



TEST REPORT	
ELECTRONICS TESTING	
EMC TEST FACILITY	
TEST REPORT NUMBER	QFM 2051CON383-1-A4
TEST REPORT ISSUE DATE	24 June 2021
TEST REPORT VERSION	1.04
MANUFACTURER	Pella Corporation
EUT NAME	Pella Insynctive Bridge
EUT MODEL	208B0000 V13
CONDITION OF EUT WHEN RECEIVED	Good
ISSUED TO : NAME AND CONTACT INFORMATION OF CUSTOMER	Pella Corporation, 102 Main St, Pella, IA 50219
ISSUED BY : NAME AND ADDRESS OF TEST LABORATORY	Tarang: Product Qualification and Compliance Planet, Wipro Limited, SJP2, Survey#70,77,78/8A, Dodda Kanelli, Sarjapur road, Bangalore. Karnataka. India - 560 035 Tel: +91-80-30292929 Fax: +91-80-30298200 Email: tarang-planet@wipro.com Web: www.wipro.com

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AMENDMENT HISTORY

Amendment Number	Amendment Date	Author of Amendment	Previous Report Version	Previous Report Date
01	1 st May 2021	Venkatesha Bagasale Sridhar	1.00	12 th Feb 2021
Amendment Details	Antenna connector details are added as per section 15.203 in Test Report Summary page section 1.0 of the test report.			
Amendment Number	Amendment Date	Author of Amendment	Previous Report Version	Previous Report Date
02	10 th May 2021	Venkatesha Bagasale Sridhar	1.01	5 th May 2021
Amendment Details	“Tarang labs” replaced with “Tarang: Product Qualification and Compliance Planet” to bring the lab name in line with lab name mentioned in A2LA or FCC website.			
Amendment Number	Amendment Date	Author of Amendment	Previous Report Version	Previous Report Date
03	28 th May 2021	Albin Antony	1.02	10 th May 2021
Amendment Details	<ul style="list-style-type: none"> Report numbering, aligned as per TARANG/QSP/15 “Section 13 “Multiple report under one (EMC) function” This report number is changed as QFM 2051CON383-1 followed by amendment details. MPE evaluation report is prepared separately by using the measured data and added in report reference number “QFM 2051CON383-2” EUT Internal photographs are removed from this report and added in report reference number “QFM 2051CON383-3” EUT External photographs are removed from this report and added in report reference number “QFM 2051CON383-4” Test setup photographs are removed from this report and added in report reference number “QFM 2051CON383-5” 			
Amendment Number	Amendment Date	Author of Amendment	Previous Report Version	Previous Report Date
04	24 th June 2021	Albin Antony	1.03	28 th May 2021
Amendment Details	<ul style="list-style-type: none"> 20dB Bandwidth and 99% Bandwidth test repeated by applying 10 kHz Bandwidth and test results updated. The device (EUT) was in continuous transmission mode and Transmitter time, not ceased during the test, hence the EUT was, configured for normal operation mode and test repeated and test results are, updated. Measurement Uncertainty updated for Occupied Bandwidth test and Transmitter time test. Serial number of the EUT (Board) which is, used for Normal operation and Continuous operation is, updated. Model number updated as per the label from “208B0000” to 208B0000 V13. 			



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1 TEST REPORT SUMMARY

Applicant	Telekiness Systems & Solutions LLP
Manufacturer	Pella Corporation
EUT Name	Pella Insynctive Bridge
EUT Model	208B0000 V13
EUT Serial Number (PCB)	CS-PELLA-P13-35 (Normal Operation mode) CS-PELLA-P13-26 (Continuous Operation mode)
Date of receipt of test item	18 December 2020
EUT Category / Type of Equipment	Wireless/Table top
EUT Operating Voltage	110VAC
EUT Operating Frequency	60Hz
Center Frequency (Intentional radiator)	433.9MHz
RF output Power rating	-2.2 dBm
Date of Test	18 December 2020 to 19 January 2021
Venue of Test	Tarang: Product Qualification and Compliance Planet-EMC

Applicable Standard	Applicable Test	Frequency range/ Class/ Test level	Applicable port	Results-Criterion
CFR 47, FCC Part 15 C (15.203)	Antenna connector	Permanently attached antenna. Monopole Copper-Clad antenna & Unique antenna connector, permanently attached antenna, or professionally installed	NA	Complies Note 1 & Antenna Pictures and further detail are available in Annexure II
CFR 47, FCC Part 15 C (15.231 (b))/ RSS-210, Issue 10 (15.231 (b))/RSS-210, Issue 10	Radiated Emissions Test	Frequency Range: 30MHz to 5GHz Emission shall be below as per FCC 15.209 (a), 15.205 (a) & 15.231 (b) limits & RSS-GEN, Issue 5, (8.9) limits	Enclosure	PASS
CFR 47, FCC Part 15 C (15.231 (b))/ RSS-210, Issue 10 (15.207)/RSS-GEN, Issue 5 (7.2)	Conducted Emissions Test	Frequency Range: 150kHz to 30MHz Emission shall be below as per FCC 15.207 limits & RSS-GEN, Issue 5, (8.8) limits	Power port	PASS
CFR 47, FCC Part 15 C (15.231 (b))/ RSS-210, Issue 10 (15.231 (c))/RSS-210, Issue 10	20dB Bandwidth, 99% Bandwidth	Section 15.231 (c) / RSS-GEN Issue 5 (6.7)	Antenna port	Refer Section 5.3.3.7
CFR 47, FCC Part 15 C (15.231 (b))/ RSS-210, Issue 10 (15.231 (a) (2))	Transmitter Time	Section 15.231(a) (2)/ RSS-GEN Issue 5.	Antenna port	Refer Section 5.3.4.7




Note 1: Antenna gain declared as maximum -3.5dBi by the manufacturer.



Pella Insynctive Bridge was tested by Tarang: Product Qualification and Compliance Planet as per the standards that are listed in the table above. Based on the observations during the test and interpretations by Tarang: Product Qualification and Compliance Planet, results have been indicated. The test results produced in this report shall apply only to the above sample that has been tested under the specific conditions and modes of testing as described in the report. Other similar equipment may not necessarily reproduce same result due to production tolerances and measurement uncertainties. Any measurement uncertainties listed in this report are for information purpose only.

The results shall stand invalid, in case there are any modifications / additions / removals to the hardware or software or end use atmosphere to the product tested. This report shall not be modified or in any way revised unless it is expressly permitted and endorsed by Tarang: Product Qualification and Compliance Planet, through a duly authorized representative. Particulars on Manufacturer / Supplier / Product configuration / performance criteria, given in this report, are based on the information given by the customer, along with test request. Tarang: Product Qualification and Compliance Planet does not assume any responsibility for the correctness of such information for the above mentioned equipment under test.

Customer acknowledges that this is a test report and not a certificate to gain market access for the product. To gain market access, Customer needs appropriate clearance from the Government or authorized agency for the target market. For markets that allow self-declaration, customer needs to follow the procedure defined by the target market.

Prepared by	Reviewed by	Approved by
		
Saranya K	Gopala Krishna M R	Albin Antony
EMC Test Engineer	Lead EMC Test Engineer	Authorized Signatory



2 GENERAL INFORMATION

2.1 ACCREDITATION DETAILS

Following are the accreditation and listing details for Tarang: Product Qualification and Compliance Planet

Accreditation / Listing body	Registration / Company / Certificate Number
NABL, India	Certificate No: TC-5992 http://www.nabl-india.org/
Telecommunication Engineering Centre (TEC)	Certificate no: TEC/MRA/CAB/IND-D/7-II http://www.tec.gov.in/list-of-cabs-designated-by-india/
American Association for Laboratory Accreditation	Certificate No: 5148.01 https://cabportal.touchstone.a2la.org/index.cfm?event=directory.index

2.2 MEASUREMENT UNCERTAINTY

The following measurement uncertainties are applicable to the relevant tests that are mentioned below:

Name of the test	Measurement Uncertainty
Radiated Emission from 30MHz to 1GHz at 3meter	± 4.9217 dB
Radiated Emission from 1GHz to 5GHz at 3meter	± 3.7078 dB
Conducted Emission from 150kHz to 30MHz	± 1.6104 dB
Occupied Bandwidth	± 2.040 %
Transmitter Time	± 0.443 %



3 INSTRUMENTATION AND CALIBRATION

3.1 TEST AND MEASURING EQUIPMENT

The list of following measuring equipment used for this testing conforms to the applicable standards. Performance of all test and measuring equipment including any accessories are checked periodically to ensure accuracy.

3.2 EQUIPMENT USED

Name of Equipment	Manufacturer	Model No.	Serial No.	Calibration Due
EMI Test Receiver	Rohde & Schwarz	ESU40	100510	25 th Dec 2020 22 nd Jan 2021
EMI Test Receiver	Rohde & Schwarz	ESR3	102072	07 th Oct 2021 09 th Feb 2021
Bi-conical Antenna/Bi-conical Elements BBA 9106	SCHWARZBECK	VHBB 9124	9124-373	15 th Sep 2021
Log- periodic Antenna	SCHWARZBECK	VUSLP 9111	9111-308	18 th Sep 2021
Pre- amplifier	Rohde & Schwarz	SCU-01	100626	19 th May 2021
Double Ridge Broad Band Horn Antenna	SCHWARZBECK	BBHA9120D	BBHA9120D-688	15 th Dec 2021
Pre-amplifier	Rohde & Schwarz	SCU-18	102275	19 th May 2021

Table 1: List of equipment used for Radiated Emission test

Name of Equipment	Manufacturer	Model No.	Serial No.	Calibration Due
EMI Test Receiver	Rohde & Schwarz	ESU40	100510	25 th Dec 2020 22 nd Jan 2021
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	101260	08 th Mar 2021
LISN	SCHWARZBECK	NNLK 8129	8129-260	17 th May 2021

Table 2: List of equipment used for Conducted Emission test

Name of Equipment	Manufacturer	Model No.	Serial No.	Calibration Due
Spectrum Analyzer	Key sight Technologies	N9020A	MY54420183	25 th Apr 2022

Table 3: List of equipment used for Conducted RF measurements



3.3 SOFTWARE USED

Test Setup	Software Name	Software Developer	Software Version
Radiated Emissions	TDK Emissions Lab	TDK RF Solutions	10.91.0.3
Conducted Emissions	TDK Emissions Lab	TDK RF Solutions	10.91.0.3
Conducted RF	Key sight Benchvue	Key sight Technologies	NA

Table 4: List of software used during test



4 EUT INFORMATION

4.1 DESCRIPTION OF THE EUT

Pella Insynctive Bridge is a wall-mounted transmitter with indication LED. The EUT connects to public AC mains. BRIDGE wirelessly and connects your Pella Insynctive products to Pella Insynctive App or a compatible security or home automation system through a 433MHz radio.

