

RADIO PERFORMANCE TEST REPORT

Test Report No. : OT-221-RWD-032

Reception No. : 2112005449

Applicant : Remote Solution Co., Ltd.

Address : 92, Chogokri, Nammyun, Kimchon City, Kyungbuk, 740-871, South Korea

Manufacturer : Remote Solution Co., Ltd.

Address : 71, Gunpocheomdansaneop 2-ro Gunpo-si, Gyeonggi-do, 15880, Korea

Type of Equipment : BLE to IR converter

FCC ID. : TX4RD58A

Model Name : PUCKmed

Multiple Model Name : RD58

Serial number : N/A

Total page of Report : 35 pages (including this page)

Date of Incoming : December 28, 2021

Date of issue : January 17, 2022

SUMMARY

The equipment complies with the regulation; **FCC PART 15 SUBPART C Section 15.247**

This test report only contains the result of a single test of the sample supplied for the examination.

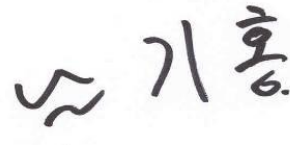
It is not a generally valid assessment of the features of the respective products of the mass-production.



Tested by
Joon-Woo, Kim / Assistant Manager
ONETECH Corp.



Reviewed by
Tae-Ho, Kim / Senior Manager
ONETECH Corp.



Approved by
Ki-Hong, Nam / General Manager
ONETECH Corp.

CONTENTS

PAGE

1. VERIFICATION OF COMPLIANCE	5
2. TEST SUMMARY	6
2.1 TEST ITEMS AND RESULTS	6
2.2 ADDITIONS, DEVIATIONS, EXCLUSIONS FROM STANDARDS.....	6
2.3 RELATED SUBMITTAL(S) / GRANT(S)	6
2.4 PURPOSE OF THE TEST	6
2.5 TEST METHODOLOGY.....	6
2.6 TEST FACILITY.....	6
3. GENERAL INFORMATION.....	7
3.1 PRODUCT DESCRIPTION.....	7
3.2 ALTERNATIVE TYPE(S)/MODEL(S); ALSO COVERED BY THIS TEST REPORT.....	7
4. EUT MODIFICATIONS.....	7
5. SYSTEM TEST CONFIGURATION	8
5.1 JUSTIFICATION.....	8
5.2 PERIPHERAL EQUIPMENT	8
5.3 MODE OF OPERATION DURING THE TEST	8
5.4 CONFIGURATION OF TEST SYSTEM.....	10
6. PRELIMINARY TEST	10
6.1 AC POWER LINE CONDUCTED EMISSIONS TESTS.....	10
6.2 GENERAL RADIATED EMISSIONS TESTS	10
7. MINIMUM 6 DB BANDWIDTH	11
7.1 OPERATING ENVIRONMENT	11
7.2 TEST SET-UP	11
7.3 TEST DATE	11
7.4 TEST DATA FOR 1 MBPS	12
8. MAXIMUM PEAK OUTPUT POWER.....	14
8.1 OPERATING ENVIRONMENT	14
8.2 TEST SET-UP	14
8.3 TEST DATE	14
8.4 TEST DATA FOR 1 MBPS	15
9. 100 KHZ BANDWIDTH OUTSIDE THE FREQUENCY BAND.....	17

This Report is not correlated with the authentication of KOLAS

It should not be reproduced except in full, without the written approval of ONETECH Corp.

OTC-TRF-RF-001(0)

ONETECH Corp.: 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)

9.1 OPERATING ENVIRONMENT	17
9.2 TEST SET-UP FOR CONDUCTED MEASUREMENT	17
9.3 TEST SET-UP FOR RADIATED MEASUREMENT.....	17
9.4 TEST DATE	17
9.5 TEST DATA FOR CONDUCTED EMISSION	18
9.5.1 Test data for 1 Mbps	18
9.6 TEST DATA FOR RADIATED EMISSION.....	23
9.6.1 Radiated Emission which fall in the Restricted Band.....	23
9.6.2 Spurious & Harmonic Radiated Emission.....	24
10. PEAK POWER SPECTRAL DENSITY	25
10.1 OPERATING ENVIRONMENT	25
10.2 TEST SET-UP	25
10.3 TEST DATE	25
10.4 TEST DATA FOR 1 MBPS	26
11. RADIATED EMISSION TEST	28
11.1 OPERATING ENVIRONMENT	28
11.2 TEST SET-UP	28
11.3 TEST DATE	29
11.4 TEST DATA FOR 30 MHz ~ 1 GHz.....	30
11.4.1 Test data for Bluetooth LE	30
11.5 Test data for Below 30 MHz	31
11.6 TEST DATA FOR ABOVE 1 GHz	31
12. CONDUCTED EMISSION TEST.....	32
12.1 OPERATING ENVIRONMENT	32
12.2 TEST SET-UP	32
12.3 TEST DATE	32
12.4 TEST DATA.....	33
13. LIST OF TEST EQUIPMENT	35

Revision History

Rev. No.	Issue Report No.	Issued Date	Revisions	Section Affected
0	OT-221-RWD-032	January 17, 2022	Initial Release	All

1. VERIFICATION OF COMPLIANCE

Applicant : Remote Solution Co., Ltd.
 Address : 92, Chogokri, Nammyun, Kimchon City, Kyungbuk, 740-871, South Korea
 Contact Person : Byung-Cheol, Kim / Manager
 Telephone No. : +82-54-420-4517
 FCC ID : TX4RD58A
 Model Name : PUCKmed
 Brand Name : Smash Toast
 Serial Number : N/A
 Date : January 17, 2022

EQUIPMENT CLASS	DTS – DIGITAL TRNSMISSION SYSTEM
E.U.T. DESCRIPTION	BLE to IR converter
THIS REPORT CONCERNS	Original Grant
MEASUREMENT PROCEDURES	ANSI C63.10: 2020
TYPE OF EQUIPMENT TESTED	Pre-Production
KIND OF EQUIPMENT AUTHORIZATION REQUESTED	Certification
EQUIPMENT WILL BE OPERATED UNDER FCC RULES PART(S)	FCC PART 15 SUBPART C Section 15.247 KDB 558074 D01 15.247 Meas Guidance v05r02
Modifications on the Equipment to Achieve Compliance	None
Final Test was Conducted On	3 m, Semi Anechoic Chamber

-. The above equipment was tested by ONETECH Corp. for compliance with the requirement set forth in the FCC Rules and Regulations. This said equipment in the configuration described in this report, shows the maximum emission levels emanating from equipment are within the compliance requirements.

2. TEST SUMMARY

2.1 Test items and results

SECTION	TEST ITEMS	RESULTS
15.247 (a) (2)	Minimum 6 dB Bandwidth	Met the Limit / PASS
15.247 (b) (3)	Maximum Peak Conducted Output Power	Met the Limit / PASS
15.247 (d)	100 kHz Bandwidth Outside the Frequency Band	Met the Limit / PASS
15.247 (d)	Radiated Emission which fall in the Restricted Band	Met the Limit / PASS
15.247 (e)	Peak Power Spectral Density	Met the Limit / PASS
15.209	Radiated Emission Limits	Met the Limit / PASS
15.207	Conducted Limits	Met the Limit / PASS
15.203	Antenna Requirement	Met requirement / PASS

2.2 Additions, deviations, exclusions from standards

No additions, deviations or exclusions have been made from standard.

2.3 Related Submittal(s) / Grant(s)

Original submittal only

2.4 Purpose of the test

To determine whether the equipment under test fulfills the requirements of the regulation stated in FCC PART 15 SUBPART C Section 15.247.

2.5 Test Methodology

Both conducted and radiated testing was performed according to the procedures in ANSI C63.10: 2020. Radiated testing was performed at a distance of 3 m from EUT to the antenna.

2.6 Test Facility

The Onetech Corp. has been designated to perform equipment testing in compliance with ISO/IEC 17025.

The Electromagnetic compatibility measurement facilities are located at 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea.

-. Site Filing:

VCCI (Voluntary Control Council for Interference) – Registration No. R-20122/ C-14617/ G-10666/ T-11842

ISED (Innovation, Science and Economic Development Canada) – Registration No. Site# 3736A-3

KOLAS (Korea Laboratory Accreditation Scheme) - Accreditation NO. KT085

FCC (Federal Communications Commission) - Accreditation No. KR0013

RRA (Radio Research Agency) – Designation No. KR0013

This Report is not correlated with the authentication of KOLAS

It should not be reproduced except in full, without the written approval of ONETECH Corp.

OTC-TRF-RF-001(0)

ONETECH Corp.: 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)

3. GENERAL INFORMATION

3.1 Product Description

The Remote Solution Co., Ltd., Model PUCKmed (referred to as the EUT in this report) is a BLE to IR converter. The product specification described herein was obtained from product data sheet or user's manual.

DEVICE TYPE	BLE to IR converter
TEMPERATURE RANGE	-5 °C ~ 50 °C
OPERATING FREQUENCY	2 402 MHz ~ 2 480 MHz
MODULATION TYPE	GFSK (Bluetooth LE)
NUMBER OF CHANNEL	40 Channel
RF OUTPUT POWER	6.65 dBm
ANTENNA TYPE	Chip Antenna
ANTENNA GAIN	0.97 dBi
List of each Osc. or crystal Freq.(Freq. >= 1 MHz)	12 MHz

3.2 Alternative type(s)/model(s); also covered by this test report.

-. The following lists consist of the added model and their differences.

Model Name	Differences	Tested
PUCKmed	Basic Model.	☒
RD58	The model is identical to basic model except for the model name only.	☐

Note: 1. Applicant consigns only basic model to test. Therefore this test report just guarantees the units, which have been tested.

2. The Applicant/manufacturer is responsible for the compliance of all variants.

4. EUT MODIFICATIONS

-. None

5. SYSTEM TEST CONFIGURATION

5.1 Justification

This device was configured for testing in a typical way as a normal customer is supposed to be used. During the test, the following components were installed inside of the EUT.

DEVICE TYPE	MANUFACTURER	MODEL/PART NUMBER	FCC ID
Main Board	Remote Solution Co., Ltd.	1BL-3128A	N/A

5.2 Peripheral equipment

Model	Manufacturer	Description	Connected to
LG-M160E	SUNLIN	Adapter	EUT
HP ProBook 450 G7	HP	Notebook PC	EUT
Telink	N/A	Test Zig	EUT

5.3 Mode of operation during the test

For the testing, software used to control the EUT for staying in continuous transmitting is programmed.

For final testing, the EUT was set at 2 402 MHz, 2 440 MHz, and 2 480 MHz to get a maximum emission levels from the EUT. The EUT was moved throughout the XY, XZ, and YZ planes and the worst case is “XY” axis, but the worst data was recorded in this report.

-. Channel List (Bluetooth LE)

Channel	Frequency[MHz]	Channel	Frequency[MHz]	Channel	Frequency[MHz]
0	2 402.00	14	2 430.00	28	2 458.00
1	2 404.00	15	2 432.00	29	2 460.00
2	2 406.00	16	2 434.00	30	2 462.00
3	2 408.00	17	2 436.00	31	2 464.00
4	2 410.00	18	2 438.00	32	2 466.00
5	2 412.00	19	2 440.00	33	2 468.00
6	2 414.00	20	2 442.00	34	2 470.00
7	2 416.00	21	2 444.00	35	2 472.00
8	2 418.00	22	2 446.00	36	2 474.00
9	2 420.00	23	2 448.00	37	2 476.00
10	2 422.00	24	2 450.00	38	2 478.00
11	2 424.00	25	2 452.00	39	2 480.00
12	2 426.00	26	2 454.00		
13	2 428.00	27	2 456.00		

This Report is not correlated with the authentication of KOLAS

It should not be reproduced except in full, without the written approval of ONETECH Corp.

