Prüfbericht - Nr.: *Test Report No.:*	**19660360 001**		**Seite 1 von 17** *Page 1 of 17*
Auftraggeber: *Client:*	**The Kroger Co.** **11450 Grooms Rd.** **Blue Ash, OH 45242** **United States**		
Gegenstand der Prüfung: *Test item:*	**G4 Zooter ZigBee HDMI Display Unit**		
Bezeichnung: *Identification:*	**G4HDMI1**	**Serien-Nr.:** *Serial No.*	**Engineering Sample**
Wareneingangs-Nr.: *Receipt No.:*	**1803289873**	**Eingangsdatum:** *Date of receipt:*	**17.01.2018**
Prüfort: *Testing location:*	**Refer Page 3 of 17 for test facilities**		
Prüfgrundlage: *Test specification:*	**FCC Part 15 Subpart C 15.247** **ANSI C63.4-2013**		
Prüfergebnis: *Test Result:*	**Der Prüfgegenstand entspricht oben genannter Prüfgrundlage(n).** *The test items passed the test specification(s).* **FCC Test Firm Registration No.: 496599**		
Prüflaboratorium: *Testing Laboratory:*	**TÜV Rheinland (India) Pvt. Ltd.** 82/A, 3rd Main, West Wing, Electronic City Phase 1 Hosur Road, Bangalore – 560 100. India		

geprüft / *tested by:*

Datum *Date*	Name/Stellung *Name/Position*	Unterschrift *Signature*
01.02.2018	Girish Kumar G Engineer	

kontrolliert / *reviewed by:*

Datum *Date*	Name/Stellung *Name/Position*	Unterschrift *Signature*
09.02.2018	Saibaba Siddapur Assistant Manager	

Sonstiges / *Other Aspects:* **FCC ID:PBR-SZG4HDMI1**

Abkürzungen:	***P(ass)***	***entspricht Prüfgrundlage***	***Abbreviations:***	***P(ass)***	***passed***
	F(ail)	***entspricht nicht Prüfgrundlage***		***F(ail)***	***failed***
	N/A	***nicht anwendbar***		***N/A***	***not applicable***
	N/T	***nicht getestet***		***N/T***	***not tested***

TABLE OF CONTENTS

1 TEST RESULT SUMMARY

Table 1: Test result summary

FCC Test Clause	Test Item	Results	Remarks
15.247 (b) (3)	Maximum Peak Conducted Output Power	N/T	This product contains 4 certified ZigBee modules. FCC ID of two modules is PBR-SZMDLNR1 and of other two is PBR-SZMDLBR1 and the antenna port test results of the same are excluded in the report.
15.247 (a) (2)	6 dB / DTS Bandwidth	N/T	
15.247 (e)	Maximum Power Spectral Density	N/T	
15.247 (d)	Emissions in non – restricted band	N/T	
15.247 (a)(1)	Conducted Spurious Emissions	N/T	
15.207	Conducted emission on A.C power lines	N/T	
FCC 15.209 , FCC 15.205	Radiated Spurious Emissions and Restricted bands of operation	Pass	-

TEST SITES

1.1 Testing Facilities

TUV Rheinland (India) Private Limited
108 , Beside ISBR Business School,
Electronic city Phase I
Bangalore - 560 100.

1.2 List of Test and Measurement Instruments

Table 2: List of Test and Measurement Instruments

Equipment	Manufacturer	Model Name	Serial Number	Calibration Due Date	Periodicity	Used for Test Items
EMI Test Receiver	Rohde & Schwarz	ESU 40	100288	24-10-2018	Yearly	Radiated Spurious Emissions
Active loop antenna	Frankonia	LAX-10	LAX-10-800	13.04.2018	Yearly	
Biconical Antenna	Schwarzbeck mess - elektronik	VHBB-9124 / BBA-9106	9124-656	09.01.2019	Yearly	
Log - Periodic Antenna	Schwarzbeck mess - elektronik	VUSLP-9111B	9111B-111	16.01.2019	Yearly	
Broadband Horn Antenna	Frankonia	HAX-18	HAX18-802	16-03-2018	Yearly	
Emission Horn Antenna	ETS Lindgren	116706	00107323	22.06.2018	Yearly	
Semi Anechoic Chamber	Frankonia	-	-	-	-	

