



RADIO TEST REPORT

Test Report No. : 13063553S-C-R2

Applicant : PIONEER CORPORATION
Type of Equipment : RDS AV RECEIVER
Model No. : DMH-W4660NEX
FCC ID : AJDK111
Test regulation : FCC Part 15 Subpart E: 2019
*Wireless LAN U-NII part
Test items : Antenna Terminal Conducted Tests
Test result : Complied (Refer to SECTION 3.2)

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7. The all test items in this test report are conducted by UL Japan, Inc. Shonan EMC Lab.
8. The opinions and the interpretations to the result of the description in this report are outside scopes where UL Japan has been accredited.
9. The information provided from the customer for this report is identified in SECTION 1.
10. This report is a revised version of 13063553S-C-R1. 13063553S-C-R1 is replaced with this report.

Date of test: September 27 to October 29, 2019

Representative test engineer:

T. Yamada

Toshinori Yamada
Engineer
Consumer Technology Division

Approved by:

K. Takeyama

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Engineer
Consumer Technology Division



CERTIFICATE 1266.03

- ☐ The testing in which "Non-accreditation" is displayed is outside the accreditation scopes in UL Japan.
- ☒ There is no testing item of "Non-accreditation".

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REVISION HISTORY

Original Test Report No.: 13063553S-C

Revision	Test report No.	Date	Page revised	Contents
- (Original)	13063553S-C	November 28, 2019	-	-
1	13063553S-C-R1	January 7, 2020	P.6	Modification of the clock frequency for Bluetooth Wi-Fi module from 32.768 MHz to 32.768 kHz
			P.6	Modification of the clock frequency for CHIPS from 32.768 MHz to 32.768 kHz
			P.6	GNSS Frequency of Operation from: See table below. to: GPS: 1575.42 MHz GLONASS: 1598.025 MHz -1605.375 MHz Galileo: 1575.42 MHz
			P.7	Modification of the reference test report number from: No. 13063554M-C to: No. 13063554M-C-R1
2	13063553S-C-R2	January 27, 2020	P.1	Addition of: *Wireless LAN U-NII part Addition of: Test items: Antenna Terminal Conducted Tests
			P.6	Modification of product description from: is a RDS AV RECEIVER to: is an RDS AV RECEIVER
			P.6	Removed from Clock frequency (ies) in the system: “Bluetooth Wi-Fi module: 32.768 kHz”
			P.7	Modification of the reference test report number from: No.13063554M-C-R1 to: No.13063554M-C-R2
			P.24	Modification of mode from: 11ac-20 MICS 0 to: 11n-20 MICS 0

Reference: Abbreviations (Including words undescribed in this report)

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

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SECTION 1: Customer information

Company Name	:	PIONEER CORPORATION
Address	:	25-1, Yamada, Kawagoe-shi, Saitama, 350-8555, JAPAN
Telephone Number	:	+81-49-228-7681
Facsimile Number	:	+81-49-228-6172
Contact Person	:	Shigeru Yoshida

The information provided from the customer is as follows;

- Applicant, Type of Equipment, Model No., 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 (E.U.T.)
- SECTION 4: Operation of E.U.T. 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 (E.U.T.)

2.1 Identification of E.U.T.

Type of Equipment	:	RDS AV RECEIVER
Model No.	:	DMH-W4660NEX
Serial No.	:	Refer to SECTION 4.2
Rating	:	DC 14.4 V (DC 10.8 V to 15.1 V)
Receipt Date of Sample (Information from test lab.)	:	September 11, 2019
Country of Mass-production	:	Thailand
Condition of EUT	:	Production prototype (Not for Sale: This sample is equivalent to mass-produced items.)
Modification of EUT	:	No Modification by the test lab.

2.2 Product Description

Model: DMH-W4660NEX (referred to as the EUT in this report) is an RDS AV RECEIVER.

General Specification

The clock frequencies used in the EUT:

Clock frequency(ies) in the system : DC-DC CONVERTER: 1008 kHz/ 700.5 kHz, 365.8 kHz/ 413.9 kHz
FM/AM TUNER: 55.467 MHz (VCO: 5.9904 GHz/ 6.2208 GHz)
MAIN PROCESSER: 24 MHz
SYSTEM MICRO COMPUTER: 12.5 MHz
LCD BACK LIGHT: 515.7 kHz/ 476.6 kHz
LINE AMPLIFIER: 515.7 kHz/ 476.6 kHz
CHIPS: 26 MHz, 32.768 kHz, 10 MHz
HDMI RECEIVER: 27 MHz
VIDEO DECODER: 32 MHz
WWR UNIT: 55.467 MHz

Radio Specification

Radio Type	:	Transceiver
Frequency of Operation	:	2.4 GHz: 2402 MHz - 2480 MHz (Bluetooth BDR/EDR, Bluetooth Low Energy) 2412 MHz - 2462 MHz (IEEE 802.11b/g/n) 5 GHz 5745 MHz (IEEE 802.11a/n-20) 5755 MHz (IEEE 802.11n-40/ac-40) 5775 MHz (IEEE 802.11ac-80)
Modulation	:	DSSS (IEEE 802.11b), OFDM (IEEE 802.11g/n/a/ac) FHSS (Bluetooth BDR/EDR) GFSK (Bluetooth Low Energy)
Power Supply (inner)	:	DC 3.3 V/1.8 V
Antenna type	:	Monopole Antenna
Antenna Gain	:	2.4 GHz: -9.4 dBi (Bluetooth BDR/EDR, Bluetooth Low Energy) -11.9 dBi (IEEE 802.11b/g/n) 5 GHz: -11.1 dBi
Operating Temperature	:	-10 deg. C to +60 deg. C

GNSS

Radio Type	:	Receiver
Frequency of Operation	:	GPS: 1575.42 MHz GLONASS: 1598.025 MHz -1605.375 MHz Galileo: 1575.42 MHz
Antenna type	:	External Antenna
Antenna Gain	:	2.0 dBi (Elevation Angle:90 deg.) -6.0 dBi (Elevation Angle:10 deg.)

SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification : FCC Part 15 Subpart E
FCC Part 15 final revised on July 19, 2019 and effective August 19, 2019 except 15.258

Title : FCC 47 CFR Part 15 Radio Frequency Device Subpart E
Unlicensed National Information Infrastructure Devices
Section 15.407 General technical requirements

*The customer has declared that the EUT has complies with FCC Part 15 Subpart B as SDoC.

