



CERTIFICATION TEST REPORT

Report Number. : 4789651209-E3V2

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

Model : SM-G991B/DS, SM-G991B

FCC ID : A3LSMG991B

EUT Description : GSM/WCDMA/LTE/5G NR Phone + BT/BLE, DTS/UNII a/b/g/n/ac/ax,
WPT and NFC

Test Standard(s) : FCC 47 CFR PART 15 SUBPART C

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ACCREDITED

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TL-637

Revision History

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V1	11/18/20	Initial issue	Hyunsik Yun
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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: SAMSUNG ELECTRONICS CO., LTD.

EUT DESCRIPTION: GSM/WCDMA/LTE/5G NR Phone + BT/BLE, DTS/UNII a/b/g/n/ac/ax, WPT and NFC

MODEL NUMBER: SM-G991B/DS, SM-G991B

SERIAL NUMBER: 47d1a444d81f7ece, R3CN80HSZ6E (CONDUCTED);
R3CN90P9ETY, R3CNA0F9GKJ, R3CNA0F9FVR (RADIATED);

DATE TESTED: SEP 28, 2020 – NOV 26, 2020;

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
CFR 47 Part 15 Subpart C	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.

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2. TEST METHODOLOGY

1. FCC CFR 47 Part 2.
2. FCC CFR 47 Part 15.
3. KDB 558074 D01 DTS Meas Guidance v05r02.
4. KDB 662911 D01 Multiple Transmitter Output v02r01
5. ANSI C63.10-2013.

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 218 Maeyeong-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16675, 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.

218 Maeyeong-ro	
<input checked="" type="checkbox"/>	Chamber 1
<input checked="" type="checkbox"/>	Chamber 2
<input type="checkbox"/>	Chamber 3

UL Korea, Ltd. is accredited by IAS, Laboratory Code TL-637. The full scope of accreditation can be viewed at <https://www.iasonline.org/wp-content/uploads/2017/05/TL-637-cert-New.pdf>.

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

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.

4.2. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

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

4.3. MEASUREMENT UNCERTAINTY

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

PARAMETER	UNCERTAINTY
Conducted Disturbance, 0.15 to 30 MHz	3.01 dB
Radiated Disturbance, 30 MHz to 1 GHz	4.26 dB
Radiated Disturbance, 1 GHz to 18 GHz	5.90 dB
Radiated Disturbance, 18 GHz to 40 GHz	5.49 dB

Uncertainty figures are valid to a confidence level of 95%.

4.4. DECISION RULE

Decision rule for statement(s) of conformity is based on Procedure 1, Clause 4.4.2 in IEC Guide 115:2007.

5. EQUIPMENT UNDER TEST

5.1. EUT DESCRIPTION

The EUT is a GSM/WCDMA/LTE/5G NR Phone + BT/BLE, DTS/UNII a/b/g/n/ac/ax, WPT and NFC. This test report addresses the DTS (WLAN) operational mode.

This report covers the Samsung models SM-G991B/DS and SM-G991B. These models are identical in hardware except SM-G991B has single SIM tray. With some pre-scan, model SM-G991B/DS was set for final test.

WiFi operating mode

Frequency range	Mode	ANT 1	ANT 2
2.4GHz (2412 MHz ~ 2472 MHz)	802.11b SISO	TX/RX	TX/RX
	802.11g MIMO	TX/RX	
	802.11n(HT20) MIMO	TX/RX	
	802.11ax(HE20) MIMO	TX/RX	

Note.

Simultaneous TX Condition

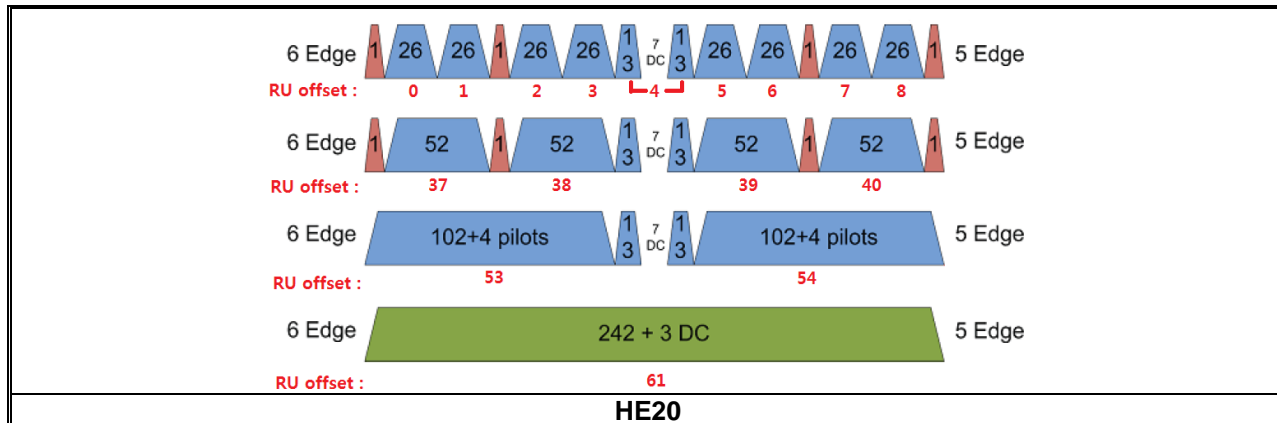
Simultaneous Tx Condition - RSDB

Mode	# of TX	5GHz WLAN		2.4GHz WLAN		Test Case
		ANT1	ANT2	ANT1	ANT2	
2.4GHz + 5GHz RSDB MIMO	4	0	0	0	0	0

Simultaneous Tx Condition - 5 GHz MIMO + Bluetooth

Mode	# of TX	5GHz WLAN		2.4GHz Bluetooth	2.4GHz WLAN	Test Case
		ANT1	ANT2	ANT1	ANT2	
5GHz MIMO & Bluetooth	3	0	0	0	-	-

802.11ax RU allocations



Test RU offset for tones

Mode	Tones number in RU	RU offset
HE20	26T	0
		4
		8
		12
	52T	37
		38
		40
	106T	53
		54
	242T / SU <small>Note 1</small>	61 / -

Note. Full RU(Resource Unit) 242T mode and SU(Single Unit) mode have no difference in physical waveform. This report has been reported the SU mode with highest output power in MIMO.

5.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum total conducted average output power as follows:

Frequency Range [MHz]	Mode	Output Power [dBm]		Output Power [mW]	
		ANT1	ANT2	ANT1	ANT2
2412 - 2472	802.11b SISO	20.76	20.89	119.12	122.74
	802.11g MIMO	20.07		101.62	
	802.11n(HT20) MIMO	20.07		101.62	
	802.11ax(HE20) MIMO	16.61		45.81	

5.3. 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 an internal antennas, with Antenna 1's maximum gain of -5.15 dBi and Antenna 2's maximum gain of -5.52 dBi
 "WiFi 1st" and "WiFi 2nd" as indicated in antenna specification are written as ANT1 and ANT2 in this report.

5.4. TESTED CHANNELS LIST

Ch.	Frequency [MHz]	11b [SISO]	11g [MIMO]	11n(HT20) [MIMO]	11ax(HE20) [MIMO]
1	2 412	O	O	O	O
2	2 417	-	O	O	-
3	2 422	-	O	O	-
6	2 437	O	O	O	O
7	2 442	-	-	O	-
8	2 447	-	-	O	-
9	2 452	-	-	O	-
10	2 457	-	O	O	-
11	2 462	O	O	O	O
12	2 467	O	O	O	O
13	2 472	O	O	O	O

5.5. WORST-CASE CONFIGURATION AND 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.

Radiated emission above 1GHz was performed with the EUT set to transmit low/mid/High Channels.

