

TITLE

WIFI 6E FLEX CABLED SIDE-FED ANTENNA TABLE OF CONTENTS

- 1.0 SCOPE
- 2.0 PRODUCT DESCRIPTION
- 3.0 APPLICABLE DOCUMENTS
- **4.0 ANTENNA PERFORMANCE**
- **5.0 ASSEMBLY GUIDELINE**
- 6.0 RF PERFORMANCE AS A FUNCTION OF IMPLEMENTATION
- 7.0 CHANGE HISTORY

REVISION:	ECR/ECN INFORMATION: EC No: 644338 DATE: 2020/08/31	WIFI 6I Antenna	1 of 32		
DOCUMEN:	T NUMBER:	CREATED / REVISED BY:	CHECKED BY:	<u>APPROV</u>	'ED BY:
AS-2069940100		Hai Liu 2020/08/31 Cheng Kang 2020/08/31 Andy Zha		Andy Zhang	2020/08/31



WIFI 6E FLEX CABLED SIDE-FED ANTENNA

1.0 SCOPE

This specification describes the antenna application and surrounding. The information in this document is for reference and benchmark purposes only. The user is responsible for validating antenna RF performance based on the user's actual implementation.

Antenna illustrations in this document are generic representations. They are not intended to be an image of any antenna listed in the scope.

2.0 PRODUCT DESCRIPTION

2.1 PRODUCT NAME AND SERIES NUMBER (S)

Product name: WiFi 6E Flex Cabled Side-fed Antenna

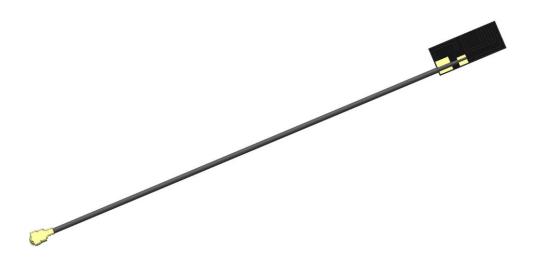
Series Number: 206994

2.2 DESCRIPTION

Series 206994 is a small monopole flexible antenna for 2.4/5/6GHz dual band. This antenna is made from poly-flexible material with small size 15.4*6.4*0.15mm, and has double-sided adhesive tape for easy "peel and stick" mounting.

2.3 PRODUCT STRUCTURE INFORMATION

Please refer to PS-2069940100 for full information.



Molex Antenna 3D View

REVISION:	ECR/ECN INFORMATION: EC No: 644338 DATE: 2020/08/31	WIFI 6I Antenna	2 of 32		
DOCUMENT NUMBER:		CREATED / REVISED BY:	CHECKED BY:	<u>APPROV</u>	/ED BY:
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3.0 APPLICABLE DOCUMENTS

DOCUMENT	NUMBER	DESCRIPTION
Cala Drawing (CD)	SD-2069940100	Machanical Dimension of the product
Sale Drawing (SD)	SD-2069941100	Mechanical Dimension of the product
Product Specification (PS)	PS-2069940100	Product Specification
Docking Drowing (DK)	PK-2069940100	Draduat nackaging an adjications
Packing Drawing (PK)	PK-2069941100	Product packaging specifications

4.0 ANTENNA PERFORMANCE

4.1 RF TEST CONDITIONS

All measurements are done of the antenna mounted on a PC/ABS material block of 1.5mm thickness with VNA Agilent E5071C and Over-The-Air (OTA) chamber. All measurements in this document are done with the part no.2069940100 with a cable length of 100mm.



