



RADIO TEST REPORT

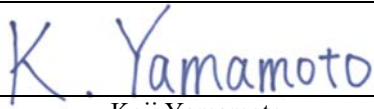
Test Report No. : 12244309H-A-R2

Applicant : Sony Corporation
Type of Equipment : UHF Synthesized Wireless Microphone
Model No. : UTX-M03
FCC ID : AK8UTXM03
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 12244309H-A-R1. 12244309H-A-R1 is replaced with this report.

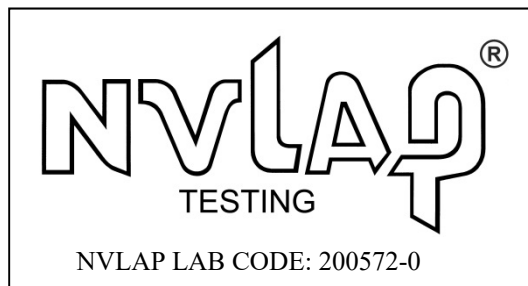
Date of test: March 30 to June 5, 2018

Representative test engineer:


Koji Yamamoto
Engineer
Consumer Technology Division

Approved by:


Tsubasa Takayama
Leader
Consumer Technology Division



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13-EM-F0429

REVISION HISTORY

Original Test Report No.: 12244309H-A

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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 Wireless Microphone
Model No.	:	UTX-M03
Serial No.	:	Refer to 4.2 in this report.
Rating	:	DC 3V (BATT), 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-M03 (referred to as the EUT in this report) is a UHF Synthesized Wireless Microphone.

Radio Specification

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: 30 mW, Low: 5 mW
Antenna type	:	1/4 Lambda Monopole antenna (helical type)
Antenna gain	:	4.6 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)	6.6 dB 2695.00 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)

Mode	Remarks
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 (UC14) Version T.010 (UC25)	
*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)

Test Item	Tested frequency	Power setting	Modulation	Remarks
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	-25.1 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	-25.1 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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4.2 Configuration and peripherals

A

* Setup was taken into consideration and test data was taken under worse case conditions.

Description of EUT

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	UHF Synthesized Wireless Microphone	UTX-M03	14UC: Low / Mid Channel 25UC: High Channel	Sony Corporation	EUT

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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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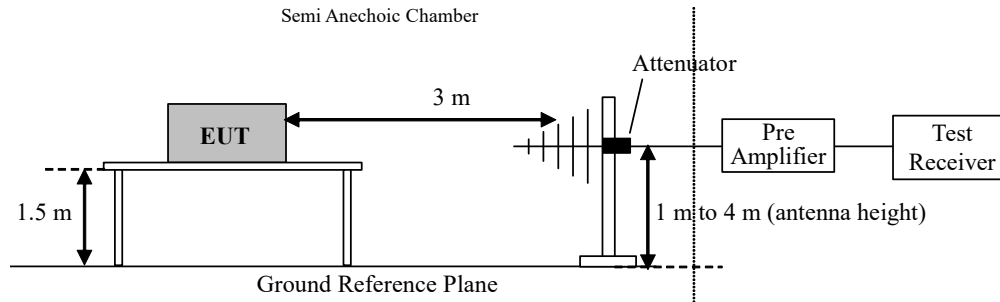
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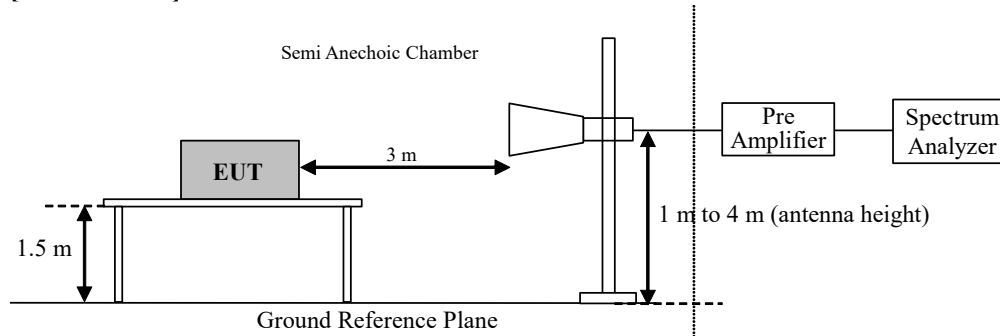
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Figure 1: Test Setup

[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 : 25 MHz - 7 GHz
Test data : APPENDIX
Test result : Pass

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
-----------------	--

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

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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	-36.90 dBV	-	-27.06 dBV	9.84 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. 12244309H
Test place Ise EMC Lab. No.6 Measurement Room
Date May 7, 2018
Temperature / Humidity 23 deg. C / 51 % RH
Engineer Koji Yamamoto
Mode Tx

Power Setting	Channel	Freq.	Reading Average	Cable Loss	Atten. Loss	Result Average 【Conducted】		Limit 【Conducted】	Margin	Remarks
		[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[mW]	[dB]	
Low	Low	470.125	5.83	0.00	0.00	5.83	3.828	250	18.15	
	Mid	539.000	6.87	0.00	0.00	6.87	4.864	250	17.11	
	High	607.875	6.78	0.00	0.00	6.78	4.764	250	17.20	
High	Low	470.125	14.01	0.00	0.00	14.01	25.2	250	9.97	
	Mid	539.000	14.03	0.00	0.00	14.03	25.3	250	9.95	
	High	607.875	14.57	0.00	0.00	14.57	28.6	250	9.41	

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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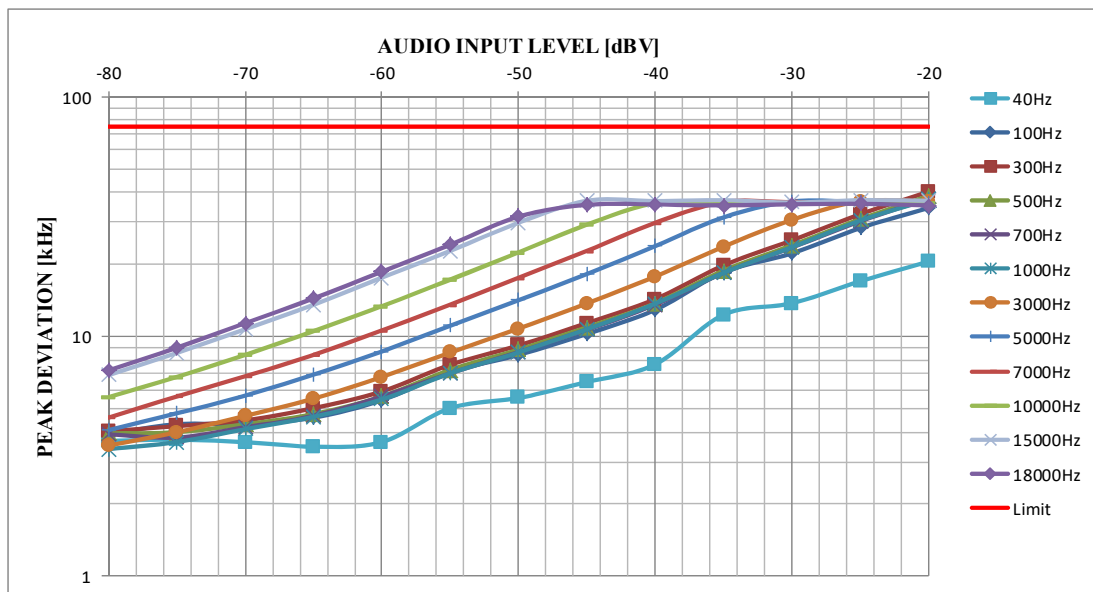
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Modulation Characteristics