Worst case condition

ANT1	ANT2	ANT ALL
Axis	Axis	Axis
X	Y	X

Based on the baseline scan, the worst-case data rates were:

- 802.11b mode: 1 Mbps 1TX
- 802.11g mode: 6 Mbps 2TX
- 802.11n HT20 mode: MCS0 2TX
- 802.11ax HE20 mode: MCS0 2TX

802.11b mode: only supports SISO mode
 802.11g & n HT20 & ax HE20 mode: only supports MIMO mode.

Worst-case selection criteria for 802.11ax test items :
 For the 6dB Bandwidth, it was tested at the RU allocation with lowest tones number for each bandwidth.

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

Test case configuration for 802.11b, g, n HT20, ax HE20(SU) modes :

SISO Target[dBm]						MIMO Target[dBm]						
Ch.	Freq.	802.11b	802.11g	802.11n HT20	802.11ax HE20(SU)	Ch.	Freq.	802.11g	802.11n HT20	802.11ax HE20(SU)		
1	2412	20	Not Supported			1	2412	18	18	16		
2	2417					2	2417	18	18			
3	2422					3	2422	20	20			
4	2427					4	2427					
5	2432					5	2432					
6	2437	20				6	2437	20	20			16
7	2442					7	2442				20	
8	2447					8	2447				18	
9	2452					9	2452				18	
10	2457					10	2457	20	16			
11	2462	20				11	2462	16	16			16
12	2467	11				12	2467	14	14			14
13	2472	5				13	2472	8	8			8

Note1. Since 802.11g and 802.11n mode's low & mid & high channel target is higher than 802.11ax, spurious test did not proceed in 802.11ax(SU) mode.
 Note2. 802.11ax's 11,12,13 channels target are the same as 802.11g, 802.11n mode's targets. So band-edge test was performed in 802.11ax(SU) mode.

Test case configuration for 802.11ax HE20(RU) modes :

MIMO Worst RU offset[dBm]					
Mode	Ch.	Freq.	Tone	RU offset	Test Case
802.11ax RU mode	1	2412	26 T	0	O
				4	-
				8	-
	6	2437		0	-
				4	O
				8	-
	11	2462		0	-
				4	O
				8	-

Note. In 802.11ax HE20(RU) mode, the test case according to RU offset was selected from the offset with worst average power.

5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
Charger	SAMSUNG	EP-TA800	R37N8BT85J8SE3	N/A
Data Cable	SAMSUNG	EP-DN980BBE	N/A	N/A

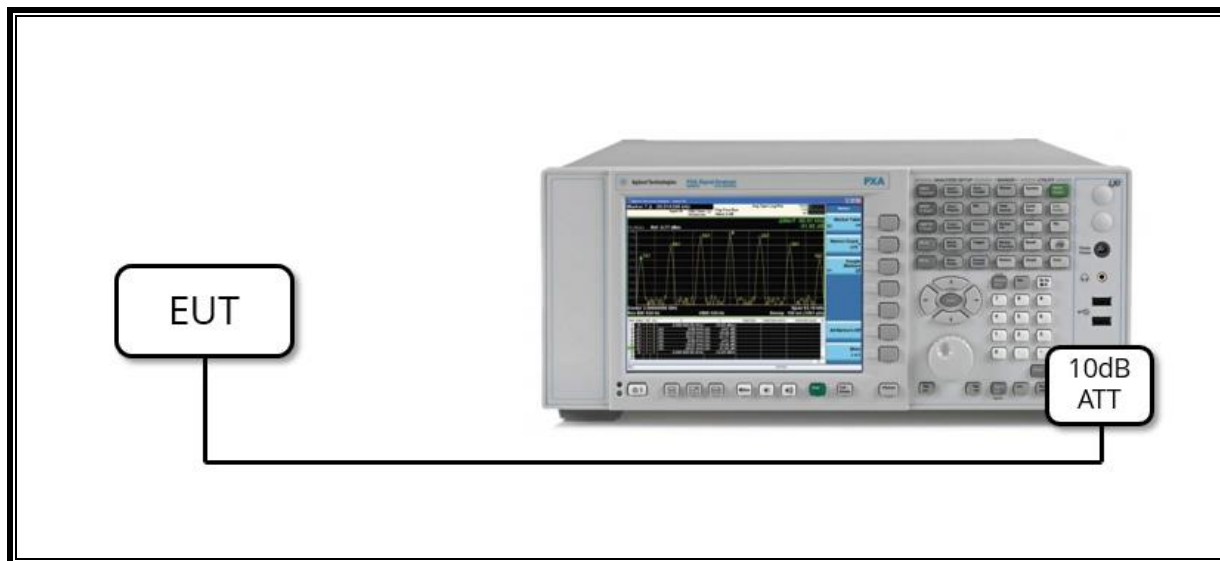
I/O CABLE

I/O Cable List						
Cable No.	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	DC Power	1	C Type	Shielded	1.0 m	N/A

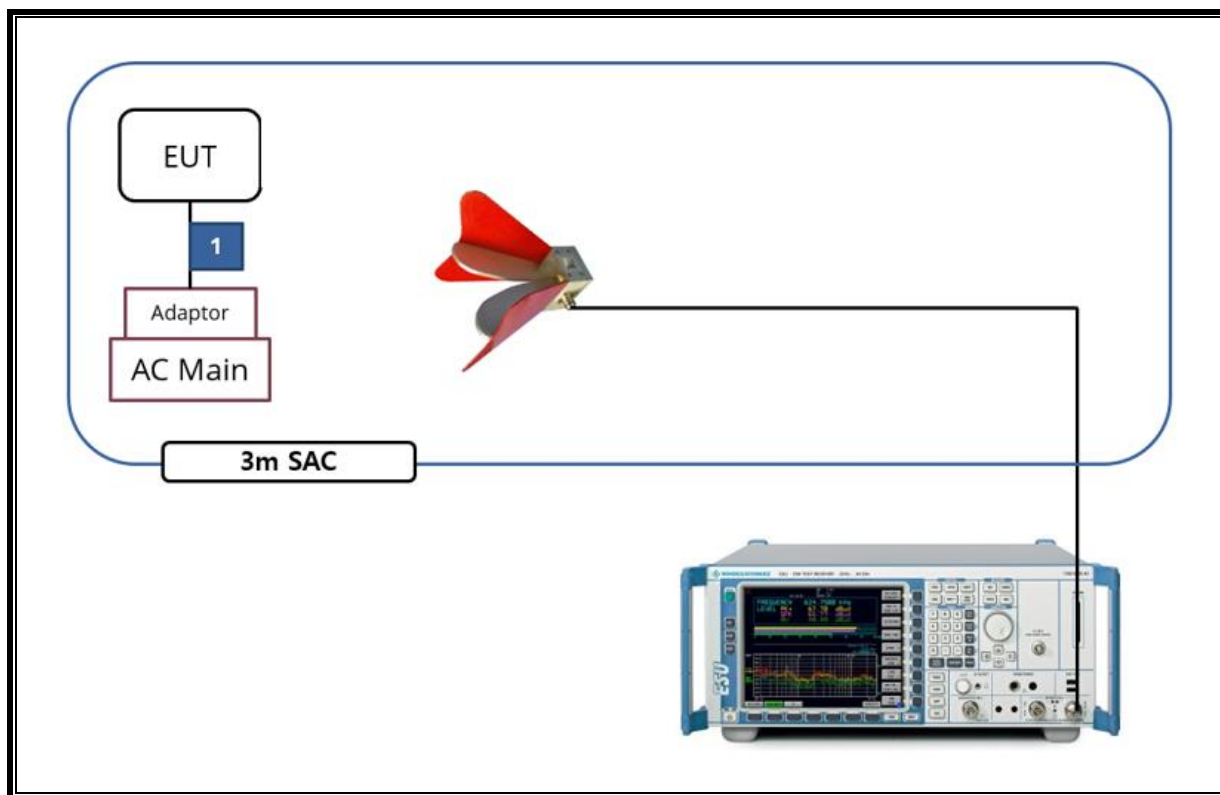
TEST SETUP

The EUT is a stand-alone unit during the tests.
 Test software in hidden menu exercised the EUT to enable DTS mode.

