



# RADIO TEST REPORT

**Test Report No. : 10686937H-B-R1**

**Applicant** : Sony Corporation  
**Type of Equipment** : Digital Wireless Transmitter  
**Model No.** : DWT-B01N  
**FCC ID** : AK8DWTB01N  
**Test regulation** : FCC Part 74: 2014  
**Test Result** : Complied

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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 above regulation.
4. The test results in this report are traceable to the national or international standards.
5. 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 Federal Government.
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. This report is a revised version of 10686937H-B. 10686937H-B is replaced with this report.

**Date of test:** February 12 to 26, 2015

**Representative test engineer:**

Hironobu Ohnishi  
Engineer

Consumer Technology Division

**Approved by:**

Takayuki Shimada  
Engineer

Consumer Technology Division



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. \*As for the range of Accreditation in NVLAP, you may refer to the WEB address, [http://japan.ul.com/resources/emc\\_accredited/](http://japan.ul.com/resources/emc_accredited/)

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13-EM-F0429



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## **SECTION 1: Customer information**

Company Name : Sony EMCS Corporation  
Address : 30 Ibarajima Ohya-cyo, Inazawa-shi, Aichi-ken, 492-8545, JAPAN  
Telephone Number : +81-50-3807-4243  
Facsimile Number : +81-50-3807-4306  
Contact Person : Youhei Hisano

### **\*Remarks**

Sony EMCS Corporation (Subsidiary Company Name) is on behalf of the applicant: Sony Corporation.

## **SECTION 2: Equipment under test (E.U.T.)**

### **2.1 Identification of E.U.T.**

Type of Equipment : Digital Wireless Transmitter  
Model No. : DWT-B01N  
Serial No. : Refer to 4.2 in this report.  
Rating : DC 3.0V (2 x AA batteries)  
Receipt Date of Sample : February 11, 2015  
Country of Mass-production : Japan  
Condition of EUT : Engineering prototype  
(Not for Sale: This sample is equivalent to mass-produced items.)  
Modification of EUT : No Modification by the test lab

### **2.2 Product Description**

Model: DWT-B01N (referred to as the EUT in this report) is a Digital Wireless Transmitter.

### **General Specification**

Clock frequency(ies) in the system : X400 8MHz  
X202 12.288MHz  
X2000 16MHz  
X801 (TCXO) 19.2MHz  
IC600, 601, 700, 720, 721 1250 - 1500kHz  
IC702 1300kHz  
IC202 600 - 1000kHz  
IC606 250kHz  
X802 (VCO: change by a transmission frequency)  
(14) 470.125-541.875MHz  
(30) 566.125-607.875MHz, 614.125-637.875MHz  
(42) 638.125-697.875MHz

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**Radio Specification (Radio microphone part)**

Radio type : Transmitter  
Modulation type :  $\pi/4$  shift QPSK  
Emission designator : 192KG1D, 192KG1E  
Necessary bandwidth : 192kHz, Manufacturer defined  
Channel spacing : 25kHz  
Frequency of operation : (14) 470.125-541.875MHz  
(30) 566.125-607.875MHz, 614.125-637.875MHz  
(42) 638.125-697.875MHz  
RF power : High: 50mW, Middle: 10mW, Low: 1mW  
Antenna type : 1/4 Lambda Monopole antenna (whip type)  
Antenna gain : 2.14dBi  
Power Supply (radio part input) : DC 2.8V, DC 3.0V, DC 5.0V  
AF Specification : 40Hz – 18000Hz, Maximum input: -24dBV (MIC level, ATT 0dB)  
Operating temperature : 0 deg. C to 50 deg. C

**Radio Specification (RF remote part)**

Radio Type : Transceiver  
Modulation type : DSSS  
Frequency of Operation : 2405MHz to 2480MHz  
Channel spacing : 5MHz  
Method of frequency generation : Synthesizer  
Power Supply (radio part input) : DC 2.8V  
Antenna Type : Chip antenna  
Antenna Gain : -1.0dBi max  
Operating temperature : 0 deg. C to 50 deg. C

\*This test report applies for Radio microphone part.

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## **SECTION 3: Test specification, procedures & results**

### **3.1 Test Specification**

Test Specification : FCC Part 74: 2014, final revised on August 15, 2014 and effective September 15, 2014.

Title : FCC 47CFR Part74  
EXPERIMENTAL RADIO, AUXILIARY, SPECIAL BROADCAST AND OTHER  
PROGRAM DISTRIBUTIONAL SERVICES

\* The EUT complies with FCC Part 15 Subpart B: 2015, final revised on January 21, 2015.

### **3.2 Procedures and results**

Item	Test Procedure	Specification	Worst margin	Results	Remarks
RF power output	FCC: Section 2.1046	FCC: Section 74.861 (e) (1)	See data.	Complied	Conducted
	IC: RSS-Gen Section 6.12 RSS-210 A1 Section 5.1	IC: RSS-210 A1 Section 6.1			
Modulation Characteristics	FCC: Section 2.1047	FCC: Section 74.861 (e) (3)	N/A	N/A *1)	-
	IC: RSS-210 A1 Section 5.3	IC: RSS-210 A1 Section 6.6			
Emission Bandwidth (99% Occupied Bandwidth)	FCC: Section 2.1049	FCC: Section 74.861 (e) (5)	See data.	Complied	Conducted
	IC: RSS-Gen Section 6.6	IC: RSS-210 A1 Section 6.2			
Spurious emissions at antenna terminals	FCC: Section 2.1051	FCC: Section 74.861 (e) (6)	See data.	Complied	Conducted
	IC: RSS-210 A1 Section 6.4	IC: RSS-210 A1 Section 6.4			
Field strength of spurious radiation	FCC: Section 2.1053	FCC: Section 74.861 (e) (6)	33.5dB 940.25MHz, Horizontal See IC report.	Complied	Radiated
	IC: RSS-Gen Section 6.13 RSS-210 A1 Section 6.4	IC: RSS-210 A1 Section 6.4			
Frequency stability	FCC: Section 2.1055	FCC: Section 74.861 (e) (4)	See data.	Complied	Conducted
	IC: RSS-Gen Section 6.11	IC: RSS-210 A1 Section 6.3			

Note: UL Japan, Inc.'s EMI Work Procedure No. 13-EM-W0420.  
This EUT does not have receiving part. Therefore Receiver Spurious Emission test was not performed.  
\*1) Because the EUT has digital modulation.

\* In case any questions arise about test procedure, TIA/EIA 603-C (2004) is also referred.

### **Supplied Voltage Information**

This test was performed with the New Battery (DC 3.0V) and the constant voltage was supplied to the EUT during the tests.

### **3.3 Addition to standard**

No addition, exclusion nor deviation has been made from the standard.

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### 3.4 Uncertainty

#### EMI

The following uncertainties have been calculated to provide a confidence level of 95% using a coverage factor k=2.

<b>Spurious Emission (EUT height: 0.8m) (+dB)</b>	
Measurement Distance 3m	
30MHz-300MHz	5.5dB
300MHz-1000MHz	4.1dB
1GHz-12.75GHz	4.8dB

<b>Power meter (+dB)</b>
Below 1GHz
0.7dB

<b>Antenna terminal conducted emission (+dB)</b>		
Below 1GHz	1GHz-3GHz	3GHz-18GHz
1.5dB	1.7dB	2.8dB

<b>Occupied bandwidth (+%)</b>
0.1

#### Radiated emission test (3m)

The data listed in this test report has enough margin, more than the site margin.

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### 3.5 Test Location

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	IC Registration Number	Width x Depth x Height (m)	Size of reference ground plane (m) / horizontal conducting plane	Other rooms
No.1 semi-anechoic chamber	2973C-1	19.2 x 11.2 x 7.7m	7.0 x 6.0m	No.1 Power source room
No.2 semi-anechoic chamber	2973C-2	7.5 x 5.8 x 5.2m	4.0 x 4.0m	-
No.3 semi-anechoic chamber	2973C-3	12.0 x 8.5 x 5.9m	6.8 x 5.75m	No.3 Preparation room
No.3 shielded room	-	4.0 x 6.0 x 2.7m	N/A	-
No.4 semi-anechoic chamber	2973C-4	12.0 x 8.5 x 5.9m	6.8 x 5.75m	No.4 Preparation room
No.4 shielded room	-	4.0 x 6.0 x 2.7m	N/A	-
No.5 semi-anechoic chamber	-	6.0 x 6.0 x 3.9m	6.0 x 6.0m	-
No.6 shielded room	-	4.0 x 4.5 x 2.7m	4.0 x 4.5 m	-
No.6 measurement room	-	4.75 x 5.4 x 3.0m	4.75 x 4.15 m	-
No.7 shielded room	-	4.7 x 7.5 x 2.7m	4.7 x 7.5m	-
No.8 measurement room	-	3.1 x 5.0 x 2.7m	N/A	-
No.9 measurement room	-	8.0 x 4.6 x 2.8m	2.4 x 2.4m	-
No.11 measurement room	-	6.2 x 4.7 x 3.0m	4.8 x 4.6m	-

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

### 3.6 Data of Radio, Test instruments, and Test set up

Refer to APPENDIX.

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## **SECTION 4: Operation of E.U.T. during testing**

### **4.1 Operating Mode(s)**

<b>Mode</b>	<b>Remarks</b>
Transmitting (Tx), Power setting: 1mW	Typ. 1mW
Transmitting (Tx), Power setting: 10mW	Typ. 10mW
Transmitting (Tx), Power setting: 50mW	Typ. 50mW
*Transmitting duty was 100% on all tests.	
*Power of the EUT was set by the software as follows; Power settings: Low (1mW), Middle (10mW), High (50mW) Software: 1.03 *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 without 1mW, 10mW or 50mW settings.	

