

RADIO TEST REPORT

Test Report No.: 14809943H-D

Customer	Panasonic Corporation of North America
Description of EUT	Radio Module (Tested inside of Panasonic Personal Computer FZ-40)
Model Number of EUT	WW21A
FCC ID	ACJ9TGW21A
Test Regulation	FCC Part 27
Test Result	Complied
Issue Date	June 16, 2023
Remarks	For Permissive change Spurious Emission (Radiated) test only

Representative test engineerTetsuro Yoshida
Engineer**Approved by**Takayuki Shimada
Leader

CERTIFICATE 5107.02

- ☐ 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".

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- This test report covers Radio technical requirements.
It does not cover administrative issues such as Manual or non-Radio test related Requirements. (if applicable)
- The all test items in this test report are conducted by UL Japan, Inc. Ise EMC Lab.
- The opinions and the interpretations to the result of the description in this report are outside scopes where UL Japan, Inc. has been accredited.
- 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.: 14809943H-D

Revision	Test Report No.	Date	Page Revised Contents
- (Original)	14809943H-D	June 16, 2023	-

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	P/M	Power meter
CISPR	Comite International Special des Perturbations Radioelectriques	PCB	Printed Circuit Board
CW	Continuous Wave	PER	Packet Error Rate
DBPSK	Differential BPSK	PHY	Physical Layer
DC	Direct Current	PK	Peak
D-factor	Distance factor	PN	Pseudo random Noise
DFS	Dynamic Frequency Selection	PRBS	Pseudo-Random Bit Sequence
DQPSK	Differential QPSK	PSD	Power Spectral Density
DSSS	Direct Sequence Spread Spectrum	QAM	Quadrature Amplitude Modulation
EDR	Enhanced Data Rate	QP	Quasi-Peak
EIRP, e.i.r.p.	Equivalent Isotropically Radiated Power	QPSK	Quadri-Phase Shift Keying
EMC	ElectroMagnetic Compatibility	RBW	Resolution Band Width
EMI	ElectroMagnetic Interference	RDS	Radio Data System
EN	European Norm	RE	Radio Equipment
ERP, e.r.p.	Effective Radiated Power	RF	Radio Frequency
EU	European Union	RMS	Root Mean Square
EUT	Equipment Under Test	RSS	Radio Standards Specifications
Fac.	Factor	Rx	Receiving
FCC	Federal Communications Commission	SA, S/A	Spectrum Analyzer
FHSS	Frequency Hopping Spread Spectrum	SAR	Specific Absorption Rate
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
ICES	Interference-Causing Equipment Standard	-	-

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SECTION 1: Customer information

Company Name	Panasonic Corporation of North America
Address	Two Riverfront Plaza, 9th Floor Newark, NEW JERSEY, 07102-5940, USA
Telephone Number	+1-201-348-7760
Contact Person	Ben Botros

***Remarks:**

Panasonic Connect Co., Ltd. is on behalf of the applicant: Panasonic Corporation of North America (Company incorporated abroad).

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	Radio Module
Model Number	WW21A
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	May 22, 2023
Test Date	May 31 to June 1, 2023

<Information of Host device>

Type	Personal Computer FZ-40 Intel Core i7-1185G7 (1.2 GHz, Max 4.8 GHz) 14 inch LCD (1920 x 1080)
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2.2 Product Description

General Specification

Rating	DC 3.0 V to 3.6 V
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Radio Specification

Wireless technology	Dup.	Band	Mode
WCDMA	FDD		2 UMTS Rel. 99 (Data) HSDPA (Rel. 5)
	FDD		4 HSUPA (Rel. 6), HSPA+ (Rel. 7), DC-HSDPA (Rel. 8)
	FDD		5
LTE	FDD		2 QPSK, 16QAM, 64QAM, 256QAM
	FDD		4
	FDD		5 Downlink MIMO Support: Yes(2x2, 4x4)
	FDD		7 Supported band : B2, B4, B7, B25, B38, B41, B42, B48, B66
	FDD		12
	FDD		13 Uplink MIMO Support: No
	FDD		14 Uplink transmission is limited to a single output stream.
	FDD		17
	FDD		25
	FDD		26
	FDD(Rx only)		29
	TDD		38
	TDD		41
	TDD		42
	TDD(Rx only)		46
	TDD		48
	FDD		66
	FDD		71
LTE CA	Downlink		Uplink
	Maximum 7 carriers		*B42: not used in US (FCC) / B48: not used in Canada(ISED)
5G NR (FR1)	FDD	15 kHz	n2 Pi/2 BPSK (DFT-s-OFDM),
	FDD	15 kHz	n5 QPSK (CP-OFDM/DFT-s-OFDM),
	TDD	15 kHz	n41 16QAM (CP-OFDM/DFT-s-OFDM),
	FDD	15 kHz	n66 64QAM (CP-OFDM/DFT-s-OFDM),
	FDD	15 kHz	n71 256QAM (CP-OFDM/DFT-s-OFDM)
	TDD	30 kHz	n77 Downlink MIMO Support: Yes(2x2, 4x4)
	TDD	30 kHz	n78 Supported band : n2, n41, n66, n77, n78
	-	-	- Uplink MIMO Support: No
	-	-	- Uplink transmission is limited to a single output stream.
EN-DC(LTE-FR1 Sub6) (NSA mode only)	Supported combination		*n78: not used in US (FCC)
	LTE Anchor Bands for NR band n2		LTE Band 5/12/13
	LTE Anchor Bands for NR band n5		LTE Band 2/7/66
	LTE Anchor Bands for NR band n41		LTE Band 2/25/26/66
	LTE Anchor Bands for NR band n66		LTE Band 5/12/13/14/71
	LTE Anchor Bands for NR band n71		LTE Band 2/7/66
	LTE Anchor Bands for NR band n77		LTE Band 41
	LTE Anchor Bands for NR band n78*		LTE Band 2/5/7/12/38/66

*This test report applies to Sub6 n77 part only.

SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification	FCC Part 27 The latest version on the first day of the testing period
Title	FCC 47CFR Part 27 MISCELLANEOUS WIRELESS COMMUNICATIONS SERVICES Subpart C Technical Standards

3.2 Procedures and results

Item	Test Specification & Procedure	Worst margin	Results	Remarks
Spurious Emission (Radiated)	FCC 2.1053 FCC 27.53	10.8 dB 3700.000 MHz Horizontal, AV	Complied	Radiated
Note: UL Japan's EMI Work Procedures No. 13-EM-W0420 *These tests were also referred to ANSI/C63.26:2015 "American National Standard for Compliance Testing of Transmitters Used in the Licensed Radio Services". *These tests were also referred to KDB 971168 D01 "Power Meas License Digital Systems v03r01", KDB 971168 D02 "Misc Rev Approv License Devices v02r01" and KDB 442401.				