3.2 Procedures and results

Item *3)	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	N/A	N/A	- *1)
26 dB Emission Bandwidth	FCC: KDB Publication Number 789033 ISED: -	FCC: 15.407 (a) (1) (2) (3) ISED: -	See data	N/A	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 a)	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		Complied b)	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	See data	Complied c)	Conducted (< 30 MHz) / Radiated (> 30 MHz) *2)
6 dB Emission Bandwidth	FCC: ANSI C63.10-2013 ISED: -	FCC: 15.407 (e) ISED: RSS-247 6.2.4.1	See data	Complied d)	Conducted
Note: UL Japan, Inc.'s EMI Work Procedures No. 13-EM-W0420 and 13-EM-W0422. *1) The test is not applicable since the EUT does not have AC power ports. *2) For the Radiated spurious emission test, refer to test report No.13063554M-C-R2. *3) DFS test is not applicable since the EUT does not operate in the 5.25 GHz -5.35 GHz and 5.47 GHz -5.725 GHz bands. a) Refer to APPENDIX 1 (data of Maximum Conducted Output Power) b) Refer to APPENDIX 1 (data of Maximum Power Spectral Density) c) Refer to APPENDIX 1 (data of Radiated Spurious Emission) d) Refer to APPENDIX 1 (data of 6 dB Bandwidth) Symbols: Complied The data of this test item has enough margin, more than the measurement uncertainty. Complied# The data of this test item meets the limits unless the measurement uncertainty is taken into consideration.					

* In case any questions arise about test procedure, ANSI C63.10: 2013 is also referred.

FCC Part 15.31 (e)

This EUT provides stable voltage constantly to the wireless transmitter regardless of input voltage. Instead of a new battery, DC power supply was used for the test. That does not affect the test result, therefore this EUT complies with the requirement.

FCC Part 15.203 Antenna requirement

It is impossible for end users to replace the antenna, because the antenna is mounted inside of the EUT. Therefore, the equipment complies with the antenna requirement of Section 15.203.

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3.3 Addition to standard

Item	Test Procedure	Specification	Worst margin	Results	Remarks
99 % Occupied Bandwidth	RSS-Gen 6.7	ISED: -	N/A	- a)	Conducted
a) Refer to APPENDIX 1 (data of 6 dB Bandwidth and 99 % Occupied Bandwidth)					

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

3.4 Uncertainty

There is no applicable rule of uncertainty in this applied standard. Therefore, the following results are derived depending on whether or not laboratory uncertainty is applied.

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

Antenna terminal test	Uncertainty (+/-)
Power Measurement above 1 GHz (Average Detector)_SPM-06	0.98 dB
Power Measurement above 1 GHz (Peak Detector)_SPM-06	1.75 dB
Power Measurement above 1 GHz (Average Detector)_SPM-07	0.89 dB
Power Measurement above 1 GHz (Peak Detector)_SPM-07	1.12 dB
Power Measurement above 1 GHz (Average Detector)_SPM-13	1.06 dB
Power Measurement above 1 GHz (Peak Detector)_SPM-13	1.24 dB
Spurious emission (Conducted) below 1GHz	0.9 dB
Spurious emission (Conducted) 1 GHz-3 GHz	0.9 dB
Spurious emission (Conducted) 3 GHz-18 GHz	2.9 dB
Spurious emission (Conducted) 18 GHz-26.5 GHz	2.6 dB
Spurious emission (Conducted) 26.5 GHz-40 GHz	2.0 dB
Bandwidth Measurement	0.07 %
Duty cycle and Time Measurement	0.262 %

3.5 Test Location

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A2LA Certificate Number: 1266.03 (FCC Test Firm Registration Number: 626366, ISED Lab Company Number: 2973D)

Test site	Width x Depth x Height (m)	Size of reference ground plane (m) / horizontal conducting plane	Maximum measurement distance
No.1 Semi-anechoic chamber	20.6 x 11.3 x 7.65	20.6 x 11.3	10 m
No.2 Semi-anechoic chamber	20.6 x 11.3 x 7.65	20.6 x 11.3	10 m
No.3 Semi-anechoic chamber	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.

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SECTION 4: Operation of E.U.T. during testing

4.1 Operating Mode(s)

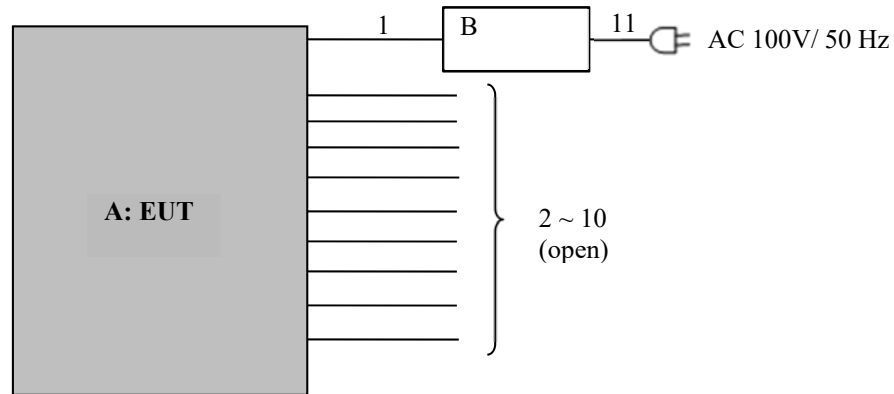
Test operating mode was determined as follows according to “Section 1 of 6 802.11 a/b/g/n testing - Managing Complex Regulatory Approvals -” of TCB Council Workshop October 2009 and also was judged the necessity of 802.11ac mode by the pre-test.

Mode	Remarks*
IEEE 802.11a (11a)	6 Mbps, PN9
IEEE 802.11n 20 MHz BW (11n-20)	MCS 0 (SGI OFF), PN9
IEEE 802.11n 40 MHz BW (11n-40)	MCS 0 (SGI ON), PN9
IEEE 802.11ac 40 MHz BW (11ac-40)	MCS 1 (SGI OFF), PN9
IEEE 802.11ac 80 MHz BW (11ac-80)	MCS 6 (SGI OFF), 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 settings: 11a:11 dBm 11n-20: 11 dBm 11n-40: 10 dBm 11ac-40: 9 dBm 11ac-80: 8 dBm Software: SoC: 0.0601107 SYS: 7.13 *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.	

*The details of Operation mode(s)

Test Item	Operating Mode	Tested Frequency			
		Lower Band	Middle Band	Additional Band	Upper Band
99 % Occupied Bandwidth, Maximum Conducted Output Power, Maximum Power Spectral Density 6 dB Bandwidth	11a Tx	-	-	-	5745 MHz
	11n-20 Tx	-	-	-	5755 MHz
	11n-40 Tx	-	-	-	5755 MHz
	11ac-40 Tx	-	-	-	5775 MHz
Conducted Spurious Emission	11a Tx *1)	-	-	-	5745 MHz
*1) The mode was tested as a representative, because it had the highest power at antenna terminal test.					

