

FCC Test Report

Product Name	10.7MHz Communication Unit
Model No.	EFC-TIDA-R1
FCC ID.	2AM4X-EFC-TIDA-R1

Applicant	Panasonic Corporation
Address	1006 Kadoma, Kadoma City, Osaka 571-8506, Japan

Date of Receipt	Mar. 13, 2018
Issued Date	Mar. 23, 2018
Report No.	1830170R-RFUSP20V00
Report Version	V1.0



The test results relate only to the samples tested.

The test results shown in the test report are traceable to the national/international standard through the calibration report of the equipment and evaluated measurement uncertainty herein.

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Test Report

Issued Date: Mar. 23, 2018

Report No.: 1830170R-RFUSP20V00



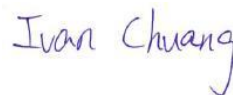
Product Name	10.7MHz Communication Unit
Applicant	Panasonic Corporation
Address	1006 Kadoma, Kadoma City, Osaka 571-8506, Japan
Manufacturer	Panasonic Corporation
Model No.	EFC-TIDA-R1
FCC ID.	2AM4X-EFC-TIDA-R1
EUT Rated Voltage	DC 5V (Power by USB) or DC 3.8V (Power by Battery)
EUT Test Voltage	DC 5V (Power by USB)
Trade Name	Panasonic
Applicable Standard	FCC CFR Title 47 Part 15 Subpart C: 2017 ANSI C63.4: 2014, ANSI C63.10: 2013
Test Result	Complied

Documented By :



(Senior Adm. Specialist / Joanne Lin)

Tested By :



(Senior Engineer / Ivan Chuang)

Approved By :



(Director / Vincent Lin)

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1. GENERAL INFORMATION

1.1. EUT Description

Product Name	10.7MHz Communication Unit
Trade Name	Panasonic
Model No.	EFC-TIDA-R1
FCC ID.	2AM4X-EFC-TIDA-R1
Frequency Range	10.7MHz
Type of Modulation	ASK
Type of antenna	Case-attached metal flat type
Number of Channel	1

Frequency of Each Channel:

Channel	Frequency
1	10.7MHz

Note:

1. The EUT is a 10.7MHz Communication Unit with a built-in 10.7MHz transceiver.
2. The device has only one antenna connected by two metal sheets to increase the transmission area.
3. These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 15 Subpart C Paragraph 15.209.
4. The radiation measurements are performed in X, Y, Z axis positioning. Only the worst case is shown in the report.

Test Mode	Mode 1: Transmit
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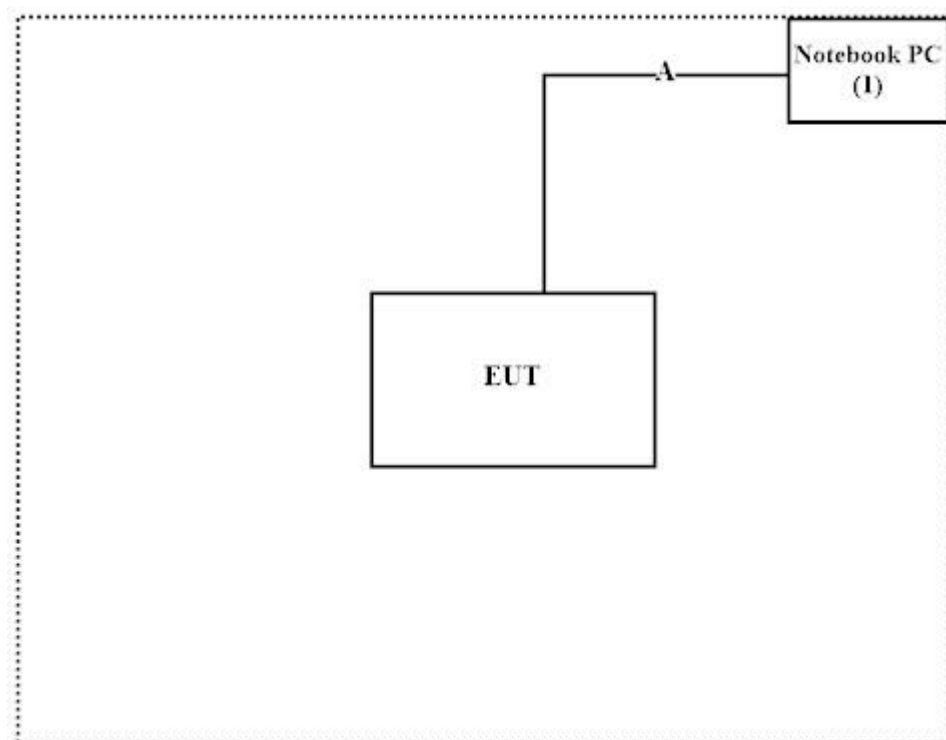
1.3. Test System Details