SETUP DIAGRAM FOR TESTS (CONDUCTED TEST SETUP)



SETUP DIAGRAM FOR TESTS (RADIATED TEST SETUP)



6. MEASUREMENT METHOD

6 dB BW : KDB 558074 D01 v05r02, Section 8.2

OUTPUT POWER : KDB 558074 D01 v05r02, Section 8.3.2.3.

POWER SPECTRAL DENSITY : KDB 558074 D01 v05r02, Section 8.4.

Out-of-band EMISSIONS (Conducted) : KDB 558074 D01 v05r02, Section 8.5.

Out-of-band EMISSIONS IN NON-RESTRICTED BANDS: KDB 558074 D01 v05r02, Section 8.5.

Out-of-band EMISSIONS IN RESTRICTED BANDS KDB 558074 D01 v05r02, Section 8.6.

AC Power Line Conducted Emission : ANSI C63.10-2013, Section 6.2.

7. TEST AND MEASUREMENT EQUIPMENT

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

Test Equipment List				
Description	Manufacturer	Model	S/N	Cal Due
Antenna, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	750	08-19-22
Antenna, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	749	08-13-22
Antenna, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	845	08-13-22
Antenna, Horn, 18 GHz	ETS	3115	00167211	07-27-22
Antenna, Horn, 18 GHz	ETS	3115	00161451	08-15-22
Antenna, Horn, 18 GHz	ETS	3117	00168724	07-27-22
Antenna, Horn, 18 GHz	ETS	3117	00168717	08-15-22
Antenna, Horn, 40 GHz	ETS	3116C	00166155	08-04-22
Antenna, Horn, 40 GHz	ETS	3116C	00168645	10-02-21
Preamplifier	ETS	3116C-PA	00168841	08-06-21
Preamplifier, 1000 MHz	Sonoma	310N	341282	08-03-21
Preamplifier, 1000 MHz	Sonoma	310N	351741	08-03-21
Preamplifier, 1000 MHz	Sonoma	310N	370599	08-06-21
Preamplifier, 18 GHz	Miteq	AFS42-00101800-25-S-42	1876511	08-03-21
Preamplifier, 18 GHz	Miteq	AFS42-00101800-25-S-42	1896138	08-03-21
Preamplifier, 18 GHz	Miteq	AFS42-00101800-25-S-42	2029169	08-04-21
Spectrum Analyzer, 44 GHz	Keysight	N9030B	MY57143717	01-20-21
Spectrum Analyzer, 44 GHz	Agilent / HP	N9030A	MY54170614	08-05-21
Spectrum Analyzer, 44 GHz	Agilent / HP	N9030A	MY54490312	08-05-21
Spectrum Analyzer, 43.5 GHz	R&S	FSW43	104089	08-06-21
Average Power Sensor	Agilent / HP	U2000	MY54270007	08-05-21
Attenuator	PASTERNAK	PE7087-10	A001	08-03-21
Attenuator	PASTERNAK	PE7087-10	A008	08-03-21
Attenuator	PASTERNAK	PE7004-10	2	08-04-21
Attenuator	PASTERNAK	PE7087-10	A009	08-03-21
EMI Test Receive, 40 GHz	R&S	ESU40	100439	08-03-21
EMI Test Receive, 40 GHz	R&S	ESU40	100457	08-03-21
EMI Test Receive, 3 GHz	R&S	ESR3	101832	08-03-21
Low Pass Filter 5GHz	Micro-Tronics	LPS17541	009	08-03-21
Low Pass Filter 5GHz	Micro-Tronics	LPS17541	015	08-03-21
Low Pass Filter 5GHz	Micro-Tronics	LPS17541	020	08-04-21
High Pass Filter 3GHz	Micro-Tronics	HPM17543	010	08-03-21
High Pass Filter 3GHz	Micro-Tronics	HPM17543	015	08-03-21
High Pass Filter 3GHz	Micro-Tronics	HPM17543	020	08-04-21
High Pass Filter 6GHz	Micro-Tronics	HPS17542	009	08-03-21
High Pass Filter 6GHz	Micro-Tronics	HPS17542	016	08-03-21
High Pass Filter 6GHz	Micro-Tronics	HPS17542	021	08-04-21
LISN	R&S	ENV-216	101837	08-06-21
Antenna, Loop, 9kHz-30MHz	R&S	HFH2-Z2	100418	10-02-21
UL Software				
Description	Manufacturer	Model	Version	
Radiated software	UL	UL EMC	Ver 9.5	
AC Line Conducted software	UL	UL EMC	Ver 9.5	

8. SUMMARY TABLE

FCC Part Section	Test Description	Test Limit	Test Condition	Test Result
15.247 (a)(2)	Occupied Band width (6dB)	> 500kHz	Conducted	Pass
2.1051, 15.247 (d)	Band Edge / Conducted Spurious Emission	-30dBc		Pass
15.247 (b)(3)	TX conducted output power	< 30dBm		Pass
15.247 (e)	PSD	< 8dBm		Pass
15.207 (a)	AC Power Line conducted emissions	Section 10	Power Line conducted	Pass
15.205, 15.209	Radiated Spurious Emission	< 54dBuV/m	Radiated	Pass