4.2 Configuration and peripherals



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

Description of EUT and support equipment

No.	Item	Model number	Serial number	Manufacturer	Remark
A	RDS AV RECEIVER	DMH-W4660NEX	SGTM000072UC	Pioneer Corporation	EUT
B	DC Power Supply	PAN 35-10A	DE001677	Kikusui	-

List of cables used

No.	Name	Length (m)	Shield		Remark
			Cable	Connector	
1	DC (+B, ACC, GND)	0.15 + 2.4	Unshielded	Unshielded	-
2	Speaker Front L	0.15	Unshielded	Unshielded	-
3	Speaker Front R	0.15	Unshielded	Unshielded	-
4	Speaker Rear L	0.15	Unshielded	Unshielded	-
5	Speaker Rear R	0.15	Unshielded	Unshielded	-
6	System Remote Control	0.15	Unshielded	Unshielded	-
7	ILL +	0.15	Unshielded	Unshielded	-
8	Reverse Gear Signal In	0.15	Unshielded	Unshielded	-
9	Parking Brake	2.0	Unshielded	Unshielded	-
10	Car Speed Signal In	0.15	Unshielded	Unshielded	-
11	AC	2.0	Unshielded	Unshielded	-

SECTION 5: 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
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)
Maximum Power Spectral Density	Encompass the entire EBW	100 kHz *2)	≥ 3 RBW	Auto	RMS Power Averaging (100 times)	Clear Write	Spectrum Analyzer
Conducted Spurious Emission*3)	9 kHz – 150 kHz	200 Hz	620 Hz	Auto	Peak	Max Hold	Spectrum Analyzer
	150 kHz – 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-5.850 GHz, but it is not possible with spectrum analyzer, so RBW Correction Factor ($10 \log(500 \text{ kHz} / 100 \text{ kHz})$) was added to the test result.

*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-150 kHz: RBW = 200 Hz, 150 kHz-30 MHz: RBW = 10 kHz)

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

99 % Occupied Bandwidth

Report No. 13063553S-C-R2
Test place Shonan EMC Lab. No.6 Shielded Room
Date October 29, 2019
Temperature / Humidity 23 deg. C / 45 % RH
Engineer Toshinori Yamada
Mode Tx

11a

Tested Frequency [MHz]	99 % Occupied Bandwidth [MHz]	Limit [MHz]
5745	17.3967	-

11n-20 SGI OFF

Tested Frequency [MHz]	99 % Occupied Bandwidth [MHz]	Limit [MHz]
5745	18.0844	-

11n-40 SGI ON

Tested Frequency [MHz]	99 % Occupied Bandwidth [MHz]	Limit [MHz]
5755	36.6226	-

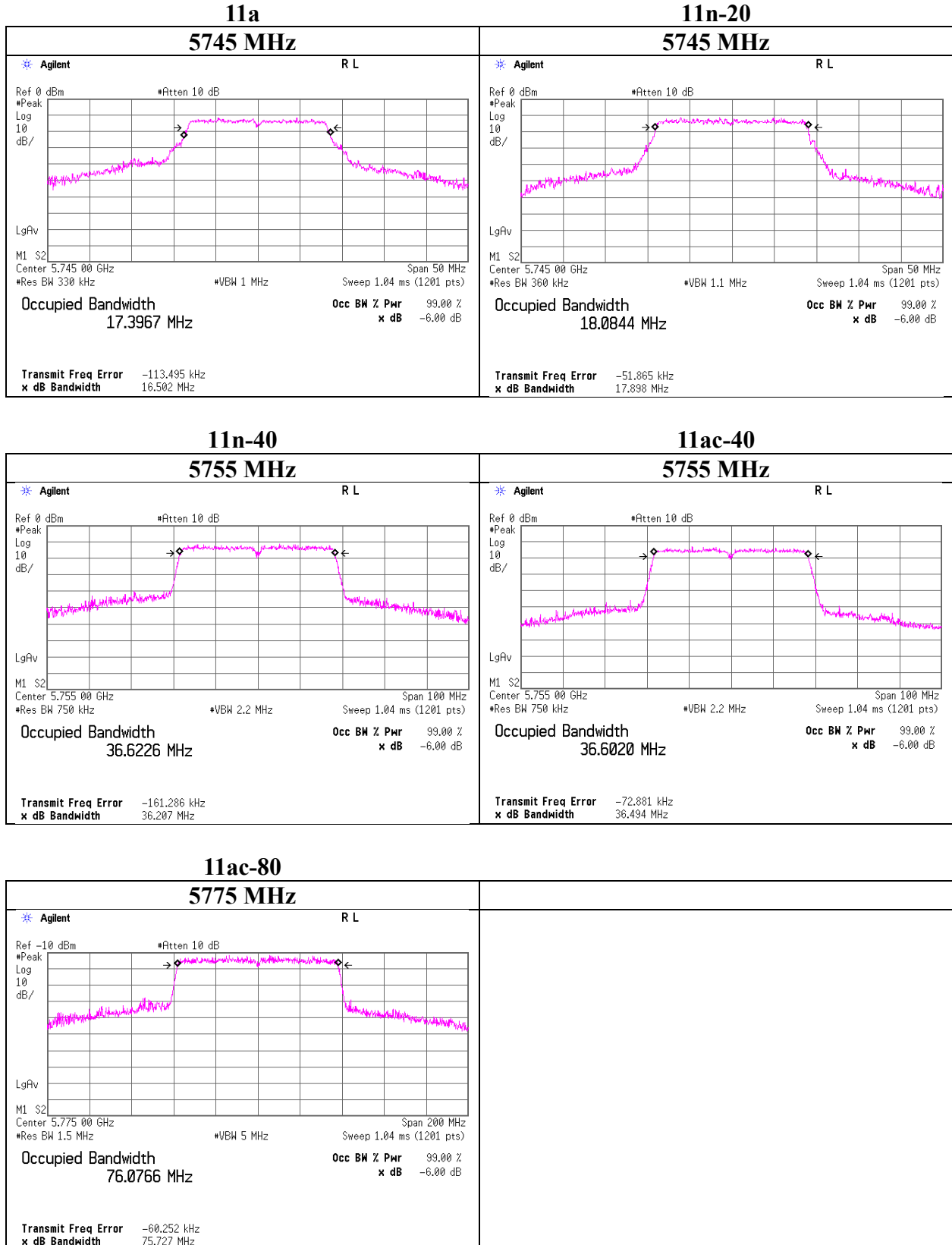
11ac-40 SGI OFF

Tested Frequency [MHz]	99 % Occupied Bandwidth [MHz]	Limit [MHz]
5755	36.6020	-

11ac-80 SGI OFF

Tested Frequency [MHz]	99 % Occupied Bandwidth [MHz]	Limit [MHz]
5775	76.0766	-

99 % Occupied Bandwidth



6 dB Bandwidth

Report No. 13063553S-C-R2
Test place Shonan EMC Lab. No.6 Shielded Room
Date October 29, 2019
Temperature / Humidity 23 deg. C / 45 % RH
Engineer Toshinori Yamada
Mode Tx

