Test Report

Date : 2019-12-23
No. : HM19110001

Applicant:	Gatekeeper Systems (HK) Ltd. 36/F, Tower 2, Times Square, 1 Matheson Street, Causeway Bay, Hong Kong
Manufacturer:	Gatekeeper Systems (HK) Ltd. 36/F, Tower 2, Times Square, 1 Matheson Street, Causeway Bay, Hong Kong
Description of Sample(s):	Product: 2.4GHz Transmitter Module Brand Name: Gatekeeper Systems Model Number: D-9000A-SMT FCC ID: W3Z-D9000ASMT
Date Sample(s) Received:	2019-11-01
Date Tested:	2019-11-27 to 2019-12-02
Investigation Requested:	Perform ElectroMagnetic Interference measurement in accordance with FCC 47CFR [Codes of Federal Regulations] Part 15: 2018 and ANSI C63.10:2013 for FCC Certification.
Conclusion(s):	The submitted product COMPLIED with the requirements of Federal Communications Commission [FCC] Rules and Regulations Part 15. The tests were performed in accordance with the standards described above and on Section 2.2 in this Test Report.
Remark(s):	---

CHEUNG Chi, Kenneth
Authorized Signatory

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Test Report

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1.0 General Details

1.1 Equipment Under Test [EUT] Description of Sample(s)

Product:	2.4GHz Transmitter Module
Manufacturer:	Gatekeeper Systems (HK) Ltd. 36/F, Tower 2, Times Square, 1 Matheson Street, Causeway Bay, Hong Kong
Brand Name:	Gatekeeper Systems
Model Number:	D-9000A-SMT
Rating:	3.3VVd.c from DC power supply

1.2 Description of EUT Operation

The Equipment Under Test (EUT) is 2.4GHz RF Transmitter Module of Gatekeeper Systems (HK) Ltd., which is 2.4GHz transceiver.
The D-9000A-SMT support 2 transmissions modes which are modulated at 500kHz MSK (Minimum Shift Keying) and 1MHz FSK (Frequency Shift Keying). There are two antenna ports supported by the EUT, port 0 is prepared for external antenna, port 1 is embedded with an integral antenna. Port 0 of the EUT was connected to reference antenna provided by the manufacturer during test. The EUT was tested under test mode which was set in maximum output power and transmit continuously.

1.3 Date of Order

2019-11-01

1.4 Submitted Sample(s):

1 Sample

1.5 Test Duration

2019-11-27 to 2019-12-02

1.6 Country of Origin

China

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2.0 Technical Details

2.1 Investigations Requested

Perform Electromagnetic Interference measurements in accordance with FCC 47CFR [Codes of Federal Regulations] Part 15: 2018 Regulations and ANSI C63.10:2013 for FCC Certification.

2.2 Test Standards and Results Summary Tables

EMISSION Results Summary					
Test Condition	Test Requirement	Test Method	Class / Severity	Test Result	
				Pass	Fail
Field Strength of Fundamental & Harmonics Emissions	FCC 47CFR 15.249	ANSI C63.10:2013	N/A	☒	☐
AC power-line conducted emissions	FCC 47CFR 15.207	ANSI C63.10:2013	N/A	N/A	
Radiated Emissions	FCC 47CFR 15.209	ANSI C63.10:2013	N/A	☒	☐
Antenna requirement	FCC 47CFR 15.203	N/A	N/A	☒	☐

Note: N/A - Not Applicable

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3.0 Test Results

3.1 Emission

3.1.1 Field Strength of Fundamental & Harmonics Emissions

Test Requirement:	FCC 47CFR 15.249
Test Method:	ANSI C63.10:2013
Test Date:	2019-11-27
Mode of Operation:	1. Tx Mode: Port 0 (External Antenna), MSK mode 2. Tx Mode: Port 0 (External Antenna), FSK mode 3. Tx Mode: Port 1 (Integral Antenna), MSK mode 4. Tx Mode: Port 1 (Integral Antenna), FSK mode

Test Method:

For emission measurements at or below 1 GHz, the sample was placed 0.8m above the ground plane of semi-anechoic Chamber*. For emission measurements above 1 GHz, the sample was placed 1.5m above the ground plane of semi-anechoic Chamber*. Measurements in both horizontal and vertical polarities were performed. During the test, each emission was maximized by: having the EUT continuously working, investigated all operating modes, rotated about all 3 axis (X, Y & Z) and considered typical configuration to obtain worst position, manipulating interconnecting cables, rotating turntable, varying antenna height from 1m to 4m in both horizontal and vertical polarizations. In the frequency range of 9kHz to 30MHz, The center of the loop antenna shall be 1 meter above the ground and rotated loop axis for maximum reading. The emissions worst-case are shown in Test Results of the following pages.

Remark: 3 orthogonal axis apply to hand-held device only.

*: Semi-anechoic chamber located on the G/F of The Hong Kong Standards and Testing Centre Ltd.
FCC Test Firm Registration Number 723883
Designation Number HK0001

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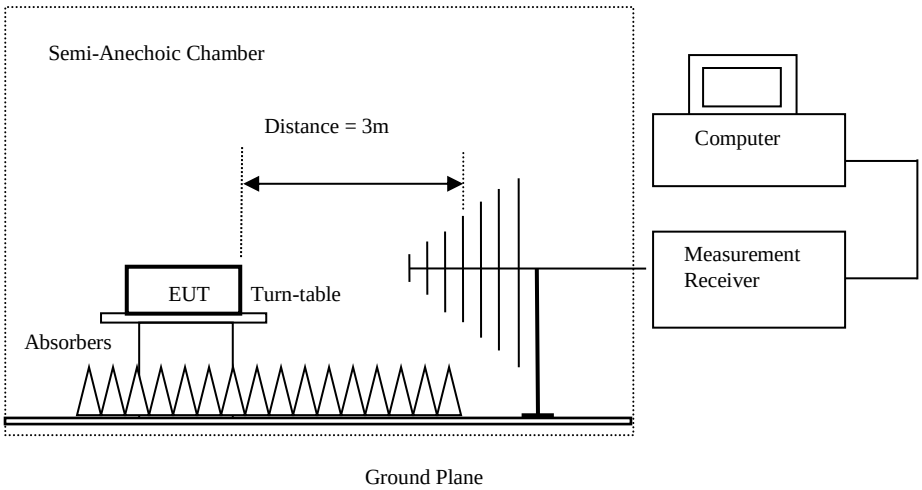
Spectrum Analyzer Setting:

9KHz – 30MHz (Pk & Av)	RBW:	10kHz
	VBW:	30kHz
	Sweep:	Auto
	Span:	Fully capture the emissions being measured
	Trace:	Max. hold
30MHz – 1GHz (QP)	RBW:	120kHz
	VBW:	120kHz
	Sweep:	Auto
	Span:	Fully capture the emissions being measured
	Trace:	Max. hold
Above 1GHz (Pk & Av)	RBW:	3MHz
	VBW:	3MHz
	Sweep:	Auto
	Span:	Fully capture the emissions being measured
	Trace:	Max. hold

Test Setup:



- Absorbers placed on top of the ground plane are for measurements above 1000MHz only.
- Measurements between 30MHz to 1000MHz made with Bi-log antennas, above 1000MHz horn antennas are used,
9kHz to 30MHz loop antennas are used.
-For emissions testing at or below 1 GHz, the table height shall be 80 cm above the reference ground

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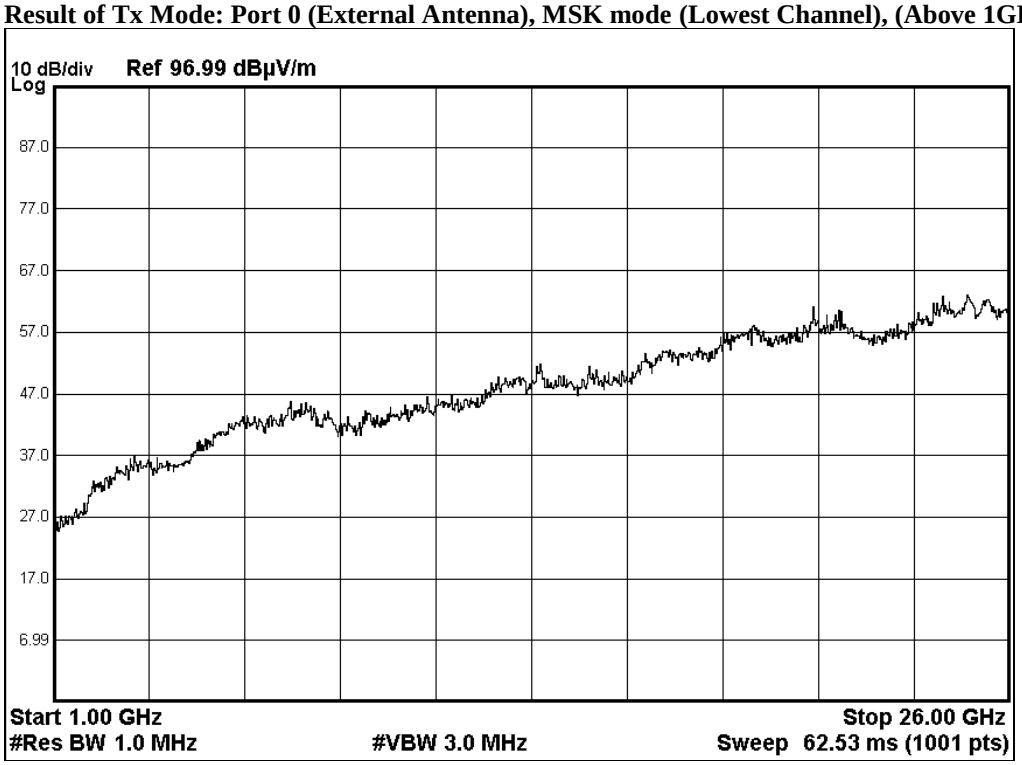
Limits for Field Strength of Fundamental & Harmonics Emissions [FCC 47CFR 15.249]:

Fundamental frequency [MHz]	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (microvolts/meter)
902-928 MHz	50	500
2400-2483.5 MHz	50	500
5725-5875 MHz	50	500
24.0-24.25 GHz	250	2500

Result of Tx Mode: Port 0 (External Antenna), MSK mode (Lowest Channel), (Above 1GHz): Pass



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Result of Tx Mode: Port 0 (External Antenna), MSK mode (Lowest Channel):Pass

Field Strength of Fundamental and Harmonics Emissions Peak Value						
Frequency MHz	Measured Level @3m dBμV/m	Correction Factor dBμV/m	Field Strength dBμV/m	Field Strength μV/m	Limit @3m μV/m	E-Field Polarity
2401.3	68.7	27.9	96.6	67,608.3	500,000	Vertical
* 4802.6	19.2	32.1	51.3	367.3	5,000	Vertical
7203.9	2.1	38.6	40.7	108.4	5,000	Vertical
9605.2	Emissions detected are more than 20 dB below the FCC Limits				5,000	Vertical
* 12006.5					5,000	Vertical
14407.8					5,000	Vertical
16809.1					5,000	Vertical
* 19210.4					5,000	Vertical
21611.7					5,000	Vertical
24013.0					5,000	Vertical

Field Strength of Fundamental and Harmonics Emissions Average Value						
Frequency MHz	Measured Level @3m dBμV/m	Correction Factor dBμV/m	Field Strength dBμV/m	Field Strength μV/m	Limit @3m μV/m	E-Field Polarity
2401.3	57.9	27.9	85.8	19,498.4	50,000	Vertical
* 4802.6	5.4	32.1	37.5	75.0	500	Vertical
7203.9	-1.3	38.6	37.3	73.3	500	Vertical
9605.2	Emissions detected are more than 20 dB below the FCC Limits				500	Vertical
* 12006.5					500	Vertical
14407.8					500	Vertical
16809.1					500	Vertical
* 19210.4					500	Vertical
21611.7					500	Vertical
24013.0					500	Vertical

Remarks: The fundamental frequency was not included in the pre-scan plot, a 2.4G notch filter was added prior to the Receiver, please refer the band-edge plot for the level of fundamental frequency.

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Result of Tx Mode: Port 0 (External Antenna), MSK mode (Lowest Channel):Pass

Field Strength of Fundamental and Harmonics Emissions Peak Value						
Frequency MHz	Measured Level @3m dBμV/m	Correction Factor dBμV/m	Field Strength dBμV/m	Field Strength μV/m	Limit @3m μV/m	E-Field Polarity
2401.3	56.3	27.9	84.2	16,218.1	500,000	Horizontal
* 4802.6	16.9	32.1	49.0	281.8	5,000	Horizontal
7203.9	2.3	38.6	40.9	110.9	5,000	Horizontal
9605.2	Emissions detected are more than 20 dB below the FCC Limits				5,000	Horizontal
* 12006.5					5,000	Horizontal
14407.8					5,000	Horizontal
16809.1					5,000	Horizontal
* 19210.4					5,000	Horizontal
21611.7					5,000	Horizontal
24013.0					5,000	Horizontal

Field Strength of Fundamental and Harmonics Emissions Average Value						
Frequency MHz	Measured Level @3m dBμV/m	Correction Factor dBμV/m	Field Strength dBμV/m	Field Strength μV/m	Limit @3m μV/m	E-Field Polarity
2401.3	46.8	27.9	74.7	5,432.5	50,000	Horizontal
* 4802.6	3.6	32.1	35.7	61.0	500	Horizontal
7203.9	-1.4	38.6	37.2	72.4	500	Horizontal
9605.2	Emissions detected are more than 20 dB below the FCC Limits				500	Horizontal
* 12006.5					500	Horizontal
14407.8					500	Horizontal
16809.1					500	Horizontal
* 19210.4					500	Horizontal
21611.7					500	Horizontal
24013.0					500	Horizontal

Remarks: The fundamental frequency was not included in the pre-scan plot, a 2.4G notch filter was added prior to the Receiver, please refer the band-edge plot for the level of fundamental frequency.

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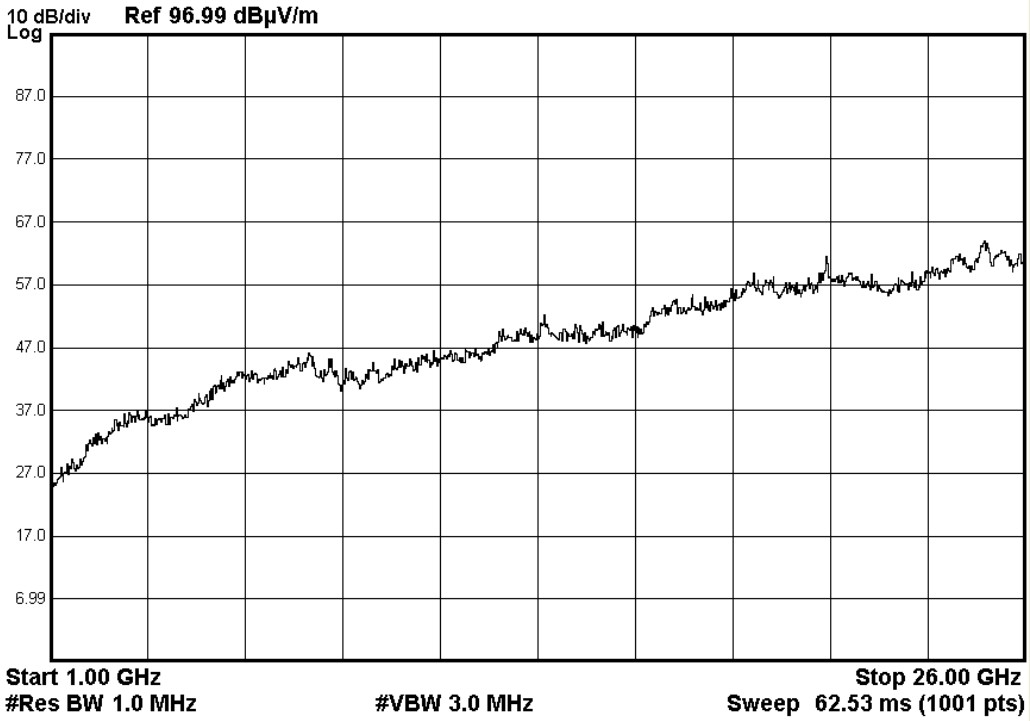
Result of Tx Mode: Port 0 (External Antenna), MSK mode (Middle Channel), (Above 1GHz): Pass



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Result of Tx Mode: Port 0 (External Antenna), MSK mode (Middle Channel), (Above 1GHz): Pass

Field Strength of Fundamental and Harmonics Emissions Peak Value						
Frequency MHz	Measured Level @3m dBμV/m	Correction Factor dBμV/m	Field Strength dBμV/m	Field Strength μV/m	Limit @3m μV/m	E-Field Polarity
2441.2	68.4	27.9	96.3	65,313.1	500,000	Vertical
* 4882.4	18.9	32.1	51.0	354.8	5,000	Vertical
* 7323.6	1.9	38.6	40.5	105.9	5,000	Vertical
9764.8	Emissions detected are more than 20 dB below the FCC Limits				5,000	Vertical
* 12206.1					5,000	Vertical
14647.3					5,000	Vertical
17088.5					5,000	Vertical
* 19529.7					5,000	Vertical
21970.9					5,000	Vertical
24412.1					5,000	Vertical

Field Strength of Fundamental and Harmonics Emissions Average Value						
Frequency MHz	Measured Level @3m dBμV/m	Correction Factor dBμV/m	Field Strength dBμV/m	Field Strength μV/m	Limit @3m μV/m	E-Field Polarity
2441.2	58.6	27.9	86.5	21,134.9	50,000	Vertical
* 4882.4	4.6	32.1	36.7	68.4	500	Vertical
* 7323.6	-1.3	38.6	37.3	73.3	500	Vertical
9764.8	Emissions detected are more than 20 dB below the FCC Limits				500	Vertical
* 12206.0					500	Vertical
14647.2					500	Vertical
17088.4					500	Vertical
* 19529.6					500	Vertical
21970.8					500	Vertical
24412.0					500	Vertical

Remarks: The fundamental frequency was not included in the pre-scan plot, a 2.4G notch filter was added prior to the Receiver, please refer the band-edge plot for the level of fundamental frequency.

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Result of Tx Mode: Port 0 (External Antenna), MSK mode (Middle Channel), (Above 1GHz): Pass

Field Strength of Fundamental and Harmonics Emissions Peak Value						
Frequency MHz	Measured Level @3m dBμV/m	Correction Factor dBμV/m	Field Strength dBμV/m	Field Strength μV/m	Limit @3m μV/m	E-Field Polarity
2441.2	56.3	27.9	84.2	16,218.1	500,000	Horizontal
* 4882.4	16.9	32.1	49.0	281.8	5,000	Horizontal
* 7323.6	1.8	38.6	40.4	104.7	5,000	Horizontal
9764.8	Emissions detected are more than 20 dB below the FCC Limits				5,000	Horizontal
* 12206.1					5,000	Horizontal
14647.3					5,000	Horizontal
17088.5					5,000	Horizontal
* 19529.7					5,000	Horizontal
21970.9					5,000	Horizontal
24412.1					5,000	Horizontal

Field Strength of Fundamental and Harmonics Emissions Average Value						
Frequency MHz	Measured Level @3m dBμV/m	Correction Factor dBμV/m	Field Strength dBμV/m	Field Strength μV/m	Limit @3m μV/m	E-Field Polarity
2441.2	46.7	27.9	74.6	5,370.3	50,000	Horizontal
* 4882.4	4.3	32.1	36.4	66.1	500	Horizontal
* 7323.6	-1.6	38.6	37.0	70.8	500	Horizontal
9764.8	Emissions detected are more than 20 dB below the FCC Limits				500	Horizontal
* 12206.0					500	Horizontal
14647.2					500	Horizontal
17088.4					500	Horizontal
* 19529.6					500	Horizontal
21970.8					500	Horizontal
24412.0					500	Horizontal

Remarks: The fundamental frequency was not included in the pre-scan plot, a 2.4G notch filter was added prior to the Receiver, please refer the band-edge plot for the level of fundamental frequency.

