
TEST REPORT FOR BLUETOOTH TESTING

Report No.: SRTC2020-9004(F)-20041302(D)

Product Name: Smartphone

Product Model: HLTE103E

Applicant: Hisense International Co., Ltd.

Manufacturer: Hisense Communications Co., Ltd.

Specification: FCC Part 15 Subpart C (2019)

FCC ID: 2ADOBHLTE103E

The State Radio_monitoring_center Testing Center (SRTC)

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1. GENERAL INFORMATION

1.1 Notes of the test report

The test report may only be reproduced or published in full. Reproduction or publication of extracts from the report requires the prior written permission of The State Radio_monitoring_center Testing Center (SRTC). The test results relate only to individual items of the samples which have been tested. The certification and accreditation identifiers used in this report shall not be applicable to the tested or calibrated samples thereof. The manufacturer shall not mark the tested samples or items (or a separate part of the item) with the identifiers of certification and accreditation to mislead relevant parties about the tested samples or items.

1.2 Information about the testing laboratory

Company:	The State Radio_monitoring_center Testing Center (SRTC)
Address:	15th Building, No.30 Shixing Street, Shijingshan District, P.R.China
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Country or Region:	P.R.China
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1.3 Applicant's details

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Country or Region:	China
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Email:	gengruifeng@hisense.com

1.4 Manufacturer's details

Company:	Hisense Communications Co., Ltd.
Address:	218 Qianwangang Road, Qingdao Economic & Technological Development Zone, Qingdao, China
City:	Qingdao
Country or Region:	China
Contacted person:	Deng Tingting
Tel:	+86-532-55753708
Fax:	---
Email:	dengtingting@hisense.com

1.5 Test Environment

Date of Receipt of test sample at SRTC:	2020-04-13
Testing Start Date:	2020-04-13
Testing End Date:	2020-04-24

Environmental Data:	Temperature (°C)	Humidity (%)
Ambient	25	30
Maximum Extreme	50	---
Minimum Extreme	-30	---

Normal Supply Voltage (V d.c.):	3.80
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2 DESCRIPTION OF THE DEVICE UNDER TEST

2.1 Final Equipment Build Status

Frequency Range	2.402GHz~2.480GHz
Number of Channel	79
Modulation Type	GFSK, π /4DQPSK, 8DPSK
Duplex Mode	TDD
Channel Spacing	1MHz
Data Rate	1Mbps, 2 Mbps, 3 Mbps
Power Supply	Battery/Charger
Hardware Version	FS273--MB-V2.1
Software Version	Hisense_HLTE103E_20_S01_01_02_MX05
IMEI	868468040003527
Antenna type	Refer to Note
Antenna connector	Refer to Note

Note: Antenna requirement (FCC part 15.203)

An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

- The antenna(s) of the EUT are permanently attached.
- There are no provisions for connection to an external antenna.

Note: The antenna provide to the EUT, please refer to the following table:

Brand	Model	Antenna gain	Frequency range(GHz)	Antenna type	Connecter Type
N/A	N/A	-0.59dBi	2.402GHz~2.480GHz	Fixed Internal Antenna	N/A

Manufacturers ensure that their designs will not be modified by the user or third parties arbitrary antenna parameters and performance. The EUT complies with the requirement of §15.203.

Note: The equipments have two supplies, are different on the supplier of Ceamear, LCD, Battery, Memory and color. These differences don't affect RF performance.

Main Supply

Part Name	Model	Supplier(Brand)	Description
Camera	BC15314 V0	LUZHOU Chengxiangtong technology CO.,LTD	Front CAM
Camera	BM1A300 V0		
CTP	Y140071B2-R	Dongguan Yuye Communication Technology CO.,ted	
LCD	Y88448	Shenzhen Digital Technology Co.,Ltd	
Battery	LIW380245	SHENZHEN UTILITY POWER SOURCE CO.,LTD	
Memory	KMQE60013M-B318	SAMSUNG	

Secondary Supply

Part Name	Model Name	Supplier(Brand)	Description
Camera	ST-CFKS103A-FF-V1.0	Shenzhen Union Image Co.,Ltd	Front CAM
Camera	ST-CFKS103A-13MBA-V1.0	Shenzhen Union Image Co.,Ltd	
CTP	YX57042TSBA00	Shenzhen AGS Optronics Tech(ShenZhen) , co.,	
LCD	FPC-K1398A-01	SHENZHEN KINGDOM SCIENCE & TECHNOLOGY CO.,LTD	
Battery	LIW380245	ShenzhenAerospaceElectronicCo.,Ltd.	
Memory	KMQE10013M-B318	SAMSUNG	

2.2 Description of Test Modes

79 channels are provided to this EUT:

CHANNEL	FREQ. (MHz)	CHANNEL	FREQ. (MHz)	CHANNEL	FREQ. (MHz)	CHANNEL	FREQ. (MHz)	CHANNEL	FREQ. (MHz)
0	2402	16	2418	32	2434	48	2450	64	2466
1	2403	17	2419	33	2435	49	2451	65	2467
2	2404	18	2420	34	2436	50	2452	66	2468
3	2405	19	2421	35	2437	51	2453	67	2469
4	2406	20	2422	36	2438	52	2454	68	2470
5	2407	21	2423	37	2439	53	2455	69	2471
6	2408	22	2424	38	2440	54	2456	70	2472
7	2409	23	2425	39	2441	55	2457	71	2473
8	2410	24	2426	40	2442	56	2458	72	2474
9	2411	25	2427	41	2443	57	2459	73	2475
10	2412	26	2428	42	2444	58	2460	74	2476
11	2413	27	2429	43	2445	59	2461	75	2477
12	2414	28	2430	44	2446	60	2462	76	2478
13	2415	29	2431	45	2447	61	2463	77	2479
14	2416	30	2432	46	2448	62	2464	78	2480
15	2417	31	2433	47	2449	63	2465		

2.2.1 Test Mode Applicability and Tested Channel Detail

EUT CONFIGURE MODE	APPLICABLE TO				DESCRIPTION
	RE ≥ 1G	RE<1G	PLC	APCM	
GFSK, π/4DQPSK, 8DPSK	√	√	√	√	-

Where

RE ≥ 1G: Radiated Emission above 1GHz

RE<1G: Radiated Emission below 1GHz

PLC: Power Line Conducted Emission

APCM: Antenna Port Conducted Measurement

Radiated Emission Test (Above 1GHz):

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

Following channel(s) was (were) selected for the final test as listed below.

AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TYPE	DATA RATE (Mbps)
0 to 78	39	GFSK, π/4DQPSK, 8DPSK	1Mbps, 2 Mbps, 3 Mbps

Radiated Emission Test (Below 1GHz):

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

Following channel(s) was (were) selected for the final test as listed below.

AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TYPE	DATA RATE (Mbps)
0 to 78	39	GFSK, $\pi/4$ DQPSK, 8DPSK	1Mbps, 2 Mbps, 3 Mbps

Power Line Conducted Emission Test:

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

Following channel(s) was (were) selected for the final test as listed below.

AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TYPE	DATA RATE (Mbps)
0 to 78	39	GFSK, $\pi/4$ DQPSK, 8DPSK	1Mbps, 2 Mbps, 3 Mbps

Antenna Port Conducted Measurement:

This item includes all test value of each mode, but only includes spectrum plot of worst value of each mode.

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

Following channel(s) was (were) selected for the final test as listed below.

AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TYPE	DATA RATE (Mbps)
0 to 78	0, 39, 78	GFSK, $\pi/4$ DQPSK, 8DPSK	1Mbps, 2 Mbps, 3 Mbps

2.3 Duty Cycle of Test Signal

Modulation Type	Duty Cycle
GFSK(DH5)	76.3%
$\pi/4$ DQPSK(DH5)	76.5%
8DPSK(DH5)	76.8%

2.4 EUT operating conditions

The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

2.5 Support Equipment

The following support equipment was used to exercise the DUT during testing:

Equipment	Battery 1
Manufacturer	Shenzhen Utility Power Source Co.,ltd.
Model Number	KS103

Equipment	Battery 2
Manufacturer	ShenzhenAerospaceElectronic Co.,Ltd.
Model Number	KS103

Equipment	Charger
Manufacturer	Shenzhen Tianyin Electronics Co.,Ltd.
Model Number	TPA-97050100UW01

Equipment	Headset
Manufacturer	Dongguan Keling Electronic Technology Co., Ltd.
Model Number	KS103

3 REFERENCE SPECIFICATION

Specification	Version	Title
FCC part15 Subpart C	2019	Intentional radiators
ANSI C63.10	2013	Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices
KDB 558074D01 V05R02r02	April 2, 2019	Guidance for compliance measurements on Digital transmission system, frequency hopping spread spectrum system, and hybrid system devices operating under section 15.247 of the FCC rules

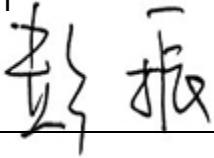

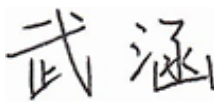
4 KEY TO NOTES AND RESULT CODES

Code	Meaning
PASS	Test result shows that the requirements of the relevant specification have been met.
FAIL	Test result shows that the requirements of the relevant specification have not been met.
N/T	Test case is not tested.

5 RESULT SUMMARY

No.	Test case	Reference	Verdict
1	20dB Bandwidth	15.247(a)(1)(iii)	Pass
2	Channel Separation	15.247(a)(1)	Pass
3	Peak Transmitter Output Power	15.247(b)(1)	Pass
4	Dwell Time	15.247(a)(1)(iii)	Pass
5	Number of Hopping Frequencies	15.247(a)(1)(iii)	Pass
6	Conducted out of band emission measurement	15.247(d)	Pass
7	Band-edge	15.247(d)	Pass
8	Spurious Radiated Emissions	15.205/15.209	Pass
9	AC Power line Conducted Emission	15.207	Pass
10	Antenna requirement	15.203	Pass(refer to section 2.1)

Note: The device is designed according to specifications of SIG, So it has a full support to Medium access protocol and fully compliant with the KDB558074 standard. The device is compliant Pseudorandom hopping, Equal hopping frequency, receiver bandwidth synchronize and have same bandwidth with transmitted signal. And the ability to have adaptive hopping when encountering other signals.

This Test Report Is Issued by: Mr. Peng Zhen 	Checked by: Mr. Li Bin 
Tested by: Miss. Wu Han 	Issued date: 20200506

6 TEST RESULT

6.1 20dB Bandwidth

6.1.1 Ambient condition

Temperature	Relative humidity	Pressure
25°C	30%	101.5kPa

6.1.2 Test limit

FCC Part15.247 (a.1.iii)

The bandwidth at 20dB down from the highest in-band spectral density is measured with a spectrum analyzer connected to the receive antenna while the EUT is operating in transmission mode at the appropriate frequencies.

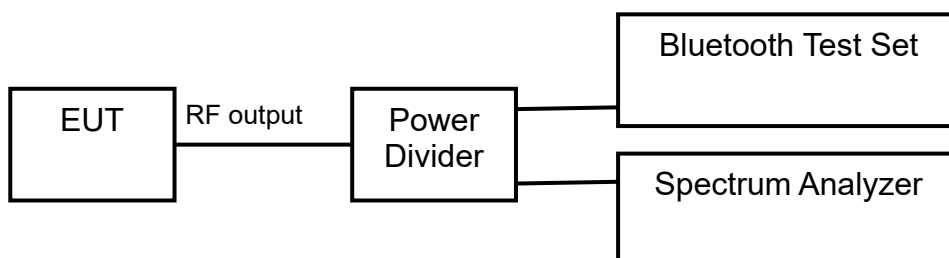
6.1.3 Test Procedure Used

ANSI C63.10-2013 – Section 6.9.2

6.1.4 Test settings

1. The signal analyzers' automatic bandwidth measurement capability of the spectrum analyzer was used to perform the 20dB bandwidth measurement. The "X" dB bandwidth parameter was set to X = 20. The bandwidth measurement was not influenced by any intermediate power nulls in the fundamental emission.
2. RBW = 1 – 5% OBW
3. VBW \geq 3 x RBW
4. Reference level set to keep signal from exceeding maximum input mixer level for linear operation.
5. Detector = Peak
6. Trace mode = max hold
7. Sweep = auto couple
8. The trace was allowed to stabilize

6.1.5 Test Setup



6.1.6 Test result

The test results are shown in Appendix A.

6.2 Channel Separation

6.2.1 Ambient condition

Temperature	Relative humidity	Pressure
25°C	30%	101.5kPa

6.2.2 Test limit

FCC Part15.247 (a) (1)

Measurement is made with EUT operating in hopping mode. The minimum permissible channel separation for this system is 2/3 the value of the 20dB BW.

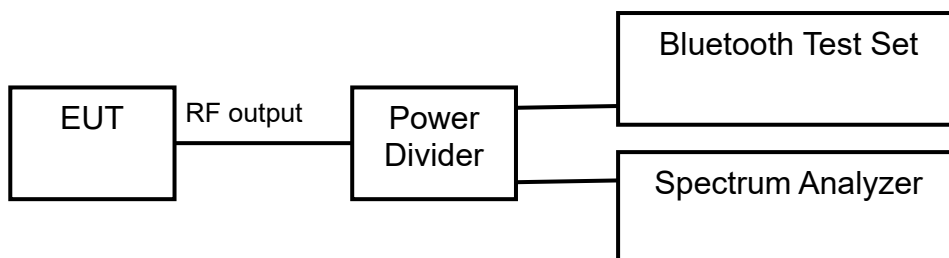
6.2.3 Test Procedure Used

ANSI C63.10-2013 – Section 7.8.2

6.2.4 Test Settings

1. Span = Wide enough to capture peaks of two adjacent channels
2. RBW = 30% of channel spacing. Adjust as necessary to best identify center of each individual channel
3. VBW \geq RBW
4. Sweep = Auto
5. Detector = Peak
6. Trace mode = max hold
7. The trace was allowed to stabilize.
8. Marker-delta function used to determine separation between peaks of the adjacent channels

6.2.5 Test Setup



6.2.6 Test result

The test results are shown in Appendix A.

6.3 Peak Transmitter Output Power

6.3.1 Ambient condition

Temperature	Relative humidity	Pressure
25°C	30%	101.5kPa

6.3.2 Test limit

FCC Part 15.247(b) (1)

For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band:1 watt.

Used conversion factor: Limit (dBm) = 10 log (Limit (W)/1mW) →

Modulation type	GFSK	$\pi/4$ DQPSK	8DPSK
Maximum Output Power	30.0dBm	30.0dBm	30.0dBm

For all other frequency hopping systems in the 2400-2483.5 MHz band:0.125 watts.

Used conversion factor: Limit (dBm) = 10 log (Limit (W)/1mW) →

Modulation type	GFSK	$\pi/4$ DQPSK	8DPSK
Maximum Output Power	21.0dBm	21.0dBm	21.0dBm

6.3.3 Test Procedure Used

ANSI C63.10-2013 – Section 7.8.5

ANSI C63.10-2013 – Section 11.9.2.3.2 method AVGPM-G

6.3.4 Test Settings

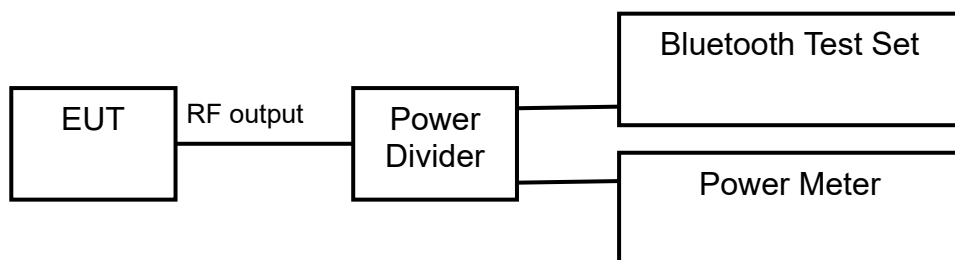
Peak Power Measurement

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 the occupied bandwidth.

Method AVGPM-G (Average Power Measurement)

Average power measurements were performed only when the EUT was transmitting at its maximum power control level using a broadband power meter with a pulse sensor. The power meter implemented triggering and gating capabilities which were set up such that power measurements were recorded only during the ON time of the transmitter. The trace was averaged over 100 traces to obtain the final measured average power.

6.3.5 Test Setup



6.3.6 Test result

The test results are shown in Appendix A.

6.4 Dwell Time

6.4.1 Ambient condition

Temperature	Relative humidity	Pressure
25°C	30%	101.5kPa

6.4.2 Test Description

The Equipment under Test (EUT) was set up in a shielded room to perform the dwell time measurements.

The EUT was connected to the spectrum analyzer and Bluetooth test set via a power splitter with a known loss.

The time slot length is measured of three different packet types which are available in the Bluetooth technology. Those are DH1, DH3 and DH5 packets. The dwell time is calculated by:

Dwell time = time slot length * hop rate * 31.6/ number of hopping channels with:

- hop rate=1600/2 * 1/s for DH1 packets =800
- hop rate=1600/4 * 1/s for DH3 packets =400
- hop rate=1600/6 * 1/s for DH5 packets =266.67
- Number of hopping channels=79
- 31.6 s=0.4 seconds multiplied by the number of hopping channels=0.4s * 79

6.4.3 Test limit

FCC Part 15.247(a) (1) (iii)

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

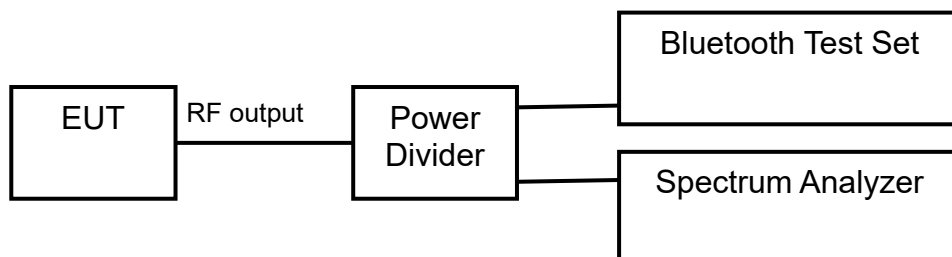
The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

6.4.4 Test Settings

ANSI C63.10-2013 Section 7.8.4

1. Span = zero span, centered on a hopping channel
2. RBW ≤ channel spacing and >> 1/T, where T is expected dwell time per channel
3. Sweep = as necessary to capture entire dwell time. Second plot may be required to demonstrate two successive hops on a channel
4. Trigger is set with appropriate trigger delay to place pulse near the center of the plot
5. Detector = peak
6. Trace mode = max hold
7. Marker-delta function used to determine transmit time per hop

6.4.5 Test Setup



6.4.6 Test result

The test results are shown in Appendix A.

6.5 Number of Hopping Frequencies

6.5.1 Ambient condition

Temperature	Relative humidity	Pressure
25°C	30%	101.5kPa

6.5.2 Test Description

The Equipment under Test (EUT) was set up in a shielded room to perform the number of hopping frequencies measurement. The EUT was connected to the spectrum analyzer and Bluetooth test set via a power splitter with a known loss.

6.5.3 Test limit

FCC Part15.247 (a) (1) (iii)

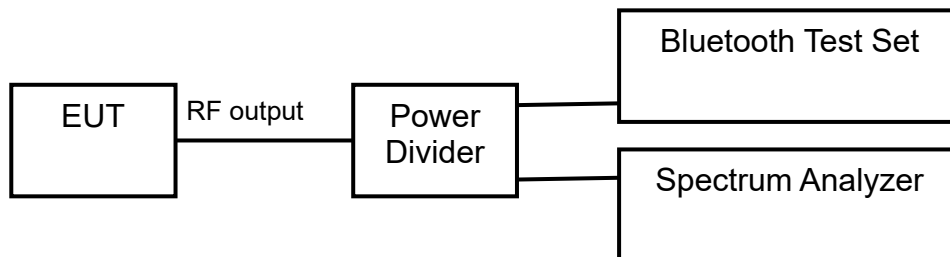
Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels.

6.5.4 Test Settings

ANSI C63.10-2013 Section 7.8.3

1. Span = frequency of band of operation (divided into two plots)
2. RBW < 30% of channel spacing or 20dB bandwidth, whichever is smaller.
3. VBW ≥ RBW
4. Sweep = auto
5. Detector = peak
6. Trace mode = max hold
7. Trace was allowed to stabilize

6.5.5 Test Setup



6.5.6 Test result

The test results are shown in Appendix A.

6.6 Conducted out of band emission measurement

6.6.1 Ambient condition

Temperature	Relative humidity	Pressure
25°C	30%	101.5kPa

6.6.2 Test limit

FCC Part15.247 (d)

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum 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.

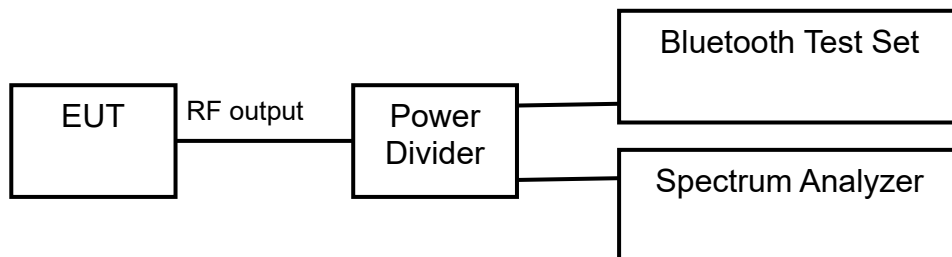
6.6.3 Test Procedure Used

ANSI C63.10-2013 – Section 7.8.8

6.6.4 Test Settings

1. Start frequency was set to 30MHz and stop frequency was set to 26GHz
2. RBW = 1MHz* (See note below)
3. VBW = 3MHz
4. Detector = Peak
5. Trace mode = max hold
6. Sweep time = auto couple
7. The trace was allowed to stabilize

6.6.5 Test Setup



6.6.6 Test result

The test results are shown in Appendix A .

The spectrum plots are attached on the following images. D1 line indicates the highest level, D2 line indicates the 20dB offset below D1. It shows compliance with the requirement.

6.7 Band-edge measurement

6.7.1 Ambient condition

Temperature	Relative humidity	Pressure
25°C	30%	101.5kPa

6.7.2 Test limit

FCC Part15.247 (d)

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum 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.

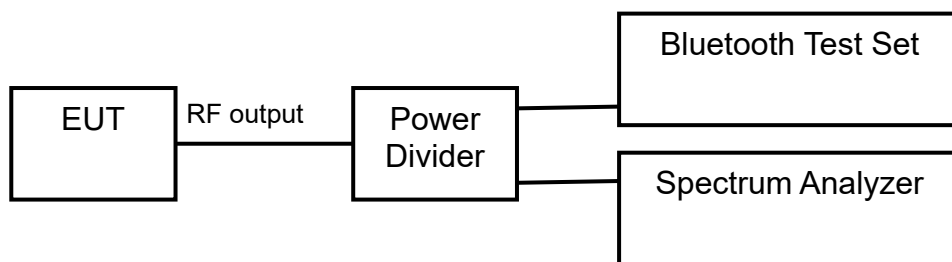
6.7.3 Test Procedure Used

ANSI C63.10-2013 – Section 6.10.4

6.7.4 Test Settings

1. Start and stop frequency were set such that the band edge would be placed in the center of the plot
2. Span was set large enough so as to capture all out of band emissions near the band edge
3. RBW = 100 kHz
4. VBW = 300 kHz
5. Detector = Peak
6. Number of sweep points $\geq 2 \times \text{Span}/\text{RBW}$
7. Trace mode = max hold
8. Sweep time = auto couple
9. The trace was allowed to stabilize

6.7.5 Test Setup



6.7.6 Test result

The test results are shown in Appendix A.

The spectrum plots are attached on the following images. D1 line indicates the highest level, D2 line indicates the 20dB offset below D1. It shows compliance with the requirement.

6.8 Spurious Radiated Emissions

6.8.1 Ambient condition

Temperature	Relative humidity	Pressure
25°C	30%	101.5kPa

6.8.2 Test Description

All out of band radiated spurious emissions are measured with a spectrum analyzer connected to a receive antenna while the EUT is operating at maximum power and at the appropriate frequencies. Only the radiated emissions of the configuration that produced the worst case emissions are reported in this section.

