



RADIO TEST REPORT

Test Report No. : 13566128S-A-R1

Applicant : Sony Corporation, Japan and Sony Group Companies
Type of EUT : AV Receiver
Model Number of EUT : XAV-AX8100
FCC ID : AK8XAVAX8100
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.
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6. This test report covers Radio technical requirements.
It does not cover administrative issues such as Manual or non-Radio test related Requirements. (if applicable)
7. The all test items in this test report are conducted by UL Japan, Inc. Shonan EMC Lab.
8. The opinions and the interpretations to the result of the description in this report are outside scopes where UL Japan has been accredited.
9. The information provided from the customer for this report is identified in SECTION 1.
10. This report is a revised version of 13566128S-A. 13566128S-A is replaced with this report.

Date of test: November 18 to 21, 2020

Representative test engineer: M. Hosaka
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Approved by: A. Hayashi
Akio Hayashi
Manager
Consumer Technology Division



CERTIFICATE 1266.03

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

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REVISION HISTORY

Original Test Report No.: 13566128S-A

Revision	Test report No.	Date	Page revised	Contents												
- (Original)	13566128S-A	December 2, 2020	-	-												
1	13566128S-A-R1	December 10, 2020	P.12	Modification of "Description of EUT and support equipment": from <table border="1"><tr><td>I</td><td>Monaural Power Amplifier</td><td>XM-4S-020</td><td>-</td><td>Sony</td><td>-</td></tr></table> to <table border="1"><tr><td>I</td><td>Stereo Power Amplifier</td><td>XM-4S</td><td>20</td><td>Sony</td><td>-</td></tr></table>	I	Monaural Power Amplifier	XM-4S-020	-	Sony	-	I	Stereo Power Amplifier	XM-4S	20	Sony	-
I	Monaural Power Amplifier	XM-4S-020	-	Sony	-											
I	Stereo Power Amplifier	XM-4S	20	Sony	-											

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Reference: Abbreviations (Including words undescribed in this report)

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

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SECTION 1: Customer information

Company Name : Sony Corporation, Japan and Sony Group Companies
Address : 700/402 Moo. 7, Amata City Chonburi Industrial Estate, Don Hua Roh,
Muang Chonburi, Chonburi 20000, Thailand
Telephone Number : +66 38 214900 17 Ext : 1932
Contact Person : Jumroen Phaoenchoke

The information provided from the customer is as follows;

- Applicant, Type 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
 - 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

Type : AV Receiver
Model Number : XAV-AX8100
Serial Number : Refer to SECTION 4.2
Rating : DC 12 V
Receipt Date : November 9, 2020
Country of Mass-production : Thailand
Condition : Engineering prototype
(Not for Sale: This sample is equivalent to mass-produced items.)
Modification : No Modification by the test lab.

2.2 Product Description

Model: XAV-AX8100 (referred to as the EUT in this report) is a AV Receiver.

General Specification

Clock frequency(ies) in the system : 32.768 kHz, 9.25 MHz, 12 MHz (Tuner), 12 MHz (DSP IC), 24 MHz, 25 MHz, 26 MHz, 28.636363 MHz

Radio Specification

Bluetooth (BDR / EDR function)

Radio Type : Transceiver
Frequency of Operation : 2402 MHz - 2480 MHz
Modulation : FHSS, GFSK (1Mbps), $\pi/4$ -DQPSK, (2Mbps) 8DPSK (3Mbps)
Antenna type : Meander Monopole antenna
Antenna Gain *1) : -0.63 dBi (Peak), -4.86 dBi (Average)
Operating Temperature : -20 deg. C to +60 deg. C
Clock frequency : 26 MHz

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SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification : FCC Part 15 Subpart C
FCC Part 15 final revised on October 13, 2020

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

* Also the EUT complies with FCC Part 15 Subpart B.

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 *1)	N/A	-
Carrier Frequency Separation	FCC: KDB 558074 D01 15.247 Meas Guidance v05r02 ISED: -	FCC: Section15.247(a)(1) ----- ISED: RSS-247 5.1 (b)	See data.	Complied a)	Conducted
20dB Bandwidth	FCC: KDB 558074 D01 15.247 Meas Guidance v05r02 ISED: -	FCC: Section15.247(a)(1) ----- ISED: RSS-247 5.1 (a)		Complied a)	Conducted
Number of Hopping Frequency	FCC: KDB 558074 D01 15.247 Meas Guidance v05r02 ISED: -	FCC: Section15.247(a)(1)(iii) ----- ISED: RSS-247 5.1 (d)		Complied b)	Conducted
Dwell time	FCC: KDB 558074 D01 15.247 Meas Guidance v05r02 ISED: -	FCC: Section15.247(a)(1)(iii) ----- ISED: RSS-247 5.1 (d)		Complied c)	Conducted
Maximum Peak Output Power	FCC: 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: 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		5.3 dB 139.237 MHz, QP, Vert. Mode: Tx, 3DH5 2480 MHz	Complied e) / f)
<p>Note: UL Japan, Inc.'s EMI Work Procedures No. 13-EM-W0420 and 13-EM-W0422. *1) The test is not applicable since the EUT does not have AC power ports. *2) Radiated test was selected over 30 MHz based on section 15.247(d)</p> <p>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)</p> <p>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.</p>					

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

FCC Part 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 EUT. Therefore, the equipment complies with the antenna requirement.

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3.3 Addition to standard

Item	Test Procedure	Specification	Worst margin	Results	Remarks
99% Occupied Bandwidth	ISED: RSS-Gen 6.7	ISED: -	N/A	- a)	Conducted
a) Refer to APPENDIX 1 (data of 20dB Bandwidth, 99%Occupied Bandwidth and Carrier Frequency Separation)					

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 $k = 2$.
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Item	Frequency range	Uncertainty (+/-)			
		No. 1 SAC / SR	No. 2 SAC / SR	No. 3 SAC / SR	No. 4,5,6,8 SR
Conducted emission (AC Mains) LISN	150 kHz-30 MHz	2.6 dB	2.6 dB	2.56dB	2.9 dB
Radiated emission (Measurement distance: 3 m)	9 kHz-30 MHz	3.0 dB	2.7 dB	2.7 dB	-
	30 MHz-200 MHz	4.6 dB	4.6 dB	4.6 dB	-
	200 MHz-1 GHz	6.0 dB	6.0 dB	6.0 dB	-
	1 GHz-6 GHz	4.8 dB	4.8 dB	4.8 dB	-
	6 GHz-18 GHz	5.4 dB	5.4 dB	5.4 dB	-
	18 GHz-40 GHz	5.3 dB	5.3 dB	5.3 dB	-
Radiated emission (Measurement distance: 1 m)	1 GHz-18 GHz	5.7 dB	5.7 dB	5.7 dB	-
	18 GHz-40 GHz	5.6 dB	5.6 dB	5.6 dB	-