\*The details of Operating mode(s)

<b>Test Item</b>	<b>Tested frequency</b>	<b>Power setting</b>	<b>Modulation</b>	<b>Remarks</b>
RF power output	470.125MHz (Low) 607.875MHz (Mid) 697.875MHz (High)	1mW, 10mW, 50mW	Digital modulation (PN9 data packet)	
Emission Bandwidth	470.125MHz (Low) 607.875MHz (Mid) 614.125MHz (Mid2) 697.875MHz (High)	1mW, 50mW	Digital modulation (PN9 data packet)	*1)
Spurious emissions at antenna terminals	470.125MHz (Low) 607.875MHz (Mid) 697.875MHz (High)	1mW, 50mW	Digital modulation (PN9 data packet)	
Field strength of spurious radiation	470.125MHz (Low) 607.875MHz (Mid) 697.875MHz (High)	1mW, 50mW	Digital modulation (PN9 data packet)	
Frequency stability	607.875MHz (Mid)	50mW	No modulation	*2)
*The isolator of RF filter circuit is consisted of passive component. It does not contain non-linear component. Therefore the test was performed on lowest, near middle and highest frequency that was chosen from available frequency band. *1) The tests were performed at both edges of allocated bands. (470-608MHz and 614-698MHz) *2) There is no difference in frequency generating method on each frequency. Therefore the test was performed on Mid channel as a representative.				

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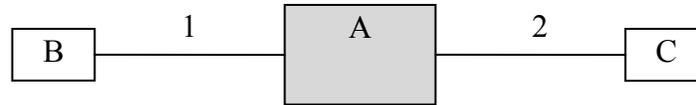
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#### 4.2 Configuration and peripherals



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

#### Description of EUT

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	Digital Wireless Transmitter	DWT-B01N	81413: Low channel, 83011: Mid/Mid2 channel, 84211: High channel	Sony EMCS Corporation	EUT
B	Lavalier Microphone	-	-	Sony EMCS Corporation	-
C	Keyboard	TK-FCP02G	1X000689	Elecom	-

#### List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	Microphone Cable	1.2	Shielded	Shielded	-
2	USB Cable	1.6	Shielded	Shielded	-

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**SECTION 5: Field strength of spurious radiation**

**Test Procedure**

- 1) EUT was placed on a urethane platform of nominal size, 1.0m by 1.5m, raised 0.8m above the conducting ground plane.  
Test was made with the antenna positioned in both the horizontal and vertical planes of polarization. The Radiated Electric Field Strength has been measured in semi anechoic chamber at a distance of 3m. The measuring antenna height was varied between 1 to 4m and the turn table was rotated a full revolution in order to obtain the maximum value of the electric field strength.  
The measurements were performed for both vertical and horizontal antenna polarization. Spurious emissions were observed with enough time according to the test standard.
  
- 2) Exchanged the EUT to the Substitution Antenna, the measurement was set for the same height 0.8m as the EUT. The frequency below 1GHz of the Substitution Antenna was used the Half wave dipole Antenna, which was tuned the measured frequency in 1).  
The frequency above 1GHz of the Substitution Antenna was used Horn Antenna.  
The Substitution Antenna was connected to the Signal Generator, and the polarized electromagnetic radiation of the Substitution Antenna was matched with the one of the measuring Antenna, which was set with the Signal Generator to the measured frequency in 1). Then, we set with the Output power (CW) of the Signal Generator where the measuring electromagnetic field strength is equal to the measured value in 1) by means of varying the measuring antenna height between 1 to 4m to obtain maximum receiving level. Its Output power of Signal Generator was recorded.
  
- 3) Effective radiated power was calculated by subtracting the cable loss and the attenuator loss connected between the Signal Generator and the Substitution Antenna from the Output power of the Signal Generator recorded in 2).  
For the usage of the Antenna (Horn Antenna) except for the Half wave dipole Antenna (2.15dBi) for the Substitution Antenna, the Effective radiated power was calculated by compensating the finite difference in the Antenna gain of the Half wave dipole Antenna, and Substitution Antenna.

Frequency	Below 1GHz	Above 1GHz
Instrument used	Test Receiver	Spectrum Analyzer
IF Bandwidth	RMS Average: 120kHz BW	RMS Average: RBW: 1MHz/VBW: 3MHz

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

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

**Measurement range** : 30M-7GHz  
**Test data** : APPENDIX  
**Test result** : Pass

## **SECTION 6: Antenna terminal tests, Emission Bandwidth and Frequency stability**

### **Test Procedure**

The tests were made with below setting connected to the antenna port.

Test	Span	RBW	VBW	Sweep time	Detector	Trace	Instrument used
RF power output	-	-	-	Auto	Average	-	Power Meter (Sensor: 50MHz BW)
Emission Bandwidth	Enough width to display emission skirts	1 to 5% of Occupied bandwidth	Three times of RBW	Auto	Peak *1)	Max Hold *1)	Spectrum Analyzer
Conducted Spurious Emission	9kHz -150kHz	200Hz	620Hz	Auto	Peak	Max Hold	Spectrum Analyzer
	150kHz - 30MHz	10kHz	30kHz				
	30MHz - 1GHz	100kHz	300kHz				
	Above 1GHz	1MHz	3MHz				
Frequency stability	-	-	-	-	-	-	Frequency Counter

\*1) The measurement was performed with Peak and Max Hold. (Worst-case measurement)

### **[Side band spectrum measurement (Emission mask)]**

- 1) Center frequency of the spectrum analyzer was set to the assigned transmitter frequency. Span was set to >500% of necessary bandwidth. Transmit the EUT, and the level of the RF power was set to a full scale reference level. This is the 0dB reference for the measurement.
- 2) The EUT was modulated with PN9 digital audio packet.
- 3) The resulting spectrum analyzer plot of the emission level was recorded.

### **[Frequency stability]**

The power supply set to 100 % nominal setting, raise EUT operating temperature to 50 deg. C.  
Record the frequency of the EUT.  
Repeat measurements at each 10 deg. C decrement to -30 deg. C.

EUT power supply was varied between 85 % and 115 % of nominal and the frequency of the EUT was recorded when temperature is 20 deg. C. The additional test was performed at battery end point voltage.

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

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

**APPENDIX 1: Data of Radio test**

**RF power output  
(Conducted)**

Test place Ise EMC Lab. No.11 Measurement Room  
Report No. 10686937H  
Date 02/23/2015  
Temperature/ Humidity 23 deg. C / 35% RH  
Engineer Hironobu Ohnishi  
Mode Tx

Power Setting	Channel	Freq. [MHz]	Reading Average [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result Average		Limit [mW]	Margin [dB]	Remarks
						[dBm]	[mW]			
1mW	Low	470.125	-10.07	0.00	9.92	-0.15	0.966	250	24.13	
	Mid	607.875	-10.26	0.00	9.90	-0.36	0.920	250	24.34	
	Mid 2	614.125	-10.16	0.00	9.90	-0.26	0.942	250	24.24	*
	High	697.875	-10.37	0.00	9.88	-0.49	0.893	250	24.47	
10mW	Low	470.125	-0.81	0.00	9.92	9.11	8.15	250	14.87	
	Mid	607.875	-0.15	0.00	9.90	9.75	9.44	250	14.23	
	High	697.875	-0.33	0.00	9.88	9.55	9.02	250	14.43	
50mW	Low	470.125	6.72	0.00	9.92	16.64	46.1	250	7.34	
	Mid	607.875	6.80	0.00	9.90	16.70	46.8	250	7.28	
	Mid 2	614.125	7.09	0.00	9.90	16.99	50.0	250	6.99	*
	High	697.875	6.75	0.00	9.88	16.63	46.0	250	7.35	

Calculation formula:

$$\text{Result} = \text{Reading} + \text{Cable Loss} + \text{Atten. Loss}$$

Cable or Atten. was not used for factor 0.00dB of the above table.

\* Reference data for the emission mask measurement.