11a

Tested Frequency [MHz]	6 dB Bandwidth [MHz]	Limit [MHz]
5745	16.408	> 0.500

11n-20 SGI OFF

Tested Frequency [MHz]	6 dB Bandwidth [MHz]	Limit [MHz]
5745	17.768	> 0.500

11n-40 SGI ON

Tested Frequency [MHz]	6 dB Bandwidth [MHz]	Limit [MHz]
5755	36.325	> 0.500

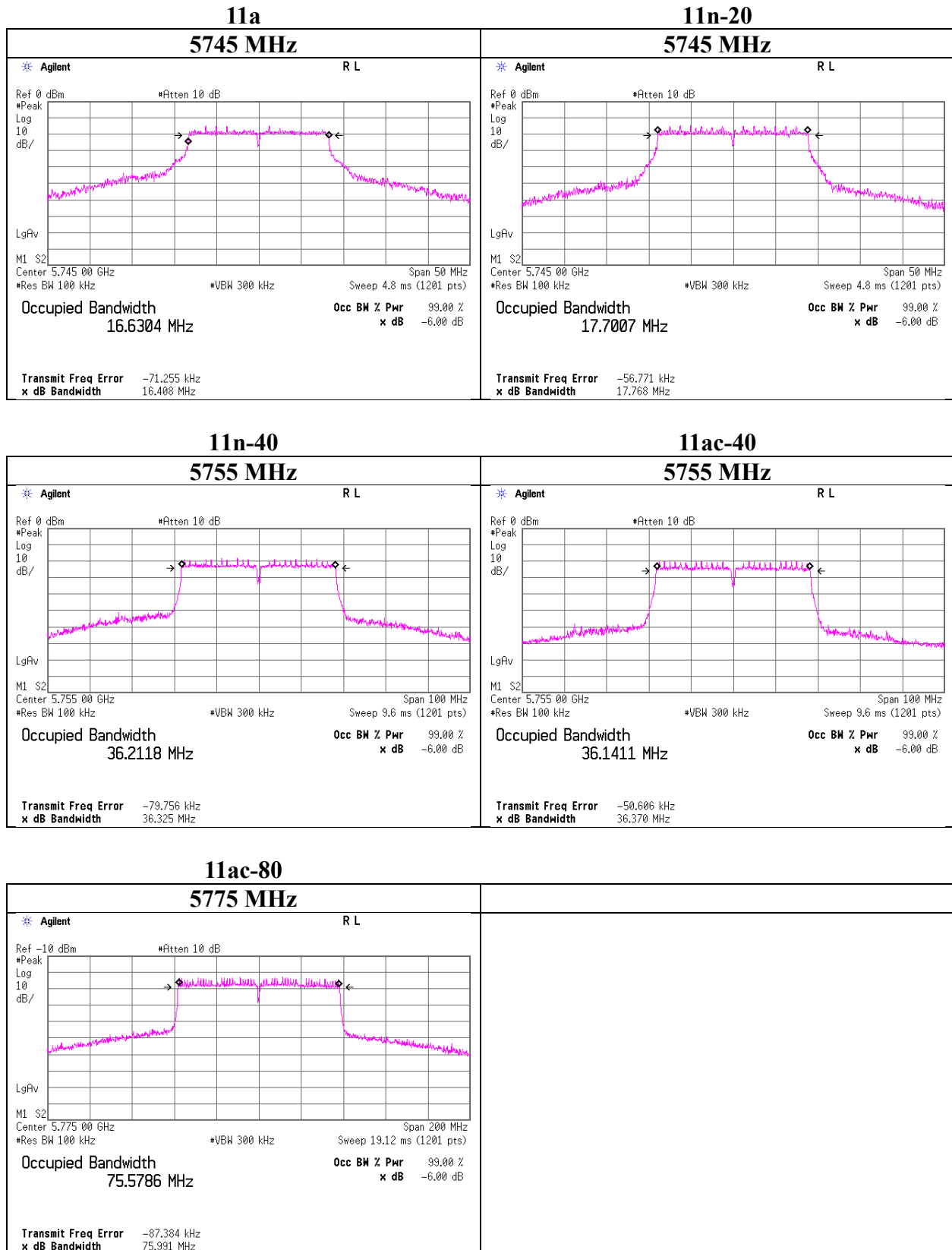
11ac-40 SGI OFF

Tested Frequency [MHz]	6 dB Bandwidth [MHz]	Limit [MHz]
5755	36.370	> 0.500

11ac-80 SGI OFF

Tested Frequency [MHz]	6 dB Bandwidth [MHz]	Limit [MHz]
5775	75.991	> 0.500

6 dB Bandwidth



Maximum Conducted Output Power

Report No. 13063553S-C-R2
Test place Shonan EMC Lab. No.5 Shielded Room
Date September 27, 2019
Temperature / Humidity 26 deg. C / 45 % RH
Engineer Makoto Hosaka
Mode Tx

11a

Applied limit: 15.407, mobile and portable client device

Tested Frequency	Power Meter Reading	Cable Loss	Atten. Loss	Duty Factor	Antenna Gain	99% OBW (B for IC)	Conducted Power				e.i.r.p.			
							Result		Limit	Margin	Result		Limit	Margin
							[dBm]	[mW]	[dBm]	[dB]	[dBm]	[mW]	[dBm]	[dB]
[MHz]	[dBm]	[dB]	[dB]	[dB]	[dBi]	[MHz]	[dBm]	[mW]	[dBm]	[dB]	[dBm]	[mW]	[dBm]	[dB]
5745	-3.64	4.09	9.95	0.29	-11.1	17.397	10.69	11.73	30.00	19.31	-0.41	0.91	36.00	36.41

11n-20 SGI OFF

Applied limit: 15.407, mobile and portable client device

Tested Frequency	Power Meter Reading	Cable Loss	Atten. Loss	Duty Factor	Antenna Gain	99% OBW (B for IC)	Conducted Power				e.i.r.p.			
							Result		Limit	Margin	Result		Limit	Margin
							[dBm]	[mW]	[dBm]	[dB]	[dBm]	[mW]	[dBm]	[dB]
[MHz]	[dBm]	[dB]	[dB]	[dB]	[dBi]	[MHz]	[dBm]	[mW]	[dBm]	[dB]	[dBm]	[mW]	[dBm]	[dB]
5745	-3.68	4.09	9.95	0.31	-11.1	18.084	10.67	11.67	30.00	19.33	-0.43	0.91	36.00	36.43

11n-40 SGI ON

Applied limit: 15.407, mobile and portable client device

Tested Frequency	Power Meter Reading	Cable Loss	Atten. Loss	Duty Factor	Antenna Gain	99% OBW (B for IC)	Conducted Power				e.i.r.p.			
							Result		Limit	Margin	Result		Limit	Margin
							[dBm]	[mW]	[dBm]	[dB]	[dBm]	[mW]	[dBm]	[dB]
[MHz]	[dBm]	[dB]	[dB]	[dB]	[dBi]	[MHz]	[dBm]	[mW]	[dBm]	[dB]	[dBm]	[mW]	[dBm]	[dB]
5755	-5.18	4.09	9.95	0.73	-11.1	36.623	9.59	9.10	30.00	20.41	-1.51	0.71	36.00	37.51

11ac-40 SGI OFF

Applied limit: 15.407, mobile and portable client device

Tested Frequency	Power Meter Reading	Cable Loss	Atten. Loss	Duty Factor	Antenna Gain	99% OBW (B for IC)	Conducted Power				e.i.r.p.			
							Result		Limit	Margin	Result		Limit	Margin
							[dBm]	[mW]	[dBm]	[dB]	[dBm]	[mW]	[dBm]	[dB]
[MHz]	[dBm]	[dB]	[dB]	[dB]	[dBi]	[MHz]	[dBm]	[mW]	[dBm]	[dB]	[dBm]	[mW]	[dBm]	[dB]
5755	-6.76	4.09	9.95	1.15	-11.1	36.602	8.43	6.97	30.00	21.57	-2.67	0.54	36.00	38.67

