AFC Device (DUT) Test Report

FCC ID	:	**2ABOF-G1BN6ASI002**
Equipment	:	**Base Node (BN)**
Brand Name	:	**Tarana Wireless**
Model Name	:	**G1BN6ASI002**
Applicant	:	**Tarana Wireless** **590 Alder Dr, Milpitas, CA 95035**
Manufacturer	:	**Tarana Wireless** **590 Alder Dr, Milpitas, CA 95035**
Standard	:	**FCC Part 15.407**

The product was received on Jan. 12, 2024 and testing was performed from Jan. 29, 2024 to Jan. 30, 2024. We, Sporton International (USA) Inc., would like to declare that the tested sample has been evaluated in accordance with the test procedures given in WiFi Alliance AFC Device (DUT) Compliance Test Plan Version 1.5 and has been in compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of Sporton International (USA) Inc., the test report shall not be reproduced except in full.

Neil Kao

Approved by: Neil Kao

Sporton International (USA) Inc.
1175 Montague Expressway, Milpitas, CA 95035

TEL : 408-904-3300

Table of Contents

1. Administration Data ---------- 4
1.1 Testing Laboratory---------- 4
1.2 Applicant---------- 4
1.3 Manufacturer---------- 4
1.4 Applied Standard ---------- 5
2. General Information ---------- 5
2.1 Description of Device Under Test (DUT)---------- 5
2.2 Protocol Test Summary ---------- 7
2.3 Support Equipment---------- 9
2.4 Measuring Equipment List---------- 9
2.5 Measurement Uncertainty ---------- 9
3. Measurement Environment ----------10
3.1 Test configuration----------10
4. Protocol Test Results ----------11
4.1 Successful registration and spectrum access request ----------11
4.2 AFCD.RSA Test Vector----------15
4.3 AFCD.RSA RF Transmit Power Measurement----------15
4.4 Unsuccessful spectrum access request ----------21
4.5 AFCD.USA Test Vectors ----------22
4.6 Successful spectrum access update----------23
4.7 AFCD.SAU Test Vectors ----------27
4.8 AFCD.SAU RF Transmit Power Measurement----------28
4.9 Unsuccessful spectrum access update ----------34
4.10 AFCD.UAU Test Vectors----------37
4.11 Unsuccessful server validation----------38
4.12 AFCD.USV Test Vectors ----------39

Appendix A. Setup Photographs

Appendix B. AFC DUT Test Logs and Tool Report

History of this test report

Report No.	Version	Description	Issue Date
FR230625004-03A	01	Initial issue of report	Feb. 27, 2024

Conformity Assessment Condition:

1. The test results (PASS/FAIL) with all measurement uncertainty excluded are presented against the regulation limits or in accordance with the requirements stipulated by the applicant/manufacturer who shall bear all the risks of non-compliance that may potentially occur if measurement uncertainty is taken into account.
2. The measurement uncertainty please refer to each test result in the section “Measurement Uncertainty”.

Disclaimer:

The product specifications of the DUT presented in the test report that may affect the test assessments are declared by the manufacturer who shall take full responsibility for the authenticity.

1. Administration Data

1.1 Testing Laboratory

Test Site	Sporton International (USA) Inc.
Test Site Location	1175 Montague Expressway, Milpitas, CA 95035 TEL: (408) 904-3300
Test Site No.	**Sporton Site No.**
	TH01-CA
Test Engineer	Thomas Chen
Temperature	20 ~ 22 ℃
Relative Humidity	48 ~ 53 %

FCC Designation No.: US1250

1.2 Applicant

Company Name	Tarana Wireless
Address	590 Alder Dr, Milpitas, CA 95035

1.3 Manufacturer

Company Name	Tarana Wireless
Address	590 Alder Dr, Milpitas, CA 95035

1.4 Applied Standard

According to the specifications declared by the manufacturer, the DUT must comply with the requirement of the following standards:

Standards	[n.1]. FCC Part 15.407 [n.2]. FCC KDB 987594 D01 U-NII 6GHz General Requirements v02r02 [n.3]. FCC KDB 987594 D05 AFC DUT Test Harness Testing v01r01 [n.4]. WiFi Alliance AFC System to AFC Device Interface Specification v1.5, 5 May 2023 [n.5]. WiFi Alliance AFC Device (DUT) Compliance Test Plan v1.5, 27 Jun 2023 [n.6]. WiFi Alliance AFC Device (DUT) Compliance Test Vectors v1.2, 27 Jun 2023 [n.7]. ANSI C63.10-2013

Remark: All the test items were validated and recorded in accordance with the standards without any modification during the testing.

2. General Information

2.1 Description of Device Under Test (DUT)

Product Feature & Specification	
DUT Type	Base Node (BN)
Brand Name	Tarana Wireless
Model Name	G1BN6ASI002
FCC ID	2ABOF-G1BN6ASI002
Device Under Test Type	■ Standard Power Access Point ☐ Fixed Client
Domain Proxy support	■ with Domain Proxy ☐ without Domain Proxy
Deployment	☐ Indoor ■ Outdoor
DUT HW Version	30-0174-001.2.3
DUT FW Version	SYS.A3.B10.XXX.2.003.002.00
DUT Serial Number	S174F2224810253
Domain Proxy SW Version	20240221203926-0f58a3e4-x2compliance

AFC DUT general capabilities declaration		
Item	**Question**	**Vendor response**
1	AFC DUT Type.	■ Standard Power Access Point (6SD) ☐ Fixed Client (6FC) ■ Domain Proxy
2	Does the AFC DUT support sending an Available Spectrum Inquiry Request based on the inquiredFrequencyRange field	No (Yes/No)
3	Does the AFC DUT support sending an Available Spectrum Inquiry Request based on the inquired Channels fields?	Yes (Yes/No)
4 (For 2, 3)	If the Answer to Items **2** and **3** is "Yes", what is AFC DUT's default inquiry type?	☐ Frequency based ■ Channel based ☐ Both
5	Does the AFC DUT need to be supplied with BSS configuration parameters?	No (Yes/No)
6	Does the AFC DUT manufacturer attest to AFC DUT compliance with rules for LPI operation?	No (Yes/No)
7	Does the AFC DUT need to be supplied with mandatory registration information to formulate an Available Spectrum Inquiry Request	No (Yes/No)
8 (For 7)	If the Answer to Item **7** is "Yes". What is the geographic Supported by the AFC DUT?	■ Ellipse ☐ Linear Polygon ☐ Radial Polygon
9	Does the AFC DUT support 160 MHz channel width operation?	No (Yes/No)
10	Which method does AFC DUT acting as a Fixed Client uses for sending an Available Spectrum Inquiry Request?	■ In-band ☐ Out-of-band

2.2 Protocol Test Summary

Section	Test Case ID	Test Description	FCC Requirement	Short Description	Test Result
4.1	AFCD.RSA	Successful registration and spectrum access request	47 CFR Section 15.407(k)(1)	Transmit only as instructed by AFC System	PASS
			47 CFR Section 15.407(k)(8)(i)	Register with AFC System prior to initial transmission	
			47 CFR Section 15.407(k)(8)(ii)	Provide required registration parameters	
			47 CFR Section 15.407(k)(8)(iii)	Registration either directly or via proxy	
			47 CFR Section 15.407(l)(ii)	Determination of appropriate channel configuration implied by AFC System response	
			47 CFR 15.407(k)(8)(iv)	Must contact an AFC system at least once per day to obtain the latest list of available frequencies and the maximum permissible power	
4.2	AFCD.USA	Unsuccessful registration and spectrum access request	47 CFR Section 15.407(k)(1)	Transmit only as instructed by AFC System	PASS
			47 CFR Section 15.407(k)(8)(i)	Register with AFC System prior to initial transmission	
			47 CFR Section 15.407(k)(8)(ii)	Provide required registration parameters	
			47 CFR Section 15.407(k)(8)(iii)	Registration either directly or via proxy	

Section	Test Case ID	Test Description	FCC Requirement	Short Description	Test Result
4.3	AFCD.SAU	Successful spectrum access update	47 CFR Section 15.407(k)(8)(i)	Register with AFC System after change of location	PASS
			47 CFR Section 15.407(k)(8)(ii)	Update AFC System upon change of registration parameters	
			47 CFR Section 15.407(k)(9)(i)	Report location and uncertainty from power-off condition	
4.4	AFCD.UAU	Unsuccessful spectrum access update	47 CFR Section 15.407(k)(8)(i)	Register with AFC System after change of location	
			47 CFR Section 15.407(k)(8)(ii)	Update AFC System upon change of registration parameters	
			47 CFR Section 15.407(k)(9)(i)	Report location and uncertainty from power-off condition	
4.5	AFCD.USV	Unsuccessful server validation	47 CFR Section 15.407(k)(8)(v)	Incorporate adequate security measurements to prevent it from accessing AFC systems not approved by the FCC	PASS

Note: For Protocol Test Results, please find the Appendix B for AFC Test Logs.

