

RADIO TEST REPORT

Test Report No. 15383304S-B

Customer	Panasonic Automotive Systems Co., Ltd.
Description of EUT	Car Navigation
Model Number of EUT	AT2402
FCC ID	ACJ932AT2402
Test Regulation	FCC Part 15 Subpart C
Test Result	Complied
Issue Date	October 25, 2024
Remarks	Wireless LAN (2.4 GHz band) and Bluetooth Low Energy part(s) Maximum Peak Output Power and Average Output Power only *Spot check

Representative Test EngineerMiku Ikudome
Engineer**Approved By**Shinichi Takano
Engineer

CERTIFICATE 1266.03

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

Report Cover Page - Form-ULID-003532 (DCS:13-EM-F0429) Issue# 23.0

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REVISION HISTORY

Original Test Report No.: 15383304S-B

Revision	Test Report No.	Date	Page Revised Contents
- (Original)	15383304S-B	October 25, 2024	-

Reference: Abbreviations (Including words undescribed in this report)

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

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SECTION 1: Customer Information

Company Name	Panasonic Automotive Systems Co., Ltd. *1)
Address	4261, Ikonobe-cho, Tsuzuki-ku, Yokohama-shi, Kanagawa-ken 224-8520, Japan
Telephone Number	+81-90-8513-8335
Contact Person	Daisuke Takahata

*1) The Grantee name in the FCC application is "Panasonic Corporation of North America".

The information provided by 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

SECTION 2: Equipment Under Test (EUT)

2.1 Identification of EUT

Description	Car Navigation
Model Number	AT2402
Serial Number	Refer to SECTION 4.2
Condition	Production prototype (Not for Sale: This sample is equivalent to mass-produced items.)
Modification	No Modification by the test lab
Receipt Date	June 27, 2024: for BT LE August 2, 2024: for WLAN
Test Date	July 27, August 19, 2024

2.2 Product Description

General Specification

Rating	DC 13.2 V
Operating temperature	-30 deg. C to +65 deg. C

Radio Specification

This report contains data provided by the customer which can impact the validity of results. UL Japan, Inc. is only responsible for the validity of results after the integration of the data provided by the customer. The data provided by the customer is marked "a)" in the table below.

Bluetooth (BR / EDR / BT LE)

Equipment Type	Transceiver
Frequency of Operation	2402 MHz to 2480 MHz
Type of Modulation	FHSS, GFSK / $\pi/4$ -DQPSK, 8DPSK / GFSK
Antenna Gain ^{a)}	4 dBi

WLAN (IEEE802.11b/11g/11n-20/11ax-20)

Equipment Type	Transceiver
Frequency of Operation	2412 MHz to 2462 MHz
Type of Modulation	DSSS, OFDM
	OFDMA: (20 MHz band): 26/52/106/242-tone RU
Antenna Gain ^{a)}	4 dBi

WLAN (IEEE802.11a/11n-20/11ac-20/11ax-20/11n-40/11ac-40/11ax-40/11ac-80/11ax-80)

Equipment Type	Transceiver	
Frequency of Operation	20 MHz Band	5180 MHz to 5240 MHz 5745 MHz to 5825 MHz
	40 MHz Band	5190 MHz to 5230 MHz 5755 MHz to 5795 MHz
	80 MHz Band	5210 MHz, 5775 MHz
Type of Modulation	OFDM	
	OFDMA (IEEE802.11ax only)	(20 MHz band): 26/52/106/242-tone RU
		(40 MHz band): 26/52/106/242/484-tone RU
		(80 MHz band): 26/52/106/242/484/996-tone RU
Antenna Gain ^{a)}	RF0: 5 dBi, RF1: 5 dBi	

2.3 Variant Models

CK-BT2EM0AJ, CK-BT2EA0AJ, CK-BT2EN6AJ, CK-BT2EN7AJ, CK-BT2EN4LX, CK-BT2EN5LX

SECTION 3: Test Specification, Procedures & Results

3.1 Test Specification

Test Specification	FCC Part 15 Subpart C The latest version on the first day of the testing period
Title	FCC 47 CFR Part 15 Radio Frequency Device Subpart C Intentional Radiators Section 15.207 Conducted limits Section 15.247 Operation within the bands 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz

3.2 Procedures and Results

Item	Test Procedure	Specification	Worst Margin	Results	Remarks
Maximum Peak Output Power	FCC: KDB 558074 D01 15.247 Meas Guidance v05r02 ISED: RSS-Gen 6.12	FCC: Section 15.247(b)(3) ISED: RSS-247 5.4(d)	See data	Complied	Conducted
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.					