### Emission Bandwidth

Test place Ise EMC Lab. No.11 Measurement Room  
Report No. 10686937H  
Date 02/24/2015  
Temperature/ Humidity 25 deg. C / 28% RH  
Engineer Hironobu Ohnishi  
Mode Tx

Power Setting	Channel	Freq. [MHz]	99% Occupied Bandwidth [kHz]	Limit [kHz]	Margin [kHz]
1mW	Low	470.125	159.0590	200	40.9410
	Mid	607.875	159.4492	200	40.5508
	Mid 2	614.125	158.4101	200	41.5899
	High	697.875	157.6478	200	42.3522
50mW	Low	470.125	158.5029	200	41.4971
	Mid	607.875	158.5428	200	41.4572
	Mid 2	614.125	159.4763	200	40.5237
	High	697.875	157.4952	200	42.5048

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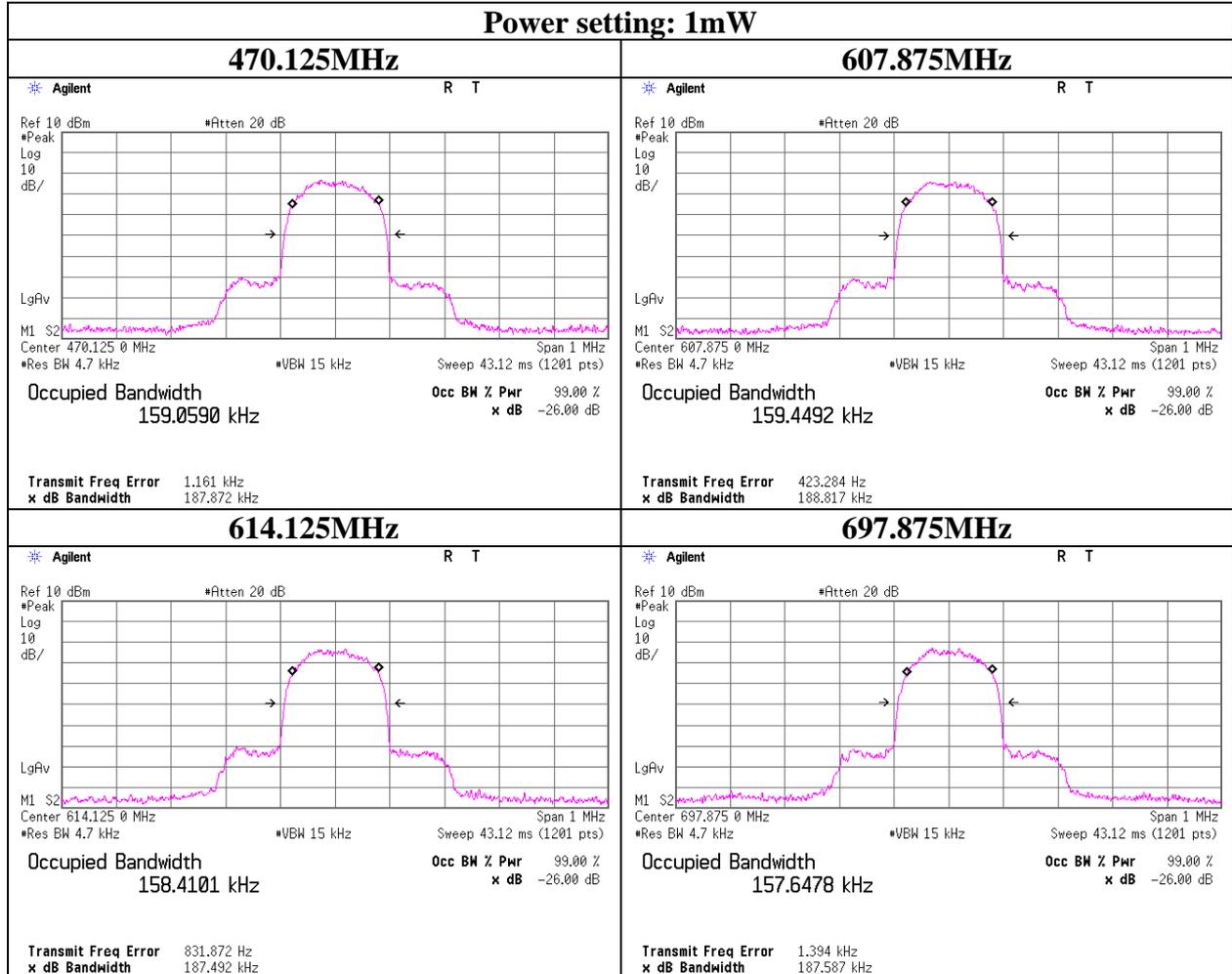
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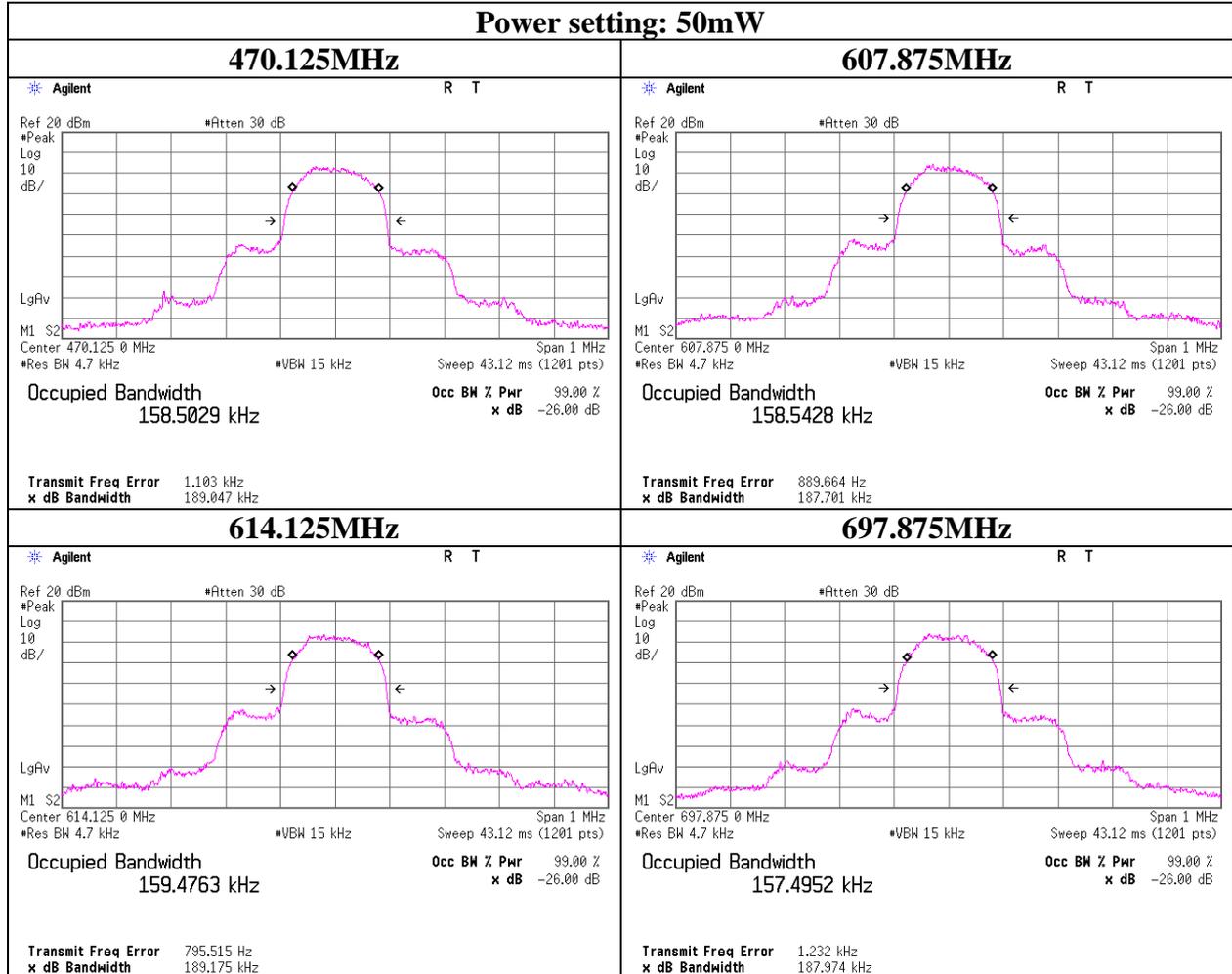
### Emission Bandwidth

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	10686937H
Date	02/24/2015
Temperature/ Humidity	25 deg. C / 28% RH
Engineer	Hironobu Ohnishi
Mode	Tx



## Emission Bandwidth

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	10686937H
Date	02/24/2015
Temperature/ Humidity	25 deg. C / 28% RH
Engineer	Hironobu Ohnishi
Mode	Tx



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**Spurious emissions at antenna terminals**

Test place Ise EMC Lab. No.11 Measurement Room  
Report No. 10686937H  
Date 02/24/2015  
Temperature/ Humidity 25 deg. C / 28% RH  
Engineer Hironobu Ohnishi  
Mode Tx

Power Setting	Channel	Tested Freq. [MHz]	Reading		Cable Loss [dB]	Atten. Loss [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
			Freq. [MHz]	Level [dBm]					
1mW	Low	470.125	0.011	-97.23	0.00	9.83	-87.40	-13	74.40
			0.15	-88.90	0.00	9.82	-79.08	-13	66.08
			940.2	-67.10	0.00	9.90	-57.20	-13	44.20
			3190	-69.68	0.00	10.04	-59.64	-13	46.64
	Mid	607.875	0.009	-97.00	0.00	9.83	-87.17	-13	74.17
			0.225	-86.93	0.00	9.82	-77.11	-13	64.11
			3953	-69.41	0.00	10.04	-59.37	-13	46.37
			7025	-67.37	0.00	10.11	-57.26	-13	44.26
	High	697.875	0.01476	-97.17	0.00	9.83	-87.34	-13	74.34
			0.2	-89.18	0.00	9.82	-79.36	-13	66.36
			3383	-69.91	0.00	10.04	-59.87	-13	46.87
			6967	-67.79	0.00	10.10	-57.69	-13	44.69
50mW	Low	470.125	0.12803	-78.08	0.00	9.82	-68.26	-13	55.26
			0.15	-76.71	0.00	9.82	-66.89	-13	53.89
			940.2	-58.00	0.00	9.90	-48.10	-13	35.10
			3187	-59.80	0.00	10.04	-49.76	-13	36.76
	Mid	607.875	0.12803	-78.67	0.00	9.82	-68.85	-13	55.85
			0.15	-77.96	0.00	9.82	-68.14	-13	55.14
			3663	-58.99	0.00	10.04	-48.95	-13	35.95
			6988	-56.83	0.00	10.10	-46.73	-13	33.73
	High	697.875	0.12803	-81.36	0.00	9.82	-71.54	-13	58.54
			0.2	-77.51	0.00	9.82	-67.69	-13	54.69
			1397	-58.02	0.00	10.01	-48.01	-13	35.01
			7188	-57.73	0.00	10.11	-47.62	-13	34.62

Calculation formula:

Result = Reading + Cable Loss + Attenuator Loss

Limit = mean output power in dBm - (43+10log10 (mean output power in watts)) dB = -13dBm

Cable or Atten. was not used for factor 0.00dB of the above table.