9. ANTENNA PORT TEST RESULTS

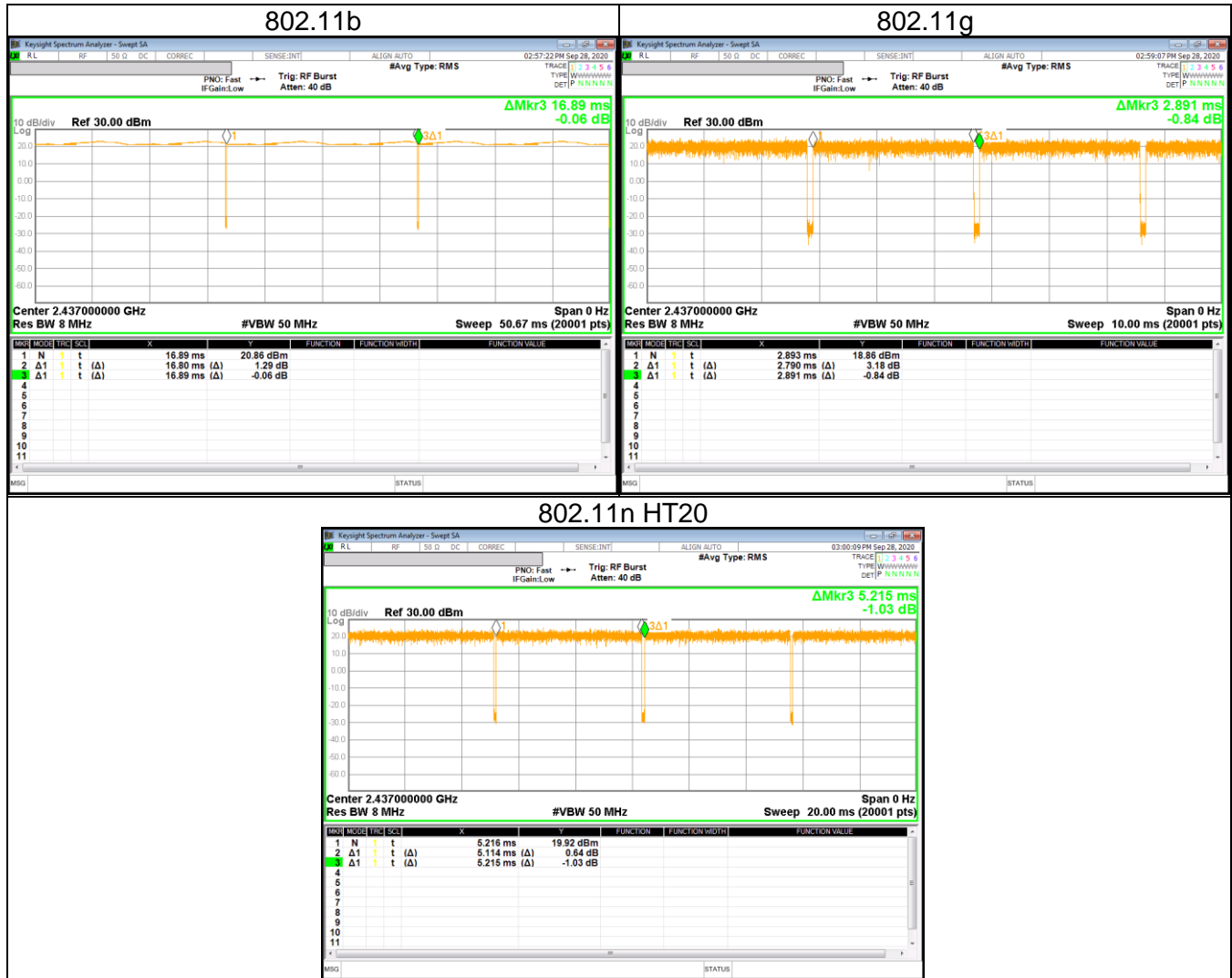
9.1. ON TIME AND DUTY CYCLE

LIMITS

None; for reporting purposes only.

Mode	On Time [ms]	Period [ms]	Duty Cycle X [Linear]	Duty Cycle X [%]	Duty Cycle Correction Factor[dB]	1/T Minimum VBW[kHz]
802.11b	16.800	16.890	0.995	99.47	-	0.06
802.11g MIMO	2.790	2.891	0.965	96.51	0.15	0.36
802.11n(HT20) MIMO	5.114	5.215	0.981	98.06	-	0.20
802.11ax(HE20) MIMO SU	4.268	4.369	0.977	97.69	0.10	0.23
802.11ax(HE20) MIMO 26T	5.222	5.323	0.981	98.10	-	0.19
802.11ax(HE20) MIMO 52T	5.102	5.204	0.980	98.04	-	0.20
802.11ax(HE20) MIMO 106T	4.754	4.855	0.979	97.92	0.09	0.21

Note. According to ANSI C63.10 Section 11.6, do not apply the Duty Cycle Correction Factor judging that a duty cycle of greater than or equal to 98% is continuous signal.





9.2. 6 dB BANDWIDTH

LIMITS

FCC §15.247 (a) (2)

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

TEST PROCEDURE

Reference to KDB 558074 D01 15.247 Meas Guidance: The transmitter output is connected to a spectrum analyzer with the RBW set to 100 kHz, the VBW >= 3 x RBW, peak detector and max hold.

RESULTS

- Please refer to the next page

9.2.1. 802.11b SISO MODE IN THE 2.4 GHz BAND

Channel	Frequency [MHz]	6 dB Bandwidth [MHz]		Minimum Limit [MHz]
		ANT 1	ANT 2	
1	2 412	7.55	8.01	0.5
6	2 437	8.01	7.05	
11	2 462	8.02	7.57	
12	2 467	7.53	7.56	
13	2 472	6.56	7.07	
Worst		6.56	7.05	

9.2.2. 802.11g MIMO MODE IN THE 2.4 GHz BAND

Channel	Frequency [MHz]	6 dB Bandwidth [MHz]		Minimum Limit [MHz]
		ANT 1	ANT 2	
1	2 412	15.92	16.32	0.5
2	2 417	16.31	16.35	
3	2 422	16.33	16.35	
6	2 437	16.34	16.34	
10	2 457	16.33	16.35	
11	2 462	16.29	16.30	
12	2 467	16.30	16.33	
13	2 472	16.31	16.35	
Worst		15.92	16.30	

9.2.3. 802.11n HT20 MIMO MODE IN THE 2.4 GHz BAND

Channel	Frequency [MHz]	6 dB Bandwidth [MHz]		Minimum Limit [MHz]
		ANT 1	ANT 2	
1	2 412	17.15	17.54	0.5
2	2 417	17.59	17.17	
3	2 422	17.58	17.57	
6	2 437	17.56	17.59	
7	2 442	17.59	17.60	
8	2 447	17.58	17.68	
9	2 452	17.58	17.61	
10	2 457	17.60	17.59	
11	2 462	17.15	17.54	
12	2 467	16.26	17.56	
13	2 472	17.15	17.57	
Worst		16.26	17.17	

9.2.4. 802.11ax HE20 MIMO MODE IN THE 2.4 GHz BAND

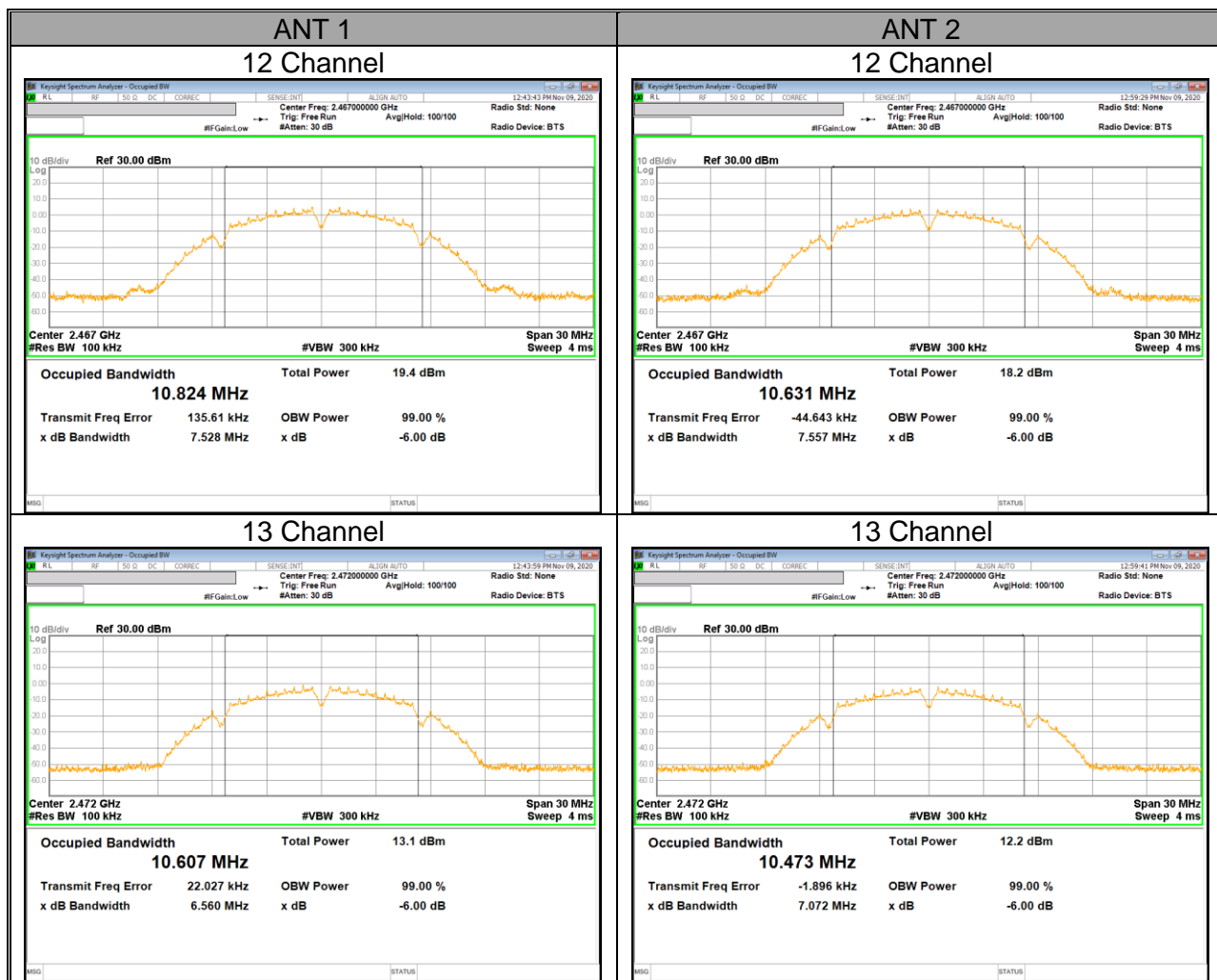
Channel	Frequency [MHz]	Tones	RU offset	6 dB Bandwidth [MHz]		Minimum Limit [MHz]
				ANT 1	ANT 2	
1	2 412	26T	0	2.025	2.057	0.5
6	2 437			1.977	1.964	
11	2 462			1.982	1.982	
Worst				1.977	1.964	

