



CERTIFICATION TEST REPORT

Report Number. : 4789300832-E2V3

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

Model : SM-T723

FCC ID : A3LSMT723
IC : 649E-SMT723

EUT Description : Digital Attractor

Test Standard(s) : FCC 47 CFR PART 15 SUBPART E
INDUSTRY CANADA RSS-247 ISSUE 2

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TL-637

Revision History

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: SAMSUNG ELECTRONICS CO., LTD.
EUT DESCRIPTION: Digital Attractor
MODEL NUMBER: SM-T723
SERIAL NUMBER: R32MC007SPL (CONDUCTED);
R32MC007SEW, R32MC007SJT (RADIATED)
DATE TESTED: DEC 26, 2019 – JAN 14, 2020

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
CFR 47 Part 15 Subpart E	Pass
INDUSTRY CANADA RSS-247 Issue 2	Pass
INDUSTRY CANADA RSS-GEN Issue 5	Pass

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

The tests documented in this report were performed in accordance with following methods.

1. FCC CFR 47 Part 2.
2. FCC CFR 47 Part 15.
3. IC RSS-GEN Issue 5.
4. IC RSS-247 Issue 2.
5. KDB 789033 D02 General UNII Test Procedures New Rules v02r01
6. KDB 905462 D02 UNII DFS Compliance Procedures New Rules v02
7. KDB 905462 D03 UNII Clients Without Radar Detection New Rules v01r02
8. 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	
☒	Chamber 1
☒	Chamber 2
☐	Chamber 3

UL Korea, Ltd. is accredited by IAS, Laboratory Code TL-637. The full scope of accreditation can be viewed at <http://www.iasonline.org/wp-content/uploads/2017/05/TL-637.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	2.35 dB
Radiated Disturbance, 30 MHz to 1 GHz	3.49 dB
Radiated Disturbance, 1 GHz to 18 GHz	5.82 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. DESCRIPTION OF EUT

The EUT is the Digital Attractor. This test report addresses the NII (UNII 802.11a/n/ac) operational mode.

WiFi operating mode

Frequency rage	Mode	ANT1
5GHz (5180 MHz ~ 5825 MHz)	802.11a SISO	TX/RX
	802.11n SISO	TX/RX
	802.11ac SISO	TX/RX

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	ANT1
5180 - 5240	802.11a SISO	12.82	19.14
	802.11n(HT20) SISO	12.81	19.10
5190 - 5230	802.11n(HT40) SISO	12.45	17.58
5210	802.11ac(VHT80) SISO	10.65	11.61
5260 - 5320	802.11a SISO	12.92	19.59
	802.11n(HT20) SISO	12.90	19.50
5270 - 5310	802.11n(HT40) SISO	12.52	17.86
5290	802.11ac(VHT80) SISO	10.41	10.99
5500 - 5720	802.11a SISO	12.63	18.32
	802.11n(HT20) SISO	12.48	17.70
5510 - 5710	802.11n(HT40) SISO	12.38	17.30
5530 - 5690	802.11ac(VHT80) SISO	10.56	11.38
5745 - 5825	802.11a SISO	12.87	19.36
	802.11n(HT20) SISO	12.69	18.58
5755 - 5795	802.11n(HT40) SISO	12.80	19.05
5775	802.11ac(VHT80) SISO	10.87	12.22

5.2. 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]	ANT Gain [dBi]
UNII 1 5150 - 5250	-2.60
UNII 2A 5250 - 5350	-2.80
UNII 2C 5470 - 5725	-2.00
UNII 3 5725 - 5850	-2.10

5.3. List of test reduction and modes covering other modes:

The output power on covered modes is equal to or less than one referenced.
These test items were performed in each mode and the worst case data was reported.
Line 3: 802.11ac VHT20 1TX covered by **802.11n HT20 1TX**
Line 5: 802.11ac VHT40 1TX covered by **802.11n HT40 1TX**

UNII 1

5150 – 5250 MHz RESTRICTED Frequency Band (Radiated Testing)	
Frequency Range [MHz]	Mode
<u>5180 - 5240</u>	<u>802.11a Legacy 1TX</u>
<u>5180 - 5240</u>	<u>802.11n HT20 1TX</u>
5180 - 5240	802.11ac VHT20 1TX
<u>5190 - 5230</u>	<u>802.11n HT40 1TX</u>
5190 - 5230	802.11ac VHT40 1TX
<u>5210</u>	<u>802.11ac VHT80 1TX</u>

UNII 2A

5250 – 5350 MHz RESTRICTED Frequency Band (Radiated Testing)	
Frequency Range [MHz]	Mode
<u>5260 - 5320</u>	<u>802.11a Legacy 1TX</u>
<u>5260 - 5320</u>	<u>802.11n HT20 1TX</u>
5260 - 5320	802.11ac VHT20 1TX
<u>5270 - 5310</u>	<u>802.11n HT40 1TX</u>
5270 - 5310	802.11ac VHT40 1TX
<u>5290</u>	<u>802.11ac VHT80 1TX</u>

