Prüfbericht-Nr.: *Test Report No.*:	**50183640 001**	**Auftrags-Nr.:** *Order No.*:	114081522	Seite 1 von 29 *Page 1 of 29*
Kunden-Referenz-Nr.: *Client Reference No.*:	N/A	**Auftragsdatum:** *Order date*:	03-Sep-2018	
Auftraggeber: *Client*:	Kitten planet Co., Ltd. 12, Daewangpangyo-ro 645beon-gil, Bundang-gu, Seongnam-si, Gyeonggi-do			
Prüfgegenstand: *Test item*:	BRUSH MONSTER SMART TOOTHBRUSH			
Bezeichnung / Typ-Nr.: *Identification / Type No.*:	BMT100			
Auftrags-Inhalt: *Order content*:	NCC Test report (BLE)			
Prüfgrundlage: *Test specification*:	NCC Low-power Radio-frequency Devices Technical Regulations LP0002(2018) Section 3.10.1			
Wareneingangsdatum: *Date of receipt*:	11-Sep-2018			
Prüfmuster-Nr.: *Test sample No.*:	A000806373-002 Rad A000806373-003 Cond			
Prüfzeitraum: *Testing period*:	11-Sep-2018 – 19-Sep-2018			
Ort der Prüfung: *Place of testing*:	EMC/RF Laboratory Taipei			
Prüflaboratorium: *Testing laboratory*:	TUV Rheinland Taiwan Ltd.			
Prüfergebnis*: *Test result**:	Pass			

Report date / *tested by*:

Datum *Date*	**Name / Stellung** *Name / Position*	**Unterschrift** *Signature*
2018-09-25	Mars Y.J. Lin / Project Engineer	

kontrolliert von / *reviewed by*:

Datum *Date*	**Name / Stellung** *Name / Position*	**Unterschrift** *Signature*
2018-09-25	Rene Charton / Expert, Electrical	

Sonstiges / *Other*:

Zustand des Prüfgegenstandes bei Anlieferung:
Condition of the test item at delivery:

Prüfmuster vollständig und unbeschädigt
Test item complete and undamaged

* Legende:	1 = sehr gut	2 = gut	3 = befriedigend	4 = ausreichend	5 = mangelhaft
	P(ass) = entspricht o.g. Prüfgrundlage(n)		F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	N/A = nicht anwendbar	N/T = nicht getestet
Legend:	*1 = very good*	*2 = good*	*3 = satisfactory*	*4 = sufficient*	*5 = poor*
	P(ass) = passed a.m. test specification(s)		*F(ail) = failed a.m. test specification(s)*	*N/A = not applicable*	*N/T = not tested*

Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens.
This test report only relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any test mark.
V04

TEST SUMMARY

5.1.1 ANTENNA REQUIREMENT
RESULT: Passed

5.1.2 PEAK OUTPUT POWER
RESULT: Passed

5.1.3 6DB BANDWIDTH
RESULT: Passed

5.1.4 POWER DENSITY
RESULT: Passed

5.1.5 CONDUCTED SPURIOUS EMISSIONS AND FREQUENCY BAND EDGE MEASURED IN 100KHZ BANDWIDTH
RESULT: Passed

5.1.6 SPURIOUS EMISSION
RESULT: Passed

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1. General Remarks

1.1 Complementary Materials

These attachments are integral parts of this test report:

Appendix P: Photo Documentation internal view
(File Name: 50183640 001APPENDIXP)

Appendix D: Test Result of Radiated Emissions
(File Name: 50183640 001APPENDIXD)

Test Specifications

The following standards were applied.

Table 1: Applied Standard and Test Levels

Radio
NCC Low-power Radio-frequency Devices Technical Regulations LP0002(2018)(107 年 1 月 10 日)

2. Test Sites

2.1 Test Laboratory

TUV Rheinland Taiwan Ltd.
Taichung Branch Office

No.9, Lane 36, Minsheng Rd., Sec. 3, Daya District,
Taichung City 428
Taiwan (R.O.C.)

2.2 Test Facility

TUV Rheinland Taiwan Ltd.
Taipei Office

11F. No.758, Sec. 4, Bade Rd., Songshan Dist.
Taipei City 105
Taiwan (R.O.C.)