FCC Part 15.31 (e)

This EUT provides the stable voltage constantly to RF part regardless of input voltage.
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.

3.3 Addition to Standard

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 $k = 2$.

Antenna terminal test	Uncertainty (+/-)
Power Measurement above 1 GHz (Average Detector)	1.3 dB
Power Measurement above 1 GHz (Peak Detector)	1.8 dB
Spurious Emission (Conducted) below 1 GHz	0.91 dB
Conducted Emissions Power Density Measurement 1 GHz to 3 GHz	1.3 dB
Conducted Emissions Power Density Measurement 3 GHz to 18 GHz	2.5 dB
Spurious Emission (Conducted) 18 GHz to 26.5 GHz	2.8 dB
Spurious Emission (Conducted) 26.5 GHz to 40 GHz	2.6 dB
Bandwidth Measurement	0.012 %
Duty Cycle and Time Measurement	0.27 %
Temperature	2.2 deg.C.
Humidity	4.0 %
Voltage	0.74 %

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 room	Width x Depth x Height (m)	Size of reference ground plane (m) / horizontal conducting plane	Maximum measurement distance
No.1 Semi-anechoic chamber (SAC1)	20.6 x 11.3 x 7.65	20.6 x 11.3	10 m
No.2 Semi-anechoic chamber (SAC2)	20.6 x 11.3 x 7.65	20.6 x 11.3	10 m
No.3 Semi-anechoic chamber (SAC3)	12.7 x 7.7 x 5.35	12.7 x 7.7	5 m
No.4 Semi-anechoic chamber (SAC4)	8.1 x 5.1 x 3.55	8.1 x 5.1	-
Wireless anechoic chamber 1 (WAC1)	9.5 x 6.0 x 5.4	9.5 x 6.0	3 m
Wireless anechoic chamber 2 (WAC2)	9.5 x 6.0 x 5.4	9.5 x 6.0	3 m
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	-	-
No.2 Measurement room	4.5 x 3.5 x 2.5	-	-
Wireless shielded room 1	3.0 x 4.5 x 2.7	3.0 x 4.5	-
Wireless shielded room 2	3.0 x 4.5 x 2.7	3.0 x 4.5	-

3.6 Test Data, Test Instruments, and Test Set Up

Refer to APPENDIX.

SECTION 4: Operation of EUT during testing

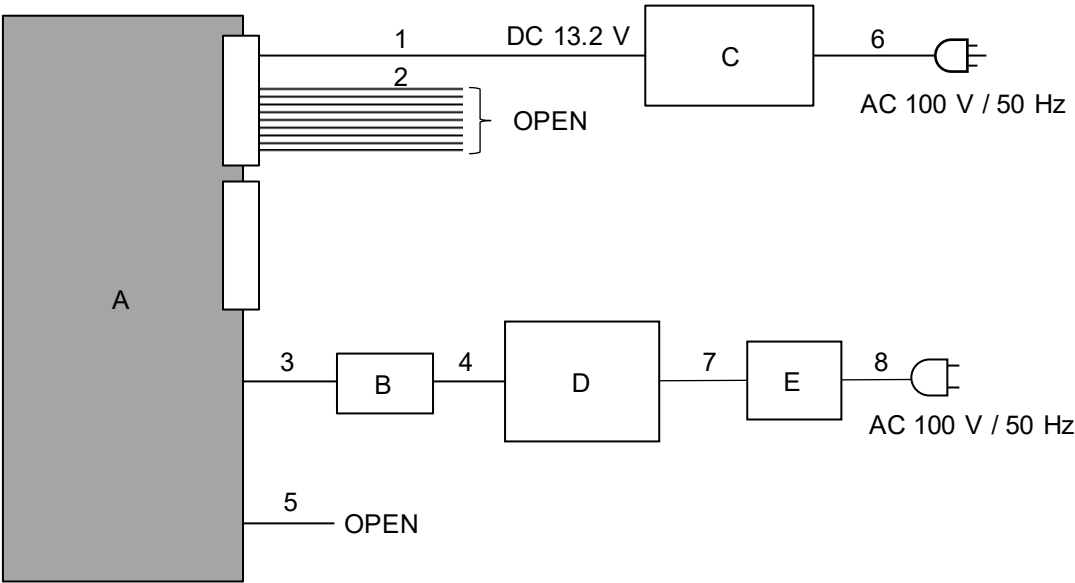
4.1 Operating Mode(s)