[Deviation versus Audio input level and Audio Frequency]

Report No. 12244309H
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	3.673	3.912	4.032	3.952	3.912	3.393	3.513	4.072	4.591	5.589	6.906	7.226	75
-75	3.713	4.311	4.232	3.992	3.792	3.633	3.992	4.790	5.629	6.786	8.543	8.982	75
-70	3.633	4.311	4.471	4.311	4.192	4.112	4.671	5.669	6.826	8.383	10.739	11.377	75
-65	3.473	4.591	5.030	4.751	4.671	4.631	5.509	6.946	8.383	10.539	13.573	14.411	75
-60	3.633	5.429	5.908	5.629	5.629	5.469	6.786	8.663	10.619	13.373	17.605	18.643	75
-55	5.030	7.106	7.625	7.265	7.026	7.026	8.583	11.098	13.573	17.285	22.754	24.152	75
-50	5.549	8.383	9.182	8.822	8.623	8.583	10.778	14.212	17.605	22.435	29.820	31.617	75
-45	6.467	10.259	11.377	10.938	10.699	10.739	13.772	18.204	22.754	29.301	36.805	35.409	75
-40	7.665	12.934	14.331	13.772	13.573	13.693	17.804	23.832	29.820	35.968	36.711	35.522	75
-35	12.335	18.523	19.800	18.842	18.443	18.443	23.713	31.417	36.367	36.287	37.006	35.209	75
-30	13.772	22.235	25.190	24.032	23.513	23.593	30.659	36.567	36.287	35.809	36.207	35.596	75
-25	17.006	28.343	32.375	30.898	30.259	30.459	36.567	36.367	36.168	36.048	37.005	35.728	75
-20	20.559	34.371	40.160	38.603	37.645	37.205	36.567	36.168	36.048	35.968	36.823	35.209	75



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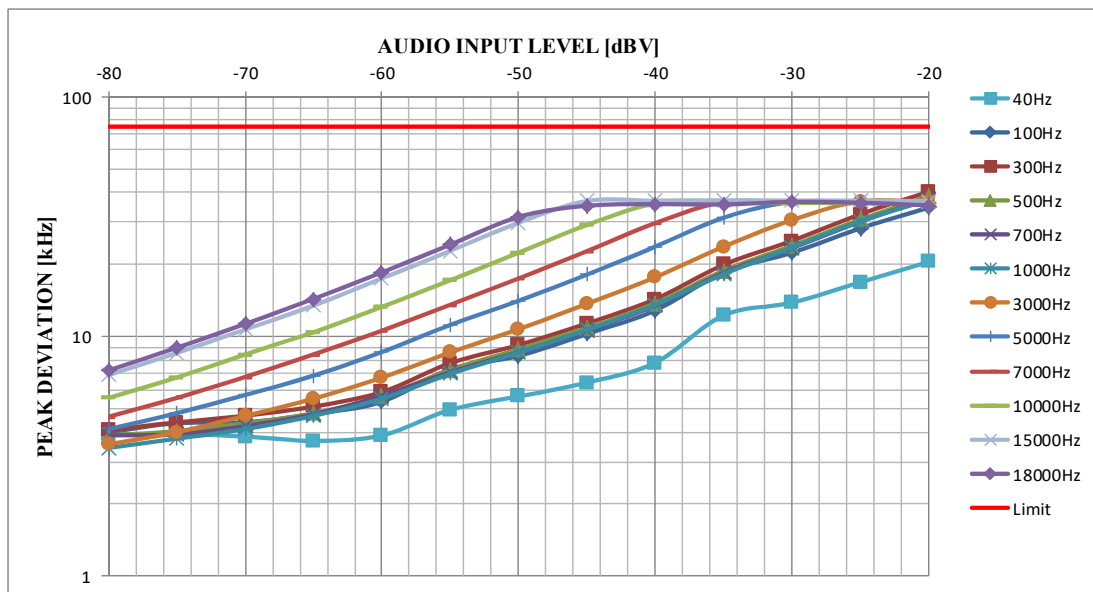
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Modulation Characteristics

[Deviation versus Audio input level and Audio Frequency]

Report No. 12244309H
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	3.912	3.992	4.072	3.872	3.872	3.433	3.553	4.112	4.631	5.549	6.906	7.226	75
-75	3.912	4.351	4.391	4.032	3.912	3.753	3.992	4.790	5.549	6.747	8.543	8.982	75
-70	3.832	4.391	4.671	4.351	4.232	4.112	4.671	5.709	6.786	8.423	10.699	11.297	75
-65	3.673	4.751	5.110	4.790	4.751	4.671	5.509	6.866	8.423	10.419	13.453	14.331	75
-60	3.872	5.349	5.868	5.629	5.669	5.509	6.747	8.623	10.579	13.293	17.485	18.523	75
-55	4.950	7.305	7.745	7.265	7.106	6.986	8.583	11.178	13.573	17.166	22.754	24.152	75
-50	5.629	8.303	9.222	8.862	8.623	8.583	10.739	14.092	17.485	22.355	29.820	31.537	75
-45	6.427	10.259	11.337	10.858	10.619	10.659	13.693	18.124	22.675	29.182	36.725	35.090	75
-40	7.784	12.854	14.331	13.772	13.453	13.573	17.685	23.713	29.740	35.848	36.806	35.649	75
-35	12.255	18.523	19.920	18.842	18.443	18.204	23.713	31.297	36.367	36.168	37.006	35.531	75
-30	13.852	22.355	25.070	23.912	23.393	23.513	30.579	36.367	36.168	36.048	36.881	36.408	75
-25	16.846	28.263	32.375	30.778	30.140	30.259	36.567	36.287	36.048	35.968	36.886	36.116	75
-20	20.479	34.491	40.160	38.483	37.645	37.126	36.367	36.168	35.968	35.848	36.687	35.209	75



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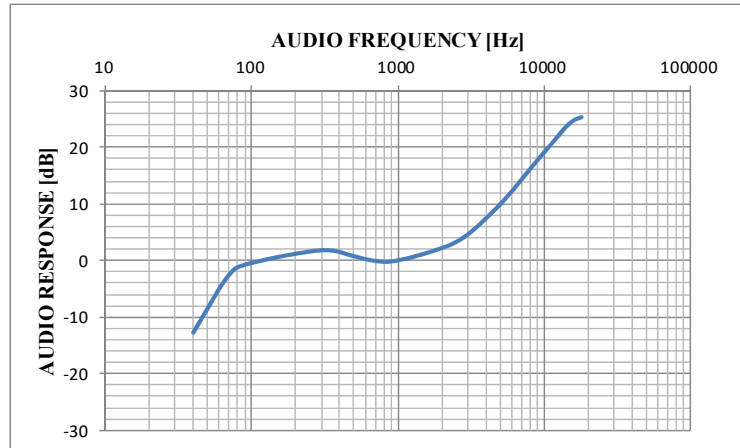
Facsimile : +81 596 24 8124

Modulation Characteristics [Audio Frequency Response]

Report No. 12244309H
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	94.30	-12.74
70	29.26	-2.57
100	22.92	-0.45
300	17.68	1.80
500	19.97	0.75
700	21.98	-0.09
1000	21.76	0.00
2000	16.91	2.19
3000	12.85	4.58
5000	6.96	9.90
7000	4.21	14.27
10000	2.41	19.11
15000	1.33	24.28
18000	1.18	25.32