2 GENERAL PRODUCT INFORMATION

2.1 Product Function and Intended Use

G4HDMI1 has an HDMI output which will be used for the displaying data from LAN port/server on an HDMI enabled display. G4HDMI1 also has four ZigBee modules mounted on it. These ZigBee Modules are used for wireless data communication with other ZigBee device. It also has Ethernet interface for LAN connectivity. It is and can be used as wired and wireless access point.

2.2 Ratings and System Details

Table 3: Ratings and System Details

Operating Frequency Range	2400MHz – 2483.5MHz
Radio Protocol	ZigBee
No. of channels	15
Channel Spacing	5 MHz
Modulation	DSSS
Data Rate	250 kbps
Number of antennas	4 (One on each module)
Antenna Gain & Type	3.27dBi & PCB Inverted F antenna for all the ZigBee modules
Supply Voltage to Product	48-57VDC (Power from PoE+)
Environmental conditions	Temp: -30 ºC - +75 ºC Humidity: 20-80% RHG

Test Conditions:

Voltage: 48-57VDC (Power from PoE+)

Environmental conditions:

Temperature: +23.4 °C RH: 61.8 %

2.3 Measurement Uncertainty:

Table 4: Measurement Uncertaninty

Parameter	Uncertainty
Occupied Channel Bandwidth	±5 %
RF output power, conducted	±1.5 dB
Power Spectral Density, conducted	±3 dB
Unwanted Emissions, conducted	±3 dB
All emissions, radiated	±6 dB
Temperature	±3 ℃
Supply Voltages	±3 %
Time	±5 %

3 OPERATIONAL DESCRIPTIONS

G4HDMI1 is a POE+ powered HDMI Display Unit. Please note that the POE+ injector is not supplied with the product. Customer can use any standard certified POE+ injector. G4Z can display on an HDMI enabled display. G4HDMI1 can also perform data transfer over the air using On-Board ZigBee modules inside ZigBee network and can transfers data through Ethernet. Thus, along with the Display unit it can also be used as a wired and wireless access point. The product contains four ZigBee modules that can operate simultaneously on the same channel of operating frequency. All the four ZigBee modules are FCC Certified. Out of that, FCC ID of two modules is PBR-SZMDLNR1 and other two have FCC: ID PBR-SZMDLBR1.

TEST SET-UP AND OPERATION MODE

3.1 Principle of Configuration Selection

Transmission was enabled on highest possible duty cycled transmission on low, mid and high channel on supporting datarates to obtain maximum emissions

3.2 Test Operation and Test Software

Testing software was used to enable the continuous transmission on low/mid/high channels on the EUT for the tests in this report.

3.3 Special Accessories and Auxiliary Equipment

- None

3.4 Countermeasures to achieve EMC Compliance

- None

Table 5: List of Centre Frequencies

Frequency Band	Channel No.	Frequency (MHz)
2400-2483.5 MHz	11	2405
	12	2410
	13	2415
	14	2420
	15	2425
	16	2430
	17	2435
	18	2440
	19	2445
	20	2450
	21	2455
	22	2460
	23	2465
	24	2470
	25	2475

4 TEST METHODOLOGY

4.1 Radiated Emission Test

The radiated emission measurement was performed according to the procedures in ANSI C63.10-2013.
The equipment under test (EUT) was placed at the middle of the 80 cm high turntable for below 1 GHz & 1.5 m height for above 1 GHz measurement, and the EUT is 3 meters far from the measuring antenna.
The turntable was rotated 360° for obtaining the maximum emission. The height of the measuring antennas was scanned between 1 m and 4 m, and the antenna rotated to repeat the measurements for both the horizontal and vertical antenna polarizations. Repeat the measurement steps until the maximum emissions were obtained. The measurement above 1000 MHz was performed by horn antenna, The measurement below 30 MHz was performed by loop antenna.
The EUT was rotated around the X-, Y-, and Z-Axis and the results from worst case axis are recorded.