OTC-TRF-RF-001(0)

ONETECH Corp.: 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)

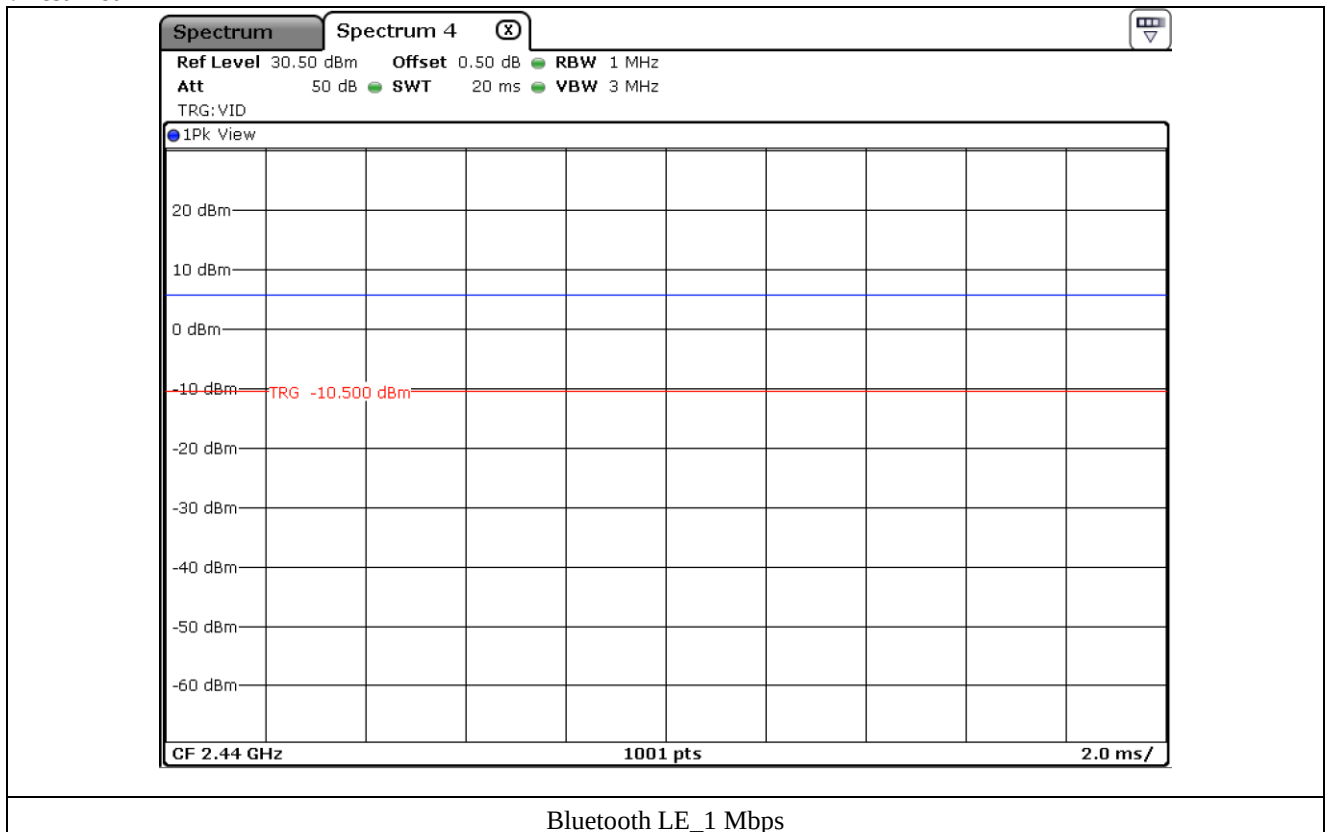
-. Duty Cycle

Mode	Tx On Time [ms]	Tx Off Time [ms]	Duty Cycle [%]	Correction Factor [dB]
Bluetooth LE	-	-	100 %	-

Note – Duty Cycle : (Tx On Time / (Tx On Time + Tx Off Time)) * 100

Correction Factor : 10 * Log(1 / (Duty Cycle / 100))

-. Test Plot



5.4 Configuration of Test System

Line Conducted Test: The EUT was tested in the Transmitting mode. All supporting equipment were connected to another LISN. Preliminary Power line Conducted Emission test was performed by using the procedure in ANSI C63.10: 2013 to determine the worse operating conditions.

Radiated Emission Test: Preliminary radiated emissions test were conducted using the procedure in ANSI C63.10: 2020 to determine the worse operating conditions. Final radiated emission tests were conducted at 3 meter Semi Anechoic Chamber.

The turntable was rotated through 360 degrees and the EUT was tested by positioned three orthogonal planes to obtain the highest reading on the field strength meter. Once maximum reading was determined, the search antenna was raised and lowered in both vertical and horizontal polarization.

5.5 Antenna Requirement

For intentional device, according to section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

Antenna Construction:

The antenna of the EUT is a PCB Antenna on the main board in the EUT, so no consideration of replacement by the user.

6. PRELIMINARY TEST

6.1 AC Power line Conducted Emissions Tests

During Preliminary Test, the following operating mode was investigated.

Operation Mode	The Worse operating condition (Please check one only)
Transmitting Mode	X

6.2 General Radiated Emissions Tests

During Preliminary Test, the following operating mode was investigated.

Operation Mode	The Worse operating condition (Please check one only)
Transmitting Mode	X

7. MINIMUM 6 dB BANDWIDTH

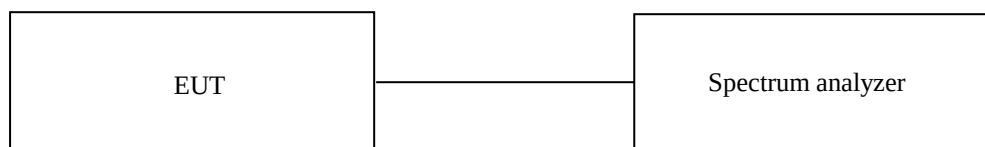
7.1 Operating environment

Temperature : 22.5 °C

Relative humidity : 53.5 % R.H.

7.2 Test set-up

The antenna output of the EUT was connected to the spectrum analyzer. The resolution bandwidth is set to 100 kHz, and peak detection was used. The 6 dB bandwidth is defined as the total spectrum over which the power is higher than the peak power minus 6 dB.