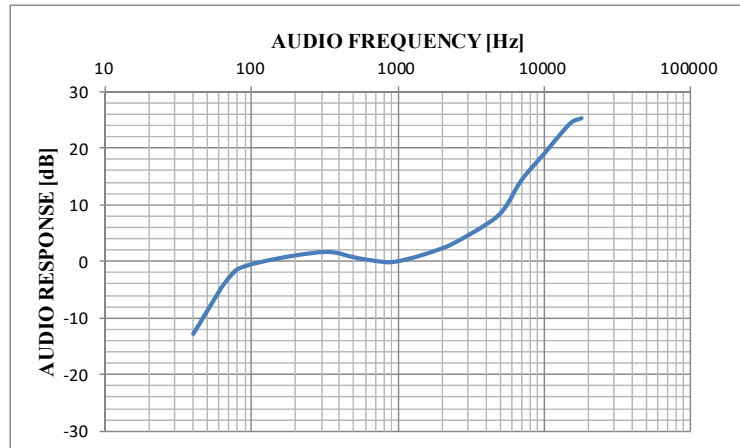


Calculation formula:

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

[Power Setting: Low]

AF Frequency [Hz]	AF Level [mV]	AF Response [dB]
40	94.60	-12.80
70	30.23	-2.89
100	23.01	-0.52
300	17.95	1.64
500	19.98	0.71
700	21.48	0.08
1000	21.68	0.00
2000	16.68	2.28
3000	12.82	4.56
5000	8.23	8.41
7000	4.17	14.32
10000	2.43	19.01
15000	1.32	24.31
18000	1.18	25.28



Calculation formula:

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

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Occupied Bandwidth

Report No. 12244309H
Test place Ise EMC Lab. No.6 Measurement Room
Date June 4, 2018
Temperature / Humidity 21 deg. C / 43 % RH
Engineer Koji Yamamoto
Mode Tx

Power Setting	Channel	Frequency [MHz]	Occupied Bandwidth [kHz]	Limit [kHz]	Margin [kHz]
Low Power	Low	470.125	83.1761	200	116.8239
	Mid	539.000	81.1240	200	118.8760
	High	607.875	81.2170	200	118.7830
High Power	Low	470.125	83.1847	200	116.8153
	Mid	539.000	81.1423	200	118.8577
	High	607.875	81.2544	200	118.7456

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Occupied Bandwidth

Report No.