SAC=Semi-Anechoic Chamber

SR= Shielded Room is applied besides radiated emission

Antenna terminal test	Uncertainty (+/-)
Power Measurement above 1 GHz (Average Detector)_SPM-06	1.4 dB
Power Measurement above 1 GHz (Peak Detector)_SPM-06	1.6 dB
Power Measurement above 1 GHz (Average Detector)_SPM-07	0.89 dB
Power Measurement above 1 GHz (Peak Detector)_SPM-07	1.2 dB
Power Measurement above 1 GHz (Average Detector)_SPM-13	0.91 dB
Power Measurement above 1 GHz (Peak Detector)_SPM-13	1.2 dB
Spurious emission (Conducted) below 1GHz	0.87 dB
Spurious emission (Conducted) 1 GHz-3 GHz	0.96 dB
Spurious emission (Conducted) 3 GHz-18 GHz	3.0 dB
Spurious emission (Conducted) 18 GHz-26.5 GHz	2.6 dB
Spurious emission (Conducted) 26.5 GHz-40 GHz	2.2 dB
Bandwidth Measurement	0.012 %
Duty cycle and Time Measurement	0.27 %

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3.5 Test Location

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

Test site	IC Registration Number	Width x Depth x Height (m)	Size of reference ground plane (m) / horizontal conducting plane	Maximum measurement distance
No.1 Semi-anechoic chamber	2973D-1	20.6 x 11.3 x 7.65	20.6 x 11.3	10 m
No.2 Semi-anechoic chamber	2973D-2	20.6 x 11.3 x 7.65	20.6 x 11.3	10 m
No.3 Semi-anechoic chamber	2973D-3	12.7 x 7.7 x 5.35	12.7 x 7.7	5 m
No.4 Semi-anechoic chamber	-	8.1 x 5.1 x 3.55	8.1 x 5.1	-
No.1 Shielded room	-	6.8 x 4.1 x 2.7	6.8 x 4.1	-
No.2 Shielded room	-	6.8 x 4.1 x 2.7	6.8 x 4.1	-
No.3 Shielded room	-	6.3 x 4.7 x 2.7	6.3 x 4.7	-
No.4 Shielded room	-	4.4 x 4.7 x 2.7	4.4 x 4.7	-
No.5 Shielded room	-	7.8 x 6.4 x 2.7	7.8 x 6.4	-
No.6 Shielded room	-	7.8 x 6.4 x 2.7	7.8 x 6.4	-
No.8 Shielded room	-	3.45 x 5.5 x 2.4	3.45 x 5.5	-
No.1 Measurement room	-	2.55 x 4.1 x 2.5	-	-

3.6 Test data, Test instruments, and Test set up

Refer to APPENDIX.

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SECTION 4: Operation of 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)	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 (Hopping On) DH5, 3DH5	-
Dwell time	Tx (Hopping On), -DH1, DH3, DH5 -3DH1, 3DH3, 3DH5	-
Maximum Peak Output Power	Tx (Hopping Off) DH5, 2DH5, 3DH5	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
<p>*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)</p> <p>*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.</p> <p>* It is considered that the non-tested packet type (e.g. inquiry) can be omitted as it is complied with above all the test items based on Bluetooth Core specification.</p> <p>*EUT has the power settings by the software as follows; Power settings: BDR: Ext.=23, Int.=39 EDR: Ext.=73, Int.=48 Software: CSR BlueSuite BlueTest Version 2.5.8 (Date: 2017.10.30, Storage location: Driven by connected PC)</p> <p>*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.</p>		

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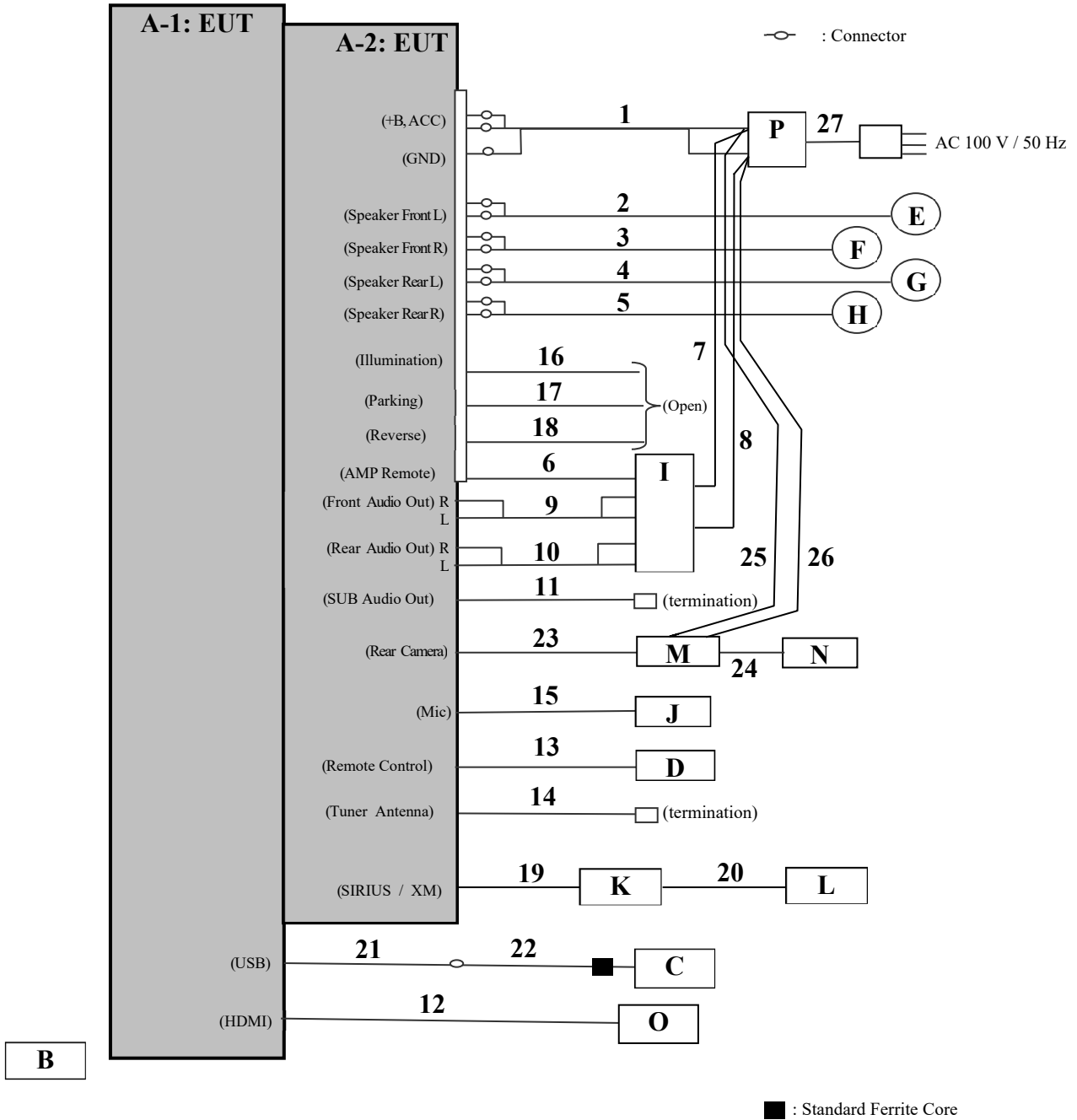
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4.2 Configuration and peripherals



