



EMI TEST REPORT

Test Report No. : 33BE0309-HO-01-R2

Applicant : DENSO CORPORATION
Type of Equipment : Tire Pressure Monitoring System (Receiver)
Model No. : 13BDY
FCC ID : HYQ13BDY
Test regulation : FCC Part 15 Subpart B: 2012
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 limits of the above regulation.
4. The test results in this test report are traceable to the national or international standards.
5. This test report must not be used by the customer to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.
6. This report is a revised version of 33BE0309-HO-01-R1. 33BE0309-HO-01-R1 is replaced with this report.

Date of test: October 31, 2012

Representative test engineer:

H. Kukita

Hiroshi Kukita
Engineer of WiSE Japan,
UL Verification Service

Approved by:

T. Hatakeda

Takahiro Hatakeda
Leader of WiSE Japan,
UL Verification Service



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<http://www.ul.com/japan/jpn/pages/services/emc/about/mar1/index.jsp#nvlap>

UL Japan, Inc.

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13-EM-F0429

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SECTION 1: Customer information

Company Name : DENSO CORPORATION
Address : 1-1 Showa-cho, Kariya-shi, Aichi-ken, 448-8661 Japan
Telephone Number : +81-566-20-3953
Facsimile Number : +81-566-25-4792
Contact Person : Masashi Urabe

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

2.1 Identification of E.U.T.

Type of Equipment : Tire Pressure Monitoring System (Receiver)
Model No. : 13BDY
Serial No. : Refer to Section 4, Clause 4.2
Receipt Date of Sample : October 26, 2012
Country of Mass-production : Japan
Condition of EUT : Engineering prototype
(Not for Sale: This sample is equivalent to mass-produced items.)
Modification of EUT : No Modification by the test lab

2.2 Product Description

Model No: 13BDY (referred to as the EUT in this report) is the Tire Pressure Monitoring System (Receiver).
13BDY has variations owing to antenna matching in ANT1.
For details of variations, see "Theory of Operation".

Feature of EUT : Tire Pressure Monitoring System is used for monitoring and indicating information of air pressure in vehicle's tires.
Transmitter sends receiver the data that are information of air pressure in vehicle's tire.
The data also include temperature, battery voltage and identity code of transmitter.
The receiver judges the data.
If the data of air pressure and others are not normal condition, the receiver sends signal to a warning lamp.
Then, the warning lamp warns drivers.

The receiver is installed inside the vehicle.
The ANT1 is installed inside the Receiver. The ANT2 is installed inside the Wheel House.

Type of receiving system : Super-heterodyne
Frequency of Operation : 314.98MHz
Oscillator Frequency : 38.035MHz (Crystal)
Intermediate frequency : 10.7MHz
Type of Modulation : FSK (F1D)
Power Supply : DC12.0V
Antenna Type : ANT1: Internal antenna (Inverse F antenna)
ANT2: External antenna (Wheel House antenna)

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SECTION 3: Test specification, procedures & results

3.1 Test specification

Test Specification : Test specification: FCC Part 15 Subpart C: 2012, final revised on August 13, 2012 and effective September 12, 2012

Title : FCC 47CFR Part15 Radio Frequency Device
Subpart B Unintentional Radiators

3.2 Procedures and results

Item	Test Procedure	Limits	Deviation	Worst margin	Result
Conducted emission	FCC: ANSI C63.4: 2003 7. AC powerline conducted emission measurements	FCC:Part 15 Subpart B 15.107(a)	N/A *1)	N/A	N/A
	IC: RSS-Gen 7.2.4	IC: RSS-Gen 7.2.4			
Radiated emission	FCC: ANSI C63.4: 2003 8. Radiated emission measurements	FCC: Part 15 Subpart B 15.109(a)	N/A	20.6dB 383.997MHz Horizontal, QP	Complied
	IC: RSS-Gen 4.10	IC: RSS-Gen 6.1			
Antenna Terminal	FCC: ANSI C63.4: 2003 12. Measurement of unintentional radiators other than ITE	FCC: Part 15 Subpart B 15.111(a)	N/A	30.3dB 1378.000MHz QP	Complied
	IC: RSS-Gen 4.10	IC: RSS-Gen 6.2 *2)			
*Note: UL Japan, Inc's EMI Work Procedure 13-EM-W0420. *1) The test is not applicable since the EUT is not the device that is designed to be connected to the public utility (AC) power line. *2) Above 1GHz, the severer limit of Part 15 Subpart B 15.111(a) was applied for the test.					

3.3 Addition to standard

Other than above, no addition, exclusion nor deviation has been made from the standard.

3.4 Uncertainty

EMI

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

Test room (semi-anechoic chamber)	Radiated emission						
	(3m*)(+dB)				(1m*)(+dB)		(0.5m*)(+dB)
	9kHz -30MHz	30MHz -300MHz	300MHz -1GHz	1GHz -10GHz	10GHz -18GHz	18GHz -26.5GHz	26.5GHz -40GHz
No.1	4.3dB	5.0dB	5.1dB	4.9dB	5.8dB	4.4dB	4.3dB
No.2	4.3dB	5.2dB	5.1dB	5.0dB	5.7dB	4.3dB	4.2dB
No.3	4.6dB	5.0dB	5.1dB	5.0dB	5.7dB	4.5dB	4.2dB
No.4	4.8dB	5.2dB	5.0dB	5.0dB	5.7dB	5.2dB	4.2dB

*3m/1m/0.5m = Measurement distance

Antenna terminal conducted emission and Power density (+dB)			Antenna terminal conducted emission (+dB)	
Below 1GHz	1GHz-3GHz	3GHz-18GHz	18GHz-26.5GHz	26.5GHz-40GHz
1.0dB	1.1dB	2.7dB	3.2dB	3.3dB

Radiated emission test(3m)

