RADIO TEST REPORT

Test Report No. : 13185013H-C-R1

Applicant	:	**DENSO CORPORATION**
Type of EUT	:	**Cockpit Control Unit (CCU)**
Model Number of EUT	:	**DNNS111**
FCC ID	:	**HYQDNNS111**
Test regulation	:	**FCC Part 15 Subpart C: 2020**
Test Result	:	**Complied (Refer to SECTION 3.2)**

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2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with the limits of the above regulation.
4. The test results in this test report are traceable to the national or international standards.
5. This test report covers Radio technical requirements.
   It does not cover administrative issues such as Manual or non-Radio test related Requirements. (if applicable)
6. The all test items in this test report are conducted by UL Japan, Inc. Ise EMC Lab.
7. This test report must not be used by the customer to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the U.S. Government.
8. The information provided from the customer for this report is identified in SECTION 1.
9. This report is a revised version of 13185013H-C. 13185013H-C is replaced with this report.

Date of test: June 8, 2018 to May 14, 2020

Representative test engineer:
Junki Nagatomi
Engineer
Consumer Technology Division

Approved by:
Satofumi Matsuyama
Engineer
Consumer Technology Division

NVLAP TESTING NVLAP LAB CODE 200572-0

This laboratory is accredited by the NVLAP LAB CODE 200572-0, U.S.A. The tests reported herein have been performed in accordance with its terms of accreditation.
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☐ This report contains data that are not covered by the NVLAP accreditation.

☒ There is no testing item of "Non-accreditation".

REVISION HISTORY

Original Test Report No.: 13185013H-C

Revision	Test report No.	Date	Page revised	Contents
- (Original)	13185013H-C	May 20, 2020	-	-
1	13185013H-C-R1	June 16, 2020	P.6	Correction of Radio Specification for AM Frequency of operation: 531 kHz to 1602 kHz=> 530kHz to 1710 kHz Channel Spacing: 9kHz => 5 kHz
1	13185013H-C-R1	June 16, 2020	P.6	Correction of the description regarding the verification of the equivalence between DNNS111 and DNNS102
1	13185013H-C-R1	June 16, 2020	P.7	Correction of sentence of *1)
1	13185013H-C-R1	June 16, 2020	P.8	Correction of sentence of *1)
1	13185013H-C-R1	June 16, 2020	P.15	Division of test method by each test model
1	13185013H-C-R1	June 16, 2020	P.55	Deletion of "*1)" from Last date of LIMS ID: 142013

Reference: Abbreviations (Including words undescribed in this report)

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

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SECTION 1: Customer information

Company Name	:	DENSO CORPORATION
Address	:	1-1 Showa-cho, Kariya-shi, Aichi ken, 448-8661 Japan
Telephone Number	:	+81-566-20-3304
Facsimile Number	:	+81-566-25-4920
Contact Person	:	Naoto Makino

The information provided from the customer is as follows:
- Applicant, Type of EUT, Model Number of EUT, FCC ID on the cover page 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
- SECTION 4: Operation of EUT during testing

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

SECTION 2: Equipment under test (EUT)

2.1 Identification of EUT

Type	:	Cockpit Control Unit (CCU)
Model Number	:	DNNS111
Serial Number	:	Refer to SECTION 4.2
Rating	:	DC 13.2 V
Receipt Date	:	June 3, 2018 (DNNS102) February 4, 2020 (DNNS111)
Country of Mass-production	:	Japan (DNNS111) the United States of America (DNNS102)
Condition	:	Production prototype (Not for Sale: This sample is equivalent to mass-produced items.)
Modification	:	No Modification by the test lab.

2.2 Product Description

Model: DNNS111 (referred to as the EUT in this report) is a Cockpit Control Unit (CCU).

Radio Specification

Feature of EUT:
Clock frequency(ies) in the system : 1.8 GHz (max.)
Operating Temperature : -30 deg. C to 65 deg. C

[AM/FM Radio]

	AM	FM
Equipment type	Receiver	
Frequency of operation	530 kHz to 1710 kHz	87.5 MHz to 108.0 MHz
Channel spacing	5 kHz	50 kHz
Antenna connector type	Receptacle Connector	

[Bluetooth (Ver4.2 BDR/EDR)]

	Bluetooth
Equipment type	Transceiver
Frequency of operation	2402 MHz - 2480 MHz
Type of modulation	FHSS (GFSK, π/4-DQPSK, 8-DPSK)
Channel spacing	1 MHz
Antenna type	ASSEMBLY Bluetooth Antenna
Antenna Connector type	MHF PLUG
Antenna Gain	-0.88 dBi

*The EUT is the modified version of model and the difference from DNNS102 is as below.
- Deletion of XM PCB
- Change of Main PCB

The radio specification other than above is identical to the original test report (12344074H-C-R1).

For verifying the equivalence between DNNS111 and DNNS102, spot-check tests were performed on RF Output power and Radiated Spurious Emission.
As a result, the deviation of worst value was within ±0.5 dB at RF Output power test and ±3.0 dB at Radiated Spurious Emission test, and the equivalence between DNNS111 and DNNS102 was confirmed.
Therefore the data of DNNS102 are included in this report.

SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification : FCC Part 15 Subpart C
FCC Part 15 final revised on April 1, 2020 and effective June 1, 2020 except 15.258

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
Conducted Emission	**FCC:** ANSI C63.10-2013 6. Standard test methods **ISED:** RSS-Gen 8.8	**FCC:** Section 15.207 **ISED:** RSS-Gen 8.8	N/A	N/A	*2)
Carrier Frequency Separation	**FCC:** FCC Public Notice DA 00-705 *1) **IC:** -	**FCC:** Section15.247(a)(1) **ISED:** RSS-247 5.1 (b)	See data.	Complied a)	Conducted
20dB Bandwidth	**FCC:** FCC Public Notice DA 00-705 *1) **IC:** -	**FCC:** Section15.247(a)(1) **ISED:** RSS-247 5.1 (a)		Complied a)	Conducted
Number of Hopping Frequency	**FCC:** FCC Public Notice DA 00-705 *1) **IC:** -	**FCC:** Section15.247(a)(1)(iii) **ISED:** RSS-247 5.1 (d)		Complied b)	Conducted
Dwell time	**FCC:** FCC Public Notice DA 00-705 *1) **IC:** -	**FCC:** Section15.247(a)(1)(iii) **ISED:** RSS-247 5.1 (d)		Complied c)	Conducted
Maximum Peak Output Power	**FCC:** (DNNS102) FCC Public Notice DA 00-705*1) (DNNS111) KDB 558074 D01 15.247 Meas Guidance v05r02 **ISED:** RSS-Gen 6.12	**FCC:** Section15.247(a)(b)(1) **ISED:** RSS-247 5.4 (b)		Complied d)	Conducted
Spurious Emission & Band Edge Compliance	**FCC:** (DNNS102) FCC Public Notice DA 00-705 *1) (DNNS111) KDB 558074 D01 15.247 Meas Guidance v05r02 **ISED:** RSS-Gen 6.13	**FCC:** Section15.247(d) **ISED:** RSS-247 5.5 RSS-Gen 8.9 RSS-Gen 8.10	2.9 dB 215.991 MHz, QP, Vert. (DNNS111)	Complied e) / f)	Conducted/ Radiated (above 30 MHz) *3)

Note: UL Japan, Inc.'s EMI Work Procedures No. 13-EM-W0420 and 13-EM-W0422.
*1) Tests for DNNS 102 was performed based on FCC Public Notice DA 00-705.
There is no difference in test between FCC Public Notice DA 00-705 and KDB 558074 D01 15.247 Meas Guidance v05r02.
*2) The test is not applicable since the EUT is not the device that is designed to be connected to the public utility (AC) power line.
*3) Radiated test was selected over 30 MHz based on section 15.247(d).
a) Refer to APPENDIX 1 (data of 20dB Bandwidth, 99%Occupied Bandwidth and Carrier Frequency Separation)
b) Refer to APPENDIX 1 (data of Number of Hopping Frequency)
c) Refer to APPENDIX 1 (data of Dwell time)
d) Refer to APPENDIX 1 (data of Maximum Peak Output Power)
e) Refer to APPENDIX 1 (data of Conducted Spurious Emission)
f) Refer to APPENDIX 1 (data of Radiated Spurious Emission)

Symbols:
Complied The data of this test item has enough margin, more than the measurement uncertainty.
Complied# The data of this test item meets the limits unless the measurement uncertainty is taken into consideration.

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

FCC 15.31 (e)
The EUT provides stable voltage constantly to the wireless transmitter regardless of input voltage.
Instead of a new battery, DC power supply was used for the test.
That does not affect the test result, therefore the 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 vehicle. Therefore, the equipment complies with the antenna requirement of Section 15.203.

3.3 Addition to standard

Item	Test Procedure	Specification	Worst margin	Results	Remarks
99% Occupied Bandwidth	**ISED:** RSS-Gen 6.6 *1)	**ISED:** -	N/A	- a)	Conducted
*1) Although tests for DNNS 102 was performed based on RSS-Gen Issue 5 Section 6.6. There is no difference in test between RSS-Gen Issue 5 Section 6.6 and RSS-Gen Issue 5+Amendment 1 Section 6.7 a) Refer to APPENDIX 1 (data of 20dB Bandwidth, 99%Occupied Bandwidth and Carrier Frequency Separation)					

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

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

3.4 Uncertainty

There is no applicable rule of uncertainty in this applied standard. Therefore, the 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.
Used on June 8 to August 3, 2018 (DNNS102)

Antenna Terminal test

Test Item		Uncertainty (+/-)
RF output power		1.3 dB
Antenna terminal conducted emission / Power dencity / Burst power		
Below 3GHz		2.0 dB
Adjacent channnel power / Channnel power		
	Below 3GHz	1.9 dB

Radiated emission

Measurement distance	Frequency range	Uncertainty (+/-)
3 m	9 kHz to 30 MHz	3.3 dB
10 m		3.2 dB
3 m	30 MHz to 200 MHz (Horizontal)	4.8 dB
	(Vertical)	5.0 dB
	200 MHz to 1000 MHz (Horizontal)	5.2 dB
	(Vertical)	6.3 dB
10 m	30 MHz to 200 MHz (Horizontal)	4.8 dB
	(Vertical)	4.9 dB
	200 MHz to 1000 MHz (Horizontal)	5.0 dB
	(Vertical)	5.0 dB
3 m	1 GHz to 6 GHz	5.0 dB
	6 GHz to 18 GHz	5.3 dB
1 m	10 GHz to 26.5 GHz	5.8 dB
	26.5 GHz to 40 GHz	5.8 dB
10 m	1 GHz to 18 GHz	5.2 dB

Used on February 4 to May 14, 2020 (DNNS111)
Ise EMC Lab.

Antenna Terminal test

Test Item	Uncertainty (+/-)
20 dB Bandwidth / 99 % Occupied Bandwidth	0.96 %
Maximum Peak Output Power / Average Output Power	1.4 dB
Carrier Frequency Separation	0.42 %
Dwell time / Burst rate	0.10 %
Conducted Spurious Emission	2.6 dB

Radiated emission

Measurement distance	Frequency range	Uncertainty (+/-)
3 m	9 kHz to 30 MHz	3.3 dB
10 m		3.2 dB
3 m	30 MHz to 200 MHz (Horizontal)	4.8 dB
	(Vertical)	5.0 dB
	200 MHz to 1000 MHz (Horizontal)	5.2 dB
	(Vertical)	6.3 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	5.5 dB
	26.5 GHz to 40 GHz	5.5 dB
0.5 m	26.5 GHz to 40 GHz	5.5 dB
10 m	1 GHz to 18 GHz	5.2 dB

3.5 Test Location

UL Japan, Inc. Ise EMC Lab.
*NVLAP Lab. code: 200572-0 / FCC Test Firm Registration Number: 199967 / ISED Lab Company Number: 2973C
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN
Telephone: +81 596 24 8999, Facsimile: +81 596 24 8124

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.11 measurement room	6.2 x 4.7 x 3.0	4.8 x 4.6	-	-

* Size of vertical conducting plane (for Conducted Emission test) : 2.0 x 2.0 m for No.1, No.2, No.3, and No.4 semi-anechoic chambers and No.3 and No.4 shielded rooms.

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)

Bluetooth (BT): Transmitting (Tx), Payload: PRBS9

Details of Operating Mode(s)

Test Item	Mode	Tested frequency
Spurious Emission (Conducted/Radiated *1))	Tx (Hopping Off) DH5, 3DH5	2402 MHz 2441 MHz 2480 MHz
Carrier Frequency Separation	Tx (Hopping On) DH5, 3DH5	2402 MHz 2441 MHz 2480 MHz
20dB Bandwidth	Tx (Hopping Off) DH5, 3DH5	2402 MHz 2441 MHz 2480 MHz
Number of Hopping Frequency	Tx DH5, 3DH5 -Hopping On	-
Dwell time	Tx (Hopping On), -DH1, DH3, DH5 -3DH1, 3DH3, 3DH5	-
Maximum Peak Output Power*1)	Tx (Hopping Off) DH5, 2DH5, 3DH5*1)	2402 MHz 2441 MHz 2480 MHz
Band Edge Compliance (Conducted)	Tx DH5, 3DH5 -Hopping On -Hopping Off	2402 MHz 2480 MHz
99% Occupied Bandwidth	Tx DH5, 3DH5 -Hopping On -Hopping Off	2402 MHz 2441 MHz 2480 MHz

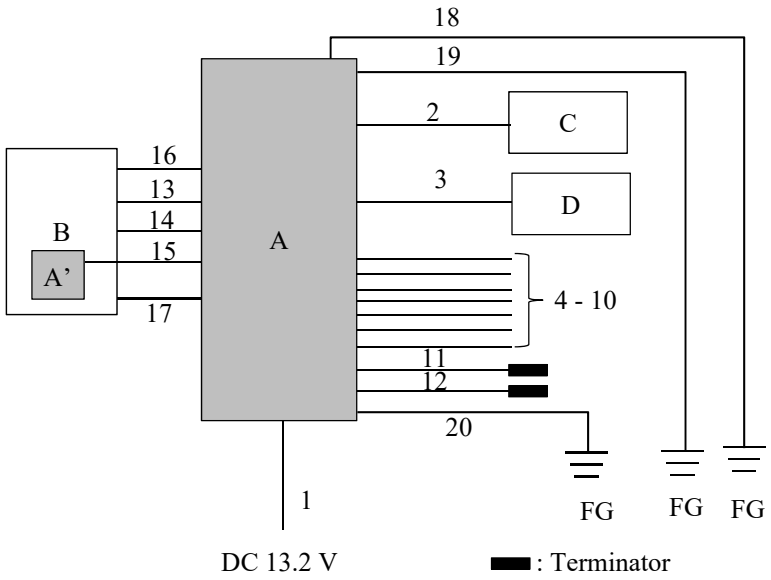
*1) Test for spot check was performed on below mode.
Radiated Spurious Emission: Tx 3DH5, 2441 MHz
Maximum Peak Putout Power: Tx 3DH5
*As a result of preliminary test, the formal test was performed with the above modes, which had the maximum payload length (except Dwell time test)
*2DH mode (2Mb/s EDR: pi/4DQPSK) was excluded for other tests than power measurement by using 3DH mode (3 Mb/s EDR: 8DPSK) as a representative.
* It is considered that the non-tested packet type (e.g. inquiry) can be omitted as it is complied with above all test items based on Bluetooth Core specification.

*EUT has the power settings by the software as follows;
Power settings: BDR/EDR: 3 dBm
Software: DNNS102: MSoC Ver: F11GBO11-O14
(Date: June 8, 2018, Storage location: EUT Memory)
DNNS111: MSoC Ver: F17GBM007-008
(Date: February 4, 2020, Storage location: EUT Memory)

*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

DNNS102



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

Description of EUT and Support equipment

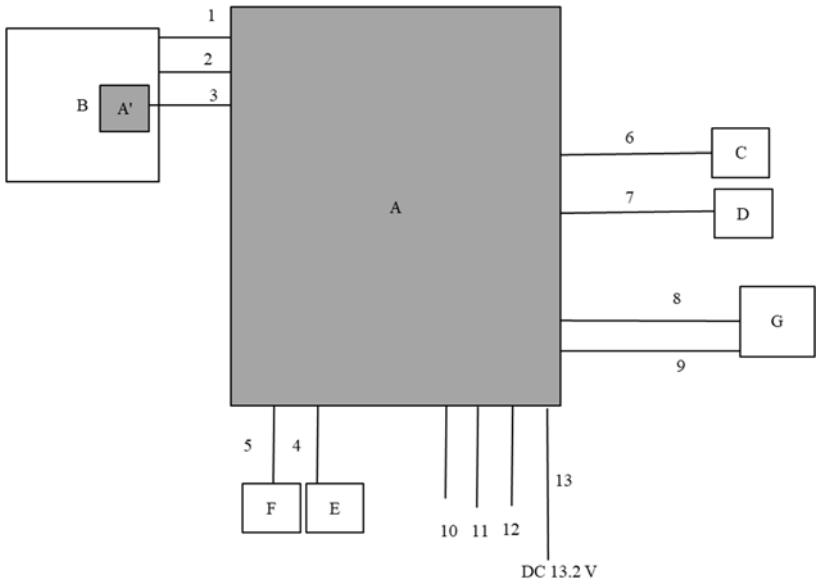
No.	Item	Model number	Serial number	Manufacturer	Remarks
A	Cockpit Control Unit (CCU)	DNNS102	468726302000305	DENSO CORPORATION	EUT
A'	ASSEMBLY Bluetooth Antenna	462810-0090/23 14134-1	*1)	TE Connectivity Ltd.	EUT
B	Center Information Display (CID)	86213AN60A	ASSY-K3-BASE-089	DENSO CORPORATION	-
C	Speaker	-	-	-	-
D	Speaker	-	-	-	-

*1) This item is controlled with item B.

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	DC Cable	2.5	Unshielded	Unshielded	-
2	Speaker Cable	1.0	Unshielded	Unshielded	-
3	Speaker Cable	1.0	Unshielded	Unshielded	-
4	Signal Cable	1.8	Unshielded	Unshielded	-
5	Mater Cable	1.7	Shielded	Shielded	-
6	USB Cable	2.0	Shielded	Shielded	-
7	USB Cable	2.0	Shielded	Shielded	-
8	USB Cable	2.0	Shielded	Shielded	-
9	XM Cable	1.0	Shielded	Shielded	-
10	Signal Cable	2.0	Unshielded	Unshielded	-
11	AM/FM Cable (Main)	1.0	Shielded	Shielded	-
12	AM/FM Cable (Sub)	1.0	Shielded	Shielded	-
13	DC Cable	0.2	Unshielded	Unshielded	-
14	Signal Cable	0.2	Shielded	Shielded	-
15	BT Cable	0.2	Shielded	Shielded	-
16	FG Cable	0.1	Unshielded	Unshielded	-
17	FG Cable	0.1	Unshielded	Unshielded	-
18	FG Cable	3.0	Unshielded	Unshielded	-
19	FG Cable	3.0	Unshielded	Unshielded	-
20	FG Cable	3.0	Unshielded	Unshielded	-

DNNS111



* 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	Cockpit Control Unit (CCU)	DNNS111	GR50	DENSO CORPORATION	EUT
A'	ASSEMBLY Bluetooth Antenna	462810-0090/23141 34-1	*1)	TE Connectivity Ltd.	EUT
B	Center Information Display (CID)	86213AN520	009	DENSO CORPORATION	-
C	Speaker	-	-	-	-
D	Speaker	-	-	-	-
E	Terminator	-	-	-	-
F	Terminator	-	-	-	-
G	Aux box	86257 FL001	-	-	-

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	DC Cable	0.2	Unshielded	Unshielded	-
2	Signal Cable	0.2	Shielded	Shielded	-
3	BT Cable	0.2	Shielded	Shielded	-
4	AM/FM Cable (Main)	2.0	Shielded	Shielded	-
5	AM/FM Cable (Sub)	2.0	Shielded	Shielded	-
6	Speaker Cable	2.0	Unshielded	Unshielded	-
7	Speaker Cable	2.0	Unshielded	Unshielded	-
8	Signal Cable	0.5	Shielded	Shielded	-
9	Signal Cable	1.5	Shielded	Shielded	-
10	Mater Cable	1.7	Shielded	Shielded	-
11	Signal Cable	2.0	Shielded	Shielded	-
12	Signal Cable	2.0	Shielded	Shielded	-
13	DC Cable	3.5	Unshielded	Unshielded	-

*1) This item is controlled with item B.

