

## RAPPORTO DI PROVA

### TEST REPORT

Rif. / Ref. n.	<b>FCCTR_178529-0</b>	Data / Date:	<b>05/03/2021</b>	Pagine / Pages:	<b>29</b>
Scopo delle prove Test object	Prove di tipo in accordo alla Norma Type test according to standards <b>47 CFR FCC part 15.205, 15.209</b>				
Richiedente Applicant	<b>Paradox Engineering SA</b> Via Passeggiata 7 – 6883 Novazzano – CH Tel.: +41 912330100				
Marchio commerciale Trade mark					
Fabbricante Manufacturer	<b>MinebeaMitsumi Inc.</b> 3-9-6 Mita, Minato-ku, Tokyo 108-8330 Tel.: 81-3-6758-6711				
Prodotto Product	Multi radio gateway				
Modello testato Testing model	<b>GWWG001US (PE Mini IoT Gateway)</b>				
Identificativo FCC FCC ID	<b>2AKPQGWG001</b>				
Data ricevimento campioni Date of test samples receipt	24/02/2021				
Campioni verificati No. of tested samples	1 – Sample by the applicant				
Data verifiche Testing date	From 24/02/2021 to 03/03/2021				
Sito di prova Testing site	PRSLAB S.r.l. Unipersonale - Via Campagna 92 - 22020 Faloppio - Como - Italy				
Esito delle valutazioni Assessment results	<b>CONFORME / COMPLIANT</b>				
Verifiche effettuate da Verifications carried out by	<b>Daniele AOSANI</b> Tecnico laboratorio EMC & RADIO EMC & RADIO Test Engineer				
Approvato Approved by	<b>Riccardo PFEIFFER</b> Responsabile laboratori EMC & RADIO EMC & RADIO Laboratory manager				

**I risultati delle prove riportati nel presente rapporto di prova si riferiscono solo ai campioni esaminati.**

*The test results reported in this test report shall refer only to the samples tested*

**Il campione è stato fornito dal cliente ed i risultati si riferiscono al campione così come ricevuto**

*The sample has been provided by the customer and the results apply to the sample as received*

**Questo Report non può essere riprodotto in modo parziale, salvo espressa autorizzazione scritta da parte del Laboratorio**

*This report may not be partially reproduced, except with the prior written permission of the issuing Laboratory*

## CONTENUTO

### TABLE OF CONTENTS

<b>0. RELEASE CONTROL RECORD .....</b>	<b>3</b>
<b>1. DECISION RULE .....</b>	<b>3</b>
<b>2. INFORMATION PROVIDED BY CUSTOMER.....</b>	<b>3</b>
<b>3. GENERAL REMARKS .....</b>	<b>3</b>
<b>4. TECHNICAL INFORMATION OF EQUIPMENT UNDER TEST (EUT).....</b>	<b>4</b>
4.1 EUT Identification .....	4
4.2 Ports identification.....	5
4.3 Modifications incorporated in E.U.T.....	5
4.4 Auxiliary equipment.....	5
<b>5. OPERATING MODES AND TEST CONDITIONS.....</b>	<b>6</b>
<b>6. REFERENCE STANDARDS .....</b>	<b>7</b>
<b>7. SUMMARY OF TEST RESULTS.....</b>	<b>7</b>
<b>8. UNITS OF MEASUREMENTS .....</b>	<b>7</b>
<b>9. LIST OF INSTRUMENTS USED .....</b>	<b>8</b>
<b>10. TEST RESULTS.....</b>	<b>8</b>
<b>11. PHOTOGRAPHIC SECTION.....</b>	<b>28</b>

## 0. RELEASE CONTROL RECORD

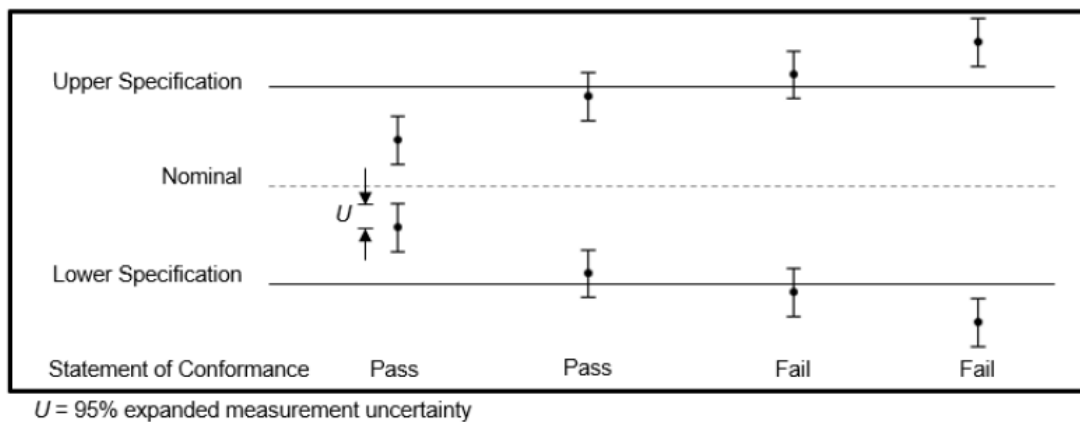
TEST REPORT NUMBER	REASON OF CHANGE	DATE OF ISSUE
FCCTR_178529_0	Original release	05/03/2021

This document is valid in last revision that deletes and replaces the previous one

## 1. DECISION RULE

PRS LAB specifies that, if the decision rules of conformity of the test results are not indicated in detail in the standard/s object of tests, it takes as a decision rule for the declaration of conformity the simple binary system ( $w = 0$ ) stated in the ILAC-G8-09:2019 document.

The decision rule is applicable for all parts of standard



Statements of conformity are reported as:

- Pass: the measured value is below the acceptance limit,  $AL=TL$ .
- Fail: the measured value is above the acceptance limit,  $AL=TL$ .

Definitions

- Guard Band ( $w$ ): interval between a tolerance limit and a corresponding acceptance limit where length  $w=|TL-AL|$ .
- Tolerance Limit (TL) (Specification Limit): specified upper or lower bound of permissible values of a property.
- Acceptance Limit (AL): specified upper or lower bound of permissible measured quantity values.

## 2. INFORMATION PROVIDED BY CUSTOMER


- None

## 3. GENERAL REMARKS

- The EUT has been tested with the internal welding (on the radio module screen) done in spots, the complete welding of the screen has the same results.

## 4. TECHNICAL INFORMATION OF EQUIPMENT UNDER TEST (EUT)

### 4.1 EUT Identification

DESCRIPTION	Multi radio gateway
MODEL NAME	GWWG001US (PE Mini IoT Gateway)
FCC ID	2AKPQGWWG001
SERIAL NO.	N/A
PRSLAB IDENTIFICATION	BC 68/2021 1/1
TRADEMARK	
MANUFACTURER	MinebeaMitsumi Inc.
COUNTRY OF MANUFACTURER	Japan
SINGLE UNIT OR SYSTEM	Single
POWER SOURCE	AC main
	PoE supply
SUPPLY VOLTAGE	115V ~ 60Hz
	48 Vdc from PoE
MAX POWER or MAX ABSORBED CURRENT	30 W
HW VERSION	ELB-PED-0145-04
FW VERSION	3.14
OPERATING TEMPERATURE	-25°C ÷ +60°C
DIMENSIONS	See photographic documentation
EUT STANDING	Wall or pole mounting
CONTAINS	FCC ID <b>TFB-1003</b> _Wi-Fi module
	FCC ID <b>N7NRC76B</b> _LTE module

## 4.2 Ports identification

PORT	DESCRIPTION	CONNECTION	NOTES
<input checked="" type="checkbox"/> Enclosure	Plastic	Screws	---
<input checked="" type="checkbox"/> AC Power input	115V ~ 60Hz	Plug	---
<input checked="" type="checkbox"/> DC Power input	PoE	RJ45	>3mt
<input checked="" type="checkbox"/> Signal / Control port	Environmental sensor	cable	>3mt
<input checked="" type="checkbox"/> Telecomm. port	2x Ethernet port	RJ45	>3mt
<input checked="" type="checkbox"/> Antenna port:	1x Dipole antenna 3x Chip antenna	SMA ---	---

**Note:**

During the tests all cables must be what provided the manufacturer or the same that used in the real employment of the EUT.

## 4.3 Modifications incorporated in E.U.T.

The following items are the modifications introduced in the equipment under test:

- None

## 4.4 Auxiliary equipment

- Personal computer model AH532, manufacturer by Fujitsu, with software Radio Tester 1.12.3, to set channels.

## 5. OPERATING MODES AND TEST CONDITIONS

In the following table there are the operating conditions adopted during tests identified by an indicator (#) at which has been referred the item "Operating condition of the equipment under test"

OPERATING CONDITION	DESCRIPTION
#1	Simultaneous Transmissions, setting for configuration 1: - WLAN, 2412MHz, mode B, TX power 24dBm, Chip antenna ANT3216LL0032400A (ELC-OTH-0166) - LTE, 876MHz, band 26, TX power 23dBm, Chip antenna 1462000001 (ELC-OTH-0148) - 6LoWPAN, 915MHz, TX power 27dBm, Chip antenna ANT1204F005R0915A (ELC-OTH-0150)
#2	Simultaneous Transmissions, setting for configuration 2: - WLAN, 2412MHz, mode B, TX power 24dBm, Chip antenna ANT3216LL0032400A (ELC-OTH-0166) - LTE, 876MHz, band 26, TX power 23dBm, Dipole antenna OMB.6912.03F21 - 6LoWPAN, 915MHz, TX power 27dBm, Chip antenna ANT1204F005R0915A (ELC-OTH-0150)

**Special Test Software:** Special software by the Applicant to operate the EUT at each channel frequency continuously. For example, the transmitter will be operated at each of the lowest, middle and highest frequencies individually continuously during testing.