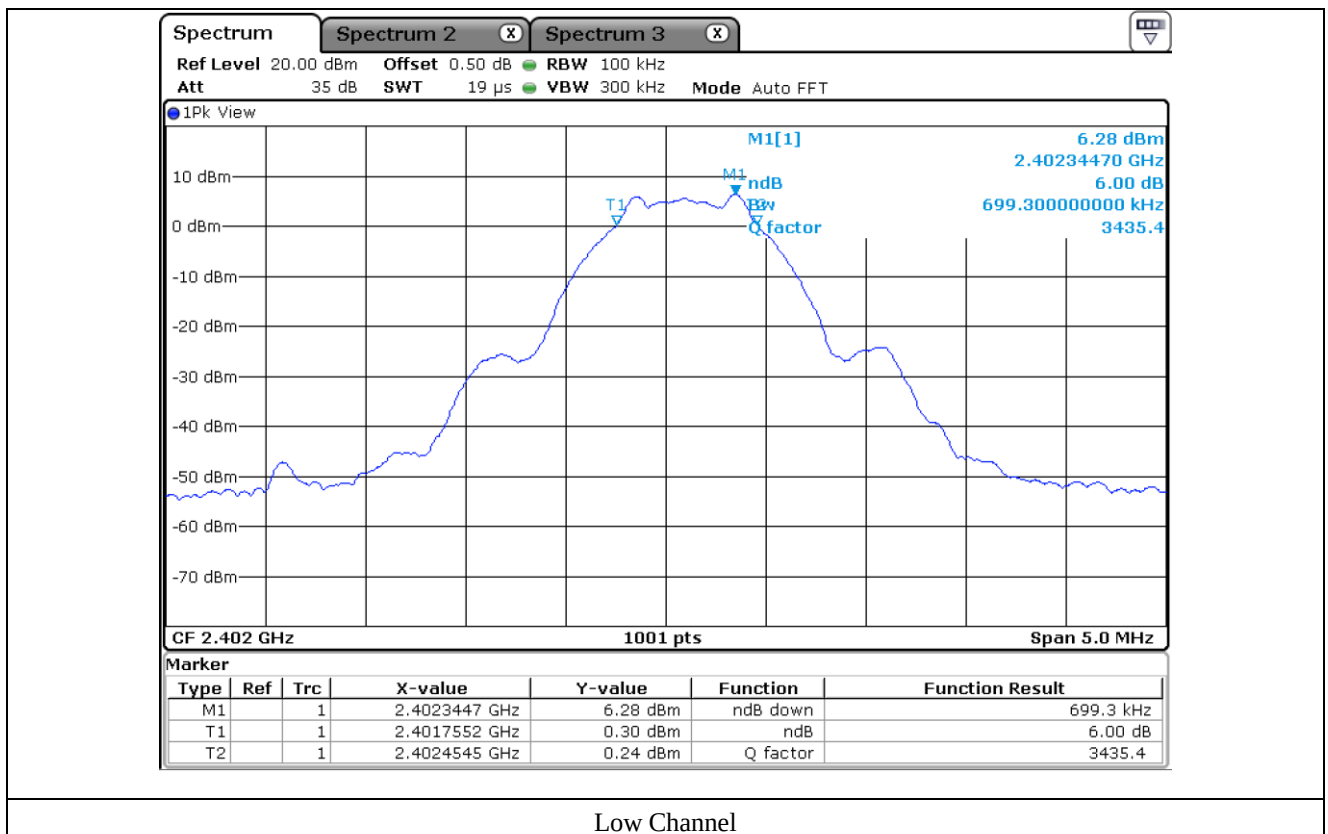
7.3 Test Date

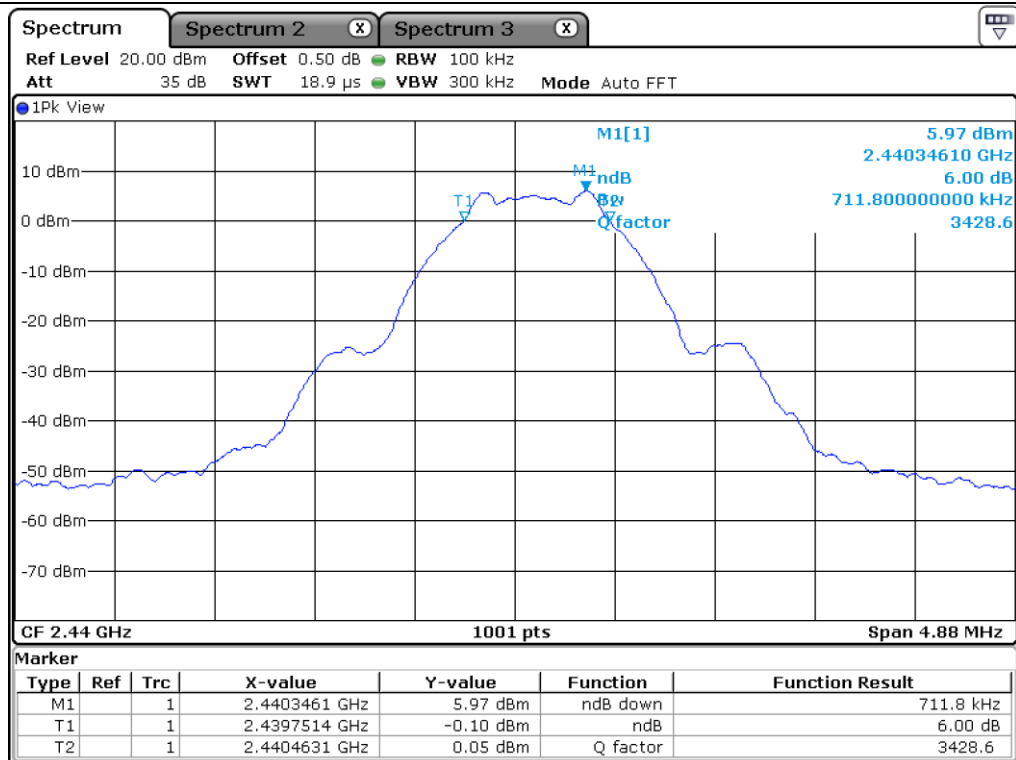
January 05, 2022 ~ January 07, 2022

7.4 Test data for 1 Mbps

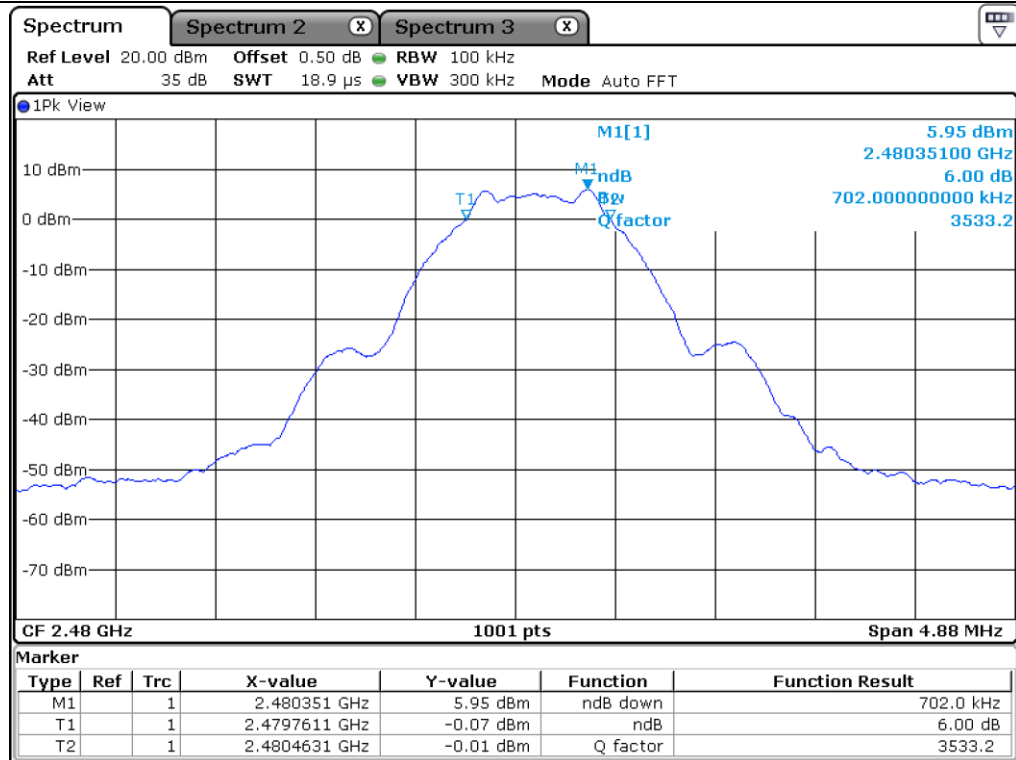
CHANNEL	FREQUENCY(MHz)	MEASURED VALUE (kHz)	LIMIT (kHz)	MARGIN (kHz)
Low	2 402.00	699.30	500.00	199.30
Middle	2 440.00	711.80	500.00	211.80
High	2 480.00	702.00	500.00	202.00

Remark. Margin = Measured Value - Limit





Middle Channel



High Channel

This Report is not correlated with the authentication of KOLAS

It should not be reproduced except in full, without the written approval of ONETECH Corp.

OTC-TRF-RF-001(0)

ONETECH Corp.: 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)

8. MAXIMUM PEAK OUTPUT POWER

8.1 Operating environment

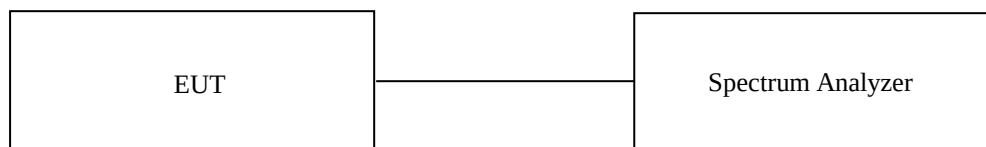
Temperature : 22.5 °C

Relative humidity : 53.5 % R.H.

8.2 Test set-up

The antenna output of the EUT was connected to the spectrum analyzer.

The resolution bandwidth is set to $\geq$ DTS Bandwidth, the video bandwidth is set to 3 times the resolution bandwidth.



8.3 Test Date

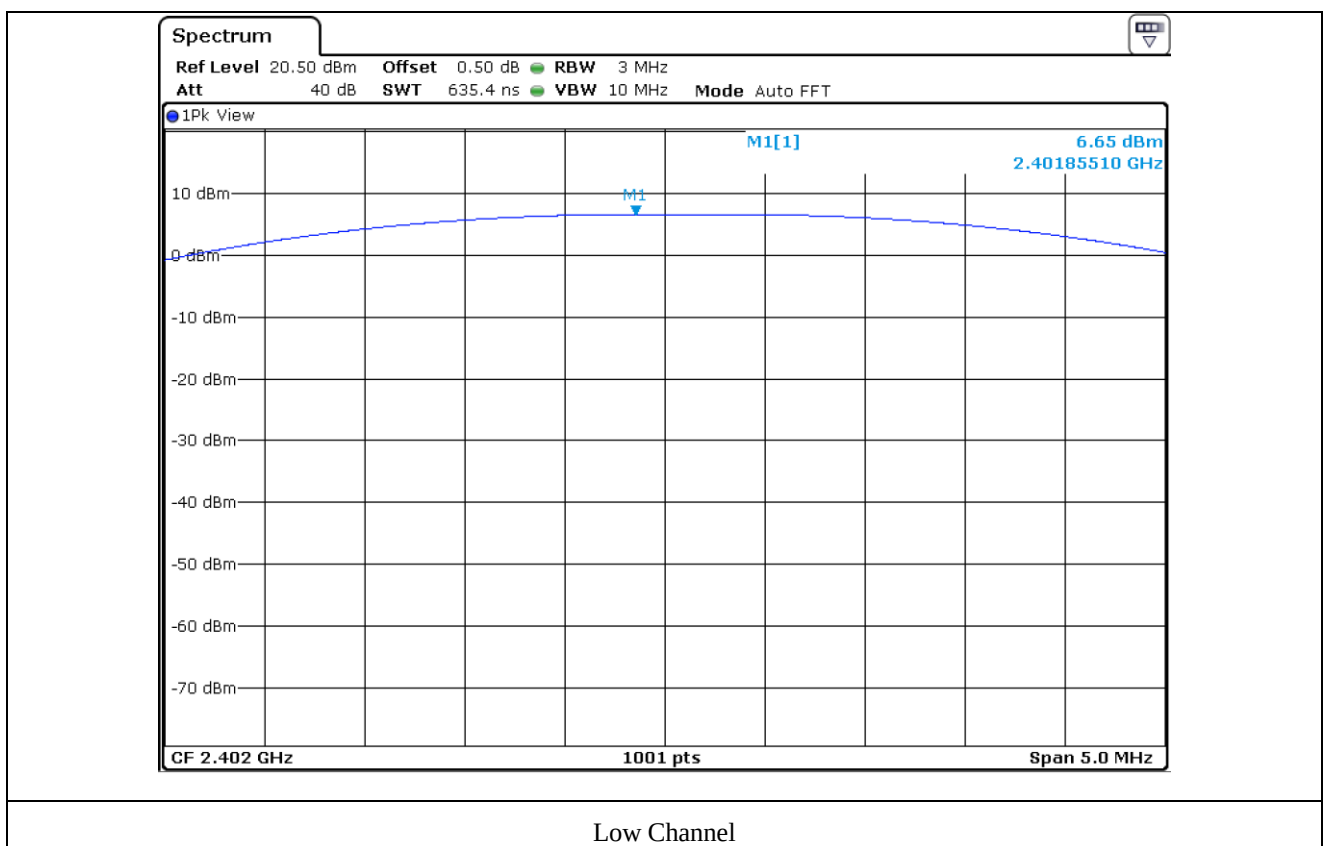
January 05, 2022 ~ January 07, 2022

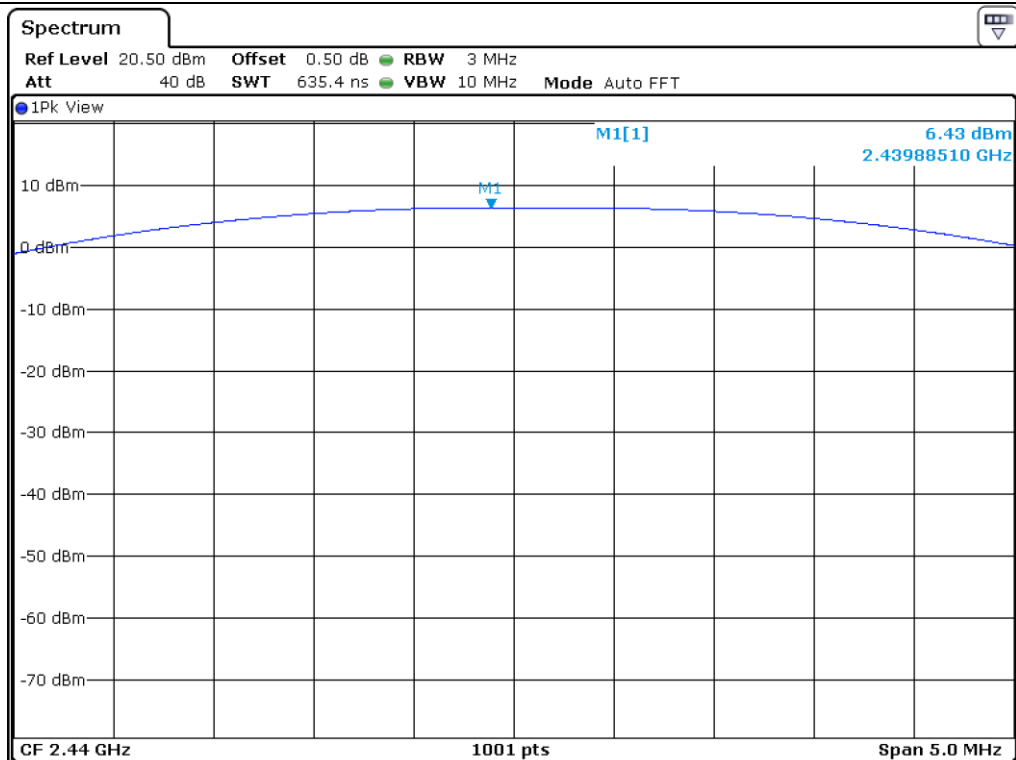
8.4 Test data for 1 Mbps

-. Test Result : Pass

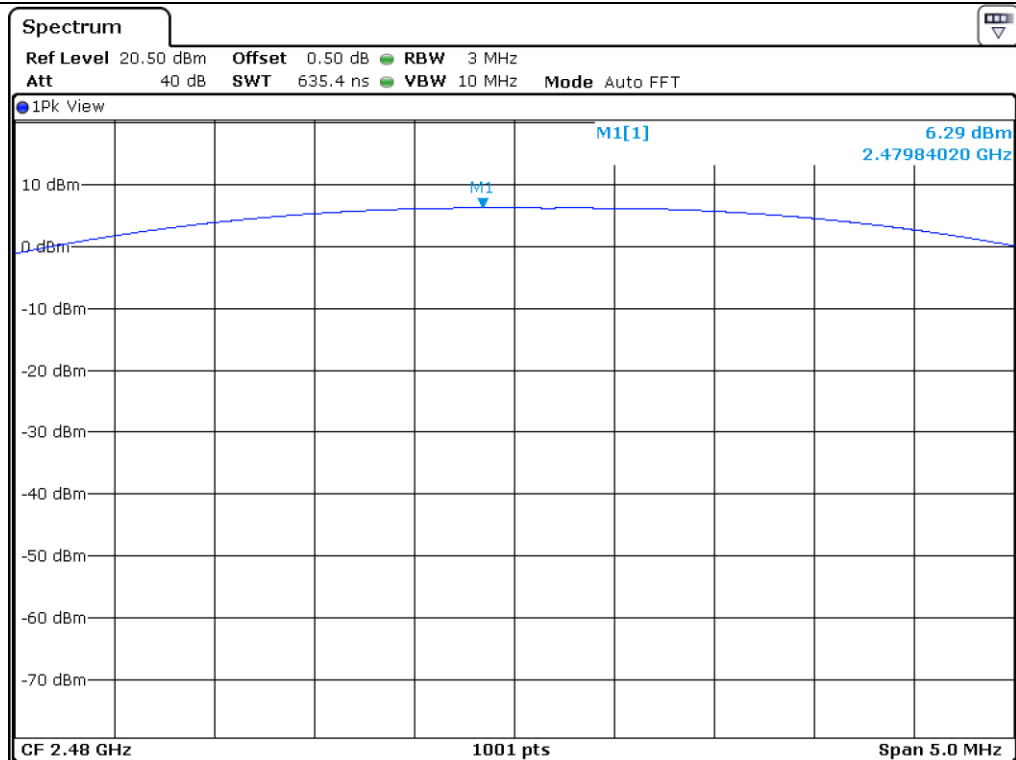
CHANNEL	FREQUENCY (MHz)	MEASURED VALUE (dBm)	LIMIT (dBm)	MARGIN (dB)
LOW	2 402.00	6.65	30.00	23.35
MIDDLE	2 440.00	6.43	30.00	23.57
HIGH	2 480.00	6.29	30.00	23.71

Remark. Margin = Limit – Measured Value (=Receiver Reading + Cable Loss)





Middle Channel



High Channel

This Report is not correlated with the authentication of KOLAS

It should not be reproduced except in full, without the written approval of ONETECH Corp.