SECTION 5: Radiated Spurious Emission

Test Procedure

[For below 1 GHz]
EUT was placed on a urethane platform of nominal size, 1.0 m by 1.5 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 beamwidth of the antenna.
The measurements were performed for both vertical and horizontal antenna polarization with the Test Receiver, or the Spectrum Analyzer.
The measurements were made with the following detector function of the test receiver and the Spectrum analyzer (in linear mode).
The test was made with the detector (RBW/VBW) in the following table.
When using Spectrum analyzer, the test was made with adjusting span to zero by using peak hold.

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

In any 100 kHz bandwidth outside the restricted band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator confirmed 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on a radiated measurement.

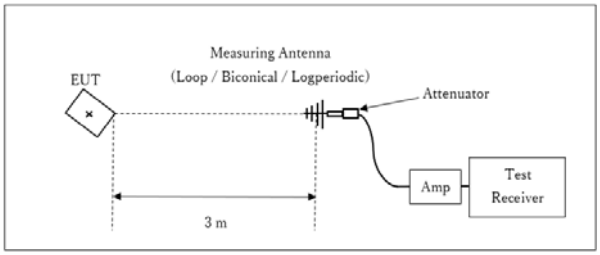
20 dBc was applied to the frequency over the limit of FCC 15.209 / Table 4 of RSS-Gen 8.9 (ISED) and outside the restricted band of FCC15.205 / Table 6 of RSS-Gen 8.10 (ISED).

Frequency	Below 1 GHz	Above 1 GHz		20 dBc
Instrument used	Test Receiver	Spectrum Analyzer		Spectrum Analyzer
Detector	QP	PK	AV	PK
IF Bandwidth	BW 120 kHz	RBW: 1 MHz VBW: 3 MHz	RBW: 1 MHz VBW: 10 Hz *1)	RBW: 100 kHz VBW: 300 kHz

*1) DNNS102: Although DA 00-705 accepts VBW = 10 Hz for AV measurements, it was confirmed that superfluous smoothing was not performed.
DNNS111: Average Power Measurement was performed based on KDB 558074 D01 15.247 Meas Guidance v05r02.

Figure 2: Test Setup

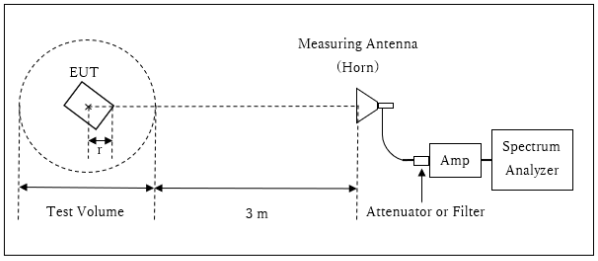
Below 1 GHz



× : Center of turn table

Test Distance: 3 m

1 GHz - 10 GHz



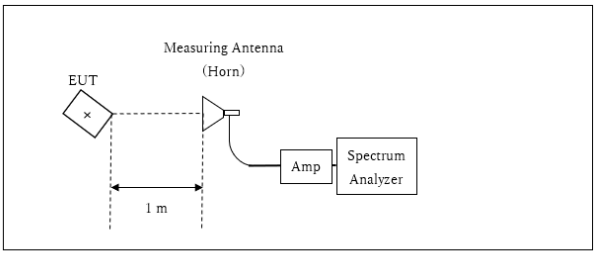
r : Radius of an outer periphery of EUT
× : Center of turn table

Distance Factor: 20 x log (4.0 m / 3.0 m) = 2.5 dB
* Test Distance: (3 + Test Volume /2) - r = 4.0 m

Test Volume : 2.0 m
(Test Volume has been calibrated based on CISPR 16-1-4.)
r = 0.0 m

* The test was performed with r = 0.0 m since EUT is small and it was the rather conservative condition.

10 GHz - 26.5 GHz



× : Center of turn table

Distance Factor: 20 x log (1.0 m / 3.0 m) = -9.5 dB
*Test Distance: 1 m

The carrier level and noise levels were confirmed at each position of 0 degree and 30 degree as tilt angle 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 - 26.5 GHz
Test data : APPENDIX
Test result : Pass

SECTION 6: 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
20dB Bandwidth	3 MHz	30 kHz	100 kHz	Auto	Peak	Max Hold	Spectrum Analyzer
99% Occupied Bandwidth *1)	Enough width to display emission skirts	1 to 5 % of OBW	Three times of RBW	Auto	Peak	Max Hold	Spectrum Analyzer
Maximum Peak Output Power	-	-	-	Auto	Peak Average *2)	-	Power Meter (Sensor: 50MHz BW)
Carrier Frequency Separation	3 MHz	30 kHz	100 kHz	Auto	Peak	Max Hold	Spectrum Analyzer
Number of Hopping Frequency	30 MHz	300 kHz	1 MHz	Auto	Peak	Max Hold	Spectrum Analyzer
Dwell Time	Zero Span	100 kHz, 1 MHz	300 kHz, 3 MHz	As necessary capture the entire dwell time per hopping channel	Peak	Clear Write	Spectrum Analyzer
Conducted Spurious Emission *3)	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				
	30 MHz to 25 GHz	100 kHz	300 kHz				
Conducted Spurious Emission Band Edge compliance	10 MHz	100 kHz	300 kHz	Auto	Peak	Max Hold	Spectrum Analyzer

*1) Peak hold was applied as Worst-case measurement.
*2) Reference data
*3) In the frequency range below 30MHz, RBW was narrowed to separate the noise contents.
Then, wide-band noise near the limit was checked separately, however the noise was low enough as shown in the chart.

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

Test data : APPENDIX
Test result : Pass

APPENDIX 1: Test data

20dB Bandwidth, 99%Occupied Bandwidth and Carrier Frequency Separation

(Test model number: DNNS102)

Report No.	13185013H
Test place	Ise EMC Lab.
Measurement Room	No.5
Date	August 3, 2018
Temperature / Humidity	24 deg. C / 50 % RH
Engineer	Takafumi Noguchi
Mode	Tx, Hopping Off, Tx, Hopping On

Mode	Freq. [MHz]	20dB Bandwidth [MHz]	99% Occupied Bandwidth [kHz]	Carrier Frequency Separation [MHz]	Limit for Carrier Frequency separation [MHz]
DH5	2402.0	0.957	864.580	1.000	>= 0.638
DH5	2441.0	0.944	873.425	1.000	>= 0.629
DH5	2480.0	0.950	854.864	1.000	>= 0.633
DH5	Hopping On	-	78649.100	-	-
3DH5	2402.0	1.283	1161.700	1.000	>= 0.855
3DH5	2441.0	1.283	1160.100	1.000	>= 0.855
3DH5	2480.0	1.286	1167.800	1.000	>= 0.857
3DH5	Hopping On	-	78702.400	-	-

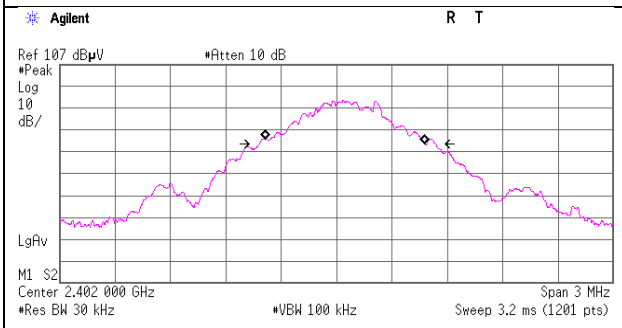
Limit: Two-thirds of 20dB Bandwidth or 25kHz (whichever is greater).
No limit applies to 20dB Bandwidth.

20dB Bandwidth and 99% Occupied Bandwidth

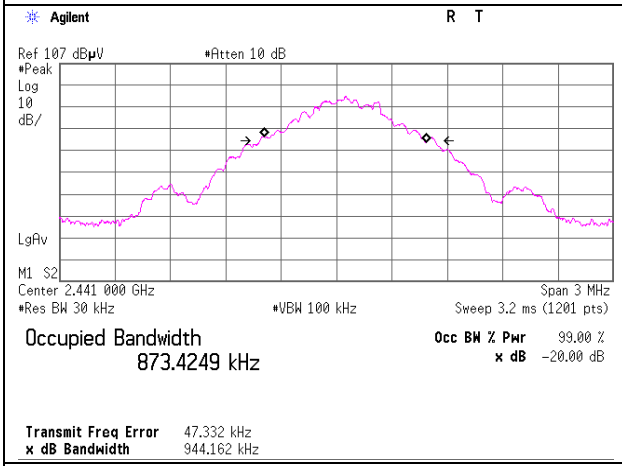
(Test model number: DNNS102)

DH5

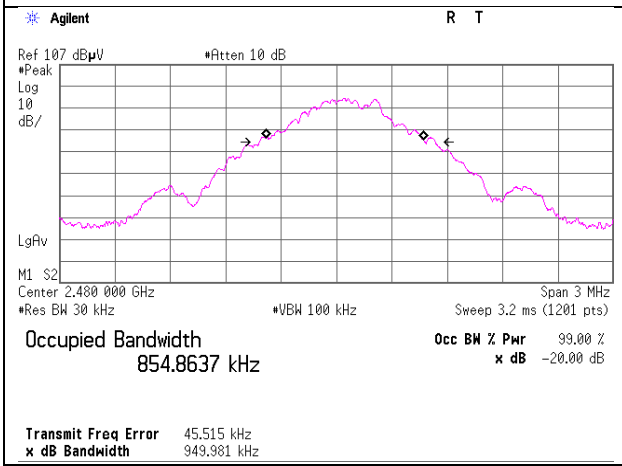
2402 MHz



2441 MHz

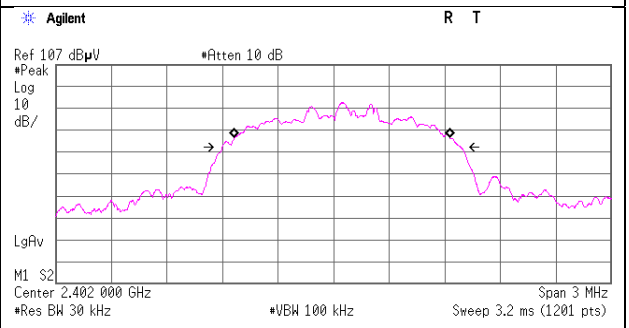


2480 MHz

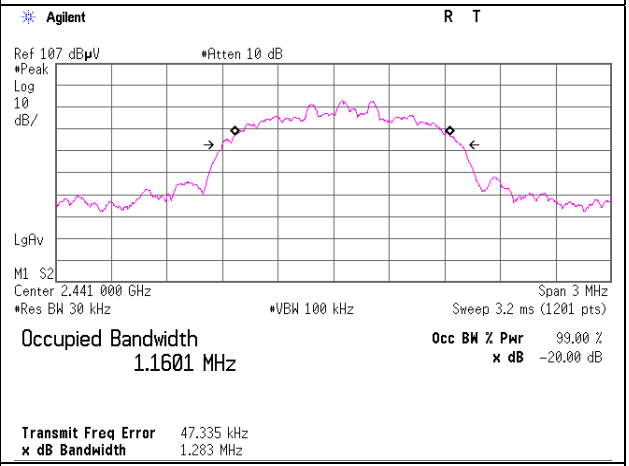


3DH5

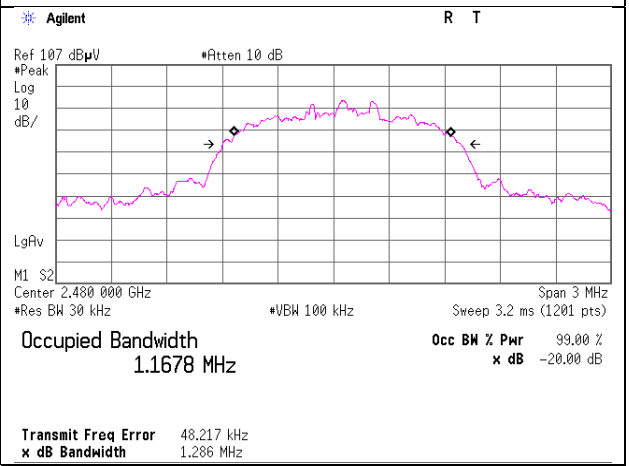
2402 MHz



2441 MHz



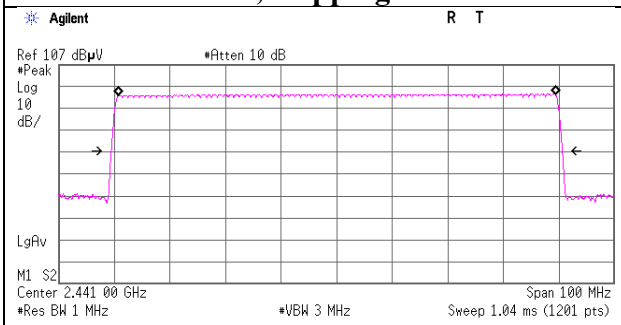
2480 MHz



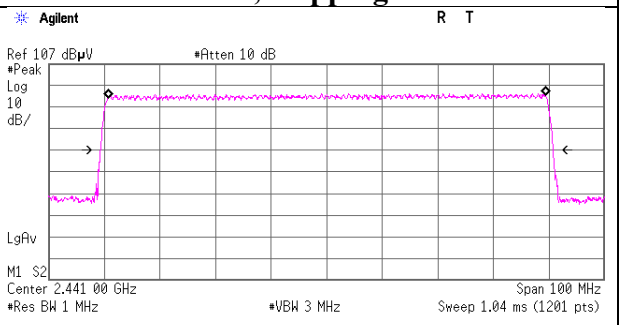
20dB Bandwidth and 99% Occupied Bandwidth

(Test model number: DNNS102)

DH5, Hopping On

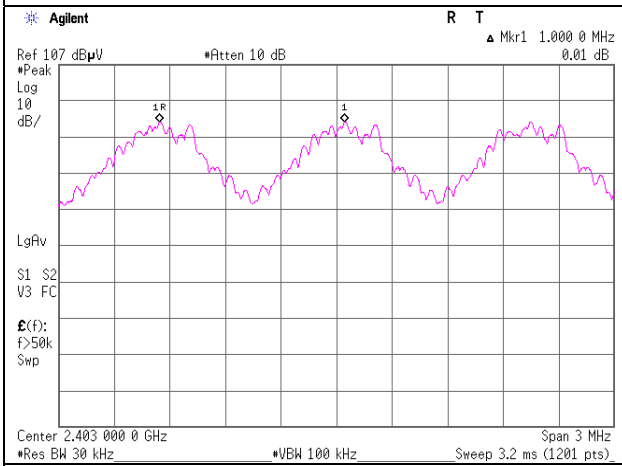
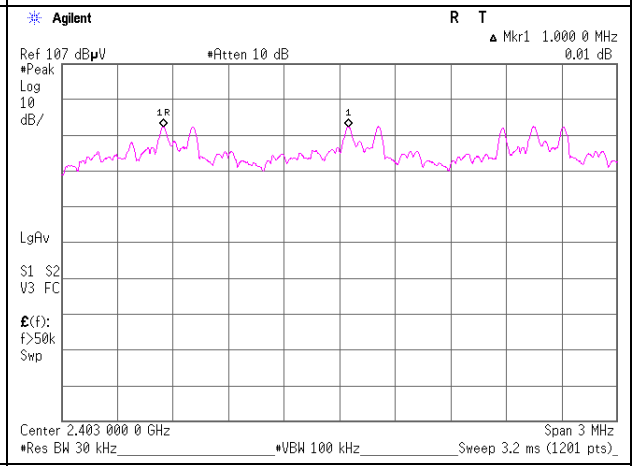
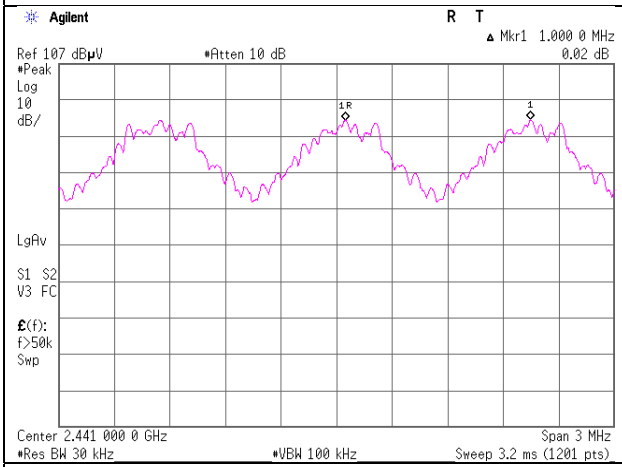
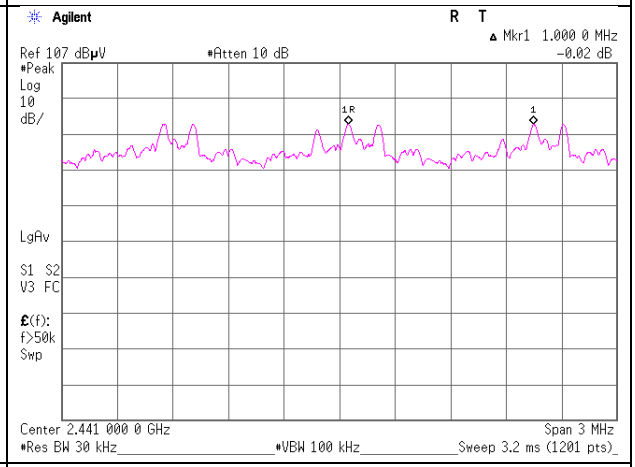
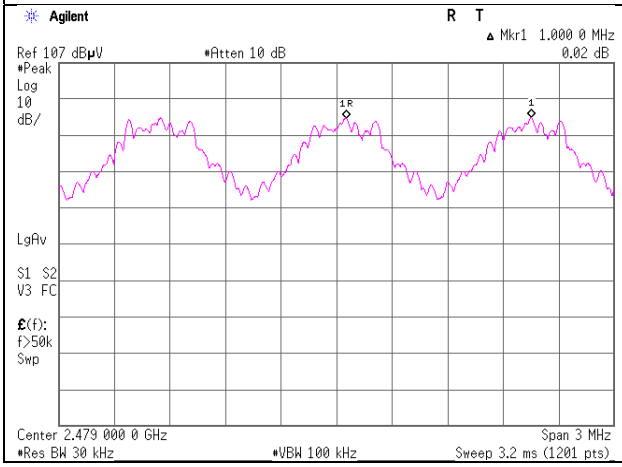
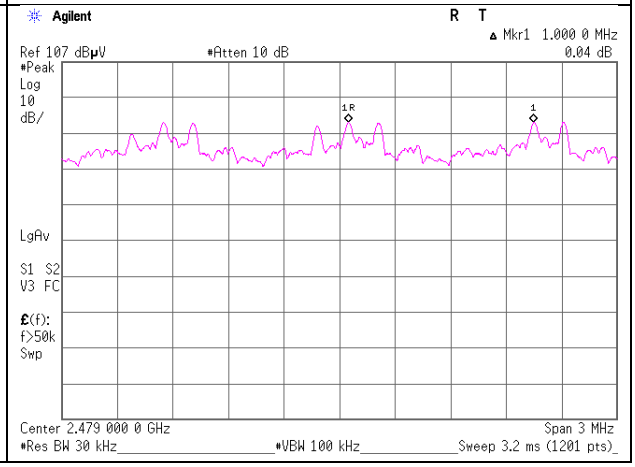


