

12. Frequency Separation Measurement

12.1 Provisions Applicable

When the power is less than 0.125W: The minimum permissible channel separation for this system is 2/3 the value of the 20dB BW.

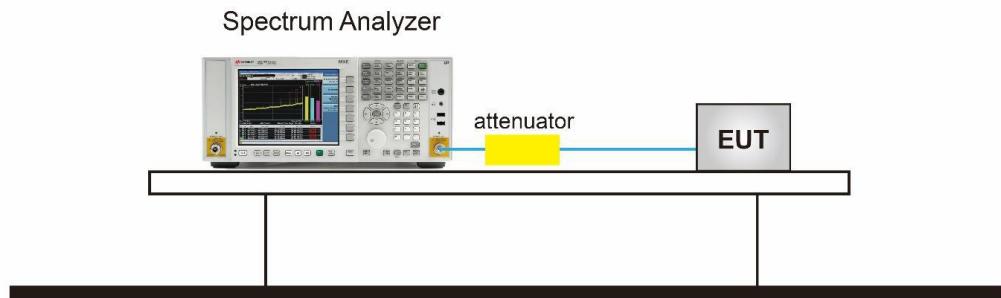
When the power is less than 1W: The minimum permissible channel separation for this system is 20dB BW.

12.2 Measurement Procedure

The EUT shall have its hopping function enabled. Use the following spectrum analyzer settings:

1. Span: Wide enough to capture the peaks of two adjacent channels.
2. RBW: Start with the RBW set to approximately 30% of the channel spacing; adjust as necessary to best identify the center of each individual channel.
3. Video (or average) bandwidth (VBW) \geq RBW.
4. Sweep: Auto.
5. Detector function: Peak.
6. Trace: Max hold. g) Allow the trace to stabilize.
7. Use the marker-delta function to determine the separation between the peaks of the adjacent channels.

12.3 Measurement Setup (Block Diagram of Configuration)



12.4 Measurement Result

Test Data of Frequency Separation			
Test Mode	Channel Separation (MHz)	Limits (MHz)	Pass or Fail
GFSK Hopping	1.021	≥ 0.635	Pass
$\pi/4$ -DQPSK Hopping	1.000	≥ 0.853	Pass
8DPSK	0.988	≥ 0.863	Pass