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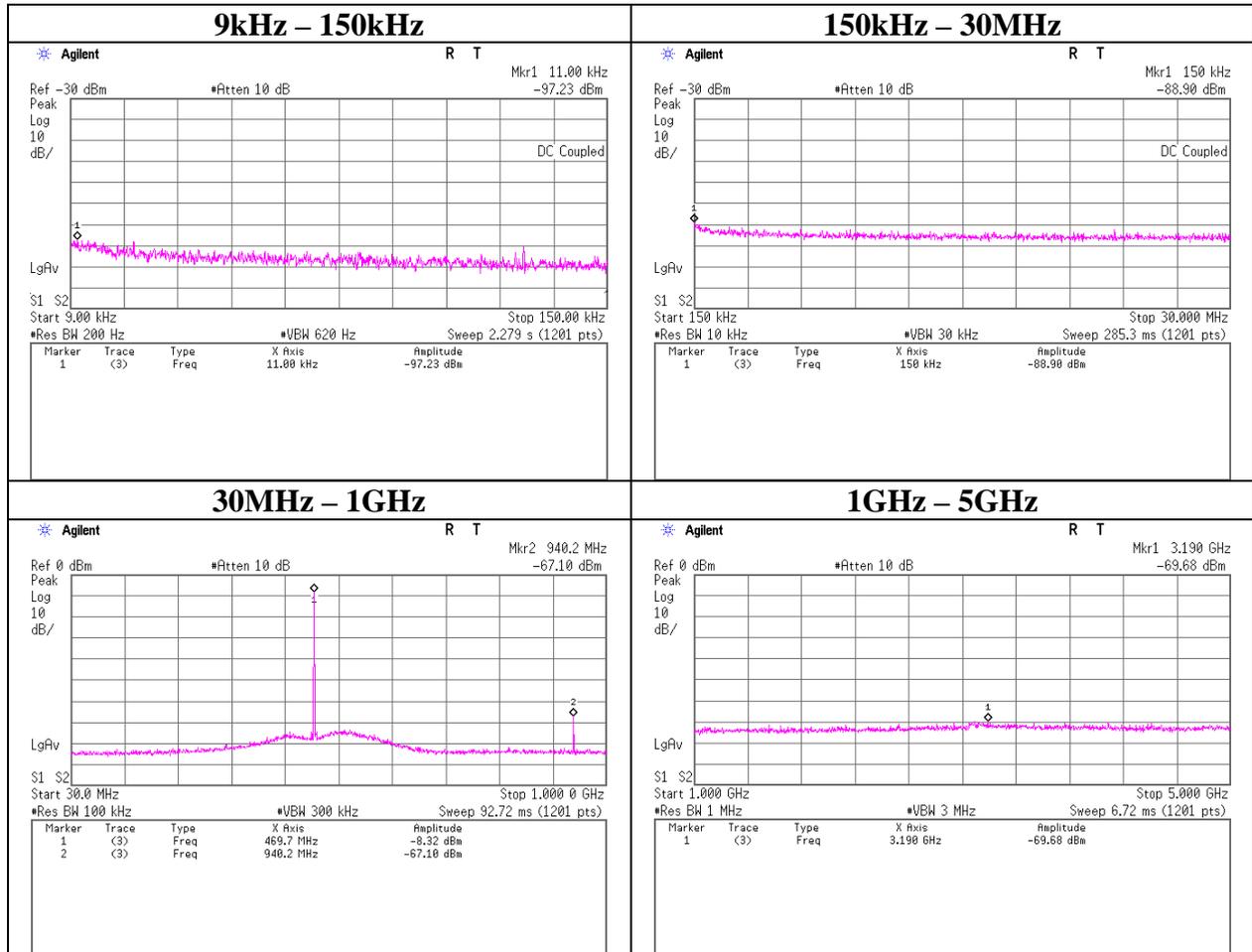
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

## Spurious emissions at antenna terminals

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	10686937H
Date	02/24/2015
Temperature/ Humidity	25 deg. C / 28% RH
Engineer	Hironobu Ohnishi
Mode	Tx 470.125MHz, 1mW



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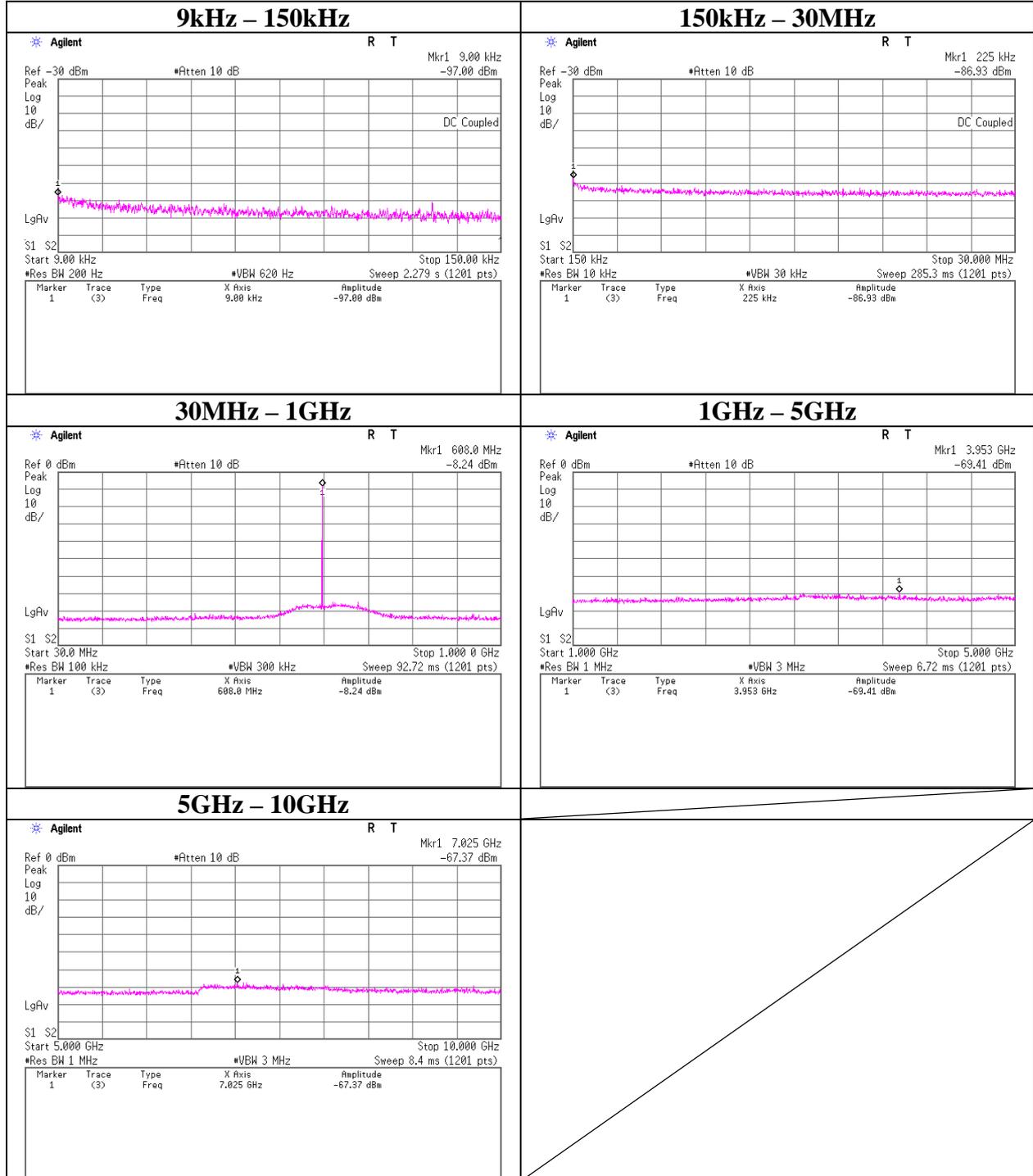
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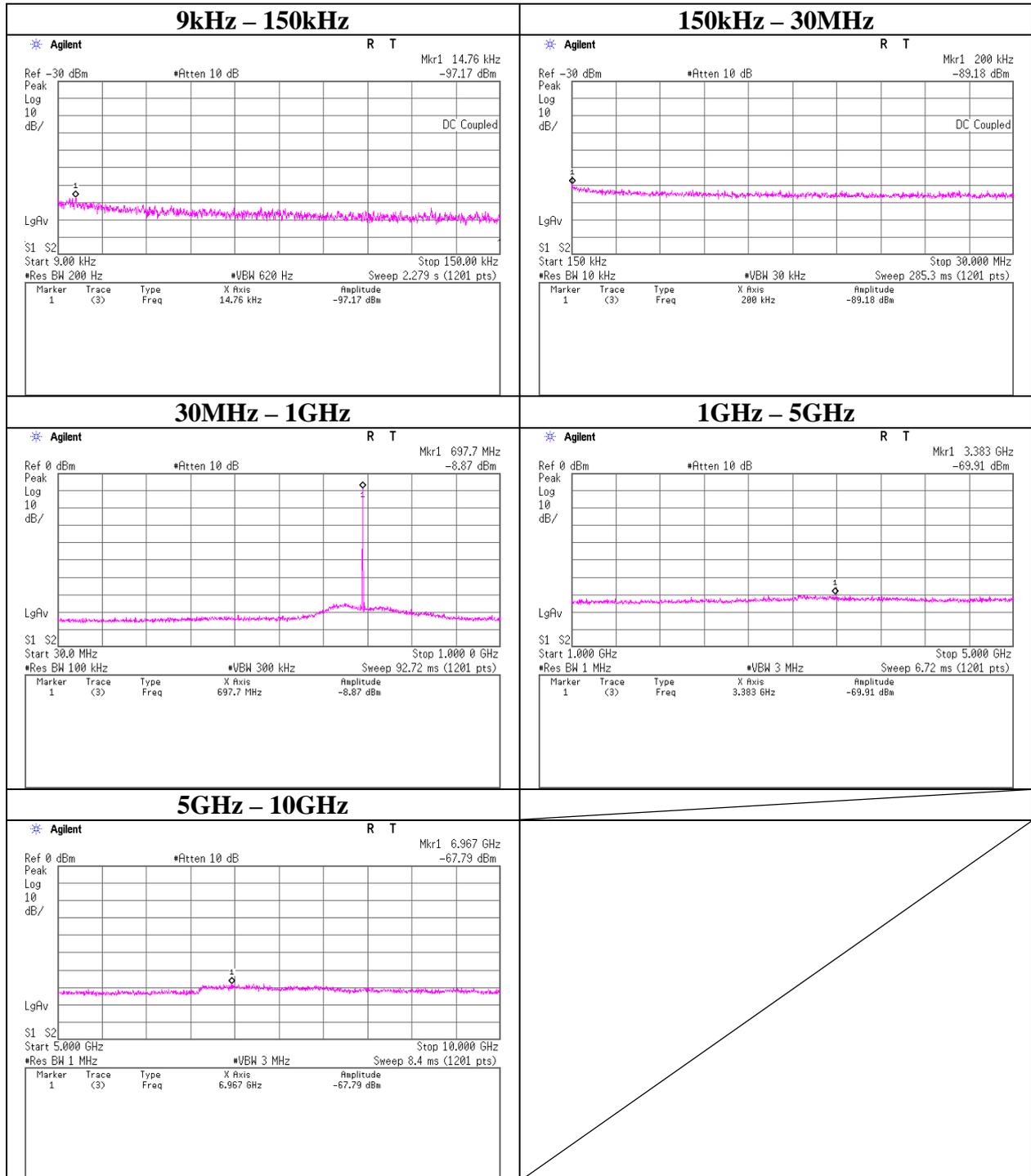
### Spurious emissions at antenna terminals

