

CERTIFICATION TEST REPORT

Report Number. : U-4791479704-FR2V2

Applicant : SAMSUNG ELECTRONICS CO., LTD.
129 SAMSUNG-RO, YEONGTONG-GU, SUWON-SI,
GYEONGGI-DO, 16677, KOREA

Model : WCF933M

FCC ID : A3LWCF933M

IC : 649E-WCF933M

EUT Description : DTS/UNII a/b/g/n/ac/ax module and BT/BLE

Test Standard(s) : FCC 47 CFR PART 15 SUBPART C
INDUSTRY CANADA RSS-247 Issue 3
INDUSTRY CANADA RSS-GEN Issue 5

Date Of Issue:

2025-01-23

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Revision History

Rev.	Issue Date	Revisions	Revised By
V1	2025-01-17	Initial issue	Jaehyeok Bang
V2	2025-01-23	Updated to address TCB`s question	Jaehyeok Bang

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: SAMSUNG ELECTRONICS CO., LTD.

EUT DESCRIPTION: DTS/UNII a/b/g/n/ac/ax module and BT/BLE

MODEL NUMBER: WCF933M

SERIAL NUMBER: 4C573957A86E(2) (CONDUCTED);
4C573957A868(3), 4C573957A85E(5) (RADIATED);

DATE TESTED: 2024-12-03 ~ 2025-01-07

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
47 CFR Part 15 Subpart C	Complies
INDUSTRY CANADA RSS-247 Issue 3	Complies
INDUSTRY CANADA RSS-GEN Issue 5	Complies

UL KOREA LTD. tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL KOREA LTD. based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL KOREA LTD. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL KOREA LTD. will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by IAS, any agency of the Federal Government, or any agency of any government.

Approved & Released For
UL KOREA LTD. By:



Changmin Kim
Senior Laboratory Engineer
UL Korea, Ltd.

Tested By:



Jaehyeok Bang
Laboratory Test Engineer
UL Korea, Ltd.

2. MANUFACTURER INFORMATION

Applicant Information

Company Name: SAMSUNG ELECTRONICS CO., LTD.
Address: 129 SAMSUNG-RO, YEONGTONG-GU, SUWON-SI,
GYEONGGI-DO, 16677, KOREA

Manufacturer Information 1

Company Name: Chengdu Xuguang Technology Co., Ltd.
Address: No.86 2nd Section, Park Road, Longquanyi District, Chengdu City,
Sichuan Province, P.R.China

Manufacturer Information 2

Company Name: CHEMTROVINA COMPANY LIMITED
Address: Nhon Trach 2 – Loc Khang IZ, Hiep Phuoc Town, Nhon Trach
District,, Dong Nai Province, Vietnam

Manufacturer Information 3

Company Name: CHEMTRONICS CO., LTD.
Address: 35, Buk-ri, Namsa-myeon, Cheoin-gu, Yongin-si, Gyeonggi-do,
Korea

Manufacturer Information 4

Company Name: SJIT CO., LTD.
Address: #54-11, Dongtanhana 1 gil, Hwaseong-si, Gyeonggi-Do, Korea

Company Name: SJIT VINA Co., Ltd
Address: Lot X2, Ho Nai Industrial Zone, Ho Nai 3 Commune, Trang Bom
District, Dong Nai Province, Vietnam

3. TEST METHODOLOGY

1. FCC 47 CFR Part 2.
2. FCC 47 CFR Part 15.
3. KDB 558074 D01 15.247 Meas Guidance v05r02.
4. IC RSS-247 Issue 3.
5. IC RSS-Gen Issue 5.
6. ANSI C63.10-2020.

4. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 42, Obongsandan 1-ro, Uiwang-si, Gyeonggi-do, Republic of Korea. Line conducted emissions are measured only at the 218 address. The following table identifies which facilities were utilized for radiated emission measurements documented in this report. Specific facilities are also identified in the test results sections.

42, Obongsandan 1-ro	
☒	Chamber 1
☒	Chamber 2

Used ISED Test Site Reg.(company number): 32001

CAB Identifier: KR0161

UL Korea, Ltd. is accredited by IAS, Laboratory Code TL-1087. The full scope of accreditation can be viewed at <https://www.iasonline.org/wp-content/uploads/2022/05/TL-1087-Cert-New.pdf>

5. DECISION RULES AND MEASUREMENT UNCERTAINTY

5.1. METROLOGICAL TRACEABILITY

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations and is traceable to recognized national standards.

5.2. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

$$\begin{aligned} \text{Field Strength (dBuV/m)} &= \text{Measured Voltage (dBuV)} + \text{Antenna Factor (dB/m)} + \\ &\text{Cable Loss (dB)} - \text{Preamplifier Gain (dB)} \\ 28.9 \text{ dBuV/m} &= 36.5 \text{ dBuV} + 18.7 \text{ dB/m} + 0.6 \text{ dB} - 26.9 \text{ dB} \end{aligned}$$

$$\begin{aligned} \text{AC Corrected Reading (dBuV)} &= \text{Measured Voltage (dBuV)} + \text{Extension Cord} \\ &\text{Loss (dB)} + \text{Cable Loss (dB)} \\ 44.72 \text{ dBuV} &= 34.72 \text{ dBuV} + 9.9 \text{ dB} + 0.1 \text{ dB} \end{aligned}$$