* Cabling and setup 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-1 A-2	AV Receiver	XAV-AX8100	015 *1) 030 *2)	Sony	EUT
B	Remote Controller	RM-X170	-	Sony	-
C	USB memory	USM4GU	-	Sony	-
D	Wired Remote Controller	RM-X4S	-	Sony	-
E	Speaker 1	XS-PKF1625	-	Sony	-
F	Speaker 2	XS-PKF1625	-	Sony	-
G	Speaker 3	XS-PKF1621	-	Sony	-
H	Speaker 4	XS-PKF1621	-	Sony	-
I	Stereo Power Amplifier	XM-4S	20	Sony	-
J	Mic	-	-	-	-
K	SIRIUS XM CONNECT VEHICLE TUNER	SXV300	1627	Sony	-
L	Vehicle Satellite Radio Antenna works on both SIRIUS and XM Networks	NGVA3	1624A	Sony	-
M	Rear View Camera	XA-R800C	100114	Sony	-
N	Camera	-	-	Sony	-
O	Smart phone	MQ792JA	C8PY95XLLC6H	Apple	-
P	DC Power Supply	PAN35-10A	NA000955	Kikusui	-

*1) Used for Antenna Terminal conducted tests

*2) Used for Radiated Emission test

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	DC Power	0.15 + 1.8	Unshielded	Unshielded	-
2	Speaker (1)	0.15 + 2.0	Unshielded	Unshielded	-
3	Speaker (2)	0.15 + 2.0	Unshielded	Unshielded	-
4	Speaker (3)	0.15 + 2.0	Unshielded	Unshielded	-
5	Speaker (4)	0.15 + 2.0	Unshielded	Unshielded	-
6	AMP Remote	0.15 + 1.0	Unshielded	Unshielded	-
7	DC Power (+)	2.5	Unshielded	Unshielded	-
8	DC Power (-)	2.5	Unshielded	Unshielded	-
9	RCA (Front Audio Out)	5.0	Shielded	Shielded	-
10	RCA (Rear Audio Out)	5.0	Shielded	Shielded	-
11	RCA (SUB Audio Out)	3.0	Shielded	Shielded	-
12	HDMI	1.6	Shielded	Shielded	-
13	Remote Control	2.0	Shielded	Shielded	-
14	Tuner Antenna	1.1	Shielded	Shielded	-
15	Mic	3.5	Unshielded	Unshielded	-
16	Illumination	0.15 + 1.0	Unshielded	Unshielded	-
17	Parking	2.0	Unshielded	Unshielded	-
18	Reverse	0.15 + 1.0	Unshielded	Unshielded	-
19	Signal	0.65	Shielded	Shielded	-
20	SIRIUS antenna	7.1	Shielded	Shielded	-
21	USB	0.6	Shielded	Shielded	-
22	USB	1.3	Shielded	Shielded	-
23	RCA (camera)	1.5	Shielded	Shielded	-
24	camera	2.9	Shielded	Shielded	-
25	DC Power (+)	1.5	Unshielded	Unshielded	-
26	DC Power (-)	1.5	Unshielded	Unshielded	-
27	AC	2.0	Unshielded	Unshielded	-

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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 2.0 m, raised 0.8 m above the conducting ground plane. The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with a ground plane.

[For above 1 GHz]

EUT was placed on a urethane platform of nominal size, 0.5 m by 0.5 m, raised 1.5 m above the conducting ground plane. The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with absorbent materials lined on a ground plane.

The height of the measuring antenna varied between 1 m and 4 m and EUT was rotated a full revolution in order to obtain the maximum value of the electric field strength.

Test antenna was aimed at the EUT for receiving the maximum signal and always kept within the illumination area of the 3 dB 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 *1)	PK
IF Bandwidth	BW 120 kHz	RBW: 1 MHz VBW: 3 MHz	RBW: 1 MHz VBW: 1/T (T: burst length, refer to Burst rate confirmation sheet) Detector: Peak	RBW: 100 kHz VBW: 300 kHz

*1) Average Power Measurement was performed based on KDB 558074 D01 15.247 Meas Guidance v05r02.

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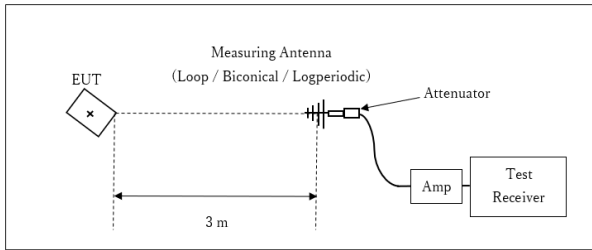
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Figure 2: Test Setup

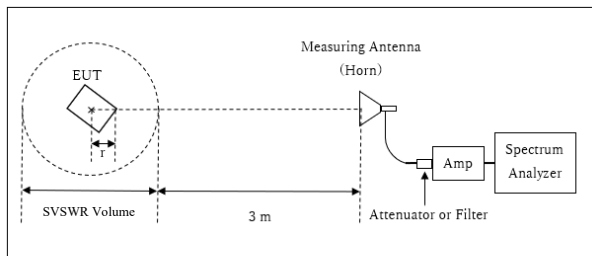
Below 1 GHz



× : Center of turn table

Test Distance: 3 m

1 GHz - 10 GHz

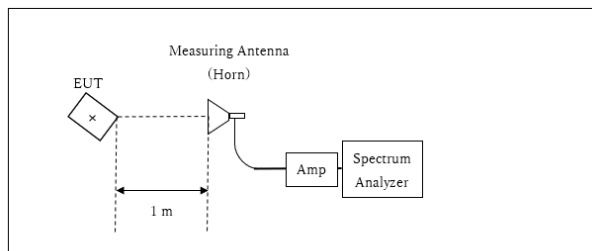


r : Radius of an outer periphery of EUT
× : Center of turn table

Distance Factor: $20 \times \log(3.85 \text{ m} / 3.0 \text{ m}) = 2.17 \text{ dB}$
* Test Distance: $(3 + \text{SVSWR Volume} / 2) - r = 3.85 \text{ m}$

SVSWR Volume : 2.0 m
(SVSWR Volume has been calibrated based on CISPR 16-1-4.)
r = 0.15 m

10 GHz - 26.5 GHz



× : Center of turn table

Distance Factor: $20 \times \log(1.0 \text{ m} / 3.0 \text{ m}) = -9.54 \text{ dB}$
*Test Distance: 1 m

- The carrier level and noise levels were confirmed at each position of 0 deg. to 30 deg. of EUT to see the position of maximum noise, and the test was made at the position that has the maximum noise.

