FCC CERTIFICATION TEST REPORT

Applicant	:	Beijing InHand Networks Technology Co., Ltd.
Address of Applicant	:	Room 501, floor 5, building 3, yard 18, ziyue road, chaoyang district, Beijing 100102, China
Manufacturer	:	Beijing InHand Networks Technology Co., Ltd.
Address of Manufacturer	:	Room 501, floor 5, building 3, yard 18, ziyue road, chaoyang district, Beijing 100102, China
Equipment under Test	:	InVehicle Gateway
Model No.	:	VG710, VG710-U, VG710-M, VG710-H, VG710-L
FCC ID	:	2AANYVG710U
Test Standard(s)	:	FCC Rules and Regulations Part 15 Subpart E, ANSI C63.10:2013, 789033 D02 General U-NII Test Procedures New Rules v02r01, 662911 D01 Multiple Transmitter Output v02r01
Report No.	:	DDT-RE23122506-2E02
Issue Date	:	2024/03/05
Issue By	:	Guangdong Dongdian Testing Service Co., Ltd. Unit 2, Building 1, No. 17, Zongbu 2nd Road, Songshan Lake Park, Dongguan, Guangdong, China, 523808

REPORT

Table of Contents

Test Report Declare

Applicant	:	Beijing InHand Networks Technology Co., Ltd.
Address of Applicant	:	Room 501, floor 5, building 3, yard 18, ziyue road, chaoyang district, Beijing 100102, China
Equipment under Test	:	InVehicle Gateway
Model No.	:	VG710, VG710-U, VG710-M, VG710-H, VG710-L
Manufacturer	:	Beijing InHand Networks Technology Co., Ltd.
Address of Manufacturer	:	Room 501, floor 5, building 3, yard 18, ziyue road, chaoyang district, Beijing 100102, China

Test Standard Used:

FCC Rules and Regulations Part 15 Subpart E,

ANSI C63.10:2013,

789033 D02 General U-NII Test Procedures New Rules v02r01,

662911 D01 Multiple Transmitter Output v02r01

We Declare:

The equipment described above is tested by Guangdong Dongdian Testing Service Co., Ltd. and in the configuration tested the equipment complied with the standards specified above. The test results are contained in this test report and Guangdong Dongdian Testing Service Co., Ltd. is assumed of full responsibility for the accuracy and completeness of these tests.

Report No.:	DDT-RE23122506-2E02		
Date of Receipt:	2024/02/01	**Date of Test:**	2024/02/01~2024/03/05

Prepared By:

Jacky Huang

Jacky Huang/Engineer

Approved By:

Damon Hu

Damon Hu/EMC Manager

Note: This report applies to above tested sample only. This report shall not be reproduced in parts without written approval of Guangdong Dongdian Testing Service Co., Ltd.

Revision History

Rev.	Revisions	Issue Date	Revised By
---	Initial issue	2024/03/05	

1. Summary of Test Results

No.	Test Parameter	Clause No.	Condition	Result
1	6/26db Bandwidth and 99% Bandwidth	FCC 15.407 (e), RSS-247 Clause 6.2	/	Pass
2	Output Power	FCC 15.407 (a)； RSS-247 Clause 6.2	/	Pass
3	Power Spectral Density	FCC 15.407 (a)； RSS-247 Clause 6.2	/	Pass
4	Frequency Stability Measurement	FCC 15.407 (g); RSS-247 Clause 6.2; RSS-GEN Clause 8.9	/	Pass
5	Radiated Emission	FCC 15.407 (b); FCC 15.209; FCC 15.205; RSS-247 Clause 6.2; RSS-GEN Clause 8.9	/	Pass
6	Band Edge Compliance	FCC 15.407 (b); FCC 15.209; FCC 15.205; RSS-247 Clause 6.2; RSS-GEN Clause 8.9	/	Pass
7	Power Line Conducted Emissions	FCC Part 15: 15.207(a), RSS-Gen Issue 5 clause 8.8	/	N/A
8	Antenna Requirement	FCC Part 15: 15.203, RSS-Gen Issue 5 clause 6.8	/	Pass
9	Dynamic Frequency Selection	FCC 15.407 (h); RSS-247 Clause 6.8	/	N/A
Note: N/A is an abbreviation for Not Applicable, and means this item is not applicable for this device or no need to test according to standard.				

2. General Test Information

2.1. Description of EUT

EUT Name	:	InVehicle Gateway
Model Number	:	VG710, VG710-U, VG710-M, VG710-H, VG710-L
Difference of model number	:	These models are the same in these: appearance, PCB layout and basic software function. The only difference is that the products are used in different markets. The test model is VG710.
EUT Function Description	:	Please reference user manual of this device
Power Supply	:	DC 9~36V
Hardware Version	:	/
Software Version	:	/

Note: This EUT support 2.4 GHz WLAN, 5 GHz WLAN, this report only for 5 GHz WLAN.

Radio Technology	:	IEEE 802.11a/n/ac
Operation Frequency	:	IEEE 802.11a: 5180MHz-5240MHz, 5745MHz-5825MHz IEEE 802.11n HT20: 5180MHz-5240MHz, 5745MHz-5825MHz IEEE 802.11n HT40: 5190MHz-5230MHz, 5755MHz-5795MHz IEEE 802.11ac VHT20: 5180MHz-5240MHz, 5745MHz-5825MHz IEEE 802.11ac VHT40: 5190MHz-5230MHz, 5755MHz-5795MHz IEEE 802.11ac VHT80: 5210MHz, 5775MHz
Modulation	:	IEEE 802.11a: OFDM (64QAM, 16QAM, QPSK, BPSK) IEEE 802.11n HT20, HT40: OFDM (64QAM, 16QAM, QPSK, BPSK) IEEE 802.11ac VHT20, VHT40, VHT80: OFDM (256QAM, 64QAM, 16QAM, QPSK, BPSK)

Antenna information		
Antenna Type	Frequency rang (MHz)	Max Antenna Gain (dBi)
External antenna	5180-5240	-2.48
	5745-5825	-2.89

Channel information					
IEEE 802.11a IEEE 802.11n (HT20) IEEE 802.11ac (VHT20)		IEEE 802.11n (HT40) IEEE 802.11ac (VHT40)		IEEE 802.11ac (VHT80)	
UNII-1					
CH	Frequency (MHz)	CH	Frequency (MHz)	CH	Frequency (MHz)
36	5180	38	5190	42	5210
40	5200	46	5230	/	/
44	5220	/	/	/	/
48	5240	/	/	/	/
UNII-3					
149	5745	151	5755	155	5775
153	5765	159	5795	/	/
157	5785	/	/	/	/
161	5805	/	/	/	/
165	5825	/	/	/	/

Note: The above EUT information is declared by manufacturer and for more detailed features description please refer to the manufacturer's specifications or User's Manual. The above Antenna information is declared by manufacturer and for more detailed features description please refer to the manufacturer's specifications, the laboratory shall not be held responsible.

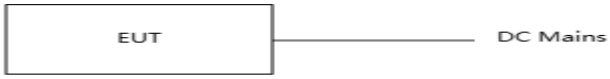
"☒" means to be chosen or applicable; "□" means don't to be chosen or not applicable; This note applies to entire report.

2.2. Accessories of EUT

Accessories	Manufacturer	Model number	Description
Power in Cable	/	/	Length: 25cm
CAN0/1 Cable	/	/	Length: 100cm
Ethernet Cable	/	/	Length: 100cm
Serial Cable	/	/	Length: 100cm
WIFI ANT	SHENZHEN GUYANG COMMUNICATION TECHNOLOGY CO.,LTD	GY-BCF-BCL2-GJ	Length: 200cm Quantity：1
WWAN ANT	SHENZHEN GUYANG COMMUNICATION TECHNOLOGY CO.,LTD	GY-BCL-BCL2-AJ	Length: 200cm Quantity：2

2.3. Block diagram of EUT configuration for test

Configuration diagram



2.4. Decision of final test mode

According pre-test, the worst test modes were reported as below:

Test software: adb.exe

The test software was used to control EUT work in Continuous Tx mode, and select test channel, wireless mode as below table.

The pathloss of external cable: 2 dB (According to the manufacturer's claims)

Tested mode, channel, and data rate information				
Mode	Setting Tx Power ANT1	Data rate (Mpbs) (see Note)	Channel	Frequency (MHz)
IEEE 802.11a	46	6	Low: CH36	5180
	46	6	Middle: CH40	5200

	46	6	High: CH48	5240
	46	6	Low: CH149	5745
	46	6	Middle: CH157	5785
	46	6	High: CH165	5825
IEEE 802.11n HT20	46	MCS 0	Low: CH36	5180
	46	MCS 0	Middle: CH40	5200
	46	MCS 0	High: CH48	5240
	46	MCS 0	Low: CH149	5745
	46	MCS 0	Middle: CH157	5785
	46	MCS 0	High: CH165	5825
IEEE 802.11n HT40	46	MCS 0	Low: CH38	5190
	46	MCS 0	Middle: CH46	5230
	46	MCS 0	Middle: CH151	5755
	46	MCS 0	High: CH159	5795
IEEE 802.11ac VHT20	46	MCS 0	Low: CH36	5180
	46	MCS 0	Middle: CH40	5200
	46	MCS 0	High: CH48	5240
	46	MCS 0	Low: CH149	5745
	46	MCS 0	Middle: CH157	5785
	46	MCS 0	High: CH165	5825
IEEE 802.11 ac VHT40	46	MCS 0	Low: CH38	5190
	46	MCS 0	Middle: CH46	5230
	46	MCS 0	Middle: CH151	5755
	46	MCS 0	High: CH159	5795
IEEE 802.11ac VHT80	46	MCS 0	CH42	5210
	46	MCS 0	CH155	5775
Note: According exploratory test, EUT will have maximum output power in those data rate, so those data rate were used for all test.				

2.5. Deviations of test standard

No deviation.

2.6. Test environment conditions

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

Temperature range:	+15℃ to +35 ℃
Humidity range:	20% to 75%
Pressure range:	86 kPa to106 kPa

Note: The specific temperature and humidity information of each test item refers to the temperature and humidity record in the corresponding test data.

2.7. Test laboratory

Guangdong Dongdian Testing Service Co., Ltd.

Add.: Unit 2, Building 1, No. 17, Zongbu 2nd Road, Songshan Lake Park, Dongguan, Guangdong, China, 523808.

Tel.: +86-0769-38826678, http://www.dgddt.com, Email: ddt@dgddt.com.

CNAS Accreditation No. L6451; A2LA Accreditation Number: 3870.01

FCC Designation Number: CN1182, Test Firm Registration Number: 540522

Innovation, Science and Economic Development Canada Site Registration Number: 10288A

Conformity Assessment Body identifier: CN0048

VCCI facility registration number: C-20087, T-20088, R-20123, R-20155, G-20118

2.8. Measurement uncertainty

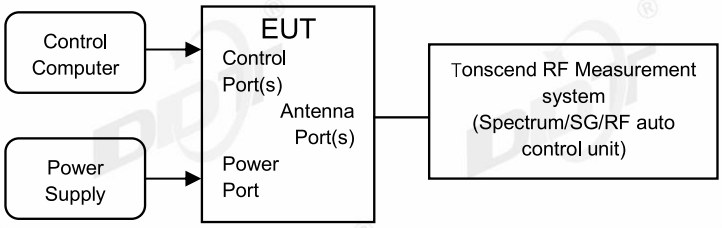
Test Item	Uncertainty
Bandwidth	1.1%
Peak Output Power (Conducted) (Spectrum analyzer)	0.86 dB (10 MHz ≤ f < 3.6 GHz);
	1.38 dB (3.6 GHz ≤ f < 8 GHz)
Peak Output Power (Conducted) (Power Sensor)	0.74 dB
Power Spectral Density	0.74 dB (10 MHz ≤ f < 3.6 GHz);
	1.38 dB (3.6 GHz ≤ f < 8 GHz)
Frequencies Stability	6.7×10^{-8} (Antenna couple method)
	5.5×10^{-8} (Conducted method)
Conducted spurious emissions	0.86 dB (10 MHz ≤ f < 3.6 GHz);
	1.40 dB (3.6 GHz ≤ f < 8 GHz)
	1.66 dB (8 GHz ≤ f < 26.5 GHz)
Uncertainty for radio frequency (RBW < 20 kHz)	3×10^{-8}
Temperature	0.4 ℃
Humidity	2 %
Uncertainty for Radiation Emission test (9 kHz – 30 MHz)	3.44 dB
Uncertainty for Radiation Emission test (30 MHz - 1 GHz)	4.70 dB (Antenna Polarize: V)
	4.84 dB (Antenna Polarize: H)
Uncertainty for Radiation Emission test (1 GHz - 40 GHz)	4.10 dB (1 - 6 GHz)
	4.40 dB (6 GHz - 18 GHz)
	3.54 dB (18 GHz - 26 GHz)
	4.30 dB (26 GHz - 40 GHz)
Uncertainty for Power line conduction emission test	3.34dB (150KHz-30MHz)
	3.72dB (9KHz-150KHz)
Note: This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.	

3. Equipment Used During Conductive Test

Equipment	Manufacturer	Model No.	Serial Number	Due Date	Cal. Interval
☒ RF Connected Test (RF Measurement System 1#)					
SIGNAL ANALYZER	R&S	FSQ26	101272	2024/04/26	1 Year
Wideband Radio Communication Tester	R&S	CMW500	120259	2024/07/14	1 Year
MXG Vector Signal Generator	KEYSIGHT	N5182B	MY59100192	2024/04/26	1 Year
MXG Vector Signal Generator	Agilent	N5182A	MY19060405	2024/04/26	1 Year
RF Control Unit	Tonsend	JS0806-2	158060010	2024/04/26	1 Year
TEMP&HUMI Programmable Chamber	ZHIXIANG	ZXGDJS-150L	ZX170110-A	2024/05/14	1 Year
Test Software	Tonscend	JS1120-3	Ver.3.2.22	N/A	NA

4. 26dB Bandwidth

4.1. Block diagram of test setup



4.2. Limits

FCC Part15, Subpart E		
Test Item	Limit	Frequency Range (MHz)
26 dB Bandwidth	---	5150 - 5250
	---	5250 - 5350
	---	5470 - 5725

4.3. Test procedure

Connect EUT's antenna output to spectrum analyzer by RF cable.

Center Frequency	The center frequency of the channel under test
Detector	Peak
RBW	approximately 1% of the emission bandwidth.
VBW	> RBW
Trace	Max hold
Sweep	Auto couple

Allow the trace to stabilize, measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 26 dB relative to the maximum level measured in the fundamental emission.

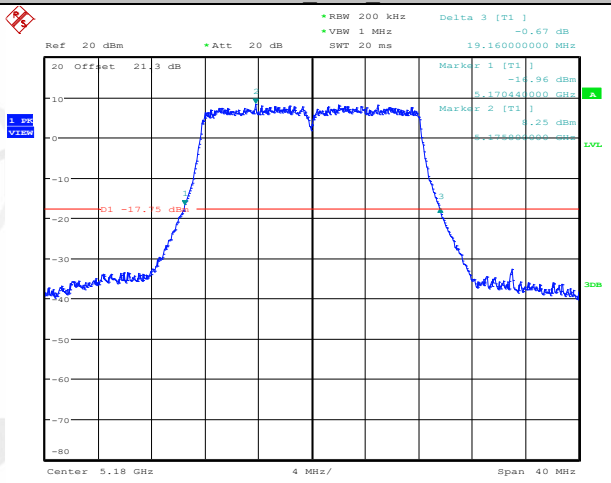
4.4. Test result

Test Engineer:	Zora Zhang	Test Site:	RF Measurement System 1#
Ambient Condition:	23.8℃, 59.2%RH	Test Date:	2024.02.01-2024.03.05
Test Power Supply:	DC 12V	EUT:	InVehicle Gateway
Sample Number:	S23122506-03	Model No.:	VG710

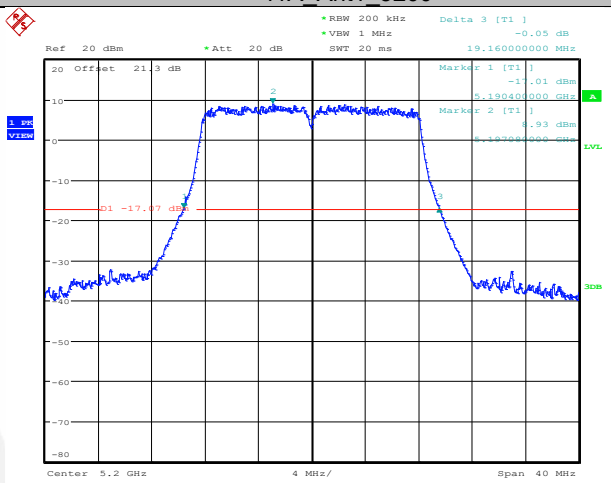
Test Mode	Antenna	Frequency [MHz]	26db EBW [MHz]	FL [MHz]	FH [MHz]	Limit [MHz]	Verdict
11A	Ant1	5180	19.16	5170.44	5189.60	---	---
		5200	19.16	5190.40	5209.56	---	---
		5240	19.24	5230.32	5249.56	---	---
		5745	19.08	5735.44	5754.52	---	---
		5785	19.12	5775.36	5794.48	---	---
		5825	19.40	5815.08	5834.48	---	---
11N20SISO	Ant1	5180	20.20	5169.84	5190.04	---	---
		5200	20.12	5189.84	5209.96	---	---
		5240	20.12	5229.88	5250.00	---	---
		5745	20.08	5734.84	5754.92	---	---
		5785	20.04	5774.88	5794.92	---	---
		5825	20.20	5814.84	5835.04	---	---
11N40SISO	Ant1	5190	39.04	5170.48	5209.52	---	---
		5230	39.20	5210.40	5249.60	---	---
		5755	39.52	5735.40	5774.92	---	---
		5795	39.52	5775.40	5814.92	---	---
11AC20SISO	Ant1	5180	20.24	5169.84	5190.08	---	---
		5200	20.12	5189.88	5210.00	---	---
		5240	20.20	5229.84	5250.04	---	---
		5745	20.16	5734.84	5755.00	---	---
		5785	20.16	5774.84	5795.00	---	---
		5825	20.20	5814.84	5835.04	---	---
11AC40SISO	Ant1	5190	39.28	5170.24	5209.52	---	---
		5230	39.28	5210.32	5249.60	---	---
		5755	39.52	5735.16	5774.68	---	---
		5795	39.44	5775.32	5814.76	---	---
11AC80SISO	Ant1	5210	83.36	5168.24	5251.60	---	---
		5775	83.52	5733.08	5816.60	---	---

