



(FCC) TEST REPORT

Report No. : BVT-RH-FCR-250007

Applicant

• Name : Glosys Inc.
• Address : B2535 Kumgang Penterium IX Tower, 27 Dongtancheomdansaneop 1-ro,
Hwaseong-si, Gyeonggi-do, Korea

Test Item

• Product Name : In-vehicle Infotainment System
• Model Name : CT90118CS

Manufacturer

• Name : Glosys Inc.
• Address : B2535 Kumgang Penterium IX Tower, 27 Dongtancheomdansaneop 1-ro,
Hwaseong-si, Gyeonggi-do, Korea

Date of Test : 2025.09.25. ~ 2025.09.26.

Test Method Used : FCC CFR 47, Part 15. Subpart C-15.247
558074 D01 15.247 Meas Guidance v05r02
ANSI C 63.10-2020

Test Result : ☒ Pass ☐ Fail

Note : None

This test report is not related to KOLAS accreditation

Affirmation Tested by
Name : Jung, Ho-Cheol (Signature)

Technical Manager
Name : Lee, Ha-Rim (Signature)

2025 . 09 . 29 .

Bureau Veritas CPS Korea Tech Limited



Revision History of test report

Date	Report No.	Revision Histoty
2025.09.29	BVT-RH-FCR-250007	Initial issue

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1. Information of Testing Laboratory

Legal Name and address

Bureau Veritas CPS Korea Tech Limited

(Annyeong-dong) 26, 28, 30, Seja-ro 406beon-gil, Hwaseong-si, Gyeonggi-do, 18326, Republic of Korea

Website: <http://www.bvcpskoreatech.co.kr>

Registration information

- KOLAS No.: KT232
- RRA No.: KR0041
- Test Lab No.: 491470
- A2LA No.: 4068.02, 4068.03
- FCC Designation No.: KR0041
- ISED Designation No.: KR0041
- VCCI Membership No.: 2005

Test location and address

☒ Hwaseong

(Annyeong-dong) 26, 28, 30, Seja-ro 406beon-gil, Hwaseong-si, Gyeonggi-do, 18326, Republic of Korea

Tel: 82-31-222-4251

☐ Anyang

Heungan-daero 49, Dongan-gu, Anyang-si, Gyeonggi-do, 14119, Republic of Korea

Tel: +82-31-689-4110, Fax: +82-31-689-4120

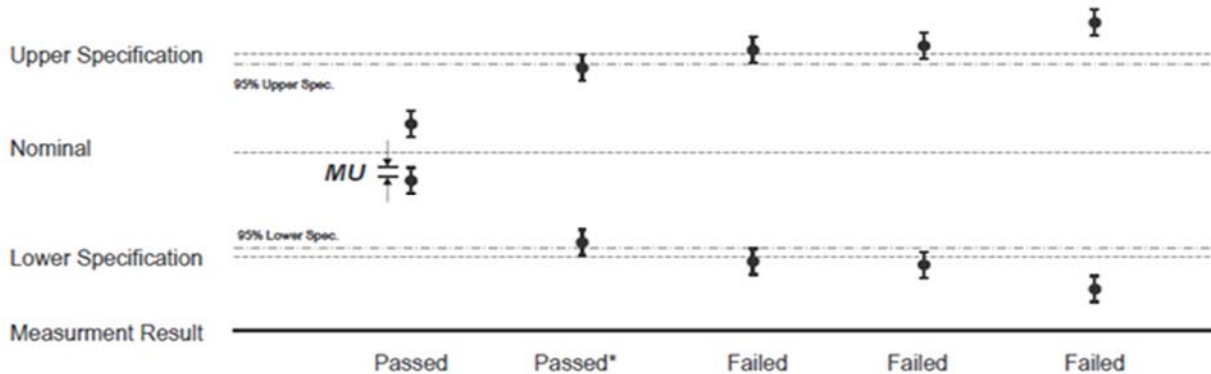
2 Summary of Test Results

The EUT has been tested according to the following specifications

Applied Standard : FCC Part 15, Subpart C 15.247					
FCC Part Section(s)	Test Description	Limit	Test Condition	Test Result	Reference
15.247(b)(1)	Peak Output Power	<30 dBm	Conducted	PASS	Section 4.1
15.247(a)(1)	20 dB Bandwidth	FCC 15.247(a)	Conducted	PASS	Section 4.2
15.247(a)(1)	Channel Separation	> two-thirds of the 20 dB bandwidth	Conducted	PASS	Section 4.3
15.247(a)(1)	Number of Hopping Channels	≥15	Conducted	PASS	Section 4.4
15.247(a)(1)	Time of Occupancy	≤ 0.4	Conducted	PASS	Section 4.5
15.247(d)	Conducted Spurious Emissions	≤ 20 than PSD level	Conducted	PASS	Section 4.6
15.247(d), 15.209 and 15.205	Radiated Spurious Emissions	FCC 15.247(d)	Radiated	PASS	Section 4.7
15.203	Antenna Requirement	FCC 15.203	-	PASS	Section 4.8
15.207	AC Power Conducted emissions	FCC 15.207	-	-	-

- 1) The test is not applicable because the EUT will be installed in vehicles and will not be connected to the public utility (AC) power line

2.1 Decision Rules for Statement of Conformity



QUA-52 Decision Rule(QA Document) was applied.

Step 1) : Reference Check, Daily Check, Peripheral device Check

Step 2) : Re-test Procedure (Repeat the test maximum 3 times, Different Test Engineer)

- 1) If the original test results are subject to retesting and the judgement is unclear, the retest is carried out.
- 2) If the result of the first retest is the same as the initial test, the judgement is made based on the value.
- 3) If the result of the first retest differ from the results of the initial test, the second re-test is carried out.
- 4) After completion of the second retest, the average of the three test results is determined as the final result. However, if the deviation of the three test values is more than 5 % of the reference value, the technical manager should review the reproducibility of the test from the beginning.

2.2 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2

Measurement Items	Frequency Range	Expanded Uncertainty $U = kU_c (k = 2)$
Radiated Spurious Emissions	1 GHz Below	5.06
	1 GHz Above	5.00
Measurement Items		Expanded Uncertainty $U = kU_c (k = 2)$
Conducted	0.009 MHz – 0.15 MHz	3.54
	0.15 MHz – 30 MHz	3.16

This uncertainty represents an expanded uncertainty expressed at approximately the 95 % confidence level using a coverage factor of $k = 2$.

3 General Information

3.1 General Description of EUT

Equipment Class	Digital Spread Spectrum (DSS)
Product name	In-vehicle Infotainment System
FCC ID	YE48CSV3
Model	CT90118CS
Additional model name	-
Power Supply	DC 12 V
Modulation Type	GFSK(BDR 1 Mbps), $\pi/4$ -DQPSK(EDR 2 Mbps), 8DPSK(EDR 3 Mbps)
Transfer Rate	-
Operating Frequency	2 402 MHz ~ 2 480 MHz
Output Power	9.07 dBm
Antenna Type	Internal FPC Antenna
Antenna Gain	-4.54 dBi
H/W Version	V 3 (2025.08.20.)
S/W Version	N320

3.2 Tested sample and Tested companion device information

Type	Model	Note
Notebook	BCM-1063	S/N: 2Z7S1Z1
Adapter	DA65NM111-00	S/N: None

3.3 Description of Test Mode

The EUT has been tested with all modes of operating conditions to determine the worst case emission characteristics.

Test Mode		Tested Frequency (MHz)		
TM 1	BDR(GFSK)	2 402	2 440	2 480
TM 2	EDR($\pi/4$ DQPSK)	2 402	2 440	2 480
TM 3	EDR(8DPSK)	2 402	2 440	2 480

3.4 INSTRUMENT CALIBRATION

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipments, which is traceable to recognized national standards.

3.5 EUT CONFIGURATION

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner that intends to maximize its emission characteristics in a continuous normal application.

3.6 General Description of Applied Standards

Generally the tests were performed according to the specifications of the standard, it must comply with the requirements of the following standards.

FCC CFR 47 Part 15, Subpart C (§15.247)
558074 D01 15.247 Meas Guidance v05r02
ANSI C63.10-2020

All test items in this test report have been performed and recorded as per the above standards.

3.7 Test Equipment

Test Equipment is traceable to the National Institute of Standards and Technology (NIST). Measurement antenna used during testing were calibrated in accordance to the requirements of ANSI C63.5-2017.

Equipment Name	Manufacturer	Model No.	Serial No.	Next Cal. Date
T & H Chamber	ESPEC CORP	PL-3J	15003623	2026.08.12
Spectrum Analyzer	Rohde & Schwarz	FSV30	20-353063	2026.01.08
EMI Test Receiver	Rohde & Schwarz	ESI	837514/004	2026.08.06
Signal Generator	Rohde & Schwarz	SMB100A	179628	2026.01.09
DC Power supply	Unicon Co.,Ltd	UP-3005T	68	2026.01.06
Attenuator	WEINSCHL	54A-10	74564	2026.08.11
Attenuator	WEINSCHL	56-10	66920	2026.01.08
Loop Antenna	Schwarzbeck	FMZB1513	#374	2027.02.11
BiconiLog Antenna(R)	ETS-LINDGREN	3142C	35880	2026.10.17
Horn Antenna	ETS-LINDGREN	3117	00135191	2026.03.24
Horn Antenna	SCHWARZBECK	BBHA 9170	9170-722	2026.01.13
AMPLIFIER(C_3)	TESTEK	TK-PA01S	200141-L	2026.08.12
AMPLIFIER	TESTEK	TK-PA18	150003	2026.01.07
AMPLIFIER	TESTEK	TK-PA1840H	160010-L	2026.01.06

3.8 Used Test Cable

Manufacturer	Model No.	Serial No.	Spec	Next Cal. Date
SUHNER	SUCOFLEX 126E	MY2202/26E	9 kHz ~ 26.5 GHz(1 M)	2026.12.01
SUHNER	SUCOFLEX 126E	MY2203/26E	9 kHz ~ 26.5 GHz(1 M)	2026.12.01

4 Test Results

4.1 Peak Output Power

4.1.1 Standard Applicable [FCC §15.247(b)(1)]

For frequency hopping systems operating in the 2 400 ~ 2 483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5 725 ~ 5 850 MHz band : 1 Watt.
For all other frequency hopping systems in the 2400 ~ 2483.5 MHz band: 0.125 watts.

4.1.2 Test Environment conditions

- Ambient temperature : 21 °C
- Relative Humidity : (38 ~ 41) % R.H.

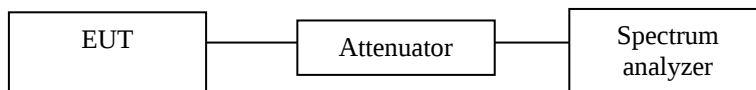
4.1.3 Measurement Procedure

ANSI C63.10 (2020) : Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems. The peak output power was measured using the marker to peak function of the spectrum analyzer.

The spectrum analyzer is set to the as follows :

- Span : approximately 5 times the 20 dB bandwidth
- RBW : > 20 dB bandwidth of the emission being measured
- VBW ≥ RBW.
- Sweep time = auto
- Detector = peak.
- Trace mode = max hold.
- Allow trace to fully stabilize.
- Use the peak marker function to determine the maximum amplitude level.

