

Prüfbericht-Nr.: <i>Test report no.:</i>	CN24QLIU 002	Auftrags-Nr.: <i>Order no.:</i>	168500420	Seite 1 von 26 <i>Page 1 of 26</i>
Kunden-Referenz-Nr.: <i>Client reference no.:</i>	N/A	Auftragsdatum: <i>Order date:</i>	2024-08-20	
Auftraggeber: <i>Client:</i>	ECARX (Hubei) Tech Co., Ltd B1336, Taizi Lake Industry Park, No 18 ShenLong AVE, WH, China			
Prüfgegenstand: <i>Test item:</i>	ECU-Display Head Unit			
Bezeichnung / Typ-Nr.: <i>Identification / Type no.:</i>	EEBABCDE1			
Auftrags-Inhalt: <i>Order content:</i>	Test Report			
Prüfgrundlage: <i>Test specification:</i>	CFR47 FCC Part 15: Subpart C Section 15.247 RSS-247 Issue 3 August 2023 RSS-Gen Issue 5 February 2021			
Wareneingangsdatum: <i>Date of sample receipt:</i>	2024-09-02	Please refer to Photo Document		
Prüfmuster-Nr.: <i>Test sample no.:</i>	S202409024250-ZJA01/2 S202409024250-ZJA02/2			
Prüfzeitraum: <i>Testing period:</i>	2024-09-02 - 2024-09-27			
Ort der Prüfung: <i>Place of testing:</i>	Refer to section 2.1			
Prüflaboratorium: <i>Testing laboratory:</i>	TÜV Rheinland (Shenzhen) Co., Ltd.			
Prüfergebnis*: <i>Test result*:</i>	Pass			
geprüft von: <i>tested by:</i>	 Hardy Suo		genehmigt von: <i>authorized by:</i>	 Lin Lin
Datum: <i>Date:</i>	2024-10-12		Ausstellungsdatum: <i>Issue date:</i>	2024-10-12
Stellung / Position:	Sachverständige(r)/Expert		Stellung / Position:	Sachverständige(r)/Expert
Sonstiges / <i>Other:</i>	FCC ID: 2BD49-EEBABCDE1 IC: 31788-EEBABCDE1, HVIN: EEBABCDE1 This report is for Bluetooth dual mode.			
Zustand des Prüfgegenstandes bei Anlieferung: <i>Condition of the test item at delivery:</i>	Prüfmuster vollständig und unbeschädigt <i>Test item complete and undamaged</i>			
* Legende:	P(ass) = entspricht o.g. Prüfgrundlage(n) F(ail) = entspricht nicht o.g. Prüfgrundlage(n) N/A = nicht anwendbar N/T = nicht getestet <i>* Legend: P(ass) = passed a.m. test specification(s) F(ail) = failed a.m. test specification(s) N/A = not applicable N/T = not tested</i>			
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Anmerkungen
Remarks

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4	Die Entscheidungsregel für Konformitätserklärungen basierend auf numerischen Messergebnissen in diesem Prüfbericht basiert auf der "Null-Grenzwert-Regel" und der "Einfachen Akzeptanz" gemäß ILAC G8:2019 und IEC Guide 115:2021, es sei denn, in der auf Seite 1 dieses Berichts genannten angewandten Norm ist etwas anderes festgelegt oder vom Kunden gewünscht. Dies bedeutet, dass die Messunsicherheit nicht berücksichtigt wird und daher auch nicht im Prüfbericht angegeben wird. Zu weiteren Informationen bezüglich des Risikos durch diese Entscheidungsregel siehe ILAC G8:2019. <i>The decision rule for statements of conformity, based on numerical measurement results, in this test report is based on the "Zero Guard Band Rule" and "Simple Acceptance" in accordance with ILAC G8:2019 and IEC Guide 115:2021, unless otherwise specified in the applied standard mentioned on Page 1 of this report or requested by the customer. This means that measurement uncertainty is not taken in account and hence also not declared in the test report. For additional information to the resulting risk based of this decision rule please refer to ILAC G8:2019.</i>

Test Summary

5.1.1 ANTENNA REQUIREMENT

RESULT: Pass

5.1.2 MAXIMUM PEAK CONDUCTED OUTPUT POWER

RESULT: Pass

5.1.3 CONDUCTED POWER SPECTRAL DENSITY

RESULT: Pass

5.1.4 6dB BANDWIDTH

RESULT: Pass

5.1.5 99% BANDWIDTH

RESULT: Pass

5.1.6 20dB BANDWIDTH

RESULT: Pass

5.1.7 CARRIER FREQUENCY SEPARATION

RESULT: Pass

5.1.8 NUMBER OF HOPPING FREQUENCY

RESULT: Pass

5.1.9 TIME OF OCCUPANCY

RESULT: Pass

5.1.10 CONDUCTED SPURIOUS EMISSIONS MEASURED IN 100 KHz BANDWIDTH

RESULT: Pass

5.1.11 RADIATED SPURIOUS EMISSION

RESULT: Pass

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1 General Remarks

1.1 Complementary Materials

All attachments are integral parts of this test report. This applies especially to the following appendix:

Appendix A: Test Results of Bluetooth BR & EDR mode

Appendix B: Test Results of Bluetooth LE

Appendix C: Photographs of the Test Set-up

2 Test Sites

2.1 Test Facilities

Shenzhen UnionTrust Quality and Technology Co., Ltd.

Unit D/E of 9/F and 16/F, Block A, Building 6, Baoneng science and technology park, Longhua district, Shenzhen, China

FCC Accreditation Designation No.: CN1194

ISED CAB identifier: CN0032

The tests at the test sites have been conducted under the supervision of a TÜV engineer.

2.2 List of Test and Measurement Instruments

Table 1: List of Test and Measurement Equipment

Radiated Emission Test Equipment List						
Used	Equipment	Manufacturer	Model No.	Serial Number	Cal. date	Cal. Due date
☒	3m SAC	ETS-LINDGREN	3m	Euroshiedpn-CT001270-1317	11-Nov-2023	10-Nov-2026
☒	Receiver	R&S	ESIB26	100114	27-Oct-2023	26-Oct-2024
☒	EXA Spectrum Analyzer	KEYSIGHT	N9010A	MY51440197	29-Mar-2024	28-Mar-2025
☒	Loop Antenna	ETS-LINDGREN	6502	00202525	30-Oct-2023	29-Oct-2024
☒	Broadband Antenna	ETS-LINDGREN	3142E	00201566	30-Oct-2023	29-Oct-2024
☒	6dB Attenuator	Talent	RA6A5-N-18	18103001	30-Oct-2023	29-Oct-2024
☒	Preamplifier	HP	8447F	2805A02960	31-Oct-2023	30-Oct-2024
☒	Band Rejection Filter (2400MHz~2500MHz)	Micro-Tronics	BRM50702	G248	27-Oct-2023	26-Oct-2024
☒	Double-Ridged Waveguide Horn Antenna (Pre-amplifier)	ETS-LINDGREN	3117-PA	00201541	1-Apr-2024	31-Mar-2025
☒	Pre-amplifier	ETS-Lindgren	00118385	00201874	1-Apr-2024	31-Mar-2025
☒	Double-Ridged Waveguide Horn Antenna (Pre-amplifier)	ETS-LINDGREN	3116C-PA	00202652	30-Oct-2023	29-Oct-2024
☒	Pre-amplifier	ETS-Lindgren	00118384	00202652	30-Oct-2023	29-Oct-2024
☒	Multi device Controller	ETS-LINDGREN	7006-001	00160105	N/A	N/A
☒	Test Software	Audix	e3	Software Version: 9.160323		

Conducted RF test Equipment List						
Used	Equipment	Manufacturer	Model No.	Serial Number	Cal. date	Cal. Due date
☒	EXA Spectrum Analyzer	KEYSIGHT	N9010A	MY51440197	29-Mar-2024	28-Mar-2025
☒	USB Wideband Power Sensor	KEYSIGHT	U2021XA	MY55430035	27-Oct-2023	26-Oct-2024

2.3 Traceability

All measurement equipment calibrations are traceable to NIM (National Institute of Metrology) or where calibration is performed in other countries, to equivalent nationally recognized standards organizations.

2.4 Calibration

Equipment requiring calibration is calibrated periodically by the manufacturer or according to manufacturer's specifications. Additionally all equipment is verified for proper performance on a regular basis using in house standards or comparisons.

2.5 Measurement Uncertainty

The estimated combined standard uncertainty for radiated emissions and conducted emissions measurements as below table.

Table 2: Measurement Uncertainty

No.	Item	Measurement Uncertainty
1	Radiated emission 9kHz-30MHz	± 4.7 dB
2	Radiated emission 30MHz-1GHz	± 4.9 dB
3	Radiated emission 1GHz-18GHz	± 4.8 dB
4	Radiated emission 18GHz-26GHz	± 5.1 dB
5	Radiated emission 26GHz-40GHz	± 5.1 dB
6	Conducted spurious emissions	± 2.7 dB
7	RF Power, Conducted	± 0.68 dB
8	Occupied Bandwidth	± 1.86 %
9	Radio Frequency	2.4 GHz: ± 6.5 x 10 ⁻⁸
10	Transmission Time	± 0.19 %

2.6 Location of Original Data

The original copies of all test data taken during actual testing were attached at Appendix A & B & C of this report and delivered to the applicant. A copy has been retained in the TÜV Rheinland (Shenzhen) Co., Ltd. file for certification follow-up purposes.

2.7 Status of Facility Used for Testing

The Shenzhen UnionTrust Quality and Technology Co., Ltd. Test facility located at Unit D/E of 9/F and 16/F, Block A, Building 6, Baoneng science and technology park, Longhua district, Shenzhen, China is listed on the US Federal Communications Commission list of facilities approved to perform measurements.

3 General Product Information

3.1 Product Function and Intended Use

The EUT is an ECU-Display Head Unit intended to be assembled into automotive environment, which supports FM, GNSS, Bluetooth (dual mode), 2.4G Wi-Fi and 5.2G/5.8G Wi-Fi technologies.

For details refer to the User Manual, Technical Description and Circuit Diagram.

3.2 Ratings and System Details

Table 3: Technical Specification of EUT

General Information of EUT	Value
Kind of Equipment:	ECU-Display Head Unit
Type Designation:	EEBABCDE1
FCC ID:	2BD49-EEBABCDE1
IC:	31788-EEBABCDE1
HVIN:	EEBABCDE1
Operating Voltage:	DC 9-16V
Testing Voltage:	DC 12V
Operating Temperature Range:	-40 °C ~ +75 °C
Operating Frequency Mode:	Bluetooth: Classic BR, EDR + BLE 2.4G Wi-Fi: 802.11 b/g/n20/n40/ax20/ax40 5.2G/5.8G Wi-Fi: 802.11 a/n20/n40/ac20/ac40/ac80/ax20/ax40/ax80 FM: 88-108MHz GNSS (1559-1610MHz): BDS, Galileo, GLONASS, GPS, SBAS
Technical Specification of Bluetooth (dual mode)	
Operating Frequency:	2402 MHz to 2480 MHz
Type of Modulation:	GFSK, $\pi/4$ -DQPSK, 8DPSK
Channel Number:	BR & EDR mode:79 channels, Low Energy mode:40 channels
Channel Separation:	BR & EDR mode:1MHz, Low Energy mode:2MHz
Data Rate:	BR & EDR mode: 1Mbps, 2Mbps, 3Mbps Low Energy mode: 1Mbps, 2Mbps
Antenna Type:	Integral Antenna
Antenna Gain:	3.6 dBi Max. (declared by client)
Technical Specification of 2.4GHz Wi-Fi	
Operating Frequency:	2412 - 2462MHz for 802.11b/g/n(HT20)/ax(HE20) 2422 - 2452MHz for 802.11n(HT40)/ax(HE40)
Type of Modulation:	DSSS(DBPSK/DQPSK/CCK) OFDM(BPSK/QPSK/16QAM/64QAM/256QAM/1024QAM) OFDMA(BPSK/QPSK/16QAM/64QAM/256QAM/1024QAM)
Data Rate:	1/2/5.5/11 Mbps for 802.11b 6/9/12/18/24/36/48/54 Mbps for 802.11g MCS0 ~ MCS7 for 802.11n MCS0~MCS11 for 802.11ax
Channel Number:	11 channels for 802.11b/g/n(HT20)/ax(HE)20

	7 channels for 802.11n(HT40)/ax(HE40)
Channel Separation:	5 MHz
Antenna Type:	Integral Antenna
Antenna Number:	1Tx1Rx Note: EEBABCDE1 has two Wi- Fi Antennas (ANT1 and ANT2), and ANT2 disabled by client via firmware and cannot works.
Antenna Gain:	3.6 dBi Max. (declared by client)
Technical Specification of 5.2GHz Wi-Fi	
Operating Frequency:	5180 - 5240MHz, 802.11 a/n20/n40/ac20/ac40/ac80/ax20/ax40/ax80
Type of Modulation:	OFDM (BPSK, QPSK, 16QAM, 64QAM, 256QAM, 1024QAM) OFDMA (BPSK/QPSK/16QAM/64QAM/256QAM/1024QAM)
Data Rate:	6/9/12/18/24/36/48/54 Mbps for 802.11a MCS0~MCS15 for 802.11n/ac MCS0~MCS11 for 802.11ax
Channel Number:	7 channels
Channel Separation:	20MHz, 40MHz, 80MHz
Antenna Type:	Integral Antenna
Antenna Number:	1Tx1Rx Note: EEBABCDE1 has two Wi- Fi Antennas (ANT1 and ANT2), and ANT2 disabled by client via firmware and cannot works.
Antenna Gain:	5.9 dBi Max. (Provided by the Client)
Technical Specification of 5.8GHz Wi-Fi	
Operating Frequency:	5745 - 5825MHz, 802.11 a/n20/n40/ac20/ac40/ac80/ax20/ax40/ax80
Type of Modulation:	OFDM (BPSK, QPSK, 16QAM, 64QAM, 256QAM, 1024QAM) OFDMA (BPSK, QPSK, 16QAM, 64QAM, 256QAM, 1024QAM)
Data Rate:	6/9/12/18/24/36/48/54 Mbps for 802.11a MCS0~MCS15 for 802.11n/ac MCS0~MCS11 for 802.11ax
Channel Number:	8 channels
Channel Separation:	20MHz, 40MHz, 80MHz
Antenna Type:	Integral Antenna
Antenna Number:	1Tx1Rx Note: EEBABCDE1 has two Wi- Fi Antennas (ANT1 and ANT2), and ANT2 disabled by client via firmware and cannot works.
Antenna Gain:	7.6 dBi Max. (declared by client)