Mode	Remarks*
IEEE 802.11b (11b)	1 Mbps, PN9
IEEE 802.11g (11g)	24 Mbps, PN9
IEEE 802.11n 20 MHz BW (11n-20)	MCS 3 G.I. 400 ns, PN9
IEEE 802.11ax 20 MHz BW (11ax-20)	MCS 10 G.I. 1600 ns, PN9
Bluetooth Low Energy (BT LE)	1M-PHY Uncoded PHY (1M-PHY), Maximum Packet Size, PRBS9
Bluetooth Low Energy (BT LE)	2M-PHY Uncoded PHY (2M-PHY), Maximum Packet Size, PRBS9
*The worst condition was determined based on the test result of RF Output Power, and Duty Factor referenced the original report.. (Reference test report No.: 14747914S-B) *Power of the EUT was set by the software as follows; Power Setting: 11b: 12 dBm 11g, 11n-20, 11ax-20: 13 dBm 11ax-20 OFDMA: 7 dBm (26-tone), 10 dBm (52-tone), 13 dBm (106/242-tone) BT LE: Fixed Software: wifi_2g_serial Version: 1 (Date: 2023.04.03, Storage location: Driven by connected PC) OFDMA_TX_2G_serial Version: 2 (Date: 2023.04.12, Storage location: Driven by connected PC) bluetooth_serial Version: 1 (Date: 2023.04.03, 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.	

*The Details of Operating Mode(s)

Test Item	Operating Mode	Tested Frequency
Maximum Peak Output Power	Tx 11b	2412 MHz
	Tx 11g	2437 MHz
	Tx 11n-20	2462 MHz
	Tx 11ax-20 (OFDM)	
	Tx 11ax-20 (OFDMA)	
	Tx BT LE, 1M-PHY	2402 MHz
	Tx BT LE, 2M-PHY	2440 MHz
		2480 MHz

4.2 Configuration and Peripherals



Description of EUT and Support Equipment

No.	Item	Model number	Serial Number	Manufacturer	Remarks
A	Car Navigation	AT2402	500069	Panasonic	EUT
B	Jig Board	-	-	-	-
C	Power Supply(DC)	SPI008	-	GOODGOODS	-
D	Laptop Computer	ThinkPad E14 Gen2	PF397TQG	LENOVO	-
E	AC Adapter	ADLX65YCC2D	8SSA10R16922 C2TJ19M1368	LENOVO	-

List of Cables Used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	DC	3.0 + 1.0	Unshielded	Unshielded	-
2	Signal	3.0	Unshielded	Unshielded	-
3	Signal	0.1	Unshielded	Unshielded	-
4	USB	1.0 + 2.0	Shielded	Shielded	-
5	Signal	0.1	Unshielded	Unshielded	-
6	AC	2.0	Unshielded	Unshielded	-
7	DC	1.8	Unshielded	Unshielded	-
8	AC	0.9	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
Maximum Peak Output Power	-	-	-	Auto	Peak/ Average *1)	-	Power Meter (Sensor: 160 MHz BW)
*1) Reference data							

Test results are rounded off and limit are rounded down, 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

Maximum Peak Output Power

Test place Shonan EMC Lab. No.5 Shielded Room
Date August 19, 2024
Temperature / Humidity 24 deg. C / 55 % RH
Engineer Shiro Kobayashi
Mode Tx

