

Report No. : FR912114-05



FCC RADIO TEST REPORT

FCC ID	: 2ADZRBGW320
Equipment	: BGW320-505 Wireless Integrated ONT Residential Gateway
Brand Name	: Nokia
Model Name	: BGW320-505
Applicant	: Nokia Shanghai Bell Co. Ltd. No. 388, Ningqiao Rd. Pilot Free Trade Zone Shanghai , China 201206
Manufacturer	: Nokia Shanghai Bell Co. Ltd. No. 388, Ningqiao Rd. Pilot Free Trade Zone Shanghai , China 201206
Standard	: 47 CFR FCC Part 15.407

The product was received on Feb. 27, 2020, and testing was started from Feb. 27, 2020 and completed on Apr. 28, 2020. We, SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory, would like to declare that the tested sample has been evaluated in accordance with the procedures given in ANSI C63.10-2013 and shown compliance with the applicable technical standards.

The report must not be used by the client to claim product certification, approval, or endorsement by TAF or any agency of government.

The test results in this variant report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory, the test report shall not be reproduced except in full.

LANK C

Approved by: Cliff Chang

SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.)

TEL : 886-3-656-9065 FAX : 886-3-656-9085 Report Template No.: CB-A12_1 Ver1.1 Page Number: 1 of 26Issued Date: Jun. 04, 2020Report Version: 01



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Photographs of EUT v01



History of this test report

Report No.	Version	Description	Issued Date
FR912114-05	01	Initial issue of report	Jun. 04, 2020



Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
1.1.2	15.203	Antenna Requirement	PASS	-
3.1	15.407(a)	Maximum Conducted Output Power	PASS	-
3.2	15.407(b)	Unwanted Emissions	PASS	-

Declaration of Conformity:

The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.

Comments and Explanations:

The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.

Reviewed by: Sam Chen

Report Producer: Wendy Pan



1 General Description

1.1 Information

1.1.1 **RF General Information**

Frequency Range (MHz)	IEEE Std. 802.11	Ch. Frequency (MHz)	Channel Number
5150-5250	a, n (HT20), ac (VHT20), ax (HEW20)	5180-5240	36-48 [4]
5250-5350		5260-5320	52-64 [4]
5470-5725		5500-5720	100-144 [12]
5725-5850		5745-5825	149-165 [5]
5150-5250	n (HT40), ac (VHT40), ax (HEW40)	5190-5230	38-46 [2]
5250-5350		5270-5310	54-62 [2]
5470-5725		5510-5710	102-142 [6]
5725-5850		5755-5795	151-159 [2]
5150-5250	ac (VHT80), ax (HEW80)	5210	42 [1]
5250-5350		5290	58 [1]
5470-5725		5530-5690	106-138 [3]
5725-5850		5775	155 [1]
5150-5350	ac (VHT160), ax (HEW160)	5250	50 [1]
5470-5725		5570	114 [1]

Band	Mode	BWch (MHz)	Nant
5.15-5.25GHz	802.11a	20	1TX, 2TX, 3TX, 4TX
5.15-5.25GHz	802.11n HT20	20	1TX, 2TX, 3TX, 4TX
5.15-5.25GHz	802.11n HT20-BF	20	2TX, 3TX, 4TX
5.15-5.25GHz	802.11ac VHT20	20	1TX, 2TX, 3TX, 4TX
5.15-5.25GHz	802.11ac VHT20-BF	20	2TX, 3TX, 4TX
5.15-5.25GHz	802.11ax HEW20	20	1TX, 2TX, 3TX, 4TX
5.15-5.25GHz	802.11ax HEW20-BF	20	2TX, 3TX, 4TX
5.15-5.25GHz	802.11n HT40	40	1TX, 2TX, 3TX, 4TX
5.15-5.25GHz	802.11n HT40-BF	40	2TX, 3TX, 4TX
5.15-5.25GHz	802.11ac VHT40	40	1TX, 2TX, 3TX, 4TX
5.15-5.25GHz	802.11ac VHT40-BF	40	2TX, 3TX, 4TX
5.15-5.25GHz	802.11ax HEW40	40	1TX, 2TX, 3TX, 4TX
5.15-5.25GHz	802.11ax HEW40-BF	40	2TX, 3TX, 4TX
5.15-5.25GHz	802.11ac VHT80	80	1TX, 2TX, 3TX, 4TX

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Band	Mode	BWch (MHz)	Nant		
5.15-5.25GHz	802.11ac VHT80-BF	80	2TX, 3TX, 4TX		
5.15-5.25GHz	802.11ax HEW80	80	1TX, 2TX, 3TX, 4TX		
5.15-5.25GHz	802.11ax HEW80-BF	80	2TX, 3TX, 4TX		
5.15-5.25GHz	802.11ac VHT160	160	1TX, 2TX, 3TX, 4TX		
5.15-5.25GHz	802.11ac VHT160-BF	160	2TX, 3TX, 4TX		
5.15-5.25GHz	802.11ax HEW160	160	1TX, 2TX, 3TX, 4TX		
5.15-5.25GHz	802.11ax HEW160-BF	160	2TX, 3TX, 4TX		
5.25-5.35GHz	802.11a	20	4TX		
5.25-5.35GHz	802.11n HT20	20	1TX, 2TX, 3TX, 4TX		
5.25-5.35GHz	802.11n HT20-BF	20	2TX, 3TX, 4TX		
5.25-5.35GHz	802.11ac VHT20	20	1TX, 2TX, 3TX, 4TX		
5.25-5.35GHz	802.11ac VHT20-BF	20	2TX, 3TX, 4TX		
5.25-5.35GHz	802.11ax HEW20	20	1TX, 2TX, 3TX, 4TX		
5.25-5.35GHz	802.11ax HEW20-BF	20	2TX, 3TX, 4TX		
5.25-5.35GHz	802.11n HT40	40	1TX, 2TX, 3TX, 4TX		
5.25-5.35GHz	802.11n HT40-BF	40	2TX, 3TX, 4TX		
5.25-5.35GHz	802.11ac VHT40	40	1TX, 2TX, 3TX, 4TX		
5.25-5.35GHz	802.11ac VHT40-BF	40	2TX, 3TX, 4TX		
5.25-5.35GHz	802.11ax HEW40	40	1TX, 2TX, 3TX, 4TX		
5.25-5.35GHz	802.11ax HEW40-BF	40	2TX, 3TX, 4TX		
5.25-5.35GHz	802.11ac VHT80	80	1TX, 2TX, 3TX, 4TX		
5.25-5.35GHz	802.11ac VHT80-BF	80	2TX, 3TX, 4TX		
5.25-5.35GHz	802.11ax HEW80	80	1TX, 2TX, 3TX, 4TX		
5.25-5.35GHz	802.11ax HEW80-BF	80	2TX, 3TX, 4TX		
5.25-5.35GHz	802.11ac VHT160	160	1TX, 2TX, 3TX, 4TX		
5.25-5.35GHz	802.11ac VHT160-BF	160	2TX, 3TX, 4TX		
5.25-5.35GHz	802.11ax HEW160	160	1TX, 2TX, 3TX, 4TX		
5.25-5.35GHz	802.11ax HEW160-BF	160	2TX, 3TX, 4TX		
5.47-5.725GHz	802.11a	20	4TX		
5.47-5.725GHz	802.11n HT20	20	1TX, 2TX, 3TX, 4TX		
5.47-5.725GHz	802.11n HT20-BF	20	2TX, 3TX, 4TX		
5.47-5.725GHz	802.11ac VHT20	20	1TX, 2TX, 3TX, 4TX		
5.47-5.725GHz	802.11ac VHT20-BF	20	2TX, 3TX, 4TX		
5.47-5.725GHz	802.11ax HEW20	20	1TX, 2TX, 3TX, 4TX		
5.47-5.725GHz	802.11ax HEW20-BF	20	2TX, 3TX, 4TX		
5.47-5.725GHz	802.11n HT40	40	1TX, 2TX, 3TX, 4TX		
5.47-5.725GHz	802.11n HT40-BF	40	2TX, 3TX, 4TX		
5.47-5.725GHz	802.11ac VHT40	40	1TX, 2TX, 3TX, 4TX		
5.47-5.725GHz	802.11ac VHT40-BF	40	2TX, 3TX, 4TX		
5.47-5.725GHz	802.11ax HEW40	40	1TX, 2TX, 3TX, 4TX		

