FCC RF TEST REPORT

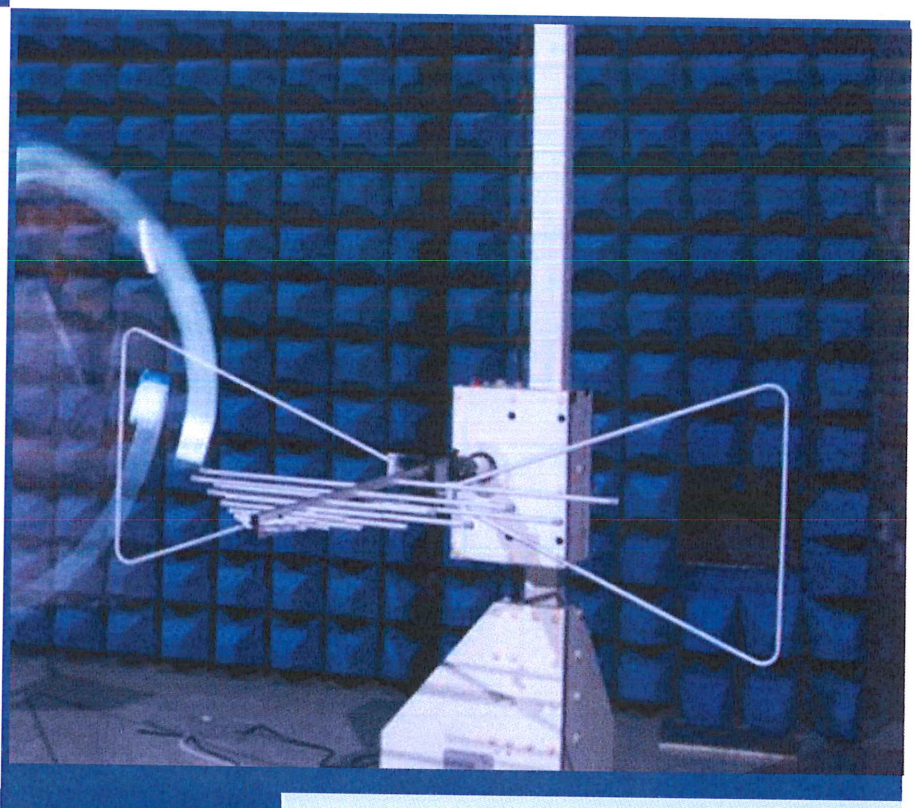
ISSUED BY
Shenzhen BALUN Technology Co., Ltd.

FOR

Aivo Connect

ISSUED TO
iOttie, Inc.

20W 37th street 6 floor, New York, NY, 10018



Tested by: Xiong Chong
Xiong Chong
Date Jul. 17, 2020

Approved by:
Liao Jianming
(Technical Director)
Date Jul. 17, 2020

Report No.:	BL-SZ2060184-402
EUT Name:	Aivo Connect
Model Name:	HLCRIO204
Brand Name:	iOttie
Test Standard:	47 CFR Part 15 Subpart C
FCC ID:	2AMRO- HLCRIO204
Test Conclusion:	Pass
Test Date:	Jun. 05, 2020 ~ Jun. 26, 2020
Date of Issue:	Jul. 17, 2020

Block B, 1st FL,Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong, P. R. China 518055
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Revision History

Version	Issue Date	Revisions
Rev. 01	Jul. 17, 2020	Initial Issue

TABLE OF CONTENTS

1 GENERAL INFORMATION

1.1 Identification of the Testing Laboratory

Company Name	Shenzhen BALUN Technology Co., Ltd.
Address	Block B, 1st FL, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China
Phone Number	+86 755 6685 0100

1.2 Identification of the Responsible Testing Location

Test Location	Shenzhen BALUN Technology Co., Ltd.
Address	Block B, 1st FL, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China
Accreditation Certificate	The laboratory has been listed by Industry Canada to perform electromagnetic emission measurements. The recognition numbers of test site are 11524A-1. The laboratory is a testing organization accredited by FCC as a accredited testing laboratory. The designation number is CN1196. The laboratory is a testing organization accredited by American Association for Laboratory Accreditation(A2LA) according to ISO/IEC 17025.The accreditation certificate is 4344.01. The laboratory is a testing organization accredited by China National Accreditation Service for Conformity Assessment (CNAS) according to ISO/IEC 17025. The accreditation certificate number is L6791.
Description	All measurement facilities used to collect the measurement data are located at Block B, FL 1, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China 518055

1.3 Laboratory Condition

Ambient Temperature	20℃ to 25℃
Ambient Relative Humidity	45% to 55%
Ambient Pressure	100 kPa to 102 kPa

1.4 Announce

(1) The test report reference to the report template version v2.7.

(2) The test report is invalid if not marked with the signatures of the persons responsible for preparing and approving the test report.

(3) The test report is invalid if there is any evidence and/or falsification.

(4) The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein.

(5) This document may not be altered or revised in any way unless done so by BALUN and all revisions are duly noted in the revisions section.

(6) Content of the test report, in part or in full, cannot be used for publicity and/or promotional purposes without prior written approval from the laboratory.

(7) The laboratory is only responsible for the data released by the laboratory, except for the part provided by the applicant.

2 PRODUCT INFORMATION

2.1 Applicant Information

Applicant	iOttie, Inc.
Address	20W 37th street 6 floor, New York, NY, 10018

2.2 Manufacturer Information

Manufacturer	iOttie, Inc.
Address	20W 37th street 6 floor, New York, NY, 10018

2.3 Factory Information

Factory	N/A
Address	N/A

2.4 General Description for Equipment under Test (EUT)

EUT Name	Aivo Connect
Model Name Under Test	HLCRIO204
Series Model Name	N/A
Description of Model name differentiation	N/A
Hardware Version	IVY2_V3.1
Software Version	SSQ21-11.108.0.13.999_0603_1128
Dimensions (Approx.)	N/A
Weight (Approx.)	N/A

2.5 Technical Information

Network and Wireless connectivity	Bluetooth, QI

The requirement for the following technical information of the EUT was tested in this report:

Operating Frequency	110~205 kHz
Product Type	☒ Mobile ☐ Portable ☐ Fix Location
Antenna Type	Coil Antenna
About Product	The EUT support the QI.

