

RF Test Report

U-NII 802.11ax OFDMA

Report No. : RF200522K003-7 R1
Customer : Samsung Electronics Co., Ltd.
Address : 129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do,
16677, Korea
Use of Report : Certification
Model Name : SM-T975
FCC ID / IC : A3LSMT975
Date of Test : 2020.06.01 to 2020.07.15
Test Method Used : FCC 47 CFR PART 15 Subpart E (Section §15.407) /
ISED RSS-247
Testing Environment : Refer to the Test Condition

Test Result : **Pass** **Fail**

ISSUED BY: BV CPS ADT Korea Ltd., EMC/RF Laboratory

ADDRESS: Innoplex No.2 106, Sinwon-ro 306, Yeongtong-gu,
Suwon-si, Gyeonggi-do, Korea 16675

TEST LOCATION: HeungAn-daero 49, DongAn-gu, Anyang-si,
Gyeonggi-do, Korea, 14119

Tested by

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Technical Manager

Name : Jongha Choi



2020. 07. 15

BV CPS ADT Korea Ltd.

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BUREAU
VERITAS

RELEASE CONTROL RECORD

REPORT NO.	REASON FOR CHANGE	DATE ISSUED
RF200522K003-7	Original release	2020.07.01
RF200522K003-7 R1	Corrected the regarding distance extrapolation factor and added statement regarding the worst case of band edge	2020.07.15

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1 Summary of Test Results

The EUT has been tested according to the following specifications

Applied Standard : FCC Part 15, Subpart E 15.407, RSS-247					
FCC Part Section(s)	RSS Section(s)	Test Description	Limit	Test Result	Reference
N/A	RSS-Gen [6.6]	26 dB Bandwidth	N/A	PASS	Section 2.5
15.407(e)	RSS-Gen [6.6]	6 dB Bandwidth	> 500 kHz (5 725 – 5 850 MHz)	PASS	Section 3.2
-	-	Occupied Bandwidth (99 % Bandwidth)	N/A	PASS	Section 2.5
15.407(a)(1)(iv) 15.407(a)(2) 15.407(a)(3)	RSS-247 [6.2]	Maximum Conducted Output Power	Maximum Conducted power must meet the limits in 15.407(a) (RSS-247 [6.2])	PASS	Section 3.3
15.407(a)(1)(iv) 15.407 (a)(2) 15.407 (a)(3)	RSS-247 [6.2]	Maximum Power Spectral Density	Maximum Conducted power must meet the limits in 15.407(a) (RSS-247 [6.2])	PASS	Section 3.4
15.407(h)	RSS-247 [6.3]	Dynamic Frequency Selection	Refer to the U-NII Test Report	PASS	N/A ₃₎
15.407(b)(1), (2),(3),(4)	RSS-247 [6.2]	Undesirable Emissions	Undesirable emissions must meet the limits detailed in 15.407(b) (RSS-247 [6.2])	PASS	Section 3.5
15.205 15.407(b)(1), (4), (5), (6)	RSS-Gen [8.9]	General Field Strength Limits (Restricted Bands and Radiated Emission Limits)	Emissions in restricted bands must meet the radiated limits detailed in 15.209 (RSS-Gen [8.9])	PASS	Section 3.5
15.407	RSS-Gen [8.8]	AC Conducted Emissions (150 kHz – 30 MHz)	< FCC 15.207 (RSS-Gen [8.8]) Limits	PASS	Section 3.6

NOTES

- 1) The general test methods used to test on this devices are ANSI C63.10.
- 2) Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.
- 3) DFS test results refer to the DFS section(section 4) of the U-NII test report.

1.1 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2

Measurement Items	Frequency Range	Expanded Uncertainty $U = kU_c (k = 2)$
Conducted Emissions at main ports	150 kHz – 30 MHz	2.62
Radiated Spurious Emissions	9 kHz – 30 MHz	1.97
	30 MHz – 1 GHz	4.04
	1 GHz – 18 GHz	5.38
	18 GHz – 40 GHz	5.18

This uncertainty represents an expanded uncertainty expressed at approximately the 95 % confidence level using a coverage factor of $k = 2$.