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Band	Mode	BWch (MHz)	Nant
5.47-5.725GHz	802.11ax HEW40-BF	40	2TX, 3TX, 4TX
5.47-5.725GHz	802.11ac VHT80	80	1TX, 2TX, 3TX, 4TX
5.47-5.725GHz	802.11ac VHT80-BF	80	2TX, 3TX, 4TX
5.47-5.725GHz	802.11ax HEW80	80	1TX, 2TX, 3TX, 4TX
5.47-5.725GHz	802.11ax HEW80-BF	80	2TX, 3TX, 4TX
5.47-5.725GHz	802.11ac VHT160	160	1TX, 2TX, 3TX, 4TX
5.47-5.725GHz	802.11ac VHT160-BF	160	2TX, 3TX, 4TX
5.47-5.725GHz	802.11ax HEW160	160	1TX, 2TX, 3TX, 4TX
5.47-5.725GHz	802.11ax HEW160-BF	160	2TX, 3TX, 4TX
5.725-5.85GHz	802.11a	20	1TX, 2TX, 3TX, 4TX
5.725-5.85GHz	802.11n HT20	20	1TX, 2TX, 3TX, 4TX
5.725-5.85GHz	802.11n HT20-BF	20	2TX, 3TX, 4TX
5.725-5.85GHz	802.11ac VHT20	20	1TX, 2TX, 3TX, 4TX
5.725-5.85GHz	802.11ac VHT20-BF	20	2TX, 3TX, 4TX
5.725-5.85GHz	802.11ax HEW20	20	1TX, 2TX, 3TX, 4TX
5.725-5.85GHz	802.11ax HEW20-BF	20	2TX, 3TX, 4TX
5.725-5.85GHz	802.11n HT40	40	1TX, 2TX, 3TX, 4TX
5.725-5.85GHz	802.11n HT40-BF	40	2TX, 3TX, 4TX
5.725-5.85GHz	802.11ac VHT40	40	1TX, 2TX, 3TX, 4TX
5.725-5.85GHz	802.11ac VHT40-BF	40	2TX, 3TX, 4TX
5.725-5.85GHz	802.11ax HEW40	40	1TX, 2TX, 3TX, 4TX
5.725-5.85GHz	802.11ax HEW40-BF	40	2TX, 3TX, 4TX
5.725-5.85GHz	802.11ac VHT80	80	1TX, 2TX, 3TX, 4TX
5.725-5.85GHz	802.11ac VHT80-BF	80	2TX, 3TX, 4TX
5.725-5.85GHz	802.11ax HEW80	80	1TX, 2TX, 3TX, 4TX
5.725-5.85GHz	802.11ax HEW80-BF	80	2TX, 3TX, 4TX

Note:

• 11a, HT20 and HT40 use a combination of OFDM-BPSK, QPSK, 16QAM, 64QAM modulation.

• VHT20, VHT40, VHT80 and VHT160 use a combination of OFDM-BPSK, QPSK, 16QAM, 64QAM, 256QAM, 1024QAM modulation.

• HEW20, HEW40, HEW80 and HEW160 use a combination of OFDMA-BPSK, QPSK, 16QAM, 64QAM, 256QAM, 1024QAM modulation.

• BWch is the nominal channel bandwidth.



1.1.2 Antenna Information

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)
1	Airgain	N2430ARJYW Rev A-PK1-L-G1X165BUR2	PCB	I-PEX	
2	Airgain	N2430ARHYN Rev A-PK1-L-Y1X140BUR2	PCB	I-PEX	
3	Airgain	N2435ARHYN Rev A-PK1-L-B1X155BU	PCB	I-PEX	
4	Airgain	N2420ARHYW Rev A-PK1-L-A1X195BU	PCB	I-PEX	
5	Airgain	N5X20QSYN Rev A-PK1-L-B50UR2	PCB	I-PEX	Note 1
6	Airgain	N5X20QSYE Rev A-PK1-L-A55UR2	PCB	I-PEX	
7	Airgain	N5X20QSYN Rev A-PK1-L-Y1X190BU	PCB	I-PEX	
8	Airgain	N5X20QSYE Rev A-PK1-L-G1X160BU	PCB	I-PEX	
9	Airgain	N5X20HGHC Rev A-PK1-L-R1X1058U	PCB	I-PEX	

Note 1:

Ant.	2	.4GH	lz Po	rt		5GHz	2 Port	t	Gain (dBi) 1TX mode for output power, PSD CDD mode for output power					
	1TX	2ТХ	3ТХ	4TX	1TX	2TX	3ТХ	4TX	2.4GHz	5GHz Band 1	5GHz Band 2	5GHz Band 3	5GHz Band 4	
1	4	4	4	4	1	1	1	1						
2	3	3	3	3	2	2	2	2	4.9	5.8	6			
3	2	2	2	2	З	З	З	3	4.9	5.6	0	-	-	
4	1	1	1	1	4	4	4	4						
5	-	1	-	-	1	1	1	1						
6	-	-	-	-	2	2	2	2	_	_	_	5.1	4.7	
7	-	1	-	-	З	З	З	3	-	-	-	5.1	4.7	
8	-	-	-	-	4	4	4	4						
9	-	-	-	-	RX only	-	-	-	-	3.9	3.4	4.6	4.2	

		Gain (dBi) CDD mode for PSD Beamforming mode, SDM Mode for output power & PSD										
Ant.		2.40	GHz		5G Bar	iHz nd 1	5GHz Band 2		5GHz Band 3		5GHz Band 4	
	3T1S/ 3T2S	3T3S	4T1S/ 4T2S	4T3S	4T1S/ 4T2S	4T3S	4T1S/ 4T2S	4T3S	4T1S/ 4T2S	4T3S	4T1S/ 4T2S	4T3S
1												
2	4.2	2.3	4.8	3.1	4.7	3.8	4.2	2.8	_	_	_	_
3	4.2	2.5	4.0	5.1	4.7	5.0	4.2	2.0	-	-	-	-
4												
5												
6		_	_	_	_	_	_	_	5.1	4.3	5	3.8
7		-	-	-	-	-	-	-	5.1	ч.5	5	5.0
8												
9	-	-	-	-	3.	3.9		.4	4	.6	4.	2





