RADIO TEST REPORT

Test Report No.: 14670604H-R1

Customer	**NIHON KOHDEN CORPORATION**
Description of EUT	**Transmitter**
Model Number of EUT	**ZM-520PA, ZM-530PA**
FCC ID	**B6BZM-5X0PAB**
Test Regulation	**FCC Part 95 Subpart H**
Test Result	**Complied (Refer to SECTION 3)**
Issue Date	**June 12, 2023**
Remarks	**ZM-520PA: Radiated emission test only** **ZM-530PA: All test items**

Representative Test Engineer	Approved By
Nachi Konegawa Engineer	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".

Report Cover Page - Form-ULID-003532 (DCS:13-EM-F0429) Issue# 21.0

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

REVISION HISTORY

Original Test Report No.: 14670604H

This report is a revised version of 14670604H. 14670604H is replaced with this report.

Revision	Test Report No.	Date	Page Revised Contents
- (Original)	14670604H	March 22, 2023	-
1	14670604H-R1	June 12, 2023	APPENDIX 1: Test data Field Strength (Electric Field Strength of Fundamental Emission, Spurious Emission and Band Edge Compliance) ZM-520PA -Correction of Remark of Test data for Mode 613.975 MHz 613.975 MHz: Refer to Maker Delta Method 614.000 MHz: Carrier → 613.975 MHz: Carrier 614.000 MHz: Refer to Maker Delta Method

Reference: Abbreviations (Including words undescribed in this report)

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

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SECTION 1: Customer Information

Company Name	NIHON KOHDEN CORPORATION
Address	1-1-6 Kusunokidai, Tokorozawa-shi, Saitama 359-0037 Japan
Telephone Number	+81-3-5996-8354
Contact Person	Toshifumi Takeuchi

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	Transmitter
Model Number	ZM-520PA, ZM-530PA
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	February 22, 2023
Test Date	February 27 to March 3, 2023

2.2 Product Description

General Specification

Rating	DC 3.0 V

Radio Specification

Equipment Type	Transmitter
Frequency of Operation	608.025 MHz to 613.975 MHz
Type of Modulation	FSK
Antenna Gain	0 dBi or less

SECTION 3: Test Specification, Procedures & Results

3.1 Test Specification

Test Specification	FCC Part 95 Subpart H
Title	FCC 47 CFR Part 95 Personal Radio Services Subpart H Wireless Medical Telemetry Service

3.2 Procedures and results

Item	Test Specification & Procedure	Worst margin	Results	Remarks
WMTS frequency accuracy *2)	FCC 2.1055 FCC 95.2365	-	Complied a)	Conducted
Bandwidth *2)	FCC 2.1049	-	Complied b)	Conducted
Conducted Spurious Emission *2)	FCC 2.1051	-	Complied c)	Conducted
WMTS field strength limits *1)	FCC 2.1046 FCC 95.2369	19.2 dB 608.025 MHz Horizontal, QP Model: ZM-530PA	Complied d)	Radiated
WMTS unwanted emissions limits *1)	FCC 2.1053 FCC 95.2379	1.9 dB 6139.750 MHz Horizontal, AV Model: ZM-530PA	Complied d)	Radiated

Note: UL Japan, Inc.'s EMI Work Procedures: Work Instructions-ULID-003591 and Work Instructions-ULID-003593.
*1) These tests were also referred to ANSI/TIA-603-E-2016 "Land Mobile FM or PM Communications Equipment and Performance Standards".
*2) These tests were also referred to ANSI/C63.26:2015 "American National Standard for Compliance Testing of Transmitters Used in the Licensed Radio Services".

a) Refer to APPENDIX 1 (data of Frequency Stability)
b) Refer to APPENDIX 1 (data of -26 dB Bandwidth and 99 % Occupied Bandwidth)
c) Refer to APPENDIX 1 (data of Conducted Spurious Emission)
d) Refer to APPENDIX 1 (data of Field Strength)

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 $k = 2$.

Radiated emission

Measurement distance	Frequency range		Uncertainty (+/-)
3 m	9 kHz to 30 MHz		3.2 dB
10 m			3.0 dB
3 m	30 MHz to 200 MHz	Horizontal	4.8 dB
		Vertical	5.0 dB
	200 MHz to 1000 MHz	Horizontal	5.1 dB
		Vertical	6.2 dB
10 m	30 MHz to 200 MHz	Horizontal	4.8 dB
		Vertical	4.8 dB
	200 MHz to 1000 MHz	Horizontal	5.0 dB
		Vertical	5.0 dB
3 m	1 GHz to 6 GHz		4.9 dB
	6 GHz to 18 GHz		5.2 dB
1 m	10 GHz to 26.5 GHz		5.4 dB
	26.5 GHz to 40 GHz		5.4 dB
10 m	1 GHz to 18 GHz		5.4 dB

Antenna Terminal test

Test Item	Uncertainty (+/-)
-26 dB Bandwidth and 99 % Occupied Bandwidth	0.96 %
Average Output Power	1.5 dB
Frequency Stability	0.01541 ppm
Conducted Spurious Emission	2.7 dB

3.5 Test Location

UL Japan, Inc. Ise EMC Lab.
*A2LA Certificate Number: 5107.02 / FCC Test Firm Registration Number: 884919
ISED Lab Company Number: 2973C / CAB identifier: JP0002
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 Japan
Telephone: +81-596-24-8999

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)

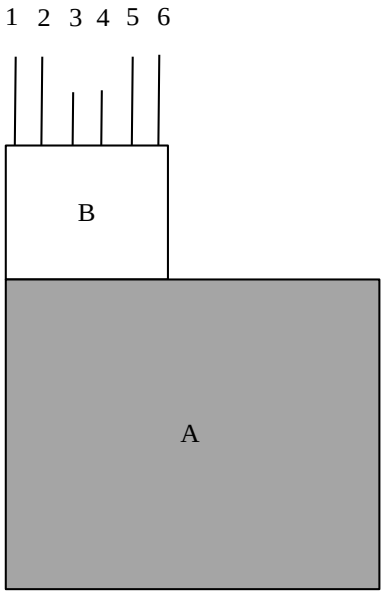
Test item	Operating mode	Tested frequency
All items	Transmitting (Modulated)	608.025 MHz, 613.975 MHz

*Power of the EUT was set by the software as follows;
Power Setting: 1 mW
Software: ZM-520PA: Ver.01-14
ZM-530PA: Ver.01-15

*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

<Radiated Emission test for ZM-520PA >



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

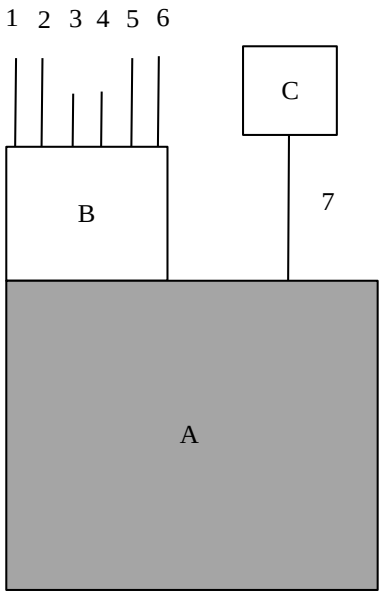
Description of EUT and Support equipment

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	Transmitter	ZM-520PA	03692	NIHON KOHDEN CORPORATION	EUT
B	ELECTRODE LEAD	BR-936PA	501021	NIHON KOHDEN CORPOATION	-

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	Signal Cable	0.85	Shielded	Shielded	-
2	Signal Cable	0.85	Shielded	Shielded	-
3	Signal Cable	0.65	Shielded	Shielded	-
4	Signal Cable	0.65	Shielded	Shielded	-
5	Signal Cable	0.85	Shielded	Shielded	-
6	Signal Cable	0.85	Shielded	Shielded	-

<Radiated Emission test for ZM-530PA >



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

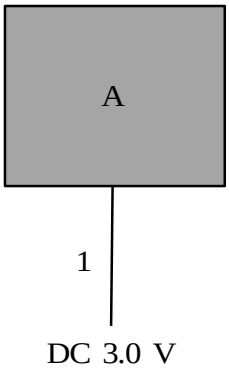
Description of EUT and Support equipment

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	Transmitter	ZM-530PA	08250	NIHON KOHDEN CORPORATION	EUT
B	ELECTRODE LEAD	BR-936PA	501021	NIHON KOHDEN CORPOATION	-
C	Finger probe, 1.6m lead	TL-201T	227920	NIHON KOHDEN CORPOATION	-

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	Signal Cable	0.85	Shielded	Shielded	-
2	Signal Cable	0.85	Shielded	Shielded	-
3	Signal Cable	0.65	Shielded	Shielded	-
4	Signal Cable	0.65	Shielded	Shielded	-
5	Signal Cable	0.85	Shielded	Shielded	-
6	Signal Cable	0.85	Shielded	Shielded	-
7	Signal Cable	1.60	Shielded	Shielded	-

<Antenna Terminal Conducted test>



* 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	Transmitter	ZM-530PA *1)	08241	NIHON KOHDEN CORPORATION	EUT

*1) The difference between ZM-520PA and ZM-530PA is only an external case and thus the test was performed with ZM-530PA as a representative according to the customer's request.