The types for all equipment, plus descriptions of all cables used in the tested system (including inserted cards) are:

Product	Manufacturer	Model No.	Serial No.	Power Cord
(1) Notebook PC	DELL	P62G	CY9FJC2	N/A

Signal Cable Type	Signal cable Description
A USB Cable	Non-Shielded, 0.3m

1.4. Configuration of Test System



1.5. EUT Exercise Software

- (1) Setup the EUT as shown in Section 1.4
- (2) Press the button of EUT.
- (3) Start the continuous transmitter.
- (4) Verify that the EUT works properly.

1.6. Test Facility

Ambient conditions in the laboratory:

Items	Required (IEC 68-1)	Actual
Temperature (°C)	15-35	20-35
Humidity (%RH)	25-75	50-65
Barometric pressure (mbar)	860-1060	950-1000

The related certificate for our laboratories about the test site and management system can be downloaded from DEKRA Testing and Certification Co., Ltd. Web Site:

<http://www.dekra.com.tw/english/about/certificates.aspx?bval=5>

The address and introduction of DEKRA Testing and Certification Co., Ltd. laboratories can be founded in our Web site: http://www.dekra.com.tw/index_en

Site Description: Accredited by TAF
Accredited Number: 3023

Site Name: DEKRA Testing and Certification Co., Ltd.
Site Address: No.159, Sec. 2, Wenhua 1st Rd., Linkou Dist.,
New Taipei City 24457, Taiwan.
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E-Mail : info.tw@dekra.com

FCC Accreditation Number: TW3023

1.7. List of Test Equipment

For Conduction measurements /ASR1

	Equipment	Manufacturer	Model No.	Serial No.	Cali. Data	Due. Data
X	EMI Test Receiver	R&S	ESR7	101601	2018.02.08	2019.02.07
X	Two-Line V-Network	R&S	ENV216	101306	2018.03.09	2019.03.08
X	Two-Line V-Network	R&S	ENV216	101307	2018.03.20	2019.03.19
X	Coaxial Cable	Quietek	RG400_BNC	RF001	2017.05.24	2018.05.23

Note:

1. All equipments are calibrated every one year.
2. The test instruments marked with “X” are used to measure the final test results.
3. Test Software version : QuieTek EMI 2.0 V2.1.113

For Radiated measurements /ACB1

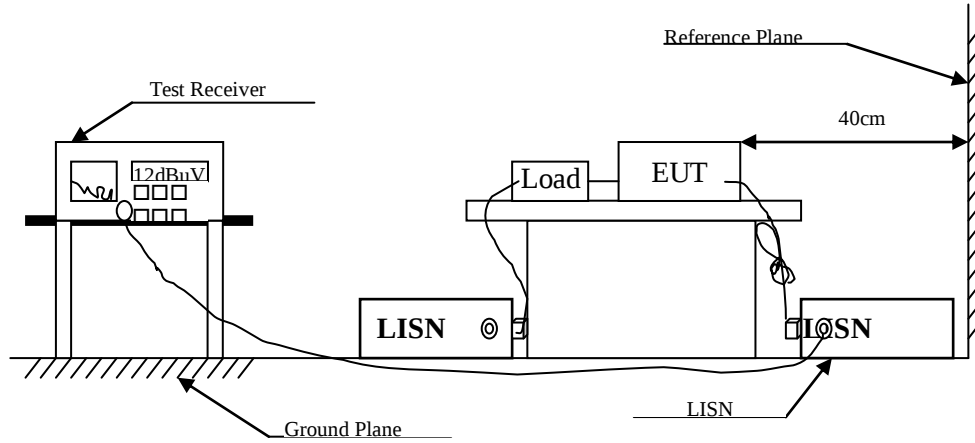
	Equipment	Manufacturer	Model No.	Serial No.	Cali. Data	Due. Data
X	Loop Antenna	AMETEK	HLA6121	49611	2018.01.26	2019.01.25
X	Bi-Log Antenna	SCHWARZBECK	VULB9168	9168-675	2017.06.01	2018.05.31
	Horn Antenna	ETS-Lindgren	3117	00203800	2017.11.10	2018.11.09
	Horn Antenna	Com-Power	AH-840	101087	2017.05.24	2018.05.23
X	Pre-Amplifier	EMCI	EMC001330	980316	2017.05.16	2018.05.15
	Pre-Amplifier	EMCI	EMC051835SE	980311	2017.05.17	2018.05.16
	Pre-Amplifier	EMCI	EMC05820SE	980310	2017.05.17	2018.05.16
	Pre-Amplifier	EMCI	EMC184045SE	980314	2017.05.17	2018.05.16
	Filter	MICRO TRONICS	BRM50702	G251	2017.08.30	2018.08.29
	Filter	MICRO TRONICS	BRM50716	G188	2017.08.30	2018.08.29
X	EMI Test Receiver	R&S	ESR7	101602	2017.12.11	2018.12.10
X	Spectrum Analyzer	R&S	FSV40	101148	2018.02.08	2019.02.07
X	Coaxial Cable	SUHNER	SUCOFLEX 106	RF002	2017.05.25	2018.05.24
	Mircoflex Cable	HUBER SUHNER	SUCOFLEX 102	MY3381/2	2017.08.11	2018.08.10

