



## FCC / ISED Test Report

**For:**

ITRON NETWORKED SOLUTIONS, INC.

**Model Name:**

NIC 511-NA1-0312

### **Product Description:**

The MicroAP 5 is a unique product with cellular connectivity that supports both cellular and RF Mesh communications simultaneously.

**FCC ID:** OWS-NIC511-LTE

**IC ID:** 5975A-NIC511LTE

### **Applied Rules and Standards:**

47 CFR Part 15.247 (DTS)

RSS-247 Issue 2 (DTSs) & RSS-Gen Issue 5

**REPORT #:** EMC\_ITRO1\_049\_21001\_FCC\_15.247\_DTS\_ATT\_Rev1

**DATE:** 2021-11-05



A2LA Accredited

IC recognized #  
3462B

### **CETECOM Inc.**

411 Dixon Landing Road ♦ Milpitas, CA 95035 ♦ U.S.A.

Phone: + 1 (408) 586 6200 ♦ Fax: + 1 (408) 586 6299 ♦ E-mail: [Contact@cetecom.com](mailto:Contact@cetecom.com) ♦ <http://www.cetecom.com>

CETECOM Inc. is a Delaware Corporation with Corporation number: 2905571

**TABLE OF CONTENTS**

<b>1</b>	<b>ASSESSMENT</b>	<b>3</b>
<b>2</b>	<b>ADMINISTRATIVE DATA</b>	<b>4</b>
2.1	IDENTIFICATION OF THE TESTING LABORATORY ISSUING THE EMC TEST REPORT	4
2.2	IDENTIFICATION OF THE CLIENT	4
2.3	IDENTIFICATION OF THE MANUFACTURER	4
<b>3</b>	<b>EQUIPMENT UNDER TEST (EUT)</b>	<b>5</b>
3.1	EUT SPECIFICATIONS	5
3.2	EUT SAMPLE DETAILS	5
3.3	MODE OF OPERATION DETAILS	6
3.4	TEST SAMPLE CONFIGURATION	6
3.5	JUSTIFICATION FOR WORST CASE MODE OF OPERATION	6
<b>4</b>	<b>SUBJECT OF INVESTIGATION</b>	<b>7</b>
<b>5</b>	<b>MEASUREMENT RESULTS SUMMARY</b>	<b>7</b>
<b>6</b>	<b>MEASUREMENT UNCERTAINTY</b>	<b>8</b>
6.1	ENVIRONMENTAL CONDITIONS DURING TESTING:	8
6.2	DATES OF TESTING:	8
<b>7</b>	<b>MEASUREMENT PROCEDURES</b>	<b>9</b>
7.1	RADIATED MEASUREMENT	9
7.2	POWER LINE CONDUCTED MEASUREMENT PROCEDURE	11
7.3	RF CONDUCTED MEASUREMENT PROCEDURE	11
<b>8</b>	<b>TEST RESULT DATA</b>	<b>12</b>
8.1	MAXIMUM PEAK CONDUCTED OUTPUT POWER	12
8.2	RADIATED TRANSMITTER SPURIOUS EMISSIONS AND RESTRICTED BANDS	17
8.3	AC POWER LINE CONDUCTED EMISSIONS	30
<b>9</b>	<b>TEST SETUP PHOTOS</b>	<b>32</b>
<b>10</b>	<b>TEST EQUIPMENT AND ANCILLARIES USED FOR TESTING</b>	<b>32</b>
<b>11</b>	<b>HISTORY</b>	<b>33</b>

## 1 Assessment

The following device was evaluated against the applicable criteria specified in FCC rules Parts 15.247 of Title 47 of the Code of Federal Regulations and the relevant ISED Canada standard RSS-247.

Based on 'NOTE (3)' in the operational description of the EUT '*Functional Description (OWS-NIC511-LTE)\_11-4-2021-1.pdf*'  
"900 MHz mesh radio identical for all models"

No deviations were ascertained.

Company	Description	Model #
ITRON NETWORKED SOLUTIONS, INC.	The MicroAP 5 is a unique product with cellular connectivity that supports both cellular and RF Mesh communications simultaneously.	NIC 511-NA1-0312

### Responsible for Testing Laboratory:

2021-11-05	Compliance	Kevin Wang (EMC Lab Manager)	
Date	Section	Name	Signature

### Responsible for the Report:

2021-11-05	Compliance	Issa W Ghanma (Sr. EMC Engineer)	
Date	Section	Name	Signature

The test results of this test report relate exclusively to the test item specified in Section 3.  
CETECOM Inc. USA does not assume responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item. The test report may only be reproduced or published in full. Reproduction or publication of extracts from the report requires the prior written approval of CETECOM Inc. USA.

## 2 Administrative Data

### 2.1 Identification of the Testing Laboratory Issuing the EMC Test Report

<b>Company Name:</b>	CETECOM Inc.
<b>Department:</b>	Compliance
<b>Street Address:</b>	411 Dixon Landing Road
<b>City/Zip Code</b>	Milpitas, CA 95035
<b>Country</b>	USA
<b>Telephone:</b>	+1 (408) 586 6200
<b>Fax:</b>	+1 (408) 586 6299
<b>EMC Lab Manager:</b>	Kevin Wang
<b>Responsible Project Leader:</b>	Rami Saman

### 2.2 Identification of the Client

<b>Client's Name:</b>	ITRON NETWORKED SOLUTIONS, INC.
<b>Street Address:</b>	230 W Tasman Avenue
<b>City/Zip Code</b>	San Jose, CA 95134
<b>Country</b>	USA

### 2.3 Identification of the Manufacturer

<b>Manufacturer's Name:</b>	Same as Client
<b>Manufacturers Address:</b>	
<b>City/Zip Code</b>	
<b>Country</b>	

### 3 Equipment Under Test (EUT)

#### 3.1 EUT Specifications

<b>Model No:</b>	NIC 511-NA1-0312
<b>HW Version :</b>	09
<b>SW Version :</b>	5.2.0
<b>FCC-ID :</b>	OWS-NIC511-LTE
<b>IC-ID :</b>	5975A-NIC511LTE
<b>Product Description:</b>	The MicroAP 5 is a unique product with cellular connectivity that supports both cellular and RF Mesh communications simultaneously. It leverages cellular communications for backhaul connectivity and uses RF Mesh communications to connect with other nearby Itron Networked Solutions, Inc. devices.
<b>Frequency Range / number of channels:</b>	Nominal band: 903.2 – 926 MHz Center to center: 903.2 MHz (ch 0) – 926 MHz (ch 19), 20 Channels
<b>Antenna Information as declared:</b>	Omni-Directional Antenna Max Gain: -4.4 dBi
<b>Measured Peak output Powers:</b>	26.26 dBm
<b>Power Supply/ Rated Operating Voltage Range:</b>	Streetlight controller(Luminator): 120V (Low) / 277V (Max) AC Luminator output to EUT: 3.6V (Low) / 4.4V (Max) DC
<b>Operating Temperature Range</b>	-40° to 65° C
<b>Other Radios included in the device:</b>	Celluar: <ul style="list-style-type: none"> <li>(4G) 2, 4, 5, 12, 13</li> </ul>
<b>Sample Revision</b>	<input type="checkbox"/> Prototype Unit; <input checked="" type="checkbox"/> Production Unit; <input type="checkbox"/> Pre-Production

#### 3.2 EUT Sample details

EUT #	Model Number	HW Version	SW Version	MAC Address	Comments
1	NIC 511-SV1-0312	08	5.2.0	00:13:50:05:01:40:FE:24	RF Conducted output power
2	NIC 511-NA1-0312	09	5.2.0	00:13:50:05:01:5B:83:95	Radiated spurious emissions

### 3.3 Mode of Operation details

Mode of Operation	Description of Operating modes	Additional Information
Op. 1	900MHz Mesh	The radio of the EUT was configured to a fixed channel transmission with highest possible duty cycle ( $\geq 98\%$ ) using software (CATT) that is not available to the end user. The measurement equipment was connected to the 50 ohm RF port of the EUT.
Op. 2	900MHz Mesh + LTE 2	The radio of the EUT was configured to a fixed channel transmission with highest possible duty cycle ( $\geq 98\%$ ) using software (CATT) that is not available to the end user. The internal antennae was connected.

### 3.4 Test Sample Configuration

EUT Set-up #	Combination of AE used for test set up	Comments
1	EUT#1	ISM radio was configured to: <ul style="list-style-type: none"> <li>• Mode: OFDM</li> <li>• Data Rate: 2.4 Mb/s</li> <li>• Max Power settings: +27 dBm</li> <li>• Transmit mode: Continuous TX</li> <li>• Hopping: No</li> <li>• Channel(s): CH0(903.2MHz), CH9(914MHz), CH19(926MHz)</li> </ul>
2	EUT#2	ISM radio was configured to: <ul style="list-style-type: none"> <li>• Mode : OFDM</li> <li>• Data Rate: : 2.4 Mb/s</li> <li>• Max Power settings: 27 dBm</li> <li>• Transmit mode : Continuous TX</li> <li>• Hopping : No</li> <li>• Channel(s) : CH0(903.2MHz), CH9(914MHz), CH19(926MHz)</li> </ul>

### 3.5 Justification for Worst Case Mode of Operation

During the testing process, the EUT was tested with transmitter sets on Low, Mid, High channels, highest duty cycle, and the maximum output power, simultaneously with the cellular radio transmitting at the highest output power LTE band 2 representing the worst case scenario.

For radiated measurements,

- All data in this report show the worst case of ISM radio, transmitting at the highest output power mode
- All data in this report shows the worst case between horizontal and vertical antenna polarizations and for all orientations of the EUT.

#### 4 Subject of Investigation

The objective of the measurements done by CETECOM Inc. was to assess the performance of the EUT according to the relevant requirements specified in FCC rules Part 15.247 of Title 47 of the Code of Federal Regulations and Radio Standard Specification RSS-247 of ISED Canada.

This test report is to support a request for new equipment authorization under the

- FCC ID: OWS-NIC511-LTE
- IC ID: 5975A-NIC511LTE

Testing procedures are based on 558074 D01 15.247 Meas Guidance v05r02 – “GUIDANCE FOR COMPLIANCE MEASUREMENTS ON DIGITAL TRANSMISSION SYSTEM, FREQUENCY HOPPING SPREAD SPECTRUM SYSTEM, AND HYBRID SYSTEM DEVICES OPERATING UNDER SECTION 15.247 OF THE FCC RULES” - April 2, 2019, by the Federal Communications Commission, Office of Engineering and Technology, Laboratory Division.