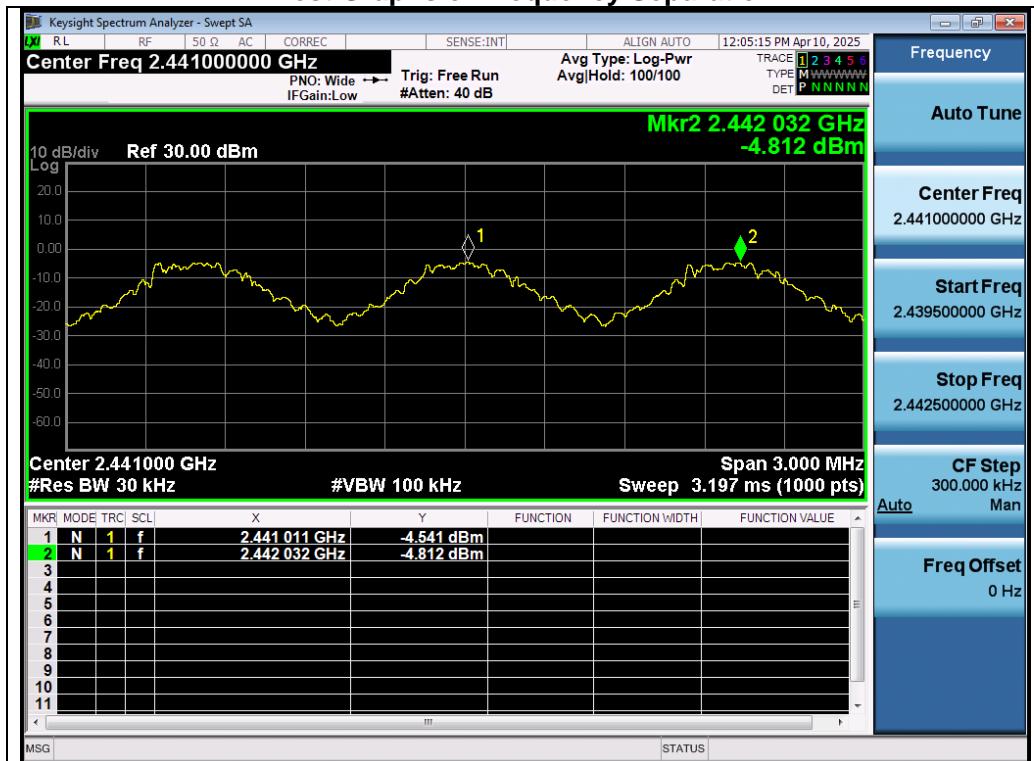
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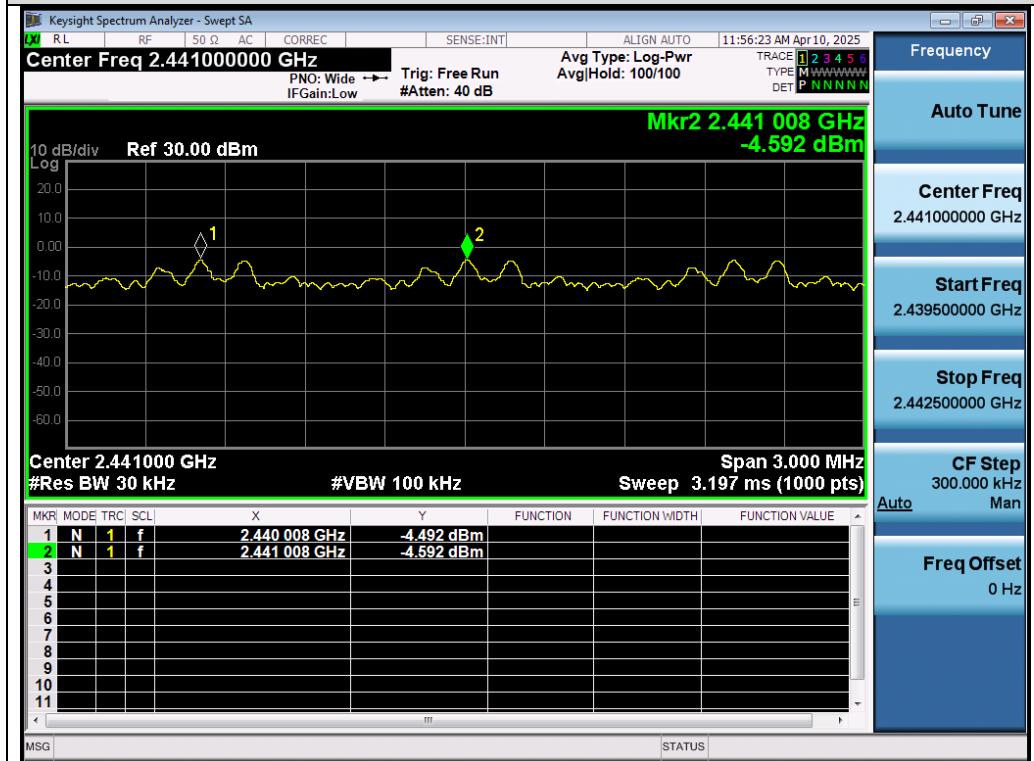
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Test Graphs of Frequency Separation