6.8.3 Test limit

Part15.205, 15.209, 15.247(d)

All out of band emissions appearing in a restricted band as specified in Section 15.205 of the Title 47 CFR must not exceed the limits shown in below Table per Section 15.209. The spectrum shall be investigated from the lowest radio frequency signal generated in the device

Frequency [MHz]	Field strength [μV/m]	Measured 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

Radiated Limits

Part15.35(b):

There is also a limit on the radio frequency emissions, as measured using instrumentation with a peak detector function, corresponding to 20 dB above the maximum permitted average limit

Used conversion factor: Limit (dBμV/m) = 20 log (Limit (μV/m)/1μV/m)

Frequency [MHz]	Detector	Unit (dBμV/m)
30~88	Quasi-peak	40.0
88~216	Quasi-peak	43.5
216~960	Quasi-peak	46.0
960~1000	Quasi-peak	54.0
1000~5th harmonic of the highest frequency or 40GHz, whichever is lower	Average	54.0
	Peak	74.0

Conversion Radiated limits

6.8.4 Test Procedure Used

KDB 558074 D01 v05r02 – Section 12.2.7

For Radiated emission below 30MHz

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. Both X and Y axes of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to Quasi-Peak Detect Function and recorded the reading with Maximum Hold Mode.

NOTE:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer complied the following setting:

Frequency	RBW
9-150kHz	200-300Hz
0.15-30MHz	9-10kHz

For Radiated emission above 30MHz

- a. The EUT was placed on the top of a rotating table 0.8 meters (for 30MHz ~ 1GHz) / 1.5 meters (for above 1GHz) above the ground in chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to quasi-peak detect function and recorded the reading with Maximum Hold Mode when the test frequency is below 1 GHz.
- f. The test-receiver system was set to peak and average detector and recorded the reading with Maximum Hold Mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

For the radiated emission test above 1GHz:

Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane.

NOTE:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Average detection (AV) at frequency above 1GHz. If duty cycle of test signal is < 98%, the duty factor need added to measured value.
4. All modes of operation were investigated and the worst-case emissions are reported.

6.8.5 Test Settings

Average Field Strength Measurements per Section 12.2.7 of KDB 558074 (Part 15.35)

Frequency	Detector
< 1000MHz	Quasi-peak
>1000MHz	Peak and average

Peak Field Strength Measurements per Section 12.2.7 of KDB 558074 (Part 15.35)

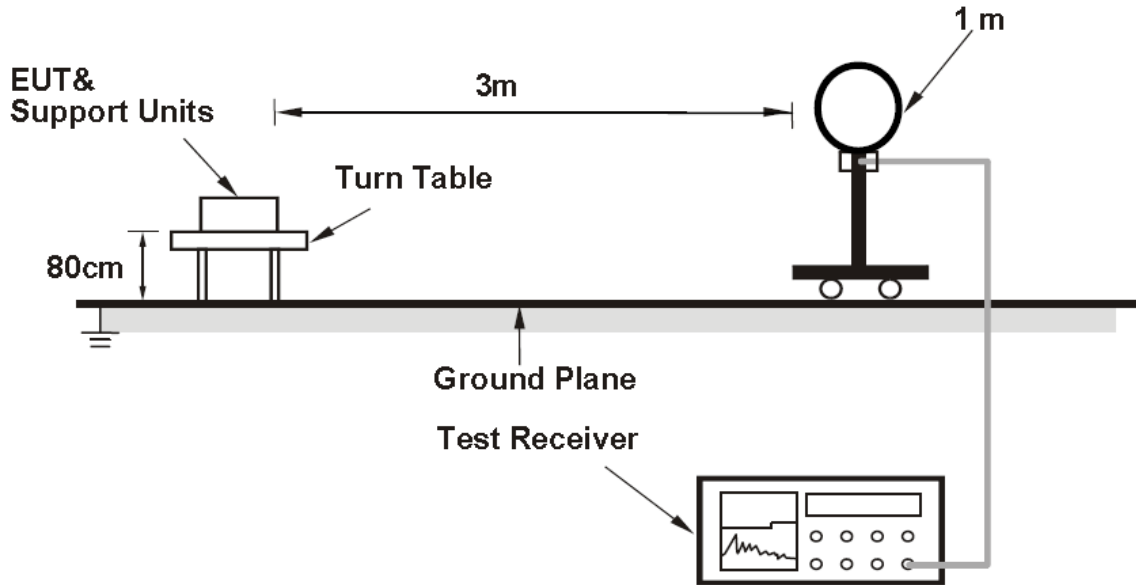
1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW is set depending on measurement frequency, as specified in following table

Frequency	RBW
9-150kHz	200-300Hz
0.15-30MHz	9-10kHz
30-1000MHz	100-120kHz
>1000MHz	1MHz

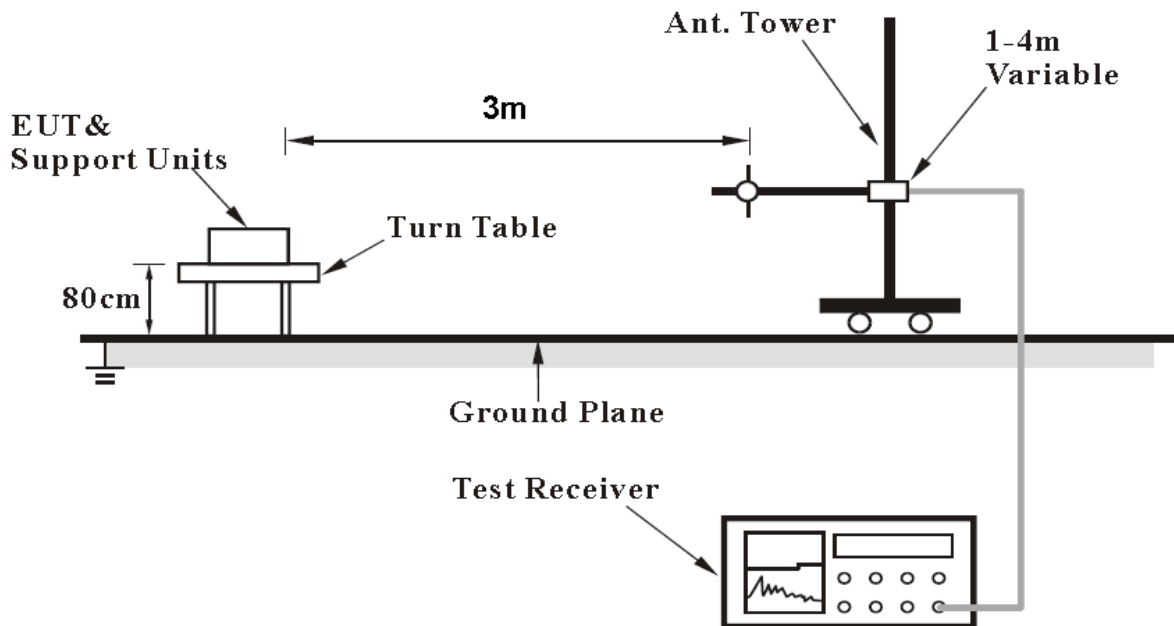
3. VBW = 3MHz
4. Detector = peak
5. Sweep time = auto couple
6. Trace mode = max hold
7. Trace was allowed to stabilize

6.8.6 Test Setup

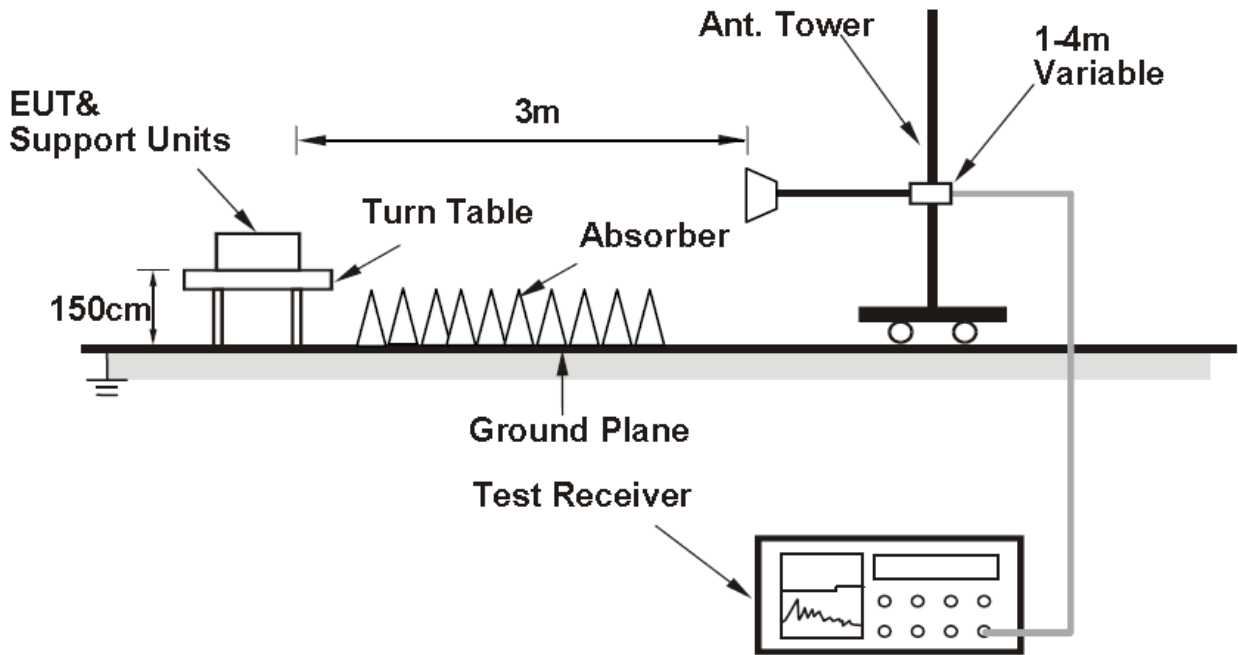
For Radiated emission below 30MHz



For Radiated emission 30MHz to 1GHz



For Radiated emission above 1GHz



6.8.7 Test result

The test results are shown in Appendix B.

6.9 AC Power line Conducted Emission

6.9.1 Ambient condition

Temperature	Relative humidity	Pressure
25°C	30%	101.5kPa

6.9.2 Test limit

FCC Part15.207

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56 *	56 to 46 *
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency.

The measurement is made according to ANSI C63.10-2013

6.9.3 Test Procedures

a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument.

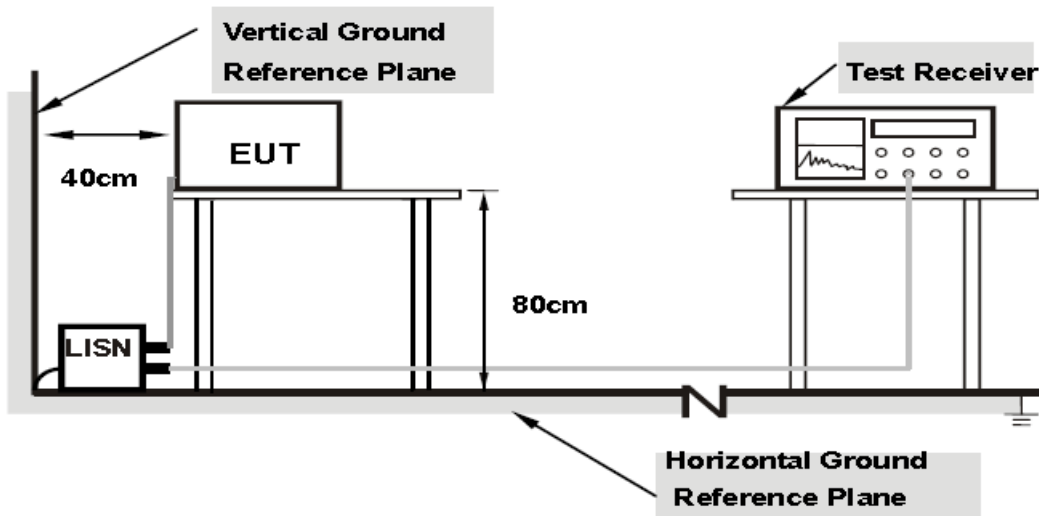
b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.

c. The frequency range from 150 kHz to 30MHz was searched. Emission levels under (Limit - 20dB) were not recorded.

NOTE: The resolution bandwidth and video bandwidth of test receiver is 9kHz for quasi-peak detection (QP) and average detection (AV) at frequency 0.15MHz-30MHz.

The EUT shall test under the power AC120V/60Hz.

6.9.4 Test Setup



For the actual test configuration, please refer to the attached file (Test Setup Photo).

6.9.5 Test result

The test results are shown in Appendix B.

7 MEASUREMENT UNCERTAINTIES

Items	Uncertainty	
Occupied Bandwidth	3kHz	
Peak power output	0.67dB	
Band edge compliance	1.20dB	
Spurious emissions	30MHz~1GHz	2.83dB
	1GHz~12.75GHz	2.50dB
	12.75GHz~25GHz	2.75dB

8 TEST EQUIPMENTS

No.	Name/ Model	Manufacturer	S/N	Cal date	Cal Due date
1.	Spectrum Analyzer FSV	ROHDE&SCHWARZ	101065	2019.08.20	2020.08.19
2.	Bluetooth Test Set MT8852B	Anritsu	1142010	2020.03.01	2021.02.28
3.	Power Divider 6007	Weinschel	6007-GJ-1	2019.08.20	2020.08.19
4.	Power Meter E4416A	Agilent	MY52370013	2020.03.01	2021.02.28
5.	Power Sensor E9327A	Agilent	MY52420006	2020.03.01	2021.02.28
6.	23.18m×16.88m×9.60m Semi-Anechoic Chamber	FRANKONIA	---	----	----
7.	Turn table Diameter:5m	FRANKONIA	----	----	----
8.	Antenna master SAC(MA4.0)	MATURO	----	----	----
9.	9.080m×5.255m×3.525m Shielding room	FRANKONIA	----	----	----
10.	HF 907 Double-Ridged Waveguide Horn Antenna	R&S	100512	2019.08.20	2020.08.19
11.	3160-09 Receive antenna	SCHWARZ-BECK	002058-002	2019.08.20	2020.08.19
12.	ESI 40 EMI test receiver	R&S	100015	2019.08.20	2020.08.19
13.	ESCS30 EMI test receiver	R&S	100029	2019.08.20	2020.08.19
14.	HL562 Receive antenna	R&S	100167	2019.08.20	2020.08.19
15.	ENV216 AMN	R&S	3560.6550.12	2019.08.20	2020.08.19

APPENDIX A – TEST DATA OF CONDUCTED EMISSION

20dB Bandwidth

Offset 11.2dB = Attenuator 10dB+ Temporary antenna connector loss 0.2dB+ Cable loss 1dB

Modulation type: GFSK

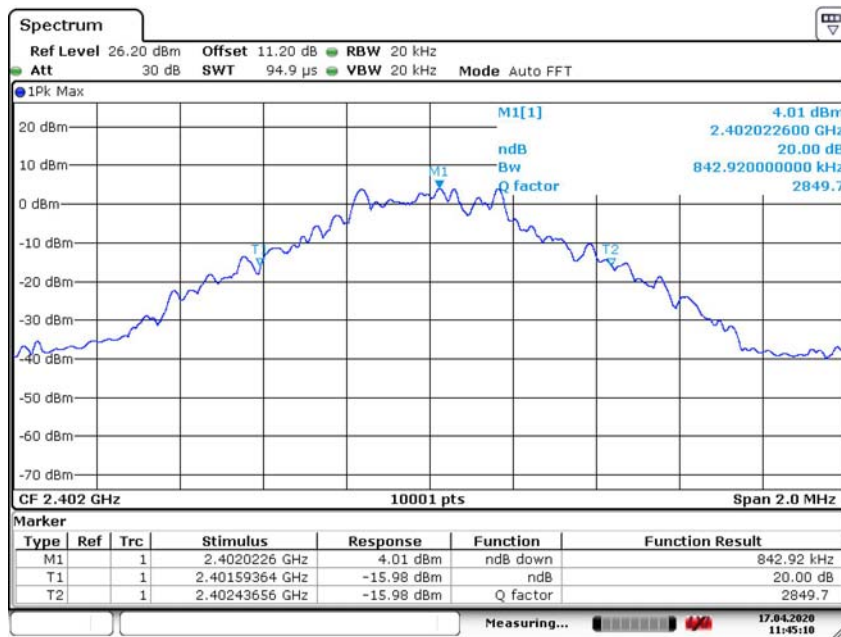
Carrier frequency (MHz)	Channel No.	20 dB bandwidth(kHz)
2402	0	842.92
2441	39	842.92
2480	78	841.52

Modulation type: $\pi/4$ DQPSK

Carrier frequency (MHz)	Channel No.	20 dB bandwidth(kHz)
2402	0	1262.47
2441	39	1262.07
2480	78	1261.47

Modulation type: 8DPSK

Carrier frequency (MHz)	Channel No.	20 dB bandwidth(kHz)
2402	0	1265.07
2441	39	1266.27
2480	78	1265.47