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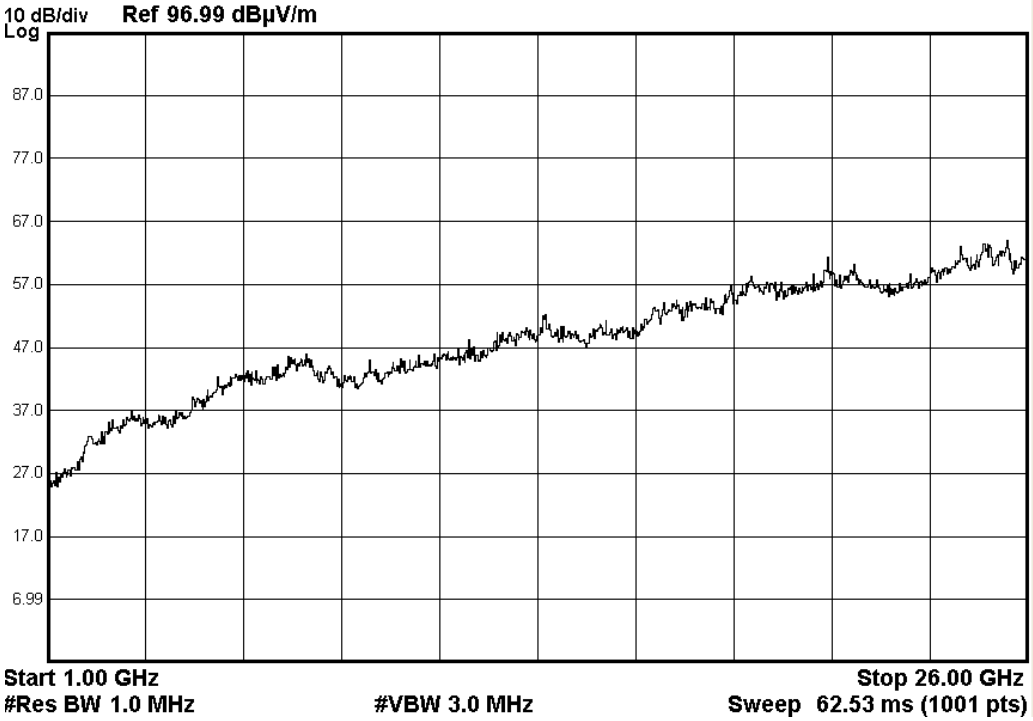
Result of Tx Mode: Port 0 (External Antenna), MSK mode (Highest Channel), (Above 1GHz): Pass



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Result of Tx Mode: Port 0 (External Antenna), MSK mode ((Highest Channel), (Above 1GHz): Pass

Field Strength of Fundamental and Harmonics Emissions Peak Value						
Frequency MHz	Measured Level @3m dBμV/m	Correction Factor dBμV/m	Field Strength dBμV/m	Field Strength μV/m	Limit @3m μV/m	E-Field Polarity
2481.1	68.7	27.9	96.6	67,608.3	500,000	Vertical
* 4962.2	18.9	32.1	51.0	354.8	5,000	Vertical
* 7443.4	1.7	38.6	40.3	103.5	5,000	Vertical
9924.5	Emissions detected are more than 20 dB below the FCC Limits				5,000	Vertical
* 12405.6					5,000	Vertical
14886.7					5,000	Vertical
17367.8					5,000	Vertical
* 19849.0					5,000	Vertical
22330.1					5,000	Vertical
24811.2					5,000	Vertical

Field Strength of Fundamental and Harmonics Emissions Average Value						
Frequency MHz	Measured Level @3m dBμV/m	Correction Factor dBμV/m	Field Strength dBμV/m	Field Strength μV/m	Limit @3m μV/m	E-Field Polarity
2481.1	57.6	27.9	85.5	18,836.5	50,000	Vertical
* 4962.2	5.1	32.1	37.2	72.4	500	Vertical
* 7443.3	-1.4	38.6	37.2	72.4	500	Vertical
9924.4	Emissions detected are more than 20 dB below the FCC Limits				500	Vertical
* 12405.5					500	Vertical
14886.6					500	Vertical
17367.7					500	Vertical
* 19848.8					500	Vertical
22329.9					500	Vertical
24811.0					500	Vertical

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Result of Tx Mode: Port 0 (External Antenna), MSK mode ((Highest Channel), (Above 1GHz): Pass

Field Strength of Fundamental and Harmonics Emissions Peak Value						
Frequency MHz	Measured Level @3m dBμV/m	Correction Factor dBμV/m	Field Strength dBμV/m	Field Strength μV/m	Limit @3m μV/m	E-Field Polarity
2481.1	57.9	27.9	85.8	19,498.4	500,000	Horizontal
* 4962.2	17.3	32.1	49.4	295.1	5,000	Horizontal
* 7443.4	2.1	38.6	40.7	108.4	5,000	Horizontal
9924.5	Emissions detected are more than 20 dB below the FCC Limits				5,000	Horizontal
* 12405.6					5,000	Horizontal
14886.7					5,000	Horizontal
17367.8					5,000	Horizontal
* 19849.0					5,000	Horizontal
22330.1					5,000	Horizontal
24811.2					5,000	Horizontal

Field Strength of Fundamental and Harmonics Emissions Average Value						
Frequency MHz	Measured Level @3m dBμV/m	Correction Factor dBμV/m	Field Strength dBμV/m	Field Strength μV/m	Limit @3m μV/m	E-Field Polarity
2481.1	45.6	27.9	73.5	4,731.5	50,000	Horizontal
* 4962.2	4.3	32.1	36.4	66.1	500	Horizontal
* 7443.3	-1.9	38.6	36.7	68.4	500	Horizontal
9924.4	Emissions detected are more than 20 dB below the FCC Limits				500	Horizontal
* 12405.5					500	Horizontal
14886.6					500	Horizontal
17367.7					500	Horizontal
* 19848.8					500	Horizontal
22329.9					500	Horizontal
24811.0					500	Horizontal

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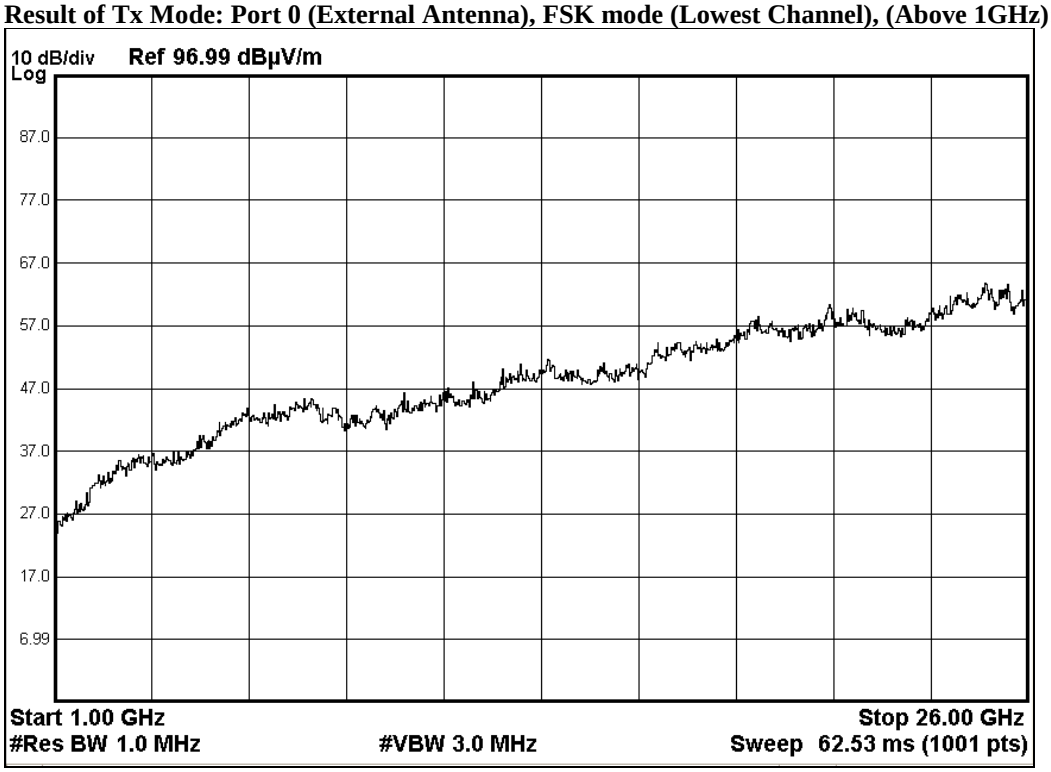
Limits for Field Strength of Fundamental & Harmonics Emissions [FCC 47CFR 15.249]:

Fundamental frequency [MHz]	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (microvolts/meter)
902-928 MHz	50	500
2400-2483.5 MHz	50	500
5725-5875 MHz	50	500
24.0-24.25 GHz	250	2500

Result of Tx Mode: Port 0 (External Antenna), FSK mode (Lowest Channel), (Above 1GHz): Pass



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Result of Tx Mode: Port 0 (External Antenna), FSK (Lowest Channel), (Above 1GHz): Pass

Field Strength of Fundamental and Harmonics Emissions Peak Value						
Frequency MHz	Measured Level @3m dBµV/m	Correction Factor dBµV/m	Field Strength dBµV/m	Field Strength µV/m	Limit @3m µV/m	E-Field Polarity
2402.0	68.4	27.9	96.3	65,313.1	500,000	Vertical
* 4804.0	16.4	32.1	48.5	266.1	5,000	Vertical
7206.0	1.8	38.6	40.4	104.7	5,000	Vertical
9608.0	Emissions detected are more than 20 dB below the FCC Limits				5,000	Vertical
* 12010.0					5,000	Vertical
14412.0					5,000	Vertical
16814.0					5,000	Vertical
* 19216.0					5,000	Vertical
21618.0					5,000	Vertical
24020.0					5,000	Vertical

Field Strength of Fundamental and Harmonics Emissions Average Value						
Frequency MHz	Measured Level @3m dBµV/m	Correction Factor dBµV/m	Field Strength dBµV/m	Field Strength µV/m	Limit @3m µV/m	E-Field Polarity
2402.0	56.3	27.9	84.2	16,218.1	50,000	Vertical
* 4804.0	3.7	32.1	35.8	61.7	500	Vertical
7206.0	-1.3	38.6	37.3	73.3	500	Vertical
9608.0	Emissions detected are more than 20 dB below the FCC Limits				500	Vertical
* 12010.0					500	Vertical
14412.0					500	Vertical
16814.0					500	Vertical
* 19216.0					500	Vertical
21618.0					500	Vertical
24020.0					500	Vertical

Remarks: The fundamental frequency was not included in the pre-scan plot, a 2.4G notch filter was added prior to the Receiver, please refer the band-edge plot for the level of fundamental frequency.

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Result of Tx Mode: Port 0 (External Antenna), FSK (Lowest Channel), (Above 1GHz): Pass

Field Strength of Fundamental and Harmonics Emissions Peak Value						
Frequency MHz	Measured Level @3m dBμV/m	Correction Factor dBμV/m	Field Strength dBμV/m	Field Strength μV/m	Limit @3m μV/m	E-Field Polarity
2402.0	61.4	27.9	89.3	29,174.3	500,000	Horizontal
* 4804.0	16.4	32.1	48.5	266.1	5,000	Horizontal
7206.0	1.8	38.6	40.4	104.7	5,000	Horizontal
9608.0	Emissions detected are more than 20 dB below the FCC Limits				5,000	Horizontal
* 12010.0					5,000	Horizontal
14412.0					5,000	Horizontal
16814.0					5,000	Horizontal
* 19216.0					5,000	Horizontal
21618.0					5,000	Horizontal
24020.0					5,000	Horizontal

Field Strength of Fundamental and Harmonics Emissions Average Value						
Frequency MHz	Measured Level @3m dBμV/m	Correction Factor dBμV/m	Field Strength dBμV/m	Field Strength μV/m	Limit @3m μV/m	E-Field Polarity
2402.0	50.4	27.9	78.3	8,222.4	50,000	Horizontal
* 4804.0	3.2	32.1	35.3	58.2	500	Horizontal
7206.0	-1.6	38.6	37.0	70.8	500	Horizontal
9608.0	Emissions detected are more than 20 dB below the FCC Limits				500	Horizontal
* 12010.0					500	Horizontal
14412.0					500	Horizontal
16814.0					500	Horizontal
* 19216.0					500	Horizontal
21618.0					500	Horizontal
24020.0					500	Horizontal

Remarks: The fundamental frequency was not included in the pre-scan plot, a 2.4G notch filter was added prior to the Receiver, please refer the band-edge plot for the level of fundamental frequency.

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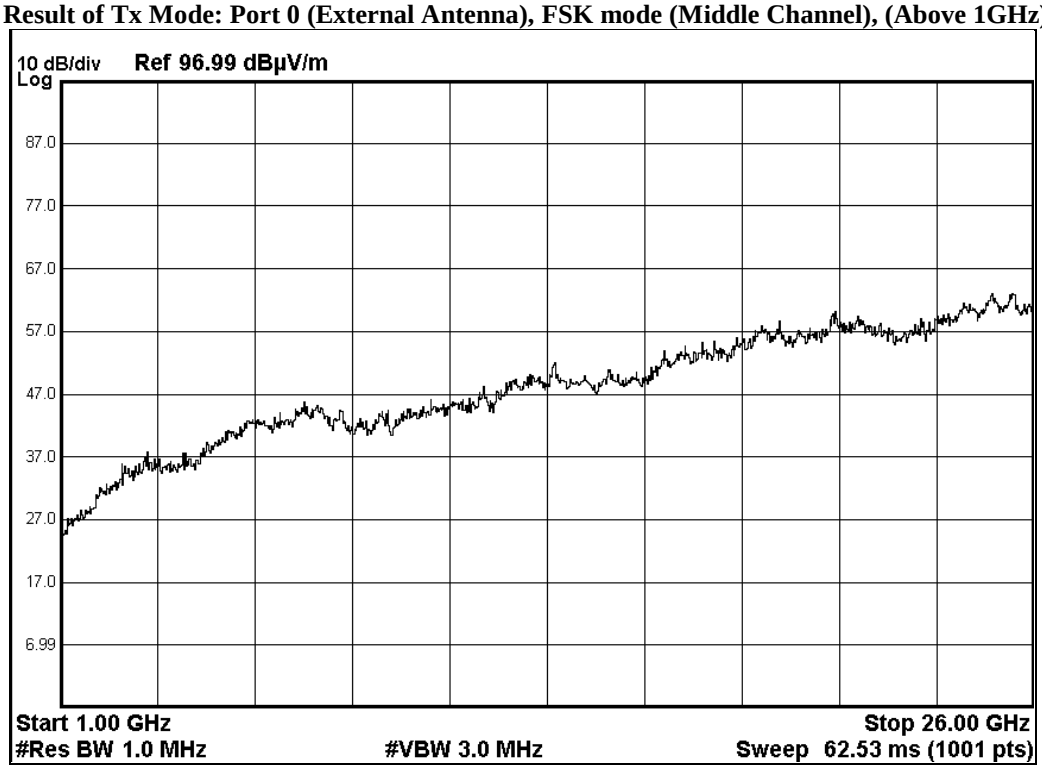
Result of Tx Mode: Port 0 (External Antenna), FSK mode (Middle Channel), (Above 1GHz): Pass



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Result of Tx Mode: Port 0 (External Antenna), FSK mode (Middle Channel), (Above 1GHz): Pass

Field Strength of Fundamental and Harmonics Emissions Peak Value						
Frequency MHz	Measured Level @3m dBμV/m	Correction Factor dBμV/m	Field Strength dBμV/m	Field Strength μV/m	Limit @3m μV/m	E-Field Polarity
2441.0	66.9	27.9	94.8	54,954.1	500,000	Vertical
* 4882.0	16.8	32.1	48.9	278.6	5,000	Vertical
* 7323.0	2.3	38.6	40.9	110.9	5,000	Vertical
9764.0	Emissions detected are more than 20 dB below the FCC Limits				5,000	Vertical
* 12205.0					5,000	Vertical
14646.0					5,000	Vertical
17087.0					5,000	Vertical
* 19528.0					5,000	Vertical
21969.0					5,000	Vertical
24410.0					5,000	Vertical

Field Strength of Fundamental and Harmonics Emissions Average Value						
Frequency MHz	Measured Level @3m dBμV/m	Correction Factor dBμV/m	Field Strength dBμV/m	Field Strength μV/m	Limit @3m μV/m	E-Field Polarity
2441.0	54.2	27.9	82.1	12,735.0	50,000	Vertical
* 4882.0	3.7	32.1	35.8	61.7	500	Vertical
* 7323.0	-1.8	38.6	36.8	69.2	500	Vertical
9764.0	Emissions detected are more than 20 dB below the FCC Limits				500	Vertical
* 12205.0					500	Vertical
14646.0					500	Vertical
17087.0					500	Vertical
* 19528.0					500	Vertical
21969.0					500	Vertical
24410.0					500	Vertical

Remarks: The fundamental frequency was not included in the pre-scan plot, a 2.4G notch filter was added prior to the Receiver, please refer the band-edge plot for the level of fundamental frequency.

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Result of Tx Mode: Port 0 (External Antenna), FSK mode (Middle Channel), (Above 1GHz): Pass

Field Strength of Fundamental and Harmonics Emissions Peak Value						
Frequency MHz	Measured Level @3m dBμV/m	Correction Factor dBμV/m	Field Strength dBμV/m	Field Strength μV/m	Limit @3m μV/m	E-Field Polarity
2441.0	59.7	27.9	87.6	23,988.3	500,000	Horizontal
* 4882.0	15.8	32.1	47.9	248.3	5,000	Horizontal
* 7323.0	2.1	38.6	40.7	108.4	5,000	Horizontal
9764.0	Emissions detected are more than 20 dB below the FCC Limits				5,000	Horizontal
* 12205.0					5,000	Horizontal
14646.0					5,000	Horizontal
17087.0					5,000	Horizontal
* 19528.0					5,000	Horizontal
21969.0					5,000	Horizontal
24410.0					5,000	Horizontal

Field Strength of Fundamental and Harmonics Emissions Average Value						
Frequency MHz	Measured Level @3m dBμV/m	Correction Factor dBμV/m	Field Strength dBμV/m	Field Strength μV/m	Limit @3m μV/m	E-Field Polarity
2441.0	54.2	27.9	82.1	12,735.0	50,000	Horizontal
* 4882.0	3.7	32.1	35.8	61.7	500	Horizontal
* 7323.0	-1.9	38.6	36.7	68.4	500	Horizontal
9764.0	Emissions detected are more than 20 dB below the FCC Limits				500	Horizontal
* 12205.0					500	Horizontal
14646.0					500	Horizontal
17087.0					500	Horizontal
* 19528.0					500	Horizontal
21969.0					500	Horizontal
24410.0					500	Horizontal

Remarks: The fundamental frequency was not included in the pre-scan plot, a 2.4G notch filter was added prior to the Receiver, please refer the band-edge plot for the level of fundamental frequency.

