

Test Report

Product: Aftermarket Automotive Type-C HUD
(Head-Up Display) - V Series
Trade Mark: VIVIHU
Model Number: EW-HUDV5-Ultra
FCC ID: 2BVR2-EW-HUDV5

Prepared for

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Unit 324, Yilifang Intangible Cultural Heritage Industrial Park, Shayi
Community, Shajing Subdistrict, Bao'an District, Shenzhen

Prepared by

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TEST RESULT CERTIFICATION

Applicant's Name..... : Shenzhen Luchi Electronics Technology Co., Ltd.
Unit 324, Yilifang Intangible Cultural Heritage Industrial Park,
Address : Shayi Community, Shajing Subdistrict, Bao'an District,
Shenzhen
Manufacturer's Name : Shenzhen Jieshi Haoyu Technology Co., Ltd.
Room 301, Avatar Benran Intangible Cultural Heritage Industrial
Address : Park, Shayi Community, Shajing Subdistrict, Bao'an District,
Shenzhen

Product description

Product name : Aftermarket Automotive Type-C HUD (Head-Up Display) - V
Series
Model Number : EW-HUDV5-Ultra
Standards : FCC Part 15.247
IEEE/ANSI C63.10-2020+Cor.1-2023+C63.10a-2024 + Errata
Test procedure..... : to C63.10a-2024
KDB 558074 D01 15.247 Meas Guidance v05r02

This device described above has been tested by Shenzhen HongBiao Certification& Testing Co., Ltd and the test results show that the equipment under test (EUT) is in compliance with the EMC requirements. And it is applicable only to the tested sample identified in the report.

Date of Test

Date (s) of performance of tests..... : May 19, 2026~July 09, 2026
Test Result..... : **Pass**

Testing Engineer :

Zoe su

(Z o e S u)

Technical Manager :

Ming Liu

(M i n g L i u)

Authorized Signatory :

Leo Su

(L e o S u)

[illegible]

1 General Description

1.1 Description of EUT

Product name:	Aftermarket Automotive Type-C HUD (Head-Up Display) - V Series
Model name:	EW-HUDV5-Ultra
Series Model:	EW-HUDVXXX...
Different of series model:	All the models are the same circuit and module, except the model No. (XXX... is a variable that can be replaced with any number, letter, or symbol).
Operation frequency:	IEEE 802.11b/g/n20: 2412-2462MHz IEEE 802.11n40: 2422-2452MHz
Modulation type:	IEEE 802.11b: DSSS (CCK, DQPSK, DBPSK) IEEE 802.11g/n (HT20/H40): OFDM (BPSK, QPSK, 16QAM, 64QAM)
Bit Rate of transmitter:	IEEE 802.11b: 1/2/5.5/11Mbps IEEE 802.11g: 6/9/12/18/24/36/48/54Mbps IEEE 802.11n(20MHz): MCS0-7, up to 150Mbps IEEE 802.11n(40MHz): MCS0-7, up to 300Mbps
Antenna type:	FPC Antenna
Antenna gain:	1.93 dBi
Max. output power:	16.82 dBm
Hardware version:	V1.0
Software version:	V1.0
Battery:	N/A
Power supply:	Input: DC 12V-15V
Adapter information:	N/A

1.2 Test Mode

Channel List for 802.11b/g/n (20)

Channel	Channel	Frequency (MHz)
Low	01	2412
Middle	06	2437

High	11	2462
------	----	------

Channel List for 802.11n (40)

Channel	Channel	Frequency (MHz)
Low	03	2422
Middle	06	2437
High	09	2452

1.3 Operation Channel list

Channel List for 802.11b/g/n (20)

Channel	Frequency (MHz)	Channel	Frequency (MHz)
01	2412	07	2442
02	2417	08	2447
03	2422	09	2452
04	2427	10	2457
05	2432	11	2462
06	2437	\	\

Channel List for 802.11n (40)

Channel	Frequency (MHz)	Channel	Frequency (MHz)
03	2422	07	2442
04	2427	08	2447
05	2432	09	2452
06	2437	\	\

1.4 Test Setup

See photographs of the test setup in the report for the actual setup and connections between EUT and support equipment.

1.5 Power setting configuration parameters

During testing channel & power controlling software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the

final end product power parameters.

Test software Version		N/A	
Mode	802.11b/g	802.11n20	802.11n40
Parameters	Default	Default	Default
RF cable			
Description	Connector	Length	Supplied by
Antenna Cable	SMA	10cm	Applicant

Note: Disclaimer: the loss of RF cable is too small and can be ignored.

1.6 Ancillary Equipment

Equipment	Model	S/N	Manufacturer
Notebook	BDR-WDH	A3RQPM242 0002411	Honor Terminal Co., Ltd.

Note: The notebook is used to assist the RF test. In order to prevent the notebook from causing unnecessary impact on the test, the notebook will be removed from the test environment after the EUT successfully transmits at a fixed frequency using the notebook.

2 Summary of Test Result

No.	Standard Section	Test Item	Result	Remark
1	15.203	Antenna Requirement	Pass	
2	15.247 (b)	Peak Output Power	N/A	
3	15.207	Conducted Emission	Pass	
4	15.247 (d) & 15.209	Radiated Spurious Emission	Pass	
5	15.247 (e)	Power Spectral Density	Pass	
6	15.247 (a)(2)	6dB Bandwidth	Pass	
7	/	Duty Cycle	Pass	
8	15.205	Band Edge Emission	Pass	
9	15.247(d)	Spurious RF Conducted Emissions	Pass	
Note: "N/A" means the test item not applicable.				

3 Test Facilities and Accreditations

3.1 Test Laboratory

Test Site	Shenzhen HongBiao Certification& Testing Co., Ltd
Test Site Location	Room 102, 201, Building 2, Yuanwanggu RFID Industrial Park, Tongguan Road, Tianliao Community, Yutang Street, Guangming District, Shenzhen, China
Telephone:	(86-755) 2998 9321
Fax:	(86-755) 2998 5110
Designation Number:	848916
FCC Registration No.:	CN1341
A2LA Certificate No.:	6765.01

3.2 Environmental Conditions

During the measurement the environmental conditions were within the listed ranges:

Temperature:	15°C~35°C
Relative Humidity:	20%~75%
Air Pressure:	98kPa~101kPa

3.3 Measurement Uncertainty

The reported uncertainty of measurement $y \pm U$, where expended uncertainty U is based on a standard uncertainty multiplied by a coverage factor of $k=2$, providing a level of confidence of approximately 95 %.

The data and results quoted in this document are true and accurate values, and uncertainties are not involved in the calculations.

In addition, components and mass production processes that are similar to testing equipment may introduce additional deviations, and the manufacturer is solely responsible for the continued compliance of the equipment.

Measurement Frequency Range	U, (dB)	Note
RF frequency	2×10^{-5}	
RF power, conducted	± 0.57 dB	
Conducted emission(150kHz~30MHz)	± 2.5 dB	
Radiated emission(9kHz-30MHz)	± 2.5 dB	
Radiated emission(30MHz~1GHz)	± 4.2 dB	
Radiated emission (above 1GHz)	± 4.7 dB	
Occupied Bandwidth	$\pm 3\%$	

Temperature	±1 degree	
Humidity	± 5 %	

3.4 Test Software

Software name	Manufacturer	Model	Version
Conducted Emission test Software	Farad	EZ-EMC	EMC-CON 3A1.1+
Radiated Emission test Software	Farad	EZ-EMC	FA-03A2
RF Test System	MWRF	MTS 8310	2.0.0.0

4 List of Test Equipment

Radiation emission							
Item	Equipment No.	Equipment name	Manufacturer	Model	Serial No.	Calibration date	Due date
1	HB-E001	Horn Antenna	Schwarzbeck	BBHA 9120D	02592	2026-04-25	2028-04-24
2	HB-E002	Biconical log-periodic composite antenna	Schwarzbeck	VULB 9168	01340	2026-04-25	2028-04-24
3	HB-E003	SHF-EHF Horn	Schwarzbeck	BBHA 9170	01193	2026-04-25	2028-04-24
4	HB-E005	Preamplifier	Noyetec	LAN-0118	NYCM1420102	2026-04-27	2027-04-26
5	HB-E006	Preamplifier	Noyetec	LAN-1840	NYCM1420103	2026-04-30	2027-04-29
6	HB-E007	EMI TEST RECEIVER	R&S	ESR7	102520	2026-04-28	2027-04-27
7	HB-E009	POSITINAL COTROLLE R	Noyetec	N/A	N/A	/	/
8	HB-E013	RF switch	Noyetec	NY-RF4	NY0CM1420204	/	/
9	HB-E066	Illuminance Tester	TASI	TA8121	N/A	2026-04-30	2027-04-29
10	HB-E075	Active loop antenna	Schwarzbeck	FMZB 1519B	1519B-00245	2026-04-25	2028-04-24
11	HB-E076	Preamplifier	Hewlett Packard	8447D	1937A02278	2026-04-28	2027-04-27
Conduction emission							
Item	Equipment No.	Equipment name	Manufacturer	Model	Serial No.	Calibration date	Due date
1	HB-E014	4 Path V-LISN	Schwarzbeck	NNLK 8121	00770	2026-04-27	2027-04-26
2	HB-E015	Pulse Limiter	Schwarzbeck	VTSD 9561-F	00949	2026-04-27	2027-04-26
3	HB-E016	Absorb clamp	ZHINAN	ZN23201	*21066*	2026-04-29	2027-04-28
4	HB-E059	Attenuator	Xianghua	TS2-6-1	220215166	2026-04-27	2027-04-26
5	HB-E069	EMI TEST RECEIVER	R&S	ESCI	100610	2026-04-27	2027-04-26

RF							
Item	Equipment No.	Equipment name	Manufacturer	Model	Serial No.	Calibration date	Due date
1	HB-E041	MXG AnaioG Signal Generator	Agilent	N5181A	MY47070421	2026-04-27	2027-04-26

2	HB-E042	WIDEBAND RADIO COMMUNICA TION TESTER	R&S	CMW500	132108	2026-04-27	2027-04-26
3	HB-E043	MXG Anaio Signal Generator	Agilent	N5182A	US46240335	2026-04-28	2027-04-27
4	HB-E044	Signal& spectrum Analyzer	R&S	FSV3044	101264	2026-04-28	2027-04-27
5	HB-E045	RF Control Box	Noyetec	NY100-R FCB	N/A	2026-04-28	2027-04-27
6	HB-E058	Thermometer Clock Humidity Monitor	N/A	HTC-1S	N/A	2026-04-30	2027-04-29

Note:

1. The calibration interval of the above test instruments is 12&24 months and the calibrations are traceable to international system unit (SI).
2. The instrument RF Control Box, numbered HB-E045, contains power meter.

5 Test Item And Results

5.1 Antenna Requirement

5.1.1 Standard Requirement

15.203 requirement: For intentional device, according to 15.203: an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device

5.1.2 Test Result

The EUT antenna is FPC Antenna. It comply with the standard requirement. In case of replacement of broken antenna the same antenna type must be used.

5.2 Conducted Emission

5.2.1 Limits

Limits – Class B		
Frequency (MHz)	Limit (dBμV)	
	Quasi-Peak	Average
0.15 to 0.5	66 to 56*	56 to 46*
0.5 to 5	56	46
5 to 30	60	50

Note:

- the tighter limit applies at the band edges.
- the limit of " * " marked band means the limitation decreases linearly with the logarithm of the frequency in the range.

5.2.2 Test Procedures

a) EUT Operating Conditions

The EUT was configured for testing in a typical fashion (as a customer would normally use it). The EUT has been programmed to continuously transmit during test. This operating condition was tested and used to collect the included data.

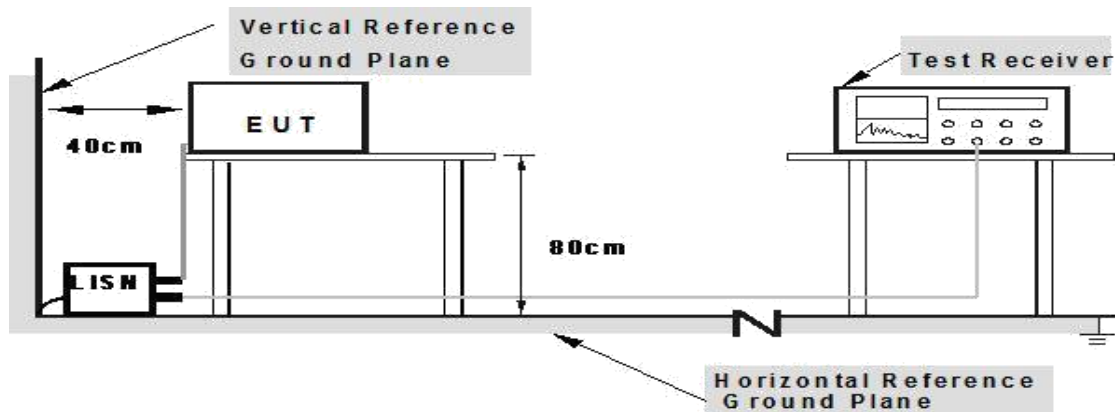
b) The following table is the setting of the receiver

Receiver Parameters	Setting
Attenuation	10 dB
Start Frequency	0.15 MHz
Stop Frequency	30 MHz
IF Bandwidth	9 kHz

- The EUT was placed 0.8 meters from the horizontal ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipment powered from additional LISN(s). The LISN provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.
- Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.
- I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
- LISN is at least 80 cm from nearest part of EUT chassis.

- g) For the actual test configuration, please refer to the related Item – photographs of the test setup.

5.2.3 Test Setup



5.2.4 Test Result

Note: This device is powered by DC, so it is not suitable for this project.

5.3 Radiated Emission

5.3.1 Limits

Frequencies (MHz)	Field Strength (micровolts/meter)	Measurement Distance (meters)
0.009~0.490	2400/F(KHz)	300
0.490~1.705	24000/F(KHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
Above 960	500	3

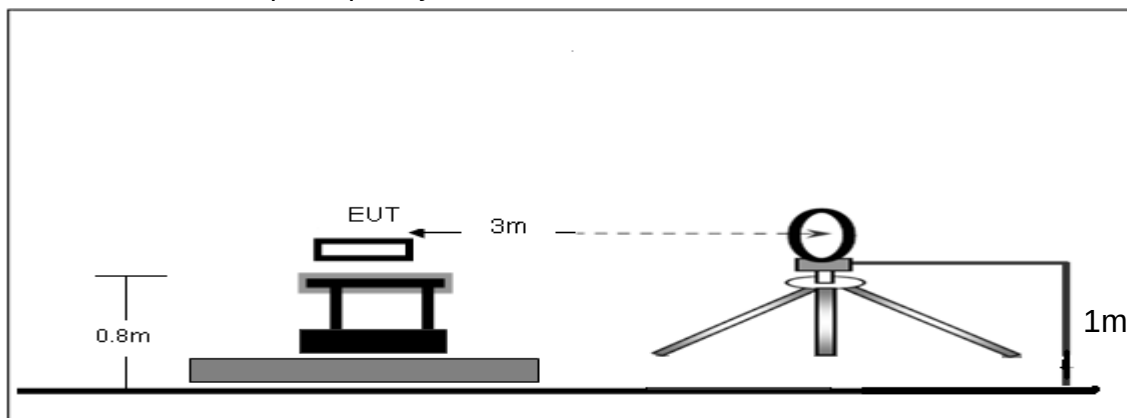
Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RB 200Hz for QP
Start ~ Stop Frequency	150kHz~30MHz / RB 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RB 120kHz for QP

5.3.2 Test Procedures

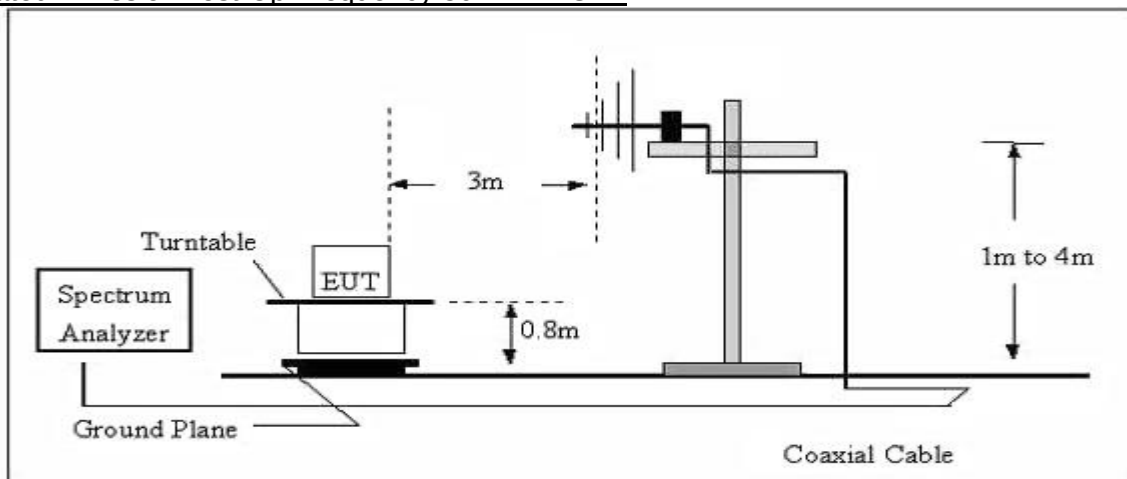
- The radiated emission tests were performed in the 3 meters.
- The EUT is placed on a turn table which is 0.8 meter above ground for below 1 GHz, and 1.5 m for above 1 GHz. The turn table is rotated 360 degrees to determine the position of the maximum emission level.
- The height of the test antenna shall vary between 1m to 4m. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- If the peak mode measured value compliance with and lower than quasi peak mode limit, the EUT shall be deemed to meet QP limits and then no additional QP mode measurement performed.
- If the peak mode measured value compliance with and lower than average mode limit, the EUT shall be deemed to meet average limits and then no additional average mode measurement performed.
- For the actual test configuration, please refer to the related item – EUT test photos.