#### 5 Measurement Results Summary

Test Specification	Test Case	Temperature and Voltage Conditions	Mode	Pass	NA	NP	Result
§15.247(a)(2) RSS-247 5.2(a)	Emission Bandwidth	Nominal	-	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Note 1
§15.247(e) RSS-247 5.2(b)	Power Spectral Density	Nominal	-	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Note 1
§15.247(b)(3) RSS-247 5.4(d)	Maximum Conducted Output Power and EIRP	Nominal	Op. 1	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Complies
§15.247(d) RSS-247 5.5	Band edge compliance Unrestricted Band Edges	Nominal	-	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Note 1
§15.247; 15.209; 15.205 RSS-Gen 8.9; 8.10	Band edge compliance Restricted Band Edges	Nominal	-	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Note 1
§15.247(d); §15.209 RSS-Gen 6.13	TX Spurious emissions-Radiated	Nominal	Op. 2	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Complies
§15.207(a) RSS Gen 8.8	AC Conducted Emissions	Nominal	Op. 2	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Complies

**Note 1:** NA= Not Applicable; NP= Not Performed.

**Note2:** Leveraged from module certification report # SSNT135-U8\_Conducted Rev B, FCC / IC ID: OWS-NIC511-LTE / 5975A-NIC511LTE

## **6 Measurement Uncertainty**

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus, with 95% confidence interval (in dB delta to result), based on a coverage factor  $k=1$ .

### **Radiated measurement**

9 kHz to 30 MHz	$\pm 2.5$ dB (Magnetic Loop Antenna)
30 MHz to 1000 MHz	$\pm 2.0$ dB (Biconilog Antenna)
1 GHz to 40 GHz	$\pm 2.3$ dB (Horn Antenna)

### **Conducted measurement**

150 kHz to 30 MHz	$\pm 0.7$ dB (LISN)
-------------------	---------------------

RF conducted measurement	$\pm 0.5$ dB
--------------------------	--------------

According to TR 102 273 a multiplicative propagation of error is assumed for RF measurement systems. For this reason the RMS method is applied to dB values and not to linear values as appropriate for additive propagation of error. Also used: <http://physics.nist.gov/cuu/Uncertainty/typeb.html>. The above calculated uncertainties apply to direct application of the Substitution method. The Substitution method is always used when the EUT comes closer than 3 dB to the limit.

### **6.1 Environmental Conditions During Testing:**

The following environmental conditions were maintained during the course of testing:

- Ambient Temperature: 20-25° C
- Relative humidity: 40-60%

### **6.2 Dates of Testing:**

6/7/2021 – 11/3/2021

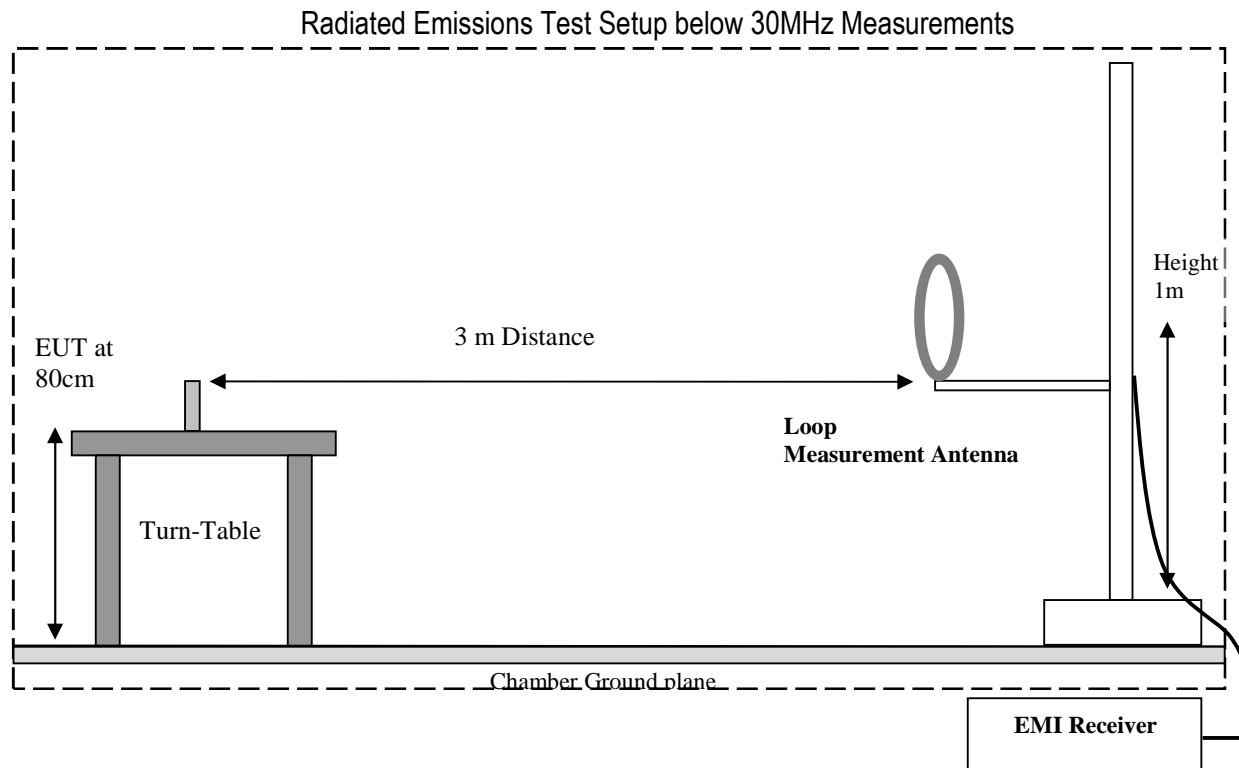


## 7 Measurement Procedures

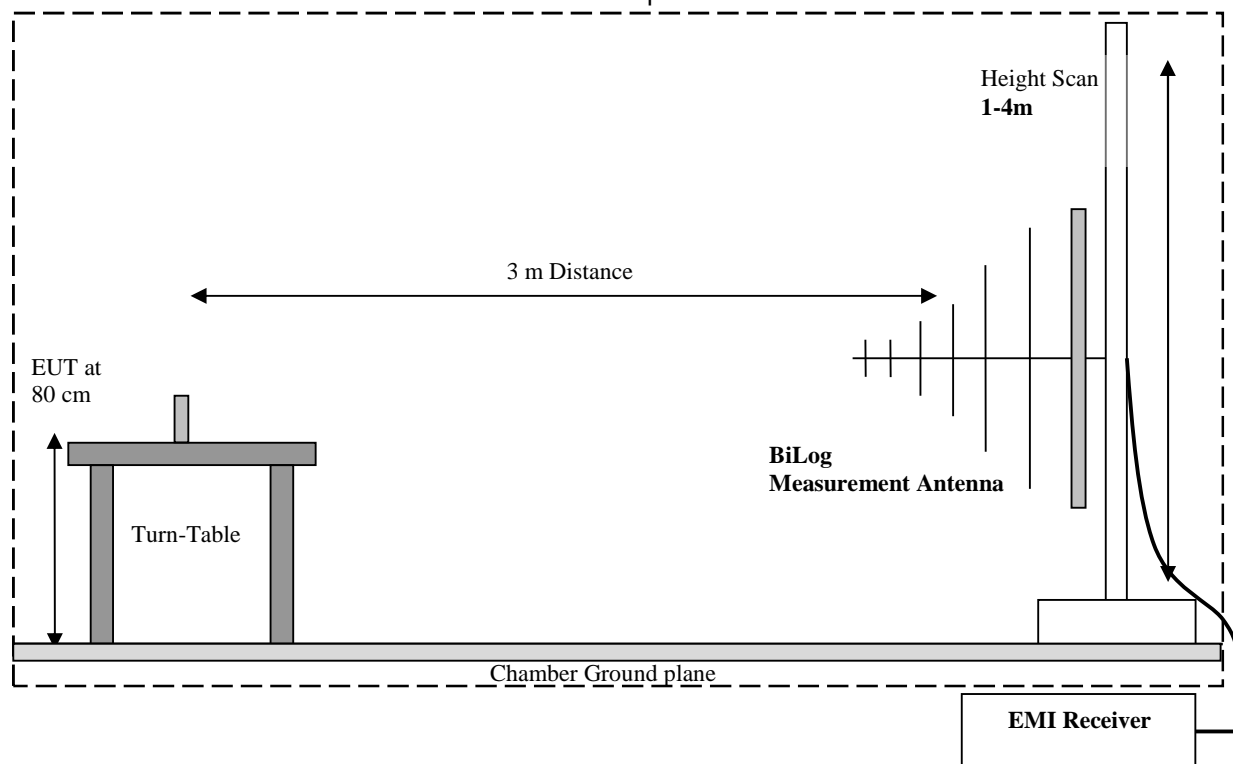
### 7.1 Radiated Measurement

The radiated measurement is performed according to ANSI C63.10 (2013)

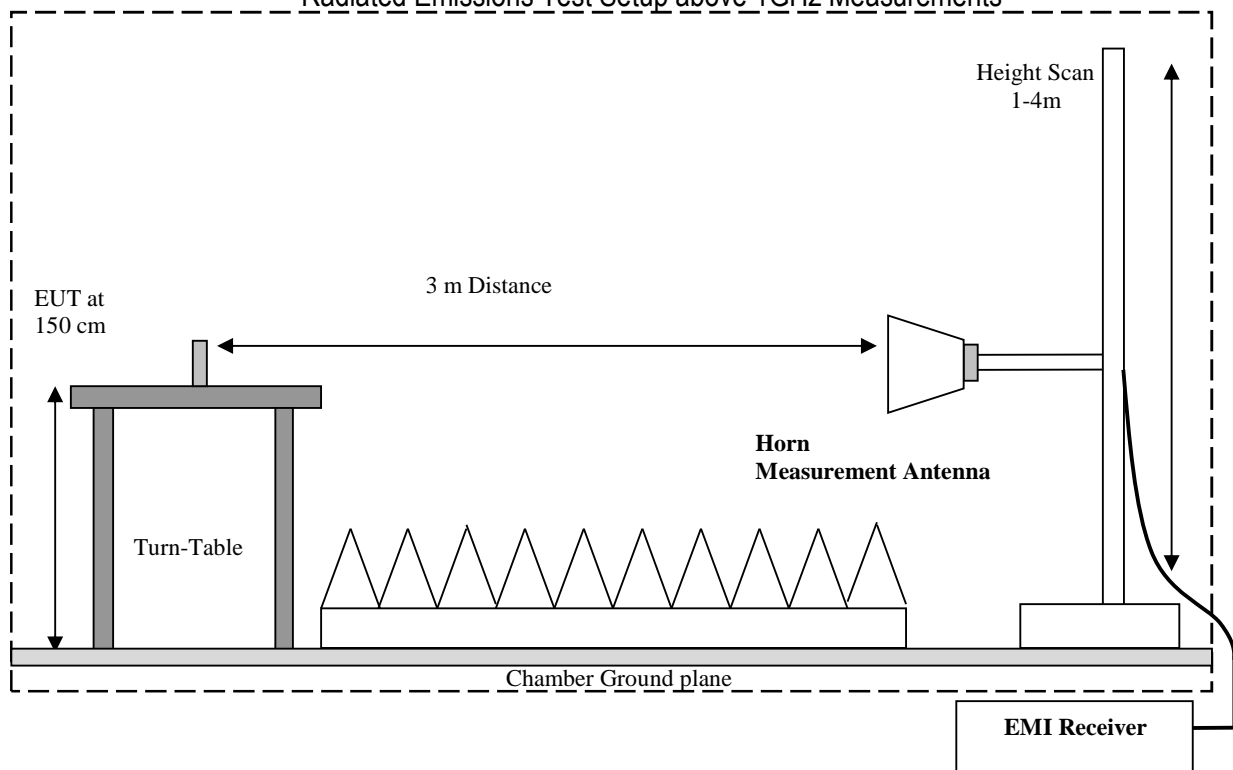
- The exploratory measurement is accomplished by running a matrix of 16 sweeps over the required frequency range with R&S Test-SW EMC32 for 4 positions of the turntable, two orthogonal positions of the EUT and both antenna polarizations. This procedure exceeds the requirement of the above standards to cover the 3 orthogonal axis of the EUT. A max peak detector is utilized during the exploratory measurement. The Test-SW creates an overall maximum trace for all 12 sweeps and saves the settings for each point of this trace. The maximum trace is part of the test report.
- The 10 highest emissions are selected with an automatic algorithm of EMC32 searching for peaks in the noise floor and ensuring that broadband signals are not selected multiple times.
- The maxima are then put through the final measurement and again maximized in a 90deg range of the turntable, fine search in frequency domain and height scan between 1m and 4m.
- The above procedure is repeated for all possible ways of power supply to EUT and for all supported modulations.
- In case there are no emissions above noise floor level only the maximum trace is reported as described above.
- The results are split up into up to 4 frequency ranges due to antenna bandwidth restrictions. A magnetic loop is used from 9 kHz to 30 MHz, a Biconilog antenna is used from 30 MHz to 1 GHz, and two different horn antennas are used to cover frequencies up to 40 GHz.