11b

Maximum peak output power 1 Mbps (worst)

Maximum peak output power:				Conducted Power					e.i.r.p. for RSS-247					
Freq.	Reading	Cable Loss	Atten. Loss	Result		Limit		Margin	Antenna Gain	Result		Limit		Margin
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dBm]	[mW]	[dB]	[dBi]	[dBm]	[mW]	[dBm]	[mW]	[dB]
2412	2.94	2.28	9.91	15.13	32.58	30.00	1000	14.87	4.00	19.13	81.85	36.02	4000	16.89
2437	2.79	2.29	9.91	14.99	31.55	30.00	1000	15.01	4.00	18.99	79.25	36.02	4000	17.03
2462	2.88	2.31	9.91	15.10	32.36	30.00	1000	14.90	4.00	19.10	81.28	36.02	4000	16.92

11g

Maximum peak output power 24 Mbps (worst)

Maximum peak output power				Conducted Power					e.i.r.p. for RSS-247					
Freq.	Reading	Cable Loss	Atten. Loss	Result		Limit		Margin	Antenna Gain	Result		Limit		Margin
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dBm]	[mW]	[dB]	[dBi]	[dBm]	[mW]	[dBm]	[mW]	[dB]
2412	11.20	2.28	9.91	23.39	218.27	30.00	1000	6.61	4.00	27.39	548.28	36.02	4000	8.63
2437	11.15	2.29	9.91	23.35	216.27	30.00	1000	6.65	4.00	27.35	543.25	36.02	4000	8.67
2462	11.18	2.31	9.91	23.40	218.78	30.00	1000	6.60	4.00	27.40	549.54	36.02	4000	8.62

11n-20 (SISO)

Maximum peak output power MCS 3 G.I. 400 ns (worst)

				Conducted Power					e.i.r.p. for RSS-247					
Freq.	Reading	Cable Loss	Atten. Loss	Result		Limit		Margin	Antenna Gain	Result		Limit		Margin
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dBm]	[mW]	[dB]	[dBi]	[dBm]	[mW]	[dBm]	[mW]	[dB]
2412	10.85	2.28	9.91	23.04	201.37	30.00	1000	6.96	4.00	27.04	505.82	36.02	4000	8.98
2437	10.81	2.29	9.91	23.01	199.99	30.00	1000	6.99	4.00	27.01	502.34	36.02	4000	9.01
2462	10.82	2.31	9.91	23.04	201.37	30.00	1000	6.96	4.00	27.04	505.82	36.02	4000	8.98

11ax-20(OFDM)

Maximum peak output power MCS 10 G.I. 1600 ns (worst)

Maximum peak output power				Conducted Power					e.i.r.p. for RSS-247					
Freq.	Reading	Cable Loss	Atten. Loss	Result		Limit		Margin	Antenna Gain	Result		Limit		Margin
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dBm]	[mW]	[dB]	[dBi]	[dBm]	[mW]	[dBm]	[mW]	[dB]
2412	12.91	2.28	9.91	25.10	323.59	30.00	1000	4.90	4.00	29.10	812.83	36.02	4000	6.92
2437	12.67	2.29	9.91	24.87	306.90	30.00	1000	5.13	4.00	28.87	770.90	36.02	4000	7.15
2462	12.66	2.31	9.91	24.88	307.61	30.00	1000	5.12	4.00	28.88	772.68	36.02	4000	7.14

Sample Calculation:

Result = Reading + Cable Loss (including the cable(s) customer supplied) + Attenuator Loss

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

Maximum Peak Output Power

Test place Shonan EMC Lab. No.5 Shielded Room
Date August 19, 2024
Temperature / Humidity 24 deg. C / 55 % RH
Engineer Shiro Kobayashi
Mode Tx