5.3.3 Test Setup

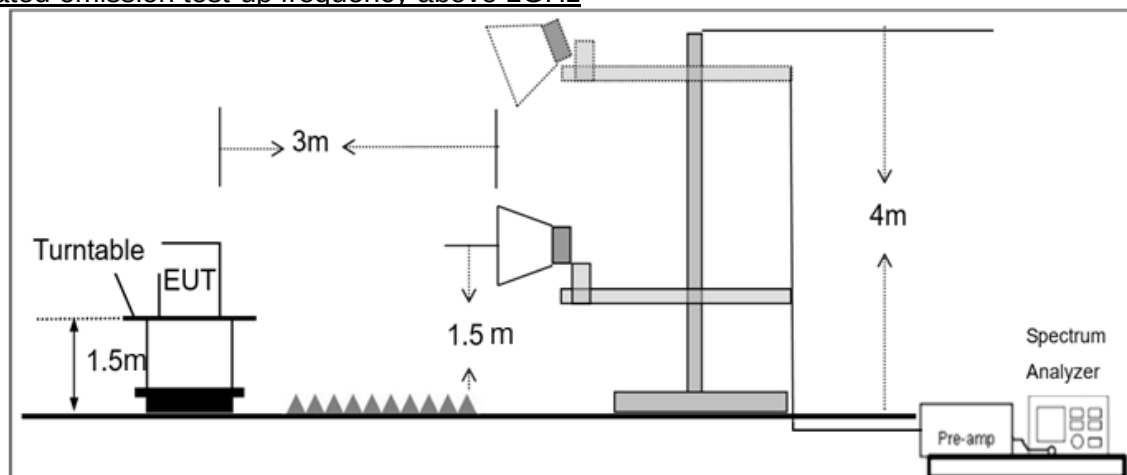
Radiated Emission Test-Up Frequency Below 30MHz



Radiated Emission Test-Up Frequency 30MHz~1GHz



Radiated emission test-up frequency above 1GHz



5.3.4 Test Result

Below 30MHz

EUT:	Aftermarket Automotive Type-C HUD (Head-Up Display) - V Series	Model Name:	EW-HUDV5-Ultra
Pressure:	1010 hPa	Test Voltage:	DC 12V from battery
Test Mode:	Charging + TX	Polarization:	--

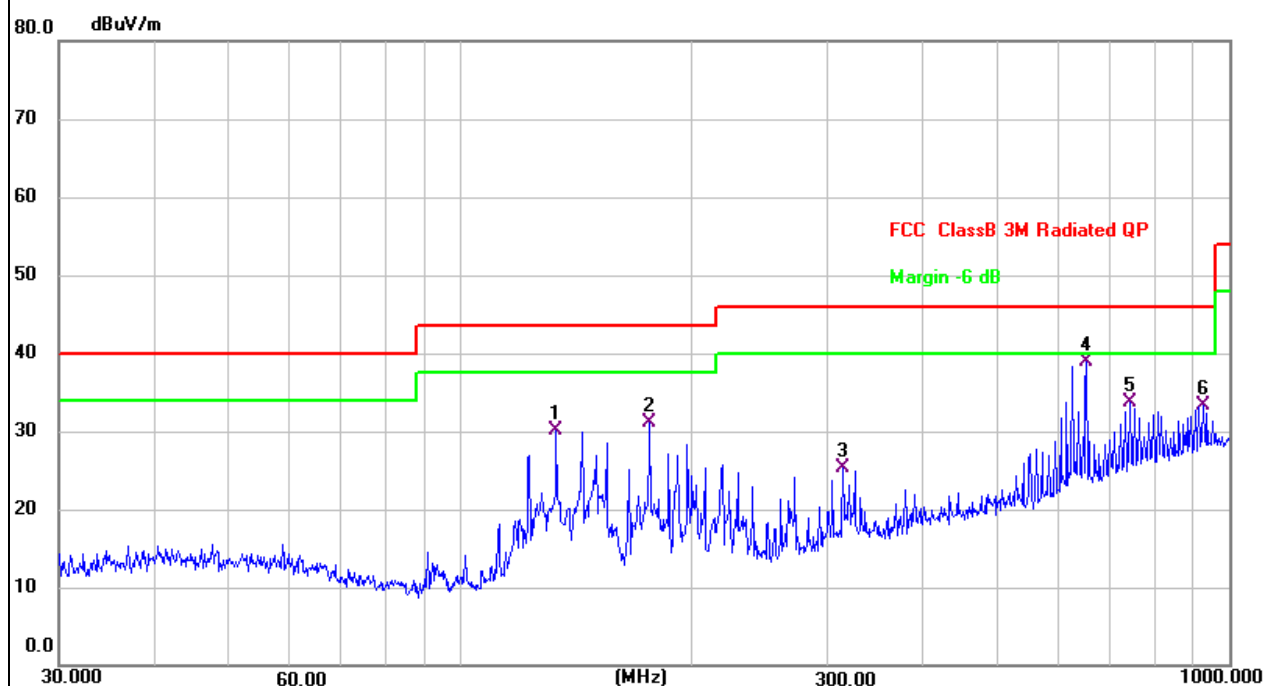
Freq.	Reading	Limit	Margin	State
(MHz)	(dBuV/m)	(dBuV/m)	(dB)	P/F
--	--	--	--	Pass
--	--	--	--	Pass

Note:

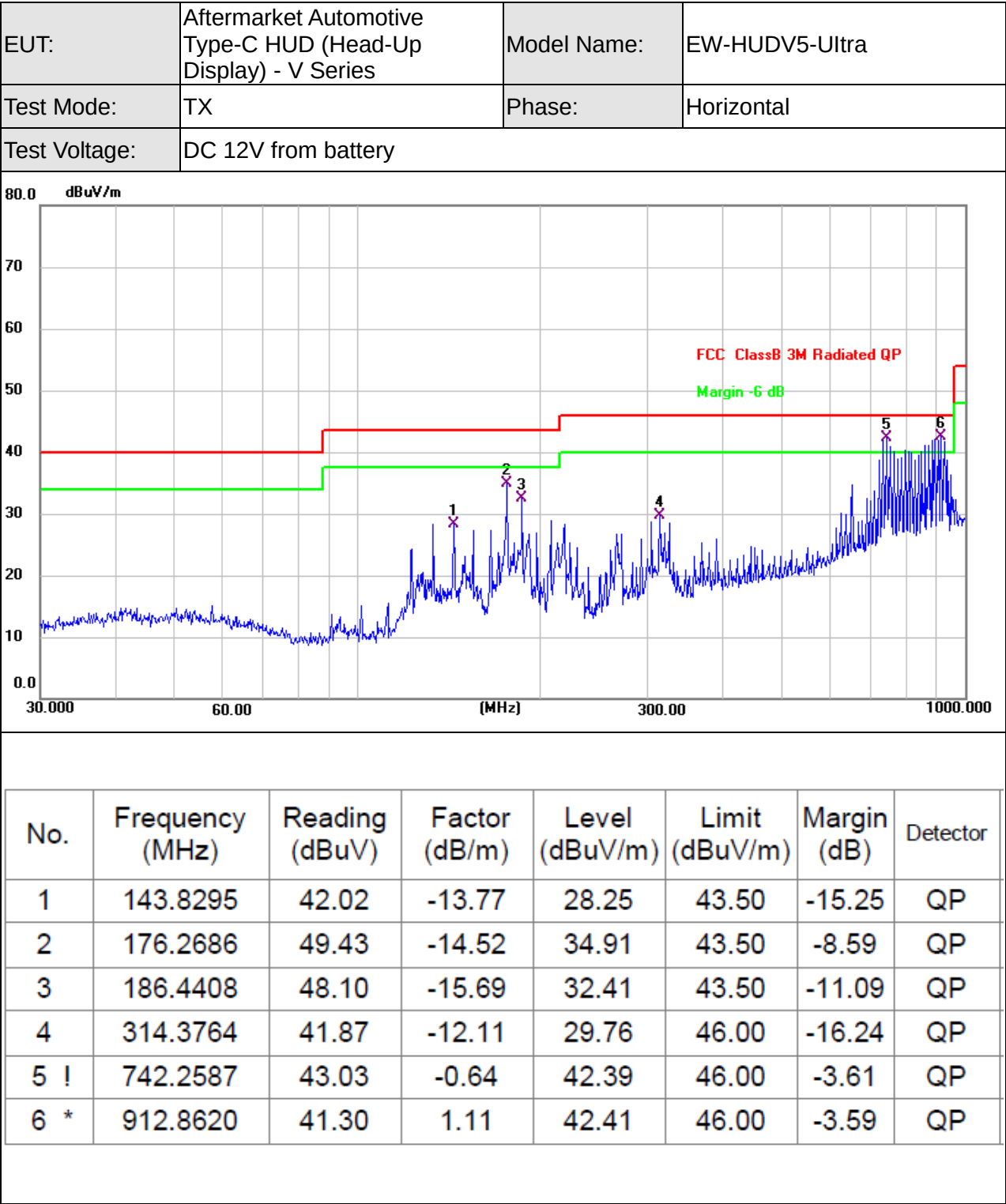
1. For 9kHz-30MHz, the amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.
2. Distance extrapolation factor = $40 \log (\text{specific distance}/\text{test distance})$ (dB);
3. Limit line = specific limits (dBuV) + distance extrapolation factor.

Frequency range (30MHz – 1GHz)

EUT:	Aftermarket Automotive Type-C HUD (Head-Up Display) - V Series	Model Name:	EW-HUDV5-Ultra
Test Mode:	TX	Phase:	Vertical
Test Voltage:	DC 12V from battery		



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	133.1511	44.68	-14.54	30.14	43.50	-13.36	QP
2	176.2686	45.69	-14.52	31.17	43.50	-12.33	QP
3	314.3765	37.40	-12.11	25.29	46.00	-20.71	QP
4 *	651.9417	41.75	-2.81	38.94	46.00	-7.06	QP
5	742.2587	34.41	-0.64	33.77	46.00	-12.23	QP
6	925.7563	32.06	1.29	33.35	46.00	-12.65	QP



Frequency range (1GHz-25GHz)

Frequency (MHz)	Read Level (dBμV)	Cable loss (dB)	Antenna Factor (dB/m)	Preamp Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type	Comment
Low Channel (2412 MHz)(802.11b)--Above 1G									
4824.161	43.60	4.83	33.6	30.80	51.23	74.00	-22.77	Pk	Vertical
4824.161	31.74	4.83	33.6	30.80	39.37	54.00	-14.63	AV	Vertical
7236.396	42.44	5.85	37.45	31.50	54.24	74.00	-19.76	Pk	Vertical
7236.396	32.15	5.85	37.45	31.50	43.95	54.00	-10.05	AV	Vertical
4824.154	43.30	4.83	33.6	30.80	50.93	74.00	-23.07	Pk	Horizontal
4824.154	32.01	4.83	33.6	30.80	39.64	54.00	-14.36	AV	Horizontal
7236.168	43.43	5.85	37.45	31.50	55.23	74.00	-18.77	Pk	Horizontal
7236.168	32.04	5.85	37.45	31.50	43.84	54.00	-10.16	AV	Horizontal
Middle Channel (2437 MHz)(802.11b)--Above 1G									
4874.112	42.74	4.88	33.75	30.80	50.57	74.00	-23.43	Pk	Vertical
4874.112	31.90	4.88	33.75	30.80	39.73	54.00	-14.27	AV	Vertical
7311.247	44.36	5.90	38.10	31.59	56.77	74.00	-17.23	Pk	Vertical
7311.247	32.78	5.90	38.10	31.59	45.19	54.00	-8.81	AV	Vertical
4874.132	43.87	4.88	33.75	30.80	51.70	74.00	-22.30	Pk	Horizontal
4874.132	31.92	4.88	33.75	30.80	39.75	54.00	-14.25	AV	Horizontal
7311.085	44.17	5.90	38.10	31.59	56.58	74.00	-17.42	Pk	Horizontal
7311.085	32.85	5.90	38.10	31.59	45.26	54.00	-8.74	AV	Horizontal
High Channel (2462 MHz)(802.11b)--Above 1G									
4924.169	43.13	4.93	34.04	30.08	52.02	74.00	-21.98	Pk	Vertical
4924.169	32.06	4.93	34.04	30.08	40.95	54.00	-13.05	AV	Vertical
7386.215	43.49	6.01	37.90	31.74	55.66	74.00	-18.34	Pk	Vertical
7386.215	32.46	6.01	37.90	31.74	44.63	54.00	-9.37	AV	Vertical
4924.045	44.11	4.93	34.04	30.08	53.00	74.00	-21.00	Pk	Horizontal
4924.045	32.24	4.93	34.04	30.08	41.13	54.00	-12.87	AV	Horizontal
7386.132	43.73	6.01	37.90	31.74	55.90	74.00	-18.10	Pk	Horizontal
7386.132	32.55	6.01	37.90	31.74	44.72	54.00	-9.28	AV	Horizontal

Note:

1. Emission Level= Antenna Factor + Cable Loss + Read Level - Preamp Factor
2. All other emissions more than 20dB below the limit.
3. All modes have been tested, and only the worst mode 802.11b in the report.

5.3.5 Radiated Band Edge

Frequency (MHz)	Meter Reading (dBμV)	Cable Loss (dB)	Antenna Factor (dB/m)	Preamplifier Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type	Comment
802.11b									
2310.00	45.99	3.40	27.80	32.41	44.78	74	-29.22	Pk	Horizontal
2310.00	33.46	3.40	27.80	32.41	32.25	54	-21.75	AV	Horizontal
2310.00	44.95	3.40	27.80	32.41	43.74	74	-30.26	Pk	Vertical
2310.00	33.52	3.40	27.80	32.41	32.31	54	-21.69	AV	Vertical
2390.00	45.72	3.45	27.70	32.49	44.38	74	-29.62	Pk	Vertical
2390.00	34.63	3.45	27.70	32.49	33.29	54	-20.71	AV	Vertical
2390.00	46.25	3.45	27.70	32.49	44.91	74	-29.09	Pk	Horizontal
2390.00	34.56	3.45	27.70	32.49	33.22	54	-20.78	AV	Horizontal
2400.00	46.52	3.46	27.80	32.54	45.24	74	-28.76	Pk	Vertical
2400.00	34.35	3.46	27.80	32.54	33.07	54	-20.93	AV	Vertical
2400.00	45.80	3.46	27.80	32.54	44.52	74	-29.48	Pk	Horizontal
2400.00	34.27	3.46	27.80	32.54	32.99	54	-21.01	AV	Horizontal
2483.50	47.06	3.48	28.53	32.55	46.52	74	-27.48	Pk	Vertical
2483.50	33.95	3.48	28.53	32.55	33.41	54	-20.59	AV	Vertical
2483.50	46.36	3.48	28.53	32.55	45.82	74	-28.18	Pk	Horizontal
2483.50	33.75	3.48	28.53	32.55	33.21	54	-20.79	AV	Horizontal
2500.00	45.43	3.49	29.20	32.66	45.46	74	-28.54	Pk	Vertical
2500.00	33.81	3.49	29.20	32.66	33.84	54	-20.16	AV	Vertical
2500.00	45.42	3.49	29.20	32.66	45.45	74	-28.55	Pk	Horizontal
2500.00	33.75	3.49	29.20	32.66	33.78	54	-20.22	AV	Horizontal
802.11g									
2310.00	46.05	3.40	27.80	32.41	44.84	74	-29.16	Pk	Horizontal
2310.00	33.38	3.40	27.80	32.41	32.17	54	-21.83	AV	Horizontal
2310.00	44.75	3.40	27.80	32.41	43.54	74	-30.46	Pk	Vertical
2310.00	33.70	3.40	27.80	32.41	32.49	54	-21.51	AV	Vertical
2390.00	45.68	3.45	27.70	32.49	44.34	74	-29.66	Pk	Vertical
2390.00	34.59	3.45	27.70	32.49	33.25	54	-20.75	AV	Vertical
2390.00	46.39	3.45	27.70	32.49	45.05	74	-28.95	Pk	Horizontal
2390.00	34.33	3.45	27.70	32.49	32.99	54	-21.01	AV	Horizontal
2400.00	46.80	3.46	27.80	32.54	45.52	74	-28.48	Pk	Vertical
2400.00	34.34	3.46	27.80	32.54	33.06	54	-20.94	AV	Vertical
2400.00	45.86	3.46	27.80	32.54	44.58	74	-29.42	Pk	Horizontal
2400.00	34.30	3.46	27.80	32.54	33.02	54	-20.98	AV	Horizontal
2483.50	47.16	3.48	28.53	32.55	46.62	74	-27.38	Pk	Vertical
2483.50	33.88	3.48	28.53	32.55	33.34	54	-20.66	AV	Vertical

2483.50	46.27	3.48	28.53	32.55	45.73	74	-28.27	Pk	Horizontal
2483.50	33.82	3.48	28.53	32.55	33.28	54	-20.72	AV	Horizontal
2500.00	45.29	3.49	29.20	32.66	45.32	74	-28.68	Pk	Vertical
2500.00	33.93	3.49	29.20	32.66	33.96	54	-20.04	AV	Vertical
2500.00	45.24	3.49	29.20	32.66	45.27	74	-28.73	Pk	Horizontal
2500.00	33.69	3.49	29.20	32.66	33.72	54	-20.28	AV	Horizontal
802.11n20									
2310.00	45.97	3.40	27.80	32.41	44.76	74	-29.24	Pk	Horizontal
2310.00	33.47	3.40	27.80	32.41	32.26	54	-21.74	AV	Horizontal
2310.00	44.70	3.40	27.80	32.41	43.49	74	-30.51	Pk	Vertical
2310.00	33.56	3.40	27.80	32.41	32.35	54	-21.65	AV	Vertical
2390.00	45.64	3.45	27.70	32.49	44.30	74	-29.70	Pk	Vertical
2390.00	34.45	3.45	27.70	32.49	33.11	54	-20.89	AV	Vertical
2390.00	46.18	3.45	27.70	32.49	44.84	74	-29.16	Pk	Horizontal
2390.00	34.33	3.45	27.70	32.49	32.99	54	-21.01	AV	Horizontal
2400.00	46.53	3.46	27.80	32.54	45.25	74	-28.75	Pk	Vertical
2400.00	34.35	3.46	27.80	32.54	33.07	54	-20.93	AV	Vertical
2400.00	45.93	3.46	27.80	32.54	44.65	74	-29.35	Pk	Horizontal
2400.00	34.55	3.46	27.80	32.54	33.27	54	-20.73	AV	Horizontal
2483.50	47.14	3.48	28.53	32.55	46.60	74	-27.40	Pk	Vertical
2483.50	34.11	3.48	28.53	32.55	33.57	54	-20.43	AV	Vertical
2483.50	46.39	3.48	28.53	32.55	45.85	74	-28.15	Pk	Horizontal
2483.50	33.79	3.48	28.53	32.55	33.25	54	-20.75	AV	Horizontal
2500.00	45.30	3.49	29.20	32.66	45.33	74	-28.67	Pk	Vertical
2500.00	33.94	3.49	29.20	32.66	33.97	54	-20.03	AV	Vertical
2500.00	45.39	3.49	29.20	32.66	45.42	74	-28.58	Pk	Horizontal
2500.00	33.82	3.49	29.20	32.66	33.85	54	-20.15	AV	Horizontal
802.11n40									
2310.00	46.09	3.40	27.80	32.41	44.88	74	-29.12	Pk	Horizontal
2310.00	33.55	3.40	27.80	32.41	32.34	54	-21.66	AV	Horizontal
2310.00	44.78	3.40	27.80	32.41	43.57	74	-30.43	Pk	Vertical
2310.00	33.45	3.40	27.80	32.41	32.24	54	-21.76	AV	Vertical
2390.00	45.59	3.45	27.70	32.49	44.25	74	-29.75	Pk	Vertical
2390.00	34.43	3.45	27.70	32.49	33.09	54	-20.91	AV	Vertical
2390.00	46.16	3.45	27.70	32.49	44.82	74	-29.18	Pk	Horizontal
2390.00	34.60	3.45	27.70	32.49	33.26	54	-20.74	AV	Horizontal
2400.00	46.63	3.46	27.80	32.54	45.35	74	-28.65	Pk	Vertical
2400.00	34.44	3.46	27.80	32.54	33.16	54	-20.84	AV	Vertical
2400.00	45.85	3.46	27.80	32.54	44.57	74	-29.43	Pk	Horizontal
2400.00	34.30	3.46	27.80	32.54	33.02	54	-20.98	AV	Horizontal
2483.50	47.21	3.48	28.53	32.55	46.67	74	-27.33	Pk	Vertical

2483.50	33.90	3.48	28.53	32.55	33.36	54	-20.64	AV	Vertical
2483.50	46.28	3.48	28.53	32.55	45.74	74	-28.26	Pk	Horizontal
2483.50	33.93	3.48	28.53	32.55	33.39	54	-20.61	AV	Horizontal
2500.00	45.39	3.49	29.20	32.66	45.42	74	-28.58	Pk	Vertical
2500.00	33.79	3.49	29.20	32.66	33.82	54	-20.18	AV	Vertical
2500.00	45.21	3.49	29.20	32.66	45.24	74	-28.76	Pk	Horizontal
2500.00	33.72	3.49	29.20	32.66	33.75	54	-20.25	AV	Horizontal

Note:

1. All Readings are Peak Value (VBW=3MHz) and AV Value (VBW=10Hz).
2. Emission Level= Antenna Factor + Cable Loss + Read Level - Preamp Factor.