UNII 2C

5470 – 5725 MHz RESTRICTED Frequency Band (Radiated Testing)	
Frequency Range [MHz]	Mode
<u>5500 - 5720</u>	<u>802.11a Legacy 1TX</u>
<u>5500 - 5720</u>	<u>802.11n HT20 1TX</u>
5500 - 5720	802.11ac VHT20 1TX
<u>5510 - 5710</u>	<u>802.11n HT40 1TX</u>
5510 - 5710	802.11ac VHT40 1TX
<u>5530 - 5690</u>	<u>802.11ac VHT80 1TX</u>

UNII 3

5725 – 5850 MHz RESTRICTED Frequency Band (Radiated Testing)	
Frequency Range [MHz]	Mode
<u>5745 - 5825</u>	<u>802.11a Legacy 1TX</u>
<u>5745 - 5825</u>	<u>802.11n HT20 1TX</u>
5745 - 5825	802.11ac VHT20 1TX
<u>5755 - 5795</u>	<u>802.11n HT40 1TX</u>
5755 - 5795	802.11ac VHT40 1TX
<u>5775</u>	<u>802.11ac VHT80 1TX</u>

5.4. 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.

The fundamental of the EUT was investigated in three orthogonal orientations X,Y,Z, it was determined that the Y orientation was worst-case orientation; therefore, all final radiated testing was performed with the EUT in the Y orientation.

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

802.11a mode: 6 Mbps 1Tx
802.11n HT20 mode: MCS0 1Tx
802.11n HT40 mode: MCS0 1Tx
802.11ac VHT80 mode: MCS0 1Tx

Note : All radiated and power line conducted tests were performed connected with charger for evaluation of worst case mode.

5.5. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
Charger	SAMSUNG	EP-TA200	R37M7FA00Q1DK3	N/A
Data Cable	SAMSUNG	ECB-DU68WB	GH39-02004A	N/A
USB Herb	Anker Technology	A7516	ACDPUD0930405348	DoC
Keyboard	LENOVO	SK-8825	3971992	Doc
Mouse	LENOVO	MOEUUOA	44VF594	DoC