4.2 SOFTWARE AND FIRMWARE DETAILS

Not Available

5 TEST DETAILS

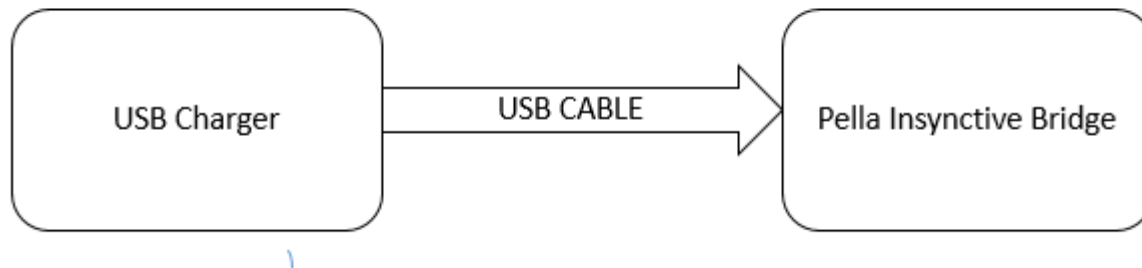
5.1 EUT AND TEST SETUP

5.1.1 EUT CONFIGURATION DURING TEST

During the testing, the EUT was operating in continuous mode. The 433MHz radio was transmitting continuously at its highest power, which is -2.2dBm. Any fault or error state will be indicated by LED (Blue LED will be switched off). The bridge module does not transmit data continuously. It transmits packet only when requested to do so by a separate controller, such as a mobile app or sensor module.

During testing, the EUT was configured to transmit packets continuously at its highest power level at full data rate. This is done only for testing purposes.

5.1.2 TEST SETUP DETAILS



5.1.3 ACCESSORIES/INTERFACES AND CABLE DETAILS

Not Applicable

5.2 DECISION RULE

- When a statement of conformity (e.g. pass/fail, in-tolerance/out-of-tolerance) is requested, the decision rule followed by Tarang: Product Qualification and Compliance Planet will be either of the following,
 - Decision rule as prescribed in the appropriate standard, where measurement results are governed by legal or regulatory standards or rules.
 - Decision rules governed by a published standard
 - Decision rules prescribed by the customer
- When no statement of conformity (e.g. pass/fail, in-tolerance/out-of-tolerance) is requested, then Tarang: Product Qualification and Compliance Planet will,
 - Report the measured result and the uncertainty



5.3 TEST RESULT AND TEST SETUP PHOTOS

5.3.1 RADIATED EMISSIONS TEST

5.3.1.1 TEST SPECIFICATION

Test Standard	CFR 47, FCC Part 15 C (15.231 (b))/ RSS-210, Issue 10	
Test Procedure	ANSI C63.10:2013/RSS-GEN, Issue 5	
Product / Generic Standard	CFR 47, FCC Part 15 C & RSS-210, Issue 10	
Class / Group	NA	
Frequency Range	30MHz to 1GHz	1GHz to 5GHz
Resolution Bandwidth	120kHz	1MHz
Video Bandwidth	300kHz	3MHz
Step size	40kHz	400kHz
Pre Scan Measurement Time	20 ms	5 ms
Final Measurement Time	1 second	1 second
Attenuation	15 dB	5 dB
Test Distance	3 meters	3 meters
Polarization	Horizontal and Vertical	
Detector	Quasi-peak	Peak & Average
EUT Type	Table Top	
Input Voltage	110 V AC	
Input Frequency	60 Hz	
Temperature	22.4 °C	
Relative Humidity	53.2 %	
Tested By	Vikram L	
Test Date	18 December 2020	

5.3.1.2 DEVIATION FROM THE STANDARD

NA



5.3.1.3 LIMITS

Maximum permissible level of Radiated Emissions at 3meters distance as per CFR 47, FCC Part 15 C (15.231 (b))/ RSS-210, Issue 10/RSS-GEN, Issue 5 as shown below:

Frequency (MHz)	Quasi-peak limit (dB μ V/m)
Section 15.209	
30 to 88	40
88 to 200	43.52
200 to 216	43.52
216 to 960	46.02
960 to 1000	53.98
Frequency (MHz)	Quasi-peak limit (dB μ V/m)
Section 15.231	
40.66 to 40.70	47.04
70 to 130	41.9
130 to 174	41.94 to 51.48*
174 to 260	51.48
260 to 470	51.48 to 61.94*
470 to 1000	61.94
Fundamental Frequency range Limit (MHz)	
260 to 470	71.48 to 81.94*

*Increasing linearly with logarithm of frequency

Frequency (GHz)	Peak limit (dB μ V/m)	Average limit (dB μ V/m)
1 to 5	61.94	53.98

5.3.1.4 TEST SETUP

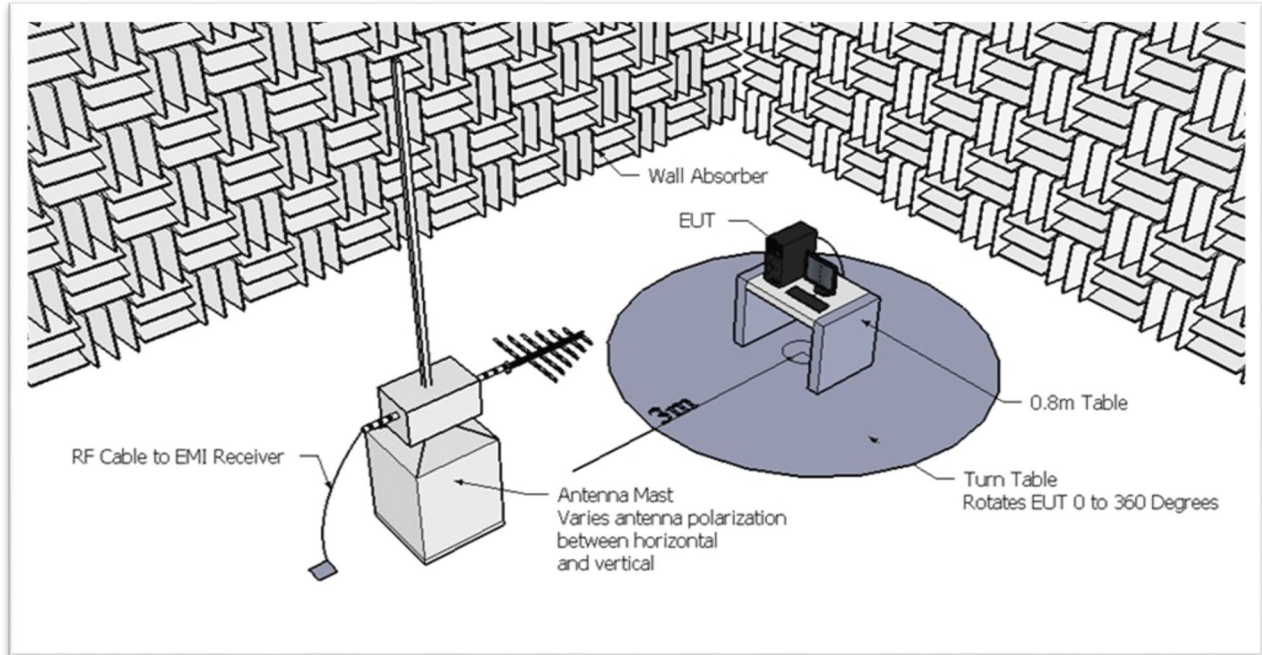


Figure 1: Sample RE test setup for tabletop equipment at 3-meter distance from 30MHz to 1GHz

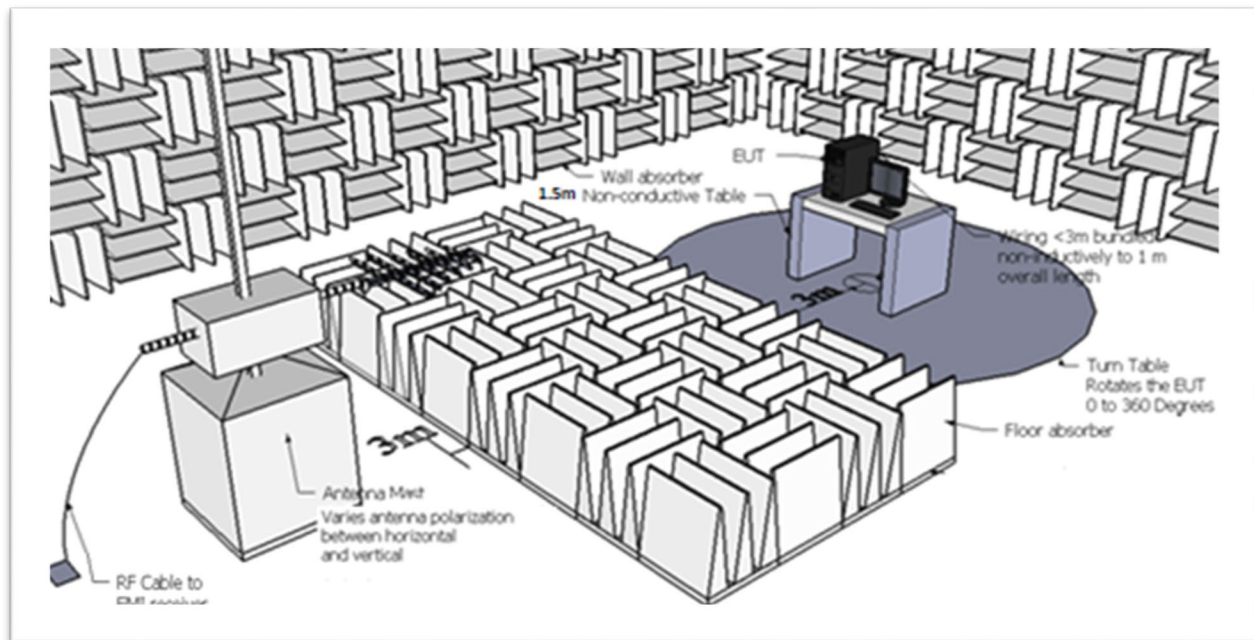


Figure 2: Sample RE test setup for tabletop equipment at 3-meter distance from 1GHz to 5GHz



5.3.1.5 TEST PROCEDURE

The test procedure was in accordance with ANSI C63.10:2013/RSS-GEN, Issue 5.