FCC RegistrationNo.: 340738
IC Canada Registration No.: 9465A-1
TAF Accredited NCC Test Lab. No.:0759
TAF ISO17025 Certification effective periods: 2016-Jul-1st to 2019-Jun-30th

TAF
Testing Laboratory
0759

2.3 List of Test and Measurement Instruments

Table 2: List of Test and Measurement Equipment

Kind of Equipment	Manu-facturer	Type	S/N	Last Calibration	Next Calibration
Test Software	Farad	EZ_EMC	Ver. TUV3A1	N/A	N/A
EMI Test Receiver	R&S	ESR 7	101549	2017/11/10	2018/11/10
Spectrum Analyzer	R&S	FSV 40	100921	2018/05/02	2019/05/02
EXA Signal Analyzer	KEYSIGHT	N9010A	MY52221334	2018/02/05	2019/02/04
Preamplifier (30MHz -1GHz)	HP	8447F	2805A03335	2018/08/14	2019/08/14
Preamplifier (18 GHz -40 GHz)	COM-POWER	PAM-840	461257	2018/01/18	2019/01/18
Pre-Amplifier (1GHz~18GHz)	EM Electronics	EM01G18G	60558	2017/11/21	2018/11/21
Bilog Antenna	TESEQ	CBL6111D	29804	2018/08/18	2019/08/18
Horn Antenna	ETS-Lindgren	3117	201918	2018/08/18	2019/08/18
Horn Antenna (18GHz~40GHz)	COM-POWER	AH-840	101029	2017/11/28	2018/11/28
Loop Antenna	Schwarzbeck	FMZB 1513	1513-076	2018/06/14	2019/06/14
EMI Test Receiver	R&S	ESR 7	101549	2017/11/10	2018/11/10
Spectrum Analyzer	R&S	FSL3	101943	2018/09/07	2019/09/07
Temp. & Humid. Chamber	Giant Force	GCT-099-40-S	MAF0103-007	2017/03/09	2019/03/09

2.4 Traceability

All measurement equipment calibrations are traceable to NML(Taiwan)/NIST(USA) or where calibration is performed outside Taiwan, to equivalent nationally recognized standards organizations.

2.5 Calibration

Equipment requiring calibration is calibrated periodically in a suitably accredited Calibration Lab. Additionally all equipment is verified for proper performance on a regular schedule using in house standards or comparisons.

2.6 Measurement Uncertainty

The estimated combined standard uncertainty for radiated emissions and conducted emissions measurements .

Table 3: Emission Measurement Uncertainty

Parameter	Uncertainty
Radio Frequency	± 0.1 ppm
RF power, conducted	± 1.5 dB
RF power density, conducted	± 3 dB
spurious emissions, conducted	± 3 dB
all emissions, radiated	± 6 dB
Temperature	± 1 ºC
Humidity	± 5 %
DC and low frequency voltages	±3 %

3. General Product Information

3.1 Product Function and Intended Use

The EUT is a smart toothbrush. It contains a Bluetooth compatible module enabling the user to communicate data through a Wireless interface.
For details refer to the User Guide, Data Sheet and Block Diagram.

3.2 System Details and Ratings

Table 4: Basic Information of EUT

Item	EUT information
Kind of Equipment/Test Item	BRUSH MONSTER SMART TOOTHBRUSH
Type Identification	BMT100
Brand Name	BRUSH MONSTER

Table 5: Technical Specification of EUT

Technical Specification	Value
Operating Frequencies	2402MHz ~ 2480MHz
Channel Spacing	2 MHz
Channel number	40
Operation Voltage	1.5Vac
Modulation	GFSK
Antenna gain	1.74dBi

3.3 Independent Operation Modes

Basic operation modes are:

A. Transmitting
   1. Low channel
   2. Middle channel
   3. High channel
B. Receiving

3.4 Noise Generating and Noise Suppressing Parts

Refer to the Block Diagram.

3.5 Submitted Documents

- Block Diagram
- Instruction Manual
- Rating Label
- Technical Description

4. Test Set-up and Operation Modes

4.1 Principle of Configuration Selection

The equipment under test (EUT) was configured to measure its maximum power level. The test modes were adapted accordingly in reference to the instructions for use.

4.2 Test Operation and Test Software

Setup for testing: Test samples are provided with USB interface which makes it possible to control them through a test software installed on a notebook computer.

This software nRFgo was running on the laptop computer connected to the EUT. It was used to enable the operation modes listed in section 3.3 as appropriate.

The samples were used as follows:
Radiated Test : A000806373-002
Conducted Test : A000806373-003

Full test was applied on all test modes, but only worst case was shown

4.3 Special Accessories and Auxiliary Equipment

The product has been tested together with the following additional accessories:

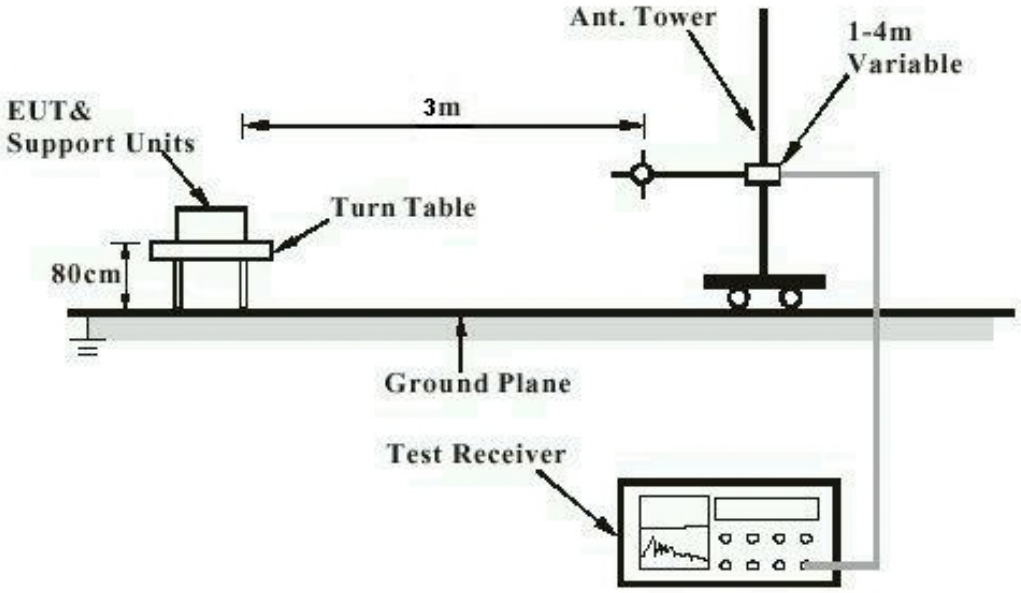
Kind of Equipment	Manufacturer	Model Name	S/N
Laptop	MSI	MSI4532 (CX420MX)	CX420 MX-233TWK 1008000096

4.4 Countermeasures to achieve EMC Compliance

The test sample which has been tested contained the noise suppression parts as described in the Constructional Data Form or the Technical Construction File. No additional measures were employed to achieve compliance.

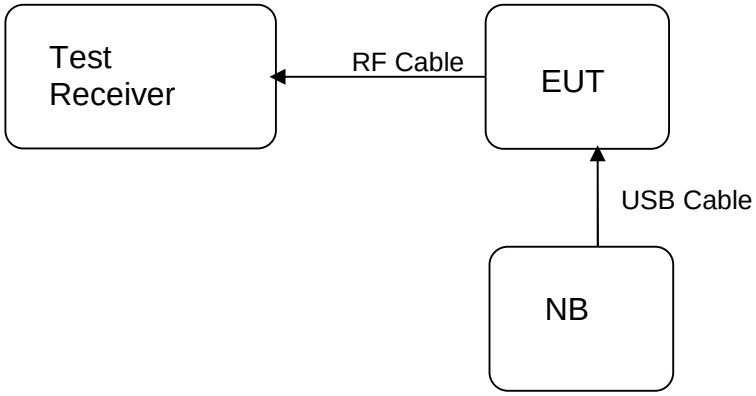
4.5 Test Setup Diagram

Diagram of Measurement Configuration for Radiation Test



Note: Measurements above 1 GHz are done with a table height of 1.5m

Diagram of Measurement Equipment Configuration for Conducted Transmitter Measurement



5. Test Results

5.1 Transmitter Requirement & Test Suites

5.1.1 Antenna Requirement

RESULT: **Passed**

Test standard	:	LP0002(2018): 2.2, 3.10.1.3
Requirement	:	use of approved antennas only with directional gains that do not exceed 6 dBi

According to the manufacturer declaration, the EUT has an antenna with a directional gain of 1.74dBi. The antenna is a printed PCB trace with no possibility of replacement with a non-approved antenna by the end-user. Therefore, the EUT is considered to comply with this provision.

Refer to EUT photo for details.

5.1.2 Peak Output Power

RESULT: **Passed**

Test standard : LP0002(2018): 3.10.1.2 (1)(C)

Basic standard : LP0002(2018)
Limit : 1 Watt
Kind of test site : Shielded room

Test setup

Test Channel : Low/ Middle/ High
Operation Mode : A

Ambient temperature : 20-24 °C
Relative humidity : 50-65 %
Atmospheric pressure : 100-103 kPa

Table 6: Test result of Peak Output Power

Channel	Channel Frequency (MHz)	Output Power		Limit
		Ant 1 (dBm)	Ant 1 (W)	(W)
Low Channel	2402	-4.64	0.00034	1
Middle Channel	2440	-5.81	0.00026	1
High Channel	2480	-6.53	0.00022	1

Pmax: 0.3436mW

5.1.3 6dB Bandwidth

RESULT: **Passed**

Test standard : LP0002(2018): 3.10.1.6 (2)(A)