4.1.4 Test setup



4.1.5 Measurement Result

■ BDR(GFSK)

Channel	Frequency [MHz]	Output Power	Limit [dBm]	Test Results
		[dBm]		
0	2 402	6.25	30	Compliance
38	2 440	6.62	30	Compliance
78	2 480	6.81	30	Compliance

■ EDR($\pi/4$ DQPSK)

Channel	Frequency [MHz]	Output Power	Limit [dBm]	Test Results
		[dBm]		
0	2 402	8.20	30	Compliance
38	2 440	8.53	30	Compliance
78	2 480	8.69	30	Compliance

■ EDR(8DPSK)

Channel	Frequency [MHz]	Output Power	Limit [dBm]	Test Results
		[dBm]		
0	2 402	8.62	30	Compliance
38	2 440	9.07	30	Compliance
78	2 480	8.98	30	Compliance

4.1.6 Test Plot

■ BDR(GFSK)

CH Low



■ EDR($\pi/4$ DQPSK)

CH Low



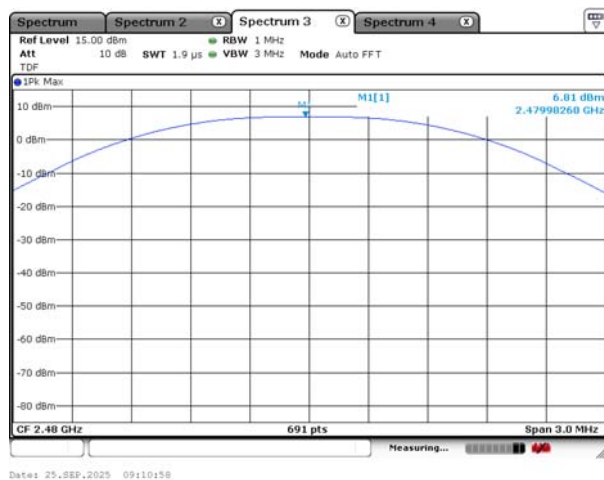
CH Middle



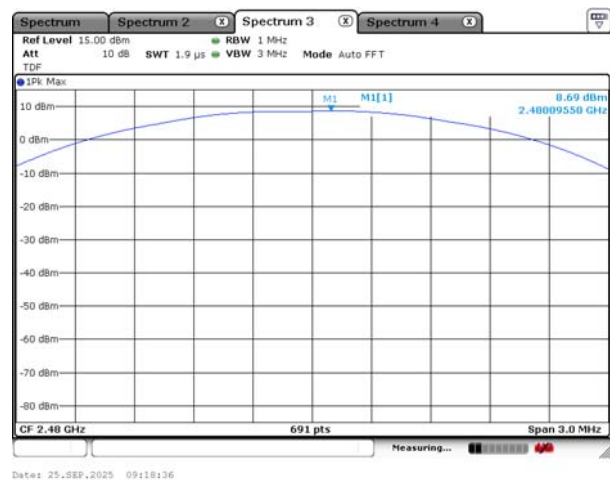
CH Middle



CH High



CH High



■ EDR(8DPSK)

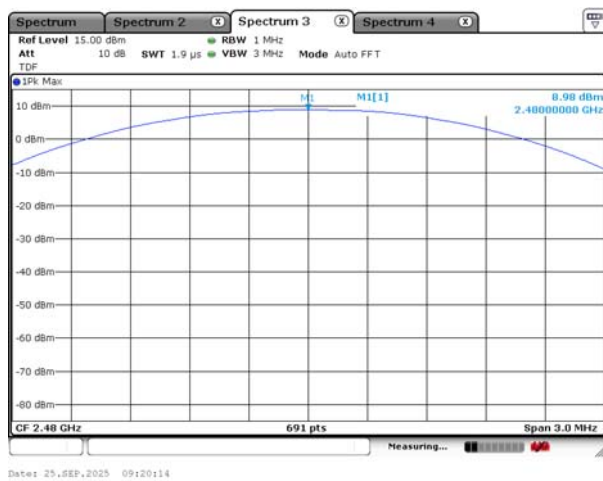
CH Low



CH Middle



CH High



4.2 20 dB Bandwidth

4.2.1 Standard Applicable [FCC §15.247(a)(1)]

Operation under the provisions of this Section is limited to frequency hopping and digitally modulated intentional radiators that comply with the following provisions:

(1) Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400–2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW. The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudo randomly ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

4.2.2 Test Environment conditions

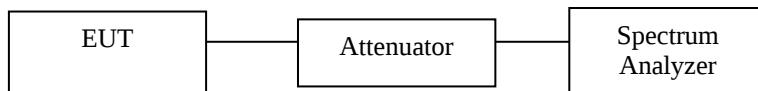
- Ambient temperature : 21 °C • Relative Humidity : (38 ~ 41) % R.H.

4.2.3 Measurement Procedure

ANSI C63.10 (2020): Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems.

1. The transmitter output (antenna port) was connected to the spectrum analyzer in peak hold mode.
2. The bandwidth of the fundamental frequency was measured by spectrum analyzer with RBW ≥ 1 % of the 20 dB bandwidth and VBW $\geq$ RBW.
3. Measured the spectrum width with power higher than 20 dB below carrier.

4.2.4 Test setup



4.2.5 Measurement Result

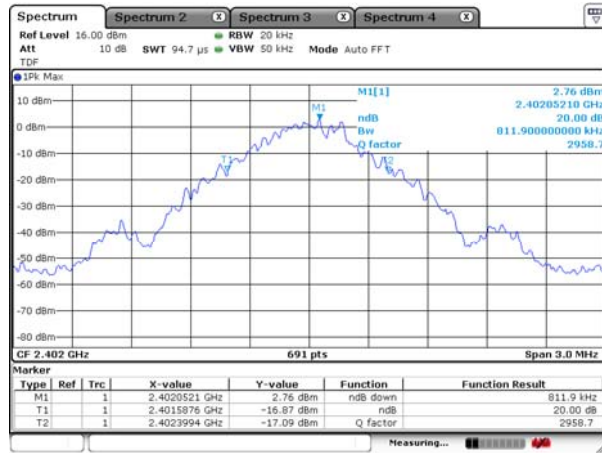
Modulation Type	Channel	Frequency [MHz]	20 dB Bandwidth [MHz]	99 % Bandwidth [MHz]	Limit [MHz]	Test Results
BDR(GFSK)	0	2 402	0.812	0.868	-	Compliance
	38	2 440	0.812	0.864	-	Compliance
	78	2 480	0.812	0.864	-	Compliance
EDR(π /4DQPSK)	0	2 402	1.333	1.194	-	Compliance
	38	2 440	1.333	1.194	-	Compliance
	78	2 480	1.333	1.194	-	Compliance
EDR(8DPSK)	0	2 402	1.303	1.190	-	Compliance
	38	2 440	1.294	1.190	-	Compliance
	78	2 480	1.294	1.194	-	Compliance

4.2.6 Test Plot

■ BDR(GFSK)

20 dB Bandwidth

CH Low



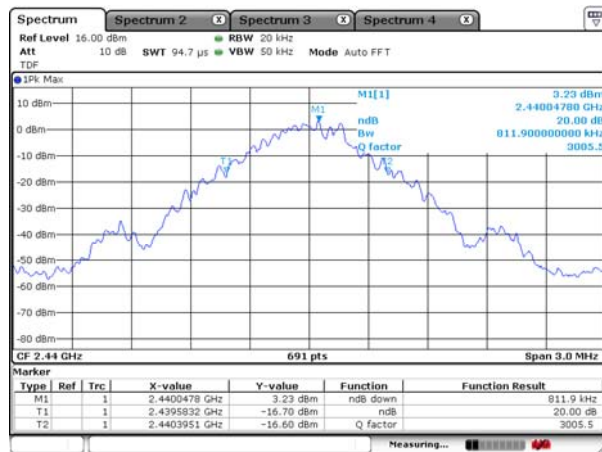
Date: 25.09.2025 09:04:04

99 % Bandwidth



Date: 25.09.2025 09:05:01

CH Middle

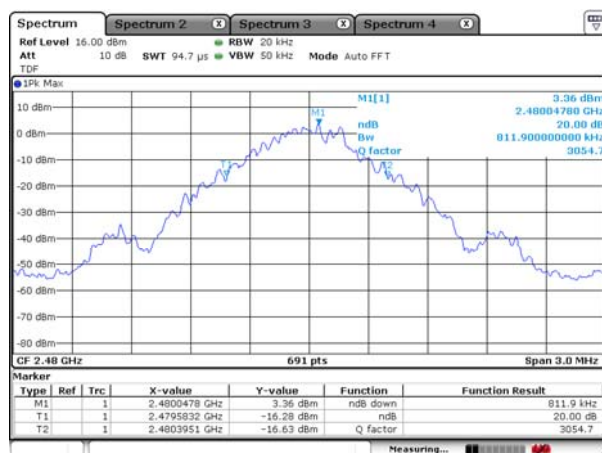


Date: 25.09.2025 09:09:10



Date: 25.09.2025 09:08:17

CH High



Date: 25.09.2025 09:10:16



Date: 25.09.2025 09:10:26

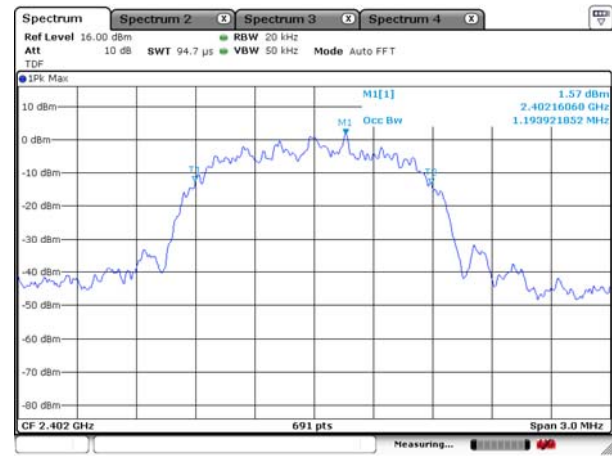
■ EDR($\pi/4$ DQPSK)