2.3 Support Equipment

Name	Brand	Type/Model	Serial Number	FCC ID
Remote Node (RN)	Tarana Wireless	G1RN6AHB012	M173M1232800024	2ABOF-G1RN6AHB012

2.4 Measuring Equipment List

Name	Brand	Type/Model	Serial Number	Calibration	
				Last Cal.	Due Date
Spectrum Analyzer	Rohde & Schwarz	FSW	104042	Dec. 22, 2023	Dec. 21, 2024
Spectrum Analyzer	Rohde & Schwarz	ESR	102177	May 23, 2023	May 22, 2024

2.5 Measurement Uncertainty

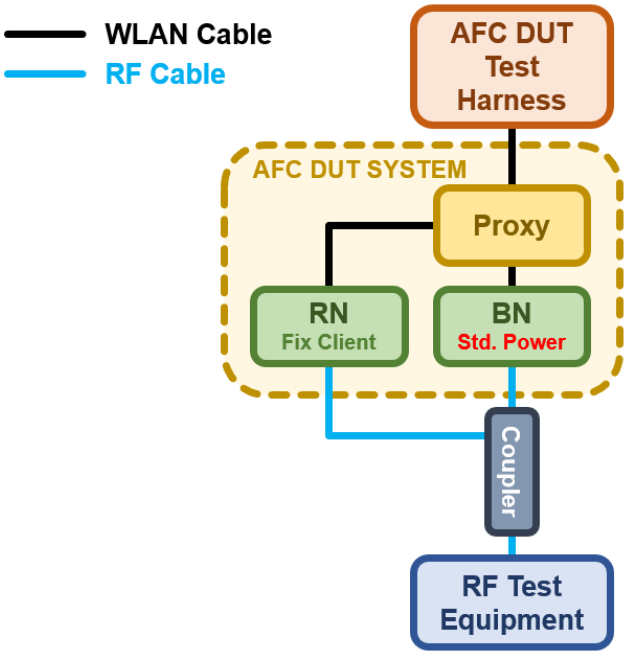
Uncertainty of Conducted Power Measurement

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2uc(y)$)	0.43dB

3. Measurement Environment

Measurement Environment Information	
AFC DUT Test Harness	AFC DUT Test Harness Version (2.0.65.148)
Operating System	Ubuntu 22.04
TLS version	V 1.2

3.1 Test configuration



Proxy representing Standard Power Access Point (BN)

and Fixed Client Device (RN) Test Setup

4. Protocol Test Results

4.1 Successful registration and spectrum access request

#	Description	Results
1	If the AFC DUT is Standard Power Access Point, go to Step 2, else go to Step 12	Go to step 2
2	AFC DUT set to Initial Pre-test State. If needed (see Table 5 declaration), configure the AFC DUT with BSS parameters per Table 9 and a temporary test regulatory identifier (e.g., FCC ID), geographic coordinates, antenna height, and uncertainty parameters. Configure the AFC DUT with AFC System URL and server root certificate. Trigger the AFC DUT to send to the AFC DUT Test Harness an Available Spectrum Inquiry Request.	Done
3	AFC DUT sends a valid Available Spectrum Inquiry Request containing the inquiredFrequencyRange and/or the inquiredChannels fields*.	PASS
4	AFC DUT Test Harness validates the presence of mandatory registration information	PASS
5	AFC DUT Test Harness sends an Available Spectrum Inquiry Response containing a list of available frequency ranges and/or channels and the maximum permissible transmit power in the availableFrequencyInfo and/or availableChannelInfo fields.	Done

#	Description	Results
6	Throughout Step 1 to Step 4, RF Test Equipment monitors the output of the AFC DUT to confirm that the AFC DUT does not transmit: ● In the band if the AFC DUT supports only SP operation Or ● Above LPI limits for AFC DUT whose manufacturer attests to its compliance with rules for LPI operation Wait for 60 seconds RF Test Equipment monitors any transmission by the AFC DUT conforms to the following: ● For SP only operation, AFC DUT conforms to the conditions contained in the Available Spectrum Inquiry Response and does not exceed emissions limits in adjacent frequencies. ● For AFC DUT whose manufacturer attests to its compliance with rules for LPI operation, AFC DUT transmit power in the band is less than CEILING [LPI limits, SP limits contained in the Available Spectrum Inquiry Response] and does not exceed emissions limits in adjacent frequencies.	PASS
7	Trigger the AFC DUT to send to the AFC DUT Test Harness an Available Spectrum Inquiry Request.	Done
8	AFC DUT sends a valid Available Spectrum Inquiry Request containing the inquiredFrequencyRange and/or the inquiredChannels fields*.	PASS
9	AFC DUT Test Harness validates the presence of mandatory registration information	PASS
10	AFC DUT Test Harness sends an Available Spectrum Inquiry Response containing a list of available frequency ranges and/or channels and the maximum permissible transmit power in the availableFrequencyInfo and/or availableChannelInfo fields which are significantly different from Step 5.	Done

#	Description	Results
11	Wait for 5 minutes (configurable) RF Test Equipment monitors any transmission by the AFC DUT conforms to the following: ● For SP only operation, AFC DUT conforms to the conditions contained in the latest Available Spectrum Inquiry Response and does not exceed emissions limits in adjacent frequencies. ● For AFC DUT whose manufacturer attests to its compliance with rules for LPI operation, AFC DUT transmit power in the band is less than CEILING [LPI limits, SP limits contained in the latest Available Spectrum Inquiry Response] and does not exceed emissions limits in adjacent frequencies.	PASS
12	If the AFC DUT is Fixed Client, go to Step 13 else Stop the test	Test end
13	The AFC DUT set to Initial Pre-test State.	Not applicable
14	If needed (see Table 5 declaration), configure the AFC DUT with a temporary test regulatory identifier (e.g., FCC ID), geographic coordinates, antenna height, and uncertainty parameters. Configure the AFC DUT with AFC System URL and server root certificate. Trigger the AFC DUT to send to the AFC DUT Test Harness an Available Spectrum Inquiry Request using either In-band or Out-of-band methods.	Not applicable
15	AFC DUT sends a valid Available Spectrum Inquiry Request containing the inquiredFrequencyRange and/or the inquiredChannels fields*	Not applicable
16	AFC DUT Test Harness validates the presence of mandatory registration information	Not applicable
17	AFC DUT Test Harness sends an Available Spectrum Inquiry Response containing a list of available frequency ranges and/or channels and the maximum permissible transmit power in the availableFrequencyInfo and/or availableChannelInfo fields.	Not applicable
18	If AFC DUT used Out-of-band method, initiate connection procedure between AFC DUT and SP Access Point by following instructions provided by the AFC DUT Vendor	Not applicable

#	Description	Results
19	Wait for 60 seconds RF Test Equipment monitors any transmission by the AFC DUT conforms to the conditions contained in the Available Spectrum Inquiry Response and does not exceed emissions limits in adjacent frequencies	Not applicable
20	Trigger the AFC DUT to send to the AFC DUT Test Harness an Available Spectrum Inquiry Request using either In-band or Out-of-band methods	Not applicable
21	AFC DUT sends a valid Available Spectrum Inquiry Request containing the inquiredFrequencyRange and/or the inquiredChannels fields*	Not applicable
22	AFC DUT Test Harness validates the presence of mandatory registration information	Not applicable
23	AFC DUT Test Harness sends an Available Spectrum Inquiry Response containing a list of available frequency ranges and/or channels and the maximum permissible transmit power in the availableFrequencyInfo and/or availableChannelInfo fields which are significantly different from Step 17.	Not applicable
24	If AFC DUT used Out-of-band method, initiate connection procedure between AFC DUT and SP Access Point by following instructions provided by the AFC DUT Vendor	Not applicable
25	Wait for 60 seconds (configurable) RF Test Equipment monitors any transmission by the AFC DUT conforms to the conditions contained in the latest Available Spectrum Inquiry Response and does not exceed emissions limits in adjacent frequencies	Not applicable

4.2 AFCD.RSA Test Vector

Test Vector	Test Category	Results
AFCD.RSA	Successful registration and spectrum access request	PASS

4.3 AFCD.RSA RF Transmit Power Measurement

Center Frequency [MHz]	BW [MHz]	DUT Internal Loss [dB]	Duty Cycle Factor [dB]	MIMO Factor [dB]	Directional Gain [dBi]	SA Reading Power [dBm]	Total EIRP [dBm]	AFC EIRP Limit [dBm]
6285	40	16.79	1.28	3.01	16.9	-9.28	28.70	29.12
6325		16.67			16.9	-10.05	27.81	28.59
6645		16.86			17.3	-4.62	33.83	34.43
6685		17.02			17.3	-10.17	28.44	28.95
5965		16.80			16.9	-7.40	30.59	30.70
6005		16.62			16.9	-5.33	32.48	32.89
6125		16.98			16.9	-6.17	32.00	32.41
6205		17.14			16.9	-6.93	31.40	31.55

Note 1: DUT will transmit on four of the available channels that have the highest allowed power based on the response from the AFC system. During testing, four channels were validated to ensure that the EIRP power for each channel does not exceed the allowed power from the AFC, i.e., AFC EIRP Limit on the table above.

