Test Report

Product: Wireless carplay adapter

Trade Mark: N/A

Model Number: TY-001

FCC ID: 2BN85-TY001

Prepared for

Dongguan phonemate Electronics co., LTD

Room 601, No.13, Administrative Inner Ring Road, Humen Town, Dongguan City, Guangdong Province

Prepared by

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TEST RESULT CERTIFICATION

Applicant's Name..... :	Dongguan phonemate Electronics co., LTD
Address ..... :	Room 601, No.13, Administrative Inner Ring Road, Humen Town, Dongguan City, Guangdong Province
Manufacturer's Name ..... :	Dongguan phonemate Electronics co., LTD
Address ..... :	Room 601, No.13, Administrative Inner Ring Road, Humen Town, Dongguan City, Guangdong Province

Product description

Product name ..... :	Wireless carplay adapter
Model Number ..... :	TY-001
Standards ..... :	FCC Part 15.247
Test procedure..... :	IEEE/ANSI C63.10-2020 KDB558074 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..... :	Mar. 13, 2025~ Mar. 24, 2025
Test Result..... :	**Pass**

Testing Engineer : Zoe Su

(Zoe Su)

Technical Manager : Gary Lu

(Gary lu)

Authorized Signatory : Leo Su

(Leo Su)

Revision History

Revised No.	Date of Issue	Description
01	Mar. 25, 2025	Original

1 General Description

1.1 Description of EUT

Product name:	Wireless carplay adapter
Model name:	TY-001
Series Model:	TY-002, TY-003, TY-004, TY-005, TY-006, TY-007, TY-008, KY-4139, KY-4141, KY-4143, KY-4145, KY-4151, KY-4161, KY-4163
Different of series model:	Except for the model, appearance color, appearance shape, appearance materials, electronic accessories, all models have the same circuits and modules.
Operation frequency:	2402-2480MHz
Modulation type:	GFSK, π/4-DQPSK, 8DPSK
Bit Rate of transmitter:	1Mbps, 2Mbps, 3Mbps
Antenna type:	PCB Antenna
Antenna gain:	-12.46dBi
Max. output power:	7.23dBm
Hardware version:	V0.3
Software version:	202407041001C
Battery:	N/A
Power supply:	DC 5V from Adapter AC 120V/60Hz
Adapter information:	N/A

Note: The circuit and electronic structure of all models listed in the report have not changed, and differences between all models have been tested. The final report only reflects the test data of the TY-001 main model in the worst-case scenario.

1.2 Test Mode

Test Mode	Channel	Frequency (MHz)
1	00	2402
2	39	2441
3	78	2480

1.3 Operation Channel List

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
00	2402	27	2429	54	2456

01	2403	28	2430	55	2457
02	2404	29	2431	56	2458
03	2405	30	2432	57	2459
04	2406	31	2433	58	2460
05	2407	32	2434	59	2461
06	2408	33	2435	60	2462
07	2409	34	2436	61	2463
08	2410	35	2437	62	2464
09	2411	36	2438	63	2465
10	2412	37	2439	64	2466
11	2413	38	2440	65	2467
12	2414	39	2441	66	2468
13	2415	40	2442	67	2469
14	2416	41	2443	68	2470
15	2417	42	2444	69	2471
16	2418	43	2445	70	2472
17	2419	44	2446	71	2473
18	2420	45	2447	72	2474
19	2421	46	2448	73	2475
20	2422	47	2449	74	2476
21	2423	48	2450	75	2477
22	2424	49	2451	76	2478
23	2425	50	2452	77	2479
24	2426	51	2453	78	2480
25	2427	52	2454	--	--
26	2428	53	2455	--	--

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 and Power Controlling Software provided by the customer was used to control theoperating channel as well as the output power level. The RF output power selection is for the setting of RFoutput power expected by the customer and is going to be fixed on the firmware of the final end product.Transmitting duty cycle is no less 98%.
The software is PUSH and CMD tool Use together.

Test software Version		PUSH and CMD	
Frequency	2402 MHz	2441 MHz	2480 MHz
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
Adapter	CD289	35810	Ugreen Group Limited
Laptop	BDR-WDH	A3RQPM242 0004454	HONR

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

2 Summary of Test Result

No.	Standard Section	Test Item	Result	Remark
1	15.203	Antenna Requirement	Pass	
2	15.247	Conducted emission	Pass	
3	15.247(d)	Band edge	Pass	
4	15.205/15.209	Spurious emission	Pass	
5	15.247(b)(1)	Peak output power	Pass	
6	15.247(a)(1)	20dB occupied bandwidth	Pass	
7	15.247(a)(1)	Carrier Frequencies Separation	Pass	
8	15.247(a)(1)	Hopping channel number	Pass	
9	15.247(a)(1)	Dwell time	Pass	
10	15.247(d)	Spurious RF Conducted Emissions	Pass	

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
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:	15ºC~35ºC
Relative Humidity:	20%~75%
Air Pressure:	98kPa~101kPa

3.3 Measurement Uncertainty

The reported uncertainty of measurement y ± 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	$2x\ 10^{-5}$	
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	±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	2024-05-18	2026-05-17
2	HB-E002	Biconical log-periodic composite antenna	Schwarzbeck	VULB 9168	01340	2024-05-18	2026-05-17
3	HB-E003	SHF-EHF Horn	Schwarzbeck	BBHA 91270	01193	2024-05-18	2026-05-17
4	HB-E005	Preamplifier	Noyetec	LAN-0118	NYCM1420102	2024-05-17	2025-05-16
5	HB-E006	Preamplifier	Noyetec	LAN-1840	NYCM1420103	2024-05-17	2025-05-16
6	HB-E007	EMI TEST RECEIVER	R&S	ESR7	102520	2024-05-17	2025-05-16
7	HB-E009	POSITINAL COTROLLER	Noyetec	N/A	N/A	/	/
8	HB-E013	RF switch	Noyetec	NY-RF4	NY0CM1420204	/	/
9	HB-E066	Illuminance Tester	TASI	TA8121	N/A	2024-05-21	2025-05-20
10	HB-E075	Active loop antenna	Schwarzbeck	FMZB 1519B	1519B-245	2024-05-18	2026-05-17
11	HB-E076	Preamplifier	Hewlett Packard	8447D	1937A02278	2024-05-17	2025-05-16
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	2024-05-17	2025-05-16
2	HB-E015	Pulse Limiter	Schwarzbeck	VTSD 9561-F	00949	2024-05-17	2025-05-16
3	HB-E016	ZN23201	Noyetec	ZN23201	N/A	2024-05-21	2025-05-20
4	HB-E059	Attenuator	Xianghua	TS2-6-1	220215166	2024-05-17	2025-05-16
5	HB-E069	EMI TEST RECEIVER	R&S	ESCI	N/A	2024-05-17	2025-05-16

RF							
Item	Equipment No.	Equipment name	Manufacturer	Model	Serial No.	Calibration date	Due date
1	HB-E041	MXG Anaiog Signal Generator	Agilent	N5181A	MY47070421	2024-05-17	2025-05-16
2	HB-E042	WIDEBAND RADIO COMMUNICA	R&S	CMW500	132108	2024-05-17	2025-05-16

		TION TESTER					
3	HB-E043	MXG Anaiog Signal Generator	Agilent	N5182A	US46240335	2024-05-17	2025-05-16
4	HB-E044	Signal& spectrum Analyzer	R&S	FSV3044	101264	2024-05-17	2025-05-16
5	HB-E045	RF Control Box	Noyetec	NY100-R FCB	N/A	2024-08-19	2025-08-18
6	HB-E058	Thermometer Clock Humidity Monitor	N/A	HTC-1	N/A	2024-08-19	2025-08-18

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 PCB 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:
1. the tighter limit applies at the band edges.
2. 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

c) 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.

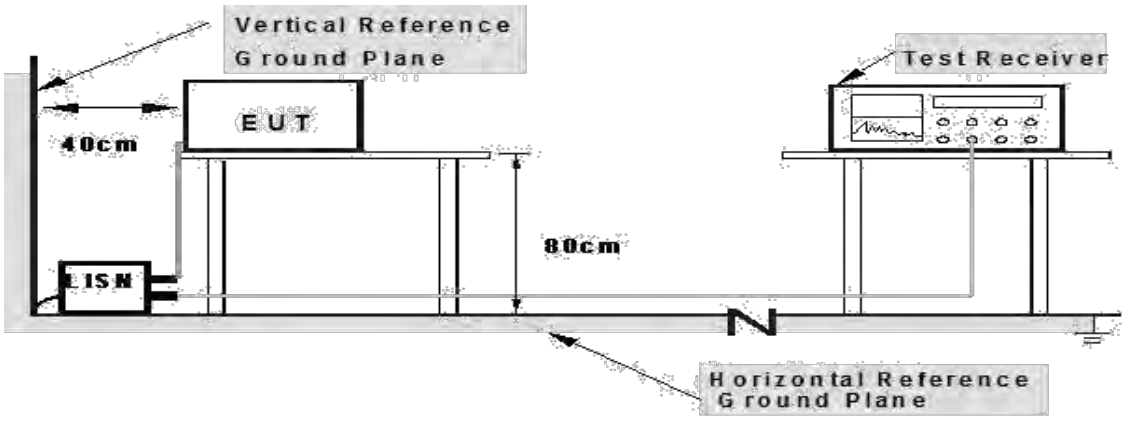
d) Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.

e) 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.

f) LISN is at least 80 cm from nearest part of EUT chassis.

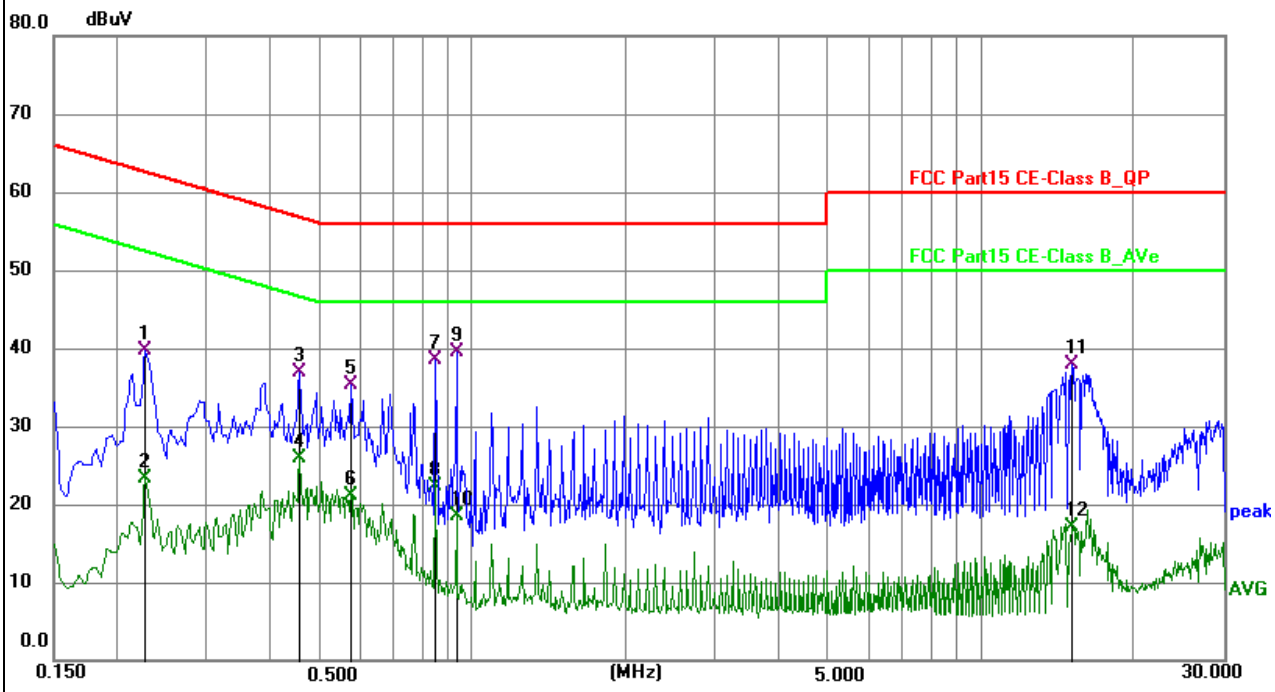
g) For the actual test configuration, please refer to the related Item – photographs of the test setup.

5.2.3 Test Setup



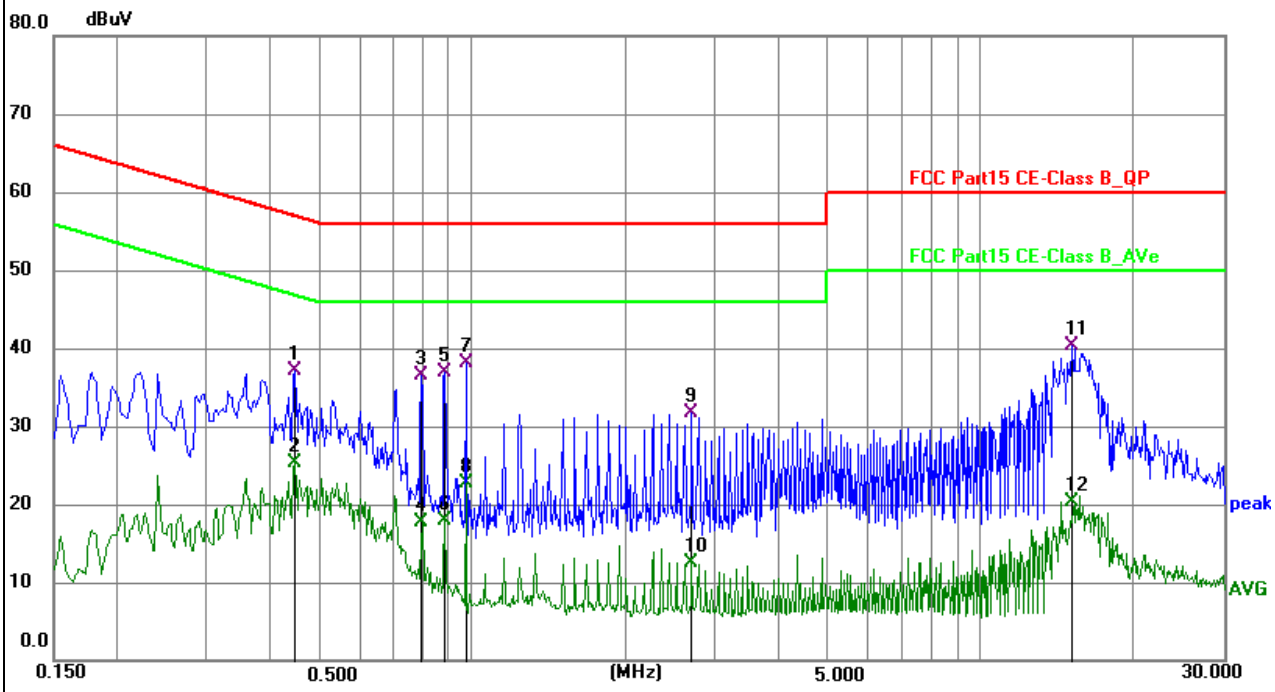
5.2.4 Test Result

EUT:	Wireless carplay adapter	Model Name:	TY-001
Test Mode:	TX	Phase:	L
Test Voltage:	DC 5V from adapter AC 120V/60Hz		



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	0.226500	29.25	10.47	39.72	62.58	-22.86	QP
2	0.226500	12.92	10.47	23.39	52.58	-29.19	AVG
3	0.456000	26.39	10.49	36.88	56.77	-19.89	QP
4	0.456000	15.33	10.49	25.82	46.77	-20.95	AVG
5	0.577500	24.88	10.50	35.38	56.00	-20.62	QP
6	0.577500	10.69	10.50	21.19	46.00	-24.81	AVG
7	0.847500	27.96	10.47	38.43	56.00	-17.57	QP
8	0.847500	11.87	10.47	22.34	46.00	-23.66	AVG
9 *	0.928500	29.16	10.44	39.60	56.00	-16.40	QP
10	0.928500	8.00	10.44	18.44	46.00	-27.56	AVG
11	15.103500	26.28	11.56	37.84	60.00	-22.16	QP
12	15.103500	5.64	11.56	17.20	50.00	-32.80	AVG

EUT:	Wireless carplay adapter	Model Name:	TY-001
Test Mode:	TX	Phase:	N
Test Voltage:	DC 5V from adapter AC 120V/60Hz		



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	0.447000	26.65	10.42	37.07	56.93	-19.86	QP
2	0.447000	14.93	10.42	25.35	46.93	-21.58	AVG
3	0.793500	26.17	10.37	36.54	56.00	-19.46	QP
4	0.793500	7.38	10.37	17.75	46.00	-28.25	AVG
5	0.883500	26.58	10.36	36.94	56.00	-19.06	QP
6	0.883500	7.57	10.36	17.93	46.00	-28.07	AVG
7 *	0.969000	27.84	10.35	38.19	56.00	-17.81	QP
8	0.969000	12.42	10.35	22.77	46.00	-23.23	AVG
9	2.697000	21.34	10.42	31.76	56.00	-24.24	QP
10	2.697000	2.09	10.42	12.51	46.00	-33.49	AVG
11	15.099000	28.73	11.58	40.31	60.00	-19.69	QP
12	15.099000	8.78	11.58	20.36	50.00	-29.64	AVG

5.3 Radiated Emission

5.3.1 Limits

Frequencies (MHz)	Field Strength (micorvolts/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

