

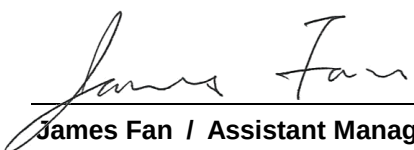
# FCC C2PC Test Report

**Equipment** : 802.11 3T3R a/n/ac module  
**Brand Name** : Senao  
**Model No.** : PCE4553AH  
**FCC ID** : U2M-PCE4553AH  
**Standard** : 47 CFR FCC Part 15.247  
**Operating Band** : 5725 MHz – 5850 MHz  
**FCC Classification** : DTS  
**Applicant** : Senao Networks, Inc.  
**Manufacturer** : 3F, No. 529, Chung Cheng Rd., Hsintien, Taipei, Taiwan

The product sample received on Apr. 21, 2014 and completely tested on Apr. 21, 2014. We, SPORTON, would like to declare that the tested sample has been evaluated in accordance with the procedures given in ANSI C63.10-2009 and shown compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL INC., the test report shall not be reproduced except in full.

Reviewed by:

  
James Fan / Assistant Manager



## **Table of Contents**

|          |                                                  |              |
|----------|--------------------------------------------------|--------------|
| <b>1</b> | <b>GENERAL DESCRIPTION .....</b>                 | <b>5</b>     |
| 1.1      | Information.....                                 | 5            |
| 1.2      | Support Equipment.....                           | 7            |
| 1.3      | Testing Applied Standards .....                  | 7            |
| 1.4      | Testing Location Information .....               | 7            |
| 1.5      | Measurement Uncertainty .....                    | 8            |
| <b>2</b> | <b>TEST CONFIGURATION OF EUT.....</b>            | <b>9</b>     |
| 2.1      | The Worst Case Modulation Configuration .....    | 9            |
| 2.2      | The Worst Case Power Setting Parameter .....     | 9            |
| 2.3      | The Worst Case Measurement Configuration.....    | 10           |
| 2.4      | Test Setup Diagram .....                         | 11           |
| <b>3</b> | <b>TRANSMITTER TEST RESULT .....</b>             | <b>12</b>    |
| 3.1      | RF Output Power.....                             | 12           |
| 3.2      | Transmitter Radiated Unwanted Emissions .....    | 16           |
| <b>4</b> | <b>TEST EQUIPMENT AND CALIBRATION DATA .....</b> | <b>23</b>    |
|          | <b>APPENDIX A. TEST PHOTOS .....</b>             | <b>A1-A4</b> |

## Summary of Test Result

| Conformance Test Specifications |                  |                                                            |                                                                        |                                                                |          |
|---------------------------------|------------------|------------------------------------------------------------|------------------------------------------------------------------------|----------------------------------------------------------------|----------|
| Report Clause                   | Ref. Std. Clause | Description                                                | Measured                                                               | Limit                                                          | Result   |
| 1.1.2                           | 15.203           | Antenna Requirement                                        | Antenna connector mechanism complied                                   | FCC 15.203                                                     | Complied |
| 3.1                             | 15.247(b)        | RF Output Power (Maximum Conducted (Average) Output Power) | Power [dBm]:26.74                                                      | Power [dBm]:30                                                 | Complied |
| 3.2                             | 15.247(d)        | Transmitter Radiated Unwanted Emissions                    | Restricted Bands [dBuV/m at 3m]:11570.00MHz 52.38 (Margin 1.62dB) - AV | Non-Restricted Bands: > 30 dBc<br>Restricted Bands: FCC 15.209 | Complied |

## Revision History

[illegible]

# 1 General Description

## 1.1 Information

This report is issued as a FCC Class II Permissive Change. No hardware and software change for this device. The modification is only adding **absorber**, therefore only conducted output power and radiated emission has been evaluated for this C2PC.

### 1.1.1 RF General Information

| RF General Information |                  |                 |                |                                    |                       |             |
|------------------------|------------------|-----------------|----------------|------------------------------------|-----------------------|-------------|
| Frequency Range (MHz)  | IEEE Std. 802.11 | Ch. Freq. (MHz) | Channel Number | Transmit Chains (N <sub>TX</sub> ) | RF Output Power (dBm) | Co-location |
| 5725-5850              | a                | 5745-5825       | 149-165 [5]    | 3                                  | 26.50                 | N/A         |
| 5725-5850              | n(HT20)          | 5745-5825       | 149-165 [5]    | 3                                  | 26.54                 | N/A         |
| 5725-5850              | n(HT40)          | 5755-5795       | 151-159 [2]    | 3                                  | 26.66                 | N/A         |
| 5725-5850              | ac(VHT20)        | 5745-5825       | 149-165 [5]    | 3                                  | 26.68                 | N/A         |
| 5725-5850              | ac(VHT40)        | 5755-5795       | 151-159 [2]    | 3                                  | 26.74                 | N/A         |
| 5725-5850              | ac(VHT80)        | 5775            | 155 [1]        | 3                                  | 24.32                 | N/A         |

Note 1: RF output power specifies that Maximum Conducted (Average) Output Power.  
 Note 2: 802.11a/n uses a combination of OFDM-BPSK, QPSK, 16QAM, 64QAM modulation.  
 Note 3: 802.11ac uses a combination of OFDM-BPSK, QPSK, 16QAM, 64QAM, 256QAM modulation.  
 Note 4: Co-location, Co-location is generally defined as simultaneously transmitting (co-transmitting) antennas within 20 cm of each other. (i.e., EUT has simultaneously co-transmitting that operating 2.4GHz and 5GHz.)

### 1.1.2 Antenna Information

| Antenna Category                    |                                                                                                                                                                                                                                                                                                                   |
|-------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <input type="checkbox"/>            | Equipment placed on the market without antennas                                                                                                                                                                                                                                                                   |
| <input type="checkbox"/>            | Integral antenna (antenna permanently attached)                                                                                                                                                                                                                                                                   |
| <input type="checkbox"/>            | Temporary RF connector provided                                                                                                                                                                                                                                                                                   |
| <input type="checkbox"/>            | No temporary RF connector provided<br>Transmit chains bypass antenna and soldered temporary RF connector provided for connected measurement. In case of conducted measurements the transmitter shall be connected to the measuring equipment via a suitable attenuator and correct for all losses in the RF path. |
| <input checked="" type="checkbox"/> | External antenna (dedicated antennas)                                                                                                                                                                                                                                                                             |
| <input type="checkbox"/>            | Single power level with corresponding antenna(s).                                                                                                                                                                                                                                                                 |
| <input type="checkbox"/>            | Multiple power level and corresponding antenna(s).                                                                                                                                                                                                                                                                |
| <input checked="" type="checkbox"/> | RF connector provided                                                                                                                                                                                                                                                                                             |
| <input checked="" type="checkbox"/> | Unique antenna connector. (e.g., MMCX, U.FL, IPX, and RP-SMA, RP-N type...)                                                                                                                                                                                                                                       |
| <input type="checkbox"/>            | Standard antenna connector. (e.g., SMA, N, BNC, and TNC type...)                                                                                                                                                                                                                                                  |

| Antenna General Information |           |                 |            |           |            |
|-----------------------------|-----------|-----------------|------------|-----------|------------|
| No.                         | Ant. Cat. | Ant. Model      | Ant. Type  | Connector | Gain (dBi) |
| 1                           | External  | Ant 2 (1002299) | PCB Dipole | UFL       | 4.2025     |
| 2                           | External  | Ant 4 (1002300) | PCB Dipole | UFL       | 4.0181     |
| 3                           | External  | Ant 6 (1002301) | PCB Dipole | UFL       | 3.4374     |

