


RF TEST REPORT

Applicant	: USEN CORPORATION SHIBYA BUILDING 8F, 9-8 SHINSENCHO, SHIBYA-KU, TOKYO
Equipment Type	: MINI AMP
Model Name	: BAP-01
Date of receipt	: 2023-04-21
Test Duration	: 2023-04-28 ~ 2023-05-02
Date of issue	: 2023-06-16
Test Laboratory	: Lab-T, Inc. 2182-42 Baegok-daero, Mohyeon-eup, Cheoin-gu, Yongin-si Gyeonggi-do 17036, Korea (Republic of)
Test Result	: Pass



Engineer
NamHyoung Kwon



Technical Manager
SangHoon Yu

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1. Revision History

Test Report No.	Date	Description
TRRTEC23-0002	2023-06-16	Initial Issue

2. Information

2.1 Applicant Information

Applicant Name	USEN CORPORATION
Address	SHIBYA BUILDING 8F, 9-8 SHINSENCHO, SHIBYA-KU, TOKYO
Manufacturer	ESTEC VINA Co., Ltd
Address	No.6, Road 6, Vietnam Singapore Industrial Park(VISIP 1), Thuan An City Binh Duong Province, Vietnam
Factory	ESTEC VINA Co., Ltd
Address	No.6, Road 6, Vietnam Singapore Industrial Park(VISIP 1), Thuan An City Binh Duong Province, Vietnam

2.2 Test Laboratory Information

Corporate Name	Lab-T, Inc.
Representative	Duke (Jongyoung) Kim
Address	2182-42 Baegok-daero, Mohyeon-eup, Cheoin-gu, Yongin-si Gyeonggi-do 17036, Korea (Republic of)
Telephone	+82-31-322-6767
Fax	+82-31-322-6768
E-mail	info@lab-t.net

FCC Designation No.	KR0159
FCC Registration No.	133186
IC Site Registration No.	22000
VCCI Registration No.	3656

2.3 Test Site

Test Site	Used	Address
Building L	<input checked="" type="checkbox"/>	2182-40 Baegok-daero, Mohyeon-eup, Cheoin-gu, Yongin-si, Gyeonggi-do 17036, Korea(Republic of)
Building T	<input type="checkbox"/>	2182-42 Baegok-daero, Mohyeon-eup, Cheoin-gu, Yongin-si, Gyeonggi-do 17036, Korea(Republic of)
Building A	<input type="checkbox"/>	2182-44 Baegok-daero, Mohyeon-eup, Cheoin-gu, Yongin-si, Gyeonggi-do 17036, Korea(Republic of)

3. Information about Test Equipment

3.1 Equipment Information

Equipment Type	MINI AMP
Model Name	BAP-01
Range of RF specification frequency	2 402 MHz ~ 2 480 MHz (1 MHz Separation; Number of Channels : 79)
Type of modulation and emission(Data rate)	GFSK(1 Mbps), $\pi/4$ -DQPSK(2 Mbps) / F1D, G1D
Size(W x D x H)	150 mm x 124 mm x 37 mm
Voltage	DC 24 V

Note 1 : The above EUT information was declared by the manufacturer.

3.2 Antenna Information

Type	Model No.	Gain	Note.
PCB Antenna	HWI-BTP-MB3021	2.9 dBi	-

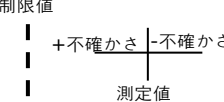


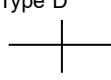
3.3 Radio Classification

Standard	Article 2-1-19 of the Type of Radio Equipment Certification Ordinance.
Test Methods	Article 88 Appendix 43 of the Ministry of Internal Affairs and Communications

4. Test Report

4.1 Measurement Uncertainty

Mesurement Items	Expanded Uncertainty
RF Output Power	0.76 dB (The confidence level is about 95 %, $k=2$)
Conducted Spurious Emissions	0.71 dB (The confidence level is about 95 %, $k=2$)

判定	測定データにおける不確かさの判断とその範囲	
適合	Type A 	測定結果と不確かさは与えられた 制限値内に入っています。 これを「適合」と呼びます。
	Type B 	完全には、制限値内でも限度値外でもありません。 この場合の適合性については、確実な結論を出すことは出来ません。
不適合	Type C 	完全には、制限値内でも限度値外でもありません。 この場合の適合性については、確実な結論を出すことは出来ません。
	Type D 	測定結果も不確かさも与えられた制限値内に入っていません。 これは「不適合」と呼びます。

4.2 Test Result

Environment of test room	Test Date	2023-04-28 ~ 2023-05-02	Declared Output Power		0.1 ~ 0.4 mW/MHz
	Temperature	22.4 ~ 24.0 °C	Factors	Cable Loss	0 dB
	Humidity	47.8 ~ 51.2 %		ATT	0 dB

Note1 : Factors were applied to the equipment during the test.

