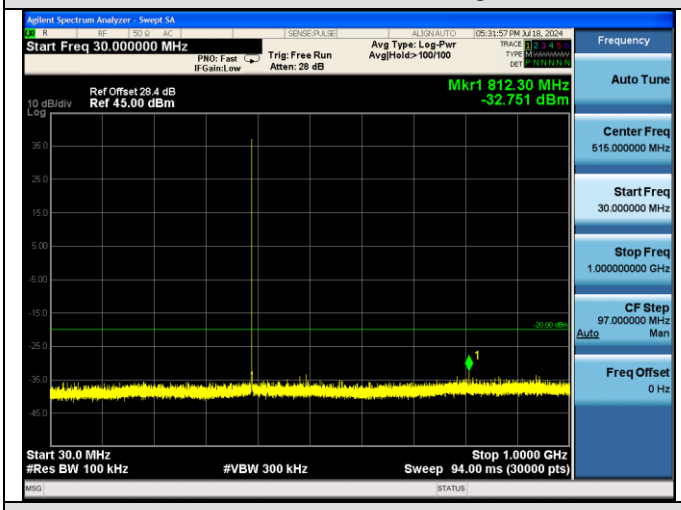
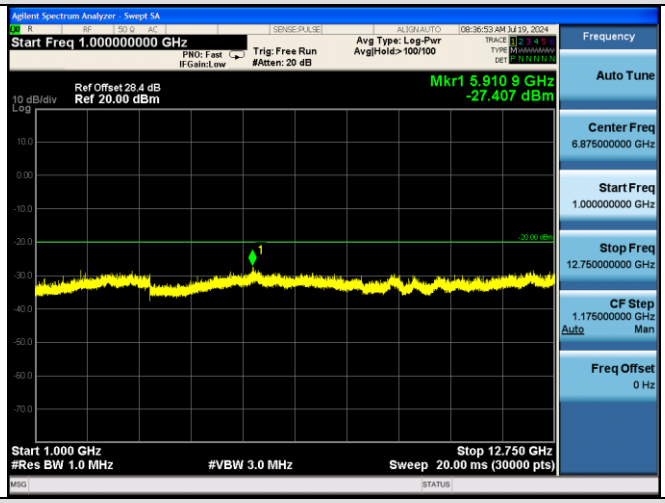
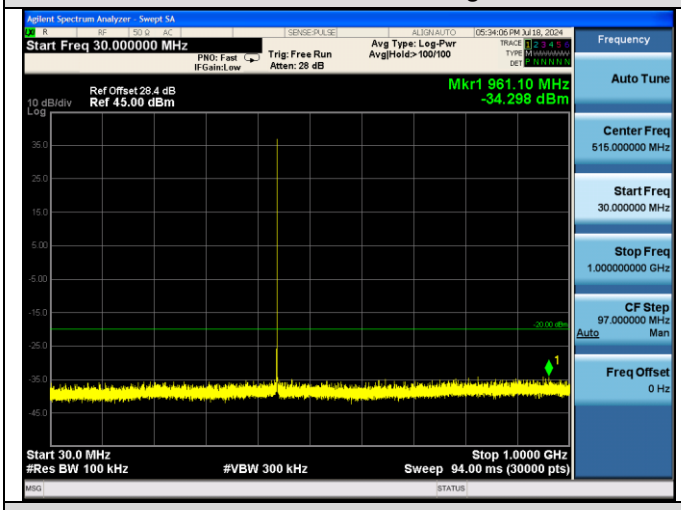
12.5kHz, Analog modulation, Assigned Frequency:406.125MHz, 5W