3.3 Addition to Standard

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 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.

Radiated emission

Calculated Emission				
Measurement distance	Frequency range		Unit	Calculated Uncertainty (+/-)
3 m	9 kHz to 30 MHz		dB	3.3
10 m			dB	3.1
3 m	30 MHz to 200 MHz	(Horizontal)	dB	4.8
		(Vertical)	dB	5.0
	200 MHz to 1000 MHz	(Horizontal)	dB	5.1
		(Vertical)	dB	6.2
10 m	30 MHz to 200 MHz	(Horizontal)	dB	4.8
		(Vertical)	dB	4.8
	200 MHz to 1000 MHz	(Horizontal)	dB	4.9
		(Vertical)	dB	5.0
3 m	1 GHz to 6 GHz		dB	4.9
	6 GHz to 18 GHz		dB	5.2
1 m	10 GHz to 26.5 GHz		dB	5.5
	26.5 GHz to 40 GHz		dB	5.4
10 m	1 GHz to 18 GHz		dB	5.3

3.5 Test Location

UL Japan, Inc. Ise EMC Lab.

4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 Japan

Telephone: +81-596-24-8999

A2LA Certificate Number: 5107.02 / FCC Test Firm Registration Number: 884919

ISED Lab Company Number: 2973C / CAB identifier: JP0002

Test site	Width x Depth x Height (m)	Size of reference ground plane (m) / horizontal conducting plane	Other rooms	Maximum measurement distance
No.1 semi-anechoic chamber	19.2 x 11.2 x 7.7	7.0 x 6.0	No.1 Power source room	10 m
No.2 semi-anechoic chamber	7.5 x 5.8 x 5.2	4.0 x 4.0	-	3 m
No.3 semi-anechoic chamber	12.0 x 8.5 x 5.9	6.8 x 5.75	No.3 Preparation room	3 m
No.3 shielded room	4.0 x 6.0 x 2.7	N/A	-	-
No.4 semi-anechoic chamber	12.0 x 8.5 x 5.9	6.8 x 5.75	No.4 Preparation room	3 m
No.4 shielded room	4.0 x 6.0 x 2.7	N/A	-	-
No.5 semi-anechoic chamber	6.0 x 6.0 x 3.9	6.0 x 6.0	-	-
No.5 measurement room	6.4 x 6.4 x 3.0	6.4 x 6.4	-	-
No.6 shielded room	4.0 x 4.5 x 2.7	4.0 x 4.5	-	-
No.6 measurement room	4.75 x 5.4 x 3.0	4.75 x 4.15	-	-
No.7 shielded room	4.7 x 7.5 x 2.7	4.7 x 7.5	-	-
No.8 measurement room	3.1 x 5.0 x 2.7	3.1 x 5.0	-	-
No.9 measurement room	8.8 x 4.6 x 2.8	2.4 x 2.4	-	-
No.10 shielded room	3.8 x 2.8 x 2.8	3.8 x 2.8	-	-
No.11 measurement room	4.0 x 3.4 x 2.5	N/A	-	-
No.12 measurement room	2.6 x 3.4 x 2.5	N/A	-	-
Large Chamber	16.9 x 22.1 x 10.17	16.9 x 22.1	-	10 m
Small Chamber	5.3 x 6.69 x 3.59	5.3 x 6.69	-	-

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) for 5G NR

<5G NR Band n77> (Part 27: For mobile operations in the 3450-3550 MHz band)

Test Item	Operating mode	Power Control	NR Band	Bandwidth (MHz)	Tested Frequency (MHz)			RB Allocation / Offset	OFDM	Modulation
					Low	Mid	High			
Spurious Emission (Radiated)	Transmitting	MAX	n77	100	3500.01			1RB / Low, DFT-s-OFDM, 64QAM		
*All modes of operation were investigated and the worst case emissions were reported with the modulation, RB sizes and offsets, and channel bandwidth configurations.										

<5G NR Band n77> (Part 27: For mobile operations in the 3700-3980 MHz band)

Test Item	Operating mode	Power Control	NR Band	Bandwidth (MHz)	Tested Frequency (MHz)			RB Allocation / Offset	OFDM	Modulation
					Low	Mid	High			
Spurious Emission (Radiated)	Transmitting	MAX	n77	100	3750.00	3840.00	3930.00	1RB / Low, DFT-s-OFDM, 64QAM		
*All modes of operation were investigated and the worst case emissions were reported with the modulation, RB sizes and offsets, and channel bandwidth configurations.										

*Power of the EUT was set by the software as follows;

Power settings : Sub6: 23.5 dBm

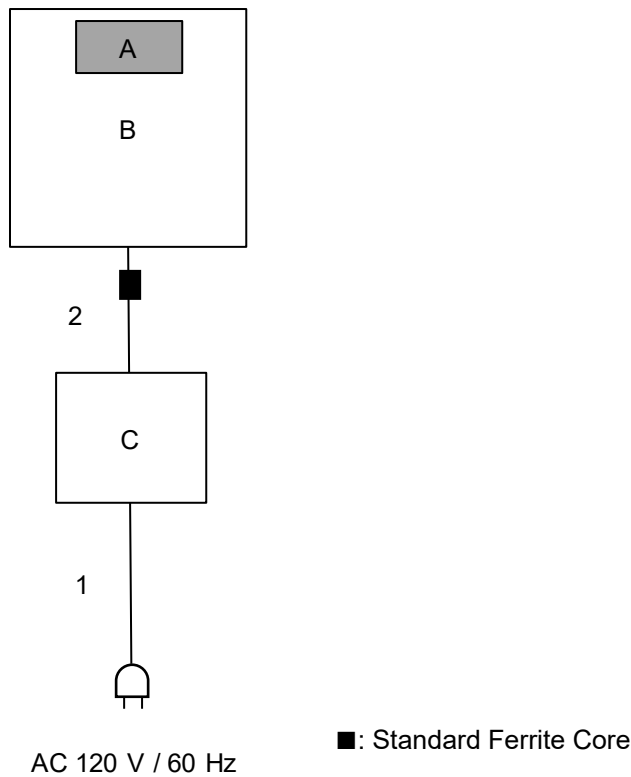
Software : Qualcomm Radio Control Toolkit (Ver.4.0)

*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.

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	Remarks
A	Radio Module	WW21A	*1)	Panasonic Connect Co., Ltd.	EUT
B	Personal Computer	FM-211DVT3D3 *2)	1LTSA00081	Panasonic Connect Co., Ltd.	-
C	AC Adaptor	CF-AA5713A M7	5713AM7209006862WB	Panasonic Connect Co., Ltd.	-

*1) This item is controlled with B: Personal Computer.

