

FCC TEST REPORT	
Co-Location	
Report Reference No	G0M-2403-2483-TFCCOLOC-V01
Testing Laboratory	Eurofins Product Service GmbH
Address	Storkower Str. 38c 15526 Reichenwalde Germany
Accreditation	  DAKKS - Registration number : D-PL-12092-01-04 (FCC) FCC Filed Test Laboratory, Reg.-No.: 96970
Applicant	Intrex Inc
Address	1896 Preston White Drive 20191 Reston, VA United States
Test Specification	47 CFR Part 24E
Non-Standard Test Method	None
Equipment under Test (EUT):	
Product Description	Wander Management wearable for elderly care/senior living
Model(s)	KALLOS
Additional Model(s)	None
Brand Name(s)	Rythmos
Hardware Version(s)	MRD_04
Software Version(s)	2024.03.1x.1
FCC ID	2AWYMKALLOS
Contains FCC ID	XMR201912BG77
Test Result	PASSED

Possible test case verdicts:		
Required by standard but not tested	N/T	
Not required by standard	N/R	
Not applicable to EUT	N/A	
Test object does meet the requirement	P(PASS)	
Test object does not meet the requirement	F(FAIL)	
Testing:		
Test Lab Temperature	20 °C - 30 °C	
Test Lab Humidity	25 % - 55 %	
Date of receipt of test item	2024-06-05	
Report:		
Compiled by	Md Abu Bakar Siddique	
Tested by (+ signature) (Responsible for Test)	Md Abu Bakar Siddique	
Approved by (+ signature) (Senior Expert)	Radwan Jaafar	
Date of Issue	2024-06-05	
Total number of pages	31	
General Remarks:		
The test results presented in this report relate only to the object tested. The results contained in this report reflect the results for this particular model and serial number. It is the responsibility of the manufacturer to ensure that all production models meet the intent of the requirements detailed within this report. This report shall not be reproduced, except in full, without the written approval of the Issuing testing laboratory.		
Additional Comments:		
None		

VERSION HISTORY

Version History			
Version	Issue Date	Remarks	Revised By
01	2024-06-05	Initial Release	--

ABBREVIATIONS AND ACRONYMS

Acronyms	
Acronym	Description
EUT	Equipment Under Test
FCC	Federal Communications Commission
ISED	Innovation, Science and Economic Development Canada
RBW	Resolution bandwidth
RMS	Root mean square
VBW	Video bandwidth
V _{NOM}	Nominal supply voltage

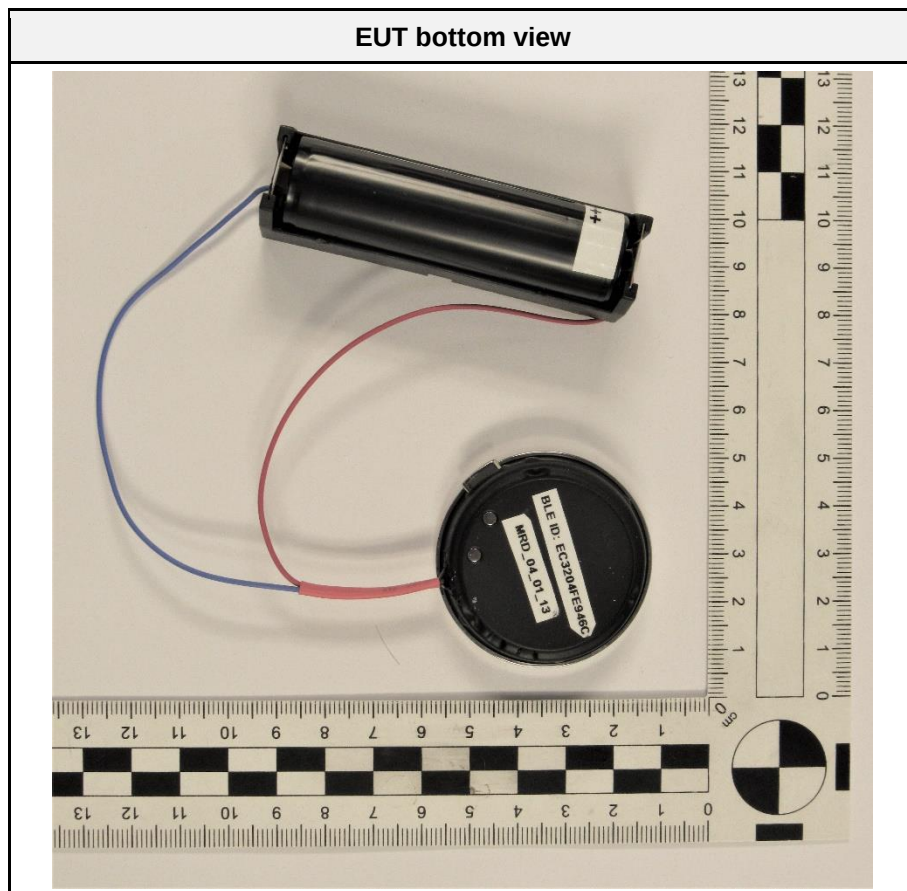
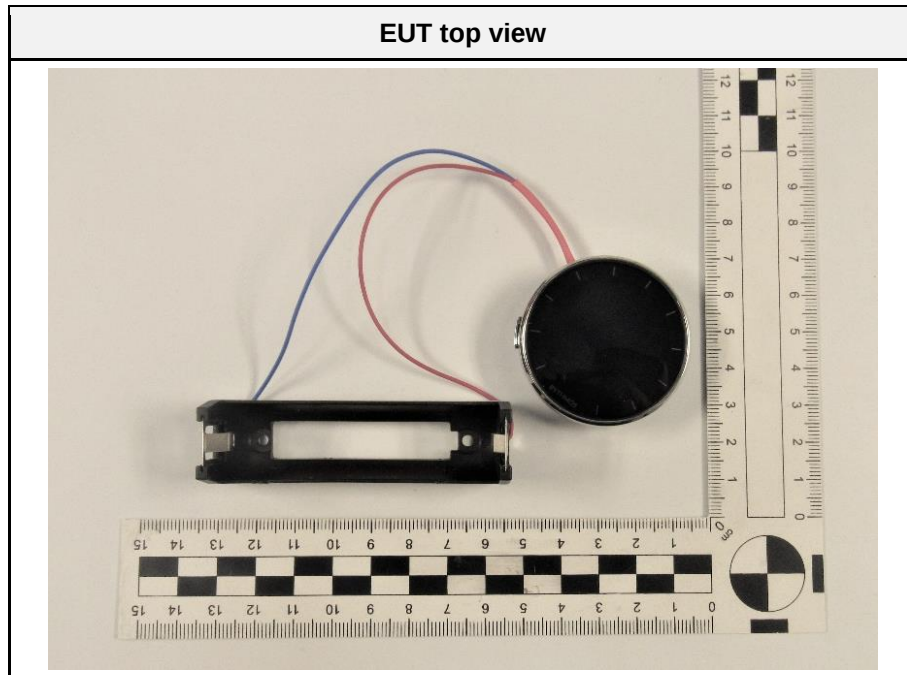
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1 Equipment (Test Item) Under Test

Description	Wander Management wearable for elderly care/senior living	
Model	KALLOS	
Additional Model(s)	None	
Brand Name(s)	Rythmos	
Serial Number(s)	MRD 04 01 13	
Test Sample Id(s)	48260	
Hardware Version(s)	MRD_04	
Software Version(s)	2024.03.1x.1	
FCC ID	2AWYMKALLOS	
Contains FCC ID	XMR201912BG77	
Equipment type	End Product	
Radio type	Transceiver	
Assigned frequency bands	LTE Cat M1 FDD2 : UL = 1850 - 1910 MHz, DL = 1930 - 1990 MHz LTE Cat M1 FDD4 : UL = 1710 - 1755 MHz, DL = 2110 - 2155 MHz LTE Cat M1 FDD12 : UL = 699 - 716 MHz, DL = 729 - 746 MHz LTE Cat M1 FDD13 : UL = 777 - 787 MHz, DL = 746 - 756 MHz LTE Cat M1 FDD66 : UL = 1710 - 1780 MHz, DL = 2110 - 2200 MHz Bluetooth : 2400.0 MHz - 2483.5 MHz	
Radio technologies	LTE + Bluetooth Low energy	
Operating modes	LTE + BLE 1 Mbps	
Modulation	QPSK, 16 QAM, GFSK	
Number of modules	1	
Radio Module (LTE)	Type	LTE-CatM1 radio module
	Model	BG77
	Manufacturer	Quectel
	HW Version	BG77LB-64-SGNS
	SW Version	BG77LAR04A01_01.200.01.200
	FCC-ID	XMR201912BG77
	IC	10224A-201912BG77
Antenna (LTE)	Type	Integrated antenna
	Model	LDS
	Manufacturer	Amphenol
	Gain	-7.4 (customer declaration)
Antenna (Bluetooth LE)	Type	Integrated antenna
	Model	LDS
	Manufacturer	Amphenol
	Gain	-8.95 (customer declaration)
Supply Voltage	V _{NOM}	5 VDC
AC/DC-Adaptor	None	
Manufacturer	Intrex Inc 1896 Preston White Drive 20191 Reston, VA United States	