The Table Top equipment was tested in a Semi-Anechoic chamber. The EUT was placed on non-conductive table of 0.8meter height for below 1GHz and 1.5meters height for above 1GHz, which was in turn placed on a turn table to enable 0° to 360° rotation as per standard.

30MHz to 1GHz:

The distance between the edge of the EUT and receiving antenna was 3meters. The receiving antenna was mounted on antenna mast to enable height variation from 1meter to 4meter above the ground plane.

Pre-scan (Peak) was measured by varying the azimuth angle in 22.5° steps and antenna height from 1meter to 4meter in 1meter steps, in both horizontal and vertical polarization of the antenna. The measurement was carried out in max-hold mode and maximum amplitude of radiated emissions from the EUT was plotted in the graph. The dominant peaks at various frequencies, closer to and above the limit line were identified using peak search option and listed. Quasi-peak measurement was carried out for the listed frequencies to get the maximized readings by rotating the turntable 0 to 360 degree and varying the antenna height from 1meter to 4meters. The maximized reading was compared with the limit specified in the standard.

1GHz to 5GHz:

The distance between the edge of the EUT and receiving antenna was 3meters. The receiving antenna was mounted on antenna mast to enable height variation from 1 to 2meters above the ground plane.

Pre-scan (Peak & Average) was measured by varying the azimuth angle in 22.5° steps and antenna height was varied from 1meter to 2meter, in both horizontal and vertical polarization of the antenna. The measurement was carried out in max-hold mode and maximum amplitude of radiated emissions from the EUT was plotted in the graph. The dominant peaks at various frequencies, closer to and above the limit line were identified using peak search option and listed. Peak and Average measurement was carried out for the listed frequencies to get the maximized readings by rotating the turntable 0 to 360 degree and varying the antenna height from 1meter to 2meters. The maximized reading was compared with the limit specified in the standard.



5.3.1.6 MEASUREMENT DATA

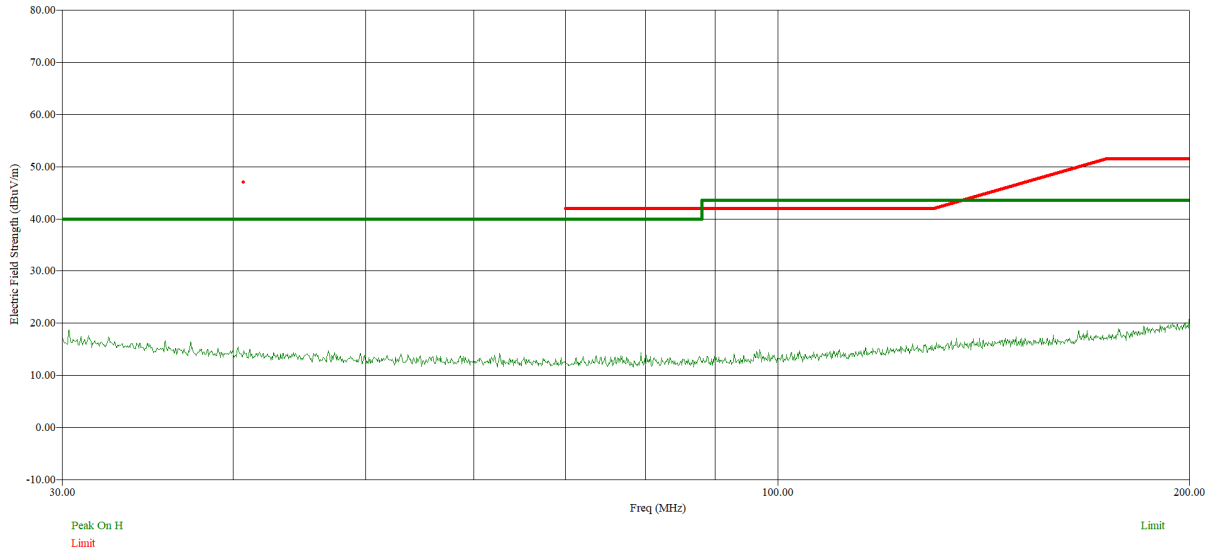


Figure 3: RE graph using peak detector on Horizontal polarization from 30MHz to 200MHz

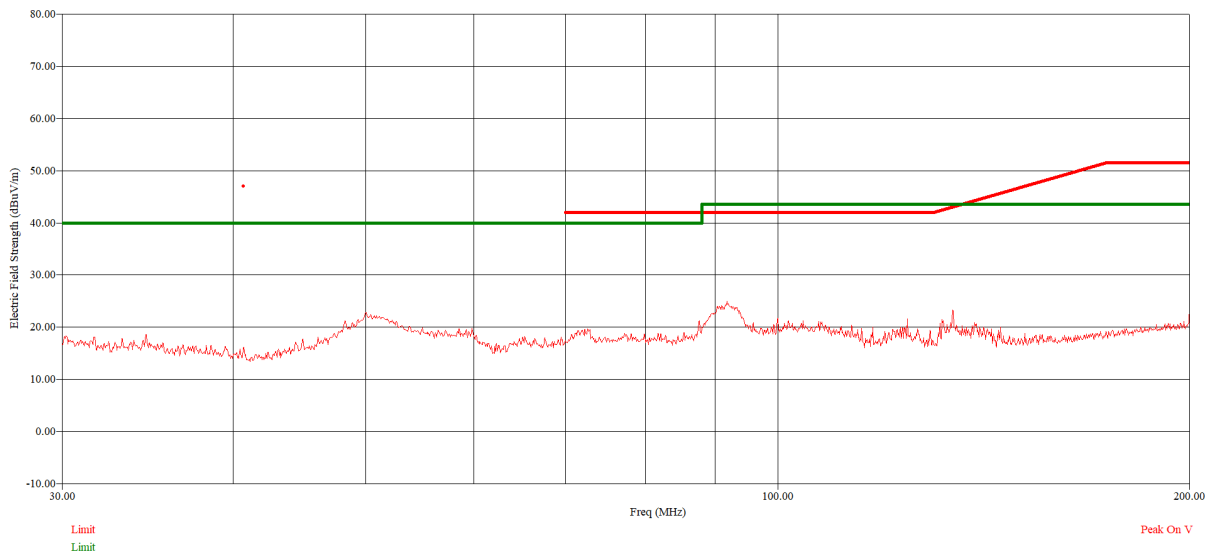


Figure 4: RE graph using peak detector on Vertical polarization from 30MHz to 200MHz

Freq (MHz)	Freq (Max) (MHz)	EUT Ttbl Agl (deg)	Pol	Twr Ht (cm)	(QP) Trace (dBuV)	Cable (dB)	Transducer (dB)	Preamp (dB)	(QP) EMI (dBuV/m)	Limit (dBuV/m)	(QP) Margin (dB)
91.84	91.83	72.50	V	101.20	44.74	2.82	16.14	43.48	20.22	41.94	-21.72
200.00	199.97	229.20	V	278.80	36.06	4.32	21.50	43.44	18.44	51.48	-33.04

Table 5: RE quasi-peak measurement table from 30MHz to 200MHz

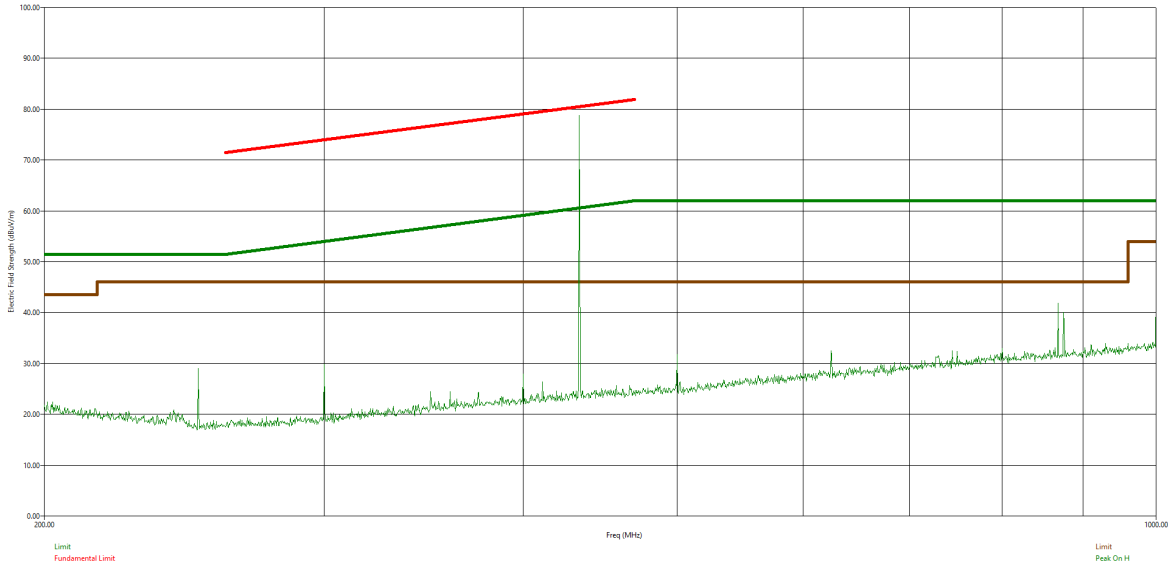


Figure 5: RE graph using peak detector on Horizontal polarization from 200MHz to 1GHz

