

TEST REPORT

Report No.: SHE20100017-02FE

Date: 2021-03-15

Page 1 of 37

Applicant : Trimble Europe BV.
Address of Applicant : Industrieweg 187a, 5683 CC Best, Netherlands

Product Name : Rugged Smart Phone
Model No. : TDC600_2, MobileMapper60_2
Sample No. : E20100017-01 #16
E20100017-01 #01
FCC ID : NZI-11705920
ISED Number : 9288A-11705920

Standards : FCC CFR47 Part 15, Subpart C
RSS-Gen (Issue 5, March 2019)
RSS-247 (Issue 2, February 2017)

Date of Receipt : 2021-01-26
Date of Test : 2021-01-26 ~ 2021-03-15
Date of Issue : 2021-03-15

Remark:

This report details the results of the testing carried out on one sample, the results contained in this report do not relate to other samples of the same product. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report.

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TEST REPORT

Report No.: SHE20100017-02FE

Date: 2021-03-15

Page 2 of 37

Contents

1	GENERAL INFORMATION	3
1.1	TESTING LABORATORY	3
1.2	DETAILS OF APPLICATION	3
1.3	DETAILS OF EUT	4
1.4	TEST METHODOLOGY	4
2	TEST CONDITION	5
2.1	ENVIRONMENTAL CONDITIONS	5
2.2	EQUIPMENT LIST	5
2.3	MEASUREMENT UNCERTAINTY	5
3	TEST SET-UP AND OPERATION MODES	6
3.1	DETAILS OF TEST MODE	6
3.2	SPECIAL ACCESSORIES AND AUXILIARY EQUIPMENT	6
3.3	SUPPORT SOFTWARE	6
3.4	TEST SETUP DIAGRAM	7
4	TEST RESULTS	9
4.1	TRANSMITTER REQUIREMENT & TEST SUITES	9
4.1.1	<i>Antenna Requirement</i>	9
4.1.2	<i>Peak Output Power and E.I.R.P.</i>	10
4.1.3	<i>6dB Bandwidth and 99% Bandwidth</i>	13
4.1.4	<i>Power Spectral Density</i>	17
4.1.5	<i>Conducted Spurious Emission & Authorized-band band-edge</i>	20
4.1.6	<i>Spurious Emission</i>	28
4.1.7	<i>Band Edge (Restricted-band band-edge)</i>	29
4.2	MAINS EMISSIONS	30
4.2.1	<i>Conducted Emission on AC Mains</i>	30
5	APPENDIXES	33
5.1	PHOTOGRAPHS OF THE SAMPLE	33
5.2	SET-UP FOR CONDUCTED EMISSIONS	35
5.3	SET-UP FOR CONDUCTED RF TEST AT ANTENNA PORT	35
5.4	SET-UP FOR SPURIOUS EMISSIONS BELOW 1GHZ	36
5.5	SET-UP FOR SPURIOUS EMISSIONS ABOVE 1GHZ	36

TEST REPORT

Report No.: SHE20100017-02FE

Date: 2021-03-15

Page 3 of 37

1 General Information

1.1 Testing Laboratory

Company Name	ICAS Testing Technology Service (Shanghai) Co., Ltd.
Address	No.1298 Pingan Rd, Minhang District, Shanghai, China
Telephone	0086 21-51682999
Fax	0086 21-54711112
Homepage	www.icasiso.com

1.2 Details of Application

Applicant Company Name	Trimble Europe BV.
Address	Industrieweg 187a, 5683 CC Best, Netherlands
Contact Person	Joel Hamberg Magnusson
Telephone	+46764953125
Email	joel_hambergmagnusson@trimble.com
Manufacturer Company Name	Trimble Europe BV.
Address	Industrieweg 187a, 5683 CC Best, Netherlands
Factory Company Name	Shenzhen UniStrong Science & Technology Co., Ltd.
Address	B,4-4Factory, Zhengcheng Road, FuyongBaoan District, Shenzhen, China

TEST REPORT

Report No.: SHE20100017-02FE

Date: 2021-03-15

Page 4 of 37

1.3 Details of EUT

Product Name	Rugged Smart Phone
Brand Name	Trimble, Spectra Geospatial
Test Model No.	TDC600_2
Series Model No.	TDC600_2; MobileMapper60_2
Description of Model name differentiation	All model are same with electrical paramters and Internal circuit structure, but only different on model name, brand name and colors and software version.
FCC ID	NZI-11705920
ISED Number	9288A-11705920
Mode of Operation	Bluetooth BLE
Frequency Range	2400MHz ~ 2483.5MHz
Number of Channels	40 (at intervals of 2 MHz)
Modulation Type	GFSK
Antenna Type	Internal Antenna
Antenna Gain	3.14 dBi
Extreme Temperature Range	-20°C ~ +55°C
Test Voltage	DC 3.8V
Hardware version	V1.0
Software version	TDC600_2.53.10.14 (model:TDC600_2) MM60_2.53.10.05 (model: MobileMapper60_2)
Test SW Version	BL410_R;BL410_E
RF power setting in TEST SW	QRCT

1.4 Test Methodology

47 CFR Part 15, Subpart C (10-1-16 Edition)	Miscellaneous Wireless Communications Services
KDB Publication 558074 D01 v05r02	DTS Meas Guidance.
RSS-Gen (Issue 5, March 2019)	General Requirements for Compliance of Radio Apparatus
RSS-247 (Issue 2, February 2017)	Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices
ANSI C63.10-2013	American National Standard for Testing Unlicensed Wireless Devices

Note(s):

All test items were verified and recorded according to the standards and without any addition/deviation/exclusion during the test.

TEST REPORT

Report No.: SHE20100017-02FE

Date: 2021-03-15

Page 5 of 37

2 Test Condition

2.1 Environmental conditions

Temperature (°C)	18-25
Humidity (%RH)	40-65
Barometric Pressure (mbar)	960-1060

2.2 Equipment List

Name of Equipment	Manufacturer	Model	Serial No.	Cal. Due Date
Spectrum Analyzer	Keysight	N9020A	MY59260184	2021-08-23
Spectrum Analyzer	Keysight	N9020B	MY59260184	2021-08-18
Spectrum Analyzer	Rohde & Schwarz	FSV40N	101450	2021-06-08
EMI Test Receiver	Rohde & Schwarz	ESPI3	100173	2021-06-08
EMI Test Receiver	Rohde & Schwarz	ESR 7	101911	2021-06-08
V-network	SCHWARZBECK	NSLK 8127	8127-902	2021-07-28
Broadband Antenna	SCHWARZBECK	VULB9163	9163-1037	2021-06-08
Horn Antenna-18G	SCHWARZBECK	BBHA9120D	9120D-1775	2021-07-28
Loop Antenna	SCHWARZBECK	FMZB 1513	N/A	2021-11-22
Horn Antenna-40G	YINGLIAN	LB-180400-KF	N/A	2021-07-26
EMC chamber 9*6*6 (L*W*H)	CHANGNING	966	N/A	2023-06-08
Shielded Enclosure 8*5*4 (L*W*H)	CHANGNING	854	N/A	2021-06-08
Test Software	BL	BL410_E	N/A	N/A
Test Software	BL	BL410_R	N/A	N/A

2.3 Measurement Uncertainty

Parameter	Frequency	Uncertainty
Antenna Port Conducted Emission	< 1GHz	± 1.5 dB
	> 1GHz	± 1.5 dB
Radiated Emission	30 MHz – 1 GHz	± 3 dB
	> 1GHz	± 3 dB

TEST REPORT

Report No.: SHE20100017-02FE

Date: 2021-03-15

Page 6 of 37

3 Test Set-up and Operation Modes

3.1 Details of Test Mode

Using test software was control EUT work in continuous transmitter and receiver mode. Select test channel as below:

Channel	Frequency
The lowest channel(CH0)	2402MHz
The middle channel(CH19)	2440MHz
The Highest channel(CH39)	2480MHz

The basic operation modes are:

- A. On
 - 1. BLE mode
 - a. Transmitting
 - i. Low Channel
 - ii. Middle Channel
 - iii. High Channel
 - b. Receiving
 - 2. Normal working with Bluetooth on
- B. Standby
- C. Off

3.2 Special Accessories and Auxiliary Equipment

Description	Manufacturer	Model No.	Serial No.
Laptop	Lenovo	TP00083A	N/A

3.3 Support Software

Description	Manufacturer	Software Name
Software	Qualcomm	QRCT

TEST REPORT

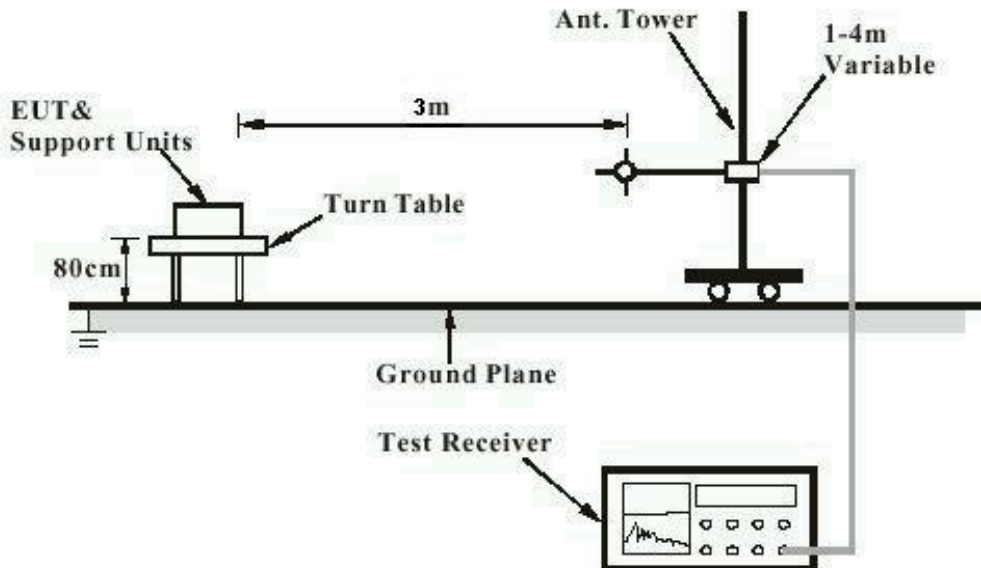
Report No.: SHE20100017-02FE

Date: 2021-03-15

Page 7 of 37

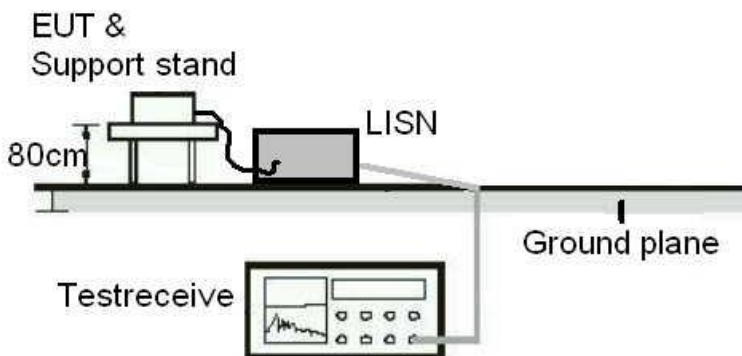
3.4 Test Setup Diagram

Diagram of Measurement Configuration for Radiation Test



Note: Measurements above 1GHz are done with a table height of 1.5m. In addition, there is RF absorbing material on the floor of the test site for above 1GHz measurement.