### Radiated Emissions Test Setup 30MHz-1GHz Measurements



### Radiated Emissions Test Setup above 1GHz Measurements



### 7.1.1 Sample Calculations for Field Strength Measurements

Field Strength is calculated from the Spectrum Analyzer/ Receiver readings, taking into account the following parameters:

1. Measured reading in dB $\mu$ V
2. Cable Loss between the receiving antenna and SA in dB and
3. Antenna Factor in dB/m

All radiated measurement plots in this report are taken from a test SW that calculates the Field Strength based on the following equation:

$$FS \text{ (dB}\mu\text{V/m)} = \text{Measured Value on SA (dB}\mu\text{V)} + \text{Cable Loss (dB)} + \text{Antenna Factor (dB/m)}$$

Example:

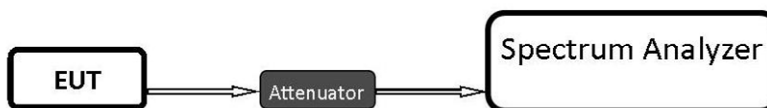
Frequency (MHz)	Measured SA (dB $\mu$ V)	Cable Loss (dB)	Antenna Factor Correction (dB)	Field Strength Result (dB $\mu$ V/m)
1000	80.5	3.5	14	98.0

### 7.2 Power Line Conducted Measurement Procedure

AC Power Line conducted emissions measurements performed according to: ANSI C63.4 (2014)

### 7.3 RF Conducted Measurement Procedure

Testing procedures are based on 558074 D01 15.247 Meas Guidance v05r02 – “GUIDANCE FOR COMPLIANCE MEASUREMENTS ON DIGITAL TRANSMISSION SYSTEM, FREQUENCY HOPPING SPREAD SPECTRUM SYSTEM, AND HYBRID SYSTEM DEVICES OPERATING UNDER SECTION 15.247 OF THE FCC RULES” - April 2, 2019, by the Federal Communications Commission, Office of Engineering and Technology, Laboratory Division.



- Connect the equipment as shown in the above diagram.
- Adjust the settings of the SA (Rohde-Schwarz Spectrum Analyzer) to connect the EUT at the required mode of test.
- Measurements are to be performed with the EUT set to the low, middle and high channels and for worst case modulation schemes.

## 8 Test Result Data

### 8.1 Maximum peak conducted output power

#### 8.1.1 Measurement according to FCC 558074 D01 15.247 Meas Guidance v05r02

##### Spectrum Analyzer settings:

- RBW  $\geq$  DTS bandwidth
- VBW  $\geq 3 \times$  RBW
- Span  $\geq 3 \times$  RBW
- Sweep = Auto couple
- Detector function = Peak
- Trace = Max hold
- Use peak marker function to determine the peak amplitude level

#### 8.1.2 Limits:

##### Maximum Peak Conducted Output Power:

##### FCC §15.247:

- (b) The maximum peak conducted output power of the intentional radiator shall not exceed the following:
  - (3) For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.

##### IC RSS-247 5.4:

- (d) For DTSs employing digital modulation techniques operating in the bands 902-928 MHz and 2400-2483.5 MHz, the maximum peak conducted output power shall not exceed 1W. The e.i.r.p. shall not exceed 4 W, except as provided in section 5.4(e).
  - As an alternative to a peak power measurement, compliance can be based on a measurement of the maximum conducted output power. The maximum conducted output power is the total transmit power delivered to all antennas and antenna elements, averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or transmitting at a reduced power level. If multiple modes of operation are implemented, the maximum conducted output power is the highest total transmit power occurring in any mode.

### 8.1.3 Test conditions and setup:

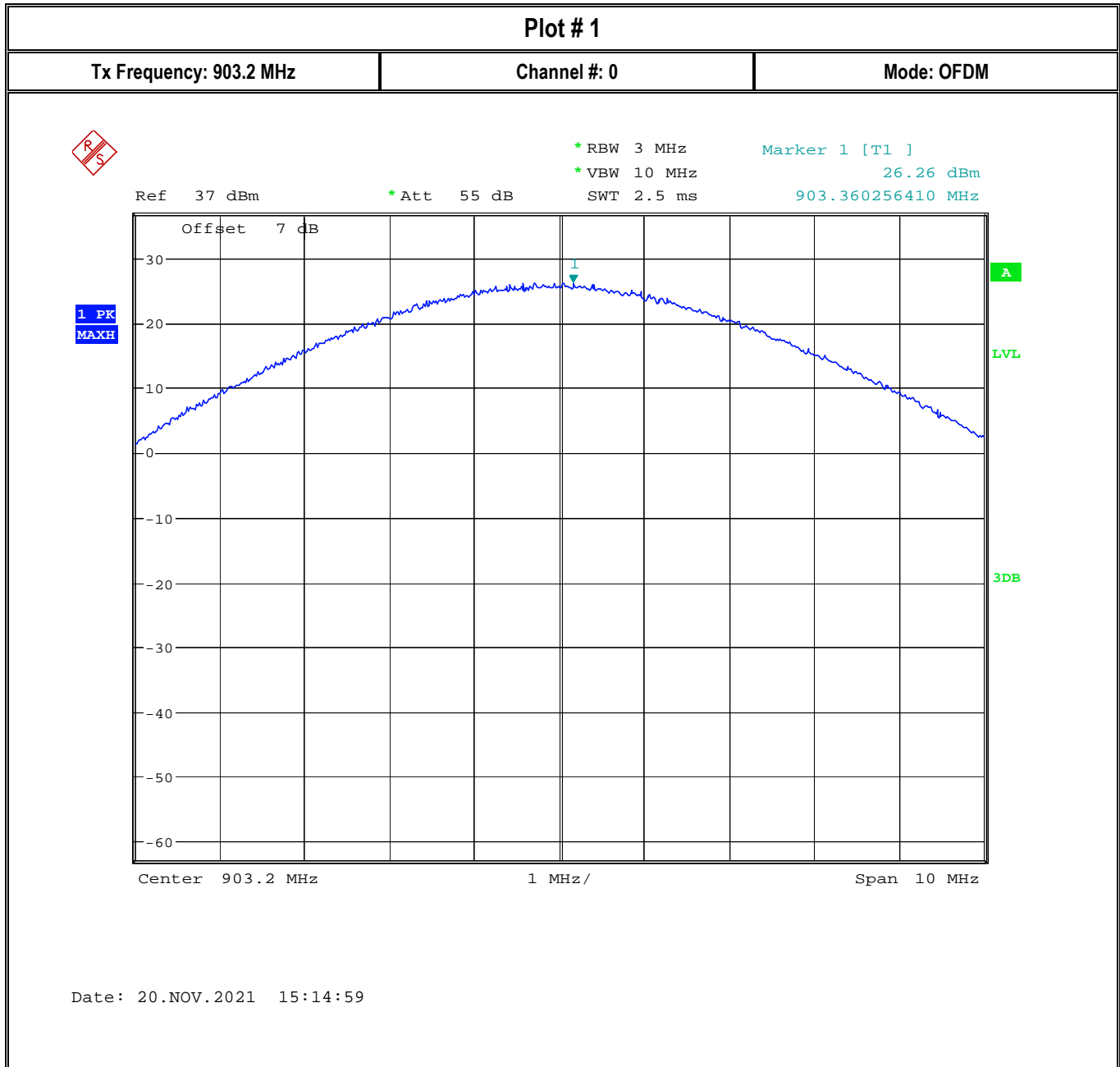
Ambient Temperature	EUT Set-Up #	EUT operating mode	Power Input	Antenna Gain
23.8°C	1	Op.1	120 V AC	-4.4 dBi

### 8.1.4 Measurement result:

Plot #	EUT operating mode	Channel #	TX Frequency (MHz)	Measured PK power		Conducted Limit		Calculated E.I.R.P <sup>1</sup>		ISED E.I.R.P Limit		Result
				W	dBm	W	dBm	W	dBm	W	dBm	
1	Op.1	0	903.2	0.42	26.26	1	30	0.15	21.86	4	36	Pass
2		9	914.0	0.41	26.15	1	30	0.15	21.75	4	36	Pass
3		19	926.0	0.38	25.76	1	30	0.14	21.36	4	36	Pass

