

TEST REPORT

of

FCC Part 15 Subpart C

☒ New Application; ☐ Class I PC; ☐ Class II PC

Product : Digital Signage / POS System / Kiosk
Brand: Zunidata
Model: 15NX-RMXXX; 22PX-RMXXX;
24PX-RMXXX; 27PX-RMXXX;
32PX-RMXXX; 43PX-RMXXX;
MCT-156HPQ-POE; MCT-156HPQ-POE-5MC;
MCT-156HPQ-XXX; MCT-215HPQ;
MCT-215HPQ-5MC; MCT-215HPQ-XXX;
MCT-238HPQ-XXX; MCT-270HPQ-XXX;
MCT-320HPQ-XXX (X=0~9 or A~Z or Blank or -)
Model Difference: Appearance and LCD size are different
FCC ID: Z28-15-43-RM
FCC Rule Part: §15.247, Cat: DSS
Applicant: Zunidata Systems, Inc.
Address: 6F, No. 945, Boai Street, Jubei City, Hsinchu, Taiwan 302

Test Performed by:
International Standards Laboratory Corp.

<LT Lab.>

*Site Registration No.

BSMI: SL2-IN-E-0013; MRA TW0997; TAF: 0997; IC: IC4067B-4;

*Address:

No. 120, Lane 180, Hsin Ho Rd.,

Lung-Tan Dist., Tao Yuan City 325, Taiwan

*Tel : 886-3-407-1718; Fax: 886-3-407-1738

Report No.: ISL-19LR308FCDSS

Issue Date : 2020/04/10



Test results given in this report apply only to the specific sample(s) tested and are traceable to national or international standard through calibration of the equipment and evaluating measurement uncertainty herein.

This report MUST not be used to claim product endorsement by TAF or any agency of the Government.

This test report shall not be reproduced except in full, without the written approval of International Standards Laboratory Corp.

VERIFICATION OF COMPLIANCE

Applicant: Zunidata Systems, Inc.

Product Description: Digital Signage / POS System / Kiosk

Brand Name: Zunidata

Model No.: 15NX-RMXXX; 22PX-RMXXX; 24PX-RMXXX;
27PX-RMXXX; 32PX-RMXXX; 43PX-RMXXX;
MCT-156HPQ-POE; MCT-156HPQ-POE-5MC;
MCT-156HPQ-XXX; MCT-215HPQ; MCT-215HPQ-5MC;
MCT-215HPQ-XXX; MCT-238HPQ-XXX;
MCT-270HPQ-XXX; MCT-320HPQ-XXX (X=0~9 or A~Z or
Blank or -)

Model Difference: Appearance and LCD size are different

FCC ID: Z28-15-43-RM

Date of test: 2019/10/16 ~ 2020/04/10

Date of EUT Received: 2019/10/16

We hereby certify that:

All the tests in this report have been performed and recorded in accordance with the standards described above and performed by an independent electromagnetic compatibility consultant, International Standards Laboratory Corp.

The test results contained in this report accurately represent the measurements of the characteristics and the energy generated by sample equipment under test at the time of the test. The sample equipment tested as described in this report is in compliance with the limits of above standards.

Test By:



Date:

2020/04/10

Barry Lee / Senior Engineer

Prepared By:



Date:

2020/04/10

Gigi Yeh / Senior Engineer

Approved By:



Date:

2020/04/10

Jerry Liu / Technical Manager

Version

Version No.	Date	Description
00	2020/04/10	Initial creation of document

Uncertainty of Measurement

Description Of Test	Uncertainty
Conducted Emission (AC power line)	2.586 dB
Field Strength of Spurious Radiation	$\leq 30\text{MHz}$: 2.96dB 30-1GHz: 4.22 dB 1-40 GHz: 4.08 dB
Conducted Power	2.412 GHz: 1.30 dB 5.805 GHz: 1.55 dB
Power Density	2.412 GHz: 1.30 dB 5.805 GHz: 1.67 dB
Frequency	0.0032%
Time	0.01%
DC Voltage	1%

Table of Contents

1. General Information	6
1.1. Product Description	6
1.2. Related Submittal(s) / Grant (s)	8
1.3. Test Methodology	8
1.4. Test Facility	8
1.5. Special Accessories	8
1.6. Equipment Modifications	8
2. System Test Configuration	9
2.1 EUT Configuration	9
2.2 EUT Exercise	9
2.3 Test Procedure	9
2.4 Configuration of Tested System	10
3. Summary of Test Results	13
4. Description of Test Modes	13
5. Conducted Emission Test	14
5.1 Standard Applicable:	14
5.2 Measurement Equipment Used:	14
5.3 EUT Setup:	14
5.4 Measurement Procedure:	15
5.5 Measurement Result:	15
6. Peak Output Power Measurement	20
6.1 Standard Applicable:	20
6.2 Measurement Equipment Used:	20
6.3 Test Set-up:	21
6.4 Measurement Procedure:	21
6.5 Measurement Result:	22
7. Spurious Emission Test	23
7.1 Standard Applicable:	23
7.2 Measurement Equipment Used:	23
7.3 Test SET-UP:	24
7.4 Measurement Procedure:	25
7.5 Field Strength Calculation	26
7.6 Measurement Result:	26
8. 100kHz Bandwidth of Band Edges Measurement	39
8.1 Standard Applicable:	39
8.2 Measurement Equipment Used:	39
8.3 Test SET-UP:	39
8.4 Measurement Procedure:	39
8.5 Field Strength Calculation	40
8.6 Measurement Result:	40
9. FREQUENCY SEPARATION	89
9.1 Standard Applicable:	89
9.2 Measurement Equipment Used:	89

9.3	Test Set-up:	89
9.4	Measurement Procedure:	89
9.5	Measurement Result:	89
10.	Number of Hopping Frequency	92
10.1	Standard Applicable:	92
10.2	Measurement Equipment Used:	92
10.3	Test Set-up:	92
10.4	Measurement Procedure:	92
10.5	Measurement Result:	92
11.	Time of Occupancy (Dwell Time)	94
11.1	Standard Applicable:	94
11.2	Measurement Equipment Used:	94
11.3	Test Set-up:	94
11.4	Measurement Procedure:	94
11.5	Measurement Result:	95
12.	20dB Bandwidth	101
12.1	Standard Applicable:	101
12.2	Measurement Equipment Used:	101
12.3	Test Set-up:	101
12.4	Measurement Procedure:	101
12.5	Measurement Result:	102
13.	Antenna Requirement	108
13.1	Standard Applicable:	108
13.2	Antenna Connected Construction:	108

1. General Information

1.1. Product Description

General:

Product Name	Digital Signage / POS System / Kiosk	
Brand Name	Zunidata	
Model Name	15NX-RMXXX; 22PX-RMXXX; 24PX-RMXXX; 27PX-RMXXX; 32PX-RMXXX; 43PX-RMXXX; MCT-156HPQ-POE; MCT-156HPQ-POE-5MC; MCT-156HPQ-XXX; MCT-215HPQ; MCT-215HPQ-5MC; MCT-215HPQ-XXX; MCT-238HPQ-XXX; MCT-270HPQ-XXX; MCT-320HPQ-XXX (X=0~9 or A~Z or Blank or -)	
Model Difference	Appearance and LCD size are different	
S/N	Z115N3119B00001 for PIFA antenna Z124P3119B00001 for Dipole Antenna	
AC In Power Port	One provided	
USB 2.0 Port	Two provided	
COM 2 (RJ45)Port	One provided	
COM 1 (RJ45)Port	One provided	
Micro USB Port	One provided	
S/PDIF Port	One provided	
Earphone Port	One provided	
LAN Port	One provided	
Mini HDMI port	One provided	
Test SW Version:	Ampak rftesttool V5.5	
RF power setting:	Refer test table	
Power Supply	12Vdc from AC/DC adapter	
	Adapter:	1. Model : 2ABL024F US; Supplier: CWT 2. Model : FSP060-DHAN3; Supplier: FSP