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	10686937H
Date	02/24/2015
Temperature/ Humidity	25 deg. C / 28% RH
Engineer	Hironobu Ohnishi
Mode	Tx 607.875MHz, 1mW



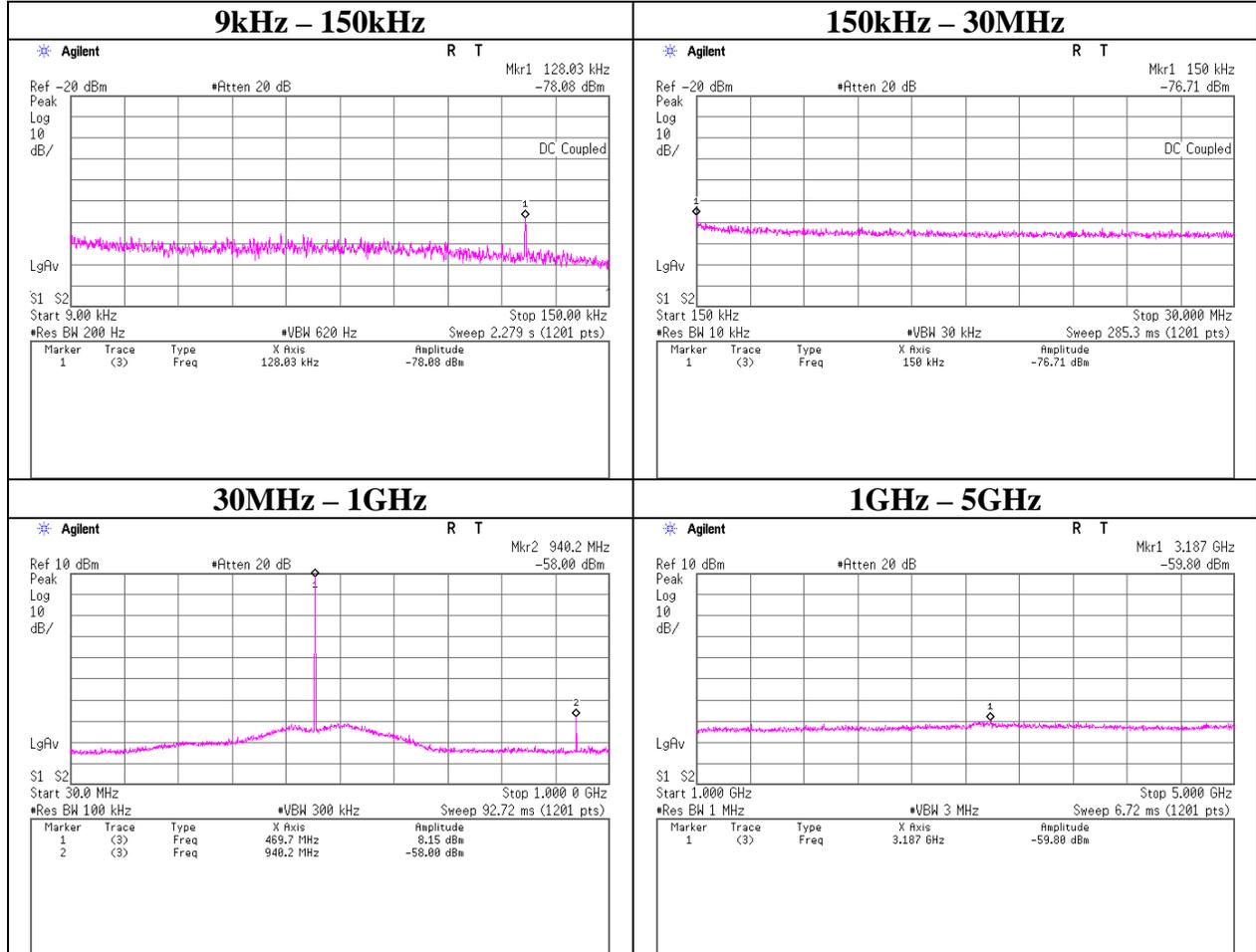
## Spurious emissions at antenna terminals

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	10686937H
Date	02/24/2015
Temperature/ Humidity	25 deg. C / 28% RH
Engineer	Hironobu Ohnishi
Mode	Tx 697.875MHz, 1mW



### Spurious emissions at antenna terminals

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	10686937H
Date	02/24/2015
Temperature/ Humidity	25 deg. C / 28% RH
Engineer	Hironobu Ohnishi
Mode	Tx 470.125MHz, 50mW

