



# RF Test Report

## For

**Applicant Name:** Shenzhen Gotron Electronic CO.,LTD.  
**Address:** 7B01, Building A, Block 1, Anhongji Tianyao Plaza, Longhua District, Shenzhen City, Guangdong Province China  
**EUT Name:** Mobile Phone  
**Brand Name:** ulefone  
**Model Number:** GQ3060  
**Series Model Number:** Refer to section 2

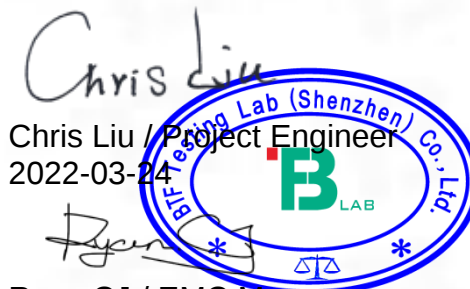
## Issued By

**Company Name:** BTF Testing Lab (Shenzhen) Co., Ltd.  
**Address:** F101, 201 and 301, Building 1, Block 2, Tantou Industrial Park, Tantou Community, Songgang Street, Bao'an District, Shenzhen, China

**Report Number:** BTF230317R03401  
**Test Standards:** 47 CFR Part 90  
**FCC ID:** 2AOWK-3060  
**Test Conclusion:** Pass  
**Test Date:** 2023-03-18 to 2022-03-23  
**Date of Issue:** 2022-03-24

**Prepared By:**

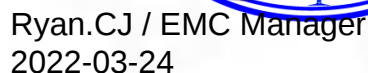
Chris Liu  
Chris Liu / Project Engineer  
2022-03-24



**Date:**

**Approved By:**

Ryan.CJ / EMC Manager  
2022-03-24



**Date:**

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| Revision History |                                                                              |                   |
|------------------|------------------------------------------------------------------------------|-------------------|
| Version          | Issue Date                                                                   | Revisions Content |
| R_V0             | 2022-03-24                                                                   | Original          |
|                  |                                                                              |                   |
| Note:            | Once the revision has been made, then previous versions reports are invalid. |                   |

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## 1. Introduction

### 1.1 Identification of Testing Laboratory

|               |                                                                                                                                     |
|---------------|-------------------------------------------------------------------------------------------------------------------------------------|
| Company Name: | BTF Testing Lab (Shenzhen) Co., Ltd.                                                                                                |
| Address:      | F101, 201 and 301, Building 1, Block 2, Tantou Industrial Park, Tantou Community, Songgang Street, Bao'an District, Shenzhen, China |
| Phone Number: | +86-0755-23146130                                                                                                                   |
| Fax Number:   | +86-0755-23146130                                                                                                                   |

### 1.2 Identification of the Responsible Testing Location

|                          |                                                                                                                                                                                                                    |
|--------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Test Location:           | BTF Testing Lab (Shenzhen) Co., Ltd.                                                                                                                                                                               |
| Address:                 | F101, 201 and 301, Building 1, Block 2, Tantou Industrial Park, Tantou Community, Songgang Street, Bao'an District, Shenzhen, China                                                                                |
| Description:             | All measurement facilities used to collect the measurement data are located at F101, 201 and 301, Building 1, Block 2, Tantou Industrial Park, Tantou Community, Songgang Street, Bao'an District, Shenzhen, China |
| FCC Registration Number: | 518915                                                                                                                                                                                                             |
| Designation Number:      | CN1330                                                                                                                                                                                                             |

### 1.3 Laboratory Condition

|                            |                   |
|----------------------------|-------------------|
| Ambient Temperature:       | 15 °C to 35 °C    |
| Ambient Relative Humidity: | 20 % to 75 %      |
| Ambient Pressure:          | 98 kPa to 102 kPa |

### 1.4 Announcement

- (1) The test report reference to the report template version v0.
- (2) The test report is invalid if not marked with the signatures of the persons responsible for preparing, reviewing and approving the test report.
- (3) The test report is invalid if there is any evidence and/or falsification.
- (4) This document may not be altered or revised in any way unless done so by BTF and all revisions are duly noted in the revisions section.
- (5) Content of the test report, in part or in full, cannot be used for publicity and/or promotional purposes without prior written approval from the laboratory.
- (6) The laboratory is only responsible for the data released by the laboratory, except for the part provided by the applicant.

## 2. Product Information

### 2.1 Application Information

|               |                                                                                                              |
|---------------|--------------------------------------------------------------------------------------------------------------|
| Company Name: | Shenzhen Gotron Electronic CO.,LTD.                                                                          |
| Address:      | 7B01, Building A, Block 1, Anhongji Tianyao Plaza, Longhua District, Shenzhen City, Guangdong Province China |

### 2.2 Manufacturer Information

|               |                                                                                                              |
|---------------|--------------------------------------------------------------------------------------------------------------|
| Company Name: | Shenzhen Gotron Electronic CO.,LTD.                                                                          |
| Address:      | 7B01, Building A, Block 1, Anhongji Tianyao Plaza, Longhua District, Shenzhen City, Guangdong Province China |

### 2.3 Factory Information

|               |                                                                                                              |
|---------------|--------------------------------------------------------------------------------------------------------------|
| Company Name: | Shenzhen Gotron Electronic CO.,LTD.                                                                          |
| Address:      | 7B01, Building A, Block 1, Anhongji Tianyao Plaza, Longhua District, Shenzhen City, Guangdong Province China |

### 2.4 General Description of Equipment under Test (EUT)

|                                           |                                                                                   |
|-------------------------------------------|-----------------------------------------------------------------------------------|
| EUT Name                                  | Mobile Phone                                                                      |
| Under Test Model Name                     | GQ3060                                                                            |
| Series Model Name                         | Armor 20WT, Armor 20W, Armor 20W Pro, Armor 20 Pro ,Armor 20W Lite, Armor 20 Lite |
| Description of Model name differentiation | The only difference is the model name and the exterior color.                     |
| Hardware Version                          | E7_V03                                                                            |
| Software and Firmware Version             | Armor 20WT_TF3_EEA_V10                                                            |

### 2.5 Technical Information

|                                   |                      |
|-----------------------------------|----------------------|
| Network and Wireless connectivity | Primary mobile radio |
|-----------------------------------|----------------------|

The requirement for the following technical information of the EUT was tested in this report:

|                           |                                                                                                                      |
|---------------------------|----------------------------------------------------------------------------------------------------------------------|
| Operation Frequency Range | 400 MHz – 480 MHz                                                                                                    |
| Permitted Frequency Range | 400MHz~406MHz, 406.1MHz~480MHz                                                                                       |
| Rated Output Power        | <input checked="" type="checkbox"/> High Power 2W (33dBm) <input checked="" type="checkbox"/> Low Power 0.5W (27dBm) |
| Modulation Type           | Analog: FM                                                                                                           |
|                           | Digital : 4FSK                                                                                                       |
| Channel Separation        | Analog: 12.5 kHz                                                                                                     |
|                           | Digital : 12.5 kHz                                                                                                   |

|              |          |
|--------------|----------|
| Antenna Type | External |
|--------------|----------|

### 3. Summary of Test Results

The EUT has been tested according to the following specifications

| Section | Identity         | Document Title                                                                            |
|---------|------------------|-------------------------------------------------------------------------------------------|
| 1       | 47 CFR Part 2    | Frequency Allocations and Radio Treaty Matters; General Rules and Regulations             |
| 2       | 47 CFR Part 90   | PRIVATE LAND MOBILE RADIO SERVICES.                                                       |
| 3       | ANSI C63.26:2015 | IEEE/ANSI Standard for Compliance Testing of Transmitters Used in Licensed Radio Services |

Test items and the results are as follows:

| Test item                               | Modulation            | Test mode                      |
|-----------------------------------------|-----------------------|--------------------------------|
| Conducted Output Power                  | unmodulated           | TX-ANH, TX-ANL, TX-DNH, TX-DNL |
| 99% Occupied Bandwidth & 26dB bandwidth | 1000Hz, 60% deviation | TX-ANH, TX-ANL, TX-DNH, TX-DNL |
| Emission Mask                           | 2500Hz, 50% deviation | TX-ANH, TX-ANL, TX-DNH, TX-DNL |
| Modulation Limit                        | 1000Hz, 60% deviation | TX-ANH                         |
| Audio Frequency Response                | 1000Hz, 20% deviation | TX-ANH                         |
| Frequency Stability VS Temperature      | unmodulated           | TX-ANH, TX-AWH                 |
| Frequency Stability VS Voltage          | unmodulated           | RX-AN, RX-AW                   |
| Transient Frequency Behavior            | unmodulated           | RX-AN, RX-AW                   |
| Transmit Conducted Spurious Emission    | 2500Hz, 50% deviation | RX-AN, RX-AW                   |
| Transmit Radiated Spurious Emission     | 2500Hz, 50% deviation | RX-AN, RX-AW                   |

| Frequency range (MHz) | Test channel    | Test Frequency (MHz) |       |
|-----------------------|-----------------|----------------------|-------|
|                       |                 | TX                   | RX    |
| 400~406<br>406.1~480  | CH <sub>L</sub> | 400.1                | 400.1 |
|                       | CH <sub>M</sub> | 435                  | 435   |
|                       | CH <sub>H</sub> | 479.9                | 479.9 |

| Test mode | Transmitting | Analog  | Digital | Power level |     |
|-----------|--------------|---------|---------|-------------|-----|
|           |              | 12.5kHz | 12.5kHz | High        | Low |
| TX-ANH    | ■            | ■       |         | ■           |     |
| TX-ANL    | ■            | ■       |         |             | ■   |
| TX-DNH    | ■            |         | ■       | ■           |     |
| TX-DNL    | ■            |         | ■       |             | ■   |

## 4. Uncertainty of Test

The following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in TR 100 028-1, and TR 100 028-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of  $k=2$ .

| Measurement                    | Value   |
|--------------------------------|---------|
| Frequency error                | 0.4 KHz |
| RF output power, conducted     | 0.87 dB |
| Unwanted Emissions, conducted  | 0.94 dB |
| All emissions, radiated(<1GHz) | 4.12 dB |
| All emissions, radiated(>1GHz) | 4.16 dB |
| Temperature                    | 0.82 °C |
| Humidity                       | 4.1 %   |

## 5. Test Configuration

### 5.1 Environment Condition

During the measurement, the normal environment conditions were within the listed ranges

|                            |                         |                |
|----------------------------|-------------------------|----------------|
| Relative Humidity (%)      | 20% to 75%              |                |
| Atmospheric Pressure (kPa) | 98 kPa to 106 kPa       |                |
| Temperature                | NT (Normal Temperature) | +15°C to +35°C |
| Working Voltage of the EUT | NV (Normal Voltage)     | DC 3.85V       |
|                            | LV (Low Voltage)        | DC 3.27V       |
|                            | HV (High Voltage)       | DC 4.43V       |

## 5.2 Test Equipment List

| Conducted Method Test                              |              |         |             |            |            |                                     |
|----------------------------------------------------|--------------|---------|-------------|------------|------------|-------------------------------------|
| Description                                        | Manufacturer | Model   | Serial No.  | Cal. Date  | Cal. Due   | Use                                 |
| MXA Signal Analyzer                                | KEYSIGHT     | N9020A  | MY50410020  | 2022.11.24 | 2023.11.23 | <input checked="" type="checkbox"/> |
| RF Communication Test Set                          | HP           | 8920A   | 3813A10206  | 2022.8.25  | 2023.8.24  | <input checked="" type="checkbox"/> |
| Digital intercom communication tester              | Aeroflex     | 3920B   | 1001682041  | 2022.8.25  | 2023.8.24  | <input checked="" type="checkbox"/> |
| Programmable constant temperature and humidity box | ZZCKONG      | ZZ-K02A | 20210928007 | 2022.11.24 | 2023.11.23 | <input checked="" type="checkbox"/> |
| RF Test software                                   | /            | V1.0    | /           | /          | /          | <input checked="" type="checkbox"/> |

| Radiated Method Test        |               |               |              |            |            |                                     |
|-----------------------------|---------------|---------------|--------------|------------|------------|-------------------------------------|
| Description                 | Manufacturer  | Model         | Serial No.   | Cal. Date  | Cal. Due   | Use                                 |
| SIGNAL ANALYZER             | ROHDE&SCHWARZ | FSQ40         | 100010       | 2022.11.24 | 2023.11.23 | <input checked="" type="checkbox"/> |
| EMI TEST RECEIVER           | ROHDE&SCHWARZ | ESCI7         | 101032       | 2022.11.24 | 2023.11.23 | <input checked="" type="checkbox"/> |
| Log periodic antenna        | SCHWARZBECK   | VULB 9168     | 01328        | 2021.11.28 | 2023.11.27 | <input checked="" type="checkbox"/> |
| Horn Antenna                | SCHWARZBECK   | BBHA9170      | 01157        | 2021.11.28 | 2023.11.27 | <input checked="" type="checkbox"/> |
| POSITIONAL CONTROLLER       | SKET          | PCI-GPIB      | /            | /          | /          | <input checked="" type="checkbox"/> |
| RE Cable                    | REBES Talent  | UF2-NMNM-10m  | 21101570     | 2022.11.24 | 2023.11.23 | <input checked="" type="checkbox"/> |
| RE Cable                    | REBES Talent  | UF2-NMNM-2.5m | 21101573     | 2022.11.24 | 2023.11.23 | <input checked="" type="checkbox"/> |
| RE Cable                    | REBES Talent  | UF2-NMNM-1m   | 21101576     | 2022.11.24 | 2023.11.23 | <input checked="" type="checkbox"/> |
| RE Cable                    | REBES Talent  | UF2-NMNM-10m  | 21101570     | 2022.11.24 | 2023.11.23 | <input checked="" type="checkbox"/> |
| Preamplifier                | SCHWARZBECK   | BBV9744       | 00246        | 2022.11.24 | 2023.11.23 | <input checked="" type="checkbox"/> |
| Horn Antenna                | Schwarzbeck   | BBHA9120D     | 2597         | 2022.5.25  | 2024.5.21  | <input checked="" type="checkbox"/> |
| Low Noise Pre-amplifier     | Sket          | LNPA_1840G-50 | SK2022032902 | 2022.3.26  | 2023.3.25  | <input checked="" type="checkbox"/> |
| Coaxial cable Multiflex 141 | Schwarzbeck   | N/SMA 0.5m    | 517386       | 2022.3.26  | 2023.3.25  | <input checked="" type="checkbox"/> |
| Broadband Preamplifier      | Schwarzbeck   | BBV9718D      | 00008        | 2022.3.26  | 2023.3.25  | <input checked="" type="checkbox"/> |

## 6. Transmitter requirement

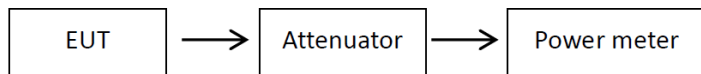
### 6.1 Conducted Output Power

#### 6.1.1 Limit

FCC Part 90.205, FCC Part 2.1046

Applicants for licenses must request and use no more power than the actual power necessary for satisfactory operation.

#### 6.1.2 Test Setup



#### 6.1.3 Test Procedures

- (1) Connect the equipment as illustrated
- (2) Correct for all losses in the RF path
- (3) Measure the transmitter output power
- (4) If the power output is adjustable, measurements shall be made for the highest and lowest power levels.

#### 6.1.4 Test Result

Please refer to ANNEX A.1.

## 6.2 99% Occupied Bandwidth & 26dB Bandwidth

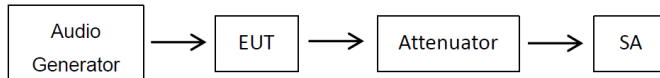
### 6.2.1 Limit

FCC Part 90.209, FCC Part 2.1049

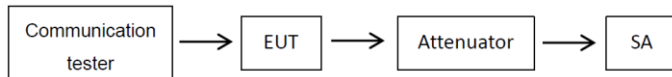
| Frequency band (MHz)                  | Channel spacing (kHz) | Authorized bandwidth (kHz) |
|---------------------------------------|-----------------------|----------------------------|
| Below 25 <sup>2</sup>                 |                       |                            |
| 25-50                                 | 20                    | 20                         |
| 72-76                                 | 20                    | 20                         |
| 150-174                               | 17.5                  | <sup>1</sup> 320/11.25/6   |
| 216-220 <sup>5</sup>                  | 6.25                  | 20/11.25/6                 |
| 220-222                               | 5                     | 4                          |
| 406-512 <sup>2</sup>                  | <sup>1</sup> 6.25     | <sup>136</sup> 20/11.25/6  |
| 806-809/851-854                       | 12.5                  | 20                         |
| 809-824/854-869                       | 25                    | <sup>6</sup> 20            |
| 896-901/935-940                       | 12.5                  | 13.6                       |
| 902-928 <sup>4</sup>                  |                       |                            |
| 929-930                               | 25                    | 20                         |
| 1427-1432 <sup>5</sup>                | 12.5                  | 12.5                       |
| <sup>3</sup> 2450-2483.5 <sup>2</sup> |                       |                            |
| Above 2500 <sup>2</sup>               |                       |                            |

### 6.2.2 Test Setup

Test setup for Analog:



Test setup for Digital:



### 6.2.3 Test Procedures

- (1) Connect the equipment as illustrated
- (2) Spectrum set as follow:
  - Centre frequency = the nominal EUT channel center frequency,
  - The frequency span for the spectrum analyzer shall be set wide enough to capture all modulation products including the emission skirts (typically a span of  $1.5 \times \text{OBW}$  is sufficient)
  - RBW = 1% to 5% of the anticipated OBW, VBW  $\geq 3 \times \text{RBW}$ , Sweep = auto,
  - Detector function = peak, Trace = max hold
- (3) Set 99% Occupied Bandwidth and 26dB Bandwidth
- (4) Measure and record the results in the test report.

### 6.2.4 Test Result

Please refer to ANNEX A.2.

## 6.3 Emission Mask

### 6.3.1 Limit

FCC Part 90.210, FCC Part 2.1049

| Frequency band (MHz)           | Mask for equipment with audio low pass filter | Mask for equipment without audio low pass filter |
|--------------------------------|-----------------------------------------------|--------------------------------------------------|
| Below 25 <sup>1</sup>          | A or B                                        | A or C                                           |
| 25-50                          | B                                             | C                                                |
| 72-76                          | B                                             | C                                                |
| 150-174 <sup>2</sup>           | B, D, or E                                    | C, D or E                                        |
| 150 paging only                | B                                             | C                                                |
| 220-222                        | F                                             | F                                                |
| 421-512 <sup>2 5</sup>         | B, D, or E                                    | C, D, or E                                       |
| 450 paging only                | B                                             | G                                                |
| 806-809/851-854 <sup>6</sup>   | B                                             | H                                                |
| 809-824/854-869 <sup>3 5</sup> | B                                             | G                                                |
| 896-901/935-940                | I                                             | J                                                |
| 902-928                        | K                                             | K                                                |
| 929-930                        | B                                             | G                                                |
| 4940-4990 MHz                  | L or M                                        | L or M                                           |
| 5850-5925 <sup>4</sup>         |                                               |                                                  |
| All other bands                | B                                             | C                                                |

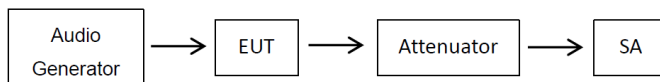
#### 12.5 kHz channel bandwidth equipment

For transmitters designed to operate with a 12.5 kHz channel bandwidth, any emission must be attenuated below the power (P) of the highest emission contained within the authorized bandwidth as follows:

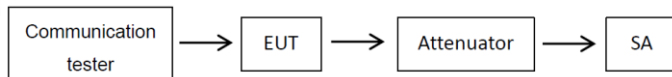
- (1) On any frequency from the centre of the authorized bandwidth  $f_0$  to 5.625 kHz removed from  $f_0$ : 0dB
- (2) On any frequency removed from the centre of the authorized bandwidth by a displacement frequency ( $f_d$  in kHz) of more than 5.625 kHz but no more than 12.5 kHz: At least  $7.27(f_d - 2.88 \text{ kHz})$  dB.
- (3) On any frequency removed from the centre of the authorized bandwidth by a displacement frequency ( $f_d$  in kHz) of more than 12.5 kHz: At least  $50 + 10 \log (P)$  dB or 70 dB, whichever is the lesser attenuation.

### 6.3.2 Test Setup

Test setup for Analog:



Test setup for Digital:



### 6.3.3 Test Procedures

- (1) Connect the equipment as illustrated.
- (2) Spectrum set as follow:  
Centre frequency = fundamental frequency, span=120kHz for 12.5kHz channel spacing,  
RBW=100Hz, VBW=1000Hz, Sweep = auto,  
Detector function = peak, Trace = max hold
- (3) Key the transmitter, and set the level of the unmodulated carrier to a full scale reference line. This is the 0dB reference for the measurement.
- (4) Apply Input Modulation Signal to EUT according to Section 4.2
- (5) Measure and record the results in the test report.

### 6.3.4 Test Result

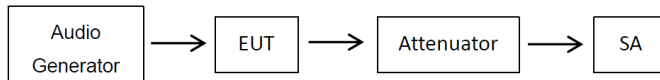
Please refer to ANNEX A.3.

## 6.4 Modulation Limit

### 6.4.1 Limit

FCC Part 2.1047(b)  
2.5kHz for 12.5 KHz Channel Spacing System

### 6.4.2 Test Setup



### 6.4.3 Test Procedures

- (1) Connect the equipment as illustrated
- (2) Adjust the transmitter per the manufacturer's procedure for full rated system deviation.
- (3) Set the test receiver to measure peak positive deviation. Set the audio bandwidth for  $\leq 0.25$  Hz to  $\geq 15,000$  Hz. Turn the de-emphasis function off.
- (4) Apply a 1000 Hz modulating signal to the transmitter from the audio frequency generator, and adjust the level to obtain 60% of full rated system deviation.
- (5) Increase the level from the audio frequency generator by 20 dB in one step (rise time between the 10% and 90% points shall be 0.1 second maximum).
- (6) Measure both the instantaneous and steady-state deviation at and after the time of increasing the audio input level
- (7) With the level from the audio frequency generator held constant at the level obtained in step 4), slowly vary the audio frequency from 300 Hz to 3000 Hz and observe the steady-state deviation. Record the maximum deviation.

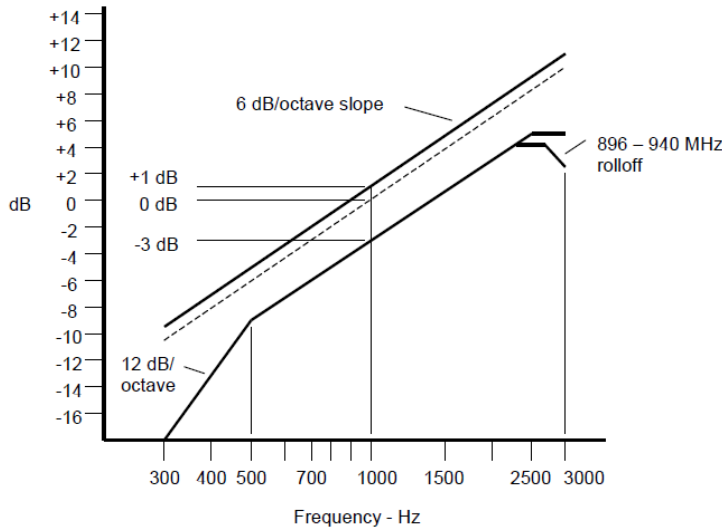
### 6.4.4 Test Result

Please refer to ANNEX A.4.

## 6.5 Audio Frequency Response

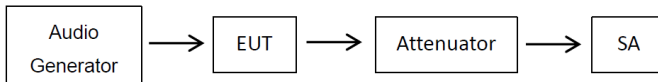
### 6.5.1 Limit

2.1047(a): Voice modulated communication equipment. A curve or equivalent data showing the frequency response of the audio modulating circuit over a range of 100 to 5000 Hz shall be submitted. For equipment required to have an audio low-pass filter, a curve showing the frequency response of the filter or of all circuitry installed between the modulation limiter and the modulated stage shall be submitted.



An additional 6 dB per octave attenuation is allowed from 2500 Hz to 3000 Hz in equipment operating in the 25 MHz to 869 MHz range.

### 6.5.2 Test Setup



### 6.5.3 Test Procedures

- (1) Connect the equipment as illustrated.
- (2) Set the test receiver to measure peak positive deviation. Set the audio bandwidth for 50 Hz to 15,000 Hz. Turn the de-emphasis function off.
- (3) Set the DMM to measure rms voltage.
- (4) Adjust the transmitter per the manufacturer's procedure for full rated system deviation.
- (5) Apply a 1000 Hz tone and adjust the audio frequency generator to produce 20% of the rated system deviation.
- (6) Set the test receiver to measure rms deviation and record the deviation reading.
- (7) Record the DMM reading as  $V_{REF}$
- (8) Set the audio frequency generator to the desired test frequency between 300 Hz and 3000 Hz.
- (9) Vary the audio frequency generator output level until the deviation reading that was recorded in step 6) is obtained.
- (10) Record the DMM reading as  $V_{FREQ}$
- (11) Calculate the audio frequency response at the present frequency as:  
audio frequency response =  $20 \log_{10} (V_{FREQ}/V_{REF})$ .
- (12) Repeat steps 8) through 11) for all the desired test frequencies

### 6.5.4 Test Result

Please refer to ANNEX A.5.

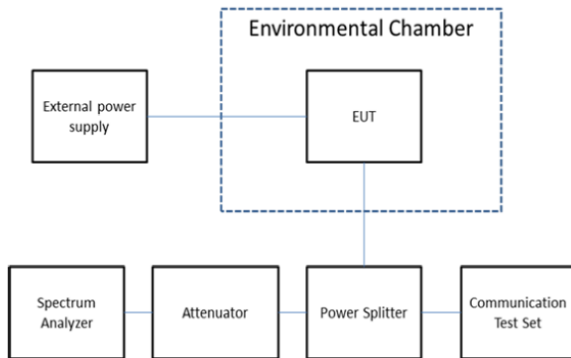
## 6.6 Frequency stability VS Temperature

### 6.6.1 Limit

FCC Part 90.213, FCC Part 2.1055

| Frequency range (MHz)    | Fixed and base stations | Mobile stations           |                              |
|--------------------------|-------------------------|---------------------------|------------------------------|
|                          |                         | Over 2 watts output power | 2 watts or less output power |
| Below 25                 | 1 2 3 100               | 100                       | 200                          |
| 25-50                    | 20                      | 20                        | 50                           |
| 72-76                    | 5                       |                           | 50                           |
| 150-174                  | 5 11 5                  | 6 5                       | 4 6 50                       |
| 216-220                  | 1.0                     |                           | 1.0                          |
| 220-222 <sup>12</sup>    | 0.1                     | 1.5                       | 1.5                          |
| 421-512                  | 7 11 14 2.5             | 8 5                       | 8 5                          |
| 806-809                  | 14 1.0                  | 1.5                       | 1.5                          |
| 809-824                  | 14 1.5                  | 2.5                       | 2.5                          |
| 851-854                  | 1.0                     | 1.5                       | 1.5                          |
| 854-869                  | 1.5                     | 2.5                       | 2.5                          |
| 896-901                  | 14 0.1                  | 1.5                       | 1.5                          |
| 902-928                  | 2.5                     | 2.5                       | 2.5                          |
| 902-928 <sup>13</sup>    | 2.5                     | 2.5                       | 2.5                          |
| 929-930                  | 1.5                     |                           |                              |
| 935-940                  | 0.1                     | 1.5                       | 1.5                          |
| 1427-1435                | 9 300                   | 300                       | 300                          |
| Above 2450 <sup>10</sup> |                         |                           |                              |

### 6.6.2 Test Setup



### 6.6.3 Test Procedures

- (1) The EUT output port was connected to communication tester.
- (2) The EUT was placed inside the temperature chamber.
- (3) Turn EUT off and set the chamber temperature to  $-30^{\circ}\text{C}$ . After the temperature stabilized for approximately 30 minutes recorded the frequency as  $MCF_{\text{MHz}}$ .
- (4) Calculate the ppm frequency error by the following:  

$$\text{ppm error} = (MCF_{\text{MHz}} / ACF_{\text{MHz}} - 1) \times 10^6$$
 where  
 $MCF_{\text{MHz}}$  is the Measured Carrier Frequency in MHz  
 $ACF_{\text{MHz}}$  is the Assigned Carrier Frequency in MHz
- (5) Repeat step 3 measure with  $10^{\circ}\text{C}$  increased per stage until the highest temperature of  $+50^{\circ}\text{C}$  reached.