5.3.6 Spurious Emission in Band 1000MHz-25000MHz

All the modulation modes have been tested, and the worst result was report as below:

Frequency (MHz)	Read Level (dBμV)	Cable loss (dB)	Antenna Factor (dB/m)	Preamp Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type	Comment
3260	44.07	3.89	30.04	32.85	45.15	74	-28.85	Pk	Vertical
3260	33.31	3.89	30.04	32.85	34.39	54	-19.61	AV	Vertical
3260	44.24	3.89	30.04	32.85	45.32	74	-28.68	Pk	Horizontal
3260	33.31	3.89	30.04	32.85	34.39	54	-19.61	AV	Horizontal
5332	43.16	5.00	34.03	31.00	51.19	74	-22.81	Pk	Vertical
5332	30.41	5.00	34.03	31.00	38.44	54	-15.56	AV	Vertical
5332	43.12	5.00	34.03	31.00	51.15	74	-22.85	Pk	Horizontal
5332	30.45	5.00	34.03	31.00	38.48	54	-15.52	AV	Horizontal
12500	44.68	8.46	39.30	31.30	61.14	74	-12.86	Pk	Vertical
12500	32.51	8.46	39.30	31.30	48.97	54	-5.03	AV	Vertical
12500	44.72	8.46	39.30	31.30	61.18	74	-12.82	Pk	Horizontal
12500	32.65	8.46	39.30	31.30	49.11	54	-4.89	AV	Horizontal

5.4 Peak Output Power

5.4.1 Limit

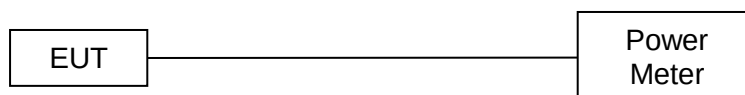
FCC Part15 Subpart C			
Section	Test Item	Limit	Frequency Range (MHz)
15.247(b)(3)	Peak output power	1 watt or 30dBm	2400-2483.5

5.4.2 Test Procedure

The maximum peak conducted output power may be measured using a broadband peak RF power meter.

The power meter shall have a video bandwidth that is greater than or equal to the DTS bandwidth and shall use a fast-responding diode detector.

5.4.3 Test Setup



5.4.4 Test Results

EUT:	Aftermarket Automotive Type-C HUD (Head-Up Display) - V Series	Model Name:	EW-HUDV5-Ultra
Test Mode:	TX Mode	Test Voltage:	DC 12V from battery

802.11b

Test Channel	Frequency (MHz)	Maximum Peak Conducted Output Power(dBm)	Limit (dBm)
CH01	2412	16.12	30
CH06	2437	16.52	30
CH11	2462	16.59	30

802.11g

Test Channel	Frequency (MHz)	Maximum Peak Conducted Output Power(dBm)	Limit (dBm)
CH01	2412	16.75	30
CH06	2437	16.82	30
CH11	2462	16.62	30

802.11n20

Test Channel	Frequency (MHz)	Maximum Peak Conducted Output Power(dBm)	Limit (dBm)
CH01	2412	16.46	30
CH06	2437	16.8	30
CH11	2462	16.82	30

802.11n40

Test Channel	Frequency (MHz)	Maximum Peak Conducted Output Power(dBm)	Limit (dBm)
CH03	2422	16.56	30
CH06	2437	16.81	30
CH09	2452	16.37	30

5.5 Power Spectral Density

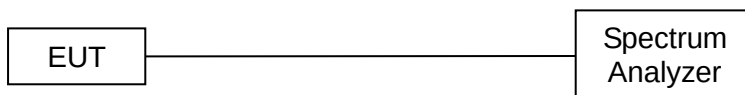
5.5.1 Limit

FCC Part15 (15.247) , Subpart C			
Section	Test Item	Limit	Frequency Range (MHz)
15.247	Power Spectral Density	8 dBm (in any 3kHz)	2400-2483.5

5.5.2 Test Procedure

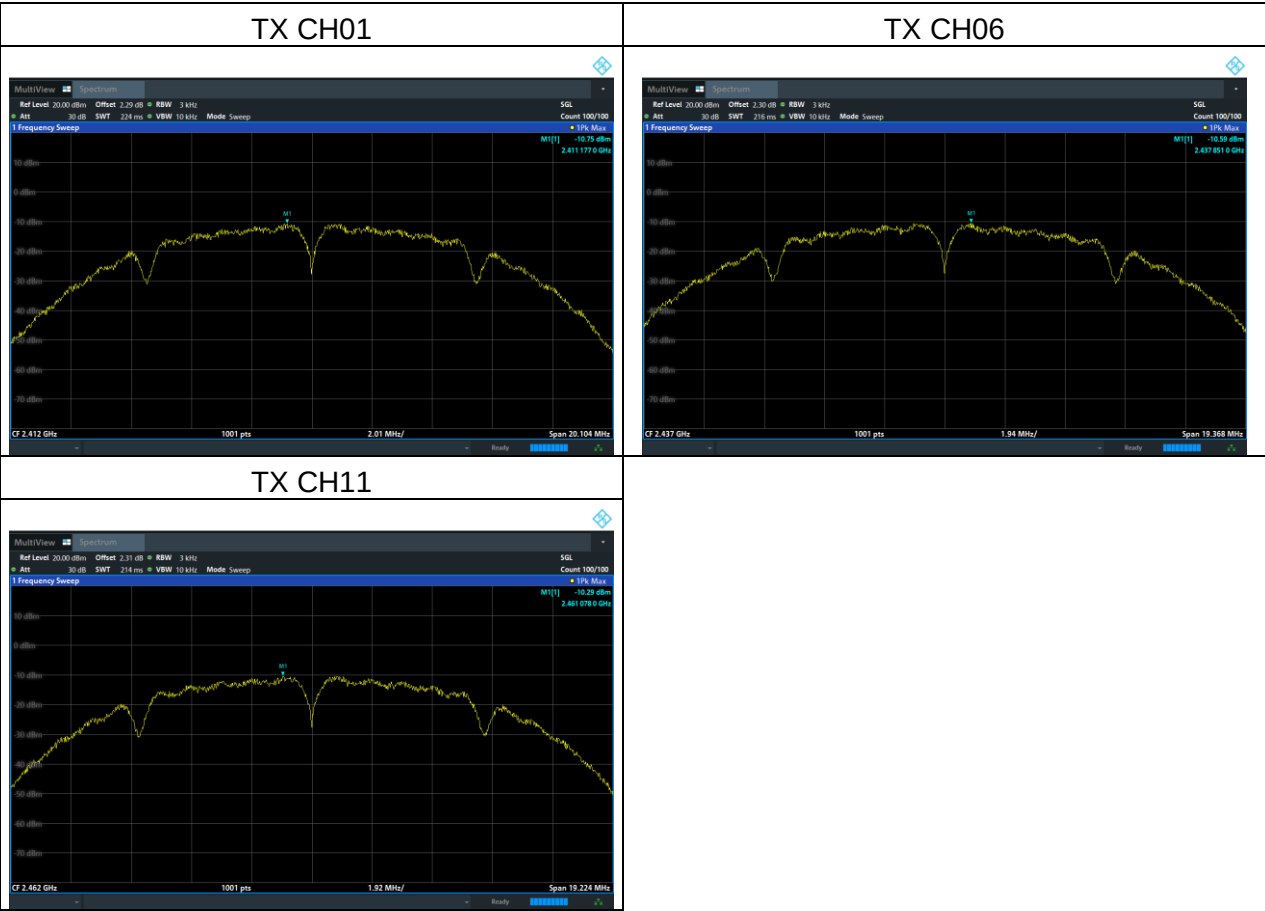
1. Set analyzer center frequency to DTS channel center frequency.
2. Set the span to 1.5 times the DTS channel bandwidth.
3. Set the RBW ≥ 3 kHz.
4. Set the VBW $\geq 3 \times$ RBW.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the maximum amplitude level.
10. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

5.5.3 Test Setup



5.5.4 Test Results

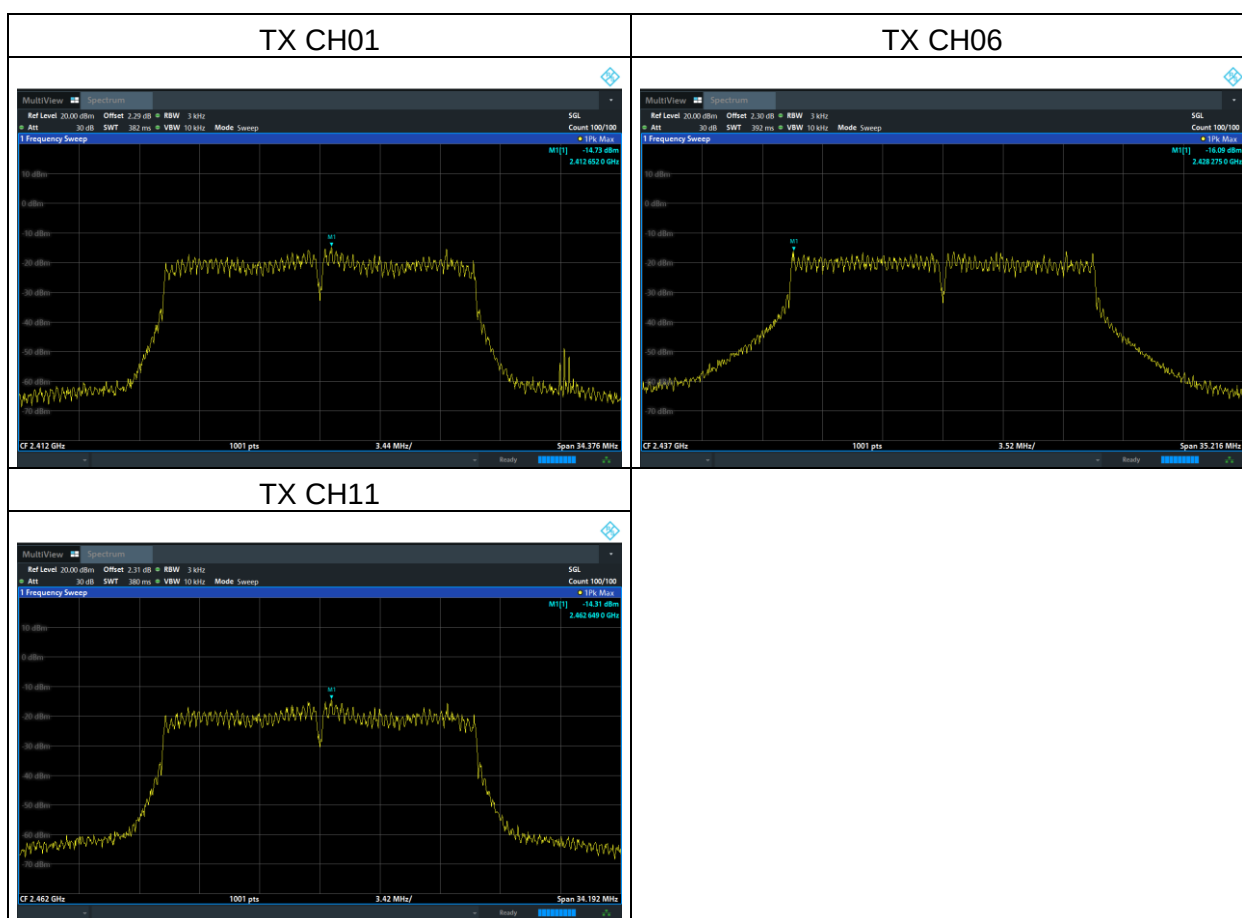
802.11b			
Frequency	Power Density (dBm/3kHz)	Limit (dBm/3kHz)	Result
2412 MHz	-10.75	8	Pass
2437 MHz	-10.59	8	Pass
2462 MHz	-10.29	8	Pass



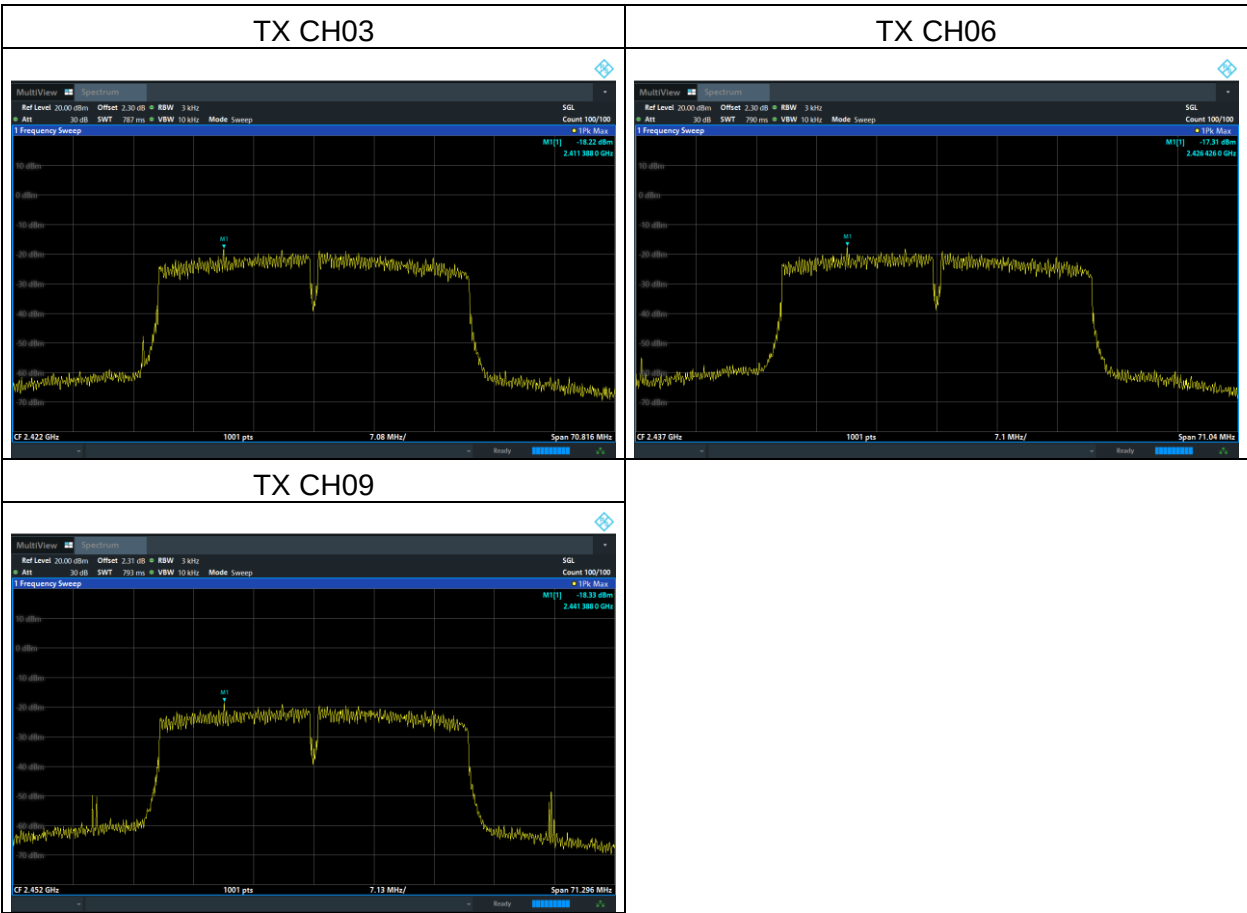
The figure displays three spectral plots, each showing a signal spectrum with a peak at approximately 2.4 GHz. The plots are arranged in a 2x2 grid, with the bottom-right cell empty.

- TX CH01 (Top Left):** The plot shows a signal spectrum with a peak at approximately 2.4 GHz. The x-axis is labeled "CF 2.412 GHz" and the y-axis is labeled "dBm". The plot includes a "Frequency Sweep" label and a "Span 32.016 MHz" label.
- TX CH06 (Top Right):** The plot shows a signal spectrum with a peak at approximately 2.4 GHz. The x-axis is labeled "CF 2.437 GHz" and the y-axis is labeled "dBm". The plot includes a "Frequency Sweep" label and a "Span 32.096 MHz" label.
- TX CH11 (Bottom Left):** The plot shows a signal spectrum with a peak at approximately 2.4 GHz. The x-axis is labeled "CF 2.462 GHz" and the y-axis is labeled "dBm". The plot includes a "Frequency Sweep" label and a "Span 31.824 MHz" label.

802.11n20			
Frequency	Power Density (dBm/3kHz)	Limit (dBm/3kHz)	Result
2412 MHz	-14.73	8	Pass
2437 MHz	-16.09	8	Pass
2462 MHz	-14.31	8	Pass



802.11n40			
Frequency	Power Density (dBm/3kHz)	Limit (dBm/3kHz)	Result
2422 MHz	-18.22	8	Pass
2437 MHz	-17.31	8	Pass
2452 MHz	-18.33	8	Pass



5.6 6dB Bandwidth

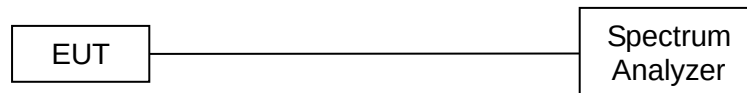
5.6.1 Limit

FCC Part15 (15.247) , Subpart C			
Section	Test Item	Limit	Frequency Range (MHz)
15.247(a)(2)	Bandwidth	$\geq 500\text{kHz}$ (6dB bandwidth)	2400-2483.5

5.6.2 Test Procedure

1. Set RBW= shall be in the range of 1% to 5% of the OBW but not less than 100 kHz.
2. Set the video bandwidth (VBW) $\geq 3 \times \text{RBW}$.
3. Detector = Peak.
4. Trace mode = max hold.
5. Sweep = No faster than coupled (auto) time.
6. Allow the trace to stabilize.
7. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

5.6.3 Test Setup

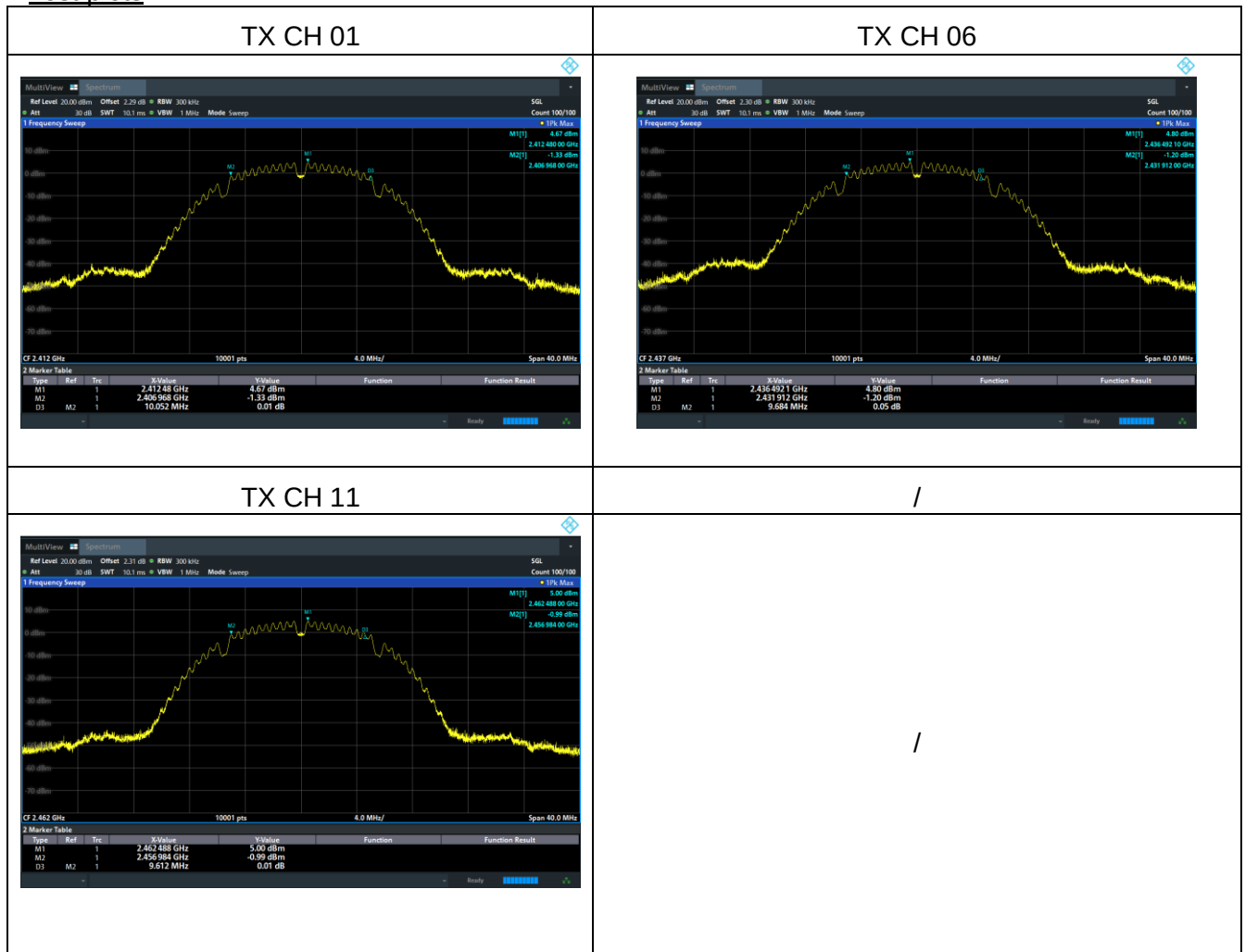


5.6.4 Test Results

EUT:	Aftermarket Automotive Type-C HUD (Head-Up Display) - V Series	Model Name:	EW-HUDV5-Ultra
Pressure:	1012 hPa	Test Voltage:	DC 12V from battery
Test Mode:	TX b Mode /CH01, CH06, CH11		