1.1 Photos – Equipment External



EUT Battery charger

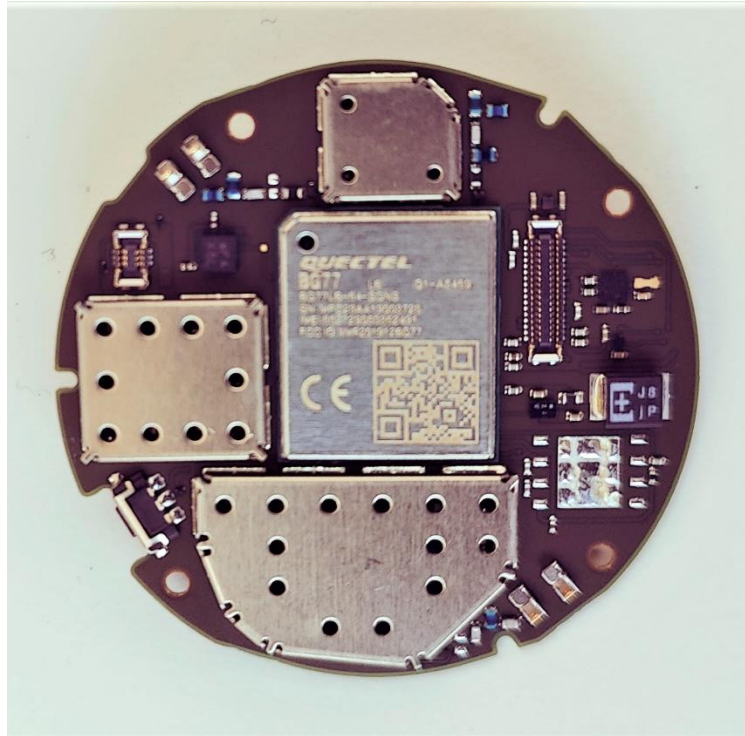


Li Ion batteries

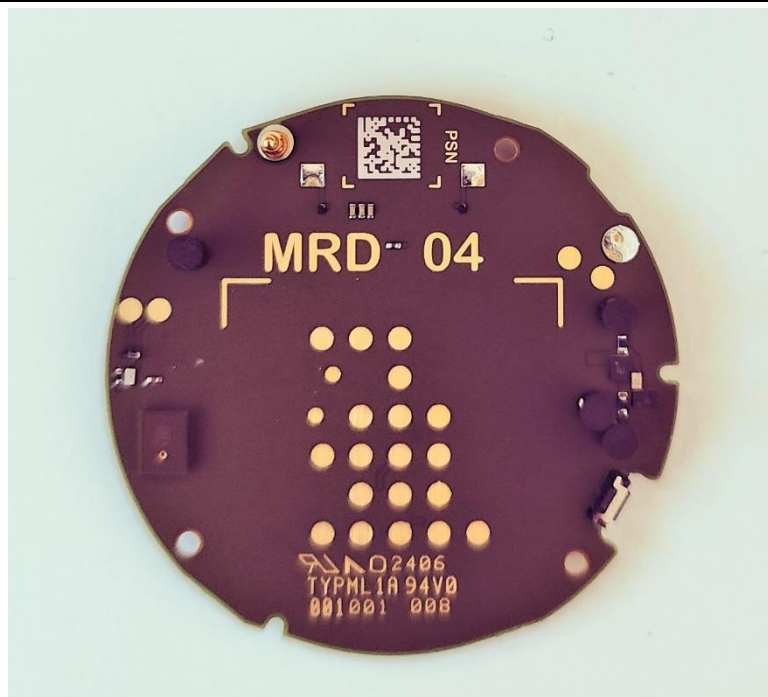


1.2 Photos – Equipment Internal

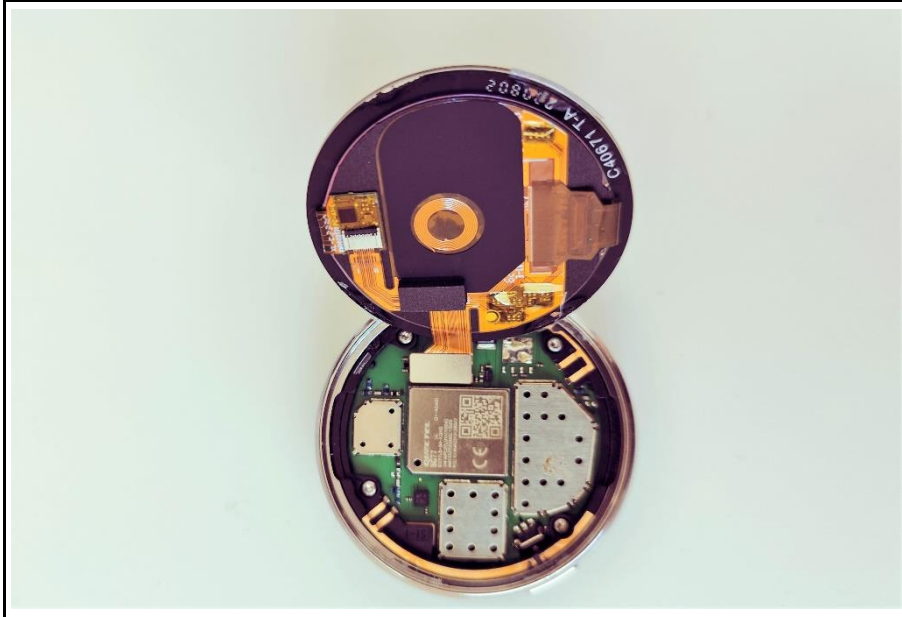
EUT PCB TOP SIDE – picture provided by client



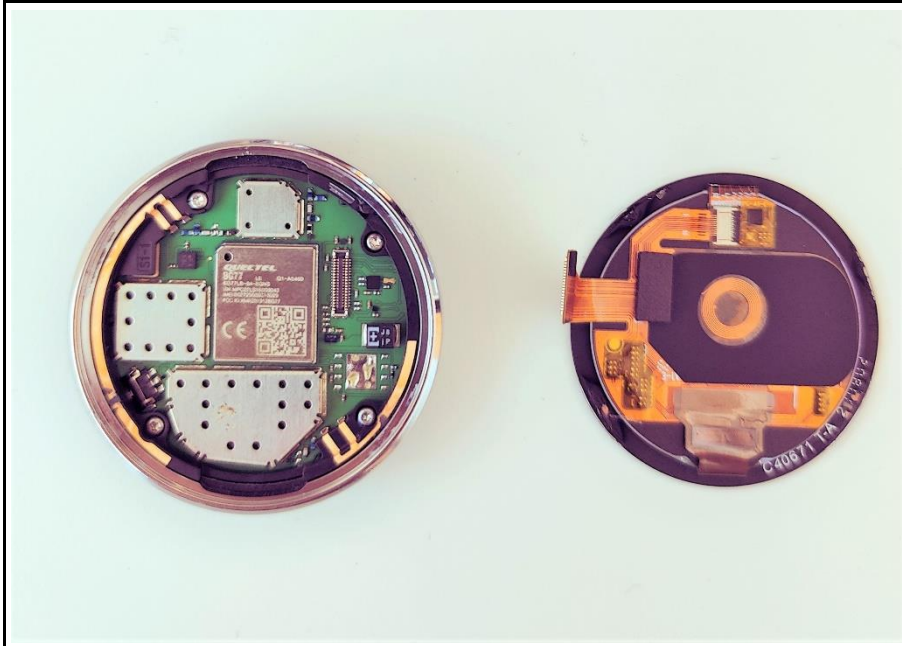
MRD_04U_Bottom



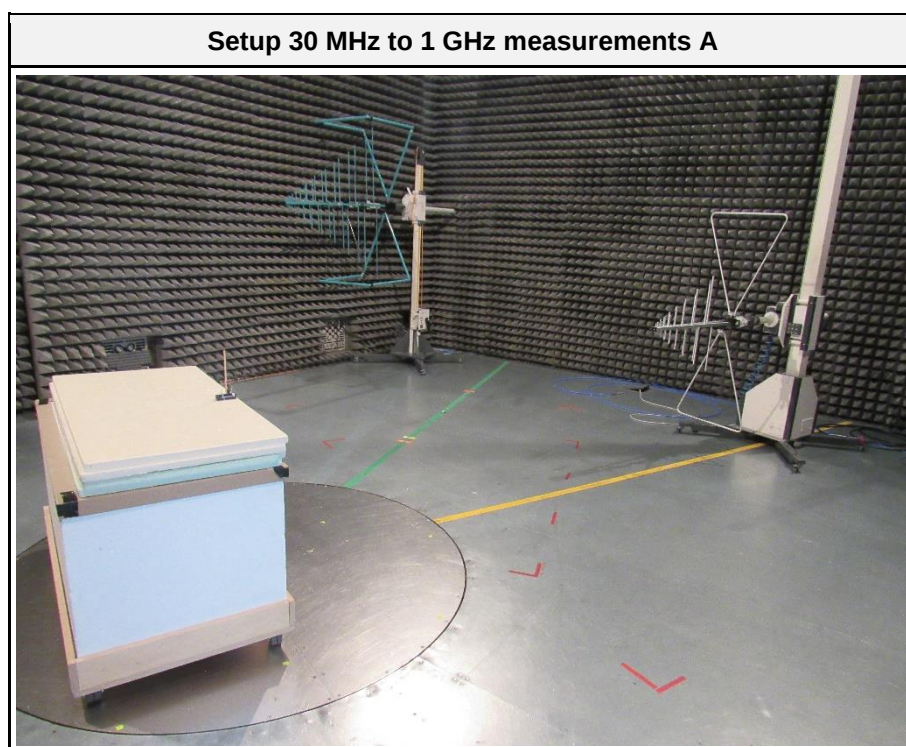
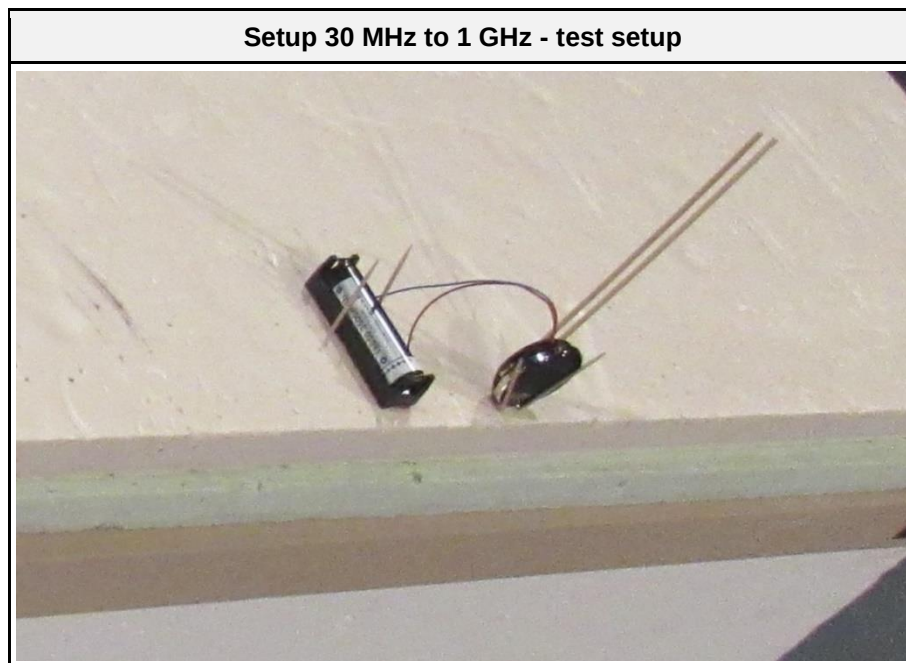
EUT with open cover