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

3.5 Test Location

UL Japan, Inc. Head Office EMC Lab. *NVLAP Lab. code: 200572-0

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

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	FCC Registration Number	IC Registration Number	Width x Depth x Height (m)	Size of reference ground plane (m) / horizontal conducting plane	Other rooms
No.1 semi-anechoic chamber	313583	2973C-1	19.2 x 11.2 x 7.7m	7.0 x 6.0m	No.1 Power source room
No.2 semi-anechoic chamber	655103	2973C-2	7.5 x 5.8 x 5.2m	4.0 x 4.0m	-
No.3 semi-anechoic chamber	148738	2973C-3	12.0 x 8.5 x 5.9m	6.8 x 5.75m	No.3 Preparation room
No.3 shielded room	-	-	4.0 x 6.0 x 2.7m	N/A	-
No.4 semi-anechoic chamber	134570	2973C-4	12.0 x 8.5 x 5.9m	6.8 x 5.75m	No.4 Preparation room
No.4 shielded room	-	-	4.0 x 6.0 x 2.7m	N/A	-
No.5 semi-anechoic chamber	-	-	6.0 x 6.0 x 3.9m	6.0 x 6.0m	-
No.6 shielded room	-	-	4.0 x 4.5 x 2.7m	4.75 x 5.4 m	-
No.6 measurement room	-	-	4.75 x 5.4 x 3.0m	4.75 x 4.15 m	-
No.7 shielded room	-	-	4.7 x 7.5 x 2.7m	4.7 x 7.5m	-
No.8 measurement room	-	-	3.1 x 5.0 x 2.7m	N/A	-
No.9 measurement room	-	-	8.0 x 4.5 x 2.8m	2.0 x 2.0m	-
No.10 measurement room	-	-	2.6 x 2.8 x 2.5m	2.4 x 2.4m	-
No.11 measurement room	-	-	3.1 x 3.4 x 3.0m	2.4 x 3.4m	-

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

3.6 Data of EMI, 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 modes

The mode(s) : 1. TPMS Receiving mode (314.98MHz)

*Tuning was confirmed to be locked on each mode by checking LED of Checker to blink.

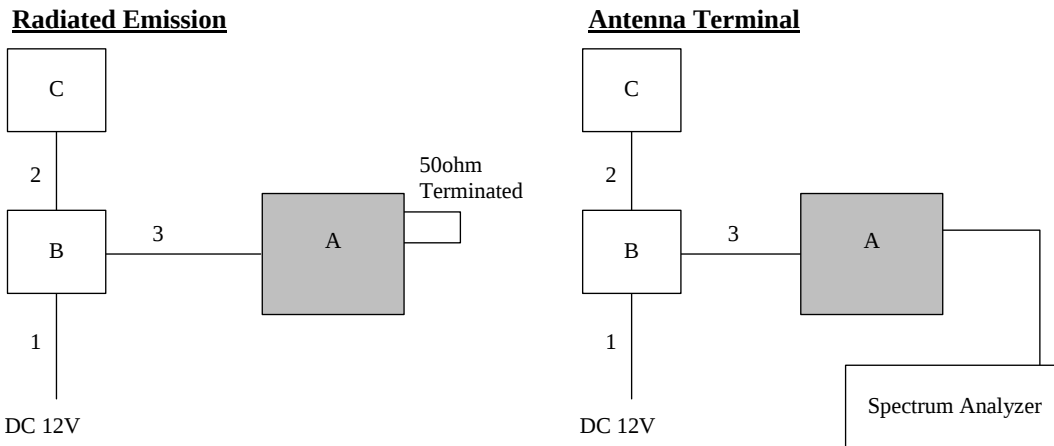
This EUT has models with external antenna connector and without external antenna connector.

In this time, the model with external antenna connector was tested.

As there are many configurations for external antenna and it cannot be specified, 50ohm termination testing was performed during internal antenna variation confirmation.

Also the conducted test of antenna terminal was performed.

4.2 Configuration and peripherals



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

Description of EUT and Support equipment

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	Tire Pressure Monitoring System (Receiver)	13BDY	001 (for Variation No.2) 002 (for Variation No.4) Reference data 003 (for Variation No.6) Reference data 004 (for Variation No.8) Reference data	DENSO CORPORATION	EUT (for Variation No.2)
B	Bench	-	-	DENSO CORPORATION	-
C	Meter (Checker)	-	-	DENSO CORPORATION	-

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	DC Cable	2.4	Unshielded	Unshielded	-
2	Signal Cable Cable	1.0	Unshielded	Unshielded	-
3	Signal Cable	2.8	Unshielded	Unshielded	-

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SECTION 5: Radiated Emission

5.1 Operating environment

Test place : No. 3 semi anechoic chamber
Temperature : See data
Humidity : See data

5.2 Test configuration

EUT was placed on a urethane platform of nominal size, 1.0m by 1.5m, raised 0.8m above the conducting ground plane. The EUT was set on the edge of the tabletop.
Test was made with the antenna positioned in both the horizontal and vertical planes of polarization. The measurement antenna was varied in height above the conducting ground plane to obtain the maximum signal strength. Photographs of the set up are shown in Appendix 3.

5.3 Test conditions

Frequency range : 30MHz-300MHz (Biconical antenna) / 300MHz-1000MHz (Logperiodic antenna)
1000MHz -2000MHz (Horn antenna)
Test distance : 3m
EUT position : Table top
EUT operation mode : See Clause 4.1

5.4 Test procedure

The height of the measuring antenna varied between 1 and 4m and EUT was rotated a full revolution in order to obtain the maximum value of the electric field intensity.
The measurements were performed for both vertical and horizontal antenna polarization with the Test Receiver, or the Spectrum Analyzer.
The radiated emission measurements were made with the following detector function of the test receiver and the Spectrum analyzer.

Frequency	Below 1GHz	Above 1GHz
Instrument used	Test Receiver	Spectrum Analyzer *1)
IF Bandwidth	QP: BW 120kHz	PK: RBW:1MHz/VBW: 3MHz AV *2): RBW:1MHz/VBW:10Hz

*1) The Spectrum Analyzer was used in 3dB resolution bandwidth.

*2) When using Spectrum analyzer, the test was made with adjusting span to zero by using peak hold.

- The 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.

