AP750NRe

Antenna PCB-000049-001-A Radiation Pattern & Gain Specifications

(Release)

Version 1

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Table of Contents

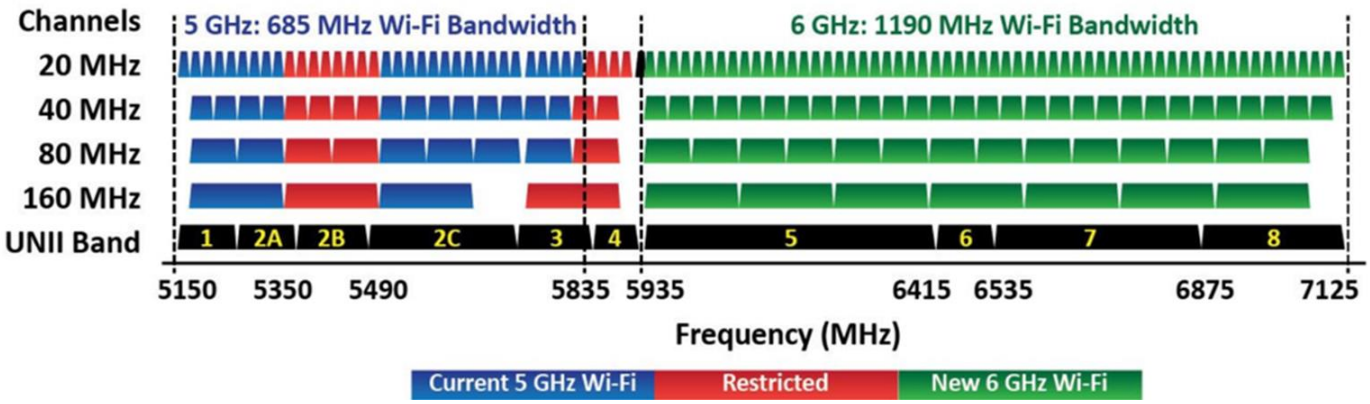
1 Overview

1.1 Preface

This document describes the radiation pattern and gain specifications for the PCB-000049-001-A, which operates in the 5 GHz UNII-2C band (5470 MHz to 5725 MHz) and 6 GHz UNII-7 band (6525 MHz to 6875 MHz)

The PCB-000049-001-A, has been certified to be compliant when operated with the Everest Networks 4-Radio Narrow Directional Outdoor Wi-Fi 7 Access Point AP750NRe:

Model Number: AP750NRe
HW Version: v1.x
FCCID: 2AGMR-AP750NRE
IC: ..... TBD



1.2 Contributors

Name	Role
Van Hoang Nguyen	Director of Engineering

1.3 Revision History

Version	Change Summery	Author	Date
0.1 (Draft)	Document Created	Van Hoang Nguyen	Feb. 13, 2024
1.0 Release	First release	Van Hoang Nguyen	June 12, 2024

1.4 Applicable PCB Part Numbers

Description	PCB Part Numbers
Square shape, Narrow, U-NII-2c + U-NII-7 bands	PCB-000049-000-A
	PCB-000049-001-A

1.5 Antenna Measurements

1.5.1 Measurement methods:

Measurement is performed over the air in a shieled anechoic chamber (NSI-MI compact range 4-110GHz) and the Antenna Under Test (AUT) is operating in radiated mode.

1.5.2 Measurement equipment

Equipment	Manufacturer	Model & Serial number	Last calibration
Standard Feed Horn 1-18GHz	ETS-Lindren	#3115 / #6532	n/a
Signal source	NSI-MI	ELE-SRC-DS(1010279) / 006	November 15, 2021
Vector Field Analyser	NSI-MI	ELE-VFA-S01 (100675-S01)/034	November 29, 2021

