







RADIO TEST REPORT

Test Report No. 14568085S-D-R2

Customer	Sony Group Corporation
Description of EUT	IEEE 802.11 1X1 a/b/g/n/ac/ax Wireless LAN + Bluetooth 5.2 + 802.15.4 Tri-radio 12 x 12 LGA Module
Model Number of EUT	AW-XM553
FCC ID	AK8XM553
Test Regulation	FCC Part 15 Subpart E
Test Result	Complied (Refer to SECTION 3)
Issue Date	May 19, 2023
Remarks	WLAN (5 GHz band) part Except for DFS test This EUT uses Bluetooth and IEEE 802.11 a/n (20 MHz / 40 MHz) only.

Representative Test Engineer	Approved By
	
Kenichi Adachi Engineer	Toyokazu Imamura Leader
 	
CERTIFICATE 1266.03	
<input type="checkbox"/> The testing in which "Non-accreditation" is displayed is outside the accreditation scopes in UL Japan, Inc.	
<input checked="" type="checkbox"/> There is no testing item of "Non-accreditation".	

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- The information provided from the customer for this report is identified in Section 1.
- For test report(s) referred in this report, the latest version (including any revisions) is always referred.

REVISION HISTORY

Original Test Report No.: 14568085S-D

This report is a revised version of 14568085S-D-R1. 14568085S-D-R1 is replaced with this report.

Revision	Test Report No.	Date	Page Revised Contents
- (Original)	14568085S-D	April 3, 2023	-
1	14568085S-D-R1	May 16, 2023	p.5: Corrected the rating from “DC 3.3 V and DC 1.8 V” to “DC 3.3 V”. p.7: Corrected from “The RF Module has its own regulator. The RF Module is constantly provided with voltage through the regulator regardless of input voltage.” to “This EUT provides stable voltage constantly to RF Module regardless of input voltage.” p.10: Corrected the serial No. of sample of radiated emission tests. p.10: Added that “The RF output power of both programs was adjusted to the level defined in the specifications.” p.18: Corrected a setting of the power density (RBW). p.18: Corrected comment “*2”). “*2) -, but it is not possible with spectrum analyzer, so RBW Correction Factor (10 log(500 kHz / 100 kHz)) was added to the test result.” to “*2) -, however, this measurement was performed at the RBW of 1 MHz, which is stricter setting of spectrum analyzer.” p.40,p.41,p.42: Corrected RBW correction factor (-3.01 to 0 dB).
2	14568085S-D-R2	May 19, 2023	p.7: Corrected from “This EUT provides stable voltage constantly to RF Module regardless of input voltage.” to “The EUT is constantly provided with stable voltage from the host device regardless of input voltage.”

Reference: Abbreviations (Including words undescribed in this report)

A2LA	The American Association for Laboratory Accreditation	ICES	Interference-Causing Equipment Standard
AC	Alternating Current	IEC	International Electrotechnical Commission
AFH	Adaptive Frequency Hopping	IEEE	Institute of Electrical and Electronics Engineers
AM	Amplitude Modulation	IF	Intermediate Frequency
Amp, AMP	Amplifier	ILAC	International Laboratory Accreditation Conference
ANSI	American National Standards Institute	ISED	Innovation, Science and Economic Development Canada
Ant, ANT	Antenna	ISO	International Organization for Standardization
AP	Access Point	JAB	Japan Accreditation Board
ASK	Amplitude Shift Keying	LAN	Local Area Network
Atten., ATT	Attenuator	LIMS	Laboratory Information Management System
AV	Average	MCS	Modulation and Coding Scheme
BPSK	Binary Phase-Shift Keying	MRA	Mutual Recognition Arrangement
BR	Bluetooth Basic Rate	N/A	Not Applicable
BT	Bluetooth	NIST	National Institute of Standards and Technology
BT LE	Bluetooth Low Energy	NS	No signal detect.
BW	BandWidth	NSA	Normalized Site Attenuation
Cal Int	Calibration Interval	NVLAP	National Voluntary Laboratory Accreditation Program
CCK	Complementary Code Keying	OBW	Occupied Band Width
Ch., CH	Channel	OFDM	Orthogonal Frequency Division Multiplexing
CISPR	Comite International Special des Perturbations Radioelectriques	P/M	Power meter
CW	Continuous Wave	PCB	Printed Circuit Board
DBPSK	Differential BPSK	PER	Packet Error Rate
DC	Direct Current	PHY	Physical Layer
D-factor	Distance factor	PK	Peak
DFS	Dynamic Frequency Selection	PN	Pseudo random Noise
DQPSK	Differential QPSK	PRBS	Pseudo-Random Bit Sequence
DSSS	Direct Sequence Spread Spectrum	PSD	Power Spectral Density
EDR	Enhanced Data Rate	QAM	Quadrature Amplitude Modulation
EIRP, e.i.r.p.	Equivalent Isotropically Radiated Power	QP	Quasi-Peak
EMC	ElectroMagnetic Compatibility	QPSK	Quadrature Phase Shift Keying
EMI	ElectroMagnetic Interference	RBW	Resolution Band Width
EN	European Norm	RDS	Radio Data System
ERP, e.r.p.	Effective Radiated Power	RE	Radio Equipment
EU	European Union	RF	Radio Frequency
EUT	Equipment Under Test	RMS	Root Mean Square
Fac.	Factor	RSS	Radio Standards Specifications
FCC	Federal Communications Commission	Rx	Receiving
FHSS	Frequency Hopping Spread Spectrum	SA, S/A	Spectrum Analyzer
FM	Frequency Modulation	SG	Signal Generator
Freq.	Frequency	SVSWR	Site-Voltage Standing Wave Ratio
FSK	Frequency Shift Keying	TR	Test Receiver
GFSK	Gaussian Frequency-Shift Keying	Tx	Transmitting
GNSS	Global Navigation Satellite System	VBW	Video BandWidth
GPS	Global Positioning System	Vert.	Vertical
Hori.	Horizontal	WLAN	Wireless LAN

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SECTION 1: Customer Information

Company Name	Sony Group Corporation
Address	1-7-1 Konan Minato-ku, Tokyo, 108-0075 Japan
Contact Person	Kazuhiko Nagano

The information provided from the customer is as follows;

- Customer, Description of EUT, Model Number of EUT, FCC ID on the cover and other relevant pages
- Operating/Test Mode(s) (Mode(s)) on all the relevant pages
- SECTION 1: Customer Information
- SECTION 2: Equipment Under Test (EUT) other than the Receipt Date and Test Date
- SECTION 4: Operation of EUT during testing

* The laboratory is exempted from liability of any test results affected from the above information in SECTION 2 and 4.

SECTION 2: Equipment Under Test (EUT)

2.1 Identification of EUT

Description	IEEE 802.11 1X1 a/b/g/n/ac/ax Wireless LAN + Bluetooth 5.2 + 802.15.4 Tri-radio 12 x 12 LGA Module
Model Number	AW-XM553
Serial Number	Refer to SECTION 4.2
Condition	Engineering prototype (Not for Sale: This sample is equivalent to mass-produced items.)
Modification	No Modification by the test lab
Receipt Date	November 10, 2022
Test Date	November 10, 2022 to January 23, 2023

2.2 Product Description

General Specification

Rating	DC 3.3 V
Operating temperature	0 deg. C to 70 deg. C

Radio Specification

Bluetooth (BR / EDR / Low Energy)

Equipment Type	Transceiver
Frequency of Operation	2402 MHz to 2480 MHz
Type of Modulation	BT: FHSS (GFSK, $\pi/4$ DQPSK, 8 DPSK) BT LE: GFSK
Antenna Type	Type D (IW611-IW620-D): Dipole Antenna Type G (IW611-IW620-G): Dipole Antenna
Antenna Gain	Type D (IW611-IW620-D): 0.38 dBi max (include 100 mm antenna cable) Type G (IW611-IW620-G): 0.29 dBi max (include 100 mm antenna cable)

WLAN (IEEE802.11a/11n-20/11n-40)

Equipment Type	Transceiver	
Frequency of Operation	20 MHz Band:	5180 MHz to 5240 MHz 5260 MHz to 5320 MHz 5500 MHz to 5700 MHz 5745 MHz to 5825 MHz
	40 MHz Band:	5190 MHz to 5230 MHz 5270 MHz to 5310 MHz 5510 MHz to 5670 MHz 5755 MHz to 5795 MHz
Type of Modulation	OFDM	
Antenna Type	Type D (IW611-IW620-D): Dipole Antenna Type G (IW611-IW620-G): Dipole Antenna	
Antenna Gain	Type D (IW611-IW620-D): 1.68 dBi max (include 100 mm antenna cable) Type G (IW611-IW620-G): 1.36 dBi max (include 100 mm antenna cable)	

* This test report applies to Wireless LAN (5 GHz Band).

* Following channels are not used.

- 20 MHz Bandwidth (5600 MHz - 5640 MHz)
- 40 MHz Bandwidth (5590 MHz - 5630 MHz)

SECTION 3: Test specification, Procedures & Results

3.1 Test Specification

Test Specification	FCC Part 15 Subpart E The latest version on the first day of the testing period
Title	FCC 47 CFR Part 15 Radio Frequency Device Subpart E Unlicensed National Information Infrastructure Devices Section 15.407 General technical requirements

3.2 Procedures and Results

Item	Test Procedure	Specification	Worst Margin	Results	Remarks
Conducted Emission	FCC: ANSI C63.10-2013 ISED: RSS-Gen 8.8	FCC: 15.407 (b) (6) / 15.207 ISED: RSS-Gen 8.8	20.7 dB, 0.49350 MHz, N, AV	Complied a)	-
26 dB Emission Bandwidth	FCC: KDB Publication Number 789033 ISED: -	FCC: 15.407 (a) (1) (2) (3) ISED: -	See data	N/A b)	Conducted
Maximum Conducted Output Power	FCC: KDB Publication Number 789033 ISED: -	FCC: 15.407 (a) (1) (2) (3) ISED: RSS-247 6.2.1.1 6.2.2.1 6.2.3.1 6.2.4.1		Complied c)	Conducted
Maximum Power Spectral Density	FCC: KDB Publication Number 789033 ISED: -	FCC : 15.407 (a) (1) (2) (3) ISED: RSS-247 6.2.1.1 6.2.2.1 6.2.3.1 6.2.4.1		N/A d)	Conducted
Spurious Emission Restricted Band Edge	FCC: ANSI C63.10-2013 KDB Publication Number 789033 ISED: -	FCC: 15.407 (b), 15.205 and 15.209 ISED: RSS-247 6.2.1.2 6.2.2.2 6.2.3.2 6.2.4.2	0.5 dB 21280.000 MHz, AV, Hori., Tx 11n-20 5320 MHz 5150.000 MHz AV, Vert., Tx 11n-40 5190 MHz	Complied e) / f)	Conducted (< 30 MHz) / Radiated (> 30 MHz) *1)
6 dB Emission Bandwidth	FCC: ANSI C63.10-2013 ISED: -	FCC: 15.407 (e) ISED: RSS-247 6.2.4.1	See data	Complied g)	Conducted
<p>Note: UL Japan, Inc.'s EMI Work Procedures: Work Instructions-ULID-003591 and Work Instructions-ULID-003593. * In case any questions arise about test procedure, ANSI C63.10: 2013 is also referred.</p> <p>*1) Radiated test was selected over 30 MHz based on RSS-247 6.2 and KDB 789033 D02 G.3.b).</p> <p>a) Refer to APPENDIX 1 (data of Conducted Emission) b) Refer to APPENDIX 1 (data of 26 dB Emission Bandwidth and 99 % Occupied Bandwidth) c) Refer to APPENDIX 1 (data of Maximum Conducted Output Power) d) Refer to APPENDIX 1 (data of Maximum Power Spectral Density) e) Refer to APPENDIX 1 (data of Radiated Spurious Emission) f) Refer to APPENDIX 1 (data of Conducted Spurious Emission) g) Refer to APPENDIX 1 (data of 6 dB Bandwidth)</p>					

FCC Part 15.31 (e)

The EUT is constantly provided with stable voltage from the host device regardless of input voltage. Therefore, this EUT complies with the requirement.

FCC Part 15.203/212 Antenna requirement

The EUT has a unique antenna connector (U.FL). Therefore, the equipment complies with the requirement of 15.203/212.

3.3 Addition to Standard

99 % Occupied Band Width	ISED: RSS-Gen 6.7	ISED: -	N/A	- b)	Conducted
b) Refer to APPENDIX 1 (data of 26 dB Emission Bandwidth and 99 % Occupied Bandwidth)					

Other than above, no addition, exclusion nor deviation has been made from the standard.

3.4 Uncertainty

Measurement uncertainty is not taken into account when stating conformity with a specified requirement.

Note: When margins obtained from test results are less than the measurement uncertainty, the test results may exceed the limit.

The following uncertainties have been calculated to provide a confidence level of 95 % using a coverage factor $k = 2$.

Item	Frequency range	Uncertainty (+/-)
Conducted emission (AC Mains) LISN	150 kHz-30 MHz	3.1 dB
Radiated emission (Measurement distance: 3 m)	9 kHz-30 MHz	3.3 dB
	30 MHz-200 MHz	4.8 dB
	200 MHz-1 GHz	6.1 dB
	1 GHz-6 GHz	4.7 dB
	6 GHz-18 GHz	5.3 dB
	18 GHz-40 GHz	5.5 dB
Radiated emission (Measurement distance: 1 m)	1 GHz-18 GHz	5.6 dB
	18 GHz-40 GHz	5.8 dB

Antenna terminal test	Uncertainty (+/-)
Power Measurement above 1 GHz (Average Detector)_SPM-06	1.3 dB
Power Measurement above 1 GHz (Peak Detector)_SPM-06	2.1 dB
Power Measurement above 1 GHz (Average Detector)_SPM-07	1.1 dB
Power Measurement above 1 GHz (Peak Detector)_SPM-07	1.2 dB
Power Measurement above 1 GHz (Average Detector)_SPM-13	1.1 dB
Power Measurement above 1 GHz (Peak Detector)_SPM-13	1.4 dB
Spurious emission (Conducted) below 1 GHz	0.84 dB
Conducted emissions Power Density Measurement 1 GHz-3 GHz	0.86 dB
Conducted emissions Power Density Measurement 3 GHz-18 GHz	2.4 dB
Spurious emission (Conducted) 18 GHz-26.5 GHz	2.4 dB
Spurious emission (Conducted) 26.5 GHz-40 GHz	2.2 dB
Bandwidth Measurement	0.012 %
Duty cycle and Time Measurement	0.27 %
Temperature_SCH-01	0.87 deg.C.
Humidity_SCH-01	3.5 %
Temperature_SCH-02	2.0 deg.C.
Humidity_SCH-02	6.7 %
Voltage	0.92 %

3.5 Test Location

UL Japan, Inc. Shonan EMC Lab.
1-22-3, Megumigaoka, Hiratsuka-shi, Kanagawa-ken 259-1220 Japan
Telephone: +81-463-50-6400
A2LA Certificate Number: 1266.03

(FCC test firm registration number: 626366, ISED lab company number: 2973D / CAB identifier: JP0001)

Test site	IC Registration Number	Width x Depth x Height (m)	Size of reference ground plane (m) / horizontal conducting plane	Maximum measurement distance
No.1 Semi-anechoic chamber	2973D-1	20.6 x 11.3 x 7.65	20.6 x 11.3	10 m
No.2 Semi-anechoic chamber	2973D-2	20.6 x 11.3 x 7.65	20.6 x 11.3	10 m
No.3 Semi-anechoic chamber	2973D-3	12.7 x 7.7 x 5.35	12.7 x 7.7	5 m
No.4 Semi-anechoic chamber	-	8.1 x 5.1 x 3.55	8.1 x 5.1	-
No.1 Shielded room	-	6.8 x 4.1 x 2.7	6.8 x 4.1	-
No.2 Shielded room	-	6.8 x 4.1 x 2.7	6.8 x 4.1	-
No.3 Shielded room	-	6.3 x 4.7 x 2.7	6.3 x 4.7	-
No.4 Shielded room	-	4.4 x 4.7 x 2.7	4.4 x 4.7	-
No.5 Shielded room	-	7.8 x 6.4 x 2.7	7.8 x 6.4	-
No.6 Shielded room	-	7.8 x 6.4 x 2.7	7.8 x 6.4	-
No.8 Shielded room	-	3.45 x 5.5 x 2.4	3.45 x 5.5	-
No.1 Measurement room	-	2.55 x 4.1 x 2.5	-	-

3.6 Test Data, Test Instruments, and Test Set Up

Refer to APPENDIX.

SECTION 4: Operation of EUT during testing

4.1 Operating Mode(s)

Test operating mode was determined as follows according to “Section 1 of 6 802.11 a/b/g/n testing - Managing Complex Regulatory Approvals -” of TCB Council Workshop October 2009.

Mode	Remarks*
IEEE 802.11a (11a)	54 Mbps, PN9
IEEE 802.11n SISO 20 MHz BW (11n-20)	MCS 7, PN9
IEEE 802.11n SISO 40 MHz BW (11n-40)	MCS 7, PN9
*The worst condition was determined based on the test result of Maximum Conducted Output Power.	
*Power of the EUT was set by the software as follows; Power Setting: Refer to *2) Software: IW611 RF Test Version 1.2 (For antenna terminal conducted tests) (Date: 2022.11.10, Storage location: Driven by connected PC) Dut LabTool, Version 1.0.0.29 (For radiated emission tests) (Date: 2022.12.15, Storage location: Driven by connected PC)	
*This setting of software is the worst case. Any conditions under the normal use do not exceed the condition of setting. In addition, end users cannot change the settings of the output power of the product.	

