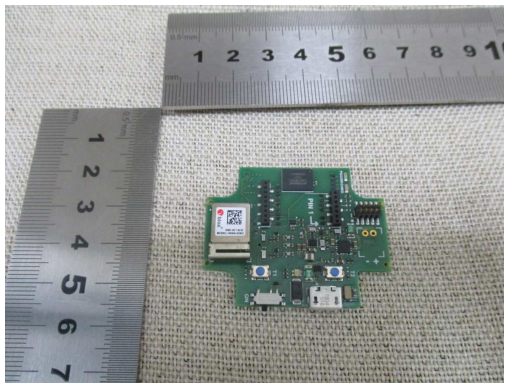
Prüfbericht-Nr.: *Test Report No.:*	**60383298 001**	**Auftrags-Nr.:** *Order No.:*	**244242523**	**Seite 1 von 32** *Page 1 of 32*
Kunden-Referenz-Nr.: *Client Reference No.:*	**-**	**Auftragsdatum:** *Order date.:*	**02.06.2020**	
Auftraggeber: *Client:*	**Bosch Sensortec GmbH** Gerhard-Kindler-Strasse 9, 72770 Reutlingen, Germany			
Prüfgegenstand: *Test item:*	**Application Board 3.0**			
Bezeichnung / Typ-Nr.: *Identification / Type No.:*	**APP 3.0**			
Auftrags-Inhalt: *Order content:*	**EMC test**			
Prüfgrundlage: *Test specification:*	**FCC 47 CFR Part 15, Subpart B:2019 Class B** **ICES-003:2016 (Updated:2019-04)**			
Wareneingangsdatum: *Date of receipt:*	**05.06.2020**			
Prüfmuster-Nr.: *Test sample No.:*	**A002888420-001**			
Prüfzeitraum: *Testing period:*	**Refer to test report**			
Ort der Prüfung: *Place of testing:*	**EMC laboratory**			
Prüflaboratorium: *Testing laboratory:*	**TÜV Rheinland (Shanghai) Co., Ltd.**			
Prüfergebnis*: *Test result*:*	**Pass**			



geprüft von / *tested by:*

Jessie Xu

Datum *Date*	Name/Stellung *Name/Position*	Unterschrift *Signature*
08.09.2020	Jessie Xu/Senior project engineer	

kontrolliert von / *reviewed by:*

Xuelan Zhang

Datum *Date*	Name/Stellung *Name/Position*	Unterschrift *Signature*
08.09.2020	Xuelan Zhang/Senior project manager	

Sonstiges / *Other:*

FCC ID: 2AO4I-APP30
IC: 26413-APP30

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 = mangelhalt
	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 specifications(s)		F(ail) = failed a.m. test specifications(s)	N/A = not applicable	N/T = not tested

TEST SUMMARY

4.1.1 MAINS TERMINAL CONTINUOUS DISTURBANCE VOLTAGE
Result:
Passed

4.2.1 RADIATED EMISSION IN THE FREQUENCY RANGE UP 1 GHZ
Result:
Passed

4.2.2 RADIATED EMISSION IN THE FREQUENCY RANGE ABOVE 1 GHZ
Result:
Passed

Contents

1 Test Sites

1.1 Test Facilities

Laboratory: TÜV Rheinland (Shanghai) Co., Ltd.
Address: No.177, 178, Lane 777 West Guangzhong Road, Jing'an District, Shanghai, China

The used test equipment is in accordance with CISPR 16-1 series standards for measurement of radio interference.

Refer to Clause 6 for test and measurement instruments.

2 General Product Information

2.1 Product Function and Intended Use

The EUT (equipment under test) is an ordinary application board which contains Bluetooth module. For the further information, refer to the user's manual.

2.2 Ratings and System Details

Rated input	:	DC 5 V (USB)
Frequency range		2402-2480 MHz
Protection class	:	III

2.3 Independent Operation Modess

The basic operation modes are "On" and "Off".

2.4 Description of interconnecting cables

None.

2.5 Noise Generating and Noise Suppressing Parts

Refer to the circuit diagram for further information.

2.6 Highest frequency generated or used in the device or on which the device operates or tunes

The highest frequency used in the EUT is 2480 MHz.

2.7 Submitted Documents

Circuit diagram, User's manual and rating label.

3 Test Set-up and Operation Modes

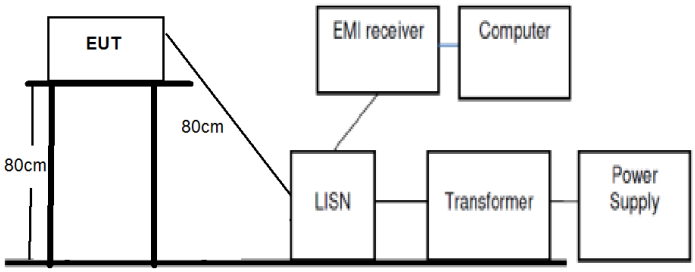
3.1 Principle of Configuration Selection

Emission: The equipment under test (EUT) was configured to measure its highest possible emission level. The test conditions were adapted accordingly in reference to the instructions for use.

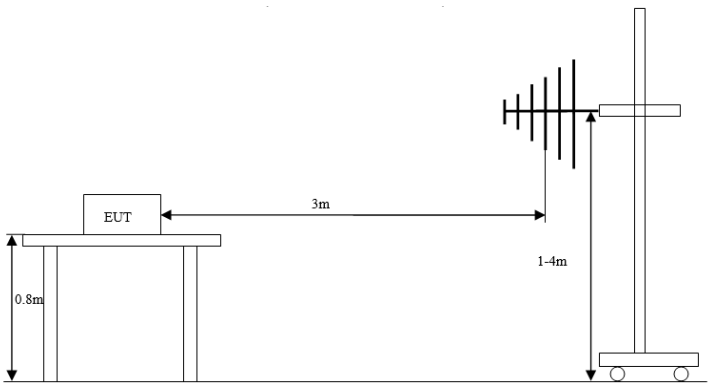
Refer to the related paragraph of this report.
The sequence of testing:
1. Radiated emission tests were performed on 23.07.2020 and 28.07.2020.
2. Conducted emission tests were performed on 20.08.2020.

3.2 Equipment and cable arrangement

Block diagram for both conducted emission and radiated emission tests is as follows:



(Conducted emission)



(Radiated emission)

Also refer to photographs on clause 5 for test setup for both conducted emission test and radiated emission test.

3.3 Test Software

During the test, the software “development desktop 20_v3-20” and “APP3.0_BLE_test” were used.

3.4 Special Accessories and Auxiliary Equipment

During the test, the sensor shuttle board (Model: BMI088) was embedded in EUT, and EUT connected with the adapter (Brand: Apple, model: A1443) and computer (Brand: ThinkPad, model: T450) by the USB port respectively.

3.5 Countermeasures to achieve EMC Compliance

No other special measure is employed to achieve the requirement.

4 Test Results E M I S S I O N

4.1 Emission in the Frequency Range up to 30 MHz

4.1.1 Mains Terminal Continuous Disturbance Voltage

Result:	**Passed**

Date of testing	:	20.08.2020
Test procedure	:	FCC 47 CFR Part 15, Subpart B:2019, ICES-003:2016 (Updated:2019-04), ANSI C63.4-2014 and CISPR 16-1 series standards
Frequency range	:	0.15 – 30 MHz
Limits	:	Quasi-peak limit: 0.15 - 0.5 MHz, 66 to 56 dBµV (decrease with the logarithm of frequency); 0.5 - 5 MHz, 56 dBµV; 5 - 30 MHz, 60 dBµV Average limit: 0.15 - 0.5 MHz, 56 to 46 dBµV (decrease with the logarithm of frequency); 0.5 – 5 MHz, 46 dBµV; 5 – 30 MHz, 50 dBµV
Bandwidth of EMI receiver for final measurement	:	9 kHz
Measurement time for final measurement	:	1 s
Kind of test site	:	Shielded room
Input voltage	:	AC 120 V, 60 Hz
Operational mode	:	Mode 1: EUT powered with adapter via USB cable. Mode 2: EUT communicated with computer via the USB cable. Mode 3: EUT connected with computer via USB cable and communicated by wireless Bluetooth.
Ambient condition	:	Temperature: 20.0 °C; Relative humidity: 47.5 %
Expanded measurement uncertainty (k=2)	:	3.39 dB

The measurement setup was made according to ANSI C63.4-2014 in a shielded room.

The measurement equipment like test receivers, quasi-peak detector and artificial mains network (AMN) are in compliance with CISPR 16-1 series standards.
The tested object was set-up on a wooden support. The EUT was set 0.8 m away from the AMN. The cord longer than necessary to be connected to the AMN was folded forth and back parallel so as to form a bundle with a length between 0.3 m and 0.4 m.
The disturbance voltage test was performed on the neutral line and phase line of the power supply of the EUT respectively.