1.5.3 Measurement setup

1.6 Photos of PCB-000049-001-A

1.6.1 Front

1.6.2 Back

1.7 AUT Descriptions and Summary

The PCB-000049-001-A consists of 2 separated and independent antenna sub-panels. The top antenna sub-panel is a 2x4 microstrip patch array operating in U-NII-2c band while the bottom antenna sub-panel is a 2x4 microstrip patch array operating in U-NII-7 band. Therefore, there are a total of 8 antenna inputs, i.e. 4 inputs for the top sub-panel and 4 inputs for the bottom sub-panel. The four (04) radio chains of a MIMO 4x4:4 radio card are connected to either U-NII-2c or U-NII-7 antenna sub-panel as illustrated in Table 0. The two (2) vertical and horizontal inputs of each sub-panel are fed to a quadrature feeding matrix, resulting in orthogonal beams for each polarization.

Table 0: RF chains' connection to U-NII-2c and U-NII-7 antenna sub-panels.

	U-NII-2c sub-panel		U-NII-7 sub-panel	
	Vertical Pol.	Horizontal Pol.	Vertical Pol.	Horizontal Pol.
Chain 0	R3-10		R3-9	
Chain 1		R3-12		R3-11
Chain 2		R3-14		R3-13
Chain 3	R3-16		R3-15	

The maximum gain for vertical polarization, horizontal polarization and directional gain has been measured and summarized in the below table:

	U-NII-2c sub-panel		U-NII-7 sub-panel	
	Vertical Pol.	Horizontal Pol.	Vertical Pol.	Horizontal Pol.
Max. Gain	11.8 dBi	13.6 dBi	14.6	14.6
Directional Gain (DG)				
Max. Tested Antenna gain	13.6 dBi		14.6 dBi	
Certified net antenna gain (Cable and switch loss)	**11.5 dBi**		**12.5 dBi**	