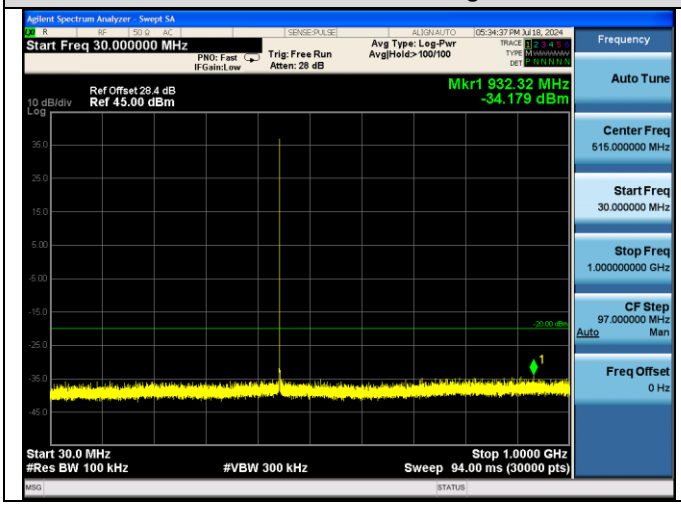


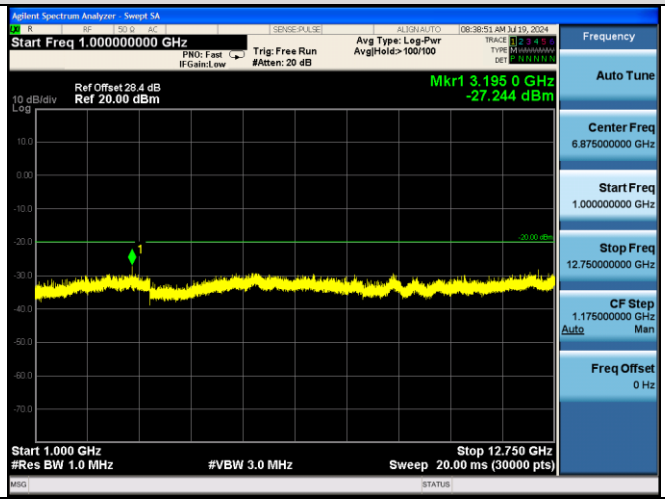




12.5kHz, Analog modulation, Assigned Frequency:453.2125MHz, 5W



12.5kHz, Analog modulation, Assigned Frequency:458.2125MHz, 5W

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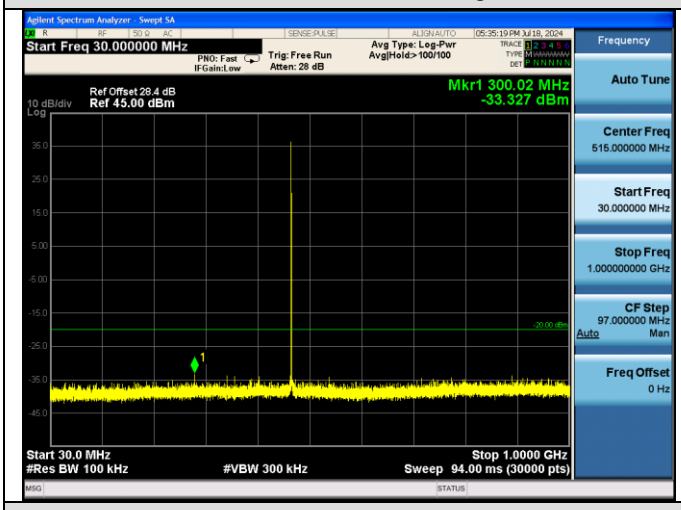
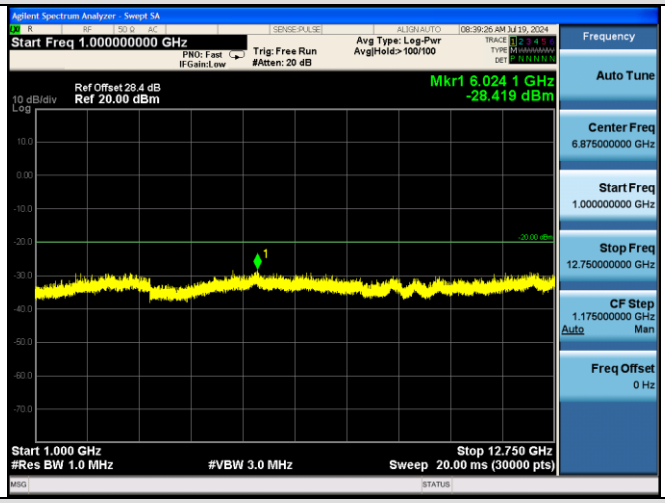
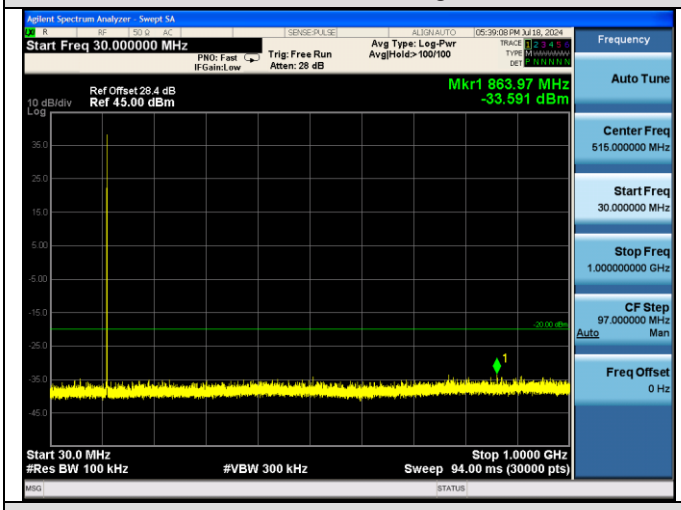
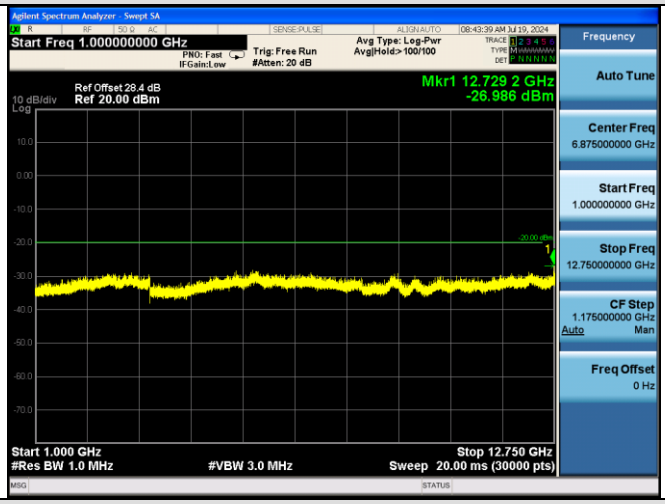
12.5kHz, Analog modulation, Assigned Frequency:479.975MHz, 5W



