

**Vpatch Cardio Pty Ltd.**

# TEST REPORT

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# Radio Spectrum TEST REPORT

<b>Applicant:</b>	<b>Vpatch Cardio Pty Ltd. Level 1, 1221 Toorak Road, Camberwell, Victoria, 3124, Australia.</b>
<b>Product:</b>	<b>ECG Remote Event Monitor</b>
<b>Model No.:</b>	<b>101</b>
<b>Brand Name:</b>	<b>Vpod</b>
<b>FCC ID:</b>	<b>2ARNZ-1001</b>
<b>Test Method/ Standard:</b>	<b>47 CFR FCC Part 15.249 &amp; ANSI C63.10 2013</b>
<b>Test By:</b>	<b>Intertek Testing Services Taiwan Ltd., Hsinchu Laboratory No. 11, Lane 275, Ko-Nan 1 Street, Chia-Tung Li, Shiang-Shan District, Hsinchu City, Taiwan</b>



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### Revision History

Report No.	Issue Date	Revision Summary
180800268TWN-001	Feb. 19, 2019	Original report

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**Summary of Tests**

<b>Test</b>	<b>Reference</b>	<b>Results</b>
20dB Bandwidth	15.215(c)	Pass
Radiated Emission test	15.249(c), 15.209	Pass
Emission on the Band Edge	15.249(d)	Pass
Conducted Emission of AC Power	15.207	N/A
Antenna Requirement	15.203	Pass

**1. General Information****1.1 Identification of the EUT**

<b>Product:</b>	ECG Remote Event Monitor
<b>Model No.:</b>	101
<b>Operating Frequency:</b>	Single channel
<b>Channel Number:</b>	2466MHz
<b>Rated Power:</b>	DC 6.0V
<b>Power Cord:</b>	N/A
<b>Sample receiving date:</b>	Aug. 20, 2018
<b>Sample condition:</b>	Workable
<b>Test Date(s):</b>	Oct. 08, 2018 ~ Jan. 29, 2019

**1.2 Antenna description**

Antenova 3030A6250-01

Antenna Type: SMD

Antenna Gain: 0.2 dBi

## 2. Test specifications

### 2.1 Test standard

The EUT was performed according to the procedures in FCC Part 15 Subpart C Paragraph 15.249 for non-spread spectrum devices.

The test of radiated measurements according to FCC Part15 Section 15.33(a) had been conducted and the field strength of this frequency band were all meet limit requirement, thus we evaluate the EUT pass the specified test.

### 2.2 Operation mode

TX mode: EUT Press the button entering test mode.

The signal is maximized through rotation and placement in the three orthogonal axes.



**X axis**

**Y axis**

**Z axis**

After verifying three axes, we found the maximum electromagnetic field was occurred at Y axis. The final test data was executed under this configuration.

### 3. 20dB Bandwidth test

#### 3.1 Operating environment

Temperature:	25	°C
Relative Humidity:	50	%
Atmospheric Pressure:	1008	hPa

#### 3.2 Test setup & procedure

Step 1: The 20dB bandwidth was measured using a 50 ohm spectrum analyzer

Step 2: The span range for the SA display shall be between two times and five times the OBW.

Step 3: The nominal IF filter bandwidth (3 dB RBW) should be approximately 1 % to 5 % of the OBW, unless otherwise specified, depending on the applicable requirement.

Step 4: The test was performed at 1 channel. The maximum 20dB modulation bandwidth is in the following Table.

#### 3.3 Measured data of modulated bandwidth test results

##### Single TX

Mode	Frequency (MHz)	20dB Occupied Bandwidth (MHz)
ANT+	2466	1.1852

Please see the plot below.