1: E.I.R.P = Measured PK power + Antenna Gain

### 8.1.5 Measurement Plots:



## Plot # 2

Tx Frequency: 914.0 MHz

Channel #: 9

Mode: OFDM

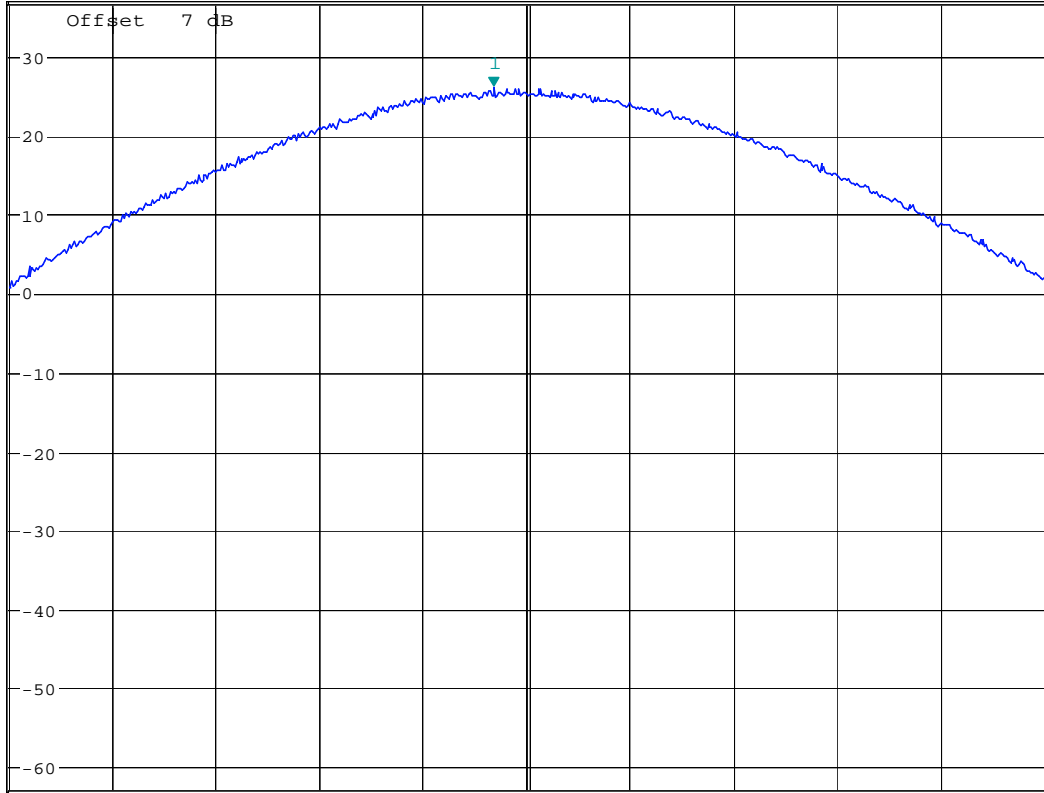


\*RBW 3 MHz  
\*VBW 10 MHz  
SWT 2.5 ms  
Marker 1 [T1 ]  
26.15 dBm  
913.679487179 MHz

Ref 37 dBm

\*Att 55 dB

1 PK  
MAXH



Date: 20.NOV.2021 15:18:23

### Plot # 3

Tx Frequency: 926.0 MHz

Channel #: 19

Mode: OFDM

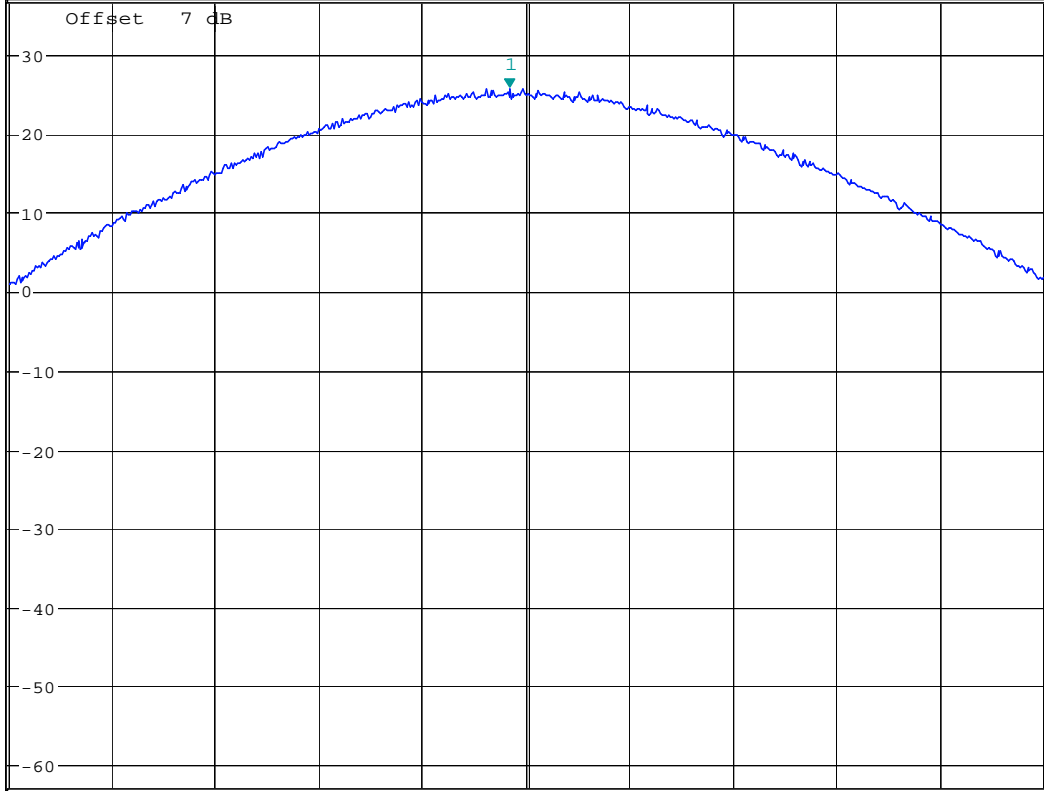


\* RBW 3 MHz  
\* VBW 10 MHz  
SWT 2.5 ms  
Marker 1 [T1]  
25.76 dBm  
925.839743590 MHz

Ref 37 dBm

\* Att 55 dB

1 PK  
MAXH



Center 926 MHz

1 MHz/

Span 10 MHz

Date: 20.NOV.2021 15:23:50



## 8.2 Radiated Transmitter Spurious Emissions and Restricted Bands

### 8.2.1 Measurement according to ANSI C63.10 (2013)

#### Spectrum Analyzer Settings:

- Frequency = 9 KHz – 30 MHz
- RBW = 9 KHz
- Detector: Peak
  
- Frequency = 30 MHz – 1 GHz
- Detector = Peak / Quasi-Peak
- RBW = 120 KHz (<1GHz)
  
- Frequency > 1 GHz
- Detector = Peak / Average
- RBW = 1 MHz
  
- Radiated spurious emissions shall be measured for the transmit frequencies, transmit power, and data rate for the lowest, middle and highest channel in each frequency band of operation and for the highest gain antenna for each antenna type, and using the appropriate parameters and test requirements.
- The highest (or worst-case) data rate shall be recorded for each measurement.
- For testing frequencies below 30 MHz at distance other than the specified in the standard, the limit conversion is calculated by using the FCC materials for the ANSI 63 committee issued on January, 27 1991.

### 8.2.2 Limits:

#### FCC §15.247

- In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. 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)).

# FCC §15.209 & RSS-Gen 8.9

- Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency of emission (MHz)	Field strength (μV/m)	Measurement Distance (m)	Field strength @ 3m (dBμV/m)
0.009–0.490	2400/F(kHz) / -----	300	-
0.490–1.705	24000/F(kHz) / -----	30	-
1.705–30.0	30 / (29.5)	30	-
30–88	100	3	40 dBμV/m
88–216	150	3	43.5 dBμV/m
216–960	200	3	46 dBμV/m
Above 960	500	3	54 dBμV/m

# FCC §15.205 & RSS-Gen 8.10

- Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
10.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	Above 38.6
13.36-13.41			

- 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)).

\*PEAK LIMIT= 74 dBμV/m

\*AVG. LIMIT= 54 dBμV/m

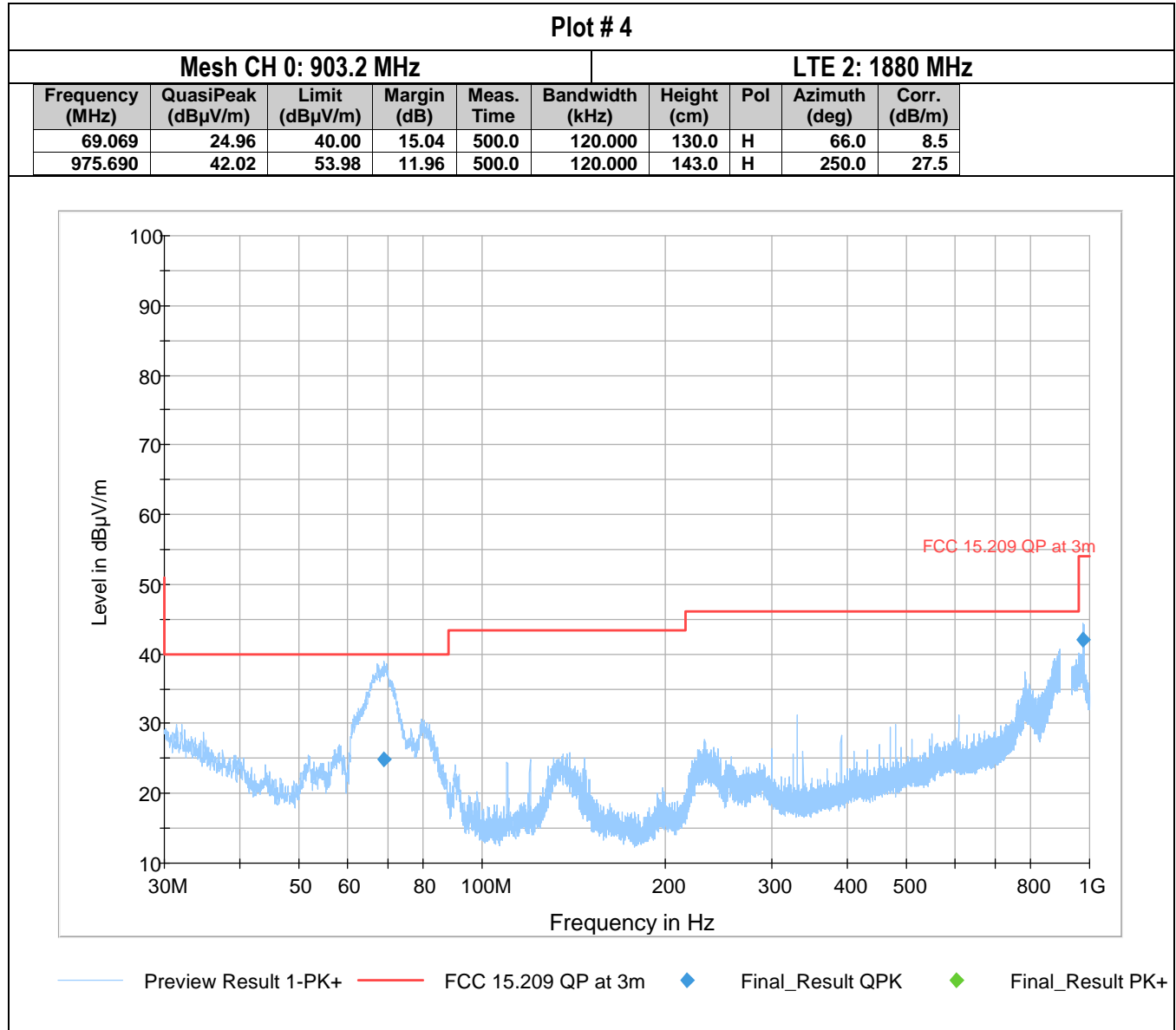
### 8.2.3 Test conditions and setup:

Ambient Temperature	EUT operating mode	Power Input
23° C	Op. 2	120 VAC

### 8.2.4 Measurement result:

Plot #	Channel #	EUT Set-up #	Scan Frequency	Result
4-7	0	2	30 MHz – 18 GHz	Pass
8-10	9	2	9 kHz – 18 GHz	Pass
11-13	19	2	30 MHz – 18 GHz	Pass

