Digi International, Inc.

OTA

Report - DGII0462

PRODUCT DESCRIPTION

Client and Equipment Under Test (EUT) Information

Company Name:	Digi International, Inc.
Address:	9350 Excelsior Blvd, Suite 700
City, State, Zip:	Hopkins, MN 55343
Test Requested by:	Bradley Ferguson
Model:	OTA
First Date of Test:	September 27, 2022
Last Date of Test:	September 27, 2022
Receipt Date of Samples:	September 27, 2022
Equipment Design Stage:	Production
Equipment Condition:	No Damage

Information Provided by the Party Requesting the Test

Functional Description of the EUT:
To be determined

Testing Objective:
To obtain 3D antenna pattern measurements and calculated antenna performance values.

Approved By:

Eric Brandon, Department Manager

OTA TEST DESCRIPTION

OTA 2018.01.04

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data. The test data represents the configuration / operating mode/ model that produced the highest emission levels as compared to the specification limit.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval
Chamber - OTA	ETS Lindgren	AMS-8923-195	OTA	4/19/2021	36 mo
Analyzer - Network Analyzer	Agilent	E5071C	NAM	11/13/2019	36 mo

TEST DESCRIPTION

Using the modes of operation and configurations noted within this report, a radiated pattern measurement test was performed. The frequency ranges investigated (scanned), are also noted in this report.

The EUT was placed on a low dielectric constant support structure (Phi Axis Positioner) in the 3D center of the measurement zone using a laser alignment system. The antenna port of the EUT is connected to an RF feed cable which is connected to a Vector Network Analyzer (VNA) at its opposite end.

The test begins with a measurement path configured (via ETS-Lindgren EMQuest Data Acquisition and Analysis Software) such that an electrical path is present from the Theta polarization element of the -165° detector antenna, to port 2 of the VNA. The VNA drives the EUT through the desired frequency range at the desired IFBW and an insertion loss measurement is obtained. The measurement path is then reconfigured (again via EMQuest) such that an electrical path is present from the Phi polarization element of the -165° detector antenna, to port 2 of the VNA. The VNA drives the EUT through the desired frequency range at the desired IFBW and an insertion loss measurement is obtained. This process is repeated at each of the 23 detector antennas in turn. This process is repeated for every rotation of the Phi Axis Positioner up to 180° - Phi Axis Resolution. When this process is complete, EMQuest applies factors from a Range Calibration and Normalization to produce a final data set with 1D/2D/3D patterns and tabular values such as antenna efficiency, Equivalent Isotropic Radiated Power (EIRP), Total Radiated Power (TRP), etc.

A measurement uncertainty estimation has been performed for this testing. When a measurement is made, the result will be different from the true or theoretically correct value. The difference is the result of tolerances in the measurement system that cannot be completely eliminated. To the extent that technology allows us, it has been our aim to minimize this error. Measurement uncertainty is a statistical expression of measurement error qualified by a probability distribution. The expanded measurement uncertainty, 95% confidence level (K=2), for Maximum Gain / Efficiency for 2400-2483.5 MHz on active measurements is +/-1.08 dB. The expanded measurement uncertainty, 95% confidence level (K=2), for Maximum Gain / Efficiency for 2400-2483.5 MHz on passive measurements is +/-1.29. The calculations for estimating measurement uncertainty are available upon request.

PASSIVE 3D ANTENNA PATTERN MEASUREMENTS

OTA 2018.01.04

EUT:	OTA
Serial Number:	2335
Customer:	Digi International Inc
Attendees:	None
Customer Project:	None
Tested By:	Christopher Heintzelman
Test Run Description:	Passive_2400-2500_Run2

Work Order:	DGII0462
Date:	9/27/2022
Temperature:	22.2 °C
Relative Humidity:	34.1% RH
Bar. Pressure:	1025 mbar
Job Site:	MN10

COMMENTS

None

Max dBi Gain -0.67

3D PATTERN DATA

Frequency (MHz)	2400	2402	2404	2406	2408	2410	2412	2414	2416	2418	2420	2422
Ant. Port Input Pwr. (dBm)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tot. Rad. Pwr. (dBm)	-8.74	-8.68	-8.59	-8.51	-8.44	-8.37	-8.29	-8.19	-8.13	-8.03	-7.93	-7.81
Peak EIRP (dBm)	-4.65	-4.61	-4.44	-4.52	-4.29	-4.25	-4.23	-4.24	-4.18	-4.04	-3.98	-3.98
Directivity (dBi)	4.08	4.07	4.14	3.99	4.15	4.12	4.06	3.96	3.95	3.99	3.95	3.83
Efficiency (dB)	-8.74	-8.68	-8.59	-8.51	-8.44	-8.37	-8.29	-8.19	-8.13	-8.03	-7.93	-7.81
Efficiency (%)	13.38	13.54	13.84	14.10	14.33	14.57	14.83	15.16	15.40	15.73	16.11	16.56
Gain (dBi)	-4.65	-4.61	-4.44	-4.52	-4.29	-4.25	-4.23	-4.24	-4.18	-4.04	-3.98	-3.98
Average Gain (dB)	-8.74	-8.68	-8.59	-8.51	-8.44	-8.37	-8.29	-8.19	-8.13	-8.03	-7.93	-7.81
E-Plane 3 dB BW (°)	39.00	40.00	39.00	42.00	39.00	40.00	40.00	42.00	40.00	40.00	40.00	42.00