2 General Information

2.1 General Description of EUT

Product	Tablet
Brand	Samsung
Model	SM-T975
Identification No. of EUT	-
Series Model	-
Model Difference	-
Power Supply	3.86 V DC By Battery / DC 5/9 V By Adapter
Modulation Type	OFDMA
Transfer Rate	MCS0 to MCS9 (802.11ax)
Operating Frequency	5 180 to 5 240 MHz (U-NII-1) 5 260 to 5 320 MHz (U-NII-2A) 5 500 to 5 720 MHz (U-NII-2C) 5 720 to 5 825 MHz (U-NII-3)
Number of Channel	4 / 2 / 1 Channels (U-NII-1)_20 / 40 / 80 MHz BW 4 / 2 / 1 Channels (U-NII-2A)_20 / 40 / 80 MHz BW 11 / 7 / 3 Channels (U-NII-2C)_20 / 40 / 80 MHz BW 1 / 1 / 1 Channels (Straddle)_20 / 40 / 80 MHz BW 5 / 2 / 1 Channels (U-NII-3)_20 / 40 / 80 MHz BW
Output Power	16.82 dBm
Antenna Type	Metal Antenna
Antenna Connector	C-clip
H/W Version	REV0.4
S/W Version	T975.001

NOTES

- 1) The above equipment has been tested by **Bureau Veritas Consumer Products Services ADT Korea**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's RF characteristics under the conditions specified in this report.
- 2) The EUT incorporates a MIMO function. Physically, the EUT provides 2 completed transmitters and 2 receivers.

Frequency Range	Test Mode	Antenna 1	Antenna 2
5 GHz U-NII Band (5 150 to 5 850 MHz)	802.11ax(HE20)_SISO	TX/RX	TX/RX
	802.11ax(HE40)_SISO	TX/RX	TX/RX
	802.11ax(HE80)_SISO	TX/RX	TX/RX
	802.11ax(HE20)_MIMO	TX/RX	TX/RX
	802.11ax(HE40)_MIMO	TX/RX	TX/RX
	802.11ax(HE80)_MIMO	TX/RX	TX/RX

3) The following antennas were provided to the EUT

Antenna	Type	Connector	Peak Gain (dBi)				
			2.4 GHz	U-NII-1	U-NII-2A	U-NII-2C	U-NII-3
Antenna 1	Metal Antenna	Internal	-5.71	-8.45	-6.15	-6.05	-8.65
Antenna 2	Metal Antenna	Internal	-6.52	-8.84	-8.46	-8.57	-7.70

4) Spurious emission of the simultaneous operation RSDB mode and the test data please refer to report no. RF200522K003-6 (U-NII Test Report).

5) List of Accessories

Accessories	Brand	Model	Manufacturer	Specification
Ear phone	Samsung	EHS64	Samsung	3.5 mm
S-pen	Samsung	EJ-PT870	Samsung	Bluetooth
Keyboard	Samsung	EF-DT970	Samsung	N/A
TA	Samsung	EP-TA200	Samsung	Input : AC 100-240 V, 50 – 60 Hz, 0.5 A Output : DC 9.0 V, 1.67 A, DC5.0 V, 2.0 A
Cable	Samsung	EP-DG930M	Samsung	A to C type, Shielded, 1.m
Battery	Samsung	EB-BT975ABY	Samsung	Rating: 3.86Vdc, 9800mAh, 37.83Wh

7) Test RU offset for tones

Mode	Tones number in RU	RU offset
HE20	26T	0
		4
		8
	52T	37
		38
		40
	106T	53
		54
	242T / SU	61 / -
	HE40	26T
9		
17		
52T		37
		41
		44
106T		53
		54
		56
242T		61
		62
484T / SU		63 / -
HE80		26T
	18	
	36	
	52T	37
		45
		52
	106T	53
		57
		60
	242T	61
		62
		64
	484T	65
		66
	996T / SU	67 / -

Mode	Channel	Tones	RU offset	Portion
HE20	Straddle 5720 MHz	26T	6	U-NII-2C & U-NII-3
		242T/SU	61 / -	
HE40	Straddle 5710 MHz	26T	16	U-NII-2C & U-NII-3
		484T/SU	65 / -	
HE80	Straddle 5690 MHz	26T	35	U-NII-2C & U-NII-3
		996T/SU	67 / -	

2.2 Description of Test Mode

[Test Channel of EUT]

- 5 GHz 802.11ax (20 MHz BW)