Note 2: The above information was declared by manufacturer. Note 3: The EUT has nine antennas. Note 4: For 2.4GHz function: For IEEE 802.11b (1TX, 4TX/4RX): For 1TX Only Port 1 can be used as transmitting antenna. For 4TX, 4RX Port 1, Port 2, Port 3 and Port 4 can be use as transmitting/receiving antenna. Port 1, Port 2, Port 3 and Port 4 could transmit/receive simultaneously. For IEEE 802.11g (4TX/4RX): Port 1, Port 2, Pot 3 and Port 4 can be used as transmitting/receiving antenna. Port 1, Port 2, Pot 3 and Port 4 could transmit/receive simultaneously. For IEEE 802.11n/VHT/ax (1TX, 2TX, 3TX, 4TX/4RX): For 1TX The EUT supports all antennas with TX diversity functions. At once time there is only one antenna port can transmitting RF signal For 2TX The EUT supports all antennas with TX diversity functions. At once time there are only two antenna port can transmitting RF signal For 3TX The EUT supports all antennas with TX diversity functions. At once time there are only three antenna port can transmitting RF signal The Port 2, Port 3 and Port 4 generated the worst case, so it was selected to test and record in the report. For 4TX, 4RX Port 1, Port 2, Port 3 and Port 4 can be use as transmitting/receiving antenna. Port 1, Port 2, Port 3 and Port 4 could transmit/receive simultaneously. For 5GHz function: For IEEE 802.11a (4TX/4RX): Port 1, Port 2, Pot 3 and Port 4 can be used as transmitting/receiving antenna. Port 1, Port 2, Pot 3 and Port 4 could transmit/receive simultaneously. For IEEE 802.11n/ac/ax (1TX, 2TX, 3TX, 4TX/4RX): For 1TX The EUT supports all antennas with TX diversity functions. At once time there is only one antenna port can transmitting RF signal For 2TX The EUT supports all antennas with TX diversity functions. At once time there are only two antenna port can transmitting RF signal For 3TX The EUT supports all antennas with TX diversity functions. At once time there are only three antenna port can transmitting RF signal For 4TX, 4RX Port 1, Port 2, Port 3 and Port 4 can be use as transmitting/receiving antenna. Port 1, Port 2, Port 3 and Port 4 could transmit/receive simultaneously. For IEEE 802.11n/ac/ax (1RX): Ant.9 can be use as receiving antenna only.



1.1.3 EUT Operational Condition

EUT Power Type	Fro	From Power Adapter							
	\boxtimes	With beamforming		Without beamforming					
Beamforming Function	The product has beamforming function for n/VHT/ax in 2.4GHz and n/ac/ax in 5GHz.								
Weather Band	\boxtimes	With 5600~5650MHz		Without 5600~5650MHz					
Function		Outdoor P2M	\square	Indoor P2M					
		Fixed P2P		Client					
TPC Function	\boxtimes	With TPC		Without TPC					
Test Software Version	accessMTool v3.1.02 Telnet v6.1.7601								

Note: The above information was declared by manufacturer.

1.1.4 Table for Class II Change

This product is an extension of original one reported under Sporton project number: FR912114AB &

FR912114-01

Below is the table for the change of the product with respect to the original one.

Modifications	Performance Checking
Remove the filter on front of the 5G Low/high band PA.	 1.Maximum Conducted Output Power. For Non beamforming 802.11ax HEW160: 5250MHz For beamforming 802.11ax HEW80: 5775MHz 2.Unwanted Emissions below 1GHz. 3.Unwanted Emissions above 1GHz. For Non beamforming 802.11ax HEW20: 5180, 5320, 5700MHz 802.11ax HEW20: 5180, 5520, 5570MHz 802.11ax HEW160: 5250, 5570MHz For beamforming 802.11ax HEW20: 5240MHz 802.11ax HEW20: 5190, 5310, 5510, 5670, 5755MHz 802.11ax HEW40: 5190, 5310, 5510, 5670, 5755MHz 802.11ax HEW80: 5210, 5290, 5530, 5775MHz

Note: 1.Above test modes have been generated the worst case from original. Consequently, measurement will follow this same test mode.

2.The test modes will be based on original output power to re-test except nonbeamforming 802.11ax HEW160, beamforming 802.11ax HEW80: 5775MHz.



1.2 Applicable Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- 47 CFR FCC Part 15
- ANSI C63.10-2013
- FCC KDB 789033 D02 v02r01
- The following reference test guidance is not within the scope of accreditation of TAF.
- FCC KDB 662911 D01 v02r01
- FCC KDB 412172 D01 v01r01
- FCC KDB 414788 D01 v01r01

1.3 Testing Location Information

	Testing Location						
	HWA YA ADD : No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.)						
		TEL	:	886-3-327-3456 FAX : 886-3-327-0973			
\boxtimes	JHUBEI	ADD : No.8, Lane 724, Bo-ai St., Jhubei City, HsinChu County 302, Taiwan, R.O.C.					
	TEL : 886-3-656-9065 FAX : 886-3-656-9085						

Test Condition	Test Site No.	Test Engineer	Test Environment	Test Date
RF Conducted	TH01-CB	Owen Hsu	24.5-26.4°C / 60-66 %	Feb. 28, 2020
Radiated<1GHz	03CH05-CB	Andy Zou	21.6-22.5°C / 55-60 %	Apr. 28, 2020
Radiated>1GHz	03CH06-CB	Andy Zou	20-21.3°C / 58-63%	Feb. 27, 2020 ~ Feb. 28, 2020

Test site Designation No. TW0006 with FCC

Test site registered number IC 4086D with Industry Canada.

1.4 Measurement Uncertainty

ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level (based on a coverage factor (k=2)

Test Items	Uncertainty	Remark
Radiated Emission (30MHz ~ 1,000MHz)	4.3 dB	Confidence levels of 95%
Radiated Emission (1GHz ~ 18GHz)	4.3 dB	Confidence levels of 95%
Radiated Emission (18GHz ~ 40GHz)	5.1 dB	Confidence levels of 95%
Output Power Measurement	1.5 dB	Confidence levels of 95%



2 Test Configuration of EUT

2.1 Test Channel Mode

<non-beamforming mode> 4T1S

Mode	PowerSetting	
802.11ax HEW20_Nss1,(MCS0)_4TX	-	
5180MHz	84	
5320MHz	73	
5700MHz	65	
802.11ac VHT40_Nss1,(MCS0)_4TX	-	
5550MHz	72	
802.11ax HEW160_Nss1,(MCS0)_4TX	-	
5250MHz Straddle 5.15-5.25GHz	44	
5250MHz	44	
5570MHz	67	

<beamforming mode> 4T1S

Mode	PowerSetting	
802.11ax HEW20-BF_Nss1,(MCS0)_4TX	-	
5240MHz	98	
802.11ax HEW40-BF_Nss1,(MCS0)_4TX	-	
5190MHz	70	
5310MHz	72	
5510MHz	69	
5670MHz	71	
5755MHz	96	
802.11ax HEW80-BF_Nss1,(MCS0)_4TX	-	
5210MHz	66	
5290MHz	71	
5530MHz	71	
5775MHz	77	



2.2 The Worst Case Measurement Configuration

The Worst Case Mode for Following Conformance Tests			
Tests Item Maximum Conducted Output Power			
Test Condition Conducted measurement at transmit chains			

Th	The Worst Case Mode for Following Conformance Tests			
Tests Item Unwanted Emissions				
Test Condition	Radiated measurement If EUT consist of multiple antenna assembly (multiple antenna are used in EUT regardless of spatial multiplexing MIMO configuration), the radiated test should be performed with highest antenna gain of each antenna type.			
Operating Mode < 1GHz	CTX			
Operating Mode > 1GHz CTX				

Note: The EUT can only be used at Y axis position.

2.3 EUT Operation during Test

For CTX Mode:

non-beamforming mode:

The EUT was programmed to be in continuously transmitting mode.

beamforming mode:

During the test, the following programs under WIN 7 were executed.

The program was executed as follows:

- 1. During the test, the EUT operation to normal function.
- 2. Executed command fixed test channel under Telnet.
- 3. Executed "LanTest20" to link with the remote workstation to transmit and receive packet by WLAN AP and transmit duty cycle no less than 98%.