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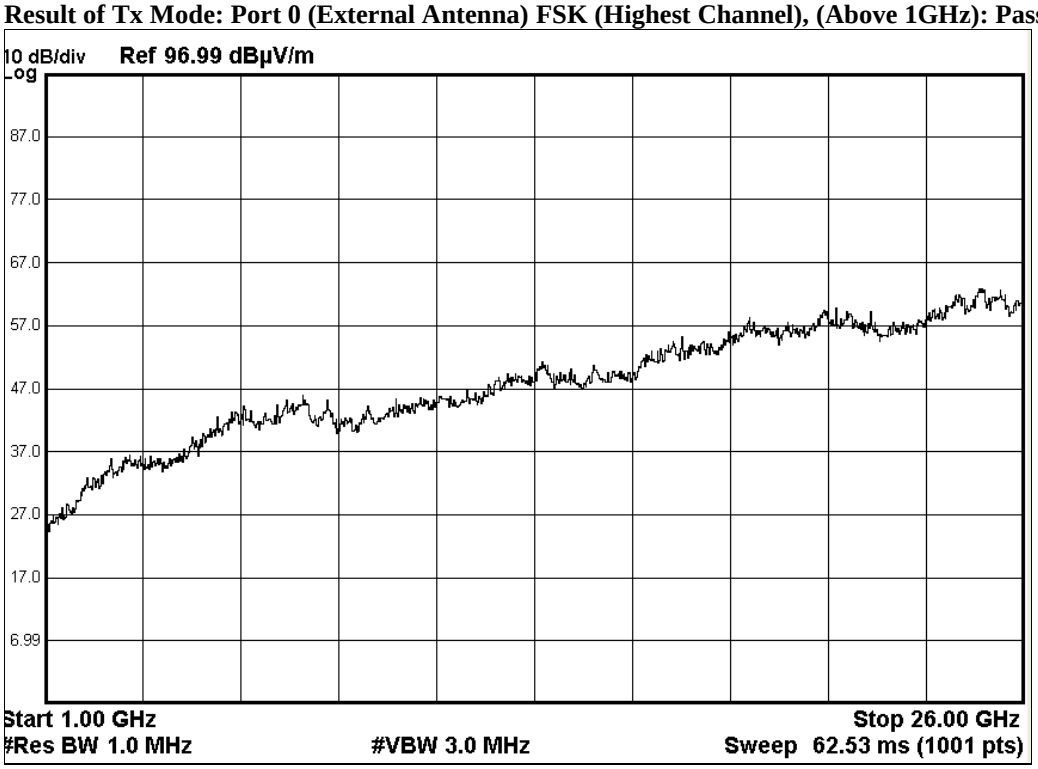
Result of Tx Mode: Port 0 (External Antenna) FSK (Highest Channel), (Above 1GHz): Pass



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Result of Tx Mode: Port 0 (External Antenna), FSK mode ((Highest Channel), (Above 1GHz): Pass

Field Strength of Fundamental and Harmonics Emissions Peak Value						
Frequency MHz	Measured Level @3m dBμV/m	Correction Factor dBμV/m	Field Strength dBμV/m	Field Strength μV/m	Limit @3m μV/m	E-Field Polarity
2480.0	68.5	27.9	96.4	66,069.3	500,000	Vertical
* 4960.0	19.4	32.1	51.5	375.8	5,000	Vertical
* 7440.0	2.9	38.6	41.5	118.9	5,000	Vertical
9920.0	Emissions detected are more than 20 dB below the FCC Limits				5,000	Vertical
* 12400.0					5,000	Vertical
14880.0					5,000	Vertical
17360.0					5,000	Vertical
* 19840.0					5,000	Vertical
22320.0					5,000	Vertical
24800.0					5,000	Vertical

Field Strength of Fundamental and Harmonics Emissions Average Value						
Frequency MHz	Measured Level @3m dBμV/m	Correction Factor dBμV/m	Field Strength dBμV/m	Field Strength μV/m	Limit @3m μV/m	E-Field Polarity
2480.0	55.7	27.9	83.6	15,135.6	50,000	Vertical
* 4960.0	4.5	32.1	36.6	67.6	500	Vertical
* 7440.0	-1.8	38.6	36.8	69.2	500	Vertical
9920.0	Emissions detected are more than 20 dB below the FCC Limits				500	Vertical
* 12400.0					500	Vertical
14880.0					500	Vertical
17360.0					500	Vertical
* 19840.0					500	Vertical
22320.0					500	Vertical
24800.0					500	Vertical

Remarks: The fundamental frequency was not included in the pre-scan plot, a 2.4G notch filter was added prior to the Receiver, please refer the band-edge plot for the level of fundamental frequency.

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Result of Tx Mode: Port 0 (External Antenna), FSK mode ((Highest Channel), (Above 1GHz): Pass

Field Strength of Fundamental and Harmonics Emissions Peak Value						
Frequency MHz	Measured Level @3m dBμV/m	Correction Factor dBμV/m	Field Strength dBμV/m	Field Strength μV/m	Limit @3m μV/m	E-Field Polarity
2480.0	61.8	27.9	89.7	30,549.2	500,000	Horizontal
* 4960.0	14.3	32.1	46.4	208.9	5,000	Horizontal
* 7440.0	2.3	38.6	40.9	110.9	5,000	Horizontal
9920.0	Emissions detected are more than 20 dB below the FCC Limits				5,000	Horizontal
* 12400.0					5,000	Horizontal
14880.0					5,000	Horizontal
17360.0					5,000	Horizontal
* 19840.0					5,000	Horizontal
22320.0					5,000	Horizontal
24800.0					5,000	Horizontal

Field Strength of Fundamental and Harmonics Emissions Average Value						
Frequency MHz	Measured Level @3m dBμV/m	Correction Factor dBμV/m	Field Strength dBμV/m	Field Strength μV/m	Limit @3m μV/m	E-Field Polarity
2480.0	50.6	27.9	78.5	8,414.0	50,000	Horizontal
* 4960.0	3.9	32.1	36.0	63.1	500	Horizontal
* 7440.0	-1.5	38.6	37.1	71.6	500	Horizontal
9920.0	Emissions detected are more than 20 dB below the FCC Limits				500	Horizontal
* 12400.0					500	Horizontal
14880.0					500	Horizontal
17360.0					500	Horizontal
* 19840.0					500	Horizontal
22320.0					500	Horizontal
24800.0					500	Horizontal

Remarks: The fundamental frequency was not included in the pre-scan plot, a 2.4G notch filter was added prior to the Receiver, please refer the band-edge plot for the level of fundamental frequency.

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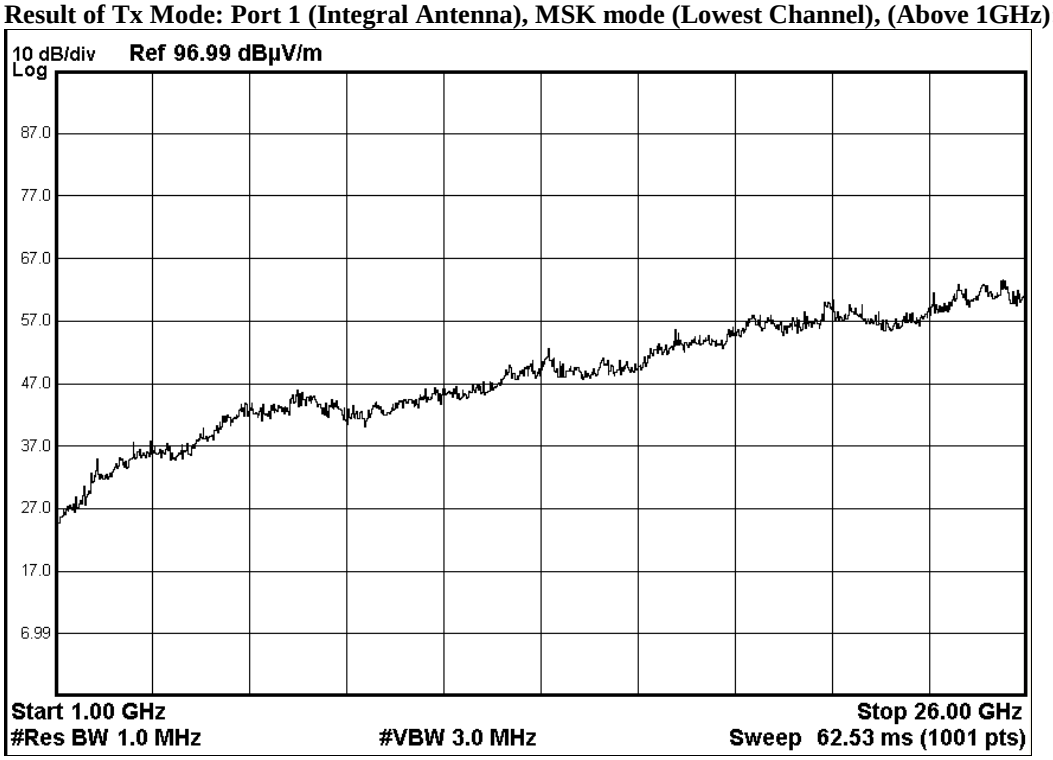
Result of Tx Mode: Port 1 (Integral Antenna), MSK mode (Lowest Channel), (Above 1GHz): Pass



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Result of Tx Mode: Port 1 (Integral Antenna), MSK mode (Lowest Channel), (Above 1GHz): Pass

Field Strength of Fundamental and Harmonics Emissions Peak Value						
Frequency MHz	Measured Level @3m dBµV/m	Correction Factor dBµV/m	Field Strength dBµV/m	Field Strength µV/m	Limit @3m µV/m	E-Field Polarity
2401.3	62.3	27.9	90.2	32,359.4	500,000	Vertical
* 4802.6	12.4	32.1	44.5	167.9	5,000	Vertical
7203.9	1.4	38.6	40.0	100.0	5,000	Vertical
9605.2	Emissions detected are more than 20 dB below the FCC Limits				5,000	Vertical
* 12006.5					5,000	Vertical
14407.8					5,000	Vertical
16809.1					5,000	Vertical
* 19210.4					5,000	Vertical
21611.7					5,000	Vertical
24013.0					5,000	Vertical

Field Strength of Fundamental and Harmonics Emissions Average Value						
Frequency MHz	Measured Level @3m dBµV/m	Correction Factor dBµV/m	Field Strength dBµV/m	Field Strength µV/m	Limit @3m µV/m	E-Field Polarity
2401.3	50.9	27.9	78.8	8,709.6	50,000	Vertical
* 4802.6	1.3	32.1	33.4	46.8	500	Vertical
7203.9	-1.5	38.6	37.1	71.6	500	Vertical
9605.2	Emissions detected are more than 20 dB below the FCC Limits				500	Vertical
* 12006.5					500	Vertical
14407.8					500	Vertical
16809.1					500	Vertical
* 19210.4					500	Vertical
21611.7					500	Vertical
24013.0					500	Vertical

Remarks: The fundamental frequency was not included in the pre-scan plot, a 2.4G notch filter was added prior to the Receiver, please refer the band-edge plot for the level of fundamental frequency.

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Result of Tx Mode: Port 1 (Integral Antenna), MSK mode (Lowest Channel), (Above 1GHz): Pass

Field Strength of Fundamental and Harmonics Emissions Peak Value						
Frequency MHz	Measured Level @3m dBμV/m	Correction Factor dBμV/m	Field Strength dBμV/m	Field Strength μV/m	Limit @3m μV/m	E-Field Polarity
2401.3	53.9	27.9	81.8	12,302.7	500,000	Horizontal
* 4802.6	11.3	32.1	43.4	147.9	5,000	Horizontal
7203.9	1.9	38.6	40.5	105.9	5,000	Horizontal
9605.2	Emissions detected are more than 20 dB below the FCC Limits				5,000	Horizontal
* 12006.5					5,000	Horizontal
14407.8					5,000	Horizontal
16809.1					5,000	Horizontal
* 19210.4					5,000	Horizontal
21611.7					5,000	Horizontal
24013.0					5,000	Horizontal

Field Strength of Fundamental and Harmonics Emissions Average Value						
Frequency MHz	Measured Level @3m dBμV/m	Correction Factor dBμV/m	Field Strength dBμV/m	Field Strength μV/m	Limit @3m μV/m	E-Field Polarity
2401.3	43.2	27.9	71.1	3,589.2	50,000	Horizontal
* 4802.6	1.5	32.1	33.6	47.9	500	Horizontal
7203.9	-1.8	38.6	36.8	69.2	500	Horizontal
9605.2	Emissions detected are more than 20 dB below the FCC Limits				500	Horizontal
* 12006.5					500	Horizontal
14407.8					500	Horizontal
16809.1					500	Horizontal
* 19210.4					500	Horizontal
21611.7					500	Horizontal
24013.0					500	Horizontal

Remarks: The fundamental frequency was not included in the pre-scan plot, a 2.4G notch filter was added prior to the Receiver, please refer the band-edge plot for the level of fundamental frequency.

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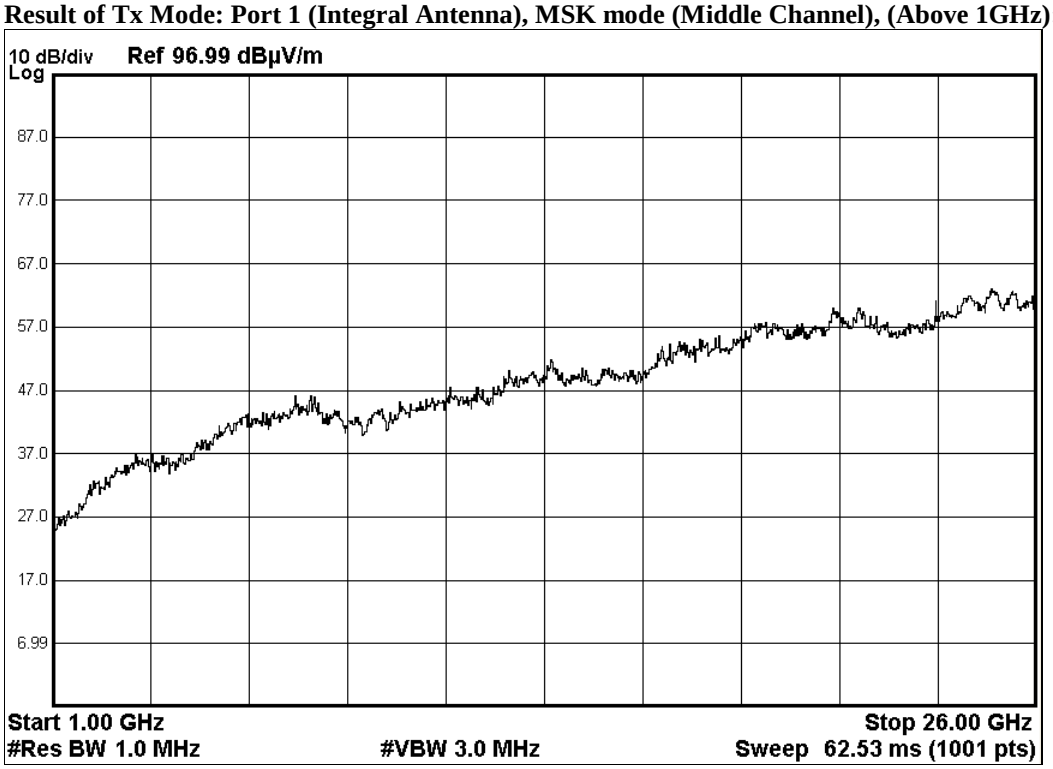
Result of Tx Mode: Port 1 (Integral Antenna), MSK mode (Middle Channel), (Above 1GHz): Pass



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Result of Tx Mode: Port 1 (Integral Antenna), MSK mode (Middle Channel), (Above 1GHz): Pass

Field Strength of Fundamental and Harmonics Emissions Peak Value						
Frequency MHz	Measured Level @3m dBμV/m	Correction Factor dBμV/m	Field Strength dBμV/m	Field Strength μV/m	Limit @3m μV/m	E-Field Polarity
2441.2	62.7	27.9	90.6	33,884.4	500,000	Vertical
* 4882.4	13.7	32.1	45.8	195.0	5,000	Vertical
* 7323.6	1.4	38.6	40.0	100.0	5,000	Vertical
9764.8	Emissions detected are more than 20 dB below the FCC Limits				5,000	Vertical
* 12206.1					5,000	Vertical
14647.3					5,000	Vertical
17088.5					5,000	Vertical
* 19529.7					5,000	Vertical
21970.9					5,000	Vertical
24412.1					5,000	Vertical

Field Strength of Fundamental and Harmonics Emissions Average Value						
Frequency MHz	Measured Level @3m dBμV/m	Correction Factor dBμV/m	Field Strength dBμV/m	Field Strength μV/m	Limit @3m μV/m	E-Field Polarity
2441.2	51.8	27.9	79.7	9,660.5	50,000	Vertical
* 4882.4	1.3	32.1	33.4	46.8	500	Vertical
* 7323.6	-2.1	38.6	36.5	66.8	500	Vertical
9764.8	Emissions detected are more than 20 dB below the FCC Limits				500	Vertical
* 12206.0					500	Vertical
14647.2					500	Vertical
17088.4					500	Vertical
* 19529.6					500	Vertical
21970.8					500	Vertical
24412.0					500	Vertical

Remarks: The fundamental frequency was not included in the pre-scan plot, a 2.4G notch filter was added prior to the Receiver, please refer the band-edge plot for the level of fundamental frequency.

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Result of Tx Mode: Port 1 (Integral Antenna), MSK mode (Middle Channel), (Above 1GHz): Pass

Field Strength of Fundamental and Harmonics Emissions Peak Value						
Frequency MHz	Measured Level @3m dBμV/m	Correction Factor dBμV/m	Field Strength dBμV/m	Field Strength μV/m	Limit @3m μV/m	E-Field Polarity
2441.2	51.2	27.9	79.1	9,015.7	500,000	Horizontal
* 4882.4	12.4	32.1	44.5	167.9	5,000	Horizontal
* 7323.6	1.6	38.6	40.2	102.3	5,000	Horizontal
9764.8	Emissions detected are more than 20 dB below the FCC Limits				5,000	Horizontal
* 12206.1					5,000	Horizontal
14647.3					5,000	Horizontal
17088.5					5,000	Horizontal
* 19529.7					5,000	Horizontal
21970.9					5,000	Horizontal
24412.1					5,000	Horizontal

Field Strength of Fundamental and Harmonics Emissions Average Value						
Frequency MHz	Measured Level @3m dBμV/m	Correction Factor dBμV/m	Field Strength dBμV/m	Field Strength μV/m	Limit @3m μV/m	E-Field Polarity
2441.2	42.1	27.9	70.0	3,162.3	50,000	Horizontal
* 4882.4	1.6	32.1	33.7	48.4	500	Horizontal
* 7323.6	-1.9	38.6	36.7	68.4	500	Horizontal
9764.8	Emissions detected are more than 20 dB below the FCC Limits				500	Horizontal
* 12206.0					500	Horizontal
14647.2					500	Horizontal
17088.4					500	Horizontal
* 19529.6					500	Horizontal
21970.8					500	Horizontal
24412.0					500	Horizontal

Remarks: The fundamental frequency was not included in the pre-scan plot, a 2.4G notch filter was added prior to the Receiver, please refer the band-edge plot for the level of fundamental frequency.

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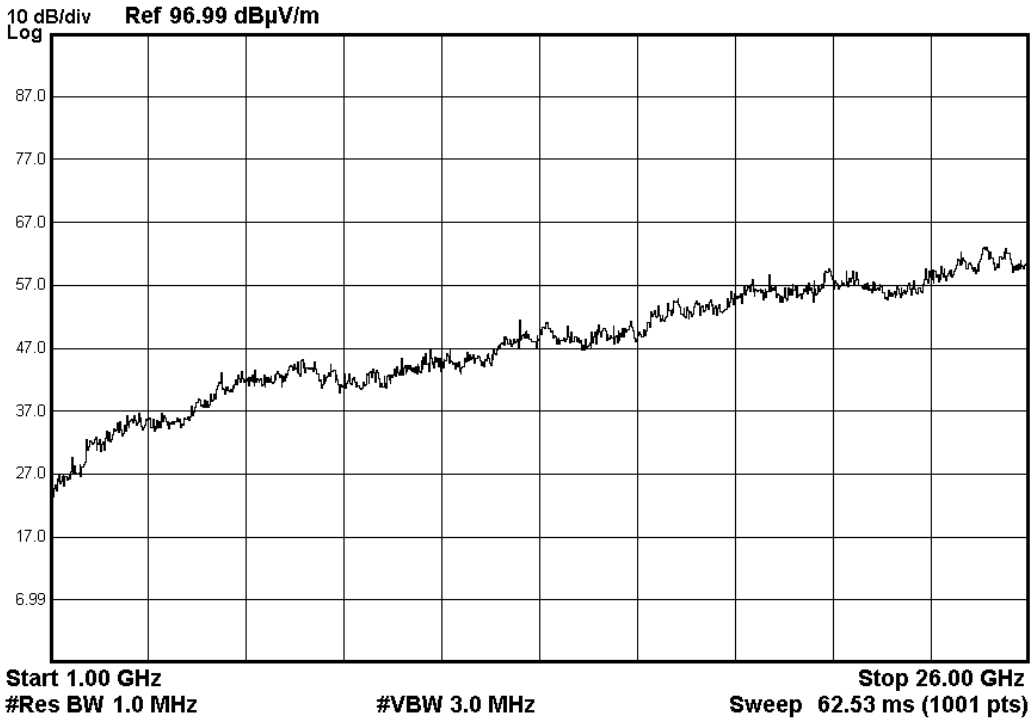
Result of Tx Mode: Port 1 (Integral Antenna), MSK mode), (Above 1GHz): Pass



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Result of Tx Mode: Port 1 (Integral Antenna), MSK mode (Highest Channel), (Above 1GHz): Pass

Field Strength of Fundamental and Harmonics Emissions Peak Value						
Frequency MHz	Measured Level @3m dBμV/m	Correction Factor dBμV/m	Field Strength dBμV/m	Field Strength μV/m	Limit @3m μV/m	E-Field Polarity
2481.1	62.7	27.9	90.6	33,884.4	500,000	Vertical
* 4962.2	12.4	32.1	44.5	167.9	5,000	Vertical
* 7443.4	1.6	38.6	40.2	102.3	5,000	Vertical
9924.5	Emissions detected are more than 20 dB below the FCC Limits				5,000	Vertical
* 12405.6					5,000	Vertical
14886.7					5,000	Vertical
17367.8					5,000	Vertical
* 19849.0					5,000	Vertical
22330.1					5,000	Vertical
24811.2					5,000	Vertical