U-NII-1		U-NII-2A		U-NII-2C		U-NII-3	
Channel	Frequency [MHz]	Channel	Frequency [MHz]	Channel	Frequency [MHz]	Channel	Frequency [MHz]
36	5 180	52	5 260	100	5 500	149	5 745
40	5 200	56	5 280	104	5 520	153	5 765
44	5 220	60	5 300	108	5 540	157	5 785
48	5 240	64	5 320	112	5 560	161	5 805
				116	5 580	165	5 825
				120	5 600		
				124	5 620		
				128	5 640		
				132	5 660		
				136	5 680		
				140	5 700		
				144	5 720		

- 5 GHz 802.11ax (40 MHz BW)

U-NII-1		U-NII-2A		U-NII-2C		U-NII-3	
Channel	Frequency [MHz]	Channel	Frequency [MHz]	Channel	Frequency [MHz]	Channel	Frequency [MHz]
38	5 190	54	5 270	102	5 510	151	5 755
46	5 230	62	5 310	110	5 550	159	5 795
				118	5 590		
				126	5 630		
				134	5 670		
				142	5 710		

- 5 GHz 802.11ax (80 MHz BW)

U-NII-1		U-NII-2A		U-NII-2C		U-NII-3	
Channel	Frequency [MHz]	Channel	Frequency [MHz]	Channel	Frequency [MHz]	Channel	Frequency [MHz]
42	5 210	58	5 290	106	5 530	155	5 775
				122	5 610		
				138	5 690		

2.2.1 Test Mode Applicability and Tested Channel Details

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates, XYZ axis and antenna ports. The worst case was found when positioned on X axis for radiated emission. Following channel(s) was(were) selected for the final test as listed below :

EUT Configure mode	Applicable to				Description
	RE < 1G	RE ≥ 1G	PLC	APCM	
-	√	√	√	√	-

Where RE ≥ 1 G : Radiated Emission above 1 GHz & Bandedge Measurement

RE < 1 G : Radiated Emission below 1 GHz

PLC : Power Line Conducted Emission

APCM : Antenna Port Conducted Measurement

Radiated Emission Test (Below 1 GHz)

- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, XYZ axis, antenna ports (if EUT with antenna diversity architecture) and data rate.
- Following channel(s) was (were) selected for the final test as listed below.

Frequency Band	EUT mode	Available Channel	Tested Channel	Modulation Type	Data Rate
U-NII-1 (5 180 - 5 240)	802.11ax(HE20)	36 to 48	36	OFDM	MCS0
U-NII-2A (5 260 - 5 320)	802.11ax(HE20)	52 to 64	34	OFDM	MCS0
U-NII-2C (5 500 - 5 700)	802.11ax(HE20)	100 to 140	100	OFDM	MCS0
U-NII-3 (5 745 - 5 825)	802.11ax(HE20)	149 to 165	149	OFDM	MCS0

Radiated Emission Test (Above 1 GHz)

- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, XYZ axis, antenna ports (if EUT with antenna diversity architecture) and data rate.
- Following channel(s) was (were) selected for the final test as listed below.
- For the band edge test, it was tested at SU mode which is worst case.

Frequency Band	EUT mode	Available Channel	Tested Channel	Modulation Type	Data Rate
U-NII-1 (5 180 - 5 240)	802.11ax(HE20)	36 to 48	36, 44, 48	OFDM	MCS0
	802.11ax(HE40)	38 to 46	38, 46	OFDM	MCS0
	802.11ax(HE80)	42	42	OFDM	MCS0
U-NII-2A (5 260 - 5 320)	802.11ax(HE20)	52 to 64	52, 60, 64	OFDM	MCS0
	802.11ax(HE40)	54 to 62	54, 62	OFDM	MCS0
	802.11ax(HE80)	58	58	OFDM	MCS0
U-NII-2C (5 500 - 5 700)	802.11ax(HE20)	100 to 140	100, 120, 140	OFDM	MCS0
	802.11ax(HE40)	102 to 134	102, 118, 134	OFDM	MCS0
	802.11ax(HE80)	106	106, 122	OFDM	MCS0
Straddle	802.11ax(HE20)	144	144	OFDM	MCS0
	802.11ax(HE40)	142	142	OFDM	MCS0
	802.11ax(HE80)	138	138	OFDM	MCS0
U-NII-3 (5 745 - 5 825)	802.11ax(HE20)	149 to 165	149, 161, 165	OFDM	MCS0
	802.11ax(HE40)	151 to 159	151, 159	OFDM	MCS0
	802.11ax(HE80)	155	155	OFDM	MCS0

Power line Conducted Emission Test

- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, XYZ axis, antenna ports (if EUT with antenna diversity architecture) and data rate.
- Following channel(s) was (were) selected for the final test as listed below.

