq Offset 0 Hz
6 7 8 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9				~	
ISG STATES			STATUS	DC Coupled	

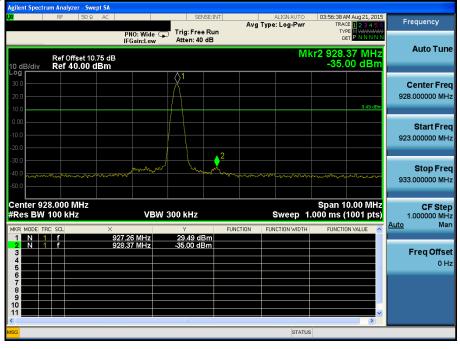
gilent Spectr	um Analyzer - Swe									
XI	RF 50 Ω		10: Fast 🖵 Gain:Low			Avg Typ	ALIGN AUTO De: Log-Pwr	TRAC	M Aug 21, 2015 DE 1 2 3 4 5 6 PE M WWWWWW ET P N N N N N	Frequency
10 dB/div	Ref Offset 15 Ref 40.00 c						Mkr2	1.011 0 -32.0	48 GHz 66 dBm	Auto Tune
30.0 20.0 10.0	¥1 								9.55 dBm	Center Free 5.015000000 GH
0.00 10.0 20.0	2									Start Fre 30.000000 MH
30.0 40.0 50.0					ent erretites				a listen antiken anti Hangapar Albana	Stop Fre 10.000000000 GH
tart 30 N Res BW	100 kHz	×	VBW (300 kHz	FUN		Sweep 95	3.3 ms (1	.000 GHz 0001 pts)	CF Ste 997.000000 MH <u>Auto</u> Ma
1 N 1 2 N 1 3 4 5 5	f	915.330 1.011 048		34.21 dB -32.66 dB	m				=	Freq Offse 0 H
7 8 9 9 9 10 11 1 1 1 1 1 1 1 1 1 1 1 1 1 1									v	
5G							STATUS	6		

Middle Channel



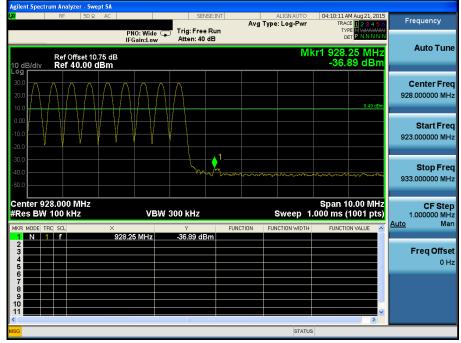
High Band-edge

Highest Channel



High Band-edge

Hopping mode



Highest Channel



Conducted Spurious Emissions

LXI RF	50 Ω <u>Δ</u> DC		SENS	ENTRIT					
				CART		ALIGNAUTO E: Log-Pwr	TRAC	M Aug 21, 2015 E 1 2 3 4 5 6	Frequency
		PNO: Fast G	🗇 Trig: Free F				TYP		
		IFGain:Low_	Atten: 40 d	В					Auto Tun
10 dB/div Ref	Offset 9.47 dB 39.47 dBm					l	48 Wkr1 28 -35	7.9 kHz 25 dBm	Auto Tuli
Log									
29.5									Center Fre
19.5								9.49 dBm	15.004500 MH
9.47								9.49 dBn	
-0.53									Start Fre
-10.5									9.000 kH
-20.5									
-30.5									Oton Ero
-40.5	www.www.www.and.	halen mereter harris	manutaria	monthlesses	Mardindum	alabland and	hatustani	- All Mall and and	Stop Fre 30.000000 MH
-50.5									30.00000 Will
Start 9 kHz							Stop 2	0.00 MHz	
#Res BW 100 H	Hz	VBW	300 kHz		s	weep 3.3	333 ms (1		CF Ste 2.999100 MH
MKR MODE TRC SCL	X		Y	FUNC		NCTION WIDTH	· ·	ON VALUE	Auto Ma
1 N 1 f		87.9 kHz	-35.25 dBr				TONCHO	IN VALUE	
2				_					Freq Offse
4									0 H
5								=	
7									
9									
10								~	
<			Ш						
MSG						STATUS	上 DC Cou	upled	