Worst case

Antenna polarization	Carrier	Spurious (Below 1 GHz)	Spurious (1 GHz – 2.8 GHz)	Spurious (2.8 GHz – 10 GHz)	Spurious (10 GHz – 18 GHz)	Spurious (18 GHz – 26.5 GHz)
Horizontal	30 deg.	0 deg.	30 deg.	30 deg.	0 deg.	0 deg.
Vertical	30 deg.	0 deg.	30 deg.	30 deg.	0 deg.	0 deg.

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

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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: 160 MHz BW)
Carrier Frequency Separation	3 MHz	100 kHz	300 kHz	Auto	Peak	Max Hold	Spectrum Analyzer
Number of Hopping Frequency	30 MHz	100 kHz	300 kHz	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) *4)	9 kHz to 150 kHz	200 Hz	620 Hz	Auto	Peak	Max Hold	Spectrum Analyzer
	150 kHz to 30 MHz	10 kHz	30 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 not detected as shown in the chart.

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

*4) The limits in CFR 47, Part 15, Subpart C, paragraph 15.209(a), are identical to those in RSS-Gen section 8.9, Table 6, since the measurements are performed in terms of magnetic field strength and converted to electric field strength levels (as reported in the table) using the free space impedance of 377 Ohms. For example, the measurement at frequency 9 kHz resulted in a level of 45.5 dBuV/m, which is equivalent to $45.5 - 51.5 = -6.0$ dBuA/m, which has the same margin, 3 dB, to the corresponding RSS-Gen Table 6 limit as it has to 15.209(a) limit.

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

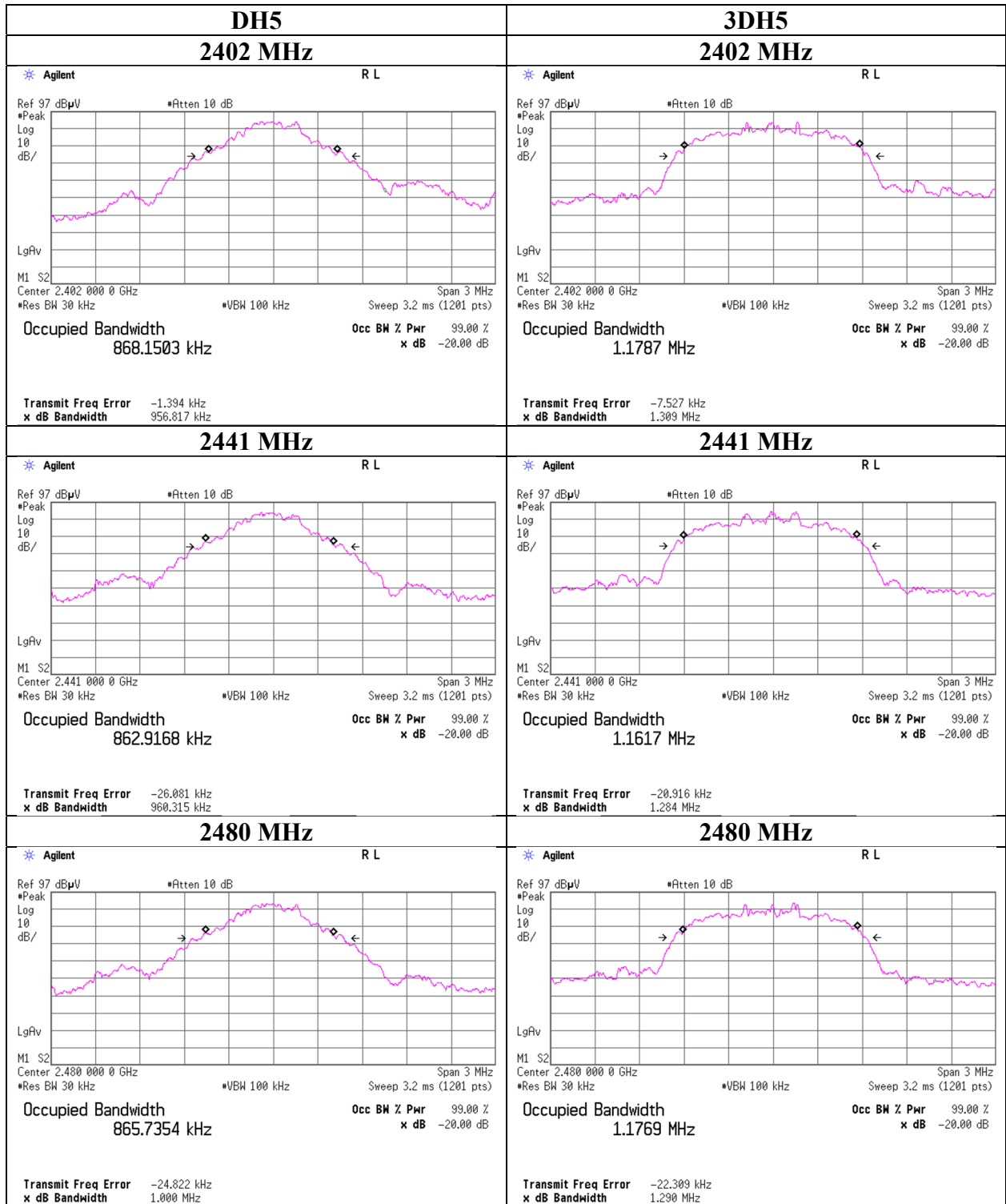
Report No. 13566128S-A-R1
Test place Shonan EMC Lab. No.3 Shielded Room
Date November 18, 2020
Temperature / Humidity 25 deg. C / 44 % RH
Engineer Makoto Hosaka
Mode Tx, Hopping Off, Tx, Hopping On

Mode	Freq. [MHz]	20dB Bandwidth [MHz]	99% Occupied Bandwidth [kHz]	Carrier Frequency Separation [MHz]	Limit for Carrier Frequency separation [MHz]
DH5	2402.0	0.9568	868.150	1.000	≥ 0.638
DH5	2441.0	0.9603	862.917	1.000	≥ 0.640
DH5	2480.0	1.000	865.735	1.000	≥ 0.667
DH5	Hopping On	-	78513.8	-	-
3DH5	2402.0	1.309	1178.7	1.000	≥ 0.873
3DH5	2441.0	1.284	1161.7	1.000	≥ 0.856
3DH5	2480.0	1.290	1176.9	1.000	≥ 0.860
3DH5	Hopping On	-	78699.1	-	-

Limit: Two-thirds of 20dB Bandwidth or 25kHz (whichever is greater).

