ANTENNA TEST REPORT

Test Place

Company Name	UL Japan, Inc. Ise EMC Lab.
Address	4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 Japan
Telephone Number	+81-596-24-8999

Equipment Under Test (EUT)

Description	Wireless Transmitter
Manufacturer	Roland Corpration
Model Number	WL-60T(2)
Frequency of Operation	2402 MHz to 2478 MHz
Antenna Type	PCB Antenna

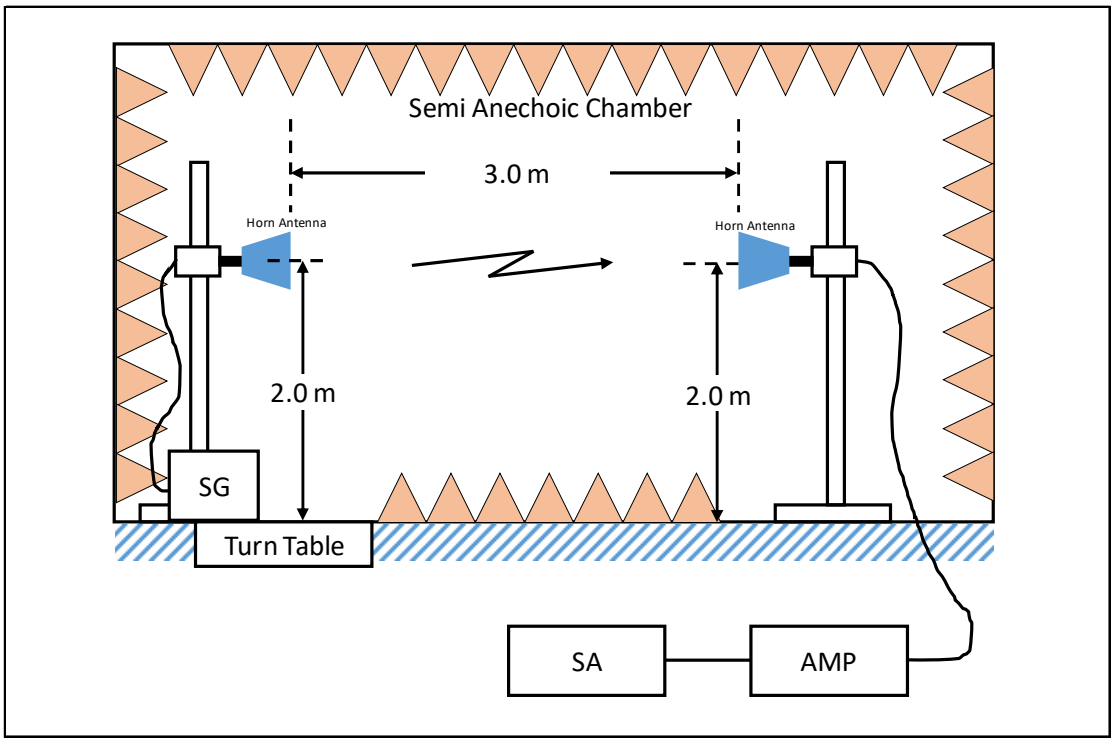
For the shape of the antenna is refer to Internal Photo.

