



# RADIO TEST REPORT

Test Report No. : 12244312H-A-R1

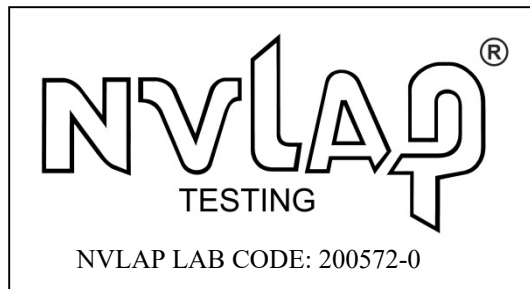
**Applicant** : Sony Corporation  
**Type of Equipment** : UHF Synthesized Transmitter  
**Model No.** : UTX-P03  
**FCC ID** : AK8UTXP03  
**Test regulation** : FCC Part 74: 2018  
**Test Result** : Complied

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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 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 Federal Government.
8. This report is a revised version of 12244312H-A. 12244312H-A is replaced with this report.

**Date of test:** March 30 to June 5, 2018

**Representative test engineer:** K. Yamamoto  
Koji Yamamoto  
Engineer  
Consumer Technology Division

**Approved by:** T. Takayama  
Tsubasa Takayama  
Leader  
Consumer Technology Division



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- The testing in which "Non-accreditation" is displayed is outside the accreditation scopes in UL Japan.  
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## **SECTION 1: Customer information**

Company Name : Sony Global Manufacturing & Operations Corporation  
Address : 8-4 Shiomi Kisarazu-shi, Chiba, 292-0834 Japan  
Telephone Number : +81-438-37-4704  
Contact Person : Youhei Hisano

### **\*Remarks**

Sony Global Manufacturing & Operations 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 : UHF Synthesized Transmitter  
Model No. : UTX-P03  
Serial No. : Refer to 4.2 in this report.  
Rating : DC 3 V (Battery), DC 5 V (USB)  
Receipt Date of Sample : March 30, 2018  
Country of Manufacture : Korea  
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: UTX-P03 (referred to as the EUT in this report) is a UHF Synthesized Transmitter.

### **Radio Specification (Radio microphone part)**

Radio type : Transmitter  
Modulation type : Frequency modulation  
Emission designator : 116KF3E  
Necessary bandwidth : 116 kHz = 2M + 2D  
where M: Maximum modulation frequency = 18 kHz  
D: Peak deviation = 40 kHz  
Channel spacing : 125 kHz  
Frequency of operation : 470.125 MHz - 607.875 MHz  
(14): 470.125 MHz - 541.875 MHz  
(25): 536.125 MHz - 607.875 MHz  
Clock frequency(ies) : PLL: 19.2 MHz (TCXO)  
RF power : High: 40 mW, Low: 5 mW  
Antenna type : 1/4 Lambda Monopole antenna (integral type)  
Antenna gain : 4.8 dBi  
AF Specification : 40 Hz - 18000 Hz, Maximum input: -24 dBV (MIC level, ATT 0 dB)

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

### **3.1 Test Specification**

Test Specification : FCC Part 74: 2018

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

### **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 G 3.1			
Modulation Characteristics	FCC: Section 2.1047	FCC: Section 74.861 (e) (3)	See data.	Complied	Conducted
	IC: RSS-210 A1 Section 5.3	IC: RSS-210 G 3.5			
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 G 3.2			
Spurious emissions at antenna terminals	EN 300 422-1 V 1.4.2 Clause 8.4	FCC: Section 74.861 (e) (6)	See data.	Complied	Conducted
		IC: RSS-210 G 3.4			
Necessary bandwidth	EN 300 422-1 V 1.4.2 Clause 8.3	FCC: Section 74.861 (e) (7)	See data.	Complied	Conducted
		IC: RSS-210 G 3.4			
Field strength of spurious radiation	EN 300 422-1 V 1.4.2 Clause 8.4	FCC: Section 74.861 (e) (7)	15.8 dB 1215.75 MHz, Horizontal	Complied	Radiated
		IC: RSS-210 G 3.4			
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 G 3.3			

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.

\* In case any questions arise about test procedure, KDB 206256 D01 Wireless Microphones v02 is also referred.

### **Supplied Voltage Information**

This EUT provides stable voltage constantly to RF Module regardless of input voltage.

### **Antenna Information**

The antenna is not removable from the EUT.

### **3.3 Addition to standard**

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

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### 3.4 Uncertainty

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

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Spurious Emission (EUT height: 1.5m)	dB
Mesurment Distance 3m	
•25 MHz - 200 MHz	5.6
•200 MHz - 1000 MHz	4.0
•1 GHz - 12.75 GHz	4.6

Antenna terminal test	Uncertainty (+/-)
RF output power	1.3 dB
Occupied bandwidth	
Span 1 MHz	0.96%
Emission mask	1.9 dB
Frequency stability	0.0154 ppm
Spurious emissions at antenna terminals	2.3 dB

#### Radiated emission test (3 m)

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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NVLAP Lab. code: 200572-0 / FCC Test Firm Registration Number: 199967

Test site	IC Registration Number	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	2973C-1	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	2973C-2	7.5 x 5.8 x 5.2	4.0 x 4.0	-	3 m
No.3 semi-anechoic chamber	2973C-3	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	2973C-4	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.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	N/A	-	-
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 m 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 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), Low power	Typ. 5 mW
Transmitting (Tx), High power	Typ. 30 mW
*Transmitting duty was 100% on all tests.	
*Power of the EUT was set by the software as follows; Power settings: Low (5 mW), High (30 mW) Software: Version 1.008 *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 High or Low 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	470.125 MHz (Low) 539.000 MHz (Mid) 607.875 MHz (High)	Low power High power	None (No modulation)	
Modulation Characteristics	539.000 MHz (Mid)	Low power High power	See data.	*1)
Occupied Bandwidth	470.125 MHz (Low) 539.000 MHz (Mid) 607.875 MHz (High)	Low power High power	-25.8 dBV, 2500 Hz, Sine wave	*2)
Spurious emissions at antenna terminals	470.125 MHz (Low) 539.000 MHz (Mid) 607.875 MHz (High)	High power	-25.8 dBV, 2500 Hz, Sine wave	*2)
Necessary bandwidth	470.125 MHz (Low) 539.000 MHz (Mid) 607.875 MHz (High)	Low power High power	See data.	
Field strength of spurious radiation	470.125 MHz (Low) 539.000 MHz (Mid) 607.875 MHz (High)	High power	None (No modulation)	
Frequency stability	539.000 MHz (Mid)	High power	None (No modulation)	*3)
*1) There is no difference in audio part on each channel. Therefore the test was performed on Mid channel as a representative. *2) When modulated by a 2500 Hz tone at an input level 16 dB greater than that necessary to produce 50 percent modulation. *3) There is no difference in frequency generating method on each channel. Therefore the test was performed on Mid channel as a representative.				

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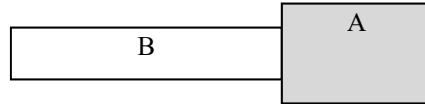
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## 4.2 Configuration and peripherals



\* Setup was 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	UHF Synthesized Transmitter	UTX-P03	14UC: Low / Mid Channel 25UC: High Channel	Sony Corporation	EUT
B	Dynamic Microphone	F-112	-	Sony Corporation	-

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

### **Test Procedure**

- 1) EUT was placed on a platform of nominal size, 0.5 m by 0.5 m, raised 1.5 m 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 3 m. The measuring antenna height was varied between 1 to 4 m and the turn table was rotated a full revolution in order to obtain the maximum value of the electric field strength. The measurements were performed for both vertical and horizontal antenna polarization.
  
- 2) Exchanged the EUT to the Substitution Antenna, the measurement was set for the same height 1.5 m as the EUT. The frequency below 1 GHz of the Substitution Antenna was used the Half wave dipole Antenna, which was tuned the measured frequency in 1). The frequency above 1 GHz 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 4 m 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	25 MHz to 200 MHz	200 MHz to 1 GHz	Above 1 GHz
Antenna Type	Biconical	Logperiodic	Horn

Frequency	25 MHz to 30 MHz	30 MHz to 1 GHz	Above 1 GHz
Instrument used	Spectrum Analyzer		
Detector	RMS Average		
IF Bandwidth	RBW: 10 kHz VBW: 30 kHz	RBW: 100 kHz VBW: 300 kHz	RBW: 1 MHz VBW: 3 MHz
Test Distance	3 m		

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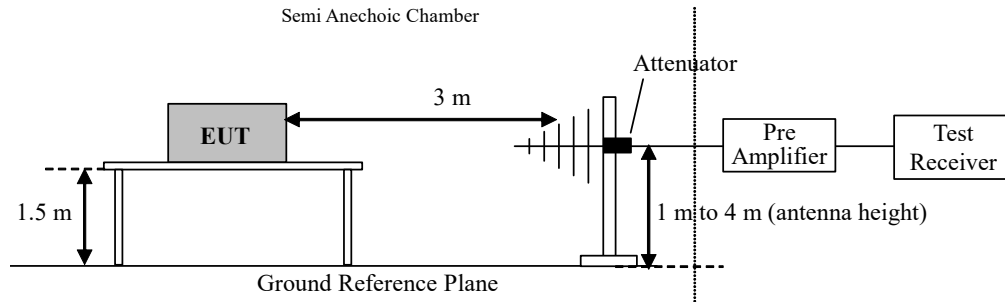
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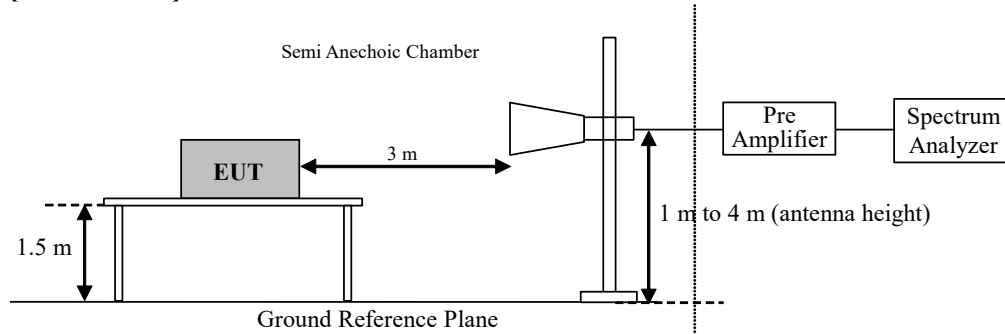
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Figure 1: Test Setup

[25 MHz - 1 GHz]



[Above 1 GHz]



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

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

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

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## **SECTION 6: Modulation Characteristics**

### **Deviation versus Audio input level and Audio Frequency**

#### **Test Procedure**

The frequency deviations were measured when input level and frequency were varied. It was measured with Radio communication Service Monitor.