3 SUMMARY OF TEST RESULTS

3.1 Test Standards

No.	Identity	Document Title
1	47 CFR Part 15, Subpart C (10-1-18 Edition)	Intentional Radiators
2	ANSI C63.10-2013	American National Standard for Testing Unlicensed Wireless Devices

3.2 Verdict

No.	Description	FCC Rule	Test Verdict	Result
1	Radiated Emission	15.209,15.215(b)	Pass	Annex A.1
2	Conducted Emission, AC Ports	15.207	N/A	Note
3	20 dB Bandwidth	15.215(c)	Pass	Annex A.3
Note1: EUT is used on Vehicle Environment. Note2: The have two work mode. Mode1: EUT + Vehicle Battery + QI Mode2: EUT + Vehicle Battery + Phone + QI				

3.3 Test Uncertainty

The following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2.This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

Measurement	Value
Conducted emissions (9 kHz-30 MHz)	2.96 dB
Radiated emissions (30 MHz-1 GHz)	3.66 dB
Radiated emissions (1 GHz-18 GHz)	5.57 dB

4 GENERAL TEST CONFIGURATIONS

4.1 Test Environments

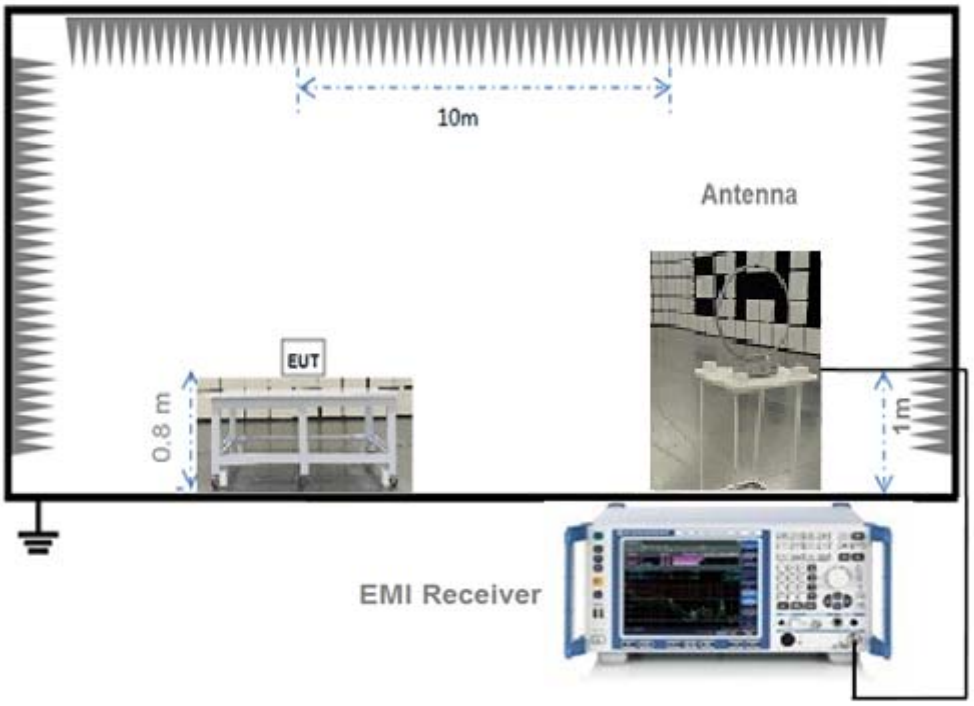
Relative Humidity	45% to 55%	
Atmospheric Pressure	100 kPa to 102 kPa	
Temperature	NT (Normal Temperature)	+22℃ to +25℃
Working Voltage of the EUT	NV (Normal Voltage)	9 V

4.2 Test Equipment List

Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
EMI Receiver	ROHDE&SCHWARZ	ESRP	101036	2019.07.04	2020.07.03
Test Antenna-Loop(9 kHz-30 MHz)	SCHWARZBECK	FMZB 1519	1519-037	2019.10.29	2021.10.28
Test Antenna-Bi-Log(30 MHz-3 GHz)	SCHWARZBECK	VULB 9163	9163-624	2018.08.22	2020.08.21
Anechoic Chamber	EMC Electronic Co., Ltd	20.10*11.60*7.35m	N/A	2018.08.08	2021.08.07
EMI Receiver	KEYSIGHT	N9010B	MY57110309	2020.06.12	2021.06.11
LISN	SCHWARZBECK	NSLK 8127	8127-687	2019.07.04	2020.07.03
Shielded Enclosure	YiHeng Electronic Co., Ltd	3.4m*3.1m*2.8m	N/A	2018.08.16	2021.08.15
Test Software	BALUN	BL410_E	V19.918	--	--
Phone	MTT	Master	N/A	--	--