4.1.1 Test Setup Configuration

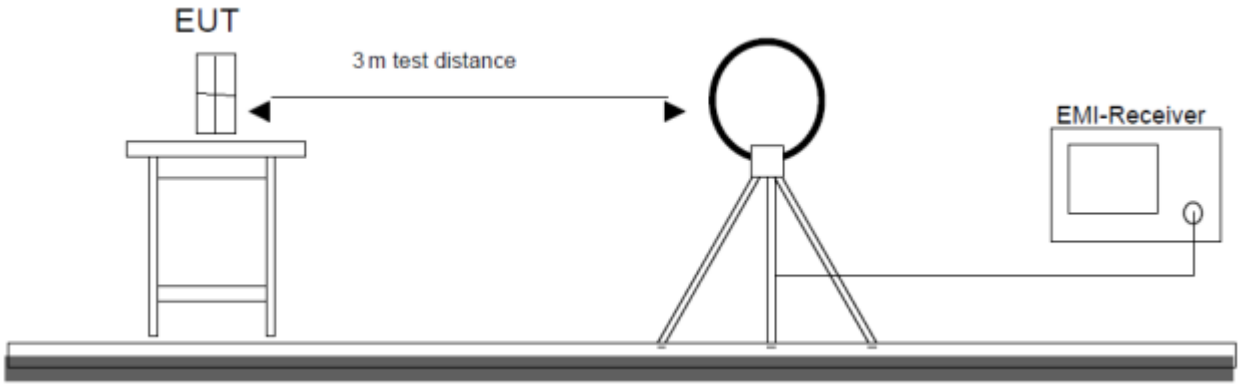

Figure 1: Frequency Range 9 KHz -30 MHz

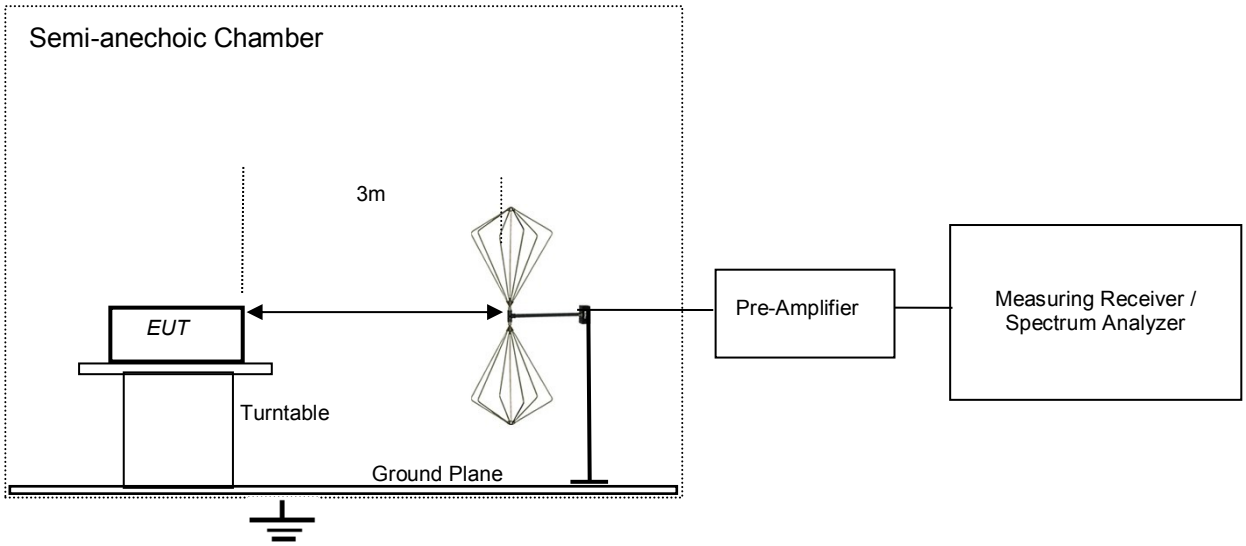

Figure 2: Frequency Range 30 MHz – 200 MHz

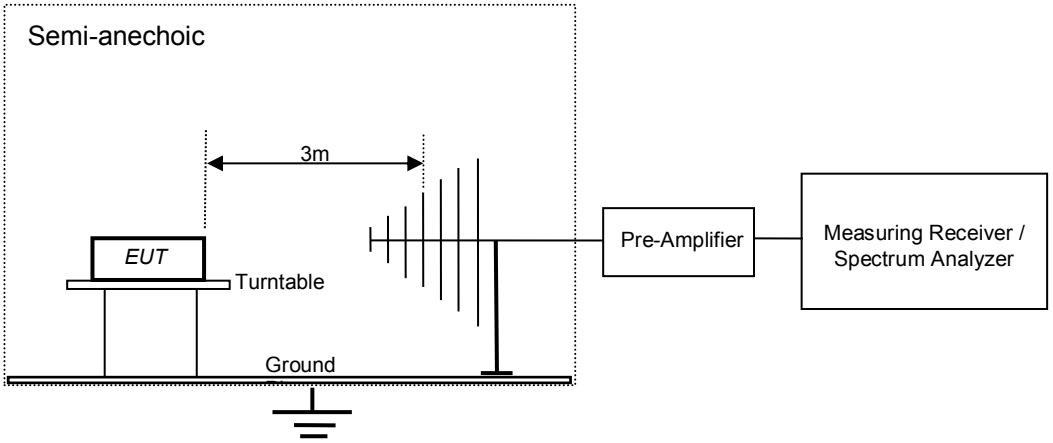

Figure 3: Frequency Range 200MHz - 1 GHz

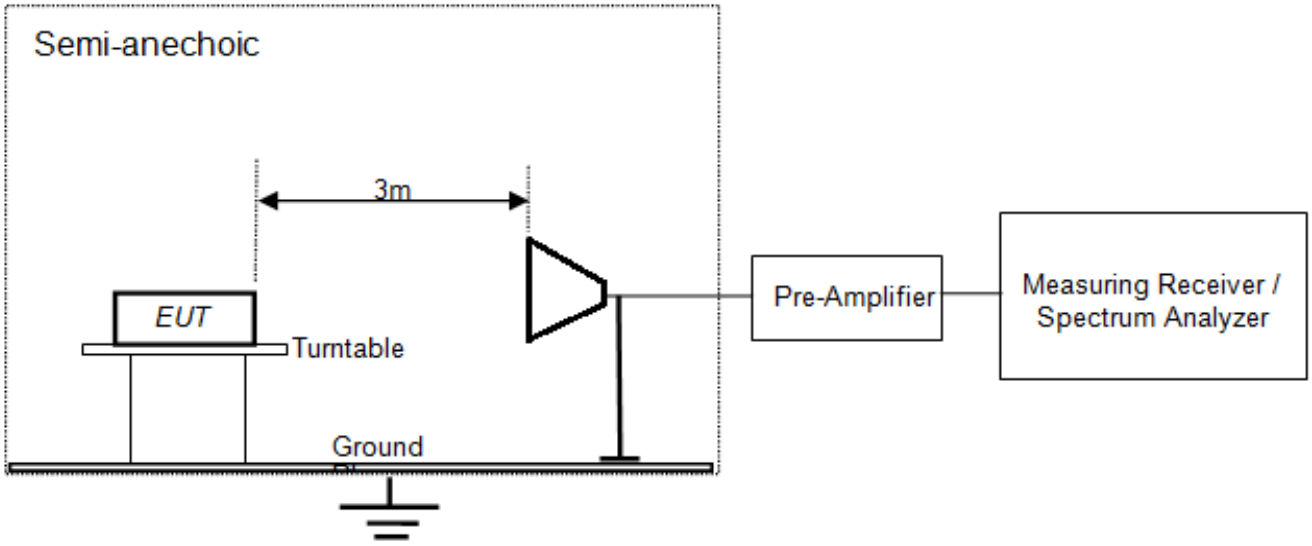

Figure 4: Frequency above 1 GHz

5 TEST RESULTS

5.1 Restricted Spurious Emissions & Restricted Bands of Operation

Result ***Pass***

Test Specification	FCC 15.205, FCC 15.209
Test Method	ANSI C63.10-2013
Measurement Location	Semi Anechoic Chamber
Measuring Frequency Range	9 KHz to 40 GHz (Up to 10th harmonic of the highest fundamental frequency)
Measuring Distance	3 m
Detection	QP for frequency below 1 GHz,Peak, Average for frequency above 1 GHz
Requirement	As per the limits mentioned in the below table

Table 6: Limit for radiated emission measurement 15.209