Test place

Date

Temperature / Humidity

Engineer

Mode

12244309H

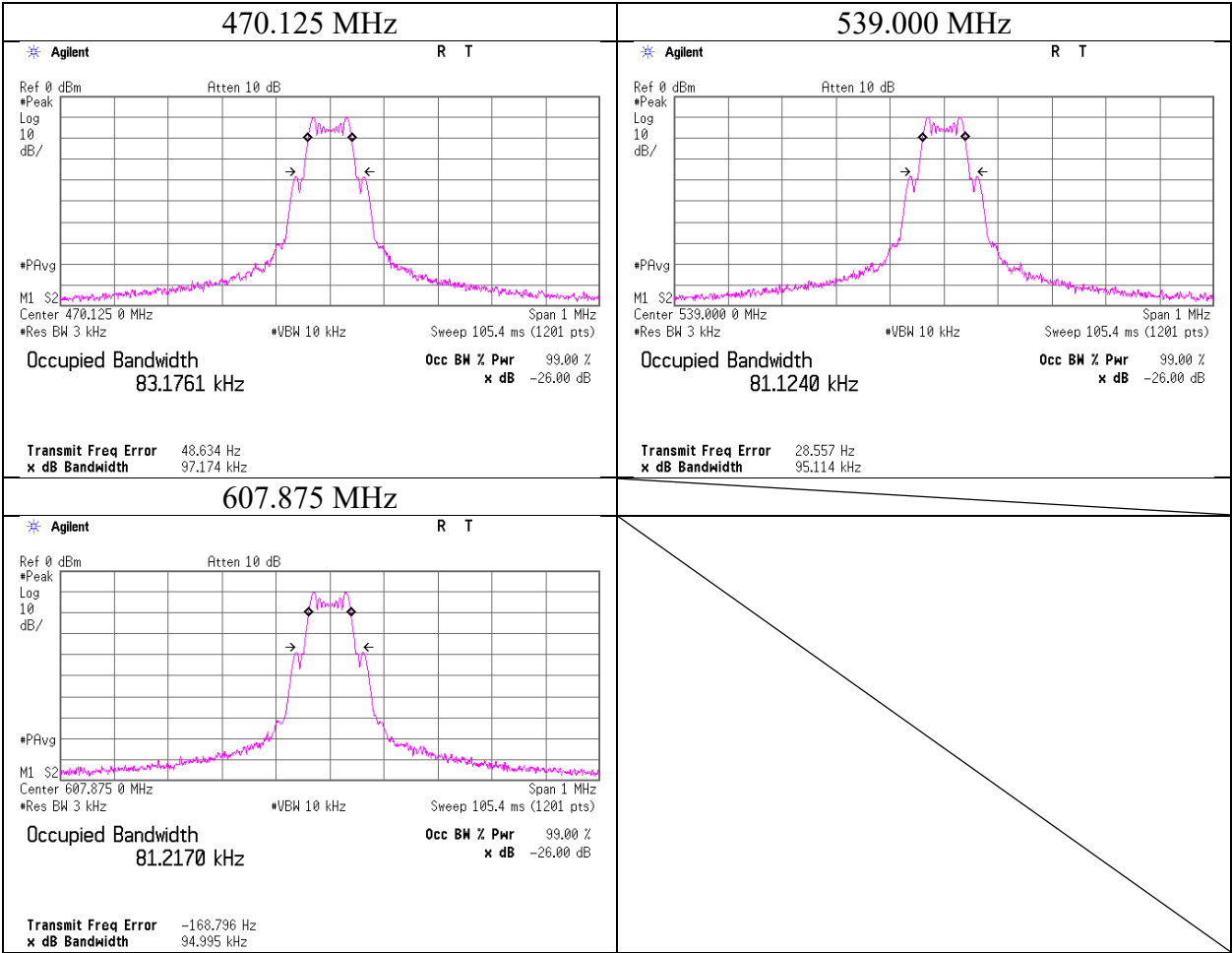
Ise EMC Lab. No.6 Measurement Room

June 4, 2018

21 deg. C / 43 % RH

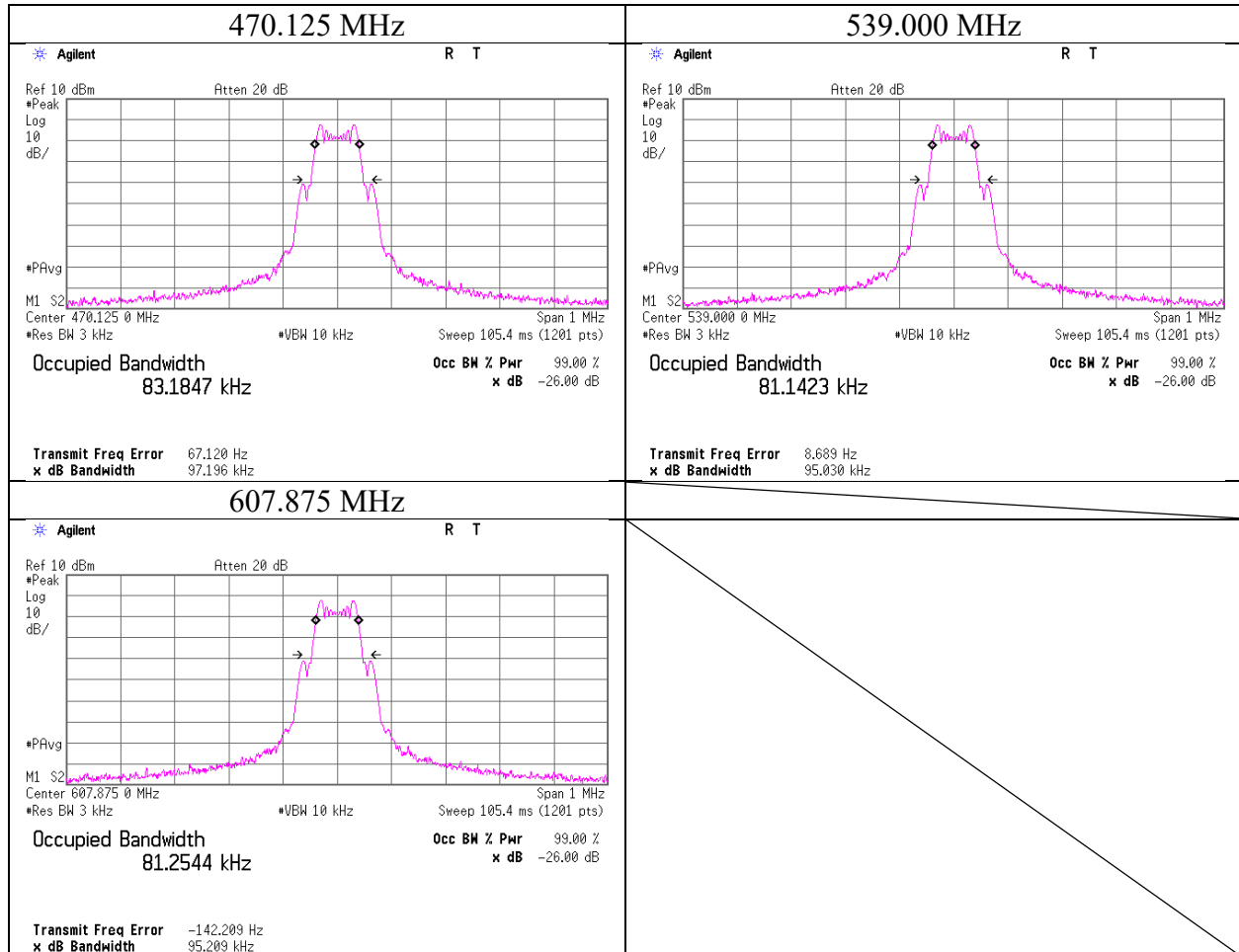
Koji Yamamoto

Tx (RF Power: Low)



Occupied Bandwidth

Report No. 12244309H
Test place Ise EMC Lab. No.6 Measurement Room
Date June 4, 2018
Temperature / Humidity 21 deg. C / 43 % RH
Engineer Koji Yamamoto
Mode Tx (RF Power: High)



Spurious emissions at antenna terminals

Report No. 12244309H
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	0.01593	-101.98	0.01	9.83	-92.14	-30	62.14
		0.15	-89.59	0.01	9.83	-79.75	-30	49.75
		940.2	-67.66	0.30	9.91	-57.45	-30	27.45
		2820	-60.04	1.00	10.05	-48.99	-30	18.99
Mid	539.000	0.00924	-99.36	0.01	9.83	-89.52	-30	59.52
		0.175	-89.23	0.01	9.83	-79.39	-30	49.39
		2695	-61.59	0.97	10.05	-50.57	-30	20.57
High	607.875	0.01088	-98.68	0.01	9.83	-88.84	-30	58.84
		0.448	-89.36	0.01	9.83	-79.52	-30	49.52
		2432	-60.51	0.92	10.04	-49.55	-30	19.55
		3209	-59.98	1.06	10.05	-48.87	-30	18.87

Calculation formula:

$$\text{Result} = \text{Reading} + \text{Cable Loss} + \text{Attenuator Loss}$$

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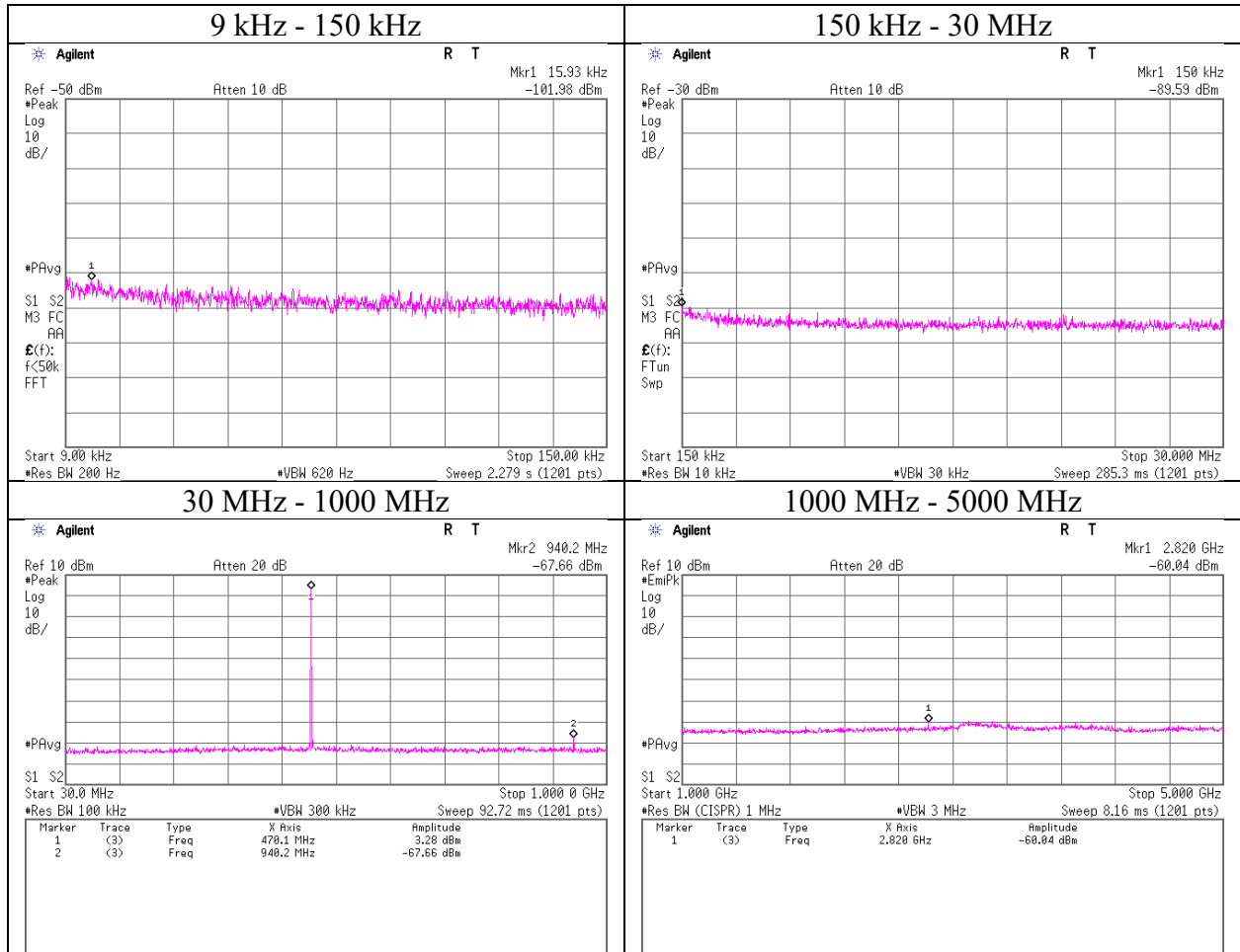
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Facsimile : +81 596 24 8124