11ac-80 SGI OFF

Applied limit: 15.407, mobile and portable client device

Tested Frequency	Power Meter Reading	Cable Loss	Atten. Loss	Duty Factor	Antenna Gain	99% OBW (B for IC)	Conducted Power				e.i.r.p.			
							Result		Limit	Margin	Result		Limit	Margin
							[dBm]	[mW]	[dBm]	[dB]	[dBm]	[mW]	[dBm]	[dB]
[MHz]	[dBm]	[dB]	[dB]	[dB]	[dBi]	[MHz]	[dBm]	[mW]	[dBm]	[dB]	[dBm]	[mW]	[dBm]	[dB]
5775	-10.15	4.10	9.95	3.69	-11.1	76.077	7.59	5.74	30.00	22.41	-3.51	0.45	36.00	39.51

Sample Calculation:

Conducted Power Result = Reading + Cable Loss (including the cable(s) customer supplied) + Atten. Loss + Duty Factor

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

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

Maximum Conducted Output Power

Report No. 13063553S-C-R2
Test place Shonan EMC Lab. No.5 Shielded Room
Date September 27, 2019
Temperature / Humidity 26 deg. C / 45 % RH
Engineer Makoto Hosaka
Mode Tx 11a

5745 MHz

Mode	Rate Mbps	Reading (timed average) [dBm]	Duty factor [dB]	Burst power [dBm]	Remarks
11a	6	-3.64	0.29	-3.35	*
	9	-3.87	0.43	-3.44	
	12	-3.99	0.56	-3.43	
	18	-4.23	0.72	-3.51	
	24	-4.51	0.92	-3.59	
	36	-4.89	1.41	-3.48	
	48	-5.25	1.74	-3.51	
	54	-5.50	1.87	-3.63	

* Worst rate

Sample Calculation:

$$\text{Burst power} = \text{Reading (timed average)} + \text{Duty factor}$$

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

Maximum Conducted Output Power

Report No.	13063553S-C-R2
Test place	Shonan EMC Lab. No.5 Shielded Room
Date	September 27, 2019
Temperature / Humidity	26 deg. C / 45 % RH
Engineer	Makoto Hosaka
Mode	Tx 11n-20

5745 MHz

Mode	Rate Mbps	Reading (timed average) [dBm]	Duty factor [dB]	Burst power [dBm]	Remarks
11n-20 SGI OFF	0	-3.68	0.31	-3.37	*
	1	-3.99	0.59	-3.40	
	2	-4.19	0.75	-3.44	
	3	-4.53	1.04	-3.49	
	4	-4.79	1.41	-3.38	
	5	-5.31	1.76	-3.55	
	6	-5.38	1.83	-3.55	
	7	-5.60	1.97	-3.63	
11n-20 SGI ON	0	-3.82	0.34	-3.48	
	1	-4.29	0.64	-3.65	
	2	-4.67	0.91	-3.76	
	3	-4.55	1.15	-3.40	
	4	-5.11	1.51	-3.60	
	5	-5.48	1.84	-3.64	
	6	-5.62	2.00	-3.62	
	7	-5.68	2.11	-3.57	

* Worst rate

Sample Calculation:

$$\text{Burst power} = \text{Reading (timed average)} + \text{Duty factor}$$

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

Maximum Conducted Output Power

Report No.	13063553S-C-R2
Test place	Shonan EMC Lab. No.5 Shielded Room
Date	September 27, 2019
Temperature / Humidity	26 deg. C / 45 % RH
Engineer	Makoto Hosaka
Mode	Tx 11n-40

5755 MHz

Mode	Rate Mbps	Reading (timed average) [dBm]	Duty factor [dB]	Burst power [dBm]	Remarks
11n-40 SGI OFF	0	-5.18	0.60	-4.58	
	1	-5.68	0.97	-4.71	
	2	-6.02	1.46	-4.56	
	3	-6.29	1.76	-4.53	
	4	-6.90	2.22	-4.68	
	5	-7.19	2.63	-4.56	
	6	-7.28	2.74	-4.54	
	7	-7.55	2.90	-4.65	
11n-40 SGI ON	0	-5.18	0.73	-4.45	*
	1	-5.81	1.28	-4.53	
	2	-6.16	1.57	-4.59	
	3	-6.65	1.92	-4.73	
	4	-7.03	2.34	-4.69	
	5	-7.45	2.81	-4.64	
	6	-7.56	2.96	-4.60	
	7	-7.65	3.09	-4.56	

* Worst rate

Sample Calculation:

$$\text{Burst power} = \text{Reading (timed average)} + \text{Duty factor}$$

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

Maximum Conducted Output Power

Report No.	13063553S-C-R2
Test place	Shonan EMC Lab. No.5 Shielded Room
Date	September 27, 2019
Temperature / Humidity	26 deg. C / 45 % RH
Engineer	Makoto Hosaka
Mode	Tx 11ac-40

5755 MHz

Mode	Rate Mbps	Reading (timed average) [dBm]	Duty factor [dB]	Burst power [dBm]	Remarks
11ac-40 SGI OFF	0	-6.31	0.66	-5.65	
	1	-6.76	1.15	-5.61	*
	2	-7.31	1.57	-5.74	
	3	-7.57	1.84	-5.73	
	4	-8.37	2.34	-6.03	
	5	-8.49	2.43	-6.06	
	6	-8.59	2.87	-5.72	
	7	-8.75	3.02	-5.73	
	8	-8.89	3.25	-5.64	
	9	-8.99	3.25	-5.74	
11ac-40 SGI ON	0	-6.61	0.66	-5.95	
	1	-7.13	1.15	-5.98	
	2	-7.50	1.57	-5.93	
	3	-7.81	1.84	-5.97	
	4	-8.31	2.34	-5.97	
	5	-8.79	2.43	-6.36	
	6	-9.11	2.88	-6.23	
	7	-8.95	3.01	-5.94	
	8	-9.15	3.25	-5.90	
	9	-9.31	3.25	-6.06	

* Worst rate

Sample Calculation:

$$\text{Burst power} = \text{Reading (timed average)} + \text{Duty factor}$$

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

Maximum Conducted Output Power

Report No.	13063553S-C-R2
Test place	Shonan EMC Lab. No.5 Shielded Room
Date	September 27, 2019
Temperature / Humidity	26 deg. C / 45 % RH
Engineer	Makoto Hosaka
Mode	Tx 11ac-80

5775 MHz

Mode	Rate Mbps	Reading (timed average) [dBm]	Duty factor [dB]	Burst power [dBm]	Remarks
11ac-80 SGI OFF	0	-7.71	1.21	-6.50	
	1	-8.39	1.92	-6.47	
	2	-9.04	2.48	-6.56	
	3	-9.48	2.81	-6.67	
	4	-9.85	3.25	-6.60	
	5	-10.18	3.52	-6.66	
	6	-10.15	3.69	-6.46	*
	7	-10.51	3.80	-6.71	
	8	-10.65	3.85	-6.80	
	9	-10.77	3.85	-6.92	
11ac-80 SGI ON	0	-7.96	1.21	-6.75	
	1	-8.74	1.92	-6.82	
	2	-9.24	2.48	-6.76	
	3	-9.60	2.81	-6.79	
	4	-10.04	3.25	-6.79	
	5	-10.27	3.52	-6.75	
	6	-10.54	3.70	-6.84	
	7	-10.64	3.81	-6.83	
	8	-10.74	3.85	-6.89	
	9	-10.89	3.85	-7.04	