*2) Power setting:

a) Power setting of sample for antenna terminal conducted tests (for serial No. 14-D4-24-DE-11-29)

11a / 11n-20: 16 (for all channel)

11n-40:

	5190	5230	5270	5310	5510	5550	5590	5630	5670	5755	5795
Power setting	14	16	16	11	16	16	16	16	16	16	16

b) Power setting of sample for radiated emissions tests (for serial No. 2C:3B:70:E7:BB:D8)

11a / 11n-20: 14 (for all channel)

11n-40:

	5190	5230	5270	5310	5510	5550	5590	5630	5670	5755	5795
Power setting	12	14	14	9	14	14	14	14	14	14	14

*Although serial No.14-D4-24-DE-11-29 and serial No.2C:3B:70:E7:BB:D8 are set to different value, the internal power settings are the same only because they are set by different programs.

The RF output power of both programs was adjusted to the level defined in the specifications.

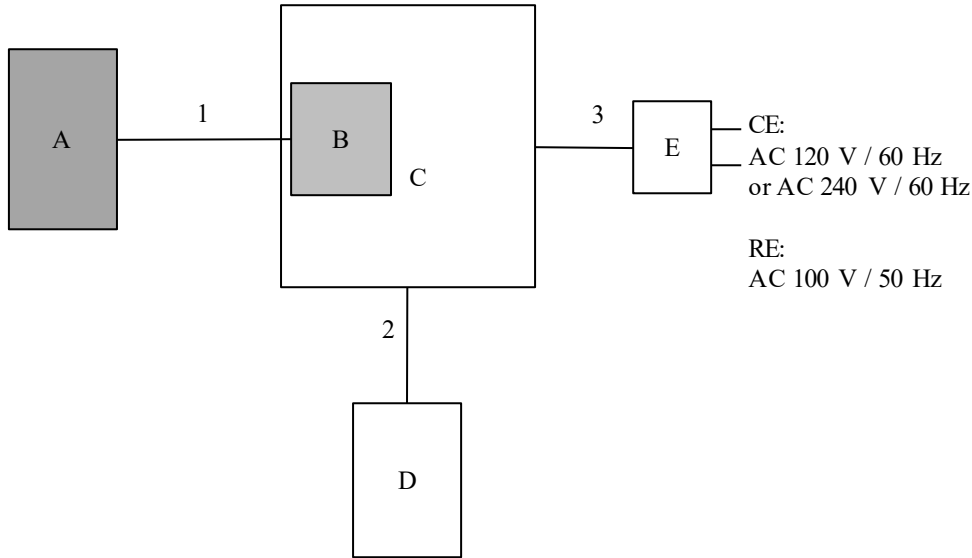
* Details of Operation Mode(s)

Test Item	Operating Mode	Tested Frequency			
		Lower Band	Middle Band	Additional Band	Upper Band
Conducted emission	Tx 11n-20 *1)	-	-	5580 MHz	-
26 dB Emission Bandwidth	Tx 11a Tx 11n-20	-	5260 MHz 5300 MHz 5320 MHz	5500 MHz 5580 MHz 5700 MHz	-
	Tx 11n-40	-	5270 MHz 5310 MHz	5510 MHz 5550 MHz 5670 MHz	-
99 % Occupied Bandwidth, Maximum Conducted Output Power, Maximum Power Spectral Density	Tx 11a Tx 11n-20	5180 MHz 5220 MHz 5240 MHz	5260 MHz 5300 MHz 5320 MHz	5500 MHz 5580 MHz 5700 MHz	5745 MHz 5785 MHz 5825 MHz
	Tx 11n-40	5190 MHz 5230 MHz	5270 MHz 5310 MHz	5510 MHz 5550 MHz 5670 MHz	5755 MHz 5795 MHz
6 dB Bandwidth	Tx 11a Tx 11n-20	-	-	-	5745 MHz 5785 MHz 5825 MHz
	Tx 11n-40	-	-	-	5755 MHz 5795 MHz
Radiated Spurious Emission (Below 1 GHz)	Tx 11n-20 *1)	-	-	5580 MHz	-
	Tx 11n-20 with Tx BT LE 2M-PHY 2402 MHz	-	-	5580 MHz	-
	Tx 11n-20 with Tx Hopping ON, 3DH5	-	-	5580 MHz	-
Radiated Spurious Emission (Above 1 GHz)	Tx 11a	5180 MHz	5320 MHz	5500 MHz 5580 MHz 5700 MHz	5745 MHz 5785 MHz 5825 MHz
	Tx 11n-20	5180 MHz 5240 MHz	5320 MHz	5500 MHz 5580 MHz 5700 MHz	5745 MHz 5785 MHz 5825 MHz
	Tx 11n-40	5190 MHz 5230 MHz	5270 MHz 5320 MHz	5500 MHz 5550 MHz 5670 MHz	5755 MHz 5795 MHz
	Tx 11a with Tx BT LE 2M-PHY 2402 MHz	5180 MHz	5320 MHz	5500 MHz 5580 MHz 5700 MHz	5745 MHz 5785 MHz 5825 MHz
	Tx 11n-20 with Tx BT LE 2M-PHY 2402 MHz	5180 MHz 5240 MHz	5320 MHz	5500 MHz 5580 MHz 5700 MHz	5745 MHz 5785 MHz 5825 MHz
	Tx 11n-40 with Tx BT LE 2M-PHY 2402 MHz	5190 MHz 5230 MHz	5270 MHz 5320 MHz	5500 MHz 5550 MHz 5670 MHz	5755 MHz 5795 MHz
	Tx 11a with Tx Hopping ON, 3DH5	5180 MHz	5320 MHz	5500 MHz 5580 MHz 5700 MHz	5745 MHz 5785 MHz 5825 MHz
	Tx 11n-20 with Tx Hopping ON, 3DH5	5180 MHz 5240 MHz	5320 MHz	5500 MHz 5580 MHz 5700 MHz	5745 MHz 5785 MHz 5825 MHz
	Tx 11n-40 with Tx Hopping ON, 3DH5	5190 MHz 5230 MHz	5270 MHz 5320 MHz	5500 MHz 5550 MHz 5670 MHz	5755 MHz 5795 MHz
Conducted Spurious Emission	Tx 11n-20 *1)	-	-	5580 MHz	-

*1) The mode was tested as a representative, because it had the highest power at antenna terminal test.
*2) The test was performed with the antenna that had higher power as a representative.
*3) Since 11a and 11n-20 have the same modulation method, only band edge tests were conducted for 11a.

4.2 Configuration and Peripherals

<Radiated Emission test and Conducted Emission test>



* Cabling and setup(s) were taken into consideration and test data was taken under worse case conditions.

*As a result of comparing AC 120 V and AC 240 V at pre-check, conducted emission test was performed with AC 120 V of the worst voltage as representative.

** The antenna used in these tests were the worst of two type of antennas in the pre-check.
(Type D (=IW611-IW620-D) or Type G (=IW611-IW620-G))

** The antenna cable used in these tests were the worst of two type of antenna cable in the pre-check.
(100 mm or 800 mm)

Description of EUT and Support Equipment

No.	Item	Model number	Serial Number	Manufacturer	Remarks
A	Antenna	Type D	001	SONY	EUT
		Type G	001	SONY	EUT
B	IEEE 802.11 1X1 a/b/g/n/ac/ax Wireless LAN + Bluetooth 5.2 + 802.15.4 Tri-radio 12 x 12 LGA Module	AW-XM553	2C:3B:70:E7:BB:D8	AzureWave	EUT
C	Evaluation board	AW-XM553-EVB	2-01-221122	AzureWave	-
D	Jig Board	AW-NM383	1256-13	AzureWave	-
E	AC Adapter	AC-0400-JP	-	SONY	-

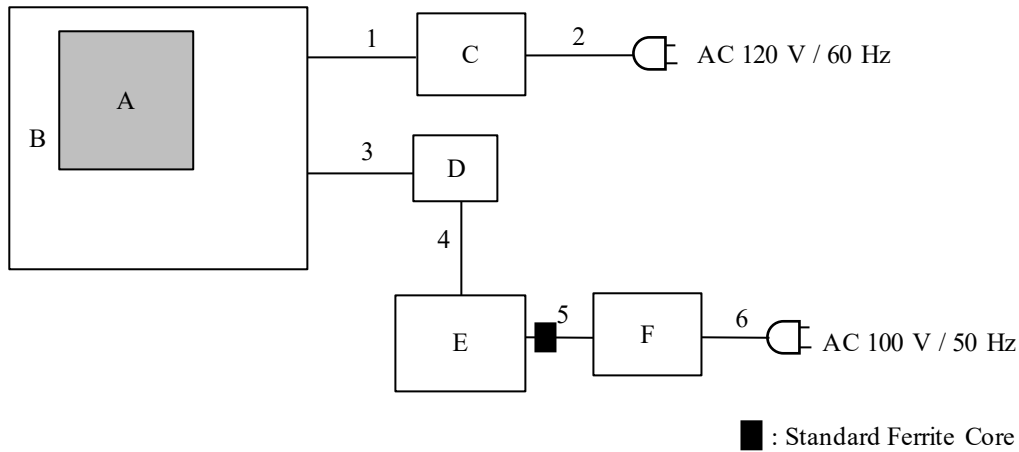
List of Cables Used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	Antenna	0.1 *1) 0.8 *2)	Shielded	Shielded	-
2	Signal	0.15	Unshielded	Unshielded	-
3	USB	1.0	Shielded	Shielded	-

*1) Used for Radiated Emission test above 1 GHz

*2) Used for Radiated Emission test below 1 GHz and Conducted Emission test

<Antenna Terminal conducted test>



Description of EUT and Support Equipment

No.	Item	Model number	Serial Number	Manufacturer	Remarks
A	IEEE 802.11 1X1 a/b/g/n/ac/ax Wireless LAN + Bluetooth 5.2 + 802.15.4 Tri-radio 12 x 12 LGA Module	AW-XM553	14-D4-24-DE-11-29	AzureWave	EUT
B	AE-C EVT	AE-C EVT	015	SONY	-
C	AC Adapter	AC-M1215WW	M2220096354	SONY	-
D	Jig Board	EBISU JIG	0001	SONY	-
E	Laptop Computer	7666-77J	LV-B8PVT 08/05	Lenovo	-
F	AC Adapter	42T4422	11S42T4422Z1ZF3D9BV4XN	Lenovo	-

List of Cables Used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	DC	1.0	Unshielded	Unshielded	-
2	AC	0.6	Unshielded	Unshielded	-
3	Signal	0.15	Unshielded	Unshielded	-
4	USB	1.2	Shielded	Shielded	-
5	DC	1.8	Unshielded	Unshielded	-
6	AC	0.9	Unshielded	Unshielded	-

SECTION 5: Conducted Emission

Test Procedure and Conditions

EUT was placed on a urethane platform of nominal size, 1.0 m by 2.0 m, raised 0.8 m above the conducting ground plane.

The rear of tabletop was located 40cm to the vertical conducting plane. The rear of EUT, including peripherals, was aligned and flushed with rear of tabletop. All other surfaces of tabletop were at least 80cm from any other grounded conducting surface. EUT was located 80cm from a Line Impedance Stabilization Network (LISN) / Artificial mains Network (AMN).

For the tests on EUT itself (as a stand alone equipment)

Each EUT current-carrying power lead, except the ground (safety) lead, was individually connected through a LISN / (AMN) to the input power source.

The AC Mains Terminal Continuous disturbance Voltage has been measured with the EUT via AC Adapter in a Shielded room.

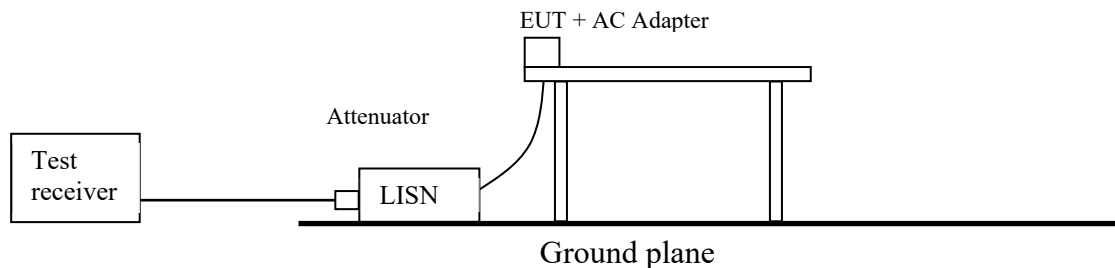
The EUT via AC Adapter was connected to a LISN (AMN).

An overview sweep with peak detection has been performed.

The test results and limit are rounded off to one decimal place, so some differences might be observed.

Detector	: QP and CISPR Average
Measurement Range	: 0.15 MHz to 30 MHz
Test Data	: APPENDIX
Test Result	: Pass

Figure 1: Test Setup



SECTION 6: Radiated Spurious Emission and Band Edge Compliance

Test Procedure

< Below 1 GHz >

EUT was placed on a urethane platform of nominal size, 0.5 m by 1.0 m, raised 0.8 m above the conducting ground plane. The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with a ground plane.

< Above 1 GHz >

EUT was placed on a urethane platform of nominal size, 0.5 m by 0.5 m, raised 1.5 m above the conducting ground plane. The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with absorbent materials lined on a ground plane. Test antenna was aimed at the EUT for receiving the maximum signal and always kept within the illumination area of the 3 dB beamwidth of the antenna.

The height of the measuring antenna varied between 1 m and 4 m and EUT was rotated a full revolution in order to obtain the maximum value of the electric field strength.

The measurements were performed for both vertical and horizontal antenna polarization with the Test Receiver, or the Spectrum Analyzer.

The measurements were made with the following detector function of the test receiver and the Spectrum analyzer (in linear mode).

The test was made with the detector (RBW/VBW) in the following table.

When using Spectrum analyzer, the test was made with adjusting span to zero by using peak hold.

< Below 1 GHz >

The result also satisfied with the general limits specified in section 15.209 (a).

< Above 1 GHz >

Inside of restricted bands (Section 15.205):

Apply to limit in the Section 15.209 (a).

Outside of the restricted bands:

Apply to limit 68.2 dBuV/m, 3 m (-27 dBm e.i.r.p.*) in the Section 15.407 (b) (1) (2) (3).

For W58 Bandedge

-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 in the section 15.407(b)(4)(i).

Restricted band edge:

Apply to limit in the Section 15.209 (a).

Since this limit is severer than the limit of the inside of restricted bands.

*Electric field strength to e.i.r.p. conversion:

$$E = \frac{1000000 \sqrt{30 P}}{3} \text{ (uV/m)} \quad : P \text{ is the e.i.r.p. (Watts)}$$

Test Antennas are used as below;

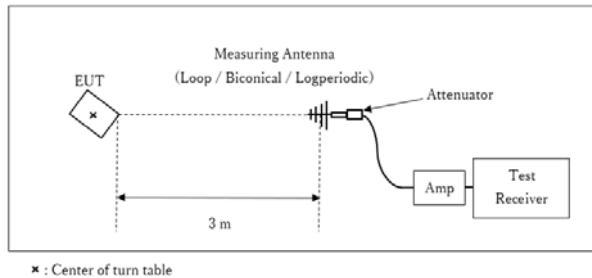
Frequency	30 MHz to 200 MHz	200 MHz to 1 GHz	Above 1 GHz
Antenna Type	Biconical	Logperiodic	Horn

Frequency	Below 1 GHz	Above 1 GHz	
Instrument Used	Test Receiver	Spectrum Analyzer	
Detector	QP	Peak	Average
IF Bandwidth	BW: 120 kHz	RBW: 1 MHz VBW: 3 MHz	Method VB RBW: 1 MHz VBW: 1/T MHz (T: Burst length, refer to Appendix) Detector: Peak Trace mode: Max hold

*1) The test method was also referred to KDB 789033 D02 General UNII Test Procedures New Rules v02r01 "Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices Part 15, Subpart E".

Figure 2: Test Setup

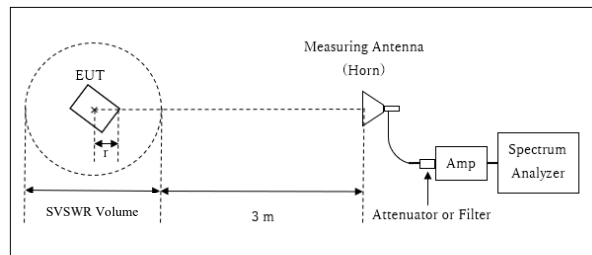
Below 1 GHz



Test Distance: 3 m

× : Center of turn table

1 GHz to 10 GHz

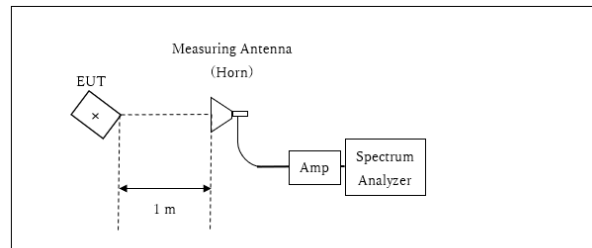


Distance Factor: $20 \times \log(3.91 \text{ m} / 3.0 \text{ m}) = 2.31 \text{ dB}$
* Test Distance: $(3 + \text{SVSWR Volume} / 2) - r = 3.91 \text{ m}$

SVSWR Volume : 2.0 m
(SVSWR Volume has been calibrated based on CISPR 16-1-4.)
 $r = 0.09 \text{ m}$

r : Radius of an outer periphery of EUT
× : Center of turn table

10 GHz to 40 GHz



Distance Factor: $20 \times \log(1.0 \text{ m} / 3.0 \text{ m}) = -9.54 \text{ dB}$
* Test Distance: 1 m

× : Center of turn table

- The carrier level and noise levels were confirmed at each position of X, Y and Z axes of EUT and antenna to see the position of maximum noise, and the test was made at the position that has the maximum noise.
- The one of antenna was used for this test to be worst data in the pre-check.
- The one of antenna cable were used for this test to be worst data in the pre-check.