Spurious emissions at antenna terminals

Report No. 12244309H
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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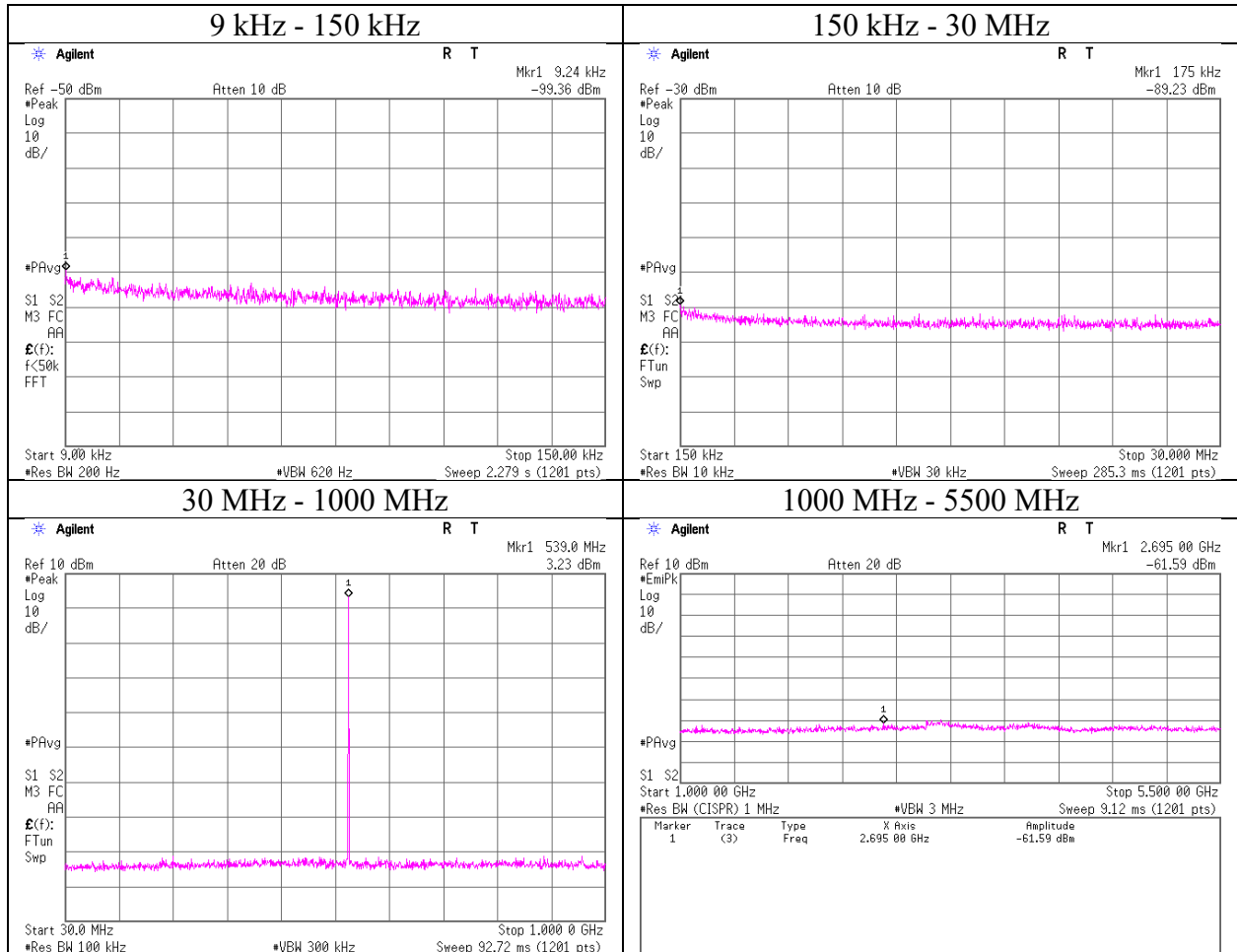
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Spurious emissions at antenna terminals

Report No. 12244309H
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)



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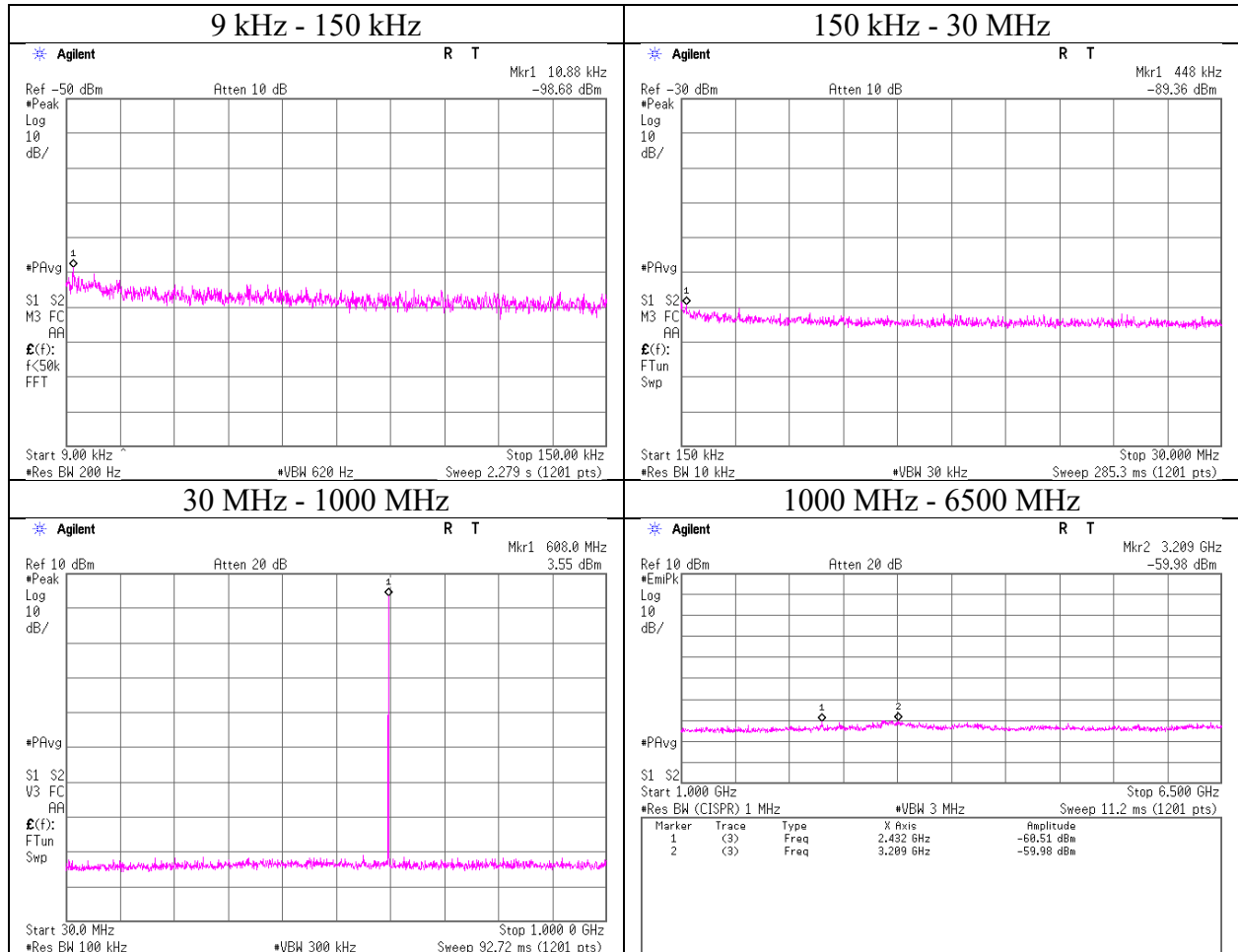
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Spurious emissions at antenna terminals

Report No. 12244309H
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)



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Ise EMC Lab.