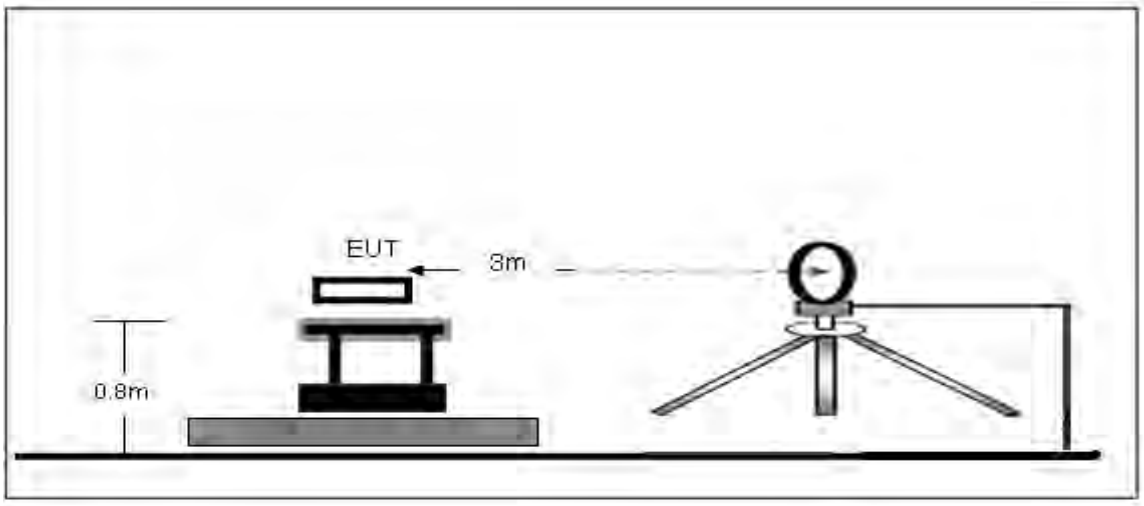
Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RB 200Hz for QP
Start ~ Stop Frequency	150kHz~30MHz / RB 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RB 120kHz for QP

5.3.2 Test Procedures

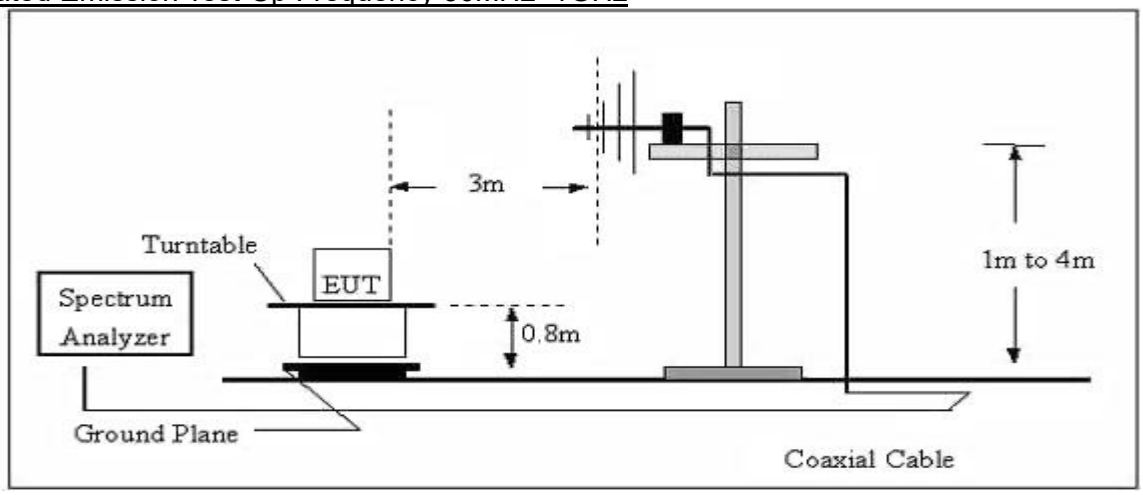
a) The radiated emission tests were performed in the 3 meters.
b) The EUT was placed on the top of a rotating table 0.8 meters above the ground. The table was rotated 360 degrees to determine the position of the highest radiation.
c) The height of the test antenna shall vary between 1m to 4m. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
d) 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.
e) 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.
f) For the actual test configuration, please refer to the related item – EUT test photos.

5.3.3 Test Setup

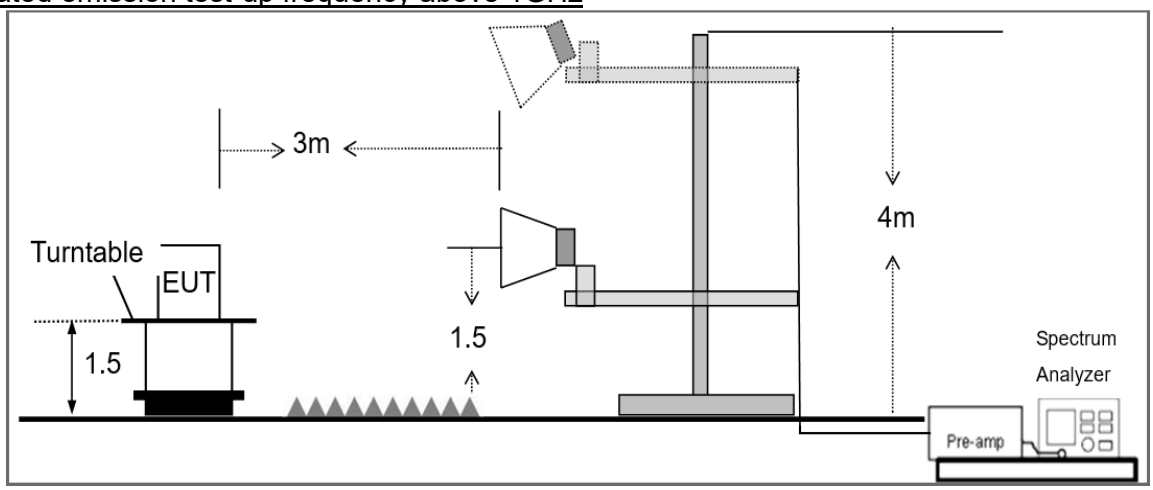
Radiated Emission Test-Up Frequency Below 30MHz



Radiated Emission Test-Up Frequency 30MHz~1GHz



Radiated emission test-up frequency above 1GHz



5.3.4 Test Result

Below 30MHz

EUT:	Wireless carplay adapter	Model Name:	TY-001
Pressure:	1010 hPa	Test Voltage:	DC 5V from adapter AC 120V/60Hz
Test Mode:	TX	Polarization:	--

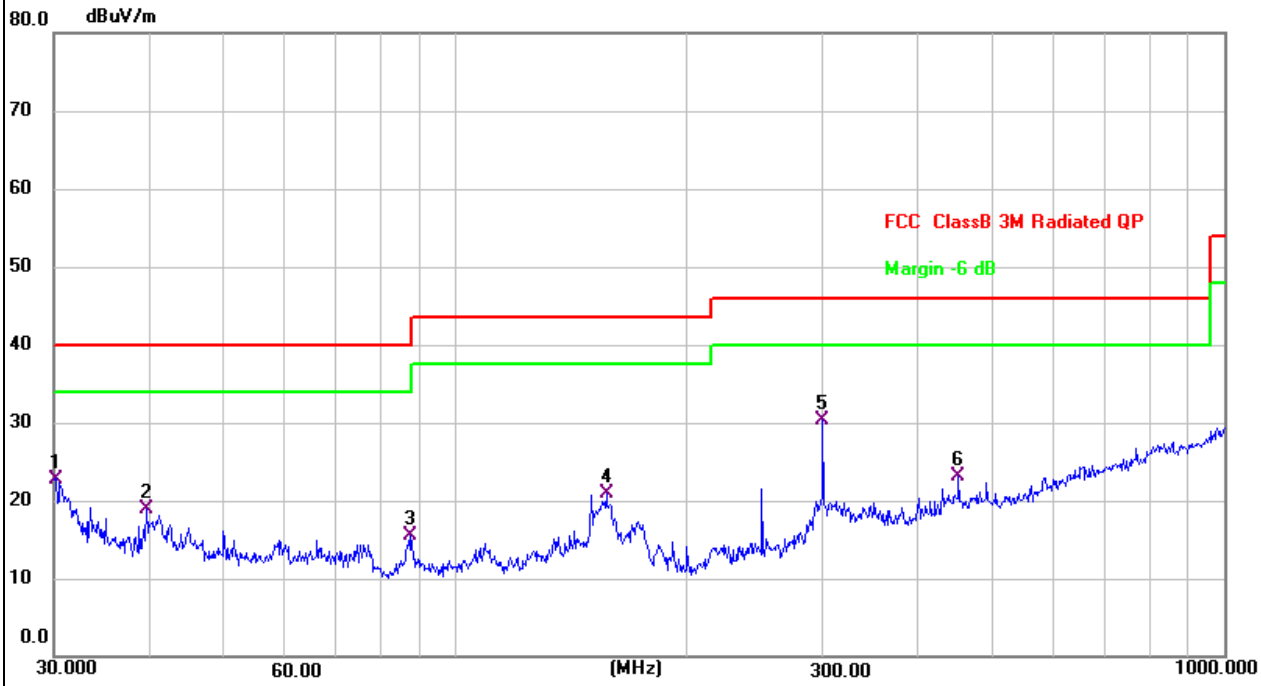
Freq.	Reading	Limit	Margin	State
(MHz)	(dBuV/m)	(dBuV/m)	(dB)	P/F
--	--	--	--	Pass
--	--	--	--	Pass

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 (specific distance/test distance)(dB);
3. Limit line = specific limits (dBuV) + distance extrapolation factor.

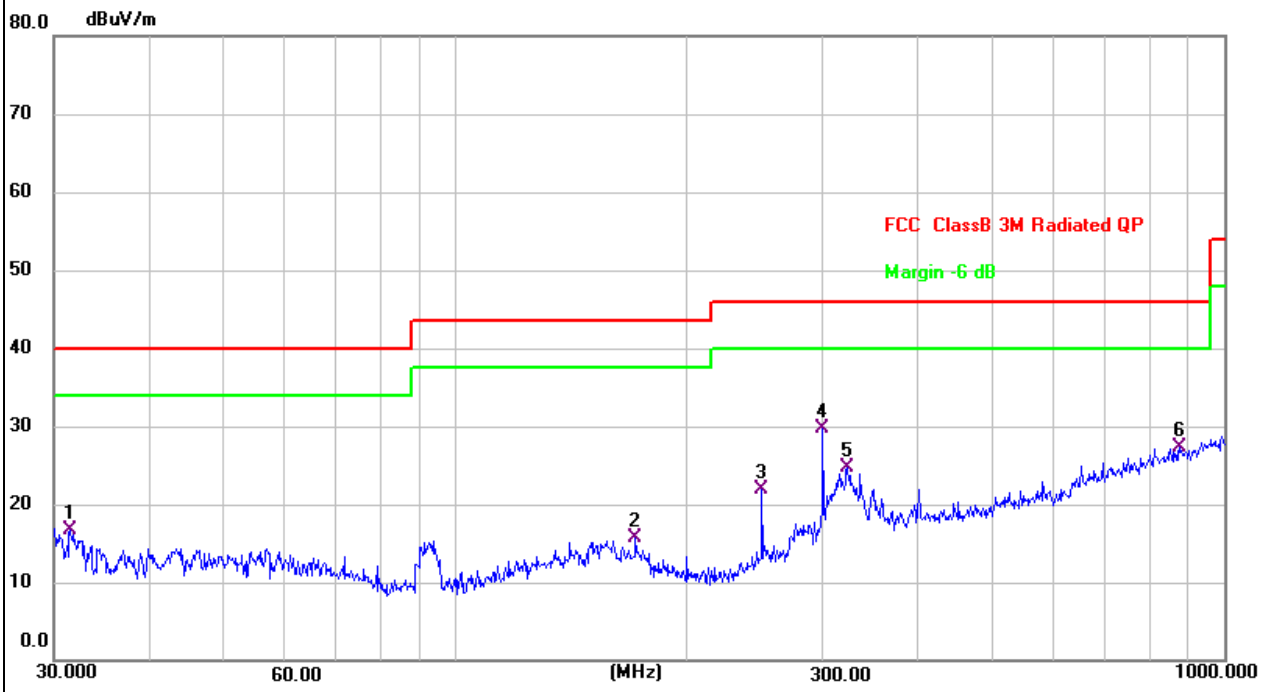
30MHz – 1GHz

EUT:	Wireless carplay adapter	Model Name:	TY-001
Test Mode:	TX	Phase:	Vertical
Test Voltage:	DC 5V from Adapter AC 120V/60Hz		



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	30.2109	38.12	-15.32	22.80	40.00	-17.20	QP
2	39.5756	32.94	-14.06	18.88	40.00	-21.12	QP
3	87.1115	33.66	-18.21	15.45	40.00	-24.55	QP
4	157.0072	34.14	-13.32	20.82	43.50	-22.68	QP
5 *	300.3672	42.95	-12.56	30.39	46.00	-15.61	QP
6	451.1349	31.38	-8.37	23.01	46.00	-22.99	QP

EUT:	Wireless carplay adapter	Model Name:	TY-001
Test Mode:	TX	Phase:	Horizontal
Test Voltage:	DC 5V from Adapter AC 120V/60Hz		



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	31.5093	31.85	-15.17	16.68	40.00	-23.32	QP
2	171.3925	29.46	-13.69	15.77	43.50	-27.73	QP
3	250.3009	36.73	-14.90	21.83	46.00	-24.17	QP
4 *	300.3672	42.35	-12.56	29.79	46.00	-16.21	QP
5	323.3201	36.64	-11.96	24.68	46.00	-21.32	QP
6	875.2468	26.72	0.56	27.28	46.00	-18.72	QP

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 (2402 MHz)(8DPSK)--Above 1G									
4804.125	42.76	4.83	33.5	30.80	50.29	74.00	-23.71	Pk	Vertical
4804.125	31.75	4.83	33.5	30.80	39.28	54.00	-14.72	AV	Vertical
7206.261	42.88	5.83	37.79	31.40	55.10	74.00	-18.90	Pk	Vertical
7206.261	31.91	5.83	37.79	31.40	44.13	54.00	-9.87	AV	Vertical
4804.194	42.86	4.83	33.5	30.80	50.39	74.00	-23.61	Pk	Horizontal
4804.194	31.65	4.83	33.5	30.80	39.18	54.00	-14.82	AV	Horizontal
7206.274	42.80	5.83	37.79	31.40	55.02	74.00	-18.98	Pk	Horizontal
7206.274	32.06	5.83	37.79	31.40	44.28	54.00	-9.72	AV	Horizontal
Mid Channel (2441 MHz)(8DPSK)--Above 1G									
4882.139	44.20	4.89	33.76	30.80	52.05	74.00	-21.95	Pk	Vertical
4882.139	31.87	4.89	33.76	30.80	39.72	54.00	-14.28	AV	Vertical
7323.284	44.26	5.95	38.25	31.70	56.76	74.00	-17.24	Pk	Vertical
7323.284	32.95	5.95	38.25	31.70	45.45	54.00	-8.55	AV	Vertical
4882.215	43.66	4.89	33.76	30.80	51.51	74.00	-22.49	Pk	Horizontal
4882.215	32.00	4.89	33.76	30.80	39.85	54.00	-14.15	AV	Horizontal
7323.299	44.05	5.95	38.25	31.70	56.55	74.00	-17.45	Pk	Horizontal
7323.299	32.94	5.95	38.25	31.70	45.44	54.00	-8.56	AV	Horizontal
High Channel (2480 MHz)(8DPSK)-- Above 1G									
4960.143	42.65	4.95	34.33	30.80	51.13	74.00	-22.87	Pk	Vertical
4960.143	31.93	4.95	34.33	30.80	40.41	54.00	-13.59	AV	Vertical
7440.296	43.30	6.11	37.60	31.74	55.27	74.00	-18.73	Pk	Vertical
7440.296	32.34	6.11	37.60	31.74	44.31	54.00	-9.69	AV	Vertical
4960.245	42.96	4.95	34.33	30.80	51.44	74.00	-22.56	Pk	Horizontal
4960.245	32.14	4.95	34.33	30.80	40.62	54.00	-13.38	AV	Horizontal
7440.304	43.05	6.11	37.60	31.74	55.02	74.00	-18.98	Pk	Horizontal
7440.304	32.23	6.11	37.60	31.74	44.20	54.00	-9.80	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.
3. All the modulation modes have been tested, and only the worst results are reflected in the report.

5.3.5 Radiated Band Edge

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
3Mbps(8DPSK)- Non-hopping									
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	44.82	3.40	27.80	32.41	43.61	74	-30.39	Pk	Vertical
2310.00	33.71	3.40	27.80	32.41	32.50	54	-21.50	AV	Vertical
2390.00	45.66	3.45	27.70	32.49	44.32	74	-29.68	Pk	Vertical
2390.00	34.49	3.45	27.70	32.49	33.15	54	-20.85	AV	Vertical
2390.00	46.42	3.45	27.70	32.49	45.08	74	-28.92	Pk	Horizontal
2390.00	34.57	3.45	27.70	32.49	33.23	54	-20.77	AV	Horizontal
2400.00	46.75	3.46	27.80	32.54	45.47	74	-28.53	Pk	Vertical
2400.00	34.60	3.46	27.80	32.54	33.32	54	-20.68	AV	Vertical
2400.00	46.05	3.46	27.80	32.54	44.77	74	-29.23	Pk	Horizontal
2400.00	34.48	3.46	27.80	32.54	33.20	54	-20.80	AV	Horizontal
2483.50	47.35	3.48	28.53	32.55	46.81	74	-27.19	Pk	Vertical
2483.50	33.82	3.48	28.53	32.55	33.28	54	-20.72	AV	Vertical
2483.50	46.12	3.48	28.53	32.55	45.58	74	-28.42	Pk	Horizontal
2483.50	33.80	3.48	28.53	32.55	33.26	54	-20.74	AV	Horizontal
2500.00	45.28	3.49	29.20	32.66	45.31	74	-28.69	Pk	Vertical
2500.00	33.79	3.49	29.20	32.66	33.82	54	-20.18	AV	Vertical
2500.00	45.19	3.49	29.20	32.66	45.22	74	-28.78	Pk	Horizontal
2500.00	33.81	3.49	29.20	32.66	33.84	54	-20.16	AV	Horizontal
3Mbps (8DPSK)- hopping									
2400.00	46.86	3.46	27.80	32.54	45.58	74	-28.42	Pk	Vertical
2400.00	34.57	3.46	27.80	32.54	33.29	54	-20.71	AV	Vertical
2400.00	45.86	3.46	27.80	32.54	44.58	74	-29.42	Pk	Horizontal
2400.00	34.65	3.46	27.80	32.54	33.37	54	-20.63	AV	Horizontal
2483.50	47.25	3.48	28.53	32.55	46.71	74	-27.29	Pk	Vertical
2483.50	34.23	3.48	28.53	32.55	33.69	54	-20.31	AV	Vertical
2483.50	46.43	3.48	28.53	32.55	45.89	74	-28.11	Pk	Horizontal
2483.50	33.86	3.48	28.53	32.55	33.32	54	-20.68	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.
3. All the modulation modes have been tested, and only the worst results are reflected in the report.