Table 4: RF Channel and Frequency of Bluetooth BR & EDR

RF Channel	Frequency (MHz)	RF Channel	Frequency (MHz)	RF Channel	Frequency (MHz)	RF Channel	Frequency (MHz)
0	2402.00	20	2422.00	40	2442.00	60	2462.00
1	2403.00	21	2423.00	41	2443.00	61	2463.00
2	2404.00	22	2424.00	42	2444.00	62	2464.00
3	2405.00	23	2425.00	43	2445.00	63	2465.00
4	2406.00	24	2426.00	44	2446.00	64	2466.00
5	2407.00	25	2427.00	45	2447.00	65	2467.00
6	2408.00	26	2428.00	46	2448.00	66	2468.00
7	2409.00	27	2429.00	47	2449.00	67	2469.00
8	2410.00	28	2430.00	48	2450.00	68	2470.00
9	2411.00	29	2431.00	49	2451.00	69	2471.00
10	2412.00	30	2432.00	50	2452.00	70	2472.00
11	2413.00	31	2433.00	51	2453.00	71	2473.00
12	2414.00	32	2434.00	52	2454.00	72	2474.00
13	2415.00	33	2435.00	53	2455.00	73	2475.00
14	2416.00	34	2436.00	54	2456.00	74	2476.00
15	2417.00	35	2437.00	55	2457.00	75	2477.00
16	2418.00	36	2438.00	56	2458.00	76	2478.00
17	2419.00	37	2439.00	57	2459.00	77	2479.00
18	2420.00	38	2440.00	58	2460.00	78	2480.00
19	2421.00	39	2441.00	59	2461.00		

Test frequencies are lowest channel: 2402 MHz, middle channel: 2441 MHz and highest channel: 2480 MHz for Bluetooth BR & EDR

Table 5: RF Channel and Frequency of Bluetooth LE

RF Channel	Frequency (MHz)	RF Channel	Frequency (MHz)	RF Channel	Frequency (MHz)	RF Channel	Frequency (MHz)
0	2402	10	2422	20	2442	30	2462
1	2404	11	2424	21	2444	31	2464
2	2406	12	2426	22	2446	32	2466
3	2408	13	2428	23	2448	33	2468
4	2410	14	2430	24	2450	34	2470
5	2412	15	2432	25	2452	35	2472
6	2414	16	2434	26	2454	36	2474
7	2416	17	2436	27	2456	37	2476
8	2418	18	2438	28	2458	38	2478
9	2420	19	2440	29	2460	39	2480

Test frequencies are lowest channel: 2402 MHz, middle channel: 2440 MHz and highest channel: 2480 MHz for Bluetooth LE

3.3 Independent Operation Modes

The basic operation modes are:

- A. On, Bluetooth transmitting mode (BR & EDR mode)
 - 1) Low Channel
 - 2) Middle Channel
 - 3) High Channel
- B. On, Bluetooth transmitting mode (Bluetooth LE mode)
 - 1) Low Channel
 - 2) Middle Channel
 - 3) High Channel
- C. On, Transmitting on Hopping channel
- D. Off

3.4 Noise Generating and Noise Suppressing Parts

Refer to Circuit Diagram for further details.

3.5 Submitted Documents

- | | |
|------------------------------|-------------------------|
| - Application Form | - Schematics |
| - ID Label and Location Info | - Operation Description |

4 Test Set-up and Operation Modes

4.1 Principle of Configuration Selection

Radio Spectrum: The equipment under test (EUT) was configured at its highest power output in order to measure its highest possible radiation and conducted level. The test modes were adapted accordingly in reference to the instructions for use.

Emission: The equipment under test (EUT) was configured to measure its highest possible radiation level. The test modes were adapted accordingly in reference to the instructions for use.

4.2 Test Operation and Test Software

Test operation refers to test setup in chapter 5. All tests were performed according to the procedures in ANSI C63.10: 2013.

According to clause 3.1, all tests were performed on model EEBABCDE1 in this report.

4.3 Special Accessories and Auxiliary Equipment

Table 6: List of Accessories and Auxiliary Equipment

1) Support Equipment

Description	Manufacturer	Model No.	Serial Number	Supplied by
Notebook	DELL	Latitude 3400	16238087894	UnionTrust
Mouse	LENOVO	MS-370	609013974	UnionTrust
High Speed Power Supplies	Keithley	2303	N/A	UnionTrust

The device is powered by rechargeable battery during test.

2) Support Cable

Cable No.	Description	Connector	Length	Supplied by
1	Antenna Cable	SMA	0.1Meter	Applicant
2	Antenna Cable	SMA	0.1Meter	Applicant

4.4 Countermeasures to Achieve EMC Compliance

The test sample which has been tested contained the noise suppression parts as described in the Technical Construction File (TCF).

No additional measures were employed to achieve compliance.

4.5 Test Setup Diagram

Diagram of Measurement Configuration for Radiation Test (Below 1GHz)

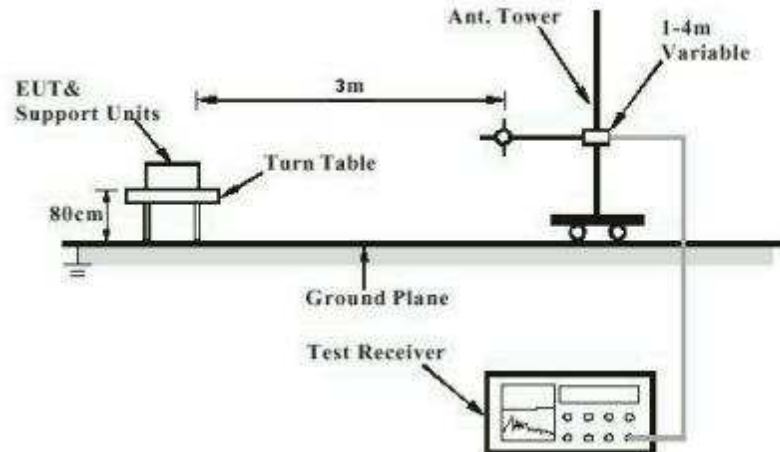


Diagram of Measurement Configuration for Radiation Test (Above 1GHz)

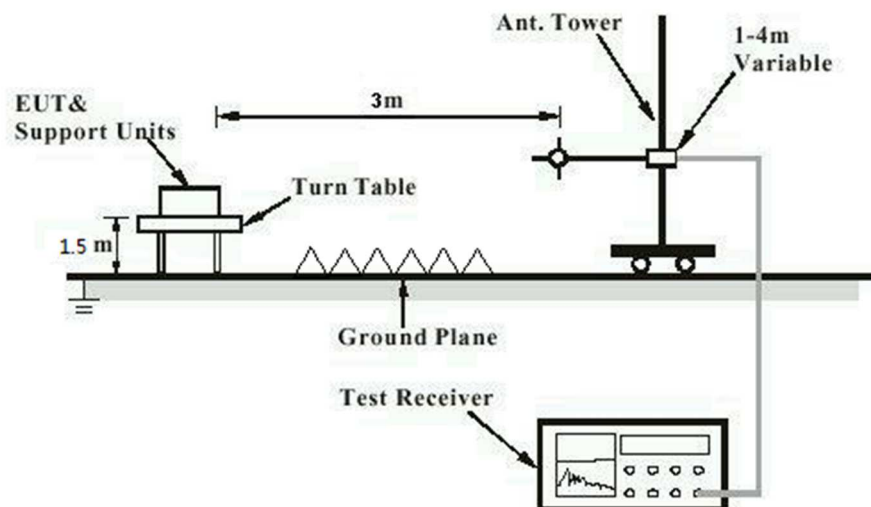
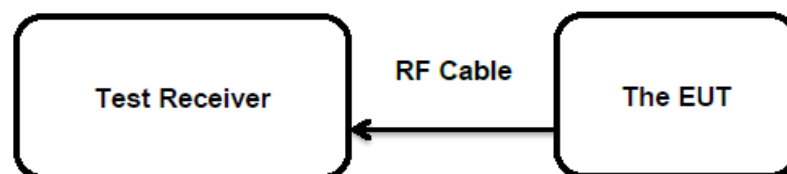


Diagram of Measurement Configuration for Conducted Transmitter Measurement



5 Test Results

5.1 Transmitter Requirement & Test Suites

5.1.1 Antenna Requirement

RESULT:**Pass****Test Specification**

Test standard : FCC Part 15.247(b)(4) and Part 15.203
RSS-Gen Clause 6.8

According to the manufacturer declared, the EUT has an Integral Antenna, the directional gain of antenna is 3.6dBi for Bluetooth, and the antenna connector is designed with permanent attachment and no consideration of replacement.

Therefore, the EUT is considered sufficient to comply with the provision.

Refer to EUT Photo for further details.

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5.1.2 Maximum Peak Conducted Output Power

RESULT:

Pass

Test Specification

Test standard	: FCC Part 15.247(b)(1)&(3) RSS-247 Clause 5.4(b)&(d)
Basic standard	: ANSI C63.10: 2013 FHSS < 0.125 Watts, DSSS < 1.0 Watts (Maximum)
Limits	: Conducted Peak Power) e.i.r.p. <4W
Kind of test site	: Shielded Room

Test Setup

Date of testing	: 2024-09-02 to 2024-09-24
Input voltage	: DC 12V
Operation mode	: A, B
Test channel	: Low / Middle / High
Ambient temperature	: 22.8 °C
Relative humidity	: 46.8 %
Atmospheric pressure	: 99.8 kPa

For details refer to following test result.

Table 7: Test Result of Maximum Peak Conducted Output Power, BR & EDR

Test Mode	Test Channel (MHz)	Measured Peak Power		Limit (W)
		(dBm)	(W)	
GFSK (BR)	2402.0	8.63	0.0073	< 0.125
	2441.0	9.57	0.0091	
	2480.0	8.31	0.0068	
8DPSK (EDR)	2402.0	8.29	0.0067	
	2441.0	9.23	0.0084	
	2480.0	7.89	0.0062	
Maximum Measured Value		9.57	0.0091	
Max. e.i.r.p.=9.57dBm+3.6dBi=13.17dBm, which is less than 36dBm=4W.				

Table 8: Test Result of Maximum Peak Conducted Output Power, Bluetooth LE

Test Mode	Data Rate	Test Channel (MHz)	Measured Peak Power		Limit (W)
			(dBm)	(W)	
Bluetooth LE	1 Mbps	2402	5.20	0.0033	< 1.0
		2440	6.10	0.0041	
		2480	5.30	0.0034	
	2 Mbps	2402	6.14	0.0041	
		2440	6.97	0.0050	
		2480	6.28	0.0042	
Maximum Measured Value			6.97	0.0050	
Max. e.i.r.p.=6.97dBm+3.6dBi=10.57dBm, which is less than 36dBm=4W.					

Note:

- 1) The cable loss is taken into account in results.
- 2) Antenna gain(G) of Bluetooth: 3.6 dBi
e.i.r.p.=P_(Peak power)+ G, which is far below the 4 W

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5.1.3 Conducted Power Spectral Density

RESULT:**Pass****Test Specification**

Test standard	: FCC Part 15.247(e) RSS-247 Clause 5.2(b)
Basic standard	: ANSI C63.10: 2013
Limits	: < 8 dBm / 3kHz
Kind of test site	: Shielded Room

Test Setup

Date of testing	: 2024-09-02 to 2024-09-24
Input voltage	: DC 12V
Operation mode	: B
Test channel	: Low / Middle / High
Ambient temperature	: 22.8 °C
Relative humidity	: 46.8 %
Atmospheric pressure	: 99.8 kPa

For the measurement records, refer to the appendix B.

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5.1.4 6dB Bandwidth

RESULT:**Pass****Test Specification**

Test standard	: FCC Part 15.247(a)(2) RSS-247 Clause 5.2(a)
Basic standard	: ANSI C63.10: 2013
Limits	: > 500 kHz
Kind of test site	: Shielded Room

Test Setup

Date of testing	: 2024-09-02 to 2024-09-24
Input voltage	: DC 12V
Operation mode	: B
Test channel	: Low / Middle / High
Ambient temperature	: 22.8 °C
Relative humidity	: 46.8 %
Atmospheric pressure	: 99.8 kPa

For the measurement records, refer to the appendix B.

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5.1.5 99% Bandwidth

RESULT:**Pass****Test Specification**

Test standard	: FCC Part 15.247(a) RSS-Gen Clause 6.7
Basic standard	: ANSI C63.10: 2013
Kind of test site	: Shielded Room

Test Setup

Date of testing	: 2024-09-02 to 2024-09-24
Input voltage	: DC 12V
Operation mode	: A, B
Test channel	: Low / Middle / High
Ambient temperature	: 22.8 °C
Relative humidity	: 46.8 %
Atmospheric pressure	: 99.8 kPa

For the measurement records, refer to the appendix A & B.

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5.1.6 20dB Bandwidth

RESULT:**Pass****Test Specification**

Test standard	: FCC Part 15.247(a)(1) RSS-247 Clause 5.1(a)
Basic standard	: ANSI C63.10: 2013
Kind of test site	: Shielded Room

Test Setup

Date of testing	: 2024-09-02 to 2024-09-24
Input voltage	: DC 12V
Operation mode	: A
Test channel	: Low / Middle / High
Ambient temperature	: 22.8 °C
Relative humidity	: 46.8 %
Atmospheric pressure	: 99.8 kPa

For the measurement records, refer to the appendix A.

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5.1.7 Carrier Frequency Separation

RESULT:**Pass****Test Specification**

Test standard	: FCC Part 15.247(a)(1) RSS-247 Clause 5.1(b)
Basic standard	: ANSI C63.10: 2013
Limits	: $\geq 25\text{kHz}$ or $2/3$ of 20dB bandwidth, whichever is greater
Kind of test site	: Shielded Room

Test Setup

Date of testing	: 2024-09-02 to 2024-09-24
Input voltage	: DC 12V
Operation mode	: C
Test channel	: Low / Middle / High
Ambient temperature	: 22.8 °C
Relative humidity	: 46.8 %
Atmospheric pressure	: 99.8 kPa

For the measurement records, refer to the appendix A.

