

Prüfbericht-Nr.: <i>Test report no.:</i>	CN2479N8 001	Auftrags-Nr.: <i>Order no.:</i>	168493211	Seite 1 von 23 Page 1 of 23
Kunden-Referenz-Nr.: <i>Client reference no.:</i>	N/A	Auftragsdatum: <i>Order date:</i>	2024-07-08	
Auftraggeber: <i>Client:</i>	Sensitech Inc. 800 Cummings Center Suite 258X, Beverly MA 01915-6197 USA			
Prüfgegenstand: <i>Test item:</i>	Quarterback Gateway			
Bezeichnung / Typ-Nr.: <i>Identification / Type no.:</i>	T11013310			
Auftrags-Inhalt: <i>Order content:</i>	Test Report			
Prüfgrundlage: <i>Test specification:</i>	CFR47 FCC Part 15: Subpart C Section 15.247 CFR47 FCC Part 15: Subpart C Section 15.209 CFR47 FCC Part 15: Subpart C Section 15.207 CFR47 FCC Part 2: Section 2.1091 RSS-247-Issue 3 August 2023 RSS-Gen Issue 5 March 2019			
Wareneingangsdatum: <i>Date of sample receipt:</i>	2024-07-10	Please refer to photo documents		
Prüfmuster-Nr.: <i>Test sample no.:</i>	A003791751-004/005			
Prüfzeitraum: <i>Testing period:</i>	2024-08-22 - 2024-11-04			
Ort der Prüfung: <i>Place of testing:</i>	Refer to Clause 2.1			
Prüflaboratorium: <i>Testing laboratory:</i>	TÜV Rheinland (Shenzhen) Co., Ltd.			
Prüfergebnis*: <i>Test result*:</i>	Pass			
geprüft von: <i>tested by:</i>	 X <u>Andy Yan</u>		genehmigt von: <i>authorized by:</i>	 X <u>Lin Lin</u>
Datum: <i>Date:</i>	2024-12-05		Ausstellungsdatum: <i>Issue date:</i>	2024-12-06
Stellung / Position:	Sachverständige(r)/Expert		Stellung / Position:	Sachverständige(r)/Expert
Sonstiges / <i>Other:</i>	FCC ID: SRMT11013310 IC: 6654A-T11013310 HVIN: T11013310 This report is for 915MHz transmitter.			
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 * 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				
Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens. <i>This test report only relates to the above mentioned test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any test mark.</i>				

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Anmerkungen
Remarks

1	Alle eingesetzten Prüfmittel waren zum angegebenen Prüfzeitraum gemäß eines festgelegten Kalibrierungsprogramms unseres Prüfhauses kalibriert. Sie entsprechen den in den Prüfprogrammen hinterlegten Anforderungen. Die Rückverfolgbarkeit der eingesetzten Prüfmittel ist durch die Einhaltung der Regelungen unseres Managementsystems gegeben. Detaillierte Informationen bezüglich Prüfkonditionen, Prüfequipment und Messunsicherheiten sind im Prüflabor vorhanden und können auf Wunsch bereitgestellt werden. <i>The equipment used during the specified testing period was calibrated according to our test laboratory calibration program. The equipment fulfils the requirements included in the relevant standards. The traceability of the test equipment used is ensured by compliance with the regulations of our management system. Detailed information regarding test conditions, equipment and measurement uncertainty is available in the test laboratory and could be provided on request.</i>
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3	Prüfklausel mit der Note * wurden an qualifizierte Unterauftragnehmer vergeben und sind unter der jeweiligen Prüfklausel des Berichts beschrieben. Abweichungen von Prüfspezifikation(en) oder Kundenanforderungen sind in der jeweiligen Prüfklausel im Bericht aufgeführt. <i>Test clauses with remark of * are subcontracted to qualified subcontractors and described under the respective test clause in the report.</i> <i>Deviations of testing specification(s) or customer requirements are listed in specific test clause in the report.</i>
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 20dB&99% BANDWIDTH

RESULT: Pass

5.1.4 CONDUCTED SPURIOUS EMISSIONS MEASURED IN 100 KHz BANDWIDTH

RESULT: Pass

5.1.5 RADIATED SPURIOUS EMISSION

RESULT: Pass

5.1.6 CARRIER FREQUENCY SEPARATION

RESULT: Pass

5.1.7 NUMBER OF HOPPING FREQUENCY

RESULT: Pass

5.1.8 TIME OF OCCUPANCY

RESULT: Pass

5.1.9 CONDUCTED EMISSION ON AC MAINS

RESULT: Pass

6.1.1 ELECTROMAGNETIC FIELDS

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: Photographs of the Test Set-up

Appendix B: Test Results.

2 Test Sites

2.1 Test Facilities

Shanghai ATBL Technology Co., Ltd.

5-6/F., Unit 1, No 8, Free Trade One Life Science and Sci-Tech Industrial Park, No.160, Basheng Road,
Pudong New District, Shanghai City, China

FCC Registration No.: 0031025281
ISED Company Number: 27371

2.2 List of Test and Measurement Instruments

Table 1: List of Test and Measurement Equipment

Shanghai ATBL Technology Co., Ltd.

Radio Conducted Test

Equipment Name	Manufacturer	Model	Serial No.	Equipment No.	Calibrated until
Power meter	Anritsu	ML2496A	1935001	SHATBL-W030	2025.07.17
Power sensor	Anritsu	MA2411B	1911006	SHATBL-W031	2025.07.17
Adjustable Attenuator	Agilent	8494B	MY42144015	SHATBL-W009	2025.07.17
Environmental Test Chamber	KSON	THS-B6C-150	9159K	SHATBL-W019	2025.03.27
Spectrum analyzer	R&S	FSV40-N	101761	SHATBL-W036	2025.07.17
Thermometer	DeLi	N/A	N/A	SHATBL-W012	2025.07.17
Test Software	FALA	LZ-RF	N/A	SHATBL-W020	2025.07.17

Radiated Spurious Emissions

Equipment Name	Manufacturer	Model	Serial No.	Equipment No.	Calibrated until
Signal analyzer	Agilent	N9020A	MY50200811	SHATBL-E017	2025.03.27
Amplifier	JPT	JPA0118-55-303A	1910001800055000	SHATBL-E006	2025.03.27
Amplifier	JPT	JPA-10M1G32	21010100035001	SHATBL-E005	2025.03.27
Antenna/Turn table Controller	Brilliant	N/A	N/A	SHATBL-E007	N/A
Loop Antenna(9kHz-30MHz)	Daze	ZN30900C	20077	SHATBL-E042	2025.05.16
Bilog Antenna	SCHWARZBECK	VULB 9168	01174	SHATBL-E008	2025.05.16
Broad-band Horn Antenna	SCHWARZBECK	BBHA 9120D	02334	SHATBL-E009	2025.05.16
Horn Antenna	COM-POWER	AH-1840	10100008	SHATBL-E043	2025.07.18
Thermometer	DeLi	N/A	N/A	SHATBL-E015	2025.07.17
Test Software	FALA	EMC-RI(Ver.4A2)	N/A	N/A	N/A

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.

Parameter	Uncertainty
Conducted Output Power	1.266dB
Power spectral density	1.282dB
Conducted spurious emissions	1.73dB
Radiated Spurious Emission 9KHz-30MHz	2.35dB
Radiated Spurious Emission 30MHz-1GHz	3.60dB
Radiated Spurious Emission 1GHz-18GHz	5.40dB

2.6 Location of Original Data

The original copies of all test data taken during actual testing were attached at Appendix B 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 **Shanghai ATBL Technology Co., Ltd.** 5-6/F., Unit 1, No 8, Free Trade One Life Science and Sci-Tech Industrial Park, No.160, Basheng Road, Pudong New District, Shanghai City, 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 T11013310 is a LTE-M/NB-IoT/2G GSM Quad band tracking device, it also support Bluetooth, 2.4GHz WiFi and 915MHz wireless technologies.

2.4GHz WiFi and Bluetooth are in report CN2479N8 002.
LTE-M/NB-IoT/2G GSM are in report CN2479N8 003.

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

3.2 Ratings and System Details

Table 2: Technical Specification of EUT

General Information of EUT	Value
Kind of Equipment	Quarterback Gateway
Type Designation	T11013310
FCC ID	SRMT11013310
ISED Certification Number	6654A-T11013310
HVIN	T11013310
Operating Voltage	AC/DC Adapter Rechargeable Battery (4.2V)
Testing Voltage	AC/DC Adapter Rechargeable Battery (4.2V)
Antenna Type	Integral Antenna
Antenna Gain	0 dBi (Max)

Technical Specification of FHSS	
Frequency Range	902.306 - 922.396MHz
Type of Modulation	GFSK
Data Rate	Up to 250Kbps
Channel Number	50 channels
Channel Separation	410 KHz

Table 3: RF Channel and Frequency of Lora FHSS

RF Channel	Frequency (MHz)	RF Channel	Frequency (MHz)	RF Channel	Frequency (MHz)	RF Channel	Frequency (MHz)
1	902.306	17	908.866	33	915.426	49	921.986
2	902.716	18	909.276	34	915.836	50	922.396
3	903.126	19	909.686	35	916.246		
4	903.536	20	910.096	36	916.656		
5	903.946	21	910.506	37	917.066		
6	904.356	22	910.916	38	917.476		
7	904.766	23	911.326	39	917.886		
8	905.176	24	911.736	40	918.296		
9	905.586	25	912.146	41	918.706		
10	905.996	26	912.556	42	919.116		
11	906.406	27	912.966	43	919.526		
12	906.816	28	913.376	44	919.936		
13	907.226	29	913.786	45	920.346		
14	907.636	30	914.196	46	920.756		
15	908.046	31	914.606	47	921.166		
16	908.456	32	915.016	48	921.576		

3.3 Independent Operation Modes

The basic operation modes are:

- A. On, transmitting mode
 - 1) Low Channel
 - 2) Middle Channel
 - 3) High Channel
- B. On, Transmitting on Hopping channel
- C. On, Normal Operation (Radio Link)
- D. Off

3.4 Noise Generating and Noise Suppressing Parts

Refer to Circuit Diagram for further details.

3.5 Submitted Documents

- ID Label and Location Info

- User Manual

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.

4.3 Special Accessories and Auxiliary Equipment

Table 4: Auxiliary Equipment Used during Test

Description	Manufacturer	Model	S/N	Rating
--	--	--	--	--

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 30MHz)

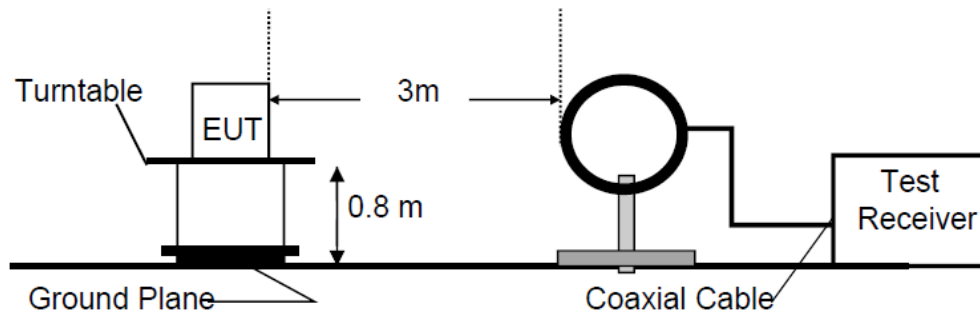


Diagram of Measurement Configuration for Radiation Test (Below 1GHz)

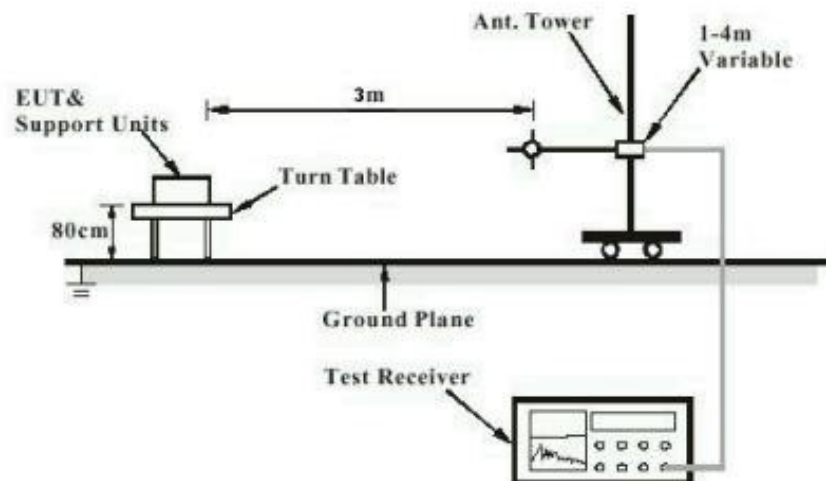


Diagram of Measurement Configuration for Radiation Test (Above 1GHz)

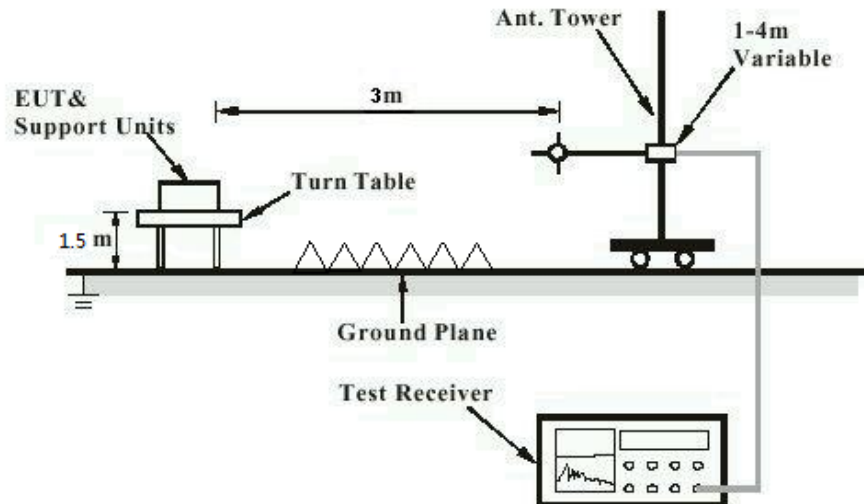
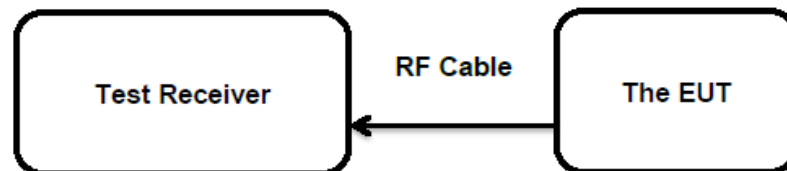


Diagram of Measurement Configuration for Conducted Transmitter Measurement



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 0 dBi, 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.

5.1.2 Maximum Peak Conducted Output Power

RESULT:
Pass
Test Specification

Test standard	:	FCC Part 15.247(b)(2)
	:	RSS-247 Clause 5.4(b)
Basic standard	:	ANSI C63.10: 2013
Limits	:	Not more than 1Watt(30dBm) for FHSS with at least 50 hopping channels in the band 902-928MHz
	:	< 4 W (e.i.r.p.)
Kind of test site	:	Shielded Room

Test Setup

Date of testing	:	2024-08-22
Input voltage	:	Fully charged battery
Operation mode	:	A
Test channel	:	Low / Middle / High
Ambient temperature	:	25.4 °C
Relative humidity	:	52.5 %
Atmospheric pressure	:	101 kPa

Table 5: Test Result of Maximum Peak Conducted Output Power, Lora FHSS

Test Mode	Test Channel (MHz)	Measured Peak Power		Limit (W)
		(dBm)	(W)	
A	902.306	12.81	0.0191	< 1W
	912.146	12.34	0.0171	
	922.396	11.70	0.0148	
Max. Measured Value		12.81	0.0191	

Note:

- 1) The cable loss is taken into account in results.
- 2) Antenna gain(G): 0 dBi, max.e.i.r.p. = 12.81dBm = 0.0191W < 4W

5.1.3 20dB&99% Bandwidth

RESULT: Pass

Test Specification

- Test standard : FCC Part 15.247(a)(1) (i)
RSS-Gen Clause 6.7
- Basic standard : ANSI C63.10: 2013
- Limits : < 250KHz for at least 50 hopping frequencies
 : >=250KHz for at least 25 hopping frequencies
- Kind of test site : Shielded Room

Test Setup

- Date of testing : 2024-08-22
- Input voltage : Fully charged battery
- Operation mode : A
- Test channel : Low / Middle / High
- Ambient temperature : 25.4 °C
- Relative humidity : 52.5 %
- Atmospheric pressure : 101 kPa

For the measurement records, refer to the appendix B.