### 1.1.3 Type of EUT

| Identify EUT                        |                                                                                                                                   |
|-------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|
| EUT Serial Number                   | N/A                                                                                                                               |
| Presentation of Equipment           | <input type="checkbox"/> Production ; <input checked="" type="checkbox"/> Pre-Production ; <input type="checkbox"/> Prototype     |
| Type of EUT                         |                                                                                                                                   |
| <input type="checkbox"/>            | Stand-alone                                                                                                                       |
| <input type="checkbox"/>            | Combined (EUT where the radio part is fully integrated within another device)<br>Combined Equipment - Brand Name / Model No.: ... |
| <input checked="" type="checkbox"/> | Plug-in radio                                                                                                                     |
| <input type="checkbox"/>            | Other:                                                                                                                            |

### 1.1.4 Test Signal Duty Cycle

| Operated Mode for Worst Duty Cycle                                          |                                       |
|-----------------------------------------------------------------------------|---------------------------------------|
| <input type="checkbox"/> Operated normally mode for worst duty cycle        |                                       |
| <input checked="" type="checkbox"/> Operated test mode for worst duty cycle |                                       |
| Test Signal Duty Cycle (x)                                                  | Power Duty Factor [dB] – (10 log 1/x) |
| <input checked="" type="checkbox"/> 100.00% - IEEE 802.11a                  | 0                                     |
| <input checked="" type="checkbox"/> 100.00% - IEEE 802.11ac (VHT20)         | 0                                     |
| <input checked="" type="checkbox"/> 100.00% - IEEE 802.11ac (VHT40)         | 0                                     |
| <input checked="" type="checkbox"/> 100.00% - IEEE 802.11ac (VHT80)         | 0                                     |

### 1.1.5 EUT Operational Condition

|                   |                                                                                                                                   |
|-------------------|-----------------------------------------------------------------------------------------------------------------------------------|
| Supply Voltage    | <input type="checkbox"/> AC mains <input checked="" type="checkbox"/> DC                                                          |
| Type of DC Source | <input type="checkbox"/> Internal DC supply <input type="checkbox"/> External DC adapter <input checked="" type="checkbox"/> Host |

## 1.2 Support Equipment

| Support Equipment |               |            |            |            |
|-------------------|---------------|------------|------------|------------|
| No.               | Equipment     | Brand Name | Model Name | Serial No. |
| 1                 | Notebook      | DELL       | E6430      | DoC        |
| 2                 | Power Supply  | GW INSTEK  | GPC-6030D  | ---        |
| 3                 | Extender card | NA         | adapter    | NA         |

## 1.3 Testing Applied Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- ♦ 47 CFR FCC Part 15
- ♦ ANSI C63.10-2009
- ♦ FCC KDB 558074 v03r01
- ♦ FCC KDB 662911 v02r01
- ♦ FCC KDB 412172 v01

## 1.4 Testing Location Information

| Testing Location                                |             |                                                                                              |               |               |
|-------------------------------------------------|-------------|----------------------------------------------------------------------------------------------|---------------|---------------|
| <input checked="" type="checkbox"/>             | Sporton Lab | ADD : No. 52, Hwa Ya 1st Rd., Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C.               |               |               |
|                                                 |             | TEL : 886-3-327-3456 FAX : 886-3-318-0055                                                    |               |               |
| <input checked="" type="checkbox"/>             | ICC Lab     | ADD : No.3-1, Lane 6, Wen San 3rd St., Kwei Shan Hsiang, Tao Yuan Hsein 333, Taiwan (R.O.C.) |               |               |
|                                                 |             | TEL : 886-3-271-8666 FAX : 886-3-318-0155                                                    |               |               |
| Test Condition                                  |             | Test Site No.                                                                                | Test Engineer | Test Date     |
| RF Conducted                                    |             | TH01-HY                                                                                      | Mark Liao     | Apr. 21, 2014 |
| *Radiated Emission                              |             | 03CH01-WS                                                                                    | Brad Wu       | Apr. 21, 2014 |
| Test site registered number [657002] with FCC.  |             |                                                                                              |               |               |
| Test site registered number [10807A-1] with IC. |             |                                                                                              |               |               |

Note: \* Sporton Lab subcontracts this test item to ICC lab (TAF: 2732).

ICC lab is a TAF accreditation test firm and also is an approved provider of Sporton lab.

## 1.5 Measurement Uncertainty

ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level (based on a coverage factor (k=2))

| Measurement Uncertainty    |               |             |       |
|----------------------------|---------------|-------------|-------|
| Test Item                  |               | Uncertainty | Limit |
| RF output power, conducted |               | ±0.63 dB    | N/A   |
| All emissions, radiated    | 30 – 1000 MHz | ±3.9 dB     | N/A   |
|                            | Above 1GHz    | ±4.2 dB     | N/A   |

## 2 Test Configuration of EUT

### 2.1 The Worst Case Modulation Configuration

| Worst Modulation Used for Conformance Testing |                                    |                 |                       |
|-----------------------------------------------|------------------------------------|-----------------|-----------------------|
| Modulation Mode                               | Transmit Chains (N <sub>TX</sub> ) | Data Rate / MCS | Worst Data Rate / MCS |
| 11a                                           | 3                                  | 6-54Mbps        | 6 Mbps                |
| HT20                                          | 3                                  | M0-23           | M0                    |
| HT40                                          | 3                                  | M0-23           | M0                    |
| VHT20                                         | 3                                  | M0-8            | M0                    |
| VHT40                                         | 3                                  | M0-9            | M0                    |
| VHT80                                         | 3                                  | M0-9            | M0                    |