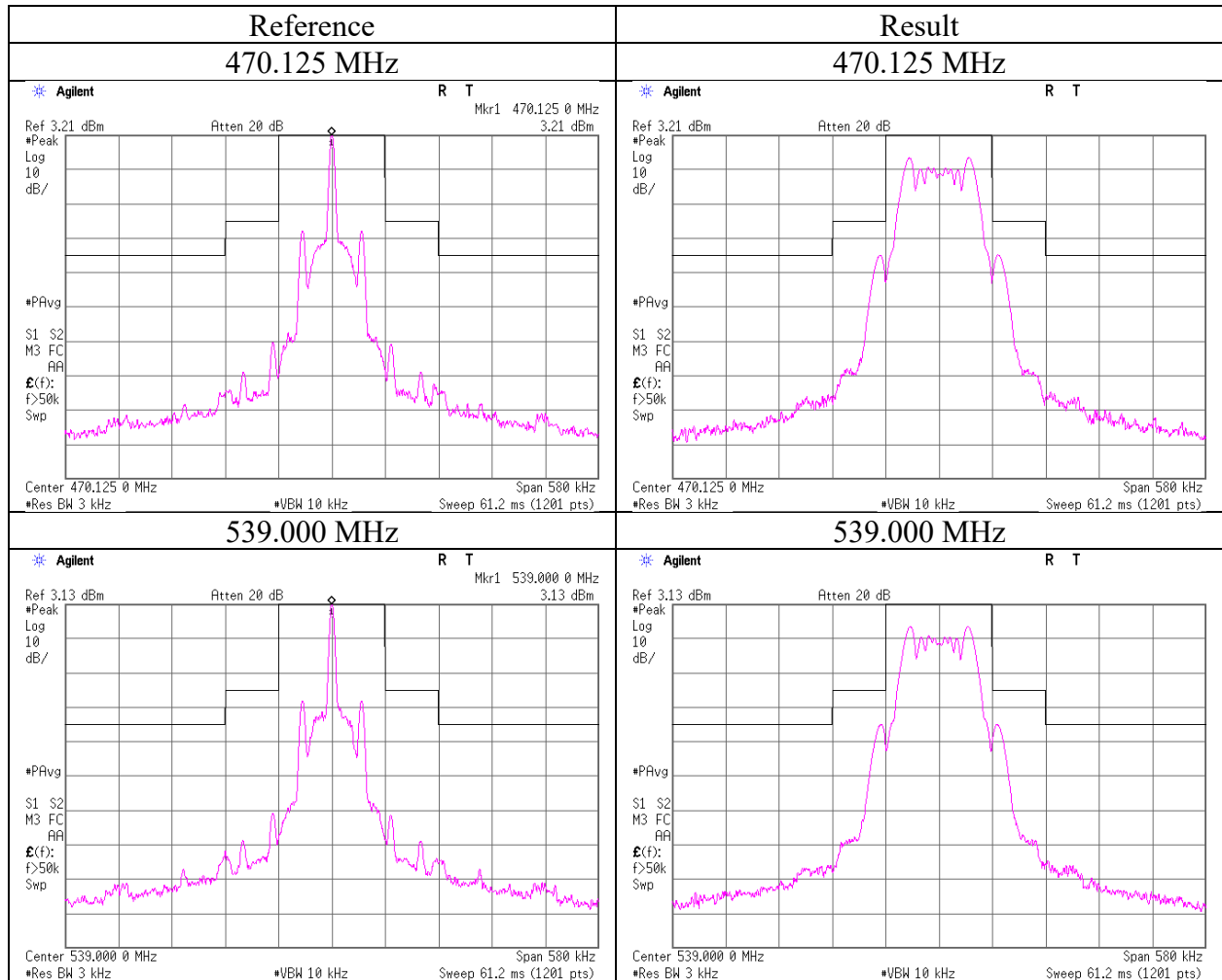
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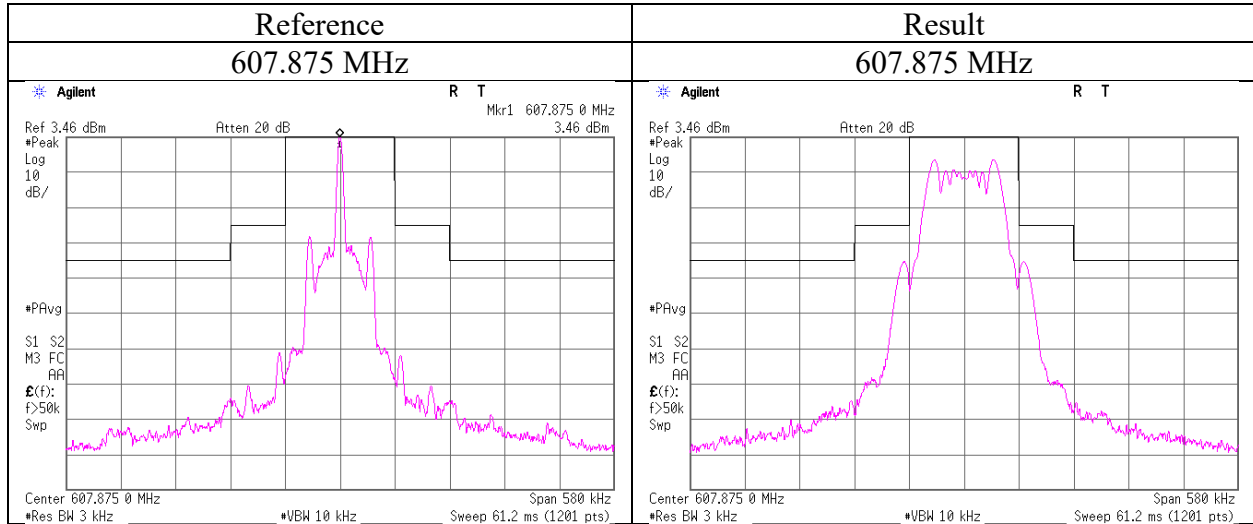
Spurious emissions at antenna terminals
[Side band Spectrum]

Report No. 12244309H
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)