Audio input level	-80 dBV to -20 dBV, 5 dB step
Audio frequency	40 Hz, 100 Hz, 300 Hz, 500 Hz, 700 Hz, 1 kHz, 3 kHz, 5 kHz, 7 kHz, 10 kHz, 15 kHz, 18 kHz

### **Audio Frequency Response**

#### **Test Procedure**

The audio input level was measured when frequency deviation indicates 50% modulation which measured with Radio communication Service Monitor.

Audio frequency	40 Hz, 70 Hz, 100 Hz, 300 Hz, 500 Hz, 700 Hz, 1 kHz, 3 kHz, 5 kHz, 7 kHz, 10 kHz, 15 kHz, 18 kHz
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The test results and limit are rounded off to one decimal place, so some differences might be observed.

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

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**SECTION 7: Antenna terminal tests, Occupied 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)
Occupied Bandwidth	Enough width to display emission skirts	1 to 5% of Anticipated OBW	Three times of RBW	Auto	Peak *1)	Max Hold *1)	Spectrum Analyzer
Spurious emissions at antenna terminals	9 kHz -150 kHz	200 Hz	620 Hz	Auto	Peak	Max Hold	Spectrum Analyzer *2)
	150 kHz - 30 MHz	10 kHz	30 kHz				
	30 MHz - 1 GHz	100 kHz	300 kHz				
	Above 1 GHz	1 MHz	3 MHz				
Frequency stability	-	-	-	-	-	-	Frequency Counter
*1) The measurement was performed with Peak and Max Hold since the modulation method was FM.							
*2) In the frequency range below 30 MHz, 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.							

**[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

**SECTION 8 : Necessary bandwidth**

**Test procedure**

In accordance with section 8.3 of ETSI EN 300 422-1, a weighted noise source through a weighting filter based on ITU-R Recommendation BS.559-2 was applied to the audio input of transmitter.

The transmitter RF output spectrums were measured at each channel using a receiving antenna and a spectrum analyzer with settings specified in the section 8.3.1 of ETSI EN 300 422-1. The input level of both white noise and filter to EUT was -12 dBV according to the following result.

	lim-8dB	lim	lim+12dB	Difference of Demodulation level lim-8dB and lim+12dB	White noise +Filter input level
EUT input level	-32 dBV	-24 dBV	-12 dBV		-12 dBV
Demodulation level	-33.27 dBV	-	-24.34 dBV	8.93 dB < 10 dB	
"lim" means "audio limiting threshold" declared by manufacturer.					

**Test data**

**APPENDIX.**

**Test result**

**Pass**

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**APPENDIX 1: Data of EMI test**

**RF power output**

Report No. 12244312H  
Test place Ise EMC Lab. No.6 Measurement Room  
Date May 8, 2018  
Temperature / Humidity 22 deg. C / 47 % RH  
Engineer Koji Yamamoto  
Mode Tx

Power Setting	Channel	Freq. [MHz]	Reading Average [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result Average 【Conducted】		Limit 【Conducted】 [mW]	Margin [dB]	Remarks
						[dBm]	[mW]			
Low	Low	470.125	7.61	0.00	0.00	7.61	5.768	250	16.37	
	Mid	539.000	8.73	0.00	0.00	8.73	7.464	250	15.25	
	High	607.875	7.53	0.00	0.00	7.53	5.662	250	16.45	
High	Low	470.125	14.61	0.00	0.00	14.61	28.9	250	9.37	
	Mid	539.000	14.78	0.00	0.00	14.78	30.1	250	9.20	
	High	607.875	14.56	0.00	0.00	14.56	28.6	250	9.42	

Calculation formula:

Result = Reading + Cable Loss + Atten. Loss

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

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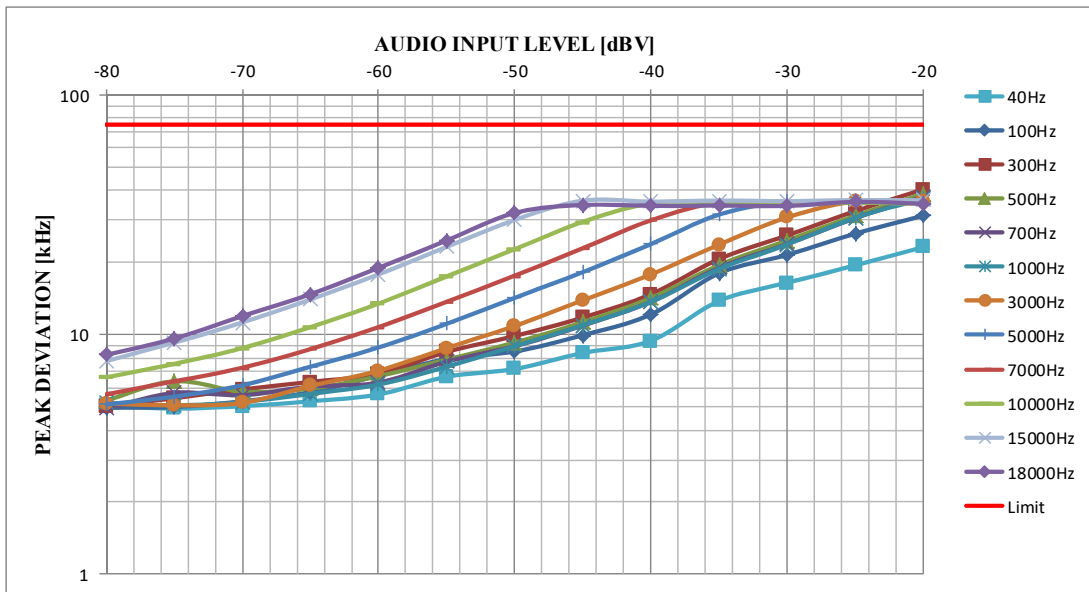
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**Modulation Characteristics**  
**[Deviation versus Audio input level and Audio Frequency]**

Report No. 12244312H  
Test place Ise EMC Lab. No.6 Measurement Room  
Date June 5, 2018  
Temperature / Humidity 23 deg. C / 49 % RH  
Engineer Koji Yamamoto  
Mode Tx 539.000 MHz (RF Power: Low)

AF Level [dBV]	AF Frequency [Hz] / Peak Deviation [kHz]												Limit [kHz]
	40	100	300	500	700	1000	3000	5000	7000	10000	15000	18000	
-80	5.070	4.950	5.030	5.309	4.910	5.190	5.150	5.110	5.629	6.627	7.745	8.224	75
-75	4.910	4.990	5.429	6.387	5.709	5.070	5.070	5.509	6.387	7.545	9.261	9.621	75
-70	5.030	5.269	5.908	5.788	5.589	5.230	5.190	6.148	7.265	8.782	11.218	11.936	75
-65	5.269	5.749	6.347	5.948	6.068	5.669	6.108	7.345	8.703	10.739	14.012	14.731	75
-60	5.629	6.747	6.866	6.707	6.307	6.188	7.066	8.822	10.739	13.453	17.804	18.962	75
-55	6.667	7.904	8.463	7.864	7.705	7.345	8.782	11.098	13.693	17.485	23.194	24.671	75
-50	7.186	8.503	9.860	9.261	8.942	8.942	10.858	14.212	17.605	22.675	30.060	32.136	75
-45	8.383	9.940	11.776	11.257	10.898	10.938	13.892	18.204	22.874	29.501	36.128	34.691	75
-40	9.421	12.136	14.731	14.212	13.693	13.693	17.804	23.832	29.940	35.209	35.813	34.378	75
-35	13.812	18.004	20.639	19.481	18.962	18.762	23.713	31.617	35.529	35.409	36.168	34.485	75
-30	16.447	21.477	25.908	24.671	23.832	23.713	30.778	35.728	35.329	35.210	35.993	34.369	75
-25	19.441	26.347	32.695	31.297	30.579	30.659	35.848	35.529	35.770	35.445	36.332	35.719	75
-20	23.154	31.297	40.279	38.603	37.525	36.806	35.728	35.409	35.209	35.090	36.275	35.102	75