5.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

Common Items

PARAMETER	UNCERTAINTY
RF Output Power	0.94 dB
Power Spectral Density	0.85 dB
Occupied Bandwidth	0.07 %
Conducted Spurious Emissions	1.21 dB
AC Power Line Conducted Emissions	2.32 dB

Uncertainty figures are valid to a confidence level of 95%, k=2

Chamber 1

PARAMETER	UNCERTAINTY
Radiated Disturbance, 30 MHz to 1 GHz	3.64 dB
Radiated Disturbance, 1 GHz to 18 GHz	5.38 dB
Radiated Disturbance, Above 18 GHz	6.23 dB

Uncertainty figures are valid to a confidence level of 95%, k=2

Chamber 2

PARAMETER	UNCERTAINTY
Radiated Disturbance, 9 kHz to 30 MHz	1.66 dB
Radiated Disturbance, 1 GHz to 18 GHz	5.39 dB

Uncertainty figures are valid to a confidence level of 95%, k=2

5.4. DECISION RULES

Decision rule for statement(s) of conformity is based on Clause 4.3.3 in IEC Guide 115:2023.
Measurement Uncertainty is not applied when providing statements of conformity in accordance with IEC Guide 115:2023, 4.3.3

6. EQUIPMENT UNDER TEST

6.1. EUT DESCRIPTION

The EUT is a DTS/UNII a/b/g/n/ac/ax module and BT/BLE.
This test report addresses the DTS (BLE) operational mode.

Representative model	Software	Hardware Type	Difference
WCF933M	Same	Type1	Basic
		Type2	1) Change the gravity sensor position 2) Add Illuminance Sensor dualization Parts
Note1. H/W changes that are not RF related. Spot-Check test was performed on Type2. The hardware Type 1 was used for final testing and is representative of the test results in this report.			

6.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum peak conducted output power as follows:

Antenna 0

Frequency Range[MHz]	Mode	Power Mode	Output Power	Output Power	Antenna gain [dBi]	e.i.r.p ^{Note1}
			[dBm]	[mW]		[dBm]
2 402 ~ 2 480	1 Mbps (255 pkt)	Peak	12.550	17.989	-2.06	10.49
		Average	12.124	16.308	-	-
	2 Mbps (255 pkt)	Peak	12.650	18.408	-2.06	10.59
		Average	11.940	15.631	-	-

Antenna 1

Frequency Range[MHz]	Mode	Power Mode	Output Power	Output Power	Antenna gain [dBi]	e.i.r.p ^{Note1}
			[dBm]	[mW]		[dBm]
2 402 ~ 2 480	1 Mbps (255 pkt)	Peak	12.480	17.701	1.60	14.08
		Average	11.953	15.678	-	-
	2 Mbps (255 pkt)	Peak	12.220	16.672	1.60	13.82
		Average	11.728	14.887	-	-

Note 1: e.i.r.p = Output Power[dBm] + Antenna gain[dBi]

6.3. DESCRIPTION OF AVAILABLE ANTENNAS

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

**The internal antenna was Permanently attached.
Therefore this E.U.T Complies with the requirement of §15.203.**

The radio utilizes a internal antenna, with a maximum gain of:

Frequency Band[MHz]	ANT0 Gain [dBi]	ANT1 Gain [dBi]
2400 – 2483.5	-2.06	1.60

6.4. WORST-CASE CONFIGURATION AND MODE

The fundamentals of the EUT were investigated in three orthogonal orientations X, Y and Z. It was determined that below table's orientation was the worst-case orientation.

ANT0	ANT1
Y	

Radiated and power line conducted tests were performed with EUT connected to AC power adapter as the worst-case configuration. Radiated harmonics spurious 1~18 GHz Low/Mid/High channels, 18-26GHz were performed with the EUT set at the 1Tx mode. Radiated emission below 1GHz and power line conducted emission were performed with the EUT set to transmit at the channel with highest output power as worst-case scenario.

All radiated and power line conducted tests were performed attached with travel adapter for the worst-case condition mode.

Power verification

The Output Power of all data rate are all investigated, the 1 Mbps(255 pkt) and 2 Mbps(255 pkt) power is the worst case for symbol rate. All tests were performed in these two modes.

Antenna	Symbol Rate [Ms/s]	Mode	Freq. [MHz]	Conducted Burst Avg [dBm]	Symbol Rate [Ms/s]	Mode	Freq. [MHz]	Conducted Burst Avg [dBm]
Ant 0	1	1 Mbps 37 pkt	2 402	11.502	2	2 Mbps 37 pkt	2 402	11.361
			2 440	11.622			2 440	11.517
			2 480	12.044			2 480	11.869
		1 Mbps 255 pkt	2 402	11.548		2 Mbps 255 pkt	2 402	11.374
			2 440	11.641			2 440	11.506
			2 480	12.124			2 480	11.940
	1 Coded S=8	125 kbps 37 pkt	2 402	11.614	1 Coded S=2	500 kbps 37 pkt	2 402	11.595
			2 440	11.719			2 440	11.746
			2 480	12.082			2 480	12.081
		125 kbps 255 pkt	2 402	11.609		500 kbps 255 pk	2 402	11.617
			2 440	11.746			2 440	11.693
			2 480	12.116			2 480	12.113
Ant 1	1	1 Mbps 37 pkt	2 402	11.868	2	2 Mbps 37 pkt	2 402	11.693
			2 440	11.845			2 440	11.675
			2 480	11.748			2 480	11.553
		1 Mbps 255 pkt	2 402	11.903		2 Mbps 255 pkt	2 402	11.728
			2 440	11.953			2 440	11.715
			2 480	11.839			2 480	11.613
	1 Coded S=8	125 kbps 37 pkt	2 402	11.894	1 Coded S=2	500 kbps 37 pkt	2 402	11.880
			2 440	11.869			2 440	11.805
			2 480	11.774			2 480	11.733
		125 kbps 255 pkt	2 402	11.895		500 kbps 255 pkt	2 402	11.935
			2 440	11.903			2 440	11.939
			2 480	11.814			2 480	11.833