Note 2: UNII-5 Antenna Gain = 16.9dBi.
The device is driving cross-polarized antenna, which has 8 horizontal polarization antennas and 8 vertical polarization antennas. Directional Gain (8H/8V) = 16.9dBi + 10log(Ntx = 8 / Nss = 8) = 16.9dBi.

Note 3: UNII-7 Antenna Gain = 17.3dBi.
The device is driving cross-polarized antenna, which has 8 horizontal polarization antennas and 8 vertical polarization antennas. Directional Gain (8H/8V) = 17.3dBi + 10log(Ntx = 8 / Nss = 8) = 17.3dBi.

Note 4: Conducted power were measured on sum of 8 horizontal polarization output ports. MIMO factor 3.01 is considered to calculate total conducted output power.

Note 5: The path loss between the DUT and the Spectrum Analyzer has been offset and configured in the Spectrum Analyzer.

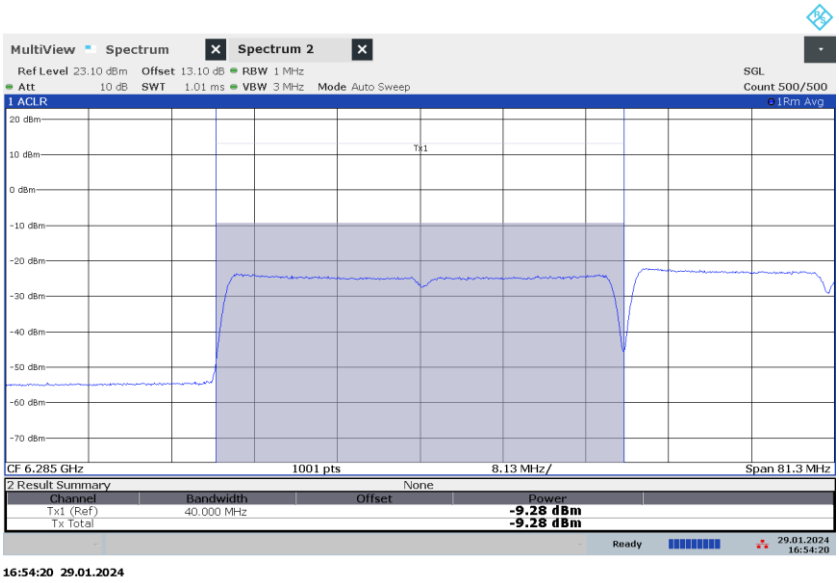
Note 6: The duty cycle factor, calculated as 10log(1/duty cycle) and listed in the table above, is used to compute the average power during continuous transmission.