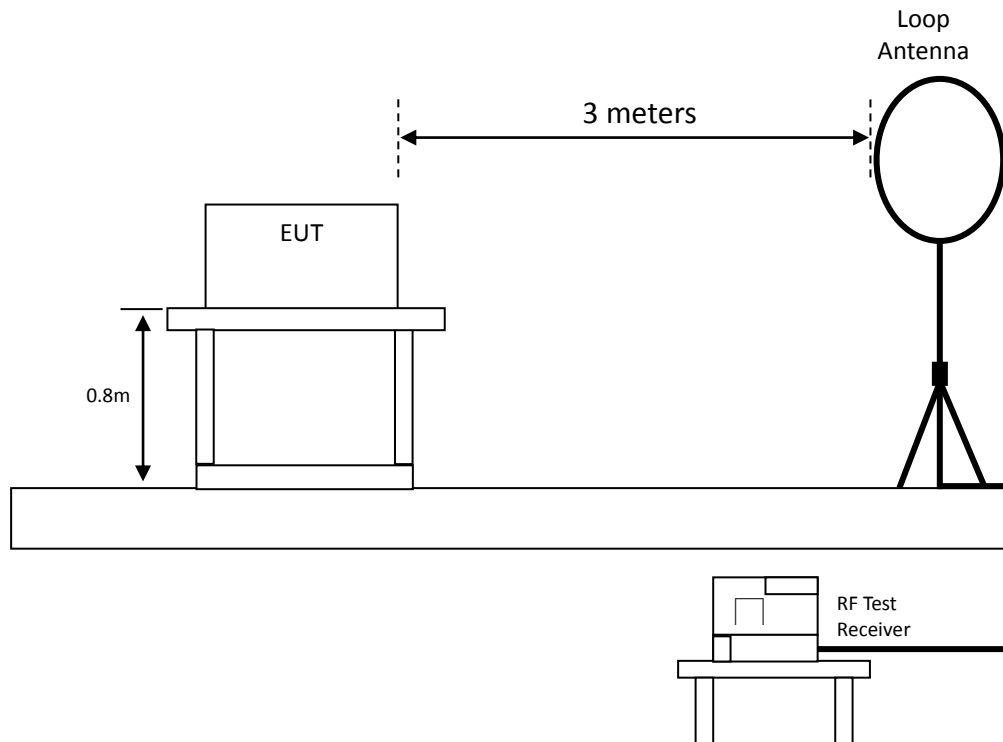
## 4. Radiated emission test FCC 15.249 (C)

### 4.1 Operating environment

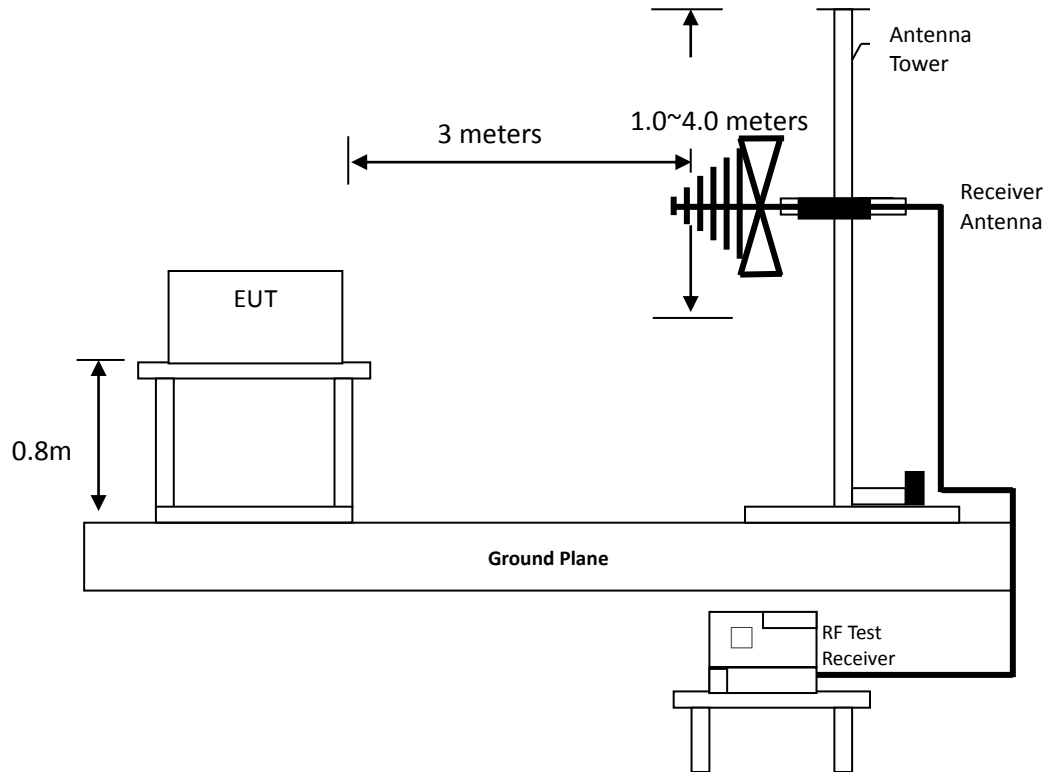
Temperature:	25	°C
Relative Humidity:	50	%
Atmospheric Pressure:	1008	hPa