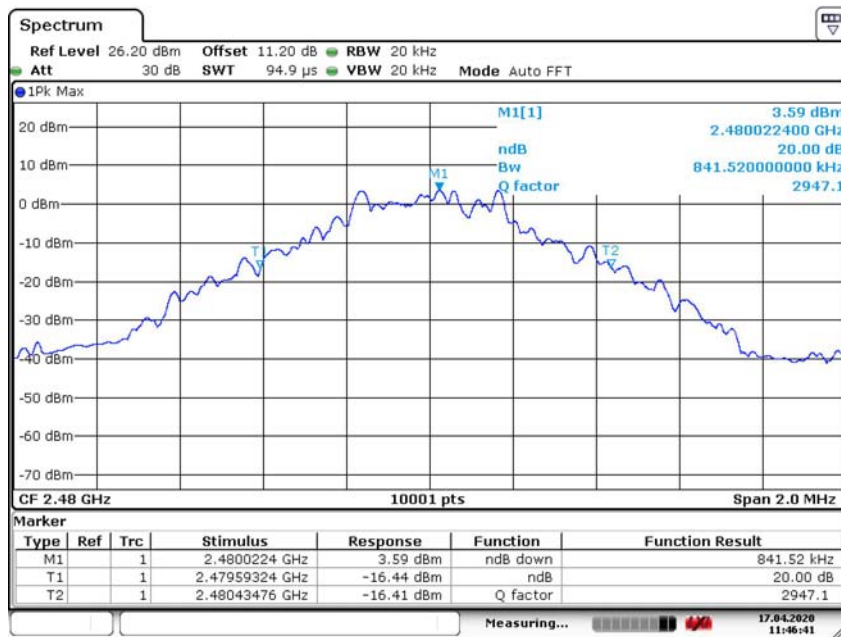
Date: 17.APR.2020 11:45:10

Carrier frequency (MHz): 2402
Channel No.:0
Modulation type: GFSK



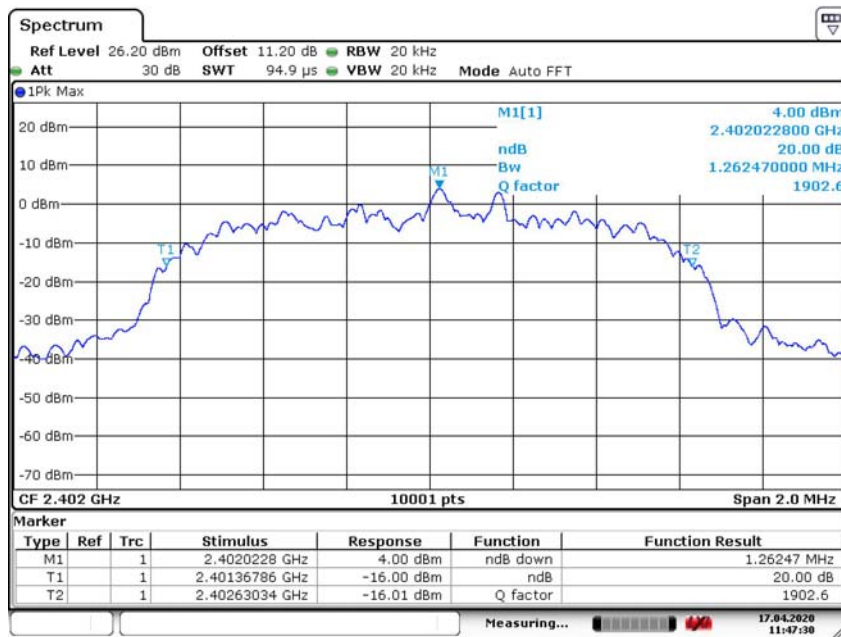
Date: 17.APR.2020 11:46:01

Carrier frequency (MHz): 2441
Channel No.:39
Modulation type: GFSK



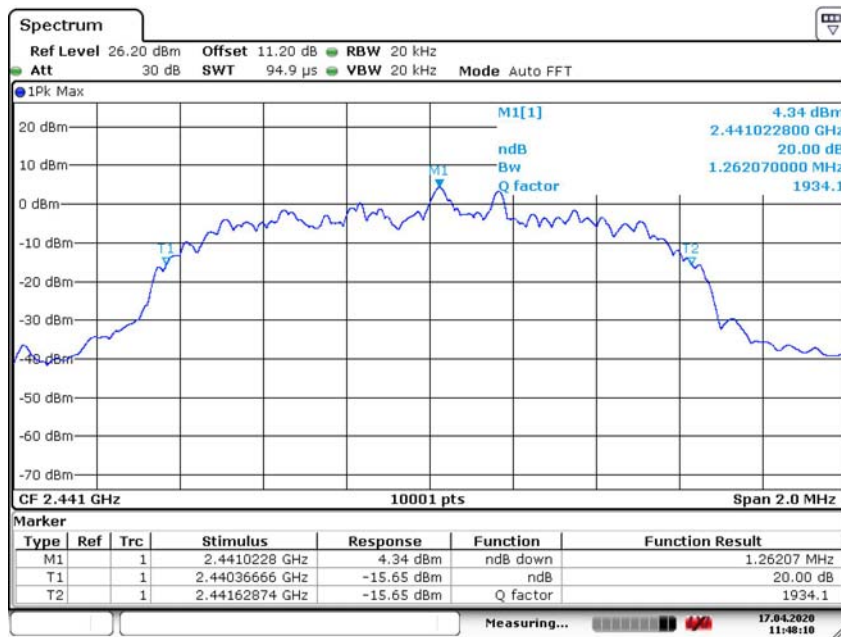
Date: 17.APR.2020 11:46:42

Carrier frequency (MHz): 2480
Channel No.:78
Modulation type: GFSK



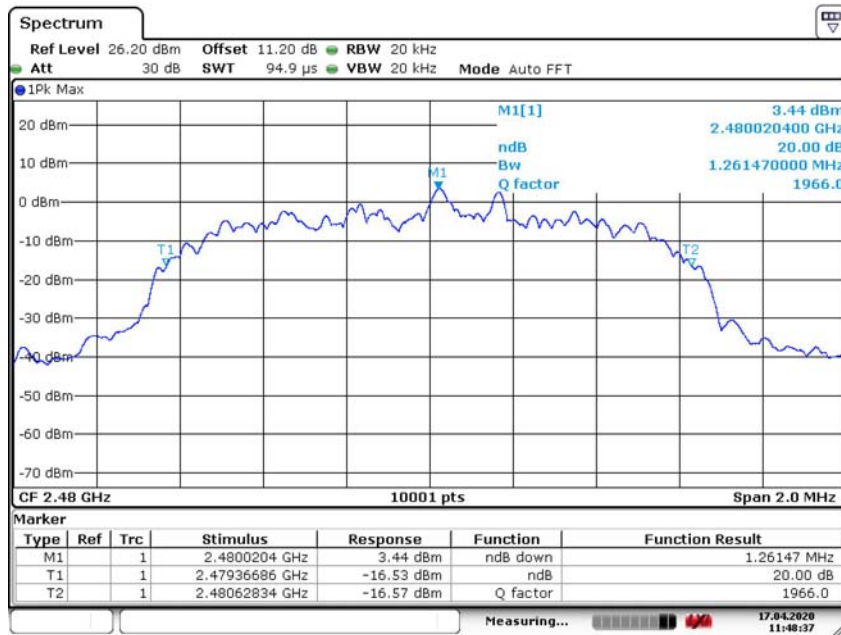
Date: 17.APR.2020 11:47:30

Carrier frequency (MHz): 2402
Channel No.:0
Modulation type: π/4DQPSK



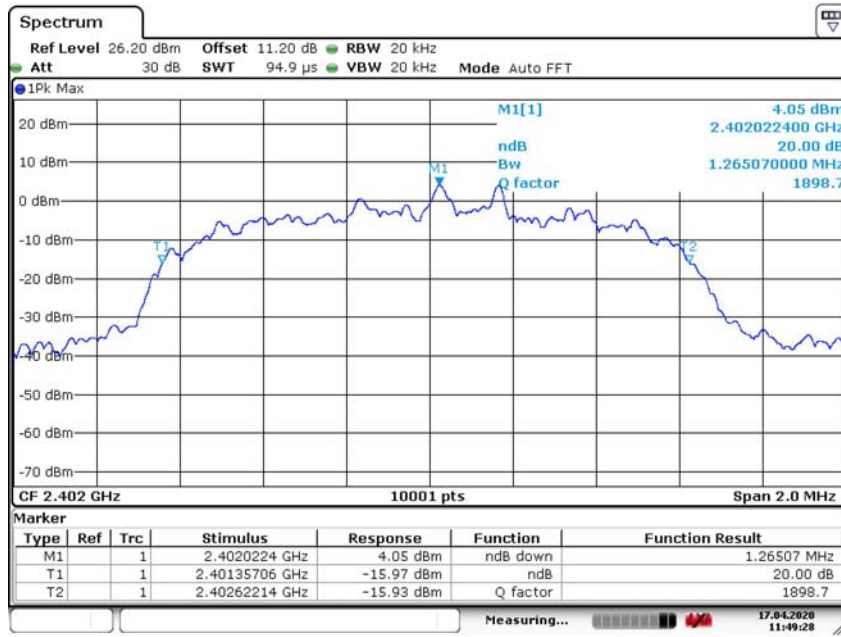
Date: 17.APR.2020 11:48:11

Carrier frequency (MHz): 2441
Channel No.:39
Modulation type: $\pi/4$ DQPSK



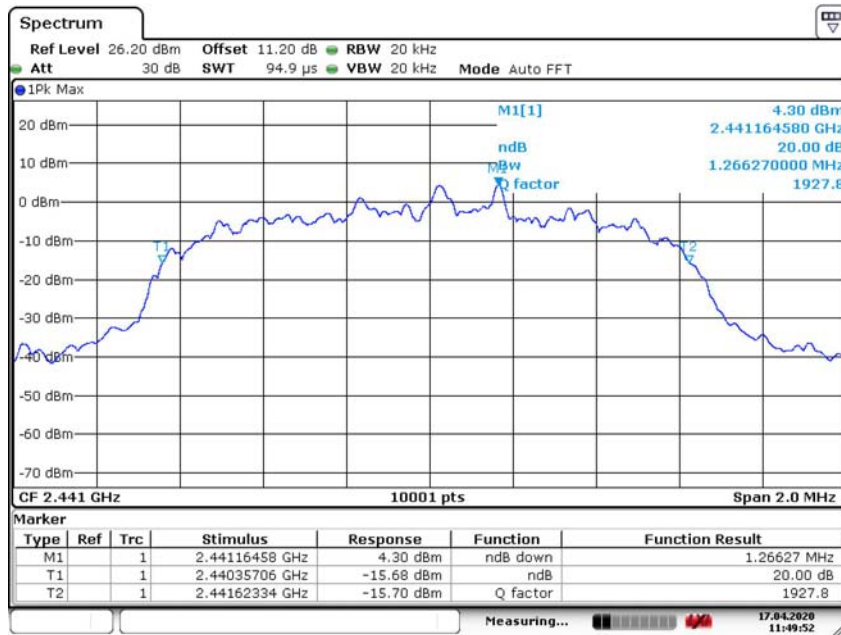
Date: 17.APR.2020 11:48:38

Carrier frequency (MHz): 2480
Channel No.:78
Modulation type: $\pi/4$ DQPSK



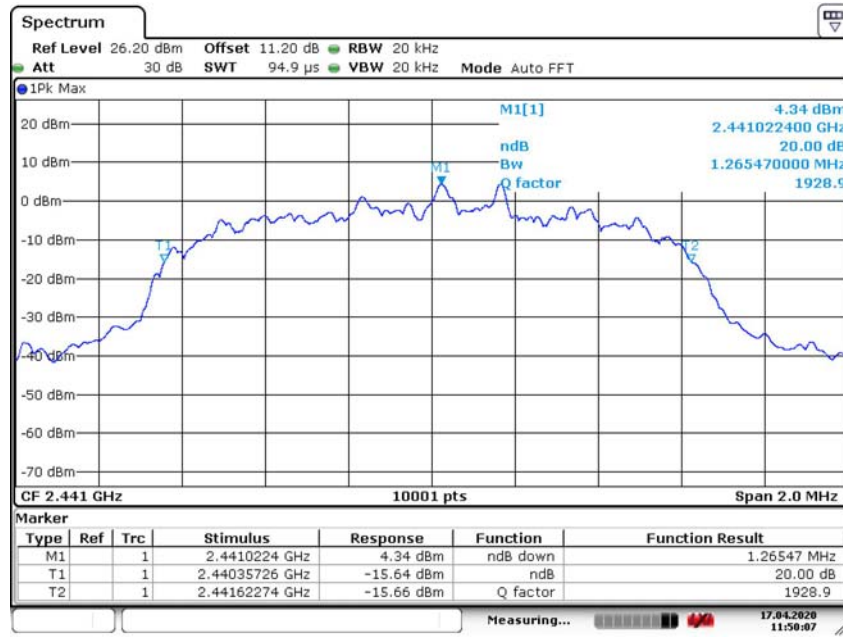
Date: 17.APR.2020 11:49:27

Carrier frequency (MHz): 2402
Channel No.:0
Modulation type: 8DPSK



Date: 17.APR.2020 11:49:52

Carrier frequency (MHz): 2441
Channel No.:39
Modulation type: 8DPSK



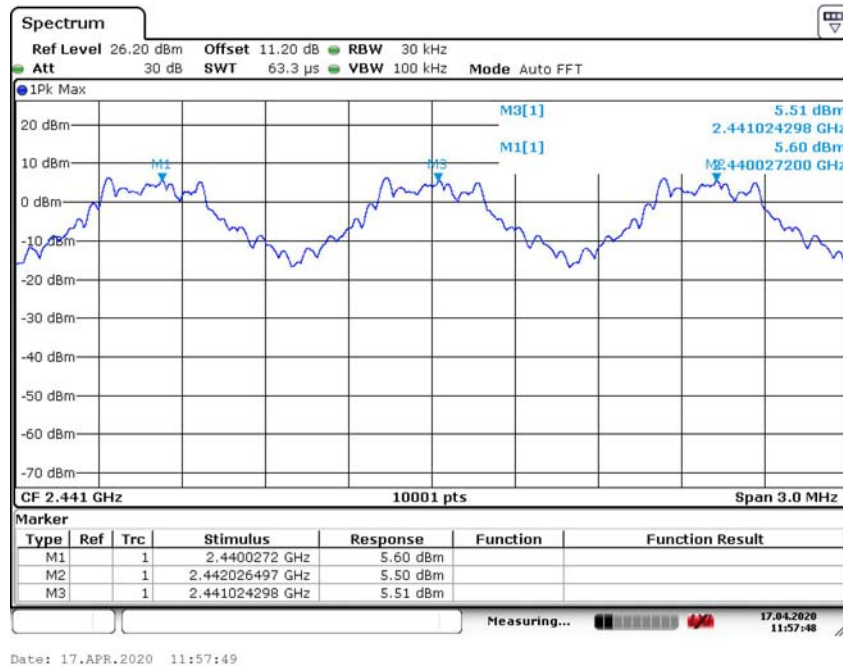
Date: 17.APR.2020 11:50:08

Carrier frequency (MHz): 2480
Channel No.:78
Modulation type: 8DPSK

Channel Separation

Offset 11.2dB = Attenuator 10dB+ Temporary antenna connector loss 0.2dB+ Cable loss 1dB

Op-mode	Channel separation MHz
Hopping mode	1



Op-mode: Hopping mode

Peak Power Output

Modulation type	Average Power Output (dBm)		
	2402MHz (Ch0)	2441MHz (Ch39)	2480MHz (Ch78)
GFSK	6.75	7.04	6.10
$\pi/4$ DQPSK	3.21	3.69	2.73
8DPSK	1.72	2.15	1.26

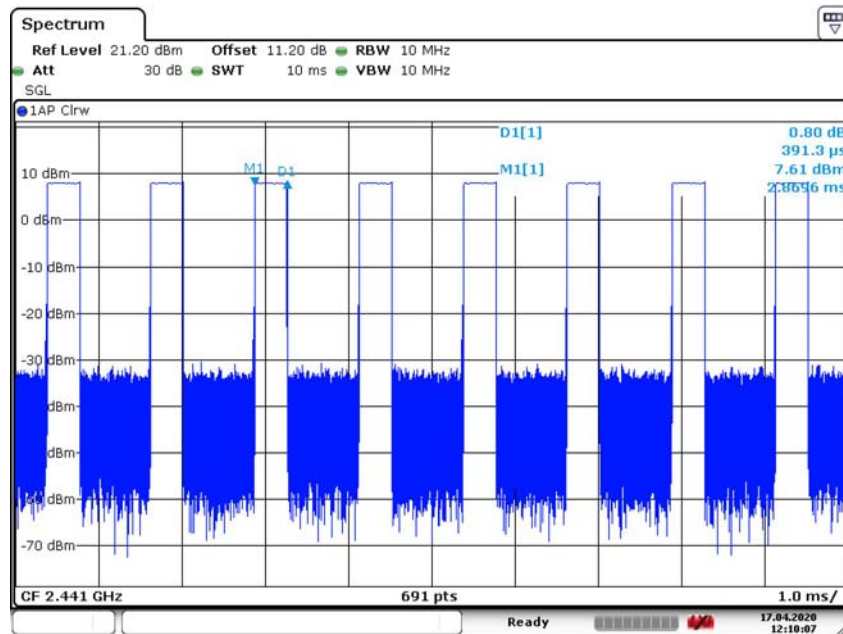
Modulation type	Peak Power Output (dBm)		
	2402MHz (Ch0)	2441MHz (Ch39)	2480MHz (Ch78)
GFSK	8.22	8.58	7.67
$\pi/4$ DQPSK	9.74	10.38	9.32
8DPSK	9.94	10.60	9.48

Dwell Time

Offset 11.2dB = Attenuator 10dB+ Temporary antenna connector loss 0.2dB+ Cable loss 1dB

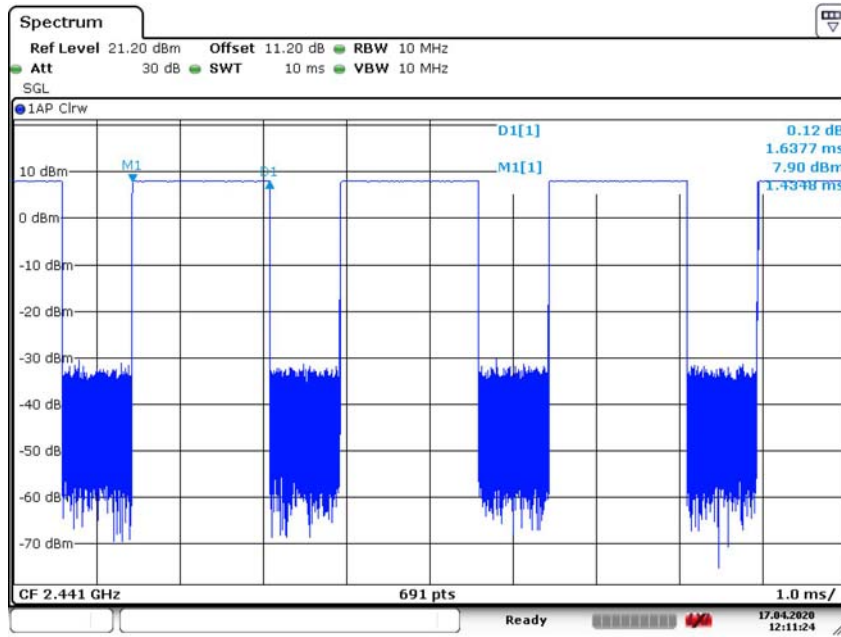
Modulation type: GFSK

Packet type	Time slot length μ s	Dwell time	Dwell time ms
DH1	391.3	time slot length *31.6 *1600/2 /79	125
DH3	1638	time slot length * 31.6 *1600/4 /79	262
DH5	2899	time slot length * 31.6 *1600/6 /79	309



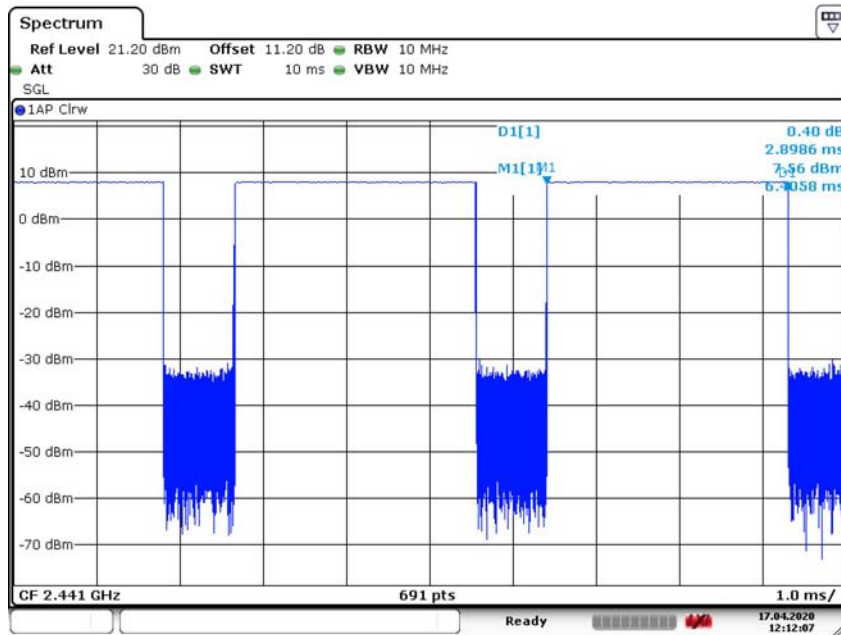
Date: 17.APR.2020 12:10:06

Carrier frequency (MHz): 2441
Packet type: DH1
Modulation type: GFSK



Date: 17.APR.2020 12:11:23

Carrier frequency (MHz): 2441
Packet type: DH3
Modulation type: GFSK

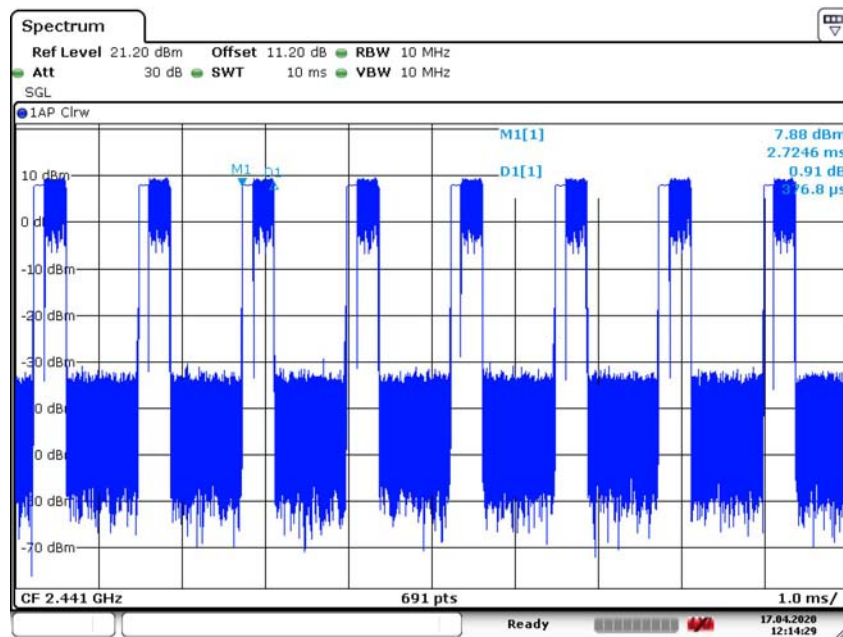


Date: 17.APR.2020 12:12:07

Carrier frequency (MHz): 2441
Packet type: DH5
Modulation type: GFSK

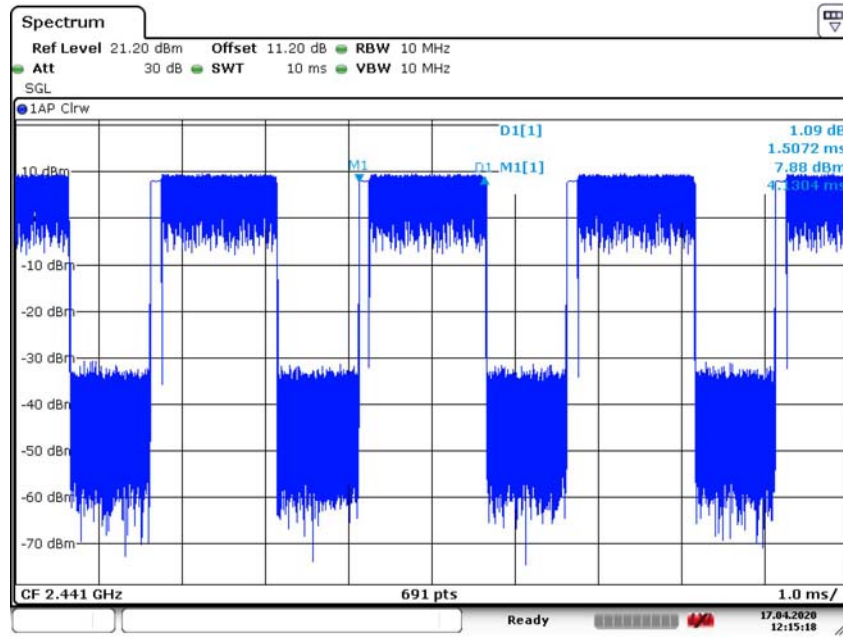
Modulation type: $\pi/4$ DQPSK

Packet type	Time slot length μ s	Dwell time	Dwell time ms
DH1	376.8	time slot length *31.6 *1600/2 /79	121
DH3	1507	time slot length * 31.6 *1600/4 /79	241
DH5	2876	time slot length * 31.6 *1600/6 /79	307



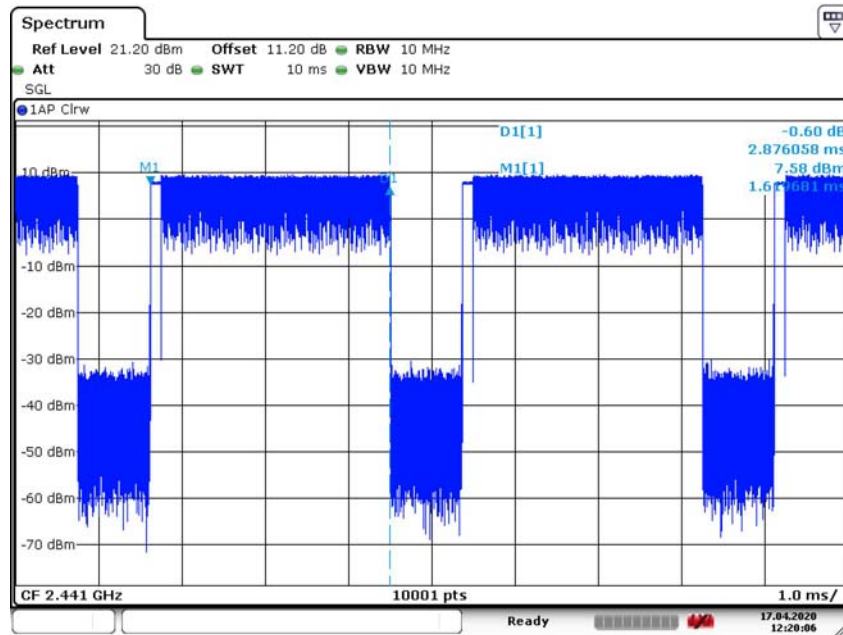
Date: 17.APR.2020 12:14:28

Carrier frequency (MHz): 2441
Packet type: DH1
Modulation type: $\pi/4$ DQPSK



Date: 17.APR.2020 12:15:18

Carrier frequency (MHz): 2441
Packet type: DH3
Modulation type: $\pi/4$ DQPSK

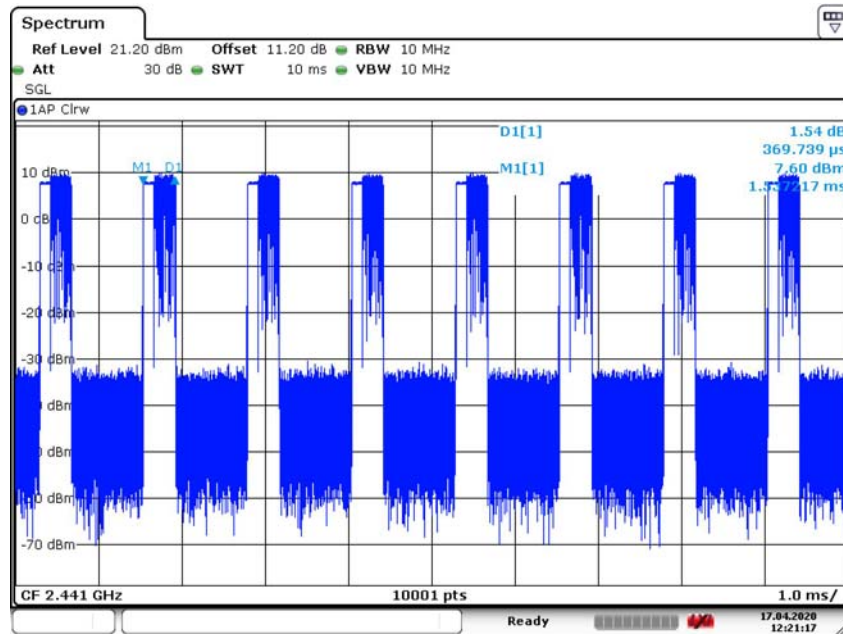


Date: 17.APR.2020 12:20:05

Carrier frequency (MHz): 2441
Packet type: DH5
Modulation type: $\pi/4$ DQPSK

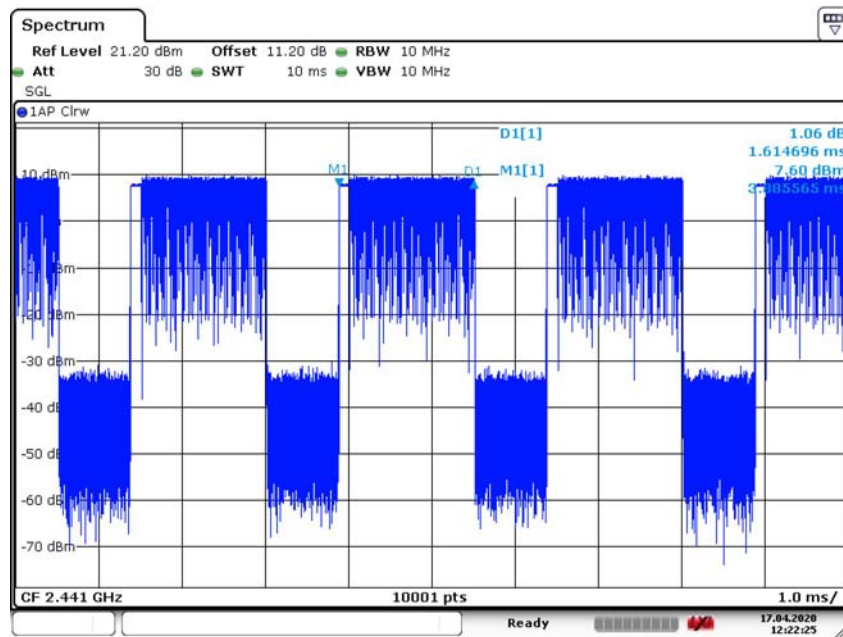
Modulation type: 8DPSK

Packet type	Time slot length μs	Dwell time	Dwell time ms
DH1	369.7	time slot length *31.6 *1600/2 /79	118
DH3	1615	time slot length * 31.6 *1600/4 /79	258
DH5	2857	time slot length * 31.6 *1600/6 /79	305