6.5. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
Test Jig	MediaTek	-	-	N/A
Laptop	Lenovo	TP00136D	PF-4M6STB	N/A
Charger	Lenovo	ADLX45YCC3G	8SSA10R16915C2TJ	N/A

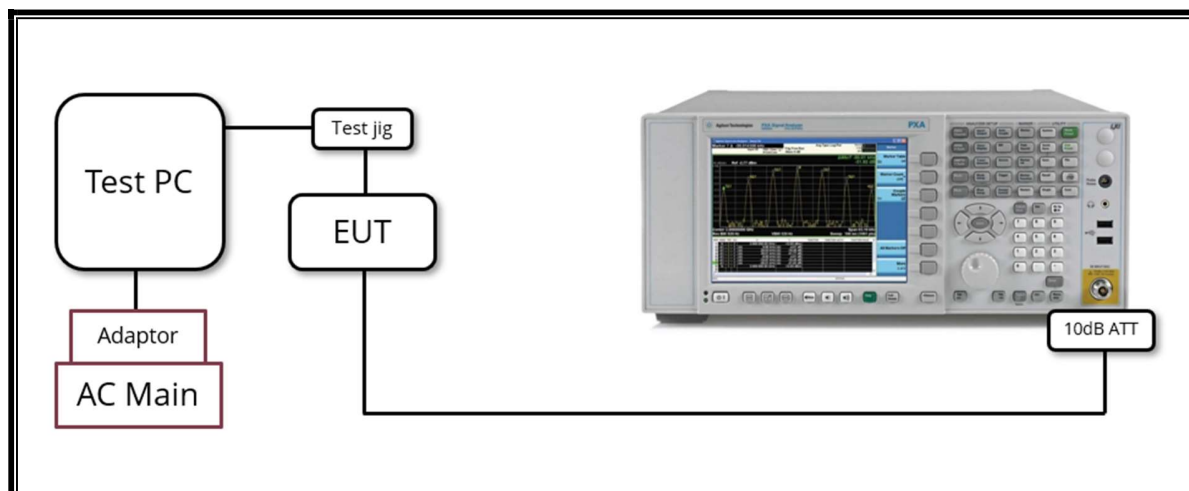
I/O CABLE

I/O Cable List						
Cable No.	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	DC Power and Data	1	24 pin	Unshielded	20 cm	N/A

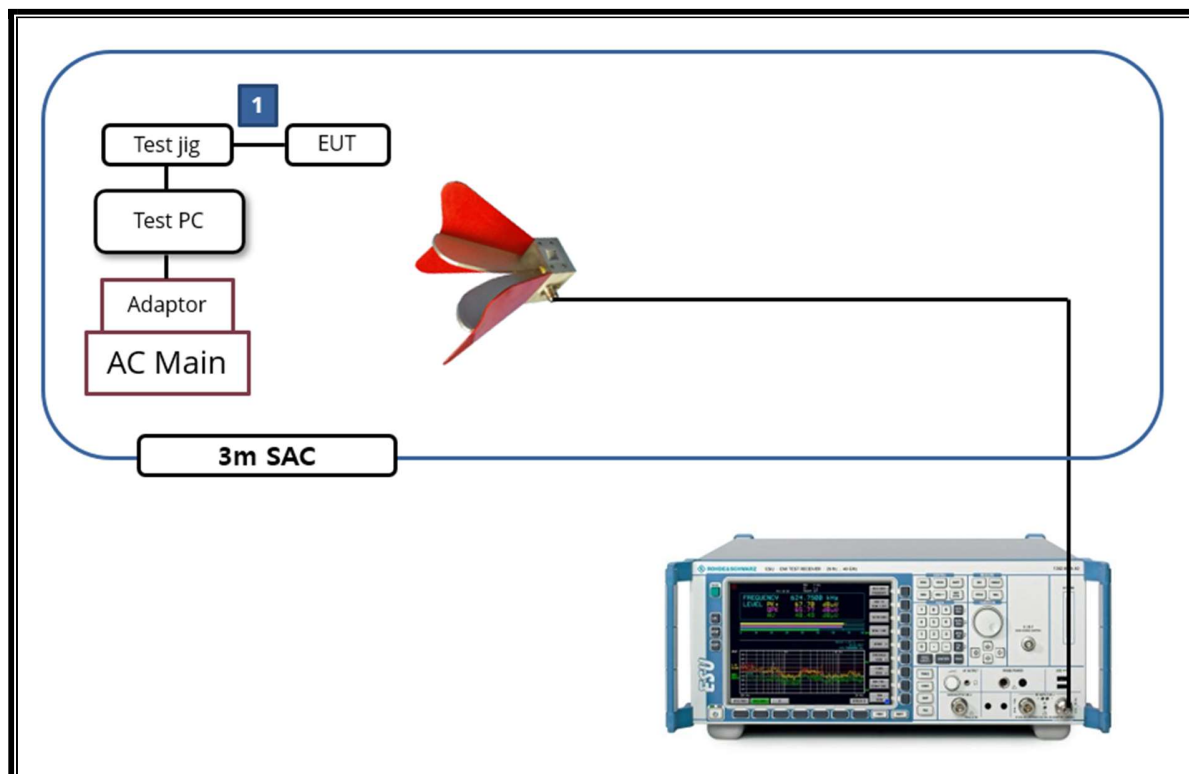
TEST SETUP

The EUT is a stand-alone unit during the tests.
Test software exercised the EUT to enable BLE mode.