*2) Marketing model number is FZ-40.

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	AC Cable	2.0	Unshielded	Unshielded	-
2	DC Cable	1.5	Unshielded	Unshielded	-

SECTION 5: Spurious Emission

§ 27.53 Emission limits.

(l)(2) For mobile operations in the 3700-3980 MHz band, the conducted power of any emission outside the licensee's authorized bandwidth shall not exceed -13 dBm/MHz. Compliance with this paragraph (l)(2) is based on the use of measurement instrumentation employing a resolution bandwidth of 1 megahertz or greater. However, in the 1 megahertz bands immediately outside and adjacent to the licensee's frequency block, the minimum resolution bandwidth for the measurement shall be either one percent of the emission bandwidth of the fundamental emission of the transmitter or 350 kHz. In the bands between 1 and 5 MHz removed from the licensee's frequency block, the minimum resolution bandwidth for the measurement shall be 500 kHz. The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

(n)(2) For mobile operations in the 3450-3550 MHz band, the conducted power of any emission outside the licensee's authorized bandwidth shall not exceed -13 dBm/MHz. Compliance with this paragraph (n)(2) is based on the use of measurement instrumentation employing a resolution bandwidth of 1 megahertz or greater. However, in the 1 megahertz bands immediately outside and adjacent to the licensee's frequency block, a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed, but limited to a maximum of 200 kHz. In the bands between 1 and 5 MHz removed from the licensee's frequency block, the minimum resolution bandwidth for the measurement shall be 500 kHz. The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

[Radiated: Spurious Emission]

[For 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.

[For 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.

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.

Test antenna was aimed at the EUT for receiving the maximum signal and always kept within the illumination area of the 3 dB beam width of the antenna.

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

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

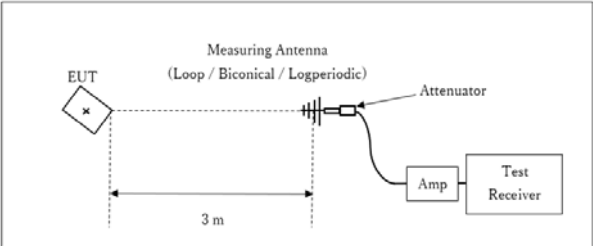
- The carrier level and noise levels were confirmed at each position of X, Y and Z axes of EUT to see the position of maximum noise, and the test was made at the position that has the maximum noise.

Setting of the spectrum analyzer:

Frequency	PK	AV
Below 1 GHz	RBW 100 kHz, VBW 300 kHz	-
Above 1 GHz	RBW 1 MHz, VBW 3 MHz	RBW 1 MHz, VBW 3 MHz, RMS Pave 100 trace

Figure 2: Test Setup

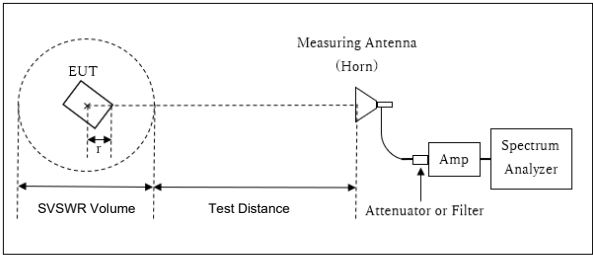
Below 1 GHz



x : Center of turn table

Test Distance: 3 m

1 GHz to 10 GHz

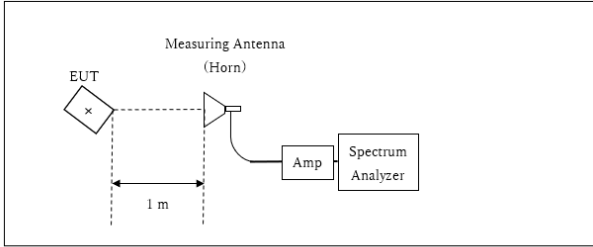


r : Radius of an outer periphery of EUT
x : Center of turn table

Distance Factor: $20 \times \log (3.8 \text{ m} / 3.0 \text{ m}) = 2.06 \text{ dB}$
* Test Distance: $(3 + \text{SVSWR Volume} / 2) - r = 3.8 \text{ m}$

SVSWR Volume : 4.0 m
(SVSWR Volume has been calibrated based on CISPR 16-1-4.)
 $r = 0.2 \text{ m}$

10 GHz to 40 GHz



x : Center of turn table

Distance Factor: $20 \times \log (1.0 \text{ m} / 3.0 \text{ m}) = -9.5 \text{ dB}$
*Test Distance: 1 m

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

APPENDIX 1: Test data

Spurious Emission (Radiated)

Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.3	No.3	No.3
Date	May 31, 2023	May 31, 2023	June 1, 2023
Temperature / Humidity	22 deg. C / 66 % RH	22 deg. C / 66 % RH	21 deg. C / 67 % RH
Engineer	Tetsuro Yoshida	Kiyoshiro Okazaki	Tetsuro Yoshida
	(1 GHz – 10 GHz)	(10 GHz – 40 GHz)	(Below 1 GHz)
Mode	NR Band n77, 3500.01 MHz, BW 100 MHz, 64QAM, 1RB Start0		