FIGURE4.1.1 ANTENNA LOADED WITH PC/ABS BLOCK OF 1.5MM THICKNESS

REVISION:	ECR/ECN INFORMATION: EC No: 644338	WIFI 6I Antenna		3 of 32	
_	DATE: 2020/08/31	Antonia	0 0. 02		
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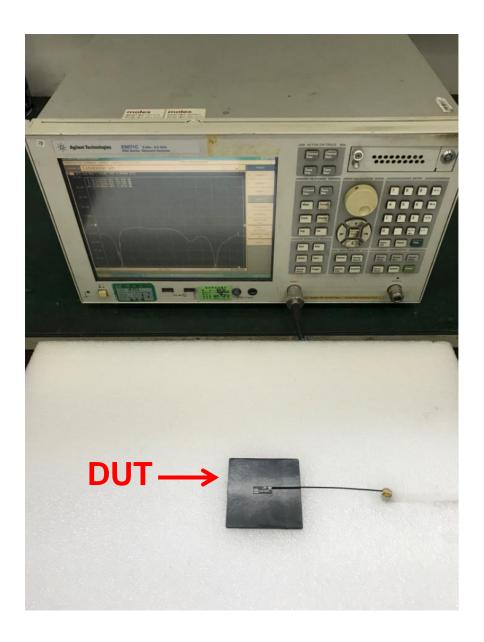


FIGURE4.1.2 ANTENNA LOADED WITH PC/ABS BLOCK OF 1.5MM THICKNESS TESTED WITH VNA E5071C

REVISION:	ECR/ECN INFORMATION: EC No: 644338 DATE: 2020/08/31	WIFI 6	E Flex Cabled Side Application Specif		4 of 32
DOCUMENT NUMBER:		CREATED / REVISED BY:	CHECKED BY:	APPRO\	ED BY:

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AS-2069940100



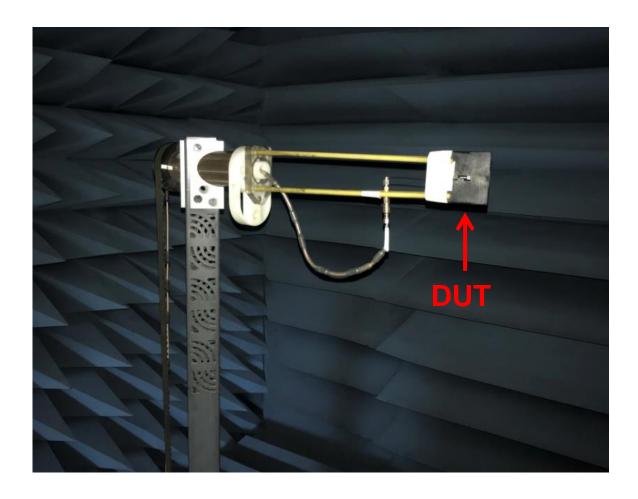


FIGURE4.1.3 ANTENNA LOADED WITH PC/ABS BLOCK OF 1.5MM THICKNESS TESTED IN OTA CHAMBER

REVISION:	ECR/ECN INFORMATION:			 SHEET No.
E	EC No: 644338 DATE: 2020/08/31		E Flex Cabled Side Application Specif	5 of 32
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4.2 ANTENNA PERFORMANCE

DESCRIPTION	EQUIPMENT	REQUIREMENT			
Frequency Range	VNA E5071C	2.4-2.5GHz	5.15-5.85GHz	5.925-7.125GHz	
Return Loss	VNA E5071C	< -10 dB	<-5dB	<-3dB	
Peak Gain (Max)	OTA Chamber	3.6dBi	3.6dBi	2.7dBi	
Average Total Efficiency	OTA Chamber	>55%	>70%	>40%	
Polarization	OTA Chamber	Linear			
Input Impedance	VNA E5071C	50 ohms			

Note that the above antenna performance is measured with just the antenna mounted on a PC/ABS block to similar a free-space condition. When implement into the system, the frequency resonant might be off-tune due to the loading of surrounding components especially metal plane. This off-tune can be compensated through matching. Although module manufacturers specify a peak gain limit, it is based on free-space conditions. The peak gain will be degraded by 1 to 2dBi in the actual implementation as the radiation pattern will change due to the surround components. As such, during selection of antenna, you can select one with high peak gain to compensate for the loss. Molex can offer assistant to choose the best location and best tuning in-order to meet this peak gain requirement.