Bluetooth:

Frequency Range:	2402 – 2480MHz
Bluetooth Version:	V2.1 + EDR
Channel number:	79 channels
Tune up power (Peak):	GFSK : 5.68 dBm +/- 1 dB π / 4DQPSK: 2.44 dBm +/- 1 dB 8DPSK: 2.41 dBm +/- 1 dB
Antenna Designation:	Dipole Antenna WiFi 2.4G Antenna : 1.5 dBi PIFA Antenna WiFi 2.4G Antenna : -1.16 dBi

This report applies for BT V2.1 + EDR

Remark: The above DUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

BT Power setting

Mode	Freq(MHz)	Power Setting (dBm)	Software value
BDR	2402	0dBm	0dBm
	2441	0dBm	0dBm
	2480	0dBm	0dBm
EDR (1M)	2402	0dBm	0dBm
	2441	0dBm	0dBm
	2480	0dBm	0dBm
EDR (2M)	2402	0dBm	0dBm
	2441	0dBm	0dBm
	2480	0dBm	0dBm

1.2. Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for **FCC ID: Z28-15-43-RM** filing to comply with Section 15.247 of the FCC Part 15, Subpart C Rules.

1.3. Test Methodology

Both conducted and radiated testing were performed according to the procedures in ANSI C63.10: 2013. Radiated testing was performed at an antenna to EUT distance 3 meters.

KDB Document: 558074 D01 15.247 Meas Guidance v05r02

1.4. Test Facility

The measurement facilities used to collect the 3m Radiated Emission and AC power line conducted data are located on the address of International Standards Laboratory Corp. <LT Lab.> No. 120, Lane 180, Hsin Ho Rd., Lung-Tan Dist., Tao Yuan City 325, Taiwan which are constructed and calibrated to meet the FCC requirements in documents . FCC Registration Number is: 487532; Designation Number is: TW0997, Canada Registration Number: 4067B-4.

1.5. Special Accessories

Not available for this EUT intended for grant.

1.6. Equipment Modifications

Not available for this EUT intended for grant.

2. System Test Configuration

2.1 EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

2.2 EUT Exercise

The EUT (Transmitter) was tested with a test program to fix the TX/RX frequency that was for the purpose of the measurements. For more information please see test data and APPENDIX 1 for set-up photographs.

2.3 Test Procedure

2.3.1 Conducted Emissions

The EUT is placed on a turn table which is 0.8 m above ground plane. According to the requirements in Section 6 of ANSI C63.10: 2013. Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR 16-1-1 Quasi-Peak and Average detector mode.

2.3.2 Radiated Emissions

The EUT is placed on a turn table which is 0.8 m/1.5m (frequency above 1GHz) above ground plane. The turn table shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max. emission, the relative positions of this hand-held transmitter(EUT) was rotated through three orthogonal axes according to the requirements in Section 6 and 11 of ANSI C63.10: 2013.

2.4 Configuration of Tested System

Fig. 2-1 Configuration of Tested System (Fixed channel)

Radiated Emission

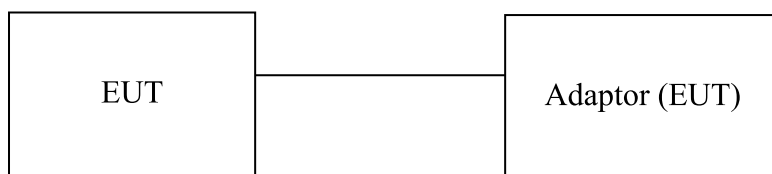
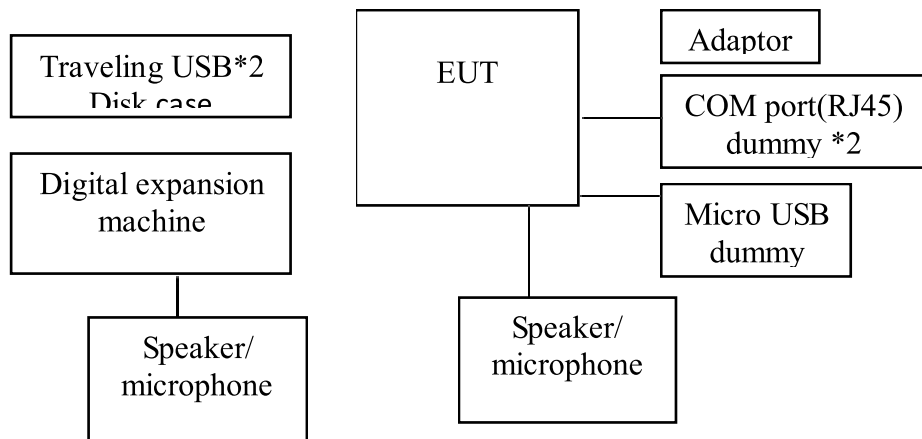


Table 1 Equipment Used in Tested System

Item	Equipment	Mfr/Brand	Model/ Type No.	Series No.	Data Cable	Power Cord
1	EUT (adaptor)	CWT	2ABL024F	NA	NA	Non-shielding
2	EUT (adaptor)	FSP	FSP060-DHAN3	NA	NA	Non-shielding

AC Conducted Emission



----- Remote -----

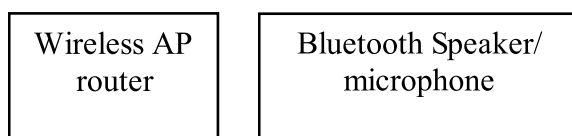


Table 1-1 Support Equipment Used in Tested System

Item	Equipment	Mrf/Brand	Model name	Series No	Data Cable	Power Cable
1	USB3.0 HDD*2	AKiTiO	SK2-U31AS-AKT	N/A	Shielded /1m	N/A
2	LCD monitor	DELL	P2715Qt	N/A	Shielded /1.8m	Non-shielded /1.8m
3	Speaker/microphone*2	HTC	RC-E160	N/A	Non-shielded /1.5m	N/A
4	Digital expansion machine	CREATIVE	DDTS-100	N/A	Non-shielded /1.5m	N/A
5	Portable Computer	Lenovo	TP00067B	N/A	N/A	Non-shielded /1.8m
6	Bluetooth Speaker/microphone	N/A	SA-868	N/A	N/A	N/A
7	Wireless AP router	ASUS	RT-AC66U	80195030	N/A	Non-shield / 1.8m

I/O Cable Condition of EUT and Support Units

Description	Path	Cable Length	Cable Type	Connector Type
AC Power cable	100V (~240V) to EUT SPS	1.8m	Non-shielded	Plastic Head
DC Power cable	EUT SPS to EUT DC input port	1.2m	Non-shielded	Metal Head
USB Data Cable	USB3.0 HDD to EUT USB Port	1m	Shielded	Metal Head
COM 2(RJ45) Data Cable	COM 2(RJ45) Data Cable to EUT COM 2 Port with dummy	1.2m	Non-shielded	Plastic Head
COM 1(RJ45) Data Cable	COM 1(RJ45) Data Cable to EUT COM 1 Port with dummy	1.2m	Non-shielded	Plastic Head
USB Data Cable	USB Data Cable to EUT Micro USB Port with dummy	0.9m	Non-shielded	Metal Head
S/PDIF Data Cable	EUT S/PDIF Port to Digital expansion machine S/PDIF Port	1.5m	Non-shielded	Plastic Head
Audio Data Cable	EUT Audio out Port to Speaker/microphone	1.5m	Non-shielded	Metal Head
LAN Data Cable	NB LAN Port to EUT LAN Port	10m	Non-shielded	Plastic Head
Audio Data Cable	Digital expansion machine S/PDIF Port to Speaker/microphone	1.5m	Non-shielded	Metal Head
Mini HDMI cable	EUT Mini HDMI Port to LCD monitor	1.8m	Shielded	Metal Head

Note: All the above equipment/cables were placed in worse case positions to maximize emission signals during emission test.