Frequency Band	EUT mode	Available Channel	Tested Channel	Modulation Type	Data Rate
-	-	-	-	-	-

Antenna Port Conducted Measurement

- This item includes all test value of each mode, but only includes spectrum plot of worst value of each mode.
- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, antenna ports (if EUT with antenna diversity architecture), and data rate.
- Following channel(s) was (were) selected for the final test as listed below.

Frequency Band	EUT mode	Available Channel	Tested Channel	Modulation Type	Data Rate
U-NII-1 (5 180 - 5 240)	802.11ax(HE20)	36 to 48	36, 44, 48	OFDM	MCS0
	802.11ax(HE40)	38 to 46	38, 46	OFDM	MCS0
	802.11ax(HE80)	42	42	OFDM	MCS0
U-NII-2A (5 260 - 5 320)	802.11ax(HE20)	52 to 64	52, 60, 64	OFDM	MCS0
	802.11ax(HE40)	54 to 62	54, 62	OFDM	MCS0
	802.11ax(HE80)	58	58	OFDM	MCS0
U-NII-2C (5 500 - 5 700)	802.11ax(HE20)	100 to 140	100, 120, 140	OFDM	MCS0
	802.11ax(HE40)	102 to 134	102, 118, 134	OFDM	MCS0
	802.11ax(HE80)	106	106, 122	OFDM	MCS0
Straddle	802.11ax(HE20)	144	144	OFDM	MCS0
	802.11ax(HE40)	142	142	OFDM	MCS0
	802.11ax(HE80)	138	138	OFDM	MCS0
U-NII-3 (5 745 – 5 825)	802.11ax(HE20)	149 to 165	149, 161, 165	OFDM	MCS0
	802.11ax(HE40)	151 to 159	151, 159	OFDM	MCS0
	802.11ax(HE80)	155	155	OFDM	MCS0

Test Condition

Applicable to	Environmental Conditions	Test Voltage	Tested by
RE < 1G	22 °C, 55 % RH	DC 5/9 V By Adaptor	Sooyeon Kim
RE ≥ 1G	22 °C, 55 % RH	DC 5/9 V By Adaptor	Sooyeon Kim
PLC	23 °C, 49 % RH	DC 5/9 V By Adaptor	Sooyeon Kim
APCM	22 °C, 51 % RH	DC 5/9 V By Adaptor	Sooyeon Kim

2.3 Maximum Output Power

Frequency Range [MHz]	Test Mode	Output Power [dBm]		Output Power [mW]	
		ANT1	ANT2	ANT1	ANT2
5 180 - 5 240	802.11ax HE20 SISO	13.67	13.61	23.28	22.96
	802.11ax HE20 MIMO	16.68		46.56	
5 190 - 5 230	802.11ax HE40 SISO	11.53	11.69	14.22	14.76
	802.11ax HE40 MIMO	14.64		29.12	
5 210	802.11ax HE80 SISO	10.61	10.51	11.51	11.25
	802.11ax HE80 MIMO	13.92		24.67	
5 260 - 5 320	802.11ax HE20 SISO	13.90	13.66	24.55	23.23
	802.11ax HE20 MIMO	16.82		48.04	
5 270 - 5 310	802.11ax HE40 SISO	11.50	11.81	14.13	15.17
	802.11ax HE40 MIMO	14.52		28.33	
5 290	802.11ax HE80 SISO	10.72	10.96	11.80	12.47
	802.11ax HE80 MIMO	13.65		23.19	
5 500 - 5 720	802.11ax HE20 SISO	13.64	13.51	23.12	22.44
	802.11ax HE20 MIMO	16.08		40.53	
5 510 - 5 710	802.11ax HE40 SISO	11.81	11.90	15.17	15.49
	802.11ax HE40 MIMO	14.97		31.40	
5 530 - 5 690	802.11ax HE80 SISO	10.88	10.97	12.25	12.50
	802.11ax HE80 MIMO	14.04		25.37	
5 745 - 5 825	802.11ax HE20 SISO	13.72	13.55	23.55	22.65
	802.11ax HE20 MIMO	16.78		47.60	
5 755 - 5 795	802.11ax HE40 SISO	11.65	11.70	14.62	14.79
	802.11ax HE40 MIMO	14.39		27.45	
5 775	802.11ax HE80 SISO	10.75	10.74	11.89	11.86
	802.11ax HE80 MIMO	13.93		24.71	