No limit applies to 20dB Bandwidth.

20dB Bandwidth and 99% Occupied Bandwidth



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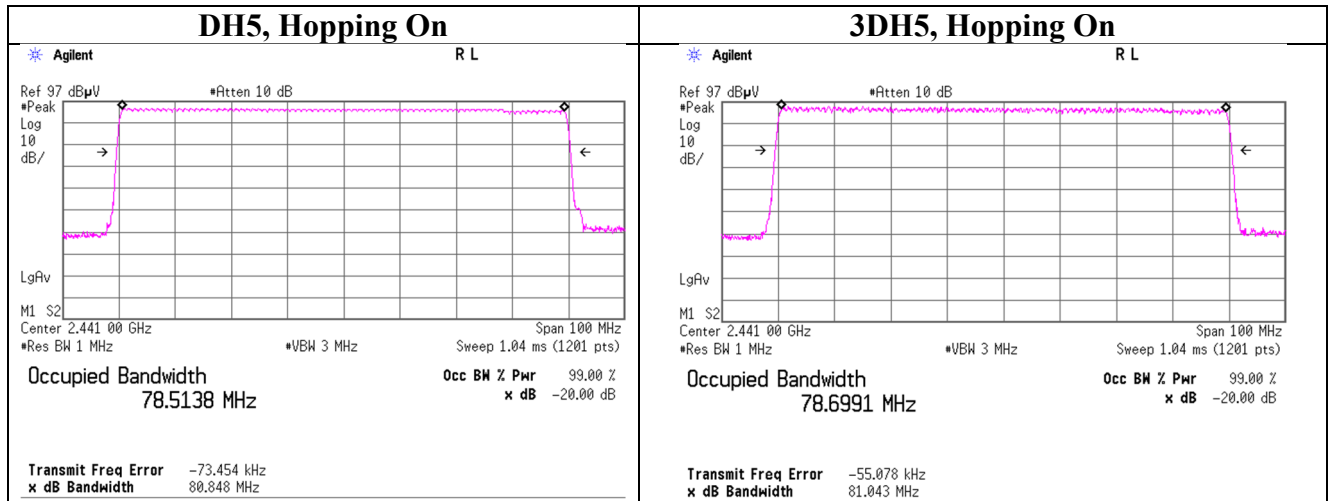
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20dB Bandwidth and 99% Occupied Bandwidth



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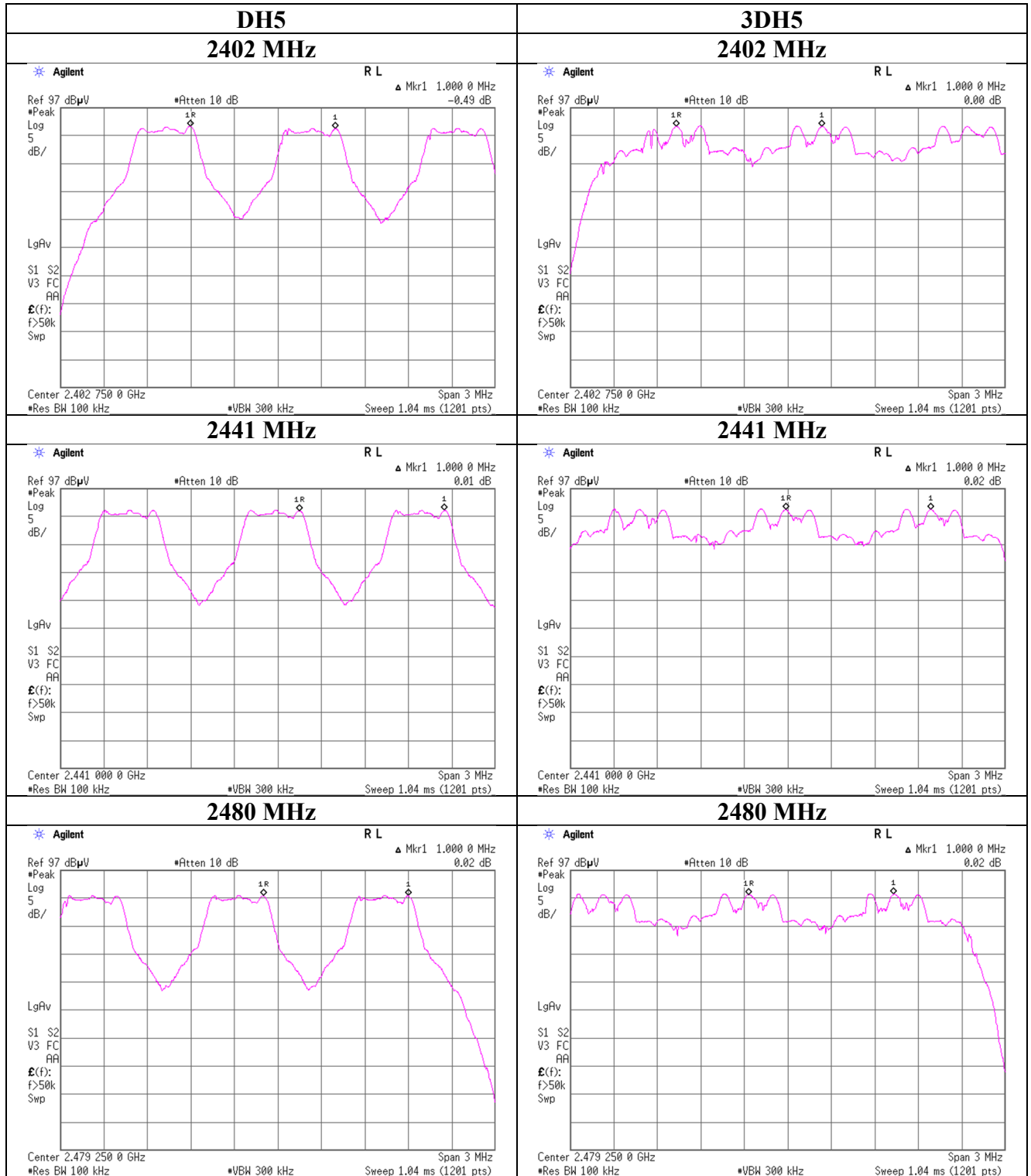
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Carrier Frequency Separation