Basic standard : LP0002(2018)
Kind of test site : Shielded room

Test setup

Test Channel : Low/ Middle/ High
Operation Mode : A

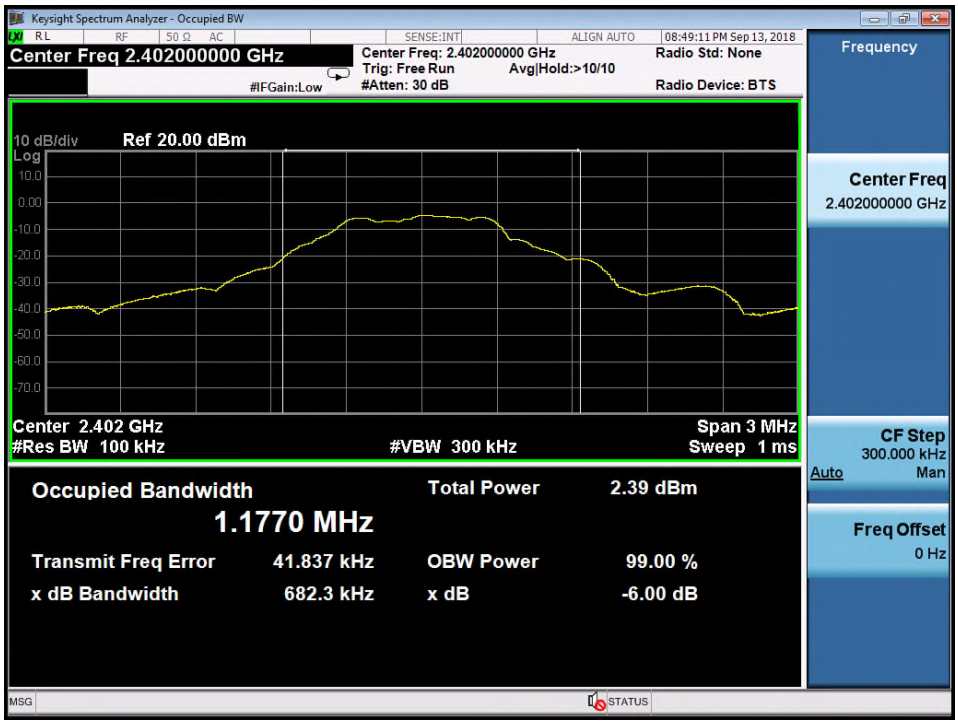
Ambient temperature : 20-24°C
Relative humidity : 50-65%
Atmospheric pressure : 100-103 kPa

Table 7: Test result of 6dB Bandwidth

Channel	Channel Frequency (MHz)	6dB Bandwidth (kHz)	Limit (kHz)	Result
Low Channel	2402	682.3	>500	Pass
Mid Channel	2440	694.5	>500	Pass
High Channel	2480	678.0	>500	Pass

Test Plot of 6dB Bandwidth

Low Channel



Middle Channel

High Channel

5.1.4 Power Density

RESULT: **Passed**

Test standard : LP0002(2018): 3.10.1.6, (2)(B)

Basic standard : LP0002(2018)
Kind of test site : Shielded room

Test setup

Test Channel : Low/ Middle/ High
Operation Mode : A
Ambient temperature : 20-24°C
Relative humidity : 50-65%
Atmospheric pressure : 100-103 kPa

Table 8: Test result of Power Density

Channel	Channel Frequency (MHz)	Power Density	Limit
		(dBm)	(dBm)
Low Channel	2402	-4.59	8
Middle Channel	2440	-5.86	8
High Channel	2480	-6.68	8

Test Plot of Power Density

Ant 1 Low Channel

Ant 1 Middle Channel

Ant 1 High Channel

5.1.5 Conducted spurious emissions and Frequency Band Edge measured in 100kHz Bandwidth

RESULT: **Passed**

Test standard	:	LP0002(2018): 3.10.1.5
Basic standard	:	LP0002(2018)
Limit	:	20dB (below that in the 100kHz bandwidth within the band that contains the highest level of the desired power)
Kind of test site	:	Shielded room