OTC-TRF-RF-001(0)

ONETECH Corp.: 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)

9. 100 kHz BANDWIDTH OUTSIDE THE FREQUENCY BAND

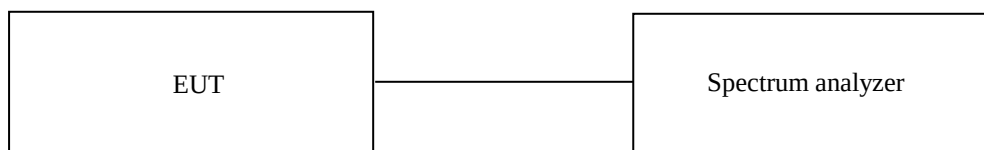
9.1 Operating environment

Temperature : 22.5 °C

Relative humidity : 53.5 % R.H.

9.2 Test set-up for conducted measurement

The antenna output of the EUT was connected to the spectrum analyzer. The resolution bandwidth is set to 100 kHz, the video bandwidth is set to 3 times the resolution bandwidth and peak detection was used.



9.3 Test set-up for radiated measurement

The radiated emissions measurements were performed on the 3 m semi anechoic chamber. The EUT was placed on turntable approximately 1.5 m above the ground plane.

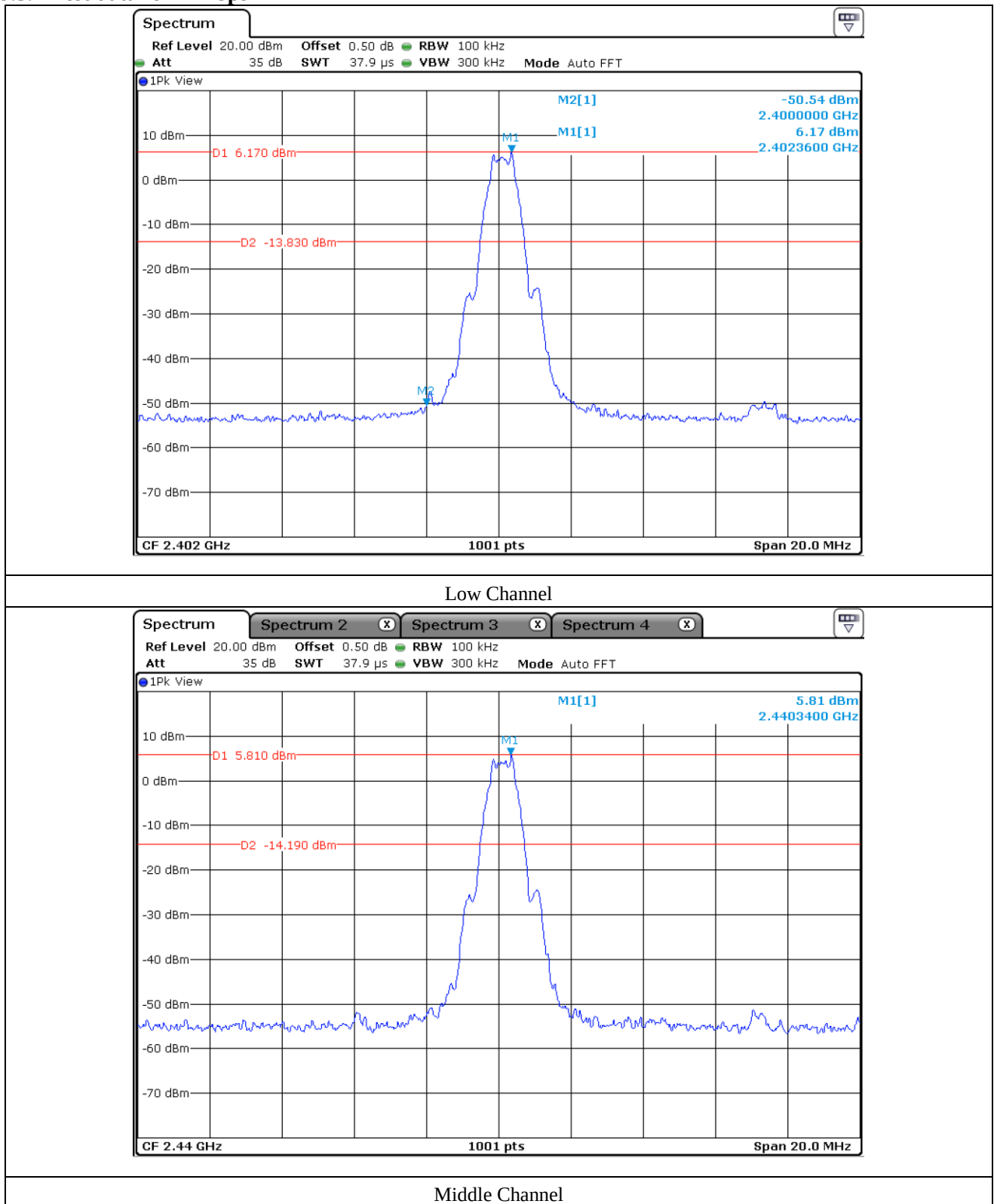
The frequency spectrum from 30 MHz to 26.5 GHz was scanned and maximum emission levels at each frequency recorded. The system was rotated 360°, and the antenna was varied in the height between 1.0 m and 4.0 m in order to determine the maximum emission levels. This procedure was performed for horizontal and vertical polarization of the receiving antenna.

9.4 Test Date

January 05, 2022 ~ January 07, 2022

9.5 Test data for conducted emission

9.5.1 Test data for 1 Mbps

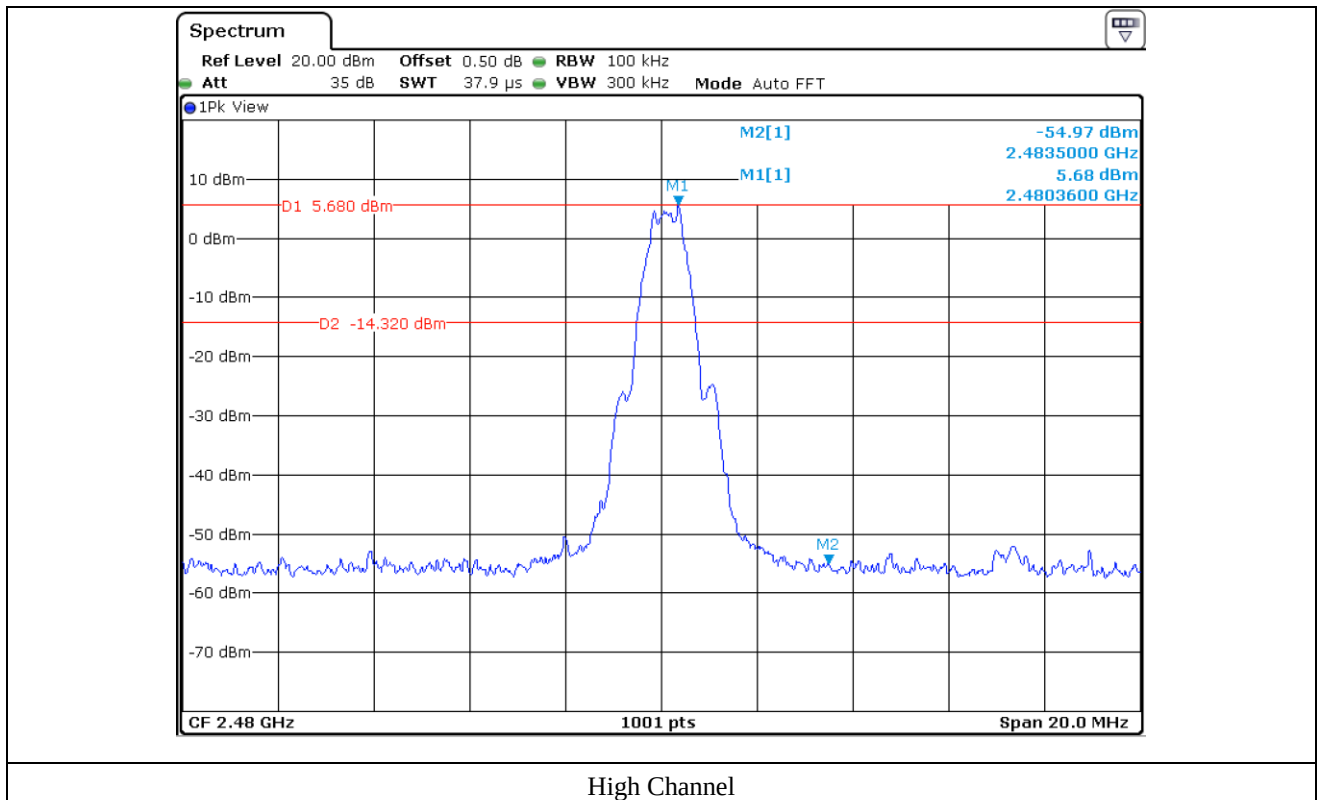


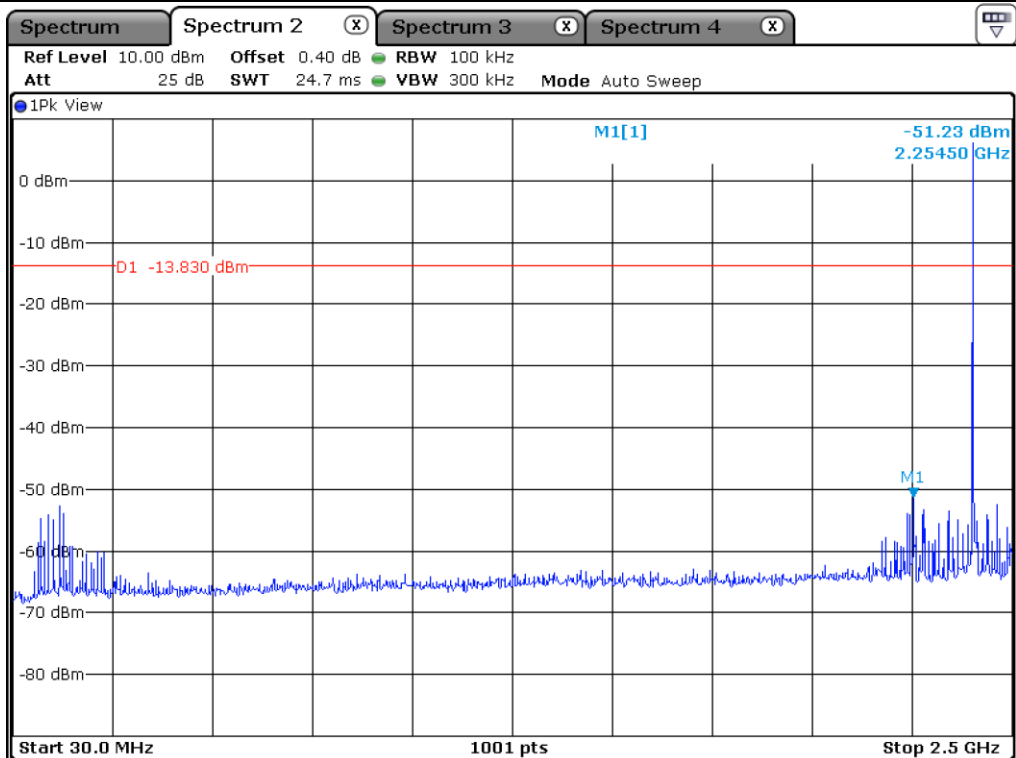
This Report is not correlated with the authentication of KOLAS

It should not be reproduced except in full, without the written approval of ONETECH Corp.