Frequency (MHz)	Field strength (μV/m)	Field strength (dBμV/m)	Distance of Measurement (m)
0.009 – 0.490	2400/F (KHz)	48.50 – 13.80	300*
0.490 – 1.705	24000/F (KHz)	33.80 – 23.00	30*
1.705 - 30	30	29.54	30*
30 - 88	100	40.0	3
88 - 216	150	43.5	3
216 - 960	200	46.0	3
Above 960	500	54.0	3

Remark: * The limit shows in the table above of frequency range 0.009 – 0.490, 0.490 – 1.705 MHz and 1.705-30MHz is at 300 meter, 30 meter and 30 meter range respectively, which corresponds to 128.51 – 93.80, 73.80 – 62.96 and 69.54 dBμV/m at 3m range by extrapolation calculation and the measurement of loop antenna.

The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9–90 kHz, 110–490 kHz and above 1000 MHz Radiated emission limits in these three bands are based on measurements employing an average detector.

Test Conditions:

Voltage: 48-57VDC (Power from PoE+)

Environmental conditions:

Temperature: +23.4 °C RH: 61.8 %

Test results:

No emission found in the frequency range 9 KHz to 30 MHz

Table 7: Test results for frequency range 30 MHz to 1 GHz

Note:

Radiated spurious emission for the frequency range from 30MHz to 1GHz was performed as per FCC part 15 subpart B 15.109, Class A. Only worst case test results are reported.

FCC Part 15 Subpart B 15.109 Class A limits

Frequency MHz	Field Strength dBuV/m	Measured Distance(mtr)	Field Strength (dBµV/m)
30-88	90.00	10.00	39.08
88-216	150.00	10.00	43.52
216-960	210.00	10.00	46.43
above 960	300.00	10.00	49.54

Test results for the frequency range 30 MHz to 1GHz are reported below.

Polarization	Measured Frequency (MHz)	Radiated Spurious Emission (dBµV/m)	Limit (dBµV/m)	Margin (dB)
Vertical	32.51	22.04	39.08	-17.04
	188.27	24.97	43.52	-18.55
	296.96	43.73	46.43	-02.70
	742.48	44.13	46.43	-02.30
Horizontal	33.28	22.07	39.08	-17.01
	152.97	23.34	43.52	-20.18
	296.96	39.31	46.43	-07.12
	890.96	42.50	46.43	-3.93