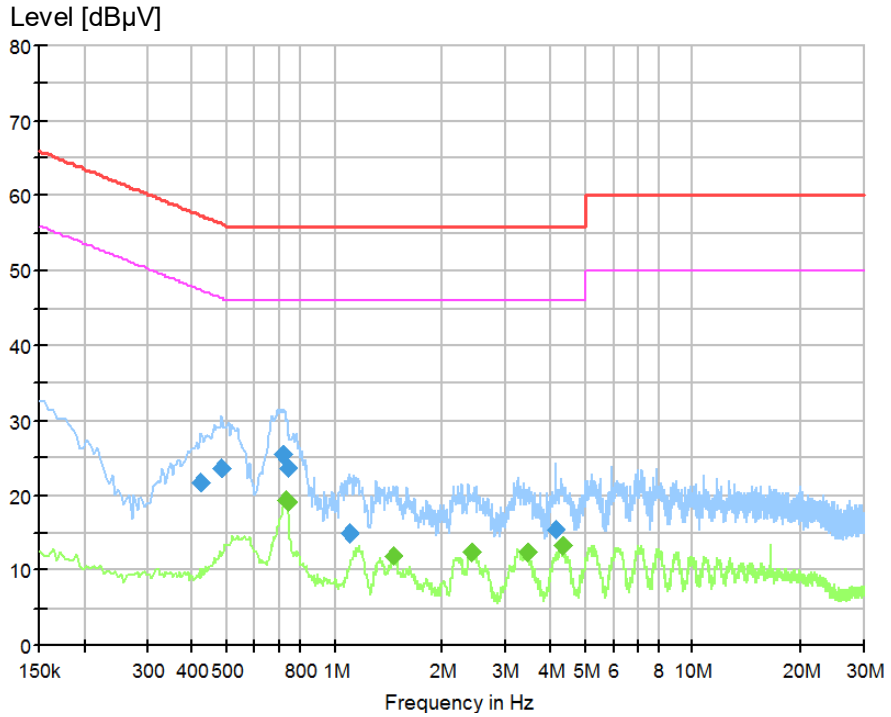
The following figures and tables were those measured by an automatic measuring system.

Both quasi-peak and average measurements were performed. In the following spectral diagram, Blue " ◆ " means Quasi-Peak Value and green " ◆ " means Average Value results.

Notes on following tables of conducted emission results and conversions:

Level (dBµV): final measurement results by using quasi-peak detector and average detector
Transd (dB): transducer factor including cable loss, insertion loss of artificial mains network and gain of pre-amplifier (if used)
Margin: Limit (dBµV) - Level (dBµV)

Figure 1: Spectral Diagrams, Conducted Emission, 150 kHz – 30 MHz, L for mode 1



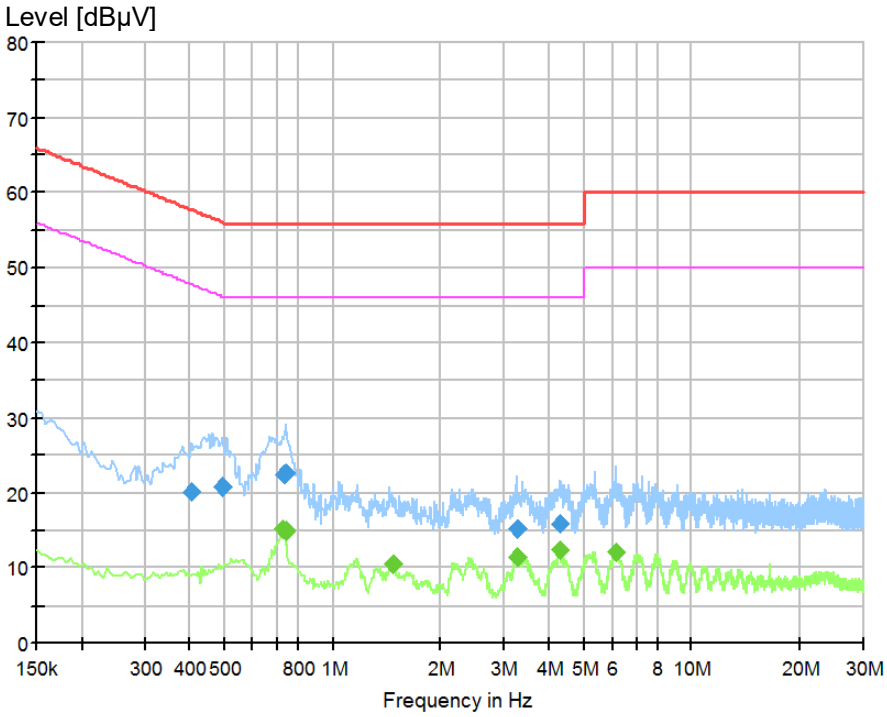
Final Quasi-peak measurement result:

Frequency (MHz)	QuasiPeak (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.424500	21.70	57.36	35.66	1000.0	9.000	L1	ON	9.6
0.483000	23.52	56.29	32.76	1000.0	9.000	L1	ON	9.6
0.717000	25.56	56.00	30.44	1000.0	9.000	L1	ON	9.6
0.739500	23.57	56.00	32.43	1000.0	9.000	L1	ON	9.6
1.095000	15.04	56.00	40.96	1000.0	9.000	L1	ON	9.6
4.146000	15.42	56.00	40.58	1000.0	9.000	L1	ON	9.7

Final Average measurement result:

Frequency (MHz)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.735000	19.49	46.00	26.51	1000.0	9.000	L1	ON	9.6
0.739500	19.06	46.00	26.94	1000.0	9.000	L1	ON	9.6
1.455000	11.82	46.00	34.18	1000.0	9.000	L1	ON	9.6
2.413500	12.37	46.00	33.63	1000.0	9.000	L1	ON	9.7
3.453000	12.38	46.00	33.62	1000.0	9.000	L1	ON	9.7
4.312500	13.42	46.00	32.58	1000.0	9.000	L1	ON	9.7

Figure 2: Spectral Diagrams, Conducted Emission, 150 kHz – 30 MHz, N for mode 1



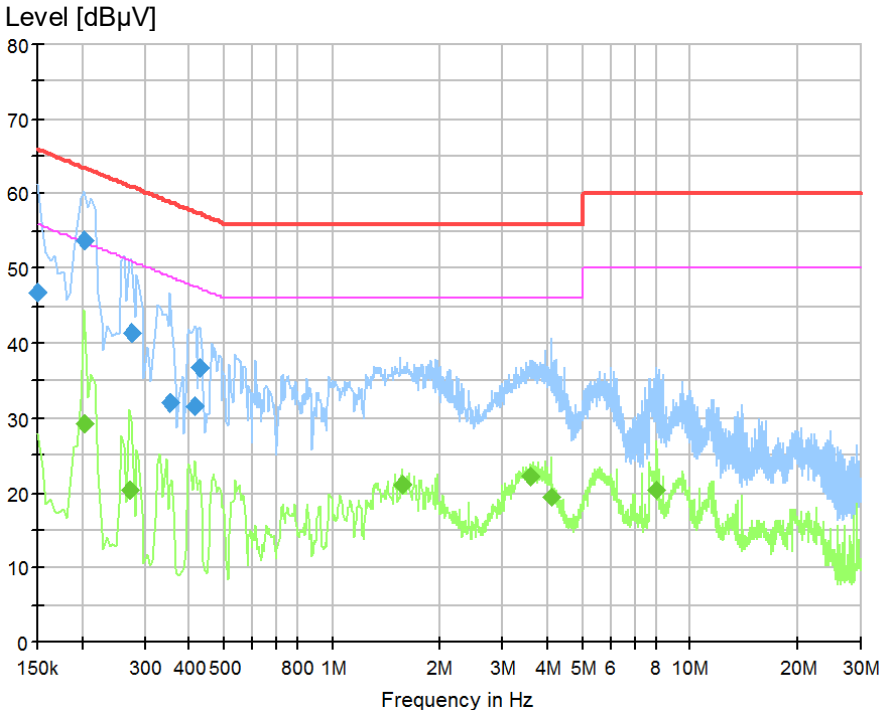
Final Quasi-peak measurement result:

Frequency (MHz)	QuasiPeak (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.402000	20.12	57.81	37.69	1000.0	9.000	N	ON	9.6
0.496500	20.78	56.06	35.28	1000.0	9.000	N	ON	9.6
0.735000	22.49	56.00	33.51	1000.0	9.000	N	ON	9.6
0.739500	22.70	56.00	33.30	1000.0	9.000	N	ON	9.6
3.255000	15.27	56.00	40.73	1000.0	9.000	N	ON	9.6
4.308000	15.90	56.00	40.10	1000.0	9.000	N	ON	9.6

Final Average measurement result:

Frequency (MHz)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.726000	15.27	46.00	30.73	1000.0	9.000	N	ON	9.6
0.739500	14.95	46.00	31.05	1000.0	9.000	N	ON	9.6
1.468500	10.48	46.00	35.52	1000.0	9.000	N	ON	9.6
3.264000	11.50	46.00	34.50	1000.0	9.000	N	ON	9.6
4.299000	12.31	46.00	33.69	1000.0	9.000	N	ON	9.6
6.130500	12.16	50.00	37.84	1000.0	9.000	N	ON	9.7