5.4 Peak Output Power

5.4.1 Limit

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

5.4.2 Test Procedure

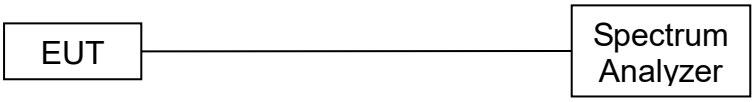
(1) The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram above.

(2) Spectrum Setting:

RBW=2MHz, VBW=10MHz, Detector=Peak

(3) The EUT was set to continuously transmitting in the max power during the test.

5.4.3 Test Setup



5.4.4 Test Results

EUT:	Wireless carplay adapter	Model Name:	TY-001
Test Mode:	TX	Test Voltage:	DC 5V from adapter AC 120V/60Hz

GFSK

Test Channel	Frequency (MHz)	Maximum Peak Output Power(dBm)	Limit (dBm)
CH00	2402	7.22	30
CH39	2441	6.49	30
CH78	2480	6.75	30

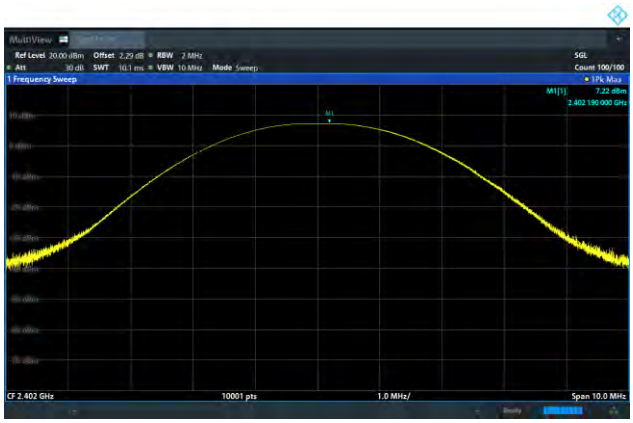
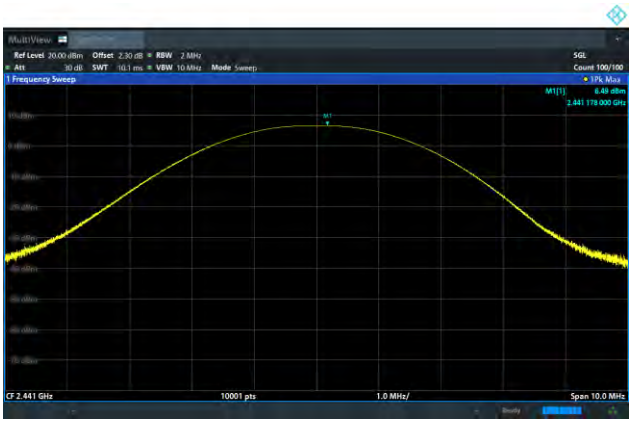
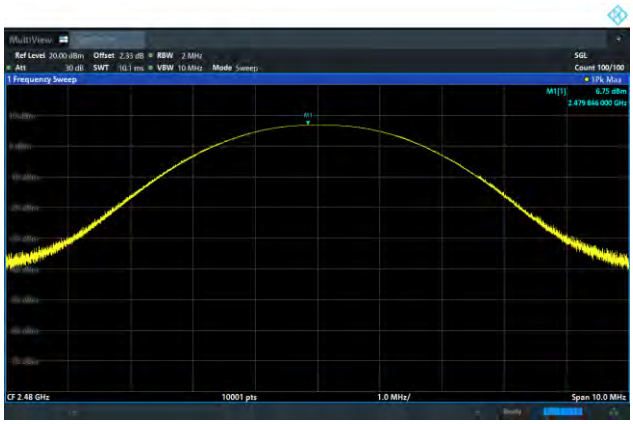
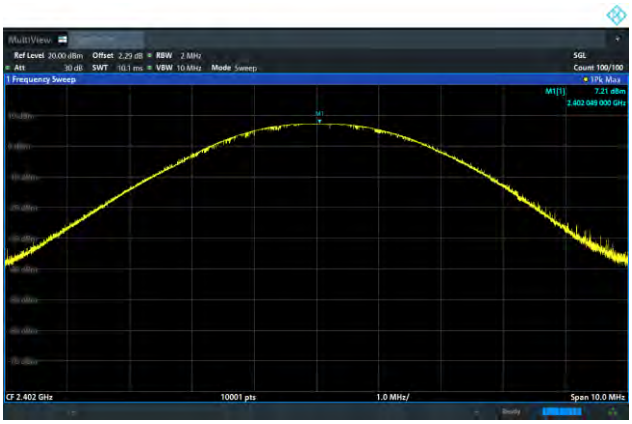
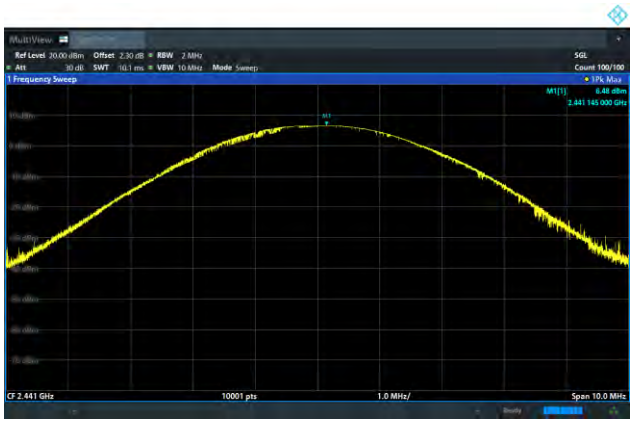
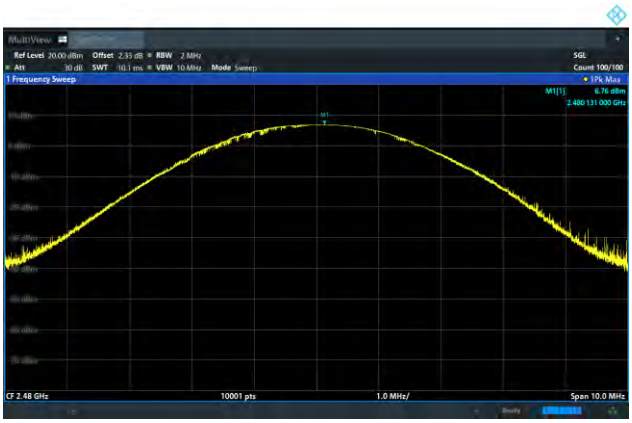
π/4-DQPSK

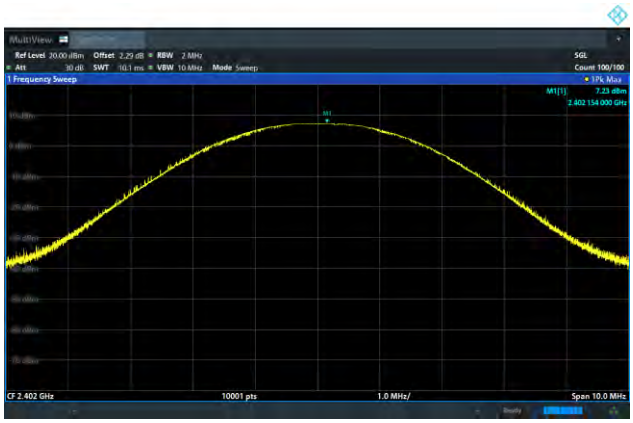
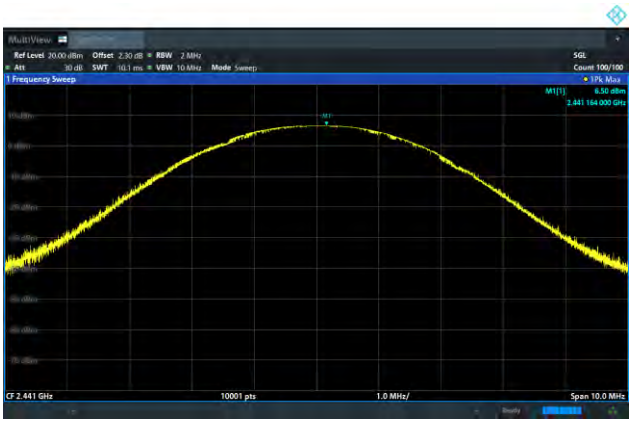
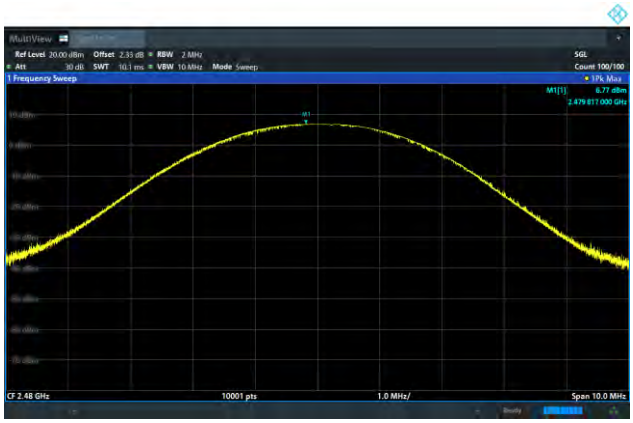
Test Channel	Frequency (MHz)	Maximum Peak Output Power(dBm)	Limit (dBm)
CH00	2402	7.21	21
CH39	2441	6.48	21
CH78	2480	6.76	21

8DPSK

Test Channel	Frequency (MHz)	Maximum Peak Output Power(dBm)	Limit (dBm)
CH00	2402	7.23	21
CH39	2441	6.50	21
CH78	2480	6.77	21

Test plots

GFSK on Channel 00	GFSK on Channel 39
	
GFSK on Channel 78	**π/4-DQPSK on Channel 00**
	
π/4-DQPSK on Channel 39	**π/4-DQPSK on Channel 78**
	

8DPSK on Channel 00	8DPSK on Channel 39
	
8DPSK on Channel 78	/
	/

5.5 20dB Occupied Channel Bandwidth

5.5.1 Limit

FCC Part15 (15.247) , Subpart C			
Section	Test Item	Limit	Frequency Range (MHz)
15.247a(1)	20dB bandwidth	N/A	2400-2483.5

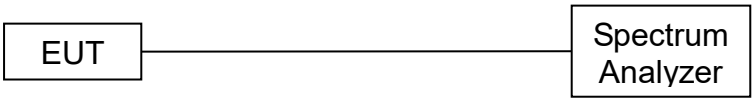
5.5.2 Test Procedure

(1) The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram above.

(2) Spectrum Setting:

Bandwidth: RBW=30 kHz, VBW=100 kHz, detector= Peak

5.5.3 Test Setup



5.5.4 Test results

EUT:	Wireless carplay adapter	Model Name:	TY-001
Test Mode:	TX	Test Voltage:	DC 5V from adapter AC 120V/60Hz

Mode	Frequency (MHz)	20dB Bandwidth (MHz)	Limit (MHz)	Result
GFSK	2402	0.922	N/A	Pass
	2441	0.911	N/A	Pass
	2480	0.919	N/A	Pass
π/4-DQPSK	2402	1.29	N/A	Pass
	2441	1.29	N/A	Pass
	2480	1.29	N/A	Pass
8DPSK	2402	1.192	N/A	Pass
	2441	1.19	N/A	Pass
	2480	1.186	N/A	Pass

Test plots

GFSK mode

TX CH00

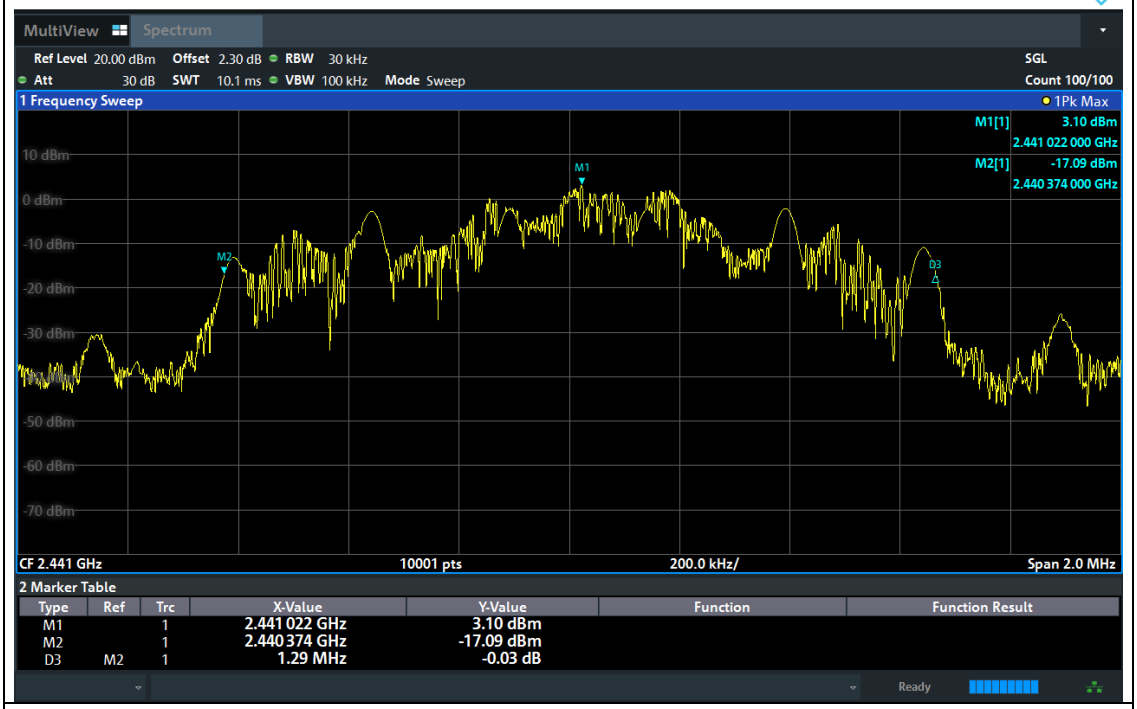
TX CH39

TX CH78

π/4-DQPSK

TX CH00

TX CH39



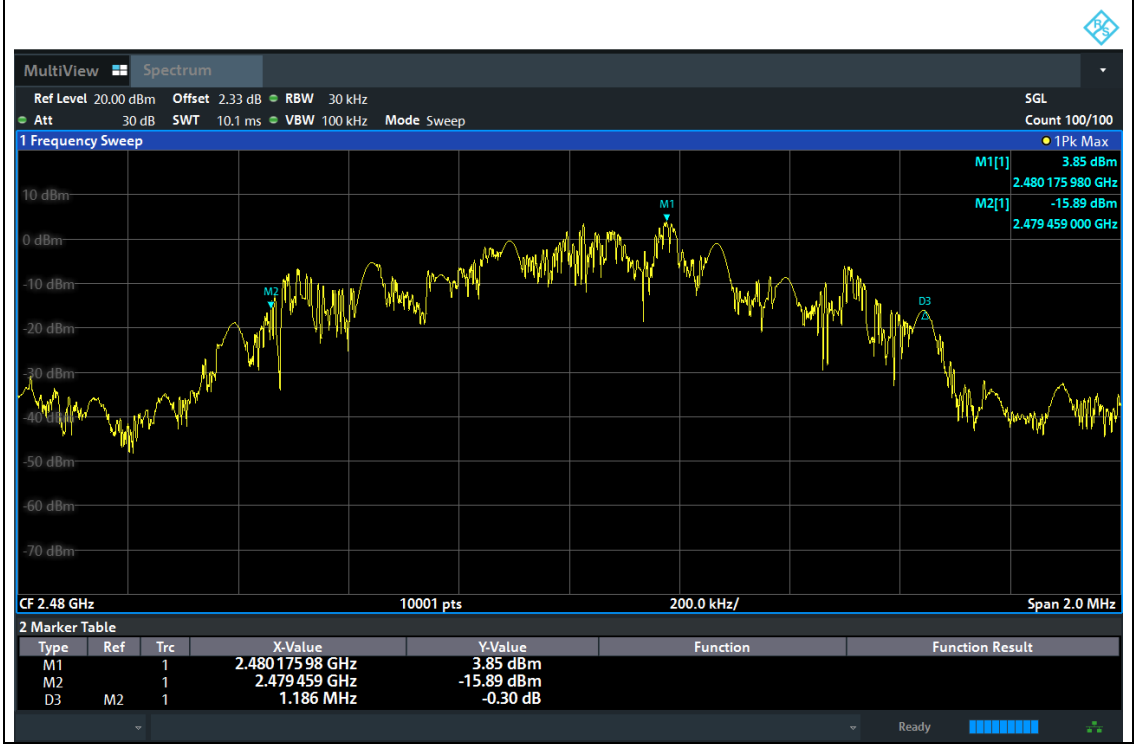
TX CH78

8DPSK mode

TX CH00

TX CH39

TX CH78


MultiView
Spectrum
Ref Level 20.00 dBm Offset 2.33 dB RBW 30 kHz
Att 30 dB SWT 10.1 ms VBW 100 kHz Mode Sweep
SGL
Count 100/100
1 Frequency Sweep
1Pk Max
M1[1] 3.85 dBm
2.480 175 980 GHz
M2[1] -15.89 dBm
2.479 459 000 GHz
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
M1
M2
D3
CF 2.48 GHz
10001 pts
200.0 kHz/
Span 2.0 MHz
2 Marker Table
Type Ref Trc X-Value Y-Value Function Function Result
M1 1 2.480 175 98 GHz 3.85 dBm
M2 1 2.479 459 GHz -15.89 dBm
D3 M2 1 1.186 MHz -0.30 dB
Ready

5.6 Carrier Frequency Separation

5.6.1 Limit

FCC Part15 (15.247) , Subpart C			
Section	Test Item	Limit	Frequency Range (MHz)
15.247(a)(1)	Channel Separation	>25kHz or >two-thirds of the 20 dB bandwidth (Which is greater)	2400-2483.5

5.6.2 Test Procedure

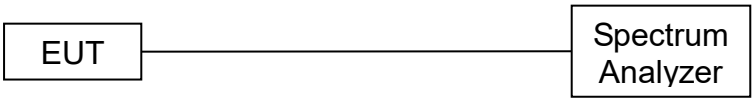
(1) The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram above.