Diagram of Measurement Equipment Configuration for Conduction Measurement



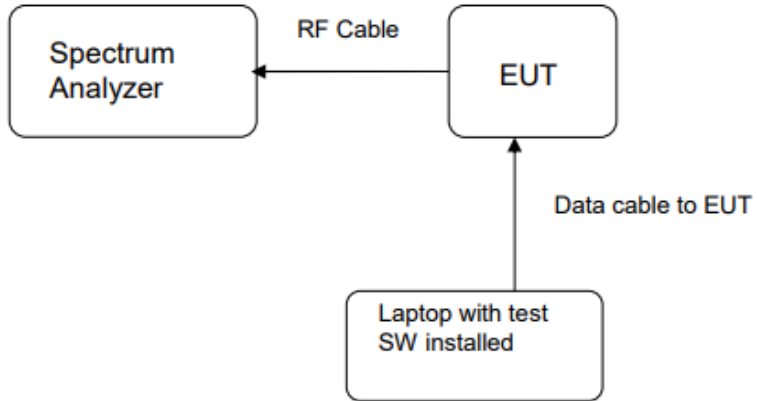
TEST REPORT

Report No.: SHE20100017-02FE

Date: 2021-03-15

Page 8 of 37

Diagram of Measurement Equipment Configuration for Transmitter Measurement



TEST REPORT

Report No.: SHE20100017-02FE

Date: 2021-03-15

Page 9 of 37

4 Test Results

4.1 Transmitter Requirement & Test Suites

4.1.1 Antenna Requirement

RESULT: **PASS**

Test standard : FCC Part 15.247(b)(4), Part 15.203
RSS-247 5.4(6)

Requirement : The use of approved antennas only with directional gains that do not exceed 6dBi

According to the manufacturer declaration, the EUT has an antenna with a directional gain of 3.14 dBi. The antenna is an internal antenna with no possibility of replacement with a non-approved antenna by the end-user.

Therefore, the EUT is considered to comply with this provision.

TEST REPORT

Report No.: SHE20100017-02FE

Date: 2021-03-15

Page 10 of 37

4.1.2 Peak Output Power and E.I.R.P

RESULT:

PASS

Test standard : FCC Part 15.247(b)(3)
RSS-247 5.4(4)
Requirement : ANSI C63.10-2013, KDB 558074
Kind of test site : Shielded room

Test setup

Test Channel : Low/Middle/High
Operation Mode : A.1.a
Ambient temperature : 23°C
Relative humidity : 52%

Table 1: Peak Output Power

Test Mode	Test Channel (MHz)	Measured Peak Power		Limit (W)
		(dBm)	(mW)	
BLE	2402	2.31	1.70	< 1
	2440	2.12	1.63	
	2480	1.77	1.50	

Table 2: E.I.R.P

Test Mode	Test Channel (MHz)	E.I.R.P		Limit (W)
		(dBm)	(mW)	
BLE	2402	5.45	3.51	< 4
	2440	5.26	3.36	
	2480	4.91	3.10	

Note: The antenna gain is 3.14dBi

TEST REPORT

Report No.: SHE20100017-02FE

Date: 2021-03-15

Page 11 of 37

Figure 1: Peak Output Power, 2402MHz

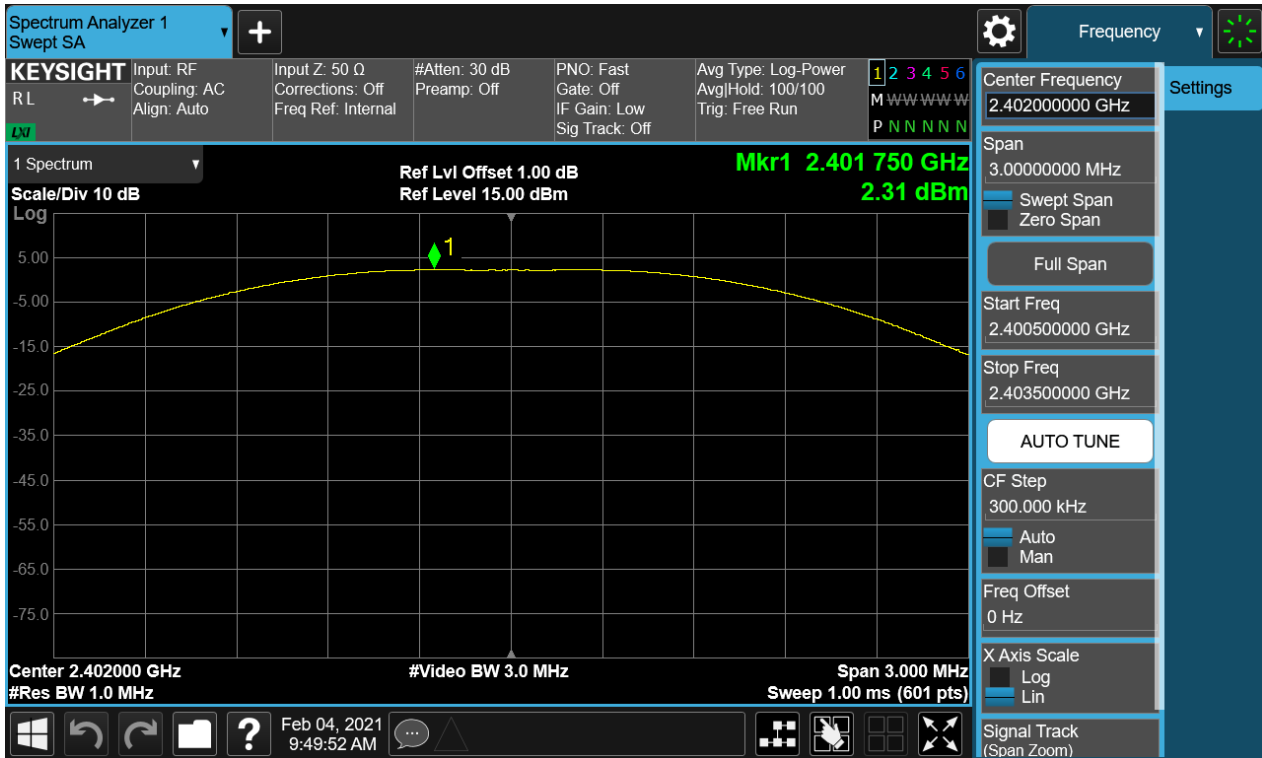
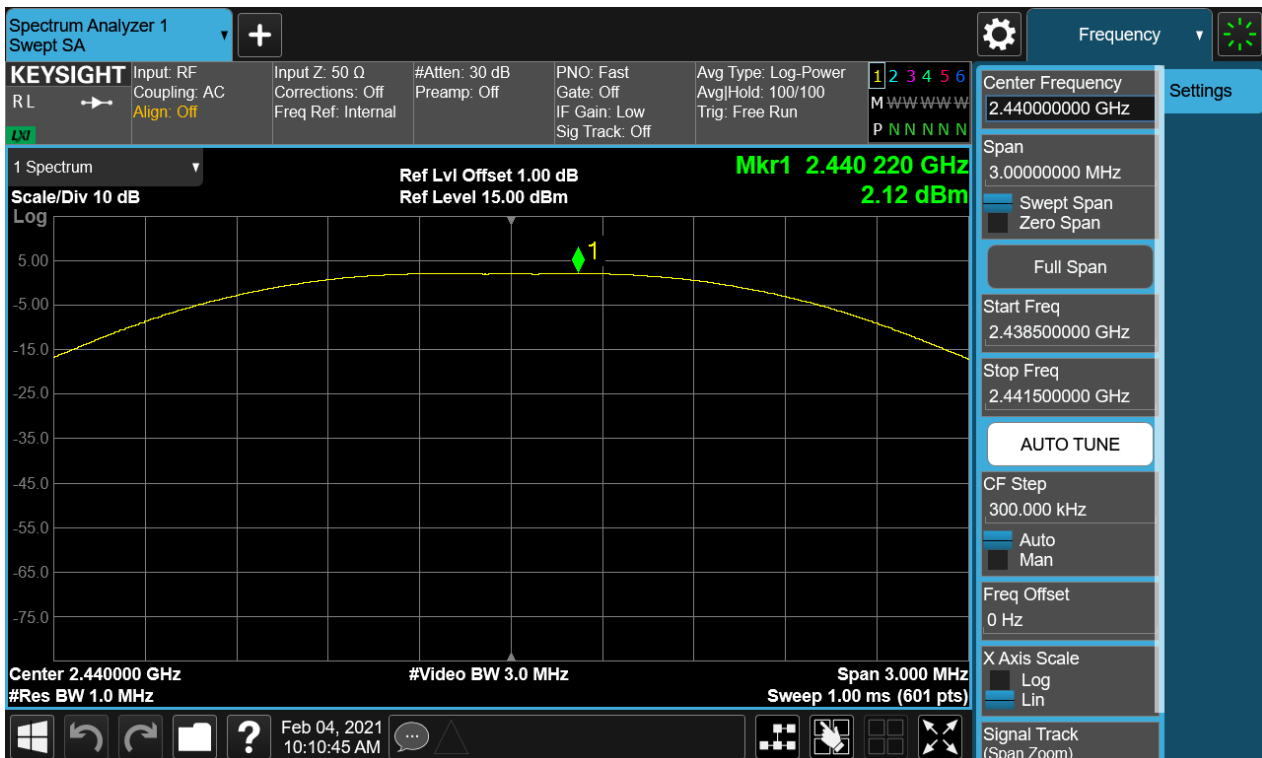