### 2.2 The Worst Case Power Setting Parameter

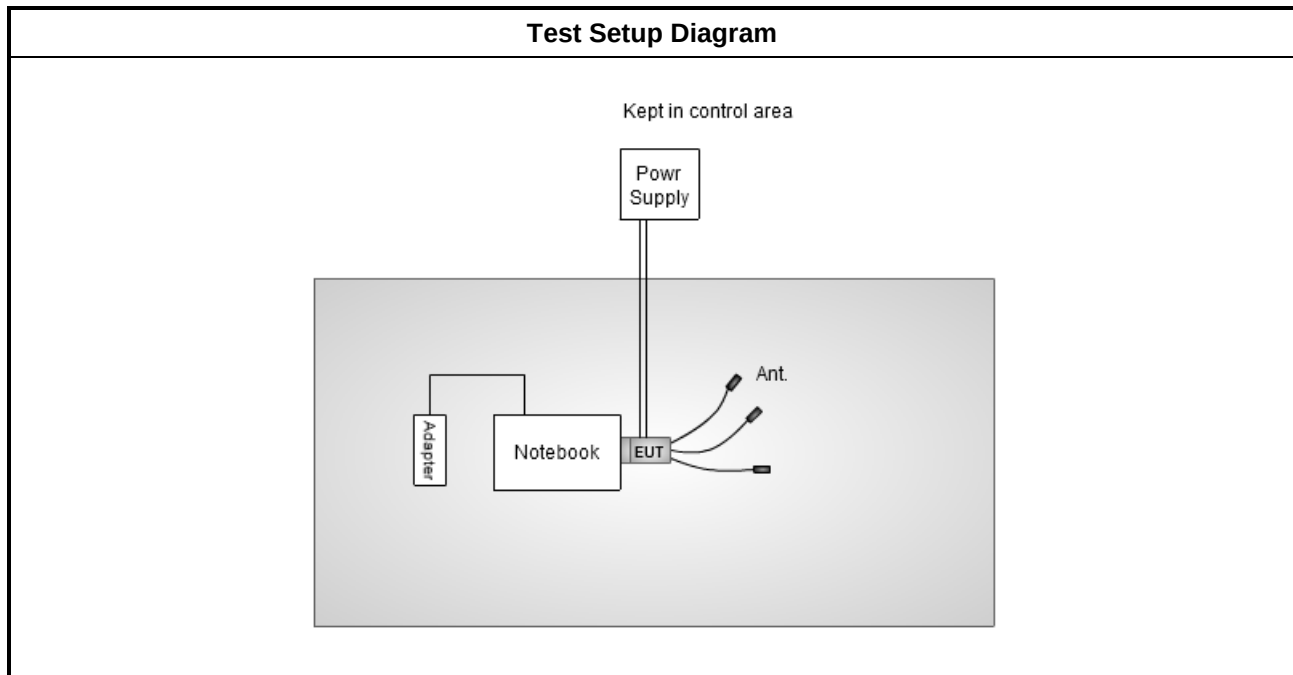
| The Worst Case Power Setting Parameter (5725-5850MHz band) |                                |                      |      |      |            |      |            |
|------------------------------------------------------------|--------------------------------|----------------------|------|------|------------|------|------------|
| Test Software Version                                      | art2, Version: 4_9_575_5_CS_U3 |                      |      |      |            |      |            |
| Modulation Mode                                            | N <sub>TX</sub>                | Test Frequency (MHz) |      |      |            |      |            |
|                                                            |                                | NCB: 20MHz           |      |      | NCB: 40MHz |      | NCB: 80MHz |
|                                                            |                                | 5745                 | 5785 | 5825 | 5755       | 5795 | 5775       |
| 11a,6-54Mbps                                               | 3                              | 22                   | 22   | 20.5 | ---        | ---  | ---        |
| HT20,M0-23                                                 | 3                              | 22                   | 22   | 21   | ---        | ---  | ---        |
| HT40,M0-23                                                 | 3                              | ---                  | ---  | ---  | 20         | 22   | ---        |
| VHT20,M0-8                                                 | 3                              | 22                   | 22   | 21   | ---        | ---  | ---        |
| VHT40,M0-9                                                 | 3                              | ---                  | ---  | ---  | 20         | 22   | ---        |
| VHT80,M0-9                                                 | 3                              | ---                  | ---  | ---  | ---        | ---  | 19         |

## 2.3 The Worst Case Measurement Configuration

| The Worst Case Mode for Following Conformance Tests |                                          |
|-----------------------------------------------------|------------------------------------------|
| <b>Tests Item</b>                                   | RF Output Power                          |
| <b>Test Condition</b>                               | Conducted measurement at transmit chains |
| <b>Modulation Mode</b>                              | 11a, HT20, HT40, VHT20, VHT40, VHT80     |
| <b>Operating Mode</b>                               | Operating Mode Description               |
| 1                                                   | DC Power & Radio link (WLAN)             |

| The Worst Case Mode for Following Conformance Tests |                                                                                                                                                                                                                                                     |                                                                                     |                                                                                       |
|-----------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| <b>Tests Item</b>                                   | Transmitter Radiated Unwanted Emissions                                                                                                                                                                                                             |                                                                                     |                                                                                       |
| <b>Test Condition</b>                               | Radiated measurement<br>If EUT consist of multiple antenna assembly (multiple antenna are used in EUT regardless of spatial multiplexing MIMO configuration), the radiated test should be performed with highest antenna gain of each antenna type. |                                                                                     |                                                                                       |
| <b>User Position</b>                                | <input type="checkbox"/> EUT will be placed in fixed position.                                                                                                                                                                                      |                                                                                     |                                                                                       |
|                                                     | <input checked="" type="checkbox"/> EUT will be placed in mobile position and operating multiple positions. EUT shall be performed two orthogonal planes. The worst planes is X.                                                                    |                                                                                     |                                                                                       |
|                                                     | <input type="checkbox"/> EUT will be operating multiple positions. The dipole antenna of EUT was pre-tested on the positioned of each 3 axis. The worst plane is Y.                                                                                 |                                                                                     |                                                                                       |
| <b>Operating Mode</b>                               | <input checked="" type="checkbox"/> 1. DC Power & Radio link (WLAN)                                                                                                                                                                                 |                                                                                     |                                                                                       |
| <b>Modulation Mode</b>                              | 11a                                                                                                                                                                                                                                                 |                                                                                     |                                                                                       |
| <b>Orthogonal Planes of EUT</b>                     | <b>X Plane</b>                                                                                                                                                                                                                                      | <b>Y Plane</b>                                                                      | <b>Z Plane</b>                                                                        |
|                                                     |                                                                                                                                                                  |  |  |

## 2.4 Test Setup Diagram



### 3 Transmitter Test Result

#### 3.1 RF Output Power

##### 3.1.1 RF Output Power Limit

| RF Output Power Limit                                                                                                                                                                                    |                                                                                                |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|
| <b>Maximum Peak Conducted Output Power or Maximum Conducted Output Power Limit (for ac(VHT80) only)</b>                                                                                                  |                                                                                                |
| <input checked="" type="checkbox"/> 5725-5850 MHz Band:                                                                                                                                                  |                                                                                                |
| <input checked="" type="checkbox"/>                                                                                                                                                                      | If $G_{TX} \leq 6$ dBi, then $P_{Out} \leq 30$ dBm (1 W)                                       |
| <input checked="" type="checkbox"/>                                                                                                                                                                      | Point-to-multipoint systems (P2M): If $G_{TX} > 6$ dBi, then $P_{Out} = 30 - (G_{TX} - 6)$ dBm |
| <input type="checkbox"/>                                                                                                                                                                                 | Point-to-point systems (P2P): If $G_{TX} > 6$ dBi, then $P_{Out} = 30$ dBm                     |
| <b>e.i.r.p. Power Limit:</b>                                                                                                                                                                             |                                                                                                |
| <input checked="" type="checkbox"/> 5725-5850 MHz Band                                                                                                                                                   |                                                                                                |
| <input checked="" type="checkbox"/>                                                                                                                                                                      | Point-to-multipoint systems (P2M): $P_{eirp} \leq 36$ dBm (4 W)                                |
| <input type="checkbox"/>                                                                                                                                                                                 | Point-to-point systems (P2P): N/A                                                              |
| $P_{Out}$ = maximum peak conducted output power or maximum conducted output power in dBm,<br>$G_{TX}$ = the maximum transmitting antenna directional gain in dBi.<br>$P_{eirp}$ = e.i.r.p. Power in dBm. |                                                                                                |

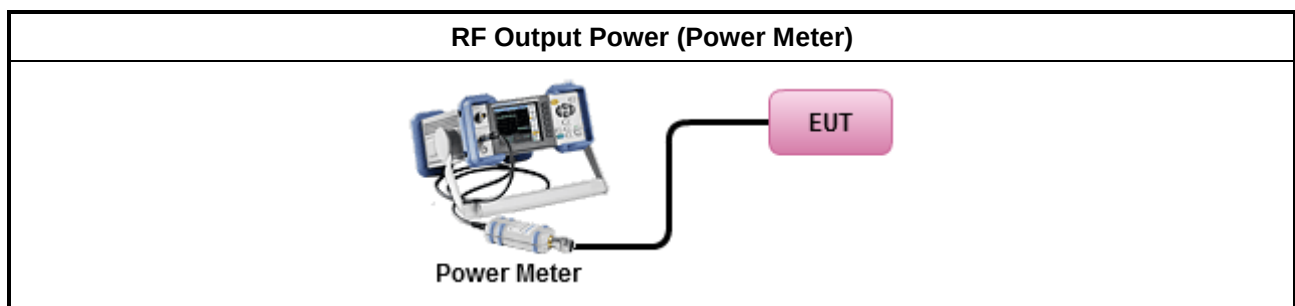
##### 3.1.2 Measuring Instruments

Refer a test equipment and calibration data table in this test report.