Test Procedure

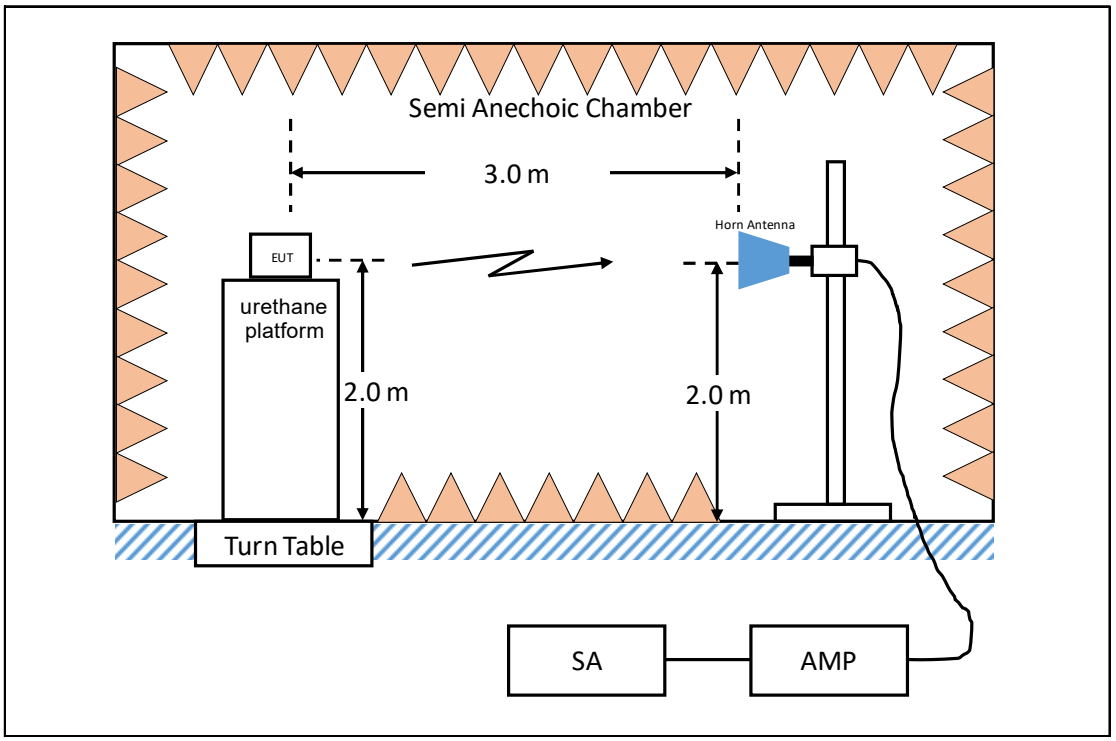
Test configuration	EUT was placed on a platform of nominal size, 0.5 m by 0.5 m, raised 2.0 m above the conducting ground plane. The measurements were performed for both vertical and horizontal antenna polarization with the Spectrum Analyzer. The setup are shown in Figure 1.
Test procedure	Step 1 The tests have been measured in semi anechoic chamber at the distance of 3 m between the Substitution Antenna and the measuring Antenna, both Antennas were placed for the height 2.0 m. The Substitution Antenna has been connected to the Signal Generator. Step 2 The output power of the Signal Generator was setting value calculated by compensating the finite difference in the Antenna gain of Substitution Antenna. Step 3 The electric field strength at the distance of 3 m is received via the measurement antenna, and the reference value at that time is measured with a spectrum analyzer. Step 4 Exchanged the Substitution Antenna to the EUT, The measurements were performed for both vertical and horizontal antenna polarization. Step 5 The EUT was rotated a full revolution and recorded the electric field strength for each degree. Step 6 Calculate and record the difference from the value recorded in Step 5 to the value recorded in Step 3. Step 7 The measurement in steps 4 to 6 repeated with both vertical and horizontal antenna polarization, each position of XY, YZ and ZX-plane of EUT. Step 8 Then the results of Step 7 were recorded. Step 9 Calculate the difference between step 8 and the Output Power of EUT, and recorded the calculated results.