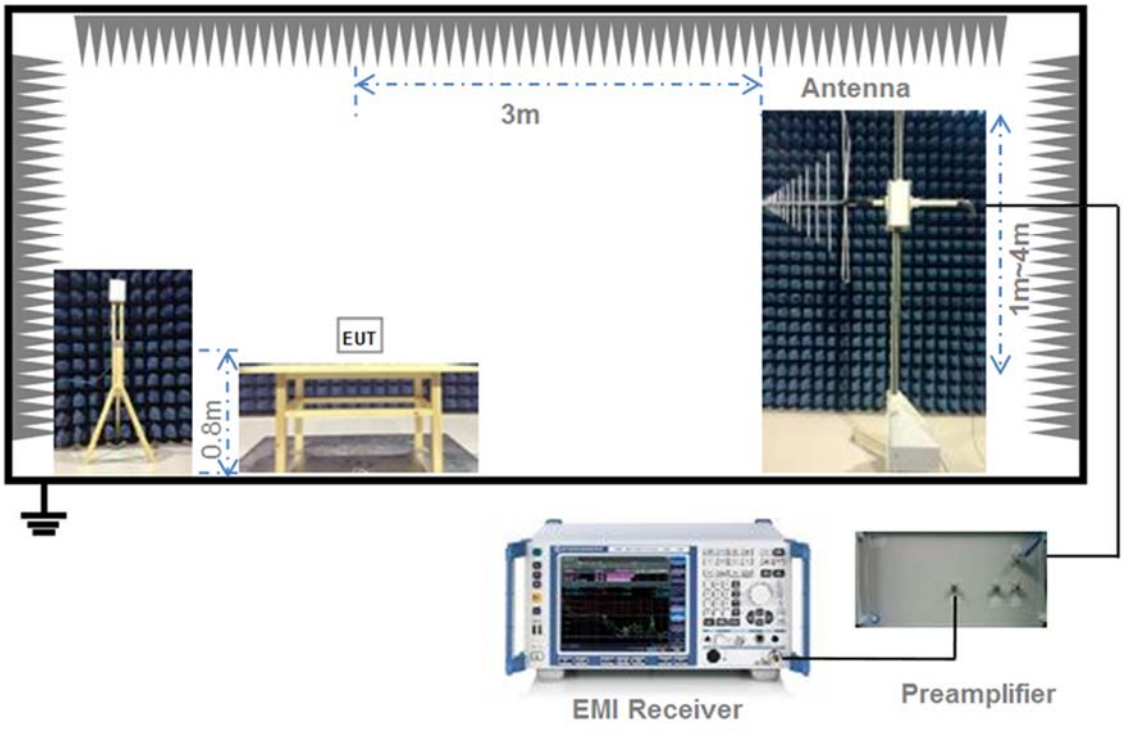
4.3 Test Setups

Test Setup 1



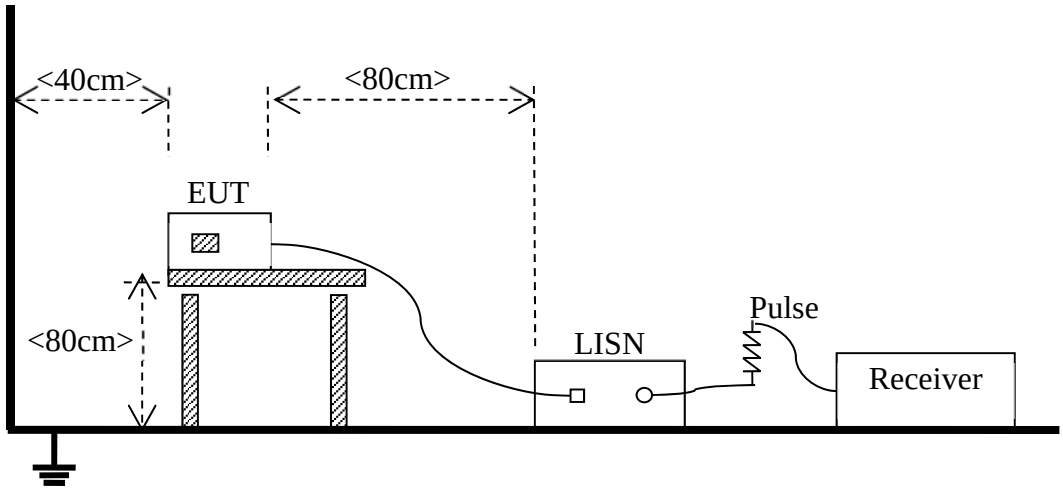
For Radiated Emission Test (Below 30 MHz))

Test Setup 2



(For Radiated Emission Test (30 MHz-1 GHz))

Test Setup 3



(For Conducted Emission, AC Ports Test)

5 TEST ITEMS

5.1 Emission Tests

5.1.1 Radiated Emission

5.1.1.1 Limit

Frequency (MHz)	Field Strength (μV/m)	Measurement Distance (m)
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

NOTE:

1) Field Strength (dBμV/m) = 20*log [Field Strength (μV/m)].

2) In the emission tables above, the tighter limit applies at the band edges.

3) For above 1000 MHz, limit field strength of harmonics: 54 dBuV/m@3 m (AV) and 74 dBuV/m@3 m (PK)

4) At frequencies below 30 MHz, measurements may be performed at a distance closer than that specified in the regulations, when performing measurements at a closer distance than specified, the results shall be extrapolated to the specified distance by either making measurements at a minimum of two distances on at least one radial to determine the proper extrapolation factor or by using the square of an inverse linear distance extrapolation factor (40 dB/decade). For example, at the frequency 9 kHz, limit @10m = 20*log (2400/f) + 40log (dlimit/dmeasure) where limit = 300m, dmeasure=10m. limit @10m = 20*log (2400/9) + 40log (300/10) = 107.5 (dBμV/m).

5) At frequencies at or above 30 MHz, measurements may be performed at a distance other than what is specified provided, When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade (inverse linear-distance for field strength measurements; inverse-linear-distance-squared for power density measurements). For example, at the frequency 30 MHz, limit @10m = 20*log (100) + 20log (dlimit/dmeasure) where limit = 3m, dmeasure=10m. limit @10m = 20*log (100) + 20log (3/10) = 29.5 (dBμV/m).

5.1.1.2 Test Setup

Refer to 4.3 section (test setup 1 to test setup 2) for radiated emission test, the photo of test setup please refer to ANNEX B.

5.1.1.3 Test Procedure

All Spurious Emission tests were performed in X, Y, Z axis direction. And only the worst axis test condition was recorded in this test report.

An initial pre-scan was performed in the chamber using the EMI Receiver in peak detection mode. Quasi-peak measurements were conducted based on the peak sweep graph. The EUT was measured by Bi-Log antenna with 2 orthogonal polarities.

5.1.1.4 Test Result

Please refer to ANNEX A.1.

NOTE:

1. Results (dBuV/m) = Reading (dBuV) + Factor (dB/m)

The reading level is calculated by software which is not shown in the sheet

2. Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB) – Amplifier Gain (dB)

3. Over limit = Results – Limit.

5.1.2 Conducted Emission

5.1.2.1 Test Limit

Frequency range (MHz)	Conducted Limit (dBμV)	
	Quasi-peak	Average
0.15 - 0.50	66 to 56	56 to 46
0.50 - 5	56	46
5 - 30	60	50

NOTE:

1) The limit is applicable to Class B ITE.
2) The lower limit shall apply at the band edges.
3) The limit decreases linearly with the logarithm of the frequency in the range 0.15 - 0.50 MHz.