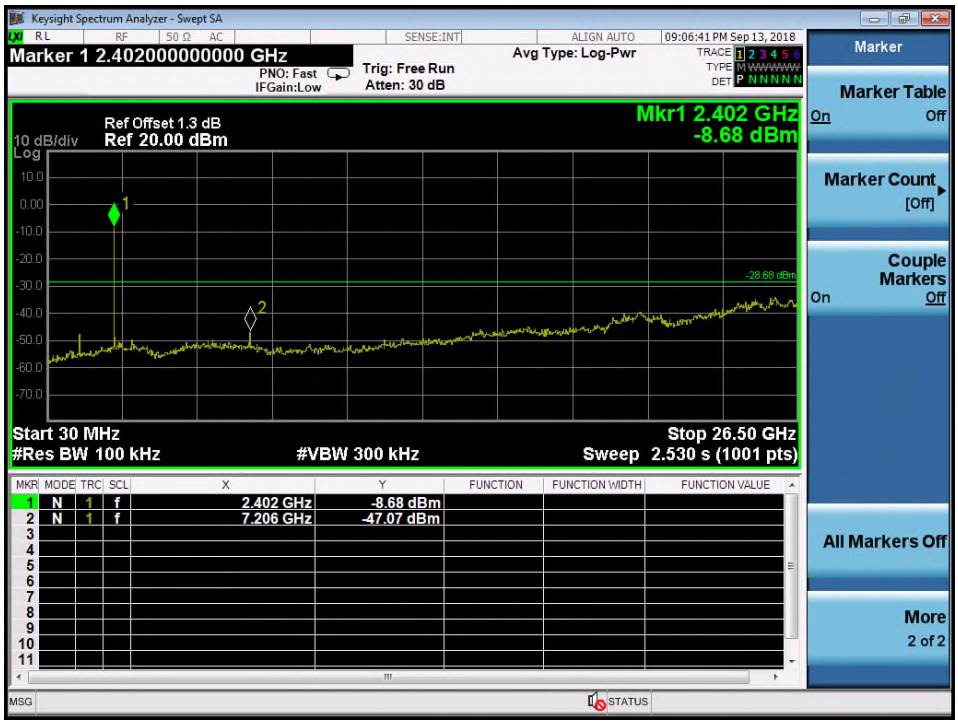
Test setup

Test Channel	:	Low/ Middle/ High for Conducted Spurious Emissions Low/ High for Frequency Band Edge
Operation Mode	:	A
Ambient temperature	:	20-24°C
Relative humidity	:	50-65%
Atmospheric pressure	:	100-103 kPa

All emissions are more than 20dB below fundamental, details refer to following test plot, and compliance is achieved as well.
Due to the small size of the product and that there are no inductive components of significant size, 9kHz to 30MHz frequency range is not tested based on technical judgment.