3DH5, Hopping On



Carrier Frequency Separation

(Test model number: DNNS102)

DH5	3DH5
2402 MHz	**2402 MHz**
	
2441 MHz	**2441 MHz**
	
2480 MHz	**2480 MHz**
	

Number of Hopping Frequency

(Test model number: DNNS102)

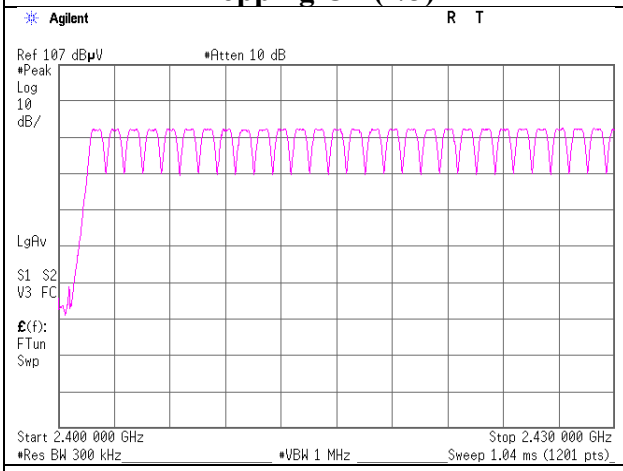
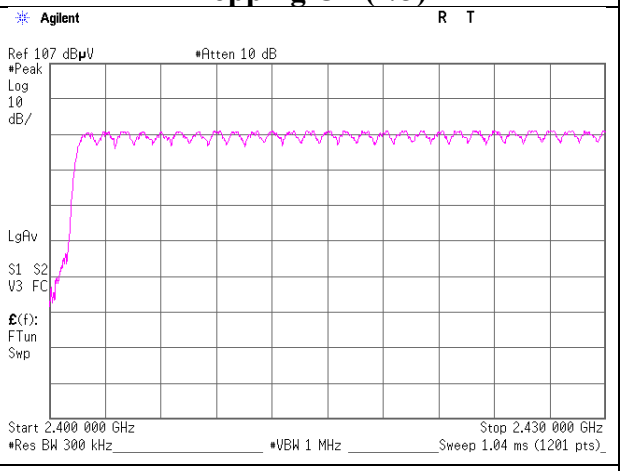
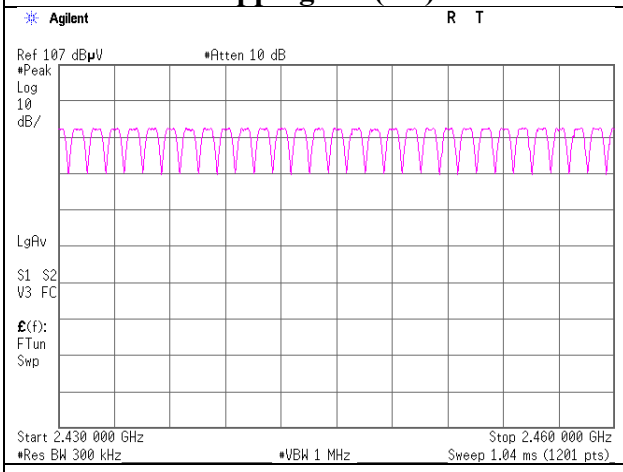
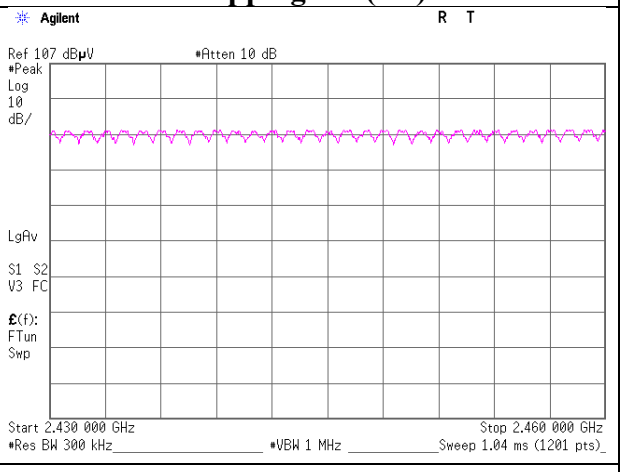
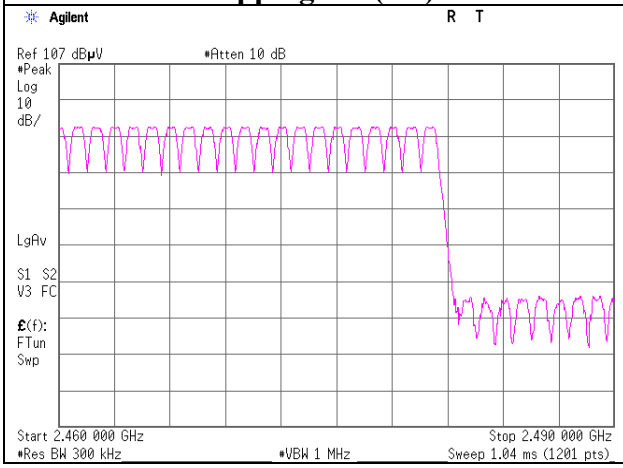
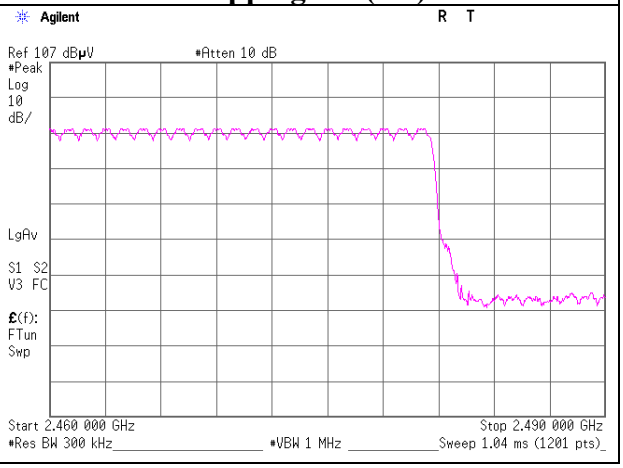
Report No.	13185013H
Test place	Ise EMC Lab.
Measurement Room	No.5
Date	August 3, 2018
Temperature / Humidity	24 deg. C / 50 % RH
Engineer	Takafumi Noguchi
Mode	Tx, Hopping On

Mode	Number of channel [channels]	Limit [channels]
DH5	79	>= 15
3DH5	79	>= 15

Test was not performed at AFH mode whose number of hopping channel is 20 channels because this Bluetooth radio is in compliance of Bluetooth Specification.

Number of Hopping Frequency

(Test model number: DNNS102)

DH5	3DH5
Hopping On (1/3)	**Hopping On (1/3)**
	
Hopping On (2/3)	**Hopping On (2/3)**
	
Hopping On (3/3)	**Hopping On (3/3)**
	

Dwell time

(Test model number: DNNS102)

Report No.	13185013H
Test place	Ise EMC Lab.
Measurement Room	No.5
Date	August 3, 2018
Temperature / Humidity	24 deg. C / 50 % RH
Engineer	Takafumi Noguchi
Mode	Tx, Hopping On

Mode	Number of transmission in a 31.6(79 Hopping x 0.4) / 12.8 (32 Hopping x 0.4) second period	Length of transmission [msec]	Result [msec]	Limit [msec]
DH1	48.2 times / 5 sec. x 31.6 sec. = 305 times	0.412	126	400
DH3	19.4 times / 5 sec. x 31.6 sec. = 123 times	1.669	205	400
DH5	15.2 times / 5 sec. x 31.6 sec. = 97 times	2.917	283	400
3DH1	49.0 times / 5 sec. x 31.6 sec. = 310 times	0.421	131	400
3DH3	21.6 times / 5 sec. x 31.6 sec. = 137 times	1.675	229	400
3DH5	15.8 times / 5 sec. x 31.6 sec. = 100 times	2.933	293	400

Sample Calculation
Result = Number of transmission x Length of transmission

*Average data of 5 tests.(except Inquiry)

Mode	Sampling [times]					Average [times]
	1	2	3	4	5	
DH1	50	48	48	48	47	48.2
DH3	18	23	17	22	17	19.4
DH5	15	16	14	17	14	15.2
3DH1	50	49	49	50	47	49
3DH3	21	21	25	20	21	21.6
3DH5	15	18	15	15	16	15.8

Sample Calculation
Average = Summation (Sampling 1 to 5) / 5

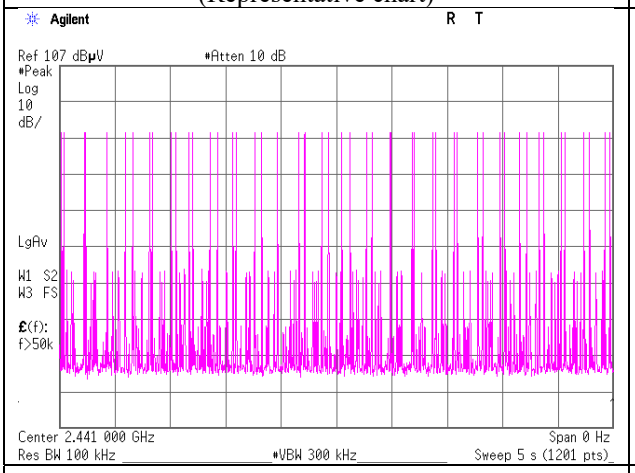
This device complies with the Bluetooth protocol for FHSS operation, employing a pseudo random channel selection and hopping rate to ensure that the occupancy time in N x 0.4s, where N is the number of channels being used in the hopping sequence ($20 \leq N \leq 79$), is always less than 0.4s regardless of packet size. This is confirmed in the test report for N = 79.

Dwell time

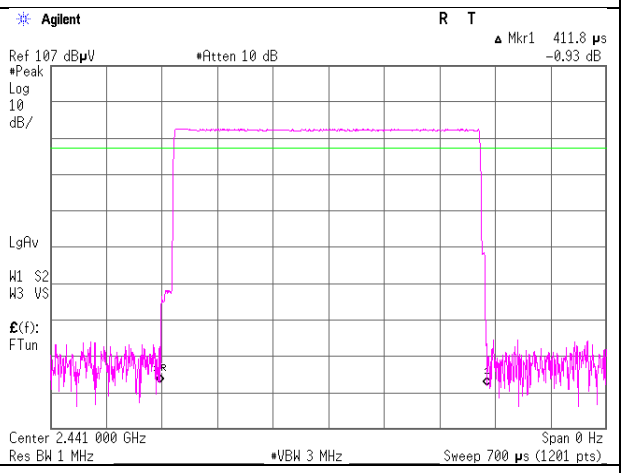
(Test model number: DNNS102)

DH1 (1/2)

(Representative chart)

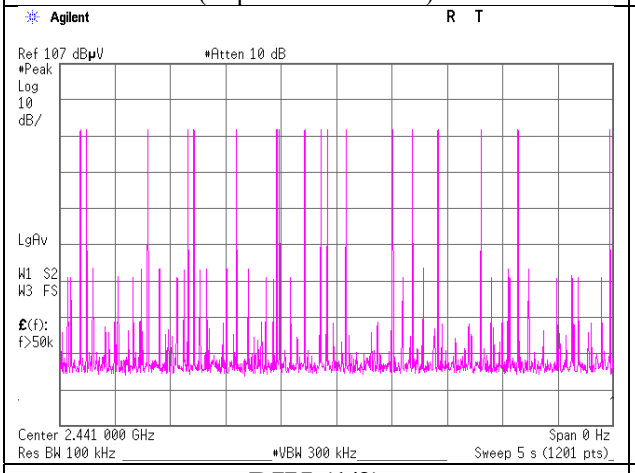


DH1 (2/2)

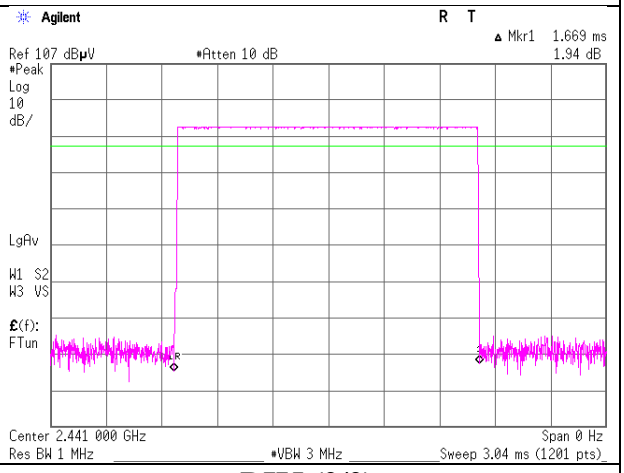


DH3 (1/2)

(Representative chart)

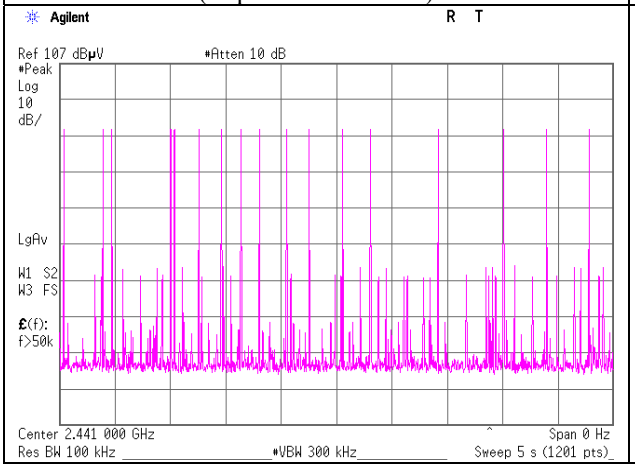


DH3 (2/2)

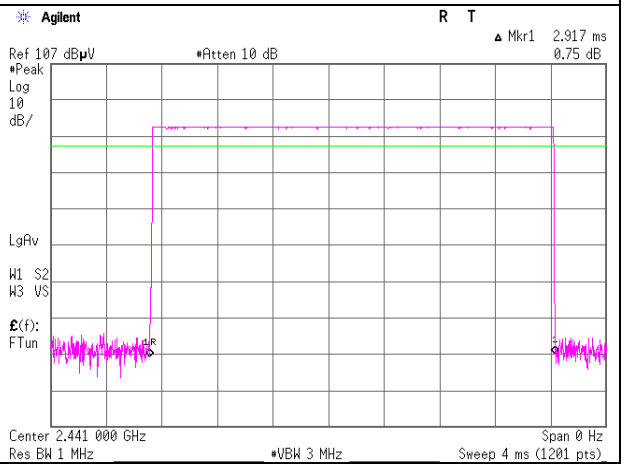


DH5 (1/2)

(Representative chart)



DH5 (2/2)

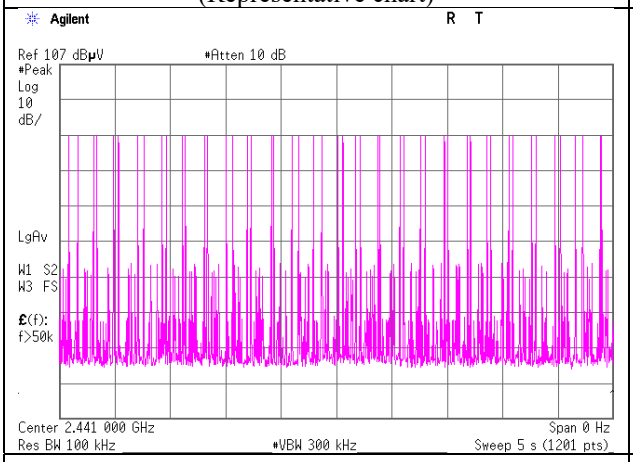


Dwell time

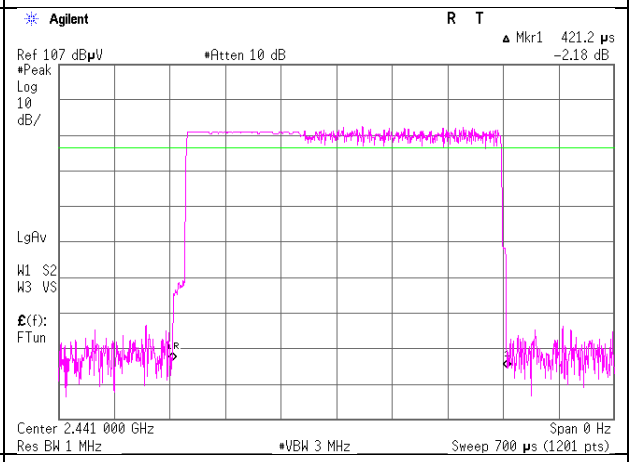
(Test model number: DNNS102)

3DH1 (1/2)

(Representative chart)

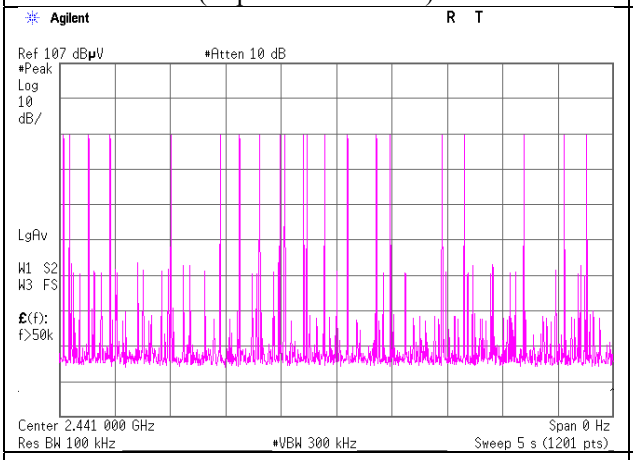


3DH1 (2/2)