5.1.2.2 Test Setup

Refer to 4.3 section test (test setup 3) for conducted emission, the photo of test setup please refer to ANNEX B.

5.1.2.3 Test Procedure

The EUT is connected to the power mains through a LISN which provides 50 Ω/50 μH of coupling impedance for the measuring instrument. The test frequency range is from 150 kHz to 30 MHz. The maximum conducted interference is searched using Peak (PK), Quasi-peak (QP) and Average (AV) detectors; the emission levels that are more than the AV and QP limits, and that have narrow margins from the AV and QP limits will be re-measured with AV and QP detectors. Tests for both L phase and N phase lines of the power mains connected to the EUT are performed.

Devices subject to Part 15 must be tested for all available U.S. voltages and frequencies (such as a nominal 120 VAC, 50/60 Hz and 240 VAC, 50/60 Hz) for which the device is capable of operation. A device rated for 50/60 Hz operation need not be tested at both frequencies provided the radiated and line conducted emissions are the same at both frequencies.

5.1.2.4 Test Result

Please refer to ANNEX A.2.

NOTE:

1. Results (dBuV/m) = Reading (dBuV) + Factor (dB/m)

The reading level is calculated by software which is not shown in the sheet

2. Factor = Insertion loss + Cable loss

3. Over limit = Results – Limit.

5.1.3 20 dB Bandwidth

5.1.3.1 Limit

FCC §15.215(c)

The 20 dB bandwidth is known as the 99% emission bandwidth, or 20 dB bandwidth (10*log1%=20 dB) taking the total RF output power.

5.1.3.2 Test Setup

Refer to 4.3 section test (test setup 1) for test setup description for the antenna port. The photo of test setup please refer to ANNEX B.

5.1.3.3 Test Procedure

Use the following spectrum analyzer settings:

Span = approximately 2 to 3 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

The EUT should be transmitting at its maximum data rate, Allow the trace to stabilize.

5.1.3.4 Test Result

Please refer to ANNEX A.3.

ANNEX A TEST RESULTS

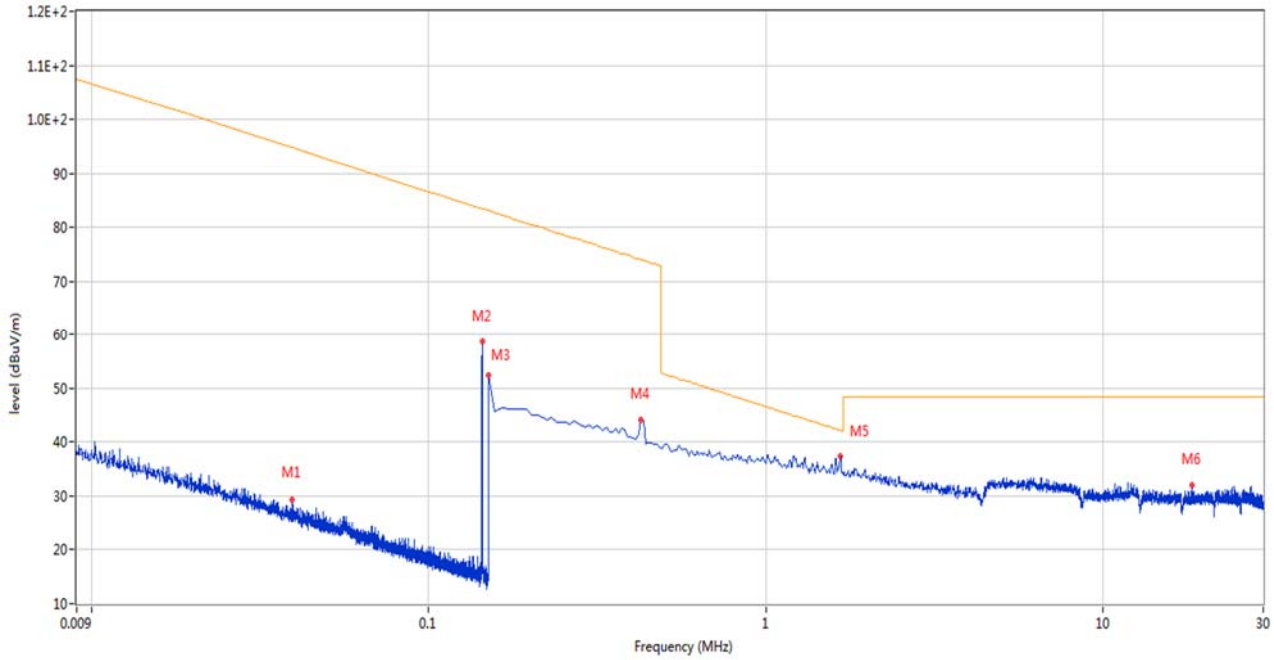
A.1 Radiated Emission

Note [1]: The symbol of "--" in the table which means not application.

Note [2]: For the test data above 1 GHz, according the ANSI C63.4-2014, where limits are specified for both average and peak (or quasi-peak) detector functions, if the peak (or quasi-peak) measured value complies with the average limit, it is unnecessary to perform an average measurement.