Figure 3: Spectral Diagrams, Conducted Emission, 150 kHz – 30 MHz, L for Mode 2



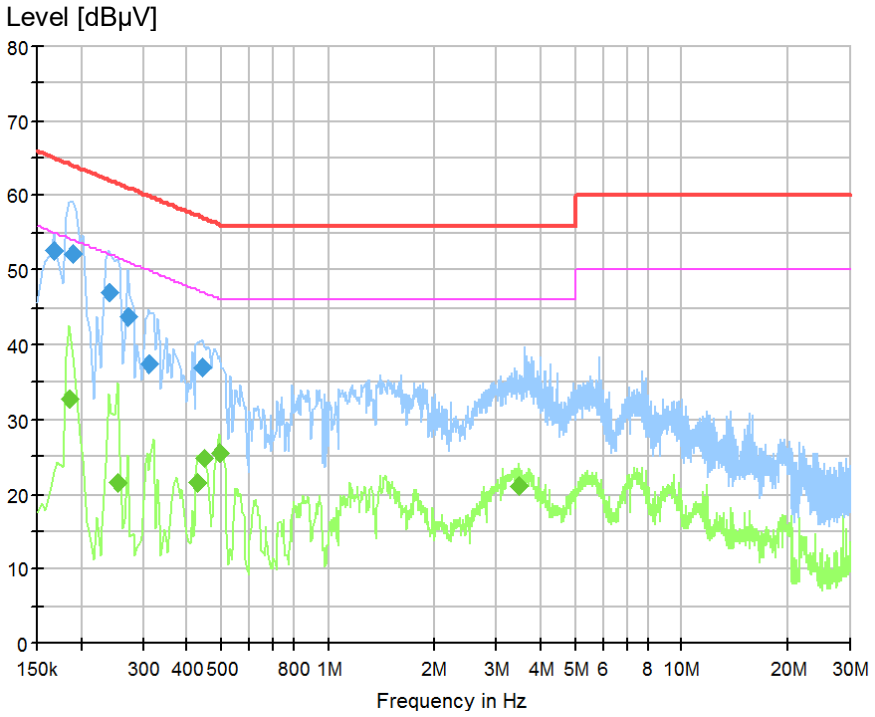
Final Quasi-peak measurement result:

Frequency (MHz)	QuasiPeak (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.150000	46.71	66.00	19.29	1000.0	0.200	L1	ON	9.5
0.204000	53.80	63.45	9.64	1000.0	9.000	L1	ON	9.5
0.276000	41.36	60.94	19.58	1000.0	9.000	L1	ON	9.6
0.352500	32.07	58.90	26.83	1000.0	9.000	L1	ON	9.6
0.411000	31.49	57.63	26.13	1000.0	9.000	L1	ON	9.6
0.429000	36.70	57.27	20.57	1000.0	9.000	L1	ON	9.6

Final Average measurement result:

Frequency (MHz)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.204000	29.13	53.45	24.32	1000.0	9.000	L1	ON	9.5
0.271500	20.37	51.07	30.70	1000.0	9.000	L1	ON	9.6
1.572000	20.95	46.00	25.05	1000.0	9.000	L1	ON	9.6
3.583500	22.13	46.00	23.87	1000.0	9.000	L1	ON	9.7
4.087500	19.32	46.00	26.68	1000.0	9.000	L1	ON	9.7
8.065500	20.30	50.00	29.70	1000.0	9.000	L1	ON	9.8

Figure 4: Spectral Diagrams, Conducted Emission, 150 kHz – 30 MHz, N for Mode 2



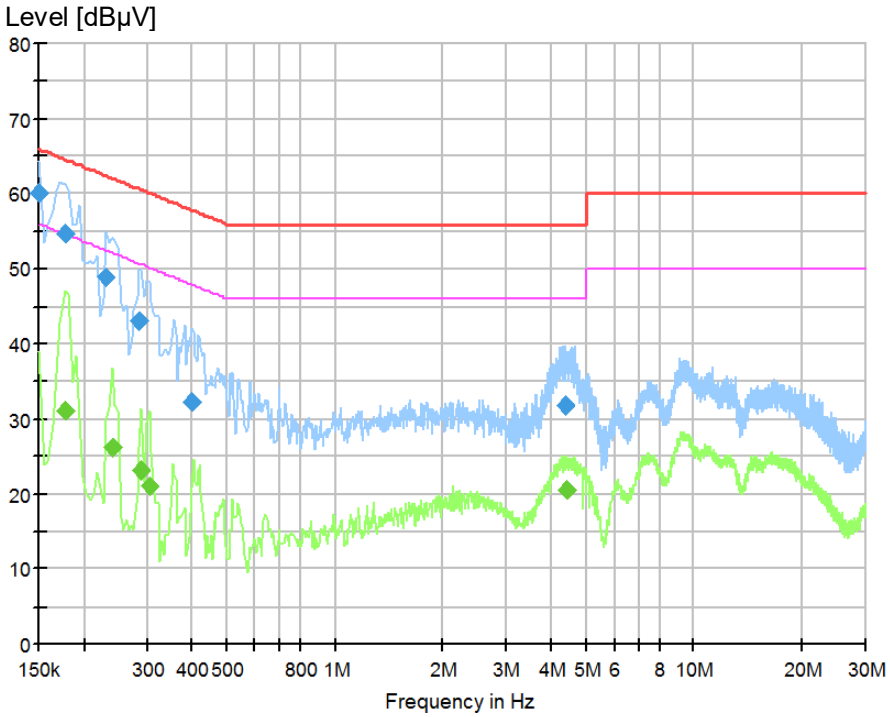
Final Quasi-peak measurement result:

Frequency (MHz)	QuasiPeak (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.168000	52.53	65.06	12.53	1000.0	9.000	N	ON	9.5
0.190500	52.24	64.02	11.77	1000.0	9.000	N	ON	9.5
0.240000	47.01	62.10	15.09	1000.0	9.000	N	ON	9.5
0.271500	43.84	61.07	17.23	1000.0	9.000	N	ON	9.5
0.312000	37.50	59.92	22.42	1000.0	9.000	N	ON	9.5
0.442500	36.95	57.02	20.06	1000.0	9.000	N	ON	9.6

Final Average measurement result:

Frequency (MHz)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.186000	32.67	54.21	21.54	1000.0	9.000	N	ON	9.5
0.253500	21.51	51.64	30.13	1000.0	9.000	N	ON	9.5
0.429000	21.46	47.27	25.81	1000.0	9.000	N	ON	9.6
0.447000	24.89	46.93	22.04	1000.0	9.000	N	ON	9.6
0.496500	25.54	46.06	20.52	1000.0	9.000	N	ON	9.6
3.444000	21.08	46.00	24.92	1000.0	9.000	N	ON	9.6

Figure 5: Spectral Diagrams, Conducted Emission, 150 kHz – 30 MHz, L for Mode 3



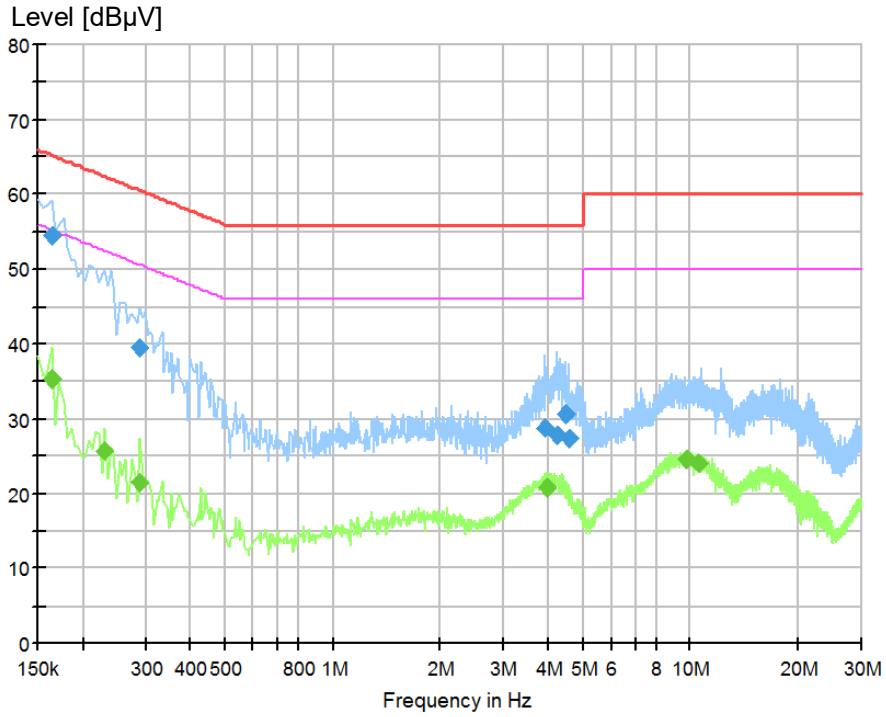
Final Quasi-peak measurement result:

Frequency (MHz)	QuasiPeak (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.150000	60.19	66.00	5.81	1000.0	0.200	L1	ON	9.5
0.177000	54.83	64.63	9.79	1000.0	9.000	L1	ON	9.5
0.231000	48.90	62.41	13.51	1000.0	9.000	L1	ON	9.5
0.285000	42.97	60.67	17.70	1000.0	9.000	L1	ON	9.6
0.397500	32.32	57.91	25.59	1000.0	9.000	L1	ON	9.6
4.398000	31.86	56.00	24.14	1000.0	9.000	L1	ON	9.7

Final Average measurement result:

Frequency (MHz)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.177000	31.17	54.63	23.46	1000.0	9.000	L1	ON	9.5
0.240000	26.21	52.10	25.89	1000.0	9.000	L1	ON	9.5
0.289500	23.16	50.54	27.37	1000.0	9.000	L1	ON	9.6
0.303000	21.05	50.16	29.11	1000.0	9.000	L1	ON	9.6
4.425000	20.50	46.00	25.50	1000.0	9.000	L1	ON	9.7

Figure 6: Spectral Diagrams, Conducted Emission, 150 kHz – 30 MHz, N for Mode 3



Final Quasi-peak measurement result:

Frequency (MHz)	QuasiPeak (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.163500	54.56	65.28	10.73	1000.0	9.000	N	ON	9.5
0.289500	39.57	60.54	20.96	1000.0	9.000	N	ON	9.5
3.930000	28.85	56.00	27.15	1000.0	9.000	N	ON	9.6
4.249500	27.76	56.00	28.24	1000.0	9.000	N	ON	9.6
4.461000	30.72	56.00	25.28	1000.0	9.000	N	ON	9.6
4.560000	27.47	56.00	28.53	1000.0	9.000	N	ON	9.6

Final Average measurement result:

Frequency (MHz)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.163500	35.28	55.28	20.01	1000.0	9.000	N	ON	9.5
0.231000	25.74	52.41	26.68	1000.0	9.000	N	ON	9.5
0.289500	21.51	50.54	29.03	1000.0	9.000	N	ON	9.5
3.943500	20.85	46.00	25.15	1000.0	9.000	N	ON	9.6
9.775500	24.50	50.00	25.50	1000.0	9.000	N	ON	9.8
10.500000	24.10	50.00	25.90	1000.0	9.000	N	ON	9.8

4.2 Emission in the Frequency Range above 30 MHz

4.2.1 Radiated emission in the frequency range up 1 GHz

Result:	**Passed**

Date of testing	:	23.07.2020 and 28.07.2020
Test procedure	:	FCC 47 CFR Part 15, Subpart B:2019, ICES-003:2016 (Updated:2019-04), ANSI C63.4-2014 and CISPR 16-1 series standards
Product classification	:	Class B
Frequency range	:	30 – 1000 MHz
Limits	:	Quasi-peak limits (3 m distance): 30 – 88 MHz, 40 dBµV/m; 88 – 216 MHz, 43.5 dBµV/m; 216 – 960 MHz, 46 dBµV/m; 960-1000 MHz, 54 dBµV/m.
Bandwidth of EMI receiver for final measurement	:	120 kHz
Measurement time for final measurement	:	1 s
Kind of test site	:	Semi-anechoic chamber
Input voltage	:	AC 120 V, 60 Hz for adapter DC 5 V
Operational mode	:	Mode 1: EUT powered with adapter via USB cable. Mode 2: EUT communicated with computer via the USB cable. Mode 3: EUT connected with computer via USB cable and communicated by wireless Bluetooth.
Ambient condition	:	Temperature: 22.7 °C; Relative humidity: 48.2 %
Expanded measurement uncertainty (k=2)	:	5.49 dB

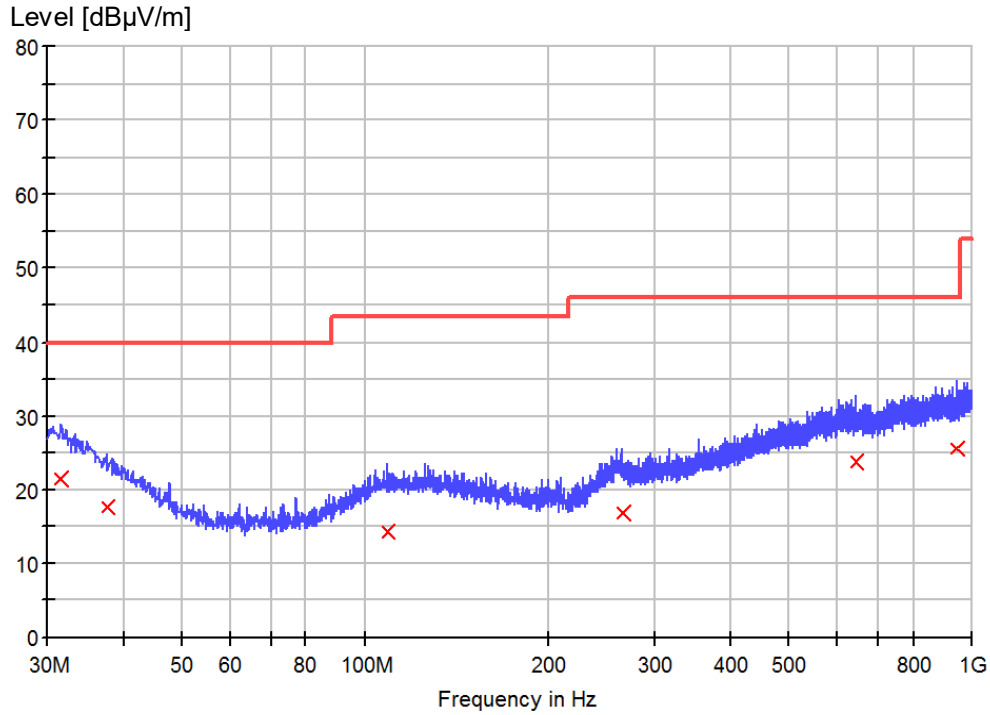
The radiated disturbance test was carried out in a semi-anechoic chamber. The test distance from the receiving antenna to the EUT is 3 m. The normalized site attenuation of the semi-anechoic chamber is regularly calibrated to ensure the radiated disturbance test results are valid. During the test, the EUT was placed on a 80 cm wooden support above the reference ground plane. The wooden support was rotated 360° around and the height of the antenna was varied from 1 m to 4 m to find the maximum disturbance. The test was performed with the antenna both in its horizontal and vertical polarizations.

The following figures and tables were those measured by an automatic measurement system. A preview test was firstly performed with peak detector. The final test was performed with quasi-peak at those critical frequencies during the preview test. In the following spectral diagram, "×" means quasi-peak test results.

Notes on following tables of radiated emission results and conversions:

QuasiPeak (dBµV/m): final measurement results by using quasi-peak detector
Corr. (dB): correction factor including: antenna factor, cable loss, and gain of pre-amplifier (if used)
Margin: Limit (dBµV/m) - QuasiPeak (dBµV/m)

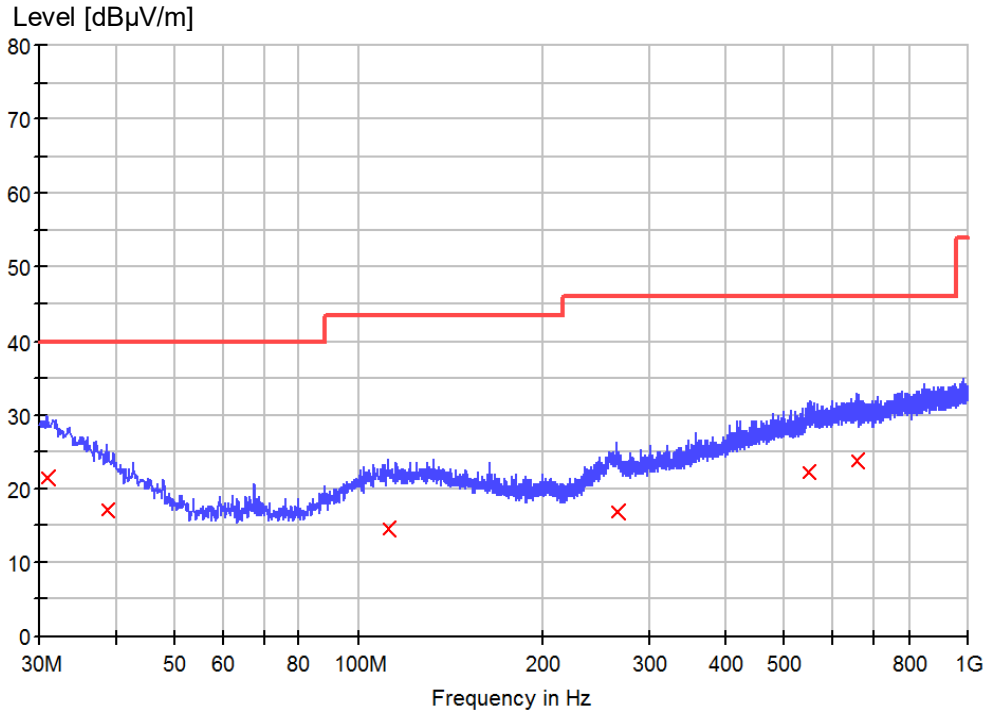
Figure 7: Spectral Diagrams, Radiated Emission, 30 MHz-1000 MHz, Horizontal polarization for mode 1



Final quasi-peak measurement results:

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBµV/m)
31.576250	21.4	1000.0	120.000	165.5	H	-180.0	24.7	18.6	40.0
37.517500	17.7	1000.0	120.000	165.5	H	-180.0	21.3	22.3	40.0
108.933750	14.4	1000.0	120.000	165.5	H	-180.0	18.5	29.1	43.5
266.316250	16.8	1000.0	120.000	165.5	H	-180.0	20.4	29.2	46.0
645.222500	23.7	1000.0	120.000	165.5	H	-180.0	26.3	22.3	46.0
944.588750	25.6	1000.0	120.000	165.5	H	-180.0	28.3	20.4	46.0