Field Strength of Fundamental and Harmonics Emissions Average Value						
Frequency MHz	Measured Level @3m dBμV/m	Correction Factor dBμV/m	Field Strength dBμV/m	Field Strength μV/m	Limit @3m μV/m	E-Field Polarity
2481.1	51.3	27.9	79.2	9,120.1	50,000	Vertical
* 4962.2	2.4	32.1	34.5	53.1	500	Vertical
* 7443.3	-1.8	38.6	36.8	69.2	500	Vertical
9924.4	Emissions detected are more than 20 dB below the FCC Limits				500	Vertical
* 12405.5					500	Vertical
14886.6					500	Vertical
17367.7					500	Vertical
* 19848.8					500	Vertical
22329.9					500	Vertical
24811.0					500	Vertical

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Result of Tx Mode: Port 1 (Integral Antenna), MSK mode (Highest Channel), (Above 1GHz): Pass

Field Strength of Fundamental and Harmonics Emissions Peak Value						
Frequency MHz	Measured Level @3m dBμV/m	Correction Factor dBμV/m	Field Strength dBμV/m	Field Strength μV/m	Limit @3m μV/m	E-Field Polarity
2481.1	53.9	27.9	81.8	12,302.7	500,000	Horizontal
* 4962.2	13.2	32.1	45.3	184.1	5,000	Horizontal
* 7443.4	2.1	38.6	40.7	108.4	5,000	Horizontal
9924.5	Emissions detected are more than 20 dB below the FCC Limits				5,000	Horizontal
* 12405.6					5,000	Horizontal
14886.7					5,000	Horizontal
17367.8					5,000	Horizontal
* 19849.0					5,000	Horizontal
22330.1					5,000	Horizontal
24811.2					5,000	Horizontal

Field Strength of Fundamental and Harmonics Emissions Average Value						
Frequency MHz	Measured Level @3m dBμV/m	Correction Factor dBμV/m	Field Strength dBμV/m	Field Strength μV/m	Limit @3m μV/m	E-Field Polarity
2481.1	43.1	27.9	71.0	3,548.1	50,000	Horizontal
* 4962.2	2.8	32.1	34.9	55.6	500	Horizontal
* 7443.3	-1.9	38.6	36.7	68.4	500	Horizontal
9924.4	Emissions detected are more than 20 dB below the FCC Limits				500	Horizontal
* 12405.5					500	Horizontal
14886.6					500	Horizontal
17367.7					500	Horizontal
* 19848.8					500	Horizontal
22329.9					500	Horizontal
24811.0					500	Horizontal

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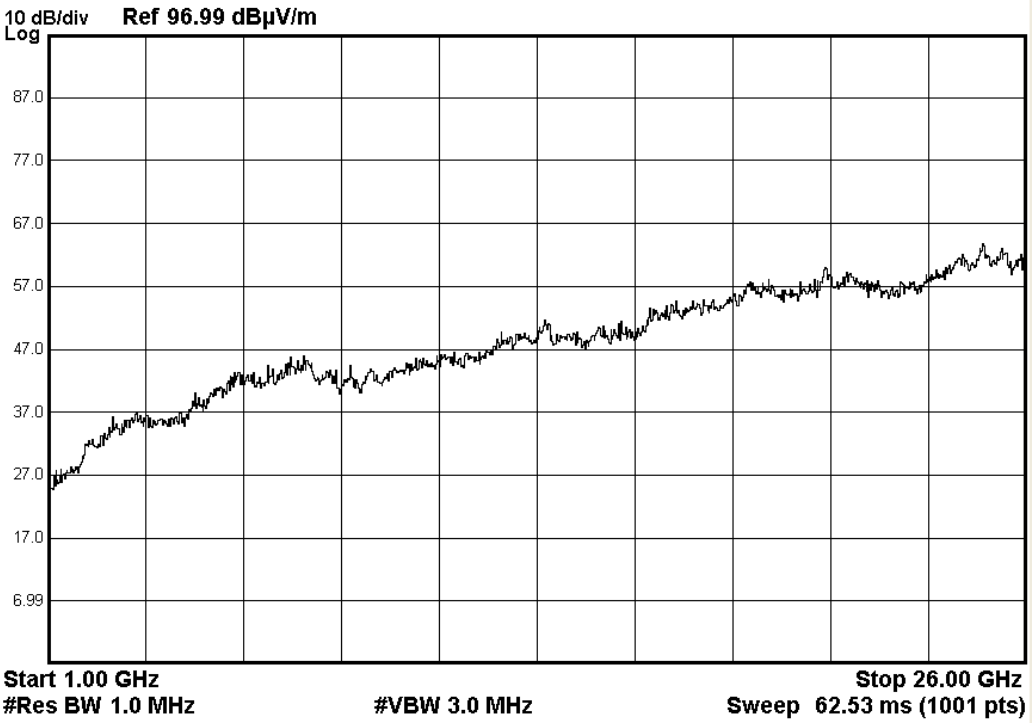
Limits for Field Strength of Fundamental & Harmonics Emissions [FCC 47CFR 15.249]:

Fundamental frequency [MHz]	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (microvolts/meter)
902-928 MHz	50	500
2400-2483.5 MHz	50	500
5725-5875 MHz	50	500
24.0-24.25 GHz	250	2500

Result of Tx Mode: Port 1 (Integral Antenna), FSK mode (Lowest Channel), (Above 1GHz): Pass



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Result of Tx Mode: Port 1 (Integral Antenna), FSK mode (Lowest Channel), (Above 1GHz): Pass

Field Strength of Fundamental and Harmonics Emissions Peak Value						
Frequency MHz	Measured Level @3m dBμV/m	Correction Factor dBμV/m	Field Strength dBμV/m	Field Strength μV/m	Limit @3m μV/m	E-Field Polarity
2402.0	63.5	27.9	91.4	37,153.5	500,000	Vertical
* 4804.0	12.1	32.1	44.2	162.2	5,000	Vertical
7206.0	1.8	38.6	40.4	104.7	5,000	Vertical
9608.0	Emissions detected are more than 20 dB below the FCC Limits				5,000	Vertical
* 12010.0					5,000	Vertical
14412.0					5,000	Vertical
16814.0					5,000	Vertical
* 19216.0					5,000	Vertical
21618.0					5,000	Vertical
24020.0					5,000	Vertical

Field Strength of Fundamental and Harmonics Emissions Average Value						
Frequency MHz	Measured Level @3m dBμV/m	Correction Factor dBμV/m	Field Strength dBμV/m	Field Strength μV/m	Limit @3m μV/m	E-Field Polarity
2402.0	48.6	27.9	76.5	6,683.4	50,000	Vertical
* 4804.0	1.1	32.1	33.2	45.7	500	Vertical
7206.0	-1.7	38.6	36.9	70.0	500	Vertical
9608.0	Emissions detected are more than 20 dB below the FCC Limits				500	Vertical
* 12010.0					500	Vertical
14412.0					500	Vertical
16814.0					500	Vertical
* 19216.0					500	Vertical
21618.0					500	Vertical
24020.0					500	Vertical

Remarks: The fundamental frequency was not included in the pre-scan plot, a 2.4G notch filter was added prior to the Receiver, please refer the band-edge plot for the level of fundamental frequency.

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Result of Tx Mode: Port 1 (Integral Antenna), FSK mode (Lowest Channel), (Above 1GHz): Pass

Field Strength of Fundamental and Harmonics Emissions Peak Value						
Frequency MHz	Measured Level @3m dBμV/m	Correction Factor dBμV/m	Field Strength dBμV/m	Field Strength μV/m	Limit @3m μV/m	E-Field Polarity
2402.0	53.9	27.9	81.8	12,302.7	500,000	Horizontal
* 4804.0	12.6	32.1	44.7	171.8	5,000	Horizontal
7206.0	2.3	38.6	40.9	110.9	5,000	Horizontal
9608.0	Emissions detected are more than 20 dB below the FCC Limits				5,000	Horizontal
* 12010.0					5,000	Horizontal
14412.0					5,000	Horizontal
16814.0					5,000	Horizontal
* 19216.0					5,000	Horizontal
21618.0					5,000	Horizontal
24020.0					5,000	Horizontal

Field Strength of Fundamental and Harmonics Emissions Average Value						
Frequency MHz	Measured Level @3m dBμV/m	Correction Factor dBμV/m	Field Strength dBμV/m	Field Strength μV/m	Limit @3m μV/m	E-Field Polarity
2402.0	43.7	27.9	71.6	3,801.9	50,000	Horizontal
* 4804.0	1.3	32.1	33.4	46.8	500	Horizontal
7206.0	-1.9	38.6	36.7	68.4	500	Horizontal
9608.0	Emissions detected are more than 20 dB below the FCC Limits				500	Horizontal
* 12010.0					500	Horizontal
14412.0					500	Horizontal
16814.0					500	Horizontal
* 19216.0					500	Horizontal
21618.0					500	Horizontal
24020.0					500	Horizontal

Remarks: The fundamental frequency was not included in the pre-scan plot, a 2.4G notch filter was added prior to the Receiver, please refer the band-edge plot for the level of fundamental frequency.

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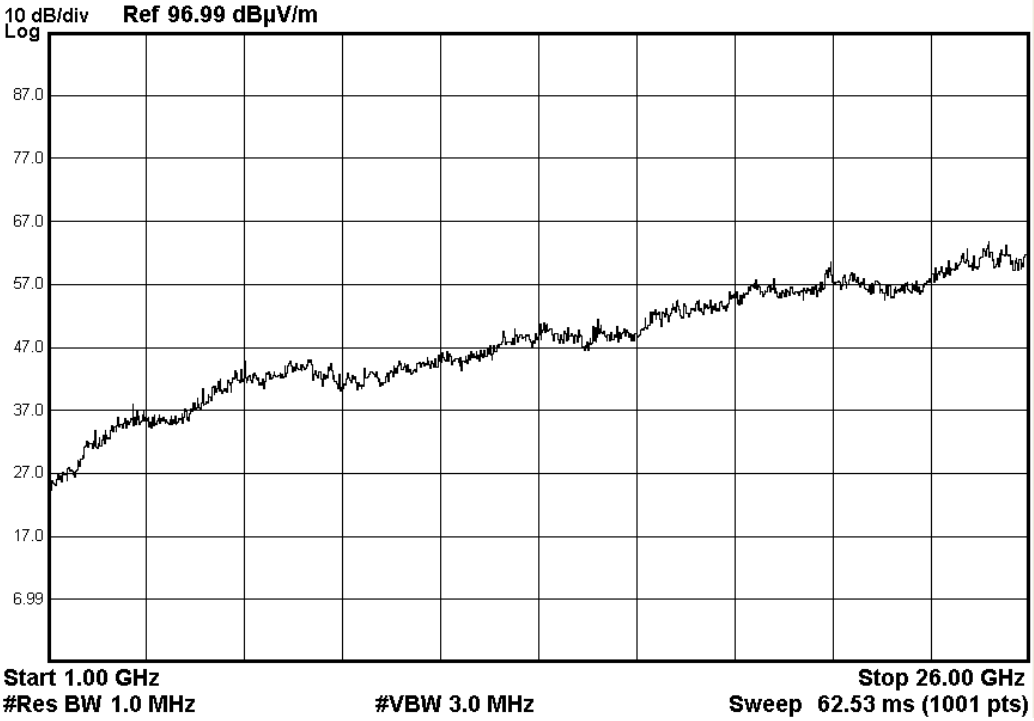
Result of Tx Mode: Port 1 (Integral Antenna), FSK mode (Middle Channel), (Above 1GHz): Pass



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Result of Tx Mode: Port 1 (Integral Antenna), FSK mode (Middle Channel), (Above 1GHz): Pass

Field Strength of Fundamental and Harmonics Emissions Peak Value						
Frequency MHz	Measured Level @3m dBμV/m	Correction Factor dBμV/m	Field Strength dBμV/m	Field Strength μV/m	Limit @3m μV/m	E-Field Polarity
2441.0	61.8	27.9	89.7	30,549.2	500,000	Vertical
* 4882.0	12.3	32.1	44.4	166.0	5,000	Vertical
* 7323.0	2.1	38.6	40.7	108.4	5,000	Vertical
9764.0	Emissions detected are more than 20 dB below the FCC Limits				5,000	Vertical
* 12205.0					5,000	Vertical
14646.0					5,000	Vertical
17087.0					5,000	Vertical
* 19528.0					5,000	Vertical
21969.0					5,000	Vertical
24410.0					5,000	Vertical

Field Strength of Fundamental and Harmonics Emissions Average Value						
Frequency MHz	Measured Level @3m dBμV/m	Correction Factor dBμV/m	Field Strength dBμV/m	Field Strength μV/m	Limit @3m μV/m	E-Field Polarity
2441.0	49.8	27.9	77.7	7,673.6	50,000	Vertical
* 4882.0	0.9	32.1	33.0	44.7	500	Vertical
* 7323.0	-1.5	38.6	37.1	71.6	500	Vertical
9764.0	Emissions detected are more than 20 dB below the FCC Limits				500	Vertical
* 12205.0					500	Vertical
14646.0					500	Vertical
17087.0					500	Vertical
* 19528.0					500	Vertical
21969.0					500	Vertical
24410.0					500	Vertical

Remarks: The fundamental frequency was not included in the pre-scan plot, a 2.4G notch filter was added prior to the Receiver, please refer the band-edge plot for the level of fundamental frequency.

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Result of Tx Mode: Port 1 (Integral Antenna), FSK mode (Middle Channel), (Above 1GHz): Pass

Field Strength of Fundamental and Harmonics Emissions Peak Value						
Frequency MHz	Measured Level @3m dBμV/m	Correction Factor dBμV/m	Field Strength dBμV/m	Field Strength μV/m	Limit @3m μV/m	E-Field Polarity
2441.0	52.1	27.9	80.0	10,000.0	500,000	Horizontal
* 4882.0	12.1	32.1	44.2	162.2	5,000	Horizontal
* 7323.0	2.4	38.6	41.0	112.2	5,000	Horizontal
9764.0	Emissions detected are more than 20 dB below the FCC Limits				5,000	Horizontal
* 12205.0					5,000	Horizontal
14646.0					5,000	Horizontal
17087.0					5,000	Horizontal
* 19528.0					5,000	Horizontal
21969.0					5,000	Horizontal
24410.0					5,000	Horizontal

Field Strength of Fundamental and Harmonics Emissions Average Value						
Frequency MHz	Measured Level @3m dBμV/m	Correction Factor dBμV/m	Field Strength dBμV/m	Field Strength μV/m	Limit @3m μV/m	E-Field Polarity
2441.0	41.9	27.9	69.8	3,090.3	50,000	Horizontal
* 4882.0	1.6	32.1	33.7	48.4	500	Horizontal
* 7323.0	-1.7	38.6	36.9	70.0	500	Horizontal
9764.0	Emissions detected are more than 20 dB below the FCC Limits				500	Horizontal
* 12205.0					500	Horizontal
14646.0					500	Horizontal
17087.0					500	Horizontal
* 19528.0					500	Horizontal
21969.0					500	Horizontal
24410.0					500	Horizontal

Remarks: The fundamental frequency was not included in the pre-scan plot, a 2.4G notch filter was added prior to the Receiver, please refer the band-edge plot for the level of fundamental frequency.

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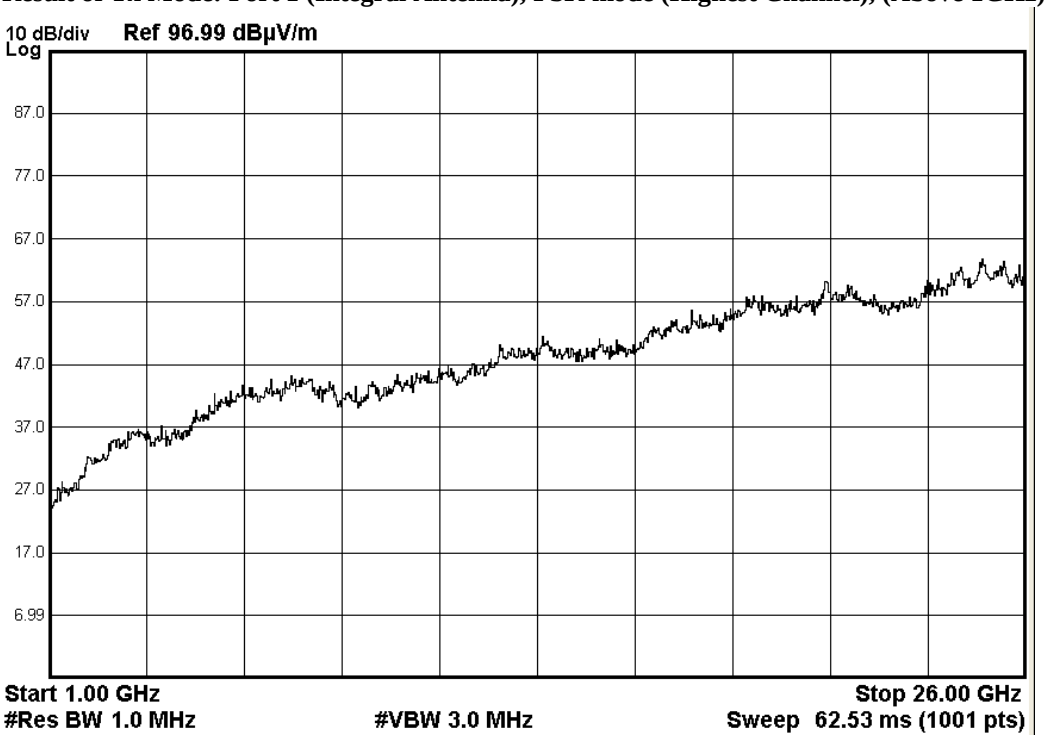
Result of Tx Mode: Port 1 (Integral Antenna), FSK mode (Highest Channel), (Above 1GHz): Pass



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Result of Tx Mode: Port 1 (Integral Antenna), FSK mode ((Highest Channel), (Above 1GHz): Pass

Field Strength of Fundamental and Harmonics Emissions Peak Value						
Frequency MHz	Measured Level @3m dBµV/m	Correction Factor dBµV/m	Field Strength dBµV/m	Field Strength µV/m	Limit @3m µV/m	E-Field Polarity
2480.0	62.9	27.9	90.8	34,673.7	500,000	Vertical
* 4960.0	12.9	32.1	45.0	177.8	5,000	Vertical
* 7440.0	1.9	38.6	40.5	105.9	5,000	Vertical
9920.0	Emissions detected are more than 20 dB below the FCC Limits				5,000	Vertical
* 12400.0					5,000	Vertical
14880.0					5,000	Vertical
17360.0					5,000	Vertical
* 19840.0					5,000	Vertical
22320.0					5,000	Vertical
24800.0					5,000	Vertical

Field Strength of Fundamental and Harmonics Emissions Average Value						
Frequency MHz	Measured Level @3m dBµV/m	Correction Factor dBµV/m	Field Strength dBµV/m	Field Strength µV/m	Limit @3m µV/m	E-Field Polarity
2480.0	50.8	27.9	78.7	8,609.9	50,000	Vertical
* 4960.0	2.4	32.1	34.5	53.1	500	Vertical
* 7440.0	-1.9	38.6	36.7	68.4	500	Vertical
9920.0	Emissions detected are more than 20 dB below the FCC Limits				500	Vertical
* 12400.0					500	Vertical
14880.0					500	Vertical
17360.0					500	Vertical
* 19840.0					500	Vertical
22320.0					500	Vertical
24800.0					500	Vertical

Remarks: The fundamental frequency was not included in the pre-scan plot, a 2.4G notch filter was added prior to the Receiver, please refer the band-edge plot for the level of fundamental frequency.