11ax-20, RU Type: 26-tone RU
Maximum peak output power

					Conducted Power				e.i.r.p. for RSS-247					
Freq.	RU Index	Reading	Cable Loss	Atten. Loss	Result		Limit	Margin	Antenna Gain	Result		Limit		Margin
[MHz]		[dBm]	[dB]	[dB]	[dBm]	[mW]	[mW]	[dB]	[dBi]	[dBm]	[mW]	[dBm]	[mW]	[dB]
2412	0	6.24	2.28	9.91	18.43	69.66	1000	11.57	4.00	22.43	174.98	36.02	4000	13.59
	4	6.22	2.28	9.91	18.41	69.34	1000	11.59	4.00	22.41	174.18	36.02	4001	13.61
	8	6.23	2.28	9.91	18.42	69.50	1000	11.58	4.00	22.42	174.58	36.02	4002	13.60
2437	0	6.01	2.29	9.91	18.21	66.22	1000	11.79	4.00	22.21	166.34	36.02	4003	13.81
	4	6.16	2.29	9.91	18.36	68.55	1000	11.64	4.00	22.36	172.19	36.02	4004	13.66
	8	6.12	2.29	9.91	18.32	67.92	1000	11.68	4.00	22.32	170.61	36.03	4005	13.71
2462	0	6.03	2.31	9.91	18.25	66.83	1000	11.75	4.00	22.25	167.88	36.03	4006	13.78
	4	6.09	2.31	9.91	18.31	67.76	1000	11.69	4.00	22.31	170.22	36.03	4007	13.72
	8	6.03	2.31	9.91	18.25	66.83	1000	11.75	4.00	22.25	167.88	36.03	4008	13.78

11ax-20, RU Type: 52-tone RU
Maximum peak output power

					Conducted Power				e.i.r.p. for RSS-247					
Freq.	RU Index	Reading	Cable Loss	Atten. Loss	Result		Limit	Margin	Antenna Gain	Result		Limit		Margin
[MHz]		[dBm]	[dB]	[dB]	[dBm]	[mW]	[mW]	[dB]	[dBi]	[dBm]	[mW]	[dBm]	[mW]	[dB]
2412	37	9.02	2.28	9.91	21.21	132.13	1000	8.79	4.00	25.21	331.89	36.02	4000	10.81
	38	9.01	2.28	9.91	21.20	131.83	1000	8.80	4.00	25.20	331.13	36.02	4001	10.82
	40	9.04	2.28	9.91	21.23	132.74	1000	8.77	4.00	25.23	333.43	36.02	4002	10.79
2437	37	9.14	2.29	9.91	21.34	136.14	1000	8.66	4.00	25.34	341.98	36.02	4003	10.68
	38	9.15	2.29	9.91	21.35	136.46	1000	8.65	4.00	25.35	342.77	36.02	4004	10.67
	40	9.14	2.29	9.91	21.34	136.14	1000	8.66	4.00	25.34	341.98	36.03	4005	10.69
2462	37	9.07	2.31	9.91	21.29	134.59	1000	8.71	4.00	25.29	338.06	36.03	4006	10.74
	38	9.05	2.31	9.91	21.27	133.97	1000	8.73	4.00	25.27	336.51	36.03	4007	10.76
	40	9.12	2.31	9.91	21.34	136.14	1000	8.66	4.00	25.34	341.98	36.03	4008	10.69

Sample Calculation:
Result = Reading + Cable Loss (including the cable(s) customer supplied) + Attenuator Loss
e.i.r.p. Result = Conducted Power Result + Antenna Gain

Maximum Peak Output Power

Test place Shonan EMC Lab. No.5 Shielded Room
Date July 27, 2024 August 19, 2024
Temperature / Humidity 25 deg. C / 40 % RH 24 deg. C / 55 % RH
Engineer Miku Ikudome Shiro Kobayashi
Mode Tx