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	DC Cable	1.0	Unshielded	Unshielded	-

SECTION 5: Average Output Power

Test Procedure

Average Output Power was measured with a power meter.

Test data : **APPENDIX**
Test result : **Only reported**

SECTION 6: Frequency Stability (Temperature/Voltage Variation)

Test Procedure

The Frequency Stability was measured with a spectrum analyzer and attenuator connected to the antenna port. The Frequency Drift was measured with the 10 deg. C. steps from –30 deg. C. to 50 deg. C., and it is presented as the ppm unit. The Frequency Drift was measured with the normal temperature (20 deg. C.) and Voltage tolerance, and it is presented as the ppm unit.

Temperature	-30 deg. C to +50 deg. C (10 deg. C. step)
Voltage	Vnom: DC 3.0 V, Vmin: DC 1.623 V (Battery Output)

Frequency Stability test was performed under the above condition.

Test data : **APPENDIX**
Test result : **Pass**

SECTION 7: -26 dB Bandwidth and 99 % Occupied Bandwidth

Test Procedure

Bandwidth was measured with below setting connected to the antenna port.

RBW	VBW	Span	Sweep time	Detector	Trace	Instrument Used
1 % to 5 % of OBW	Three times of RBW	Enough width to display emission skirts	Auto	Peak	Max Hold	Spectrum Analyzer

Test data : **APPENDIX**
Test result : **Only reported**

SECTION 8: Conducted Spurious Emission

Test procedure

Conducted Spurious Emission was measured with below setting connected to the antenna port.

Span	RBW	VBW	Sweep time	Detector	Trace	Instrument Used
9 kHz to 150 kHz	200 Hz	620 Hz	Auto	Peak	Max Hold	Spectrum Analyzer
150 kHz to 30 MHz	9.1 kHz	27 kHz				

Test data : APPENDIX
Test result : Only reported

SECTION 9: Field strength

Test Procedure

[For below 30 MHz]
The noise level was checked by moving a search-coil (Loop Antenna) close to the EUT.

[For above 30 MHz]
EUT was placed on a platform of nominal size, 1.0 m by 1.5 m, raised 0.8 m above the conducting ground plane.
The Field strength has been measured in Semi Anechoic Chamber with a ground plane.
The measuring antenna height was varied between 1 to 4 m and the turn table was rotated a full revolution in order to obtain the maximum value of the electric field strength.
The measurements were performed for both vertical and horizontal antenna polarization.

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

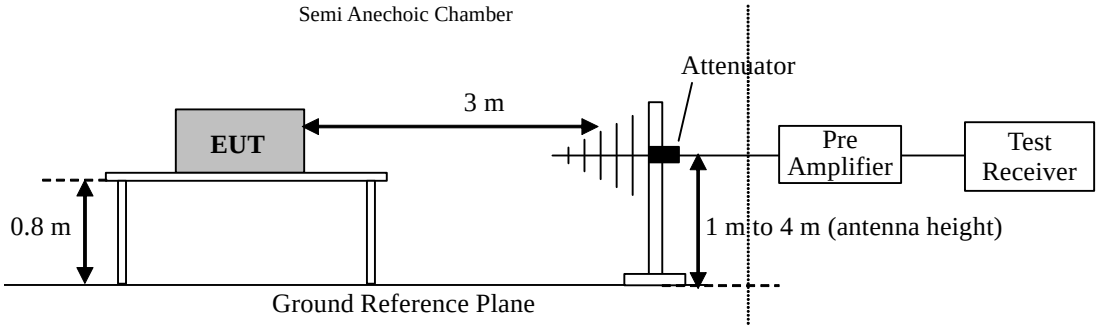
Frequency	Below 30 MHz	30 MHz to 200 MHz	200 MHz to 1 GHz	Above 1 GHz
Antenna Type	Loop	Biconical	Logperiodic	Horn

Frequency	9 kHz to 150 kHz	150 kHz to 30 MHz	30 MHz to 1 GHz	Above 1 GHz
Instrument used	Test Receiver	Test Receiver	Test Receiver	Spectrum Analyzer
Detector	Quasi Peak	Quasi Peak	Quasi Peak	Peak
IF Bandwidth	BW: 200 Hz	BW: 9 kHz	BW: 120 kHz	RBW: 1 MHz VBW: 10 Hz
Test Distance	3 m			

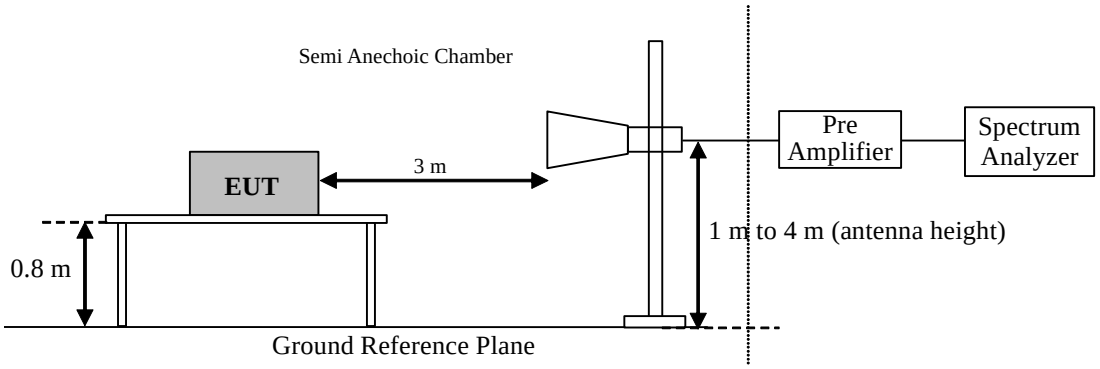
[For Band edge]
To determine the level of band-edge spurious, we use the following procedure:
Set the resolution bandwidth to 1 kHz in the peak detector mode.
Because we don't want to include in-band emission at Band edge measurement if center frequencies are following cases,
Band edge of "608.025 MHz" is "608 MHz" or Band edge of "613.975 MHz" is "614 MHz".
We used RBW = 1 kHz (greater than 1 % bandwidth) to prevent to detect in-band emission. Refer to KDB 971168 D01 (971168 D01 Power Meas License Digital Systems v03r01).
Measure the maximum level of the in-band channel closest to the band edge and the maximum level of the out-of-band emissions close to the same band edge. Determine the ratio of the in-band signal to the out-of-band emissions. Then, measure the level of the in-band channel in peak mode with 1 MHz bandwidth. Using the ratio obtained, we calculate the equivalent level of the out-of-band emissions to determine compliance with the limits.

Figure 2: Test Setup

[30 MHz to 1 GHz]



[1 GHz to 10 GHz]



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.

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

Measurement range : 30 MHz to 7 GHz
Test data : APPENDIX
Test result : Pass

APPENDIX 1: Test data

Average Output Power
(Reference data for RF Exposure)

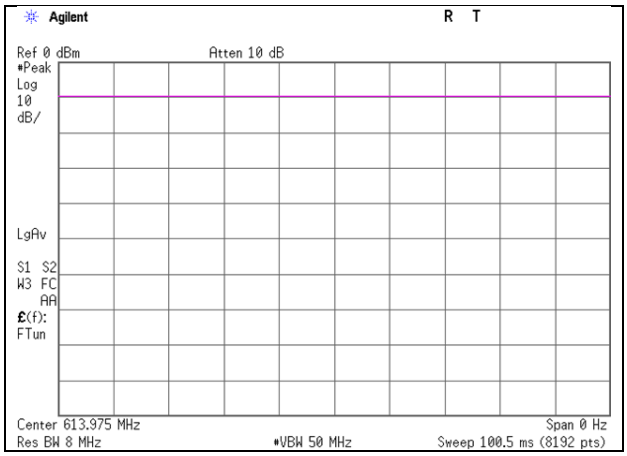
Test place	Ise EMC Lab.
Measurement Room	No.8
Date	February 27, 2023
Temperature / Humidity	24 deg. C / 40 % RH
Engineer	Nachi Konegawa
Mode	Tx

Tested Frequency	Power Meter Reading	Cable Loss	Atten. Loss	Result (Timed average)		Duty factor	Result (Burst power average)	
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dB]	[dBm]	[mW]
608.025	-9.91	0.30	9.76	0.15	1.04	0.00	0.15	1.04
613.975	-9.96	0.30	9.76	0.10	1.02	0.00	0.10	1.02

Sample Calculation:
Result (Timed average) = Reading + Cable Loss (including the cable(s) customer supplied) + Atten. Loss
Result (Burst power average) = Time average + Duty factor

Burst rate confirmation

Test place	Ise EMC Lab.
Measurement Room	No.8
Date	February 27, 2023
Temperature / Humidity	24 deg. C / 40 % RH
Engineer	Nachi Konegawa
Mode	Tx



Frequency Stability (Temperature / Voltage Variation)

Test place	Ise EMC Lab.	
Measurement Room	No.8	No.8
Date	March 1, 2023	March 2, 2023
Temperature / Humidity	23 deg. C / 38 % RH	24 deg. C / 43 % RH
Engineer	Nachi Konegawa	Nachi Konegawa
Mode	Tx 608.025 MHz	