SETUP DIAGRAM FOR TESTS (CONDUCTED TEST SETUP)



SETUP DIAGRAM FOR TESTS (RADIATED TEST SETUP)



7. MEASUREMENT METHOD

6 dB BW : ANSI C63.10-2020, Section 11.8.2 Option 2

OUTPUT POWER : ANSI C63.10-2020, Section 11.9.1.1 RBW $\geq$ DTS bandwidth

POWER SPECTRAL DENSITY : ANSI C63.10-2020, Section 11.10.2 Method PKPSD (peak PSD)

Out-of-band Emissions (Conducted) : ANSI C63.10-2020, Section 11.11 Emissions in nonrestricted frequency bands

Out-of-band Emissions in Non-restricted Bands: ANSI C63.10-2020, Section 11.11 Emissions in nonrestricted frequency bands

Out-of-band Emissions in Restricted Bands : ANSI C63.10-2020, Section 11.12 Emissions in restricted frequency bands

AC Power Line Conducted Emission : ANSI C63.10-2020, Section 6.2

8. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due date
Spectrum Analyzer	Rohde & Schwarz	FSW50	101567	2024-07-18	2025-07-18
Spectrum Analyzer	KEYSIGHT	N9030B	MY57143717	2024-07-23	2025-07-23
EMI Test Receiver	Rohde & Schwarz	ESW44	103297	2024-07-18	2025-07-18
EMI Test Receiver	Rohde & Schwarz	ESW44	103313	2024-01-29	2025-01-29
EMI Test Receiver	Rohde & Schwarz	ESW44	103350	2024-04-08	2025-04-08
EMI Test Receiver	Rohde & Schwarz	ESR7	102328	2024-01-29	2025-01-29
2 Line LISN	Rohde & Schwarz	EVN216	102638	2024-01-30	2025-01-30
Signal Generator	Rohde & Schwarz	SMB100A	184060	2024-07-18	2025-07-18
Loop Antenna	TESEQ	HLA 6121	65111	2023-08-01	2025-08-01
TRILOG BROADBAND ANTENNA	Schwarzbeck	VULB 9163	01670	2023-10-17	2025-10-17
Double-Ridged Guide Antenna	ETS LINDGREN	3117	00261223	2024-09-24	2025-09-24
Double-Ridged Guide Antenna	ETS LINDGREN	3117	00261463	2024-09-20	2025-09-20
DOUBLE-RIDGED WAVEGUIDE HORN ANTENNA	ETS LINDGREN	3116C	00261440	2024-09-20	2025-09-20
Amplifier	ETS LINDGREN	3116C-PA	00261440	2024-09-20	2025-09-20
Signal Conditioning Unit	Rohde & Schwarz	SCU01F	100316	2024-03-22	2025-03-22
Amplifier	EXYNOD	ELNA03-40D	631509	2024-07-18	2025-07-18
Amplifier	BNZ	BZR-01001800-231040-182020	28452	2024-04-08	2025-04-08
Amplifier	BNZ	BZR-01001800-231040-181515	31049	2024-07-18	2025-07-18
Attenuator	Centric RF	C040-10	N/A	2024-01-11	2025-01-11
Attenuator	EXYNOD	RLAN-210-18G	10A001	2024-04-08	2025-04-08
Fixed Attenuator	PASTERNAK	PE7087-10	2241	2024-07-18	2025-07-18
Low Pass Filter	Micro-Tronics	LPS17541	019	2024-07-18	2025-07-18
Low Pass Filter	Micro-Tronics	LPS17541	050	2024-04-08	2025-04-08
High Pass Filter	Micro-Tronics	HPM50107	G115	2024-07-18	2025-07-18
High Pass Filter	Micro-Tronics	HPM17543	021	2024-07-18	2025-07-18
High Pass Filter	Micro-Tronics	HPS17542	020	2024-07-18	2025-07-18
High Pass Filter	Micro-Tronics	HPM17543	051	2024-04-08	2025-04-08
High Pass Filter	Micro-Tronics	HPS17542	051	2024-04-08	2025-04-08
Humidity/Baro/Temp DATA RECORDER	Lutron	MHB-382SD	AL.92208	2024-07-23	2025-07-23
Humidity/Baro/Temp DATA RECORDER	Lutron	MHB-382SD	AM.00223	2024-01-11	2025-01-11
				2025-01-02	2026-01-02
Humidity/Baro/Temp DATA RECORDER	Lutron	MHB-382SD	AM.00227	2024-01-11	2025-01-11
				2025-01-02	2026-01-02
Digital Multimeter	Fluke Corporation	17B+	51260820WS	2024-07-18	2025-07-18