5.5 Test result

Summary of the test results: Pass

Date: October 31, 2012

Test engineer: Hiroshi Kukita

UL Japan, Inc.

Head Office EMC Lab.

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SECTION 6: Antenna Terminal

6.1 Operating environment

Test place : No. 3 semi anechoic chamber
Temperature : See data
Humidity : See data

6.2 Test configuration

EUT was placed on a wooden table of nominal size, 1.0m by 1.5m, raised 0.8m from the ground.

6.3 Test conditions

Frequency range : 30MHz-1000MHz / 1000MHz-2000MHz
Test distance : N/A
EUT position : Table top
EUT operation mode : See Clause 4.1

6.4 Test procedure

The Antenna Terminal was measured with a spectrum analyzer connected to the antenna port.

Frequency	Below 1GHz	Above 1GHz
Instrument used	Spectrum Analyzer	Spectrum Analyzer *1)
IF Bandwidth	PK: RBW:100kHz/VBW: 300kHz	PK: RBW:1MHz/VBW: 3MHz

*1) The Spectrum Analyzer was used in 3dB resolution bandwidth.

6.5 Test result

Summary of the test results: Pass

Date: October 31, 2012

Test engineer: Hiroshi Kukita

APPENDIX 1: Data of EMI test

Radiated Emission Below 1GHz: Variation No. 2

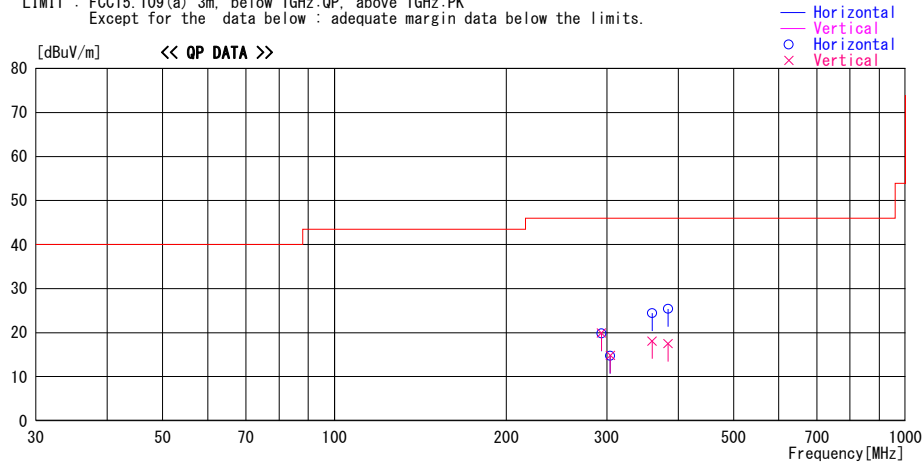
DATA OF RADIATED EMISSION TEST

UL Japan, Inc. Head Office EMC Lab. No.3 Semi Anechoic Chamber
Date : 2012/10/31

Report No. : 33BE0309-HO-01
Temp./Humi. : 21deg. C / 45% RH
Engineer : Hiroshi Kukita

Mode / Remarks : Rx 314.98MHz, Worst axis Hor:X axis, Ver:X axis

LIMIT : FCC15.109(a) 3m, below 1GHz:QP, above 1GHz:PK
Except for the data below : adequate margin data below the limits.



Frequency [MHz]	Reading [dBuV]	DET	Antenna		Level [dBuV/m]	Angle [Deg]	Height [cm]	Polar.	Limit [dBuV/m]	Margin [dB]	Comment
			Factor [dB/m]	Loss & Gain [dB]							
293.580	22.4	QP	19.7	-22.2	19.9	2	100	Vert.	46.0	26.1	
293.580	22.3	QP	19.7	-22.2	19.8	255	400	Hori.	46.0	26.2	
304.280	22.1	QP	14.7	-22.1	14.7	148	100	Hori.	46.0	31.3	
304.280	22.2	QP	14.7	-22.1	14.8	258	100	Vert.	46.0	31.2	
359.998	23.5	QP	16.3	-21.7	18.1	258	100	Vert.	46.0	27.9	
359.998	29.8	QP	16.3	-21.7	24.4	187	100	Hori.	46.0	21.6	
383.997	29.9	QP	17.0	-21.5	25.4	335	100	Hori.	46.0	20.6	
383.997	22.0	QP	17.0	-21.5	17.5	232	200	Vert.	46.0	28.5	

CHART: WITH FACTOR ANT TYPE: -30MHz: LOOP, 30-300MHz: BICONICAL, 300MHz-1000MHz: LOGPERIODIC, 1000MHz-: HORN
CALCULATION: RESULT = READING + ANT FACTOR + LOSS (CABLE+ATTEN.) - GAIN (AMP)

*The limit is rounded down to one decimal place.

*The test result is rounded off to one or two decimal places, so some differences might be observed.

Radiated Emission Above 1GHz: Variation No. 2

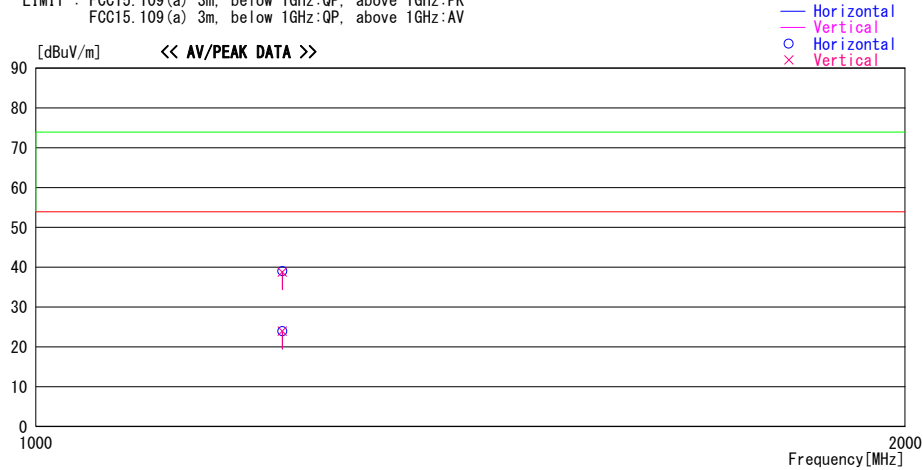
DATA OF RADIATED EMISSION TEST

UL Japan, Inc. Head Office EMC Lab. No.3 Semi Anechoic Chamber
Date : 2012/10/31

Report No. : 33BE0309-HO-01
Temp./Humi. : 21deg. C / 45% RH
Engineer : Hiroshi Kukita