Agilent Spectr	um Analyz	er - Swep	ot SA								
L <mark>XI</mark>	RF	50 Ω	AC			SENSE:INT		ALIGN AUTO		AM Aug 21, 2015	Frequency
			1	PNO: Fast FGain:Low	Trig: Fr Atten:		Avgi	Type: Log-Pwi	Th	CE 123456 PE MWWWWW ET P NNNNN	
10 dB/div	Ref Off Ref 4	set 15.3 0.00 d	38 dB Bm					Mkr	2 1.023 (-33.)12 GHz 03 dBm	Auto Tune
Log 30.0 20.0 10.0	√1									9.49 dBm	Center Freq 5.015000000 GHz
0.00 -10.0 -20.0	2										Start Freq 30.000000 MHz
-30.0 -40.0 -50.0										Nillan Alingan	Stop Freq 10.000000000 GHz
Start 30 N #Res BW		z		٧B١	№ 300 kHz			Sweep 9	Stop 10 953.3 ms (1	.000 GHz 0001 pts)	CF Step 997.000000 MHz
MKR MODE TH	f			00 MHz	۲ 34.01	dBm	INCTION	FUNCTION WIDT	H FUNCTI	ON VALUE	<u>Auto</u> Man
2 N 1 3 4 5 2	f		1.0231	112 GHz	-33.03	aBm				=	Freq Offset 0 Hz
6 7 8 9 10											
11					III					×	
MSG								STAT	TUS		



3. Carrier Frequency Separation

3.1. Test Setup

Refer to the APPENDIX I.

3.2. Limit

The EUT shall have hopping channel carrier frequencies separated by a minimum of 25kHz or the 20dB bandwidth of the hopping channel, whichever is greater.

3.3 Test Procedure:

The carrier frequency separation was measured with a spectrum analyzer connected to the antenna terminal, while EUT had its hopping function enabled.

After the trace being stable, the reading value between the peaks of the adjacent channels using the marker-delta function was recorded as the measurement results.

The spectrum analyzer is set to:

Span = wide enough to capture the peaks of two adjacent channels

RBW = 1% of the span Sweep = auto

VBW = ≥ RBW Detector function = peak

Trace = max hold

3.4 Test Results:

Hopping	Peak of center channel	Peak of adjacent Channel	Test Result
Mode	(MHz)	(MHz)	(kHz)
Enable	914.75	915.25	





4. Number of Hopping Frequencies

4.1. Test Setup

Refer to the APPENDIX I.

4.2. Limit

Limit: >= 50 hops

4.3 Test Procedure:

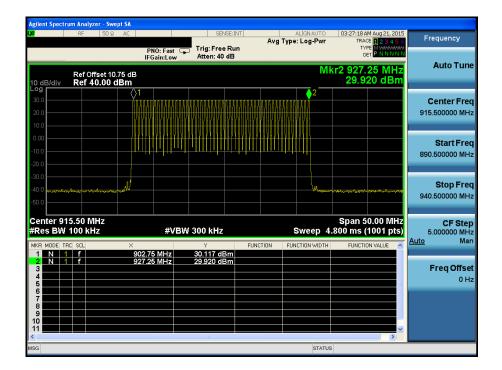
The number of hopping frequencies was measured with a spectrum analyzer connected to the antenna terminal, while EUT had its hopping function enabled.

The spectrum analyzer is set to:

Span = 50 MHz(Start Frequency = 890.5 MHz/Stop Frequency = 940.5 MHz)RBW = 1% of the span or moreSweep = autoVBW = \geq RBWDetector function = peakTrace = max holdTrace = max hold

4.4 Test Results:

Hopping mode	Test Result (Total Hops)	
Enable	50	





5. 20dBc BW

5.1. Test Setup

Refer to the APPENDIX I.