DUT Duty Cycle: 74.40%

AFC EIRP Limit 29.12 dBm

DUT Center Frequency 6285 MHz, Bandwidth 40 MHz, Total EIRP 28.70 dBm

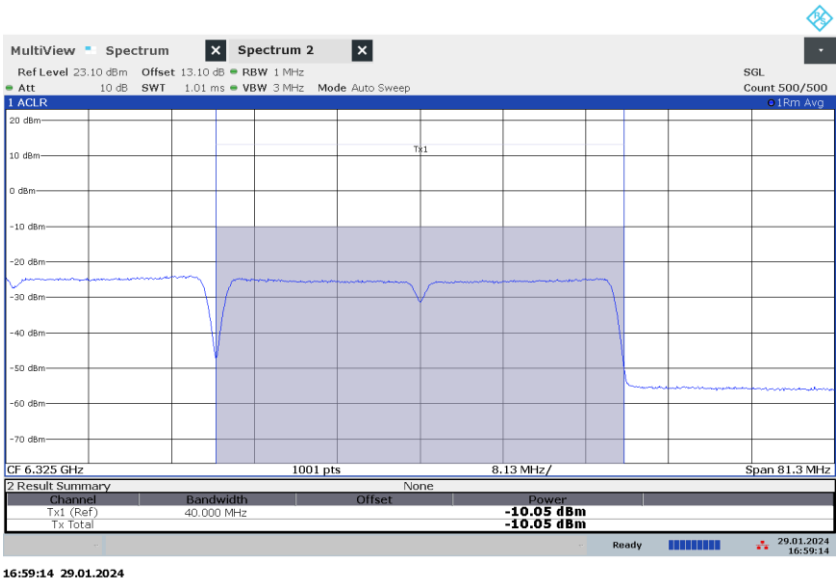
SA Reading Power: -9.28 dBm



AFC EIRP Limit 28.59 dBm

DUT Center Frequency 6325 MHz, Bandwidth 40 MHz, Total EIRP 27.81 dBm

SA Reading Power: -10.05 dBm

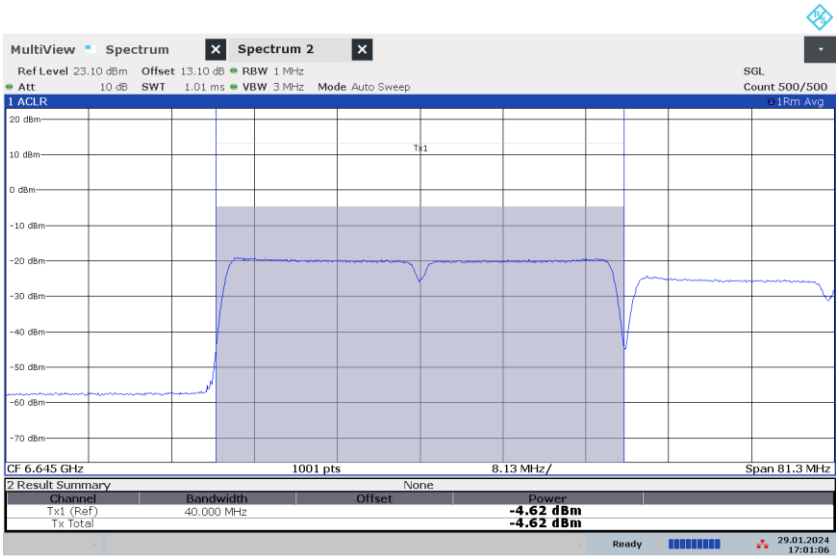


16:59:14 29.01.2024

AFC EIRP Limit 34.43 dBm

DUT Center Frequency 6645 MHz, Bandwidth 40 MHz, Total EIRP 33.83 dBm

SA Reading Power: -4.62 dBm

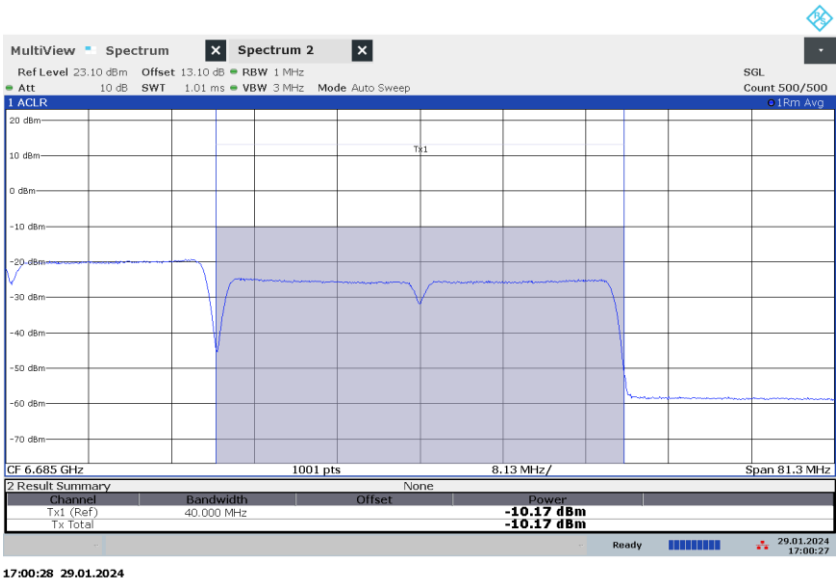


17:01:07 29.01.2024

AFC EIRP Limit 28.95 dBm

DUT Center Frequency 6685 MHz, Bandwidth 40 MHz, Total EIRP 28.44 dBm

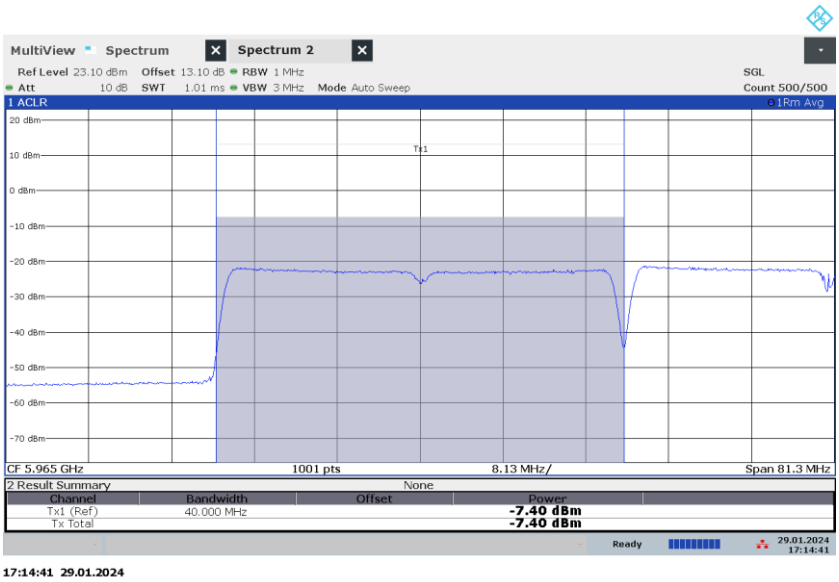
SA Reading Power: -10.17 dBm



AFC EIRP Limit 30.70 dBm

DUT Center Frequency 5965 MHz, Bandwidth 40 MHz, Total EIRP 30.59 dBm

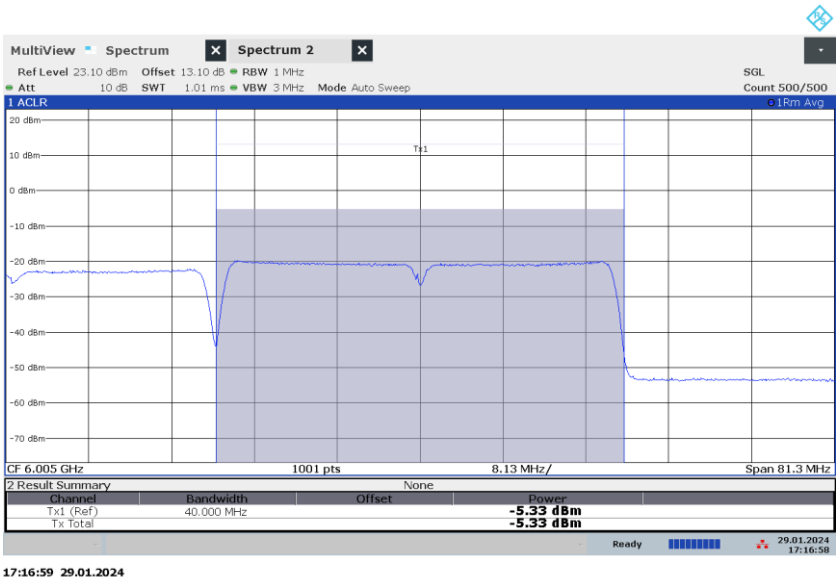
SA Reading Power: -7.40 dBm



AFC EIRP Limit 32.89 dBm

DUT Center Frequency 6005 MHz, Bandwidth 40 MHz, Total EIRP 32.48 dBm

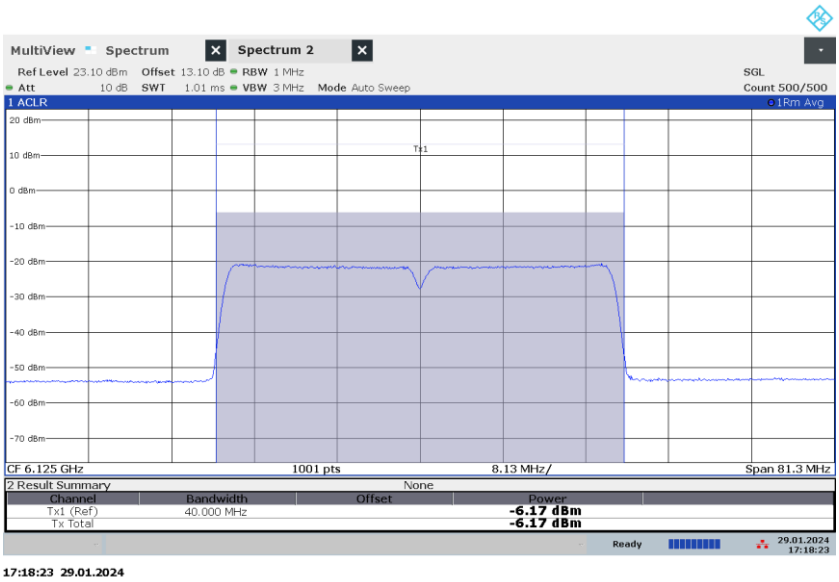
SA Reading Power: -5.33 dBm



AFC EIRP Limit 32.41 dBm

DUT Center Frequency 6125 MHz, Bandwidth 40 MHz, Total EIRP 32.00 dBm

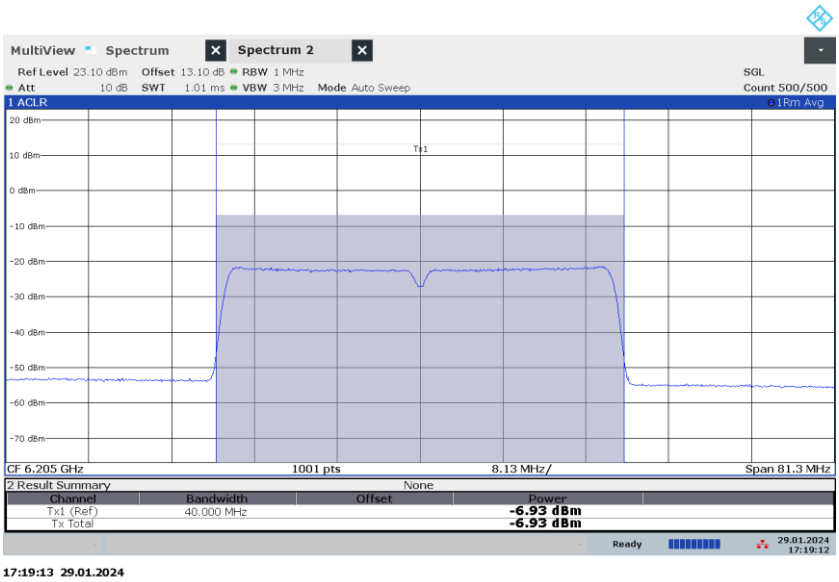
SA Reading Power: -6.17 dBm



AFC EIRP Limit 31.55 dBm

DUT Center Frequency 6205 MHz, Bandwidth 40 MHz, Total EIRP 31.40 dBm

SA Reading Power: -6.93 dBm



4.4 Unsuccessful spectrum access request

#	Description	Results
1	If the AFC DUT is Standard Power Access Point, go to Step 2, else go to Step 7	Go to step 2
2	AFC DUT set to Initial Pre-test State. If needed (see Table 5 declaration), configure the AFC DUT with BSS parameters per Table 9 and a temporary test regulatory identifier (e.g., FCC ID), geographic coordinates, antenna height, and uncertainty parameters. Configure the AFC DUT with AFC System URL and server root certificate. Trigger the AFC DUT to send to the AFC DUT Test Harness an Available Spectrum Inquiry Request.	Done
3	AFC DUT sends a valid Available Spectrum Inquiry Request containing the inquiredFrequencyRange and/or the inquiredChannels fields*.	PASS
4	AFC DUT Test Harness validates mandatory registration information.	PASS
5	AFC DUT Test Harness sends an Available Spectrum Inquiry Response indicating that no frequency ranges and/or channels are available.	Done
6	Throughout Step 2 to Step 5 and subsequent to Step 5, RF Test Equipment monitors the output of the AFC DUT to confirm the following: ● For SP only operation, AFC DUT does not transmit in the band. ● For AFC DUT whose manufacturer attests to its compliance with rules for LPI operation, the AFC DUT does not transmit above LPI limits.	PASS
7	If the AFC DUT is Fixed Client, go to Step 8 else Stop the test	Test end
8	The AFC DUT set to Initial Pre-test State.	Not applicable
9	If needed (see Table 5 declaration), configure the AFC DUT with a temporary test regulatory identifier (e.g., FCC ID or IC ID), geographic coordinates, antenna height, and uncertainty parameters. Configure the AFC DUT with AFC System URL and server root certificate. Trigger the AFC DUT to send to the AFC DUT Test Harness an Available Spectrum Inquiry Request.	Not applicable
10	AFC DUT sends a valid Available Spectrum Inquiry Request containing the inquiredFrequencyRange and/or the inquiredChannels fields*.	Not applicable
11	AFC DUT Test Harness validates mandatory registration information.	Not applicable