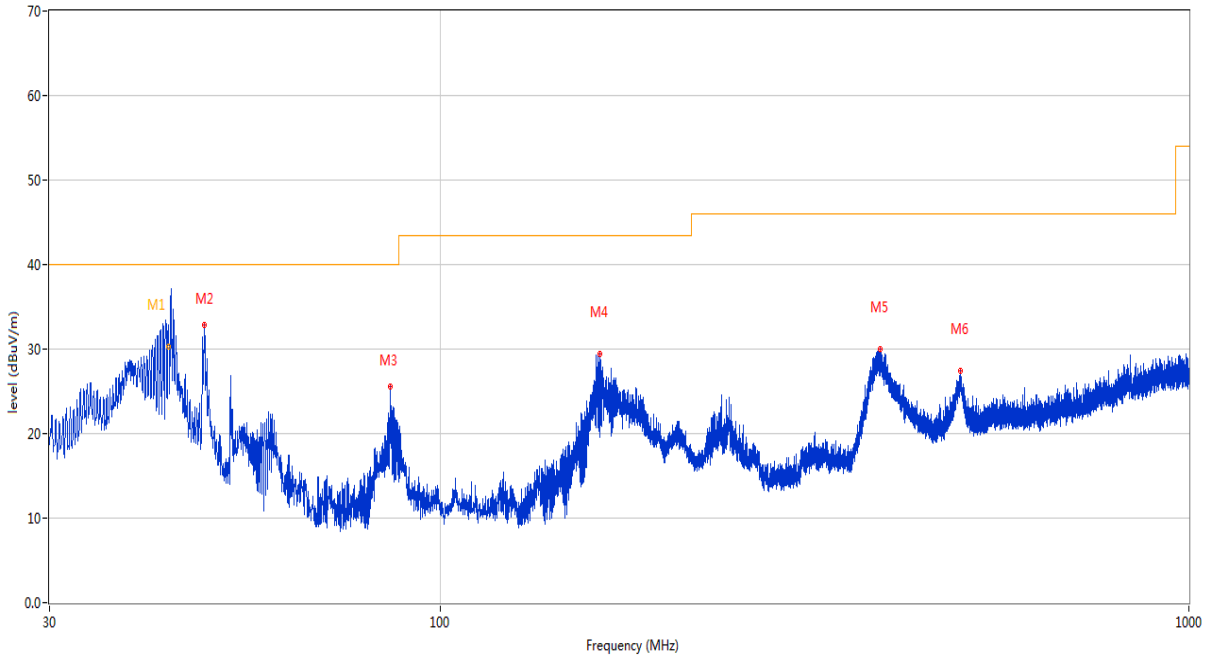
QI Test Data and Plots (Mode1)

A.1.1 Test Antenna Vertical, 9 kHz –30 MHz



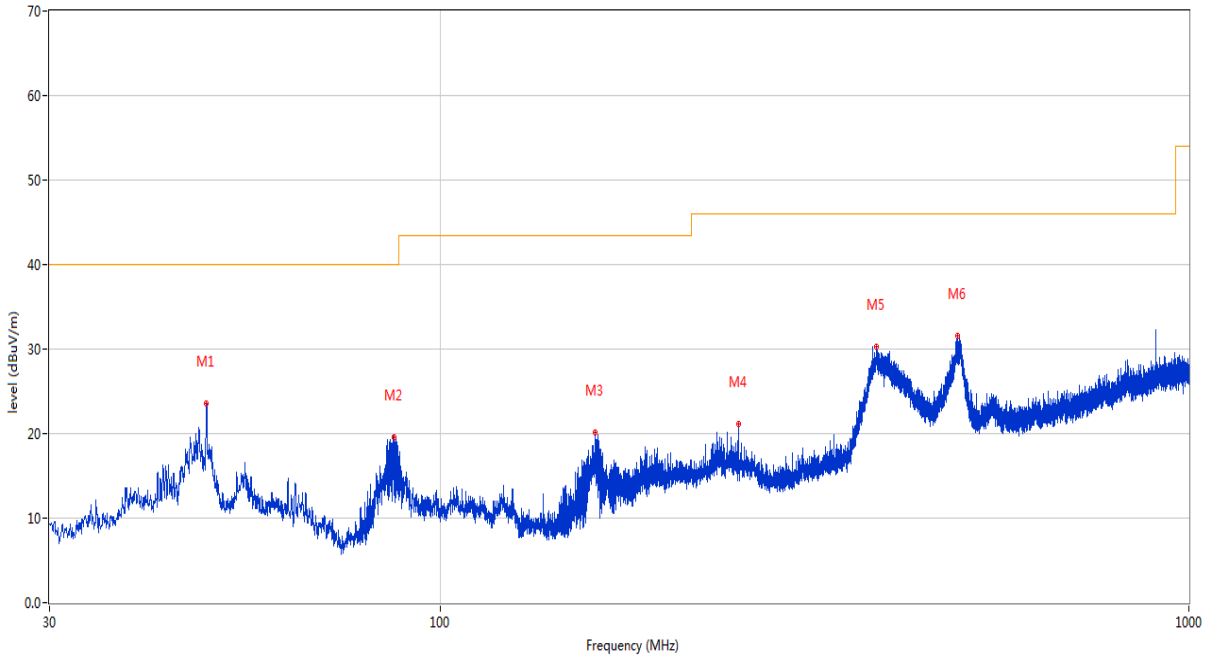
No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	0.039	29.97	20.23	94.8	-64.83	Peak	115.00	100	Vertical	Pass
2	0.144	59.01	20.15	83.5	-24.49	Peak	1.00	100	Vertical	N/A
3	0.150	52.27	20.10	83.1	-30.83	Peak	80.00	100	Vertical	Pass
4	0.426	44.02	20.20	74.0	-29.98	Peak	325.00	100	Vertical	Pass
5	1.665	37.28	20.46	42.1	-4.82	Peak	307.00	100	Vertical	Pass
6	18.429	32.05	21.05	48.5	-16.45	Peak	360.00	100	Vertical	Pass

A.1.2 Test Antenna Vertical, 30 MHz – 1 GHz



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	43.245	43.11	-23.33	40.0	3.11	Peak	0.00	107	Vertical	N/A
1*	43.245	30.30	-23.33	40.0	-9.70	QP	0.00	107	Vertical	Pass
2	48.333	32.86	-22.57	40.0	-7.14	Peak	227.90	100	Vertical	Pass
3	85.581	25.53	-27.33	40.0	-14.47	Peak	261.60	100	Vertical	Pass
4	163.423	29.39	-26.90	43.5	-14.11	Peak	98.20	100	Vertical	Pass
5	386.766	29.97	-19.59	46.0	-16.03	Peak	173.50	100	Vertical	Pass
6	495.649	27.39	-16.55	46.0	-18.61	Peak	341.40	100	Vertical	Pass