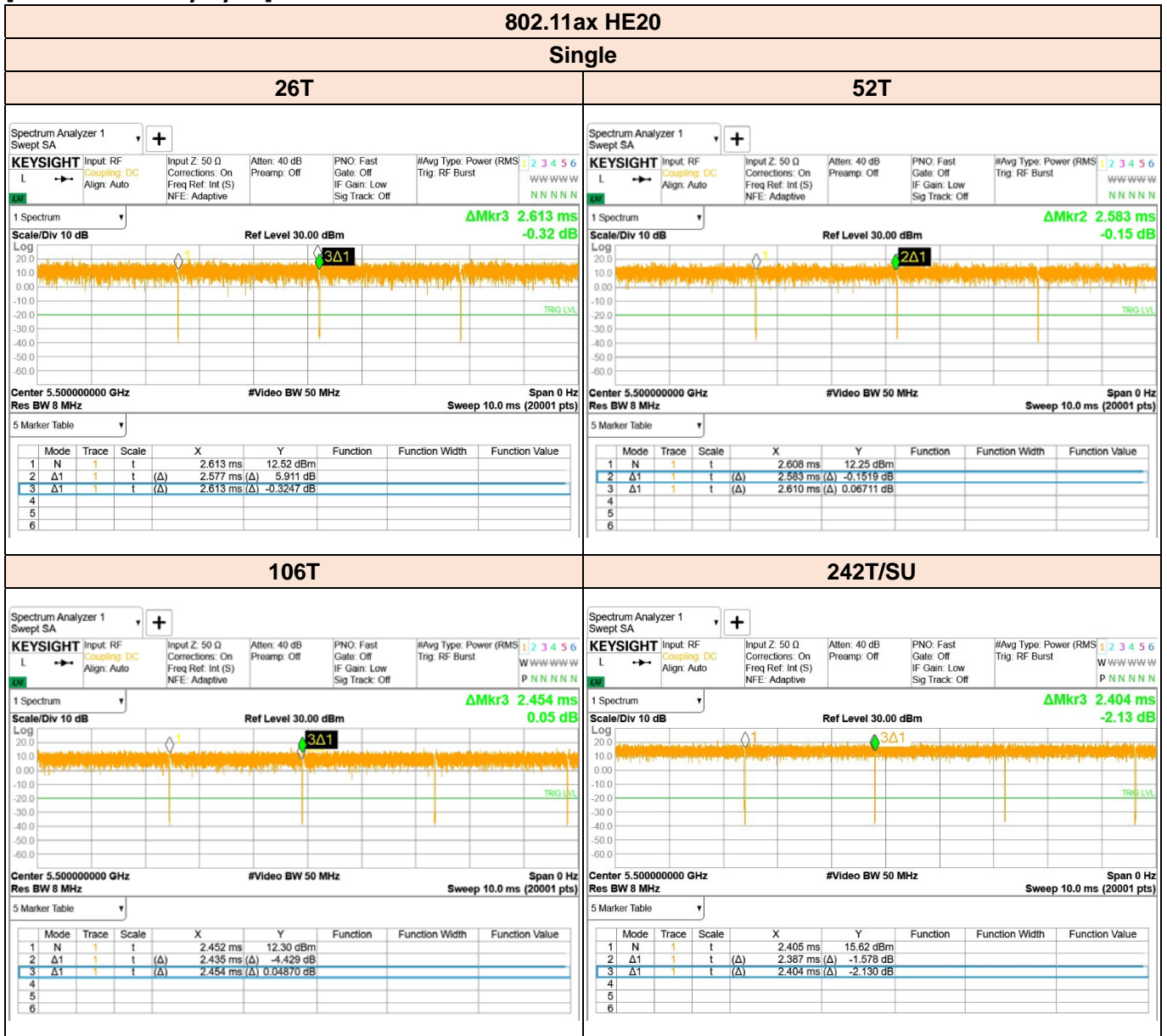


2.4 Duty Cycle of Test Signal

Antenna	Mode	Tone	On Time [msec]	Period [msec]	Duty Cycle X [Linear]	Duty Cycle [%]	DCCF [dB]	
SISO	802.11ax HE20	26T	2.577	2.613	0.986	98.62	0.00	
		52T	2.583	2.610	0.990	98.97	0.00	
		106T	2.435	2.454	0.992	99.23	0.00	
		242T/SU	2.387	2.404	0.993	99.29	0.00	
	802.11ax HE40	26T	2.581	2.612	0.988	98.81	0.00	
		52T	2.583	2.610	0.990	98.97	0.00	
		106T	2.424	2.453	0.988	98.82	0.00	
		242T	2.385	2.404	0.992	99.21	0.00	
	802.11ax HE80	484T/SU	2.382	2.400	0.993	99.25	0.00	
		26T	2.582	2.612	0.989	98.85	0.00	
		52T	2.583	2.609	0.990	99.00	0.00	
		106T	2.420	2.452	0.987	98.69	0.00	
		242T	2.371	2.406	0.985	98.55	0.00	
	MIMO	802.11ax HE20	484T	2.382	2.400	0.993	99.25	0.00