(2) Spectrum Setting:

RBW=30 kHz, VBW=100 kHz, detector= Peak, Sweep Time =auto.

(3) The EUT was set to the Hopping Mode for Channel Separation Test and continuously transmitting for the Test.

5.6.3 Test Setup



5.6.4 Test Results

EUT:	Wireless carplay adapter	Model Name:	TY-001
Pressure:	1012 hPa	Test Voltage:	DC 5V from adapter AC 120V/60Hz
Test Mode:	GFSK, π/4-DQPSK, 8DPSK /CH00, CH39, CH78		

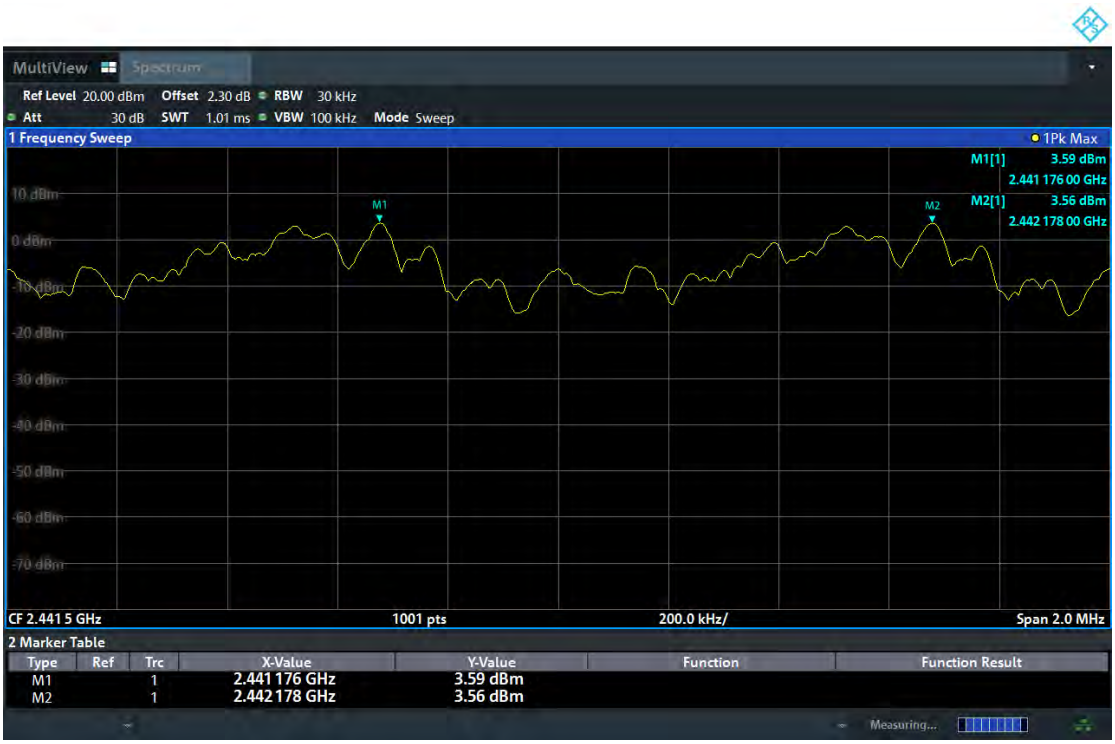
Mode	Channel	Frequency (MHz)	Test Result (MHz)	Limit (MHz)		Result
GFSK	Middle	2441	1.000	0.911	20dB BW	Pass
π/4-DQPSK	Middle	2441	0.998	0.859	2/3 of 20dB BW	Pass
8DPSK	Middle	2441	1.002	0.793	2/3 of 20dB BW	Pass

Test plots

GFSK mode-CH39

π/4-DQPSK mode-CH39

8DPSK mode-CH39



5.7 Hopping Channel Number

5.7.1 Limit

Frequency hopping systems in the 2400-2483.5MHz band shall use at least 15 channels.

5.7.2 Test Procedure

The testing follows IEEE / ANSI C63.10-2020 clause 7.8.3

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 must have its hopping function enabled.

Use the following spectrum analyzer settings:

Span = the frequency band of operation

RBW : To identify clearly the individual channels, set the RBW to less than 30% of the channel spacing or the 20 dB bandwidth, whichever is smaller.

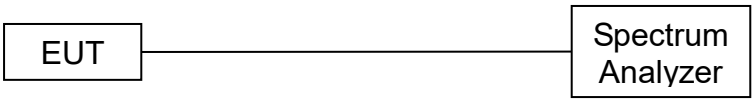
VBW ≥ RBW

Sweep = auto

Detector function = peak

Trace = max hold

5.7.3 Test Setup



5.7.4 Test Results

Mode	Quantity of Hopping Channel	Limit	Results
GFSK, π/4-DQPSK, 8DPSK	79	>15	Pass

Test plots

GFSK mode

π/4-DQPSK mode

8DPSK mode

MultiView
Ref Level 20.00 dBm Offset 2.29 dB RBW 100 kHz
Att 30 dB SWT 1.01 ms VBW 300 kHz Mode Sweep
1 Frequency Sweep
1Pk Max
M1[1] -0.47 dBm
2.401 503 0 GHz
M2[1] -1.51 dBm
2.480 577 5 GHz
2.4 GHz
1001 pts
8.35 MHz/
2.483 5 GHz
2 Marker Table
Type Ref Trc X-Value Y-Value Function Function Result
M1 1 2.401 503 GHz -0.47 dBm
M2 1 2.480 577 5 GHz -1.51 dBm

5.8 Dwell Time

5.8.1 Limit

FCC Part15 (15.247) , Subpart C			
Section	Test Item	Limit	Frequency Range (MHz)
15.247(a)(1)	Dwell time	0.4 sec	2400-2483.5

5.8.2 Test Procedure

(1) The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram above.

(2) Spectrum Setting: RBW=1MHz, VBW=3MHz, Span=0Hz, Detector=Peak

(3) Use video trigger with the trigger level set to enable triggering only on full pulses.

(4) Sweep Time is more than once pulse time.

(5) Set the center frequency on any frequency would be measure and set the frequency span to zero span.

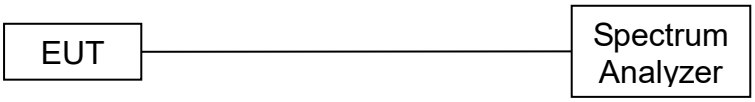
(6) Measure the maximum time duration of one single pulse.

(7) Set the EUT for packet transmitting.

(8) Measure the maximum time duration of one single pulse.

(9) The EUT was set to the Hopping Mode for Dwell Time Test.

5.8.3 Test Setup



5.8.4 Test Results

EUT:	Wireless carplay adapter	Model Name:	TY-001
Pressure:	1012 hPa	Test Voltage:	DC 5V from adapter AC 120V/60Hz
Test Mode:	GFSK, π/4-DQPSK, 8DPSK /CH39		

Mode	Data Packet	Frequency (MHz)	Pulse Duration (ms)	Dwell Time (ms)	Limit(s)	Conclusion
GFSK	DH1	2441	0.368	117.392	<0.4	Pass
	DH3	2441	1.625	271.375	<0.4	Pass
	DH5	2441	2.873	278.681	<0.4	Pass
π/4-DQPSK	2DH1	2441	0.377	120.263	<0.4	Pass
	2DH3	2441	1.629	262.269	<0.4	Pass
	2DH5	2441	2.876	316.36	<0.4	Pass
8DPSK	3DH1	2441	0.378	120.582	<0.4	Pass
	3DH3	2441	1.629	244.35	<0.4	Pass
	3DH5	2441	2.880	305.28	<0.4	Pass

Note:
1.A period time = 0.4 (s) * 79 = 31.6(s)

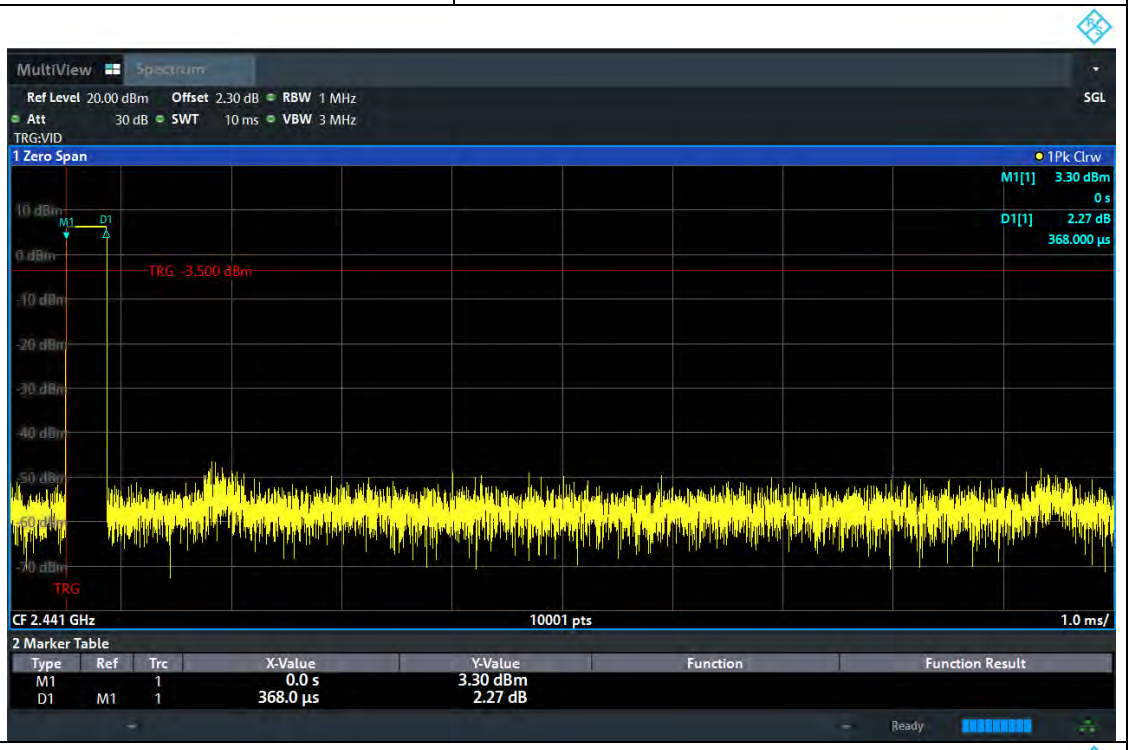
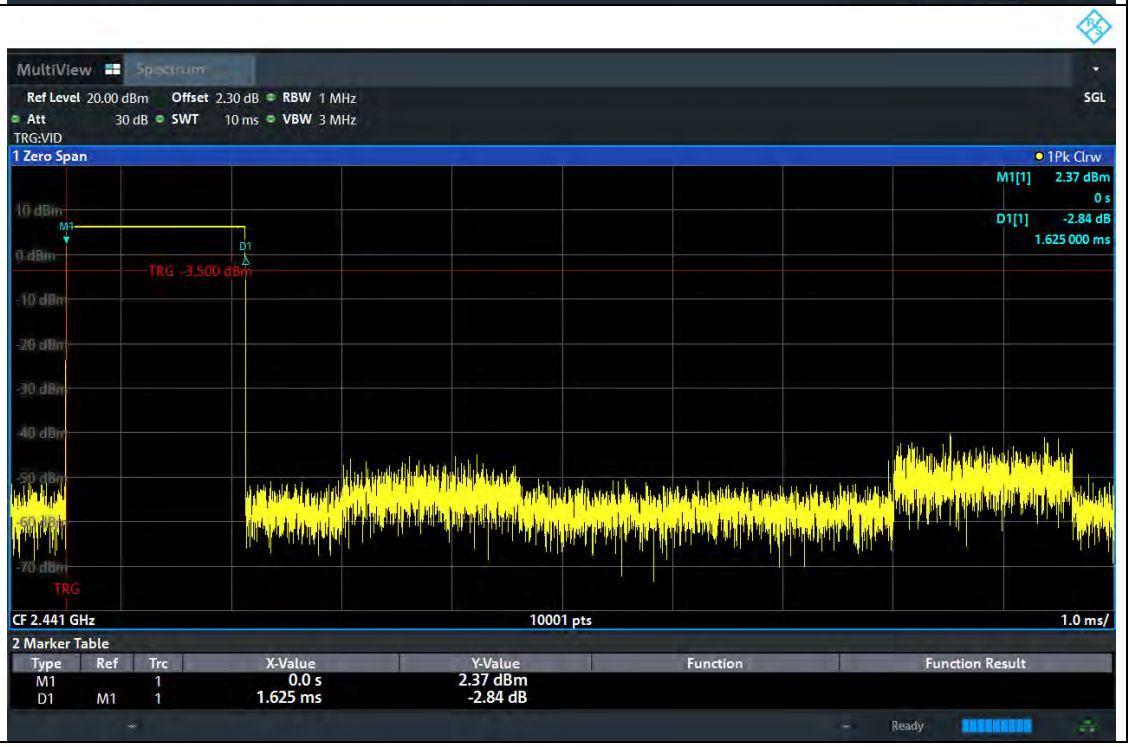
2.DH1 time slot = Pulse Duration * (1600/(2*79)) * A period time

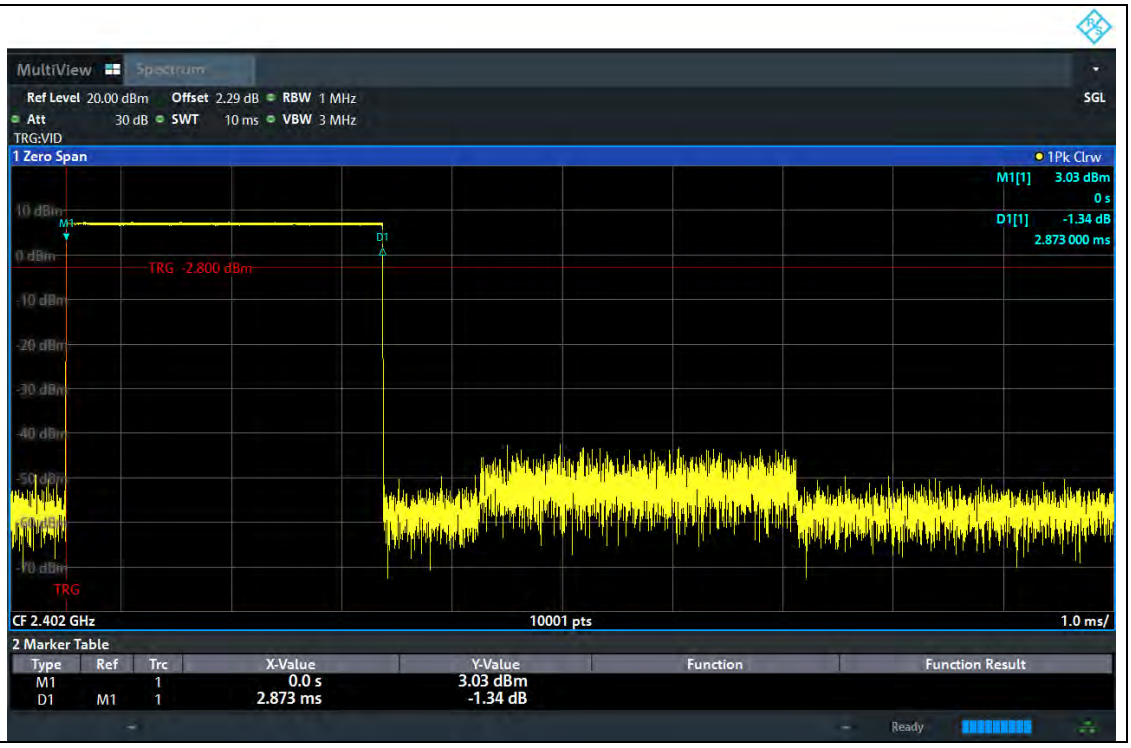
DH3 time slot = Pulse Duration * (1600/(4*79)) * A period time