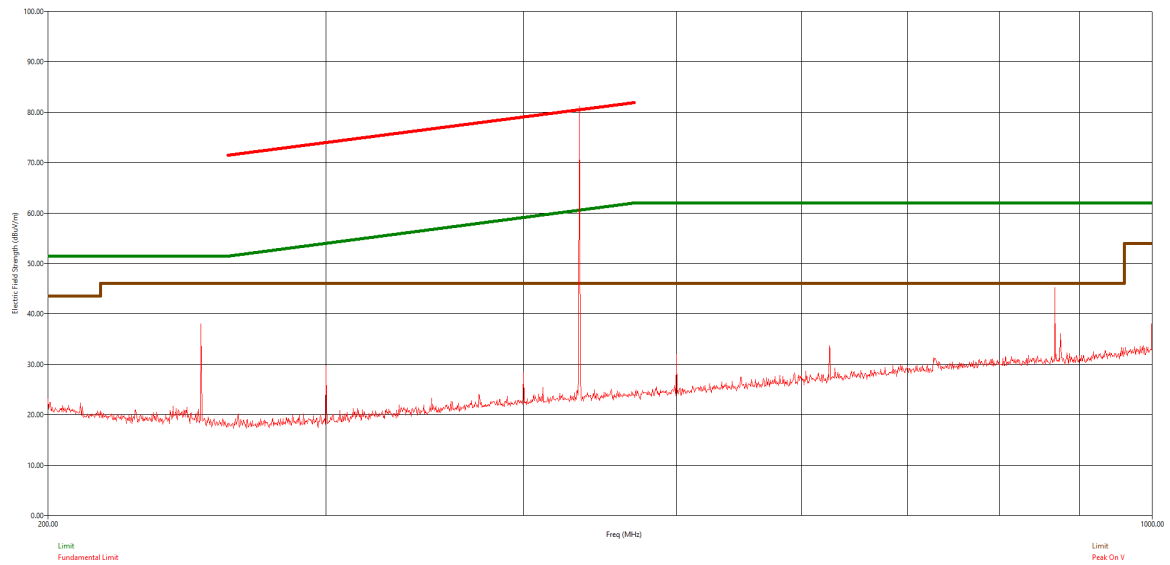


Figure 6: RE graph using peak detector on Vertical polarization from 200MHz to 1GHz

Freq (MHz)	Freq (Max) (MHz)	Pol	Twr Ht (cm)	EUT Ttbl Agl (deg)	(QP) Trace (dBuV)	Cable (dB)	Transducer (dB)	Preamp (dB)	(QP) EMI (dBuV/m)	(QP) Limit (dBuV/m)	(QP) Margin QPL (dB)
250.00	249.99	V	254.90	230.10	53.32	4.77	19.00	43.46	33.63	46.02	-12.39
867.88	867.85	V	101.30	228.20	46.64	9.47	27.62	42.73	41.00	46.02	-5.02
867.88	867.85	H	102.40	207.80	45.29	9.47	28.46	42.73	40.49	46.02	-5.53

Table 6: RE quasi-peak measurement table from 200MHz to 1GHz

Freq (MHz)	Freq (Max) (MHz)	Pol	Twr Ht (cm)	EUT Ttbl Agl (deg)	(QP) Trace (dBuV)	Cable (dB)	Transducer (dB)	Preamp (dB)	(QP) EMI (dBuV/m)	Limit (dBuV/m)	(QP) Margin (dB)
433.92	433.93	V	101.60	224.20	92.93	6.53	23.14	43.29	79.31	80.52	-1.21
433.92	433.92	H	103.50	206.90	92.75	6.53	23.31	43.29	79.30	80.52	-1.22

Table 7: RE quasi-peak measurement table from 200MHz to 1GHz_Fundamental

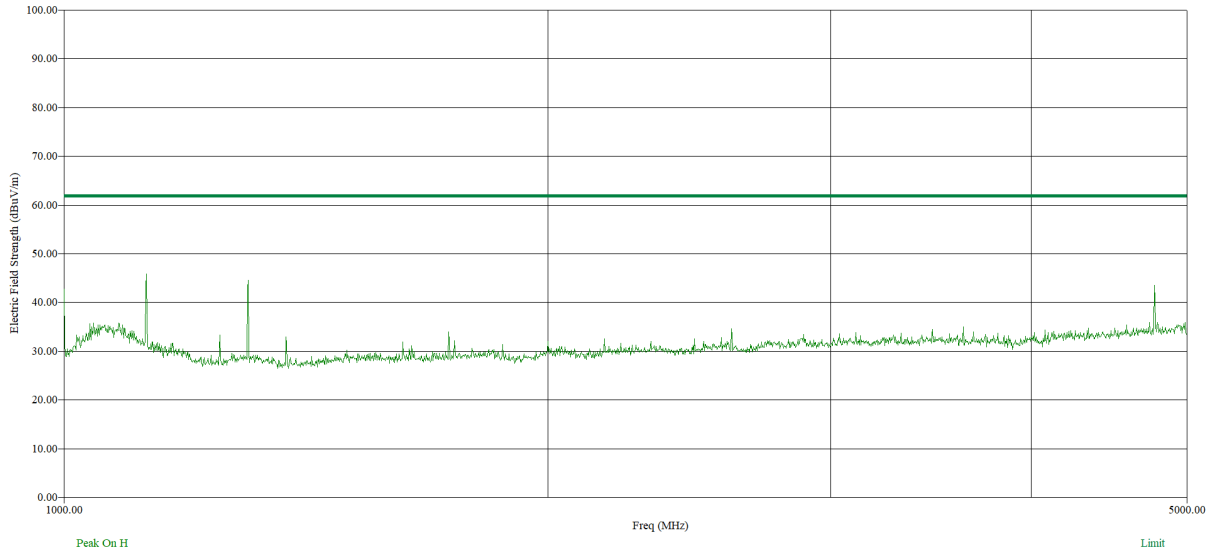


Figure 7: RE graph using peak detector on Horizontal polarization from 1GHz to 5GHz

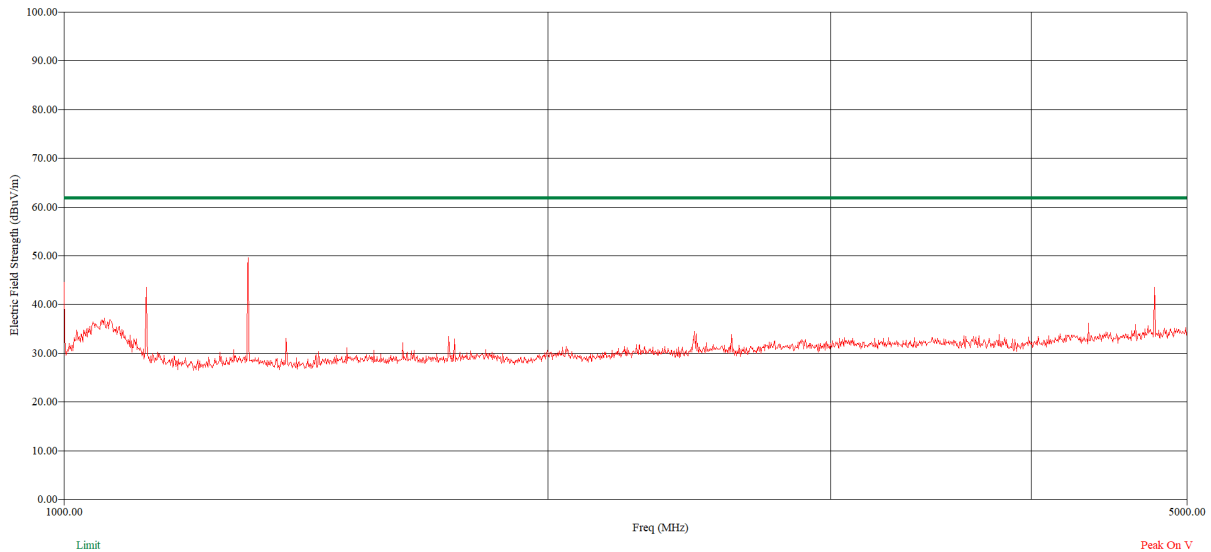


Figure 8: RE graph using peak detector on Vertical polarization from 1GHz to 5GHz

Freq (MHz)	Freq (Max) (MHz)	Pol	EUT Ttbl Agl (deg)	Twr Ht (cm)	(PEAK) Trace (dBuV)	Cable (dB)	Transducer (dB)	Preamp (dB)	(PEAK) EMI (dBuV/m)	Limit (dBuV/m)	(PEAK) Margin (dB)
1000.00	1000.00	H	333.60	163.80	63.25	1.71	24.35	45.61	43.70	61.94	-18.24
1000.00	1000.00	V	242.20	102.80	64.86	1.71	24.76	45.61	45.72	61.94	-16.22
1125.20	1125.02	H	163.80	101.00	65.65	1.82	24.68	45.55	46.61	61.94	-15.33
1125.20	1125.02	V	303.50	104.10	63.02	1.82	25.03	45.55	44.31	61.94	-17.63
1301.60	1301.81	H	14.60	102.20	63.72	1.96	25.10	45.47	45.30	61.94	-16.64
1301.60	1301.81	V	98.70	157.90	68.79	1.96	25.35	45.47	50.62	61.94	-11.32