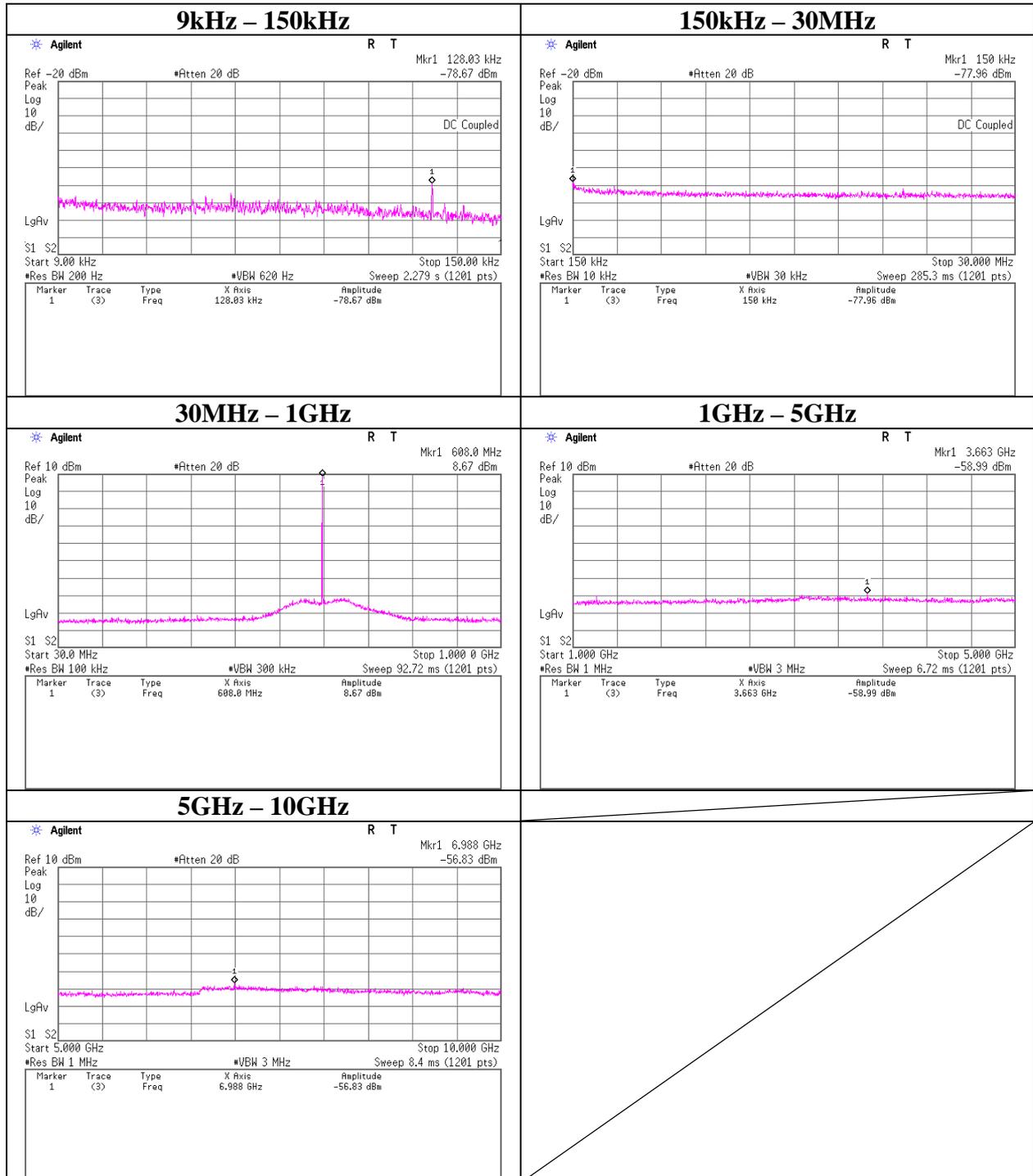


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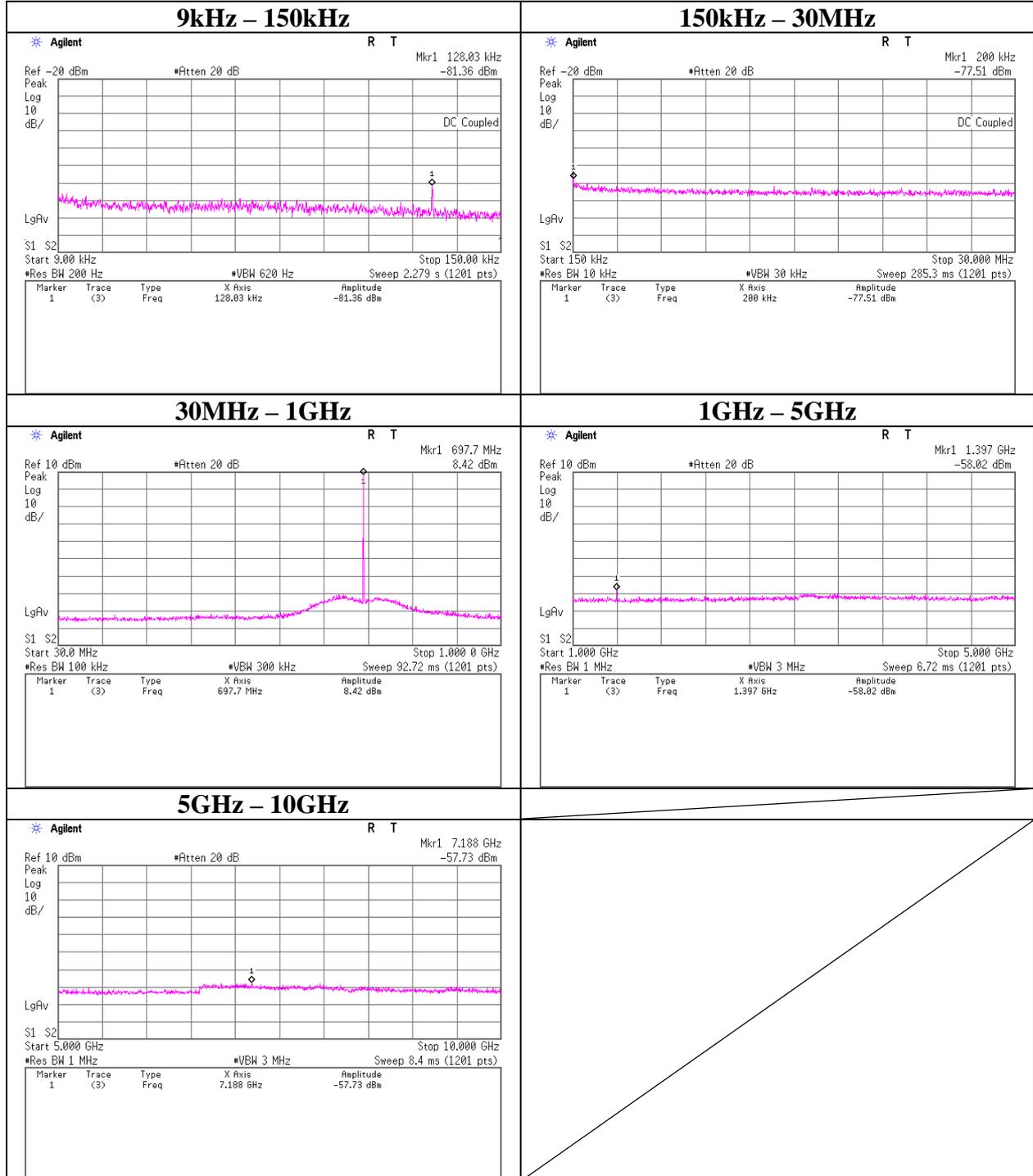
## Spurious emissions at antenna terminals

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	10686937H
Date	02/24/2015
Temperature/ Humidity	25 deg. C / 28% RH
Engineer	Hironobu Ohnishi
Mode	Tx 607.875MHz, 50mW



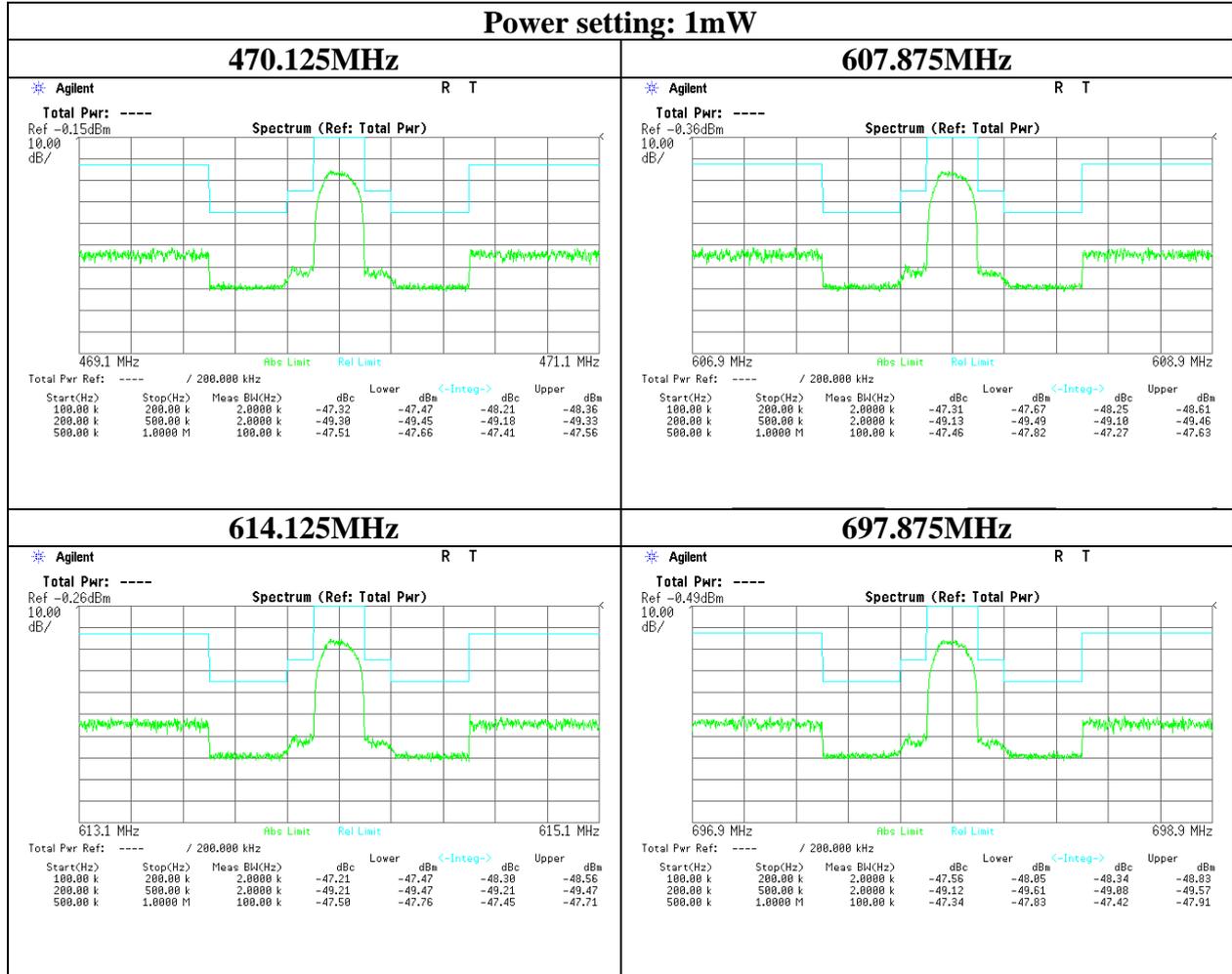
### Spurious emissions at antenna terminals