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Result of Tx Mode: Port 1 (Integral Antenna), FSK mode ((Highest Channel), (Above 1GHz): Pass

Field Strength of Fundamental and Harmonics Emissions Peak Value						
Frequency MHz	Measured Level @3m dBμV/m	Correction Factor dBμV/m	Field Strength dBμV/m	Field Strength μV/m	Limit @3m μV/m	E-Field Polarity
2480.0	53.5	27.9	81.4	11,749.0	500,000	Horizontal
* 4960.0	12.1	32.1	44.2	162.2	5,000	Horizontal
* 7440.0	2.0	38.6	40.6	107.2	5,000	Horizontal
9920.0	Emissions detected are more than 20 dB below the FCC Limits				5,000	Horizontal
* 12400.0					5,000	Horizontal
14880.0					5,000	Horizontal
17360.0					5,000	Horizontal
* 19840.0					5,000	Horizontal
22320.0					5,000	Horizontal
24800.0					5,000	Horizontal

Field Strength of Fundamental and Harmonics Emissions Average Value						
Frequency MHz	Measured Level @3m dBμV/m	Correction Factor dBμV/m	Field Strength dBμV/m	Field Strength μV/m	Limit @3m μV/m	E-Field Polarity
2480.0	42.8	27.9	70.7	3,427.7	50,000	Horizontal
* 4960.0	2.3	32.1	34.4	52.5	500	Horizontal
* 7440.0	-1.9	38.6	36.7	68.4	500	Horizontal
9920.0	Emissions detected are more than 20 dB below the FCC Limits				500	Horizontal
* 12400.0					500	Horizontal
14880.0					500	Horizontal
17360.0					500	Horizontal
* 19840.0					500	Horizontal
22320.0					500	Horizontal
24800.0					500	Horizontal

Remarks: The fundamental frequency was not included in the pre-scan plot, a 2.4G notch filter was added prior to the Receiver, please refer the band-edge plot for the level of fundamental frequency.

No additional spurious emissions found between lowest internal used/generated frequency and 30 MHz

***: Denotes restricted band of operation.**
Measurements were made using a peak detector. Any emission less than 1000 MHz and falling within the restricted bands of FCC Rules Part 15 Section 15.205 and the limits of FCC Rules Part 15 Section 15.209 were applied.

Calculated measurement uncertainty : 9kHz to 30MHz: 2.4dB
30MHz to 18GHz: 5.0dB
18GHz – 26.5Hz: 5.24dB

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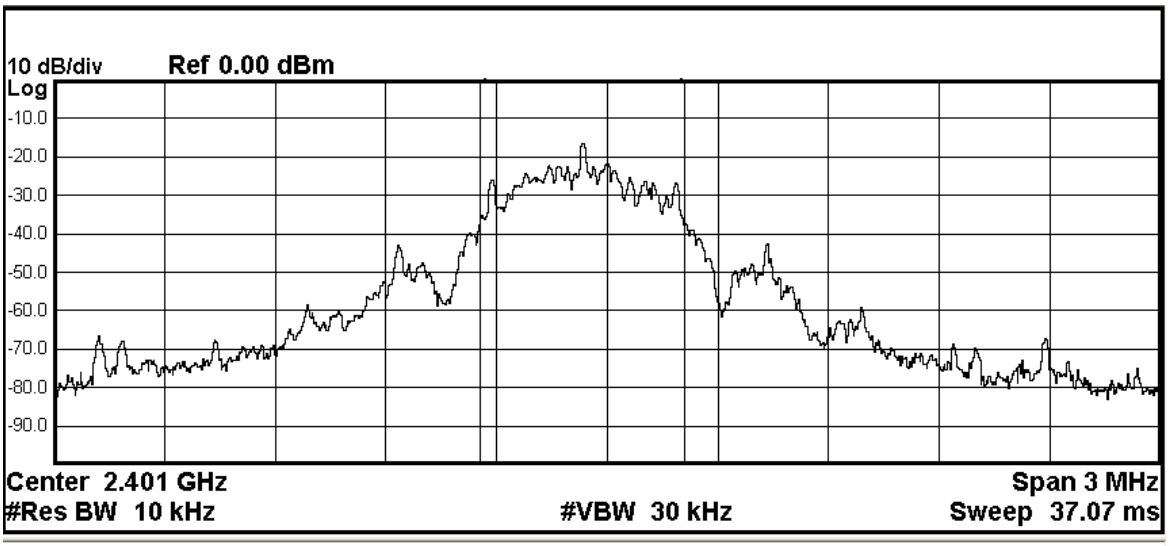
Limits for 20dB Bandwidth of Fundamental Emission:

Frequency Range [MHz]	20dB Bandwidth [MHz]
2401.31	0.549

Tx Mode: Port 0 (External Antenna), MSK mode (Lowest Channel)

20dB Bandwidth of Fundamental Emission



Occupied Bandwidth	549.11 kHz	Total Power	-8.34 dBm
Transmit Freq Error	-64.564 kHz	OBW Power	99.00 %
x dB Bandwidth	548.6 kHz	x dB	-20.00 dB

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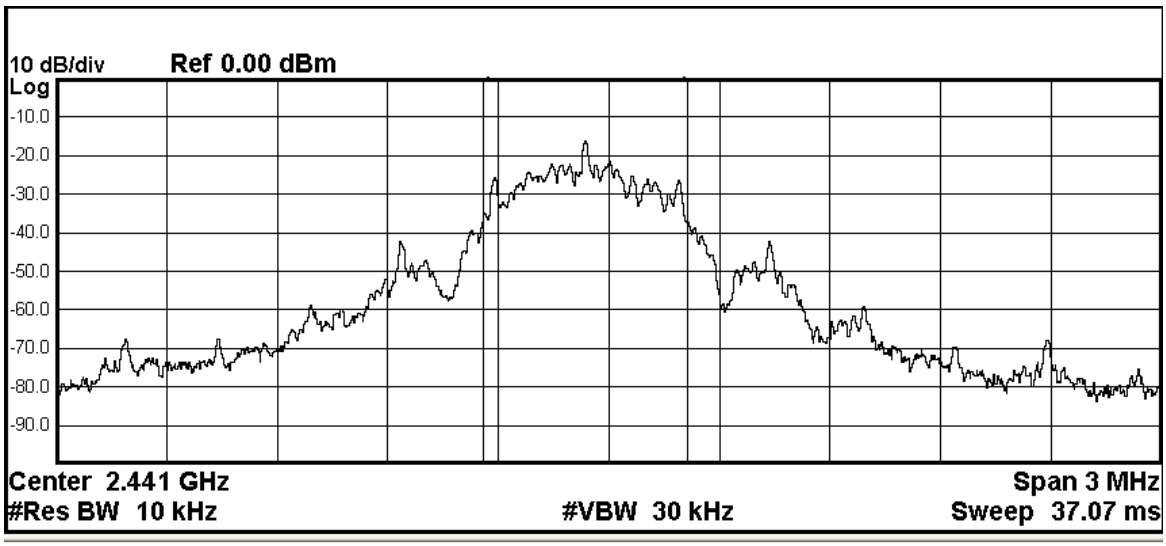
Frequency Range [MHz]	20dB Bandwidth [MHz]
2441.21	0.548

Tx Mode: Port 0 (External Antenna), MSK mode (Middle Channel)

20dB Bandwidth of Fundamental Emission



Occupied Bandwidth	549.36 kHz	Total Power	-8.21 dBm
Transmit Freq Error	-62.847 kHz	OBW Power	99.00 %
x dB Bandwidth	548.3 kHz	x dB	-20.00 dB

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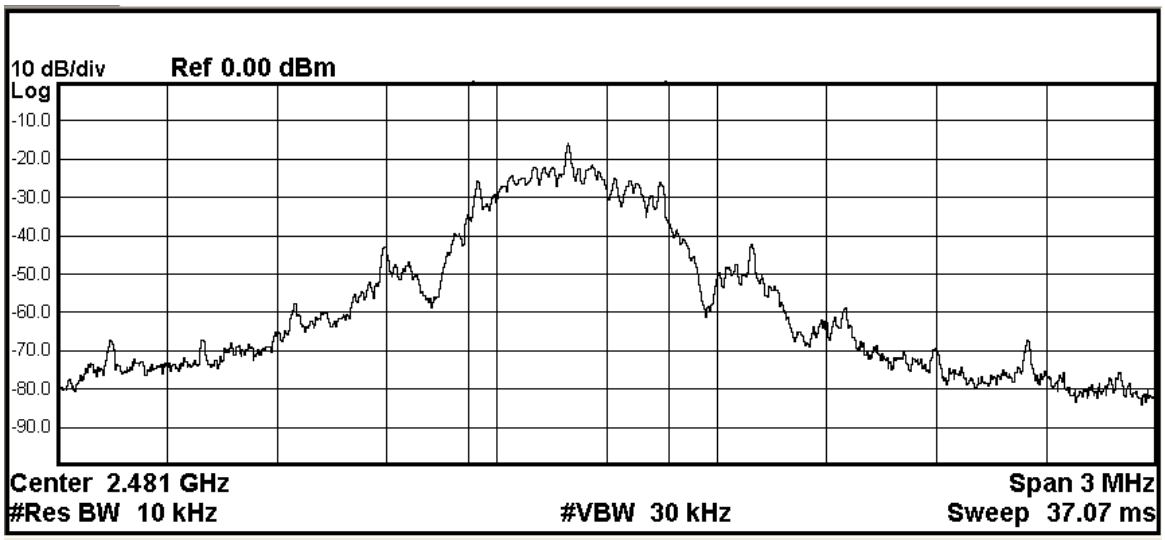
Frequency Range [MHz]	20dB Bandwidth [MHz]
2481.12	0.547

Tx Mode: Port 0 (External Antenna), MSK mode Highest Channel

20dB Bandwidth of Fundamental Emission



Occupied Bandwidth	548.56 kHz	Total Power	-8.00 dBm
Transmit Freq Error	-104.19 kHz	OBW Power	99.00 %
x dB Bandwidth	547.3 kHz	x dB	-20.00 dB

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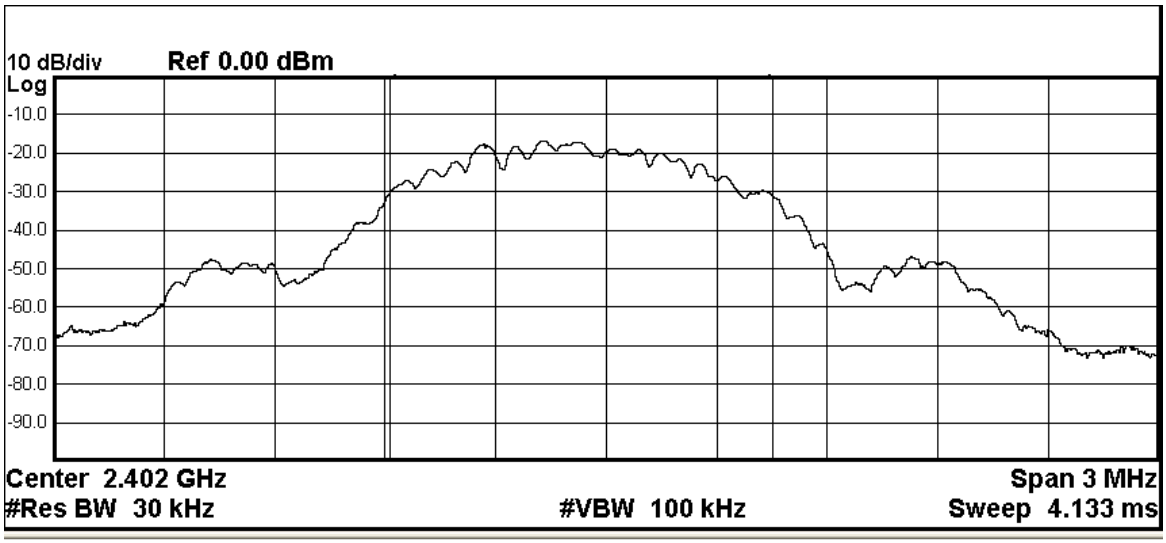
Frequency Range [MHz]	20dB Bandwidth [MHz]
2402.0	1.032

Tx Mode: Port 0 (External Antenna), FSK mode (Lowest Channel)

20dB Bandwidth of Fundamental Emission



Occupied Bandwidth	1.0318 MHz	Total Power	-6.06 dBm
Transmit Freq Error	-66.554 kHz	OBW Power	99.00 %
x dB Bandwidth	1.151 MHz	x dB	-20.00 dB

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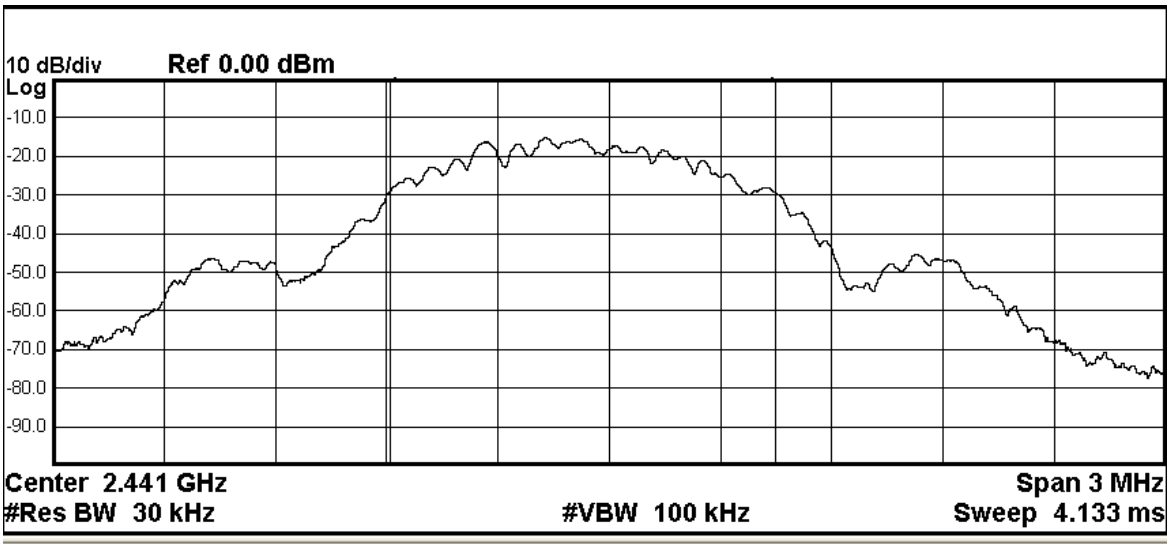
Frequency Range [MHz]	20dB Bandwidth [MHz]
2441.0	1.150

Tx Mode: Port 0 (External Antenna), FSK mode (Middle Channel)

20dB Bandwidth of Fundamental Emission



Occupied Bandwidth	1.0326 MHz	Total Power	-4.58 dBm
Transmit Freq Error	-68.096 kHz	OBW Power	99.00 %
x dB Bandwidth	1.150 MHz	x dB	-20.00 dB

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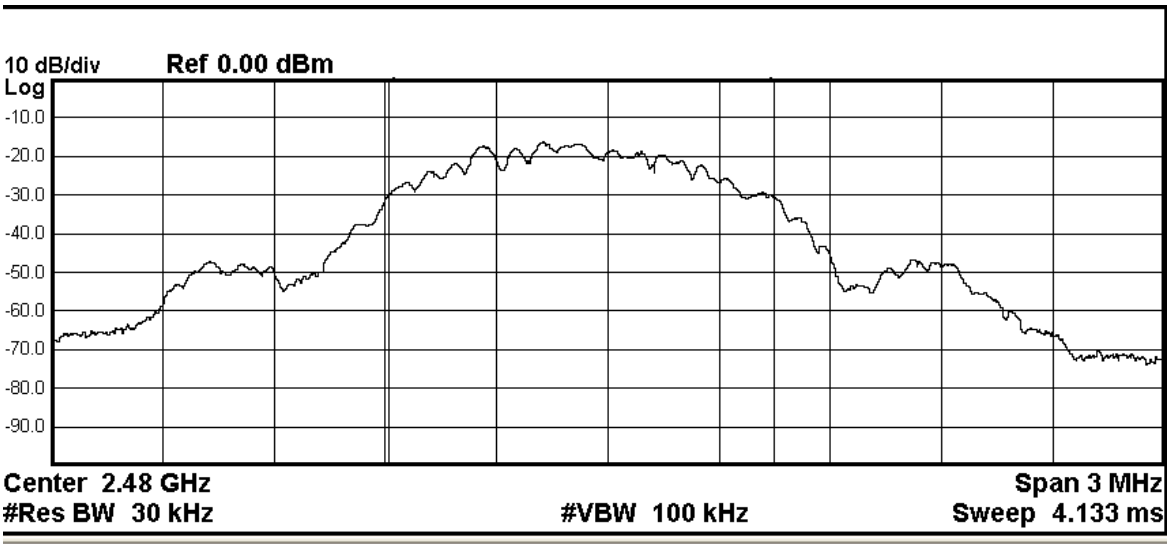
Frequency Range [MHz]	20dB Bandwidth [MHz]
2480.0	1.145

Tx Mode: Port 0 (External Antenna), FSK mode Highest Channel

20dB Bandwidth of Fundamental Emission



Occupied Bandwidth	1.0326 MHz	Total Power	-5.77 dBm
Transmit Freq Error	-69.290 kHz	OBW Power	99.00 %
x dB Bandwidth	1.145 MHz	x dB	-20.00 dB

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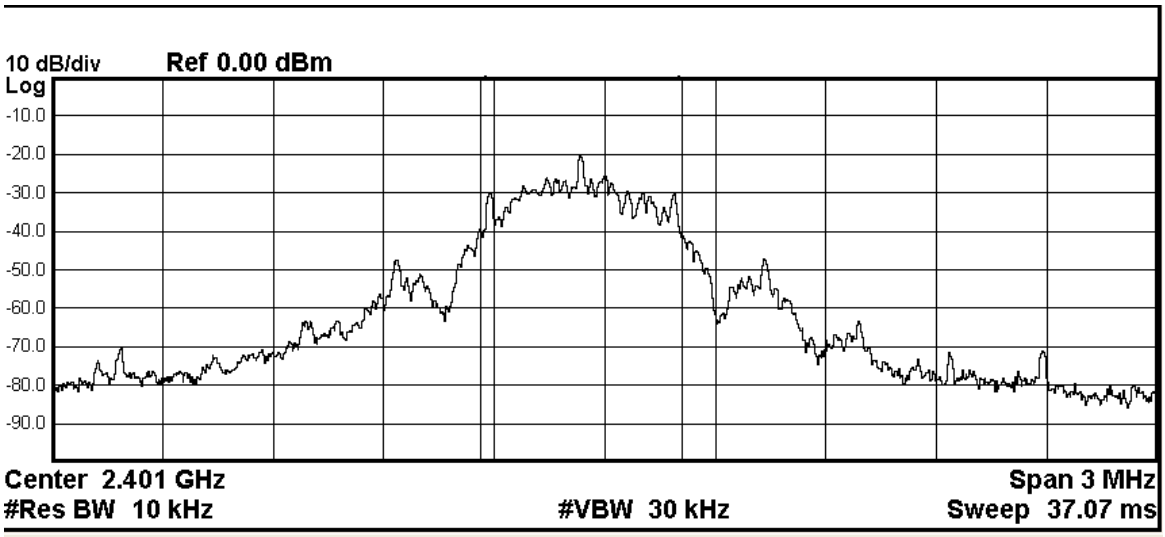
Frequency Range [MHz]	20dB Bandwidth [MHz]
2401.31	0.547

Tx Mode: Port 1 (Integral Antenna), MSK mode (Lowest Channel)

20dB Bandwidth of Fundamental Emission



Occupied Bandwidth	549.56 kHz	Total Power	-12.3 dBm
Transmit Freq Error	-63.944 kHz	OBW Power	99.00 %
x dB Bandwidth	547.0 kHz	x dB	-20.00 dB

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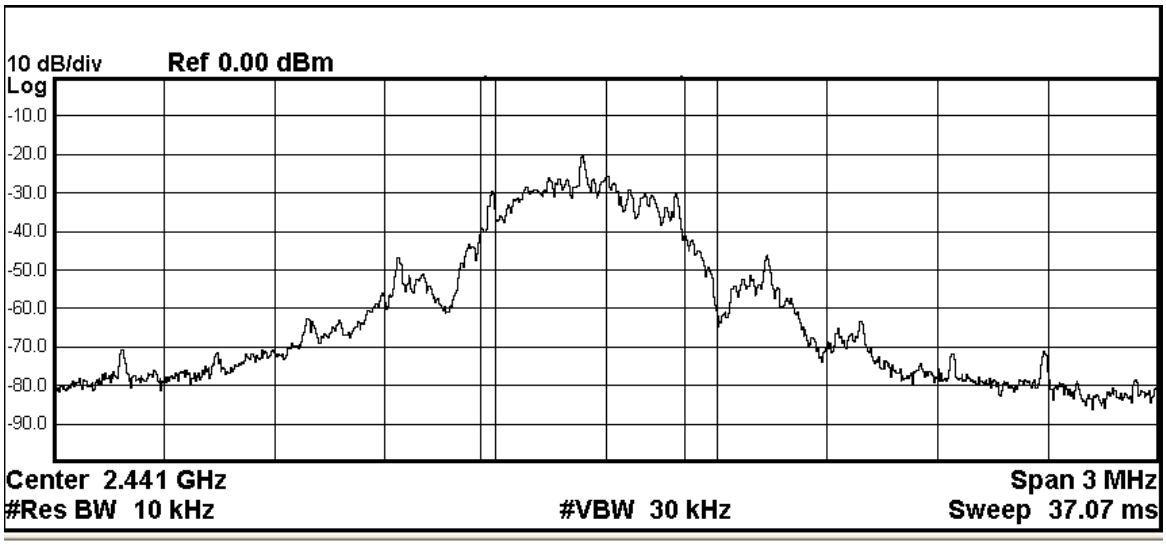
Frequency Range [MHz]	20dB Bandwidth [MHz]
2441.21	0.548