ECR/ECN INF EC No: 6443 DATE: 2020	38	WIFI 6I Antenna	SHEET No. 6 of 32		
DOCUMENT NUMBER: AS-2069940100		CREATED / REVISED BY: Hai Liu 2020/08/31	CHECKED BY: Cheng Kang 2020/08/31	APPROV Andy Zhang	



4.3 RETURN LOSS PLOT

All measurements in this document are done with a cable length of 100mm.

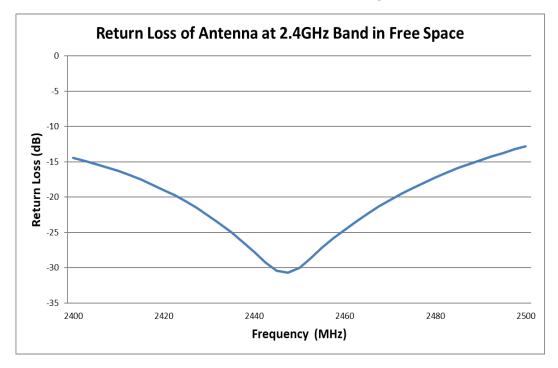


FIGURE 4.3.1 RETURN LOSS OF ANTENNA AT WIFI 2.4GHZ BAND IN FREE SPACE

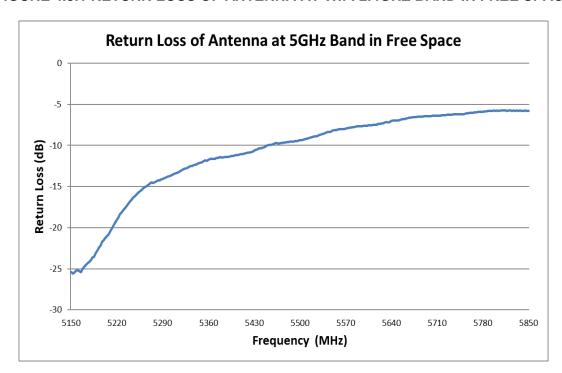


FIGURE 4.3.2 RETURN LOSS OF ANTENNA AT WIFI 5GHZ BAND IN FREE SPACE

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E	DATE: 2020/08/31	Antenna	Antenna Application Specification				
_	EC No: 644338	WIFI 6E Flex Cabled Side-Fed			7 of 32		
REVISION:	ECR/ECN INFORMATION:	TITLE:			SHEET No.		



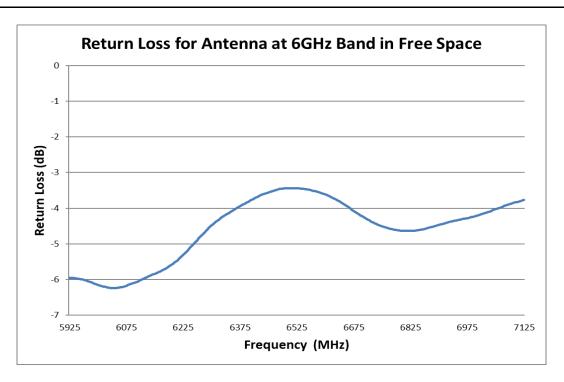


FIGURE 4.3.3 RETURN LOSS OF ANTENNA AT WIFI 6GHZ BAND IN FREE SPACE

4.4 EFFICIENCY PLOT

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All measurements in this document are done with a cable length of 100mm.