2 PCA-000049-001-A Antenna Pattern and Gain in U-NII-2c

2.1 Port R3-14 (Horizontal polarization)

2.1.1 R3-14 Radiation Pattern in Elevation at 5560 MHz

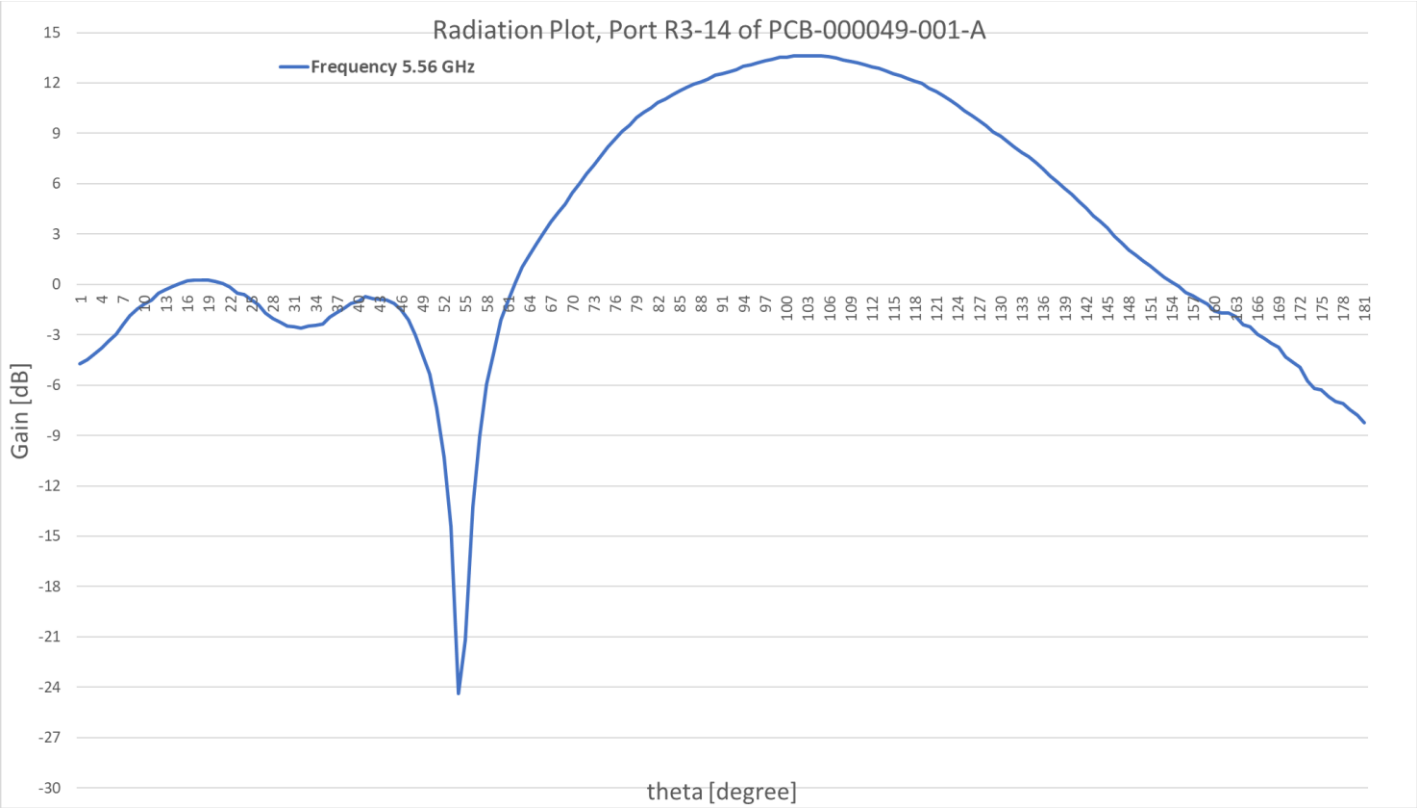


Figure 1 - Port R3-14, Horizontal polarization, Elevation cut at 5560.00 MHz

2.1.2 Port R3-14 Gain table at 5560 MHz – Horizontal Polarization

Angle θ [deg]	Gain (ϕ=0)	Angle θ [deg]	Gain (ϕ=0)	Angle θ [deg]	Gain (ϕ=0)	Angle θ [deg]	Gain (ϕ=0)
1	-4.73	46	-1.52	91	12.56	136	6.86
2	-4.49	47	-2.10	92	12.67	137	6.45
3	-4.15	48	-3.01	93	12.80	138	6.09
4	-3.78	49	-4.22	94	12.99	139	5.72
5	-3.39	50	-5.34	95	13.09	140	5.35
6	-2.96	51	-7.33	96	13.19	141	4.94
7	-2.40	52	-10.30	97	13.31	142	4.53
8	-1.86	53	-14.42	98	13.43	143	4.11
9	-1.46	54	-24.37	99	13.52	144	3.77
10	-1.16	55	-21.17	100	13.55	145	3.35
11	-0.91	56	-13.25	101	13.62	146	2.88
12	-0.53	57	-9.05	102	13.63	147	2.46
13	-0.31	58	-5.96	103	13.63	148	2.04
14	-0.11	59	-3.99	104	13.62	149	1.74
15	0.04	60	-2.12	105	13.60	150	1.39
16	0.21	61	-0.92	106	13.57	151	1.12
17	0.25	62	0.08	107	13.50	152	0.73