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5.1.8 Number of Hopping Frequency

RESULT:**Pass****Test Specification**

Test standard	: FCC part 15.247(a)(1)(iii) RSS-247 Clause 5.1(d)
Basic standard	: ANSI C63.10: 2013
Limits	: ≥ 15 non-overlapping channels
Kind of test site	: Shielded Room

Test Setup

Date of testing	: 2024-09-02 to 2024-09-24
Input voltage	: DC 12V
Operation mode	: C
Ambient temperature	: 22.8 °C
Relative humidity	: 46.8 %
Atmospheric pressure	: 99.8 kPa

For the measurement records, refer to the appendix A.

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5.1.9 Time of Occupancy

RESULT:**Pass****Test Specification**

Test standard	: FCC part 15.247(a)(1)(iii) RSS-247 Clause 5.1(d)
Basic standard	: ANSI C63.10: 2013
Limits	: < 0.4s
Kind of test site	: Shielded Room

Test Setup

Date of testing	: 2024-09-02 to 2024-09-24
Input voltage	: DC 12V
Operation mode	: C
Test channel	: Low / Middle / High
Ambient temperature	: 22.8 °C
Relative humidity	: 46.8 %
Atmospheric pressure	: 99.8 kPa

For the measurement records, refer to the appendix A.

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5.1.10 Conducted Spurious Emissions Measured in 100 kHz Bandwidth

RESULT:

Pass

Test Specification

Test standard	: FCC Part 15.247(d) RSS-247 Clause 5.5
Basic standard	: ANSI C63.10: 2013
Limits	: 20dB (below that in the 100kHz bandwidth within the band that contains the highest level of the desired power); In addition, radiated emissions which fall in the restricted bands, must also comply with the radiated emission limits specified in 15.209(a)
Kind of test site	: Shielded Room

Test Setup

Date of testing	: 2024-09-02 to 2024-09-24
Input voltage	: DC 12V
Operation mode	: A, B
Test channel	: Low / Middle / High
Ambient temperature	: 22.8 °C
Relative humidity	: 46.8 %
Atmospheric pressure	: 99.8 kPa

Test results of 100kHz Bandwidth of Frequency Band Edge by Conducted method refer to test plots, and compliance is achieved as well.

For the measurement records, refer to the appendix A & B.

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5.1.11 Radiated Spurious Emission

RESULT:**Pass****Test Specification**

Test standard	: FCC Part 15.247(d) & FCC Part 15.205 RSS-247 Clause 3.3
Basic standard	: ANSI C63.10: 2013
Limits	: Refer to 15.209(a) of FCC part 15.247(d) RSS-Gen Section 8.9 & 8.10
Kind of test site	: 3m Semi-anechoic Chamber

Test Setup

Date of testing	: 2024-09-24 to 2024-09-27
Input voltage	: DC 12V
Operation mode	: A, B
Test channel	: Low / Middle / High
Ambient temperature	: Refer to test result
Relative humidity	: Refer to test result
Atmospheric pressure	: Refer to test result

Remark:

Testing was carried out within frequency range 9kHz to the tenth harmonics. Only the worst case spurious emissions configuration of the each mode were reported.

For the measurement records, refer to the appendix A & B.

6 Photographs of the Test Set-Up

For photographs of the test set-up, refer to the appendix C.

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Appendix A: Test Results of Bluetooth BR & EDR mode

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Appendix A.1: Test Results of 99% Bandwidth

TestMode	Antenna	Frequency[MHz]	OCB [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
DH5	Ant1	2402	0.88498	2401.5559	2402.4409	---	PASS
DH5	Ant1	2441	0.86282	2440.5578	2441.4207	---	PASS
DH5	Ant1	2480	0.87333	2479.5548	2480.4281	---	PASS
2DH5	Ant1	2402	1.1795	2401.4031	2402.5826	---	PASS
2DH5	Ant1	2441	1.1853	2440.4017	2441.5870	---	PASS
2DH5	Ant1	2480	1.1837	2479.3998	2480.5835	---	PASS
3DH5	Ant1	2402	1.1777	2401.4086	2402.5863	---	PASS
3DH5	Ant1	2441	1.1915	2440.3974	2441.5889	---	PASS
3DH5	Ant1	2480	1.1989	2479.3915	2480.5904	---	PASS



DH5-Ant1-2402



DH5-Ant1-2441



DH5-Ant1-2480



2DH5-Ant1-2402



2DH5-Ant1-2441



2DH5-Ant1-2480



3DH5-Ant1-2402



3DH5-Ant1-2441



3DH5-Ant1-2480

Appendix A.2: Test Results of 20dB Bandwidth

TestMode	Antenna	Frequency[MHz]	20db EBW[MHz]	Limit[MHz]	Verdict
DH5	Ant1	2402	0.9619	---	PASS
DH5	Ant1	2441	0.9648	---	PASS
DH5	Ant1	2480	0.9580	---	PASS
2DH5	Ant1	2402	1.323	---	PASS
2DH5	Ant1	2441	1.327	---	PASS
2DH5	Ant1	2480	1.329	---	PASS
3DH5	Ant1	2402	1.299	---	PASS
3DH5	Ant1	2441	1.300	---	PASS
3DH5	Ant1	2480	1.301	---	PASS



DH5-Ant1-2402



DH5-Ant1-2441



DH5-Ant1-2480



2DH5-Ant1-2402



2DH5-Ant1-2441



2DH5-Ant1-2480



3DH5-Ant1-2402



3DH5-Ant1-2441



3DH5-Ant1-2480

Appendix A.3: Test Results of Carrier Frequency Separation

TestMode	Antenna	Frequency[MHz]	Result[MHz]	Limit[MHz]	Verdict
DH5	Ant1	Hop	1.002	≥ 0.965	PASS
2DH5	Ant1	Hop	1.318	≥ 0.886	PASS
3DH5	Ant1	Hop	1.038	≥ 0.867	PASS



DH5-Ant1-Hop-PASS



2DH5-Ant1-Hop-PASS



3DH5-Ant1-Hop-PASS

Appendix A.4: Test Results of Number of Hopping Frequency

TestMode	Antenna	Frequency[MHz]	Result[Num]	Limit[Num]	Verdict
DH5	Ant1	Hop	79	≥15	PASS
2DH5	Ant1	Hop	79	≥15	PASS
3DH5	Ant1	Hop	79	≥15	PASS



DH5-Ant1-Hop-PASS



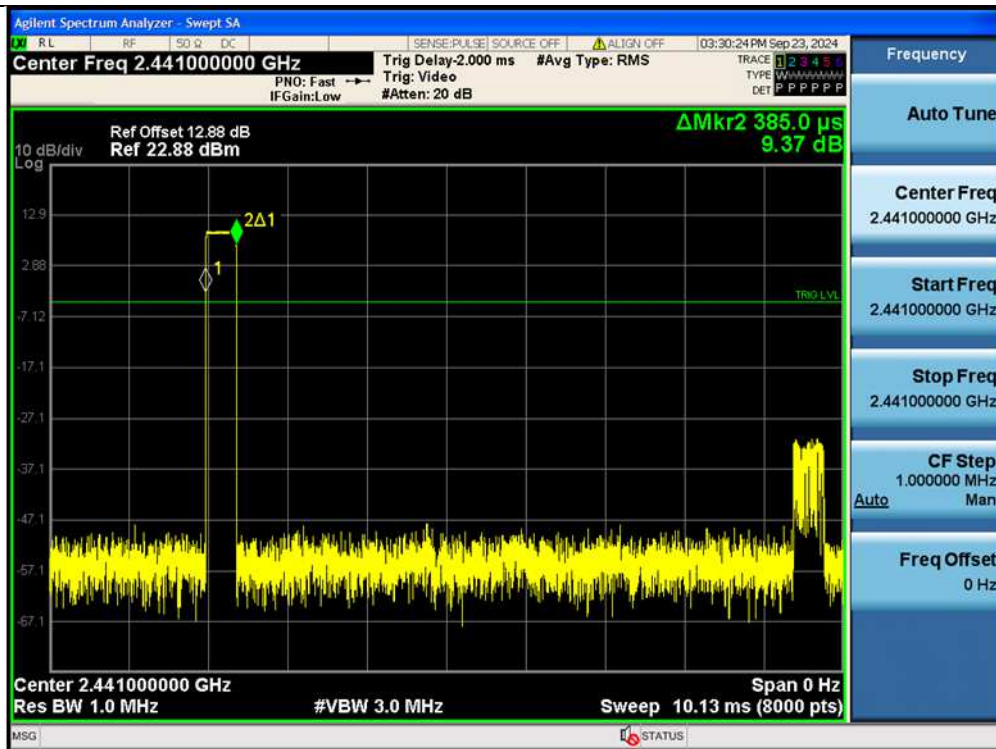
2DH5-Ant1-Hop-PASS



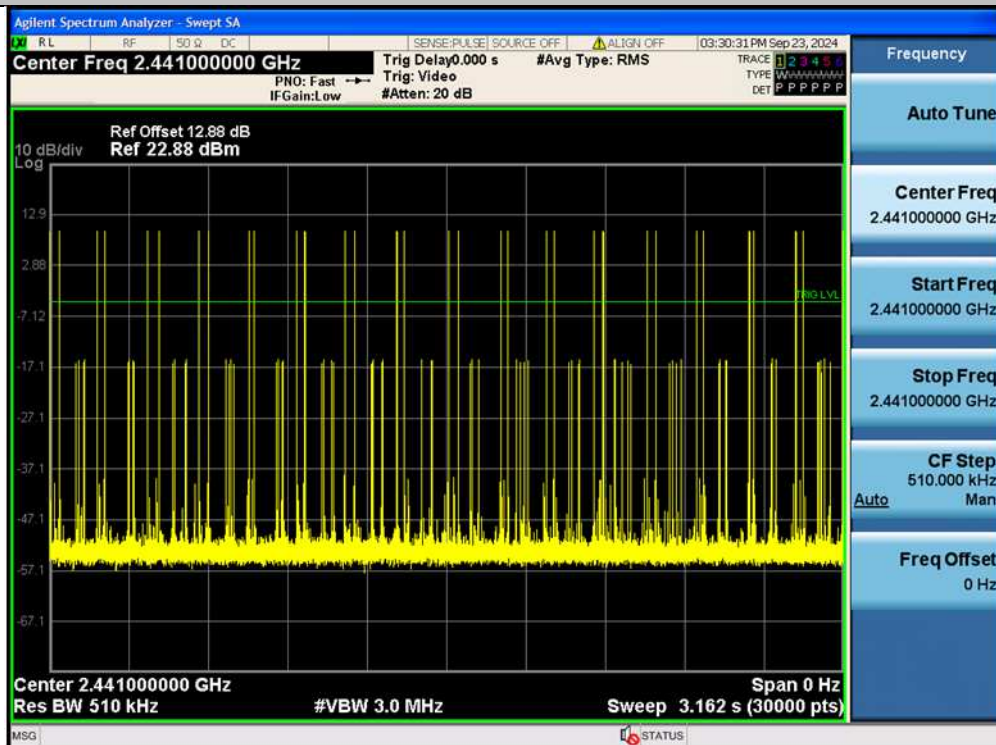
3DH5-Ant1-Hop-PASS

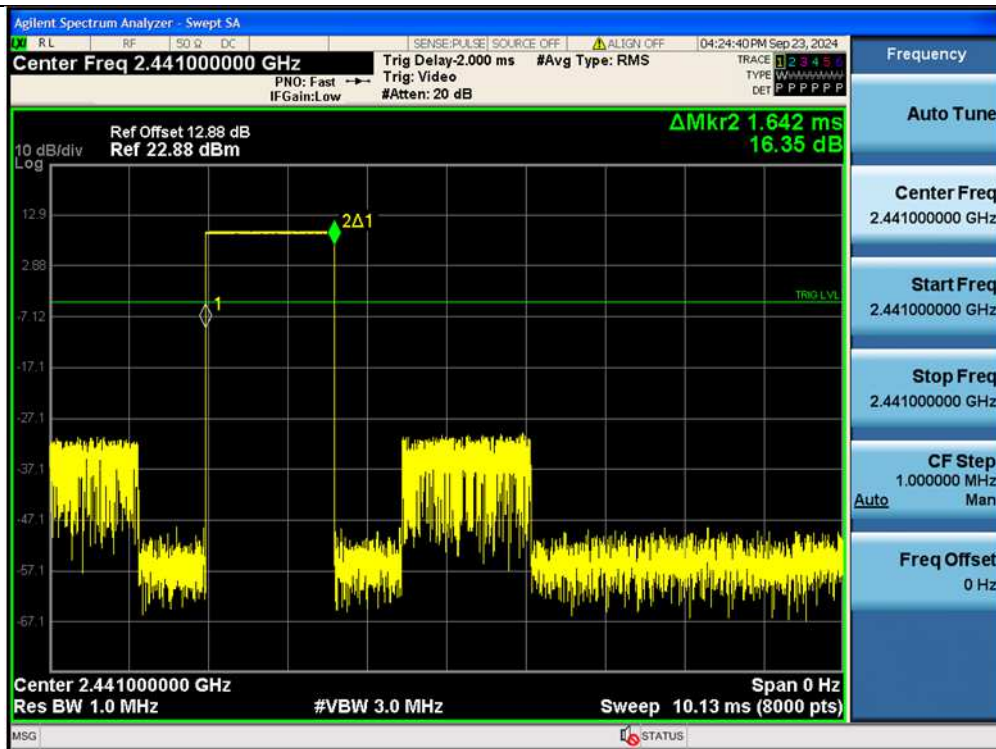
Appendix A.5: Test Results of Time of Occupancy

TestMode	Antenna	Frequency[MHz]	BurstWidth [ms]	TotalHops [Num]	Result[s]	Limit[s]	Verdict
DH1	Ant1	Hop	0.385	330	0.127	≤0.4	PASS
DH3	Ant1	Hop	1.642	170	0.279	≤0.4	PASS
DH5	Ant1	Hop	2.889	110	0.318	≤0.4	PASS
2DH1	Ant1	Hop	0.388	330	0.128	≤0.4	PASS
2DH3	Ant1	Hop	1.639	160	0.262	≤0.4	PASS
2DH5	Ant1	Hop	2.887	110	0.318	≤0.4	PASS
3DH1	Ant1	Hop	0.385	330	0.127	≤0.4	PASS
3DH3	Ant1	Hop	1.637	160	0.262	≤0.4	PASS
3DH5	Ant1	Hop	2.887	70	0.202	≤0.4	PASS