2.4 Accessories

	Accessories							
No.	No. Equipment Brand Model Rating							
1	Adapter	DIRECTV	EPS48R0-16	Input: 120V~1.1A, 60Hz Output: 12V, 4A, 48W				

2.5 Support Equipment

For Radiated (below 1GHz):

	Support Equipment							
No.	No. Equipment Brand Name Model Name FCC ID							
А	A Notebook DELL E4300 N/A							

For Radiated (above 1GHz) and RF Conducted test:

<non-beamforming mode>

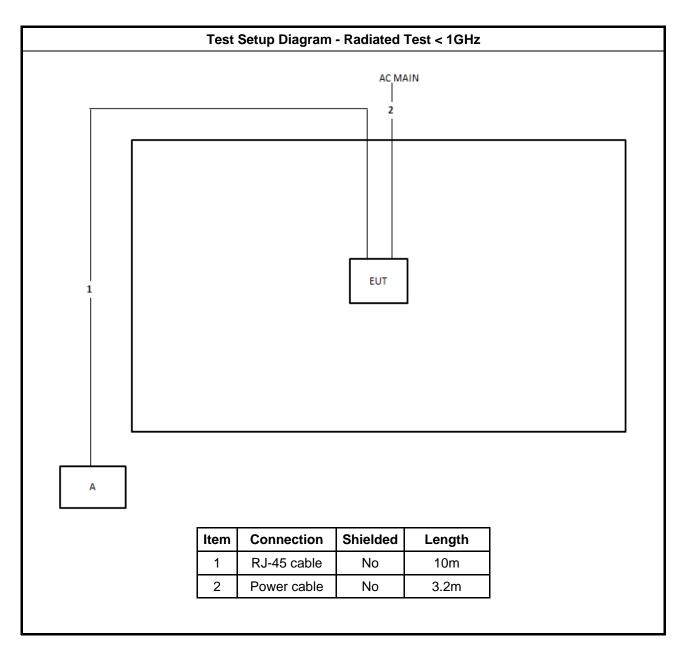
	Support Equipment						
No.	No. Equipment Brand Name Model Name FCC ID						
A Notebook DELL E4300 N/A							

<beamforming mode>

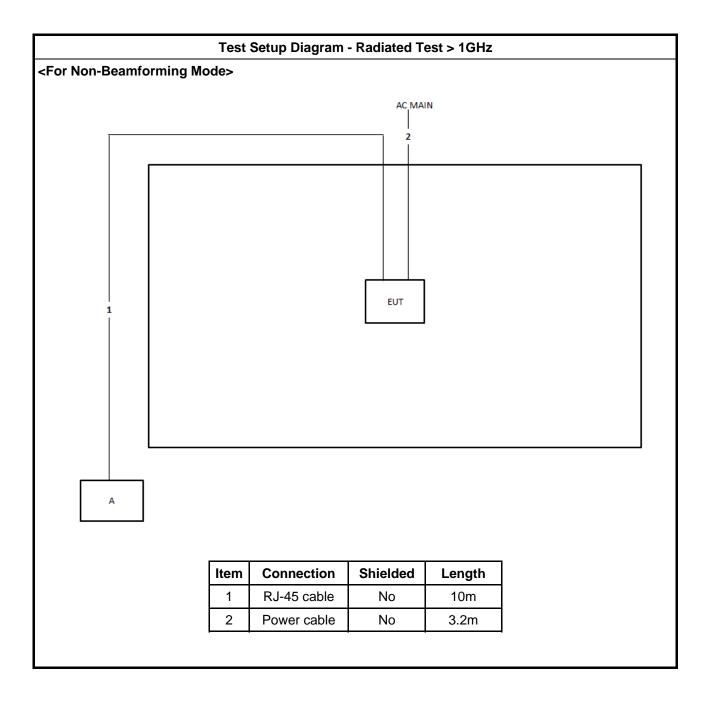
	Support Equipment							
No.	No. Equipment Brand Name Model Name FCC ID							
А	Notebook	DELL	E4300	N/A				
В	WLAN AP	ASUS	RT-AX88U	MSQ-RTAXHP00				
С	Notebook	DELL	E4300	N/A				



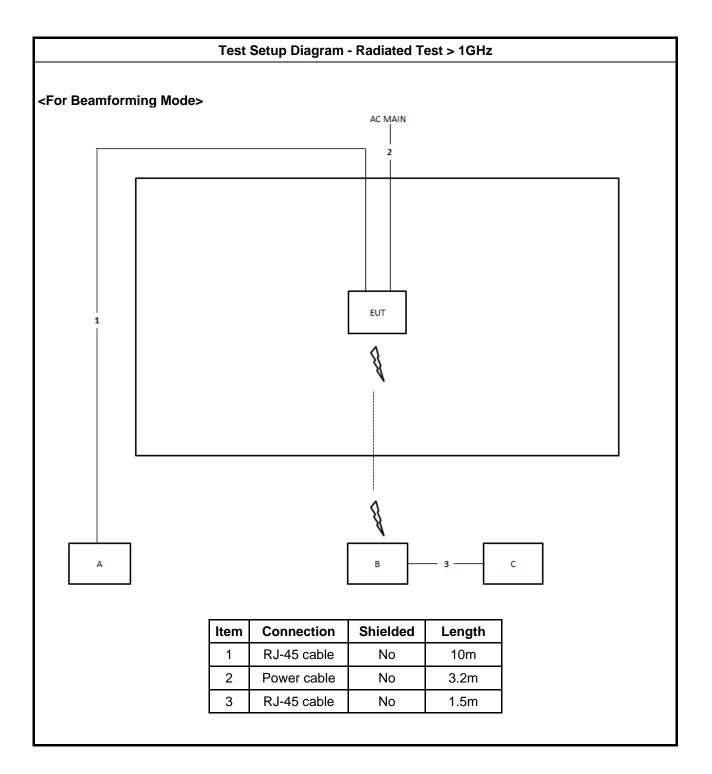
2.6 Test Setup Diagram













3 Transmitter Test Result

3.1 Maximum Conducted Output Power

3.1.1 Maximum Conducted Output Power Limit

	Maximum Conducted Output Power Limit
UN	I Devices
\boxtimes	For the 5.15-5.25 GHz band:
	 Outdoor AP: the maximum conducted output power (P_{Out}) shall not exceed the lesser of 1 W. If G_{TX} > 6 dBi, then P_{Out} = 30 - (G_{TX} - 6). e.i.r.p. at any elevation angle above 30 degrees ≤ 125mW [21dBm]
	 Indoor AP: the maximum conducted output power (P_{Out}) shall not exceed the lesser of 1 W. If G_{TX} > 6 dBi, then P_{Out} = 30 - (G_{TX} - 6)
	 Point-to-point AP: the maximum conducted output power (P_{Out}) shall not exceed the lesser of 1 W If G_{TX} > 23 dBi, then P_{Out} = 30 - (G_{TX} - 23).
	 Mobile or Portable Client: the maximum conducted output power (P_{Out}) shall not exceed the lesser of 250 mW. If G_{TX} > 6 dBi, then P_{Out} = 24 - (G_{TX} - 6).
\boxtimes	For the 5.25-5.35 GHz band, the maximum conducted output power (P_{Out}) shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in MHz. If $G_{TX} > 6$ dBi, then $P_{Out} = 24 - (G_{TX} - 6)$.
	For the 5.47-5.725 GHz band, the maximum conducted output power (P_{Out}) shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in MHz. If $G_{TX} > 6$ dBi, then $P_{Out} = 24 - (G_{TX} - 6)$.
\boxtimes	For the 5.725-5.85 GHz band:
	 Point-to-multipoint systems (P2M): the maximum conducted output power (P_{Out}) shall not exceed the lesser of 1 W. If G_{TX} > 6 dBi, then P_{Out} = 30 - (G_{TX} - 6).
	 Point-to-point systems (P2P): the maximum conducted output power (P_{Out}) shall not exceed the lesser of 1 W.
LE-	LAN Devices
	For the 5.15-5.25 GHz band, the maximum e.i.r.p. shall not exceed 200 mW or 10 + 10 log B, dBm, whichever power is less. B is the 99% emission bandwidth in MHz.
	For the 5.25-5.35 GHz band, the maximum e.i.r.p. shall not exceed 1.0 W or 17 + 10 log B, dBm, whichever power is less. B is the 99% emission bandwidth in MHz
	For the 5.47-5.6 GHz band and 5.65-5.725 GHz band, the maximum e.i.r.p. shall not exceed 1.0 W or 17 + 10 log B, dBm, whichever power is less. B is the 99% emission bandwidth in MHz
	For the 5.725-5.85 GHz band:
	 Point-to-multipoint systems (P2M): the maximum conducted output power (P_{Out}) shall not exceed the lesser of 1 W. If G_{TX} > 6 dBi, then P_{Out} = 30 - (G_{TX} - 6).
	 Point-to-point systems (P2P): the maximum conducted output power (P_{Out}) shall not exceed the lesser of 1 W.
	t = maximum conducted output power in dBm, = the maximum transmitting antenna directional gain in dBi.
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3.1.2 Measuring Instruments

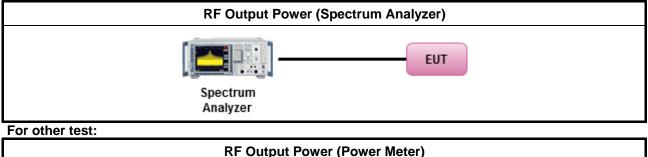
Refer a test equipment and calibration data table in this test report.