Figure 1: Test Setup

Setup for step 1 to 4



Setup after step 5



SG: Signal Generator
SA: Spectrum Analyzer
AMP: Pre Amplifier

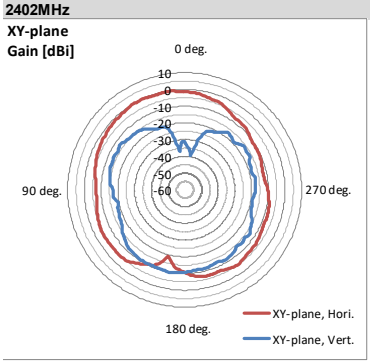
Test Data

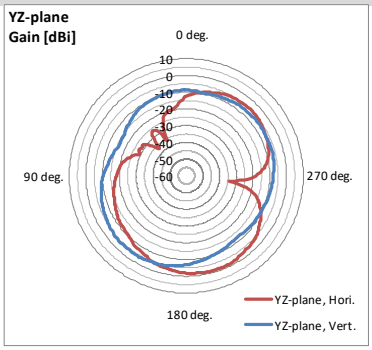
Antenna Pattern and Gain

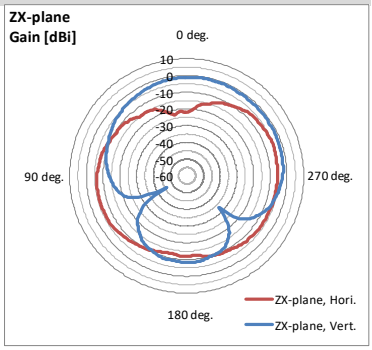
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.3
Date	December 3, 2018
Temperature / Humidity	25 deg. C / 47 % RH
Engineer	Tomoki Matsui
Mode	Tx

Antenna pattern (Top view)

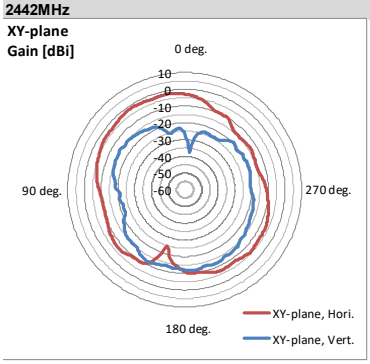
2402MHz

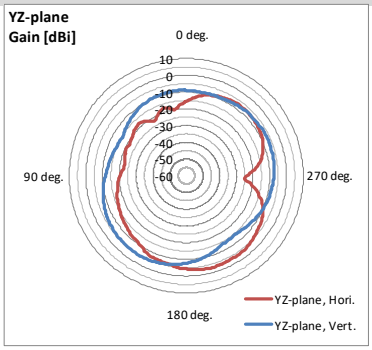


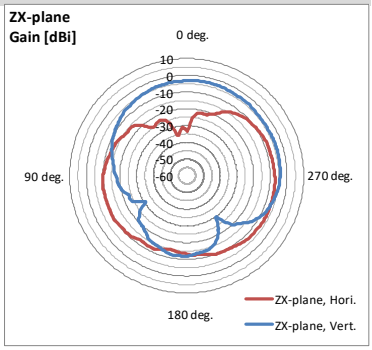




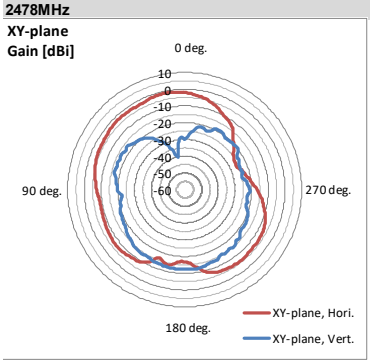
2442MHz

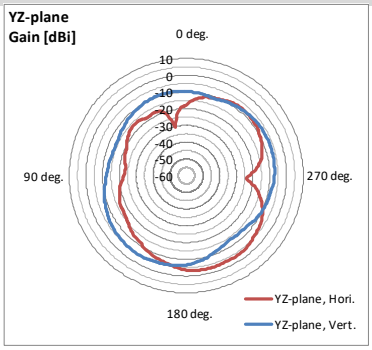


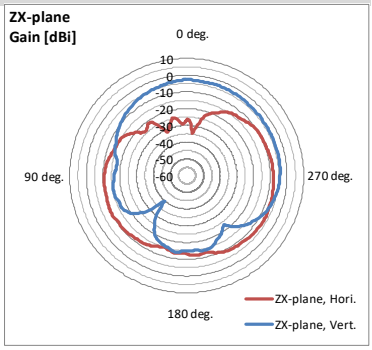




2478MHz







Antenna gain [UNIT: dBi]

Peak

Frequency [MHz]	2402.0	2442.0	2478.0
Peak gain	-0.19	-1.72	-1.11

Average

Frequency [MHz]		2402.0	2442.0	2478.0
XY-plane	Hori.	-4.93	-6.69	-6.42
	Vert.	-14.59	-16.21	-17.29
	Avg (H/V)	-7.49	-9.24	-9.09
YZ-plane	Hori.	-7.15	-8.96	-9.13
	Vert.	-7.96	-8.47	-8.55
	Avg (H/V)	-7.53	-8.71	-8.83
ZX-plane	Hori.	-8.35	-10.71	-11.18
	Vert.	-4.95	-7.00	-7.16
	Avg (H/V)	-6.33	-8.47	-8.72
Total		-7.08	-8.80	-8.88

Hori. : Horizontal
Vert. : Vertical

Average : Result of averaging the true value of the value of each degree of angle.