#	Description	Results
12	AFC DUT Test Harness sends an Available Spectrum Inquiry Response indicating that no frequency ranges and/or channels are available using either In-band or Out-of-band methods.	Not applicable
13	If AFC DUT used Out-of-band method, initiate connection procedure between Fixed Client and SP Access Point by following instructions provided by the AFC DUT Vendor	Not applicable
14	Wait for 60 seconds RF Test Equipment monitors that the AFC DUT does not transmit above maximum transmit power limits advertised by the Standard Power Access Point for Standard Client Devices in the channel.	Not applicable

4.5 AFCD.USA Test Vectors

Test Vector	Test Category	Results
AFCD.USA	Unsuccessful spectrum access request	PASS

4.6 Successful spectrum access update

#	Description	Results
1	If the AFC DUT is Standard Power Access Point, go to Step 2, else go to Step 12	Go to step 2
2	AFC DUT set to Initial Pre-test State. If needed (see Table 5 declaration), configure the DUT with BSS parameters per Table 9 and a temporary test regulatory identifier (e.g., FCC ID), geographic coordinates, antenna height, and uncertainty parameters. Configure the AFC DUT with AFC System URL and server root certificate. Trigger the AFC DUT to send to the AFC DUT Test Harness an Available Spectrum Inquiry Request.	Done
3	AFC DUT sends a valid Available Spectrum Inquiry Request containing the inquiredFrequencyRange and/or the inquiredChannels fields*.	PASS
4	AFC DUT Harness validates mandatory registration information.	PASS
5	AFC DUT Test Harness sends an Available Spectrum Inquiry Response containing a list of available frequency ranges and/or channels and the maximum permissible transmit power in the availableFrequencyInfo and/or availableChannelInfo fields.	Done

#	Description	Results
6	Throughout the preceding steps, RF Test Equipment monitors the output of the AFC DUT to confirm that the AFC DUT does not transmit: ● In the band if the AFC DUT supports only SP operation Or ● Above LPI limits for AFC DUT whose manufacturer attests to its compliance with rules for LPI operation Wait for 60 seconds RF Test Equipment monitors any transmission by the AFC DUT conforms to the following: ● For SP only operation, AFC DUT conforms to the conditions contained in the Available Spectrum Inquiry Response and does not exceed emissions limits in adjacent frequencies. ● For AFC DUT whose manufacturer attests to its compliance with rules for LPI operation, AFC DUT transmit power in the band is less than CEILING [LPI limits, SP limits contained in the Available Spectrum Inquiry Response] and does not exceed emissions limits in adjacent frequencies.	PASS
7	AFC DUT is power cycled. If needed (see Table 5 declaration), configure the AFC DUT with a temporary test regulatory identifier (e.g., FCC ID), new geographic coordinates, antenna height, and uncertainty parameters. Configure the AFC DUT with AFC System URL and server root certificate.	Done
8	Wait for 60 seconds If the AFC DUT does not send an Available Spectrum Inquiry Request, RF Test Equipment monitors the output of the AFC DUT to verify the following and STOP the test ● For SP only operation, AFC DUT does not transmit in the band. ● For AFC DUT whose manufacturer attests to its compliance with rules for LPI operation, the AFC DUT does not transmit above LPI limits. If the AFC DUT sends an Available Spectrum Inquiry Request, then CONTINUE with Step 9	PASS

#	Description	Results
9	AFC DUT Test Harness evaluates validity of mandatory registration information	PASS
10	AFC DUT Test Harness waits for 60 seconds before sending an Available Spectrum Inquiry Response containing a list of available frequency ranges and/or channels and the maximum permissible transmit power in the availableFrequencyInfo and/or availableChannelInfo fields which are significantly different from Step 5. ● During the 60 seconds wait time: ■ For AFC DUT whose manufacturer attests to its compliance with rules for LPI operation, RF Test Equipment monitors the output of the AFC DUT to confirm that AFC DUT does not transmit above LPI threshold limits ■ For SP only operation, RF Test Equipment monitors the output of the AFC DUT to confirm that AFC DUT doesn't transmit in the band	Done
11	Wait for 60 seconds RF Test Equipment monitors any transmission by the AFC DUT conforms to the following: ● For SP only operation, AFC DUT conforms to the conditions contained in the Available Spectrum Inquiry Response and does not exceed emissions limits in adjacent frequencies. ● For AFC DUT whose manufacturer attests to its compliance with rules for LPI operation, AFC DUT transmit power in the band is less than CEILING [LPI limits, SP limits contained in the Available Spectrum Inquiry Response] and does not exceed emissions limits in adjacent frequencies.	PASS
12	If the AFC DUT is Fixed Client, go to Step 13 else Stop the test	Test end
13	The AFC DUT set to Initial Pre-test State.	Not applicable

#	Description	Results
14	If needed (see Table 5 declaration), configure the AFC DUT with a temporary test regulatory identifier (e.g., FCC ID), geographic coordinates, antenna height, and uncertainty parameters. Configure the AFC DUT with AFC System URL and server root certificate. Trigger the AFC DUT to send to the AFC DUT Test Harness an Available Spectrum Inquiry Request using either In-band or Out-of-band methods.	Not applicable
15	AFC DUT sends a valid Available Spectrum Inquiry Request containing the inquiredFrequencyRange and/or the inquiredChannels fields*	Not applicable
16	AFC DUT Test Harness validates the presence of mandatory registration information	Not applicable
17	AFC DUT Test Harness sends an Available Spectrum Inquiry Response containing a list of available frequency ranges and/or channels and the maximum permissible transmit power in the availableFrequencyInfo and/or availableChannelInfo fields.	Not applicable
18	If AFC DUT used Out-of-band method, initiate connection procedure between AFC DUT and SP Access Point by following instructions provided by the AFC DUT Vendor	Not applicable
19	Wait for 60 seconds RF Test Equipment monitors any transmission by the AFC DUT conforms to the conditions contained in the Available Spectrum Inquiry Response and does not exceed emissions limits in adjacent frequencies	Not applicable
20	AFC DUT is power cycled. If needed (see Table 5 declaration), configure the AFC DUT with a temporary test regulatory identifier (e.g., FCC ID), new geographic coordinates, antenna height, and uncertainty parameters. Configure the AFC DUT with AFC System URL and server root certificate	Not applicable

#	Description	Results
21	Wait for 60 seconds If the AFC DUT does not send an Available Spectrum Inquiry Request, RF Test Equipment monitors the output of the AFC DUT to verify the AFC DUT does not transmit above maximum transmit power limits advertised by the Standard Power Access Point for Standard Client Devices in the channel and STOP the test. If the AFC DUT sends an Available Spectrum Inquiry Request, then CONTINUE with Step 21	Not applicable
22	AFC DUT Test Harness evaluates validity of mandatory registration information	Not applicable
23	AFC DUT Test Harness waits for 60 seconds before sending an Available Spectrum Inquiry Response containing a list of available frequency ranges and/or channels and the maximum permissible transmit power in the availableFrequencyInfo and/or availableChannelInfo fields which are significantly different from step 17. During the 60 seconds wait time, RF Test Equipment monitors the output of the AFC DUT to confirm that the AFC DUT does not transmit above maximum transmit power limits advertised by the Standard Power Access Point for Standard Client Devices in the channel.	Not applicable
24	If AFC DUT used Out-of-band method, initiate connection procedure between AFC DUT and SP Access Point by following instructions provided by the AFC DUT Vendor	Not applicable
25	Wait for 60 seconds RF Test Equipment monitors any transmission by the AFC DUT conforms to the conditions contained in the Available Spectrum Inquiry Response and does not exceed emissions limits in adjacent frequencies	Not applicable

4.7 AFCD.SAU Test Vectors

Test Vector	Test Category	Results
AFCD.SAU	Successful spectrum access update	PASS

4.8 AFCD.SAU RF Transmit Power Measurement

Center Frequency [MHz]	BW [MHz]	DUT Internal Loss [dB]	Duty Cycle Factor [dB]	MIMO Factor [dB]	Directional Gain [dBi]	SA Reading Power [dBm]	Total EIRP [dBm]	AFC EIRP Limit [dBm]
5965	40	16.80	1.28	3.01	16.9	-8.03	29.96	30.81
6005		16.62			16.9	-8.06	29.75	31.04
6045		16.63			16.9	-9.03	28.79	29.21
6245		16.88			16.9	-8.09	29.98	30.97
6285		16.79			16.9	-6.31	31.67	31.93
6325		16.67			16.9	-6.77	31.09	31.36
6405		16.98			16.9	-5.95	32.22	32.40
6725		17.26			17.3	-6.76	32.09	32.77

Note 1: DUT will transmit on four of the available channels that have the highest allowed power based on the response from the AFC system. During testing, four channels were validated to ensure that the EIRP power for each channel does not exceed the allowed power from the AFC, i.e., AFC EIRP Limit on the table above.

Note 2: UNII-5 Antenna Gain = 16.9dBi.
The device is driving cross-polarized antenna, which has 8 horizontal polarization antennas and 8 vertical polarization antennas. Directional Gain (8H/8V) = 16.9dBi + 10log(Ntx = 8 / Nss = 8) = 16.9dBi.