Note:

1. All equipments are calibrated every one year.
2. The test instruments marked with “X” are used to measure the final test results.
3. Test Software version : QuieTek EMI 2.0 V2.1.113

2. Conducted Emission

2.1. Test Setup



2.2. Limits

FCC Part 15 Subpart C Paragraph 15.207 (dB μ V) Limit		
Frequency MHz	Limits	
	QP	AV
0.15 - 0.50	66-56 _(註)	56-46 _(註)
0.50-5.0	56	46
5.0 - 30	60	50

2.3. Test Procedure

The EUT and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50 ohm /50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm /50uH coupling impedance with 50ohm termination. (Please refers to the block diagram of the test setup and photographs.)

Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.4: 2014 on conducted measurement.

Conducted emissions were investigated over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9kHz.

2.4. Uncertainty

± 2.35 dB

2.5. Test Result of Conducted Emission

Product : 10.7MHz Communication Unit
 Test Item : Conducted Emission Test
 Power Line : Line 1
 Test date : 2018/03/15
 Test Mode : Mode 1: Transmit

Frequency	Correct	Reading	Measurement	Margin	Limit
MHz	Factor	Level	Level		
	dB	dB μ V	dB μ V	dB	dB μ V
LINE 1					
Quasi-Peak					
0.154	9.622	35.723	45.344	-20.542	65.886
0.370	9.691	31.248	40.939	-18.775	59.714
0.450	9.696	29.336	39.033	-18.396	57.429
2.400	9.764	16.875	26.639	-29.361	56.000
7.800	9.895	17.582	27.477	-32.523	60.000
20.000	10.070	22.632	32.702	-27.298	60.000
Average					
0.154	9.622	10.775	20.396	-35.490	55.886
0.370	9.691	17.135	26.826	-22.888	49.714
0.450	9.696	13.702	23.398	-24.031	47.429
2.400	9.764	5.511	15.275	-30.725	46.000
7.800	9.895	7.145	17.040	-32.960	50.000
20.000	10.070	16.564	26.634	-23.366	50.000

Note:

1. All Reading Levels are Quasi-Peak and average value.
2. “” means the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

Product : 10.7MHz Communication Unit
 Test Item : Conducted Emission Test
 Power Line : Line 2
 Test date : 2018/03/15
 Test Mode : Mode 1: Transmit

Frequency	Correct	Reading	Measurement	Margin	Limit
MHz	Factor	Level	Level		
	dB	dB μ V	dB μ V	dB	dB μ V
LINE 2					
Quasi-Peak					
0.157	9.618	34.112	43.730	-22.070	65.800
0.310	9.684	28.032	37.716	-23.713	61.429
0.440	9.688	29.923	39.611	-18.103	57.714
0.560	9.693	26.210	35.902	-20.098	56.000
2.400	9.764	16.949	26.713	-29.287	56.000
19.320	10.080	22.776	32.856	-27.144	60.000
Average					
0.157	9.618	11.399	21.016	-34.784	55.800
0.310	9.684	14.885	24.569	-26.860	51.429
0.440	9.688	12.837	22.525	-25.189	47.714
0.560	9.693	10.906	20.599	-25.401	46.000
2.400	9.764	5.347	15.111	-30.889	46.000
19.320	10.080	16.648	26.728	-23.272	50.000