4.5. Test graphs

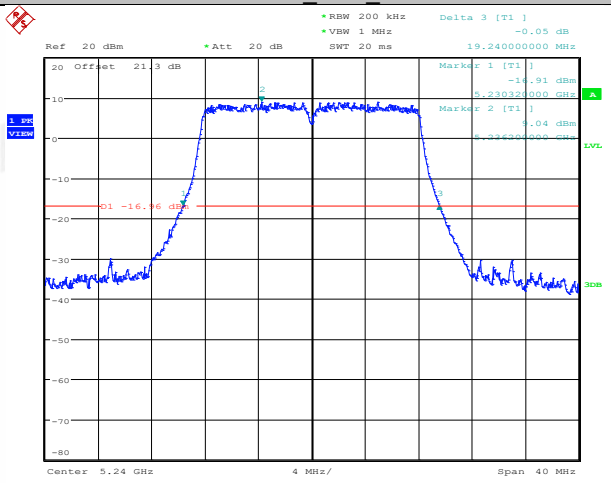
11A_Ant1_5180



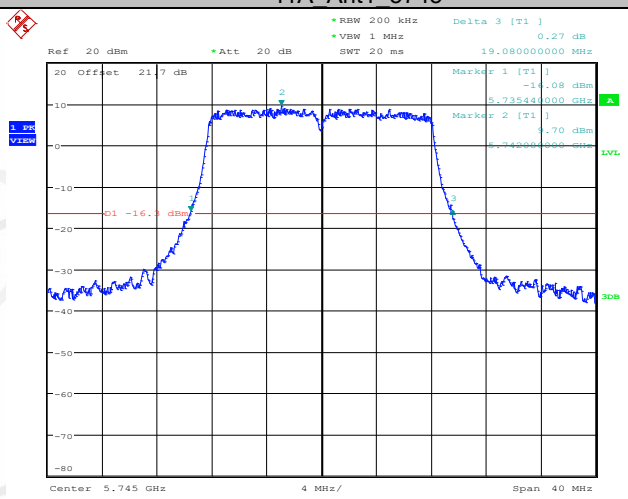
11A_Ant1_5200



11A_Ant1_5240

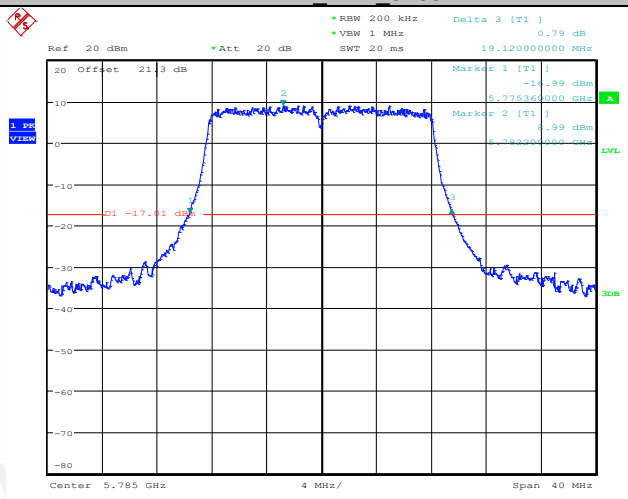


11A_Ant1_5745



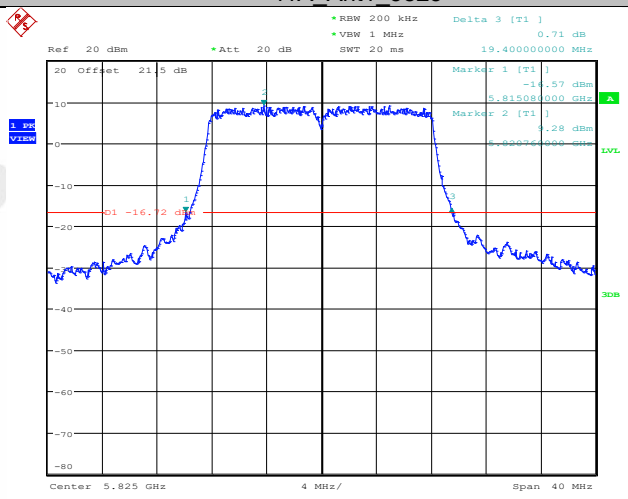
Date: 1.FEB.2024 20:15:19

11A_Ant1_5785



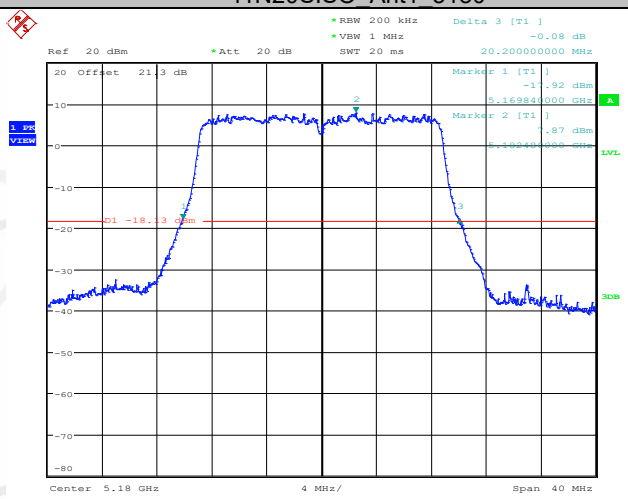
Date: 1.FEB.2024 20:19:03

11A_Ant1_5825



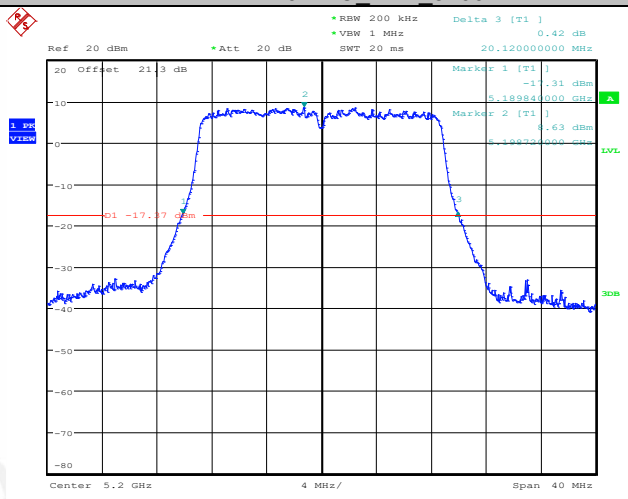
Date: 1.FEB.2024 20:22:46

11N20SISO_Ant1_5180



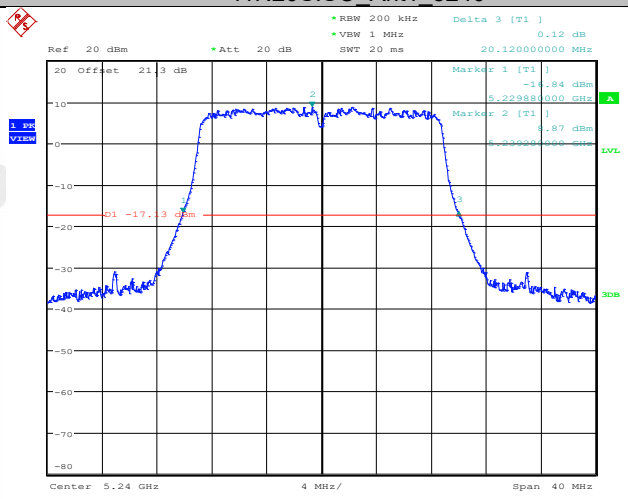
Date: 1.FEB.2024 20:26:39

11N20SISO_Ant1_5200



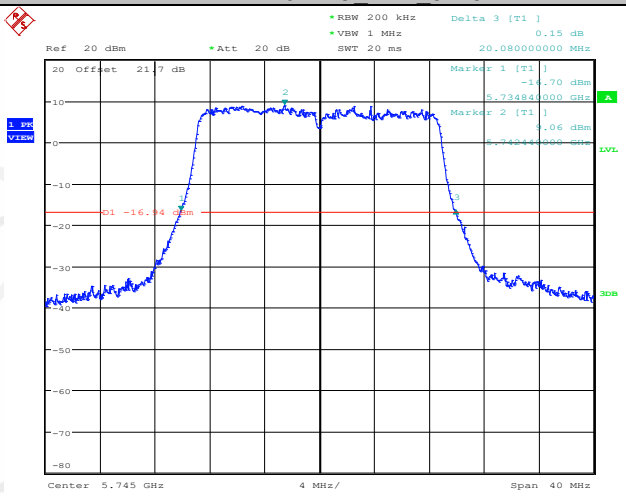
Date: 1.FEB.2024 20:28:19

11N20SISO_Ant1_5240



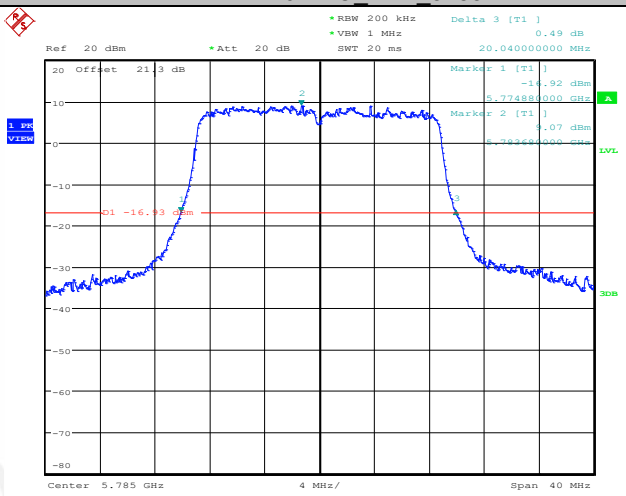
Date: 1.FEB.2024 20:30:04

11N20SISO_Ant1_5745



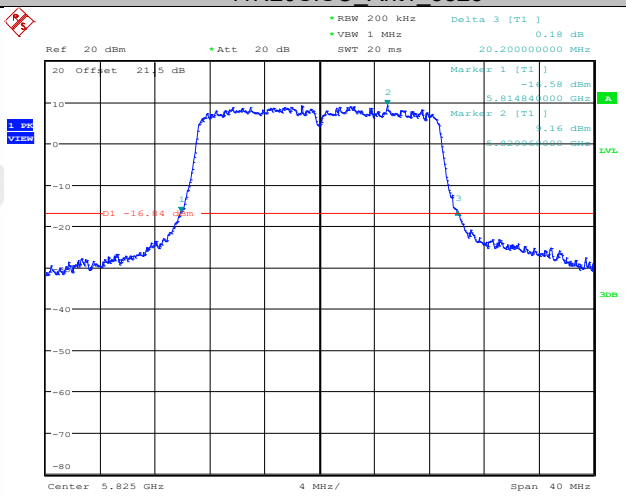
Date: 1.FEB.2024 20:32:09

11N20SISO_Ant1_5785



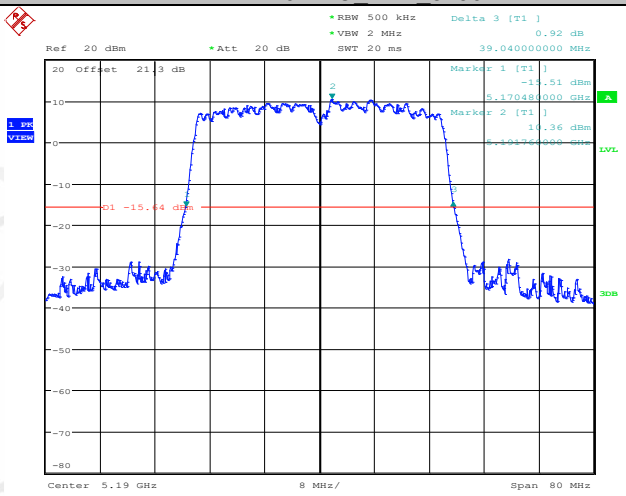
Date: 1.FEB.2024 20:34:14

11N20SISO_Ant1_5825



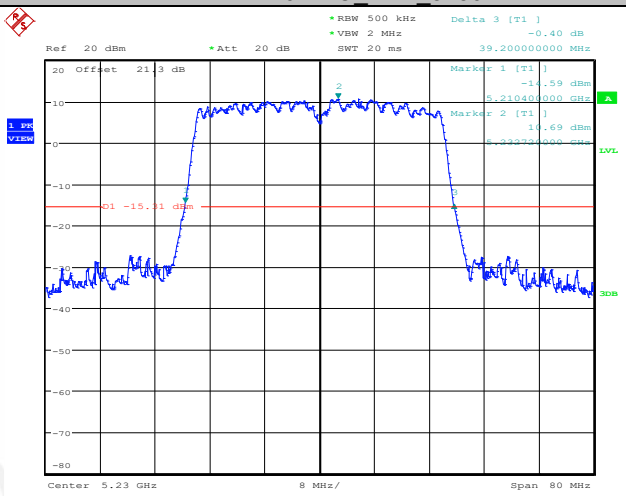
Date: 1.FEB.2024 20:36:14

11N40SISO_Ant1_5190



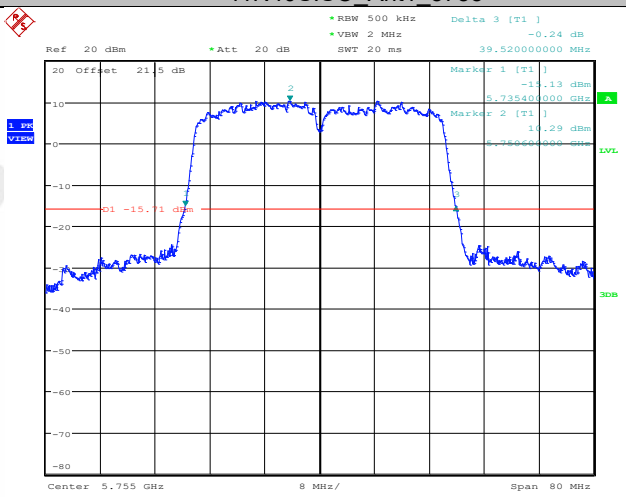
Date: 1.FEB.2024 20:39:35

11N40SISO_Ant1_5230



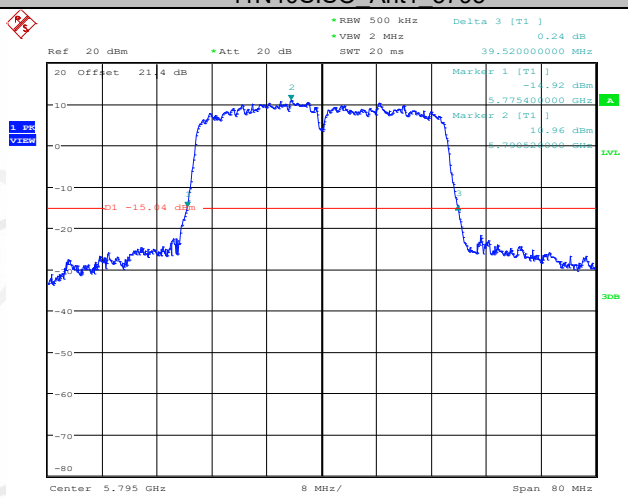
Date: 1.FEB.2024 20:42:59

11N40SISO_Ant1_5755



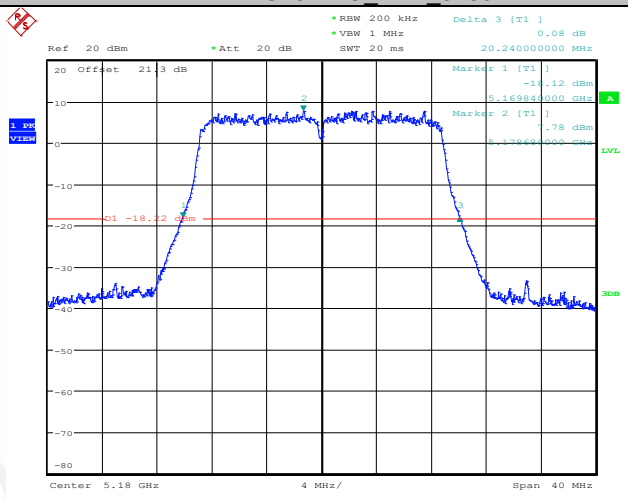
Date: 1.FEB.2024 20:46:04

11N40SISO_Ant1_5795



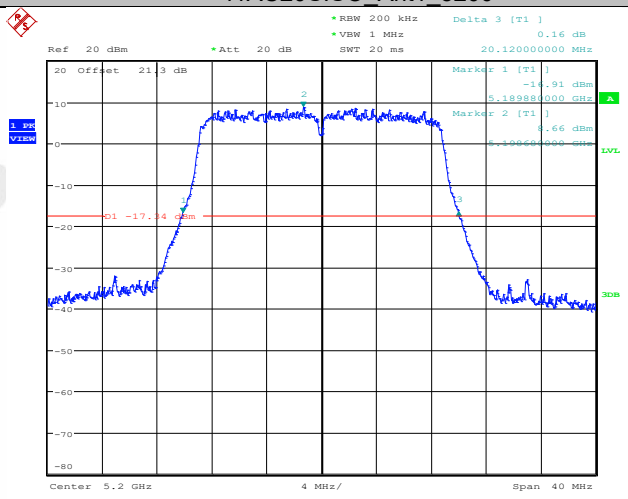
Date: 1.FEB.2024 20:49:01

11AC20SISO_Ant1_5180



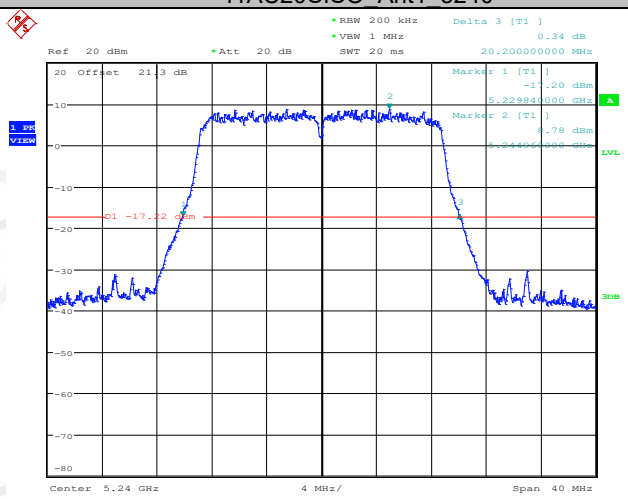
Date: 1.FEB.2024 20:52:18

11AC20SISO_Ant1_5200



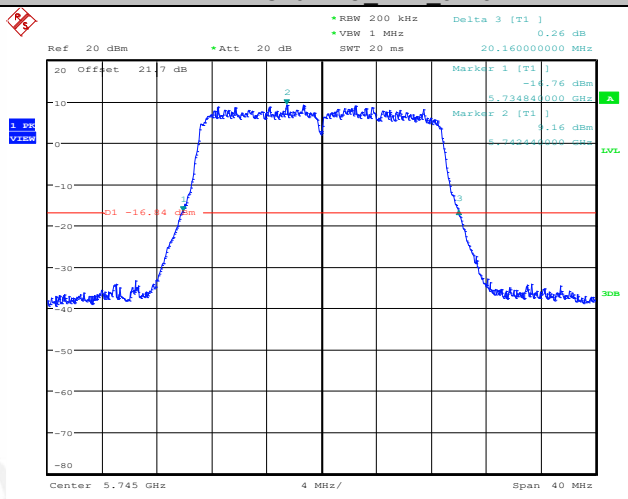
Date: 1.FEB.2024 20:54:04

11AC20SISO_Ant1_5240



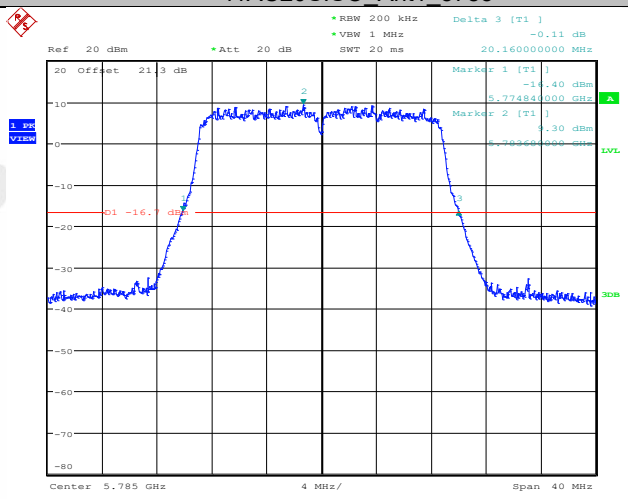
Date: 1.FEB.2024 20:55:47

11AC20SISO_Ant1_5745



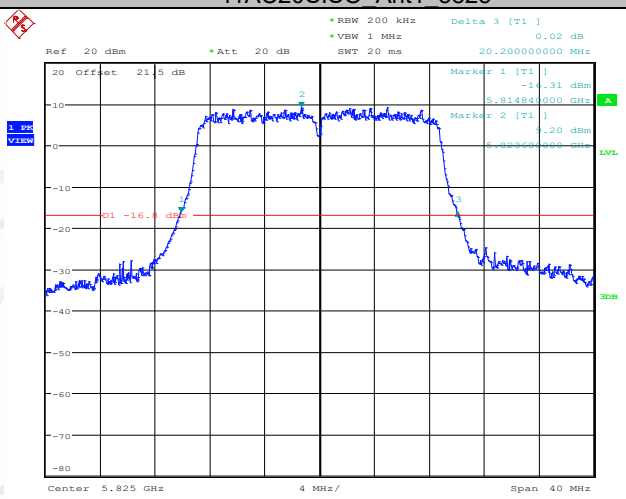
Date: 1.FEB.2024 20:57:36

11AC20SISO_Ant1_5785



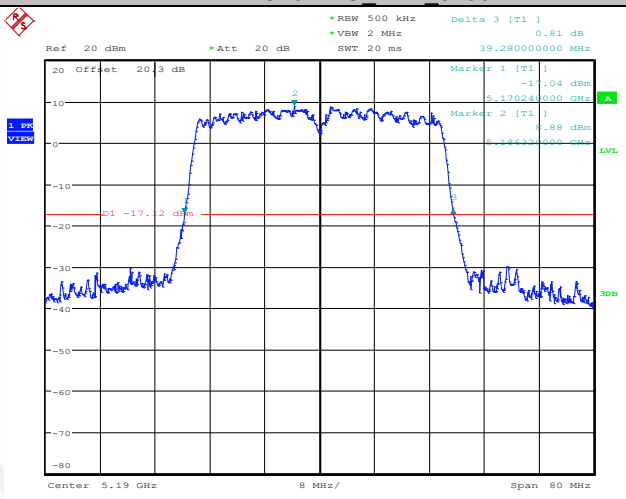
Date: 1.FEB.2024 21:04:49

11AC20SISO_Ant1_5825



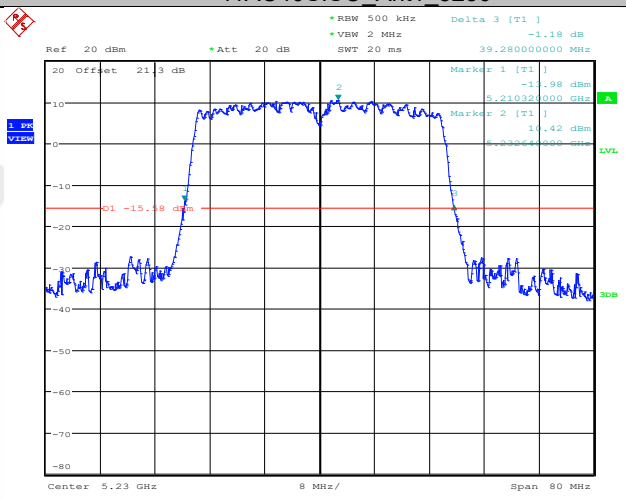
Date: 1.FEB.2024 21:08:33

11AC40SISO_Ant1_5190



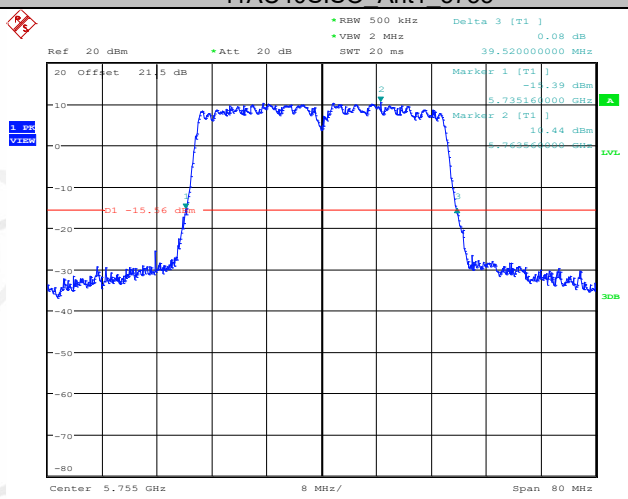
Date: 5.MAR.2024 19:39:11

11AC40SISO_Ant1_5230



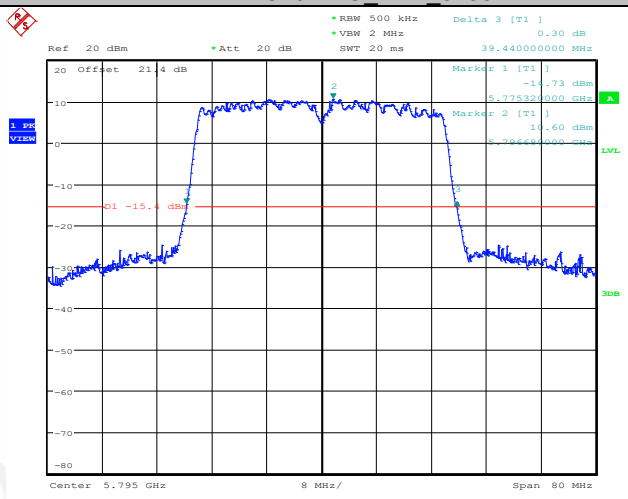
Date: 5.MAR.2024 19:43:52

11AC40SISO_Ant1_5755



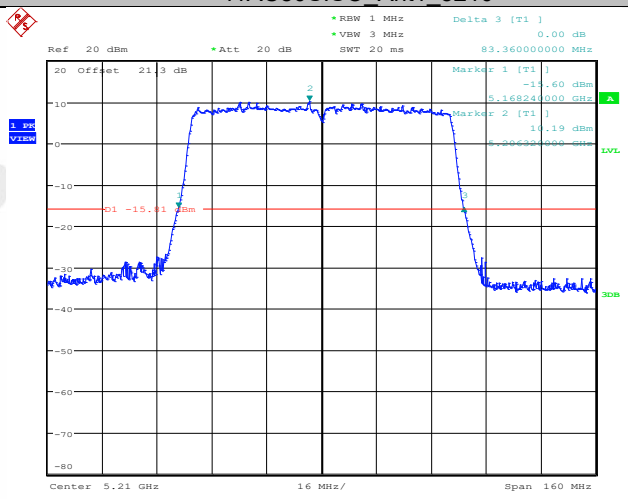
Date: 1.FEB.2024 21:14:54

11AC40SISO_Ant1_5795



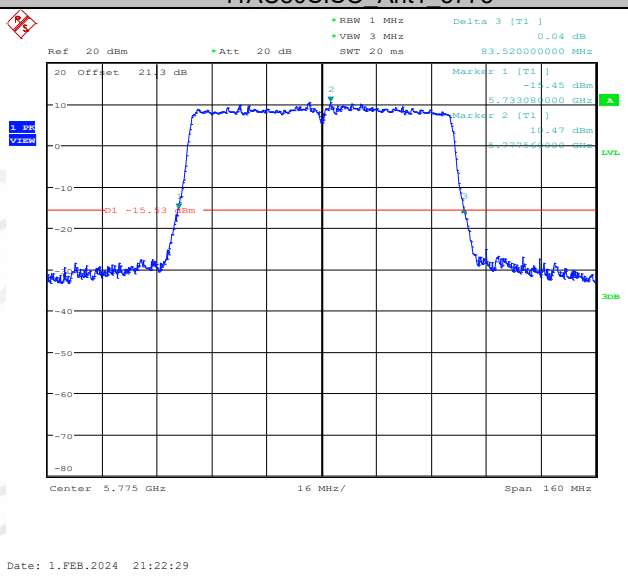
Date: 1.FEB.2024 21:16:50

11AC80SISO_Ant1_5210



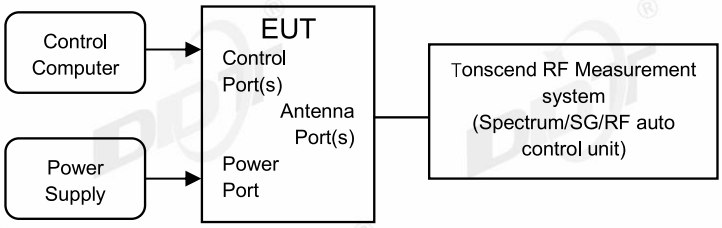
Date: 5.MAR.2024 19:46:39

11AC80SISO_Ant1_5775



5. 6dB Bandwidth

5.1. Block diagram of test setup



5.2. Limits

FCC Part15, Subpart E		
Test Item	Limit	Frequency Range (MHz)
6 dB Bandwidth	Minimum 500 kHz	5725 - 5850

5.3. Test procedure

Connect EUT's antenna output to spectrum analyzer by RF cable.

Center Frequency	The center frequency of the channel under test
Detector	Peak
RBW	For 6 dB Bandwidth: RBW=100 kHz For 26 dB Bandwidth: approximately 1% of the emission bandwidth.
VBW	For 6 dB Bandwidth: VBW=300 kHz For 26 dB Bandwidth: >3 RBW
Trace	Max hold
Sweep	Auto couple

Allow the trace to stabilize, measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

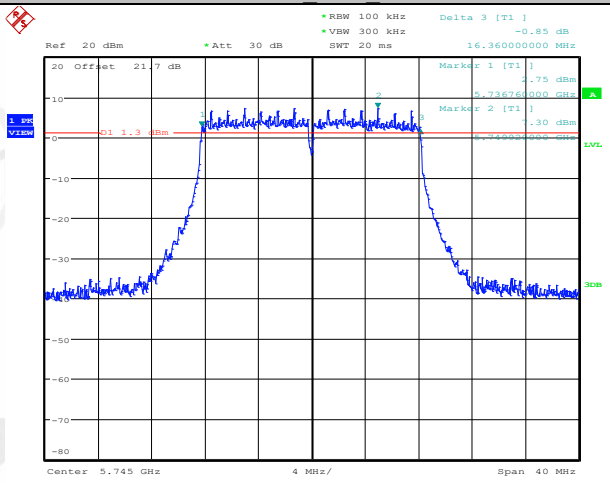
5.4. Test result B4

Test Engineer:	Zora Zhang	Test Site:	RF Measurement System 1#
Ambient Condition:	23.8℃, 59.2%RH	Test Date:	2024.02.01-2024.03.05
Test Power Supply:	DC 12V	EUT:	InVehicle Gateway
Sample Number:	S23122506-03	Model No.:	VG710

Test Mode	Antenna	Frequency [MHz]	6db EBW [MHz]	FL [MHz]	FH [MHz]	Limit [MHz]	Verdict
11A	Ant1	5745	16.36	5736.76	5753.12	0.5	PASS
		5785	16.36	5776.76	5793.12	0.5	PASS
		5825	16.36	5816.76	5833.12	0.5	PASS
11N20SISO	Ant1	5745	17.60	5736.12	5753.72	0.5	PASS
		5785	17.44	5776.16	5793.60	0.5	PASS
		5825	17.44	5816.16	5833.60	0.5	PASS
11N40SISO	Ant1	5755	35.12	5737.40	5772.52	0.5	PASS
		5795	35.12	5777.40	5812.52	0.5	PASS
11AC20SISO	Ant1	5745	17.56	5736.16	5753.72	0.5	PASS
		5785	17.56	5776.16	5793.72	0.5	PASS
		5825	17.56	5816.16	5833.72	0.5	PASS
11AC40SISO	Ant1	5755	35.12	5737.40	5772.52	0.5	PASS
		5795	35.36	5777.16	5812.52	0.5	PASS
11AC80SISO	Ant1	5775	75.68	5736.76	5812.44	0.5	PASS