Test Instruments

Test Equipment

Test Item	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Cal Int
APG	142013	AC3_Semi Anechoic Chamber(SVSWR)	TDK	Semi Anechoic Chamber 3m	DA-10005	4/6/2018	12
APG	141554	Thermo-Hygrometer	CUSTOM	CTH-180	1301	1/24/2018	12
APG	141532	DIGITAL HiTESTER	HIOKI	3805	51201197	1/9/2018	12
APG	142183	Measure	KOMELON	KMC-36	-	-	-
APG	141899	Spectrum Analyzer	AGILENT	E4448A	MY46180655	8/10/2018	12
APG	141328	Microwave Cable 1G-40GHz	Suhner	SUCOFLEX102	28636/2	4/24/2018	12
APG	141225	Microwave Cable	Junkosha	MWX221	1409S497	3/14/2018	12
APG	141417	Microwave Cable	Junkosha	MWX221	1404S374(1m) / 1405S074(5m)	5/7/2018	12
APG	141580	MicroWave System Amplifier	AGILENT	83017A	MY39500779	3/13/2018	12
APG	141896	Signal Generator	Rohde & Schwarz	SMR40	100137	6/7/2018	12
APG	141409	Microwave Cable(1-30GHz)	Huber+Suhner	SF103/11PC3.5-31/11PC3.5-31/8.0m	54308/3	1/16/2018	12
APG	141514	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	1611	6/5/2018	12
APG	141507	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	258	6/7/2018	12

***Hyphens for Last Calibration 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.
As for some calibrations performed after the tested dates, those test equipment have been controlled by means of an unbroken chains of calibrations.
All equipment is calibrated with valid calibrations. Each measurement data is traceable to the national or international standards.

Test item: APG: Antenna Pattern and Gain

Photographs of Test Setup

Test setup (Overall view)