11ax-20, RU Type: 106-tone RU
Maximum peak output power

					Conducted Power				e.i.r.p. for RSS-247					
Freq.	RU Index	Reading	Cable Loss	Atten. Loss	Result		Limit	Margin	Antenna Gain	Result		Limit		Margin
[MHz]		[dBm]	[dB]	[dB]	[dBm]	[mW]	[mW]	[dB]	[dBi]	[dBm]	[mW]	[dBm]	[mW]	[dB]
2412	53	12.28	2.28	9.91	24.47	279.90	1000	5.53	4.00	28.47	703.07	36.02	4000	7.55
	54	12.27	2.28	9.91	24.46	279.25	1000	5.54	4.00	28.46	701.46	36.02	4001	7.56
2437	53	12.05	2.29	9.91	24.25	266.07	1000	5.75	4.00	28.25	668.34	36.02	4002	7.77
	54	12.09	2.29	9.91	24.29	268.53	1000	5.71	4.00	28.29	674.53	36.02	4003	7.73
2462	53	12.06	2.31	9.91	24.28	267.92	1000	5.72	4.00	28.28	672.98	36.02	4004	7.74
	54	12.05	2.31	9.91	24.27	267.30	1000	5.73	4.00	28.27	671.43	36.03	4005	7.76

11ax-20, RU Type: 242-tone RU
Maximum peak output power

					Conducted Power				e.i.r.p. for RSS-247					
Freq.	RU Index	Reading	Cable Loss	Atten. Loss	Result		Limit	Margin	Antenna Gain	Result		Limit		Margin
[MHz]		[dBm]	[dB]	[dB]	[dBm]	[mW]	[mW]	[dB]	[dBi]	[dBm]	[mW]	[dBm]	[mW]	[dB]
2412	61	12.29	2.28	9.91	24.48	280.54	1000	5.52	4.00	28.48	704.69	36.02	4000	7.54
2437	61	12.23	2.29	9.91	24.43	277.33	1000	5.57	4.00	28.43	696.63	36.02	4000	7.59
2462	61	12.05	2.31	9.91	24.27	267.30	1000	5.73	4.00	28.27	671.43	36.02	4000	7.75

Sample Calculation:
Result = Reading + Cable Loss (including the cable(s) customer supplied) + Attenuator Loss
e.i.r.p. Result = Conducted Power Result + Antenna Gain

BT LE 1M-PHY
Maximum peak output power

				Conducted Power					e.i.r.p. for RSS-247					
Freq.	Reading	Cable Loss	Atten. Loss	Result		Limit		Margin	Antenna Gain	Result		Limit		Margin
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dBm]	[mW]	[dB]	[dBi]	[dBm]	[mW]	[dBm]	[mW]	[dB]
2402	-6.98	2.28	10.05	5.35	3.43	30.00	1000	24.65	4.00	9.35	8.61	36.02	4000	26.67
2440	-7.27	2.29	10.05	5.07	3.21	30.00	1000	24.93	4.00	9.07	8.07	36.02	4000	26.95
2480	-7.18	2.31	10.05	5.18	3.30	30.00	1000	24.82	4.00	9.18	8.28	36.02	4000	26.84

BT LE 2M-PHY
Maximum peak output power

				Conducted Power					e.i.r.p. for RSS-247					
Freq.	Reading	Cable Loss	Atten. Loss	Result		Limit		Margin	Antenna Gain	Result		Limit		Margin
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dBm]	[mW]	[dB]	[dBi]	[dBm]	[mW]	[dBm]	[mW]	[dB]
2402	-6.78	2.28	10.05	5.55	3.59	30.00	1000	24.45	4.00	9.55	9.02	36.02	4000	26.47
2440	-7.02	2.29	10.05	5.32	3.40	30.00	1000	24.68	4.00	9.32	8.55	36.02	4000	26.70
2480	-6.92	2.31	10.05	5.44	3.50	30.00	1000	24.56	4.00	9.44	8.79	36.02	4000	26.58

Sample Calculation:
Result = Reading + Cable Loss (including the cable(s) customer supplied) + Attenuator Loss
e.i.r.p. Result = Conducted Power Result + Antenna Gain

Average Output Power (Reference data for RF Exposure)

Test place	Shonan EMC Lab. No.5 Shielded Room
Date	August 19, 2024
Temperature / Humidity	24 deg. C / 55 % RH
Engineer	Shiro Kobayashi
Mode	Tx

11b

Average power 2 Mbps (worst)

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result (Time average)		Duty factor [dB]	Result (Burst power average)	
				[dBm]	[mW]		[dBm]	[mW]
2412	0.40	2.28	9.91	12.59	18.16	0.00	12.59	18.16
2437	0.25	2.29	9.91	12.45	17.58	0.00	12.45	17.58
2462	0.30	2.31	9.91	12.52	17.86	0.00	12.52	17.86