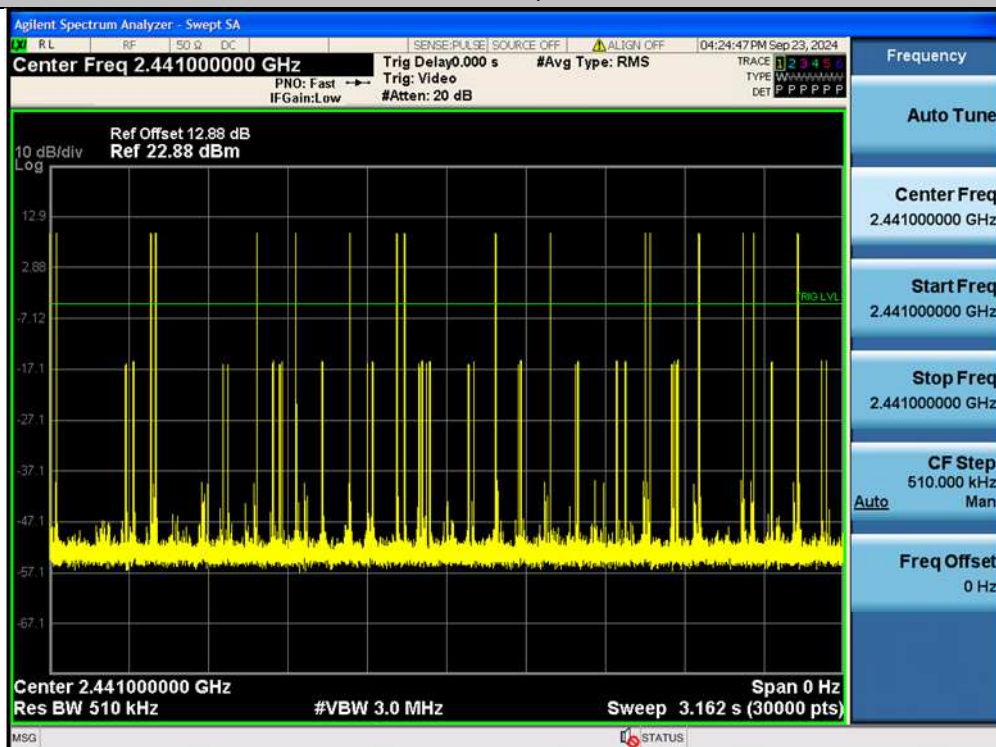


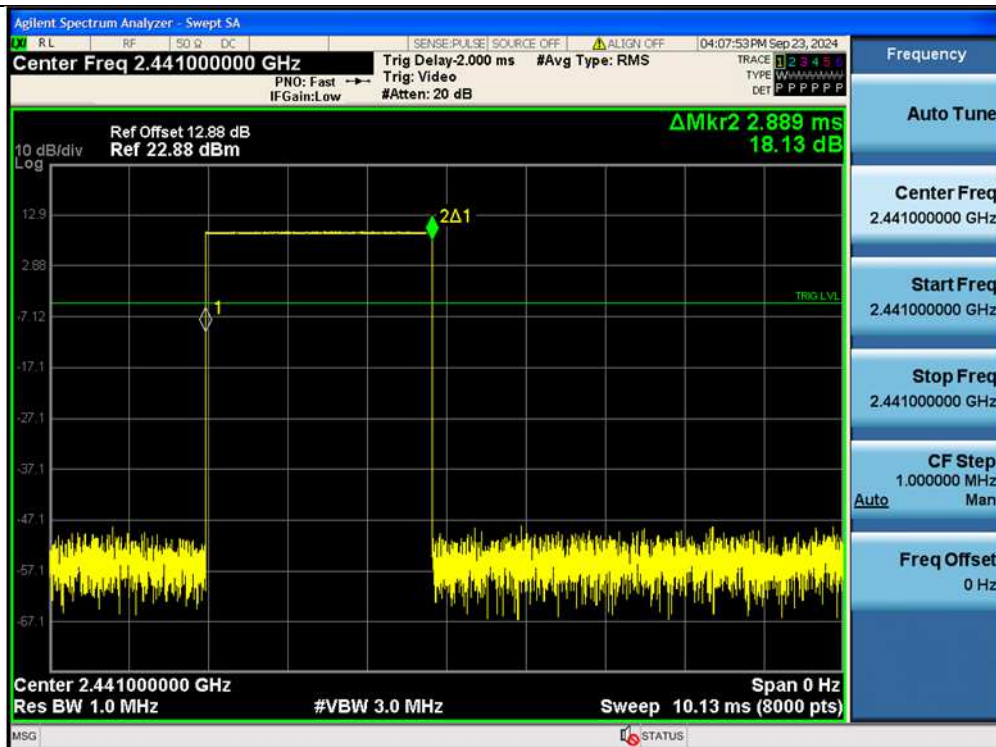
DH1-Ant1-Hop-PASS



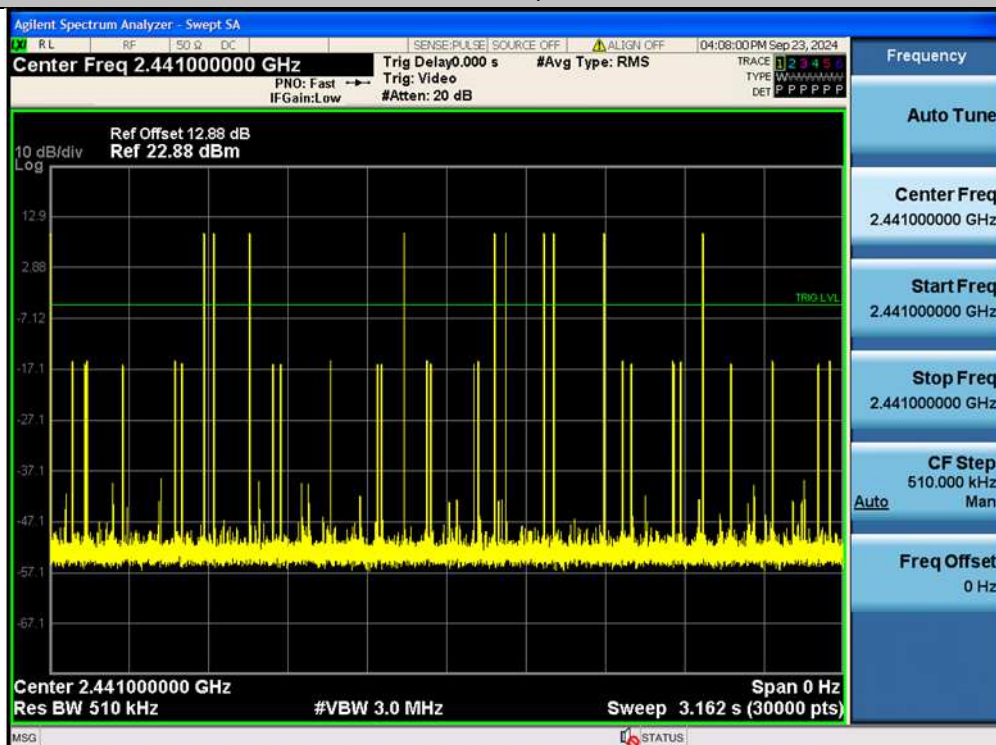


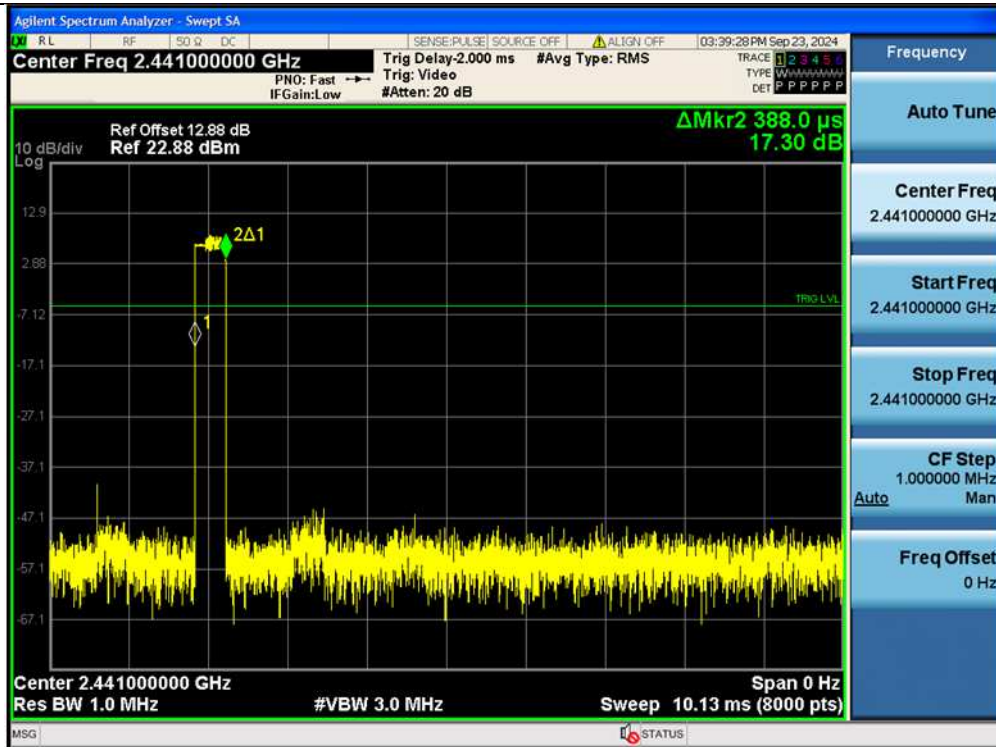
DH3-Ant1-Hop-PASS



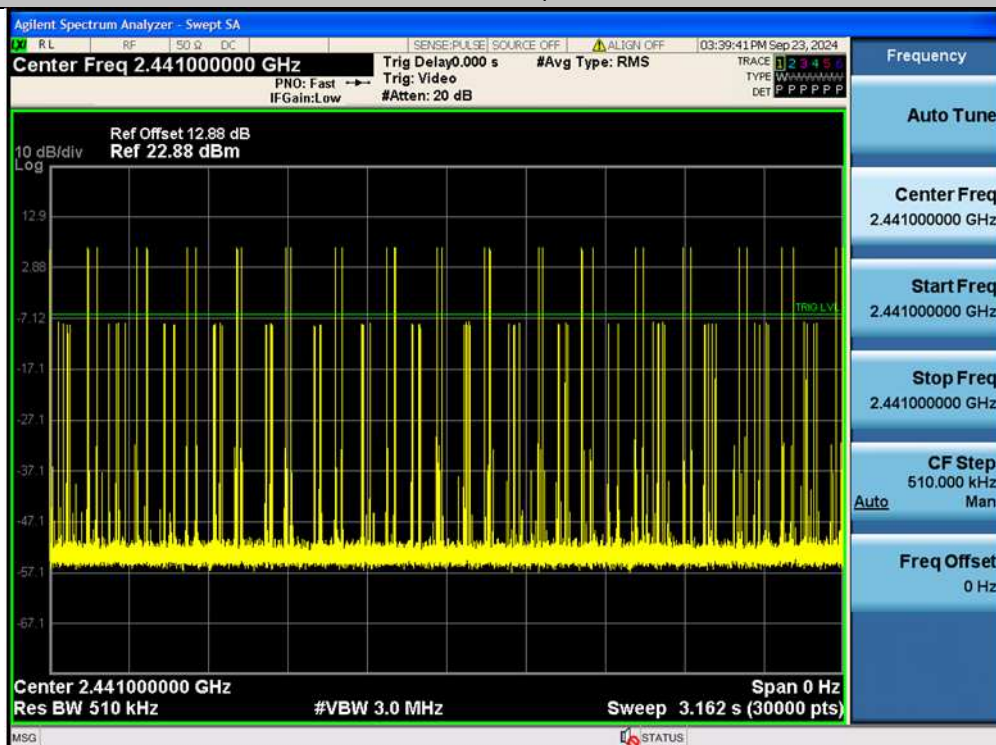


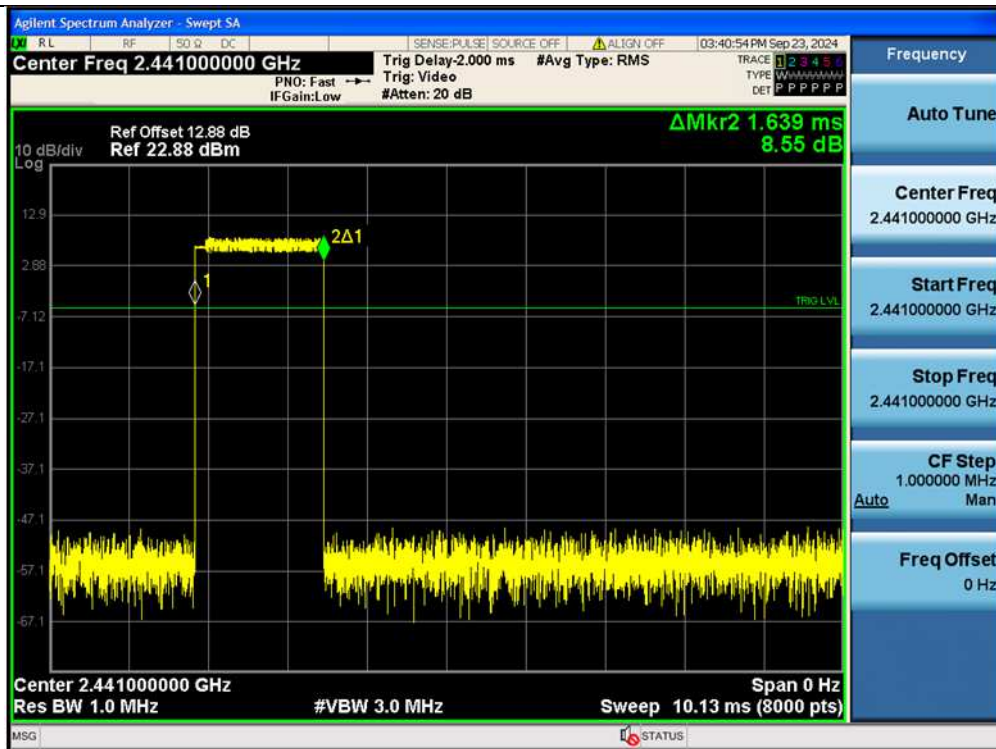
DH5-Ant1-Hop-PASS



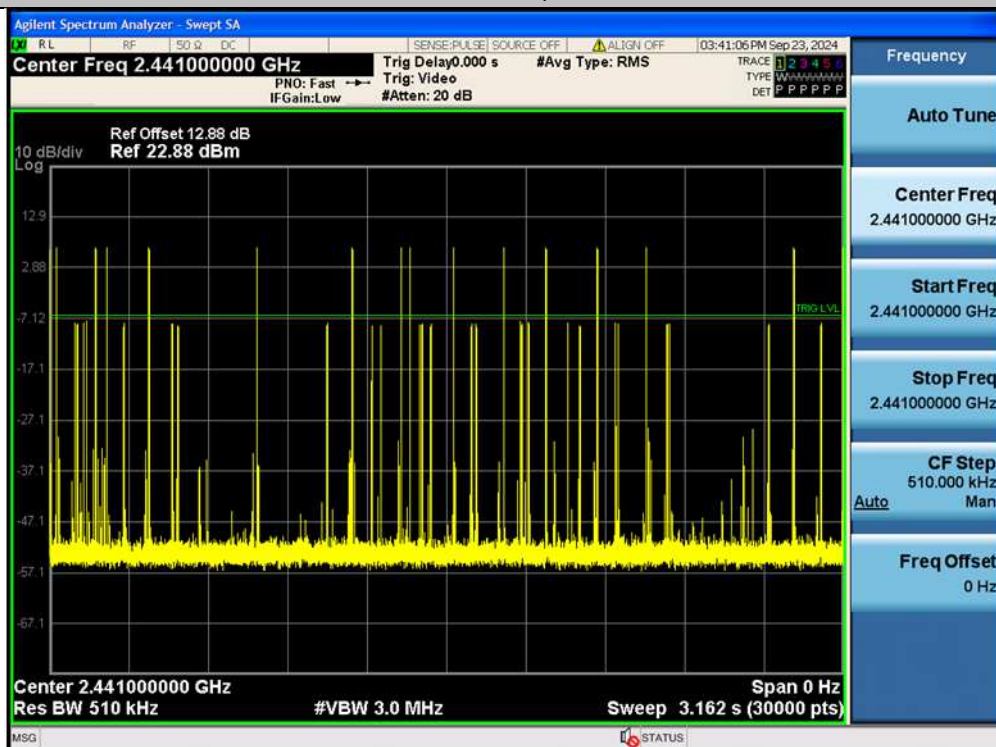


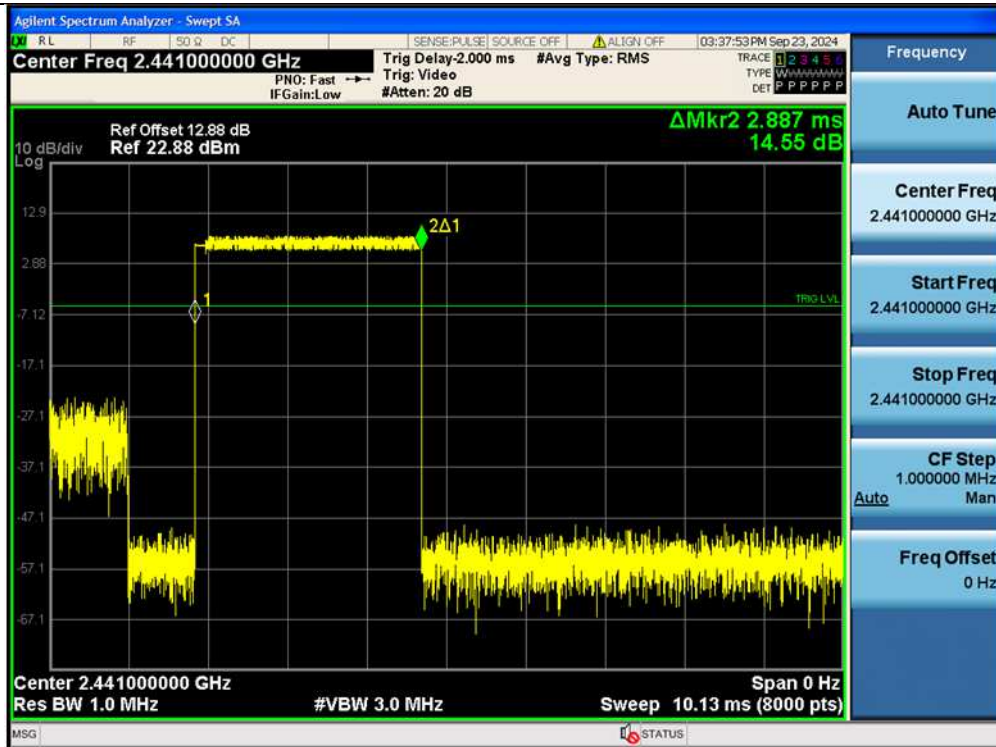
2DH1-Ant1-Hop-PASS



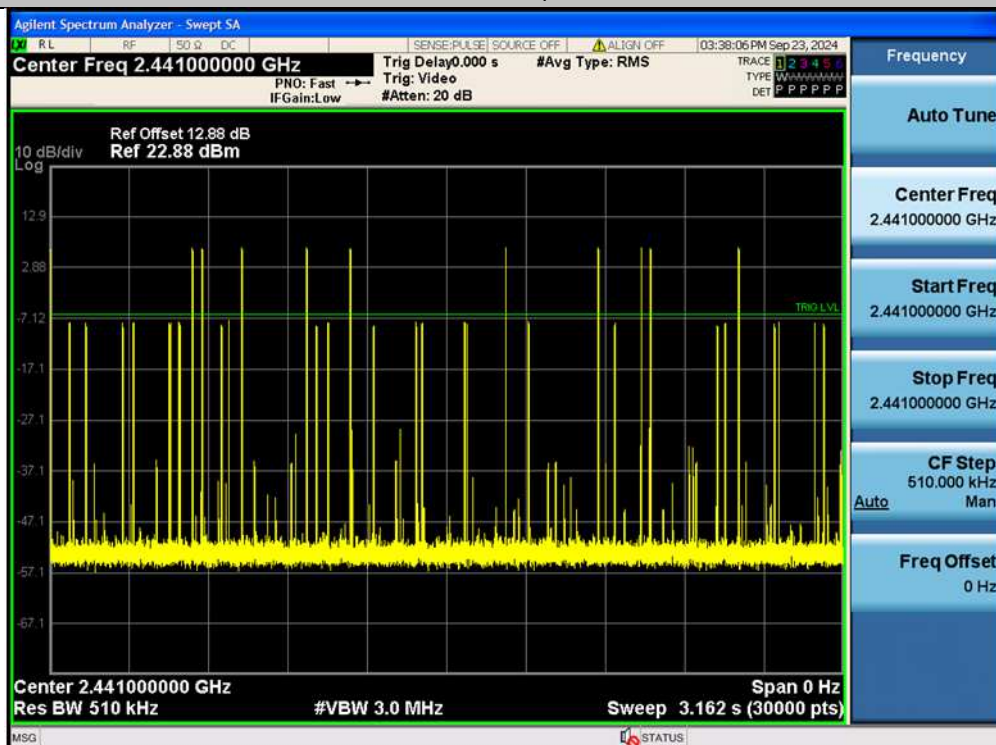


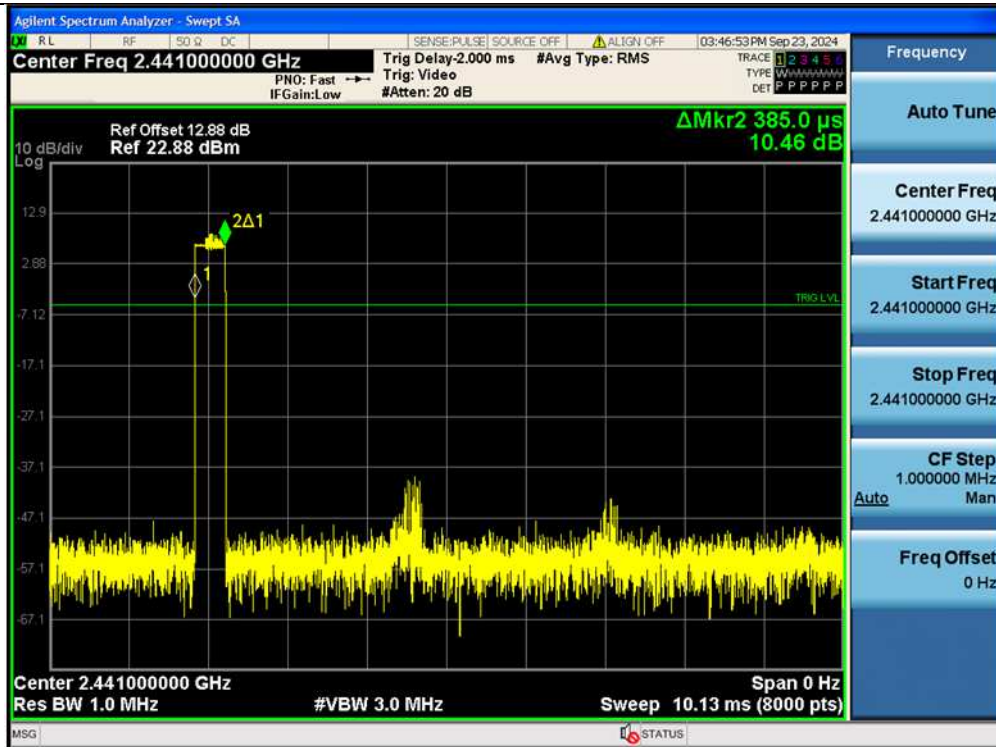
2DH3-Ant1-Hop-PASS



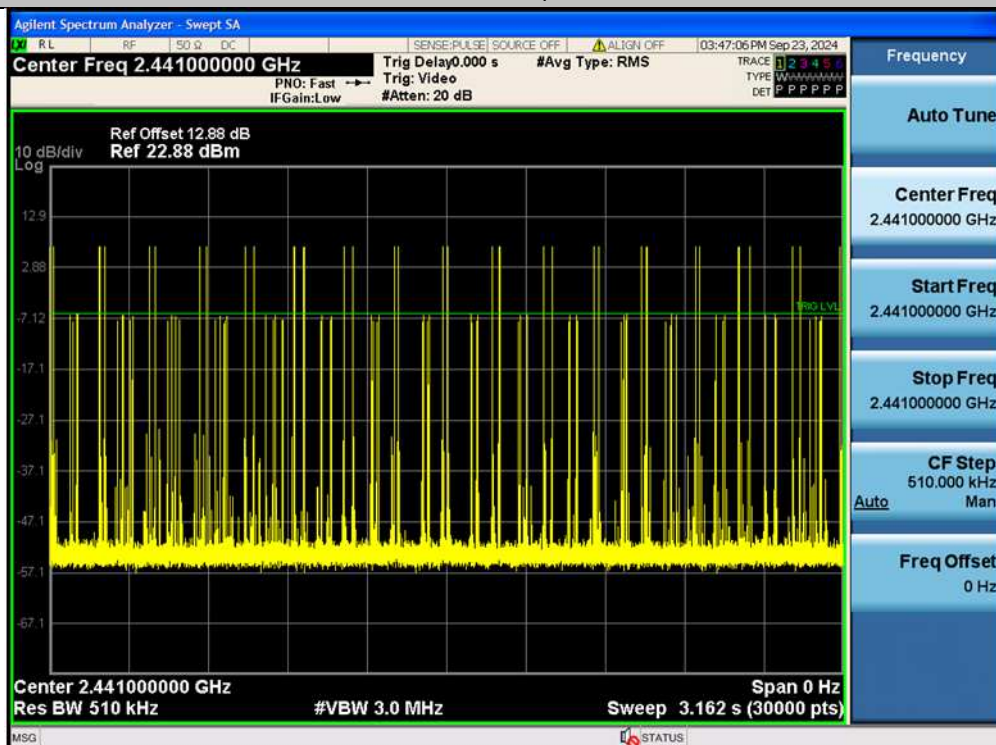