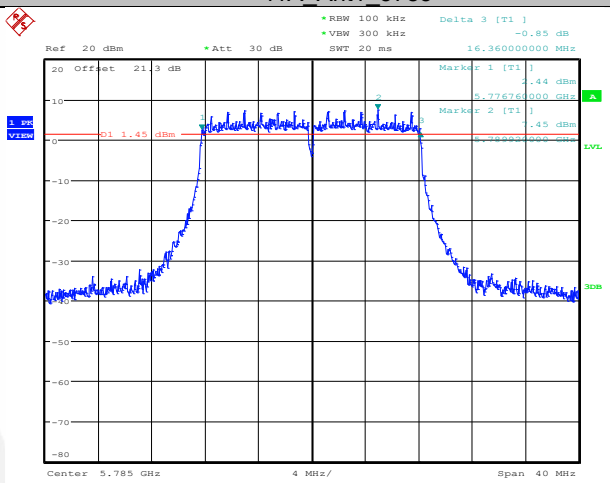
5.5. Test graphs B4

11A_Ant1_5745



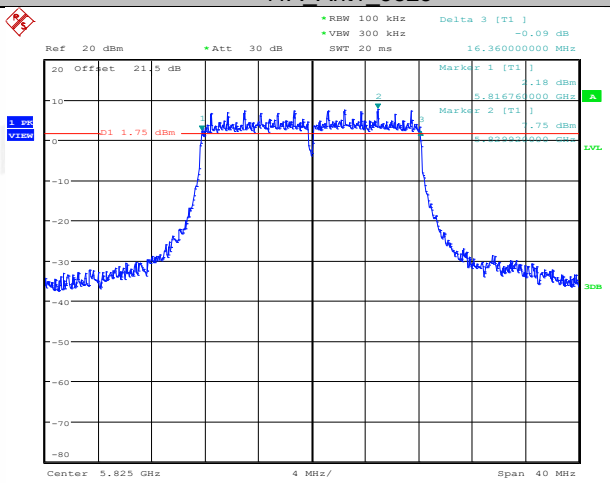
Date: 1.FEB.2024 20:15:35

11A_Ant1_5785



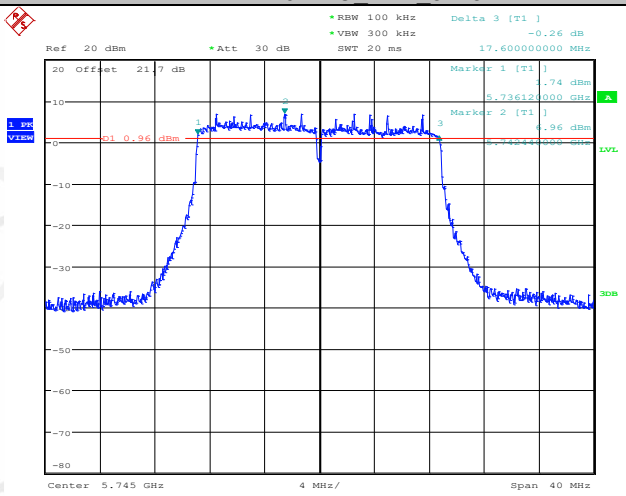
Date: 1.FEB.2024 20:19:18

11A_Ant1_5825



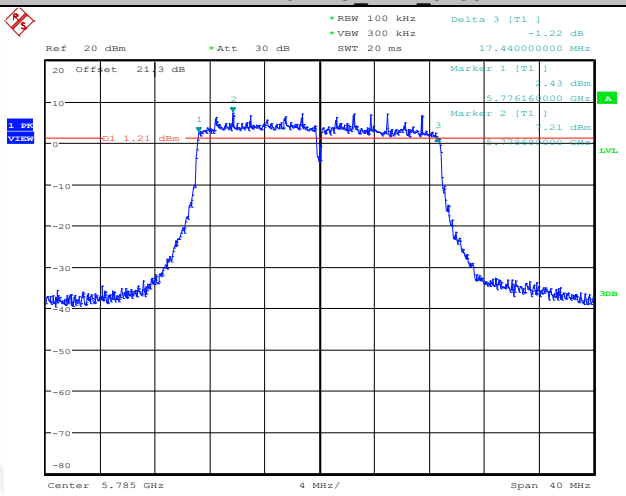
Date: 1.FEB.2024 20:23:02

11N20SISO_Ant1_5745



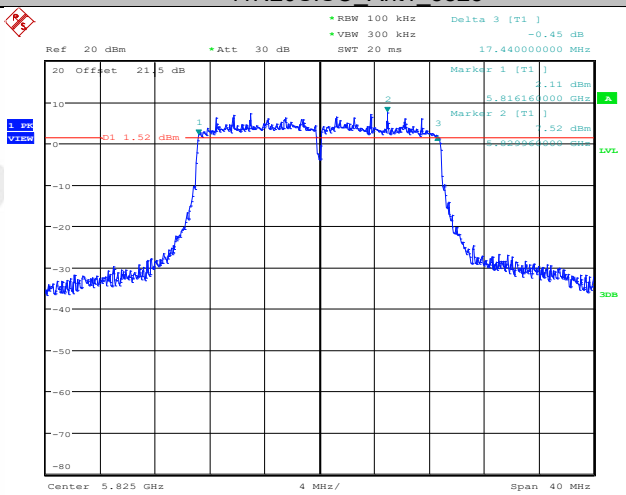
Date: 1.FEB.2024 20:32:25

11N20SISO_Ant1_5785



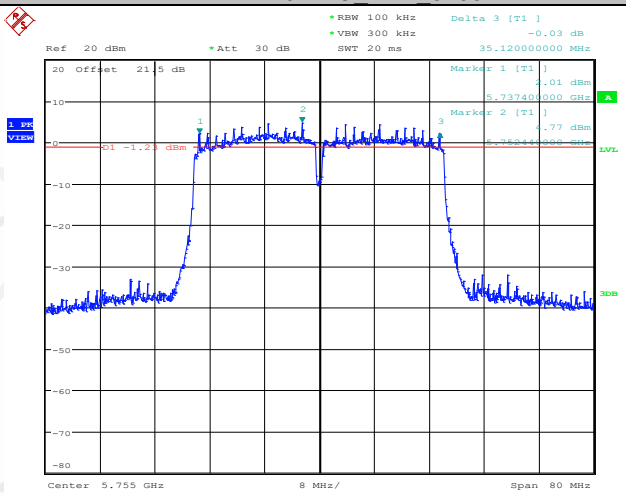
Date: 1.FEB.2024 20:34:30

11N20SISO_Ant1_5825



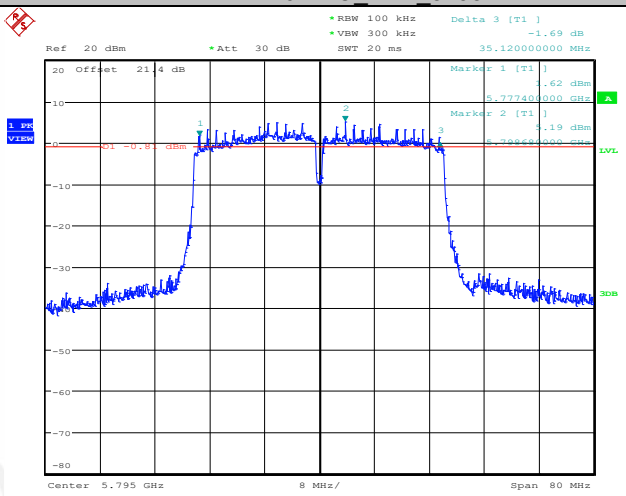
Date: 1.FEB.2024 20:36:30

11N40SISO_Ant1_5755



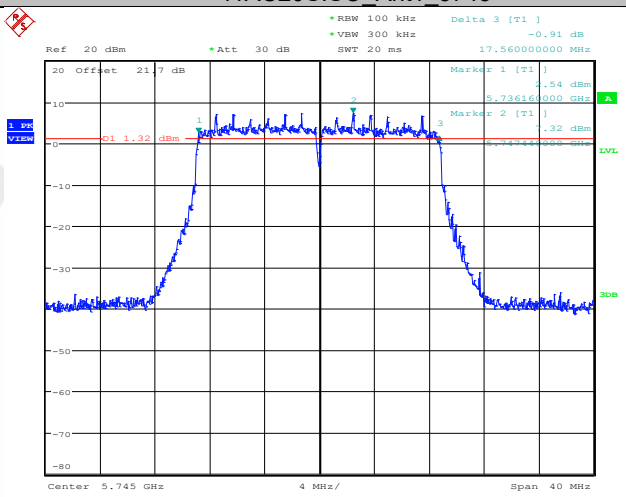
Date: 1.FEB.2024 20:46:20

11N40SISO_Ant1_5795



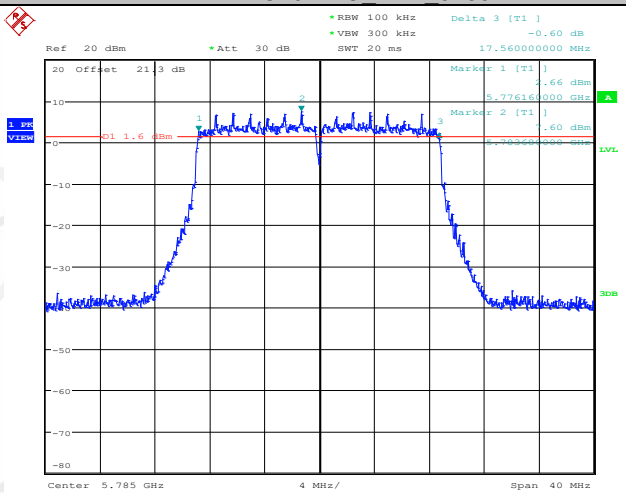
Date: 1.FEB.2024 20:49:17

11AC20SISO_Ant1_5745



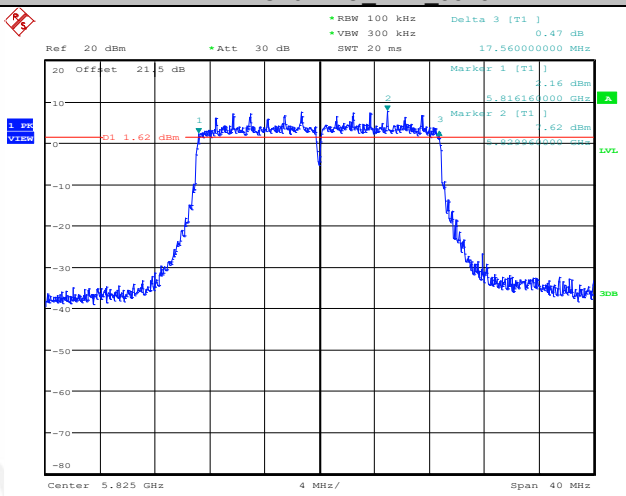
Date: 1.FEB.2024 20:57:52

11AC20SISO_Ant1_5785



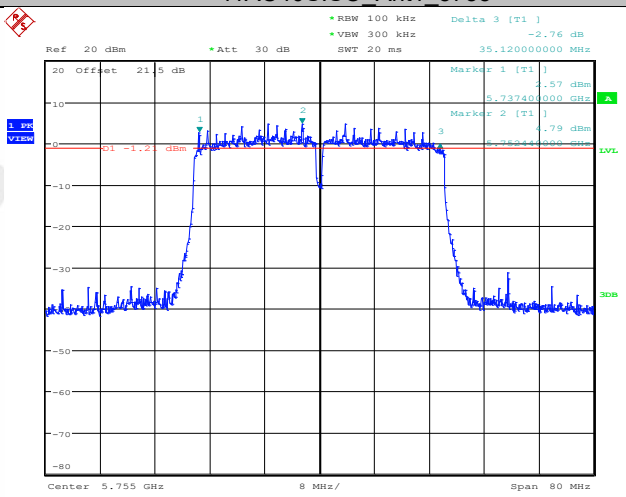
Date: 1.FEB.2024 21:05:04

11AC20SISO_Ant1_5825



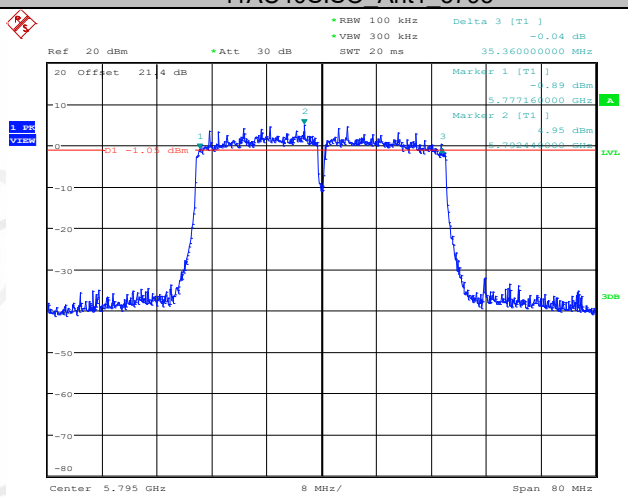
Date: 1.FEB.2024 21:08:49

11AC40SISO_Ant1_5755



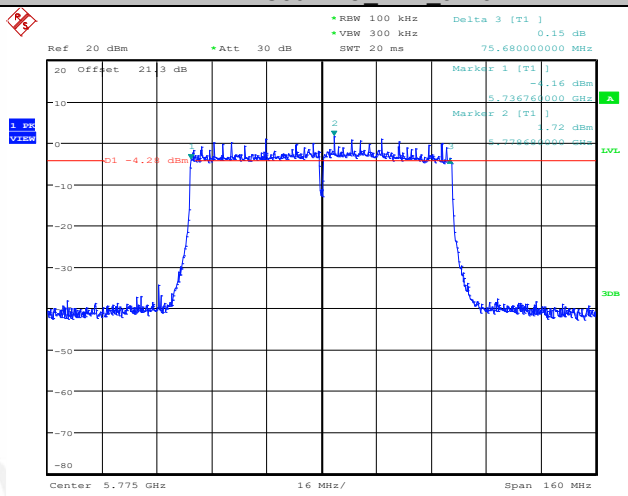
Date: 1.FEB.2024 21:15:10

11AC40SISO_Ant1_5795



Date: 1.FEB.2024 21:17:06

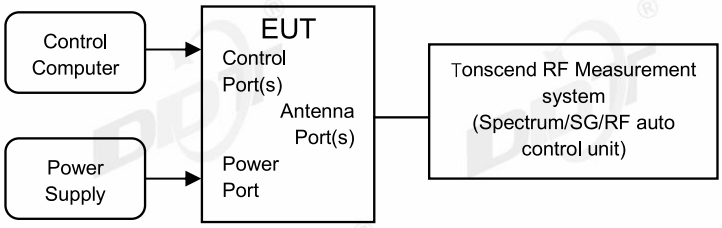
11AC80SISO_Ant1_5775



Date: 1.FEB.2024 21:22:45

6. 99% Bandwidth

6.1. Block diagram of test setup



6.2. Limits

Just for Report.

6.3. Test procedure

(1) Connect EUT's antenna output to spectrum analyzer by RF cable.

Center Frequency	The center frequency of the channel under test
Detector	Peak
RBW	1% to 5% of the OBW
VBW	approximately three times the RBW
Trace	Max hold

(2) Use the 99% power bandwidth function of the instrument (if available) and report the measured bandwidth.

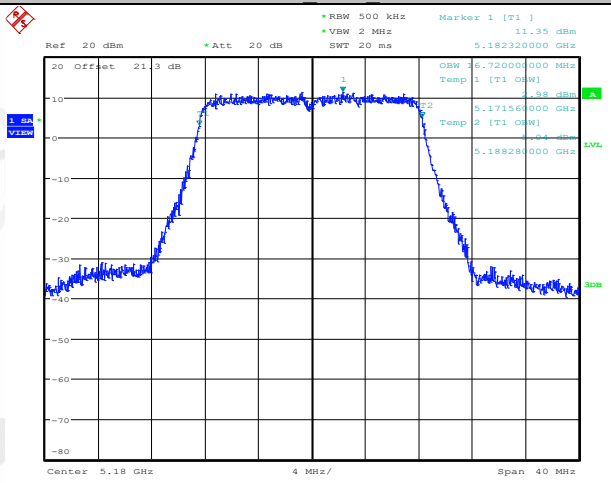
6.4. Test result

Test Engineer:	Zora Zhang	Test Site:	RF Measurement System 1#
Ambient Condition:	23.8℃, 59.2%RH	Test Date:	2024.02.01-2024.03.05
Test Power Supply:	DC 12V	EUT:	InVehicle Gateway
Sample Number:	S23122506-03	Model No.:	VG710

Test Mode	Antenna	Frequency [MHz]	OCB [MHz]	FL [MHz]	FH [MHz]	Limit [MHz]	Verdict
11A	Ant1	5180	16.72	5171.5600	5188.2800	---	---
		5200	16.64	5191.6000	5208.2400	---	---
		5240	16.68	5231.6000	5248.2800	---	---
		5745	16.68	5736.5600	5753.2400	---	---
		5785	16.64	5776.6000	5793.2400	---	---
		5825	16.72	5816.5600	5833.2800	---	---
11N20SISO	Ant1	5180	17.84	5171.0000	5188.8400	---	---
		5200	17.84	5191.0000	5208.8400	---	---
		5240	17.8	5231.0400	5248.8400	---	---
		5745	17.88	5735.9600	5753.8400	---	---
		5785	17.8	5776.0400	5793.8400	---	---
		5825	17.8	5816.0400	5833.8400	---	---
11N40SISO	Ant1	5190	36.08	5171.9200	5208.0000	---	---
		5230	36.08	5211.8400	5247.9200	---	---
		5755	36.16	5736.9200	5773.0800	---	---
		5795	36.16	5776.9200	5813.0800	---	---
11AC20SISO	Ant1	5180	17.88	5171.0000	5188.8800	---	---
		5200	17.88	5191.0000	5208.8800	---	---
		5240	17.88	5231.0000	5248.8800	---	---
		5745	17.84	5736.0000	5753.8400	---	---
		5785	17.84	5776.0000	5793.8400	---	---
		5825	17.88	5816.0000	5833.8800	---	---
11AC40SISO	Ant1	5190	36.16	5171.8400	5208.0000	---	---
		5230	36.08	5211.8400	5247.9200	---	---
		5755	36.16	5736.8400	5773.0000	---	---
		5795	36.08	5776.8400	5812.9200	---	---
11AC80SISO	Ant1	5210	76.32	5171.6000	5247.9200	---	---
		5775	76.32	5736.6000	5812.9200	---	---