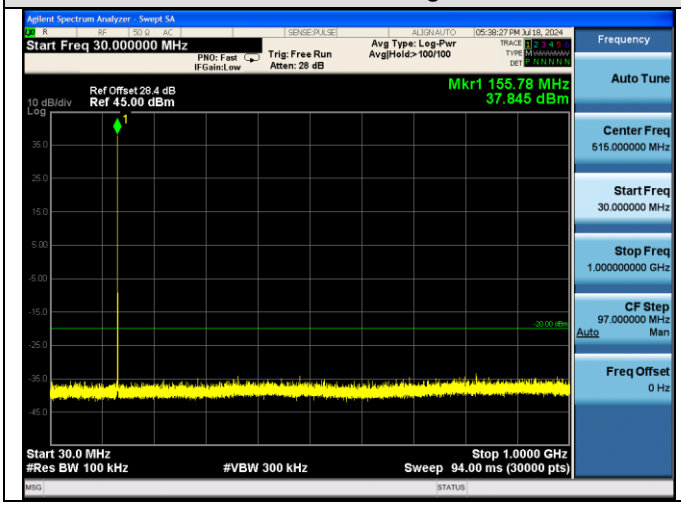



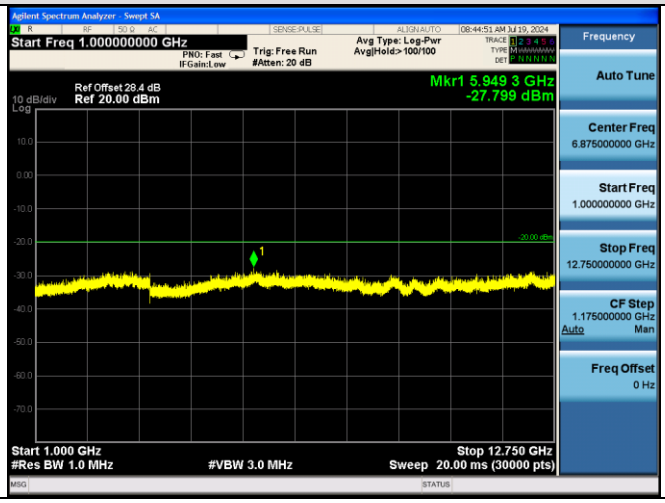

12.5kHz, Digital modulation, Assigned Frequency:136.025MHz, 7W




12.5kHz, Digital modulation, Assigned Frequency:155.7525MHz, 7W

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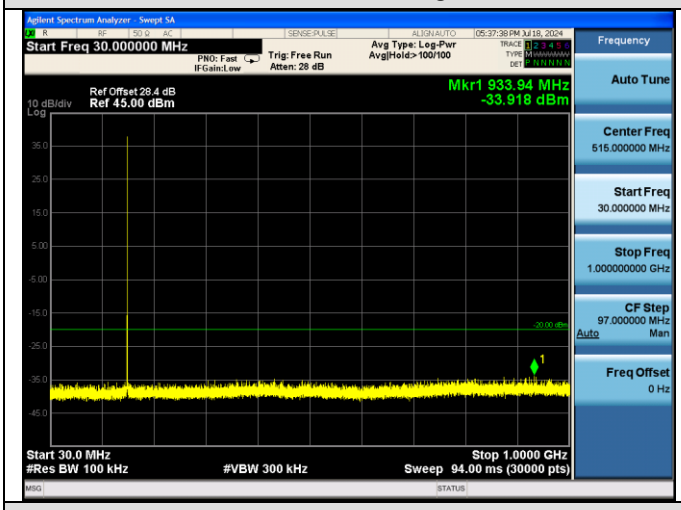
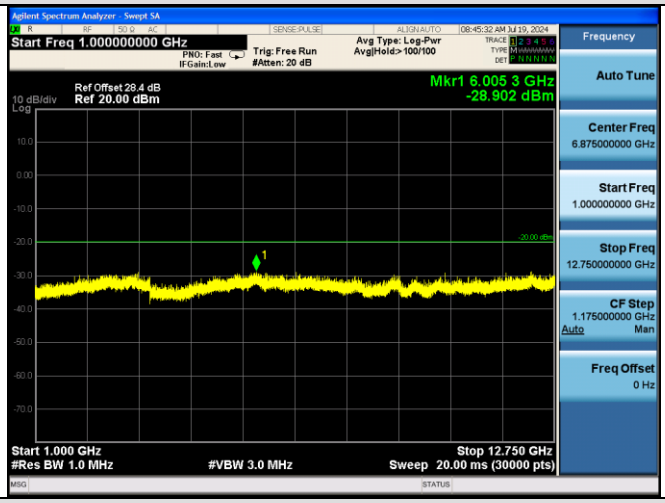
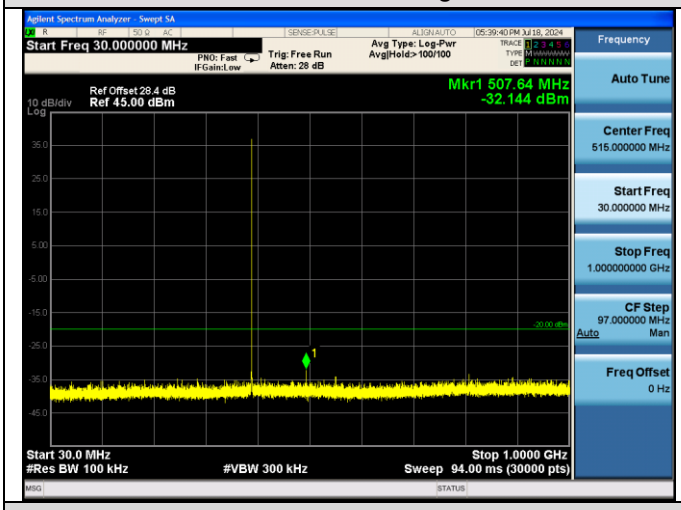
12.5kHz, Digital modulation, Assigned Frequency:173.975MHz, 7W