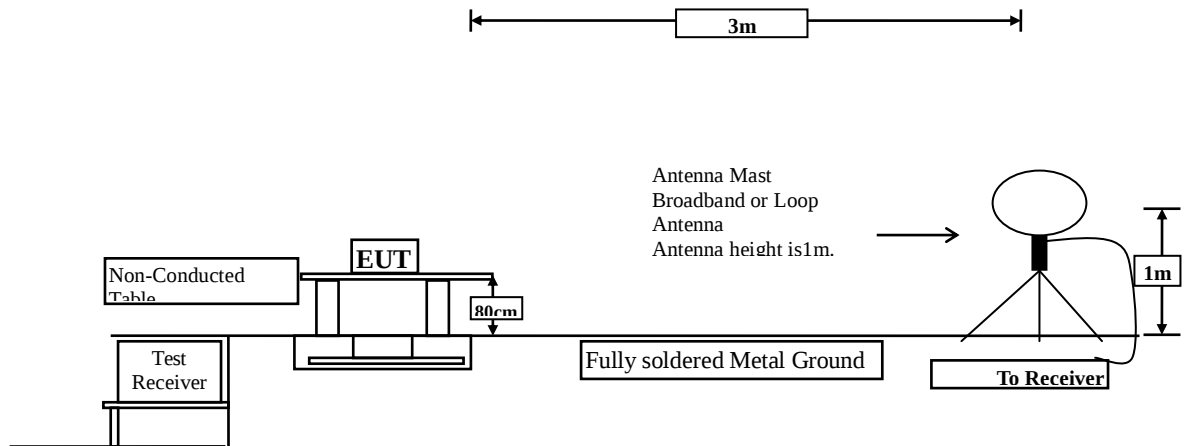
Note:

1. All Reading Levels are Quasi-Peak and average value.
2. “” means the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

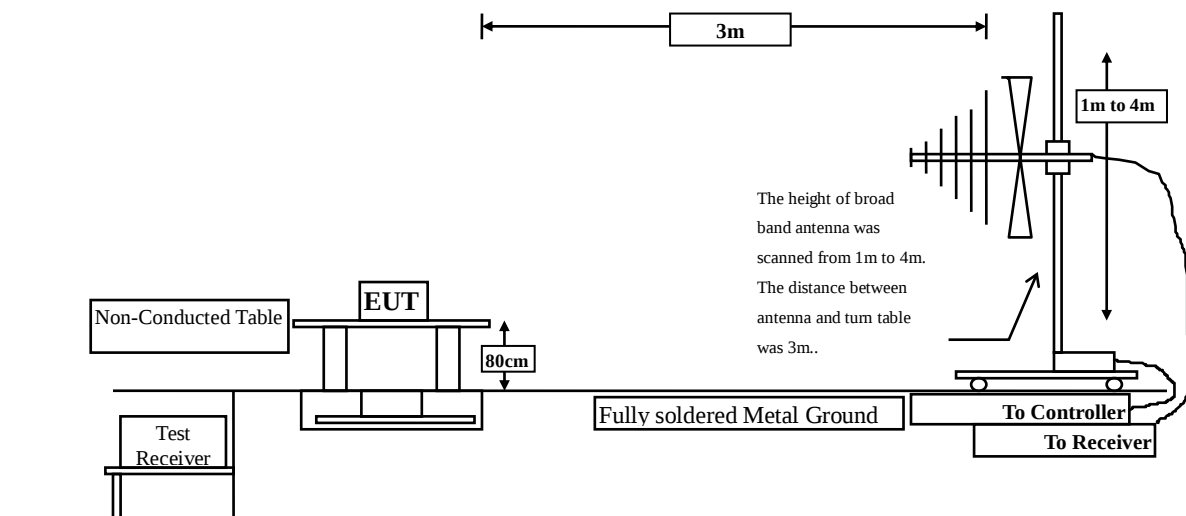
3. Radiated Emission

3.1. Test Setup

Radiated Emission Under 30MHz



Radiated Emission Below 1GHz



3.2. Limits

FCC Part 15 Subpart C Paragraph 15.209 Limits		
Frequency MHz	Field strength (microvolts/meter)	Measurement distance (meter)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

- Remarks :
1. RF Voltage (dB μ V) = 20 log RF Voltage (uV)
 2. In the Above Table, the tighter limit applies at the band edges.
 3. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.

3.3. Test Procedure

The EUT was setup according to ANSI C63.10, 2013 and tested compliance to FCC 47CFR 15.209 requirements.

The EUT and its simulators are placed on a turn table which is 0.8 meter above ground. The turn table can rotate 360 degrees to determine the position of the maximum emission level. The EUT was positioned such that the distance from antenna to the EUT was 3 meters.