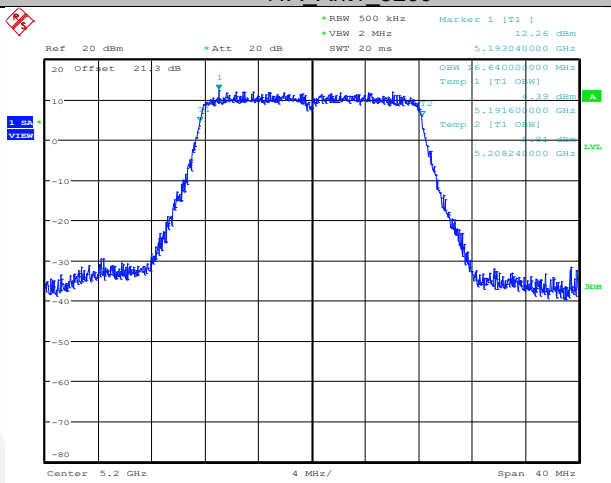
6.5. Test graphs

11A_Ant1_5180



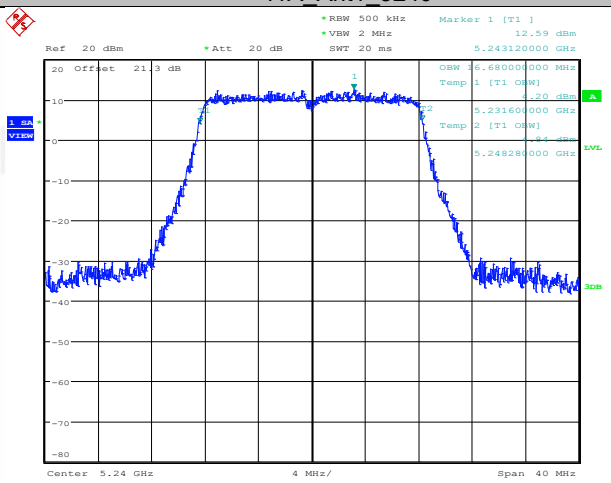
Date: 1.FEB.2024 19:58:19

11A_Ant1_5200



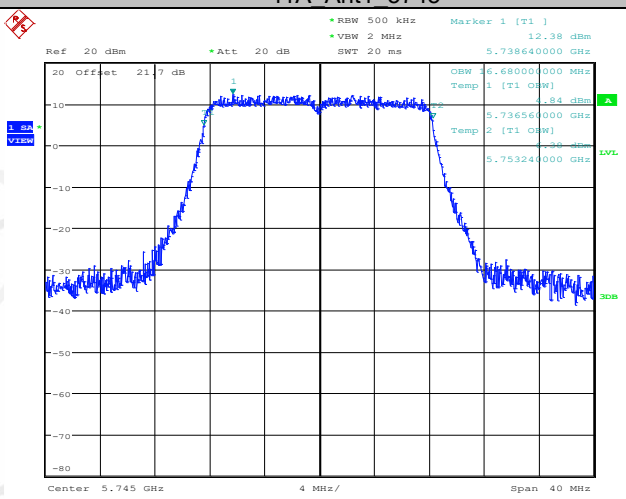
Date: 1.FEB.2024 20:01:11

11A_Ant1_5240



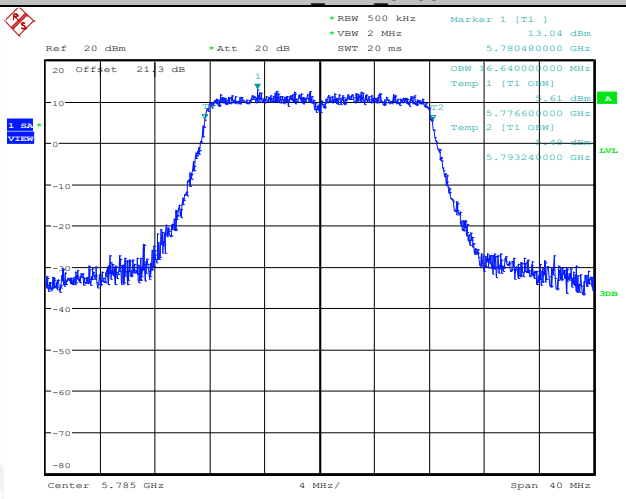
Date: 1.FEB.2024 20:11:41

11A_Ant1_5745



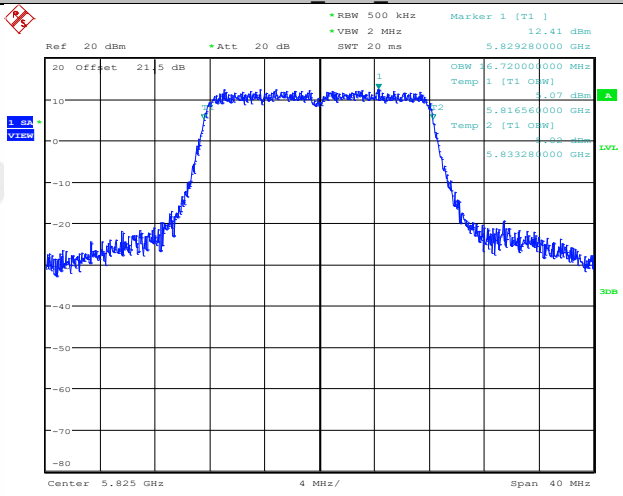
Date: 1.FEB.2024 20:15:50

11A_Ant1_5785



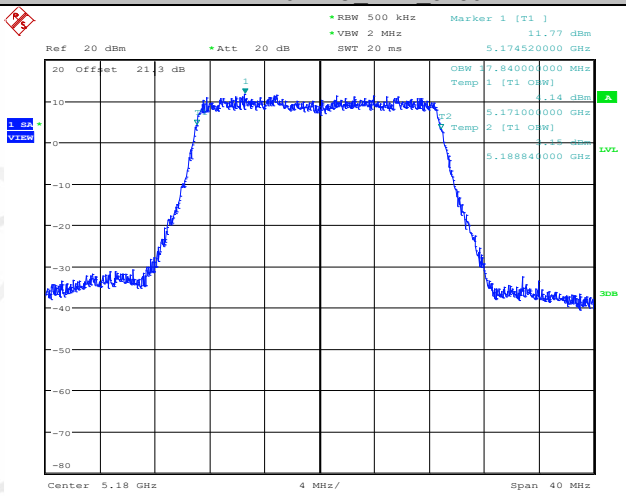
Date: 1.FEB.2024 20:19:33

11A_Ant1_5825

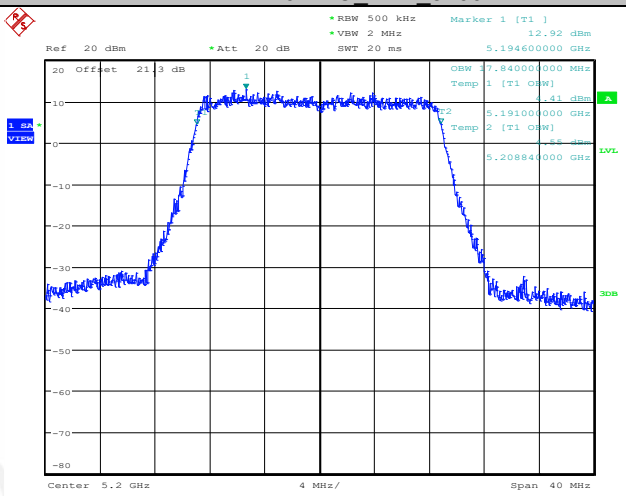


Date: 1.FEB.2024 20:23:17

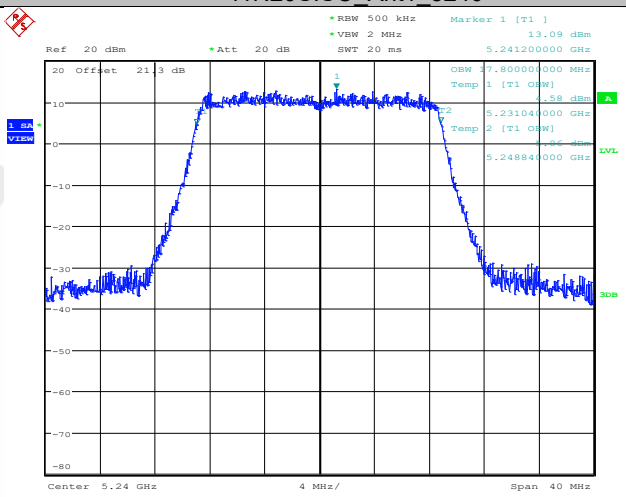
11N20SISO_Ant1_5180



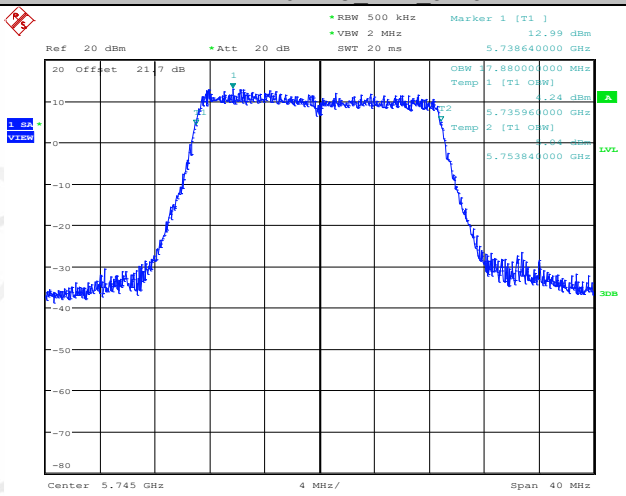
11N20SISO_Ant1_5200



11N20SISO_Ant1_5240

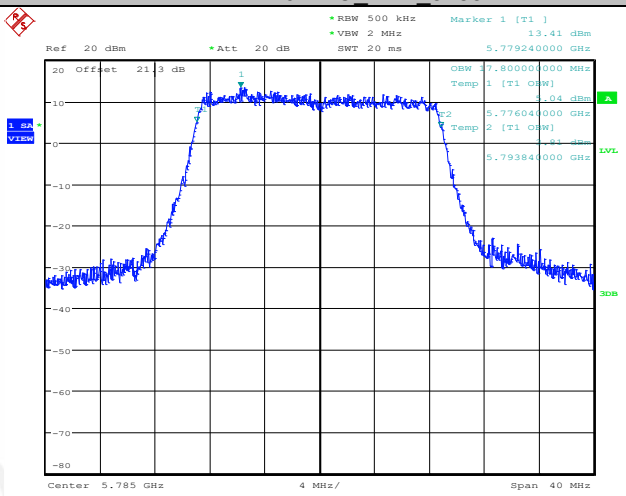


11N20SISO_Ant1_5745



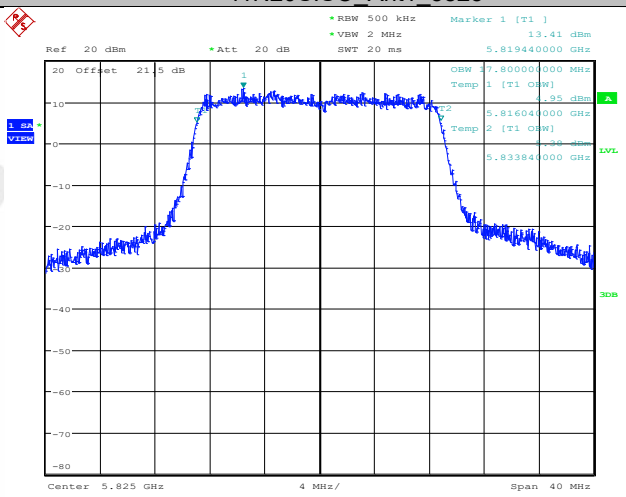
Date: 1.FEB.2024 20:32:40

11N20SISO_Ant1_5785



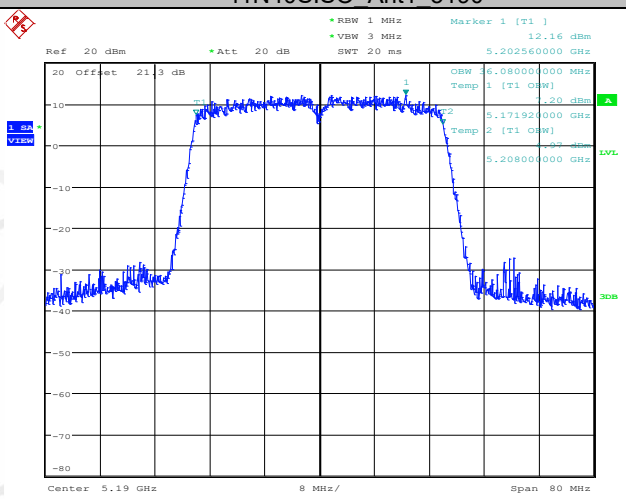
Date: 1.FEB.2024 20:34:45

11N20SISO_Ant1_5825

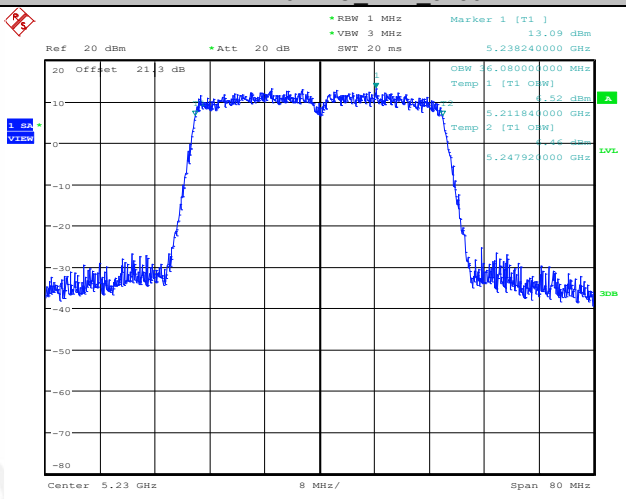


Date: 1.FEB.2024 20:36:44

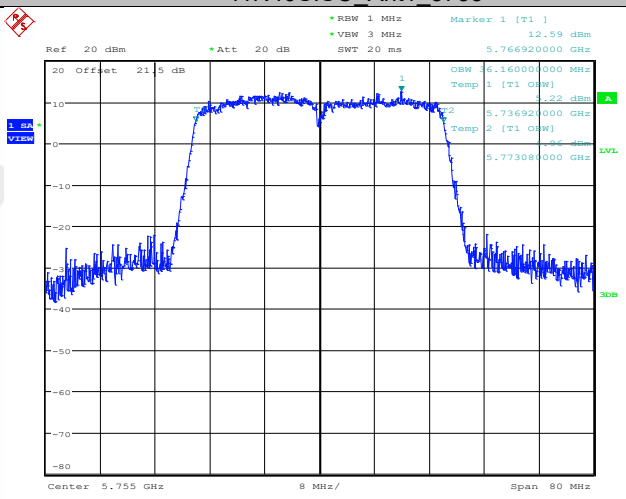
11N40SISO_Ant1_5190



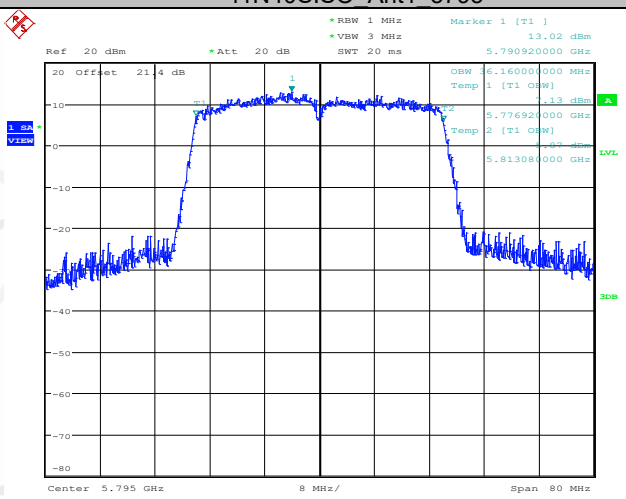
11N40SISO_Ant1_5230



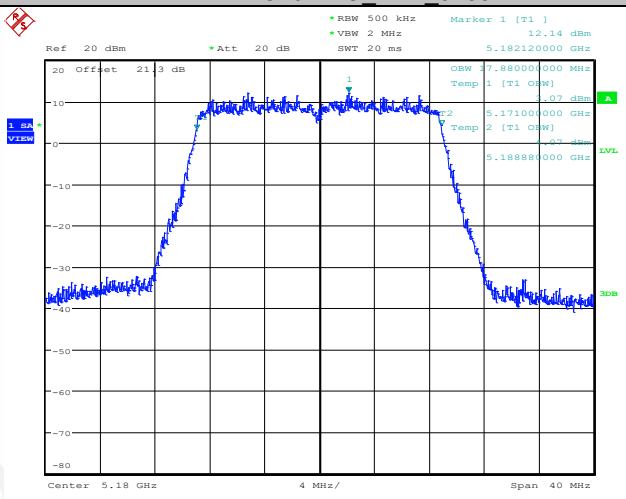
11N40SISO_Ant1_5755



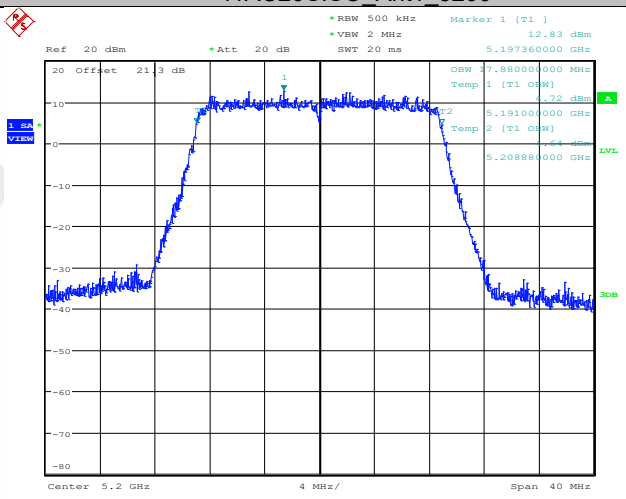
11N40SISO_Ant1_5795



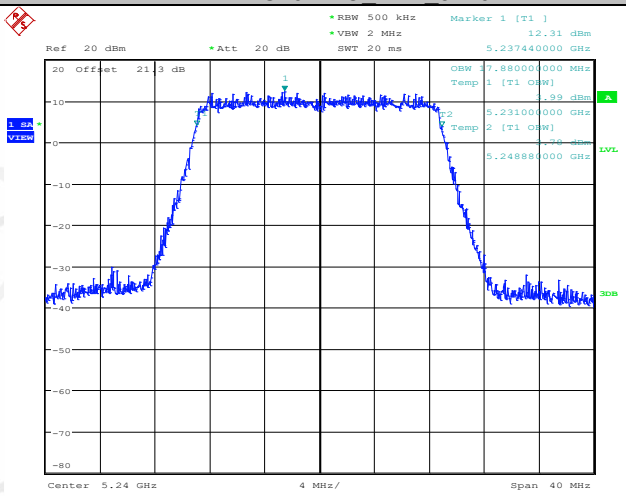
11AC20SISO_Ant1_5180



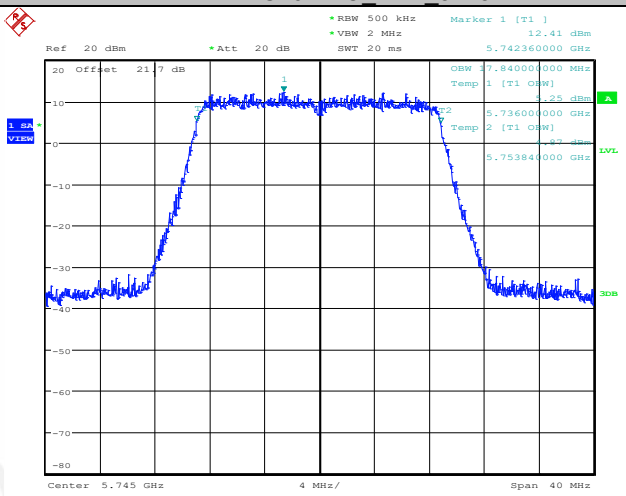
11AC20SISO_Ant1_5200



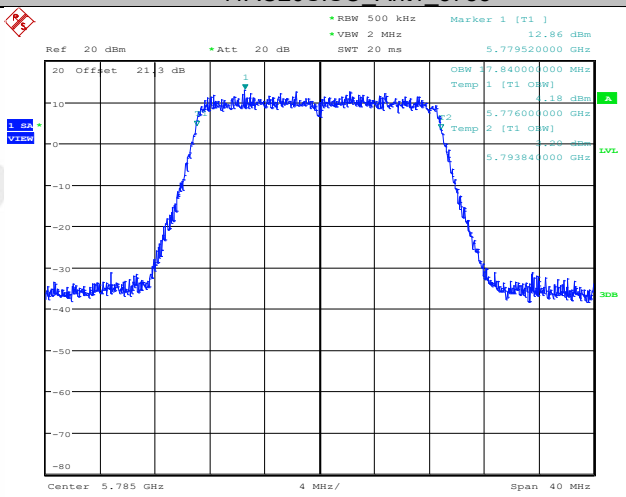
11AC20SISO_Ant1_5240



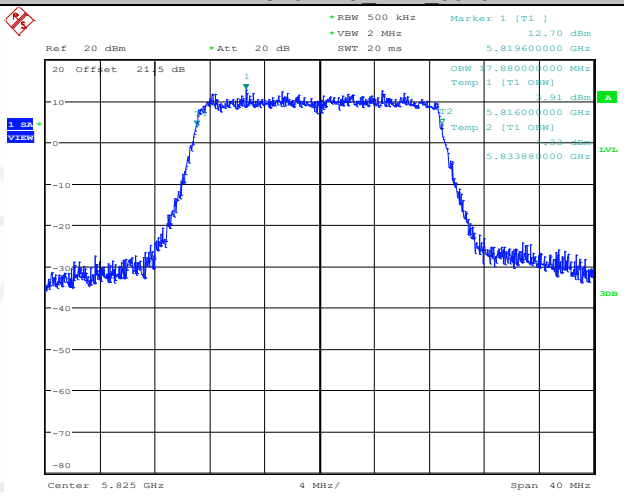
11AC20SISO_Ant1_5745



11AC20SISO_Ant1_5785

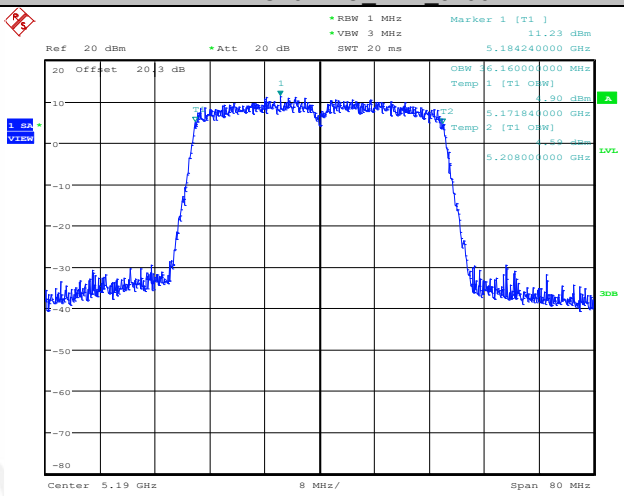


11AC20SISO_Ant1_5825



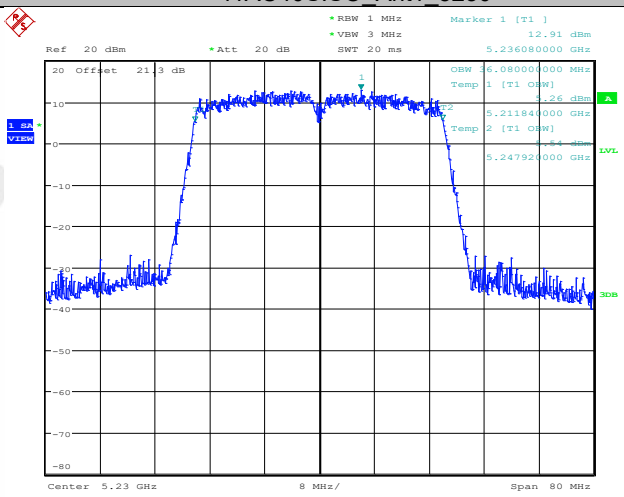
Date: 1.FEB.2024 21:09:03

11AC40SISO_Ant1_5190



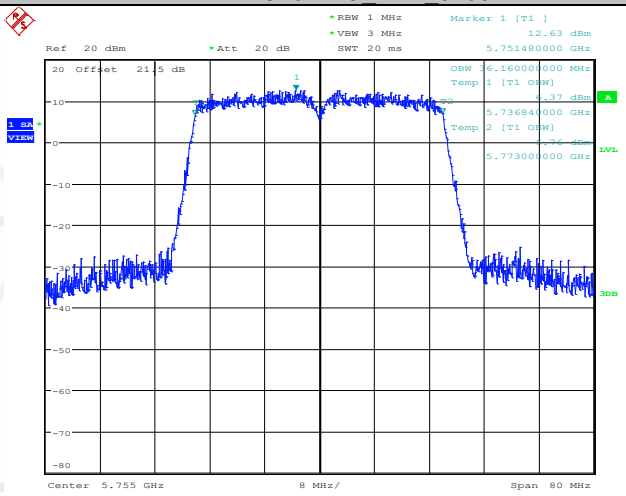
Date: 5.MAR.2024 19:39:25

11AC40SISO_Ant1_5230

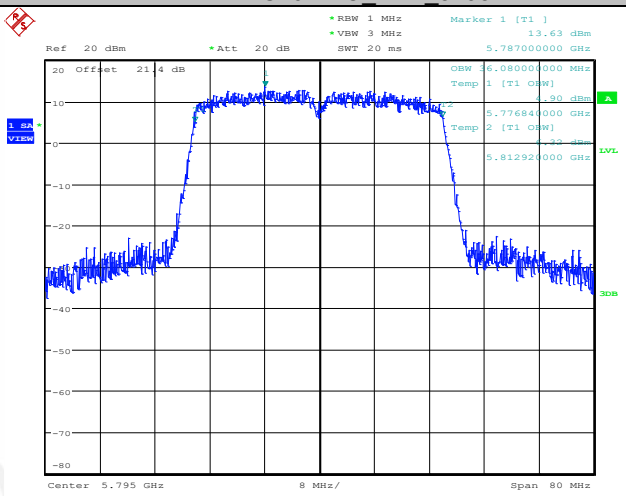


Date: 5.MAR.2024 19:44:06

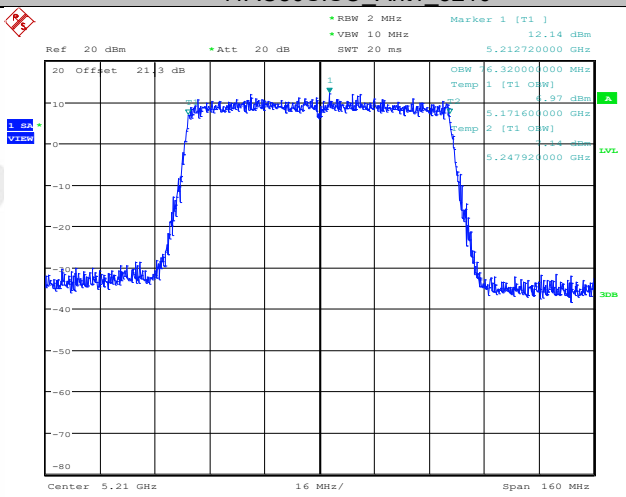
11AC40SISO_Ant1_5755



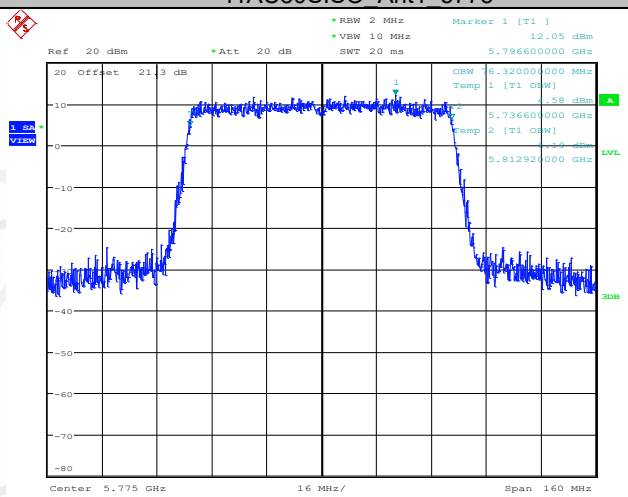
11AC40SISO_Ant1_5795



11AC80SISO_Ant1_5210

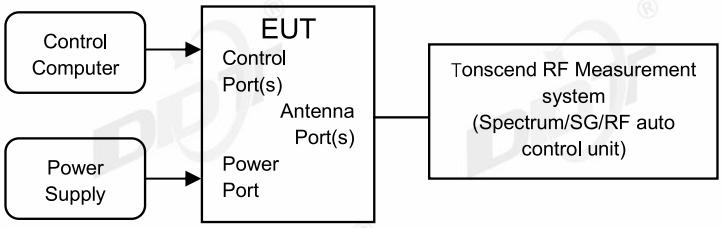


11AC80SISO_Ant1_5775



7. Duty Cycle

7.1. Block diagram of test setup



7.2. Limit

Just for Report.

7.3. Test procedure

(1) Connected the EUT's antenna port to the Spectrum Analyzer by suitable attenuator, The cable loss and attenuator loss have been put into spectrum analyzer as amplitude offset.

set the Spectrum Analyzer as below:

Centre Frequency: The centre frequency of the middle hopping channel.

Resolution BW: 10 MHz.

Video BW: 10 MHz.

Span: Zero span.

Detector: Peak.

Trace Mode: Clear Write.

Sweep: Video Trigger

(2) When the trace is complete, measure the sending time of 1 burst and the duty cycle of 1 burst cycle.

(3) Calculate dwell time follow below formula:

Duty cycle= Pulse's on time / Burst cycle

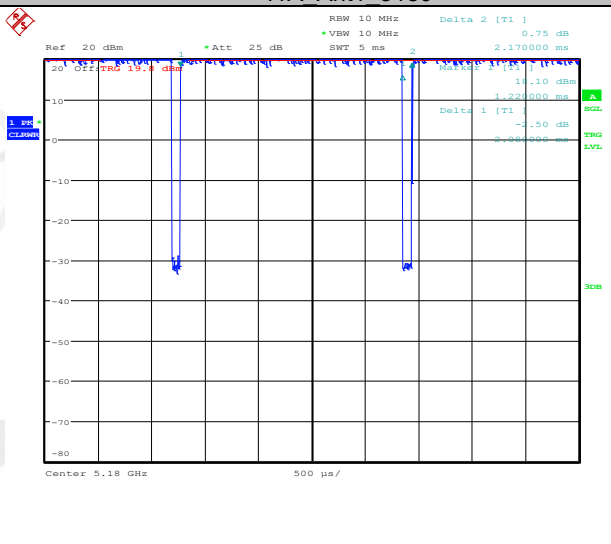
7.4. Test result

Test Engineer:	Zora Zhang	Test Site:	RF Measurement System 1#
Ambient Condition:	23.8℃,59.2%RH	Test Date:	2024.02.01-2024.03.05
Test Power Supply:	DC 12V	EUT:	InVehicle Gateway
Sample Number:	S23122506-03	Model No.:	VG710

Test Mode	Antenna	Frequency [MHz]	Transmission Duration [ms]	Transmission Period [ms]	Duty Cycle [%]
11A	Ant1	5180	2.08	2.17	95.85
		5200	2.07	2.16	95.83
		5240	2.08	2.16	96.30
		5745	2.08	2.17	95.85
		5785	2.08	2.16	96.30
		5825	2.08	2.16	96.30
11N20SISO	Ant1	5180	4.51	4.60	98.04
		5200	4.51	4.59	98.26
		5240	4.50	5.10	88.24
		5745	4.50	4.59	98.04
		5785	4.51	4.60	98.04
		5825	4.50	4.59	98.04
11N40SISO	Ant1	5190	3.29	3.90	84.36
		5230	3.29	3.90	84.36
		5755	2.20	2.28	96.49
		5795	2.20	2.29	96.07
11AC20SISO	Ant1	5180	2.29	2.95	77.63
		5200	2.29	2.95	77.63
		5240	2.30	2.95	77.97
		5745	2.29	2.94	77.89
		5785	2.30	2.95	77.97
		5825	2.29	2.94	77.89
11AC40SISO	Ant1	5190	3.29	3.94	83.50
		5230	3.28	3.94	83.25
		5755	3.28	3.93	83.46
		5795	3.28	3.93	83.46
11AC80SISO	Ant1	5210	3.55	4.20	84.52
		5775	3.54	4.19	84.49