11g

Average power 12 Mbps (worst)

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result (Time average)		Duty factor [dB]	Result (Burst power average)	
				[dBm]	[mW]		[dBm]	[mW]
2412	1.23	2.28	9.91	13.42	21.98	0.00	13.42	21.98
2437	1.17	2.29	9.91	13.37	21.73	0.00	13.37	21.73
2462	1.22	2.31	9.91	13.44	22.08	0.00	13.44	22.08

11n-20 (SISO)

Average power MCS 1 (worst)

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result (Time average)		Duty factor [dB]	Result (Burst power average)	
				[dBm]	[mW]		[dBm]	[mW]
2412	1.24	2.28	9.91	13.43	22.03	0.00	13.43	22.03
2437	1.17	2.29	9.91	13.37	21.73	0.00	13.37	21.73
2462	1.25	2.31	9.91	13.47	22.23	0.00	13.47	22.23

11ax-20(OFDM)

Average power MCS 2 (worst)

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result (Time average)		Duty factor [dB]	Result (Burst power average)	
				[dBm]	[mW]		[dBm]	[mW]
2412	1.28	2.28	9.91	13.47	22.23	0.00	13.47	22.23
2437	1.16	2.29	9.91	13.36	21.68	0.00	13.36	21.68
2462	1.21	2.31	9.91	13.43	22.03	0.00	13.43	22.03

Sample Calculation:

Result (Time average) = Reading + Cable Loss (including the cable(s) customer supplied) + Attenuator Loss

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

Average Output Power (Reference data for RF Exposure)

Test place	Shonan EMC Lab. No.5 Shielded Room
Date	August 19, 2024
Temperature / Humidity	24 deg. C / 55 % RH
Engineer	Shiro Kobayashi
Mode	Tx

11ax-20, RU Type: 26-tone RU

Average power

Freq. [MHz]	RU Index	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result (Time average)		Result (Burst power average)	
					[dBm]	[mW]	[dBm]	[mW]
2412	0	-4.97	2.28	9.91	7.22	5.27	7.22	5.27
	4	-5.34	2.28	9.91	6.85	4.84	6.85	4.84
	8	-4.83	2.28	9.91	7.36	5.45	7.36	5.45
2437	0	-5.01	2.29	9.91	7.19	5.24	7.19	5.24
	4	-5.42	2.29	9.91	6.78	4.76	6.78	4.76
	8	-4.97	2.29	9.91	7.23	5.28	7.23	5.28
2462	0	-4.94	2.31	9.91	7.28	5.35	7.28	5.35
	4	-5.49	2.31	9.91	6.73	4.71	6.73	4.71
	8	-5.14	2.31	9.91	7.08	5.11	7.08	5.11

11ax-20, RU Type: 52-tone RU

Average power

Freq. [MHz]	RU Index	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result (Time average)		Result (Burst power average)	
					[dBm]	[mW]	[dBm]	[mW]
2412	37	-2.12	2.28	9.91	10.07	10.16	10.07	10.16
	38	-2.24	2.28	9.91	9.95	9.89	9.95	9.89
	40	-1.86	2.28	9.91	10.33	10.79	10.33	10.79
2437	37	-1.87	2.29	9.91	10.33	10.79	10.33	10.79
	38	-2.04	2.29	9.91	10.16	10.38	10.16	10.38
	40	-1.80	2.29	9.91	10.40	10.96	10.40	10.96
2462	37	-1.83	2.31	9.91	10.39	10.94	10.39	10.94
	38	-2.08	2.31	9.91	10.14	10.33	10.14	10.33
	40	-1.95	2.31	9.91	10.27	10.64	10.27	10.64

Sample Calculation:

Result (Time average) = Reading + Cable Loss (including the cable(s) customer supplied) + Attenuator Loss

Result (Burst power average) = Result (Time average)

Average Output Power (Reference data for RF Exposure)

Test place	Shonan EMC Lab. No.5 Shielded Room
Date	August 19, 2024
Temperature / Humidity	24 deg. C / 55 % RH
Engineer	Shiro Kobayashi
Mode	Tx