Figure 2: Peak Output Power, 2440MHz



TEST REPORT

Report No.:

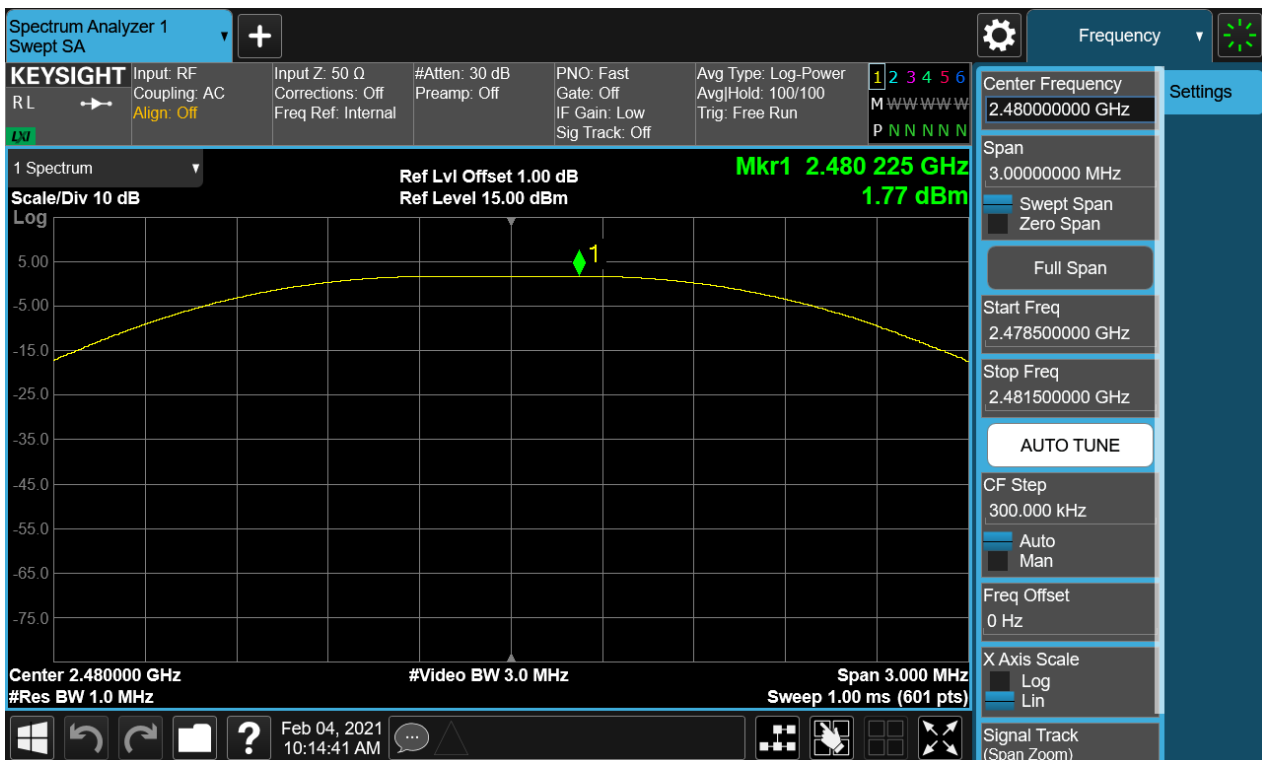
SHE20100017-02FE

Date:

2021-03-15

Page 12 of 37

Figure 3: Peak Output Power, 2480MHz



TEST REPORT

Report No.: SHE20100017-02FE

Date: 2021-03-15

Page 13 of 37

4.1.3 6dB Bandwidth and 99% Bandwidth

RESULT:

PASS

Test standard : FCC Part 15.247(a)(2)
RSS-247 5.2(1)
RSS-Gen 6.6

Requirement : ANSI C63.10-2013, KDB 558074

Kind of test site : Shielded room

Test setup

Test Channel : Low/Middle/High

Operation Mode : A.1.a

Ambient temperature : 23°C

Relative humidity : 52%

Table 3: 6dB Bandwidth and 99% Bandwidth

Test Mode	Test Channel (MHz)	6dB Bandwidth (MHz)	99% Bandwidth (MHz)	6dB Bandwidth Limit
BLE	2402	0.7193	1.0655	≥0.5 MHz
	2440	0.6769	1.0668	
	2480	0.6634	1.0698	

TEST REPORT

Report No.:

SHE20100017-02FE

Date:

2021-03-15

Page 14 of 37

Figure 4: 6dB Bandwidth and 99% Bandwidth, 2402MHz



TEST REPORT

Report No.:

SHE20100017-02FE

Date:

2021-03-15

Page 15 of 37

Figure 5: 6dB Bandwidth and 99% Bandwidth, 2440MHz



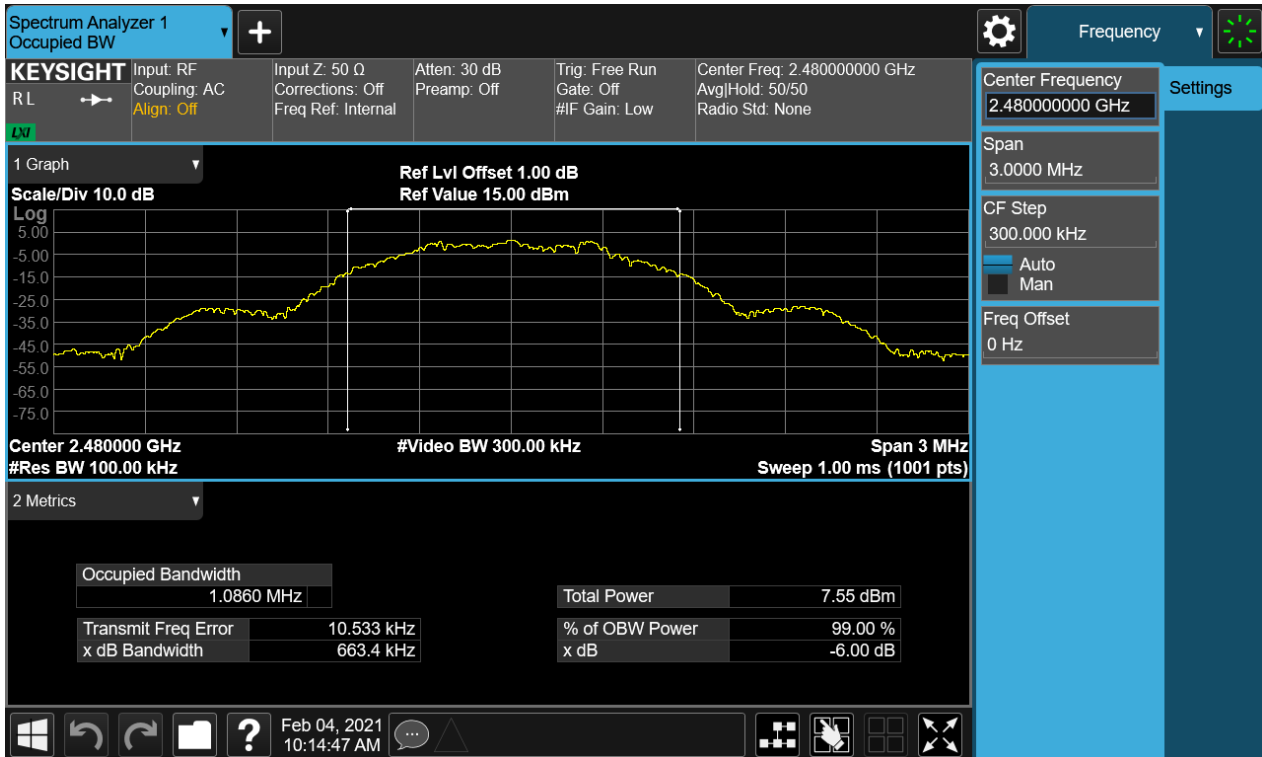
TEST REPORT

Report No.: SHE20100017-02FE

Date: 2021-03-15

Page 16 of 37

Figure 6: 6dB Bandwidth and 99% Bandwidth, 2480MHz



TEST REPORT

Report No.: SHE20100017-02FE

Date: 2021-03-15

Page 17 of 37

4.1.4 Power Spectral Density

RESULT:

PASS

Test standard : FCC Part 15.247(e)
RSS-247 5.2(2)
Requirement : ANSI C63.10-2013, KDB 558074
Kind of test site : Shielded room

Test setup

Test Channel : Low/Middle/High
Operation Mode : A.1.a
Ambient temperature : 23°C
Relative humidity : 52%

Table 4: Power Spectral Density

Test Mode	Test Channel (MHz)	Measured Result (dBm/3kHz)	Limit (dBm/3kHz)
BLE	2402	-13.48	8
	2440	-13.28	
	2480	-13.58	

TEST REPORT

Report No.:

SHE20100017-02FE

Date:

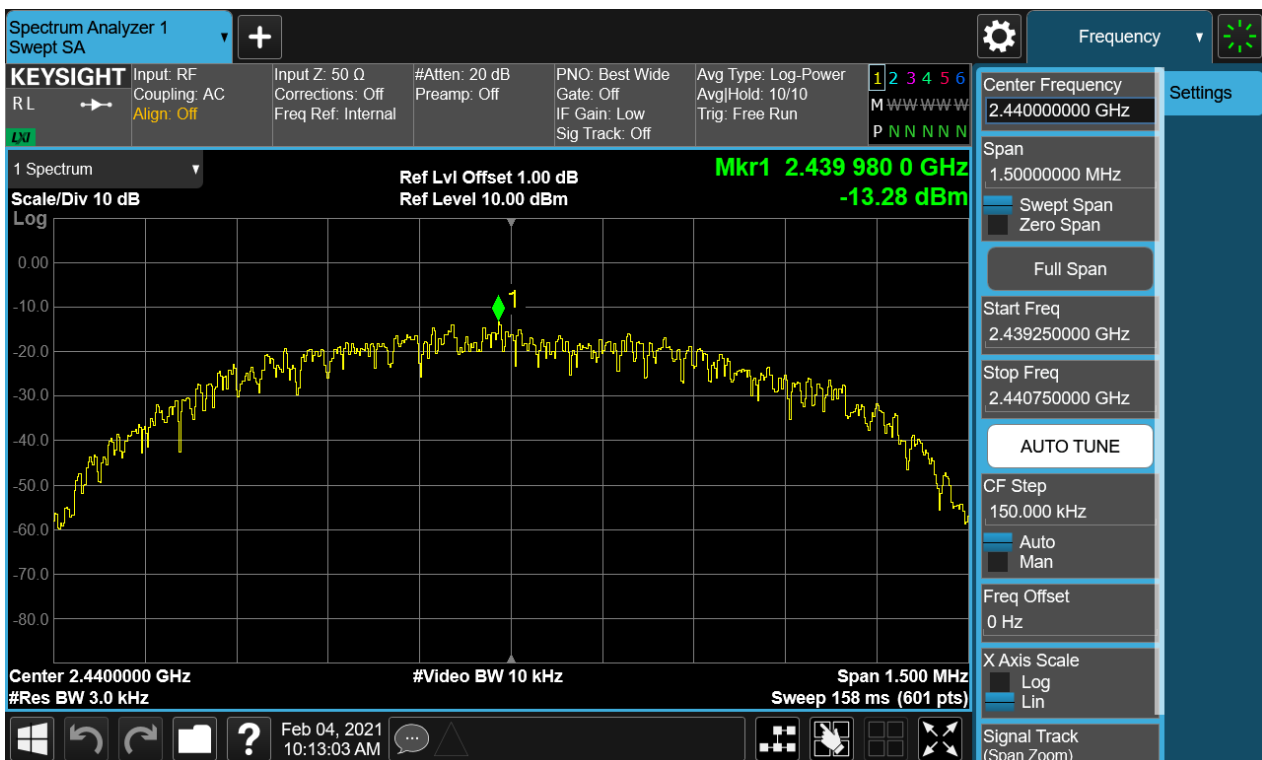
2021-03-15

Page 18 of 37

Figure 7: Power Spectral Density, 2402MHz



Figure 8: Power Spectral Density, 2440MHz



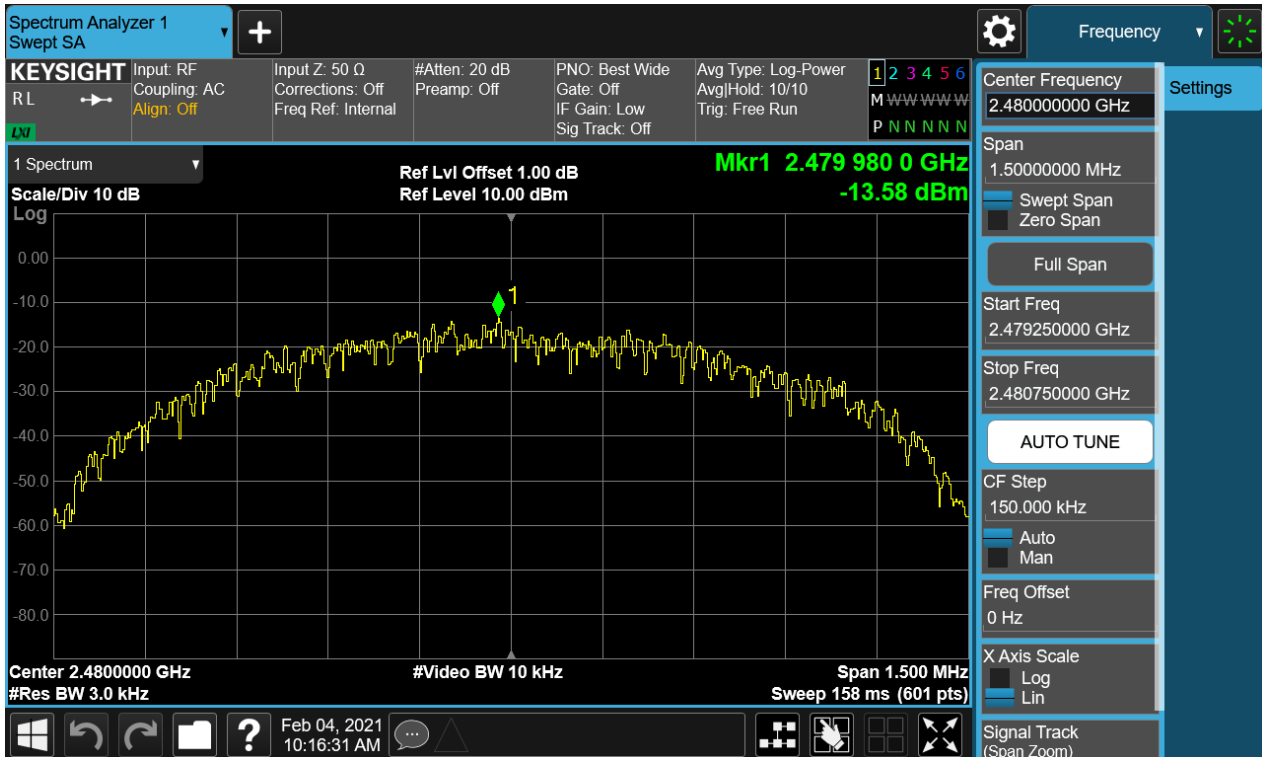
TEST REPORT

Report No.: SHE20100017-02FE

Date: 2021-03-15

Page 19 of 37

Figure 9: Power Spectral Density, 2480MHz



TEST REPORT

Report No.: SHE20100017-02FE

Date: 2021-03-15

Page 20 of 37

4.1.5 Conducted Spurious Emission & Authorized-band band-edge

RESULT:

PASS

Test standard : FCC Part 15.247(d)
RSS-247 5.5
Requirement : ANSI C63.10-2013, KDB 558074
Kind of test site : Shielded room

Test setup

Test Channel : Low/Middle/High for spurious, Low/High for Band
Edge
Operation Mode : A.1.a
Ambient temperature : 23°C
Relative humidity : 52%

For details refer to following test plot.

TEST REPORT

Report No.:

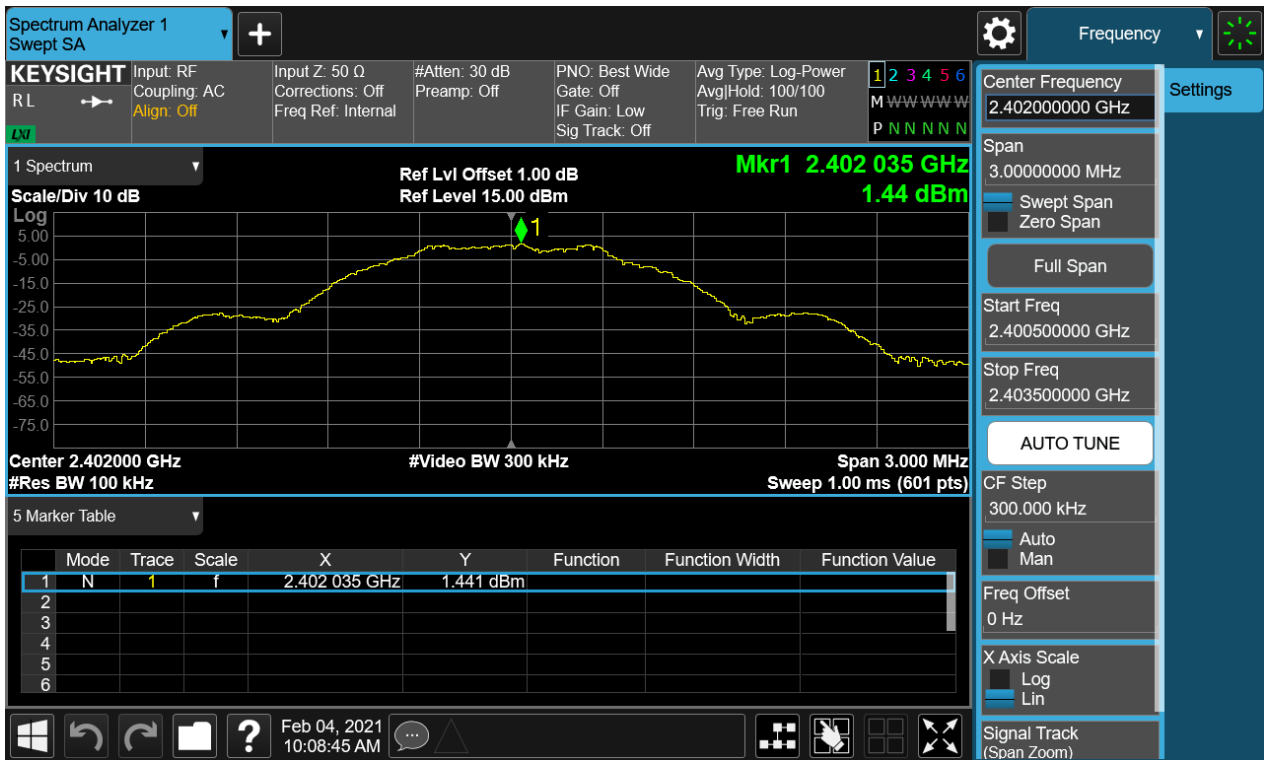
SHE20100017-02FE

Date:

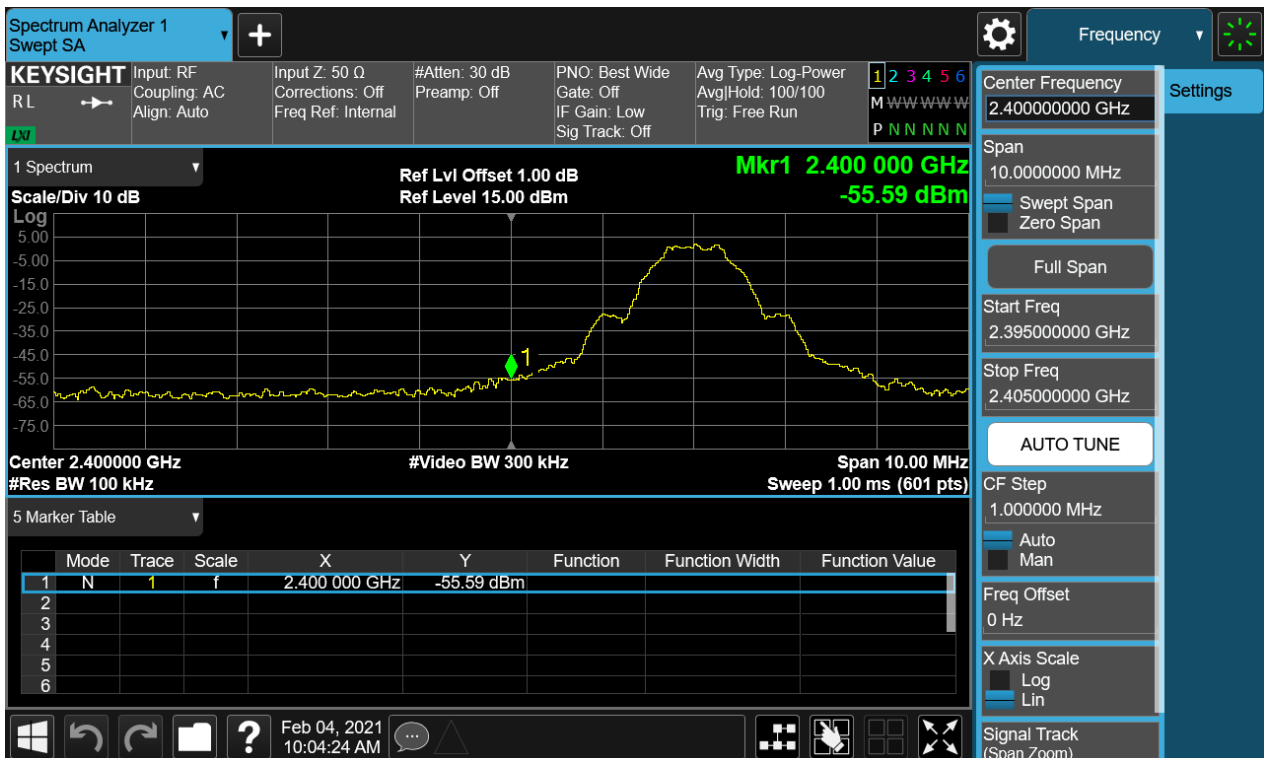
2021-03-15

Page 21 of 37

Figure 10: Conducted Spurious Emission & Authorized-band band-edge, 2402MHz, BLE Carrier Level



Band Edge



TEST REPORT

Report No.:

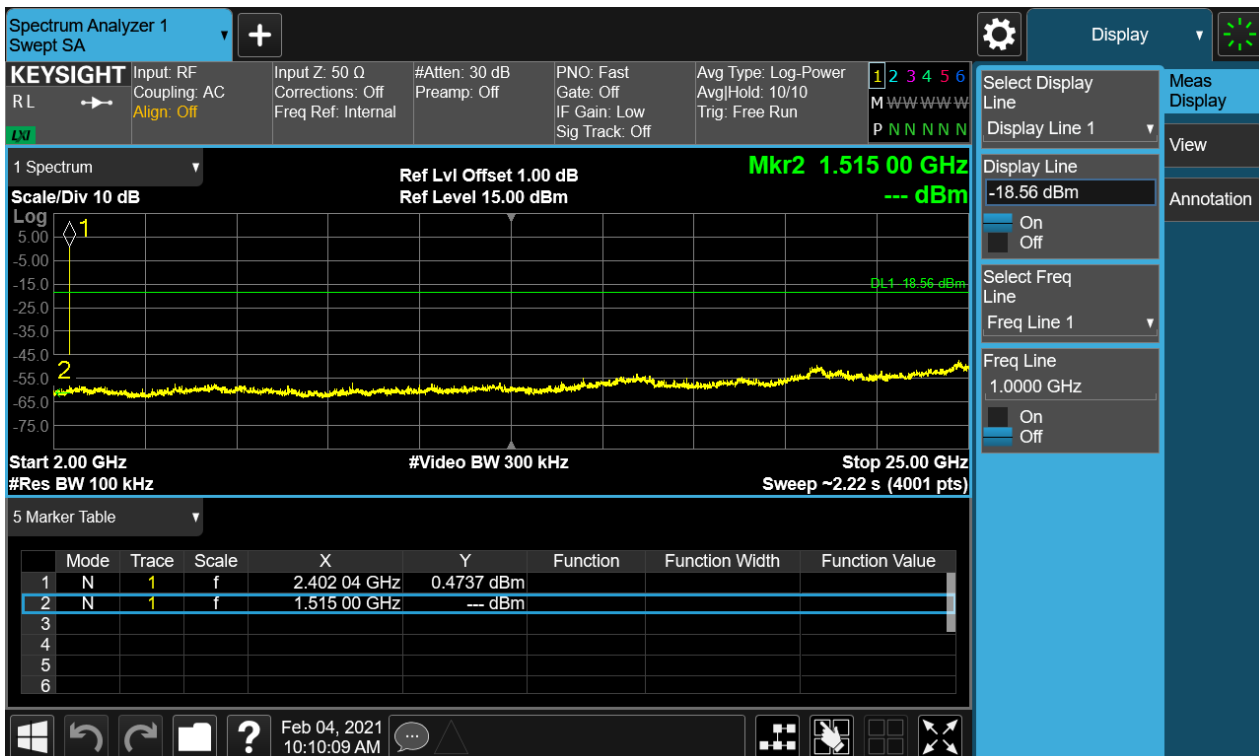
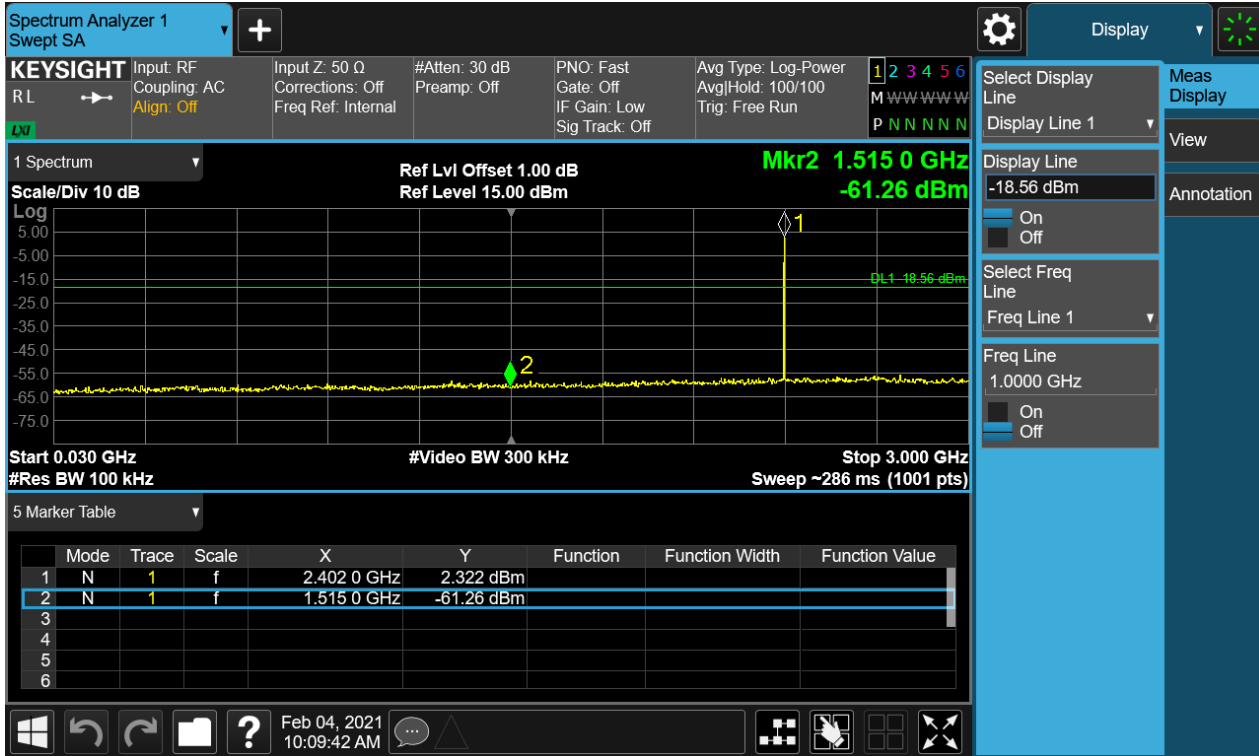
SHE20100017-02FE

Date:

2021-03-15

Page 22 of 37

Conducted spurious emissions 30MHz-25GHz



TEST REPORT

Report No.:

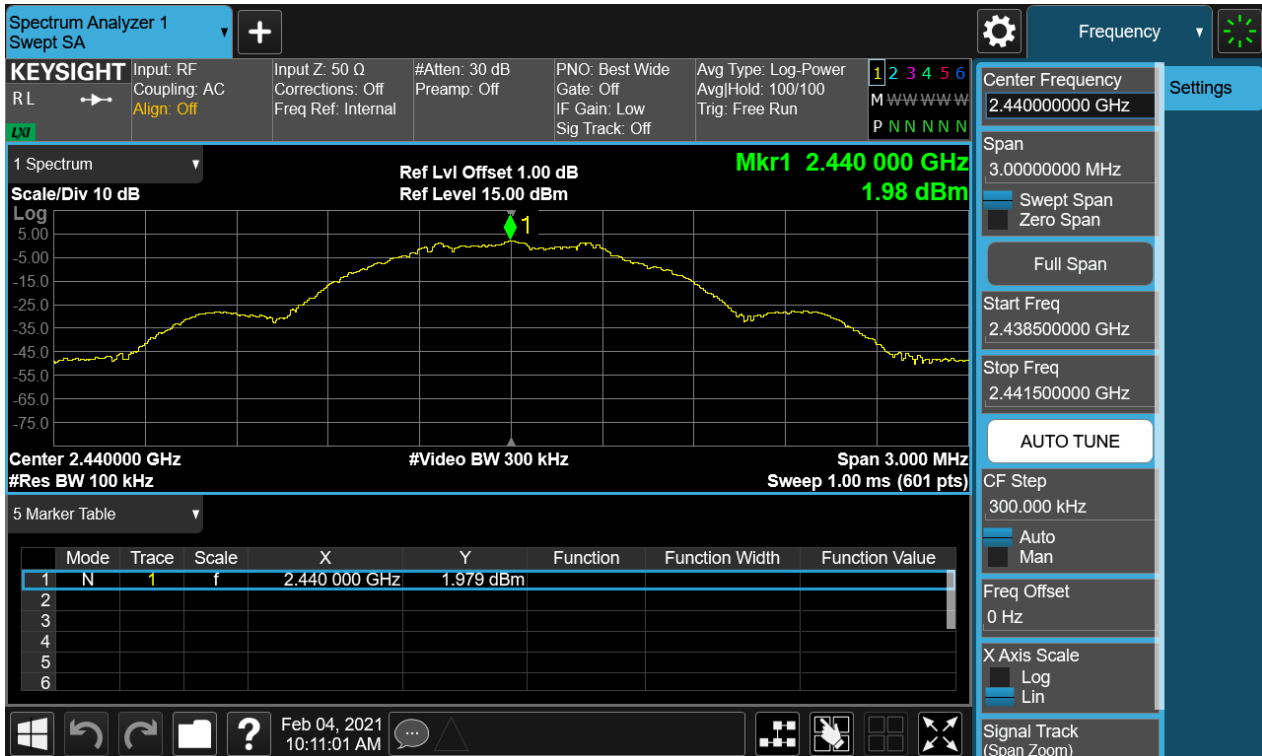
SHE20100017-02FE

Date:

2021-03-15

Page 23 of 37

Figure 11: Conducted Spurious Emission & Authorized-band band-edge, 2440MHz, BLE Carrier Level



Conducted spurious emissions 30MHz-25GHz

TEST REPORT

Report No.:

SHE20100017-02FE

Date:

2021-03-15

Page 24 of 37

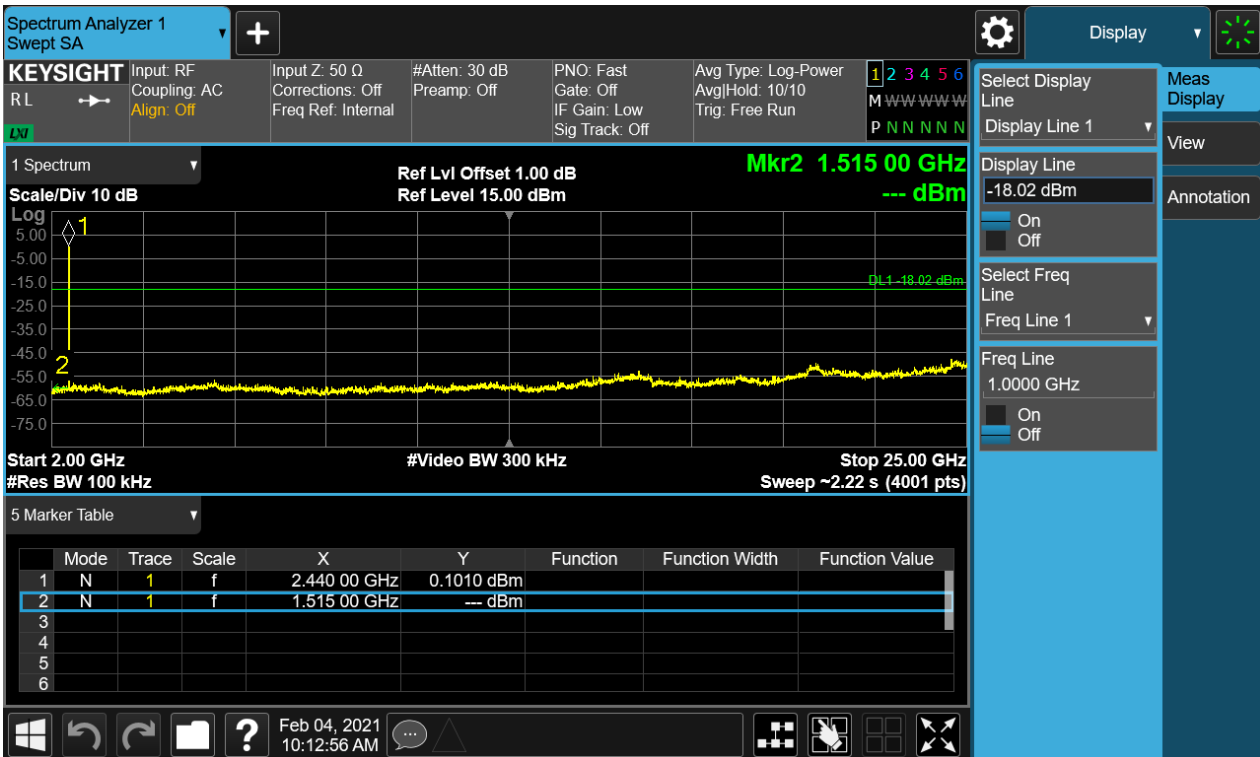
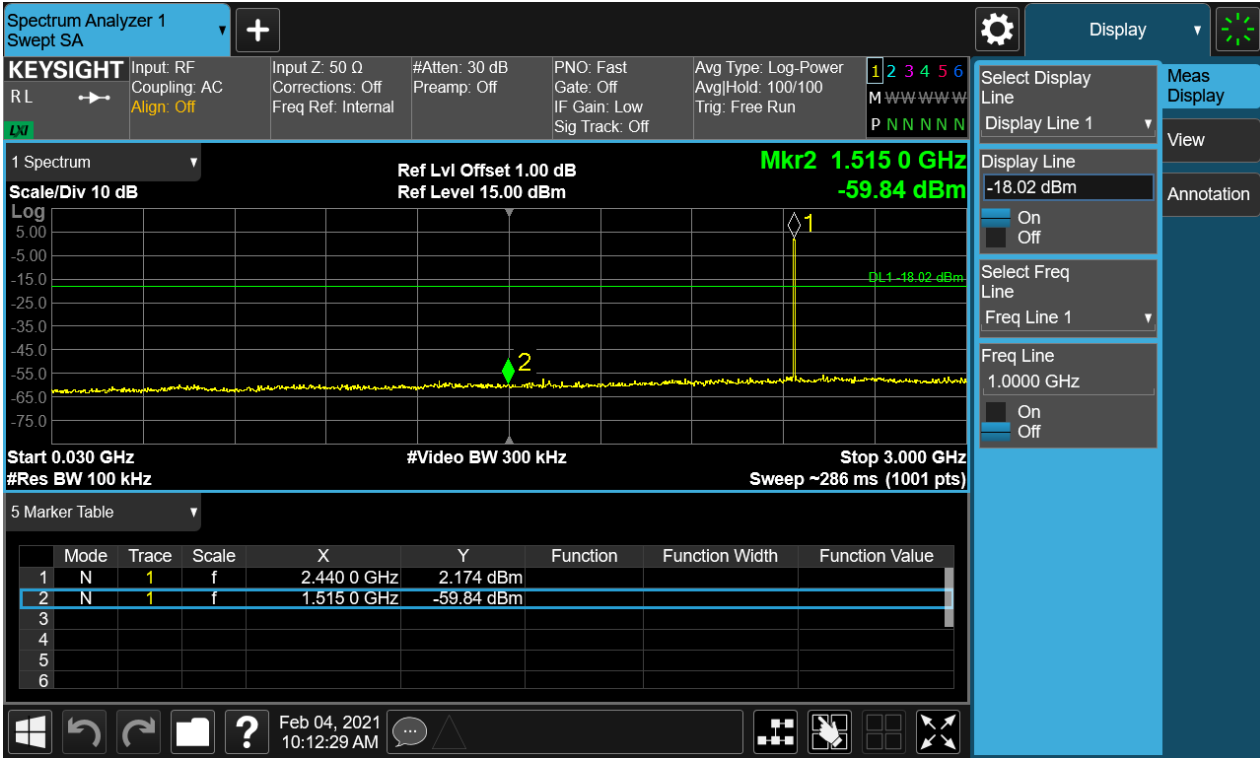


Figure 12: Conducted Spurious Emission & Authorized-band band-edge, 2480MHz, BLE Carrier Level

TEST REPORT

Report No.:

SHE20100017-02FE

Date:

2021-03-15

Page 25 of 37



Band Edge

TEST REPORT

Report No.:

SHE20100017-02FE

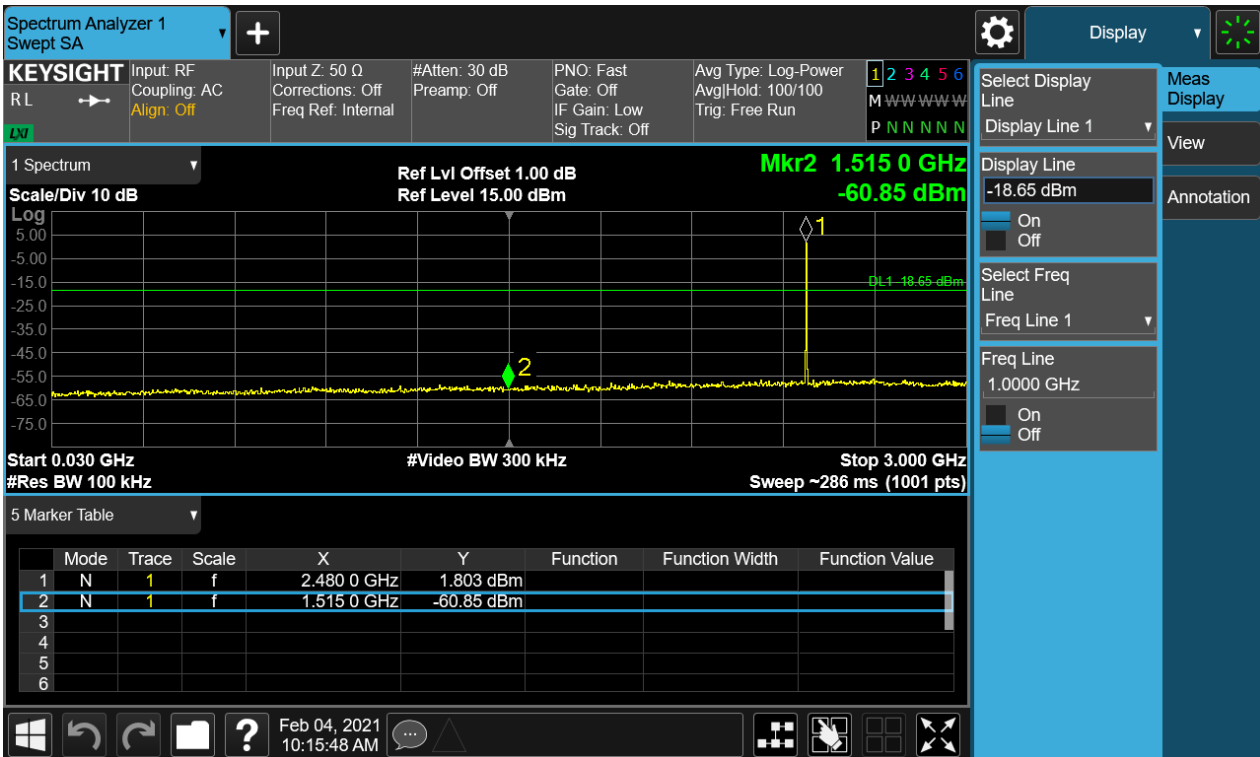
Date:

2021-03-15

Page 26 of 37



Conducted spurious emissions 30MHz-25GHz



TEST REPORT

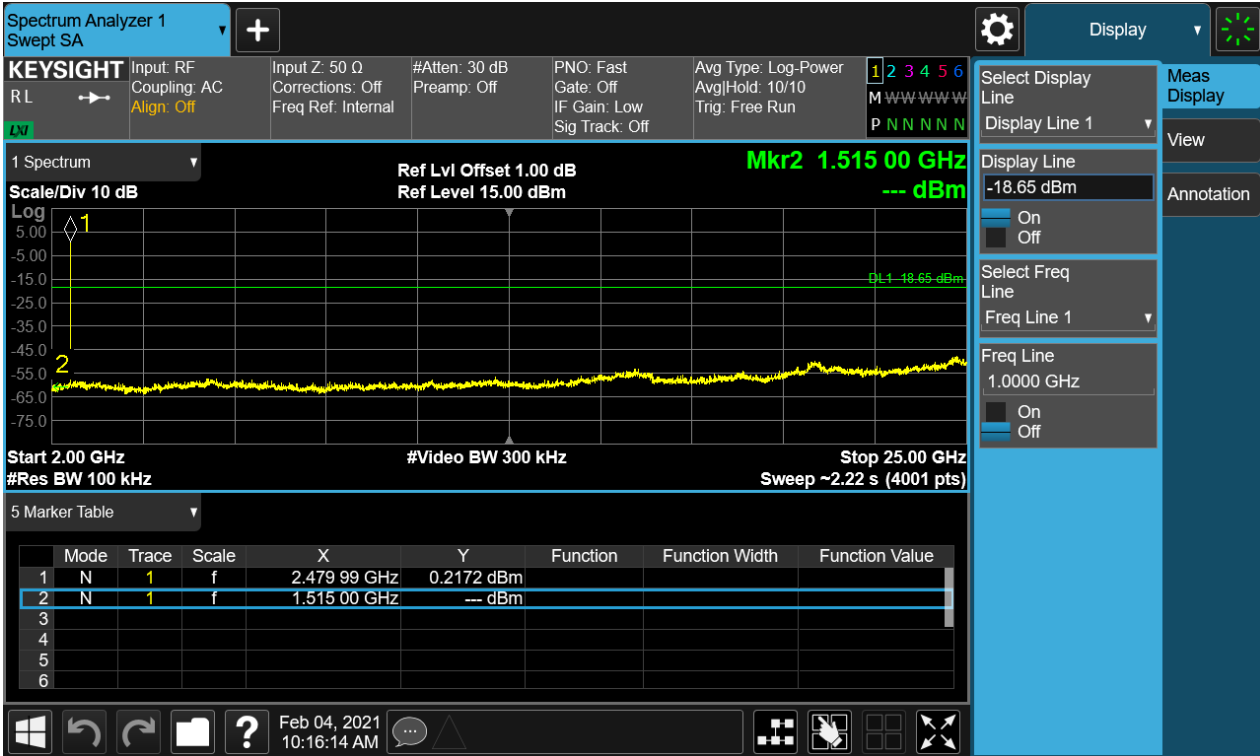
Report No.:

SHE20100017-02FE

Date:

2021-03-15

Page 27 of 37



TEST REPORT

Report No.: SHE20100017-02FE

Date: 2021-03-15

Page 28 of 37

4.1.6 Spurious Emission

RESULT:

PASS

Test standard : FCC Part 15.247(d), 15.205, 15.209
RSS-247 5.5
Requirement : ANSI C63.10-2013, KDB 558074
Kind of test site : 3m Semi-Anechoic Chamber

Test setup

Test Channel : Low/Middle/High
Operation Mode : A
Ambient temperature : 23°C
Relative humidity : 52%

Notes

Test plots please refer to the annex document "SHE20100017-02FE DATA BLE-TX EXHIBIT A".

1. For 9 kHz ~ 30 MHz, the amplitude of spurious emissions that are attenuated by more than 20dB below the permissible. The value has no need to be reported.
2. The spurious above 18GHz is noise only and 20dB below the limit. The value has no need to be reported.
3. The EUT is working in the Normal link mode below 1 GHz.

TEST REPORT

Report No.: SHE20100017-02FE

Date: 2021-03-15

Page 29 of 37

4.1.7 Band Edge (Restricted-band band-edge)

RESULT:

PASS

Test standard : FCC Part 15.247(d), 15.205, 15.209
RSS-247 5.5
Requirement : ANSI C63.10-2013, KDB 558074
Kind of test site : 3m Semi-Anechoic Chamber

Test setup

Test Channel : Low/Middle/High
Operation Mode : A.1
Ambient temperature : 23°C
Relative humidity : 52%

Notes

Test plots please refer to the annex document "SHE20100017-02FE DATA BLE-TX EXHIBIT A".

TEST REPORT

Report No.: SHE20100017-02FE

Date: 2021-03-15

Page 30 of 37

4.2 Mains Emissions

4.2.1 Conducted Emission on AC Mains

RESULT:

PASS

Test standard : FCC Part 15.207(a)
RSS-Gen 8.8
Requirement : ANSI C63.10-2013
Kind of test site : Shielded room

Test setup

Input Voltage : AC 120V, 60Hz; AC 240V, 50Hz
Operation Mode : A.2
Earthing : Not Connected
Ambient temperature : 23°C
Relative humidity : 52%

For details refer to following test plot.

TEST REPORT

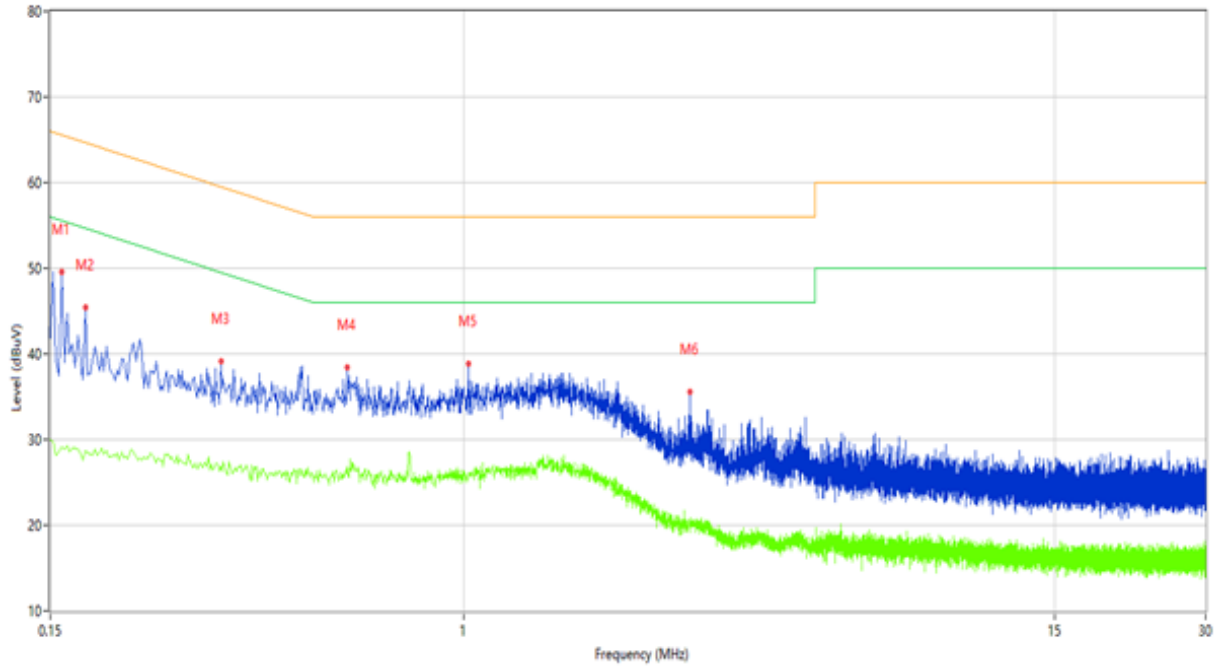
Report No.: SHE20100017-02FE

Date: 2021-03-15

Page 31 of 37

Note: The all configurations were tested respectively, but only the worst configuration shown here.