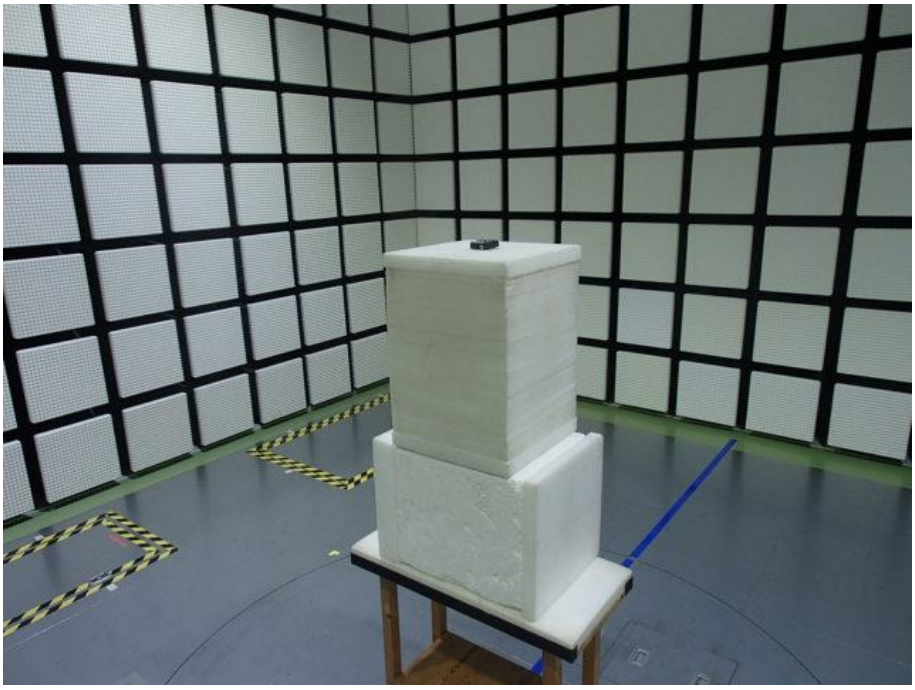


Photo 1

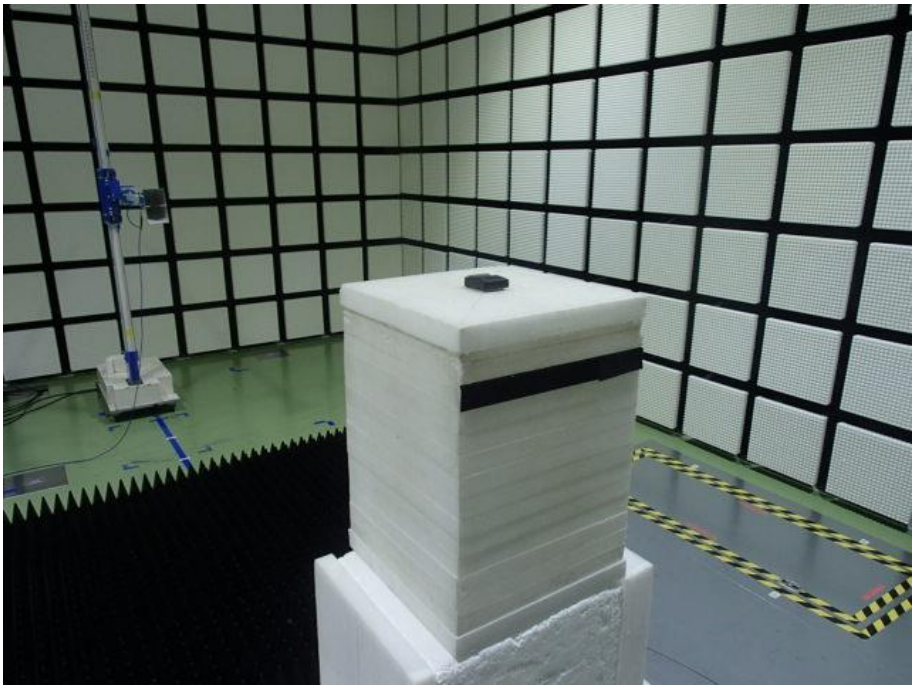
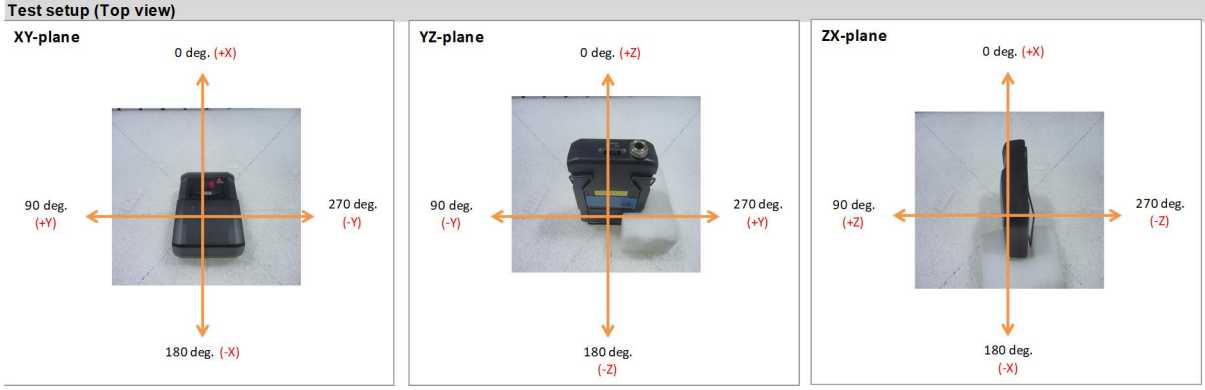


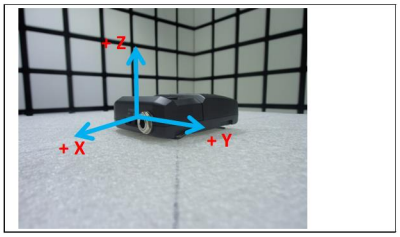
Photo 2

Test setup (Top view)

Test setup (Top view)



Definition of XYZ plane



End of Report