Test result	Voltage		V	Limit	DC	24.0	V	Normal	DC	26.4	V	Normal +10%	DC	21.6	V	Normal -10%	Result	Note	
	Test Frequency		MHz	-	BDR	BDR(AFH)	EDR	EDR(AFH)	BDR	BDR(AFH)	EDR	EDR(AFH)	BDR	BDR(AFH)	EDR	EDR(AFH)	-		
	Frequency error(measured frequency)		MHz	-	2440.990				2440.990				2440.990				-		
	Frequency error		ppm	50	-3.999				-4.005				-4.011				PASS		
	Occupied bandwidth		MHz	83.5	78.131	19.570	78.332	19.904	78.131	19.570	78.365	19.921	78.182	19.570	78.232	19.938	PASS		
	Spreading bandwidth		MHz	0.5	71.101	18.001	70.884	18.201	70.884	18.034	70.985	18.335	70.818	18.001	71.285	18.201	PASS		
	Spreading Factor			5	71.101	18.001	70.884	18.201	70.884	18.034	70.985	18.335	70.818	18.001	71.285	18.201	PASS	Symbol rate : 1 MHz	
	Spurious	(measured frequency)	MHz	-	1888.900	2170.200	2196.500	2257.400	2023.300	2190.900	2067.600	2053.800	2214.500	2326.700	2199.200	2371.100	-		
		30 ~ 2387 MHz	μW/MHz	2.5	0.038	0.041	0.038	0.036	0.034	0.048	0.033	0.036	0.033	0.039	0.034	0.037	PASS		
		(measured frequency)	MHz	-	2399.994	2388.292	2399.981	2399.162	2399.994	2387.773	2399.994	2392.162	2399.994	2395.682	2399.994	2398.279	-		
		2387 ~ 2400 MHz	μW/MHz	25	1.067	0.037	4.375	0.036	1.256	0.036	4.775	0.049	1.047	0.046	4.699	0.036	PASS		
		(measured frequency)	MHz	-	2487.325	2487.857	2483.558	2491.649	2488.597	2489.597	2483.610	2494.922	2484.831	2494.299	2483.571	2493.299	-		
		2483.5 ~ 2496.5 MHz	μW/MHz	25	0.041	0.043	0.073	0.044	0.051	0.038	0.047	0.040	0.040	0.040	0.045	0.048	PASS		
		(measured frequency)	MHz	-	6908.500	6259.500	6948.500	5839.500	6938.500	6119.500	6968.500	6978.500	6968.500	6189.500	6189.500	6189.500	-		
	2496.5 ~ 12500 MHz		μW/MHz	2.5	0.110	0.113	0.102	0.125	0.110	0.123	0.121	0.102	0.116	0.113	0.117	0.116	PASS		
	Antenna power		mW/MHz	3.00	0.108	0.423	0.107	0.417	0.107	0.422	0.107	0.413	0.108	0.425	0.107	0.418	PASS		
	deviation		%	20	7.78	5.68	7.21	4.25	7.12	5.49	7.05	3.25	7.96	6.17	7.10	4.49	PASS		
				-80													-		
	Collateral Emission	(measured frequency)	MHz	-	937.500					544.070				926.840				-	
		30 ~ 1000 MHz	nW	4	0.013					0.014				0.011				PASS	
		(measured frequency)	MHz	-	11924.300					11931.800				6956.500				-	
	1000 ~ 12500 MHz		nW	20	0.322					0.304				0.265				PASS	
	E.I.R.P.		mW/MHz	N/A														N/A	
	Hopping Frequency staying time		sec	0.4	0.277	0.277	0.277	0.281	0.277	0.277	0.277	0.281	0.277	0.277	0.277	0.281	0.277	PASS	
	Interference Protection (Deveice ID)			yes	Complies	Complies	Complies	Complies	Complies	Complies	Complies	Complies	Complies	Complies	Complies	Complies	Complies	PASS	
Carrier Sense			N/A														N/A		
																	-		