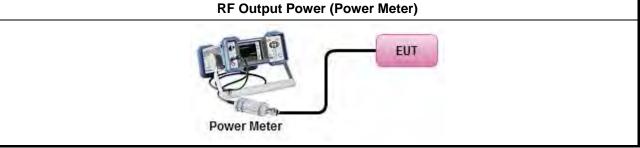
3.1.3 Test Procedures

	Test Method							
•	Maximum Conducted Output Power							
	Average over on/off periods with duty factor							
	Refer as FCC KDB 789033, clause E Method SA-2 (spectral trace averaging).							
	Refer as FCC KDB 789033, clause E Method SA-2 Alt. (RMS detection with slow sweep speed)							
	Wideband RF power meter and average over on/off periods with duty factor							
	Refer as FCC KDB 789033, clause E Method PM-G (using an RF average power meter).							
•	For conducted measurement.							
	 If the EUT supports multiple transmit chains using options given below: Refer as FCC KDB 662911, In-band power measurements. Using the measure-and-sum approach, measured all transmit ports individually. Sum the power (in linear power units e.g., mW) of all ports for each individual sample and save them. 							
	 If multiple transmit chains, EIRP calculation could be following as methods: P_{total} = P₁ + P₂ + + P_n (calculated in linear unit [mW] and transfer to log unit [dBm]) EIRP_{total} = P_{total} + DG 							

3.1.4 Test Setup

For Straddle channel test:





3.1.5 Test Result of Maximum Conducted Output Power

Refer as Appendix A



3.2 Unwanted Emissions

3.2.1 Transmitter Unwanted Emissions Limit

Unwanted emissions below 1 GHz and restricted band emissions above 1GHz limit								
Frequency Range (MHz)	Field Strength (uV/m)	Field Strength (dBuV/m)	Measure Distance (m)					
0.009~0.490	2400/F(kHz)	48.5 - 13.8	300					
0.490~1.705	24000/F(kHz)	33.8 - 23	30					
1.705~30.0	30	29	30					
30~88 100		40	3					
88~216	150	43.5	3					
216~960	200	46	3					
Above 960	500	54	3					

Note 1: Test distance for frequencies at or above 30 MHz, measurements may be performed at a distance other than the limit distance provided they are not performed in the near field and the emissions to be measured can be detected by the measurement equipment. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade (inverse of linear distance for field-strength measurements, inverse of linear distance-squared for power-density measurements).

Note 2: Test distance for frequencies at below 30 MHz, measurements may be performed at a distance closer than the EUT limit distance; however, an attempt should be made to avoid making measurements in the near field. When performing measurements below 30 MHz at a closer distance than the limit distance, the results shall be extrapolated to the specified distance by either making measurements at a minimum of two or more distances on at least one radial to determine the proper extrapolation factor or by using the square of an inverse linear distance extrapolation factor (40 dB/decade). The test report shall specify the extrapolation method used to determine compliance of the EUT.

Note 3: Using the distance of 1m during the test for above 18 GHz, and the test value to correct for the distance factor at 3m.





	Un-restricted band emissions above 1GHz Limit							
Operating Band	Limit							
🔀 5.15 - 5.25 GHz	e.i.r.p27 dBm [68.2 dBuV/m@3m]							
🔀 5.25 - 5.35 GHz	e.i.r.p27 dBm [68.2 dBuV/m@3m]							
🔀 5.47 - 5.725 GHz	e.i.r.p27 dBm [68.2 dBuV/m@3m]							
⊠ 5.725 - 5.85 GHz	all emissions shall be limited to a level of -27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.							
Note 1: Measurements may be performed at a distance other than the limit distance provided they are not performed in the near field and the emissions to be measured can be detected by the measurement equipment. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade (inverse of linear distance for field-strength measurements, inverse of linear distance-squared for power-density measurements).								

3.2.2 Measuring Instruments

Refer a test equipment and calibration data table in this test report.

3.2.3 Test Procedures

Test Method

- Measurements may be performed at a distance other than the limit distance provided they are not performed in the near field and the emissions to be measured can be detected by the measurement equipment. Measurements shall not be performed at a distance greater than 30 m for frequencies above 30 MHz, unless it can be further demonstrated that measurements at a distance of 30 m or less are impractical. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade (inverse of linear distance for field-strength measurements, inverse of linear distance-squared for power-density measurements).
- The average emission levels shall be measured in [duty cycle ≥ 98 or duty factor].
- For the transmitter unwanted emissions shall be measured using following options below:
 - Refer as FCC KDB 789033, clause G)2) for unwanted emissions into non-restricted bands.
 - Refer as FCC KDB 789033, clause G)1) for unwanted emissions into restricted bands.
 - Refer as FCC KDB 789033, G)6) Method AD (Trace Averaging).
 - Refer as FCC KDB 789033, G)6) Method VB (Reduced VBW).
 - Refer as ANSI C63.10, clause 11.12.2.5.3 (Reduced VBW). VBW ≥ 1/T, where T is pulse time.
 - Refer as ANSI C63.10, clause 7.5 average value of pulsed emissions.
 - Refer as FCC KDB 789033, clause G)5) measurement procedure peak limit.
 - Refer as ANSI C63.10, clause 4.1.4.2.2 measurement procedure peak limit.



Test Meth	۱od
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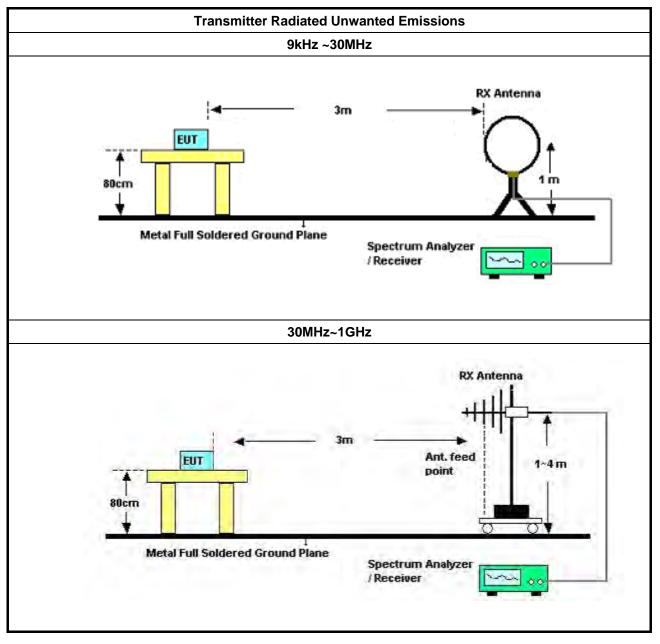
•	For radiated measurement.						
	•	Refer as ANSI C63.10, clause 6.4 for radiated emissions below 30 MHz and test distance is 3m.					
	•	Refer as ANSI C63.10, clause 6.5 for radiated emissions 30 MHz to 1 GHz and test distance is 3m.					
	•	Refer as ANSI C63.10, clause 6.6 for radiated emissions above 1GHz.					