Test_Graph_BR_HOP_ANT1_NA_1Mbps_Hopping Separation



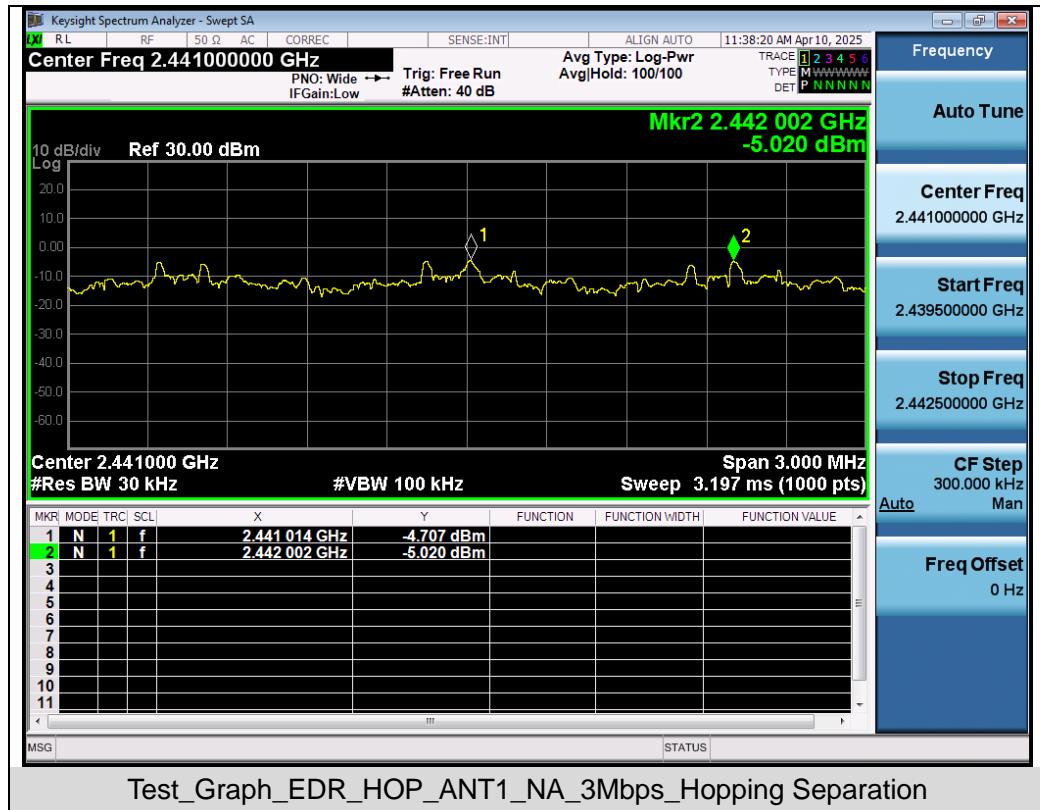
Test_Graph_EDR_HOP_ANT1_NA_2Mbps_Hopping Separation

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13. AC Power Line Conducted Emission Test

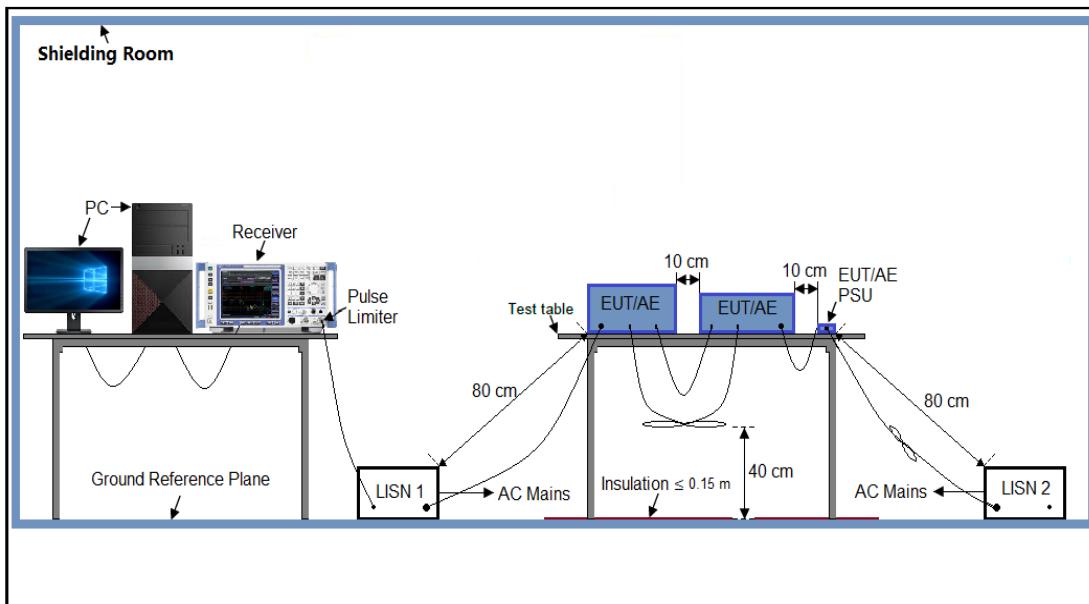
13.1 Measurement Limit

Frequency	Maximum RF Line Voltage	
	Q.P. (dB μ V)	Average (dB μ V)
150kHz~500kHz	66-56	56-46
500kHz~5MHz	56	46
5MHz~30MHz	60	50