### 6.6.4 Test Result

Please refer to ANNEX A.6.

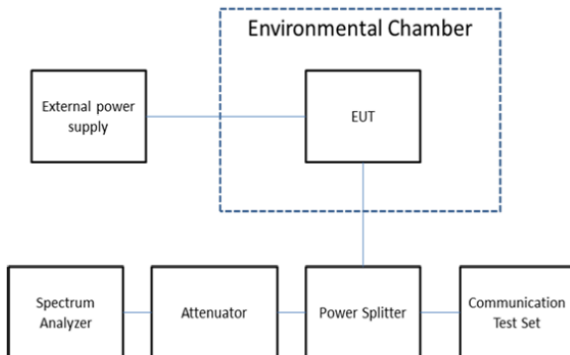
## 6.7 Frequency stability VS Voltage

### 6.7.1 Limit

FCC Part 90.213, FCC Part 2.1055

| Frequency range (MHz)    | Fixed and base stations | Mobile stations           |                              |
|--------------------------|-------------------------|---------------------------|------------------------------|
|                          |                         | Over 2 watts output power | 2 watts or less output power |
| Below 25                 | 1 2 3 100               | 100                       | 200                          |
| 25-50                    | 20                      | 20                        | 50                           |
| 72-76                    | 5                       |                           | 50                           |
| 150-174                  | 5 11 5                  | 6 5                       | 4 6 50                       |
| 216-220                  | 1.0                     |                           | 1.0                          |
| 220-222 <sup>12</sup>    | 0.1                     | 1.5                       | 1.5                          |
| 421-512                  | 7 11 14 2.5             | 8 5                       | 8 5                          |
| 806-809                  | 14 1.0                  | 1.5                       | 1.5                          |
| 809-824                  | 14 1.5                  | 2.5                       | 2.5                          |
| 851-854                  | 1.0                     | 1.5                       | 1.5                          |
| 854-869                  | 1.5                     | 2.5                       | 2.5                          |
| 896-901                  | 14 0.1                  | 1.5                       | 1.5                          |
| 902-928                  | 2.5                     | 2.5                       | 2.5                          |
| 902-928 <sup>13</sup>    | 2.5                     | 2.5                       | 2.5                          |
| 929-930                  | 1.5                     |                           |                              |
| 935-940                  | 0.1                     | 1.5                       | 1.5                          |
| 1427-1435                | 9 300                   | 300                       | 300                          |
| Above 2450 <sup>10</sup> |                         |                           |                              |

### 6.7.2 Test Setup



### 6.7.3 Test Procedures

- (1) The EUT output port was connected to communication tester.
- (2) The EUT was placed inside the temperature chamber at 25°C
- (3) Record the carrier frequency of the transmitter as  $MCF_{MHz}$
- (4) Calculate the ppm frequency error by the following:  

$$\text{ppm error} = (MCF_{MHz} / ACF_{MHz} - 1) \times 10^6$$
 where  
 $MCF_{MHz}$  is the Measured Carrier Frequency in MHz  
 $ACF_{MHz}$  is the Assigned Carrier Frequency in MHz
- (5) Repeat step 3 measure with varied  $\pm 15\%$  of the nominal value measured at the input to the EUT

### 6.7.4 Test Result

Please refer to ANNEX A.7.

## 6.8 Transmitter Frequency Behavior

### 6.8.1 Limit

FCC part 90.214

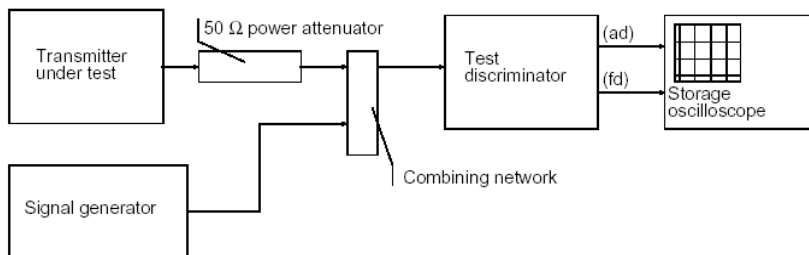
Transmitters designed to operate in the 150-174 MHz and 421-512 MHz frequency bands must maintain transient frequencies within the maximum frequency difference limits during the time intervals indicated:

| Time intervals <sup>1 2</sup>                                                       | Maximum frequency difference <sup>3</sup> | All equipment  |                |
|-------------------------------------------------------------------------------------|-------------------------------------------|----------------|----------------|
|                                                                                     |                                           | 150 to 174 MHz | 421 to 512 MHz |
| Transient Frequency Behavior for Equipment Designed to Operate on 25 kHz Channels   |                                           |                |                |
| t <sub>1</sub> <sup>4</sup>                                                         | ±25.0 kHz                                 | 5.0 ms         | 10.0 ms        |
| t <sub>2</sub>                                                                      | ±12.5 kHz                                 | 20.0 ms        | 25.0 ms        |
| t <sub>3</sub> <sup>4</sup>                                                         | ±25.0 kHz                                 | 5.0 ms         | 10.0 ms        |
| Transient Frequency Behavior for Equipment Designed to Operate on 12.5 kHz Channels |                                           |                |                |
| t <sub>1</sub> <sup>4</sup>                                                         | ±12.5 kHz                                 | 5.0 ms         | 10.0 ms        |
| t <sub>2</sub>                                                                      | ±6.25 kHz                                 | 20.0 ms        | 25.0 ms        |
| t <sub>3</sub> <sup>4</sup>                                                         | ±12.5 kHz                                 | 5.0 ms         | 10.0 ms        |
| Transient Frequency Behavior for Equipment Designed to Operate on 6.25 kHz Channels |                                           |                |                |
| t <sub>1</sub> <sup>4</sup>                                                         | ±6.25 kHz                                 | 5.0 ms         | 10.0 ms        |
| t <sub>2</sub>                                                                      | ±3.125 kHz                                | 20.0 ms        | 25.0 ms        |
| t <sub>3</sub> <sup>4</sup>                                                         | ±6.25 kHz                                 | 5.0 ms         | 10.0 ms        |

Note:

- (1) On is the instant when a 1 kHz test signal is completely suppressed, including any capture time due to phasing.
  - 1)  $t_1$  is the time period immediately following  $t_{on}$ .
  - 2)  $t_2$  is the time period immediately following  $t_1$ .
  - 3)  $t_3$  is the time period from the instant when the transmitter is turned off until  $t_{off}$ .
  - 4)  $t_{off}$  is the instant when the 1 kHz test signal starts to rise.
- (2) During the time from the end of  $t_2$  to the beginning of  $t_3$ , the frequency difference must not exceed the limits specified in §90.213.
- (3) Difference between the actual transmitter frequency and the assigned transmitter frequency.
- (4) If the transmitter carrier output power rating is 6 watts or less, the frequency difference during this time period may exceed the maximum frequency difference for this time period.

### 6.8.2 Test Setup



### 6.8.3 Test Procedures

- (1) Connect DUT into Test discriminator and Storage Oscilloscope and keep DUT stats ON;
- (2) Input 1kHz signal into DUT;
- (3) Set the modulation domain analyzer to trigger on the rising edge of the waveform in order to capture a single-shot turn-on of the transmitter signals;
- (4) Keep DUT in OFF state and Key the PTT;
- (5) Observe the stored oscilloscope of modulation domain analyzer. The signal trace shall be maintained within the allowable limits during the periods  $t_1$  and  $t_2$ , and shall also remain within limits following  $t_2$ ;
- (6) Adjust the modulation domain analyzer to trigger on the falling edge of the transmitter waveform in order to capture a single-shot turn-off transmitter of the transmitter signal.
- (7) Keep the digital portable radio in ON state and unkey the PTT;
- (8) Observe the stored oscilloscope of modulation domain analyzer, the signal trace shall be maintained within the allowable limits during the period  $t_3$ .
- (9) Set the signal generator to the assigned transmitter frequency and modulate it with a 1 kHz tone at  $\pm 12.5$  kHz deviation and set its output level to -100dBm.
- (10) Turn on the transmitter.
- (11) Supply sufficient attenuation via the RF attenuator to provide an input level to the stored oscilloscope that is 40 dB below the maximum allowed input power when the transmitter is operating at its rated power level. Note this power level on the stored oscilloscope as  $P_0$ .
- (12) Turn off the transmitter.
- (13) Adjust the RF level of the signal generator to provide RF power equal to  $P_0$ . This signal generator RF level shall be maintained throughout the rest of the measurement.
- (14) Remove the attenuation, so the input power to the stored oscilloscope is increased by 30 dB when the transmitter is turned on.
- (15) Adjust the vertical amplitude control of the stored oscilloscope to display the 1000 Hz at  $\pm 4$  divisions vertically centered on the display. Set trigger mode of the Spectrum Analyzer to "Video", and tune the "trigger level" on suitable level. Then set the "trigger offset" to -10ms for turn on and -15ms for turn off.
- (16) Turn on the transmitter and the transient wave will be captured on the screen of Spectrum Analyzer. Observe the stored display. The instant when the 1 kHz test signal is completely suppressed is considered to be ton. The trace should be maintained within the allowed divisions during the period  $t_1$  and  $t_2$ .
- (17) Then turn off the transmitter, and another transient wave will be captured on the screen of Spectrum
- (18) Analyzer. The trace should be maintained within the allowed divisions during the period  $t_3$ .

### 6.8.4 Test Result

Please refer to ANNEX A.8.

## 6.9 Transmit Conducted Spurious Emission

### 6.9.1 Limit

FCC Part 90.210, FCC Part 2.1051

For transmitters designed to operate with a 12.5 kHz channel bandwidth, any emission must be attenuated below the power (P) of the highest emission contained within the authorized bandwidth as follows:

(3) On any frequency removed from the center of the authorized bandwidth by a displacement frequency ( $f_d$  in kHz) of more than 12.5 kHz: At least  $50 + 10 \log(P)$  dB or 70 dB, whichever is the lesser attenuation.

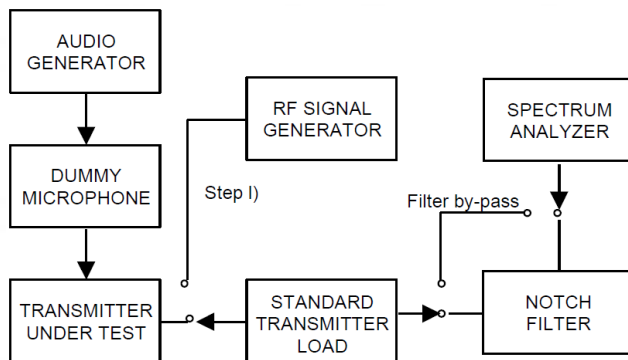
In general, the worse case attenuation requirement shown above was applied.

Calculation: Limit (dBm) = EL-50-10log (P)

EL is the emission level of the Output Power expressed in dBm,

Limit (dBm) = P(dBm)-50-10 log (Pwatts) = -20dBm

### 6.9.2 Test Setup



### 6.9.3 Test Procedures

- (1) Connect the equipment as illustrated, with the notch filter by-passed.
- (2) Apply Input Modulation Signal to EUT according to Section 4.2
- (3) Adjust the spectrum analyzer for the following settings:  
Below 1GHz: RBW=100kHz, VBW=300kHz  
Above 1GHz: RBW=1MHz, VBW=3MHz  
Detector=Peak, Sweep time=Auto, Trace=Max hold
- (4) Scan frequency range up to 10<sup>th</sup> harmonic.
- (5) Record the frequencies and levels of spurious emissions

### 6.9.4 Test Result

Please refer to ANNEX A.9.

## 6.10 Transmitter Radiated Spurious Emission

### 6.10.1 Limit

FCC Part 90.210, FCC Part 2.1051

For transmitters designed to operate with a 12.5 kHz channel bandwidth, any emission must be attenuated below the power (P) of the highest emission contained within the authorized bandwidth as follows:

On any frequency removed from the center of the authorized bandwidth by a displacement frequency ( $f_d$  in kHz) of more than 12.5 kHz: At least  $50 + 10 \log(P)$  dB or 70 dB, whichever is the lesser attenuation.

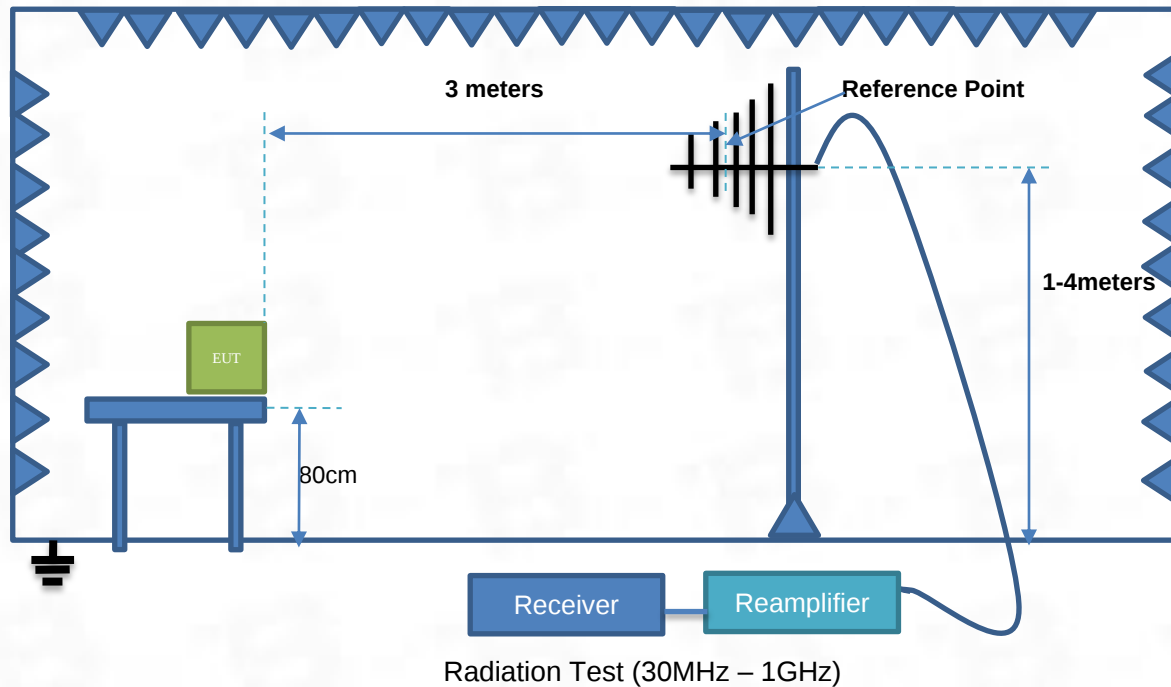
In general, the worse case attenuation requirement shown above was applied.

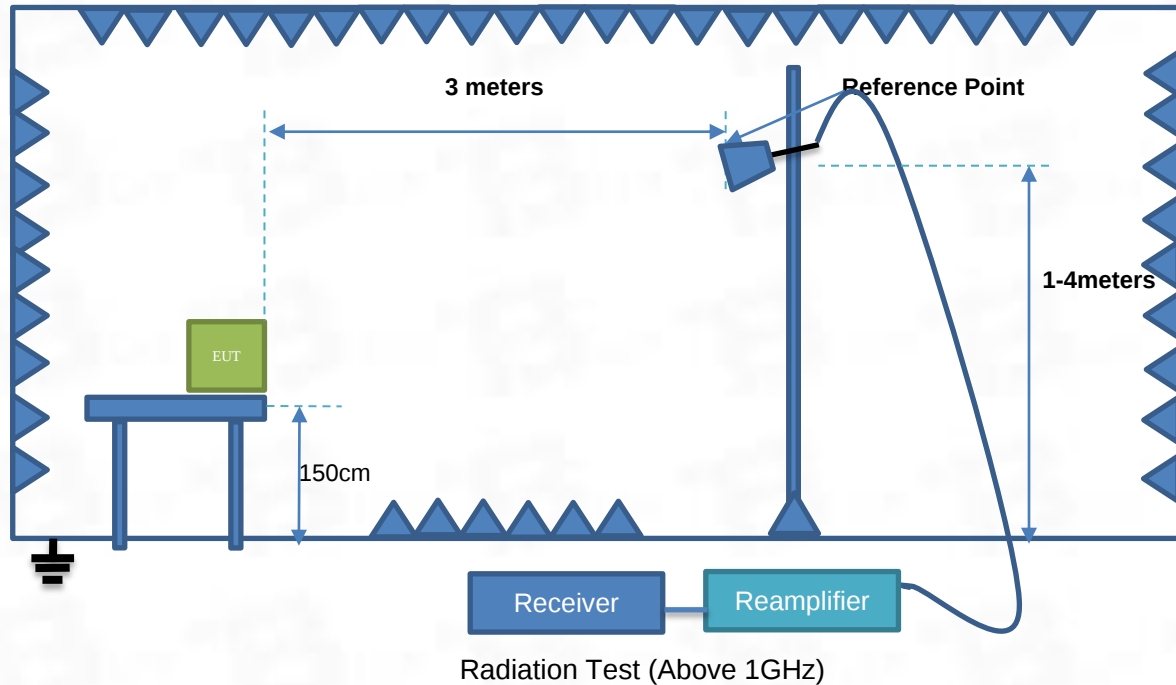
Calculation: Limit (dBm) =  $EL - 50 - 10 \log(P)$

EL is the emission level of the Output Power expressed in dBm,

Limit (dBm) =  $P(\text{dBm}) - 50 - 10 \log(P_{\text{watts}}) = -20\text{dBm}$

### 6.10.2 Test Setup





### 6.10.3 Test Procedures

- (1) Place the EUT in the center of the turntable. The EUT shall be configured to transmit into the standard non-radiating load (for measuring radiated spurious emissions), connected with cables of minimal length unless specified otherwise. If the EUT uses an adjustable antenna, the antenna shall be positioned to the length that produces the worst case emission at the fundamental operating frequency.
- (2) Each emission under consideration shall be evaluated:
  - 1) Raise and lower the measurement antenna in accordance 5.5.2, as necessary to enable detection of the maximum emission amplitude relative to measurement antenna height.
  - 2) Rotate the EUT through 360° to determine the maximum emission level relative to the axial position.
  - 3) Return the turntable to the azimuth where the highest emission amplitude level was observed.
  - 4) Vary the measurement antenna height again through 1 m to 4 m again to find the height associated with the maximum emission amplitude.
  - 5) Record the measured emission amplitude level and frequency using the appropriate RBW.
- (3) Repeat step 2) for each emission frequency with the measurement antenna oriented in both the horizontal and vertical polarizations to determine the orientation that gives the maximum emissions amplitude.
- (4) Set-up the substitution measurement with the reference point of the substitution antenna located as near as possible to where the center of the EUT radiating element was located during the initial EUT measurement.
- (5) Maintain the previous measurement instrument settings and test set-up, with the exception that the EUT is removed and replaced by the substitution antenna.
- (6) Connect a signal generator to the substitution antenna; locate the signal generator so as to minimize any potential influences on the measurement results. Set the signal generator to the frequency where emissions are detected, and set an output power level such that the radiated signal can be detected by the measurement instrument, with sufficient dynamic range relative to the noise floor.
- (7) For each emission that was detected and measured in the initial test [i.e., in step 2) and step 3)]:
  - 1) Vary the measurement antenna height between 1 m to 4 m to maximize the received (measured) signal amplitude.

- 2) Adjust the signal generator output power level until the amplitude detected by the measurement instrument equals the amplitude level of the emission previously measured directly in step 2) and step 3).
- 3) Record the output power level of the signal generator when equivalence is achieved in step 2).
- (8) Repeat step 5) through step 7) with the measurement antenna oriented in the opposite polarization.
- (9) Calculate the emission power in dBm referenced to a half-wave dipole using the following equation:  
$$P_e = P_s(\text{dBm}) - \text{cable loss (dB)} + \text{antenna gain (dBd)}$$

Where

$P_e$  = equivalent emission power in dBm

$P_s$  = source (signal generator) power in dBm

NOTE - dBd refers to the measured antenna gain in decibels relative to a half-wave dipole.

- (10) Correct the antenna gain of the substitution antenna if necessary to reference the emission power to a half-wave dipole. When using measurement antennas with the gain specified in dBi, the equivalent dipole-referenced gain can be determined from:  $\text{gain (dBd)} = \text{gain (dBi)} - 2.15 \text{ dB}$ . If necessary, the antenna gain can be calculated from calibrated antenna factor information
- (11) Provide the complete measurement results as a part of the test report.
- (12) Spectrum set as follow:  
Below 1GHz, RBW=100kHz, VBW=300kHz, Detector=Peak, Sweep time=Auto  
Above 1GHz, RBW=1MHz, VBW=3MHz, Detector=Peak, Sweep time=Auto

#### 6.10.4 Test Result

Please refer to ANNEX A.10.