Note. 11ax mode was tested at the RU allocation with lowest tones(lowest bandwidth) number for each bandwidth.

9.2.5. 6 dB BANDWIDTH TEST PLOTS

DTS 2.4 GHz IEEE 802.11b mode





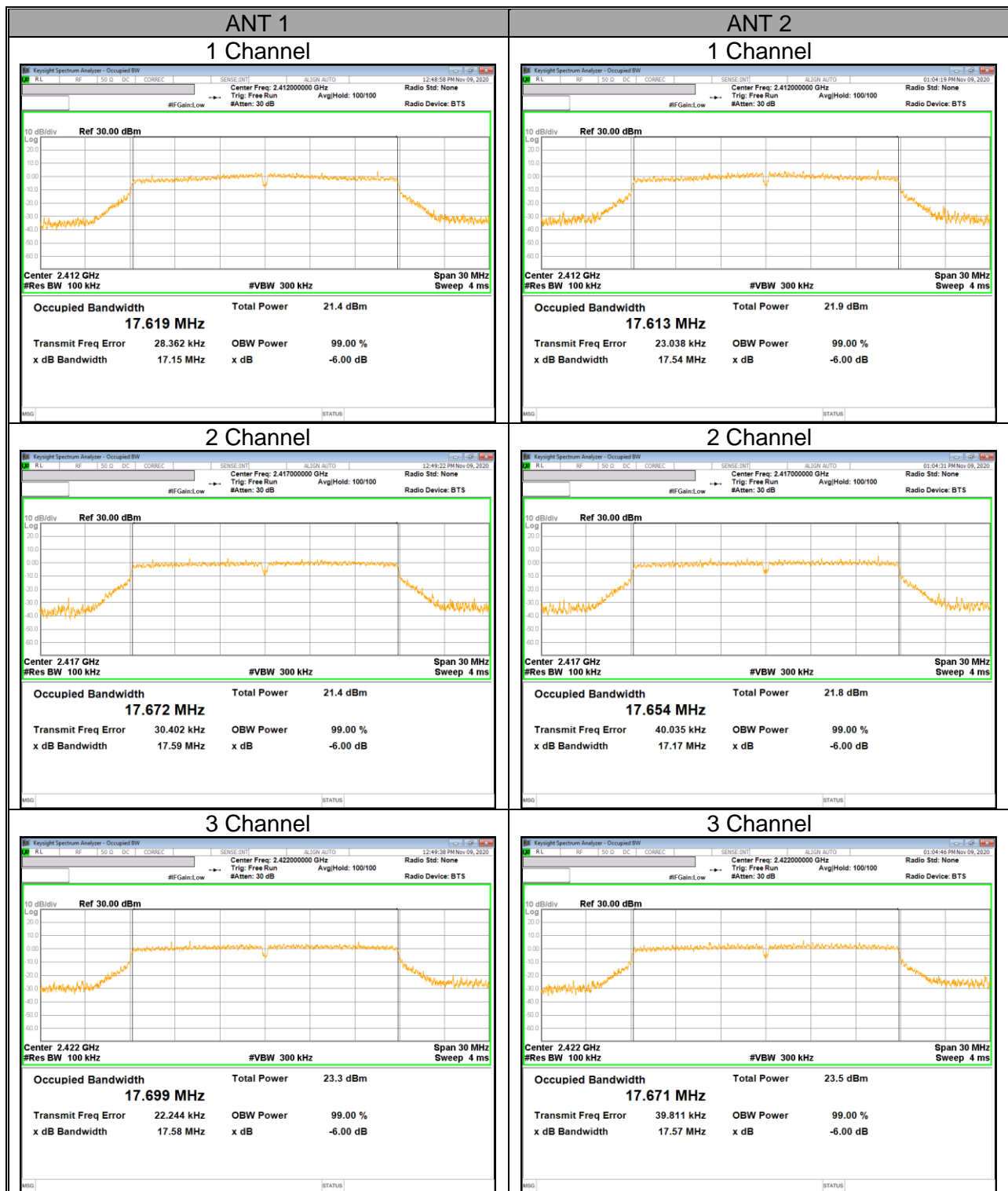
DTS 2.4 GHz IEEE 802.11g mode

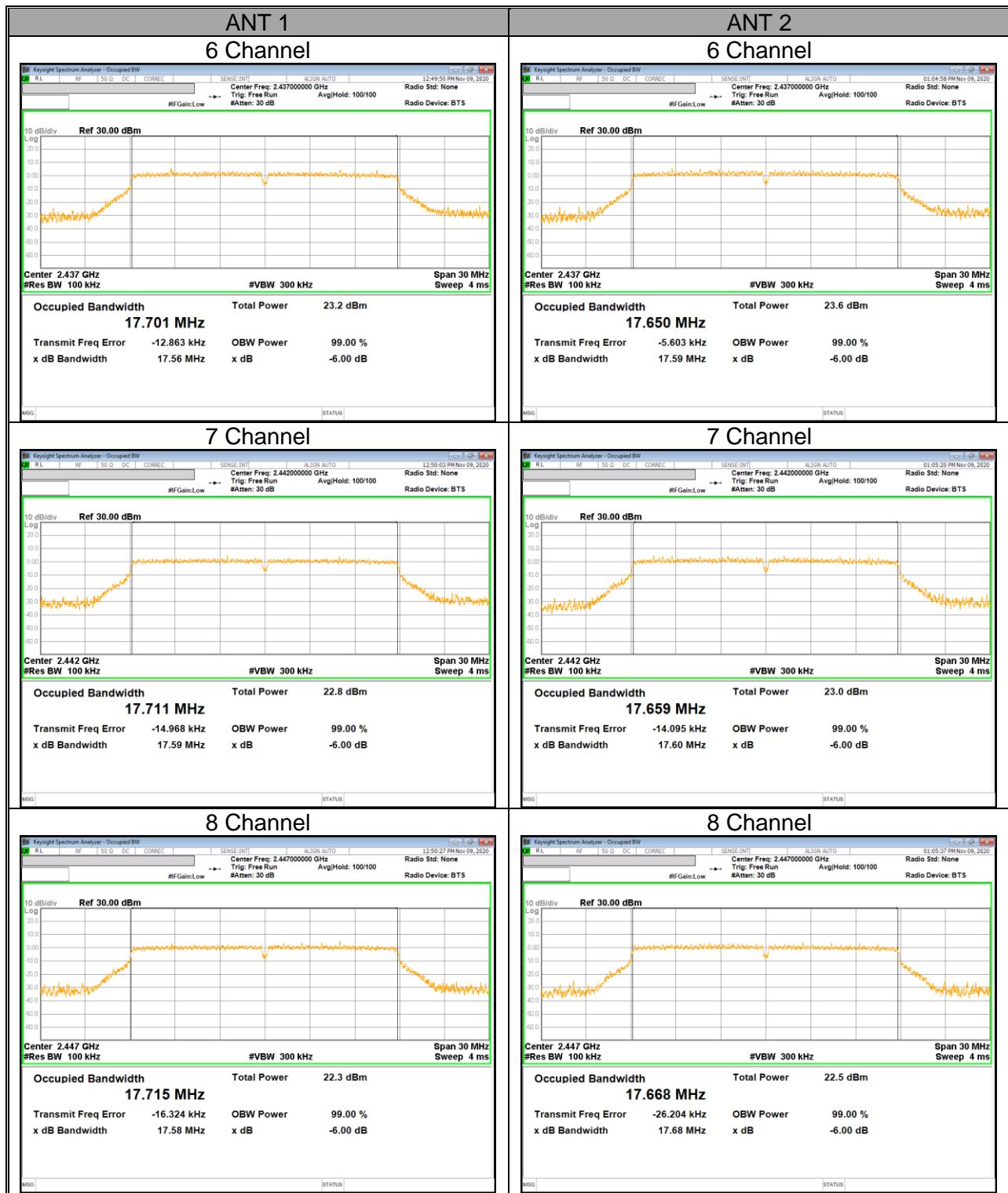




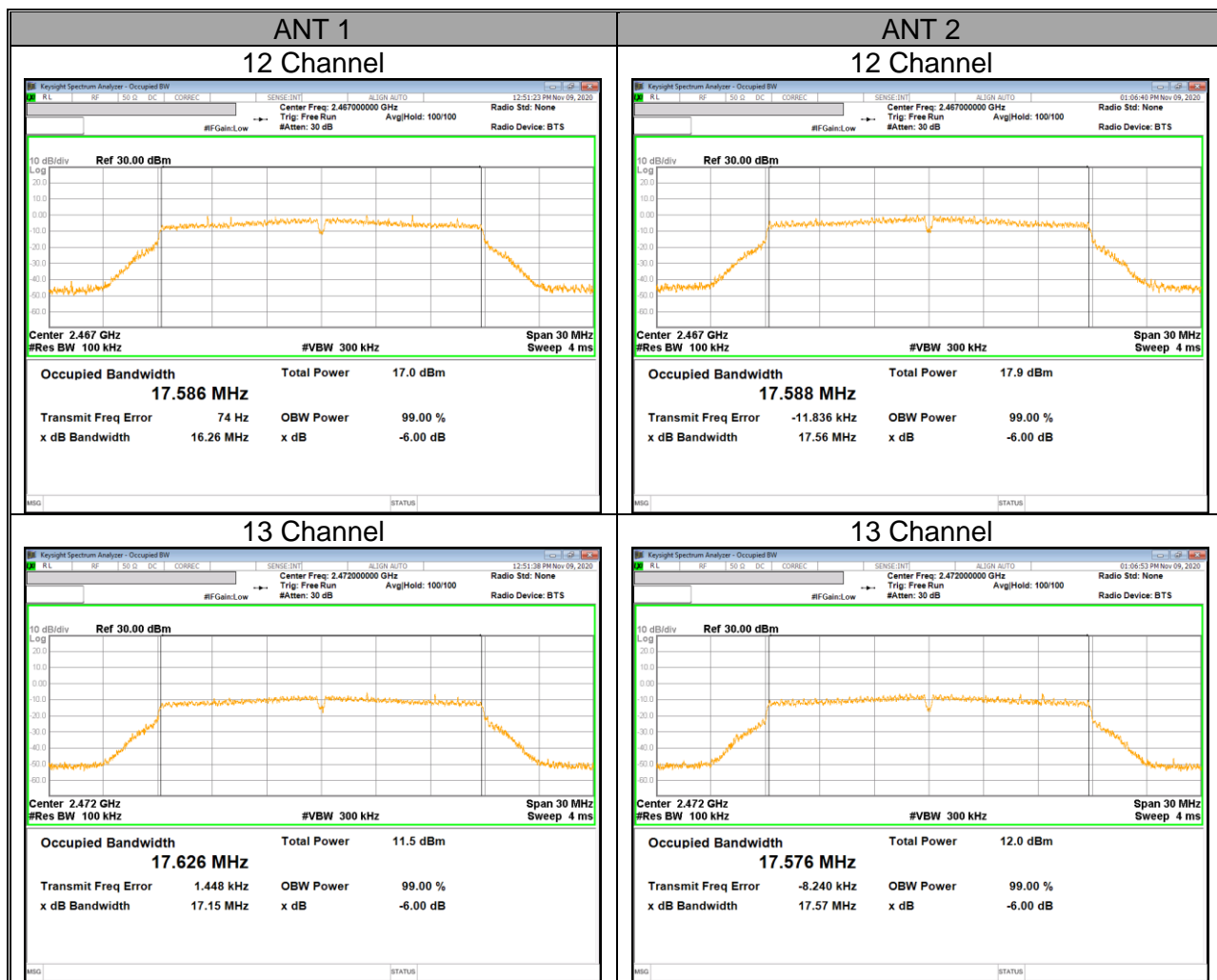


DTS 2.4 GHz IEEE 802.11n HT20 mode









DTS 2.4 GHz IEEE 802.11ax HE20(26T) mode



9.3. OUTPUT POWER

LIMITS

FCC §15.247 (b) (3)

For systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands: 1 Watt, based on the use of antennas with directional gains that do not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

TEST PROCEDURE

The transmitter output is connected to a power meter.

The cable assembly insertion loss was entered as an offset in the power meter to allow for direct reading of power.

Output power measurement was performed utilizing the 8.3.2.3 under KDB558074 D01 15.247 Meas Guidance.

DIRECTIONAL ANTENNA GAIN

The TX chains are correlated and the antenna gain is unequal among the chains.

The directional gain is:

Bands [MHz]	ANT 1 [dBi]	ANT 2 [dBi]	Correlated Directional Gain [dBi]
2 412 – 2 472	-5.15	-5.52	-2.32

9.3.1. TEST RESULTS

Included in Calculations of Corr'd Power			
Duty Cycle CF	802.11b SISO	-	dB
	802.11g MIMO	0.15	dB
	802.11n HT20 MIMO	-	dB