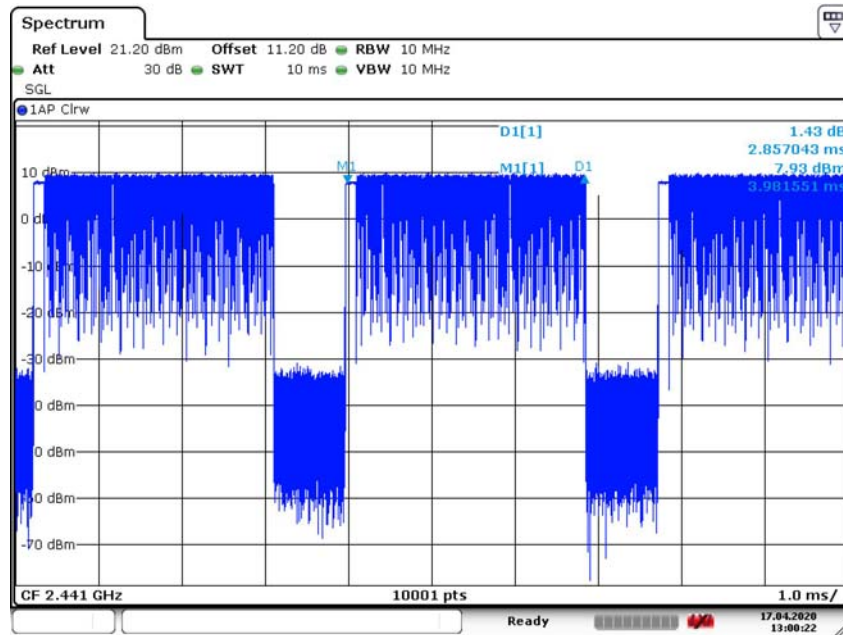
Date: 17.APR.2020 12:21:17

Carrier frequency (MHz): 2441
Packet type:DH1
Modulation type: 8DPSK



Date: 17.APR.2020 12:22:25

Carrier frequency (MHz): 2441
Packet type:DH3
Modulation type: 8DPSK



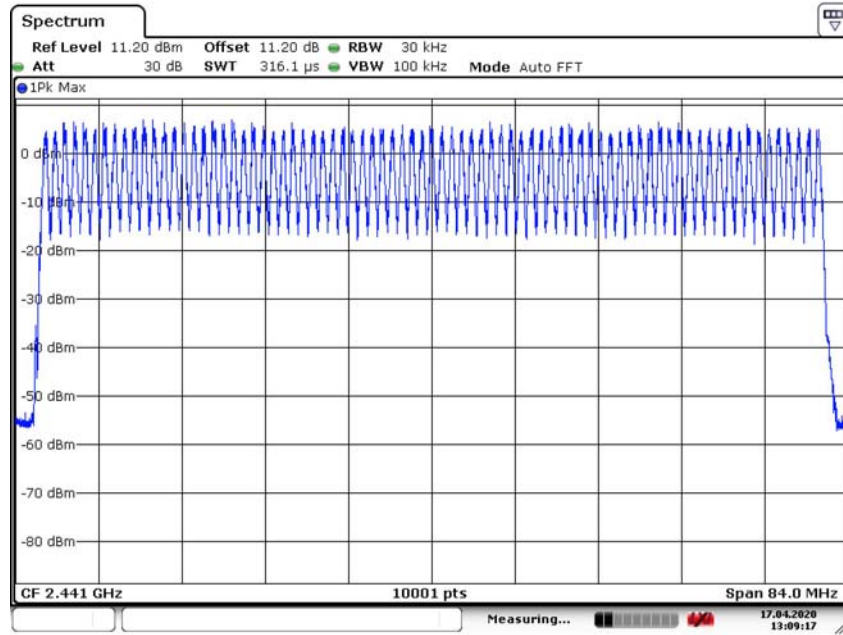
Date: 17.APR.2020 13:00:21

Carrier frequency (MHz): 2441
Packet type:DH5
Modulation type: 8DPSK

Number of Hopping Frequencies

Offset 11.2dB = Attenuator 10dB+ Temporary antenna connector loss 0.2dB+ Cable loss 1dB

Op-mode	Result
Hopping mode	79



Date: 17.APR.2020 13:09:16

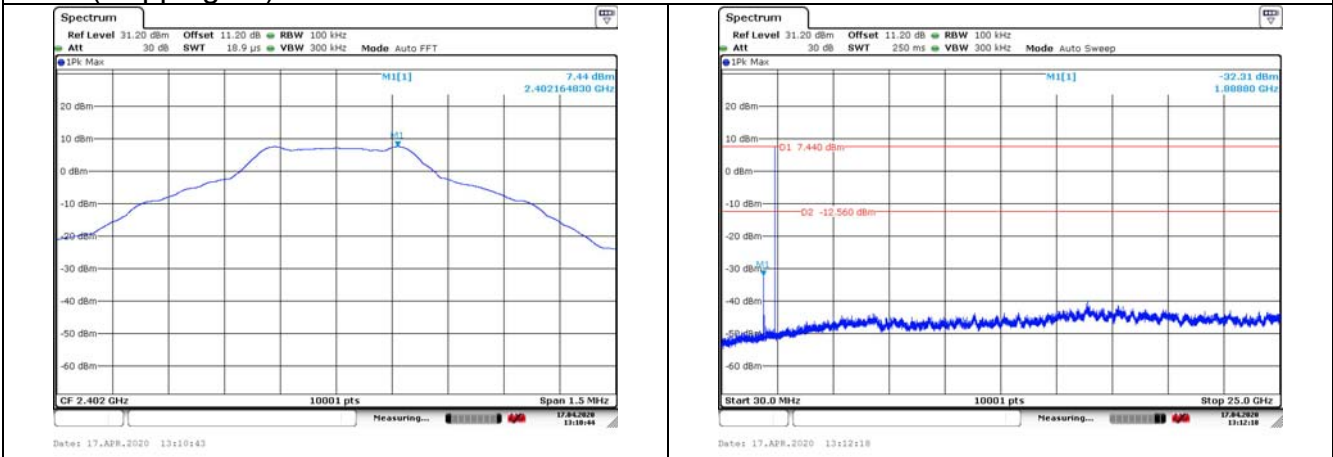
Op-mode: Hopping mode

Conducted out of band emission measurement

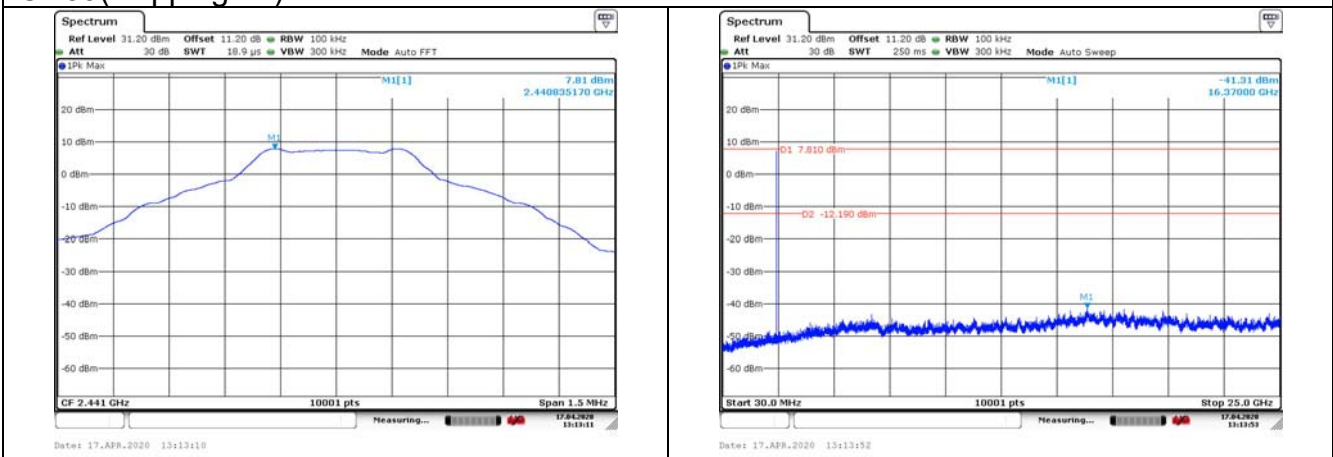
Offset 11.2dB = Attenuator 10dB+ Temporary antenna connector loss 0.2dB+ Cable loss 1dB

GFSK

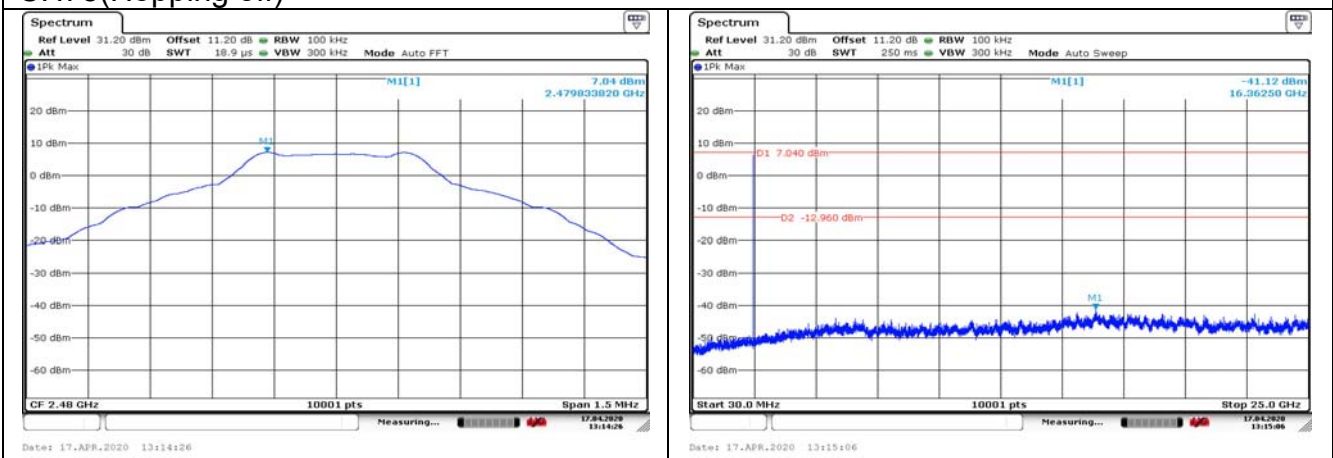
CH0 (Hopping off)



CH39(Hopping off)

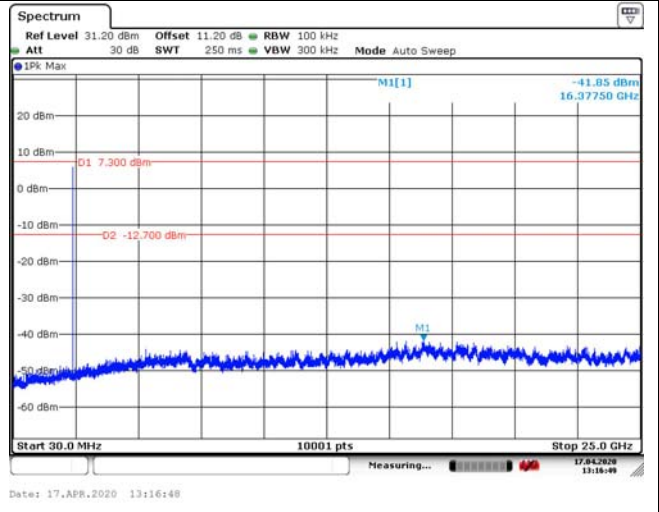
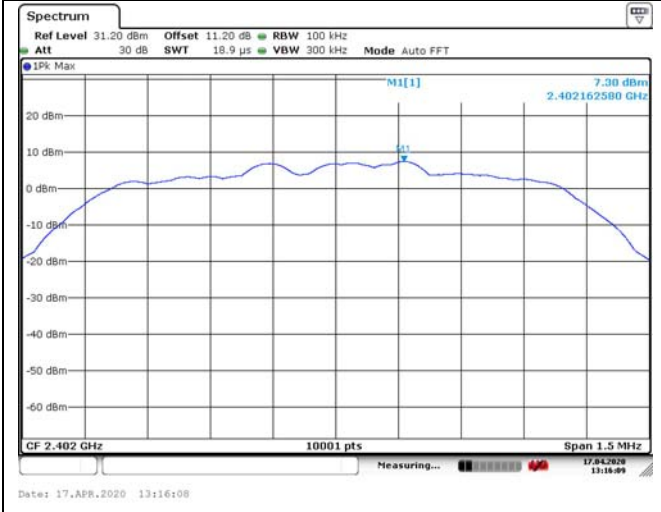


CH78(Hopping off)

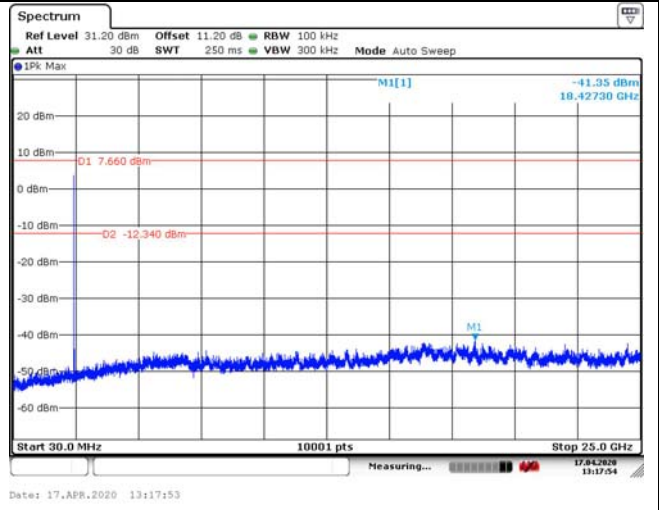
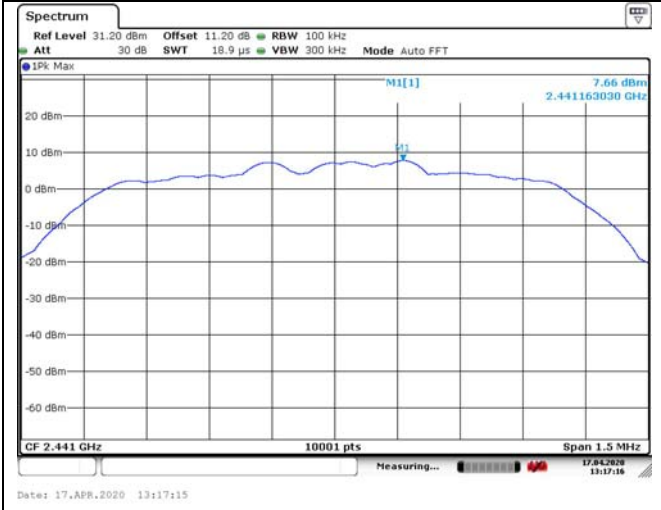


$\pi/4$ DQPSK

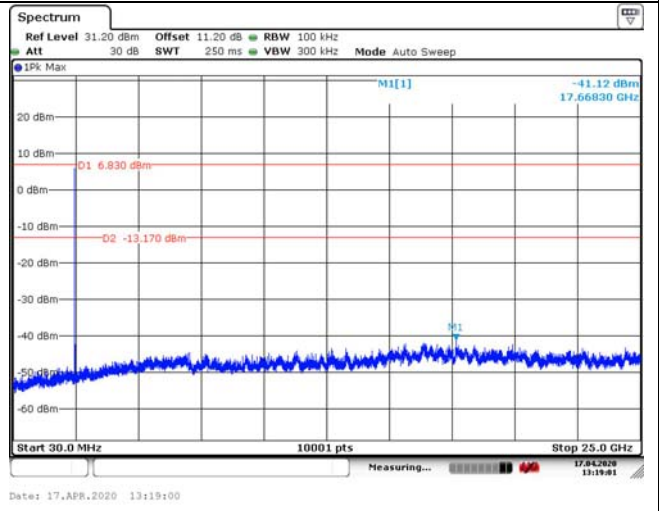
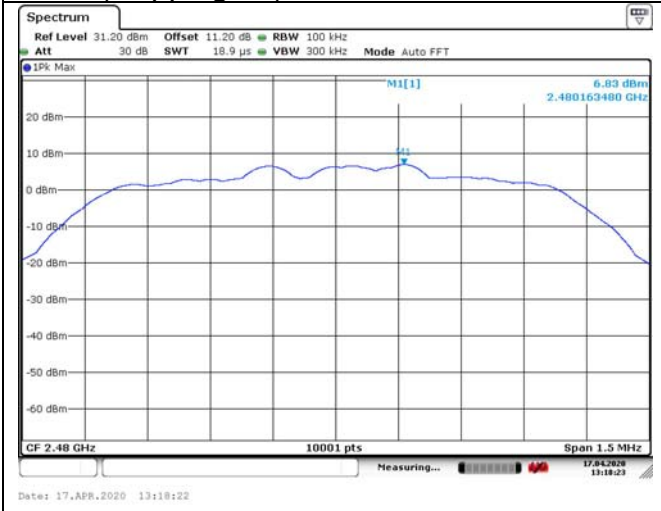
CH0 (Hopping off)



CH39(Hopping off)

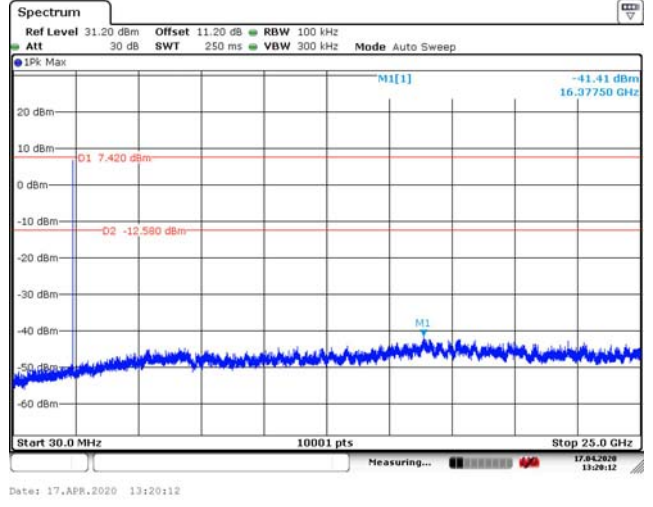
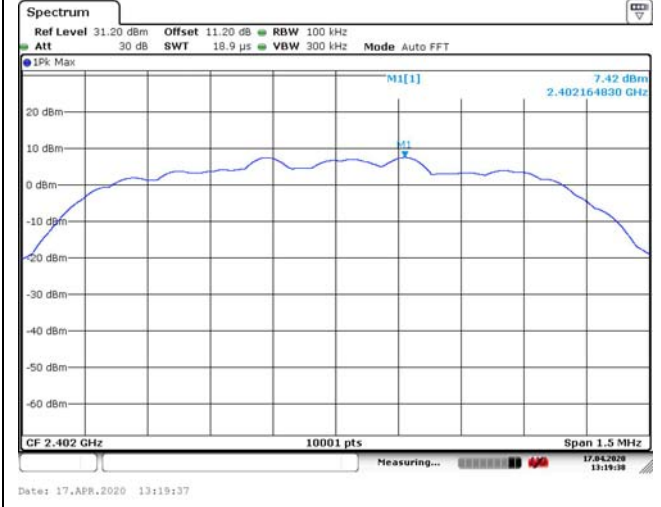


CH78(Hopping off)

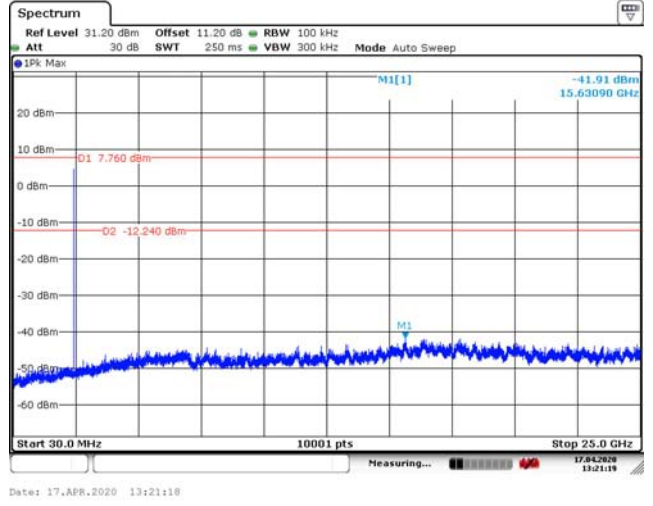
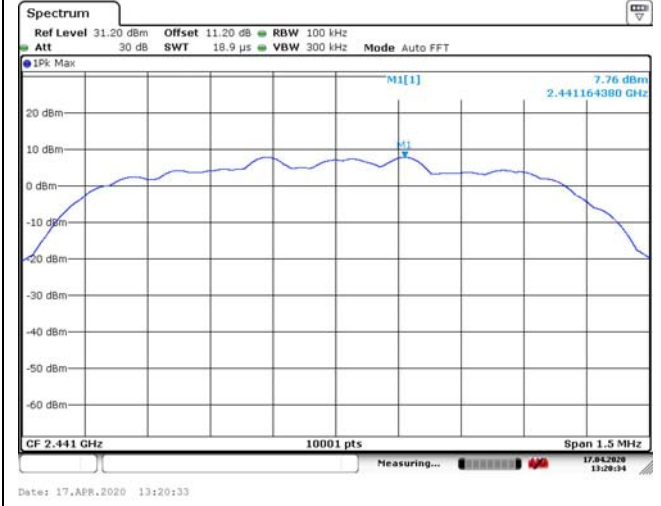


8DPSK

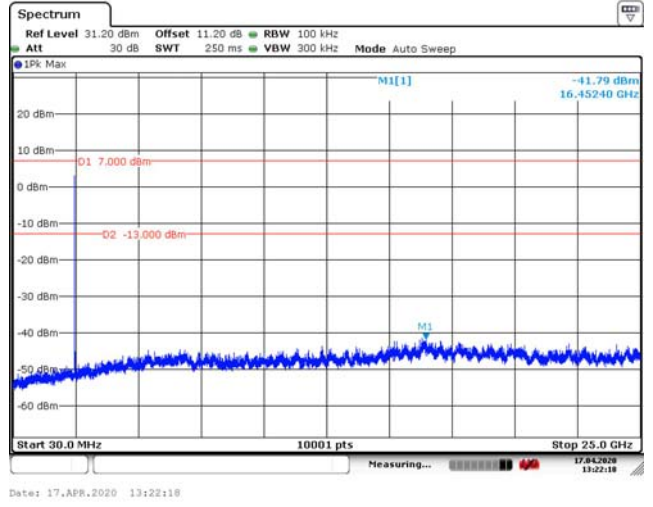
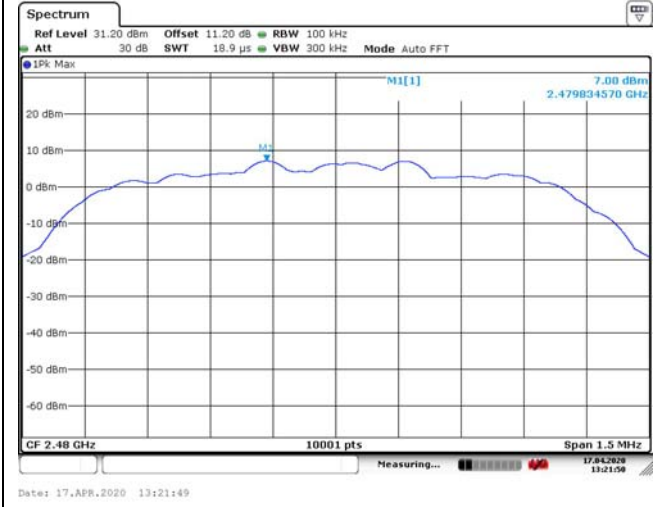
CH0 (Hopping off)



CH39(Hopping off)



CH78(Hopping off)