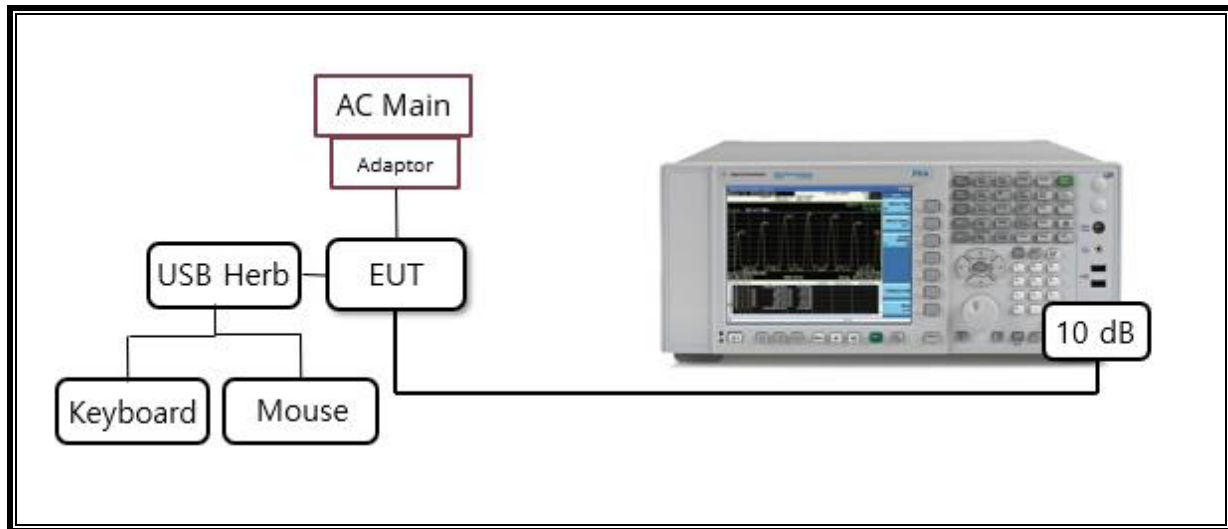
I/O CABLE

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	1.0m	N/A

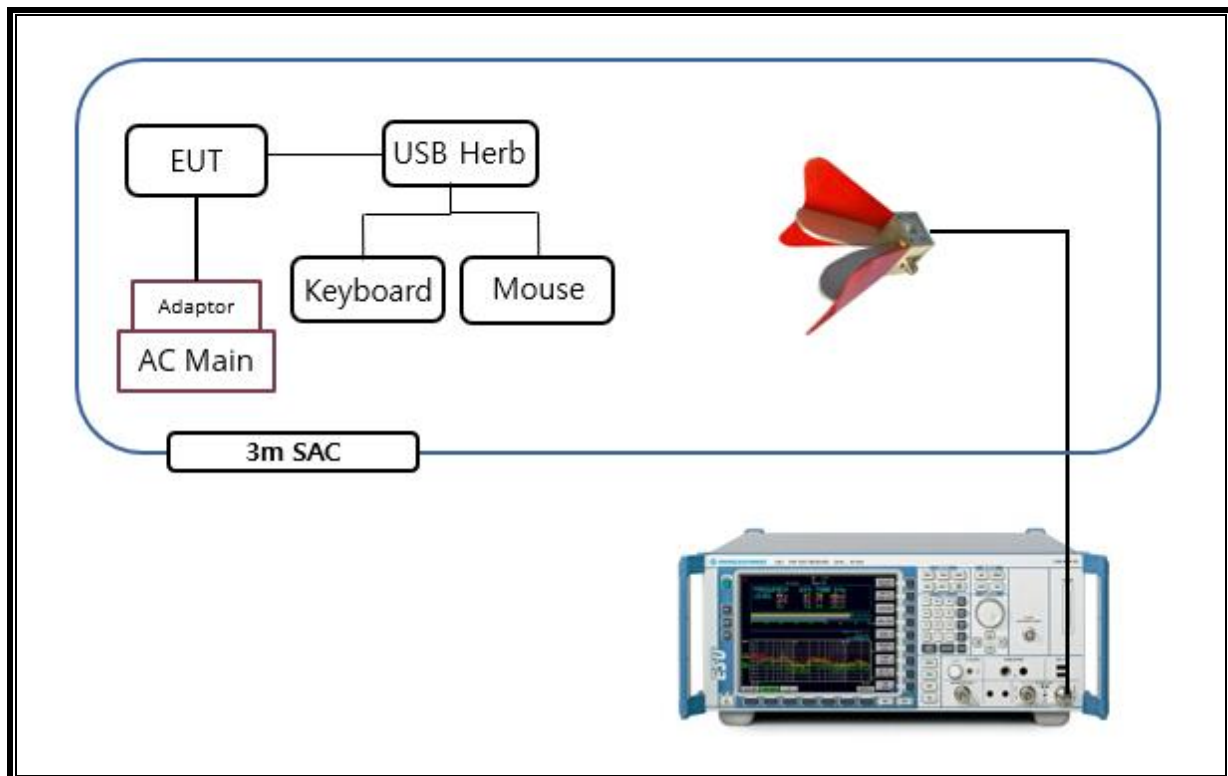
TEST SETUP

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

SETUP DIAGRAM FOR TESTS (CONDUCTED TEST SETUP)



SETUP DIAGRAM FOR TESTS (RADIATED TEST SETUP)



6. 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	08-04-20
Antenna, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	749	08-04-20
Antenna, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	845	08-04-20
Antenna, Horn, 18 GHz	ETS	3115	00167211	08-04-20
Antenna, Horn, 18 GHz	ETS	3115	00161451	08-04-20
Antenna, Horn, 18 GHz	ETS	3117	00168724	08-04-20
Antenna, Horn, 18 GHz	ETS	3117	00168717	08-04-20
Antenna, Horn, 18 GHz	ETS	3117	00205959	08-04-20
Antenna, Horn, 40 GHz	ETS	3116C	00166155	08-14-20
Antenna, Horn, 40 GHz	ETS	3116C	00168645	10-02-21
Preamplifier	ETS	3116C-PA	00168841	08-08-20
Preamplifier, 1000 MHz	Sonoma	310N	341282	08-05-20
Preamplifier, 1000 MHz	Sonoma	310N	351741	08-05-20
Preamplifier, 1000 MHz	Sonoma	310N	370599	08-05-20
Preamplifier, 18 GHz	Miteq	AFS42-00101800-25-S-42	1876511	08-06-20
Preamplifier, 18 GHz	Miteq	AFS42-00101800-25-S-42	1896138	08-06-20
Preamplifier, 18 GHz	Miteq	AFS42-00101800-25-S-42	2029169	08-06-20
Spectrum Analyzer, 44 GHz	Agilent / HP	N9030A	MY54170614	08-06-20