5.2. Limit

Limit: < 250kHz for applying the hopping frequencies and the average time of occupancy

5.3. Test Procedure

The bandwidth at 20 dB below the highest in band spectral density was measured with a spectrum analyzer connected to the antenna terminal, while EUT had its hopping function disabled at the highest, middle and the lowest available channels.

After the trace being stable, Use the marker-to-peak function to set the marker to the peak of the emission. Use the marker-delta function to measure 20dB down one side of the emission. Reset the marker-delta function, and move the marker to the other side of the emission, until it is (as close as possible to) even with the reference marker level. The marker-delta reading at this point is the 20 dB bandwidth of the emission.

The spectrum analyzer is set to:

Center frequency = the highest, middle and the lowest channels

Span = 500 kHz	
RBW = 1 kHz	Sweep = auto
VBW = ≥ RBW	Detector function = peak
Trace = max hold	

5.4. Test Results

Ambient temperature:23 °CRelative humidity:49 %

Frequency (MHz)	Tested Channel	20dBc BW (kHz)	
902.75	Lowest	47.45	
915.25	Middle	44.18	
927.25	Highest	46.50	

Note 1: See next pages for actual measured spectrum plots.

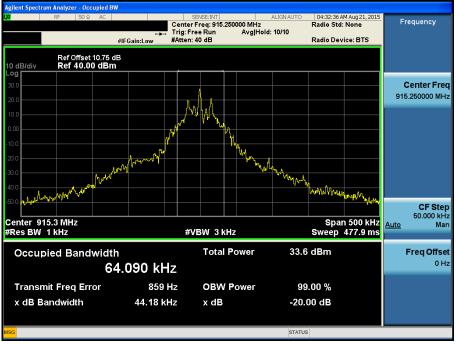


20dBc Bandwidth

Lowest Channel 04:31:51 AM Aug 21, 2015 Radio Std: None Frequency Center Freq: 902.750000 MHz Trig: Free Run Avg|Hold: 10/10 #Atten: 40 dB #IFGain:Low Radio Device: BTS Ref Offset 10.75 dB Ref 40.00 dBm 0 dB/di **Center Freq** 902.750000 MHz Muy Manny Award A **CF Step** 50.000 kHz Man Center 902.8 MHz #Res BW 1 kHz Span 500 kHz Sweep 477.9 ms <u>Auto</u> #VBW 3 kHz Total Power 33.0 dBm Freq Offset **Occupied Bandwidth** 0 Hz 61.922 kHz -778 Hz Transmit Freq Error **OBW Power** 99.00 % x dB Bandwidth 47.45 kHz x dB -20.00 dB STATUS

20dBc Bandwidth

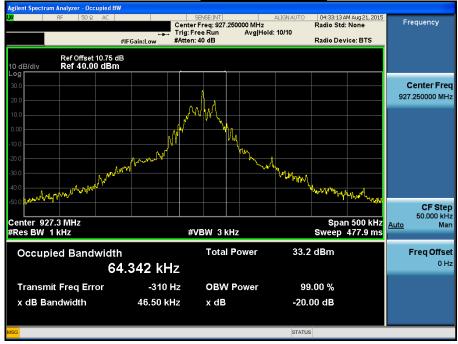
Middle Channel





20dBc Bandwidth

Highest Channel





6. Time of Occupancy (Dwell Time)

6.1. Test Setup

Refer to the APPENDIX I.

6.2. Limit

Limit: < 0.4 seconds within a 20 second period

6.3. Test Procedure

The dwell time was measured with a spectrum analyzer connected to the antenna terminal, while EUT had its hopping function enabled.