Mode / Remarks : Rx 314.98MHz, Worst axis Hor:X axis, Ver:X axis

LIMIT : FCC15.109(a) 3m, below 1GHz:QP, above 1GHz:PK
FCC15.109(a) 3m, below 1GHz:QP, above 1GHz:AV



Frequency	Reading	DET	Antenna	Loss&	Level	Angle	Height	Polar.	Limit	Margin	Comment
			Factor	Gain							
[MHz]	[dBuV]		[dB/m]	[dB]	[dBuV/m]	[Deg]	[cm]		[dBuV/m]	[dB]	
1217.120	46.9	PK	24.6	-32.7	38.8	111	100	Vert.	73.9	35.1	
1217.120	32.1	AV	24.6	-32.7	24.0	169	100	Vert.	53.9	29.9	
1217.120	47.1	PK	24.6	-32.7	39.0	169	100	Hori.	73.9	34.9	
1217.120	32.0	AV	24.6	-32.7	23.9	111	100	Hori.	53.9	30.0	

CHART:WITH FACTOR ANT TYPE: -30MHz:LOOP, 30-300MHz:BICONICAL, 300MHz-1000MHz:LOGPERIODIC, 1000MHz-:HORN
CALCULATION:RESULT = READING + ANT FACTOR + LOSS (CABLE+ATTEN.) - GAIN (AMP)

*The limit is rounded down to one decimal place.
*The test result is rounded off to one or two decimal places, so some differences might be observed.
* Except for the data below: adequate margin data below the limits.

Radiated Emission
Below 1GHz: Variation No. 4
(Reference data)

DATA OF RADIATED EMISSION TEST

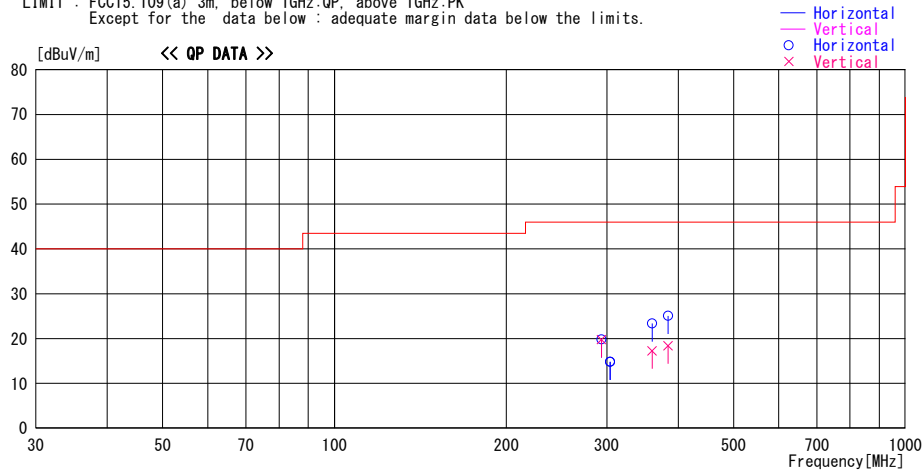
UL Japan, Inc. Head Office EMC Lab. No.3 Semi Anechoic Chamber
Date : 2012/10/31

Report No. : 33BE0309-HO-01

Temp./Humi. : 21deg. C / 45% RH
Engineer : Hiroshi Kukita

Mode / Remarks : Rx 314.98MHz, Worst axis Hor:X axis, Ver:X axis

LIMIT : FCC15.109(a) 3m, below 1GHz:QP, above 1GHz:PK
Except for the data below : adequate margin data below the limits.



Frequency [MHz]	Reading [dBuV]	DET	Antenna	Loss&	Level [dBuV/m]	Angle [Deg]	Height [cm]	Polar.	Limit [dBuV/m]	Margin [dB]	Comment
			Factor [dB/m]	Gain [dB]							
293.580	22.3	QP	19.7	-22.2	19.8	0	400	Hori.	46.0	26.2	
293.580	22.3	QP	19.7	-22.2	19.8	0	100	Vert.	46.0	26.2	
304.280	22.2	QP	14.7	-22.1	14.8	0	100	Hori.	46.0	31.2	
304.280	22.2	QP	14.7	-22.1	14.8	0	100	Hori.	46.0	31.2	
359.997	28.8	QP	16.3	-21.7	23.4	0	100	Hori.	46.0	22.6	
359.999	22.7	QP	16.3	-21.7	17.3	0	100	Vert.	46.0	28.7	
383.997	29.6	QP	17.0	-21.5	25.1	335	100	Hori.	46.0	20.9	
383.998	22.9	QP	17.0	-21.5	18.4	359	200	Vert.	46.0	27.6	

CHART:WITH FACTOR ANT TYPE: -30MHz:LOOP, 30-300MHz:BICONICAL, 300MHz-1000MHz:LOGPERIODIC, 1000MHz-:HORN
CALCULATION:RESULT = READING + ANT FACTOR + LOSS(CABLE+ATTEN.) - GAIN(AMP)

*The limit is rounded down to one decimal place.

*The test result is rounded off to one or two decimal places, so some differences might be observed.