**Special Hardware Used:** None

**Transmitter Test Antenna:** The EUT has been tested with the antenna fitted in a manner typical of normal intended

## 6. REFERENCE STANDARDS

REFERENCE STANDARD	
Cfr 47 part 15 subpart C par. 15.205	Radio Frequency Devices – Intentional Radiators Restricted bands of operation
Cfr 47 part 15 subpart C par. 15.209	Radio Frequency Devices – Intentional Radiators Radiated emissions limits, general requirements
ANSI C63.4:2014	American National Standard for Methods of Measuring of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz – 40 GHz

## 7. SUMMARY OF TEST RESULTS

EUT PORT	DESCRIPTION OF PHENOMENA	BASIC STANDARD	OPERATING CONDITION	RESULTS
Enclosure	Restricted bands of operation	FCC Part 15 §15.205	#1, #2	Within the limits
	Radiated emissions limits, general requirements	FCC Part 15 §15.209	#1, #2	Within the limits

## 8. UNITS OF MEASUREMENTS

Conducted EMI Data is in dB $\mu$ V; dB referenced to one microvolt

Radiated EMI Data is in dB $\mu$ V/m; dB/m referenced to one microvolt per meter

Sample Calculation:

RFS = Radiated Field Strength,

FSM = Field Strength Measured,

A.F. = Receive antenna factor,

Gain = amplification gains and/or cable losses.

$$\text{RFS (dB}\mu\text{V/m @ 3m)} = \text{FSM (dB}\mu\text{V)} + \text{A.F. (dB/m)} - \text{Gain (dB)}$$

## 9. LIST OF INSTRUMENTS USED

Instrument	Manufacturer	Model	Serial n°	Calibrated on	Due to
MXE Emi Receiver	Keysight	N9038A	MY57290150	06/2020	06/2021
Stabilized Power Supply	Spitzenberger+Spies	PAS5000	A154201/00595	03/2020	03/2021
Loop antenna	Rohde & Schwarz	HFH 2-Z2	841801/012	03/2020	03/2023
Bi-log antenna	Chase	CBL6111C	2717	03/2019	03/2022
Horn antenna	Electro Metrics	EM-6961	100437	10/2020	10/2023
High pass filter	Wainwright	WHK 1,3/15G	9	03/2019	03/2021
High pass filter	Wainwright	WHK 2,8/15G	1	03/2019	03/2021
Semi-Anechoic Chamber	Siemens	B83117-D6019-T232	003-005-134/94C	02/2021	02/2022
Software EMC	Rohde & Schwarz	EMC32-E	V 8.40.0	N.A.	

## 10. TEST RESULTS

**RADIATED EMISSION ..... 9**



## TEST 1.

### RADIATED EMISSION

#### REFERENCE DOCUMENT

#### According to §15,209

Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

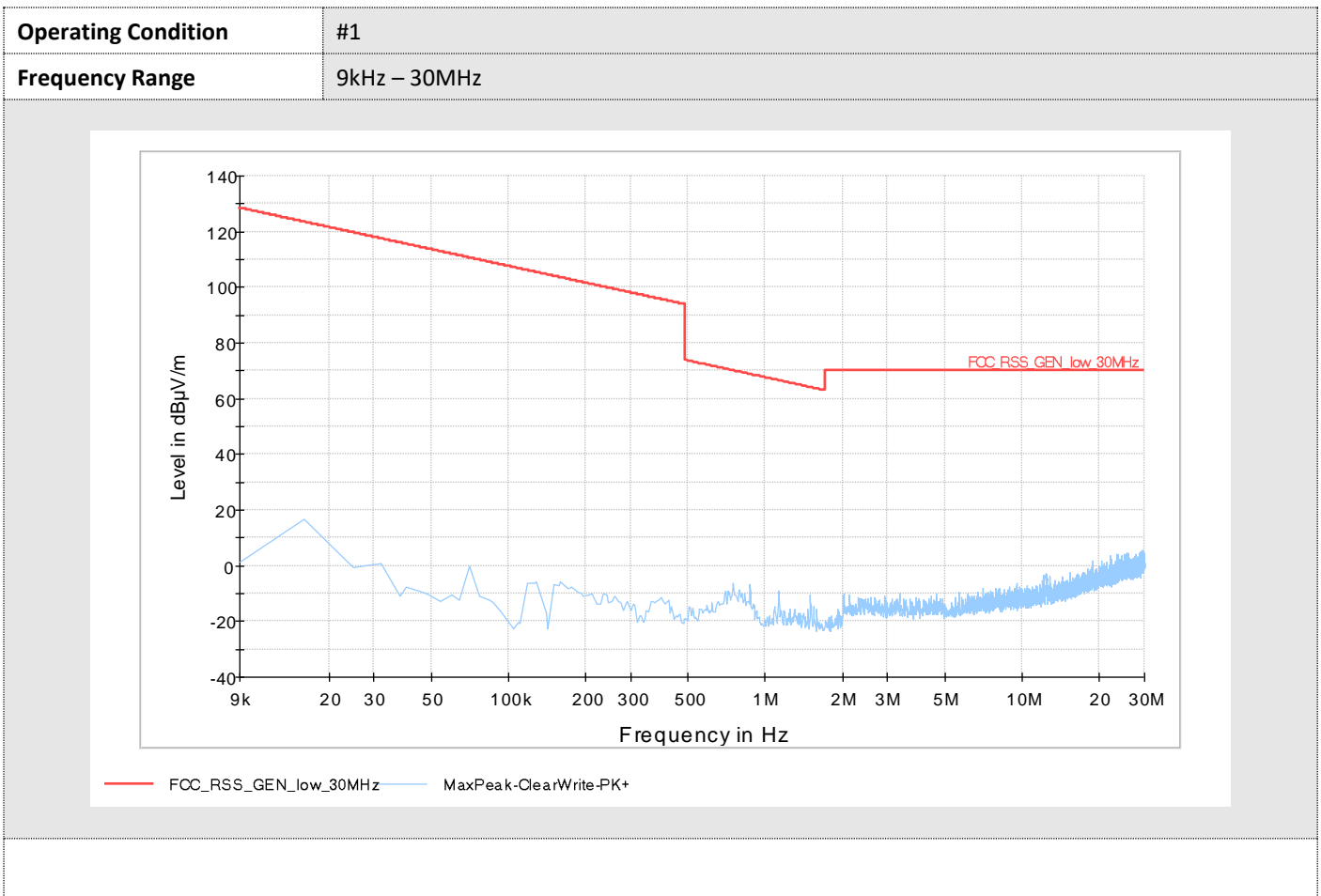
• <b>TEST SETUP</b>	Acc. to reference document
• <b>TEST LOCATION</b>	Semi-anechoic chamber with measure distance at 3 meters
• <b>TYPE OF MEASUREMENT</b>	Radiated
• <b>TEST EQUIPMENT USED FOR TEST</b>	Stabilized Power Supply Spitzenberger+Spies mod. PAS5000 MXE Emi Receiver Keysight mod. N9038 Loop Antenna Rohde & Schwarz mod. HFH 2-Z2 Bi-log antenna Chase mod. CBL6111C Horn antenna Electro Metrics mod. EM-6961 High pass filter Wainwright mod. WHK 1,3/15G SW Rohde & Schwarz EMC32-E
• <b>TEST PERFORMED BY</b>	Daniele Aosani
• <b>UNCERTAINTY OF MEASURE:</b>	Level of confidence = 95% (k=2) Expanded uncertainty 9kHz – 30MHz = 4,24 dB Expanded uncertainty 30MHz – 1GHz = 5,86 dB Expanded uncertainty 1GHz – 10GHz = 5,3 dB

TEST CONDITIONS	REQUIRED	MEASURED
<b>Ambient temperature</b>	<b>23°C ± 5°C</b>	24 °C
<b>Ambient humidity</b>	<b>25 - 75%rH</b>	45%
<b>Pressure</b>	<b>85 - 106kPa (860mbar - 1060mbar)</b>	960 mbar