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	10686937H
Date	02/24/2015
Temperature/ Humidity	25 deg. C / 28% RH
Engineer	Hironobu Ohnishi
Mode	Tx 697.875MHz, 50mW



### Spurious emissions at antenna terminals

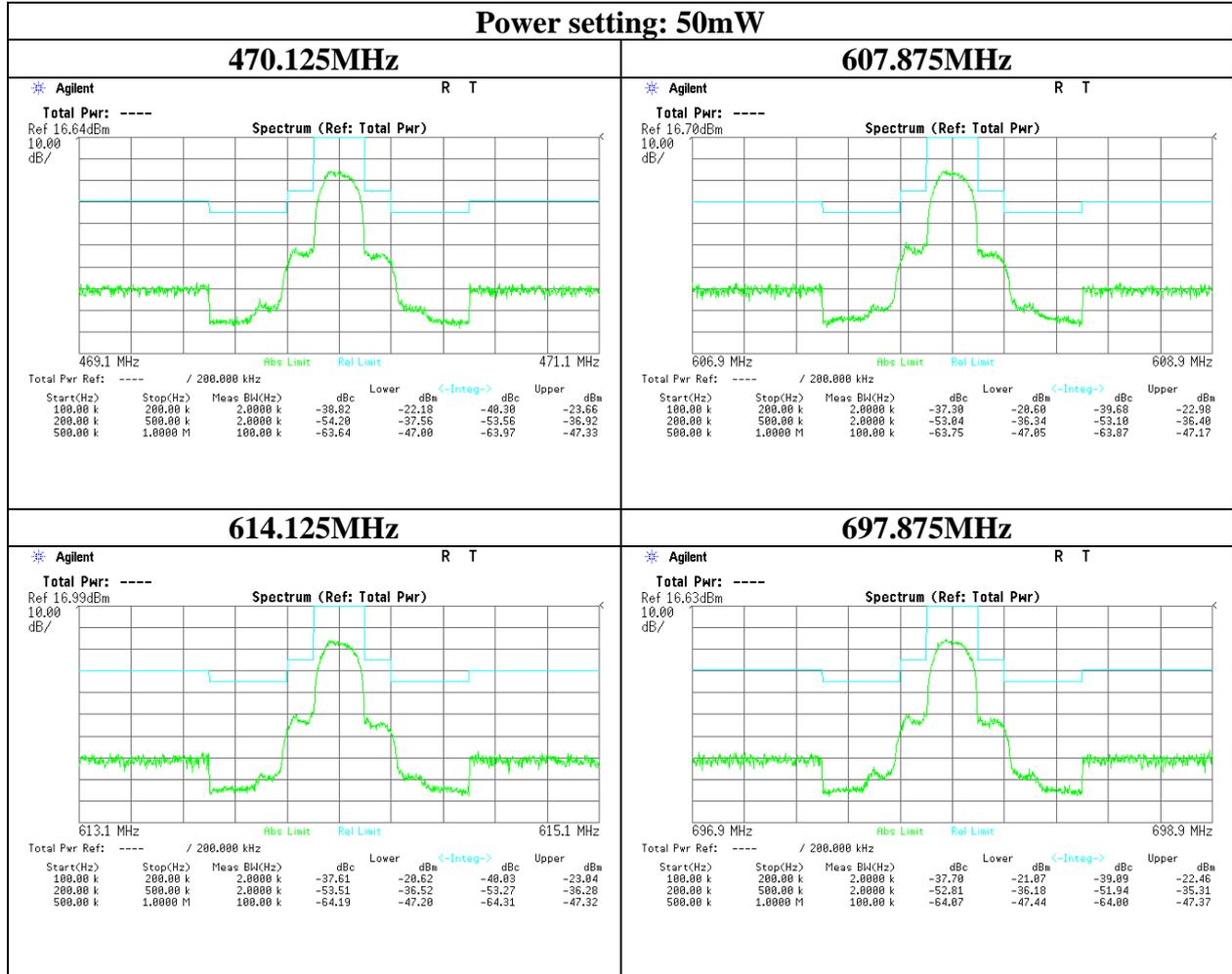
Test place : Ise EMC Lab. No.11 Measurement Room  
 Report No. : 10686937H  
 Date : 02/24/2015  
 Temperature/ Humidity : 25 deg. C / 28% RH  
 Engineer : Hironobu Ohnishi  
 Mode : Tx



0dB reference level was set to each RF power output result.

### Spurious emissions at antenna terminals

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	10686937H
Date	02/24/2015
Temperature/ Humidity	25 deg. C / 28% RH
Engineer	Hironobu Ohnishi
Mode	Tx



0dB reference level was set to each RF power output result.

**Field strength of spurious radiation**

Test place Ise EMC Lab. No.4 Semi Anechoic Chamber  
Report No. 10686937H  
Date 02/12/2015 02/13/2015  
Temperature/ Humidity 23 deg. C / 33% RH 23 deg. C / 31% RH  
Engineer Satofumi Matsuyama Satofumi Matsuyama  
(Below 1GHz) (Above 1GHz)  
Mode Tx 470.125MHz

**[Power setting: 1mW]**

Frequency [MHz]	Rx SA/TR		Tx SG		Tx Cable Loss [dB]	Tx Ant. Gain [dBi]	Tx Ant. Atten. Loss [dB]	Result (ERP) [dBm]		Limit (ERP) [dBm]	Margin [dB]		Horizontal		Vertical		Remarks
	Reading [dBuV]		Reading [dBm]					(ERP)			(ERP)		Rx Ant.	Turn	Rx Ant.	Turn	
	HOR	VER	HOR	VER				HOR	VER		HOR	VER	Height [cm]	Table [deg.]	Height [cm]	Table [deg.]	
940.25	51.9	47.8	-35.2	-37.5	5.2	2.2	10.1	-50.5	-52.8	-13.0	37.5	39.8	100	284	120	75	
1410.38	NS	NS	-	-	-	-	-	-	-	-13.0	-	-	-	-	-	-	
1880.50	NS	NS	-	-	-	-	-	-	-	-13.0	-	-	-	-	-	-	
2350.63	NS	NS	-	-	-	-	-	-	-	-13.0	-	-	-	-	-	-	
2820.75	NS	NS	-	-	-	-	-	-	-	-13.0	-	-	-	-	-	-	
3290.88	NS	NS	-	-	-	-	-	-	-	-13.0	-	-	-	-	-	-	
3761.00	NS	NS	-	-	-	-	-	-	-	-13.0	-	-	-	-	-	-	
4231.13	NS	NS	-	-	-	-	-	-	-	-13.0	-	-	-	-	-	-	
4701.25	NS	NS	-	-	-	-	-	-	-	-13.0	-	-	-	-	-	-	

**[Power setting: 50mW]**

Frequency [MHz]	Rx SA/TR		Tx SG		Tx Cable Loss [dB]	Tx Ant. Gain [dBi]	Tx Ant. Atten. Loss [dB]	Result (ERP) [dBm]		Limit (ERP) [dBm]	Margin [dB]		Horizontal		Vertical		Remarks
	Reading [dBuV]		Reading [dBm]					(ERP)			(ERP)		Rx Ant.	Turn	Rx Ant.	Turn	
	HOR	VER	HOR	VER				HOR	VER		HOR	VER	Height [cm]	Table [deg.]	Height [cm]	Table [deg.]	
940.25	55.9	48.7	-31.2	-36.6	5.2	2.2	10.1	-46.5	-51.9	-13.0	33.5	38.9	100	79	100	306	
1410.38	42.2	38.0	-65.9	-71.1	3.1	7.4	0.0	-63.8	-69.0	-13.0	50.8	56.0	103	304	114	329	
1880.50	36.1	34.7	-75.0	-75.1	3.6	9.6	0.0	-71.1	-71.2	-13.0	58.1	58.2	103	353	100	357	
2350.63	NS	NS	-	-	-	-	-	-	-	-13.0	-	-	-	-	-	-	
2820.75	NS	NS	-	-	-	-	-	-	-	-13.0	-	-	-	-	-	-	
3290.88	NS	NS	-	-	-	-	-	-	-	-13.0	-	-	-	-	-	-	
3761.00	NS	NS	-	-	-	-	-	-	-	-13.0	-	-	-	-	-	-	
4231.13	NS	NS	-	-	-	-	-	-	-	-13.0	-	-	-	-	-	-	
4701.25	NS	NS	-	-	-	-	-	-	-	-13.0	-	-	-	-	-	-	

Calculation Result = SG Reading - Tx Cable Loss + Tx Antenna Gain - Tx Antenna Attenuator Loss -2.15  
Rx-ANTENNA : Biconical Antenna(30M-300MHz), Logperiodic Antenna(300M-1000MHz), Horn Antenna(1G-12.75GHz)  
Tx-ANTENNA : 120MHz tuned Dipole Antenna(30M-120MHz), Dipole Antenna(120M-1000MHz), Horn Antenna(1G-12.75GHz)  
Other frequency noises omitted in this report were not seen or had enough margin (more than 20dB).  
NS : No signal detect.  
Detector : Below 1GHz: Test receiver RMS (BW: 120kHz)  
Above 1GHz: Spectrum analyzer RMS Average (RBW: 1MHz, VBW: 3MHz)  
Limit = mean output power in dBm - (43+10log10 (mean output power in watts)) dB = -13dBm