Spectrum Analyzer, 44 GHz	Agilent / HP	N9030A	MY54490312	08-06-20
Spectrum Analyzer, 43.5 GHz	R&S	FSW43	104089	08-06-20
Average Power Sensor	Agilent / HP	U2000	MY54270007	08-09-20
Attenuator	PASTERNAK	PE7087-10	A001	08-08-20
Attenuator	PASTERNAK	PE7087-10	A008	08-08-20
Attenuator	PASTERNAK	PE7004-10	2	08-06-20
Attenuator	PASTERNAK	PE7087-10	A009	08-08-20
EMI Test Receive, 40 GHz	R&S	ESU40	100439	08-06-20
EMI Test Receive, 40 GHz	R&S	ESU40	100457	08-06-20
EMI Test Receive, 44 GHz	R&S	ESW44	101590	08-05-20
EMI Test Receive, 3 GHz	R&S	ESR3	101832	08-05-20
Low Pass Filter 5GHz	Micro-Tronics	LPS17541	009	08-06-20
Low Pass Filter 5GHz	Micro-Tronics	LPS17541	015	08-06-20
Low Pass Filter 5GHz	Micro-Tronics	LPS17541	020	08-06-20
High Pass Filter 3GHz	Micro-Tronics	HPM17543	010	08-06-20
High Pass Filter 3GHz	Micro-Tronics	HPM17543	015	08-06-20
High Pass Filter 3GHz	Micro-Tronics	HPM17543	020	08-06-20
High Pass Filter 6GHz	Micro-Tronics	HPS17542	009	08-06-20
High Pass Filter 6GHz	Micro-Tronics	HPS17542	016	08-06-20
High Pass Filter 6GHz	Micro-Tronics	HPS17542	021	08-06-20
LISN	R&S	ENV-216	101837	08-09-20
Antenna, Loop, 9kHz-30MHz	R&S	HFH2-Z2	100418	10-02-21
Termination	WEINSCHL	M1406A	T01	08-08-20
Attenuator	WEINSCHL	WA76-30-21	A015	08-08-20
UL Software				
Description	Manufacturer	Model	Version	
Radiated software	UL	UL EMC	Ver 9.5	
AC Line Conducted software	UL	UL EMC	Ver 9.5	