Test Plot 100kHz Conducted Emissions

Ant 1 Low Channel

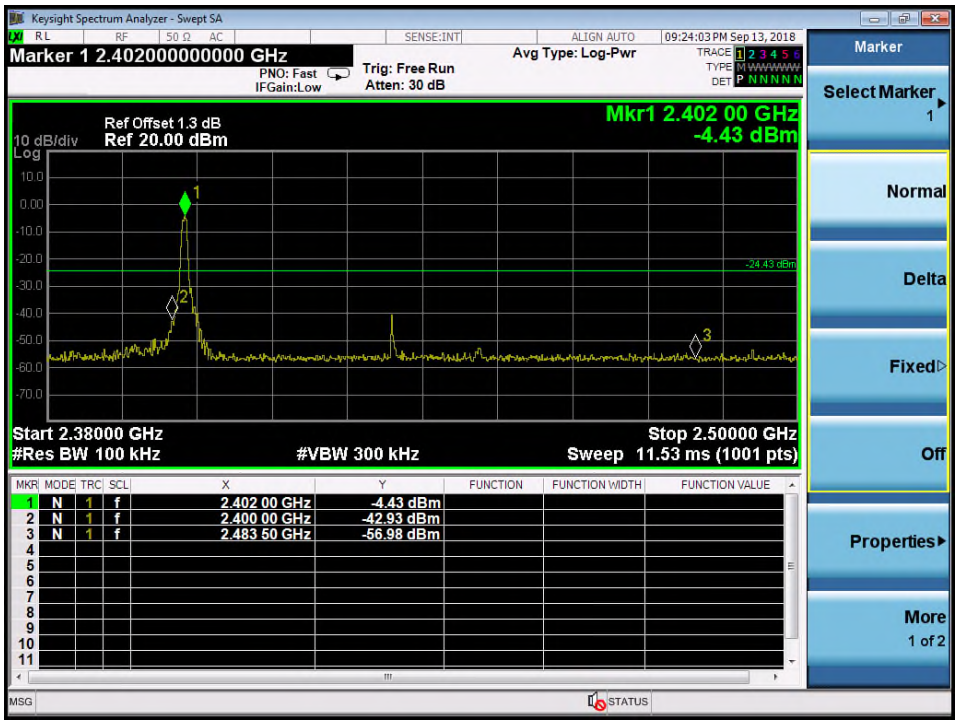


Ant 1 Middle Channel

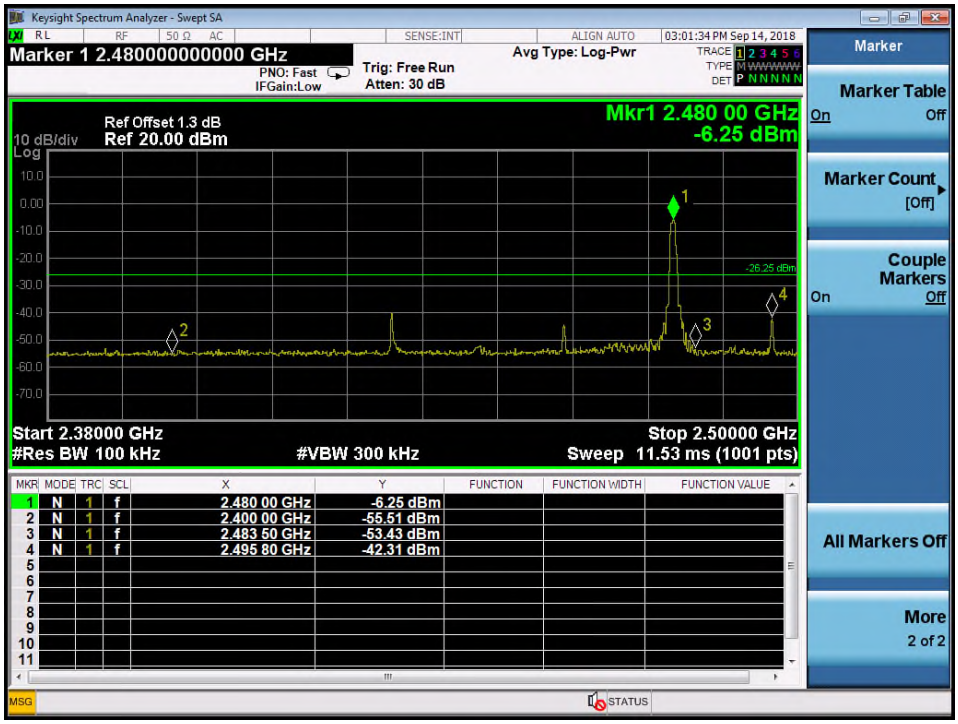
Ant 1 High Channel

Test Plot 100kHz RBW of Band Edge

Ant 1 Low Channel



Ant 1 High Channel



5.1.6 Spurious Emission

RESULT: **Passed**

Test standard	:	LP0002(2018): 3.10.1.5, (2)
Basic standard	:	LP0002(2018)
Limits	:	Radiated emissions which fall in the restricted bands, as defined in LP0002(2018): 2.7 , must comply with the radiated emission limits specified in LP0002(2018): 2.8 Emission radiated outside the specified frequency bands must comply with the radiated emission limits specified in LP0002(2018): 2.8
Kind of test site	:	3m Semi-Anechoic Chamber

Test setup

Test Channel	:	Low/ Middle/ High
Operation mode	:	A,B

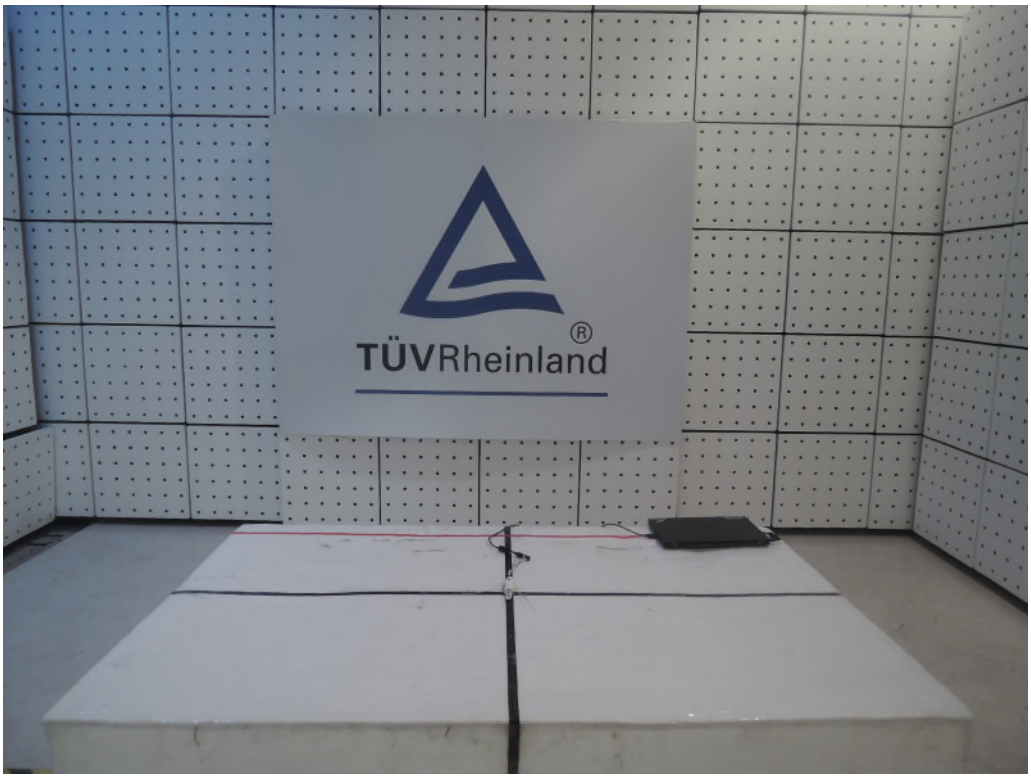
Remark: Testing was carried out within frequency range 30MHz to the tenth harmonic.