Note:

1. The lower limit shall apply at the transition frequency.
2. The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.

13.2 Measurement Setup (Block Diagram of Configuration)



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13.3 Preliminary Procedure of Line Conducted Emission Test

1. The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. When the EUT is a tabletop system, a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.10 (see Test Facility for the dimensions of the ground plane used). When the EUT is a floor-standing equipment, it is placed on the ground plane which has a 3-12 mm non-conductive covering to insulate the EUT from the ground plane.
2. Support equipment, if needed, was placed as per ANSI C63.10.
3. All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10.
4. All support equipment received AC120V/60Hz power from a LISN, if any.
5. The EUT received DC 5V power from adapter which received AC120V/60Hz power from a LISN.
6. The test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side).
7. Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.
8. Analyzer / Receiver scanned from 150 kHz to 30MHz for emissions in each of the test modes.
9. During the above scans, the emissions were maximized by cable manipulation.
10. The test mode(s) were scanned during the preliminary test.
11. Then, the EUT configuration and cable configuration of the above highest emission level were recorded for reference of final testing.

13.4 Final Procedure of Line Conducted Emission Test

1. EUT and support equipment was set up on the test bench as per step 2 of the preliminary test.
2. A scan was taken on both power lines, Line 1 and Line 2, recording at least the six highest emissions. Emission frequency and amplitude were recorded into a computer in which correction factors were used to calculate the emission level and compare reading to the applicable limit.
3. If EUT emission level was less -2dB to the A.V. limit in Peak mode, then the emission signal was re-checked using Q.P and Average detector.
4. The test data of the worst case condition(s) was reported on the Summary Data page.
5. A conducted emission is calculated by the following equation:
 - Measurement Level (dB μ V) = Receiver reading (dB μ V) + Transd (dB)
 - Transd (dB)= AMN Factor(dB)+Cable Loss(dB)+Attenuation(dB)
 - Margin= Limit-Level

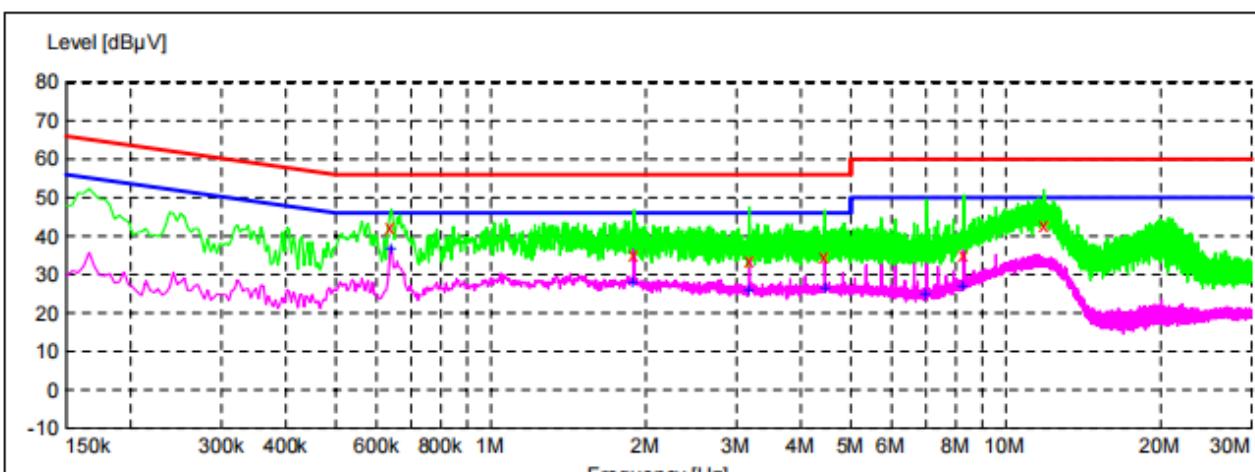
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13.5 Measurement Result