Table 6: Test Result of 20dB Bandwidth

Test Mode	Channel Frequency (MHz)	20dB Bandwidth (kHz)	99% Bandwidth (kHz)	Limit (MHz)
A	902.306	72.1	108.3	<250KHz
	912.146	181.2	185.3	
	922.396	71.3	114.4	

Note: The fundamental emissions stay within the allocated band 902-928MHz.

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5.1.4 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	: 2024-08-22
Input voltage	: Fully charged battery
Operation mode	: A
Test channel	: Low / Middle / High
Ambient temperature	: 25.4 °C
Relative humidity	: 52.5 %
Atmospheric pressure	: 101 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 B.

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5.1.5 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 Table 6 & Table 7
Kind of test site	:	3m Semi-anechoic Chamber

Test Setup

Date of testing	:	2024-08-26
Input voltage	:	Fully charged battery
Operation mode	:	A, B
Test channel	:	Low / Middle / High
Ambient temperature	:	Refer to test result
Relative humidity	:	Refer to test result
Atmospheric pressure	:	101 kPa

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 B.

5.1.6 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 20dB bandwidth, whichever is greater
 Kind of test site : Shielded Room

Test Setup

Date of testing : 2024-08-22
 Input voltage : Fully charged battery
 Operation mode : B
 Test channel : Low / Middle / High
 Ambient temperature : 25.4 °C
 Relative humidity : 52.5 %
 Atmospheric pressure : 101 kPa

For the measurement records, refer to the appendix B.

Table 7: Test Result of Carrier Frequency Separation

Test Mode	Channel	Channel Frequency (MHz)	Measured Channel Separation (KHz)	Limit (kHz)	Result
Hopping	Low Channel	902.306	421.7	≥ 20dB bandwidth	Pass
	Adjacency Channel	902.716			
	Middle Channel	912.146	384.1		Pass
	Adjacency Channel	912.556			
	High Channel	921.986	403.0		Pass
	Adjacency Channel	922.396			

Note:

The limit is maximum 2/3 of the 20 dB bandwidth: 166 KHz.

5.1.7 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 : ≥ 50 non-overlapping channels
- Kind of test site : Shielded Room

Test Setup

- Date of testing : 2024-08-22
- Input voltage : Fully charged battery
- Operation mode : B
- Ambient temperature : 25.4 °C
- Relative humidity : 52.5 %
- Atmospheric pressure : 101 kPa

For the measurement records, refer to the appendix B.

Table 8: Test result of hopping channel number

Test Mode	20dB Bandwidth(kHz)	Hopping frequencies	Limit
Hopping	20dB Bandwidth < 250	50	≥ 50

5.1.8 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 : 2024-07-24
Input voltage : Fully charged battery
Operation mode : B
Test channel : Low / Middle / High
Ambient temperature : 25.4 °C
Relative humidity : 52.5 %
Atmospheric pressure : 101 kPa

For the measurement records, refer to the appendix B.

Table 9: Test result of Channel Occupancy

Test Mode	20dB Bandwidth(kHz)	Period (s)	Channel Occupancy Time (ms)	Limit (ms)
Hopping	20dB Bandwidth < 250	20	15.65	400

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5.1.9 Conducted Emission on AC Mains

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

Test standard	: FCC Part 15.207(a) & FCC Part 15.107(a)
Basic standard	: ANSI C63.10: 2013 & Error! Reference source not found.
Frequency range	: 0.15 – 30MHz
Limits	: FCC Part 15.207(a) & FCC Part 15.107(a)
Kind of test site	: Shielded Room

Test Setup

Date of testing	: 2024-09-27
Input voltage	: Battery charged by AC/DC adapter with 120V/60Hz input
Operation mode	: B
Earthing	: Not connected
Ambient temperature	: 22 °C
Relative humidity	: 56 %
Atmospheric pressure	: 101 kPa

For the measurement records, refer to the appendix B.

6 Safety Human Exposure

6.1 Radio Frequency Exposure Compliance

6.1.1 Electromagnetic Fields

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

Test standard : CFR47 FCC Part 2: Section 2.1091
CFR47 FCC Part 1: Section 1.1310
FCC KDB Publication 447498 v06
FCC KDB Publication 865664 D02 v01r02

FCC requirement: Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess limit for maximum permissible exposure. In accordance with 47 CFR FCC Part 2 Subpart J, section 2.1091 this device has been defined as a mobile device whereby a distance of 20cm normally can be maintained between the user and the device.

MPE Calculation Method

Power Density: $S_{(mW/cm^2)} = PG/4\pi R^2$ or $EIRP/4\pi R^2$

Where:

S = power density (mW/cm²)

P = power input to the antenna (mW)

G = power gain of the antenna in the direction of interest relative to an isotropic radiator

R = distance to the center of radiation of the antenna (cm)

The nominal maximum conducted output power specified:

14.00 dBm

From the peak RF output power, the minimum mobile separation distance, d=20 cm, as well as the antenna gain (0.0 dBi), the RF power density can be calculated as below:

$$S_{(mW/cm^2)} = PG/4\pi R^2 < 0.01 \text{ mW/cm}^2$$

Limits for Maximum Permissible Exposure (MPE) according to FCC Part 1.1310: 1.0 mW/cm²

“RF Radiation Exposure Statement Caution: This Transmitter must be installed to provide a separation distance of at least 20 cm from all persons.”

7 Photographs of the Test Set-Up

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

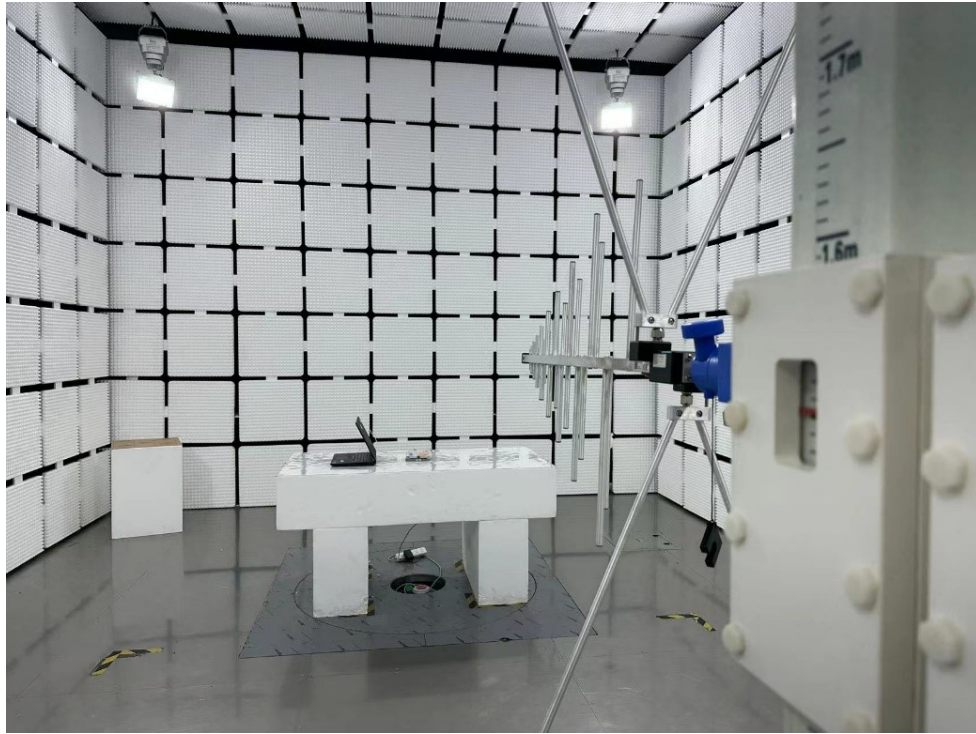
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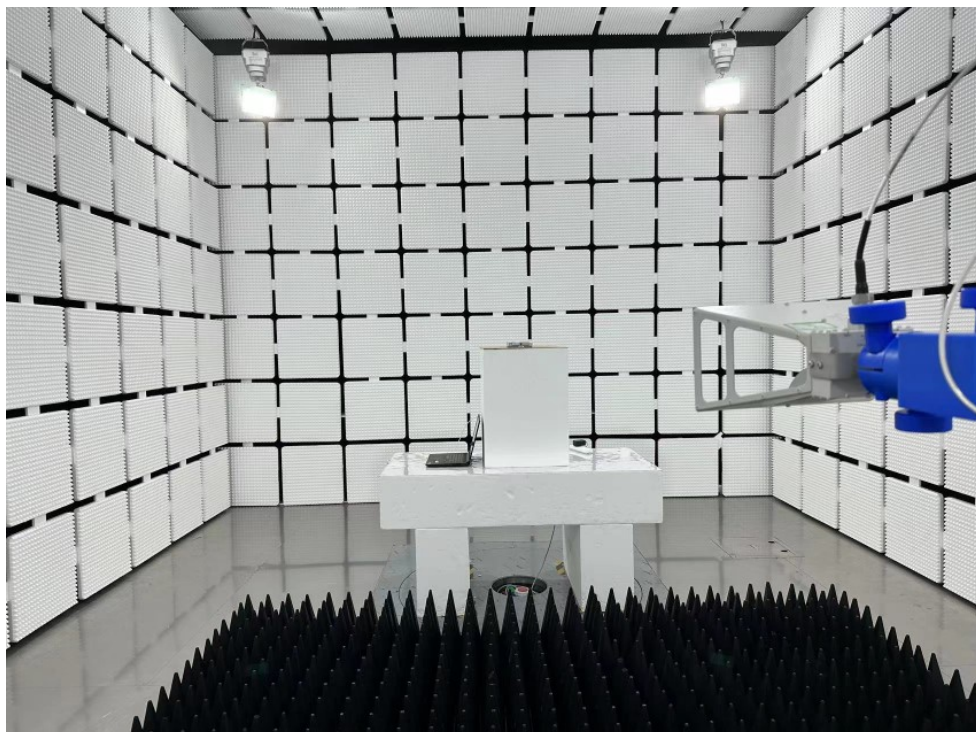
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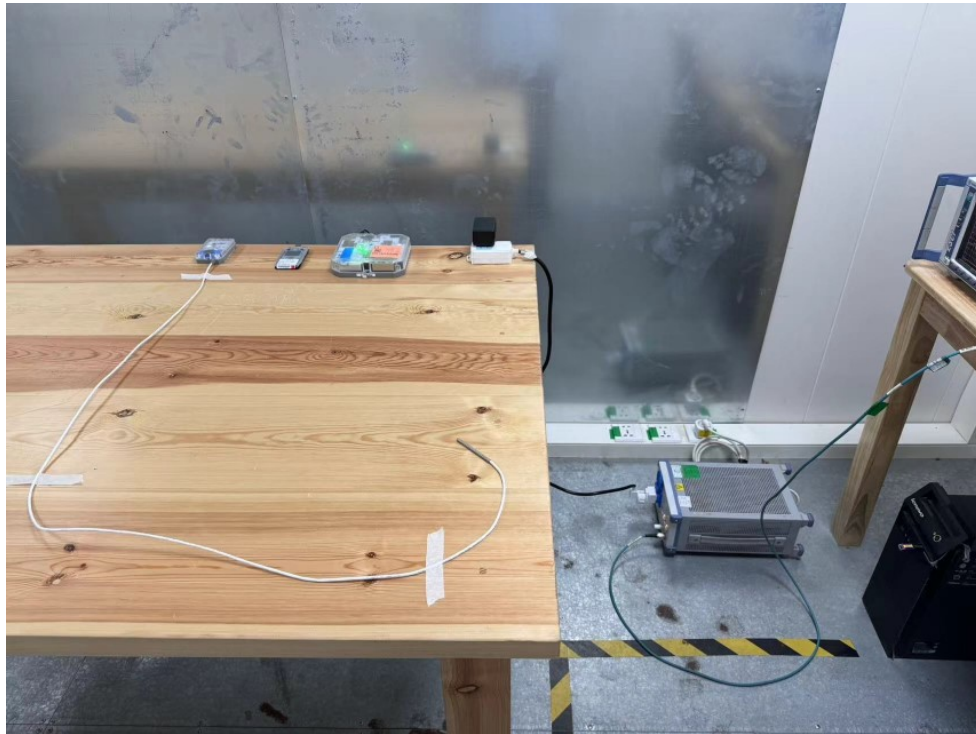
Photograph 1: Set-up for Radiated Spurious Emission, Below 1GHz



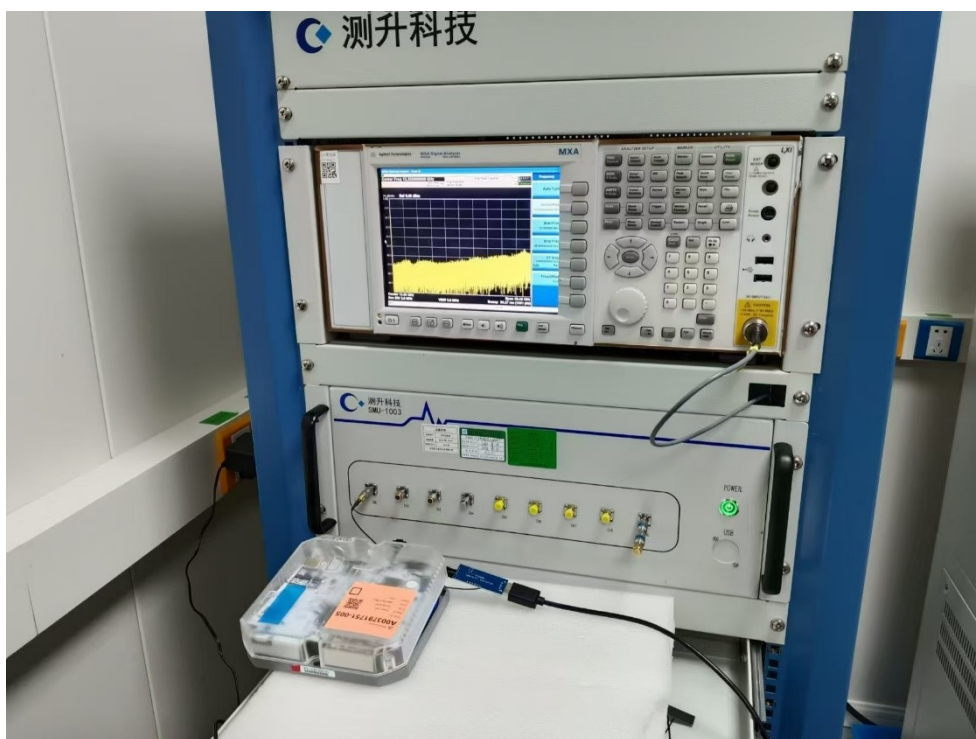
Photograph 2: Set-up for Radiated Spurious Emission, Above 1GHz