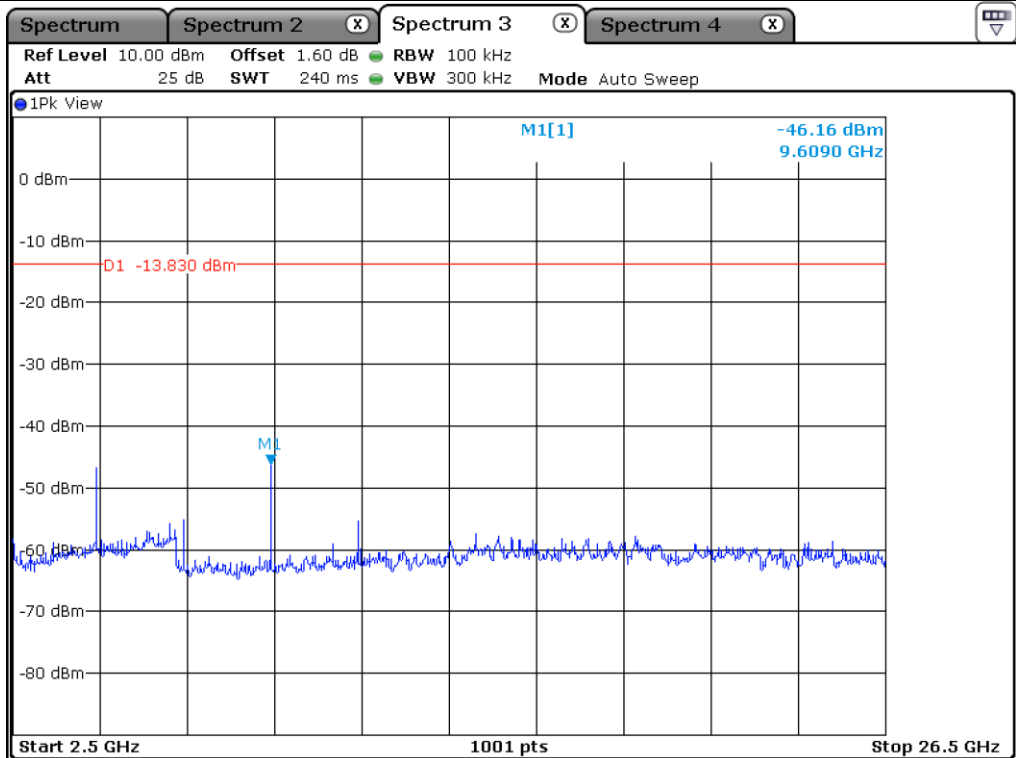
OTC-TRF-RF-001(0)

ONETECH Corp.: 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)





Low Channel



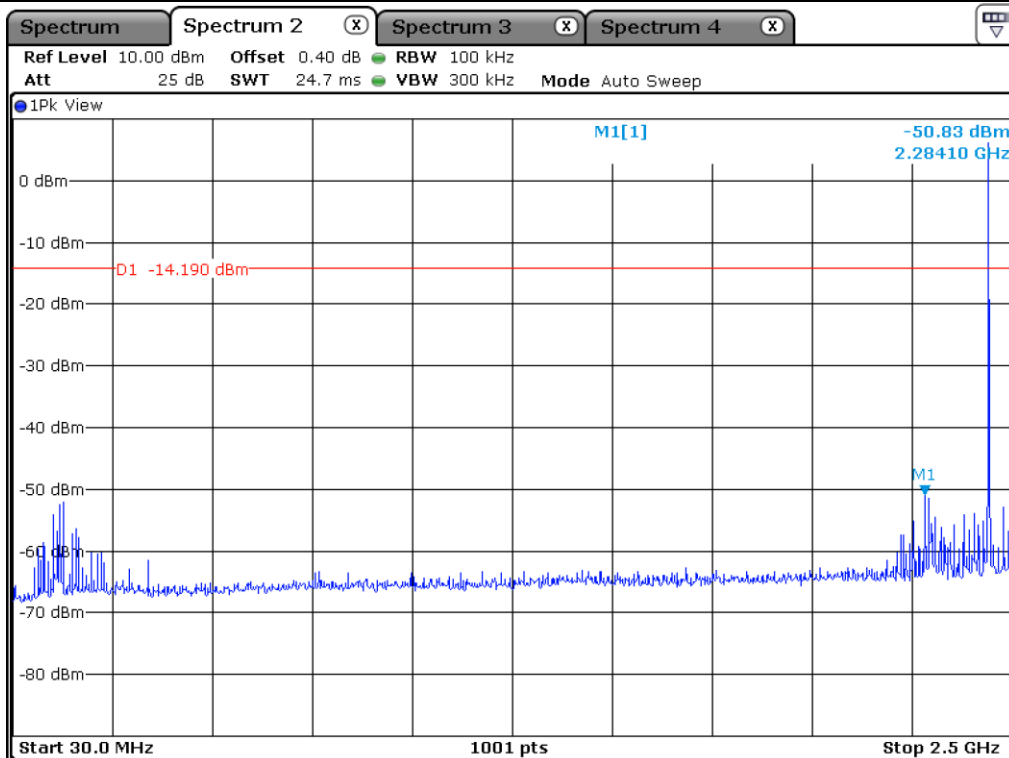
Low Channel

This Report is not correlated with the authentication of KOLAS

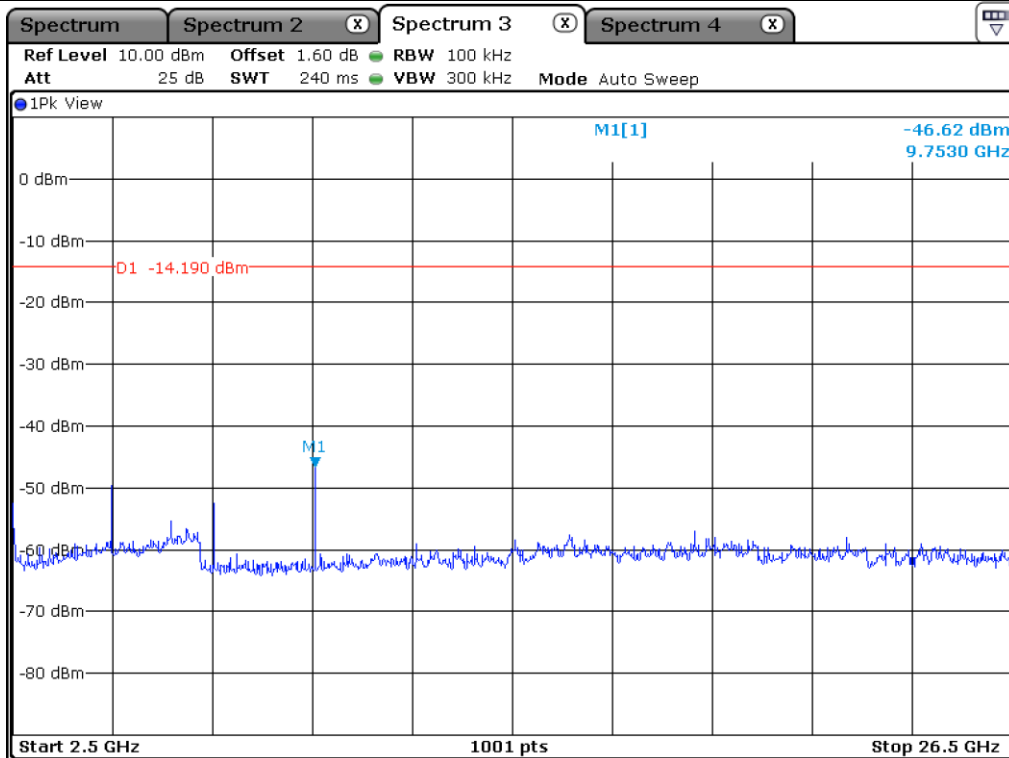
It should not be reproduced except in full, without the written approval of ONETECH Corp.

OTC-TRF-RF-001(0)

ONETECH Corp.: 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)



Middle Channel



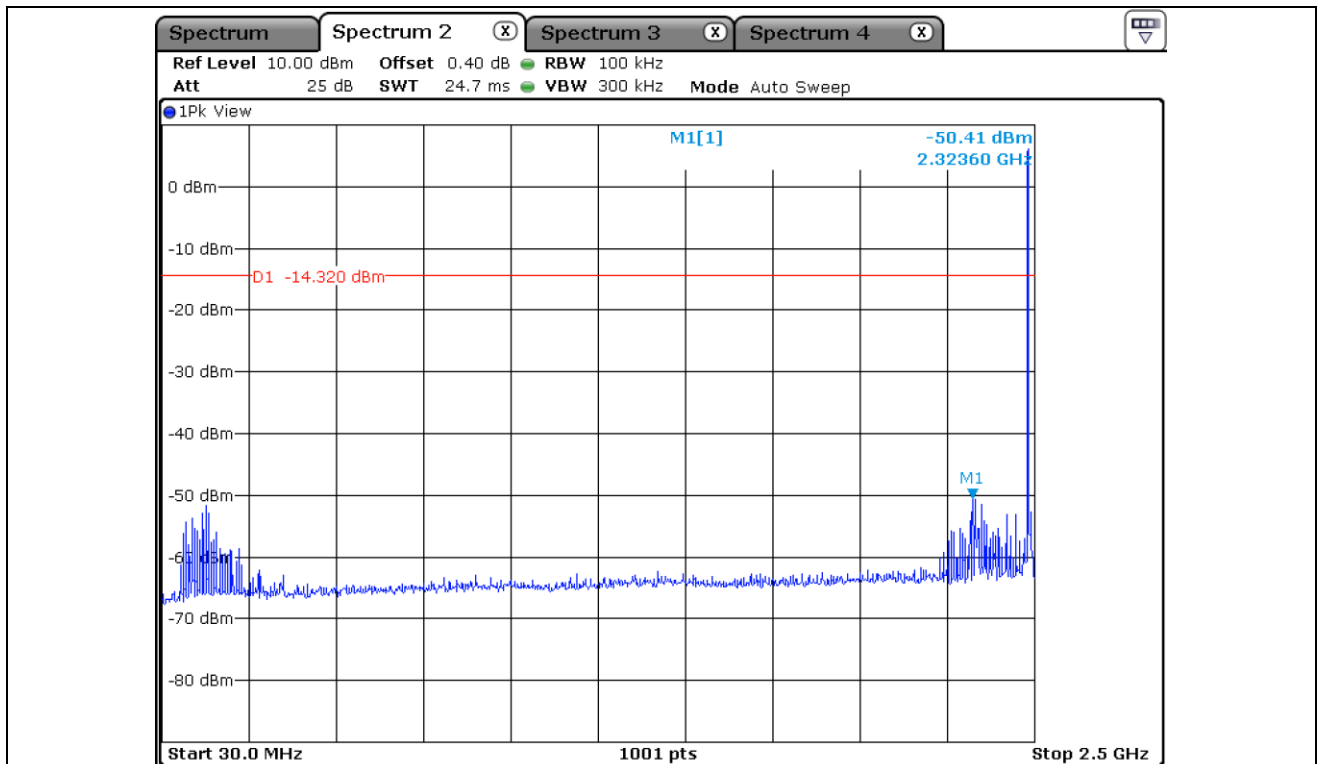
Middle Channel

This Report is not correlated with the authentication of KOLAS

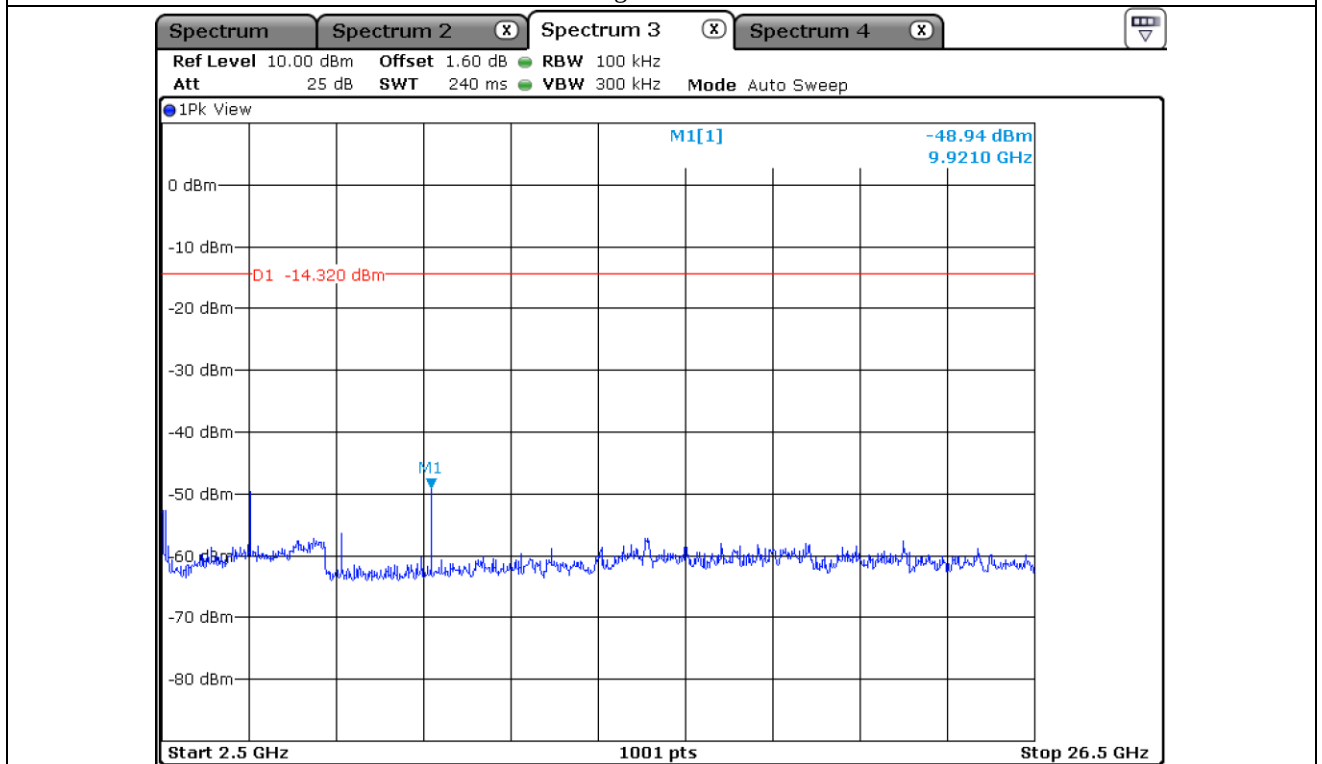
It should not be reproduced except in full, without the written approval of ONETECH Corp.