Radiated Emission
Above 1GHz: Variation No. 4
(Reference data)

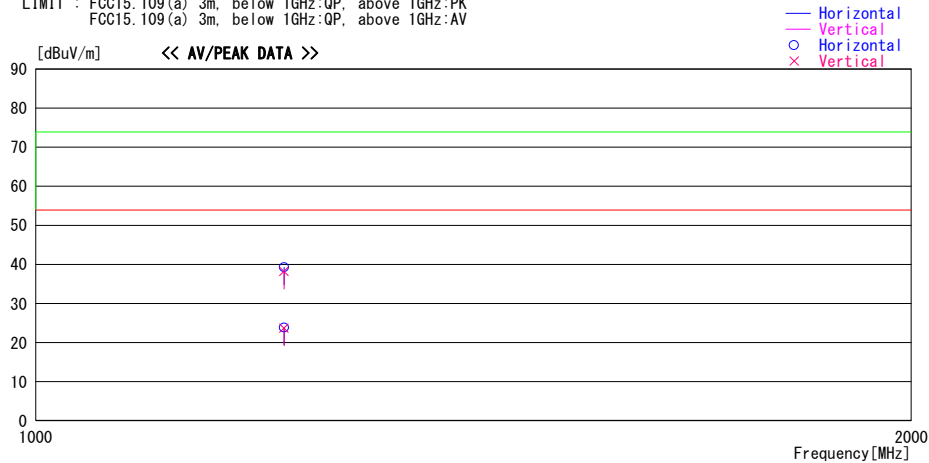
DATA OF RADIATED EMISSION TEST

UL Japan, Inc. Head Office EMC Lab. No.3 Semi Anechoic Chamber
Date : 2012/10/31

Report No. : 33BE0309-HO-01
Temp./Humi. : 21deg. C / 45% RH
Engineer : Hiroshi Kukita

Mode / Remarks : Rx 314.98MHz, Worst axis Hor:X axis, Ver:X axis

LIMIT : FCC15.109(a) 3m, below 1GHz:QP, above 1GHz:PK
FCC15.109(a) 3m, below 1GHz:QP, above 1GHz:AV



Frequency	Reading	DET	Antenna Factor	Loss& Gain	Level	Angle	Height	Polar.	Limit	Margin	Comment
[MHz]	[dBuV]		[dB/m]	[dB]	[dBuV/m]	[Deg]	[cm]		[dBuV/m]	[dB]	
1217.120	46.3	PK	24.6	-32.7	38.2	111	100	Vert.	73.9	35.7	
1217.120	31.8	AV	24.6	-32.7	23.7	169	100	Vert.	53.9	30.2	
1217.120	47.4	PK	24.6	-32.7	39.3	169	100	Hori.	73.9	34.6	
1217.120	31.9	AV	24.6	-32.7	23.8	111	100	Hori.	53.9	30.1	

CHART:WITH FACTOR ANT TYPE: -30MHz:LOOP, 30-300MHz:BICONICAL, 300MHz-1000MHz:LOGPERIODIC, 1000MHz-:HORN
CALCULATION:RESULT = READING + ANT FACTOR + LOSS (CABLE+ATTEN.) - GAIN (AMP)

*The limit is rounded down to one decimal place.
*The test result is rounded off to one or two decimal places, so some differences might be observed.
* Except for the data below: adequate margin data below the limits.

Radiated Emission
Below 1GHz: Variation No. 6
(Reference data)

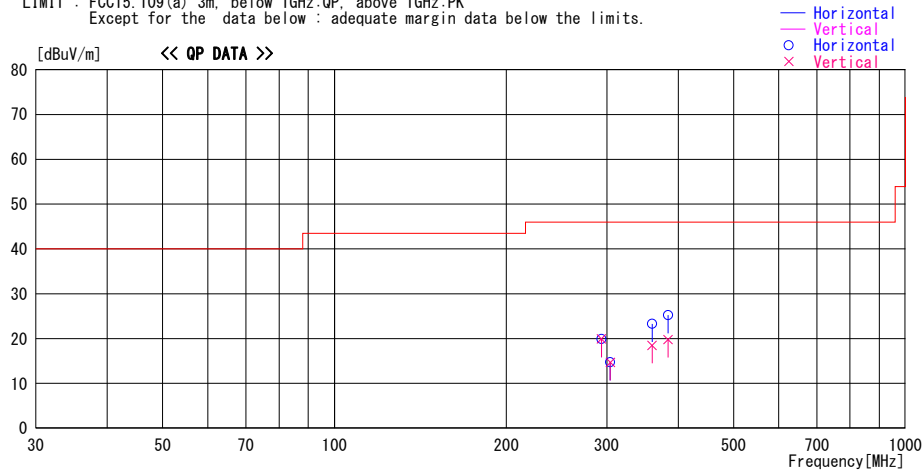
DATA OF RADIATED EMISSION TEST

UL Japan, Inc. Head Office EMC Lab. No.3 Semi Anechoic Chamber
Date : 2012/10/31

Report No. : 33BE0309-HO-01
Temp./Humi. : 21deg. C / 45% RH
Engineer : Hiroshi Kukita

Mode / Remarks : Rx 314.98MHz, Worst axis Hor:X axis, Ver:X axis

LIMIT : FCC15.109(a) 3m, below 1GHz:QP, above 1GHz:PK
Except for the data below : adequate margin data below the limits.



Frequency	Reading	DET	Antenna Factor	Loss & Gain	Level	Angle	Height	Polar.	Limit	Margin	Comment
[MHz]	[dBuV]		[dB/m]	[dB]	[dBuV/m]	[Deg]	[cm]		[dBuV/m]	[dB]	
293.580	22.4	QP	19.7	-22.2	19.9	0	400	Hori.	46.0	26.1	
293.580	22.4	QP	19.7	-22.2	19.9	0	100	Vert.	46.0	26.1	
304.280	22.1	QP	14.7	-22.1	14.7	1	100	Hori.	46.0	31.3	
304.280	22.1	QP	14.7	-22.1	14.7	1	100	Vert.	46.0	31.3	
359.997	28.7	QP	16.3	-21.7	23.3	354	100	Hori.	46.0	22.7	
359.998	23.9	QP	16.3	-21.7	18.5	271	267	Vert.	46.0	27.5	
383.997	29.7	QP	17.0	-21.5	25.2	327	100	Hori.	46.0	20.8	
383.997	24.3	QP	17.0	-21.5	19.8	269	221	Vert.	46.0	26.2	

CHART:WITH FACTOR ANT TYPE: -30MHz:LOOP, 30-300MHz:BICONICAL, 300MHz-1000MHz:LOGPERIODIC, 1000MHz--:HORN
CALCULATION:RESULT = READING + ANT FACTOR + LOSS(CABLE+ATTEN.) - GAIN(AMP)

*The limit is rounded down to one decimal place.