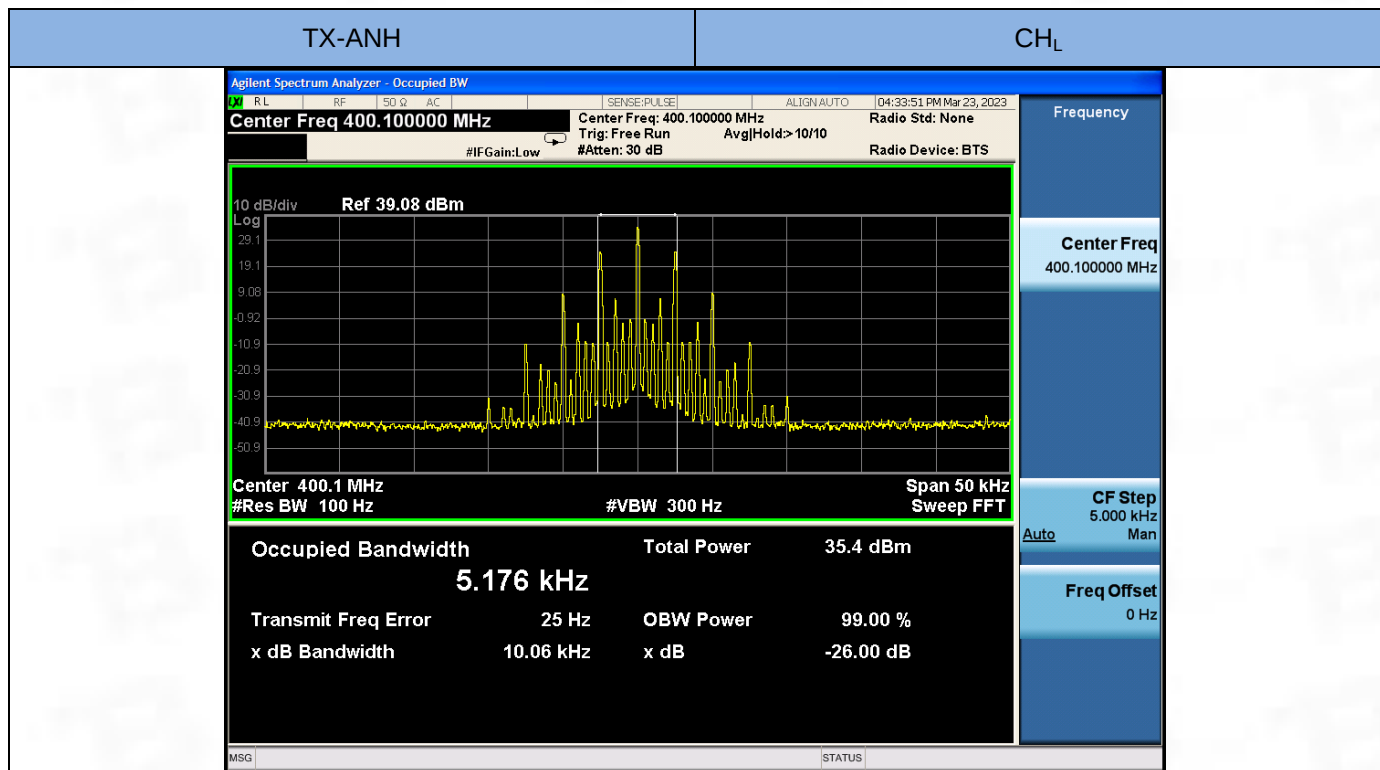
## ANNEX A Test Results

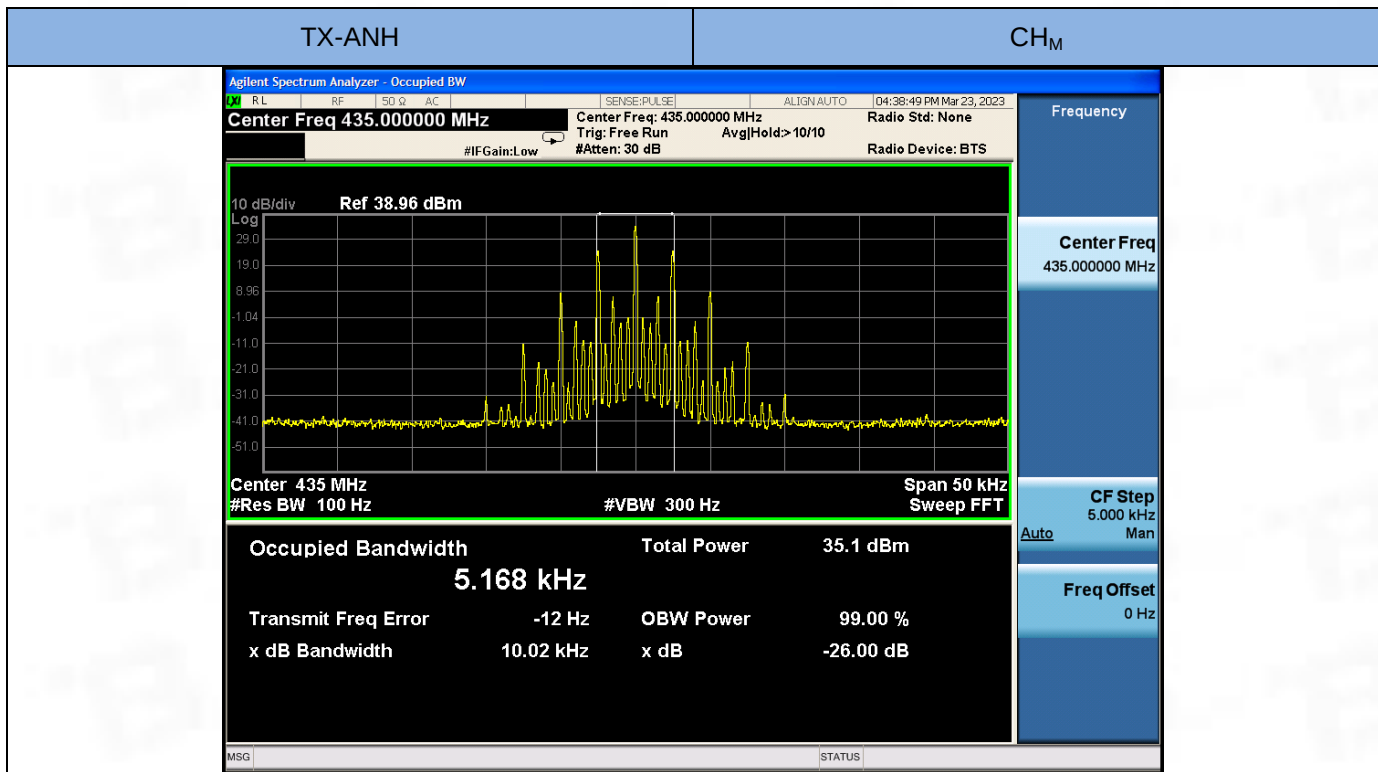
### A.1 Conducted Output Power

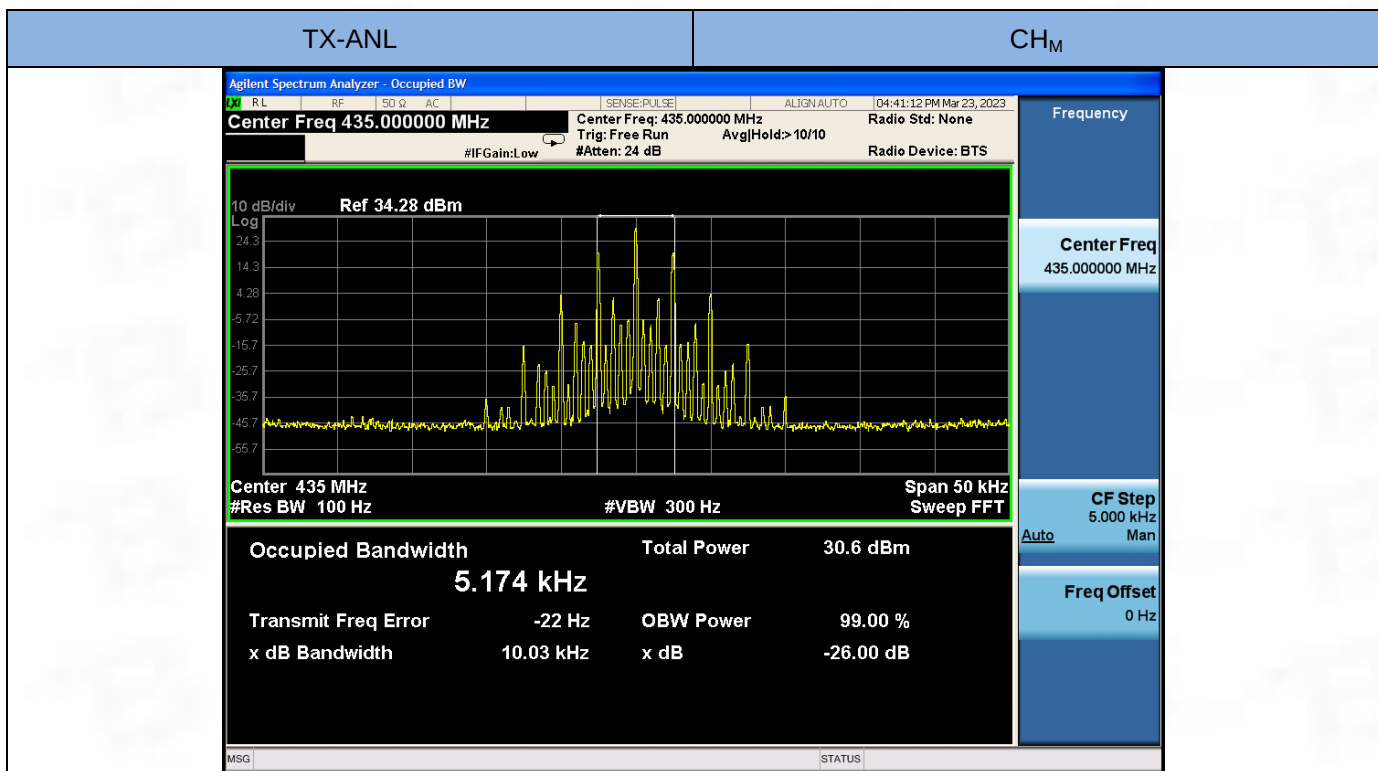
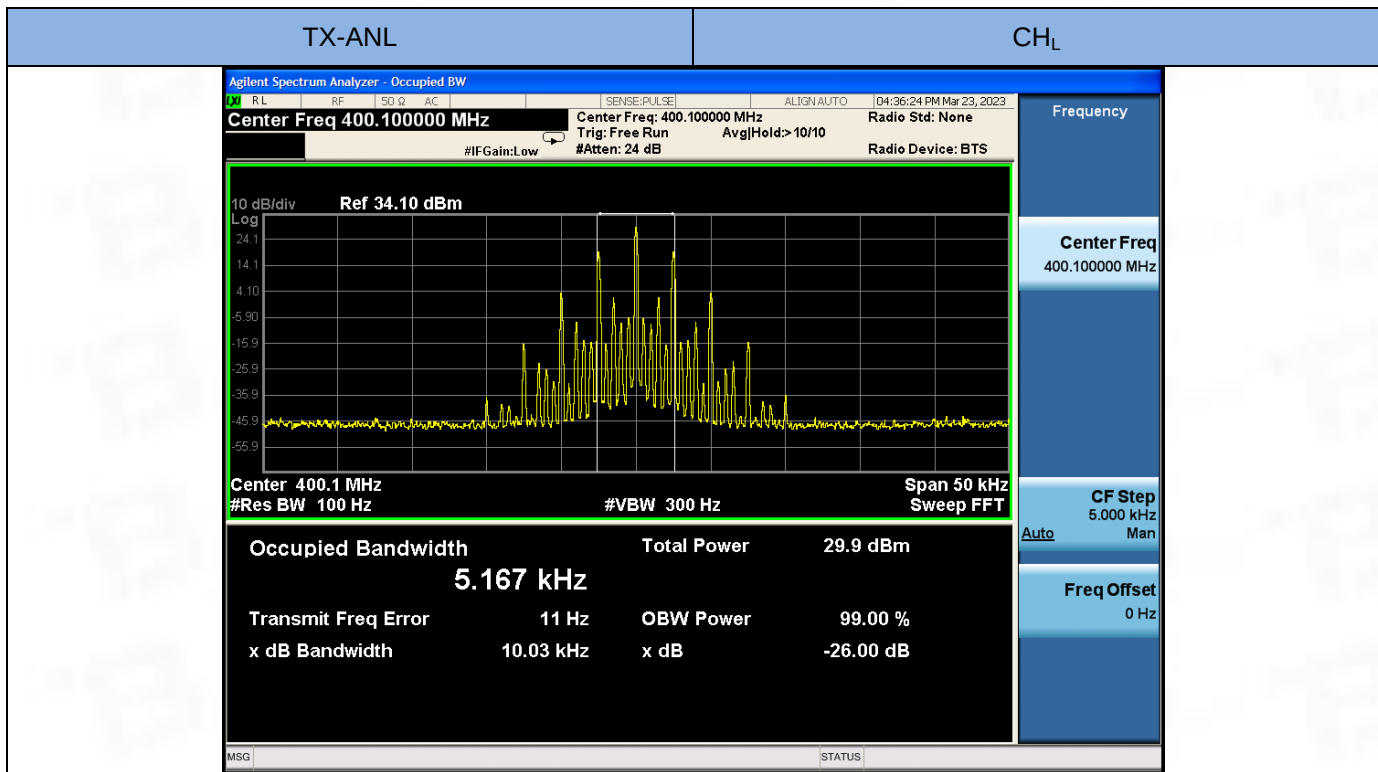
| Operation Mode | Modulation Type | Test Channel    | Measured Power(dBm) | Measured Power(W) | Rated Power(W) | Percentage(%) | Limit (%) | Result |
|----------------|-----------------|-----------------|---------------------|-------------------|----------------|---------------|-----------|--------|
| TX-DNH         | 4FSK            | CH <sub>L</sub> | 32.2                | 1.66              | 2.00           | -17.0         | ±20       | PASS   |
| TX-DNH         | 4FSK            | CH <sub>M</sub> | 32.4                | 1.74              | 2.00           | -13.0         | ±20       | PASS   |
| TX-DNH         | 4FSK            | CH <sub>H</sub> | 32.5                | 1.78              | 2.00           | -11.0         | ±20       | PASS   |
| TX-DNL         | 4FSK            | CH <sub>L</sub> | 26.3                | 0.43              | 0.50           | -14.0         | ±20       | PASS   |
| TX-DNL         | 4FSK            | CH <sub>M</sub> | 26.5                | 0.45              | 0.50           | -10.0         | ±20       | PASS   |
| TX-DNL         | 4FSK            | CH <sub>H</sub> | 26.2                | 0.42              | 0.50           | -16.0         | ±20       | PASS   |
| TX-ANH         | FM              | CH <sub>L</sub> | 32.4                | 1.74              | 2.00           | -13.0         | ±20       | PASS   |
| TX-ANH         | FM              | CH <sub>M</sub> | 32.2                | 1.66              | 2.00           | -17.0         | ±20       | PASS   |
| TX-ANH         | FM              | CH <sub>H</sub> | 32.1                | 1.62              | 2.00           | -19.0         | ±20       | PASS   |
| TX-ANL         | FM              | CH <sub>L</sub> | 26.5                | 0.45              | 0.50           | -10.0         | ±20       | PASS   |
| TX-ANL         | FM              | CH <sub>M</sub> | 26.1                | 0.41              | 0.50           | -18.0         | ±20       | PASS   |
| TX-ANL         | FM              | CH <sub>H</sub> | 26.2                | 0.42              | 0.50           | -16.0         | ±20       | PASS   |

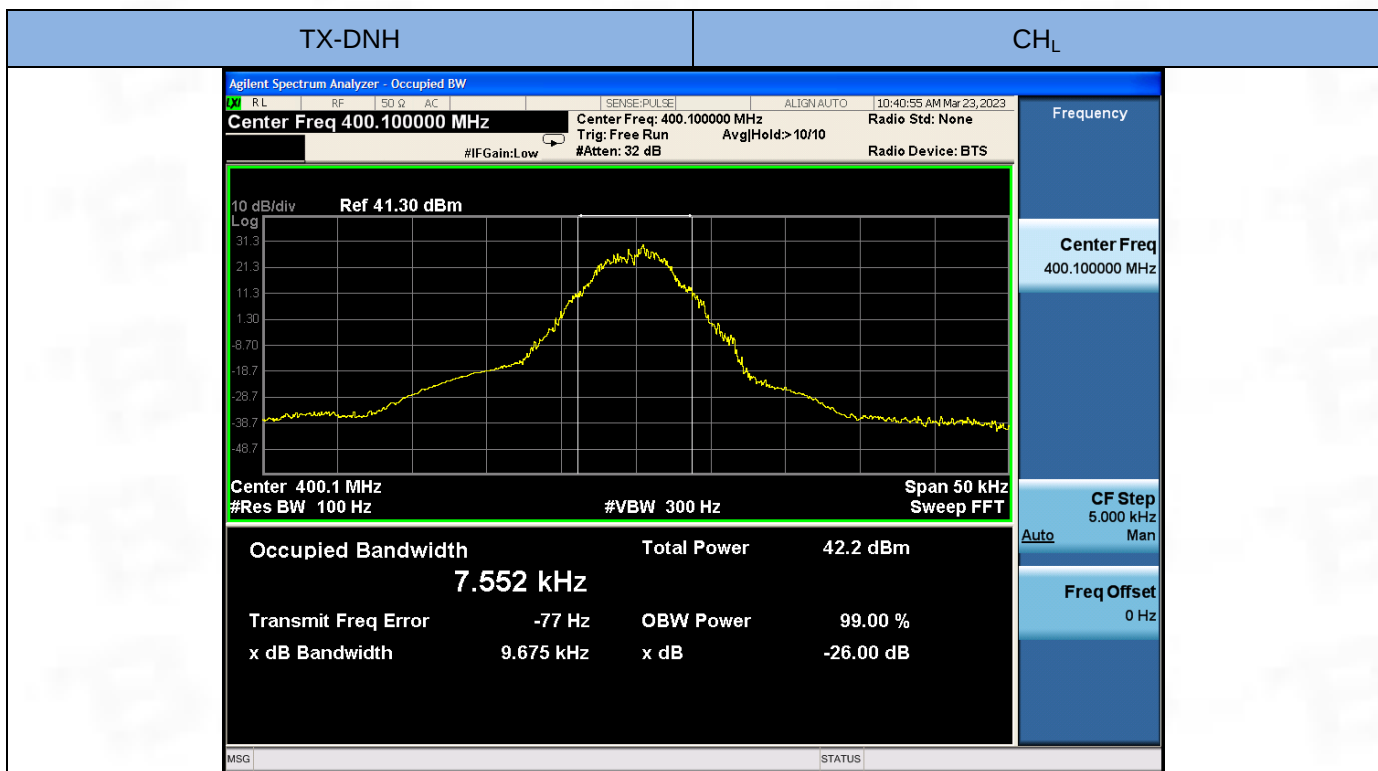
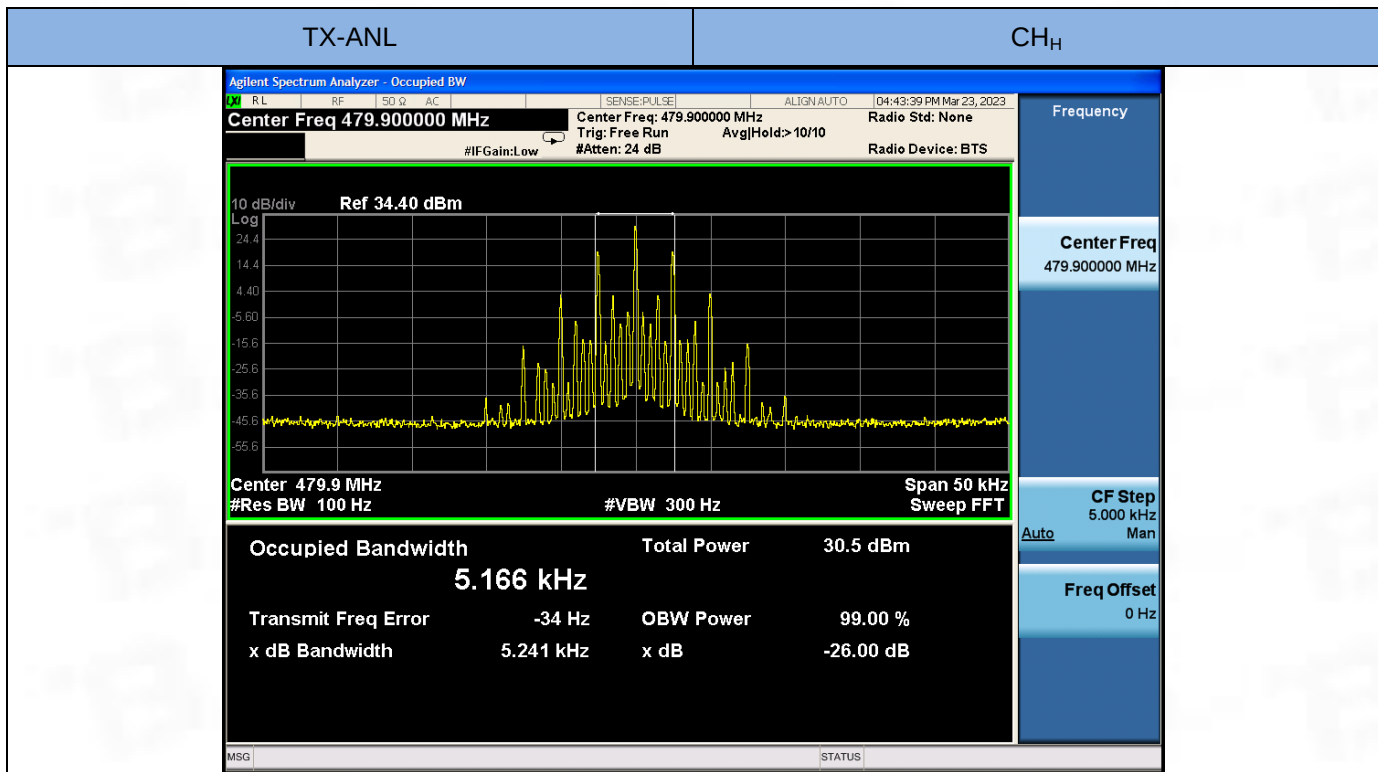
## A.2 99% Occupied Bandwidth & 26dB bandwidth

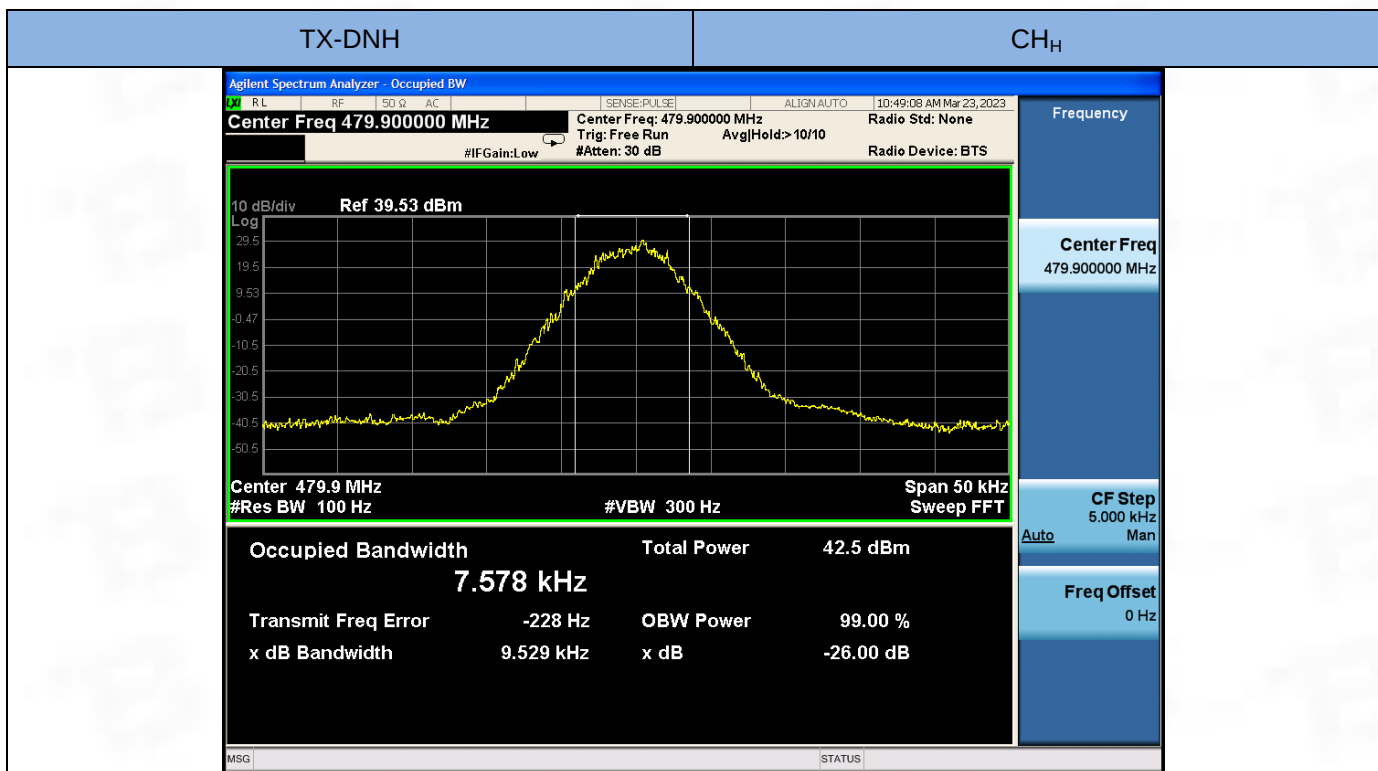
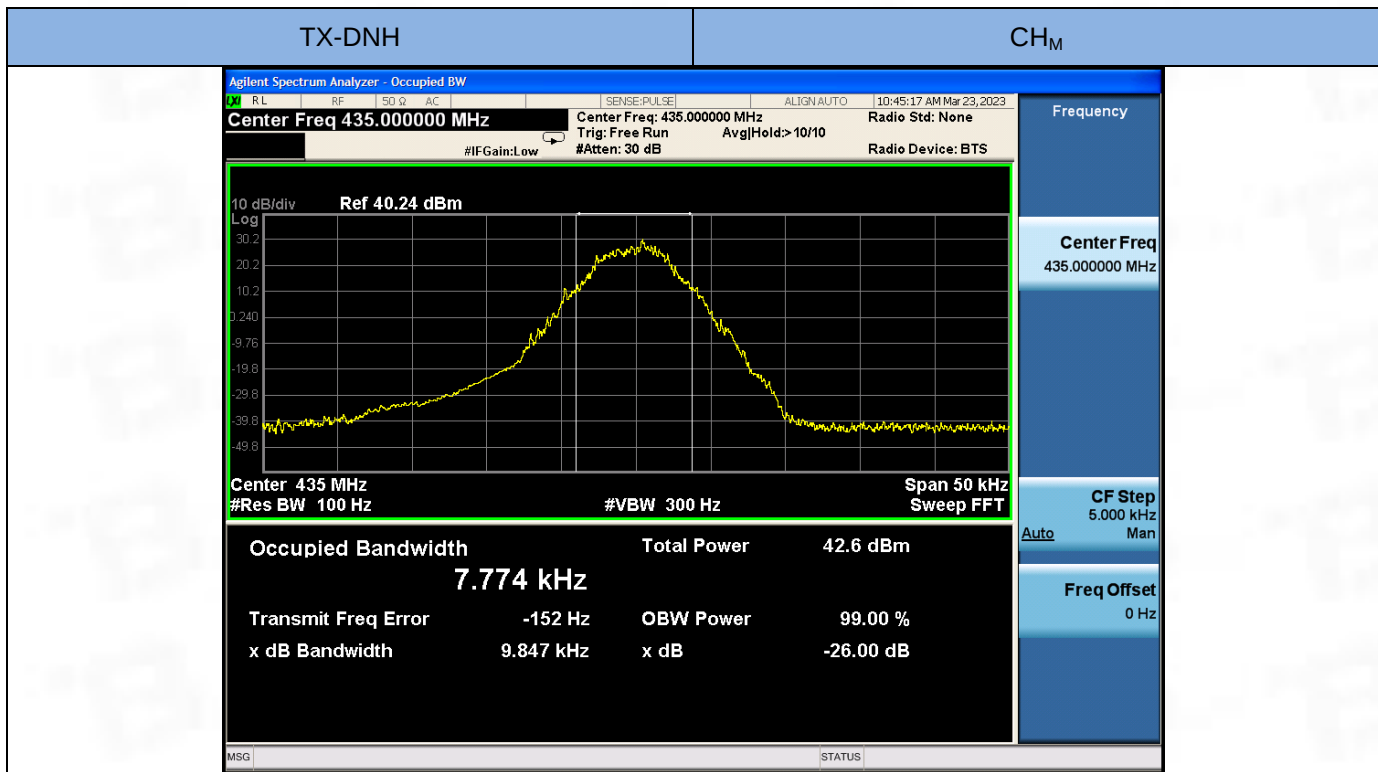
| Operation Mode | Modulation Type | Test Channel    | Occupied Bandwidth |           | 99% Limit(kHz) | Result |
|----------------|-----------------|-----------------|--------------------|-----------|----------------|--------|
|                |                 |                 | 99%(kHz)           | 26dB(kHz) |                |        |
| TX-DNH         | 4FSK            | CH <sub>L</sub> | 7.552              | 9.675     | ≤11.25         | PASS   |
| TX-DNH         | 4FSK            | CH <sub>M</sub> | 7.774              | 9.847     | ≤11.25         | PASS   |
| TX-DNH         | 4FSK            | CH <sub>H</sub> | 7.578              | 9.529     | ≤11.25         | PASS   |
| TX-DNL         | 4FSK            | CH <sub>L</sub> | 7.747              | 9.808     | ≤11.25         | PASS   |
| TX-DNL         | 4FSK            | CH <sub>M</sub> | 7.482              | 9.575     | ≤11.25         | PASS   |
| TX-DNL         | 4FSK            | CH <sub>H</sub> | 7.860              | 9.970     | ≤11.25         | PASS   |
| TX-ANH         | FM              | CH <sub>L</sub> | 5.176              | 10.060    | ≤11.25         | PASS   |
| TX-ANH         | FM              | CH <sub>M</sub> | 5.168              | 10.020    | ≤11.25         | PASS   |
| TX-ANH         | FM              | CH <sub>H</sub> | 5.148              | 5.258     | ≤11.25         | PASS   |
| TX-ANL         | FM              | CH <sub>L</sub> | 5.167              | 10.030    | ≤11.25         | PASS   |
| TX-ANL         | FM              | CH <sub>M</sub> | 5.174              | 10.030    | ≤11.25         | PASS   |
| TX-ANL         | FM              | CH <sub>H</sub> | 5.166              | 5.241     | ≤11.25         | PASS   |

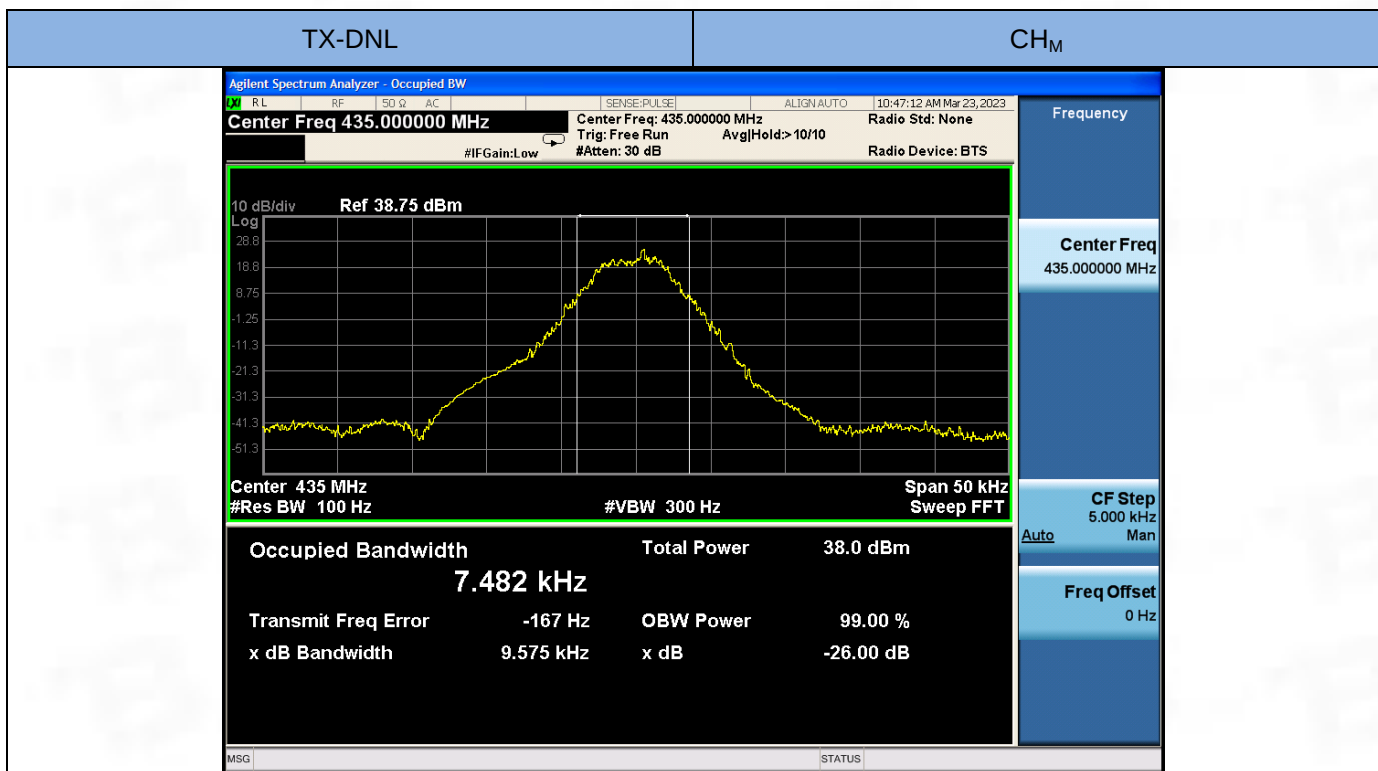
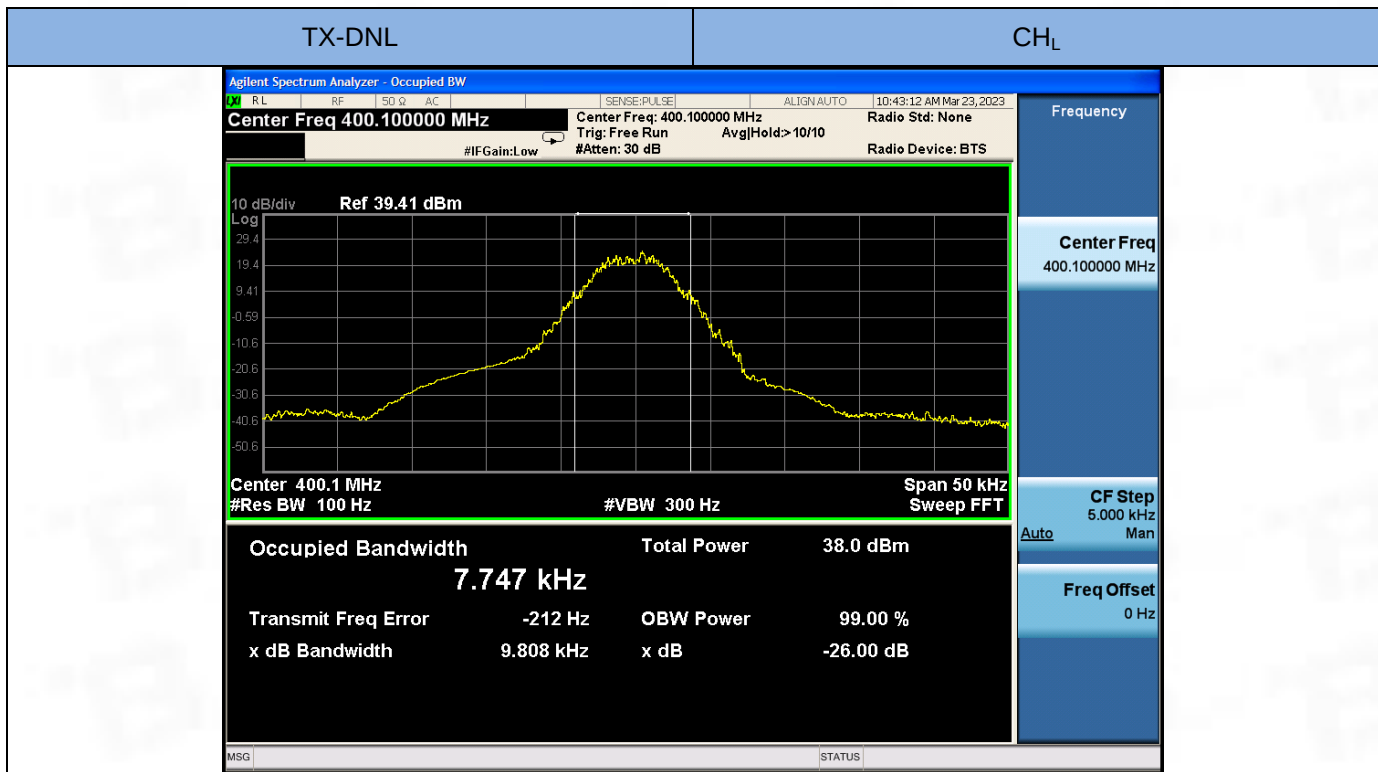