Channel	Frequency (MHz)	6dB bandwidth (MHz)	Limit (kHz)	Result
CH01	2412	10.052	500	Pass
CH06	2437	9.684	500	Pass
CH11	2462	9.612	500	Pass

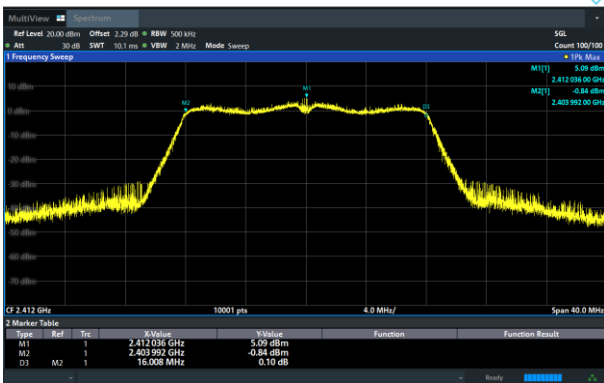
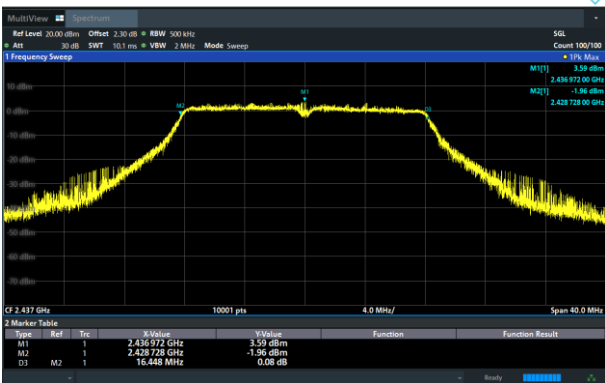
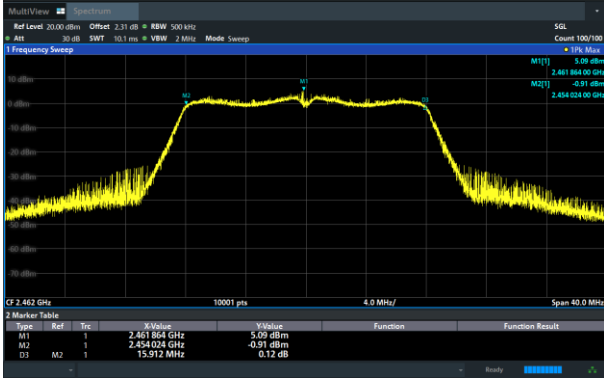
Test plots



EUT:	Aftermarket Automotive Type-C HUD (Head-Up Display) - V Series	Model Name:	EW-HUDV5-Ultra
Pressure:	1012 hPa	Test Voltage:	DC 12V from battery
Test Mode:	TX g Mode /CH01, CH06, CH11		

Channel	Frequency (MHz)	6dB bandwidth (MHz)	Limit (kHz)	Result
CH01	2412	16.008	500	Pass
CH06	2437	16.448	500	Pass
CH11	2462	15.912	500	Pass

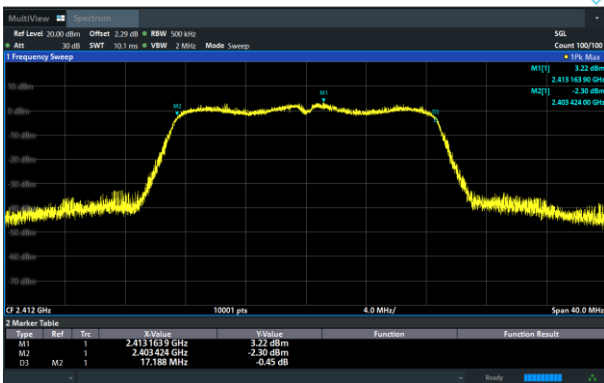
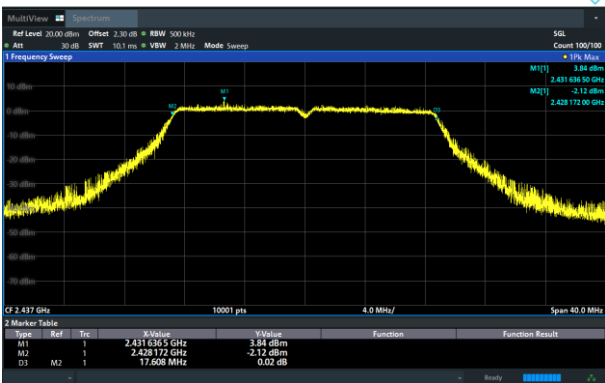
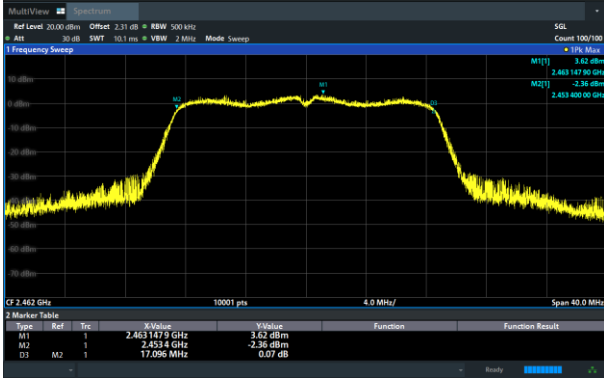
Test plots

TX CH 01 	TX CH 06 
TX CH 11 	/

EUT:	Aftermarket Automotive Type-C HUD (Head-Up Display) - V Series	Model Name:	EW-HUDV5-Ultra
Pressure:	1012 hPa	Test Voltage:	DC 12V from battery
Test Mode:	TX n20 Mode /CH01, CH06, CH11		

Channel	Frequency (MHz)	6dB bandwidth (MHz)	Limit (kHz)	Result
CH01	2412	17.188	500	Pass
CH06	2437	17.608	500	Pass
CH11	2462	17.096	500	Pass

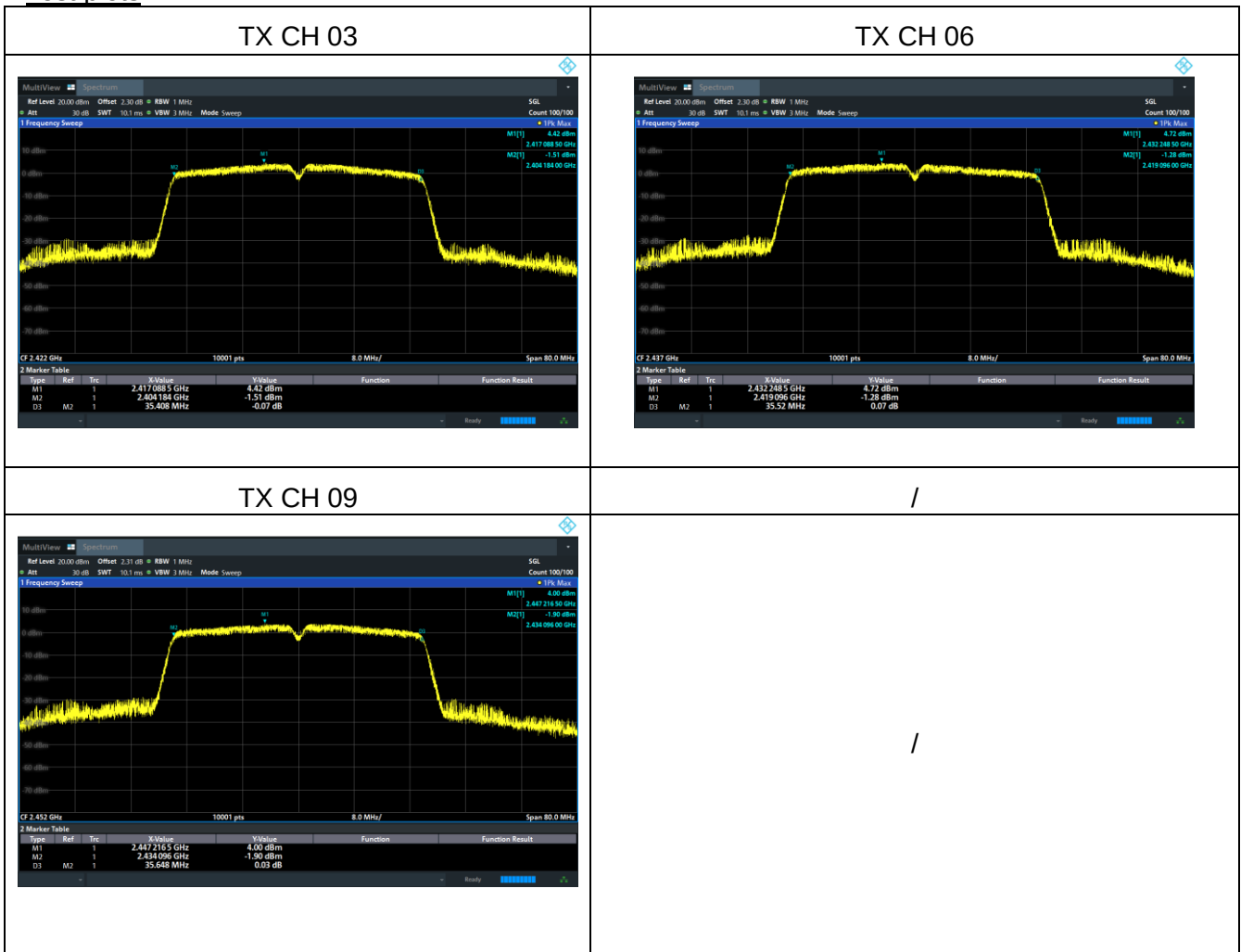
Test plots

TX CH 01 	TX CH 06 
TX CH 11 	/

EUT:	Aftermarket Automotive Type-C HUD (Head-Up Display) - V Series	Model Name:	EW-HUDV5-Ultra
Pressure:	1012 hPa	Test Voltage:	DC 12V from battery
Test Mode:	TX n40 Mode /CH03, CH06, CH09		

Channel	Frequency (MHz)	6dB bandwidth (MHz)	Limit (kHz)	Result
CH03	2422	35.408	500	Pass
CH06	2437	35.52	500	Pass
CH09	2452	35.648	500	Pass

Test plots



5.7 Duty Cycle

5.7.1 Limit

No limit requirement.

5.7.2 Test Procedure

The zero-span mode on a spectrum analyzer or EMI receiver if the response time and spacing between bins on the sweep are sufficient to permit accurate measurements of the on and off times of the transmitted signal. Set the center frequency of the instrument to the center frequency of the transmission. Set $RBW \geq OBW$ if possible; otherwise, set RBW to the largest available value. Set $VBW \geq RBW$. Set detector = peak or average. The zero-span measurement method shall not be used unless both RBW and VBW are $> 50/T$ and the number of sweep points across duration T exceeds 100. (For example, if VBW and/or RBW are limited to 3 MHz, then the zero-span method of measuring duty cycle shall not be used if $T \leq 16.7$ microseconds.)

The transmitter output is connected to the Spectrum Analyzer. We tested according to the zero-span measurement method, 6.0(b) in KDB 558074 D01 DTS Meas Guidance v05r02.

The largest available value of RBW is 10 MHz and VBW is 10 MHz. The zero-span method of measuring duty cycle shall not be used if $T \leq 6.25$ microseconds. ($50/6.25 = 8$)

The zero-span method was used because all measured T data are > 6.25 microseconds and both RBW and VBW are $> 50/T$.

The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator.

The path loss was compensated to the results for each measurement.

Set to the maximum power setting and enable the EUT transmit continuously.

The EUT was operating in controlled its channel.

Use the following spectrum analyzer settings:

Span = Zero Span

RBW = 10MHz (the largest available value)

VBW = 10MHz ($\geq$ RBW)

Number of points in Sweep > 100

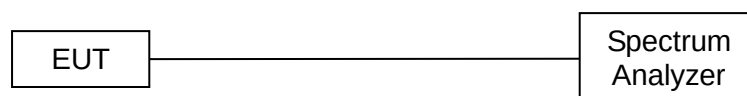
Detector function = peak

Trace = Clear write

Measure Total and Ton

Calculate Duty Cycle = $Ton / Total$

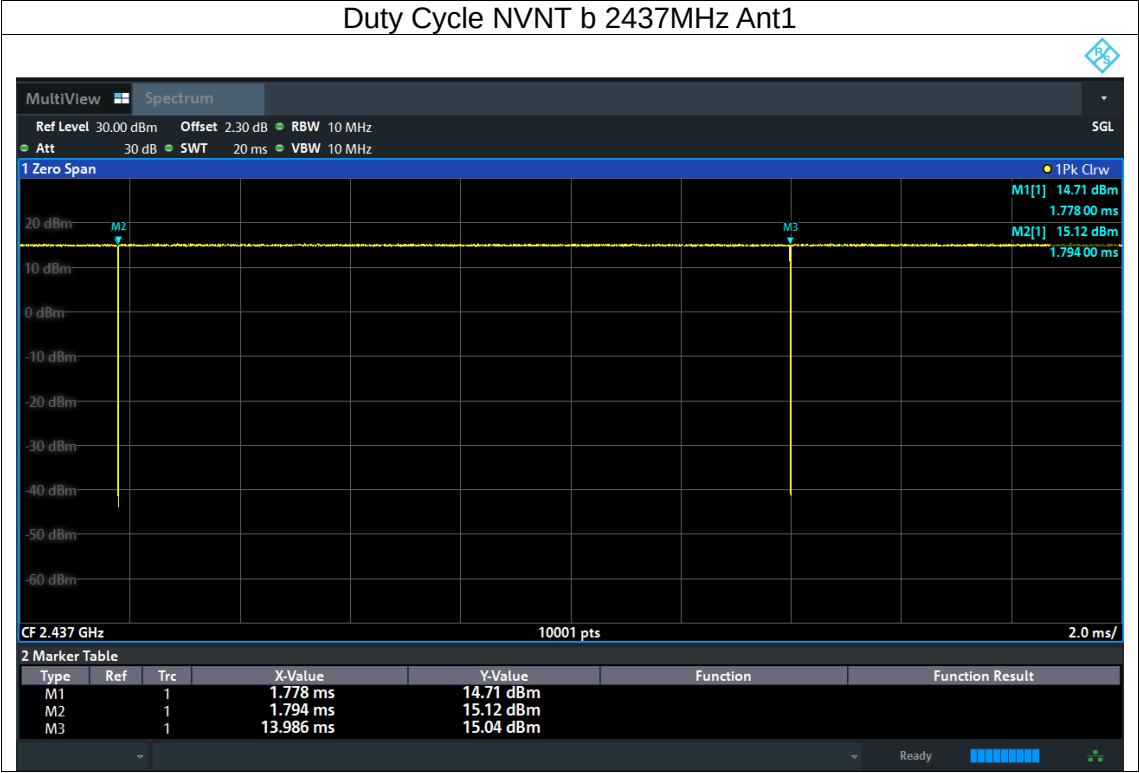
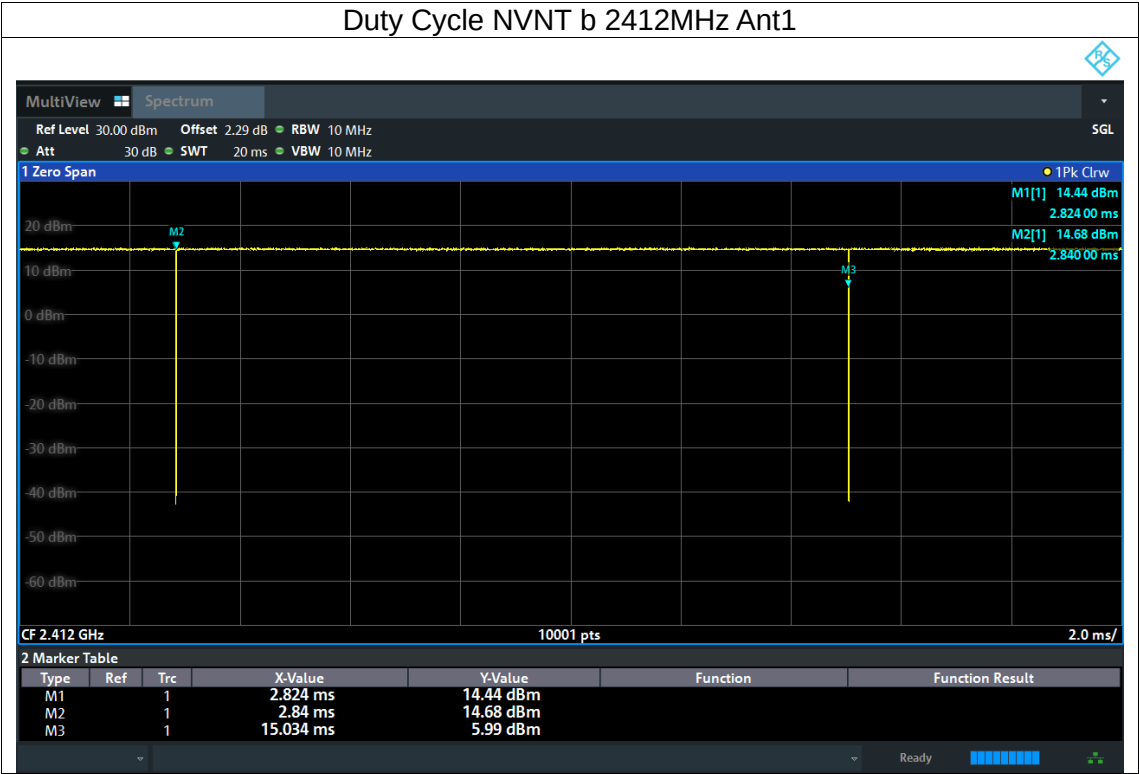
5.7.3 Test Setup