Photograph 3: Set-up for AC Conducted Emissions Test



Photograph 4: Set-up for Conducted Test

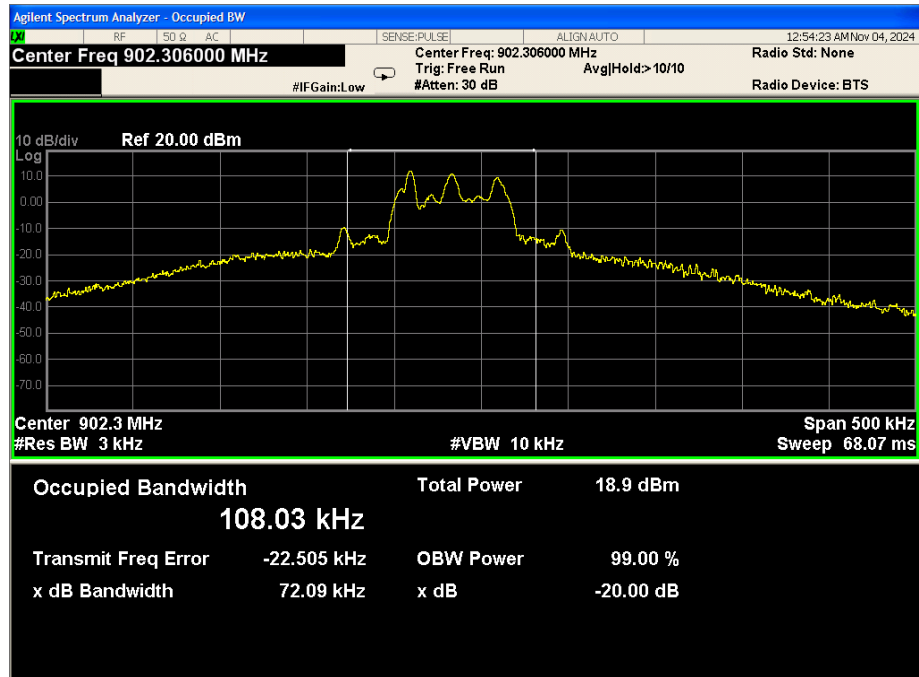


Appendix B: Test Results

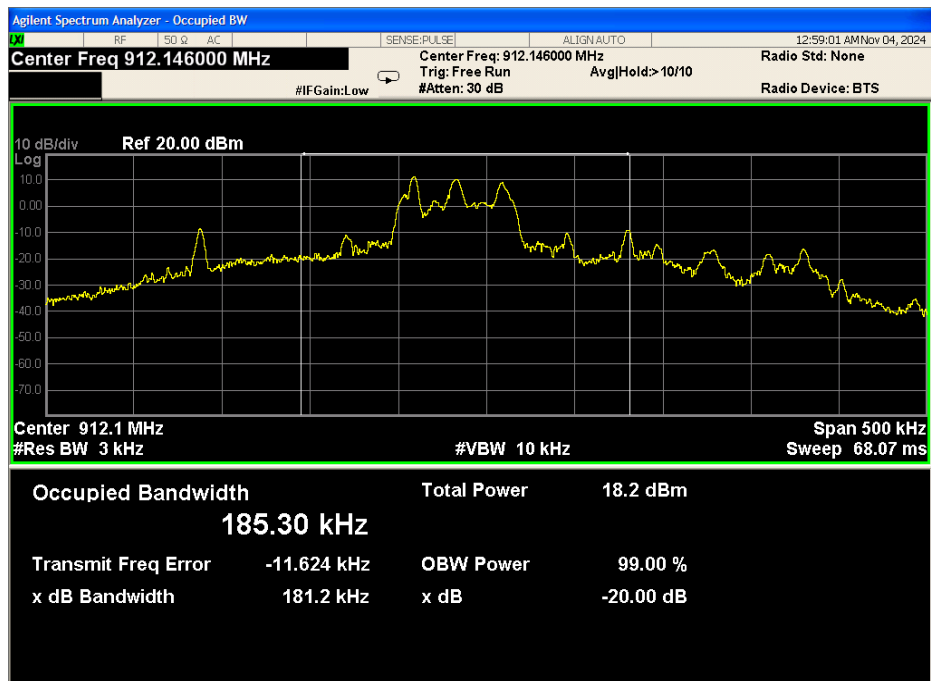
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Appendix B.1: 20dB & 99% Bandwidth

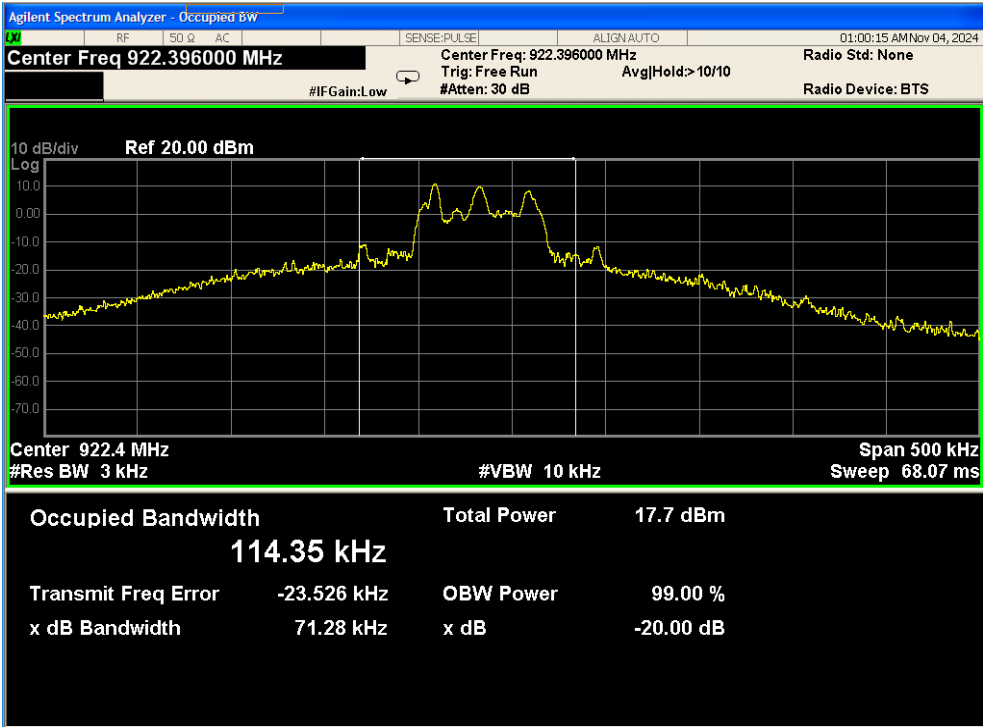
Low Channel



Middle Channel

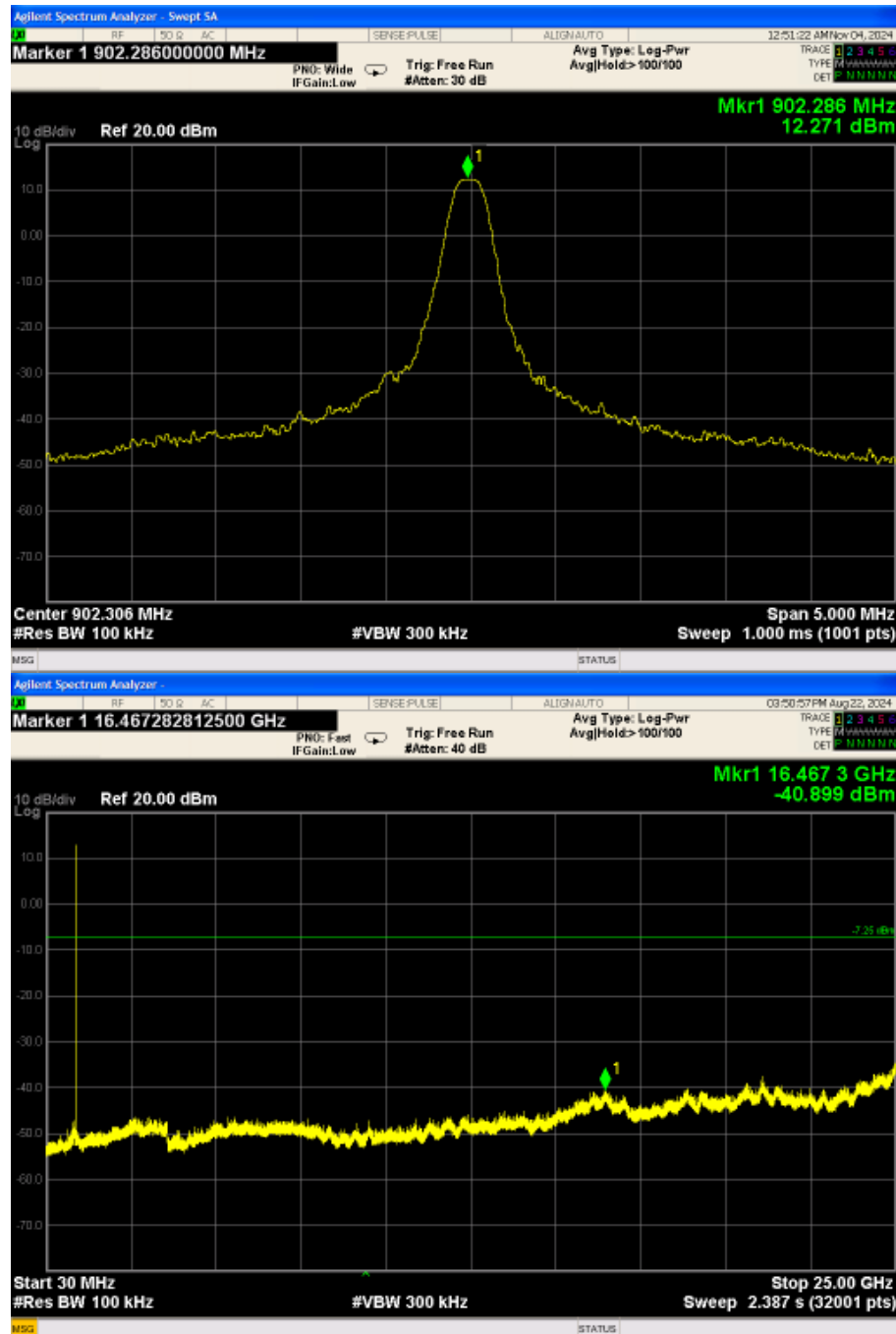


High Channel

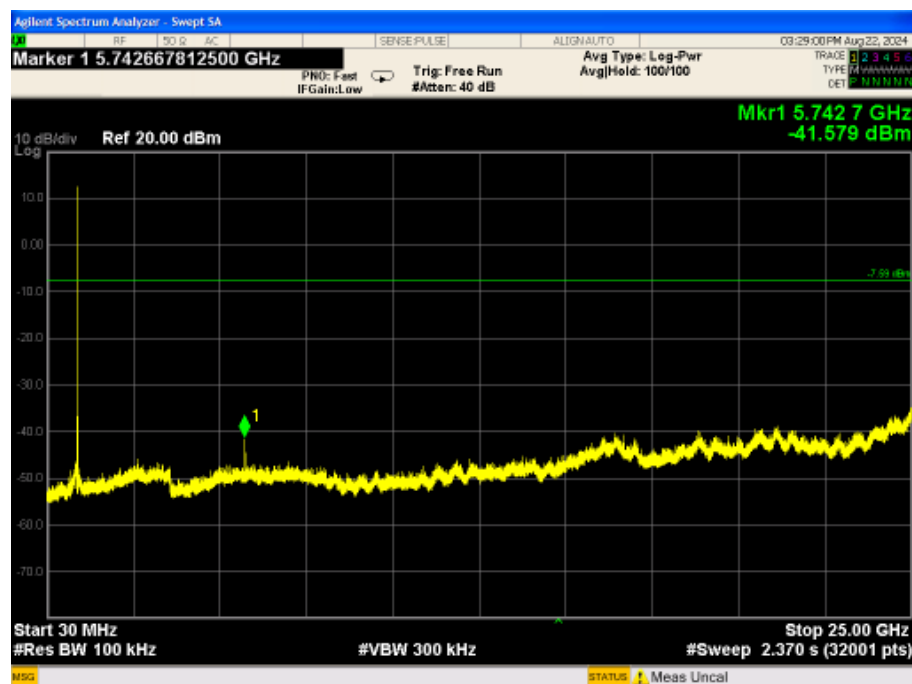
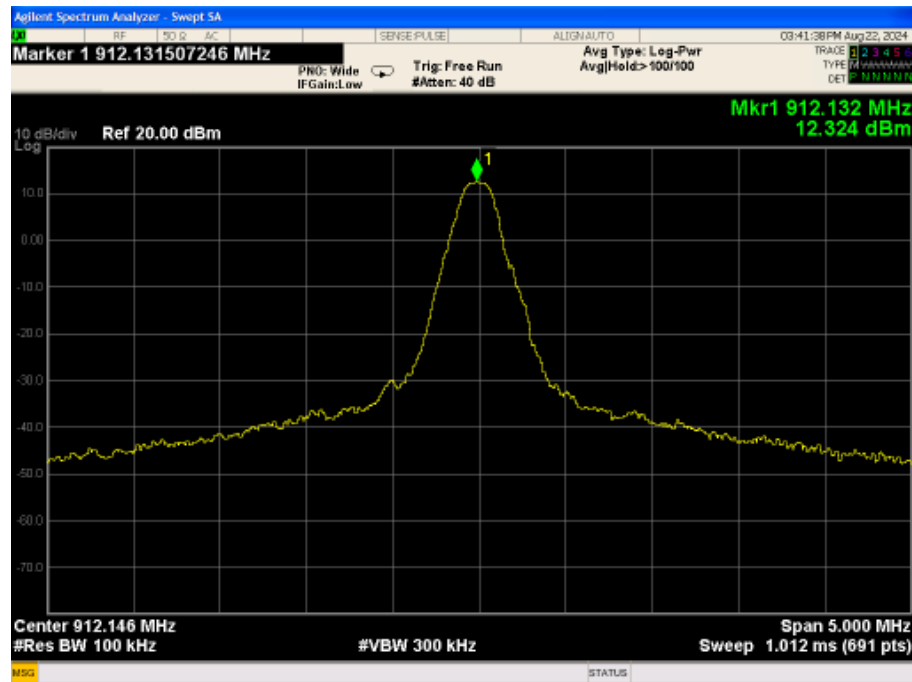