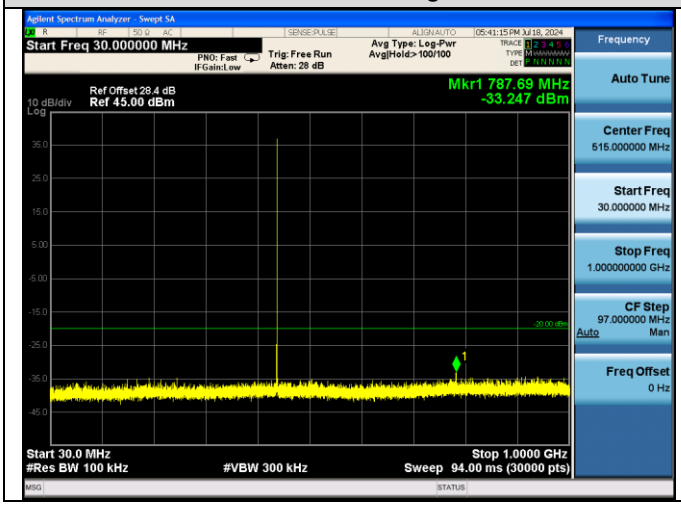


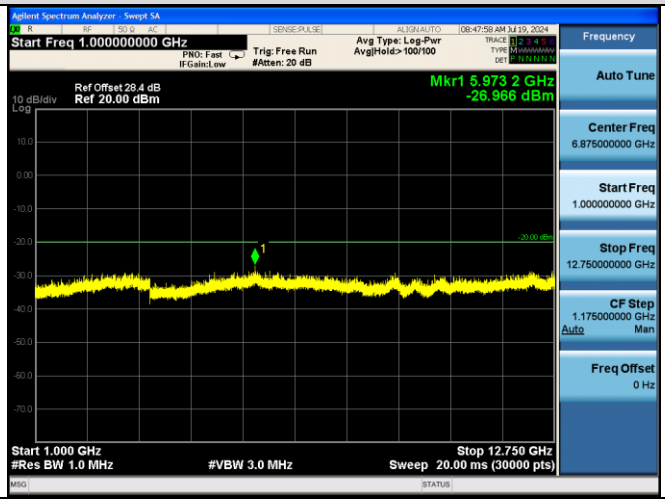




12.5kHz, Digital modulation, Assigned Frequency:406.125MHz,5W



12.5kHz, Digital modulation, Assigned Frequency:453.2125MHz, 5W

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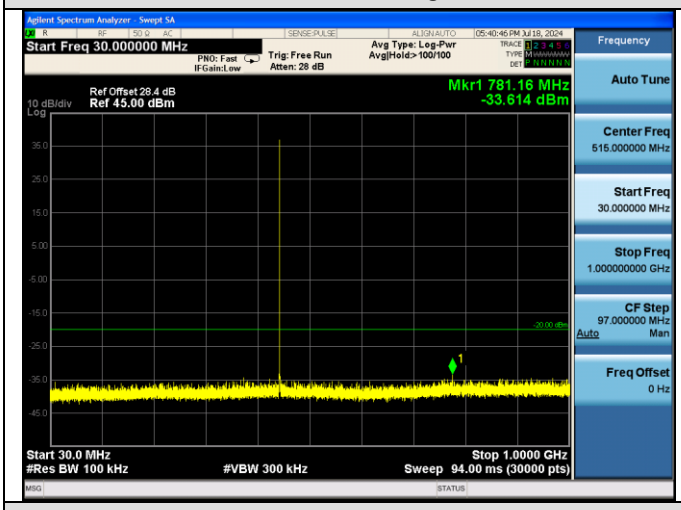
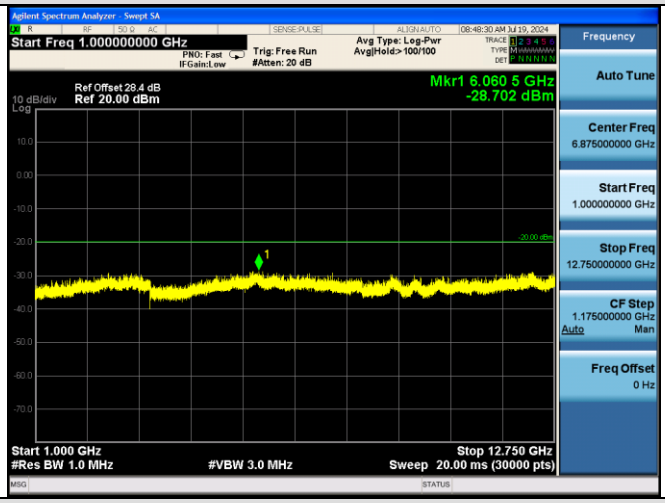
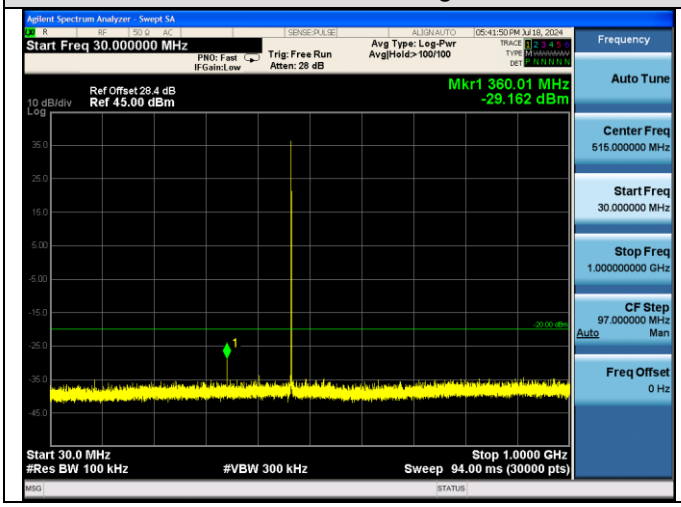
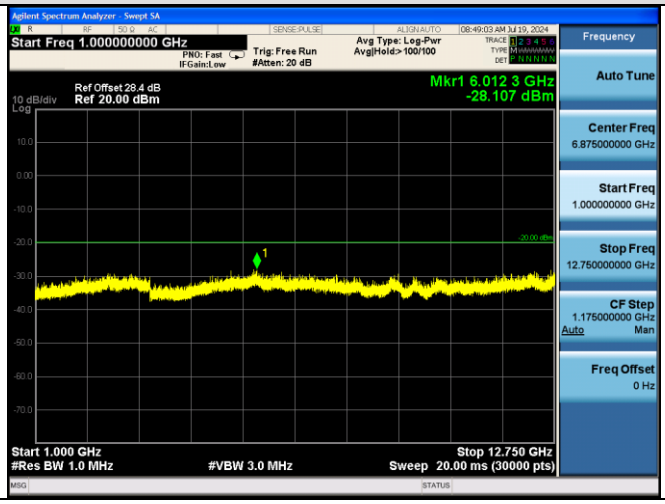
12.5kHz, Digital modulation, Assigned Frequency:458.2125MHz, 5W




12.5kHz, Digital modulation, Assigned Frequency:479.975MHz,5W




**Note:** All test frequencies was tested, but only the worst data be recorded in this part.

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# 12. Transmitter Frequency Behavior

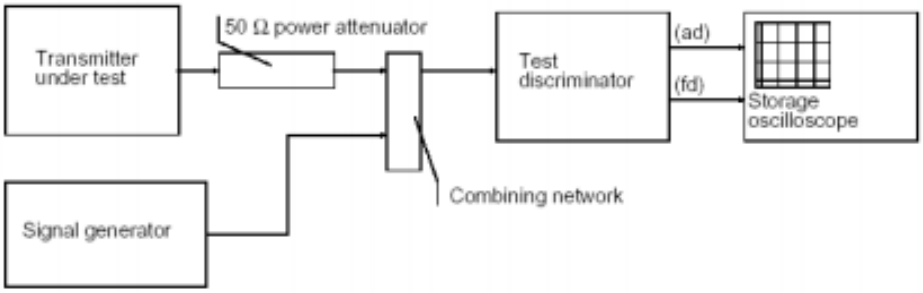
## 12.1 Provisions Applicable

47CFR FCC PART §90.214

| Time intervals [1, 2] | Maximum frequency difference [3] | All equipment | |
|---|---|---|---|
| | | 150 to 174 MHz | 421 to 512 MHz |
| Transient Frequency Behavior for Equipment Designed to Operate on 25 kHz Channels | | | |
| $t_1$ [4] | ± 25.0 kHz | 5.0 ms | 10.0 ms |
| $t_2$ | ± 12.5 kHz | 20.0 ms | 25.0 ms |
| $t_3$ [4] | ± 25.0 kHz | 5.0 ms | 10.0 ms |
| Transient Frequency Behavior for Equipment Designed to Operate on 12.5 kHz Channels | | | |
| $t_1$ [4] | ± 12.5 kHz | 5.0 ms | 10.0 ms |
| $t_2$ | ± 6.25 kHz | 20.0 ms | 25.0 ms |
| $t_3$ [4] | ± 12.5 kHz | 5.0 ms | 10.0 ms |
| Transient Frequency Behavior for Equipment Designed to Operate on 6.25 kHz Channels | | | |
| $t_1$ [4] | ± 6.25 kHz | 5.0 ms | 10.0 ms |
| $t_2$ | ± 3.125 kHz | 20.0 ms | 25.0 ms |
| $t_3$ [4] | ± 6.25 kHz | 5.0 ms | 10.0 ms |

[1] $t_{on}$ is the instant when a 1 kHz test signal is completely suppressed, including any capture time due to phasing.
$t_1$ is the time period immediately following $t_{on}$.
$t_2$ is the time period immediately following $t_1$.
$t_3$ is the time period from the instant when the transmitter is turned off until $t_{off}$.
$t_{off}$ 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.