3D PATTERN DATA

Frequency (MHz)	2424	2426	2428	2430	2432	2434	2436	2438	2440	2442	2444	2446
Ant. Port Input Pwr. (dBm)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tot. Rad. Pwr. (dBm)	-7.72	-7.65	-7.56	-7.45	-7.37	-7.31	-7.21	-7.08	-6.96	-6.87	-6.78	-6.67
Peak EIRP (dBm)	-3.85	-3.79	-3.73	-3.63	-3.52	-3.44	-3.35	-3.18	-3.07	-2.93	-2.81	-2.74
Directivity (dBi)	3.88	3.86	3.82	3.82	3.84	3.87	3.86	3.90	3.89	3.94	3.97	3.93
Efficiency (dB)	-7.72	-7.65	-7.56	-7.45	-7.37	-7.31	-7.21	-7.08	-6.96	-6.87	-6.78	-6.67
Efficiency (%)	16.89	17.17	17.54	17.99	18.33	18.59	19.00	19.58	20.12	20.57	20.99	21.53
Gain (dBi)	-3.85	-3.79	-3.73	-3.63	-3.52	-3.44	-3.35	-3.18	-3.07	-2.93	-2.81	-2.74
Average Gain (dB)	-7.72	-7.65	-7.56	-7.45	-7.37	-7.31	-7.21	-7.08	-6.96	-6.87	-6.78	-6.67
E-Plane 3 dB BW (°)	41.00	49.00	40.00	48.00	49.00	49.00	49.00	49.00	48.00	48.00	49.00	49.00

3D PATTERN DATA

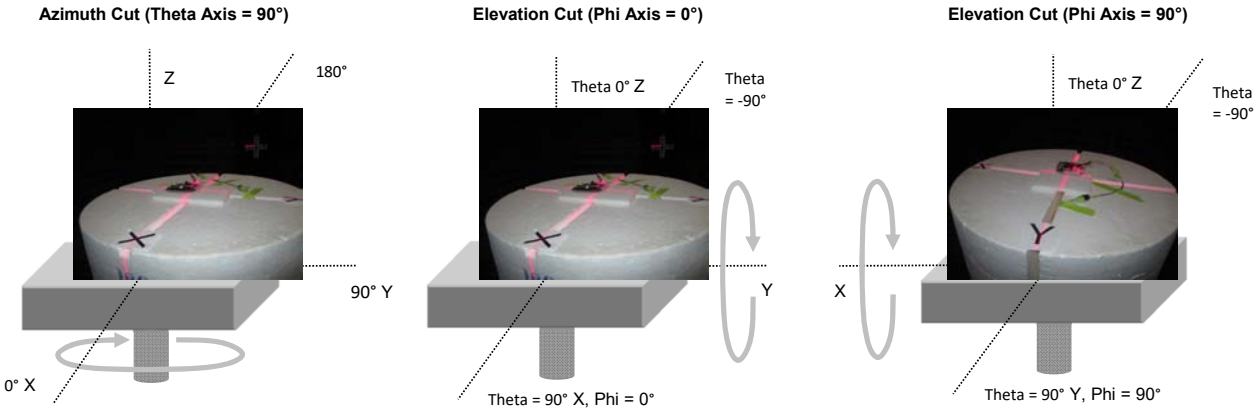
Frequency (MHz)	2448	2450	2452	2454	2456	2458	2460	2462	2464	2466	2468	2470
Ant. Port Input Pwr. (dBm)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tot. Rad. Pwr. (dBm)	-6.57	-6.45	-6.37	-6.25	-6.15	-6.06	-5.98	-5.89	-5.81	-5.75	-5.69	-5.61
Peak EIRP (dBm)	-2.73	-2.52	-2.46	-2.31	-2.30	-2.16	-2.06	-1.97	-1.95	-1.89	-1.85	-1.69
Directivity (dBi)	3.83	3.93	3.91	3.94	3.86	3.90	3.92	3.92	3.86	3.87	3.84	3.92
Efficiency (dB)	-6.57	-6.45	-6.37	-6.25	-6.15	-6.06	-5.98	-5.89	-5.81	-5.75	-5.69	-5.61
Efficiency (%)	22.05	22.66	23.07	23.71	24.26	24.80	25.25	25.78	26.22	26.58	26.97	27.49
Gain (dBi)	-2.73	-2.52	-2.46	-2.31	-2.30	-2.16	-2.06	-1.97	-1.95	-1.89	-1.85	-1.69
Average Gain (dB)	-6.57	-6.45	-6.37	-6.25	-6.15	-6.06	-5.98	-5.89	-5.81	-5.75	-5.69	-5.61
E-Plane 3 dB BW (°)	50.00	49.00	49.00	48.00	49.00	48.00	48.00	47.00	48.00	48.00	48.00	48.00

