NCC RF TEST REPORT

Equipment	:	**Mobile Computer**
Brand Name	:	**Zebra**
Model Name	:	**MC3300R**
Applicant	:	台灣斑馬科技股份有限公司 台北市信義區松高路 **9** 號 **13** 樓
Manufacturer	:	**Zebra Technologies Corporation** **1 Zebra Plaza, Holtsville, NY 11742**
Standard	:	**NCC LP0002 (2018-01-10)**

The product was received on Jul. 19, 2018 and testing was started from Jul. 25, 2018 and completed on Aug. 27, 2018. We, SPORTON INTERNATIONAL INC., would like to declare that the tested sample has been evaluated in accordance with the test procedures and has been in compliance with the applicable technical standards.

The report must not be used by the client to claim product certification, approval, or endorsement by TAF or any agency of government.

The test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERTIONAL INC. EMC & Wireless Communications Laboratory, the test report shall not be reproduced except in full.

Approved by: Jones Tsai

SPORTON INTERTIONAL INC. EMC & Wireless Communications Laboratory
No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.)

TEL : 886-3-327-3456
FAX : 886-3-328-4978

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History of this test report

Report No.	Version	Description	Issued Date
TR812630-07D	01	Initial issue of report	Sep. 12, 2018

Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
3.1	4.8.1.4(1)	Number of Channels	Pass	-
3.2	4.8.1.4(1)	Hopping Channel Separation	Pass	-
3.3	4.8.1.4(1)	Dwell Time of Each Channel	Pass	-
3.4	4.8.1.4(1)	20dB Bandwidth	Pass	-
3.4	-	99% Bandwidth	Pass	-
3.5	4.8.1.1(1)(A) 4.8.1.1(1)(B) 4.8.1.1(2)	Output Power	Pass	-
3.6	4.8.1.3	Conducted Band Edges	Pass	-
3.7	4.8.1.3	Conducted Spurious Emission	Pass	-
3.8	4.8.1.3	Radiated Band Edges and Radiated Spurious Emission	Pass	Under limit 3.05 dB at 35.940 MHz
3.9	LP0002 2.11	Receiver Radiated Emission	Pass	Under limit 3.10 dB at 41.070 MHz
-	LP0002 2.3	AC Conducted Emission	Not Required	
3.10	4.8.1.2	Antenna Requirement	Pass	-
Remark: Not required means after assessing, test items are not necessary to carry out.				

Reviewed by: Joseph Lin

Report Producer: Nancy Yang

1 General Description

1.1 Product Feature of Equipment Under Test

Product Feature	
Equipment	Mobile Computer
Brand Name	Zebra
Model Name	MC3300R
EUT supports Radios application	UHF RFID WLAN 11b/g/n HT20 WLAN 11a/n HT20/HT40 WLAN 11ac VHT20/VHT40/VHT80 Bluetooth BR/EDR/LE
HW Version	DV
SW Version	RFID Manager Application Version: 2.0.9.1 RFID Demo. Application Version: 2.2.5.24 Terminal Version: 91-01-49-NN-00-A
FW Version	Module Version: PAAEES00-001-N12 Radio Version: 2.0.29.0 Terminal Version: FUSION_BA_2_10.0.0.019_N
MFD	10JUL18
EUT Stage	Identical Prototype

Remark: The above EUT's information was declared by manufacturer.

Specification of Accessories				
Sentry 2X battery	**Brand Name**	Zebra	**Part Number**	BT-000337
MC32 2X battery	**Brand Name**	Symbol	**Part Number**	82-000012-02
Adapter	**Brand Name**	Zebra	**Part Number**	PWR-WUA5V12W0US
USB Cable	**Brand Name**	Zebra	**Part Number**	CBL-MC33-USBCHG-01
GUN HOLSTER	**Brand Name**	Zebra	**Part Number**	SG-MC3021212-01R

<Sample Information>

	SKU1	SKU2	SKU3
Part Number	MC339R-GE2HA4-US	MC339R-GF2HA4-US	MC333R-GI2HA4-US
RFID Antenna	Long range	Long range	Middle range
Scanner	SE4850	SE4750	SE4750
Keypad	29	29	29
Region	US	US	US

	SKU4	SKU5	SKU6
Part Number	MC339R-GE3HA4US	MC339R-GF3HA4US	MC333R-GI3HA4US
RFID Antenna	Long range	Long range	Middle range
Scanner	SE4850	SE4750	SE4750
Keypad	38	38	38
Region	US	US	US

	SKU7	SKU8	SKU9
Part Number	MC339R-GE4HA4US	MC339R-GF4HA4US	MC333R-GI4HA4US
RFID Antenna	Long range	Long range	Middle range
Scanner	SE4850	SE4750	SE4750
Keypad	47	47	47
Region	US	US	US

1.2 Product Specification of Equipment Under Test

Product Feature	
Tx/Rx Frequency Range	922.25 MHz ~ 927.75 MHz
Number of Channels	12
Maximum Output Power to Antenna	Conducted power from antenna side: Long Range: 29.97dBm (0.9931 W)
20dB Bandwidth	Long Range: 0.328 MHz Middle Range: 0.328 MHz
99% Occupied Bandwidth	Long Range: 0.314 MHz Middle Range: 0.314 MHz
Antenna Type / Gain	Long Range: Yagi Antenna with gain 5.95 dBi Middle Range: Dipole Antenna with gain 0.12 dBi
Type of Modulation	ASK

1.3 Modification of EUT

No modifications are made to the EUT during all test items.

1.4 Testing Location

Sporton Lab is accredited to ISO 17025 by Taiwan Accreditation Foundation (TAF code : 1190) and the FCC designation No. TW1190 and TW0007 under the FCC 2.948(e) by Mutual Recognition Agreement (MRA) in FCC Test.

Test Site	SPORTON INTERNATIONAL INC.
Test Site Location	No.52, Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.) TEL: +886-3-327-3456 FAX: +886-3-328-4978
Test Site No.	**Sporton Site No.**
	TH05-HY

Note: The test site complies with ANSI C63.4 2014 requirement.

Test Site	SPORTON INTERNATIONAL INC.
Test Site Location	No.58, Aly. 75, Ln. 564, Wenhua 3rd, Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.) TEL: +886-3-327-0868 FAX: +886-3-327-0855
Test Site No.	**Sporton Site No.**
	03CH11-HY

Note: The test site complies with ANSI C63.4 2014 requirement.

1.5 Applicable Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- NCC LP0002 (2018-01-10)
- ANSI C63.10-2013

Remark: All test items were verified and recorded according to the standards and without any deviation during the test.

2 Test Configuration of Equipment Under Test

2.1 Carrier Frequency Channel

Frequency Band	Channel	Freq. (MHz)	Channel	Freq. (MHz)
922.25-927.75 MHz	0	922.25	6	925.25
	1	922.75	7	925.75
	2	923.25	8	926.25
	3	923.75	9	926.75
	4	924.25	10	927.25
	5	924.75	11	927.75

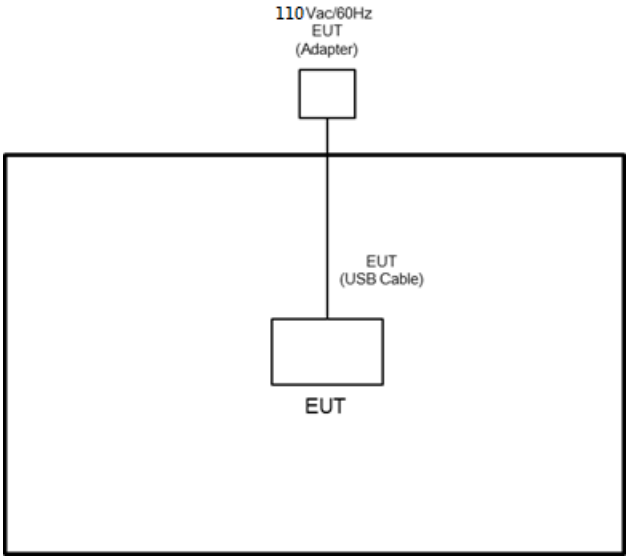
2.2 Test Mode

a. The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application. Frequency range investigated:, radiation emission (9 kHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower). For radiated measurement, pre-scanned in three orthogonal panels, X, Y, Z. The worst cases (Z plane) were recorded in this report.

The following summary table is showing all test modes to demonstrate in compliance with the standard.

Summary table of Test Cases	
Test Item	**UHF RFID**
Conducted Test Cases	Mode 1: UHF RFID Tx CH00_922.25 MHz Mode 2: UHF RFID Tx CH06_924.75 MHz Mode 3: UHF RFID Tx CH11_927.75 MHz
Radiated Test Cases	Mode 1: UHF RFID Tx CH00_922.25 MHz for SKU 3 Mode 2: UHF RFID Tx CH11_927.75 MHz for SKU 3 Mode 3: UHF RFID Tx CH00_922.25 MHz for SKU 2 Mode 4: UHF RFID Tx CH11_927.75 MHz for SKU 2 Mode 5: UHF RFID Tx CH11_927.75 MHz for SKU 1
Receiver Radiated Emission	Mode 1: UHF RFID Idle for SKU 3 Mode 2: UHF RFID Idle for SKU 2
Remark: For Radiated Test Cases, the tests were performed with Sentry 2X battery.	

2.3 Connection Diagram of Test System



2.4 EUT Operation Test Setup

The RF test items, utility “Regulatory Test application” was installed in EUT which was programmed in order to make the EUT get into the engineering modes to provide channel selection, power level, data rate and the application type and for continuous transmitting signals.

2.5 Measurement Results Explanation Example

For all conducted test items:

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuator factor between EUT conducted output port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly the EUT RF output level.

Example:
The spectrum analyzer offset is derived from RF cable loss and attenuator factor.
Offset = RF cable loss + attenuator factor.
Following shows an offset computation example with cable loss 4.2 dB and 10dB attenuator.

Offset(dB) = RF cable loss(dB) + attenuator factor(dB).
= 4.2 + 10 = 14.2 (dB)

3 Test Result

3.1 Number of Channel Measurement

3.1.1 Limits of Number of Hopping Frequency

Frequency hopping systems in the 922.25-927.75 MHz band shall use at least 12 channels.

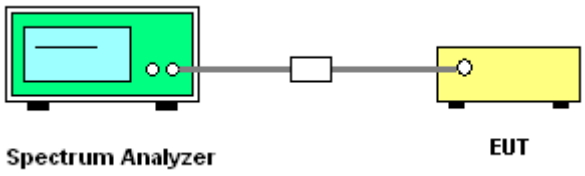
3.1.2 Measuring Instruments

See list of measuring equipment of this test report.

3.1.3 Test Procedure

1. The testing follows ANSI C63.10-2013 clause 7.8.3.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Enable the EUT hopping function.
5. Use the following spectrum analyzer settings: Span = the frequency band of operation; RBW = 300kHz; VBW ≥ RBW; Sweep = auto; Detector function = peak; Trace = max hold.
6. The number of hopping frequency used is defined as the number of total channel.
7. Record the measurement data derived from spectrum analyzer.

3.1.4 Test Setup



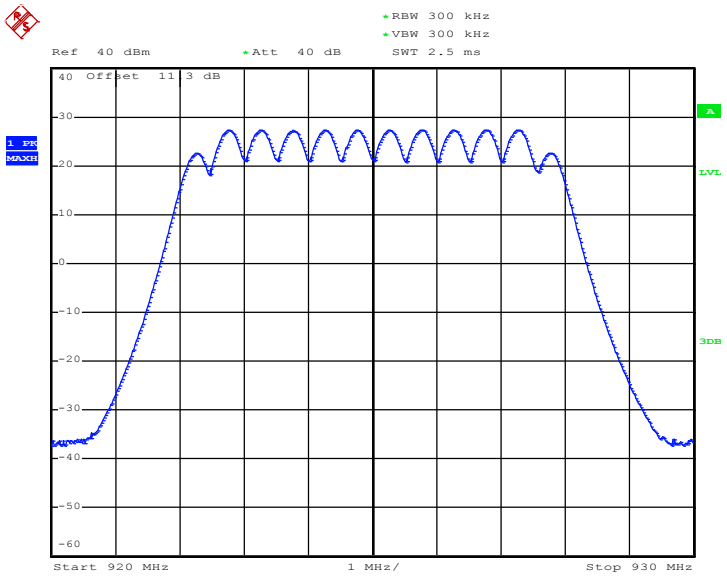
3.1.5 Test Result of Number of Hopping Frequency

Test Mode :	UHF	**Temperature :**	21~25℃
Test Engineer :	Tommy Lee	**Relative Humidity :**	51~54%

Number of Hopping (Channel)	Limits (Channel)	Pass/Fail
12	> 12	Pass

<Longe Range>

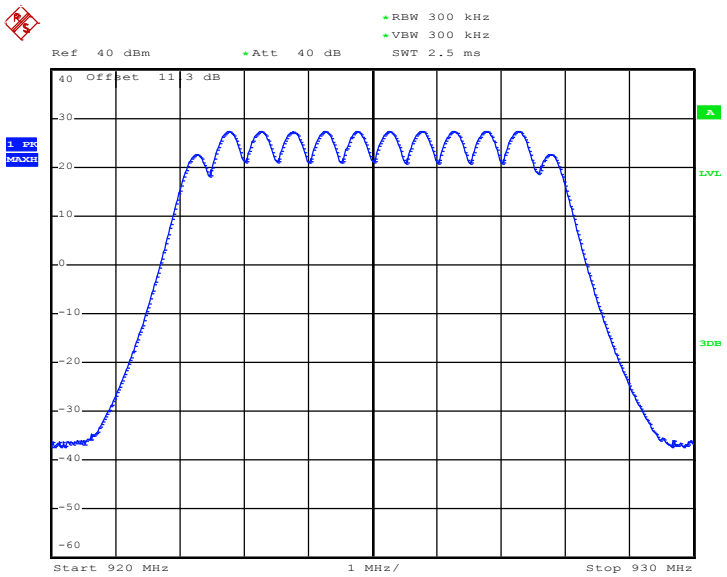
Number of Hopping Channel Plot on Channel 00 - 11



Date: 10.AUG.2018 17:20:37

<Middle Range>

Number of Hopping Channel Plot on Channel 00 - 11



Date: 10.AUG.2018 17:20:37

3.2 Hopping Channel Separation Measurement

3.2.1 Limit of Hopping Channel Separation

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

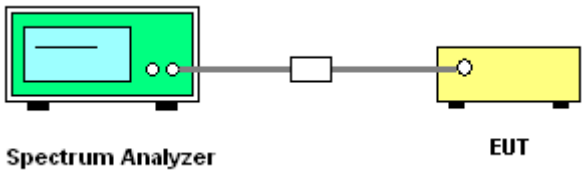
3.2.2 Measuring Instruments

See list of measuring equipment of this test report.

3.2.3 Test Procedures

1. The testing follows ANSI C63.10-2013 clause 7.8.2.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Enable the EUT hopping function.
5. Use the following spectrum analyzer settings:
   Span = wide enough to capture the peaks of two adjacent channels;
   RBW = 300kHz; VBW ≥ RBW; Sweep = auto; Detector function = peak; Trace = max hold.
6. Measure and record the results in the test report.