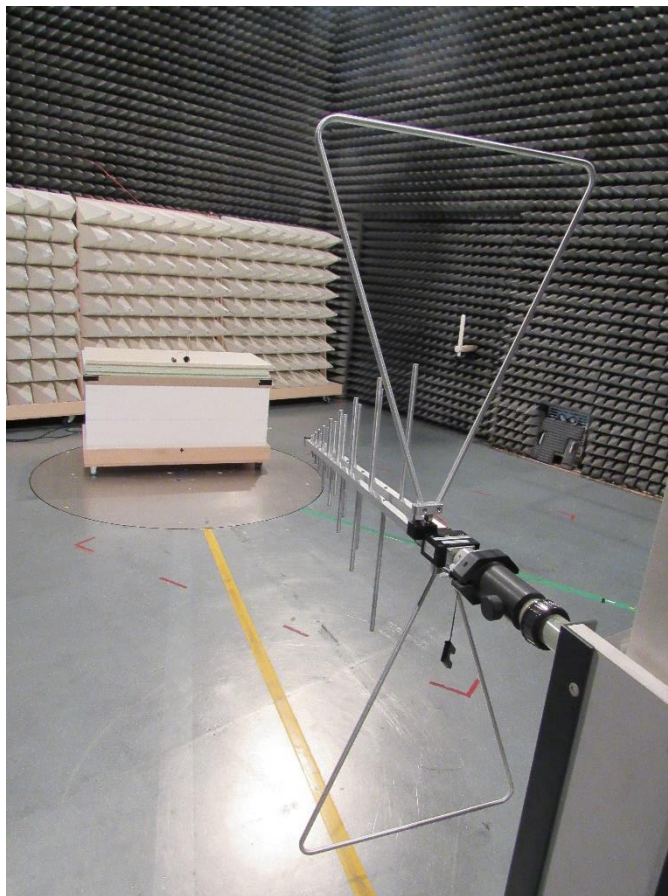
EUT with open cover_2



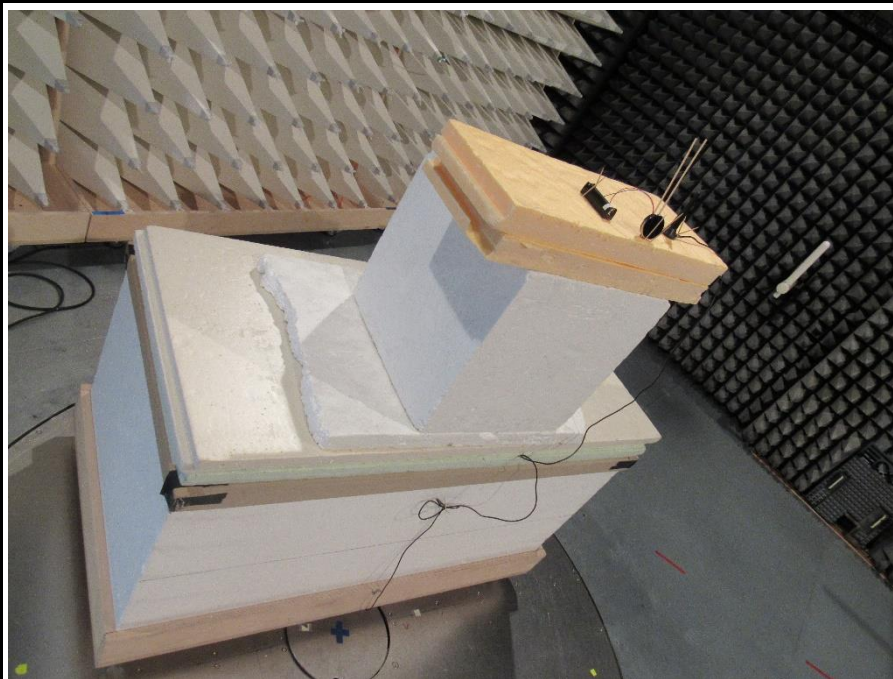
1.3 Photos – Test Setup



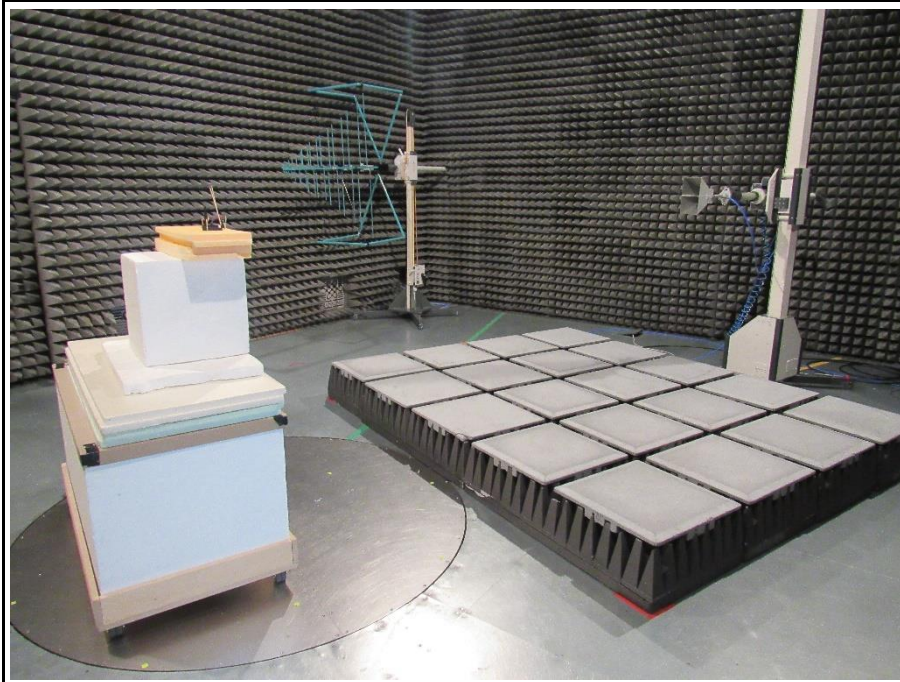
Setup 30 MHz to 1 GHz measurements B



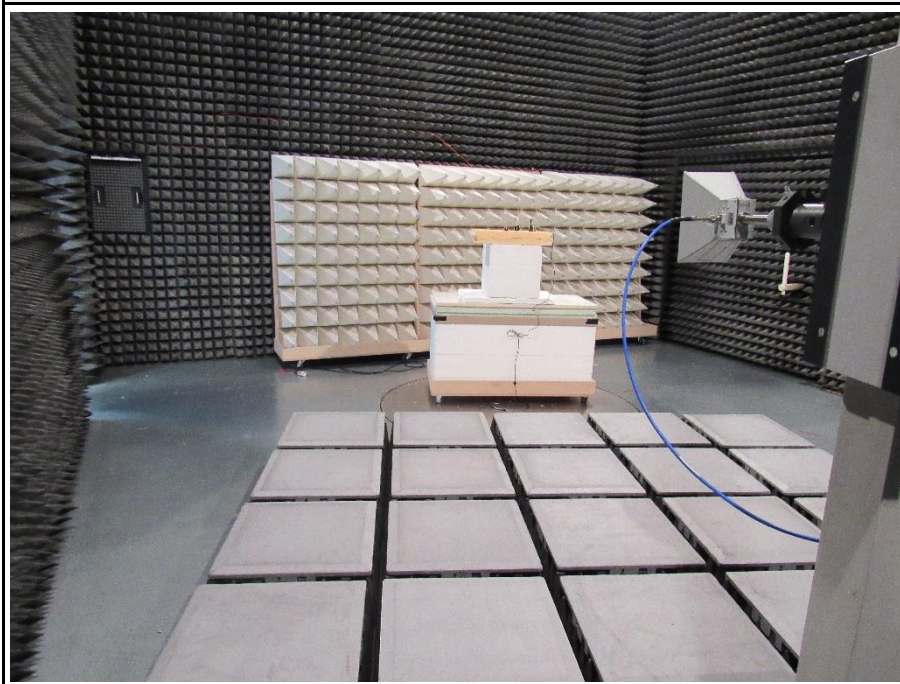
Setup 1 GHz - 17 GHz - test setup



Setup 1 GHz to 17 GHz measurements A



Setup 1 GHz to 17 GHz measurements B



1.4 Support Equipment

Product Type	Device	Manufacturer	Model	Comment
SIM	Communication Tester	R&S	CMW290	Base Station Simulator
AE	Individual Charger	--	MRD CHG 02 01	EUT power source
AE	Laptop	Lenovo	Thinkpad E14 Gen 4	For mode selection
Description:				
AE	Auxiliary Equipment			
SIM	Simulator			
CBL	Connecting Cable			
SFT	Software			

1.5 Test Modes

Mode	Description
LTE FDD B2	Channel = 1852.5 MHz Mode = Transmit Power = Maximum Modulation = QPSK BW = 5 MHz RB size = 1 RB offset = 0
LTE FDD B4	Channel = 1754.3 MHz Mode = Transmit Power = Maximum Modulation = QPSK BW = 1.4 MHz RB size = 1 RB offset = 5
LTE FDD B12	Channel = 707.5 MHz Mode = Transmit Power = Maximum Modulation = 16QAM BW = 10 MHz RB size = 4 RB offset = 0
LTE FDD B13	Channel = 782 MHz Mode = Transmit Power = Maximum Modulation = 16QAM BW = 10 MHz RB size = 4 RB offset = 0
BLE 1 Mbps	Mode = Transmit Modulation = GFSK Spreading = None Packet type = PRBS9 Duty cycle = 62%
Comment: Test modes LTE B2/B4/B12/B13 and BLE 1Mbps were tested simultaneously. Above modes are selected because they caused maximum output power in modular approval tests.	