Table 8: RE peak measurement table from 1GHz to 5GHz

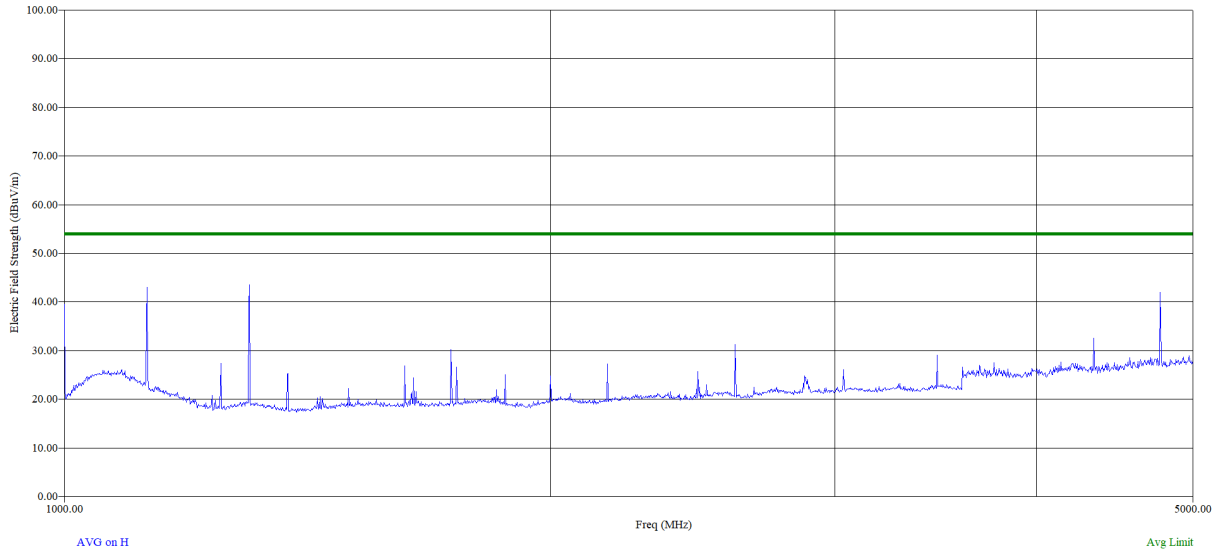


Figure 9: RE graph using average detector on Horizontal polarization from 1GHz to 5GHz

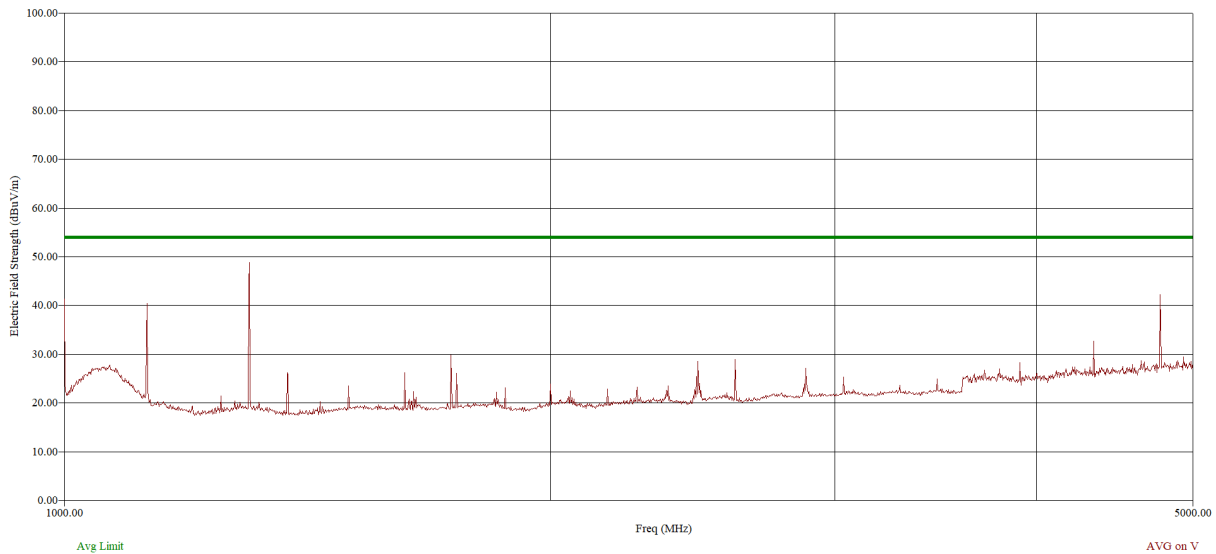


Figure 10: RE graph using average detector on Vertical polarization from 1GHz to 5GHz

Freq (MHz)	Freq (Max) (MHz)	Pol	EUT Ttbl Agl (deg)	Twr Ht (cm)	(AVG) Trace (dBuV)	Cable (dB)	Transducer (dB)	Preamp (dB)	(AVG) EMI (dBuV/m)	Limit (dBuV/m)	(AVG) Margin (dB)
1000.00	1000.00	H	333.60	163.80	59.85	1.71	24.35	45.61	40.30	53.98	-21.64
1000.00	1000.00	V	242.20	102.80	61.89	1.71	24.76	45.61	42.75	53.98	-19.19
1125.20	1125.02	H	163.80	101.00	62.81	1.82	24.68	45.55	43.77	53.98	-18.17
1125.20	1125.02	V	303.50	104.10	59.92	1.82	25.03	45.55	41.22	53.98	-20.72
1301.60	1301.81	H	14.60	102.20	62.19	1.96	25.10	45.47	43.77	53.98	-18.17
1301.60	1301.81	V	98.70	157.90	68.03	1.96	25.35	45.47	49.87	53.98	-12.07

Table 9: RE average measurement table from 1GHz to 5GHz



Note:

$$QP\ EMI\ (dB\mu V/m) = QP\ Trace\ (dB\mu V) + Cable\ Loss\ (dB) + Transducer\ (dB/m) - Preamp\ (dB)$$

$$QP\ Margin\ (dB) = QP\ EMI\ (dB\mu V/m) - QP\ Limit\ (dB\mu V/m)$$

$$PEAK\ EMI\ (dB\mu V/m) = PEAK\ Trace\ (dB\mu V) + Cable\ Loss\ (dB) + Transducer\ (dB/m) - Preamp\ (dB)$$

$$PEAK\ Margin\ (dB) = PEAK\ EMI\ (dB\mu V/m) - PEAK\ Limit\ (dB\mu V/m)$$

$$AVG\ EMI\ (dB\mu V/m) = AVG\ Trace\ (dB\mu V) + Cable\ Loss\ (dB) + Transducer\ (dB/m) - Preamp\ (dB)$$

$$AVG\ Margin\ (dB) = AVG\ EMI\ (dB\mu V/m) - AVG\ Limit\ (dB\mu V/m)$$

5.3.1.7 TEST SETUP PHOTOS

Refer report number “QFM 2051CON383-5”

5.3.1.8 RESULT

Radiated Emissions from the EUT as per CFR 47, FCC Part 15 C/RSS-210, Issue 10 limit: PASS.

Decision Rule followed:

Decision rule as prescribed in the appropriate standard, where measurement results are governed by legal or regulatory standards or rules.



5.3.2 CONDUCTED EMISSIONS TEST

5.3.2.1 TEST SPECIFICATION

Test Standard	CFR 47, FCC Part 15 C (15.207)/RSS-GEN, Issue 5 (7.2)
Test Procedure	ANSI C63.10:2013
Product / Generic Standard	CFR 47, FCC Part 15 C/RSS-GEN, Issue 5
Class / Group	NA
Frequency Range	150kHz to 30MHz
Resolution Bandwidth	9kHz
Video Bandwidth	30kHz
Step size	4kHz
Pre scan Measurement Time	20 ms
Final Measurement Time	1second
Attenuation	10 dB
Detector	Quasi-peak and Average
EUT Type	Table top
Input Voltage	110 V AC
Input Frequency	60 Hz
Temperature	22.4 °C
Relative Humidity	63.2 %
Tested By	Tejesh K
Test Date	22 December 2020

5.3.2.2 DEVIATION FROM THE STANDARD

NAs

5.3.2.3 LIMITS

Maximum permissible conducted emission (disturbance) at the mains port as per CFR 47, FCC Part 15 C (15.207)/RSS-GEN, Issue 5 (7.2) as shown below:

Frequency (Hz)	Voltage limits(dB μ V)	
	Quasi-peak	Average
0.15M to 0.50M	66 to 56*	56 to 46*
0.5M to 5M	56	46
5M to 30M	60	50

**Decreasing linearly with logarithm of frequency*

5.3.2.4 TEST SETUP

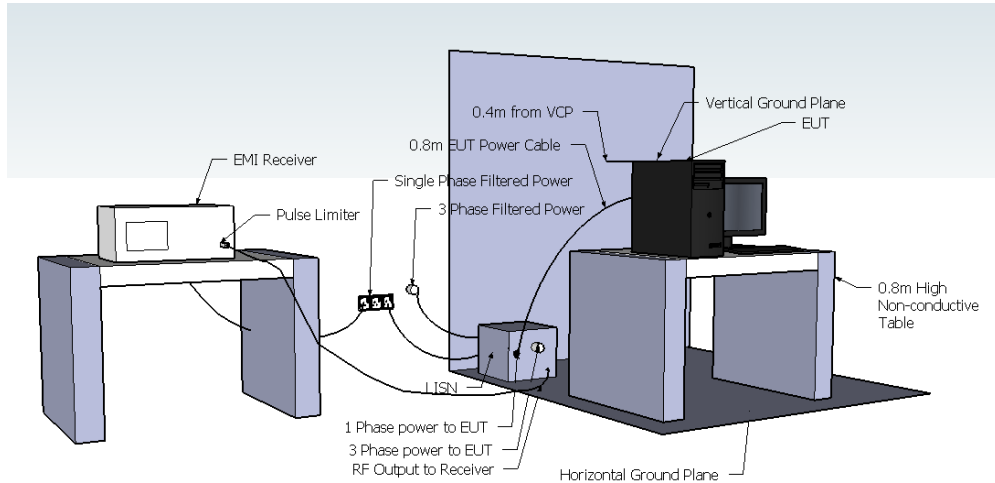


Figure 11: Sample CE test setup for table top equipment from 150kHz to 30MHz

5.3.2.5 TEST PROCEDURE

The test procedure was in accordance with ANSI C63.10:2013/ RSS-GEN, Issue 5.