20 dB Bandwidth

CH Low



99 % Bandwidth



CH Middle

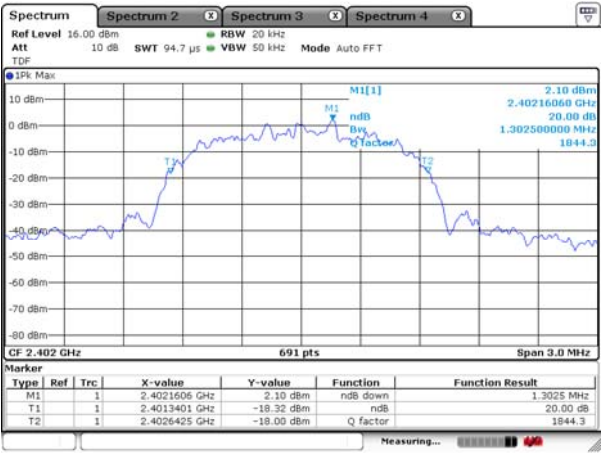


CH High





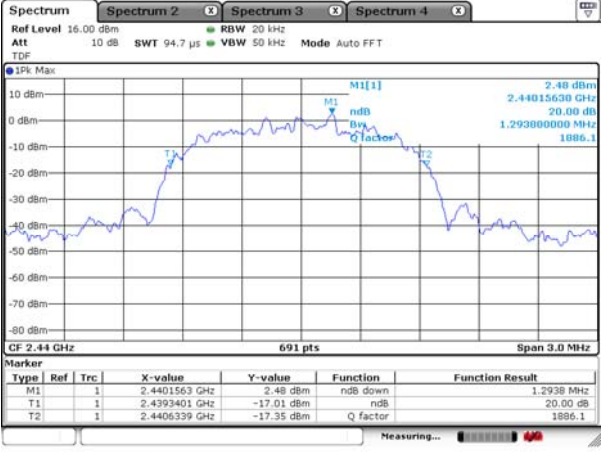
EDR(8DPSK)
20 dB Bandwidth
CH Low



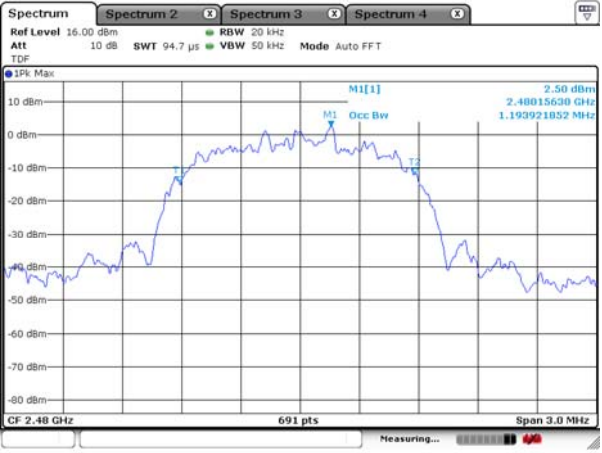
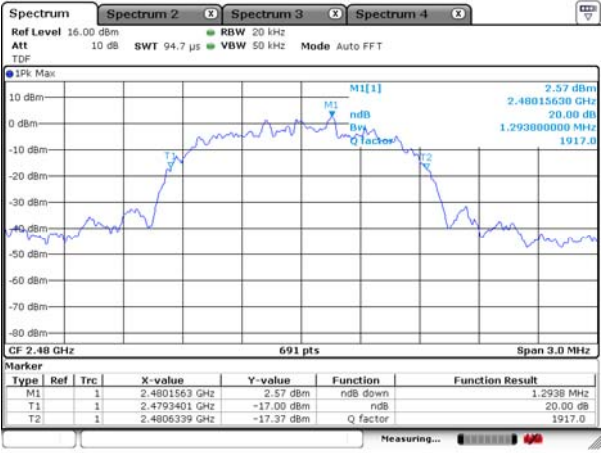
99 % Bandwidth



CH Middle



CH High



4.3 Channel Separation

4.3.1 Standard Applicable [FCC §15.247(a)(1)]

Operation under the provisions of this Section is limited to frequency hopping and digitally modulated intentional radiators that comply with the following provisions:

(1) Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400–2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW. The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudo randomly ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

4.3.2 Test Environment conditions

- Ambient temperature : 21 °C
- Relative Humidity : (38 ~ 41) % R.H.

4.3.3 Measurement Procedure

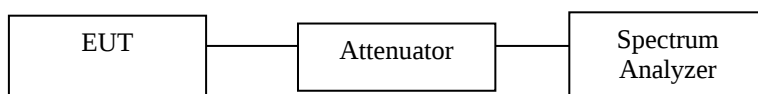
ANSI C63.10 (2020) : Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems.

1. The transmitter output (antenna port) was connected to the spectrum analyzer in peak hold mode.
2. The resolution bandwidth of 30 kHz and the video bandwidth of 100 kHz were used.
3. After the trace being stable, the reading value between the peak of the adjacent channels using the marker- Delta function was recorded as the measurement results.

The spectrum analyzer is set to the as follows :

- Span : wide enough to capture the peak of two adjacent channels
- RBW : $\geq 1\%$ of the span
- VBW : $\geq$ RBW
- Sweep : auto
- Detector function : peak
- Trace : max hold

4.3.4 Test setup



4.3.5 Measurement Result

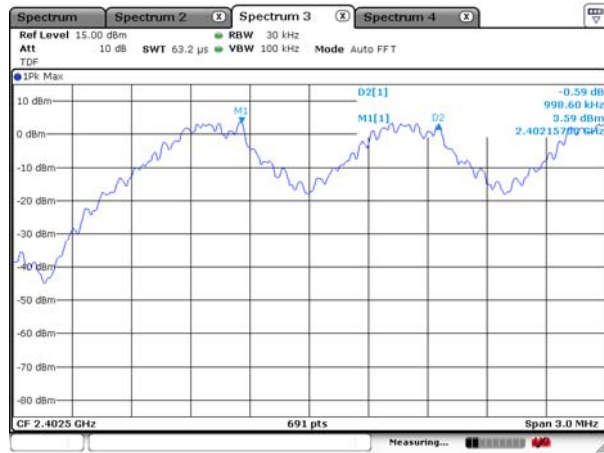
Modulation Type	Channel	Frequency[MHz]	Channel Separation(MHz)	Limit(MHz)	Test Results
BDR(GFSK)	00	2 402	0.999	≥ 0.812	Compliance
	38	2 440	0.999	≥ 0.812	Compliance
	78	2 480	0.999	≥ 0.812	Compliance
EDR($\pi/4$ DQPSK)	00	2 402	0.999	≥ 1.333	Compliance
	38	2 440	0.999	≥ 1.333	Compliance
	78	2 480	0.999	≥ 1.333	Compliance
EDR(8DPSK)	00	2 402	0.999	≥ 1.303	Compliance
	38	2 440	0.999	≥ 1.294	Compliance
	78	2 480	0.999	≥ 1.294	Compliance

* Limit : ≥ 25 kHz or two-thirds of the 20 dB bandwidth

4.3.6 Test plot

■ BDR(GFSK)

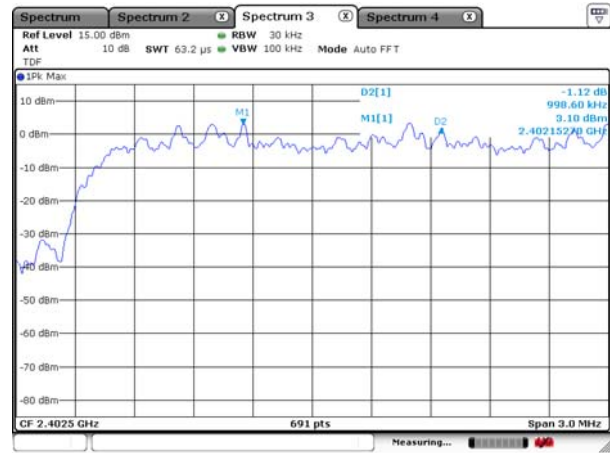
Channel 00



Date: 25,SEP,2025 09:35:24

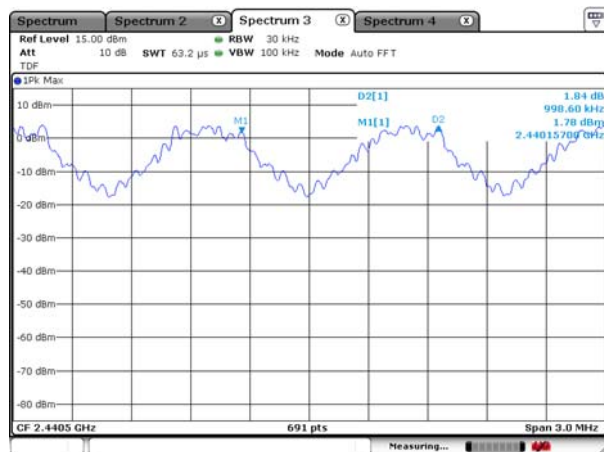
■ EDR(π /4DQPSK)

Channel 00



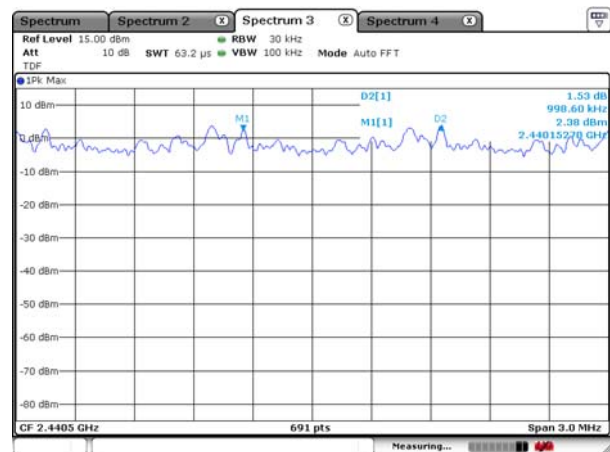
Date: 25,SEP,2025 09:39:05

Channel 38



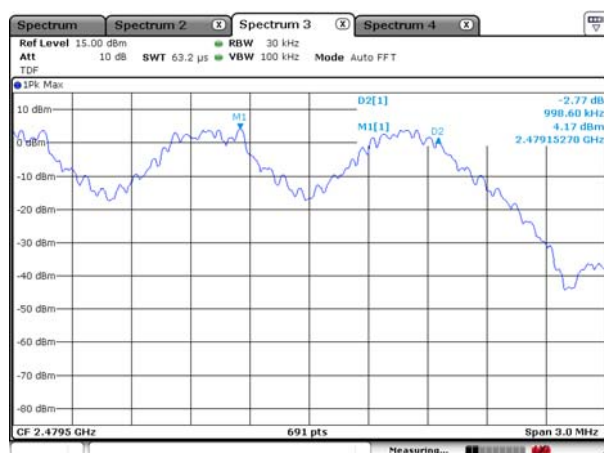
Date: 25,SEP,2025 09:36:39

Channel 38



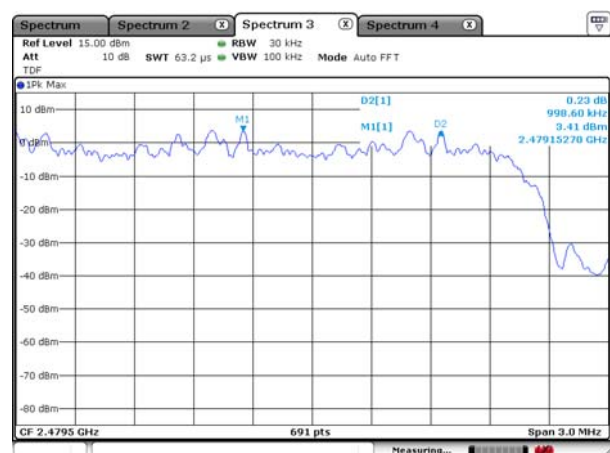
Date: 25,SEP,2025 09:38:36

Channel 78



Date: 25,SEP,2025 09:37:13

Channel 78

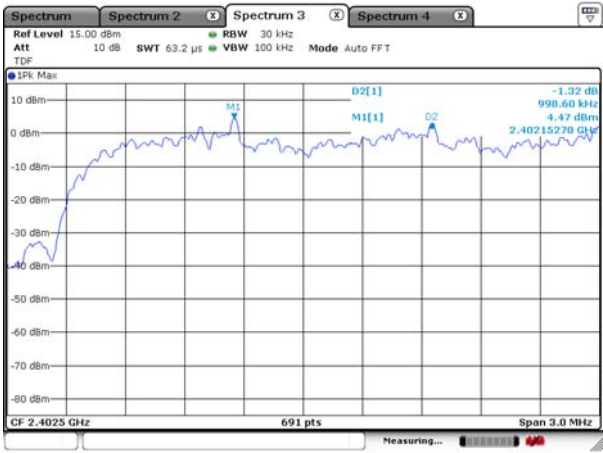


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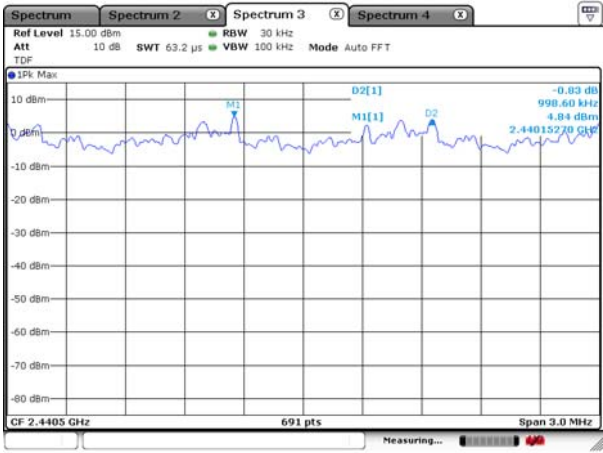