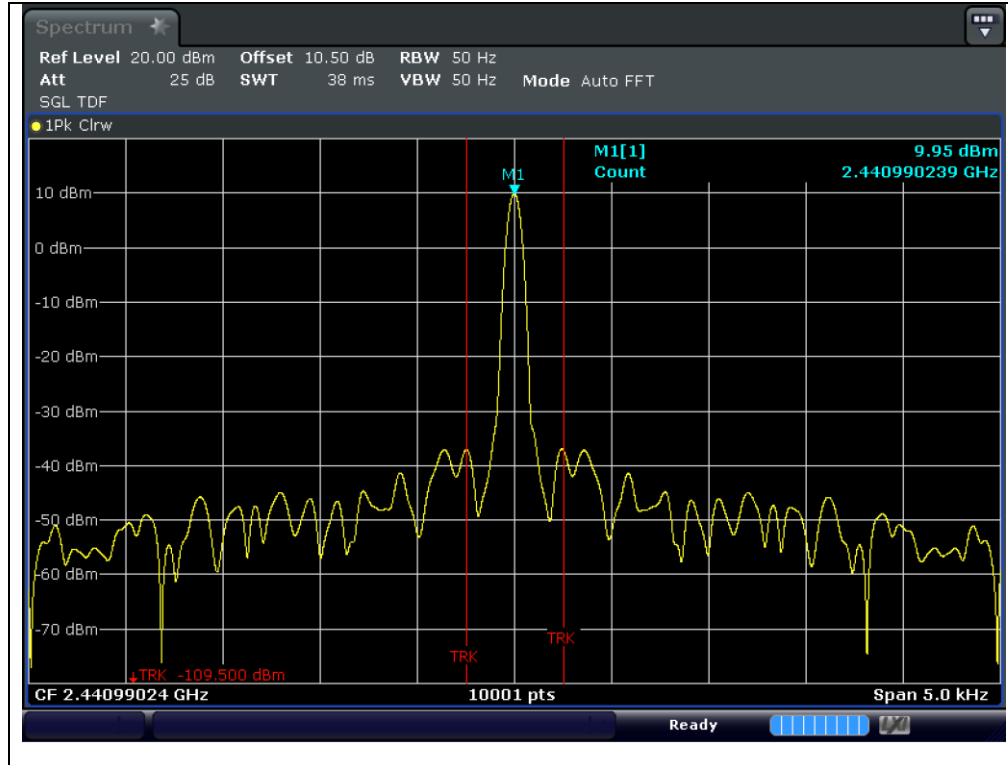
4.3 Test Setup Photo



4.4 Test Plot

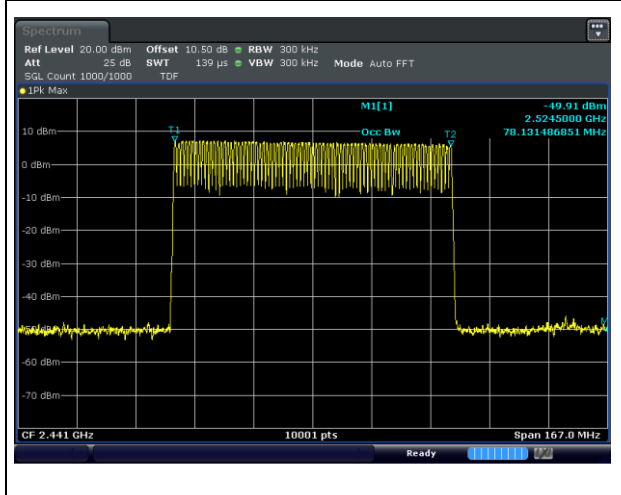
4.4.1 Frequency Tolerance

CW Mode

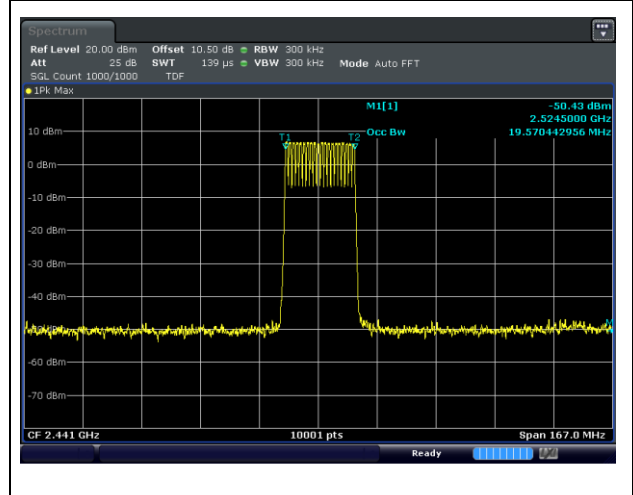


4.4.2 Occupied Bandwidth

BDR_Non-AFH



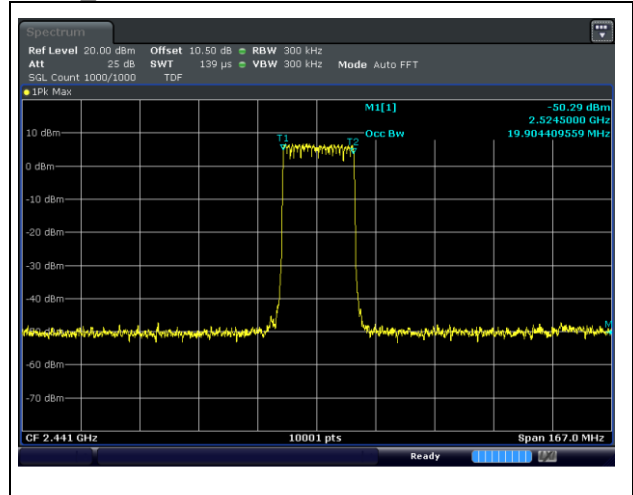
BDR_AFH



EDR_Non-AFH

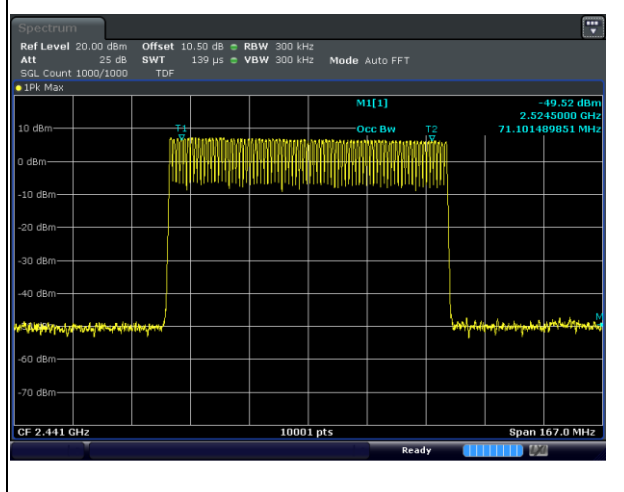


EDR_AFH

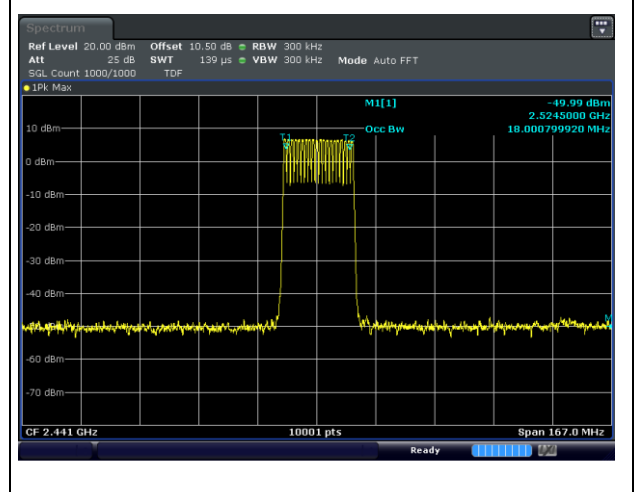


4.4.3 Spreading Bandwidth

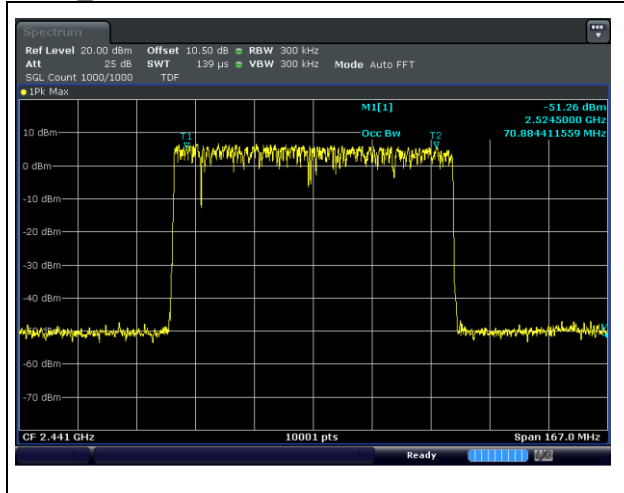
BDR_Non-AFH



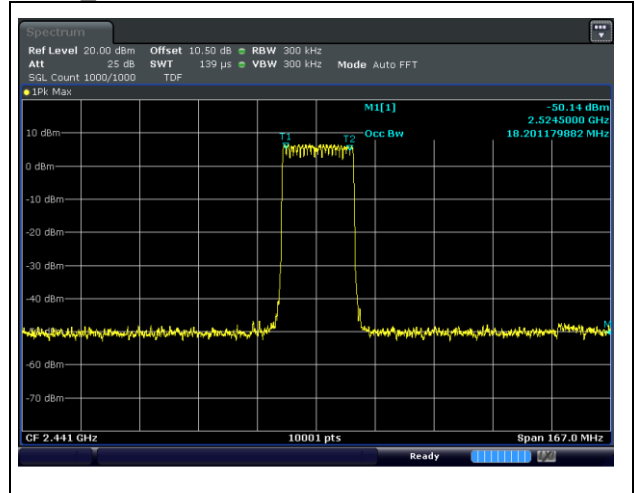
BDR_AFH



EDR_Non-AFH



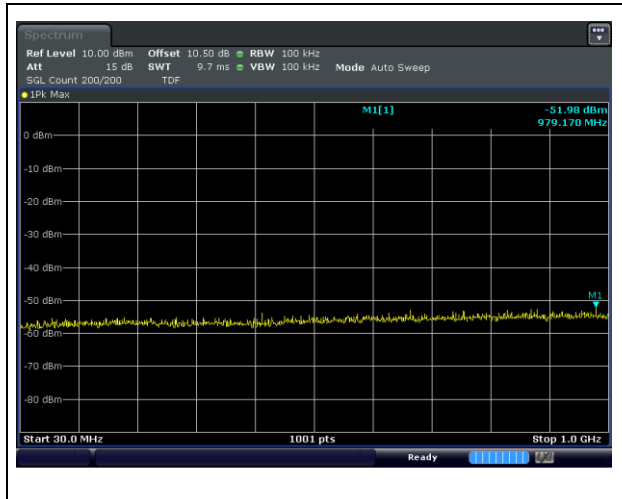
EDR_AFH



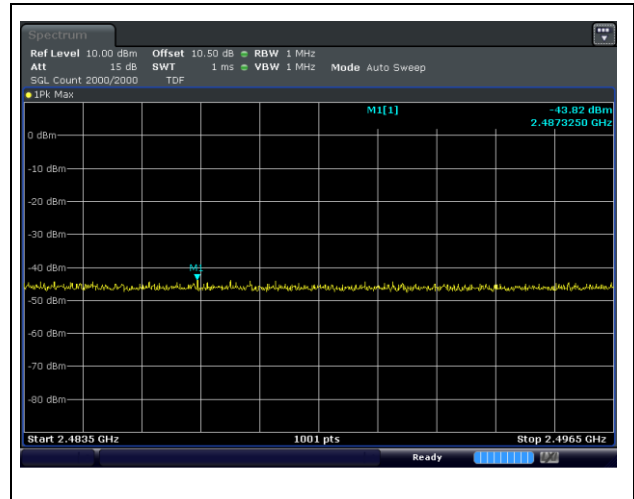