Test condition		Tested	Measured	Frequency	Result	Limit	Margin
Temp. [deg. C]	Voltage [V]	timing	frequency [MHz]	error [MHz]	[ppm]	[+/- ppm]	[ppm]
20	DC 1.623V (Vmin)	Power on	608.025351	0.000351	0.577338	2.5	1.922662
		+ 2 min.	608.025351	0.000351	0.577632	2.5	1.922368
		+ 5 min.	608.025349	0.000349	0.574754	2.5	1.925246
		+ 10 min.	608.025348	0.000348	0.572133	2.5	1.927867
	DC 3V (Vnom)	Power on	608.025421	0.000421	0.693103	2.5	1.806897
		+ 2 min.	608.025389	0.000389	0.639602	2.5	1.860398
		+ 5 min.	608.025387	0.000387	0.636003	2.5	1.863997
		+ 10 min.	608.025388	0.000388	0.637814	2.5	1.862186
50	DC 3V (Vnom)	Power on	608.024767	-0.000233	-0.383293	-	-
		+ 2 min.	608.024774	-0.000226	-0.371417	-	-
		+ 5 min.	608.024778	-0.000222	-0.365232	-	-
		+ 10 min.	608.024789	-0.000211	-0.346331	-	-
40		Power on	608.024756	-0.000244	-0.400613	2.5	2.099387
		+ 2 min.	608.024752	-0.000248	-0.408314	2.5	2.091686
		+ 5 min.	608.024755	-0.000245	-0.402646	2.5	2.097354
		+ 10 min.	608.024761	-0.000239	-0.392458	2.5	2.107542
30		Power on	608.025002	0.000002	0.002498	2.5	2.497502
		+ 2 min.	608.025009	0.000009	0.014118	2.5	2.485882
		+ 5 min.	608.025013	0.000013	0.021687	2.5	2.478313
		+ 10 min.	608.025023	0.000023	0.037099	2.5	2.462901
20		Power on	608.025421	0.000421	0.693103	2.5	1.806897
		+ 2 min.	608.025389	0.000389	0.639602	2.5	1.860398
		+ 5 min.	608.025387	0.000387	0.636003	2.5	1.863997
		+ 10 min.	608.025388	0.000388	0.637814	2.5	1.862186
10		Power on	608.025431	0.000431	0.709037	2.5	***1.790963***
		+ 2 min.	608.025431	0.000431	0.708489	2.5	1.791511
		+ 5 min.	608.025431	0.000431	0.708647	2.5	1.791353
		+ 10 min.	608.025429	0.000429	0.705034	2.5	1.794966
0		Power on	608.025069	0.000069	0.114221	2.5	2.385779
		+ 2 min.	608.025079	0.000079	0.130292	2.5	2.369708
		+ 5 min.	608.025068	0.000068	0.112380	2.5	2.387620
		+ 10 min.	608.025043	0.000043	0.071525	2.5	2.428475
-10		Power on	608.024006	-0.000994	-1.634171	-	-
		+ 2 min.	608.024041	-0.000959	-1.577975	-	-
		+ 5 min.	608.024028	-0.000972	-1.598525	-	-
		+ 10 min.	608.023817	-0.001183	-1.945644	-	-
-20		Power on	608.021346	-0.003654	-6.009621	-	-
		+ 2 min.	608.021490	-0.003510	-5.772789	-	-
		+ 5 min.	608.021506	-0.003494	-5.746474	-	-
		+ 10 min.	608.021270	-0.003730	-6.134616	-	-
-30		Power on	608.018245	-0.006755	-11.109741	-	-
		+ 2 min.	608.018439	-0.006561	-10.790675	-	-
		+ 5 min.	608.018650	-0.006350	-10.443650	-	-
		+ 10 min.	608.017701	-0.007299	-12.004441	-	-

*The test was begun from 50 deg. C and the temperature was lowered each 10 deg. C.
*The test on 50 deg. C, -10 deg. C, -20 deg. C and -30 deg. C were reference data, since the specification of operating temperature of EUT was 0 deg. C to 40 deg. C (It used the manufacturer's specified conditions (refer to FCC 95.2365).
*Also the test on 0 deg. C, the manufacturere's specified condition was applied instead of lowest operating temperature value of 5 deg. C.

Frequency Stability (Temperature / Voltage Variation)

Test place	Ise EMC Lab.
Measurement Room	No.8
Date	March 1, 2023
Temperature / Humidity	23 deg. C / 38 % RH
Engineer	Nachi Konegawa
Mode	Tx 613.975 MHz

Test condition		Tested	Measured	Frequency	Result	Limit	Margin
Temp. [deg. C]	Voltage [V]	timing	frequency [MHz]	error [MHz]	[ppm]	[+/- ppm]	[ppm]
20	DC 1.623V (Vmin)	Power on	613.975360	0.000360	0.586109	2.5	1.913891
		+ 2 min.	613.975368	0.000368	0.599876	2.5	1.900124
		+ 5 min.	613.975370	0.000370	0.602635	2.5	1.897365
		+ 10 min.	613.975376	0.000376	0.612005	2.5	1.887995
	DC 3V (Vnom)	Power on	613.975345	0.000345	0.561668	2.5	1.938332
		+ 2 min.	613.975354	0.000354	0.577015	2.5	1.922985
		+ 5 min.	613.975366	0.000366	0.596275	2.5	1.903725
		+ 10 min.	613.975368	0.000368	0.599811	2.5	1.900189
50	DC 3V (Vnom)	Power on	613.974775	-0.000225	-0.365720	-	-
		+ 2 min.	613.974778	-0.000222	-0.360790	-	-
		+ 5 min.	613.974788	-0.000212	-0.345824	-	-
		+ 10 min.	613.974796	-0.000204	-0.331523	-	-
40		Power on	613.974812	-0.000188	-0.306359	2.5	2.193641
		+ 2 min.	613.974817	-0.000183	-0.298488	2.5	2.201512
		+ 5 min.	613.974819	-0.000181	-0.294115	2.5	2.205885
		+ 10 min.	613.974828	-0.000172	-0.280873	2.5	2.219127
30		Power on	613.975029	0.000029	0.046811	2.5	2.453189
		+ 2 min.	613.975047	0.000047	0.075861	2.5	2.424139
		+ 5 min.	613.975051	0.000051	0.083160	2.5	2.416840
		+ 10 min.	613.975061	0.000061	0.098781	2.5	2.401219
20		Power on	613.975345	0.000345	0.561668	2.5	1.938332
		+ 2 min.	613.975354	0.000354	0.577015	2.5	1.922985
		+ 5 min.	613.975366	0.000366	0.596275	2.5	1.903725
		+ 10 min.	613.975368	0.000368	0.599811	2.5	1.900189
10		Power on	613.975421	0.000421	0.685948	2.5	1.814052
		+ 2 min.	613.975460	0.000460	0.748832	2.5	1.751168
		+ 5 min.	613.975466	0.000466	0.758443	2.5	***1.741557***
		+ 10 min.	613.975465	0.000465	0.756876	2.5	1.743124
0		Power on	613.975035	0.000035	0.057364	2.5	2.442636
		+ 2 min.	613.975059	0.000059	0.096854	2.5	2.403146
		+ 5 min.	613.975049	0.000049	0.080433	2.5	2.419567
		+ 10 min.	613.975019	0.000019	0.030586	2.5	2.469414
-10		Power on	613.973801	-0.001199	-1.952848	-	-
		+ 2 min.	613.973825	-0.001175	-1.913759	-	-
		+ 5 min.	613.973823	-0.001177	-1.917016	-	-
		+ 10 min.	613.973754	-0.001246	-2.029399	-	-
-20		Power on	613.971277	-0.003723	-6.063765	-	-
		+ 2 min.	613.971360	-0.003640	-5.928580	-	-
		+ 5 min.	613.971367	-0.003633	-5.917179	-	-
		+ 10 min.	613.971171	-0.003829	-6.236410	-	-
-30		Power on	613.967779	-0.007221	-11.761065	-	-
		+ 2 min.	613.967972	-0.007028	-11.446720	-	-
		+ 5 min.	613.967976	-0.007024	-11.440205	-	-
		+ 10 min.	613.967414	-0.007586	-12.355552	-	-

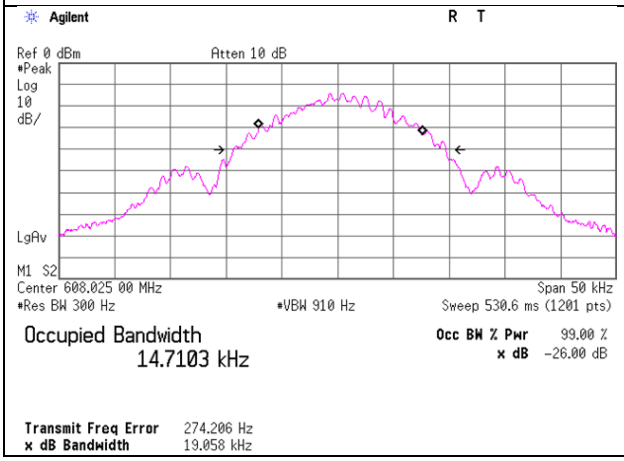
*The test was begun from 50 deg. C and the temperature was lowered each 10 deg. C.
*The test on 50 deg. C, -10 deg. C, -20 deg. C. and -30 deg. C were reference data, since the specification of operating temperature of EUT was 0 deg. C to 40 deg. C (It used the manufacturer's specified conditions (refer to FCC 95.2365).
*Also the test on 0 deg. C, the manufacturere's specified condition was applied instead of lowest operating temperature value of 5 deg. C.