*The test result is rounded off to one or two decimal places, so some differences might be observed.

Radiated Emission
Above 1GHz: Variation No. 6
(Reference data)

DATA OF RADIATED EMISSION TEST

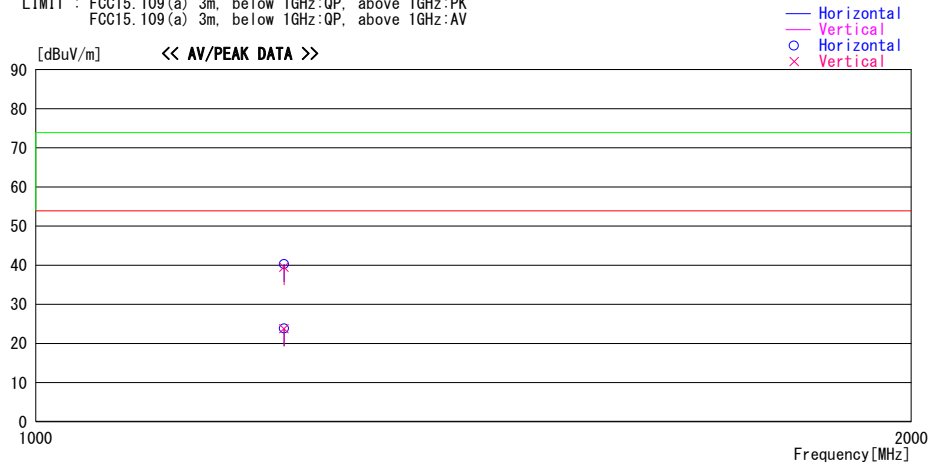
UL Japan, Inc. Head Office EMC Lab. No.3 Semi Anechoic Chamber
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Report No. : 33BE0309-HO-01

Temp./Humi. : 21deg. C / 45% RH
Engineer : Hiroshi Kukita

Mode / Remarks : Rx 314.98MHz, Worst axis Hor:X axis, Ver:X axis

LIMIT : FCC15.109(a) 3m, below 1GHz:QP, above 1GHz:PK
FCC15.109(a) 3m, below 1GHz:QP, above 1GHz:AV



Frequency	Reading	DET	Antenna Factor	Loss& Gain	Level	Angle	Height	Polar.	Limit	Margin	Comment
[MHz]	[dBuV]		[dB/m]	[dB]	[dBuV/m]	[Deg]	[cm]		[dBuV/m]	[dB]	
1217.120	47.6	PK	24.6	-32.7	39.5	123	100	Vert.	73.9	34.4	
1217.120	31.9	AV	24.6	-32.7	23.8	163	100	Vert.	53.9	30.1	
1217.120	48.4	PK	24.6	-32.7	40.3	163	100	Hori.	73.9	33.6	
1217.120	31.9	AV	24.6	-32.7	23.8	126	100	Hori.	53.9	30.1	

CHART:WITH FACTOR ANT TYPE: -30MHz:LOOP, 30-300MHz:BICONICAL, 300MHz-1000MHz:LOGPERIODIC, 1000MHz-:HORN
CALCULATION:RESULT = READING + ANT FACTOR + LOSS(CABLE+ATTEN.) - GAIN(AMP)

*The limit is rounded down to one decimal place.
*The test result is rounded off to one or two decimal places, so some differences might be observed.
* Except for the data below: adequate margin data below the limits.

Radiated Emission
Below 1GHz: Variation No. 8
(Reference data)

DATA OF RADIATED EMISSION TEST

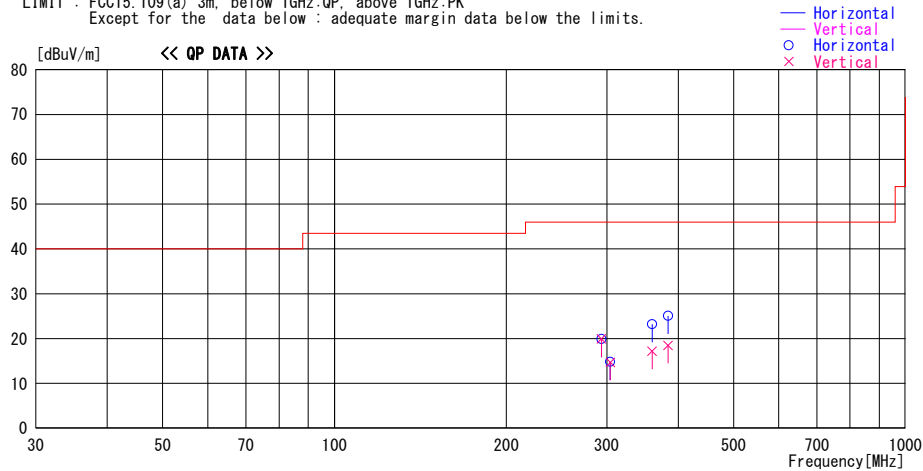
UL Japan, Inc. Head Office EMC Lab. No.3 Semi Anechoic Chamber
Date : 2012/10/31

Report No. : 33BE0309-HO-01

Temp./Humi. : 21deg. C / 45% RH
Engineer : Hiroshi Kukita

Mode / Remarks : Rx 314.98MHz, Worst axis Hor:X axis, Ver:X axis

LIMIT : FCC15.109(a) 3m, below 1GHz:QP, above 1GHz:PK
Except for the data below : adequate margin data below the limits.