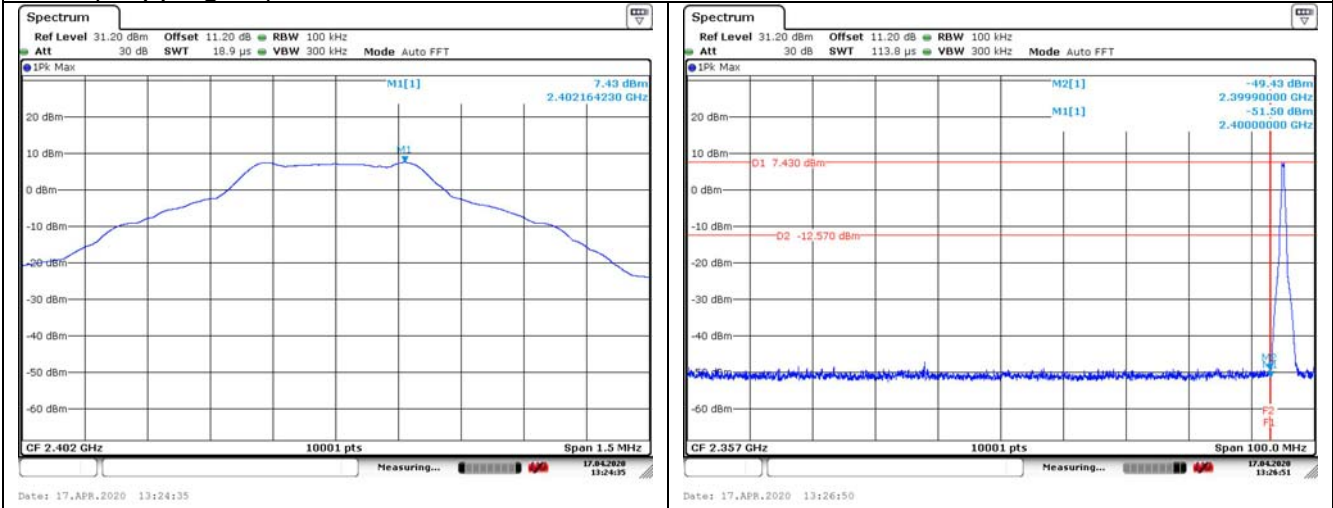


Band Edge measurement

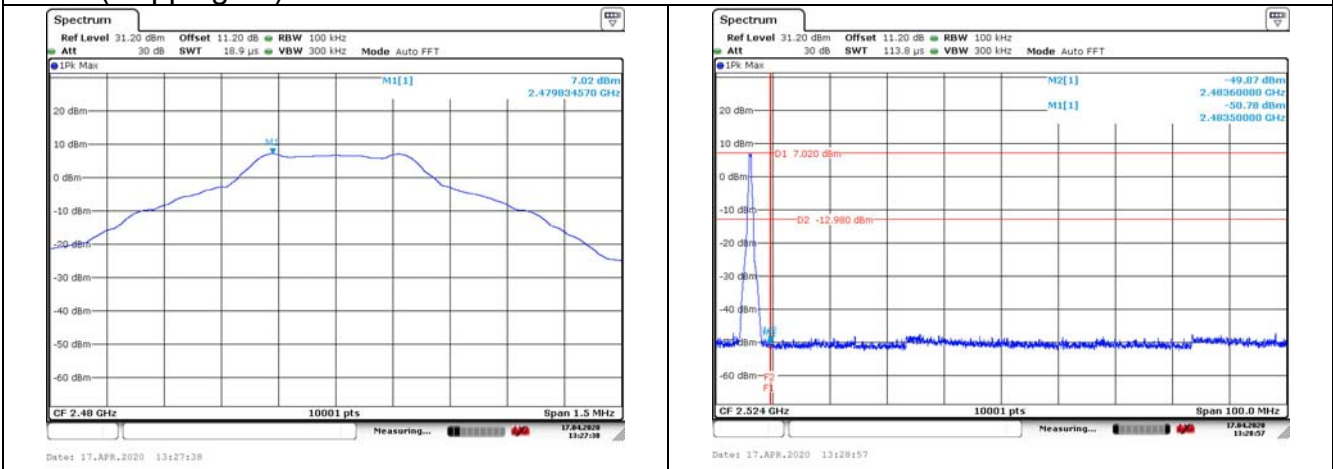
Offset 11.2dB = Attenuator 10dB+ Temporary antenna connector loss 0.2dB+ Cable loss 1dB

GFSK

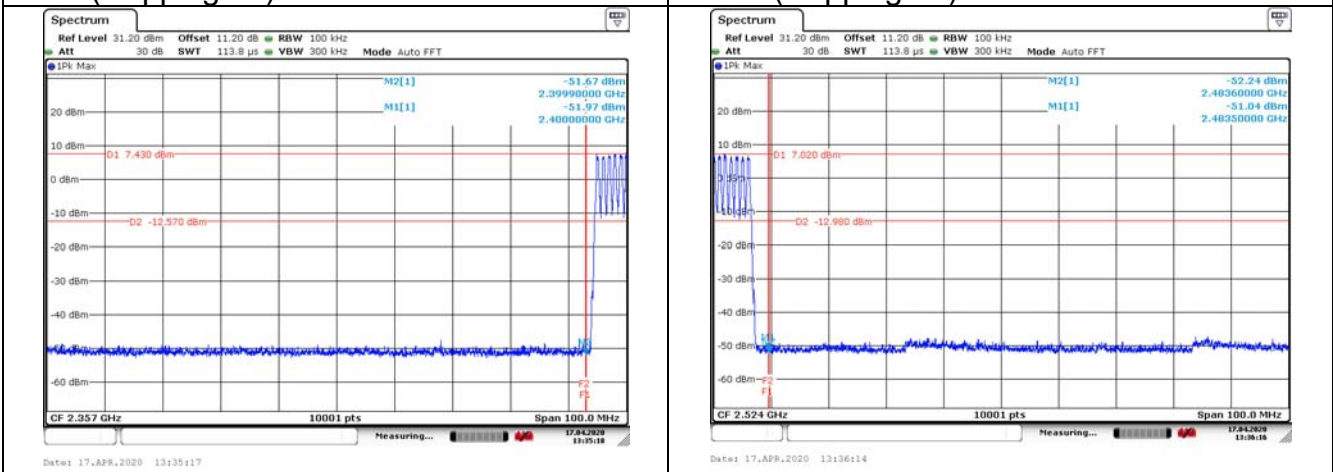
CH0 (Hopping off)



CH78 (Hopping off)



CH0 (Hopping on)

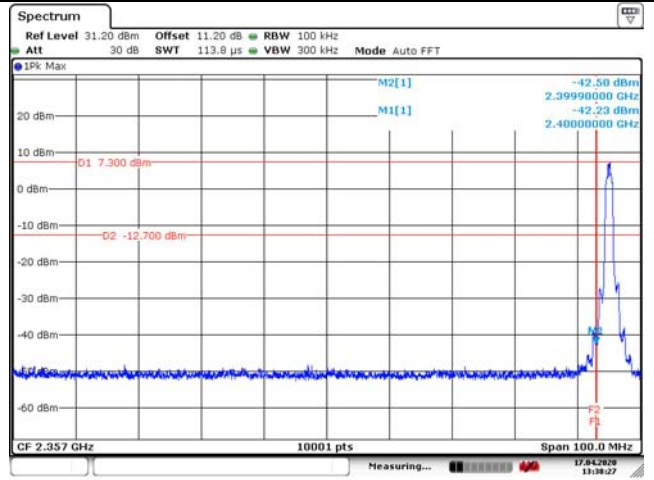


$\pi/4$ DQPSK

CH0 (Hopping off)



Date: 17, APR, 2020 13:37:13

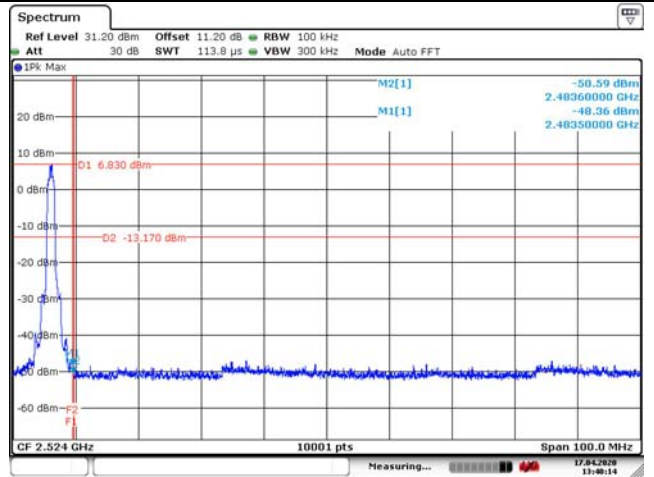


Date: 17, APR, 2020 13:38:26

CH78(Hopping off)

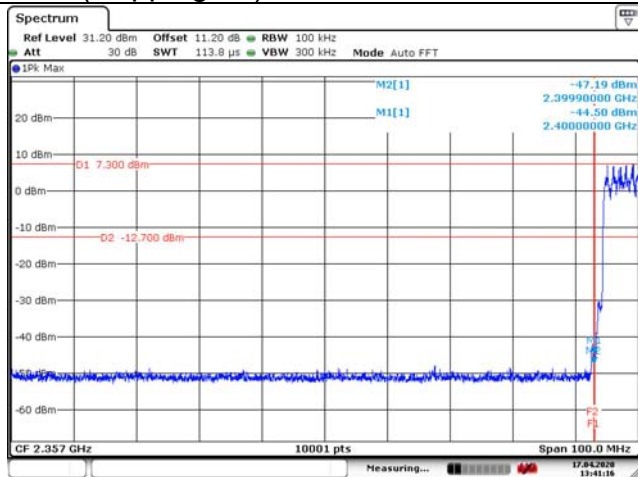


Date: 17, APR, 2020 13:39:11



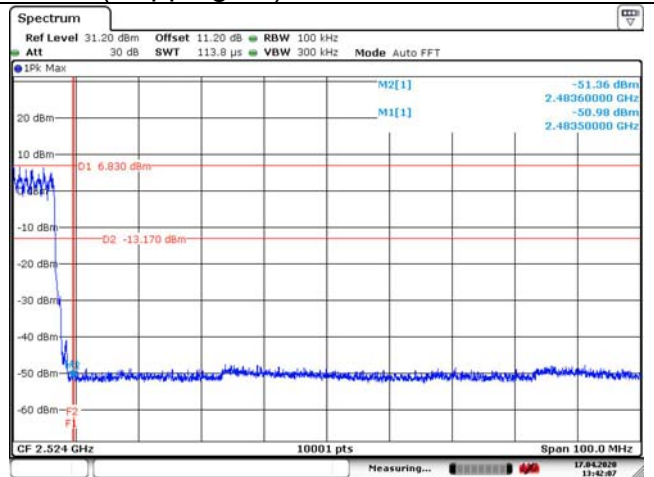
Date: 17, APR, 2020 13:40:13

CH0 (Hopping on)



Date: 17, APR, 2020 13:41:15

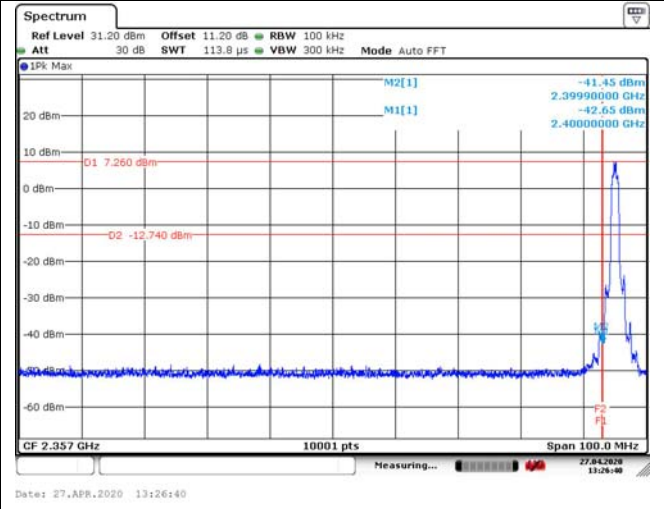
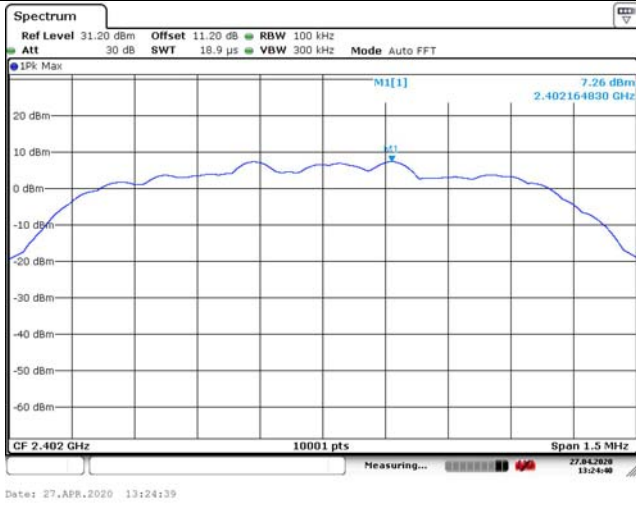
CH78 (Hopping on)



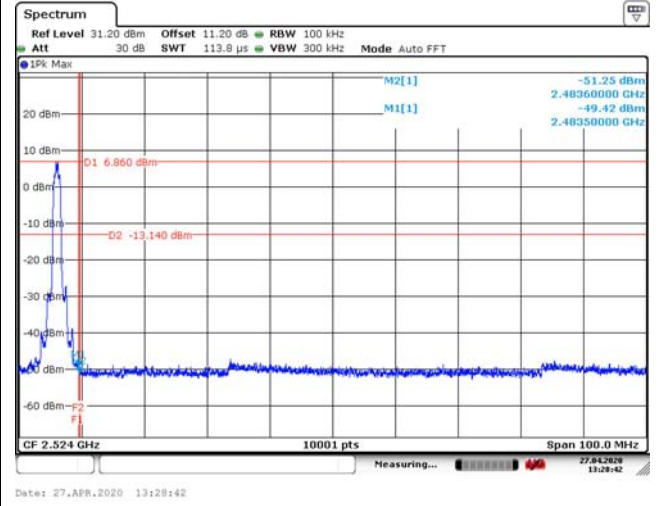
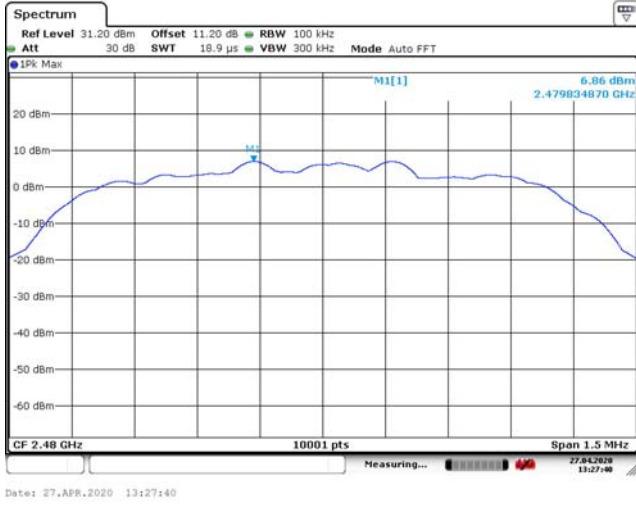
Date: 17, APR, 2020 13:42:06

8DPSK

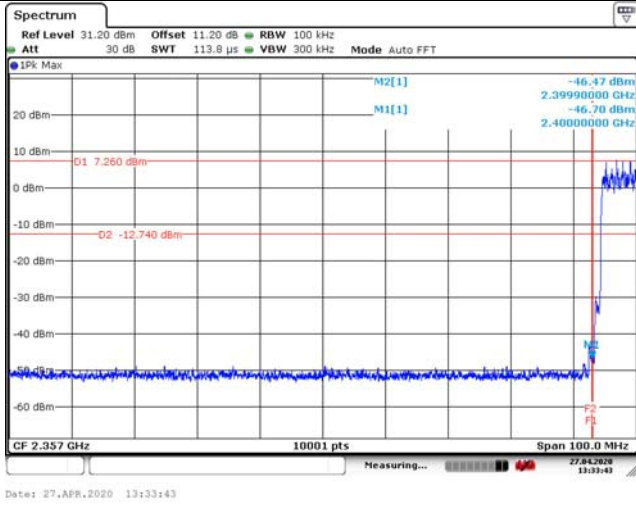
CH0 (Hopping off)



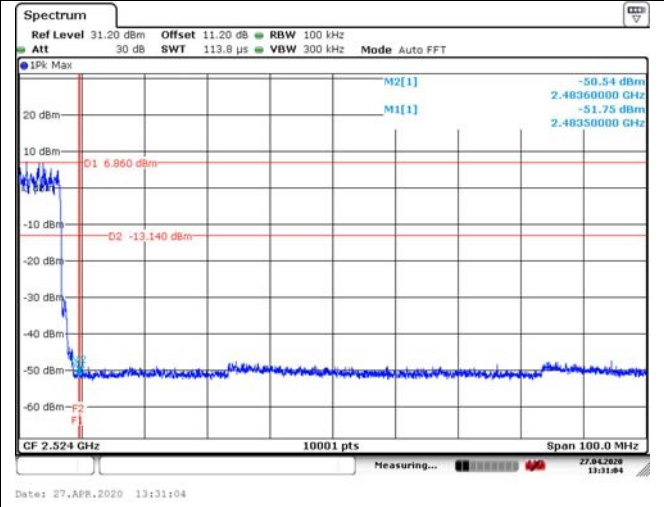
CH78(Hopping off)



CH0 (Hopping on)



CH78 (Hopping on)



APPENDIX B – TEST DATA OF RADIATED EMISSION

Radiated Emission Band Edge

The worst case attitude: The mobile lay down.

The measurement results are obtained as described below:

Measure Level = Reading Level + cable loss + antenna factor

Sample calculation: (91.68 dBuV/m) = (57.68 dBμV) + (8.90 dB) + (25.10 dB), the corresponding frequency is 2402MHz.

Carrier frequency (MHz): 2402

Channel No.:0

Test Mode: GFSK

Polarity: Vertical

Detector: Peak

No	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	cable loss (dB)	antenna factor (dB)
1	2402	91.68	57.68	N/A	N/A	8.90	25.10
2	2390	39.01	5.01	-34.99	74.00	8.90	25.10

Carrier frequency (MHz): 2402

Channel No.:0

Test Mode: GFSK

Polarity: Horizontal

Detector: Peak

No	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	cable loss (dB)	antenna factor (dB)
1	2402	84.98	50.98	N/A	N/A	8.90	25.10
2	2390	35.68	1.68	-38.32	74.00	8.90	25.10

Carrier frequency (MHz): 2402

Channel No.:0

Test Mode: GFSK

Polarity: Vertical

Detector: Average

No	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	cable loss (dB)	antenna factor (dB)
1	2402	77.29	43.29	N/A	N/A	8.90	25.10
2	2390	26.97	-7.03	-27.03	54.00	8.90	25.10

Carrier frequency (MHz): 2402
Channel No.:0
Test Mode: GFSK
Polarity: Horizontal
Detector: Average

No	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	cable loss (dB)	antenna factor (dB)
1	2402	74.90	40.90	N/A	N/A	8.90	25.10
2	2390	26.16	-7.84	-27.84	54.00	8.90	25.10

Carrier frequency (MHz): 2480
Channel No.:78
Test Mode: GFSK
Polarity: Vertical
Detector: Peak

No	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	cable loss (dB)	antenna factor (dB)
1	2480	90.12	56.12	N/A	N/A	8.90	25.10
2	2483.5	39.42	5.42	-34.58	74.00	8.90	25.10

Carrier frequency (MHz): 2480
Channel No.:78
Test Mode: GFSK
Polarity: Horizontal
Detector: Peak

No	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	cable loss (dB)	antenna factor (dB)
1	2480	85.96	51.96	N/A	N/A	8.90	25.10
2	2483.5	34.12	0.12	-39.88	74.00	8.90	25.10

Carrier frequency (MHz): 2480
Channel No.:78
Test Mode: GFSK
Polarity: Vertical
Detector: Average

No	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	cable loss (dB)	antenna factor (dB)
1	2480	78.43	44.43	N/A	N/A	8.90	25.10
2	2483.5	27.47	-6.53	-26.53	54.00	8.90	25.10

Carrier frequency (MHz): 2480

Channel No.:78

Test Mode: GFSK

Polarity: Horizontal

Detector: Average

No	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	cable loss (dB)	antenna factor (dB)
1	2480	75.44	41.44	N/A	N/A	8.90	25.10
2	2483.5	25.86	-8.14	-28.14	54.00	8.90	25.10

Carrier frequency (MHz): 2402

Channel No.:0

Test Mode: $\pi/4$ DQPSK

Polarity: Vertical

Detector: Peak

No	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	cable loss (dB)	antenna factor (dB)
1	2402	91.41	57.41	N/A	N/A	8.90	25.10
2	2390	38.03	4.03	-35.97	74.00	8.90	25.10

Carrier frequency (MHz): 2402

Channel No.:0

Test Mode: $\pi/4$ DQPSK

Polarity: Horizontal

Detector: Peak

No	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	cable loss (dB)	antenna factor (dB)
1	2402	84.97	50.97	N/A	N/A	8.90	25.10
2	2390	32.47	-1.53	-41.53	74.00	8.90	25.10

Carrier frequency (MHz): 2402

Channel No.:0

Test Mode: $\pi/4$ DQPSK

Polarity: Vertical

Detector: Average

No	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	cable loss (dB)	antenna factor (dB)
1	2402	78.99	44.99	N/A	N/A	8.90	25.10
2	2390	24.83	-9.17	-29.17	54.00	8.90	25.10

Carrier frequency (MHz): 2402

Channel No.:0

Test Mode: $\pi/4$ DQPSK

Polarity: Horizontal

Detector: Average

No	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	cable loss (dB)	antenna factor (dB)
1	2402	72.51	38.51	N/A	N/A	8.90	25.10
2	2390	25.36	-8.64	-28.64	54.00	8.90	25.10

Carrier frequency (MHz): 2480

Channel No.:78

Test Mode: $\pi/4$ DQPSK

Polarity: Vertical

Detector: Peak

No	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	cable loss (dB)	antenna factor (dB)
1	2480	92.04	58.04	N/A	N/A	8.90	25.10
2	2483.5	39.73	5.73	-34.27	74.00	8.90	25.10

Carrier frequency (MHz): 2480

Channel No.:78

Test Mode: $\pi/4$ DQPSK

Polarity: Horizontal

Detector: Peak

No	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	cable loss (dB)	antenna factor (dB)
1	2480	86.22	52.22	N/A	N/A	8.90	25.10
2	2483.5	36.32	2.32	-37.68	74.00	8.90	25.10

Carrier frequency (MHz): 2480

Channel No.:78

Test Mode: $\pi/4$ DQPSK

Polarity: Vertical

Detector: Average

No	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	cable loss (dB)	antenna factor (dB)
1	2480	76.93	42.93	N/A	N/A	8.90	25.10
2	2483.5	26.30	-7.70	-27.70	54.00	8.90	25.10

Carrier frequency (MHz): 2480
Channel No.:78
Test Mode: $\pi/4$ DQPSK
Polarity: Horizontal
Detector: Average

No	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	cable loss (dB)	antenna factor (dB)
1	2480	75.06	41.06	N/A	N/A	8.90	25.10
2	2483.5	25.25	-8.75	-28.75	54.00	8.90	25.10

Carrier frequency (MHz): 2402
Channel No.:0
Test Mode: 8DPSK
Polarity: Vertical
Detector: Peak

No	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	cable loss (dB)	antenna factor (dB)
1	2402	91.31	57.31	N/A	N/A	8.90	25.10
2	2390	36.66	2.66	-37.34	74.00	8.90	25.10

Carrier frequency (MHz): 2402
Channel No.:0
Test Mode: 8DPSK
Polarity: Horizontal
Detector: Peak

No	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	cable loss (dB)	antenna factor (dB)
1	2402	85.82	51.82	N/A	N/A	8.90	25.10
2	2390	35.38	1.38	-38.62	74.00	8.90	25.10

Carrier frequency (MHz): 2402
Channel No.:0
Test Mode: 8DPSK
Polarity: Vertical
Detector: Average

No	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	cable loss (dB)	antenna factor (dB)
1	2402	77.10	43.10	N/A	N/A	8.90	25.10
2	2390	26.50	-7.50	-27.50	54.00	8.90	25.10

Carrier frequency (MHz): 2402

Channel No.:0

Test Mode: 8DPSK

Polarity: Horizontal

Detector: Average

No	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	cable loss (dB)	antenna factor (dB)
1	2402	73.88	39.88	N/A	N/A	8.90	25.10
2	2390	24.94	-9.06	-29.06	54.00	8.90	25.10

Carrier frequency (MHz): 2480

Channel No.:78

Test Mode: 8DPSK

Polarity: Vertical

Detector: Peak

No	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	cable loss (dB)	antenna factor (dB)
1	2480	93.01	59.01	N/A	N/A	8.90	25.10
2	2483.5	36.69	2.69	-37.31	74.00	8.90	25.10

Carrier frequency (MHz): 2480

Channel No.:78

Test Mode: 8DPSK

Polarity: Horizontal

Detector: Peak

No	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	cable loss (dB)	antenna factor (dB)
1	2480	85.21	51.21	N/A	N/A	8.90	25.10
2	2483.5	35.12	1.12	-38.88	74.00	8.90	25.10

Carrier frequency (MHz): 2480

Channel No.:78

Test Mode: 8DPSK

Polarity: Vertical

Detector: Average

No	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	cable loss (dB)	antenna factor (dB)
1	2480	75.85	41.85	N/A	N/A	8.90	25.10
2	2483.5	26.28	-7.72	-27.72	54.00	8.90	25.10

Carrier frequency (MHz): 2480
Channel No.:78
Test Mode: 8DPSK
Polarity: Horizontal
Detector: Average

No	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	cable loss (dB)	antenna factor (dB)
1	2480	73.23	39.23	N/A	N/A	8.90	25.10
2	2483.5	25.71	-8.29	-28.29	54.00	8.90	25.10

Sample Calculations

Determining Spurious Emissions Levels

A “reference path loss” is established and the A_{Rpl} is the attenuation of “reference path loss”, and including the gain of receive antenna, the gain of the preamplifier, the cable loss.