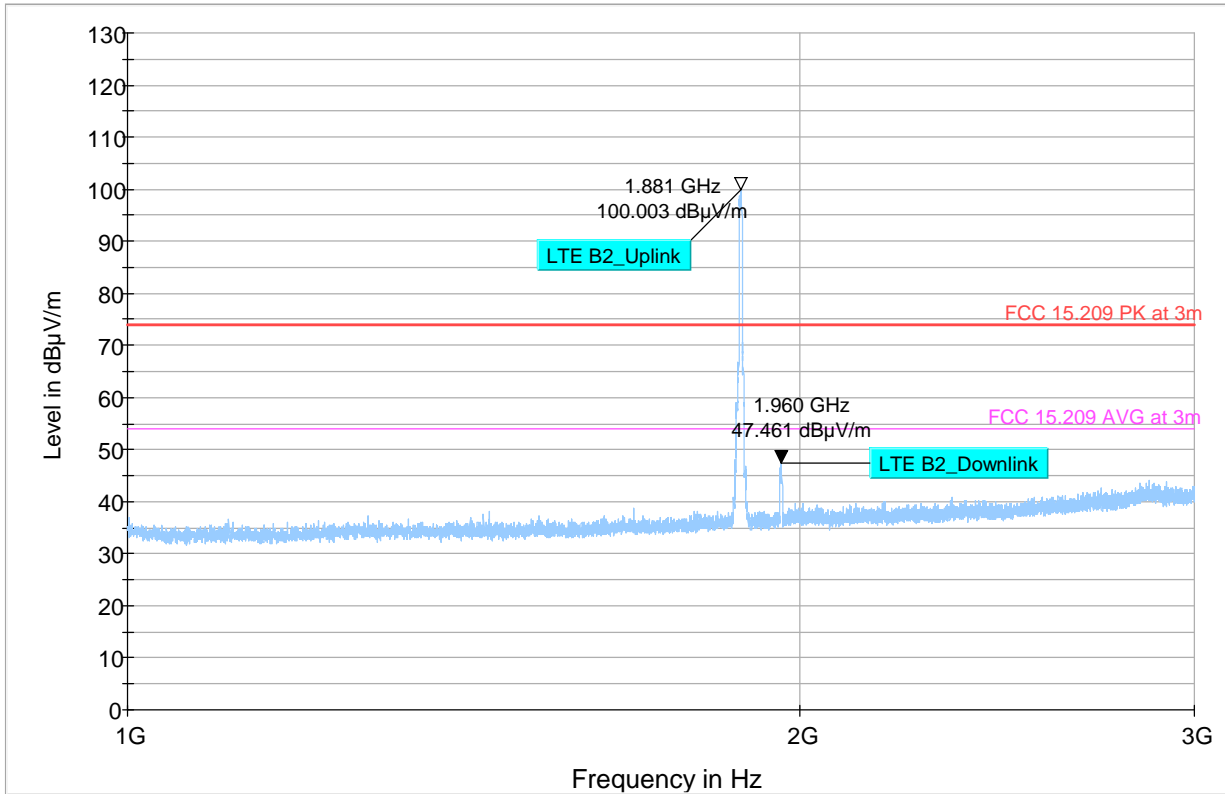
## 8.2.5 Measurement Plots:



Plot # 5

Mesh CH 0: 903.2 MHz

LTE 2: 1880 MHz



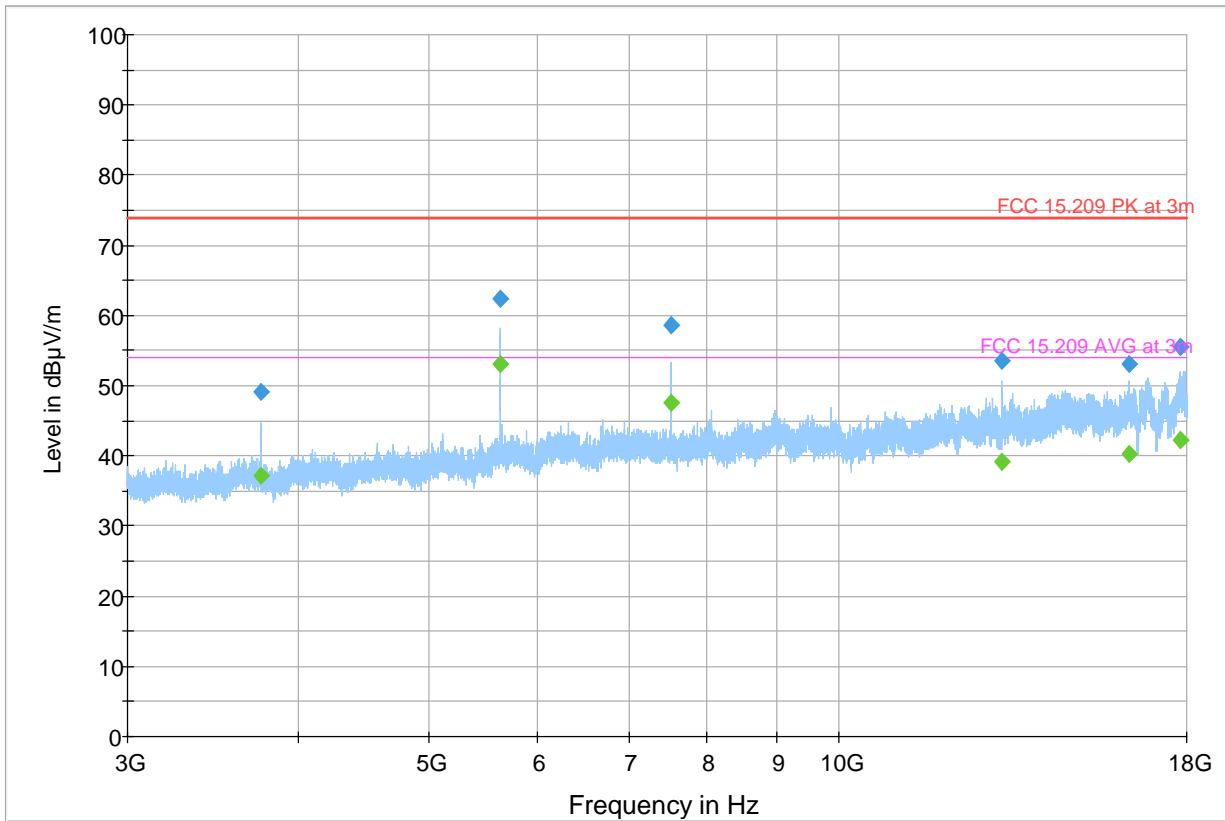
Preview Result 2-AVG	Preview Result 1-PK+	Critical_Freqs AVG
* Critical_Freqs PK+	FCC 15.209 PK at 3m	FCC 15.209 AVG at 3m
◆ Final_Result PK+	◆ Final_Result CAV	

Plot # 6

Mesh CH 0: 903.2 MHz

LTE 2: 1880 MHz

Frequency (MHz)	MaxPeak (dBμV/m)	CAverage (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
3760.000	49.14	---	73.98	24.84	500.0	1000.000	240.0	V	-20.0	-5.7
3760.000	---	37.18	53.98	16.80	500.0	1000.000	240.0	V	-20.0	-5.7
5639.250	---	53.06	53.98	0.92	500.0	1000.000	162.0	H	3.0	-1.1
5639.250	62.38	---	73.98	11.60	500.0	1000.000	162.0	H	3.0	-1.1
7520.000	58.71	---	73.98	15.27	500.0	1000.000	107.0	V	-4.0	0.2
7520.000	---	47.62	53.98	6.36	500.0	1000.000	107.0	V	-4.0	0.2
13156.250	53.43	---	73.98	20.55	500.0	1000.000	116.0	H	-2.0	8.6
13156.250	---	39.24	53.98	14.74	500.0	1000.000	116.0	H	-2.0	8.6
16328.750	---	40.21	53.98	13.77	500.0	1000.000	171.0	V	240.0	13.9
16328.750	53.13	---	73.98	20.85	500.0	1000.000	171.0	V	240.0	13.9
17801.000	55.49	---	73.98	18.49	500.0	1000.000	232.0	H	37.0	17.8
17801.000	---	42.21	53.98	11.77	500.0	1000.000	232.0	H	37.0	17.8



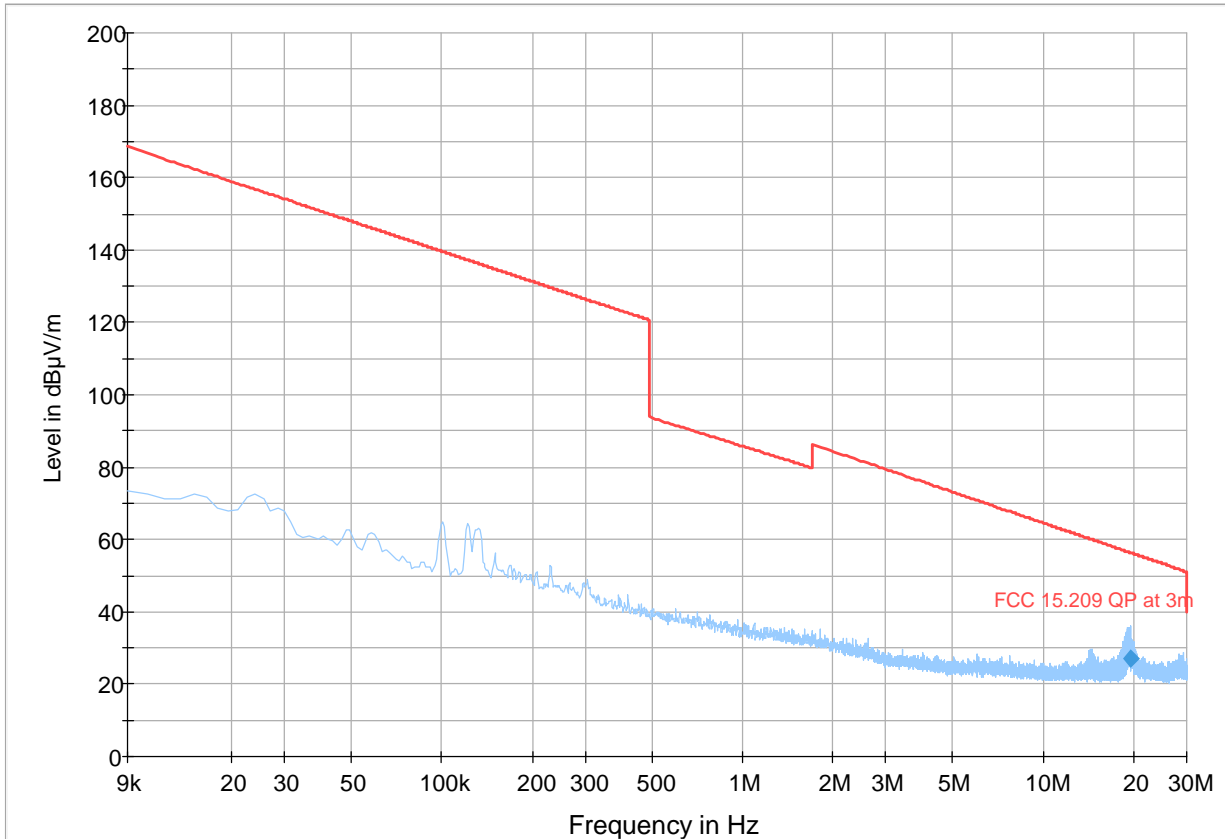
— Preview Result 2-AVG     — Preview Result 1-PK+     — FCC 15.209 PK at 3m  
— FCC 15.209 AVG at 3m     ◆ Final\_Result PK+     ◆ Final\_Result CAV