		Conducted emission	Below 30 MHz	1-2.8 GHz	2.8-10 GHz	10-18 GHz	18-26.5 GHz
EUT (module)	Horizontal	-	X	Y	Y	Y	Y
	Vertical		X	Y	Y	Z	Y
Antenna	Horizontal	-	X	Y	Y	X	X
	Vertical		X	Z	Z	Y	Z
Used antenna	Horizontal	Type D	Type D	Type D	Type D	Type D	Type D
	Vertical		Type D	Type D	Type D	Type D	Type D
Antenna cable	Horizontal	800 mm	800 mm	100 mm	100 mm	100 mm	100 mm
	Vertical		800 mm	100 mm	100 mm	100 mm	100 mm

The test results and limit are rounded off to one decimal place, so some differences might be observed.

Measurement Range : 30 MHz to 40 GHz
Test Data : APPENDIX
Test Result : Pass

SECTION 7: Antenna Terminal Conducted Tests

Test Procedure

The tests were made with below setting connected to the antenna port.

Test	Span	RBW	VBW	Sweep time	Detector	Trace	Instrument used and Test method
26 dB Bandwidth	Enough to capture the emission	Close to 1 % of EBW	> RBW	Auto	Peak	Max Hold	Spectrum Analyzer
99 % Occupied Bandwidth *1)	Enough width to display emission skirts	1 % to 5 % of OBW	≥ 3 RBW	Auto	Peak	Max Hold	Spectrum Analyzer
6 dB Bandwidth	Enough to capture the emission	100 kHz	300 kHz	Auto	Peak	Max Hold	Spectrum Analyzer
Maximum Conducted Output Power	-	-	-	Auto	Average	-	Power Meter (Sensor: 160 MHz BW) (Method PM-G)
Maximum Power Spectral Density	Encompass the entire EBW	1 MHz *2)	≥ 3 RBW	Auto	RMS Power Averaging (100 times)	Clear Write	Spectrum Analyzer
Conducted Spurious Emission*3) *4)	9 kHz to 150 kHz	200 Hz	620 Hz	Auto	Peak	Max Hold	Spectrum Analyzer
	150 kHz to 30 MHz	10 kHz	30 kHz				

* The test method was also referred to KDB 789033 D02 General UNII Test Procedures New Rules v02r01 "Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices Part 15, Subpart E".

*1) Peak hold was applied as Worst-case measurement.

*2) KDB 789033 D02 says that RBW is set to be 500 kHz for 5.725 GHz to 5.850 GHz, however, this measurement was performed at the RBW of 1 MHz, which is stricter setting of spectrum analyzer.

*3) In the frequency range below 30 MHz, RBW was narrowed to separate the noise contents.

Then, wide-band noise near the limit was checked separately, however the noise was not detected as shown in the chart. (9 kHz to 150 kHz: RBW = 200 Hz, 150 kHz to 30 MHz: RBW = 10 kHz)

*4) The limits in CFR 47, Part 15, Subpart C, paragraph 15.209(a), are identical to those in RSS-Gen section 8.9, Table 6, since the measurements are performed in terms of magnetic field strength and converted to electric field strength levels (as reported in the table) using the free space impedance of 377 Ohms. For example, the measurement at frequency 9 kHz resulted in a level of 45.5 dBuV/m, which is equivalent to $45.5 - 51.5 = -6.0$ dBuA/m, which has the same margin, 3 dB, to the corresponding RSS-Gen Table 6 limit as it has to 15.209(a) limit.

The test results and limit are rounded off to two decimals place, so some differences might be observed. The equipment and cables were not used for factor 0 dB of the data sheets.

Test Data : APPENDIX
Test Result : Pass

APPENDIX 1: Test Data

Conducted Emission

DATA OF CONDUCTED EMISSION TEST

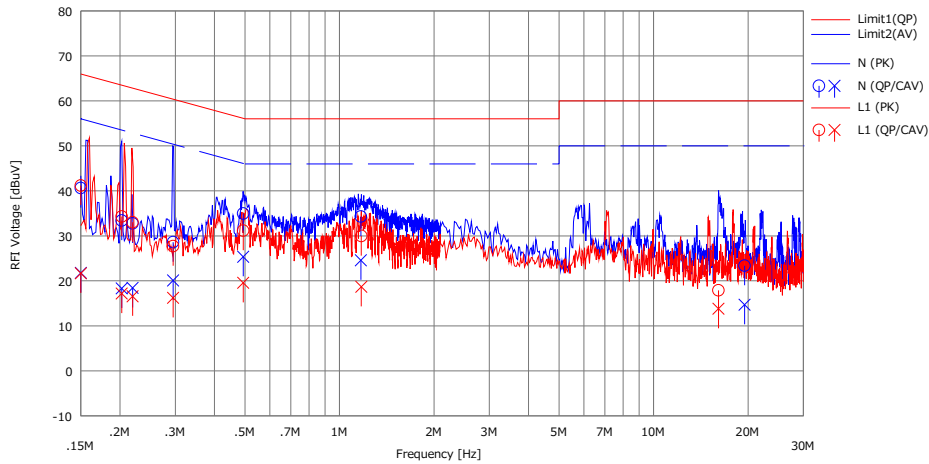
UL Japan, Inc. Shonan EMC Lab. No.3 Shielded Room
Date : 2023/01/11

Mode : Tx 11n-20 5580 MHz
Power : AC 240 V / 60 Hz
Temp./Humi. : 22 deg.C / 34 %RH

Remarks : ANT(Type D), RF cable: 800 mm

Limit : FCC_Part 15 Subpart C(15.207)

Engineer : Takahiro Suzuki



No.	Freq. [MHz]	Reading		C.Fac	Results		Limit		Margin		Phase	Comment
		<QP> [dBuV]	<CAV> [dBuV]		<QP> [dBuV]	<CAV> [dBuV]	<QP> [dBuV]	<AV> [dBuV]	<QP> [dB]	<AV> [dB]		
1	0.15000	28.05	9.19	12.59	40.64	21.78	66.00	56.00	25.3	34.2	N	
2	0.20259	20.83	5.74	12.59	33.42	18.33	63.50	53.50	30.0	35.1	N	
3	0.21937	20.16	5.84	12.60	32.76	18.44	62.84	52.84	30.0	34.4	N	
4	0.29513	16.00	7.49	12.60	28.60	20.09	60.38	50.38	31.7	30.2	N	
5	0.49350	22.32	12.73	12.63	34.95	25.36	56.11	46.11	21.1	20.7	N	
6	1.17000	21.62	11.89	12.69	34.31	24.58	56.00	46.00	21.6	21.4	N	
7	19.49000	9.16	0.48	14.22	23.38	14.70	60.00	50.00	36.6	35.3	N	
8	0.15000	28.63	9.12	12.56	41.19	21.68	66.00	56.00	24.8	34.3	L1	
9	0.20259	21.75	4.63	12.56	34.31	17.19	63.50	53.50	29.1	36.3	L1	
10	0.21937	20.46	4.00	12.57	33.03	16.57	62.84	52.84	29.8	36.2	L1	
11	0.29513	15.13	3.65	12.58	27.71	16.23	60.38	50.38	32.6	34.1	L1	
12	0.49350	18.58	6.97	12.60	31.18	19.57	56.11	46.11	24.9	26.5	L1	
13	1.17337	17.31	6.00	12.67	29.98	18.67	56.00	46.00	26.0	27.3	L1	
14	16.10849	4.13	0.04	13.77	17.90	13.81	60.00	50.00	42.1	36.1	L1	

Calculation: Result[dBuV]=Reading[dBuV]+C.Fac(LISN(AMN)+Cable+ATT)[dB]
LISN(AMN):SLS-02

26 dB Emission Bandwidth and 99 % Occupied Bandwidth

Test place	Shonan EMC Lab. No.5 Shielded Room	
Date	November 14, 2022	November 16, 2022
Temperature / Humidity	25 deg. C / 36 % RH	24 deg. C / 34 % RH
Engineer	Miku Ikudome	Miku Ikudome
Mode	Tx	

11a

Tested Frequency [MHz]	26 dB Emission Bandwidth [MHz]	99 % Occupied Bandwidth [kHz]
5180	-	16771.0
5220	-	16848.5
5240	-	16755.9
5260	18.993	16719.9
5300	19.516	16809.8
5320	19.900	16789.8
5500	19.660	16760.3
5580	19.639	16738.3
5700	19.136	16686.6
5745	-	16731.1
5785	-	16702.0
5825	-	16703.0

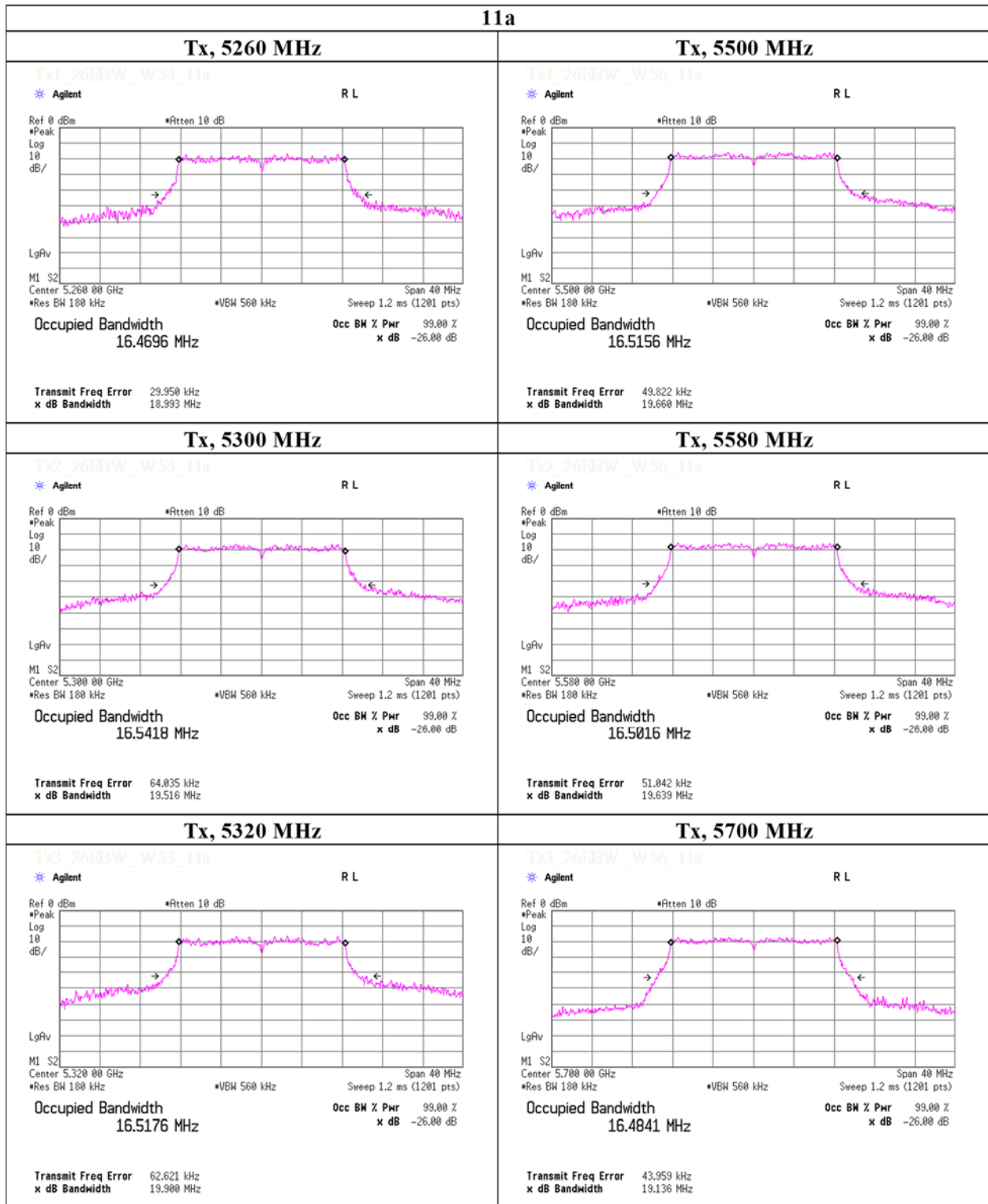
11n-20

Tested Frequency [MHz]	26 dB Emission Bandwidth [MHz]	99 % Occupied Bandwidth [kHz]
5180	-	17862.4
5220	-	17887.9
5240	-	17898.8
5260	21.830	17874.0
5300	20.161	17846.7
5320	22.167	17841.2
5500	19.987	17863.3
5580	19.701	17871.0
5700	19.675	17795.4
5745	-	17819.9
5785	-	17748.8
5825	-	17818.2

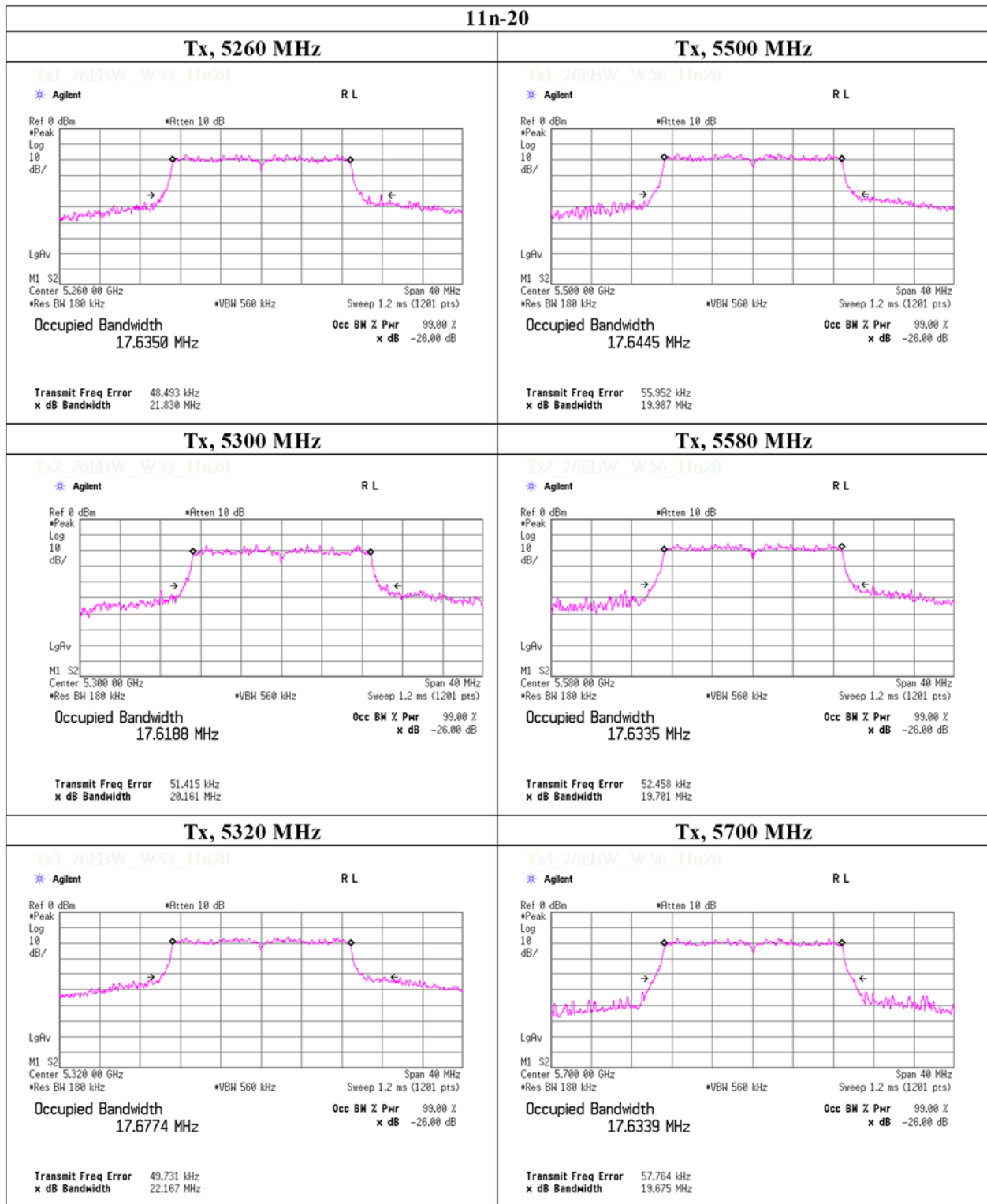
11n-40

Tested Frequency [MHz]	26 dB Emission Bandwidth [MHz]	99 % Occupied Bandwidth [kHz]
5190	-	36530.8
5230	-	36551.7
5270	44.376	36461.5
5310	46.473	36606.9
5510	49.181	36611.6
5550	43.370	36587.7
5670	40.036	36406.7
5755	-	36366.6
5795	-	36307.0