3.2.4 Test Setup



3.2.5 Test Result of Hopping Channel Separation

Test Mode :	UHF	Temperature :	21~25℃
Test Engineer :	Tommy Lee	Relative Humidity :	51~54%

<Long Range>

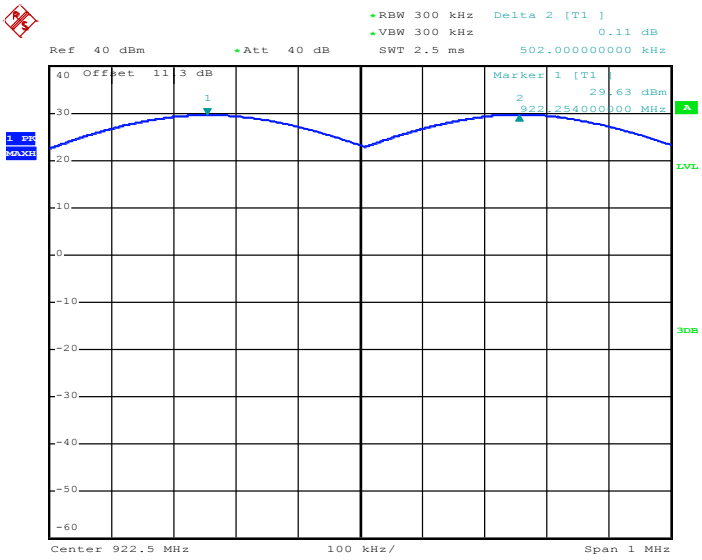
Mod.	NTX	CH.	Freq. (MHz)	Hopping Channel Separation Measurement (MHz)	Hopping Channel Separation Measurement Limit (MHz)	Pass/Fail
UHF RFID	1	0	922.25	0.502	0.3280	Pass
UHF RFID	1	05	924.75	0.502	0.3280	Pass
UHF RFID	1	11	927.75	0.510	0.3280	Pass

<Middle Range>

Mod.	NTX	CH.	Freq. (MHz)	Hopping Channel Separation Measurement (MHz)	Hopping Channel Separation Measurement Limit (MHz)	Pass/Fail
UHF RFID	1	0	922.25	0.502	0.3280	Pass
UHF RFID	1	05	924.75	0.502	0.3280	Pass
UHF RFID	1	11	927.75	0.510	0.3280	Pass

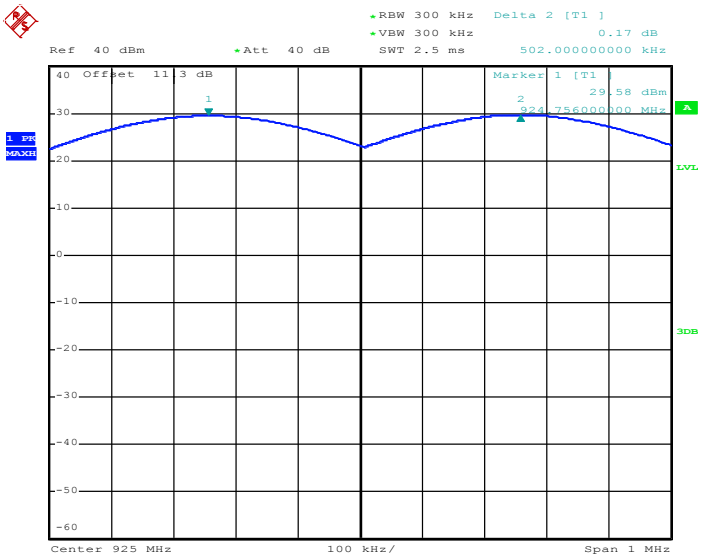
<Long Range>

Channel Separation Plot on Channel 00 - 01



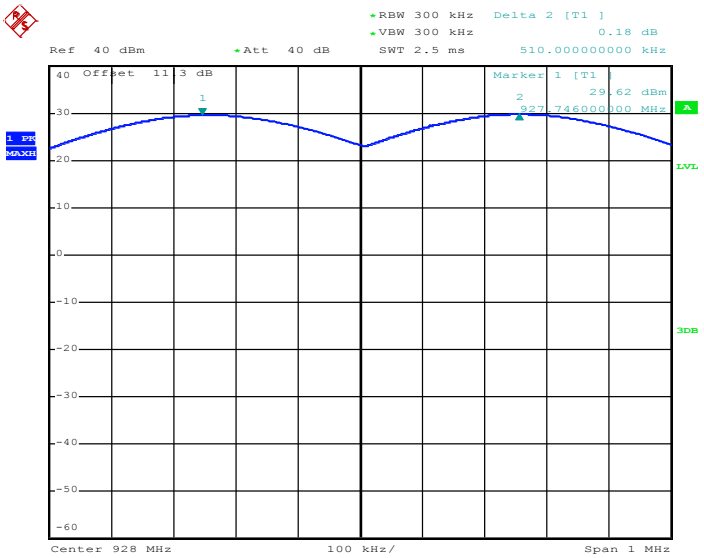
Date: 10.AUG.2018 16:16:56

Channel Separation Plot on Channel 05 - 06



Date: 10.AUG.2018 16:19:45

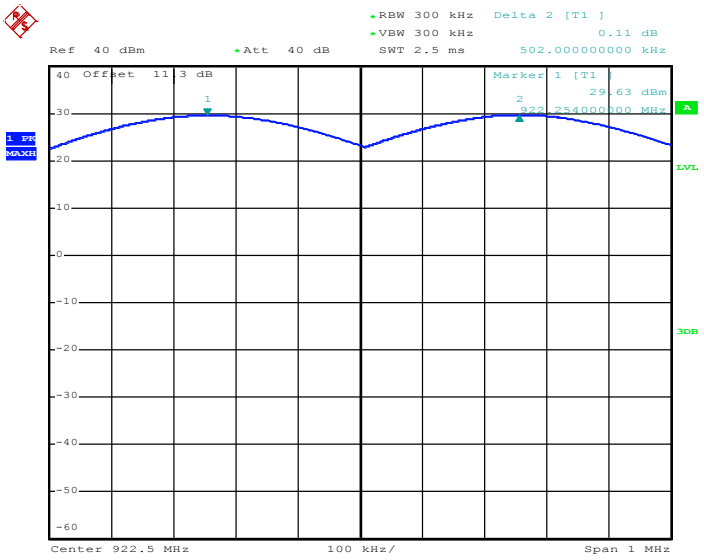
Channel Separation Plot on Channel 10 - 11



Date: 10.AUG.2018 16:22:03

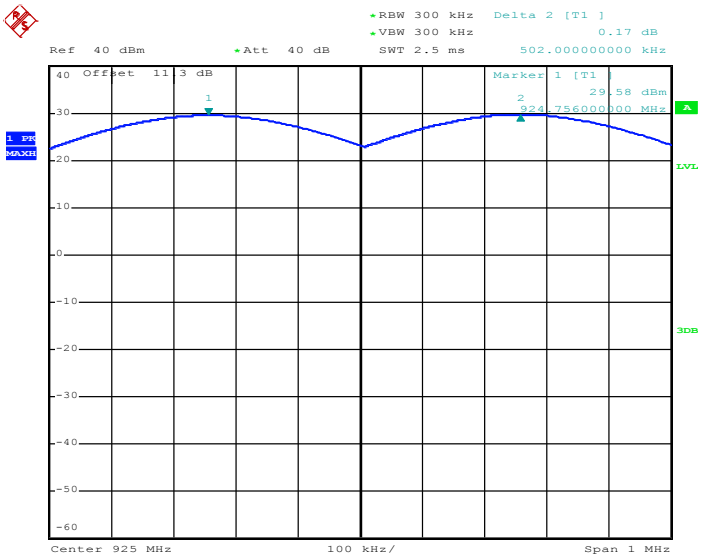
<Middle Range>

Channel Separation Plot on Channel 00 - 01



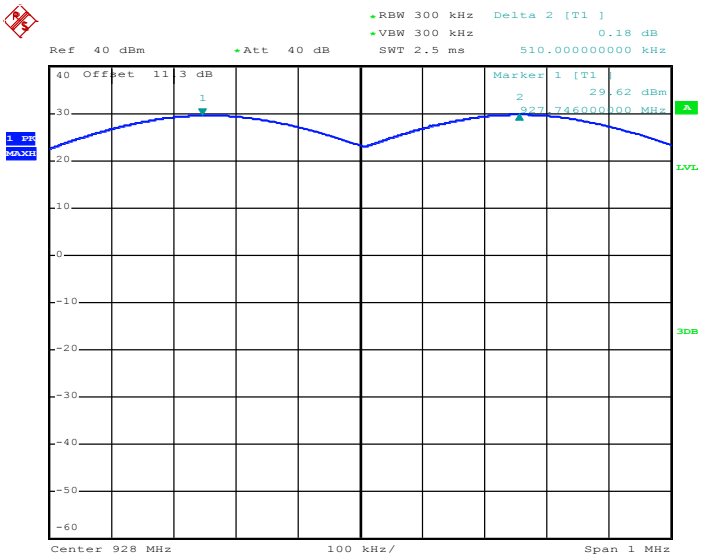
Date: 10.AUG.2018 16:16:56

Channel Separation Plot on Channel 05 - 06



Date: 10.AUG.2018 16:19:45

Channel Separation Plot on Channel 10 - 11



Date: 10.AUG.2018 16:22:03

3.3 Dwell Time Measurement

3.3.1 Limit of Dwell Time

Frequency hopping systems, the average time of occupancy on any frequency each times shall be less than or equal 0.4 seconds within a time period in seconds equal to the number of hopping channels limit employed multiplied by 0.4.

3.3.2 Measuring Instruments

See list of measuring equipment of this test report.

3.3.3 Test Procedures

1. The testing follows ANSI C63.10-2013 clause 7.8.4.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Enable the EUT hopping function.
5. Use the following spectrum analyzer settings: Span = zero span, centered on a hopping channel; RBW = 1 MHz; VBW ≥ RBW; Sweep = as necessary to capture the entire dwell time per hopping channel; Detector function = peak; Trace = max hold.
6. Measure and record the results in the test report.

3.3.4 Test Setup

3.3.5 Test Result of Dwell Time

Test Mode :	UHF	Temperature :	21~25℃
Test Engineer :	Tommy Lee	Relative Humidity :	51~54%

<Long Range>

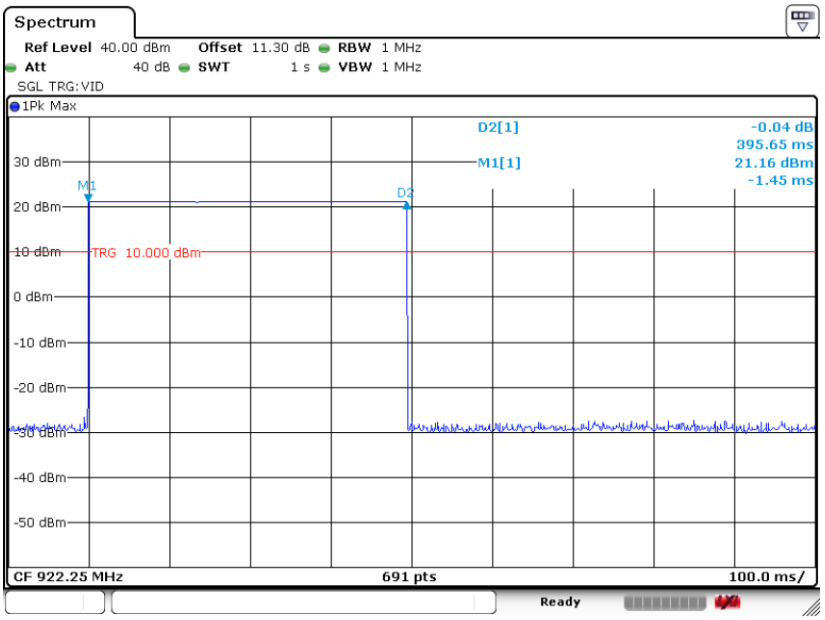
Mod.	Channel Number Rate	Package Transfer Time (msec)	Hops Over Occupancy Time (hops)	Dwell Time (sec)	Limits (sec)	Pass/Fail
Nomal	12	395.65	1.00	0.396	0.4	Pass

<Middle Range>

Mod.	Channel Number Rate	Package Transfer Time (msec)	Hops Over Occupancy Time (hops)	Dwell Time (sec)	Limits (sec)	Pass/Fail
Nomal	12	395.65	1.00	0.396	0.4	Pass

<Long Range>

Package Transfer Time Plot



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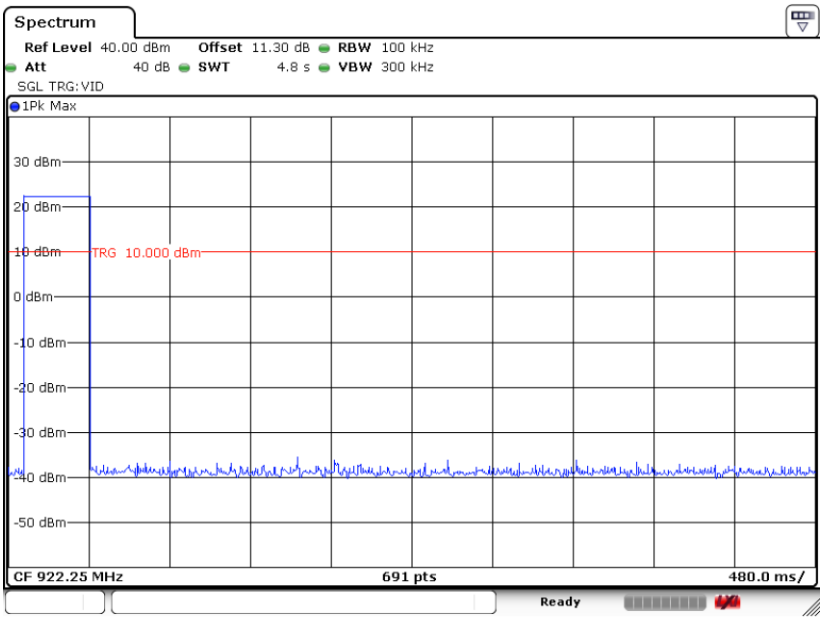
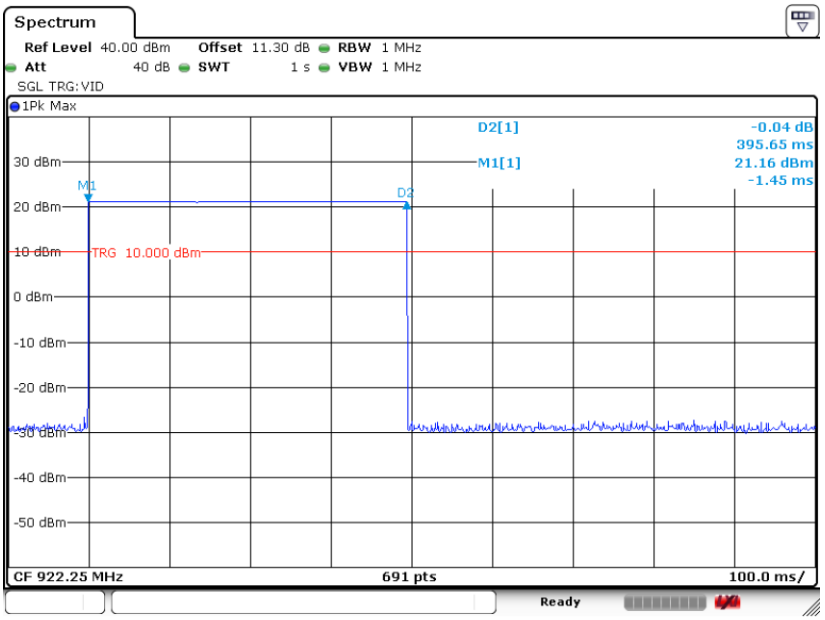


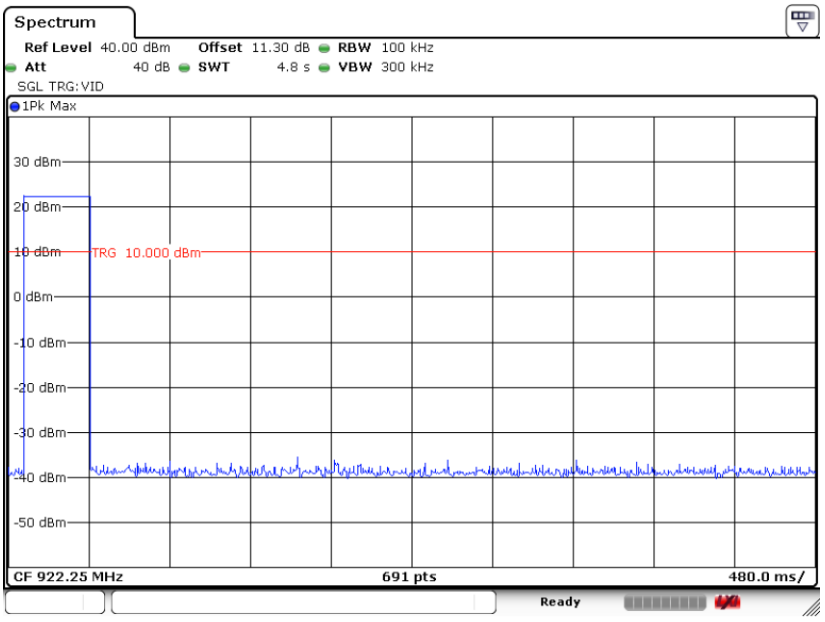
Date: 10.AUG.2018 13:51:54

<Middle Range>

Package Transfer Time Plot



Date: 10.AUG.2018 13:52:29



Date: 10.AUG.2018 13:51:54

Remark: Dwell Time(s) = Hops Over Occupancy Time (hops) x Package Transfer Time

3.4 20dB and 99% Bandwidth Measurement

3.4.1 Limit of 20dB and 99% Bandwidth

Reporting only

3.4.2 Measuring Instruments

See list of measuring equipment of this test report.