## 12.2 Measurement Setup

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### 12.3 Measurement Procedure

According to TIA/EIA-603 2.2.19 requirement, as for the product different from PTT, we use test steps as follows:

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
4. single-shot turn-on of the transmitter signals;
5. Keep DUT in OFF state and Key the PTT;
6. Observe the stored oscilloscope of modulation domain analyzer. The signal trace shall be maintained within the allowable limits during the periods t1 and t2,and shall also remain within limits following t2;
7. 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.
8. Keep the digital portable radio in ON state and unkey the PTT;
9. Observe the stored oscilloscope of modulation domain analyzer, The signal trace shall be maintained within the allowable limits during the period t3.
10. Set the signal generator to the assigned transmitter frequency and modulate it with a 1 kHz tone at ±12.5 kHz deviation and set its output level to -100dBm.
11. Turn on the transmitter.
12. 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
13. level. Note this power level on the stored oscilloscope as P0.
14. Turn off the transmitter.
15. Adjust the RF level of the signal generator to provide RF power equal to P0. This signal generator RF level shall be maintained throughout the rest of the measurement.
16. Remove the attenuation, so the input power to the stored oscilloscope is increased by 30 dB when the transmitter is turned on.
17. Adjust the vertical amplitude control of the stored oscilloscope to display the 1000 Hz at ±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 “tiger offset” to -10ms for turn on and -15ms for turn off.
18. Turn on the transmitter and the transient wave will be captured on the screen of Spectrum Analyzer.
19. 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 t1 and t2.
20. Then turn off the transmitter, and another transient wave will be captured on the screen of Spectrum Analyzer. The trace should be maintained within the allowed divisions during the period t3.

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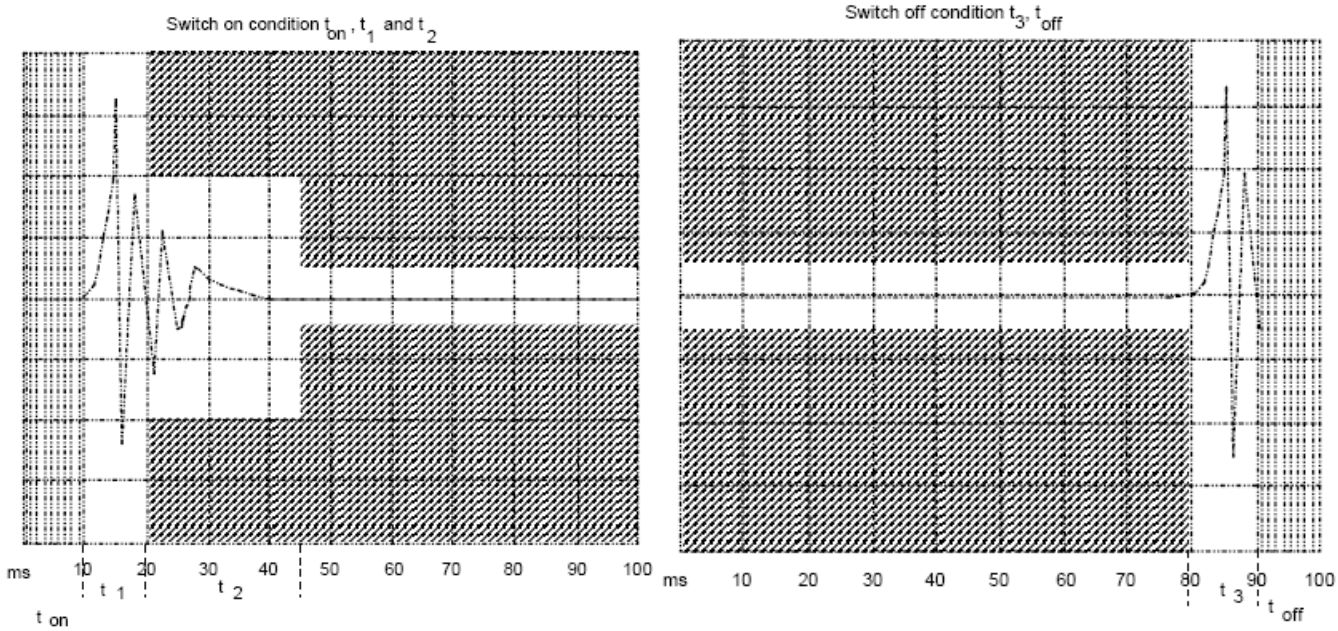
- **Describe limit line of transmitter frequency behavior:**

- **ton:** The switch-on instant ton of a transmitter is defined by the condition when the output power, measured at the antenna terminal, exceeds 0,1 % of the full output power (-30 dBc).
- **t1:** period of time starting at ton and finishing according to above 11.1
- **t2:** period of time starting at the end of t1 and finishing according to above 11.1
- toff: switch-off instant defined by the condition when the output power falls below 0,1 % of the full output power (-30 dBc).
- **t3**: period of time that finishing at toff and starting according to above 11.1