	802.11ax HE20(SU) MIMO	0.10	dB

Calculation of Output Power result

→ Average Power = Meas. Power + Duty Cycle CF / → Total Corr'd Power = ANT1's Average Power + ANT2's Average Power

- SISO Mode

Mode	Channel	Frequency [MHz]	Average Power [dBm]		Power Limit [dBm]
			ANT1	ANT2	
802.11b	1	2 412	20.21	20.06	30.00
	6	2 437	20.72	20.20	
	11	2 462	20.76	20.89	
	12	2 467	11.64	11.70	
	13	2 472	5.69	5.13	
Worst Case			20.76	20.89	

- MIMO Mode

Mode	Channel	Frequency [MHz]	Average Power [dBm]		Total Corr'd Power [dBm]	Power Limit [dBm]
			ANT1	ANT2		
802.11g	1	2 412	14.79	15.14	17.98	30.00
	2	2 417	14.83	15.09	17.97	
	3	2 422	17.07	17.05	20.07	
	6	2 437	16.80	17.15	19.99	
	10	2 457	16.50	17.05	19.79	
	11	2 462	13.49	13.85	16.68	
	12	2 467	10.88	11.42	14.17	
	13	2 472	4.45	5.69	8.12	
Worst Case					20.07	
802.11n HT20	1	2 412	14.95	15.18	18.08	30.00
	2	2 417	14.90	15.16	18.04	
	3	2 422	17.03	17.08	20.07	
	6	2 437	16.81	17.16	20.00	
	7	2 442	16.62	16.77	19.71	
	8	2 447	15.94	15.91	18.94	
	9	2 452	15.50	15.70	18.61	
	10	2 457	12.84	13.18	16.02	
	11	2 462	13.51	13.85	16.69	
	12	2 467	11.18	11.63	14.42	
	13	2 472	5.23	5.92	8.60	
Worst Case					20.07	
802.11ax HE20(SU)	1	2 412	13.64	13.56	16.61	30.00
	6	2 437	13.41	13.20	16.32	
	11	2 462	13.06	13.38	16.23	
	12	2 467	10.81	11.63	14.25	
	13	2 472	4.78	5.04	7.92	
Worst Case					16.61	