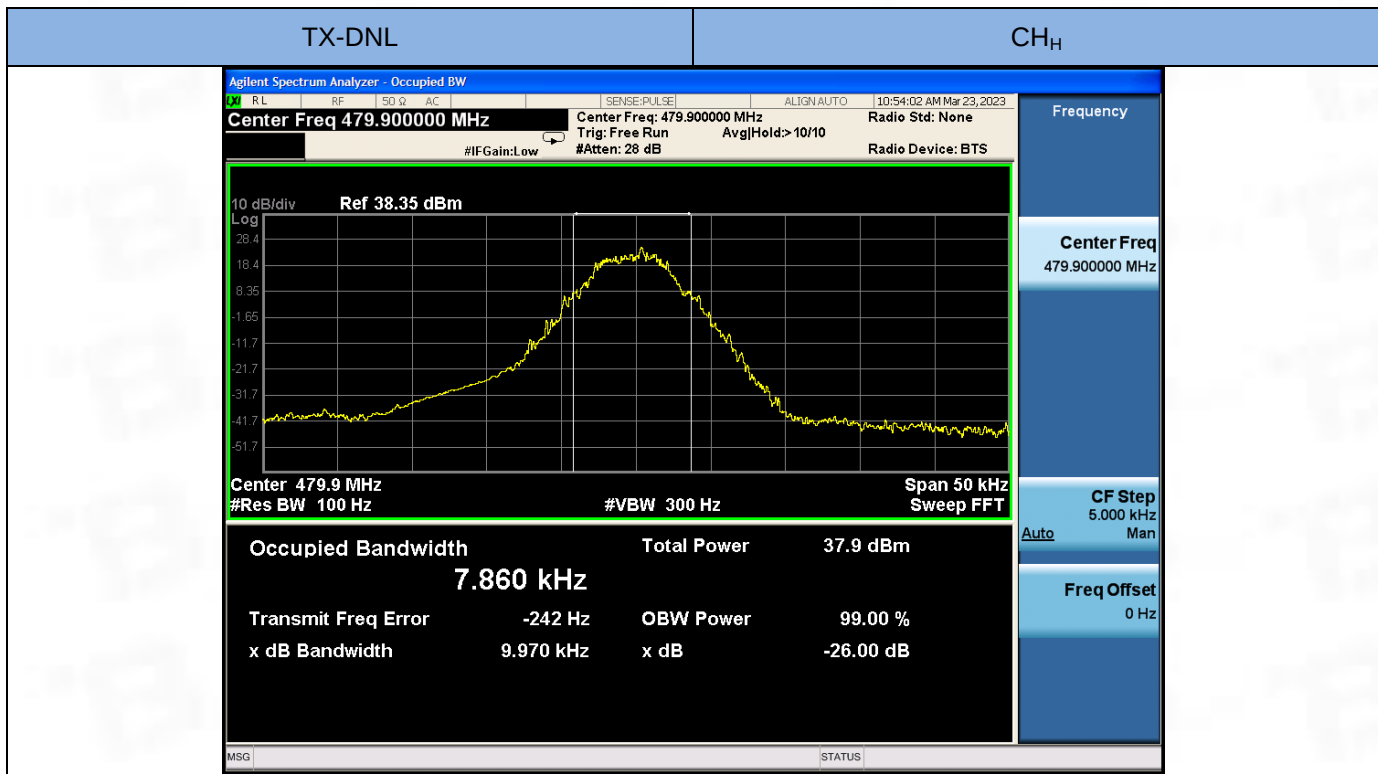




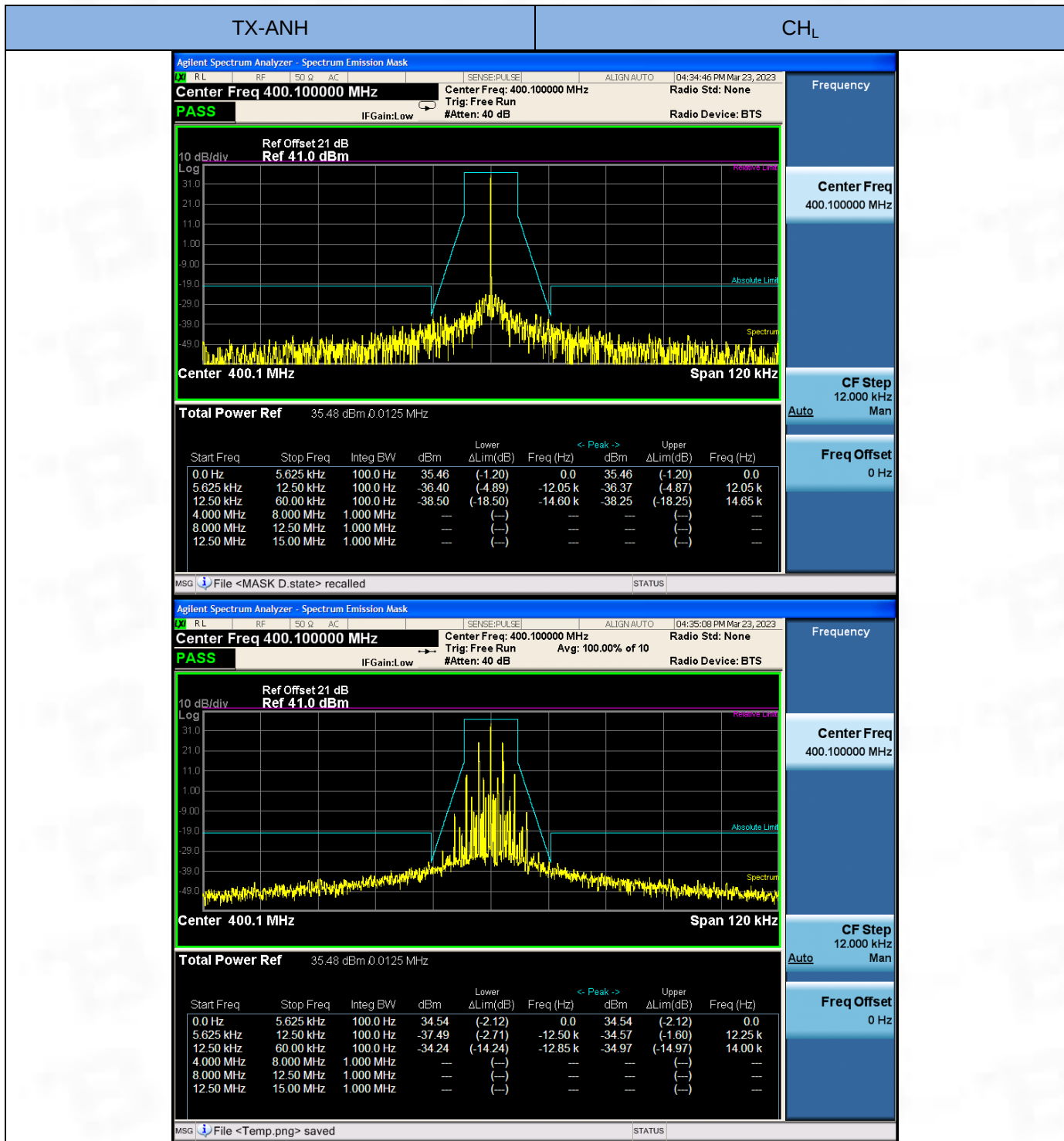


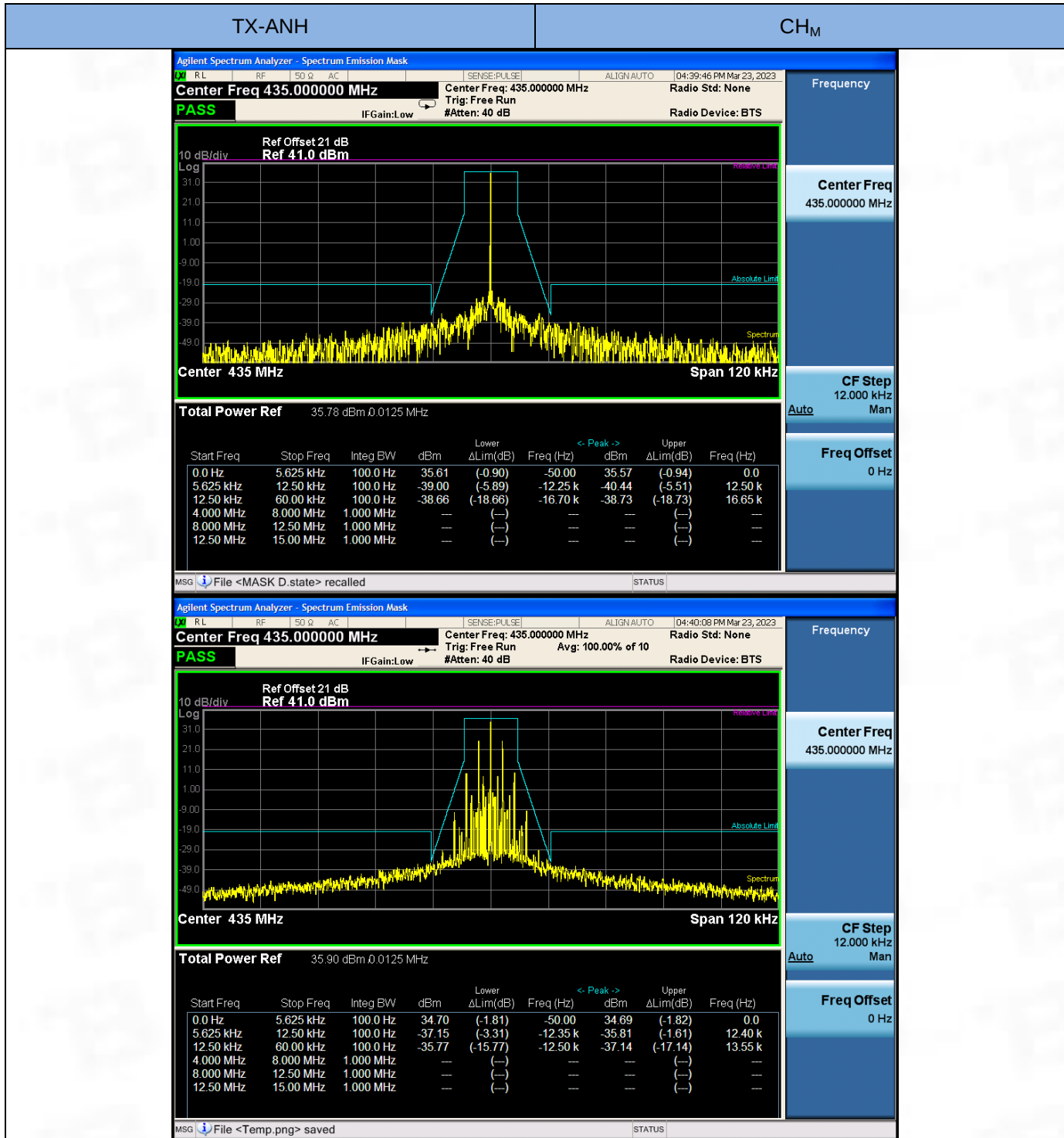


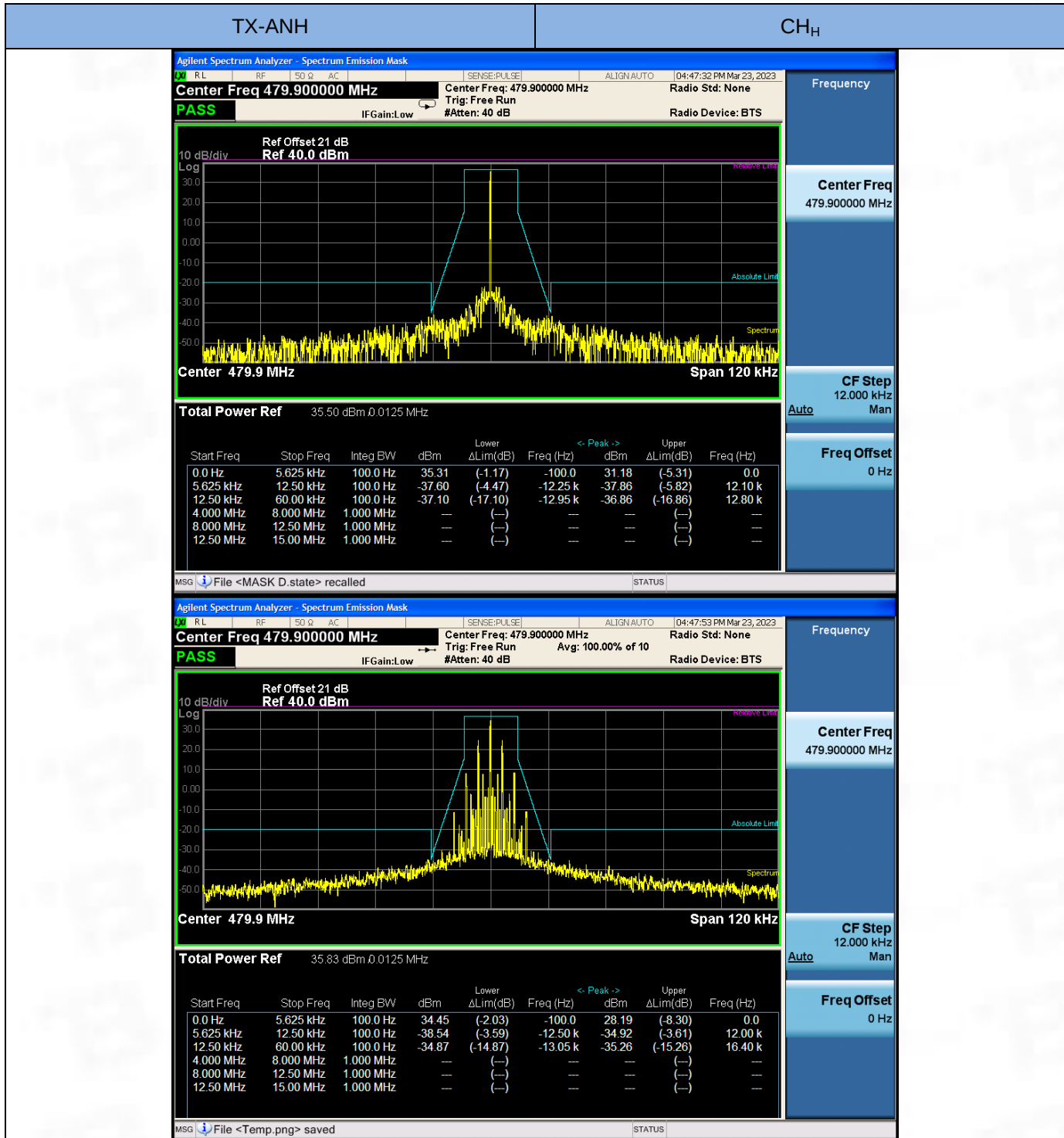


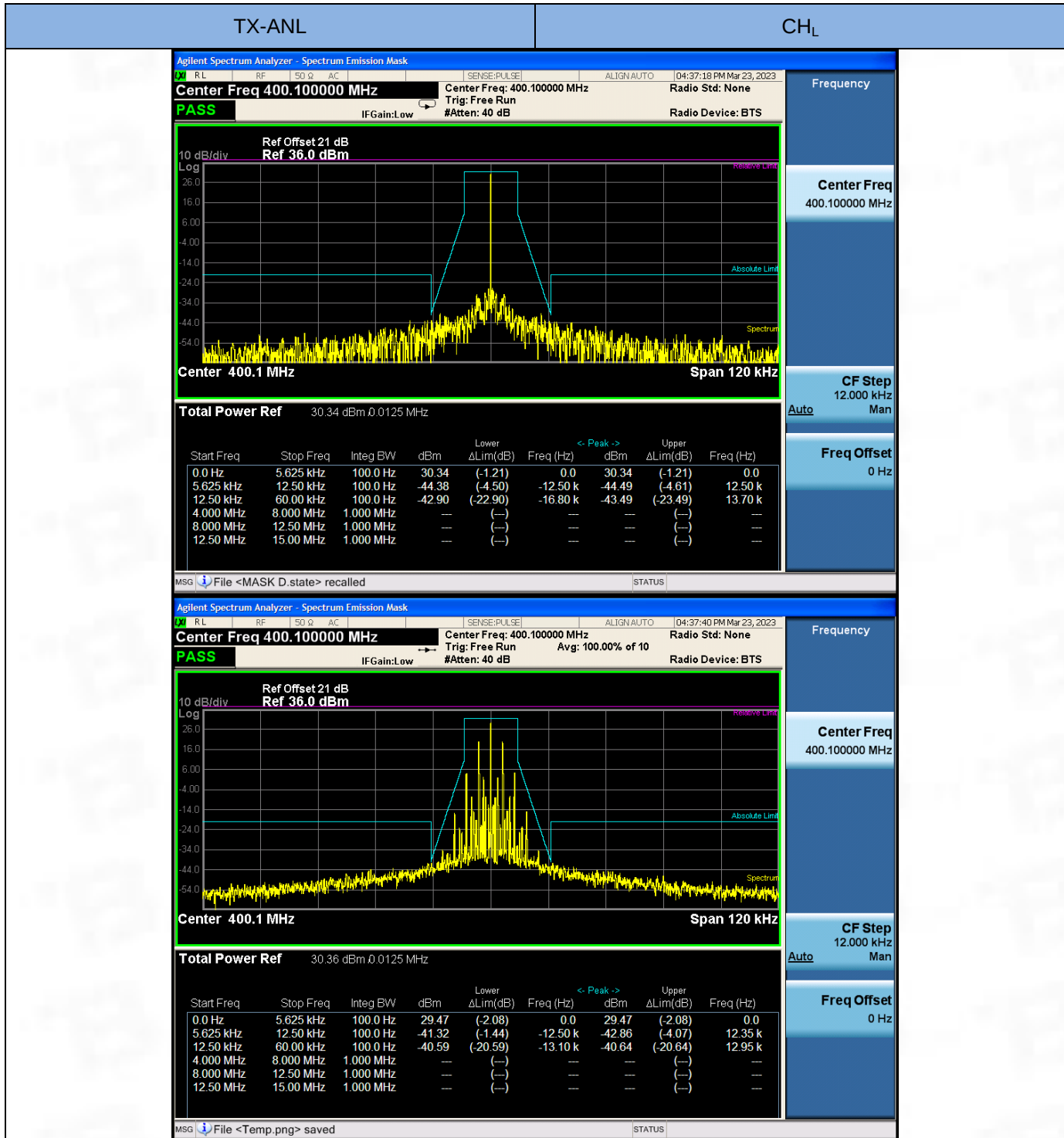


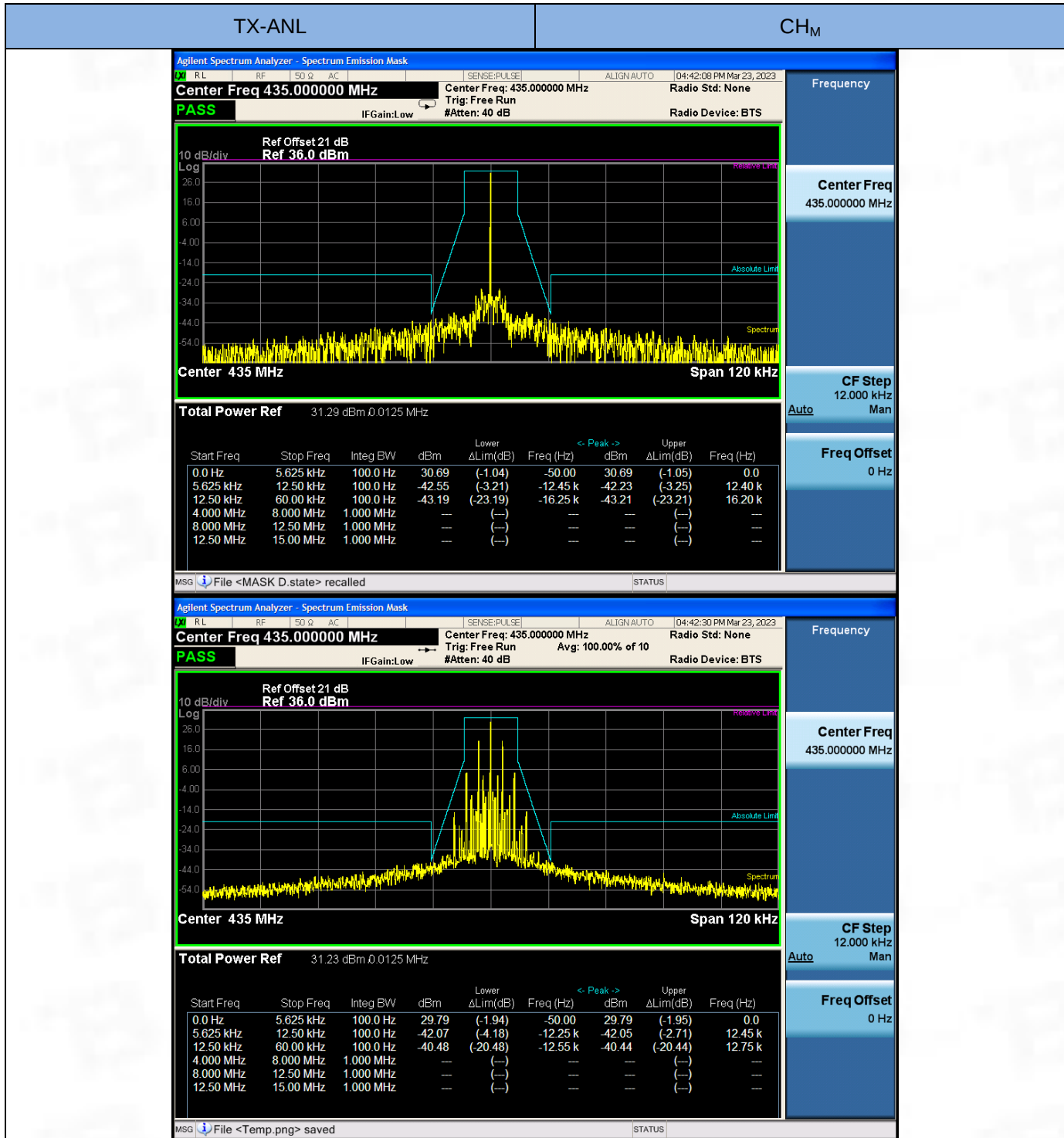
### A.3 Emission Mask

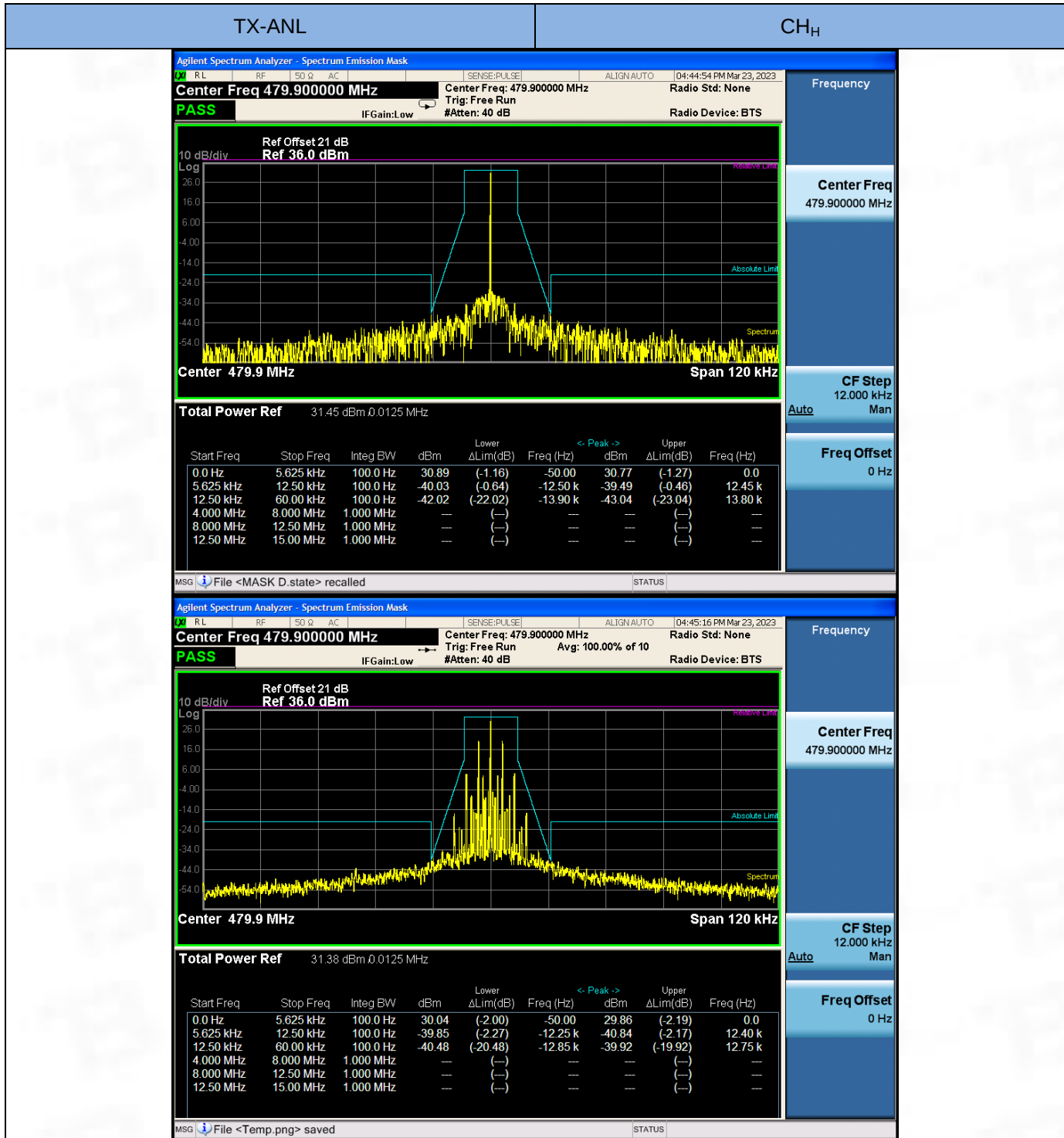


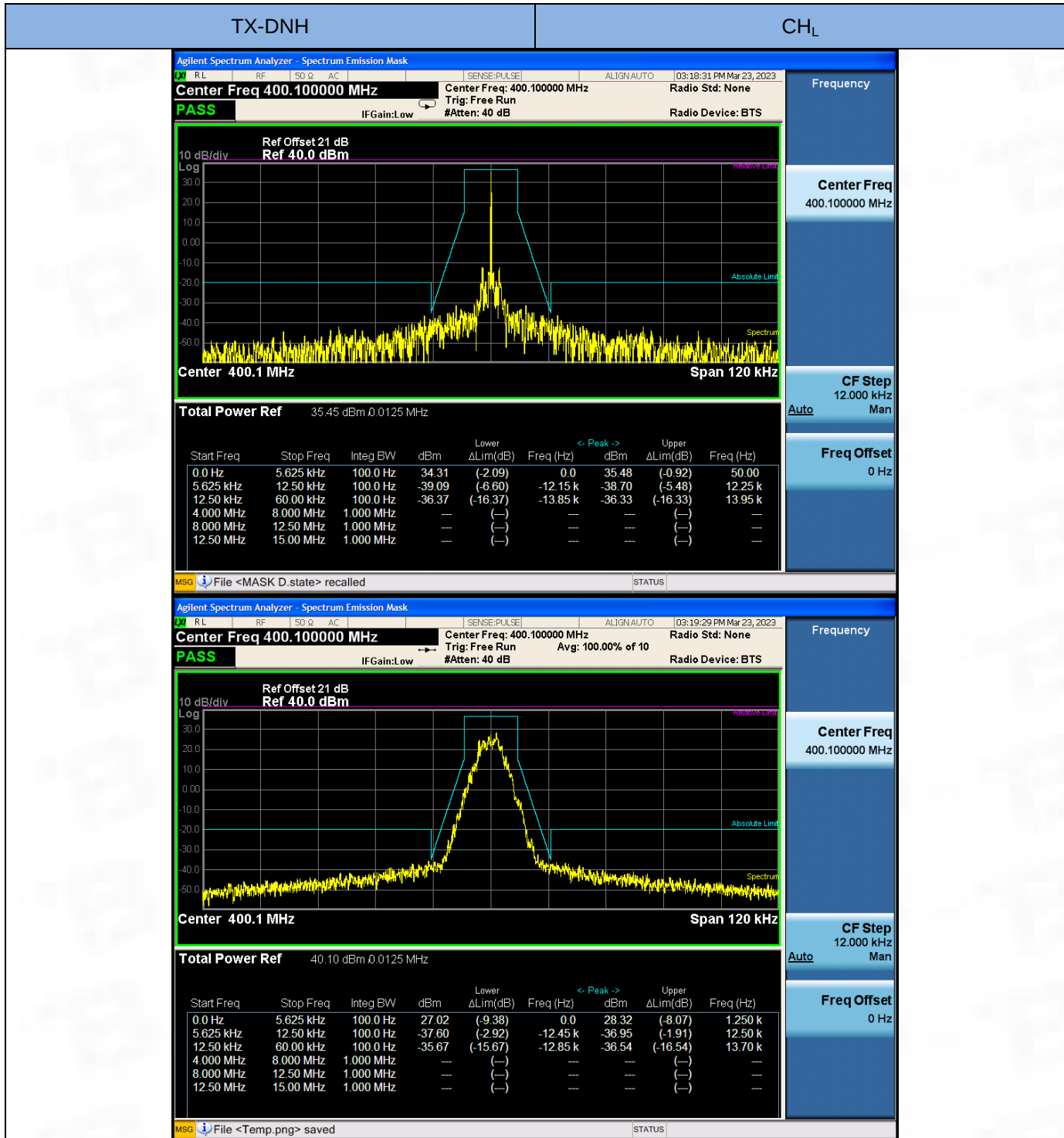


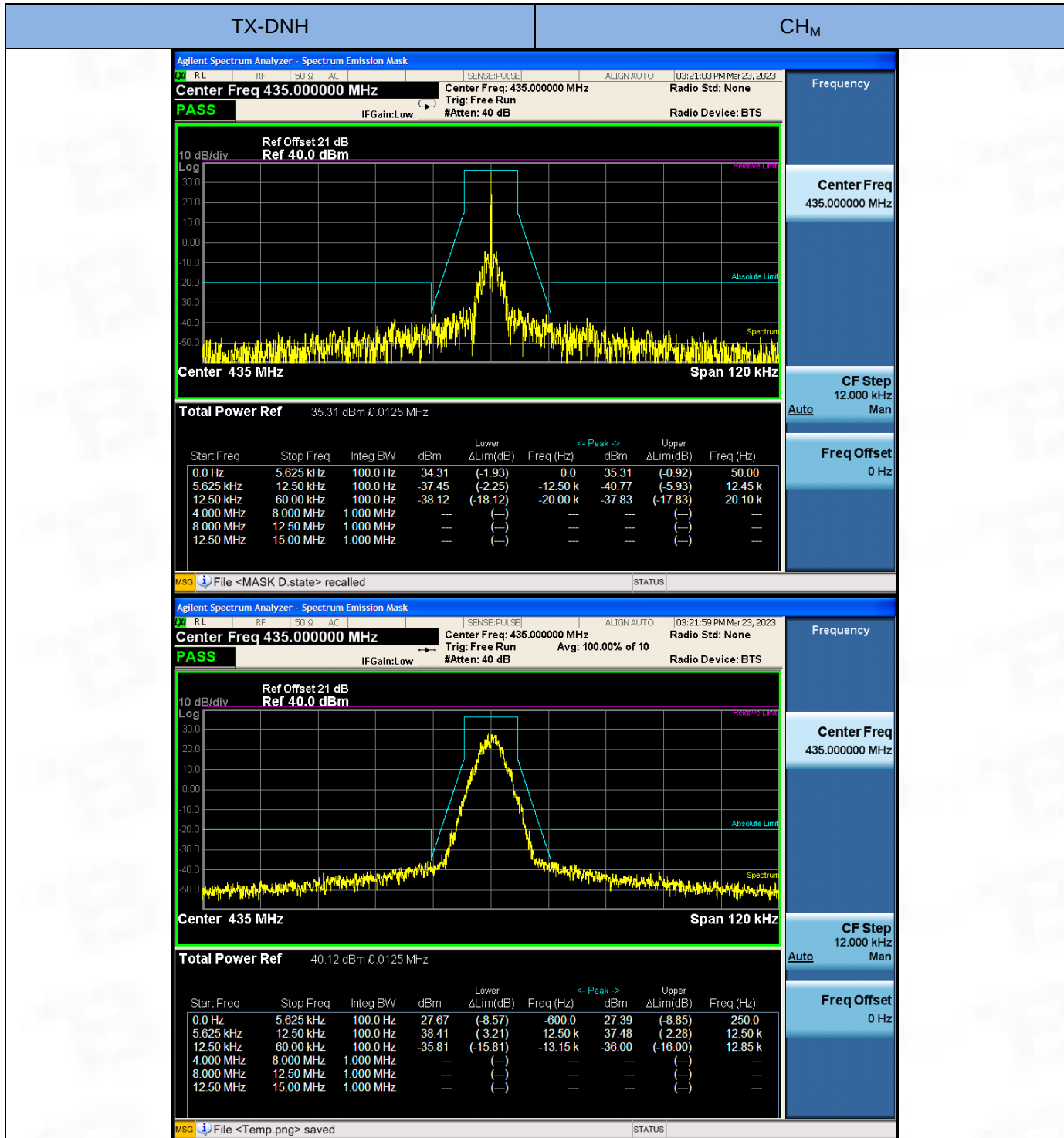


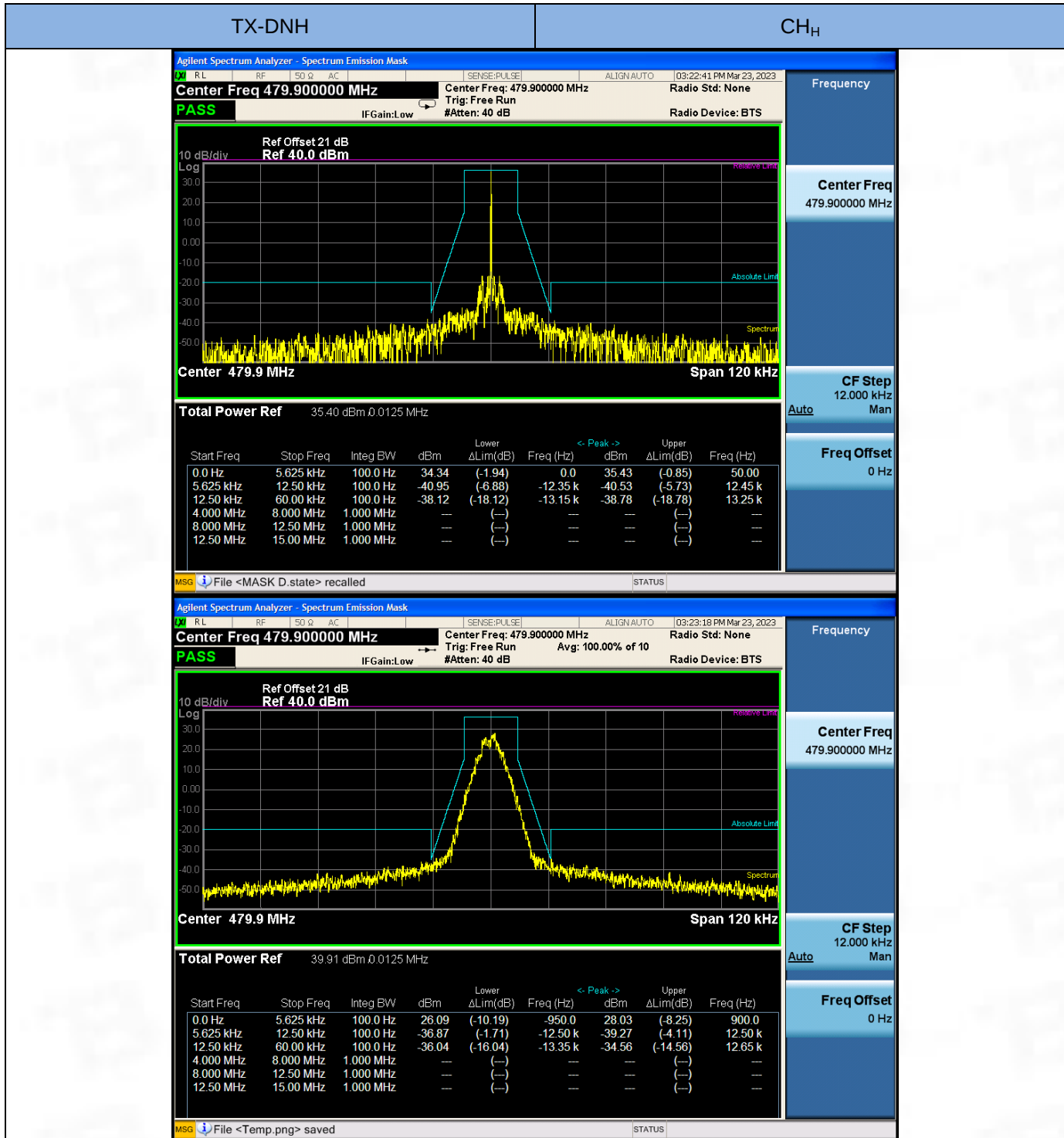


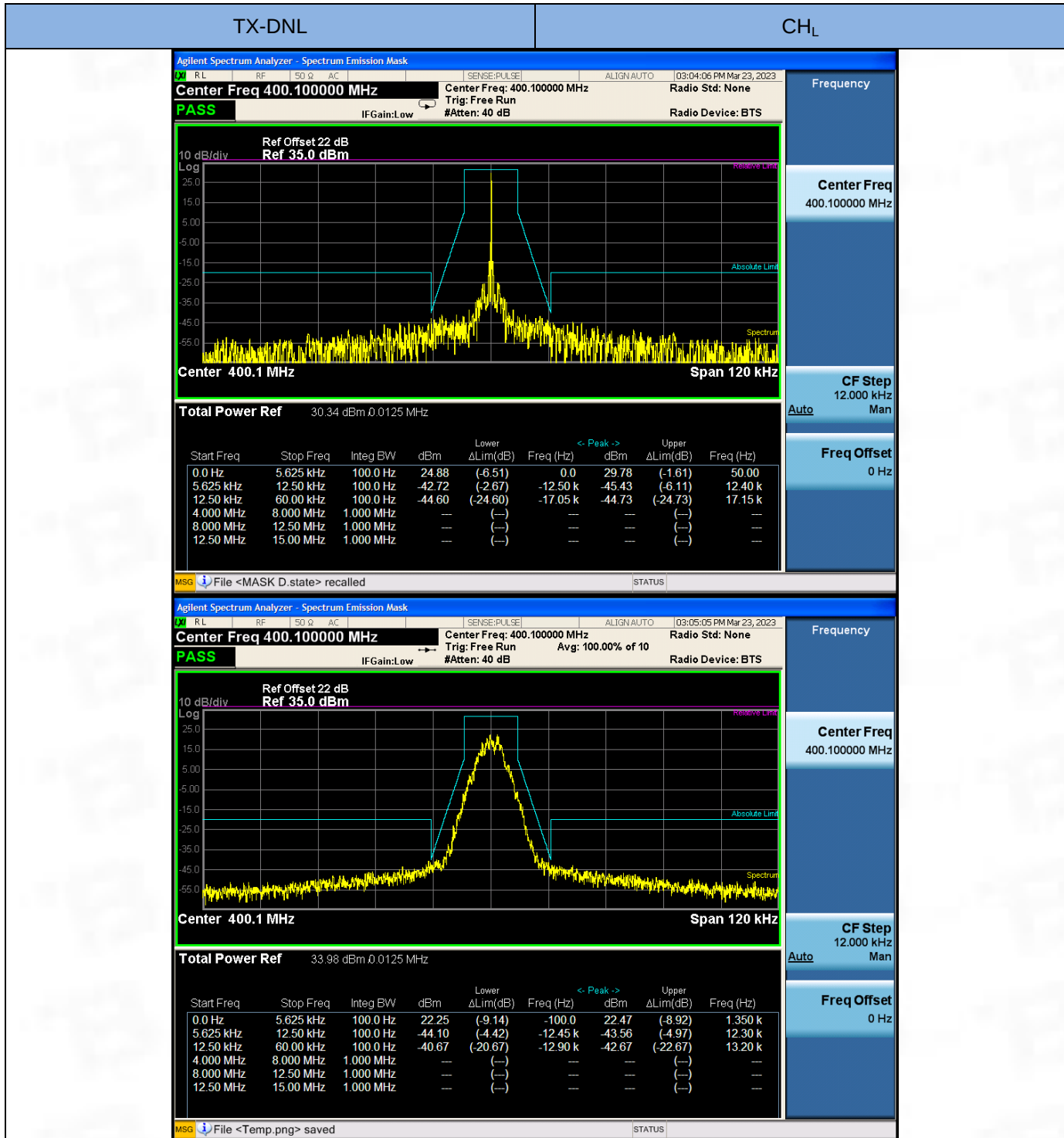


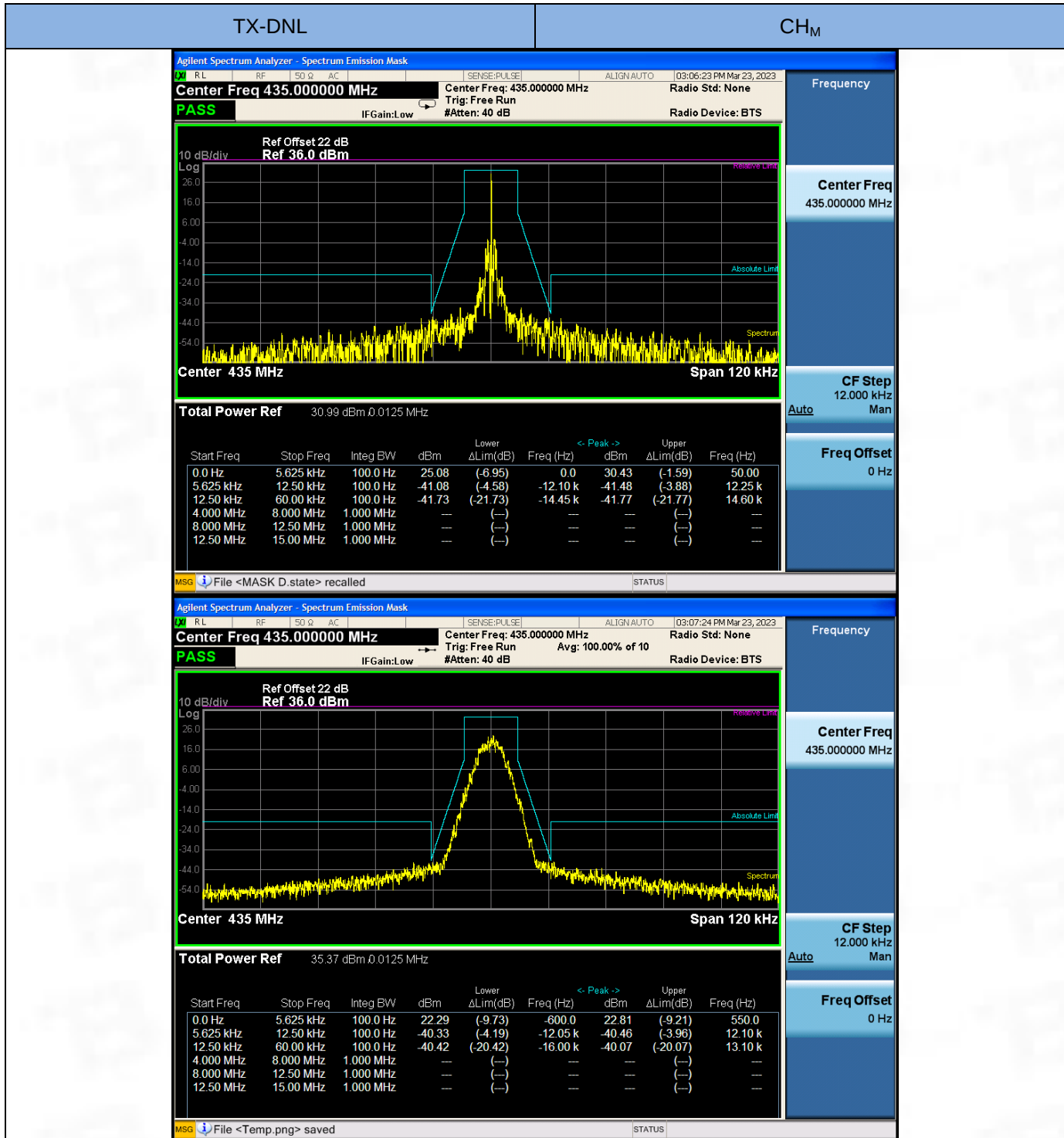


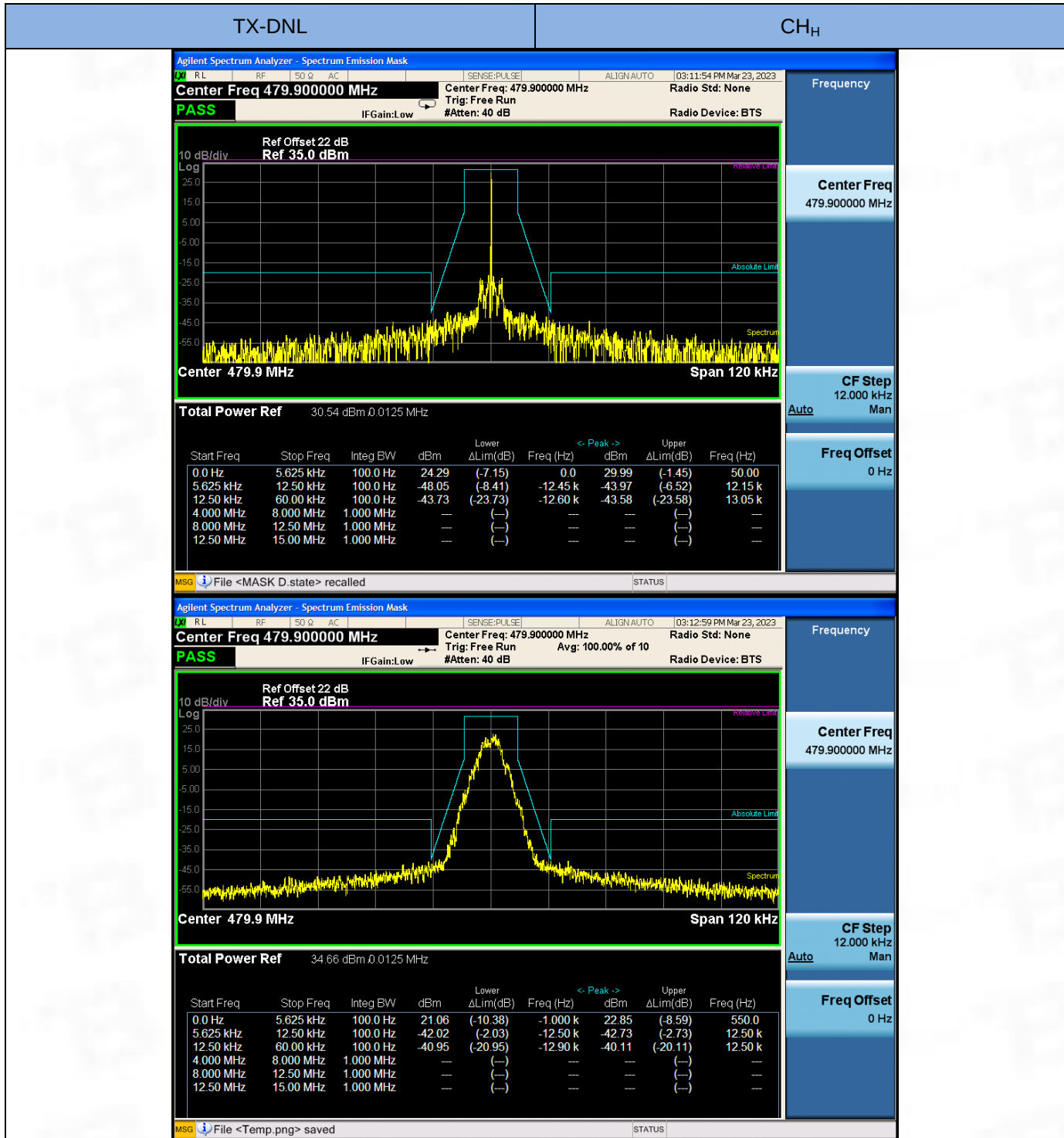












## A.4 Modulation Limit

| Operation Mode | Modulation Type | Test Channel    | Modulation Level (dB) | Peak frequency deviation (kHz) |        |        |         | Limit (kHz) | Result |
|----------------|-----------------|-----------------|-----------------------|--------------------------------|--------|--------|---------|-------------|--------|
|                |                 |                 |                       | 300Hz                          | 1004Hz | 1500Hz | 2500 Hz |             |        |
| TX-ANH         | FM              | CH <sub>M</sub> | -20                   | 0.091                          | 0.208  | 0.293  | 0.415   | 2.5         | PASS   |
| TX-ANH         | FM              | CH <sub>M</sub> | -15                   | 0.125                          | 0.340  | 0.485  | 0.709   | 2.5         | PASS   |
| TX-ANH         | FM              | CH <sub>M</sub> | -10                   | 0.192                          | 0.578  | 0.839  | 1.243   | 2.5         | PASS   |
| TX-ANH         | FM              | CH <sub>M</sub> | -5                    | 0.313                          | 1.007  | 1.433  | 1.534   | 2.5         | PASS   |
| TX-ANH         | FM              | CH <sub>M</sub> | 0                     | 0.527                          | 1.551  | 1.614  | 1.596   | 2.5         | PASS   |
| TX-ANH         | FM              | CH <sub>M</sub> | 5                     | 0.842                          | 1.817  | 1.677  | 1.683   | 2.5         | PASS   |
| TX-ANH         | FM              | CH <sub>M</sub> | 10                    | 1.437                          | 1.932  | 1.694  | 1.707   | 2.5         | PASS   |
| TX-ANH         | FM              | CH <sub>M</sub> | 15                    | 1.673                          | 1.965  | 1.707  | 1.720   | 2.5         | PASS   |
| TX-ANH         | FM              | CH <sub>M</sub> | 20                    | 1.707                          | 1.974  | 1.711  | 1.746   | 2.5         | PASS   |

## A.5 Audio Frequency Response

| Operation Mode | Modulation Type | Test Channel    | Frequency (Hz) | Audio Frequency Response (dB) | Lower Limit | Upper Limit | Result |
|----------------|-----------------|-----------------|----------------|-------------------------------|-------------|-------------|--------|
| TX-ANH         | FM              | CH <sub>M</sub> | 100            | -33.20                        | /           | /           | PASS   |
| TX-ANH         | FM              | CH <sub>M</sub> | 200            | -32.48                        | /           | /           | PASS   |
| TX-ANH         | FM              | CH <sub>M</sub> | 300            | -10.95                        | -17.84      | -9.42       | PASS   |
| TX-ANH         | FM              | CH <sub>M</sub> | 400            | -8.60                         | -12.86      | -6.93       | PASS   |