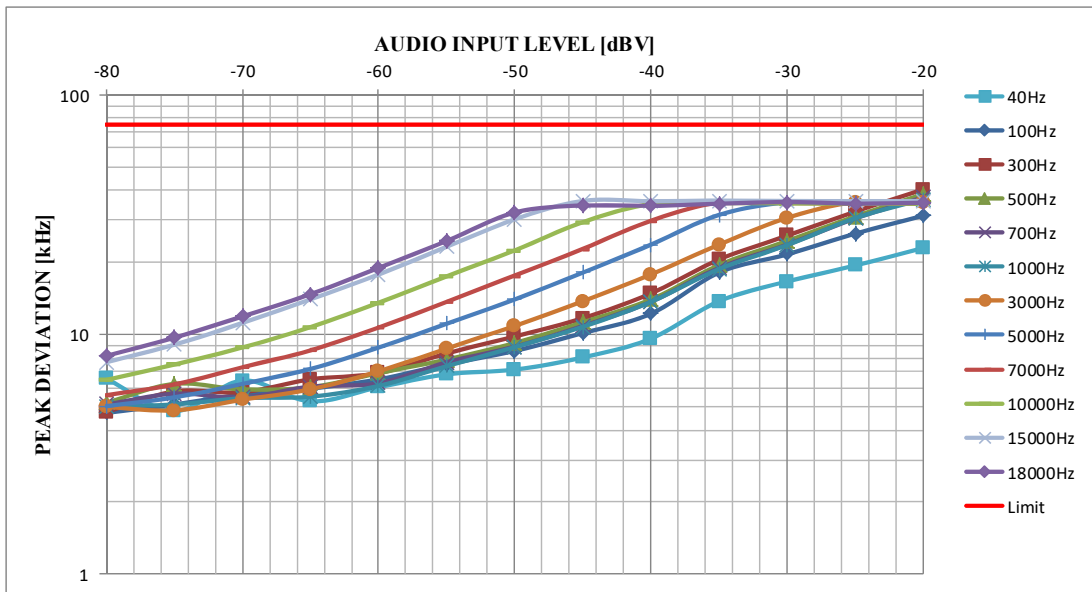




**Modulation Characteristics**  
**[Deviation versus Audio input level and Audio Frequency]**

Report No. 12244312H  
Test place Ise EMC Lab. No.6 Measurement Room  
Date June 5, 2018  
Temperature / Humidity 23 deg. C / 49 % RH  
Engineer Koji Yamamoto  
Mode Tx 539.000 MHz (RF Power: High)

AF Level [dBV]	AF Frequency [Hz] / Peak Deviation [kHz]												Limit [kHz]
	40	100	300	500	700	1000	3000	5000	7000	10000	15000	18000	
-80	6.547	4.711	4.751	5.190	5.110	5.030	4.990	5.030	5.589	6.467	7.665	8.144	75
-75	4.790	5.110	5.788	6.228	5.669	5.110	4.830	5.469	6.188	7.505	9.062	9.701	75
-70	6.427	5.629	5.749	5.908	5.469	5.429	5.349	6.228	7.305	8.822	11.178	11.896	75
-65	5.269	5.948	6.507	6.028	6.068	5.509	5.908	7.186	8.583	10.739	14.012	14.731	75
-60	6.028	6.507	6.906	6.906	6.267	6.108	7.026	8.822	10.699	13.573	17.804	18.962	75
-55	6.826	7.505	8.343	7.864	7.665	7.385	8.743	11.098	13.693	17.485	23.194	24.551	75
-50	7.146	8.543	9.820	9.222	8.902	8.862	10.858	14.012	17.605	22.435	30.259	32.255	75
-45	8.024	10.140	11.697	11.257	10.858	10.778	13.772	18.124	22.754	29.421	36.048	34.491	75
-40	9.621	12.216	14.850	14.012	13.693	13.693	17.804	23.713	29.820	35.010	35.968	34.371	75
-35	13.772	18.124	20.559	19.481	18.962	18.762	23.713	31.537	35.529	35.329	36.168	35.103	75
-30	16.647	21.597	25.828	24.551	23.713	23.593	30.659	35.529	35.329	35.209	36.048	35.667	75
-25	19.401	26.347	32.575	31.098	30.459	30.579	35.649	35.409	35.209	35.090	35.968	35.138	75
-20	22.954	31.297	40.279	38.483	37.325	36.687	35.529	35.329	35.090	35.090	36.048	35.425	75

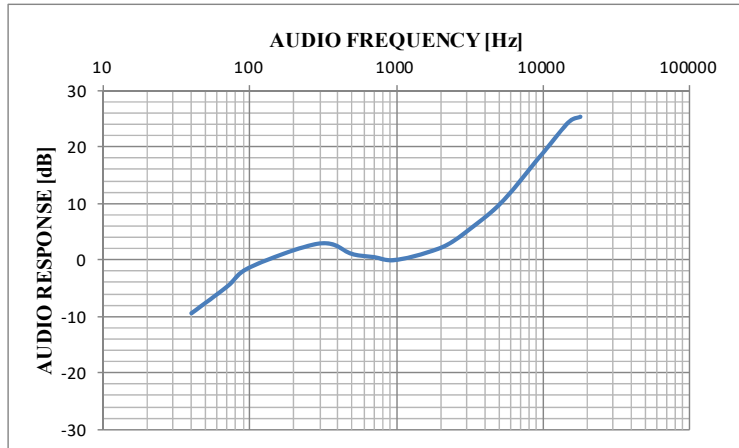


**Modulation Characteristics**  
**[Audio Frequency Response]**

Report No. 12244312H  
Test place Ise EMC Lab. No.6 Measurement Room  
Date June 5, 2018  
Temperature / Humidity 23 deg. C / 49 % RH  
Engineer Koji Yamamoto  
Mode Tx 539.000 MHz

**[Power Setting: High]**

AF Frequency [Hz]	AF Level [mV]	AF Response [dB]
40	63.12	-9.45
70	36.65	-4.73
100	24.73	-1.31
300	15.21	2.91
500	18.88	1.04
700	20.06	0.51
1000	21.27	0.00
2000	16.65	2.13
3000	12.00	4.97
5000	6.98	9.68
7000	4.22	14.05
10000	2.41	18.92
15000	1.28	24.41
18000	1.15	25.34

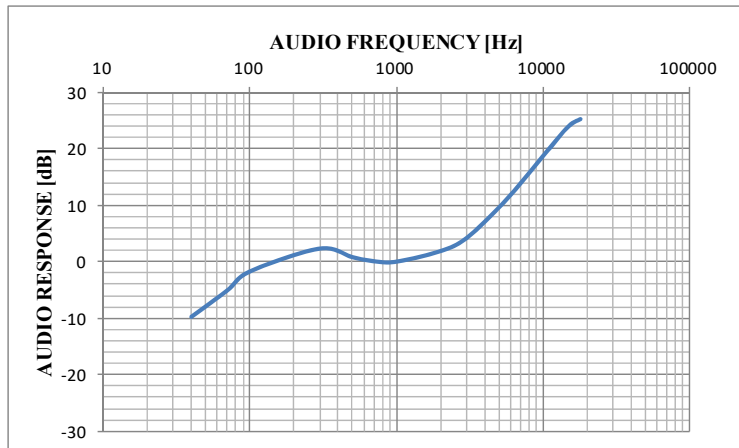


Calculation formula:

$$\text{AF Response} = 20 * \log (\text{AF Level of 1 kHz} / \text{AF Level})$$

**[Power Setting: Low]**

AF Frequency [Hz]	AF Level [mV]	AF Response [dB]
40	62.99	-9.77
70	36.87	-5.12
100	24.97	-1.73
300	15.67	2.32
500	18.65	0.80
700	20.25	0.09
1000	20.46	0.00
2000	16.49	1.87
3000	12.69	4.15
5000	6.80	9.57
7000	4.18	13.79
10000	2.38	18.69
15000	1.29	24.01
18000	1.12	25.23



Calculation formula:

$$\text{AF Response} = 20 * \log (\text{AF Level of 1 kHz} / \text{AF Level})$$

### Occupied Bandwidth

Report No. 12244312H  
Test place Ise EMC Lab. No.7 Shielded Room  
Date May 25, 2018  
Temperature/ Humidity 22 deg. C / 42% RH  
Engineer Ken Fujita  
Mode Tx

Power Setting	Channel	Freq. [MHz]	99% Occupied Bandwidth [kHz]	Limit [kHz]	Margin [kHz]
Low Power	Low	470.125	101.6946	200	98.3054
	Mid	539.000	80.7820	200	119.2180
	High	607.875	81.7412	200	118.2588
High Power	Low	470.125	101.7632	200	98.2368
	Mid	539.000	80.6718	200	119.3282
	High	607.875	81.6646	200	118.3354

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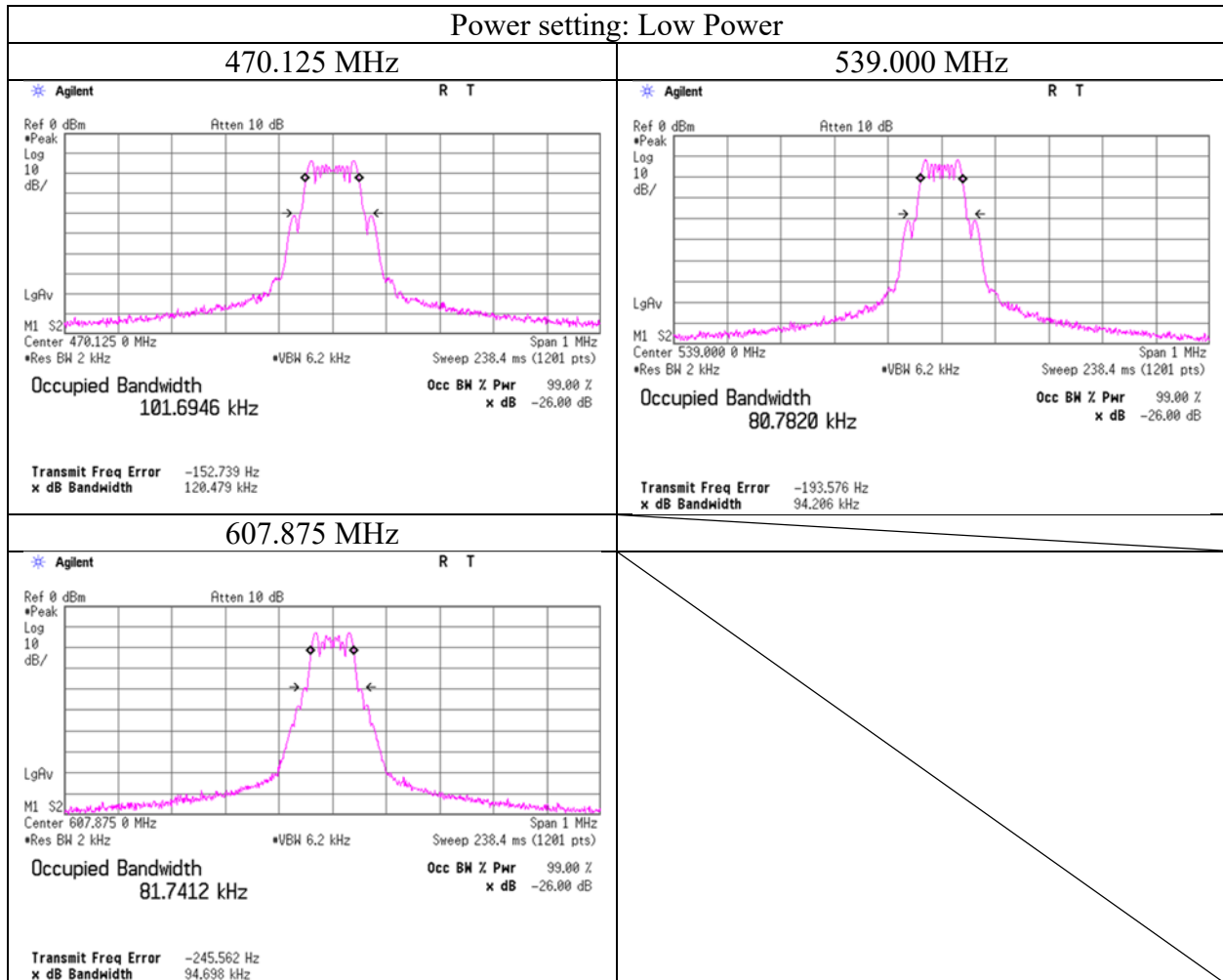
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