### 3.1.3 Test Procedures

| Test Method                         |                                                                                                                                                                                                                                                                                                                  |
|-------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <input type="checkbox"/>            | Maximum Peak Conducted Output Power                                                                                                                                                                                                                                                                              |
| <input type="checkbox"/>            | Refer as FCC KDB 558074 v03r01, clause 9.1.1 (RBW $\geq$ DTS BW).                                                                                                                                                                                                                                                |
| <input type="checkbox"/>            | Refer as FCC KDB 558074 v03r01, clause 9.1.2 (Integrated band power method).                                                                                                                                                                                                                                     |
| <input type="checkbox"/>            | Refer as FCC KDB 558074 v03r01, clause 9.1.3 (Peak power meter)                                                                                                                                                                                                                                                  |
| <input checked="" type="checkbox"/> | Maximum Conducted Output Power                                                                                                                                                                                                                                                                                   |
| <input type="checkbox"/>            | Refer as FCC KDB 558074 v03r01, clause 9.2.1.2 Method AVGSA-1 (spectral trace averaging).                                                                                                                                                                                                                        |
| <input type="checkbox"/>            | Refer as FCC KDB 558074 v03r01, clause 9.2.1.3 Method AVGSA-1 Alt. (slow sweep speed)                                                                                                                                                                                                                            |
| <input type="checkbox"/>            | Refer as FCC KDB 558074 v03r01, clause 9.2.1.4 Method AVGSA-2 (spectral trace averaging).                                                                                                                                                                                                                        |
| <input type="checkbox"/>            | Refer as FCC KDB 558074 v03r01, clause 9.2.1.5 Method AVGSA-2 Alt. (slow sweep speed)                                                                                                                                                                                                                            |
|                                     | RF power meter and average over on/off periods with duty factor or gated trigger                                                                                                                                                                                                                                 |
| <input checked="" type="checkbox"/> | Refer as FCC KDB 558074 v03r01, clause 9.2.2 Method AVGPM-G (using a gated RF average power meter)                                                                                                                                                                                                               |
| <input checked="" type="checkbox"/> | For conducted measurement.                                                                                                                                                                                                                                                                                       |
| <input type="checkbox"/>            | The EUT supports single transmit chain and measurements performed on this transmit chain.                                                                                                                                                                                                                        |
| <input type="checkbox"/>            | The EUT supports diversity transmitting and the results on transmit chain port 1 is the worst case.                                                                                                                                                                                                              |
| <input checked="" type="checkbox"/> | The EUT supports multiple transmit chains using options given below:<br>Refer as FCC KDB 662911, In-band power measurements. Using the measure-and-sum approach, measured all transmit ports individually. Sum the power (in linear power units e.g., mW) of all ports for each individual sample and save them. |
| <input checked="" type="checkbox"/> | If multiple transmit chains, EIRP calculation could be following as methods:<br>$P_{\text{total}} = P_1 + P_2 + \dots + P_n$ (calculated in linear unit [mW] and transfer to log unit [dBm])<br>$\text{EIRP}_{\text{total}} = P_{\text{total}} + \text{DG}$                                                      |

### 3.1.4 Test Setup



### 3.1.5 Directional Gain for Power Measurement

| Directional Gain (DG) Result                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |          |          |          |        |                 |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|----------|----------|--------|-----------------|
| Transmit Chains No.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |          | 1        | 2        | 3      | -               |
| Maximum $G_{ANT}$ (dBi)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |          | 4.2025   | 4.0181   | 3.4374 | -               |
| Modulation Mode                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | DG (dBi) | $N_{TX}$ | $N_{SS}$ | STBC   | Array Gain (dB) |
| 11a,6-54Mbps                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 4.2025   | 3        | 1        | -      | -               |
| HT20,M0-23                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 4.2025   | 3        | 1        | -      | -               |
| HT40,M0-23                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 4.2025   | 3        | 1        | -      | -               |
| VHT20,M0-9                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 4.2025   | 3        | 1        | -      | -               |
| VHT40,M0-9                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 4.2025   | 3        | 1        | -      | -               |
| VHT80,M0-9                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 4.2025   | 3        | 1        | -      | -               |
| <p>Note 1: For CDD transmissions, directional gain is calculated as power measurements:<br/>           Directional Gain (DG) = <math>G_{ANT}</math> + Array Gain, where Array Gain is as follows:<br/>           Array Gain = 0 dB (i.e., no array gain) for <math>N_{TX} \leq 4</math>;<br/>           Array Gain = 0 dB (i.e., no array gain) for channel widths <math>\geq 40</math> MHz for any <math>N_{TX}</math>;<br/>           Note 2: Directional gain may be calculated by using the formulas applicable to equal gain antennas with <math>G_{ANT}</math> set equal to the gain of the antenna having the highest gain</p> |          |          |          |        |                 |

**3.1.6 Test Result of Maximum Conducted (Average) Output Power**

| Condition       |                 |             | RF Output Power (dBm) |              |              |           |             |          |            |            |
|-----------------|-----------------|-------------|-----------------------|--------------|--------------|-----------|-------------|----------|------------|------------|
| Modulation Mode | N <sub>TX</sub> | Freq. (MHz) | Chain Port 1          | Chain Port 2 | Chain Port 3 | Sum Chain | Power Limit | DG (dBi) | EIRP Power | EIRP Limit |
| 11a             | 3               | 5745        | 21.12                 | 21.13        | 22.72        | 26.48     | 30.00       | 4.2025   | 30.6825    | 36.00      |
| 11a             | 3               | 5785        | 21.01                 | 21.43        | 22.34        | 26.38     | 30.00       | 4.2025   | 30.5825    | 36.00      |
| 11a             | 3               | 5825        | 20.21                 | 19.79        | 21.97        | 25.51     | 30.00       | 4.2025   | 29.7125    | 36.00      |
| HT20            | 3               | 5745        | 19.81                 | 19.77        | 21.07        | 25.03     | 30.00       | 4.2025   | 29.2325    | 36.00      |
| HT20            | 3               | 5785        | 21.45                 | 21.14        | 22.57        | 26.54     | 30.00       | 4.2025   | 30.7425    | 36.00      |
| HT20            | 3               | 5825        | 20.34                 | 19.93        | 22.12        | 25.68     | 30.00       | 4.2025   | 29.8825    | 36.00      |
| HT40            | 3               | 5755        | 19.49                 | 19.77        | 21.25        | 25.01     | 30.00       | 4.2025   | 29.2125    | 36.00      |
| HT40            | 3               | 5795        | 21.24                 | 21.29        | 22.93        | 26.66     | 30.00       | 4.2025   | 30.8625    | 36.00      |
| VHT20           | 3               | 5745        | 19.69                 | 19.73        | 21.24        | 25.05     | 30.00       | 4.2025   | 29.2525    | 36.00      |
| VHT20           | 3               | 5785        | 21.50                 | 21.21        | 22.84        | 26.68     | 30.00       | 4.2025   | 30.8825    | 36.00      |
| VHT20           | 3               | 5825        | 20.51                 | 20.09        | 22.49        | 25.93     | 30.00       | 4.2025   | 30.1325    | 36.00      |
| VHT40           | 3               | 5755        | 19.60                 | 19.99        | 21.29        | 25.13     | 30.00       | 4.2025   | 29.3325    | 36.00      |
| VHT40           | 3               | 5795        | 21.30                 | 21.29        | 23.06        | 26.74     | 30.00       | 4.2025   | 30.9425    | 36.00      |
| VHT80           | 3               | 5775        | 18.72                 | 19.21        | 20.52        | 24.32     | 30.00       | 4.2025   | 28.5225    | 36.00      |
| <b>Result</b>   |                 |             | <b>Complied</b>       |              |              |           |             |          |            |            |