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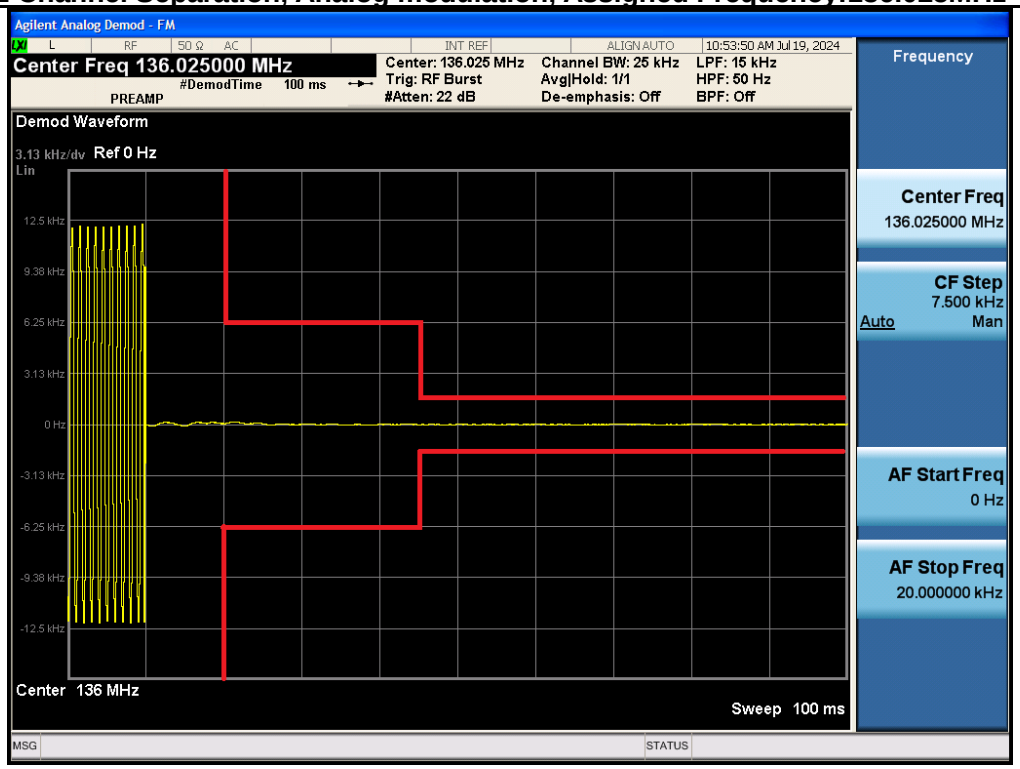
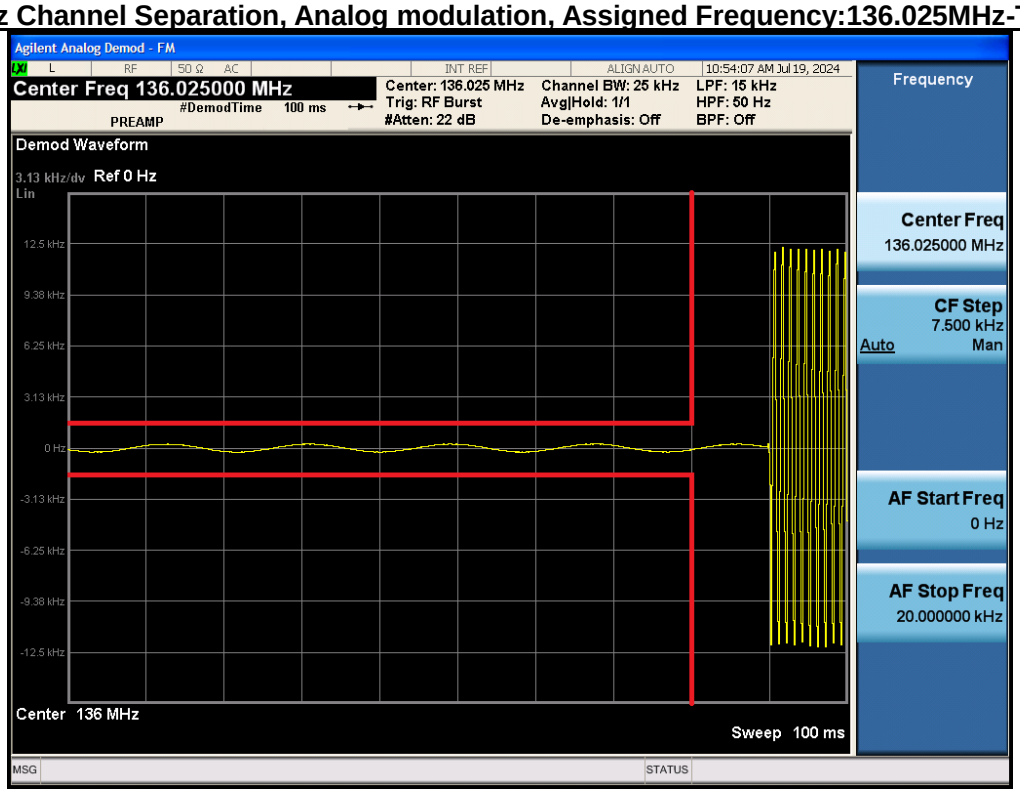
## 12.4 Measurement Result

**12.5 kHz Channel Separation, Analog modulation, Assigned Frequency:136.025MHz-Turn On**




**12.5 kHz Channel Separation, Analog modulation, Assigned Frequency:136.025MHz-Turn Off**

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**12.5 kHz Channel Separation, Analog modulation, Assigned Frequency:406.125MHz-Turn On**

**12.5 kHz Channel Separation, Analog modulation, Assigned Frequency:406.125MHz-Turn Off**

Note: All test frequencies was tested, but only the worst data be recorded in this part.

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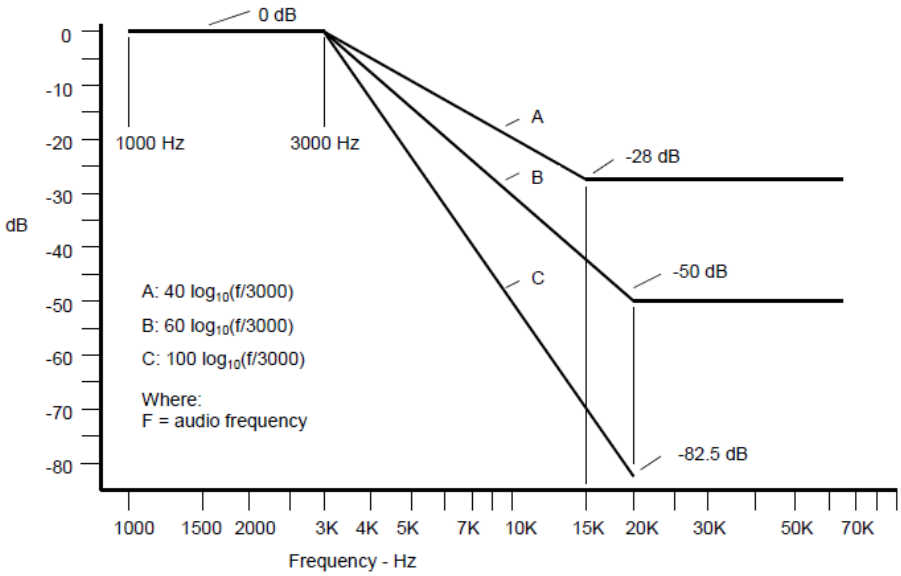
# 13. Audio Low Pass Filter Response