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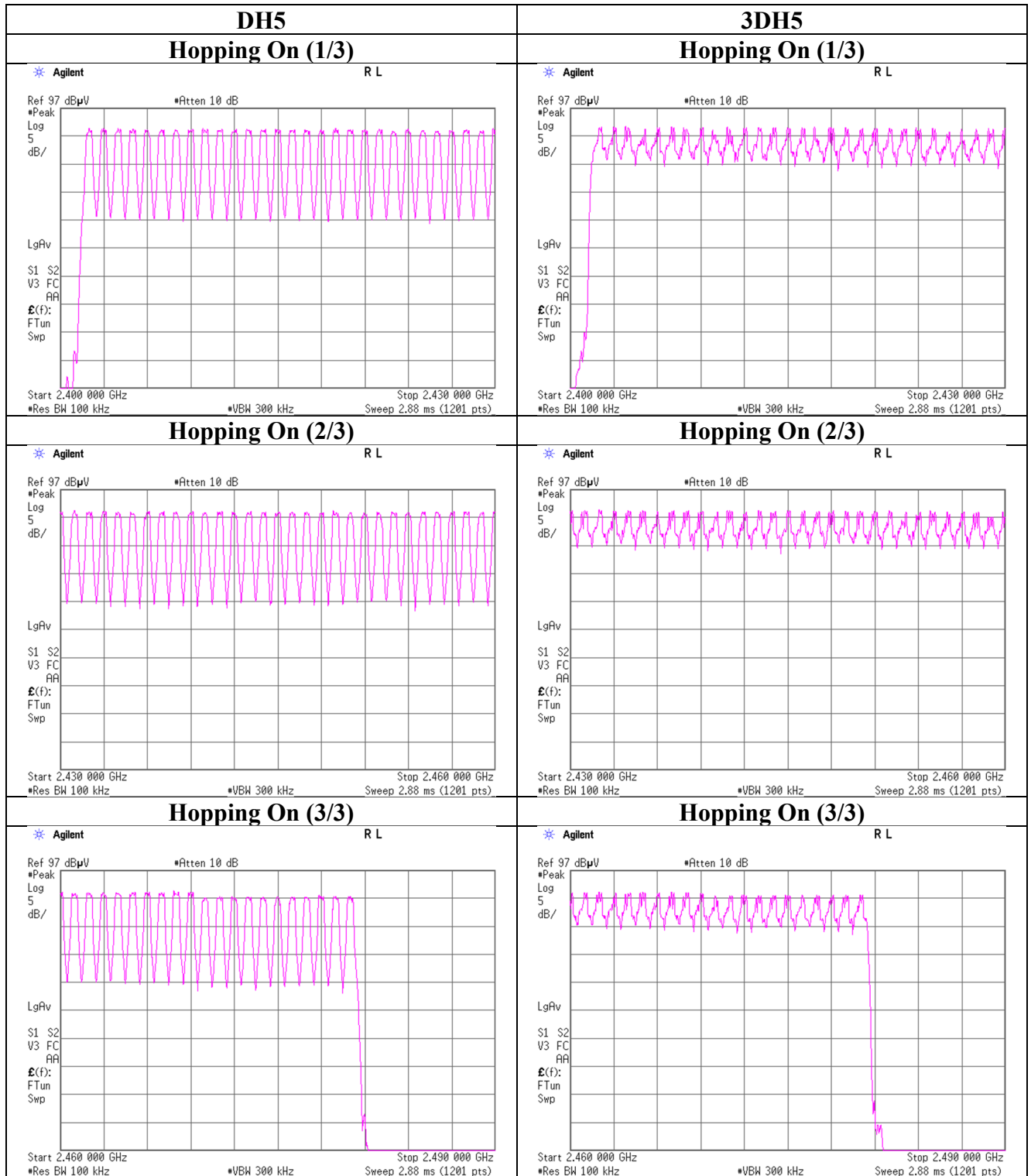
Number of Hopping Frequency

Report No. 13566128S-A-R1
Test place Shonan EMC Lab. No.3 Shielded Room
Date November 18, 2020
Temperature / Humidity 25 deg. C / 44 % RH
Engineer Makoto Hosaka
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



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Dwell time

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Test place Shonan EMC Lab. No.3 Shielded Room
Date November 18, 2020
Temperature / Humidity 25 deg. C / 44 % RH
Engineer Makoto Hosaka
Mode Tx, Hopping On

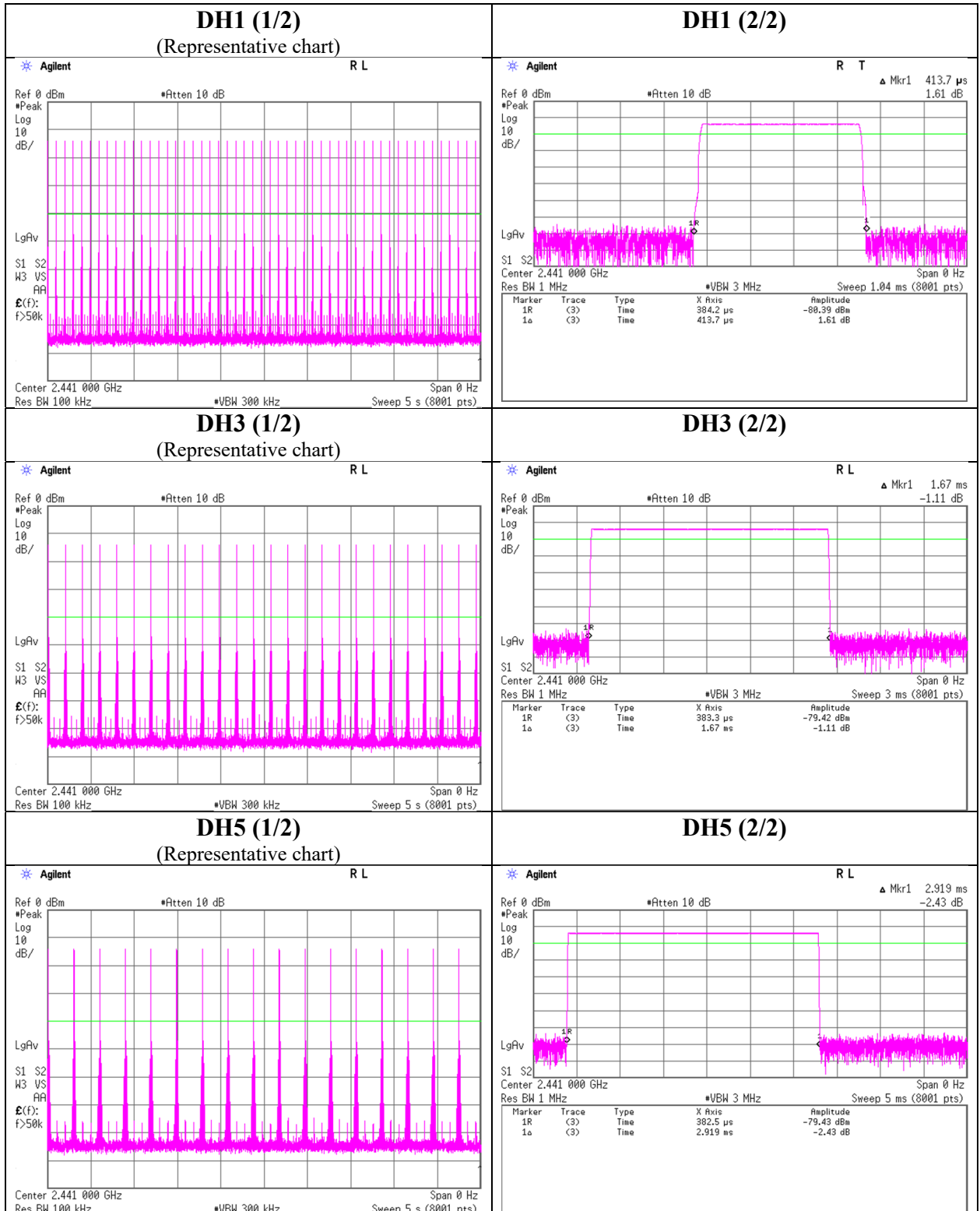
Mode	Number of transmission in a 31.6(79 Hopping x 0.4) / second period	Length of transmission [msec]	Result [msec]	Limit [msec]
DH1	51.0 times / 5 sec. x 31.6 sec. = 323 times	0.414	134	400
DH3	26.0 times / 5 sec. x 31.6 sec. = 165 times	1.670	276	400
DH5	17.0 times / 5 sec. x 31.6 sec. = 108 times	2.919	315	400
3DH1	51.0 times / 5 sec. x 31.6 sec. = 323 times	0.431	139	400
3DH3	26.0 times / 5 sec. x 31.6 sec. = 165 times	1.682	278	400
3DH5	17.0 times / 5 sec. x 31.6 sec. = 108 times	2.933	317	400