This Table top equipment was tested at the conducted emissions test site with a horizontal ground reference plane and a vertical ground reference plane bonded together. The EUT was placed on non-conductive table of 0.8meter height as per standard. The power supply to the EUT and auxiliary equipment was feed through LISN.

LISN (Voltage Method):

The conducted emissions (disturbance) was measured through the 50 Ω RF port of the LISN using an EMI receiver. Pre-scan (Peak and Average) was carried out in max hold mode and conducted emission from the EUT coupled through the Power (mains) port was plotted in the graph. The dominant peaks at various frequencies, closer to and above the limit line were identified using peak search option and listed. Quasi-peak and Average measurement was carried out for the listed frequencies and compared with the limit specified in the standard.

5.3.2.6 MEASUREMENT DATA

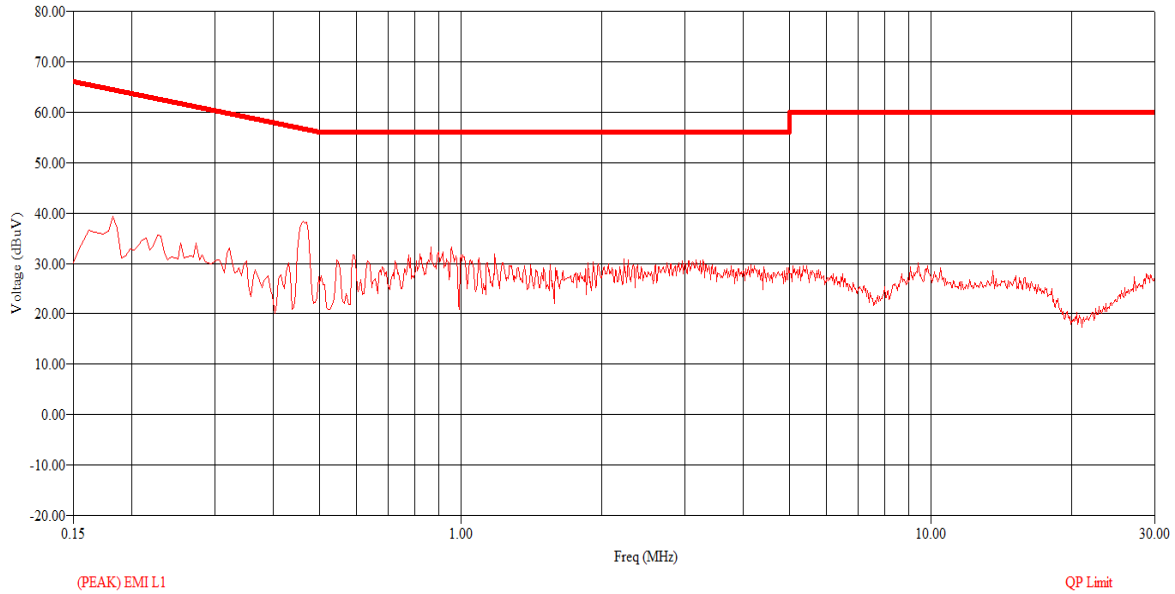


Figure 12: CE graph using peak detector from 150kHz to 30MHz_Line

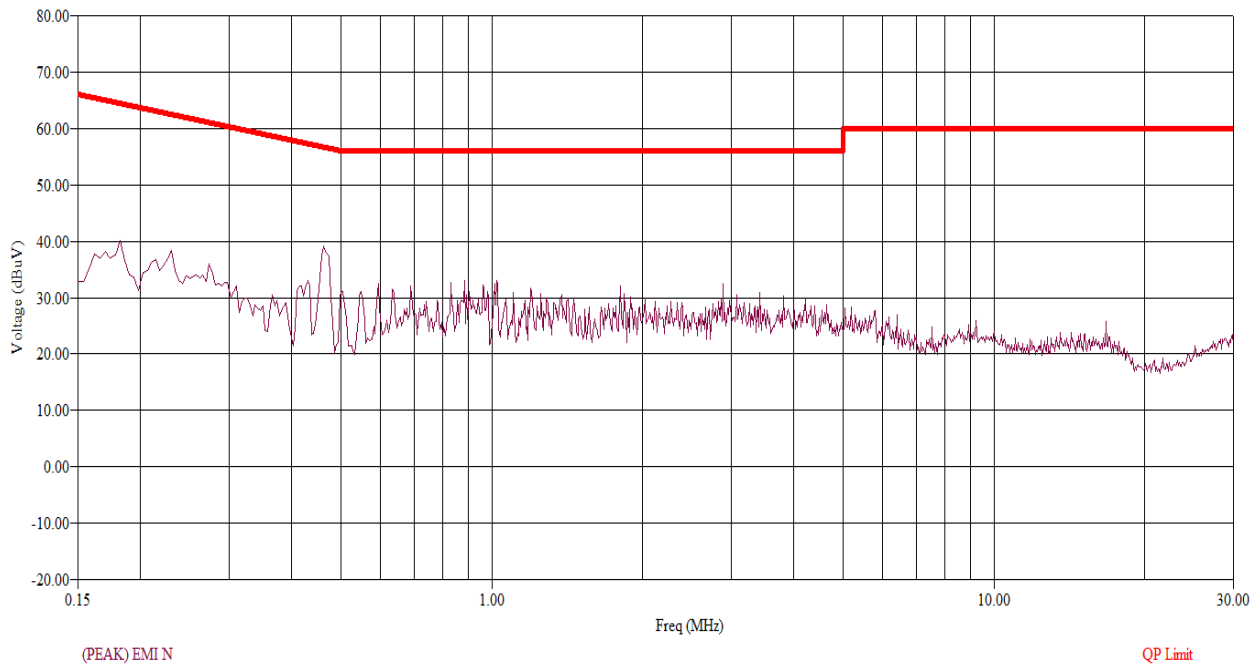


Figure 13: CE graph using peak detector from 150kHz to 30MHz_Neutral



Freq (MHz)	Freq (Max) (MHz)	(QP) Trace (dBuV)	Line	Cable loss (dB)	Pulse Limiter (dB)	Transducer N (dB)	Transducer L (dB)	(QP) EMI (dBuV)	QP Limit (dBuV)	(QP) Margin (dB)
0.162	0.164	23.44	L1	0.12	9.83	0.00	0.05	33.45	65.26	-31.81
0.182	0.182	23.00	L1	0.13	9.83	0.00	0.05	33.01	64.39	-31.38
0.182	0.182	23.72	N	0.13	9.83	0.05	0.00	33.73	64.38	-30.65
0.230	0.227	21.90	N	0.13	9.83	0.04	0.00	31.90	62.56	-30.66
0.430	0.429	20.64	N	0.15	9.82	0.07	0.00	30.69	57.28	-26.59
0.462	0.458	26.51	L1	0.16	9.82	0.00	0.08	36.57	56.72	-20.16
0.462	0.471	26.33	N	0.16	9.82	0.08	0.00	36.39	56.50	-20.11
0.590	0.595	19.03	L1	0.17	9.83	0.00	0.09	29.12	56.00	-26.88
0.594	0.594	18.11	N	0.17	9.83	0.09	0.00	28.20	56.00	-27.80
0.830	0.823	14.60	N	0.19	9.84	0.10	0.00	24.73	56.00	-31.27
0.866	0.867	18.66	L1	0.20	9.84	0.00	0.10	28.80	56.00	-27.20
0.962	0.963	18.39	N	0.21	9.85	0.10	0.00	28.54	56.00	-27.46
1.002	1.001	18.89	L1	0.21	9.85	0.00	0.10	29.05	56.00	-26.95
1.022	1.021	17.65	N	0.21	9.85	0.10	0.00	27.81	56.00	-28.19
1.186	1.183	18.46	L1	0.21	9.85	0.00	0.10	28.62	56.00	-27.38
2.230	2.230	17.28	L1	0.22	9.83	0.00	0.11	27.45	56.00	-28.55
2.890	2.891	12.75	N	0.23	9.83	0.11	0.00	22.92	56.00	-33.08