The measurement results are obtained as described below:

Result= $P_{mea} + A_{Rpl}$

Sample calculation: $(30.07 \text{ dB}\mu\text{V/m}) = (-21.1 \text{ dB}\mu\text{V}) + (51.17 \text{ dB/m})$, the corresponding frequency is 30.2425MHz.

The worst case attitude: The mobile lay down.

For GFSK

Channel No.:0

Frequency (MHz)	Result (dBuV/m)	A_{Rpl} (dB)	P_{mea} (dBuV/m)	Polarity	Limit (dBuV/m)
30.2425	30.07	-21.1	51.17	Vertical	40
42.998	22.99	-17.8	40.79	Vertical	40
63.2225	20.62	-19.5	40.12	Vertical	40
87.8605	16.17	-21.3	37.47	Vertical	40
198.1495	23.61	-18.4	42.01	Vertical	43.5
953.4885	24.1	-0.8	24.90	Vertical	46

For $\pi/4$ DQPSK
Channel No.:0

Frequency (MHz)	Result (dBuV/m)	A _{Rpl} (dB)	P _{mea} (dBuV/m)	Polarity	Limit (dBuV/m)
30.097	31.24	-21.1	52.34	Vertical	40
42.9495	22.36	-17.8	40.16	Vertical	40
64.4835	21.38	-20	41.38	Vertical	40
87.5695	14.71	-21.6	36.31	Vertical	40
193.251	22.83	-19.2	42.03	Vertical	43.5
947.2805	24.59	-0.8	25.39	Vertical	46

For 8DPSK
Channel No.:0

Frequency (MHz)	Result (dBuV/m)	A _{Rpl} (dB)	P _{mea} (dBuV/m)	Polarity	Limit (dBuV/m)
30.873000	31.93	-20.9	52.83	Vertical	40.00
43.192000	22.96	-17.8	40.76	Vertical	40.00
65.405000	21.07	-20.2	41.27	Vertical	40.00
87.812000	14.28	-21.3	35.58	Vertical	40.00
186.073000	23.02	-19.5	42.52	Vertical	43.50
952.179000	23.38	-0.8	24.18	Vertical	46.00

For GFSK
Channel No.:39

Frequency (MHz)	Result (dBuV/m)	A _{Rpl} (dB)	P _{mea} (dBuV/m)	Polarity	Limit (dBuV/m)
30.533500	34.16	-21.0	55.16	Vertical	40.00
60.312500	20.17	-18.5	38.67	Vertical	40.00
77.239000	21.24	-23.3	44.54	Vertical	40.00
189.225500	22.48	-19.2	41.68	Vertical	43.50
678.930000	19.96	-5.7	25.66	Vertical	46.00
839.368000	24.54	-2.6	27.14	Vertical	46.00

For $\pi/4$ DQPSK
Channel No.:39

Frequency (MHz)	Result (dBuV/m)	A _{Rpl} (dB)	P _{mea} (dBuV/m)	Polarity	Limit (dBuV/m)
30.388000	33.10	-21.0	54.10	Vertical	40.00
60.167000	19.67	-18.5	38.17	Vertical	40.00
77.239000	21.53	-23.3	44.83	Vertical	40.00
164.878500	17.18	-21.0	38.18	Vertical	43.50
194.900000	22.78	-18.7	41.48	Vertical	43.50
918.423000	24.87	-1.2	26.07	Vertical	46.00

For 8DPSK
Channel No.:39

Frequency (MHz)	Result (dBuV/m)	A _{Rpl} (dB)	P _{mea} (dBuV/m)	Polarity	Limit (dBuV/m)
30.097000	33.00	-21.1	54.10	Vertical	40.00
59.342500	19.80	-18.3	38.10	Vertical	40.00
77.821000	21.49	-23.5	44.99	Vertical	40.00
165.121000	17.14	-20.9	38.04	Vertical	43.50
194.948500	23.32	-18.7	42.02	Vertical	43.50
959.890500	23.96	-0.7	24.66	Vertical	46.00

For GFSK
Channel No.:78

Frequency (MHz)	Result (dBuV/m)	A _{Rpl} (dB)	P _{mea} (dBuV/m)	Polarity	Limit (dBuV/m)
30.970000	34.04	-20.9	54.94	Vertical	40.00
59.924500	19.54	-18.4	37.94	Vertical	40.00
77.093500	21.52	-23.3	44.82	Vertical	40.00
87.957500	14.06	-21.2	35.26	Vertical	40.00
197.470500	22.44	-18.5	40.94	Vertical	43.50
912.700000	23.73	-1.3	25.03	Vertical	46.00

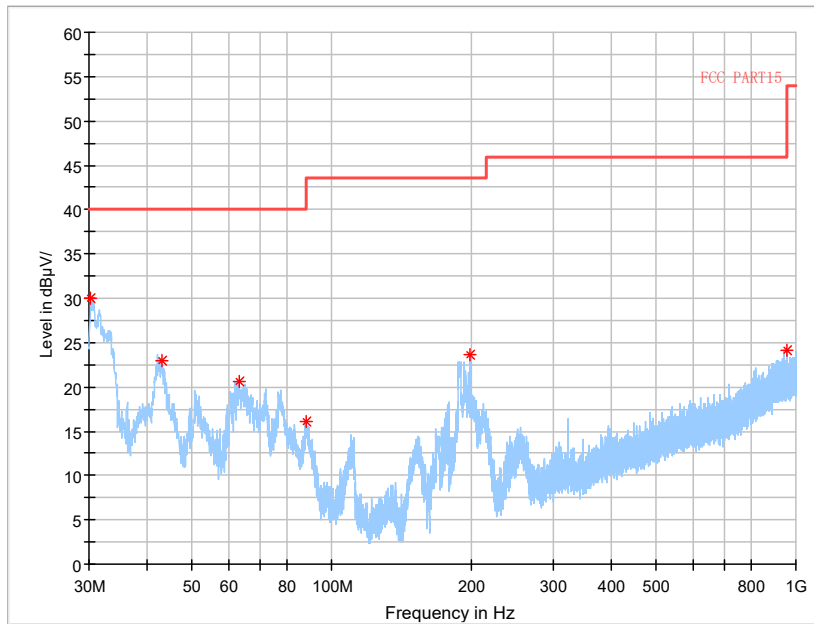
For $\pi/4$ DQPSK
Channel No.:78

Frequency (MHz)	Result (dBuV/m)	A _{Rpl} (dB)	P _{mea} (dBuV/m)	Polarity	Limit (dBuV/m)
30.436500	35.33	-21.0	56.33	Vertical	40.00
42.998000	20.12	-17.8	37.92	Vertical	40.00
77.481500	21.36	-23.4	44.76	Vertical	40.00
191.359500	22.84	-19.0	41.84	Vertical	43.50
687.369000	19.52	-5.6	25.12	Vertical	46.00
934.476500	24.16	-1.0	25.16	Vertical	46.00

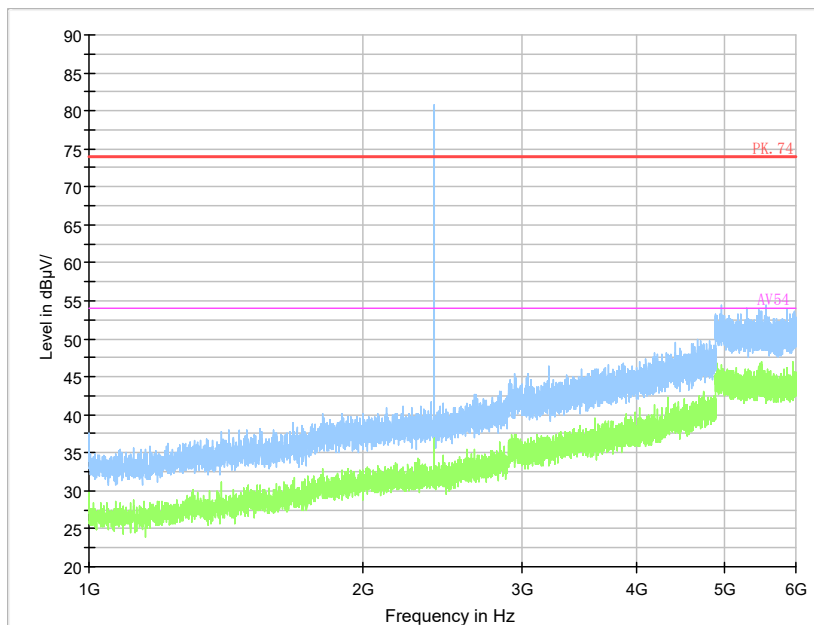
For 8DPSK
Channel No.:78

Frequency (MHz)	Result (dBuV/m)	A _{Rpl} (dB)	P _{mea} (dBuV/m)	Polarity	Limit (dBuV/m)
30.194000	32.63	-21.1	53.73	Vertical	40.00
60.409500	20.09	-18.5	38.59	Vertical	40.00
77.675500	21.50	-23.4	44.90	Vertical	40.00
167.109500	17.69	-20.8	38.49	Vertical	43.50
186.655000	22.67	-19.5	42.17	Vertical	43.50
928.365500	24.04	-1.1	25.14	Vertical	46.00

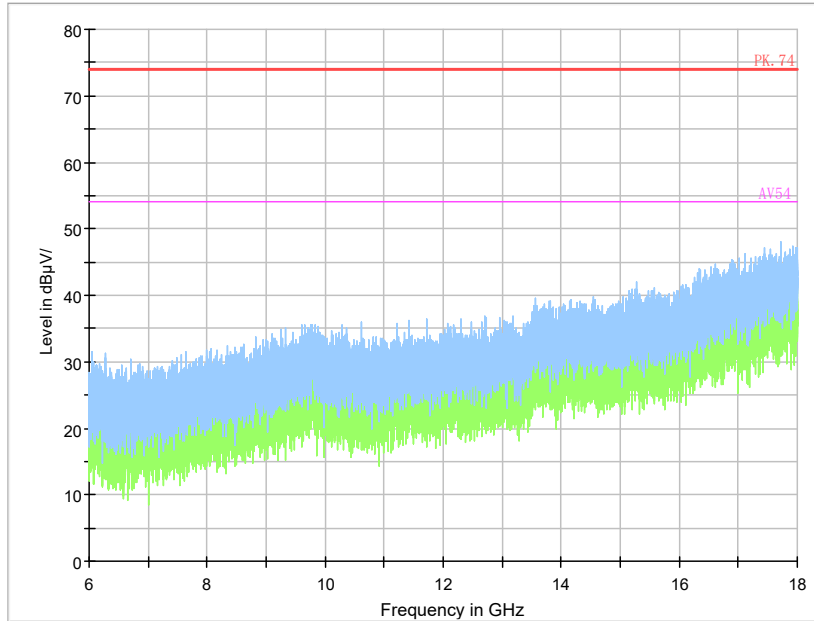
Carrier frequency (MHz): 2402
Channel No.:0



Frequency Range: 30MHz-1000MHz
Detector: QP mode
Modulation type: GFSK

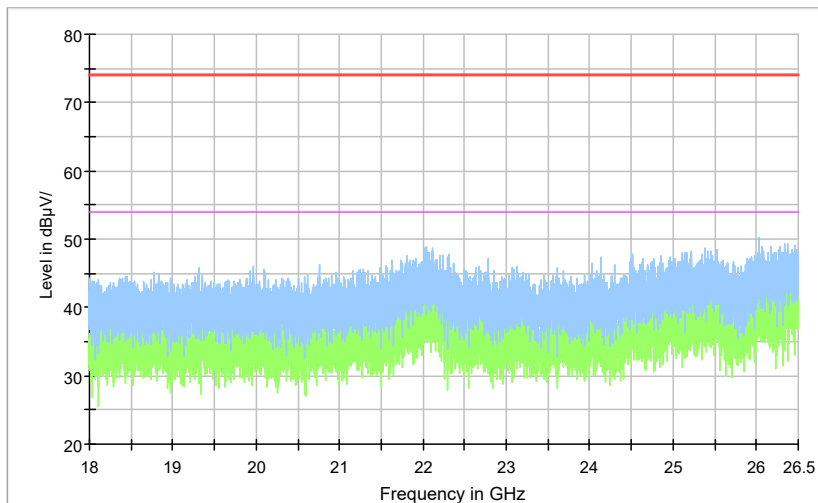


Frequency Range: 1GHz -6GHz
Detector: Av mode and PK mode
Modulation type: GFSK



Frequency Range: 6GHz- 18GHz
Detector: Av mode and PK mode
Modulation type: GFSK

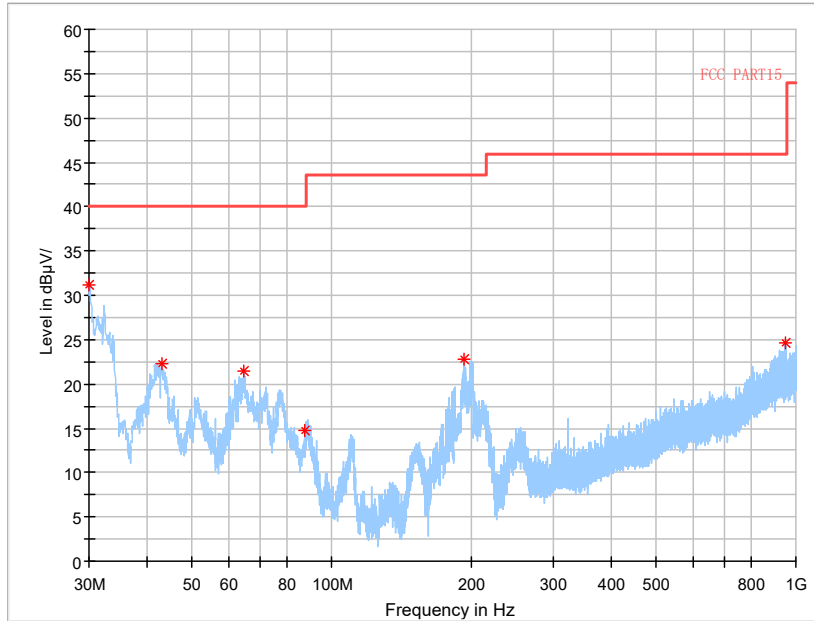
Full Spectrum



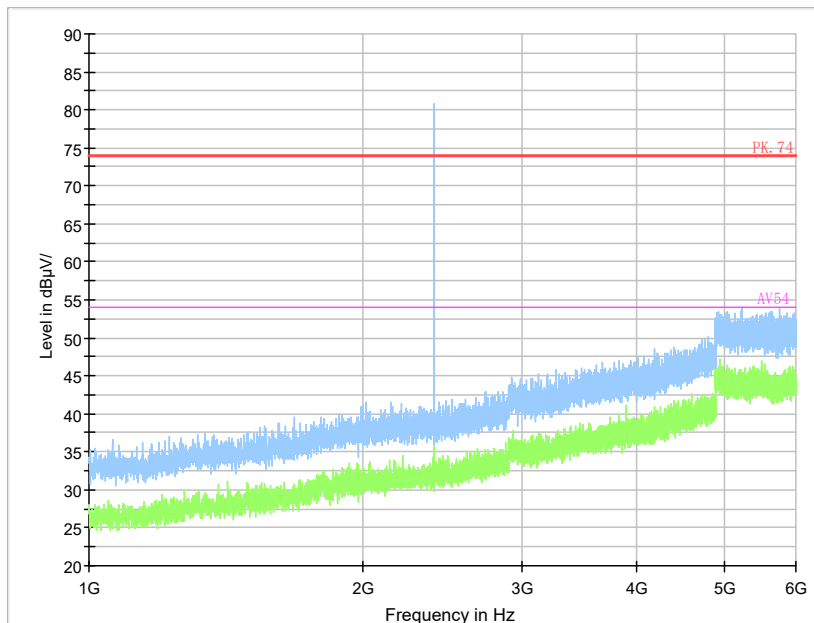
Preview Result 2-AVG Preview Result 1-PK+ PK70-74 AV50-54

Comment

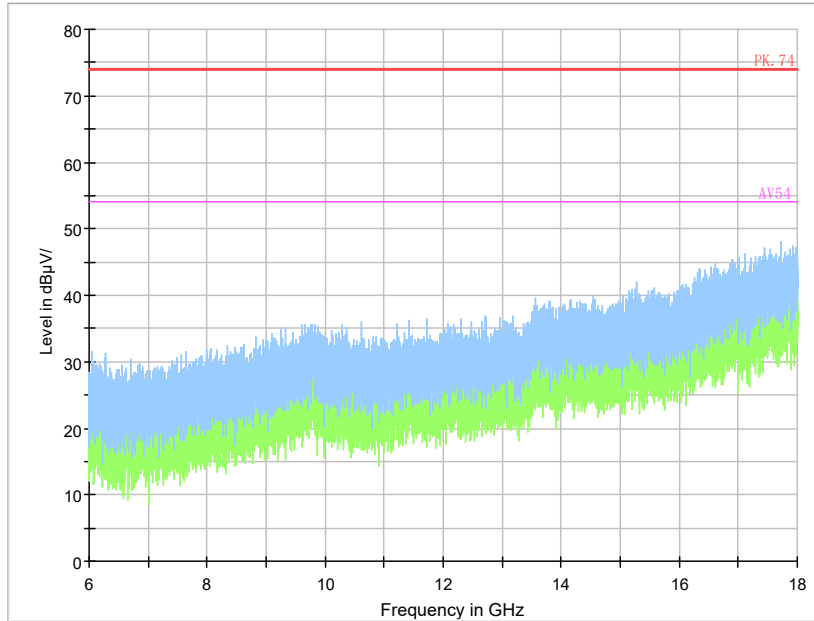
Frequency Range: 18GHz-25GHz
Detector: Av mode and PK mode
Modulation type: GFSK



Frequency Range: 30MHz-1000 MHz
Detector: QP mode
Modulation type: $\pi/4$ DQPSK

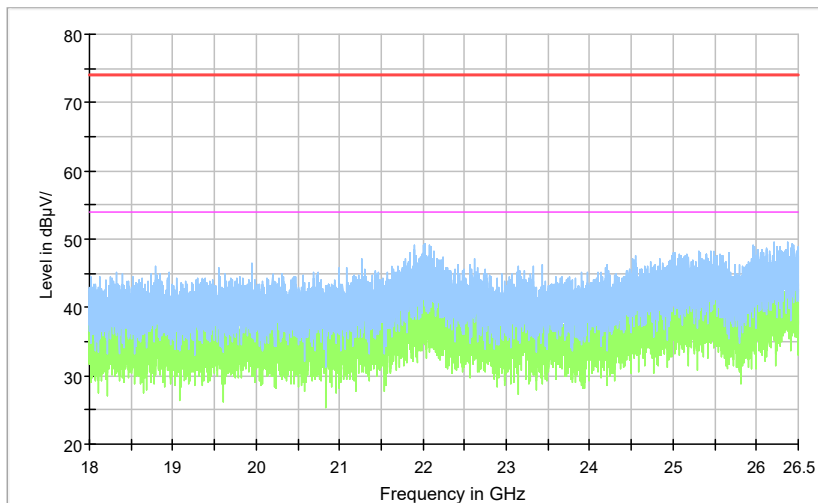


Frequency Range: 1GHz -6GHz
Detector: Av mode and PK mode
Modulation type: $\pi/4$ DQPSK



Frequency Range: 6GHz-18GHz
Detector: Av mode and PK mode
Modulation type: $\pi/4$ DQPSK

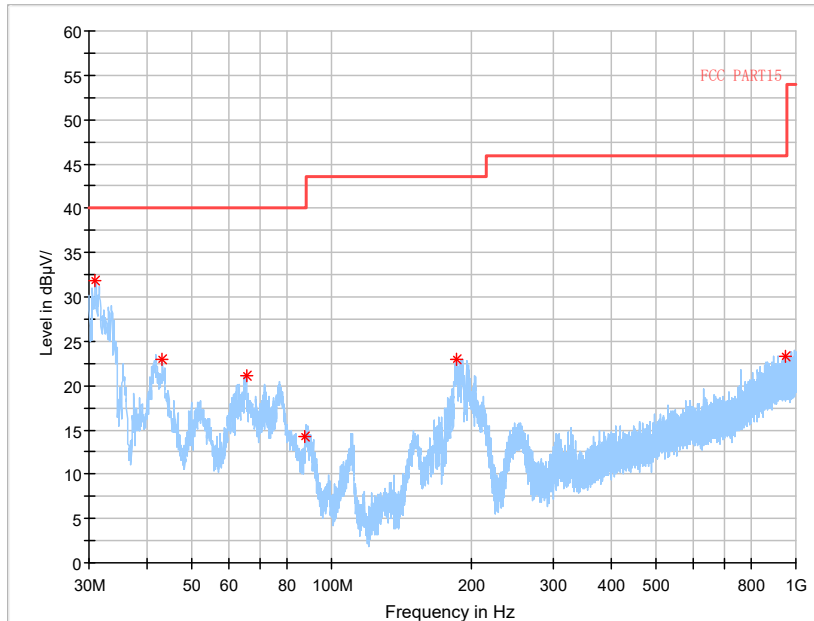
Full Spectrum



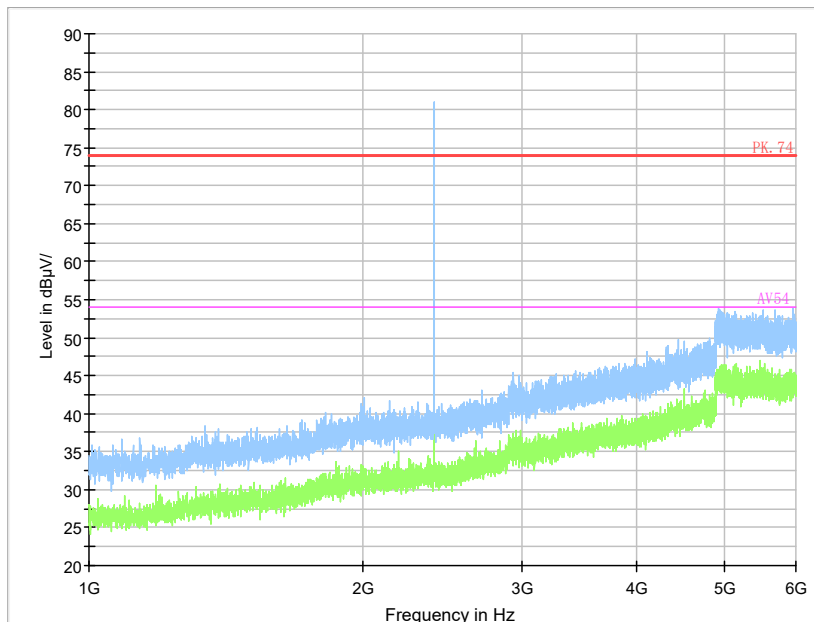
Preview Result 2-AVG Preview Result 1-PK+ PK70-74 AV50-54