Plot # 7

Mesh CH 9: 914 MHz

LTE 2: 1880 MHz

Frequency (MHz)	QuasiPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
19.455	27.10	56.37	29.27	500.0	9.000	100.0	H	218.0	33.8

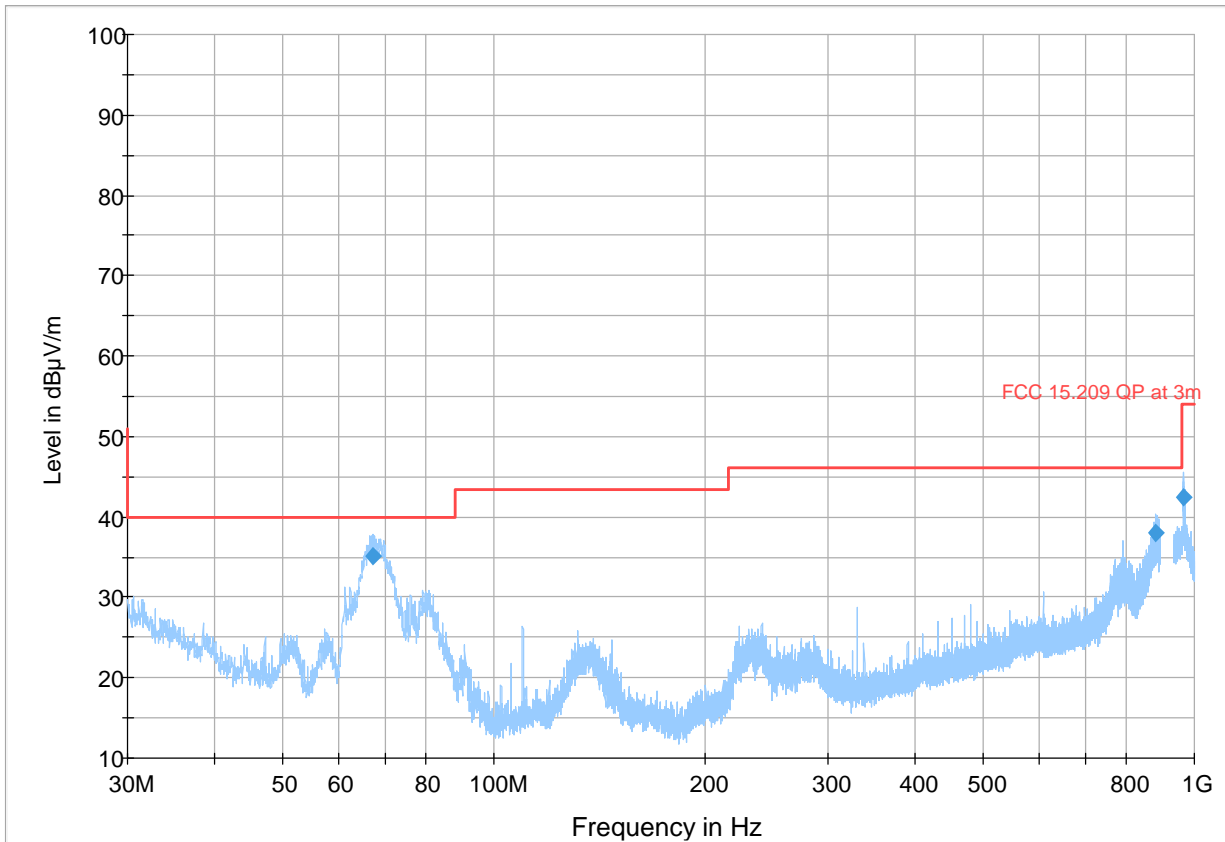


**Plot # 8**

**Mesh CH 9: 914 MHz**

**LTE 2: 1880 MHz**

Frequency (MHz)	QuasiPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
67.310	35.19	40.00	4.81	500.0	120.000	185.0	V	167.0	8.2
879.978	38.05	46.02	7.97	500.0	120.000	107.0	V	262.0	25.5
966.005	42.50	53.98	11.48	500.0	120.000	149.0	H	253.0	27.4



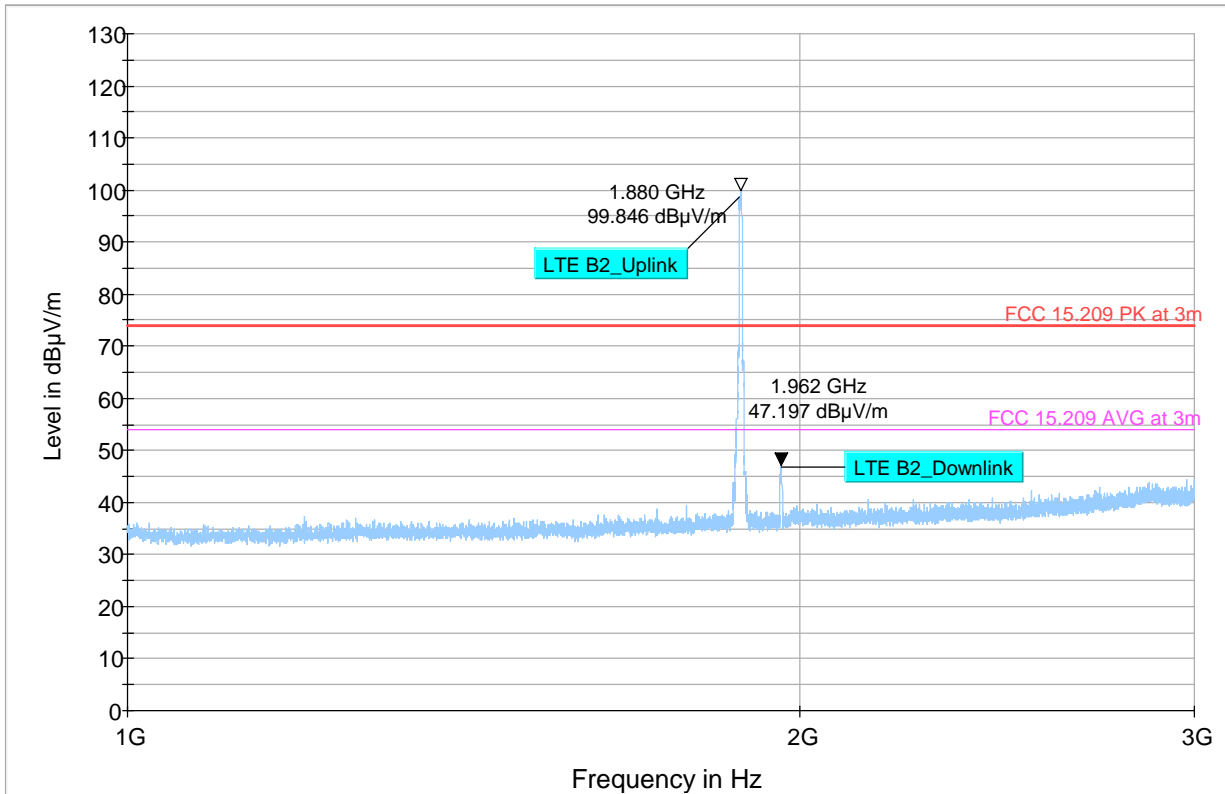
— Preview Result 1-PK+ — FCC 15.209 QP at 3m ◆ Final\_Result QPK ◆ Final\_Result PK+



Plot # 9

Mesh CH 9: 914 MHz

LTE 2: 1880 MHz



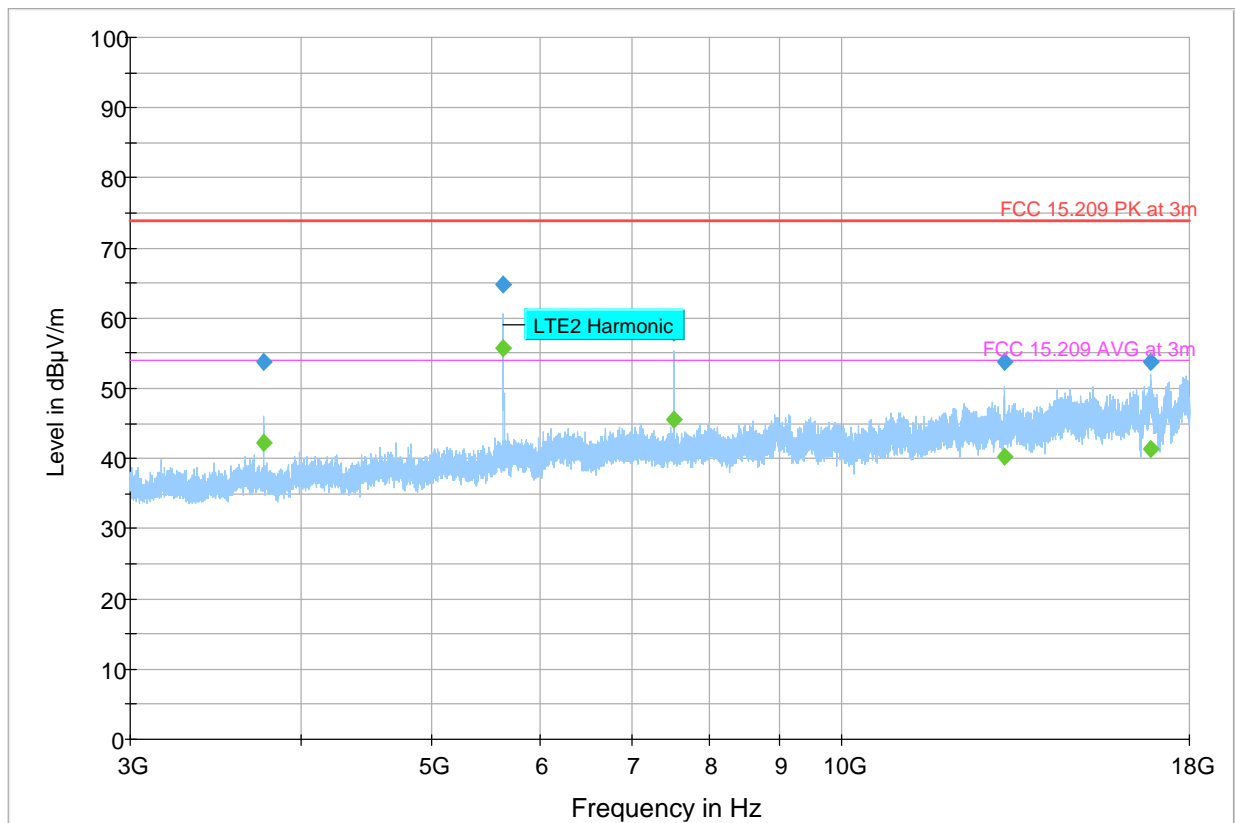
Preview Result 2-AVG	Preview Result 1-PK+	Critical_Freqs AVG
* Critical_Freqs PK+	— FCC 15.209 PK at 3m	* FCC 15.209 AVG at 3m
◆ Final_Result PK+	◆ Final_Result CAV	