### 4.2 Test setup & procedure

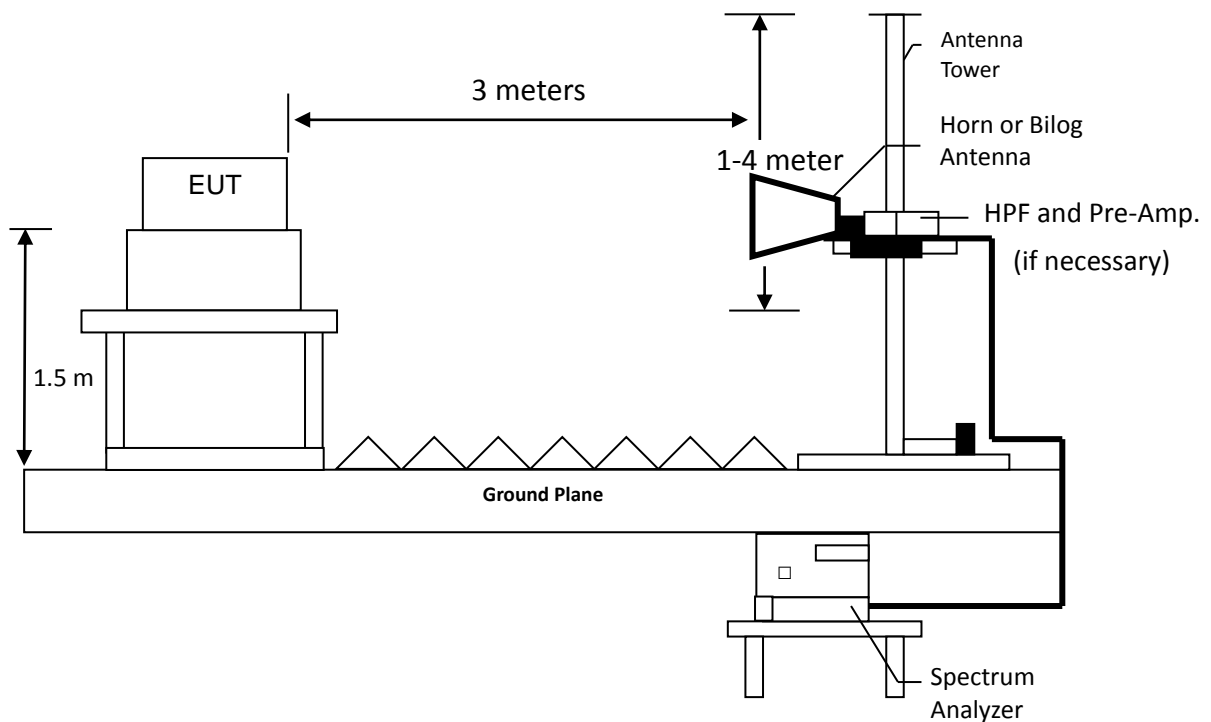
Radiated emission from 9kHz to 30MHz uses Loop Antenna:



## Radiated emission below 1GHz using Bilog Antenna



## Radiated emission above 1GHz using Horn Antenna



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Radiated emissions were investigated cover the frequency range from 30MHz to 1000MHz using a receiver RBW of 120kHz record QP reading, and the frequency over 1GHz using a spectrum analyzer RBW of 1MHz and 10Hz VBW record Average reading. (15.209 paragraph), the Peak reading (1 MHz RBW/ 3 MHz VBW) recorded also on the report.

The EUT for testing is arranged on a turntable. If some peripherals apply to the EUT, the peripherals will be connected to EUT and the whole system. During the test, all cables were arranged to produce worst-case emissions. The signal is maximized through rotation. The height of antenna and polarization is changing constantly for exploring for maximum signal level. The height of antenna can be up to 4 meters and down to 1 meter.

The measurement for radiated emission will be done at the distance of three meters unless the signal level is too low to measure at that distance. In the case of the reading under noise floor, a pre-amplifier is used and/or the test is conducted at a closer distance. And then all readings are extrapolated back to the equivalent three meter reading using inverse scaling with distance.