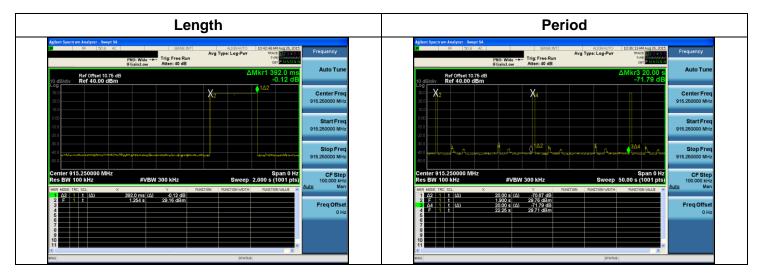
The spectrum analyzer is set to:

RBW = 100kHz	VBW = ≥ RBW
Span = zero	Detector function = peak
Trace max hold	

6.4. Test Results

Ambient temperature	:	23 °C
Relative humidity	:	49 %

Channel Frequency (MHz)	Length (ms)	Number	Dwell Time (ms)
915.25	392	1	392





7. Maximum Peak Output Power Measurement

7.1. Test Setup

Refer to the APPENDIX I.

7.2. Limit

The maximum peak output power of the intentional radiator shall not exceed the following :

1. §15.247(b)(2), For frequency hopping systems operating in the 902-928 MHz band: 1 watt for systems employing at least 50 hopping channels; and, 0.25 watts for systems employing less than 50 hopping channels, but at least 25 hopping channels,

7.3. Test Procedure

- 1. The RF power output was measured with a Spectrum analyzer connected to the RF Antenna connector (conducted measurement) while EUT was operating in transmit mode at the appropriate center frequency, A spectrum analyzer was used to record the shape of the transmit signal.
- 2. The bandwidth of the fundamental frequency was measured with the spectrum analyzer using ;

 $RBW \ge 20^{dB}BW$ $VBW \ge RBW$ Sweep = auto Detector function = peak Trace = max hold

7.4. Test Results

Ambient temperature	:	23 °C
Relative humidity	:	49 %

Tested Channel	Peak Outp	ut Power
	dBm	mW
Lowest	29.610	914.113
Middle	29.430	877.001
Highest	29.390	868.960

Note 1: See next pages for actual measured spectrum plots.

Lowest Channel



Peak Output Power



Peak Output Power

Middle Channel





Peak Output Power

Swept SA eilent So m Analyz Frequency Avg Type: Log-Pwr PNO: Fast IFGain:Low Atten: 40 dB TYPE Auto Tune Mkr1 927.225 MHz 29.39 dBm Ref Offset 10.75 dB Ref 40.00 dBm I0 dB/div **Center Freq** 927.250000 MHz Start Freq 924.750000 MHz Stop Freq 929.750000 MHz **CF Step** 500.000 kHz Man <u>Auto</u> Freq Offset 0 Hz Center 927.250 MHz #Res BW 1.0 MHz Span 5.000 MHz Sweep 1.000 ms (1001 pts) #VBW 3.0 MHz

Highest Channel



8. Transmitter AC Power Line Conducted Emission

8.1. Test Setup

N/A

8.2. Limit

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 klz to 30 Mlz, shall not exceed the limits in the following table, as measured using a 50 uH/50 ohm line impedance stabilization network(LISN).

Compliance with the provision of this paragraph shall on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower applies at the boundary between the frequency ranges.

Frequency Range	Conducted Limit (dBuV)		
(MHz)	Quasi-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

8.3. Test Procedures

Conducted emissions from the EUT were measured according to the dictates of ANSI C63.10