## 3.2 Transmitter Radiated Unwanted Emissions

### 3.2.1 Transmitter Radiated Unwanted Emissions Limit

| Restricted Band Emissions Limit |                       |                         |                      |
|---------------------------------|-----------------------|-------------------------|----------------------|
| Frequency Range (MHz)           | Field Strength (uV/m) | Field Strength (dBuV/m) | Measure Distance (m) |
| 0.009~0.490                     | 2400/F(kHz)           | 48.5 - 13.8             | 300                  |
| 0.490~1.705                     | 24000/F(kHz)          | 33.8 - 23               | 30                   |
| 1.705~30.0                      | 30                    | 29                      | 30                   |
| 30~88                           | 100                   | 40                      | 3                    |
| 88~216                          | 150                   | 43.5                    | 3                    |
| 216~960                         | 200                   | 46                      | 3                    |
| Above 960                       | 500                   | 54                      | 3                    |

Note 1: Test distance for frequencies at or above 30 MHz, measurements may be performed at a distance other than the limit distance provided they are not performed in the near field and the emissions to be measured can be detected by the measurement equipment. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade (inverse of linear distance for field-strength measurements, inverse of linear distance-squared for power-density measurements).

Note 2: Test distance for frequencies at below 30 MHz, measurements may be performed at a distance closer than the EUT limit distance; however, an attempt should be made to avoid making measurements in the near field. When performing measurements below 30 MHz at a closer distance than the limit distance, the results shall be extrapolated to the specified distance by either making measurements at a minimum of two or more distances on at least one radial to determine the proper extrapolation factor or by using the square of an inverse linear distance extrapolation factor (40 dB/decade). The test report shall specify the extrapolation method used to determine compliance of the EUT.

| Un-restricted Band Emissions Limit |            |
|------------------------------------|------------|
| RF output power procedure          | Limit (dB) |
| Peak output power procedure        | 20         |
| Average output power procedure     | 30         |

Note 1: If the peak output power procedure is used to measure the fundamental emission power to demonstrate compliance to requirements, then the peak conducted output power measured within any 100 kHz outside the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum measured in-band peak PSD level.

Note 2: If the average output power procedure is used to measure the fundamental emission power to demonstrate compliance to requirements, then the power in any 100 kHz outside of the authorized frequency band shall be attenuated by at least 30 dB relative to the maximum measured in-band average PSD level.

### 3.2.2 Measuring Instruments

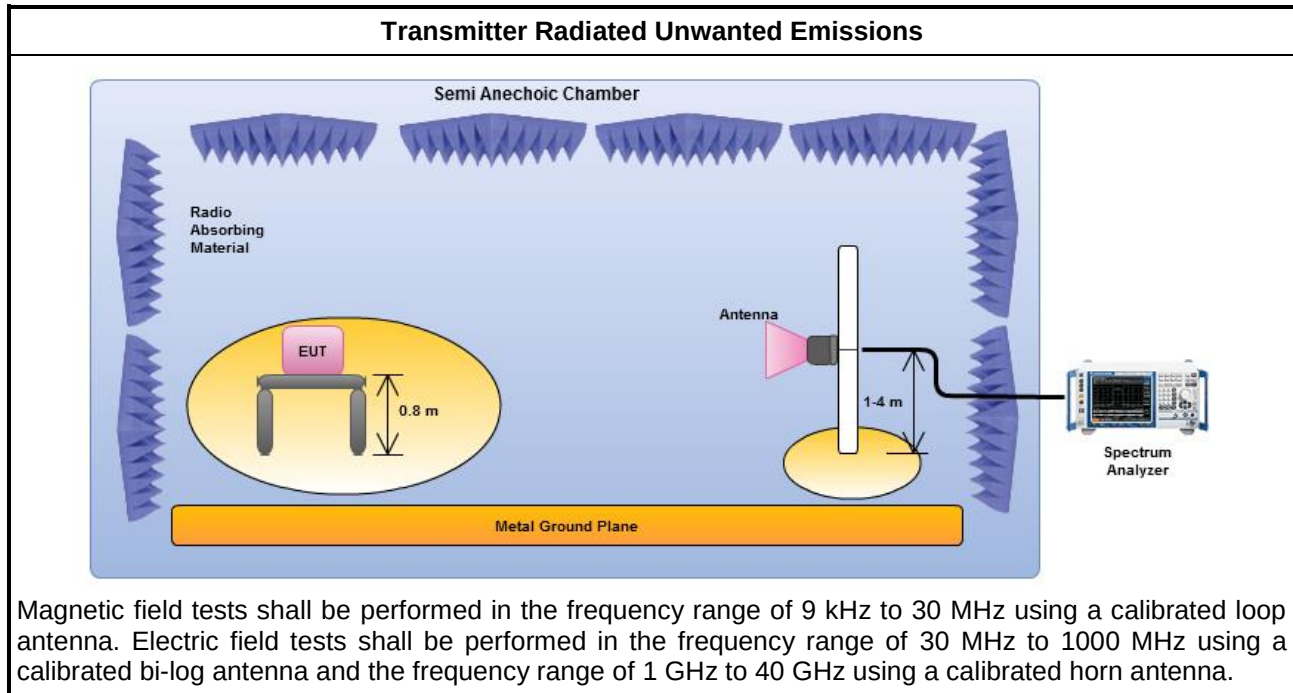
Refer a test equipment and calibration data table in this test report.