7. SUMMARY TABLE

FCC Part Section	RSS Section	Test Description	Test Limit	Test Condition	Test Result
15.407(e)	RSS-247 6.2.4.1	6dB Band width (5.8Ghz)	500KHz	Condcuted	PASS
15.407 (a)(2)	RSS-247 6.2.1.1 6.2.2.1 6.2.3.1	TX Cond. Power 5.15-2.25, 5.25-5.35 & 5.47-5.725	<24dBm or 11+10Log(OBW)		PASS
15.407 (a)(3)	RSS-247 6.2.4.1	TX Cond. Power 5.725-5.825	< 30dBm or 17+10Log(OBW)		PASS
15.407 (a)(5)	RSS-247 6.2.1.1 6.2.2.1 6.2.3.1	PSD (5.2,5.3,5.5GHz)	<11dBm		PASS
15.407 (a)(5)	RSS-247 6.2.4.1	PSD (5.8GHz)	30dBm per 500kHz		PASS
15.207 (a)	RSS-GEN Clause 8.8	AC Power Line conducted emissions	Section 10	Radiated	PASS
15.407 (b) & 15.209	RSS-GEN Clause 7 & 8.9	Radiated Spurious Emission	< 54dBuV/m		PASS
15.407 (h)(2)	RSS-247 6.3	Dynamic Frequency Selection	N/A	Condcuted	PASS

8. MEASUREMENT METHODS

On-Time and Duty Cycle : KDB 789033 D02 v02r01, Section II.B.

6dB Emission BW : KDB 789033 D02 v02r01, Section II.C.2.

26dB Emission BW : KDB 789033 D02 v02r01, Section II.C.1.

99% Occupied BW : KDB 789033 D02 v02r01, Section II.D.

Conducted Output Power : KDB 789033 D02 v02r01, Section II.E.3.b(Method PM-G)

Conducted Output Power for Straddle Channel (ch144/142/138 for 20/40/80MHz BW):

KDB 789033 D02 v02r01, Section II.E.2.b(Method SA-1)

Power Spectral Density : KDB 789033 D02 v02r01, Section II.F.

Unwanted emissions in restricted bands : KDB 789033 D02 v02r01, Section II.G.3 – II.G.6.

Unwanted emissions in non-restricted bands : KDB 789033 D02 v02r01, Section II.G.3 – II.G.6.

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

9. REFERENCE MEASUREMENTS RESULTS

9.1. ON TIME AND DUTY CYCLE RESULTS

Mode	ON Time [msec]	Period [msec]	Duty Cycle X [linear]	Duty Cycle [%]	Duty Cycle Correction Factor [dB]
802.11a	2.795	2.834	0.99	98.6	0.00
802.11n HT20	2.600	2.637	0.99	98.6	0.00
802.11n HT40	5.478	5.515	0.99	99.3	0.00
802.11ac VHT80	2.555	2.592	0.99	98.6	0.00

LIMITS

None; for reporting purposes only.

PROCEDURE

KDB 789033 D02 v02r01 Zero-Span Spectrum Analyzer Method.

9.2. DUTY CYCLE PLOTS



9.3. 26 dB & 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

Reference to 789033 D02 General UNII Test Procedures New Rules v02r01: The transmitter output is connected to a spectrum analyzer.

- 26 dB Bandwidth

RBW set to approximately 1% of EBW, the VBW > RBW, peak detector and max hold.

- 99% Bandwidth

RBW: 1 ~ 5% of 99% Bandwidth, VBW $\geq 3 \times$ RBW, sample detector and clear write.