1.6 Test Frequencies

Designator	Mode	Channel	Frequency [MHz]
F1	Tx	LTE B2 EARFCN 18625	1852.5
F2	Tx	LTE B4 EARFCN 20393	1754.3
F3	Tx	LTE B12 EARFCN 23095	707.5
F4	Tx	LTE B13 EARFCN 23230	782.0
F5	Tx	LTE B66 EARFCN 132665	1779.3
F6	Tx	BLE Channel 18	2442
Comment: Test frequencies F1-F5 are tested along with F6. LTE and BLE transmitter was active simultaneously. Above channels are selected because they caused maximum output power in modular approval tests.			

1.7 Sample emission level calculation

The following is a description of terms and a sample calculation, as appears in the radiated emissions data table. The numbers used in the calculation are for example only. There is no direct correlation to the specific data taken for the product described in this document:

Reading:

This is the reading obtained on the spectrum analyzer in dBμV. Any external preamplifiers used are taken into account through internal analyzer settings.

A.F.:

This is the antenna factor for the receiving antenna. It is a conversion factor, which converts electric fields strengths to voltages, which can be measured directly on the spectrum analyzer. It is treated as a loss in dB. Cable losses have been included with the A.F. to simplify the calculations. The antenna factor is used in calculations as follows:

$$\text{Reading on Analyzer (dB}\mu\text{V)} + \text{A.F. (dB/m)} = \text{Net field strength (dB}\mu\text{V/m)}$$

Net:

This is the net field strength measurement (as shown above).

Limit:

This is the FCC Class B radiated emission limit (in units of dBμV/m). The FCC limits are given in units of μV/m. The following formula is used to convert the units of μV/m to dBμV/m:

$$\text{Limit (dB}\mu\text{V/m)} = 20 \cdot \log(\mu\text{V/m})$$

Margin:

This is the margin of compliance below the FCC limit. The units are given in dB. A negative margin indicates the emission was below the limit. A positive margin indicates that the emission exceeds the limit.

Example only:

Reading + AF	= Net Reading	:	Net reading - FCC limit	= Margin
+21.5 dBμV + 26 dB/m	= 47.5 dBμV/m	:	47.5 dBμV/m - 57.0 dBμV/m	= -9.5 dB

2 Result Summary

FCC 47 CFR Part 24E				
Product Standard Reference	Requirement	Reference Method	Result	Remarks
FCC § 24.238(a)	Transmitter radiated spurious emissions	ANSI C63.10-2013 ANSI/TIA-603-D-2016 KDB 971168 ANSI C63.26-2015 5.5	PASS	--
Comment: Above standards have been selected for tests because they allow the highest spurious emission limits when considering all built-in radio technologies.				

Possible Test Case Verdicts	
PASS	Test object does meet the requirements
FAIL	Test object does not meet the requirements
N/T	Required by standard but not tested
N/R	Not required by standard for the test object

3 Test Conditions and Results

3.1 Test Conditions and Results - Transmitter radiated emissions

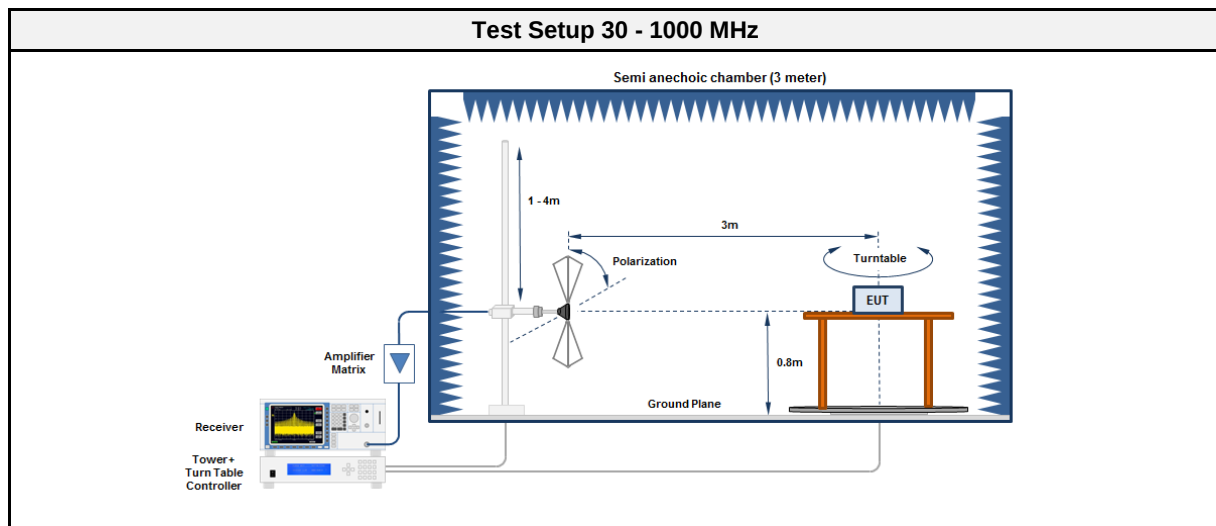
3.1.1 Information

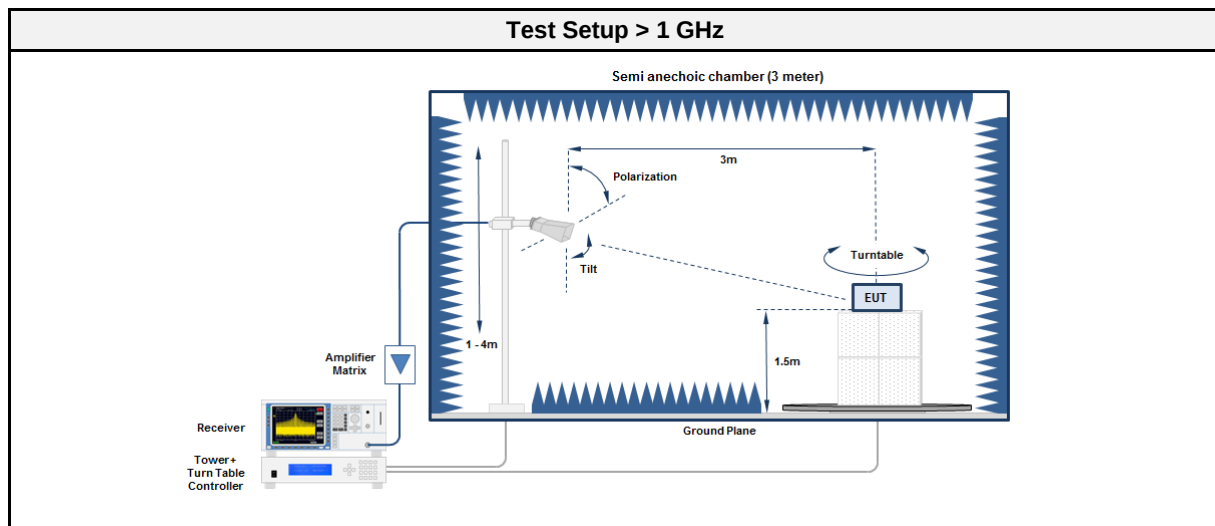
Test Information	
Reference	FCC § 24.238(a)
Measurement Method	ANSI/TIA-603-D / ANSI C63.26-2015 5.5
Measurement Uncertainty	± 5.95 dB
Operator	Md Abu Bakar Siddique
Date	2024-05-14

3.1.2 Limits

Limits FCC				
Band	Frequency range [MHz]	Bandwidth	Attenuation [dB]	Limit [dBm EIRP]
-	-	1 MHz	$43+10 \cdot \log_{10}(P[W])$	-13
Comment: Above limit/rule part is applied to all bands according to KDB 996369 D04, clause 3.1				

3.1.3 Setup





3.1.4 Equipment

Test Equipment 30 - 1000 MHz					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Anechoic Chamber	Frankonia	AC1	EF00062	2022-11	2025-11
Measurement Receiver	R&S	ESU26	EF00887	2024-01	2025-01
Antenna	Schwarzbeck	VULB 9168	EF01824	2022-10	2025-10
Antenna	Schwarzbeck	BBHA 9120B	EF01561	2021-11	2024-11

Test Equipment Above 1GHz					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Anechoic Chamber	Frankonia	AC1	EF01011	2022-11	2024-11
Measurement Receiver	R&S	ESU26	EF00887	2024-01	2025-01
Antenna	Schwarzbeck	VULB 9168	EF01824	2022-10	2025-10
Antenna	Schwarzbeck	BBHA 9120B	EF01561	2021-11	2024-11

3.1.5 Procedure

Test Procedure 30 - 1000 MHz
1. EUT is placed on a non conducting support at the center of a turn table 0.8 m above the ground 2. EUT set to test mode 3. The receiver is set to peak detection with max hold 4. The EUT is rotated through 360° and the height of the antenna is varied from 1 m to 4 m 5. All significant emissions are measured again using the corresponding final detector

Test Procedure > 1 GHz
1. EUT is placed on a non conducting support at the center of a turn table 1.5 m above the ground 2. EUT set to test mode 3. The receiver is set to peak detection with max hold 4. The EUT is rotated through 360° and the height of the antenna is varied from 1 m to 4 m 5. All significant emissions are measured again using the corresponding final detector