4.4.4 Tx Spurious Emission

BDR Non-AFH

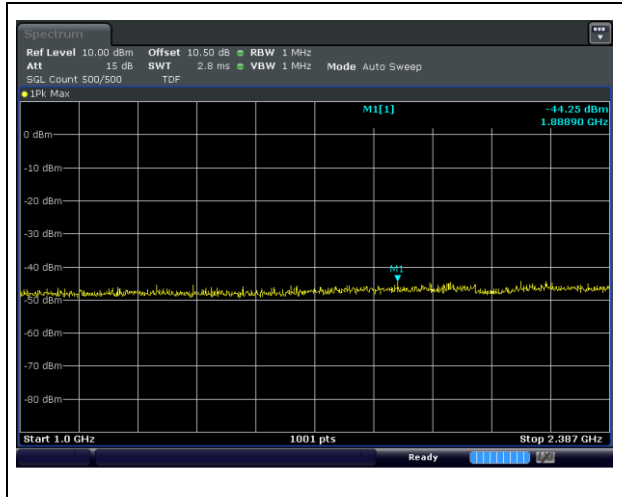
30 MHz ~ 1 000 MHz



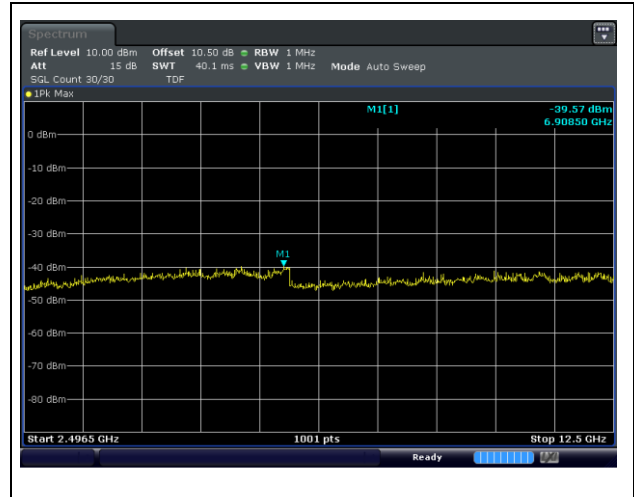
2 483.5 MHz ~ 2 496.5 MHz



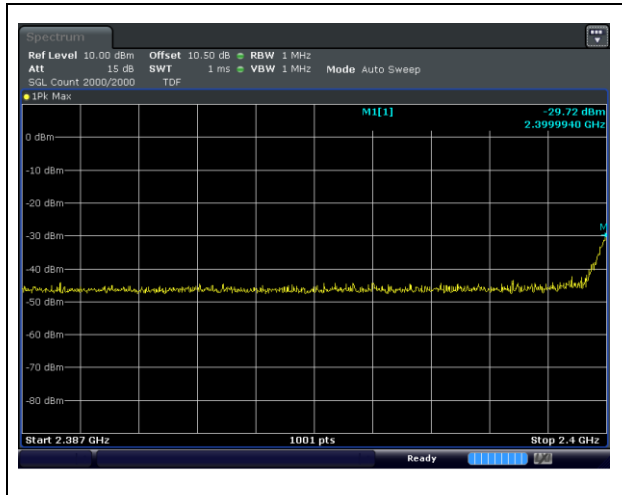
1 000 MHz ~ 2 387 MHz



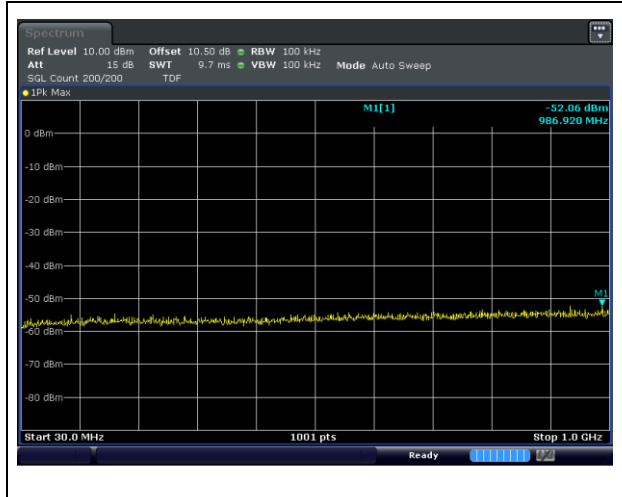
2 496.5 MHz ~ 12 500 MHz



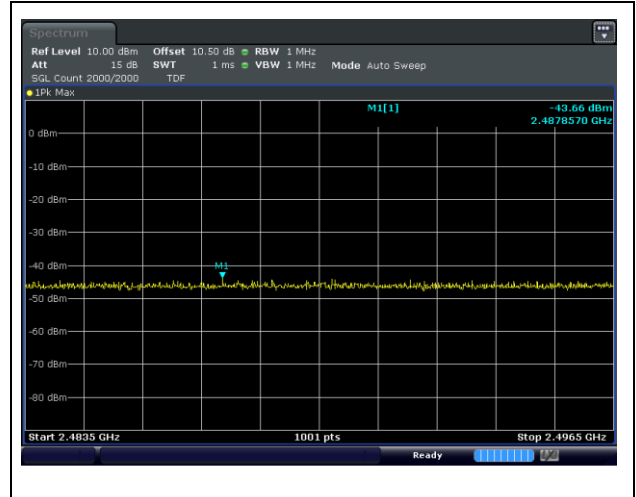
2 387 MHz ~ 2 400 MHz



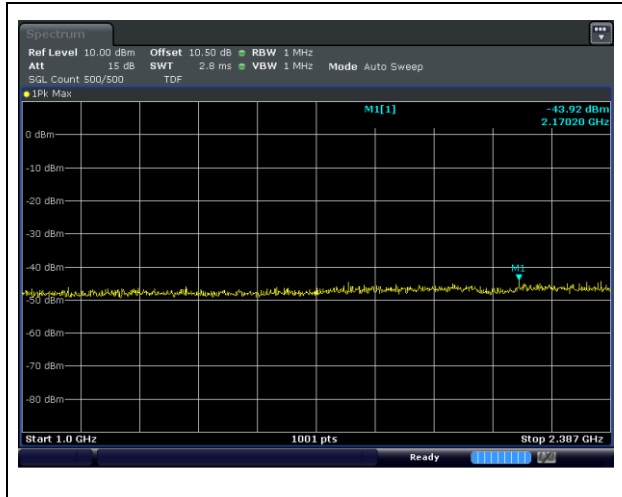
BDR AFH
30 MHz ~ 1 000 MHz



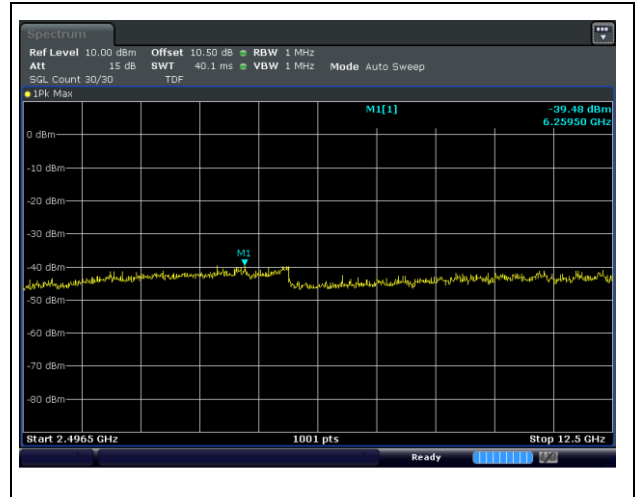
2 483.5 MHz ~ 2 496.5 MHz



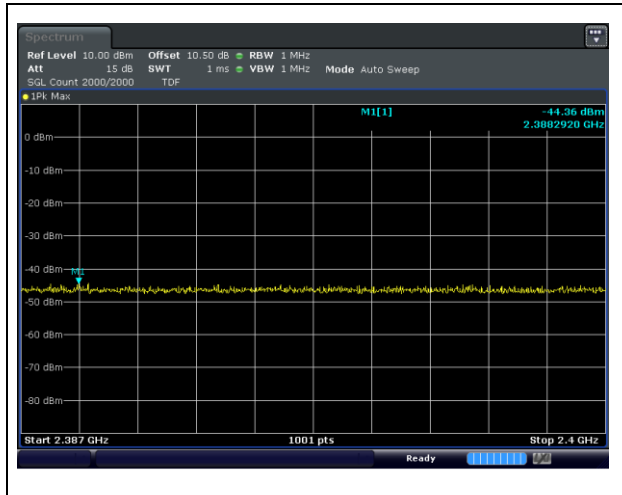
1 000 MHz ~ 2 387 MHz



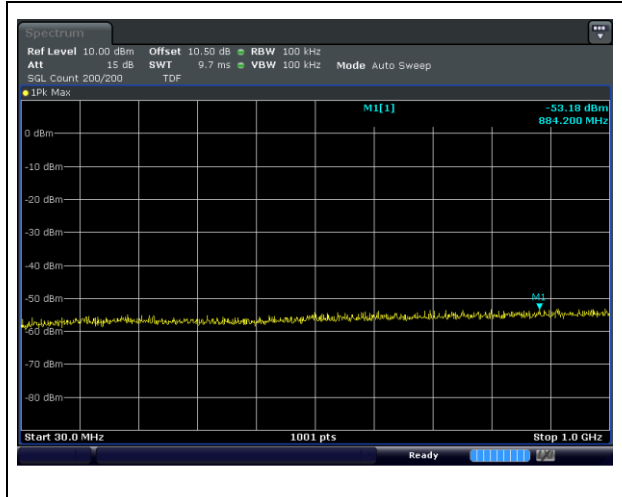
