ANTENNA SPECIFICATION

For the

eero Model S010001

Wi-Fi Router/Access Point

FCC ID: 2AEM4-71213573

Version	Date	Author	Description
1.0	12/13/2020	C. Clarke	Initial release for initial FCC filing. No DFS, UNII-4 or 6 GHz band WLAN.
2.0	1/26/2021	C. Clarke	Added remining frequency bands; UNII-2A, 2C, 4, 5, 6 ,7 and 8.
2.1	3/1/2022	C. Clarke	Clarified frequencies of operation.
2.2	3/17/2022	C. Clarke	Added detail on antenna gain measurement methodology
2.3	3/18/2022	C. Clarke	Expanded antenna gain tables

Introduction

The eero Model S010001 uses custom designed antennas.

Each of the antennas is a dipole antenna constructed on flexible printed circuit board material (Flex PCB). The antennas for each band are nearly fully polarized and have a frequency response tuned to their specific range of operation.

Summary

Characteristics of each antenna are given in the table below:

Antenna	**Frequency Range***	**Max Gain (dBi)**
ANT1	2.4 GHz; BLE/ZigBee 2400-2483.5 MHz	3.24

ANT2	6 GHz WLAN 6105 MHz *** To 7105 MHz **** UNII-5 UNII-6 UNII-7 UNII-8	4.18
ANT3	2.4 GHz WLAN CH1 2400-2483.5 MHz	2.88
ANT4	5 GHz WLAN CH0 5150-5850 MHz UNII-1 UNII-2A UNNI-2C UNII-3	5.71
ANT4	UNII-4 CH0 5850-5895 MHz	4.7
ANT5	5 GHz WLAN CH1 5150-5850 MHz UNII-1 UNII-2A UNNI-2C UNII-3	4.78
ANT5	UNII-4 CH1 5850-5895 MHz	5.4
ANT6	2.4 GHz WLAN CH0 2400-2483.5 MHz	4.85
ANT7	6 GHz WLAN 6105*** - 7065**** MHz UNII-5 UNII-6 UNII-7 UNII-8	3.66

NOTES:

* WLAN Frequencies listed are band edge frequencies as specified by the regulatory bodies. Due to channel center frequencies and bandwidths, the actual measured operation may be slightly different. See test reports for specific values.

** The frequency band 5850-5895 is designated by the FCC as the UNII-4 band and used only in the United States of America. Operation outside the jurisdiction of the FCC is limited by software. The highest channel in this band is Channel 177 with center frequency at 5885 MHz.

*** In the 6 GHz UNII-5 band, the eero devices begin operation on Channel 33 which is centered at 6115 MHz and has lower channel edge frequency at 6105 MHz. Operation on Channels 1 through 29 is prevented through limits in both the hardware and software.

**** In the 6 GHz UNII-8 band the eero device will operate on channel 221 as its highest channel. This channel is centered at 7055 MHz and has its upper channel edge at 7065 MHz. Operation above this is prevented by the software.

Antenna Characterization Methodology

The eero custom antennas are measured using Over the Air (OTA) chambers following the same process used to measure emissions on small hand-held devices and calculating key metrics such as Total Radiated Power (TRP). For this eero device, engineers used the Rayzone 1800 chamber.

A reference signal, typically normalized to 0 dB is fed into each antenna. Measurement antennas placed around the device measure the signal strength. The eero device under test is rotated 360 degrees around each of the x-, y-, and z-axis.

The data is compiled provided a spherical representation of the antenna patterns.

Mathematical analysis of the output signal using software such as EMQuest from ETS-Lingren allows the calculation of the maximum antenna gain.

The pictures below show the set-up and reference axis.

These measurements are repeated to evaluate each antenna over each band of operation. For brevity, only the data from the 6 GHz band is shown here.


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RayZone 1800


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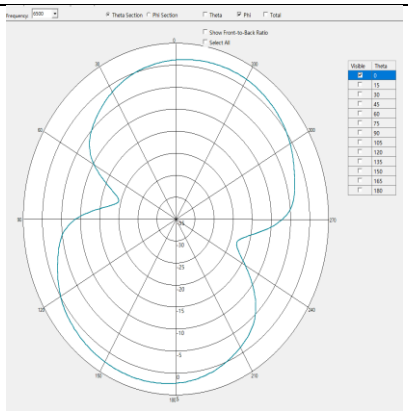