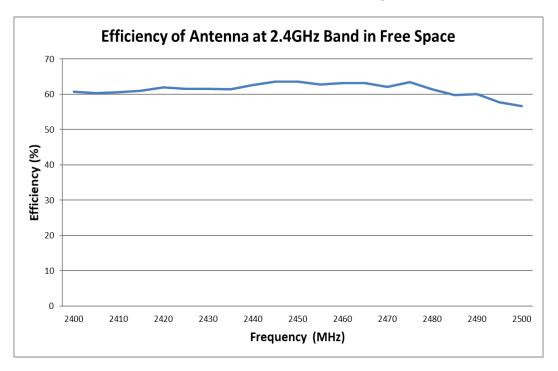


FIGURE 4.4.1 EFFICIENCY OF ANTENNA AT WIFI 2.4GHZ BAND IN FREE SPACE

E	EC No: 644338 DATE: 2020/08/31		E Flex Cabled Side Application Specif		8 of 32
DOCUMENT NUMBER:		CREATED / REVISED BY:	CHECKED BY:	<u>APPROV</u>	ED BY:
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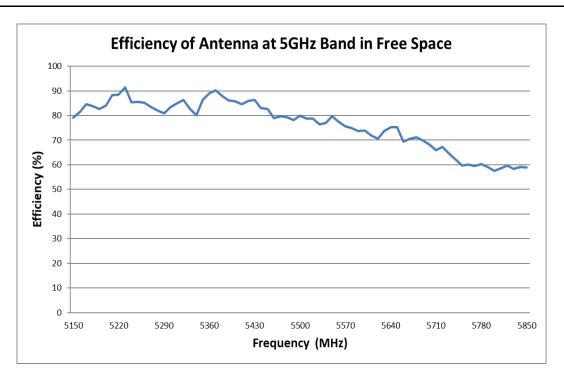


FIGURE 4.4.2 EFFICIENCY OF ANTENNA AT WIFI 5GHZ BAND IN FREE SPACE

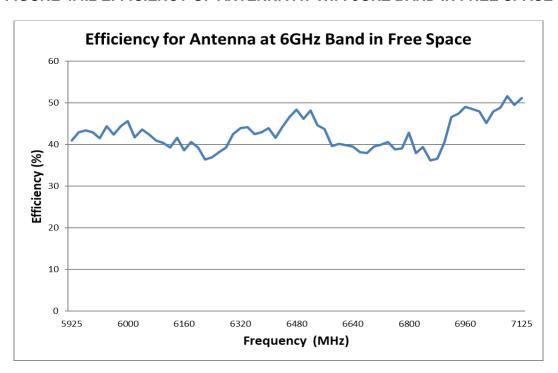


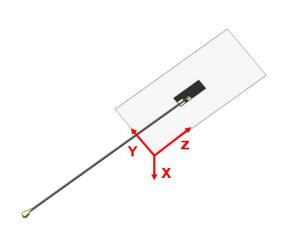
FIGURE 4.4.3 EFFICIENCY OF ANTENNA AT WIFI 6GHZ BAND IN FREE SPACE

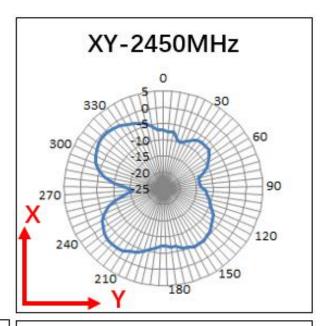
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Е	EC No: 644338	_	WIFI 6E Flex Cabled Side-Fed					
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DOCUMENT NUMBER:		CREATED / REVISED BY:	CHECKED BY:	<u>APPROV</u>	<u>ED BY:</u>			
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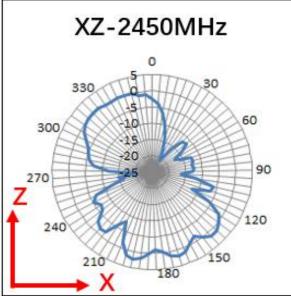