OPERATING CONDITION :#1, #2

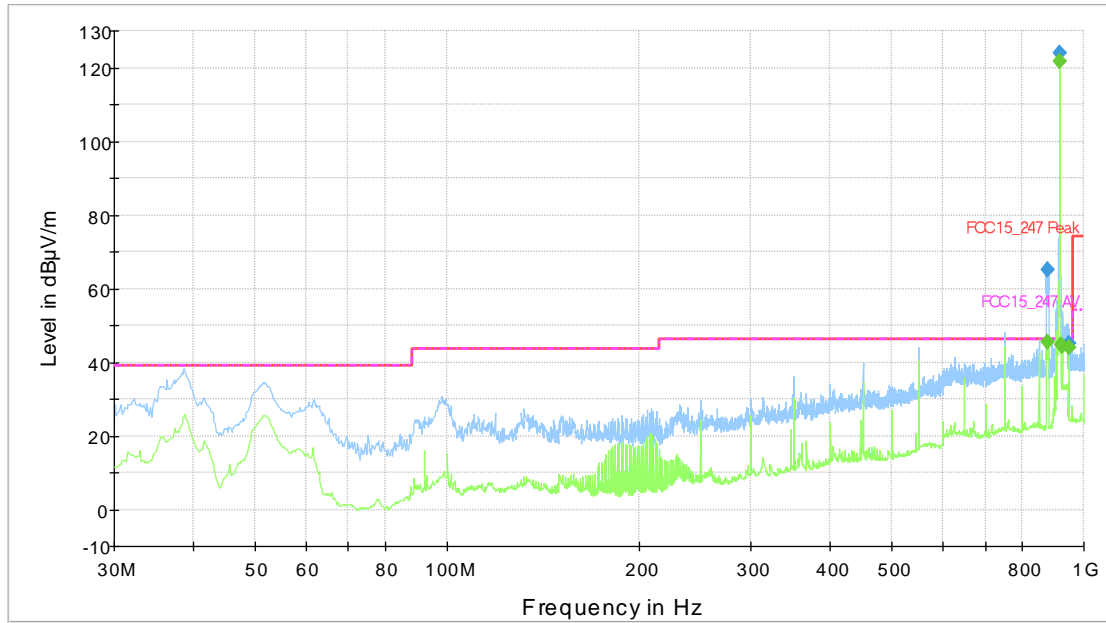
RESULT: **WITHIN THE LIMITS**

## MEASUREMENT RESULT



**Frequency Range** 30MHz – 1GHz

**Polarization** Vertical



— FCC 15\_247 Peak-CAR    
 - - - FCC 15\_247 AV-CAR    
 — MaxPeak-ClearWrite-PK+  
— Average-ClearWrite-AVG    
 ◆ Final Result 1-PK+    
 ◆ Final Result 2-AVG

**Final Result Quasi Peak**

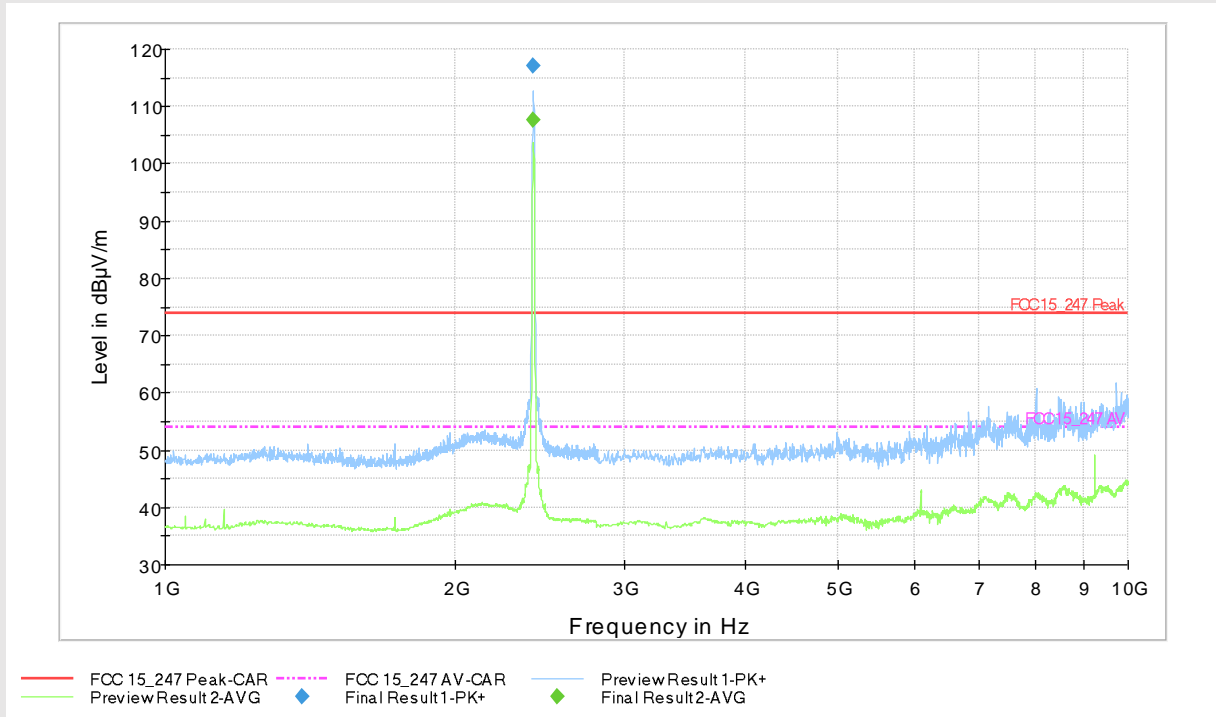
Frequency (MHz)	MaxPeak (dBµV/m)	Height (cm)	Azimuth (deg)	Margin (dB)	Limit (dBµV/m)
876.810000	64.9	274.5	273.0	-18.50	46.40
915.060000	124.1	117.8	262.0	-77.70	46.40
950.010000	45.0	104.7	177.0	1.40	46.40

**Final Result Average**

Frequency (MHz)	Average (dBµV/m)	Height (cm)	Azimuth (deg)	Margin (dB)	Limit (dBµV/m)
876.090000	45.4	271.5	277.0	1.00	46.40
915.000000	121.6	118.7	262.0	-75.20	46.40
920.460000	44.6	114.7	262.0	1.80	46.40
925.230000	44.2	119.7	262.0	2.20	46.40
950.010000	44.1	97.5	172.0	2.30	46.40

NOTE: Peaks out of limits are due to the Radio Carriers and fall in the Exclusion Bands.

<b>Frequency Range</b>	1GHz – 10GHz
<b>Polarization</b>	Vertical



**Final Result Peak**

Frequency (MHz)	MaxPeak (dBµV/m)	Height (cm)	Azimuth (deg)	Margin (dB)	Limit (dBµV/m)
2412.000000	117.1	106.9	223.0	-43.10	74.00