• The any unwanted emissions level shall not exceed the fundamental emission level.

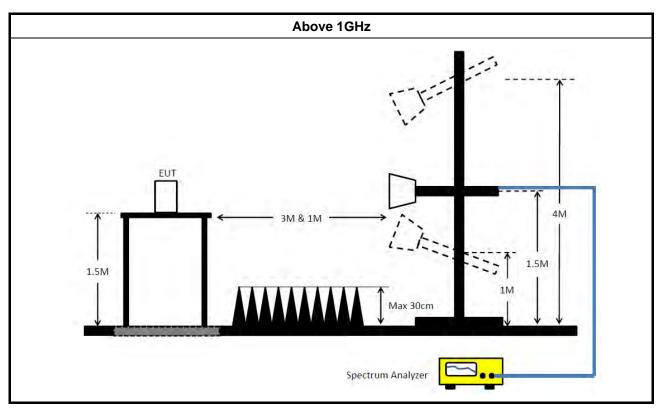
 All amplitude of spurious emissions that are attenuated by more than 20 dB below the permissible value has no need to be reported.



3.2.4 Test Setup







3.2.5 Measurement Results Calculation

The measured Level is calculated using:

Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level.

3.2.6 Transmitter Unwanted Emissions (Below 30MHz)

There is a comparison data of both open-field test site and alternative test site - semi-Anechoic chamber according to KDB414788 Radiated Test Site, and the result came out very similar.

All amplitude of spurious emissions that are attenuated by more than 20 dB below the permissible value has no need to be reported.

The radiated emissions were investigated from 9 kHz or the lowest frequency generated within the device, up to the 10 harmonic or 40 GHz, whichever is appropriate.

3.2.7 Test Result of Transmitter Unwanted Emissions

Refer as Appendix B



4 Test Equipment and Calibration Data

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Calibration Due Date	Remark
Bilog Antenna with 6dB Attenuator	TESEQ & EMCI	CBL 6112D & N-6-06	35236 & AT-N0610	30MHz ~ 2GHz	Mar. 27, 2020	Mar. 26, 2021	Radiation (03CH05-CB)
Loop Antenna	Teseq	HLA 6120	24155	9kHz - 30 MHz	Apr. 13, 2020	Apr. 12, 2021	Radiation (03CH05-CB)
Pre-Amplifier	EMCI	EMC330N	980331	20MHz ~ 3GHz	May 01, 2019	Apr. 30, 2020	Radiation (03CH05-CB)
Spectrum Analyzer	R&S	FSP40	100304	9kHz ~ 40GHz	Aug. 15, 2019	Aug. 14, 2020	Radiation (03CH05-CB)
EMI Test Receiver	R&S	ESCS	826547/017	9kHz ~ 2.75GHz	May 15, 2019	May 14, 2020	Radiation (03CH05-CB)
RF Cable-low	Woken	RG402	LOW Cable-04+23	30MHz~1GHz	Oct. 07, 2019	Oct. 06, 2020	Radiation (03CH05-CB)
Horn Antenna	SCHWARZBE CK	BBHA9120D	9120D-1292	1GHz~18GHz	Jul. 17, 2019	Jul. 16, 2020	Radiation (03CH06-CB)
Horn Antenna	SCHWARZBE CK	BBHA 9170	BBHA9170507	15GHz ~ 40GHz	Jun. 12, 2019	Jun. 11, 2020	Radiation (03CH06-CB)
Pre-Amplifier	Agilent	83017A	MY53270064	0.5GHz ~ 26.5GHz	May 08, 2019	May 07, 2020	Radiation (03CH06-CB)
Pre-Amplifier	MITEQ	TTA1840-35-H G	1864479	18GHz ~ 40GHz	Jul. 03, 2019	Jul. 02, 2020	Radiation (03CH06-CB)
Spectrum analyzer	R&S	FSP40	100080	9kHz~40GHz	Oct. 21, 2019	Oct. 20, 2020	Radiation (03CH06-CB)
RF Cable-high	HUBER+SUH NER	RG402	High Cable-05	1GHz~18GHz	Oct. 07, 2019	Oct. 06, 2020	Radiation (03CH06-CB)
RF Cable-high	HUBER+SUH NER	RG402	High Cable-05+24	1GHz~18GHz	Oct. 07, 2019	Oct. 06, 2020	Radiation (03CH06-CB)
RF Cable-high	Woken	RG402	High Cable-40G#1	18GHz ~ 40 GHz	Jul. 24, 2019	Jul. 23, 2020	Radiation (03CH06-CB)
RF Cable-high	Woken	RG402	High Cable-40G#2	18GHz ~ 40 GHz	Jul. 24, 2019	Jul. 23, 2020	Radiation (03CH06-CB)
Spectrum analyzer	R&S	FSV40	101027	9kHz~40GHz	Jul. 02, 2019	Jul. 01, 2020	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-06	1 GHz – 26.5 GHz	Oct. 07, 2019	Oct. 06, 2020	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-07	1 GHz –26.5 GHz	Oct. 07, 2019	Oct. 06, 2020	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-08	1 GHz –26.5 GHz	Oct. 07, 2019	Oct. 06, 2020	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-09	1 GHz –26.5 GHz	Oct. 07, 2019	Oct. 06, 2020	Conducted (TH01-CB)



Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Calibration Due Date	Remark
RF Cable-high	Woken	RG402	High Cable-10	1 GHz –26.5 GHz	Oct. 07, 2019	Oct. 06, 2020	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-28	1 GHz –26.5 GHz	Nov. 18, 2019	Nov. 17, 2020	Conducted (TH01-CB)
Power Sensor	Agilent	E9327A	US40442088	50MHz~18GHz	Feb. 07, 2020	Feb. 06, 2021	Conducted (TH01-CB)
Power Meter	Agilent	E4416A	GB41291199	50MHz~18GHz	Feb. 07, 2020	Feb. 06, 2021	Conducted (TH01-CB)

Note: Calibration Interval of instruments listed above is one year.



Average Power

Appendix A.1

Summary

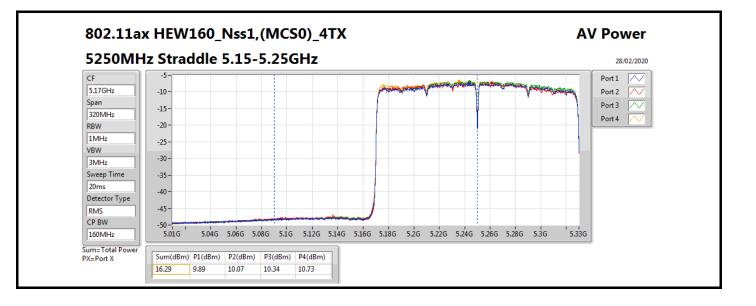
	Mode	Total Power	Total Power
		(dBm)	(W)
	5.15-5.25GHz	16.29	0.042560.
802	.11ax HEW160_Nss1,(MCS0)_4TX		
	5.25-5.35GHz	16.07	0.040458

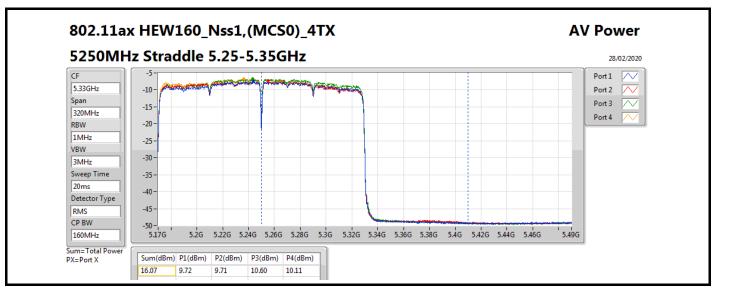
Result

Mode	Result	DG (dBi)	Port 1 (dBm)	Port 2 (dBm)	Port 3 (dBm)	Port 4 (dBm)	Total Power (dBm)	Power Limit (dBm)
802.11ax HEW160_Nss1,(MCS0)_4TX	-	-	-	-	-	-	-	-
5250MHz Straddle 5.15-5.25GHz	Pass	5.80	9.89	10.07	10.34	10.73	16.29	30.00
5250MHz	Pass	6.00	9.72	9.71	10.60	10.11	16.07	23.98