9.3.2. RU mode TEST RESULTS

Included in Calculations of Corr'd Power			
Duty Cycle CF	802.11ax HE20 26T MIMO	-	dB
	802.11ax HE20 52T MIMO	-	dB
	802.11ax HE20 106T MIMO	0.09	dB

Calculation of Output Power result

→ Average Power = Meas. Power + Duty Cycle CF / → Total Corr'd Power = ANT1's Average Power + ANT2's Average Power

- MIMO Mode

Channel	Frequency [MHz]	Tones	RU Offset	Average Power [dBm]		Total Corr'd Power [dBm]	Power Limit [dBm]			
				ANT1	ANT2					
1	2 412	26T	0	9.61	10.87	13.30	30.00			
			4	9.34	9.95	12.67				
			8	9.44	10.76	13.16				
		52T	37	11.24	11.96	14.63				
			38	11.93	11.84	14.90				
			40	11.27	11.63	14.46				
		106T	53	11.41	12.26	14.87				
			54	11.68	12.17	14.94				
		6	2 437	26T	0	10.33		10.08	13.22	30.00
					4	10.55		10.59	13.58	
8	9.08				10.49	12.85				
52T	37			10.98	10.96	13.98				
	38			11.80	11.98	14.90				
	40			10.75	11.15	13.96				
106T	53			11.58	12.60	15.13				
	54			11.58	12.98	15.35				
11	2 462			26T	0	9.23	10.41	12.87	30.00	
					4	10.13	10.66	13.41		
		8	9.75		10.62	13.22				
		52T	37	9.92	10.82	13.40				
			38	11.40	11.97	14.70				
			40	11.12	11.56	14.36				
		106T	53	11.13	12.29	14.76				
			54	11.06	11.81	14.46				
		12	2 467	26T	0	8.87	10.13	12.56		30.00
					4	10.18	10.61	13.41		
8	9.11				10.45	12.84				
52T	37			10.61	11.97	14.35				
	38			10.85	11.99	14.47				
	40			10.85	11.48	14.19				
106T	53			10.24	10.94	13.61				
	54			10.72	11.74	14.27				
13	2 472			26T	0	4.30	5.51	7.96	30.00	
					4	4.69	5.32	8.03		
		8	3.71		5.10	7.47				
		52T	37	4.56	4.96	7.77				
			38	5.00	5.35	8.19				
			40	4.81	4.92	7.88				
		106T	53	4.40	5.62	8.06				
			54	4.41	5.15	7.81				

9.4. POWER SPECTRAL DENSITY

LIMITS

FCC §15.247 (e)

RSS-247 (5.2) (b)

The power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

TEST PROCEDURE

Power Spectral Density was performed utilizing the section 8.4 under KDB558074 D01 15.247 Meas Guidance.

RESULTS

9.4.1. 802.11b/g/n HT20 MODE TEST RESULTS

Included in Calculations of Corr'd Power			
Duty Cycle CF	802.11b SISO	-	dB
	802.11g MIMO	0.15	dB
	802.11n HT20 MIMO	-	dB

Calculation of Output PSD result

- 1TX : Corr'd PSD = Meas PSD + Duty Cycle CF
- 2TX : Total PSD = ANT1 Meas PSD + ANT2 Meas PSD + Duty Cycle CF

- SISO Mode

Mode	Channel	Frequency [MHz]	Meas PSD [dBm/3kHz]		Total Corr'd PSD [dBm/3kHz]		PSD Limit [dBm/3kHz]
			ANT1	ANT2	ANT1	ANT2	
802.11b	1	2 412	-10.20	-10.16	-10.20	-10.16	8.00
	6	2 437	-9.99	-10.11	-9.99	-10.11	
	11	2 462	-10.22	-9.56	-10.22	-9.56	
	12	2 467	-18.76	-18.69	-18.76	-18.69	
	13	2 472	-25.06	-24.93	-25.06	-24.93	

- MIMO Mode

Mode	Channel	Frequency [MHz]	Meas PSD [dBm/3kHz]		Total Corr'd PSD [dBm/3kHz]	PSD Limit [dBm/3kHz]
			ANT1	ANT2		
802.11g	1	2 412	-16.78	-15.80	-13.10	8.00
	2	2 417	-18.12	-16.42	-14.03	
	3	2 422	-16.07	-14.76	-12.21	
	6	2 437	-16.46	-14.90	-12.45	
	10	2 457	-16.59	-15.40	-12.79	
	11	2 462	-18.04	-17.00	-14.33	
	12	2 467	-20.91	-19.71	-17.11	
802.11n HT20	13	2 472	-27.10	-25.62	-23.13	8.00
	1	2 412	-17.69	-16.72	-14.17	
	2	2 417	-19.18	-18.26	-15.68	
	3	2 422	-17.18	-16.40	-13.76	
	6	2 437	-17.26	-16.39	-13.80	
	7	2 442	-17.55	-16.72	-14.11	
	8	2 447	-18.07	-17.62	-14.83	
	9	2 452	-18.39	-17.77	-15.06	
	10	2 457	-21.41	-20.31	-17.81	
	11	2 462	-18.78	-18.09	-15.41	
	12	2 467	-21.94	-21.08	-18.48	
13	2 472	-27.83	-26.48	-24.09		

9.4.2. 802.11ax HE20 MODE TEST RESULTS

Included in Calculations of Corr'd Power			
Duty Cycle CF	802.11ax HE20(26T) MIMO	-	dB
	802.11ax HE20(SU) MIMO	0.10	dB