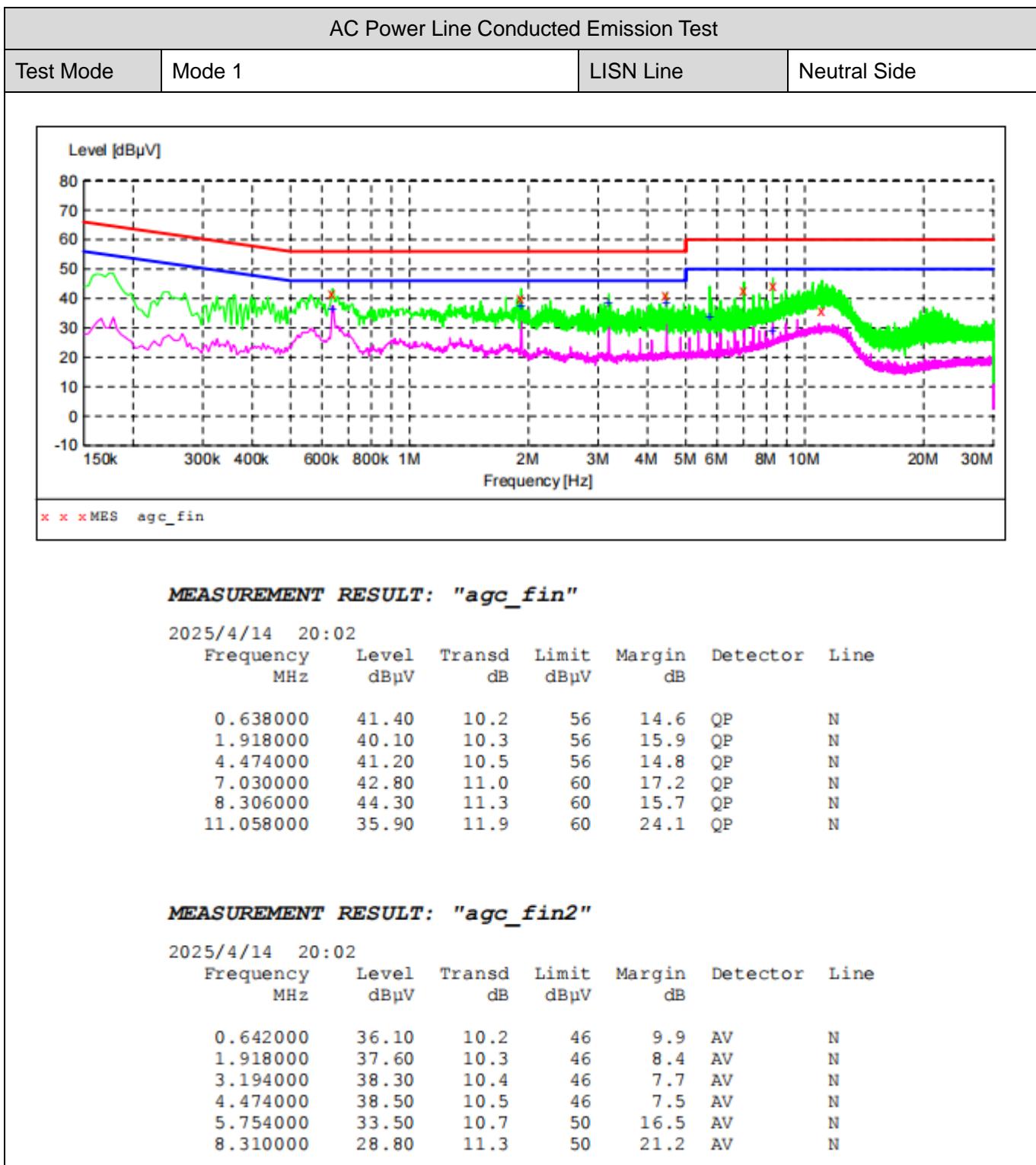
AC Power Line Conducted Emission Test																																																								
Test Mode	Mode 1		LISN Line		Hot Side																																																			
 <p>Level [dBμV]</p> <p>Frequency [Hz]</p> <p>Legend: x x x MES agc_fin</p>																																																								
<p>MEASUREMENT RESULT: "agc_fin"</p> <p>2025/4/14 20:00</p> <table> <thead> <tr> <th>Frequency MHz</th> <th>Level dBμV</th> <th>Transd dB</th> <th>Limit dBμV</th> <th>Margin dB</th> <th>Detector</th> <th>Line</th> </tr> </thead> <tbody> <tr> <td>0.642000</td> <td>42.20</td> <td>10.2</td> <td>56</td> <td>13.8</td> <td>QP</td> <td>L1</td> </tr> <tr> <td>1.898000</td> <td>34.90</td> <td>10.3</td> <td>56</td> <td>21.1</td> <td>QP</td> <td>L1</td> </tr> <tr> <td>3.174000</td> <td>33.60</td> <td>10.4</td> <td>56</td> <td>22.4</td> <td>QP</td> <td>L1</td> </tr> <tr> <td>4.454000</td> <td>34.60</td> <td>10.5</td> <td>56</td> <td>21.4</td> <td>QP</td> <td>L1</td> </tr> <tr> <td>8.290000</td> <td>35.30</td> <td>11.3</td> <td>60</td> <td>24.7</td> <td>QP</td> <td>L1</td> </tr> <tr> <td>11.846000</td> <td>42.70</td> <td>12.1</td> <td>60</td> <td>17.3</td> <td>QP</td> <td>L1</td> </tr> </tbody> </table>								Frequency MHz	Level dB μ V	Transd dB	Limit dB μ V	Margin dB	Detector	Line	0.642000	42.20	10.2	56	13.8	QP	L1	1.898000	34.90	10.3	56	21.1	QP	L1	3.174000	33.60	10.4	56	22.4	QP	L1	4.454000	34.60	10.5	56	21.4	QP	L1	8.290000	35.30	11.3	60	24.7	QP	L1	11.846000	42.70	12.1	60	17.3	QP	L1