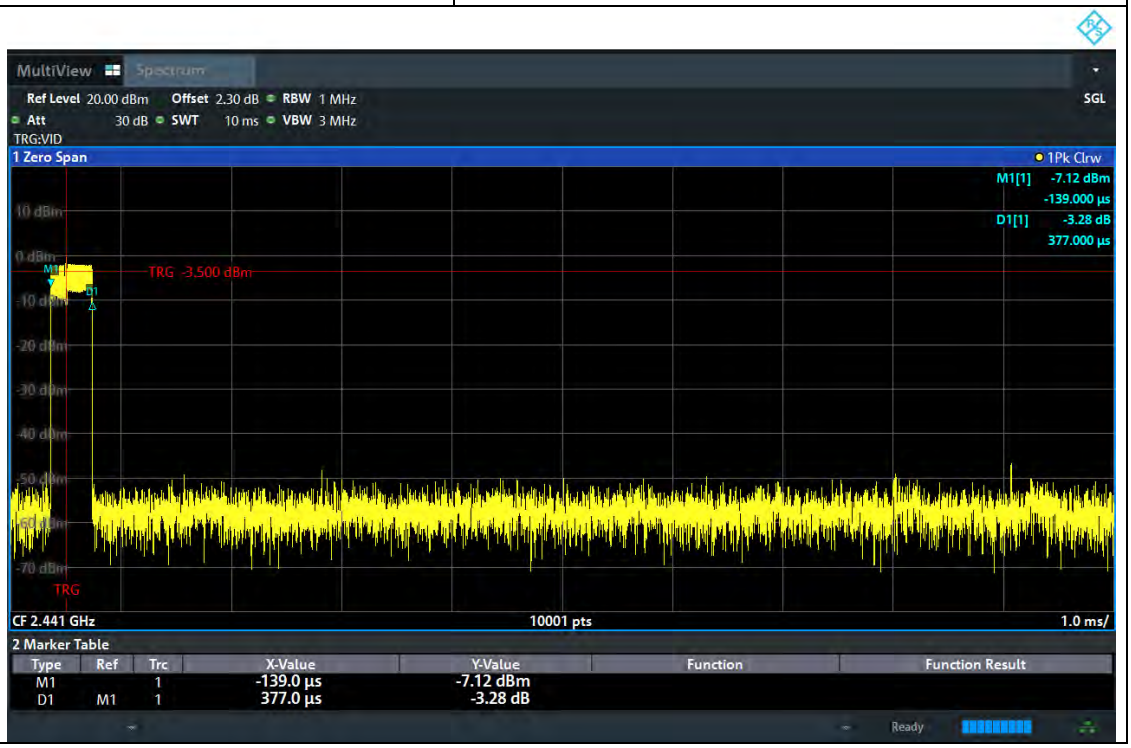
DH5 time slot = Pulse Duration * (1600/(6*79)) * A period time

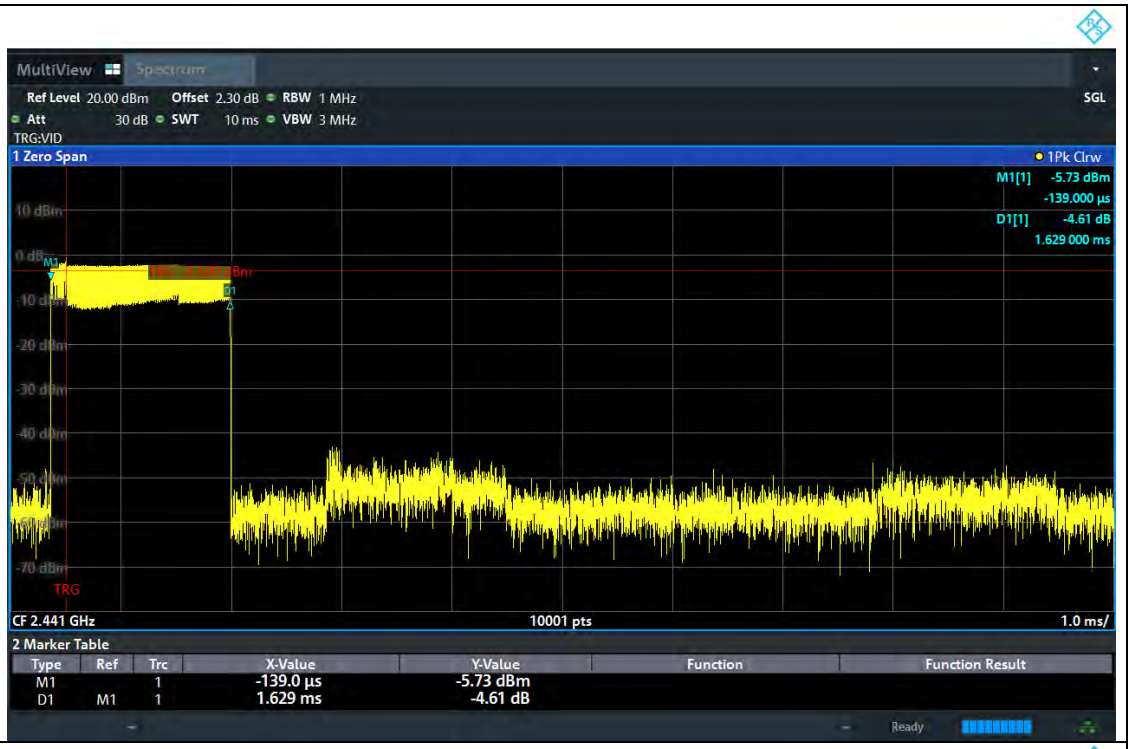
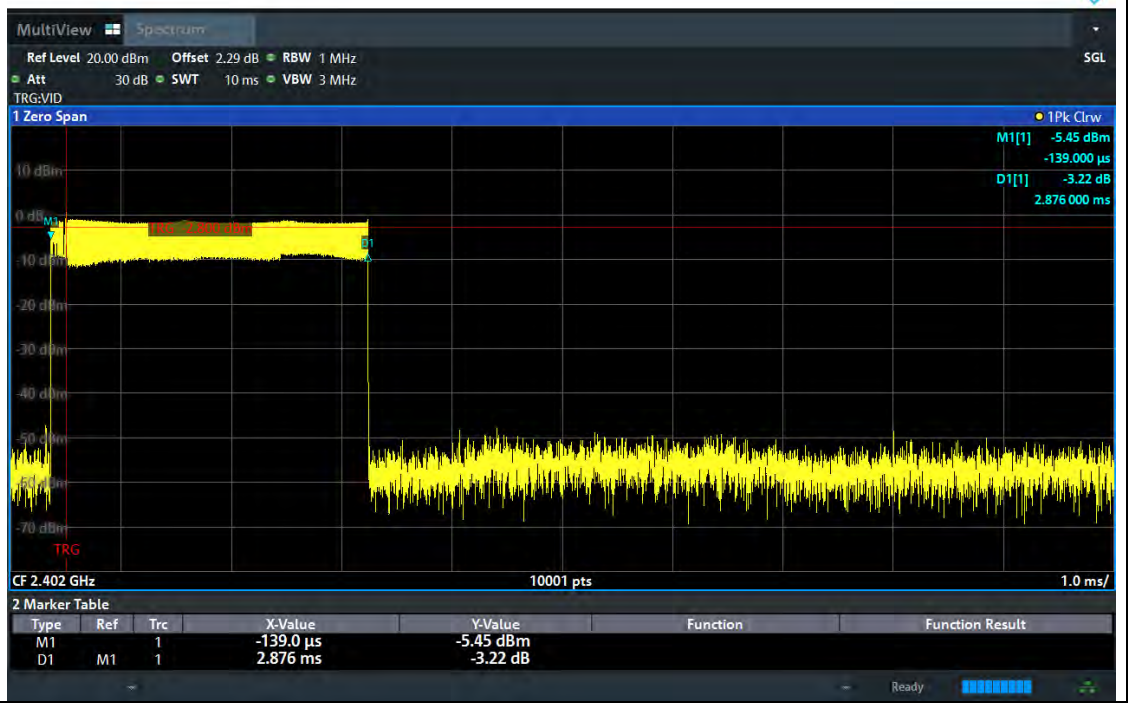
3. For GFSK, π/4-DQPSK, 8DPSK: The test period: T= 0.4 Second/Channel x 79 Channel = 31.6 s

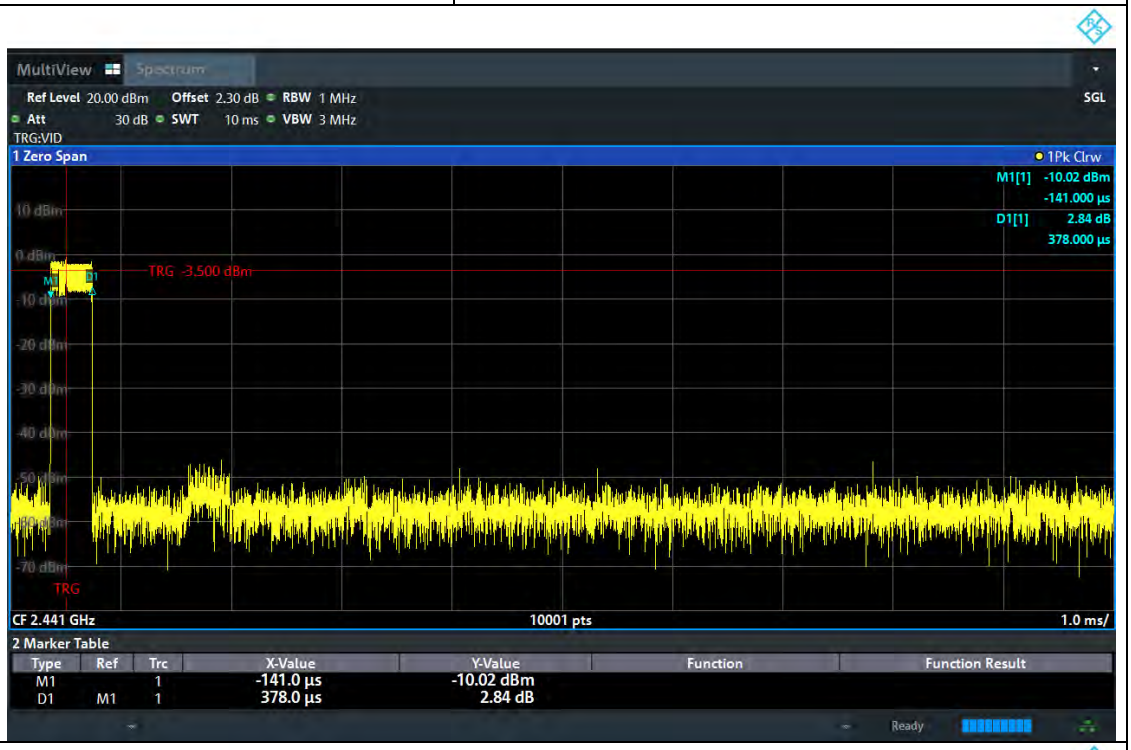
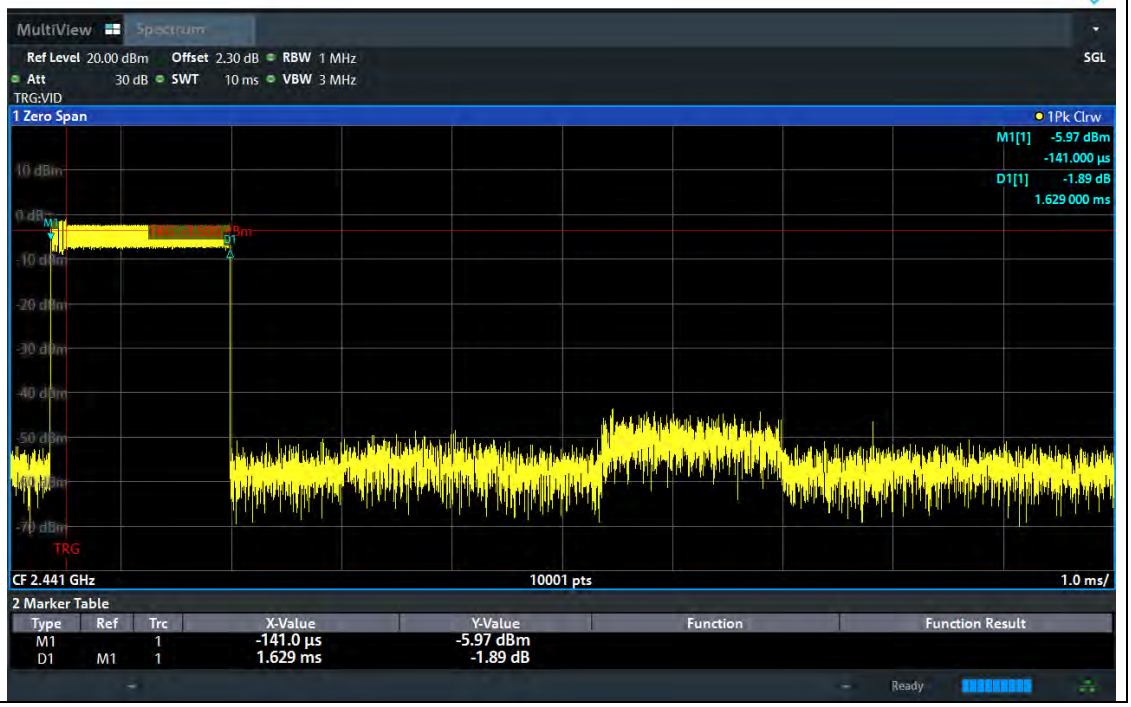
Test plots

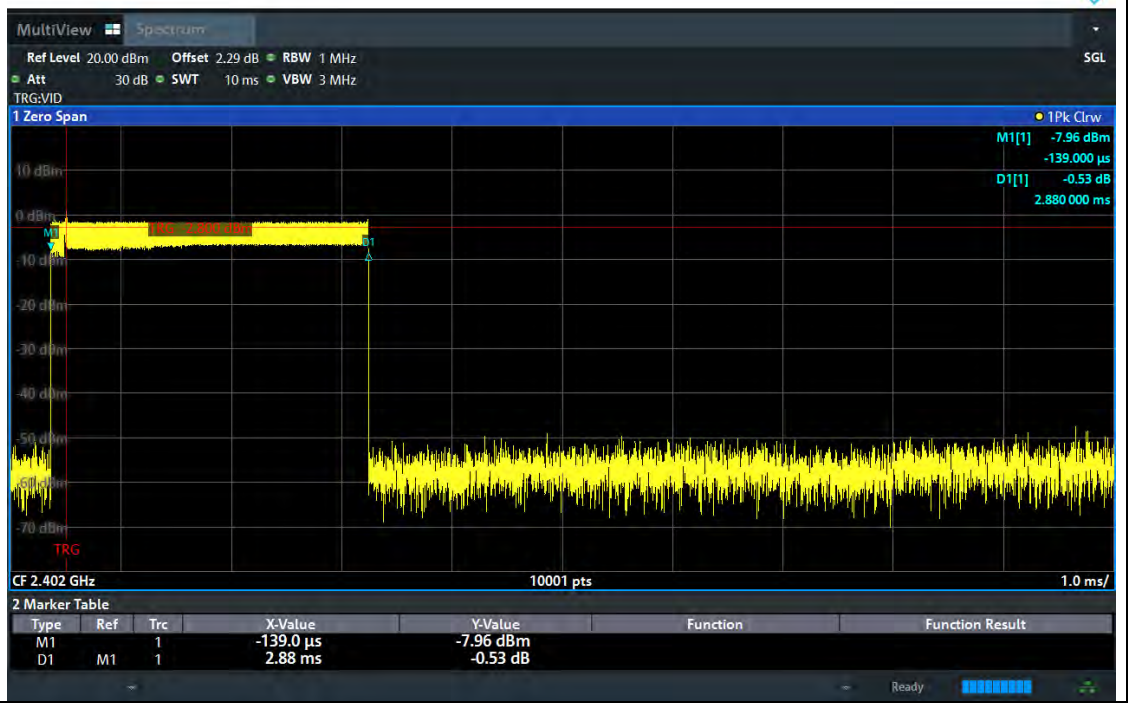
Modulation mode	GFSK mode
DH1	
DH3	

DH5	

Modulation mode	π/4-DQPSK mode
2-DH1	

2-DH3	 MultiView Spectrum Ref Level 20.00 dBm Offset 2.30 dB RBW 1 MHz Att 30 dB SWT 10 ms VBW 3 MHz SGL TRG:VID 1 Zero Span 1Pk Clrw M1[1] -5.73 dBm -139.000 µs D1[1] -4.61 dB 1.629 000 ms TRG CF 2.441 GHz 10001 pts 1.0 ms/ 2 Marker Table Type Ref Trc X-Value Y-Value Function Function Result M1 1 -139.0 µs -5.73 dBm D1 M1 1 1.629 ms -4.61 dB Ready
2-DH5	 MultiView Spectrum Ref Level 20.00 dBm Offset 2.29 dB RBW 1 MHz Att 30 dB SWT 10 ms VBW 3 MHz SGL TRG:VID 1 Zero Span 1Pk Clrw M1[1] -5.45 dBm -139.000 µs D1[1] -3.22 dB 2.876 000 ms TRG CF 2.402 GHz 10001 pts 1.0 ms/ 2 Marker Table Type Ref Trc X-Value Y-Value Function Function Result M1 1 -139.0 µs -5.45 dBm D1 M1 1 2.876 ms -3.22 dB Ready

Modulation mode	8DPSK mode
3-DH1	
3-DH3	

3-DH5	

MultiView
Spectrum
Ref Level 20.00 dBm Offset 2.29 dB RBW 1 MHz
Att 30 dB SWT 10 ms VBW 3 MHz
SGL
TRG:VID
1 Zero Span
1Pk Clrw
M1[1] -7.96 dBm
-139.000 µs
D1[1] -0.53 dB
2.880 000 ms
TRG
CF 2.402 GHz
10001 pts
1.0 ms/
2 Marker Table
Type Ref Trc X-Value Y-Value Function Function Result
M1 1 -139.0 µs -7.96 dBm
D1 M1 1 2.88 ms -0.53 dB
Ready

5.9 Conducted Band Edge

5.9.1 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)).

5.9.2 Test Procedure

a) Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.

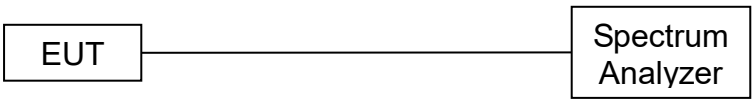
b) Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.

