

# ANTENNA UNDER 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	Electronic Key
Manufacturer	TOKAI RIKKA CO., LTD.
Model Number	G2C2J2S
Frequency of Operation	312.5 MHz
Antenna Type	Pattarn Antenna

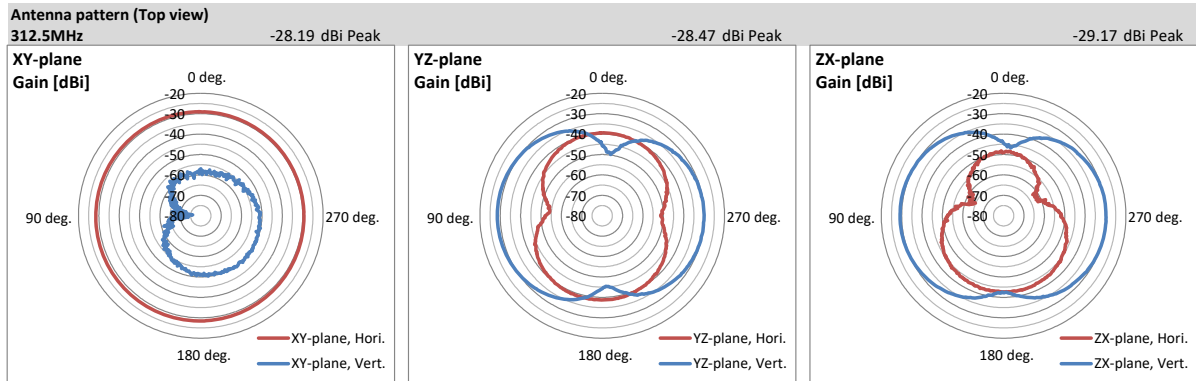
## Test Procedure

Test configuration	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. The measurements were performed for both vertical and horizontal antenna polarization with the Spectrum Analyzer.
Test procedure	<p>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 1.5 m. The Substitution Antenna has been connected to the Signal Generator.</p> <p>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.</p> <p>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.</p> <p>Step 4 The measurements were performed for both vertical and horizontal antenna polarization.</p> <p>Step 5 Exchanged the Substitution Antenna to the EUT, the output power of the Signal Generator was setting value calculated by 0 dBm at the input of EUT.</p> <p>Step 6 The EUT was rotated a full revolution and recorded the electric field strength for each degree.</p> <p>Step 7 Calculate and record the difference from the value recorded in Step 6 to the value recorded in Step 3.</p> <p>Step 8 The measurement in steps 5 to 7 repeated with both vertical and horizontal antenna polarization, each position of XY, YZ and ZY-plane of EUT.</p> <p>Step 9 Then the results of Step 8 were recorded.</p> <p>Step 10 Calculate the difference between step 9 and the Output Power of EUT, and recorded the calculated results.</p>

# Test Data, Result

## Antenna Pattern and Gain

Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.3
Date	March 6, 2023
Temperature / Humidity	23 deg. C / 37 % RH
Engineer	Takumi Nishida
Mode	Tx 312.5 MHz



**Result: Antenna gain [UNIT: dBi]**

Peak	
Frequency [MHz]	312.5
Peak gain	-28.19

**Average (角度1度毎の値を真値平均した結果)**

Average		
Frequency [MHz]	312.5	
XY-plane	Hori.	-28.82
	Vert.	-53.91
	Avg (H/V)	-31.82
YZ-plane	Hori.	-41.73
	Vert.	-32.09
	Avg (H/V)	-34.66
ZX-plane	Hori.	-46.93
	Vert.	-32.25
	Avg (H/V)	-35.12
Total		-33.61

Hori. : Horizontal  
Vert. : Vertical

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

Yellow highlighted area: Maximum Antenna Gain [dBi]

## Test Instruments

### Test Equipment

Test Item	Local ID	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Cal Int
APG	MAEC-03	142008	AC3_Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	2022/05/23	24
APG	MOS-13	141554	Thermo-Hygrometer	CUSTOM. Inc	CTH-201	1301	2023/01/13	12
APG	MMM-08	141532	DIGITAL HiTESTER	HIOKI E.E. CORPORATION	3805	51201197	2023/01/17	12
APG	MJM-16	142183	Measure	KOMELON	KMC-36	-	2022/10/03	12
APG	MAEC-03-SVSWR	142013	AC3_Semi Anechoic Chamber(SVSWR)	TDK	Semi Anechoic Chamber 3m	DA-10005	2021/04/01	24
APG	MRENT-130	141855	Spectrum Analyzer	Keysight Technologies Inc	E4440A	MY46187750	2022/12/01	12
APG	MCC-51	141323	Coaxial cable	UL Japan	-	-	2022/09/27	12
APG	MAT-95	142314	Attenuator	Pasternack Enterprises	PE7390-6	D/C 1504	2022/06/13	12
APG	MLA-22	141266	Logperiodic Antenna(200-1000MHz)	Schwarzbeck Mess-Elektronik OHG	VUSLP9111B	9111B-191	2022/08/26	12
APG	MDA-03	141454	Dipole Antenna	Schwarzbeck Mess-Elektronik OHG	UHAP	991	2022/12/26	12
APG	MPA-13	141582	Pre Amplifier	SONOMA INSTRUMENT	310	260834	2023/02/07	12
APG	YTSSG03	141967	Signal Generator	Rohde & Schwarz	SMT02	51400043	2022/08/05	12
APG	MCC-64	141327	Coaxial Cable	UL Japan	-	-	2023/02/01	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**