| TX-ANH         | FM              | CH <sub>M</sub> | 500            | -6.38                         | -9.00       | -5.00       | PASS   |
| TX-ANH         | FM              | CH <sub>M</sub> | 600            | -4.50                         | -7.42       | -3.42       | PASS   |
| TX-ANH         | FM              | CH <sub>M</sub> | 700            | -3.16                         | -6.09       | -2.09       | PASS   |
| TX-ANH         | FM              | CH <sub>M</sub> | 800            | -1.96                         | -4.93       | -0.93       | PASS   |
| TX-ANH         | FM              | CH <sub>M</sub> | 900            | -0.96                         | -3.91       | 0.09        | PASS   |
| TX-ANH         | FM              | CH <sub>M</sub> | 1000           | -0.03                         | -3.00       | 1.00        | PASS   |
| TX-ANH         | FM              | CH <sub>M</sub> | 1200           | 1.56                          | -1.42       | 2.58        | PASS   |
| TX-ANH         | FM              | CH <sub>M</sub> | 1400           | 2.88                          | -0.09       | 3.91        | PASS   |
| TX-ANH         | FM              | CH <sub>M</sub> | 1600           | 3.96                          | 1.07        | 5.07        | PASS   |
| TX-ANH         | FM              | CH <sub>M</sub> | 1800           | 4.77                          | 2.09        | 6.09        | PASS   |
| TX-ANH         | FM              | CH <sub>M</sub> | 2000           | 5.25                          | 3.00        | 7.00        | PASS   |
| TX-ANH         | FM              | CH <sub>M</sub> | 2100           | 5.32                          | 3.42        | 7.42        | PASS   |
| TX-ANH         | FM              | CH <sub>M</sub> | 2200           | 5.42                          | 3.83        | 7.83        | PASS   |
| TX-ANH         | FM              | CH <sub>M</sub> | 2300           | 5.52                          | 4.21        | 8.21        | PASS   |
| TX-ANH         | FM              | CH <sub>M</sub> | 2400           | 5.79                          | 4.58        | 8.58        | PASS   |
| TX-ANH         | FM              | CH <sub>M</sub> | 2500           | 5.81                          | 4.93        | 8.93        | PASS   |
| TX-ANH         | FM              | CH <sub>M</sub> | 2600           | 6.04                          | 4.59        | 9.27        | PASS   |
| TX-ANH         | FM              | CH <sub>M</sub> | 2700           | 6.25                          | 4.27        | 9.60        | PASS   |
| TX-ANH         | FM              | CH <sub>M</sub> | 2800           | 6.39                          | 3.95        | 9.91        | PASS   |
| TX-ANH         | FM              | CH <sub>M</sub> | 2900           | 6.32                          | 3.65        | 10.22       | PASS   |
| TX-ANH         | FM              | CH <sub>M</sub> | 3000           | 5.65                          | 3.35        | 10.51       | PASS   |
| TX-ANH         | FM              | CH <sub>M</sub> | 3500           | -22.36                        | /           | /           | PASS   |
| TX-ANH         | FM              | CH <sub>M</sub> | 4000           | -32.53                        | /           | /           | PASS   |
| TX-ANH         | FM              | CH <sub>M</sub> | 4500           | -32.39                        | /           | /           | PASS   |
| TX-ANH         | FM              | CH <sub>M</sub> | 5000           | -32.63                        | /           | /           | PASS   |