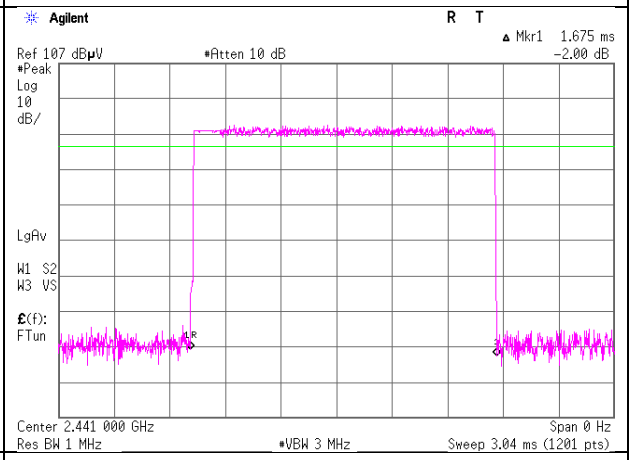


3DH3 (1/2)

(Representative chart)

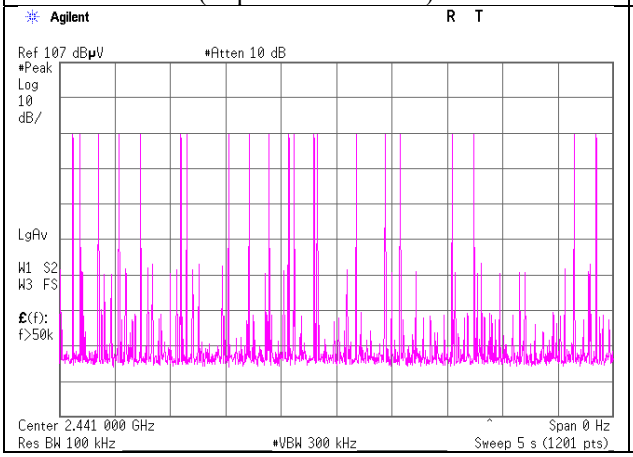


3DH3 (2/2)

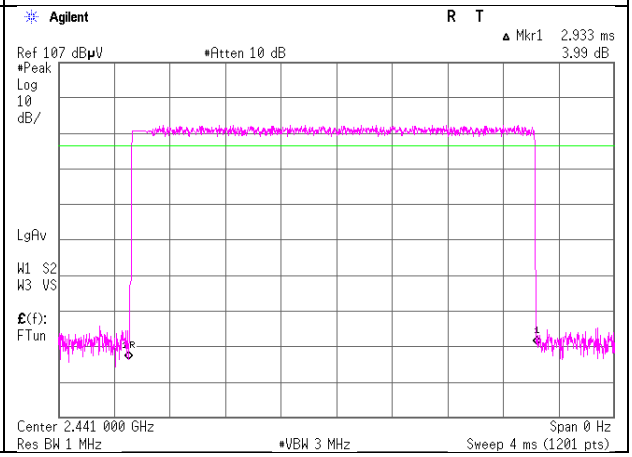


3DH5 (1/2)

(Representative chart)



3DH5 (2/2)



Maximum Peak Output Power

(Test model number: DNNS102)

Report No.	13185013H
Test place	Ise EMC Lab. No.5 Measurement Room
Date	August 3, 2018
Temperature / Humidity	24 deg. C / 50 % RH
Engineer	Takafumi Noguchi
Mode	Tx, Hopping Off

					Conducted Power				
Mode	Freq.	Reading	Cable Loss	Atten. Loss	Result		Limit		Margin
	[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dBm]	[mW]	[dB]
DH5	2402.0	-13.93	1.50	10.06	-2.37	0.58	20.96	125	23.33
DH5	2441.0	-13.46	1.11	10.06	-2.29	0.59	20.96	125	23.25
DH5	2480.0	-13.38	1.23	10.06	-2.09	0.62	20.96	125	23.05
2DH5	2402.0	-14.26	1.50	10.06	-2.70	0.54	20.96	125	23.66
2DH5	2441.0	-13.65	1.11	10.06	-2.48	0.57	20.96	125	23.44
2DH5	2480.0	-13.55	1.23	10.06	-2.26	0.59	20.96	125	23.22
3DH5	2402.0	-13.71	1.50	10.06	-2.15	0.61	20.96	125	23.11
3DH5	2441.0	-13.07	1.11	10.06	-1.90	0.65	20.96	125	22.86
3DH5	2480.0	-12.88	1.23	10.06	-1.59	0.69	20.96	125	22.55

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

Test was not performed at AFH mode, because the decrease of number of channel (min: 20ch) at AFH mode does not influence on the output power and bandwidth of the EUT.
As this device had AFH mode and frequency separation could not meet the requirement of over 20dB BW without 2/3 relaxation, 125mW power limit was applied to it.

Maximum Peak Output Power (Spot-check test)

(Test model number: DNNS111)

Report No.	13185013H
Test place	Ise EMC Lab. No.6 Shielded Room
Date	May 14, 2020
Temperature / Humidity	23 deg. C / 42 % RH
Engineer	Junki Nagatomi
Mode	Tx, Hopping Off

					Conducted Power					e.i.r.p. for RSS-247					
Mode	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]
3DH5	2402.0	-13.44	1.50	10.10	-1.84	0.65	20.96	125	22.80	-0.88	-2.72	0.53	36.02	4000	38.74
3DH5	2441.0	-12.79	1.11	10.10	-1.58	0.70	20.96	125	22.54	-0.88	-2.46	0.57	36.02	4000	38.48
3DH5	2480.0	-12.43	1.23	10.10	-1.10	0.78	20.96	125	22.06	-0.88	-1.98	0.63	36.02	4000	38.00

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

Test was not performed at AFH mode, because the decrease of number of channel (min: 20ch) at AFH mode does not influence on the output power and bandwidth of the EUT.
As this device had AFH mode and frequency separation could not meet the requirement of over 20dB BW without 2/3 relaxation, 125mW power limit was applied to it.

Average Output Power
(Reference data for RF Exposure)
(Test model number: DNNS102)

Report No.	13185013H
Test place	Ise EMC Lab. No.5 Measurement Room
Date	August 3, 2018
Temperature / Humidity	24 deg. C / 50 % RH
Engineer	Takafumi Noguchi
Mode	Tx, Hopping Off

Mode	Freq.	Reading	Cable Loss	Atten. Loss	Result (Time average)		Duty factor	Result (Burst power average)	
	[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dB]	[dBm]	[mW]
DH5	2402.0	-15.54	1.50	10.06	-3.98	0.40	1.10	-2.88	0.51
DH5	2441.0	-15.01	1.11	10.06	-3.84	0.41	1.10	-2.74	0.53
DH5	2480.0	-14.93	1.23	10.06	-3.64	0.43	1.10	-2.54	0.56
2DH5	2402.0	-18.35	1.50	10.06	-6.79	0.21	1.08	-5.71	0.27
2DH5	2441.0	-17.57	1.11	10.06	-6.40	0.23	1.08	-5.32	0.29
2DH5	2480.0	-17.46	1.23	10.06	-6.17	0.24	1.08	-5.09	0.31
3DH5	2402.0	-18.30	1.50	10.06	-6.74	0.21	1.08	-5.66	0.27
3DH5	2441.0	-17.55	1.11	10.06	-6.38	0.23	1.08	-5.30	0.30
3DH5	2480.0	-17.32	1.23	10.06	-6.03	0.25	1.08	-4.95	0.32

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

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

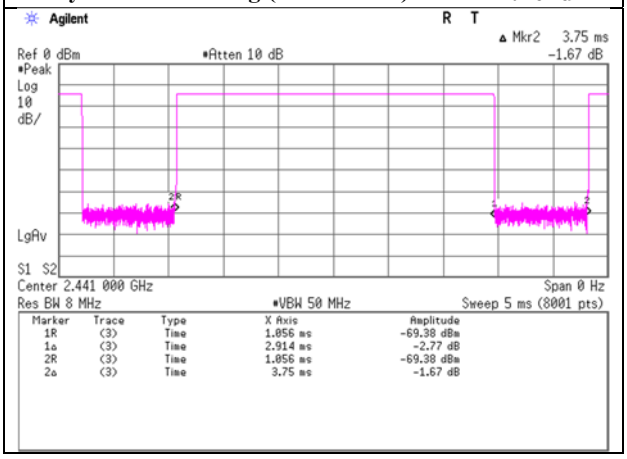
Burst Rate Confirmation

(Test model number: DNNS102)

Report No.	13185013H
Test place	Ise EMC Lab. No.5 Measurement Room
Date	August 3, 2018
Temperature / Humidity	24 deg. C / 50 % RH
Engineer	Takafumi Noguchi
Mode	Tx, Hopping Off

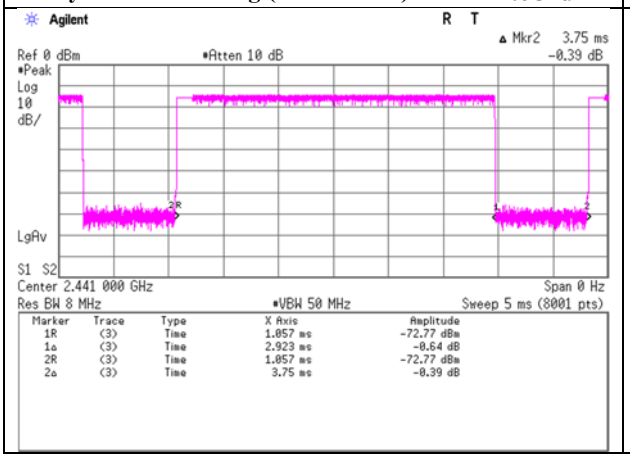
DH5

Tx on / (Tx on + Tx off) =	0.777
Tx on / (Tx on + Tx off) * 100 =	77.7 %
Duty factor = 10 * log (3.75 / 2.914) =	1.10 dB



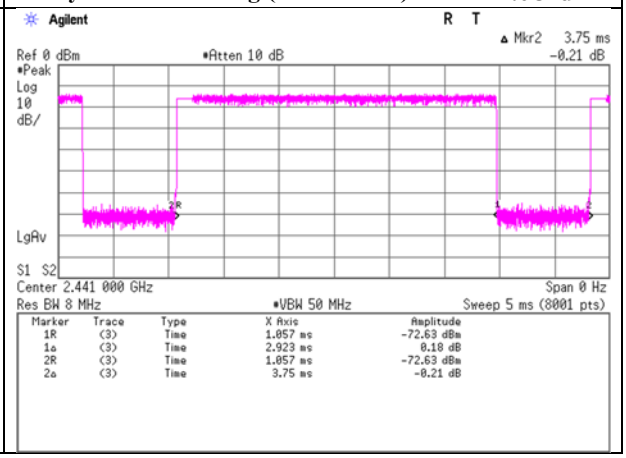
2DH5

Tx on / (Tx on + Tx off) =	0.779
Tx on / (Tx on + Tx off) * 100 =	77.9 %
Duty factor = 10 * log (3.75 / 2.923) =	1.08 dB



3DH5

Tx on / (Tx on + Tx off) =	0.779
Tx on / (Tx on + Tx off) * 100 =	77.9 %
Duty factor = 10 * log (3.75 / 2.923) =	1.08 dB



Radiated Spurious Emission

(Test model number: DNNS102)

Report No.	13185013H		
Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.4	No.4	No.4
Date	June 8, 2018	June 11, 2018 (Night)	June 12, 2018 (Night)
Temperature / Humidity	22 deg. C / 65 % RH	23 deg. C / 69 % RH	21 deg. C / 57 % RH
Engineer	Yuta Moriya	Takumi Shimada	Takumi Shimada
	(1 GHz -10 GHz)	(Above 10 GHz)	(Below 1 GHz)
Mode	Tx, Hopping Off, DH5 2402 MHz		

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	224.000	QP	40.4	11.6	9.3	32.0	-	29.3	46.0	16.7	
Hori	232.000	QP	43.0	11.7	9.4	32.0	-	32.1	46.0	13.9	
Hori	240.000	QP	41.0	11.7	9.5	32.0	-	30.2	46.0	15.8	
Hori	318.638	QP	34.6	13.9	10.1	32.0	-	26.6	46.0	19.4	
Hori	733.869	QP	41.9	20.3	12.4	32.0	-	42.6	46.0	3.4	
Hori	847.697	QP	32.8	21.6	12.9	31.5	-	35.8	46.0	10.2	
Hori	2390.000	PK	41.8	27.2	5.9	32.1	-	42.8	73.9	31.1	
Hori	4804.000	PK	40.3	31.3	8.1	31.3	-	48.4	73.9	25.5	Floor noise
Hori	7206.000	PK	45.7	35.8	9.5	32.4	-	58.6	73.9	15.3	
Hori	9608.000	PK	43.1	38.4	10.2	32.6	-	59.1	73.9	14.8	Floor noise
Hori	2390.000	AV	29.8	27.2	5.9	32.1	-	30.8	53.9	23.1	
Hori	4804.000	AV	27.1	31.3	8.1	31.3	-	35.2	53.9	18.7	Floor noise
Hori	7206.000	AV	33.0	35.8	9.5	32.4	-	45.9	53.9	8.0	
Hori	9608.000	AV	30.1	38.4	10.2	32.6	-	46.1	53.9	7.8	Floor noise
Vert	224.000	QP	40.1	11.6	9.3	32.0	-	29.0	46.0	17.0	
Vert	232.000	QP	42.2	11.7	9.4	32.0	-	31.3	46.0	14.7	
Vert	240.000	QP	42.3	11.7	9.5	32.0	-	31.5	46.0	14.5	
Vert	320.241	QP	32.1	14.0	10.1	32.0	-	24.2	46.0	21.8	
Vert	737.076	QP	37.2	20.3	12.4	32.0	-	37.9	46.0	8.1	
Vert	854.110	QP	33.6	21.7	12.9	31.4	-	36.8	46.0	9.2	
Vert	2390.000	PK	41.4	27.2	5.9	32.1	-	42.4	73.9	31.5	
Vert	4804.000	PK	41.1	31.3	8.1	31.3	-	49.2	73.9	24.7	Floor noise
Vert	7206.000	PK	44.5	35.8	9.5	32.4	-	57.4	73.9	16.5	
Vert	9608.000	PK	43.0	38.4	10.2	32.6	-	59.0	73.9	14.9	Floor noise
Vert	2390.000	AV	28.3	27.2	5.9	32.1	-	29.3	53.9	24.6	
Vert	4804.000	AV	27.4	31.3	8.1	31.3	-	35.5	53.9	18.4	Floor noise
Vert	7206.000	AV	32.9	35.8	9.5	32.4	-	45.8	53.9	8.1	
Vert	9608.000	AV	30.2	38.4	10.2	32.6	-	46.2	53.9	7.7	Floor noise

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

*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 (4.0 m / 3.0 m) = 2.5 dB
10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

20dBc Data Sheet

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2402.000	PK	87.8	27.2	5.9	32.1	88.8	-	-	Carrier
Hori	2400.000	PK	35.4	27.2	5.9	32.1	36.4	68.8	32.4	
Vert	2402.000	PK	84.2	27.2	5.9	32.1	85.2	-	-	Carrier
Vert	2400.000	PK	34.8	27.2	5.9	32.1	35.8	65.2	29.4	

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

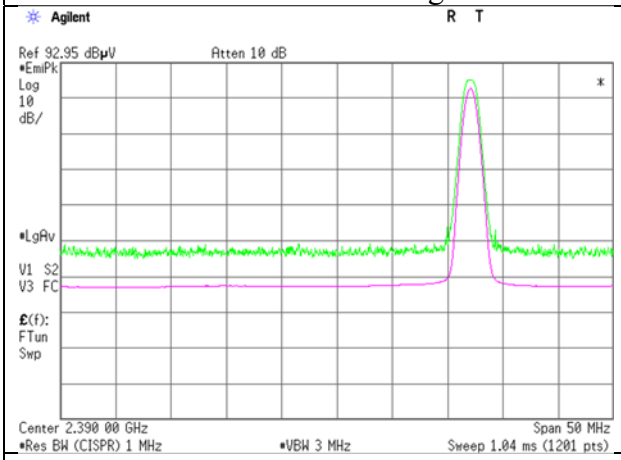
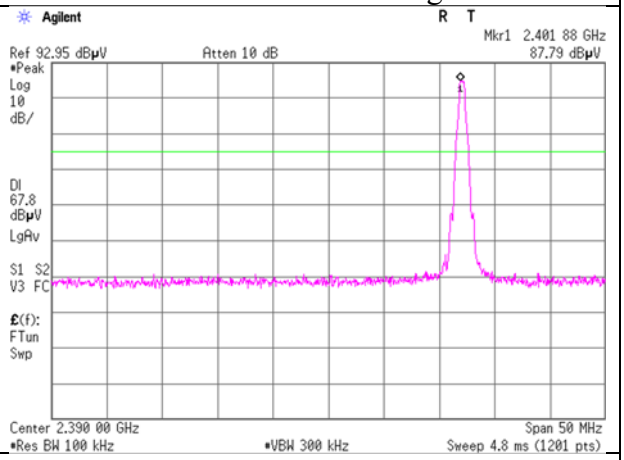
Distance factor: 1 GHz - 10 GHz 20log (4.0 m / 3.0 m) = 2.5 dB

***These results have sufficient margin without taking account Dwell time factor.**

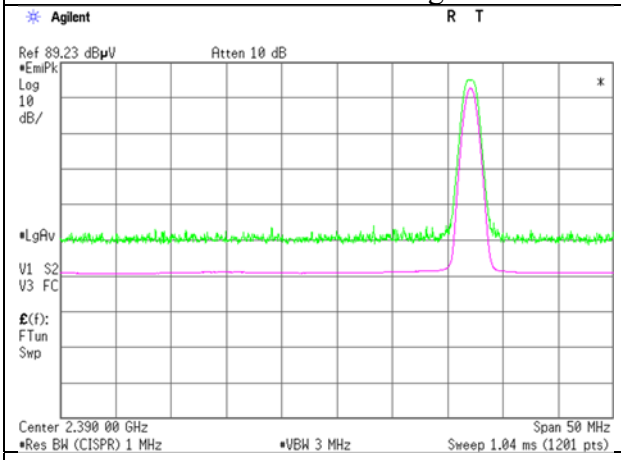
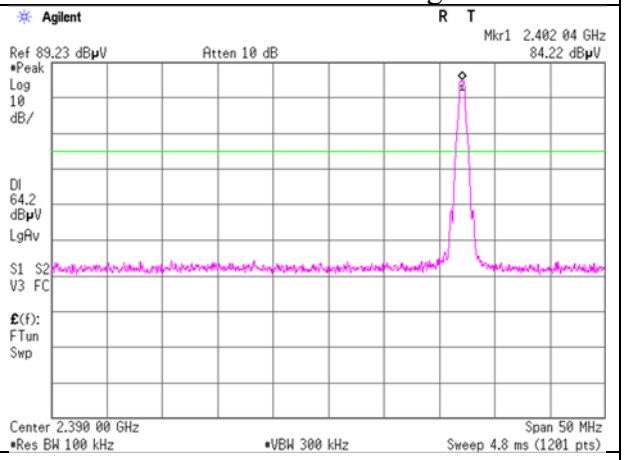
Radiated Spurious Emission
(Reference Plot for band-edge)
(Test model number: DNNS102)

Report No.	13185013H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.4
Date	June 8, 2018
Temperature / Humidity	22 deg. C / 65 % RH
Engineer	Yuta Moriya (1 GHz -10 GHz)
Mode	Tx, Hopping Off, DH5 2402 MHz

Horizontal

Restricted-band band-edge Plot	Authorized-band band-edge Plot
	
Trace Green : Peak Plot Trace Purple : Average Plot	20dBc Plot

Vertical

Restricted-band band-edge Plot	Authorized-band band-edge Plot
	
Trace Green : Peak Plot Trace Purple : Average Plot	20dBc Plot

* Final result of restricted band edge was shown in tabular data.