Test results for frequency range 1 GHz to 26.5 GHz

Table 8: ZigBee Module 1

Channel Frequency (MHz)	Polarization	Measured Frequency (MHz)	Radiated Spurious Emission (dBµV/m)	Limit (dBµV/m)	Margin (dB)
Test Configuration 1: Module 1 operating at low channel					
2405	Vertical	2390 (Pk)	64.72	74	-9.28
		2390 (Av)	51.91	54	-2.09
		2405 (Pk)	87.89	*	-
		2405 (Av)	81.53	*	-
		4810 (Pk)	49.52	74	-24.48
		4810 (Av)	37.72	54	-16.28
	Horizontal	2390 (Pk)	64.12	74	-9.88
		2390 (Av)	52.08	54	-1.92
		2405 (Pk)	100.58	*	-
		2405 (Av)	94.10	*	-
		4810 (Pk)	49.42	74	-24.58
		4810 (Av)	37.17	54	-16.83
Module 1 operating at high channel					
2480	Vertical	2483.5 (Pk)	64.15	74	-9.85
		2483.5 (Av)	52.3	54	-1.7
		2480 (Pk)	86.62	*	-
		2480 (Av)	81.24	*	-
		4960 (Pk)	49.38	74	-24.62
		4960 (Av)	36.74	54	-17.26
	Horizontal	2483.5 (Pk)	63.74	74	-10.26
		2483.5 (Av)	52.66	54	-1.34
		2480 (Pk)	98.88	*	-
		2480 (Av)	94.04	*	-
		4960 (Pk)	49.18	74	-24.82
		4960 (Av)	36.36	54	-17.64

Table 9: ZigBee Module 2

Channel Frequency (MHz)	Polarization	Measured Frequency (MHz)	Radiated Spurious Emission (dBµV/m)	Limit (dBµV/m)	Margin (dB)
Test Configuration 2: Module 2 operating at low channel					
2405	Vertical	2390 (Pk)	63.62	74	-10.38
		2390 (Av)	51.93	54	-2.07
		2405 (Pk)	77.61	*	-
		2405 (Av)	70.37	*	-
		4810 (Pk)	48.82	74	-25.18
		4810 (Av)	36.32	54	-17.68
	Horizontal	2390 (Pk)	63.22	74	-10.78
		2390 (Av)	51.92	54	-2.08
		2405 (Pk)	84.44	*	-
		2405 (Av)	78.34	*	-
		4810 (Pk)	49.42	74	-24.58
		4810 (Av)	37.17	54	-16.83
Module 2 operating at high channel					
2480	Vertical	2483.5 (Pk)	63.41	74	-10.59
		2483.5 (Av)	52.25	54	-1.75
		2480 (Pk)	76.21	*	-
		2480 (Av)	69.85	*	-
		4960 (Pk)	49.18	74	-24.82
		4960 (Av)	36.32	54	-17.68
	Horizontal	2483.5 (Pk)	63.61	74	-10.39
		2483.5 (Av)	52.22	54	-1.78
		2480 (Pk)	82.55	*	-
		2480 (Av)	76.12	*	-
		4960 (Pk)	49.48	74	-24.52
		4960 (Av)	36.86	54	-17.14

Table 10: ZigBee Module 3

Channel Frequency (MHz)	Polarization	Measured Frequency (MHz)	Radiated Spurious Emission (dBµV/m)	Limit (dBµV/m)	Margin (dB)
Test Configuration 3: Module 3 operating at low channel					
2405	Vertical	2390 (Pk)	63.49	74	-10.51
		2390 (Av)	51.90	54	-2.1
		2405 (Pk)	85.09	*	-
		2405 (Av)	77.24	*	-
		4810 (Pk)	48.63	74	-25.37
		4810 (Av)	38.12	54	-15.88
	Horizontal	2390 (Pk)	63.93	74	-10.07
		2390 (Av)	51.97	54	-2.03
		2405 (Pk)	98.45	*	-
		2405 (Av)	91.84	*	-
		4810 (Pk)	47.31	74	-26.69
		4810 (Av)	38.27	54	-15.73
Module 3 operating at high channel					
2480	Vertical	2483.5 (Pk)	63.87	74	-10.13
		2483.5 (Av)	52.18	54	-1.82
		2480 (Pk)	87.39	*	-
		2480 (Av)	79.69	*	-
		4960 (Pk)	48.28	74	-25.72
		4960 (Av)	37.41	54	-16.59
	Horizontal	2483.5 (Pk)	64.41	74	-9.59
		2483.5 (Av)	53.20	54	-0.8
		2480 (Pk)	97.67	*	-
		2480 (Av)	93.29	*	-
		4960 (Pk)	48.12	74	-25.88
		4960 (Av)	36.16	54	-17.84