Grounding: Grounding was in accordance with the manufacturer's requirements and conditions for the intended use.

3. Summary of Test Results

FCC Rules	Description Of Test	Result
§15.207(a)	AC Power line Conducted Emission	Compliant
§15.247(b)(1)	Peak Output Power	Compliant
§15.247(d)	100 kHz Bandwidth Of Frequency Band Edges	Compliant
§15.247(c)	Spurious Emission	Compliant
§15.247(a)(1)	Frequency Separation	Compliant
§15.247(a)(1)(iii)	Number of hopping frequency	Compliant
§15.247(a)(1)(ii)	Time of Occupancy	Compliant
§15.247(a)(1)	20dB Bandwidth	Compliant
§15.203, §15.247(c)	Antenna Requirement	Compliant

4. Description of Test Modes

Test program used to control the EUT for staying in continuous transmitting and receiving mode is programmed.

Channel low (2402MHz), mid (2441MHz) and high (2480MHz) with each modulation were chosen for full testing.

The worst case BDR mode was reported for Radiated Emission.

5. Conducted Emission Test

5.1 Standard Applicable:

According to §15.207 frequency range within 150kHz to 30MHz shall not exceed the Limit table as below.

Frequency range MHz	Limits dB(uV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50
Note 1.The lower limit shall apply at the transition frequencies 2.The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.		

5.2 Measurement Equipment Used:

Location	Equipment Name	Brand	Model	S/N	Last Cal. Date	Next Cal. Date
Conduction 02	LISN 26	R&S	ENV216	102378	11/21/2018	11/21/2019
Conduction 02	LISN 26	R&S	ENV216	102378	11/21/2019	11/21/2020
Conduction 02	LISN 20	R&S	ENV216	101477	07/31/2019	07/31/2020
Conduction 02	Conduction 02-1 Cable	WOKEN	CFD 300-NL	Conduction 02 -1	09/11/2019	09/11/2020
Conduction 02	EMI Receiver 14	ROHDE&SCHWARZ	ESCI	101034	05/31/2019	05/31/2020
Conduction 02	ISN T8 10	Teseq GmbH	ISN T800	42773	08/02/2019	08/02/2020
Conduction 02	Capacitive Voltage Probe	FCC	F-CVP-1	68	02/19/2019	02/19/2020
Conduction 02	Current Probe	SCHAFFNER	SMZ 11	18030	02/19/2019	02/19/2020

5.3 EUT Setup:

1. The conducted emission tests were performed in the test site, using the setup in accordance with the ANSI C63.10-2013.
2. The AC/DC Power adaptor of EUT was plug-in LISN. The EUT was placed flushed with the rear of the table.
3. The LISN was connected with 120Vac/60Hz power source.

5.4 Measurement Procedure:

1. The EUT was placed on a table which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. Repeat above procedures until all frequency measured were complete.
4. Both 120V & 240V have been verified, and 120V/60Hz was defined as the worst-case and record in the report.

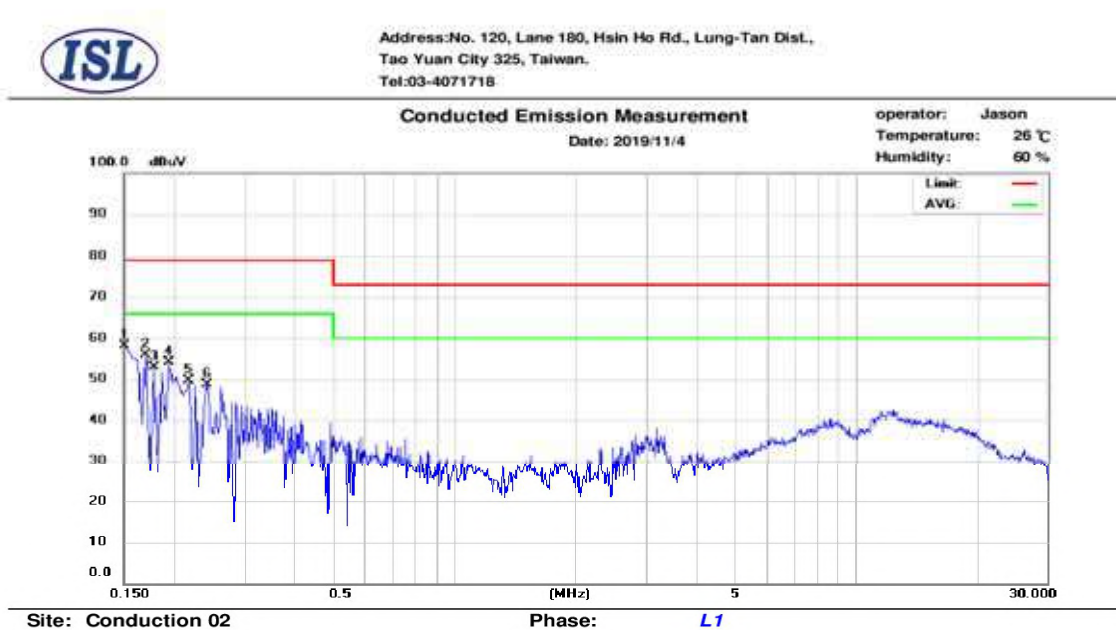
5.5 Measurement Result:

The initial step in collecting conducted data is a spectrum analyzer peak scan of the measurement range. Significant peaks are then marked as shown on the following data page, and these signals are then quasi-peaked.

Note: Refer to next page for measurement data and plots.

AC POWER LINE CONDUCTED EMISSION TEST DATA

Operation Mode:	Normal Operation (Worst data)	Adaptor mode:	2ABL024F
-----------------	-------------------------------	---------------	----------



No.	Frequency (MHz)	QP_R (dBuV)	AVG_R (dBuV)	Correct Factor (dB)	QP Emission (dBuV)	QP Limit (dBuV)	QP Margin (dB)	AVG Emission (dBuV)	AVG Limit (dBuV)	AVG Margin (dB)
1	0.150	44.11	28.25	9.63	53.74	79.00	-25.26	37.88	66.00	-28.12
2	0.170	39.44	14.42	9.63	49.07	79.00	-29.93	24.05	66.00	-41.95
3	0.178	37.78	11.01	9.62	47.40	79.00	-31.60	20.63	66.00	-45.37
4	0.194	36.61	15.69	9.62	46.23	79.00	-32.77	25.31	66.00	-40.69
5	0.218	34.36	15.35	9.62	43.98	79.00	-35.02	24.97	66.00	-41.03
6	0.242	31.72	11.84	9.62	41.34	79.00	-37.66	21.46	66.00	-44.54