18	0.28	63	1.02	108	13.38	153	0.40
19	0.28	64	1.79	109	13.29	154	0.12
20	0.19	65	2.44	110	13.20	155	-0.12
21	0.05	66	3.13	111	13.10	156	-0.47
22	-0.14	67	3.72	112	12.95	157	-0.67
23	-0.51	68	4.30	113	12.86	158	-0.94
24	-0.62	69	4.81	114	12.72	159	-1.17
25	-0.92	70	5.45	115	12.57	160	-1.58
26	-1.23	71	6.01	116	12.43	161	-1.70
27	-1.71	72	6.57	117	12.28	162	-1.72
28	-2.05	73	7.13	118	12.09	163	-1.93
29	-2.23	74	7.66	119	11.96	164	-2.38
30	-2.48	75	8.18	120	11.71	165	-2.52
31	-2.54	76	8.68	121	11.47	166	-2.96
32	-2.62	77	9.12	122	11.23	167	-3.21
33	-2.48	78	9.50	123	10.94	168	-3.52
34	-2.44	79	9.93	124	10.69	169	-3.75
35	-2.36	80	10.25	125	10.33	170	-4.33
36	-1.96	81	10.50	126	10.05	171	-4.66
37	-1.65	82	10.82	127	9.77	172	-4.94
38	-1.40	83	11.03	128	9.45	173	-5.75
39	-1.15	84	11.30	129	9.09	174	-6.21
40	-1.03	85	11.53	130	8.83	175	-6.29
41	-0.74	86	11.74	131	8.50	176	-6.68
42	-0.86	87	11.92	132	8.18	177	-6.98
43	-0.87	88	12.06	133	7.86	178	-7.09
44	-0.94	89	12.24	134	7.60	179	-7.48
45	-1.12	90	12.46	135	7.24	180	-7.79