Tx Mode: Port 1 (Integral Antenna), MSK mode (Middle Channel)

20dB Bandwidth of Fundamental Emission



Occupied Bandwidth	551.12 kHz	Total Power	-12.2 dBm
Transmit Freq Error	-61.981 kHz	OBW Power	99.00 %
x dB Bandwidth	548.0 kHz	x dB	-20.00 dB

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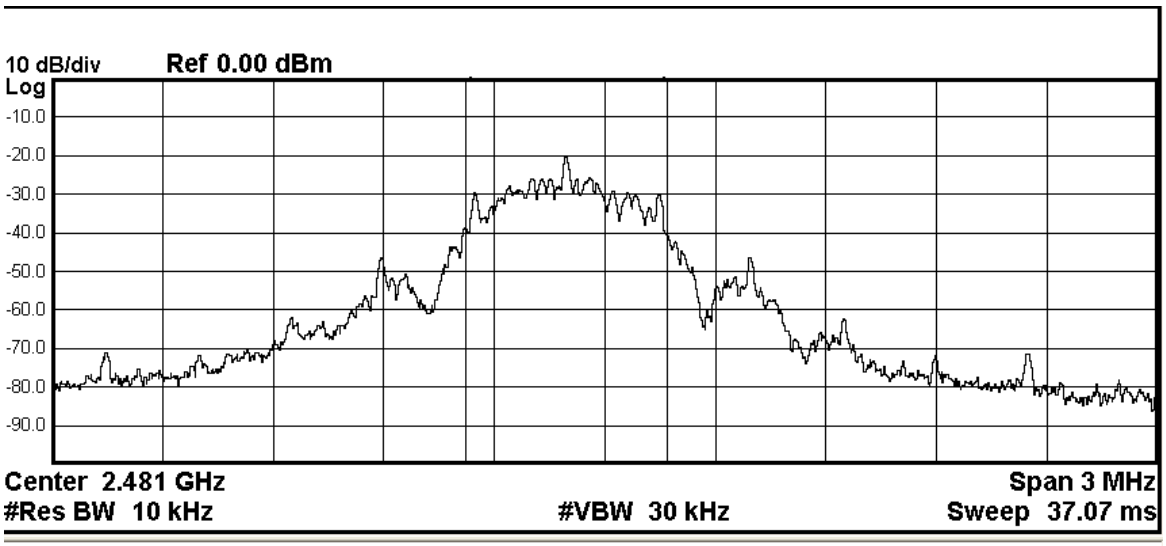
Frequency Range [MHz]	20dB Bandwidth [MHz]
2481.12	0.548

Tx Mode: Port 1 (Integral Antenna), MSK mode Highest Channel

20dB Bandwidth of Fundamental Emission



Occupied Bandwidth	549.23 kHz	Total Power	-11.9 dBm
Transmit Freq Error	-104.32 kHz	OBW Power	99.00 %
x dB Bandwidth	547.6 kHz	x dB	-20.00 dB

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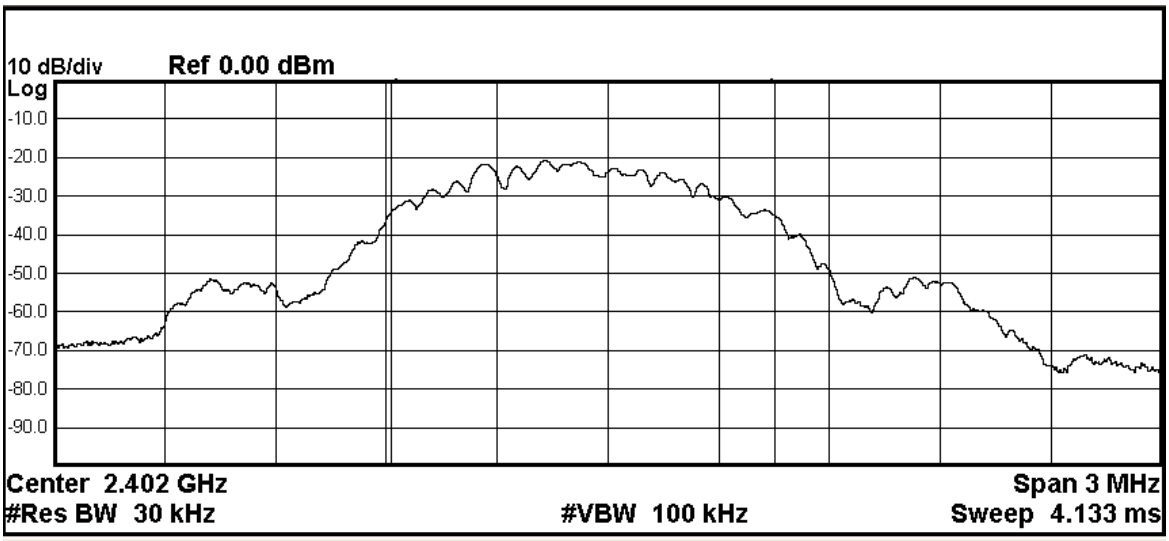
Frequency Range [MHz]	20dB Bandwidth [MHz]
2402.0	1.15

Tx Mode: Port 1 (Integral Antenna), FSK mode (Lowest Channel)

20dB Bandwidth of Fundamental Emission



Occupied Bandwidth	1.0324 MHz	Total Power	-10.1 dBm
Transmit Freq Error	-66.781 kHz	OBW Power	99.00 %
x dB Bandwidth	1.151 MHz	x dB	-20.00 dB

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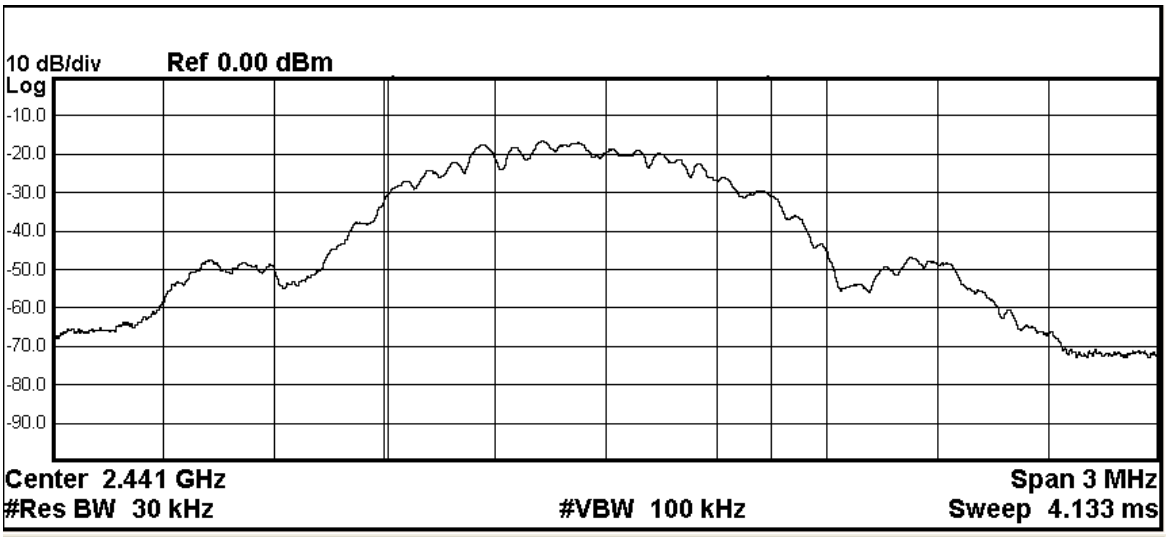
Frequency Range [MHz]	20dB Bandwidth [MHz]
2441.0	1.150

Tx Mode: Port 1 (Integral Antenna), FSK mode (Middle Channel)

20dB Bandwidth of Fundamental Emission



Occupied Bandwidth	1.0323 MHz	Total Power	-5.97 dBm
Transmit Freq Error	-67.891 kHz	OBW Power	99.00 %
x dB Bandwidth	1.150 MHz	x dB	-20.00 dB

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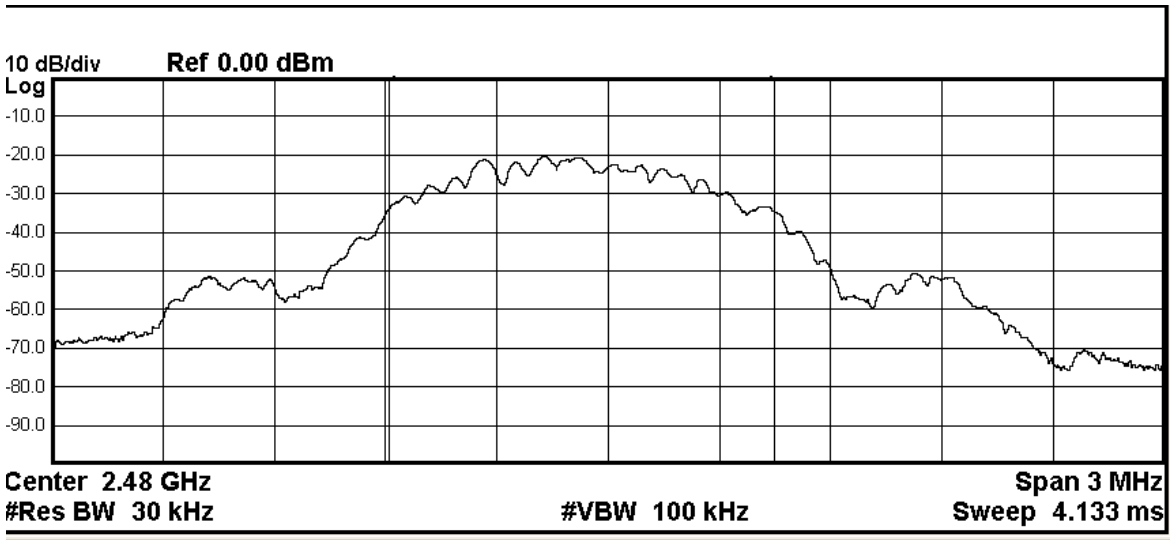
Frequency Range [MHz]	20dB Bandwidth [MHz]
2480.0	1.15

Tx Mode: Port 1 (Integral Antenna), FSK mode Highest Channel

20dB Bandwidth of Fundamental Emission



Occupied Bandwidth	1.0331 MHz	Total Power	-9.68 dBm
Transmit Freq Error	-69.088 kHz	OBW Power	99.00 %
x dB Bandwidth	1.151 MHz	x dB	-20.00 dB

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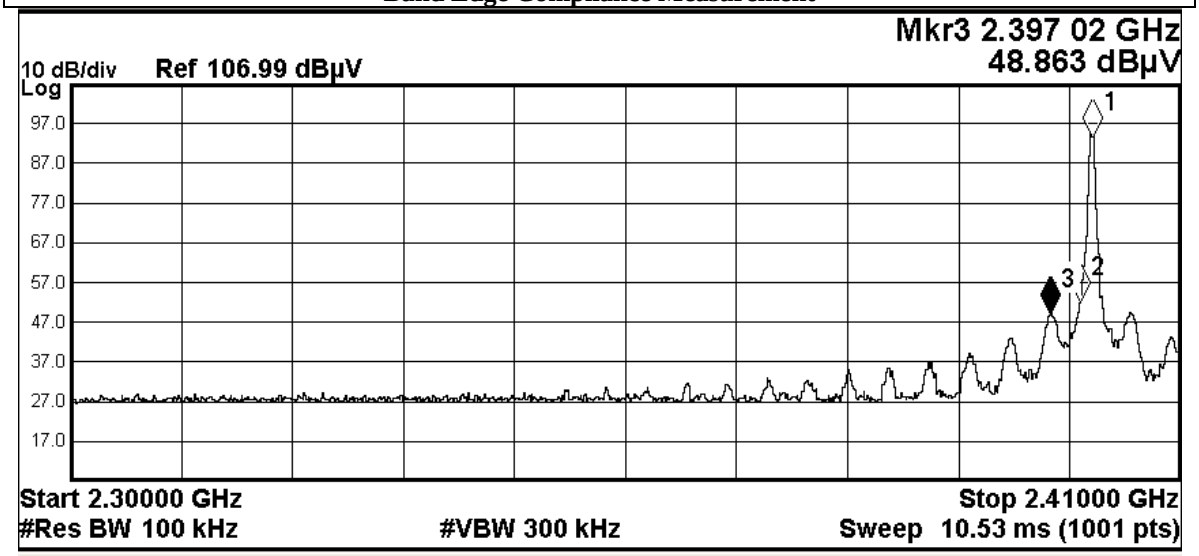
Band Edge Measurement:

Frequency Range [MHz]	Radiated Emission Attenuated below the Fundamental [dB]
2400MHz – Lowest Fundamental	41.6

Tx Mode: Port 0 (External Antenna), MSK mode

Band Edge Compliance Measurement



MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	N	1	f	2.401 20 GHz	93.632 dBµV			
2	N	1	f	2.400 00 GHz	51.998 dBµV			
3	N	1	f	2.397 02 GHz	48.863 dBµV			
4								

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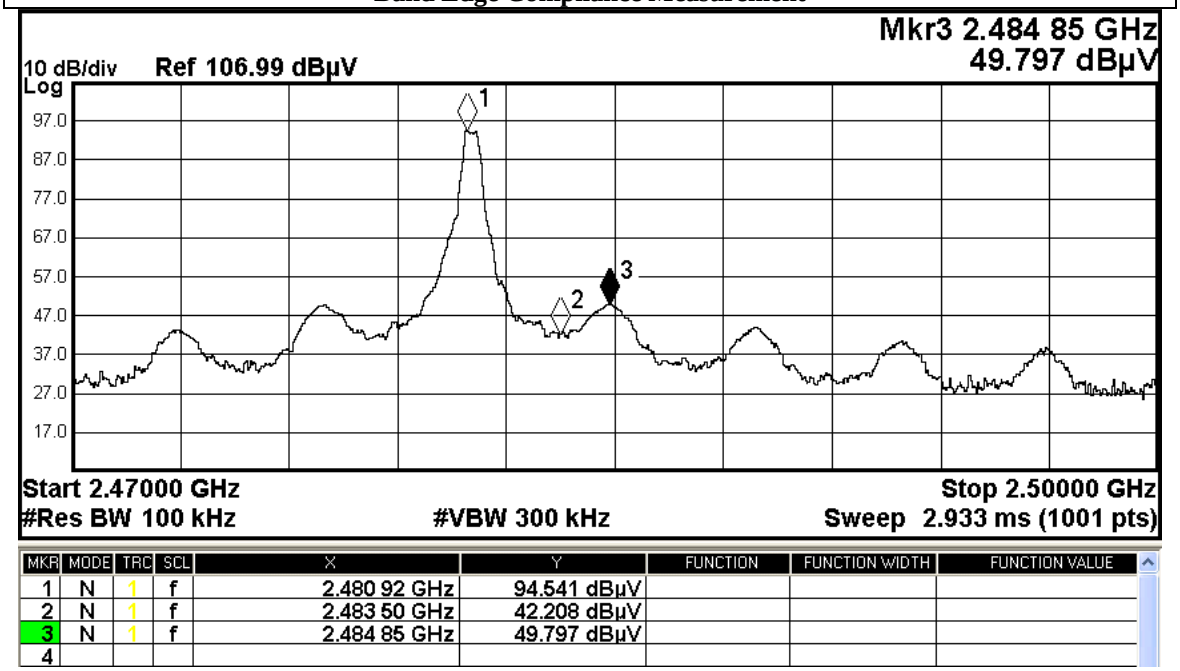
Band Edge Measurement:

Frequency Range [MHz]	Radiated Emission Attenuated below the Fundamental [dB]
Highest Fundamental – 2483.5MHz	52.3

Tx Mode: Port 0 (External Antenna), MSK mode

Band Edge Compliance Measurement



MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	N	1	f	2.480 92 GHz	94.541 dBµV			
2	N	1	f	2.483 50 GHz	42.208 dBµV			
3	N	1	f	2.484 85 GHz	49.797 dBµV			
4								

Result of Tx Mode: Port 0 (External Antenna), MSK mode, Band-edge measurement: PASS

Field Strength of Fundamental and Harmonics Emissions Peak Value						
Frequency MHz	Measured Level @3m dBµV/m	Correction Factor dBµV/m	Field Strength dBµV/m	Field Strength µV/m	Limit @3m µV/m	E-Field Polarity
2389.5	23.3	27.9	51.2	363.1	5,000	Vertical
2487.7	27.5	27.9	55.4	588.8	5,000	Vertical

Field Strength of Fundamental and Harmonics Emissions Average Value						
Frequency MHz	Measured Level @3m dBµV/m	Correction Factor dBµV/m	Field Strength dBµV/m	Field Strength µV/m	Limit @3m µV/m	E-Field Polarity
2389.5	12.8	27.9	40.7	108.4	500	Vertical
2487.7	16.4	27.9	44.3	164.1	500	Vertical

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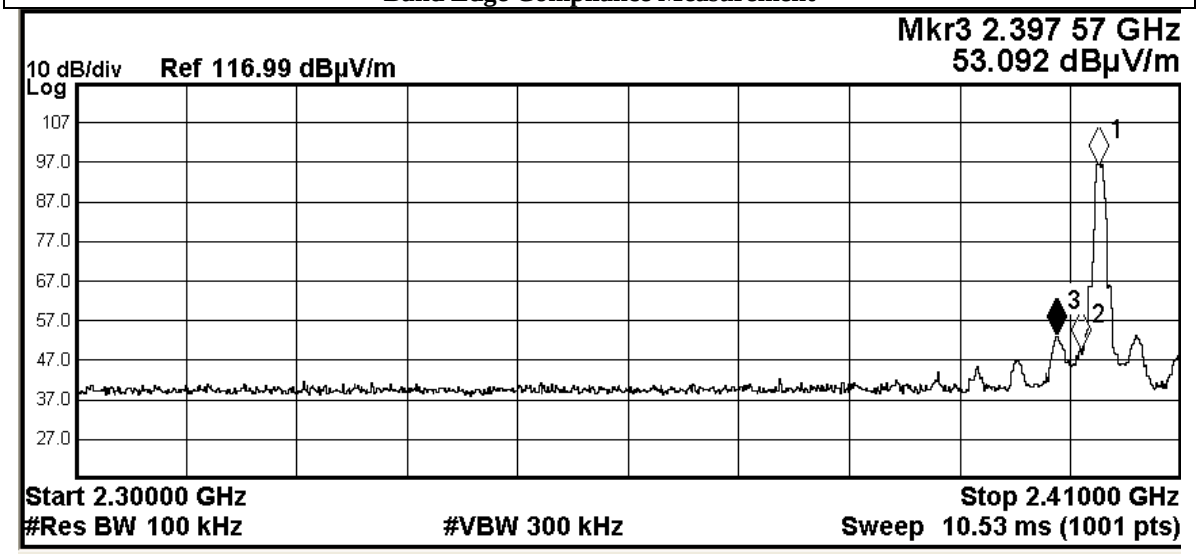
Band Edge Measurement:

Frequency Range [MHz]	Radiated Emission Attenuated below the Fundamental [dB]
2400MHz – Lowest Fundamental	46.5

Tx Mode: Port 0 (External Antenna), FSK mode

Band Edge Compliance Measurement



MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	N	1	f	2.401 75 GHz	96.321 dBµV/m			
2	N	1	f	2.400 00 GHz	49.776 dBµV/m			
3	N	1	f	2.397 57 GHz	53.092 dBµV/m			
4								