Sample Calculation

Result = Number of transmission x Length of transmission

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 $N \times 0.4s$, 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



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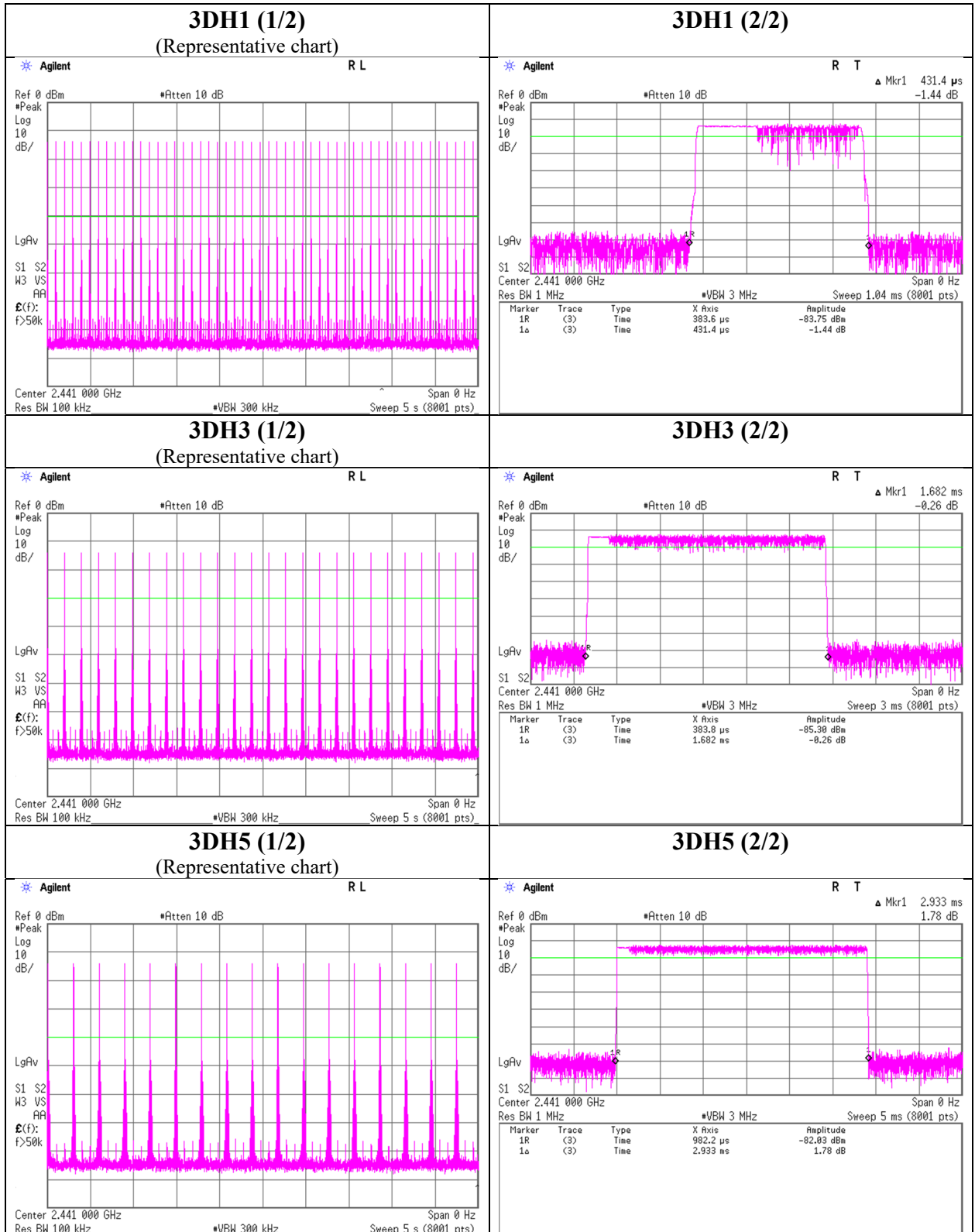
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Dwell time



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Maximum Peak Output Power

Report No. 13566128S-A-R1
Test place Shonan EMC Lab. No.3 Shielded Room
Date November 18, 2020
Temperature / Humidity 25 deg. C / 44 % RH
Engineer Makoto Hosaka
Mode Tx, Hopping Off