4.5 RADIATION PATTERN

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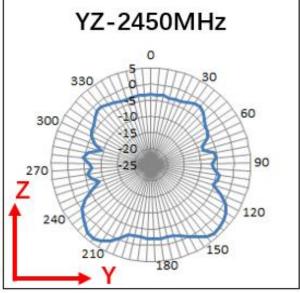


FIGURE 4.5.1 2D RADIATION PATTERN OF ANTENNA AT 2450MHZ IN FREE SPACE

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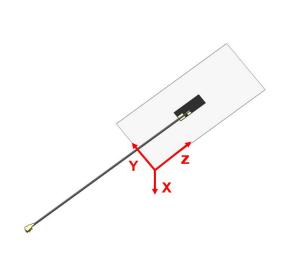
WIFI 6E Flex Cabled Side-Fed
Antenna Application Specification

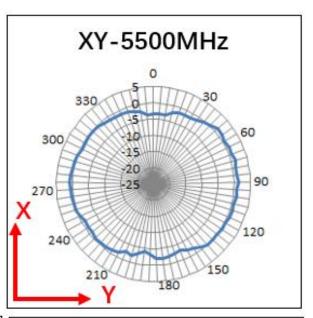
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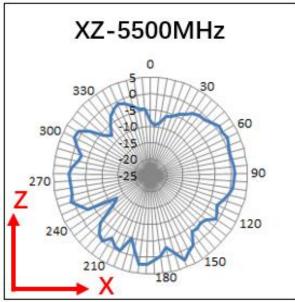
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10 of 32









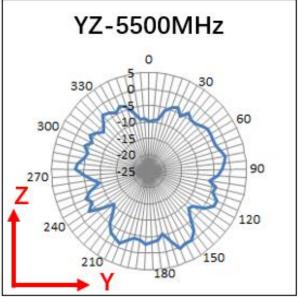
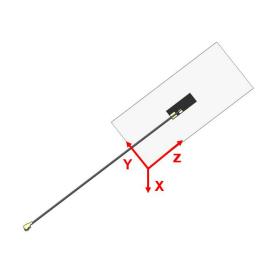
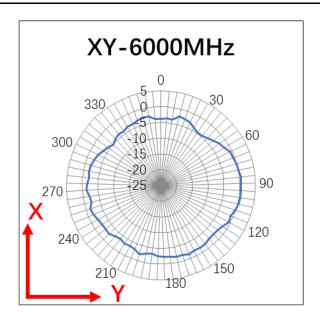
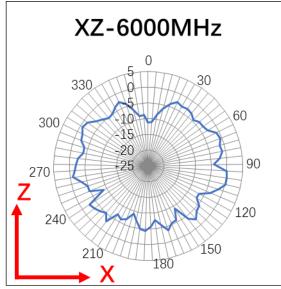


FIGURE 4.5.2 2D RADIATION PATTERN OF ANTENNA AT 5500MHZ IN FREE SPACE









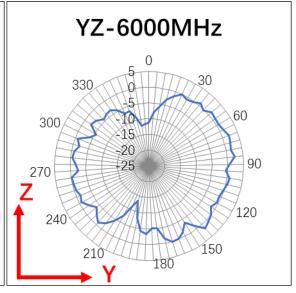


FIGURE 4.5.3 2D RADIATION PATTERN OF ANTENNA AT 6000MHZ IN FREE SPACE

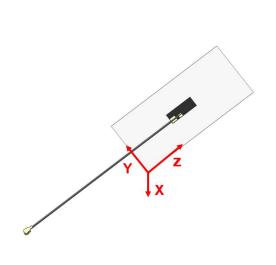
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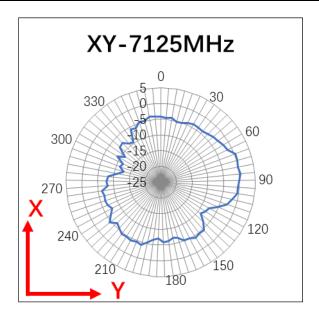
WIFI 6E Flex Cabled Side-Fed Antenna Application Specification