Table 10: CE quasi-peak measurement table from 150kHz to 30MHz_Line and Neutral

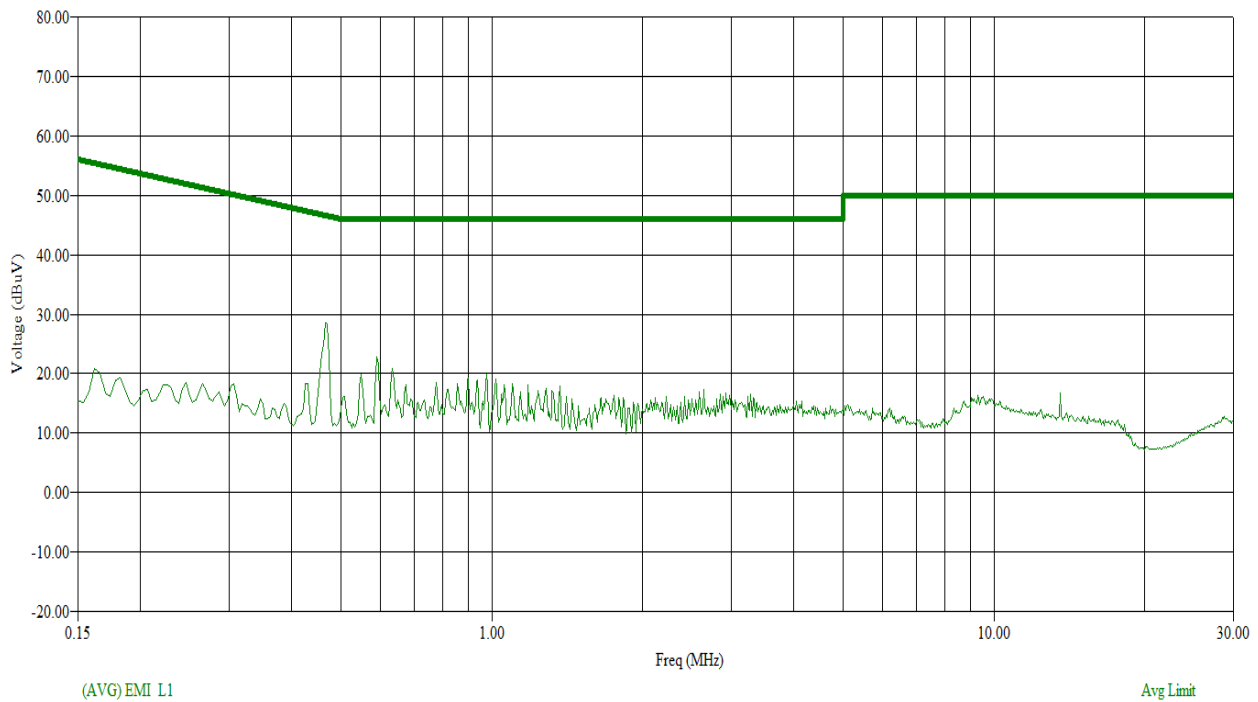


Figure 14: CE graph using average detector from 150kHz to 30MHz_Line

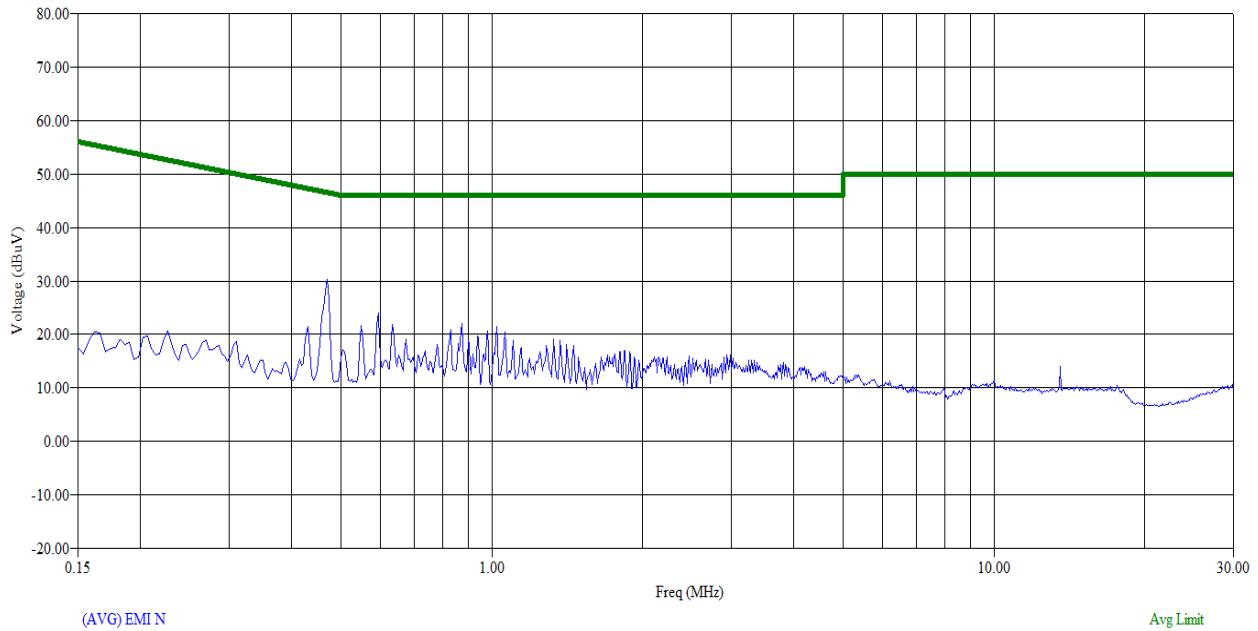


Figure 15: CE graph using average detector from 150kHz to 30MHz_Neutral

Freq (MHz)	Freq (Max) (MHz)	(AVG) Trace (dBuV)	Line	Cable loss (dB)	Pulse Limiter (dB)	Transducer N (dB)	Transducer L (dB)	(AVG) EMI (dBuV)	Avg Limit (dBuV)	(AVG) Margin (dB)
0.162	0.164	9.41	L1	0.12	9.83	0.00	0.05	19.42	55.26	-35.84
0.182	0.182	8.12	L1	0.13	9.83	0.00	0.05	18.12	54.39	-36.27
0.182	0.182	8.49	N	0.13	9.83	0.05	0.00	18.50	54.38	-35.88
0.230	0.227	8.24	N	0.13	9.83	0.04	0.00	18.23	52.56	-34.33
0.430	0.429	11.58	N	0.15	9.82	0.07	0.00	21.62	47.28	-25.66
0.462	0.458	13.07	L1	0.16	9.82	0.00	0.08	23.12	46.72	-23.60
0.462	0.471	19.53	N	0.16	9.82	0.08	0.00	29.59	46.50	-16.91
0.590	0.595	10.38	L1	0.17	9.83	0.00	0.09	20.47	46.00	-25.53
0.594	0.594	13.57	N	0.17	9.83	0.09	0.00	23.65	46.00	-22.35
0.830	0.823	5.82	N	0.19	9.84	0.10	0.00	15.95	46.00	-30.05
0.866	0.867	4.76	L1	0.20	9.84	0.00	0.10	14.89	46.00	-31.11
0.962	0.963	6.43	N	0.21	9.85	0.10	0.00	16.59	46.00	-29.41
1.002	1.001	3.96	L1	0.21	9.85	0.00	0.10	14.12	46.00	-31.88
1.022	1.021	10.90	N	0.21	9.85	0.10	0.00	21.06	46.00	-24.94
1.186	1.183	6.19	L1	0.21	9.85	0.00	0.10	16.34	46.00	-29.66
2.230	2.230	3.95	L1	0.22	9.83	0.00	0.11	14.11	46.00	-31.89
2.890	2.891	4.49	N	0.23	9.83	0.11	0.00	14.67	46.00	-31.33

Table 11: CE average measurement table from 150 kHz to 30MHz_Line and Neutral

Note:

$$(QP) EMI (dB\mu V) = (QP) Trace (dB\mu V) + Transducer (dB) + Cable Loss (dB) + Pulse limiter (dB)$$

$$QP Margin (dB) = (QP) EMI (dB\mu V) - (QP) Limit (dB\mu V)$$

$$(AVG) EMI (dB\mu V) = (AVG) Trace (dB\mu V) + Transducer (dB) + Cable Loss (dB) + Pulse limiter (dB)$$

$$AVG Margin (dB) = (AVG) EMI (dB\mu V) - (AVG) Limit (dB\mu V)$$



5.3.2.7 TEST SETUP PHOTOS

Refer report number “QFM 2051CON383-5”

5.3.2.8 RESULT

Conducted Emissions from the EUT as per CFR 47, FCC Part 15 C/ RSS-GEN, Issue 5 limit: PASS.

Decision Rule followed:

Decision rule as prescribed in the appropriate standard, where measurement results are governed by legal or regulatory standards or rules.

5.3.3 20dB BANDWIDTH AND 99% BANDWIDTH

5.3.3.1 TEST SPECIFICATION

Test Standard	CFR 47, FCC Part 15 C (15.231 (c)) & RSS-210, Issue 10
Test Setup	ANSI C63.10:2013 & RSS-GEN, Issue 5
Product / Generic Standard	CFR 47, FCC Part 15 C & RSS-210, Issue 10
Operating Frequency	433.9 MHz
Resolution Bandwidth	10 kHz
Video Bandwidth	30 kHz
Span	1 MHz
Sweep time	12.4 milliseconds
Detector	RMS
External Attenuation	10dB
Temp	22.5 °C
Humidity	58.0 %
Tested By	Magesh. S & Madhu. K.N
Test Date	18 June 2021

5.3.3.2 LIMITS

According to CFR 47, FCC Part 15 C (15.231(c)) requirement: Periodic operation in the band 40.66MHz to 40.70MHz and above 70MHz bands. Minimum 20dB and 99% bandwidth shall be less than 0.25% below 900MHz.