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<p>MEASUREMENT RESULT: "agc_fin2"</p> <p>2025/4/14 20:00</p> <table> <thead> <tr> <th>Frequency MHz</th> <th>Level dBμV</th> <th>Transd dB</th> <th>Limit dBμV</th> <th>Margin dB</th> <th>Detector</th> <th>Line</th> </tr> </thead> <tbody> <tr> <td>0.642000</td> <td>36.80</td> <td>10.2</td> <td>46</td> <td>9.2</td> <td>AV</td> <td>L1</td> </tr> <tr> <td>1.898000</td> <td>28.00</td> <td>10.3</td> <td>46</td> <td>18.0</td> <td>AV</td> <td>L1</td> </tr> <tr> <td>3.174000</td> <td>25.90</td> <td>10.4</td> <td>46</td> <td>20.1</td> <td>AV</td> <td>L1</td> </tr> <tr> <td>4.454000</td> <td>26.20</td> <td>10.5</td> <td>46</td> <td>19.8</td> <td>AV</td> <td>L1</td> </tr> <tr> <td>7.010000</td> <td>24.70</td> <td>11.0</td> <td>50</td> <td>25.3</td> <td>AV</td> <td>L1</td> </tr> <tr> <td>8.286000</td> <td>26.90</td> <td>11.3</td> <td>50</td> <td>23.1</td> <td>AV</td> <td>L1</td> </tr> </tbody> </table>								Frequency MHz	Level dB μ V	Transd dB	Limit dB μ V	Margin dB	Detector	Line	0.642000	36.80	10.2	46	9.2	AV	L1	1.898000	28.00	10.3	46	18.0	AV	L1	3.174000	25.90	10.4	46	20.1	AV	L1	4.454000	26.20	10.5	46	19.8	AV	L1	7.010000	24.70	11.0	50	25.3	AV	L1	8.286000	26.90	11.3	50	23.1	AV	L1
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Appendix I: Photographs of Test Setup

Refer to the Report No.: AGC09477250401AP01

Appendix II: Photographs of Test EUT

Refer to the Report No.: AGC09477250401AP02

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