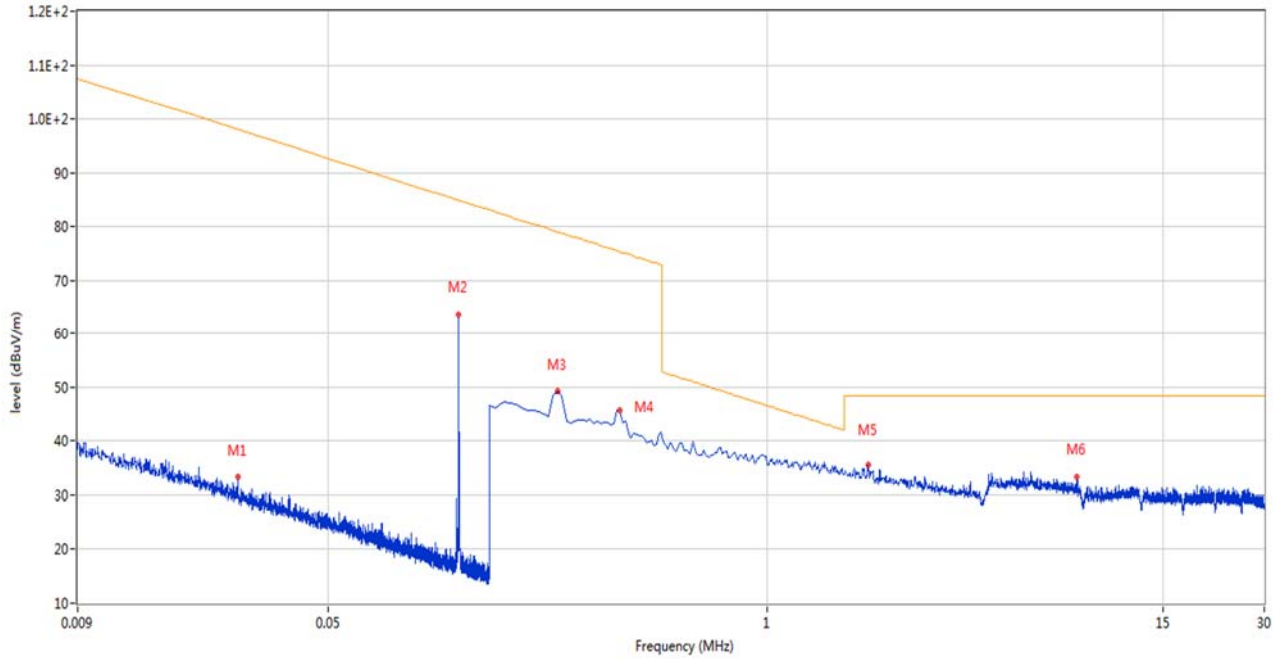
A.1.3 Test Antenna Horizontal, 30 MHz – 1 GHz



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	48.624	23.62	-22.51	40.0	-16.38	Peak	283.40	100	Horizontal	Pass
2	86.648	19.52	-26.90	40.0	-20.48	Peak	180.40	200	Horizontal	Pass
3	160.999	20.18	-27.23	43.5	-23.32	Peak	70.80	200	Horizontal	Pass
4	249.802	21.17	-22.91	46.0	-24.83	Peak	70.80	200	Horizontal	Pass
5	382.692	30.30	-18.99	46.0	-15.70	Peak	337.70	100	Horizontal	Pass
6	490.314	31.56	-16.86	46.0	-14.44	Peak	111.20	100	Horizontal	Pass

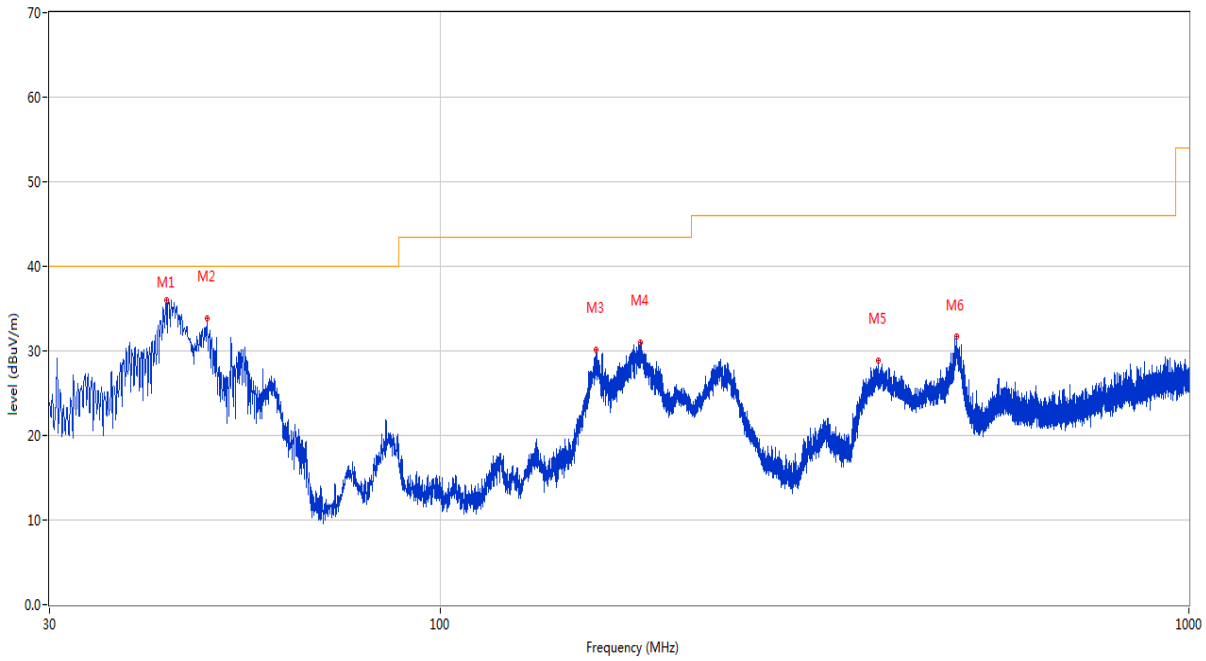
QI Test Data and Plots (Mode2)