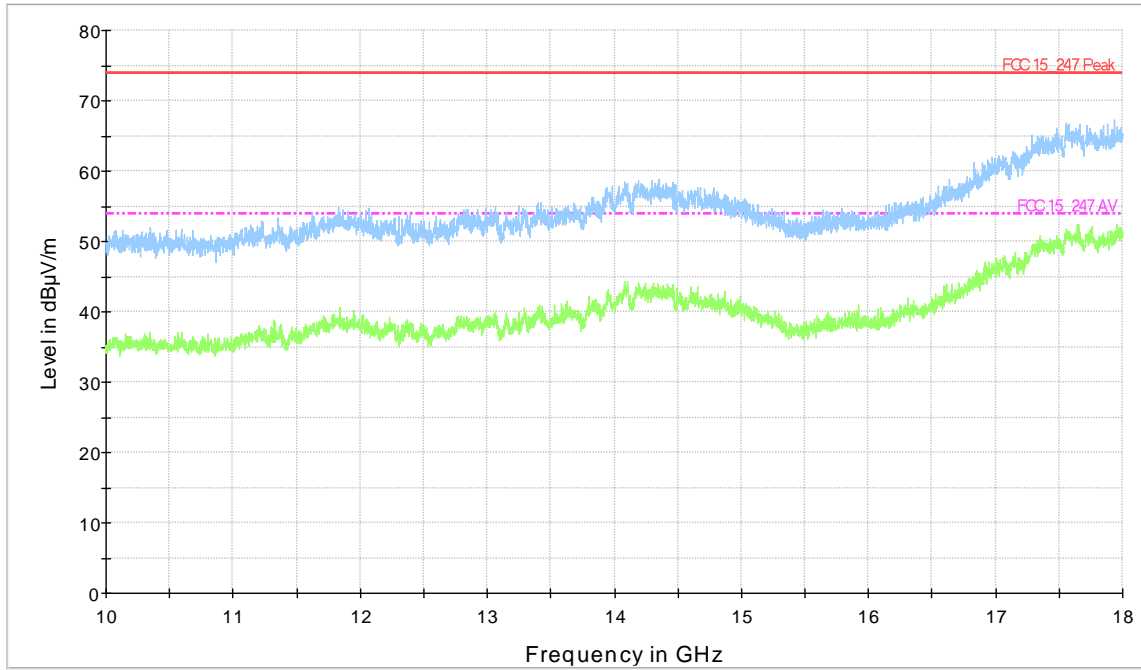
**Final Result Average**

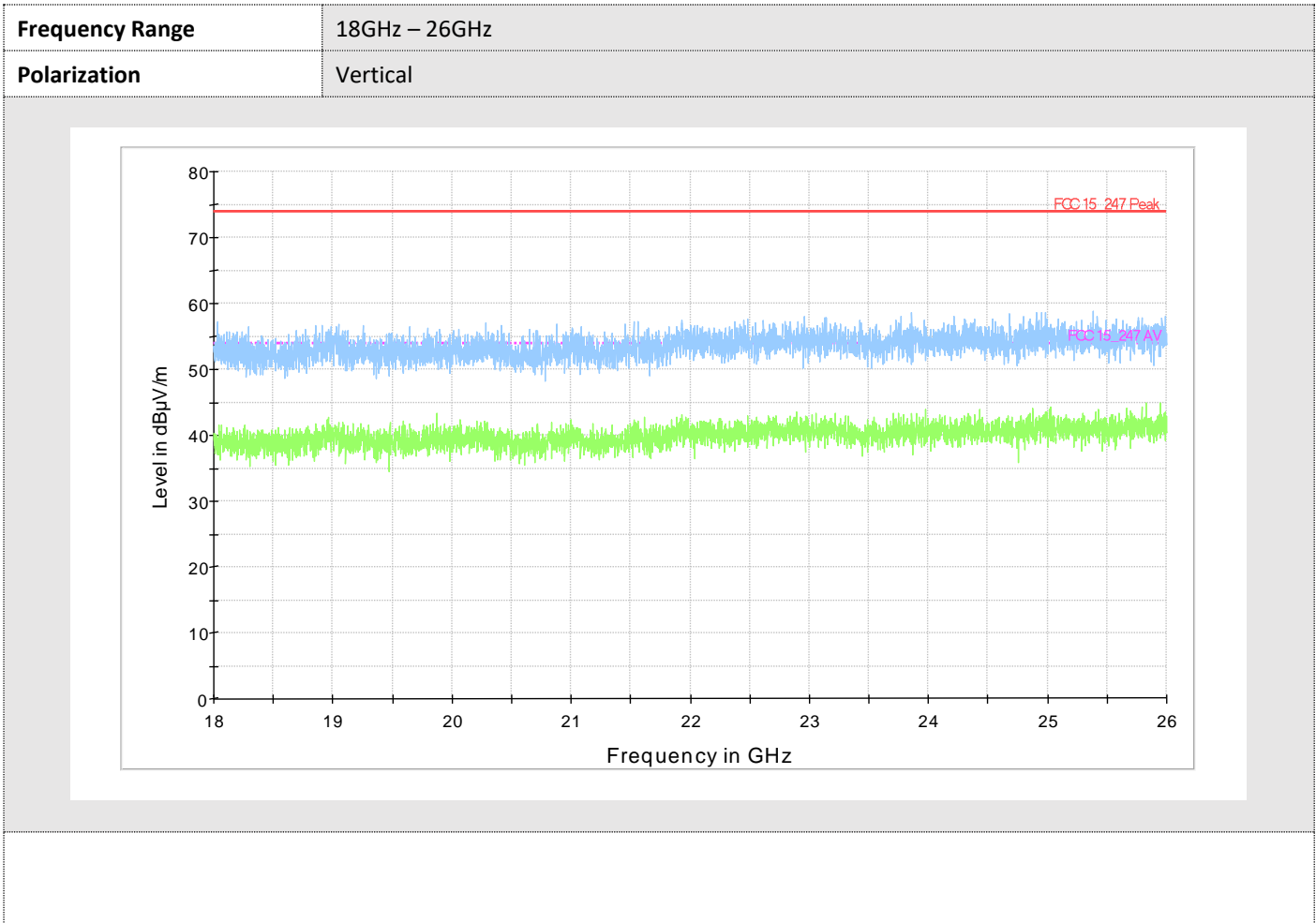
Frequency (MHz)	Average (dBµV/m)	Height (cm)	Azimuth (deg)	Margin (dB)	Limit (dBµV/m)
2411.000000	107.6	200.6	233.0	-53.60	54.00

NOTE: Peaks out of limits are due to the Radio Carriers and fall in the Exclusion Bands.

**Frequency Range** 10GHz – 18GHz

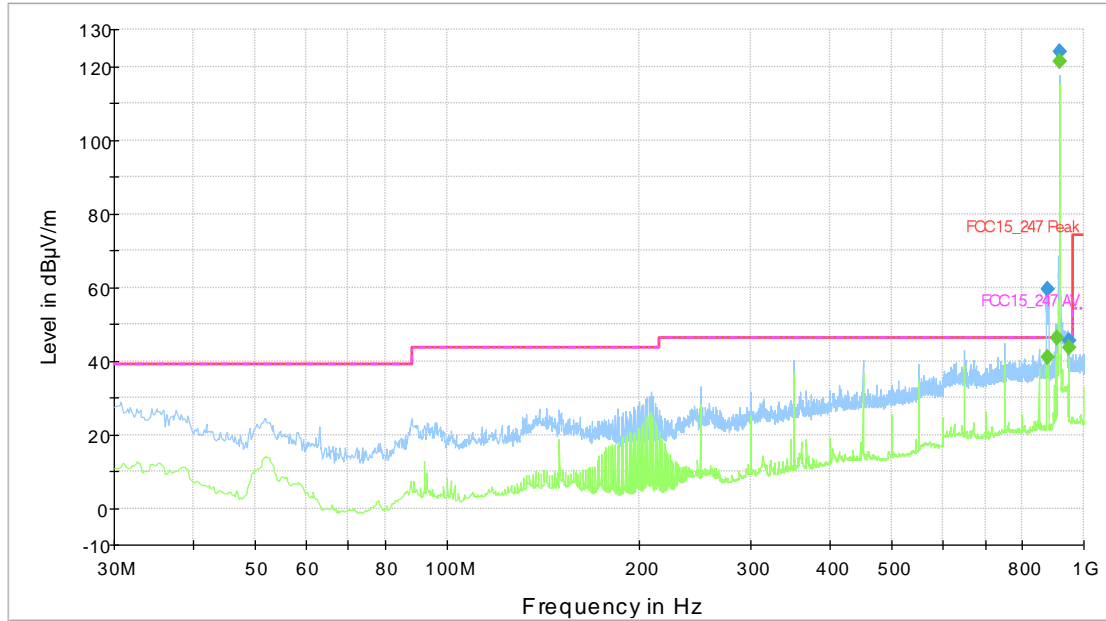
**Polarization** Vertical





**Frequency Range** 30MHz – 1GHz

**Polarization** Horizontal



— FCC 15\_247 Peak-CAR    ◆ FCC 15\_247 AV-CAR    — MaxPeak-ClearWrite-PK+  
— Average-ClearWrite-AVG    ◆ Final Result1-PK+    ◆ Final Result2-AVG

**Final Result Quasi Peak**

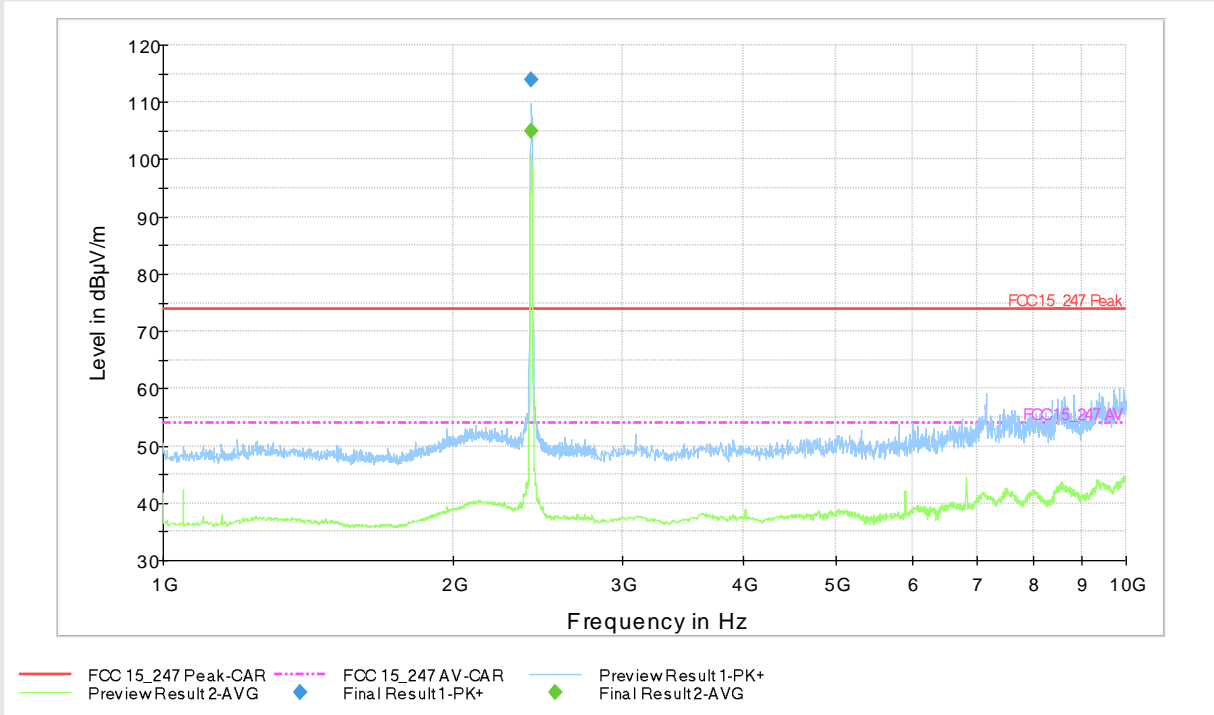
Frequency (MHz)	MaxPeak (dBµV/m)	Height (cm)	Azimuth (deg)	Margin (dB)	Limit (dBµV/m)
876.780000	59.5	97.4	97.0	-13.10	46.40
915.060000	123.8	117.7	187.0	-77.40	46.40
949.980000	45.4	115.7	174.0	1.00	46.40

**Final Result Average**

Frequency (MHz)	Average (dBµV/m)	Height (cm)	Azimuth (deg)	Margin (dB)	Limit (dBµV/m)
876.570000	41.1	97.5	172.0	5.30	46.40
909.540000	46.2	227.6	187.0	0.20	46.40
915.000000	121.2	146.6	187.0	-74.80	46.40
949.980000	43.5	115.7	183.0	2.90	46.40

NOTE: Peaks out of limits are due to the Radio Carriers and fall in the Exclusion Bands.