■ EDR(8DPSK)

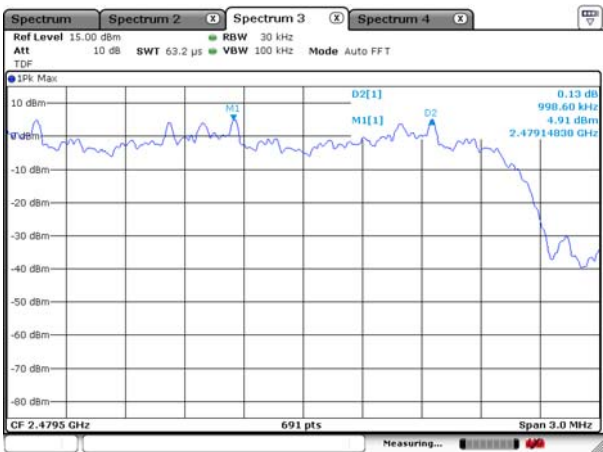
Channel 00



Channel 38



Channel 78



4.4 Number of Hopping Channels

4.4.1 Standard Applicable [FCC §15.247(a)(1)]

Operation under the provisions of this Section is limited to frequency hopping and digitally modulated intentional radiators that comply with the following provisions:

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

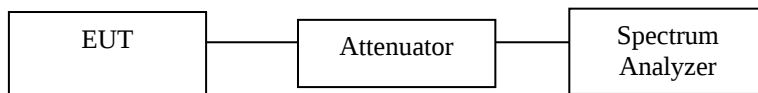
4.4.2 Test Environment conditions

- Ambient temperature : 21 °C • Relative Humidity : (38 ~ 41) % R.H.

4.4.3 Measurement Procedure

ANSI C63.10: 2020 and FCC Public Notice DA 00-705 Released March 30, 2000: Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems.

4.4.4 Test setup

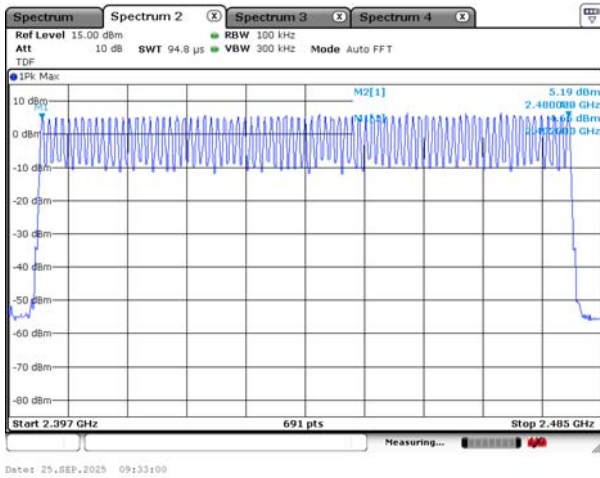


4.4.5 Measurement Result

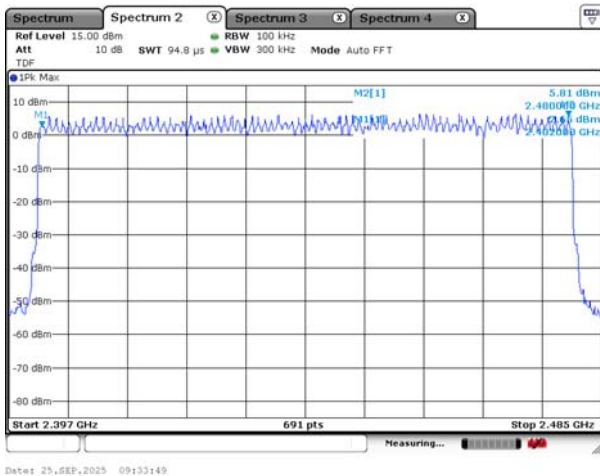
Modulation Type	Hopping channels number	Limit	Test Results
BDR(GFSK)	79	≥15	Compliance
EDR($\pi/4$ DQPSK)	79	≥15	Compliance
EDR(8DPSK)	79	≥15	Compliance

4.4.6 Test plot

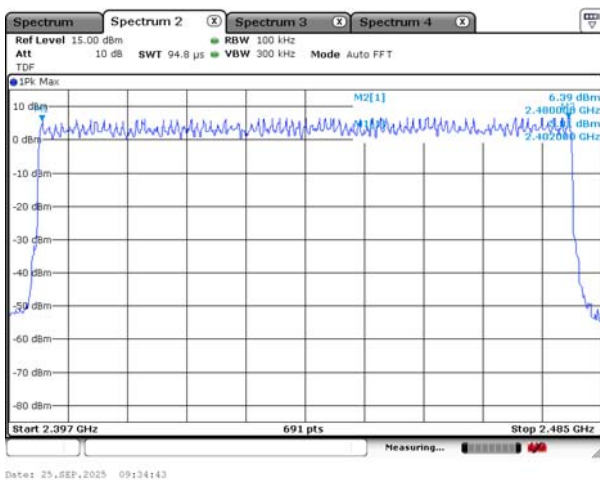
■ BDR(GFSK)



■ EDR(π /4DQPSK)



■ EDR(8DPSK)



4.5 Time of Occupancy

4.5.1 Standard Applicable [FCC §15.247(a)(1)]

(1)(iii) 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.

4.5.2 Test Environment conditions

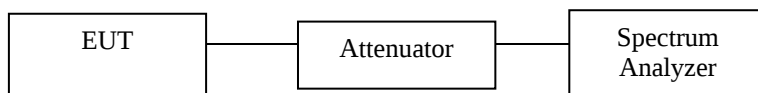
- Ambient temperature : 21 °C • Relative Humidity : (38 ~ 41) % R.H.

4.5.3 Measurement Procedure

ANSI C63.10 (2020) : Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems.

The dwell time was measured with a spectrum analyzer connected to the antenna terminal, while EUT had its hopping function enabled. After used the marker-delta function to determine the dwell time.

4.5.4 Test setup



4.5.5 Measurement Result

Burst width per one hop (ms) (Time slot)			Test Results		
			Dwell time (ms)	Limit	Result
BDR(GFSK)	DH1	0.377	0.121	≤ 0.4	Compliance
	DH3	1.623	0.260	≤ 0.4	Compliance
	DH5	2.884	0.308	≤ 0.4	Compliance
EDR($\pi/4$ DQPSK)	2DH1	0.391	0.125	≤ 0.4	Compliance
	2DH3	1.623	0.260	≤ 0.4	Compliance
	2DH5	2.884	0.308	≤ 0.4	Compliance
EDR(8DPSK)	3DH1	0.391	0.125	≤ 0.4	Compliance
	3DH3	1.623	0.260	≤ 0.4	Compliance
	3DH5	2.906	0.310	≤ 0.4	Compliance

Note:

DH1 Packet permit maximum 1600 / 79 / 2 hops per second in each channel (1 time slot RX, 1 time slot TX).

DH3 Packet permit maximum 1600 / 79 / 4 hops per second in each channel (3 time slots RX, 1 time slot TX).

DH5 Packet permit maximum 1600 / 79 / 6 hops per second in each channel (5 time slots RX, 1 time slot TX).

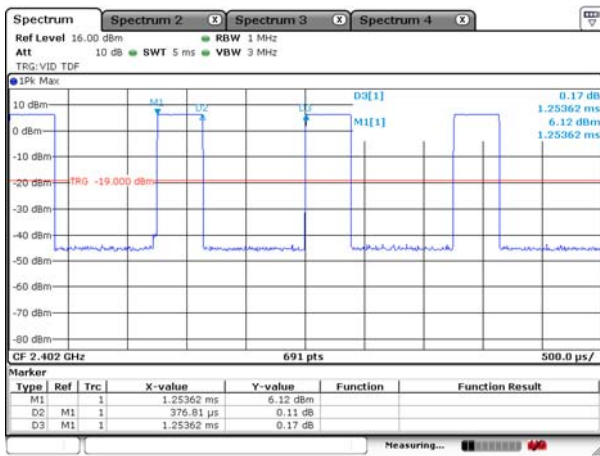
Therefore, dwell Time can be calculated as follows:

Data Packet	Dwell Time(s)
DH1/2DH1/3DH1	$1600/79/2*0.4*79*(MkrDelta)/1000$
DH3/2DH3/3DH3	$1600/79/4*0.4*79*(MkrDelta)/1000$
DH5/2DH5/3DH5	$1600/79/6*0.4*79*(MkrDelta)/1000$

4.5.6 Test plot

■ BDR(GFSK)

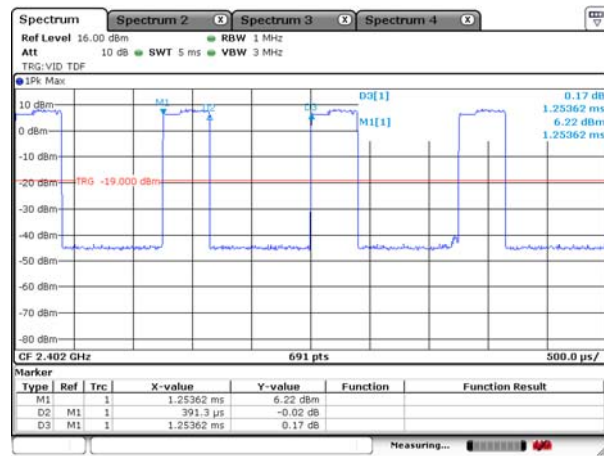
DH1



Date: 25,SEP,2025 09:27:28

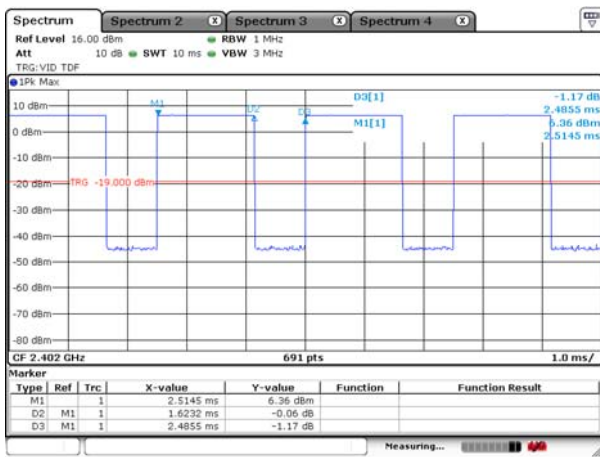
■ EDR($\pi/4$ DQPSK)