-26 dB Bandwidth and 99 % Occupied Bandwidth

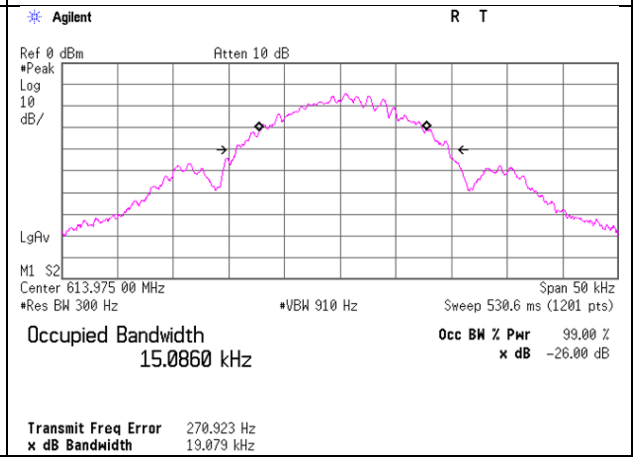
Test place	Ise EMC Lab.
Measurement Room	No.8
Date	February 27, 2023
Temperature / Humidity	24 deg. C / 40 % RH
Engineer	Nachi Konegawa
Mode	Tx

Frequency [MHz]	-26dB Bandwidth [kHz]	99% Occupied Bandwidth [kHz]
608.025	19.0580	14.7103
613.975	19.0790	15.0860

Tx 608.025 MHz



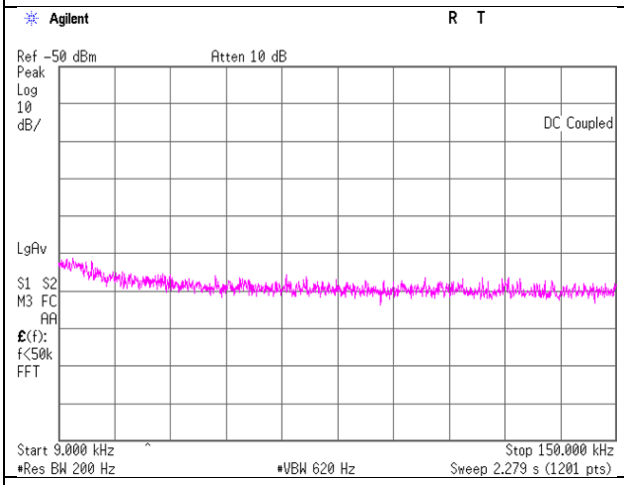
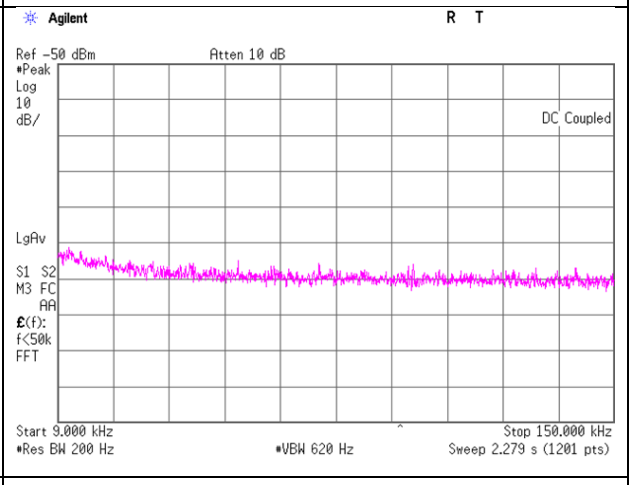
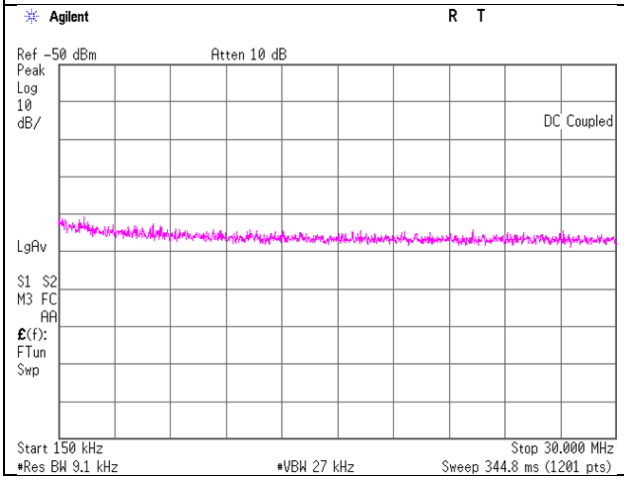
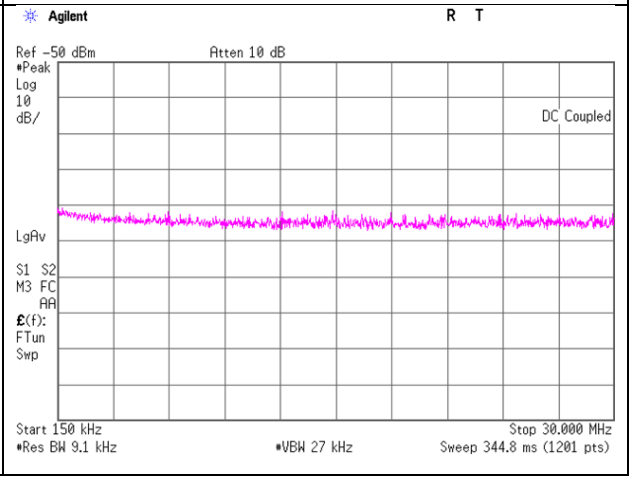
Tx 613.975 MHz



Conducted Spurious Emission

Test place	Ise EMC Lab.
Measurement Room	No.8
Date	February 28, 2023
Temperature / Humidity	22 deg. C / 37 % RH
Engineer	Nachi Konegawa
Mode	Tx

No signal detected.

Tx 608.025 MHz	Tx 613.975 MHz
9 kHz - 150 kHz	**9 kHz - 150 kHz**
	
150 kHz - 30 MHz	**150 kHz - 30 MHz**
	

Field Strength(Electric Field Strength of Fundamental Emission, Spurious Emission and Band Edge Compliance)

ZM-520PA

Test place	Ise EMC Lab.	
Semi Anechoic Chamber	No.2	No.2
Date	March 1, 2023	March 2, 2023
Temperature / Humidity	22 deg. C / 48 % RH	22 deg. C / 44 % RH
Engineer	Kiyoshiro Okazaki (Below 1 GHz)	Yuta Moriya (Above 1 GHz)
Mode	Tx 608.025 MHz	