<b>Frequency Range</b>	1GHz – 10GHz
<b>Polarization</b>	Horizontal



**Final Result Peak**

Frequency (MHz)	MaxPeak (dBµV/m)	Height (cm)	Azimuth (deg)	Margin (dB)	Limit (dBµV/m)
2412.000000	113.9	174.7	323.0	-39.90	74.00

**Final Result Average**

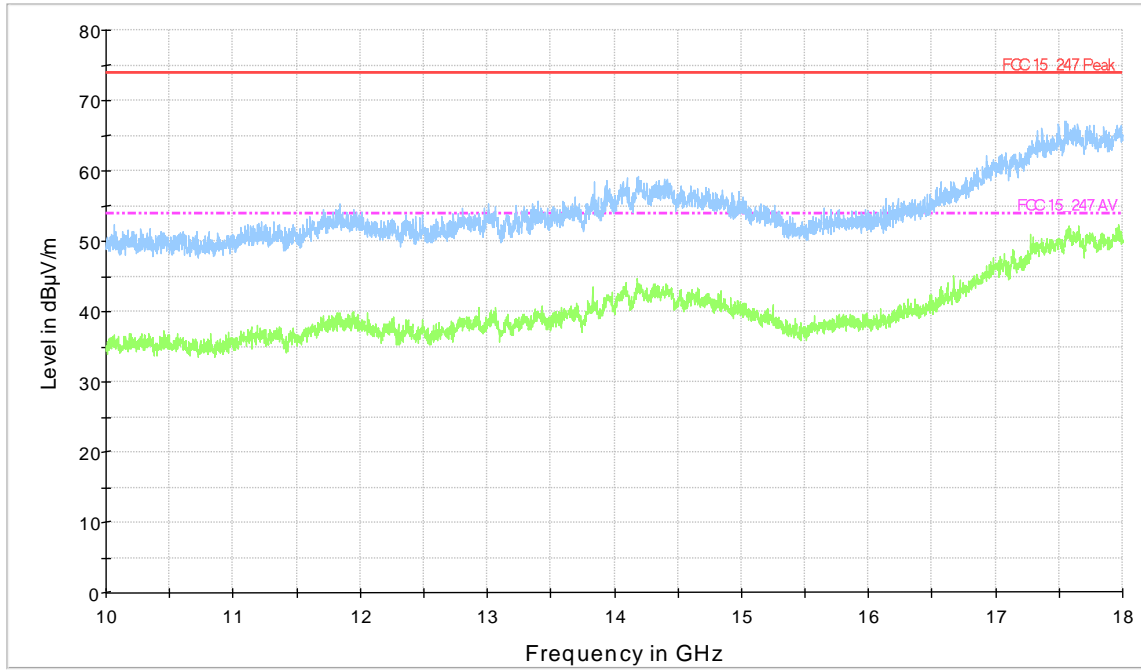
Frequency (MHz)	Average (dBµV/m)	Height (cm)	Azimuth (deg)	Margin (dB)	Limit (dBµV/m)
2411.000000	105.0	177.6	312.0	-51.00	54.00

NOTE: Peaks out of limits are due to the Radio Carriers and fall in the Exclusion Bands.