2DH1



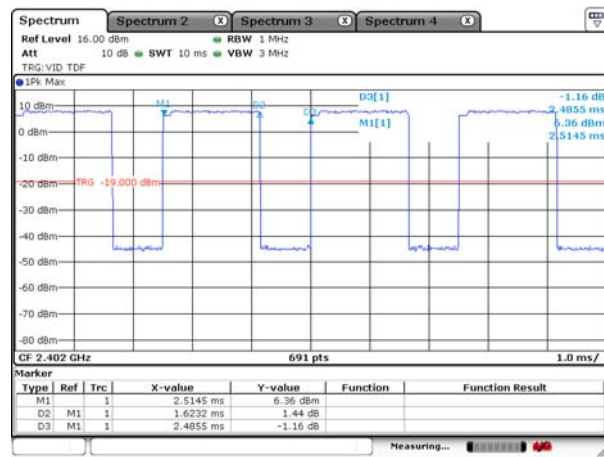
Date: 25,SEP,2025 09:29:36

DH3



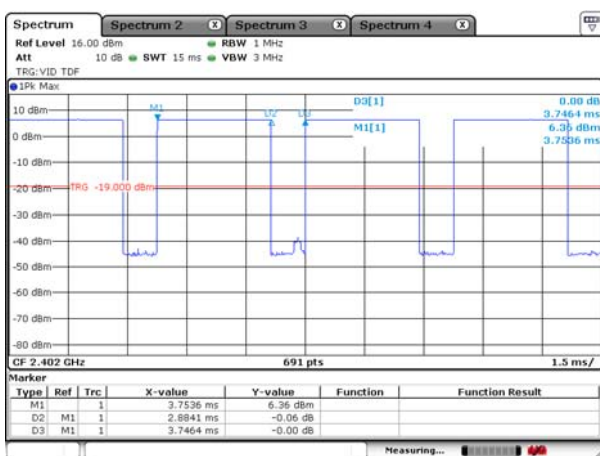
Date: 25,SEP,2025 09:28:24

2DH3



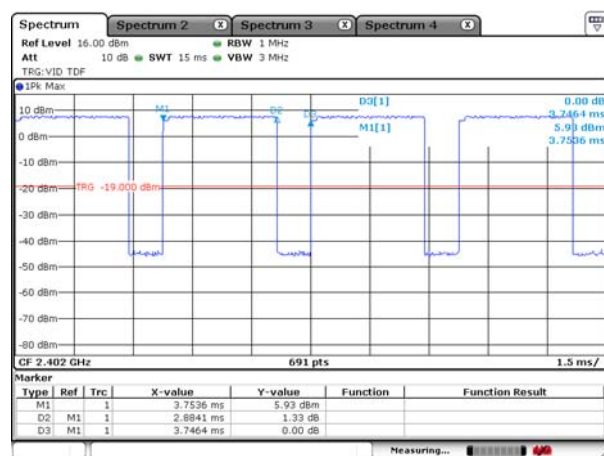
Date: 25,SEP,2025 09:30:13

DH5



Date: 25,SEP,2025 09:28:54

2DH5

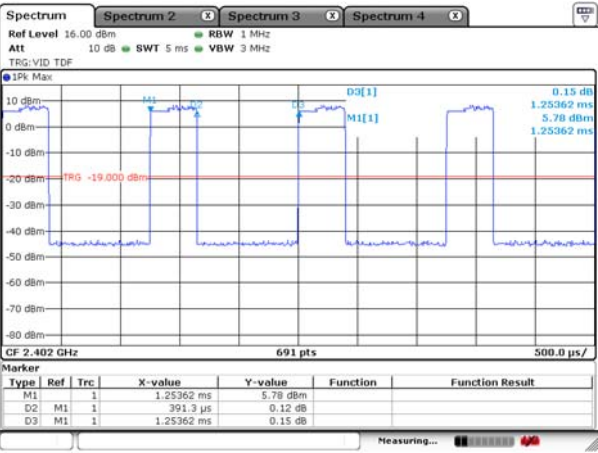


Date: 25,SEP,2025 09:30:42



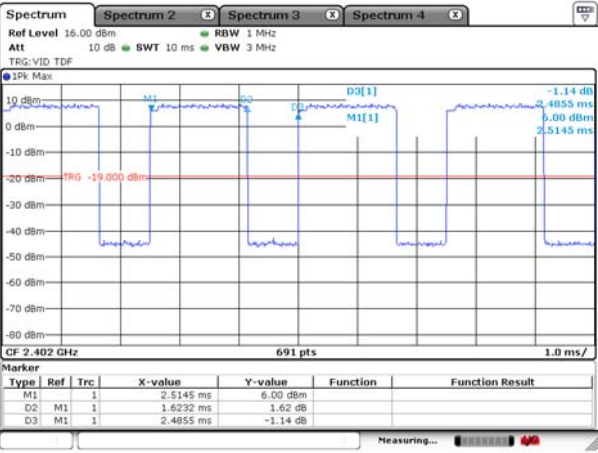
EDR(8DPSK)

3DH1



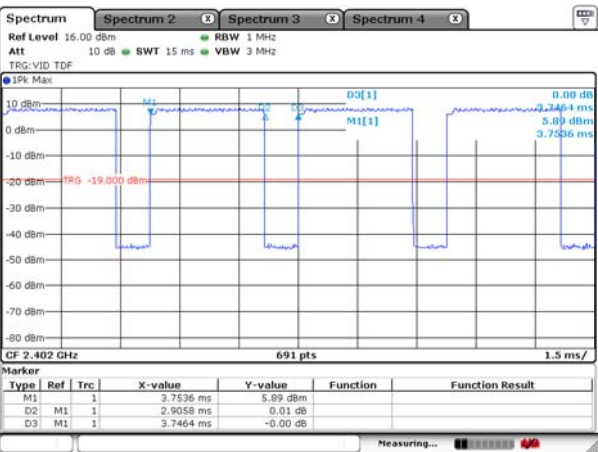
Date: 25.SEP.2025 09:31:25

3DH3



Date: 25.SEP.2025 09:31:56

3DH5



Date: 25.SEP.2025 09:32:28

4.6 Conducted Spurious Emissions (Band-edge)

4.6.1 Standard Applicable [FCC §15.247(d)]

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 RF conducted.

4.6.2 Test Environment conditions

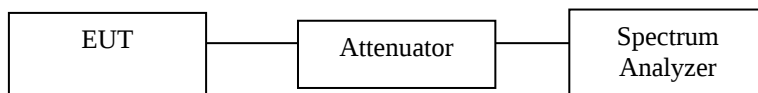
- Ambient temperature : 21 °C • Relative Humidity : (38 ~ 41) % R.H.

4.6.3 Measurement Procedure

ANSI C63.10 (2020) : Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems.

- (1) The transmitter output was connected to the spectrum analyzer through an attenuator.
- (2) Conducted spurious emission the bandwidth of the fundamental frequency was measured by spectrum analyzer with RBW=100 KHz and VBW=300KHz.
- (3) Below -20dB of the highest emission level in operating band.

4.6.4 Test setup



4.6.5 Measurement Result

Setting Channel		Test Results			
		Measured value [dB]		Limit [dB]	Result
		Hop on	Hop off		
BDR(GFSK)	CH 0	-57.29	-56.51	≤ 20 than PSD level	Compliance
	CH 78	-58.47	-55.27		Compliance
EDR($\pi/4$ DQPSK)	CH 0	-53.85	-50.38		Compliance
	CH 78	-57.02	-54.81		Compliance
EDR(8DPSK)	CH 0	-51.37	-50.64		Compliance
	CH 78	-56.07	-54.80		Compliance

Note: The following plots show that there are no conducted spurious emissions exceeding the 20dB down criteria. Plots are also presented showing the band edge compliance.

4.6.6 Test Plot (Band-edge)

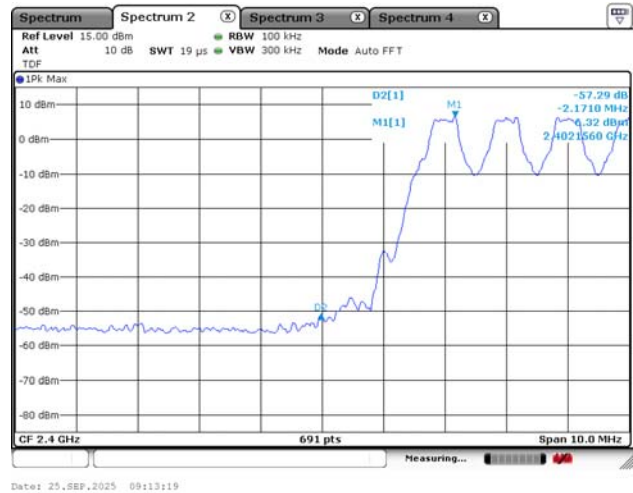
■ BDR(GFSK)

CH Low

Hop off

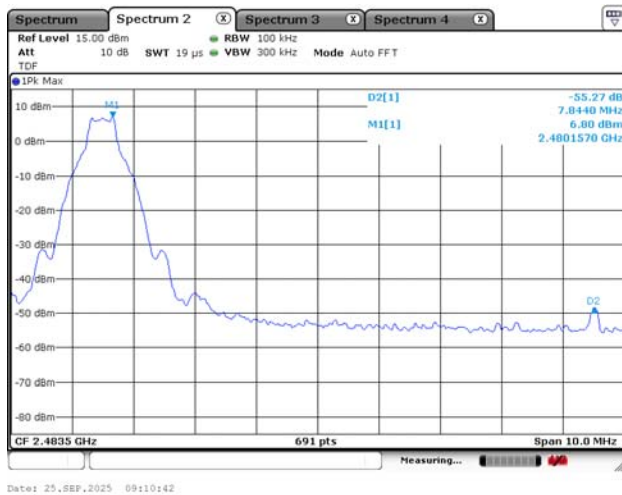


Hop on

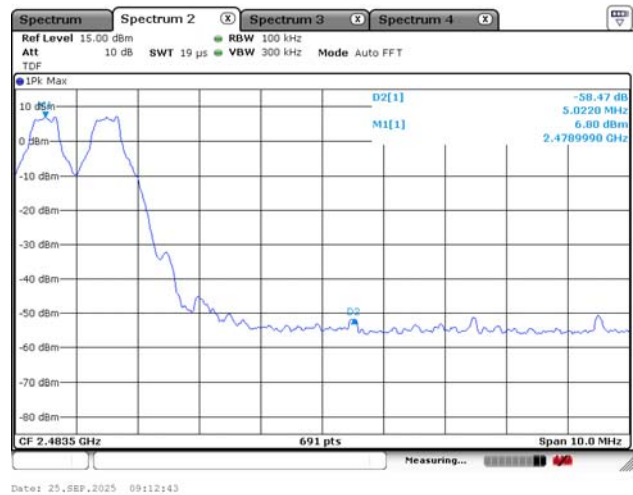


CH High

Hop off



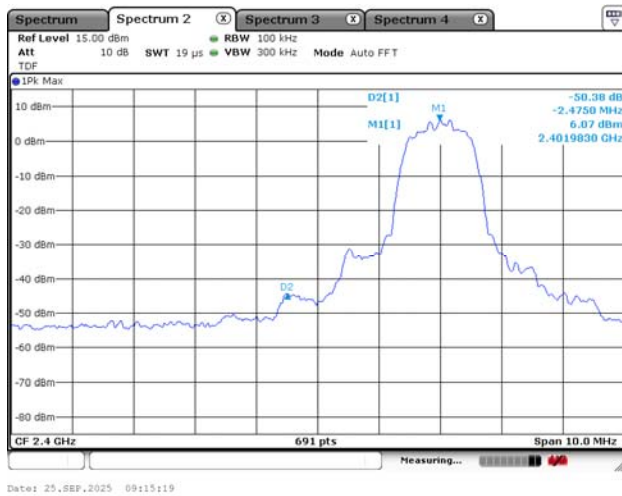
Hop on



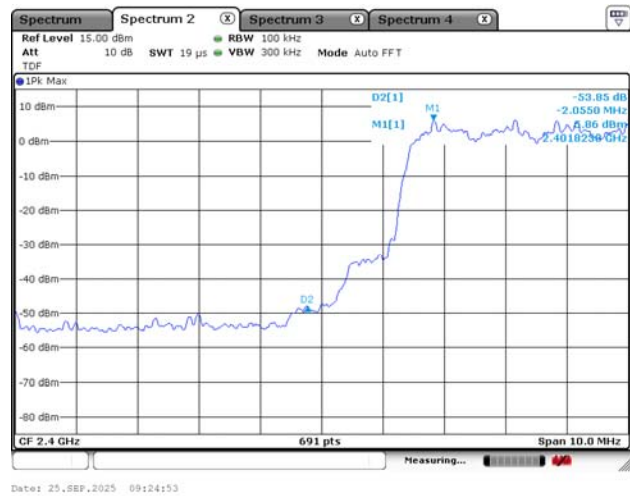
■ EDR($\pi/4$ DQPSK)