DG = Directional Gain; **Port X** = Port X output power









Average Power

Appendix A.2

Summary

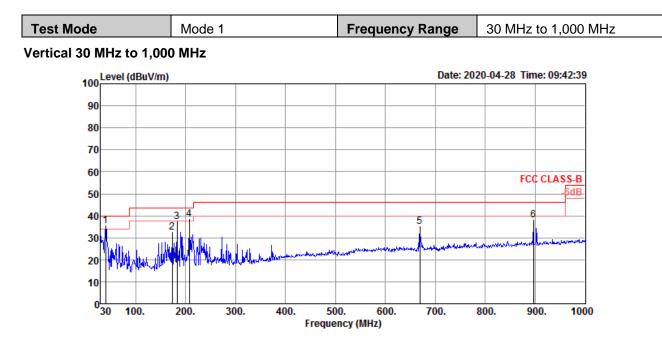
Mode	Total Power	Total Power
	(dBm)	(W)
5.725-5.85GHz	-	-
802.11ax HEW80-BF_Nss1,(MCS0)_4TX	26.46	0.44258

Result

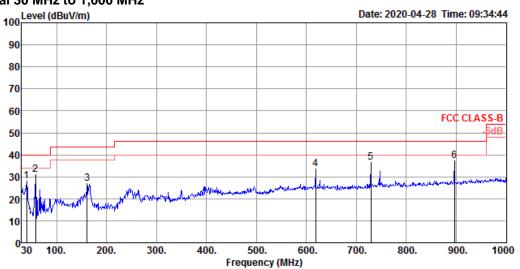
Mode	Result	DG	Port 1	Port 2	Port 3	Port 4	Total Power	Power Limit
		(dBi)	(dBm)	(dBm)	(dBm)	(dBm)	(dBm)	(dBm)
802.11ax HEW80-BF_Nss1,(MCS0)_4TX	-	-	-	-	-	-	-	-
5775MHz	Pass	5.00	20.28	20.65	20.24	20.57	26.46	30.00

DG = Directional Gain; Port X = Port X output power





	Freq	Level				CableAntenna Loss Factor				T/Pos	Remark	Pol/Phase	
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg			
1	39.70	35.30	40.00	-4.70	46.20	1.39	19.22	31.51	150	359	Peak	VERTICAL	
2	173.56	32.39	43.50	-11.11	47.02	1.87	15.44	31.94	300	116	Peak	VERTICAL	
3	183.26	37.32	43.50	-6.18	52.35	1.92	15.03	31.98	300	110	Peak	VERTICAL	
4	207.51	38.47	43.50	-5.03	53.64	2.03	14.76	31.96	300	97	Peak	VERTICAL	
5	669.23	35.17	46.00	-10.83	39.59	3.68	24.42	32.52	100	360	Peak	VERTICAL	
6	896.21	37.87	46.00	-8.13	39.82	4.57	25.89	32.41	200	144	Peak	VERTICAL	



Horizontal 30 MHz to 1,000 MHz

	Freq	Level				ead CableAntenna Pre vel Loss Factor Fac				T/Pos	Remark	Pol/Phase
-	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	39.70	28.02	40.00	-11.98	38.92	1.39	19.22	31.51	150	51	Peak	HORIZONTAL
2	58.13	30.91	40.00	-9.09	48.77	1.16	12.81	31.83	125	244	Peak	HORIZONTAL
3	160.95	26.80	43.50	-16.70	39.89	1.81	16.93	31.83	150	168	Peak	HORIZONTAL
4	618.79	33.44	46.00	-12.56	38.05	3.54	24.24	32.39	100	5	Peak	HORIZONTAL
5	729.37	36.58	46.00	-9.42	40.23	3.92	24.82	32.39	100	340	Peak	HORIZONTAL
6	896.21	37.17	46.00	-8.83	39.12	4.57	25.89	32.41	300	71	Peak	HORIZONTAL



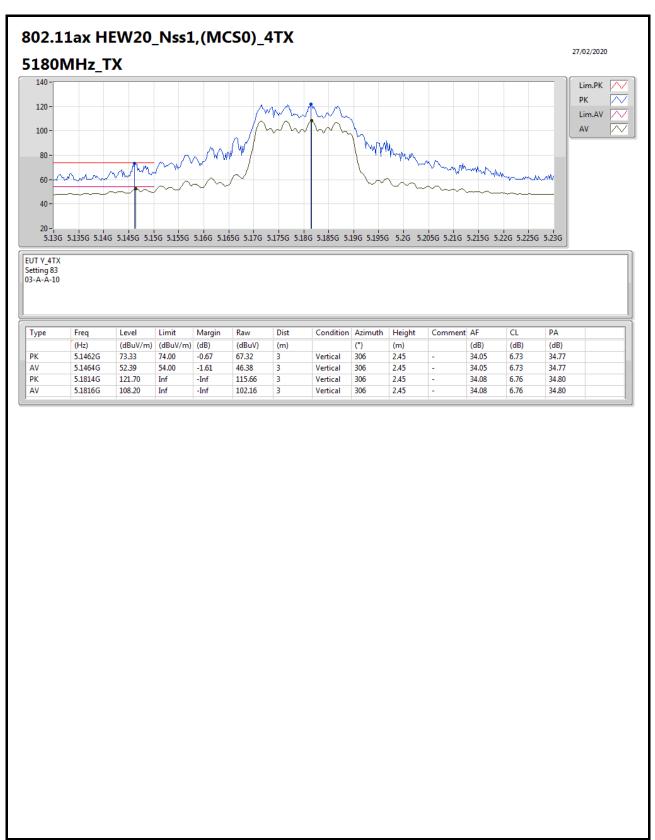
Appendix B.2

Summary

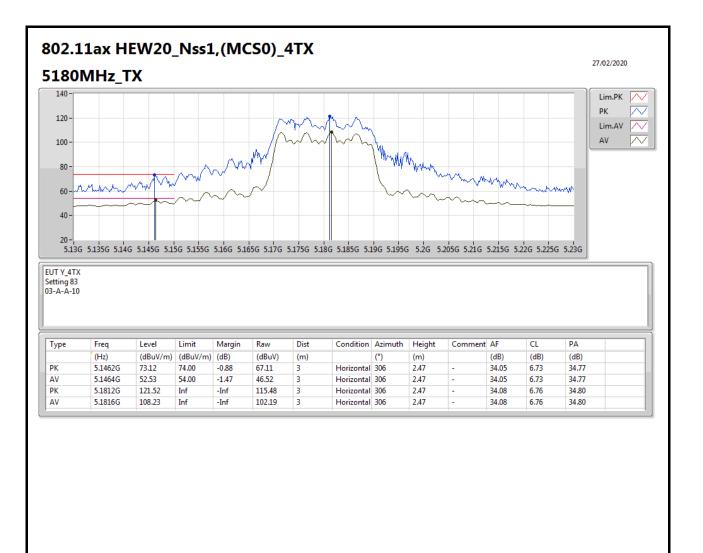
Mode	Result	Туре	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Dist (m)	Condition	Azimuth	Height (m)	Comments
5.25-5.35GHz	-	-	-	-	-	-	-	-	-	-	
802.11ax HEW80-BF_Nss1,(MCS0)_4TX	Pass	AV	5.3564G	53.97	54.00	-0.03	3	Vertical	40	1.80	-