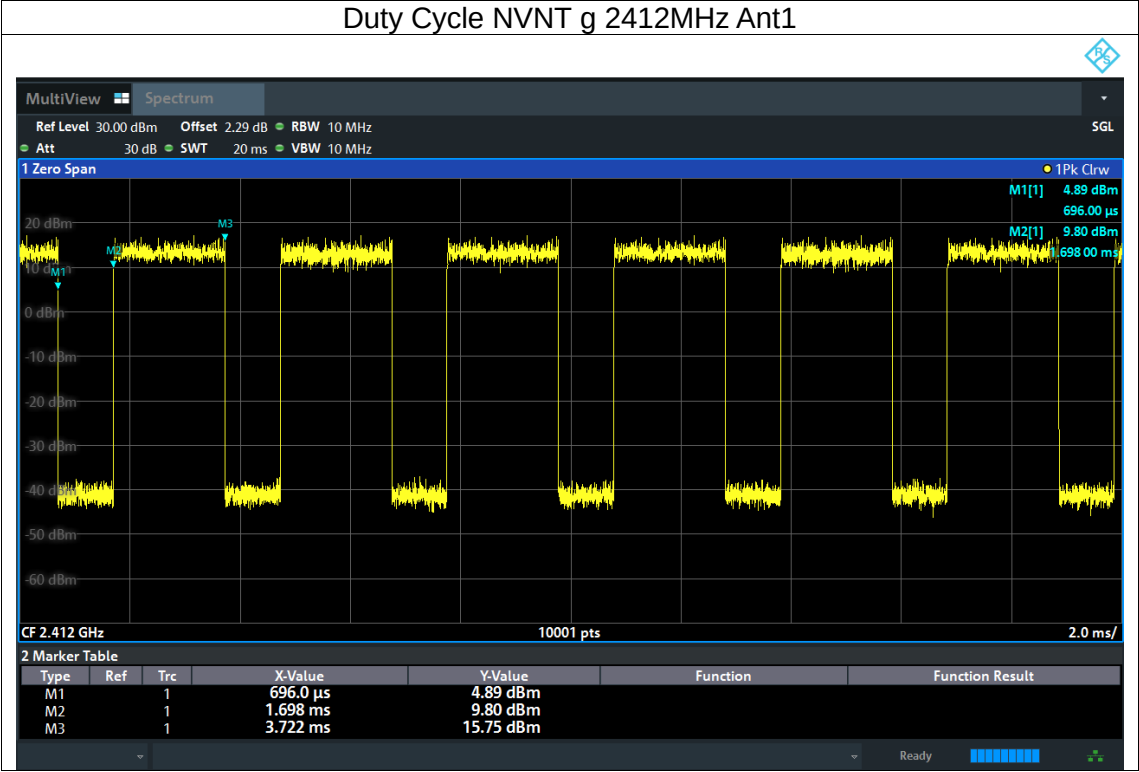
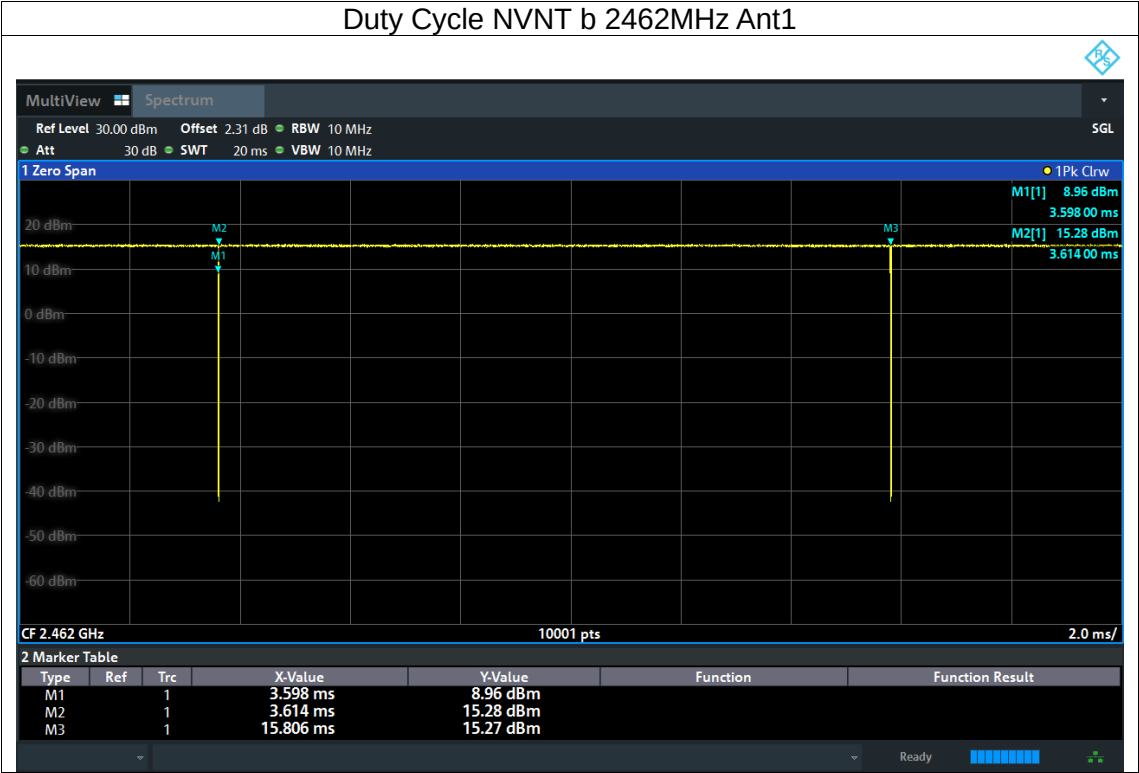


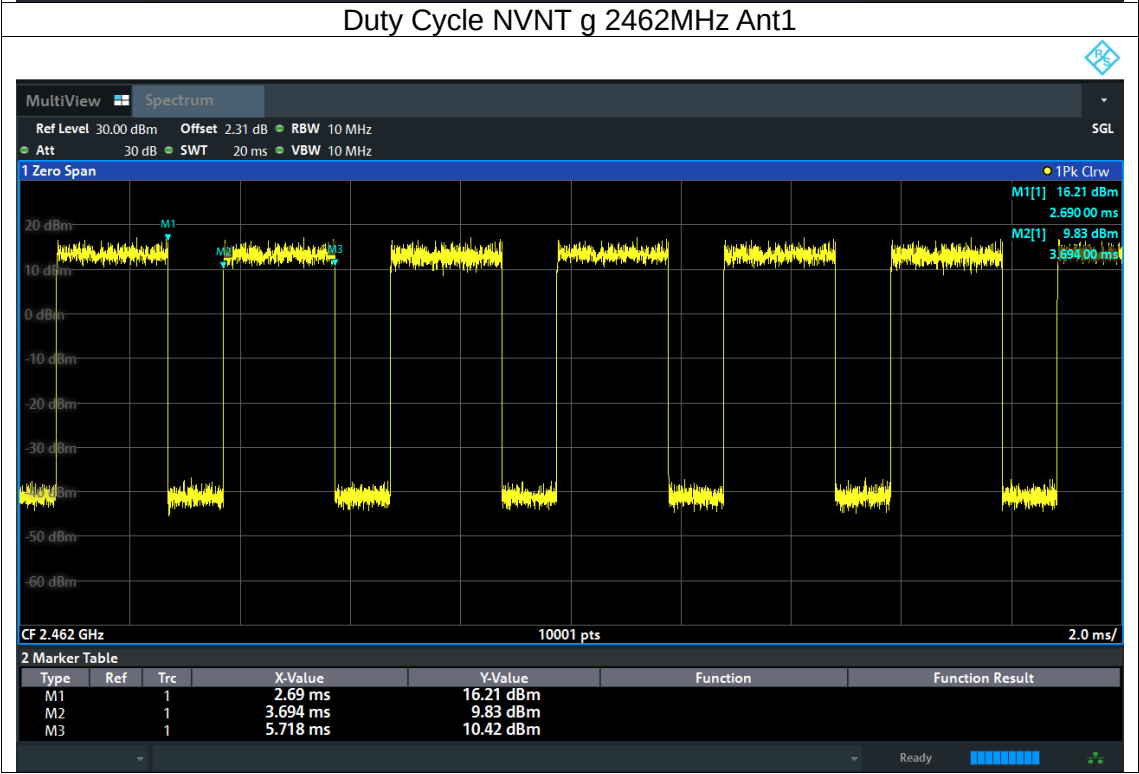
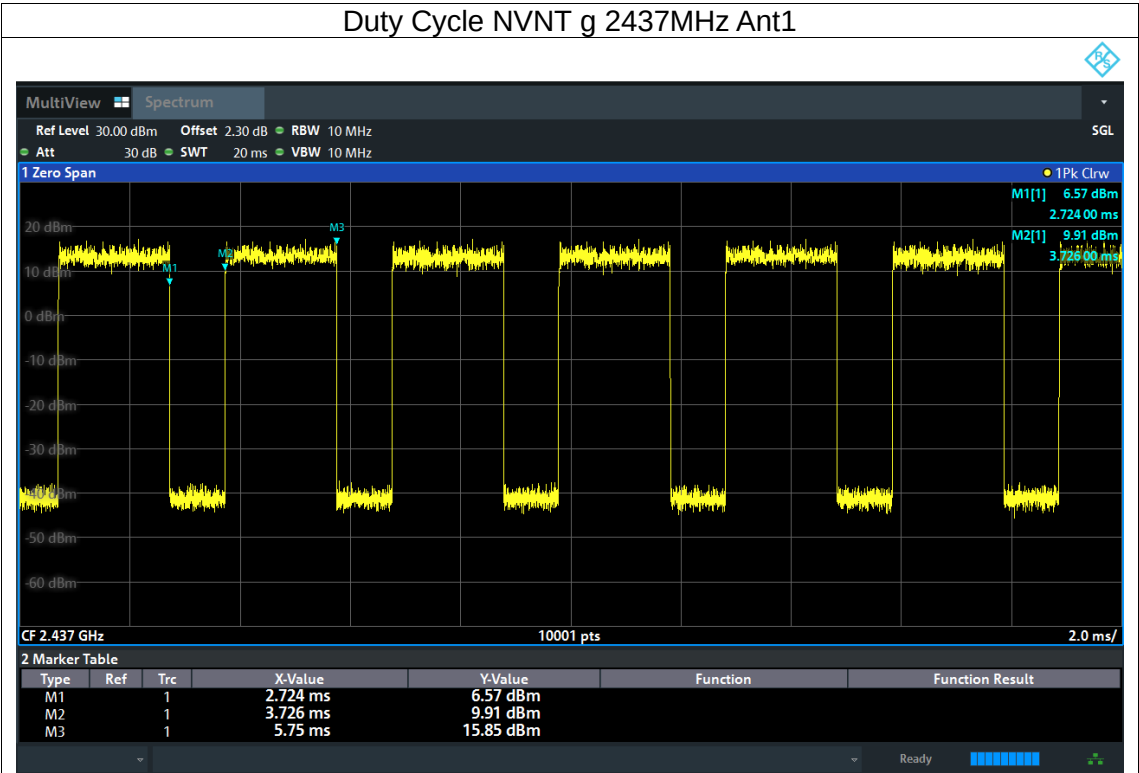
5.7.4 Test Results

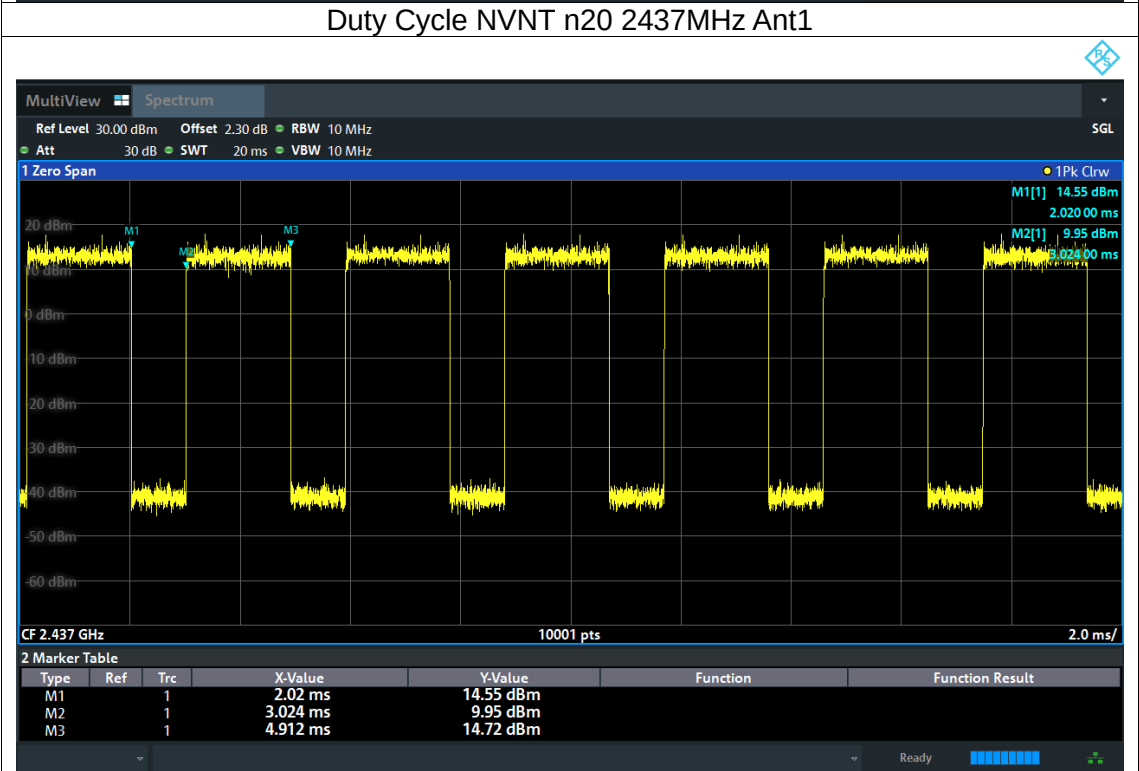
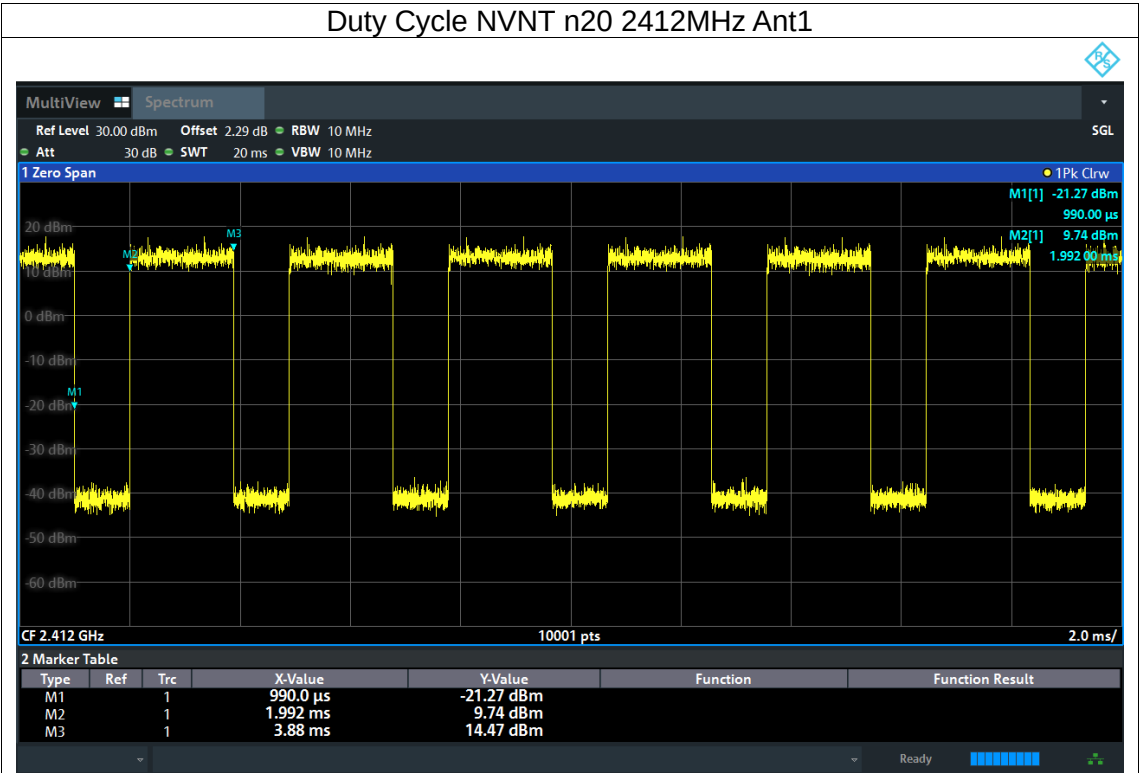
EUT:	Aftermarket Automotive Type-C HUD (Head-Up Display) - V Series	Model Name:	EW-HUDV5-Ultra
Pressure:	1012 hPa	Test Voltage:	DC 12V from battery
Test Mode:	TX b/g/n(20/40) Mode / CH06		

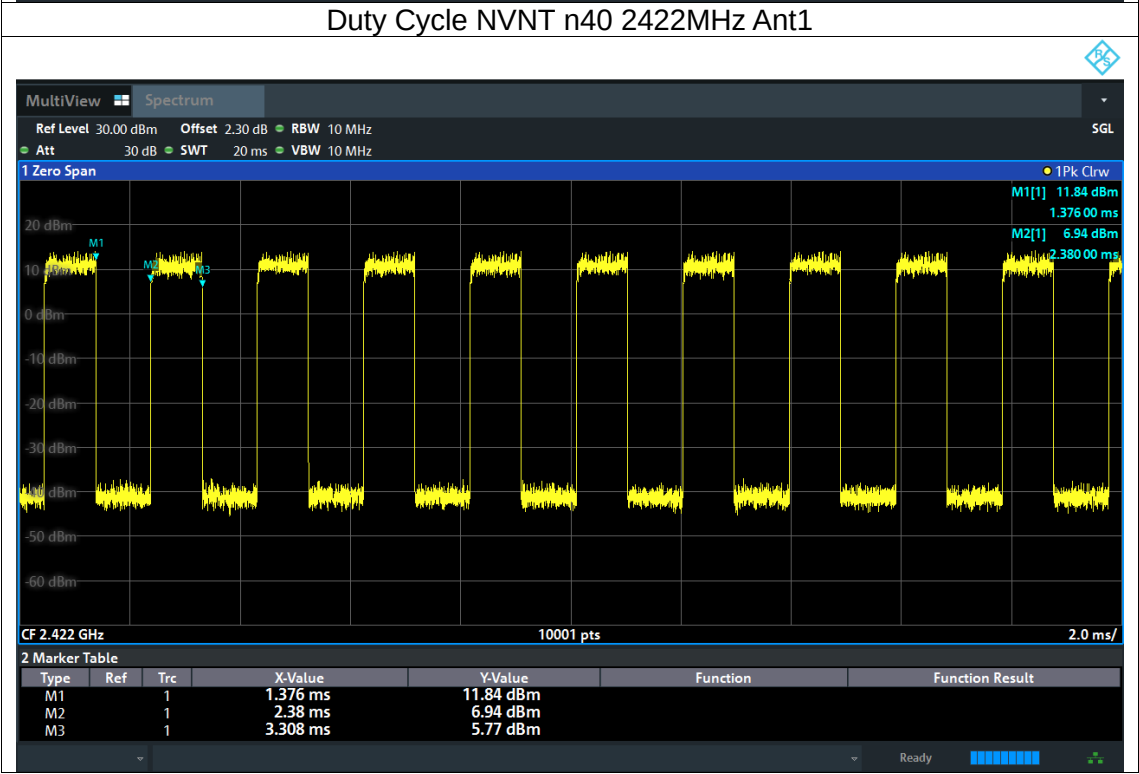
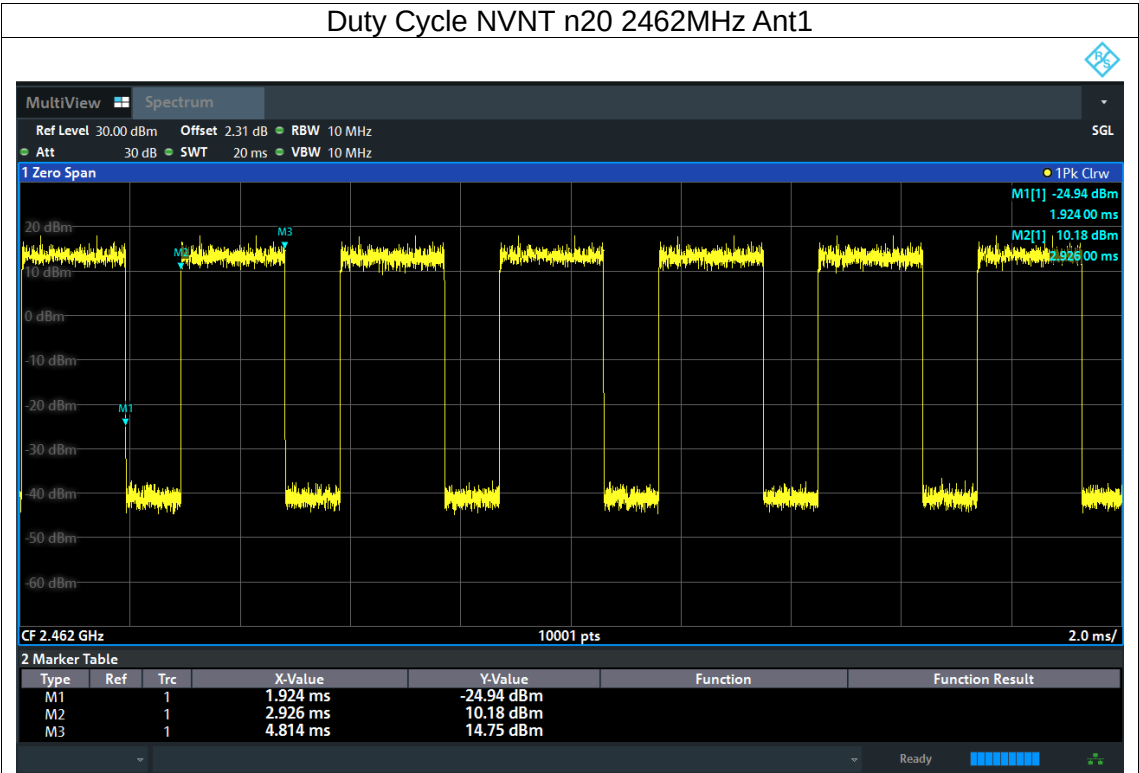
Mode	Frequency (MHz)	Antenna	Duty Cycle (%)	Correction Factor (dB)	1/T (kHz)
b	2412	Ant1	99.87	0	0.08
b	2437	Ant1	99.87	0	0.08
b	2462	Ant1	99.87	0	0.08
g	2412	Ant1	66.89	1.75	0.49
g	2437	Ant1	66.89	1.75	0.49
g	2462	Ant1	66.84	1.75	0.49
n20	2412	Ant1	65.33	1.85	0.53
n20	2437	Ant1	65.28	1.85	0.53
n20	2462	Ant1	65.33	1.85	0.53
n40	2422	Ant1	48.03	3.18	1.08
n40	2437	Ant1	48.03	3.18	1.08
n40	2452	Ant1	48.08	3.18	1.08