## Occupied Bandwidth

Report No.	12244312H
Test place	Ise EMC Lab. No.7 Shielded Room
Date	May 25, 2018
Temperature/ Humidity	22 deg. C / 42% RH
Engineer	Ken Fujita
Mode	Tx

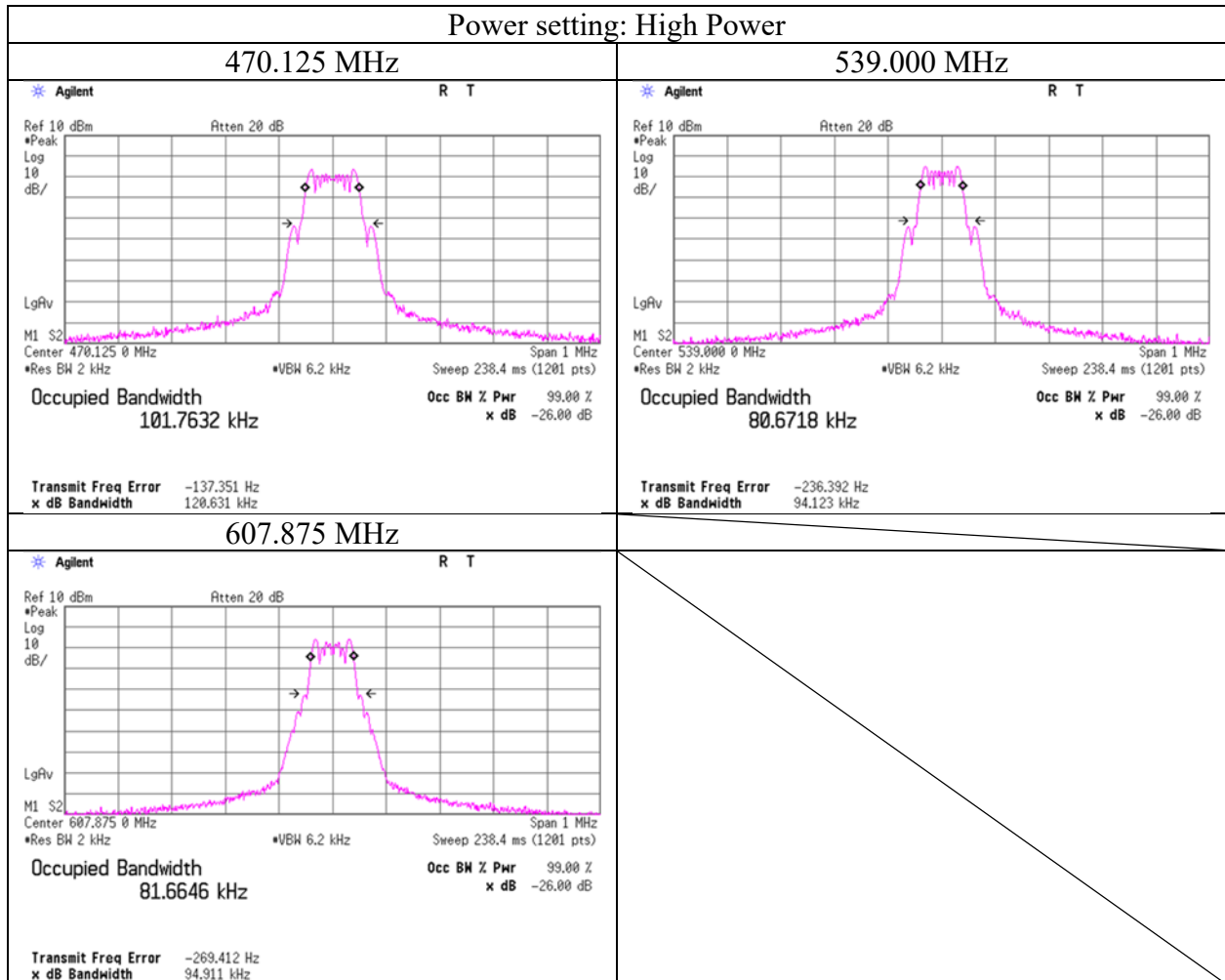


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## Occupied Bandwidth

Report No.	12244312H
Test place	Ise EMC Lab. No.7 Shielded Room
Date	May 25, 2018
Temperature/ Humidity	22 deg. C / 42% RH
Engineer	Ken Fujita
Mode	Tx



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**Spurious emissions at antenna terminals**

Report No. 12244312H  
Test place Ise EMC Lab. No.6 Measurement Room  
Date June 4, 2018  
Temperature / Humidity 23 deg. C / 55 % RH  
Engineer Koji Yamamoto  
Mode Tx (RF Power: High)

Channel	Tested Freq. [MHz]	Reading		Cable Loss [dB]	Atten. Loss [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
		Freq. [MHz]	Level [dBm]					
Low	470.125	0.01041	-100.61	0.01	9.83	-90.77	-30	60.77
		0.15	-89.82	0.01	9.83	-79.98	-30	49.98
		337.2	-66.41	0.16	9.88	-56.37	-30	26.37
		940.2	-64.99	0.30	9.91	-54.78	-30	24.78
		310.7	-60.01	1.05	10.05	-48.91	-30	18.91
Mid	539.000	0.01488	-99.58	0.01	9.83	-89.74	-30	59.74
		0.175	-90.09	0.01	9.83	-80.25	-30	50.25
		1078	-61.68	0.62	10.02	-51.04	-30	21.04
		3220	-59.97	1.07	10.05	-48.85	-30	18.85
High	607.875	0.01476	-100.52	0.01	9.83	-90.68	-30	60.68
		0.399	-89.51	0.01	9.83	-79.67	-30	49.67
		1216	-60.93	0.66	10.03	-50.24	-30	20.24
		7058	-60.21	1.06	10.05	-49.10	-30	19.10

Result = Reading + Cable Loss + Attenuator Loss

**UL Japan, Inc.**

**Ise EMC Lab.**

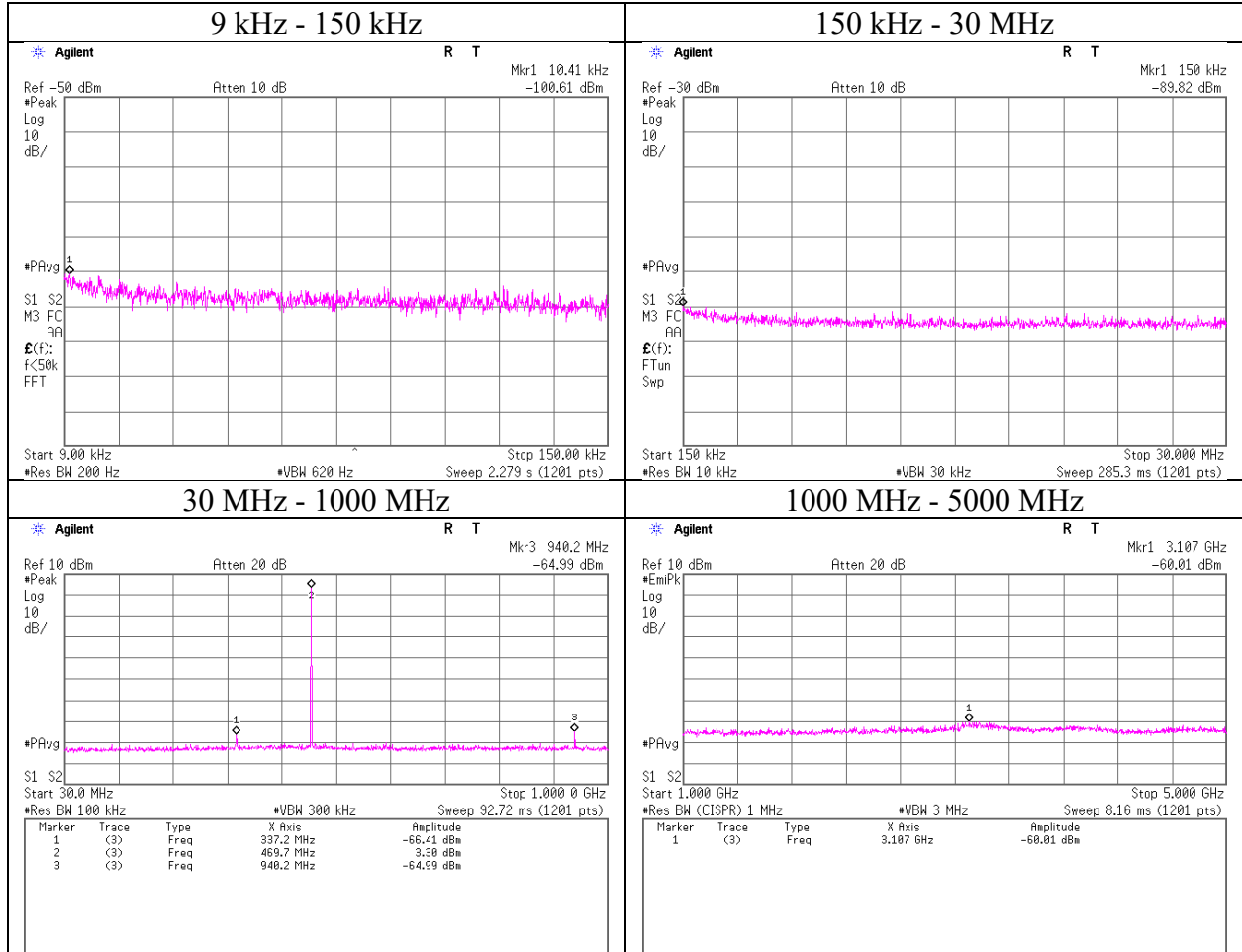
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Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