## 13.1 Provisions Applicable

**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.

**ANSI TIA/EIA 603-E:2016 3.2.15**: Recommended audio filter attenuation characteristics are given below:




For audio frequencies above 3000 Hz, the audio response of the post limiter low-pass filter shall meet or exceed the following requirements:

a) For equipment operating on 20, 25 or 30 kHz channel bandwidth in the 25 MHz to 174 MHz range:

At frequencies from 3000 Hz through 15,000 Hz the attenuation shall be greater than the attenuation at 1000 Hz by at least: 40 log10 (f / 3000) dB where: f is the audio frequency in Hz.

At frequencies above 15,000 Hz, the attenuation shall be greater than the attenuation at 1000 Hz, by at least: 28 dB.

b) For equipment operating with 25 kHz bandwidth channels between 406 and 512 MHz through 896 MHz, and between 929 MHz through 930 MHz: At frequencies from 3000 Hz through 20,000 Hz, the attenuation shall be greater

than the attenuation at 1000 Hz by at least: 60 log10 (f / 3000) dB where: f is the audio frequency in Hz.

At frequencies above 20,000 Hz the attenuation shall be greater than the attenuation at 1000 Hz by at least: 50 dB.

c) For equipment operating on channels between 896 MHz through 901 MHz, between 935 MHz through 940 MHz, and 12.5 or 15 kHz spaced channels in the frequency range 138-174 MHz and 406-512 MHz.

At frequencies from 3000 Hz through 20,000 Hz the attenuation shall be greater than the attenuation at 1000 Hz by at least: 100 log10 (f / 3000) dB where: f is the audio frequency in Hz.

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### 13.2 Measurement Procedure

The rated audio input signal was applied to the input of the audio low-pass filter (or of all modulation stages) using an audio oscillator, this input signal level and its corresponding output signal were then measured and recorded using the FFT Digital Spectrum Analyzer. Tests were repeated at different audio signal frequencies from 0 to 50 kHz.

The DUT transmitter output port was connected to Modulation Analyzer.

2) Path loss for the measurement included.

3) Press 23.1SPCL on modulation analyzer to enable the external LO from Sigen.

4) Set the Sigen frequency to Fc + 1.5 MHz, RF output level to 0dBm without modulation.

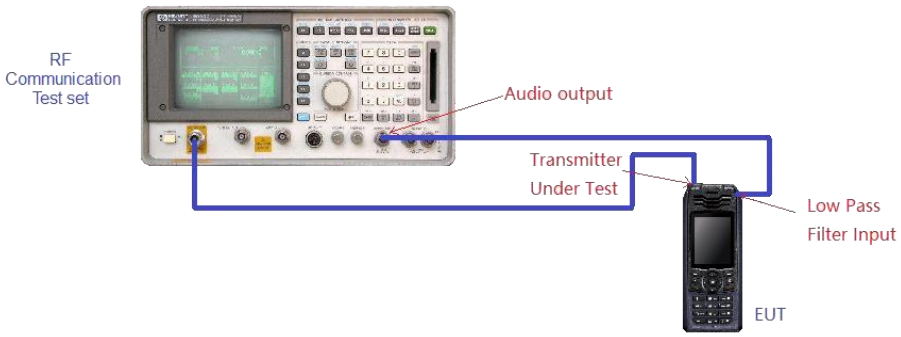
5) Transmit the radio and set the audio analyzer to 1 kHz audio frequency and 60% of the Full rated system deviation.

6) Up the amplitude by 20dB.

7) On DSA, get the reference point to 0dB.

8) Vary the frequency on audio analyzer from 3 kHz to 20 kHz, record the audio tone from DSA

### 13.3 Measurement Setup

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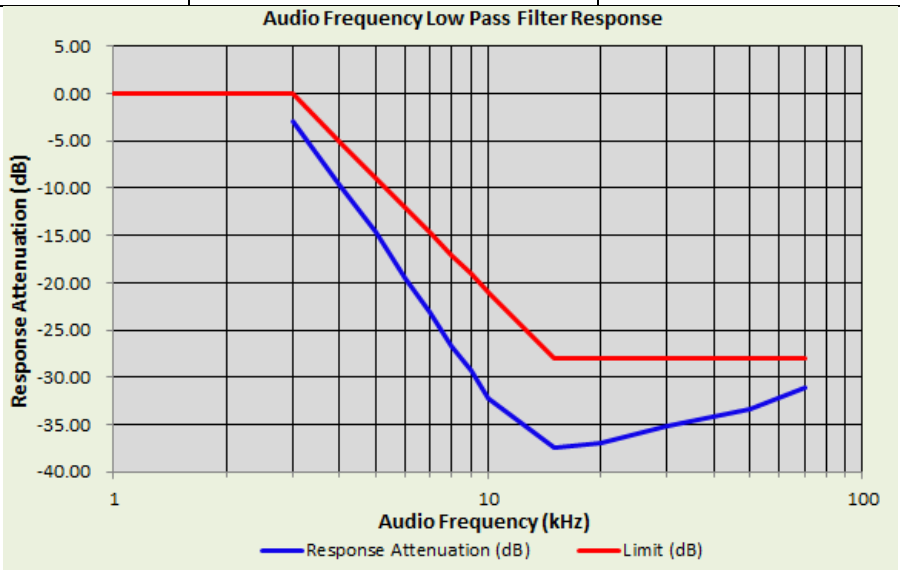
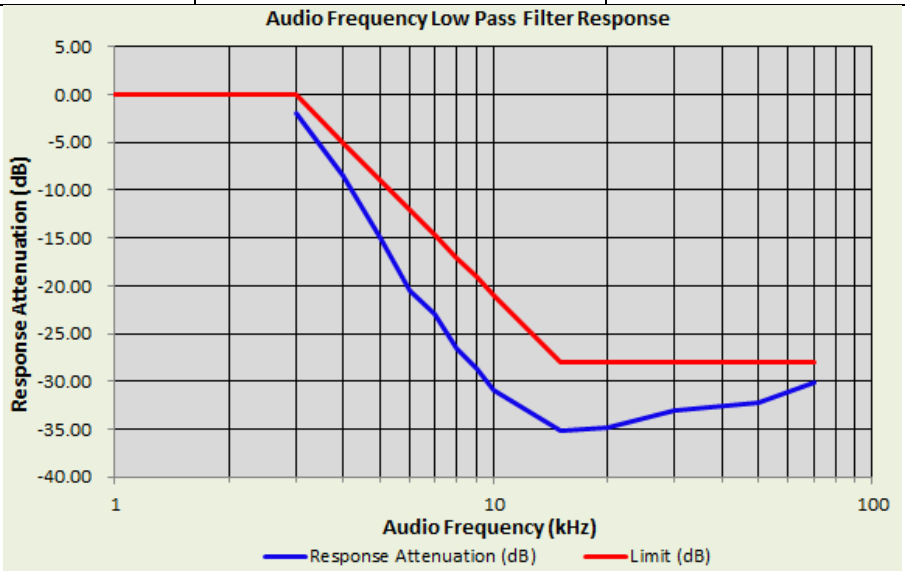
### 13.4 Measurement Result