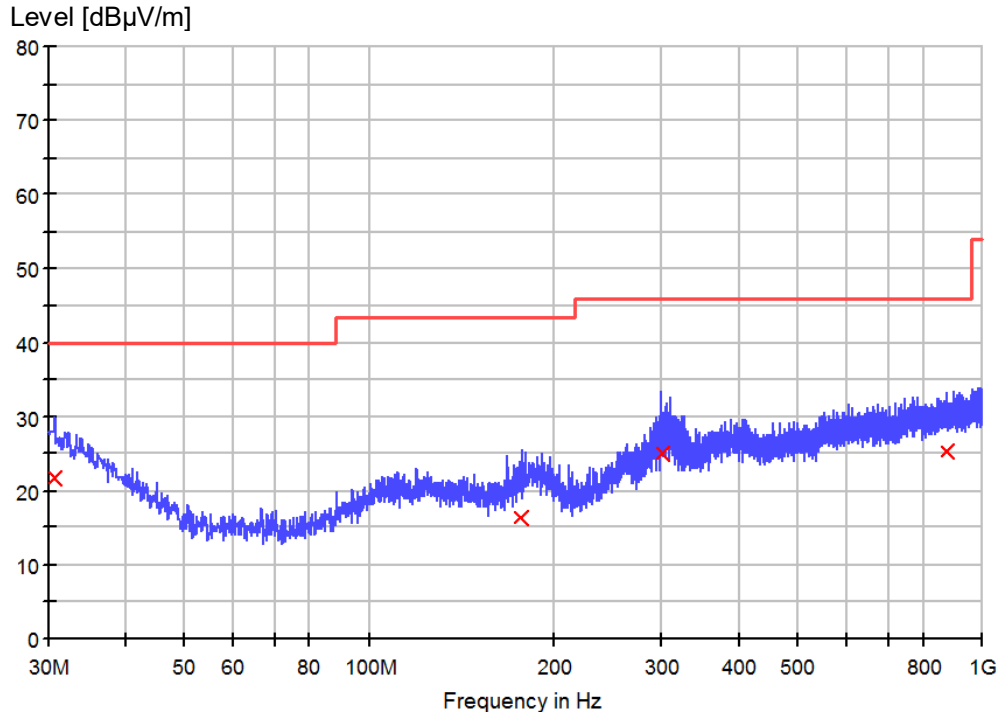
Figure 8: Spectral Diagrams, Radiated Emission, 30 MHz-1000 MHz, Vertical polarization for mode 1



Final quasi-peak measurement results:

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBµV/m)
30.970000	21.6	1000.0	120.000	200.0	V	-90.0	24.9	18.4	40.0
38.608750	17.2	1000.0	120.000	200.0	V	-90.0	20.8	22.8	40.0
112.207500	14.6	1000.0	120.000	200.0	V	-90.0	18.5	28.9	43.5
265.346250	16.9	1000.0	120.000	200.0	V	-90.0	20.6	29.1	46.0
546.403750	22.3	1000.0	120.000	200.0	V	-90.0	26.0	23.7	46.0
658.075000	23.7	1000.0	120.000	200.0	V	-90.0	26.2	22.3	46.0

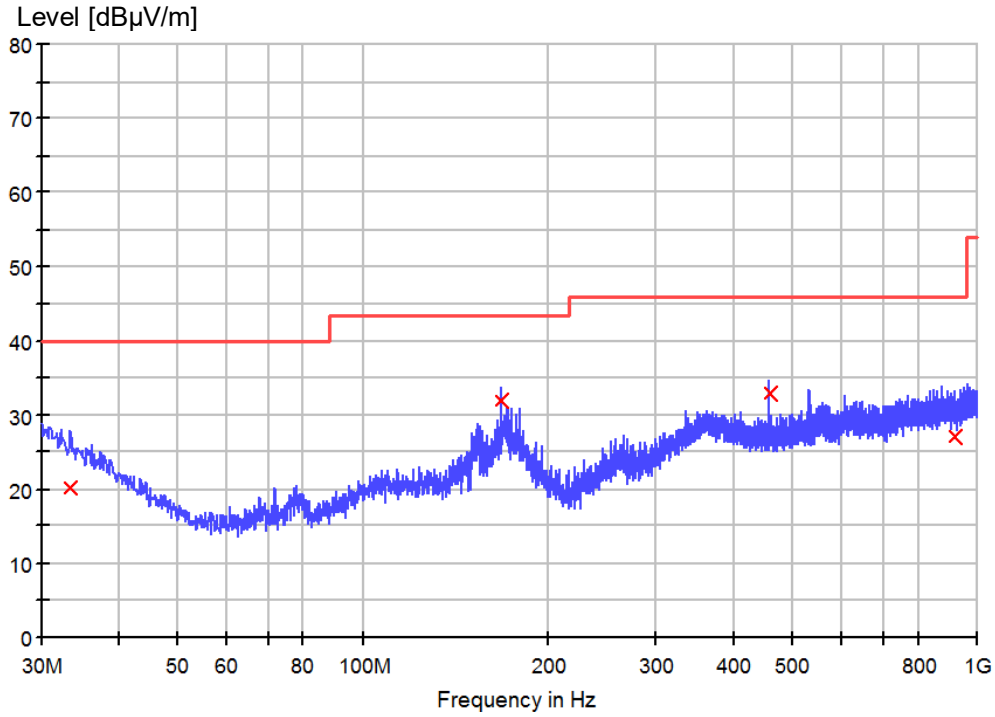
Figure 9: Spectral Diagrams, Radiated Emission, 30 MHz-1000 MHz, Horizontal polarization for mode 2



Final quasi-peak measurement results:

Frequency (MHz)	QuasiPeak (dB µ V/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dB µ V/m)
30.727500	21.7	1000.0	120.000	100.0	H	0.0	25.0	18.3	40.0
176.106250	16.4	1000.0	120.000	100.0	H	0.0	16.0	27.1	43.5
300.387500	24.9	1000.0	120.000	100.0	H	0.0	20.0	21.1	46.0
872.202500	25.4	1000.0	120.000	100.0	H	0.0	28.0	20.6	46.0

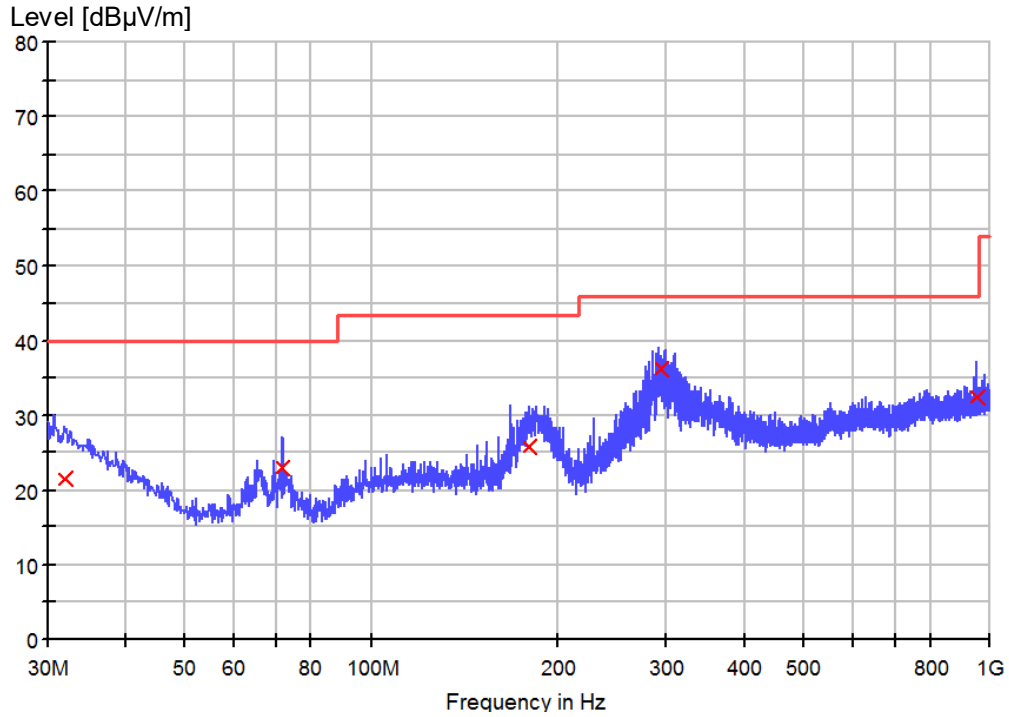
Figure 10: Spectral Diagrams, Radiated Emission, 30 MHz-1000 MHz, Vertical polarization for mode 2



Final quasi-peak measurement results:

Frequency (MHz)	QuasiPeak (dB µ V/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dB µ V/m)
33.395000	20.2	1000.0	120.000	100.0	V	0.0	23.6	19.8	40.0
167.982500	32.1	1000.0	120.000	100.0	V	0.0	16.4	11.4	43.5
457.770000	33.0	1000.0	120.000	100.0	V	0.0	24.3	13.0	46.0
915.731250	27.1	1000.0	120.000	100.0	V	0.0	28.1	18.9	46.0