### Spurious emissions at antenna terminals

Report No.	12244312H
Test place	Ise EMC Lab. No.6 Measurement Room
Date	June 4, 2018
Temperature / Humidity	23 deg. C / 55 % RH
Engineer	Koji Yamamoto
Mode	Tx 470.125 MHz (RF Power: High)

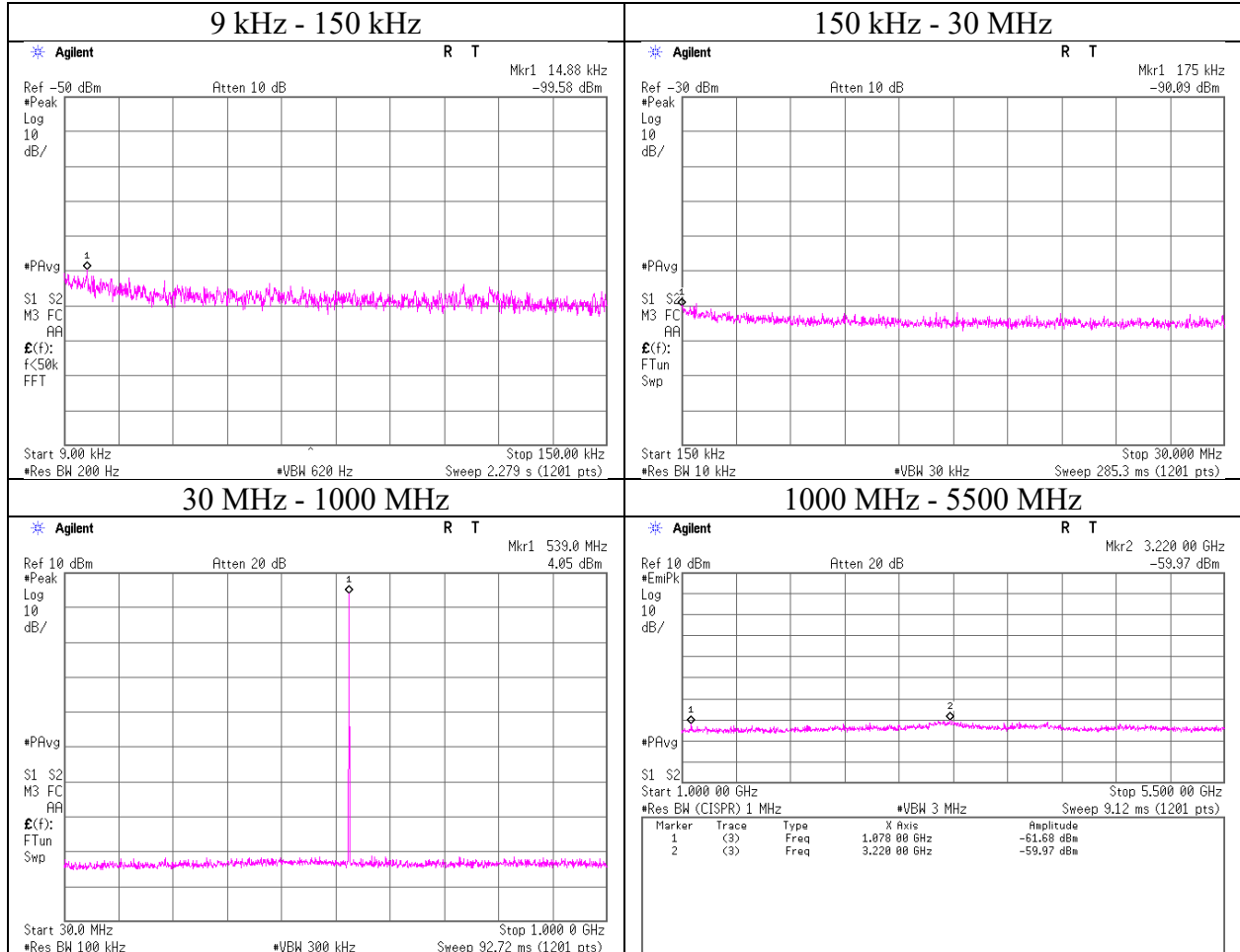


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### Spurious emissions at antenna terminals

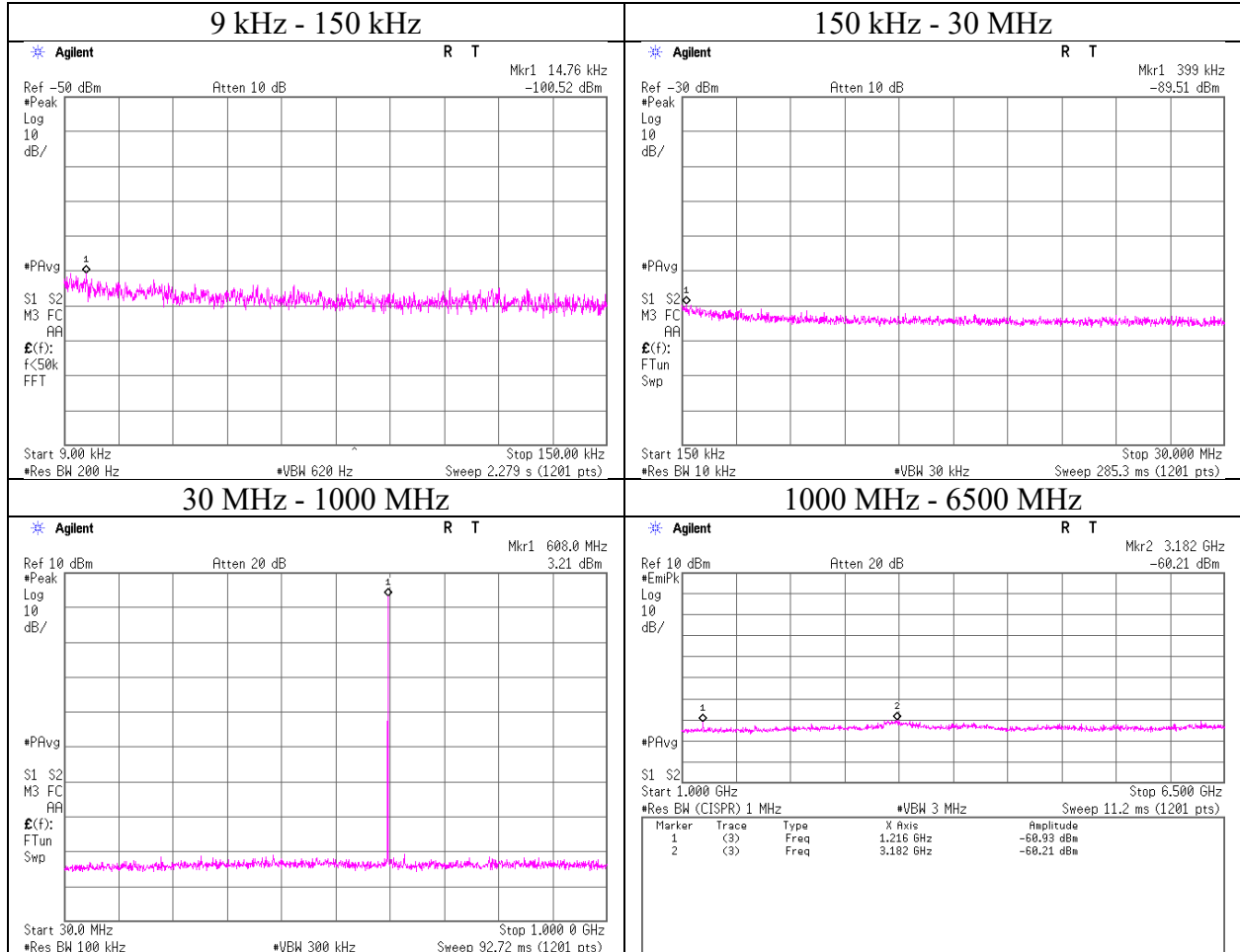
Report No. 12244312H  
 Test place Ise EMC Lab. No.6 Measurement Room  
 Date June 4, 2018  
 Temperature / Humidity 23 deg. C / 55 % RH  
 Engineer Koji Yamamoto  
 Mode Tx 539.000 MHz (RF Power: High)