Radiated Spurious Emission

(Test model number: DNNS102)

Report No.	13185013H		
Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.4	No.4	No.4
Date	June 8, 2018	June 11, 2018 (Night)	June 12, 2018 (Night)
Temperature / Humidity	22 deg. C / 65 % RH	23 deg. C / 69 % RH	21 deg. C / 57 % RH
Engineer	Yuta Moriya	Takumi Shimada	Takumi Shimada
	(1 GHz -10 GHz)	(Above 10 GHz)	(Below 1 GHz)
Mode	Tx, Hopping Off, DH5 2441 MHz		

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	224.000	QP	40.3	11.6	9.3	32.0	-	29.2	46.0	16.8	
Hori	232.000	QP	43.1	11.7	9.4	32.0	-	32.2	46.0	13.8	
Hori	240.000	QP	41.2	11.7	9.5	32.0	-	30.4	46.0	15.6	
Hori	318.643	QP	34.5	13.9	10.1	32.0	-	26.5	46.0	19.5	
Hori	734.833	QP	42.0	20.3	12.4	32.0	-	42.7	46.0	3.3	
Hori	848.354	QP	32.6	21.6	12.9	31.5	-	35.6	46.0	10.4	
Hori	4882.000	PK	40.4	31.5	8.2	31.2	-	48.9	73.9	25.0	Floor noise
Hori	7323.000	PK	45.0	36.1	9.5	32.4	-	58.2	73.9	15.7	
Hori	9764.000	PK	43.0	38.5	10.2	32.7	-	59.0	73.9	14.9	Floor noise
Hori	4882.000	AV	28.0	31.5	8.2	31.2	-	36.5	53.9	17.4	Floor noise
Hori	7323.000	AV	35.0	36.1	9.5	32.4	-	48.2	53.9	5.7	
Hori	9764.000	AV	30.2	38.5	10.2	32.7	-	46.2	53.9	7.7	Floor noise
Vert	224.000	QP	40.1	11.6	9.3	32.0	-	29.0	46.0	17.0	
Vert	232.000	QP	42.3	11.7	9.4	32.0	-	31.4	46.0	14.6	
Vert	240.000	QP	42.2	11.7	9.5	32.0	-	31.4	46.0	14.6	
Vert	320.238	QP	32.3	14.0	10.1	32.0	-	24.4	46.0	21.6	
Vert	737.071	QP	37.4	20.3	12.4	32.0	-	38.1	46.0	7.9	
Vert	854.117	QP	33.3	21.7	12.9	31.4	-	36.5	46.0	9.5	
Vert	4882.000	PK	41.1	31.5	8.2	31.2	-	49.6	73.9	24.3	Floor noise
Vert	7323.000	PK	46.7	36.1	9.5	32.4	-	59.9	73.9	14.0	
Vert	9764.000	PK	42.5	38.5	10.2	32.7	-	58.5	73.9	15.4	Floor noise
Vert	4882.000	AV	27.9	31.5	8.2	31.2	-	36.4	53.9	17.5	Floor noise
Vert	7323.000	AV	37.1	36.1	9.5	32.4	-	50.3	53.9	3.6	
Vert	9764.000	AV	30.7	38.5	10.2	32.7	-	46.7	53.9	7.2	Floor noise

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

*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 (4.0 m / 3.0 m) = 2.5 dB
10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

***These results have sufficient margin without taking account Dwell time factor.**

Radiated Spurious Emission

(Test model number: DNNS102)

Report No.	13185013H		
Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.4	No.4	No.4
Date	June 8, 2018	June 11, 2018 (Night)	June 12, 2018 (Night)
Temperature / Humidity	22 deg. C / 65 % RH	23 deg. C / 69 % RH	21 deg. C / 57 % RH
Engineer	Yuta Moriya	Takumi Shimada	Takumi Shimada
	(1 GHz -10 GHz)	(Above 10 GHz)	(Below 1 GHz)
Mode	Tx, Hopping Off, DH5 2480 MHz		

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	224.000	QP	40.4	11.6	9.3	32.0	-	29.3	46.0	16.7	
Hori	232.000	QP	43.3	11.7	9.4	32.0	-	32.4	46.0	13.6	
Hori	240.000	QP	41.1	11.7	9.5	32.0	-	30.3	46.0	15.7	
Hori	319.240	QP	34.2	14.0	10.1	32.0	-	26.3	46.0	19.7	
Hori	734.385	QP	41.8	20.3	12.4	32.0	-	42.5	46.0	3.5	
Hori	849.238	QP	32.1	21.6	12.9	31.5	-	35.1	46.0	10.9	
Hori	2483.500	PK	42.2	27.4	5.9	32.0	-	43.5	73.9	30.4	
Hori	4960.000	PK	40.5	31.6	8.2	31.2	-	49.1	73.9	24.8	Floor noise
Hori	7440.000	PK	43.1	36.3	9.5	32.5	-	56.4	73.9	17.5	
Hori	9920.000	PK	43.6	38.6	10.2	32.8	-	59.6	73.9	14.3	Floor noise
Hori	2483.500	AV	30.1	27.4	5.9	32.0	-	31.4	53.9	22.5	
Hori	4960.000	AV	28.1	31.6	8.2	31.2	-	36.7	53.9	17.2	Floor noise
Hori	7440.000	AV	32.4	36.3	9.5	32.5	-	45.7	53.9	8.2	
Hori	9920.000	AV	30.3	38.6	10.2	32.8	-	46.3	53.9	7.6	Floor noise
Vert	224.000	QP	40.2	11.6	9.3	32.0	-	29.1	46.0	16.9	
Vert	232.000	QP	42.1	11.7	9.4	32.0	-	31.2	46.0	14.8	
Vert	240.000	QP	42.4	11.7	9.5	32.0	-	31.6	46.0	14.4	
Vert	320.242	QP	32.4	14.0	10.1	32.0	-	24.5	46.0	21.5	
Vert	736.866	QP	37.6	20.3	12.4	32.0	-	38.3	46.0	7.7	
Vert	854.467	QP	33.2	21.7	12.9	31.4	-	36.4	46.0	9.6	
Vert	2483.500	PK	42.2	27.4	5.9	32.0	-	43.5	73.9	30.4	
Vert	4960.000	PK	41.2	31.6	8.2	31.2	-	49.8	73.9	24.1	Floor noise
Vert	7440.000	PK	45.5	36.3	9.5	32.5	-	58.8	73.9	15.1	
Vert	9920.000	PK	43.1	38.6	10.2	32.8	-	59.1	73.9	14.8	Floor noise
Vert	2483.500	AV	30.0	27.4	5.9	32.0	-	31.3	53.9	22.6	
Vert	4960.000	AV	27.8	31.6	8.2	31.2	-	36.4	53.9	17.5	Floor noise
Vert	7440.000	AV	35.4	36.3	9.5	32.5	-	48.7	53.9	5.2	
Vert	9920.000	AV	30.1	38.6	10.2	32.8	-	46.1	53.9	7.8	Floor noise

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

*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 (4.0 m / 3.0 m) = 2.5 dB
10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

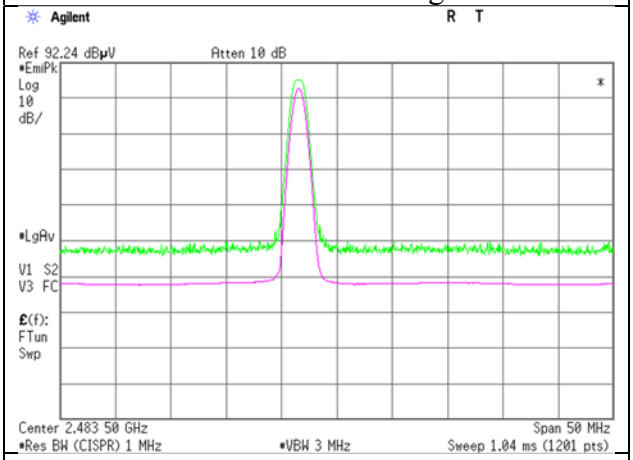
***These results have sufficient margin without taking account Dwell time factor.**

Radiated Spurious Emission
(Reference Plot for band-edge)
(Test model number: DNNS102)

Report No.	13185013H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.4
Date	June 8, 2018
Temperature / Humidity	22 deg. C / 65 % RH
Engineer	Yuta Moriya
	(1 GHz -10 GHz)
Mode	Tx, Hopping Off, DH5 2480 MHz

Horizontal

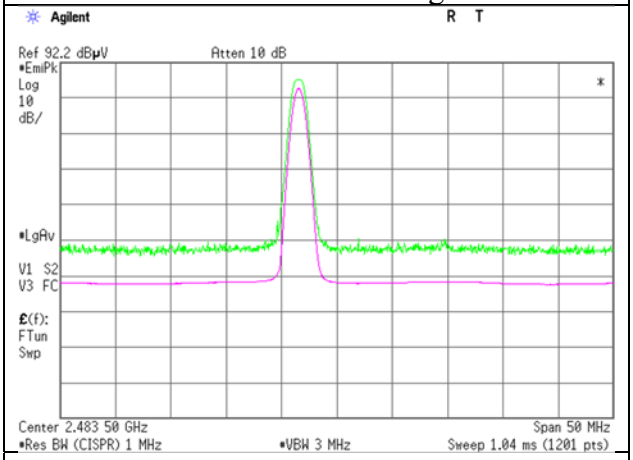
Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

Vertical

Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

* Final result of restricted band edge was shown in tabular data.

Radiated Spurious Emission

(Test model number: DNNS102)

Report No.	13185013H		
Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.4	No.4	No.4
Date	June 8, 2018	June 11, 2018 (Night)	June 12, 2018 (Night)
Temperature / Humidity	22 deg. C / 65 % RH	23 deg. C / 69 % RH	21 deg. C / 57 % RH
Engineer	Yuta Moriya	Takumi Shimada	Takumi Shimada
	(1 GHz -10 GHz)	(Above 10 GHz)	(Below 1 GHz)
Mode	Tx, Hopping Off, 3DH5 2402 MHz		

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	224.000	QP	40.1	11.6	9.3	32.0	-	29.0	46.0	17.0	
Hori	232.000	QP	43.5	11.7	9.4	32.0	-	32.6	46.0	13.4	
Hori	240.000	QP	41.2	11.7	9.5	32.0	-	30.4	46.0	15.6	
Hori	318.544	QP	34.4	13.9	10.1	32.0	-	26.4	46.0	19.6	
Hori	735.435	QP	41.5	20.3	12.4	32.0	-	42.2	46.0	3.8	
Hori	849.445	QP	32.3	21.6	12.9	31.5	-	35.3	46.0	10.7	
Hori	2390.000	PK	41.5	27.2	5.9	32.1	-	42.5	73.9	31.4	
Hori	4804.000	PK	40.2	31.3	8.1	31.3	-	48.3	73.9	25.6	Floor noise
Hori	7206.000	PK	44.7	35.8	9.5	32.4	-	57.6	73.9	16.3	
Hori	9608.000	PK	43.2	38.4	10.2	32.6	-	59.2	73.9	14.7	Floor noise
Hori	2390.000	AV	29.8	27.2	5.9	32.1	-	30.8	53.9	23.1	
Hori	4804.000	AV	27.5	31.3	8.1	31.3	-	35.6	53.9	18.3	Floor noise
Hori	7206.000	AV	33.9	35.8	9.5	32.4	-	46.8	53.9	7.1	
Hori	9608.000	AV	30.2	38.4	10.2	32.6	-	46.2	53.9	7.7	Floor noise
Vert	224.000	QP	40.0	11.6	9.3	32.0	-	28.9	46.0	17.1	
Vert	232.000	QP	42.3	11.7	9.4	32.0	-	31.4	46.0	14.6	
Vert	240.000	QP	42.6	11.7	9.5	32.0	-	31.8	46.0	14.2	
Vert	321.146	QP	32.4	14.0	10.1	32.0	-	24.5	46.0	21.5	
Vert	737.365	QP	37.8	20.3	12.4	32.0	-	38.5	46.0	7.5	
Vert	853.143	QP	33.2	21.7	12.9	31.4	-	36.4	46.0	9.6	
Vert	2390.000	PK	41.5	27.2	5.9	32.1	-	42.5	73.9	31.4	
Vert	4804.000	PK	41.6	31.3	8.1	31.3	-	49.7	73.9	24.2	Floor noise
Vert	7206.000	PK	45.0	35.8	9.5	32.4	-	57.9	73.9	16.0	
Vert	9608.000	PK	43.3	38.4	10.2	32.6	-	59.3	73.9	14.6	Floor noise
Vert	2390.000	AV	29.6	27.2	5.9	32.1	-	30.6	53.9	23.3	
Vert	4804.000	AV	28.2	31.3	8.1	31.3	-	36.3	53.9	17.6	Floor noise
Vert	7206.000	AV	33.5	35.8	9.5	32.4	-	46.4	53.9	7.5	
Vert	9608.000	AV	30.3	38.4	10.2	32.6	-	46.3	53.9	7.6	Floor noise

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

*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 (4.0 m / 3.0 m) = 2.5 dB
10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

20dBc Data Sheet

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2402.000	PK	86.9	27.2	5.9	32.1	87.9	-	-	Carrier
Hori	2400.000	PK	36.5	27.2	5.9	32.1	37.5	67.9	30.4	
Vert	2402.000	PK	83.9	27.2	5.9	32.1	84.9	-	-	Carrier
Vert	2400.000	PK	35.2	27.2	5.9	32.1	36.2	64.9	28.7	

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

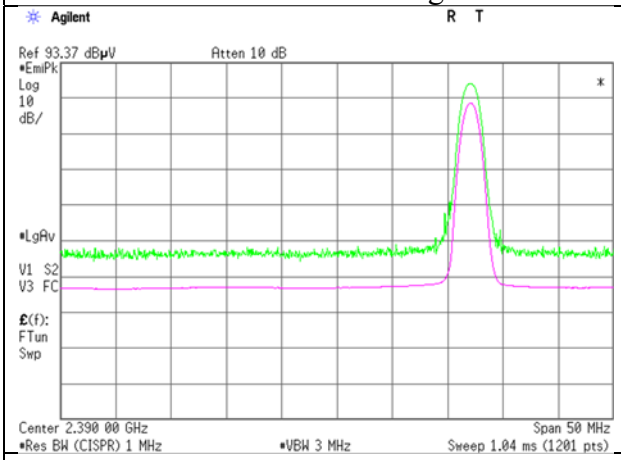
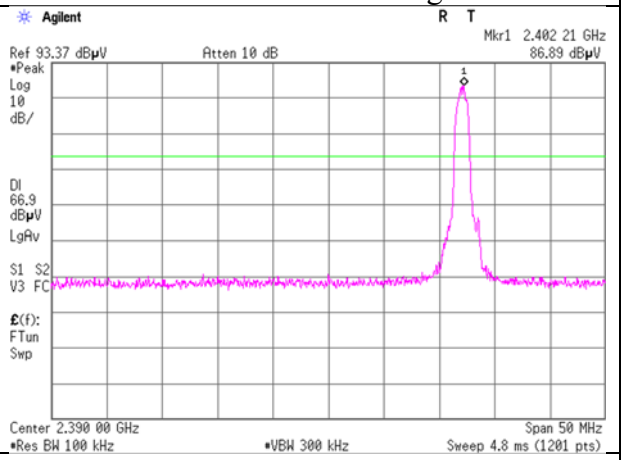
Distance factor: 1 GHz - 10 GHz 20log (4.0 m / 3.0 m) = 2.5 dB

***These results have sufficient margin without taking account Dwell time factor.**

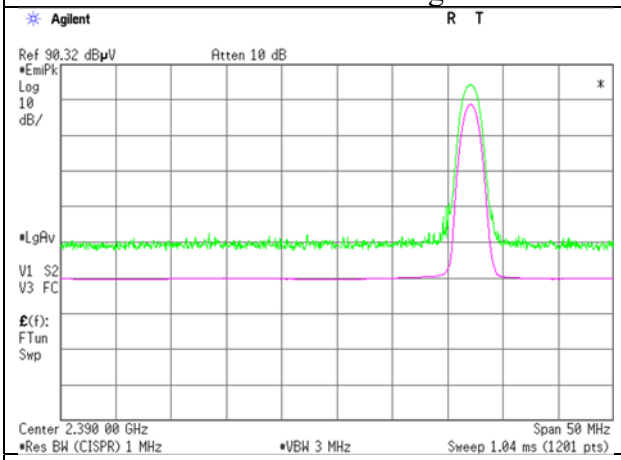
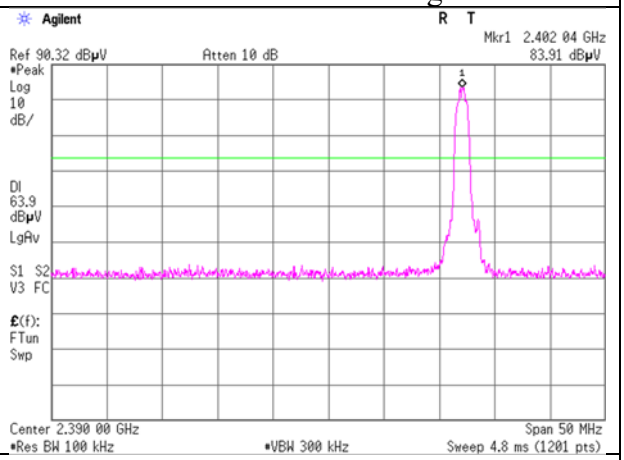
Radiated Spurious Emission
(Reference Plot for band-edge)
(Test model number: DNNS102)

Report No.	13185013H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.4
Date	June 8, 2018
Temperature / Humidity	22 deg. C / 65 % RH
Engineer	Yuta Moriya
	(1 GHz -10 GHz)
Mode	Tx, Hopping Off, 3DH5 2402 MHz

Horizontal

Restricted-band band-edge Plot	Authorized-band band-edge Plot
	
Trace Green : Peak Plot Trace Purple : Average Plot	20dBc Plot

Vertical

Restricted-band band-edge Plot	Authorized-band band-edge Plot
	
Trace Green : Peak Plot Trace Purple : Average Plot	20dBc Plot

* Final result of restricted band edge was shown in tabular data.