UL Software			
Description	Manufacturer	Model	Vesrsion
Radiated software	UL	UL EMC	Ver 9.5
AC Line Conducted Software	Rohde & Schwarz	EMC32	Ver 11.10.00

9. TEST RESULTS SUMMARY

FCC Part Section	IC Part Section	Test Description	Test Limit	Test Condition	Test Result
15.247 (a)(2)	RSS-247 5.2(a)	Occupied Bandwidth (6dB & 99%)	> 500kHz	Conducted	Complies
2.1051, 15.247(d)	RSS-247 5.5	Band Edge / Conducted Spurious Emission	-20 dBc		Complies
15.247 (b)(3)	RSS-247 5.4(d)	TX conducted output power	< 30 dBm		Complies
15.247(e)	RSS-247 5.2(b)	PSD	< 8 dBm/3kHz		Complies
15.207(a)	RSS-GEN Clause 8.8	AC Power Line conducted emissions	Section 12	Power Line conducted	Complies
15.205, 15.209	RSS-GEN Clause 8.9 & 8.10	Radiated Spurious Emission	< 54dBuV/m(Av)	Radiated	Complies

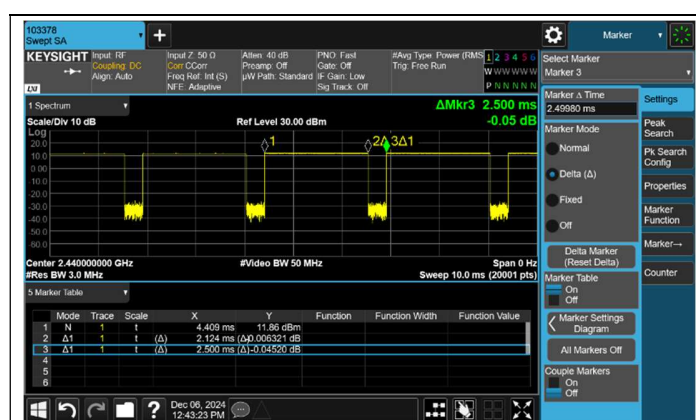
10. ANTENNA PORT TEST RESULTS

10.1. ON TIME AND DUTY CYCLE

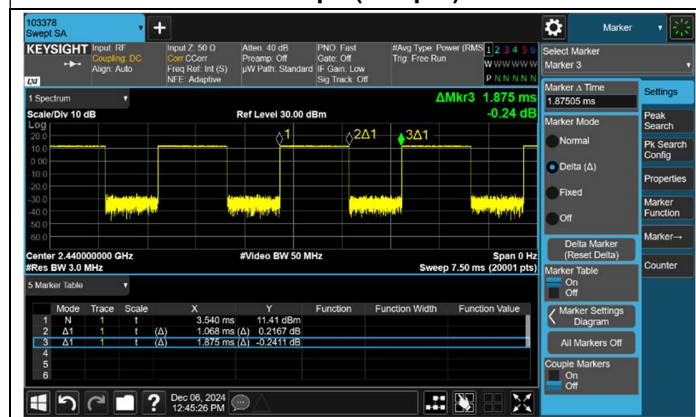
LIMITS

None; for reporting purposes only.

Mode	On time [msec]	Period [msec]	Duty Cycle [%]	Duty Cycle Correction Factor [dB]	1/T Minimum VBW [kHz]
2 400 ~ 2 483.5 MHz Bands					
1 Mbps [255 pkt]	2.124	2.500	84.960	0.710	0.471
2 Mbps [255 pkt]	1.068	1.875	56.960	2.440	0.936



1 Mbps (255 pkt)



2 Mbps (255 pkt)

10.2. 6 dB & 99% BANDWIDTH

LIMITS

6dB Bandwidth:

FCC §15.247 (a) (2), RSS-247 5.2 (a)

The minimum 6 dB bandwidth shall be at least 500 kHz.

Occupied Bandwidth:

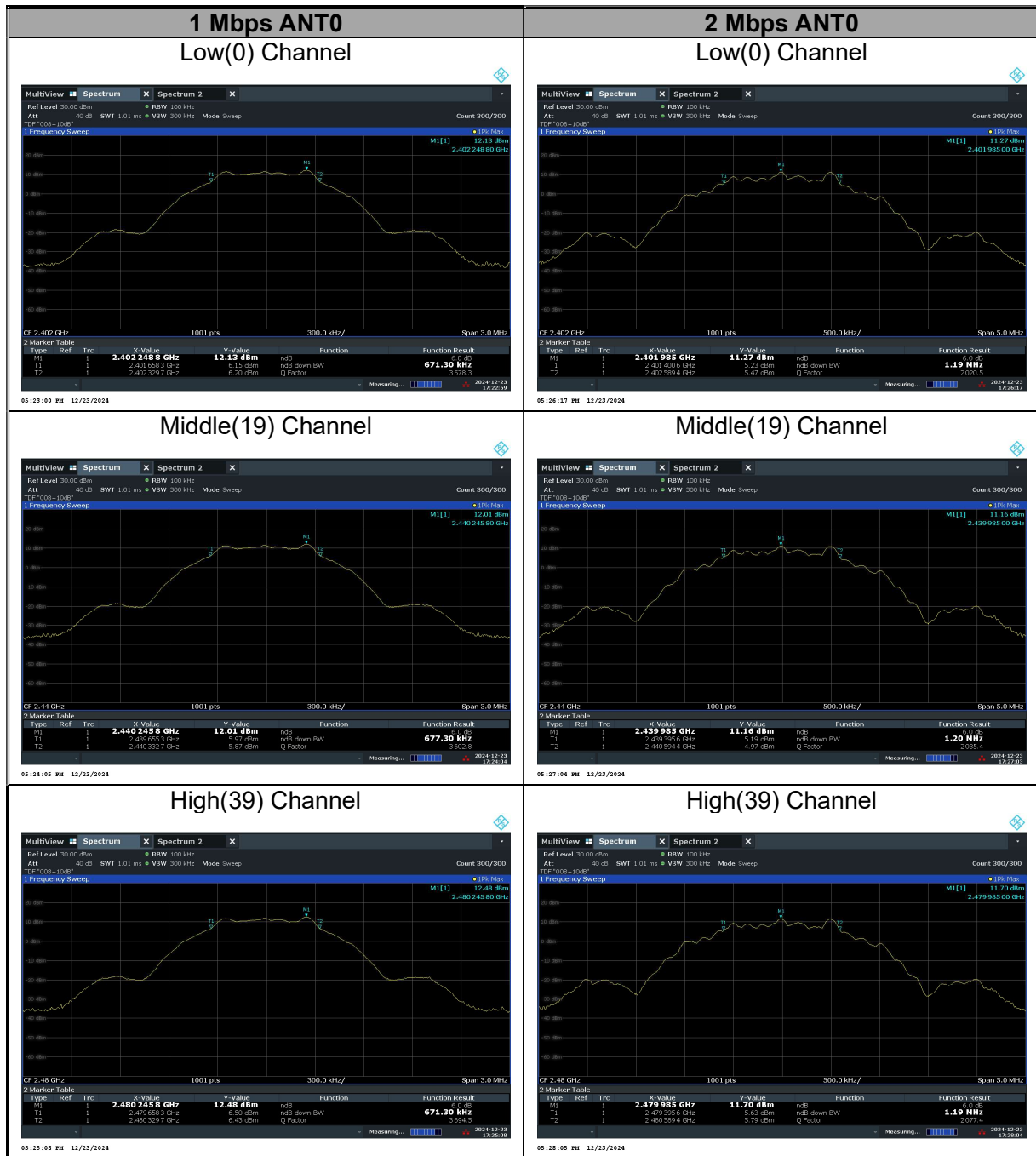
None; for reporting purposes only.