OTC-TRF-RF-001(0)

ONETECH Corp.: 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)



High Channel



High Channel

This Report is not correlated with the authentication of KOLAS

It should not be reproduced except in full, without the written approval of ONETECH Corp.

OTC-TRF-RF-001(0)

ONETECH Corp.: 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)

9.6 Test data for radiated emission

9.6.1 Radiated Emission which fall in the Restricted Band

- . Resolution bandwidth : 1 MHz and Peak Detector for Peak Mode
1 MHz and RMS Detector for Average Mode
- . Video bandwidth : 3 MHz for Peak and Average Mode
- . Measurement distance : 3 m
- . Duty Cycle : 100 %
- . Result : PASSED

Frequency (MHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	AMP Factor	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
Test Data for Low Channel									
2 366 294	57.86	Peak	H	28.30	5.52	47.10	44.58	74.00	29.42
2 366 110	52.30	Average	H	28.30	5.52	47.10	39.02	54.00	14.98
2 340 835	53.39	Peak	V	28.30	5.52	47.10	40.11	74.00	33.89
2 366 110	44.10	Average	V	28.20	5.52	47.10	30.72	54.00	23.28
Test Data for High Channel									
2 487 662	65.26	Peak	H	27.70	5.66	47.10	51.52	74.00	22.48
2 484 026	55.73	Average	H	27.70	5.66	47.10	41.99	54.00	12.01
2 487 562	54.44	Peak	V	27.70	5.66	47.10	40.70	74.00	33.30
2 484 006	45.68	Average	V	27.70	5.66	47.10	31.94	54.00	22.06

Remark: "H": Horizontal, "V": Vertical

Margin (dB) = Limits (dBμV/m) - Total Level (dBμV/m)

Total Level = Reading + Antenna Factor + Cable Loss + Correction Factor – AMP Factor

9.6.2 Spurious & Harmonic Radiated Emission

- . Resolution bandwidth : 1 MHz for Peak and Average Mode for the emissions fall in restricted band,
1 MHz for Peak Mode for the emissions outside restricted band
- . Video bandwidth : 3 MHz for Peak and Average Mode
- . Frequency range : 1 GHz ~ 26.5 GHz
- . Measurement distance : 3 m
- . Duty Cycle : 100 %
- . Result : PASSED

Frequency (MHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	AMP Factor	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
Test Data for Low Channel									
4 804.00	54.79	Peak	H	31.30	8.20	46.20	48.09	74.00	25.91
4 804.00	45.61	Average	H	31.30	8.20	46.20	38.91	54.00	15.09
4 804.00	55.43	Peak	V	31.30	8.20	46.20	48.73	74.00	25.27
4 804.00	47.30	Average	V	31.30	8.20	46.20	40.60	54.00	13.40
Test Data for Middle Channel									
4 880.00	54.03	Peak	H	31.20	8.20	46.20	47.23	74.00	26.77
4 880.00	46.45	Average	H	31.20	8.20	46.20	39.65	54.00	14.35
4 880.00	56.25	Peak	V	31.20	8.20	46.20	49.45	74.00	24.55
4 880.00	46.48	Average	V	31.20	8.20	46.20	39.68	54.00	14.32
Test Data for High Channel									
4 960.00	54.66	Peak	H	31.20	8.20	46.20	47.86	74.00	26.14
4 960.00	48.00	Average	H	31.20	8.20	46.20	41.20	54.00	12.80
4 960.00	53.71	Peak	V	31.20	8.20	46.20	46.91	74.00	27.09
4 960.00	46.34	Average	V	31.20	8.20	46.20	39.54	54.00	14.46

Remark: "H": Horizontal, "V": Vertical

$$\text{Margin (dB)} = \text{Limits (dBμV/m)} - \text{Total Level (dBμV/m)}$$

$$\text{Total Level} = \text{Reading} + \text{Antenna Factor} + \text{Cable Loss} + \text{Correction Factor} - \text{AMP Factor}$$

10. PEAK POWER SPECTRAL DENSITY

10.1 Operating environment

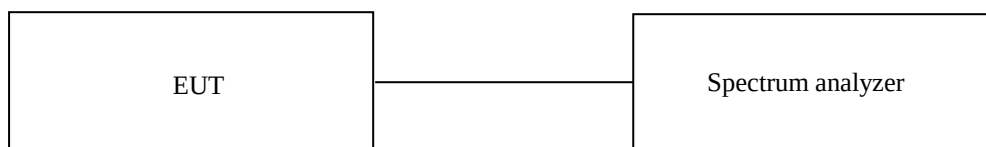
Temperature : 22.5 °C

Relative humidity : 53.5 % R.H.

10.2 Test set-up

The antenna output of the EUT was connected to the spectrum analyzer.

The resolution bandwidth is set to $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$, the video bandwidth is set to 3 times the resolution bandwidth.