Radiated Spurious Emission

(Test model number: DNNS102)

Report No.	13185013H		
Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.4	No.4	No.4
Date	June 8, 2018	June 11, 2018 (Night)	June 12, 2018 (Night)
Temperature / Humidity	22 deg. C / 65 % RH	23 deg. C / 69 % RH	21 deg. C / 57 % RH
Engineer	Yuta Moriya	Takumi Shimada	Takumi Shimada
	(1 GHz -10 GHz)	(Above 10 GHz)	(Below 1 GHz)
Mode	Tx, Hopping Off, 3DH5 2441 MHz		

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	224.000	QP	40.3	11.6	9.3	32.0	-	29.2	46.0	16.8	
Hori	232.000	QP	43.8	11.7	9.4	32.0	-	32.9	46.0	13.1	
Hori	240.000	QP	41.1	11.7	9.5	32.0	-	30.3	46.0	15.7	
Hori	316.385	QP	34.2	13.9	10.1	32.0	-	26.2	46.0	19.8	
Hori	734.673	QP	41.7	20.3	12.4	32.0	-	42.4	46.0	3.6	
Hori	851.164	QP	32.7	21.6	12.9	31.4	-	35.8	46.0	10.2	
Hori	4882.000	PK	40.3	31.5	8.2	31.2	-	48.8	73.9	25.1	Floor noise
Hori	7323.000	PK	44.7	36.1	9.5	32.4	-	57.9	73.9	16.0	
Hori	9764.000	PK	43.1	38.5	10.2	32.7	-	59.1	73.9	14.8	Floor noise
Hori	4882.000	AV	28.1	31.5	8.2	31.2	-	36.6	53.9	17.3	Floor noise
Hori	7323.000	AV	33.5	36.1	9.5	32.4	-	46.7	53.9	7.2	
Hori	9764.000	AV	30.1	38.5	10.2	32.7	-	46.1	53.9	7.8	Floor noise
Vert	224.000	QP	40.1	11.6	9.3	32.0	-	29.0	46.0	17.0	
Vert	232.000	QP	42.2	11.7	9.4	32.0	-	31.3	46.0	14.7	
Vert	240.000	QP	42.5	11.7	9.5	32.0	-	31.7	46.0	14.3	
Vert	321.241	QP	32.1	14.0	10.1	32.0	-	24.2	46.0	21.8	
Vert	736.863	QP	38.0	20.3	12.4	32.0	-	38.7	46.0	7.3	
Vert	853.249	QP	34.9	21.7	12.9	31.4	-	38.1	46.0	7.9	
Vert	4882.000	PK	41.2	31.5	8.2	31.2	-	49.7	73.9	24.2	Floor noise
Vert	7323.000	PK	44.7	36.1	9.5	32.4	-	57.9	73.9	16.0	
Vert	9764.000	PK	42.4	38.5	10.2	32.7	-	58.4	73.9	15.5	Floor noise
Vert	4882.000	AV	27.7	31.5	8.2	31.2	-	36.2	53.9	17.7	Floor noise
Vert	7323.000	AV	32.5	36.1	9.5	32.4	-	45.7	53.9	8.2	
Vert	9764.000	AV	30.6	38.5	10.2	32.7	-	46.6	53.9	7.3	Floor noise

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

*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 (4.0 m / 3.0 m) = 2.5 dB
10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

***These results have sufficient margin without taking account Dwell time factor.**

Radiated Spurious Emission

(Test model number: DNNS102)

Report No.	13185013H		
Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.4	No.4	No.4
Date	June 8, 2018	June 11, 2018 (Night)	June 12, 2018 (Night)
Temperature / Humidity	22 deg. C / 65 % RH	23 deg. C / 69 % RH	21 deg. C / 57 % RH
Engineer	Yuta Moriya	Takumi Shimada	Takumi Shimada
	(1 GHz -10 GHz)	(Above 10 GHz)	(Below 1 GHz)
Mode	Tx, Hopping Off, 3DH5 2480 MHz		

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	224.000	QP	40.5	11.6	9.3	32.0	-	29.4	46.0	16.6	
Hori	232.000	QP	44.0	11.7	9.4	32.0	-	33.1	46.0	12.9	
Hori	240.000	QP	41.3	11.7	9.5	32.0	-	30.5	46.0	15.5	
Hori	316.419	QP	34.3	13.9	10.1	32.0	-	26.3	46.0	19.7	
Hori	734.572	QP	41.9	20.3	12.4	32.0	-	42.6	46.0	3.4	
Hori	851.546	QP	32.5	21.6	12.9	31.4	-	35.6	46.0	10.4	
Hori	2483.500	PK	42.0	27.4	5.9	32.0	-	43.3	73.9	30.6	
Hori	4960.000	PK	40.4	31.6	8.2	31.2	-	49.0	73.9	24.9	Floor noise
Hori	7440.000	PK	42.8	36.3	9.5	32.5	-	56.1	73.9	17.8	
Hori	9920.000	PK	43.5	38.6	10.2	32.8	-	59.5	73.9	14.4	Floor noise
Hori	2483.500	AV	29.8	27.4	5.9	32.0	-	31.1	53.9	22.8	
Hori	4960.000	AV	28.0	31.6	8.2	31.2	-	36.6	53.9	17.3	Floor noise
Hori	7440.000	AV	31.6	36.3	9.5	32.5	-	44.9	53.9	9.0	
Hori	9920.000	AV	30.2	38.6	10.2	32.8	-	46.2	53.9	7.7	Floor noise
Vert	224.000	QP	40.2	11.6	9.3	32.0	-	29.1	46.0	16.9	
Vert	232.000	QP	42.2	11.7	9.4	32.0	-	31.3	46.0	14.7	
Vert	240.000	QP	42.5	11.7	9.5	32.0	-	31.7	46.0	14.3	
Vert	320.741	QP	32.2	14.0	10.1	32.0	-	24.3	46.0	21.7	
Vert	736.794	QP	37.8	20.3	12.4	32.0	-	38.5	46.0	7.5	
Vert	853.345	QP	35.2	21.7	12.9	31.4	-	38.4	46.0	7.6	
Vert	2483.500	PK	42.7	27.4	5.9	32.0	-	44.0	73.9	29.9	
Vert	4960.000	PK	41.3	31.6	8.2	31.2	-	49.9	73.9	24.0	Floor noise
Vert	7440.000	PK	44.5	36.3	9.5	32.5	-	57.8	73.9	16.1	
Vert	9920.000	PK	43.2	38.6	10.2	32.8	-	59.2	73.9	14.7	Floor noise
Vert	2483.500	AV	30.1	27.4	5.9	32.0	-	31.4	53.9	22.5	
Vert	4960.000	AV	27.7	31.6	8.2	31.2	-	36.3	53.9	17.6	Floor noise
Vert	7440.000	AV	33.3	36.3	9.5	32.5	-	46.6	53.9	7.3	
Vert	9920.000	AV	30.2	38.6	10.2	32.8	-	46.2	53.9	7.7	Floor noise

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

*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 (4.0 m / 3.0 m) = 2.5 dB
10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

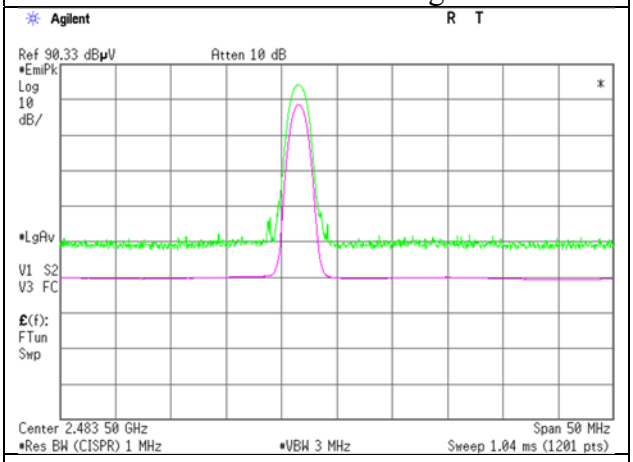
***These results have sufficient margin without taking account Dwell time factor.**

Radiated Spurious Emission
(Reference Plot for band-edge)
(Test model number: DNNS102)

Report No.	13185013H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.4
Date	June 8, 2018
Temperature / Humidity	22 deg. C / 65 % RH
Engineer	Yuta Moriya
	(1 GHz -10 GHz)
Mode	Tx, Hopping Off, 3DH5 2480 MHz

Horizontal

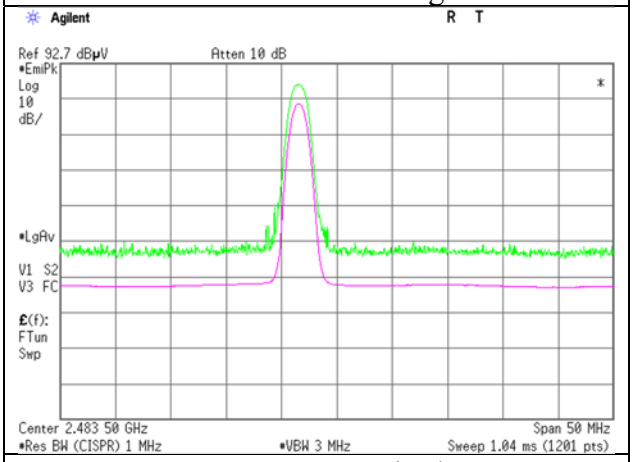
Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

Vertical

Restricted-band band-edge Plot

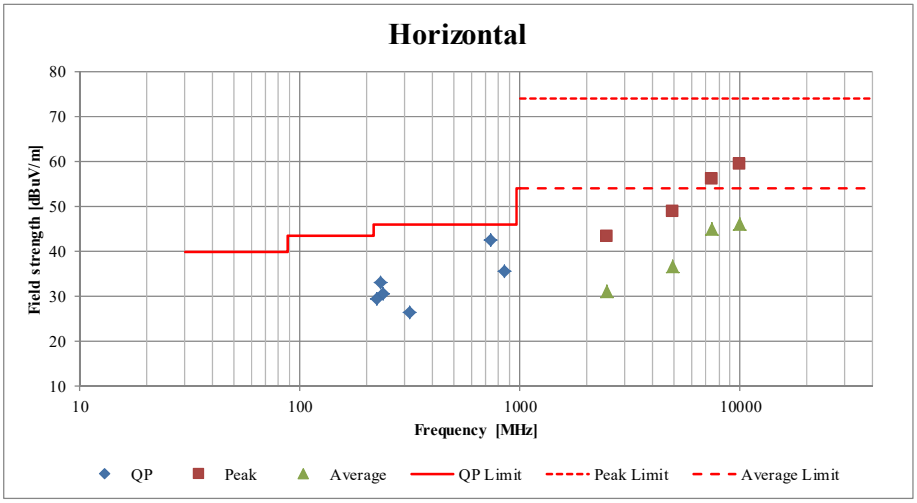


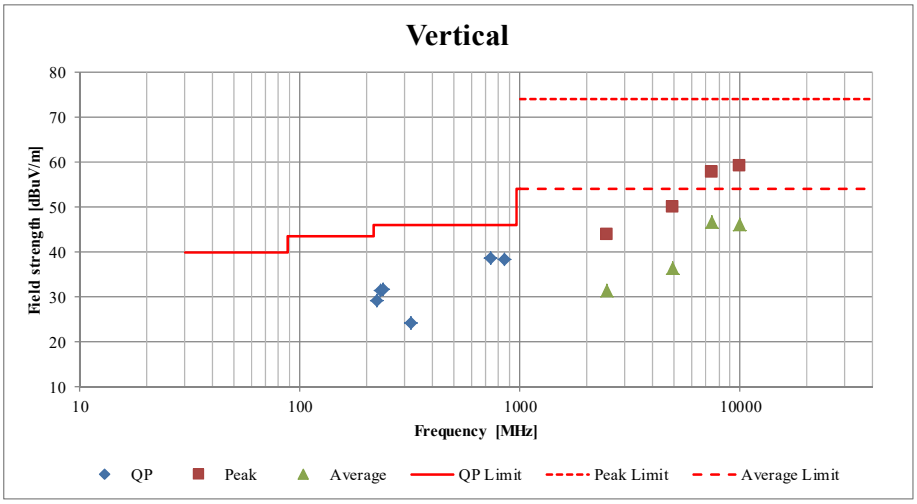
Trace Green : Peak Plot
Trace Purple : Average Plot

* Final result of restricted band edge was shown in tabular data.

Radiated Spurious Emission
(Plot data, Worst case)
(Test model number: DNNS102)

Report No.	13185013H		
Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.4	No.4	No.4
Date	June 8, 2018	June 11, 2018 (Night)	June 12, 2018 (Night)
Temperature / Humidity	22 deg. C / 65 % RH	23 deg. C / 69 % RH	21 deg. C / 57 % RH
Engineer	Yuta Moriya	Takumi Shimada	Takumi Shimada
	(1 GHz -10 GHz)	(Above 10 GHz)	(Below 1 GHz)
Mode	Tx, Hopping Off, 3DH5 2480 MHz		





*These plots data contains sufficient number to show the trend of characteristic features for EUT.

Radiated Spurious Emission

(Test model number: DNNS111)

Report No.	13185013H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.3
Date	February 4, 2020
Temperature / Humidity	23 deg. C / 39 % RH
Engineer	Tomohisa Nakagawa
Mode	Tx, Hopping Off, DH5 2441 MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	59.389	QP	33.2	8.0	7.5	32.2	-	16.6	40.0	23.4	
Hori.	215.995	QP	48.7	11.1	9.3	32.0	-	37.0	43.5	6.5	
Hori.	223.991	QP	50.3	11.1	9.3	32.0	-	38.7	46.0	7.3	
Hori.	232.000	QP	51.1	11.3	9.4	32.0	-	39.8	46.0	6.3	
Hori.	255.984	QP	44.2	12.0	9.6	32.0	-	33.9	46.0	12.2	
Hori.	311.945	QP	44.1	13.8	10.1	31.9	-	36.0	46.0	10.0	
Hori.	4882.000	PK	42.5	31.5	7.6	31.8	-	49.9	73.9	24.0	Floor noise
Hori.	7323.000	PK	44.0	36.2	9.0	32.7	-	56.5	73.9	17.4	
Hori.	9764.000	PK	41.0	38.8	9.5	33.4	-	55.9	73.9	18.0	Floor noise
Hori.	4882.000	AV	27.7	31.5	7.6	31.8	-	35.1	53.9	18.8	Floor noise
Hori.	7323.000	AV	34.5	36.2	9.0	32.7	-	47.0	53.9	6.9	
Hori.	9764.000	AV	27.0	38.8	9.5	33.4	-	41.9	53.9	12.0	Floor noise
Vert.	59.389	QP	39.9	8.0	7.5	32.2	-	23.3	40.0	16.7	
Vert.	215.991	QP	52.3	11.1	9.3	32.0	-	40.6	43.5	2.9	
Vert.	224.006	QP	48.3	11.1	9.3	32.0	-	36.7	46.0	9.3	
Vert.	232.006	QP	50.3	11.3	9.4	32.0	-	39.0	46.0	7.1	
Vert.	256.000	QP	51.5	12.0	9.6	32.0	-	41.2	46.0	4.9	
Vert.	313.200	QP	39.0	13.8	10.1	31.9	-	31.0	46.0	15.0	
Vert.	4882.000	PK	43.1	31.5	7.6	31.8	-	50.4	73.9	23.5	Floor noise
Vert.	7323.000	PK	44.2	36.2	9.0	32.7	-	56.7	73.9	17.2	
Vert.	9764.000	PK	41.7	38.8	9.5	33.4	-	56.7	73.9	17.3	Floor noise
Vert.	4882.000	AV	27.7	31.5	7.6	31.8	-	35.1	53.9	18.8	Floor noise
Vert.	7323.000	AV	34.2	36.2	9.0	32.7	-	46.7	53.9	7.2	
Vert.	9764.000	AV	27.0	38.8	9.5	33.4	-	41.9	53.9	12.0	Floor noise

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)
*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 (4 m / 3.0 m) = 2.5 dB
10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

***These results have sufficient margin without taking account Dwell time factor.**

Radiated Spurious Emission

(Test model number: DNNS111)

Report No.	13185013H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.3
Date	February 4, 2020
Temperature / Humidity	23 deg. C / 39 % RH
Engineer	Tomohisa Nakagawa
	Band edge
Mode	Tx, Hopping Off, 3DH5 2480 MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2483.500	PK	42.4	27.5	5.6	32.7	-	42.7	73.9	31.2	
Hori.	2483.500	AV	28.3	27.5	5.6	32.7	-	28.6	53.9	25.3	
Vert.	2483.500	PK	40.7	27.5	5.6	32.7	-	41.1	73.9	32.8	
Vert.	2483.500	AV	28.2	27.5	5.6	32.7	-	28.6	53.9	25.3	

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

*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 (4 m / 3.0 m) = 2.5 dB
10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

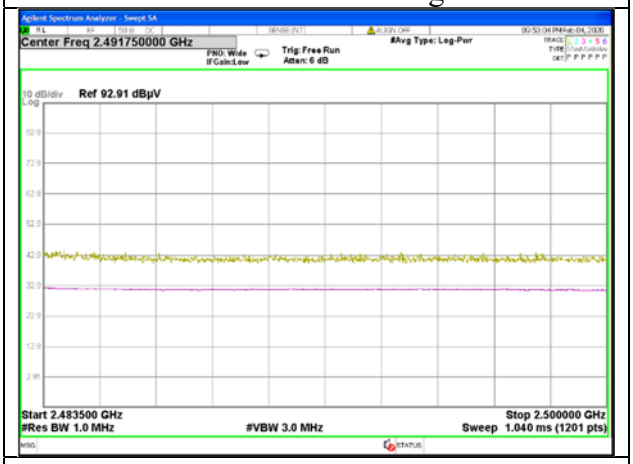
***These results have sufficient margin without taking account Dwell time factor.**

Radiated Spurious Emission
(Reference Plot for band-edge)
(Test model number: DNNS111)

Report No.	13185013H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.3
Date	February 4, 2020
Temperature / Humidity	23 deg. C / 39 % RH
Engineer	Tomohisa Nakagawa
	Band edge
Mode	Tx, Hopping Off, DH5 2480 MHz

Horizontal

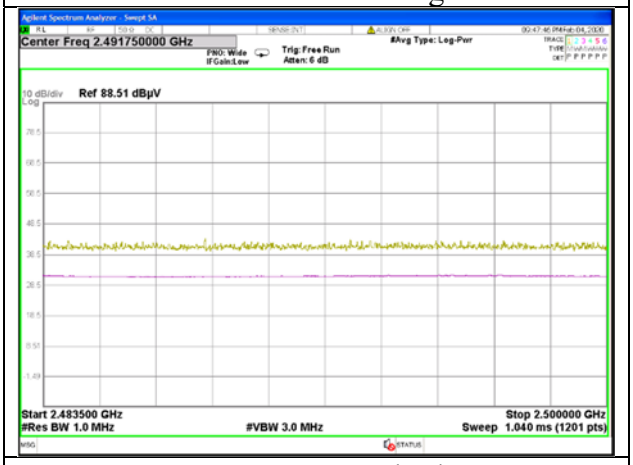
Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

Vertical

Restricted-band band-edge Plot

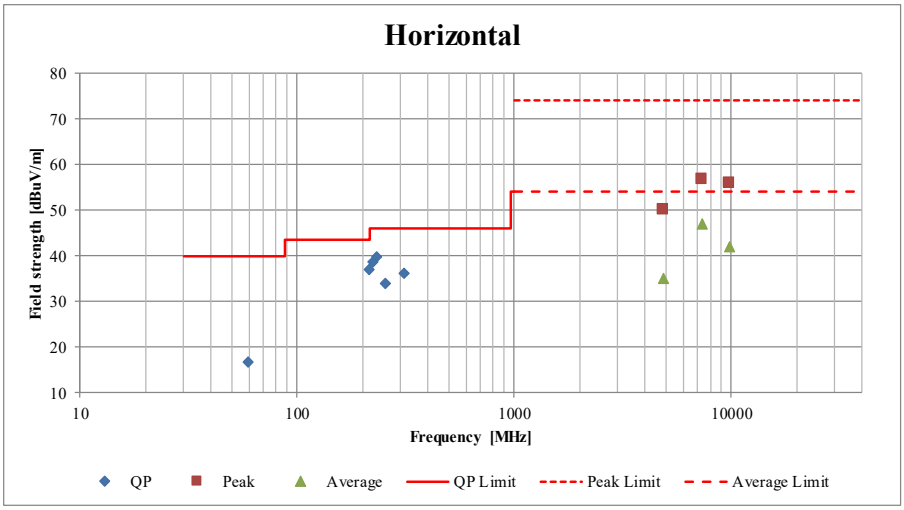


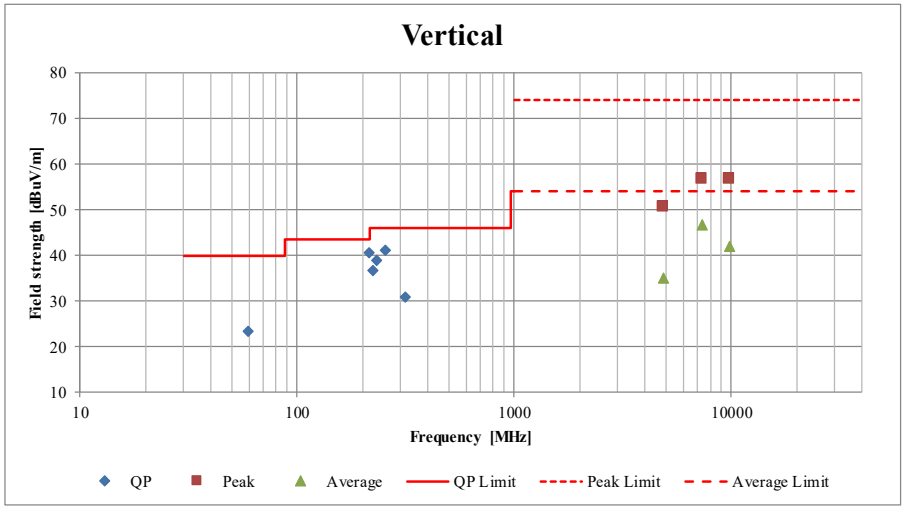
Trace Green : Peak Plot
Trace Purple : Average Plot

* Final result of restricted band edge was shown in tabular data.