CH Low

Hop off

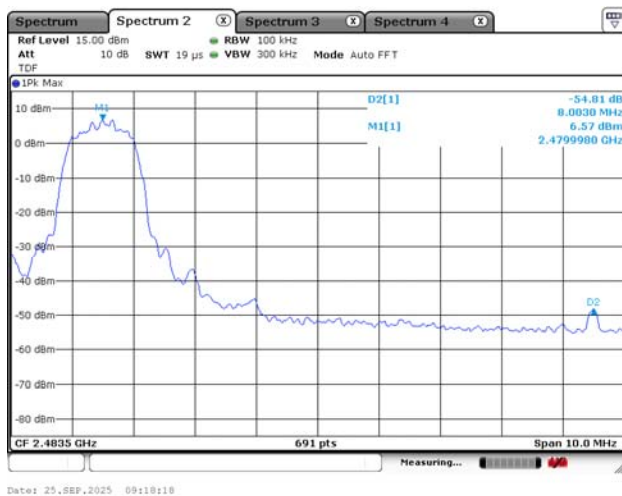


Hop on



CH High

Hop off



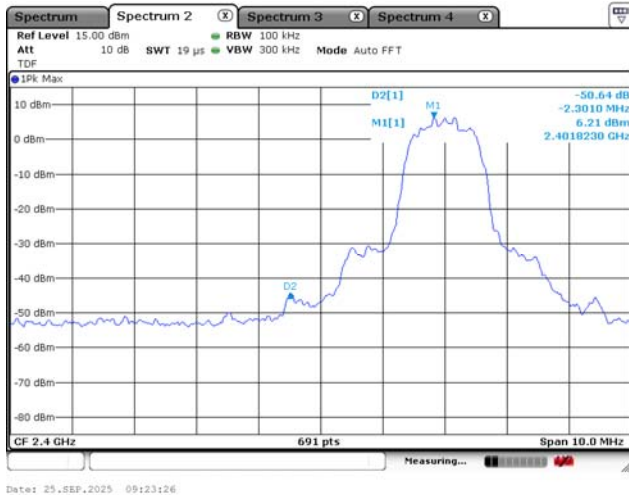
Hop on



■ EDR(8DPSK)

CH Low

Hop off

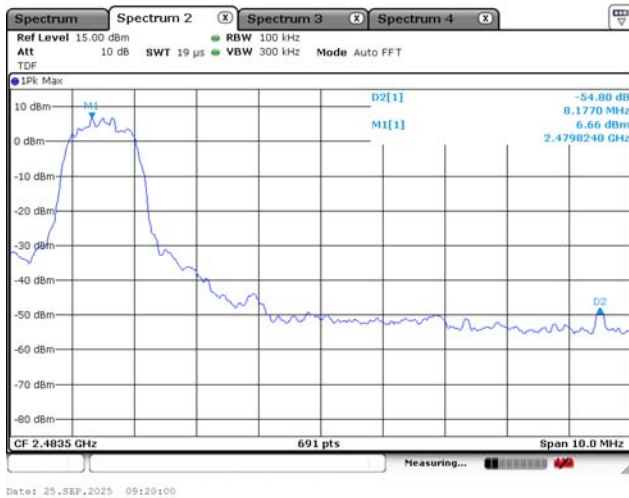


Hop on

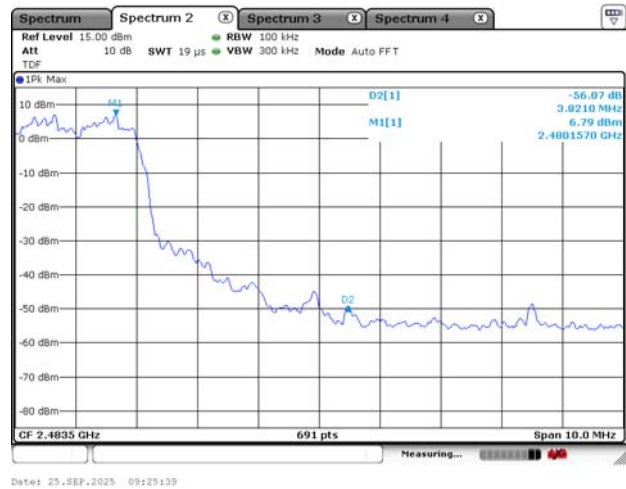


CH High

Hop off



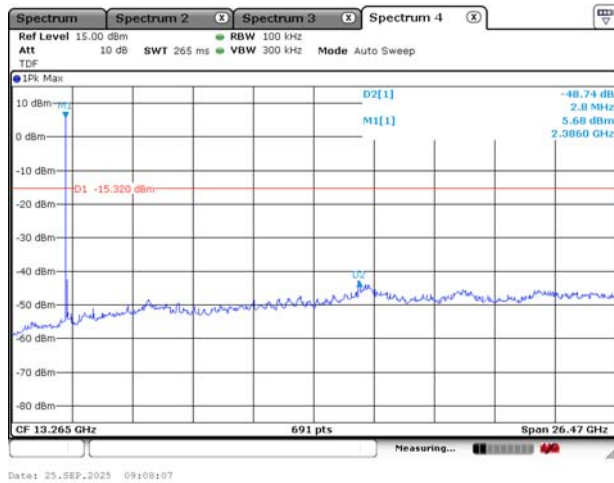
Hop on



Test Plot (Conducted spurious emissions)

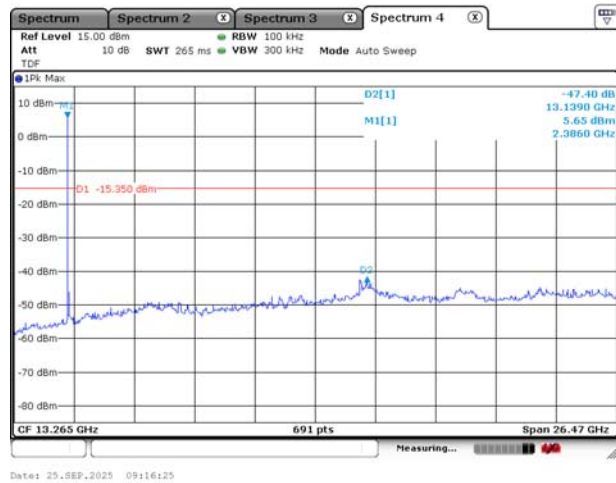
■ BDR(GFSK)

CH Low

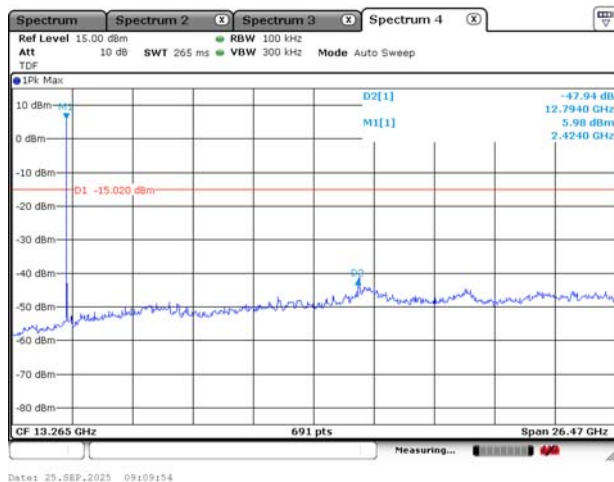


■ EDR($\pi/4$ DQPSK)