**4.3 Emission limit****4.3.1 Fundamental and harmonics emission limits**

Frequency (MHz)	Field Strength of Fundamental		Field Strength of Harmonics	
	(mV/m@3m)	(dBuV/m@3m)	(uV/m@3m)	(dBuV/m@3m)
2400-2483.5	50	94	500	54

#### 4.3.2 General radiated emission limits

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50dB below the level of the fundamental or to the general radiated emission limits in paragraph 15.209, whichever is the lesser attenuation.

<b>Frequency MHz</b>	<b>15.209 Limits (dB<math>\mu</math>V/m@3m)</b>
30-88	40
88-216	43.5
216-960	46
Above 960	54

Remark:

1. In the above table, the tighter limit applies at the band edges.
2. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system

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### 4.4 Radiated spurious emission test data

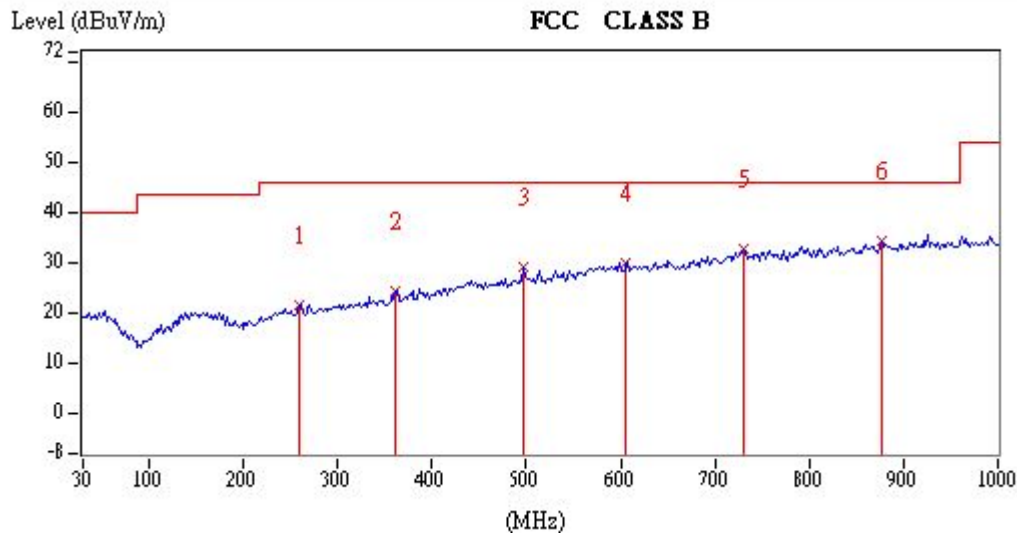
#### 4.4.2 Measurement results: frequencies equal to or less than 1 GHz

Polarity: Vertical

Frequency	Factor	Reading	Emission	Limit	Margin
MHz	dB	dB $\mu$ V	dB $\mu$ V/m	dB $\mu$ V/m	dB
258.92	20.50	1.26	21.76	46.00	-24.24
361.74	22.95	1.59	24.54	46.00	-21.46
497.54	26.03	3.29	29.31	46.00	-16.69
606.18	28.41	1.76	30.17	46.00	-15.83
730.34	30.41	2.42	32.83	46.00	-13.17
877.78	32.31	2.24	34.55	46.00	-11.45

Remark:

1. Factor = Antenna Factor (dB/m) + Cable Loss (dB)
2. Emission (dB $\mu$ V/m) = Factor (dB) + Reading (dB $\mu$ V)
3. Margin (dB) = Emission (dB  $\mu$  V/m) – Limit (dB  $\mu$  V/m)