Appendix B.2: Conducted Spurious Emissions Measured in 100 kHz Bandwidth

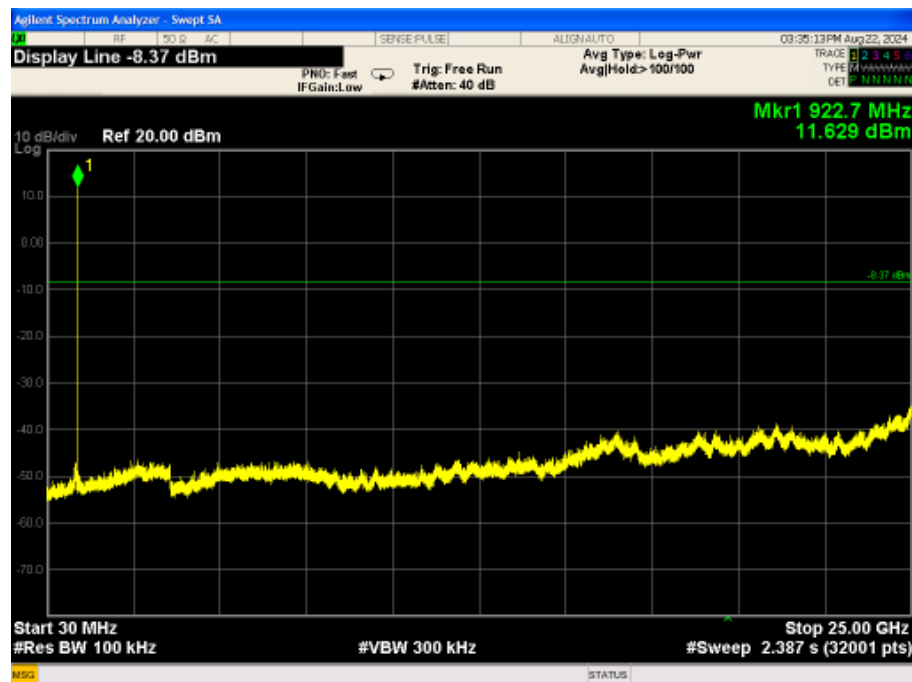
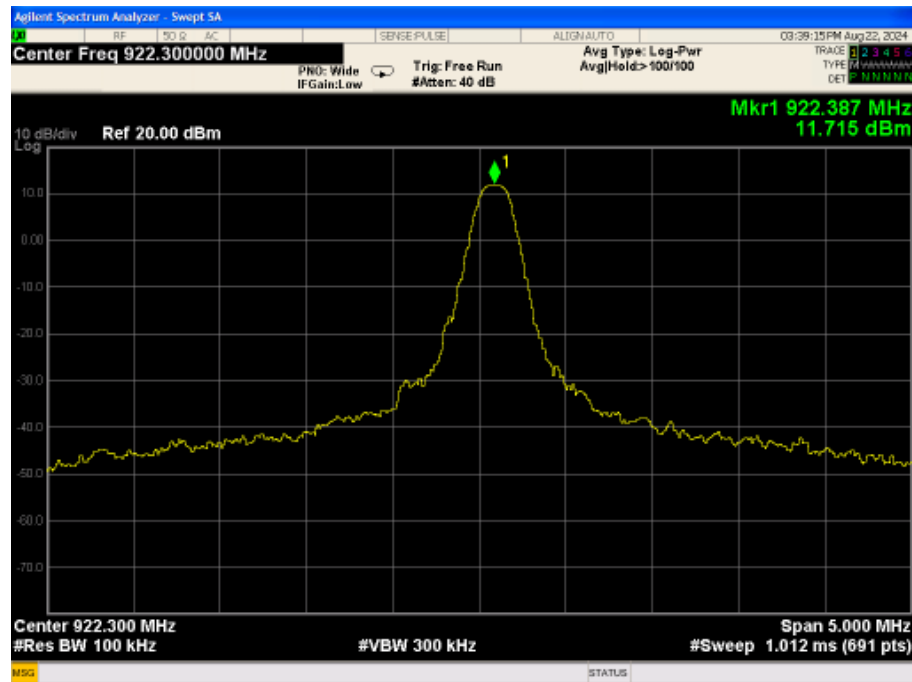
Low Channel



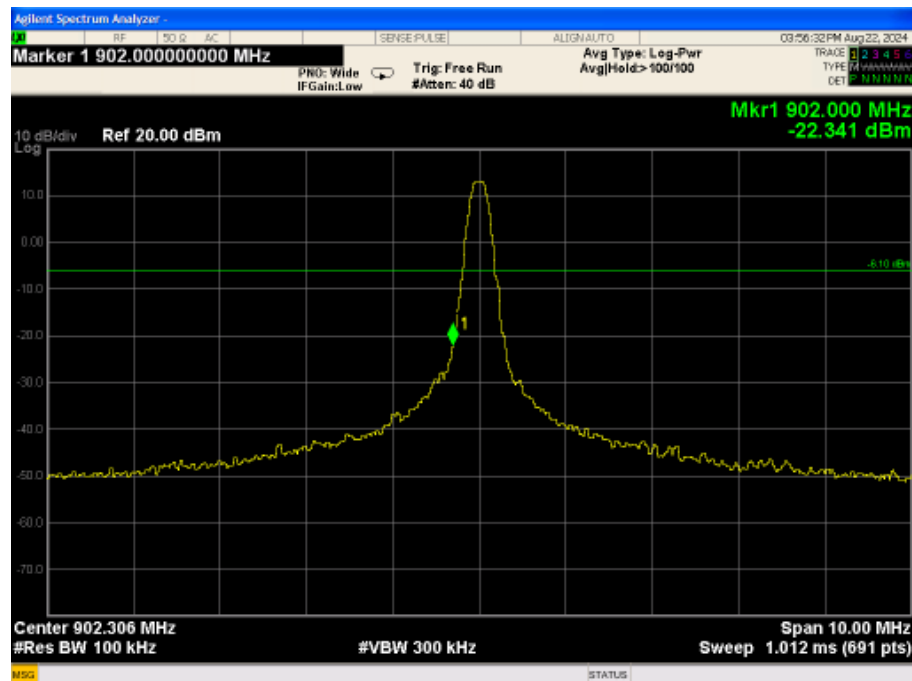
Middle Channel



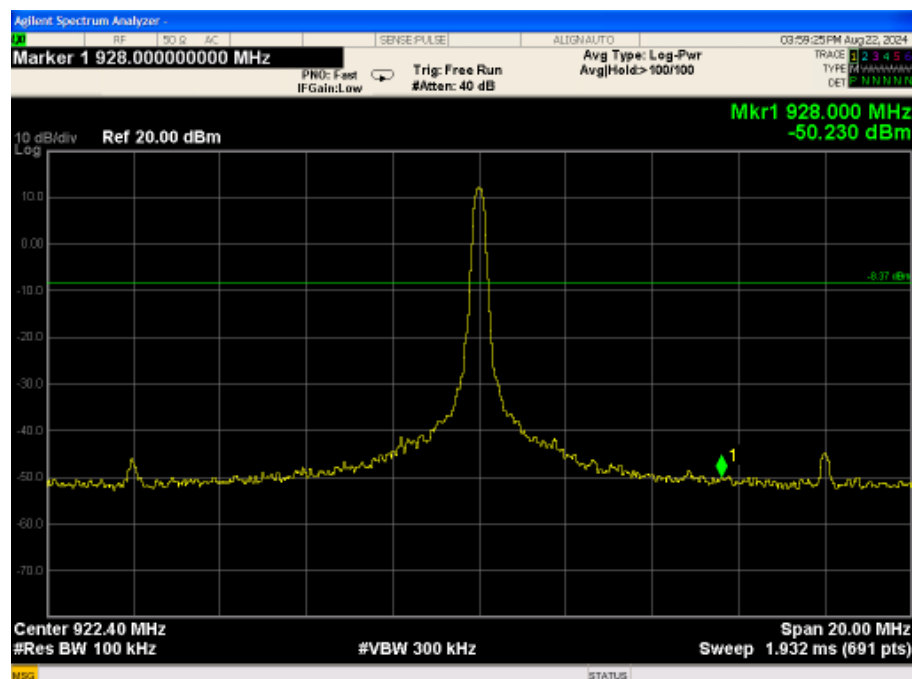
High Channel



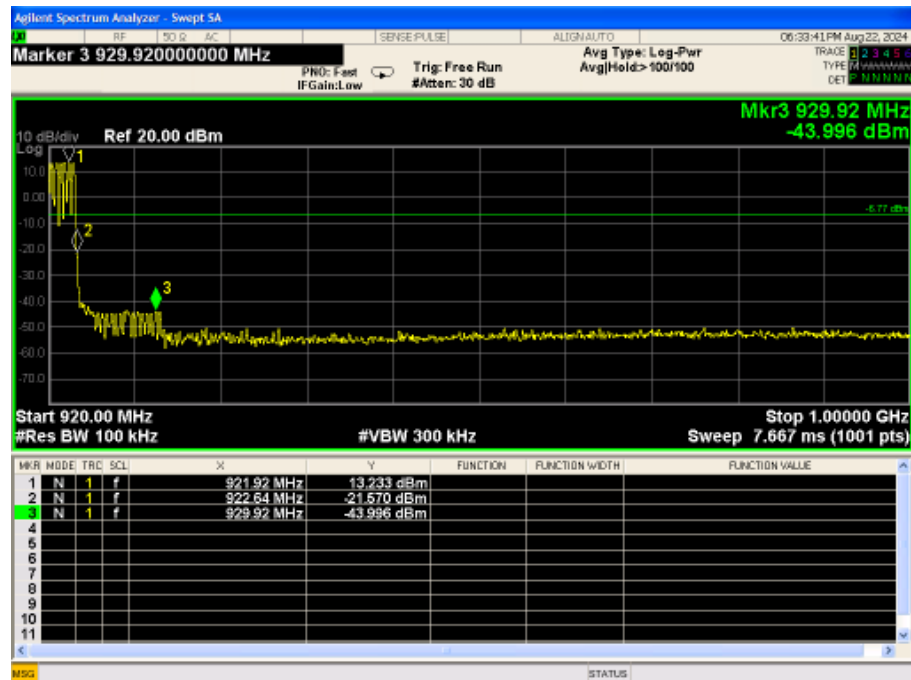
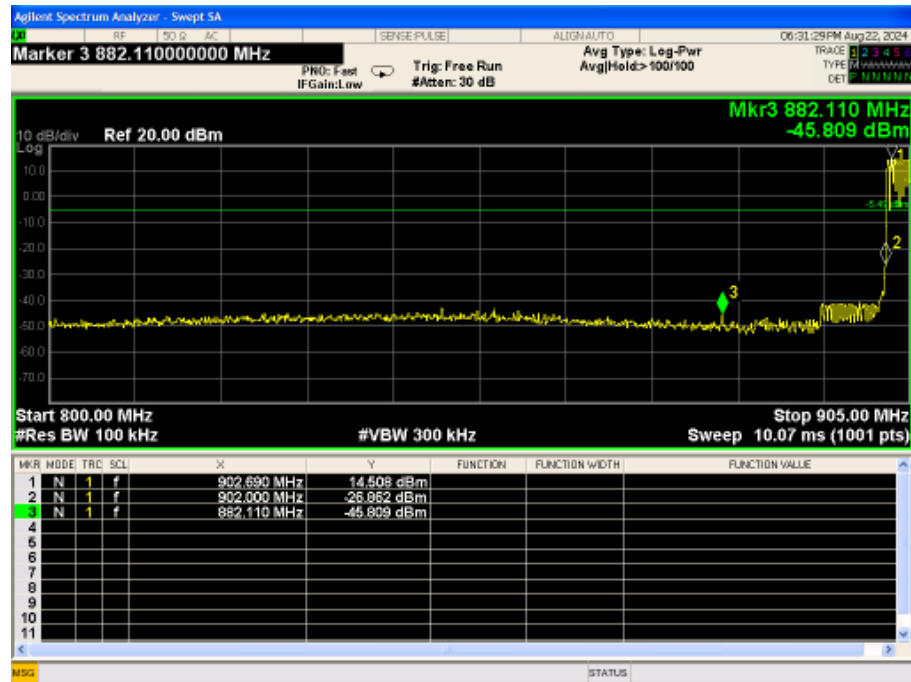
Band Edge Low Channel