### 3.2.3 Test Procedures

| Test Method                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|-------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <input checked="" type="checkbox"/> | Measurements may be performed at a distance other than the limit distance provided they are not performed in the near field and the emissions to be measured can be detected by the measurement equipment. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade (inverse of linear distance for field-strength measurements, inverse of linear distance-squared for power-density measurements). |
| <input checked="" type="checkbox"/> | The average emission levels shall be measured in [duty cycle $\geq 98$ or duty factor].                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <input checked="" type="checkbox"/> | For the transmitter unwanted emissions shall be measured using following options below:                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <input checked="" type="checkbox"/> | Refer as FCC KDB 558074 v03r01, clause 11 for unwanted emissions into non-restricted bands.                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <input checked="" type="checkbox"/> | Refer as FCC KDB 558074 v03r01, clause 12 for unwanted emissions into restricted bands.                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <input type="checkbox"/>            | Refer as FCC KDB 558074 v03r01, clause 12.2.4.1 Option 1 (trace averaging for duty cycle $\geq 98\%$ )                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <input type="checkbox"/>            | Refer as FCC KDB 558074 v03r01, clause 12.2.4.2 Option 2 (trace averaging + duty factor).                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <input checked="" type="checkbox"/> | Refer as FCC KDB 558074 v03r01, clause 12.2.4.3 Option 3 (Reduced VBW $\geq 1/T$ ).                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <input type="checkbox"/>            | Refer as ANSI C63.10, clause 4.2.3.2.3 (Reduced VBW). VBW $\geq 1/T$ , where T is pulse time.                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <input type="checkbox"/>            | Refer as ANSI C63.10, clause 4.2.3.2.4 average value of pulsed emissions.                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <input checked="" type="checkbox"/> | Refer as FCC KDB 558074 v03r01, 12.2.3 measurement procedure peak limit.                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <input type="checkbox"/>            | Refer as FCC KDB 558074 v03r01, clause 12.2.2 measurement procedure Quasi-Peak limit.                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <input checked="" type="checkbox"/> | For radiated measurement, refer as FCC KDB 558074 v03r01, clause 12.2.6.                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <input checked="" type="checkbox"/> | Refer as ANSI C63.10, clause 6.4 for radiated emissions from below 30 MHz.                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <input checked="" type="checkbox"/> | Refer as ANSI C63.10, clause 6.5 for radiated emissions from 30 MHz to 1000 MHz.                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <input checked="" type="checkbox"/> | Refer as ANSI C63.10, clause 6.6 for radiated emissions from above 1 GHz.                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

| Test Method              |                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <input type="checkbox"/> | For conducted and cabinet radiation measurement, refer as FCC KDB 558074 v03r01, clause 12.2                                                                                                                                                                                                                                                                                                                                    |
| <input type="checkbox"/> | For conducted unwanted emissions into non-restricted bands (relative emission limits).<br>Devices with multiple transmit chains:<br>Refer as FCC KDB 662911, when testing out-of-band and spurious emissions against relative emission limits, tests may be performed on each output individually without summing or adding 10 log(N) if the measurements are made relative to the in-band emissions on the individual outputs. |
| <input type="checkbox"/> | For conducted unwanted emissions into restricted bands (absolute emission limits).<br>Devices with multiple transmit chains using options given below:<br>(1) Measure and sum the spectra across the outputs or<br>(2) Measure and add 10 log(N) dB                                                                                                                                                                             |