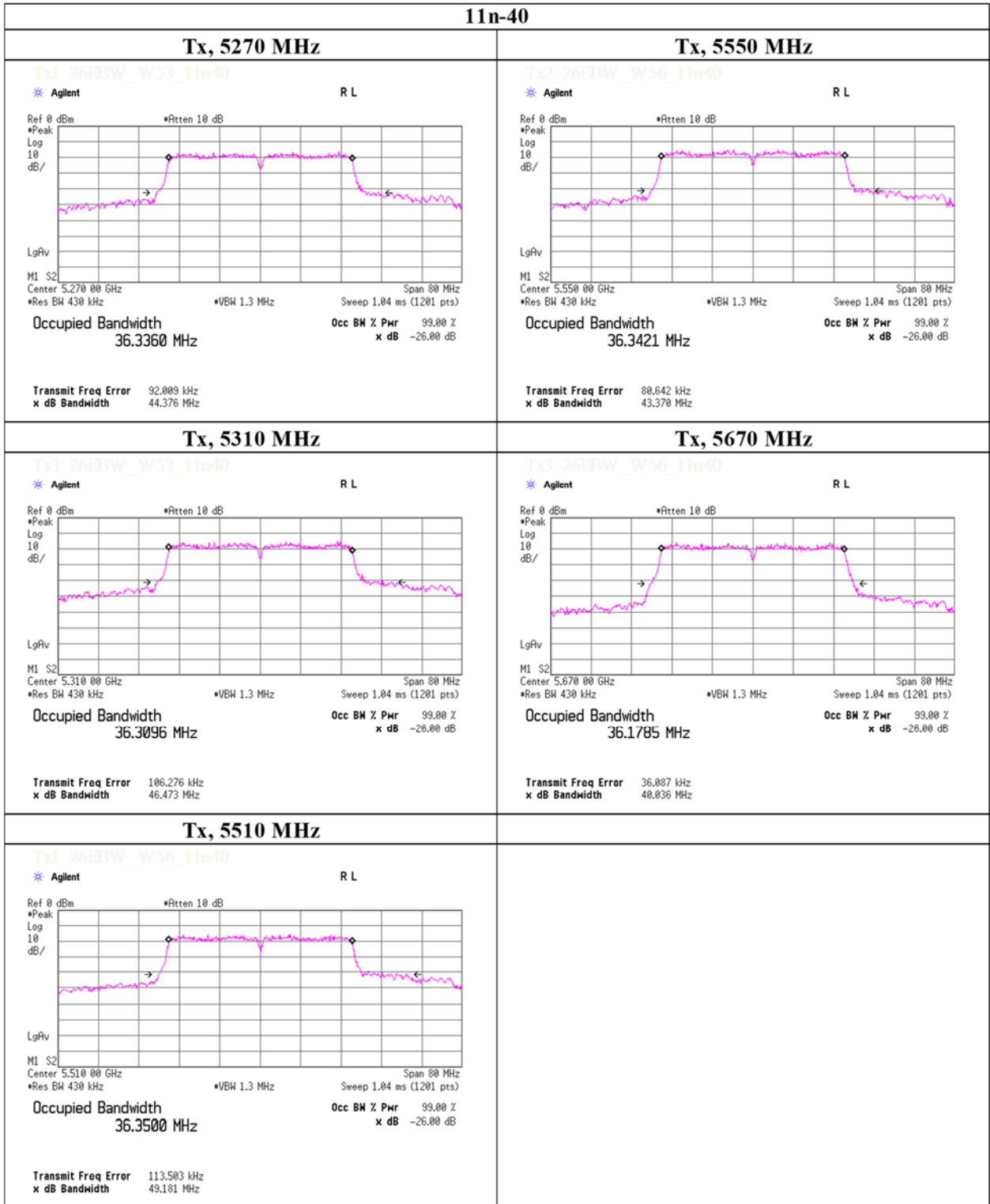
26 dB Emission Bandwidth



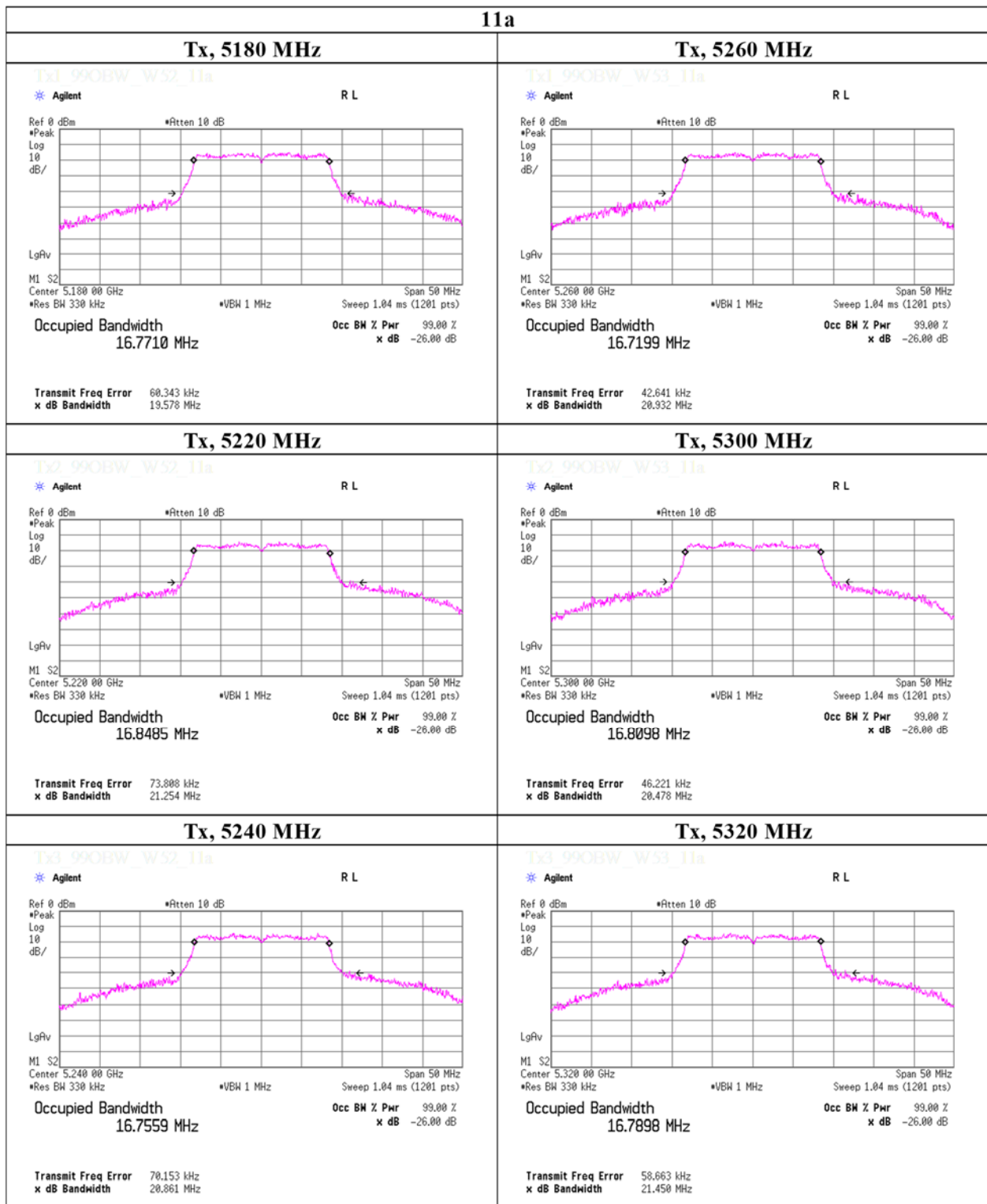
26 dB Emission Bandwidth



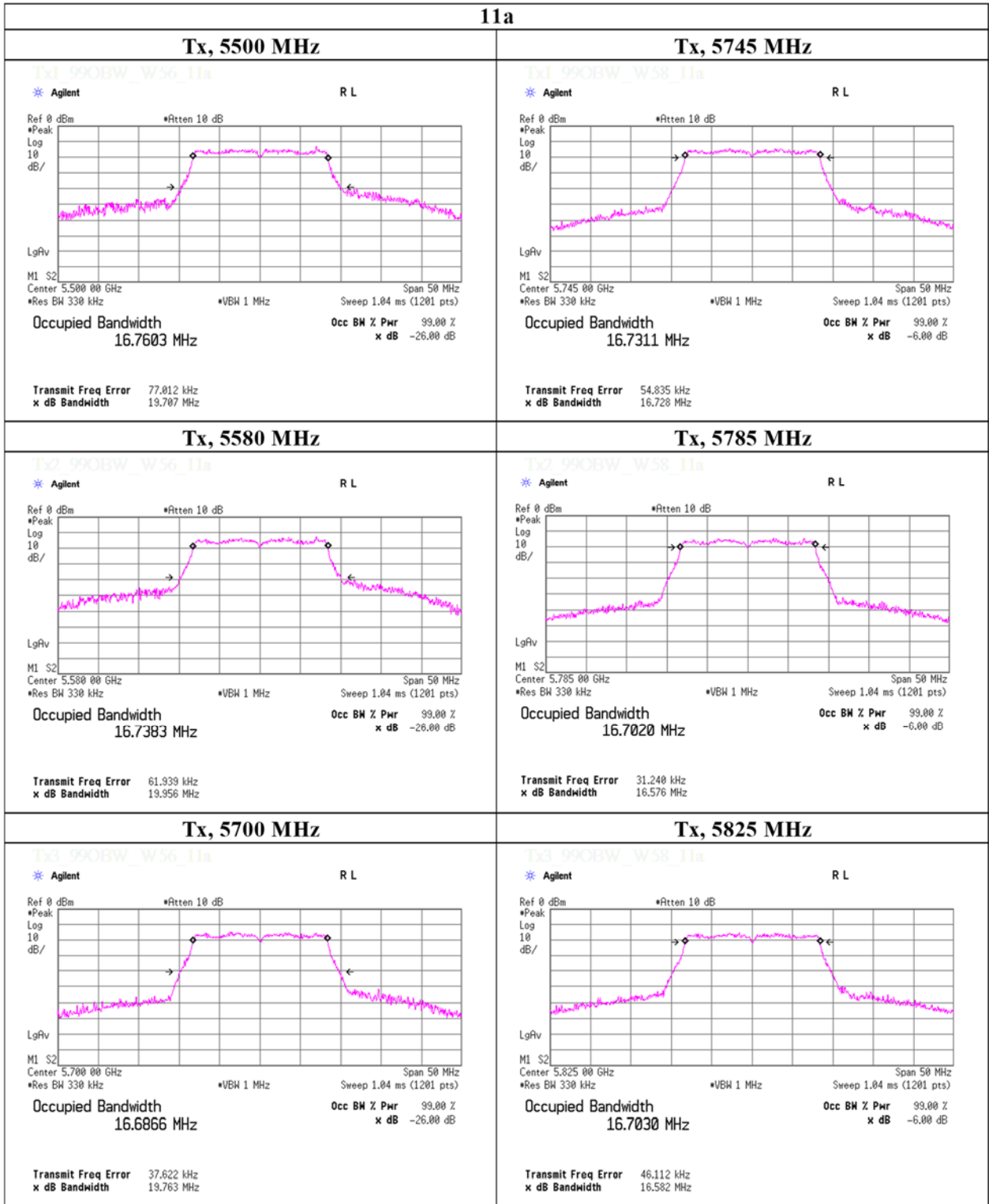
26 dB Emission Bandwidth



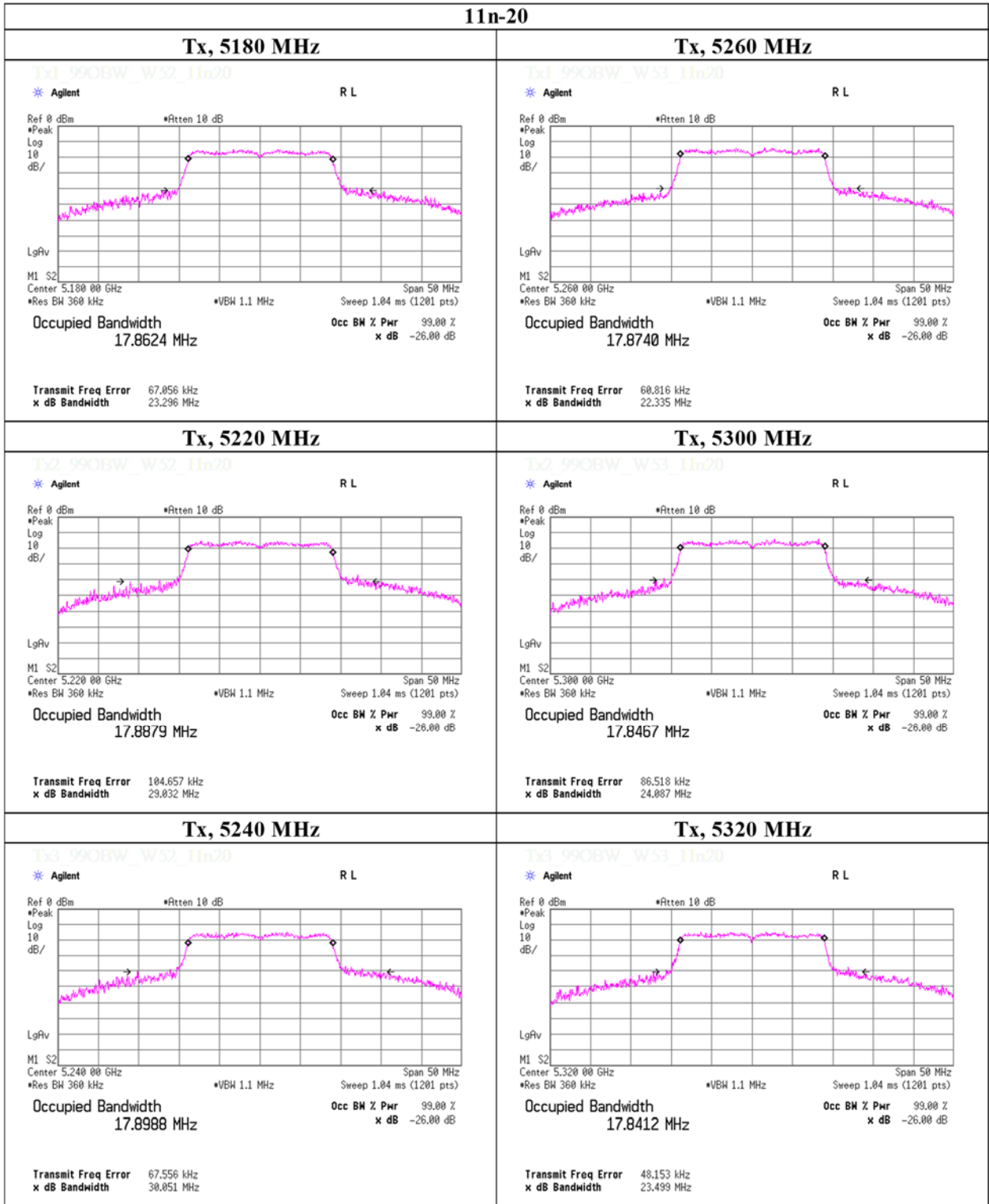
99 % Occupied Bandwidth



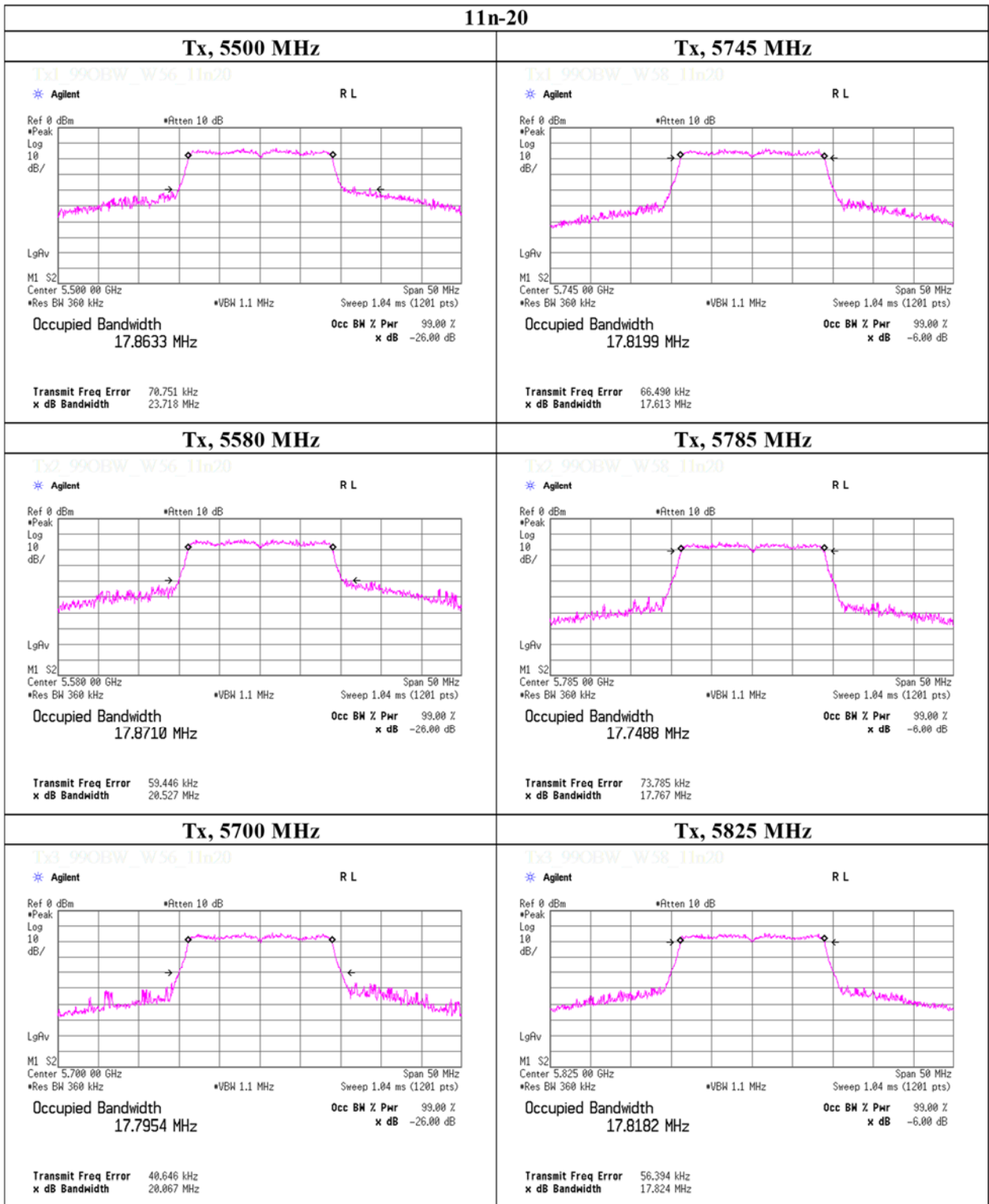
99 % Occupied Bandwidth



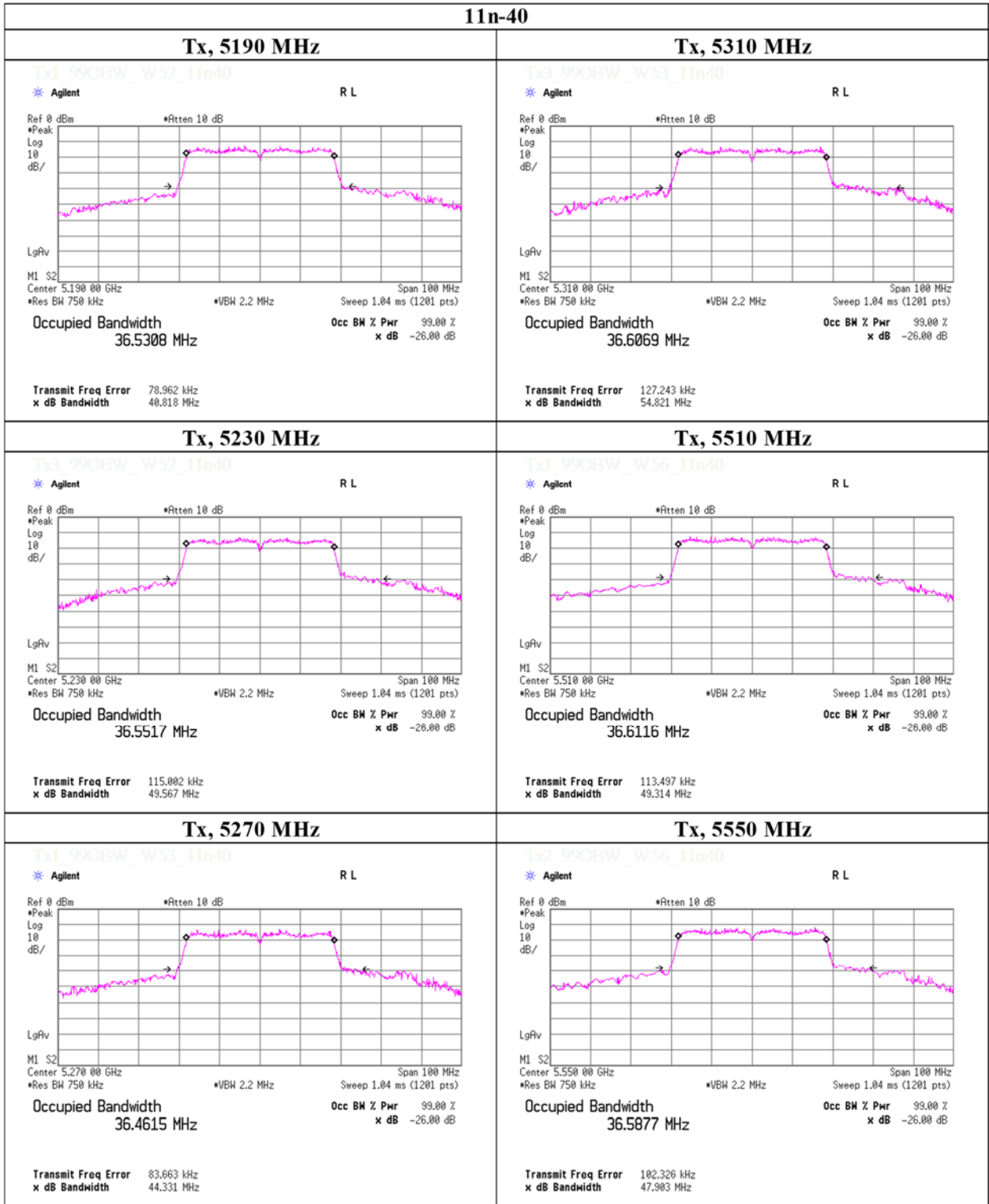
99 % Occupied Bandwidth



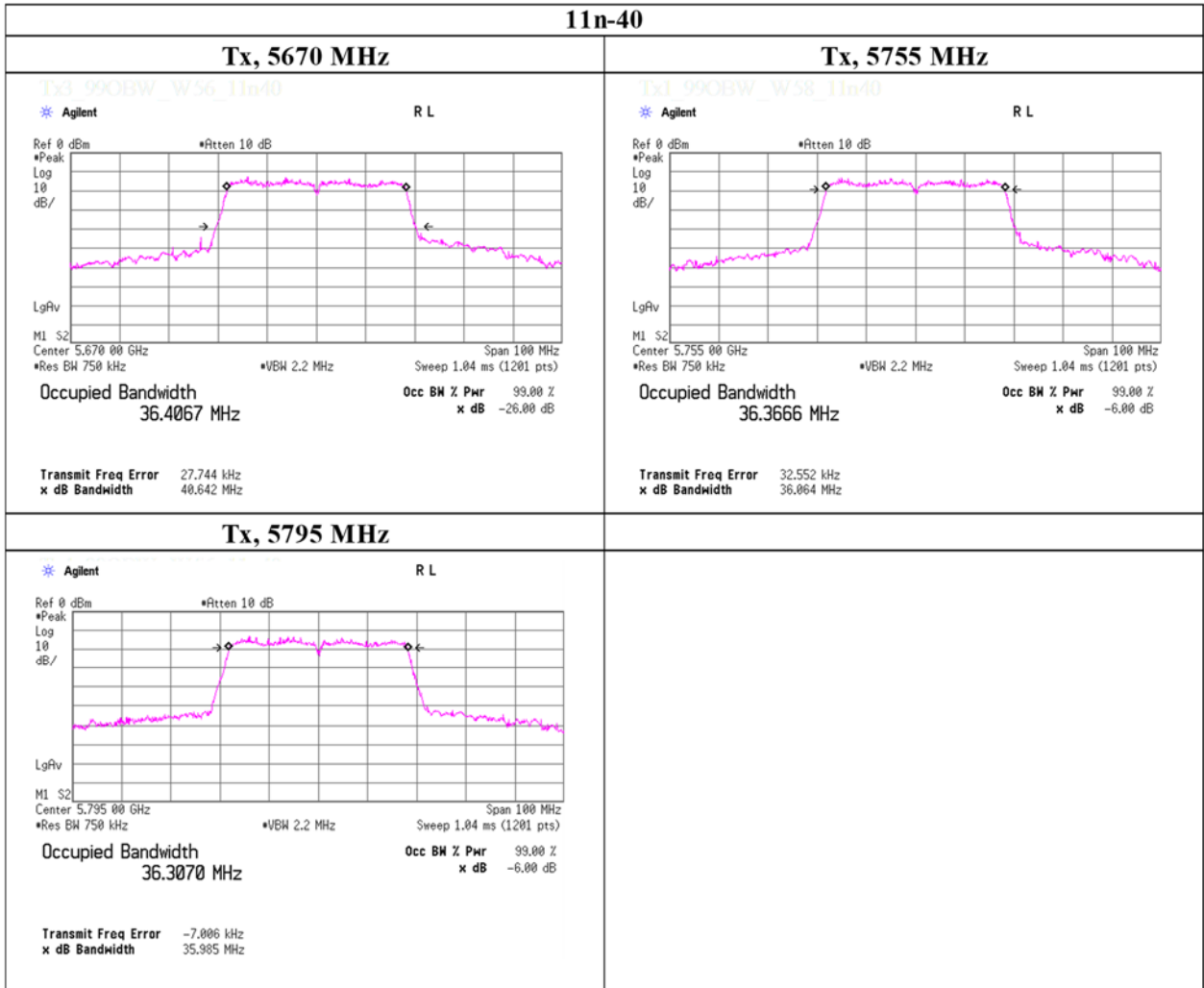
99 % Occupied Bandwidth



99 % Occupied Bandwidth



99 % Occupied Bandwidth



6 dB Bandwidth

Test place Shonan EMC Lab. No.5 Shielded Room
Date November 16, 2022
Temperature / Humidity 24 deg. C / 34 % RH
Engineer Miku Ikudome
Mode Tx

11a

Tested Frequency [MHz]	6 dB Emission Bandwidth [MHz]
5745	16.493
5785	16.501
5825	16.478

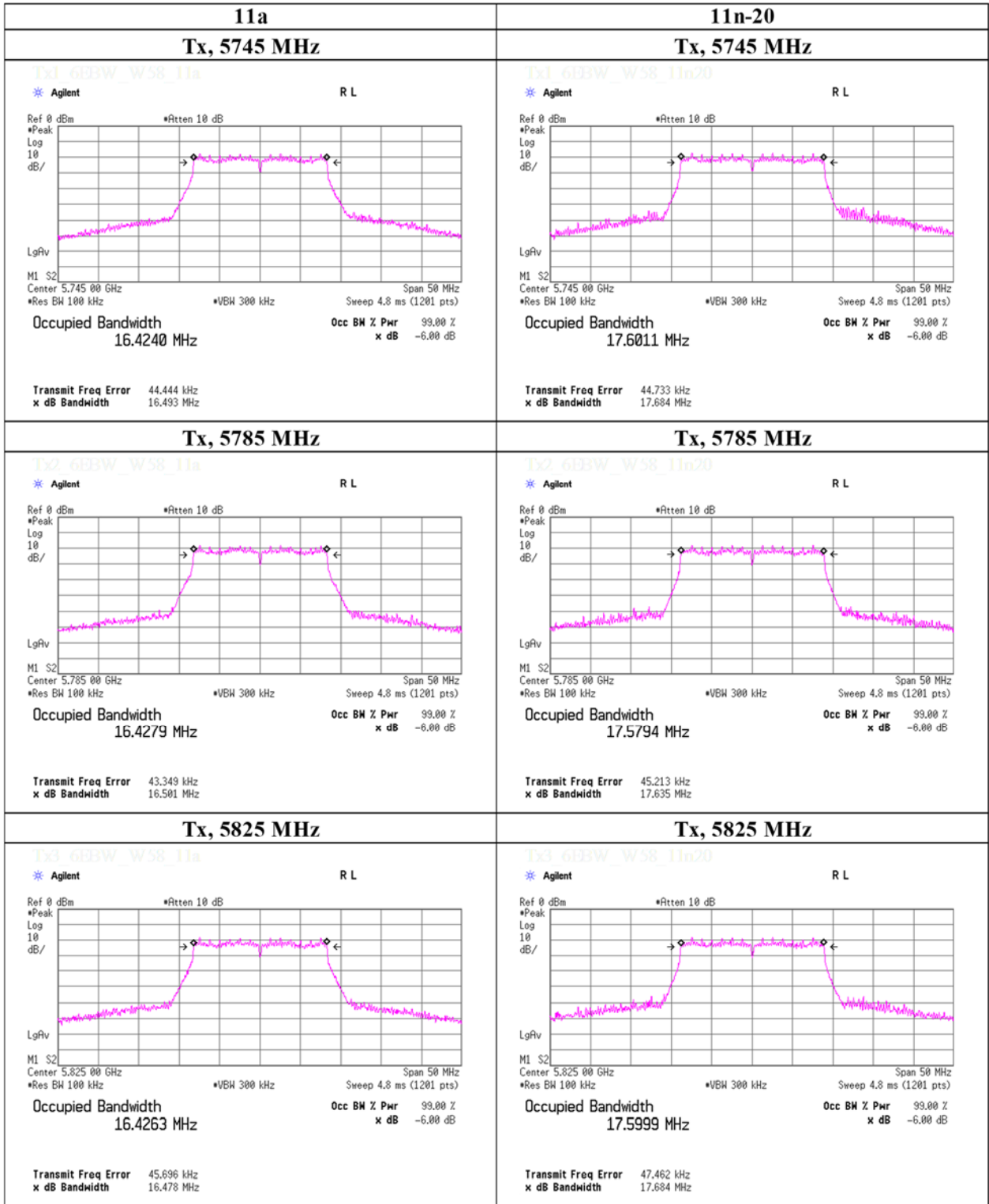
11n-20

Tested Frequency [MHz]	6 dB Emission Bandwidth [MHz]
5745	17.684
5785	17.635
5825	17.684

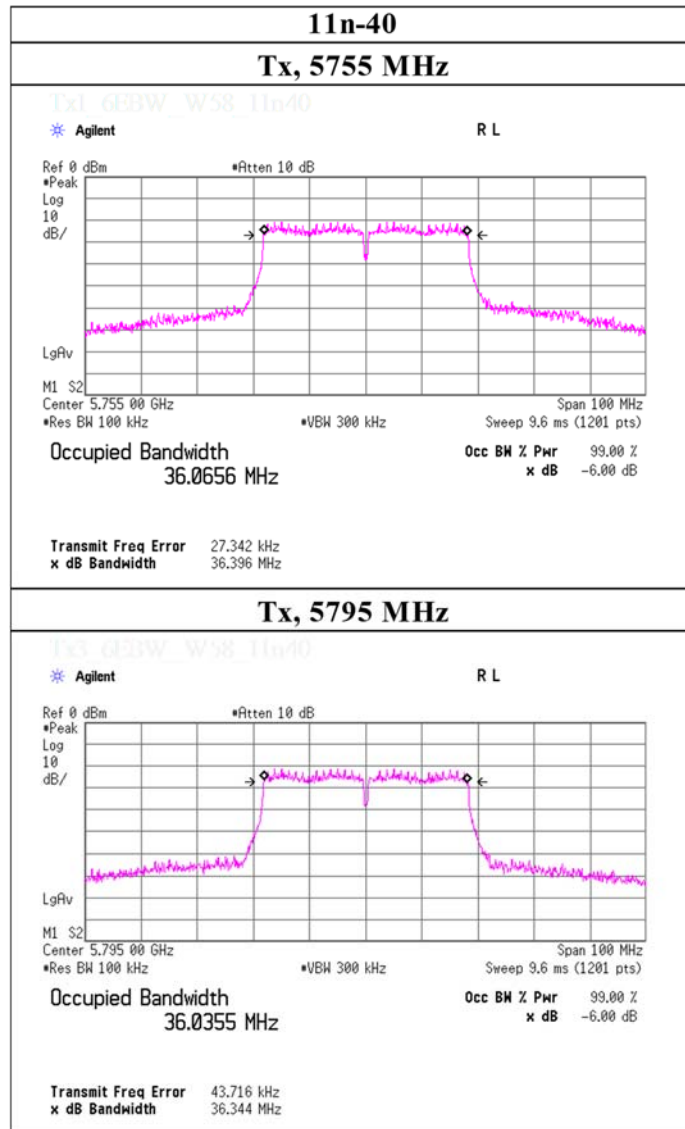
11n-40

Tested Frequency [MHz]	6 dB Emission Bandwidth [MHz]
5755	36.396
5795	36.344

6 dB Bandwidth



6 dB Bandwidth



Maximum Conducted Output Power

Test place	Shonan EMC Lab. No.5 Shielded Room	
Date	November 10, 2022	November 11, 2022
Temperature / Humidity	26 deg. C / 32 % RH	26 deg. C / 30 % RH
Engineer	Kenichi Adachi	Kenichi Adachi
Mode	Tx 11a	

11a

(*)

Applied limit: 15.407, mobile and portable client device

Tested Frequency [MHz]	Power Meter Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Duty Factor [dB]	Antenna Gain [dBi]	26 dB EBW (B for FCC) [MHz]	99 % OBW (B for IC) [MHz]	Conducted Power				e.i.r.p.			