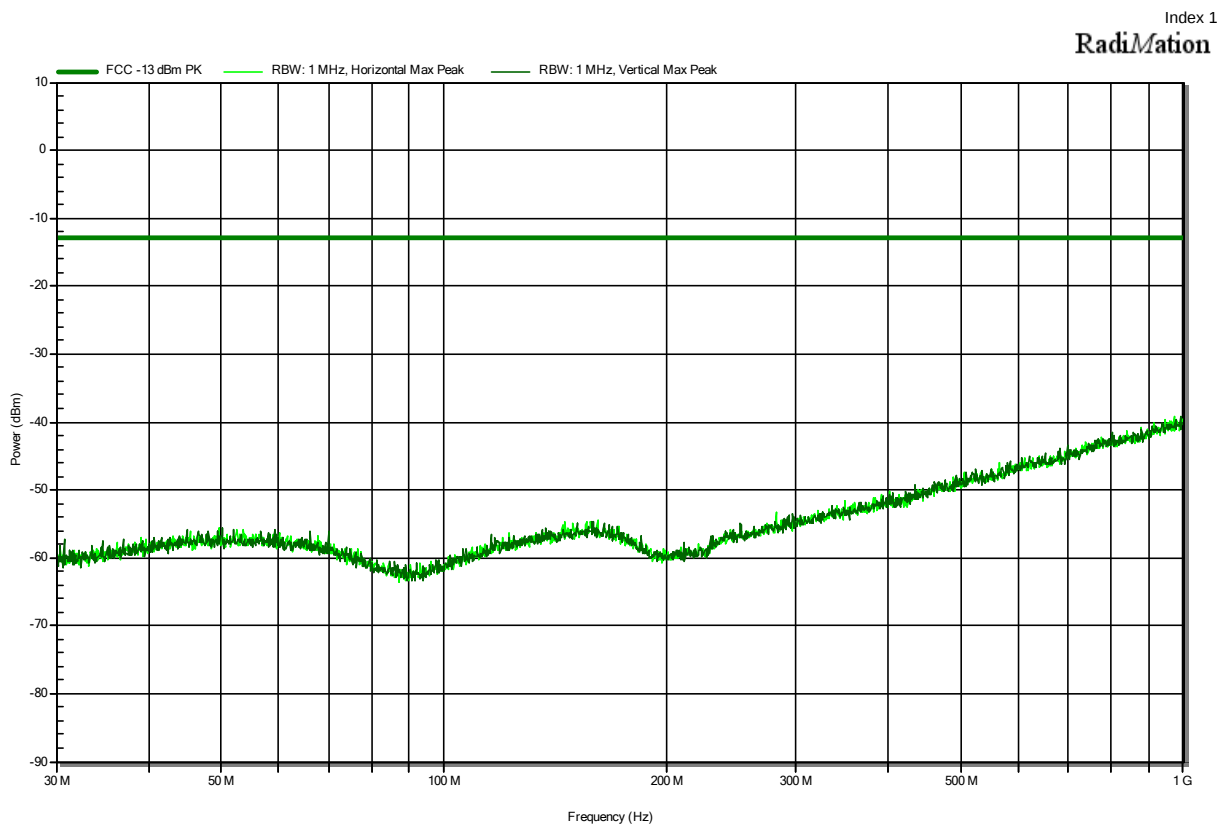
3.1.6 Results

Test Results - Cellular + Bluetooth BR/EDR						
Frequency [MHz]	Mode	Emission [MHz]	Level [dBm]	Pol.	Limit [dBm]	Margin [dB]
1852.5 2442	LTE B2 BLE 1Mbps	1259	-26.40	ver	-13.00	-13.36
1852.5 2442	LTE B2 BLE 1Mbps	1933	-31.60	ver	-13.00	-18.59
1852.5 2442	LTE B2 BLE 1Mbps	3109	-29.00	ver	-13.00	-16.03
1852.5 2442	LTE B2 BLE 1Mbps	3700	-18.20	hor	-13.00	-05.17
1754.3 2442	LTE B4 BLE 1Mbps	1068	-30.30	ver	-13.00	-17.32
1754.3 2442	LTE B4 BLE 1Mbps	2155	-33.10	ver	-13.00	-20.14
1754.3 2442	LTE B4 BLE 1Mbps	3129	-34.70	ver	-13.00	-21.72
707.5 2442	LTE B12 BLE 1Mbps	740.848	-33.20	ver	-13.00	-20.22
782 2442	LTE B13 BLE 1Mbps	753.814	-33.20	ver	-13.00	-20.21
1779.3 2442	LTE B66 BLE 1Mbps	1117	-22.20	ver	-13.00	-09.20
1779.3 2442	LTE B66 BLE 1Mbps	3105	-37.80	ver	-13.00	-24.78

ANNEX A Transmitter sprurious emissions

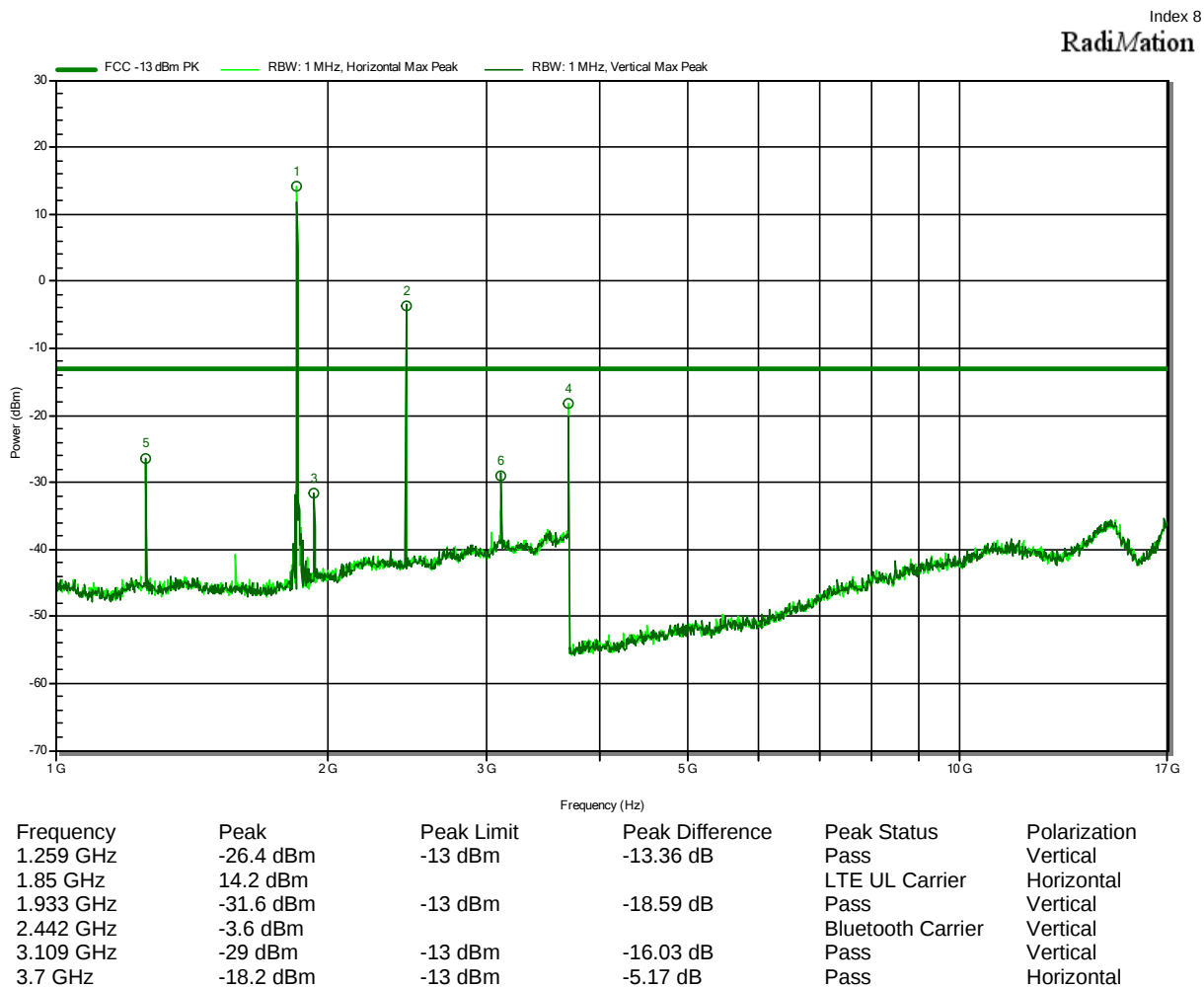
Radiated Spurious Emissions according to FCC Part 24E

Project Number: G0M-2403-2483
 Applicant: Intrex Inc
 Model Description: Wander Management wearable for elderly care/senior living
 Model: MRD 04 01 13
 Test Sample ID: 48260
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Siddique
 Measurement software: RadiMation, version 2020.1.8
 Test Conditions: Tnom: 23 °Celsius, Vnom: 5 VDC
 Antenna: Schwarzbeck VULB 9168
 Measurement distance: 3 m
 Mode: Tx; LTE B2_1852.5MHz_BW5MHz_QPSK_RB1_Index0_BLE_1M_2442MHz
 Test Date: 2024-05-14