### 3.2.4 Test Setup

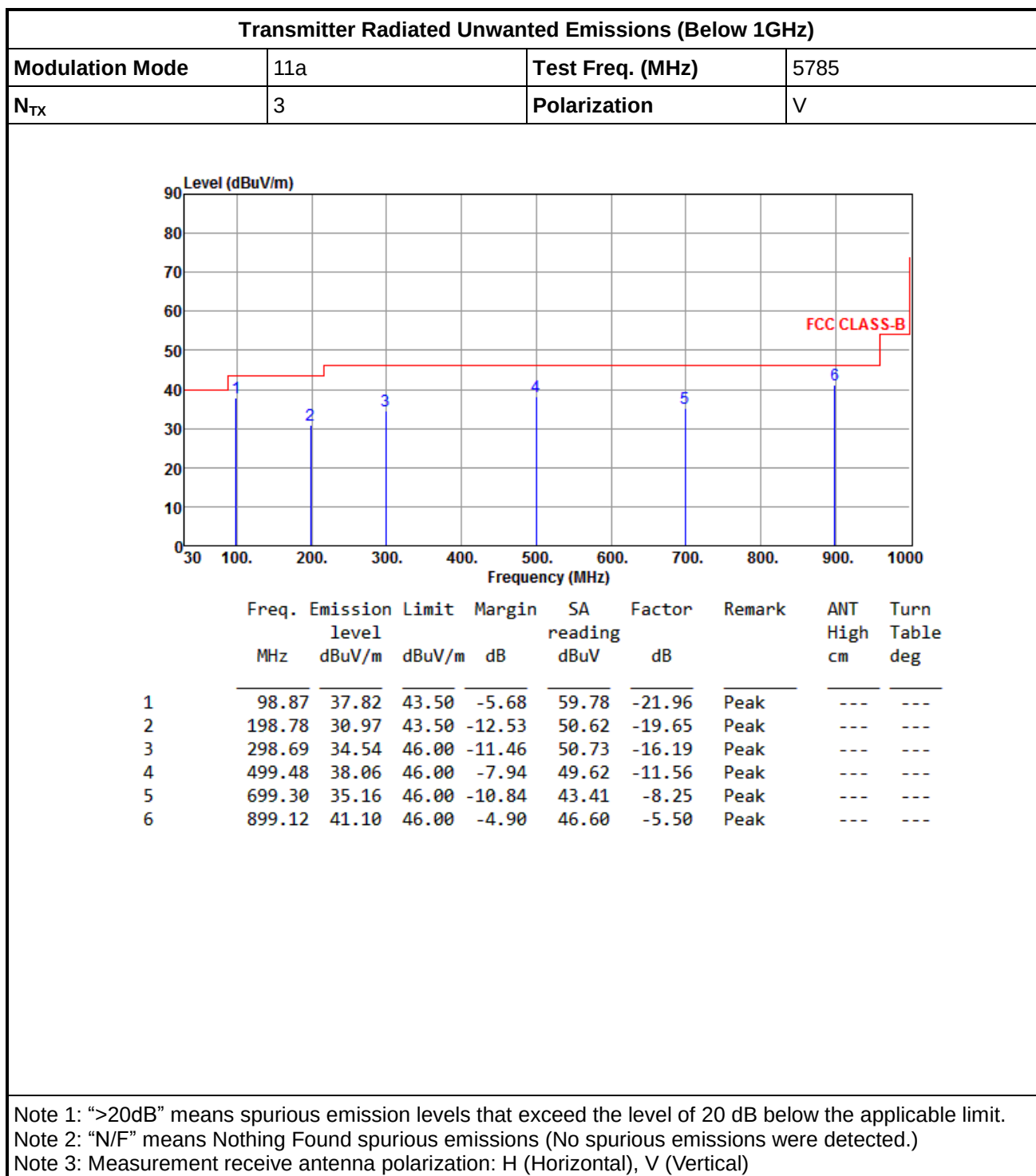


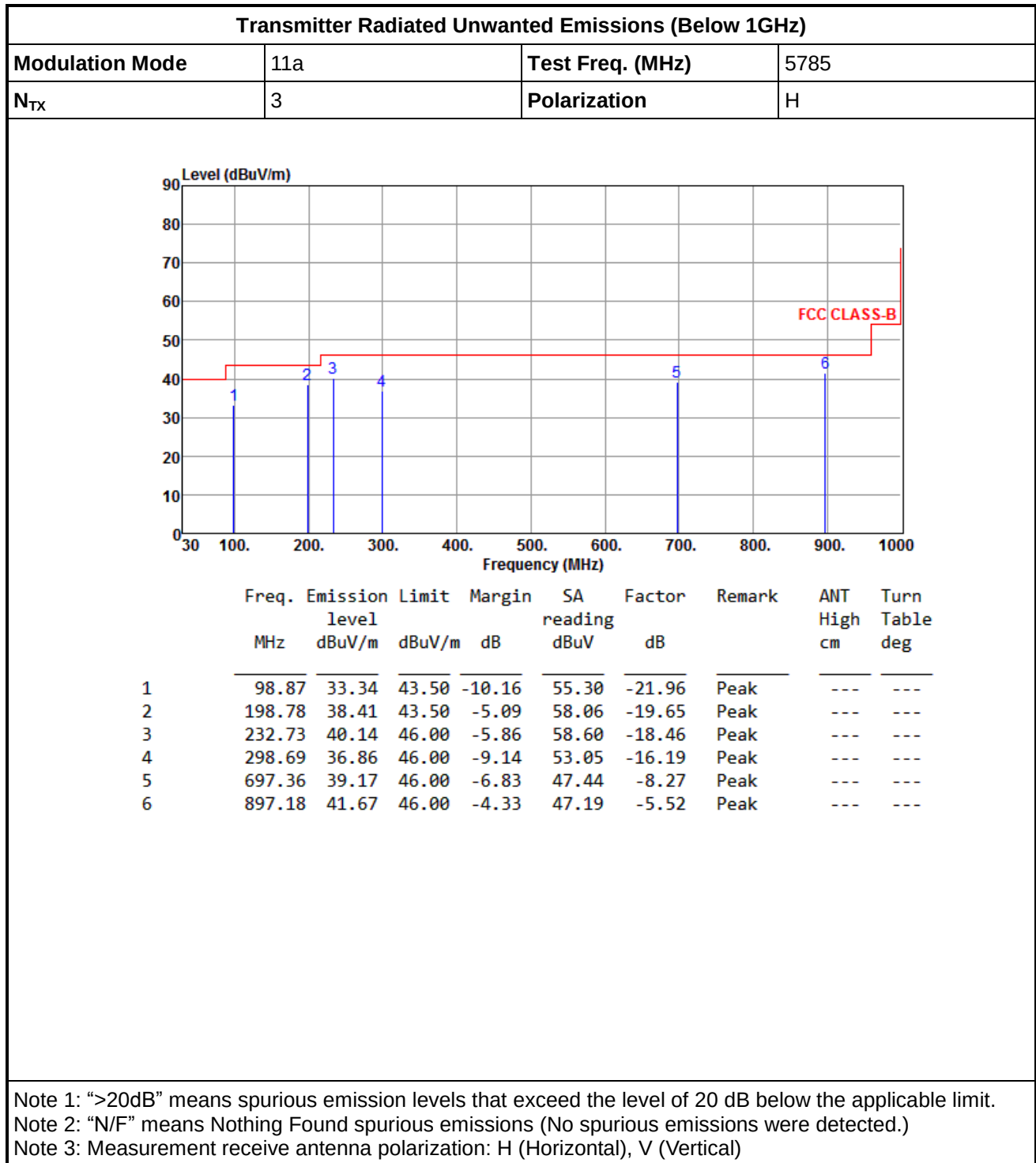
Note: The test distance is 3m.

### 3.2.5 Transmitter Radiated Unwanted Emissions (Below 30MHz)

All amplitude of spurious emissions that are attenuated by more than 20 dB below the permissible value has no need to be reported.

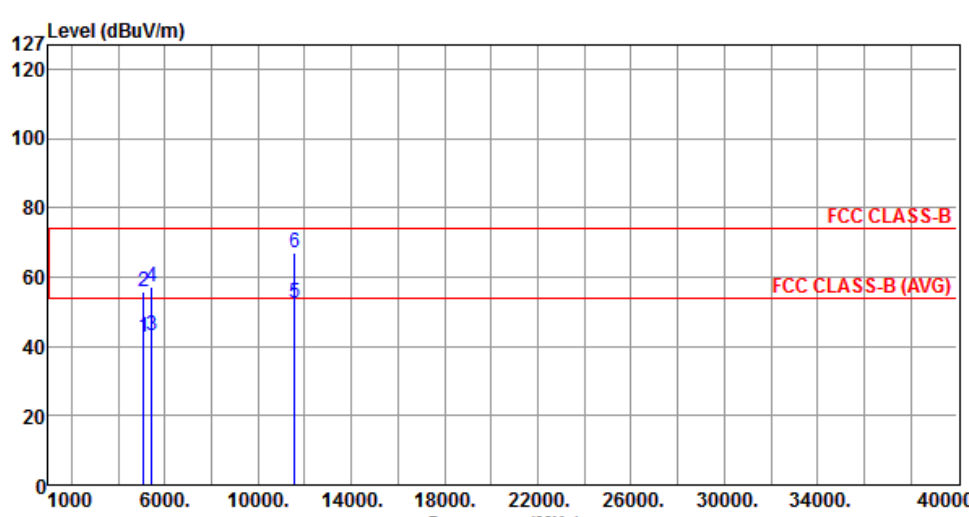
### 3.2.6 Transmitter Radiated Unwanted Emissions (Below 1GHz)





### 3.2.7 Transmitter Radiated Unwanted Emissions (Above 1GHz)

| Transmitter Radiated Unwanted Emissions (Above 1GHz) |     |  |  |  |                  |      |  |  |  |
|------------------------------------------------------|-----|--|--|--|------------------|------|--|--|--|
| Modulation Mode                                      | 11a |  |  |  | Test Freq. (MHz) | 5785 |  |  |  |
| N <sub>TX</sub>                                      | 3   |  |  |  | Polarization     | V    |  |  |  |

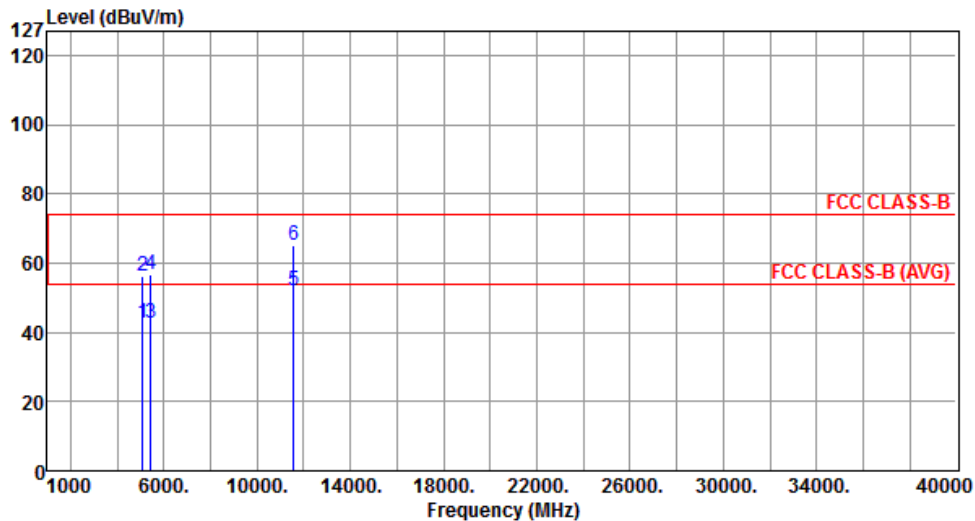
  


|   | Freq.<br>MHz | Emission<br>level<br>dBuV/m | Limit<br>dBuV/m | Margin<br>dB | SA<br>reading<br>dBuV | Factor<br>dB | Remark  | ANT<br>High<br>cm | Turn<br>Table<br>deg |
|---|--------------|-----------------------------|-----------------|--------------|-----------------------|--------------|---------|-------------------|----------------------|
| 1 | 5097.00      | 42.63                       | 54.00           | -11.37       | 37.14                 | 5.49         | Average | ---               | ---                  |
| 2 | 5097.00      | 55.94                       | 74.00           | -18.06       | 50.45                 | 5.49         | Peak    | ---               | ---                  |
| 3 | 5427.00      | 43.21                       | 54.00           | -10.79       | 37.50                 | 5.71         | Average | ---               | ---                  |
| 4 | 5427.00      | 57.18                       | 74.00           | -16.82       | 51.47                 | 5.71         | Peak    | ---               | ---                  |
| 5 | 11570.00     | 52.38                       | 54.00           | -1.62        | 37.89                 | 14.49        | Average | ---               | ---                  |
| 6 | 11570.00     | 66.86                       | 74.00           | -7.14        | 52.37                 | 14.49        | Peak    | ---               | ---                  |

Note 1: ">20dB" means spurious emission levels that exceed the level of 20 dB below the applicable limit.  
Note 2: "N/F" means Nothing Found spurious emissions (No spurious emissions were detected.)  
Note 3: Measurement receive antenna polarization: H (Horizontal), V (Vertical)  
Note 4: For restricted bands, the peak measurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the AV-Limit so that the AV level does not need to be reported in addition.  
Note 5: For un-restricted bands, unwanted emissions shall be attenuated by at least 30 dB relative to the maximum measured in-band level.