3.4.3 Test Procedures

1. The testing follows ANSI C63.10-2013 clause 6.9.2 and 6.9.3.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Use the following spectrum analyzer settings for 20dB Bandwidth measurement.
   Span = approximately 2 to 5 times the 20 dB bandwidth, centered on a hopping channel;
   RBW ≥ 1% of the 20 dB bandwidth; VBW ≥ RBW; Sweep = auto; Detector function = peak;
   Trace = max hold.
5. Use the following spectrum analyzer settings for 99 % Bandwidth measurement.
   Span = approximately 1.5 to 5 times the 99% bandwidth, centered on a hopping channel;
   RBW ≥ 1% of the 99% bandwidth; VBW ≥ RBW; Sweep = auto; Detector function = peak;
   Trace = max hold.
6. Measure and record the results in the test report.

3.4.4 Test Setup

3.4.5 Test Result of 20dB Bandwidth

Test Mode :	UHF	Temperature :	21~25℃
Test Engineer :	Tommy Lee	Relative Humidity :	51~54%

<Long Range>

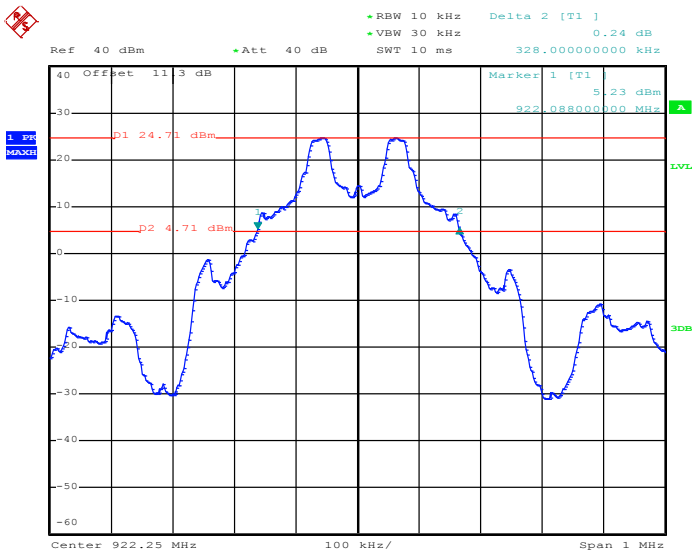
Mod.	NTX	CH.	Freq.(MHz)	20db BW (MHz)	Pass/Fail
UHF RFID	1	0	922.25	0.328	Pass
UHF RFID	1	05	924.75	0.328	Pass
UHF RFID	1	11	927.75	0.328	Pass

<Middle Range>

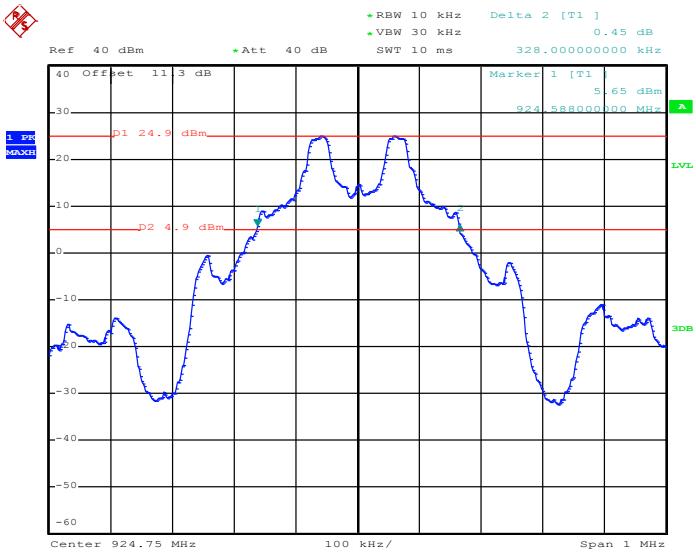
Mod.	NTX	CH.	Freq.(MHz)	20db BW (MHz)	Pass/Fail
UHF RFID	1	0	922.25	0.328	Pass
UHF RFID	1	05	924.75	0.328	Pass
UHF RFID	1	11	927.75	0.328	Pass

<Long Range>

20 dB Bandwidth Plot on Channel 00

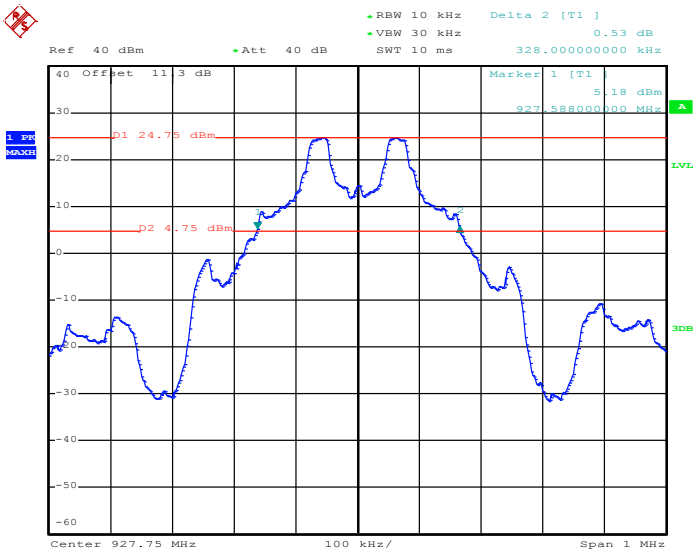


20 dB Bandwidth Plot on Channel 05



Date: 10.AUG.2018 15:37:07

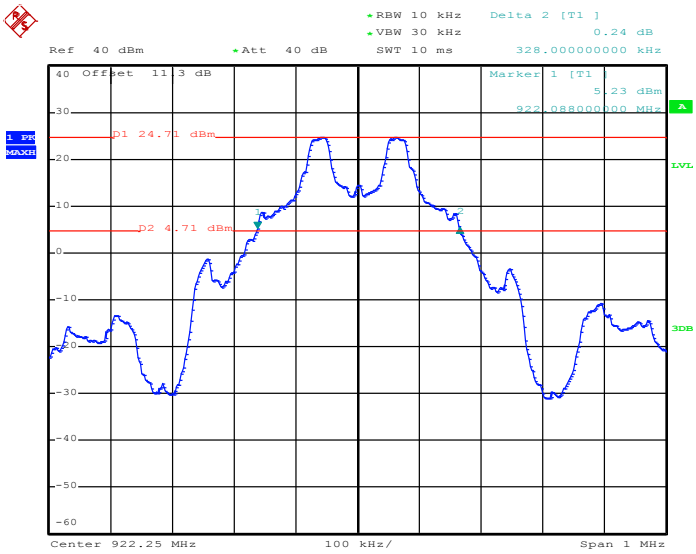
20 dB Bandwidth Plot on Channel 11



Date: 10.AUG.2018 15:34:15

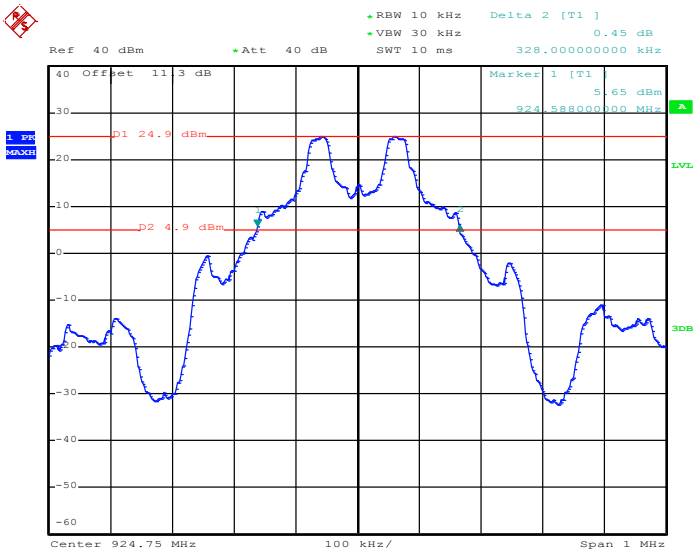
<Middle Range>

20 dB Bandwidth Plot on Channel 00



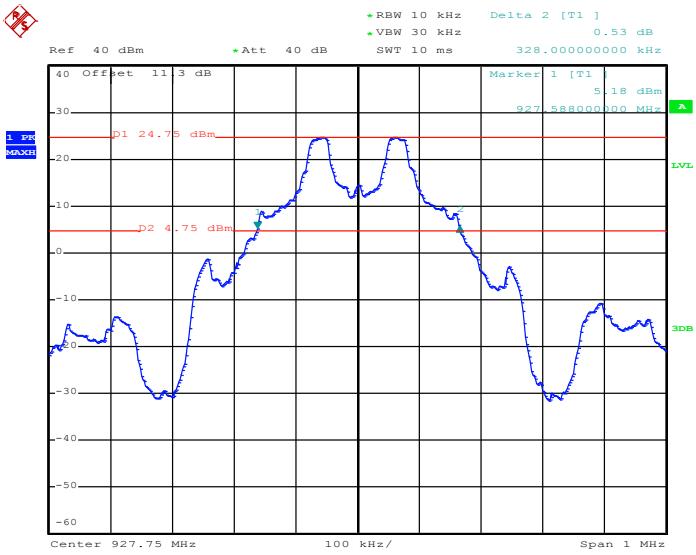
Date: 10.AUG.2018 09:38:43

20 dB Bandwidth Plot on Channel 05



Date: 10.AUG.2018 15:37:07

20 dB Bandwidth Plot on Channel 11



Date: 10.AUG.2018 15:34:15

3.4.6 Test Result of 99% Occupied Bandwidth

Test Mode :	UHF	Temperature :	21~25℃
Test Engineer :	Tommy Lee	Relative Humidity :	51~54%

<Long Range>

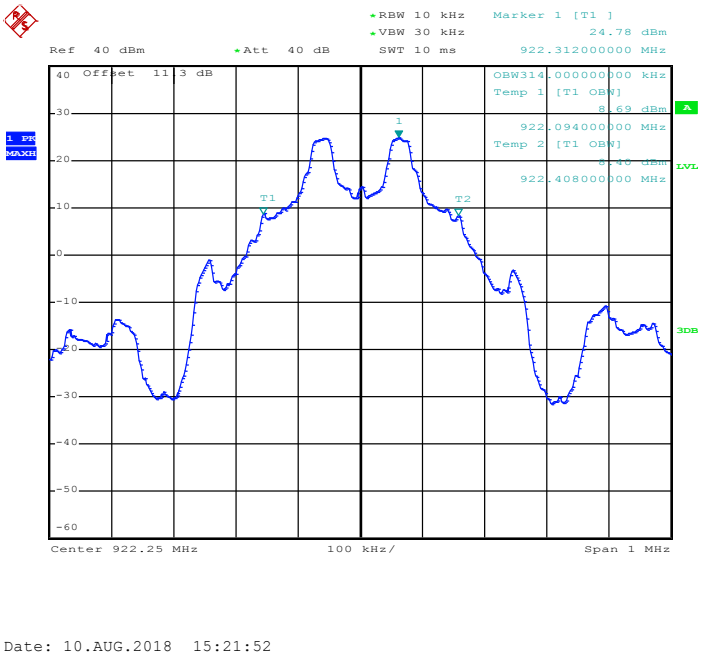
Mod.	NTX	CH.	Freq. (MHz)	99% Bandwidth (MHz)	Pass/Fail
UHF RFID	1	0	922.25	0.314	Pass
UHF RFID	1	05	924.75	0.314	Pass
UHF RFID	1	11	927.75	0.314	Pass

<Middle Range>

Mod.	NTX	CH.	Freq. (MHz)	99% Bandwidth (MHz)	Pass/Fail
UHF RFID	1	0	922.25	0.314	Pass
UHF RFID	1	05	924.75	0.314	Pass
UHF RFID	1	11	927.75	0.314	Pass

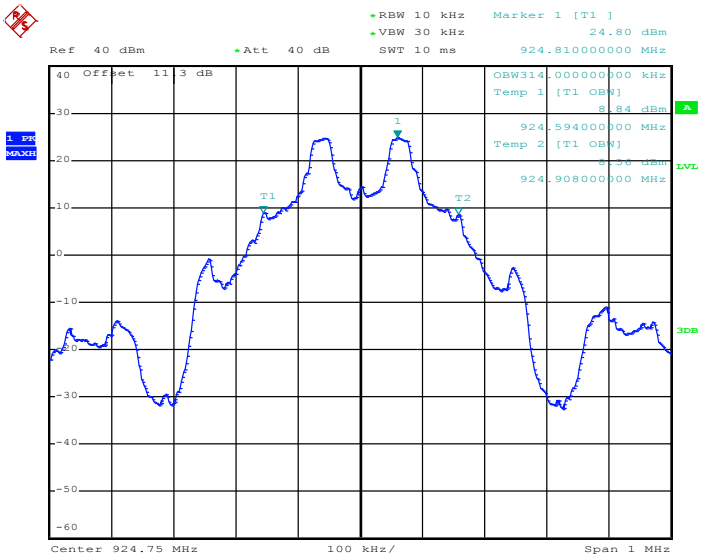
<Long Range>

99% Occupied Bandwidth Plot on Channel 00



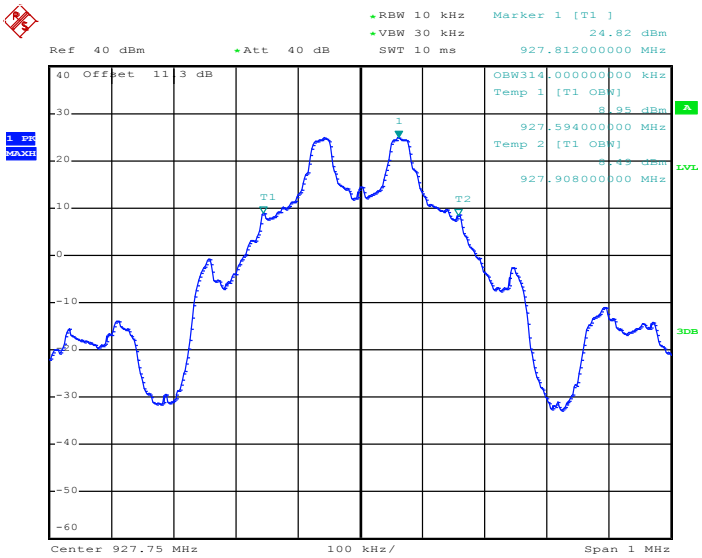
Date: 10.AUG.2018 15:21:52

99% Occupied Bandwidth Plot on Channel 05



Date: 10.AUG.2018 15:24:26

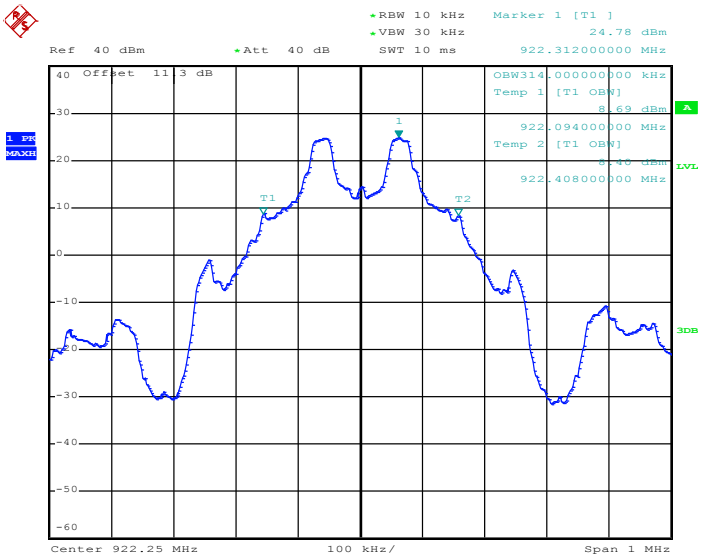
99% Occupied Bandwidth Plot on Channel 11