Comment

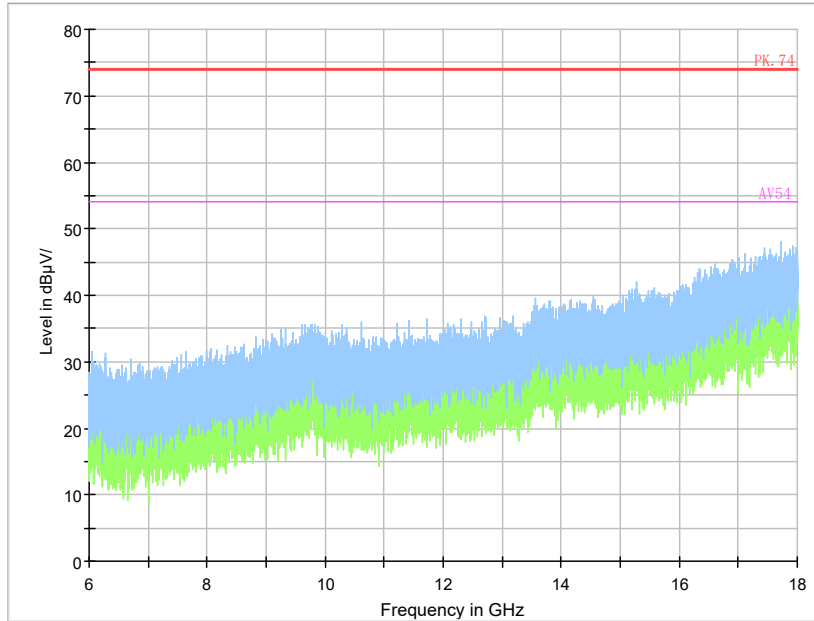
Frequency Range: 18GHz-25GHz
Detector: Av mode and PK mode
Modulation type: $\pi/4$ DQPSK



Frequency Range: 30MHz-1000 MHz
Detector: QP mode
Modulation type: 8DPSK

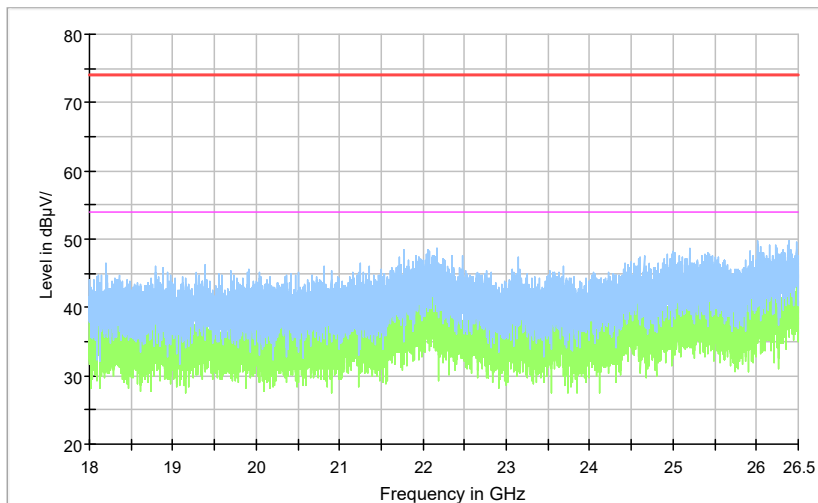


Frequency Range: 1GHz -6GHz
Detector: Av mode and PK mode
Modulation type: 8DPSK



Frequency Range: 6GHz-18GHz
Detector: Av mode and PK mode
Modulation type: 8DPSK

Full Spectrum



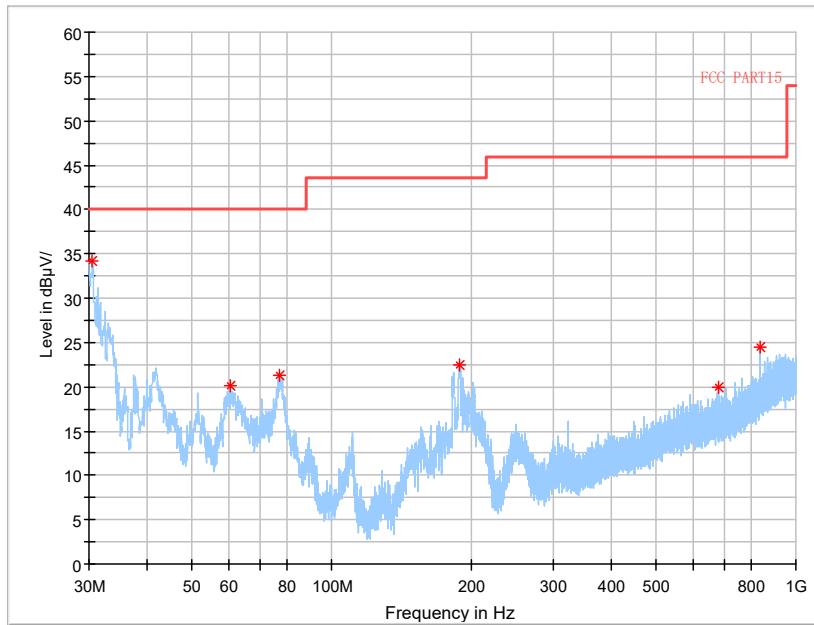
Preview Result 2-AVG Preview Result 1-PK+ PK70-74 AV50-54

Comment

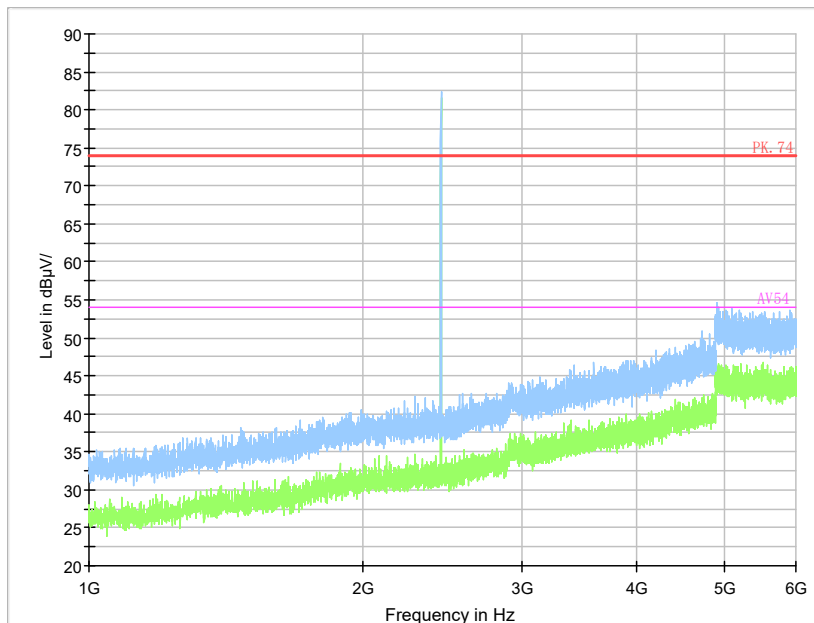
Frequency Range: 18GHz-25GHz
Detector: Av mode and PK mode
Modulation type: 8DPSK

Carrier frequency (MHz): 2441

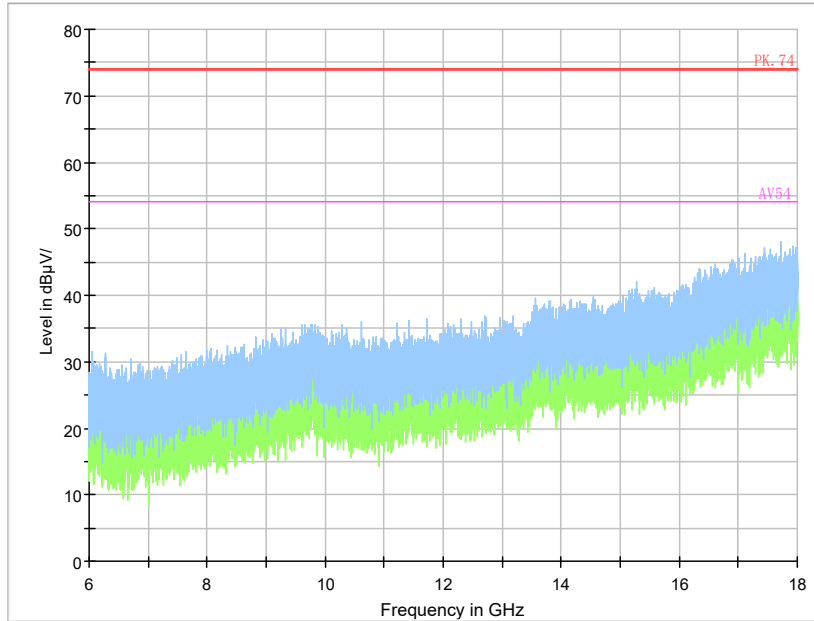
Channel No.:39



Frequency Range: 30MHz-1000MHz
Detector: QP mode
Modulation type: GFSK

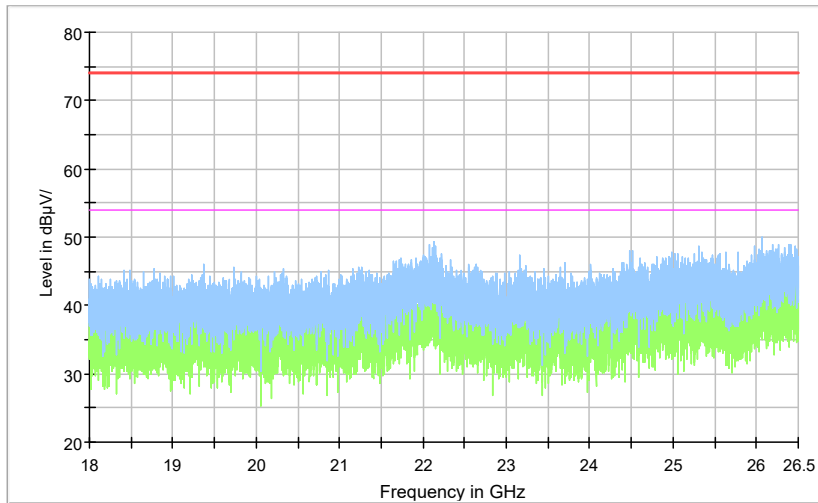


Frequency Range: 1GHz -6GHz
Detector: Av mode and PK mode
Modulation type: GFSK



Frequency Range: 6GHz- 18GHz
Detector: Av mode and PK mode
Modulation type: GFSK

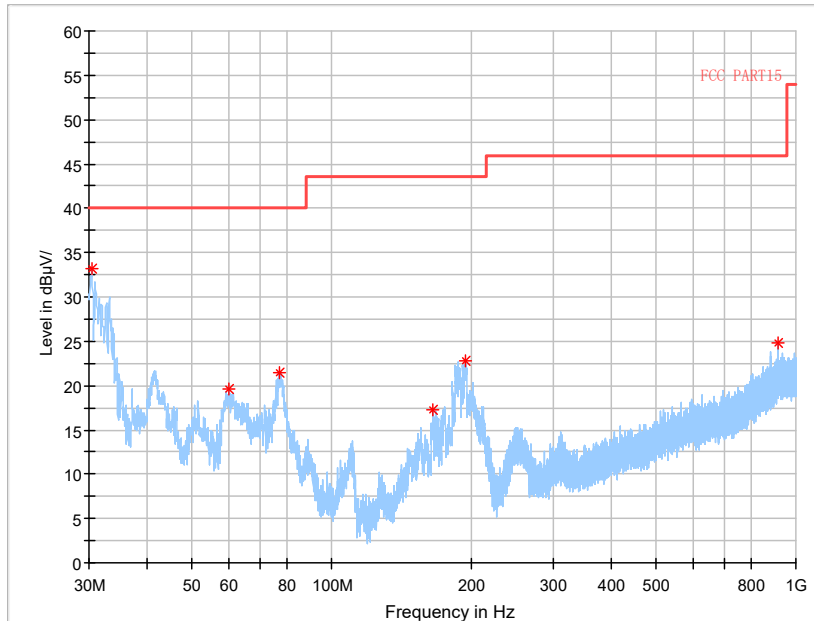
Full Spectrum



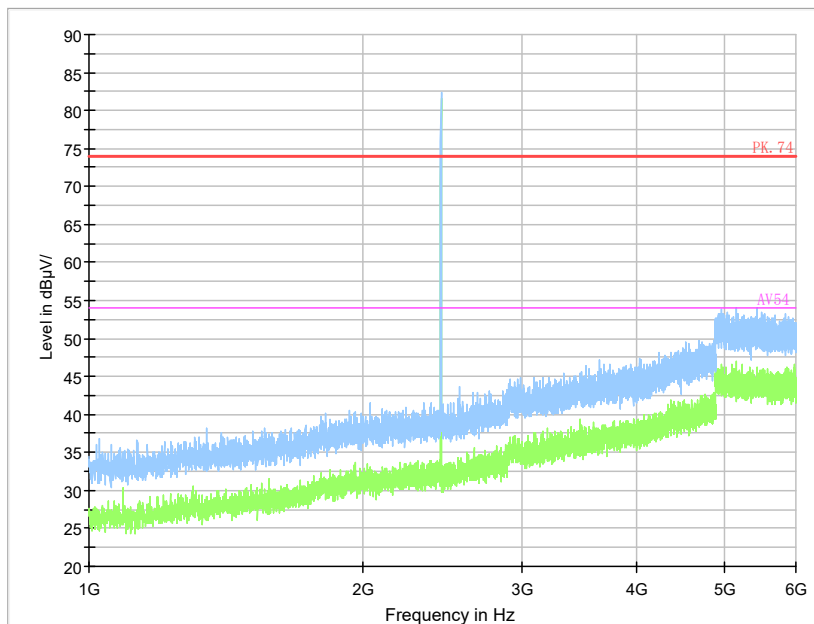
Preview Result 2-AVG Preview Result 1-PK+ PK70-74 AV50-54

Comment

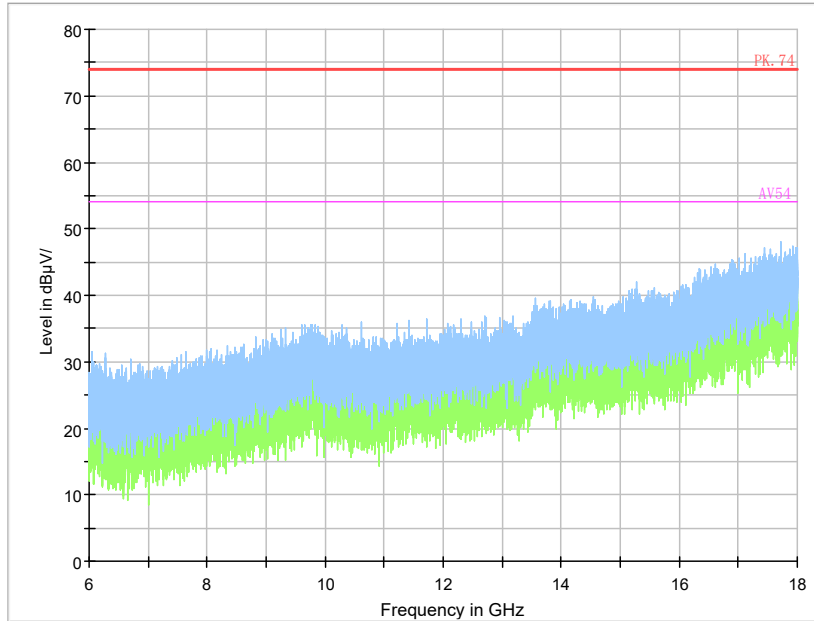
Frequency Range: 18GHz-25GHz
Detector: Av mode and PK mode
Modulation type: GFSK



Frequency Range: 30MHz-1000 MHz
Detector: QP mode
Modulation type: $\pi/4$ DQPSK

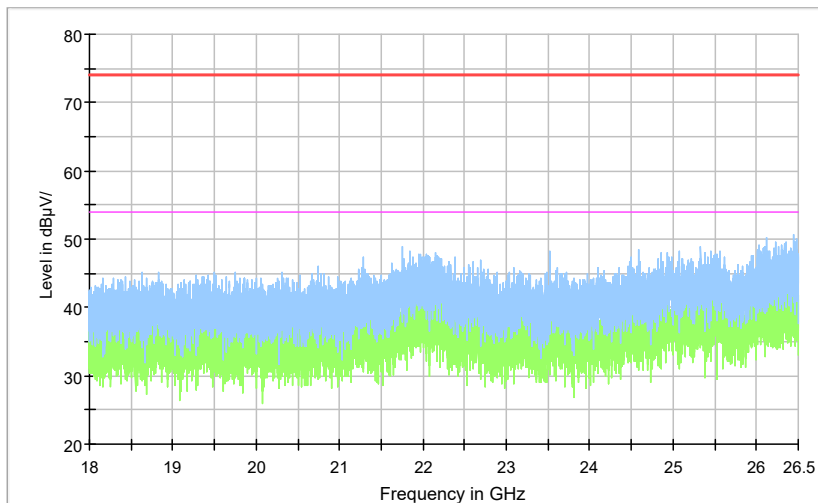


Frequency Range: 1GHz -6GHz
Detector: Av mode and PK mode
Modulation type: $\pi/4$ DQPSK



Frequency Range: 6GHz-18GHz
Detector: Av mode and PK mode
Modulation type: $\pi/4$ DQPSK

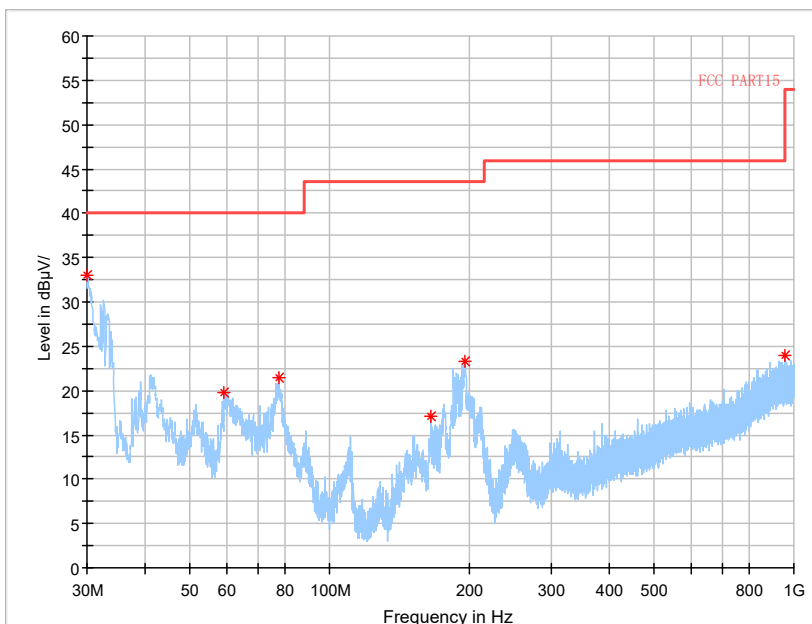
Full Spectrum



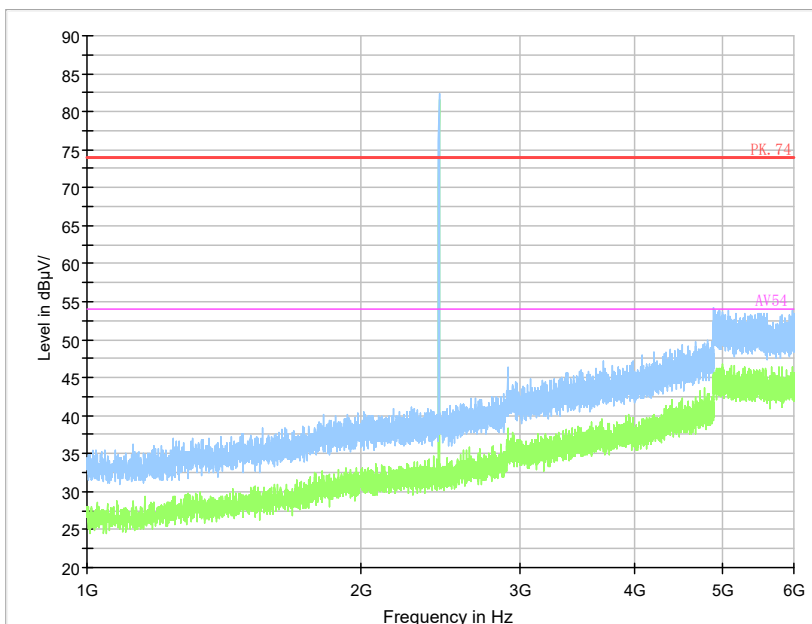
Preview Result 2-AVG Preview Result 1-PK+ PK70-74 AV50-54

Comment

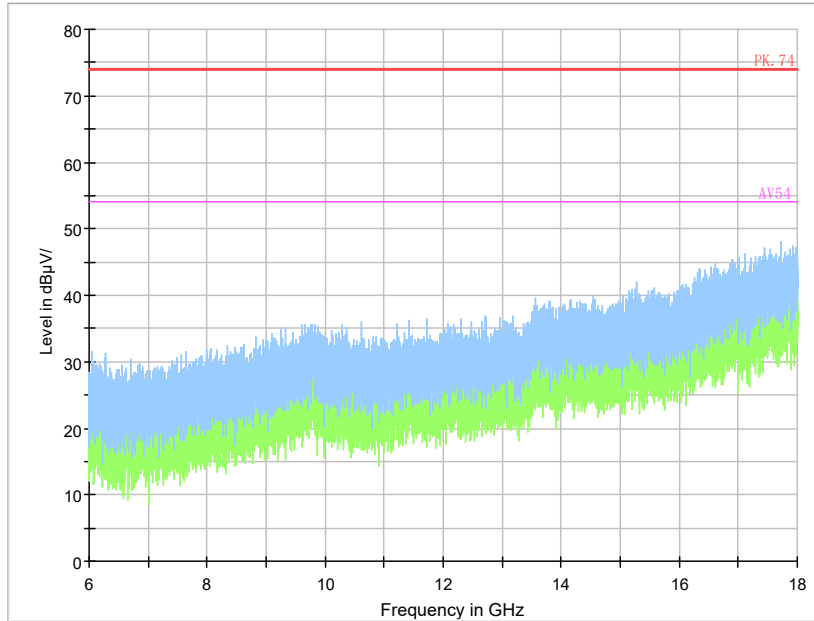
Frequency Range: 18GHz-25GHz
Detector: Av mode and PK mode
Modulation type: $\pi/4$ DQPSK