								Result [dBm]	Limit [dBm]	Margin [dB]	Result [dBm]	Limit [dBm]	Margin [dB]		
5180	-7.61	1.65	20.21	0.00	1.68	-	16.771	14.25	26.61	23.97	9.72	15.93	39.17	29.97	14.04
5220	-7.37	1.66	20.21	0.00	1.68	-	16.849	14.50	28.18	23.97	9.47	16.18	41.50	29.97	13.79
5240	-7.18	1.56	20.22	0.00	1.68	-	16.756	14.60	28.84	23.97	9.37	16.28	42.46	29.97	13.69
5260	-7.33	1.61	20.22	0.00	1.68	18.993	16.720	14.50	28.18	23.78	9.28	16.18	41.50	29.97	13.79
5300	-7.28	1.62	20.22	0.00	1.68	19.516	16.810	14.56	28.58	23.90	9.34	16.24	42.07	29.97	13.73
5320	-7.13	1.58	20.22	0.00	1.68	19.900	16.790	14.67	29.31	23.97	9.30	16.35	43.15	29.97	13.62
5500	-6.93	1.66	20.22	0.00	1.68	19.660	16.760	14.95	31.26	23.93	8.98	16.63	46.03	29.97	13.34
5580	-6.47	1.67	20.22	0.00	1.68	19.639	16.738	15.42	34.83	23.93	8.51	17.10	51.29	29.97	12.87
5700	-7.91	1.57	20.22	0.00	1.68	19.136	16.687	13.88	24.43	23.81	9.93	15.56	35.97	29.97	14.41
5745	-7.39	1.56	20.22	0.00	1.68	-	16.731	14.39	27.48	30.00	15.61	16.07	40.46	36.00	19.93
5785	-8.10	1.57	20.23	0.00	1.68	-	16.702	13.70	23.44	30.00	16.30	15.38	34.51	36.00	20.62
5825	-8.27	1.58	20.23	0.00	1.68	-	16.703	13.54	22.59	30.00	16.46	15.22	33.27	36.00	20.78

Sample Calculation:

Conducted Power Result = Reading + Cable Loss + Atten. Loss + Duty Factor

e.i.r.p. Result = Conducted Power Result + Antenna Gain

(*1) Power was measured with using the gate function of power meter.