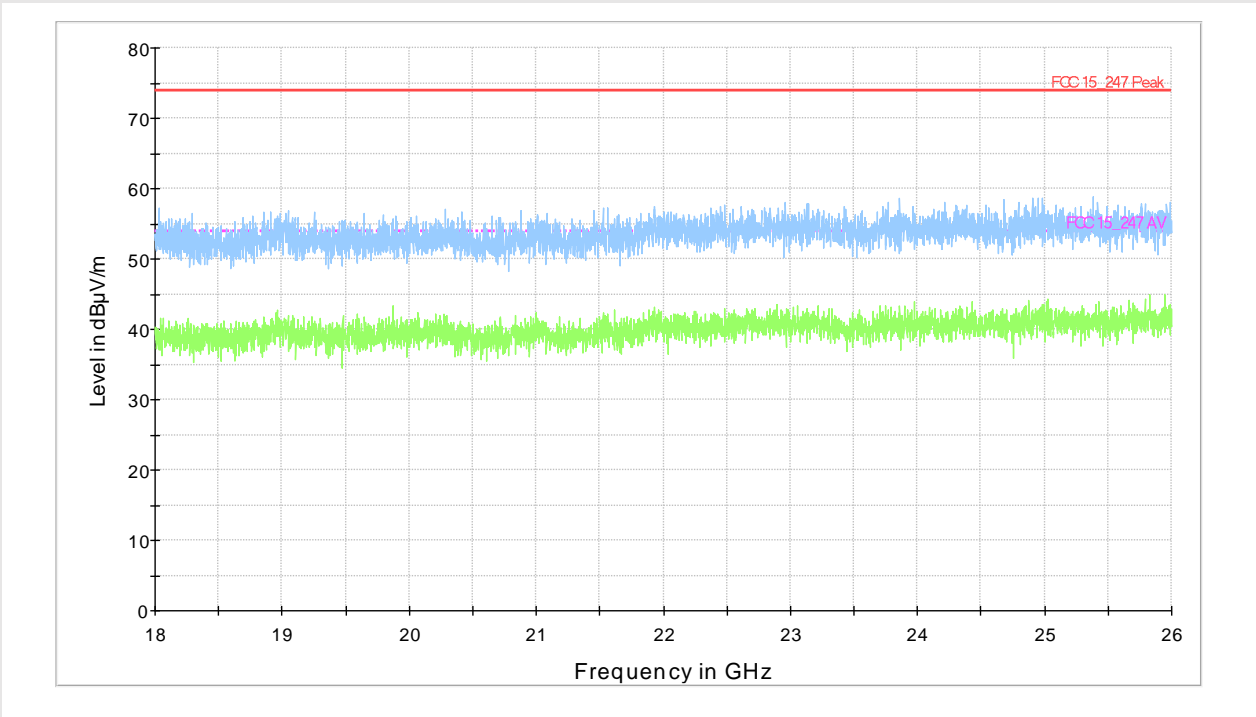
**Frequency Range** 10GHz – 18GHz

**Polarization** Horizontal



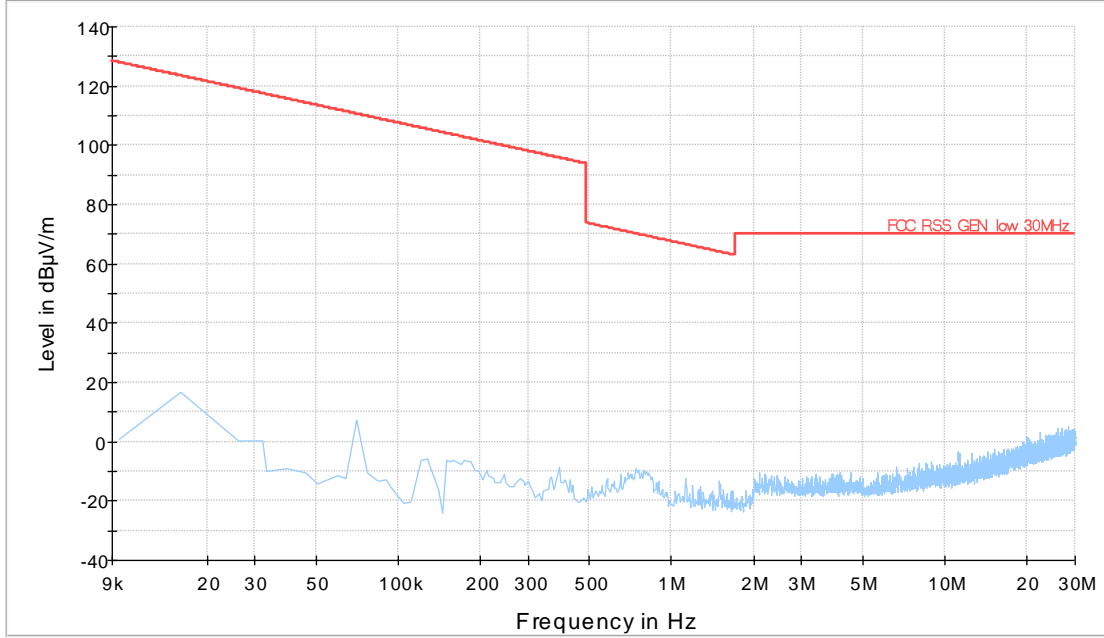
**Frequency Range** 18GHz – 26GHz

**Polarization** Horizontal



**Operating Condition** #2

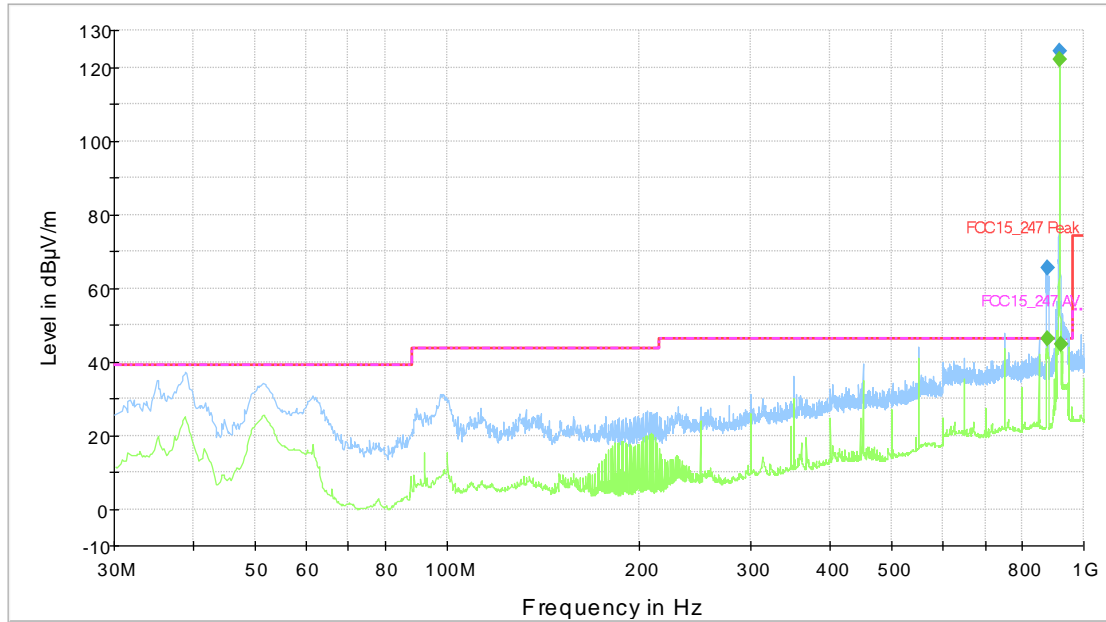
**Frequency Range** 9kHz – 30MHz



— FCC\_RSS\_GEN\_low\_30MHz — MaxPeak-ClearWrite-PK+ ◆ Final Result1-PK+

**Frequency Range** 30MHz – 1GHz

**Polarization** Vertical



— FCC 15\_247 Peak-CAR    - - - - - FCC 15\_247 AV-CAR    — MaxPeak-ClearWrite-PK+  
— Average-ClearWrite-AVG    ◆ Final Result1-PK+    ◆ Final Result2-AVG

**Final Result Quasi Peak**

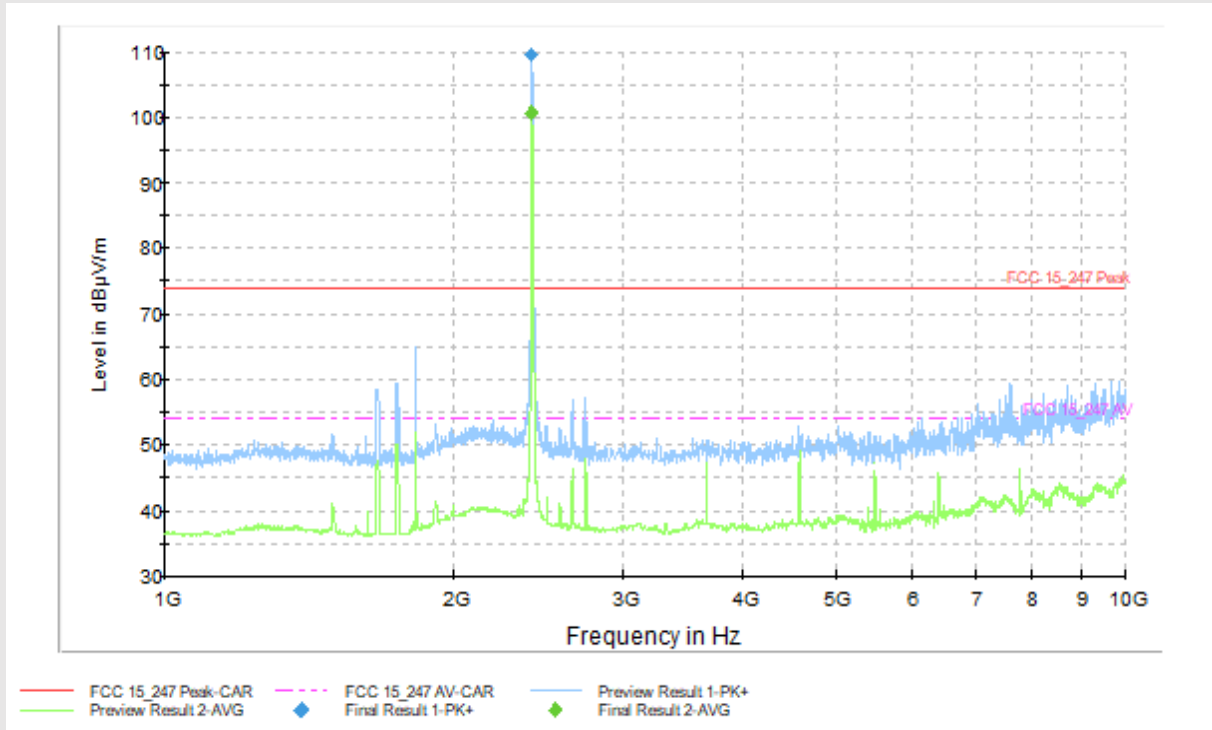
Frequency (MHz)	MaxPeak (dBµV/m)	Height (cm)	Azimuth (deg)	Margin (dB)	Limit (dBµV/m)
876.270000	65.4	254.7	270.0	-19.00	46.40
915.060000	124.4	114.6	262.0	-78.00	46.40

**Final Result Average**

Frequency (MHz)	Average (dBµV/m)	Height (cm)	Azimuth (deg)	Margin (dB)	Limit (dBµV/m)
876.540000	46.1	274.6	277.0	0.30	46.40
915.000000	122.0	115.7	262.0	-75.60	46.40
920.460000	44.9	97.3	262.0	1.50	46.40

NOTE: Peaks out of limits are due to the Radio Carriers and fall in the Exclusion Bands.

<b>Frequency Range</b>	1GHz – 10GHz
<b>Polarization</b>	Vertical



**Final Result Peak**

Frequency (MHz)	MaxPeak (dBµV/m)	Height (cm)	Azimuth (deg)	Margin (dB)	Limit (dBµV/m)
2412.000000	109.5	149.8	175.0	-35.50	74.00

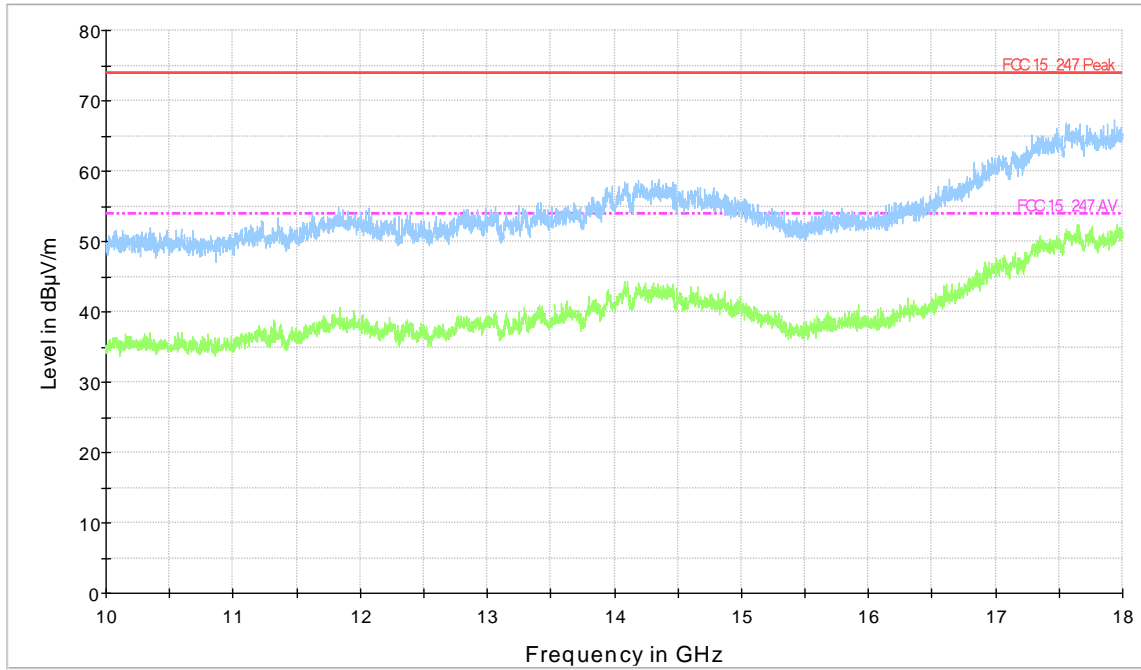
**Final Result Average**

Frequency (MHz)	Average (dBµV/m)	Height (cm)	Azimuth (deg)	Margin (dB)	Limit (dBµV/m)
2413.000000	100.7	148.9	180.0	-46.70	54.00

NOTE: Peaks out of limits are due to the Radio Carriers and fall in the Exclusion Bands.