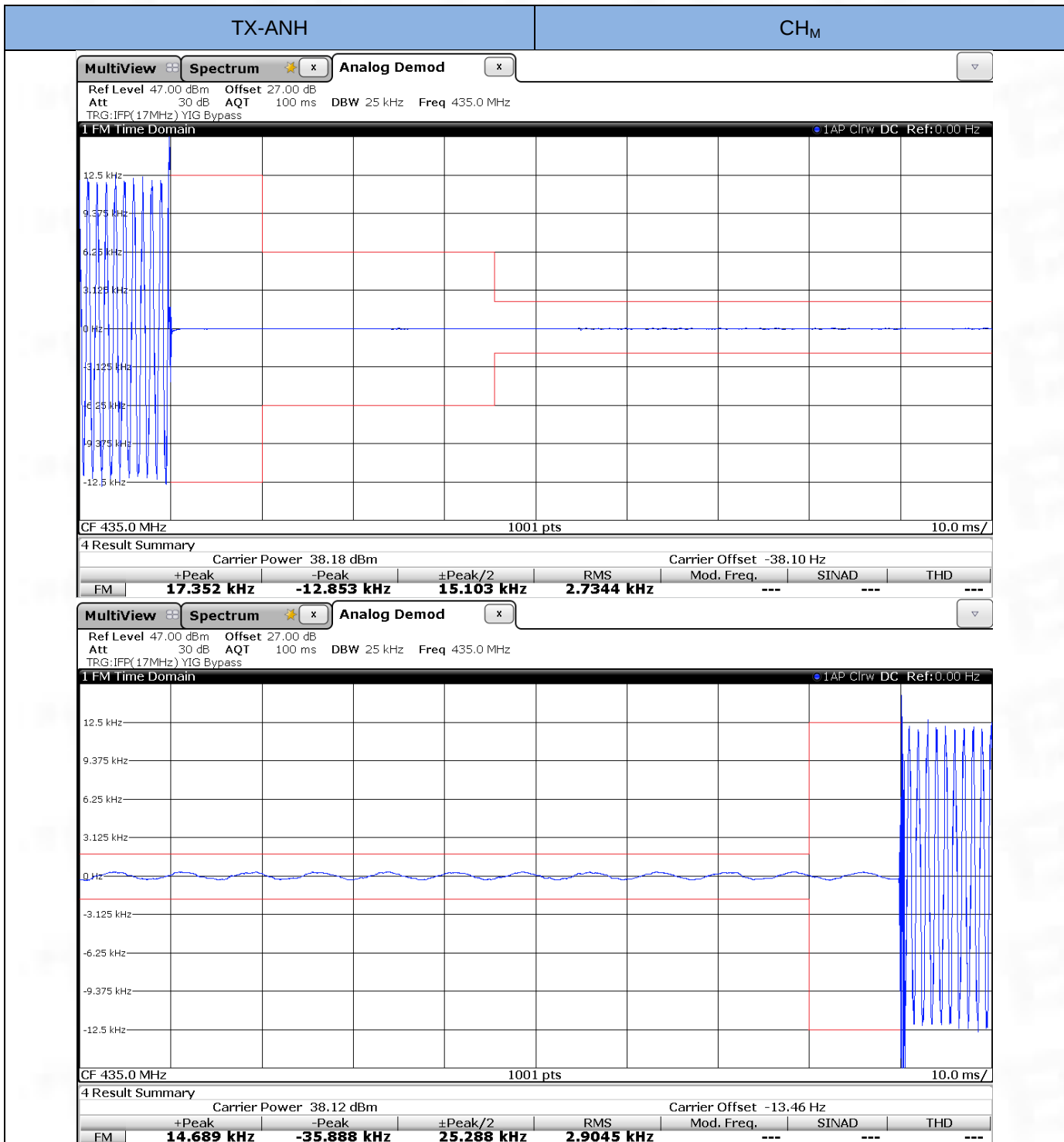
## A.6 Frequency Stability VS Temperature

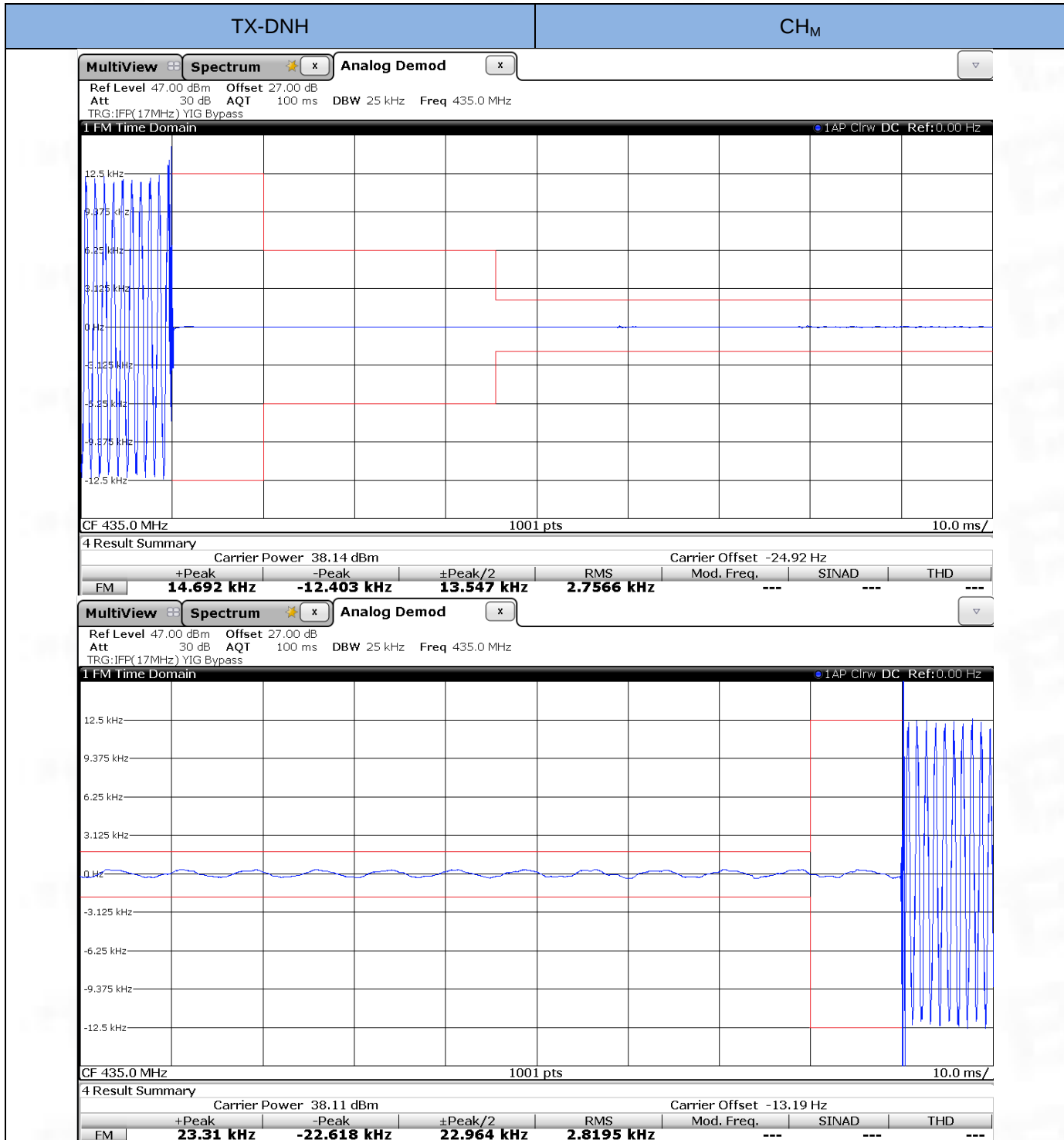
| Operation Mode | Modulation Type | Test Conditions |             | Frequency error (ppm) |                 |                 | Limit (ppm) | Result |
|----------------|-----------------|-----------------|-------------|-----------------------|-----------------|-----------------|-------------|--------|
|                |                 | Voltage         | Temperature | CH <sub>L</sub>       | CH <sub>M</sub> | CH <sub>H</sub> |             |        |
| TX-DNH         | 4FSK            | V <sub>N</sub>  | -30         | -0.606                | -0.646          | -0.665          | ±5.0        | PASS   |
| TX-DNH         | 4FSK            | V <sub>N</sub>  | -20         | -0.641                | -0.639          | -0.666          | ±5.0        | PASS   |
| TX-DNH         | 4FSK            | V <sub>N</sub>  | -10         | -0.615                | -0.628          | -0.701          | ±5.0        | PASS   |
| TX-DNH         | 4FSK            | V <sub>N</sub>  | 0           | -0.631                | -0.627          | -0.697          | ±5.0        | PASS   |
| TX-DNH         | 4FSK            | V <sub>N</sub>  | 10          | -0.593                | -0.647          | -0.667          | ±5.0        | PASS   |
| TX-DNH         | 4FSK            | V <sub>N</sub>  | 20          | -0.591                | -0.606          | -0.652          | ±5.0        | PASS   |
| TX-DNH         | 4FSK            | V <sub>N</sub>  | 30          | -0.616                | -0.614          | -0.700          | ±5.0        | PASS   |
| TX-DNH         | 4FSK            | V <sub>N</sub>  | 40          | -0.605                | -0.654          | -0.657          | ±5.0        | PASS   |
| TX-DNH         | 4FSK            | V <sub>N</sub>  | 50          | -0.641                | -0.659          | -0.656          | ±5.0        | PASS   |
| TX-DNL         | 4FSK            | V <sub>N</sub>  | -30         | -0.626                | -0.640          | -0.669          | ±5.0        | PASS   |
| TX-DNL         | 4FSK            | V <sub>N</sub>  | -20         | -0.616                | -0.656          | -0.655          | ±5.0        | PASS   |
| TX-DNL         | 4FSK            | V <sub>N</sub>  | -10         | -0.587                | -0.643          | -0.648          | ±5.0        | PASS   |
| TX-DNL         | 4FSK            | V <sub>N</sub>  | 0           | -0.627                | -0.667          | -0.693          | ±5.0        | PASS   |
| TX-DNL         | 4FSK            | V <sub>N</sub>  | 10          | -0.591                | -0.660          | -0.706          | ±5.0        | PASS   |
| TX-DNL         | 4FSK            | V <sub>N</sub>  | 20          | -0.583                | -0.611          | -0.643          | ±5.0        | PASS   |
| TX-DNL         | 4FSK            | V <sub>N</sub>  | 30          | -0.600                | -0.654          | -0.703          | ±5.0        | PASS   |
| TX-DNL         | 4FSK            | V <sub>N</sub>  | 40          | -0.591                | -0.658          | -0.704          | ±5.0        | PASS   |
| TX-DNL         | 4FSK            | V <sub>N</sub>  | 50          | -0.599                | -0.665          | -0.704          | ±5.0        | PASS   |
| TX-ANH         | FM              | V <sub>N</sub>  | -30         | 0.076                 | -0.002          | -0.033          | ±5.0        | PASS   |
| TX-ANH         | FM              | V <sub>N</sub>  | -20         | 0.082                 | -0.002          | -0.034          | ±5.0        | PASS   |
| TX-ANH         | FM              | V <sub>N</sub>  | -10         | 0.079                 | -0.002          | -0.033          | ±5.0        | PASS   |
| TX-ANH         | FM              | V <sub>N</sub>  | 0           | 0.076                 | -0.002          | -0.033          | ±5.0        | PASS   |
| TX-ANH         | FM              | V <sub>N</sub>  | 10          | 0.082                 | -0.002          | -0.033          | ±5.0        | PASS   |
| TX-ANH         | FM              | V <sub>N</sub>  | 20          | 0.075                 | -0.002          | -0.032          | ±5.0        | PASS   |
| TX-ANH         | FM              | V <sub>N</sub>  | 30          | 0.081                 | -0.002          | -0.032          | ±5.0        | PASS   |
| TX-ANH         | FM              | V <sub>N</sub>  | 40          | 0.077                 | -0.002          | -0.033          | ±5.0        | PASS   |
| TX-ANH         | FM              | V <sub>N</sub>  | 50          | 0.080                 | -0.002          | -0.034          | ±5.0        | PASS   |
| TX-ANL         | FM              | V <sub>N</sub>  | -30         | 0.043                 | -0.017          | -0.115          | ±5.0        | PASS   |
| TX-ANL         | FM              | V <sub>N</sub>  | -20         | 0.044                 | -0.018          | -0.111          | ±5.0        | PASS   |
| TX-ANL         | FM              | V <sub>N</sub>  | -10         | 0.043                 | -0.017          | -0.113          | ±5.0        | PASS   |
| TX-ANL         | FM              | V <sub>N</sub>  | 0           | 0.040                 | -0.018          | -0.112          | ±5.0        | PASS   |
| TX-ANL         | FM              | V <sub>N</sub>  | 10          | 0.042                 | -0.017          | -0.120          | ±5.0        | PASS   |
| TX-ANL         | FM              | V <sub>N</sub>  | 20          | 0.040                 | -0.017          | -0.111          | ±5.0        | PASS   |
| TX-ANL         | FM              | V <sub>N</sub>  | 30          | 0.041                 | -0.018          | -0.116          | ±5.0        | PASS   |
| TX-ANL         | FM              | V <sub>N</sub>  | 40          | 0.040                 | -0.017          | -0.113          | ±5.0        | PASS   |
| TX-ANL         | FM              | V <sub>N</sub>  | 50          | 0.041                 | -0.018          | -0.116          | ±5.0        | PASS   |

## A.7 Frequency Stability VS Voltage

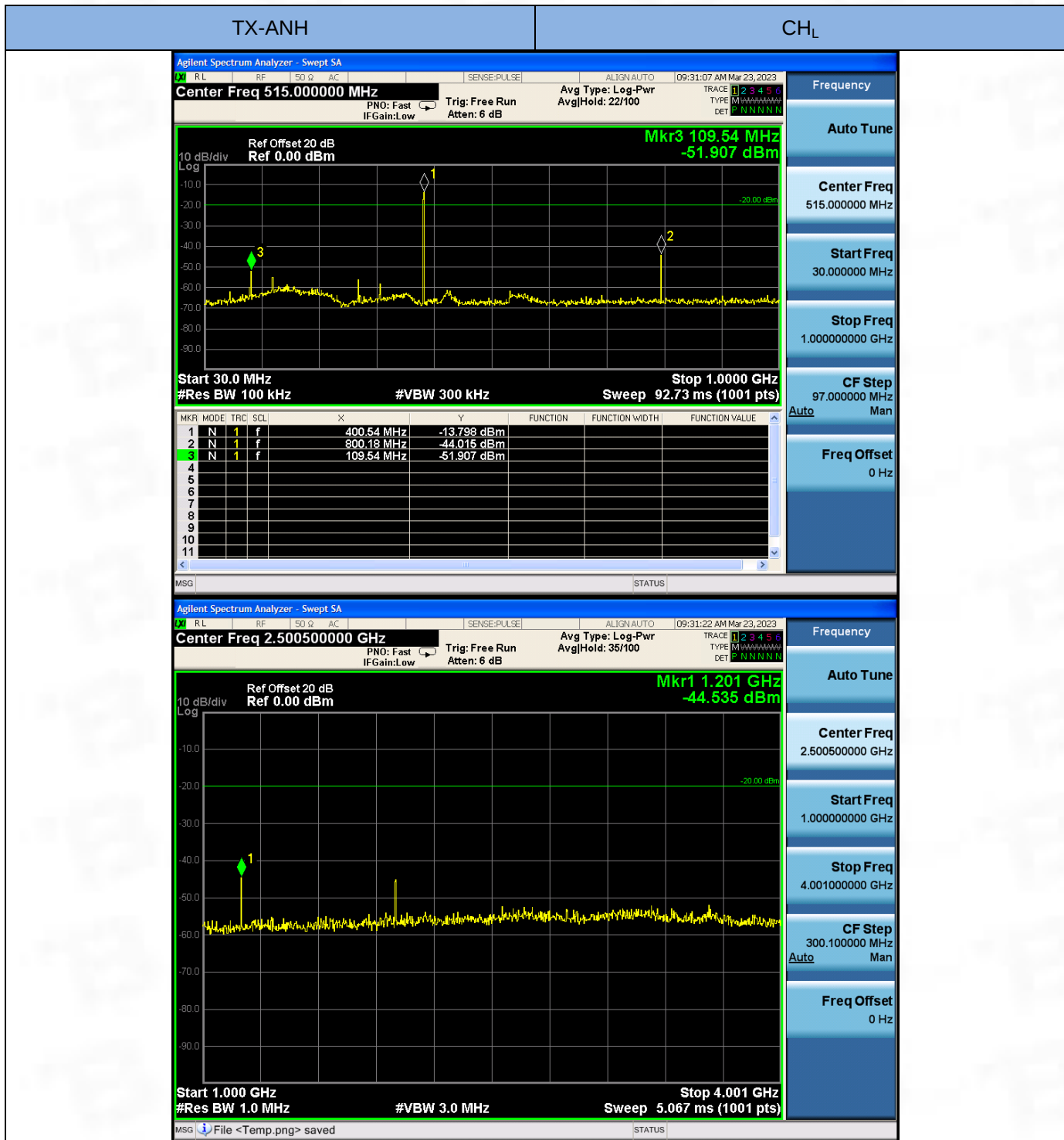
| Operation Mode | Modulation Type | Test Conditions |                | Frequency error (ppm) |                 |                 | Limit (ppm) | Result |
|----------------|-----------------|-----------------|----------------|-----------------------|-----------------|-----------------|-------------|--------|
|                |                 | Voltage         | Temperature    | CH <sub>L</sub>       | CH <sub>M</sub> | CH <sub>H</sub> |             |        |
| TX-DNH         | 4FSK            | V <sub>N</sub>  | T <sub>N</sub> | -0.591                | -0.606          | -0.652          | ±5.0        | PASS   |
| TX-DNH         | 4FSK            | V <sub>L</sub>  | T <sub>N</sub> | -0.597                | -0.607          | -0.663          | ±5.0        | PASS   |
| TX-DNH         | 4FSK            | V <sub>H</sub>  | T <sub>N</sub> | -0.625                | -0.611          | -0.673          | ±5.0        | PASS   |
| TX-DNL         | 4FSK            | V <sub>N</sub>  | T <sub>N</sub> | -0.583                | -0.611          | -0.643          | ±5.0        | PASS   |
| TX-DNL         | 4FSK            | V <sub>L</sub>  | T <sub>N</sub> | -0.591                | -0.613          | -0.652          | ±5.0        | PASS   |
| TX-DNL         | 4FSK            | V <sub>H</sub>  | T <sub>N</sub> | -0.591                | -0.635          | -0.663          | ±5.0        | PASS   |
| TX-ANH         | FM              | V <sub>N</sub>  | T <sub>N</sub> | 0.075                 | -0.002          | -0.032          | ±5.0        | PASS   |
| TX-ANH         | FM              | V <sub>L</sub>  | T <sub>N</sub> | 0.076                 | -0.002          | -0.033          | ±5.0        | PASS   |
| TX-ANH         | FM              | V <sub>H</sub>  | T <sub>N</sub> | 0.075                 | -0.002          | -0.033          | ±5.0        | PASS   |
| TX-ANL         | FM              | V <sub>N</sub>  | T <sub>N</sub> | 0.040                 | -0.017          | -0.111          | ±5.0        | PASS   |
| TX-ANL         | FM              | V <sub>L</sub>  | T <sub>N</sub> | 0.040                 | -0.017          | -0.111          | ±5.0        | PASS   |
| TX-ANL         | FM              | V <sub>H</sub>  | T <sub>N</sub> | 0.042                 | -0.018          | -0.117          | ±5.0        | PASS   |