Conducted Power Limit (5250 MHz-5350 MHz, 5470 MHz-5725 MHz) = 250 mW or (11 + 10logB) dBm, whichever is lower

Conducted Power Limit (5725 MHz-5850 MHz) = 1W

Although the EUT operates on Master mode, more stringent limit for Client device was applied. (W52 for FCC)

5180 MHz

(*)

-	Data rate [Mbps]	P/M (AV) Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Duty factor [dB]	Result [dBm]	Remarks
-	6	-7.65	1.65	20.21	0.00	14.21	
-	9	-7.63	1.65	20.21	0.00	14.23	
-	12	-7.71	1.65	20.21	0.00	14.15	
-	18	-7.64	1.65	20.21	0.00	14.22	
-	24	-7.70	1.65	20.21	0.00	14.16	
-	36	-7.62	1.65	20.21	0.00	14.24	
-	48	-7.63	1.65	20.21	0.00	14.23	
-	54	-7.61	1.65	20.21	0.00	14.25	Worst

Sample Calculation:

Conducted Power Result = Reading + Cable Loss + Atten. Loss + Duty Factor

(*1) Power was measured with using the gate function of power meter.

* All comparison were carried out on same frequency and measurement factors.

Maximum Conducted Output Power

Test place	Shonan EMC Lab. No.5 Shielded Room	
Date	November 10, 2022	November 11, 2022
Temperature / Humidity	26 deg. C / 32 % RH	26 deg. C / 30 % RH
Engineer	Kenichi Adachi	Kenichi Adachi
Mode	Tx 11n-20	

11n-20

(*)

Applied limit: 15.407, mobile and portable client device

Tested Frequency [MHz]	Power Meter Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Duty Factor [dB]	Antenna Gain [dBi]	26 dB EBW (B for FCC) [MHz]	99 % OBW (B for IC) [MHz]	Conducted Power				e.i.r.p.			
								Result [dBm]	Limit [dBm]	Margin [dB]	Result [dBm]	Limit [dBm]	Margin [dB]		
5180	-7.51	1.65	20.21	0.00	1.68	-	17.862	14.35	27.23	23.97	9.62	16.03	40.09	29.97	13.94
5220	-7.30	1.66	20.21	0.00	1.68	-	17.888	14.57	28.64	23.97	9.40	16.25	42.17	29.97	13.72
5240	-7.18	1.56	20.22	0.00	1.68	-	17.899	14.60	28.84	23.97	9.37	16.28	42.46	29.97	13.69
5260	-7.30	1.61	20.22	0.00	1.68	21.830	17.874	14.53	28.38	23.97	9.44	16.21	41.78	29.97	13.76
5300	-7.18	1.62	20.22	0.00	1.68	20.161	17.847	14.66	29.24	23.97	9.31	16.34	43.05	29.97	13.63
5320	-7.10	1.58	20.22	0.00	1.68	22.167	17.841	14.70	29.51	23.97	9.27	16.38	43.45	29.97	13.59
5500	-6.91	1.66	20.22	0.00	1.68	19.987	17.863	14.97	31.41	23.97	9.00	16.65	46.24	29.97	13.32
5580	-6.36	1.67	20.22	0.00	1.68	19.701	17.871	15.53	35.73	23.94	8.41	17.21	52.60	29.97	12.76
5700	-7.86	1.57	20.22	0.00	1.68	19.675	17.795	13.93	24.72	23.93	10.00	15.61	36.39	29.97	14.36
5745	-7.38	1.56	20.22	0.00	1.68	-	17.820	14.40	27.54	30.00	15.60	16.08	40.55	36.00	19.92
5785	-8.10	1.57	20.23	0.00	1.68	-	17.749	13.70	23.44	30.00	16.30	15.38	34.51	36.00	20.62
5825	-8.26	1.58	20.23	0.00	1.68	-	17.818	13.55	22.65	30.00	16.45	15.23	33.34	36.00	20.77

Sample Calculation:

Conducted Power Result = Reading + Cable Loss + Atten. Loss + Duty Factor

e.i.r.p. Result = Conducted Power Result + Antenna Gain

(*1) Power was measured with using the gate function of power meter.

Conducted Power Limit (5250 MHz-5350 MHz, 5470 MHz-5725 MHz) = 250 mW or (11 + 10logB) dBm, whichever is lower

Conducted Power Limit (5725 MHz-5850 MHz) = 1W

Although the EUT operates on Master mode, more stringent limit for Client device was applied. (W52 for FCC)

5180 MHz

(*)

	Mode (MCS)	P/M (AV) Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Duty factor [dB]	Result [dBm]	Remarks
-	0	-7.69	1.65	20.21	0.00	14.17	
	1	-7.61	1.65	20.21	0.00	14.25	
	2	-7.56	1.65	20.21	0.00	14.30	
	3	-7.58	1.65	20.21	0.00	14.28	
	4	-7.62	1.65	20.21	0.00	14.24	
	5	-7.55	1.65	20.21	0.00	14.31	
	6	-7.52	1.65	20.21	0.00	14.34	
	7	-7.51	1.65	20.21	0.00	14.35	Worst

Sample Calculation:

Conducted Power Result = Reading + Cable Loss + Atten. Loss + Duty Factor

(*1) Power was measured with using the gate function of power meter.

* All comparison were carried out on same frequency and measurement factors.

Maximum Conducted Output Power

Test place	Shonan EMC Lab. No.5 Shielded Room			
Date	November 10, 2022	November 11, 2022	January 13, 2023	January 23, 2023
Temperature / Humidity	26 deg. C / 32 % RH	26 deg. C / 30 % RH	23 deg. C / 30 % RH	25 deg. C / 39 % RH
Engineer	Kenichi Adachi	Kenichi Adachi	Yasumasa Owaki	Kouki Yamada
Mode	Tx 11n-40			

11n-40 (*) Applied limit: 15.407, mobile and portable client device

Tested Frequency [MHz]	Power Meter Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Duty Factor [dB]	Antenna Gain [dBi]	26 dB EBW (B for FCC) [MHz]	99 % OBW (B for IC) [MHz]	Conducted Power				e.i.r.p.			
								Result [dBm]	[mW]	Limit [dBm]	Margin [dB]	Result [dBm]	[mW]	Limit [dBm]	Margin [dB]
5190	-8.04	1.65	20.21	0.00	1.68	-	36.531	13.82	24.10	23.97	10.15	15.50	35.48	29.97	14.47
5230	-7.26	1.56	20.22	0.00	1.68	-	36.552	14.52	28.31	23.97	9.45	16.20	41.69	29.97	13.77
5270	-7.28	1.61	20.22	0.00	1.68	44.376	36.462	14.55	28.51	23.97	9.42	16.23	41.98	29.97	13.74
5310	-11.62	1.58	20.22	0.00	1.68	46.473	36.607	10.18	10.42	23.97	13.79	11.86	15.35	29.97	18.11
5510	-6.82	1.66	20.22	0.00	1.68	49.181	36.612	15.06	32.06	23.97	8.91	16.74	47.21	29.97	13.23
5550	-6.38	1.67	20.22	0.00	1.68	43.370	36.588	15.51	35.56	23.97	8.46	17.19	52.36	29.97	12.78
5670	-7.33	1.57	20.22	0.00	1.68	40.036	36.407	14.46	27.93	23.97	9.51	16.14	41.11	29.97	13.83
5755	-7.47	1.56	20.22	0.00	1.68	-	36.367	14.31	26.98	30.00	15.69	15.99	39.72	36.00	20.01
5795	-8.13	1.58	20.23	0.00	1.68	-	36.307	13.68	23.33	30.00	16.32	15.36	34.36	36.00	20.64

Sample Calculation:

Conducted Power Result = Reading + Cable Loss + Atten. Loss + Duty Factor

e.i.r.p. Result = Conducted Power Result + Antenna Gain

(*) Power was measured with using the gate function of power meter.

Conducted Power Limit (5250 MHz-5350 MHz, 5470 MHz-5725 MHz) = 250 mW or (11 + 10logB) dBm, whichever is lower

Conducted Power Limit (5725 MHz-5850 MHz) = 1W

Although the EUT operates on Master mode, more stringent limit for Client device was applied. (W52 for FCC)

5190 MHz

(*)

	Mode (MCS)	P/M (AV) Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Duty factor [dB]	Result [dBm]	Remarks
-	0	-8.05	1.65	20.21	0.00	13.81	
	1	-9.48	1.65	20.21	0.00	12.38	
	2	-9.49	1.65	20.21	0.00	12.37	
	3	-9.48	1.65	20.21	0.00	12.38	
	4	-9.47	1.65	20.21	0.00	12.39	
	5	-9.49	1.65	20.21	0.00	12.37	
	6	-9.49	1.65	20.21	0.00	12.37	
	7	-8.04	1.65	20.21	0.00	13.82	Worst

Sample Calculation:

Conducted Power Result = Reading + Cable Loss + Atten. Loss + Duty Factor

(*) Power was measured with using the gate function of power meter.

* All comparison were carried out on same frequency and measurement factors.

Average Output Power
(Reference data for RF Exposure)

Test place	Shonan EMC Lab. No.5 Shielded Room	
Date	November 10, 2022	November 11, 2022
Temperature / Humidity	26 deg. C / 32 % RH	26 deg. C / 30 % RH
Engineer	Kenichi Adachi	Kenichi Adachi
Mode	Tx 11a	

11a 6 Mbps (*1)

Tested Frequency [MHz]	Power Meter Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result (Timed average)		Duty factor [dB]	Result (Burst power average)	
				[dBm]	[mW]		[dBm]	[mW]
5180	-7.65	1.65	20.21	14.21	26.36	0.00	14.21	26.36
5220	-7.39	1.66	20.21	14.48	28.05	0.00	14.48	28.05
5240	-7.20	1.56	20.22	14.58	28.71	0.00	14.58	28.71
5260	-7.35	1.61	20.22	14.48	28.05	0.00	14.48	28.05
5300	-7.30	1.62	20.22	14.54	28.44	0.00	14.54	28.44
5320	-7.14	1.58	20.22	14.66	29.24	0.00	14.66	29.24
5500	-6.94	1.66	20.22	14.94	31.19	0.00	14.94	31.19
5580	-6.49	1.67	20.22	15.40	34.67	0.00	15.40	34.67
5700	-7.92	1.57	20.22	13.87	24.38	0.00	13.87	24.38
5745	-7.40	1.56	20.22	14.38	27.42	0.00	14.38	27.42
5785	-8.12	1.57	20.23	13.68	23.33	0.00	13.68	23.33
5825	-8.28	1.58	20.23	13.53	22.54	0.00	13.53	22.54

Sample Calculation:

Result (Timed average) = Reading + Cable Loss + Atten. Loss

Result (Burst power average) = Time average + Duty factor

*The equipment and cables were not used for factor 0 dB of the data sheets.

(*1) Power was measured with using the gate function of power meter.

The average output power was measured with the lowest order modulation and lowest data rate configuration in each IEEE 802.11 mode based on KDB 248227 D01.

Average Output Power
(Reference data for RF Exposure)

Test place	Shonan EMC Lab. No.5 Shielded Room	
Date	November 10, 2022	November 11, 2022
Temperature / Humidity	26 deg. C / 32 % RH	26 deg. C / 30 % RH
Engineer	Kenichi Adachi	Kenichi Adachi
Mode	Tx 11n-20	

Tested Frequency [MHz]	Power Meter Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result (Timed average)		Duty factor [dB]	Result (Burst power average)	
				[dBm]	[mW]		[dBm]	[mW]
				11n-20 MCS 0 (*1)				
5180	-7.69	1.65	20.21	14.17	26.12	0.00	14.17	26.12
5220	-7.32	1.66	20.21	14.55	28.51	0.00	14.55	28.51
5240	-7.20	1.56	20.22	14.58	28.71	0.00	14.58	28.71
5260	-7.32	1.61	20.22	14.51	28.25	0.00	14.51	28.25
5300	-7.21	1.62	20.22	14.63	29.04	0.00	14.63	29.04
5320	-7.12	1.58	20.22	14.68	29.38	0.00	14.68	29.38
5500	-6.93	1.66	20.22	14.95	31.26	0.00	14.95	31.26
5580	-6.38	1.67	20.22	15.51	35.56	0.00	15.51	35.56
5700	-7.88	1.57	20.22	13.91	24.60	0.00	13.91	24.60
5745	-7.40	1.56	20.22	14.38	27.42	0.00	14.38	27.42
5785	-8.12	1.57	20.23	13.68	23.33	0.00	13.68	23.33
5825	-8.28	1.58	20.23	13.53	22.54	0.00	13.53	22.54

Sample Calculation:

Result (Timed average) = Reading + Cable Loss + Atten. Loss

Result (Burst power average) = Time average + Duty factor

*The equipment and cables were not used for factor 0 dB of the data sheets.

(*1) Power was measured with using the gate function of power meter.

The average output power was measured with the lowest order modulation and lowest data rate configuration in each IEEE 802.11 mode based on KDB 248227 D01.

Average Output Power
(Reference data for RF Exposure)

Test place	Shonan EMC Lab. No.5 Shielded Room			
Date	November 10, 2022	November 11, 2022	January 13, 2023	January 23, 2023
Temperature / Humidity	26 deg. C / 32 % RH	26 deg. C / 30 % RH	23 deg. C / 30 % RH	25 deg. C / 39 % RH
Engineer	Kenichi Adachi	Kenichi Adachi	Yasumasa Owaki	Kouki Yamada
Mode	Tx 11n-40			

11n-40 MCS 0

(*1)

Tested Frequency [MHz]	Power Meter Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result (Timed average)		Duty factor [dB]	Result (Burst power average)	
				[dBm]	[mW]		[dBm]	[mW]
5190	-8.05	1.65	20.21	13.81	24.04	0.00	13.81	24.04
5230	-7.30	1.56	20.22	14.48	28.05	0.00	14.48	28.05
5270	-7.31	1.61	20.22	14.52	28.31	0.00	14.52	28.31
5310	-11.72	1.58	20.22	10.08	10.19	0.00	10.08	10.19
5510	-6.84	1.66	20.22	15.04	31.92	0.00	15.04	31.92
5550	-6.40	1.67	20.22	15.49	35.40	0.00	15.49	35.40
5670	-7.36	1.57	20.22	14.43	27.73	0.00	14.43	27.73
5755	-7.49	1.56	20.22	14.29	26.85	0.00	14.29	26.85
5795	-8.15	1.58	20.23	13.66	23.23	0.00	13.66	23.23

Sample Calculation:

Result (Timed average) = Reading + Cable Loss + Atten. Loss

Result (Burst power average) = Time average + Duty factor

*The equipment and cables were not used for factor 0 dB of the data sheets.

(*1) Power was measured with using the gate function of power meter.