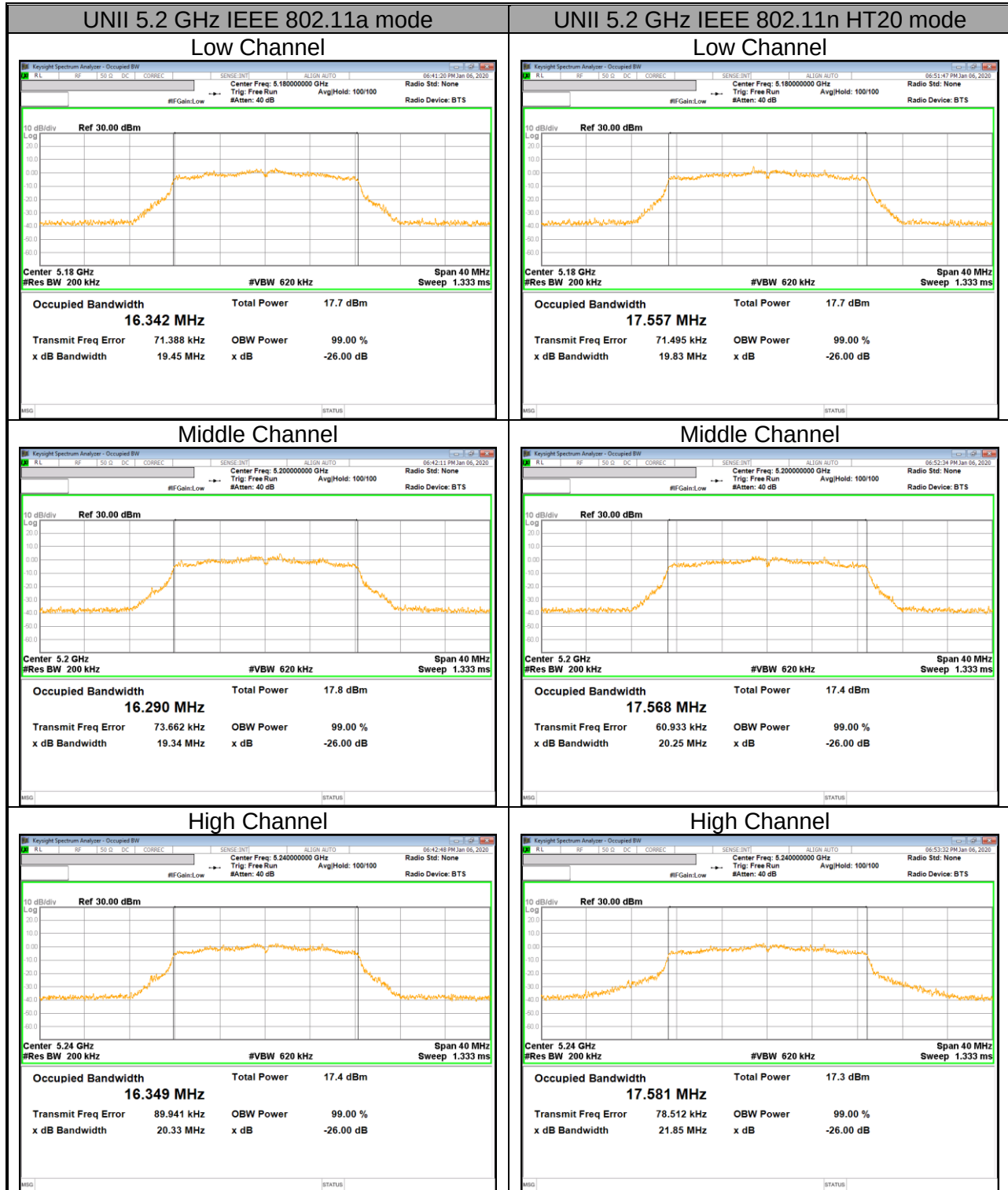
RESULTS

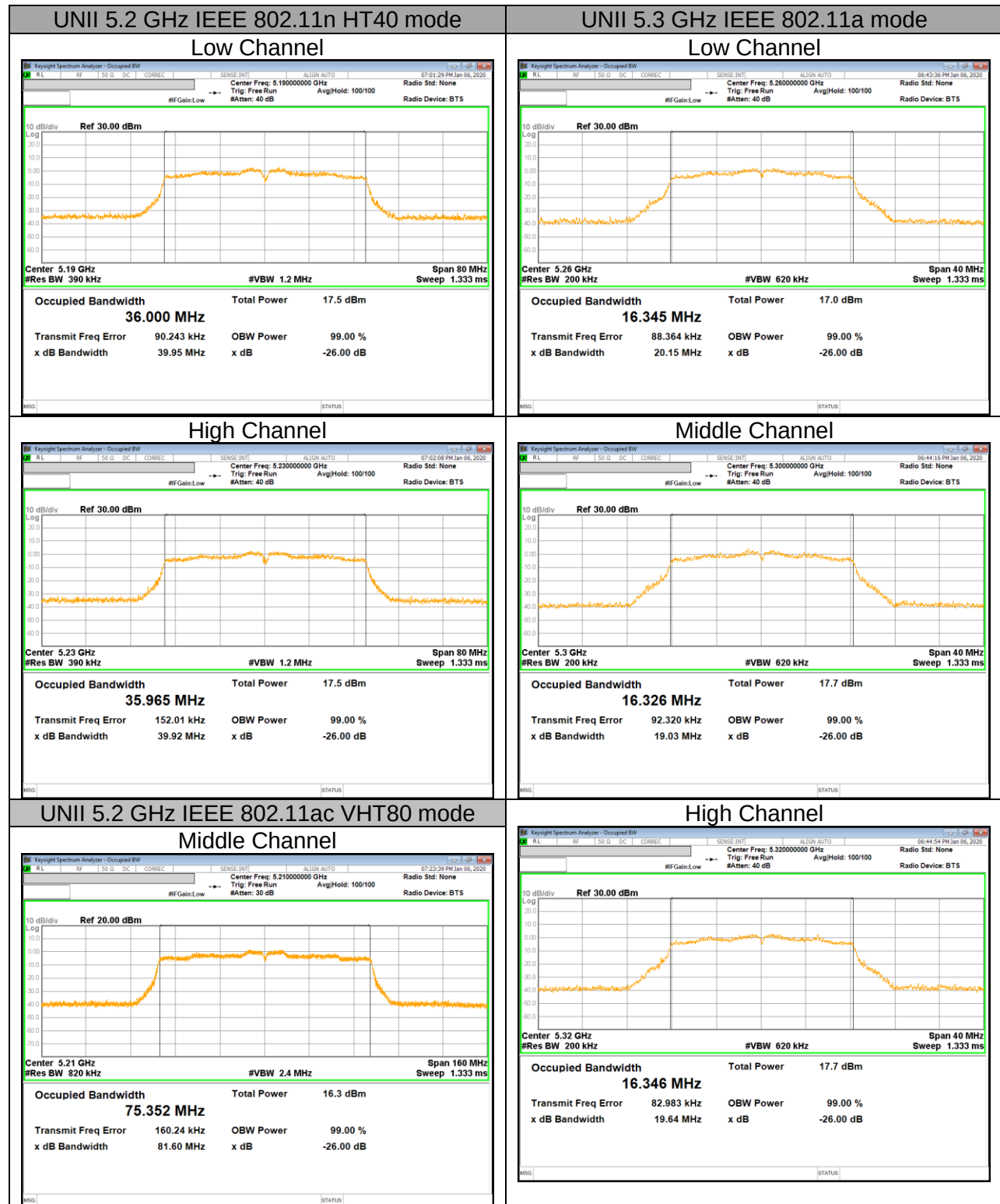
9.3.1. 26 dB & 99% BANDWIDTH TEST RESULTS