**Transmitter Radiated Unwanted Emissions (Above 1GHz)**

|                        |     |                         |      |
|------------------------|-----|-------------------------|------|
| <b>Modulation Mode</b> | 11a | <b>Test Freq. (MHz)</b> | 5785 |
| <b>N<sub>TX</sub></b>  | 3   | <b>Polarization</b>     | H    |



|   | Freq.<br>MHz | Emission<br>level<br>dBuV/m | Limit<br>dBuV/m | Margin<br>dB | SA<br>reading<br>dBuV | Factor<br>dB | Remark  | ANT<br>High<br>cm | Turn<br>Table<br>deg |
|---|--------------|-----------------------------|-----------------|--------------|-----------------------|--------------|---------|-------------------|----------------------|
| 1 | 5097.00      | 42.61                       | 54.00           | -11.39       | 37.12                 | 5.49         | Average | ---               | ---                  |
| 2 | 5097.00      | 56.19                       | 74.00           | -17.81       | 50.70                 | 5.49         | Peak    | ---               | ---                  |
| 3 | 5427.00      | 42.65                       | 54.00           | -11.35       | 36.94                 | 5.71         | Average | ---               | ---                  |
| 4 | 5427.00      | 56.64                       | 74.00           | -17.36       | 50.93                 | 5.71         | Peak    | ---               | ---                  |
| 5 | 11570.00     | 51.84                       | 54.00           | -2.16        | 37.35                 | 14.49        | Average | ---               | ---                  |
| 6 | 11570.00     | 65.20                       | 74.00           | -8.80        | 50.71                 | 14.49        | Peak    | ---               | ---                  |

Note 1: ">20dB" means spurious emission levels that exceed the level of 20 dB below the applicable limit.

Note 2: "N/F" means Nothing Found spurious emissions (No spurious emissions were detected.)

Note 3: Measurement receive antenna polarization: H (Horizontal), V (Vertical)

Note 4: For restricted bands, the peak measurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the AV-Limit so that the AV level does not need to be reported in addition.

Note 5: For un-restricted bands, unwanted emissions shall be attenuated by at least 30 dB relative to the maximum measured in-band level.

## 4 Test Equipment and Calibration Data

|                                                                     |                            |                  |                   |                         |                          |
|---------------------------------------------------------------------|----------------------------|------------------|-------------------|-------------------------|--------------------------|
| <b>Test Item</b>                                                    | Radiated Emission          |                  |                   |                         |                          |
| <b>Test Site</b>                                                    | 966 chamber1 / (03CH01-WS) |                  |                   |                         |                          |
| <b>Instrument</b>                                                   | <b>Manufacturer</b>        | <b>Model No.</b> | <b>Serial No.</b> | <b>Calibration Date</b> | <b>Calibration Until</b> |
| Spectrum Analyzer                                                   | R&S                        | FSV40            | 101498            | Jan. 25, 2014           | Jan. 24, 2015            |
| Receiver                                                            | R&S                        | ESR3             | 101658            | Jan. 10, 2014           | Jan. 09, 2015            |
| Bilog Antenna                                                       | SCHWARZBECK                | VULB9168         | VULB9168-522      | Jan. 02, 2014           | Jan. 01, 2015            |
| Horn Antenna<br>1G-18G                                              | SCHWARZBECK                | BBHA 9120 D      | BBHA 9120 D 1096  | Feb. 13, 2014           | Feb. 12, 2015            |
| Horn Antenna<br>18G-40G                                             | SCHWARZBECK                | BBHA 9170        | BBHA 9170517      | Dec. 27, 2013           | Dec. 26, 2014            |
| Preamplifier                                                        | Burgeon                    | BPA-530          | SN:100219         | Nov. 28, 2013           | Nov. 27, 2014            |
| Preamplifier                                                        | Agilent                    | 83017A           | MY39501308        | Dec. 16, 2013           | Dec. 15, 2014            |
| Preamplifier                                                        | EM                         | EM18G40G         | 060572            | Jun. 20, 2013           | Jun. 19, 2014            |
| RF Cable                                                            | HUBER+SUHNER               | SUCOFLEX104      | MY16014/4         | Dec. 16, 2013           | Dec. 15, 2014            |
| RF Cable                                                            | HUBER+SUHNER               | SUCOFLEX104      | MY16019/4         | Dec. 16, 2013           | Dec. 15, 2014            |
| RF Cable                                                            | HUBER+SUHNER               | SUCOFLEX104      | MY16139/4         | Dec. 16, 2013           | Dec. 15, 2014            |
| LF cable 3M                                                         | Woken                      | CFD400NL-LW      | CFD400NL-001      | Dec. 16, 2013           | Dec. 15, 2014            |
| LF cable 10M                                                        | Woken                      | CFD400NL-LW      | CFD400NL-002      | Dec. 16, 2013           | Dec. 15, 2014            |
| Note: Calibration Interval of instruments listed above is one year. |                            |                  |                   |                         |                          |

|                                                                     |     |         |        |               |               |
|---------------------------------------------------------------------|-----|---------|--------|---------------|---------------|
| Loop Antenna                                                        | R&S | HFH2-Z2 | 100330 | Nov. 15, 2012 | Nov. 14, 2014 |
| Note: Calibration Interval of instruments listed above is two year. |     |         |        |               |               |

|                                                                     |                     |                  |                   |                         |                          |
|---------------------------------------------------------------------|---------------------|------------------|-------------------|-------------------------|--------------------------|
| <b>Test Item</b>                                                    | RF Conducted        |                  |                   |                         |                          |
| <b>Test Site</b>                                                    | TH01-HY             |                  |                   |                         |                          |
| <b>Instrument</b>                                                   | <b>Manufacturer</b> | <b>Model No.</b> | <b>Serial No.</b> | <b>Calibration Date</b> | <b>Calibration Until</b> |
| Spectrum Analyzer                                                   | R&S                 | FSV 40           | 101063            | Feb. 17, 2014           | Feb. 16, 2015            |
| Signal Generator                                                    | R&S                 | SMB100A          | 175727            | Jan. 07, 2014           | Jan. 06, 2015            |
| Power Sensor                                                        | Anritsu             | MA2411B          | 1207366           | Oct. 24, 2013           | Oct. 23, 2014            |
| Power Meter                                                         | Anritsu             | ML2495A          | 1241002           | Oct. 24, 2013           | Oct. 23, 2014            |
| DC Power Source                                                     | G.W.                | GPC-6030D        | C671845           | Jun. 21, 2013           | Jun. 20, 2014            |
| Note: Calibration Interval of instruments listed above is one year. |                     |                  |                   |                         |                          |