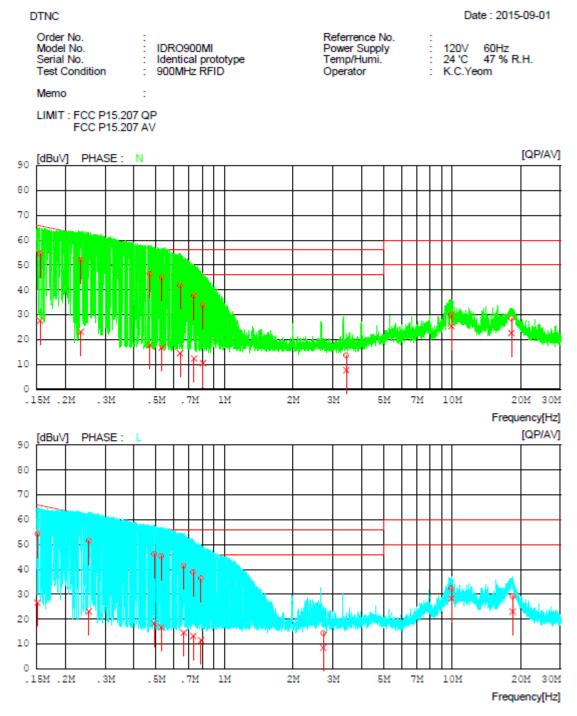
- The test procedure is performed in a 6.5 m × 3.5 m × 3.5 m (L × W × H) shielded room. The EUT along with its peripherals were placed on a 1.0 m (W) × 1.5 m (L) and 0.8 m in height wooden table and the EUT was adjusted to maintain a 0.4 meter space from a vertical reference plane.
- 2. The EUT was connected to power mains through a line impedance stabilization network (LISN) which provides 50 ohm coupling impedance for measuring instrument and the chassis ground was bounded to the horizontal ground plane of shielded room.
- 3. All peripherals were connected to the second LISN and the chassis ground also bounded to the horizontal ground plane of shielded room.
- 4. The excess power cable between the EUT and the LISN was bundled. The power cables of peripherals were unbundled. All connecting cables of EUT and peripherals were moved to find the maximum emission.



8.4. Test Results

Measurement Data

Results of Conducted Emission





Measurement Data

Results of Conducted Emission

DTNC			Date : 2015-09-01
Order No. Model No. Serial No. Test Condition	: IDRO900MI Identical prototype 900MHz RFID	Referrence No. Power Supply Temp/Humi. Operator	: 120V 60Hz 24 'C 47 % R.H. K.C.Yeom
Memo	:		
LIMIT : FCC P15 FCC P15			
NO FREQ [MHz]	READING C.FACTOR QP AV [dBuV][dBuV] [dB]	RESULT LIMIT QP AV QP AV [dBuV][dBuV][dBuV]	MARGIN PHASE QP AV [dBuV][dBuV]
1 0.15516 2 0.23450 3 0.47112 4 0.53129 5 0.63932 6 0.73623 7 0.80528 8 3.43200 9 9.93620 10 18.24680 11 0.15114 12 0.25417 13 0.49223 14 0.52871 15 0.66271 16 0.73086 17 0.79126 18 2.72000 19 9.93900 20 18.48440	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	11.3 28.2 N 10.3 29.2 N 10.1 28.8 N 11.0 29.3 N 14.2 31.5 N 18.3 33.7 N 22.2 35.5 N 42.4 38.3 N 30.0 24.6 N 31.5 27.4 N 11.7 29.3 L 10.1 28.5 L 10.0 27.9 L 10.7 29.3 L 10.7 29.3 L 14.6 31.5 L 17.2 32.8 L 19.7 34.5 L 19.7 34.5 L 27.7 21.7 L 30.8 27.0 L



9. Antenna Requirement

9.1 Procedure

Describe how the EUT complies with the requirement that either its antenna is permanently attached, or that it employs a unique antenna connector, for every antenna proposed for use with the EUT.

9.2 Conclusion

: Comply

The antenna is permanently attached.(Refer to Internal Photo file.)

Minimum Standard:

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

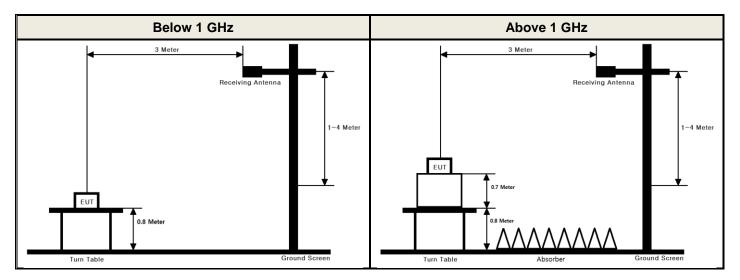


APPENDIX I

Test set up Diagrams

Radiated Measurement

The diagram below shows the test setup that is utilized to make the measurements for emission from 9kHz to 10GHz Emissions.



Conducted Measurement