Polarity [Hori/Vert]	Frequency [MHz]	Reading (QP / PK) [dBuV]	Reading (AV) [dBuV]	Ant. Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result (QP / PK) [dBuV/m]	Result (AV) [dBuV/m]	Limit (QP / PK) [dBuV/m]	Limit (AV) [dBuV/m]	Margin (QP / PK) [dB]	Margin (AV) [dB]	Remark
Hori.	41.050	22.5	-	14.6	6.8	28.6	-	15.3	-	46.0	-	30.7	-	
Hori.	48.021	22.8	-	12.0	6.9	28.6	-	13.2	-	46.0	-	32.9	-	
Hori.	62.642	23.4	-	7.3	7.0	28.5	-	9.2	-	46.0	-	36.8	-	
Hori.	342.413	22.0	-	15.3	8.9	28.0	-	18.3	-	46.0	-	27.8	-	
Hori.	497.614	22.3	-	18.0	9.8	29.1	-	21.0	-	46.0	-	25.0	-	
Hori.	608.000	23.3	-	19.5	10.2	29.3	-	23.7	-	46.0	-	22.3	-	Refer to Maker Delta Method
Hori.	608.025	85.7	-	19.5	10.2	29.3	-	86.1	-	106.0	-	19.9	-	Carrier
Hori.	1216.050	---	46.0	25.6	4.5	35.8	-	-	40.2	-	53.9	-	13.7	VBW 10Hz
Hori.	1824.075	---	41.1	25.3	3.4	35.3	-	-	34.5	-	53.9	-	19.4	VBW 10Hz
Hori.	2432.100	---	35.8	27.5	3.7	34.9	-	-	32.0	-	53.9	-	21.9	VBW 10Hz
Hori.	3040.125	---	42.4	28.5	4.1	34.6	-	-	40.4	-	53.9	-	13.5	VBW 10Hz
Hori.	3648.150	---	33.6	29.2	4.9	34.2	-	-	33.4	-	53.9	-	20.5	Floor noise
Hori.	4256.175	---	42.3	30.4	5.3	34.0	-	-	44.0	-	53.9	-	9.9	VBW 10Hz
Hori.	4864.200	---	34.9	31.7	5.5	34.2	-	-	37.9	-	53.9	-	16.0	VBW 10Hz
Hori.	5472.225	---	37.1	31.9	5.7	33.9	-	-	40.7	-	53.9	-	13.2	VBW 10Hz
Hori.	6080.250	---	37.3	32.7	5.9	34.0	-	-	41.9	-	53.9	-	12.0	VBW 10Hz
Vert.	41.050	22.5	-	14.6	6.8	28.6	-	15.3	-	46.0	-	30.7	-	
Vert.	48.021	23.4	-	12.0	6.9	28.6	-	13.8	-	46.0	-	32.3	-	
Vert.	62.642	25.3	-	7.3	7.0	28.5	-	11.1	-	46.0	-	34.9	-	
Vert.	342.413	21.8	-	15.3	8.9	28.0	-	18.1	-	46.0	-	28.0	-	
Vert.	497.614	22.1	-	18.0	9.8	29.1	-	20.8	-	46.0	-	25.2	-	
Vert.	608.000	21.0	-	19.5	10.2	29.3	-	21.4	-	46.0	-	24.6	-	Refer to Maker Delta Method
Vert.	608.025	83.3	-	19.5	10.2	29.3	-	83.7	-	106.0	-	22.3	-	Carrier
Vert.	1216.050	---	43.6	25.6	4.5	35.8	-	-	37.8	-	53.9	-	16.1	VBW 10Hz
Vert.	1824.075	---	39.8	25.3	3.4	35.3	-	-	33.2	-	53.9	-	20.7	VBW 10Hz
Vert.	2432.100	---	35.5	27.5	3.7	34.9	-	-	31.7	-	53.9	-	22.2	VBW 10Hz
Vert.	3040.125	---	39.0	28.5	4.1	34.6	-	-	37.0	-	53.9	-	16.9	VBW 10Hz
Vert.	3648.150	---	33.6	29.2	4.9	34.2	-	-	33.4	-	53.9	-	20.5	Floor noise
Vert.	4256.175	---	40.0	30.4	5.3	34.0	-	-	41.7	-	53.9	-	12.2	VBW 10Hz
Vert.	4864.200	---	33.7	31.7	5.5	34.2	-	-	36.7	-	53.9	-	17.2	VBW 10Hz
Vert.	5472.225	---	35.2	31.9	5.7	33.9	-	-	38.8	-	53.9	-	15.1	VBW 10Hz
Vert.	6080.250	---	40.5	32.7	5.9	34.0	-	-	45.1	-	53.9	-	8.8	VBW 10Hz

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

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

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

*QP detector was used up to 960MHz.

Marker Delta Method(Test distance 3 m)

			AV			
		Polarity	Hor.		Ver.	
		RBW / VBW	[dBuV] Reading	[dBuV/m] Result	[dBuV] Reading	[dBuV/m] Result
Step1	Fundamental(608.025 MHz)	QP	85.70	86.10	83.30	83.70
Step2	Fundamental(608.025 MHz)	1 kHz / 3 kHz	84.34	84.74	82.06	82.46
	Band-edge(608 MHz)	1 kHz / 3 kHz	23.34	23.74	20.97	21.37
	Amplitude delta	-	61.00	61.00	61.09	61.09
Step3	Field strength of band-edge	-	-	25.10	-	22.61
	Limit	-	-	46.0	-	46.0
	Margin	-	-	20.9	-	23.4

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter) - Gain(Amprifier)

*1 Amplitude delta = Fundamental(RBW: kHz,VBW: kHz) - Band-edge(RBW: kHz,VBW: kHz)

*2 Field strength of band-edge = Fundamental(AV) - Amplitude delta

*As we stated at section ("Bandedge" section), we used RBW = 1 kHz (greater than 1 % bandwidth) to prevent to detect in-band emission. Refer to KDB 971168 D01 (KDB 971168 D01 Power Meas Licence Digital System D03r01).

Field Strength(Electric Field Strength of Fundamental Emission, Spurious Emission and Band Edge Compliance)

ZM-520PA

Test place	Ise EMC Lab.	
Semi Anechoic Chamber	No.2	No.2
Date	March 1, 2023	March 2, 2023
Temperature / Humidity	22 deg. C / 48 % RH	22 deg. C / 44 % RH
Engineer	Kiyoshiro Okazaki (Below 1 GHz)	Yuta Moriya (Above 1 GHz)
Mode	Tx 613.975 MHz	

Polarity [Hori/Vert]	Frequency [MHz]	Reading (QP / PK) [dBuV]	Reading (AV) [dBuV]	Ant. Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result (QP / PK) [dBuV/m]	Result (AV) [dBuV/m]	Limit (QP / PK) [dBuV/m]	Limit (AV) [dBuV/m]	Margin (QP / PK) [dB]	Margin (AV) [dB]	Remark
Hori.	41.050	22.3	-	14.6	6.8	28.6	-	15.1	-	46.0	-	30.9	-	
Hori.	48.021	22.7	-	12.0	6.9	28.6	-	13.1	-	46.0	-	33.0	-	
Hori.	62.642	23.4	-	7.3	7.0	28.5	-	9.2	-	46.0	-	36.8	-	
Hori.	342.413	22.0	-	15.3	8.9	28.0	-	18.3	-	46.0	-	27.8	-	
Hori.	497.614	22.2	-	18.0	9.8	29.1	-	20.9	-	46.0	-	25.1	-	
Hori.	613.975	85.9	-	19.5	10.2	29.3	-	86.3	-	106.0	-	19.7	-	Carrier
Hori.	614.000	24.8	-	19.5	10.2	29.3	-	25.3	-	46.0	-	20.8	-	Refer to Maker Delta Method
Hori.	1227.950	---	42.0	25.7	4.3	35.8	-	-	36.2	-	53.9	-	17.7	VBW 10Hz
Hori.	1841.925	---	42.0	25.4	3.4	35.2	-	-	35.5	-	53.9	-	18.4	VBW 10Hz
Hori.	2455.900	---	35.0	27.5	3.7	34.9	-	-	31.2	-	53.9	-	22.7	VBW 10Hz
Hori.	3069.875	---	44.1	28.5	4.1	34.6	-	-	42.1	-	53.9	-	11.8	VBW 10Hz
Hori.	3683.850	---	33.2	29.2	4.9	34.2	-	-	33.2	-	53.9	-	20.7	Floor noise
Hori.	4297.825	---	40.1	30.6	5.4	34.0	-	-	42.0	-	53.9	-	11.9	VBW 10Hz
Hori.	4911.800	---	36.3	31.7	5.5	34.2	-	-	39.4	-	53.9	-	14.5	VBW 10Hz
Hori.	5525.775	---	35.4	31.9	5.7	33.9	-	-	39.1	-	53.9	-	14.8	VBW 10Hz
Hori.	6139.750	---	36.1	32.8	5.9	34.0	-	-	40.8	-	53.9	-	13.1	VBW 10Hz
Vert.	41.050	22.4	-	14.6	6.8	28.6	-	15.2	-	46.0	-	30.8	-	
Vert.	48.021	23.3	-	12.0	6.9	28.6	-	13.7	-	46.0	-	32.4	-	
Vert.	62.642	25.2	-	7.3	7.0	28.5	-	11.0	-	46.0	-	35.0	-	
Vert.	342.413	21.5	-	15.3	8.9	28.0	-	17.8	-	46.0	-	28.3	-	
Vert.	497.614	22.0	-	18.0	9.8	29.1	-	20.7	-	46.0	-	25.3	-	
Vert.	613.975	83.3	-	19.5	10.2	29.3	-	83.7	-	106.0	-	22.3	-	Carrier
Vert.	614.000	22.8	-	19.5	10.2	29.3	-	23.2	-	46.0	-	22.8	-	Refer to Maker Delta Method
Vert.	1227.950	---	37.5	25.7	4.3	35.8	-	-	31.6	-	53.9	-	22.3	VBW 10Hz
Vert.	1841.925	---	39.8	25.4	3.4	35.2	-	-	33.3	-	53.9	-	20.6	VBW 10Hz
Vert.	2455.900	---	35.0	27.5	3.7	34.9	-	-	31.2	-	53.9	-	22.7	VBW 10Hz
Vert.	3069.875	---	39.7	28.5	4.1	34.6	-	-	37.7	-	53.9	-	16.2	VBW 10Hz
Vert.	3683.850	---	33.2	29.2	4.9	34.2	-	-	33.2	-	53.9	-	20.7	Floor noise
Vert.	4297.825	---	38.8	30.6	5.4	34.0	-	-	40.7	-	53.9	-	13.2	VBW 10Hz
Vert.	4911.800	---	36.3	31.7	5.5	34.2	-	-	39.4	-	53.9	-	14.5	VBW 10Hz
Vert.	5525.775	---	34.5	31.9	5.7	33.9	-	-	38.2	-	53.9	-	15.8	VBW 10Hz
Vert.	6139.750	---	37.8	32.8	5.9	34.0	-	-	42.5	-	53.9	-	11.4	VBW 10Hz

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

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

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

*QP detector was used up to 960MHz.