3D PATTERN DATA

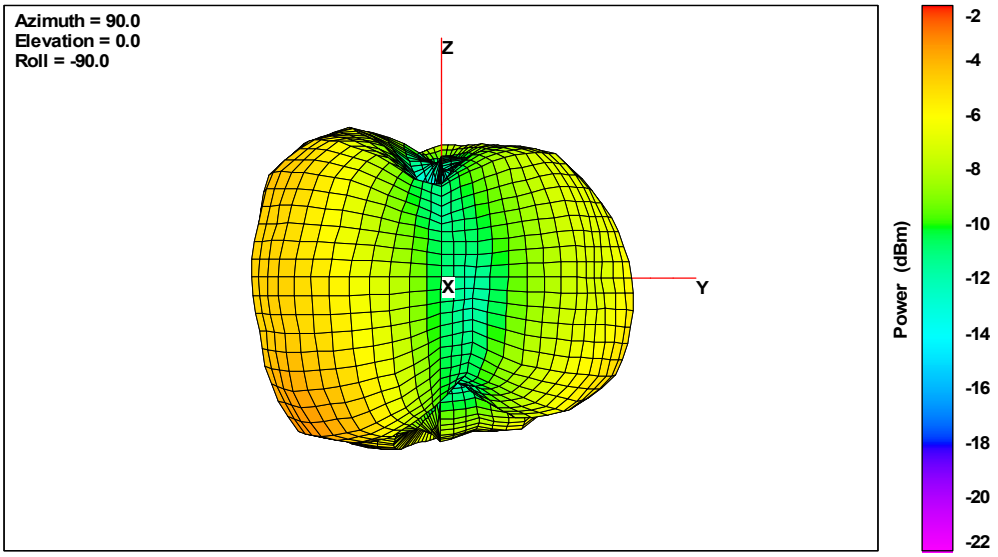
Frequency (MHz)	2472	2474	2476	2478	2480	2482	2484	2486	2488	2490	2492	2494
Ant. Port Input Pwr. (dBm)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tot. Rad. Pwr. (dBm)	-5.53	-5.49	-5.46	-5.40	-5.34	-5.29	-5.24	-5.17	-5.06	-4.97	-4.87	-4.78
Peak EIRP (dBm)	-1.68	-1.62	-1.58	-1.56	-1.54	-1.41	-1.37	-1.35	-1.22	-1.11	-1.01	-0.91
Directivity (dBi)	3.84	3.87	3.88	3.83	3.80	3.88	3.87	3.82	3.83	3.86	3.86	3.87
Efficiency (dB)	-5.53	-5.49	-5.46	-5.40	-5.34	-5.29	-5.24	-5.17	-5.06	-4.97	-4.87	-4.78
Efficiency (%)	28.01	28.23	28.42	28.87	29.25	29.59	29.94	30.39	31.22	31.83	32.56	33.27
Gain (dBi)	-1.68	-1.62	-1.58	-1.56	-1.54	-1.41	-1.37	-1.35	-1.22	-1.11	-1.01	-0.91
Average Gain (dB)	-5.53	-5.49	-5.46	-5.40	-5.34	-5.29	-5.24	-5.17	-5.06	-4.97	-4.87	-4.78
E-Plane 3 dB BW (°)	48.00	48.00	47.00	47.00	48.00	47.00	48.00	48.00	49.00	47.00	48.00	48.00

3D PATTERN DATA

Frequency (MHz)	2496	2498	2500
Ant. Port Input Pwr. (dBm)	0.00	0.00	0.00
Tot. Rad. Pwr. (dBm)	-4.68	-4.58	-4.48
Peak EIRP (dBm)	-0.80	-0.72	-0.67
Directivity (dBi)	3.88	3.86	3.82
Efficiency (dB)	-4.68	-4.58	-4.48
Efficiency (%)	34.05	34.84	35.60
Gain (dBi)	-0.80	-0.72	-0.67
Average Gain (dB)	-4.68	-4.58	-4.48
E-Plane 3 dB BW (°)	48.00	48.00	49.00



Total Power - 2442 MHz



Total Power - 2442 MHz