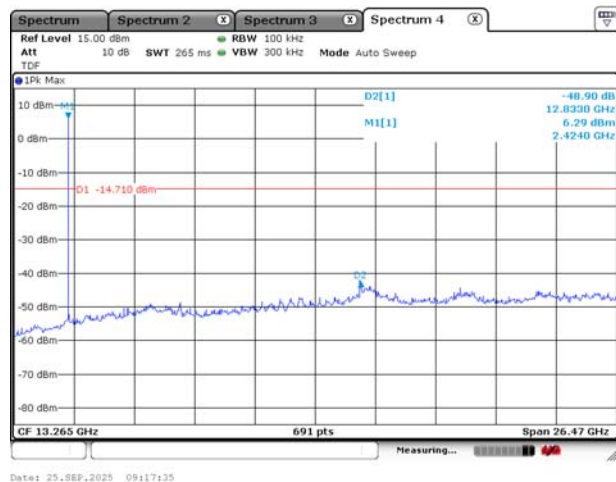
CH Low



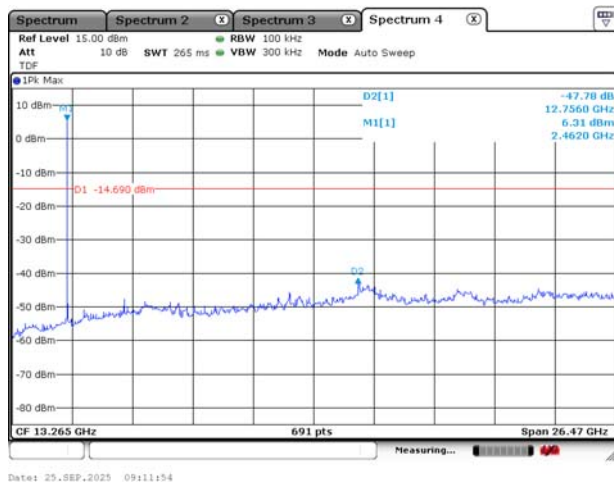
CH Middle



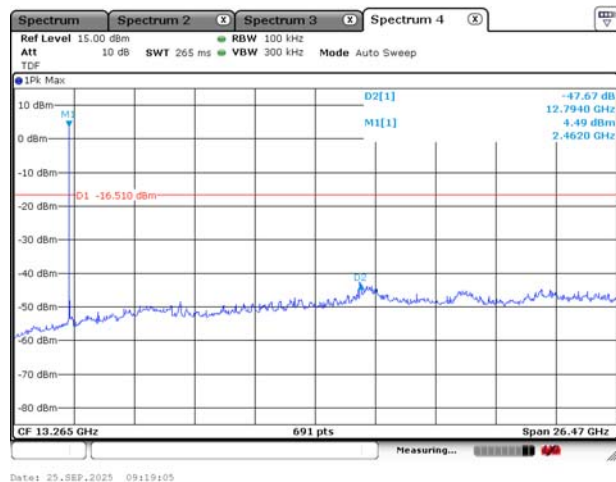
CH Middle



CH High



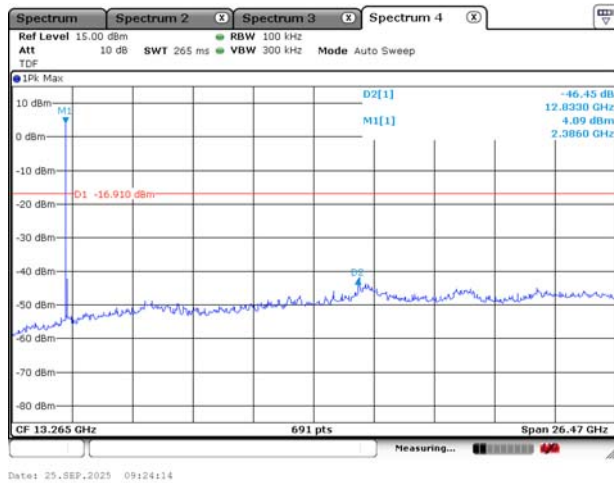
CH High



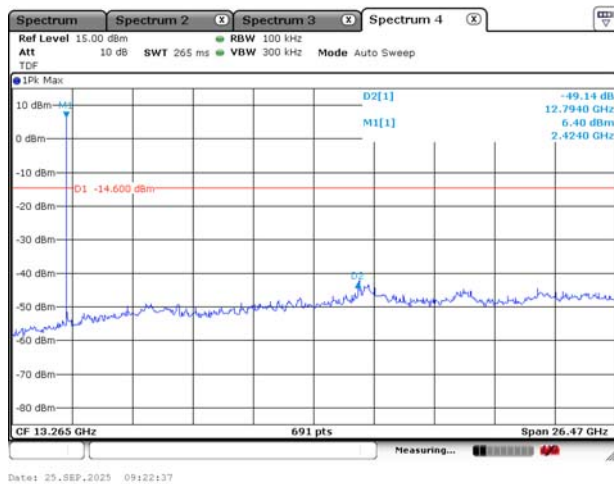
Note: It is not recorded on the report that the reading of emissions are attenuated more than 20 dB below the permissible limits

■ EDR(8DPSK)

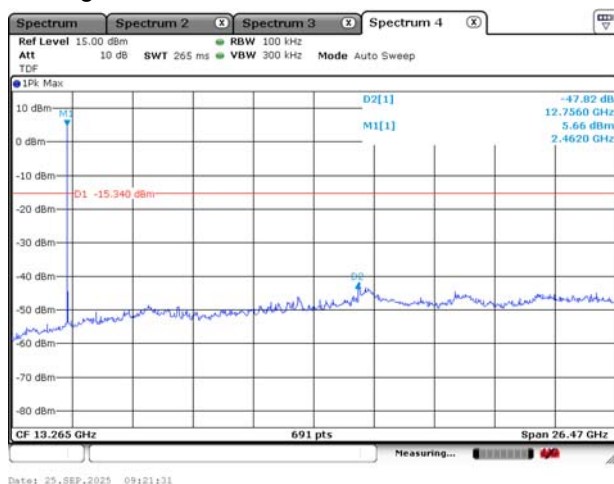
CH Low



CH Middle



CH High



Note: It is not recorded on the report that the reading of emissions are attenuated more than 20 dB below the permissible limits

4.7 Spurious RF Radiated emissions

4.7.1 Standard Applicable [FCC §15.247(d)]

FCC

All other emissions outside these bands shall not exceed the general radiated emission limits specified in §15.209(a). And according to §15.33(a)(1), for an intentional radiator operates below 10 GHz, the frequency Range of measurements: to the tenth harmonic of the highest fundamental frequency or to 40 GHz, Whichever is lower. In addition, radiated emissions which fall in the restricted bands, as defined in Sec.15.205(a), must also comply with the radiated emission limits specified in Sec. 15.209(a)

§15.209 and RSS-Gen limits for radiated emissions measurements (distance at 3 m)

Frequency Band [MHz]	DISTANCE [Meters]	Limit [$\mu\text{V}/\text{m}$]	Limit [$\text{dB } \mu\text{V}/\text{m}$]	Detector
0.009 ~ 0.490	300	2400/F(kHz)	67.6-20log(F)	Peak
0.490 ~ 1.705	30	24000/F(kHz)	87.6-20log(F)	Peak
1.705 ~ 30.0	30	30	29.54	Peak
30 - 88	3	100 **	40.00	Quasi peak
88 - 216	3	150 **	43.52	Quasi peak
216 - 960	3	200 **	46.02	Quasi peak
Above 960	3	500	54.00	Average
Above 1000	3	74.0 dB $\mu\text{V}/\text{m}$ (Peak), 54.0 dB $\mu\text{V}/\text{m}$ (Average)		
** fundamental emissions from intentional radiators operation under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz, or 470-806 MHz. However, operation within these Frequency bands is permitted under other sections of this Part Section 15.231 and 15.241				

§15.205. Restrict Band of Operation for FCC

[MHz]	[MHz]	[MHz]	[GHz]
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
0.495 - 0.505**	16.694 75 - 16.695 25	608 - 614	5.35 - 5.46
2.173 5 - 2.190 5	16.804 25 - 16.804 75	960 – 1 240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1 300 – 1 427	8.025 - 8.
4.177 25 - 4.177 75	37.5 -38.25	1 435 – 1 626.5	9.0 - 9.2
4.207 25 - 4.207 75	73 - 74.6	1 645.5 – 1 646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1 660 – 1 710	10.6 - 12.7
6.267 75 - 6.268 25	108 - 121.94	1 718.8 -1 722.2	13.25 - 13.4
6.311 75 - 6.312 25	123 - 138	2 200 – 2 300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2 310 – 2 390	15.35 - 16.2
8.362 - 8.366	156.524 75 - 156.525 25	2 483.5 – 2 500	17.7 - 21.4
8.376 25 - 8.38 6 75	156.7 - 156.9	2 690 – 2 900	22.01 - 23.12
8.414 25 - 8.414 75	162.012 5 - 167.17	3 260 – 3 267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3 332 – 3 339	31.2 - 31.8
12.519 75 - 12.520 25	240 - 285	3 345.8 – 3 358	36.43 - 36.5
12.576 75 - 12.577 25	322 - 335.4	3 600 – 4 400	Above 38.6
13.36 - 13.41			

** Until February 1, 1999, this restricted band shall be 0.490-0.510

4.7.2 Test Environment conditions

- Ambient temperature : (20 ~ 21) °C • Relative Humidity : (40 ~ 42) % R.H.

4.7.3 Measurement Procedure

The measurements procedure of the Spurious RF Radiated emissions is as following describe method.

1. The EUT was placed on the top of a rotating table (0.8 meters for below 1 GHz and 1.5 meters for above 1 GHz) above the ground at a 3 meter camber. The table was rotated 360 degree to determine the position of the highest radiation.
 2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna master.
 3. The antenna height 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.
 4. 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 rotating table was turned from 0 - 360 degrees to find the maximum reading.
 5. The measuring receiver was set to peak detector and specified bandwidth with max hold function.
 6. Low, Middle and high channels were measured, and radiation measurements are performed in X, Y, Z axis positioning. And found the worst axis position and only the test worst case mode is recorded in the report.
- The measurement results are obtained as described below:
$$\text{Result(dB}\mu\text{V/m)} = \text{Reading(dB}\mu\text{V)} + \text{Antenna factor(dB/m)} + \text{CL(dB)} + \text{other applicable factor (dB)}$$
 - The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for RMS Average (Duty cycle < 98 %) for Average detection (AV) at frequency above 1 GHz, then the measurement results was added to a correction factor ($10 \log(1/\text{duty cycle})$).
 - The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 10 Hz (Duty cycle $\geq$ 98 %) for Average detection (AV) at frequency above 1 GHz.
 - According to §15.33 (a)(1), Frequency range of radiated measurement is performed the tenth harmonic.
- Above test was performed in accordance with ANSI C63.10-2020 Section 6.10.5 & 6.4, 6.5, 6.6

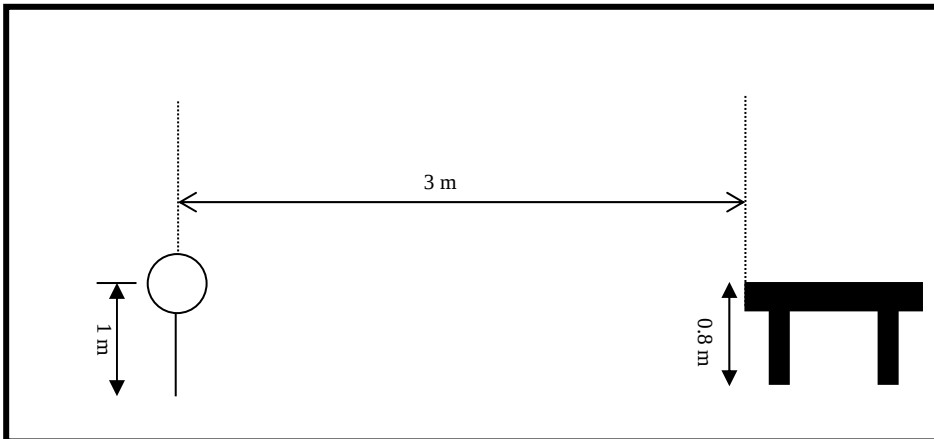
4.7.4 Measurement Uncertainty

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.10-2020. All measurement uncertainty values are shown with a coverage factor of $k = 2$ to indicate a 95% level of confidence. The measurement uncertainty shown below meets or exceeds the UCISPR measurement uncertainty values specified in CISPR 16-4-2 and, thus, can be compared directly to specified limits to determine compliance.

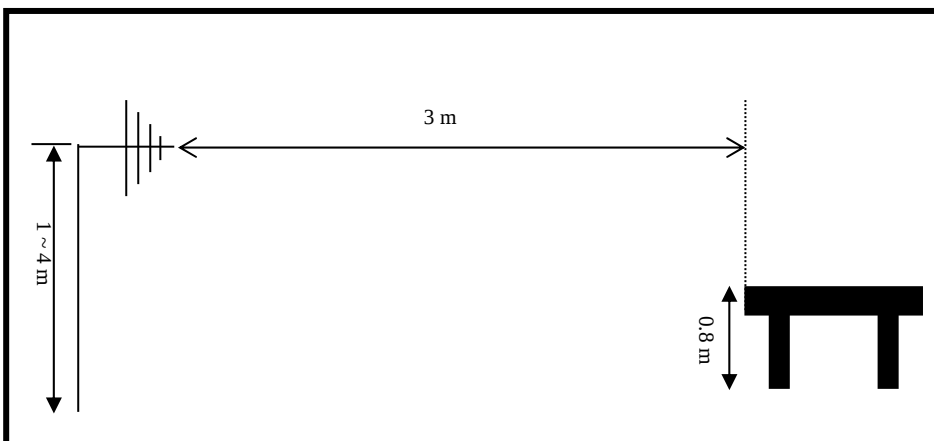
Radiated Emission measurement: Below 1 GHz: 5.06 dB (CL: Approx 95 %, $k=2$)
Above 1 GHz: 5.00 dB (CL: Approx 95 %, $k=2$)

4.7.5 Test Configuration

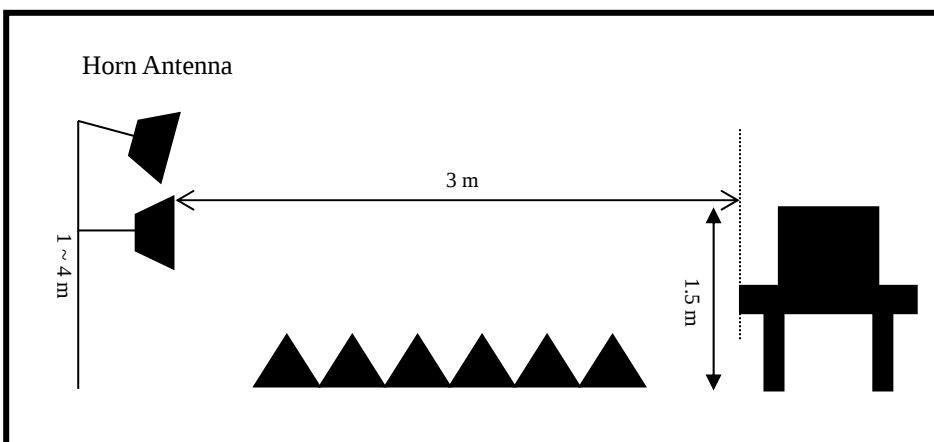
Radiated emission setup, below 30 MHz



Radiated emission setup, below 1 000 MHz



Radiated emission setup, above 1 GHz



4.7.6 Measurement Result

After having pre-scan all modulation mode, found the EDR(8DPSK) modulation which it was worst case, so only the worst case's data on the test report.