High Channel

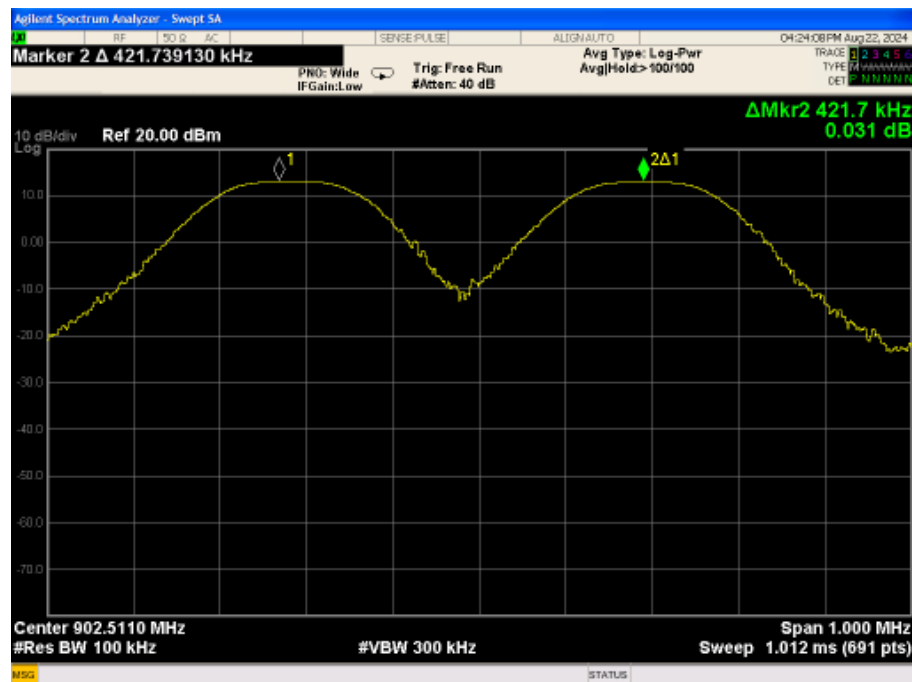


hopping, Band Edge

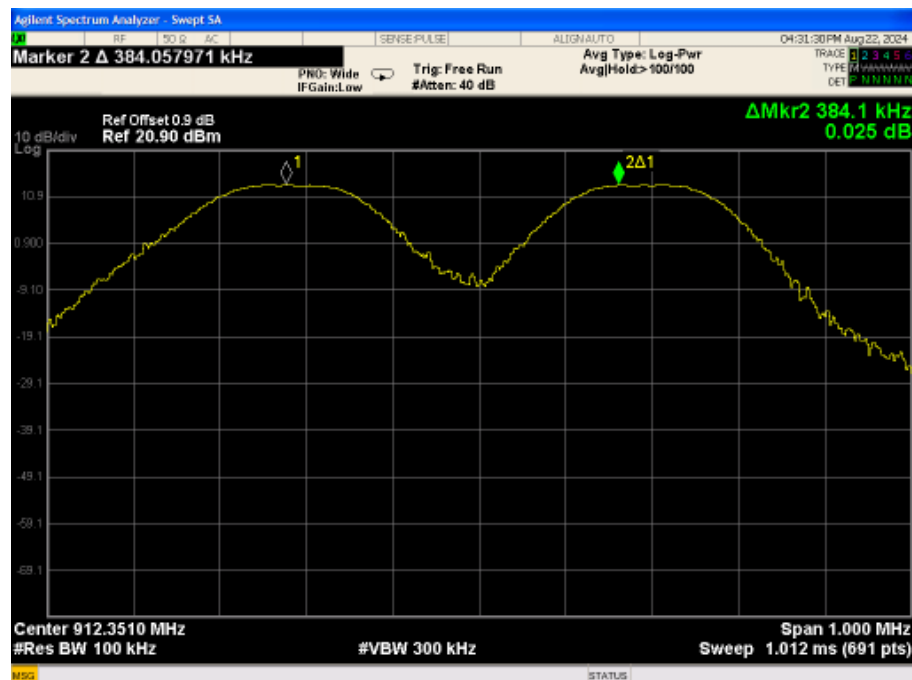


Appendix B.3: Carrier Frequency Separation

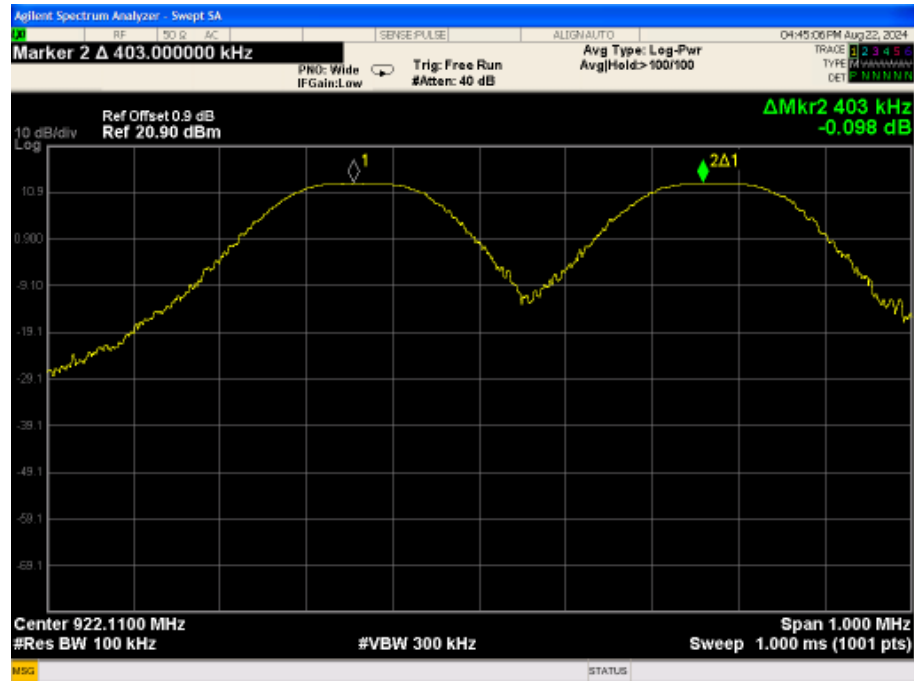
Low Channel



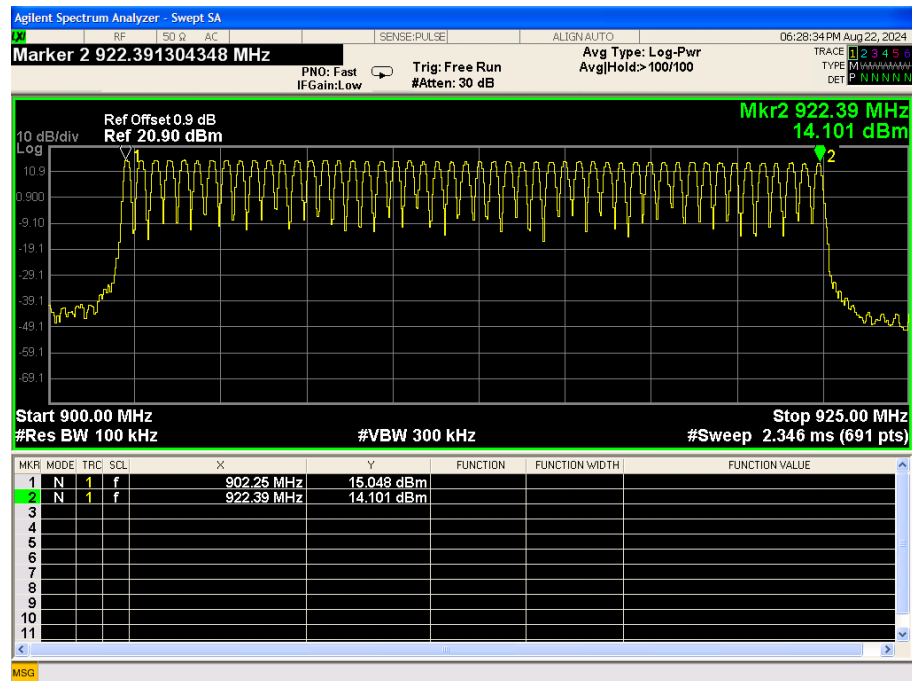
Middle Channel



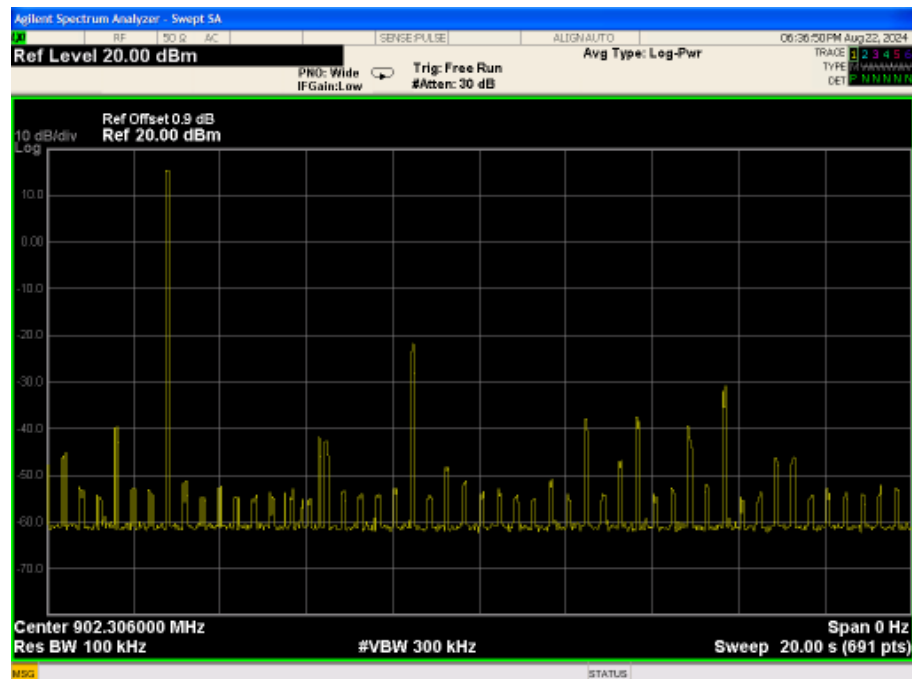
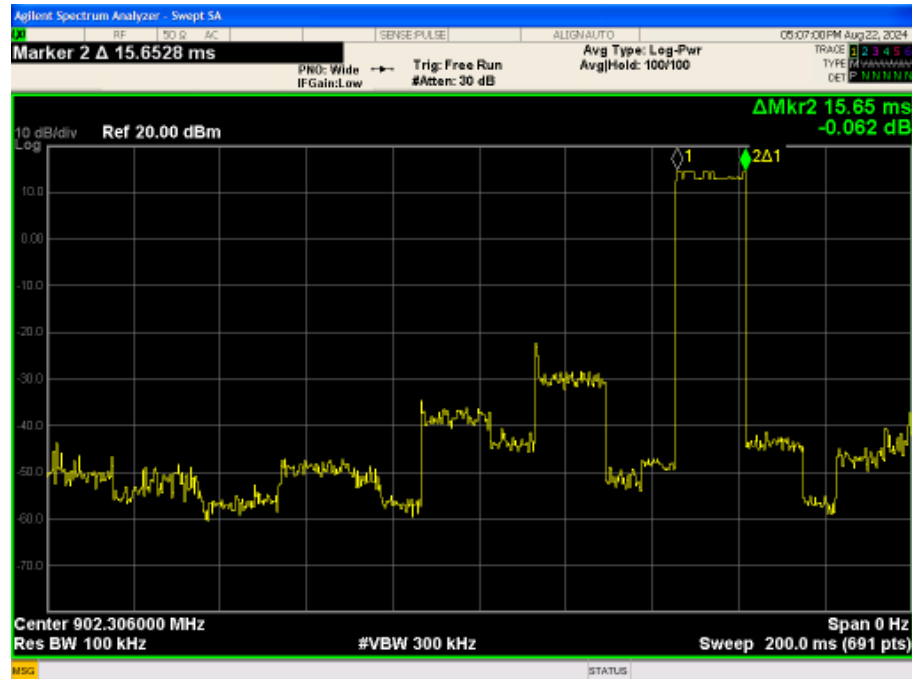
High Channel



Appendix B.4: Number of Hopping Frequency



Appendix B.5: Time of Occupancy



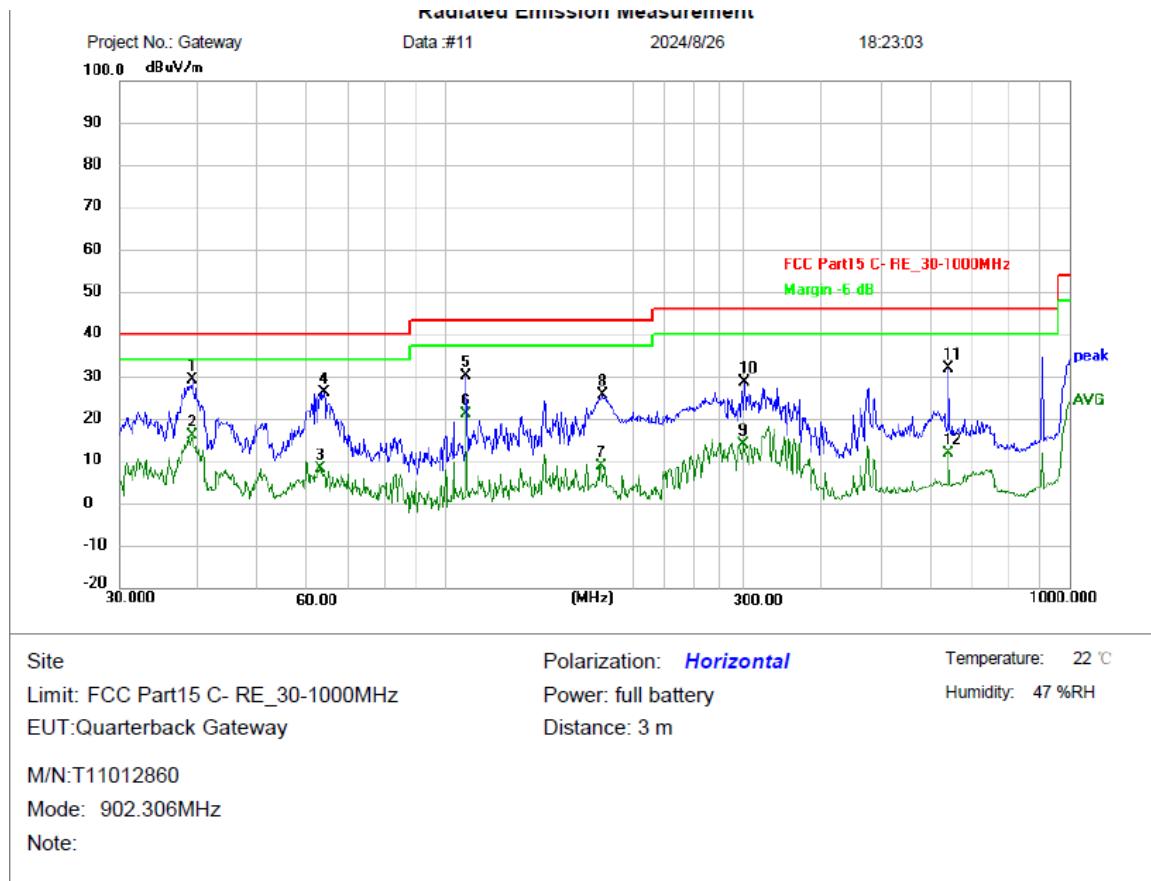
Appendix B.6: Test Results of Radiated Spurious Emissions

Note 1: Testing was carried out within frequency range 9 kHz to the tenth harmonics. The measurement results below 30MHz were greater than 20dB below the limit, so only the radiated spurious emissions from 30MHz to 10GHz were reported.