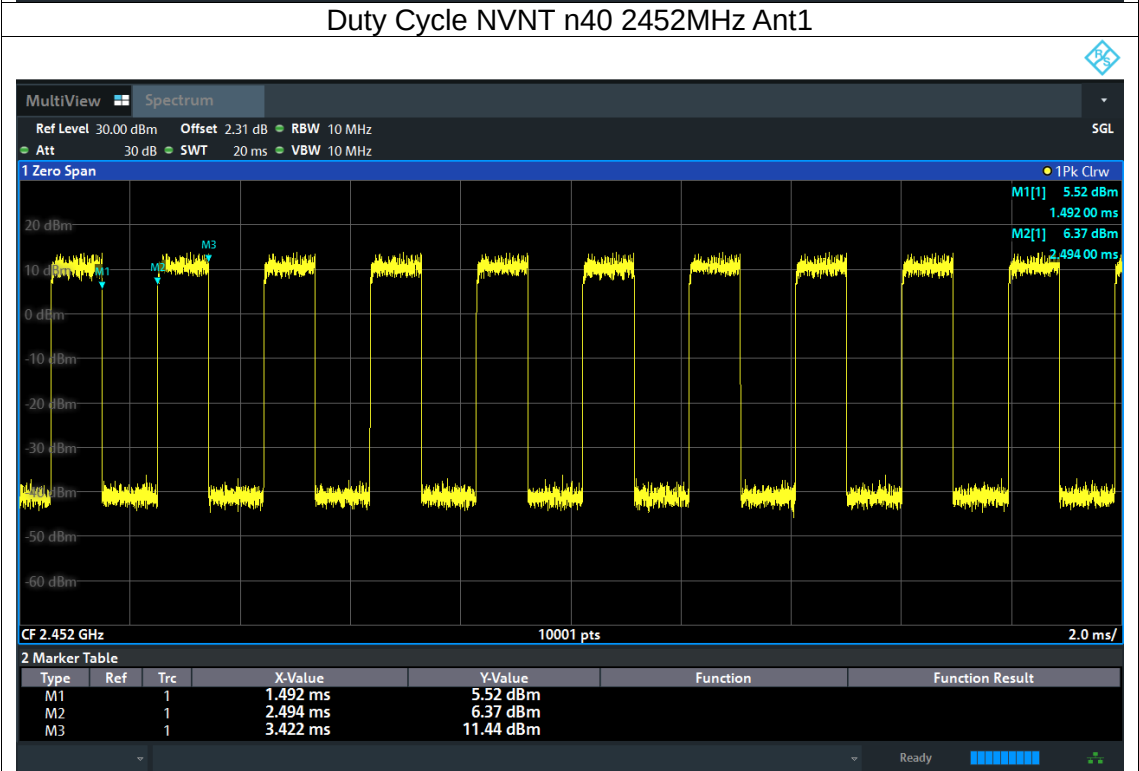
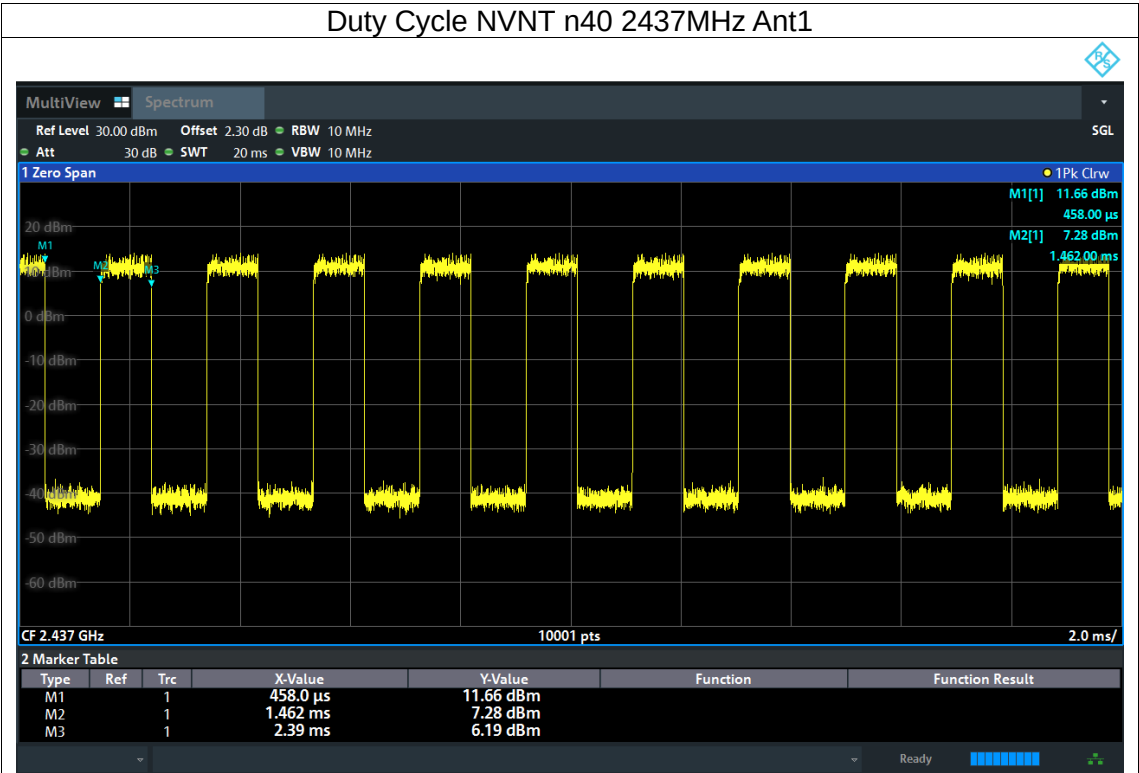












5.8 Conducted Band Edge

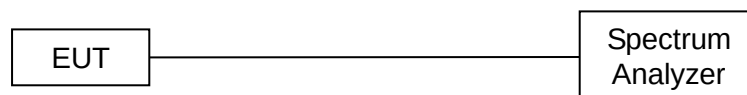
5.8.1 Limit

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

5.8.2 Test Procedure

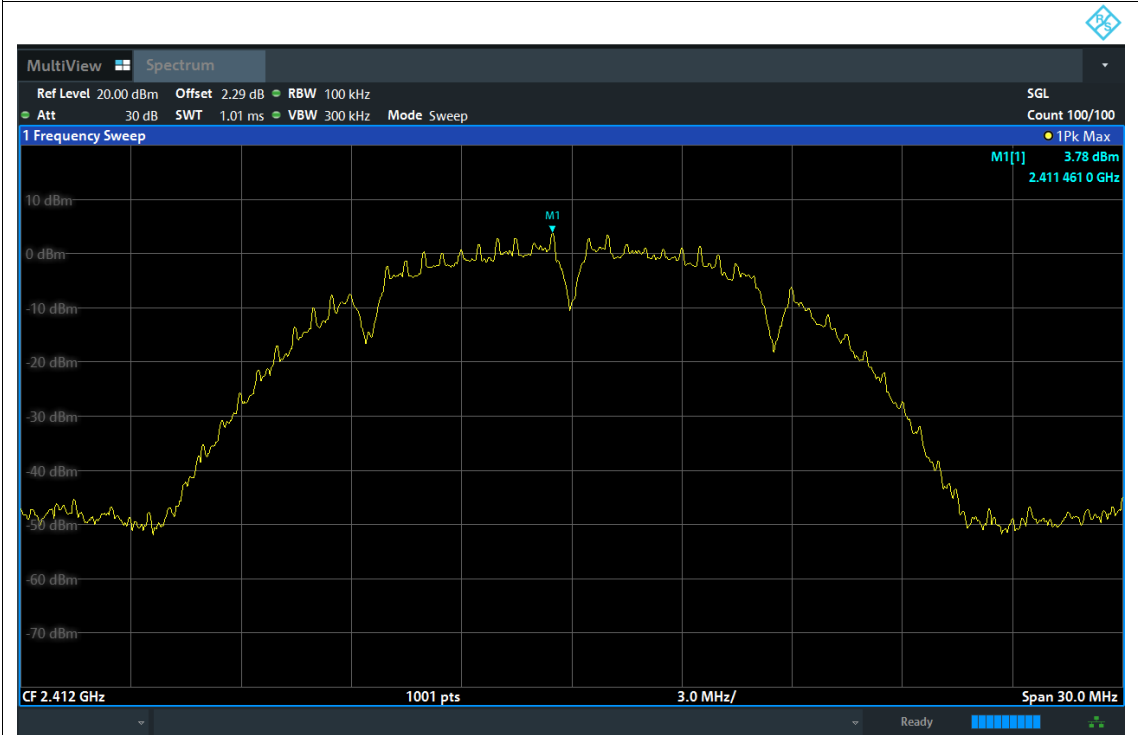
- a) Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
- b) Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
- c) Set RBW to 100 kHz and VBW of spectrum analyzer to 300 kHz with a convenient frequency span including 100 kHz bandwidth from band edge.
- d) Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
- e) Repeat above procedures until all measured frequencies were complete.

5.8.3 Test Setup

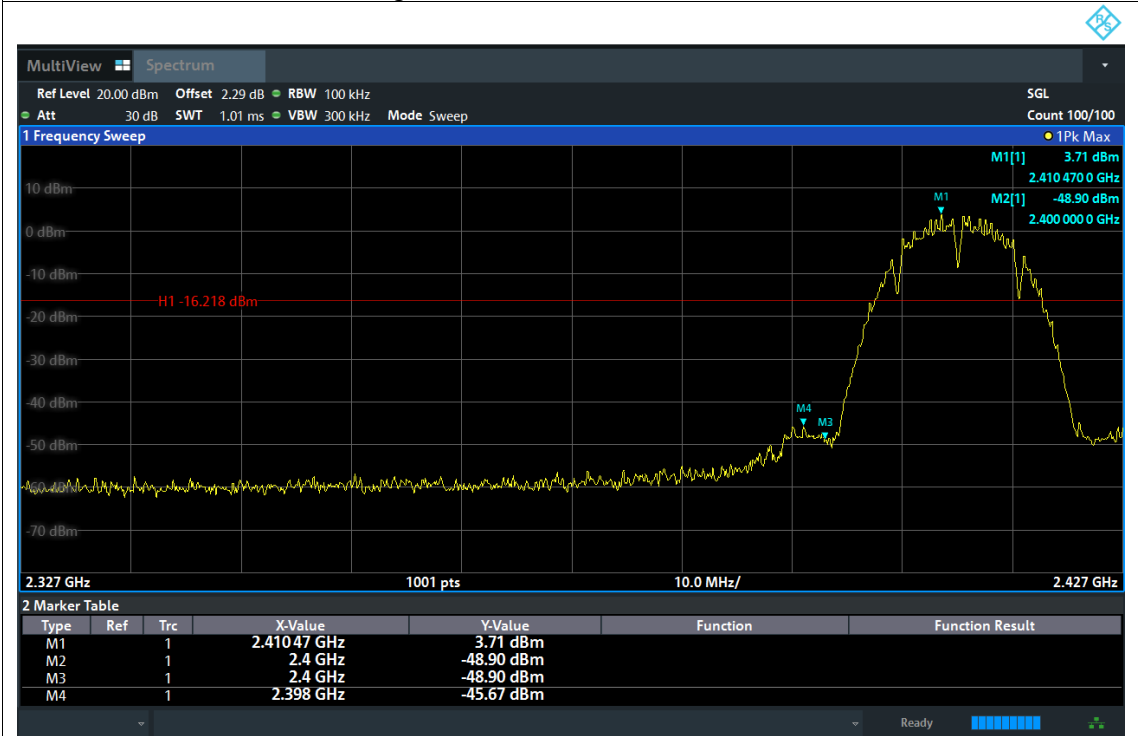


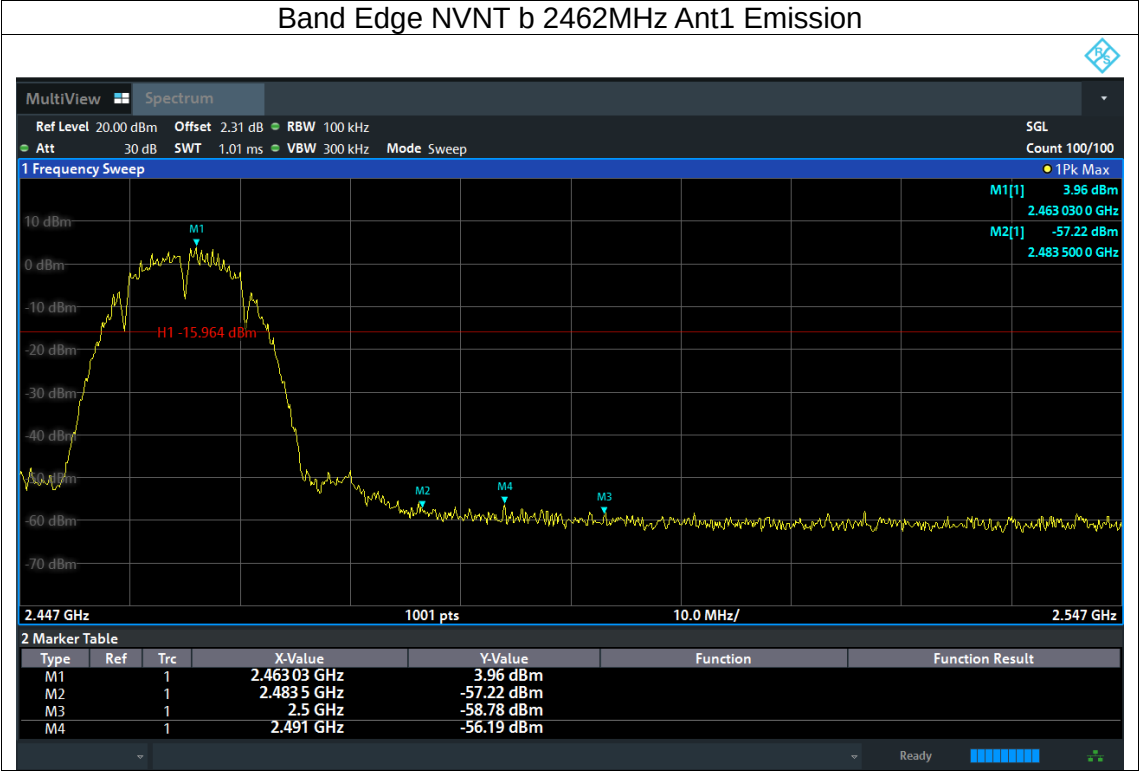
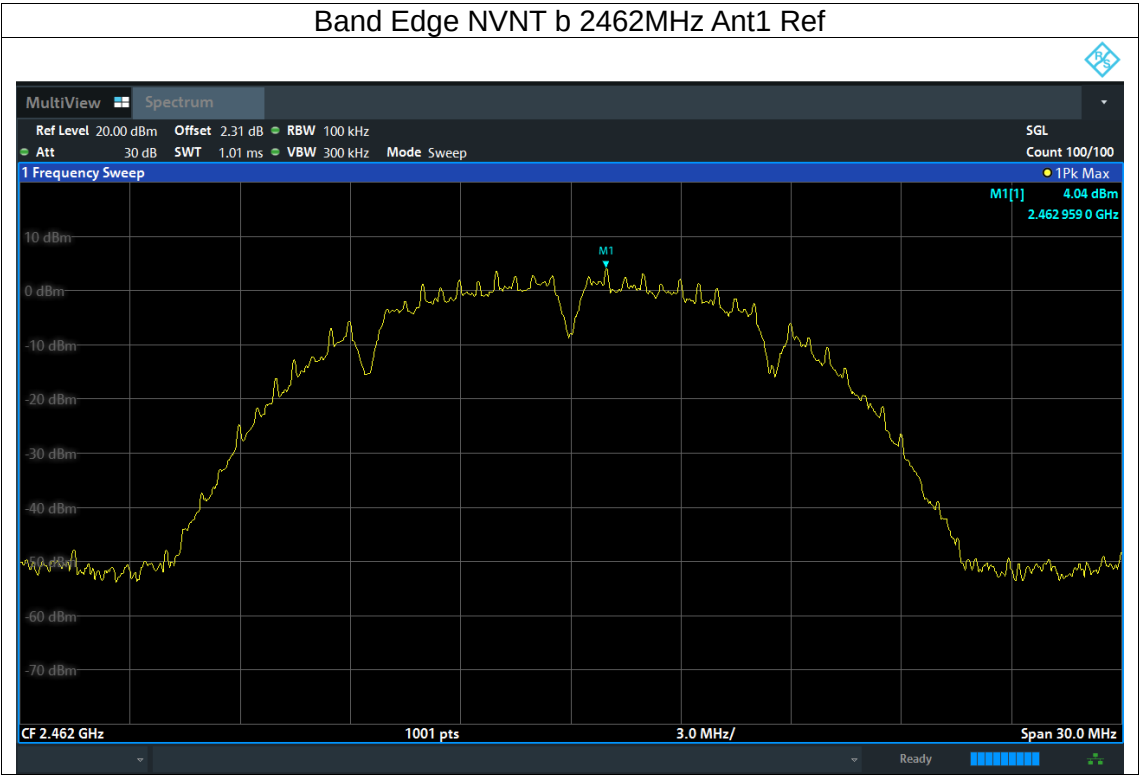
5.8.4 Test Results