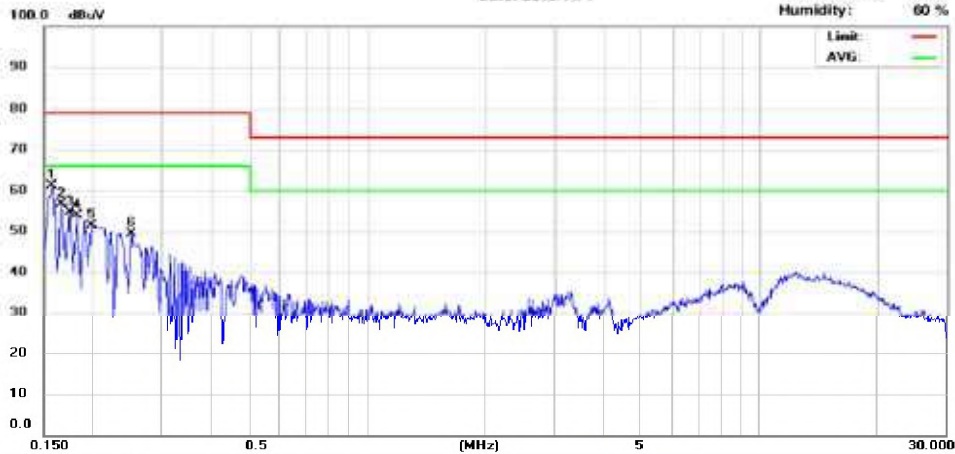


Address: No. 120, Lane 180, Hsin Ho Rd., Lung-Tan Dist.,
 Tao Yuan City 325, Taiwan.
 Tel: 03-4071718

Conducted Emission Measurement

Date: 2019/11/4

operator: Jason
 Temperature: 26 °C
 Humidity: 60 %

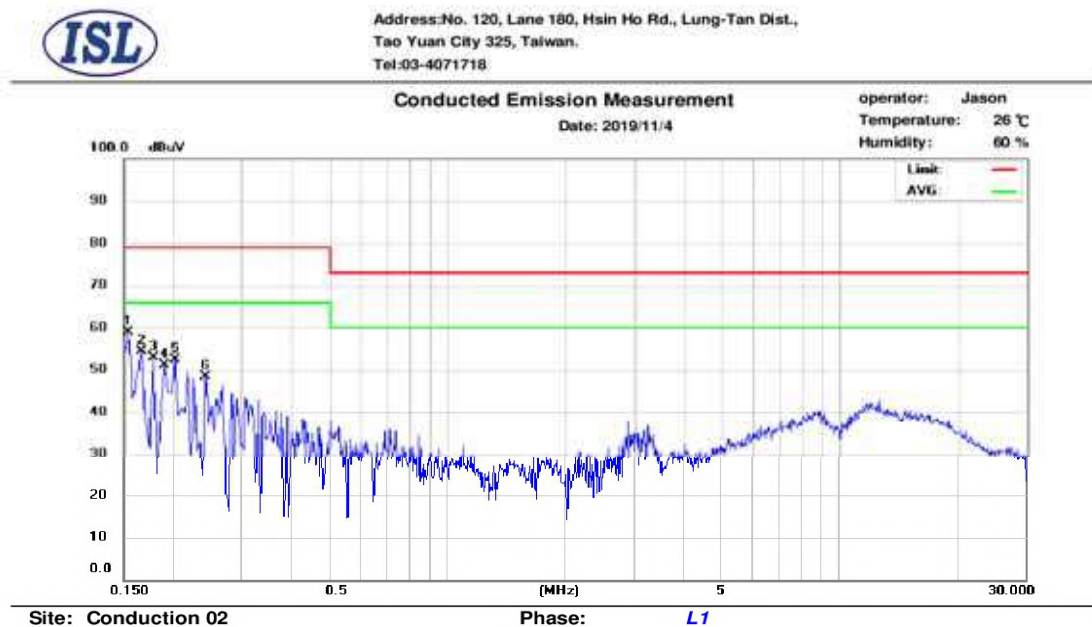


Site: Conduction 02

Phase: **N**

No.	Frequency (MHz)	QP_R (dBuV)	AVG_R (dBuV)	Correct Factor (dB)	QP Emission (dBuV)	QP Limit (dBuV)	QP Margin (dB)	AVG Emission (dBuV)	AVG Limit (dBuV)	AVG Margin (dB)
1	0.158	46.30	30.79	9.63	55.93	79.00	-23.07	40.42	66.00	-25.58
2	0.166	40.58	18.89	9.63	50.21	79.00	-28.79	28.52	66.00	-37.48
3	0.174	38.89	12.05	9.63	48.52	79.00	-30.48	21.68	66.00	-44.32
4	0.182	37.24	10.44	9.62	46.86	79.00	-32.14	20.06	66.00	-45.94
5	0.199	38.92	20.50	9.62	48.54	79.00	-30.46	30.12	66.00	-35.88
6	0.250	33.46	15.21	9.63	43.09	79.00	-35.91	24.84	66.00	-41.16

Operation Mode:	Normal Operation (Worst data)	Adaptor mode:	FSP060-DHAN3
-----------------	-------------------------------	---------------	--------------



No.	Frequency (MHz)	QP_R (dBuV)	AVG_R (dBuV)	Correct Factor (dB)	QP Emission (dBuV)	QP Limit (dBuV)	QP Margin (dB)	AVG Emission (dBuV)	AVG Limit (dBuV)	AVG Margin (dB)
1	0.154	44.36	31.27	9.63	53.99	79.00	-25.01	40.90	66.00	-25.10
2	0.166	39.03	13.73	9.63	48.66	79.00	-30.34	23.36	66.00	-42.64
3	0.178	37.55	11.05	9.62	47.17	79.00	-31.83	20.67	66.00	-45.33
4	0.190	36.47	14.87	9.62	46.09	79.00	-32.91	24.49	66.00	-41.51
5	0.202	37.46	25.66	9.62	47.08	79.00	-31.92	35.28	66.00	-30.72
6	0.242	32.04	15.50	9.62	41.66	79.00	-37.34	25.12	66.00	-40.88

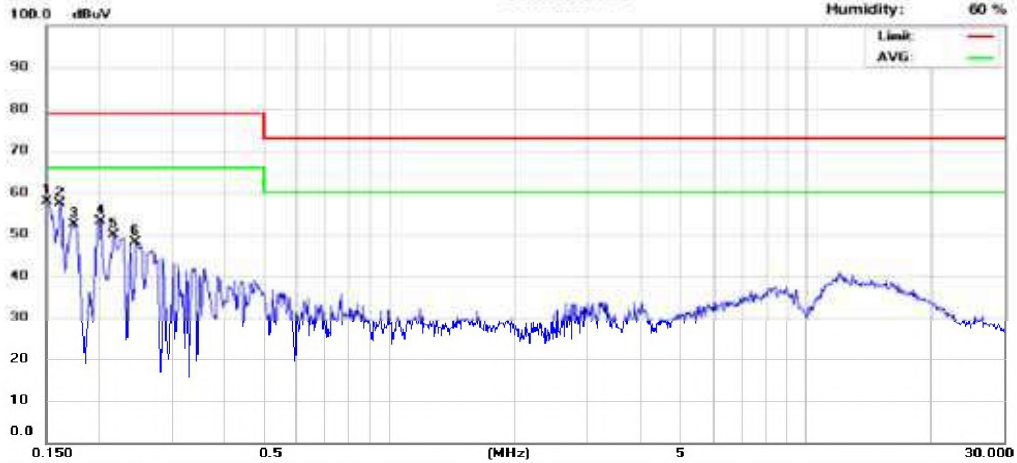


Address: No. 120, Lane 180, Hsin Ho Rd., Lung-Tan Dist.,
 Tao Yuan City 325, Taiwan.
 Tel: 03-4071718