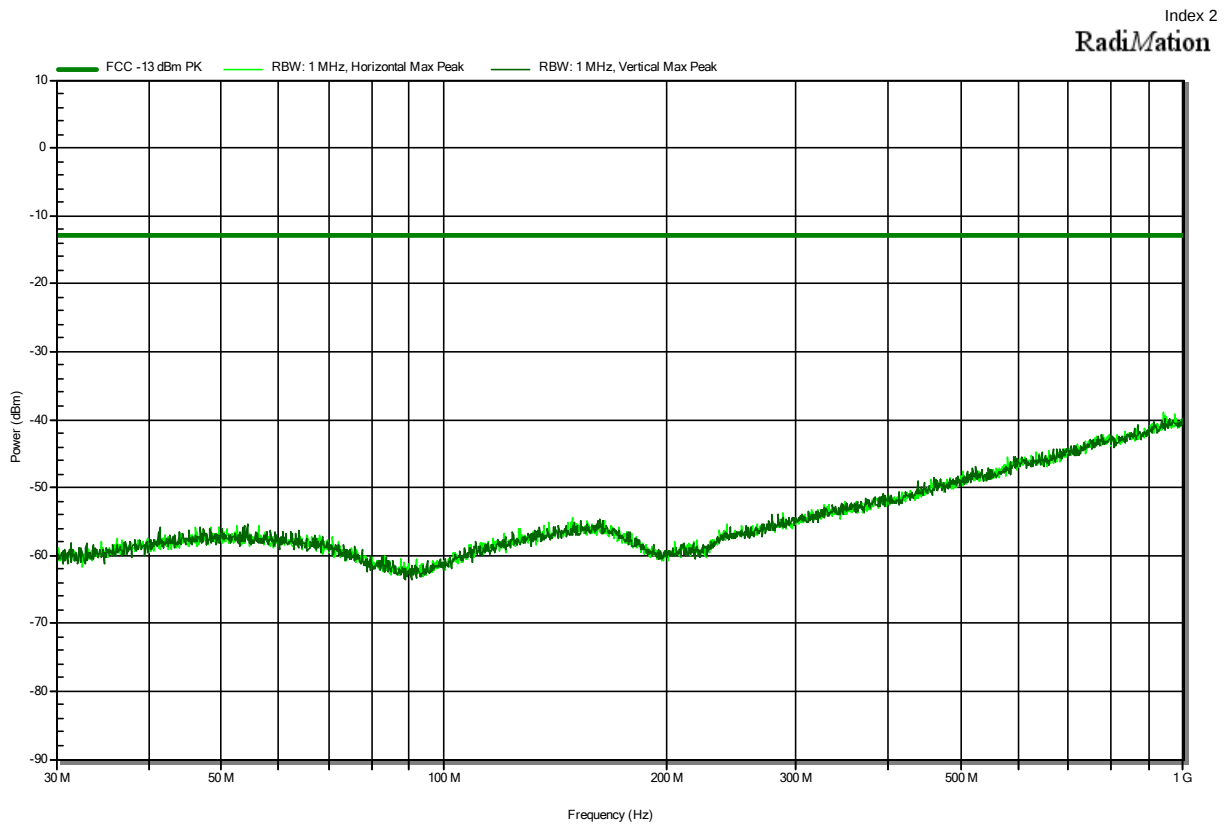
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 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Siddique
 Measurement software: RadiMation, version 2020.1.8
 Test Conditions: Tnom: 23 °Celsius, Vnom: 5 VDC
 Antenna: Schwarzbeck BBHA 9120D
 Measurement distance: 3 m
 Mode: Tx; LTE B2_1852.5MHz_BW5MHz_QPSK_RB1_Index0_BLE_1M_2442MHz
 Test Date: 2024-05-14
 Note: Marker 1: LTE UL Carrier
 Marker 2: Bluetooth Carrier
 Marker 3: LTE DL Carrier



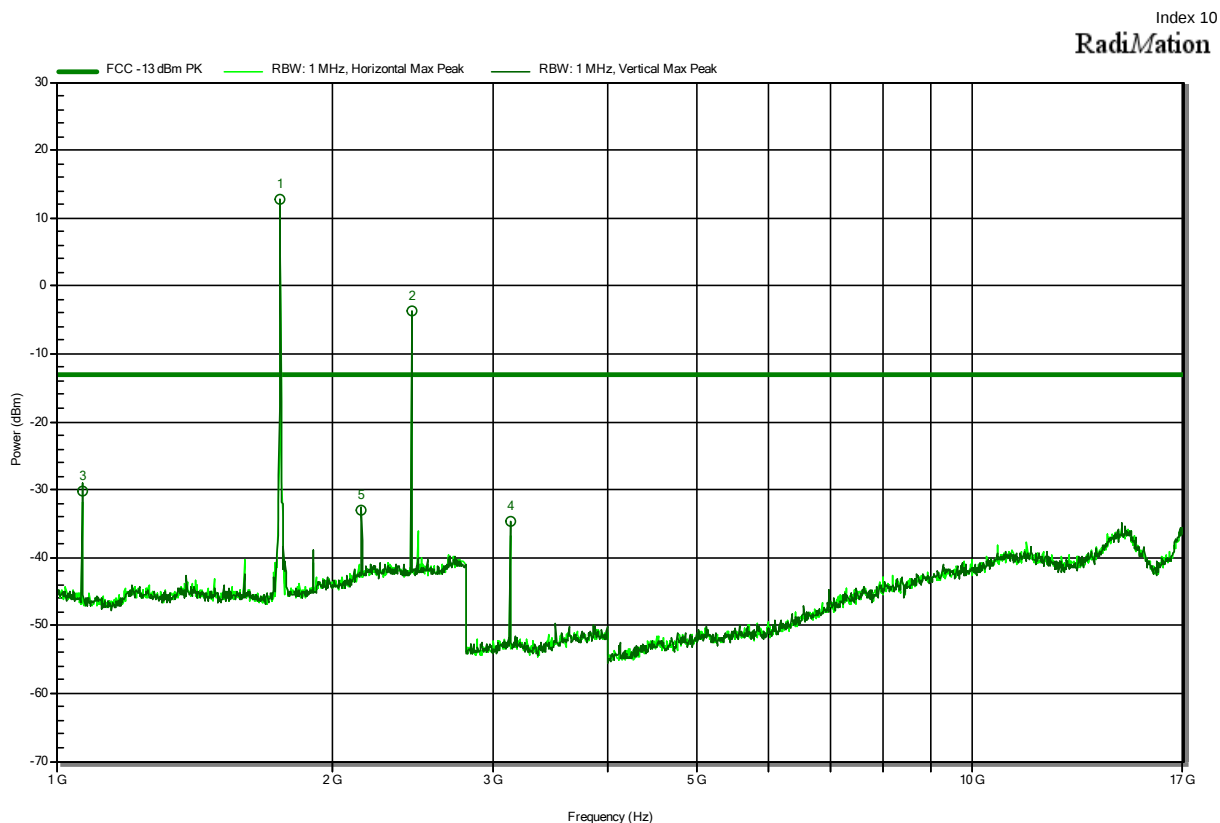
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 Measurement software: RadiMation, version 2020.1.8
 Test Conditions: Tnom: 23 °Celsius, Vnom: 5 VDC
 Antenna: Schwarzbeck VULB 9168
 Measurement distance: 3 m
 Mode: Tx; LTE B4_1754.3MHz_BW1.4MHz_QPSK_RB1_Index5_BLE_1M_2442MHz
 Test Date: 2024-05-14



Radiated Spurious Emissions according to FCC Part 24E

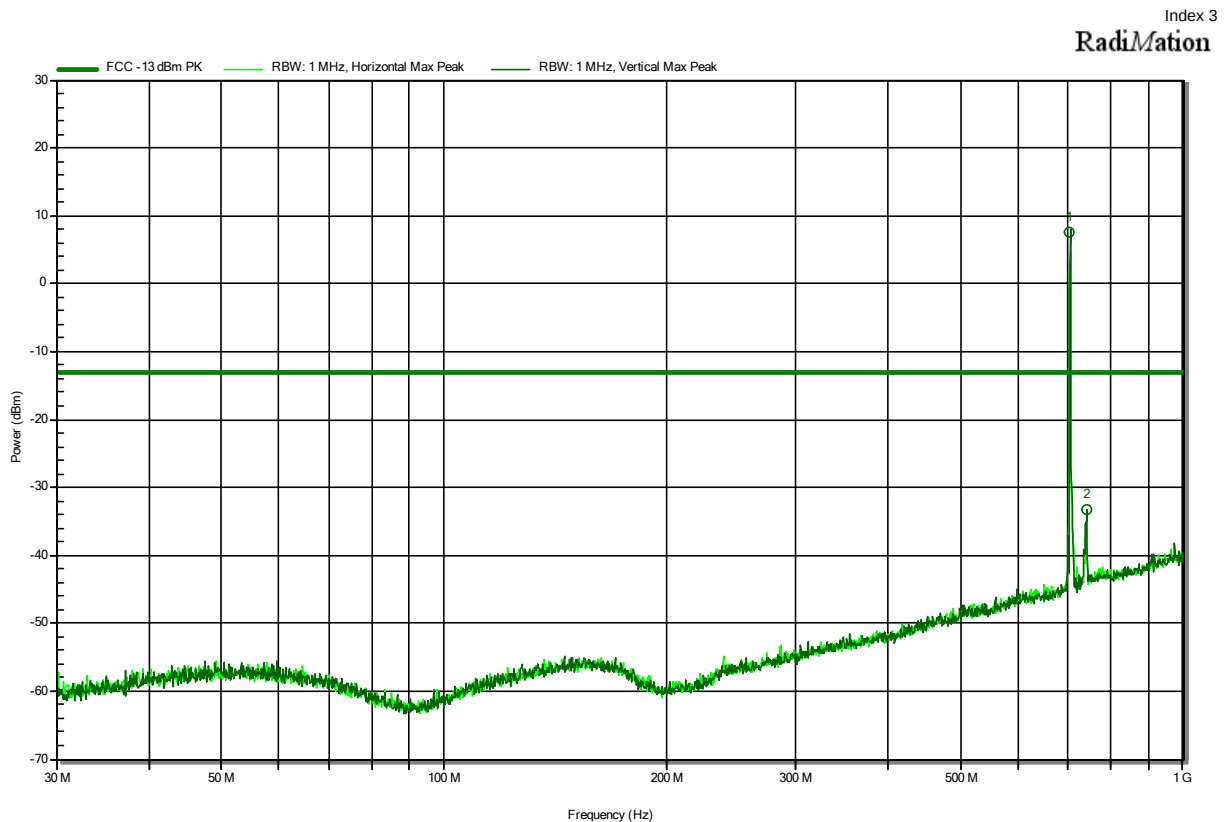
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 Test Date: 2024-05-14
 Note: Marker 1: LTE UL Carrier
 Marker 2: Bluetooth Carrier



Frequency	Peak	Peak Limit	Peak Difference	Peak Status	Polarization
1.068 GHz	-30.3 dBm	-13 dBm	-17.32 dB	Pass	Vertical
1.755 GHz	12.7 dBm	-13 dBm	-20.14 dB	LTE UL Carrier	Vertical
2.155 GHz	-33.1 dBm	-13 dBm	-20.14 dB	Pass	Vertical
2.442 GHz	-3.8 dBm	-13 dBm	-21.72 dB	Bluetooth Carrier	Vertical
3.129 GHz	-34.7 dBm	-13 dBm	-21.72 dB	Pass	Vertical