Plot # 10

Mesh CH 9: 914 MHz

LTE 2: 1880 MHz

Frequency (MHz)	MaxPeak (dBμV/m)	CAverage (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
3760.000	53.70	---	73.98	20.28	500.0	1000.000	233.0	V	40.0	-5.7
3760.000	---	42.17	53.98	11.80	500.0	1000.000	233.0	V	40.0	-5.7
5639.750	64.78	---	73.98	9.20	500.0	1000.000	118.0	V	49.0	-1.1
5639.750	---	55.77	53.98	-1.79	500.0	1000.000	118.0	V	49.0	-1.1
7522.250	57.90	---	73.98	16.08	500.0	1000.000	143.0	V	151.0	0.2
7522.250	---	45.55	53.98	8.43	500.0	1000.000	143.0	V	151.0	0.2
13160.750	---	40.26	53.98	13.72	500.0	1000.000	107.0	H	-3.0	8.5
13160.750	53.82	---	73.98	20.16	500.0	1000.000	107.0	H	-3.0	8.5
16845.250	53.70	---	73.98	20.28	500.0	1000.000	161.0	V	44.0	14.4
16845.250	---	41.35	53.98	12.62	500.0	1000.000	161.0	V	44.0	14.4



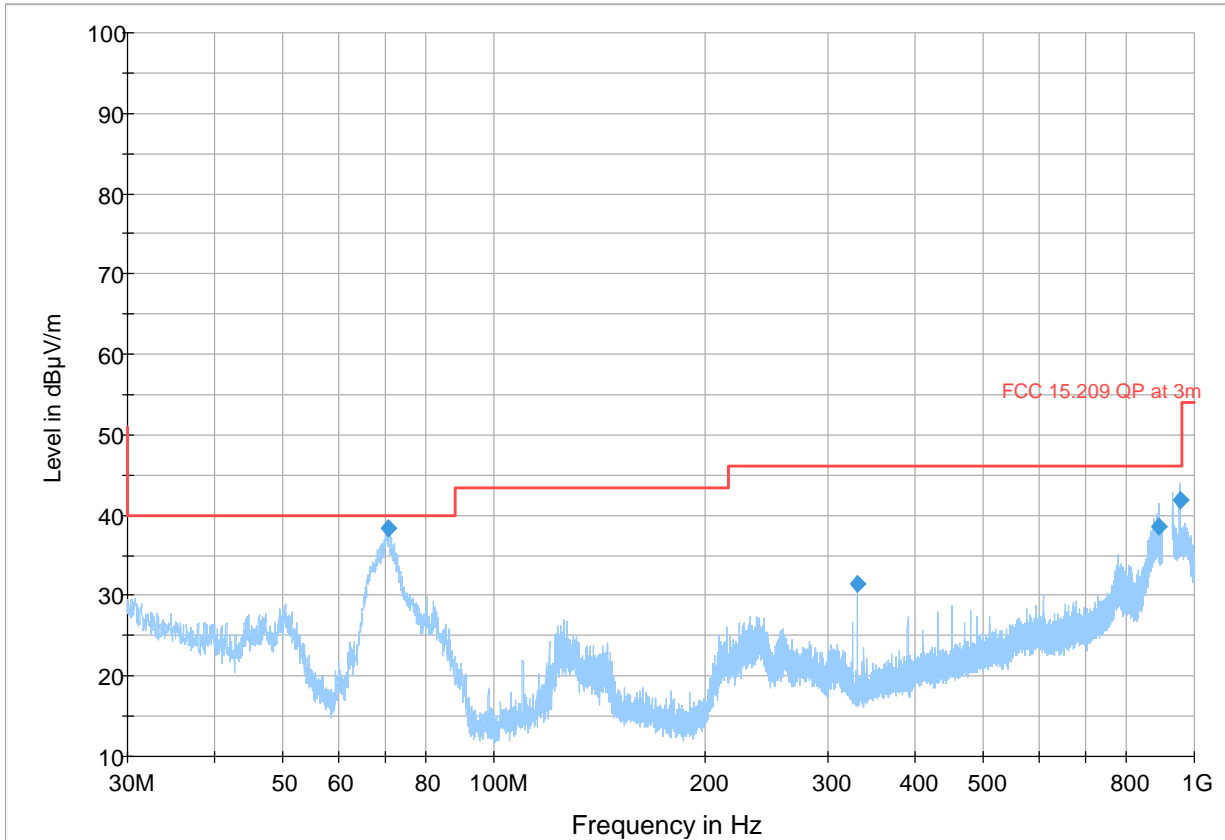
— Preview Result 2-AVG    — Preview Result 1-PK+    — FCC 15.209 PK at 3m  
— FCC 15.209 AVG at 3m    ◆ Final\_Result PK+    ◆ Final\_Result CAV

Plot # 11

Mesh CH 19: 926 MHz

LTE 2: 1880 MHz

Frequency (MHz)	QuasiPeak (dBμV/m)	MaxPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
70.861	38.36	---	40.00	1.64	500.0	120.000	151.0	V	220.0	7.6
329.976	31.38	---	46.02	14.64	500.0	120.000	253.0	V	250.0	15.5
888.777	38.66	---	46.02	7.36	500.0	120.000	117.0	V	268.0	25.5
955.130	41.87	---	46.02	4.15	500.0	120.000	285.0	H	224.0	26.9

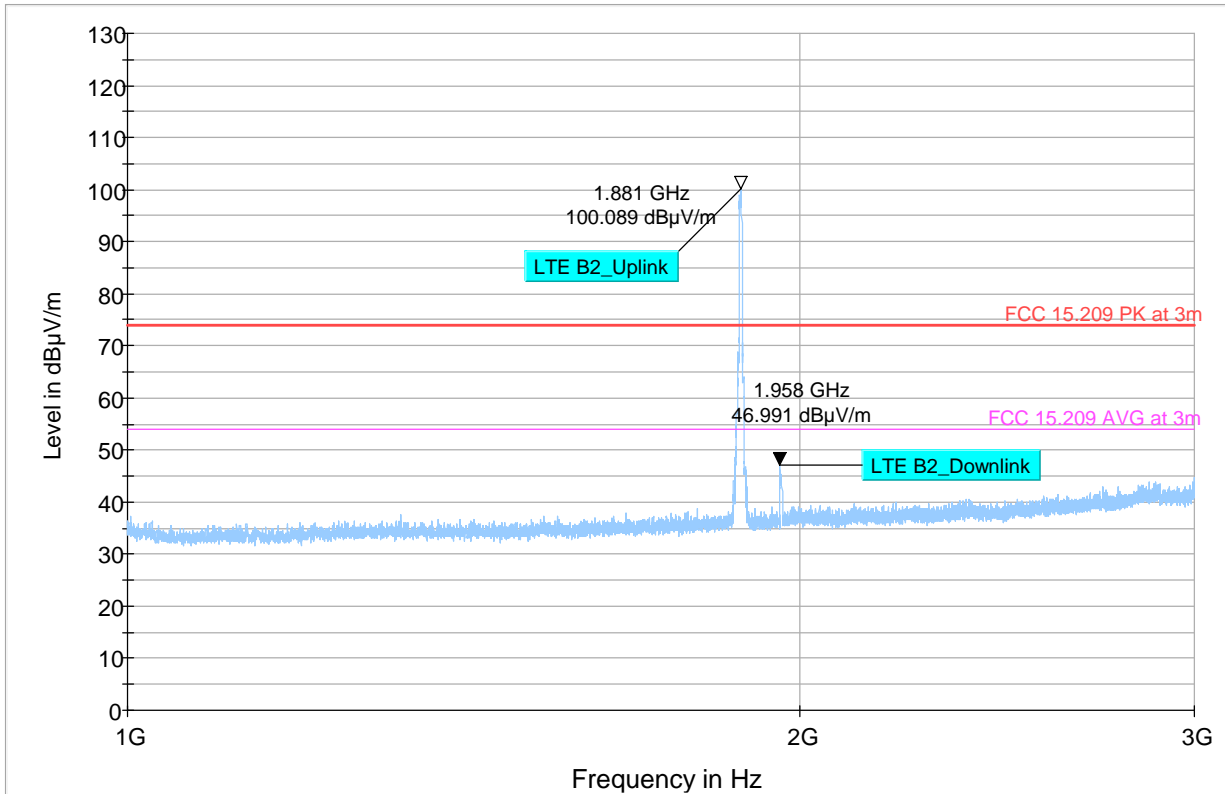


Preview Result 1-PK+    FCC 15.209 QP at 3m    ◆ Final\_Result QPK    ◆ Final\_Result PK+

Plot # 12

Mesh CH 19: 926 MHz

LTE 2: 1880 MHz



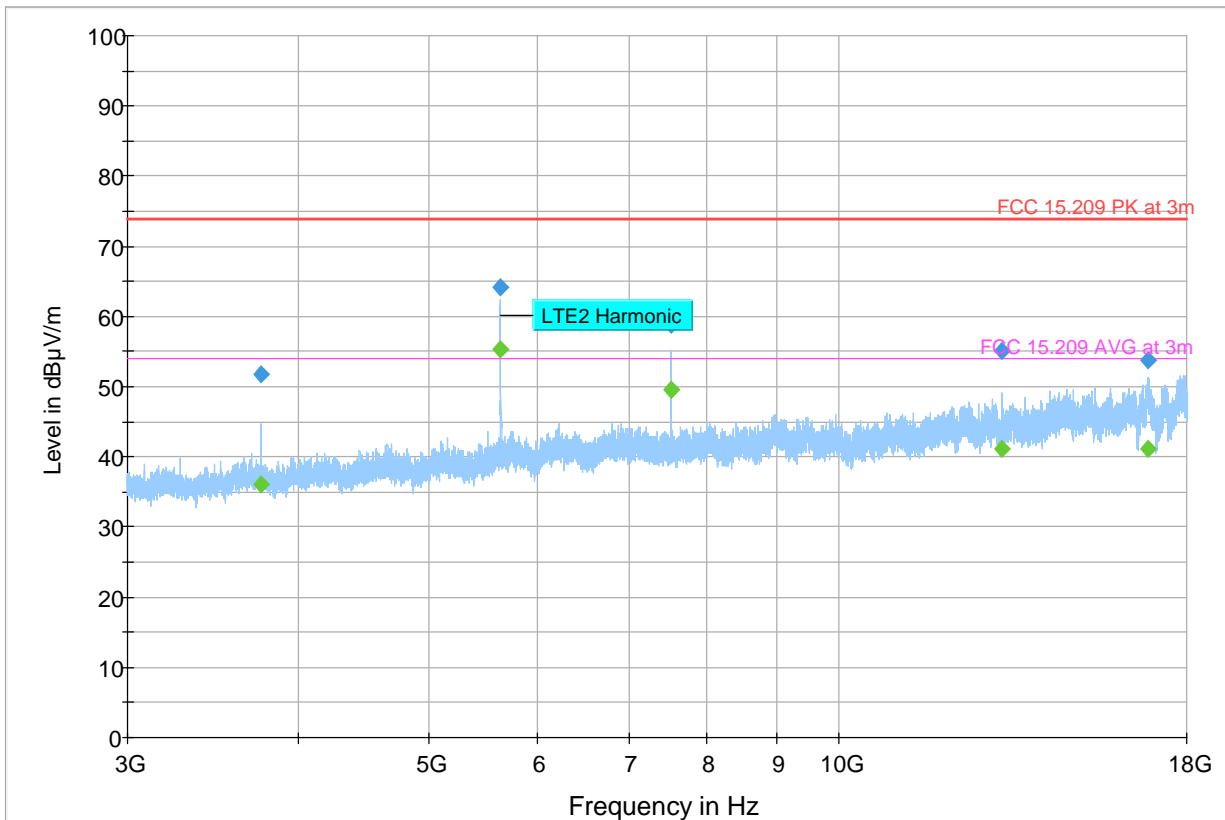
Preview Result 2-AVG	Preview Result 1-PK+	Critical_Freqs AVG
* Critical_Freqs PK+	— FCC 15.209 PK at 3m	* FCC 15.209 AVG at 3m
◆ Final_Result PK+	◆ Final_Result CAV	