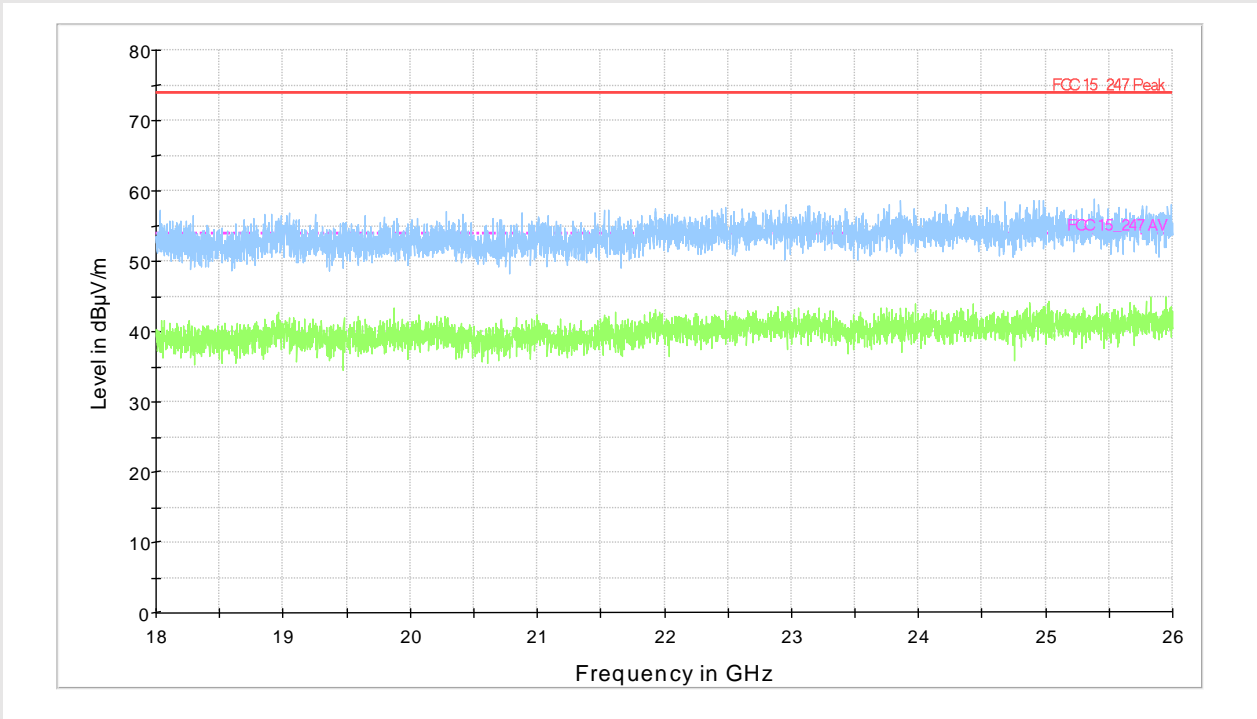
**Frequency Range** 10GHz – 18GHz

**Polarization** Vertical



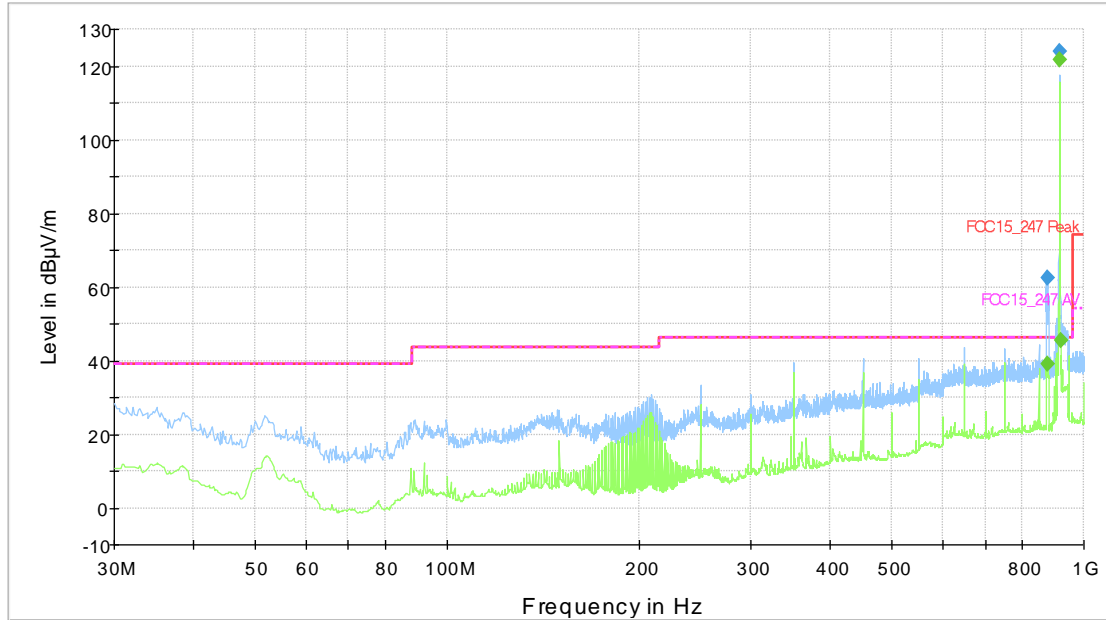
**Frequency Range** 18GHz – 26GHz

**Polarization** Vertical



**Frequency Range** 30MHz – 1GHz

**Polarization** Horizontal



— FCC 15\_247 Peak-CAR     - - - FCC 15\_247 AV-CAR     — MaxPeak-ClearWrite-PK+  
— Average-ClearWrite-AVG     ◆ Final Result1-PK+     ◆ Final Result2-AVG

**Final Result Quasi Peak**

Frequency (MHz)	MaxPeak (dBµV/m)	Height (cm)	Azimuth (deg)	Margin (dB)	Limit (dBµV/m)
876.930000	62.5	97.5	172.0	-16.10	46.40
915.060000	123.8	117.7	187.0	-77.40	46.40

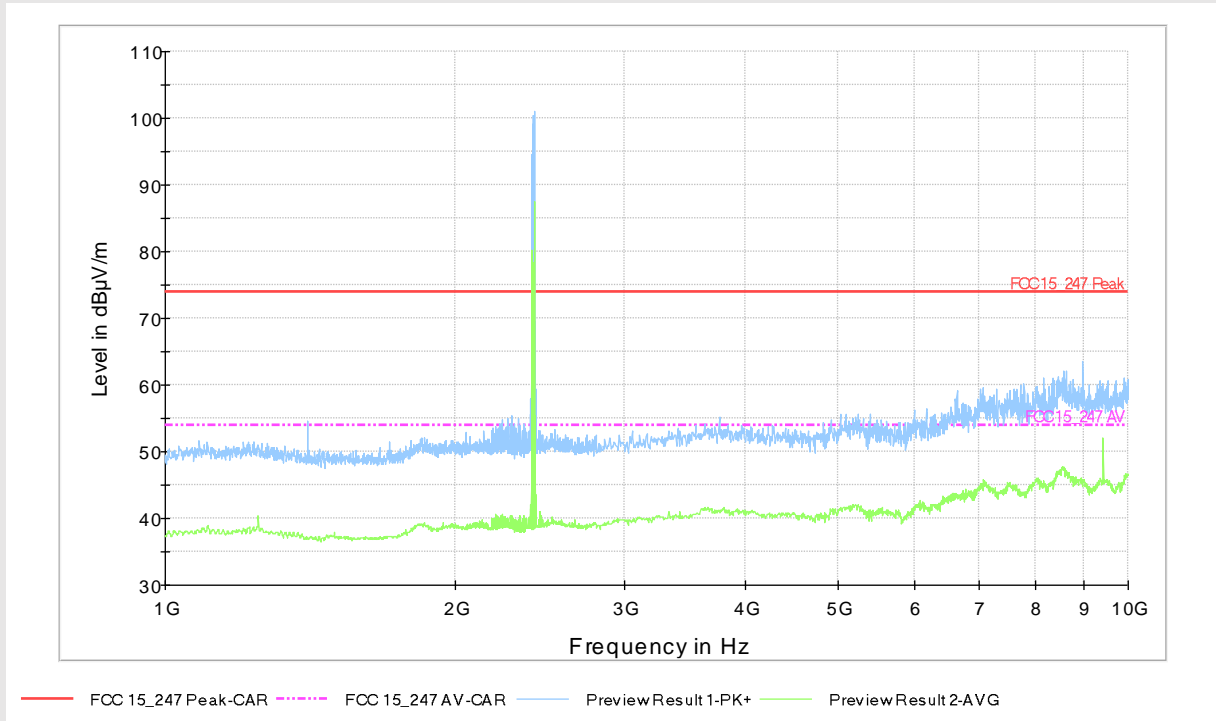
**Final Result Average**

Frequency (MHz)	Average (dBµV/m)	Height (cm)	Azimuth (deg)	Margin (dB)	Limit (dBµV/m)
876.570000	39.2	97.5	97.0	7.20	46.40
915.000000	121.8	143.6	187.0	-75.40	46.40
920.460000	45.3	118.7	187.0	1.10	46.40

NOTE: Peaks out of limits are due to the Radio Carriers and fall in the Exclusion Bands.