Table 1 - Port R3-14 Gain table at 5560 MHz – Horizontal Polarization [1º-180º]

2.2 Port R3-10 (Vertical polarization)

2.2.1 Port R3-10 Radiation Pattern in Elevation at 5640 MHz

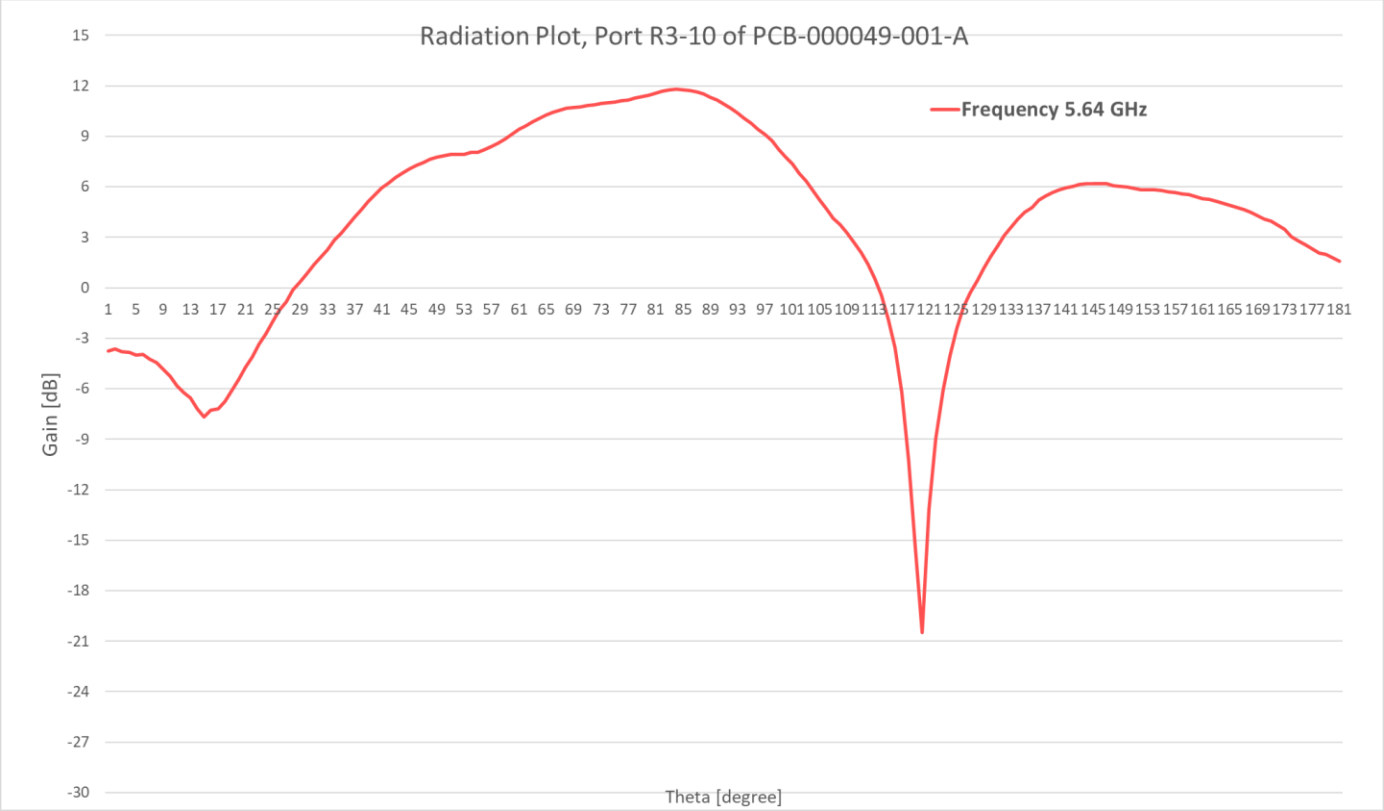


Figure 2 - Port R3-10, vertical polarization, Elevation cut at 5640.00 MHz

2.2.2 Port R3-10 Gain table at 5640 MHz – Vertical Polarization

Angle q [deg]	Gain (f=0)	Angle q [deg]	Gain (f=0)	Angle q [deg]	Gain (f=0)	Angle q [deg]	Gain (f=0)
1	-3.76	46	7.29	91	10.93	136	4.77
2	-3.62	47	7.45	92	10.66	137	5.20
3	-3.80	48	7.63	93	10.37	138	5.44
4	-3.84	49	7.77	94	10.07	139	5.66
5	-3.99	50	7.84	95	9.78	140	5.82
6	-3.96	51	7.92	96	9.43	141	5.94
7	-4.26	52	7.94	97	9.11	142	6.03
8	-4.43	53	7.92	98	8.72	143	6.13
9	-4.85	54	8.04	99	8.22	144	6.19
10	-5.27	55	8.06	100	7.76	145	6.18
11	-5.82	56	8.20	101	7.35	146	6.19
12	-6.24	57	8.42	102	6.78	147	6.18
13	-6.55	58	8.59	103	6.33	148	6.06
14	-7.20	59	8.86	104	5.76	149	6.01
15	-7.68	60	9.15	105	5.21	150	5.97
16	-7.27	61	9.42	106	4.67	151	5.88
17	-7.18	62	9.63	107	4.13	152	5.84
18	-6.73	63	9.85	108	3.74	153	5.83
19	-6.10	64	10.07	109	3.27	154	5.82
20	-5.45	65	10.26	110	2.67	155	5.79
21	-4.73	66	10.42	111	2.10	156	5.71
22	-4.12	67	10.56	112	1.41	157	5.67
23	-3.35	68	10.65	113	0.57	158	5.57
24	-2.73	69	10.72	114	-0.42	159	5.55
25	-2.03	70	10.76	115	-1.87	160	5.41
26	-1.31	71	10.83	116	-3.55	161	5.28
27	-0.86	72	10.86	117	-6.23	162	5.24
28	-0.13	73	10.94	118	-10.24	163	5.12
29	0.31	74	11.00	119	-15.49	164	5.02
30	0.82	75	11.05	120	-20.50	165	4.88
31	1.36	76	11.12	121	-13.15	166	4.77
32	1.84	77	11.16	122	-8.96	167	4.66
33	2.26	78	11.26	123	-6.05	168	4.50
34	2.83	79	11.37	124	-4.03	169	4.30
35	3.23	80	11.46	125	-2.43	170	4.07
36	3.71	81	11.57	126	-1.14	171	3.95
37	4.20	82	11.69	127	-0.28	172	3.74
38	4.65	83	11.75	128	0.41	173	3.47
39	5.13	84	11.78	129	1.19	174	3.04
40	5.53	85	11.75	130	1.85	175	2.81
41	5.93	86	11.72	131	2.46	176	2.54
42	6.23	87	11.62	132	3.12	177	2.30
43	6.54	88	11.53	133	3.60	178	2.07
44	6.83	89	11.33	134	4.07	179	1.98
45	7.06	90	11.14	135	4.47	180	1.77

Table 2 - Port R3-10 Gain table at 5640 MHz – Vertical Polarization [1º-180º]