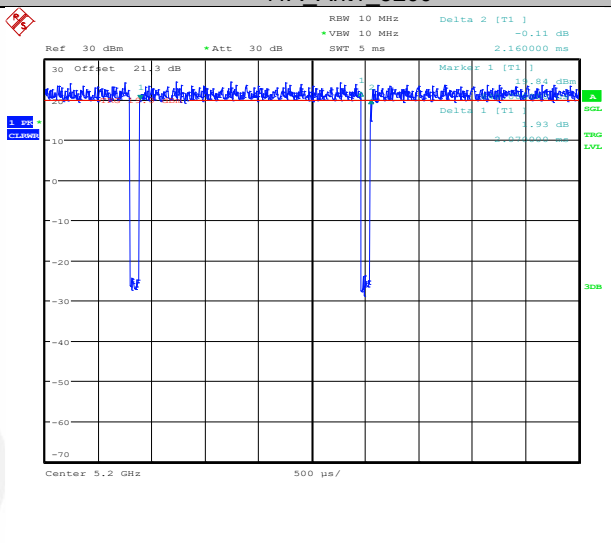
7.5. Test graphs

11A_Ant1_5180



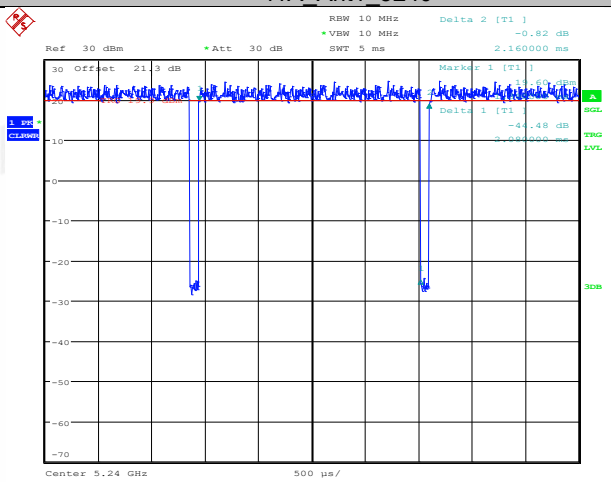
Date: 1.FEB.2024 19:58:33

11A_Ant1_5200



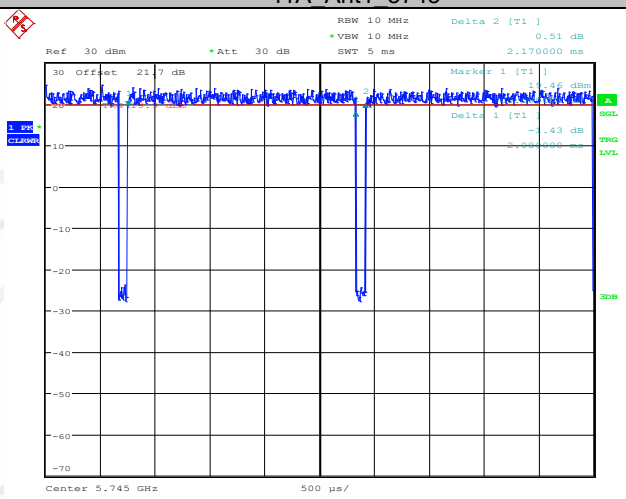
Date: 1.FEB.2024 20:08:21

11A_Ant1_5240



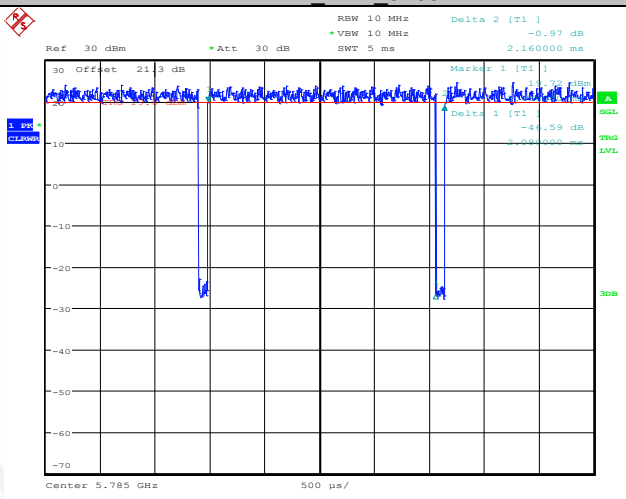
Date: 1.FEB.2024 20:11:54

11A_Ant1_5745



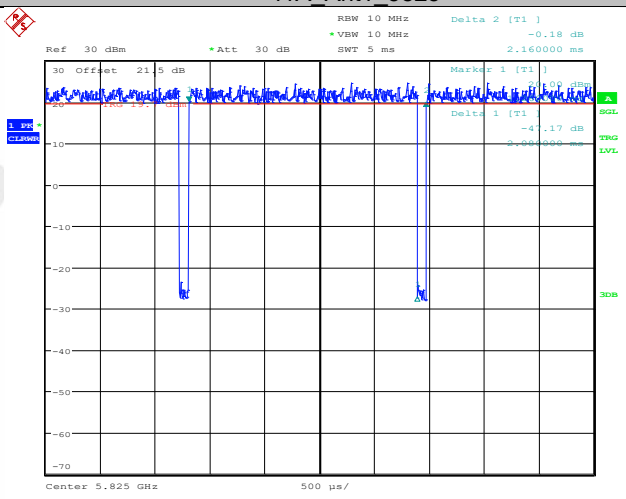
Date: 1.FEB.2024 20:16:03

11A_Ant1_5785



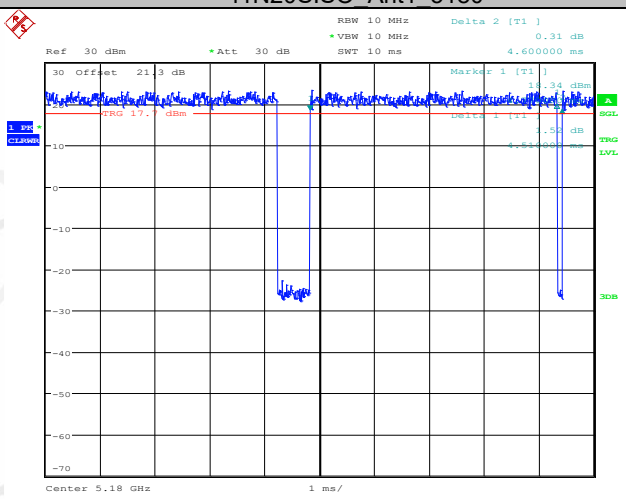
Date: 1.FEB.2024 20:19:46

11A_Ant1_5825

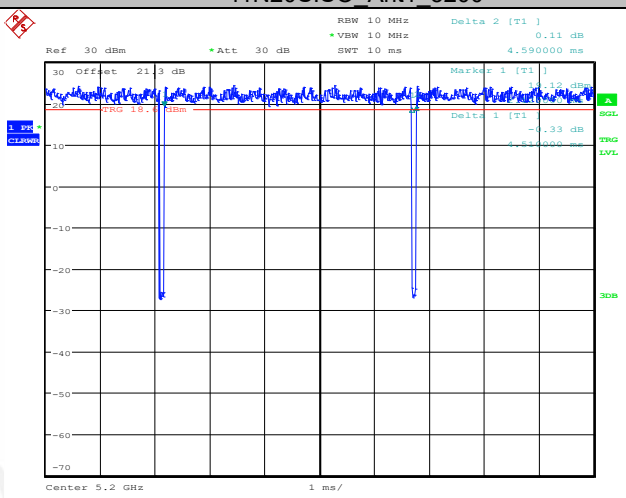


Date: 1.FEB.2024 20:23:30

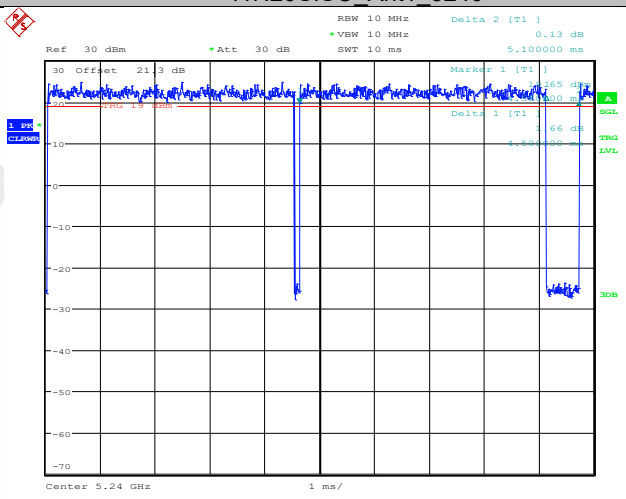
11N20SISO_Ant1_5180



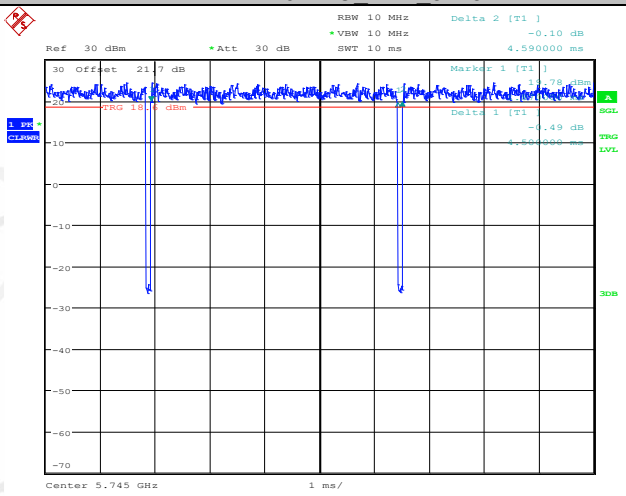
11N20SISO_Ant1_5200



11N20SISO_Ant1_5240

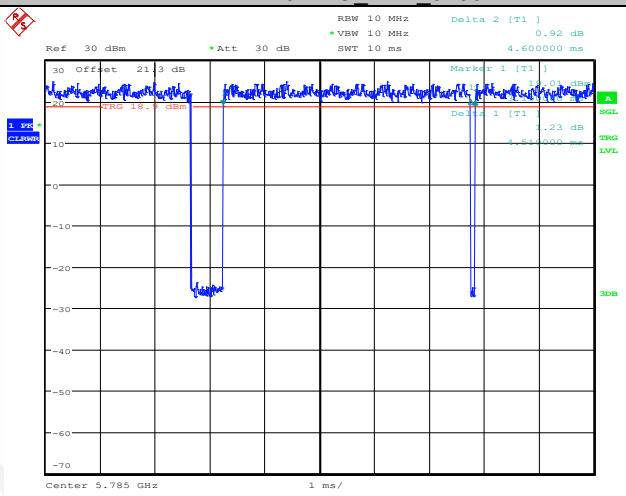


11N20SISO_Ant1_5745



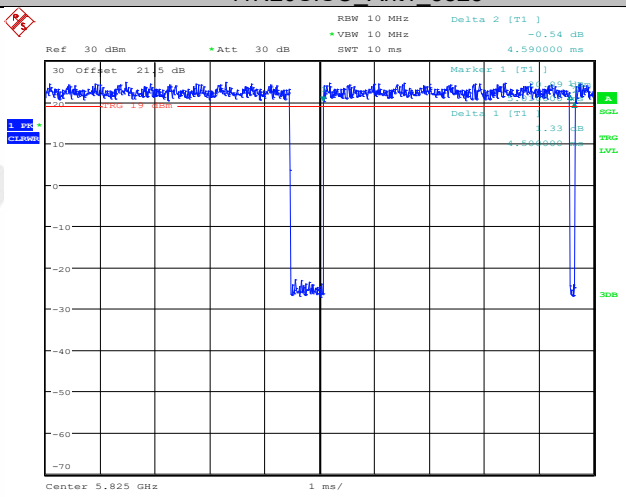
Date: 1.FEB.2024 20:32:57

11N20SISO_Ant1_5785



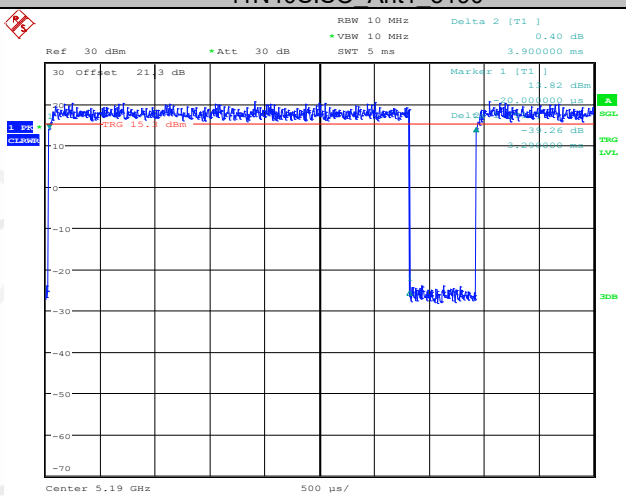
Date: 1.FEB.2024 20:35:01

11N20SISO_Ant1_5825

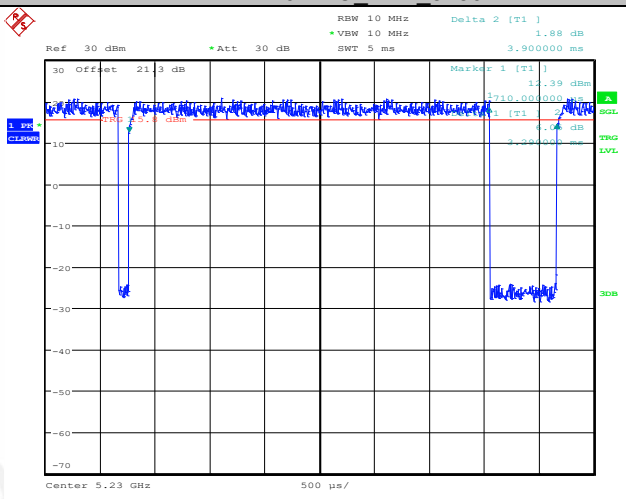


Date: 1.FEB.2024 20:37:02

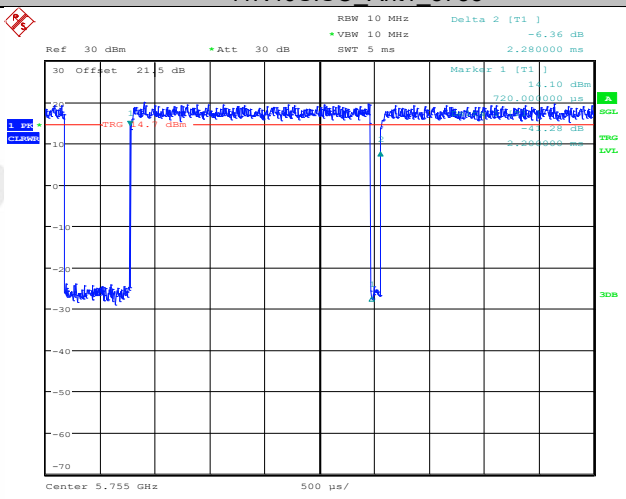
11N40SISO_Ant1_5190



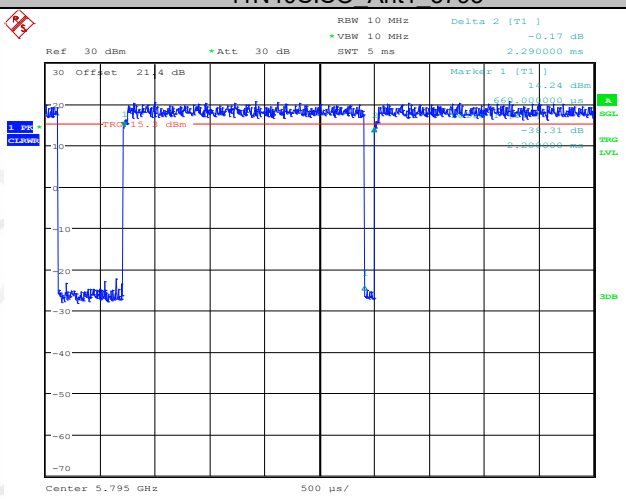
11N40SISO_Ant1_5230



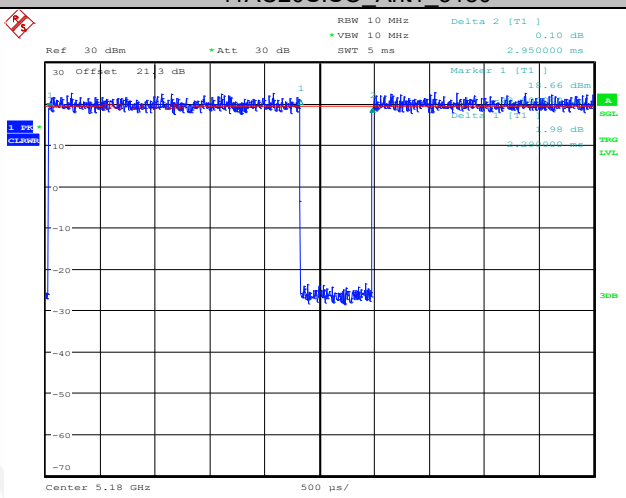
11N40SISO_Ant1_5755



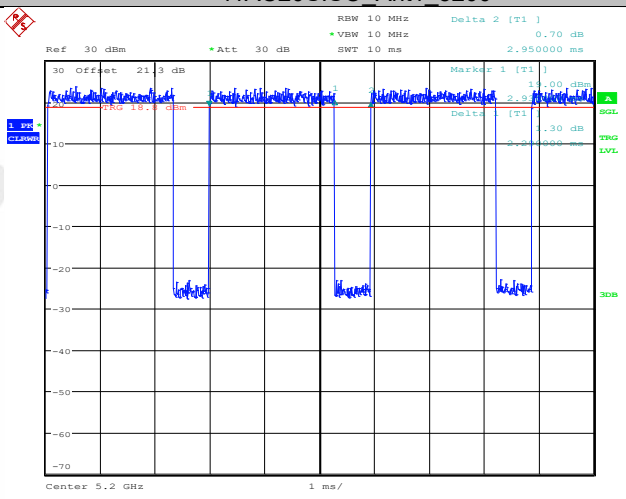
11N40SISO_Ant1_5795



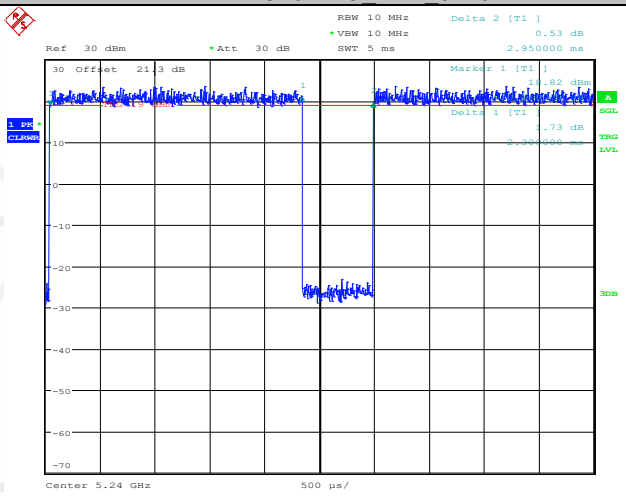
11AC20SISO_Ant1_5180



11AC20SISO_Ant1_5200

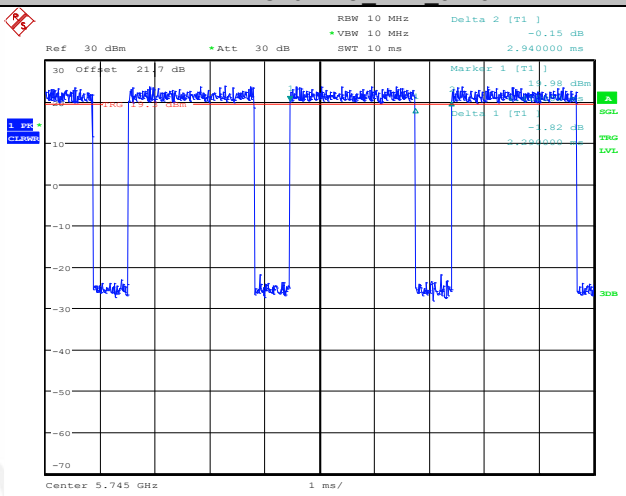


11AC20SISO_Ant1_5240



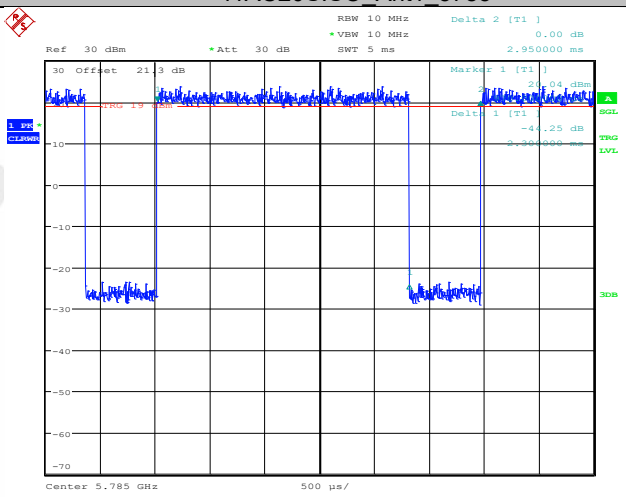
Date: 1.FEB.2024 20:56:15

11AC20SISO_Ant1_5745



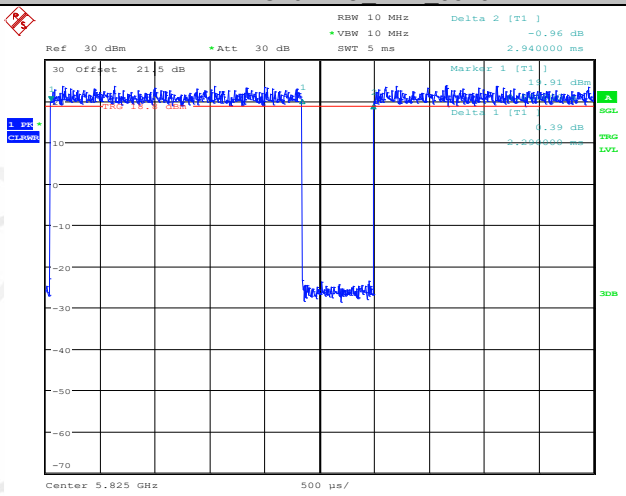
Date: 1.FEB.2024 20:58:23

11AC20SISO_Ant1_5785



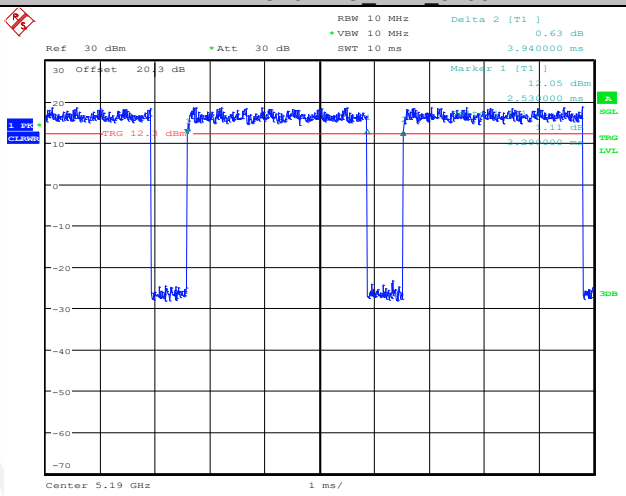
Date: 1.FEB.2024 21:05:33

11AC20SISO_Ant1_5825



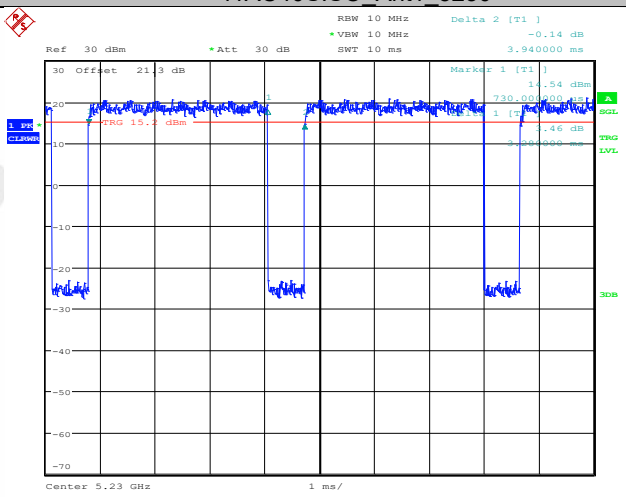
Date: 1.FEB.2024 21:09:17

11AC40SISO_Ant1_5190



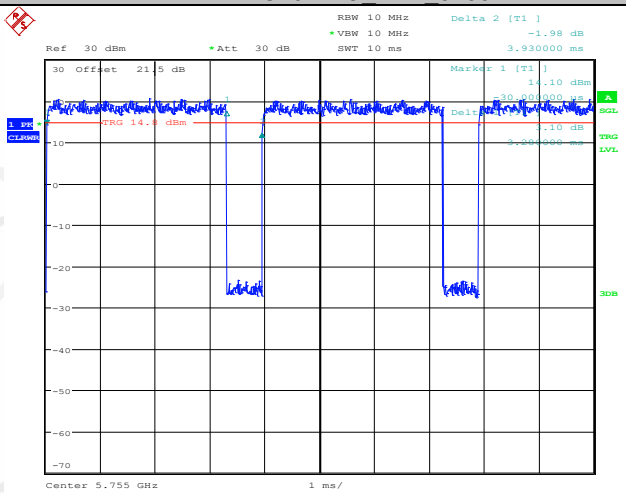
Date: 5.MAR.2024 19:39:41

11AC40SISO_Ant1_5230

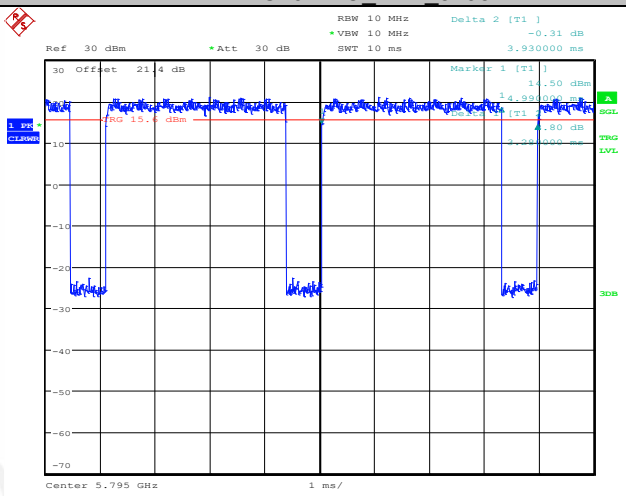


Date: 5.MAR.2024 19:44:23

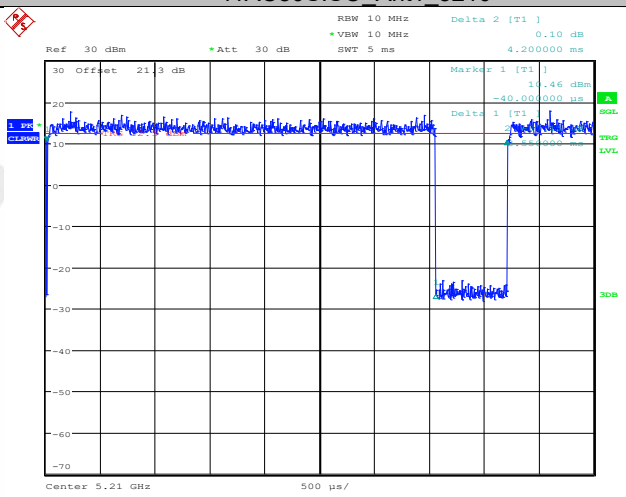
11AC40SISO_Ant1_5755



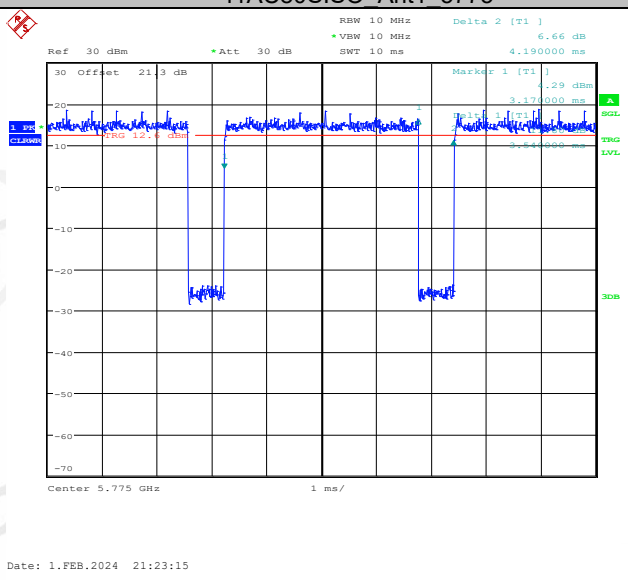
11AC40SISO_Ant1_5795



11AC80SISO_Ant1_5210



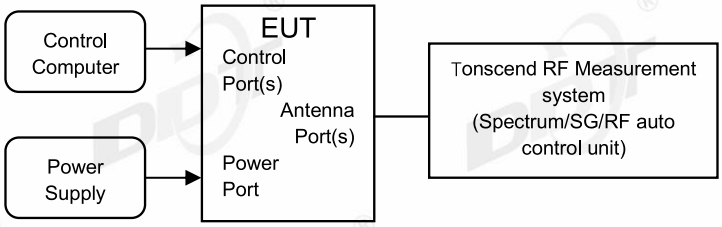
11AC80SISO_Ant1_5775



Date: 1.FEB.2024 21:23:15

8. Maximum Output Power

8.1. Block diagram of test setup



8.2. Limits

FCC Part15, Subpart E/ RSS-247		
Test Item	Limit	Frequency Range (MHz)
Maximum Output Power	outdoor access point: 1 W (30 dBm) indoor access point: 1 W (30 dBm) fixed point-to-point access points1 W (30 dBm) client devices: 250 mW (24 dBm)	5150-5250
	250 mW (24 dBm) or 11 + 10 $\log_{10}$ B	5250-5350
	250 mW (24 dBm) or 11 + 10 $\log_{10}$ B	5470-5725
	1 Watt (30 dBm)	5725-5850
Note: B=26 bandwidth		

8.3. Test procedure

Connect each EUT's antenna output to power sensor by RF cable and attenuator

Measure the output power of each antenna port by power sensor.