Date: 10.AUG.2018 15:26:01

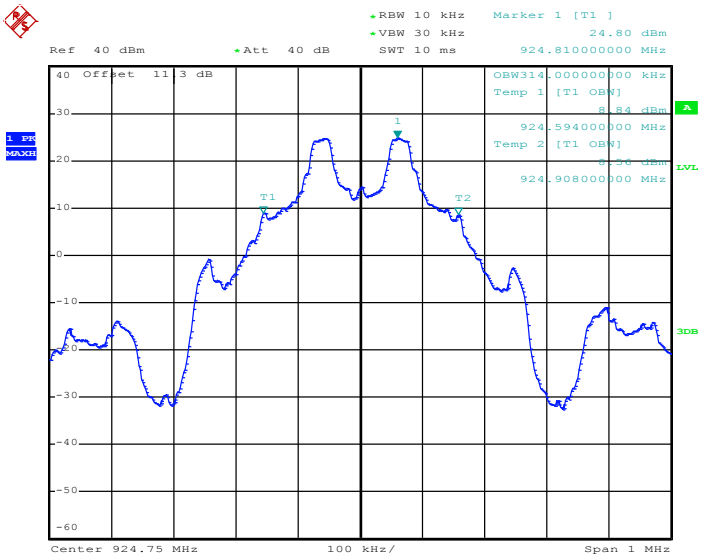
<Middle Range>

99% Occupied Bandwidth Plot on Channel 00



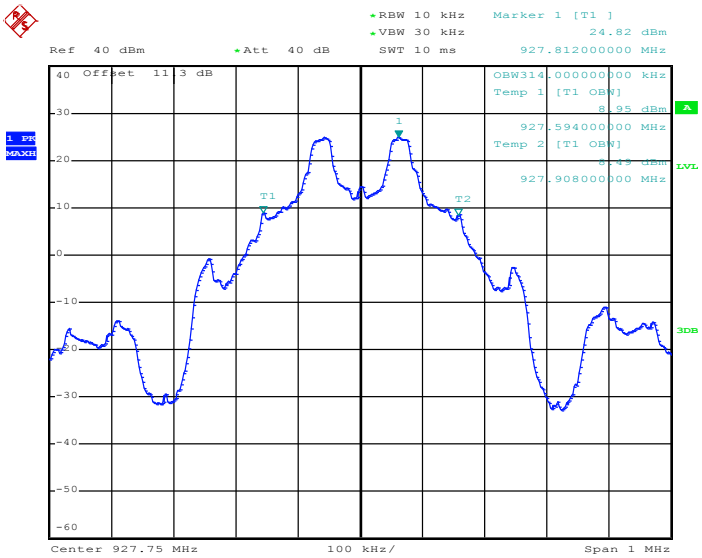
Date: 10.AUG.2018 15:21:52

99% Occupied Bandwidth Plot on Channel 05



Date: 10.AUG.2018 15:24:26

99% Occupied Bandwidth Plot on Channel 11



Date: 10.AUG.2018 15:26:01

Note: The occupied channel bandwidth is maintained within the band of operation for all of the modulations.

3.5 Output Power Measurement

3.5.1 Limit of Output Power

Installed areas and the maximum peak output power limit:

(A) For devices installed indoor or specific area: the maximum peak output power limit up to 1 W (inclusive).

(B) For devices installed outdoor: the maximum peak output power limit up to 0.5 W (inclusive).

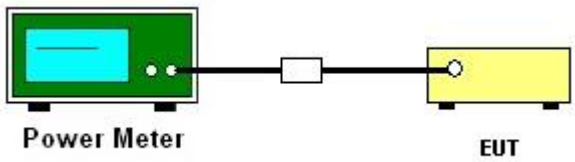
3.5.2 Measuring Instruments

See list of measuring equipment of this test report.

3.5.3 Test Procedures

1. The testing follows ANSI C63.10-2013 clause 7.8.5.
2. The RF output of EUT was connected to the power meter by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Measure the conducted output power with cable loss and record the results in the test report.
5. Measure and record the results in the test report.

3.5.4 Test Setup



3.5.5 Test Result of Output Power

Test Mode :	UHF	Temperature :	21~25℃
Test Engineer :	Tommy Lee	Relative Humidity :	51~54%

<Long Range>

Channel	Frequency (MHz)	RF Power (dBm)		
		UHF	Max. Limits (dBm)	Pass/Fail
0	922.25	29.89	30.00	Pass
05	924.75	29.97	30.00	Pass
11	927.75	29.96	30.00	Pass

<Middle Range>

Channel	Frequency (MHz)	RF Power (dBm)		
		UHF	Max. Limits (dBm)	Pass/Fail
0	922.25	29.82	30.00	Pass
05	924.75	29.83	30.00	Pass
11	927.75	29.81	30.00	Pass

3.6 Conducted Band Edges Measurement

3.6.1 Limit of Band Edges

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power shall be attenuated at least 20 dB.

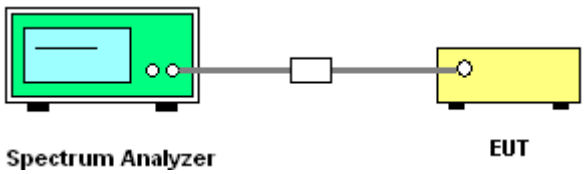
3.6.2 Measuring Instruments

See list of measuring equipment of this test report.

3.6.3 Test Procedures

1. The testing follows ANSI C63.10-2013 clause 7.8.6.
2. Set to the maximum power setting and enable the EUT transmit continuously.
3. Set RBW = 100kHz, VBW = 300kHz. Band edge emissions must be at least 20 dB down from the highest emission level within the authorized band as measured with a 100kHz RBW. The attenuation shall be 30 dB instead of 20 dB when RMS conducted output power procedure is used.
4. Enable hopping function of the EUT and then repeat step 2. and 3.
5. Measure and record the results in the test report.

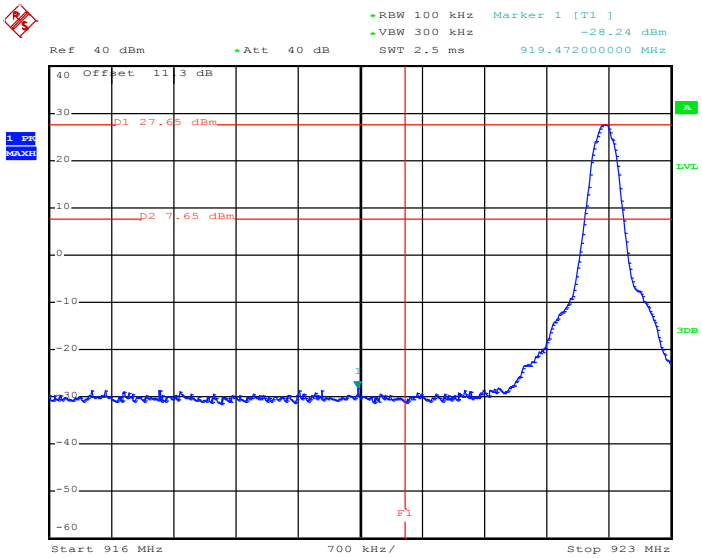
3.6.4 Test Setup



3.6.5 Test Result of Conducted Band Edges

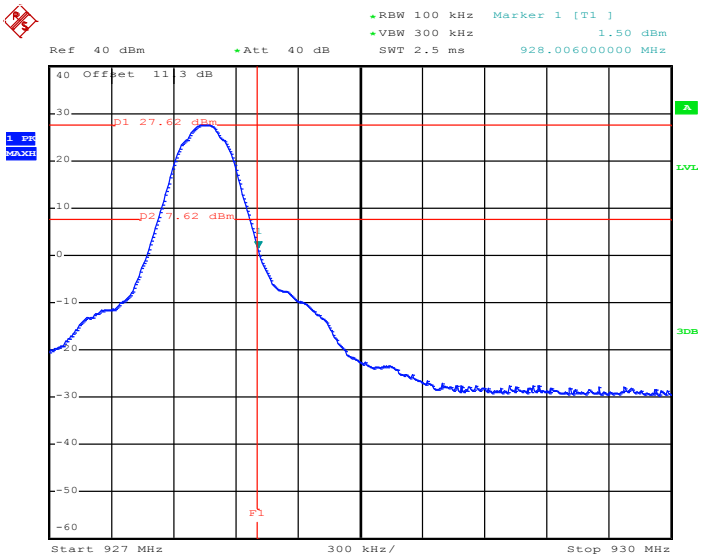
<Long Range>

Low Band Edge Plot on Channel 00



Date: 10.AUG.2018 09:27:34

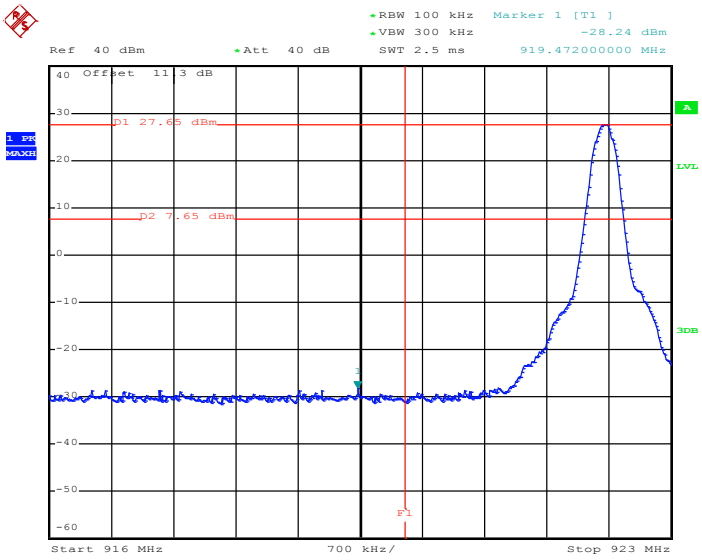
High Band Edge Plot on Channel 11



Date: 10.AUG.2018 16:53:48

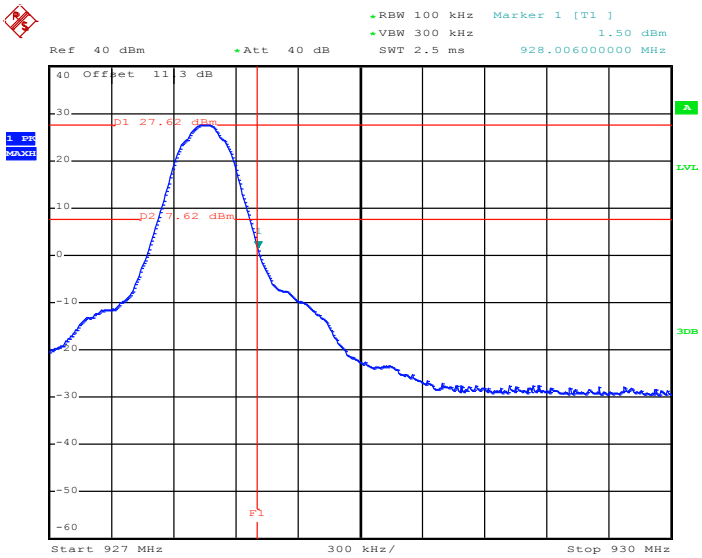
<Middle Range>

Low Band Edge Plot on Channel 00



Date: 10.AUG.2018 09:27:34

High Band Edge Plot on Channel 11

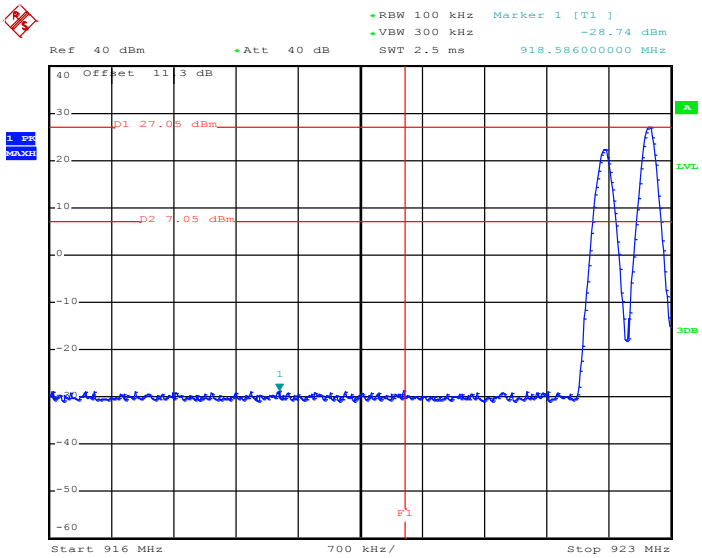


Date: 10.AUG.2018 16:53:48

3.6.6 Test Result of Conducted Hopping Mode Band Edges

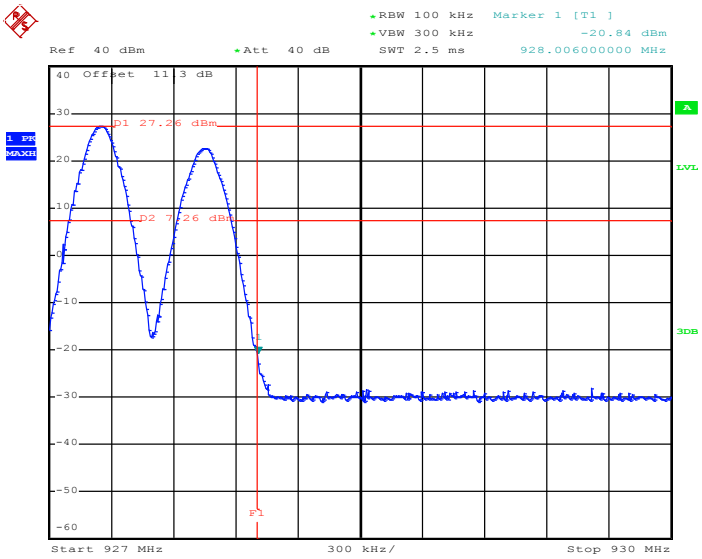
<Long Range>

Hopping Mode Low Band Edge Plot



Date: 10.AUG.2018 09:56:43

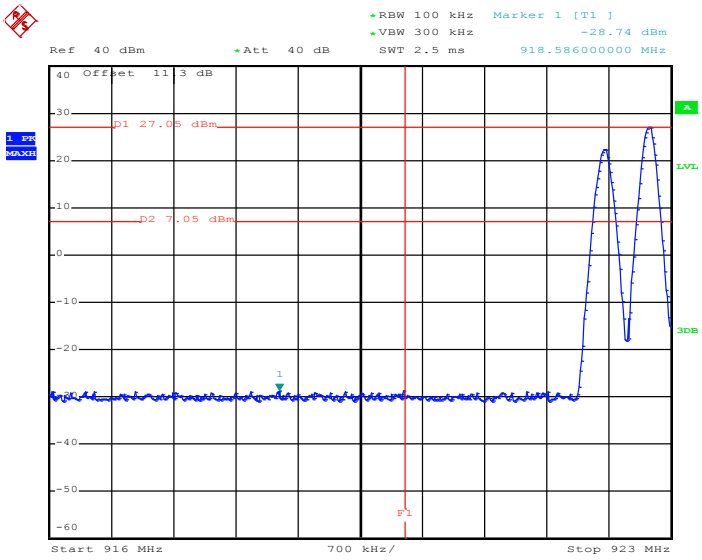
Hopping Mode High Band Edge Plot



Date: 10.AUG.2018 17:38:53

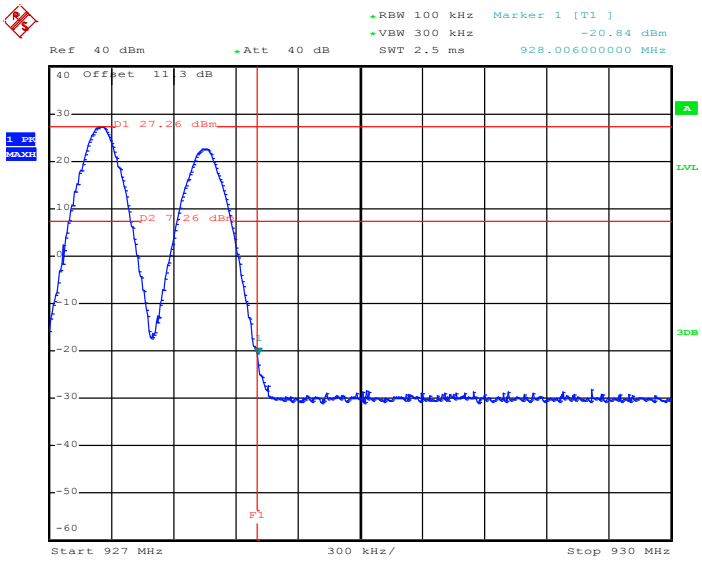
<Middle Range>

Hopping Mode Low Band Edge Plot



Date: 10.AUG.2018 09:56:43

Hopping Mode High Band Edge Plot



Date: 10.AUG.2018 17:38:53

3.7 Conducted Spurious Emission Measurement

3.7.1 Limit of Spurious Emission Measurement

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power shall be attenuated at least 20 dB.