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.

5.9.3 Test Setup

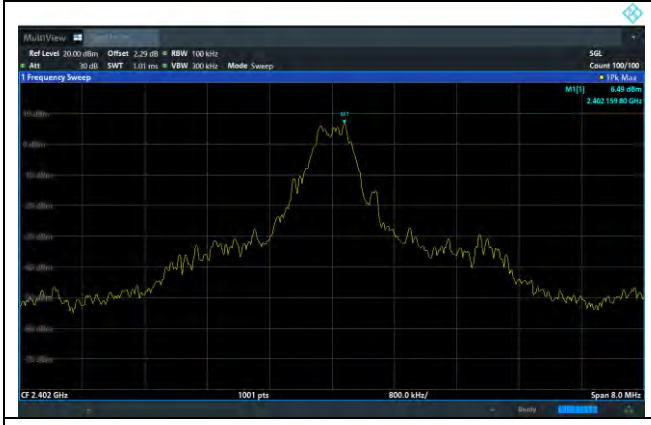


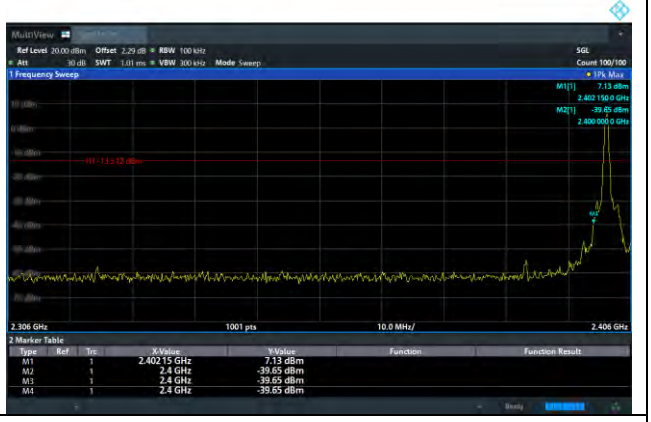
5.9.4 Test Results

EUT:	Wireless carplay adapter	Model Name:	TY-001
Pressure:	1012 hPa	Test Voltage:	DC 5V from adapter AC 120V/60Hz