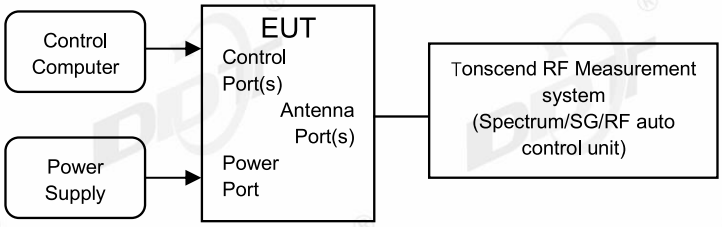
8.4. Test result channel power

Test Engineer:	Zora Zhang	Test Site:	RF Measurement System 1#
Ambient Condition:	23.8℃, 59.2%RH	Test Date:	2024.02.01-2024.03.05
Test Power Supply:	DC 12V	EUT:	InVehicle Gateway
Sample Number:	S23122506-03	Model No.:	VG710

Test Mode	Antenna	Frequency [MHz]	Duty Cycle [%]	DC Factor [dB]	Result [dBm]	Limit [dBm]	EIRP [dBm]	EIRP Limit [dBm]	Verdict
11A	Ant1	5180	95.85	0.18	18.74	≤23.98	16.26	---	PASS
		5200	95.83	0.18	19.05	≤23.98	16.57	---	PASS
		5240	96.30	0.16	19.59	≤23.98	17.11	---	PASS
		5745	95.85	0.18	19.20	≤30.00	16.31	---	PASS
		5785	96.30	0.16	19.17	≤30.00	16.28	---	PASS
		5825	96.30	0.16	19.39	≤30.00	16.50	---	PASS
11N20 SISO	Ant1	5180	98.04	0.09	18.61	≤23.98	16.13	---	PASS
		5200	98.26	0.08	18.91	≤23.98	16.43	---	PASS
		5240	88.24	0.54	19.97	≤23.98	17.49	---	PASS
		5745	98.04	0.09	18.89	≤30.00	16.00	---	PASS
		5785	98.04	0.09	19.01	≤30.00	16.12	---	PASS
		5825	98.04	0.09	19.30	≤30.00	16.41	---	PASS
11N40 SISO	Ant1	5190	84.36	0.74	19.16	≤23.98	16.68	---	PASS
		5230	84.36	0.74	19.78	≤23.98	17.30	---	PASS
		5755	96.49	0.16	18.85	≤30.00	15.96	---	PASS
		5795	96.07	0.17	18.89	≤30.00	16.00	---	PASS
11AC20 SISO	Ant1	5180	77.63	1.10	18.44	≤23.98	15.96	---	PASS
		5200	77.63	1.10	18.83	≤23.98	16.35	---	PASS
		5240	77.97	1.08	19.34	≤23.98	16.86	---	PASS
		5745	77.89	1.09	18.81	≤30.00	15.92	---	PASS
		5785	77.97	1.08	18.88	≤30.00	15.99	---	PASS
		5825	77.89	1.09	19.16	≤30.00	16.27	---	PASS
11AC40 SISO	Ant1	5190	83.50	0.78	18.31	≤23.98	15.83	---	PASS
		5230	83.25	0.80	19.05	≤23.98	16.57	---	PASS
		5755	83.46	0.79	18.91	≤30.00	16.02	---	PASS
		5795	83.46	0.79	18.96	≤30.00	16.07	---	PASS
11AC80 SISO	Ant1	5210	84.52	0.73	18.25	≤23.98	15.77	---	PASS
		5775	84.49	0.73	18.45	≤30.00	15.56	---	PASS

9. Power Spectral Density

9.1. Block diagram of test setup



9.2. Limits

FCC Part15, Subpart E		
Test Item	Limit	Frequency Range (MHz)
Power Spectral Density	Other than Mobile and portable:17 dBm/MHz Mobile and portable client devices:11 dBm/MHz	5150-5250
	11 dBm/MHz	5250-5350
	11 dBm/MHz	5470-5725
	30 dBm/500 kHz	5725-5850

9.3. Test procedure

The transmitter output was connected to a spectrum analyzer. Power density was measured by spectrum analyzer with 1MHz RBW and 3MHz VBW.

Connect the UUT to the spectrum analyser and use the following settings:

5150 MHz~5250 MHz, 5250 MHz~5350 MHz, 5470 MHz~5725 MHz

Center Frequency	The centre frequency of the channel under test
Detector	RMS
RBW	1MHz
VBW	≥3 × RBW
Span	Encompass the entire emissions bandwidth (EBW) of the signal
Trace	Max hold
Sweep time	Auto

5725 MHz-5850 MHz

Center Frequency	The centre frequency of the channel under test
Detector	RMS
RBW	500 kHz
VBW	≥3 × RBW
Span	Encompass the entire emissions bandwidth (EBW) of the signal
Trace	Max hold
Sweep time	Auto

9.4. Test result

Test Engineer:	Zora Zhang	Test Site:	RF Measurement System 1#
Ambient Condition:	23.8℃, 59.2%RH	Test Date:	2024.02.01-2024.03.05
Test Power Supply:	DC 12V	EUT:	InVehicle Gateway
Sample Number:	S23122506-03	Model No.:	VG710

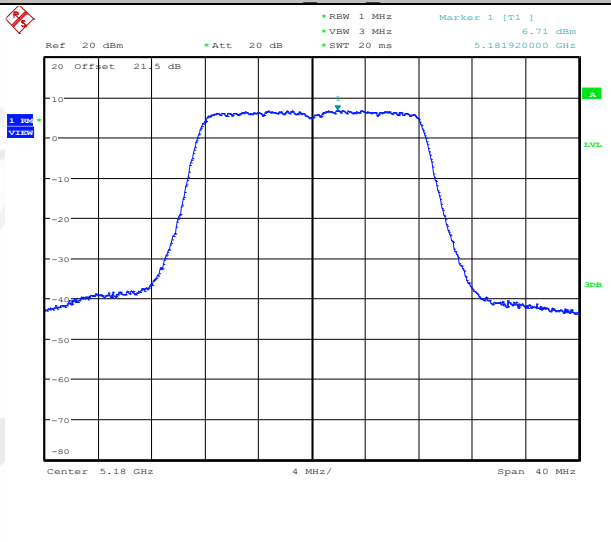
Test Mode	Antenna	Frequency [MHz]	Result [dBm/MHz]	Limit [dBm/MHz]	Verdict
11A	Ant1	5180	6.71	≤11.00	PASS
		5200	7.52	≤11.00	PASS
		5240	7.75	≤11.00	PASS
		5745	4.86	≤30.00	PASS
		5785	5.00	≤30.00	PASS
		5825	4.96	≤30.00	PASS
11N20SISO	Ant1	5180	6.08	≤11.00	PASS
		5200	7.16	≤11.00	PASS
		5240	7.84	≤11.00	PASS
		5745	4.59	≤30.00	PASS
		5785	4.80	≤30.00	PASS
		5825	4.71	≤30.00	PASS
11N40SISO	Ant1	5190	4.79	≤11.00	PASS
		5230	5.18	≤11.00	PASS
		5755	2.03	≤30.00	PASS
		5795	2.29	≤30.00	PASS
11AC20SISO	Ant1	5180	6.15	≤11.00	PASS
		5200	7.52	≤11.00	PASS
		5240	7.63	≤11.00	PASS
		5745	4.36	≤30.00	PASS
		5785	4.49	≤30.00	PASS
		5825	4.53	≤30.00	PASS
11AC40SISO	Ant1	5190	4.10	≤11.00	PASS
		5230	5.09	≤11.00	PASS
		5755	1.67	≤30.00	PASS
		5795	2.10	≤30.00	PASS
11AC80SISO	Ant1	5210	0.76	≤11.00	PASS
		5775	-1.59	≤30.00	PASS

Note：1.The Result and Limit Unit is dBm/500 kHz in the band 5.725–5.85 GHz.

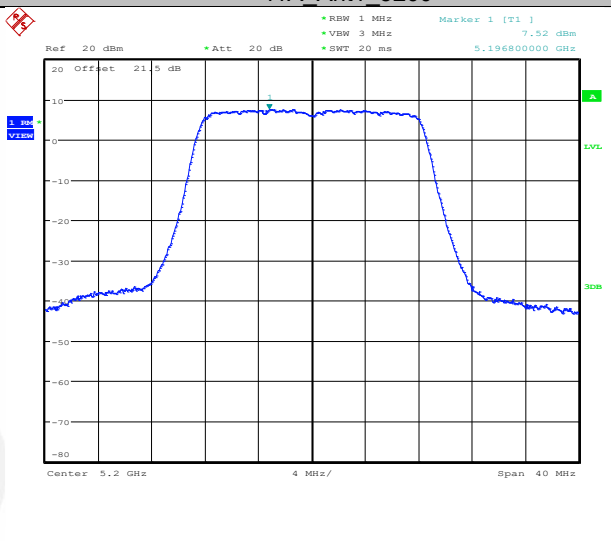
2.The Duty Cycle Factor is compensated in the graph.