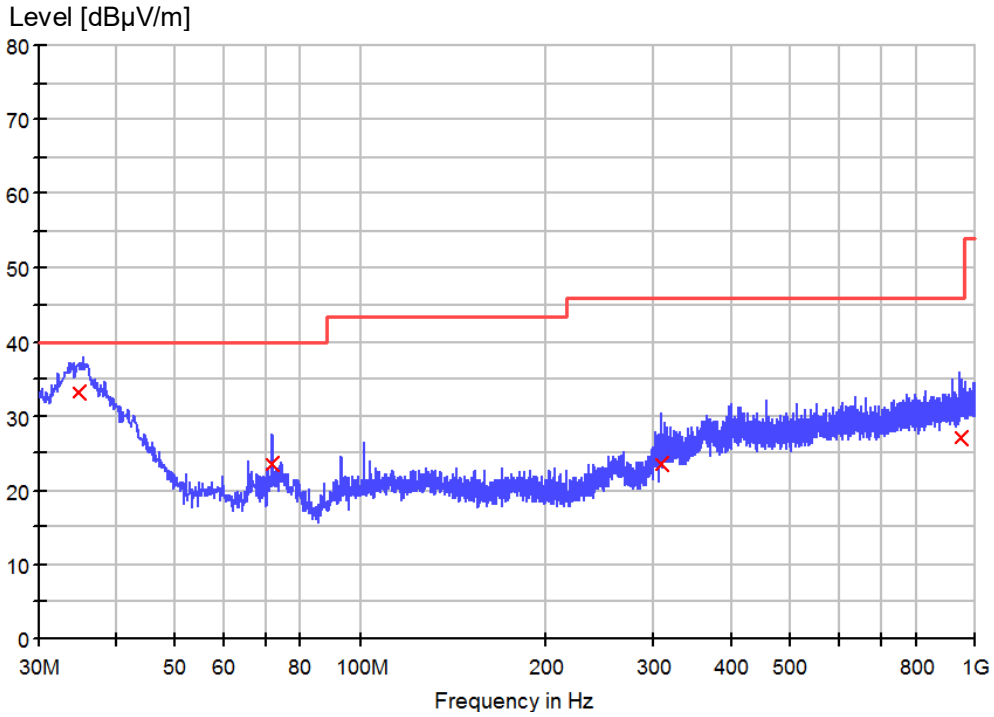
Figure 11: Spectral Diagrams, Radiated Emission, 30 MHz-1000 MHz, Horizontal polarization for mode 3



Final quasi-peak measurement results:

Frequency (MHz)	QuasiPeak (dB µ V/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dB µ V/m)
31.940000	21.4	1000.0	120.000	100.0	H	179.0	24.5	18.6	40.0
71.952500	23.1	1000.0	120.000	100.0	H	179.0	13.1	16.9	40.0
179.743750	25.8	1000.0	120.000	100.0	H	179.0	15.9	17.7	43.5
294.325000	36.3	1000.0	120.000	100.0	H	179.0	19.8	9.7	46.0
948.590000	32.6	1000.0	120.000	100.0	H	179.0	28.3	13.4	46.0

Figure 12: Spectral Diagrams, Radiated Emission, 30 MHz-1000 MHz, Vertical polarization for mode 3



Final quasi-peak measurement results:

Frequency (MHz)	QuasiPeak (dB µ V/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dB µ V/m)
34.850000	33.2	1000.0	120.000	100.0	V	0.0	22.9	6.8	40.0
71.952500	23.5	1000.0	120.000	100.0	V	0.0	13.1	16.5	40.0
308.753750	23.4	1000.0	120.000	100.0	V	0.0	20.2	22.6	46.0
947.135000	27.1	1000.0	120.000	100.0	V	0.0	28.3	18.9	46.0

4.2.2 Radiated Emission in the frequency range above 1 GHz

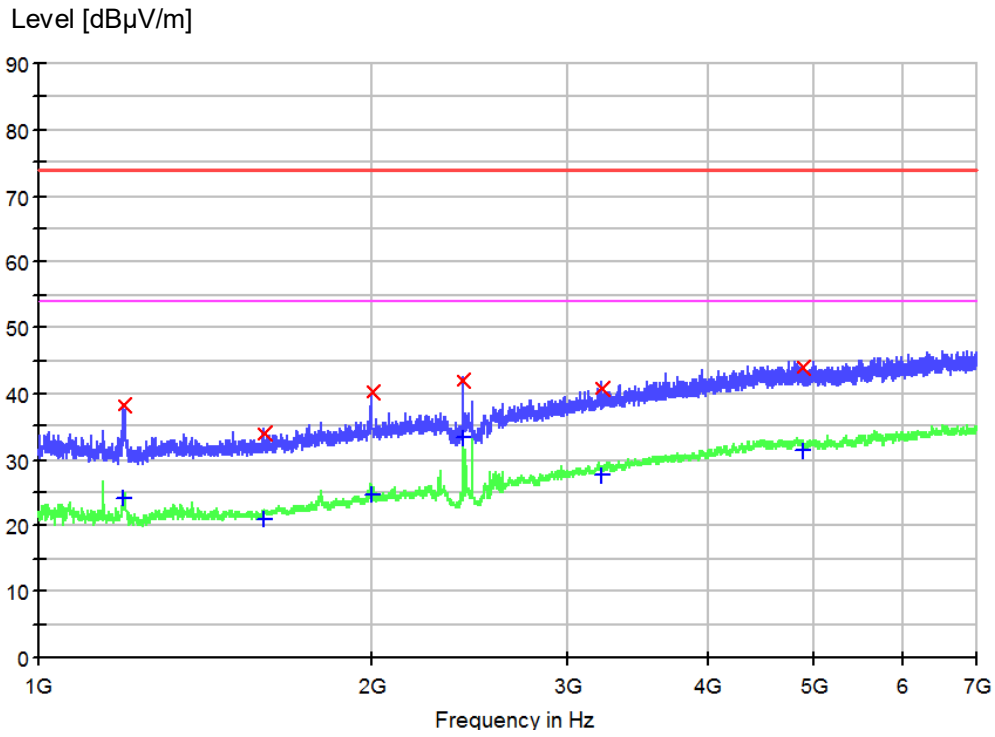
Result:	**Passed**

Date of testing	:	28.07.2020
Port	:	Enclosure
Test procedure	:	FCC 47 CFR Part 15, Subpart B:2019, ICES-003:2016 (Updated:2019-04), ANSI C63.4-2014 and CISPR 16-1 series standards
Product classification	:	Class B
Limit	:	MaxPeak limits (3 m distance): 1-12.5 GHz, 74 dBµV/m CAverage limits (3 m distance): 1-12.5 GHz, 54 dBµV/m
Frequency range	:	1 GHz-12.5 GHz (Note: The highest frequency in the EUT is 2483.5 MHz for BT section. According to FCC Part 15 subpart B §15.33 (b) (1), the upper frequency for radiated emission measurement is 12.5 GHz.
Kind of test site	:	Anechoic chamber
Test distance	:	3 m
Test voltage	:	DC 5 V
Operational mode	:	EUT connected with computer via USB cable and communicated by wireless Bluetooth.
Earthing	:	No earth
Ambient condition	:	Temperature: 22.7 °C; Relative humidity: 48.2 %
Expanded measurement uncertainty (k=2)	:	5.17 dB (1 GHz~6 GHz) 5.12 dB (6 GHz~18 GHz)

The radiated disturbance test was carried out in a fully anechoic room. The test distance from the receiving antenna to the EUT is 3 m. The normalized site attenuation of the fully-anechoic chamber is regularly calibrated to ensure the radiated disturbance test results are valid. During the test, the EUT was placed on a polythylene support, which is 80 cm high. And the wooden support was rotated 360° around. The test was performed with the antenna both in its horizontal and vertical polarizations.

The following figures and tables were those measured by an automatic measurement system. The final test was performed with peak detector and average detector at those critical frequencies during the preview test. In the following figure, "× (red)" means measurement results with peak detector and "+ (blue)" means measurement results with average detector.