Marker Delta Method(Test distance 3 m)

			AV			
		Polarity	Hor.		Ver.	
		RBW / VBW	[dBuV] Reading	[dBuV/m] Result	[dBuV] Reading	[dBuV/m] Result
Step1	Fundamental(613.975 MHz)	QP	85.90	86.34	83.30	83.74
Step2	Fundamental(613.975 MHz)	1 kHz / 3 kHz	84.28	84.72	81.77	82.21
	Band-edge(614 MHz)	1 kHz / 3 kHz	24.81	25.25	22.76	23.20
	Amplitude delta	-	59.47	59.47	59.01	59.01
Step3	Field strength of band-edge	-	-	26.87	-	24.73
	Limit	-	-	46.0	-	46.0
	Margin	-	-	19.1	-	21.3

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter) - Gain(Amprifier)

*1 Amplitude delta = Fundamental(RBW: kHz,VBW: kHz) - Band-edge(RBW: kHz,VBW: kHz)

*2 Field strength of band-edge = Fundamental(AV) - Amplitude delta

*As we stated at section ("Bandedge" section), we used RBW = 1 kHz (greater than 1 % bandwidth) to prevent to detect in-band emission. Refer to KDB 971168 D01 (KDB 971168 D01 Power Meas Licence Digital System D03r01).

Field Strength(Electric Field Strength of Fundamental Emission, Spurious Emission and Band Edge Compliance)

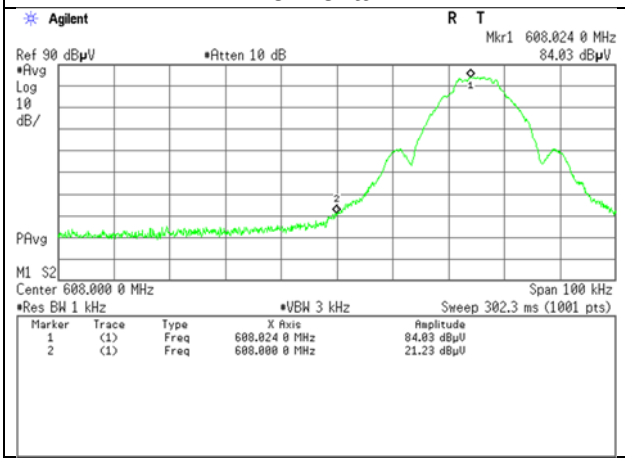
ZM-520PA

Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.2
Date	March 1, 2023
Temperature / Humidity	22 deg. C / 48 % RH
Engineer	Kiyoshiro Okazaki (Below 1 GHz)
Mode	Tx

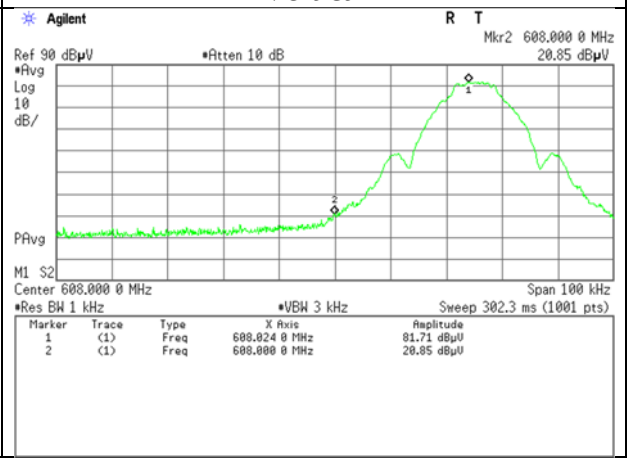
Reference Plot for Band Edge compliance (Marker Delta Method)

Transmitting (608.025 MHz)

Horizontal

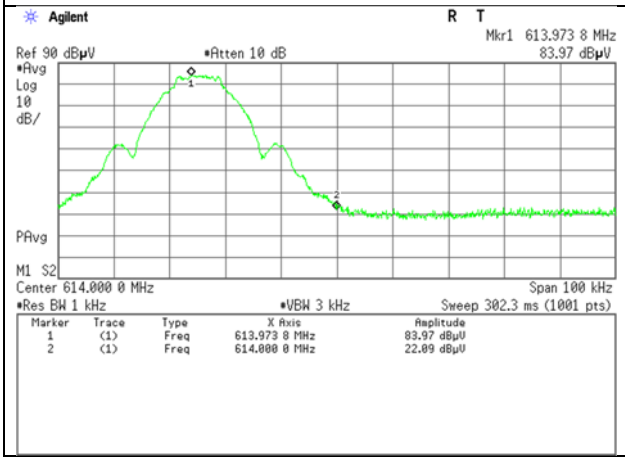


Vertical

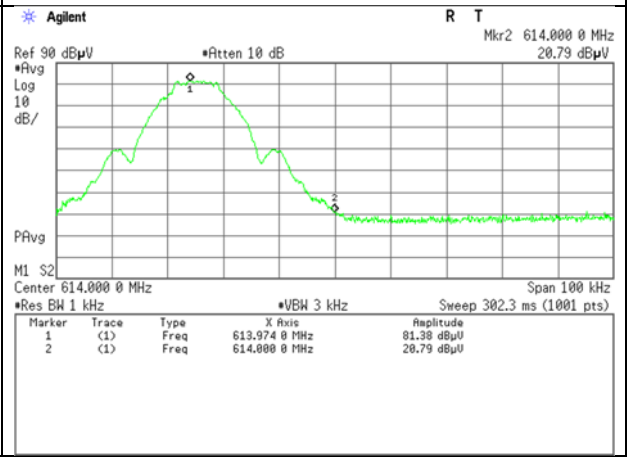


Transmitting (613.975 MHz)

Horizontal



Vertical



* Final results were shown in tabular data.

Field Strength(Electric Field Strength of Fundamental Emission, Spurious Emission and Band Edge Compliance)

ZM-530PA

Test place	Ise EMC Lab.	
Semi Anechoic Chamber	No.2	No.2
Date	March 1, 2023	March 3, 2023
Temperature / Humidity	22 deg. C / 48 % RH	22 deg. C / 45 % RH
Engineer	Kiyoshiro Okazaki (Below 1 GHz)	Takumi Nishida (Above 1 GHz)
Mode	Tx 608.025 MHz	

Polarity [Hori/Vert]	Frequency [MHz]	Reading (QP / PK) [dBuV]	Reading (AV) [dBuV]	Ant. Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result (QP / PK) [dBuV/m]	Result (AV) [dBuV/m]	Limit (QP / PK) [dBuV/m]	Limit (AV) [dBuV/m]	Margin (QP / PK) [dB]	Margin (AV) [dB]	Remark
Hori.	48.021	22.5	-	12.0	6.9	28.6	-	12.9	-	46.0	-	33.2	-	
Hori.	62.642	23.3	-	7.3	7.0	28.5	-	9.1	-	46.0	-	36.9	-	
Hori.	178.881	25.3	-	16.1	8.0	28.1	-	21.3	-	46.0	-	24.7	-	
Hori.	288.006	32.3	-	14.0	8.6	27.8	-	27.1	-	46.0	-	18.9	-	
Hori.	536.018	24.5	-	17.9	10.0	29.2	-	23.1	-	46.0	-	22.9	-	
Hori.	607.998	26.4	-	19.5	10.2	29.3	-	26.8	-	46.0	-	19.2	-	Refer to Maker Delta Method
Hori.	608.000	24.9	-	19.5	10.2	29.3	-	25.3	-	46.0	-	20.7	-	Refer to Maker Delta Method
Hori.	608.025	86.4	-	19.5	10.2	29.3	-	86.8	-	106.0	-	19.2	-	Carrier
Hori.	1216.050	---	48.0	25.6	4.5	35.8	-	-	42.2	0	53.9	-	11.7	VBW 10Hz
Hori.	1824.075	---	44.0	25.3	3.4	35.3	-	-	37.4	0	53.9	-	16.5	VBW 10Hz
Hori.	2432.100	---	35.7	27.5	3.7	34.9	-	-	31.9	0	53.9	-	22.0	VBW 10Hz
Hori.	3040.125	---	39.5	28.5	4.1	34.6	-	-	37.4	0	53.9	-	16.5	VBW 10Hz
Hori.	3648.150	---	36.6	29.2	4.9	34.2	-	-	36.4	0	53.9	-	17.5	VBW 10Hz
Hori.	4256.175	---	41.4	30.4	5.3	34.0	-	-	43.2	0	53.9	-	10.7	VBW 10Hz
Hori.	4864.200	---	32.7	31.7	5.5	34.2	-	-	35.7	0	53.9	-	18.2	Floor noise
Hori.	5472.225	---	40.1	31.9	5.7	33.9	-	-	43.8	0	53.9	-	10.1	VBW 10Hz
Hori.	6080.250	---	46.6	32.7	5.9	34.0	-	-	51.2	0	53.9	-	2.7	VBW 10Hz
Vert.	48.021	23.4	-	12.0	6.9	28.6	-	13.8	-	46.0	-	32.3	-	
Vert.	62.642	25.4	-	7.3	7.0	28.5	-	11.2	-	46.0	-	34.8	-	
Vert.	178.881	22.5	-	16.1	8.0	28.1	-	18.5	-	46.0	-	27.5	-	
Vert.	288.006	24.0	-	14.0	8.6	27.8	-	18.8	-	46.0	-	27.2	-	
Vert.	536.018	22.2	-	17.9	10.0	29.2	-	20.8	-	46.0	-	25.2	-	
Vert.	607.998	24.5	-	19.5	10.2	29.3	-	24.9	-	46.0	-	21.1	-	Refer to Maker Delta Method
Vert.	608.000	19.4	-	19.5	10.2	29.3	-	19.8	-	46.0	-	26.2	-	Refer to Maker Delta Method
Vert.	608.025	80.6	-	19.5	10.2	29.3	-	81.0	-	106.0	-	25.0	-	Carrier
Vert.	1216.050	---	44.5	25.6	4.5	35.8	-	-	38.7	0	53.9	-	15.2	VBW 10Hz
Vert.	1824.075	---	42.9	25.3	3.4	35.3	-	-	36.3	0	53.9	-	17.6	VBW 10Hz
Vert.	2432.100	---	35.2	27.5	3.7	34.9	-	-	31.4	0	53.9	-	22.5	VBW 10Hz
Vert.	3040.125	---	41.4	28.5	4.1	34.6	-	-	39.4	0	53.9	-	14.6	VBW 10Hz
Vert.	3648.150	---	37.2	29.2	4.9	34.2	-	-	37.1	0	53.9	-	16.8	VBW 10Hz
Vert.	4256.175	---	39.0	30.4	5.3	34.0	-	-	40.7	0	53.9	-	13.2	VBW 10Hz
Vert.	4864.200	---	32.9	31.7	5.5	34.2	-	-	35.9	0	53.9	-	18.0	Floor noise
Vert.	5472.225	---	38.2	31.9	5.7	33.9	-	-	41.9	0	53.9	-	12.0	VBW 10Hz
Vert.	6080.250	---	46.3	32.7	5.9	34.0	-	-	50.9	0	53.9	-	3.0	VBW 10Hz