2.3 Maximum Gain versus Frequency

2.3.1 Port R3-10 (Vertical Polarization) and Port R3-14 (Horizontal Polarization)

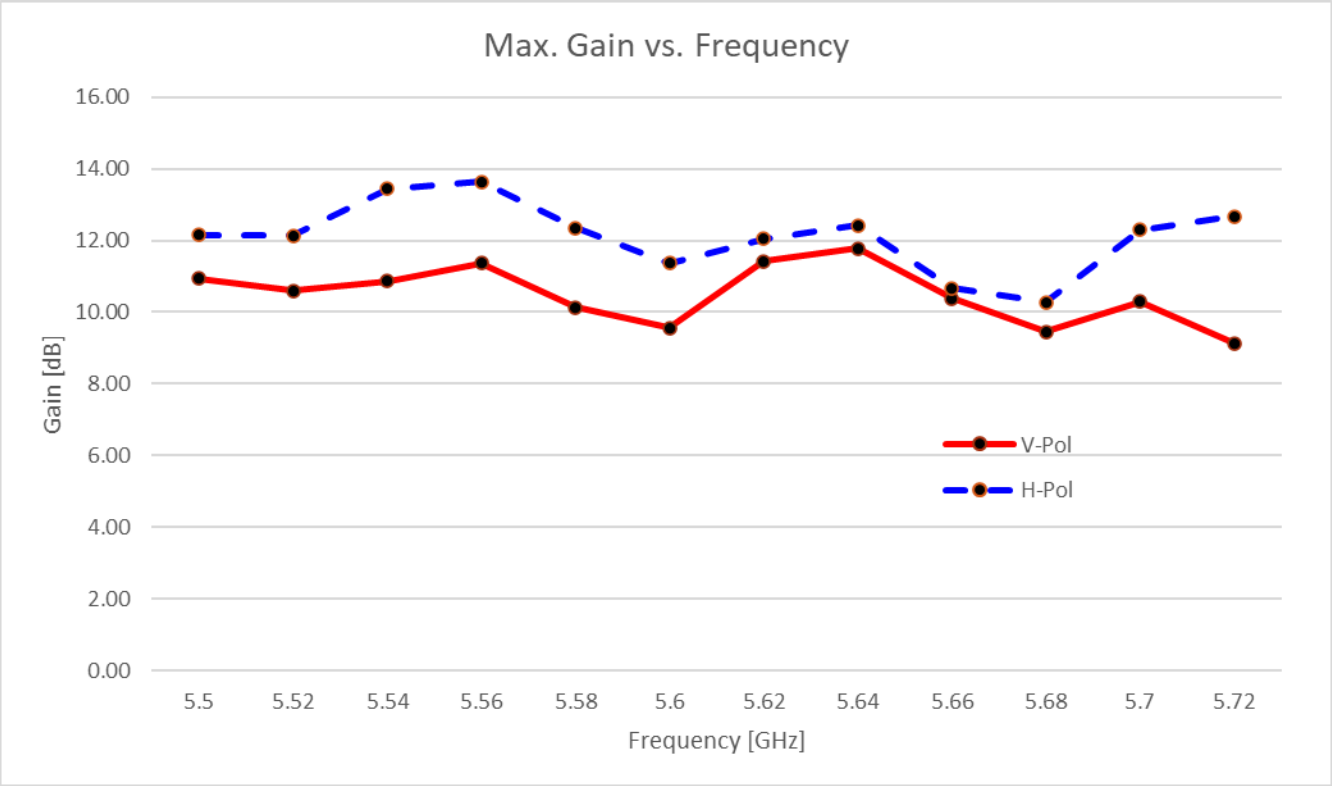


Figure 3 – Maximum Gain versus Frequency of port R3-10 (Vertical) and port R3-14 (Horizontal)

3 PCA-000049-001-A Antenna Pattern and Gain in U-NII-7

To be completed.

4 References

[1] FCC document KDB 662911 D01 Multiple Transmitter Output v02r01, October 31, 2013

[2] AP 10.4 Programmer's Guide, March 16, 2016