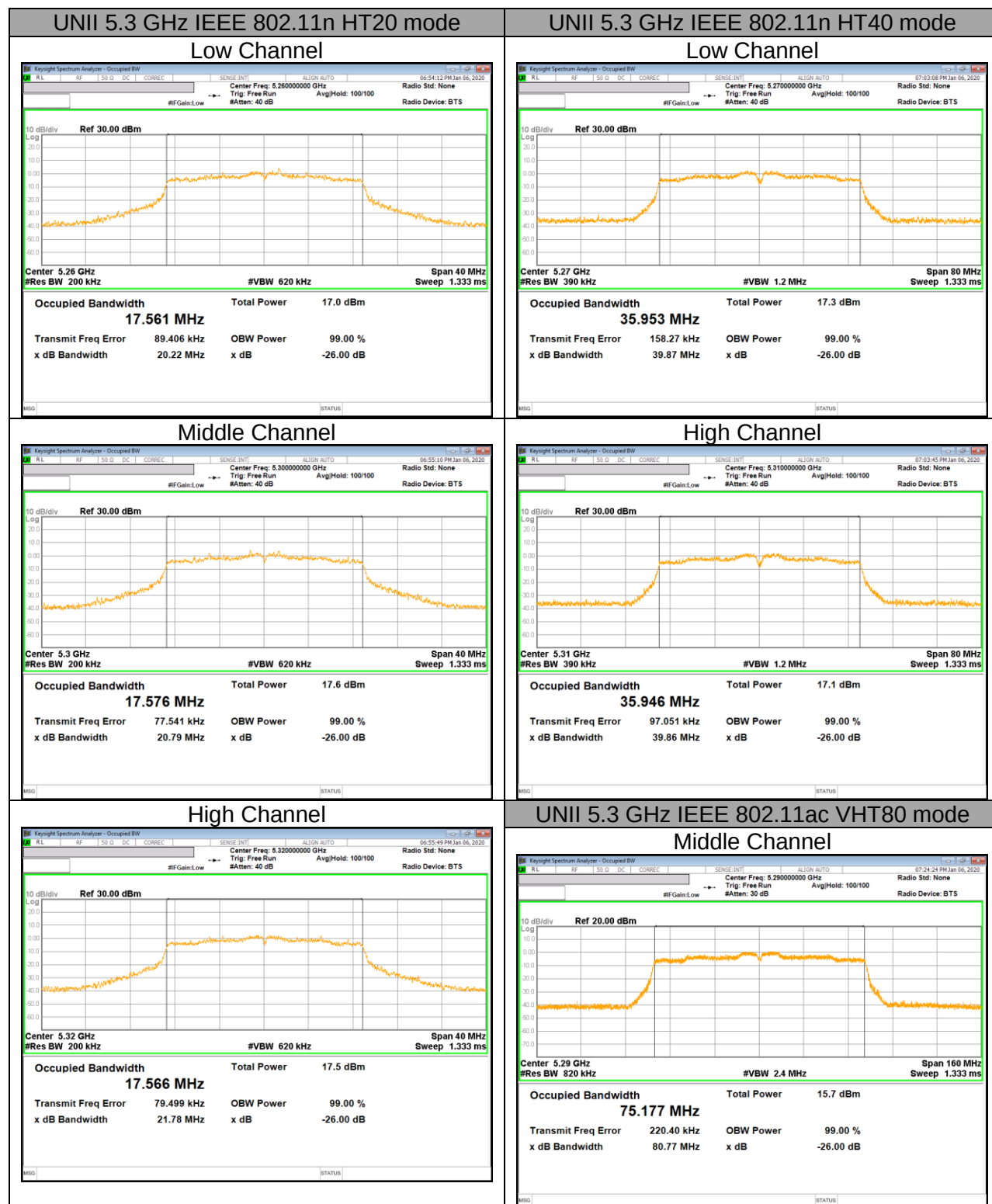
Band	Mode	Channel	Center Freq [MHz]	26 dB BW [MHz]	99% BW [MHz]	26 dB BW Worst
UNII-1	802.11a	Low	5180	19.45	16.450	20.33
		Mid	5200	19.34	16.477	
		High	5240	20.33	16.471	
	802.11n HT20	Low	5180	19.83	17.662	21.85
		Mid	5200	20.25	17.607	
		High	5240	21.85	17.687	
	802.11n HT40	Low	5190	39.95	36.116	39.95
		High	5230	39.92	36.066	
	802.11ac VHT80	Mid	5210	81.60	75.505	81.60
UNII-2A	802.11a	Low	5260	20.15	16.455	20.15
		Mid	5300	19.03	16.400	
		High	5320	19.64	16.294	
	802.11n HT20	Low	5260	20.22	17.542	21.78
		Mid	5300	20.79	17.603	
		High	5320	21.78	17.709	
	802.11n HT40	Low	5270	39.87	36.114	39.87
		High	5310	39.86	36.040	
	802.11ac VHT80	Mid	5290	80.77	75.229	80.77
UNII-2C	802.11a	Low	5500	20.03	16.409	20.03
		Mid	5580	19.66	16.431	
		High	5700	19.78	16.443	
	802.11n HT20	Low	5500	21.58	17.621	21.58
		Mid	5580	20.95	17.541	
		High	5700	21.42	17.540	
	802.11n HT40	Low	5510	39.69	36.003	39.81
		Mid	5550	39.73	36.020	
		High	5670	39.81	36.089	
	802.11ac VHT80	Low	5530	81.56	75.399	81.56
		High	5610	81.43	75.155	