11ax-20, RU Type: 106-tone RU

Average power

Freq. [MHz]	RU Index	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result (Time average)		Result (Burst power average)	
					[dBm]	[mW]	[dBm]	[mW]
2412	53	0.97	2.28	9.91	13.16	20.70	13.16	20.70
	54	1.04	2.28	9.91	13.23	21.04	13.23	21.04
2437	53	1.02	2.29	9.91	13.22	20.99	13.22	20.99
	54	0.90	2.29	9.91	13.10	20.42	13.10	20.42
2462	53	1.07	2.31	9.91	13.29	21.33	13.29	21.33
	54	0.93	2.31	9.91	13.15	20.65	13.15	20.65

11ax-20, RU Type: 242-tone RU

Average power

Freq. [MHz]	RU Index	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result (Time average)		Result (Burst power average)	
					[dBm]	[mW]	[dBm]	[mW]
2412	61	1.19	2.28	9.91	13.38	21.78	13.38	21.78
2437	61	1.18	2.29	9.91	13.38	21.78	13.38	21.78
2462	61	1.18	2.31	9.91	13.40	21.88	13.40	21.88

Sample Calculation:

Result (Time average) = Reading + Cable Loss (including the cable(s) customer supplied) + Attenuator Loss

Result (Burst power average) = Result (Time average)

Average Output Power (Reference data for RF Exposure)

Test place	Shonan EMC Lab. No.5 Shielded Room
Date	July 27, 2024
Temperature / Humidity	25 deg. C / 40 % RH
Engineer	Miku Ikudome
Mode	Tx

BT LE 1M-PHY Average power

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result (Time average)		Duty factor [dB]	Result (Burst power average)	
				[dBm]	[mW]		[dBm]	[mW]
2402	-9.44	2.28	10.05	2.89	1.95	1.77	4.66	2.92
2440	-9.72	2.29	10.05	2.62	1.83	1.77	4.39	2.75
2480	-9.61	2.31	10.05	2.75	1.88	1.77	4.52	2.83

BT LE 2M-PHY Average power

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result (Time average)		Duty factor [dB]	Result (Burst power average)	
				[dBm]	[mW]		[dBm]	[mW]
2402	-12.25	2.28	10.05	0.08	1.02	4.28	4.36	2.73
2440	-12.53	2.29	10.05	-0.19	0.96	4.28	4.09	2.56
2480	-12.39	2.31	10.05	-0.03	0.99	4.28	4.25	2.66

Sample Calculation:

Result (Time average) = Reading + Cable Loss (including the cable(s) customer supplied) + Attenuator Loss

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

APPENDIX 2: Test Instruments

Test Equipment

Test Item	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Cal Int
AT	145111	Digital Tester	SANWA	PC500	7019232	2023/09/25	12
AT	146212	Digital Hitester	HIOKI E.E. CORPORATION	3805-50	80997828	2023/09/25	12
AT	146247	Power Meter	Keysight Technologies Inc	8990B	MY51000272	2024/05/14	12
AT	146310	Power sensor	Keysight Technologies Inc	N1923A	MY5326009	2024/05/14	12
AT	169910	Power Meter	Keysight Technologies Inc	8990B	MY51000448	2023/09/28	12
AT	169911	Power sensor	Keysight Technologies Inc	N1923A	MY57270004	2023/09/28	12
AT	169912	Power sensor	Keysight Technologies Inc	N1923A	MY57290005	2023/09/28	12
AT	191845	Thermo-Hygrometer	CUSTOM. Inc	CTH-201	-	2023/08/07	12
AT	204926	Attenuator	Weinschel Corp.	54A-10	109971	2024/02/14	12
AT	239652	Coaxial Cable	Huber+Suhner	SUCOFLEX 102	2001220/2	2023/08/22	12
AT	239653	Coaxial Cable	Huber+Suhner	SUCOFLEX 102	2001221/2	2023/08/22	12
AT	242067	Attenuator	Weinschel Corp.	54A-10	120523	2023/11/02	12
AT	242068	Attenuator	Weinschel Corp.	54A-10	120524	2023/11/02	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