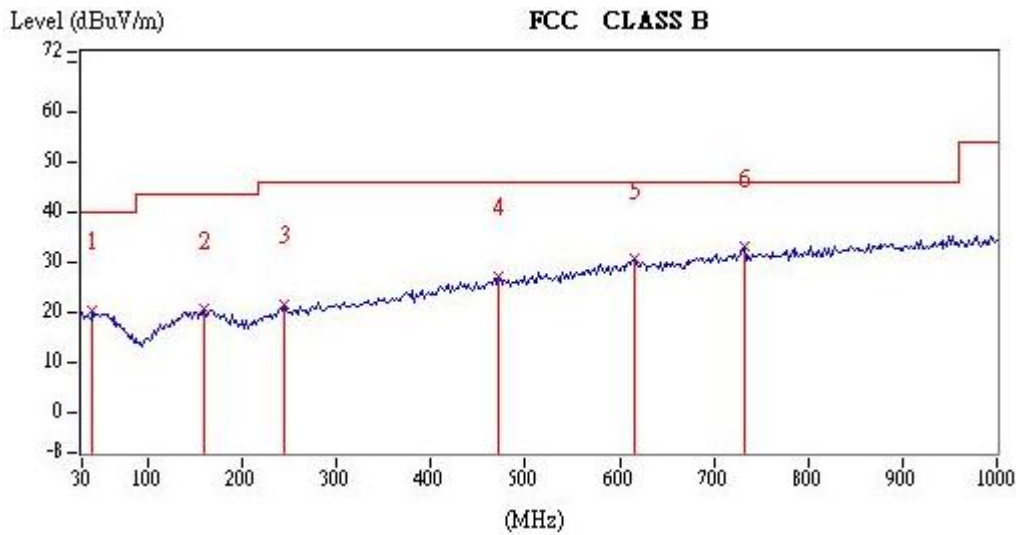


Polarity: Horizontal

Frequency	Factor	Reading	Emission	Limit	Margin
MHz	dB	dB $\mu$ V	dB $\mu$ V/m	dB $\mu$ V/m	dB
41.64	19.95	0.50	20.46	40.00	-19.54
159.98	20.38	0.24	20.62	43.50	-22.88
243.40	20.22	1.44	21.66	46.00	-24.34
472.32	25.68	1.71	27.39	46.00	-18.61
615.88	28.53	2.15	30.68	46.00	-15.32
732.28	30.45	2.72	33.16	46.00	-12.84

Remark:

1. Factor = Antenna Factor (dB/m) + Cable Loss (dB)
2. Emission (dB $\mu$ V/m) = Factor (dB) + Reading (dB $\mu$ V)
3. Margin (dB) = Emission (dB  $\mu$  V/m) – Limit (dB  $\mu$  V/m)



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**4.4.3 Measurement results: frequency above 1GHz**

Mode	Frequency (MHz)	Spectrum Analyzer Detector	Ant. Pol. (H/V)	Correction Factor (dB/m)	Reading (dBμV)	Corrected Reading (dBμV/m)	Limit @ 3 m (dBμV/m)	Margin (dB)
ANT+	4932	PK	V	6.34	54.51	60.85	74.00	-13.15
	4932	AV	V	6.34	40.44	46.78	54.00	-7.22
	7398	PK	V	14.75	38.14	52.89	74.00	-21.11
	4932	PK	H	6.34	54.58	60.92	74.00	-13.08
	4932	AV	H	6.34	40.45	46.79	54.00	-7.21
	7398	PK	H	14.75	31.73	46.48	74.00	-27.52

Remark: Correction Factor = Antenna Factor + Cable Loss + High Pass Filter Loss - Pre\_Amplifier Gain



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**4.4.4 Measurement results: Fundamental**

Mode	Frequency (MHz)	Spectrum Analyzer Detector	Ant. Pol. (H/V)	Correction Factor (dB/m)	Reading (dBμV)	Corrected Reading (dBμV/m)	Limit @ 3 m (dBμV/m)	Margin (dB)
ANT+	2466	PK	V	34.36	46.53	80.89	114.00	-33.11
	2466	AV	V	34.36	32.44	66.80	94.00	-27.20
	2466	PK	H	34.36	56.48	90.84	114.00	-23.16
	2466	AV	H	34.36	42.35	76.71	94.00	-17.29

Remark: Correction Factor = Antenna Factor + Cable Loss

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**5. Radiated emission on the band edge FCC 15.249(d)**