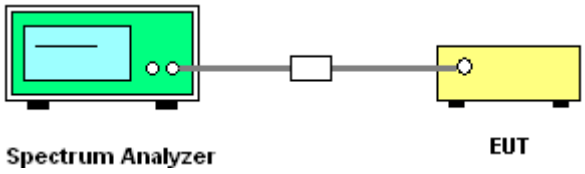
3.7.2 Measuring Instruments

See list of measuring equipment of this test report.

3.7.3 Test Procedure

1. The testing follows ANSI C63.10-2013 clause 7.8.8.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Set RBW = 100 kHz, VBW = 300kHz, scan up through 10th harmonic. All harmonics / spurs must be at least 20 dB down from the highest emission level within the authorized band as measured with a 100 kHz RBW.
5. Measure and record the results in the test report.
6. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.

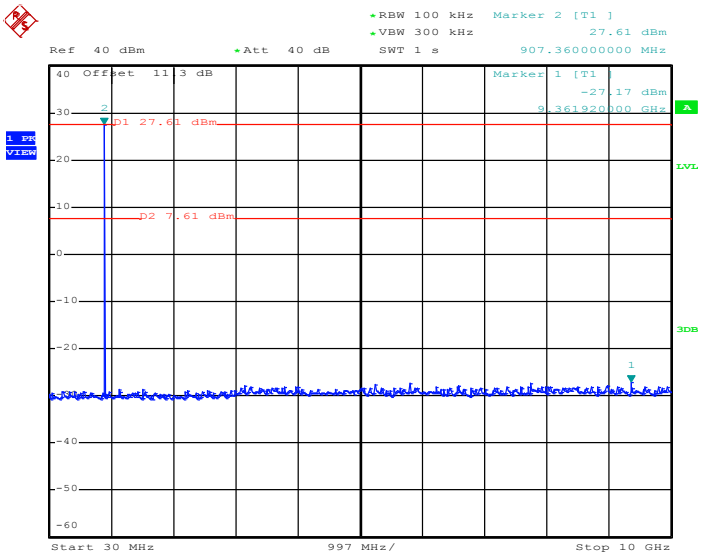
3.7.4 Test Setup



3.7.5 Test Result of Conducted Spurious Emission

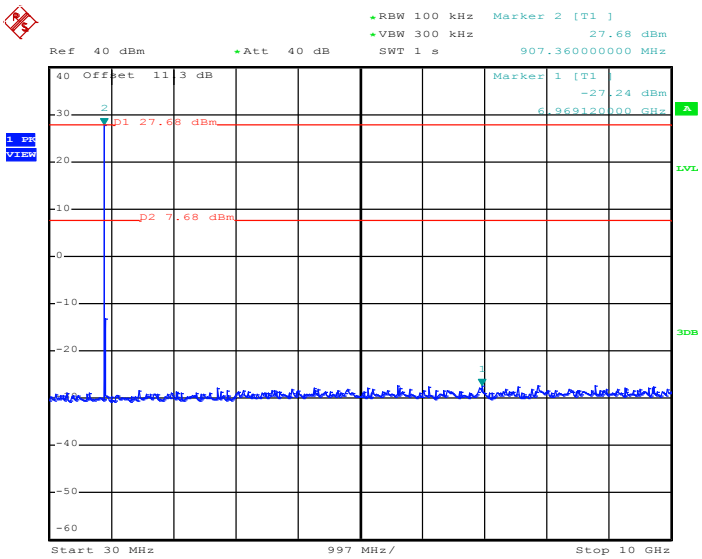
<Long Range>

CSE Plot on Ch 00 between 30MHz ~ 10 GHz



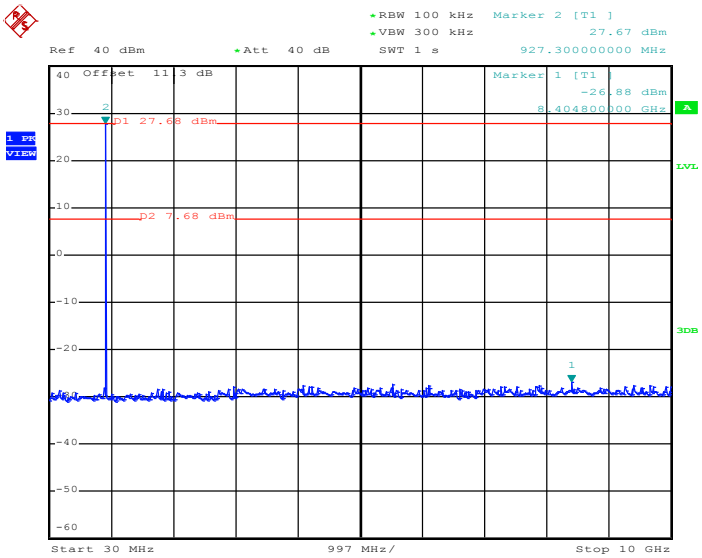
Date: 10.AUG.2018 15:49:18

CSE Plot on Ch 05 between 30MHz ~ 10 GHz



Date: 10.AUG.2018 15:51:19

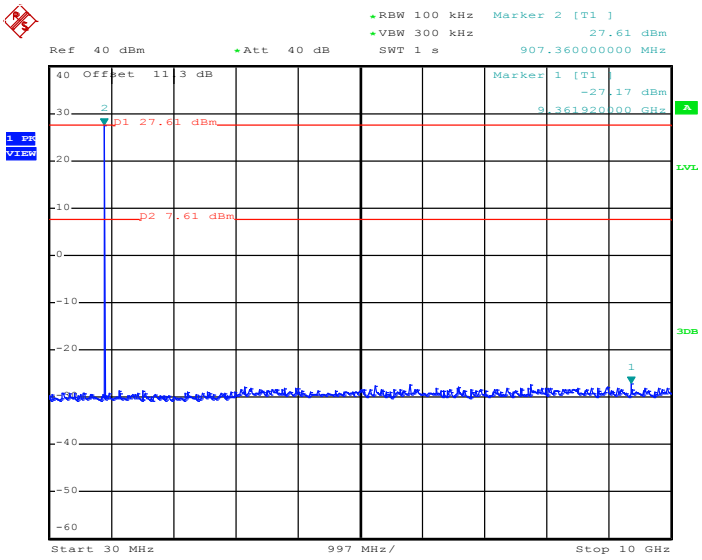
CSE Plot on Ch 11 between 30MHz ~ 10 GHz



Date: 10.AUG.2018 15:53:39

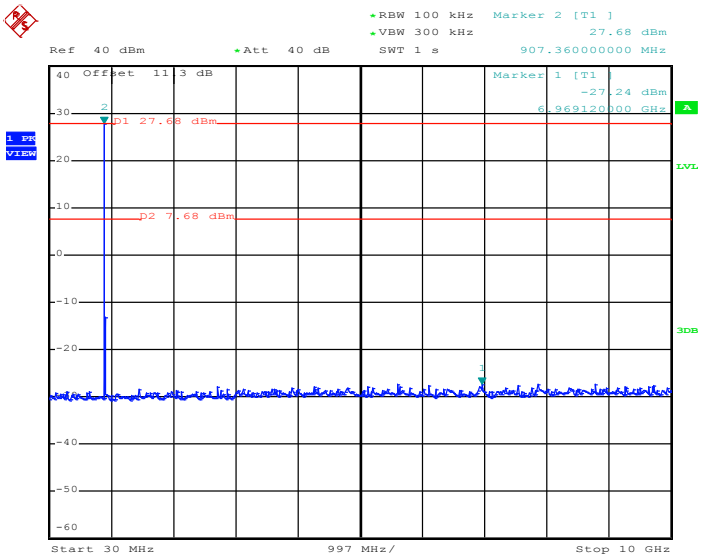
<Middle Range>

CSE Plot on Ch 00 between 30MHz ~ 10 GHz



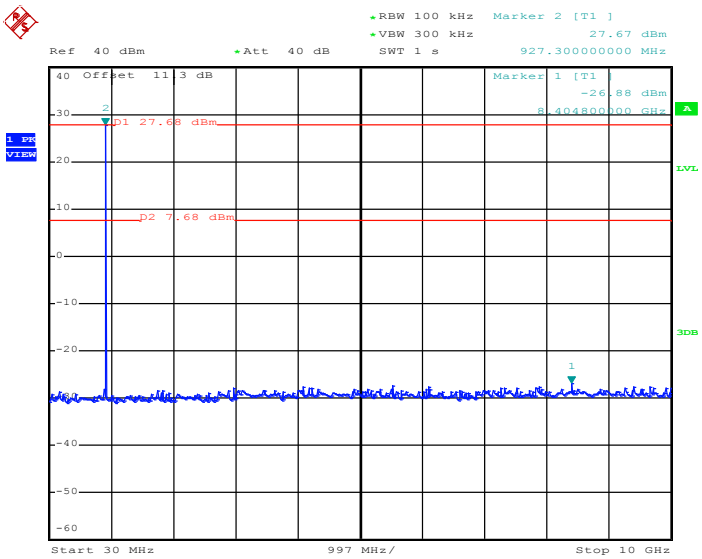
Date: 10.AUG.2018 15:49:18

CSE Plot on Ch 05 between 30MHz ~ 10 GHz



Date: 10.AUG.2018 15:51:19

CSE Plot on Ch 11 between 30MHz ~ 10 GHz



Date: 10.AUG.2018 15:53:39

3.8 Radiated Band Edges and Spurious Emission Measurement

3.8.1 Limit of Radiated Band Edges and Spurious Emission

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power shall be attenuated at least 20 dB and the measured RMS shall be 30 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. In addition, for radiated emissions that fall under Section 2.7 the restricted bands must also comply with the radiated emission limit specified in Section 2.8 as below.

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
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

3.8.2 Measuring Instruments

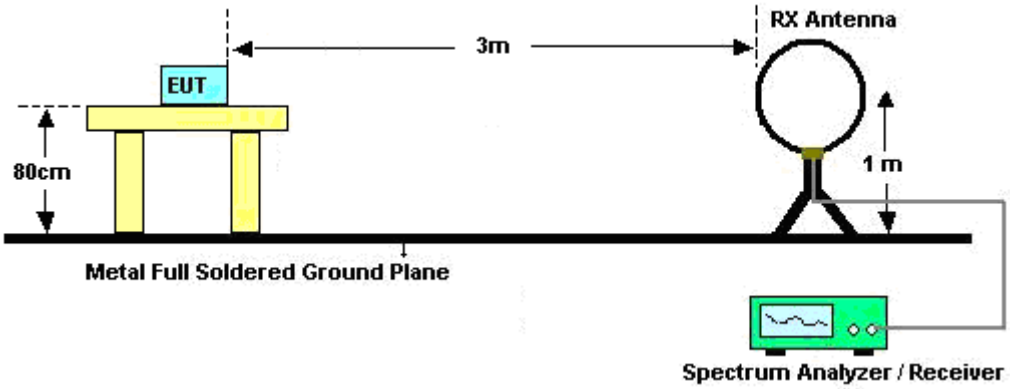
See list of measuring equipment of this test report.

3.8.3 Test Procedures

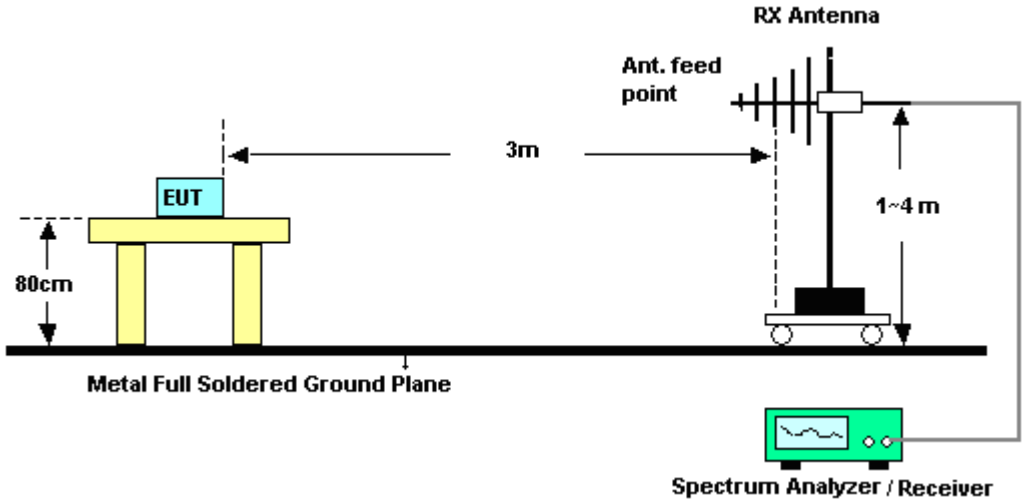
1. The EUT was placed on a turntable with 0.8 meter for frequency below 1GHz and 1.5 meter for frequency above 1GHz respectively above ground.
2. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
3. For each suspected emission, the EUT was arranged to its worst case and then tune the Antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level to comply with the guidelines.
4. Set to the maximum power setting and enable the EUT transmit continuously.
5. Use the following spectrum analyzer settings:
   (1) Span shall wide enough to fully capture the emission being measured;
   (2) Set RBW=100 kHz for f < 1 GHz, RBW=1MHz for f>1GHz ; VBW ≥ RBW; Sweep = auto; Detector function = peak; Trace = max hold for peak
   (3) For average measurement: use duty cycle correction factor method per 15.35(c).
   Duty cycle = On time/100 milliseconds
   On time = N1*L1+N2*L2+...+Nn-1*LNn-1+Nn*Ln
   Where N1 is number of type 1 pulses, L1 is length of type 1 pulses, etc.
   Average Emission Level = Peak Emission Level + 20*log(Duty cycle)
6. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level

3.8.4 Test Setup

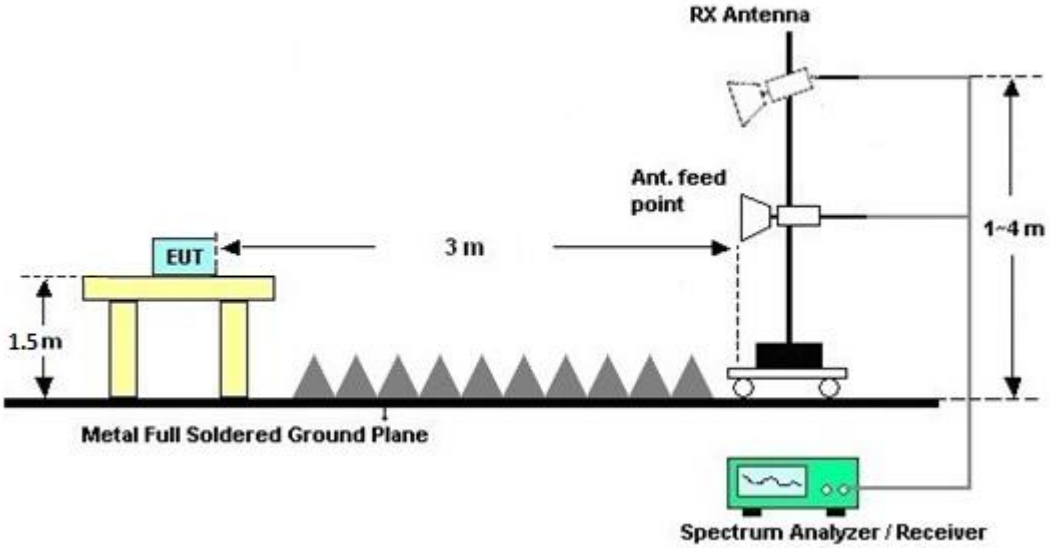
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz



3.8.5 Test Results of Radiated Spurious Emissions (9 kHz ~ 30 MHz)

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line per NCC LP0002 section 5.13 was not reported.