Radiated Spurious Emission
(Plot data, Worst case)
(Test model number: DNNS111)

Report No.	13185013H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.3
Date	February 4, 2020
Temperature / Humidity	23 deg. C / 39 % RH
Engineer	Tomohisa Nakagawa
Mode	Tx, Hopping Off, DH5 2441 MHz





*These plots data contains sufficient number to show the trend of characteristic features for EUT.

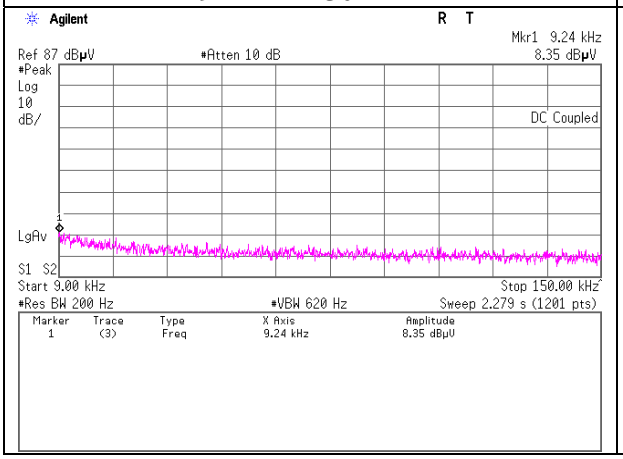
Conducted Spurious Emission

(Test model number: DNNS102)

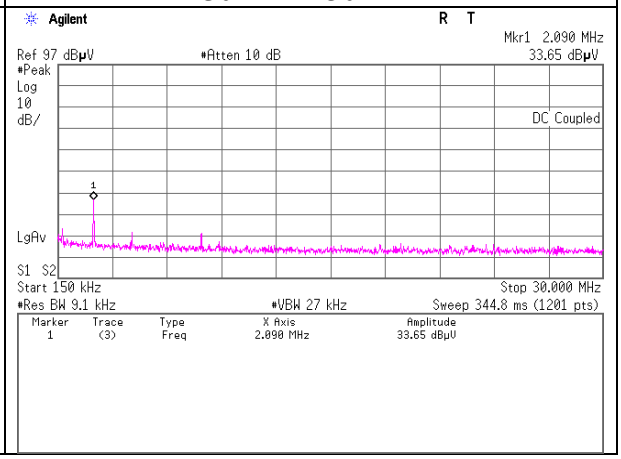
Report No.	13185013H
Test place	Ise EMC Lab. No.5 Measurement Room
Date	August 3, 2018
Temperature / Humidity	24 deg. C / 50 % RH
Engineer	Takafumi Noguchi
Mode	Tx, Hopping Off, DH5

2402 MHz

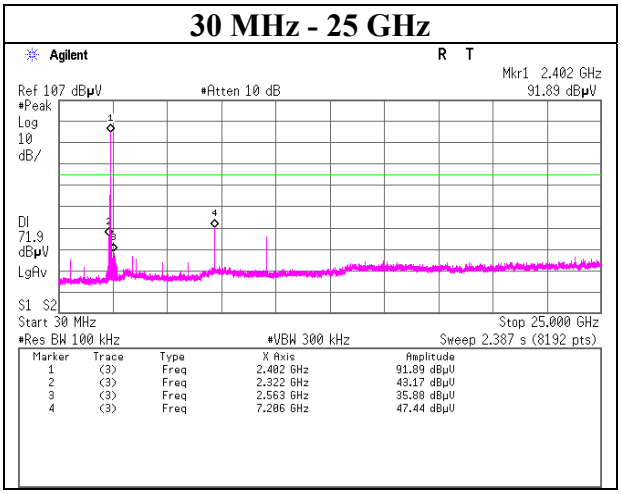
9 kHz - 150 kHz



150 kHz - 30 MHz



30 MHz - 25 GHz



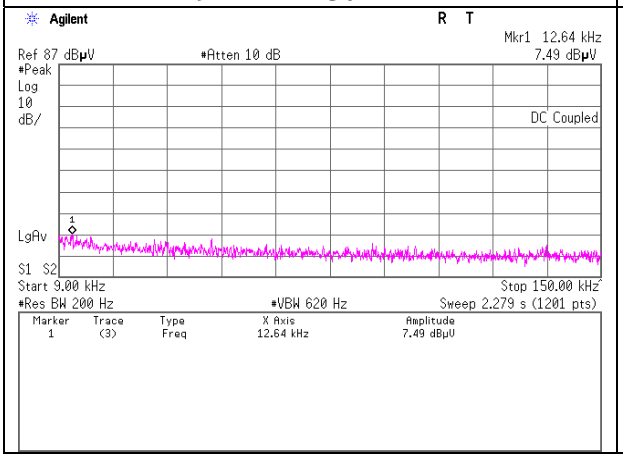
Conducted Spurious Emission

(Test model number: DNNS102)

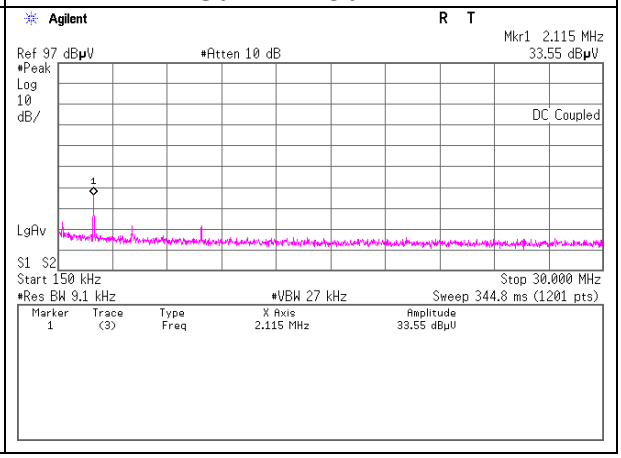
Report No.	13185013H
Test place	Ise EMC Lab. No.5 Measurement Room
Date	August 3, 2018
Temperature / Humidity	24 deg. C / 50 % RH
Engineer	Takafumi Noguchi
Mode	Tx, Hopping Off, DH5

2441 MHz

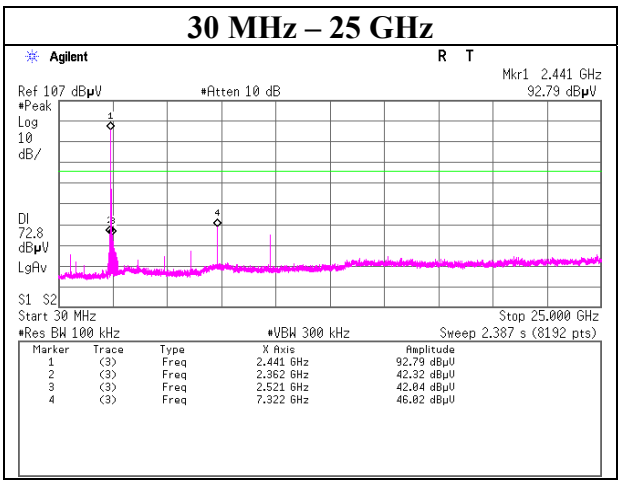
9 kHz – 150 kHz



150 kHz – 30 MHz



30 MHz – 25 GHz



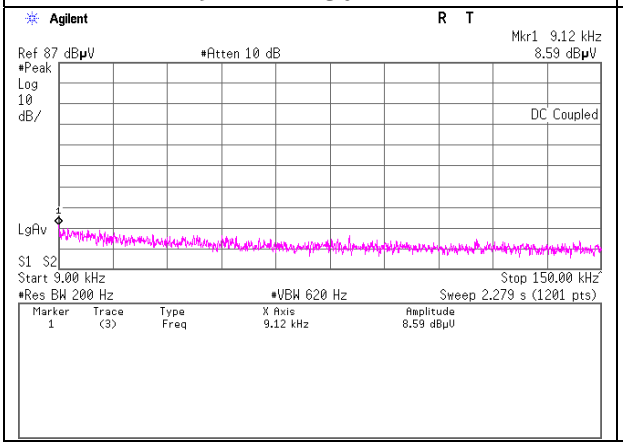
Conducted Spurious Emission

(Test model number: DNNS102)

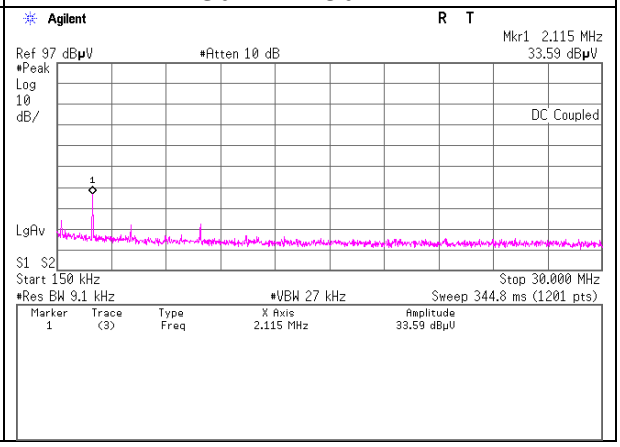
Report No.	13185013H
Test place	Ise EMC Lab. No.5 Measurement Room
Date	August 3, 2018
Temperature / Humidity	24 deg. C / 50 % RH
Engineer	Takafumi Noguchi
Mode	Tx, Hopping Off, DH5

2480 MHz

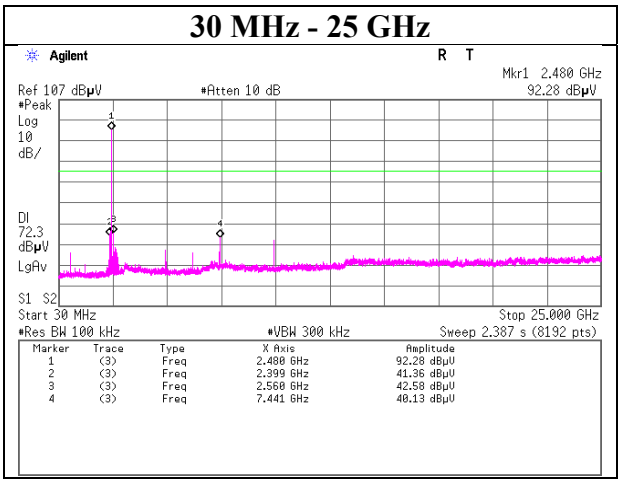
9 kHz - 150 kHz



150 kHz - 30 MHz



30 MHz - 25 GHz



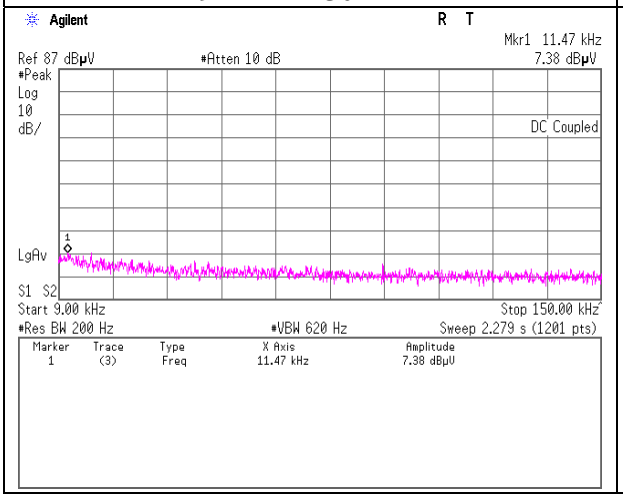
Conducted Spurious Emission

(Test model number: DNNS102)

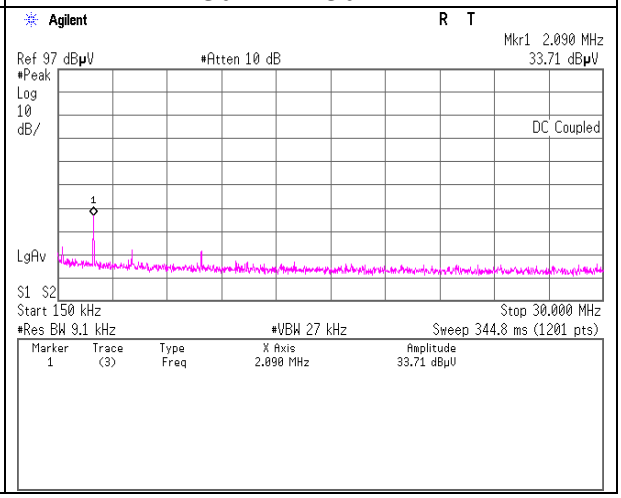
Report No.	13185013H
Test place	Ise EMC Lab. No.5 Measurement Room
Date	August 3, 2018
Temperature / Humidity	24 deg. C / 50 % RH
Engineer	Takafumi Noguchi
Mode	Tx, Hopping Off, 3DH5

2402 MHz

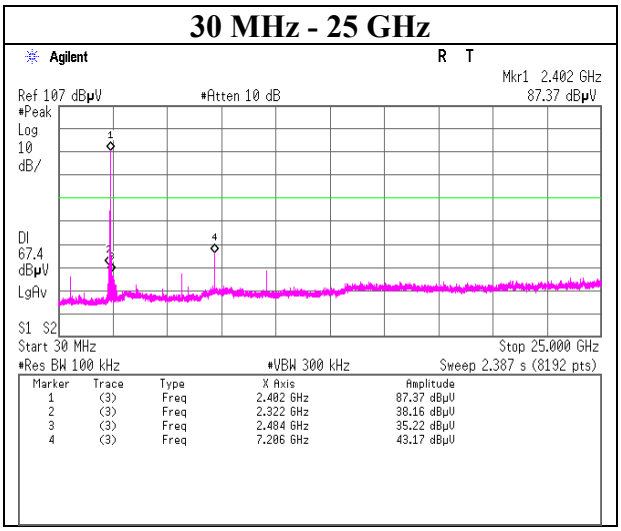
9 kHz - 150 kHz



150 kHz - 30 MHz



30 MHz - 25 GHz



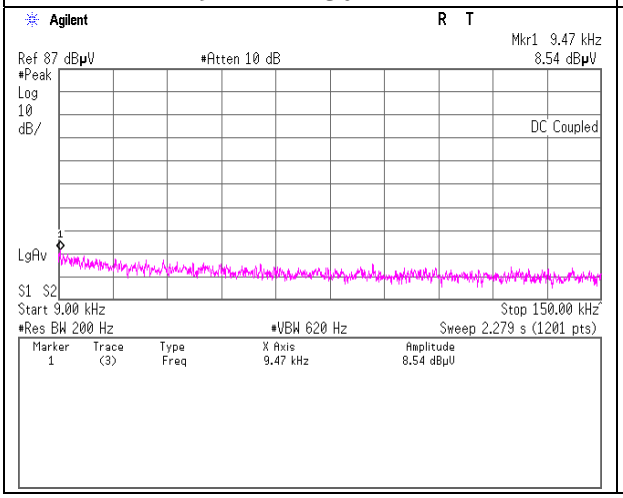
Conducted Spurious Emission

(Test model number: DNNS102)

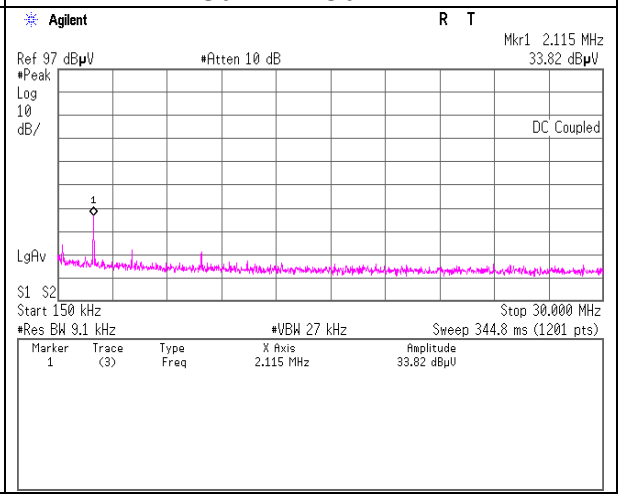
Report No.	13185013H
Test place	Ise EMC Lab. No.5 Measurement Room
Date	August 3, 2018
Temperature / Humidity	24 deg. C / 50 % RH
Engineer	Takafumi Noguchi
Mode	Tx, Hopping Off, 3DH5