Part 27: For mobile operations in the 3450-3550 MHz band

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	EIRP [dBm]	ERP [dBm]	Limit [dBm]	Margin [dB]	Remark
Hori.	39.010	PK	29.3	15.2	7.2	32.2	19.5	-75.8	-77.9	-13.0	64.9	Floor noise
Hori.	50.265	PK	30.4	11.1	7.4	32.2	16.7	-78.5	-80.7	-13.0	67.7	Floor noise
Hori.	79.350	PK	30.1	6.8	7.8	32.1	12.6	-82.7	-84.8	-13.0	71.8	Floor noise
Hori.	84.850	PK	29.9	7.6	7.9	32.1	13.3	-82.0	-84.1	-13.0	71.1	Floor noise
Hori.	288.001	PK	31.1	13.7	9.9	32.0	22.7	-72.5	-74.7	-13.0	61.7	
Hori.	593.725	PK	28.9	19.2	12.0	32.0	28.1	-67.1	-69.3	-13.0	56.3	Floor noise
Hori.	6902.040	PK	43.7	34.9	9.3	32.2	55.7	-39.6	-41.7	-13.0	28.7	Floor noise
Hori.	10353.060	PK	50.0	40.0	-2.2	33.1	54.6	-40.6	-42.8	-13.0	29.8	
Hori.	13804.080	PK	45.8	41.9	-1.1	32.3	54.4	-40.9	-43.0	-13.0	30.0	Floor noise
Hori.	17255.100	PK	45.9	43.1	0.2	32.3	56.9	-38.4	-40.5	-13.0	27.5	Floor noise
Hori.	3450.000	AV	63.2	28.6	5.2	31.9	65.1	-30.2	-32.3	-13.0	19.3	
Hori.	3550.000	AV	19.3	29.0	5.3	31.9	21.7	-73.6	-75.7	-13.0	62.7	Floor noise
Vert.	39.010	PK	32.2	15.2	7.2	32.2	22.5	-72.8	-74.9	-13.0	61.9	
Vert.	50.265	PK	36.6	11.1	7.4	32.2	23.0	-72.3	-74.4	-13.0	61.4	
Vert.	79.350	PK	39.6	6.8	7.8	32.1	22.1	-73.2	-75.3	-13.0	62.3	
Vert.	84.850	PK	39.3	7.6	7.9	32.1	22.7	-72.5	-74.7	-13.0	61.7	
Vert.	288.001	PK	32.7	13.7	9.9	32.0	24.3	-70.9	-73.1	-13.0	60.1	
Vert.	593.725	PK	28.9	19.2	12.0	32.0	28.2	-67.1	-69.3	-13.0	56.3	Floor noise
Vert.	6902.040	PK	43.7	34.9	9.3	32.2	55.7	-39.6	-41.7	-13.0	28.7	Floor noise
Vert.	10353.060	PK	50.2	40.0	-2.2	33.1	54.8	-40.4	-42.6	-13.0	29.6	
Vert.	13804.080	PK	46.2	41.9	-1.1	32.3	54.7	-50.1	-52.2	-13.0	39.2	Floor noise
Vert.	17255.100	PK	45.9	43.1	0.2	32.3	56.9	-47.9	-50.1	-13.0	37.1	Floor noise
Vert.	3450.000	AV	64.4	28.6	5.2	31.9	66.4	-38.4	-40.6	-13.0	27.6	
Vert.	3550.000	AV	19.1	29.0	5.3	31.9	21.5	-83.3	-85.4	-13.0	72.4	Floor noise

Result (E) = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)

EIRP = E + 20*log(D) -104.8

ERP =EIRP -2.15

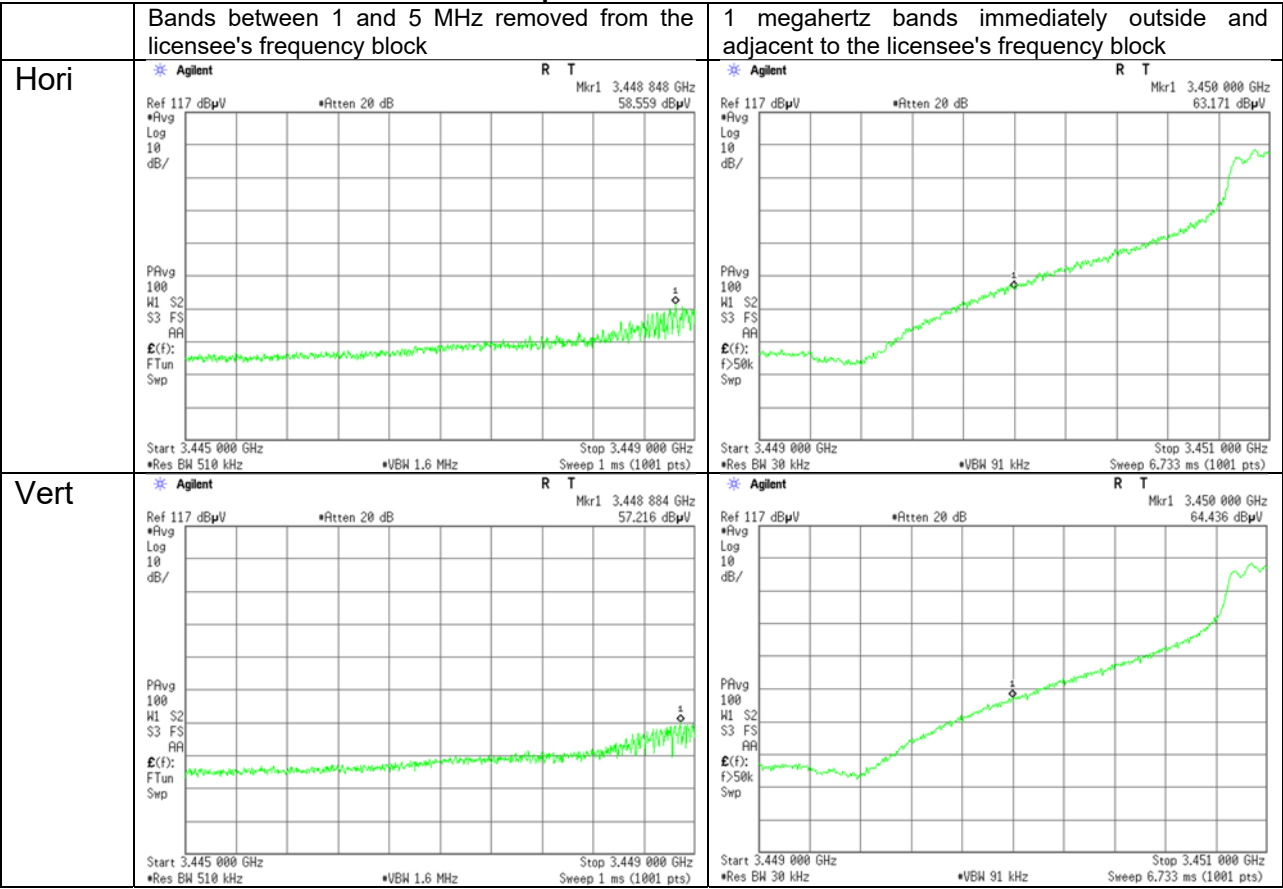
*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

Distance factor: 1 GHz - 10 GHz 20log (3.8 m / 3.0 m) = 2.06 dB
10 GHz - 40 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

Spurious Emission (Radiated)
(Reference Plot for band-edge)

Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.3
Date	May 31, 2023
Temperature / Humidity	22 deg. C / 66 % RH
Engineer	Tetsuro Yoshida
	(1 GHz - 10 GHz)
Mode	NR Band n77, 3500.01 MHz, BW 100 MHz, 64QAM, 1RB Start0