For details refer to Appendix D.

Testing was carried out within frequency range 30MHz to the tenth harmonic. For details refer to Appendix D. The Radiated Emissions testing was performed in the X, Y and Z axis orientation. The worst-case Axis orientation is recorded in this test report. Due to the small size of the product and that there are no inductive components of significant size, 9kHz to 30MHz frequency range is not tested based on technical judgment.

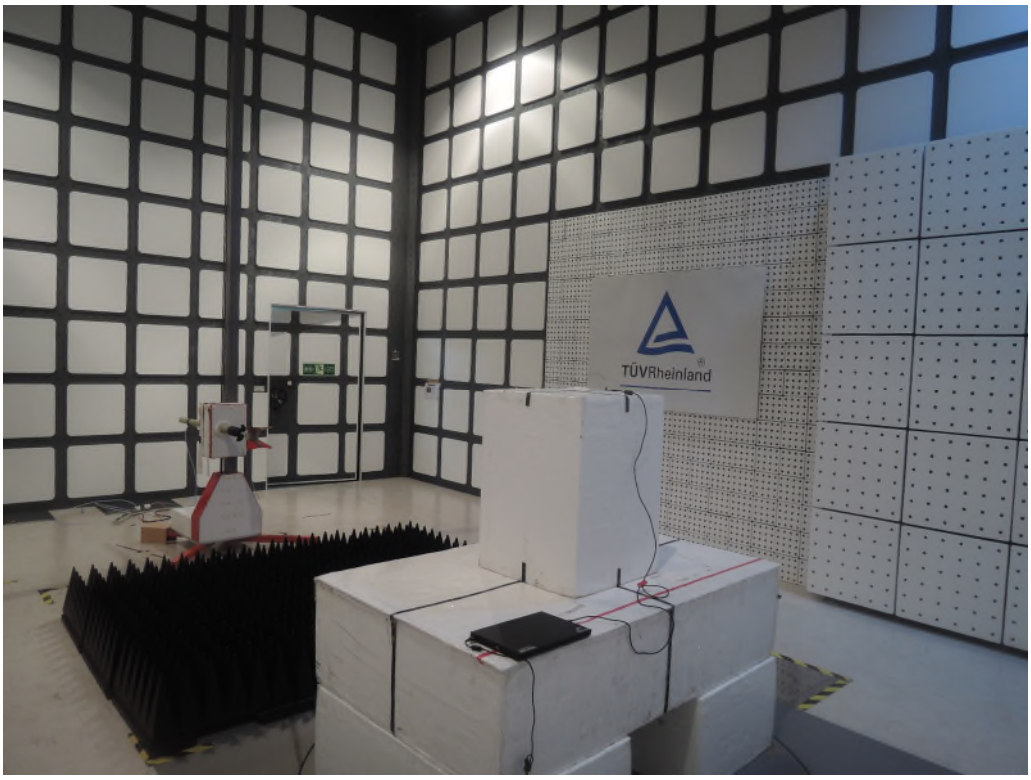
6. Photographs of the Test Set-Up

Photograph 1: Set-up for Spurious Emissions (Front View)