			996T/SU	2.418	2.439	0.991	99.14	0.00
26T			2.579	2.613	0.987	98.70	0.00	
52T			2.583	2.610	0.990	98.97	0.00	
802.11ax HE40		106T	2.435	2.453	0.993	99.27	0.00	
		242T/SU	2.386	2.405	0.992	99.21	0.00	
		26T	2.580	2.613	0.987	98.74	0.00	
		52T	2.581	2.606	0.990	99.04	0.00	
		106T	2.432	2.451	0.992	99.22	0.00	
802.11ax HE80		242T	2.383	2.404	0.991	99.13	0.00	
		484T/SU	2.381	2.399	0.992	99.25	0.00	
		26T	2.576	2.612	0.986	98.62	0.00	
		52T	2.576	2.609	0.987	98.74	0.00	
		106T	2.421	2.454	0.987	98.66	0.00	
		242T	2.369	2.403	0.986	98.59	0.00	
802.11ax HE80	484T	2.381	2.400	0.992	99.21	0.00		
	996T/SU	2.418	2.437	0.992	99.22	0.00		



[Test Plot of Duty Cycle]





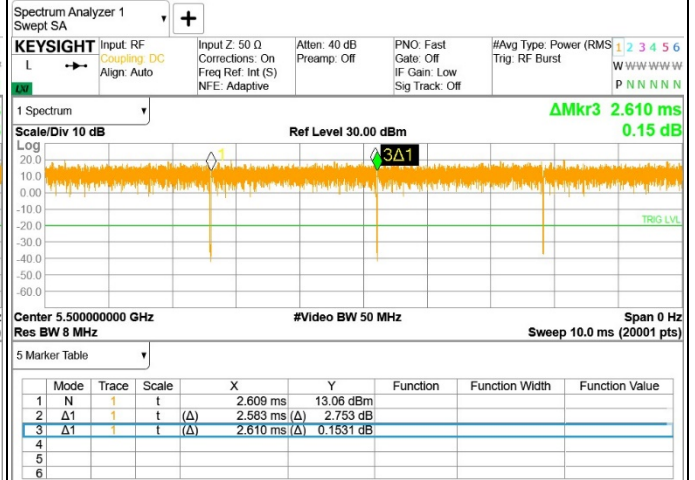
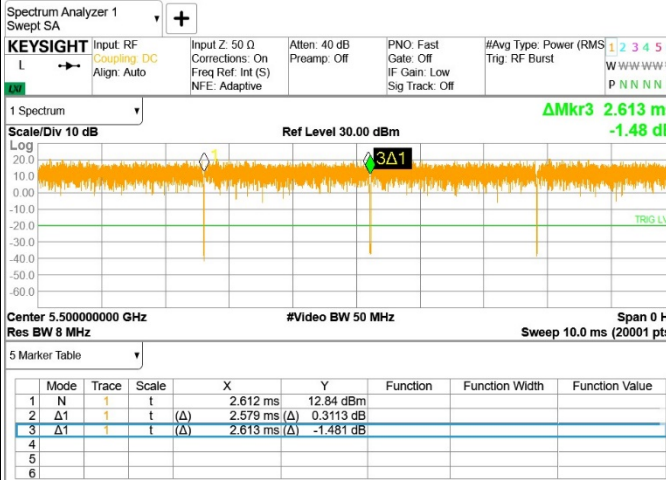
BUREAU VERITAS