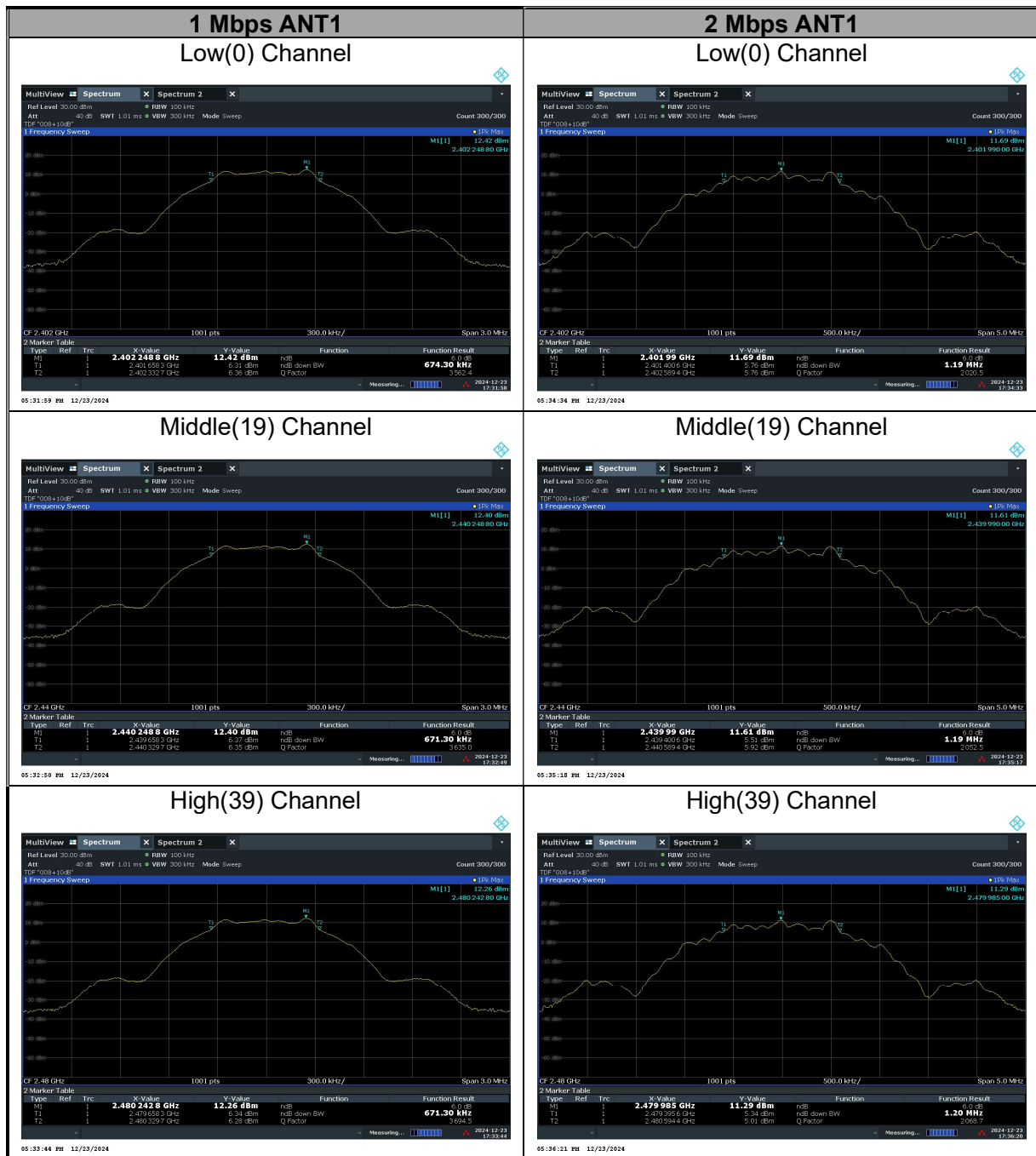
RESULTS

10.2.1. Test data

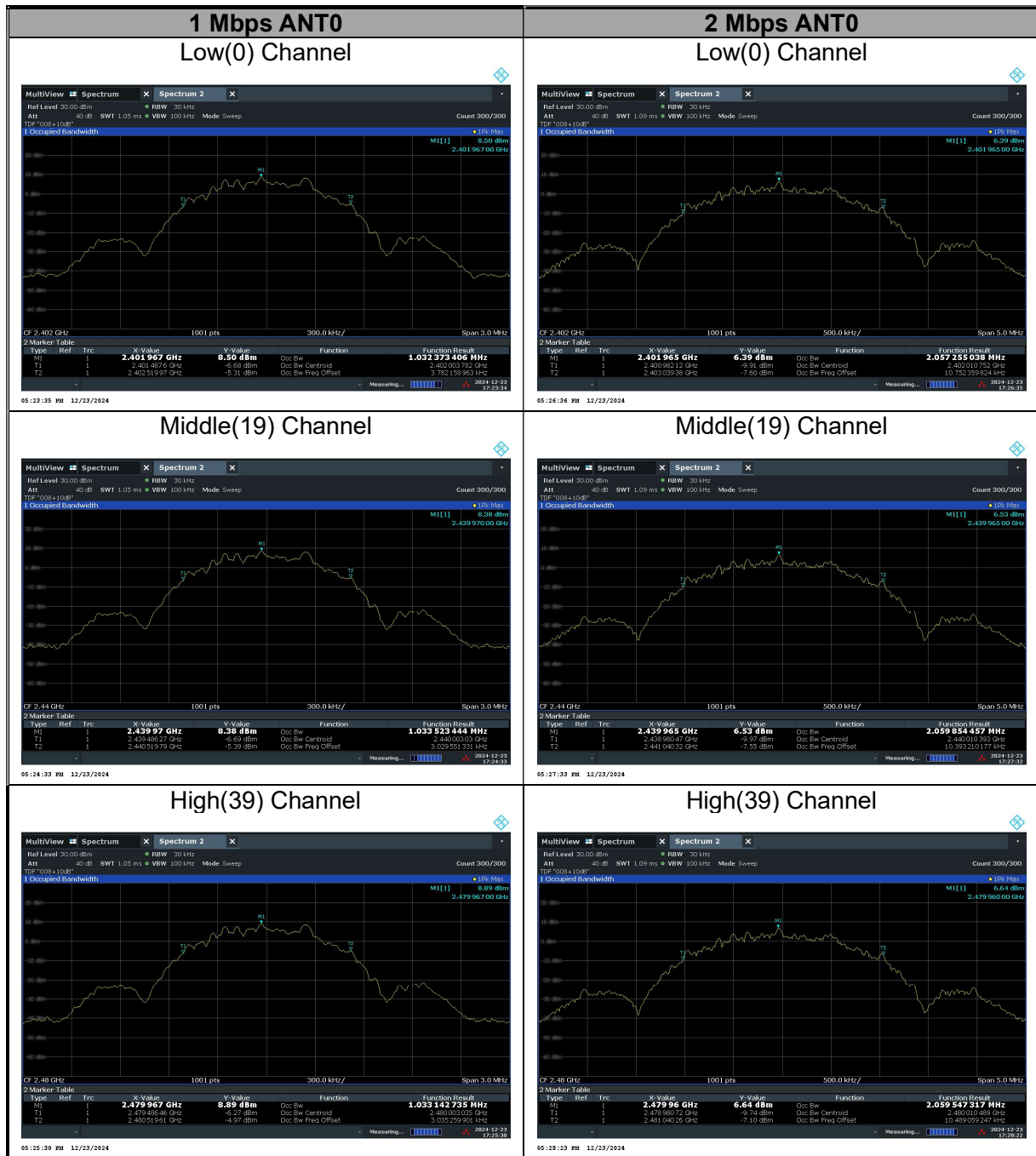
Mode	Antenna	Channel	Frequency [MHz]	6 dB Bandwidth [kHz]	Minimum Limit [kHz]
1 Mbps (255pkt)	ANT0	0	2 402	671.3	500.0
		19	2 440	677.3	
		39	2 480	671.3	
	ANT1	0	2 402	674.3	
		19	2 440	671.3	
		39	2 480	671.3	
2 Mbps (255pkt)	ANT0	0	2 402	1190.0	
		19	2 440	1200.0	
		39	2 480	1190.0	
	ANT1	0	2 402	1190.0	
		19	2 440	1190.0	
		39	2 480	1200.0	
Worst				671.3	