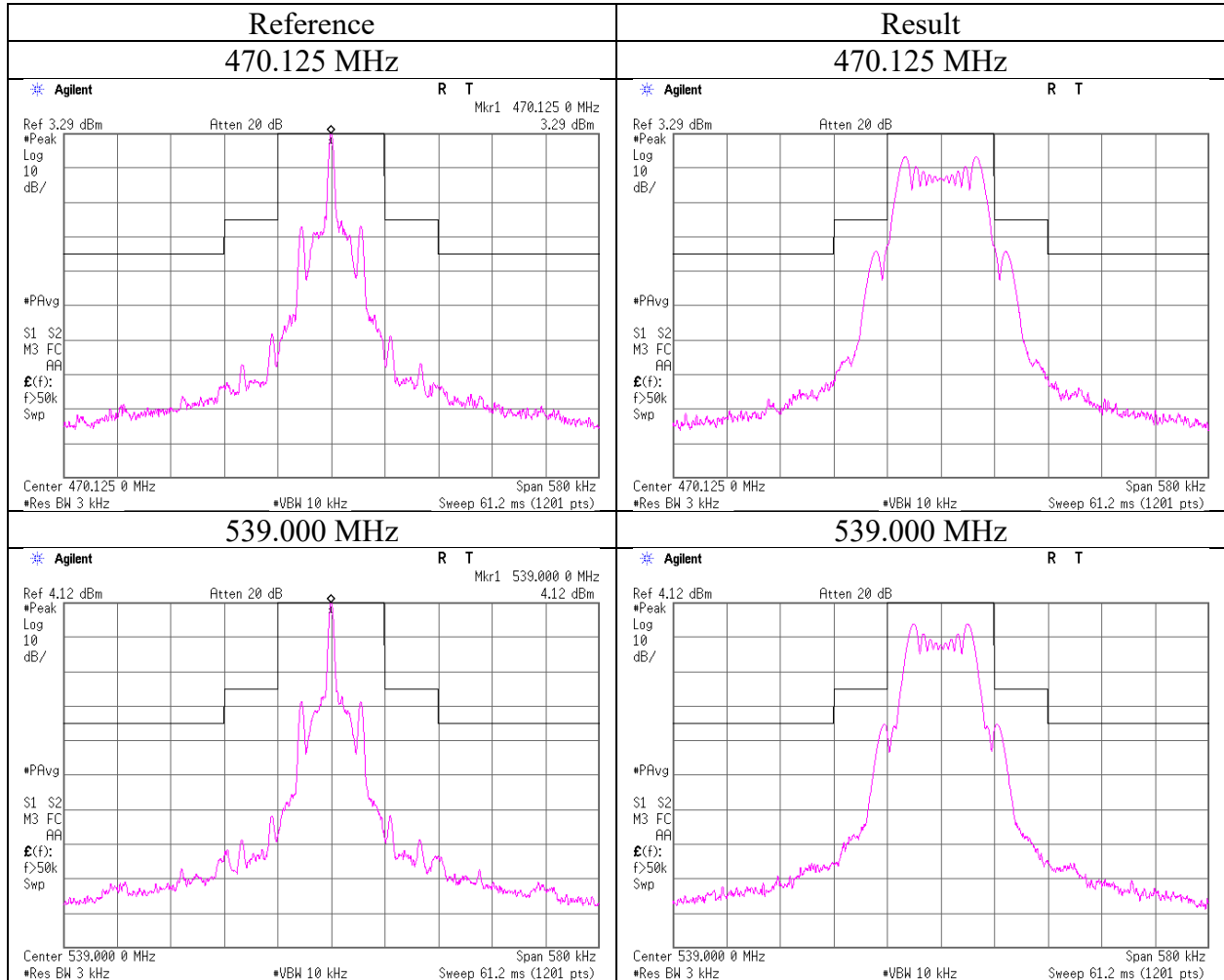
**Spurious emissions at antenna terminals**

Report No. 12244312H  
Test place Ise EMC Lab. No.6 Measurement Room  
Date June 4, 2018  
Temperature / Humidity 23 deg. C / 55 % RH  
Engineer Koji Yamamoto  
Mode Tx 607.875 MHz (RF Power: High)



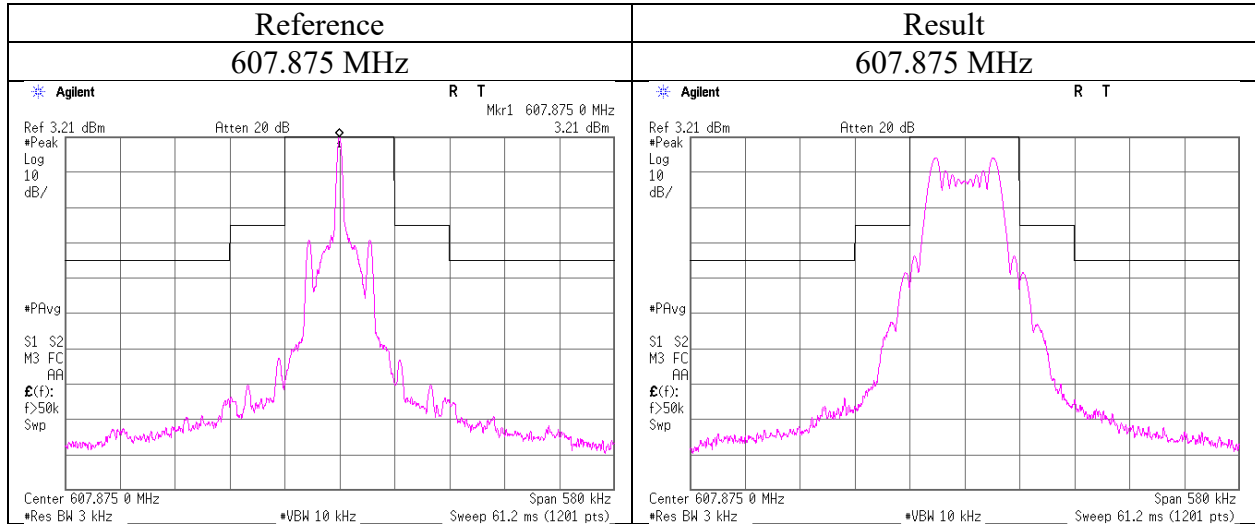
**Spurious emissions at antenna terminals**  
 [Side band Spectrum]

Report No.	12244312H
Test place	Ise EMC Lab. No.6 Measurement Room
Date	June 4, 2018
Temperature / Humidity	23 deg. C / 51 % RH
Engineer	Koji Yamamoto
Mode	Tx (RF Power: High)



**Spurious emissions at antenna terminals**  
 [Side band Spectrum]

Report No.	12244312H
Test place	Ise EMC Lab. No.6 Measurement Room
Date	June 4, 2018
Temperature / Humidity	23 deg. C / 51 % RH
Engineer	Koji Yamamoto
Mode	Tx (RF Power: High)