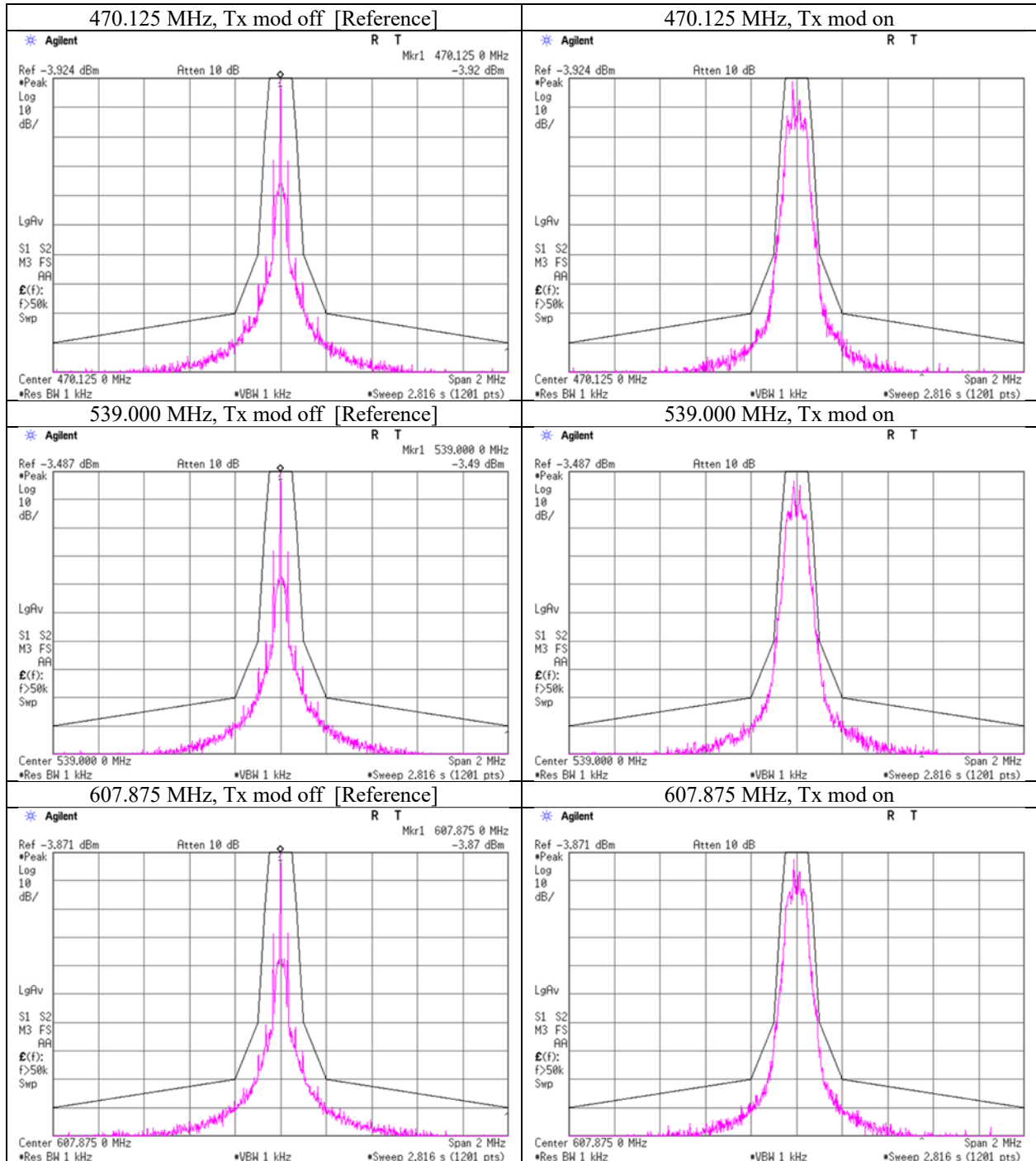
Spurious emissions at antenna terminals [Side band Spectrum]

Report No.	12244309H
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)



Necessary bandwidth

Report No.	12244309H
Test place	Ise EMC Lab. No.7 Shielded Room
Date	May 24, 2018
Temperature/ Humidity	22 deg. C / 42% RH
Engineer	Ken Fujita
Mode	Transmitting mode (RF Power: Low)



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Ise EMC Lab.

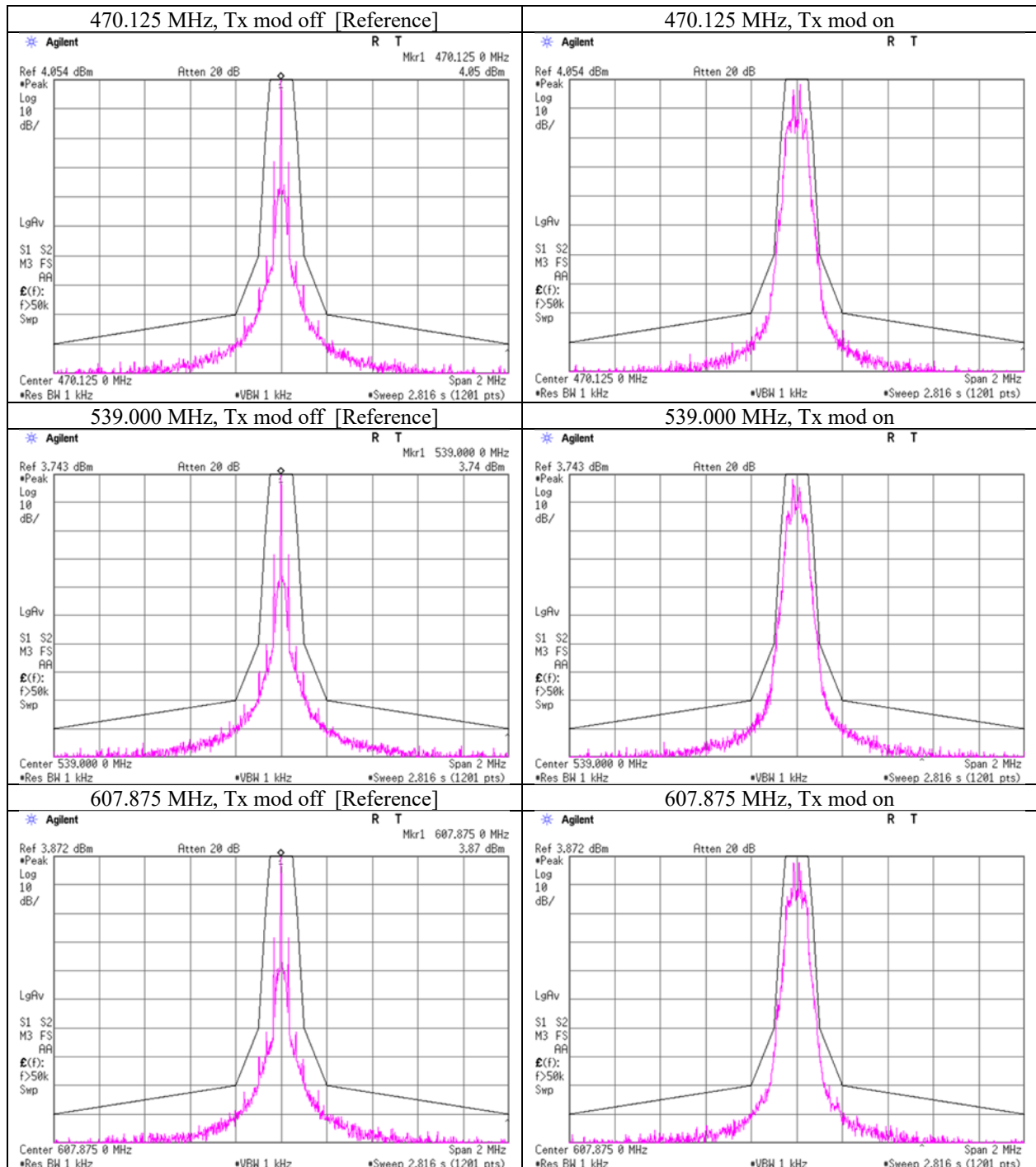
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Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