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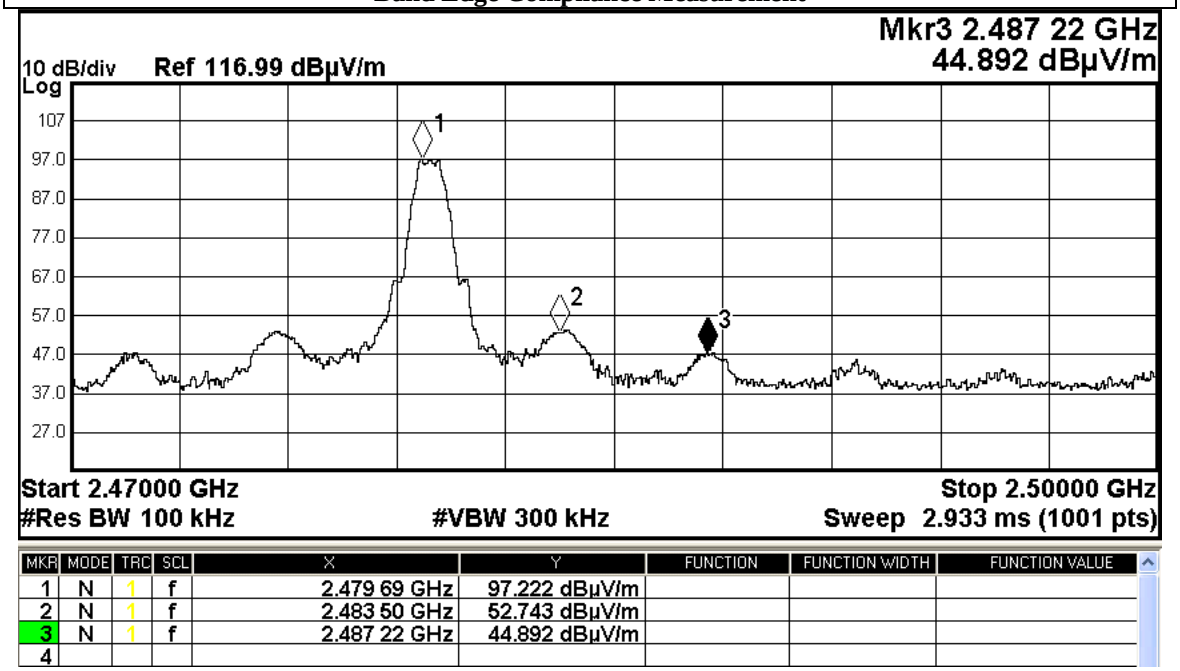
Band Edge Measurement:

Frequency Range [MHz]	Radiated Emission Attenuated below the Fundamental [dB]
Highest Fundamental – 2483.5MHz	36.0

Tx Mode: Port 0 (External Antenna), FSK mode

Band Edge Compliance Measurement



MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	N	1	f	2.479 69 GHz	97.222 dBµV/m			
2	N	1	f	2.483 50 GHz	52.743 dBµV/m			
3	N	1	f	2.487 22 GHz	44.892 dBµV/m			
4								

Result of Tx Mode: Port 0 (External Antenna), FSK mode, Band-edge measurement: PASS

Field Strength of Fundamental and Harmonics Emissions Peak Value						
Frequency MHz	Measured Level @3m dBµV/m	Correction Factor dBµV/m	Field Strength dBµV/m	Field Strength µV/m	Limit @3m µV/m	E-Field Polarity
2389.5	23.3	27.9	51.2	363.1	5,000	Vertical
2487.7	27.5	27.9	55.4	588.8	5,000	Vertical

Field Strength of Fundamental and Harmonics Emissions Average Value						
Frequency MHz	Measured Level @3m dBµV/m	Correction Factor dBµV/m	Field Strength dBµV/m	Field Strength µV/m	Limit @3m µV/m	E-Field Polarity
2389.5	12.8	27.9	40.7	108.4	500	Vertical
2487.7	16.4	27.9	44.3	164.1	500	Vertical

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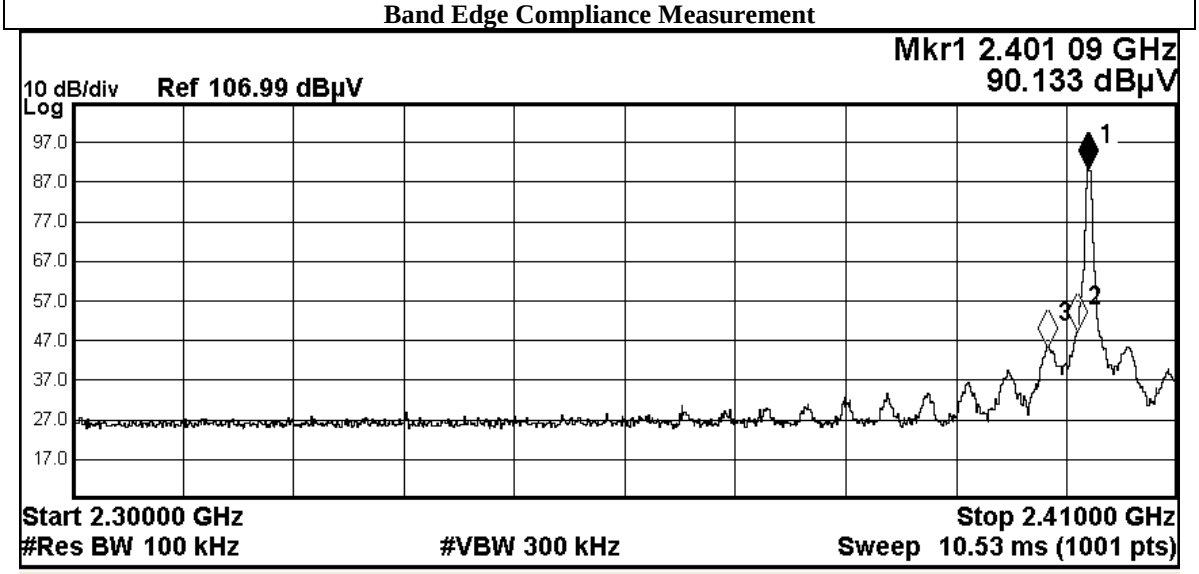
Band Edge Measurement:

Frequency Range [MHz]	Radiated Emission Attenuated below the Fundamental [dB]
2400MHz – Lowest Fundamental	40.9

Tx Mode: Port 1 (Internal Antenna), MSK mode

Band Edge Compliance Measurement



MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	N	1	f	2.401 09 GHz	90.133 dBµV			
2	N	1	f	2.400 00 GHz	49.225 dBµV			
3	N	1	f	2.397 02 GHz	45.194 dBµV			
4								

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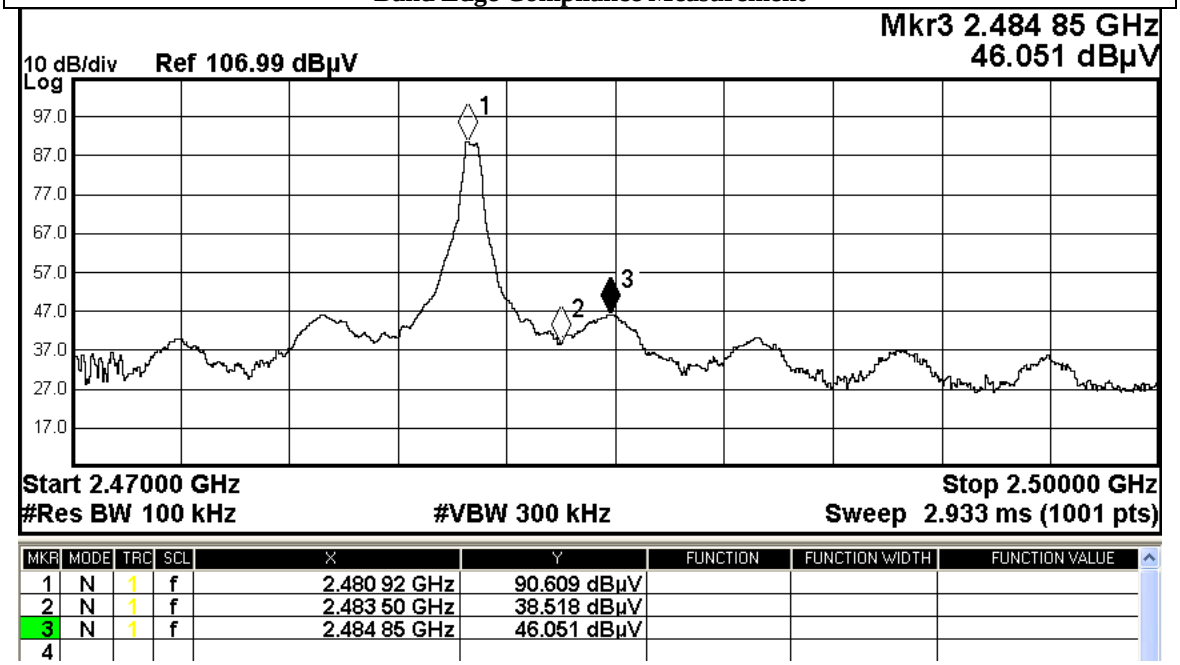
Band Edge Measurement:

Frequency Range [MHz]	Radiated Emission Attenuated below the Fundamental [dB]
Highest Fundamental – 2483.5MHz	52.1

Tx Mode: Port 1 (Internal Antenna), MSK mode

Band Edge Compliance Measurement



MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	N	1	f	2.480 92 GHz	90.609 dBµV			
2	N	1	f	2.483 50 GHz	38.518 dBµV			
3	N	1	f	2.484 85 GHz	46.051 dBµV			
4								

Result of Tx Mode: Port 1 (Internal Antenna), MSK mode, Band-edge measurement: PASS

Field Strength of Fundamental and Harmonics Emissions
Peak Value

Frequency MHz	Measured Level @3m dBµV/m	Correction Factor dBµV/m	Field Strength dBµV/m	Field Strength µV/m	Limit @3m µV/m	E-Field Polarity
2397.0	17.3	27.9	45.2	182.0	5,000	Vertical
2484.9	18.2	27.9	46.1	201.8	5,000	Vertical

Field Strength of Fundamental and Harmonics Emissions
Average Value

Frequency MHz	Measured Level @3m dBµV/m	Correction Factor dBµV/m	Field Strength dBµV/m	Field Strength µV/m	Limit @3m µV/m	E-Field Polarity
2389.5	8.3	27.9	36.2	64.6	500	Vertical
2484.9	9.7	27.9	37.6	75.9	500	Vertical

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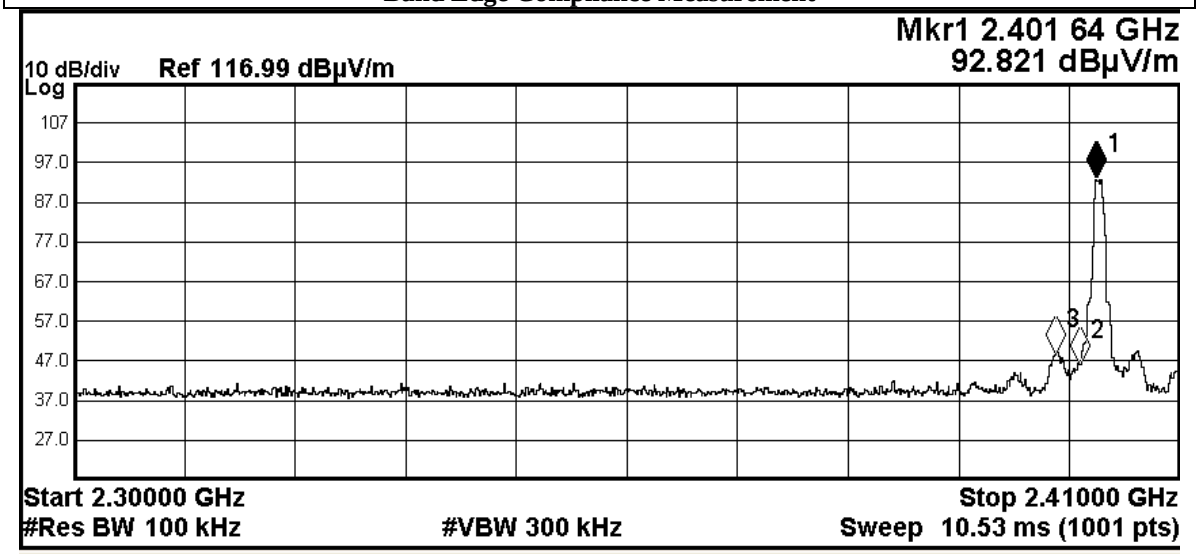
Band Edge Measurement:

Frequency Range [MHz]	Radiated Emission Attenuated below the Fundamental [dB]
2400MHz – Lowest Fundamental	46.9

Tx Mode: Port 1 (Internal Antenna), FSK mode

Band Edge Compliance Measurement



MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	N	1	f	2.401 64 GHz	92.821 dBµV/m			
2	N	1	f	2.400 00 GHz	45.955 dBµV/m			
3	N	1	f	2.397 57 GHz	48.602 dBµV/m			
4								

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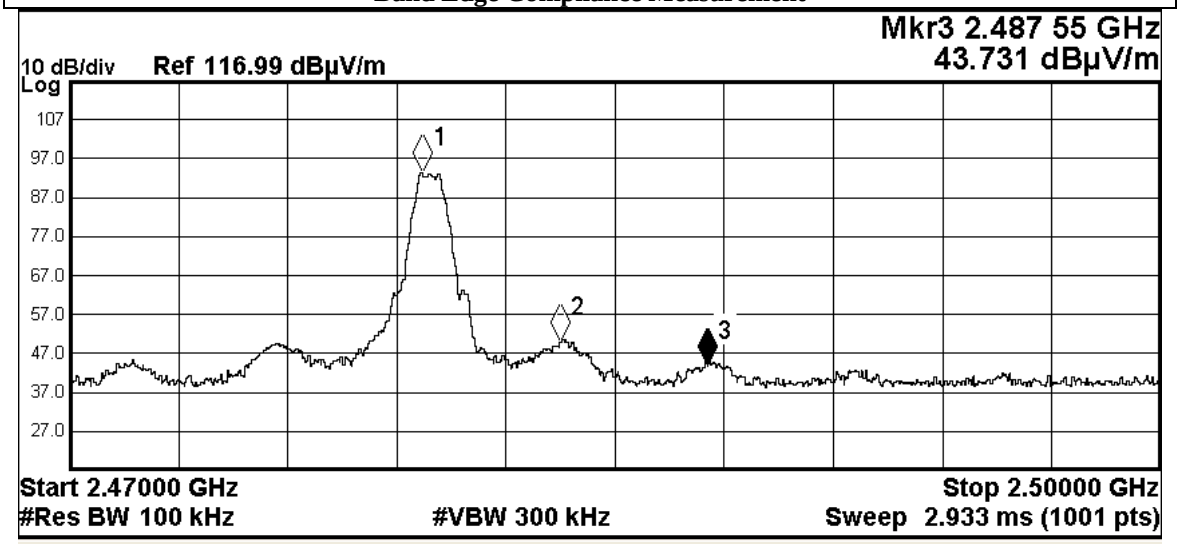
Band Edge Measurement:

Frequency Range [MHz]	Radiated Emission Attenuated below the Fundamental [dB]
Highest Fundamental – 2483.5MHz	43.4

Tx Mode: Port 1 (External Antenna), FSK mode

Band Edge Compliance Measurement



MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	N	1	f	2.479 69 GHz	93.391 dBµV/m			
2	N	1	f	2.483 50 GHz	49.992 dBµV/m			
3	N	1	f	2.487 55 GHz	43.731 dBµV/m			
4								

Result of Tx Mode: Port 1 (Internal Antenna), FSK mode, Band-edge measurement: PASS

Field Strength of Fundamental and Harmonics Emissions Peak Value						
Frequency MHz	Measured Level @3m dBµV/m	Correction Factor dBµV/m	Field Strength dBµV/m	Field Strength µV/m	Limit @3m µV/m	E-Field Polarity
2397.6	20.7	27.9	48.6	269.2	5,000	Vertical
2487.6	15.8	27.9	43.7	153.1	5,000	Vertical

Field Strength of Fundamental and Harmonics Emissions Average Value						
Frequency MHz	Measured Level @3m dBµV/m	Correction Factor dBµV/m	Field Strength dBµV/m	Field Strength µV/m	Limit @3m µV/m	E-Field Polarity
2389.5	8.9	27.9	36.8	69.2	500	Vertical
2487.7	6.8	27.9	34.7	54.3	500	Vertical

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Limits for Radiated Emissions [FCC 47 CFR 15.209]:

Frequency Range [MHz]	Quasi-Peak Limits [μV/m]
0.009-0.490	2400/F (kHz)
0.490-1.705	24000/F (kHz)
1.705-30	30
30-88	100
88-216	150
216-960	200
Above960	500

The emission limits shown in the above table are based on measurement employing a CISPR quasi-peak detector and above 1000MHz are based on measurements employing an average detector.

Remarks: Preliminary tests were performed in different data rate to find the worst radiated emission. The data rate in the table below is the worst case rate with respect to the specific test item.
Investigation has been done on all the possible configurations for searching the worst cases.

Result of TX mode, (9kHz – 30MHz): PASS
Emissions detected are more than 20 dB below the FCC Limits

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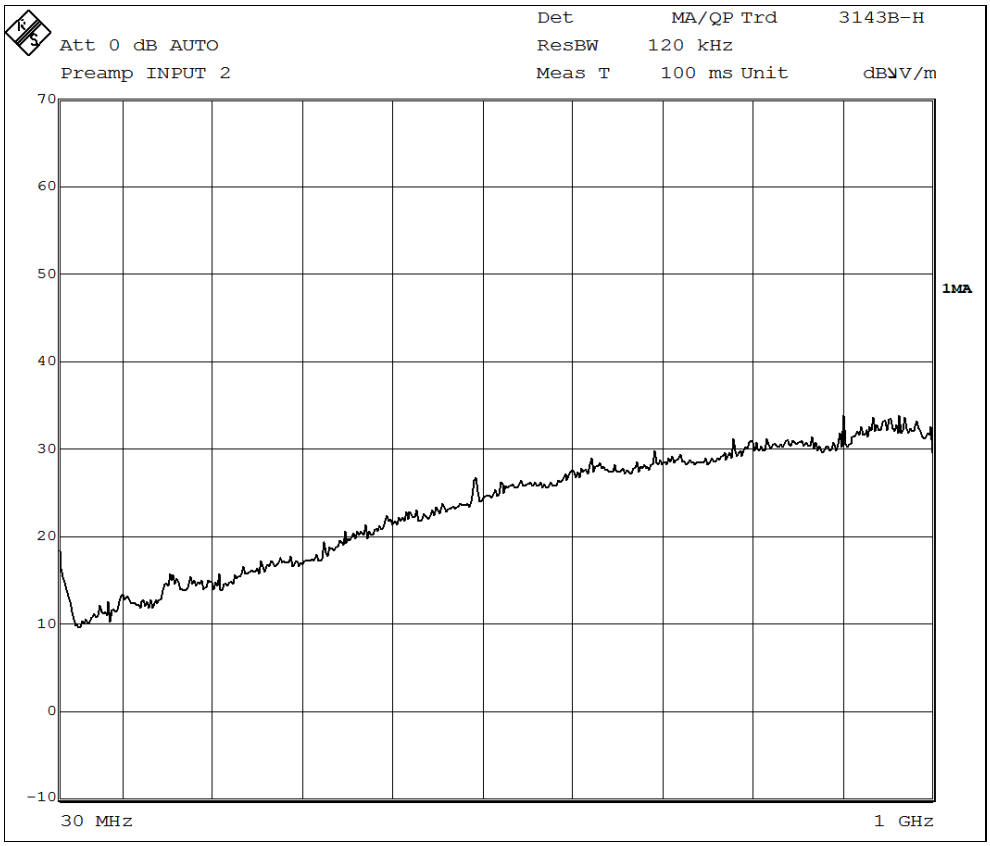
Result of TX mode (30MHz – 1GHz): PASS



Field Strength of Fundamental and Harmonics Emissions Quasi-Peak Value						
Frequency MHz	Measured Level @3m dBµV/m	Correction Factor dBµV/m	Field Strength dBµV/m	Field Strength µV/m	Limit @3m µV/m	E-Field Polarity
38.4	9.8	7.5	17.3	7.3	100	Horizontal
111.4	5.4	8.4	13.8	4.9	150	Horizontal
224.5	4.8	10.5	15.3	5.8	150	Horizontal
387.4	6.8	18.2	25.0	17.8	200	Horizontal
512.8	3.4	21.2	24.6	17.0	200	Horizontal
598.4	2.3	21.1	23.4	14.8	200	Horizontal
32.4	8.7	8.1	16.8	6.9	100	Vertical
90.3	6.3	8.9	15.2	5.8	150	Vertical

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Result of Receiver mode, (9kHz – 30MHz): N/A

Result of Receiver mode, (30MHz – 1GHz): N/A

Result of Receiver mode, (1GHz – 18GHz): N/A

Remarks:

No additional spurious emissions found between lowest internal used/generated frequency and 30 MHz
Correction Factor included Antenna Factor and Cable Attenuation.