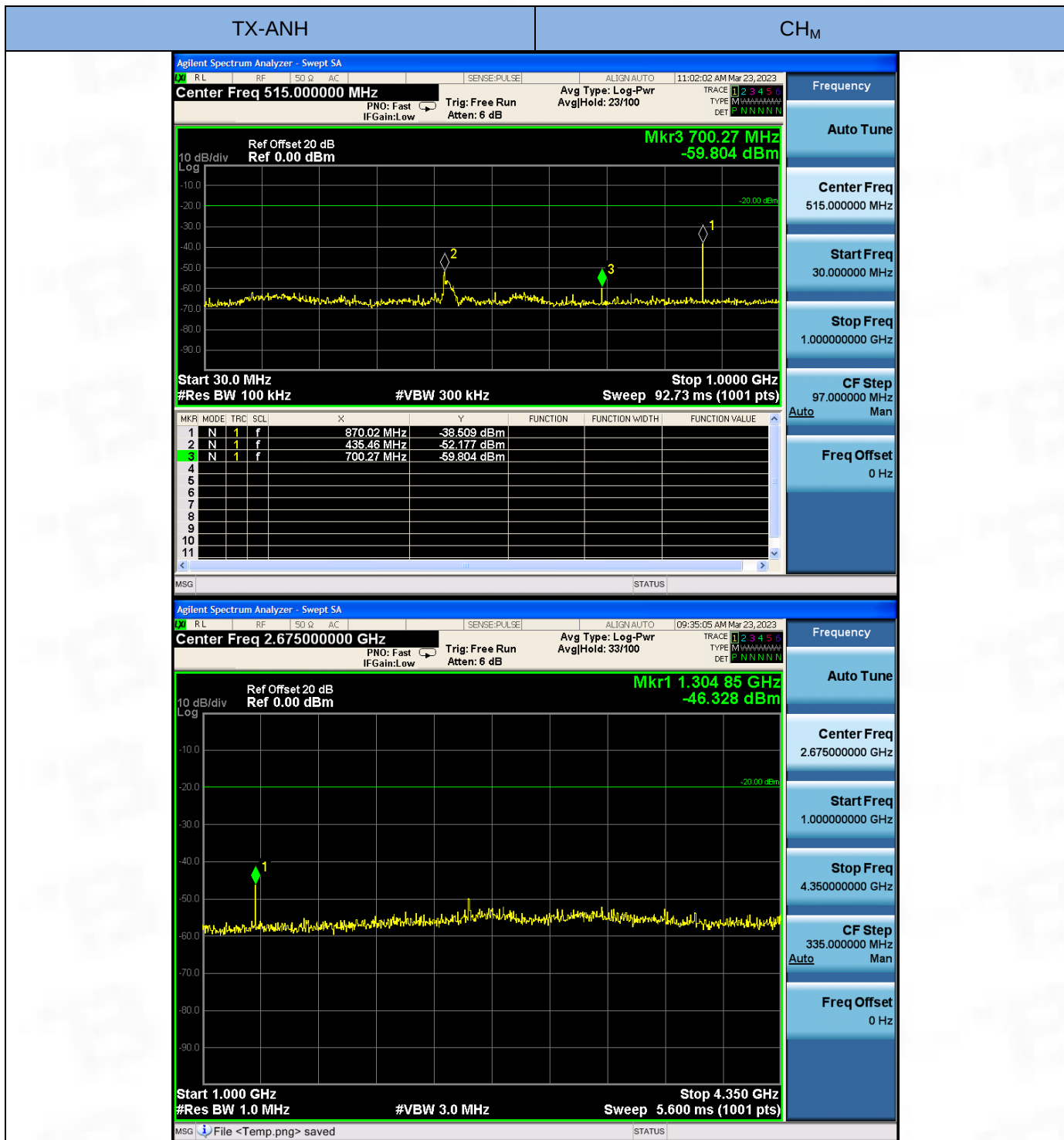
## A.8 Transient Frequency Behavior

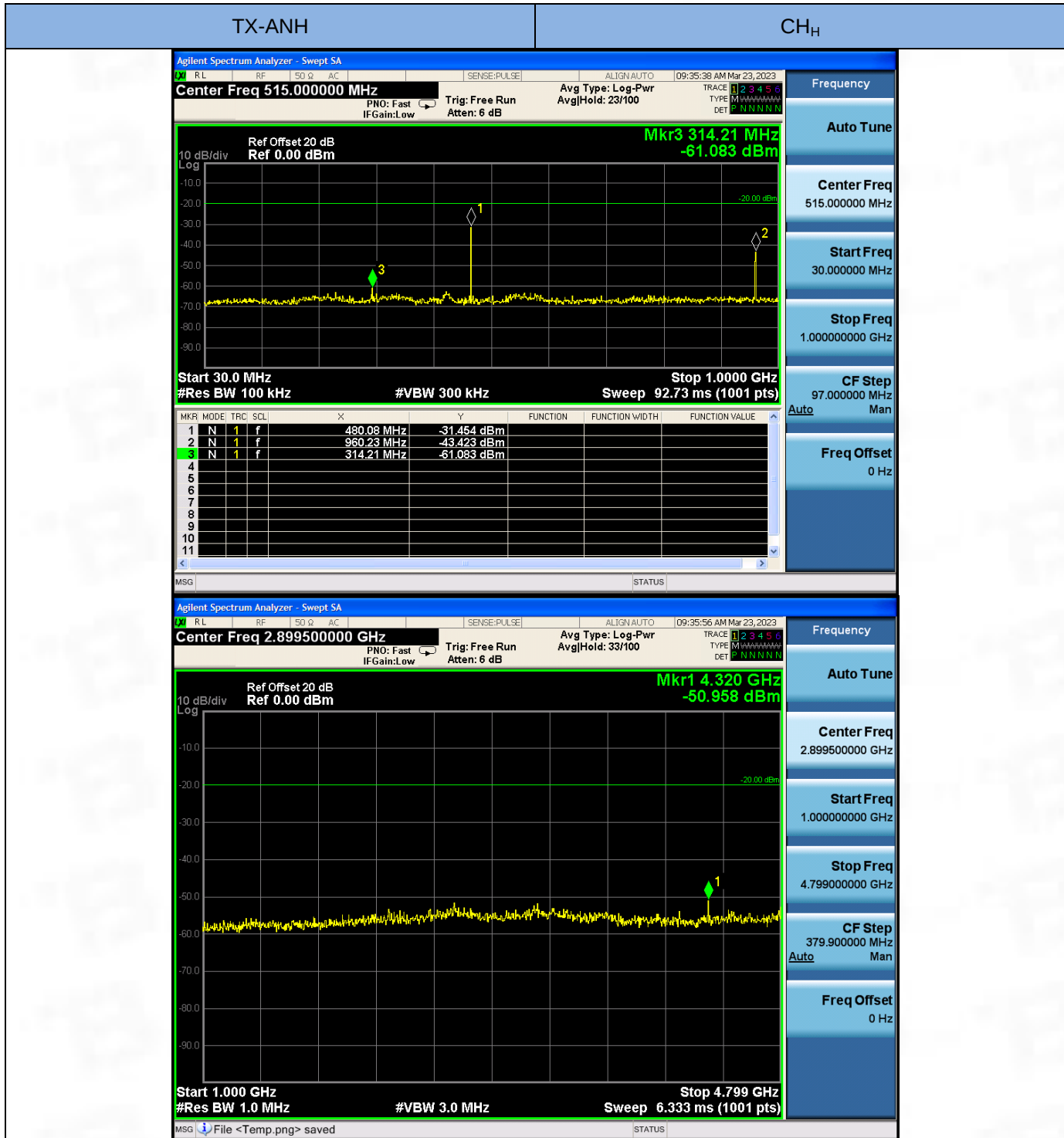


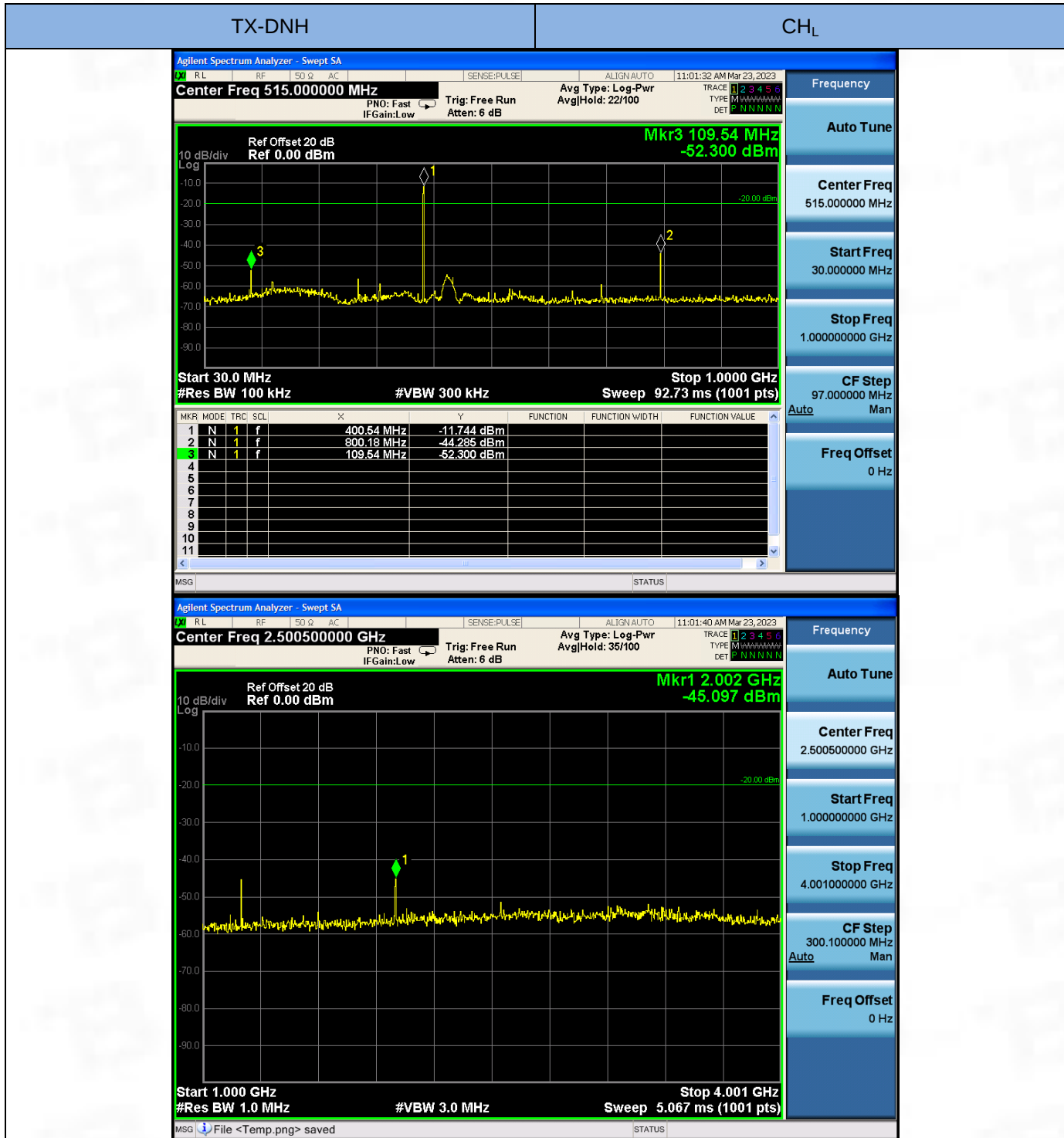


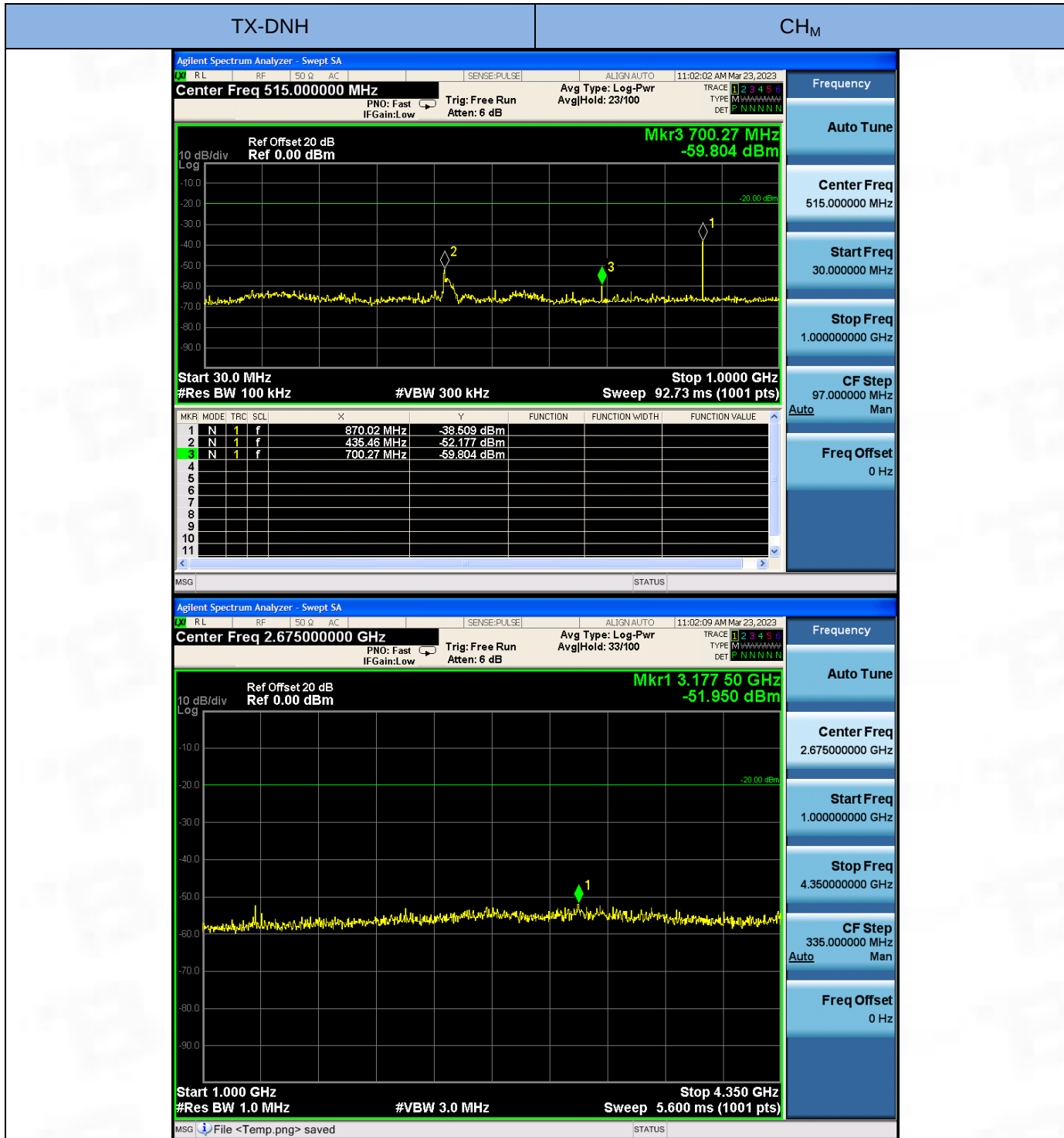
## A.9 Transmit Conducted Spurious Emission

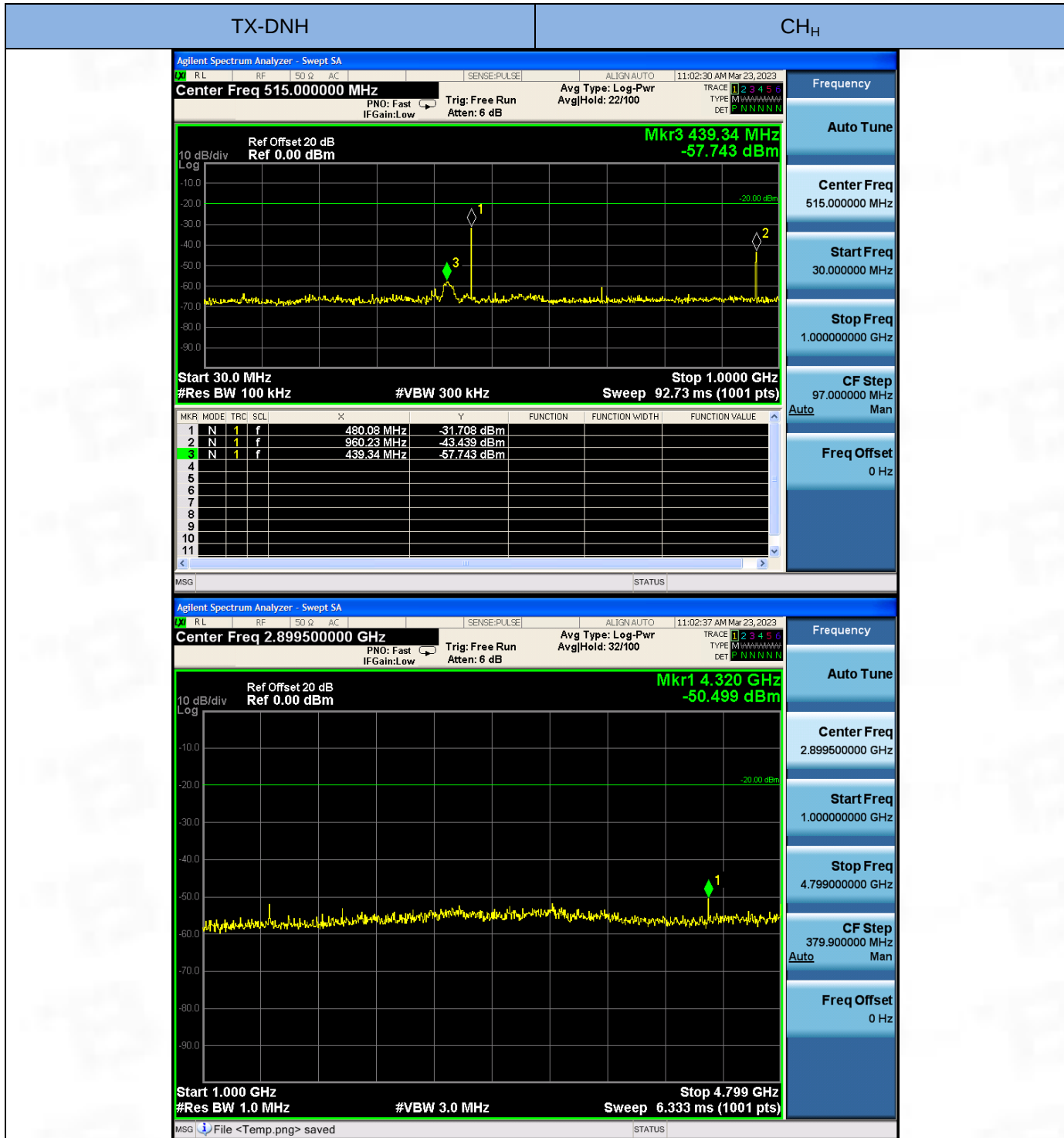




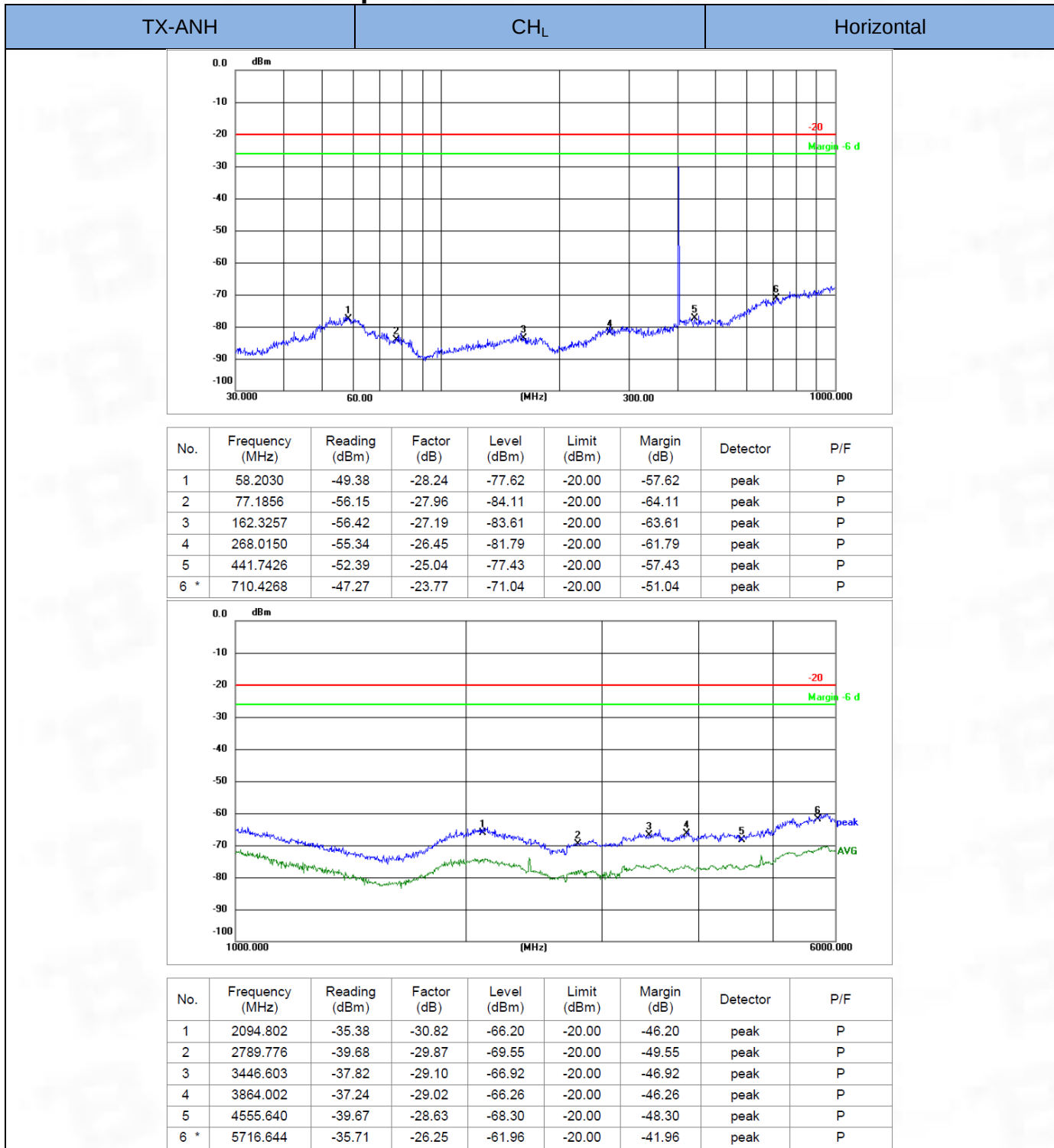


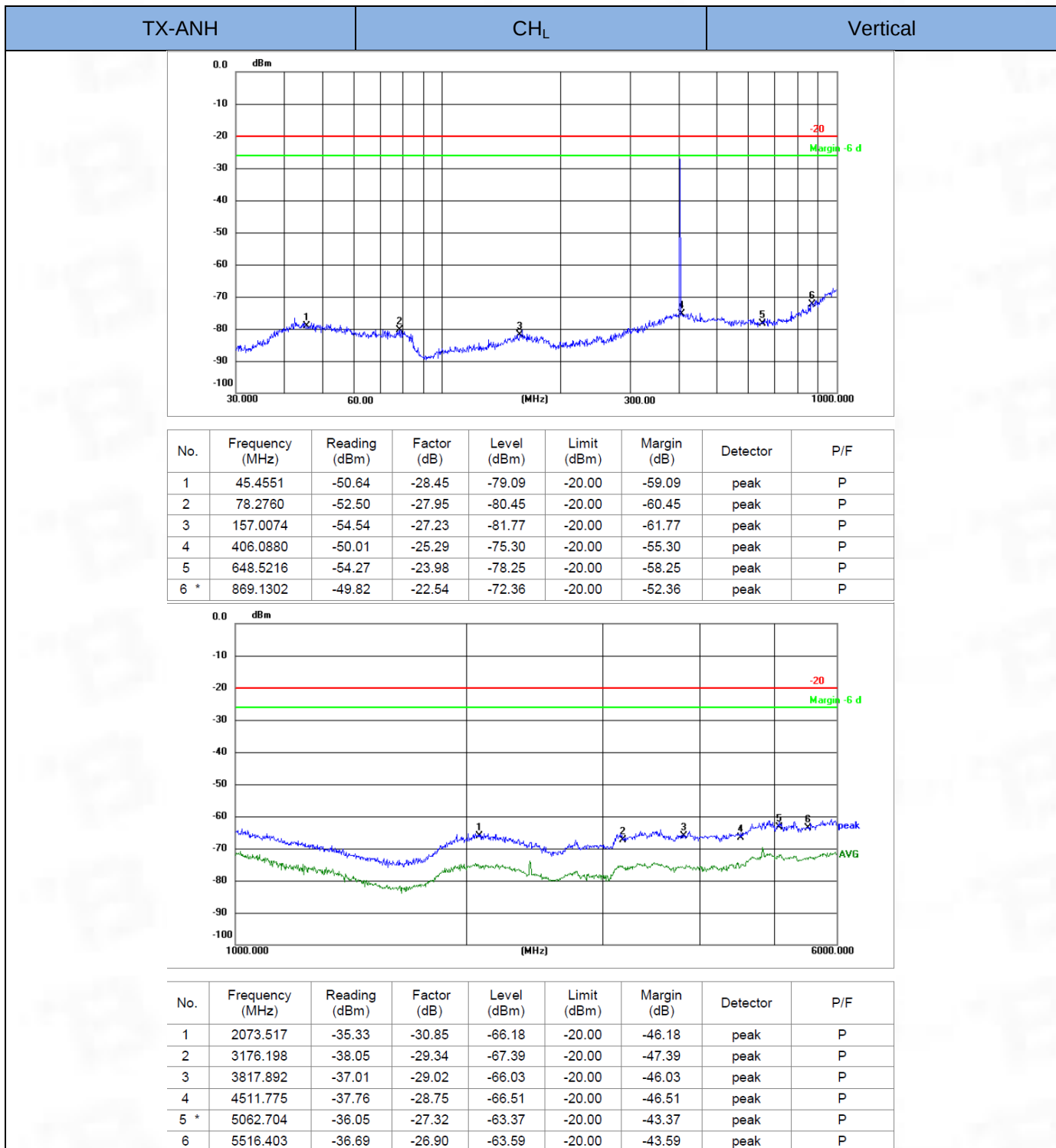


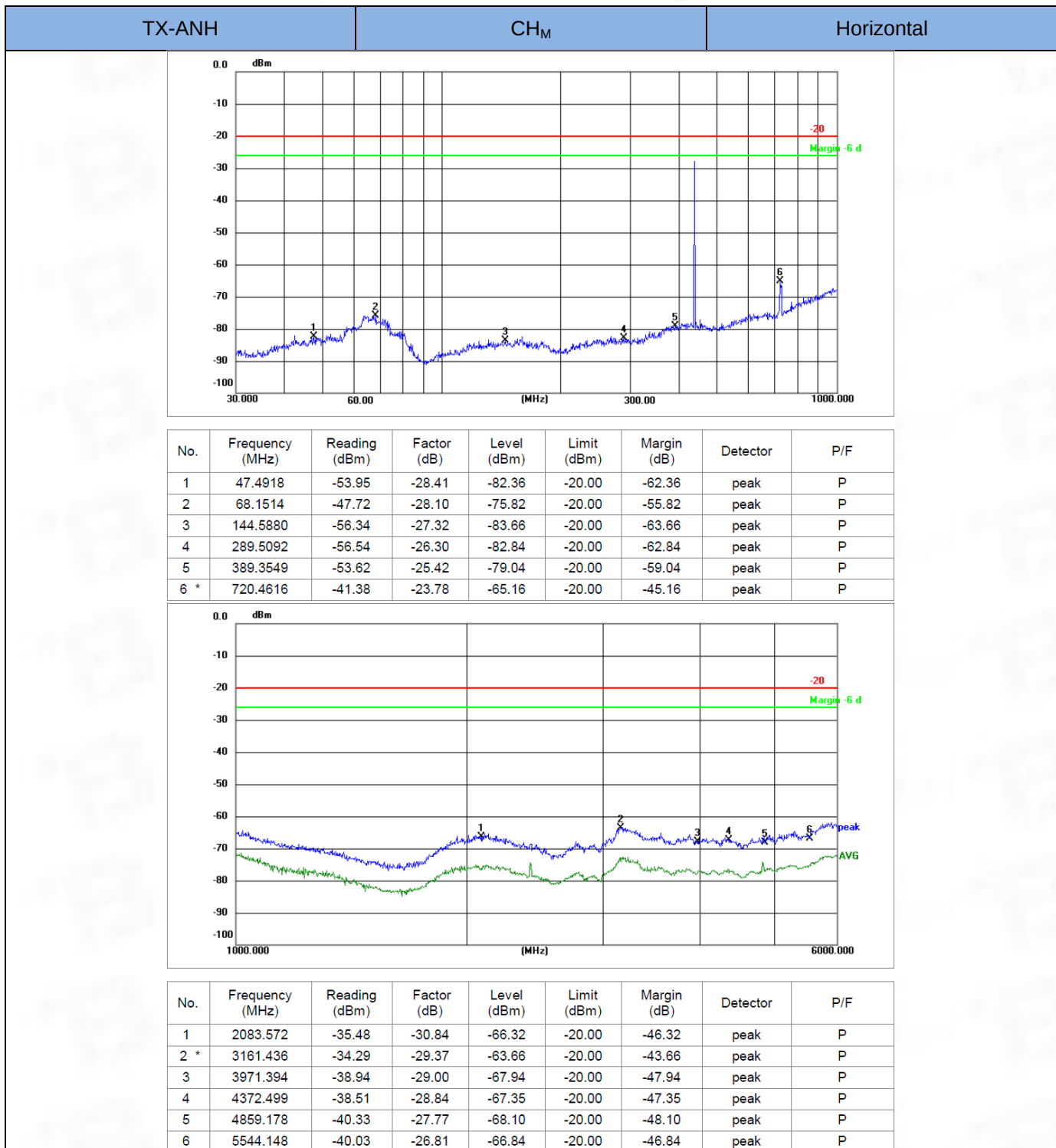


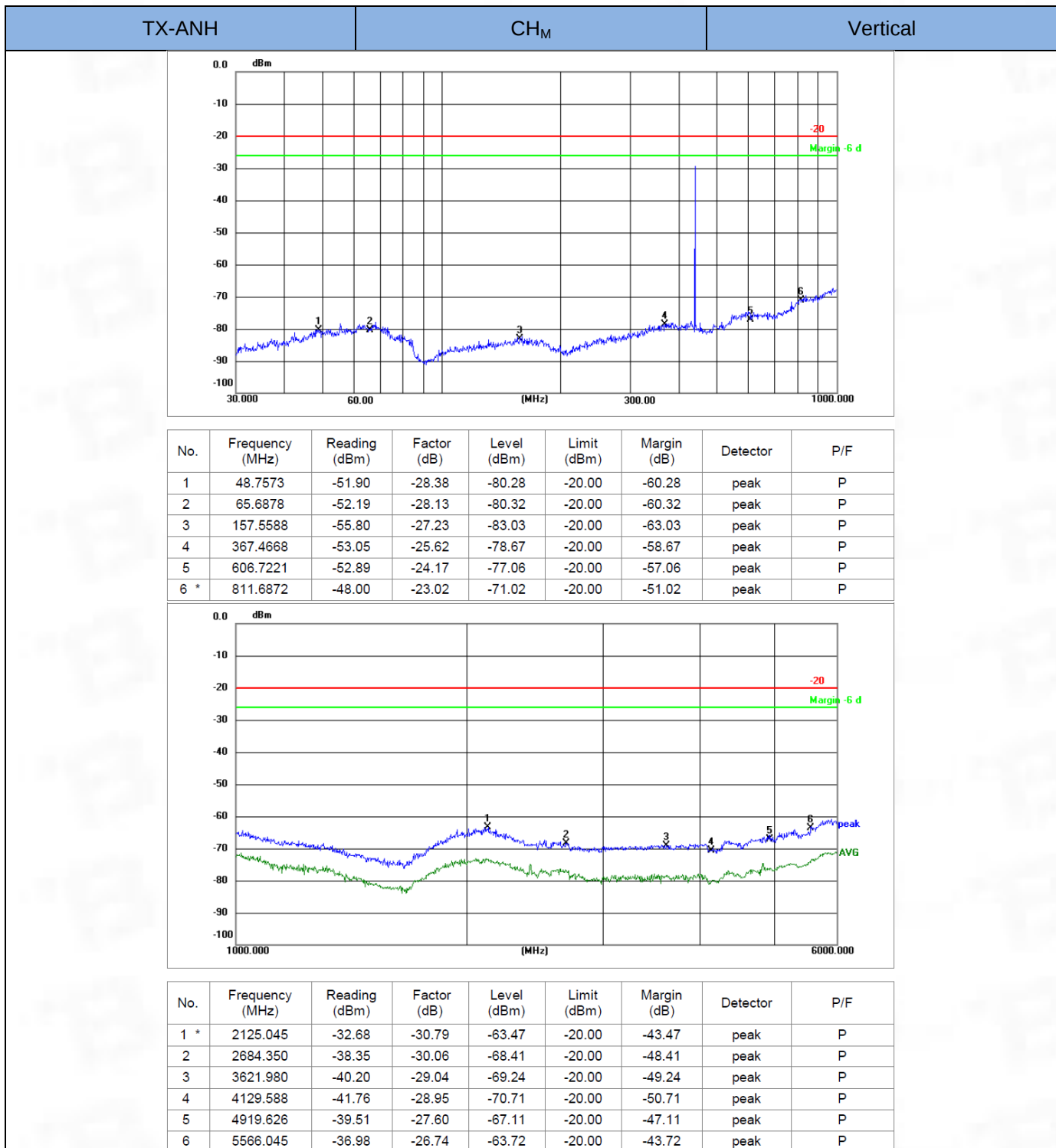


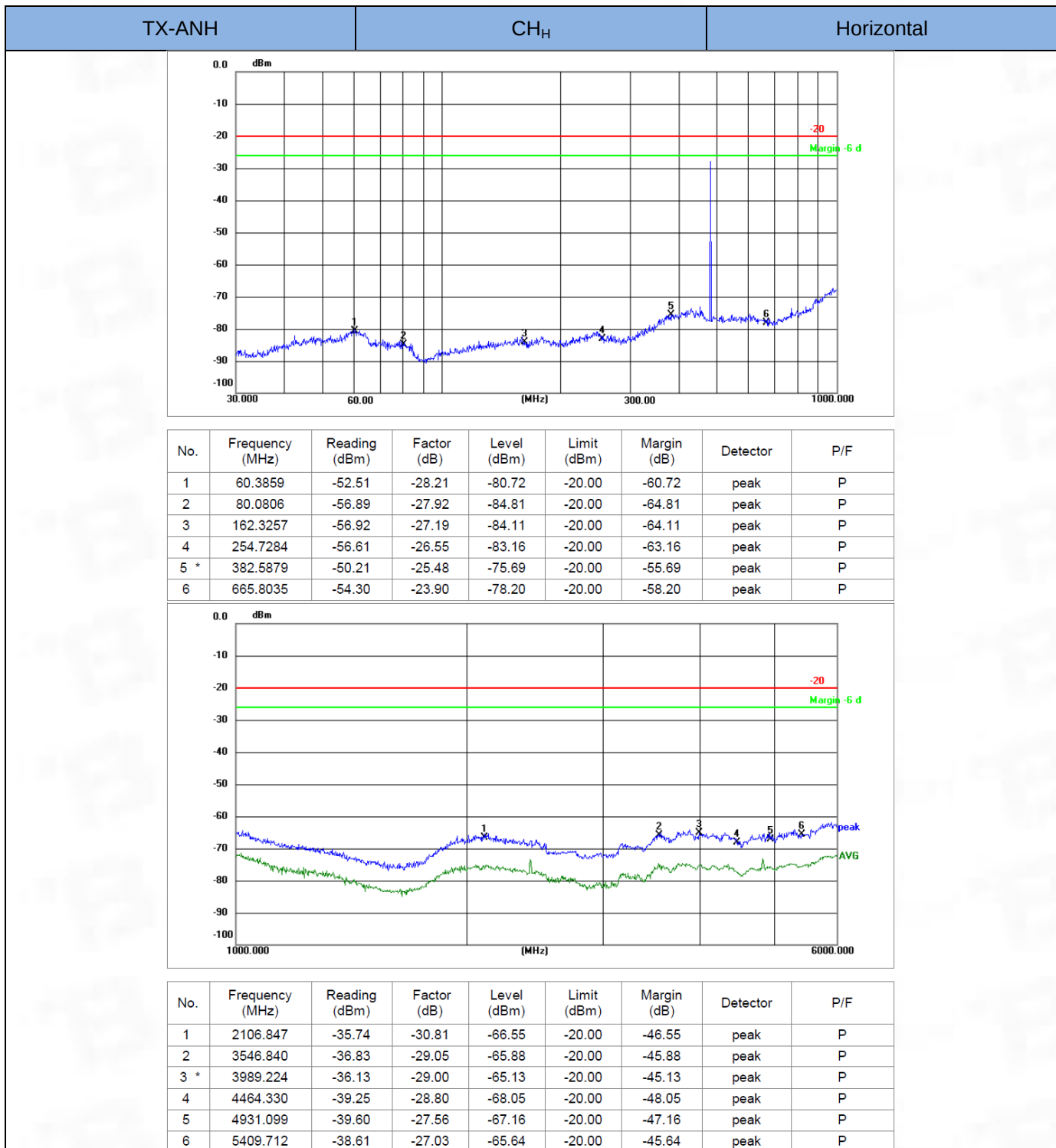
## A.10 Transmit Radiated Spurious Emission