Table 11: ZigBee Module 4

Channel Frequency (MHz)	Polarization	Measured Frequency (MHz)	Radiated Spurious Emission (dBµV/m)	Limit (dBµV/m)	Margin (dB)
Test Configuration 4: Module 4 operating at low channel					
2405	Vertical	2390 (Pk)	63.92	74	-10.08
		2390 (Av)	52.06	54	-1.94
		2405 (Pk)	73.93	*	-
		2405 (Av)	66.87	*	-
		4810 (Pk)	48.92	74	-25.08
		4810 (Av)	37.12	54	-16.88
	Horizontal	2390 (Pk)	63.66	74	-10.34
		2390 (Av)	52.03	54	-1.97
		2405 (Pk)	86.59	*	-
		2405 (Av)	78.87	*	-
		4810 (Pk)	49.61	74	-24.39
		4810 (Av)	37.18	54	-16.82
Module 4 operating at high channel					
2480	Vertical	2483.5 (Pk)	64.44	74	-9.56
		2483.5 (Av)	52.28	54	-1.72
		2480 (Pk)	73.00	*	-
		2480 (Av)	66.18	*	-
		4960 (Pk)	48.82	74	-25.18
		4960 (Av)	37.14	54	-16.86
	Horizontal	2483.5 (Pk)	63.99	74	-10.01
		2483.5 (Av)	52.17	54	-1.83
		2480 (Pk)	84.93	*	-
		2480 (Av)	80.06	*	-
		4960 (Pk)	48.98	74	-25.02
		4960 (Av)	36.76	54	-17.24

Table 12: Simultaneous transmission

Channel Frequency (MHz)	Polarization	Measured Frequency (MHz)	Radiated Spurious Emission (dBµV/m)	Limit (dBµV/m)	Margin (dB)
Test Configuration 5: All the 4 ZigBee modules operating at low channel					
2405	Vertical	2390 (Pk)	63.33	74	-10.67
		2390 (Av)	51.98	54	-2.02
		2405 (Pk)	90.28	*	-
		2405 (Av)	82.88	*	-
		4810 (Pk)	49.82	74	-24.18
		4810 (Av)	36.42	54	-17.58
	Horizontal	2390 (Pk)	63.96	74	-10.04
		2390 (Av)	52.07	54	-1.93
		2405 (Pk)	102.45	*	-
		2405 (Av)	96.03	*	-
		4810 (Pk)	48.91	74	-25.09
		4810 (Av)	37.26	54	-16.74
All the 4 ZigBee modules operating at high channel					
2480	Vertical	2483.5 (Pk)	63.44	74	-10.56
		2483.5 (Av)	52.46	54	-1.54
		2480 (Pk)	88.72	*	-
		2480 (Av)	81.23	*	-
		4960 (Pk)	49.79	74	-24.21
		4960 (Av)	36.35	54	-17.65
	Horizontal	2483.5 (Pk)	64.32	74	-9.68
		2483.5 (Av)	53.09	54	-0.91
		2480 (Pk)	99.92	*	-
		2480 (Av)	93.95	*	-
		4960 (Pk)	49.42	74	-24.58
		4960 (Av)	36.57	54	-17.43

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*****END OF TEST REPORT*****