9.5. Test graphs

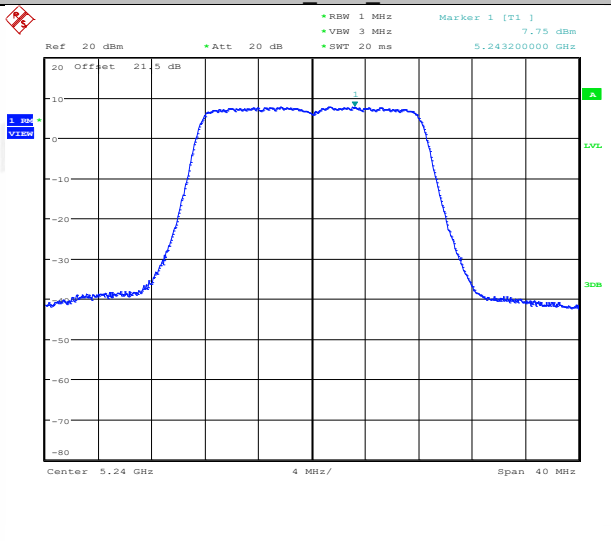
11A_Ant1_5180



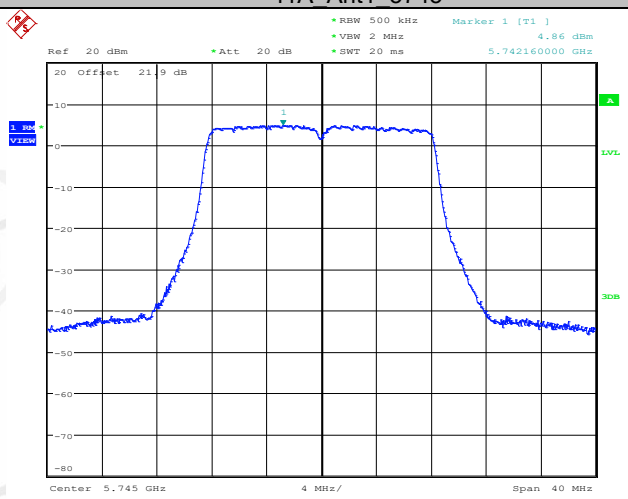
11A_Ant1_5200



11A_Ant1_5240

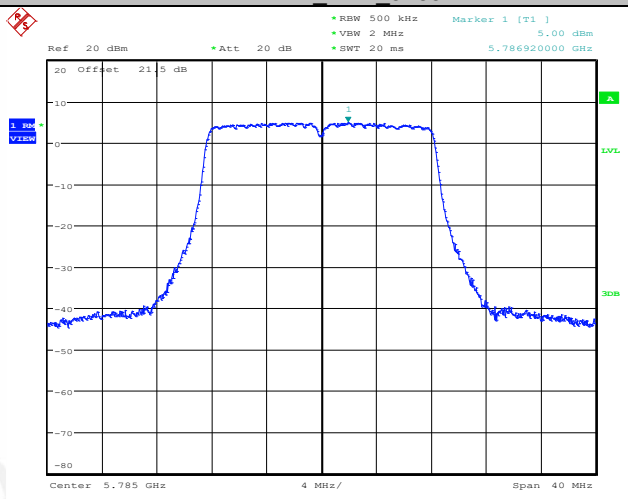


11A_Ant1_5745



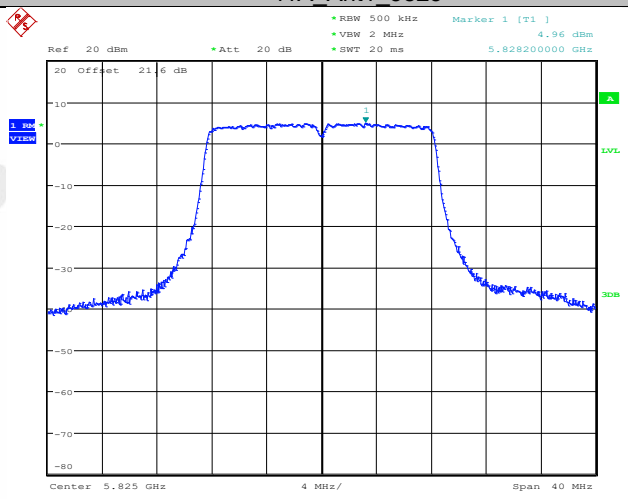
Date: 1.FEB.2024 20:16:41

11A_Ant1_5785



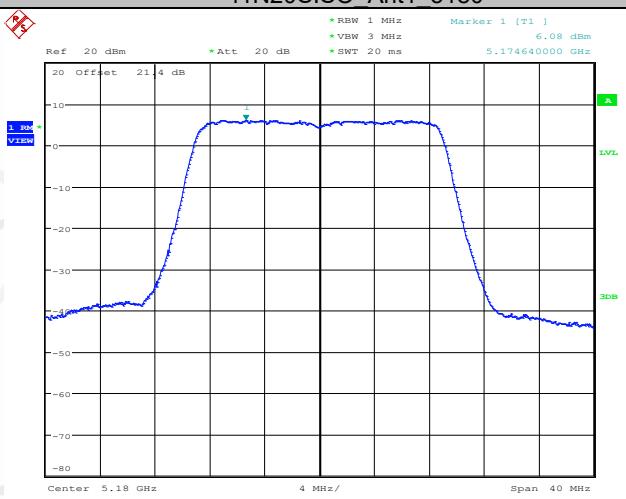
Date: 1.FEB.2024 20:20:24

11A_Ant1_5825



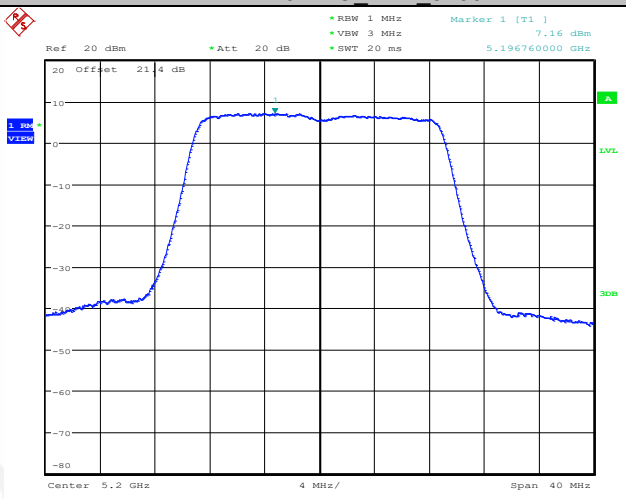
Date: 1.FEB.2024 20:24:08

11N20SISO_Ant1_5180



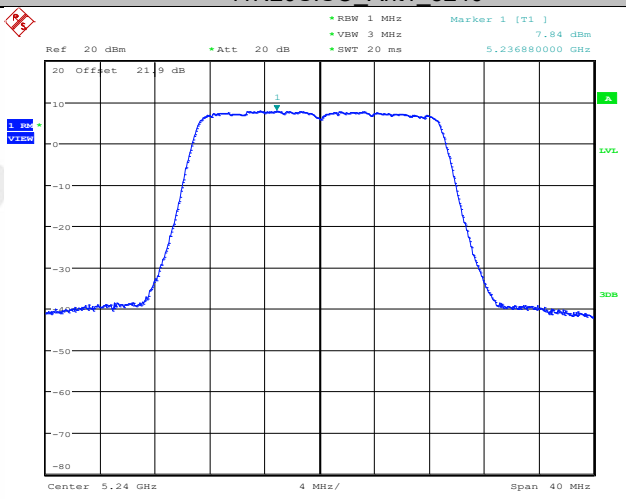
Date: 1.FEB.2024 20:27:47

11N20SISO_Ant1_5200



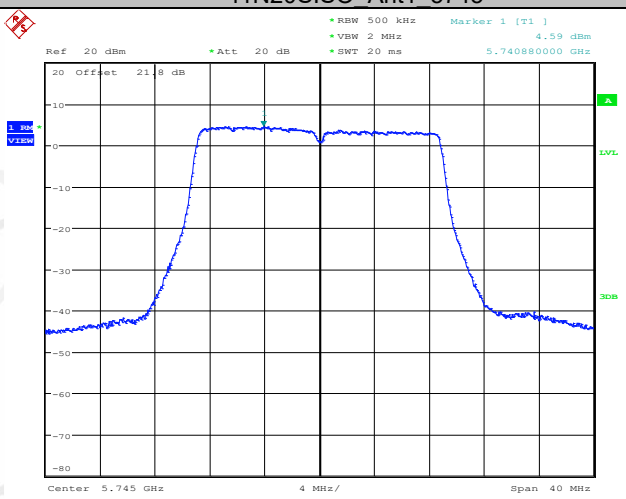
Date: 1.FEB.2024 20:29:26

11N20SISO_Ant1_5240



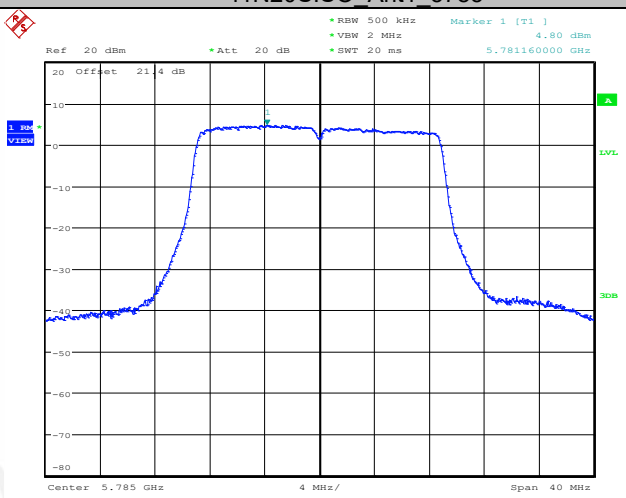
Date: 1.FEB.2024 20:31:11

11N20SISO_Ant1_5745



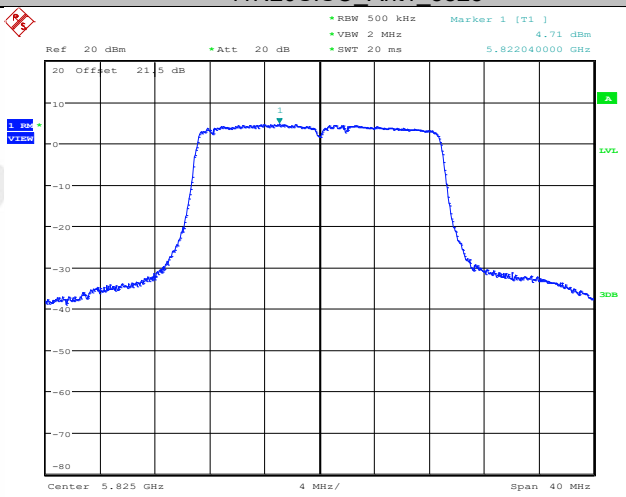
Date: 1.FEB.2024 20:33:35

11N20SISO_Ant1_5785



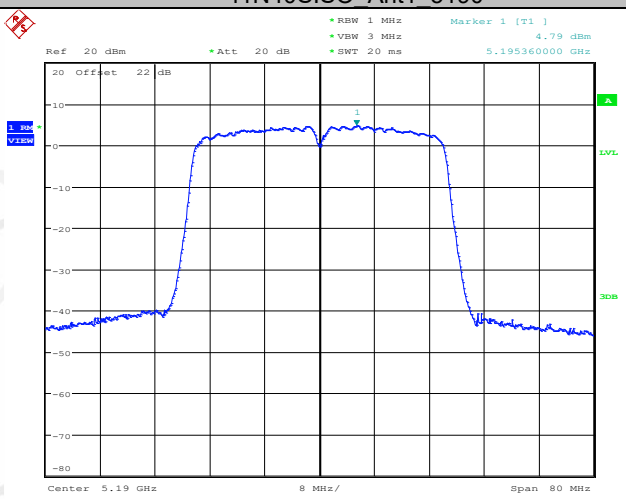
Date: 1.FEB.2024 20:35:39

11N20SISO_Ant1_5825

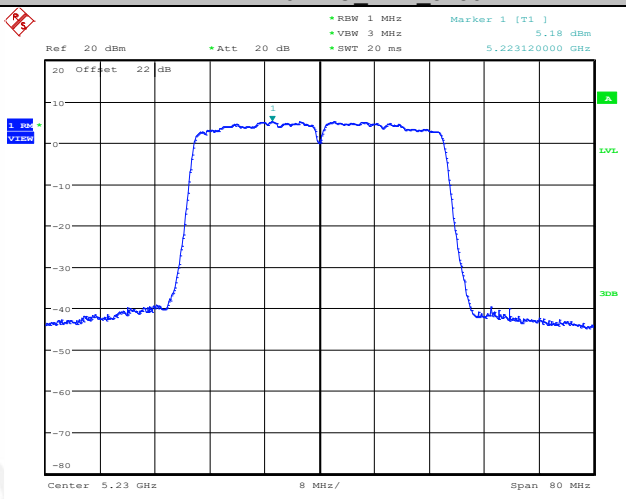


Date: 1.FEB.2024 20:37:40

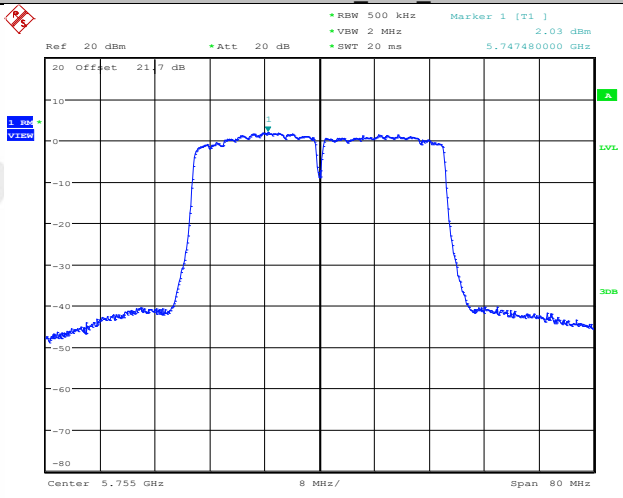
11N40SISO_Ant1_5190



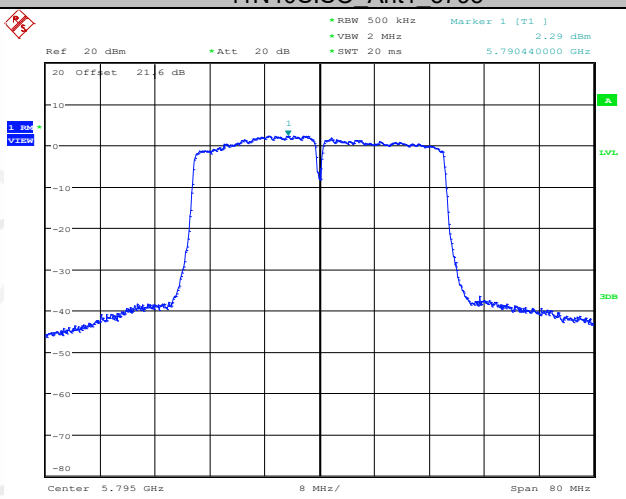
11N40SISO_Ant1_5230



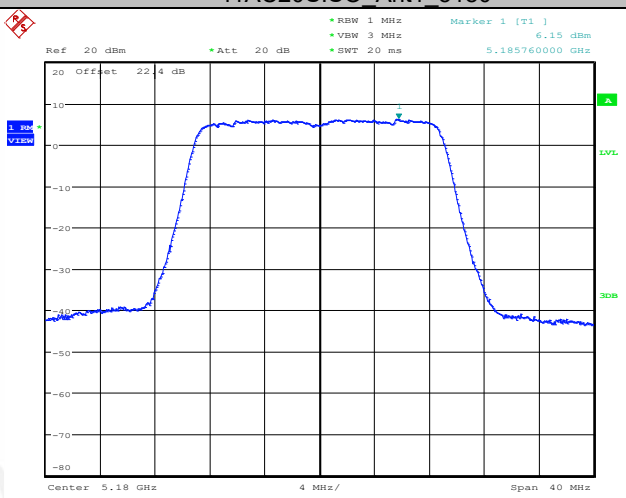
11N40SISO_Ant1_5755



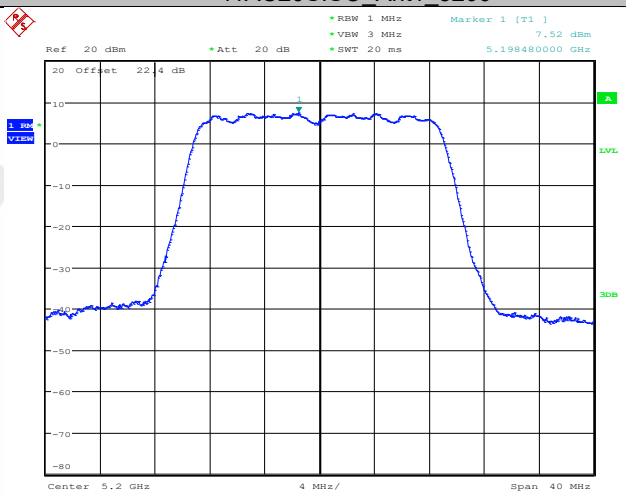
11N40SISO_Ant1_5795



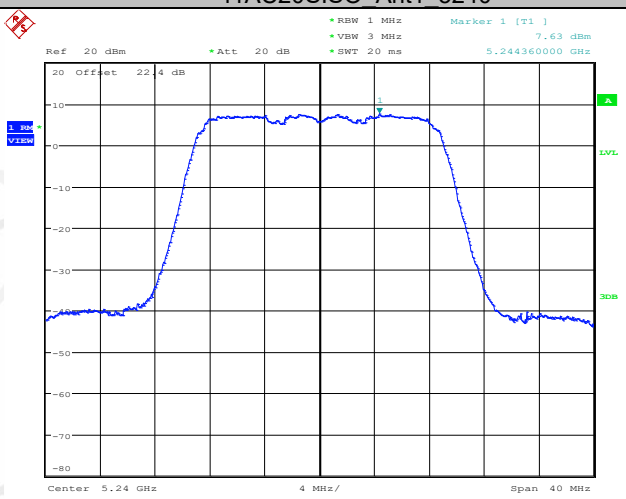
11AC20SISO_Ant1_5180



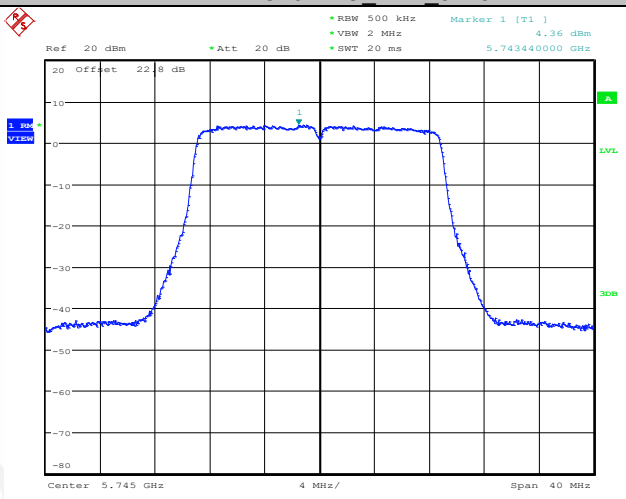
11AC20SISO_Ant1_5200



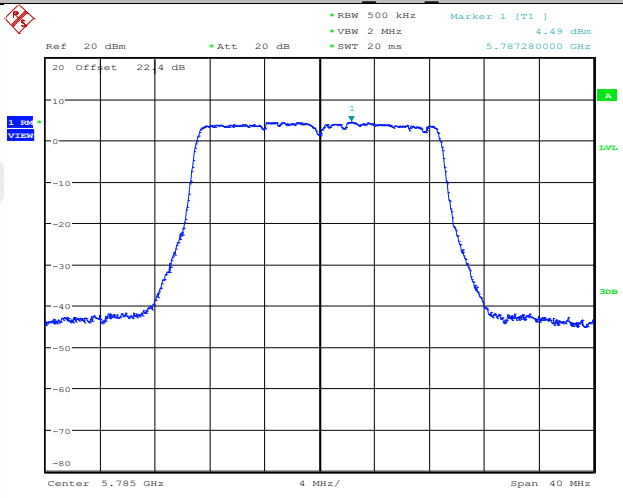
11AC20SISO_Ant1_5240



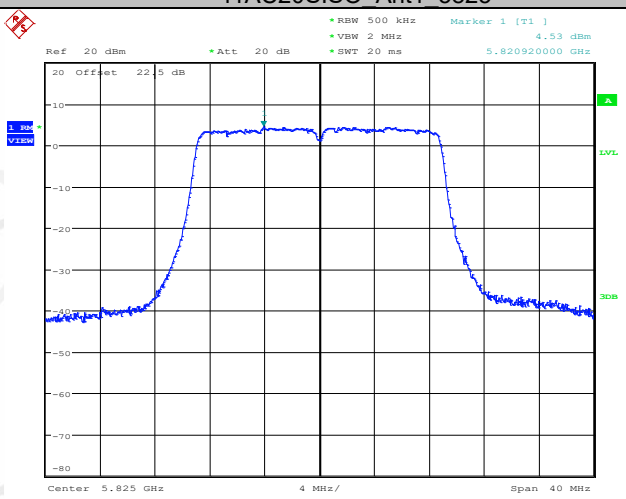
11AC20SISO_Ant1_5745



11AC20SISO_Ant1_5785

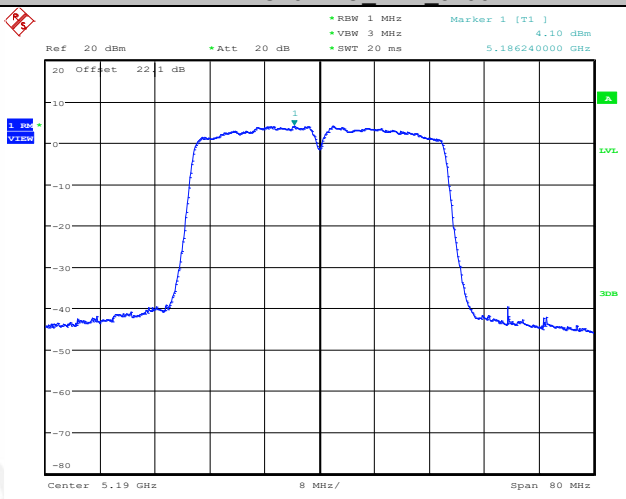


11AC20SISO_Ant1_5825



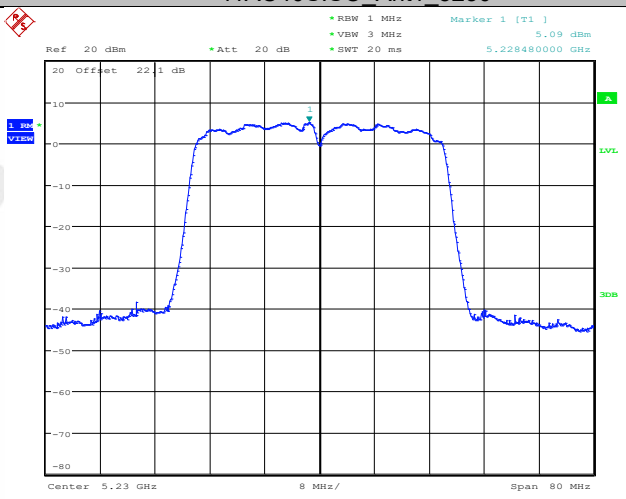
Date: 1.FEB.2024 21:09:54

11AC40SISO_Ant1_5190



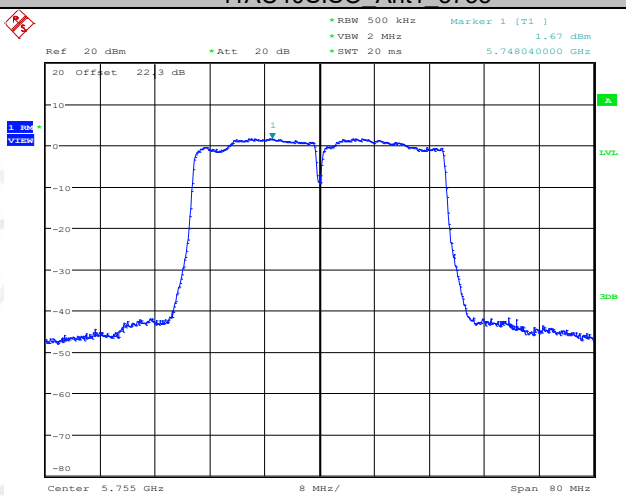
Date: 5.MAR.2024 19:43:04

11AC40SISO_Ant1_5230

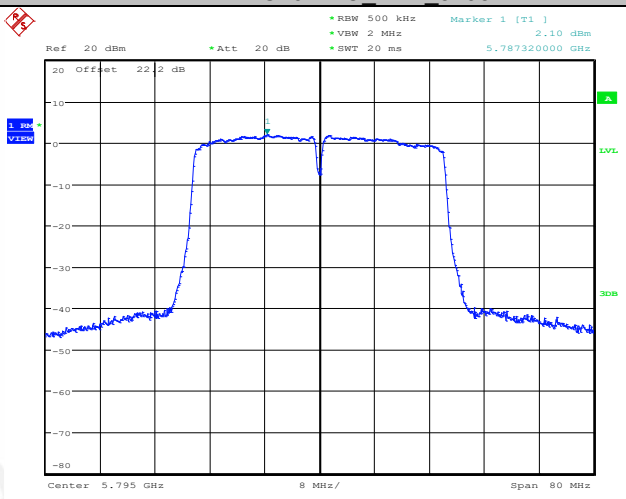


Date: 5.MAR.2024 19:45:00

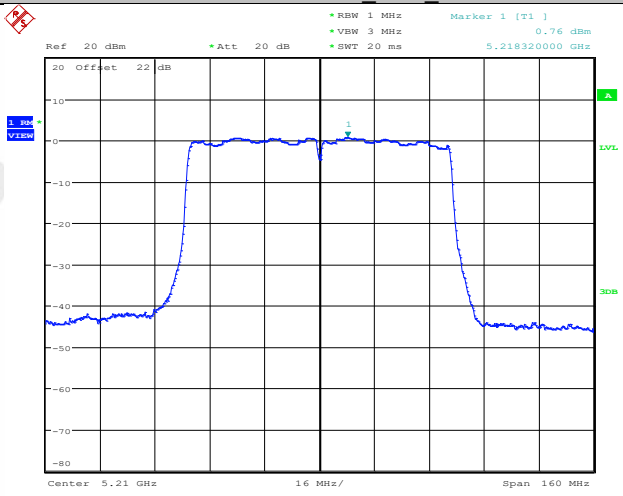
11AC40SISO_Ant1_5755



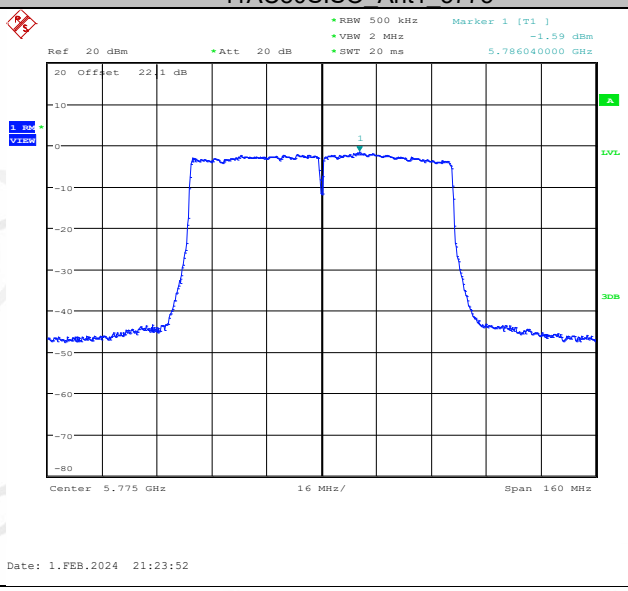
11AC40SISO_Ant1_5795



11AC80SISO_Ant1_5210



11AC80SISO_Ant1_5775



10. Frequency Stability Measurement

10.1. Limit of Frequency Stability

Manufacturers of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the user's manual.

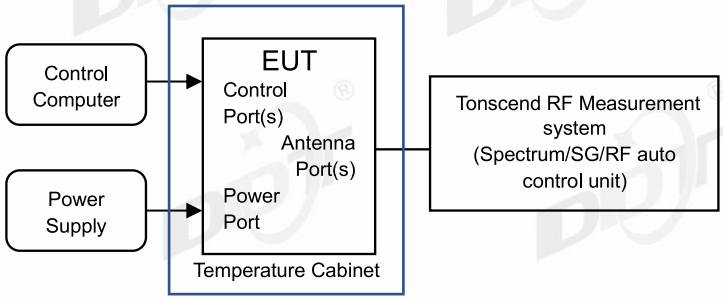
10.2. Measuring Instruments

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

10.3. Test procedures

(1) To ensure emission at the band edge is maintained within the authorized band, those values shall be measured by radiation emissions at upper and lower frequency points, and finally compensated by frequency deviation as procedures below.
(2) The EUT was operated at the maximum output power, and connected to the spectrum analyzer, which is set to maximum hold function and peak detector. The peak value of the power envelope was measured and noted. The upper and lower frequency points were respectively measured relatively 10 dB lower than the measured peak value.
(3) The frequency deviation was calculated by adding the upper frequency point and the lower frequency point divided by two. Those detailed values of frequency deviation are provided in table below.

10.4. Test setup



10.5. Test result

Test Engineer:	Zora Zhang	Test Site:	RF Measurement System 1#
Ambient Condition:	23.8℃,59.2%RH	Test Date:	2024.02.01-2024.03.05
Test Power Supply:	DC 12V	EUT:	InVehicle Gateway
Sample Number:	S23122506-03	Model No.:	VG710

Voltage								
Test Mode	Antenna	Frequency [MHz]	Voltage [Vdc]	Temperature (℃)	Deviation (Hz)	Deviation (ppm)	Limit (ppm)	Verdict
11A	Ant1	5180	NV	NT	-40000.00	-7.722008	20	PASS
			LV	NT	-60000.00	-11.583012	20	PASS
			HV	NT	-60000.00	-11.583012	20	PASS
		5200	NV	NT	-80000.00	-15.384615	20	PASS
			LV	NT	-60000.00	-11.538462	20	PASS
			HV	NT	-80000.00	-15.384615	20	PASS
		5240	NV	NT	-60000.00	-11.450382	20	PASS
			LV	NT	-60000.00	-11.450382	20	PASS
			HV	NT	-60000.00	-11.450382	20	PASS
		5745	NV	NT	-80000.00	-13.925152	20	PASS
			LV	NT	-60000.00	-10.443864	20	PASS
			HV	NT	-60000.00	-10.443864	20	PASS
		5785	NV	NT	-60000.00	-10.371651	20	PASS
			LV	NT	-80000.00	-13.828868	20	PASS
			HV	NT	-80000.00	-13.828868	20	PASS
		5825	NV	NT	-60000.00	-10.300429	20	PASS
			LV	NT	-60000.00	-10.300429	20	PASS
			HV	NT	-60000.00	-10.300429	20	PASS
11N40 SISO	Ant1	5190	NV	NT	-40000.00	-7.707129	20	PASS
			LV	NT	-40000.00	-7.707129	20	PASS
			HV	NT	-40000.00	-7.707129	20	PASS
		5230	NV	NT	-40000.00	-7.648184	20	PASS
			LV	NT	-40000.00	-7.648184	20	PASS
			HV	NT	-40000.00	-7.648184	20	PASS
		5755	NV	NT	0.00	0.000000	20	PASS
			LV	NT	-40000.00	-6.950478	20	PASS
			HV	NT	-40000.00	-6.950478	20	PASS
		5795	NV	NT	-40000.00	-6.902502	20	PASS
			LV	NT	-40000.00	-6.902502	20	PASS
			HV	NT	-40000.00	-6.902502	20	PASS
11AC20	Ant1	5785	NV	NT	-60000.00	-10.371651	20	PASS

SISO			LV	NT	-60000.00	-10.371651	20	PASS
			HV	NT	-80000.00	-13.828868	20	PASS
11AC80 SISO	Ant1	5210	NV	NT	-80000.00	-15.355086	20	PASS
			LV	NT	-80000.00	-15.355086	20	PASS
			HV	NT	-80000.00	-15.355086	20	PASS
		5775	NV	NT	-80000.00	-13.852814	20	PASS
			LV	NT	-80000.00	-13.852814	20	PASS
			HV	NT	-80000.00	-13.852814	20	PASS

Temperature								
Test Mode	Antenna	Frequency [MHz]	Voltage [Vdc]	Temperature (℃)	Deviation (Hz)	Deviation (ppm)	Limit (ppm)	Verdict
11A	Ant1	5180	NV	-30	-60000.00	-11.583012	20	PASS
			NV	-20	-40000.00	-7.722008	20	PASS
			NV	-10	-60000.00	-11.583012	20	PASS
			NV	0	-60000.00	-11.583012	20	PASS
			NV	10	-80000.00	-15.444015	20	PASS
			NV	20	-60000.00	-11.583012	20	PASS
			NV	30	-60000.00	-11.583012	20	PASS
			NV	40	-40000.00	-7.722008	20	PASS
			NV	50	-80000.00	-15.444015	20	PASS
			NV	60	-60000.00	-11.583012	20	PASS
			NV	70	-60000.00	-11.583012	20	PASS
		5200	NV	-30	-60000.00	-11.538462	20	PASS
			NV	-20	-60000.00	-11.538462	20	PASS
			NV	-10	-60000.00	-11.538462	20	PASS
			NV	0	-60000.00	-11.538462	20	PASS
			NV	10	-60000.00	-11.538462	20	PASS
			NV	20	-60000.00	-11.538462	20	PASS
			NV	30	-60000.00	-11.538462	20	PASS
			NV	40	-60000.00	-11.538462	20	PASS
			NV	50	-80000.00	-15.384615	20	PASS
			NV	60	-80000.00	-15.384615	20	PASS
			NV	70	-80000.00	-15.384615	20	PASS
		5240	NV	-30	-80000.00	-15.267176	20	PASS
			NV	-20	-60000.00	-11.450382	20	PASS
			NV	-10	-80000.00	-15.267176	20	PASS
			NV	0	-60000.00	-11.450382	20	PASS
			NV	10	-60000.00	-11.450382	20	PASS
			NV	20	-60000.00	-11.450382	20	PASS
			NV	30	-80000.00	-15.267176	20	PASS

			NV	40	-60000.00	-11.450382	20	PASS
			NV	50	-60000.00	-11.450382	20	PASS
			NV	60	-80000.00	-15.267176	20	PASS
			NV	70	-60000.00	-11.450382	20	PASS
		5745	NV	-30	-80000.00	-13.925152	20	PASS
			NV	-20	-80000.00	-13.925152	20	PASS
			NV	-10	-80000.00	-13.925152	20	PASS
			NV	0	-60000.00	-10.443864	20	PASS
			NV	10	-80000.00	-13.925152	20	PASS
			NV	20	-80000.00	-13.925152	20	PASS
			NV	30	-80000.00	-13.925152	20	PASS
			NV	40	-60000.00	-10.443864	20	PASS
			NV	50	-80000.00	-13.925152	20	PASS
			NV	60	-80000.00	-13.925152	20	PASS
			NV	70	-80000.00	-13.925152	20	PASS
		5785	NV	-30	-80000.00	-13.828868	20	PASS
			NV	-20	-60000.00	-10.371651	20	PASS
			NV	-10	-80000.00	-13.828868	20	PASS
			NV	0	-60000.00	-10.371651	20	PASS
			NV	10	-60000.00	-10.371651	20	PASS
			NV	20	-60000.00	-10.371651	20	PASS
			NV	30	-60000.00	-10.371651	20	PASS
			NV	40	-80000.00	-13.828868	20	PASS
			NV	50	-80000.00	-13.828868	20	PASS
			NV	60	-60000.00	-10.371651	20	PASS
			NV	70	-80000.00	-13.828868	20	PASS
		5825	NV	-30	-60000.00	-10.300429	20	PASS
			NV	-20	-60000.00	-10.300429	20	PASS
			NV	-10	-60000.00	-10.300429	20	PASS
			NV	0	-60000.00	-10.300429	20	PASS
			NV	10	-80000.00	-13.733906	20	PASS
			NV	20	-60000.00	-10.300429	20	PASS
			NV	30	-60000.00	-10.300429	20	PASS
			NV	40	-60000.00	-10.300429	20	PASS
			NV	50	-80000.00	-13.733906	20	PASS
			NV	60	-80000.00	-13.733906	20	PASS
			NV	70	-40000.00	-6.866953	20	PASS
11N40SISO	Ant1	5190	NV	-30	0.00	0.000000	20	PASS
			NV	-20	-40000.00	-7.707129	20	PASS

			NV	-10	-40000.00	-7.707129	20	PASS
			NV	0	-40000.00	-7.707129	20	PASS
			NV	10	-40000.00	-7.707129	20	PASS
			NV	20	-40000.00	-7.707129	20	PASS
			NV	30	-40000.00	-7.707129	20	PASS
			NV	40	-40000.00	-7.707129	20	PASS
			NV	50	-40000.00	-7.707129	20	PASS
			NV	60	-80000.00	-15.414258	20	PASS
			NV	70	-80000.00	-15.414258	20	PASS
		5230	NV	-30	-40000.00	-7.648184	20	PASS
			NV	-20	-40000.00	-7.648184	20	PASS
			NV	-10	-40000.00	-7.648184	20	PASS
			NV	0	-40000.00	-7.648184	20	PASS
			NV	10	-40000.00	-7.648184	20	PASS
			NV	20	-40000.00	-7.648184	20	PASS
			NV	30	-80000.00	-15.296367	20	PASS
			NV	40	-40000.00	-7.648184	20	PASS
			NV	50	-40000.00	-7.648184	20	PASS
			NV	60	-40000.00	-7.648184	20	PASS
			NV	70	-40000.00	-7.648184	20	PASS
		5755	NV	-30	-40000.00	-6.950478	20	PASS
			NV	-20	-40000.00	-6.950478	20	PASS
			NV	-10	-40000.00	-6.950478	20	PASS
			NV	0	-40000.00	-6.950478	20	PASS
			NV	10	-40000.00	-6.950478	20	PASS
			NV	20	-40000.00	-6.950478	20	PASS
			NV	30	-40000.00	-6.950478	20	PASS
			NV	40	-80000.00	-13.900956	20	PASS
			NV	50	0.00	0.000000	20	PASS
			NV	60	-40000.00	-6.950478	20	PASS
			NV	70	-40000.00	-6.950478	20	PASS
		5795	NV	-30	-40000.00	-6.902502	20	PASS
			NV	-20	-40000.00	-6.902502	20	PASS
			NV	-10	-40000.00	-6.902502	20	PASS
			NV	0	-40000.00	-6.902502	20	PASS
			NV	10	-40000.00	-6.902502	20	PASS
			NV	20	-40000.00	-6.902502	20	PASS
			NV	30	-40000.00	-6.902502	20	PASS
			NV	40	-40000.00	-6.902502	20	PASS

			NV	50	-40000.00	-6.902502	20	PASS
			NV	60	-40000.00	-6.902502	20	PASS
			NV	70	-40000.00	-6.902502	20	PASS
11AC20SISO	Ant1	5785	NV	-30	-40000.00	-6.914434	20	PASS
			NV	-20	-60000.00	-10.371651	20	PASS
			NV	-10	-60000.00	-10.371651	20	PASS
			NV	0	-60000.00	-10.371651	20	PASS
			NV	10	-60000.00	-10.371651	20	PASS
			NV	20	-60000.00	-10.371651	20	PASS
			NV	30	-60000.00	-10.371651	20	PASS
			NV	40	-40000.00	-6.914434	20	PASS
			NV	50	-60000.00	-10.371651	20	PASS
11AC80SISO	Ant1	5210	NV	-30	-80000.00	-15.355086	20	PASS
			NV	-20	-80000.00	-15.355086	20	PASS
			NV	-10	-80000.00	-15.355086	20	PASS
			NV	0	-80000.00	-15.355086	20	PASS
			NV	10	-80000.00	-15.355086	20	PASS
			NV	20	-80000.00	-15.355086	20	PASS
			NV	30	-80000.00	-15.355086	20	PASS
			NV	40	-80000.00	-15.355086	20	PASS
			NV	50	-80000.00	-15.355086	20	PASS
			NV	60	-80000.00	-15.355086	20	PASS
			NV	70	-80000.00	-15.355086	20	PASS
		5775	NV	-30	-80000.00	-13.852814	20	PASS
			NV	-20	-80000.00	-13.852814	20	PASS
			NV	-10	-80000.00	-13.852814	20	PASS
			NV	0	-80000.00	-13.852814	20	PASS
			NV	10	-80000.00	-13.852814	20	PASS
			NV	20	-80000.00	-13.852814	20	PASS
			NV	30	-80000.00	-13.852814	20	PASS
			NV	40	-80000.00	-13.852814	20	PASS
			NV	50	-80000.00	-13.852814	20	PASS
			NV	60	-80000.00	-13.852814	20	PASS
			NV	70	-80000.00	-13.852814	20	PASS

Note 1: The temperature range of the product is -30°~ 70°.

Note 2：For 802.11n and 802.11 ac only records the worse cases of each nominal bandwidth in this report.

11. Dynamic Frequency Selection

11.1. Applicability of DFS requirements

Table 1: Applicability of DFS Requirements Prior to Use of a Channel

Requirement	Operational Mode		
	☐Master	☒Client Without Radar Detection	☐Client with Radar Detection
Non-Occupancy Period	Yes	Not required	Yes
DFS Detection Threshold	Yes	Not required	Yes
Channel Availability Check Time	Yes	Not required	Not required
U-NII Detection Bandwidth	Yes	Not required	Yes

Table 2: Applicability of DFS requirements during normal operation

Requirement	Operational Mode	
	☐Master Device or Client with Radar Detection	☒Client Without Radar Detection
DFS Detection Threshold	Yes	Not required
Channel Closing Transmission Time	Yes	Yes
Channel Move Time	Yes	Yes
U-NII Detection Bandwidth	Yes	Not required

Additional requirements for devices with multiple bandwidth modes	☐Master Device or Client with Radar Detection	☒Client Without Radar Detection
U-NII Detection Bandwidth and Statistical Performance Check	All BW modes must be tested	Not required
Channel Move Time and Channel Closing Transmission Time	Test using widest BW mode available	Test using the widest BW mode available for the link
All other tests	Any single BW mode	Not required
Note: Frequencies selected for statistical performance check should include several frequencies within the radar detection bandwidth and frequencies near the edge of the radar detection bandwidth. For 802.11 devices it is suggested to select frequencies in each of the bonded 20 MHz channels and the channel center frequency.		

11.2. Limit

(1) DFS Detection Thresholds

Table 3: DFS Detection Thresholds for Master Devices and Client Devices with Radar Detection

Maximum Transmit Power	Value (See Notes 1, 2, and 3)
EIRP ≥ 200 milliwatt	-64 dBm
EIRP < 200 milliwatt and power spectral density < 10 dBm/MHz	-62 dBm
EIRP < 200 milliwatt that do not meet the power spectral density requirement	-64 dBm
Note 1: This is the level at the input of the receiver assuming a 0 dBi receive antenna. Note 2: Throughout these test procedures an additional 1 dB has been added to the amplitude of the test transmission waveforms to account for variations in measurement equipment. This will ensure that the test signal is at or above the detection threshold level to trigger a DFS response. Note3: EIRP is based on the highest antenna gain. For MIMO devices refer to KDB Publication 662911 D01.	