A.1.4 Test Antenna Vertical, 9 kHz –30 MHz



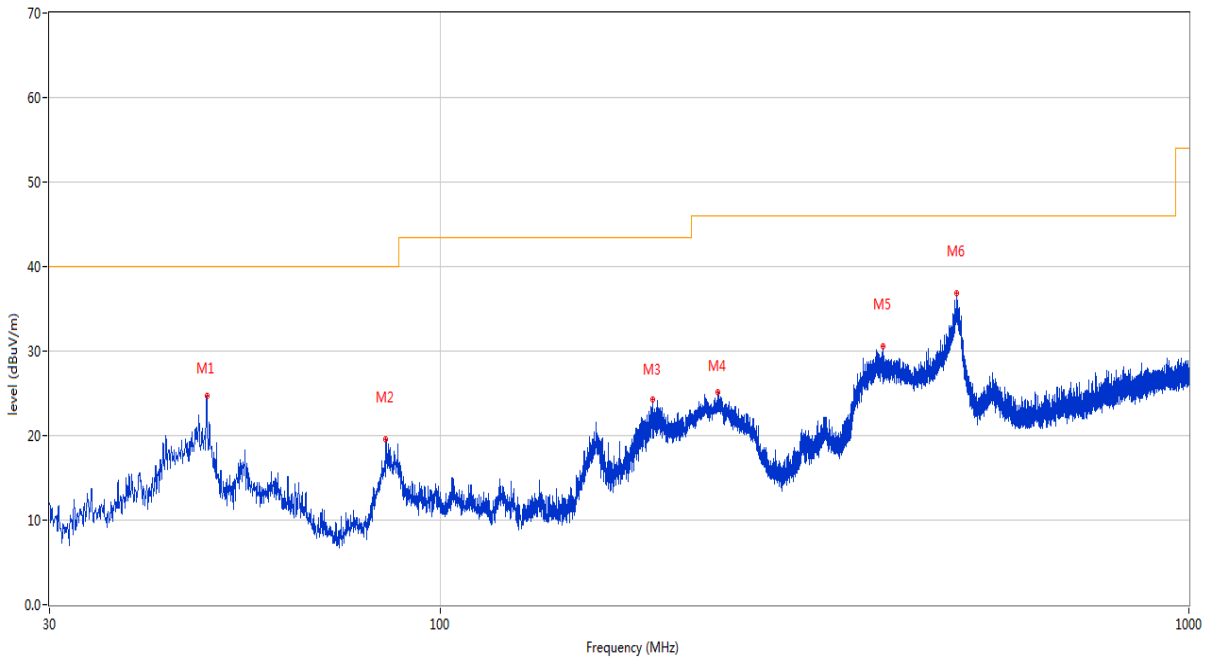
No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	0.027	33.36	20.26	98.0	-64.64	Peak	113.00	100	Vertical	Pass
2	0.122	54.25	20.16	84.9	-30.65	Peak	350.00	100	Vertical	N/A
3	0.240	49.31	20.12	79.0	-29.69	Peak	211.00	100	Vertical	Pass
4	0.366	45.76	20.16	75.3	-29.54	Peak	326.00	100	Vertical	Pass
5	2.000	35.55	20.46	48.5	-12.95	Peak	17.00	100	Vertical	Pass
6	8.357	33.45	20.81	48.5	-15.05	Peak	291.00	100	Vertical	Pass

A.1.5 Test Antenna Vertical, 30 MHz – 1 GHz



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	42.950	35.96	-23.38	40.0	-4.04	Peak	173.80	100	Vertical	Pass
2	48.721	33.88	-22.49	40.0	-6.12	Peak	152.90	100	Vertical	Pass
3	161.241	30.14	-27.20	43.5	-13.36	Peak	102.70	100	Vertical	Pass
4	184.958	30.93	-25.37	43.5	-12.57	Peak	148.70	100	Vertical	Pass
5	384.050	28.81	-19.32	46.0	-17.19	Peak	152.90	100	Vertical	Pass
6	489.926	31.72	-16.74	46.0	-14.28	Peak	325.10	100	Vertical	Pass

A.1.6 Test Antenna Horizontal, 30 MHz – 1 GHz



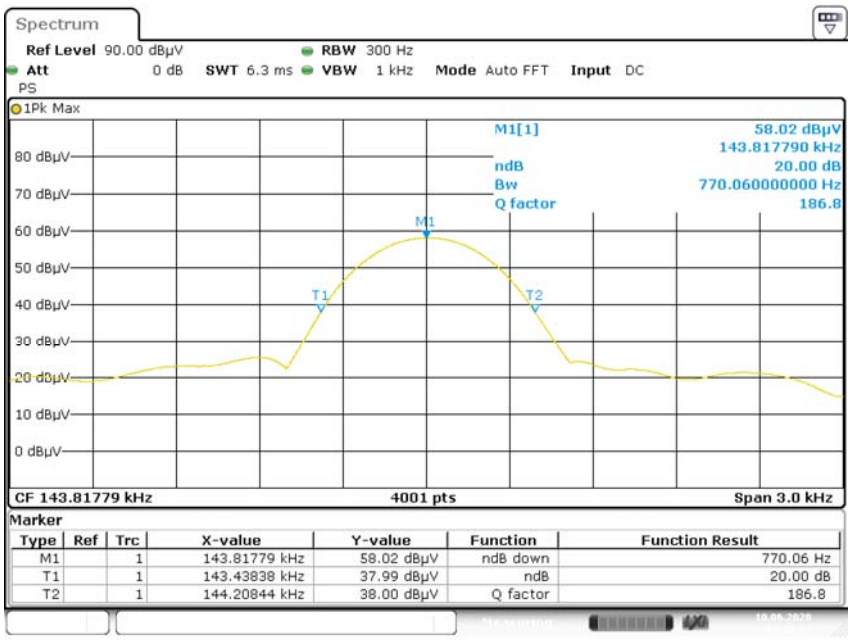
No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	48.672	24.76	-22.50	40.0	-15.24	Peak	246.30	100	Horizontal	Pass
2	84.465	19.59	-27.69	40.0	-20.41	Peak	177.20	200	Horizontal	Pass
3	191.942	24.33	-25.09	43.5	-19.17	Peak	294.60	200	Horizontal	Pass
4	234.816	25.16	-23.03	46.0	-20.84	Peak	160.50	200	Horizontal	Pass
5	390.452	30.52	-19.36	46.0	-15.48	Peak	309.40	100	Horizontal	Pass
6	489.634	36.85	-16.65	46.0	-9.15	Peak	111.30	100	Horizontal	Pass

A.2 Conducted Emission

Note: Not applicable.