Frequency	Reading	DET	Antenna Factor	Loss & Gain	Level	Angle	Height	Polar.	Limit	Margin	Comment
[MHz]	[dBuV]		[dB/m]	[dB]	[dBuV/m]	[Deg]	[cm]		[dBuV/m]	[dB]	
293.580	22.4	QP	19.7	-22.2	19.9	0	400	Hori.	46.0	26.1	
293.580	22.4	QP	19.7	-22.2	19.9	0	100	Vert.	46.0	26.1	
304.280	22.2	QP	14.7	-22.1	14.8	0	100	Hori.	46.0	31.2	
304.280	22.1	QP	14.7	-22.1	14.7	0	100	Vert.	46.0	31.3	
359.997	28.6	QP	16.3	-21.7	23.2	181	100	Hori.	46.0	22.8	
359.999	22.6	QP	16.3	-21.7	17.2	0	100	Vert.	46.0	28.8	
383.997	29.6	QP	17.0	-21.5	25.1	325	100	Hori.	46.0	20.9	
383.998	23.0	QP	17.0	-21.5	18.5	0	200	Vert.	46.0	27.5	

CHART:WITH FACTOR ANT TYPE: -30MHz:LOOP, 30-300MHz:BICONICAL, 300MHz-1000MHz:LOGPERIODIC, 1000MHz--:HORN
CALCULATION:RESULT = READING + ANT FACTOR + LOSS(CABLE+ATTEN.) - GAIN(AMP)

*The limit is rounded down to one decimal place.

*The test result is rounded off to one or two decimal places, so some differences might be observed.

Radiated Emission
Above 1GHz: Variation No. 8
(Reference data)

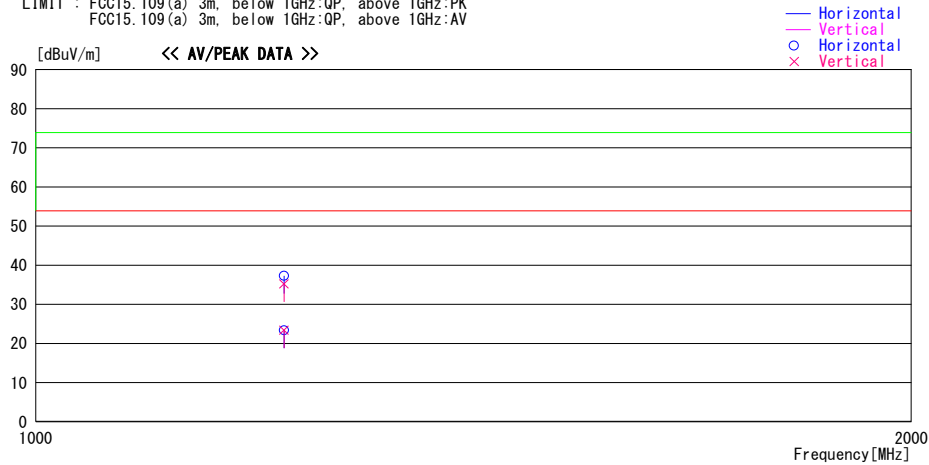
DATA OF RADIATED EMISSION TEST

UL Japan, Inc. Head Office EMC Lab. No.3 Semi Anechoic Chamber
Date : 2012/10/31

Report No. : 33BE0309-HO-01
Temp./Humi. : 21deg. C / 45% RH
Engineer : Hiroshi Kukita

Mode / Remarks : Rx 314.98MHz, Worst axis Hor:X axis, Ver:X axis

LIMIT : FCC15.109(a) 3m, below 1GHz:QP, above 1GHz:PK
FCC15.109(a) 3m, below 1GHz:QP, above 1GHz:AV



Frequency	Reading	DET	Antenna Factor	Loss& Gain	Level	Angle	Height	Polar.	Limit	Margin	Comment
[MHz]	[dBuV]		[dB/m]	[dB]	[dBuV/m]	[Deg]	[cm]		[dBuV/m]	[dB]	
1217.120	45.4	PK	24.6	-32.7	37.3	129	100	Hori.	73.9	36.7	
1217.120	31.5	AV	24.6	-32.7	23.4	137	100	Hori.	53.9	30.5	
1217.120	43.3	PK	24.6	-32.7	35.2	127	100	Vert.	73.9	38.7	
1217.120	31.5	AV	24.6	-32.7	23.4	136	100	Vert.	53.9	30.5	

CHART:WITH FACTOR ANT TYPE: -30MHz:LOOP, 30-300MHz:BICONICAL, 300MHz-1000MHz:LOGPERIODIC, 1000MHz-:HORN
CALCULATION:RESULT = READING + ANT FACTOR + LOSS(CABLE+ATTEN.) - GAIN(AMP)

*The limit is rounded down to one decimal place.
*The test result is rounded off to one or two decimal places, so some differences might be observed.
* Except for the data below: adequate margin data below the limits.

Antenna Terminal Conducted Emission Below 1GHz: Variation No. 2

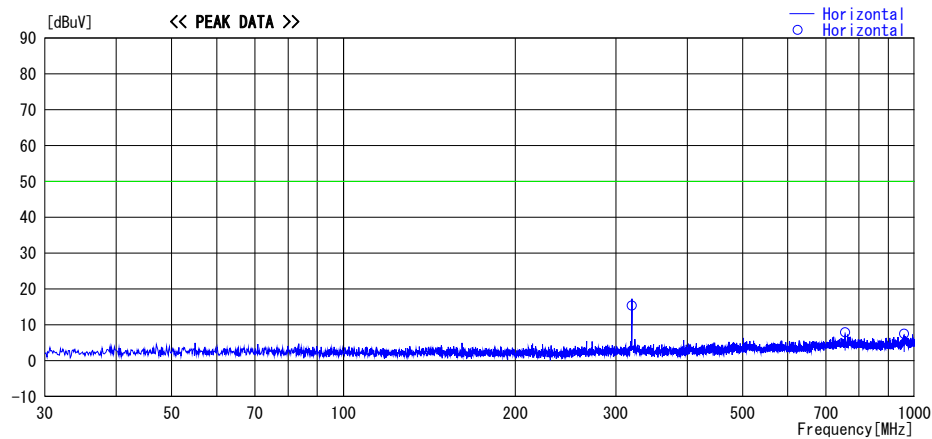
DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Head Office EMC Lab. No.3 Semi Anechoic Chamber
Date : 2012/10/31

Report No. : 33BE0309-HO-01
Temp./Humi. : 21deg. C / 45% RH
Engineer : Hiroshi Kukita

Mode / Remarks : Rx 314.98MHz

LIMIT : FCC15.111 Antenna terminal measurement
Except for the data below : adequate margin data below the limits.