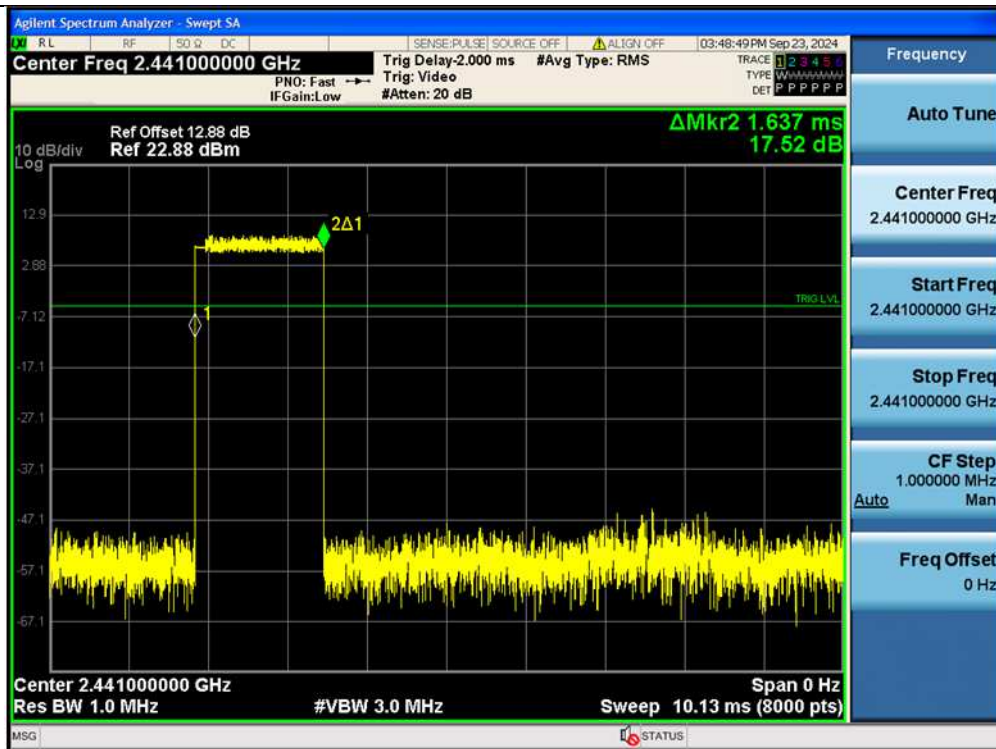
2DH5-Ant1-Hop-PASS



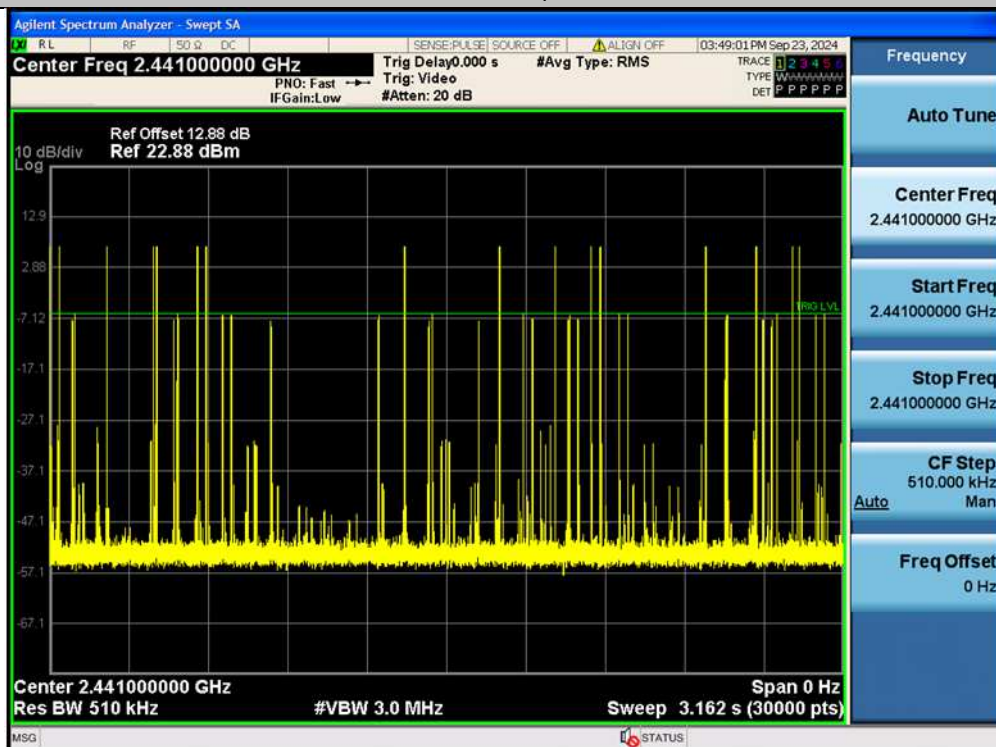


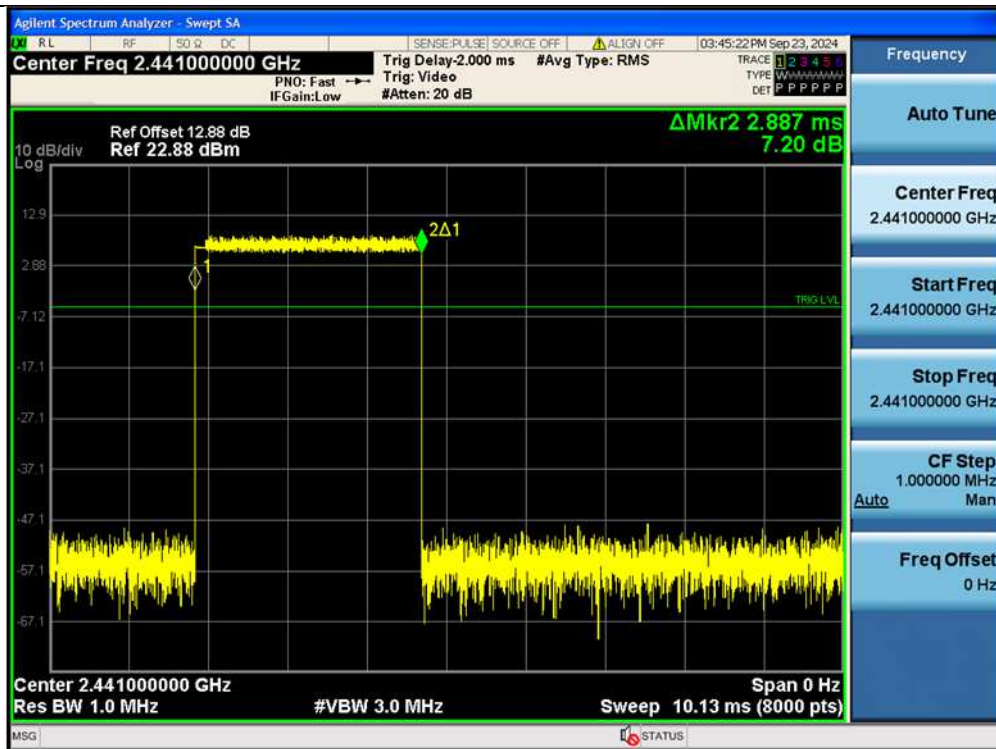
3DH1-Ant1-Hop-PASS



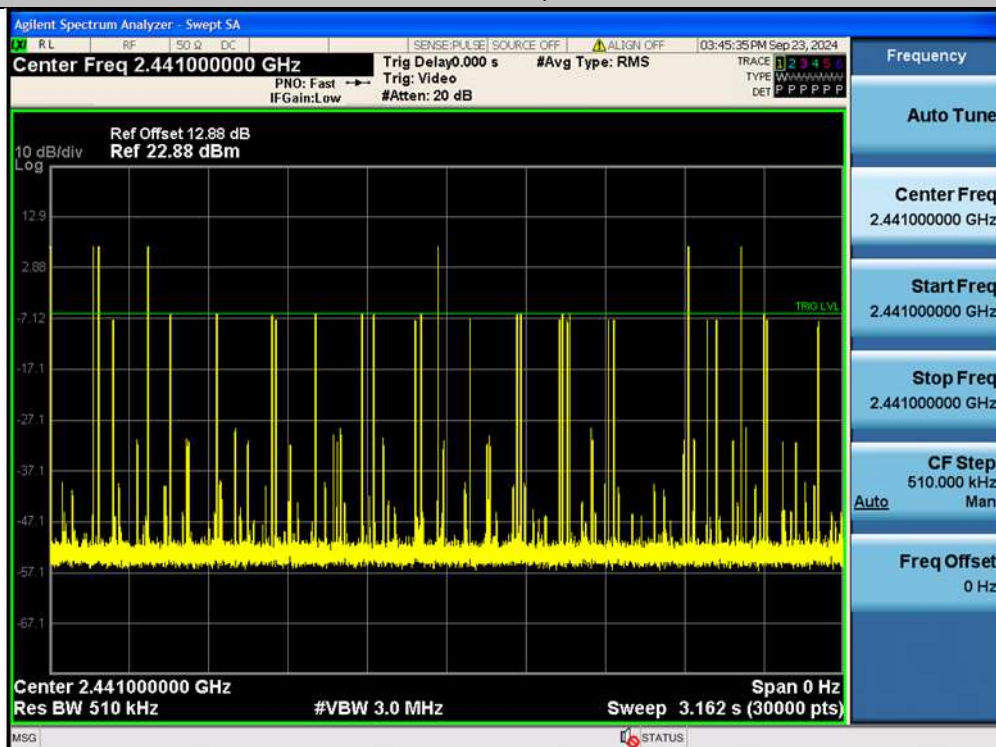


3DH3-Ant1-Hop-PASS





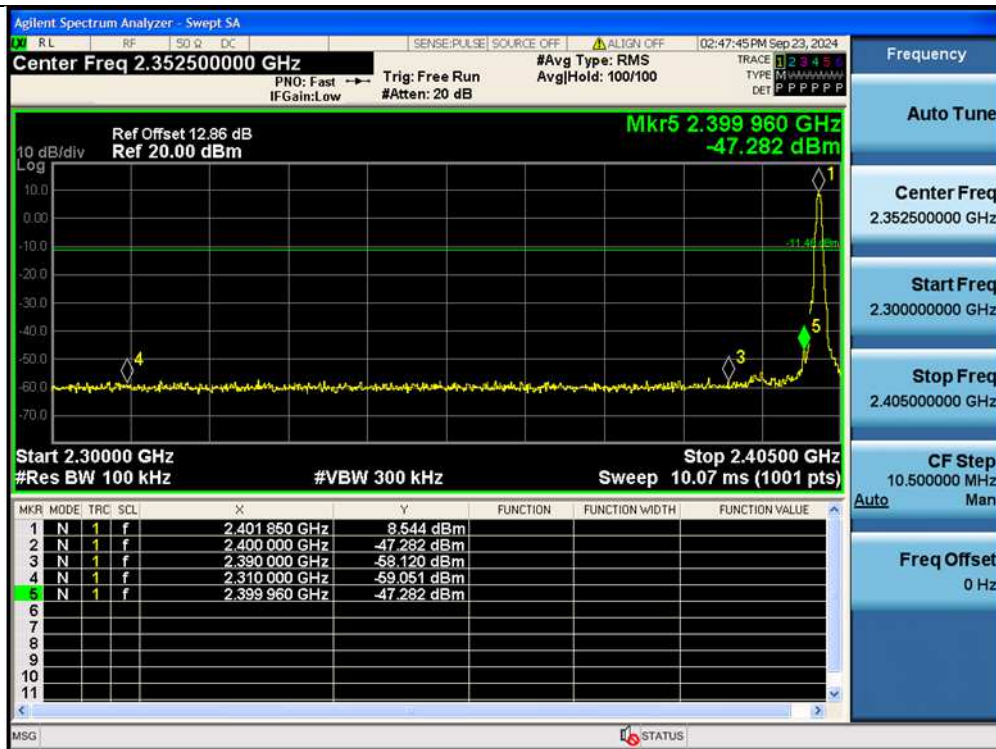
3DH5-Ant1-Hop-PASS



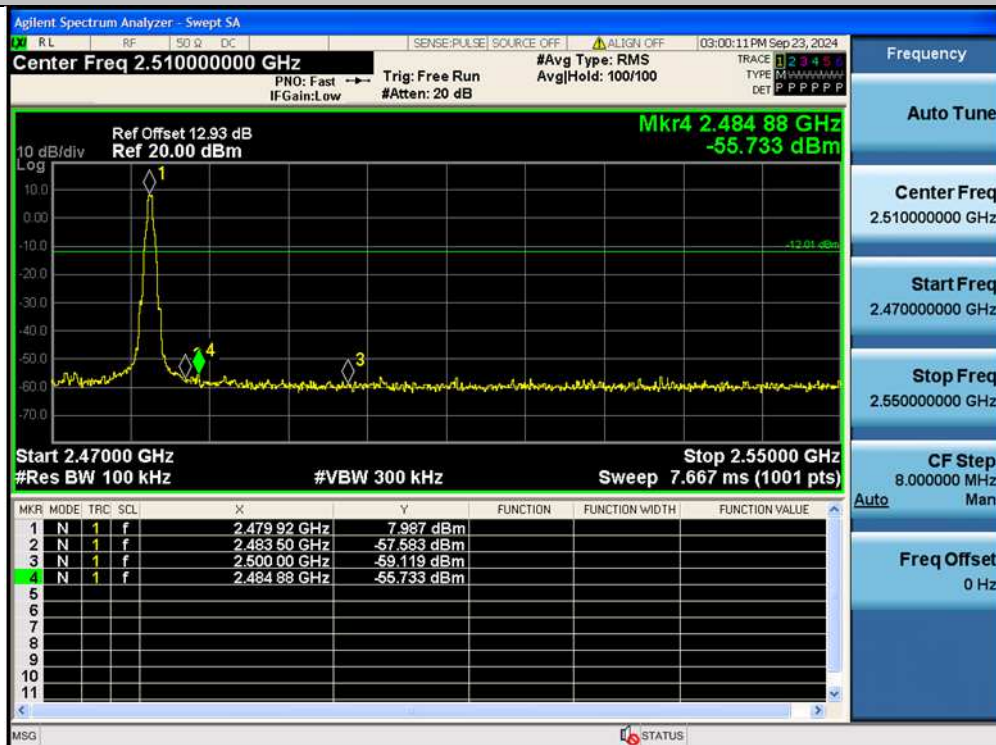
Appendix A.6: Test Results of Conducted Spurious Emissions Measured in 100 kHz Bandwidth

Band Edge

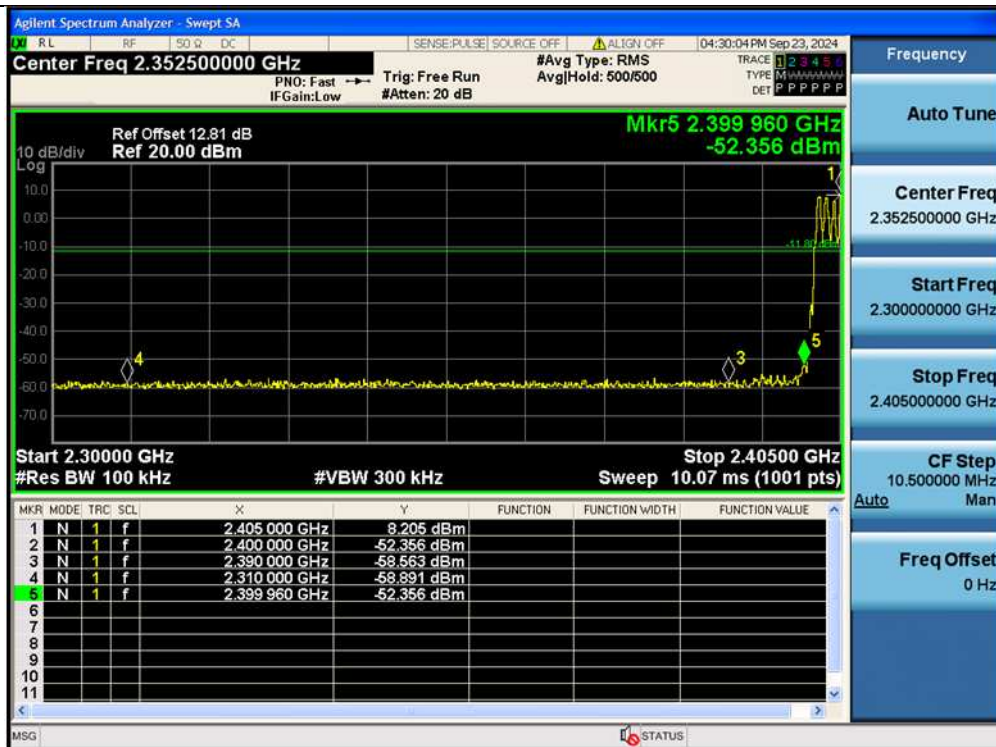
TestMode	Antenna	ChName	Frequency[MHz]	RefLevel [dBm]	Result [dBm]	Limit [dBm]	Verdict
DH5	Ant1	Low	2402	8.54	-47.28	≤-11.46	PASS
DH5	Ant1	High	2480	7.99	-55.73	≤-12.01	PASS
DH5	Ant1	Low	Hop_2402	8.21	-52.36	≤-11.8	PASS
DH5	Ant1	High	Hop_2480	8.66	-55.04	≤-11.34	PASS
2DH5	Ant1	Low	2402	3.68	-50.78	≤-16.32	PASS
2DH5	Ant1	High	2480	4.29	-55.97	≤-15.71	PASS
2DH5	Ant1	Low	Hop_2402	4.17	-50.38	≤-15.83	PASS
2DH5	Ant1	High	Hop_2480	3.88	-53.35	≤-16.12	PASS
3DH5	Ant1	Low	2402	5.75	-47.78	≤-14.25	PASS
3DH5	Ant1	High	2480	4.67	-53.88	≤-15.33	PASS
3DH5	Ant1	Low	Hop_2402	3.68	-48.77	≤-16.32	PASS
3DH5	Ant1	High	Hop_2480	5.90	-47.08	≤-14.1	PASS