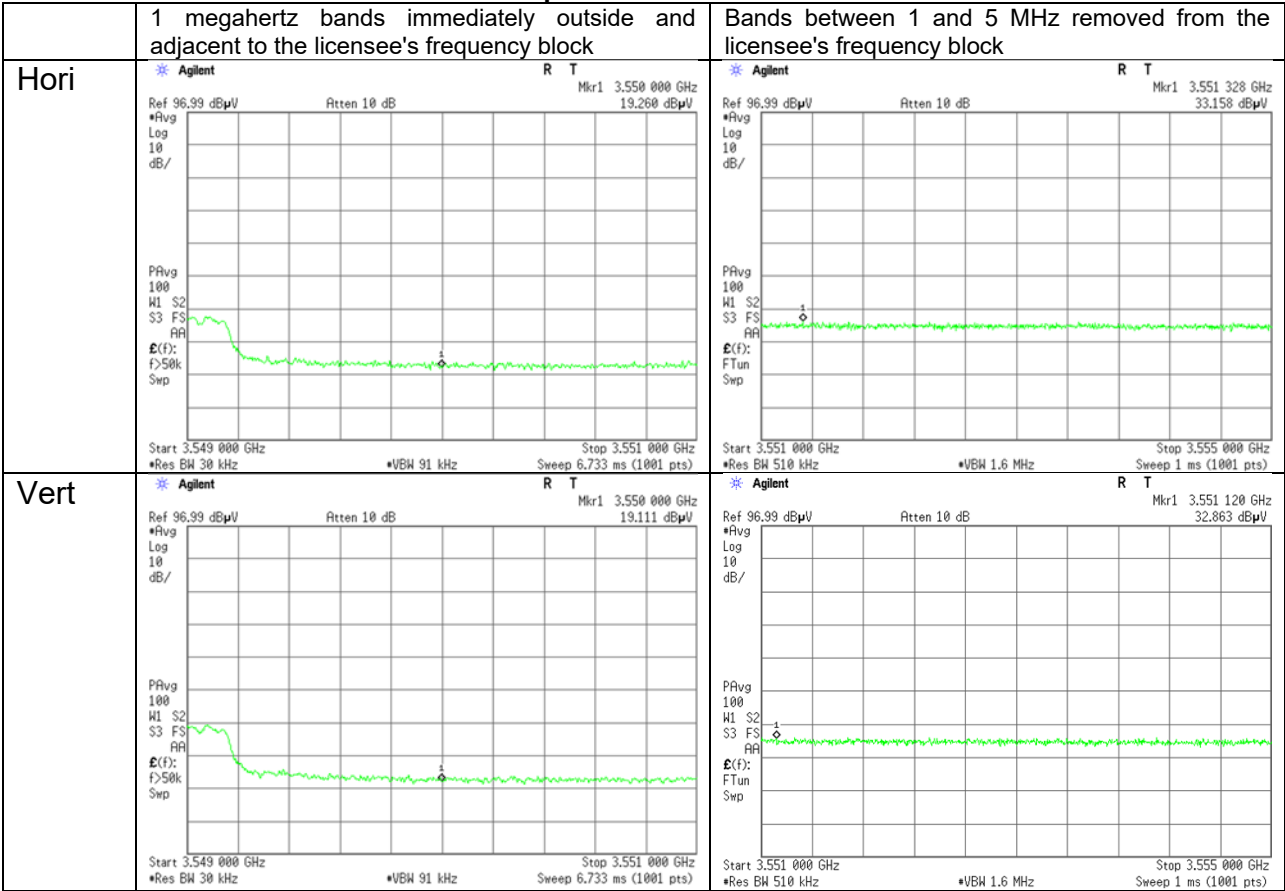
Part 27: For mobile operations in the 3450-3550 MHz band



Spurious Emission (Radiated)
(Reference Plot for band-edge)

Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.3
Date	June 12, 2023
Temperature / Humidity	21 deg. C / 62 % RH
Engineer	Tetsuro Yoshida
	(1 GHz - 10 GHz)
Mode	NR Band n77, 3500.01 MHz, BW 100 MHz, 64QAM, 1RB Start0

Part 27: For mobile operations in the 3450-3550 MHz band



Spurious Emission (Radiated)

Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.3	No.3	No.3
Date	May 31, 2023	May 31, 2023	June 1, 2023
Temperature / Humidity	22 deg. C / 66 % RH	22 deg. C / 66 % RH	21 deg. C / 67 % RH
Engineer	Tetsuro Yoshida (1 GHz - 10 GHz)	Kiyoshiro Okazaki (10 GHz - 40 GHz)	Tetsuro Yoshida (Below 1 GHz)
Mode	NR Band n77, 3750 MHz, BW 100 MHz, 64QAM, 1RB Start0		

Part 27: For mobile operations in the 3700-3980 MHz band

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	EIRP [dBm]	ERP [dBm]	Limit [dBm]	Margin [dB]	Remark
Hori.	39.010	PK	29.3	15.2	7.2	32.2	19.5	-75.8	-77.9	-13.0	64.9	Floor noise
Hori.	50.265	PK	30.4	11.1	7.4	32.2	16.7	-78.5	-80.7	-13.0	67.7	Floor noise
Hori.	79.350	PK	30.1	6.8	7.8	32.1	12.6	-82.7	-84.8	-13.0	71.8	Floor noise
Hori.	84.850	PK	29.9	7.6	7.9	32.1	13.3	-82.0	-84.1	-13.0	71.1	Floor noise
Hori.	288.001	PK	31.5	13.7	9.9	32.0	23.1	-72.1	-74.3	-13.0	61.3	
Hori.	593.725	PK	28.9	19.2	12.0	32.0	28.1	-67.1	-69.3	-13.0	56.3	Floor noise
Hori.	7402.040	PK	43.2	36.2	9.0	32.4	56.0	-39.2	-41.4	-13.0	28.4	Floor noise
Hori.	14804.080	PK	45.5	39.7	-0.3	32.1	52.8	-42.5	-44.6	-13.0	31.6	Floor noise
Hori.	18505.100	PK	60.5	37.6	0.5	32.2	66.4	-28.9	-31.0	-13.0	18.0	
Hori.	3700.000	AV	70.7	29.4	5.4	31.8	73.6	-21.7	-23.8	-13.0	10.8	
Hori.	11103.060	AV	64.1	39.9	-2.0	33.2	68.8	-26.4	-28.6	-13.0	15.6	
Vert.	39.010	PK	32.2	15.2	7.2	32.2	22.5	-72.8	-74.9	-13.0	61.9	
Vert.	50.265	PK	36.3	11.1	7.4	32.2	22.7	-72.6	-74.7	-13.0	61.7	
Vert.	79.350	PK	39.5	6.8	7.8	32.1	22.0	-73.3	-75.4	-13.0	62.4	
Vert.	84.850	PK	39.8	7.6	7.9	32.1	23.2	-72.1	-74.2	-13.0	61.2	
Vert.	288.001	PK	32.4	13.7	9.9	32.0	24.0	-71.2	-73.4	-13.0	60.4	
Vert.	593.725	PK	28.9	19.2	12.0	32.0	28.2	-67.1	-69.3	-13.0	56.3	Floor noise
Vert.	7402.040	PK	43.2	36.2	9.0	32.4	56.0	-39.2	-41.4	-13.0	28.4	Floor noise
Vert.	14804.080	PK	45.1	39.7	-0.3	32.1	52.4	-42.9	-45.0	-13.0	32.0	Floor noise
Vert.	18505.100	PK	60.1	37.6	0.5	32.2	66.0	-29.2	-31.4	-13.0	18.4	
Vert.	3700.000	AV	72.1	29.4	5.4	31.8	75.0	-29.8	-31.9	-13.0	18.9	
Vert.	11103.060	AV	60.0	39.9	-2.0	33.2	64.8	-40.1	-42.2	-13.0	29.2	