Frequency [MHz]	Reading [dBuV]	DET	Antenna	Loss&	Level [dBuV]	Angle [Deg]	Height [cm]	Polar.	Limit *1) [dBuV]	Margin [dB]	Comment
			Factor [dB/m]	Gain [dB]							
320.015	40.9	PK	0.0	-25.5	15.4	0	100	-	50.0	34.6	
756.000	32.4	PK	0.0	-24.5	7.9	0	100	-	50.0	42.1	
959.250	30.9	PK	0.0	-23.4	7.5	0	100	-	50.0	42.5	

CHART: WITH FACTOR ANT TYPE: -30MHz: LOOP, 30-300MHz: BICONICAL, 300MHz-1000MHz: LOGPERIODIC, 1000MHz-: HORN
CALCULATION: RESULT = READING + ANT FACTOR + LOSS (CABLE+ATTEN.) - GAIN (AMP)

*1) 2nW = -57dBm = 50dBuV

*The limit is rounded down to one decimal place.

*The test result is rounded off to one or two decimal places, so some differences might be observed.

Antenna Terminal Conducted Emission Above 1GHz: Variation No. 2

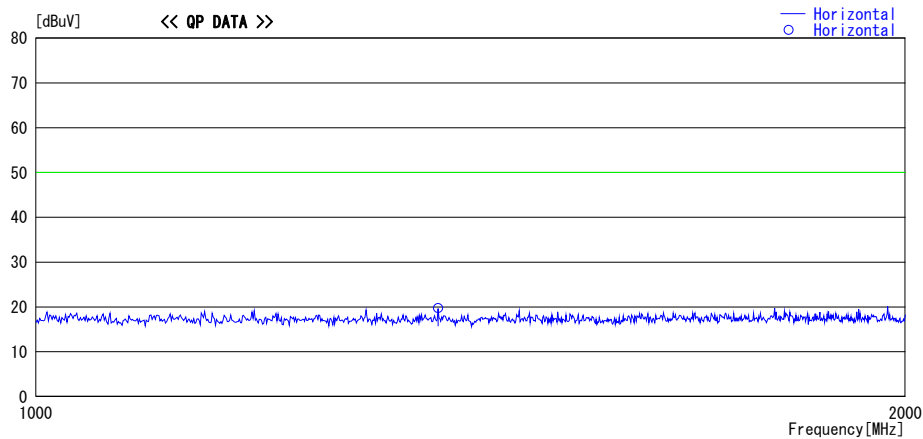
DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Head Office EMC Lab. No.3 Semi Anechoic Chamber
Date : 2012/10/31

Report No. : 33BE0309-HO-01
Temp./Humi. : 21deg. C / 45% RH
Engineer : Hiroshi Kukita

Mode / Remarks : Rx 314.98MHz

LIMIT : FCC15.111 Antenna terminal measurement
Except for the data below : adequate margin data below the limits.



Frequency [MHz]	Reading [dBuV]	DET	Antenna	Loss&	Level [dBuV]	Angle [Deg]	Height [cm]	Polar.	Limit *1)	Margin	Comment
			Factor [dB/m]	Gain [dB]					[dBuV]	[dB]	
1378.000	45.5	QP	0.0	-25.8	19.7	0	100	-	50.0	30.3	

CHART: WITH FACTOR ANT TYPE: -30MHz: LOOP, 30-300MHz: BICONICAL, 300MHz-1000MHz: LOGPERIODIC, 1000MHz-: HORN
CALCULATION: RESULT = READING + ANT FACTOR + LOSS (CABLE+ATTEN.) - GAIN (AMP)

*1) 2nW = -57dBm = 50dBuV

*The limit is rounded down to one decimal place.

*The test result is rounded off to one or two decimal places, so some differences might be observed.

APPENDIX 2: Test instruments

EMI test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MAEC-03	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	RE	2012/02/24 * 12
MOS-13	Thermo-Hygrometer	Custom	CTH-180	-	RE/AT	2012/02/06 * 12
MJM-15	Measure	KOMELON	KMC-36	-	RE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE/AT	-
MSA-05	Spectrum Analyzer	Advantest	R3273	160400285	RE/AT	2011/11/23 * 12
MTR-08	Test Receiver	Rohde & Schwarz	ESCI	100767	RE	2012/08/23 * 12
MBA-03	Biconical Antenna	Schwarzbeck	BBA9106	1915	RE	2012/10/08 * 12
MLA-03	Logperiodic Antenna	Schwarzbeck	USLP9143	174	RE	2012/10/08 * 12
MCC-51	Coaxial cable	UL Japan	-	-	RE	2012/07/12 * 12
MAT-09	Attenuator(6dB)	Weinschel Corp	2	BK7973	RE	2011/11/02 * 12
MPA-13	Pre Amplifier	SONOMA INSTRUMENT	310	260834	RE/AT	2012/03/16 * 12
MHA-20	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	258	RE	2012/05/25 * 12
MCC-133	Microwave Cable	HUBER+SUHNER	SUCOFLEX104	336164/4(1m) / 340640(5m)	RE/AT	2012/09/05 * 12
MPA-11	MicroWave System Amplifier	Agilent	83017A	MY39500779	RE/AT	2012/03/29 * 12
MCC-64	Coaxial Cable	UL Japan	-	-	AT	2012/03/22 * 12

The expiration date of the calibration is the end of the expired month.

All equipment is calibrated with valid calibrations. Each measurement data is traceable to the national or international standards.

As for some calibrations performed after the tested dates, those test equipment have been controlled by means of an unbroken chains of calibrations.

Test Item:

RE: Radiated emission

AT: Antenna Terminal

UL Japan, Inc.

Head Office EMC Lab.

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