802.11ax HE20

ALL

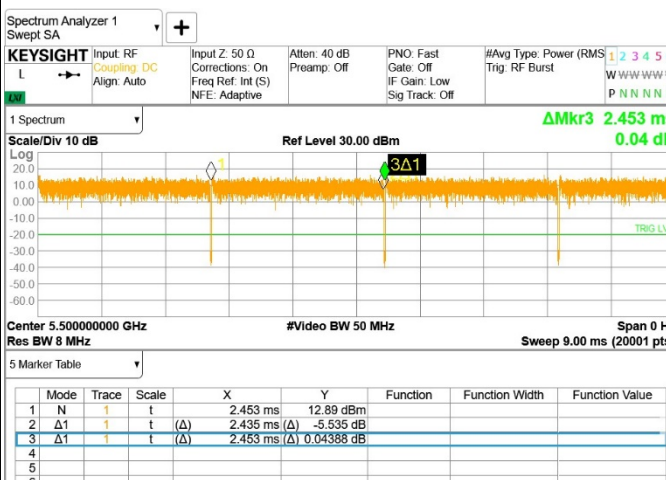
26T

52T



106T

242T/SU





BUREAU VERITAS

802.11ax HE40

Single

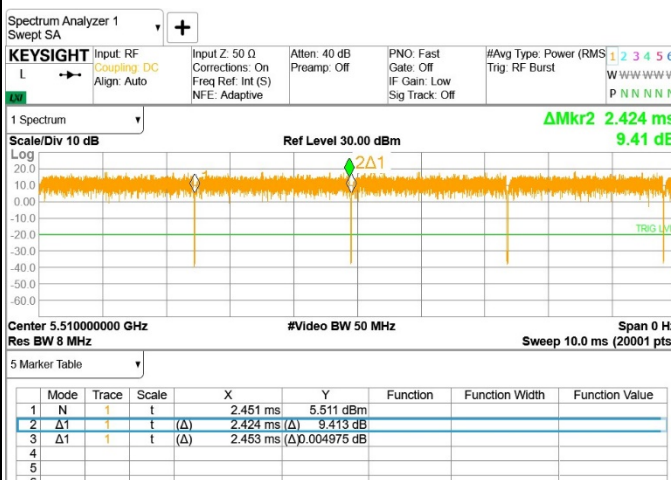
26T

52T



106T

242T



484T/SU



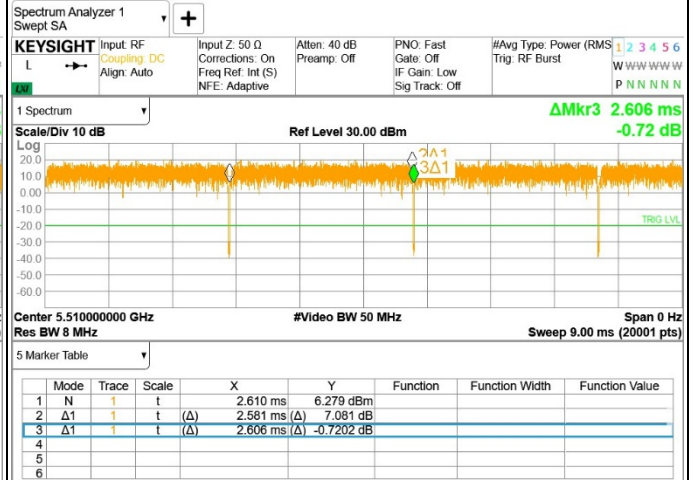
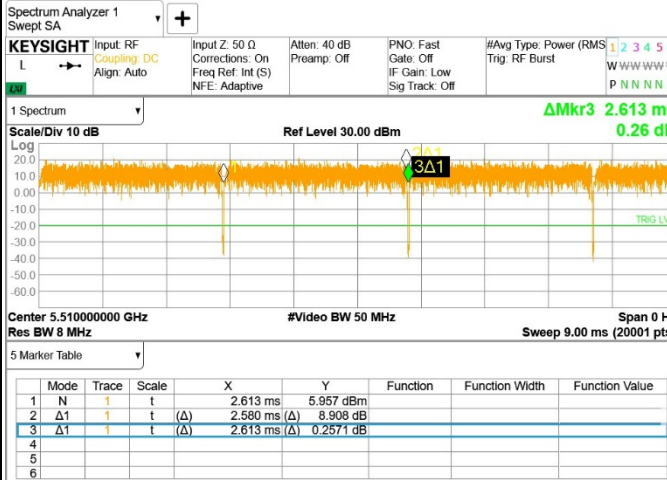