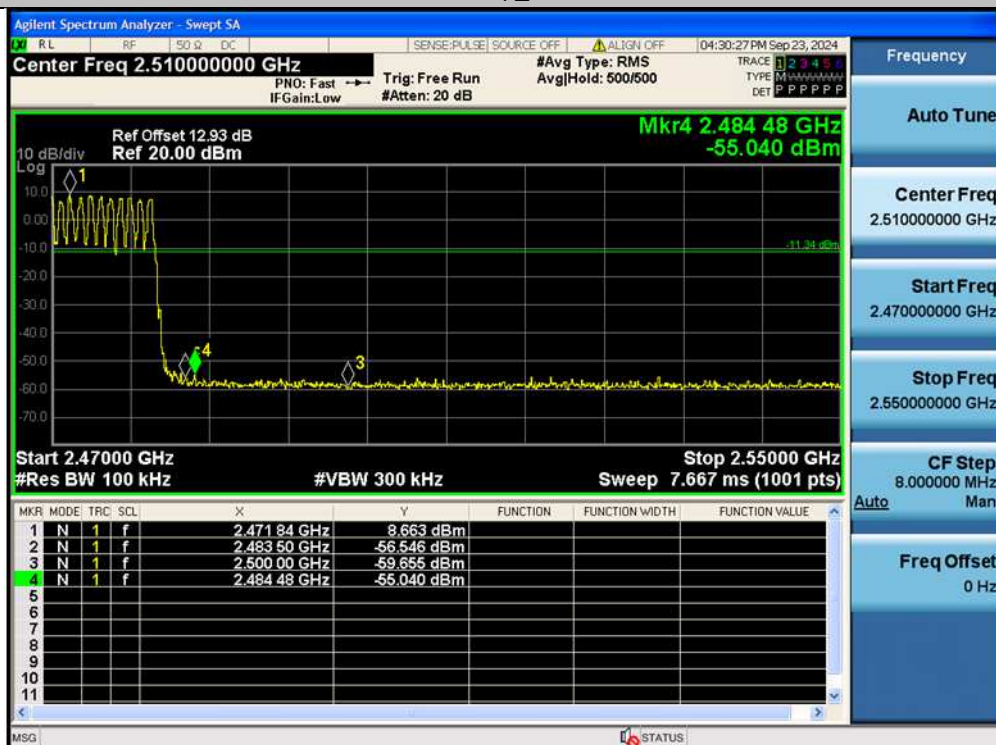
DH5-Ant1-2402-PASS



DH5-Ant1-2480-PASS



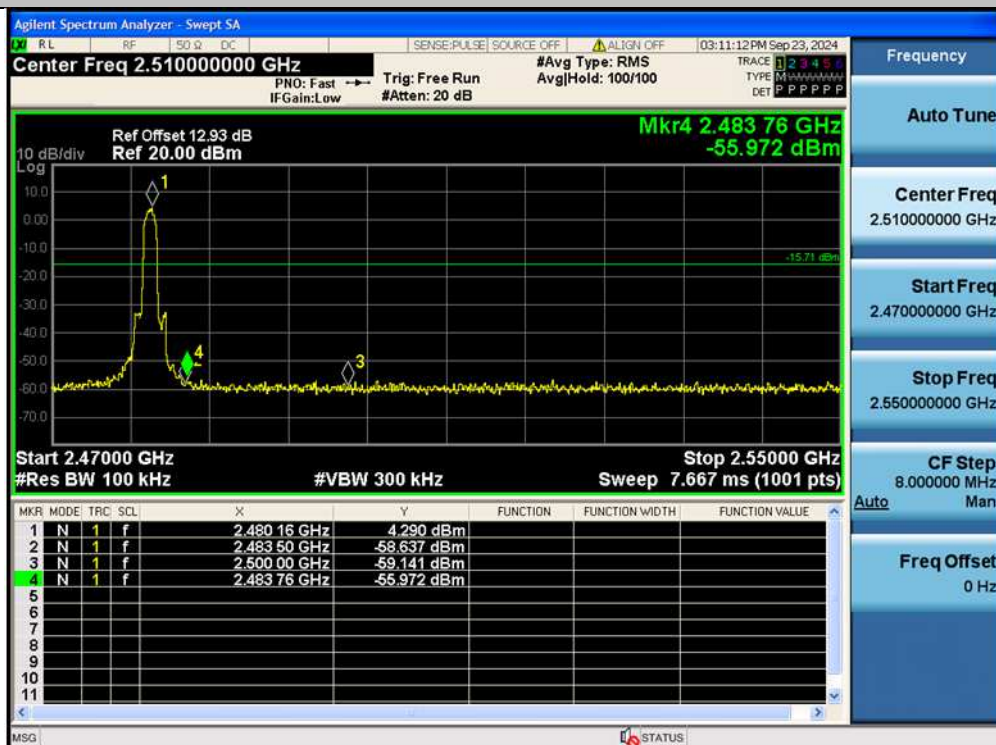
DH5-Ant1-Hop_2402-PASS



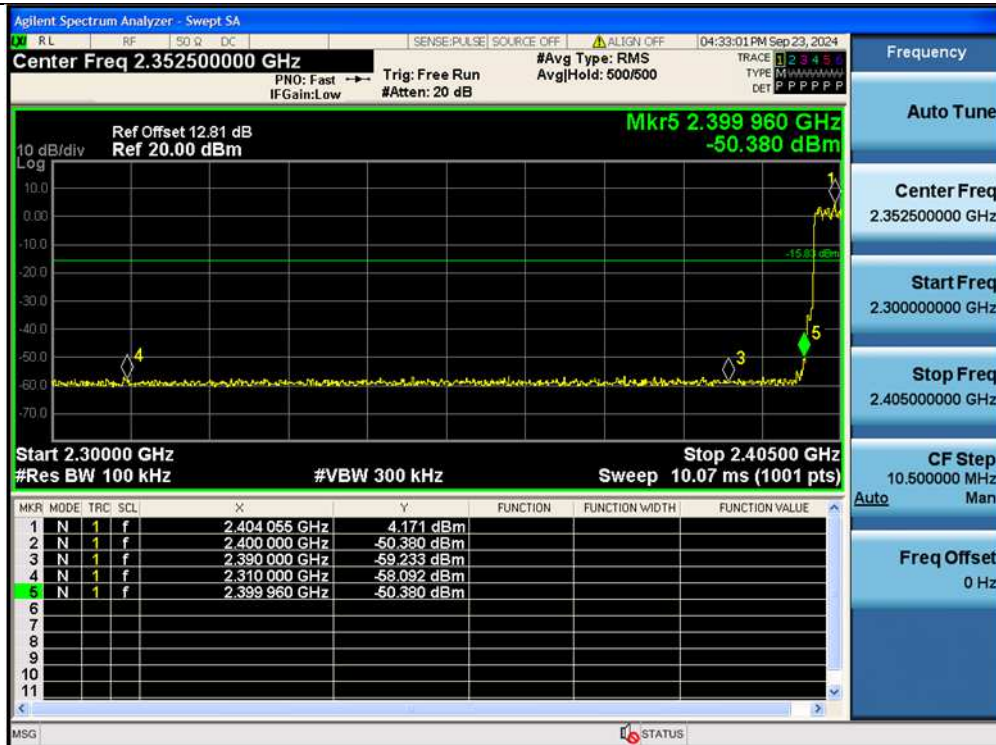
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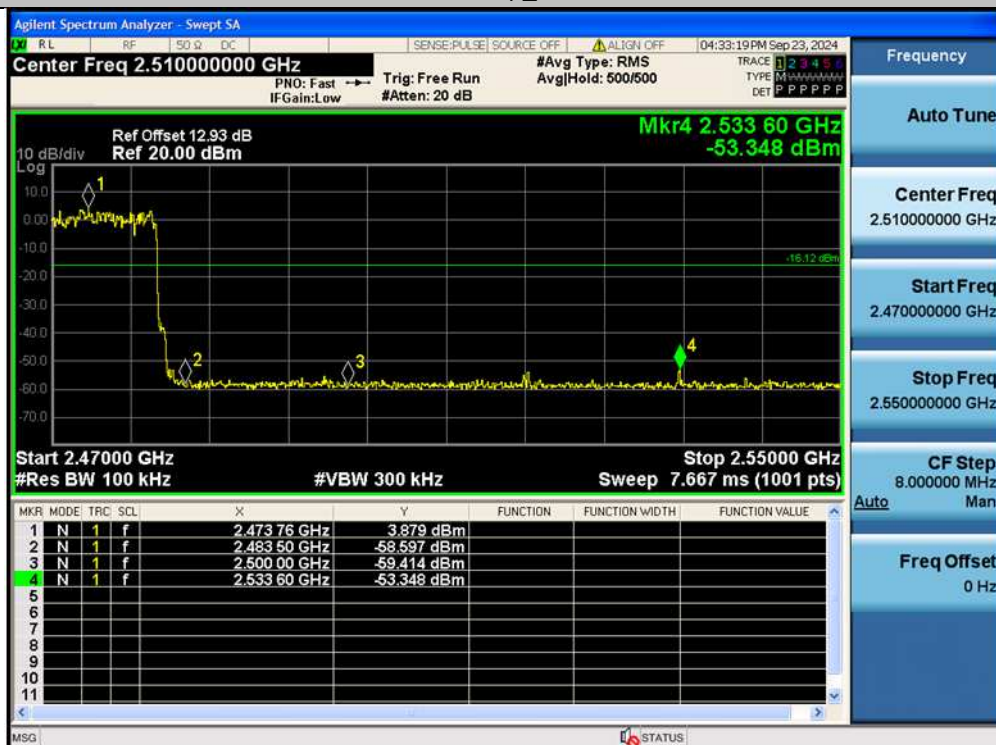
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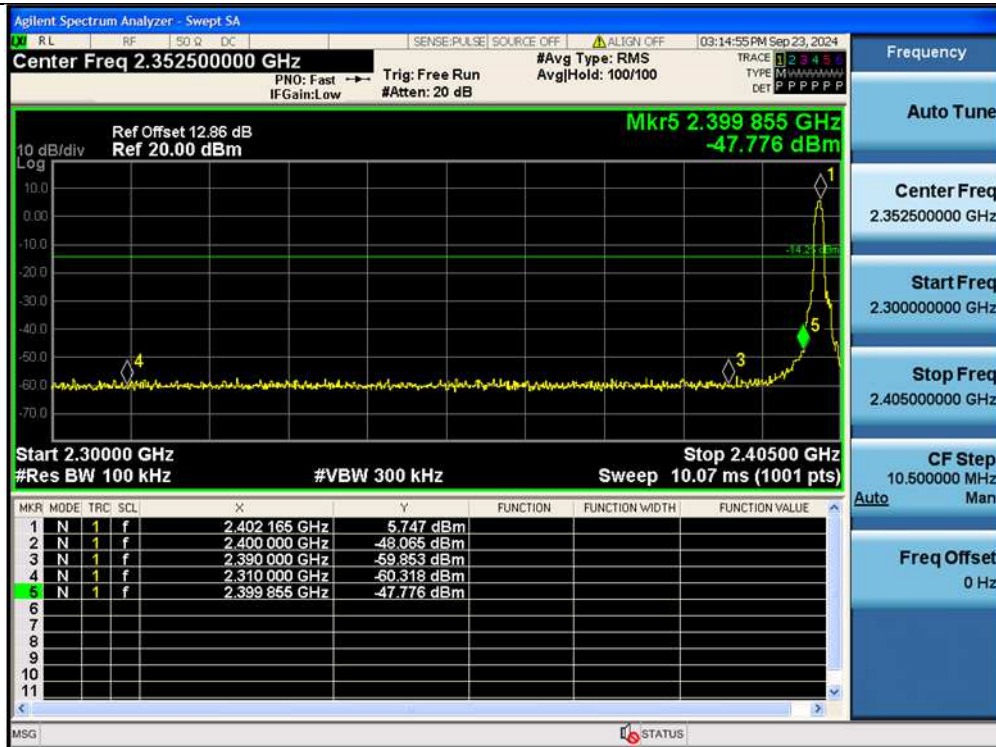
2DH5-Ant1-2480-PASS