Result (E) = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)

EIRP = E + 20*log(D) -104.8

ERP =EIRP -2.15

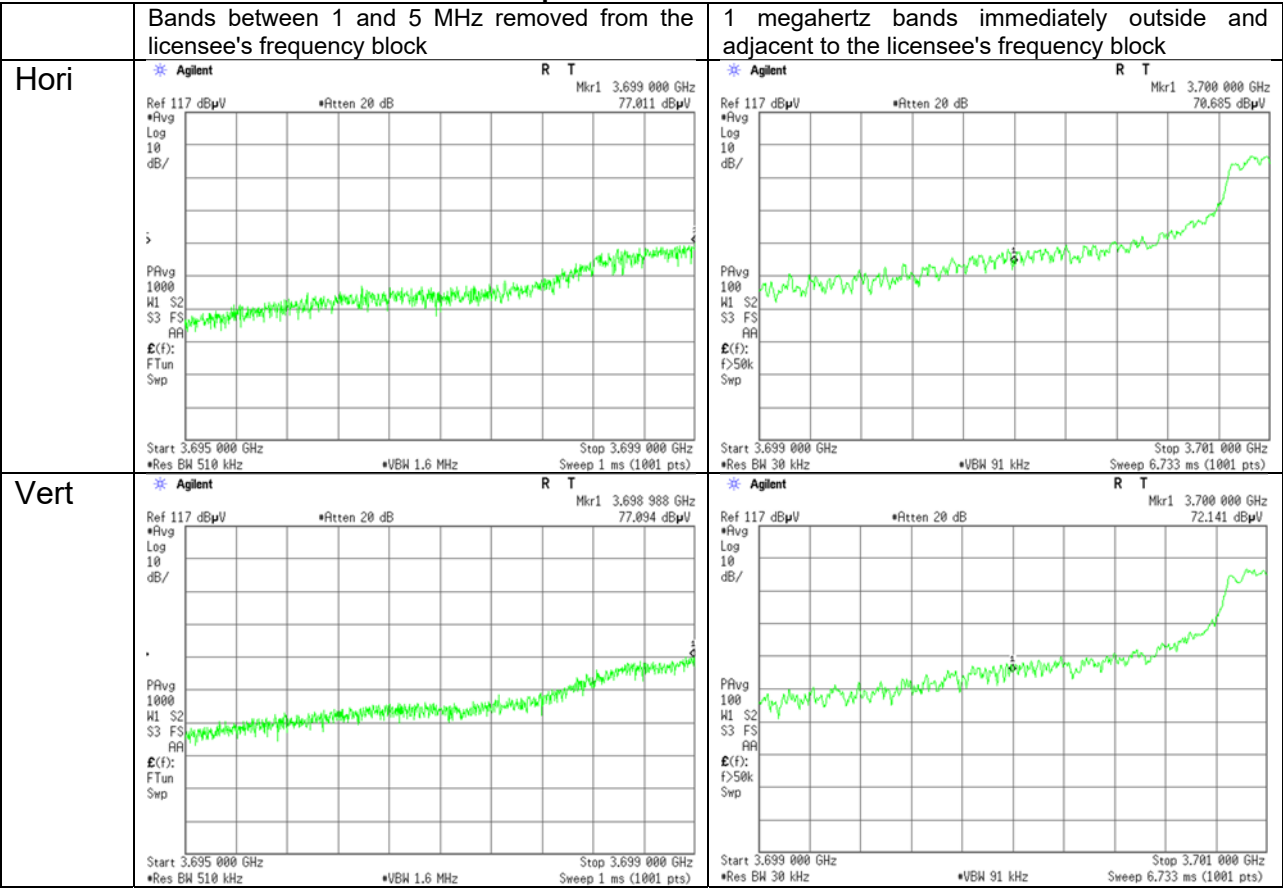
*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

Distance factor: 1 GHz - 10 GHz 20log (3.8 m / 3.0 m) = 2.06 dB
 10 GHz - 40 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

Spurious Emission (Radiated)
(Reference Plot for band-edge)

Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.3
Date	May 31, 2023
Temperature / Humidity	22 deg. C / 66 % RH
Engineer	Tetsuro Yoshida
	(1 GHz - 10 GHz)
Mode	NR Band n77, 3750 MHz, BW 100 MHz, 64QAM, 1RB Start0

Part 27: For mobile operations in the 3700-3980 MHz band



Spurious Emission (Radiated)

Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.3	No.3	No.3
Date	May 31, 2023	May 31, 2023	June 1, 2023
Temperature / Humidity	22 deg. C / 66 % RH	22 deg. C / 66 % RH	21 deg. C / 67 % RH
Engineer	Tetsuro Yoshida (1 GHz - 10 GHz)	Kiyoshiro Okazaki (10 GHz - 40 GHz)	Tetsuro Yoshida (Below 1 GHz)
Mode	NR Band n77, 3840 MHz, BW 100 MHz, 64QAM, 1RB Start0		