10.3 Test Date

January 05, 2022 ~ January 07, 2022

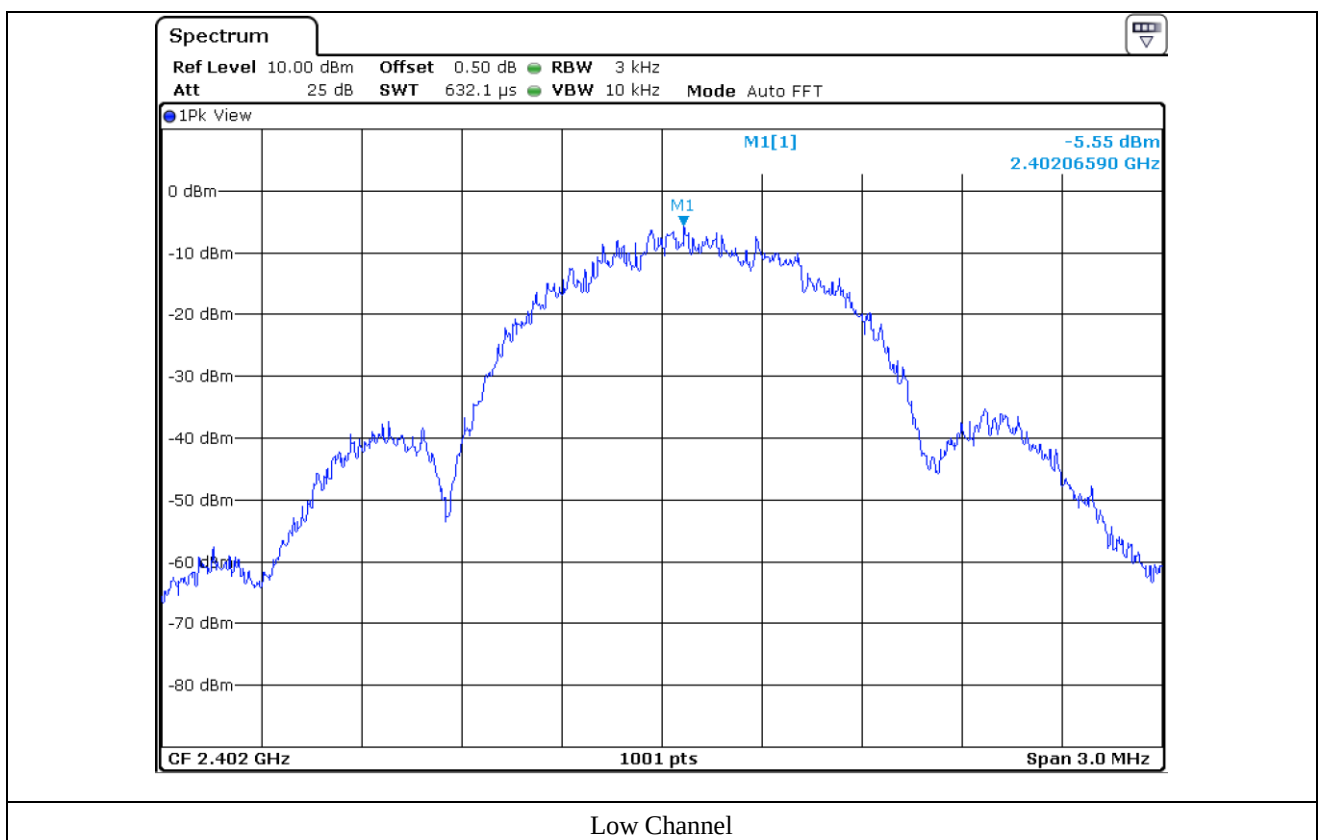
10.4 Test data for 1 Mbps

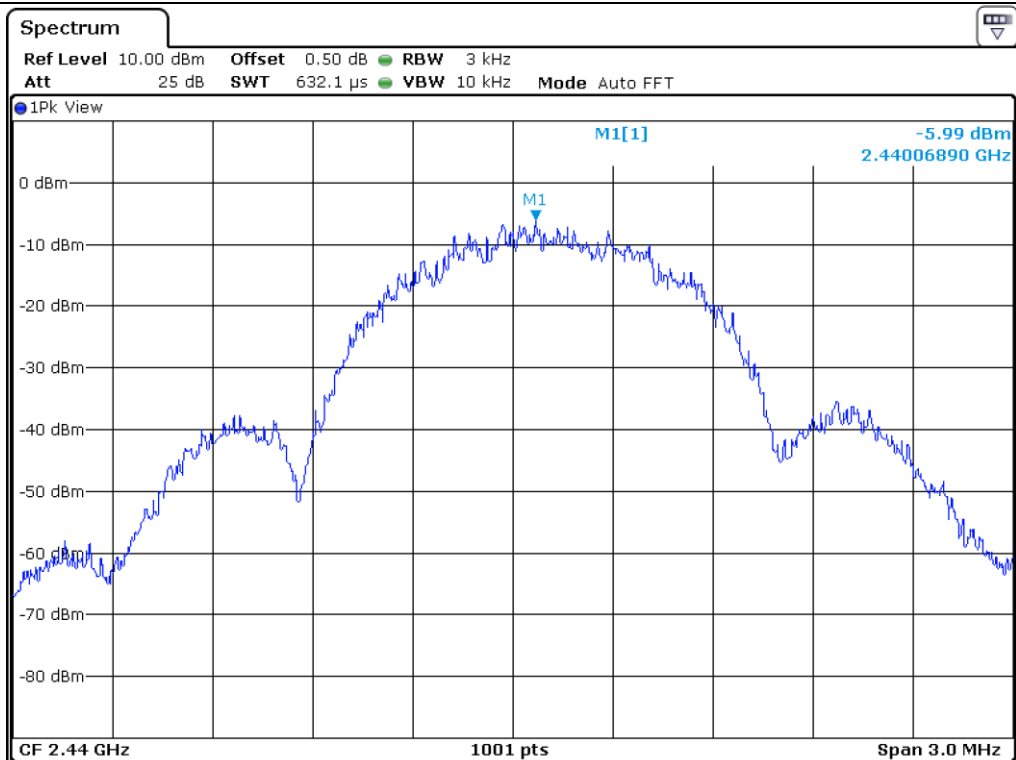
-. Test Result : Pass

-. Operating Condition : Continuous transmitting mode

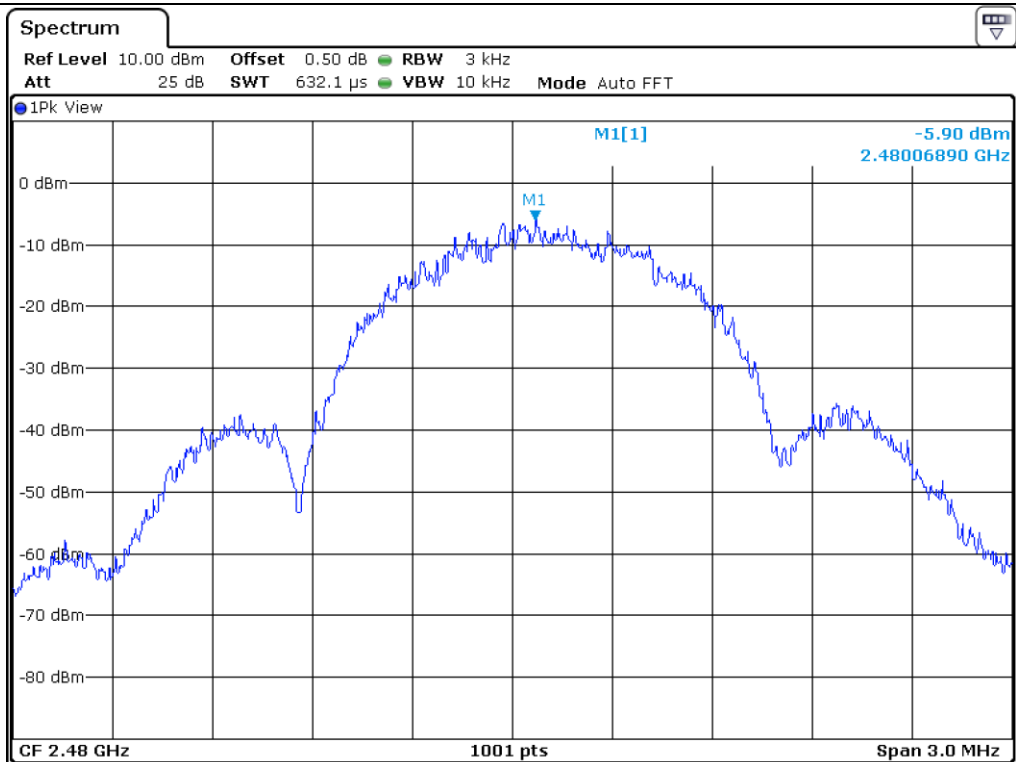
CHANNEL	FREQUENCY(MHz)	MEASURED VALUE (dBm)	LIMIT (dBm)	MARGIN (dB)
Low	2 402.00	-5.55	8.00	13.55
Middle	2 440.00	-5.99	8.00	13.99
High	2 480.00	-5.90	8.00	13.90

Remark. Margin = Limit – Measured value





Middle Channel



High Channel

This Report is not correlated with the authentication of KOLAS

It should not be reproduced except in full, without the written approval of ONETECH Corp.

OTC-TRF-RF-001(0)

ONETECH Corp.: 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)

11. RADIATED EMISSION TEST

11.1 Operating environment

Temperature : 22.5 °C

Relative humidity : 53.5 % R.H.

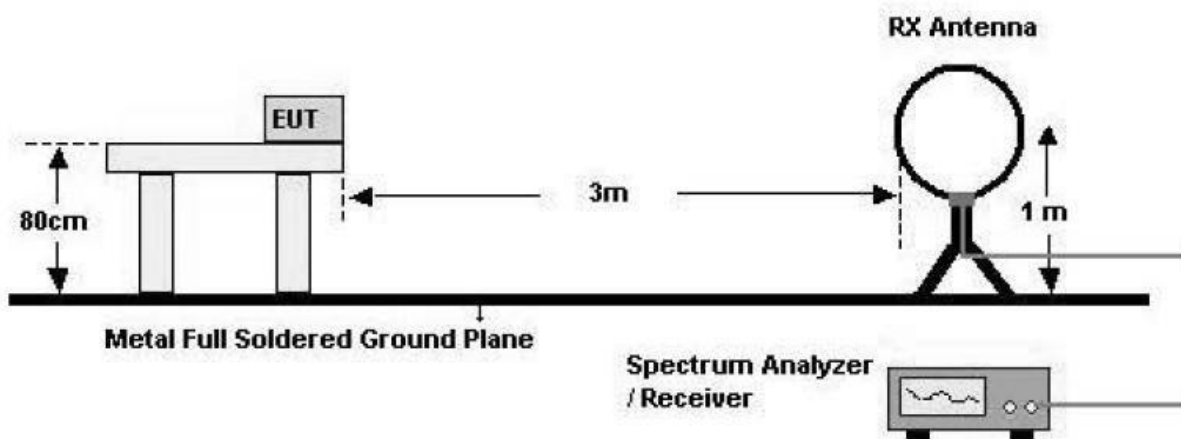
11.2 Test set-up

The radiated emissions measurements were on the 3 m semi anechoic chamber. The EUT and other support equipment were placed on a non-conductive turntable above the ground plane. The interconnecting cables from outside test site were inserted into ferrite clamps at the point where the cables reach the turntable.

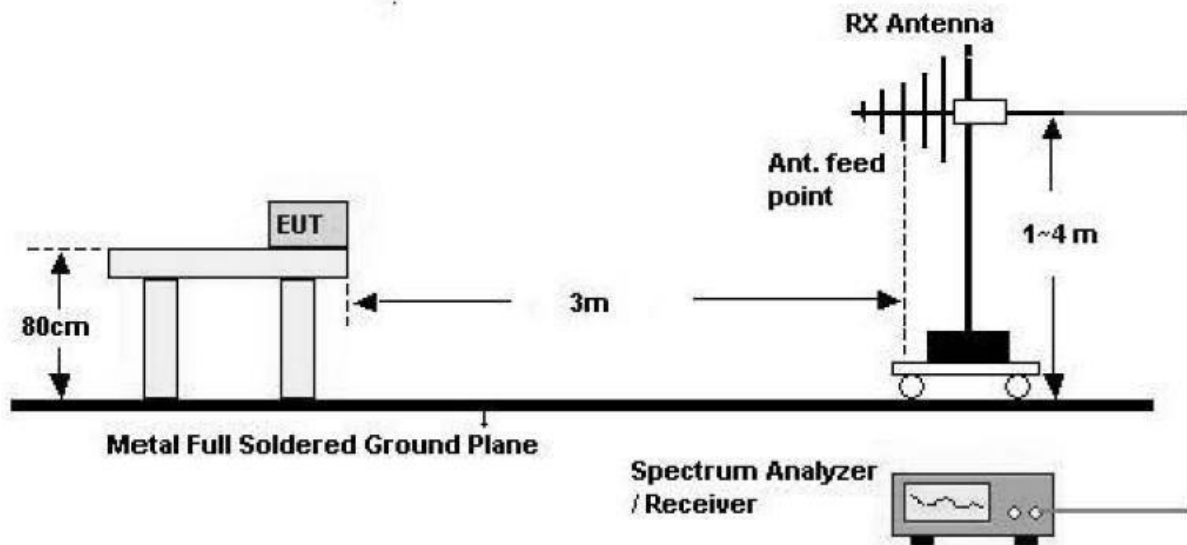
The frequency spectrum from 30 MHz to 26.5 GHz was scanned and emission levels maximized at each frequency recorded. The system was rotated 360°, and the antenna was varied in height between 1.0 m and 4.0 m in order to determine the maximum emission levels. This procedure was performed for both horizontal and vertical polarization of the receiving antenna.

- Test Configuration

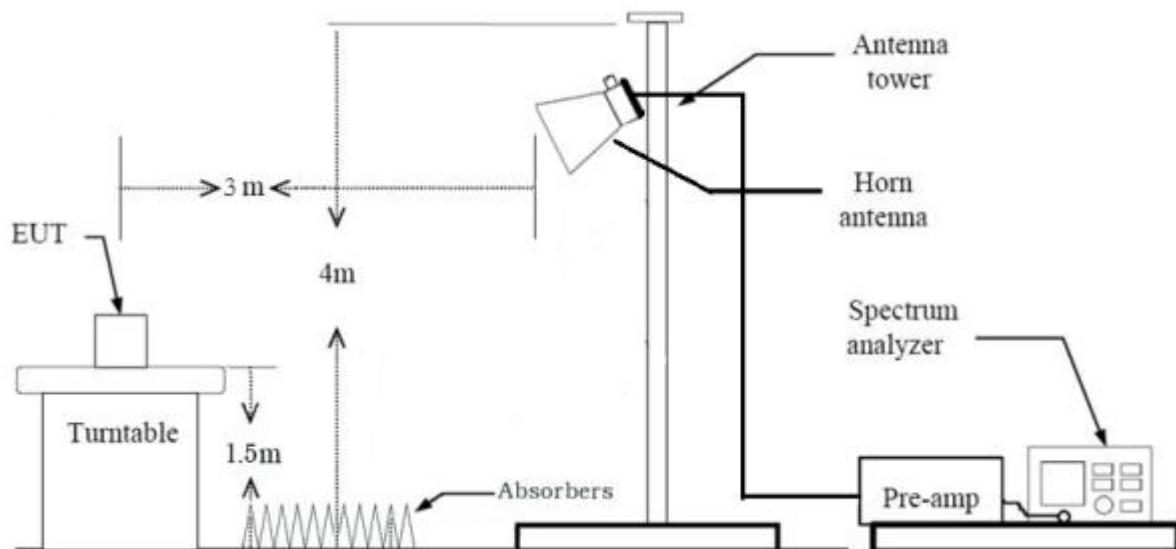
1. Below 30 MHz



2. 30 MHz - 1 GHz



3. Above 1 GHz



11.3 Test Date

January 05, 2022 ~ January 07, 2022

11.4 Test data for 30 MHz ~ 1 GHz

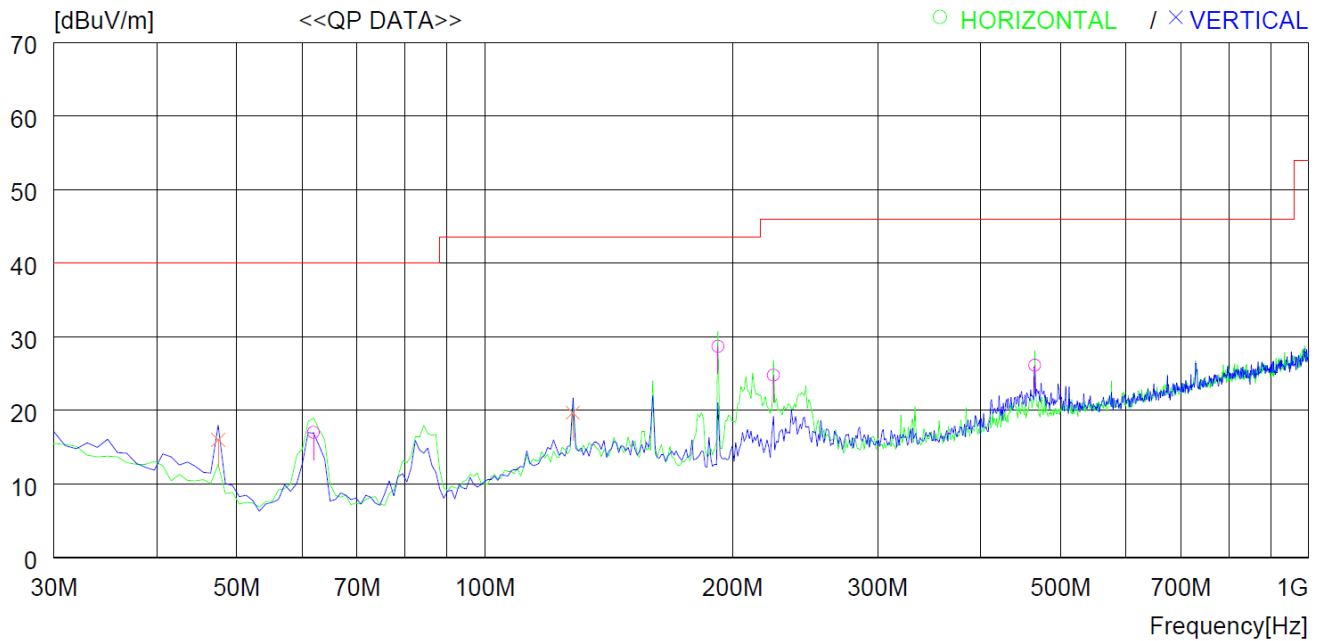
11.4.1 Test data for Bluetooth LE

Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.247

Result : PASSED

EUT : BLE to IR converter

Detector : CISPR Quasi-Peak (6 dB Bandwidth: 120 kHz)



No.	FREQ	READING	ANT	LOSS	GAIN	RESULT	LIMIT	MARGIN	ANTENNA	TABLE
	[MHz]	QP	FACTOR	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[cm]	[DEG]
----- Horizontal -----										
1	62.010	36.4	12.3	1.4	33.1	17.0	40.0	23.0	300	347
2	191.990	43.4	15.7	2.6	33.0	28.7	43.5	14.8	200	354
3	224.000	39.2	15.8	2.8	33.0	24.8	46.0	21.2	100	359
4	465.531	32.0	22.9	4.3	33.1	26.1	46.0	19.9	300	80
----- Vertical -----										
5	47.460	33.6	14.2	1.3	33.1	16.0	40.0	24.0	100	230
6	127.970	31.4	19.1	2.2	33.0	19.7	43.5	23.8	100	64

11.5 Test data for Below 30 MHz

- . Resolution bandwidth : 200 Hz (from 9 kHz to 0.15 MHz), 9 kHz (from 0.15 MHz to 30 MHz)
- . Frequency range : 9 kHz ~ 30 MHz
- . Measurement distance : 3 m
- . Operating mode : Transmitting mode

Frequency (MHz)	Reading (dBμV)	Ant. Pol. (H/V)	Ant. Height (m)	Angle (°)	Ant. Factor (dB/m)	Cable Loss	Emission Level(dBμV/m)	Limits (dBμV/m)	Margin (dB)
Emission from the EUT more than 20 dB below the limit in each frequency range.									