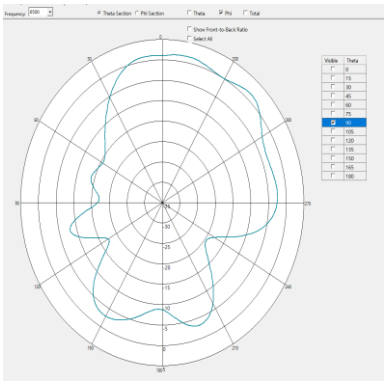

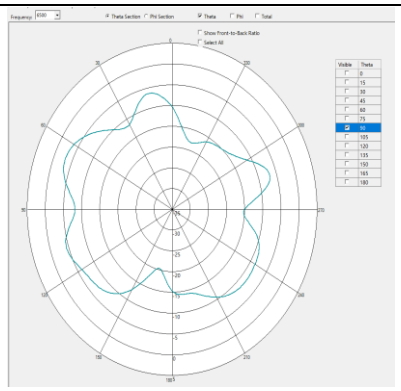

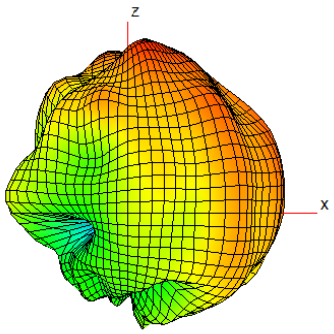

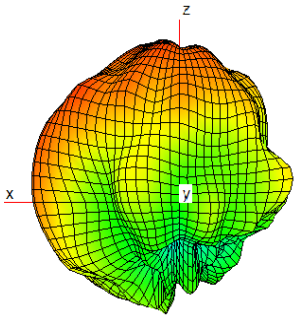

Antenna Gain Data

(Antennas for 5 GHz and 6 GHz bands shown; other antenna gains determined in like manner)

5 GHz Frequency Band						
ANT-4				**ANT-5**		
Frequency	Efficiency	Gain		Frequency	Efficiency	Gain
5000	52%	2.82		5000	51%	2.79
5050	54%	3.07		5050	56%	3.29
5100	59%	3.08		5100	61%	4.17
5150	63%	3.69		5150	62%	4.05
5200	65%	4.30		5200	65%	4.50
5250	67%	4.65		5250	68%	4.54
5300	70%	5.69		5300	69%	4.78

5350	71%	5.71		5350	72%	4.67
5400	72%	4.98		5400	72%	4.50
5450	70%	4.66		5450	67%	4.30
5500	67%	4.87		5500	64%	4.23
5550	66%	5.09		5550	60%	4.05
5600	63%	5.04		5600	56%	3.92
5650	59%	4.92		5650	54%	3.67
5700	56%	5.02		5700	47%	3.15
5750	57%	4.60		5750	49%	3.05
5800	59%	3.91		5800	54%	3.63
5850	60%	3.82		5850	58%	4.59
5900	60%	4.66		5900	60%	5.40
5950	64%	4.70		5950	62%	4.85

6 GHz Frequency band						
ANT-2				**ANT-7**		
Frequency	Efficiency	Gain		Frequency	Efficiency	Gain
5800	68%	3.39		5800	78%	3.43
5850	65%	2.67		5850	80%	3.56
5900	53%	0.95		5900	69%	2.86
5950	51%	1.11		5950	65%	2.43
6000	53%	1.37		6000	67%	2.45
6050	54%	1.78		6050	67%	2.49
6100	55%	1.8		6100	68%	2.75
6150	57%	1.82		6150	69%	2.9

6200	57%	1.72		6200	71%	3.38
6250	56%	2.71		6250	70%	3.56
6300	55%	3.07		6300	70%	3.66
6350	56%	2.58		6350	71%	3.52
6400	56%	2.23		6400	70%	3.15
6450	55%	2.62		6450	69%	3.04
6500	54%	3.23		6500	69%	3.12
6550	55%	3.63		6550	70%	2.64
6600	55%	3.79		6600	69%	3.27
6650	54%	4.04		6650	68%	3.29
6700	53%	4.05		6700	66%	3.09
6750	52%	3.86		6750	64%	2.87
6800	53%	4.09		6800	65%	3.12
6850	53%	4.18		6850	63%	2.25
6900	54%	4.16		6900	63%	2.4
6950	53%	3.98		6950	62%	2.42
7000	54%	4.02		7000	62%	2.44
7050	55%	4.08		7050	64%	2.99
7100	54%	3.8		7100	65%	2.99
7150	52%	3.6		7150	65%	3
7200	47%	3.3		7200	64%	3.01

Antennas diagram

Numbering of the antennas as they attach to the carrier is clockwise, starting with ANT1 in the lower left front.

The PCA silkscreen clearly labels each connector or cable receptacle.

Antenna Location and Cable Routing