Radiated Spurious Emissions according to FCC Part 24E

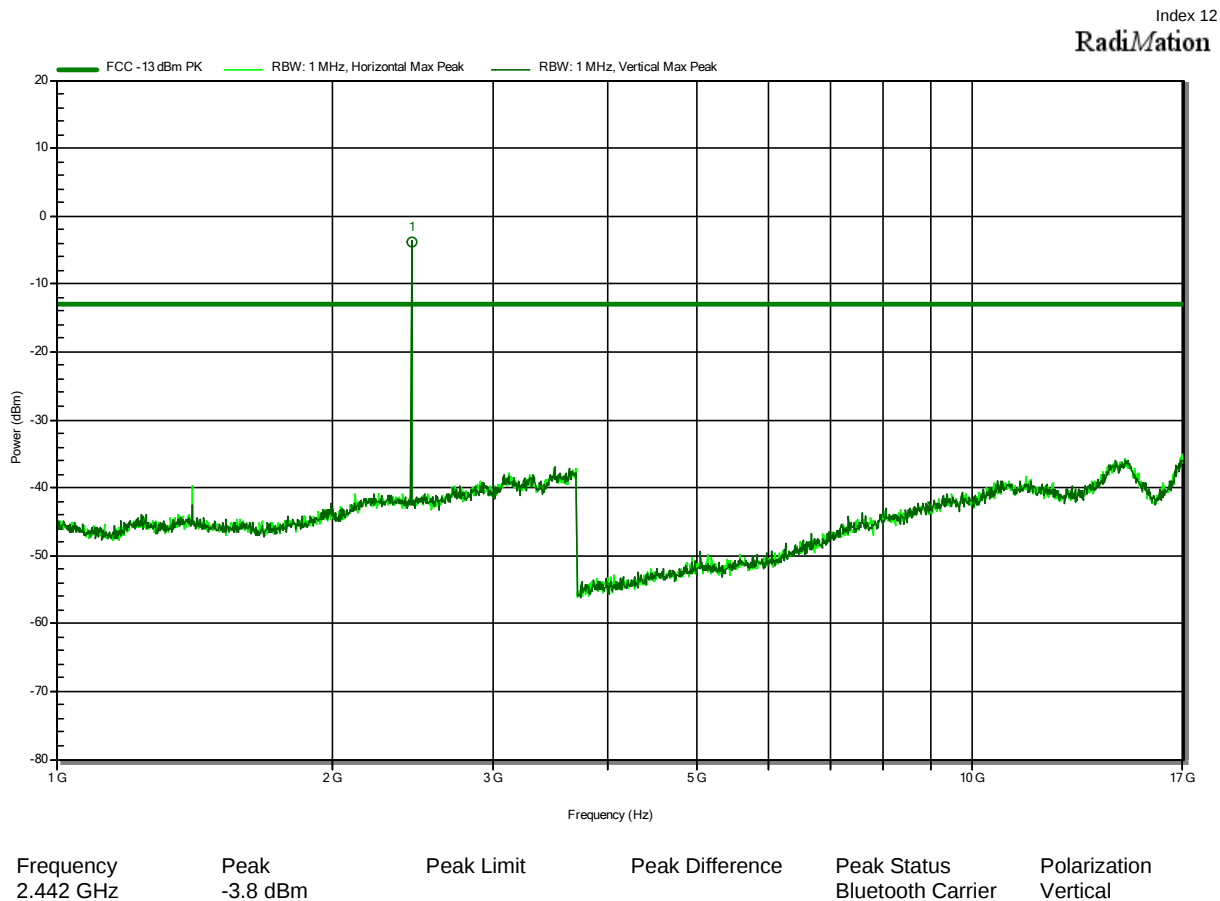
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 Test Date: 2024-05-14



Frequency	Peak	Peak Limit	Peak Difference	Peak Status	Polarization
703.503 MHz	7.7 dBm	-13 dBm	-20.22 dB	LTE UL Carrier	Vertical
740.848 MHz	-33.2 dBm	-13 dBm		Pass	Vertical

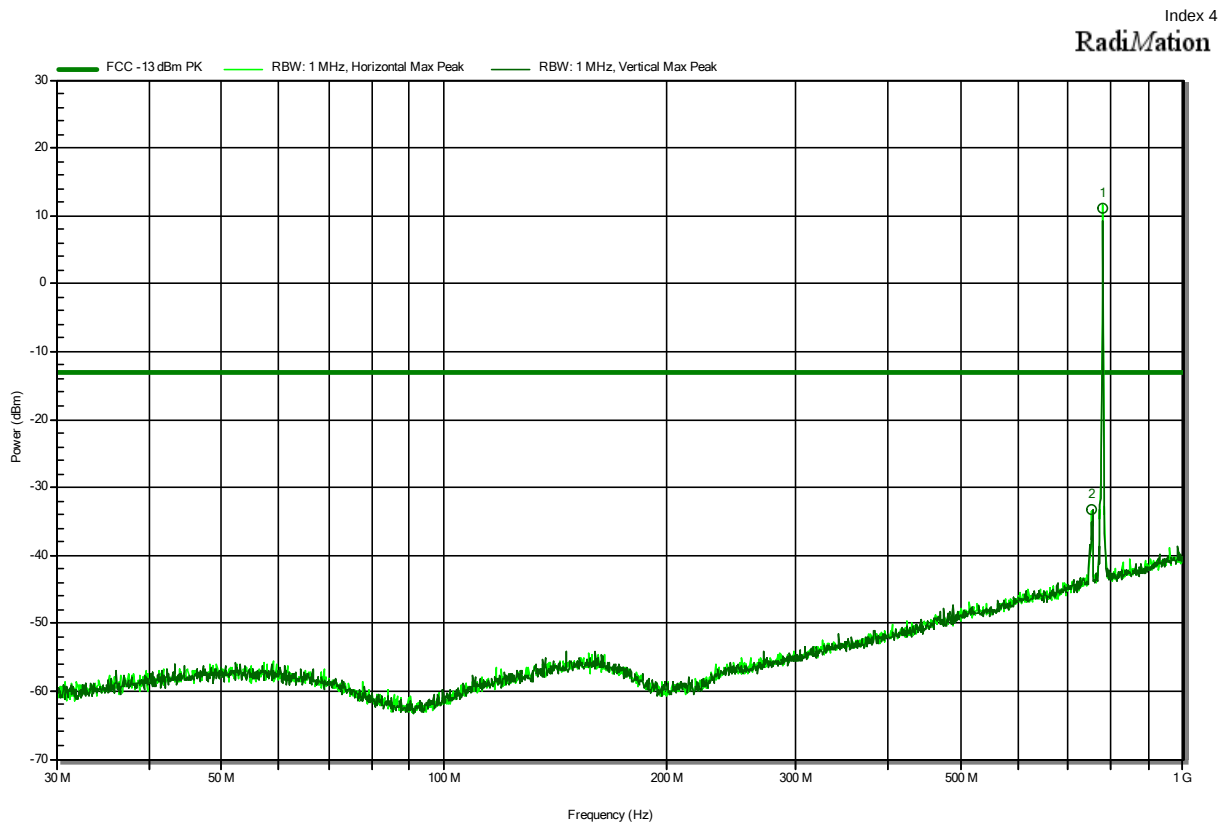
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 Measurement distance: 3 m
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 Test Date: 2024-05-14
 Note: Marker 1: Bluetooth Carrier



Radiated Spurious Emissions according to FCC Part 24E

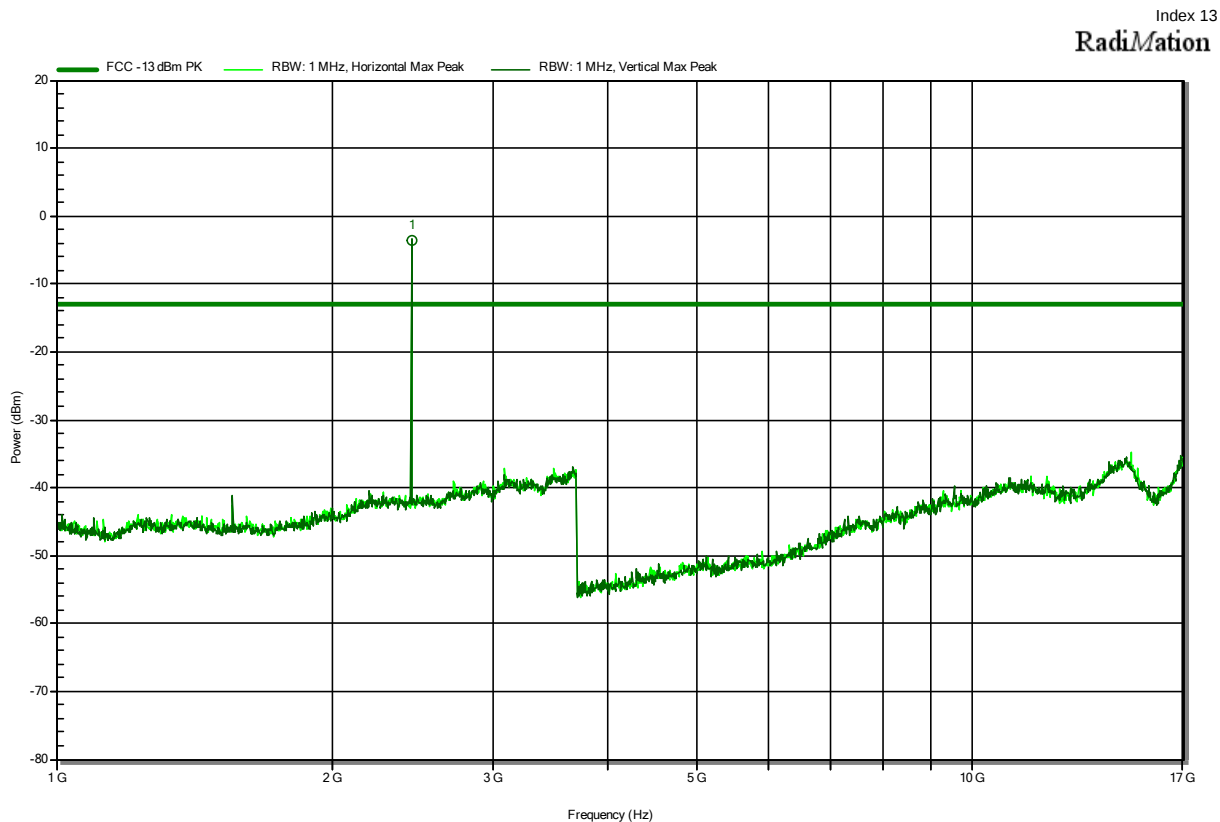
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 Model: MRD 04 01 13
 Test Sample ID: 48260
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Siddique
 Measurement software: RadiMation, version 2020.1.8
 Test Conditions: Tnom: 23 °Celsius, Vnom: 5 VDC
 Antenna: Schwarzbeck VULB 9168
 Measurement distance: 3 m
 Mode: Tx; LTE B13_782MHz_BW10MHz_16QAM_RB4_Index0_BLE_1M_2442MHz
 Test Date: 2024-05-14