11.6 Test data for above 1 GHz

- . Resolution bandwidth : 1 MHz for Peak and Average Mode for the emissions fall in restricted band,
1 MHz for Peak Mode for the emissions outside restricted band
- . Video bandwidth : 3 MHz for Peak and Average Mode
- . Frequency range : 1 GHz ~ 26.5 GHz
- . Measurement distance : 3 m
- . Operating mode : Transmitting mode

Frequency (MHz)	Reading (dBμV)	Ant. Pol. (H/V)	Ant. Height (m)	Angle (°)	Ant. Factor (dB/m)	Cable Loss	Emission Level(dBμV/m)	Limits (dBμV/m)	Margin (dB)
Emission from the EUT more than 20 dB below the limit in each frequency range.									

12. CONDUCTED EMISSION TEST

12.1 Operating environment

Temperature : 23 °C
Relative humidity : 45 % R.H.

12.2 Test set-up

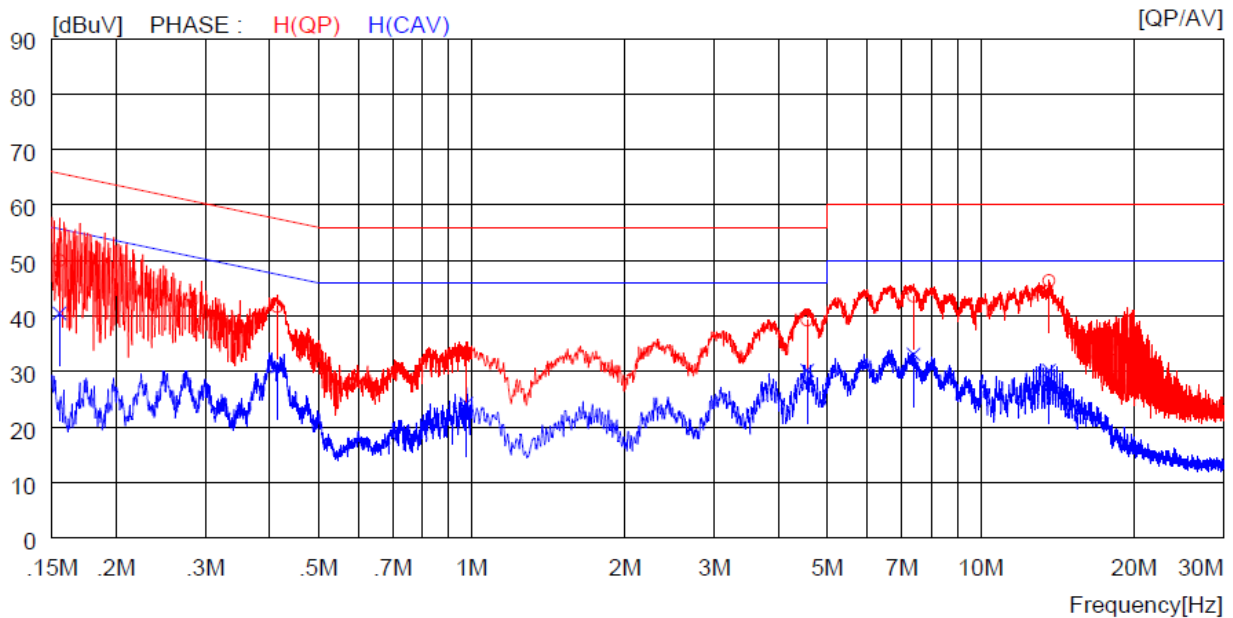
The EUT was placed on a wooden table, 0.8 m height above the floor. Power was fed to the EUT through a $50\ \Omega$ / $50\ \mu\text{H}$ + $5\ \Omega$ Artificial Mains Network (AMN). The ground plane was electrically bonded to the reference ground system and all power lines were filtered from ambient.

12.3 Test Date

January 05, 2022 ~ January 07, 2022

12.4 Test data

- Resolution bandwidth : 9 kHz
- Frequency range : 0.15 MHz ~ 30 MHz
- Tested Line : HOT LINE



NO	FREQ [MHz]	READING		C.FACTOR [dB]	RESULT		LIMIT		MARGIN		PHASE
		QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	
1	0.15500	40.0	----	10.0	50.0	----	65.7	----	15.7	----	H (QP)
2	0.41500	31.7	----	10.0	41.7	----	57.5	----	15.8	----	H (QP)
3	0.97600	23.4	----	10.0	33.4	----	56.0	----	22.6	----	H (QP)
4	4.56400	29.1	----	10.2	39.3	----	56.0	----	16.7	----	H (QP)
5	7.38000	33.4	----	10.2	43.6	----	60.0	----	16.4	----	H (QP)
6	13.63000	36.1	----	10.3	46.4	----	60.0	----	13.6	----	H (QP)
7	0.15500	----	30.5	10.0	----	40.5	----	55.7	----	15.2	H (CAV)
8	0.41500	----	20.9	10.0	----	30.9	----	47.5	----	16.6	H (CAV)
9	0.97600	----	14.2	10.0	----	24.2	----	46.0	----	21.8	H (CAV)
10	4.56400	----	20.0	10.2	----	30.2	----	46.0	----	15.8	H (CAV)
11	7.38000	----	22.9	10.2	----	33.1	----	50.0	----	16.9	H (CAV)
12	13.63000	----	19.9	10.3	----	30.2	----	50.0	----	19.8	H (CAV)

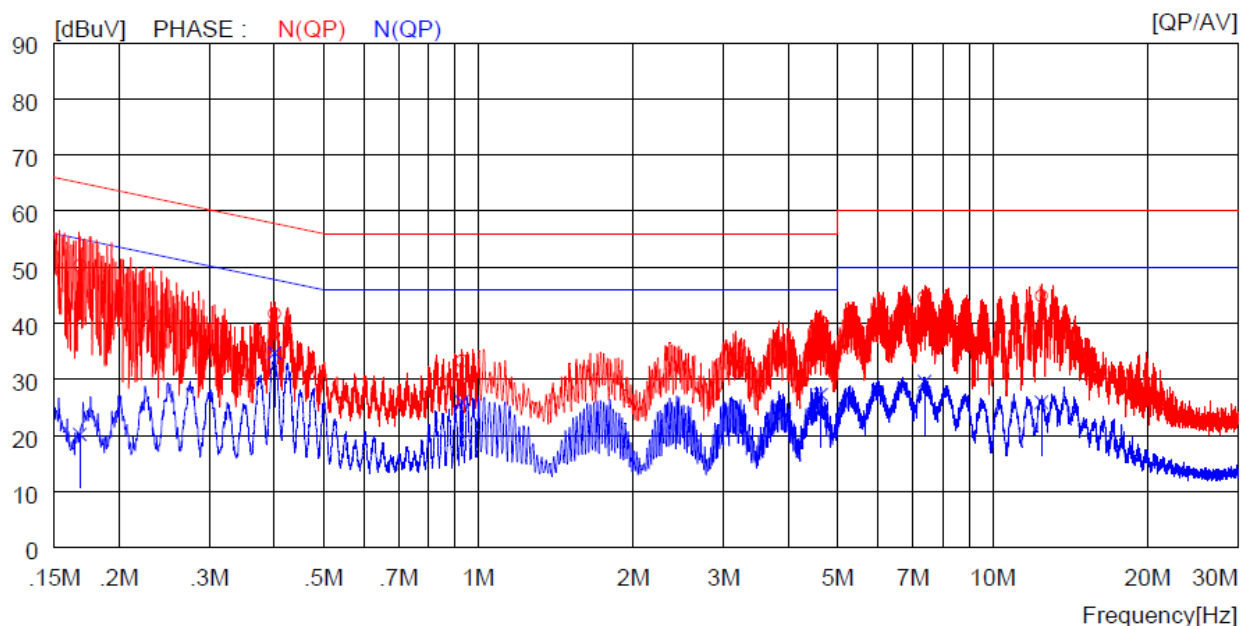
This Report is not correlated with the authentication of KOLAS

It should not be reproduced except in full, without the written approval of ONETECH Corp.

OTC-TRF-RF-001(0)

ONETECH Corp.: 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)

-. Tested Line : NEUTRAL LINE



NO	FREQ [MHz]	READING		C. FACTOR [dB]	RESULT		LIMIT		MARGIN		PHASE
		QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	
1	0.16800	40.3	----	10.0	50.3	----	65.1	----	14.8	----	N (QP)
2	0.40200	31.7	----	10.0	41.7	----	57.8	----	16.1	----	N (QP)
3	0.92900	23.3	----	10.0	33.3	----	56.0	----	22.7	----	N (QP)
4	4.63600	30.1	----	10.2	40.3	----	56.0	----	15.7	----	N (QP)
5	7.37000	34.5	----	10.2	44.7	----	60.0	----	15.3	----	N (QP)
6	12.44000	34.6	----	10.3	44.9	----	60.0	----	15.1	----	N (QP)
7	0.16800	----	10.2	10.0	----	20.2	----	55.1	----	34.9	N (CAV)
8	0.40200	----	24.7	10.0	----	34.7	----	47.8	----	13.1	N (CAV)
9	0.92900	----	16.0	10.0	----	26.0	----	46.0	----	20.0	N (CAV)
10	4.63600	----	17.1	10.2	----	27.3	----	46.0	----	18.7	N (CAV)
11	7.37000	----	19.4	10.2	----	29.6	----	50.0	----	20.4	N (CAV)
12	12.44000	----	15.6	10.3	----	25.9	----	50.0	----	24.1	N (CAV)

Remark: Margin (dB) = Limit – Level (Result)

The emission level in above table is included the transducer factor that means insertion loss (LISN), cable loss and attenuator.

13. LIST OF TEST EQUIPMENT

Model Number	Manufacturer	Description	Serial Number	Last Cal.(Interval)
FSV40-N	Rohde & Schwarz	Signal Analyzer	102177	Apr. 16, 2021 (1Y)
ESR	Rohde & Schwarz	EMI Test Receiver	101470	Oct. 18, 2021 (1Y)
ESCI	R/S	Test Receiver	101012	Oct. 20, 2021 (1Y)
310N	Sonoma Instrument	Pre-Amplifier	312545	Mar. 15, 2021 (1Y)
SCU18	Rohde & Schwarz	Signal Conditioning unit	102209	Oct. 14, 2021 (1Y)
DT5000	Innco System	Turn Table	DT3000/093	N/A
MA-4000XPET	Innco System	Antenna Master	MA4000/509	N/A
HLP-2008	TDK RF Solutions	Hybrid Antenna	131314	Feb. 27, 2020 (2Y)
BBHA9120D	Schwarzbeck	Horn Antenna	9120D-1366	Jul. 20, 2021 (1Y)
NSLK8128	Schwarzbeck	V - LISN (4*32/50A)	8128216	Mar. 16, 2021 (1Y)
ESH3-Z2	R/S	Pulse Limiter	100655	Mar. 15, 2021 (1Y)