Calculation of Output PSD result

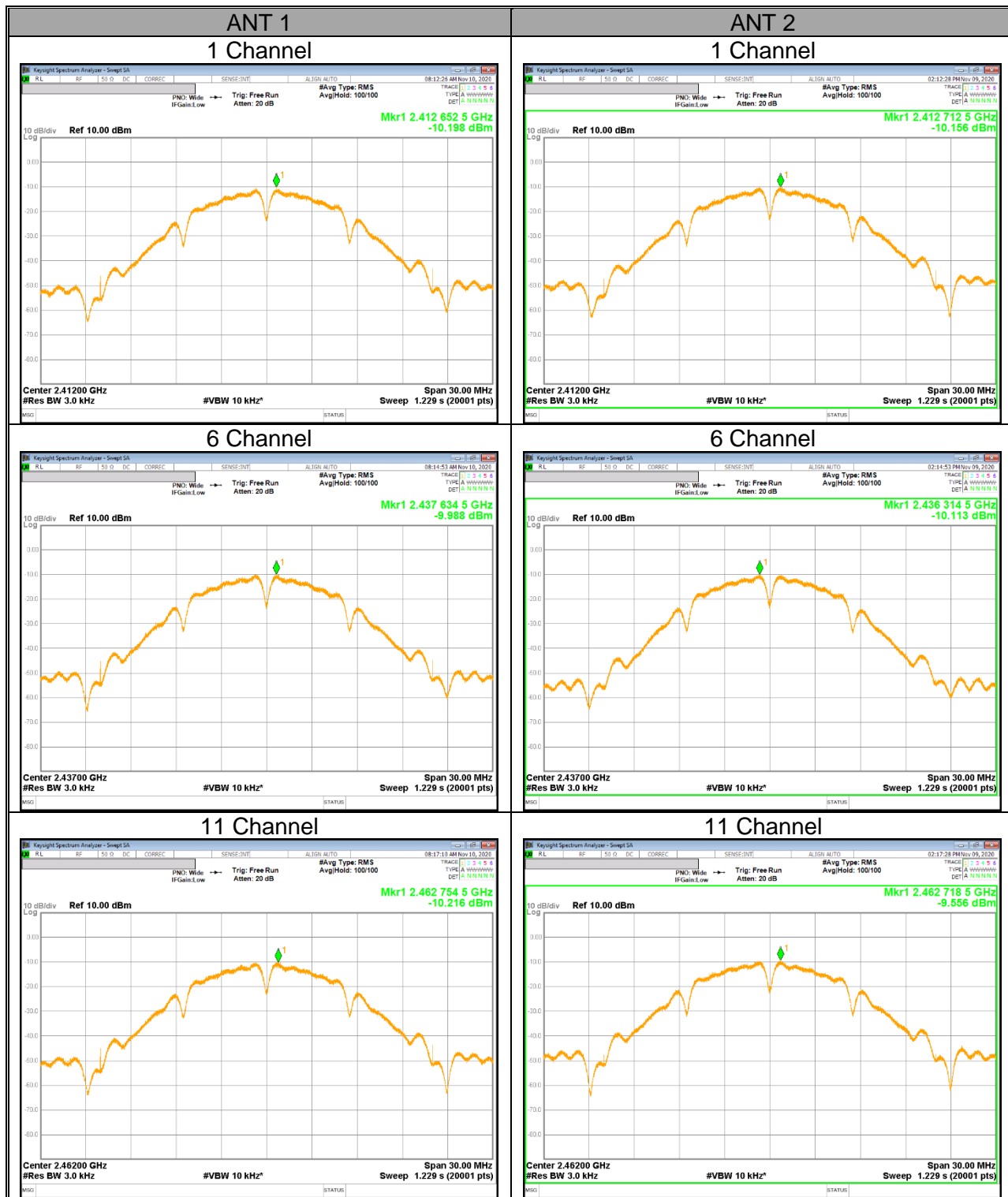
2TX : Total PSD = ANT1 Meas PSD + ANT2 Meas PSD + Duty Cycle CF

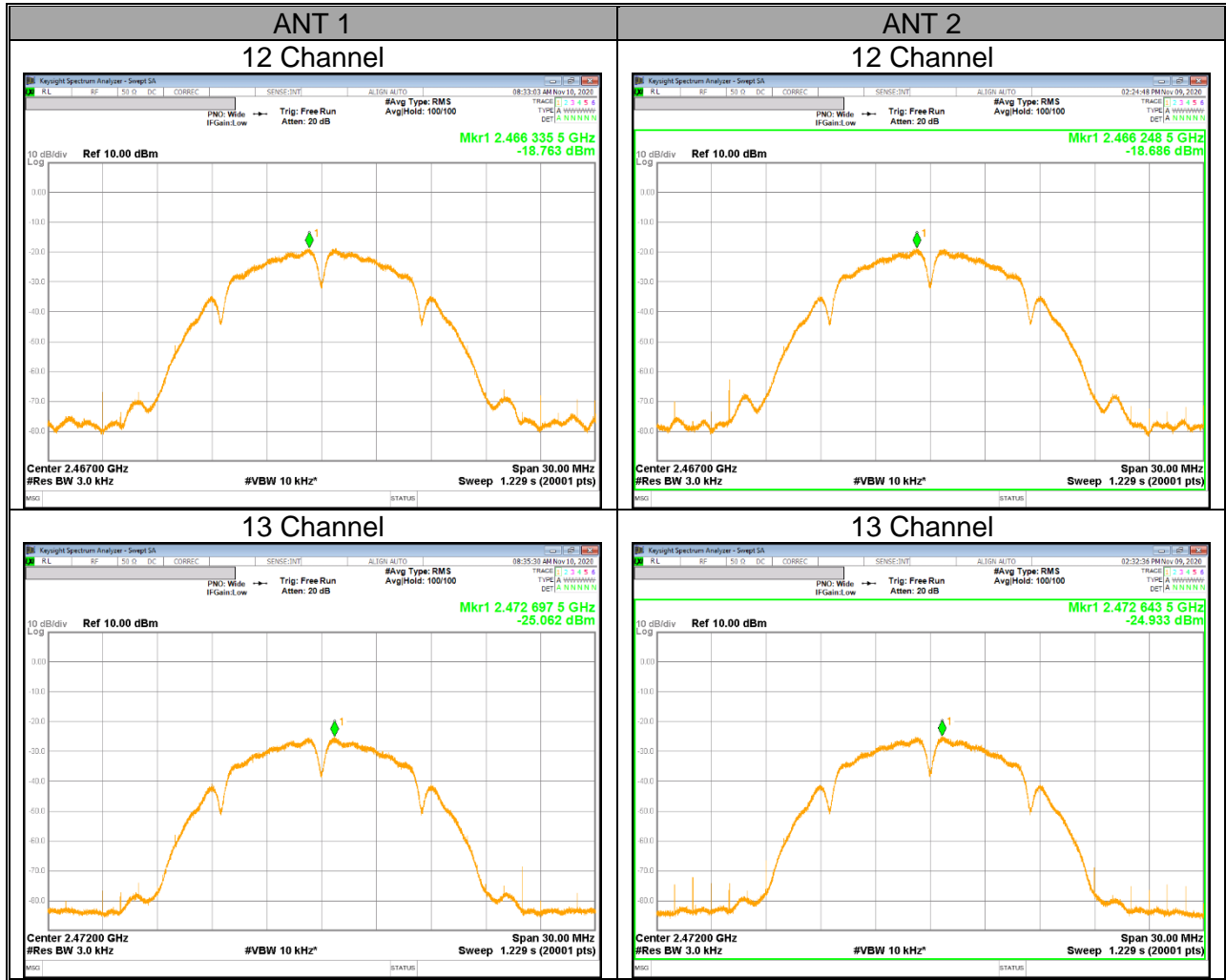
Channel	Frequency [MHz]	Tones	RU Offset	Meas PPSD [dBm/100kHz]		Total Corr'd PPSD [dBm/100kHz]	PSD Limit [dBm/3kHz]
				ANT1	ANT2		
1	2 412	26T	0	-1.61	-0.72	1.87	8.00
			4	-2.78	-1.85	0.72	
			8	-2.48	-1.17	1.23	
		SU	-	-5.92	-6.33	-3.01	
6	2 437	26T	0	-1.79	-1.95	1.14	8.00
			4	-0.91	-1.29	1.92	
			8	-2.45	-1.31	1.17	
		SU	-	-7.51	-8.14	-4.70	
11	2 462	26T	0	-2.92	-1.71	0.74	8.00
			4	-1.56	-0.84	1.82	
			8	-2.31	-1.57	1.08	
		SU	-	-6.51	-6.52	-3.41	
12	2 467	26T	0	-2.53	-1.39	1.08	8.00
			4	-1.99	-1.74	1.15	
			8	-2.76	-1.05	1.19	
		SU	-	-8.91	-8.57	-5.62	
13	2 472	26T	0	-7.80	-6.74	-4.23	8.00
			4	-8.36	-6.33	-4.22	
			8	-8.96	-7.73	-5.29	
		SU	-	-15.80	-14.80	-12.16	

Note. RBW 100kHz measurement data is lower than 8dBm/3kHz limit.

9.4.3. PSD TEST PLOTS

DTS 2.4 GHz IEEE 802.11b mode





DTS 2.4 GHz IEEE 802.11g mode