There is a comparison data of both open-field test site and semi-Anechoic chamber, and the result came out very similar.

3.8.6 Test Result of Radiated Spurious at Band Edges

Please refer to Appendix A and B.

3.8.7 Duty Cycle

Please refer to Appendix C.

3.8.8 Test Result of Radiated Spurious Emission

Please refer to Appendix A and B.

3.9 Receiver Radiated Emission Measurement

3.9.1 Limit of Receiver Radiated Emission

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
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

3.9.2 Measuring Instruments

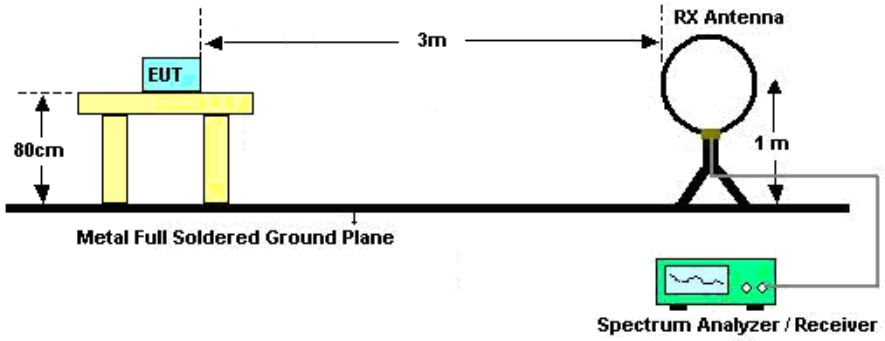
See list of measuring equipment of this test report.

3.9.3 Test Procedures

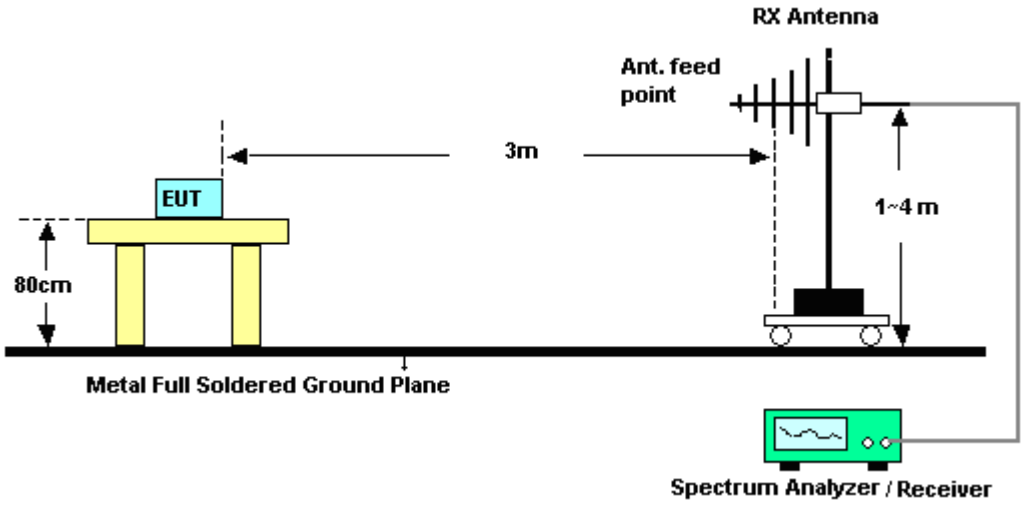
1. The EUT was placed on a turntable with 0.8 meter above ground.
2. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
3. The table was rotated 360 degrees to determine the position of the highest radiation.
4. The antenna is a Bi-Log antenna and its height is adjusted between one to four meters above ground to find the maximum value of the field strength for both horizontal polarization and vertical polarization of the antenna.
5. For each suspected emission, the EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading.
6. Set the test-receiver system to Peak Detect Function and specified bandwidth with Maximum Hold Mode (RBW=120kHz/VBW=300kHz for frequency below 1GHz; RBW=1MHz VBW=3MHz (Peak), RBW=1MHz/VBW=10Hz (Average) for frequency above 1GHz).
7. If the emission level of the EUT in peak mode was 3 dB lower than the limit specified, peak values of EUT will be reported. Otherwise, the emission will be repeated by using the quasi-peak method and reported.
8. Emission level (dBμV/m) = 20 log Emission level (μV/m)
9. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level

3.9.4 Test Setup

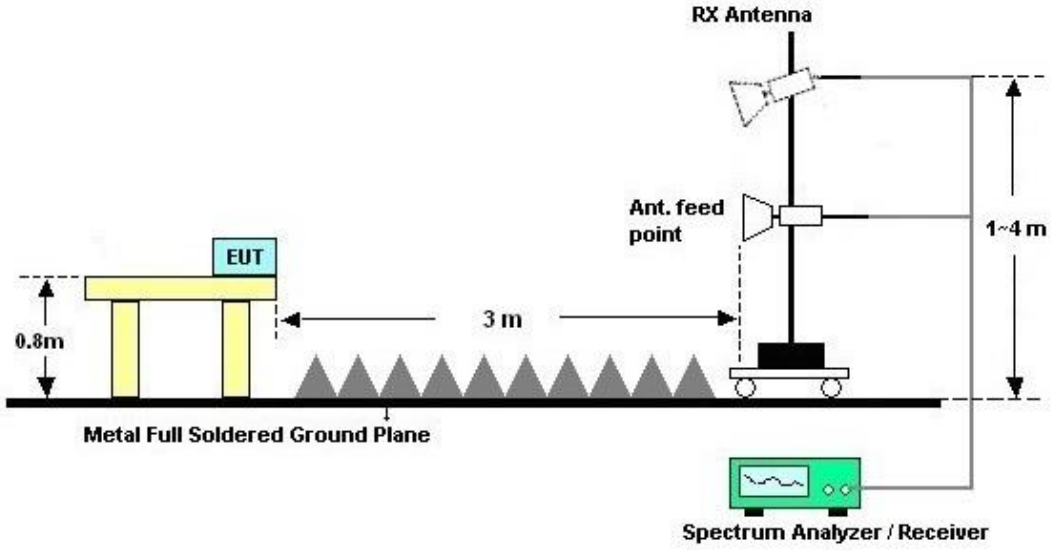
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz



3.9.5 Test Result of Receiver Radiated Spurious Emissions (9kHz ~ 30MHz)

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line per NCC LP0002 section 5.13 was not reported.

There is a comparison data of both open-field test site and semi-Anechoic chamber, and the result came out very similar.

3.9.6 Test Result of Receiver Radiated Spurious Emission (30MHz ~ 5th Harmonic)

Please refer to Appendix B.

3.10 Antenna Requirements

3.10.1 Standard Applicable

If directional gain of transmitting Antennas is greater than 6dBi, the power shall be reduced by the same level in dB comparing to gain minus 6dBi. 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 rule.

3.10.2 Antenna Anti-Replacement Construction

An embedded-in antenna design is used.

3.10.3 Antenna Gain

The antenna peak gain of EUT is 6 dBi. Therefore, it is not necessary to reduce maximum peak output power limit.

4 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Power Meter	Anritsu	ML2495A	1218006	N/A	Oct. 06, 2017	Jul. 25, 2018 ~ Aug. 10, 2018	Oct. 05, 2018	Conducted (TH05-HY)
Power Sensor	Anritsu	MA2411B	1207363	300MHz~40GHz	Oct. 06, 2017	Jul. 25, 2018 ~ Aug. 10, 2018	Oct. 05, 2018	Conducted (TH05-HY)
Spectrum Analyzer	Rohde & Schwarz	FSP40	100057	9kHz-40GHz	Nov. 21, 2017	Jul. 25, 2018 ~ Aug. 10, 2018	Nov. 20, 2018	Conducted (TH05-HY)
Spectrum Analyzer	Rohde & Schwarz	FSV40	101397	10Hz~40GHz	Nov. 07, 2017	Jul. 25, 2018 ~ Aug. 10, 2018	Nov. 06, 2018	Conducted (TH05-HY)
Amplifier	SONOMA	310N	187312	9kHz~1GHz	Jan. 16, 2018	Aug. 07, 2018~ Aug. 27, 2018	Jan. 15, 2019	Radiation (03CH11-HY)
Preamplifier	COM-POWER	PA-103A	161241	10MHz-1GHz	May 21, 2018	Aug. 07, 2018~ Aug. 27, 2018	May 20, 2019	Radiation (03CH11-HY)
Bilog Antenna	TESEQ	CBL 6111D&N-6-06	35414&AT-N0602	30MHz~1GHz	Oct. 14, 2017	Aug. 07, 2018~ Aug. 27, 2018	Oct. 13, 2018	Radiation (03CH11-HY)
Horn Antenna	SCHWARZBECK	BBHA 9120 D	9120D-1326	1GHz ~ 18GHz	Oct. 16, 2017	Aug. 07, 2018~ Aug. 27, 2018	Oct. 15, 2018	Radiation (03CH11-HY)
Loop Antenna	Rohde & Schwarz	HFH2-Z2	100488	9 kHz~30 MHz	Nov. 23, 2017	Aug. 07, 2018~ Aug. 27, 2018	Nov. 22, 2018	Radiation (03CH11-HY)
Preamplifier	Keysight	83017A	MY53270080	1GHz~26.5GHz	Jan. 16, 2018	Aug. 07, 2018~ Aug. 27, 2018	Jan. 15, 2020	Radiation (03CH11-HY)
Spectrum Analyzer	Keysight	N9010A	MY54200486	10Hz ~ 44GHz	Oct. 19, 2017	Aug. 07, 2018~ Aug. 27, 2018	Oct. 18, 2018	Radiation (03CH11-HY)
Antenna Mast	EMEC	AM-BS-4500-B	N/A	1~4m	N/A	Aug. 07, 2018~ Aug. 27, 2018	N/A	Radiation (03CH11-HY)
Turn Table	EMEC	TT 2000	N/A	0~360 Degree	N/A	Aug. 07, 2018~ Aug. 27, 2018	N/A	Radiation (03CH11-HY)
Preamplifier	Jet-Power	JPA0118-55-303K	1710001800054001	1GHz~18GHz	Apr. 16, 2018	Aug. 07, 2018~ Aug. 27, 2018	Apr. 15, 2019	Radiation (03CH11-HY)
Software	Audix	E3 6.2009-8-24	RK-001042	N/A	N/A	Aug. 07, 2018~ Aug. 27, 2018	N/A	Radiation (03CH11-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY9837/4PE	9kHz-30MHz	Mar. 14, 2018	Aug. 07, 2018~ Aug. 27, 2018	Mar. 13, 2019	Radiation (03CH11-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	MY2859/2	30MHz-40GHz	Mar. 14, 2018	Aug. 07, 2018~ Aug. 27, 2018	Mar. 13, 2019	Radiation (03CH11-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY9837/4PE	30M-18G	Mar. 14, 2018	Aug. 07, 2018~ Aug. 27, 2018	Mar. 13, 2019	Radiation (03CH11-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	MY4274/2	30MHz-40GHz	Mar. 14, 2018	Aug. 07, 2018~ Aug. 27, 2018	Mar. 13, 2019	Radiation (03CH11-HY)
Filter	Wainwright	WHKX12-1080-1200-1500-60SS	SN2	1.2G High Pass	Sep. 18, 2017	Aug. 07, 2018~ Aug. 27, 2018	Sep. 17, 2018	Radiation (03CH11-HY)

5 Uncertainty of Evaluation

Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**5.2**

Uncertainty of Radiated Emission Measurement (1000 MHz ~ 18000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**5.5**

Uncertainty of Radiated Emission Measurement (18000 MHz ~ 40000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**5.2**

Appendix A. Radiated Spurious Emission

Test Engineer :	Hao Hsu, Ken Wu, and Chuan Zhu	**Temperature :**	21~25°C
		Relative Humidity :	51~56%

<SKU 3>

920~928MHz

UHF (1GHz ~ 10GHz @ 3m)

UHF	Note	Frequency	Level	Over	Limit	Read	Antenna	Cable	Preamp	Ant	Table	Peak	Pol.
				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
		(MHz)	(dBµV/m)	(dB)	(dBµV/m)	(dBµV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
922.25MHz		1594	38.1	-35.9	74	68.71	25.46	5.67	61.74	100	0	P	H
		1684	39.91	-34.09	74	70.2	25.59	5.81	61.69	100	0	P	H
		2766.75	33.97	-40.03	74	59.4	28.04	6.88	60.35	100	0	P	H
		3689	35.56	-38.44	74	58.32	29.02	7.69	59.47	100	0	P	H
		7378	49.66	-24.34	74	61.26	36.4	10.77	58.77	100	0	P	H
		1594	38.38	-35.62	74	68.99	25.46	5.67	61.74	100	0	P	V
		1684	39.72	-34.28	74	70.01	25.59	5.81	61.69	100	0	P	V
		2766.75	35.23	-38.77	74	60.66	28.04	6.88	60.35	100	0	P	V
		3689	35.57	-38.43	74	58.33	29.02	7.69	59.47	100	0	P	V
		7378	50.27	-23.73	74	61.87	36.4	10.77	58.77	100	0	P	V
927.75MHz		1594	35.93	-38.07	74	66.54	25.46	5.67	61.74	100	0	P	H
		1684	37.91	-36.09	74	68.2	25.59	5.81	61.69	100	0	P	H
		2783.25	33.2	-40.8	74	58.53	28.08	6.9	60.31	100	0	P	H
		3711	37.33	-36.67	74	60.02	29.06	7.7	59.45	100	0	P	H
		7422	49.32	-24.68	74	60.68	36.55	10.77	58.68	100	0	P	H
		1594	36.56	-37.44	74	67.17	25.46	5.67	61.74	100	0	P	V
		1684	37.88	-36.12	74	68.17	25.59	5.81	61.69	100	0	P	V
		2783.25	33.47	-40.53	74	58.8	28.08	6.9	60.31	100	0	P	V
		3711	35.16	-38.84	74	57.85	29.06	7.7	59.45	100	0	P	V
		7422	54.4	-19.6	74	65.76	36.55	10.77	58.68	315	33	P	V
		7422	50.16	-3.84	54	61.52	36.55	10.77	58.68	315	33	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

920~928MHz

UHF (30MHz ~ 1GHz @ 3m)

UHF	Note	Frequency	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Ant Pos	Table Pos	Peak Avg.	Pol.
		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
920.25MHz		30	32.14	-7.86	40	27.45	24.17	10.7	30.18	-	-	P	H
		111	32.49	-11.01	43.5	34.52	16.81	11.23	30.07	-	-	P	H
		128.28	32.52	-10.98	43.5	33.91	17.31	11.35	30.05	-	-	P	H
		746.6	39.57	-6.43	46	27.95	27.78	13.35	29.51	-	-	P	H
		792.1	40.96	-5.04	46	28.83	28.08	13.41	29.36	-	-	P	H
		856.5	42.06	-3.94	46	28.6	28.94	13.61	29.09	100	0	P	H
	*	922.25	124.83	-	-	110.54	29.34	13.71	28.76	-	-	P	H
		35.94	36.95	-3.05	40	35.11	21.31	10.7	30.17	100	0	P	V
		64.56	35.19	-4.81	40	42.7	11.74	10.88	30.13	-	-	P	V
		113.16	29.64	-13.86	43.5	31.56	16.91	11.23	30.06	-	-	P	V
		739.6	40.52	-5.48	46	29.03	27.72	13.3	29.53	-	-	P	V
		842.5	41.19	-4.81	46	28.21	28.6	13.53	29.15	-	-	P	V
		871.2	41.76	-4.24	46	28.11	29.08	13.6	29.03	-	-	P	V
	*	922.25	121.83	-	-	107.54	29.34	13.71	28.76	-	-	P	V

Remark	1. No other spurious found. 2. All results are PASS against limit line.