<b>Frequency Range</b>	1GHz – 10GHz
<b>Polarization</b>	Horizontal



**Final Result Peak**

Frequency (MHz)	MaxPeak (dBµV/m)	Height (cm)	Azimuth (deg)	Margin (dB)	Limit (dBµV/m)
2412.000000	101.3	149.8	170.0	-27.30	74.00

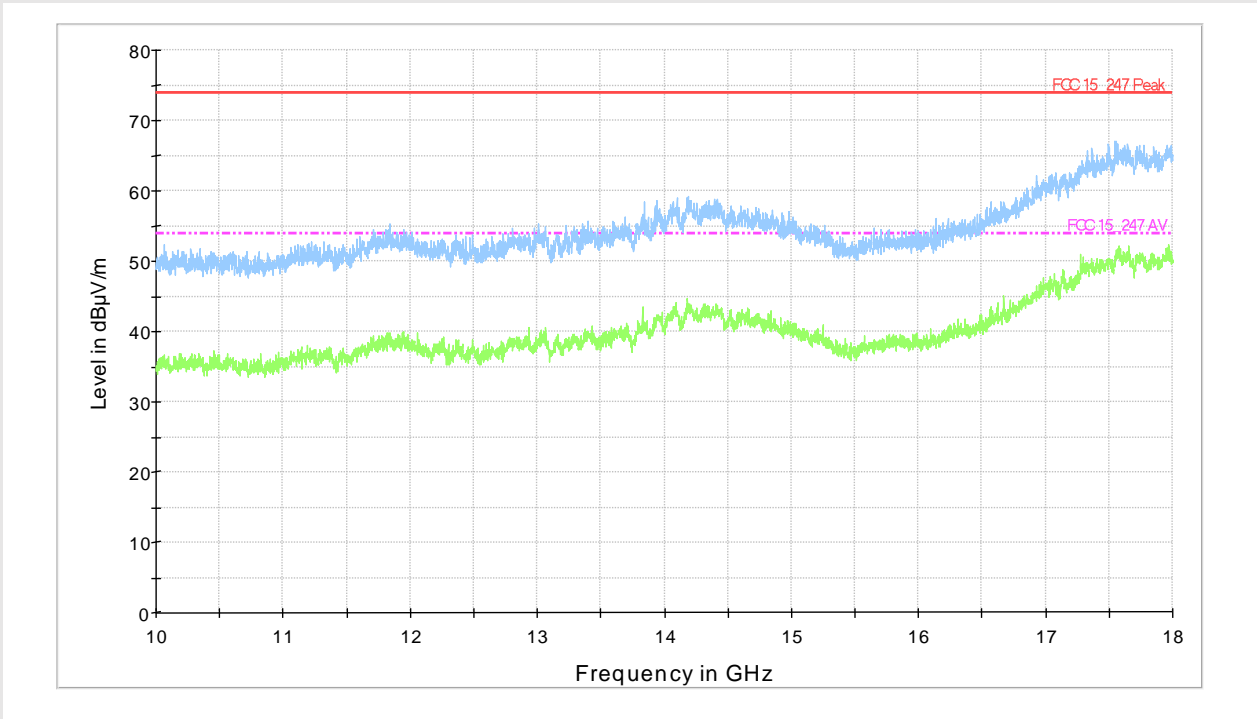
**Final Result Average**

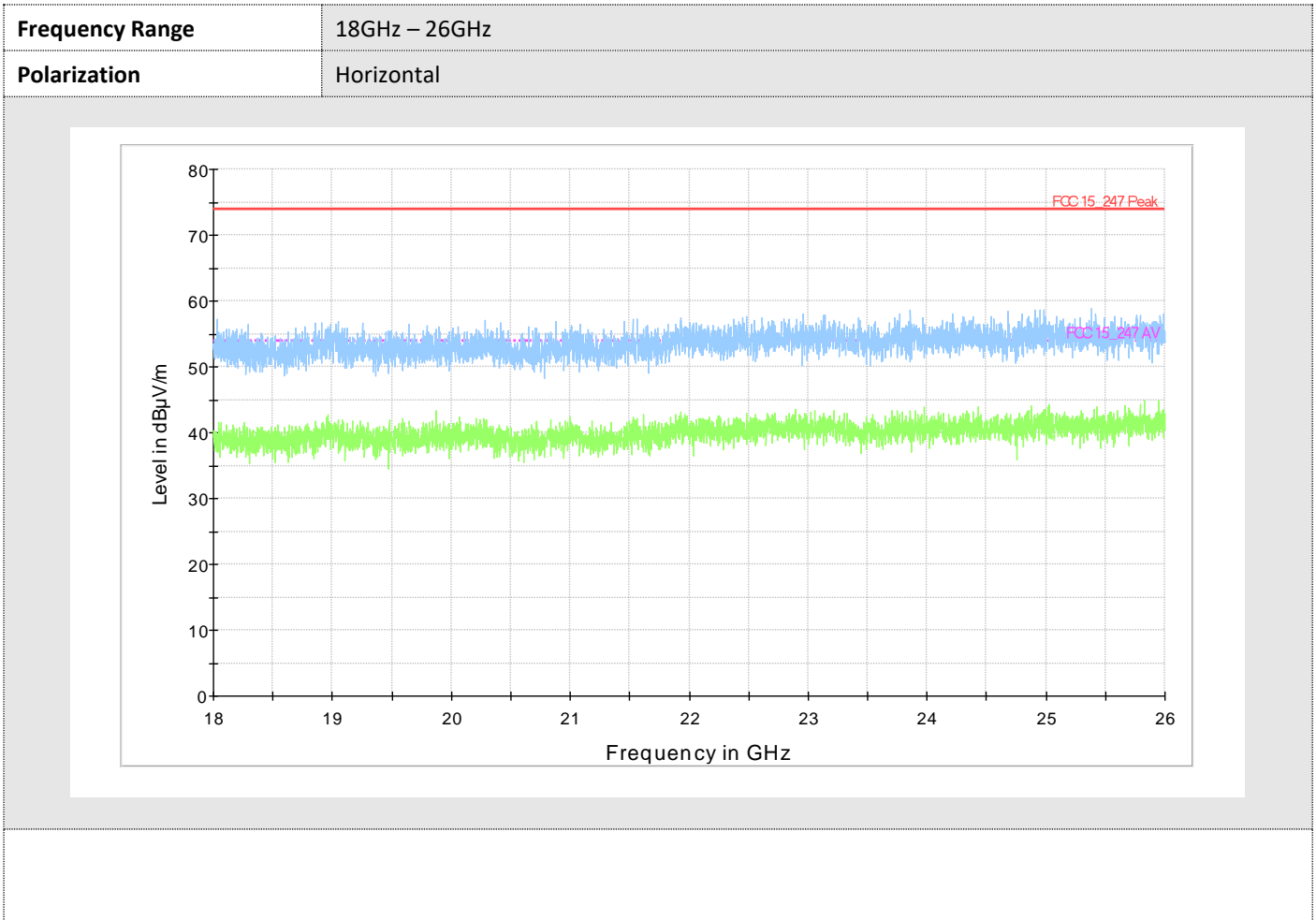
Frequency (MHz)	Average (dBµV/m)	Height (cm)	Azimuth (deg)	Margin (dB)	Limit (dBµV/m)
2412.000000	88.6	148.9	197.0	-34.60	54.00

NOTE: Peaks out of limits are due to the Radio Carriers and fall in the Exclusion Bands.

**Frequency Range** 10GHz – 18GHz

**Polarization** Horizontal





## 11. PHOTOGRAPHIC SECTION

PHOTO N° 1 – EUT IDENTIFICATION

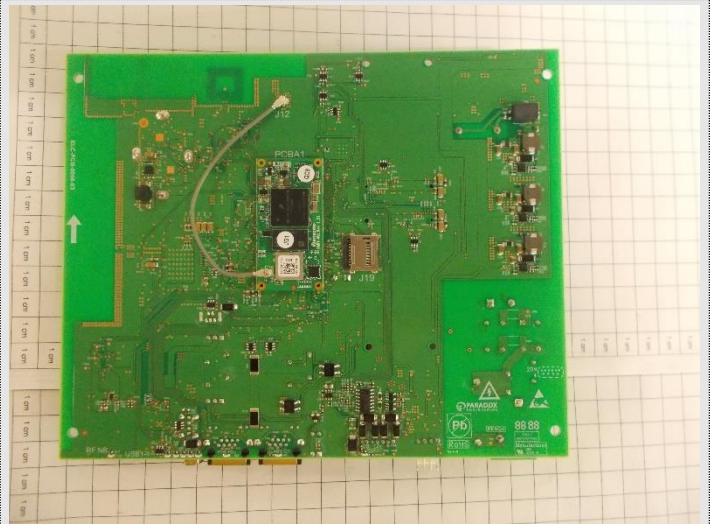
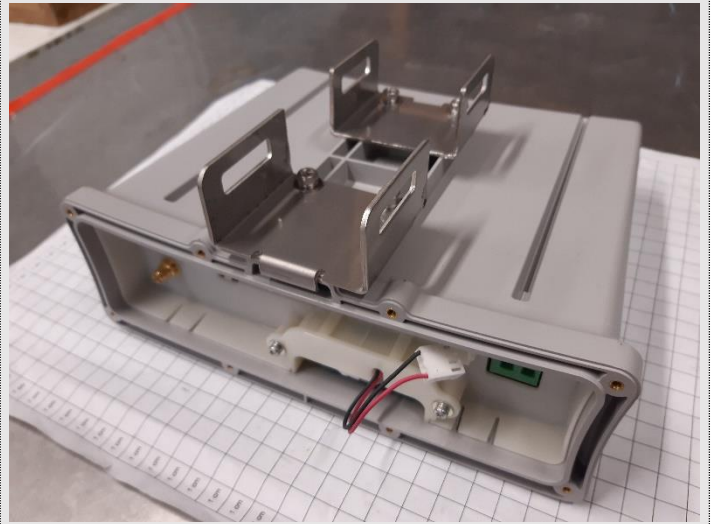


PHOTO N° 2 – RADIATED SETUP