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

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

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

*QP detector was used up to 960MHz.

Marker Delta Method(Test distance 3 m)

			AV			
		Polarity	Hor.		Ver.	
		RBW / VBW	[dBuV] Reading	[dBuV/m] Result	[dBuV] Reading	[dBuV/m] Result
Step1	Fundamental(608.025 MHz)	QP	86.40	86.80	80.60	81.00
Step2	Fundamental(608.025 MHz)	1 kHz / 3 kHz	85.60	86.00	79.25	79.65
	Band-edge(608 MHz)	1 kHz / 3 kHz	24.90	25.30	19.42	19.82
	Amplitude delta(608 MHz)	-	60.70	60.70	59.83	59.83
	Band-edge(607.998 MHz)	1 kHz / 3 kHz	26.41	26.81	24.54	24.94
	Amplitude delta(607.998 MHz)	-	59.19	59.19	54.71	54.71
Step3	Field strength of band-edge(608 MHz)	-	-	26.10	-	21.17
	Field strength of band-edge(607.998 MHz)	-	-	27.61	-	26.29
	Limit	-	-	46.0	-	46.0
	Margin(608 MHz)	-	-	19.9	-	24.8
	Margin(607.998 MHz)	-	-	18.4	-	19.7

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter) - Gain(Amprifier)

*1 Amplitude delta = Fundamental(RBW: kHz,VBW: kHz) - Band-edge(RBW: kHz,VBW: kHz)

*2 Field strength of band-edge = Fundamental(AV) - Amplitude delta

*As we stated at section ("Bandedge" section), we used RBW = 1 kHz (greater than 1 % bandwidth) to prevent to detect in-band emission. Refer to KDB 971168 D01 (KDB 971168 D01 Power Meas Licence Digital System D03r01).

Field Strength(Electric Field Strength of Fundamental Emission, Spurious Emission and Band Edge Compliance)

ZM-530PA

Test place	Ise EMC Lab.	
Semi Anechoic Chamber	No.2	No.2
Date	March 1, 2023	March 3, 2023
Temperature / Humidity	22 deg. C / 48 % RH	22 deg. C / 45 % RH
Engineer	Kiyoshiro Okazaki (Below 1 GHz)	Takumi Nishida (Above 1 GHz)
Mode	Tx 613.975 MHz	

Polarity [Hori/Vert]	Frequency [MHz]	Reading (QP / PK) [dBuV]	Reading (AV) [dBuV]	Ant. Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result (QP / PK) [dBuV/m]	Result (AV) [dBuV/m]	Limit (QP / PK) [dBuV/m]	Limit (AV) [dBuV/m]	Margin (QP / PK) [dB]	Margin (AV) [dB]	Remark
Hori.	48.870	22.4	-	11.7	6.9	28.6	-	12.5	-	46.0	-	33.5	-	
Hori.	64.119	23.3	-	7.0	7.0	28.5	-	8.9	-	46.0	-	37.2	-	
Hori.	178.244	30.4	-	16.1	7.9	28.1	-	26.3	-	46.0	-	19.7	-	
Hori.	336.014	30.7	-	15.3	8.9	28.0	-	26.9	-	46.0	-	19.1	-	
Hori.	512.654	24.5	-	17.9	9.9	29.2	-	23.1	-	46.0	-	22.9	-	
Hori.	613.975	82.4	-	19.5	10.2	29.3	-	82.8	-	106.0	-	23.2	-	Carrier
Hori.	614.000	20.7	-	19.5	10.2	29.3	-	21.1	-	46.0	-	24.9	-	Refer to Maker Delta Method
Hori.	1227.950	---	45.9	25.7	4.3	35.8	-	-	40.1	0	53.9	-	13.8	VBW 10Hz
Hori.	1841.925	---	43.7	25.4	3.4	35.2	-	-	37.3	0	53.9	-	16.6	VBW 10Hz
Hori.	2455.900	---	35.0	27.5	3.7	34.9	-	-	31.2	0	53.9	-	22.7	Floor noise
Hori.	3069.875	---	39.1	28.5	4.1	34.6	-	-	37.2	0	53.9	-	16.7	VBW 10Hz
Hori.	3683.850	---	36.7	29.2	4.9	34.2	-	-	36.7	0	53.9	-	17.2	VBW 10Hz
Hori.	4297.825	---	40.5	30.6	5.4	34.0	-	-	42.3	0	53.9	-	11.6	VBW 10Hz
Hori.	4911.800	---	33.8	31.7	5.5	34.2	-	-	36.9	0	53.9	-	17.0	VBW 10Hz
Hori.	5525.775	---	40.2	31.9	5.7	33.9	-	-	43.9	0	53.9	-	10.0	VBW 10Hz
Hori.	6139.750	---	47.2	32.8	5.9	34.0	-	-	52.0	0	53.9	-	1.9	VBW 10Hz
Vert.	48.870	23.3	-	11.7	6.9	28.6	-	13.4	-	46.0	-	32.6	-	
Vert.	64.119	25.6	-	7.0	7.0	28.5	-	11.2	-	46.0	-	34.9	-	
Vert.	178.244	22.3	-	16.1	7.9	28.1	-	18.2	-	46.0	-	27.8	-	
Vert.	336.014	26.5	-	15.3	8.9	28.0	-	22.7	-	46.0	-	23.3	-	
Vert.	512.654	22.7	-	17.9	9.9	29.2	-	21.3	-	46.0	-	24.7	-	
Vert.	613.975	83.3	-	19.5	10.2	29.3	-	83.7	-	106.0	-	22.3	-	Carrier
Vert.	614.000	22.2	-	19.5	10.2	29.3	-	22.7	-	46.0	-	23.3	-	Refer to Maker Delta Method
Vert.	1227.950	---	44.6	25.7	4.3	35.8	-	-	38.7	0	53.9	-	15.2	VBW 10Hz
Vert.	1841.925	---	42.9	25.4	3.4	35.2	-	-	36.4	0	53.9	-	17.5	VBW 10Hz
Vert.	2455.900	---	35.0	27.5	3.7	34.9	-	-	31.2	0	53.9	-	22.7	Floor noise
Vert.	3069.875	---	38.2	28.5	4.1	34.6	-	-	36.3	0	53.9	-	17.6	VBW 10Hz
Vert.	3683.850	---	36.6	29.2	4.9	34.2	-	-	36.5	0	53.9	-	17.4	VBW 10Hz
Vert.	4297.825	---	39.0	30.6	5.4	34.0	-	-	40.9	0	53.9	-	13.0	VBW 10Hz
Vert.	4911.800	---	34.2	31.7	5.5	34.2	-	-	37.3	0	53.9	-	16.6	VBW 10Hz
Vert.	5525.775	---	40.4	31.9	5.7	33.9	-	-	44.1	0	53.9	-	9.8	VBW 10Hz
Vert.	6139.750	---	44.3	32.8	5.9	34.0	-	-	49.1	0	53.9	-	4.8	VBW 10Hz

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

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

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

*QP detector was used up to 960MHz.