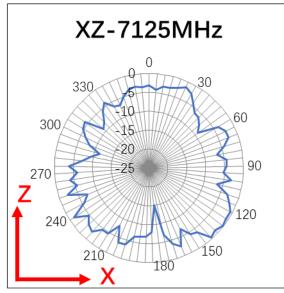
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SHEET No. 12 of 32









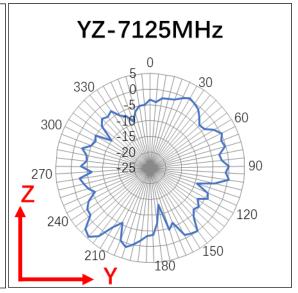


FIGURE 4.5.4 2D RADIATION PATTERN OF ANTENNA AT 7125MHZ IN FREE SPACE

REVISION:	ECR/ECN INFORMATION:				SHEET No.		
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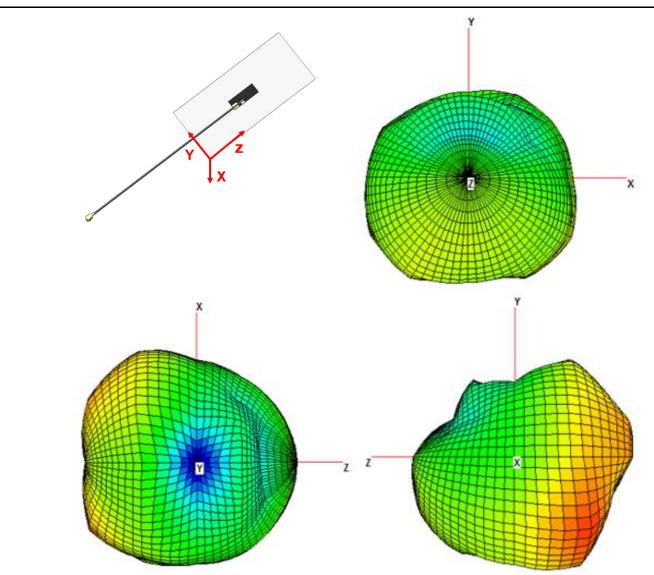


FIGURE 4.5.5 3D RADIATION PATTERN OF ANTENNA AT 2450MHZ IN FREE SPACE

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_	EC No: 644338	WIFI 6E Flex Cabled Side-Fed	
E	DATE: 2020/08/31	Antenna Application Specification	14 of 32