2 496.5 MHz ~ 12 500 MHz



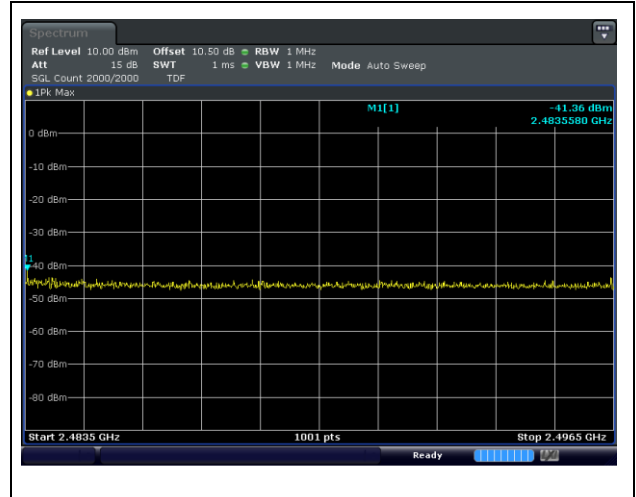
2 387 MHz ~ 2 400 MHz



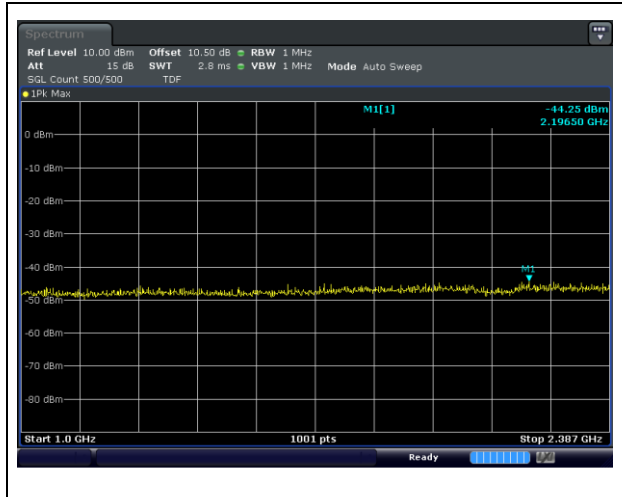
EDR Non-AFH 30 MHz ~ 1 000 MHz



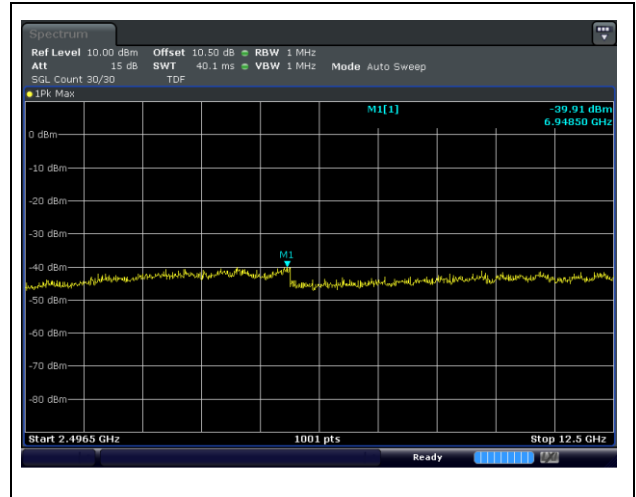
2 483.5 MHz ~ 2 496.5 MHz



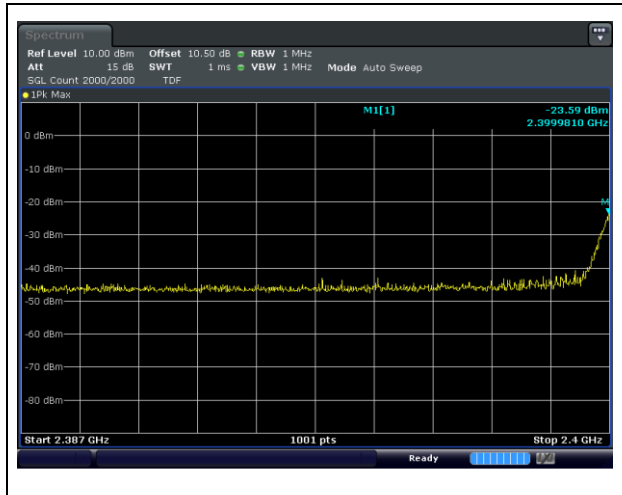
1 000 MHz ~ 2 387 MHz



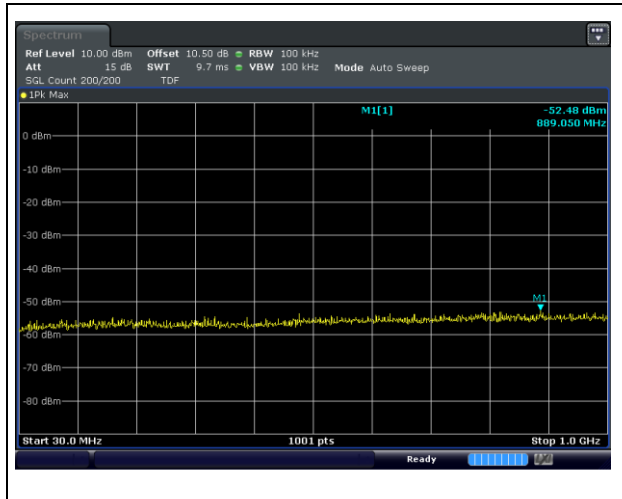
2 496.5 MHz ~ 12 500 MHz



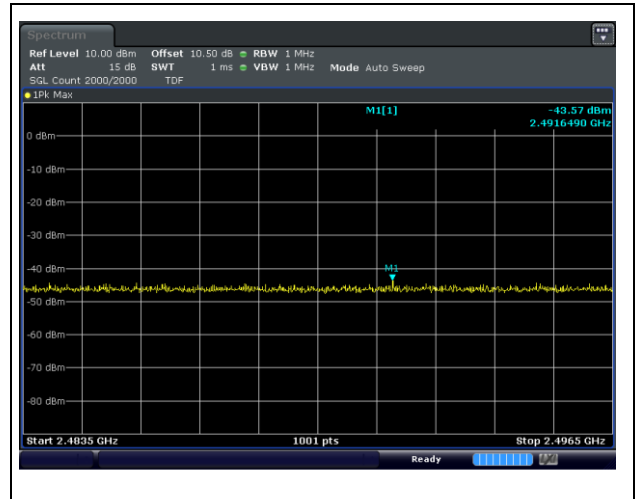
2 387 MHz ~ 2 400 MHz



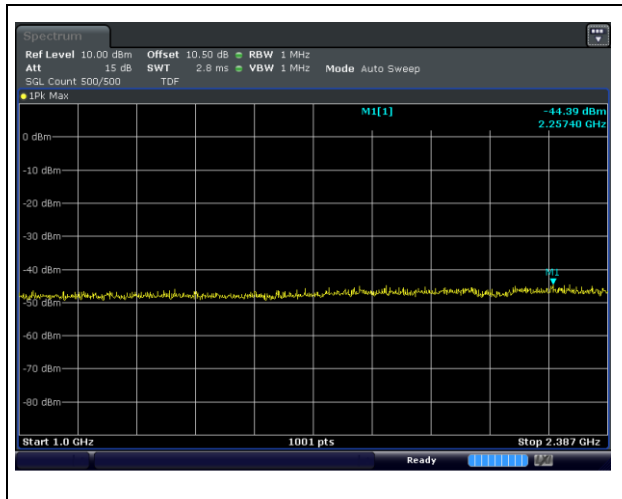
EDR AFH 30 MHz ~ 1 000 MHz



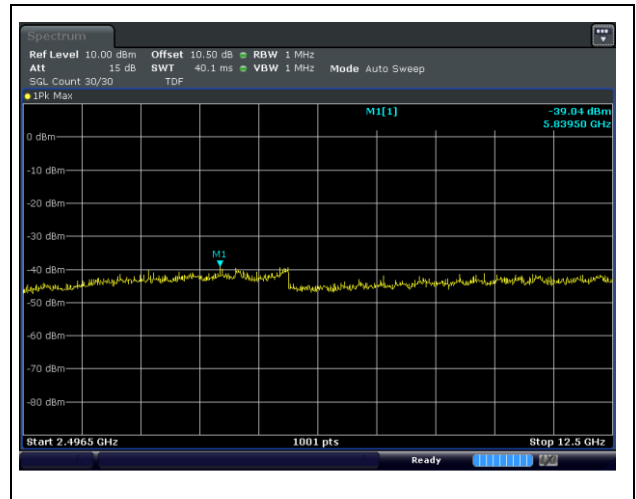
2 483.5 MHz ~ 2 496.5 MHz



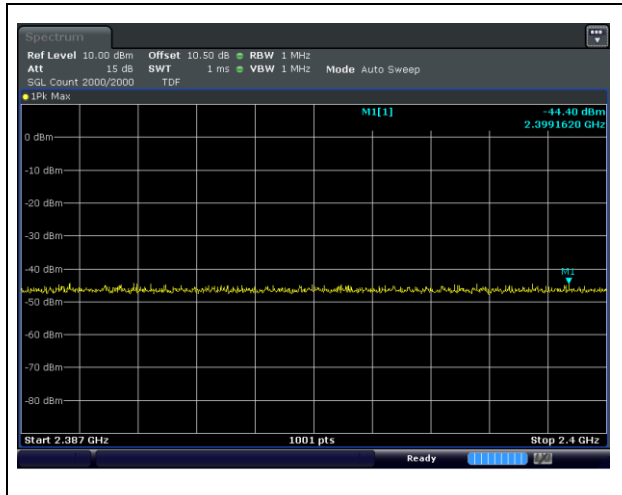