Frequency Range: 30MHz-1000 MHz
Detector: QP mode
Modulation type: 8DPSK

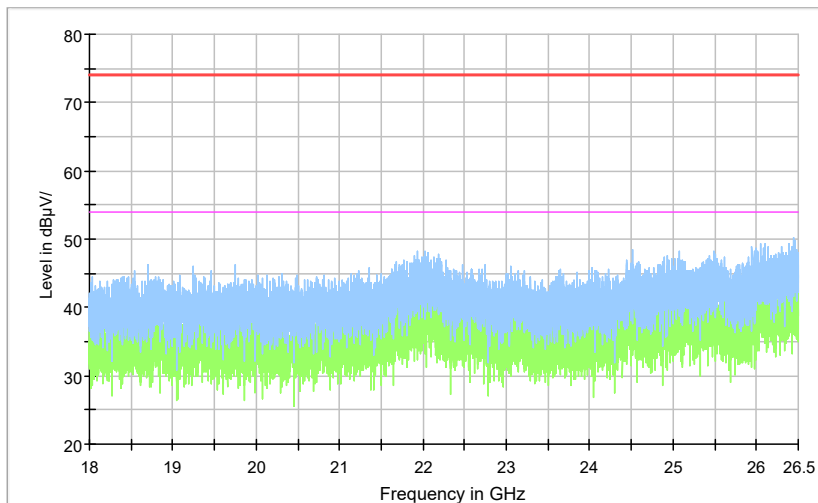


Frequency Range: 1GHz -6GHz
Detector: Av mode and PK mode
Modulation type: 8DPSK



Frequency Range: 6GHz-18GHz
Detector: Av mode and PK mode
Modulation type: 8DPSK

Full Spectrum



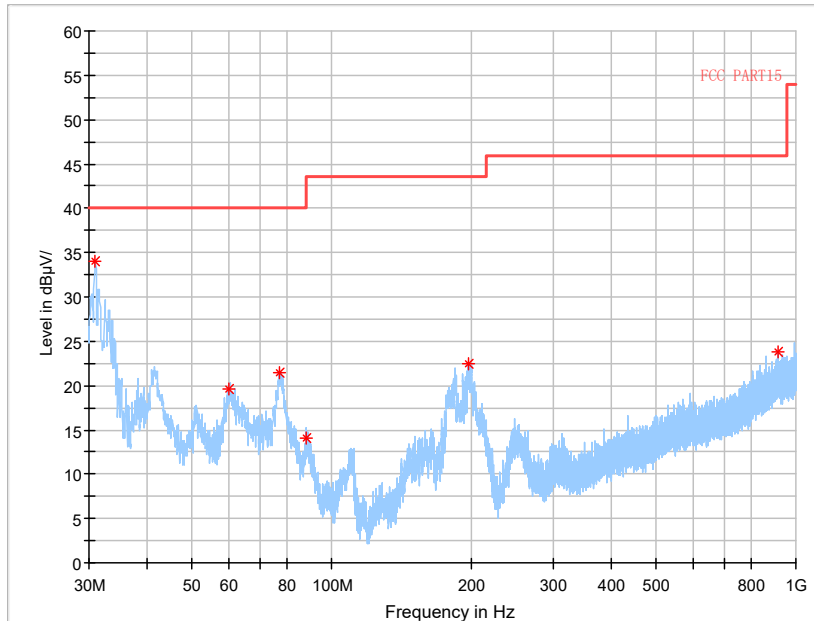
Preview Result 2-AVG Preview Result 1-PK+ PK70-74 AV50-54

Comment

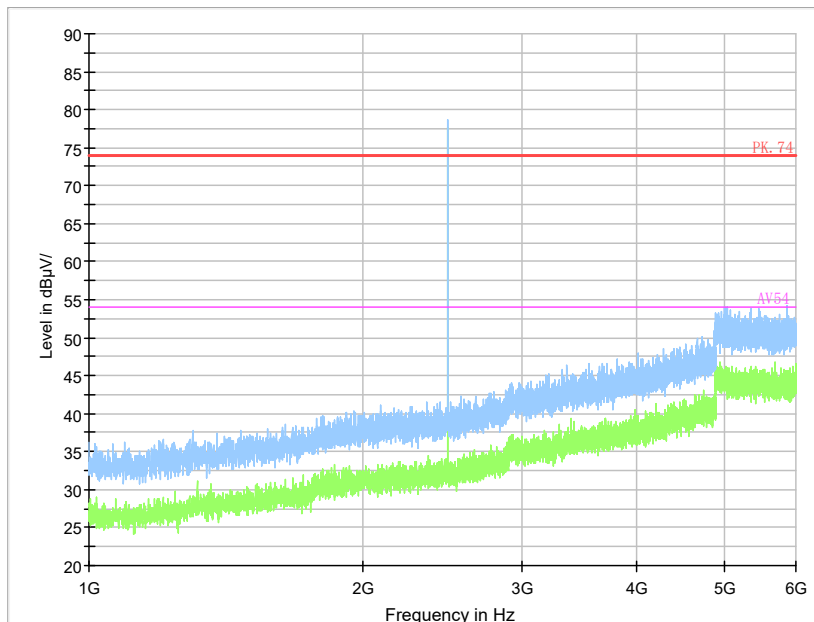
Frequency Range: 18GHz-25GHz
Detector: Av mode and PK mode
Modulation type: 8DPSK

Carrier frequency (MHz): 2480

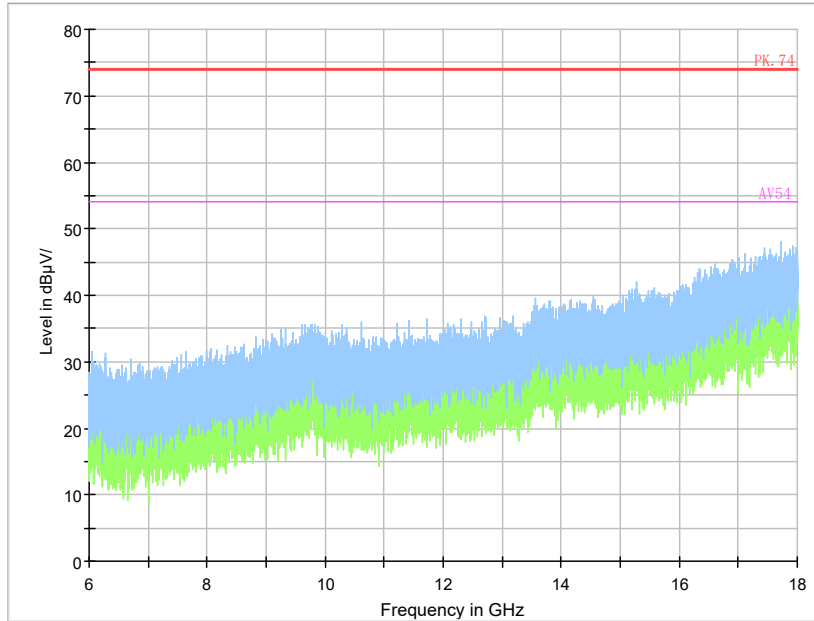
Channel No.:78



Frequency Range: 30MHz-1000MHz
Detector: QP mode
Modulation type: GFSK

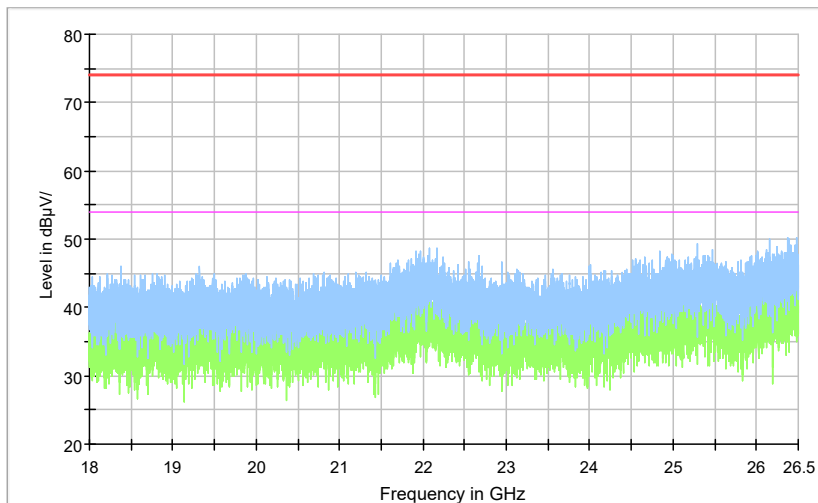


Frequency Range: 1GHz -6GHz
Detector: Av mode and PK mode
Modulation type: GFSK



Frequency Range: 6GHz- 18GHz
Detector: Av mode and PK mode
Modulation type: GFSK

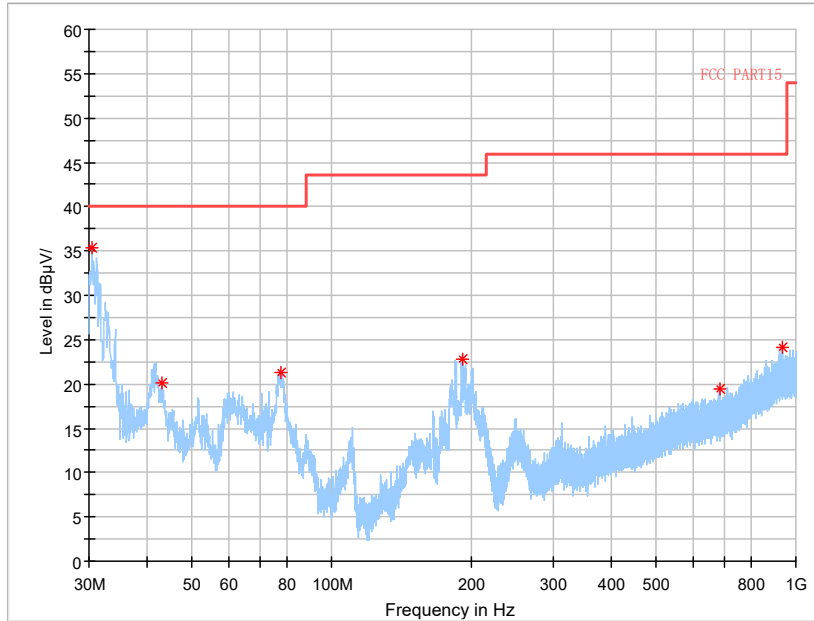
Full Spectrum



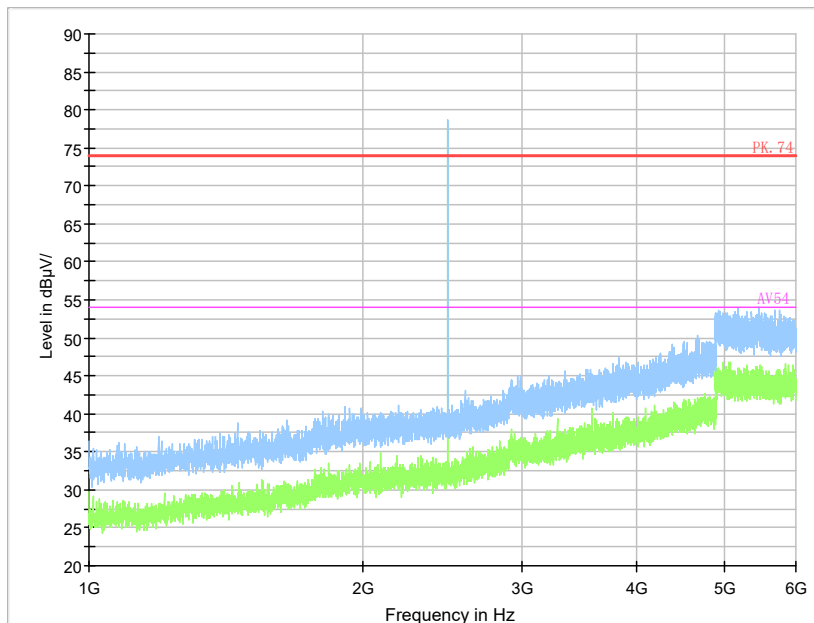
Preview Result 2-AVG Preview Result 1-PK+ PK70-74 AV50-54

Comment

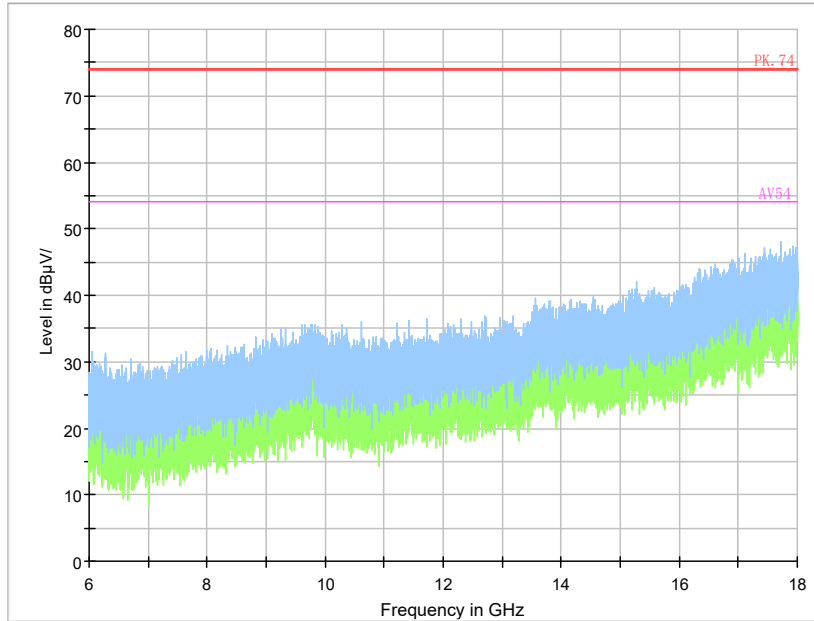
Frequency Range: 18GHz-25GHz
Detector: Av mode and PK mode
Modulation type: GFSK



Frequency Range: 30MHz-1000 MHz
Detector: QP mode
Modulation type: $\pi/4$ DQPSK

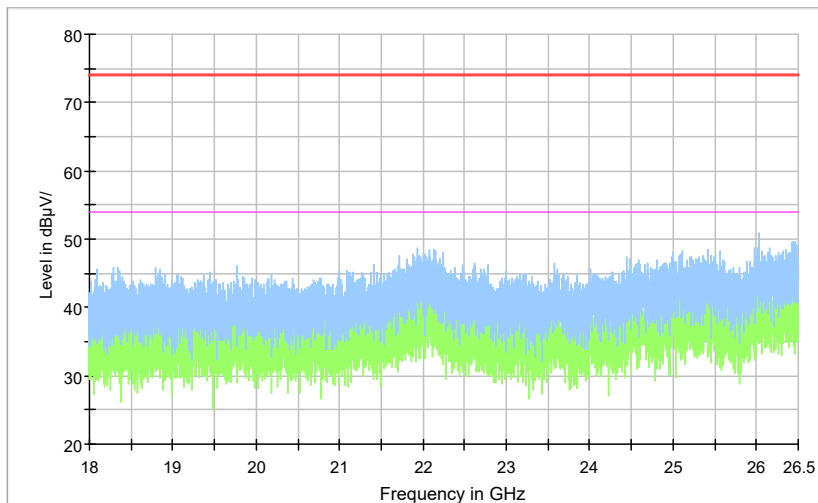


Frequency Range: 1GHz -6GHz
Detector: Av mode and PK mode
Modulation type: $\pi/4$ DQPSK



Frequency Range: 6GHz-18GHz
Detector: Av mode and PK mode
Modulation type: $\pi/4$ DQPSK

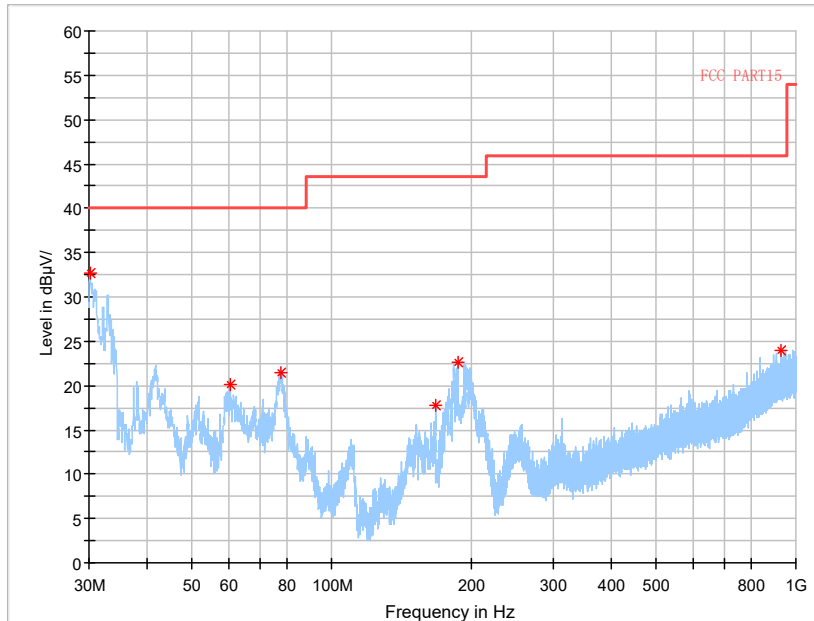
Full Spectrum



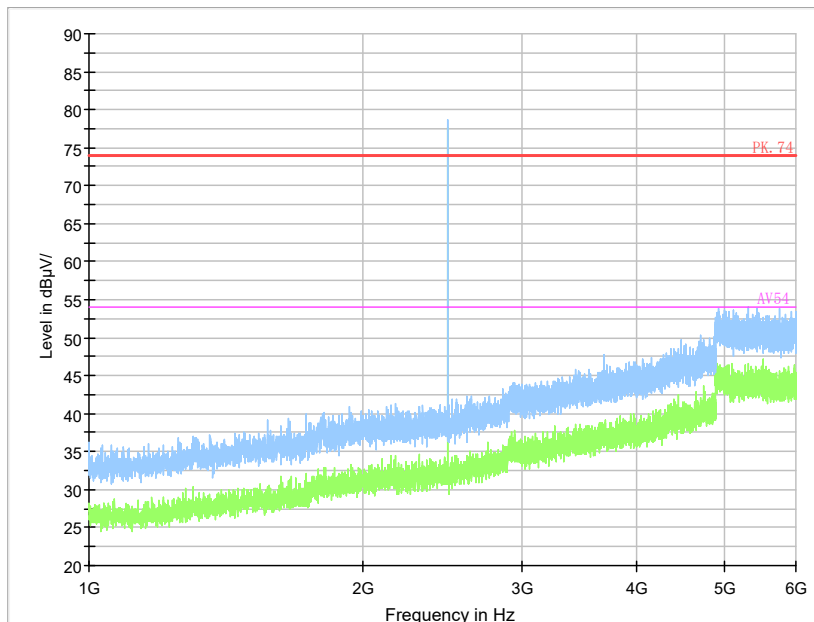
Preview Result 2-AVG Preview Result 1-PK+ PK70-74 AV50-54

Comment

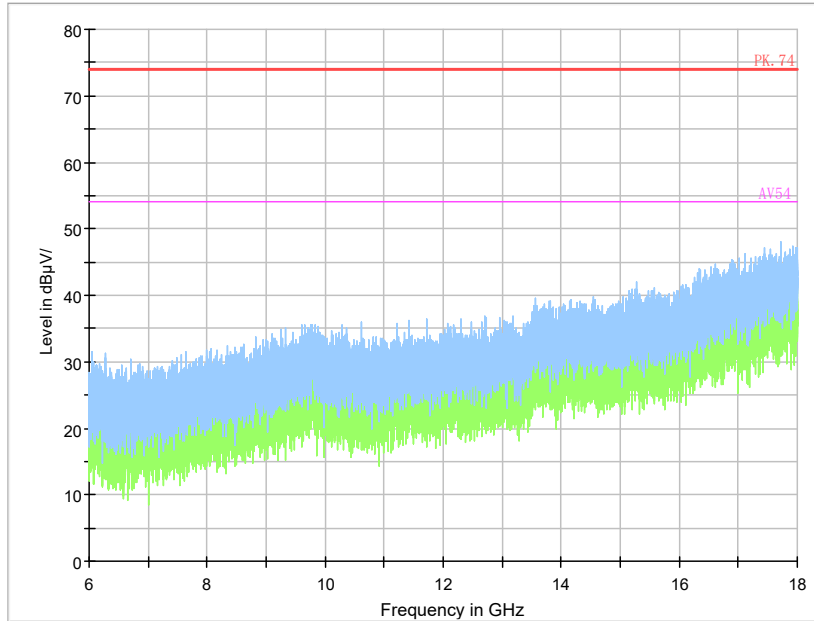
Frequency Range: 18GHz-25GHz
Detector: Av mode and PK mode
Modulation type: $\pi/4$ DQPSK



Frequency Range: 30MHz-1000 MHz
Detector: QP mode
Modulation type: 8DPSK

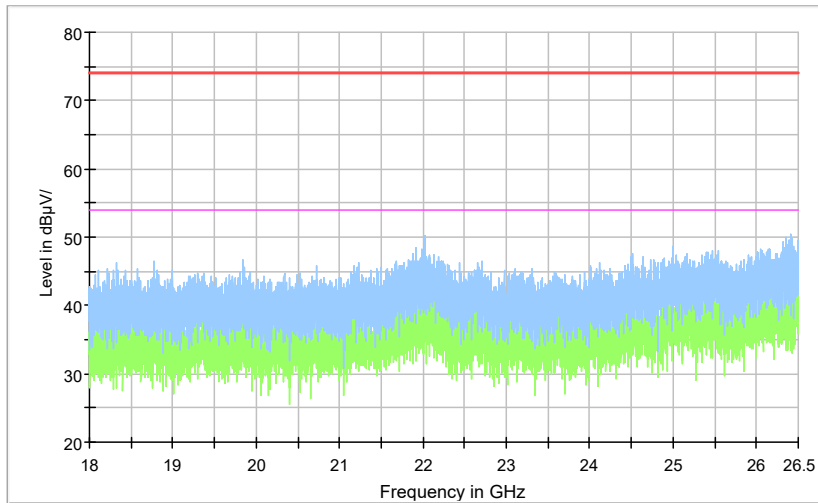


Frequency Range: 1GHz -6GHz
Detector: Av mode and PK mode
Modulation type: 8DPSK



Frequency Range: 6GHz-18GHz
Detector: Av mode and PK mode
Modulation type: 8DPSK

Full Spectrum



Preview Result 2-AVG Preview Result 1-PK+ PK70-74 AV50-54

Comment

Frequency Range: 18GHz-25GHz
Detector: Av mode and PK mode
Modulation type: 8DPSK

AC Power line Conducted Emission

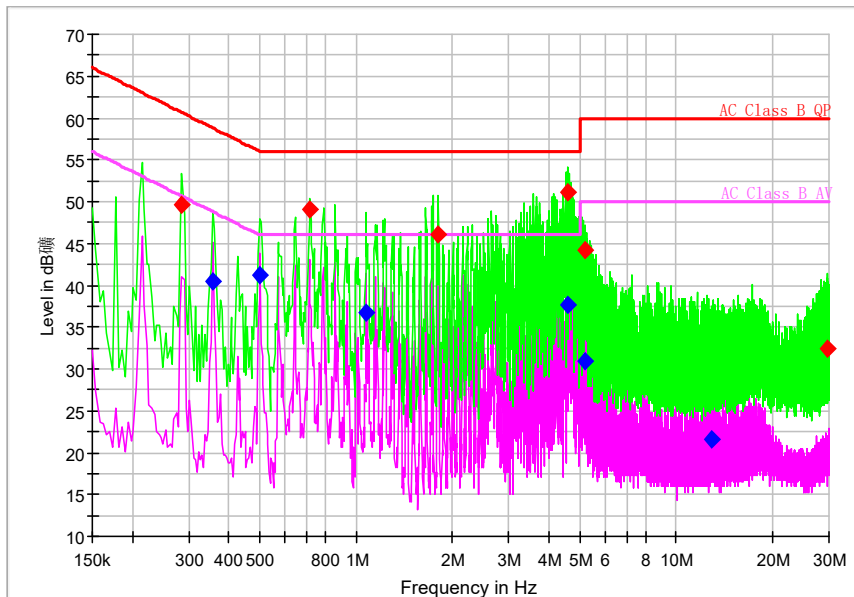
A "reference path loss" Corr.(dB) is established and the $L_{cable}+ATT+VDF$ is the attenuation of "reference path loss", and including the cable loss, the attenuation of the attenuator, the voltage division factor of AMN.

The measurement results are obtained as described below:

$$P_{result}=P_{mea}+ Corr.(dB)$$

Sample calculation: $(49.58 \text{ dB}\mu\text{V}) = (19.88 \text{ dB}\mu\text{V}) + (29.7 \text{ dB})$, the corresponding frequency is 0.286000MHz.

Full Spectrum



L+N Line

MEASUREMENT RESULT:

Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Line	Corr. (dB)	P _{mea} QuasiPeak (dBµV)	P _{mea} Average (dBµV)
0.286000	49.58	---	60.64	11.06	N	29.7	19.88	---
0.358000	---	40.46	48.78	8.31	L1	29.7	---	10.76
0.502000	---	41.30	46.00	4.70	L1	29.7	---	11.6
0.718000	49.13	---	56.00	6.87	L1	29.7	19.43	---
1.074000	---	36.70	46.00	9.30	L1	29.7	---	7.0
1.810000	46.11	---	56.00	9.89	L1	29.7	16.41	---
4.582000	51.19	---	56.00	4.81	L1	29.8	21.39	---
4.582000	---	37.65	46.00	8.35	L1	29.8	---	7.85
5.162000	44.17	---	60.00	15.83	L1	29.8	14.37	---
5.162000	---	30.91	50.00	19.09	L1	29.8	---	1.11
12.894000	---	21.57	50.00	28.43	L1	29.9	---	-8.33
29.650000	32.41	---	60.00	27.59	N	29.9	2.51	---

---End of Test Report---