Necessary bandwidth

Report No.	12244309H
Test place	Ise EMC Lab. No.7 Shielded Room
Date	May 24, 2018
Temperature/ Humidity	22 deg. C / 42% RH
Engineer	Ken Fujita
Mode	Transmitting mode (RF Power: High)



Field strength of spurious radiation

Report No.	12244309H	
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		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. Height [cm]	Turn Table [deg.]	Rx Ant. Height [cm]	Turn Table [deg.]	
	HOR	VER	HOR	VER				HOR	VER		HOR	VER					
940.25	NS	NS	-	-	-	-	-	-	-	-36.0	-	-	-	-	-	-	
1410.38	NS	NS	-	-	-	-	-	-	-	-30.0	-	-	-	-	-	-	
1880.50	52.4	49.7	-55.3	-59.0	3.7	10.0	0.0	-51.1	-54.8	-30.0	21.1	24.8	150	326	157	348	
2350.63	58.9	50.9	-47.3	-54.2	4.2	10.8	0.0	-42.9	-49.8	-30.0	12.9	19.8	114	324	137	50	
2820.75	59.2	55.6	-45.4	-48.6	4.6	10.8	0.0	-41.3	-44.5	-30.0	11.3	14.5	109	326	140	225	
3290.88	54.4	52.6	-50.8	-52.9	4.9	11.3	0.0	-46.5	-48.6	-30.0	16.5	18.6	128	49	139	212	
3761.00	50.4	47.6	-52.8	-57.6	5.3	11.7	0.0	-48.5	-53.3	-30.0	18.5	23.3	150	53	113	349	
4231.13	52.4	50.2	-49.2	-52.1	5.6	11.9	0.0	-45.1	-48.0	-30.0	15.1	18.0	116	330	136	31	
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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Facsimile : +81 596 24 8124

Field strength of spurious radiation

Report No.	12244309H	
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	Rx SA/TR		Tx SG		Tx	Tx	Tx Ant.	Result		Limit	Margin		Horizontal		Vertical		Remarks
	Reading [dBuV]		Reading [dBm]		Cable Loss	Ant. Gain	Atten. Loss	(ERP) [dBm]		(ERP) [dBm]	[dB]		Rx Ant. Height	Turn Table	Rx Ant. Height	Turn Table	
	[MHz]	HOR	VER	HOR	VER	[dB]	[dBi]	[dB]	HOR	VER	HOR	VER	[cm]	[deg.]	[cm]	[deg.]	
1078.00	NS	NS	-	-	-	-	-	-	-	-30.0	-	-	-	-	-	-	
1617.00	NS	NS	-	-	-	-	-	-	-	-30.0	-	-	-	-	-	-	
2156.00	60.0	52.2	-45.5	-52.4	4.0	10.7	0.0	-40.9	-47.8	-30.0	10.9	17.8	123	132	114	178	
2695.00	64.9	58.5	-40.8	-46.1	4.5	10.8	0.0	-36.6	-41.9	-30.0	6.6	11.9	100	323	117	93	
3234.00	55.3	52.7	-51.4	-52.2	4.9	11.3	0.0	-47.2	-48.0	-30.0	17.2	18.0	119	58	129	226	
3773.00	46.3	47.6	-56.6	-55.7	5.3	11.7	0.0	-52.3	-51.4	-30.0	22.3	21.4	120	283	151	121	
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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Field strength of spurious radiation

Report No.	12244309H	
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 607.875 MHz	

[Power Setting: High]

Frequency	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. Height [cm]	Turn Table [deg.]	Rx Ant. Height [cm]	Turn Table [deg.]	
	HOR	VER	HOR	VER				HOR	VER		HOR	VER					
1215.75	NS	NS	-	-	-	-	-	-	-	-30.0	-	-	-	-	-	-	
1823.63	59.1	55.5	-49.0	-53.7	3.6	9.6	0.0	-45.1	-49.8	-30.0	15.1	19.8	109	38	133	194	
2431.50	52.9	51.6	-53.2	-54.1	4.3	10.8	0.0	-48.9	-49.8	-30.0	18.9	19.8	127	325	114	114	
3039.38	54.1	50.3	-50.1	-55.2	4.7	10.9	0.0	-46.0	-51.1	-30.0	16.0	21.1	113	25	129	267	
3647.25	50.1	51.6	-53.4	-52.2	5.2	11.7	0.0	-49.1	-47.9	-30.0	19.1	17.9	140	31	116	96	
4255.13	NS	NS	-	-	-	-	-	-	-	-30.0	-	-	-	-	-	-	
4863.00	49.4	47.3	-50.0	-52.5	6.1	12.2	0.0	-46.0	-48.5	-30.0	16.0	18.5	116	150	139	242	
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. 12244309H
Test place Ise EMC Lab. No.6 Measurement Room
Date May 7, 2018
Temperature / Humidity 23 deg. C / 51 % RH
Engineer 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	539.000046	0.000046	0.00001	0.005	
40	3.00	539.000	539.000012	0.000012	0.00000	0.005	
30	3.00	539.000	539.000028	0.000028	0.00001	0.005	
20	3.00	539.000	539.000027	0.000027	0.00001	0.005	
10	3.00	539.000	539.000021	0.000021	0.00000	0.005	
0	3.00	539.000	539.000052	0.000052	0.00001	0.005	
-10	3.00	539.000	539.000086	0.000086	0.00002	0.005	
-20	3.00	539.000	539.000077	0.000077	0.00001	0.005	
-30	3.00	539.000	539.000115	0.000115	0.00002	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	3.00	539.000	539.000027	0.000027	0.00001	0.005	Nominal
20	2.16	539.000	539.000035	0.000035	0.00001	0.005	Battery End Point

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

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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	141392	Microwave Cable	Junkosha	MWX221	1604S253(1 m) / 1608S087(5 m)	8/4/2017	8/31/2018	12
RE	141579	Pre Amplifier	AGILENT	8449B	3008A02142	1/23/2018	1/31/2019	12
RE	141556	Thermo-Hygrometer	CUSTOM	CTH-201	0003	12/21/2017	12/31/2018	12
RE	141297	High Pass Filter (1.1-10GHz)	TOKYO KEIKI	TF219CD1	1001	1/18/2018	1/31/2019	12
RE	141896	Signal Generator	Rohde & Schwarz	SMR40	100137	6/7/2018	6/30/2019	12
RE	141542	Digital Tester	Fluke Corporation	FLUKE 26-3	78030611	8/7/2017	8/31/2018	12
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	142004	AC2 Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-06902	8/31/2017	8/31/2018	12
RE	141512	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	254	2/25/2018	2/28/2019	12
RE	141152	EMI measurement program	TSJ	TEPTO-DV	-	-	-	-
RE	141507	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	258	5/21/2017	5/31/2018 *1)	12
RE	142182	Measure	KOMELON	KMC-36	-	-	-	-
RE	141203	Attenuator(6dB)	Weinschel Corp	2	BK7970	11/14/2017	11/30/2018	12
RE	141427	Biconical Antenna	Schwarzbeck	VHA9103B	8031	9/13/2017	9/30/2018	12
RE	141317	Coaxial Cable	Fujikura/Agilent	-	-	2/23/2018	2/28/2019	12
RE	141265	Logperiodic Antenna (200-1000MHz)	Schwarzbeck	VUSLP9111B	911B-190	12/10/2017	12/31/2018	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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