802.11ax HE40

ALL

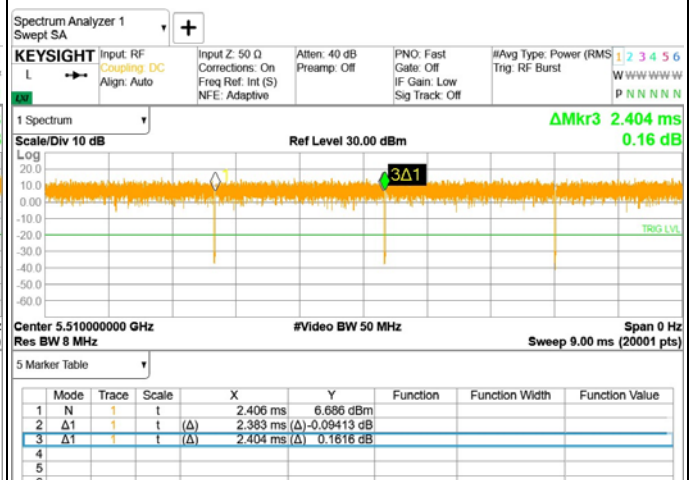
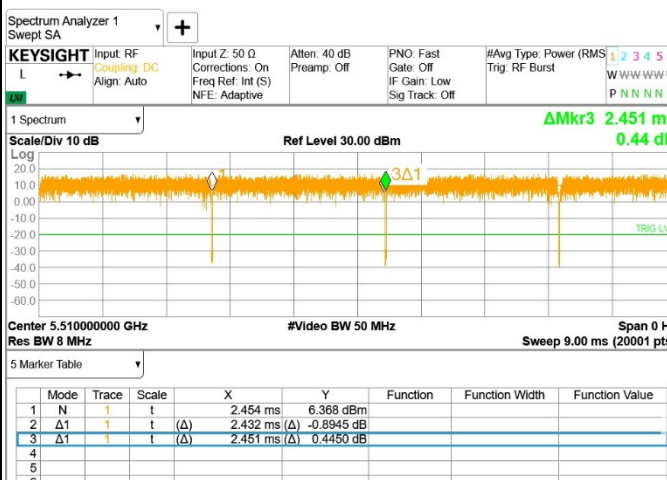
26T

52T

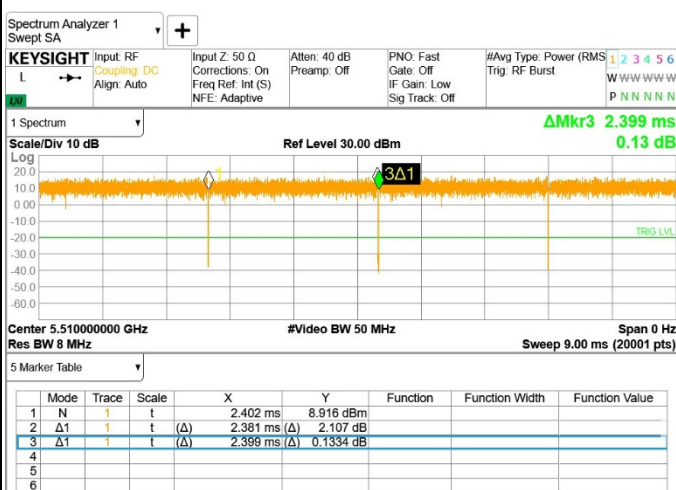


106T

242T



484T/SU





BUREAU VERITAS

802.11ax HE80

Single

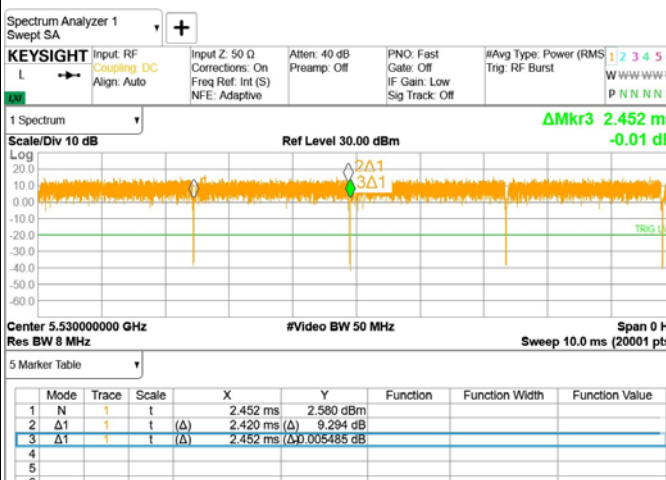
26T

52T



106T

242T



484T

996T/SU