Conducted Emission Measurement

Date: 2019/11/4

operator: Jason
 Temperature: 26 °C
 Humidity: 60 %



Site: Conduction 02

Phase: **N**

No.	Frequency (MHz)	QP_R (dBuV)	AVG_R (dBuV)	Correct Factor (dB)	QP Emission (dBuV)	QP Limit (dBuV)	QP Margin (dB)	AVG Emission (dBuV)	AVG Limit (dBuV)	AVG Margin (dB)
1	0.150	45.93	27.38	9.63	55.56	79.00	-23.44	37.01	66.00	-28.99
2	0.162	43.34	27.36	9.63	52.97	79.00	-26.03	36.99	66.00	-29.01
3	0.174	39.39	12.00	9.63	49.02	79.00	-29.98	21.63	66.00	-44.37
4	0.202	38.41	21.43	9.62	48.03	79.00	-30.97	31.05	66.00	-34.95
5	0.218	35.26	15.47	9.62	44.88	79.00	-34.12	25.09	66.00	-40.91
6	0.246	32.60	12.40	9.62	42.22	79.00	-36.78	22.02	66.00	-43.98

6. Peak Output Power Measurement

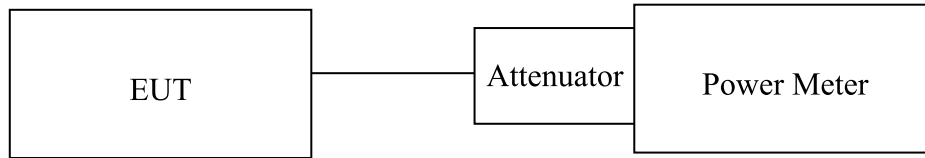
6.1 Standard Applicable:

According to §15.247(b)(1), For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 hopping channels, and all frequency hopping systems in the 5725-5850MHz band: 1Watt. For all other frequency hopping systems in the 2400 – 2483.5MHz band: 0.125 Watts.

6.2 Measurement Equipment Used:

Location Conducted	Equipment Name	Brand	Model	S/N	Last Cal. Date	Next Cal. Date
Conducted	Power Meter	Anritsu	ML2495A	1116010	10/04/2019	10/04/2020
Conducted	Power Sensor	Anritsu	MA2411B	34NKF50	10/04/2019	10/04/2020
Conducted	Power Sensor	DARE	RPR3006W	13I00030SNO33	01/11/2019	01/11/2020
Conducted	Power Sensor	DARE	RPR3006W	14I00889SNO35	06/27/2019	06/27/2020
Conducted	Power Sensor	DARE	RPR3006W	14I00889SNO36	06/27/2019	06/27/2020
Conducted	Temperature Chamber	KSON	THS-B4H100	2287	02/19/2019	02/19/2020
Conducted	DC Power supply	ABM	8185D	N/A	01/10/2019	01/10/2020
Conducted	AC Power supply	EXTECH	CFC105W	NA	N/A	N/A
Conducted	Spectrum analyzer	Keysight	N9010A	MY56070257	10/05/2019	10/05/2020
Conducted	Spectrum analyzer	R&S	FSP40	100116	01/10/2019	01/10/2020
Conducted	Test Software	DARE	Radiation Ver:2013.1.23	NA	NA	NA
Conducted	Test Software	R&S	CMUGO Ver:2.0.0	N/A	N/A	N/A
Conducted	Radio Communication Analyzer	R&S	CMU200	111968	10/29/2019	10/29/2020
Conducted	Radio Communication Analyzer	R&S	CMW500	1201.002K50108 793-JG	10/11/2019	10/11/2020
Conducted	BT Simulator	Agilent	N4010A	MY48100200	NA	NA
Conducted	GPS Simulator	Welnavigate	GS-50	701523	NA	NA

6.3 Test Set-up:



6.4 Measurement Procedure:

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the power meter
3. Record the max. reading.
4. Repeat above procedures until all frequency measured were complete.

6.5 Measurement Result:

BDR Mode

Frequency (MHz)	Peak Reading Power (dBm)	Output Power (dBm)	Output Power (W)	Limit (W)
Low	5.58	5.58	0.00362	1
Mid	5.68	5.68	0.00370	1
High	5.32	5.32	0.00340	1

EDR 2M Mode

Frequency (MHz)	Peak Reading Power (dBm)	Output Power (dBm)	Output Power (W)	Limit (W)
Low	2.15	2.15	0.00164	0.125
Mid	2.44	2.44	0.00175	0.125
High	1.87	1.87	0.00154	0.125

EDR 3M Mode

Frequency (MHz)	Peak Reading Power (dBm)	Output Power (dBm)	Output Power (W)	Limit (W)
Low	2.16	2.16	0.00164	0.125
Mid	2.41	2.41	0.00174	0.125
High	1.85	1.85	0.00153	0.125

7. Spurious Emission Test

7.1 Standard Applicable:

According to §15.247(d), all other emissions outside these bands shall not exceed the general radiated emission limits specified in §15.209(a). And according to §15.33(a)(1), for an intentional radiator operates below 10GHz, the frequency range of measurements: to the tenth harmonic of the highest fundamental frequency or to 40GHz, whichever is lower.

7.2 Measurement Equipment Used:

7.2.1. Conducted Emission at antenna port:

Refer to section 6.2 for details.

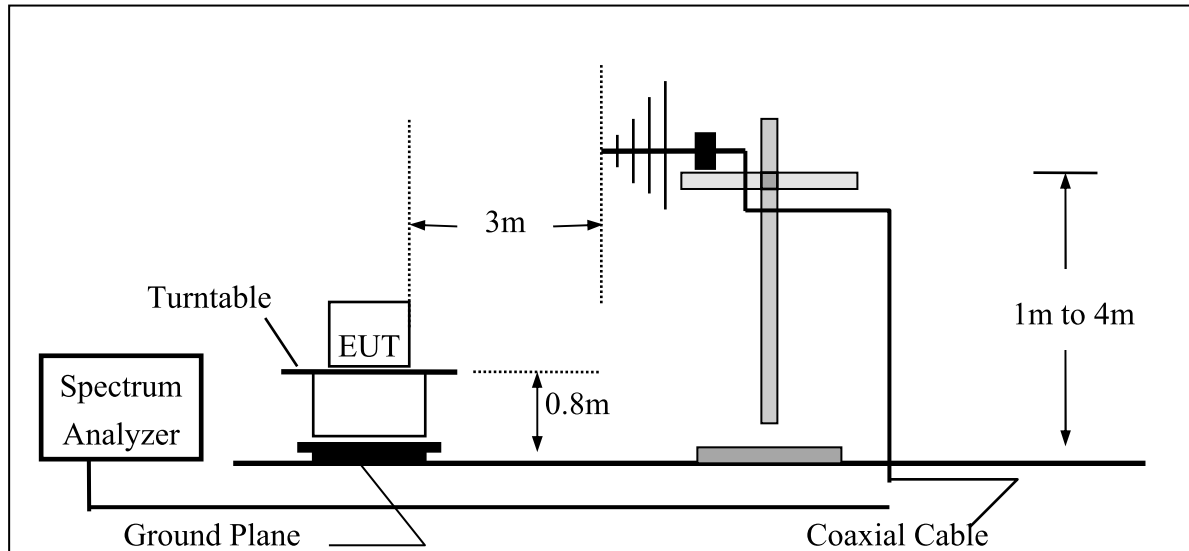
7.2.2. Radiated emission:

Location	Equipment Name	Brand	Model	S/N	Last Cal. Date	Next Cal. Date
Chamber 19	Spectrum analyzer	R&S	FSP40	100116	01/10/2020	01/10/2021
Chamber 19	EMI Receiver	R&S	ESR3	102461	08/08/2018	08/08/2020
Chamber 19	Loop Antenna	EM	EM-6879	271	05/31/2019	05/31/2020
Chamber 19	Bilog Antenna (30MHz-1GHz)	Schwarzbeck	VULB9168 w 5dB Att.	736	01/29/2019	01/29/2020
Chamber 19	Horn antenna (1GHz-18GHz)	Schwarzbeck	9120D	9120D-1627	06/17/2019	06/17/2020
Chamber 19	Horn antenna (18GHz-26GHz)	Com-power	AH-826	081001	11/25/2019	11/25/2020
Chamber 19	Horn antenna (26GHz-40GHz)	Com-power	AH-640	100A	03/29/2019	03/29/2021
Chamber 19	Preamplifier (9kHz-1GHz)	HP	8447F	3113A06362	01/14/2020	01/14/2021
Chamber 19	Preamplifier (1GHz-26GHz)	Agilent	8449B	3008A02471	10/05/2019	10/05/2020
Chamber 19	Preamplifier (26GHz-40GHz)	MITEQ	JS4-26004000-27-5A	818471	05/06/2019	05/06/2020
Chamber 19	RF Cable (9kHz-18GHz)	HUBER SU-HNER	Sucoflex 104A	MY1397/4A	01/17/2020	01/17/2021
Chamber 19	RF Cable (18GHz-40GHz)	HUBER SU-HNER	Sucoflex 102	27963/2&374 21/2	11/21/2019	11/21/2020
Chamber 19	Signal Generator	Anritsu	MG3692A	20311	01/09/2020	01/09/2021
Chamber 19	Test Software	Audix	E3 Ver:6.12023	N/A	N/A	N/A
Chamber 19	Magnetic Field Meter	Combinova	MFM-10	645	10/16/2019	10/16/2020
Chamber 19	Magnetic Field Meter	Combinova	MFM-1000	619	12/06/2019	12/06/2020
Chamber 19	Electric Field Meter	Combinova	EFM-200	402	10/16/2019	10/16/2020
Chamber 19	E-field probe	Narda / Wandel & Goltermann	EF-0691 + NBM-520	D-0135 + D-0526	03/02/2019	03/02/2020

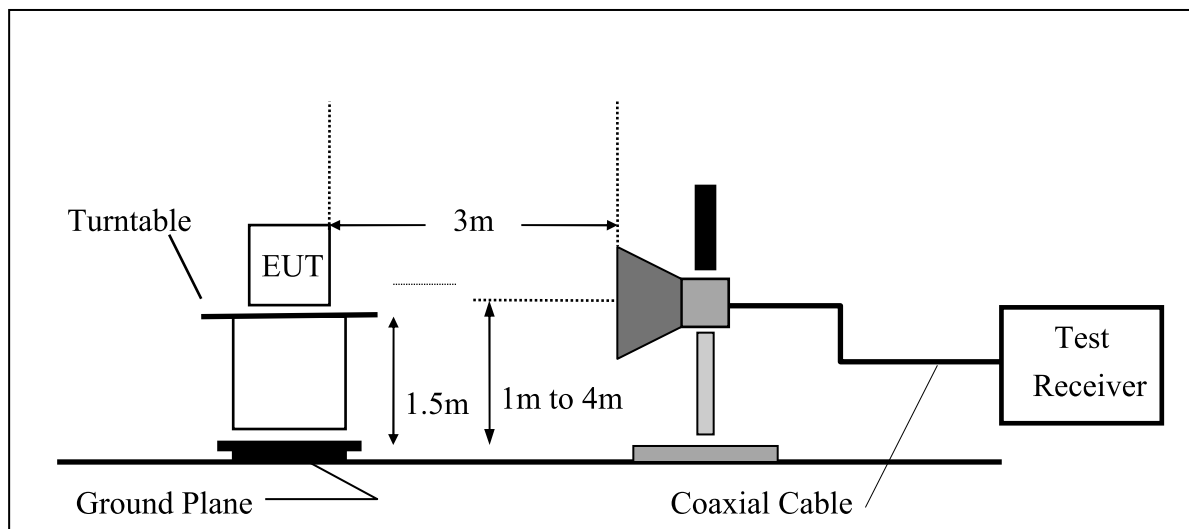
7.3 Test SET-UP:

The test item only performed radiated mode

(A) Radiated Emission Test Set-Up, Frequency Below 1000MHz



(B) Radiated Emission Test Set-Up Frequency Over 1 GHz



7.4 Measurement Procedure:

1. According 414788 section 2, Either OATS or chamber for radiated emission below 30MHz, the test was done at 966 chamber, the test site was evaluated with OATS and the Chamber has test signals level greater than OATS's .
2. The EUT was placed on a turn table which is 0.8m/1.5m above ground plane in 966 chamber.
3. The turn table shall rotate 360 degrees to determine the position of maximum emission level.
4. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emissions.
5. When measurement procedures for electric field radiated emissions above 1 GHz the EUT measurement is to be made “while keeping the antenna in the ‘cone of radiation’ from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response.” is still within the 3dB illumination BW of the measurement antenna.
6. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
7. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
8. Repeat above procedures until all frequency measured were complete.

Test receiver setting : Blew 1GHz
 Detector : Average(9kHz – 90kHz, 110kHz – 90kHz), Quasi-Peak
 Bandwidth : 9kHz, 120kHz
 Test spectrum setting : Above 1GHz
 Peak : RBW=1MHz, VBW=3MHz, Sweep=auto
 Average (for BT) : RBW=1MHz, VBW=0.5KHz, Sweep=auto

Average Measurement Setting (VBW)

Mode	ON time (ms)	Total time (ms)	Duty Cycle	Duty Factor	1/Ton	VBW (kHz)
1M	2.850	3.750	76.000%	1.19	0.351	0.5
2M	2.880	3.750	76.800%	1.15	0.347	0.5
3M	2.895	3.780	76.587%	1.16	0.345	0.5

7.5 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor(if any) from the measured reading. The basic equation with a sample calculation is as follows:

$$FS = RA + AF + CL - AG$$

Where	FS = Field Strength	CL = Cable Attenuation Factor (Cable Loss)
	RA = Reading Amplitude	AG = Amplifier Gain
	AF = Antenna Factor	

7.6 Measurement Result:

Note: Refer to next page spectrum analyzer data chart and tabular data sheets.

Dipole Antenna

Radiated Spurious Emission Measurement Result: (below 1GHz) (Worst case: BDR)

Operation Mode	TX CH Low	Test Date	2020/01/21
Fundamental Frequency	2402MHz	Test By	Barry
Temperature	25 °C	Humidity	60 %

No	Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark	Pol V/H
1	355.92	37.74	-2.88	34.86	46.00	-11.14	Peak	VERTICAL
2	427.70	42.58	-1.48	41.10	46.00	-4.90	Peak	VERTICAL
3	625.58	33.65	1.77	35.42	46.00	-10.58	Peak	VERTICAL
4	641.10	35.25	1.96	37.21	46.00	-8.79	Peak	VERTICAL
5	854.50	32.69	5.41	38.10	46.00	-7.90	Peak	VERTICAL
6	927.25	31.05	6.52	37.57	46.00	-8.43	Peak	VERTICAL
1	174.53	44.35	-5.60	38.75	43.50	-4.75	Peak	HORIZONTAL
2	180.35	44.08	-6.14	37.94	43.50	-5.56	Peak	HORIZONTAL
3	191.02	41.95	-7.08	34.87	43.50	-8.63	Peak	HORIZONTAL
4	569.32	32.91	0.69	33.60	46.00	-12.40	Peak	HORIZONTAL
5	825.40	31.83	5.07	36.90	46.00	-9.10	Peak	HORIZONTAL
6	875.84	31.94	5.71	37.65	46.00	-8.35	Peak	HORIZONTAL

Remark:

- 1 No further spurious emissions detected from the lowest internal frequency and 30MHz.
- 2 Measuring frequencies from the lowest internal frequency to the 1GHz.
- 3 Radiated emissions measured in frequency range from 9MHz to 1000MHz were made with an instrument detector setting 9-90kHz/110-490kHz using PK/AV and other Frequency Band using PK/QP
- 4 Measurement result within this frequency range shown “ - ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- 5 The IF bandwidth of SPA between 9kHz to 30MHz was 10kHz, VBW= 30kHz; between 30MHz to 1GHz was 100kHz, VBW=300kHz.