Calculated measurement uncertainty	:	(9kHz – 30MHz):	2.4dB
		(30MHz – 18GHz):	5.0dB
		(18GHz - 26GHz):	5.24dB

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3.1.3 Antenna Requirement

Ambient temperature 21°C Relative humidity 50%

Test Requirements: § 15.203

Test Specification:

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

Test Results:

There are 2 antennae, for port 0 which is mounted on the enclosure of the EUT, the antenna gain = 13dBi, for port 1, which is a PCB printed inverted F antenna, the antenna gain = 3.3dBi. There is no external antenna port. User is unable to remove or changed the Antenna.

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Appendix A

LIST OF MEASUREMENT EQUIPMENT

Radiated Emission

EQP NO.	DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	LAST CAL	DUE CAL
EM215	MULTIDEVICE CONTROLLER	EMCO	2090	00024676	N/A	N/A
EM217	ELECTRIC POWERED TURNTABLE	EMCO	2088	00029144	N/A	N/A
EM218	ANECHOIC CHAMBER	ETS-LINDGREN	FACT-3	--	2019/04/24	2020/04/24
EM356	ANTENNA POSITIONING TOWER	ETS-LINDGREN	2171B	00150346	N/A	N/A
EM355	BICONILOG ANTENNA	ETS-LINDGREN	3143B	00201783	2019/03/11	2021/03/11
EM229	EMI TEST RECEIVER	R&S	ESIB40	100248	2019/06/11	2020/06/11
EM299	DOUBLE-RIDGED WAVEGUIDE HORN ANTENNA	ETS-LINDGREN	3115	00114120	2018/04/27	2020/04/27
EM300	PYRAMIDAL STANDARD GAIN HORN ANTENNA	ETS-LINDGREN	3160-09	00130130	2018/05/13	2020/05/13
EM353	LOOP ANTENNA	ETS_LINDGREN	6502	00206533	2018/03/16	2020/03/16

Remarks:

CM Corrective Maintenance
N/A Not Applicable or Not Available
TBD To Be Determined

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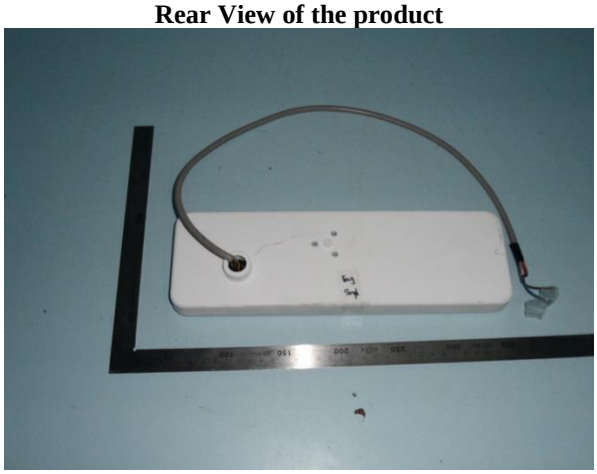
Appendix B

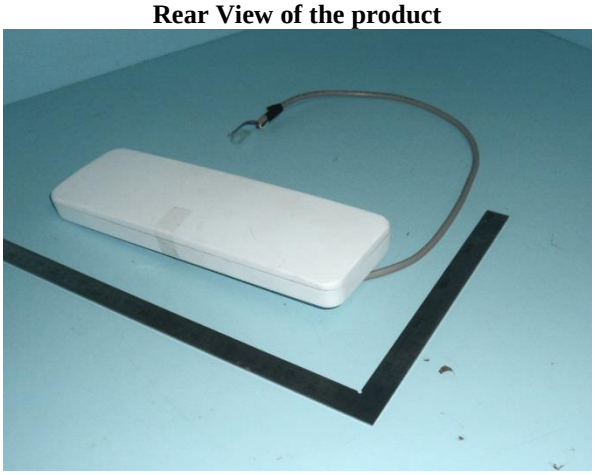
Photographs of EUT

Front View of the product

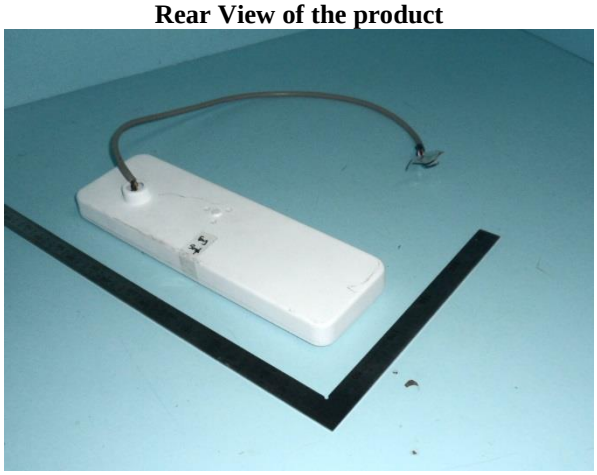
Rear View of the product



Rear View of the product



Rear View of the product



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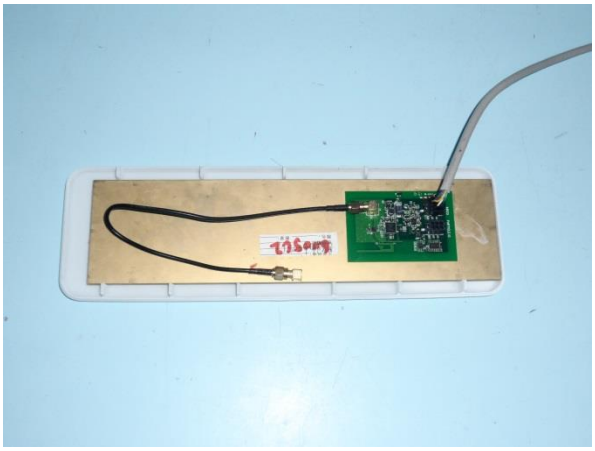
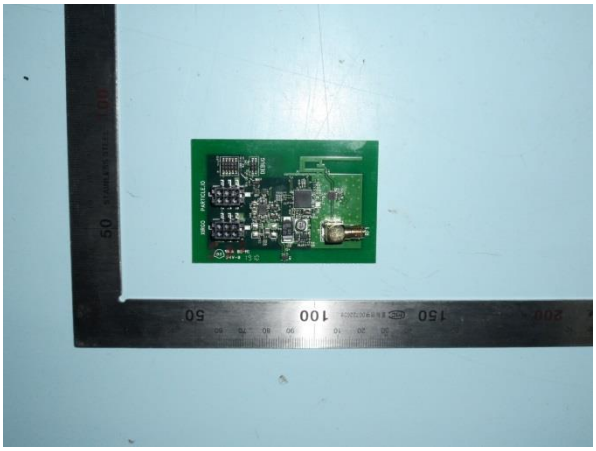
Photographs of EUT

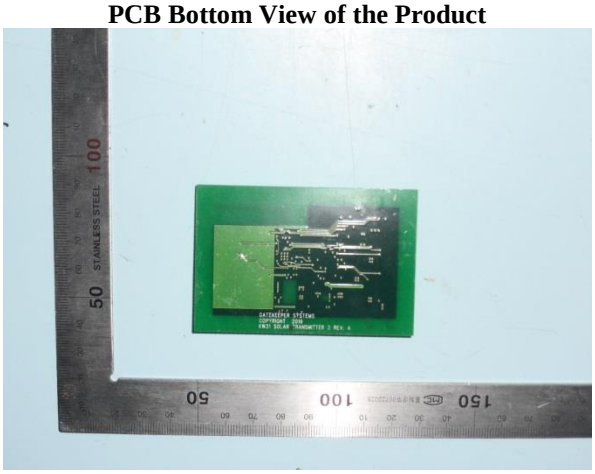
Inner View of the Product



PCB Front View of the Product



PCB Bottom View of the Product



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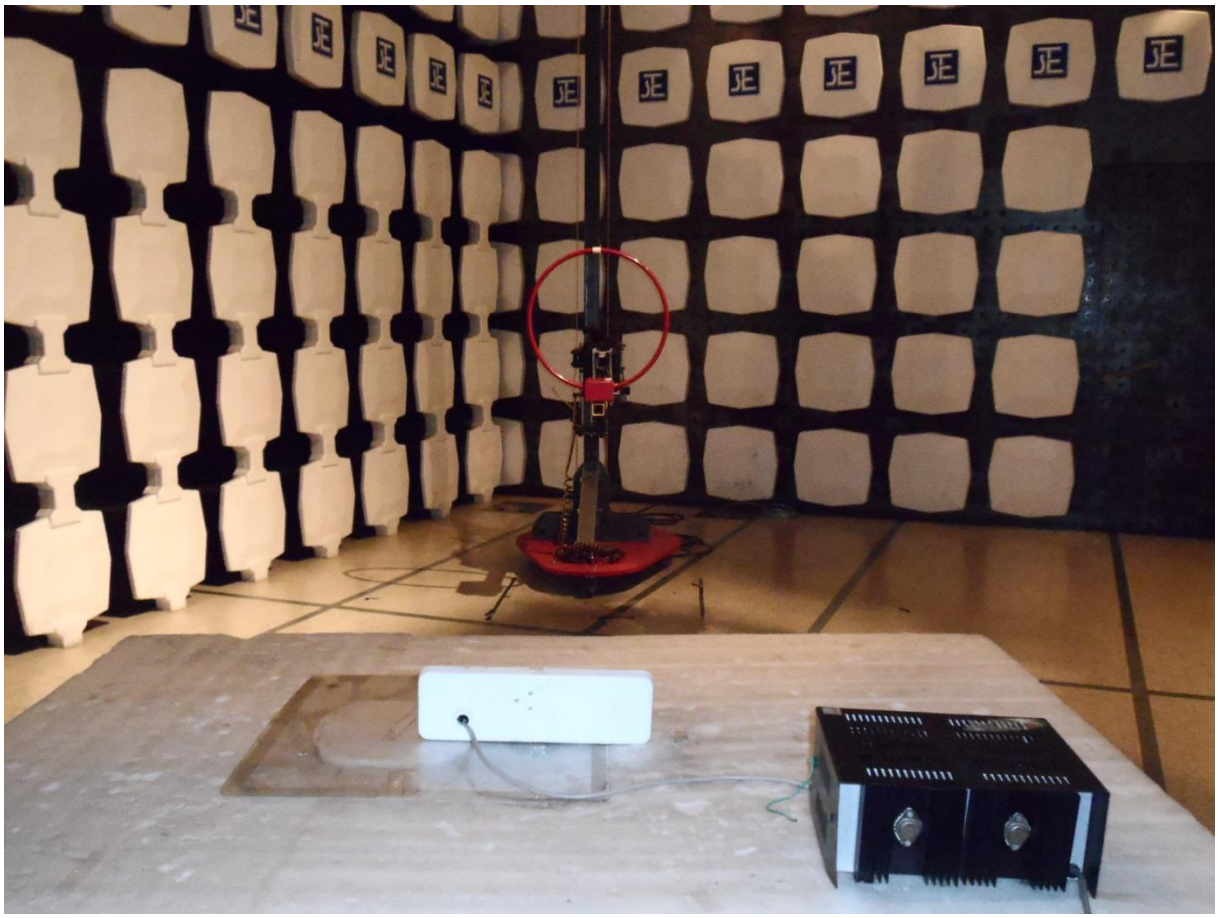
Photographs of EUT

Measurement of Radiated Emission Test Set Up (9kHz to 30MHz)



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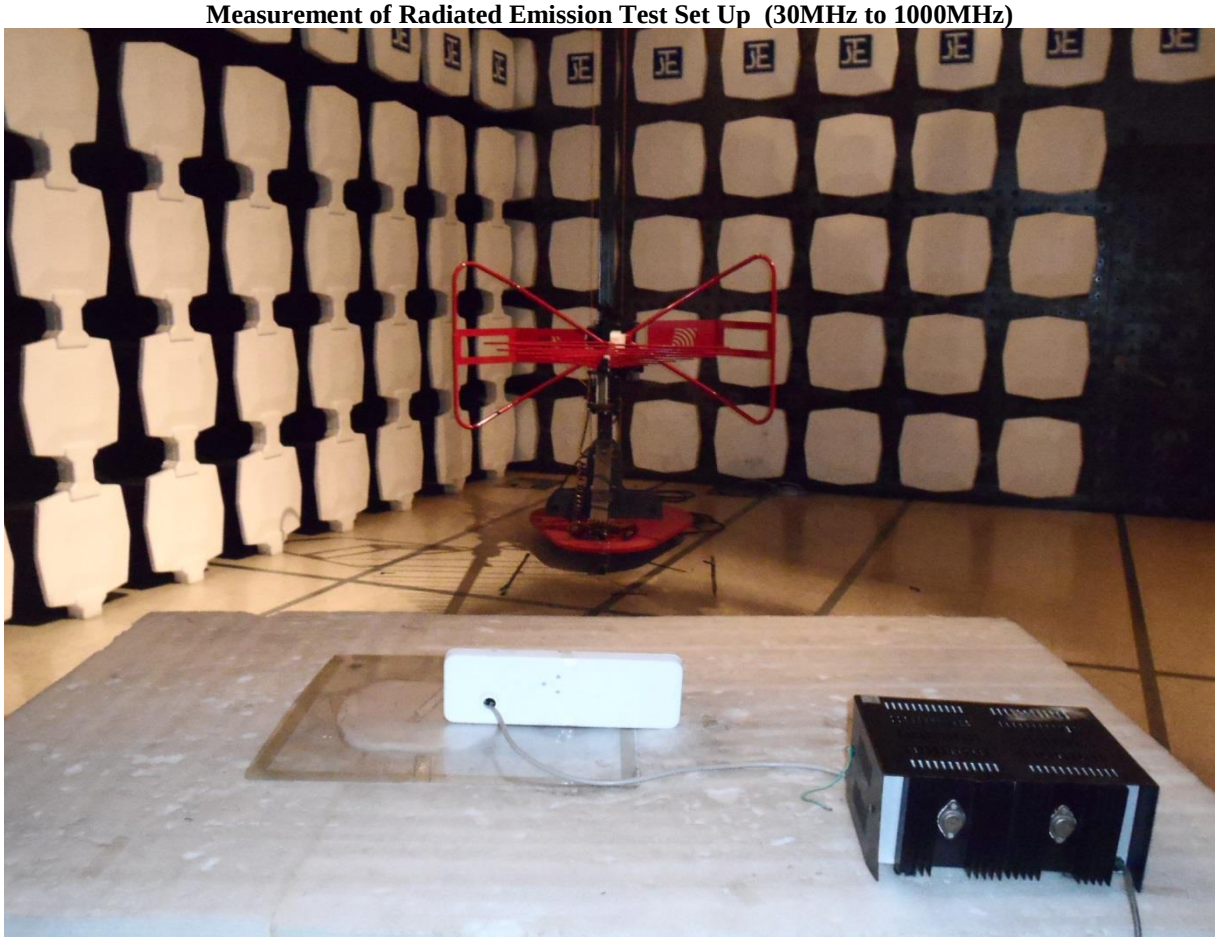
Photographs of EUT

Measurement of Radiated Emission Test Set Up (30MHz to 1000MHz)



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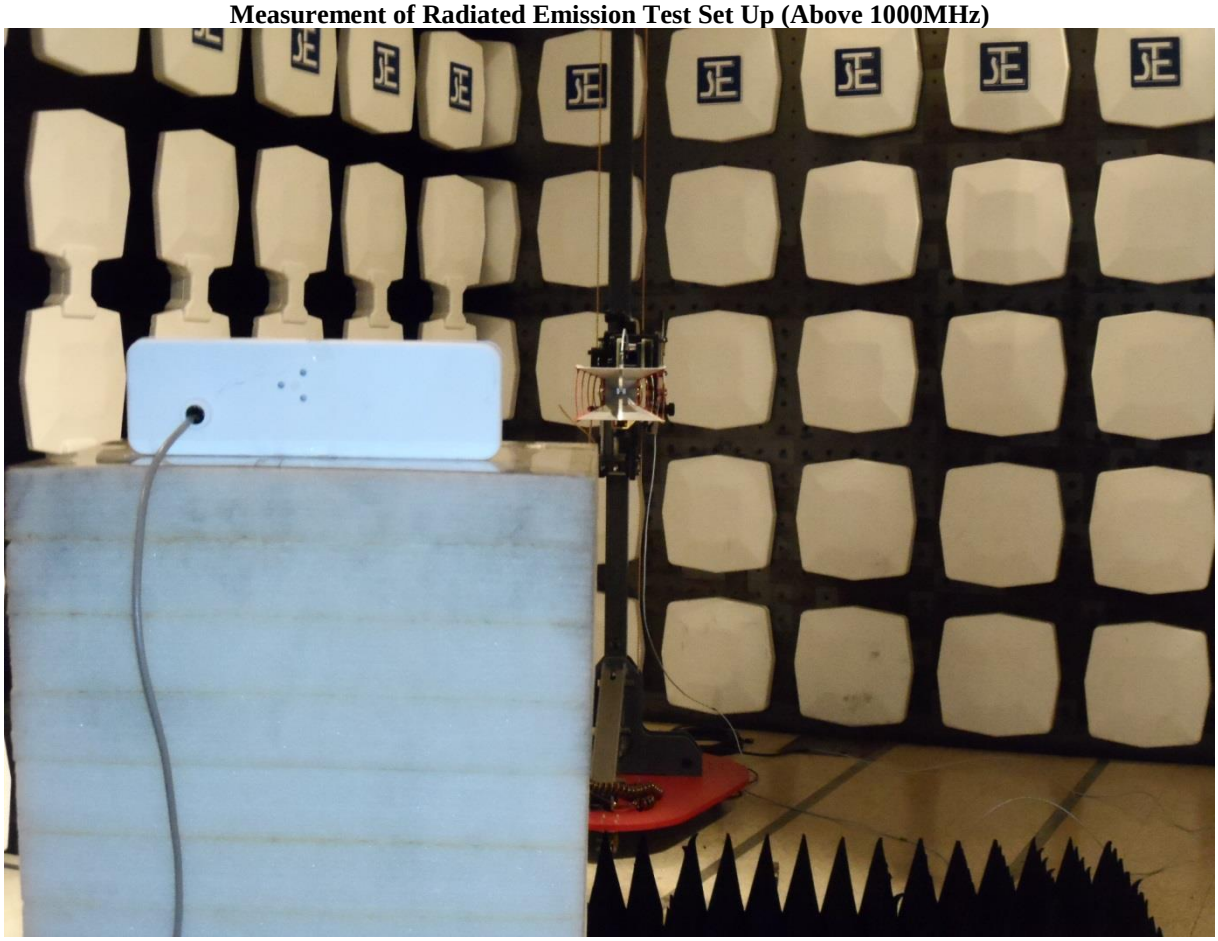
Photographs of EUT

Measurement of Radiated Emission Test Set Up (Above 1000MHz)



******* End of Test Report *******

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5. The results in Report apply only to the sample as received and do not apply to the bulk, unless the sampling has been carried out by the Company and is stated as such in the Report.

6. When a statement of conformity to a specification or standard is provided, the ILAC-G8 Guidance document (and/or IEC Guide 115 in the electrotechnical sector) will be adopted as a decision rule for the determination of conformity unless it is inherent in the requested specification or standard, or otherwise specified in the Report.

7. In the event of the improper use the report as determined by the Company, the Company reserves the right to withdraw it, and to adopt any other additional remedies which may be appropriate.

8. Sample submitted for testing are accepted on the understanding that the Report issued cannot form the basis of, or be the instrument for, any legal action against the Company.

9. The Company will not be liable for or accept responsibility for any loss or damage howsoever arising from the use of information contained in any of its Reports or in any communication whatsoever about its said tests or investigations.

10. Clients wishing to use the Report in court proceedings or arbitration shall inform the Company to that effect prior to submitting the sample for testing.

11. Subject to the variable length of retention time for test data and report stored hereinto as to otherwise specifically required by individual accreditation authorities, the Company will only keep the supporting test data and information of this test report for a period of three years. The data and information will be disposed of after the aforementioned retention period has elapsed. Under no circumstances shall we provide any data and information which has been disposed of after the retention period. Under no circumstances shall we be liable for damages of any kind, including (but not limited to) compensatory damages, lost profits, lost data, or any form of special, incidental, indirect, consequential or punitive damages of any kind, whether based on breach of contract of warranty, tort (including negligence), product liability or otherwise, even if we are informed in advance of the possibility of such damages.

12. Issuance records of the Report are available on the internet at www.stc.group. Further enquiry of validity or verification of the Reports should be addressed to the Company.