**5.1 Operating environment**

Temperature:	25	°C
Relative Humidity:	50	%
Atmospheric Pressure:	1008	hPa

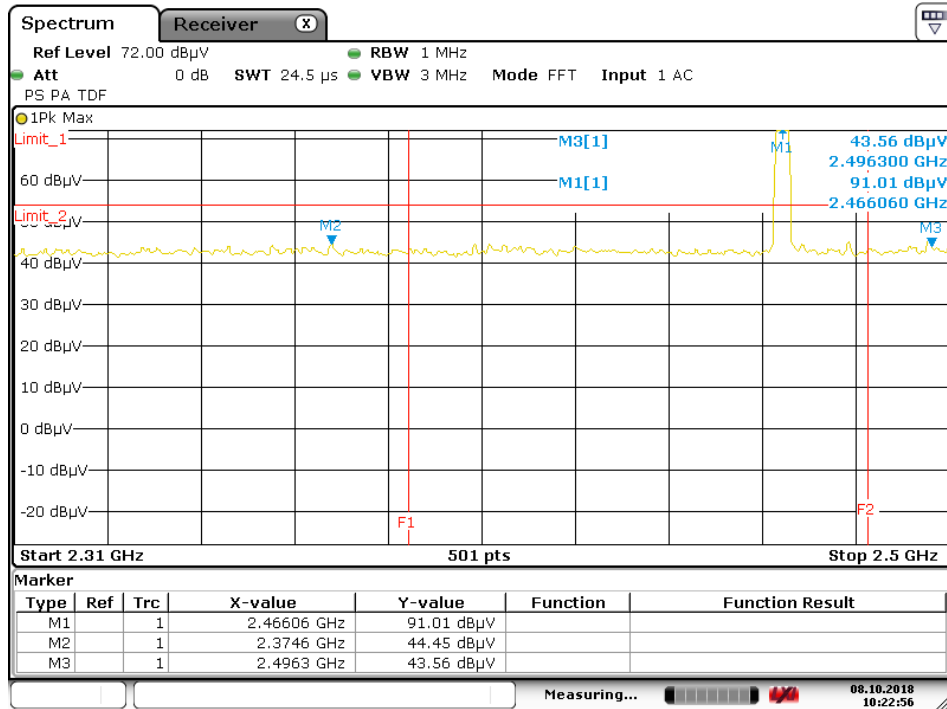
**5.2 Radiated emission on the band edge test data**

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental (2470MHz) or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

Mode	Frequency (MHz)	Spectrum Analyzer Detector	Ant. Pol. (H/V)	Correction Factor (dB/m)	Reading (dBμV)	Corrected Reading (dBμV/m)	Limit @ 3 m (dBμV/m)	Margin (dB)	Restricted band (MHz)
ANT+	2376.60	PK	V	34.37	10.08	44.45	74	-29.55	2310~2390
	2381.43	AV	V	34.37	-3.53	30.84	54	-23.16	
	2496.30	PK	V	34.35	9.21	43.56	74	-30.44	2483.5~2500
	2497.91	AV	V	34.35	-3.11	31.24	54	-22.76	

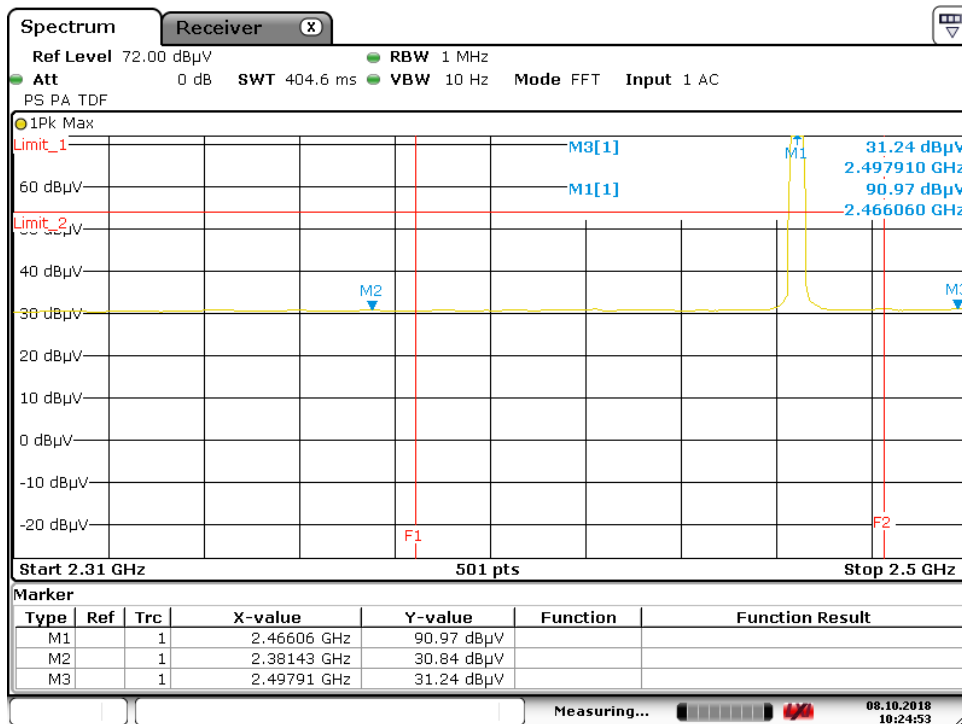
Remark: Correction Factor = Antenna Factor + Cable Loss