5.3.3.3 TEST SETUP

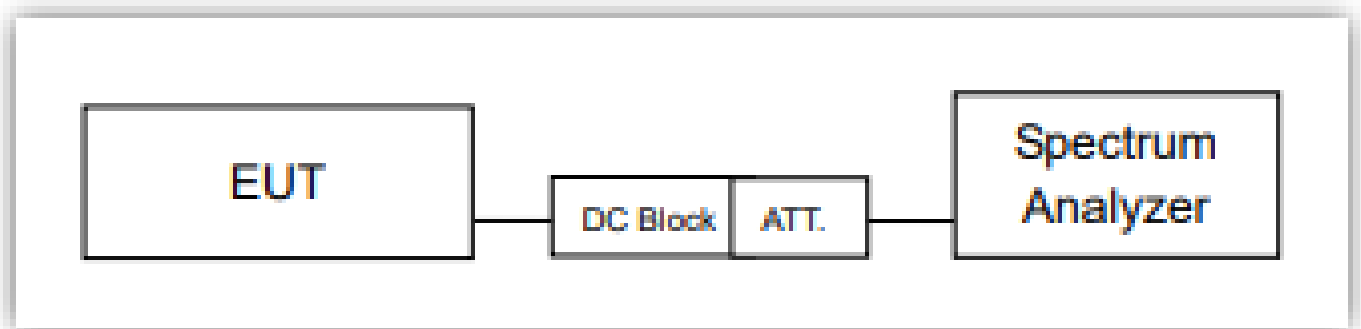


Figure 16: Typical test setup for 20dB & 99% Bandwidth



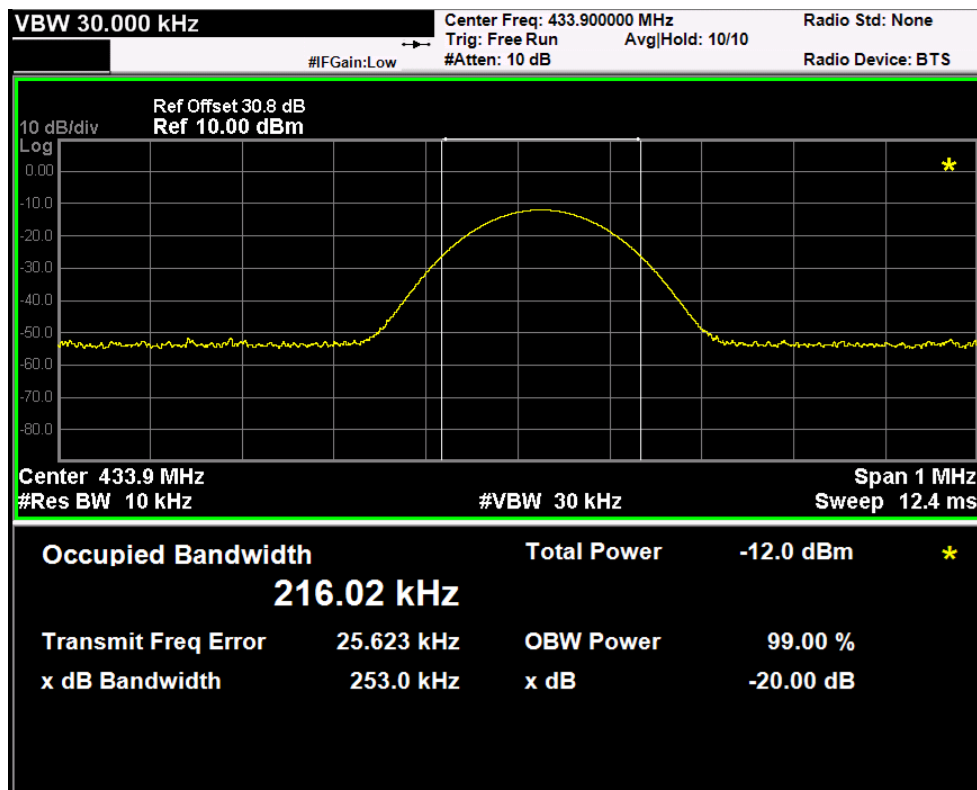
5.3.3.4 TEST PROCEDURE

The 20dB Bandwidth & 99% Occupied channel bandwidth test was performed using the spectrum analyzer. Measurement was done as per the CFR 47, FCC Part C (Part 15.231 (c) & RSS-GEN, Issue 5. The RF output of the EUT was connected to the input port of the Spectrum Analyzer. Data from spectrum analyzer was captured through software.

The 20dB Bandwidth & 99% Occupied channel bandwidth was performed with nominal ambient temperature.

Note: Considered cable loss and attenuator loss as correction factors in the test results.

5.3.3.5 MEASUREMENT DATA



Frequency (Hz)	Measured 20dB Bandwidth (Hz)	Measured 99% Bandwidth (Hz)	Limit (Hz)
433.9M	253.0k	216.02k	1084.7k

Table 12: 20dB & 99% Bandwidth measurement readings



5.3.3.6 TEST SETUP PHOTOS

Refer report number “QFM 2051CON383-5”

5.3.3.7 RESULT

The 20dB Bandwidth & 99% Bandwidth is within the specified limit as per CFR 47, FCC Part 15 C (15.231 (b))/ RSS-210, Issue 10.

Decision Rule followed:

Decision rule as prescribed in the appropriate standard, where measurement results are governed by legal or regulatory standards or rules.

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5.3.4 TRANSMITTER TIME

5.3.4.1 TEST SPECIFICATION

Test Standard	CFR 47 FCC Part 15 C (15.231 (a) (2))
Test Setup	ANSI C63.10:2013 & RSS-GEN, Issue 5
Product / Generic Standard	CFR 47, FCC Part 15 C
Operating Frequency	433.9MHz
Resolution Bandwidth	100kHz
Video Bandwidth	300kHz
Span	0 Hz
Sweep time	20 seconds
Sweep points	8001
External Attenuation	30dB
Temperature	23.5 °C
Humidity	59.0 %
Tested By	Magesh. S & Madhu. K.N
Test Date	18 June 2021

5.3.4.2 LIMITS

According to CFR 47, FCC Part 15 C (15.231 (a) (2)) requirement : Periodic operation in the band 40.66MHz to 40.70MHz and above 70MHz bands. A transmitter activated automatically shall cease transmission within 5 seconds after activation.

5.3.4.3 TEST SETUP

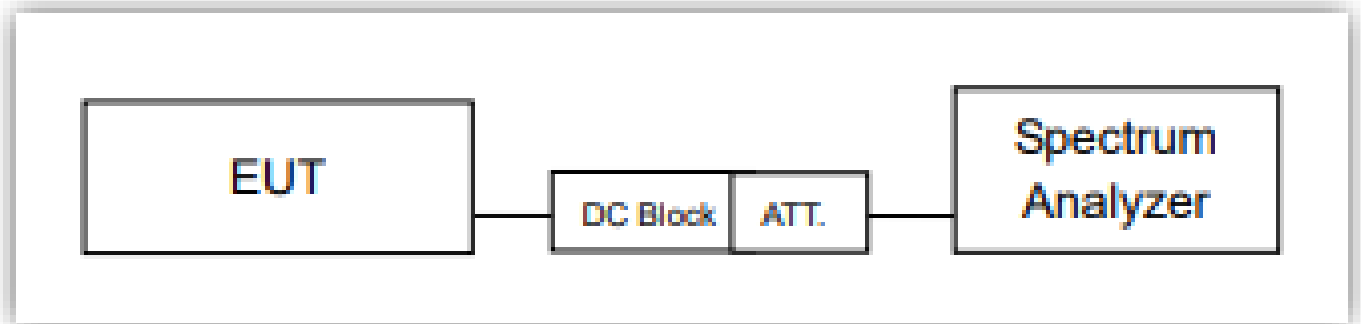


Figure 17: Typical test setup for Transmitter Time

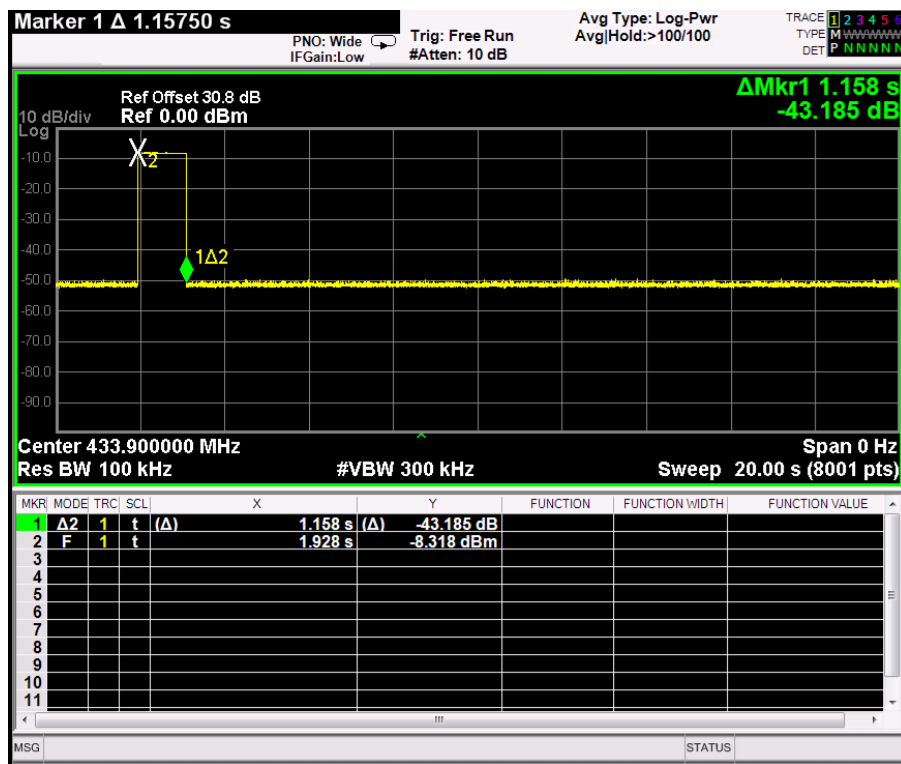


5.3.4.4 TEST PROCEDURE

The EUT was, configured for normal operation mode (Serial No: CS-PELLA-P13-35). The Transmitter time measurement was performed using the spectrum analyzer. Measurement was performed as per the CFR 47, FCC Part C (15.231 (a) (2)) & RSS-GEN, Issue 5. The RF output of the EUT was connected to the input port of the Spectrum Analyzer. Data from spectrum analyzer was captured through software.

Note: Considered cable loss and attenuator loss as correction factors in the test results.

5.3.4.5 MEASUREMENT DATA



Frequency (Hz)	Measured Deactivation time (seconds)	Limit (seconds)
433.9M	1.158	5

Table 13: Transmitter time measurement



5.3.4.6 TEST SETUP PHOTOS

Refer report number “QFM 2051CON383-5”

5.3.4.7 RESULT

Transmitter time is within the specified limit as per CFR 47, FCC Part 15 C (15.231 (b))/ RSS-210, Issue 105.

Decision Rule followed:

Decision rule as prescribed in the appropriate standard, where measurement results are governed by legal or regulatory standards or rules.



ANNEXURE I: EUT AND ACCESSORIES PHOTOGRAPHS

Refer report number “QFM 2051CON383-3 & QFM 2051CON383-4”

ANNEXURE II: ANY OTHER ADDITIONAL INFORMATION



Figure 18 Photograph of Monopole Copper-Clad antenna installed in the product



ANNEXURE III: ACRONYMS

AC	Alternating Current
dB	Decibel
EMC	Electromagnetic Compatibility
EUT	Equipment Under Test
GRP	Ground Reference Plane
Hz	Hertz
kHz	Kilo Hertz,
MHz	Mega Hertz
GHz	Giga Hertz
ms	Milli second
ns	Nano second
s	Second
NA	Not Applicable
RE	Radiated Emissions
TEC	Telecommunication Engineering Center
NABL	National Accreditation Board for Testing and Calibration Laboratories

END OF REPORT