Figure 13: Conducted Emission on AC Mains, L Phase



No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Over Limit (dB)	Detector	Line	Verdict
1	0.158	55.51	9.67	65.57	-10.06	Peak	L	Pass
1*	0.158	35.78	9.67	65.57	-29.79	QP	L	Pass
1**	0.158	29.20	9.67	55.57	-26.37	AV	L	Pass
2	0.176	45.10	9.66	64.67	-19.57	Peak	L	Pass
2*	0.176	31.98	9.66	64.67	-32.69	QP	L	Pass
2**	0.176	28.66	9.66	54.67	-26.01	AV	L	Pass
3	0.328	36.00	9.71	59.50	-23.50	Peak	L	Pass
3*	0.328	26.75	9.71	59.50	-32.75	QP	L	Pass
3**	0.328	26.92	9.71	49.50	-22.58	AV	L	Pass
4	0.586	38.90	9.76	56.00	-17.10	Peak	L	Pass
4*	0.586	26.75	9.76	56.00	-29.25	QP	L	Pass
4**	0.586	26.80	9.76	46.00	-19.20	AV	L	Pass
5	1.020	31.20	9.66	56.00	-24.80	Peak	L	Pass
5*	1.020	22.09	9.66	56.00	-33.91	QP	L	Pass
5**	1.020	26.10	9.66	46.00	-19.90	AV	L	Pass
6	2.814	30.27	9.69	56.00	-25.73	Peak	L	Pass
6*	2.814	19.28	9.69	56.00	-36.72	QP	L	Pass
6**	2.814	20.41	9.69	46.00	-25.59	AV	L	Pass

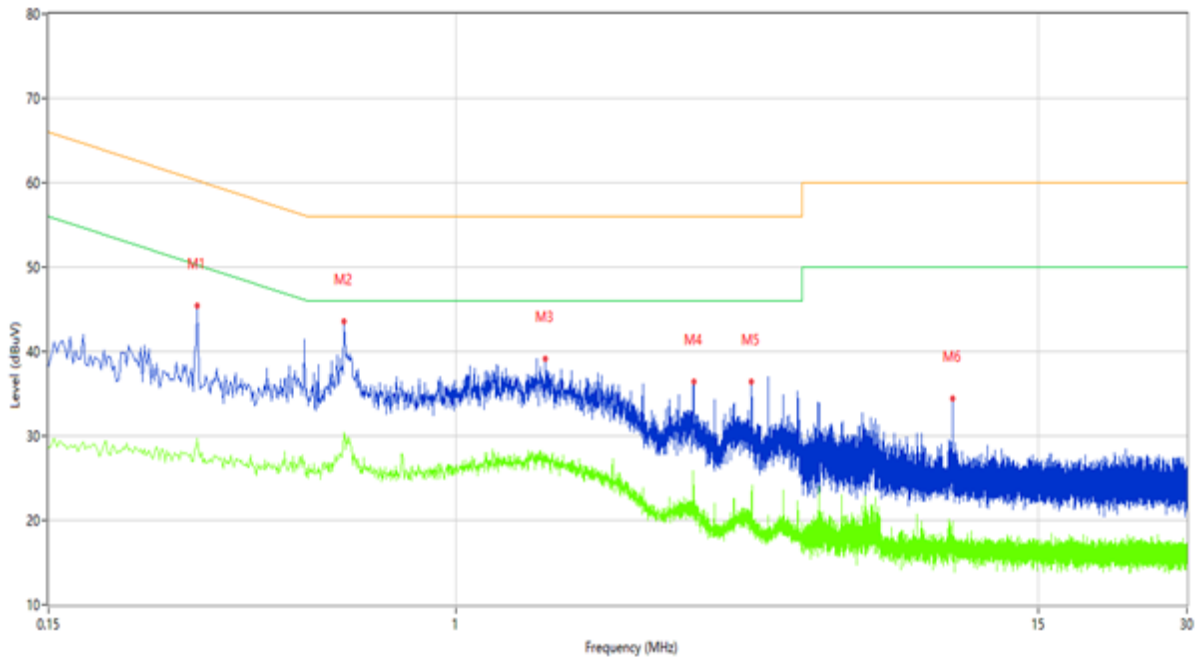
TEST REPORT

Report No.: SHE20100017-02FE

Date: 2021-03-15

Page 32 of 37

Figure 14: Conducted Emission on AC Mains, N Phase



No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Over Limit (dB)	Detector	Line	Verdict
1	0.300	42.31	9.70	60.24	-17.93	Peak	N	Pass
1*	0.300	28.00	9.70	60.24	-32.24	QP	N	Pass
1**	0.300	29.75	9.70	50.24	-20.49	AV	N	Pass
2	0.592	39.50	9.76	56.00	-16.50	Peak	N	Pass
2*	0.592	32.02	9.76	56.00	-23.98	QP	N	Pass
2**	0.592	30.11	9.76	46.00	-15.89	AV	N	Pass
3	1.516	32.01	9.67	56.00	-23.99	Peak	N	Pass
3*	1.516	23.03	9.67	56.00	-32.97	QP	N	Pass
3**	1.516	27.58	9.67	46.00	-18.42	AV	N	Pass
4	3.018	34.04	9.69	56.00	-21.96	Peak	N	Pass
4*	3.018	25.11	9.69	56.00	-30.89	QP	N	Pass
4**	3.018	23.97	9.69	46.00	-22.03	AV	N	Pass
5	3.956	35.68	9.68	56.00	-20.32	Peak	N	Pass
5*	3.956	25.61	9.68	56.00	-30.39	QP	N	Pass
5**	3.956	23.37	9.68	46.00	-22.63	AV	N	Pass
6	10.074	27.73	9.65	60.00	-32.27	Peak	N	Pass
6*	10.074	18.94	9.65	60.00	-41.06	QP	N	Pass
6**	10.074	19.81	9.65	50.00	-30.19	AV	N	Pass

TEST REPORT

Report No.: SHE20100017-02FE

Date: 2021-03-15

Page 33 of 37

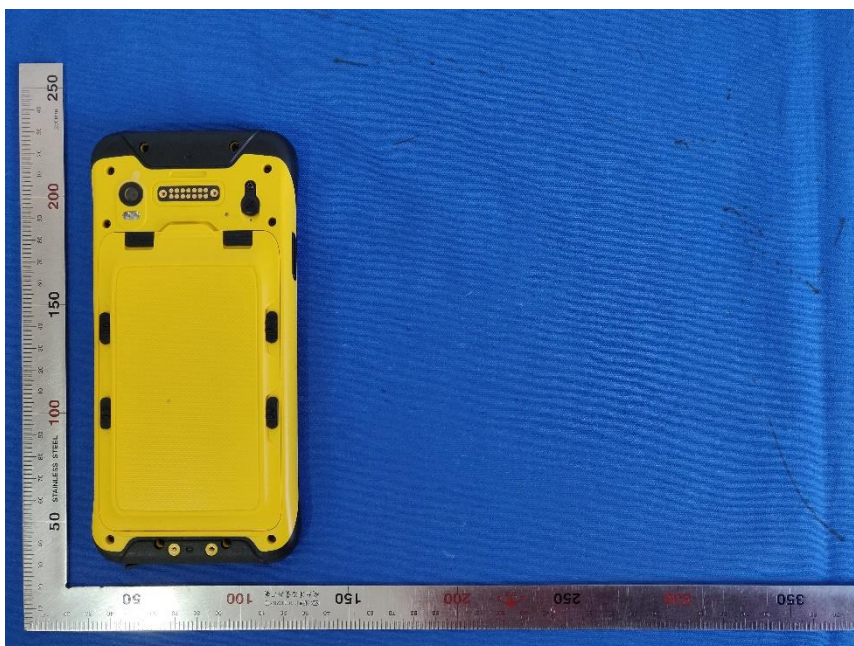
5 Appendixes

5.1 Photographs of the Sample

TDC600_2 Model



Front of the sample



Rear of the sample

TEST REPORT

Report No.:

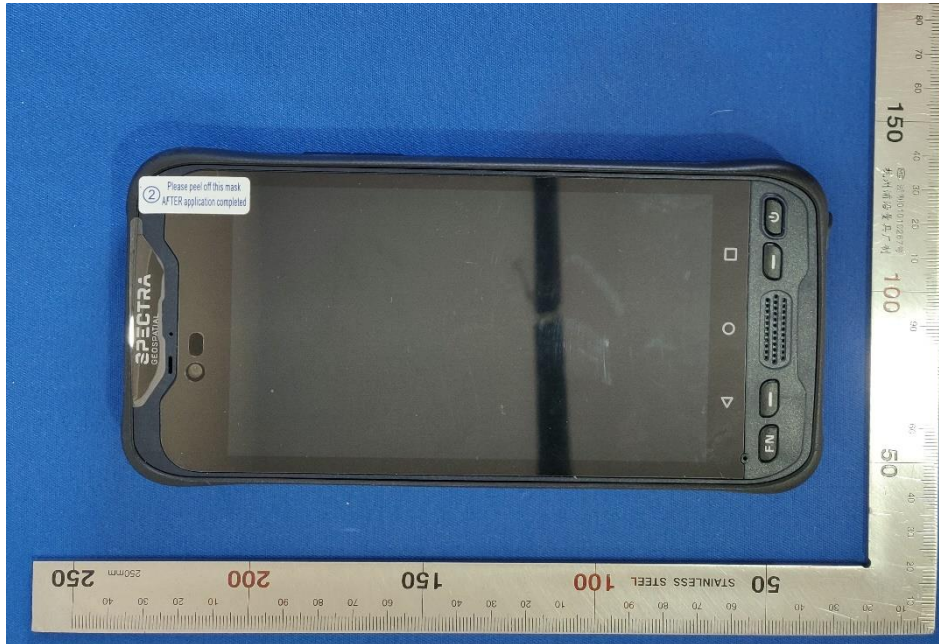
SHE20100017-02FE

Date:

2021-03-15

Page 34 of 37

MobileMapper60_2 Model



Front of the sample



Rear of the sample

TEST REPORT

Report No.: SHE20100017-02FE

Date: 2021-03-15

Page 35 of 37

5.2 Set-up for Conducted Emissions



5.3 Set-up for Conducted RF test at Antenna Port



TEST REPORT

Report No.: SHE20100017-02FE

Date: 2021-03-15

Page 36 of 37

5.4 Set-up for Spurious Emissions below 1GHz



5.5 Set-up for Spurious Emissions above 1GHz

TEST REPORT

Report No.:

SHE20100017-02FE

Date:

2021-03-15

Page 37 of 37



End of the report