**Field strength of spurious radiation**

Test place Ise EMC Lab. No.4 Semi Anechoic Chamber  
Report No. 10686937H  
Date 02/12/2015 02/13/2015  
Temperature/ Humidity 23 deg. C / 33% RH 23 deg. C / 31% RH  
Engineer Satofumi Matsuyama Satofumi Matsuyama  
(Below 1GHz) (Above 1GHz)  
Mode Tx 607.875MHz

**[Power setting: 1mW]**

Frequency [MHz]	Rx SA/TR		Tx SG		Tx Cable Loss [dB]	Tx Ant. Gain [dBi]	Tx Ant. Atten. Loss [dB]	Result (ERP) [dBm]		Limit (ERP) [dBm]	Margin [dB]		Horizontal		Vertical		Remarks
	Reading [dBuV]		Reading [dBm]					(ERP)			(dB)		Rx Ant. Height [cm]	Turn Table [deg.]	Rx Ant. Height [cm]	Turn Table [deg.]	
	HOR	VER	HOR	VER				HOR	VER		HOR	VER					
1215.75	NS	NS	-	-	-	-	-	-	-	-13.0	-	-	-	-	-	-	-
1823.63	NS	NS	-	-	-	-	-	-	-	-13.0	-	-	-	-	-	-	-
2431.50	NS	NS	-	-	-	-	-	-	-	-13.0	-	-	-	-	-	-	-
3039.38	NS	NS	-	-	-	-	-	-	-	-13.0	-	-	-	-	-	-	-
3647.25	NS	NS	-	-	-	-	-	-	-	-13.0	-	-	-	-	-	-	-
4255.13	NS	NS	-	-	-	-	-	-	-	-13.0	-	-	-	-	-	-	-
4863.00	NS	NS	-	-	-	-	-	-	-	-13.0	-	-	-	-	-	-	-
5470.88	NS	NS	-	-	-	-	-	-	-	-13.0	-	-	-	-	-	-	-
6078.75	NS	NS	-	-	-	-	-	-	-	-13.0	-	-	-	-	-	-	-

**[Power setting: 50mW]**

Frequency [MHz]	Rx SA/TR		Tx SG		Tx Cable Loss [dB]	Tx Ant. Gain [dBi]	Tx Ant. Atten. Loss [dB]	Result (ERP) [dBm]		Limit (ERP) [dBm]	Margin [dB]		Horizontal		Vertical		Remarks
	Reading [dBuV]		Reading [dBm]					(ERP)			(dB)		Rx Ant. Height [cm]	Turn Table [deg.]	Rx Ant. Height [cm]	Turn Table [deg.]	
	HOR	VER	HOR	VER				HOR	VER		HOR	VER					
1215.75	47.2	44.3	-59.4	-64.3	2.9	6.8	0.0	-57.6	-62.5	-13.0	44.6	49.5	129	50	159	260	
1823.63	37.4	37.6	-69.1	-71.4	3.5	9.3	0.0	-65.4	-67.7	-13.0	52.4	54.7	105	350	100	186	
2431.50	NS	NS	-	-	-	-	-	-	-	-13.0	-	-	-	-	-	-	
3039.38	35.5	36.6	-68.3	-68.4	4.6	10.6	0.0	-64.5	-64.6	-13.0	51.5	51.6	100	292	104	356	
3647.25	41.5	41.1	-61.0	-62.0	5.1	12.4	0.0	-55.9	-56.9	-13.0	42.9	43.9	100	85	104	32	
4255.13	NS	NS	-	-	-	-	-	-	-	-13.0	-	-	-	-	-	-	
4863.00	NS	NS	-	-	-	-	-	-	-	-13.0	-	-	-	-	-	-	
5470.88	NS	NS	-	-	-	-	-	-	-	-13.0	-	-	-	-	-	-	
6078.75	NS	NS	-	-	-	-	-	-	-	-13.0	-	-	-	-	-	-	

Calculation Result = SG Reading - Tx Cable Loss + Tx Antenna Gain - Tx Antenna Attenuator Loss -2.15

Rx-ANTENNA : Biconical Antenna(30M-300MHz), Logperiodic Antenna(300M-1000MHz), Horn Antenna(1G-12.75GHz)

Tx-ANTENNA : 120MHz tuned Dipole Antenna(30M-120MHz), Dipole Antenna(120M-1000MHz), Horn Antenna(1G-12.75GHz)

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

NS : No signal detect.

Detector : Below 1GHz: Test receiver RMS (BW: 120kHz)

Above 1GHz: Spectrum analyzer RMS Average (RBW: 1MHz, VBW: 3MHz)

Limit = mean output power in dBm - (43+10log10 (mean output power in watts)) dB = -13dBm

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### Frequency stability

Test place : Ise EMC Lab. No.11 Measurement Room  
 Report No. : 10686937H  
 Date : 02/26/2015  
 Temperature/ Humidity : 24 deg. C / 32% RH  
 Engineer : Hironobu Ohnishi  
 Mode : Tx 607.875MHz

<b>Tested frequency:</b>	607.875 MHz
--------------------------	-------------

Test condition		Measured frequency [MHz]	Result [ppm]	Limit (+/- 0.005%) [+/- ppm]	Remarks
Temp. [deg. C]	Voltage [V]				
50	3	607.874614	-0.63	50	
40	3	607.874708	-0.48	50	
30	3	607.874838	-0.27	50	
20	3	607.874938	-0.10	50	
10	3	607.874962	-0.06	50	
0	3	607.874828	-0.28	50	
-10	3	607.874659	-0.56	50	
-20	3	607.874630	-0.61	50	
-30	3	607.875023	0.04	50	
20	2.55	607.874938	-0.10	50	85% of nominal voltage
20	3.45	607.874938	-0.10	50	115% of nominal voltage
20	2.01	607.874938	-0.10	50	Battery end point voltage

Calculation formula:

$$\text{Result} = (\text{Measured frequency} - \text{Tested frequency}) / \text{Tested frequency} * 10^6$$

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## **APPENDIX 2: Test instruments**

### **EMI test equipment**

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MAEC-04	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	RE	2014/02/28 * 12
MOS-15	Thermo-Hygrometer	Custom	CTH-180	1501	RE	2015/01/13 * 12
MJM-23	Measure	ASKUL	-	-	RE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE	-
MTR-01	Test Receiver	Rohde & Schwarz	ESI40	100084	RE	2014/11/10 * 12
MBA-05	Biconical Antenna	Schwarzbeck	BBA9106	1302	RE	2014/11/22 * 12
MLA-08	Logperiodic Antenna	Schwarzbeck	UKLP9140-A	N/A	RE	2014/11/22 * 12
MCC-50	Coaxial Cable	UL Japan	-	-	RE	2014/06/02 * 12
MAT-68	Attenuator	Anritsu	MP721B	6200961025	RE	2014/11/11 * 12
MPA-19	Pre Amplifier	MITEQ	MLA-10K01-B01-35	1237616	RE	2015/02/03 * 12
MBF-06	Band Pass Filter	M-City	BPF0950-01	UL0002	RE	2014/04/14 * 12
MCC-38	Coaxial Cable	UL Japan	-	-	RE	2014/12/02 * 12
YTSSG03	Signal Generator	Rohde & Schwarz	SMT02	51400043	RE	2014/08/18 * 12
MCC-126	Coaxial Cable	UL Japan	-	-	RE	2014/07/14 * 12
MDA-03	Dipole Antenna	Schwarzbeck	UHAP	991	RE	2014/10/06 * 12
MSA-10	Spectrum Analyzer	Agilent	E4448A	MY46180655	RE	2015/02/26 * 12
MHA-21	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	9120D-557	RE	2014/08/12 * 12
MCC-141	Microwave Cable	Junkosha	MWX221	1305S002R(1m) / 1405S146(5m)	RE	2014/06/11 * 12
MPA-12	MicroWave System Amplifier	Agilent	83017A	MY39500780	RE	2014/03/11 * 12
MHF-27	High Pass Filter (1.1-10GHz)	TOKYO KEIKI	TF219CD1	1001	RE	2015/01/23 * 12
KSG-05	Signal Generator	Rohde & Schwarz	SMR40	100137	RE	2014/07/23 * 12
MCC-130	Microwave Cable (1-30GHz)	HUBER+SUHNER	SF103/11PC3.5-31/ 11PC3.5-31/8.0m	54308/3	RE	2015/01/07 * 12
MOS-19	Thermo-Hygrometer	Custom	CTH-201	0001	AT	2014/12/22 * 12
MSA-15	Spectrum Analyzer	Agilent	E4440A	MY46187105	AT	2014/11/11 * 12
MPM-12	Power Meter	Anritsu	ML2495A	0825002	AT	2014/06/16 * 12
MPSE-17	Power sensor	Anritsu	MA2411B	0738285	AT	2014/06/16 * 12
MAT-10	Attenuator(10dB)	Weinschel Corp	2	BL1173	AT	2014/11/19 * 12
MAT-25	Attenuator(10dB) (above1GHz)	Agilent	8493C	71642	AT	2014/06/12 * 12
MCH-06	Temperature and Humidity Chamber	Tabai Spec	PL-1KT	14007630	AT	2014/04/23 * 12
MMM-17	DIGITAL HiTESTER	Hioki	3805	070900530	AT	2015/01/16 * 12

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, AT: Antenna Terminal Conducted test

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