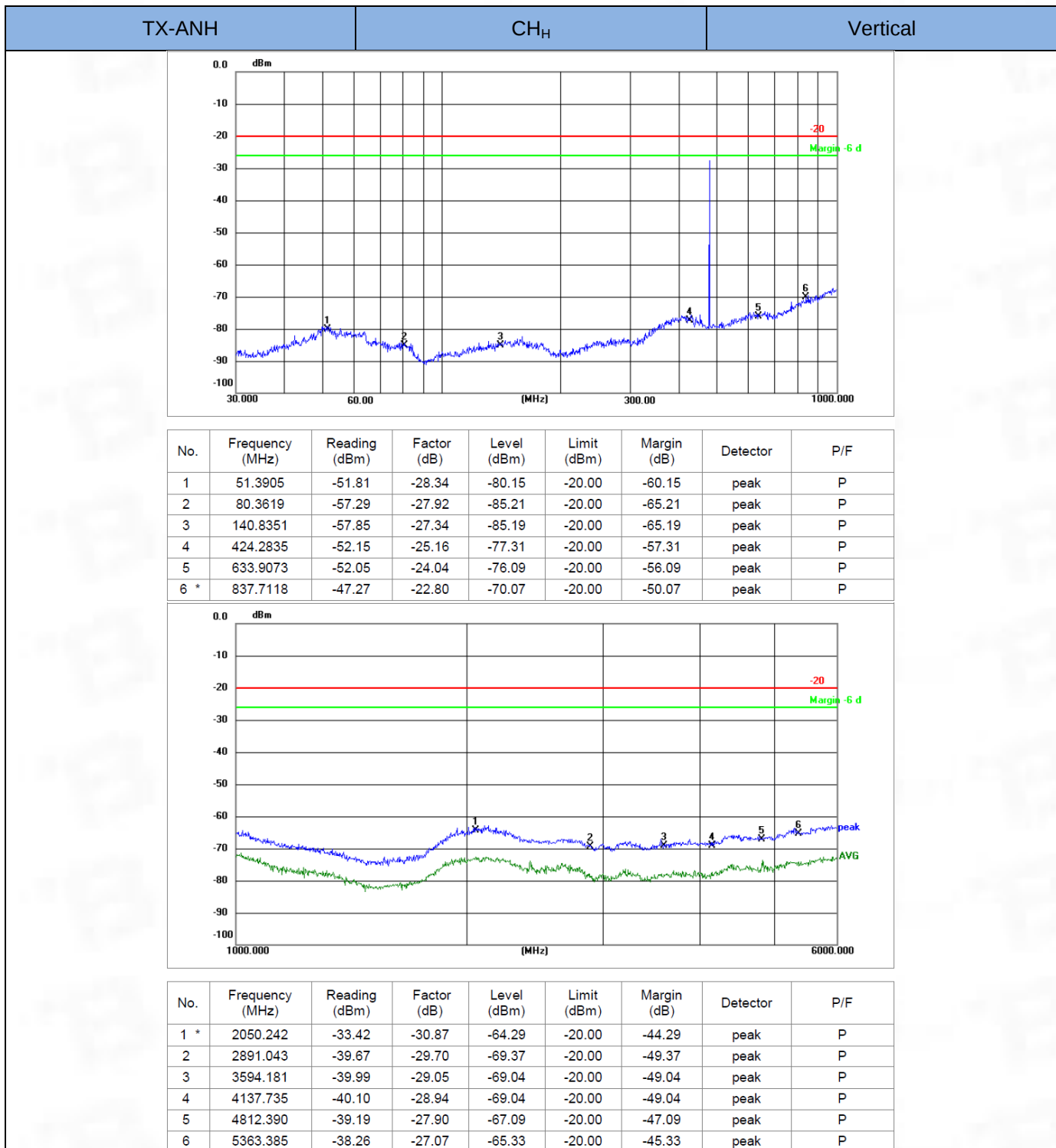


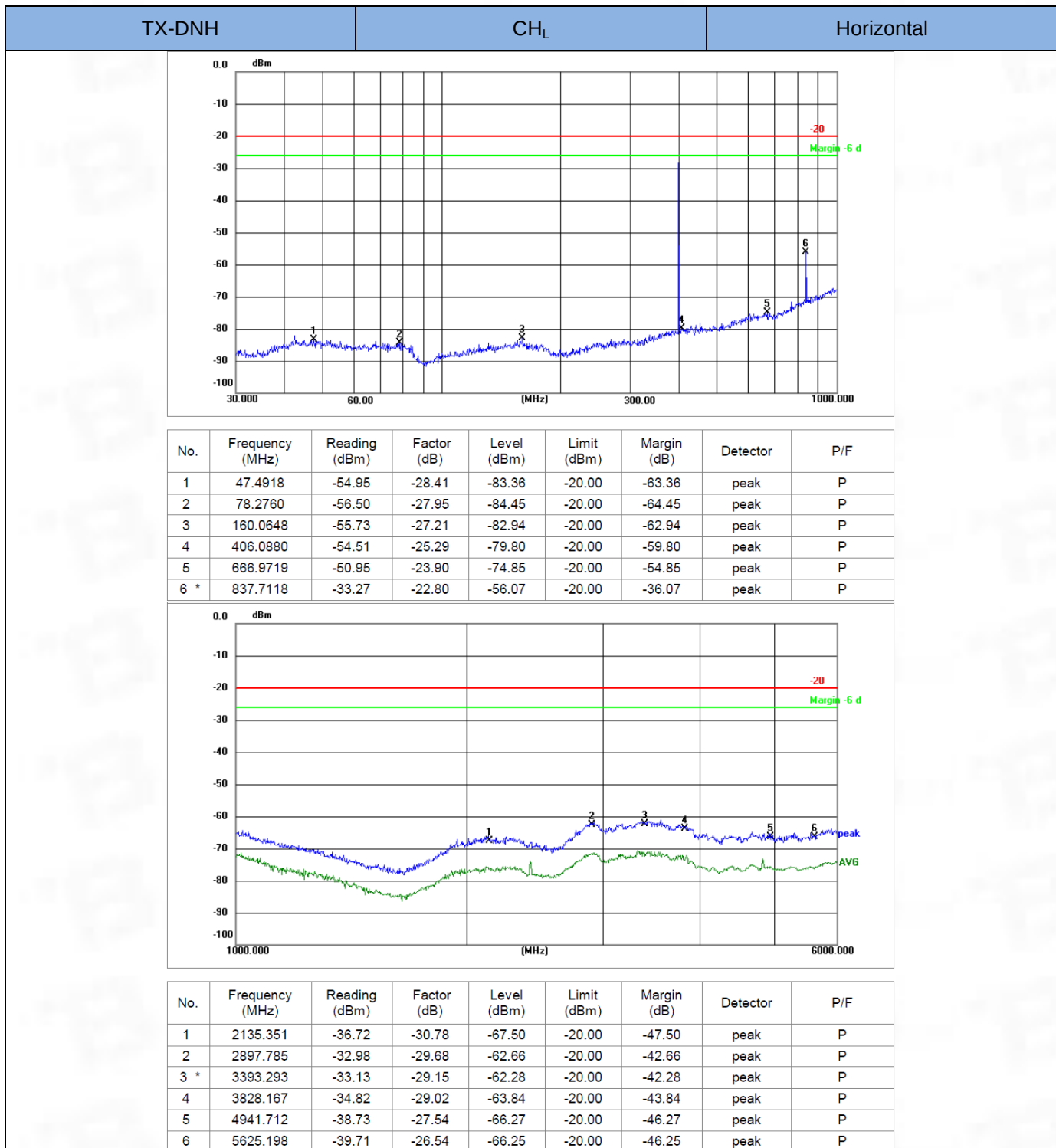


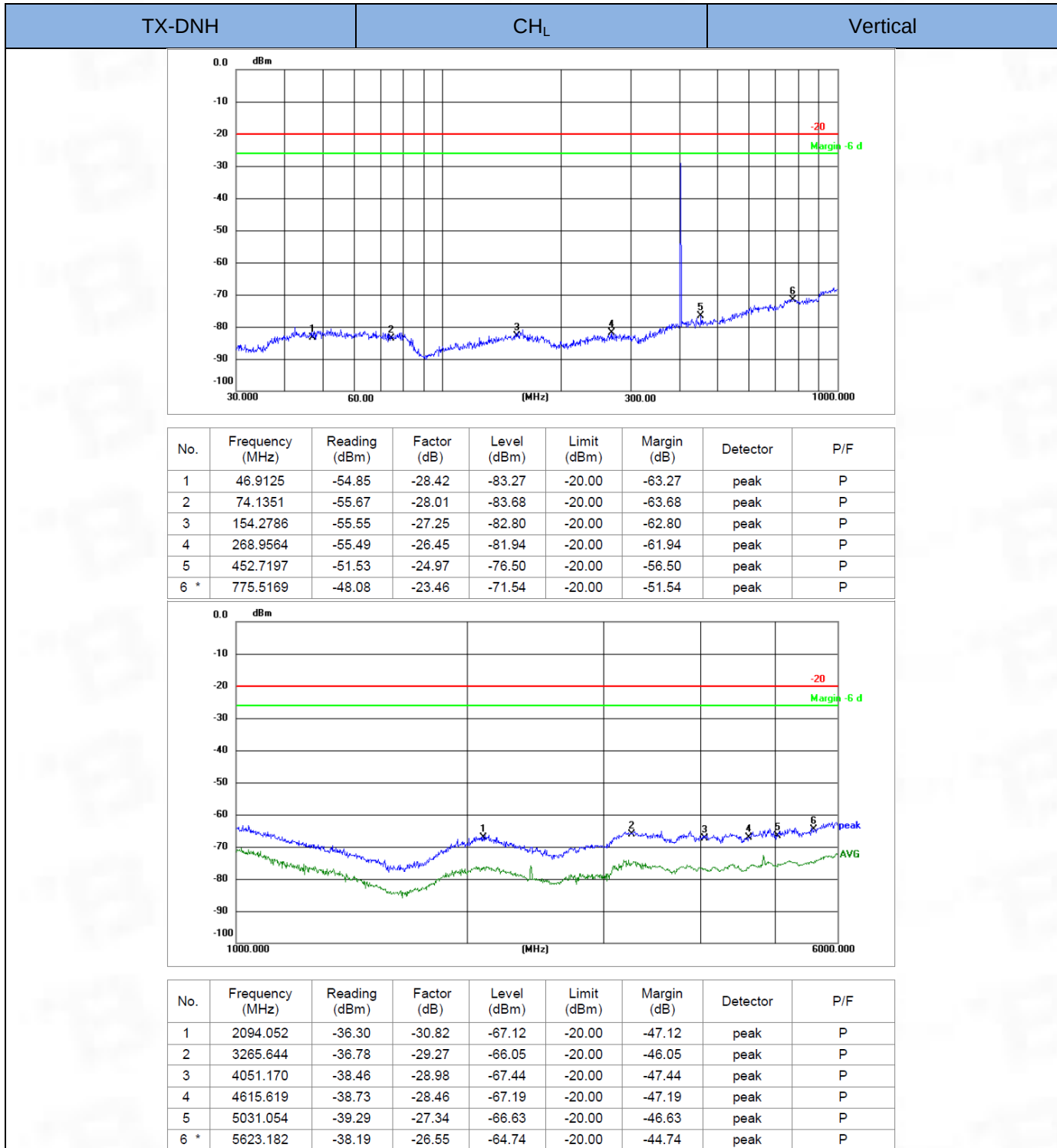


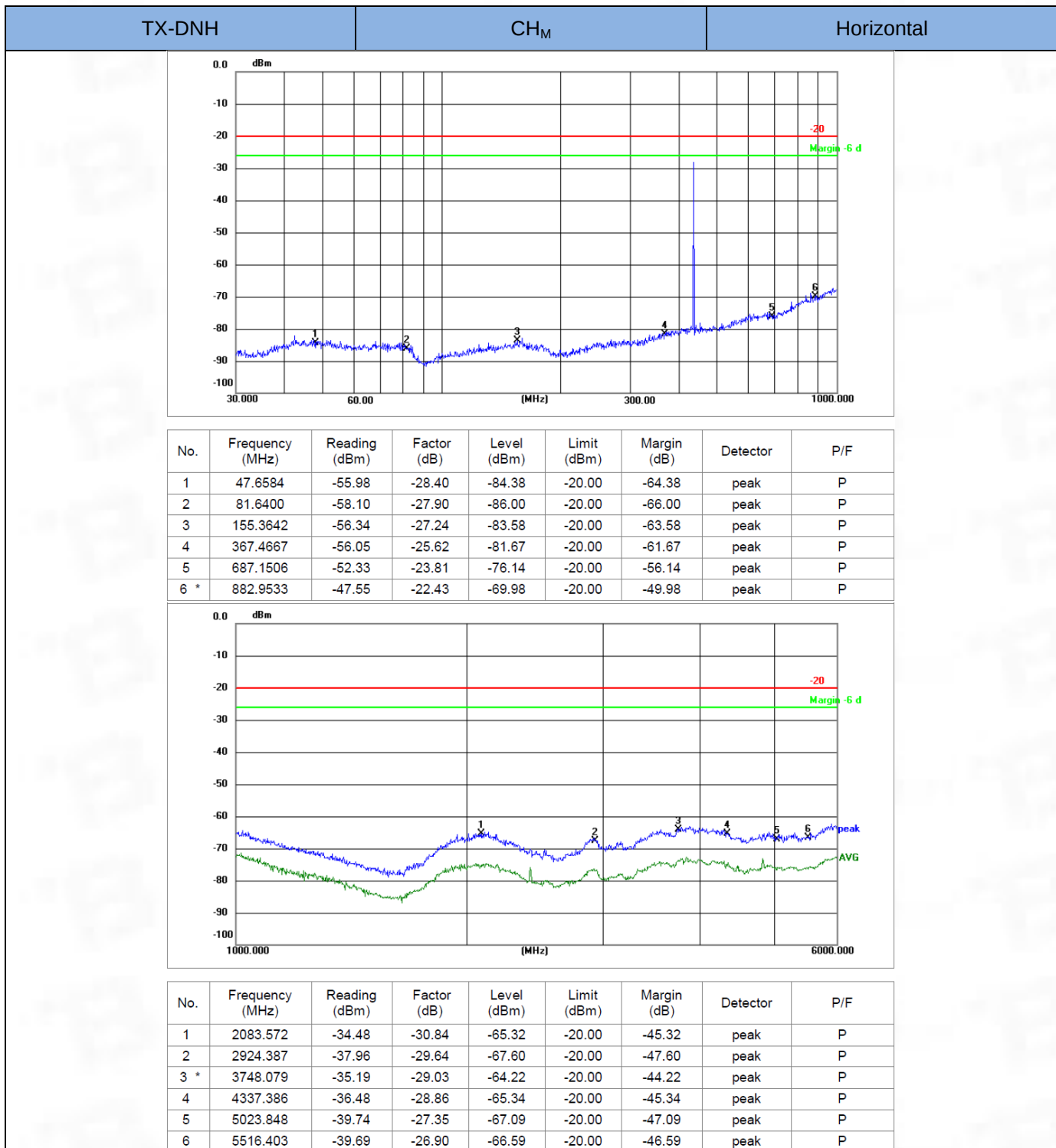


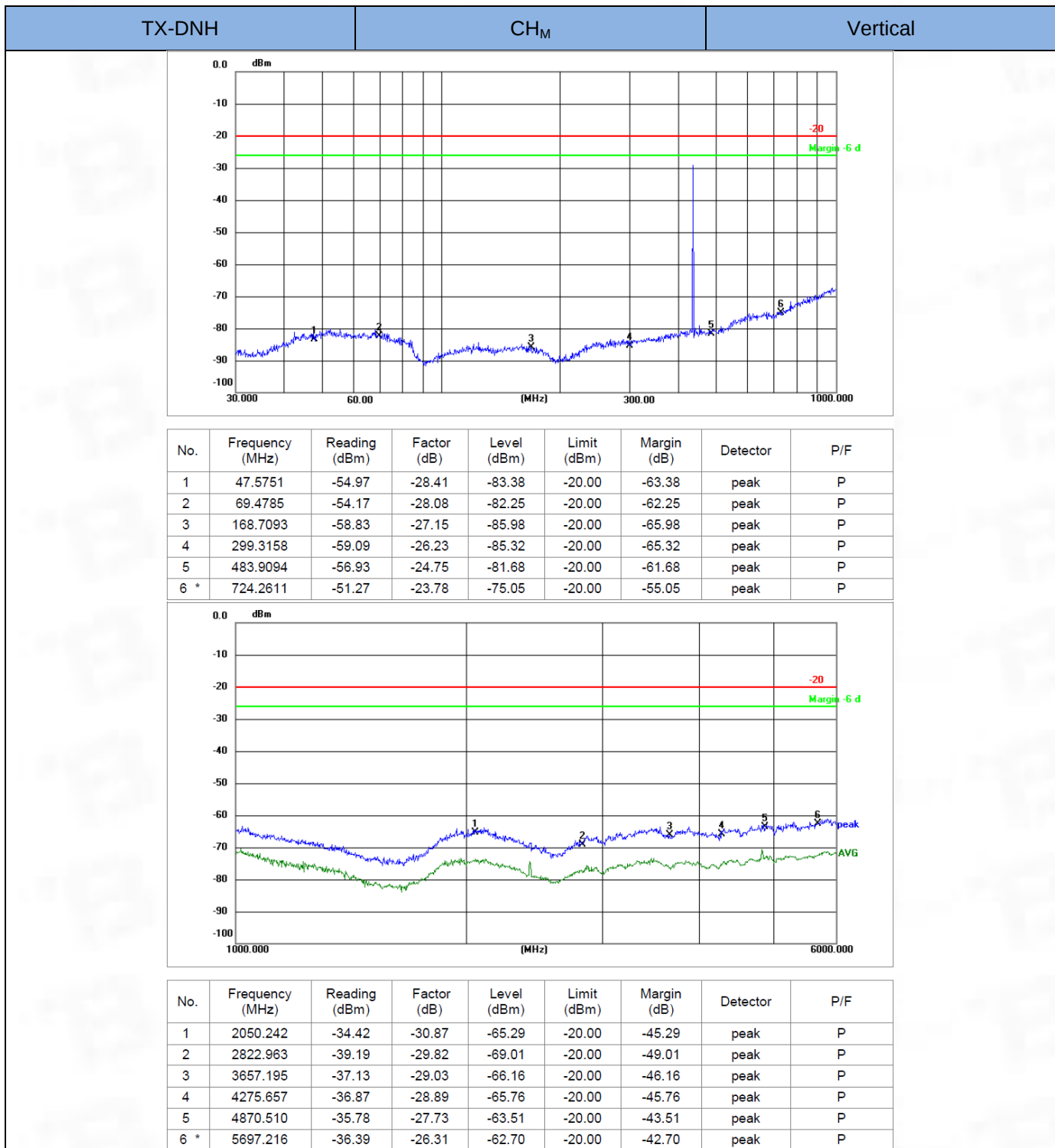


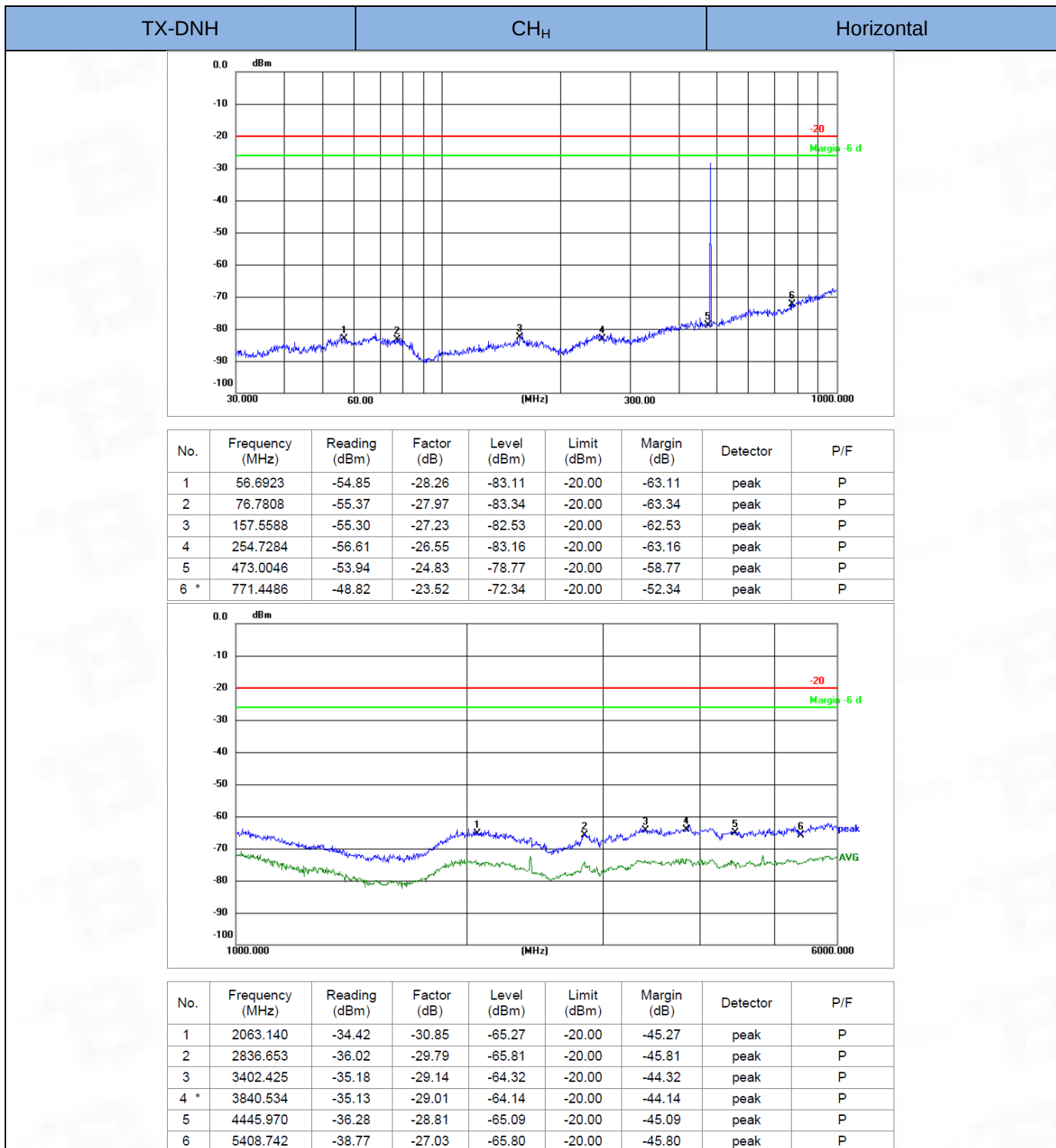


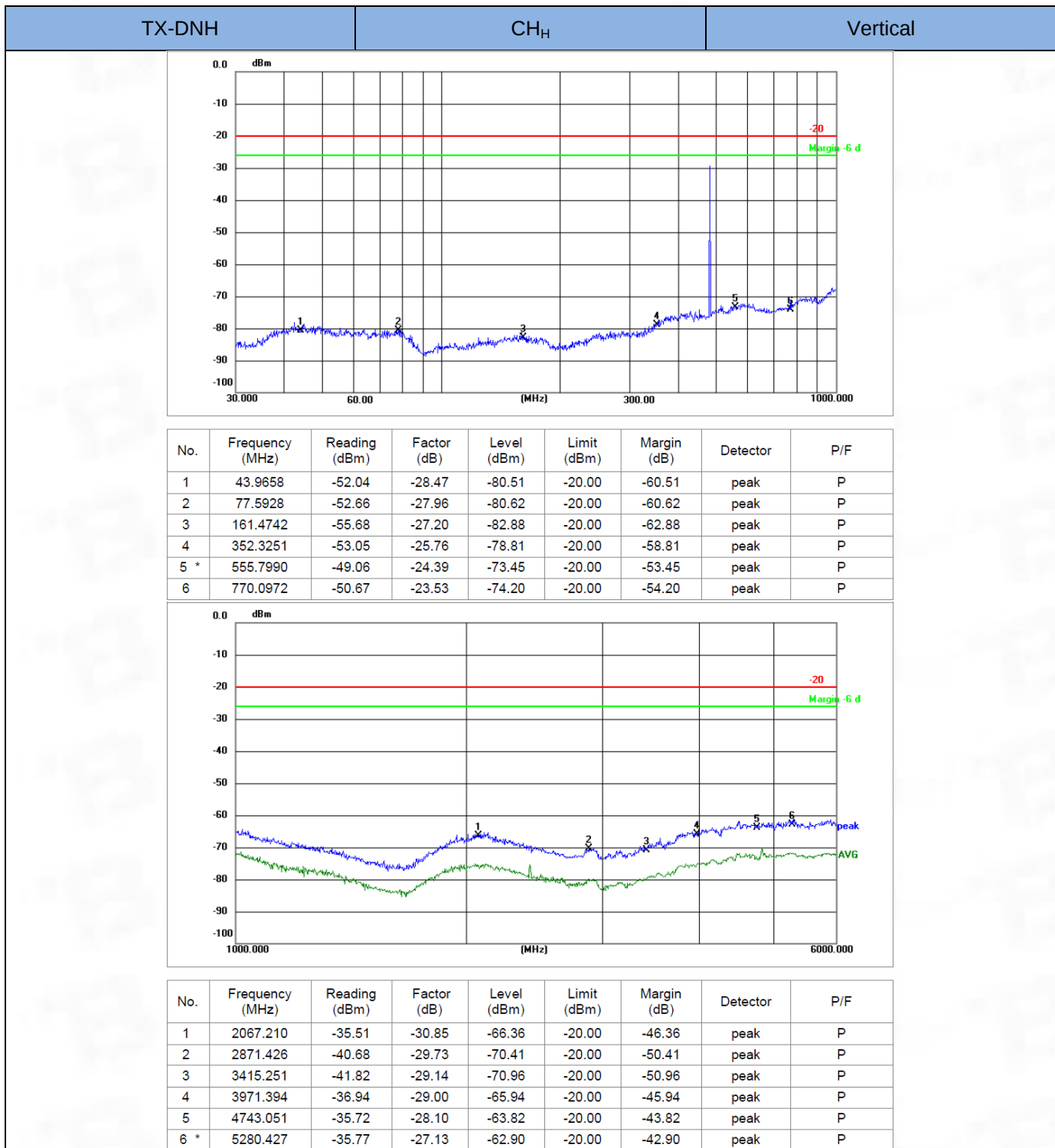






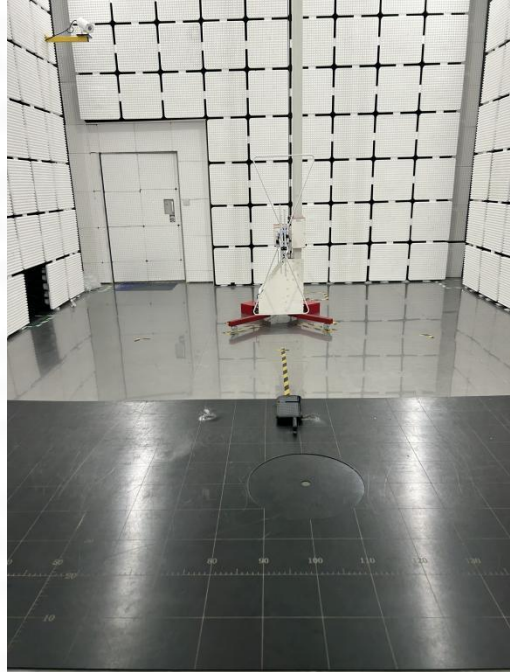






## ANNEX B TEST SETUP PHOTOS

**Transmitter unwanted emissions in the spurious domain (30MHz to 1GHz)**  
**Receiver spurious emissions (30MHz to 1GHz)**



**Transmitter unwanted emissions in the spurious domain (above 1GHz)**  
**Receiver spurious emissions (above 1GHz)**



## **ANNEX C     EUT EXTERNAL PHOTOS**

Please refer to EUT PHOTO

## **ANNEX D     EUT INTERNAL PHOTOS**

Please refer to EUT PHOTO



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**--END OF REPORT--**