Radiated Spurious Emission Measurement Result (below 1GHz)

Operation Mode	TX CH Mid	Test Date	2020/01/21
Fundamental Frequency	2441MHz	Test By	Barry
Temperature	25 °C	Humidity	60 %

No	Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark	Pol V/H
1	355.92	40.52	-2.88	37.64	46.00	-8.36	Peak	VERTICAL
2	427.70	42.52	-1.48	41.04	46.00	-4.96	Peak	VERTICAL
3	625.58	33.63	1.77	35.40	46.00	-10.60	Peak	VERTICAL
4	641.10	35.33	1.96	37.29	46.00	-8.71	Peak	VERTICAL
5	854.50	32.02	5.41	37.43	46.00	-8.57	Peak	VERTICAL
6	926.28	31.35	6.51	37.86	46.00	-8.14	Peak	VERTICAL
1	177.44	44.79	-5.87	38.92	43.50	-4.58	Peak	HORIZONTAL
2	191.02	41.09	-7.08	34.01	43.50	-9.49	Peak	HORIZONTAL
3	213.33	39.73	-7.20	32.53	43.50	-10.97	Peak	HORIZONTAL
4	570.29	33.37	0.71	34.08	46.00	-11.92	Peak	HORIZONTAL
5	820.55	29.93	5.00	34.93	46.00	-11.07	Peak	HORIZONTAL
6	875.84	32.14	5.71	37.85	46.00	-8.15	Peak	HORIZONTAL

Remark:

- 1 No further spurious emissions detected from the lowest internal frequency and 30MHz.
- 2 Measuring frequencies from the lowest internal frequency to the 1GHz.
- 3 Radiated emissions measured in frequency range from 9MHz to 1000MHz were made with an instrument detector setting 9-90kHz/110-490kHz using PK/AV and other Frequency Band using PK/QP
- 4 Measurement result within this frequency range shown “ - ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- 5 The IF bandwidth of SPA between 9kHz to 30MHz was 10kHz, VBW= 30kHz; between 30MHz to 1GHz was 100kHz, VBW=300kHz.

Radiated Spurious Emission Measurement Result (below 1GHz)

Operation Mode TX CH High
Fundamental Frequency 2480MHz
Temperature 25 °C

Test Date 2020/01/21
Test By Barry
Humidity 60 %

No	Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark	Pol V/H
1	355.92	35.31	-2.88	32.43	46.00	-13.57	Peak	VERTICAL
2	427.70	43.92	-1.48	42.44	46.00	-3.56	Peak	VERTICAL
3	625.58	33.75	1.77	35.52	46.00	-10.48	Peak	VERTICAL
4	641.10	35.10	1.96	37.06	46.00	-8.94	Peak	VERTICAL
5	855.47	31.27	5.41	36.68	46.00	-9.32	Peak	VERTICAL
6	875.84	32.02	5.71	37.73	46.00	-8.27	Peak	VERTICAL
1	174.53	44.12	-5.60	38.52	43.50	-4.98	Peak	HORIZONTAL
2	177.44	44.72	-5.87	38.85	43.50	-4.65	Peak	HORIZONTAL
3	213.33	38.00	-7.20	30.80	43.50	-12.70	Peak	HORIZONTAL
4	570.29	33.09	0.71	33.80	46.00	-12.20	Peak	HORIZONTAL
5	845.77	29.82	5.31	35.13	46.00	-10.87	Peak	HORIZONTAL
6	875.84	32.11	5.71	37.82	46.00	-8.18	Peak	HORIZONTAL

Remark:

- 1 No further spurious emissions detected from the lowest internal frequency and 30MHz.
- 2 Measuring frequencies from the lowest internal frequency to the 1GHz.
- 3 Radiated emissions measured in frequency range from 9MHz to 1000MHz were made with an instrument detector setting 9-90kHz/110-490kHz using PK/AV and other Frequency Band using PK/QP
- 4 Measurement result within this frequency range shown “ - ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- 5 The IF bandwidth of SPA between 9kHz to 30MHz was 10kHz, VBW= 30kHz; between 30MHz to 1GHz was 100kHz, VBW=300kHz.

PIFA Antenna

Radiated Spurious Emission Measurement Result: (below 1GHz) (Worst case: BDR)

Operation Mode	TX CH Low	Test Date	2020/01/21
Fundamental Frequency	2402MHz	Test By	Barry
Temperature	25 °C	Humidity	60 %

No	Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark	Pol V/H
1	71.71	43.41	-8.21	35.20	40.00	-4.80	Peak	VERTICAL
2	395.69	40.93	-2.08	38.85	46.00	-7.15	Peak	VERTICAL
3	500.45	41.47	-0.64	40.83	46.00	-5.17	Peak	VERTICAL
4	625.58	38.66	1.77	40.43	46.00	-5.57	Peak	VERTICAL
5	750.71	32.85	3.99	36.84	46.00	-9.16	Peak	VERTICAL
6	952.47	26.90	7.02	33.92	46.00	-12.08	Peak	VERTICAL
1	250.19	33.65	-5.51	28.14	46.00	-17.86	Peak	HORIZONTAL
2	375.32	34.88	-2.39	32.49	46.00	-13.51	Peak	HORIZONTAL
3	500.45	31.10	-0.64	30.46	46.00	-15.54	Peak	HORIZONTAL
4	625.58	31.64	1.77	33.41	46.00	-12.59	Peak	HORIZONTAL
5	750.71	29.56	3.99	33.55	46.00	-12.45	Peak	HORIZONTAL
6	952.47	27.63	7.02	34.65	46.00	-11.35	Peak	HORIZONTAL

Remark:

- 1 No further spurious emissions detected from the lowest internal frequency and 30MHz.
- 2 Measuring frequencies from the lowest internal frequency to the 1GHz.
- 3 Radiated emissions measured in frequency range from 9MHz to 1000MHz were made with an instrument detector setting 9-90kHz/110-490kHz using PK/AV and other Frequency Band using PK/QP
- 4 Measurement result within this frequency range shown “ - ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- 5 The IF bandwidth of SPA between 9kHz to 30MHz was 10kHz, VBW= 30kHz; between 30MHz to 1GHz was 100kHz, VBW=300kHz.