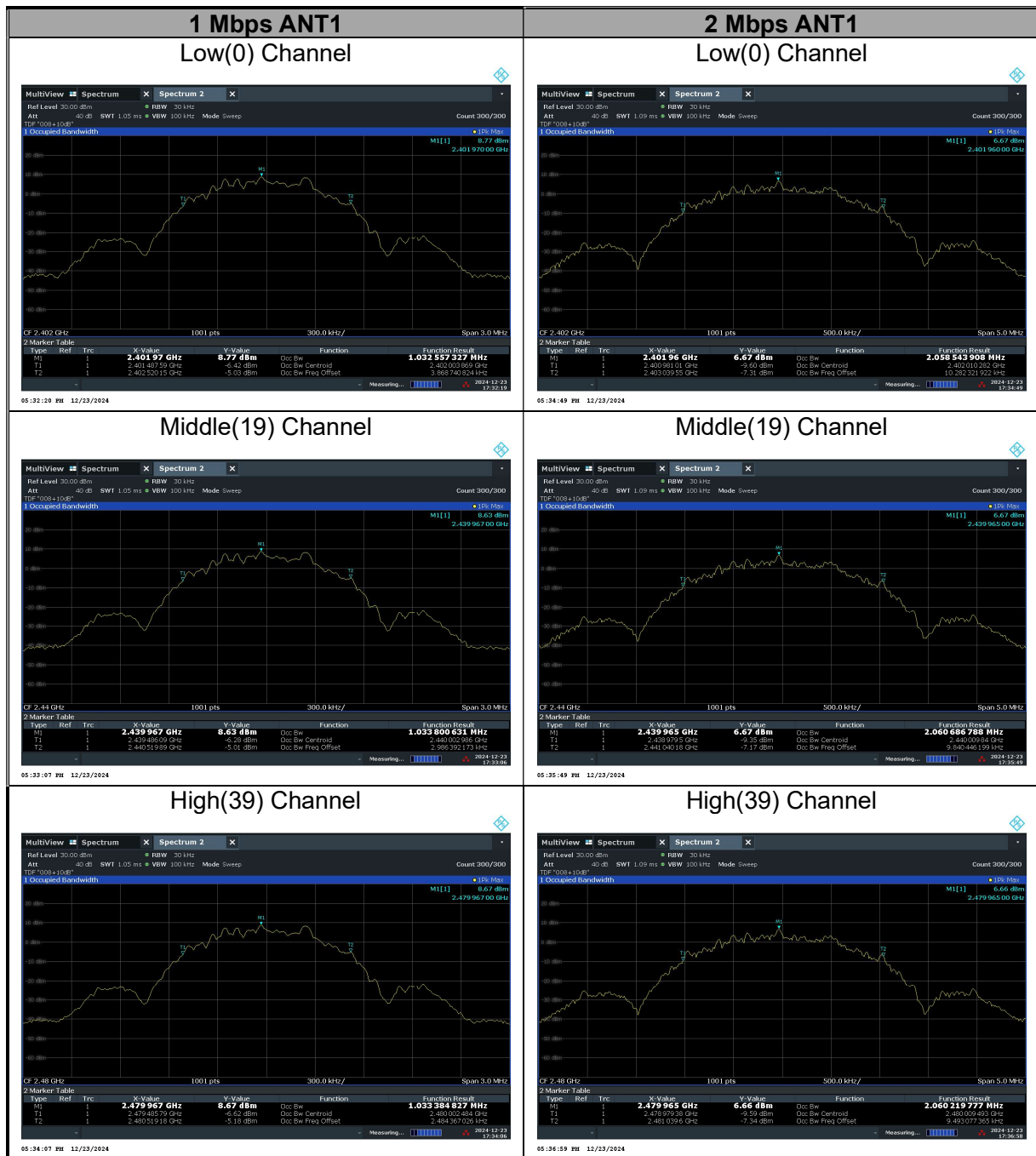
10.2.2. 6 dB BANDWIDTH PLOTS





10.2.3. 99% BANDWIDTH PLOTS





10.3. OUTPUT POWER

LIMITS

FCC §15.247 (b) (3), RSS-247 5.4(d)

The maximum antenna gain is less than or equal to 6 dBi, therefore the limit is 30 dBm.

TEST PROCEDURE

Peak power is measured using ANSI C63.10(2020) under section 11.9.1.1 utilizing spectrum analyzer(RBW $\geq$ DTS bandwidth).

RESULTS

10.3.1. TEST DATA

Mode	Antenna	Channel	Frequency [MHz]	Peak Output Power [dBm]	Limit [dBm]	Margin [dB]
1 Mbps (255 pkt)	ANT0	0	2 402	11.870	30.000	-18.130
		19	2 440	12.080		-17.920
		39	2 480	12.550		-17.450
	ANT1	0	2 402	12.400		-17.600
		19	2 440	12.480		-17.520
		39	2 480	12.370		-17.630
2 Mbps (255 pkt)	ANT0	0	2 402	12.050		-17.950
		19	2 440	12.070		-17.930
		39	2 480	12.650		-17.350
	ANT1	0	2 402	12.220	-17.780	
		19	2 440	12.180	-17.820	
		39	2 480	12.220	-17.780	
Worst				12.650	-17.350	

10.3.2. PEAK POWER PLOTS