Part 27: For mobile operations in the 3700-3980 MHz band

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	AntFac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	EIRP [dBm]	ERP [dBm]	Limit [dBm]	Margin [dB]	Remark
Hori.	39.010	PK	29.3	15.2	7.2	32.2	19.5	-75.8	-77.9	-13.0	64.9	Floor noise
Hori.	50.265	PK	30.4	11.1	7.4	32.2	16.7	-78.5	-80.7	-13.0	67.7	Floor noise
Hori.	79.350	PK	30.1	6.8	7.8	32.1	12.6	-82.7	-84.8	-13.0	71.8	Floor noise
Hori.	84.850	PK	29.9	7.6	7.9	32.1	13.3	-82.0	-84.1	-13.0	71.1	Floor noise
Hori.	288.001	PK	31.4	13.7	9.9	32.0	23.0	-72.2	-74.4	-13.0	61.4	
Hori.	593.725	PK	28.9	19.2	12.0	32.0	28.1	-67.1	-69.3	-13.0	56.3	Floor noise
Hori.	7582.040	PK	44.7	36.1	9.0	32.5	57.3	-37.9	-40.1	-13.0	27.1	Floor noise
Hori.	11373.060	PK	44.4	40.1	-1.9	33.1	49.5	-45.7	-47.9	-13.0	34.9	Floor noise
Hori.	15164.080	PK	45.5	38.3	0.0	32.1	51.7	-43.6	-45.7	-13.0	32.7	Floor noise
Vert.	39.010	PK	32.1	15.2	7.2	32.2	22.4	-72.9	-75.0	-13.0	62.0	
Vert.	50.265	PK	36.6	11.1	7.4	32.2	23.0	-72.3	-74.5	-13.0	61.5	
Vert.	79.350	PK	39.1	6.8	7.8	32.1	21.6	-73.6	-75.8	-13.0	62.8	
Vert.	84.850	PK	39.5	7.6	7.9	32.1	22.9	-72.4	-74.5	-13.0	61.5	
Vert.	288.001	PK	32.3	13.7	9.9	32.0	23.9	-71.3	-73.5	-13.0	60.5	
Vert.	593.725	PK	28.9	19.2	12.0	32.0	28.2	-67.1	-69.3	-13.0	56.3	Floor noise
Vert.	7582.040	PK	44.7	36.1	9.0	32.5	57.4	-37.9	-40.0	-13.0	27.0	Floor noise
Vert.	11373.060	PK	44.4	40.1	-1.9	33.1	49.5	-45.7	-47.9	-13.0	34.9	Floor noise
Vert.	15164.080	PK	45.7	38.3	0.0	32.1	51.9	-43.3	-45.5	-13.0	32.5	Floor noise

Result (E) = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)

EIRP = E + 20*log(D) -104.8

ERP =EIRP -2.15

*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

Distance factor: 1 GHz - 10 GHz 20log (3.8 m / 3.0 m) = 2.06 dB
 10 GHz - 40 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

Spurious Emission (Radiated)

Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.3	No.3	No.3
Date	May 31, 2023	May 31, 2023	June 1, 2023
Temperature / Humidity	22 deg. C / 66 % RH	22 deg. C / 66 % RH	21 deg. C / 67 % RH
Engineer	Tetsuro Yoshida (1 GHz - 10 GHz)	Kiyoshiro Okazaki (10 GHz - 40 GHz)	Tetsuro Yoshida (Below 1 GHz)
Mode	NR Band n77, 3930 MHz, BW 100 MHz, 64QAM, 1RB Start0		

Part 27: For mobile operations in the 3700-3980 MHz band

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	EIRP [dBm]	ERP [dBm]	Limit [dBm]	Margin [dB]	Remark
Hori.	39.010	PK	29.3	15.2	7.2	32.2	19.5	-75.8	-77.9	-13.0	64.9	Floor noise
Hori.	50.265	PK	30.4	11.1	7.4	32.2	16.7	-78.5	-80.7	-13.0	67.7	Floor noise
Hori.	79.350	PK	30.1	6.8	7.8	32.1	12.6	-82.7	-84.8	-13.0	71.8	Floor noise
Hori.	84.850	PK	29.9	7.6	7.9	32.1	13.3	-82.0	-84.1	-13.0	71.1	Floor noise
Hori.	288.001	PK	31.4	13.7	9.9	32.0	23.0	-72.2	-74.4	-13.0	61.4	
Hori.	593.725	PK	28.9	19.2	12.0	32.0	28.1	-67.1	-69.3	-13.0	56.3	Floor noise
Hori.	7762.040	PK	44.2	36.2	9.0	32.5	56.8	-38.4	-40.6	-13.0	27.6	Floor noise
Hori.	11643.060	PK	44.7	39.3	-1.8	33.0	49.2	-46.1	-48.2	-13.0	35.2	Floor noise
Hori.	15524.080	PK	45.8	37.8	0.1	32.2	51.4	-43.8	-46.0	-13.0	33.0	Floor noise
Hori.	3980.000	AV	17.2	29.9	5.5	31.7	20.9	-74.4	-76.5	-13.0	63.5	Floor noise
Vert.	39.010	PK	32.7	15.2	7.2	32.2	23.0	-72.3	-74.4	-13.0	61.4	
Vert.	50.265	PK	36.8	11.1	7.4	32.2	23.2	-72.1	-74.2	-13.0	61.2	
Vert.	79.350	PK	39.1	6.8	7.8	32.1	21.6	-73.6	-75.8	-13.0	62.8	
Vert.	84.850	PK	39.7	7.6	7.9	32.1	23.0	-72.2	-74.4	-13.0	61.4	
Vert.	288.001	PK	32.6	13.7	9.9	32.0	24.2	-71.1	-73.3	-13.0	60.3	
Vert.	593.725	PK	28.9	19.2	12.0	32.0	28.2	-67.1	-69.3	-13.0	56.3	Floor noise
Vert.	7762.040	PK	44.3	36.2	9.0	32.5	56.9	-38.4	-40.5	-13.0	27.5	Floor noise
Vert.	11643.060	PK	44.5	39.3	-1.8	33.0	49.0	-46.2	-48.4	-13.0	35.4	Floor noise
Vert.	15524.080	PK	45.9	37.8	0.1	32.2	51.5	-43.7	-45.9	-13.0	32.9	Floor noise
Vert.	3980.000	AV	17.4	29.9	5.5	31.7	21.1	-74.2	-76.3	-13.0	63.3	Floor noise

Result (E) = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)