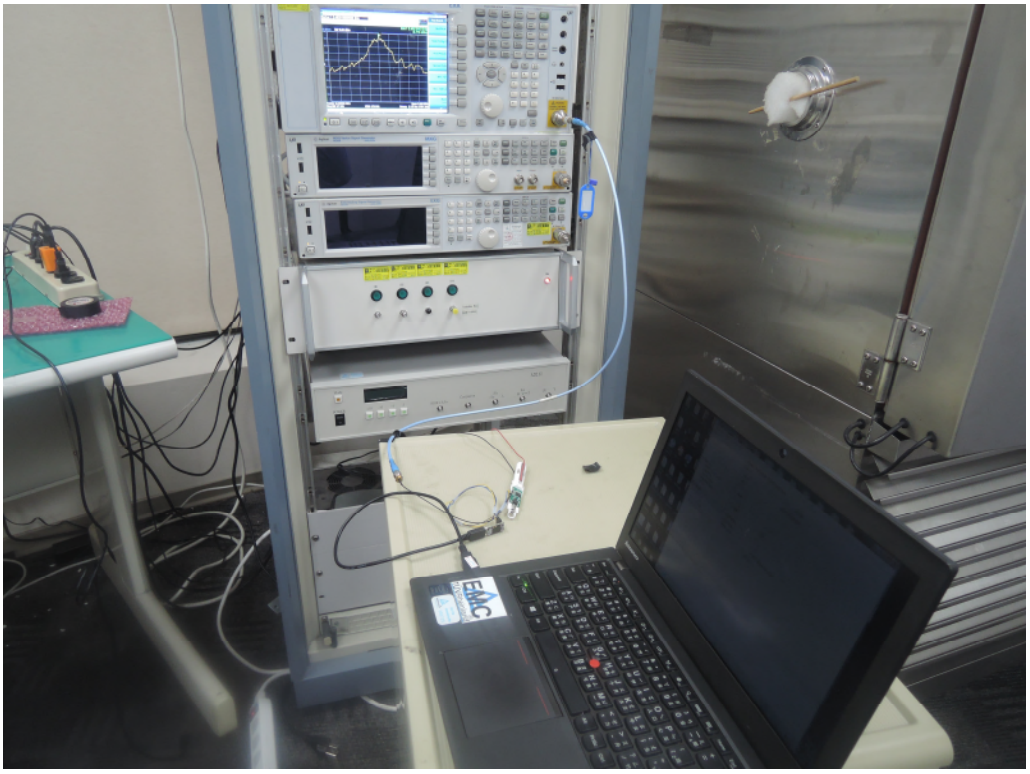


Photograph 2: Set-up for Spurious Emissions (Back View 1)

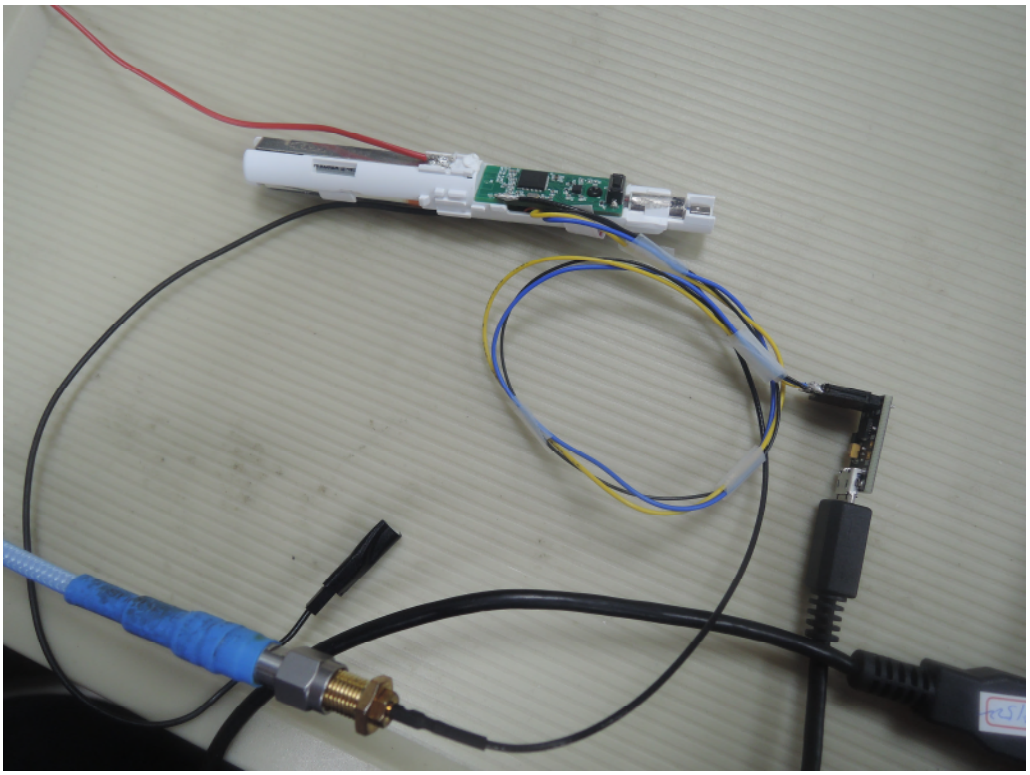
Photograph 3: Set-up for Spurious Emissions (Back View 2)



Photograph 4: Set-up for Conducted testing



Photograph 5: Set-up for Conducted testing



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