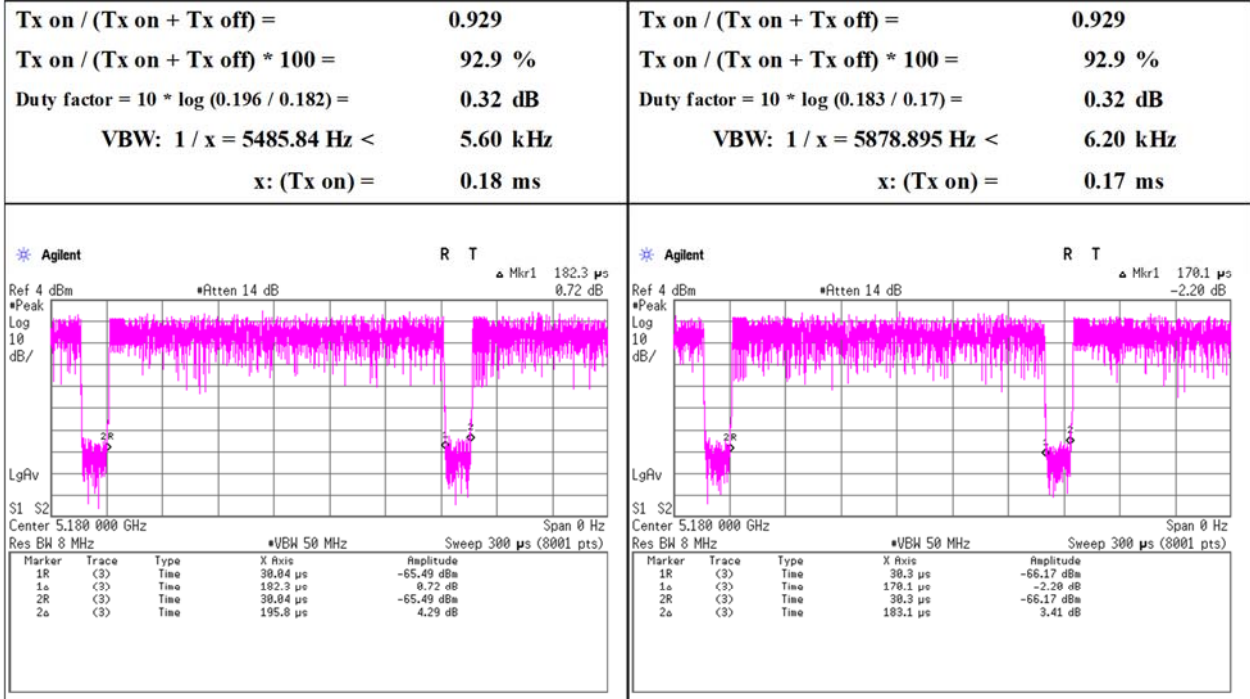
The average output power was measured with the lowest order modulation and lowest data rate configuration in each IEEE 802.11 mode based on KDB 248227 D01.

Burst rate confirmation

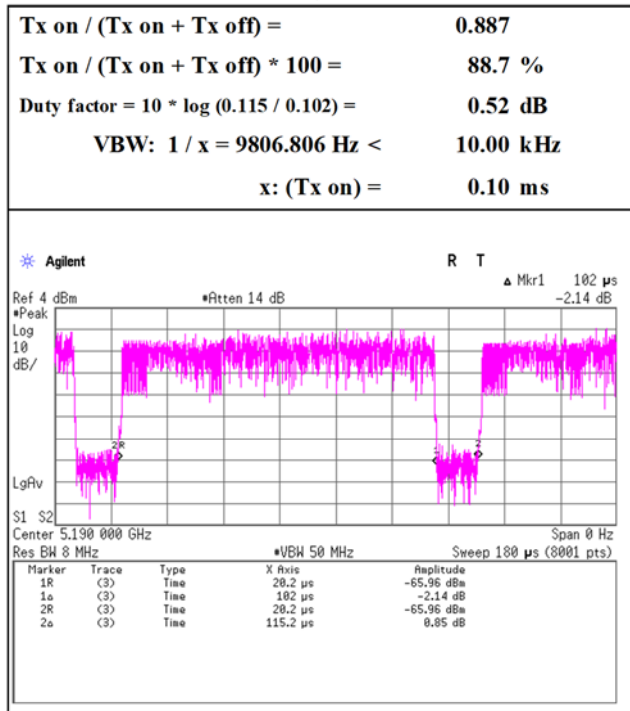
Test place	Shonan EMC Lab. No.5 Shielded Room
Date	November 11, 2022
Temperature / Humidity	26 deg. C / 30 % RH
Engineer	Kenichi Adachi
Mode	Tx

11a, 54 Mbps

11n-20, MCS 7



11n-40, MCS 7



Maximum Power Spectral Density

Test place	Shonan EMC Lab. No.5 Shielded Room	
Date	November 14, 2022	November 16, 2022
Temperature / Humidity	25 deg. C / 36 % RH	24 deg. C / 34 % RH
Engineer	Miku Ikudome	Miku Ikudome
Mode	Tx 11a	

11a

(*1)

Applied limit: 15.407, mobile and portable client device

Tested Frequency [MHz]	PSD Frequency [MHz]	PSD Reading [dBm /MHz]	Cable Loss [dB]	Atten. Loss [dB]	Duty Factor [dB]	Antenna Gain [dBi]	RBW Correction Factor [dB]	PSD (Conducted)			PSD (e.i.r.p.)		
								Result [dBm /MHz]	Limit [dBm /MHz]	Margin [dB]	Result [dBm /MHz]	Limit [dBm /MHz]	Margin [dB]
5180	5182.383	-18.03	1.65	20.21	0.00	1.68	0.00	3.83	11.00	7.17	5.51	17.00	11.49
5220	5217.183	-17.73	1.66	20.21	0.00	1.68	0.00	4.14	11.00	6.86	5.82	17.00	11.18
5240	5237.335	-17.43	1.56	20.22	0.00	1.68	0.00	4.35	11.00	6.65	6.03	17.00	10.97
5260	5262.383	-17.82	1.61	20.22	0.00	1.68	0.00	4.01	11.00	6.99	5.69	17.00	11.31
5300	5302.708	-17.54	1.62	20.22	0.00	1.68	0.00	4.30	11.00	6.70	5.98	17.00	11.02
5320	5322.535	-17.68	1.58	20.22	0.00	1.68	0.00	4.12	11.00	6.88	5.80	17.00	11.20
5500	5502.275	-16.95	1.66	20.22	0.00	1.68	0.00	4.93	11.00	6.07	6.61	17.00	10.39
5580	5577.443	-16.69	1.67	20.22	0.00	1.68	0.00	5.20	11.00	5.80	6.88	17.00	10.12
5700	5702.535	-18.31	1.57	20.22	0.00	1.68	0.00	3.48	11.00	7.52	5.16	17.00	11.84
5745	5747.643	-17.54	1.56	20.22	0.00	1.68	0.00	4.24	30.00	25.76	5.92	36.00	30.08
5785	5782.248	-17.87	1.57	20.23	0.00	1.68	0.00	3.93	30.00	26.07	5.61	36.00	30.39
5825	5822.790	-18.48	1.58	20.23	0.00	1.68	0.00	3.33	30.00	26.67	5.01	36.00	30.99

Sample Calculation:

PSD: Power Spectral Density

(*1) Power density was measured with using the gate function of spectrum analyzer.

The PSD within 5725 MHz to 5825 MHz are based on any 500 kHz band.

RBW Correction Factor = $10 * \log(\text{Specified bandwidth} / \text{Measured bandwidth})$

PSD Result (Conducted) = Reading + Cable Loss + Atten. Loss + Duty Factor + RBW Correction Factor

PSD Result (e.i.r.p.) = Conducted PSD Result + Antenna Gain

Although the EUT operates on Master mode, more stringent limit for Client device was applied. (W52 for FCC)

Maximum Power Spectral Density

Test place	Shonan EMC Lab. No.5 Shielded Room	
Date	November 14, 2022	November 14, 2022
Temperature / Humidity	25 deg. C / 36 % RH	25 deg. C / 36 % RH
Engineer	Miku Ikudome	Miku Ikudome
Mode	Tx 11n-20	

11n-20

(*1)

Applied limit: 15.407, mobile and portable client device

Tested Frequency [MHz]	PSD Frequency [MHz]	PSD Reading [dBm /MHz]	Cable Loss [dB]	Atten. Loss [dB]	Duty Factor [dB]	Antenna Gain [dBi]	RBW Correction Factor [dB]	PSD (Conducted)			PSD (e.i.r.p.)		
								Result [dBm /MHz]	Limit [dBm /MHz]	Margin [dB]	Result [dBm /MHz]	Limit [dBm /MHz]	Margin [dB]
5180	5182.600	-18.06	1.65	20.21	0.00	1.68	0.00	3.80	11.00	7.20	5.48	17.00	11.52
5220	5222.882	-17.92	1.66	20.21	0.00	1.68	0.00	3.95	11.00	7.05	5.63	17.00	11.37
5240	5232.438	-17.65	1.56	20.22	0.00	1.68	0.00	4.13	11.00	6.87	5.81	17.00	11.19
5260	5262.860	-17.54	1.61	20.22	0.00	1.68	0.00	4.29	11.00	6.71	5.97	17.00	11.03
5300	5302.925	-17.60	1.62	20.22	0.00	1.68	0.00	4.24	11.00	6.76	5.92	17.00	11.08
5320	5318.202	-17.67	1.58	20.22	0.00	1.68	0.00	4.13	11.00	6.87	5.81	17.00	11.19
5500	5501.907	-17.44	1.66	20.22	0.00	1.68	0.00	4.44	11.00	6.56	6.12	17.00	10.88
5580	5582.557	-16.85	1.67	20.22	0.00	1.68	0.00	5.04	11.00	5.96	6.72	17.00	10.28
5700	5697.942	-18.29	1.57	20.22	0.00	1.68	0.00	3.50	11.00	7.50	5.18	17.00	11.82
5745	5742.660	-18.06	1.56	20.22	0.00	1.68	0.00	3.72	30.00	26.28	5.40	36.00	30.60
5785	5782.400	-18.59	1.57	20.23	0.00	1.68	0.00	3.22	30.00	26.79	4.90	36.00	31.11
5825	5823.787	-18.89	1.58	20.23	0.00	1.68	0.00	2.92	30.00	27.08	4.60	36.00	31.40

Sample Calculation:

PSD: Power Spectral Density

(*1) Power density was measured with using the gate function of spectrum analyzer.

The PSD within 5725 MHz to 5825 MHz are based on any 500 kHz band.

RBW Correction Factor = $10 * \log(\text{Specified bandwidth} / \text{Measured bandwidth})$

PSD Result (Conducted) = Reading + Cable Loss + Atten. Loss + Duty Factor + RBW Correction Factor

PSD Result (e.i.r.p.) = Conducted PSD Result + Antenna Gain

Although the EUT operates on Master mode, more stringent limit for Client device was applied. (W52 for FCC)

Maximum Power Spectral Density

Test place	Shonan EMC Lab. No.5 Shielded Room			
Date	November 14, 2022	November 14, 2022	January 13, 2023	January 23, 2023
Temperature / Humidity	25 deg. C / 36 % RH	25 deg. C / 36 % RH	23 deg. C / 30 % RH	25 deg. C / 39 % RH
Engineer	Miku Ikudome	Miku Ikudome	Yasumasa Owaki	Kouki Yamada
Mode	Tx 11n-40			

11n-40

(*)

Applied limit: 15.407, mobile and portable client device

Tested Frequency [MHz]	PSD Frequency [MHz]	PSD Reading [dBm /MHz]	Cable Loss [dB]	Atten. Loss [dB]	Duty Factor [dB]	Antenna Gain [dBi]	RBW Correction Factor [dB]	PSD (Conducted)			PSD (e.i.r.p.)		
								Result [dBm /MHz]	Limit [dBm /MHz]	Margin [dB]	Result [dBm /MHz]	Limit [dBm /MHz]	Margin [dB]
5190	5205.860	-22.62	1.65	20.21	0.00	1.68	0.00	-0.76	11.00	11.76	0.92	17.00	16.08
5230	5224.670	-21.26	1.56	20.22	0.00	1.68	0.00	0.52	11.00	10.48	2.20	17.00	14.80
5270	5264.760	-21.26	1.61	20.22	0.00	1.68	0.00	0.57	11.00	10.43	2.25	17.00	14.75
5310	5313.990	-26.05	1.58	20.22	0.00	1.68	0.00	-4.25	11.00	15.25	-2.57	17.00	19.57
5510	5504.800	-20.03	1.66	20.22	0.00	1.68	0.00	1.85	11.00	9.15	3.53	17.00	13.47
5550	5555.500	-20.35	1.67	20.22	0.00	1.68	0.00	1.55	11.00	9.46	3.23	17.00	13.78
5670	5654.700	-21.04	1.57	20.22	0.00	1.68	0.00	0.75	11.00	10.25	2.43	17.00	14.57
5755	5759.770	-21.25	1.56	20.22	0.00	1.68	0.00	0.53	30.00	29.47	2.21	36.00	33.79
5795	5780.270	-21.34	1.58	20.23	0.00	1.68	0.00	0.47	30.00	29.53	2.15	36.00	33.85

Sample Calculation:

PSD: Power Spectral Density

(*) Power density was measured with using the gate function of spectrum analyzer.

The PSD within 5725 MHz to 5825 MHz are based on any 500 kHz band.

RBW Correction Factor = $10 * \log(\text{Specified bandwidth} / \text{Measured bandwidth})$

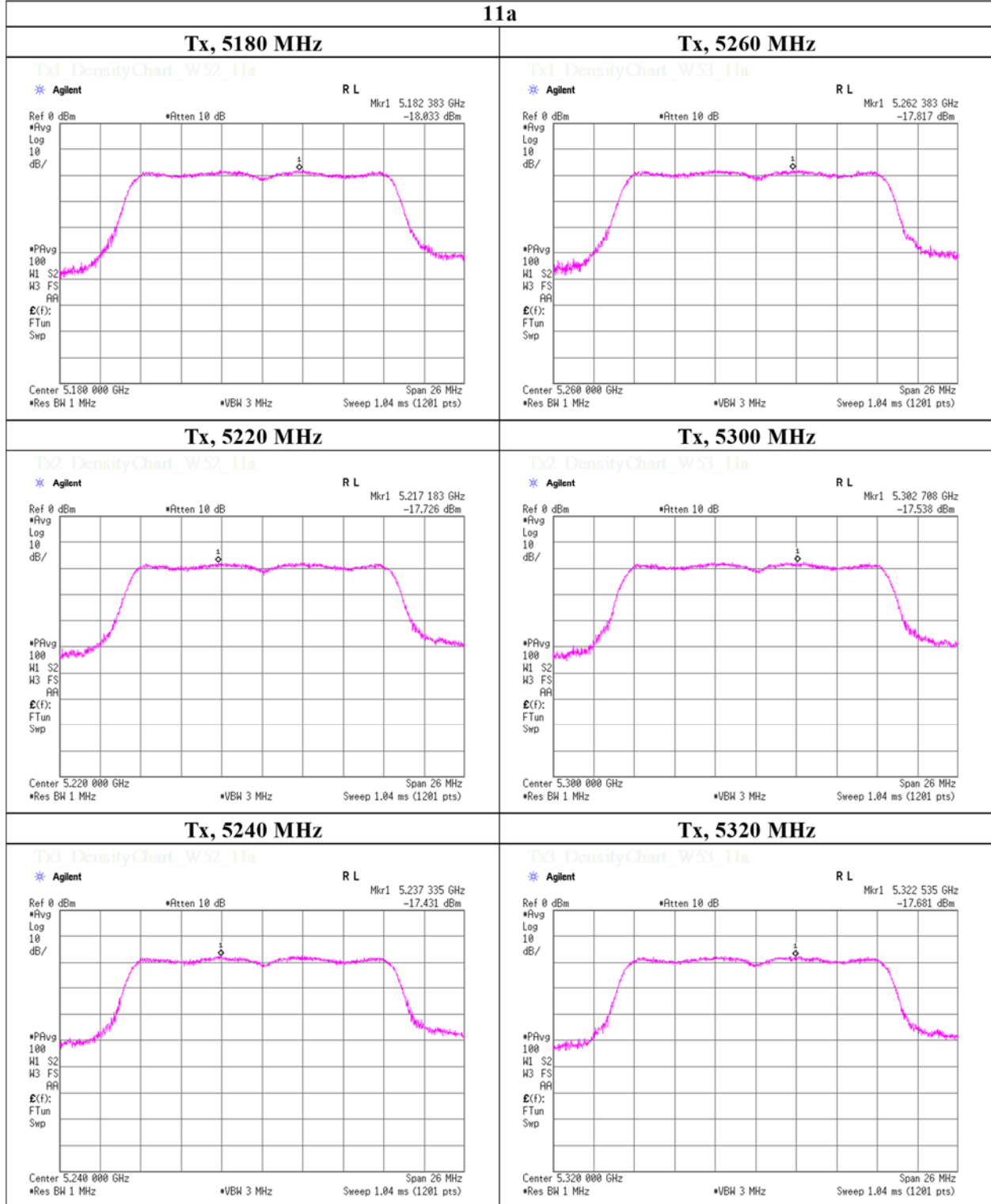
PSD Result (Conducted) = Reading + Cable Loss + Atten. Loss + Duty Factor + RBW Correction Factor

PSD Result (e.i.r.p.) = Conducted PSD Result + Antenna Gain

Although the EUT operates on Master mode, more stringent limit for Client device was applied. (W52 for FCC)