| 12.5kHz, Analog modulation, Assigned Frequency:136.025MHz-7W | | |
|---|---|---|
| Audio Frequency (kHz) | Response Attenuation (dB) | Limit (dB) |
| 1 | 0 | / |
| 3 | -2.89 | 0.00 |
| 4 | -9.66 | -5.00 |
| 5 | -14.65 | -8.87 |
| 6 | -19.56 | -12.04 |
| 7 | -23.08 | -14.72 |
| 8 | -26.67 | -17.04 |
| 9 | -29.34 | -19.08 |
| 10 | -32.25 | -20.92 |
| 15 | -37.39 | -28.00 |
| 20 | -36.89 | -28.00 |
| 30 | -35.11 | -28.00 |
| 50 | -33.31 | -28.00 |
| 70 | -31.15 | -28.00 |




Any report having not been signed by authorized approver, or having been altered without authorization, or having not been stamped by the "Dedicated Testing/Inspection Stamp" is deemed to be invalid. Copying or excerpting portion of, or altering the content of the report is not permitted without the written authorization of AGC. The test results presented in the report apply only to the tested sample. Any objections to report issued by AGC should be submitted to AGC within 15days after the issuance of the test report. Further enquiry of validity or verification of the test report should be addressed to AGC by agc01@agccert.com.

| 12.5kHz, Analog modulation, Assigned Frequency:406.125MHz-5W | | |
|---|---|---|
| Audio Frequency (kHz) | Response Attenuation (dB) | Limit (dB) |
| 1 | 0 | / |
| 3 | -1.98 | 0.00 |
| 4 | -8.52 | -5.00 |
| 5 | -14.99 | -8.87 |
| 6 | -20.43 | -12.04 |
| 7 | -22.87 | -14.72 |
| 8 | -26.56 | -17.04 |
| 9 | -28.66 | -19.08 |
| 10 | -30.90 | -20.92 |
| 15 | -35.11 | -28.00 |
| 20 | -34.89 | -28.00 |
| 30 | -33.11 | -28.00 |
| 50 | -32.31 | -28.00 |
| 70 | -30.05 | -28.00 |




Note: All test frequencies was tested, but only the worst data be recorded in this part.

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## Appendix I: Photographs of Test Setup

Refer to the Report No.: AGC01284240707AP01

## Appendix II: Photographs of Test EUT

Refer to the Report No.: AGC01284240707AP02

**-----End of Report-----**

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# Conditions of Issuance of Test Reports

1. All samples and goods are accepted by the Attestation of Global Compliance (Shenzhen) Co., Ltd (the "Company") solely for testing and reporting in accordance with the following terms and conditions. The company provides its services on the basis that such terms and conditions constitute express agreement between the company and any person, firm or company requesting its services (the "Clients").

2. Any report issued by Company as a result of this application for testing services (the "Report") shall be issued in confidence to the Clients and the Report will be strictly treated as such by the Company. It may not be reproduced either in its entirety or in part and it may not be used for advertising or other unauthorized purposes without the written consent of the Company. The Clients to whom the Report is issued may, however, show or send it, or a certified copy thereof prepared by the Company to its customer, supplier or other persons directly concerned. The Company will not, without the consent of the Clients, enter into any discussion or correspondence with any third party concerning the contents of the Report, unless required by the relevant governmental authorities, laws or court orders.

3.The Company shall not be called or be liable to be called to give evidence or testimony on the Report in a court of law without its prior written consent, unless required by the relevant governmental authorities, laws or court orders.

4. In the event of the improper use of the report as determined by the Company, the Company reserves the right to withdraw it, and to adopt any other additional remedies which may be appropriate.

5. Samples submitted for testing are accepted on the understanding that the Report issued cannot form the basis of, or be the instrument for, any legal action against the Company.

6. The Company will not be liable for or accept responsibility for any loss or damage however arising from the use of information contained in any of its Reports or in any communication whatsoever about its said tests or investigations.

7.Clients wishing to use the Report in court proceedings or arbitration shall inform the Company to that effect prior to submitting the sample for testing.

8. The Company is not responsible for recalling the electronic version of the original report when any revision is made to them. The Client assumes the responsibility to providing the revised version to any interested party who uses them.

9. Subject to the variable length of retention time for test data and report stored hereinto as otherwise specifically required by individual accreditation authorities, the Company will only keep the supporting test data and information of the test report for a period of six years. The data and information will be disposed of after the aforementioned retention period has elapsed. Under no circumstances shall we provide any data and information which has been disposed of after retention period. Under no circumstances shall we be liable for damage of any kind, including (but not limited to) compensatory damages, lost profits, lost data, or any form of special, incidental, indirect, consequential or punitive damages of any kind, whether based on breach of contract of warranty, tort (including negligence), product liability or otherwise, even if we are informed in advance of the possibility of such damages.

Any report having not been signed by authorized approver, or having been altered without authorization, or having not been stamped by the "Dedicated Testing/Inspection Stamp" is deemed to be invalid. Copying or excerpting portion of, or altering the content of the report is not permitted without the written authorization of AGC. The test results presented in the report apply only to the tested sample. Any objections to report issued by AGC should be submitted to AGC within 15days after the issuance of the test report. Further enquiry of validity or verification of the test report should be addressed to AGC by agc01@agccert.com.