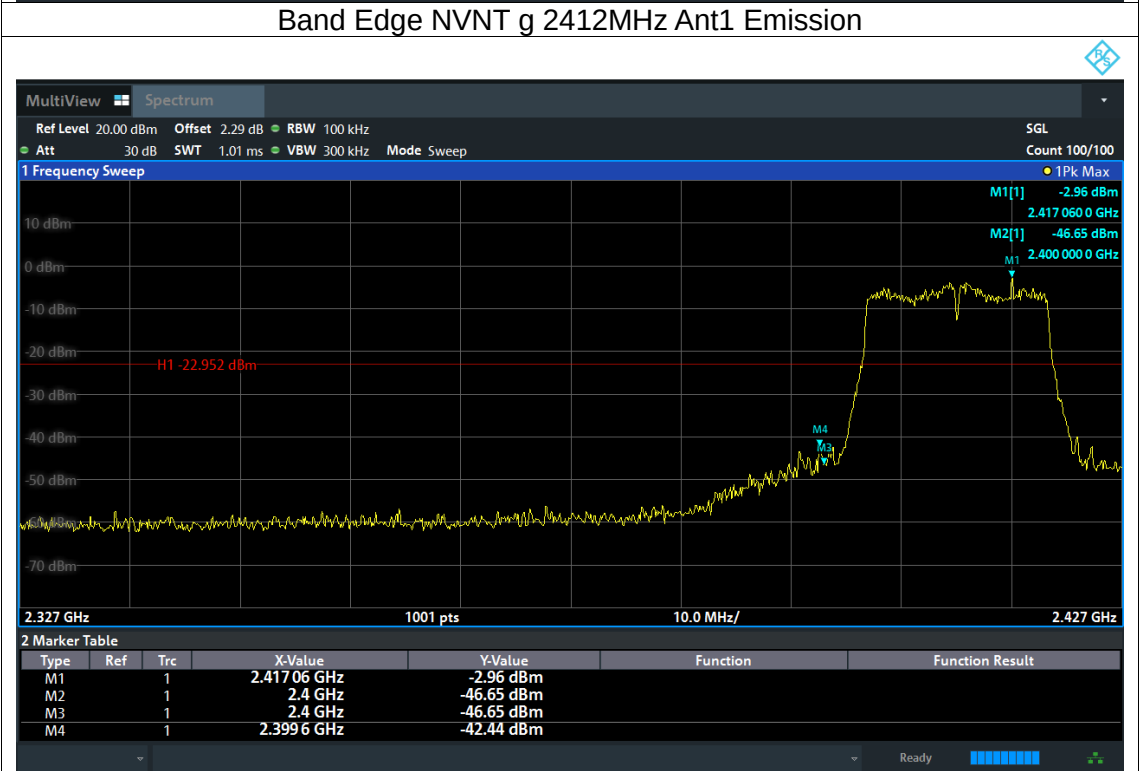
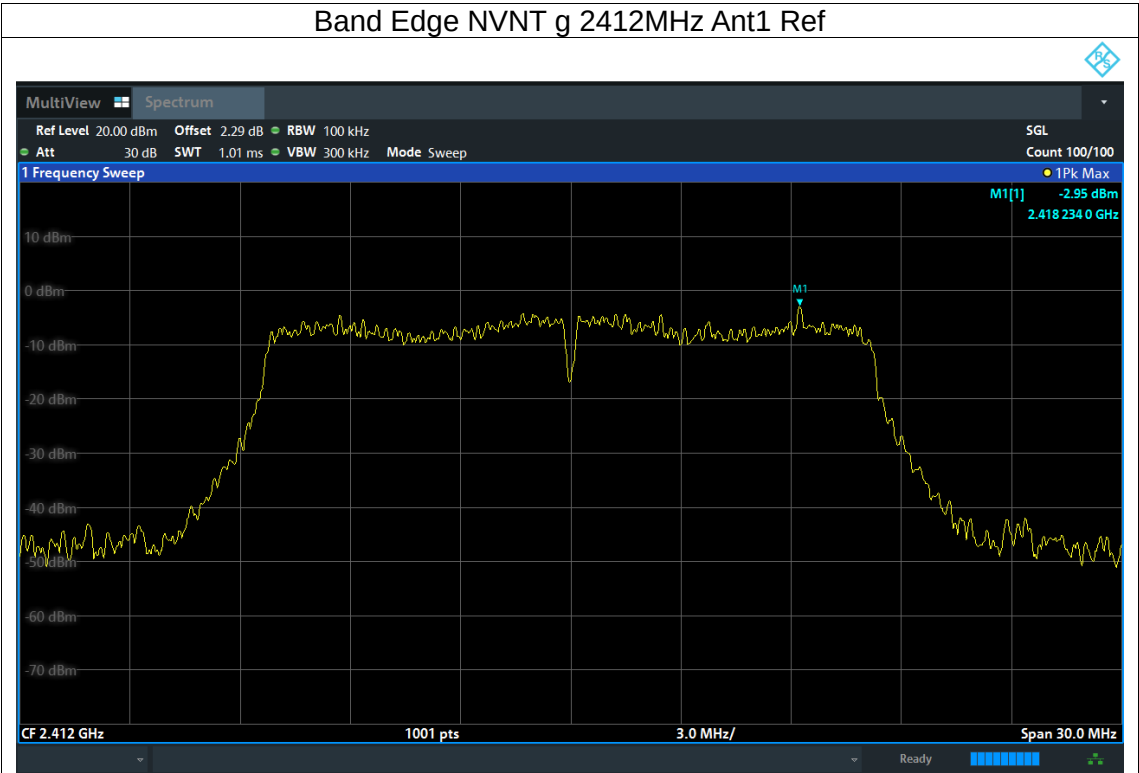
Band Edge NVNT b 2412MHz Ant1 Ref

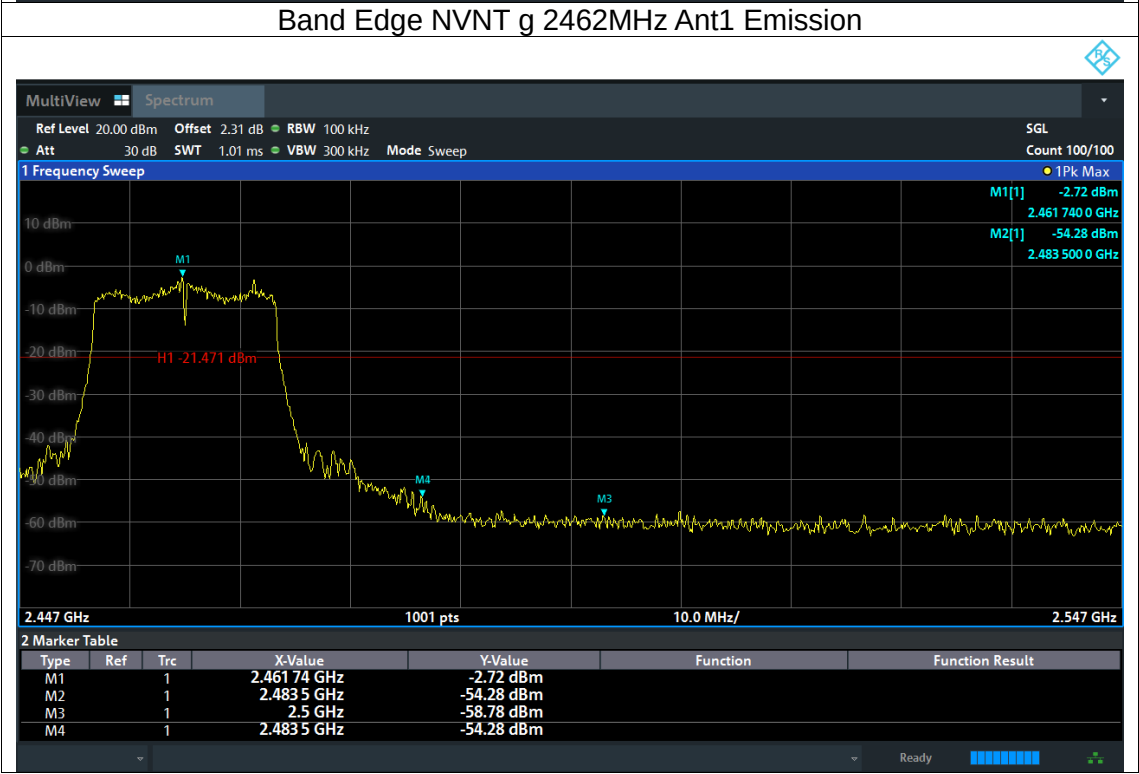
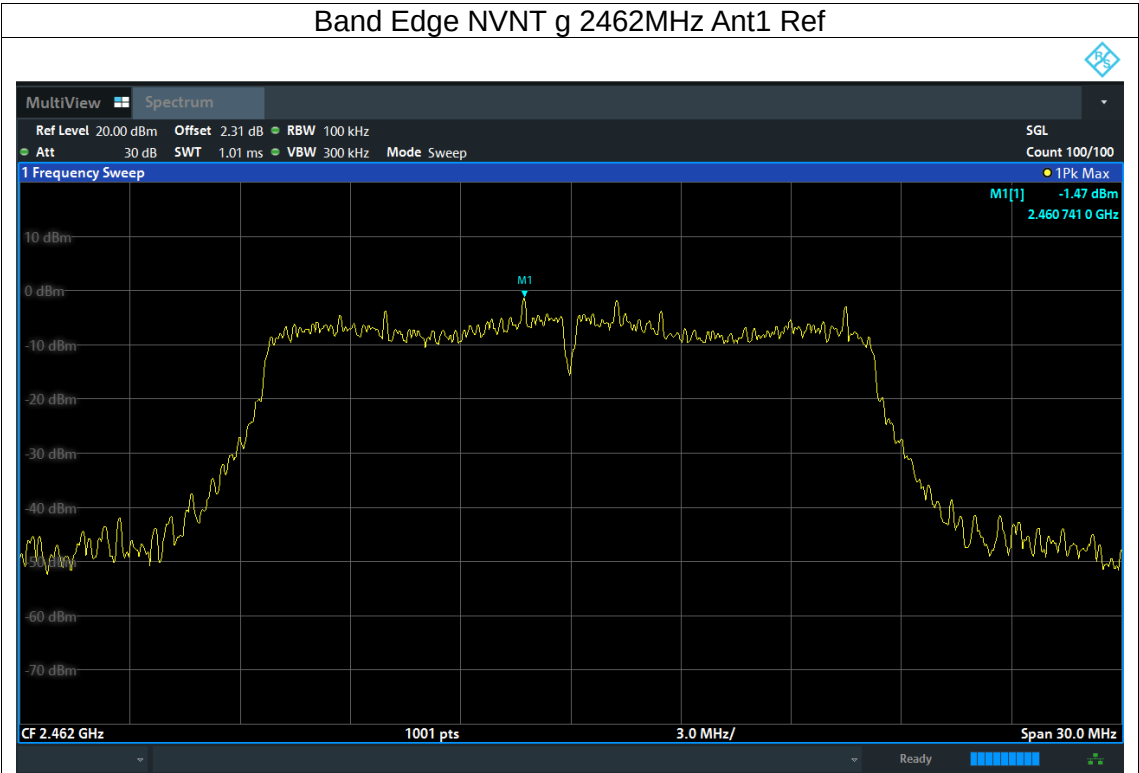


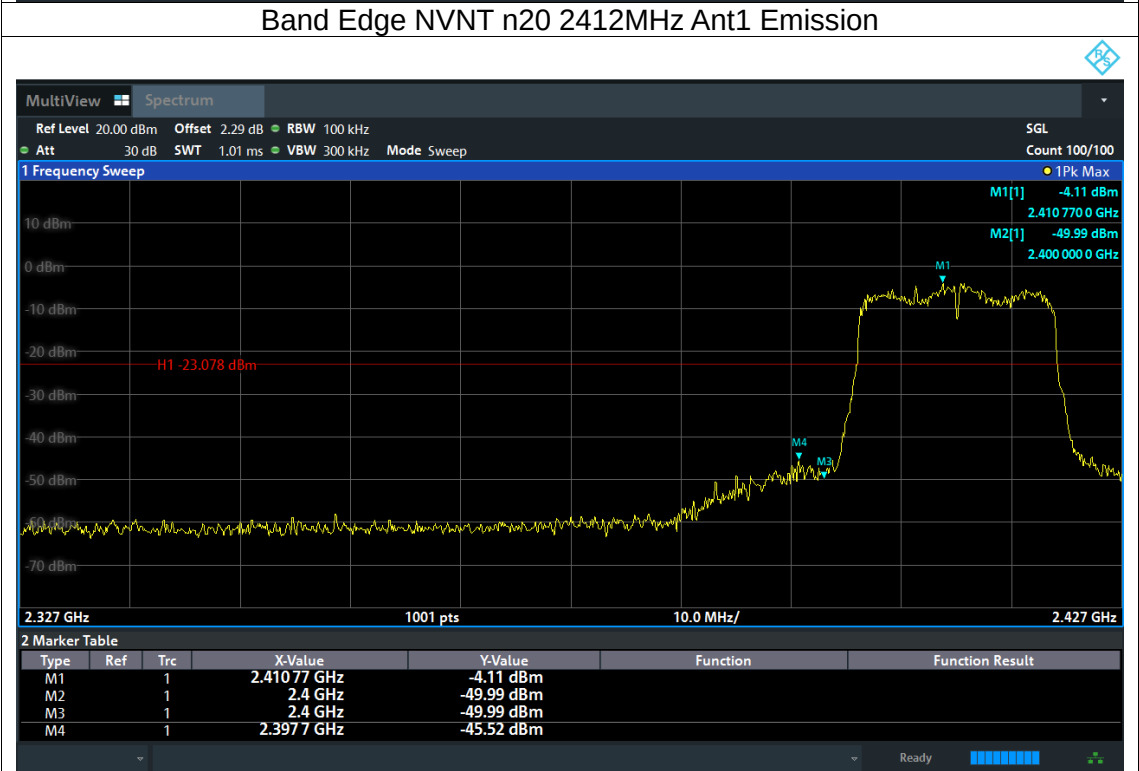
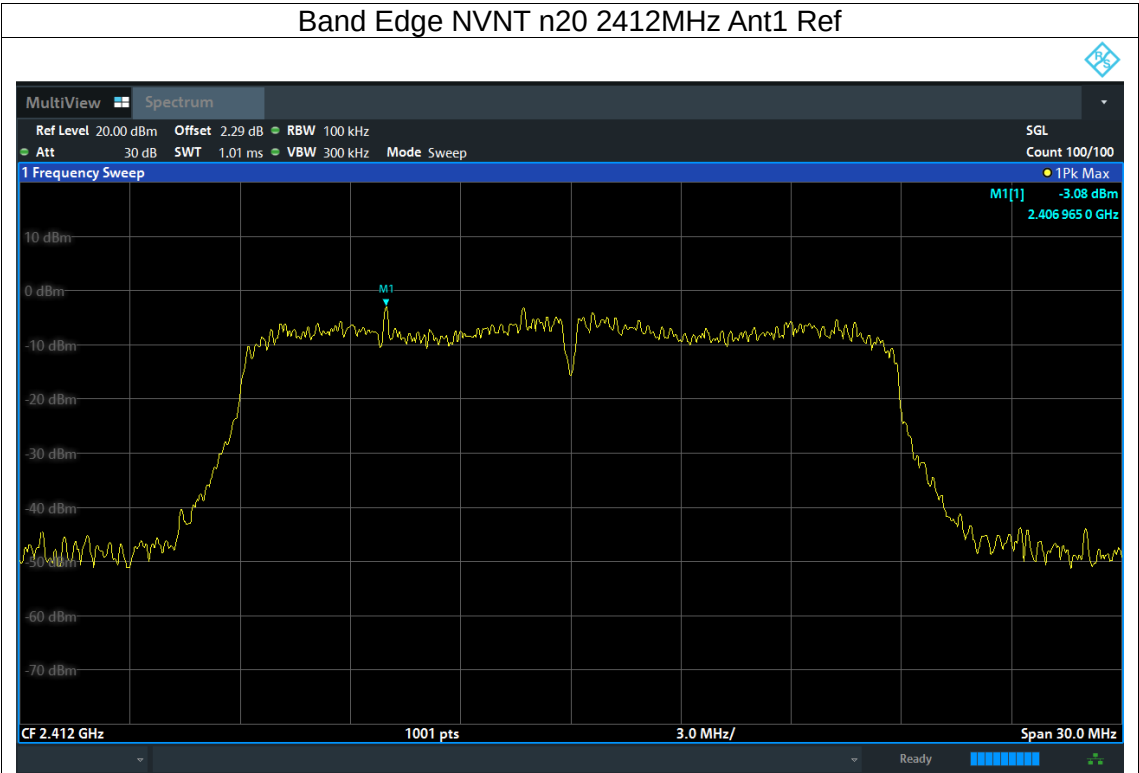
Band Edge NVNT b 2412MHz Ant1 Emission

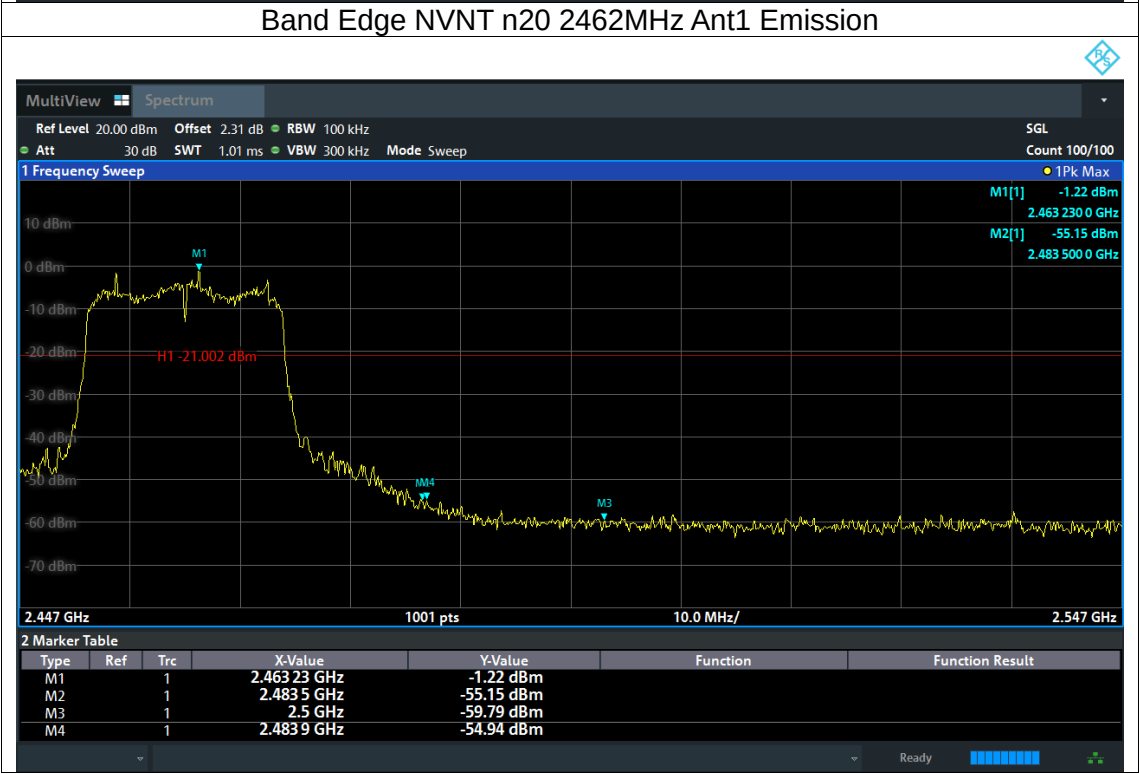
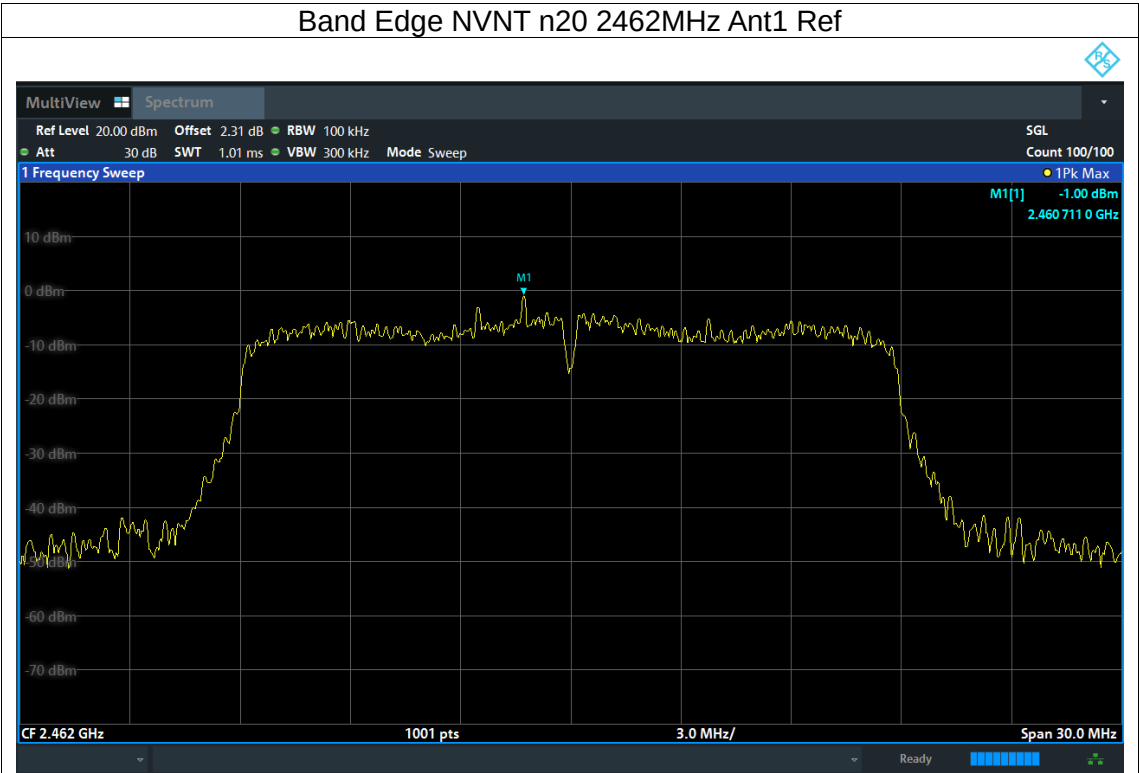