Marker Delta Method(Test distance 3 m)

			AV			
		Polarity	Hor.		Ver.	
			[dBuV]	[dBuV/m]	[dBuV]	[dBuV/m]
		RBW / VBW	Reading	Result	Reading	Result
Step1	Fundamental(613.975 MHz)	QP	82.40	82.84	83.30	83.74
Step2	Fundamental(613.975 MHz)	1 kHz / 3 kHz	80.87	81.31	81.76	82.20
	Band-edge(614 MHz)	1 kHz / 3 kHz	20.69	21.13	22.24	22.68
	Amplitude delta	-	60.18	60.18	59.52	59.52
Step3	Field strength of band-edge	-	-	22.66	-	24.22
	Limit	-	-	46.0	-	46.0
	Margin	-	-	23.3	-	21.8

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter) - Gain(Amprifier)

*1 Amplitude delta = Fundamental(RBW: kHz, VBW: kHz) - Band-edge(RBW: kHz, VBW: kHz)

*2 Field strength of band-edge = Fundamental(AV) - Amplitude delta

*As we stated at section ("Bandedge" section), we used RBW = 1 kHz (greater than 1 % bandwidth) to prevent to detect in-band emission. Refer to KDB 971168 D01 (KDB 971168 D01 Power Meas Licence Digital System D03r01).

Field Strength(Electric Field Strength of Fundamental Emission, Spurious Emission and Band Edge Compliance)

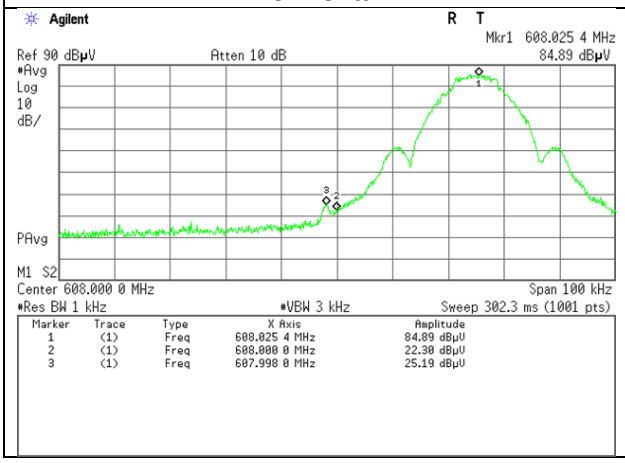
ZM-530PA

Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.2
Date	March 1, 2023
Temperature / Humidity	22 deg. C / 48 % RH
Engineer	Kiyoshiro Okazaki (Below 1 GHz)
Mode	Tx

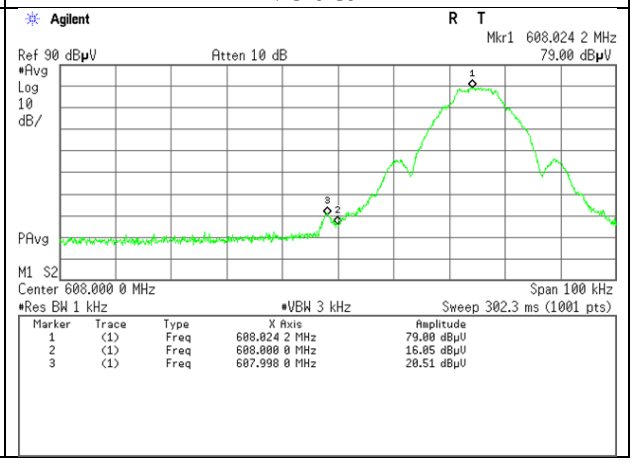
Reference Plot for Band Edge compliance (Marker Delta Method)

Transmitting (608.025 MHz)

Horizontal

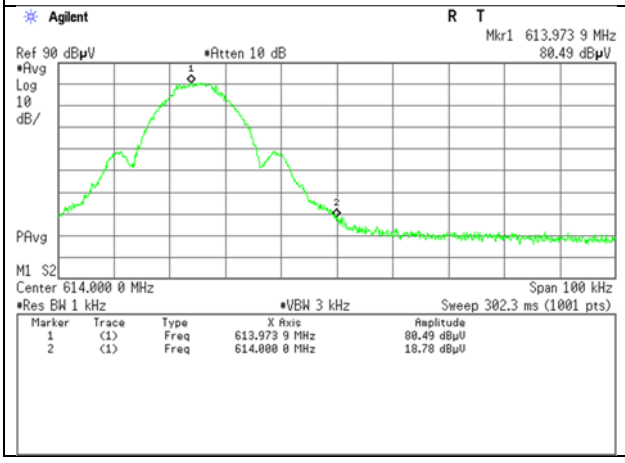


Vertical

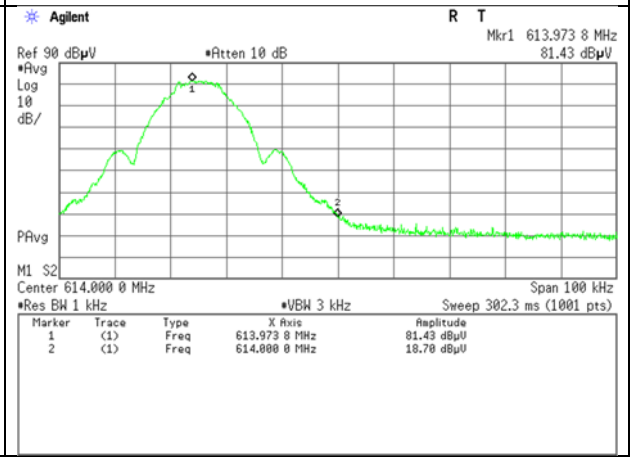


Transmitting (613.975 MHz)

Horizontal



Vertical



* Final results were shown in tabular data.

APPENDIX 2: Test instruments

Test equipment

Test Item	Local ID	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Cal Int
RE	COTS-MEMI-02	178648	EMI measurement program	TSJ (Techno Science Japan)	TEPTO-DV	-	-	-
RE	MAEC-02	142004	AC2_Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-06902	05/30/2022	24
RE	MAT-112	220646	Attenuator	Huber+Suhner	6806_N-50-1	-	06/07/2022	12
RE	MBA-08	141427	Biconical Antenna	Schwarzbeck Mess-Elektronik OHG	VHA9103B+ BBA9106	08031	07/30/2022	12
RE	MCC-12	141317	Coaxial Cable	UL Japan	-	-	09/27/2022	12
RE	MCC-218	141394	Microwave Cable	Junkosha	MWX221	1607S141(1 m) / 1608S264(5 m)	09/12/2022	12
RE	MHA-06	141512	Horn Antenna 1-18GHz	Schwarzbeck Mess-Elektronik OHG	BBHA9120D	254	10/20/2022	12
RE	MHF-04	141403	High Pass Filter 1.22-4.60GHz	Mini-Circuits	VHF-1200	10435	08/01/2022	12
RE	MHF-26	141296	High Pass Filter 3.5-18.0GHz	UL Japan	HPF SELECTOR	002	09/08/2022	12
RE	MJM-27	142228	Measure, Tape, Steel	KOMELON	KMC-36	-	-	-
RE	MLA-21	141265	Logperiodic Antenna (200-1000MHz)	Schwarzbeck Mess-Elektronik OHG	VUSLP9111B	9111B-190	07/30/2022	12
RE	MMM-01	141542	Digital Tester	Fluke Corporation	FLUKE 26-3	78030611	08/12/2022	12
RE	MOS-41	192300	Thermo-Hygrometer	CUSTOM. Inc	CTH-201	0013	12/17/2022	12
RE	MPA-10	141579	Pre Amplifier	Keysight Technologies Inc	8449B	3008A02142	02/14/2023	12
RE	MPA-24	141594	Pre Amplifier	Keysight Technologies Inc	8447D	2944A10150	02/02/2023	12
RE	MSA-16	141903	Spectrum Analyzer	Keysight Technologies Inc	E4440A	MY46186390	01/16/2023	12
RE	MTR-03	141942	Test Receiver	Rohde & Schwarz	ESCI	100300	07/29/2022	12
AT	MAT-26	141244	Attenuator(10dB)	Weinschel - API Technologies Corp	WA8-10-34	A198	02/01/2023	12
AT	MCC-243	196430	Microwave Cable	Huber+Suhner	SF102D/11PC24/ 11PC24/1000mm	537059/126EA	02/02/2023	12
AT	MCH-05	141440	Temperature and Humidity Chamber	Espec	PL-1KP	14019569	04/24/2022	12
AT	MMM-17	141557	DIGIITAL HiTESTER	HIOKI E.E. CORPORATION	3805	70900530	01/18/2023	12
AT	MOS-28	141567	Thermo-Hygrometer	CUSTOM. Inc	CTH-201	0008	01/13/2023	12
AT	MPM-08	141805	Power Meter	Anritsu Corporation	ML2495A	6K00003338	07/04/2022	12
AT	MPSE-11	141840	Power sensor	Anritsu Corporation	MA2411B	11737	07/04/2022	12
AT	MSA-14	141901	Spectrum Analyzer	Keysight Technologies Inc	E4440A	MY48250080	01/16/2023	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 Emission
AT: Antenna Terminal Conducted