Radiated Spurious Emission Measurement Result (below 1GHz)

Operation Mode	TX CH Mid	Test Date	2020/01/21
Fundamental Frequency	2441MHz	Test By	Barry
Temperature	25 °C	Humidity	60 %

No	Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark	Pol V/H
1	71.71	45.01	-8.21	36.80	40.00	-3.20	Peak	VERTICAL
2	395.69	37.03	-2.08	34.95	46.00	-11.05	Peak	VERTICAL
3	500.45	39.18	-0.64	38.54	46.00	-7.46	Peak	VERTICAL
4	625.58	33.69	1.77	35.46	46.00	-10.54	Peak	VERTICAL
5	750.71	32.83	3.99	36.82	46.00	-9.18	Peak	VERTICAL
6	875.84	32.06	5.71	37.77	46.00	-8.23	Peak	VERTICAL
1	250.19	35.15	-5.51	29.64	46.00	-16.36	Peak	HORIZONTAL
2	500.45	37.30	-0.64	36.66	46.00	-9.34	Peak	HORIZONTAL
3	520.82	30.85	0.08	30.93	46.00	-15.07	Peak	HORIZONTAL
4	625.58	29.56	1.77	31.33	46.00	-14.67	Peak	HORIZONTAL
5	810.85	26.46	4.85	31.31	46.00	-14.69	Peak	HORIZONTAL
6	875.84	29.53	5.71	35.24	46.00	-10.76	Peak	HORIZONTAL

Remark:

- 1 No further spurious emissions detected from the lowest internal frequency and 30MHz.
- 2 Measuring frequencies from the lowest internal frequency to the 1GHz.
- 3 Radiated emissions measured in frequency range from 9MHz to 1000MHz were made with an instrument detector setting 9-90kHz/110-490kHz using PK/AV and other Frequency Band using PK/QP
- 4 Measurement result within this frequency range shown “ - ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- 5 The IF bandwidth of SPA between 9kHz to 30MHz was 10kHz, VBW= 30kHz; between 30MHz to 1GHz was 100kHz, VBW=300kHz.

Radiated Spurious Emission Measurement Result (below 1GHz)

Operation Mode TX CH High
Fundamental Frequency 2480MHz
Temperature 25 °C

Test Date 2020/01/21
Test By Barry
Humidity 60 %

No	Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark	Pol V/H
1	83.35	44.25	-10.82	33.43	40.00	-6.57	Peak	VERTICAL
2	395.69	38.99	-2.08	36.91	46.00	-9.09	Peak	VERTICAL
3	500.45	40.26	-0.64	39.62	46.00	-6.38	Peak	VERTICAL
4	625.58	40.09	1.77	41.86	46.00	-4.14	Peak	VERTICAL
5	750.71	34.78	3.99	38.77	46.00	-7.23	Peak	VERTICAL
6	847.71	27.75	5.32	33.07	46.00	-12.93	Peak	VERTICAL
1	250.19	38.90	-5.51	33.39	46.00	-12.61	Peak	HORIZONTAL
2	500.45	33.35	-0.64	32.71	46.00	-13.29	Peak	HORIZONTAL
3	521.79	42.04	0.11	42.15	46.00	-3.85	Peak	HORIZONTAL
4	625.58	34.56	1.77	36.33	46.00	-9.67	Peak	HORIZONTAL
5	750.71	30.52	3.99	34.51	46.00	-11.49	Peak	HORIZONTAL
6	875.84	28.18	5.71	33.89	46.00	-12.11	Peak	HORIZONTAL

Remark:

- 1 No further spurious emissions detected from the lowest internal frequency and 30MHz.
- 2 Measuring frequencies from the lowest internal frequency to the 1GHz.
- 3 Radiated emissions measured in frequency range from 9MHz to 1000MHz were made with an instrument detector setting 9-90kHz/110-490kHz using PK/AV and other Frequency Band using PK/QP
- 4 Measurement result within this frequency range shown “ - ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- 5 The IF bandwidth of SPA between 9kHz to 30MHz was 10kHz, VBW= 30kHz; between 30MHz to 1GHz was 100kHz, VBW=300kHz.

Dipole Antenna

Radiated Spurious Emission Measurement Result (above 1GHz)

Operation Mode	TX CH Low	Test Date	2020/01/21
Fundamental Frequency	2402 MHz	Test By	Barry
Temperature	25 °C	Humidity	60 %

No	Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark	Pol V/H
1	4804.00	42.72	-9.41	33.31	74.00	-40.69	Peak	VERTICAL
2	7206.00	42.78	-1.83	40.95	74.00	-33.05	Peak	VERTICAL
1	4804.00	42.30	-9.41	32.89	74.00	-41.11	Peak	HORIZONTAL
2	7206.00	43.38	-1.83	41.55	74.00	-32.45	Peak	HORIZONTAL

Remark:

- 1 Measuring frequencies from the lowest internal frequency to the 10th of fundamental frequency
- 2 Field strength limits for frequency above 1000MHz are based on average limits. However, Peak mode field strength shall not exceed the average limits specified plus 20dB.
- 3 Measurement of data within this frequency range shown “ - ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

Radiated Spurious Emission Measurement Result (above 1GHz)

Operation Mode	TX CH Mid	Test Date	2020/01/21
Fundamental Frequency	2441 MHz	Test By	Barry
Temperature	25 °C	Humidity	60 %

No	Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark	Pol V/H
1	4882.00	44.02	-9.21	34.81	74.00	-39.19	Peak	VERTICAL
2	7323.00	43.64	-1.75	41.89	74.00	-32.11	Peak	VERTICAL
1	4882.00	42.52	-9.21	33.31	74.00	-40.69	Peak	HORIZONTAL
2	7323.00	43.76	-1.75	42.01	74.00	-31.99	Peak	HORIZONTAL

Remark:

- 1 Measuring frequencies from the lowest internal frequency to the 10th of fundamental frequency
- 2 Field strength limits for frequency above 1000MHz are based on average limits. However, Peak mode field strength shall not exceed the average limits specified plus 20dB.
- 3 Measurement of data within this frequency range shown “ - ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

Radiated Spurious Emission Measurement Result (above 1GHz)

Operation Mode TX CH High
Fundamental Frequency 2480 MHz
Temperature 25 °C

Test Date 2020/01/21
Test By Barry
Humidity 60 %

No	Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark	Pol V/H
1	4960.00	45.02	-9.01	36.01	74.00	-37.99	Peak	VERTICAL
2	7440.00	42.59	-1.75	40.84	74.00	-33.16	Peak	VERTICAL
1	4960.00	43.23	-9.01	34.22	74.00	-39.78	Peak	HORIZONTAL
2	7440.00	43.65	-1.75	41.90	74.00	-32.10	Peak	HORIZONTAL

Remark:

- 1 Measuring frequencies from the lowest internal frequency to the 10th of fundamental frequency
- 2 Field strength limits for frequency above 1000MHz are based on average limits. However, Peak mode field strength shall not exceed the average limits specified plus 20dB.
- 3 Measurement of data within this frequency range shown “ - ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

PIFA Antenna

Radiated Spurious Emission Measurement Result (above 1GHz)

Operation Mode	TX CH Low	Test Date	2020/01/21
Fundamental Frequency	2402 MHz	Test By	Barry
Temperature	25 °C	Humidity	60 %

No	Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark	Pol V/H
1	4804.00	45.21	-9.41	35.80	74.00	-38.20	Peak	VERTICAL
2	7206.00	44.52	-1.83	42.69	74.00	-31.31	Peak	VERTICAL
1	4804.00	44.48	-9.41	35.07	74.00	-38.93	Peak	HORIZONTAL
2	7206.00	43.90	-1.83	42.07	74.00	-31.93	Peak	HORIZONTAL

Remark:

- 1 Measuring frequencies from the lowest internal frequency to the 10th of fundamental frequency
- 2 Field strength limits for frequency above 1000MHz are based on average limits. However, Peak mode field strength shall not exceed the average limits specified plus 20dB.
- 3 Measurement of data within this frequency range shown “ - ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.