Band	Mode	Channel	Center Freq [MHz]	26 dB BW [MHz]		99% BW [MHz]	
				UNII-2C	UNII-3	UNII-2C	UNII-3
Straddle Channel	802.11a	Straddle	5720	15.948	4.928	13.068	4.117
	802.11n HT20	Straddle	5720	15.098	5.326	13.700	4.362
	802.11n HT40	Straddle	5710	34.916	5.372	32.947	4.046
	802.11ac VHT80	Straddle	5690	75.776	5.824	72.326	4.719

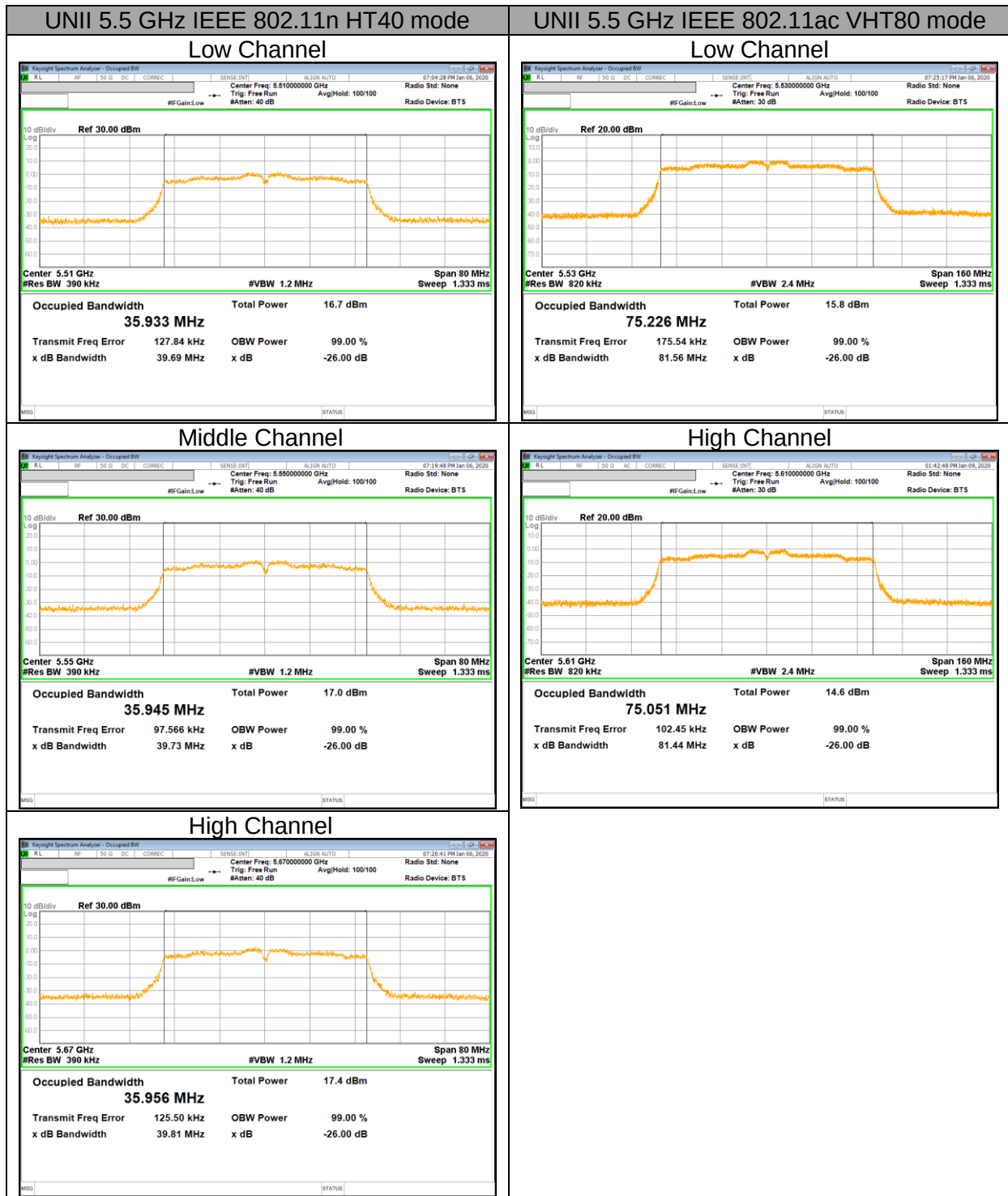
9.3.2. 26 dB BANDWIDTH PLOTS



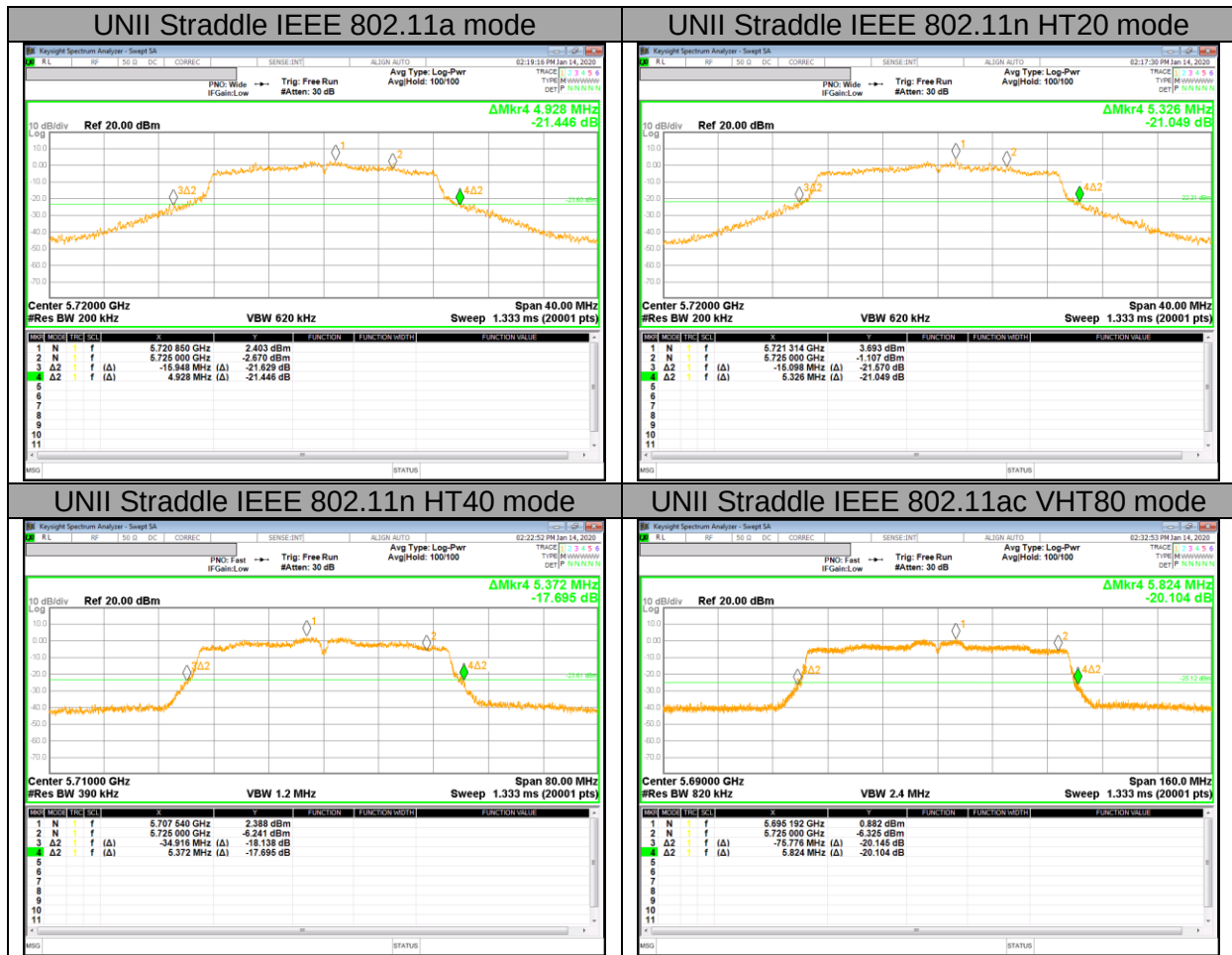








UNII Straddle Channel



9.3.3. 99% BANDWIDTH PLOTS