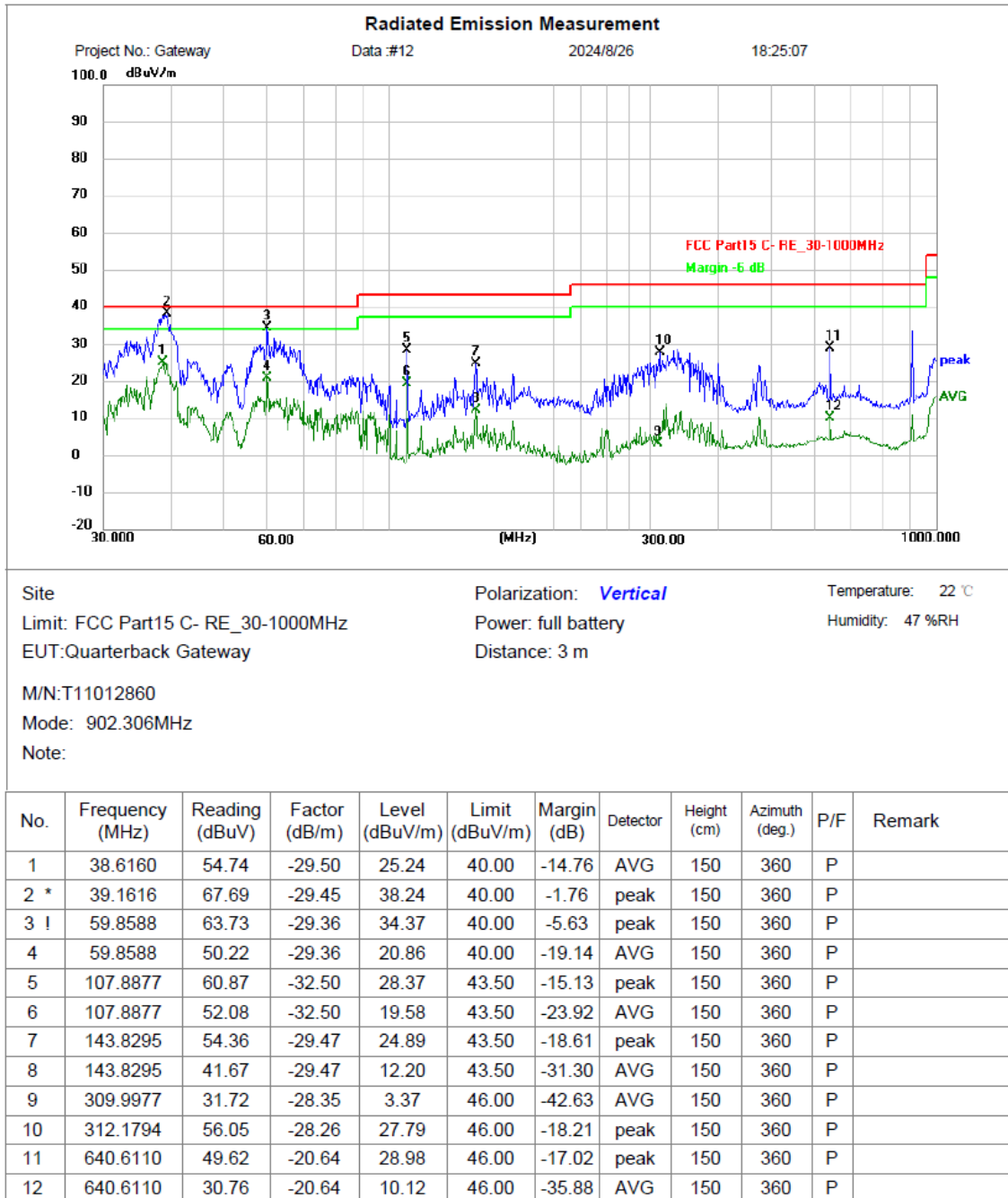
30MHz - 1GHz

Model: T11013310

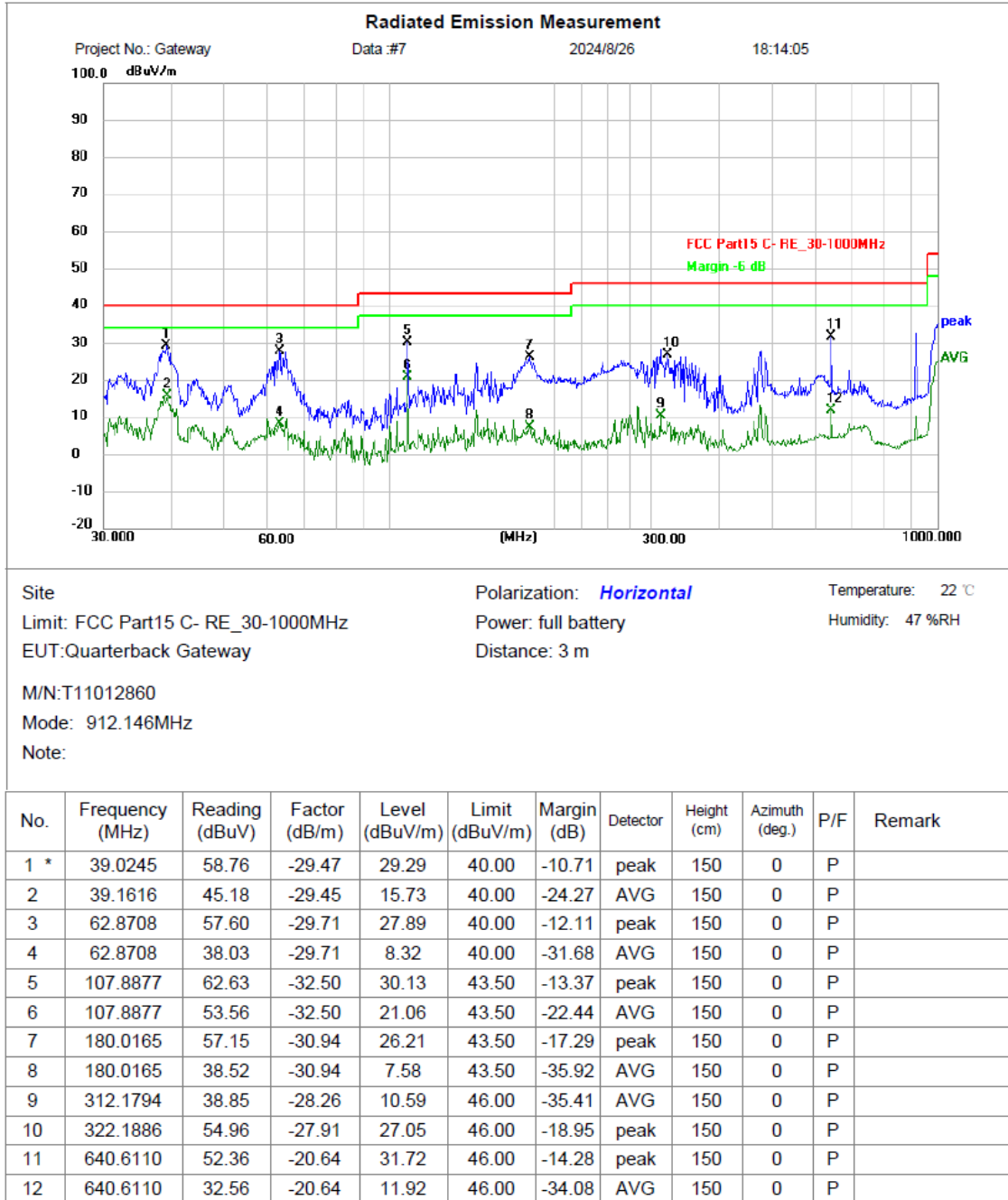
Low Channel

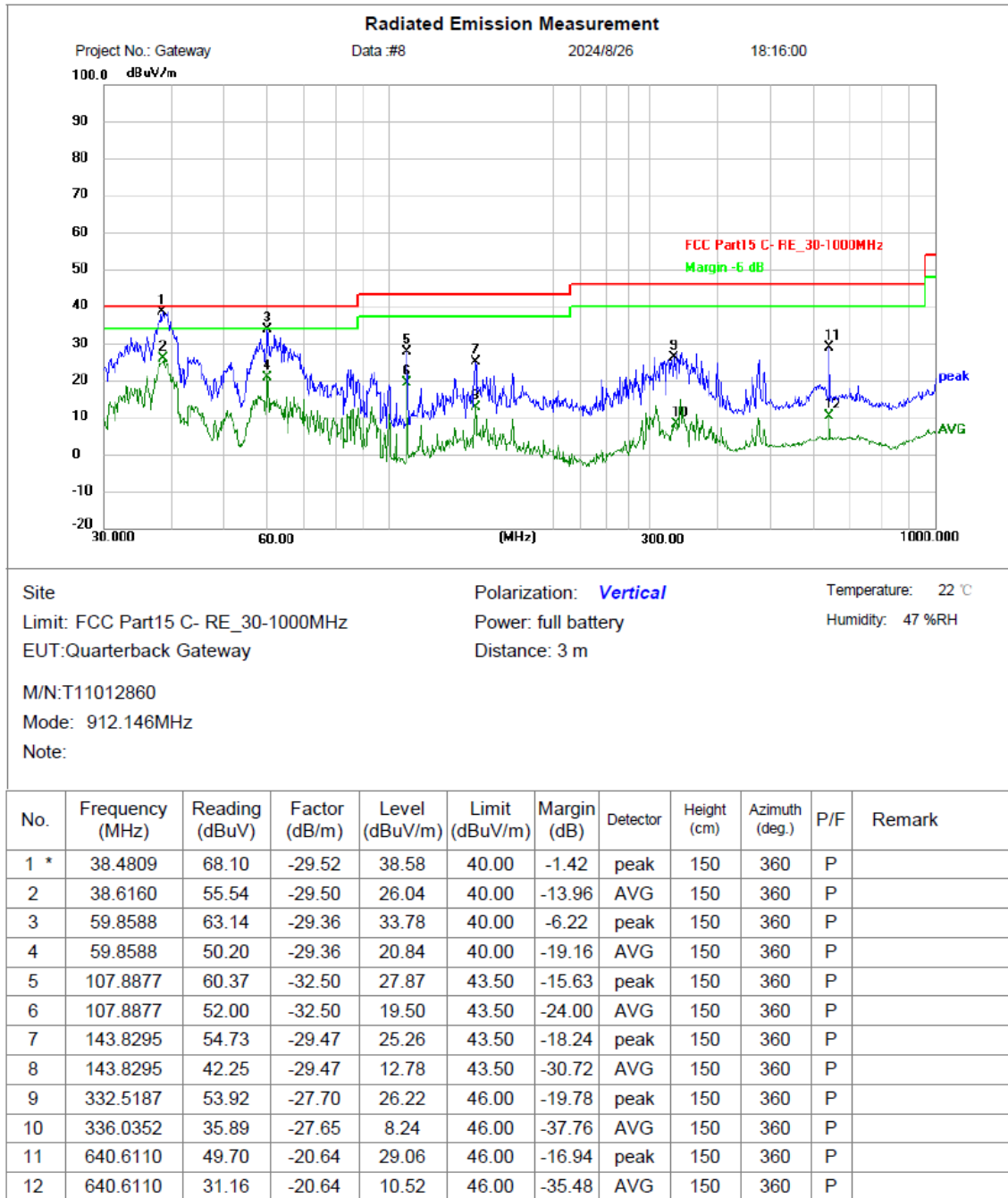


No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1 *	39.1616	58.83	-29.45	29.38	40.00	-10.62	peak	150	0	P	
2	39.1616	45.70	-29.45	16.25	40.00	-23.75	AVG	150	0	P	
3	62.8708	37.97	-29.71	8.26	40.00	-31.74	AVG	150	0	P	
4	63.7588	56.05	-29.76	26.29	40.00	-13.71	peak	150	0	P	
5	107.8877	62.72	-32.50	30.22	43.50	-13.28	peak	150	0	P	
6	107.8877	53.64	-32.50	21.14	43.50	-22.36	AVG	150	0	P	
7	177.5092	39.65	-30.60	9.05	43.50	-34.45	AVG	150	0	P	
8	178.7584	56.53	-30.76	25.77	43.50	-17.73	peak	150	0	P	
9	300.3672	42.59	-28.64	13.95	46.00	-32.05	AVG	150	0	P	
10	301.4224	57.28	-28.62	28.66	46.00	-17.34	peak	150	0	P	
11	640.6110	52.68	-20.64	32.04	46.00	-13.96	peak	150	0	P	
12	640.6110	32.71	-20.64	12.07	46.00	-33.93	AVG	150	0	P	

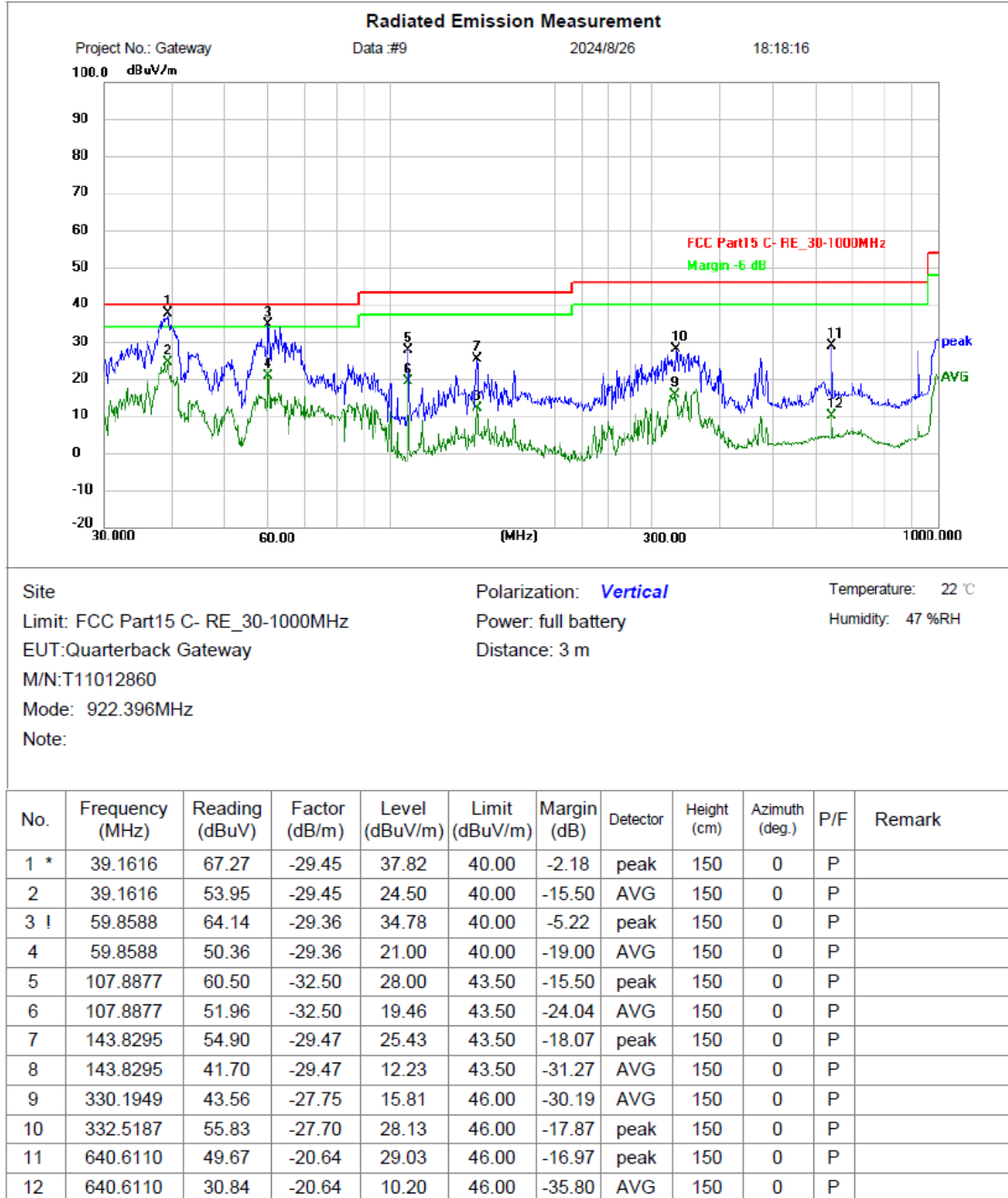


Middle Channel

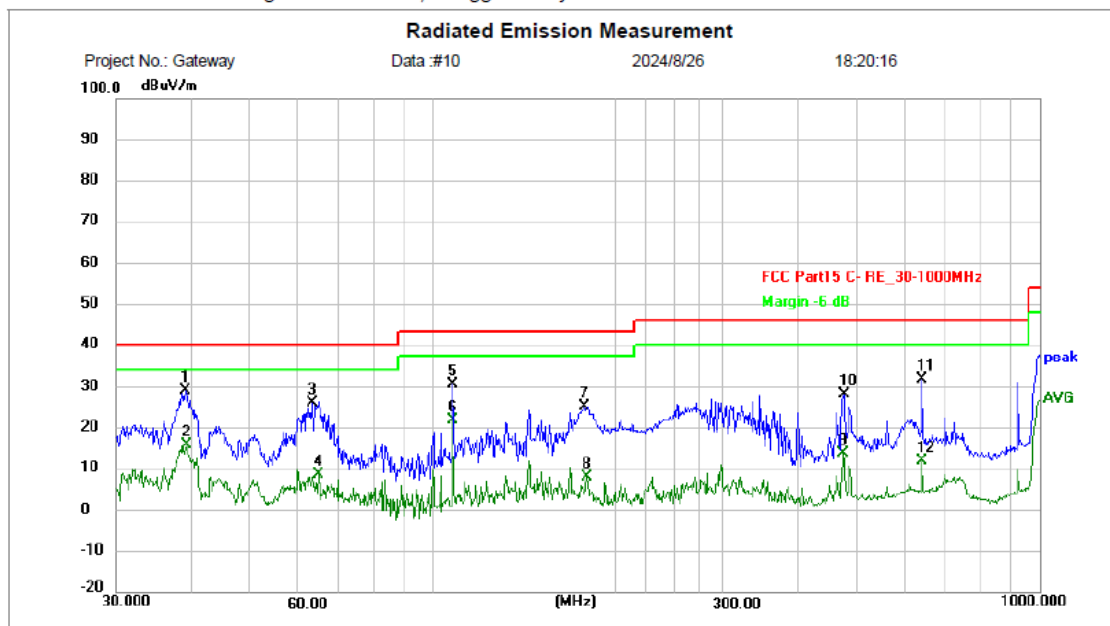




High Channel



Longshan Lake Park, Dongguan City



Site

Limit: FCC Part15 C- RE_30-1000MHz

EUT:Quarterback Gateway

M/N:T11012860

Mode: 922.396MHz

Note:

Polarization: **Horizontal**

Power: full battery

Distance: 3 m

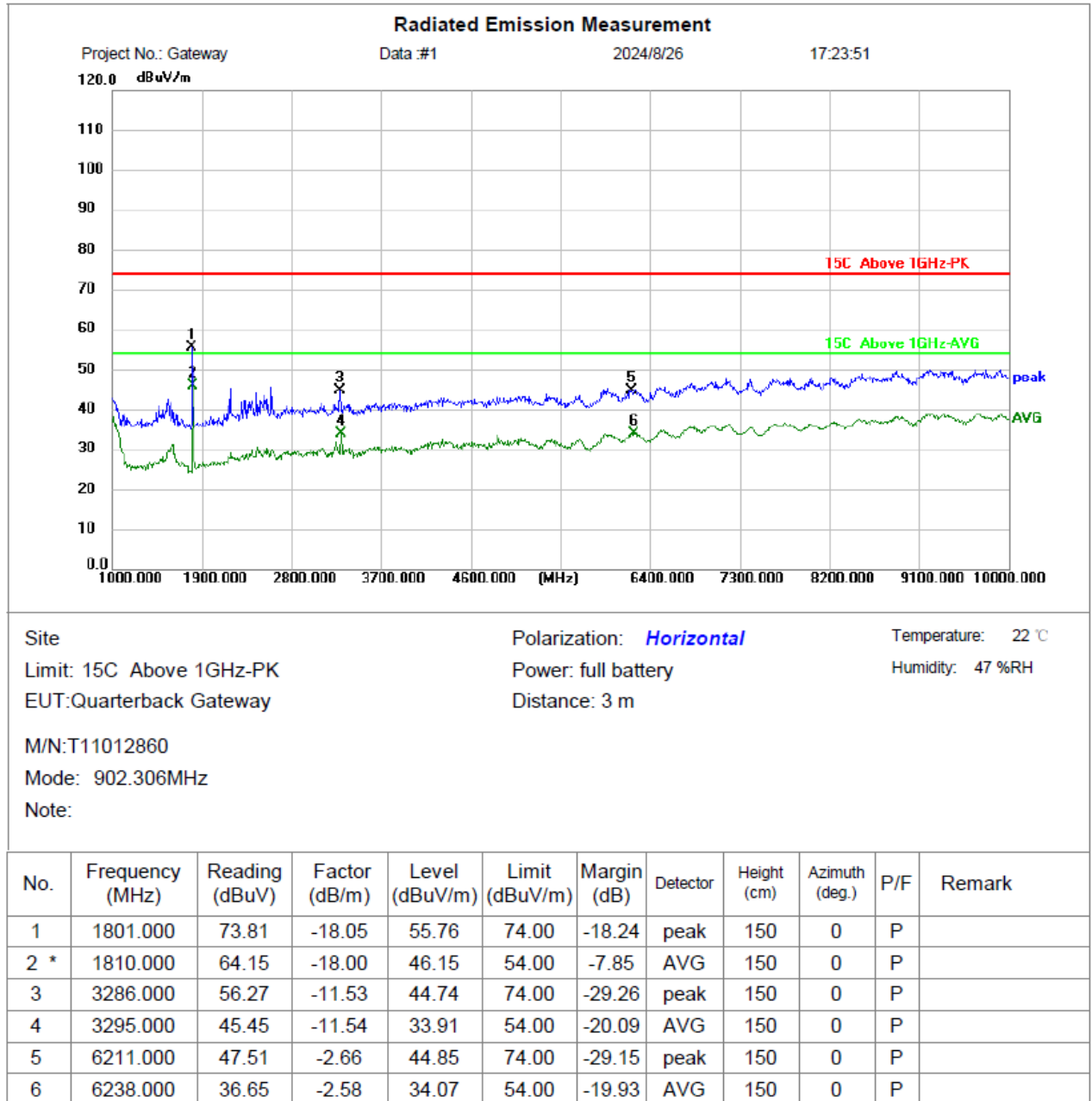
Temperature: 22 °C

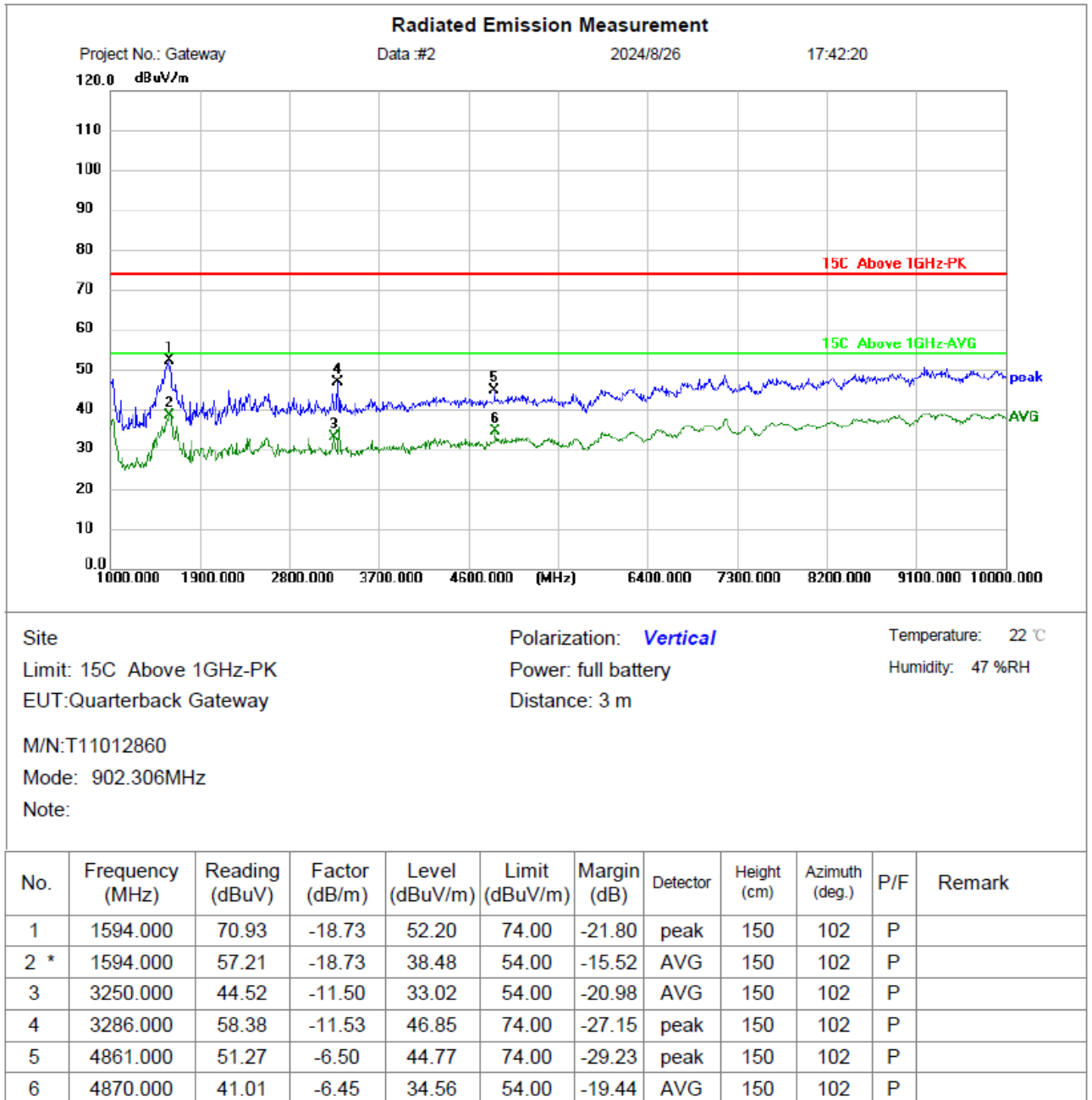
Humidity: 47 %RH

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1 *	39.0245	58.42	-29.47	28.95	40.00	-11.05	peak	150	360	P	
2	39.1616	45.30	-29.45	15.85	40.00	-24.15	AVG	150	360	P	
3	63.3132	55.92	-29.74	26.18	40.00	-13.82	peak	150	360	P	
4	64.6594	38.57	-29.97	8.60	40.00	-31.40	AVG	150	360	P	
5	107.8877	63.11	-32.50	30.61	43.50	-12.89	peak	150	360	P	
6	107.8877	54.38	-32.50	21.88	43.50	-21.62	AVG	150	360	P	
7	177.5092	55.79	-30.60	25.19	43.50	-18.31	peak	150	360	P	
8	179.3863	39.03	-30.85	8.18	43.50	-35.32	AVG	150	360	P	
9	473.8347	37.96	-24.23	13.73	46.00	-32.27	AVG	150	360	P	
10	475.4991	52.23	-24.21	28.02	46.00	-17.98	peak	150	360	P	
11	640.6110	52.39	-20.64	31.75	46.00	-14.25	peak	150	360	P	
12	640.6110	32.59	-20.64	11.95	46.00	-34.05	AVG	150	360	P	

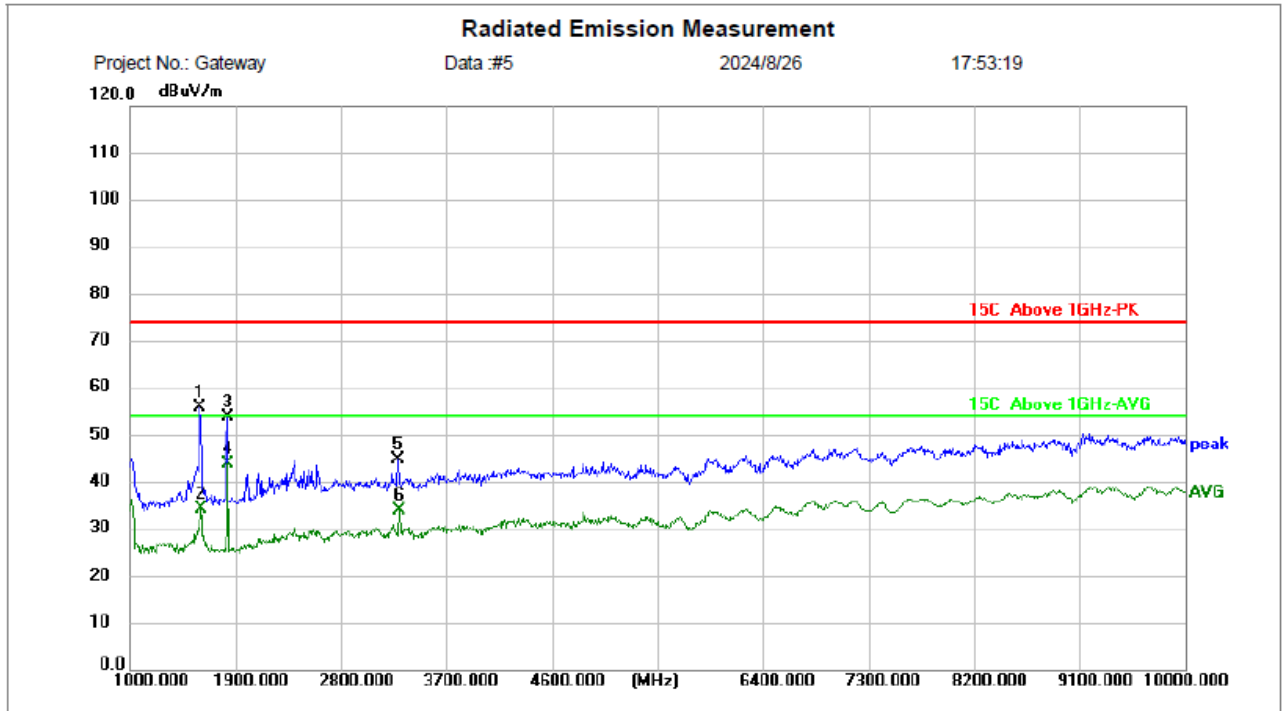
1GHz - 10GHz
Model: T11013310

Low Channel





Middle Channl



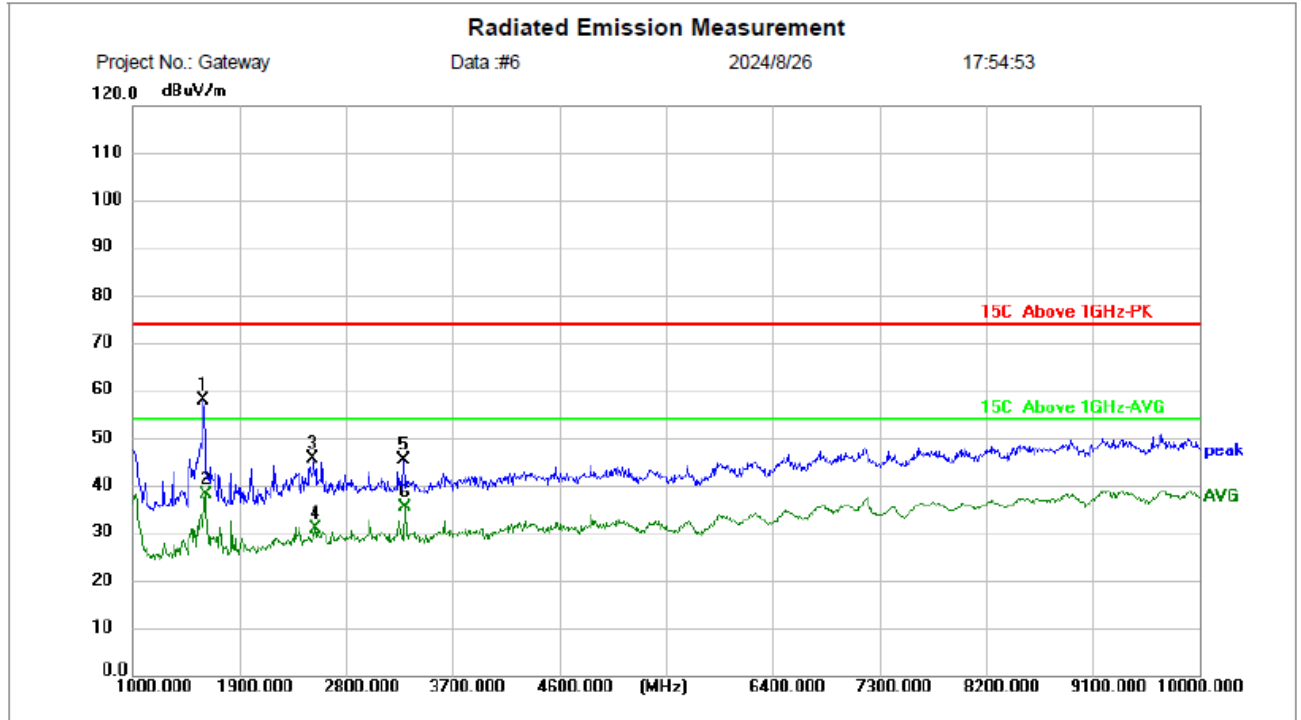
Site
Limit: 15C Above 1GHz-PK
EUT:Quarterback Gateway

Polarization: **Horizontal**
Power: full battery
Distance: 3 m

Temperature: 22 °C
Humidity: 47 %RH

M/N:T11012860
Mode: 912.146MHz
Note:

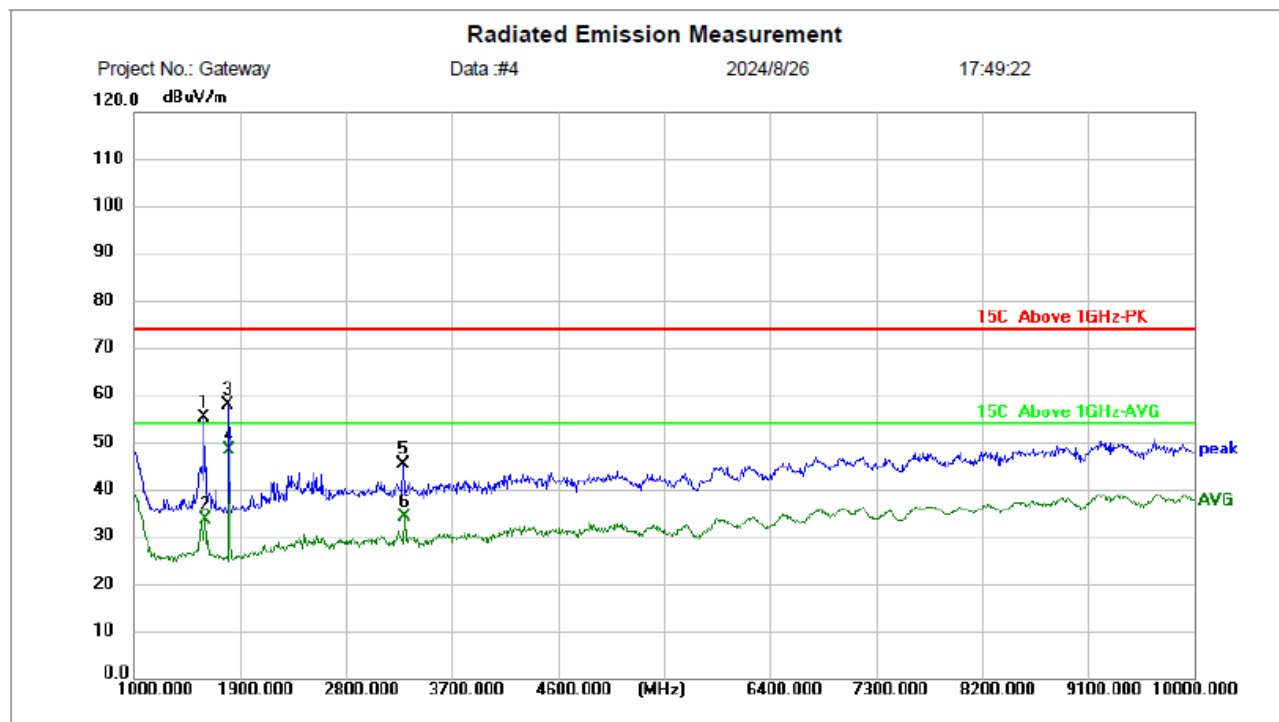
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	1594.000	74.79	-18.73	56.06	74.00	-17.94	peak	150	0	P	
2	1603.000	52.95	-18.72	34.23	54.00	-19.77	AVG	150	0	P	
3	1828.000	71.70	-17.92	53.78	74.00	-20.22	peak	150	0	P	
4 *	1837.000	61.83	-17.88	43.95	54.00	-10.05	AVG	150	0	P	
5	3286.000	56.29	-11.53	44.76	74.00	-29.24	peak	150	0	P	
6	3295.000	45.64	-11.54	34.10	54.00	-19.90	AVG	150	0	P	