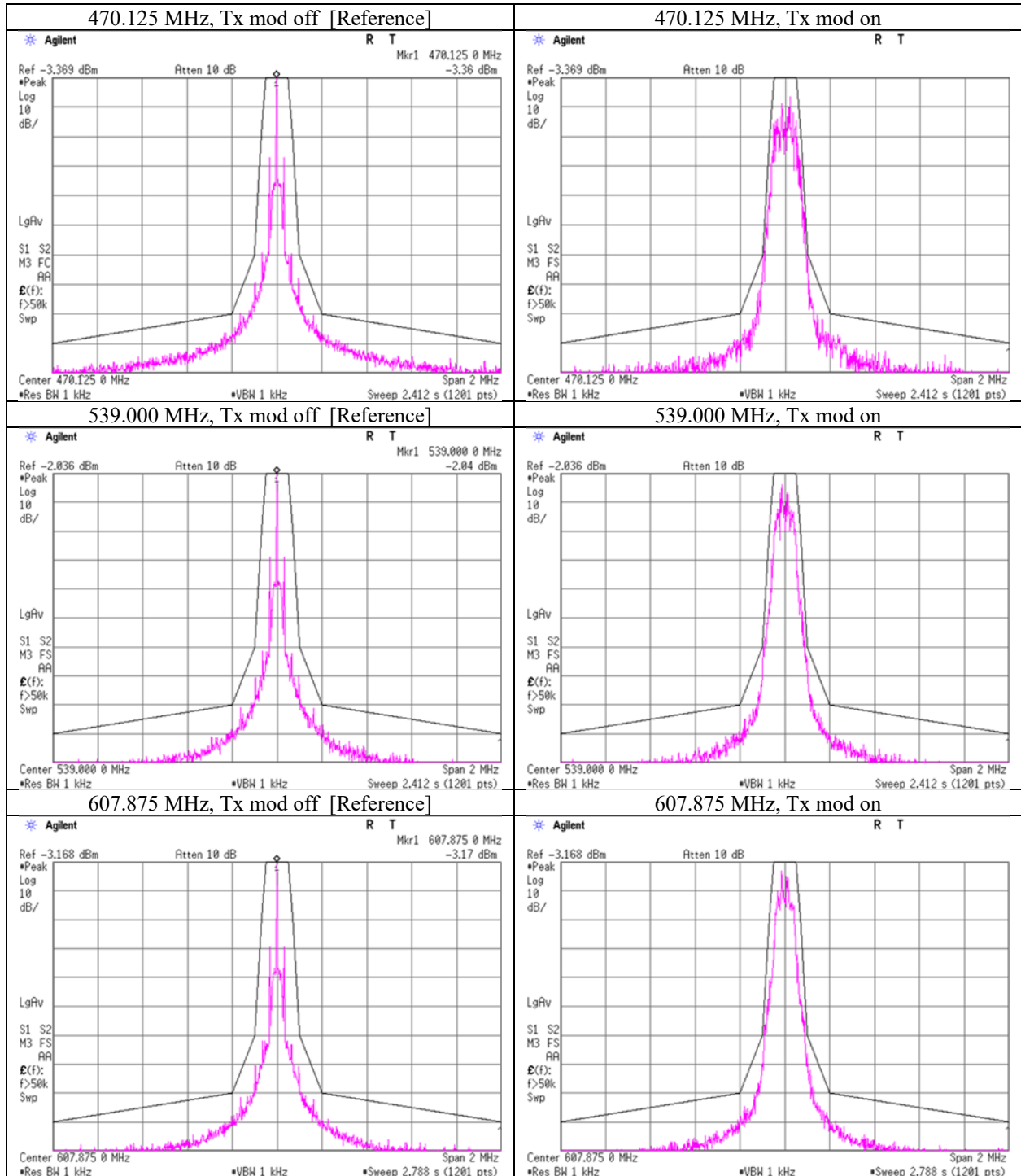


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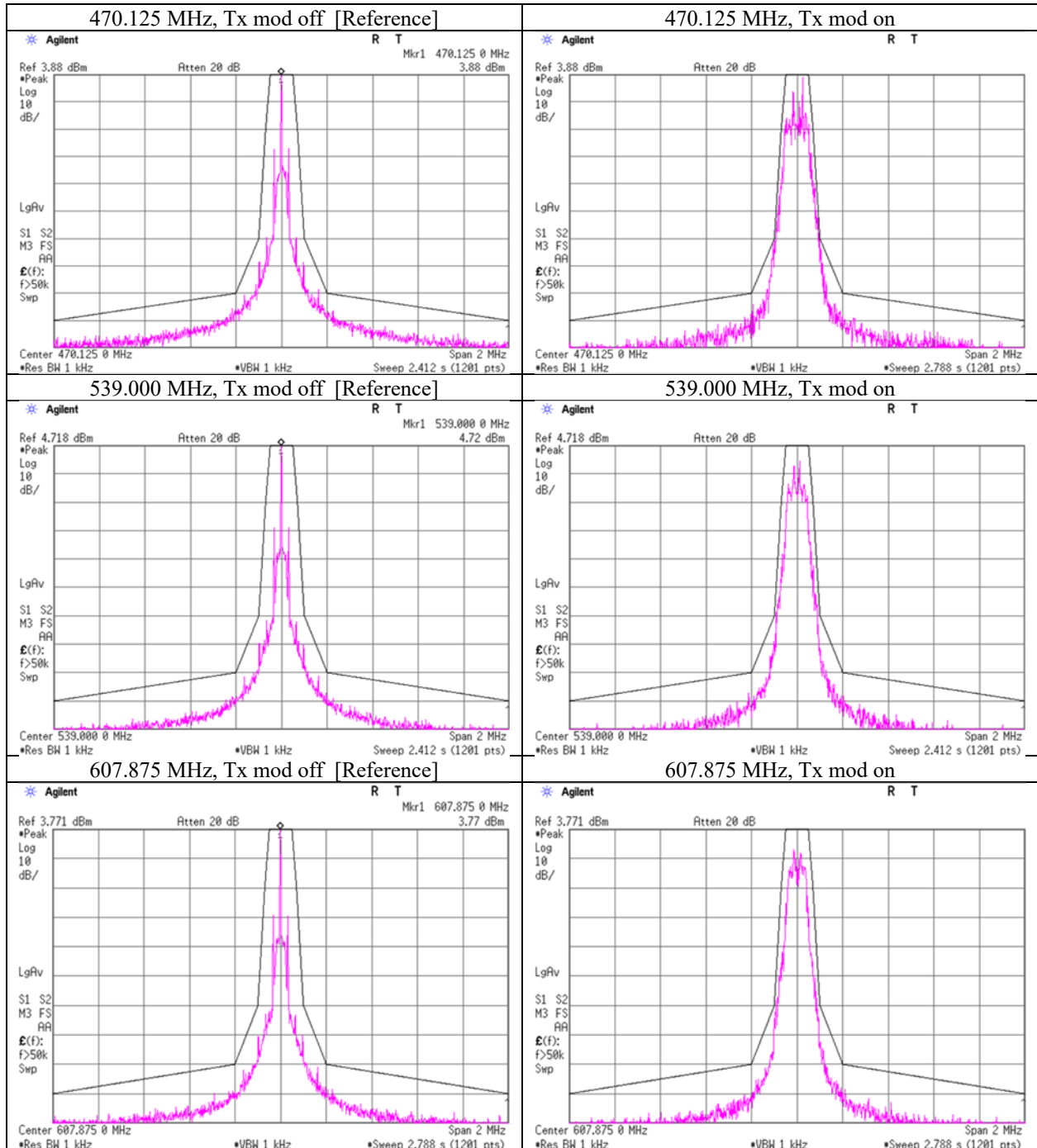
**Necessary bandwidth**

Report No. 12244312H  
 Test place Ise EMC Lab. No.7 Shielded Room  
 Date May 25, 2018  
 Temperature/ Humidity 22 deg. C / 42% RH  
 Engineer Ken Fujita  
 Mode Transmitting mode (RF Power: Low)



### Necessary bandwidth

Report No.	12244312H
Test place	Ise EMC Lab. No.7 Shielded Room
Date	May 25, 2018
Temperature/ Humidity	22 deg. C / 42% RH
Engineer	Ken Fujita
Mode	Transmitting mode (RF Power: High)



## Field strength of spurious radiation

Report No.	12244312H	
Test place	Ise EMC Lab.	
Semi Anechoic Chamber	No.2	No.2
Date	March 30, 2018	March 31, 2018
Temperature / Humidity	22 deg. C / 36 % RH	23 deg. C / 39 % RH
Engineer	Ryota Yamanaka (Above 1 GHz)	Ken Fujita (Below 1 GHz)
Mode	Tx 470.125 MHz	

[Power Setting: High]

Frequency [MHz]	Rx SA/TR Reading [dBuV]		Tx SG Reading [dBm]		Tx Cable Loss [dB]	Tx Ant. Gain [dBi]	Tx Ant. Atten. Loss [dB]	Result (ERP) [dBm]		Limit (ERP) [dBm]	Margin [dB]		Horizontal		Vertical		Remarks
	HOR	VER	HOR	VER				HOR	VER		HOR	VER	Rx Ant. Height [cm]	Turn Table [deg.]	Rx Ant. Height [cm]	Turn Table [deg.]	
940.25	NS	NS	-	-	-	-	-	-	-	-36.0	-	-	-	-	-	-	-
1410.38	48.0	48.3	-59.7	-60.4	3.2	7.0	0.0	-58.1	-58.8	-30.0	28.1	28.8	112	262	122	145	
1880.50	48.2	50.1	-58.0	-55.0	3.7	10.0	0.0	-53.8	-50.8	-30.0	23.8	20.8	125	89	130	294	
2350.63	NS	NS	-	-	-	-	-	-	-	-30.0	-	-	-	-	-	-	
2820.75	47.3	48.4	-57.9	-57.1	4.6	10.8	0.0	-53.8	-53.0	-30.0	23.8	23.0	107	2	124	333	
3290.88	46.0	46.6	-57.2	-58.6	4.9	11.3	0.0	-52.9	-54.3	-30.0	22.9	24.3	140	354	115	4	
3761.00	NS	NS	-	-	-	-	-	-	-	-30.0	-	-	-	-	-	-	
4231.13	NS	NS	-	-	-	-	-	-	-	-30.0	-	-	-	-	-	-	
4701.25	NS	NS	-	-	-	-	-	-	-	-30.0	-	-	-	-	-	-	

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

Rx-ANTENNA : Biconical Antenna (25 M - 200 MHz), Logperiodic Antenna (200 M - 1000 MHz), Horn Antenna (1 G - 7 GHz)

Tx-ANTENNA : 120 MHz tuned Dipole Antenna (25 M - 120 MHz), Dipole Antenna (120 M - 1000 MHz), Horn Antenna (1 G - 7 GHz)

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

NS : No signal detect.

Detector : 25 MHz to 30 MHz: Spectrum Analyzer RMS Average (RBW: 10 kHz / VBW: 30 kHz)

30 MHz to 1 GHz: Spectrum Analyzer RMS Average (RBW: 100 kHz / VBW: 300 kHz)

Above 1 GHz: Spectrum Analyzer RMS Average (RBW: 1 MHz / VBW: 3 MHz)

\*Emissions were investigated up to the 10th harmonic of the fundamental.

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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

### Field strength of spurious radiation

Report No.	12244312H	
Test place	Ise EMC Lab.	
Semi Anechoic Chamber	No.2	No.2
Date	March 30, 2018	March 31, 2018
Temperature / Humidity	22 deg. C / 36 % RH	23 deg. C / 39 % RH
Engineer	Ryota Yamanaka (Above 1 GHz)	Ken Fujita (Below 1 GHz)
Mode	Tx 539.000 MHz	

[Power Setting: High]

Frequency [MHz]	Rx SA/TR Reading [dBuV]		Tx SG Reading [dBm]		Tx Cable Loss [dB]	Tx Ant. Gain [dBi]	Tx Ant. Atten. Loss [dB]	Result (ERP) [dBm]		Limit (ERP) [dBm]	Margin [dB]		Horizontal		Vertical		Remarks
	HOR	VER	HOR	VER				HOR	VER		HOR	VER	Rx Ant. Height [cm]	Turn Table [deg.]	Rx Ant. Height [cm]	Turn Table [deg.]	
1078.00	NS	NS	-	-	-	-	-	-	-	-30.0	-	-	-	-	-	-	-
1617.00	50.5	51.2	-55.0	-53.4	3.4	8.2	0.0	-52.4	-50.8	-30.0	22.4	20.8	120	240	106	129	
2156.00	54.0	53.9	-51.7	-50.7	4.0	10.7	0.0	-47.1	-46.1	-30.0	17.1	16.1	111	38	127	43	
2695.00	50.7	49.5	-56.0	-55.4	4.5	10.8	0.0	-51.8	-51.2	-30.0	21.8	21.2	140	2	141	150	
3234.00	47.0	48.6	-55.9	-54.7	4.9	11.3	0.0	-51.7	-50.5	-30.0	21.7	20.5	117	52	119	337	
3773.00	NS	NS	-	-	-	-	-	-	-	-30.0	-	-	-	-	-	-	
4312.00	NS	NS	-	-	-	-	-	-	-	-30.0	-	-	-	-	-	-	
4851.00	NS	NS	-	-	-	-	-	-	-	-30.0	-	-	-	-	-	-	
5390.00	NS	NS	-	-	-	-	-	-	-	-30.0	-	-	-	-	-	-	

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

Rx-ANTENNA : Biconical Antenna (25 M - 200 MHz), Logperiodic Antenna (200 M - 1000 MHz), Horn Antenna (1 G - 7 GHz)

Tx-ANTENNA : 120 MHz tuned Dipole Antenna (25 M - 120 MHz), Dipole Antenna (120 M - 1000 MHz), Horn Antenna (1 G - 7 GHz)

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

NS : No signal detect.