The antenna can move up and down between 1 meter and 4 meters to find out the maximum emission level.

Both horizontal and vertical polarization of the antenna are set on measurement. In order to find the maximum emission, all of the interface cables must be manipulated according to ANSI C63.10: 2013 on radiated measurement.

The resolution bandwidth below 1GHz setting on the field strength meter is 120 kHz and above 1GHz is 1MHz. Radiated emission measurements below 1GHz are made using broadband Bilog antenna and above 1GHz are made using Horn Antennas.

The measurement is divided into the Preliminary Measurement and the Final Measurement.

The suspected frequencies are searched for in Preliminary Measurement with the measurement antenna kept pointed at the source of the emission both in azimuth and elevation, with the polarization of the antenna oriented for maximum response. The antenna is pointed at an angle towards the source of the emission, and the EUT is rotated in both height and polarization to maximize the measured emission. The emission is kept within the illumination area of the 3 dB bandwidth of the antenna.

The worst radiated emission is measured on the Final Measurement.

The measurement frequency range from 9kHz - 10th Harmonic of fundamental was investigated.

3.4. Uncertainty

Horizontal :

30-300MHz: $\pm 4.08\text{dB}$; 300M-1GHz: $\pm 3.86\text{dB}$ °

Vertical :

30-300MHz: $\pm 4.81\text{dB}$; 300M-1GHz: $\pm 3.87\text{dB}$ °

3.5. Test Result of Radiated Emission

Product : 10.7MHz Communication Unit
 Test Item : Radiated Emission
 Test date : 2018/03/16
 Test Mode : Mode 1: Transmit

Fundamental

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dB μ V	dB μ V/m	dB	dB μ V/m
Quasi-Peak					
X-axis					
Horizontal					
10.700	20.542	22.620	43.162	-26.378	69.540
Vertical					
10.700	20.542	29.830	50.372	-19.168	69.540
Y-axis					
Horizontal					
10.700	20.542	24.820	45.362	-24.178	69.540
Vertical					
10.700	20.542	29.100	49.642	-19.898	69.540
Z-axis					
Horizontal					
10.700	20.542	24.720	45.262	-24.278	69.540
Vertical					
10.700	20.542	30.020	50.562	-18.978	69.540

Note:

1. The reading levels below 1GHz are quasi-peak values.
2. Measurement Level = Reading Level + Correct Factor.

Product : 10.7MHz Communication Unit
 Test Item : Radiated Emission
 Test date : 2018/03/16
 Test Mode : Mode 1: Transmit

9kHz~30MHz

Frequency	Correct	Reading	Measurement	Margin	Limit
	Factor	Level	Level		
MHz	dB	dBμV	dBμV/m	dB	dBμV/m
Quasi-Peak					
Horizontal					
21.400	20.308	24.300	44.608	-24.932	69.540
Vertical					
21.400	20.308	30.120	50.428	-19.112	69.540

Note:

1. The reading levels below 1GHz are quasi-peak values.
2. “ ” means the worst emission level.
3. Measurement Level = Reading Level + Correct Factor.
4. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product : 10.7MHz Communication Unit
 Test Item : General Radiated Emission
 Test date : 2018/03/16
 Test Mode : Mode 1: Transmit

30MHz~1GHz

Frequency	Correct	Reading	Measurement	Margin	Limit
MHz	Factor	Level	Level		
	dB	dB μ V	dB μ V/m	dB	dB μ V/m
Quasi-Peak					
Horizontal					
79.203	-15.137	36.519	21.382	-18.618	40.000
135.435	-11.423	29.349	17.926	-25.574	43.500
202.913	-13.362	39.297	25.935	-17.565	43.500
263.362	-11.221	36.627	25.406	-20.594	46.000
311.159	-9.650	37.748	28.098	-17.902	46.000
349.116	-8.776	34.396	25.620	-20.380	46.000
Vertical					
42.652	-10.960	31.602	20.642	-19.358	40.000
107.319	-14.581	35.064	20.483	-23.017	43.500
160.739	-10.462	30.586	20.125	-23.375	43.500
198.696	-13.469	33.719	20.249	-23.251	43.500
266.174	-11.074	29.670	18.596	-27.404	46.000
312.565	-9.618	30.542	20.923	-25.077	46.000

Note:

1. The reading levels below 1GHz are quasi-peak values.
2. “ ” means the worst emission level.
3. Measurement Level = Reading Level + Correct Factor.
4. The emission levels of other frequencies are very lower than the limit and not show in test report.

4. EMI Reduction Method During Compliance Testing

No modification was made during testing.