UHF	Note	Frequency	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Ant Pos	Table Pos	Peak Avg.	Pol.
		(MHz)	(dBµV/m)	(dB)	(dBµV/m)	(dBµV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
927.75MHz		64.56	28.32	-11.68	40	35.83	11.74	10.88	30.13	-	-	P	H
		115.86	35.83	-7.67	43.5	37.58	17.08	11.23	30.06	-	-	P	H
		160.41	34.17	-9.33	43.5	36.43	16.28	11.47	30.01	-	-	P	H
		737.5	39.85	-6.15	46	28.48	27.6	13.3	29.53	-	-	P	H
		800.5	41.04	-4.96	46	28.8	28.13	13.45	29.34	-	-	P	H
		851.6	41.45	-4.55	46	28.13	28.82	13.61	29.11	100	0	P	H
	*	927.75	123.14	-	-	108.49	29.62	13.74	28.71	-	-	P	H
		38.37	36.88	-3.12	40	36.61	19.74	10.7	30.17	100	0	P	V
		63.48	32.28	-7.72	40	39.84	11.69	10.88	30.13	-	-	P	V
		74.28	31.85	-8.15	40	38.45	12.44	11.08	30.12	-	-	P	V
		734	39.65	-6.35	46	28.42	27.47	13.3	29.54	-	-	P	V
		811	41.06	-4.94	46	28.97	27.93	13.45	29.29	-	-	P	V
		855.8	42.27	-3.73	46	28.83	28.92	13.61	29.09	-	-	P	V
	*	927.75	120.23	-	-	105.58	29.62	13.74	28.71	-	-	P	V

Remark	1. No other spurious found. 2. All results are PASS against limit line.

<SKU 2>

920~928MHz

UHF (1GHz ~ 10GHz @ 3m)

UHF	Note	Frequency	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Ant Pos	Table Pos	Peak Avg.	Pol.
		(MHz)	(dBµV/m)	(dB)	(dBµV/m)	(dBµV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
922.25MHz		1594	36	-38	74	66.61	25.46	5.67	61.74	100	0	P	H
		1685	38.02	-35.98	74	68.31	25.59	5.81	61.69	100	0	P	H
		2766.75	41.87	-32.13	74	67.3	28.04	6.88	60.35	100	0	P	H
		3689	41.61	-32.39	74	64.37	29.02	7.69	59.47	100	0	P	H
		1594	36.59	-37.41	74	67.2	25.46	5.67	61.74	100	0	P	V
		1685	37.66	-36.34	74	67.95	25.59	5.81	61.69	100	0	P	V
		2766.75	35.17	-38.83	74	60.6	28.04	6.88	60.35	100	0	P	V
		3689	38.58	-35.42	74	61.34	29.02	7.69	59.47	100	0	P	V
927.75MHz		1594	35.52	-38.48	74	66.13	25.46	5.67	61.74	100	0	P	H
		1685	38.19	-35.81	74	68.48	25.59	5.81	61.69	100	0	P	H
		2783.25	33.44	-40.56	74	58.77	28.08	6.9	60.31	100	0	P	H
		3711	41.88	-32.12	74	64.57	29.06	7.7	59.45	100	0	P	H
		1594	35.83	-38.17	74	66.44	25.46	5.67	61.74	100	0	P	V
		1685	38.47	-35.53	74	68.76	25.59	5.81	61.69	100	0	P	V
		2783.25	32.91	-41.09	74	58.24	28.08	6.9	60.31	100	0	P	V
		3711	39.11	-34.89	74	61.8	29.06	7.7	59.45	100	0	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

920~928MHz

UHF (30MHz ~ 1GHz @ 3m)

UHF	Note	Frequency	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Ant Pos	Table Pos	Peak Avg.	Pol.
		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
922.25MHz		30.27	32.86	-7.14	40	28.17	24.17	10.7	30.18	-	-	P	H
		108.84	32.25	-11.25	43.5	34.46	16.61	11.25	30.07	-	-	P	H
		124.5	33.26	-10.24	43.5	34.73	17.23	11.35	30.05	-	-	P	H
		631.1	38.48	-7.52	46	29.2	26.01	13.06	29.79	-	-	P	H
		734.7	40.21	-5.79	46	28.98	27.47	13.3	29.54	-	-	P	H
		874	42.56	-3.44	46	28.88	29.09	13.6	29.01	100	0	P	H
	*	922.25	123.07	-	-	108.78	29.34	13.71	28.76	-	-	P	H
		35.67	36.7	-3.3	40	34.87	21.31	10.7	30.18	100	0	P	V
		44.31	33.51	-6.49	40	36.22	16.55	10.9	30.16	-	-	P	V
		62.94	29.88	-10.12	40	37.49	11.64	10.88	30.13	-	-	P	V
		745.9	39.76	-6.24	46	28.15	27.77	13.35	29.51	-	-	P	V
		804.7	40.87	-5.13	46	28.7	28.04	13.45	29.32	-	-	P	V
		861.4	42.13	-3.87	46	28.55	29.04	13.61	29.07	-	-	P	V
	*	922.25	126.31	-	-	112.02	29.34	13.71	28.76	-	-	P	V

Remark	1. No other spurious found. 2. All results are PASS against limit line.

UHF	Note	Frequency	Level	Over	Limit	Read	Antenna	Cable	Preamp	Ant	Table	Peak	Pol.
				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
927.75MHz		31.62	32.12	-7.88	40	28.36	23.24	10.7	30.18	-	-	P	H
		108.3	32.39	-11.11	43.5	34.6	16.61	11.25	30.07	-	-	P	H
		124.5	32.81	-10.69	43.5	34.28	17.23	11.35	30.05	-	-	P	H
		725.6	39.28	-6.72	46	28.44	27.11	13.3	29.57	-	-	P	H
		793.5	40.96	-5.04	46	28.82	28.09	13.41	29.36	-	-	P	H
		856.5	41.82	-4.18	46	28.36	28.94	13.61	29.09	100	0	P	H
	*	927.75	121.75	-	-	107.1	29.62	13.74	28.71	-	-	P	H
												P	H
												P	H
												P	H
												P	H
												P	H
		35.4	36.8	-3.2	40	34.97	21.31	10.7	30.18	100	0	P	V
		43.23	33.28	-6.72	40	35.46	17.08	10.9	30.16	-	-	P	V
		62.94	30.48	-9.52	40	38.09	11.64	10.88	30.13	-	-	P	V
		713	39	-7	46	28.67	26.7	13.24	29.61	-	-	P	V
		756.4	40.29	-5.71	46	28.55	27.87	13.35	29.48	-	-	P	V
		824.3	41.53	-4.47	46	29.29	27.94	13.53	29.23	-	-	P	V
	*	927.75	125.94	-	-	111.29	29.62	13.74	28.71	-	-	P	V
												P	V
												P	V
												P	V
												P	V
												P	V

Remark	1. No other spurious found. 2. All results are PASS against limit line.

<SKU 1>

920~928MHz

UHF (1GHz ~ 10GHz @ 3m)

RFID	Note	Frequency	Level	Over	Limit	Read	Antenna	Cable	Preamp	Ant	Table	Peak	Pol.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
1		(MHz)	(dBµV/m)	(dB)	(dBµV/m)	(dBµV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
927.75MHz		1594	36.8	-37.2	74	67.41	25.46	5.67	61.74	100	0	P	H
		1684	38.04	-35.96	74	68.33	25.59	5.81	61.69	100	0	P	H
		2783.25	33.74	-40.26	74	59.07	28.08	6.9	60.31	100	0	P	H
		3711	39.67	-34.33	74	62.36	29.06	7.7	59.45	100	0	P	H
		7422	52.32	-21.68	74	63.68	36.55	10.77	58.68	257	69	P	H
		7422	46.64	-7.36	54	58	36.55	10.77	58.68	257	69	P	H
		1594	36.29	-37.71	74	66.9	25.46	5.67	61.74	100	0	P	V
		1684	37.42	-36.58	74	67.71	25.59	5.81	61.69	100	0	P	V
		2783.25	34.55	-39.45	74	59.88	28.08	6.9	60.31	100	0	P	V
		3711	38.06	-35.94	74	60.75	29.06	7.7	59.45	100	0	P	V
		7422	48.54	-25.46	74	59.9	36.55	10.77	58.68	100	0	P	V

Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.

920~928MHz

UHF (30MHz ~ 1GHz @ 3m)

UHF	Note	Frequency	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Ant Pos	Table Pos	Peak Avg.	Pol.
		(MHz)	(dBµV/m)	(dB)	(dBµV/m)	(dBµV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
927.25MHz		30.27	32.5	-7.5	40	27.81	24.17	10.7	30.18	-	-	P	H
		115.32	35.29	-8.21	43.5	37.1	17.02	11.23	30.06	-	-	P	H
		157.98	33.47	-10.03	43.5	35.65	16.36	11.47	30.01	-	-	P	H
		693.4	38.7	-7.3	46	28.76	26.37	13.23	29.66	-	-	P	H
		758.5	40.19	-5.81	46	28.42	27.89	13.35	29.47	-	-	P	H
		806.8	41.16	-4.84	46	29.02	28	13.45	29.31	100	0	P	H
		927.75	121.13	-	-	106.48	29.62	13.74	28.71	-	-	P	H
		30	36.2	-3.8	40	31.51	24.17	10.7	30.18	-	-	P	V
		38.37	36.71	-3.29	40	36.44	19.74	10.7	30.17	-	-	P	V
		62.94	30.69	-9.31	40	38.3	11.64	10.88	30.13	-	-	P	V
		742.4	39.98	-6.02	46	28.45	27.74	13.31	29.52	-	-	P	V
		802.6	41.28	-4.72	46	29.07	28.09	13.45	29.33	-	-	P	V
		869.1	42.86	-3.14	46	29.23	29.07	13.6	29.04	100	0	P	V
		927.75	126.14	-	-	111.49	29.62	13.74	28.71	-	-	P	V

Remark	1. No other spurious found. 2. All results are PASS against limit line.

Note symbol

*	**Fundamental Frequency** which can be ignored. However, the level of any unwanted emissions shall not exceed the level of the fundamental frequency.
!	Test result is **over limit** line.
QP/P/A	Quasi Peak or Peak or Average
H/V	**H**orizontal or **V**ertical

A calculation example for radiated spurious emission is shown as below:

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Cable	Preamp	Ant	Table	Peak	Pol.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
1+2		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11b CH 01 2412MHz		2390	55.45	-18.55	74	54.51	32.22	4.58	35.86	103	308	P	H
		2390	43.54	-10.46	54	42.6	32.22	4.58	35.86	103	308	A	H

1. Level(dBμV/m) =

Antenna Factor(dB/m) + Cable Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)

2. Over Limit(dB) = Level(dBμV/m) – Limit Line(dBμV/m)

For Peak Limit @ 2390MHz:

1. Level(dBμV/m)

= Antenna Factor(dB/m) + Cable Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)

= 32.22(dB/m) + 4.58(dB) + 54.51(dBμV) – 35.86 (dB)

= 55.45 (dBμV/m)

2. Over Limit(dB)

= Level(dBμV/m) – Limit Line(dBμV/m)

= 55.45(dBμV/m) – 74(dBμV/m)

= -18.55(dB)

For Average Limit @ 2390MHz:

1. Level(dBμV/m)

= Antenna Factor(dB/m) + Cable Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)

= 32.22(dB/m) + 4.58(dB) + 42.6(dBμV) – 35.86 (dB)

= 43.54 (dBμV/m)

2. Over Limit(dB)

= Level(dBμV/m) – Limit Line(dBμV/m)

= 43.54(dBμV/m) – 54(dBμV/m)

= -10.46(dB)

Both peak and average measured complies with the limit line, so test result is “PASS”.

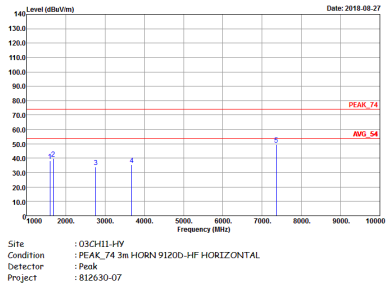
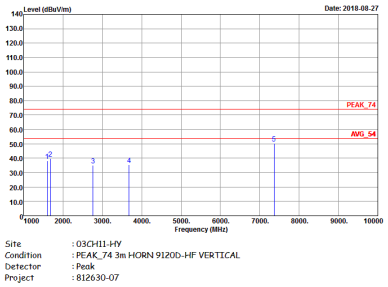
Appendix B. Radiated Spurious Emission Plots

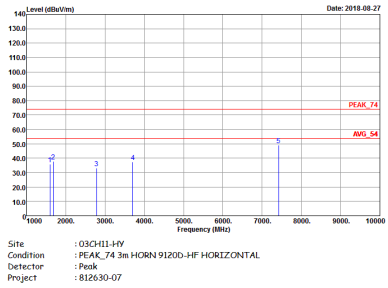
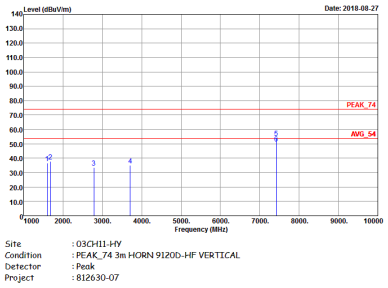
Test Engineer :	Hao Hsu, Ken Wu, and Chuan Zhu	Temperature :	22~25°C
		Relative Humidity :	52~57%

<SKU 3>

920~928MHz

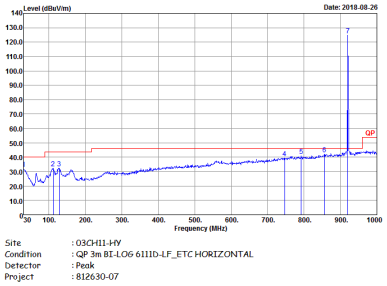
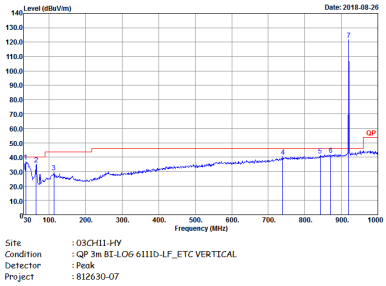
UHF (1GHz ~ 10GHz @ 3m)

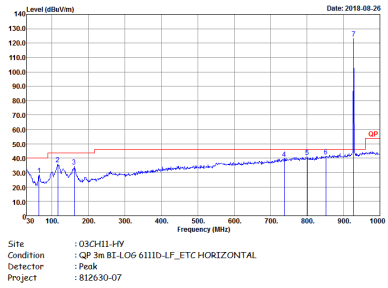
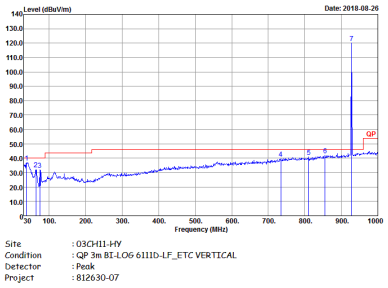
UHF	920~928MHz UHF (1GHz ~ 10GHz @ 3m)	
	UHF CH00 922.25 MHz	
	Horizontal	Vertical
Peak Avg.		

UHF	920~928MHz UHF (1GHz ~ 10GHz @ 3m)	
	UHF CH11 927.75 MHz	
	Horizontal	Vertical
Peak Avg.		