Mode	Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Conducted Power					e.i.r.p. for RSS-247					
					Result		Limit		Margin	Antenna Gain [dBi]	Result		Limit		Margin
					[dBm]	[mW]	[dBm]	[mW]	[dB]		[dBm]	[mW]	[dBm]	[mW]	
DH5	2402.0	-12.87	1.08	10.18	-1.61	0.69	20.96	125	22.57	-0.63	-2.24	0.60	36.02	4000	38.26
DH5	2441.0	-12.95	1.08	10.18	-1.69	0.68	20.96	125	22.65	-0.63	-2.32	0.59	36.02	4000	38.34
DH5	2480.0	-13.55	1.10	10.18	-2.27	0.59	20.96	125	23.23	-0.63	-2.90	0.51	36.02	4000	38.92
2DH5	2402.0	-11.55	1.08	10.18	-0.29	0.94	20.96	125	21.25	-0.63	-0.92	0.81	36.02	4000	36.94
2DH5	2441.0	-11.92	1.08	10.18	-0.66	0.86	20.96	125	21.62	-0.63	-1.29	0.74	36.02	4000	37.31
2DH5	2480.0	-12.57	1.10	10.18	-1.29	0.74	20.96	125	22.25	-0.63	-1.92	0.64	36.02	4000	37.94
3DH5	2402.0	-11.10	1.08	10.18	0.16	1.04	20.96	125	20.80	-0.63	-0.47	0.90	36.02	4000	36.49
3DH5	2441.0	-11.44	1.08	10.18	-0.18	0.96	20.96	125	21.14	-0.63	-0.81	0.83	36.02	4000	36.83
3DH5	2480.0	-12.23	1.10	10.18	-0.95	0.80	20.96	125	21.91	-0.63	-1.58	0.70	36.02	4000	37.60

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.
However, the limit level 125mW of AFH mode was used for the test.

Average Output Power
(Reference data for RF Exposure)

Report No. 13566128S-A-R1
Test place Shonan EMC Lab. No.3 Shielded Room
Date November 18, 2020
Temperature / Humidity 25 deg. C / 44 % RH
Engineer Makoto Hosaka
Mode Tx, Hopping Off

Mode	Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result (Time average)		Duty factor [dB]	Result (Burst power average)	
					[dBm]	[mW]		[dBm]	[mW]
DH5	2402.0	-14.96	1.08	10.18	-3.70	0.43	1.09	-2.61	0.55
DH5	2441.0	-15.12	1.08	10.18	-3.86	0.41	1.09	-2.77	0.53
DH5	2480.0	-15.82	1.10	10.18	-4.54	0.35	1.09	-3.45	0.45
2DH5	2402.0	-15.76	1.08	10.18	-4.50	0.35	1.07	-3.43	0.45
2DH5	2441.0	-15.98	1.08	10.18	-4.72	0.34	1.07	-3.65	0.43
2DH5	2480.0	-16.80	1.10	10.18	-5.52	0.28	1.07	-4.45	0.36
3DH5	2402.0	-15.57	1.08	10.18	-4.31	0.37	1.07	-3.24	0.47
3DH5	2441.0	-15.98	1.08	10.18	-4.72	0.34	1.07	-3.65	0.43
3DH5	2480.0	-16.82	1.10	10.18	-5.54	0.28	1.07	-4.47	0.36

Sample Calculation:

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

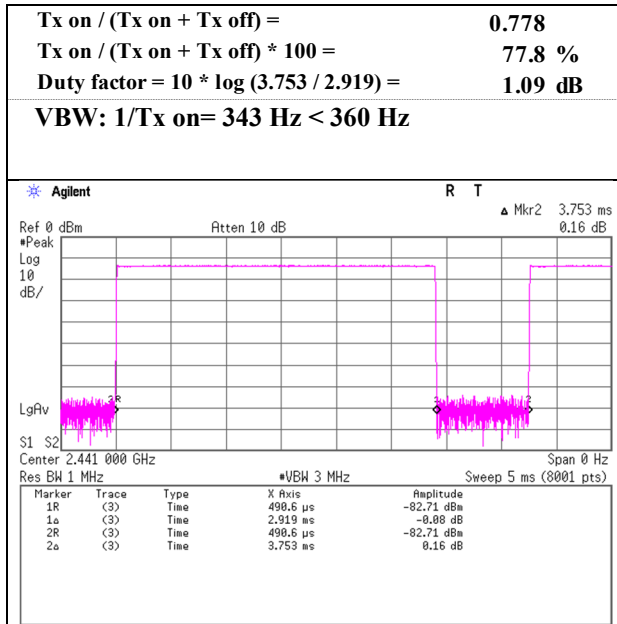
Result (Burst power average) = Time average + Duty factor

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

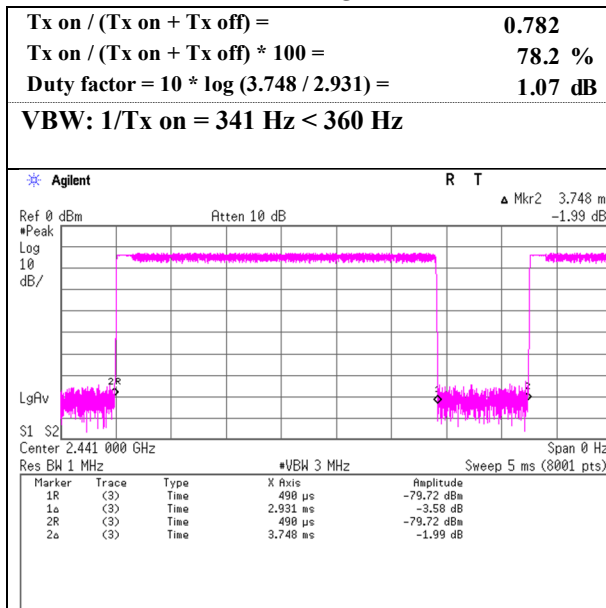
Burst Rate Confirmation

Report No. 13566128S-A-R1
Test place Shonan EMC Lab. No.3 Shielded Room
Date November 18, 2020
Temperature / Humidity 25 deg. C / 44 % RH
Engineer Makoto Hosaka
Mode Tx, Hopping Off

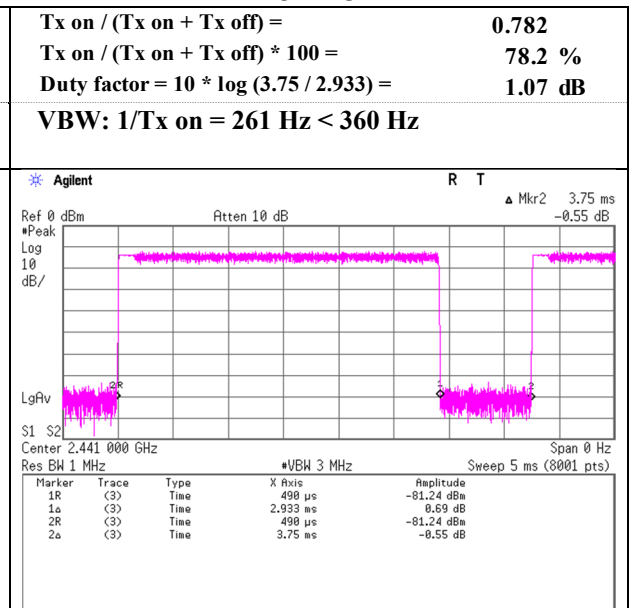
DH5



2DH5



3DH5



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