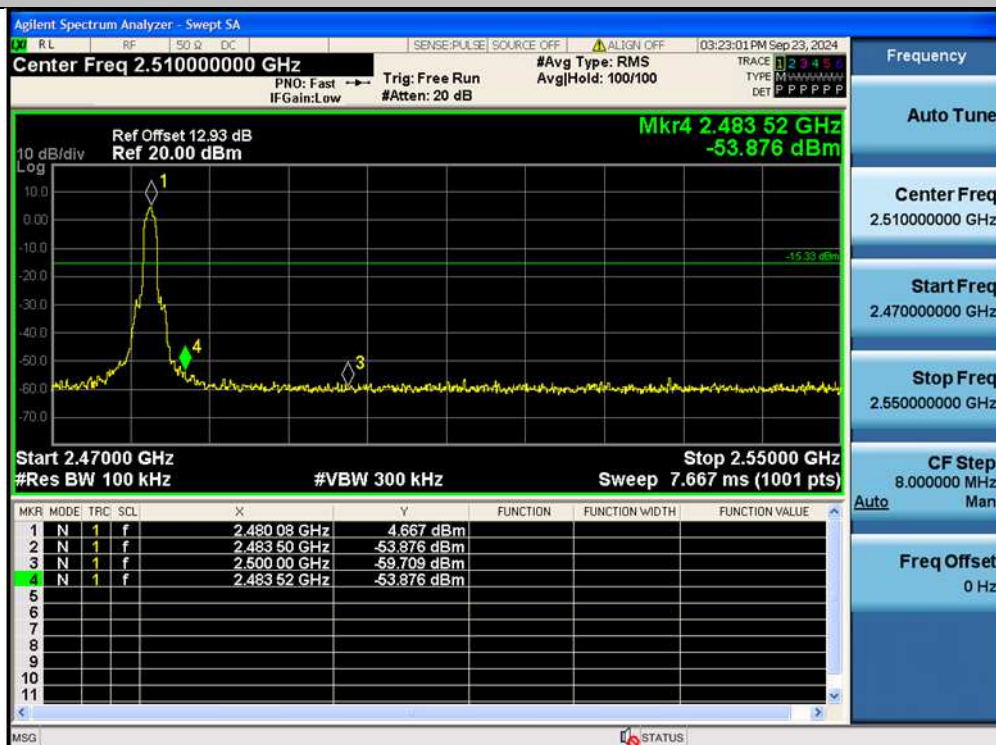
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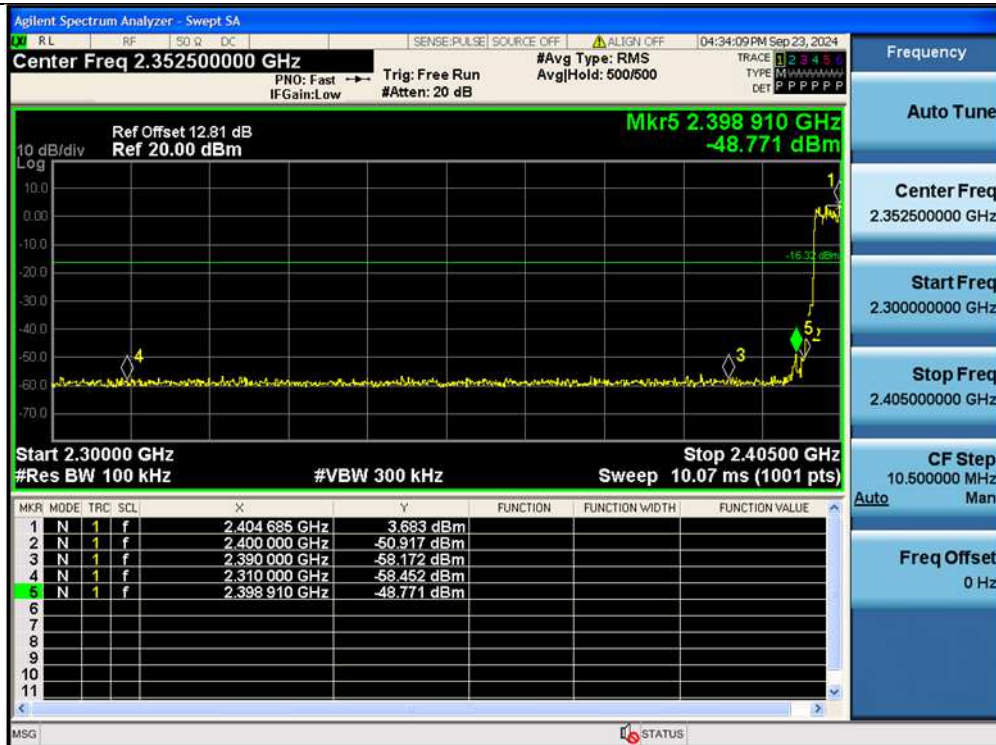
2DH5-Ant1-Hop_2480-PASS



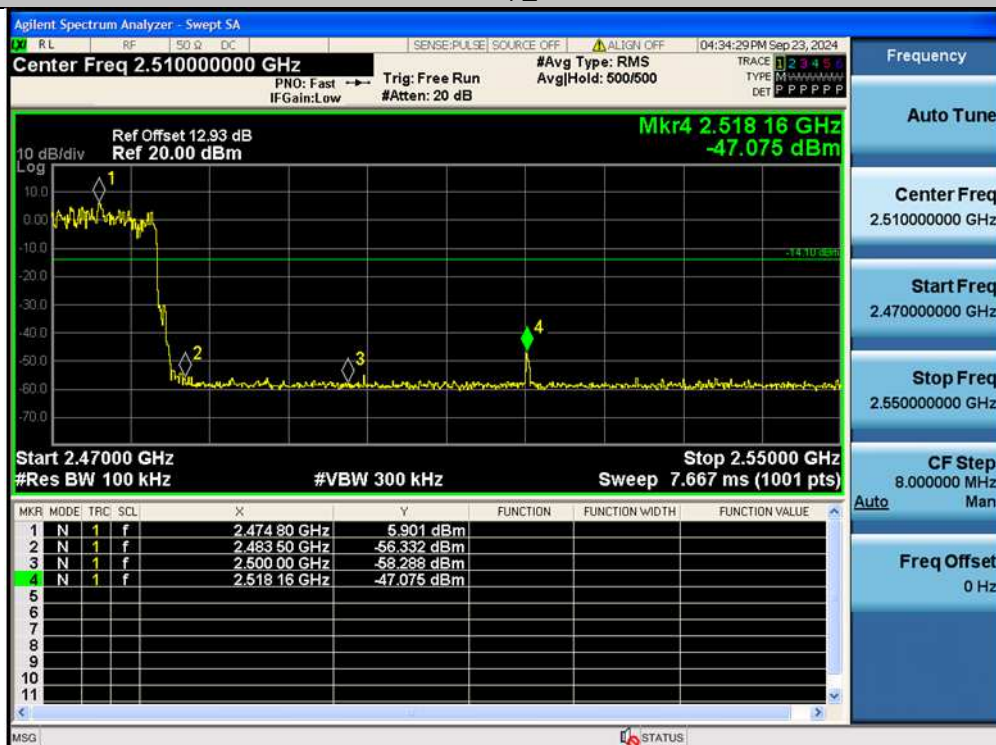
3DH5-Ant1-2402-PASS



3DH5-Ant1-2480-PASS



3DH5-Ant1-Hop_2402-PASS



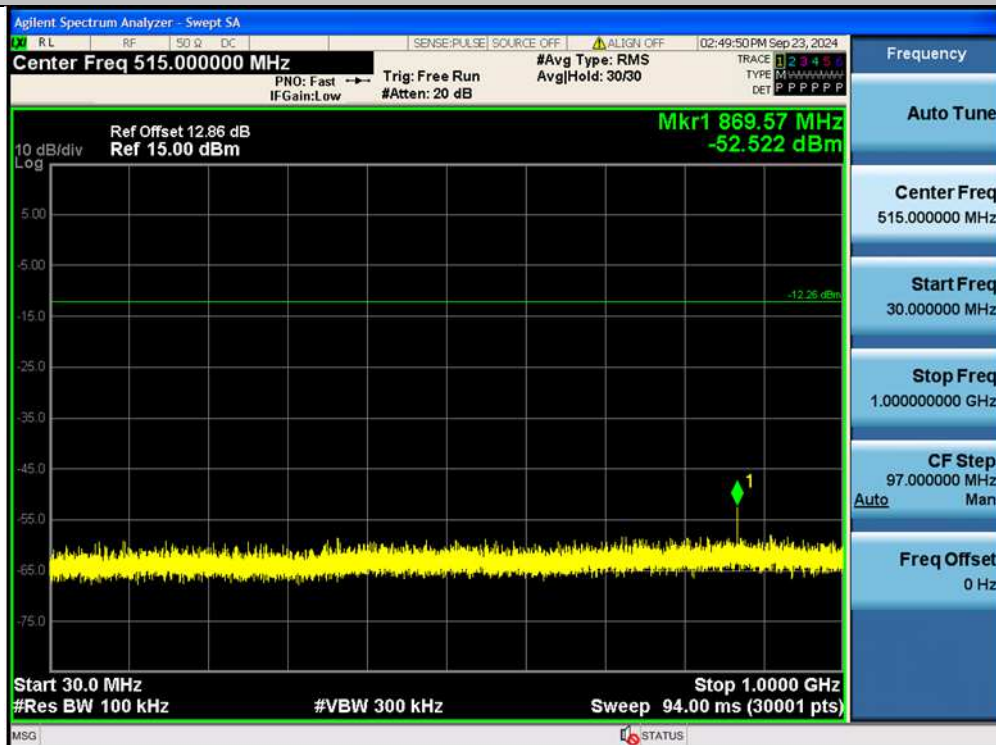
3DH5-Ant1-Hop_2480-PASS

Conducted Spurious Emission

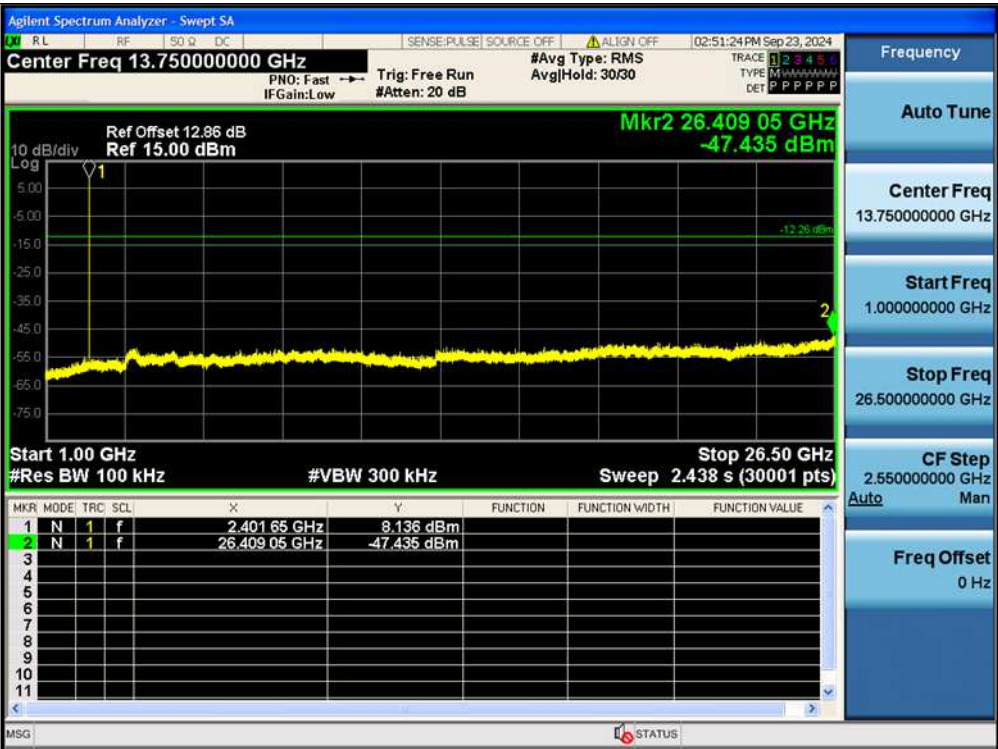
TestMode	Antenna	Frequency[MHz]	FreqRange [MHz]	RefLevel [dBm]	Result [dBm]	Limit [dBm]	Verdict
DH5	Ant1	2402	0~Reference	7.74	7.74	---	PASS
DH5	Ant1	2402	30~1000	7.74	-52.52	≤-12.26	PASS
DH5	Ant1	2402	1000~26500	7.74	-47.44	≤-12.26	PASS
DH5	Ant1	2441	0~Reference	9.32	9.32	---	PASS
DH5	Ant1	2441	30~1000	9.32	-52.43	≤-10.68	PASS
DH5	Ant1	2441	1000~26500	9.32	-47.28	≤-10.68	PASS
DH5	Ant1	2480	0~Reference	7.53	7.53	---	PASS
DH5	Ant1	2480	30~1000	7.53	-53.95	≤-12.47	PASS
DH5	Ant1	2480	1000~26500	7.53	-47.34	≤-12.47	PASS
2DH5	Ant1	2402	0~Reference	4.24	4.24	---	PASS
2DH5	Ant1	2402	30~1000	4.24	-53.26	≤-15.76	PASS
2DH5	Ant1	2402	1000~26500	4.24	-47.29	≤-15.76	PASS
2DH5	Ant1	2441	0~Reference	6.42	6.42	---	PASS
2DH5	Ant1	2441	30~1000	6.42	-52.75	≤-13.58	PASS
2DH5	Ant1	2441	1000~26500	6.42	-46.96	≤-13.58	PASS
2DH5	Ant1	2480	0~Reference	4.56	4.56	---	PASS
2DH5	Ant1	2480	30~1000	4.56	-53.18	≤-15.44	PASS
2DH5	Ant1	2480	1000~26500	4.56	-47.61	≤-15.44	PASS
3DH5	Ant1	2402	0~Reference	3.61	3.61	---	PASS
3DH5	Ant1	2402	30~1000	3.61	-54.28	≤-16.39	PASS
3DH5	Ant1	2402	1000~26500	3.61	-47.46	≤-16.39	PASS
3DH5	Ant1	2441	0~Reference	4.16	4.16	---	PASS
3DH5	Ant1	2441	30~1000	4.16	-53.32	≤-15.84	PASS
3DH5	Ant1	2441	1000~26500	4.16	-47.71	≤-15.84	PASS
3DH5	Ant1	2480	0~Reference	5.33	5.33	---	PASS
3DH5	Ant1	2480	30~1000	5.33	-52.66	≤-14.67	PASS
3DH5	Ant1	2480	1000~26500	5.33	-46.67	≤-14.67	PASS



DH5-Ant1-2402-0~Reference-PASS



DH5-Ant1-2402-30~1000-PASS



DH5-Ant1-2402-1000~26500-PASS



DH5-Ant1-2441-0~Reference-PASS