* Worst rate

Sample Calculation:

$$\text{Burst power} = \text{Reading (timed average)} + \text{Duty factor}$$

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

Average Output Power (Reference data for RF Exposure)

Report No.	13063553S-C-R2
Test place	Shonan EMC Lab. No.5 Shielded Room
Date	September 27, 2019
Temperature / Humidity	26 deg. C / 45 % RH
Engineer	Makoto Hosaka
Mode	Tx

11a

Tested Frequency	Power Meter Reading	Cable Loss	Atten. Loss	Result (Timed average)	
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]
5745	-3.64	4.09	9.95	10.40	10.96

11n-20 SGIOFF

Tested Frequency	Power Meter Reading	Cable Loss	Atten. Loss	Result (Timed average)	
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]
5745	-3.68	4.09	9.95	10.36	10.86

11n-40 SGION

Tested Frequency	Power Meter Reading	Cable Loss	Atten. Loss	Result (Timed average)	
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]
5755	-5.18	4.09	9.95	8.86	7.69

11ac-40 SGIOFF

Tested Frequency	Power Meter Reading	Cable Loss	Atten. Loss	Result (Timed average)	
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]
5755	-6.76	4.09	9.95	7.28	5.35

11ac-80 SGIOFF

Tested Frequency	Power Meter Reading	Cable Loss	Atten. Loss	Result (Timed average)	
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]
5775	-10.15	4.10	9.95	3.90	2.45

Sample Calculation:

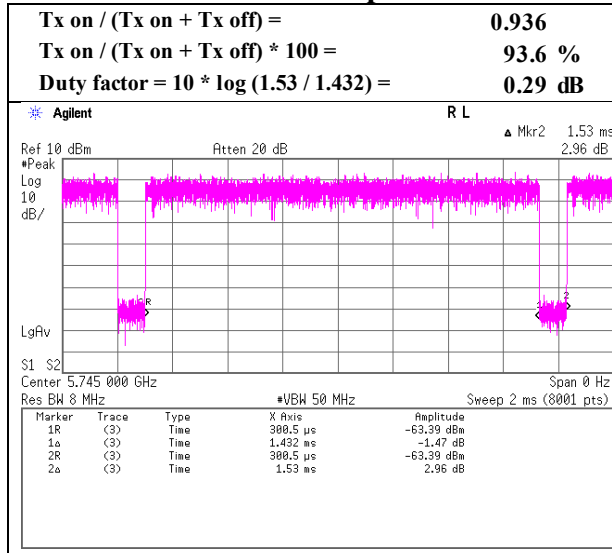
Result (Timed average) = Reading + Cable Loss (including the cable(s) customer supplied) + Atten. Loss

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

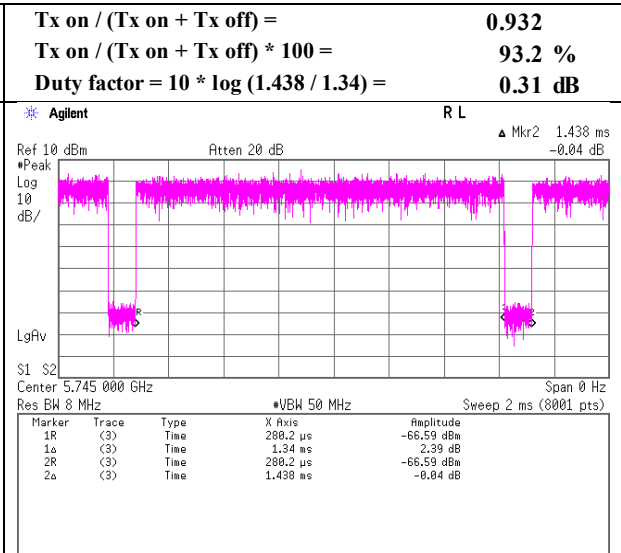
Burst rate confirmation

Report No. 13063553S-C-R2
Test place Shonan EMC Lab. No.5 Shielded Room
Date September 27, 2019
Temperature / Humidity 26 deg. C / 45 % RH
Engineer Makoto Hosaka
Mode Tx

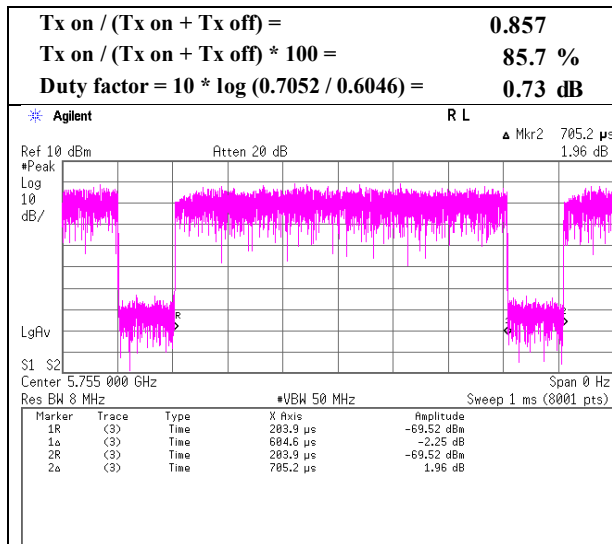
11a 6 Mbps



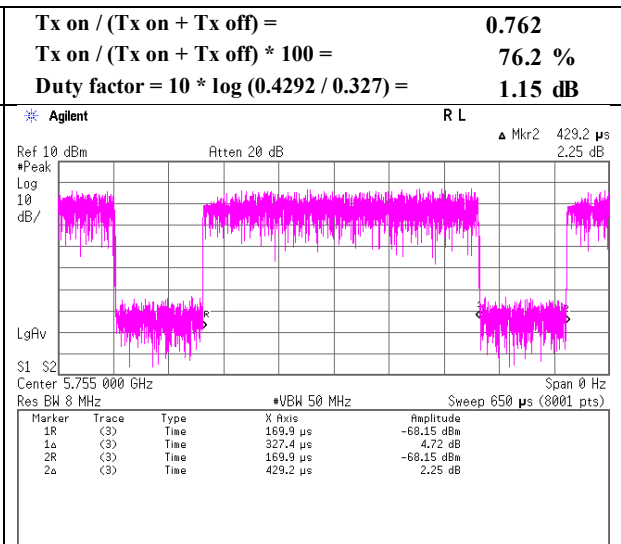
11n-20 MCS 0



11n-40 MCS 0



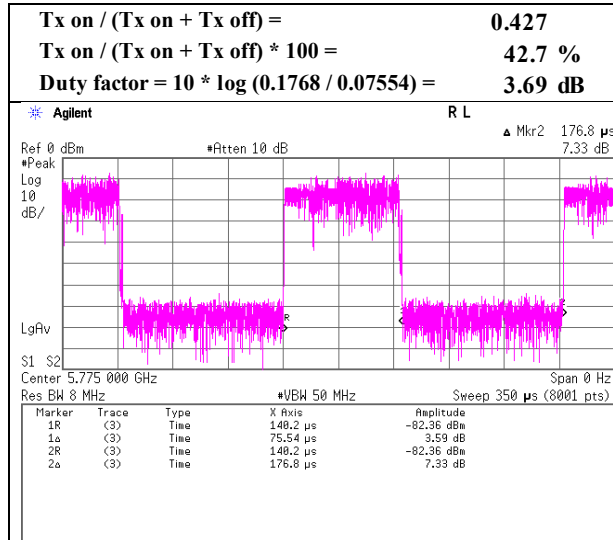
11ac-40 MCS 1



Burst rate confirmation

Report No. 13063553S-C-R2
Test place Shonan EMC Lab. No.5 Shielded Room
Date September 27, 2019
Temperature / Humidity 26 deg. C / 45 % RH
Engineer Makoto Hosaka
Mode Tx