■ Above 1 GHz

CH Low (2 402 MHz)

Freq. (GHz)	Reading (dB μ V/m)		Table (Deg)	Antenna			CL (dB)	AMP (dB)	Meas Result (dB μ V/m)		Limit (dB μ V/m)		Mgn. (dB)		Result
	PK	AV		Height (m)	Pol. (H/V)	Fctr. (dB/m)			PK	AV	PK	AV	PK	AV	
2.350*	34.06	24.71	175	1.5	H	27.85	6.72	45.68	34.06	24.71	74	54	39.94	29.29	Compliance
2.359*	34.59	25.54	175	1.5	V	27.90	6.75	45.68	34.59	25.54	74	54	39.41	28.46	Compliance

* Band-edge emissions.

CH Middle (2 440 MHz)

Freq. (GHz)	Reading (dB μ V/m)		Table (Deg)	Antenna			CL (dB)	AMP (dB)	Meas Result (dB μ V/m)		Limit (dB μ V/m)		Mgn. (dB)		Result
	PK	AV		Height (m)	Pol. (H/V)	Fctr. (dB/m)			PK	AV	PK	AV	PK	AV	
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

CH High (2 480 MHz)

Freq. (GHz)	Reading (dB μ V/m)		Table (Deg)	Antenna			CL (dB)	AMP (dB)	Meas Result (dB μ V/m)		Limit (dB μ V/m)		Mgn. (dB)		Result
	PK	AV		Height (m)	Pol. (H/V)	Fctr. (dB/m)			PK	AV	PK	AV	PK	AV	
2.490*	35.86	26.51	175	1.5	H	28.37	6.78	45.66	35.86	26.51	74	54	38.14	27.49	Compliance
2.492*	34.99	25.87	175	1.5	V	28.38	6.78	45.66	34.99	25.87	74	54	39.01	28.13	Compliance

* Restrict band & Band-edge emissions.

※Note

- Above 1 GHz is measured average and peak detector mode on Spectrum analyzer in accordance with FCC Rule15.35
- Limit: 54 dB μ V/m(Average), 74 dB μ V/m(Peak), Attenuated more than 20 dB below the permissible value.
- It is not recorded on the report that the reading of emissions are attenuated more than 20 dB below the permissible limits or the field strength is too small to measured.
- For the below 30 MHz and above 2.492 GHz, measured any other signal is not detected on test receiver
- The transmitter radiated spectrum was investigated from 9 kHz to 26.5 GHz.

■ Below 1 GHz

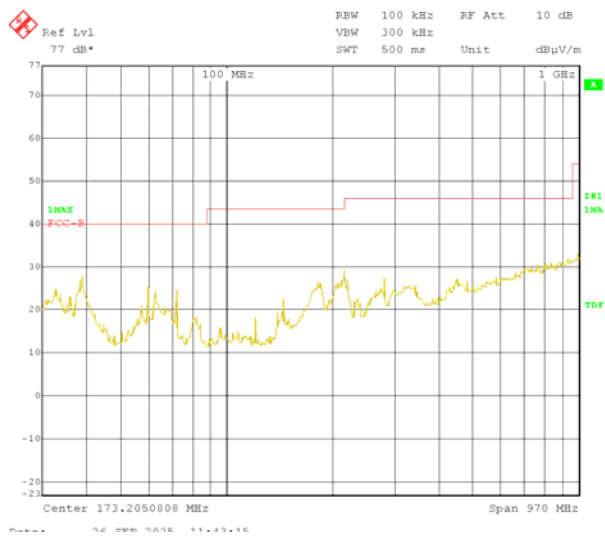
Freq. (MHz)	Reading (dB μ V/m)	Table (Deg)	Antenna			CL (dB)	AMP (dB)	Meas Result (dB μ V/m)	Limit (dB μ V/m)	Mgn (dB)	Result
			Height (m)	Pol. (H/V)	Fctr. (dB/m)						
38.64	33.47	175	1.0	V	18.23	0.88	46.42	33.47	40.00	6.53	Compliance
59.73	22.43	180	3.8	H	13.03	1.07	46.53	22.43	40.00	17.57	Compliance
72.21	30.84	180	1.2	V	12.28	1.18	46.53	30.84	40.00	9.16	Compliance
173.81	20.09	175	1.6	V	14.87	1.84	46.47	20.09	43.50	23.41	Compliance
216.12	25.95	175	2.1	H	16.53	2.14	46.46	25.95	46.00	20.05	Compliance
481.51	25.46	180	2.8	V	23.74	3.08	46.37	25.46	46.00	20.54	Compliance
Freq.(MHz) : Measurement frequency, Reading(dB μ V/m) : Indicated value for test receiver, Table (Deg) : Directional degree of Turn table Antenna (Height, Pol, Fctr) : Antenna Height, Polarization and Factor, Cbl(dB) : Cable loss, Pre AMP(dB) : Preamplifier gain(dB) Meas Result (dB μ V/m) : Reading(dB μ V/m)+ Antenna factor.(dB/m) + CL(dB) - Pre AMP(dB) Limit(dB μ V/m): Limit value specified with FCC Rule, Mgn(dB) : FCC Limit (dB μ V/m) – Meas Result(dB μ V/m)											

4.7.7 Plots

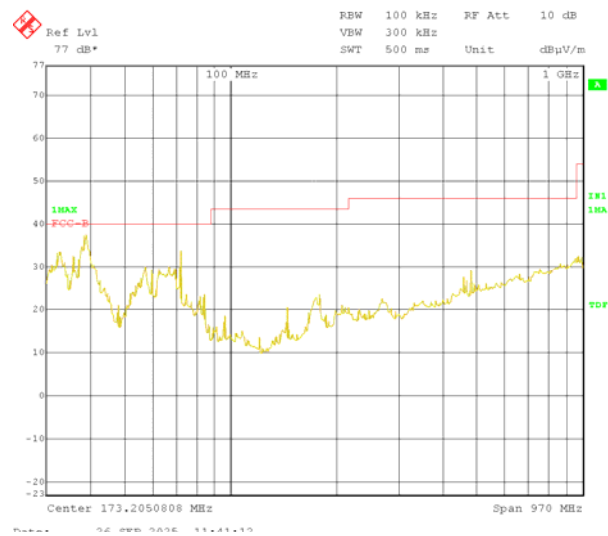
*The worst case only.

- Below 1 GHz

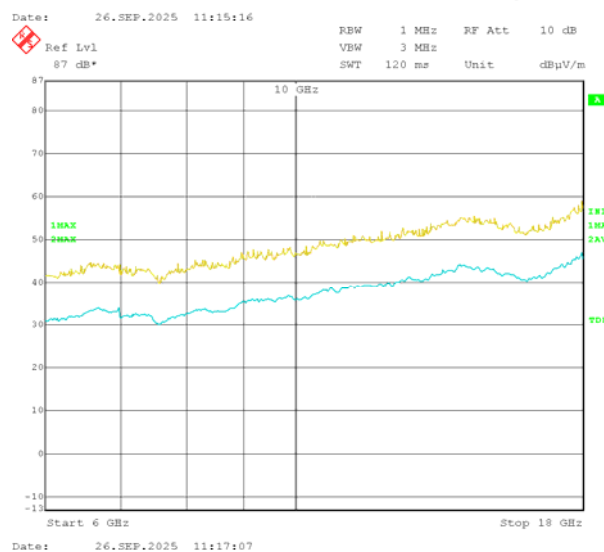
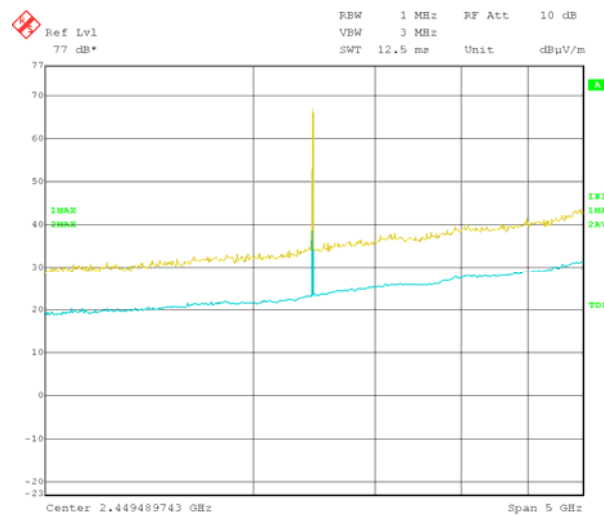
Horizontal

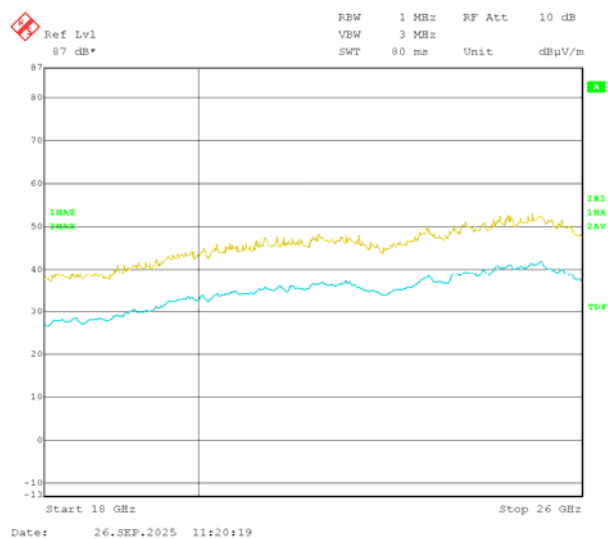


Vertical



- Above 1 GHz





4.8 Antenna requirement

4.8.1 Standard applicable [FCC §15.203]

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

The use of a permanently attached antenna or of an antenna that user a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

The manufacturer may design the unit so that broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

4.8.2 Antenna details

Frequency Band	Antenna Type	Gain [dBi]	Results
2.4 GHz	Internal PCB antenna	-4.54 dBi	Compliance