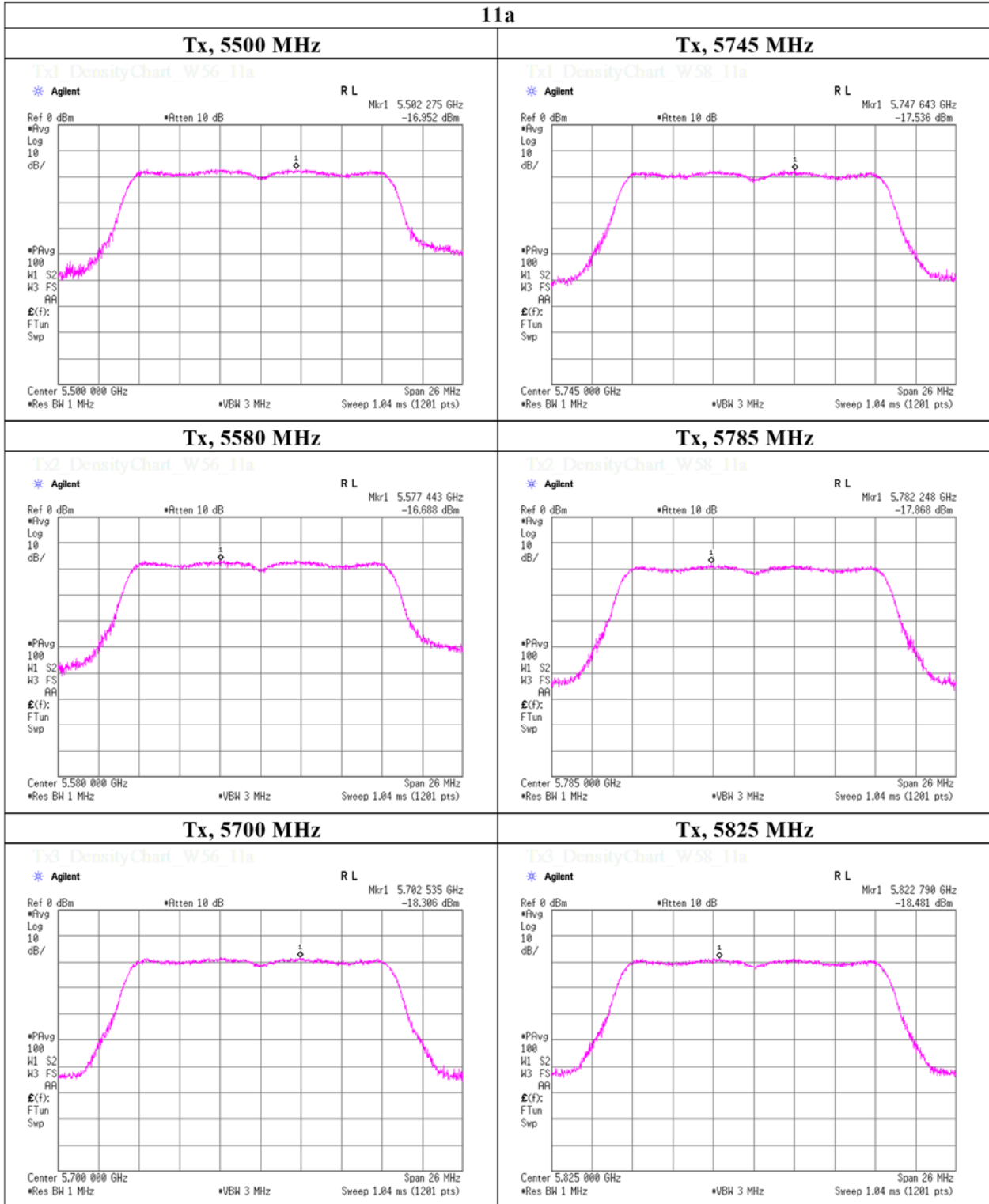
Maximum Power Spectral Density

Test place	Shonan EMC Lab. No.5 Shielded Room	
Date	November 14, 2022	November 14, 2022
Temperature / Humidity	25 deg. C / 36 % RH	25 deg. C / 36 % RH
Engineer	Miku Ikudome	Miku Ikudome
Mode	Tx 11a	



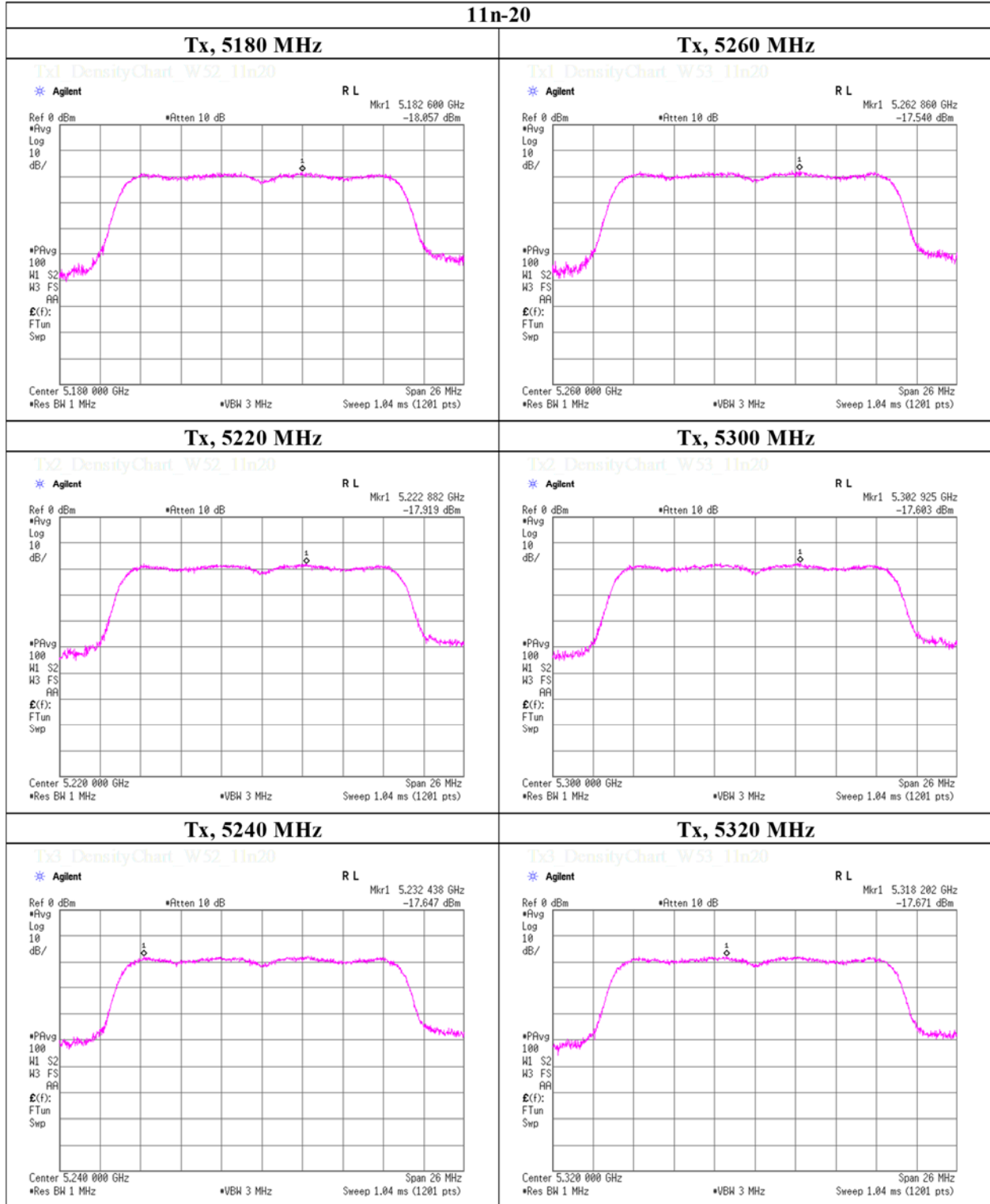
Maximum Power Spectral Density

Test place	Shonan EMC Lab. No.5 Shielded Room	
Date	November 14, 2022	November 14, 2022
Temperature / Humidity	25 deg. C / 36 % RH	25 deg. C / 36 % RH
Engineer	Miku Ikudome	Miku Ikudome
Mode	Tx 11a	



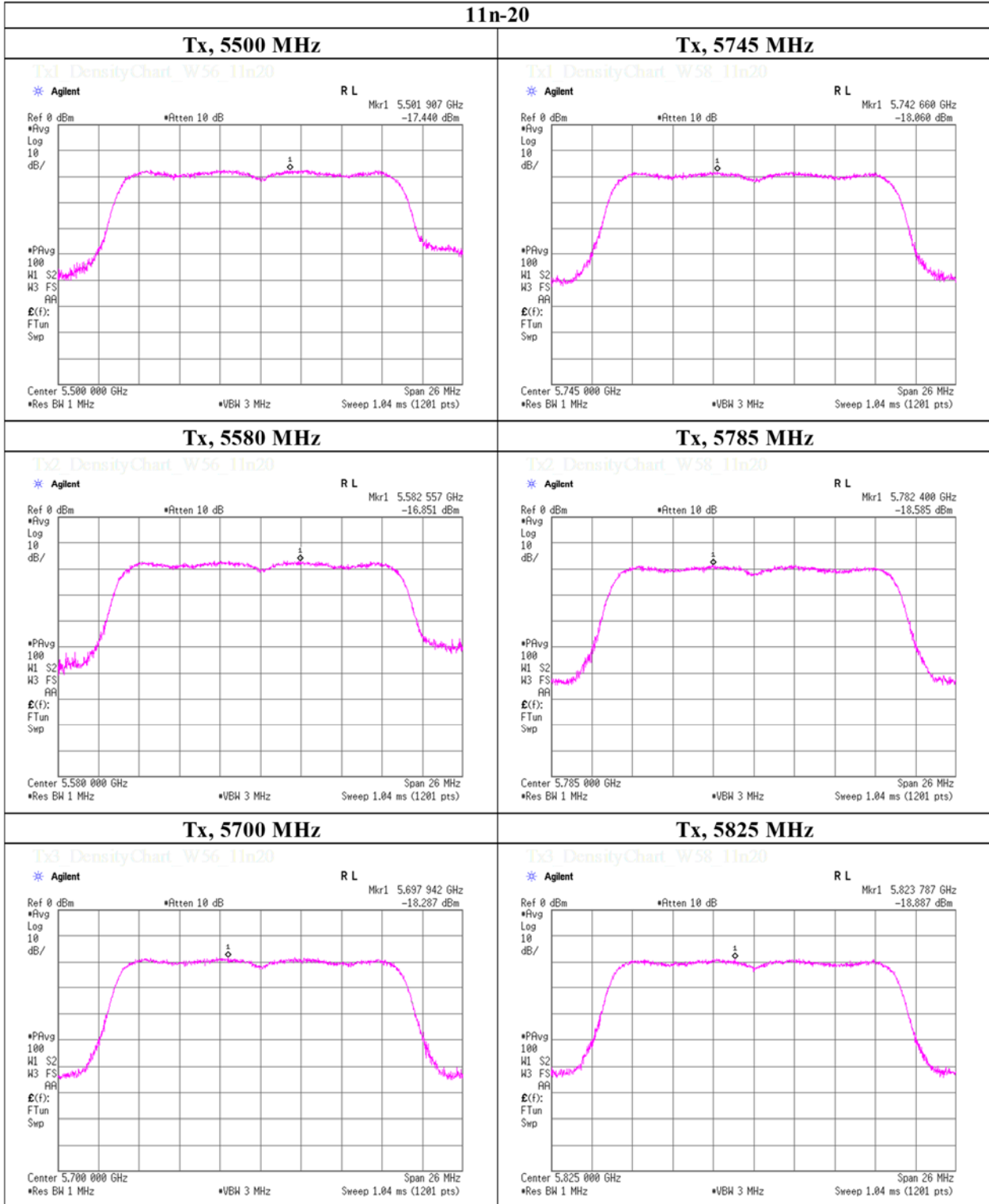
Maximum Power Spectral Density

Test place	Shonan EMC Lab. No.5 Shielded Room	
Date	November 14, 2022	November 14, 2022
Temperature / Humidity	25 deg. C / 36 % RH	25 deg. C / 36 % RH
Engineer	Miku Ikudome	Miku Ikudome
Mode	Tx 11n-20	



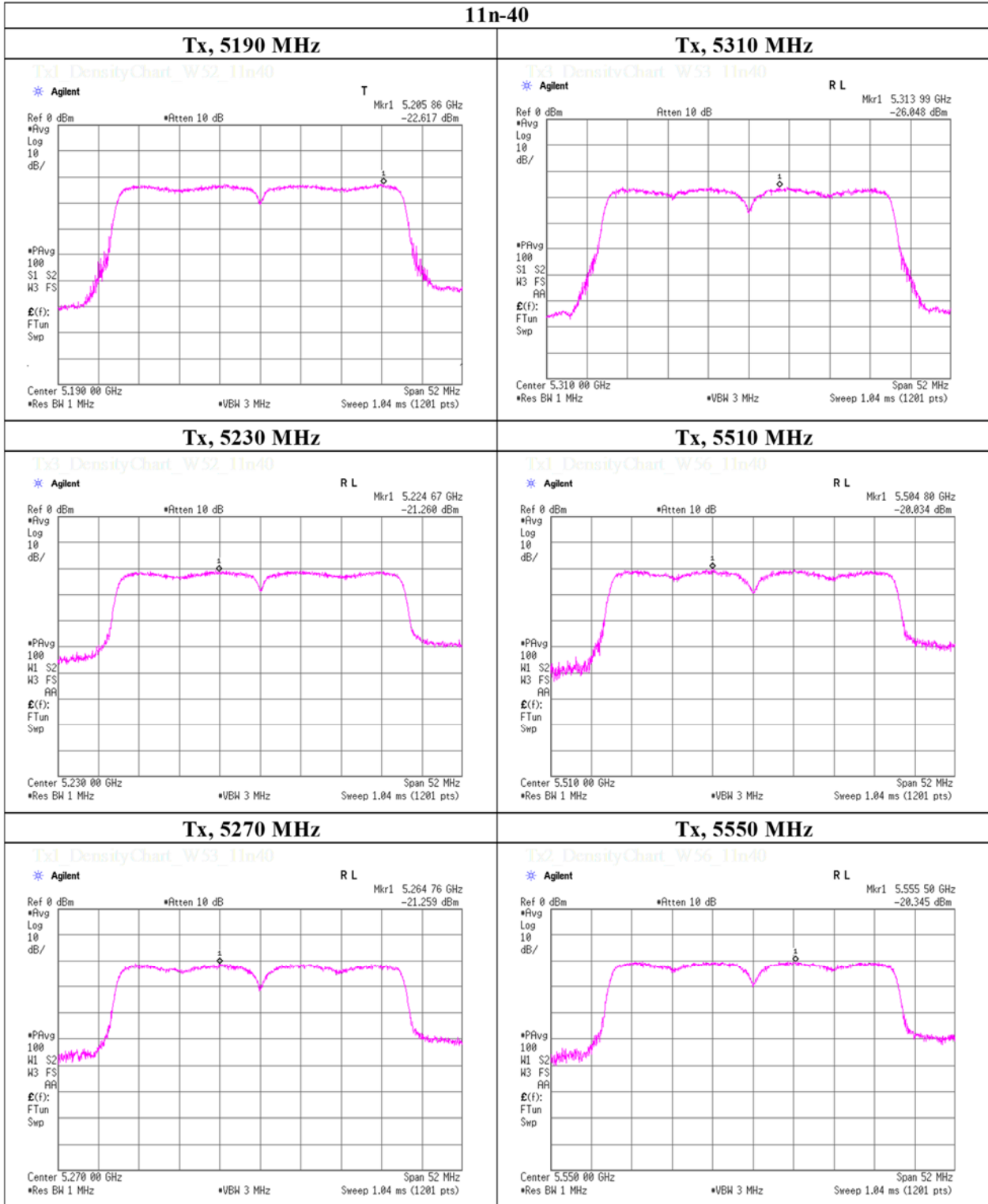
Maximum Power Spectral Density

Test place	Shonan EMC Lab. No.5 Shielded Room	
Date	November 14, 2022	November 14, 2022
Temperature / Humidity	25 deg. C / 36 % RH	25 deg. C / 36 % RH
Engineer	Miku Ikudome	Miku Ikudome
Mode	Tx 11n-20	



Maximum Power Spectral Density

Test place	Shonan EMC Lab. No.5 Shielded Room			
Date	November 14, 2022	November 14, 2022	January 13, 2023	January 23, 2023
Temperature / Humidity	25 deg. C / 36 % RH	25 deg. C / 36 % RH	23 deg. C / 30 % RH	25 deg. C / 39 % RH
Engineer	Miku Ikudome	Miku Ikudome	Yasumasa Owaki	Kouki Yamada
Mode	Tx 11n-40			



Maximum Power Spectral Density

Test place	Shonan EMC Lab. No.5 Shielded Room			
Date	November 14, 2022	November 14, 2022	January 13, 2023	January 23, 2023
Temperature / Humidity	25 deg. C / 36 % RH	25 deg. C / 36 % RH	23 deg. C / 30 % RH	25 deg. C / 39 % RH
Engineer	Miku Ikudome	Miku Ikudome	Yasumasa Owaki	Kouki Yamada
Mode	Tx 11n-40			