Site: Polarization: **Vertical** Temperature: 22 °C
Limit: 15C Above 1GHz-PK Power: full battery Humidity: 47 %RH
EUT: Quarterback Gateway Distance: 3 m
M/N: T11012860
Mode: 912.146MHz
Note:

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	1594.000	76.64	-18.73	57.91	74.00	-16.09	peak	150	360	P	
2 *	1612.000	57.07	-18.68	38.39	54.00	-15.61	AVG	150	360	P	
3	2521.000	60.35	-14.49	45.86	74.00	-28.14	peak	150	360	P	
4	2539.000	45.39	-14.40	30.99	54.00	-23.01	AVG	150	360	P	
5	3286.000	57.12	-11.53	45.59	74.00	-28.41	peak	150	360	P	
6	3295.000	47.04	-11.54	35.50	54.00	-18.50	AVG	150	360	P	

High Channel



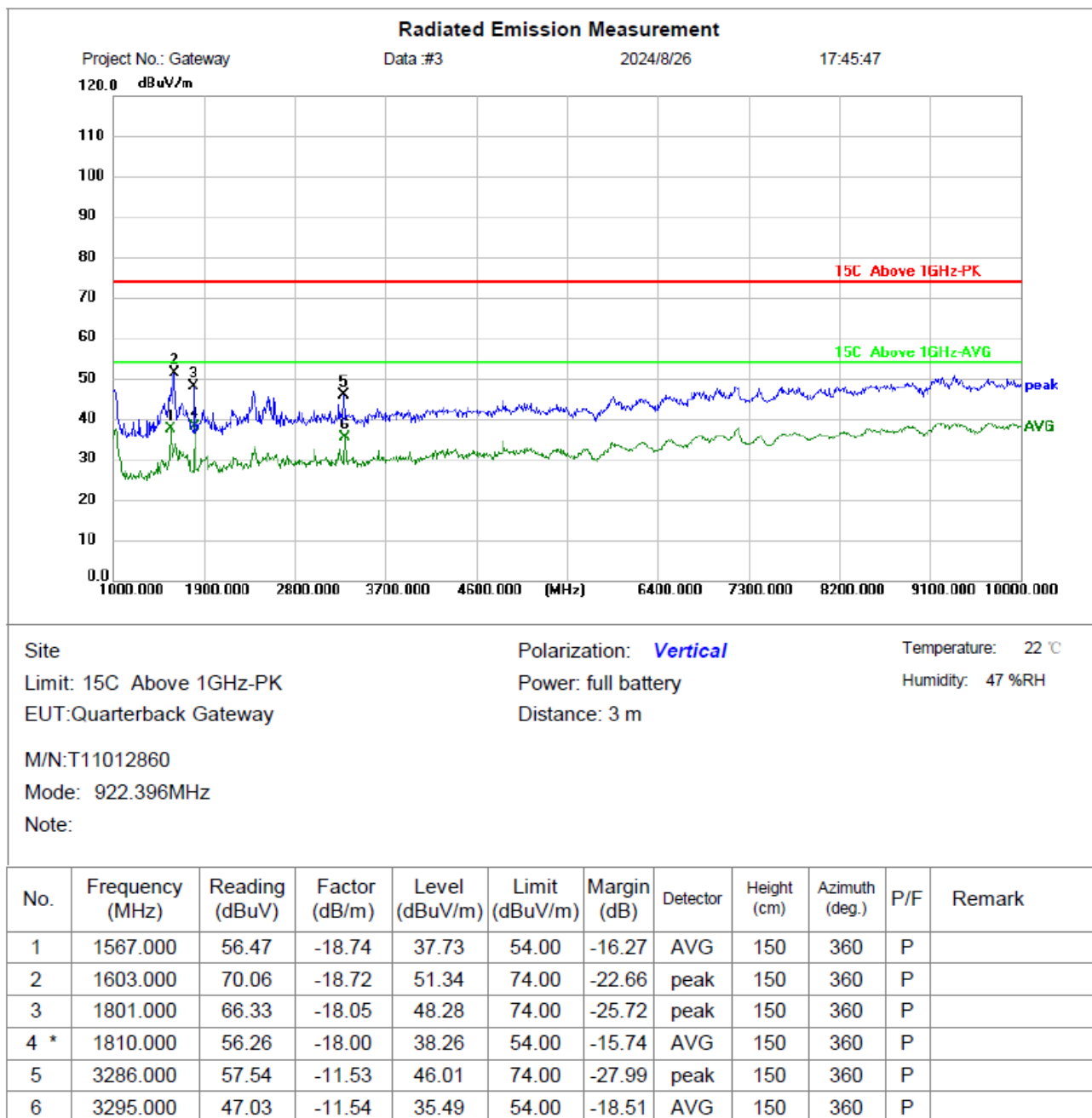
Site
Limit: 15C Above 1GHz-PK
EUT: Quarterback Gateway

Polarization: **Horizontal**
Power: full battery
Distance: 3 m

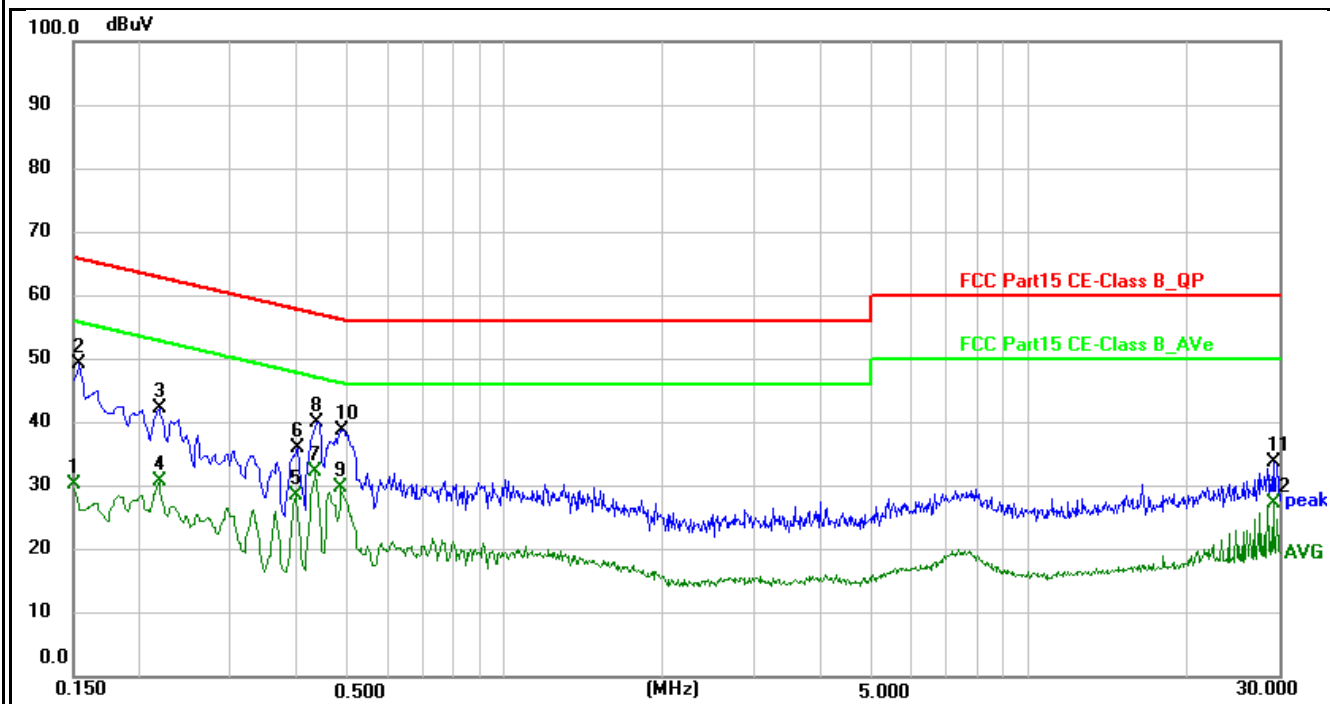
Temperature: 22 °C
Humidity: 47 %RH

M/N: T11012860
Mode: 922.396MHz
Note:

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	1594.000	73.96	-18.73	55.23	74.00	-18.77	peak	150	0	P	
2	1603.000	52.36	-18.72	33.64	54.00	-20.36	AVG	150	0	P	
3	1801.000	76.04	-18.05	57.99	74.00	-16.01	peak	150	0	P	
4 *	1810.000	66.49	-18.00	48.49	54.00	-5.51	AVG	150	0	P	
5	3286.000	57.02	-11.53	45.49	74.00	-28.51	peak	150	0	P	
6	3295.000	45.79	-11.54	34.25	54.00	-19.75	AVG	150	0	P	

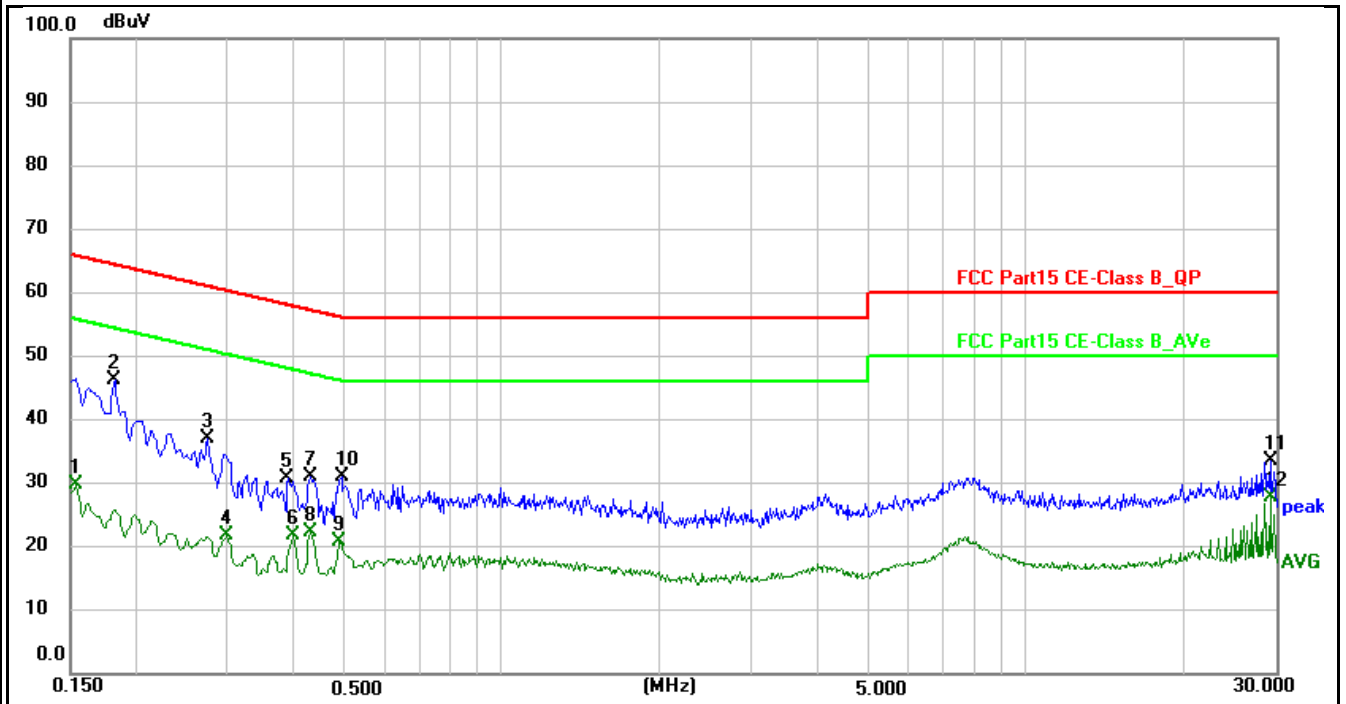


Appendix B.7: Test Results of Conducted Emission on AC Mains



Site:	FCC Part15 CE-Class B_QP	Phase: L1	Temperature(C):22(C)
Limit:	Quarterback Gateway	Test Time:	Humidity(%):56%
EUT:	Gateway	Power Rating:	2024/9/27 17:02:44
M/N.:	BT+4G+915MHz	Test Engineer:	AC120V/60Hz
Mode:			Bosco
Note:			

No.	Frequency (MHz)	Reading Level(dBuV)	Factor (dB)	Measure-ment(dBuV)	Limit (dBuV)	Margin (dB)	Detector	Comment
1	0.1500	10.84	19.42	30.26	56.00	-25.74	AVG	
2	0.1539	29.82	19.42	49.24	65.79	-16.55	peak	
3	0.2180	22.85	19.42	42.27	62.89	-20.62	peak	
4	0.2180	11.29	19.42	30.71	52.89	-22.18	AVG	
5	0.3980	9.02	19.47	28.49	47.90	-19.41	AVG	
6	0.4020	16.45	19.47	35.92	57.81	-21.89	peak	
7 *	0.4340	12.72	19.47	32.19	47.18	-14.99	AVG	
8	0.4380	20.52	19.47	39.99	57.10	-17.11	peak	
9	0.4860	10.30	19.47	29.77	46.24	-16.47	AVG	
10	0.4900	19.37	19.46	38.83	56.17	-17.34	peak	
11	29.2980	11.53	22.23	33.76	60.00	-26.24	peak	
12	29.2980	5.02	22.23	27.25	50.00	-22.75	AVG	



Site:	FCC Part15 CE-Class B_QP	Phase: N	Temperature(C):22(C)
Limit:	Quarterback Gateway	Test Time:	Humidity(%):56%
EUT:	Gateway	Power Rating:	2024/9/27 17:04:53
M/N.:	BT+4G+915MHz	Test Engineer:	AC120V/60Hz
Mode:			Bosco
Note:			

No.	Frequency (MHz)	Reading Level(dBuV)	Factor (dB)	Measure-ment(dBuV)	Limit (dBuV)	Margin (dB)	Detector	Comment
1	0.1539	10.30	19.44	29.74	55.79	-26.05	AVG	
2 *	0.1819	26.94	19.44	46.38	64.40	-18.02	peak	
3	0.2740	17.57	19.44	37.01	61.00	-23.99	peak	
4	0.2980	2.34	19.44	21.78	50.30	-28.52	AVG	
5	0.3899	11.34	19.48	30.82	58.07	-27.25	peak	
6	0.3980	2.24	19.48	21.72	47.90	-26.18	AVG	
7	0.4300	11.68	19.48	31.16	57.25	-26.09	peak	
8	0.4300	2.94	19.48	22.42	47.25	-24.83	AVG	
9	0.4900	1.42	19.47	20.89	46.17	-25.28	AVG	
10	0.4940	11.62	19.47	31.09	56.10	-25.01	peak	
11	29.3020	11.64	21.84	33.48	60.00	-26.52	peak	
12	29.3020	5.86	21.84	27.70	50.00	-22.30	AVG	