Note 3: UNII-7 Antenna Gain = 17.3dBi.
The device is driving cross-polarized antenna, which has 8 horizontal polarization antennas and 8 vertical polarization antennas. Directional Gain (8H/8V) = 17.3dBi + 10log(Ntx = 8 / Nss = 8) = 17.3dBi.

Note 4: Conducted power were measured on sum of 8 horizontal polarization output ports. MIMO factor 3.01 is considered to calculate total conducted output power.

Note 5: The path loss between the DUT and the Spectrum Analyzer has been offset and configured in the Spectrum Analyzer.

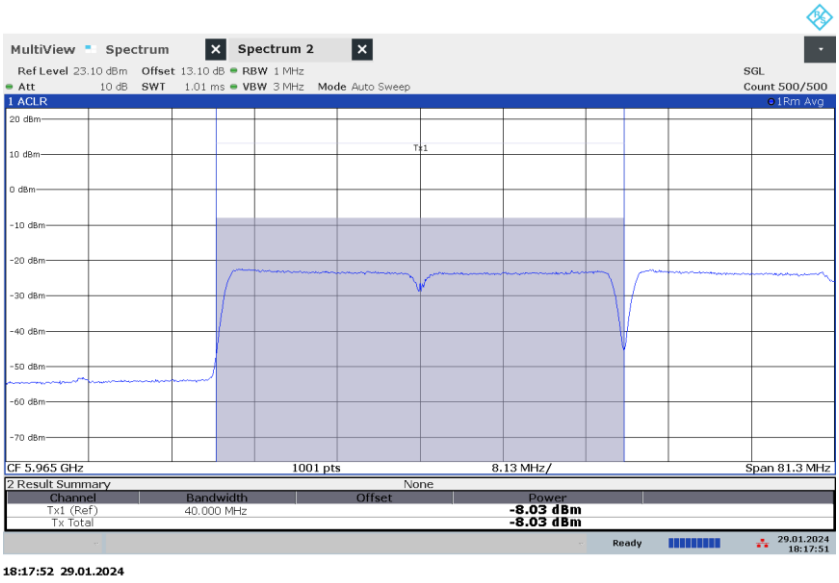
Note 6: The duty cycle factor, calculated as 10log(1/duty cycle) and listed in the table above, is used to compute the average power during continuous transmission.