(2) DFS Response Requirements

Table 4: DFS Response Requirement Values

Parameter	Value
Non-occupancy period	Minimum 30 minutes
Channel Availability Check Time	60 seconds
Channel Move Time	10 seconds See Note 1.
Channel Closing Transmission Time	200 milliseconds + an aggregate of 60 milliseconds over remaining 10 second period. See Notes 1 and 2.
U-NII Detection Bandwidth	Minimum 100% of the U-NII 99% transmission power bandwidth. See Note 3.
Note 1: Channel Move Time and the Channel Closing Transmission Time should be performed with Radar Type 0. The measurement timing begins at the end of the Radar Type 0 burst. Note 2: The Channel Closing Transmission Time is comprised of 200 milliseconds starting at the beginning of the Channel Move Time plus any additional intermittent control signals required facilitating a Channel move (an aggregate of 60 milliseconds) during the remainder of the 10 second period. The aggregate duration of control signals will not count quiet periods in between transmissions. Note 3: During the U-NII Detection Bandwidth detection test, radar type 0 should be used. For each frequency step the minimum percentage of detection is 90 percent. Measurements are performed with no data traffic.	

11.3. Parameters of radar test waveforms

This section provides the parameters for required test waveforms, minimum percentage of successful detections, and the minimum number of trials that must be used for determining DFS conformance. Step intervals of 0.1 microsecond for Pulse Width, 1 microsecond for PRI, 1 MHz for chirp width and 1 for the number of pulses will be utilized for the random determination of specific test waveforms.

Table 5 Short Pulse Radar Test Waveforms

Radar Type	Pulse Width (μsec)	PRI (μsec)	Number of Pulses	Minimum Percentage of Successful Detection	Minimum Number of Trials
0	1	1428	18	See Note 1	See Note 1
1	1	Test A	$\text{Roundup}\left\{\left(\frac{1}{360}\right)\cdot\left(\frac{19\cdot10^6}{\text{PRI}_{\mu\text{sec}}}\right)\right\}$	60%	30
		Test B			
2	1-5	150-230	23-29	60%	30
3	6-10	200-500	16-18	60%	30
4	11-20	200-500	12-16	60%	30
Aggregate (Radar Types 1-4)				80%	120

Note 1: Short Pulse Radar Type 0 should be used for the detection bandwidth test, channel move time, and channel closing time tests.
Test A: 15 unique PRI values randomly selected from the list of 23 PRI values in Table 5a
Test B: 15 unique PRI values randomly selected within the range of 518-3066 μsec, with a minimum increment of 1 μsec, excluding PRI values selected in Test A

A minimum of 30 unique waveforms are required for each of the Short Pulse Radar Types 2 through 4. If more than 30 waveforms are used for Short Pulse Radar Types 2 through 4, then each additional waveform must also be unique and not repeated from the previous waveforms. If more than 30 waveforms are used for Short Pulse Radar Type 1, then each additional waveform is generated with Test B and must also be unique and not repeated from the previous waveforms in Tests A or B. Test aggregate is average of the percentage of successful detections of short pulse radar types 1-4

11.4. Calibration of radar waveform

Radar Waveform Calibration Procedure:

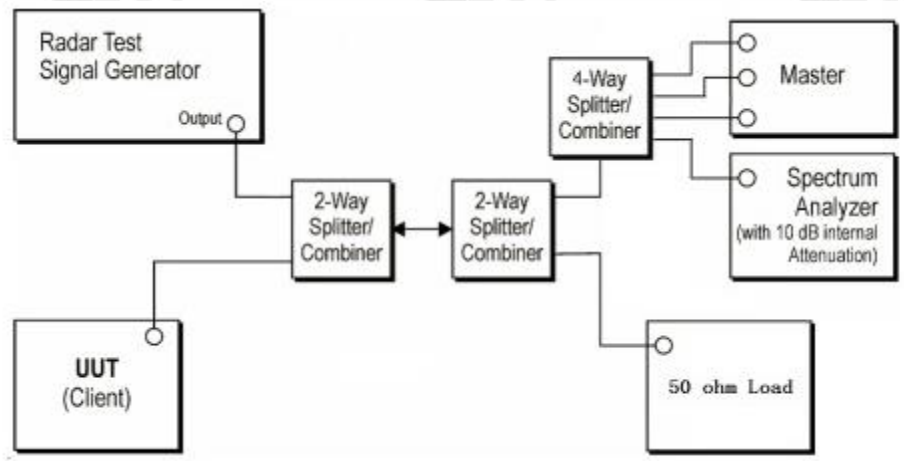
(1) A 50 ohm load is connected in place of the spectrum analyzer, and the spectrum analyzer is connected to place of the master

(2) The interference Radar Detection Threshold Level is -62dBm + 0dBi +1dB = -61dBm that had been taken into account the output power range and antenna gain.

(3) The following equipment setup was used to calibrate the conducted radar waveform. A vector signal generator was utilized to establish the test signal level for radar type 0. During this process there were no transmissions by either the master or client device. The spectrum analyzer was switched to the zero spans (time domain) at the frequency of the radar waveform generator. Peak detection was used. The spectrum analyzer resolution bandwidth (RBW) and video bandwidth (VBW) were set to 3 MHz. The spectrum analyzer had offset -1.0dB to compensate RF cable loss 1.0dB.

(4) The vector signal generator amplitude was set so that the power level measured at the spectrum analyzer was - -62dBm + 0dBi +1dB = -61dBm. Capture the spectrum analyzer plots on short pulse radar waveform.

Conducted Calibration Setup:



Note: 1. Use the software "Web" to set the frequency channel.

2. EUT is not support TPC and not with Radar detection.

11.5. Channel closing transmission time, channel move time and non-occupancy period

Block diagram of test setup Test Procedure:

(1) The radar pulse generator is setup to provide a pulse at frequency that the master and client are operating. A type 0 radar pulse with a 1us pulse width and a 1428us PRI is used for the testing.

(2) The vector signal generator is adjusted to provide the radar burst (18 pulses) at the level of approximately -61dBm at the antenna port of the master device.

(3) A trigger is provided from the pulse generator to the DFS monitoring system in order to capture the traffic and the occurrence of the radar pulse.

(4) EUT will associate with the master at channel. The file “iperf.exe” specified by the FCC is streamed from the PC 2 through the master and the client device to the PC 1 and played in full motion video using Test Software in order to properly load the network for the entire period of the test.

(5) When radar burst with a level equal to the DFS Detection Threshold +1dB is generated on the operating channel of the U-NII device. At time T0 the radar waveform generator sends a burst of pulse of the radar waveform at Detection Threshold +1dB.

(6) Observe the transmissions of the EUT at the end of the radar Burst on the Operating Channel. Measure and record the transmissions from the UUT during the observation time (Channel Move Time). One 15 seconds plot is reported for the Short Pulse Radar Type 0. The plot for the Short Pulse Radar Types start at the end of the radar burst. The Channel Move Time will be calculated based on the zoom in 600ms plot of the Short Pulse Radar Type.

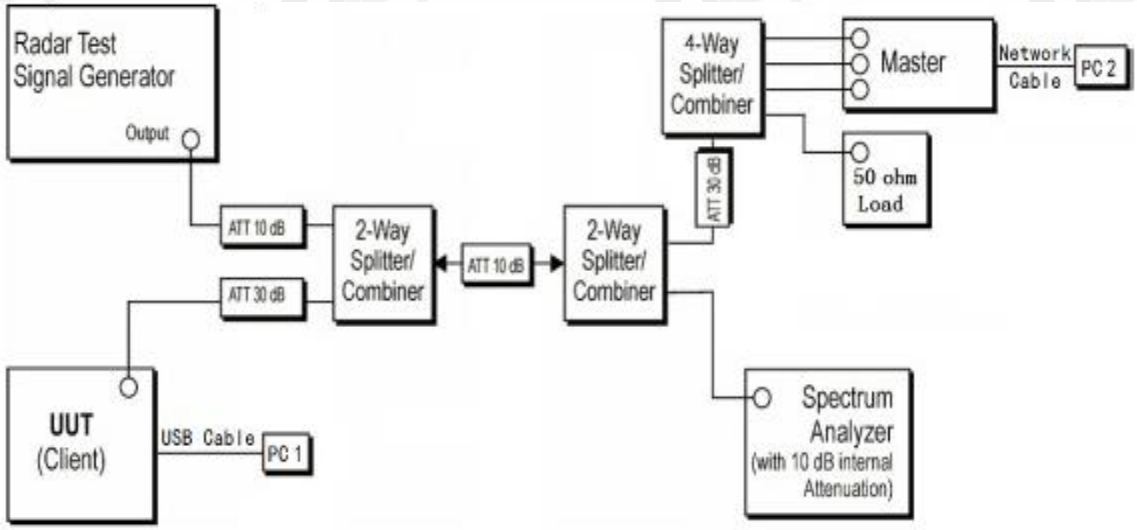
(7) Measurement of the aggregate duration of the Channel Closed Transmission Time method. With the

(8) spectrum analyzer set to zero span tuned to the center frequency of the EUT operating channel at the radar simulated frequency, peak detection, and max hold, the dwell time per bin is given by: Dwell (0.3ms) =S (12000ms) / B (4000); where Dwell is the dwell time per spectrum analyzer sampling bin, S is sweep time and B is the number of spectrum analyzer sampling bins. An upper bound of the aggregate duration of the intermittent control signals of Channel Closing Transmission Time is calculated by: C (ms)= N X Dwell (0.3ms); where C is the Closing Time, N is the number of spectrum analyzer sampling bins (intermittent control signals) showing a U-NII transmission and Dwell is the dwell time per bin.

Measurement the EUT for more than 30 minutes following the channel move time to verify that no transmission or beacons occur on this channel.

11.6. Test setup

Setup for Client with injection at the Master



11.7. Test result

Not applicable. The EUT does not use in U-NII-2A and UNII-2C band (from frequency 5250MHz to 5725MHz).

12. Antenna Requirements

12.1. Limit

For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. And according to FCC 47 CFR Section 15.247 (b), if transmitting antennas of directional gain greater than 6 dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

For intentional device, according to RSS-Gen issue 5 section 6.8.

The applicant for equipment certification shall provide a list of all antenna types that may be used with the transmitter, where applicable (i.e. for transmitters with detachable antenna), indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna. The test report shall demonstrate the compliance of the transmitter with the limit for maximum equivalent isotropically radiated power (e.i.r.p.) specified in the applicable RSS, when the transmitter is equipped with any antenna type, selected from this list.

12.2. Result

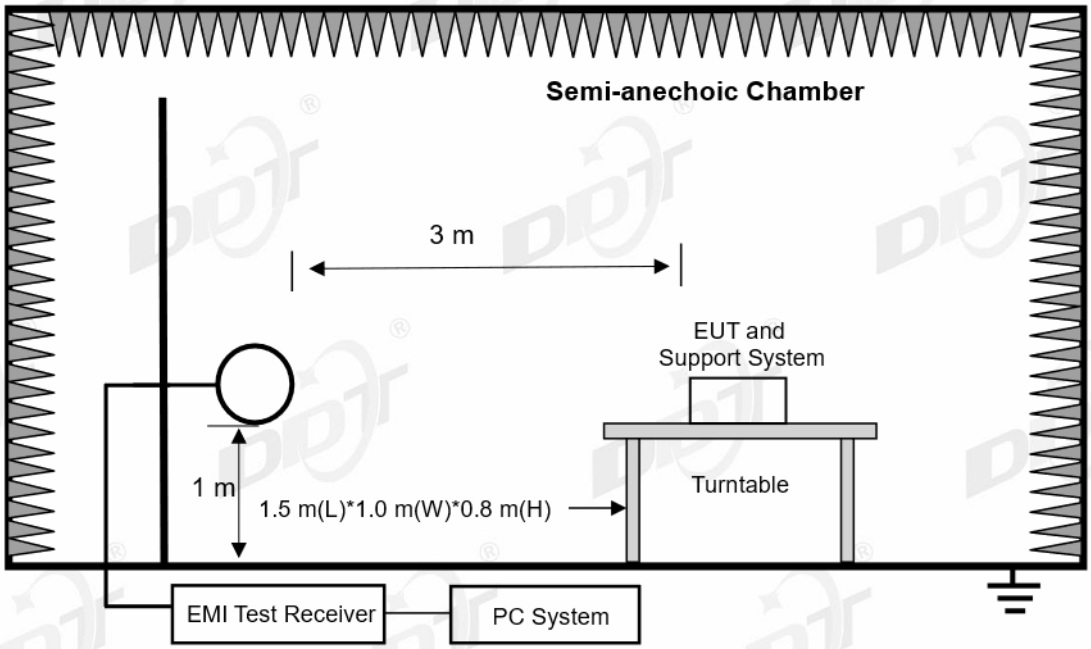
The antenna used for this product as Antenna information described in section 2.1 of the report, and there is no other antenna than that furnished by the responsible party shall be used with the device.

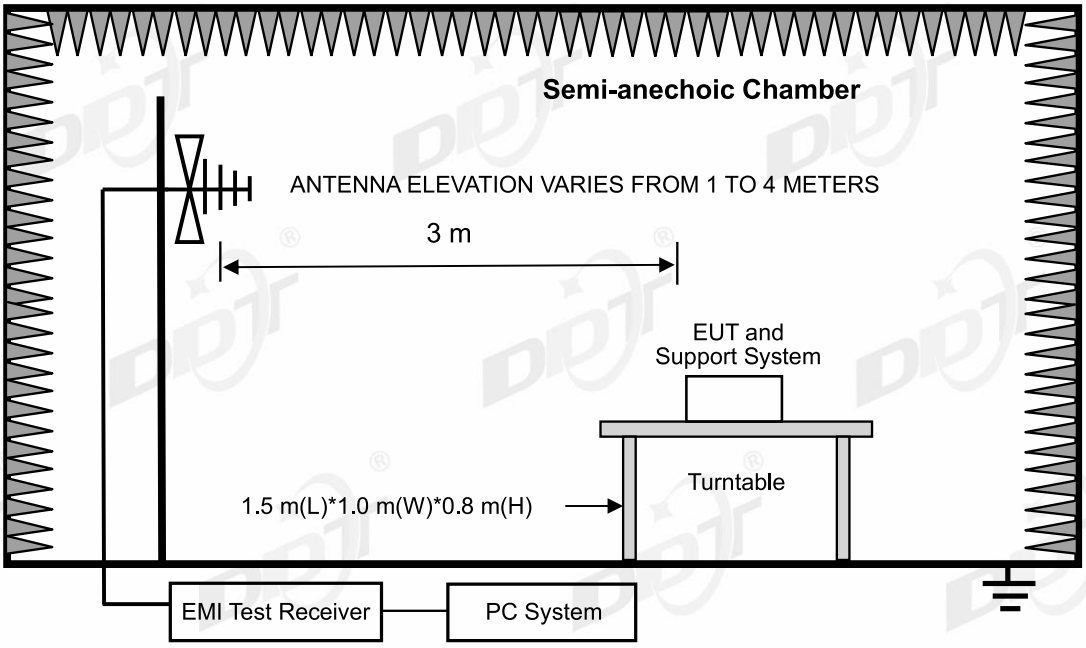
13.Radiated Emission

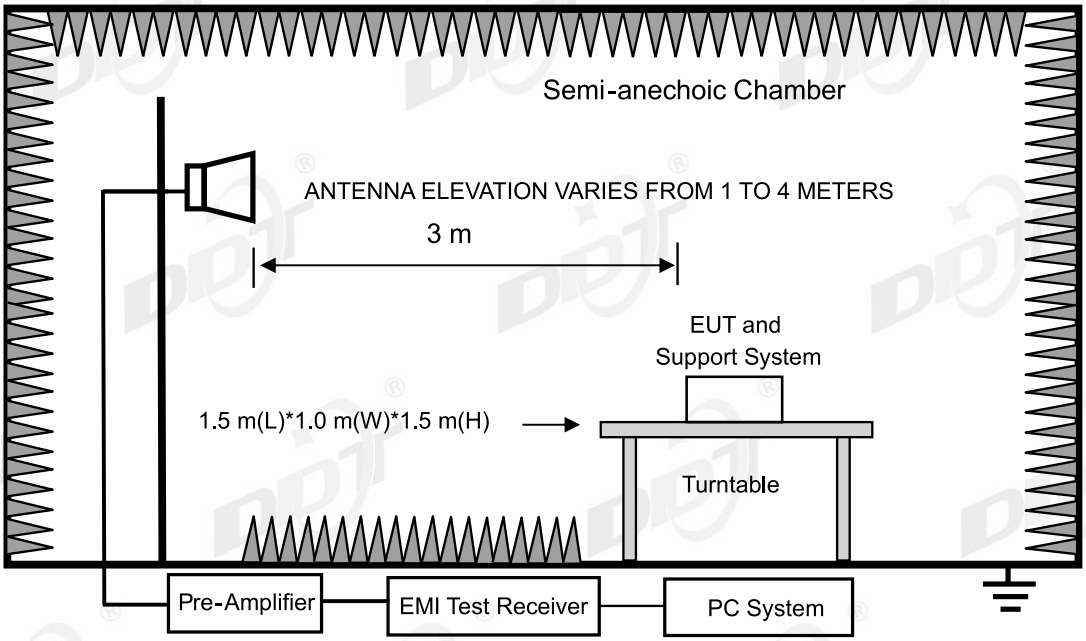
13.1. Test equipment

Equipment	Manufacturer	Model No.	Serial No.	Cal Due To	Cal. Interval
Broad-Band Horn Antenna	Schwarzbeck	BBHA 9170	DDT-ZC00506	2024/04/26	1 Year
RF cable	Yuhu Technology	ZT26S-SMAJ-SMAJ-1M	DDT-ZC02037	2024/04/23	1 Year
High pass filter	Micro-Tronics	HPM50102	DDT-ZC00561	2024/05/14	1 Year
Trilog Broadband Antenna	Schwarzbeck	VULB 9163	DDT-ZC02050	2024/07/11	1 Year
Micro-Tronics filters	REBES	BRM50702	DDT-ZC03242	/	NA
RF cable	Yuhu Technology	JCTB810-NJ-NJ-9M	DDT-ZC02538	2024/04/23	1 Year
High Pass filter	XIANXINGBO	XBLBQ-GTA67	DDT-ZC02179	2024/05/14	1 Year
Micro-Tronics filters	REBES	BRM50716	DDT-ZC03240	/	NA
RF Cable	N/A	W13.02 AP1-X2	DDT-ZC04023	2024/04/21	1 Year
RF cable	Zhongke Junchuang	JCT26S-NJ-NJ-1.5M	DDT-ZC02762	2024/04/20	1 Year
Pre-amplifier	COM-POWER	PAM-118A	DDT-ZC01293	2024/07/14	1 Year
Pre-amplifier	COM-POWER	PAM-840A	DDT-ZC01693	2024/04/27	1 Year
PSA Series Spectrum Analyzer	Agilent	E4447A	DDT-ZC00517	2024/04/23	1 Year
RF Cable	N/A	W24.02 HL-562	DDT-ZC04022	2024/04/21	1 Year
High pass filter	Micro-Tronics	HPM50108	DDT-ZC00560	2024/05/14	1 Year
Hochgewinn-Hornantenne	Schwarzbeck Mess-Elektronik	BBHA 9120 D	DDT-ZC02129	2024/09/17	1 Year
Active Loop Antenna	Schwarzbeck	FMZB1519	DDT-ZC00524	2024/09/10	1 Year
EMI TEST RECEIVER	R&S	ESU26	DDT-ZC01909	2024/04/23	1 Year

13.2. Block diagram of test setup







13.3. Limits

(1) FCC 15.205 Restricted frequency band

MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
[1]0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.1772&4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.2072&4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	([2])
13.36-13.41			

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

2Above 38.6

RSS-Gen section 8.10 Restricted frequency bands*

MHz	MHz	MHz	GHz
0.090-0.110	12.51975-12.52025	240-285	3.5-4.4
0.495-0.505	12.57675-12.57725	322-335.4	4.5-5.15
2.1735-2.1905	13.36-13.41	399.9-410	5.35-5.46
3.020-3.026	16.42-16.423	608-614	7.25-7.75
4.125-4.128	16.69475-16.69525	960-1427	8.025-8.5
4.1772&4.17775	16.80425-16.80475	1435-1626.5	9.0-9.2
4.2072&4.20775	25.5-25.67	1645.5-1646.5	9.3-9.5
5.677-5.683	37.5-38.25	1660-1710	10.6-12.7
6.215-6.218	73-74.6	1718.8-1722.2	13.25-13.4
6.26775-6.26825	74.8-75.2	2200-2300	14.47-14.5
6.31175-6.31225	108-138	2310-2390	15.35-16.2
8.291-8.294	149.9-150.05	2483.5-2500	17.7-21.4
8.362-8.366	156.52475-156.52525	2655-2900	22.01-23.12
8.37625-8.38675	156.7-156.9	3260-3267	23.6-24.0
8.41425-8.41475	162.0125-167.17	3332-3339	31.2-31.8
12.29-12.293	167.72-173.2	3345.8-3358	36.43-36.5
			Above 38.6

* Certain frequency bands listed in table and in bands above 38.6 GHz are designated for licence-exempt applications. These frequency bands and the requirements that apply to related devices are set out in the 200 and 300 series of RSSs.

(2) FCC 15.209 Limit & RSS-Gen section 8.9 Limit

FREQUENCY MHz			DISTANCE Meters	FIELD STRENGTHS LIMIT	
				mV/m	dB(mV)/m
0.009 ~ 0.490			300	2400/F(kHz)	67.6-20log(F)
0.490 ~ 1.705			30	24000/F(kHz)	87.6-20log(F)
1.705 ~ 30.0			30	30	29.54
30	~	88	3	100	40.0
88	~	216	3	150	43.5
216	~	960	3	200	46.0
960	~	1000	3	500	54.0
Above		1000	3	74.0 dB(mV)/m (Peak) 54.0 dB(mV)/m (Average)	

Note:

(1) The emission limits shown in the above table are based on measurements employing a CISPR QP detector except for the frequency bands 9 - 90 kHz, 110 - 490 kHz and above 1000 MHz, radiated emissions limits in these three bands are based on measurements employing an average detector.

(2) At frequencies below 30 MHz, measurement may be performed at a distance closer than that specified, and the limit at closer measurement distance can be extrapolated by below formula:

$$Limit_{3m}(dBuV/m) = Limit_{30m}(dBuV/m) + 40Log(30m/3m)$$

(3) Limit for this EUT

The emissions appearing within 15.205 restricted frequency bands shall not exceed the limits shown in 15.209, and the emissions appearing within RSS-Gen section 8.10 Restricted frequency bands shall not exceed the limits shown in RSS-Gen section 8.9, all the other emissions shall be at least 20 dB below the fundamental emissions or comply with 15.209 limits and RSS-Gen section 8.9 limits.

13.4. Assistant equipment used for test

Assistant equipment	Manufacturer	Model number	other
DC Power Source	Varied	RU-150-150010B	/

13.5. Test procedure

(1) EUT was placed on a non-metallic table, 80 cm above the ground plane inside a semi-anechoic chamber for below 1G and 150 cm above the ground plane inside a fully-anechoic chamber for above 1G.

(2) Test antenna was located 3 m from the EUT on an adjustable mast, and the antenna used as below table.

Test frequency range	Test antenna used	Test antenna distance
9 kHz - 30 MHz	Active Loop antenna	3 m
30 MHz - 1 GHz	Trilog Broadband Antenna	3 m
1 GHz - 18 GHz	Double Ridged Horn Antenna (1 GHz-18 GHz)	3 m
18 GHz - 40 GHz	Horn Antenna (18 GHz-40 GHz)	1 m

According ANSI C63.10:2013 clause 6.4.6 and 6.5.3, for measurements below 30 MHz, Antenna was located 3 m from EUT, the loop antenna was positioned in three antenna orientations (parallel, perpendicular, and round-parallel), for each measurement antenna alignment, the EUT shall be rotated through 0° to 360° on a turntable, and the lowest height of the magnetic antenna shall be 1 m above the ground. For measurement above 30MHz, the trilog Broadband Antenna or Horn Antenna was located 3m from EUT, Measurements were made with the antenna positioned in both the horizontal and vertical planes of Polarization, and the measurement antenna was varied from 1 m to 4 m. in height above the reference ground plane to obtain the maximum signal strength.

(3) Below pre-scan procedure was first performed in order to find prominent frequency spectrum radiated emissions from 9 kHz to 25 GHz:

(a) Scanning the peak frequency spectrum with the antenna specified in step (3), and the EUT was rotated 360 degree, the antenna height was varied from 1 m to 4 m (Except loop antenna, it's fixed 1 m above ground.)

(b) Change work frequency or channel of device if practicable.

(c) Change modulation type of device if practicable.

(d) Change power supply range from 85% to 115% of the rated supply voltage

(e) Rotated EUT though three orthogonal axes to determine the attitude of EUT arrangement produces highest emissions.

Spectrum frequency from 9 kHz to 25 GHz (tenth harmonic of fundamental frequency) was investigated, and no any obvious emission were detected from 18 GHz to 25 GHz, so below final test was performed with frequency range from 9 kHz to 18 GHz.

(4) For final emissions measurements at each frequency of interest, the EUT was rotated and the antenna height was varied between 1 m and 4 m in order to maximize the emission. Measurements in both horizontal and vertical polarities were made and the data was recorded. In order to find the maximum emission, the relative positions of equipment and all of the interface cables were changed according to ANSI C63.10:2013 on Radiated Emission test.

(5) The emissions from 9 kHz to 1 GHz were measured based on CISPR QP detector except for the frequency bands 9 - 90 kHz, 110 - 490 kHz, for emissions from 9 kHz - 90 kHz,110 kHz - 490 kHz and above 1 GHz were measured based on average detector, for emissions above 1 GHz, peak emissions also be measured and need comply with Peak limit.

(6) The emissions from 9 kHz to 1 GHz, QP or average values were measured with EMI receiver with below RBW.

Frequency band	RBW
9 kHz - 150 kHz	200 Hz
150 kHz - 30 MHz	9 kHz
30 MHz - 1 GHz	120 kHz

(7) For emissions above 1GHz, both Peak and Average level were measured with Spectrum Analyzer, and the RBW is set at 1 MHz, VBW is set at 3 MHz for Peak measure; According ANSI C63.10:2013 clause 4.1.4.2.2 procedure for average measure.

13.6. Test result

PASS. (See below detailed test result)