11ac-80 MCS 6



Maximum Power Spectral Density

Report No. 13063553S-C-R2
Test place Shonan EMC Lab. No.6 Shielded Room
Date October 29, 2019
Temperature / Humidity 23 deg. C / 45 % RH
Engineer Toshinori Yamada
Mode Tx

11a

Applied limit: 15.407, mobile and portable client device

Tested 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]
5745	-23.47	2.80	9.95	0.29	-11.1	6.99	-3.44	30.00	33.44	-14.54	36.00	50.54

11n-20 SGI OFF

Applied limit: 15.407, mobile and portable client device

Tested 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]
5745	-22.84	2.80	9.95	0.31	-11.1	6.99	-2.79	30.00	32.79	-13.89	36.00	49.89

11n-40 SGI ON

Applied limit: 15.407, mobile and portable client device

Tested 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]
5755	-28.54	2.81	9.95	0.73	-11.1	6.99	-8.06	30.00	38.06	-19.16	36.00	55.16

11ac-40 SGI OFF

Applied limit: 15.407, mobile and portable client device

Tested 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]
5755	-30.10	2.81	9.95	1.15	-11.1	6.99	-9.20	30.00	39.20	-20.30	36.00	56.30

11ac-80 SGI OFF

Applied limit: 15.407, mobile and portable client device

Tested 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]
5775	-33.43	2.81	9.95	3.69	-11.1	6.99	-9.99	30.00	39.99	-21.09	36.00	57.09

Sample Calculation:

PSD: Power Spectral Density

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

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

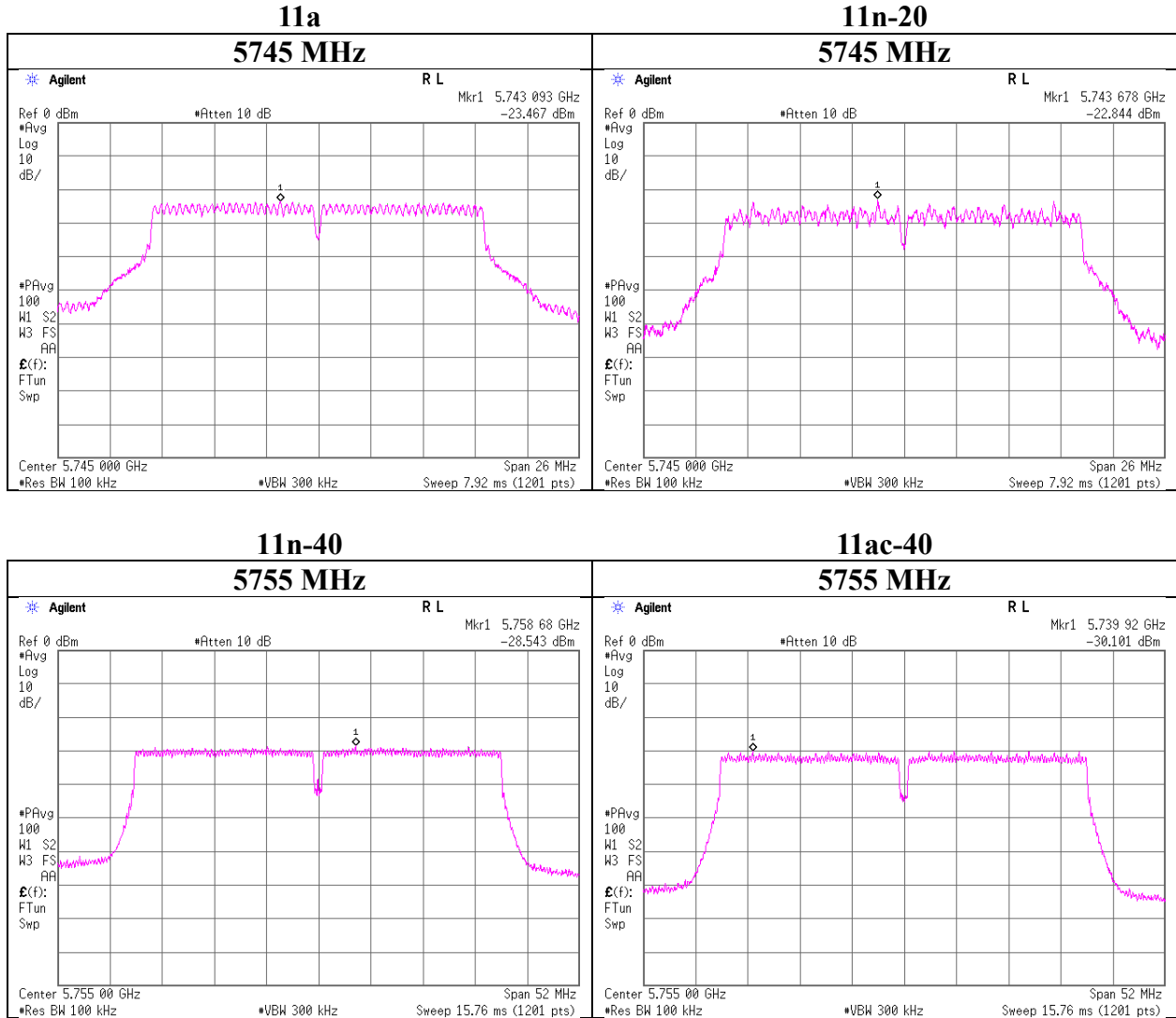
PSD Result (Conducted) = Reading + Cable Loss (including the cable(s) customer supplied) + Atten. Loss + Duty Factor + RBW Correction Factor

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

The conducted PSD limit was reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. (All frequencies for FCC, 5725 MHz-5850 MHz for IC)

Maximum Power Spectral Density

Report No.	13063553S-C-R2
Test place	Shonan EMC Lab. No.6 Shielded Room
Date	October 29, 2019
Temperature / Humidity	23 deg. C / 45 % RH
Engineer	Toshinori Yamada
Mode	Tx



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Shonan EMC Lab.