## Vpod\_Bandedge @ mode ANT+ 2466MHz Peak



Date: 8.OCT.2018 10:22:56

## Vpod\_Bandedge @ mode ANT+ 2466MHz Average



Date: 8.OCT.2018 10:24:53

## **6. AC Power Line Conducted Emission**

Since the EUT is not connected to AC source, therefore, the test can be waived.

### Appendix A: Test equipment list

Test Equipment/ Test site	Brand	Model No.	Serial No.	Calibration Date	Next Calibration Date
ESCI EMI Test Receiver	Rohde & Schwarz	ESCI	100018	2018/11/14	2019/11/13
Spectrum Analyzer	Rohde & Schwarz	FSP30	100245	2018/02/23	2019/02/22
Horn Antenna (1-18G)	SHWARZBECK	BBHA 9120 D	9120D-456	2018/01/23	2019/01/22
Horn Antenna (14-42G)	SHWARZBECK	BBHA 9170	BBHA9170159	2017/09/04	2020/09/02
Broadband Antenna	SHWARZBECK	VULB 9168	9168-172	2018/04/23	2019/04/22
Pre-Amplifier	EMC Co.	EMC12635SE	980205	2018/12/10	2019/12/09
Pre-Amplifier	MITEQ	JS4-26004000--27-8A	828825	2018/08/28	2019/08/27
Power Meter	Anritsu	ML2495A	0844001	2018/10/29	2019/10/28
Power Sensor	Anritsu	MA2411B	0738452	2018/10/29	2019/10/28
Signal Analyzer	Agilent	N9030A	MY51380492	2018/08/24	2019/08/23
966-2(A) Cable 9kHz~26.5GHz	SUHNER	SMA / EX 100	N/A	2018/08/07	2019/08/06
966-2(B) Cable 9kHz~26.5GHz	SUHNER	SUCOFLEX 104P	CB0005	2018/08/07	2019/08/06
RF Cable 9kHz~26.5GHz	SUHNER	SUCOFLEX 102	CB0006	2018/05/03	2019/05/02
966-2_3m Semi-Anechoic Chamber	966_2	CEM-966_2	N/A	2018/03/05	2019/03/04
High Pass Filter	Wainwright	WHKX3.0/18G-12SS	N/A	2018/06/01	2019/05/31
Active Loop Antenna	SCHWARZBECK MESS-ELEKTRONIC	FMZB1519	1519-067	2018/04/17	2019/04/16

Note: No Calibration Required (NCR)

## Appendix B: Measurement Uncertainty

This uncertainty represents an expanded uncertainty expressed at approximately the 95 % confidence level using a coverage factor of  $k=2$ .

Item	Uncertainty
Vertically polarized radiated disturbances from 30MHz~1GHz in a semi-anechoic chamber at a distance of 3m	5.14 dB
Horizontally polarized radiated disturbances from 30MHz~1GHz in a semi-anechoic chamber at a distance of 3m	5.22 dB
Vertically polarized Radiated disturbances from 1GHz~18GHz in a semi-anechoic chamber at a distance of 3m	3.64 dB
Horizontally polarized Radiated disturbances from 1GHz~18GHz in a semi-anechoic chamber at a distance of 3m	3.64 dB
Vertically polarized Radiated disturbances from 18GHz~40GHz in a semi-anechoic chamber at a distance of 3m	2.68 dB
Horizontally polarized Radiated disturbances from 18GHz~40GHz in a semi-anechoic chamber at a distance of 3m	2.68 dB
Radiated disturbances from 9kHz~30MHz in a semi-anechoic chamber at a distance of 3m	3.54 dB
Emission on the Band Edge Test	3.64 dB
20dB Bandwidth	1.22 dB
AC Power Line Conducted Emission	2.48 dB