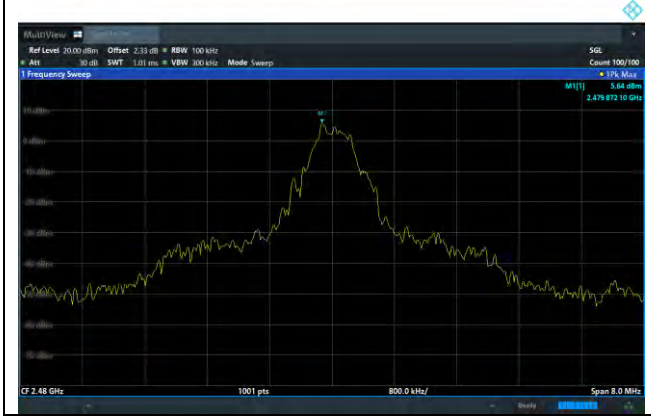
Test plots

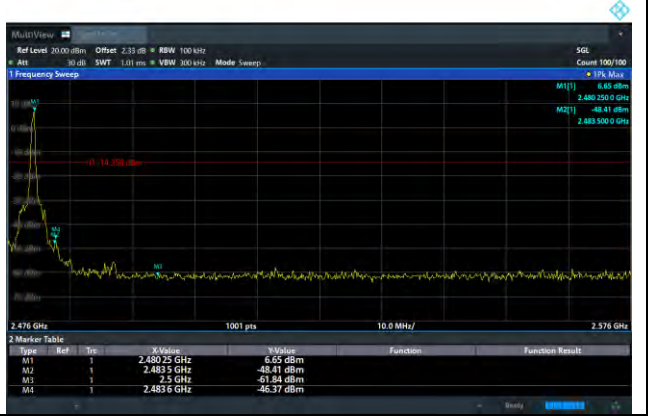
GFSK: Band Edge, Left Side



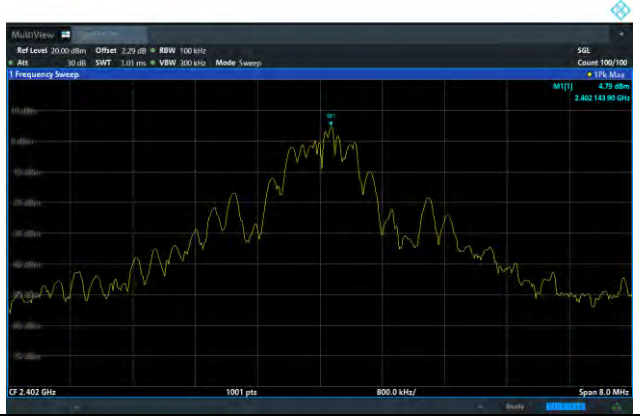


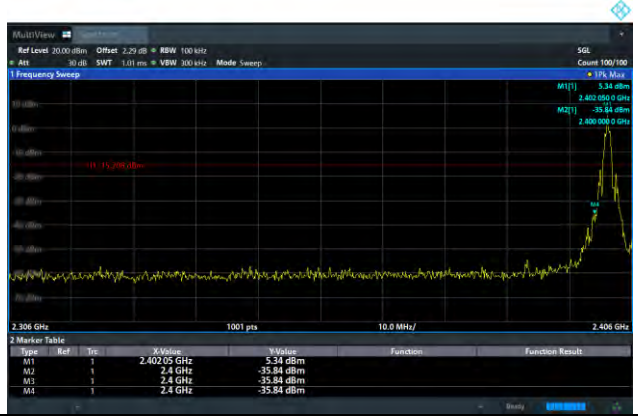
GFSK: Band Edge, Right Side



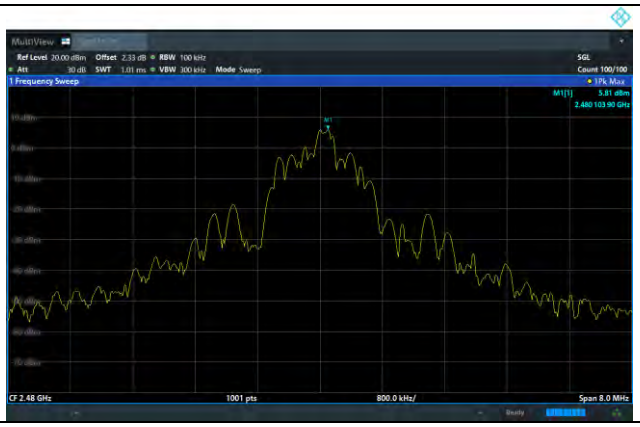


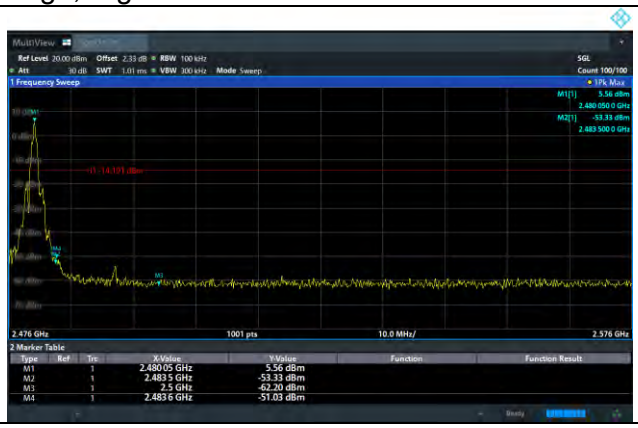
π/4-DQPSK: Band Edge, Left Side



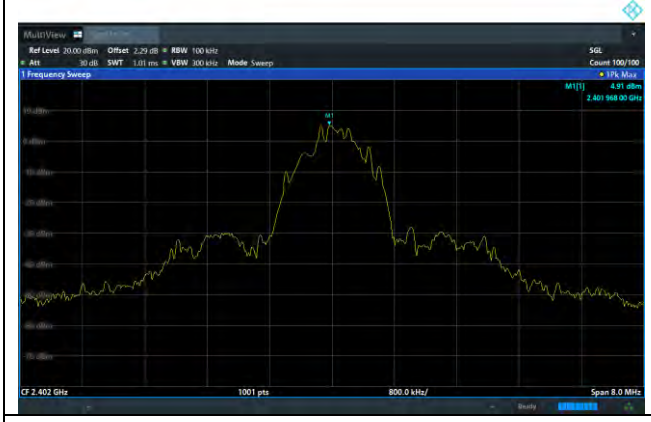


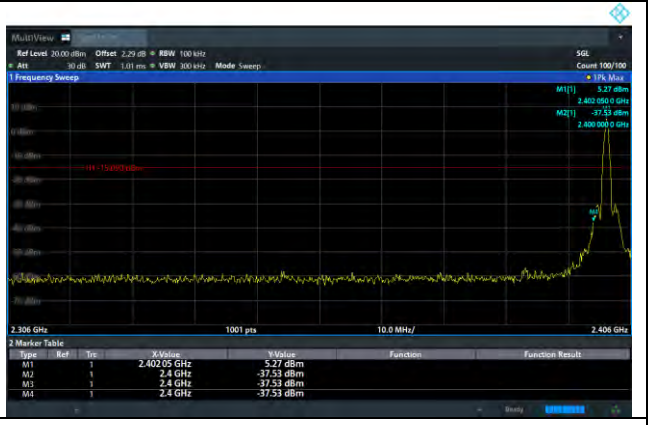
π/4-DQPSK: Band Edge, Right Side



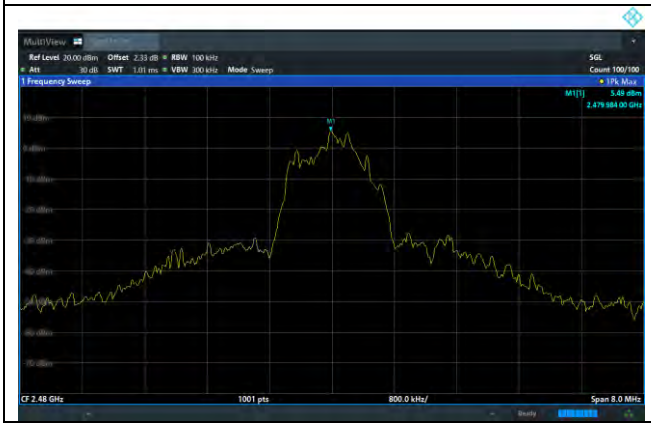


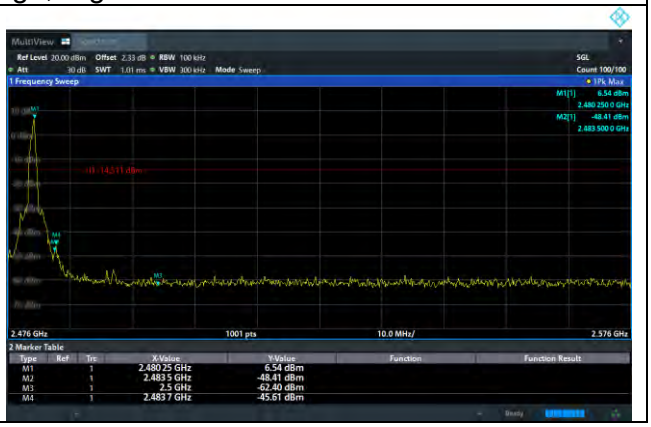
8DPSK: Band Edge, Left Side





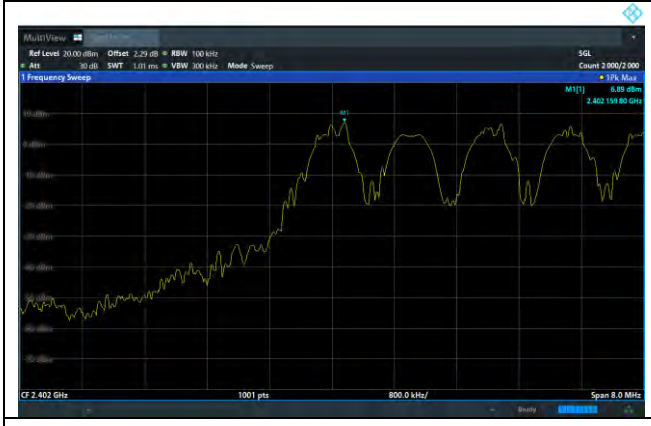
8DPSK: Band Edge, Right Side

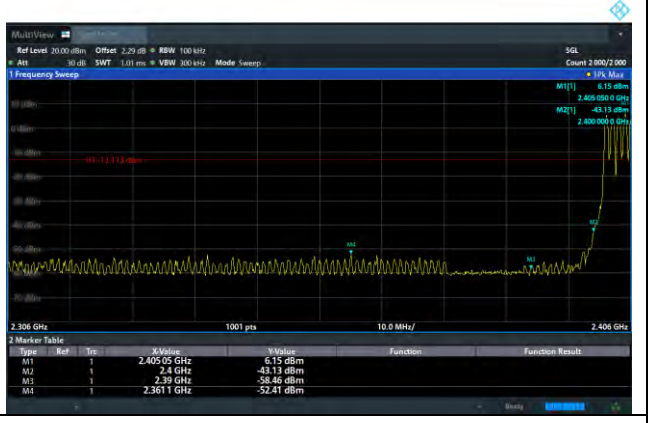




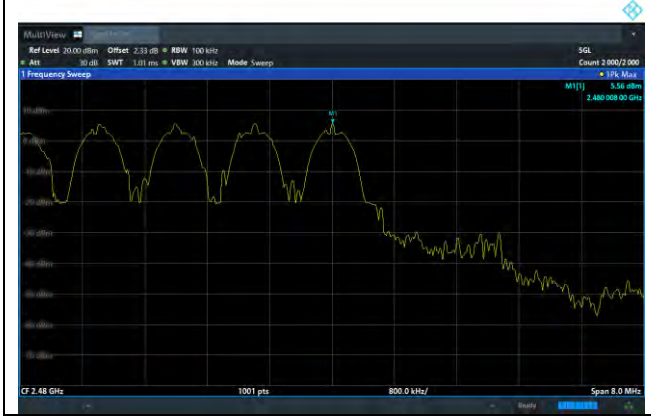
Hopping Mode
Test plots

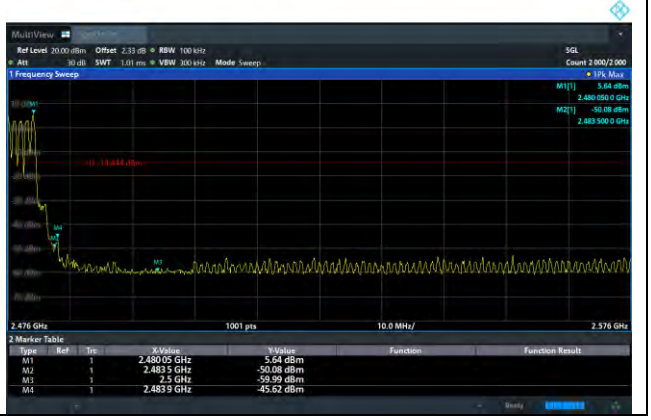
GFSK: Band Edge, Left Side



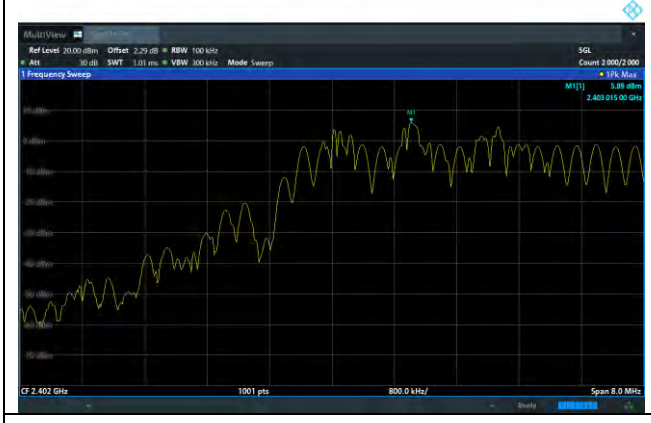


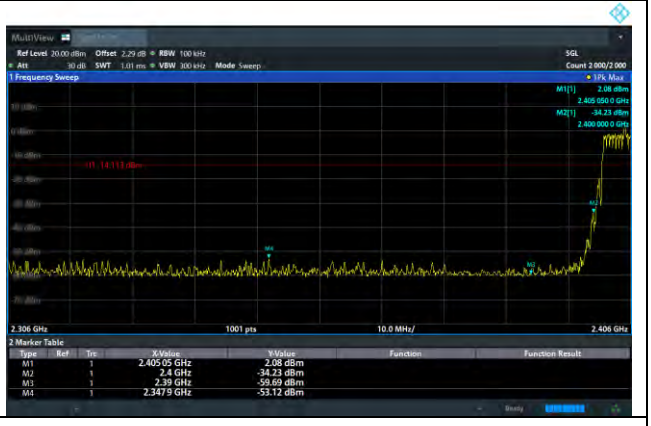
GFSK: Band Edge, Right Side



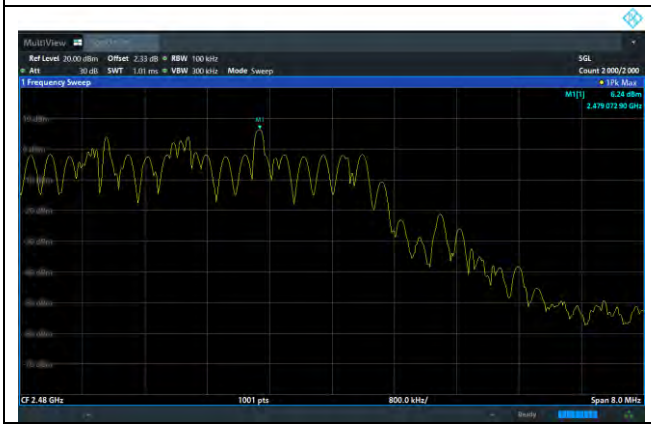


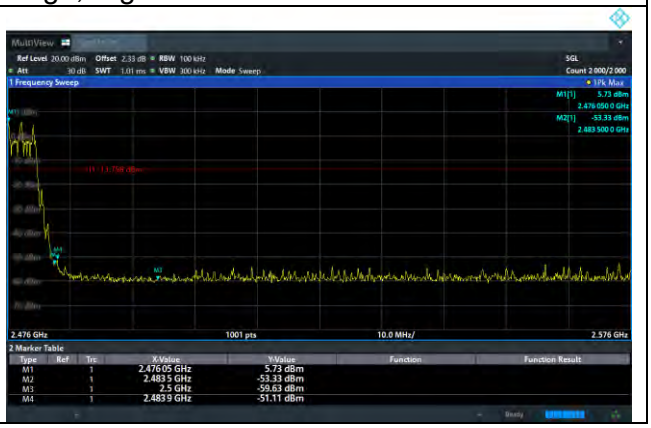
π/4-DQPSK: Band Edge, Left Side



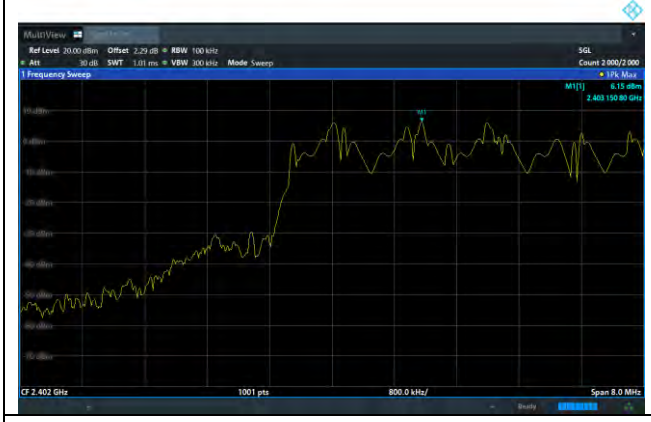


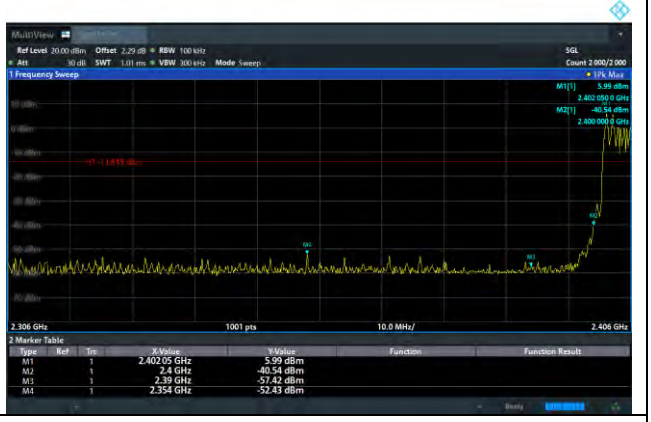
π/4-DQPSK: Band Edge, Right Side



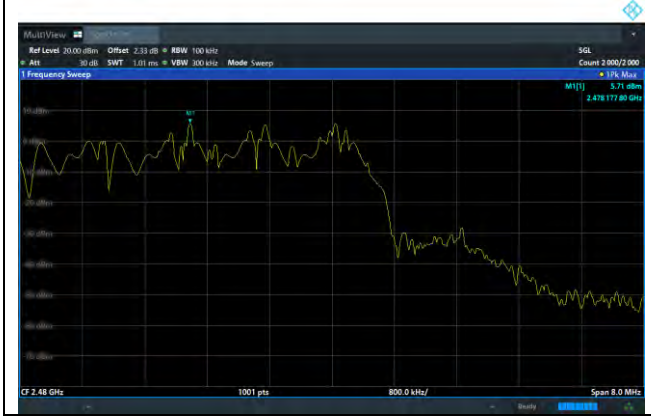


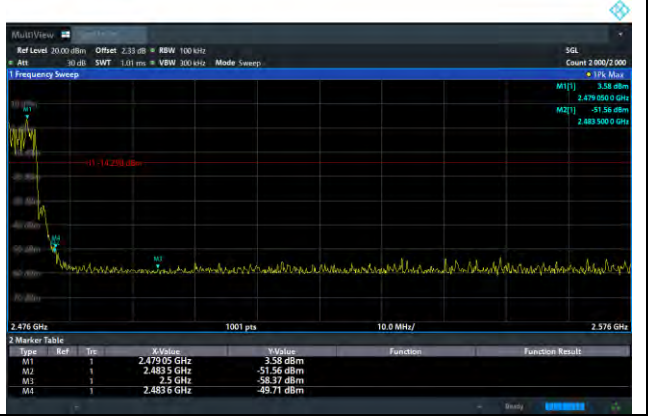
8DPSK: Band Edge, Left Side





8DPSK: Band Edge, Right Side





5.10 Spurious RF Conducted Emissions

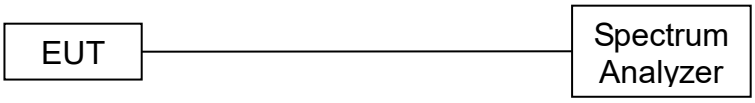
5.10.1 Limit

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

5.10.2 Test Procedure

The Spurious RF conducted emissions compliance of RF radiated emission should be measured by following the guidance in ANSI C63.10-2020 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.

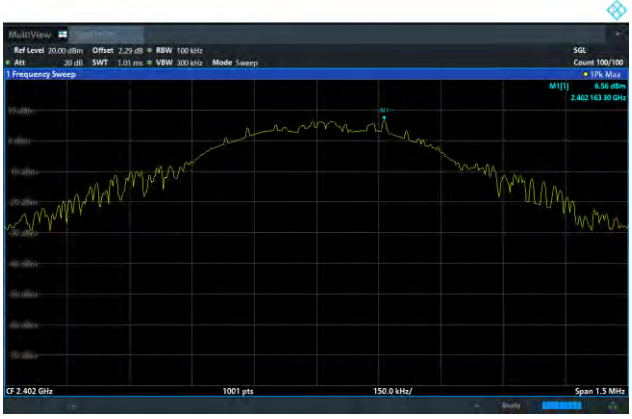
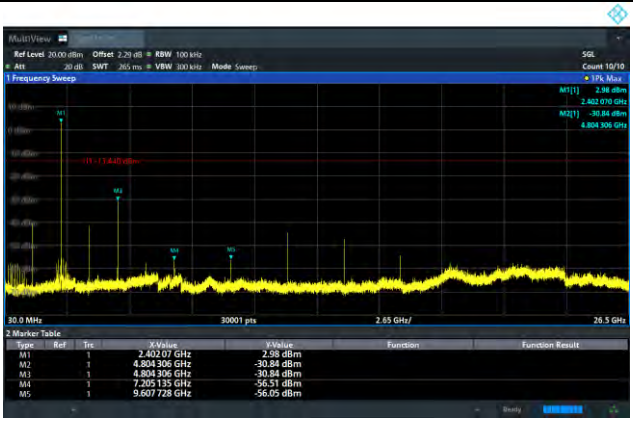
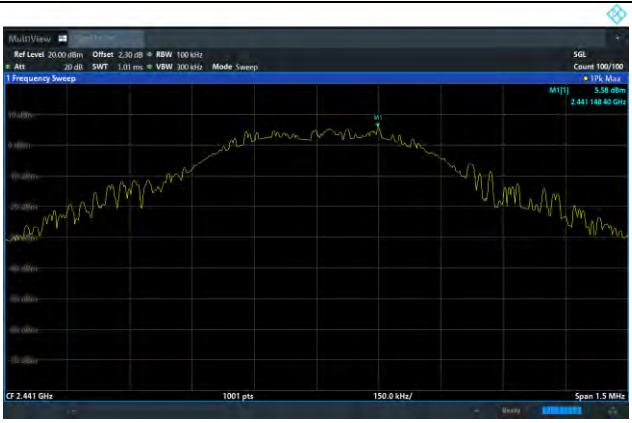
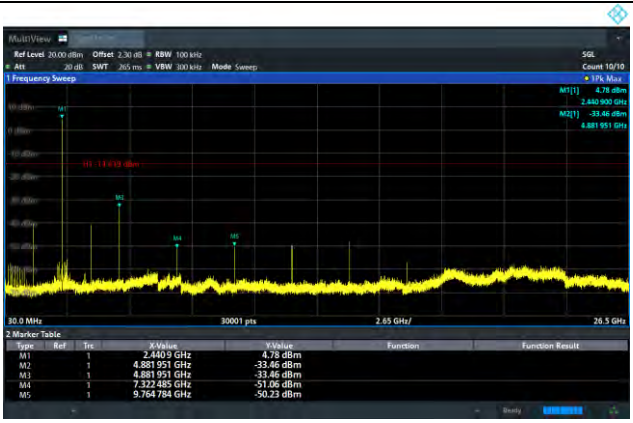
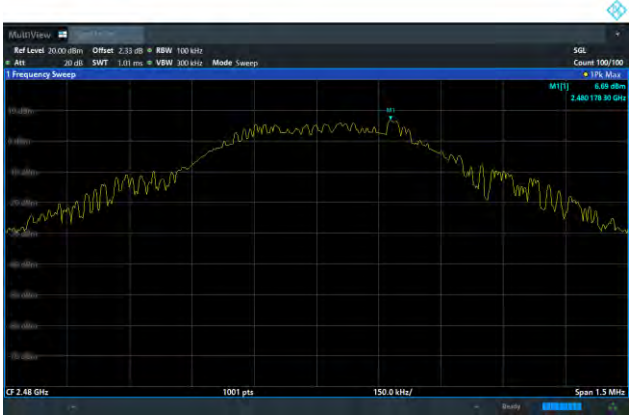
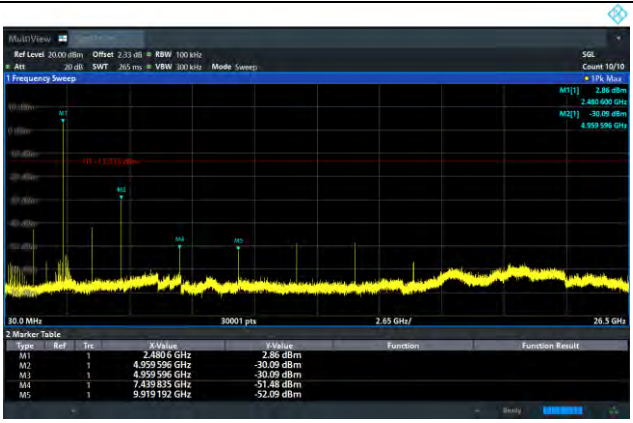
5.10.3 Test Setup



5.10.4 Test Results

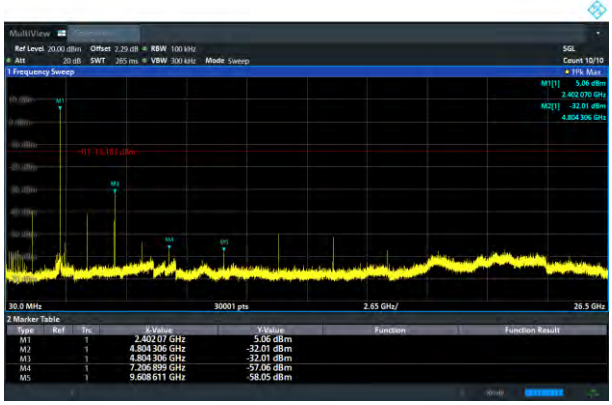
Note:

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.

GFSK on Channel 00	GFSK on Channel 00
	
GFSK on Channel 39	**GFSK on Channel 39**
	
GFSK on Channel 78	**GFSK on Channel 78**
	

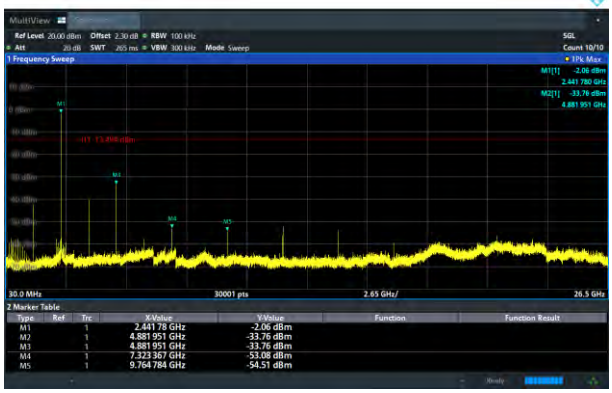
π/4-DQPSK on Channel 00

π/4-DQPSK on Channel 00

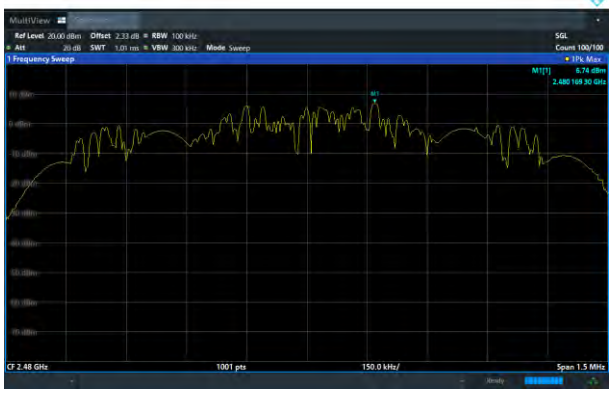


π/4-DQPSK on Channel 39

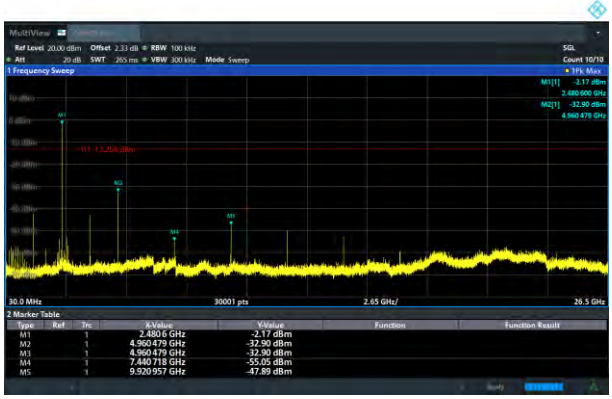
π/4-DQPSK on Channel 39

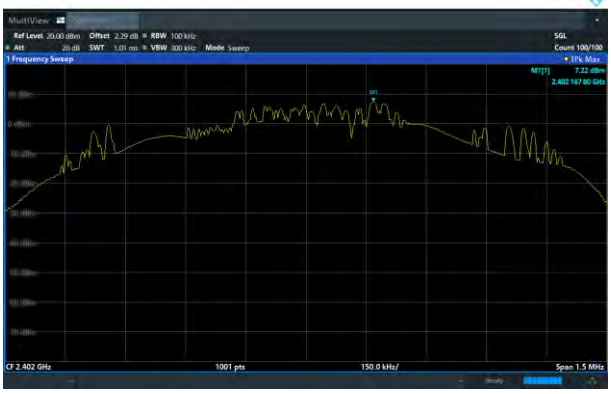
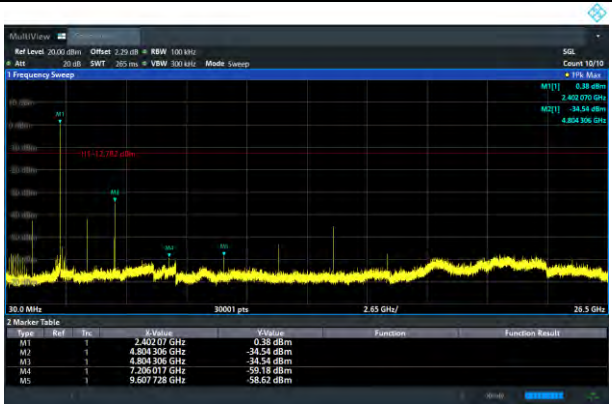
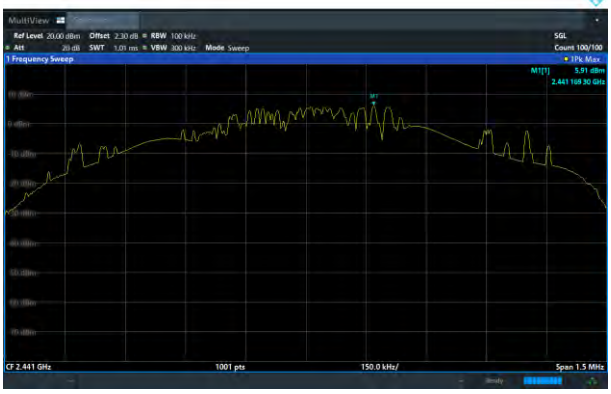
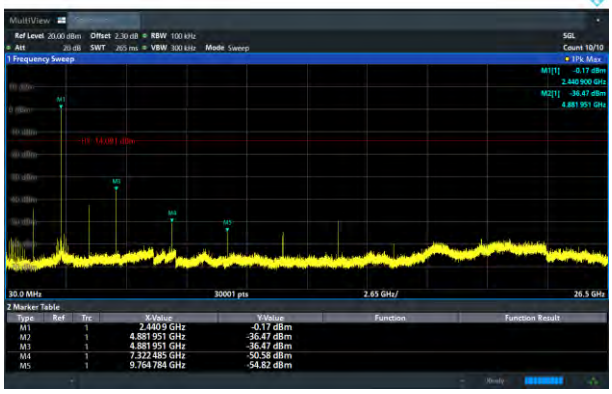
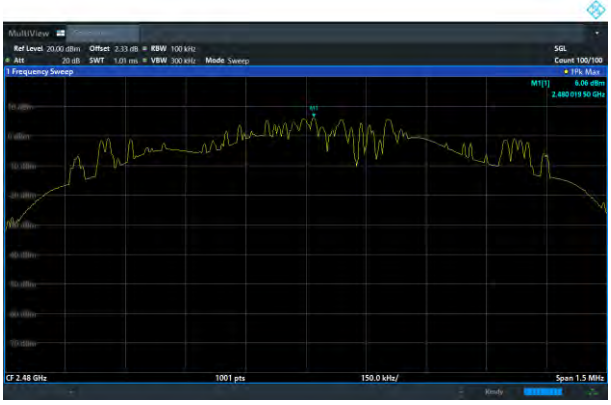
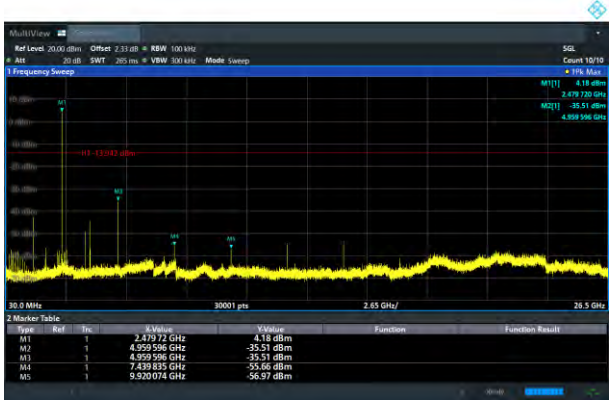