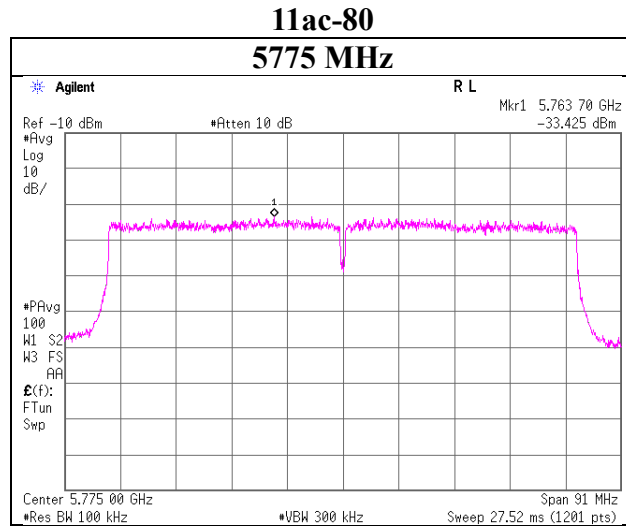
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

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Facsimile : +81 463 50 6401

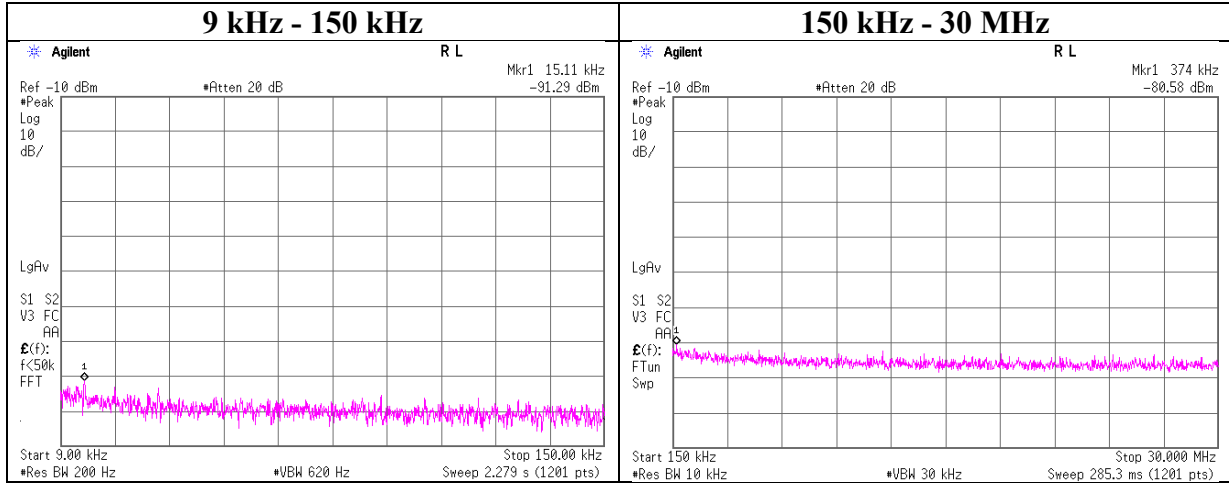
Maximum Power Spectral Density

Report No. 13063553S-C-R2
Test place Shonan EMC Lab. No.6 Shielded Room
Date October 29, 2019
Temperature / Humidity 23 deg. C / 45 % RH
Engineer Toshinori Yamada
Mode Tx



Conducted Spurious Emission

Report No. 13063553S-C-R2
Test place Shonan EMC Lab. No.6 Shielded Room
Date October 29, 2019
Temperature / Humidity 23 deg. C / 45 % RH
Engineer Toshinori Yamada
Mode Tx 11a, 5745 MHz



Frequency [kHz]	Reading [dBm]	Cable Loss [dB]	Attenuator [dB]	Antenna Gain* [dBi]	N (Number of Output)	EIRP [dBm]	Distance [m]	Ground bounce [dB]	E (field strength) [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
15.11	-91.3	1.92	10.6	2.0	1	-76.8	300	6.0	-15.6	44.0	59.6	
374.00	-80.6	1.92	10.6	2.0	1	-66.1	300	6.0	-4.8	16.1	20.9	

$$E \text{ [dBuV/m]} = \text{EIRP [dBm]} - 20 \log (\text{Distance [m]}) + \text{Ground bounce [dB]} + 104.8 \text{ [dBuV/m]}$$

$$\text{EIRP [dBm]} = \text{Reading [dBm]} + \text{Cable loss [dB]} + \text{Attenuator Loss [dB]} + \text{Antenna gain [dBi]} + 10 * \log (N)$$

N: Number of output

*2.0 dBi was applied to the test result based on KDB 789033 since antenna gain was less than 2.0 dBi.

UL Japan, Inc.

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APPENDIX 2: Test instruments

Test Instruments

Local ID	Test Name	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Calibration Due Date	Calibration Interval (Month)
KTS-06	AT	145110	Digital Tester	SANWA	PC500	7019240	2019/4/2	2020/4/30	12
KTS-07	AT	145111	Digital Tester	SANWA	PC500	7019232	2019/10/1	2020/10/31	12
SAT10-09	AT	145132	Attenuator	Weinschel Corp.	54A-10	W5692	2019/11/5	2020/11/30	12
SAT10-12	AT	151609	Attenuator	Weinschel Corp.	54A-10	81601	2019/3/27	2020/3/31	12
SCC-G32	AT	145183	Coaxial Cable	Junkosha	MWX241-02000KMSK MS	OCT-09-13-005	2018/11/25	2019/11/30	12
SCC-G37	AT	151614	Coaxial Cable	Junkosha	MWX241-01000KMSK MS/B	1612Q035	2018/12/25	2019/12/31	12
SOS-09	AT	146318	Humidity Indicator	A&D	AD-5681	4061484	2018/12/5	2019/12/31	12
SOS-18	AT	175822	Humidity Indicator	CUSTOM	CTH-201	-	2018/12/5	2019/12/31	12
SPM-13	AT	169910	Power Meter	EMC Instruments Corporation	8990B	MY510004 48	2019/3/6	2020/3/31	12
SPSS-06	AT	169911	Power sensor	EMC Instruments Corporation	N1923A	MY572700 04	2019/3/6	2020/3/31	12
SRENT-15	AT	160899	Spectrum Analyzer	AGILENT (KEYSIGHT)	E4440A	MY461855 16	2019/1/21	2020/1/31	12
SSA-02	AT	145800	Spectrum Analyzer	AGILENT	E4448A	MY482501 06	2019/4/4	2020/4/30	12
STM-G10	AT	171617	Terminator	Weinschel - API Technologies Corp	M1459A	92420	2019/7/4	2020/7/31	12

*Hyphens for Last Calibration Date and Cal Int (month) are instruments that Calibration is not required (e.g. software), or instruments checked in advance before use.

The expiration date of the calibration is the end of the expired month.

As for some calibrations performed after the tested dates, those test equipment have been controlled by means of an unbroken chains of calibrations.

All equipment is calibrated with valid calibrations. Each measurement data is traceable to the national or international standards.

Test item:

AT: Antenna Terminal Conducted test

UL Japan, Inc.

Shonan EMC Lab.

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