2441 MHz

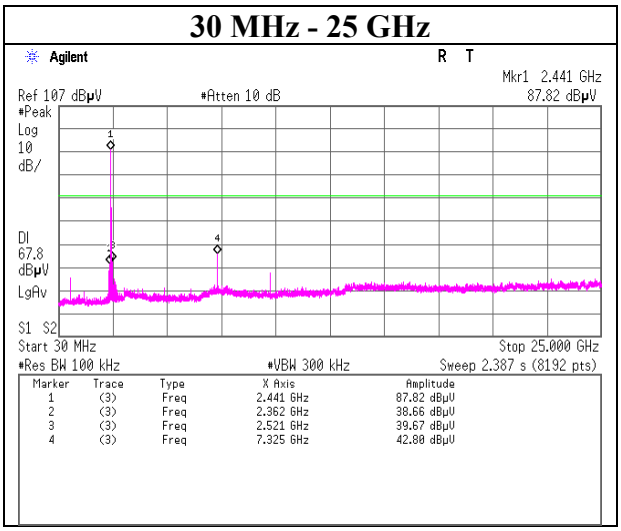
9 kHz - 150 kHz



150 kHz - 30 MHz



30 MHz - 25 GHz



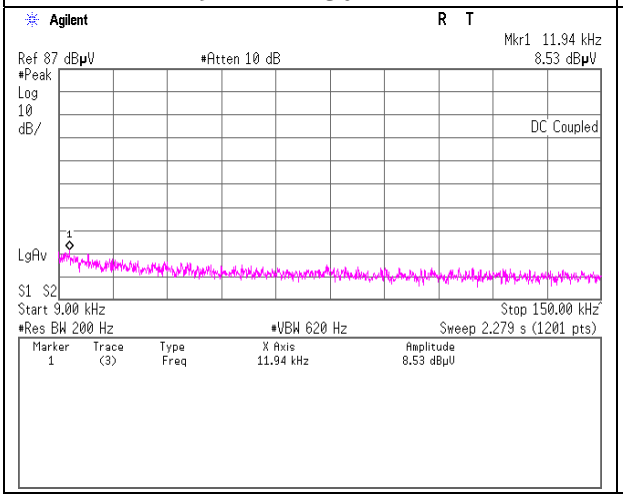
Conducted Spurious Emission

(Test model number: DNNS102)

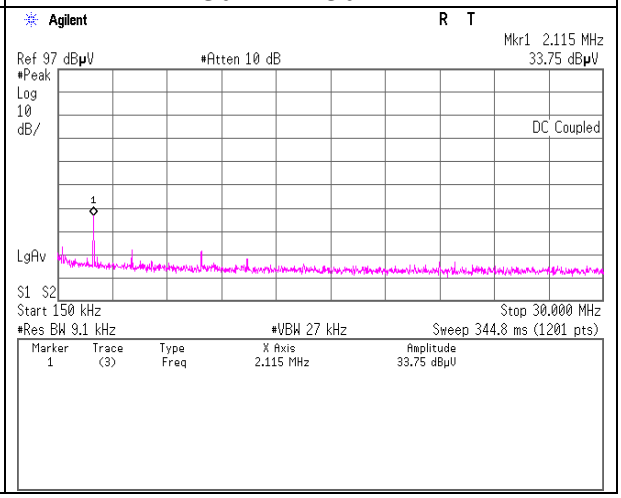
Report No.	13185013H
Test place	Ise EMC Lab. No.5 Measurement Room
Date	August 3, 2018
Temperature / Humidity	24 deg. C / 50 % RH
Engineer	Takafumi Noguchi
Mode	Tx, Hopping Off, 3DH5

2480 MHz

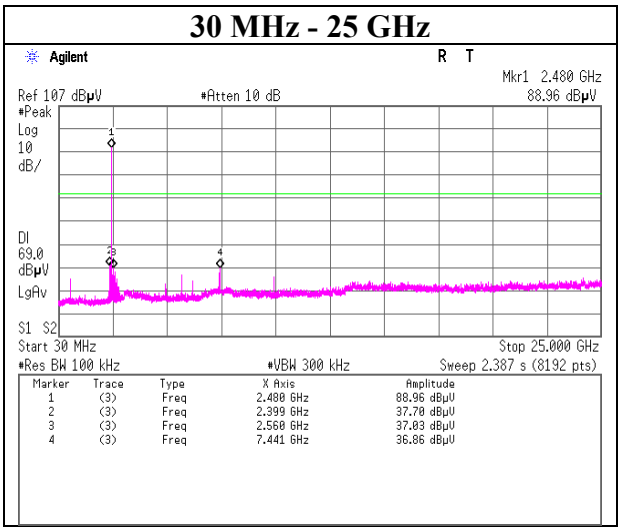
9 kHz - 150 kHz



150 kHz - 30 MHz



30 MHz - 25 GHz



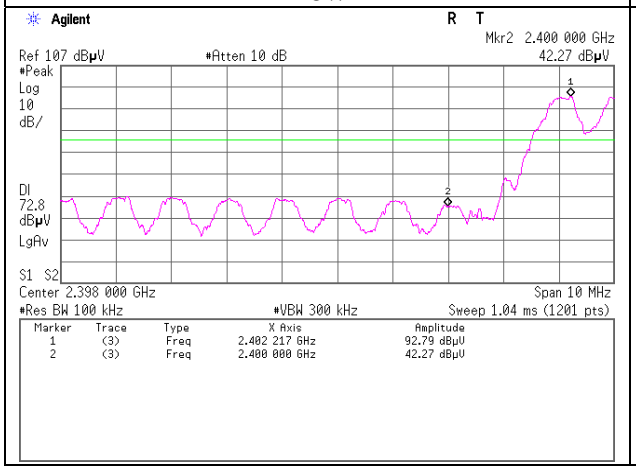
Conducted Emission Band Edge compliance

(Test model number: DNNS102)

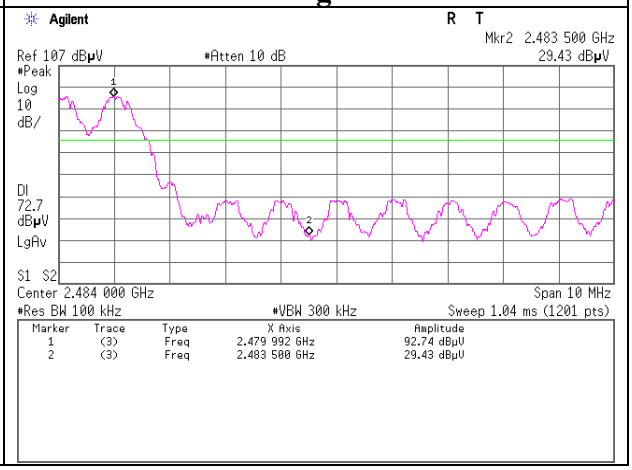
Report No.	13185013H
Test place	Ise EMC Lab. No.5 Measurement Room
Date	August 3, 2018
Temperature / Humidity	24 deg. C / 50 % RH
Engineer	Takafumi Noguchi
Mode	Tx DH5

Hopping On

Low

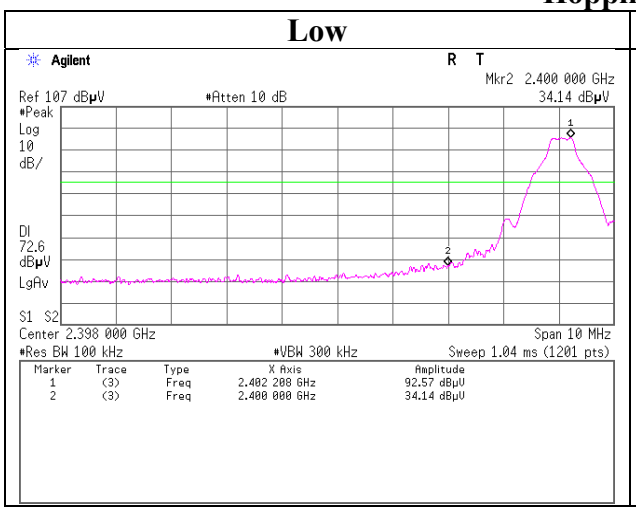


High

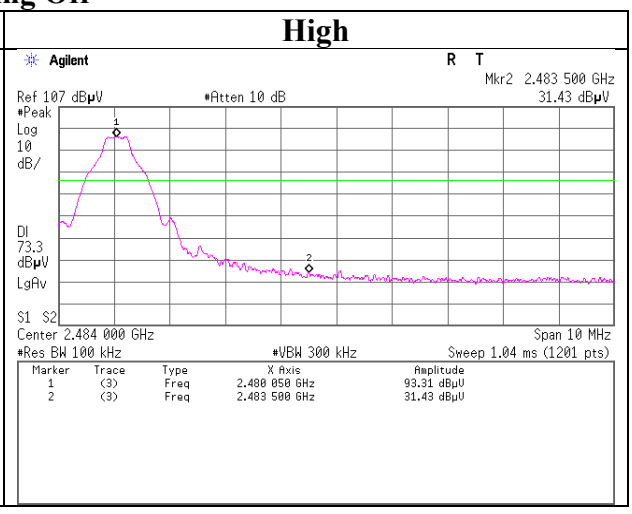


Hopping Off

Low



High



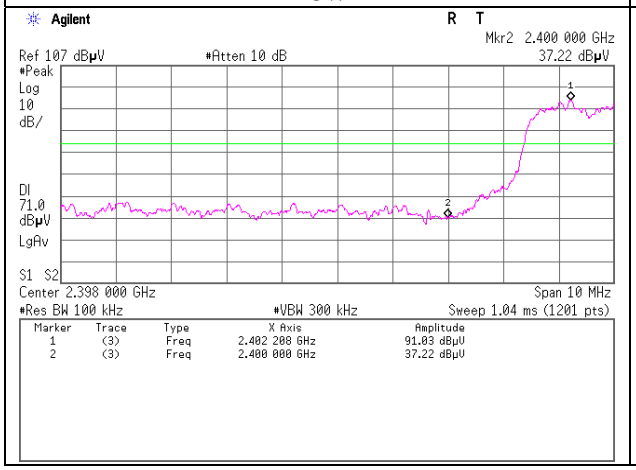
Conducted Emission Band Edge compliance

(Test model number: DNNS102)

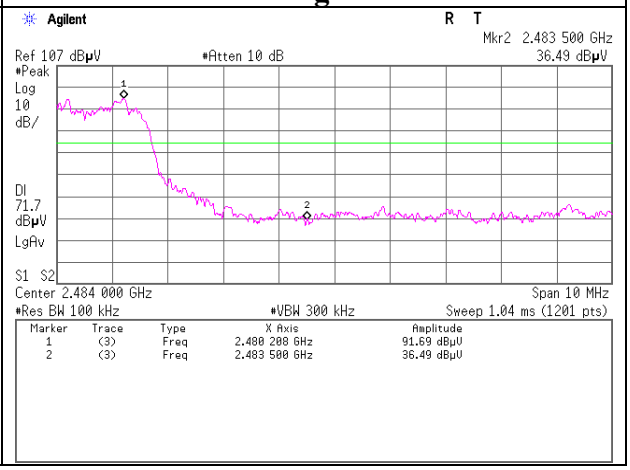
Report No.	13185013H
Test place	Ise EMC Lab. No.5 Measurement Room
Date	August 3, 2018
Temperature / Humidity	24 deg. C / 50 % RH
Engineer	Takafumi Noguchi
Mode	Tx 3DH5

Hopping On

Low

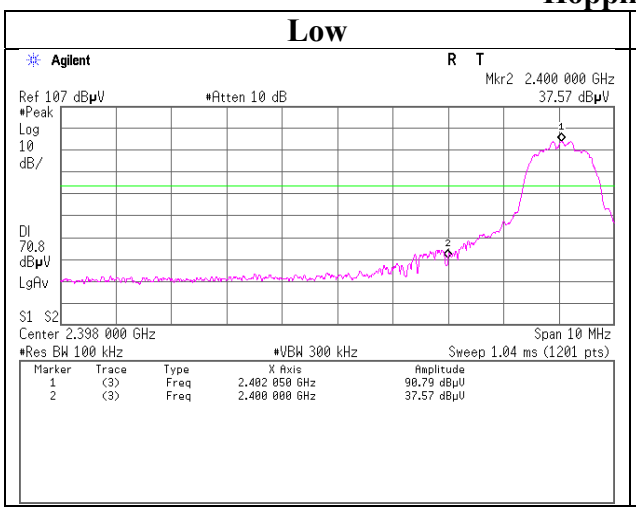


High

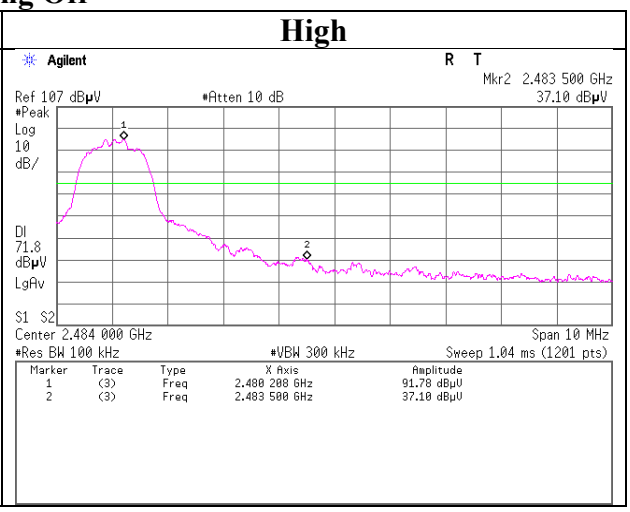


Hopping Off

Low



High



APPENDIX 2: Test instruments

Used on June 8 to August 3, 2018 (DNNS102)

Test Item	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Calibration Due Date	Cal Int
RE	141296	High Pass Filter 3.5-18.0GHz	UL Japan	HPF SELECTOR	002	9/11/2017	9/30/2018	12
RE	141545	DIGITAL HiTESTER	HIOKI	3805	51201148	1/9/2018	1/31/2019	12
RE	141412	Microwave Cable	Junkosha	MWX221	1305S002R(1m) / 1405S146(5m)	6/14/2018	6/30/2019	12
RE	141581	MicroWave System Amplifier	AGILENT	83017A	650	10/6/2017	10/31/2018	12
RE	141512	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	254	2/25/2018	2/28/2019	12
RE	141152	EMI measurement program	TSJ	TEPTO-DV	-	-	-	-
RE	142227	Measure	KOMELON	KMC-36	-	-	-	-
RE	141562	Thermo-Hygrometer	CUSTOM	CTH-180	1501	1/24/2018	1/31/2019	12
RE	142011	AC4_Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	10/30/2017	10/31/2018	12
RE	141885	Spectrum Analyzer	AGILENT	E4448A	US44300523	11/14/2017	11/30/2018	12
RE	141951	EMI Test Receiver	Rohde & Schwarz	ESR26	101408	1/30/2018	1/31/2019	12
RE	141425	Biconical Antenna	Schwarzbeck	BBA9106	1302	11/23/2017	11/30/2018	12
RE	141267	Logperiodic Antenna (200-1000MHz)	Schwarzbeck	VUSLP9111B	911B-192	12/10/2017	12/31/2018	12
RE	148898	Attenuator	KEYSIGHT	8491A	MY52462282	10/12/2017	10/31/2018	12
RE	141397	Coaxial Cable	UL Japan	-	-	6/13/2018	6/30/2019	12
RE	141506	Horn Antenna 15-40GHz	Schwarzbeck	BBHA9170	BBHA9170307	6/29/2017	6/30/2018	12
RE	141583	Pre Amplifier	SONOMA INSTRUMENT	11/5/1900	260833	2/27/2018	2/28/2019	12
AT	141156	Attenuator(10dB)	Weinschel Corp	2	BL1173	11/14/2017	11/30/2018	12
AT	141547	DIGITAL HiTESTER	HIOKI	3805	60500120	2/7/2018	2/28/2019	12
AT	141805	Power Meter	ANRITSU	ML2495A	6K00003338	10/13/2017	10/31/2018	12
AT	141563	Thermo-Hygrometer	CUSTOM	CTH-180	1701	01/24/2018	01/31/2019	12
AT	141334	Attenuator(10dB)	Suhner	6810.19.A	-	12/04/2017	12/31/2018	12
AT	141903	Spectrum Analyzer	AGILENT	E4440A	MY46186390	09/20/2017	09/30/2018	12
AT	141840	Power sensor	ANRITSU	MA2411B	11737	10/13/2017	10/31/2018	12

***Hyphens for Last Calibration Date, Calibration Due Date and Cal Int 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.
All equipment is calibrated with valid calibrations. Each measurement data is traceable to the national or international standards.

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

Test item: RE: Radiated Emission test
AT: Antenna Terminal Conducted test

Used on February 4 to May 14, 2020 (DNNS111)

Test Item	Local ID	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Cal Int
RE	COTS-MEMI	141152	EMI measurement program	TSJ	TEPTO-DV	-	-	-
RE	MCC-231	177964	Microwave Cable	Junkosha INC.	MMX221	1901S329(1m)/ 1902S579(5m)	03/05/2019 *1)	12
RE	MSA-17	141904	Spectrum Analyzer	Keysight Technologies Inc	N9030A	US51350215	09/20/2019	12
RE	MHA-20	141507	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	258	09/26/2019	12
RE	MPA-11	141580	MicroWave System Amplifier	Keysight Technologies Inc	83017A	MY39500779	03/05/2019 *1)	12
RE	MHF-25	141232	High Pass Filter 3.5-18.0GHz	UL Japan	HPF SELECTOR	001	09/11/2019	12
RE	MAEC-03	142008	AC3_Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	06/26/2018	24
RE	MAEC-03-SVSWR	142013	AC3_Semi Anechoic Chamber(SVSWR)	TDK	Semi Anechoic Chamber 3m	DA-10005	04/08/2019	24
RE	MMM-08	141532	DIGITAL HiTESTER	HIOKI	3805	51201197	01/06/2020	12
RE	MJM-26	142227	Measure	KOMELON	KMC-36	-	-	-
RE	MHA-16	141513	Horn Antenna 15-40GHz	Schwarzbeck	BBHA9170	BBHA9170306	10/08/2019	12
RE	MBA-03	141424	Biconical Antenna	Schwarzbeck	VHA9103+ BBA9106	1915	08/24/2019	12
RE	MLA-22	141266	Logperiodic Antenna (200-1000MHz)	Schwarzbeck	VUSLP9111B	9111B-191	08/24/2019	12
RE	MAT-95	142314	Attenuator	Pasternack	PE7390-6	D/C 1504	06/11/2019	12
RE	MPA-13	141582	Pre Amplifier	SONOMA INSTRUMENT	310	260834	02/10/2020	12
RE	TR-08	146754	Test Receiver	Rohde & Schwarz	ESCI	100299	10/08/2019	12
RE	MCC-51	141323	Coaxial cable	UL Japan	-	-	07/02/2019	12
AT	MPM-13	141810	Power Meter	ANRITSU	ML2495A	824014	10/09/2019	12
AT	MPSE-18	141832	Power sensor	ANRITSU	MA2411B	738174	10/09/2019	12
AT	MAT-23	141361	Attenuator(10dB) 1-18GHz	Orient Microwave	BX10-0476-00	-	04/21/2020	12
AT	MOS-14	141561	Thermo-Hygrometer	CUSTOM	CTH-201	1401	01/07/2020	12
AT	MMM-12	141547	DIGITAL HiTESTER	Hioki	3805	60500120	02/03/2020	12

***1) This test equipment was used for the tests before the expiration date of the calibration.**

***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 test
AT: Antenna Terminal Conducted test