1 000 MHz ~ 2 387 MHz



2 496.5 MHz ~ 12 500 MHz



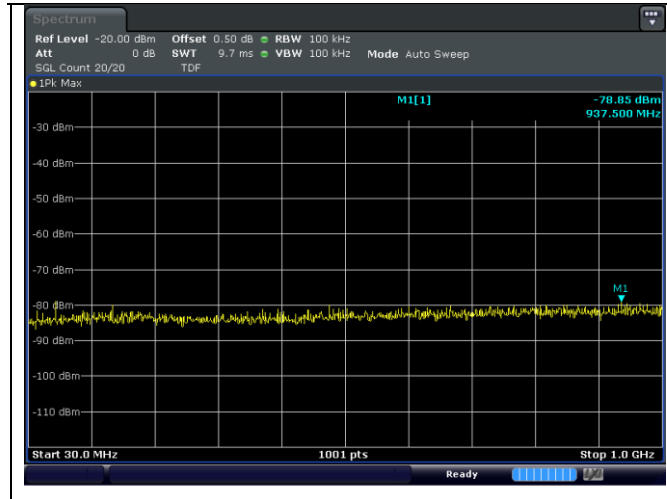
2 387 MHz ~ 2 400 MHz



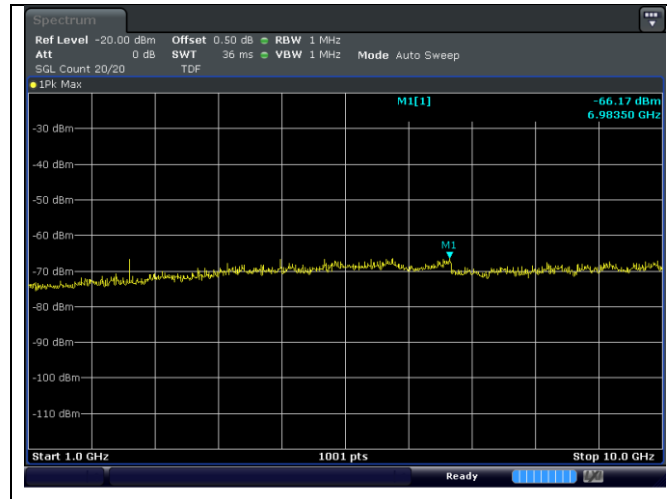
4.4.5 Rx Spurious Emission

RX Mode

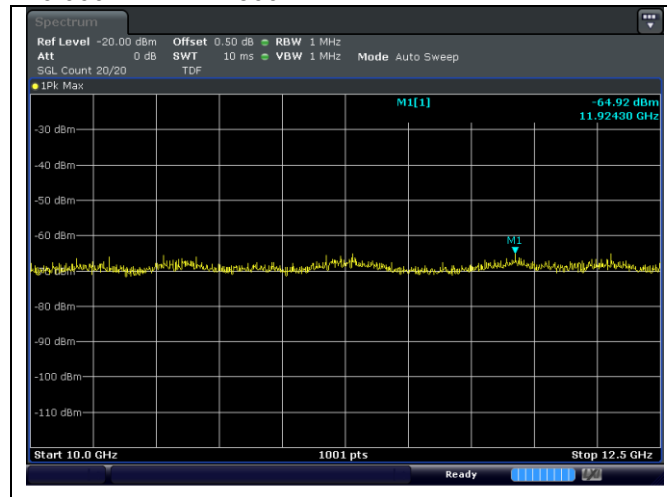
30 MHz ~ 1 000 MHz



1 000 MHz ~ 10 000 MHz

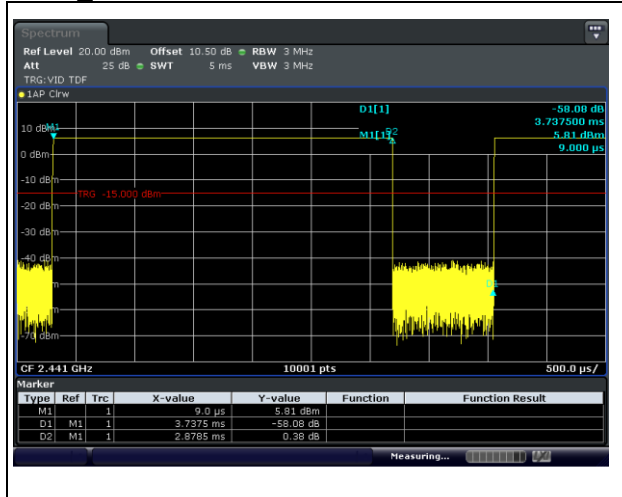


10 000 MHz ~ 12 500 MHz

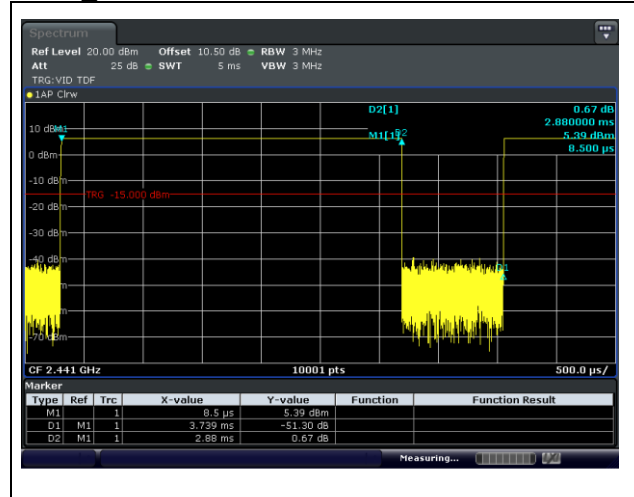


4.4.6 Hopping Frequency Dwell Time

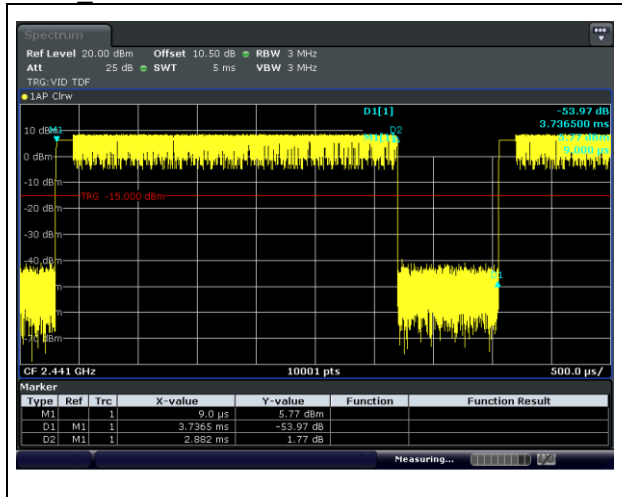
BDR Non-AFH



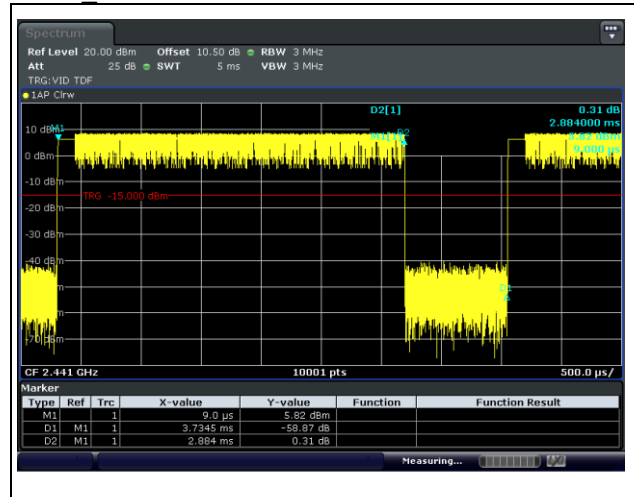
BDR AFH



EDR Non-AFH



EDR AFH



APPENDIX I

TEST EQUIPMENT USED FOR TESTS