Detector : 25 MHz to 30 MHz: Spectrum Analyzer RMS Average (RBW: 10 kHz / VBW: 30 kHz)

30 MHz to 1 GHz: Spectrum Analyzer RMS Average (RBW: 100 kHz / VBW: 300 kHz)

Above 1 GHz: Spectrum Analyzer RMS Average (RBW: 1 MHz / VBW: 3 MHz)

\*Emissions were investigated up to the 10th harmonic of the fundamental.

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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

## Field strength of spurious radiation

Report No.	12244312H		
Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.2	No.2	
Date	March 30, 2018	March 31, 2018	
Temperature / Humidity	22 deg. C / 36 % RH	23 deg. C / 39 % RH	
Engineer	Ryota Yamanaka	Ken Fujita	
	(Above 1 GHz)	(Below 1 GHz)	
Mode	Tx 607.875 MHz		

[Power Setting: High]

Frequency [MHz]	Rx SA/TR		Tx SG		Tx	Tx	Tx Ant.	Result		Limit	Margin		Horizontal		Vertical		Remarks
	Reading [dBuV]		Reading [dBm]		Cable Loss [dB]	Ant. Gain [dBi]	Atten. Loss [dB]	(ERP) [dBm]		(ERP) [dBm]	[dB]		Rx Ant.	Turn	Rx Ant.	Turn	
	HOR	VER	HOR	VER				HOR	VER		HOR	VER	Height [cm]	Table [deg.]	Height [cm]	Table [deg.]	
1215.75	60.4	60.1	-46.7	-47.8	3.0	6.0	0.0	-45.8	-46.9	-30.0	15.8	16.9	108	196	113	327	
1823.63	48.2	47.3	-59.9	-61.9	3.6	9.6	0.0	-56.0	-58.0	-30.0	26.0	28.0	111	38	110	134	
2431.50	NS	NS	-	-	-	-	-	-	-	-30.0	-	-	-	-	-	-	
3039.38	48.9	47.7	-55.3	-57.8	4.7	10.9	0.0	-51.2	-53.7	-30.0	21.2	23.7	114	349	103	349	
3647.25	47.7	47.8	-55.8	-56.0	5.2	11.7	0.0	-51.5	-51.7	-30.0	21.5	21.7	148	10	157	10	
4255.13	NS	NS	-	-	-	-	-	-	-	-30.0	-	-	-	-	-	-	
4863.00	49.5	49.8	-49.9	-50.0	6.1	12.2	0.0	-45.9	-46.0	-30.0	15.9	16.0	138	325	147	320	
5470.88	NS	NS	-	-	-	-	-	-	-	-30.0	-	-	-	-	-	-	
6078.75	NS	NS	-	-	-	-	-	-	-	-30.0	-	-	-	-	-	-	

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

Rx-ANTENNA : Biconical Antenna (25 M - 200 MHz), Logperiodic Antenna (200 M - 1000 MHz), Horn Antenna (1 G - 7 GHz)

Tx-ANTENNA : 120 MHz tuned Dipole Antenna (25 M - 120 MHz), Dipole Antenna (120 M - 1000 MHz), Horn Antenna (1 G - 7 GHz)

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

NS : No signal detect.

Detector : 25 MHz to 30 MHz: Spectrum Analyzer RMS Average (RBW: 10 kHz / VBW: 30 kHz)

30 MHz to 1 GHz: Spectrum Analyzer RMS Average (RBW: 100 kHz / VBW: 300 kHz)

Above 1 GHz: Spectrum Analyzer RMS Average (RBW: 1 MHz / VBW: 3 MHz)

\*Emissions were investigated up to the 10th harmonic of the fundamental.

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## Frequency stability

Report No. 12244312H  
Test place Ise EMC Lab. No.6 Measurement Room  
Date May 8, 2018 June 4, 2018  
Temperature / Humidity 22 deg. C / 47 % RH 23 deg. C / 55 % RH  
Engineer Koji Yamamoto Koji Yamamoto  
Mode Tx 539.000 MHz (RF Power: High)

### [Varying Temperature]

Test condition		Tested frequency [MHz]	Measured frequency [MHz]	Frequency error [MHz]	Result [%]	Limit [+/- %]	Remarks
Temp. [deg. C]	Voltage [V]						
50	3.00	539.000	538.999515	-0.000485	-0.00009	0.005	
40	3.00	539.000	538.999862	-0.000138	-0.00003	0.005	
30	3.00	539.000	538.999871	-0.000129	-0.00002	0.005	
20	3.00	539.000	538.999732	-0.000268	-0.00005	0.005	
10	3.00	539.000	538.999739	-0.000261	-0.00005	0.005	
0	3.00	539.000	538.999853	-0.000147	-0.00003	0.005	
-10	3.00	539.000	538.999802	-0.000198	-0.00004	0.005	
-20	3.00	539.000	538.999898	-0.000102	-0.00002	0.005	
-30	3.00	539.000	539.000297	0.000297	0.00006	0.005	

Calculation formula: Frequency error = Measured frequency - Tested frequency  
Result [%] = Frequency error / Tested frequency \* 100

### [Varying Supply Voltage]

Test condition		Tested frequency [MHz]	Measured frequency [MHz]	Frequency error [MHz]	Result [%]	Limit [+/- %]	Remarks
Temp. [deg. C]	Voltage [V]						
20	5.00	539.000	539.000021	0.000021	0.00000	0.005	USB Power (nominal)
20	4.25	539.000	539.000028	0.000028	0.00001	0.005	USB Power (-15 %)
20	5.75	539.000	539.000028	0.000028	0.00001	0.005	USB Power (+15 %)
20	3.45	539.000	538.999732	-0.000268	-0.00005	0.005	Battery Power
20	1.96	539.000	538.999703	-0.000297	-0.00006	0.005	Battery End Point

Calculation formula: Frequency error = Measured frequency - Tested frequency  
Result [%] = Frequency error / Tested frequency \* 100

**UL Japan, Inc.**

**Ise EMC Lab.**

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

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

## APPENDIX 2: Test instruments

### Test Instruments

Test Item	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Calibration Due Date	Cal Int
AT	141498	Microwave Counter	ADVANTEST	R5373	120100309	6/21/2017	6/30/2018	12
AT	141441	Temperature Chamber	ESPEC CORP.	SU-241	92013843	7/18/2017	7/31/2018	12
AT	141840	Power sensor	ANRITSU	MA2411B	11737	10/13/2017	10/31/2018	12
AT	141805	Power Meter	ANRITSU	ML2495A	6K00003338	10/13/2017	10/31/2018	12
AT	141900	Spectrum Analyzer	AGILENT	E4440A	MY46185823	11/16/2017	11/30/2018	12
AT	141547	DIGITAL HiTESTER	HIOKI	3805	60500120	2/7/2018	2/28/2019	12
AT	141561	Thermo-Hygrometer	CUSTOM	CTH-201	1401	1/24/2018	1/31/2019	12
AT	141225	Microwave Cable	Junkosha	MWX221	1409S497	3/14/2018	3/31/2019	12
AT	141269	Attenuator(10dB) 1-18GHz	Orient Microwave	BX10-0476-00	-	3/12/2018	3/31/2019	12
AT	141156	Attenuator(10dB)	Weinschel Corp	2	BL1173	11/14/2017	11/30/2018	12
AT	141321	Microwave Cable	Junkosha	MWX221	1409S493	3/12/2018	3/31/2019	12
AT	141395	Coaxial Cable	UL Japan	-	-	12/15/2017	12/31/2018	12
AT	142764	Radiocommunication Service Monitor	Rohde & Schwarz	CMS54	829000/009	9/5/2017	9/30/2018	12
AT/RE	141885	Spectrum Analyzer	AGILENT	E4448A	US44300523	11/14/2017	11/30/2018	12
RE	141507	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	258	5/21/2017	5/31/2018 *1)	12
RE	141896	Signal Generator	Rohde & Schwarz	SMR40	100137	6/7/2018	6/30/2019	12
RE	141297	High Pass Filter (1.1-10GHz)	TOKYO KEIKI	TF219CD1	1001	1/18/2018	1/31/2019	12
RE	141556	Thermo-Hygrometer	CUSTOM	CTH-201	0003	12/21/2017	12/31/2018	12
RE	142004	AC2_Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-06902	8/31/2017	8/31/2018	12
RE	141579	Pre Amplifier	AGILENT	8449B	3008A02142	1/23/2018	1/31/2019	12
RE	141392	Microwave Cable	Junkosha	MWX221	1604S253(1 m) / 1608S087(5 m)	8/4/2017	8/31/2018	12
RE	142182	Measure	KOMELON	KMC-36	-	-	-	-
RE	141512	Horn Antenna 1- 18GHz	Schwarzbeck	BBHA9120D	254	2/25/2018	2/28/2019	12
RE	141542	Digital Tester	Fluke Corporation	FLUKE 26-3	78030611	8/7/2017	8/31/2018	12
RE	141152	EMI measurement program	TSJ	TEPTO-DV	-	-	-	-
RE	141409	Microwave Cable (1-30GHz)	Huber+Suhner	SF103/11PC3.5- 31/11PC3.5-31/ 8.0m	54308/3	1/16/2018	1/31/2019	12
RE	141265	Logperiodic Antenna (200-1000MHz)	Schwarzbeck	VUSLP9111B	911B-190	12/10/2017	12/31/2018	12
RE	141317	Coaxial Cable	Fujikura/Agilent	-	-	2/23/2018	2/28/2019	12
RE	141427	Biconical Antenna	Schwarzbeck	VHA9103B	8031	9/13/2017	9/30/2018	12
RE	141203	Attenuator(6dB)	Weinschel Corp	2	BK7970	11/14/2017	11/30/2018	12
RE	141578	Pre Amplifier	AGILENT	8447D	2944A10845	9/27/2017	9/30/2018	12

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

\*Hyphens for Last Calibration Date, Calibration Due 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.

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

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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