Frequency	Peak	Peak Limit	Peak Difference	Peak Status	Polarization
753.814 MHz	-33.2 dBm	-13 dBm	-20.21 dB	Pass	Vertical
777.935 MHz	11.1 dBm			LTE UL Carrier	Horizontal

Radiated Spurious Emissions according to FCC Part 24E

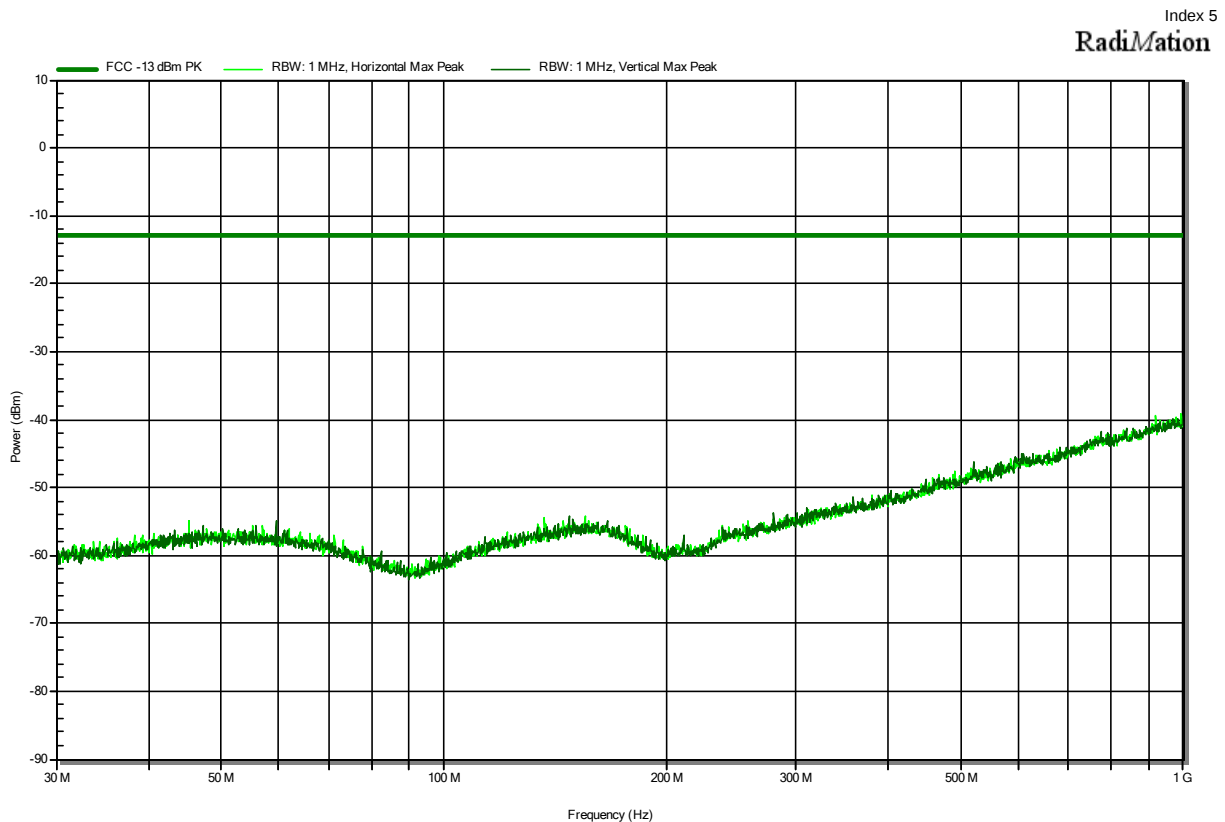
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 Test Date: 2024-05-14
 Note: Marker 1: Bluetooth Carrier



Frequency	Peak	Peak Limit	Peak Difference	Peak Status	Polarization
2.442 GHz	-3.6 dBm			Bluetooth Carrier	Vertical

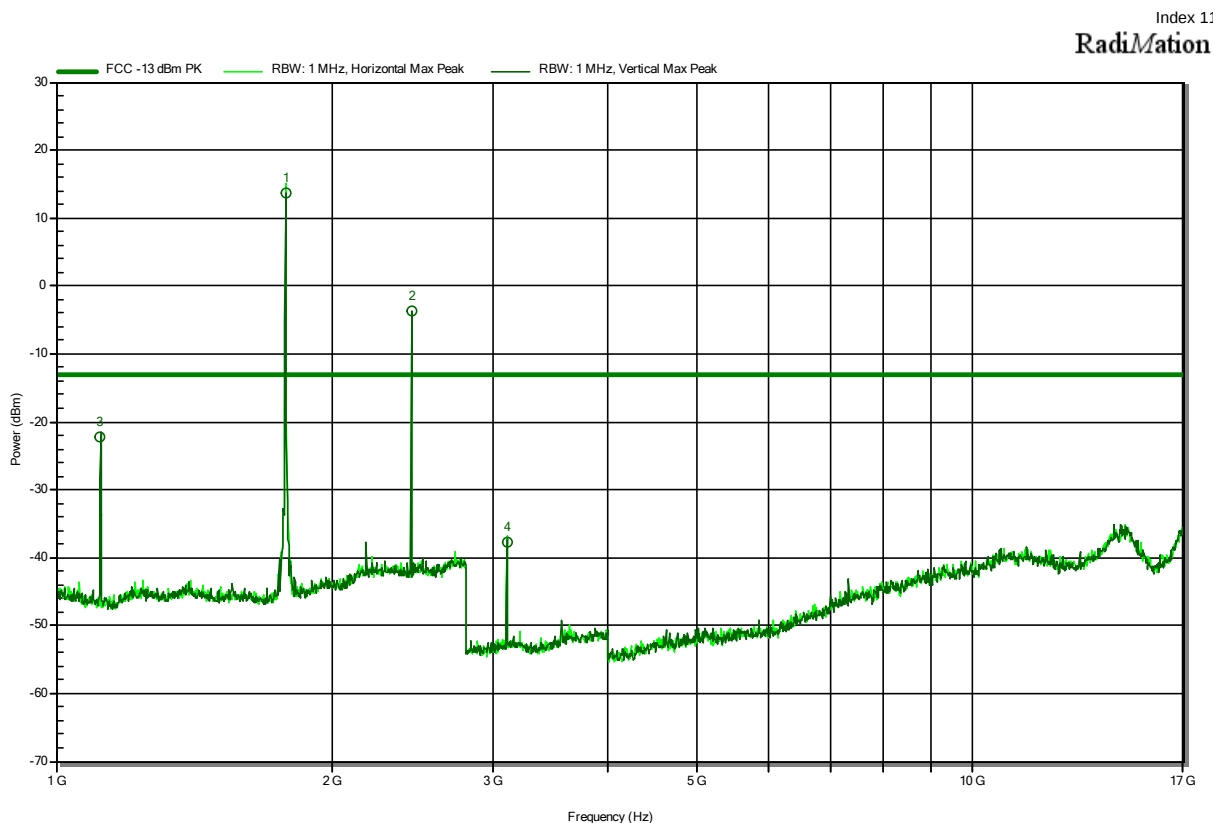
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 Measurement distance: 3 m
 Mode: Tx; LTE B66_1779.3MHz_BW1.4MHz_QPSK_RB1_Index5_BLE_1M_2442MHz
 Test Date: 2024-05-14



Radiated Spurious Emissions according to FCC Part 24E

Project Number: G0M-2403-2483
 Applicant: Intrex Inc
 Model Description: Wander Management wearable for elderly care/senior living
 Model: MRD 04 01 13
 Test Sample ID: 48260
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Siddique
 Measurement software: RadiMation, version 2020.1.8
 Test Conditions: Tnom: 23 °Celsius, Vnom: 5 VDC
 Antenna: Schwarzbeck BBHA 9120D
 Measurement distance: 3 m
 Mode: Tx; LTE B66_1779.3MHz_BW1.4MHz_QPSK_RB1_Index5_BLE_1M_2442MHz
 Test Date: 2024-05-14
 Note: Marker 1: LTE UL Carrier
 Marker 2: Bluetooth Carrier



Frequency	Peak	Peak Limit	Peak Difference	Peak Status	Polarization
1.117 GHz	-22.2 dBm	-13 dBm	-9.2 dB	Pass	Vertical
1.78 GHz	13.7 dBm			LTE UL Carrier	Vertical
2.442 GHz	-3.7 dBm			Bluetooth Carrier	Vertical
3.105 GHz	-37.8 dBm	-13 dBm	-24.78 dB	Pass	Vertical

=== End of test report ===

Test Report No.: G0M-2403-2483-TFCCOLOC-V01

Eurofins Product Service GmbH
 Storkower Str. 38c, D-15526 Reichenwalde, Germany