A.3 20 dB Bandwidth

QI Test Data and Plots (Mode1)



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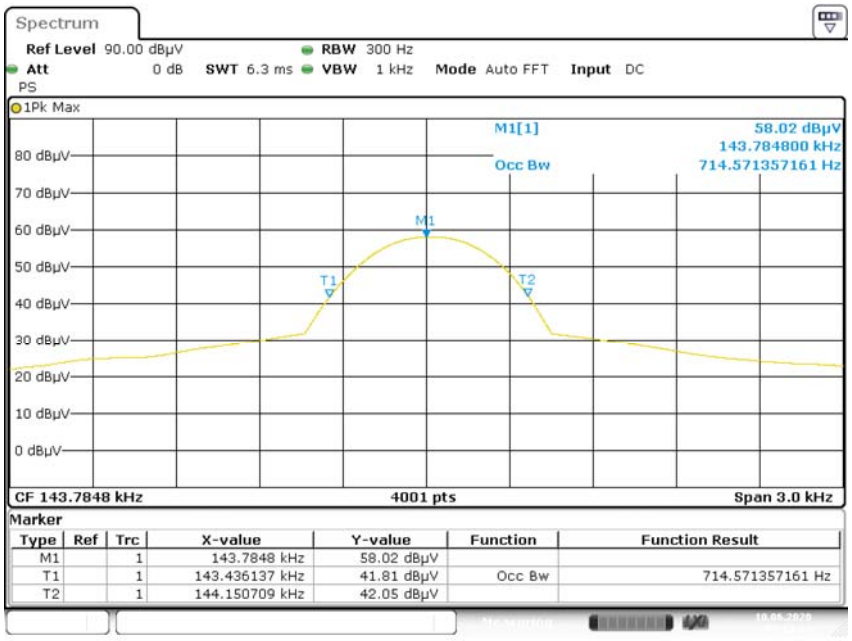
99% Occupied Bandwidth

QI Test Data and Plots(Mode1)



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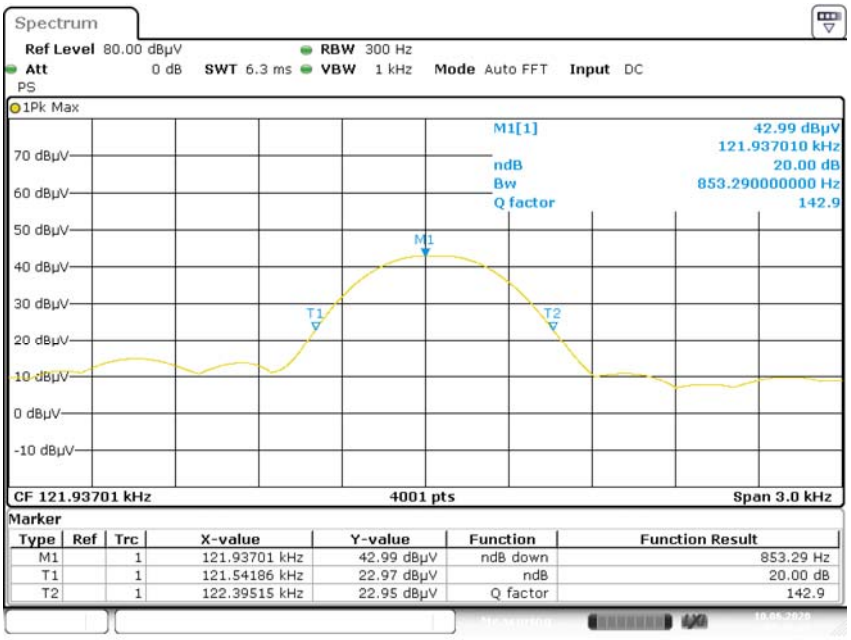
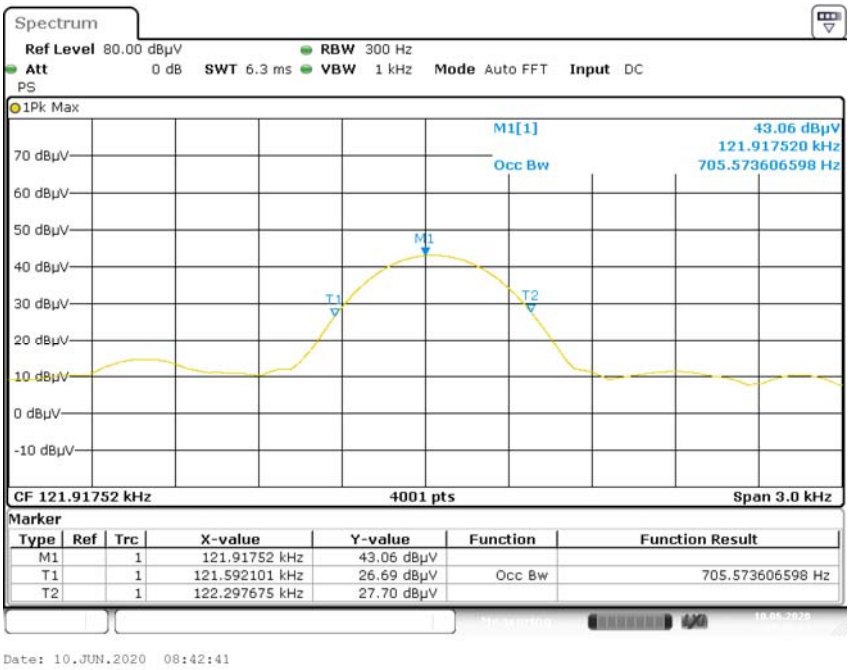
QI Test Data and Plots (Mode2)



99% Occupied Bandwidth

QI Test Data and Plots(Mode2)



ANNEX B TEST SETUP PHOTOS

Please refer the document “BL-SZ2060184-AE-2.PDF”.

ANNEX C EUT EXTERNAL PHOTOS

Please refer the document “BL-SZ2060184-AW.PDF”.

ANNEX D EUT INTERNAL PHOTOS

Please refer the document “BL-SZ2060184-AI.PDF”.

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