Plot # 13

Mesh CH 19: 926 MHz

LTE 2: 1880 MHz

Frequency (MHz)	MaxPeak (dBμV/m)	CAverage (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
3760.250	51.78	---	73.98	22.20	500.0	1000.000	117.0	H	344.0	-5.7
3760.250	---	36.02	53.98	17.96	500.0	1000.000	117.0	H	344.0	-5.7
5639.750	---	55.29	53.98	-1.31	500.0	1000.000	118.0	V	47.0	-1.1
5639.750	64.26	---	73.98	9.72	500.0	1000.000	118.0	V	47.0	-1.1
7519.750	---	49.56	53.98	4.42	500.0	1000.000	142.0	V	151.0	0.2
7519.750	58.81	---	73.98	15.17	500.0	1000.000	142.0	V	151.0	0.2
13160.000	---	41.24	53.98	12.74	500.0	1000.000	117.0	H	-2.0	8.6
13160.000	55.12	---	73.98	18.86	500.0	1000.000	117.0	H	-2.0	8.6
16834.000	53.72	---	73.98	20.26	500.0	1000.000	187.0	H	54.0	14.4
16834.000	---	41.07	53.98	12.91	500.0	1000.000	187.0	H	54.0	14.4



— Preview Result 2-AVG   
 — Preview Result 1-PK+   
 — FCC 15.209 PK at 3m  
— FCC 15.209 AVG at 3m   
◆ Final\_Result PK+   
◆ Final\_Result CAV

### 8.3 AC Power Line Conducted Emissions

#### 8.3.1 Measurement according to ANSI C63.4

##### Analyzer Settings:

- RBW = 9 KHz (CISPR Bandwidth)
- Detector: Peak / Average for Pre-scan
- Quasi-Peak/Average for Final Measurements

#### 8.3.2 Limits: §15.207 & RSS-Gen 8.8

##### FCC §15.207(a) & RSS-Gen 8.8

- Except as shown in paragraphs (b) and (c) of this section of the CFR, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table (1), as measured using a 50  $\mu$ H/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between frequency ranges.

Frequency of emission (MHz)	Conducted limit (dB $\mu$ V)	
	Quasi-peak	Average
0.15–0.5	66 to 56*	56 to 46*
0.5–5	56	46
5–30	60	50

\*Decreases with the logarithm of the frequency.

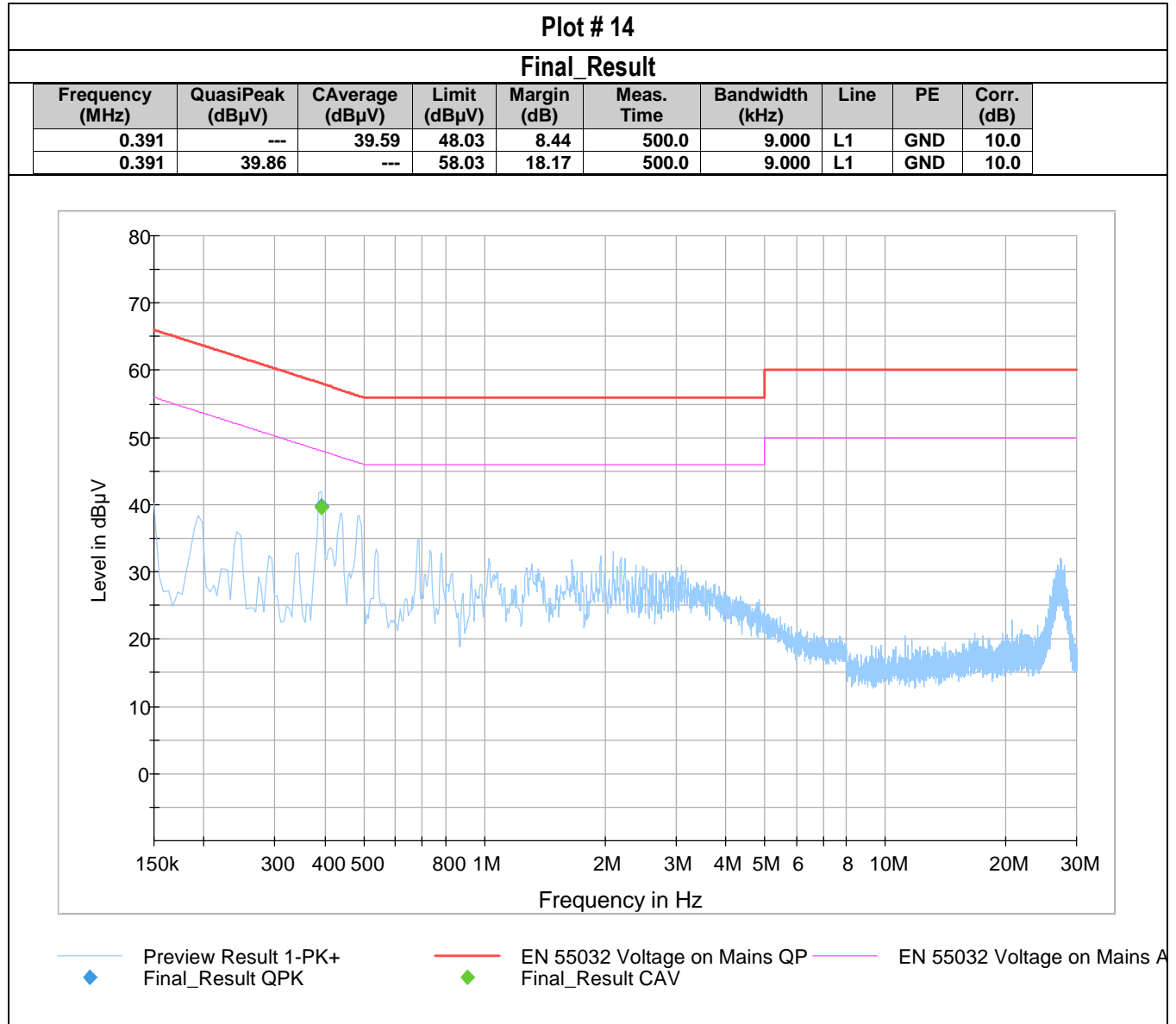
#### 8.3.3 Test conditions and setup:

Ambient Temperature (C)	Power line (L1, L2, L3, N)	Power Input
22	Line & Neutral	120V / 60 Hz

#### 8.3.4 Measurement Result:

Plot #	Port	EUT Set-Up #:	EUT operating mode	Scan Frequency	Result
14	AC Mains	2	Op. 2	150 kHz – 30 MHz	Pass

### 8.3.5 Measurement Plots:



## 9 Test setup photos

Setup photos are included in supporting file name: "EMC\_ITRO1\_049\_21001\_FCC\_ISED\_ATT\_Setup\_Photos.pdf"

## 10 Test Equipment And Ancillaries Used For Testing

Equipment Name/Type	Manufacturer	Model	Serial #	Calibration Cycle	Last Calibration Date
Active Loop Antenna	ETS Lindgren	6507	161344	2 Years	10/30/2020
Biconilog Antenna	ETS Lindgren	3142E	166067	2 Years	03/12/2020
Horn Antenna	ETS Lindgren	3115	35114	2 Years	10/10/2020
Horn Antenna	ETS Lindgren	3117-PA	215984	2 Years	01/31/2021
Horn Antenna	ETS Lindgren	3116	00070497	2 Years	11/23/2020
Spectrum Analyzer	R&S	ESU40	100251	2 Years	09/13/2021
LISN	FCC	FCC-LISN-50-25-2-08	08014	2 Years	08/31/2021
Thermometer Humidity Monitor	Dickson	TM320	5280063	2 Years	11/02/2020

Note:

1. Equipment used meets the measurement uncertainty requirements as required per applicable standards for 95% confidence levels.

Calibration due dates, unless defined specifically, falls on the last day of the month. Items indicated "N/A" for cal status either do not specifically require calibration or is internally characterized before use.



## 11 History

Date	Template Revision	Changes to report	Prepared by
2021-09-30	EMC_ITRO1_049_21001_FCC_15.247_DTS_ATT	Initial Version	Issa W Ghanma
2021-11-05	EMC_ITRO1_049_21001_FCC_15.247_DTS_ATT_Rev1	<ol style="list-style-type: none"> <li>1. Section 1: Add client declaration</li> <li>2. Section 3.1: Replace "Max. declared output Powers" with "Measured Peak output powers"</li> <li>3. Section 3.2: Add EUT Sample details for the EUT used for RF conducted output power measurement. (EUT#1)</li> <li>4. Section 3.3: Add Mode of operation details for the EUT used for RF conducted output power measurement. (Op.1)</li> <li>5. Section 3.4: Add Test Sample configuration for the EUT used for RF conducted output power. (EUT Set-up # 1)</li> <li>6. Section 3.5: <ol style="list-style-type: none"> <li>a. Add Low, and High channels to the statement.</li> <li>b. Add the Co-Transmitter information to the statement.</li> </ol> </li> <li>7. Section 5: <ol style="list-style-type: none"> <li>a. Update the Test Specification column.</li> <li>b. Add the maximum peak conducted output power to the performed test cases.</li> <li>c. Update the Mode column with the suitable operating mode number for the performed test cases.</li> <li>d. Add Note2.</li> </ol> </li> <li>8. Section 6.3: Update the dates of testing.</li> <li>9. Add section 7.3</li> <li>10. Add section 8.1</li> <li>11. Section 8.2.3: Update the EUT operation mode</li> <li>12. Section 8.2.4: Update the Plot # and EUT Set-up #</li> <li>13. Section 8.3.4: Update the Plot #, EUT Set-up #, and EUT operating mode.</li> <li>14. Section 10: Update test equipment with the latest calibration dates.</li> </ol>	Issa W Ghanma

<<< The End >>>