Model and Type Name	Serial Number	Manufacturer	Last calibrated Date	Calibration Company	Calibration Method
FSV40 / FSV Signal Analyzer	101010	ROHDE&SCHWARZ	2023-04-13	HCT	ha
54A-10/ ATTENUATOR	69688	WEINSCHEL	2022-10-11	HCT	ha
SMB100A / Signal Generator	178384	ROHDE&SCHWARZ	2022-10-11	HCT	ha
PCR 500L / AC POWER SUPPLY	FE002647	KIKUSUI	2023-04-12	HCT	ha
34401A / Digital MultiMeter	US36025428	HP	2023-01-10	HCT	ha
MHB-382SD / HUMIDITY/TEMP DATA RECORDER	79735	LUTRON	2023-04-19	HCT	ha
U2022XA / Power Sensor	MY55320008	KEYSIGHT	2022-08-16	HCT	ha

Note 1 : Based on Japanese Radio Law 24-2-4-2-ha

Note 2 : Calibration Method

i) : Calibration conducted by the National Institute of Information and Communications Technology(NICT) or a designated calibration agency under Article 102-18 paragraph (1) of the Radio Law.

ro) : Calibration conducted pursuant to the provisions of Article 135 or Article 144 of the Measurement Law (Law No. 51 of 1992) Japan Calibration Service System.

ha) : Calibration conducted in foreign countries, which shall be equivalent to the calibration conducted by the NICT or a designated calibration agency under Article 102-18 paragraph (1).

ni) : Calibration conducted by using other equipment that listed above from a) to c).