DUT Duty Cycle: 74.40%

AFC EIRP Limit 30.81 dBm

DUT Center Frequency 5965 MHz, Bandwidth 40 MHz, Total EIRP 29.96 dBm

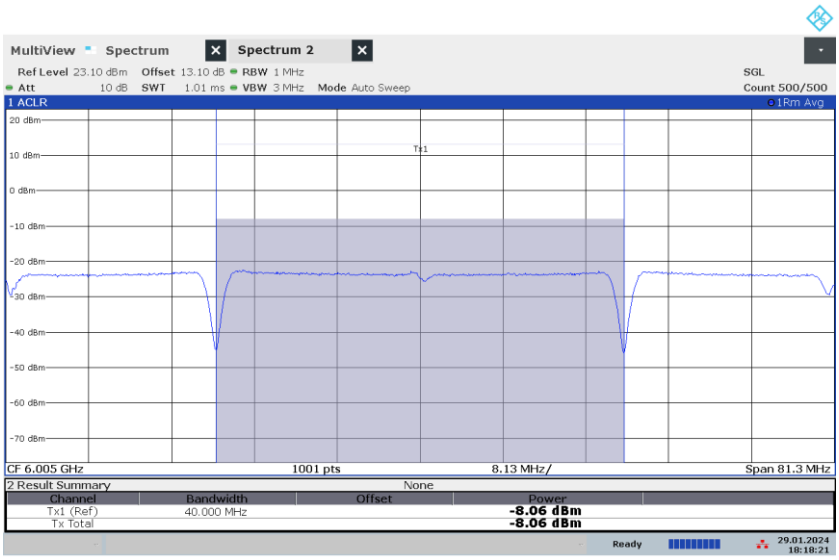
SA Reading Power: -8.03 dBm



AFC EIRP Limit 31.04 dBm

DUT Center Frequency 6005 MHz, Bandwidth 40 MHz, Total EIRP 29.75 dBm

SA Reading Power: -8.06 dBm

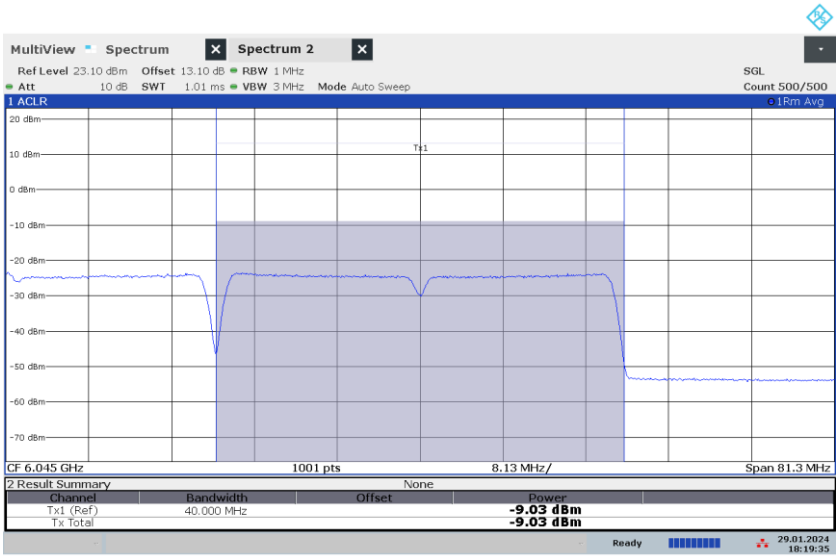


18:18:22 29.01.2024

AFC EIRP Limit 29.21 dBm

DUT Center Frequency 6045 MHz, Bandwidth 40 MHz, Total EIRP 28.79 dBm

SA Reading Power: -9.03 dBm

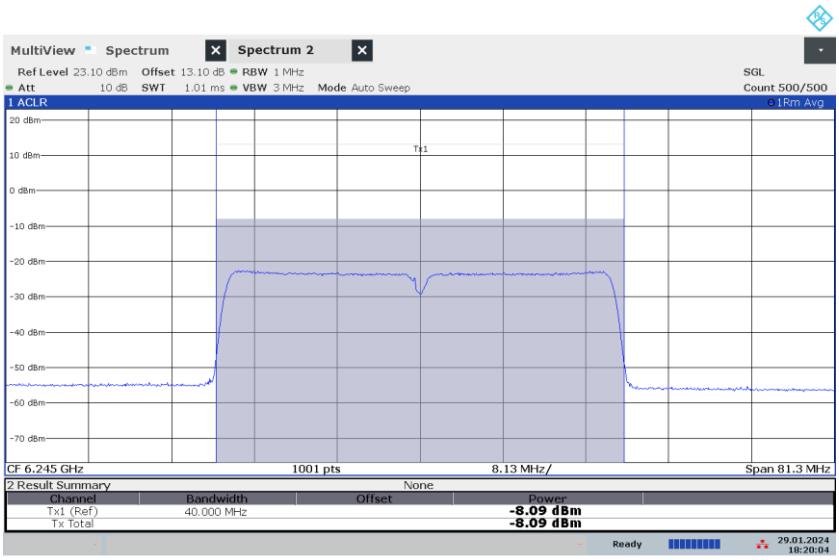


18:19:36 29.01.2024

AFC EIRP Limit 30.97 dBm

DUT Center Frequency 6245 MHz, Bandwidth 40 MHz, Total EIRP 29.98 dBm

SA Reading Power: -8.09 dBm

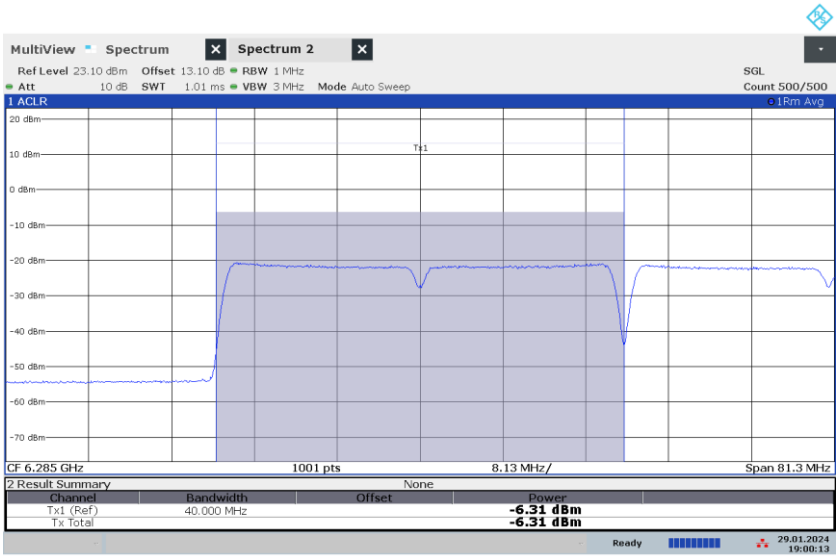


18:20:04 29.01.2024

AFC EIRP Limit 31.93 dBm

DUT Center Frequency 6285 MHz, Bandwidth 40 MHz, Total EIRP 31.67 dBm

SA Reading Power: -6.31 dBm

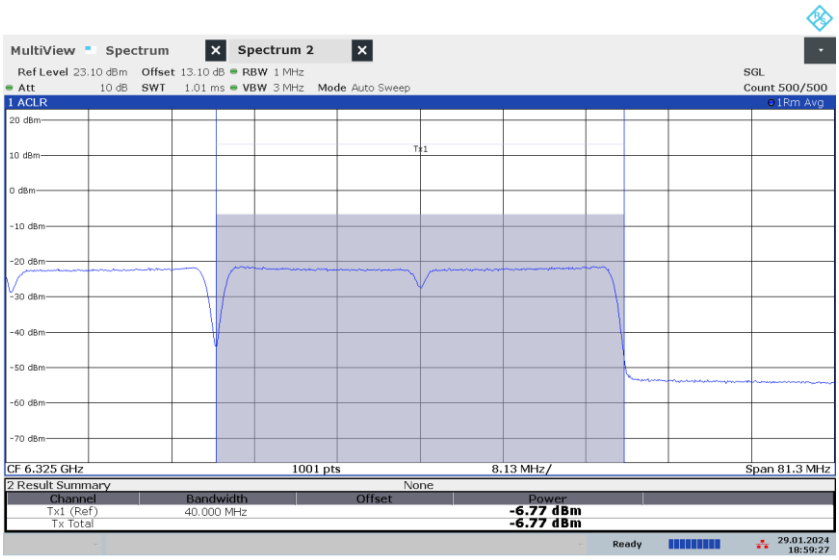


19:00:14 29.01.2024

AFC EIRP Limit 31.36 dBm

DUT Center Frequency 6325 MHz, Bandwidth 40 MHz, Total EIRP 31.09 dBm

SA Reading Power: -6.77 dBm

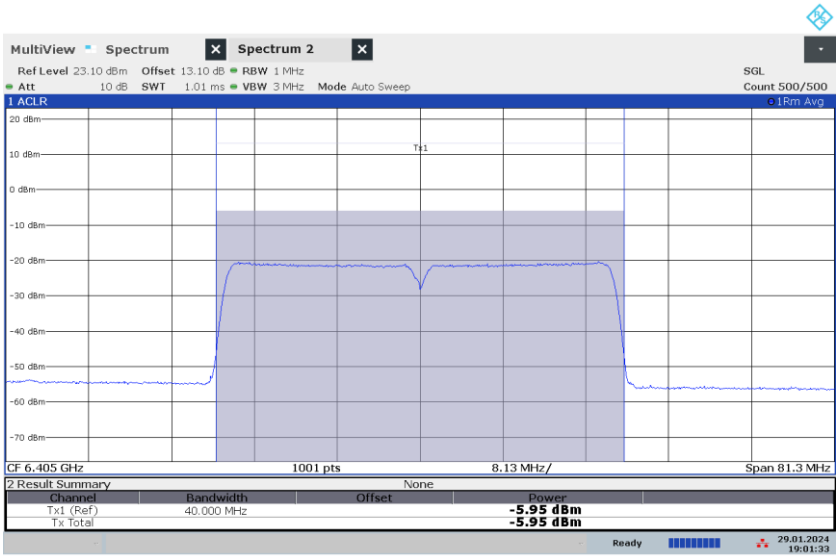


18:59:28 29.01.2024

AFC EIRP Limit 32.40 dBm

DUT Center Frequency 6405 MHz, Bandwidth 40 MHz, Total EIRP 32.22 dBm

SA Reading Power: -5.95 dBm

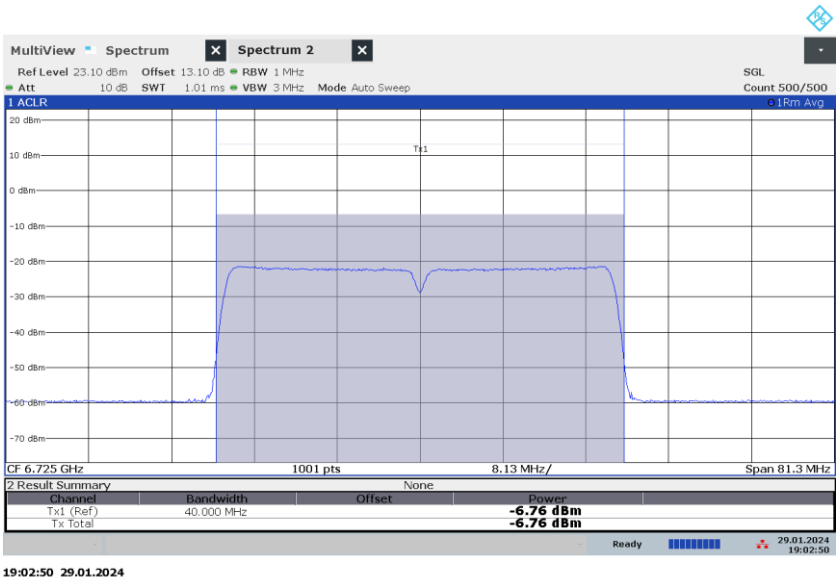


19:01:34 29.01.2024

AFC EIRP Limit 32.77 dBm

DUT Center Frequency 6725 MHz, Bandwidth 40 MHz, Total EIRP 32.09 dBm

SA Reading Power: -6.76 dBm



4.9 Unsuccessful spectrum access update

#	Description	Results
1	If the AFC DUT is Standard Power Access Point, go to Step 2, else go to Step 12	Go to step 2
2	AFC DUT set to Initial Pre-test State. If needed (see Table 5 declaration), configure the AFC DUT with BSS parameters per Table 9 and a temporary test regulatory identifier (e.g., FCC ID), geographic coordinates, antenna height, and uncertainty parameters. Configure the DUT with AFC System URL and server root certificate. Trigger the DUT to send to the AFC DUT Test Harness an Available Spectrum Inquiry Request using either In-band or Out-of-band methods.	Done
3	AFC DUT sends a valid Available Spectrum Inquiry Request containing the inquiredFrequencyRange and/or the inquiredChannels fields.	PASS
4	AFC DUT Test Harness validates mandatory registration information	PASS
5	AFC DUT Test Harness sends an Available Spectrum Inquiry Response containing a list of available frequency ranges and/or channels and the maximum permissible transmit power in the availableFrequencyInfo and/or availableChannelInfo fields.	Done
6	Throughout the Step 2 to 5, RF Test Equipment monitors the output of the AFC DUT to confirm that the AFC DUT does not transmit: ● In the band if the AFC DUT supports only SP operation Or ● Above LPI limits for AFC DUT whose manufacturer attests to its compliance with rules for LPI operation Wait for 60 seconds RF Test Equipment monitors any transmission by the AFC DUT conforms to the following: ● For SP only operation, AFC DUT conforms to the conditions contained in the Available Spectrum Inquiry Response and does not exceed emissions limits in adjacent frequencies. For AFC DUT whose manufacturer attests to its compliance with rules for LPI operation, AFC DUT transmit power in the band is less than CEILING [LPI limits, SP limits contained in the Available Spectrum Inquiry Response] and does not exceed emissions limits in adjacent frequencies	PASS

#	Description	Results
7	AFC DUT is power cycled. If needed (see Table 5declaration), configure the AFC DUT with a temporary test regulatory identifier (e.g., FCC ID), new geographic coordinates, antenna height, and uncertainty parameters. Configure the AFC DUT with AFC System URL and server root certificate.	Done
8	Wait for 60 seconds ● If the AFC DUT does not send an Available Spectrum Inquiry Request, RF Test Equipment monitors the output of the DUT to verify the following and STOP the test: ■ For SP only operation, AFC DUT does not transmit in the band, ■ For AFC DUT whose manufacturer attests to its compliance with rules for LPI operation, the AFC DUT does not transmit above LPI limits. ● If the AFC DUT sends an Available Spectrum Inquiry Request, then CONTINUE with Step 8	PASS
9	AFC DUT Test Harness evaluates validity of mandatory registration information.	PASS
10	AFC DUT Test Harness sends an Available Spectrum Inquiry Response indicating that no frequency ranges and/or channels are available.	Done
11	Throughout Step 7 to 10 and subsequent to Step 10 Test Equipment monitors the output of the AFC DUT to confirm that: For SP only operation, AFC DUT does not transmit in the band. For AFC DUT whose manufacturer attests to its compliance with rules for LPI operation, the AFC DUT does not transmit above LPI limits.	PASS
12	If the AFC DUT is Fixed Client, go to Step 13 else Stop the test	Test end
13	The AFC DUT set to Initial Pre-test State.	Not applicable