Figure 13: Spectral Diagrams and measurement results, 1 GHz-7 GHz, horizontal polarization



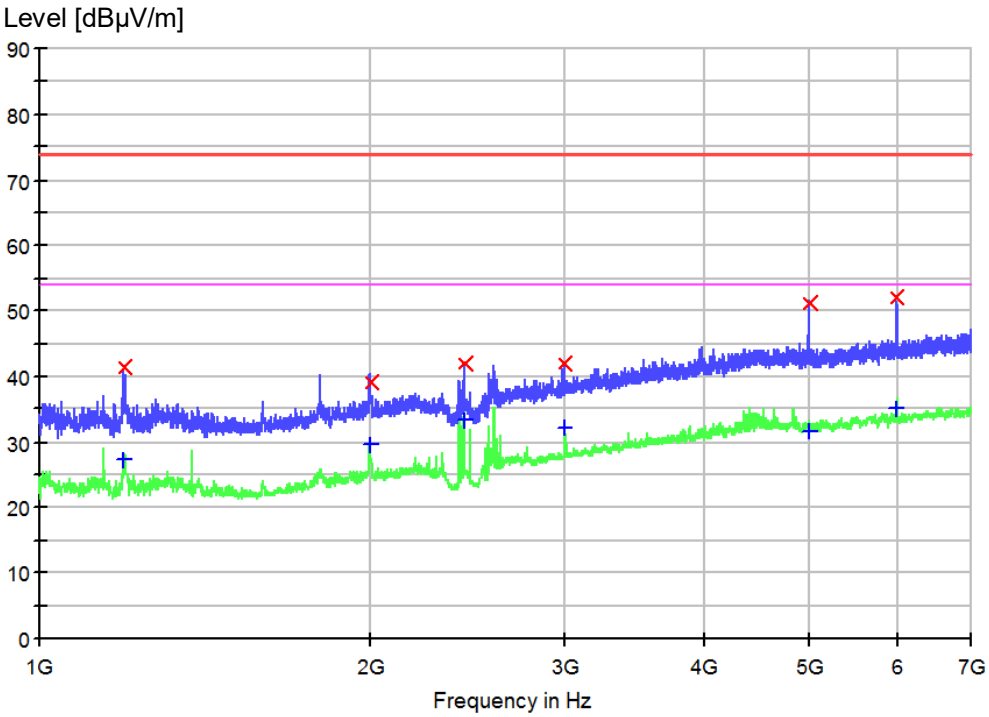
Final maxpeak measurement result:

Frequency (MHz)	MaxPeak (dB µ V/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Margin - PK+ (dB)	Limit - PK+ (dB µ V/m)
1195.000000	38.2	1000.0	1000.000	150.0	H	180.0	-21.3	35.8	74.0
1596.500000	33.9	1000.0	1000.000	150.0	H	180.0	-18.3	40.1	74.0
1994.000000	40.2	1000.0	1000.000	150.0	H	180.0	-16.3	33.8	74.0
2411.500000	41.8	1000.0	1000.000	150.0	H	180.0	-14.4	32.2	74.0
3213.000000	40.7	1000.0	1000.000	150.0	H	180.0	-10.7	33.3	74.0
4876.000000	44.0	1000.0	1000.000	150.0	H	180.0	-6.5	30.0	74.0

Final average measurement result:

Frequency (MHz)	Average (dB µ V/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Margin - AVG (dB)	Limit - AVG (dB µ V/m)
1195.000000	27.2	1000.0	1000.000	150.0	H	-180.0	-21.3	26.8	54.0
1994.000000	29.6	1000.0	1000.000	150.0	H	-180.0	-16.3	24.4	54.0
2428.000000	33.4	1000.0	1000.000	150.0	H	-180.0	-14.4	20.6	54.0
2996.000000	32.3	1000.0	1000.000	150.0	H	-180.0	-11.8	21.7	54.0
4993.000000	31.7	1000.0	1000.000	150.0	H	-180.0	-6.7	22.3	54.0
5988.000000	35.2	1000.0	1000.000	150.0	H	-180.0	-5.9	18.8	54.0

Figure 14: Spectral Diagrams and measurement results, 1 GHz-7 GHz, vertical polarization



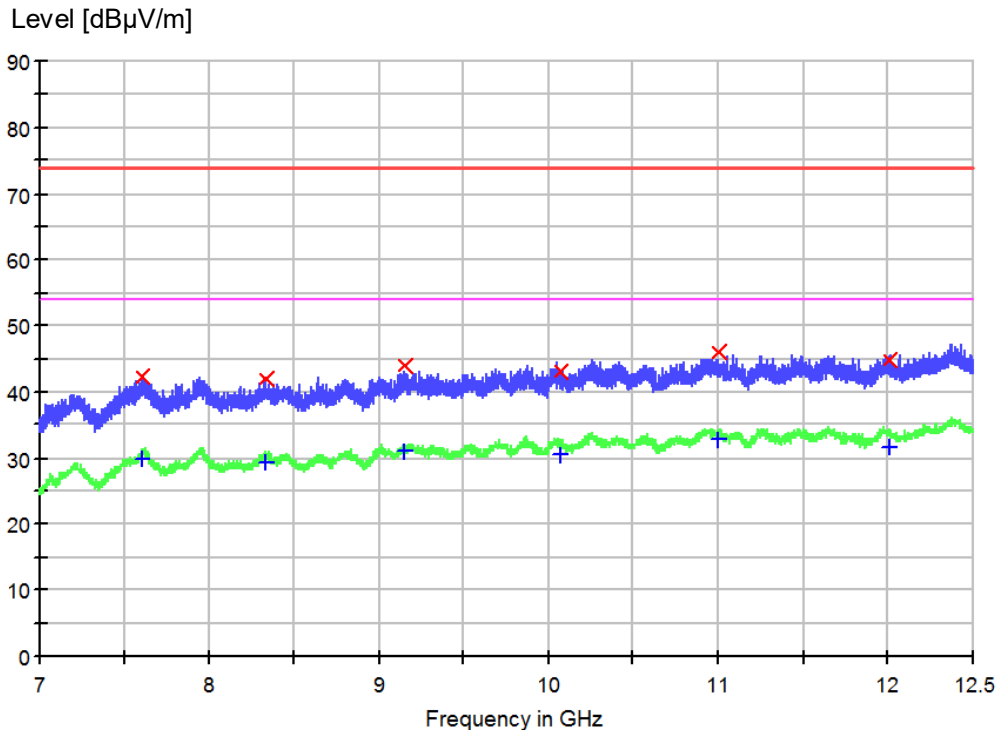
Final maxpeak measurement result:

Frequency (MHz)	MaxPeak (dB µ V/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Margin - PK+ (dB)	Limit - PK+ (dB µ V/m)
1195.000000	41.5	1000.0	1000.000	150.0	V	-180.0	-21.3	32.5	74.0
1994.000000	39.1	1000.0	1000.000	150.0	V	-180.0	-16.3	34.9	74.0
2428.000000	41.9	1000.0	1000.000	150.0	V	-180.0	-14.4	32.1	74.0
2996.000000	42.1	1000.0	1000.000	150.0	V	-180.0	-11.8	31.9	74.0
4993.000000	51.2	1000.0	1000.000	150.0	V	-180.0	-6.7	22.8	74.0
5988.000000	52.0	1000.0	1000.000	150.0	V	-180.0	-5.9	22.0	74.0

Final average measurement result:

Frequency (MHz)	Average (dB µ V/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Margin - AVG (dB)	Limit - AVG (dB µ V/m)
1195.000000	27.2	1000.0	1000.000	150.0	V	-180.0	-21.3	26.8	54.0
1994.000000	29.6	1000.0	1000.000	150.0	V	-180.0	-16.3	24.4	54.0
2428.000000	33.4	1000.0	1000.000	150.0	V	-180.0	-14.4	20.6	54.0
2996.000000	32.3	1000.0	1000.000	150.0	V	-180.0	-11.8	21.7	54.0
4993.000000	31.7	1000.0	1000.000	150.0	V	-180.0	-6.7	22.3	54.0
5988.000000	35.2	1000.0	1000.000	150.0	V	-180.0	-5.9	18.8	54.0

Figure 15: Spectral Diagrams and measurement results, 7 GHz-12.5 GHz, horizontal polarization



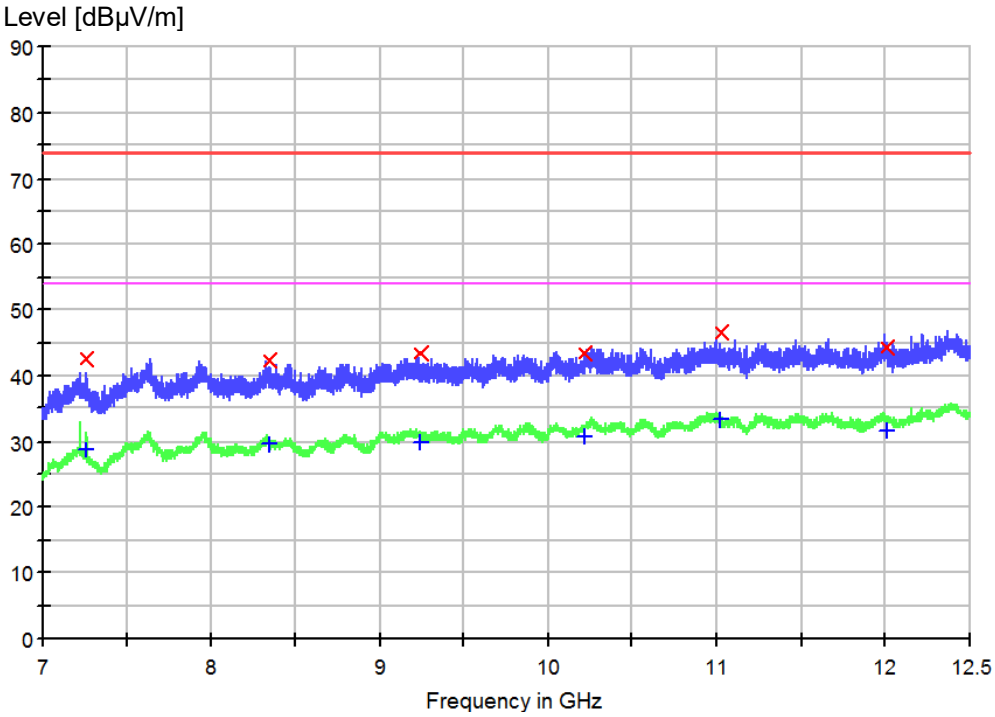
Final maxpeak measurement result:

Frequency (MHz)	MaxPeak (dB µ V/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Margin - PK+ (dB)	Limit - PK+ (dB µ V/m)
7602.250000	42.3	1000.0	1000.000	150.0	H	-180.0	-3.1	31.7	74.0
8328.250000	41.9	1000.0	1000.000	150.0	H	-180.0	-2.7	32.1	74.0
9151.416667	44.0	1000.0	1000.000	150.0	H	-180.0	-1.0	30.0	74.0
10069.916667	43.2	1000.0	1000.000	150.0	H	-180.0	-0.2	30.8	74.0
10995.750000	46.0	1000.0	1000.000	150.0	H	-180.0	1.0	28.0	74.0
12004.541667	45.0	1000.0	1000.000	150.0	H	-180.0	1.1	29.0	74.0

Final average measurement result:

Frequency (MHz)	Average (dB µ V/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Margin - AVG (dB)	Limit - AVG (dB µ V/m)
7602.250000	29.8	1000.0	1000.000	150.0	H	-180.0	-3.1	24.2	54.0
8328.250000	29.2	1000.0	1000.000	150.0	H	-180.0	-2.7	24.8	54.0
9151.416667	31.1	1000.0	1000.000	150.0	H	-180.0	-1.0	22.9	54.0
10069.916667	30.5	1000.0	1000.000	150.0	H	-180.0	-0.2	23.5	54.0
10995.750000	32.9	1000.0	1000.000	150.0	H	-180.0	1.0	21.1	54.0
12004.541667	31.7	1000.0	1000.000	150.0	H	-180.0	1.1	22.3	54.0

Figure 16: Spectral Diagrams and measurement results, 7 GHz-12.5 GHz, vertical polarization



Final maxpeak measurement result:

Frequency (MHz)	MaxPeak (dB µ V/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Margin - PK+ (dB)	Limit - PK+ (dB µ V/m)
7259.416667	42.5	1000.0	1000.000	150.0	V	-180.0	-4.0	31.5	74.0
8344.291667	42.3	1000.0	1000.000	150.0	V	-180.0	-2.6	31.7	74.0
9242.625000	43.3	1000.0	1000.000	150.0	V	-180.0	-0.8	30.7	74.0
10213.375000	43.4	1000.0	1000.000	150.0	V	-180.0	0.3	30.6	74.0
11018.666667	46.5	1000.0	1000.000	150.0	V	-180.0	1.0	27.5	74.0
12002.708333	44.4	1000.0	1000.000	150.0	V	-180.0	1.1	29.6	74.0

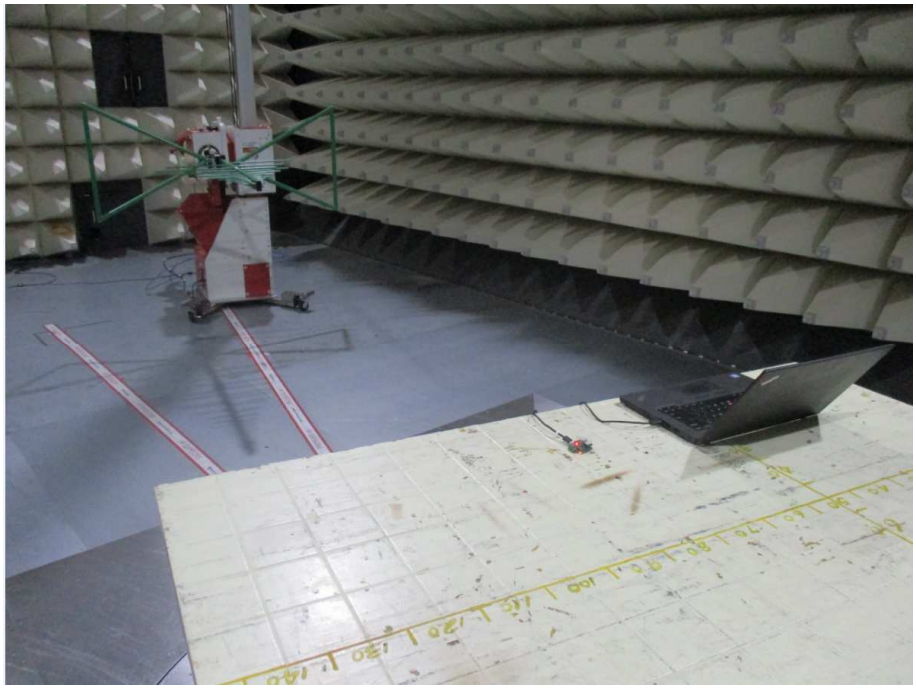
Final average measurement result:

Frequency (MHz)	Average (dB µ V/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Margin - AVG (dB)	Limit - AVG (dB µ V/m)
7259.416667	28.9	1000.0	1000.000	150.0	V	-180.0	-4.0	25.1	54.0
8344.291667	29.7	1000.0	1000.000	150.0	V	-180.0	-2.6	24.3	54.0
9242.625000	30.0	1000.0	1000.000	150.0	V	-180.0	-0.8	24.0	54.0
10213.375000	30.8	1000.0	1000.000	150.0	V	-180.0	0.3	23.2	54.0
11018.666667	33.5	1000.0	1000.000	150.0	V	-180.0	1.0	20.5	54.0
12002.708333	31.7	1000.0	1000.000	150.0	V	-180.0	1.1	22.3	54.0

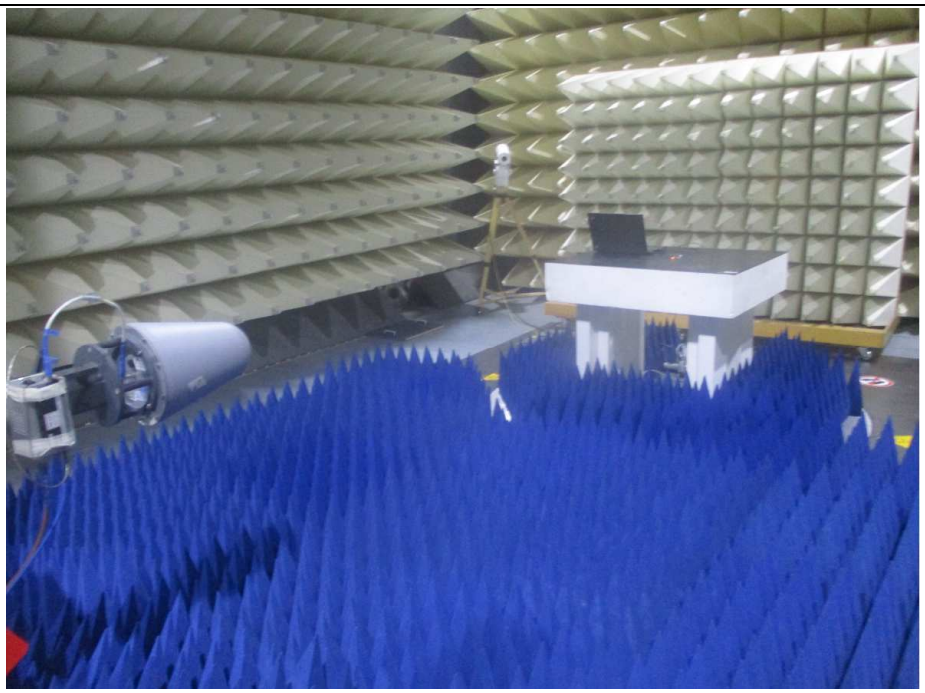
5 Photographs of the Test Set-Up

Photograph 1: Set-up for measurement of conducted emission

Photograph 2: Set-up for measurement of radiated emission



(30-1000 MHz)



(1-12.5 GHz)

6 List of Test and Measurement Instruments

Equip.	Description	Model	Manufacturer	Last Date DD.MM.YYYY	Due Date DD.MM.YYYY
1811380	EMI test receiver	ESIB26	Rohde&Schwarz	19.04.2020	19.04.2021
1811403	Artificial mains network	ENV216	Rohde&Schwarz	17.09.2020	17.09.2021
1824845	EMC measurement software	EMC32 (Ver 10.20.01)	Rohde&Schwarz	N/A	N/A
G1811378	3m modified semi-anechoic chamber	SAC3	Frankonia	27.06.2019	27.06.2022
G1811402	EMI test receiver	ESCI	Rohde&Schwarz	16.09.2019	16.09.2020
G1811425	Bilog antenna	CBL 6112D	Teseq	10.03.2020	10.03.2023
G1811417	Log periodic antenna	HL050	Rohde&Schwarz	10.03.2020	10.03.2023
G1822702	Spectrum analyser	FSV40	Rohde&Schwarz	01.11.2019	01.11.2021
G1825371	Preamplifier	EMC051845SE	Taiwan EMCI	06.03.2019	06.03.2021
G1824845	EMC measurement software	EMC32 (Ver 10.20.01)	Rohde&Schwarz	N/A	N/A

7 List of Figures

8 List of Photographs

End of test report