π/4-DQPSK on Channel 78

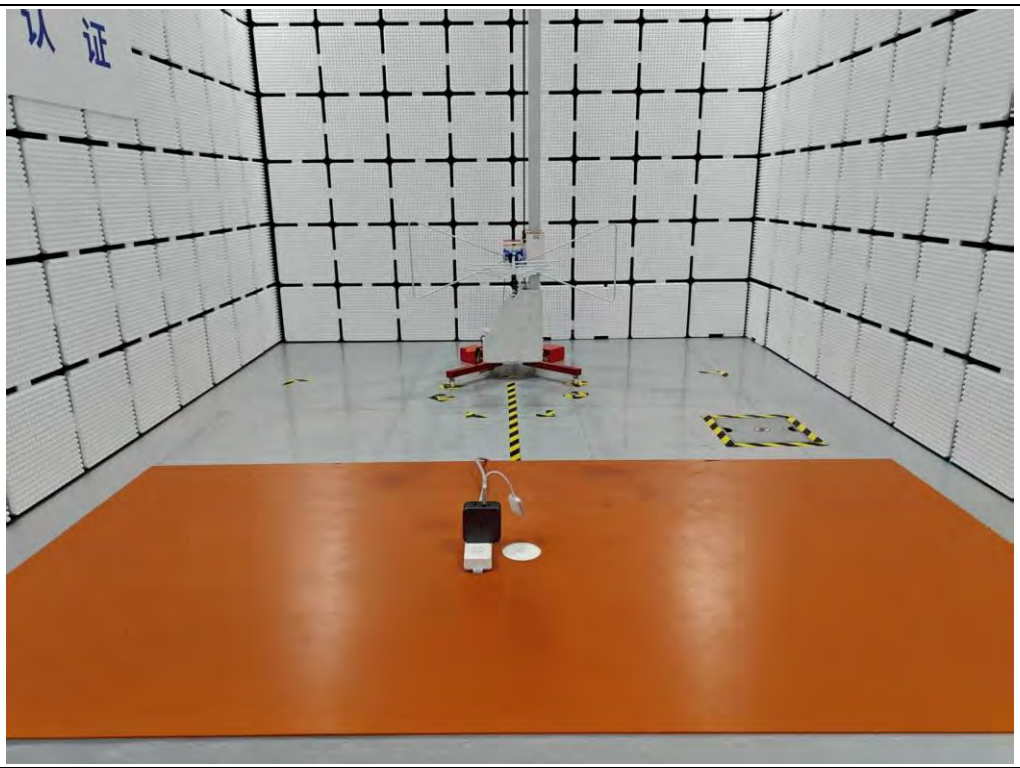


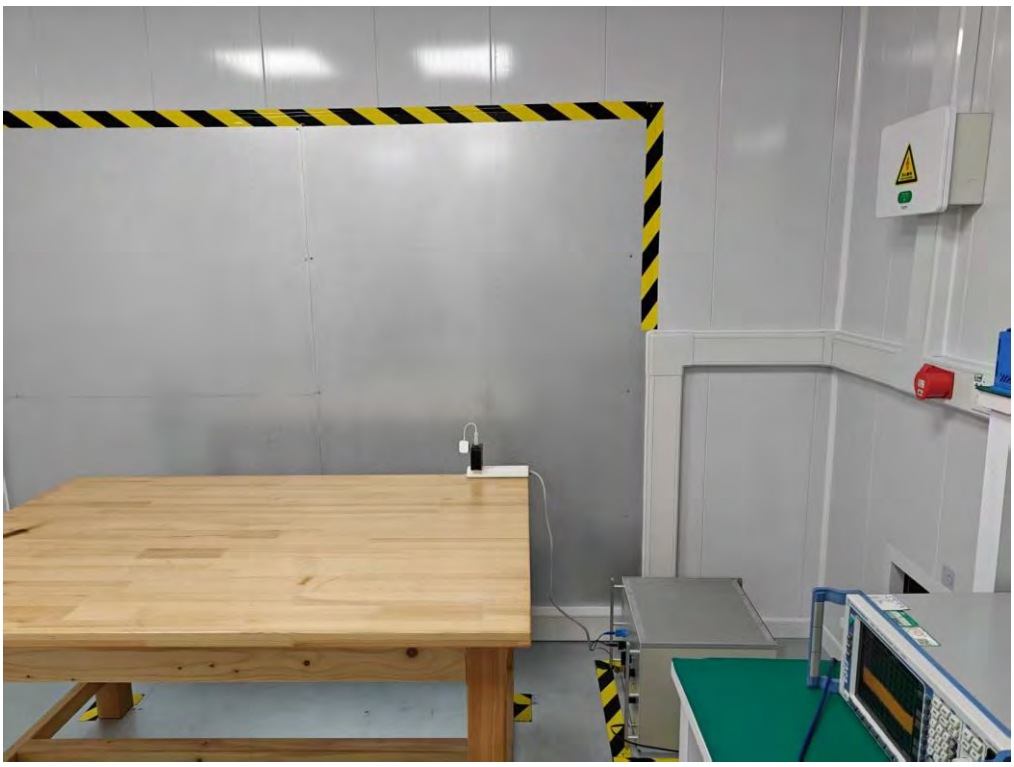
π/4-DQPSK on Channel 78



8DPSK on Channel 00	8DPSK on Channel 00
	
8DPSK on Channel 39	**8DPSK on Channel 39**
	
8DPSK on Channel 78	**8DPSK on Channel 78**
	

6 Photographs of the Test Setup

Radiated Emission Below 1GHz

Radiated Emission Above 1GHz

Conducted Emission


7 Photographs of the EUT

Photo 1

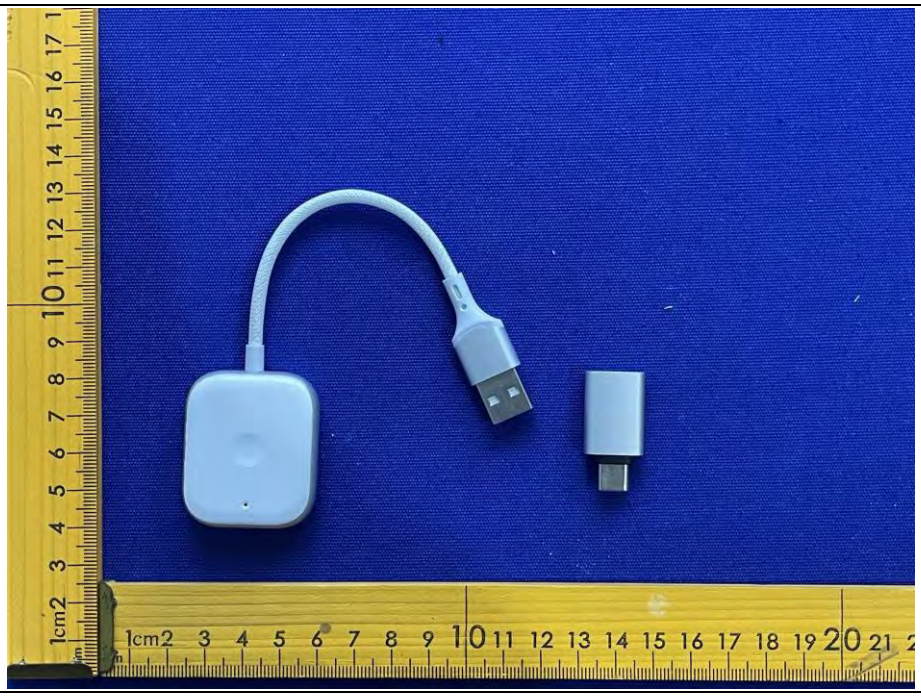



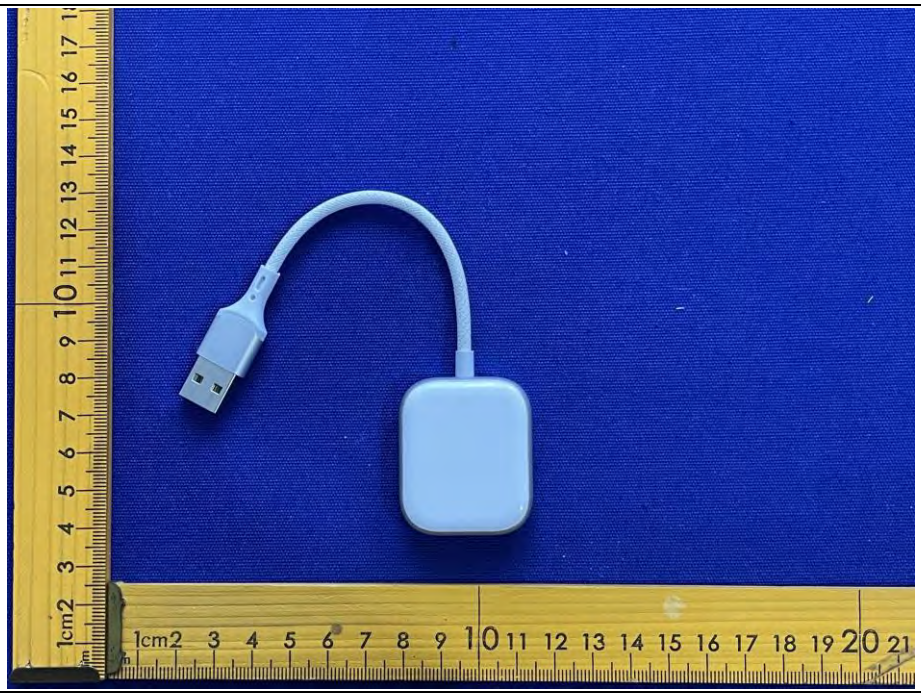
Photo 2


Photo 3

Photo 4

Photo 5

Photo 6

Photo 7

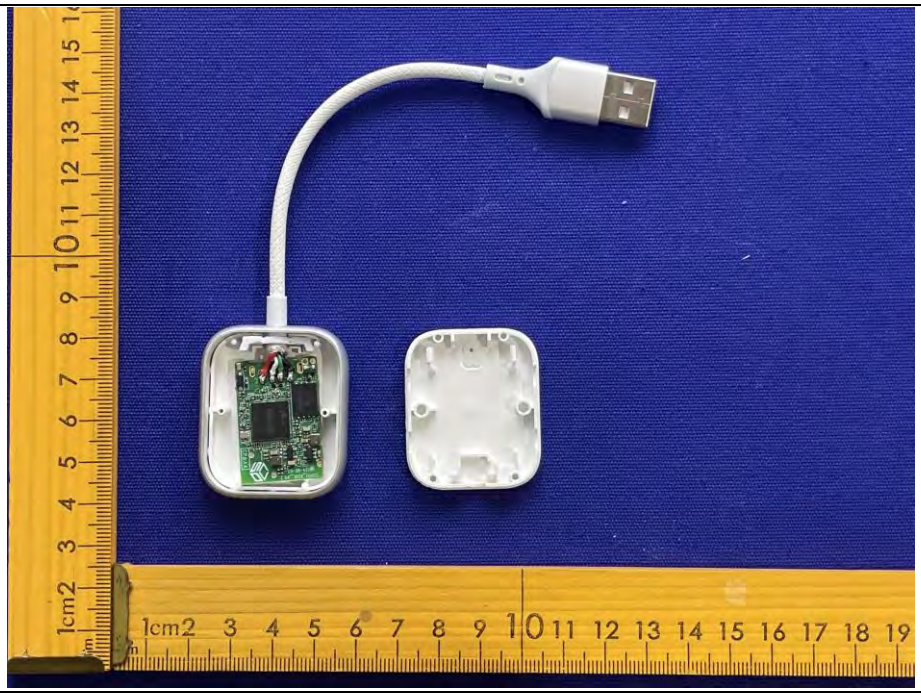


Photo 8

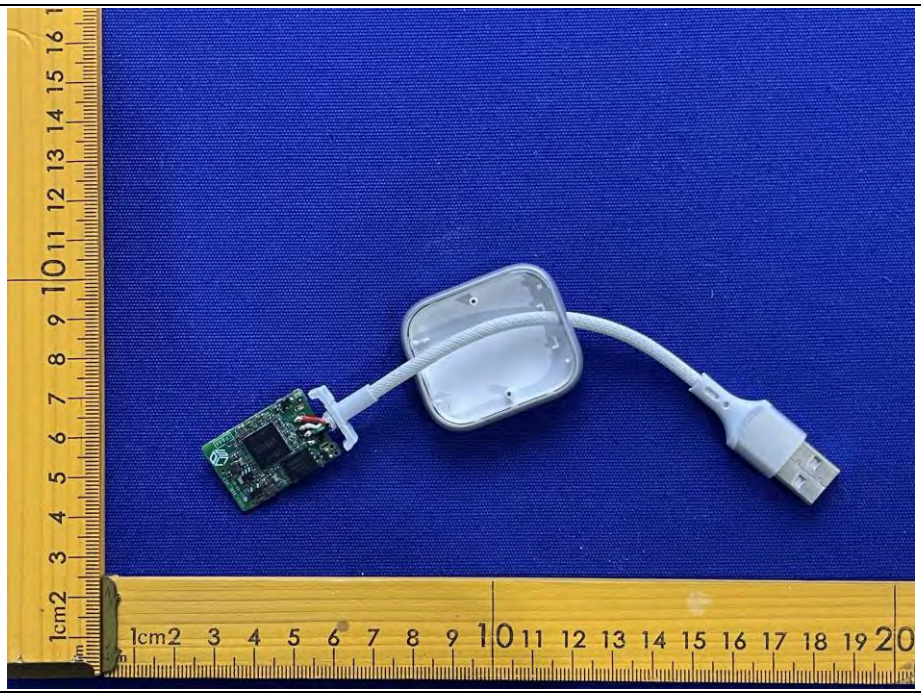


Photo 9

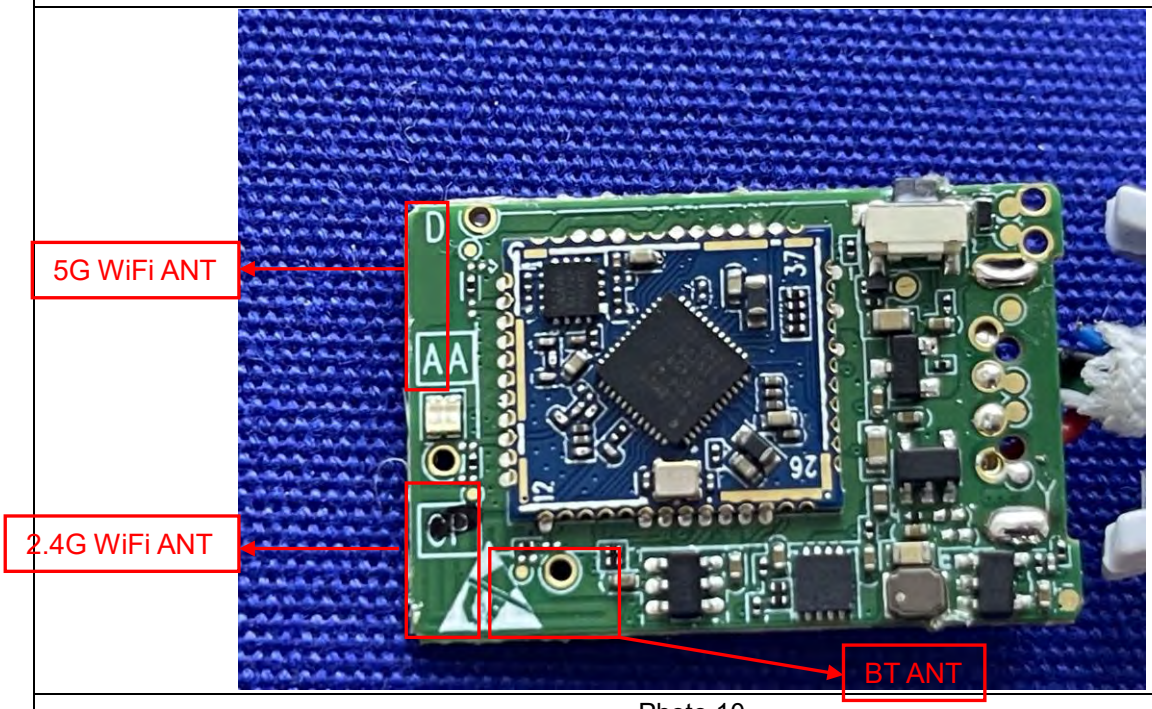


Photo 10

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