EIRP = E + 20*log(D) -104.8

ERP =EIRP -2.15

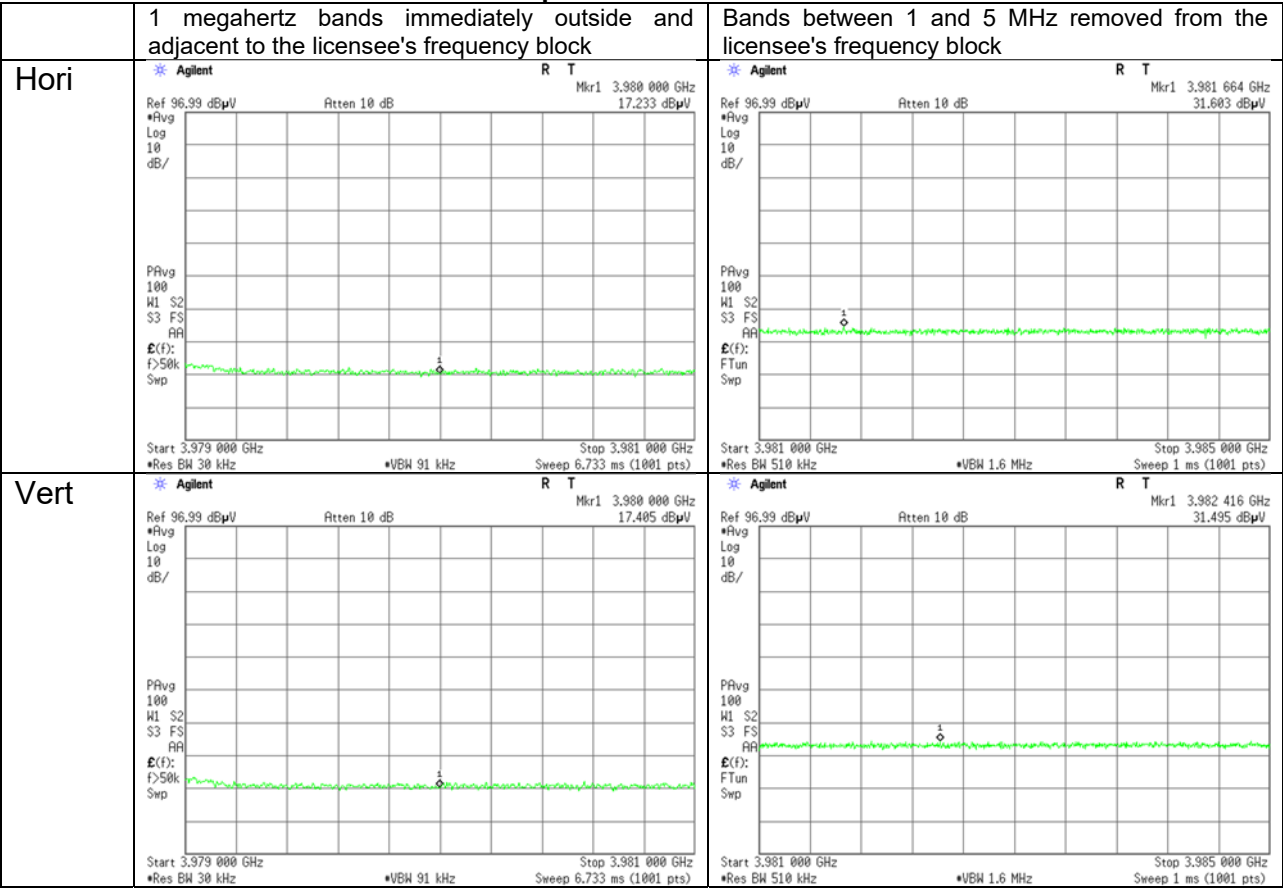
*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

Distance factor: 1 GHz - 10 GHz 20log (3.8 m / 3.0 m) = 2.06 dB
 10 GHz - 40 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

Spurious Emission (Radiated)
Reference Plot for band-edge

Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.3
Date	June 12, 2023
Temperature / Humidity	21 deg. C / 62 % RH
Engineer	Tetsuro Yoshida
	(1 GHz - 10 GHz)
Mode	NR Band n77, 3750 MHz, BW 100 MHz, 64QAM, 1RB Start0

Part 27: For mobile operations in the 3700-3980 MHz band



APPENDIX 2: Test instruments

Test equipment

Test Item	Local ID	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Cal Int
RE	MAEC-03	142008	AC3_Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	05/23/2022	24
RE	MOS-13	141554	Thermo-Hygrometer	CUSTOM. Inc	CTH-201	1301	01/13/2023	12
RE	MMM-08	141532	DIGITAL HiTESTER	HIOKI E.E. CORPORATION	3805	51201197	01/17/2023	12
RE	MJM-16	142183	Measure	KOMELON	KMC-36	-	10/03/2022	12
RE	COTS-MEMI-02	178648	EMI measurement program	TSJ (Techno Science Japan)	TEPTO-DV	-	-	-
RE	MAEC-03-SVSWR	142013	AC3_Semi Anechoic Chamber(SVSWR)	TDK	Semi Anechoic Chamber 3m	DA-10005	04/12/2023	24
RE	MSA-04	141885	Spectrum Analyzer	Keysight Technologies Inc	E4448A	US44300523	11/21/2022	12
RE	MHA-20	141507	Horn Antenna 1-18GHz	Schwarzbeck Mess-Elektronik OHG	BBHA9120D	258	11/14/2022	12
RE	MCC-217	141393	Microwave Cable	Junkosha	MWX221	1604S254(1m) / 1608S088(5m)	08/02/2022	12
RE	MPA-11	141580	MicroWave System Amplifier	Keysight Technologies Inc	83017A	MY39500779	03/08/2023	12
RE	MHF-22	141293	High Pass Filter 7-20GHz	TOKIMEC	TF37NCCB	602	02/01/2023	12
RE	MCC-177	141226	Microwave Cable	Junkosha	MMX221-00500DMSDMS	1502S304	03/03/2023	12
RE	MHA-16	141513	Horn Antenna 15-40GHz	Schwarzbeck Mess-Elektronik OHG	BBHA9170	BBHA9170306	07/05/2022	12
RE	MHA-29	141517	Horn Antenna 26.5-40GHz	ETS-Lindgren	3160-10	152399	11/14/2022	12
RE	MPA-22	141588	Pre Amplifier	L3 Narda-MITEQ	AMF-6F-2600400-33-8P / AMF-4F-2600400-33-8P	1871355 / 1871328	01/24/2023	12
RE	MCC-224	160324	Coaxial Cable	Huber+Suhner	SUCOFLEX 102A	MY009/2A	10/19/2022	12
RE	MBA-05	141425	Biconical Antenna	Schwarzbeck Mess-Elektronik OHG	VHA9103+BBA9106	VHA91031302	08/26/2022	12
RE	MLA-22	141266	Logperiodic Antenna(200-1000MHz)	Schwarzbeck Mess-Elektronik OHG	VUSLP9111B	9111B-191	08/26/2022	12
RE	MAT-95	142314	Attenuator	Pasternack Enterprises	PE7390-6	D/C 1504	06/13/2022	12
RE	MCC-51	141323	Coaxial cable	UL Japan	-	-	09/27/2022	12
RE	MPA-13	141582	Pre Amplifier	SONOMA INSTRUMENT	310	260834	02/07/2023	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: RE: Radiated Spurious Emission test