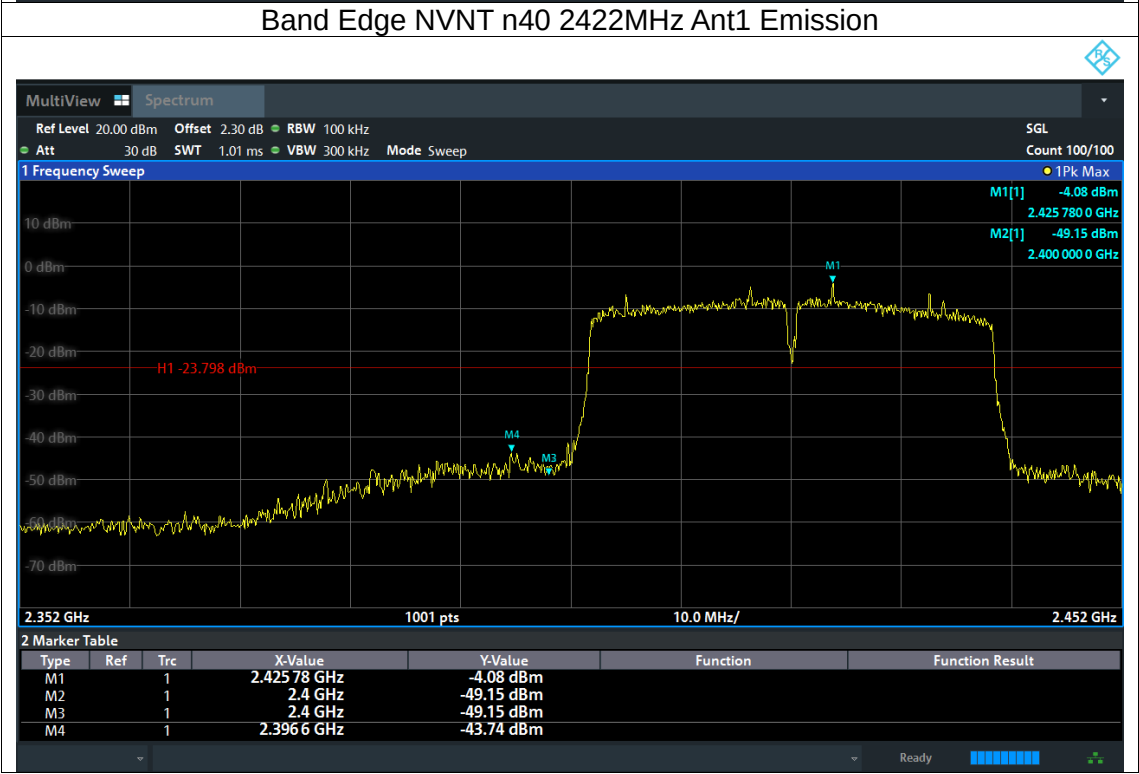
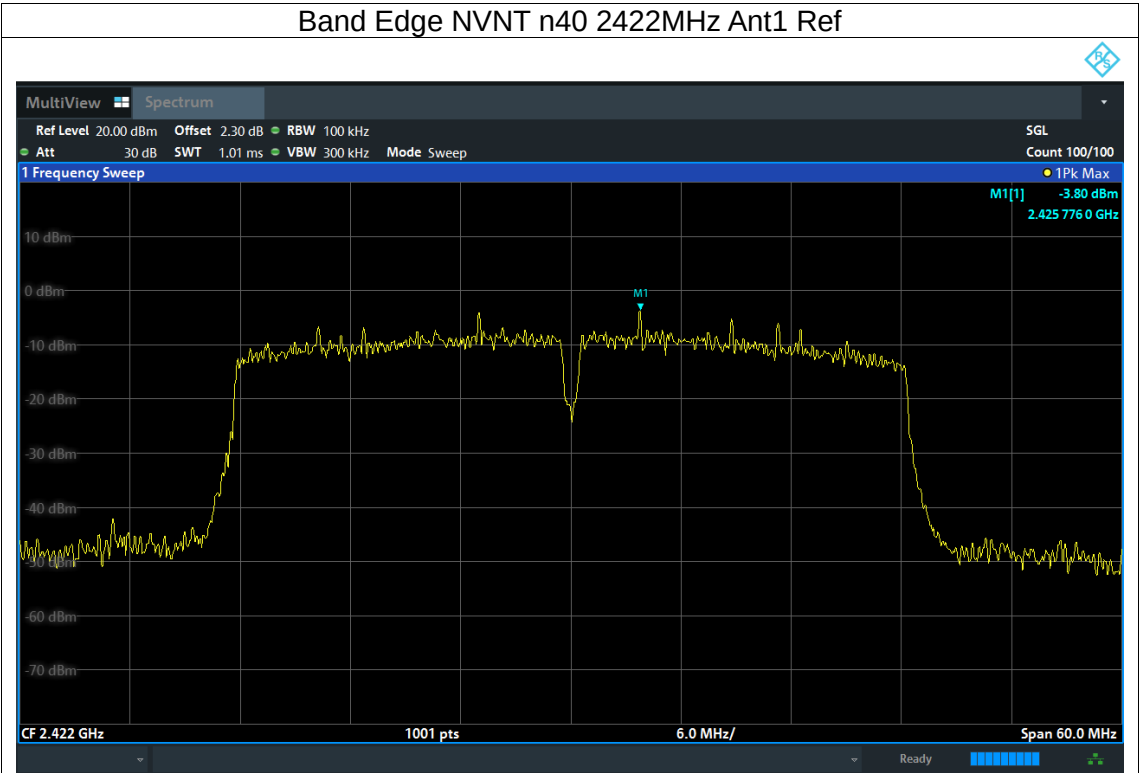


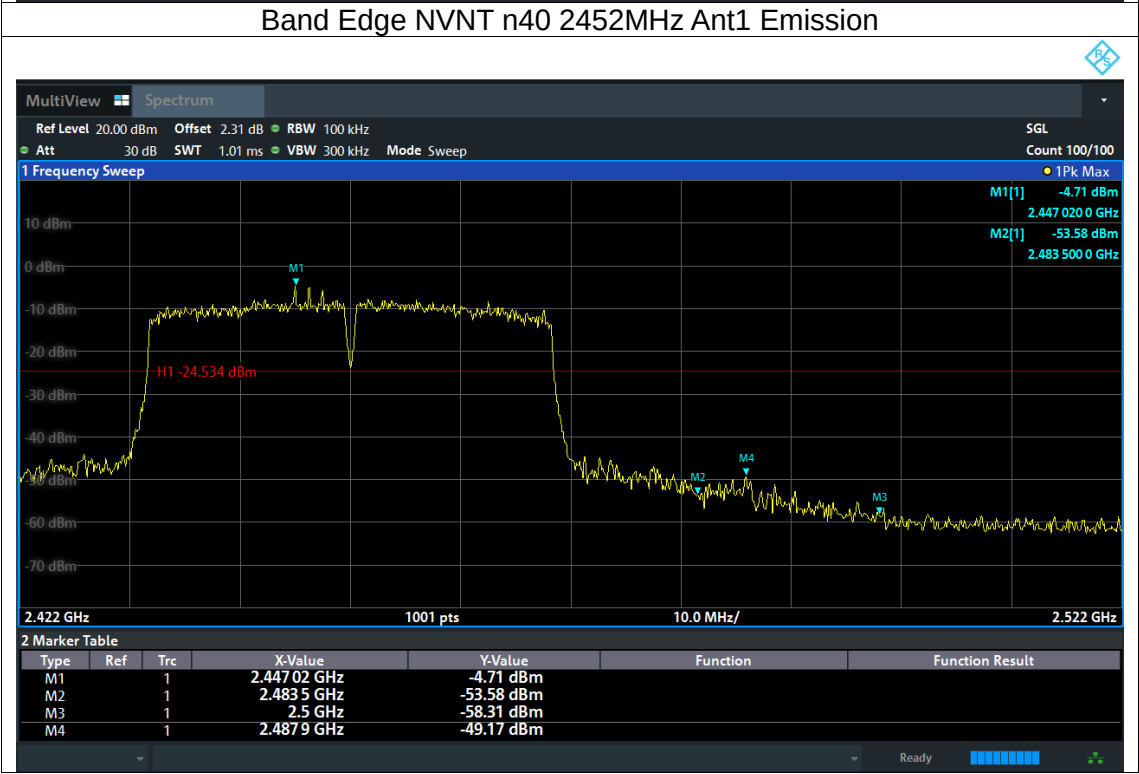
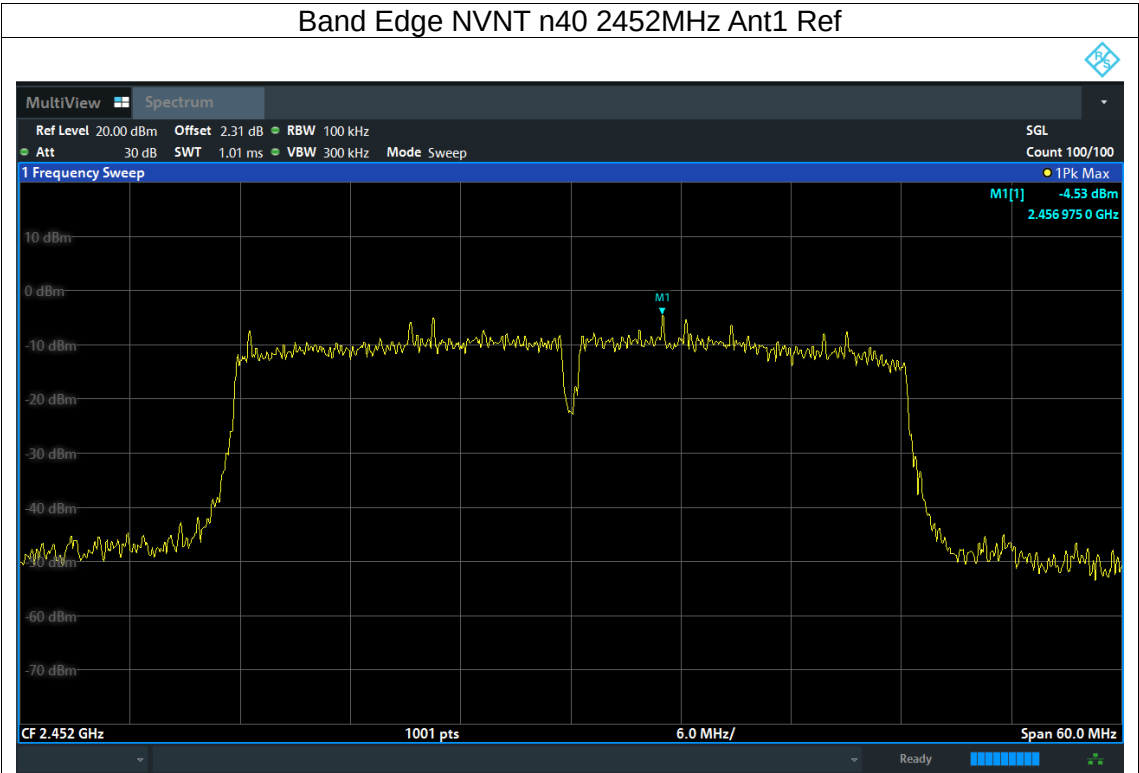












5.9 Spurious RF Conducted Emissions

5.9.1 Limit

Below -20dB of the highest emission level in operating band.

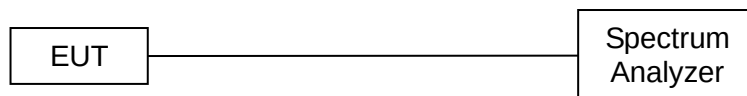
5.9.2 Measuring Instruments

The Measuring equipment is listed in the section 4 of this test report.

5.9.3 Test Procedure

The Spurious RF conducted emissions compliance of RF radiated emission should be measured by following the guidance in ANSI C63.10-2020+Cor.1-2023+C63.10a-2024 + Errata to C63.10a-2024 with respect to maximizing the emission by rotating the EUT, measuring the emission while the EUT is situated in three orthogonal planes (if appropriate), adjusting the measurement antenna height and polarization etc. Set RBW=100kHz and VBW= 300kHz to measure the peak field strength, and measure frequency range from 9kHz to 26.5GHz.

5.9.4 Test Setup



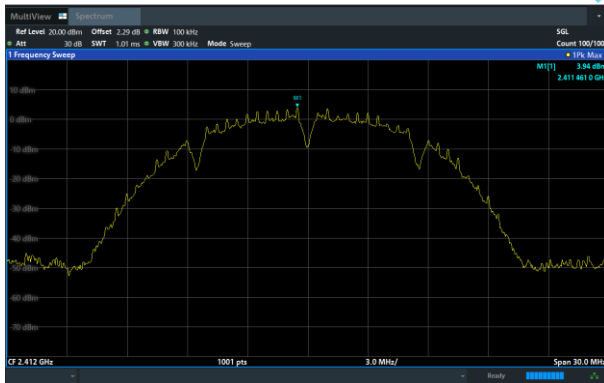
5.9.5 Test Results

Note:

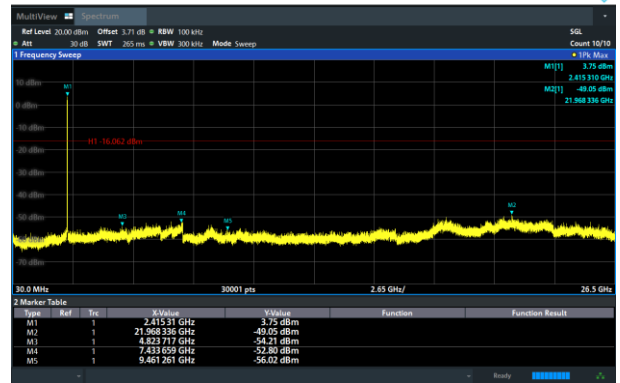
1: The measurement frequency range is from 9kHz to the 10th harmonic of the fundamental frequency; The lowest, middle and highest channels are tested to verify the spurious emissions and band edge measurement data.

2: All modes have been tested, and only the worst mode 802.11b in the report.

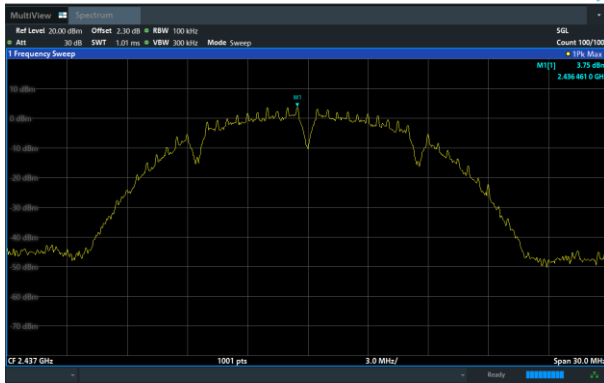
802.11b on Channel 01



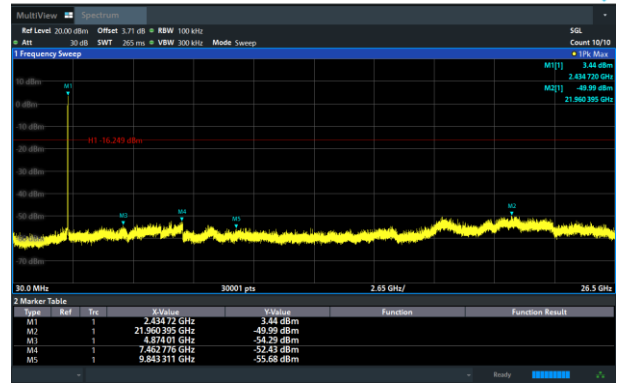
802.11b on Channel 01



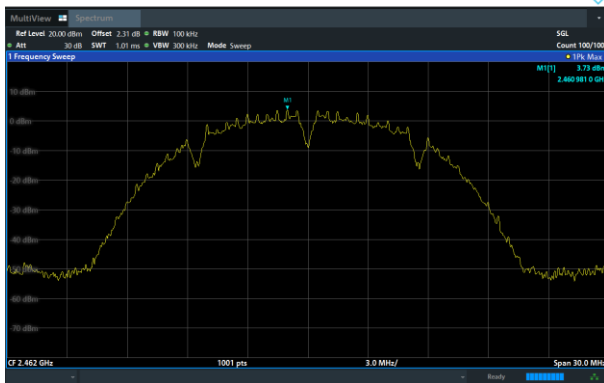
802.11b on Channel 06



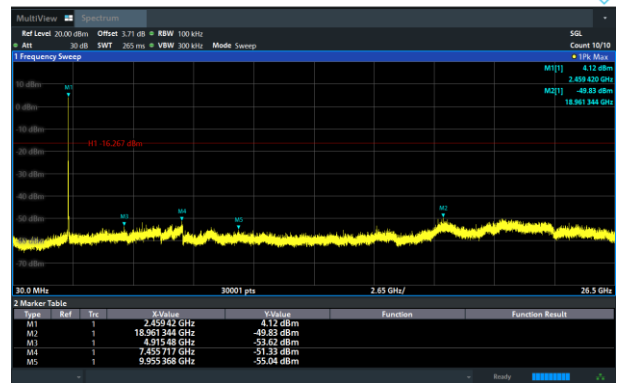
802.11b on Channel 06



802.11b on Channel 11



802.11b on Channel 11



6 Photographs of the Test Setup

Radiated Emission Below 1GHz



Radiated Emission Above 1GHz



7 Photographs of the EUT

Please refer to report HB20260519008E-01 for product photos.

******* END OF REPORT *******