920~928MHz

UHF (30MHz ~ 1GHz @ 3m)

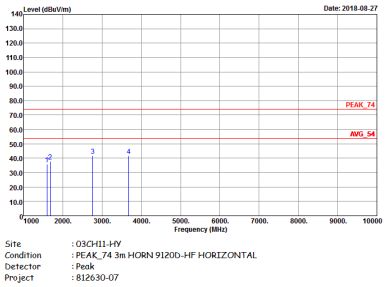
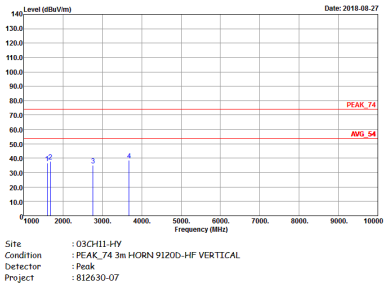
UHF	920~928MHz UHF (30MHz ~ 1GHz @ 3m)	
	UHF CH00 922.25 MHz	
	Horizontal	Vertical
QP / Peak		

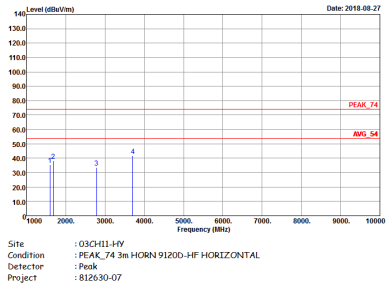
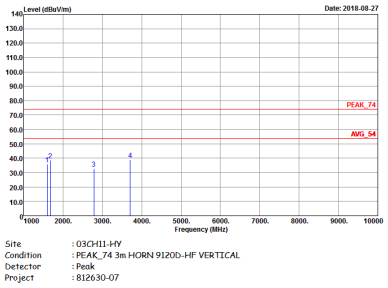
UHF	920~928MHz UHF (30MHz ~ 1GHz @ 3m)	
	UHF CH11 927.75 MHz	
	Horizontal	Vertical
QP / Peak		

<SKU 2>

920~928MHz

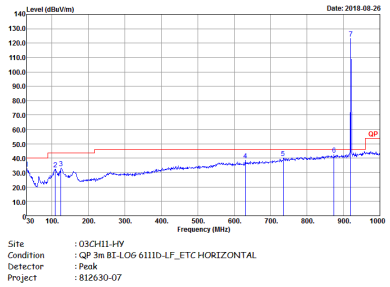
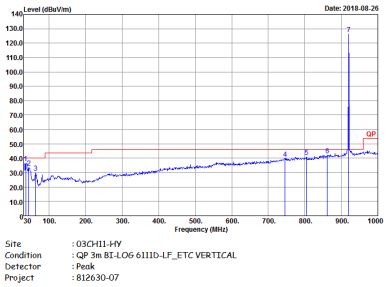
UHF (1GHz ~ 10GHz @ 3m)

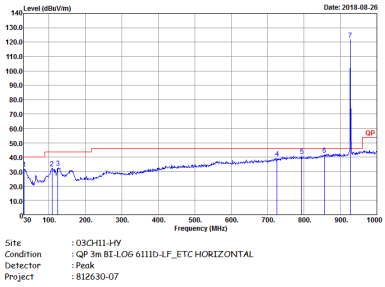
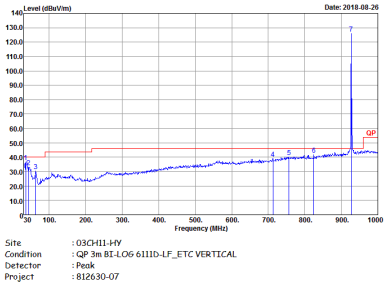
UHF	920~928MHz UHF (1GHz ~ 10GHz @ 3m)	
	UHF CH00 922.25 MHz	
	Horizontal	Vertical
Peak Avg.		

UHF	920~928MHz UHF (1GHz ~ 10GHz @ 3m)	
	UHF CH11 927.75 MHz	
	Horizontal	Vertical
Peak Avg.		

920~928MHz

UHF (30MHz ~ 1GHz @ 3m)

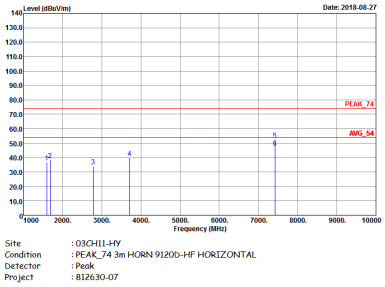
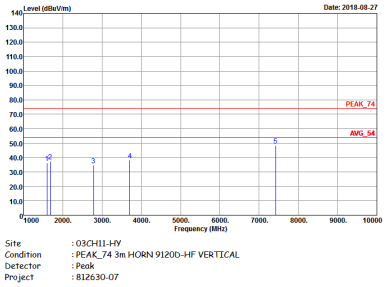
UHF	920~928MHz UHF (30MHz ~ 1GHz @ 3m)	
	UHF CH00 922.25 MHz	
	Horizontal	Vertical
QP / Peak		

UHF	920~928MHz UHF (30MHz ~ 1GHz @ 3m)	
	UHF CH11 927.75 MHz	
	Horizontal	Vertical
QP / Peak		

<SKU 1>

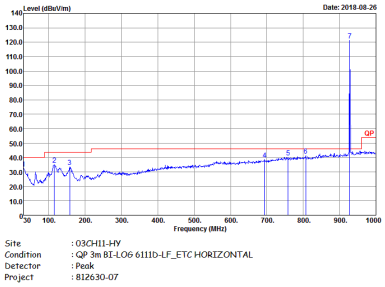
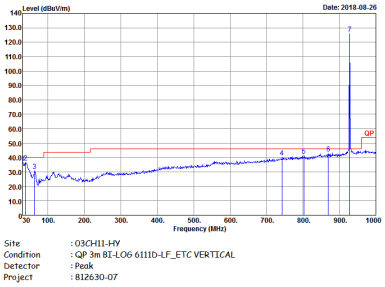
920~928MHz

UHF (1GHz ~ 10GHz @ 3m)

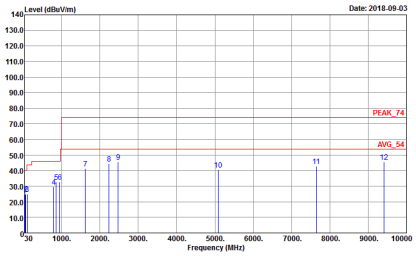
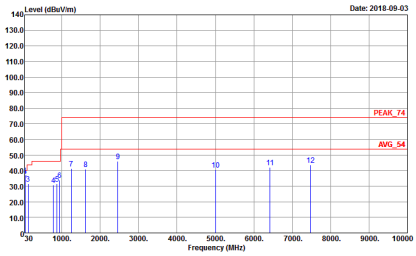
UHF	920~928MHz UHF (1GHz ~ 10GHz @ 3m)	
	UHF CH11 927.75 MHz	
	Horizontal	Vertical
Peak Avg.		

920~928MHz

UHF (30MHz ~ 1GHz @ 3m)

UHF	920~928MHz UHF (30MHz ~ 1GHz @ 3m)	
	UHF CH11 927.75 MHz	
	Horizontal	Vertical
QP / Peak		

<SKU 3>

	UHF Idle	
	Horizontal	Vertical
Peak Avg.		

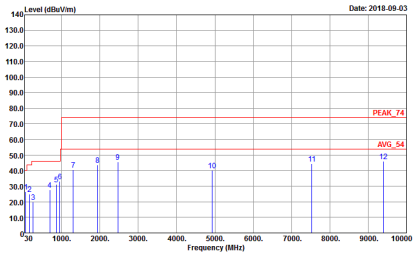
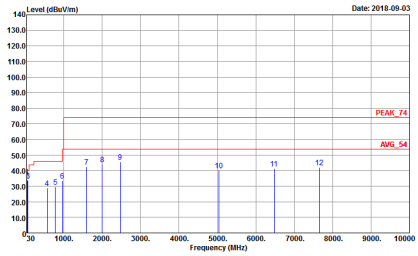
Site : 03CH11-HY
Condition : PEAK_74 3m HORN 9120D-HF HORIZONTAL
Detector : Peak
Project : 812630-07

	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	42.96	24.44	-15.56	40.00	38.50	17.61	0.82	32.49	---	---	Peak
2	65.91	25.42	-14.58	40.00	45.10	11.78	1.02	32.49	---	---	Peak
3	105.60	24.88	-18.62	43.50	39.61	16.32	1.39	32.47	---	---	Peak
4	791.40	29.67	-16.33	46.00	30.17	28.07	3.49	32.21	---	---	Peak
5	859.30	32.79	-13.21	46.00	31.82	29.02	3.67	31.87	---	---	Peak
6	949.60	32.80	-13.20	46.00	29.45	30.56	3.82	31.20	100	0	Peak
7	1620.00	41.38	-32.62	74.00	45.01	25.49	5.07	34.19	---	---	Peak
8	2234.00	44.38	-29.62	74.00	45.34	26.73	5.94	33.63	---	---	Peak
9	2476.00	45.51	-28.49	74.00	45.35	27.36	6.38	33.58	---	---	Peak
10	5085.00	40.59	-33.41	74.00	57.50	31.68	9.58	58.60	---	---	Peak
11	7650.00	42.85	-31.15	74.00	52.79	36.82	11.60	58.78	---	---	Peak
12	9420.00	45.82	-28.18	74.00	52.76	38.61	13.31	59.20	---	---	Peak

Site : 03CH11-HY
Condition : PEAK_74 3m HORN 9120D-HF VERTICAL
Detector : Peak
Project : 812630-07

	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	41.07	36.90	-3.10	40.00	49.88	18.68	0.82	32.49	100	0	Peak
2	45.39	35.01	-4.99	40.00	50.34	16.14	1.02	32.49	---	---	Peak
3	120.99	31.50	-12.00	43.50	45.10	17.31	1.51	32.46	---	---	Peak
4	782.30	30.63	-15.37	46.00	31.20	28.02	3.49	32.23	---	---	Peak
5	876.10	31.68	-14.32	46.00	30.47	29.10	3.73	31.78	---	---	Peak
6	935.60	33.85	-12.15	46.00	31.28	29.91	3.82	31.33	---	---	Peak
7	1246.00	41.38	-32.62	74.00	47.54	24.73	4.46	35.35	---	---	Peak
8	1620.00	40.79	-33.21	74.00	44.42	25.49	5.07	34.19	---	---	Peak
9	2462.00	45.88	-28.12	74.00	45.77	27.31	6.38	33.58	---	---	Peak
10	5010.00	40.74	-33.26	74.00	57.70	31.62	9.50	58.52	---	---	Peak
11	6420.00	42.08	-31.92	74.00	55.96	34.25	10.82	59.30	---	---	Peak
12	7485.00	43.79	-30.21	74.00	53.95	36.66	11.41	58.62	---	---	Peak

<SKU 2>

	UHF Idle	
	Horizontal	Vertical
Peak Avg.		

Site : 03CH11-HY
Condition : PEAK_74 3m HORN 9120D-HF HORIZONTAL
Detector : Peak
Project : 812630-07

	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	65.10	26.67	-13.33	40.00	46.39	11.74	1.02	32.49	---	---	Peak
2	159.60	25.09	-18.41	43.50	39.53	16.28	1.61	32.43	---	---	Peak
3	253.29	19.95	-26.05	46.00	31.32	18.85	2.09	32.38	---	---	Peak
4	692.00	27.76	-18.24	46.00	30.47	26.36	3.27	32.47	---	---	Peak
5	862.80	31.11	-14.89	46.00	30.09	29.05	3.67	31.85	---	---	Peak
6	955.90	33.05	-12.95	46.00	29.20	30.92	3.90	31.14	100	0	Peak
7	1300.00	40.66	-33.34	74.00	46.37	24.88	4.55	35.14	---	---	Peak
8	1938.00	43.51	-30.49	74.00	45.75	25.99	5.52	33.75	---	---	Peak
9	2468.00	45.60	-28.40	74.00	45.49	27.31	6.38	33.58	---	---	Peak
10	4935.00	40.15	-33.85	74.00	57.22	31.48	9.54	58.53	---	---	Peak
11	7530.00	44.30	-29.70	74.00	54.35	36.73	11.45	58.64	---	---	Peak
12	9405.00	45.83	-28.17	74.00	52.77	38.57	13.33	59.18	---	---	Peak

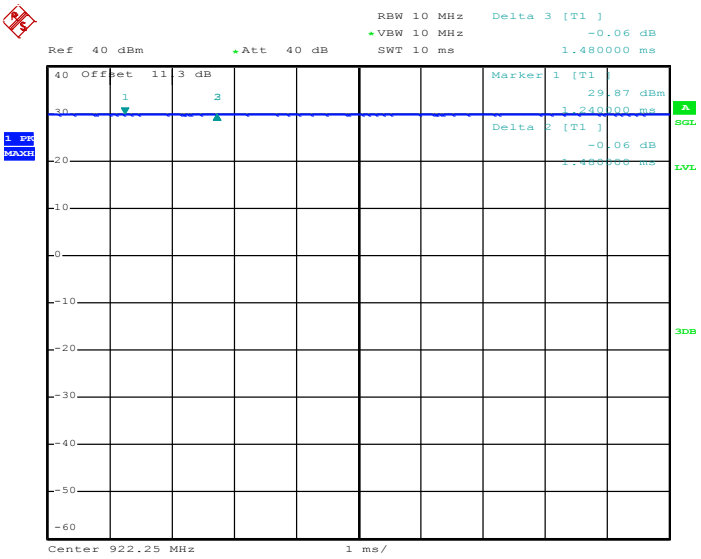
Site : 03CH11-HY
Condition : PEAK_74 3m HORN 9120D-HF VERTICAL
Detector : Peak
Project : 812630-07

	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	37.56	36.24	-3.76	40.00	47.64	20.26	0.82	32.49	100	0	Peak
2	45.39	34.34	-5.66	40.00	49.67	16.14	1.02	32.49	---	---	Peak
3	64.83	33.41	-6.59	40.00	53.13	11.74	1.02	32.49	---	---	Peak
4	564.60	28.79	-17.21	46.00	32.18	25.92	3.03	32.43	---	---	Peak
5	780.90	29.54	-16.46	46.00	30.13	28.01	3.49	32.24	---	---	Peak
6	957.30	33.65	-12.35	46.00	29.75	30.97	3.90	31.14	---	---	Peak
7	1588.00	42.48	-31.52	74.00	46.22	25.46	5.03	34.23	---	---	Peak
8	1996.00	43.99	-30.01	74.00	45.95	26.10	5.62	33.68	---	---	Peak
9	2466.00	45.53	-28.47	74.00	45.42	27.31	6.38	33.58	---	---	Peak
10	5040.00	40.11	-33.89	74.00	57.04	31.65	9.54	58.56	---	---	Peak
11	6480.00	41.18	-32.82	74.00	54.90	34.40	10.83	59.30	---	---	Peak
12	7650.00	42.27	-31.73	74.00	52.21	36.82	11.60	58.78	---	---	Peak

Appendix C. Duty Cycle Plots

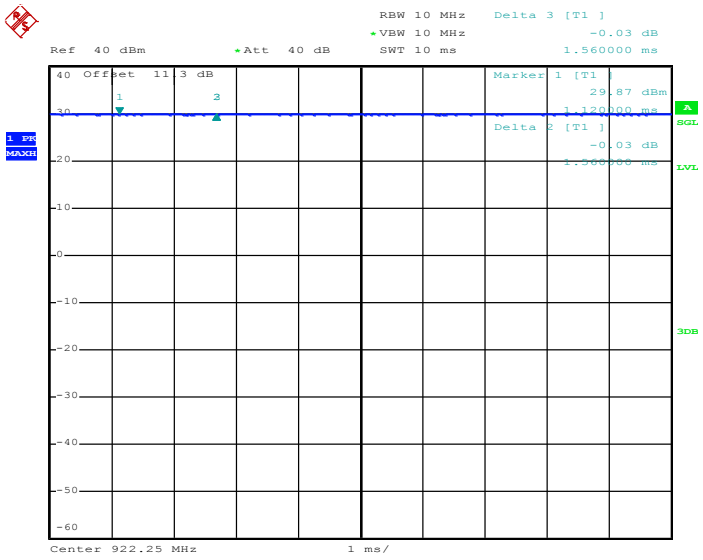
Band	Duty Cycle (%)	T(us)	1/T(kHz)	VBW Setting
UHF for Long Range	100.00	-	-	10Hz
UHF for Middle Range	100.00	-	-	10Hz

<Long Range>



Date: 26.JUL.2018 10:36:21

<Middle Range>



Date: 26.JUL.2018 10:36:44