#	Description	Results
14	If needed (see Table 5 declaration), configure the DUT with a temporary test regulatory identifier (e.g., FCC ID), geographic coordinates, antenna height, and uncertainty parameters. Configure the AFC DUT with AFC System URL and server root certificate. Trigger the AFC DUT to send to the AFC DUT Test Harness an Available Spectrum Inquiry Request using either In-band or Out-of-band methods.	Not applicable
15	AFC DUT sends a valid Available Spectrum Inquiry Request containing the inquiredFrequencyRange and/or the inquiredChannels fields*	Not applicable
16	AFC DUT Test Harness validates the presence of mandatory registration information	Not applicable
17	AFC DUT Test Harness sends an Available Spectrum Inquiry Response containing a list of available frequency ranges and/or channels and the maximum permissible transmit power in the availableFrequencyInfo and/or availableChannelInfo fields.	Not applicable
18	If AFC DUT used Out-of-band method, initiate connection procedure between AFC DUT and SP Access Point by following instructions provided by the AFC DUT Vendor	Not applicable
19	Wait for 60 seconds RF Test Equipment monitors any transmission by the AFC DUT conforms to the conditions contained in the Available Spectrum Inquiry Response and does not exceed emissions limits in adjacent frequencies	Not applicable
20	AFC DUT is power cycled. If needed (see Table 5 declaration), configure the AFC DUT with a temporary test regulatory identifier (e.g., FCC ID or IC ID), new geographic coordinates, antenna height, and uncertainty parameters. Configure the AFC DUT with AFC System URL and server root certificate	Not applicable
21	Wait for 60 seconds If the AFC DUT does not send an Available Spectrum Inquiry Request, RF Test Equipment monitors that the AFC DUT does not transmit above maximum transmit power limits advertised by the Standard Power Access Point for Standard Client Devices in the channel., If the AFC DUT sends an Available Spectrum Inquiry Request, then CONTINUE with Step 22 else STOP the test	Not applicable

#	Description	Results
22	AFC DUT Test Harness evaluates validity of mandatory registration information.	Not applicable
23	AFC DUT Test Harness sends an Available Spectrum Inquiry Response indicating that no frequency ranges and/or channels are available.	Not applicable
24	If AFC DUT used Out-of-band method, initiate connection procedure between AFC DUT and SP Access Point by following instructions provided by the AFC DUT Vendor	Not applicable
25	Wait for 60 seconds RF Test Equipment monitors that the AFC DUT does not transmit above maximum transmit power limits advertised by the Standard Power Access Point for Standard Client Devices in the channel.	Not applicable

4.10 AFCD.UAU Test Vectors

Test Vector	Test Category	Results
AFCD.UAU	Unsuccessful spectrum access update	PASS

4.11 Unsuccessful server validation

#	Description	Results
1	The AFC DUT set to Initial Pre-test State. If needed (see Table 5 declaration), configure the AFC DUT with BSS parameters per Table 9 and a temporary test regulatory identifier (e.g., FCC ID), geographic coordinates, antenna height, and uncertainty parameters. Configure the AFC DUT Test Harness with TLS configuration that is the same as the default configuration defined in Section 2.3.1 except for the following: ● Run 1: A different server certificate (and private key) with SAN domain name entry "badafc.com" (i.e. that does not match AFC system URL's domain name); signed by the same root certificate as per Section 2.3.1 ● Run 2: A different server certificate (and private key) where all attributes other than Public Key are the same as the server certificate per Section 2.3.1, but the certificate is signed by a different root certificate ● Run 3: A different server certificate (and private key) with SAN domain name entry "wfatestorg.org" only (i.e. SAN domain name only matches suffix of AFC server's hostname); signed by the same root certificate as per Section 2.3.1 ● Run 4: A different server certificate (and private key) where all attributes other than Public Key are the same as the server certificate per Section 2.3.1 signed by the same root certificate as per Section 2.3.1, but the server certificate is revoked as indicated in stapled OCSP response ● Run 5: Same configuration as per Section 2.3.1, except OCSP stapling is disabled and CRL/OCSP servers are not available ● Run 6: Same configuration as per Section 2.3.1, except stapled OCSP response has expired and CRL/OCSP servers are not available ● Run 7: Same configuration as per Section 2.3.1, except only the TLS cipher suite "eNULL" (no encryption) is enabled ● Run 8: N/A (same configuration as per Section 2.3.1) Configure the DUT with the AFC System URL and the following root certificate: ● Runs 1-7: Root certificate as per Section 2.3.1 ● Run 8: No root certificate Trigger the DUT to send to the AFC DUT Test Harness an Available Spectrum Inquiry Request.	Done

#	Description	Results
2	AFC DUT Test Harness waits 10 seconds, and verifies no Available Spectrum Inquiry Request is sent to it.	PASS
3	Steps 1 and 2 are repeated for each of the remaining Runs	PASS

4.12 AFCD.USV Test Vectors

Test Vector	Test Category	Results
AFCD.USV	Unsuccessful server validation	PASS

Appendix B. AFC DUT Test Logs and Tool Report

Section	Test Case ID	Test Description	FCC Requirement	Short Description	Test Result
4.1	AFCD.RSA	Successful registration and spectrum access request	47 CFR Section 15.407(k)(1)	Transmit only as instructed by AFC System	PASS
			47 CFR Section 15.407(k)(8)(i)	Register with AFC System prior to initial transmission	
			47 CFR Section 15.407(k)(8)(ii)	Provide required registration parameters	
			47 CFR Section 15.407(k)(8)(iii)	Registration either directly or via proxy	
			47 CFR Section 15.407(l)(ii)	Determination of appropriate channel configuration implied by AFC System response	
			47 CFR 15.407(k)(8)(iv)	Must contact an AFC system at least once per day to obtain the latest list of available frequencies and the maximum permissible power	

Note: For AFCD.RSA test logs, please refer to following files:

1. Tarana BN-4 Carriers_RSA31_AFC DUT Compliance Test Report.pdf
2. Tarana BN-4 Carriers_RSA31_DUT_Available_Spectrum_Inquiry_Request-Response.pdf

Section	Test Case ID	Test Description	FCC Requirement	Short Description	Test Result
4.2	AFCD.USA	Unsuccessful registration and spectrum access request	47 CFR Section 15.407(k)(1)	Transmit only as instructed by AFC System	PASS
			47 CFR Section 15.407(k)(8)(i)	Register with AFC System prior to initial transmission	
			47 CFR Section 15.407(k)(8)(ii)	Provide required registration parameters	
			47 CFR Section 15.407(k)(8)(iii)	Registration either directly or via proxy	

Note: For AFCD.USA test logs, please refer to following files:

1. Tarana BN-4 Carriers_USA32_AFC DUT Compliance Test Report.pdf
2. Tarana BN-4 Carriers_USA32_DUT_Available_Spectrum_Inquiry_Request-Response.pdf

Section	Test Case ID	Test Description	FCC Requirement	Short Description	Test Result
4.3	AFCD.SAU	Successful spectrum access update	47 CFR Section 15.407(k)(8)(i)	Register with AFC System after change of location	PASS
			47 CFR Section 15.407(k)(8)(ii)	Update AFC System upon change of registration parameters	
			47 CFR Section 15.407(k)(9)(i)	Report location and uncertainty from power-off condition	

Note: For AFCD.SAU test logs, please refer to following files:

1. Tarana BN-4 Carriers_SAU33_AFC DUT Compliance Test Report.pdf
2. Tarana BN-4 Carriers_SAU33_DUT_Available_Spectrum_Inquiry_Request-Response.pdf

Section	Test Case ID	Test Description	FCC Requirement	Short Description	Test Result
4.4	AFCD.UAU	Unsuccessful spectrum access update	47 CFR Section 15.407(k)(8)(i)	Register with AFC System after change of location	PASS
			47 CFR Section 15.407(k)(8)(ii)	Update AFC System upon change of registration parameters	
			47 CFR Section 15.407(k)(9)(i)	Report location and uncertainty from power-off condition	

Note: For AFCD.UAU test logs, please refer to following files:

1. Tarana BN-4 Carriers_UAU34_AFC DUT Compliance Test Report.pdf
2. Tarana BN-4 Carriers_UAU34_DUT_Available_Spectrum_Inquiry_Request-Response.pdf

Section	Test Case ID	Test Description	FCC Requirement	Short Description	Test Result
4.5	AFCD.USV	Unsuccessful server validation	47 CFR Section 15.407(k)(8)(v)	Incorporate adequate security measurements to prevent it from accessing AFC systems not approved by the FCC	PASS

Note: For AFCD.USV test logs, please refer to following files:

1. Tarana BN-4 Carriers_USV35_AFC DUT Compliance Test Report.pdf

———THE END———