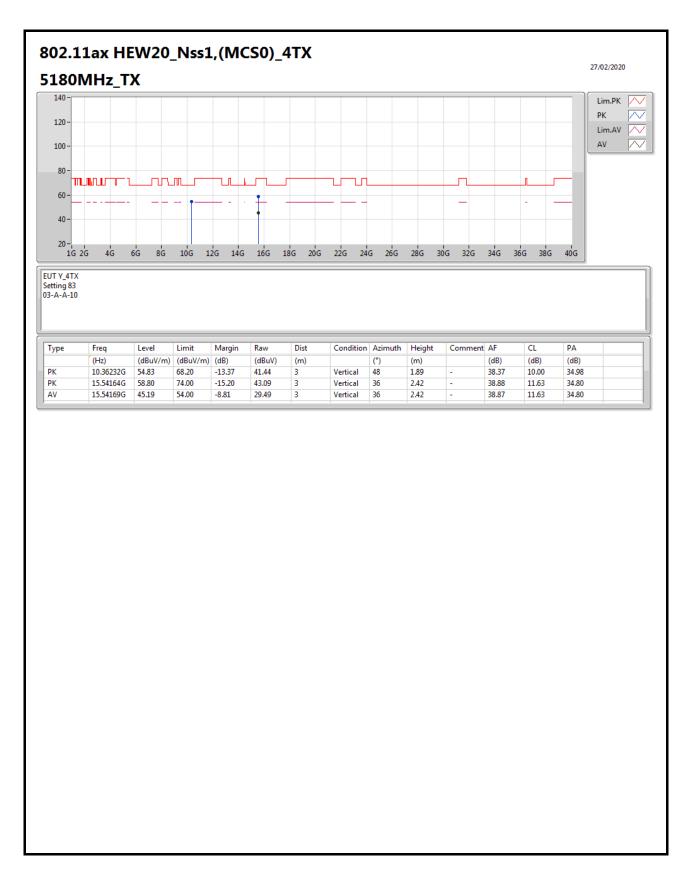
Appendix B.2



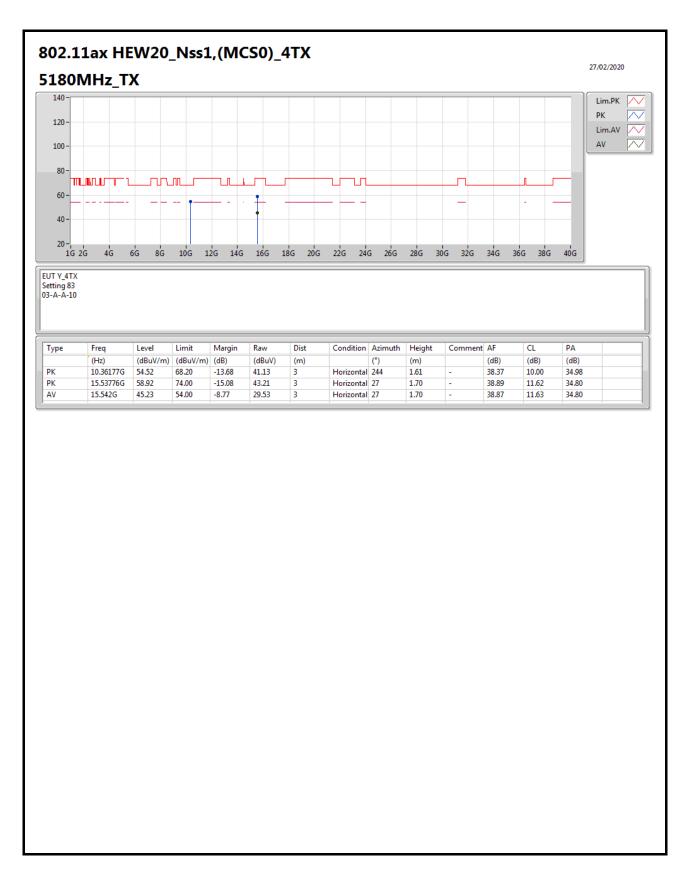




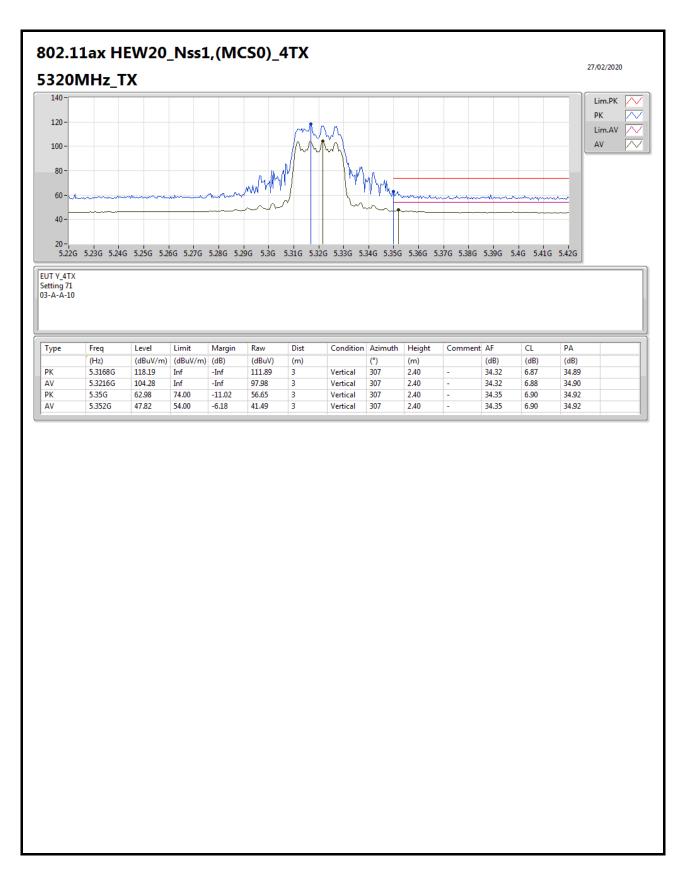




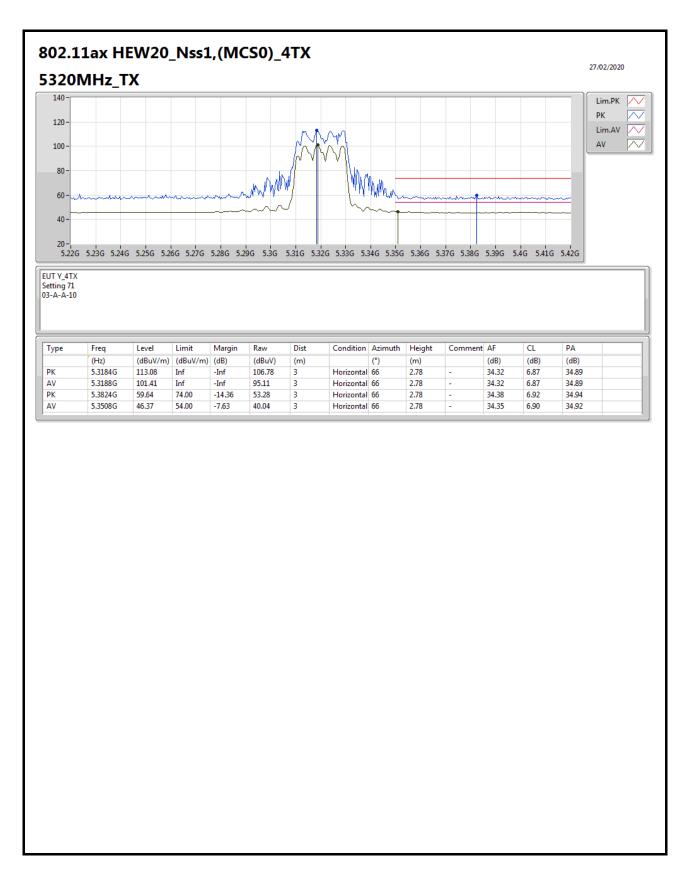














Appendix B.2