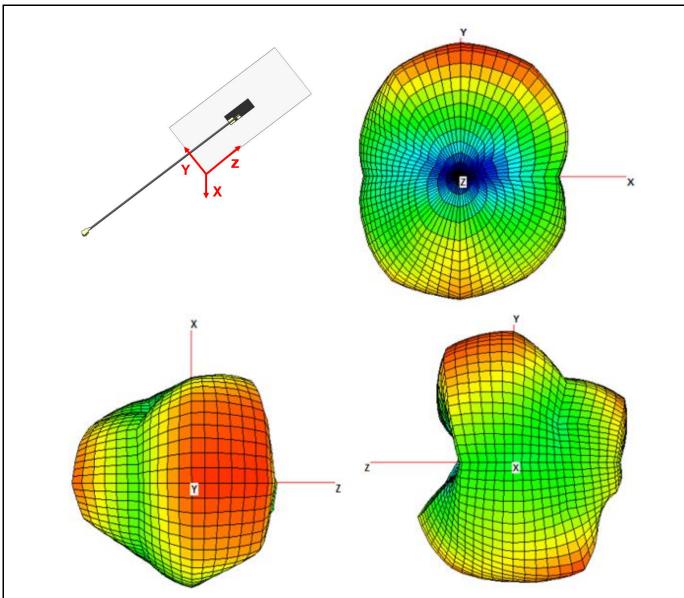


FIGURE 4.5.6 3D RADIATION PATTERN OF ANTENNA AT 5500MHZ IN FREE SPACE



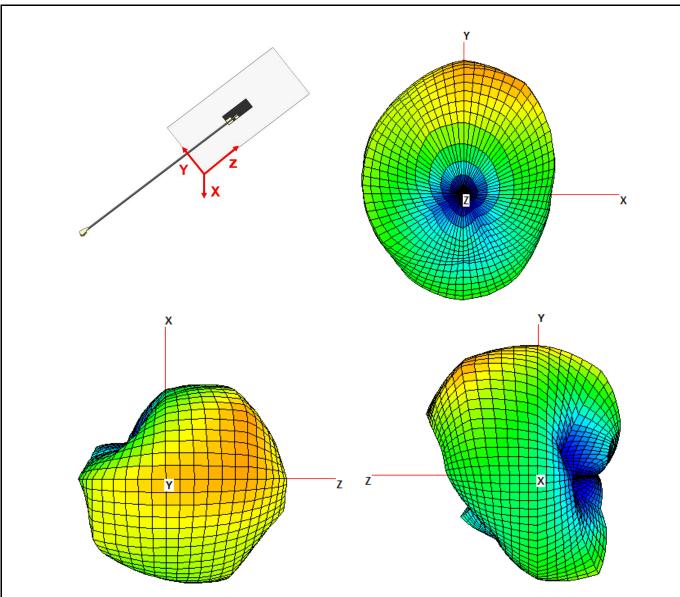


FIGURE 4.5.7 3D RADIATION PATTERN OF ANTENNA AT 6000MHZ IN FREE SPACE

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DATE: 2020/08/31

| ECR/ECN INFORMATION: | TITLE: | WIFI 6E Flex Cabled Side-Fed | Antenna Application Specification | 16 of 32



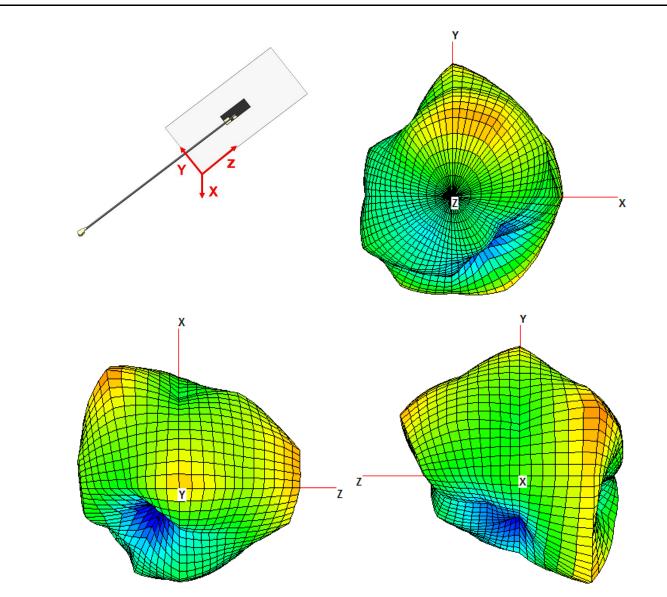


FIGURE 4.5.8 3D RADIATION PATTERN OF ANTENNA AT 7125MHZ IN FREE SPACE

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E	DATE: 2020/08/31	Ant	enna	Application Specification	ication	17 of 32



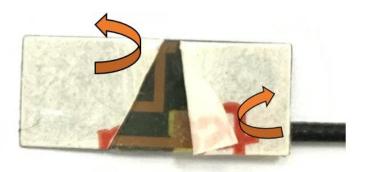
5.0 ASSEMBLY GUIDELINE

The flex antenna comes with an adhesive TESA 68537 for assemble onto the plastic wall of the system. The surface should be smooth with Ra<1.6um and need to clean the surface before sticking this product. The antenna cannot be placed on a metallic surface.

5.1 HOW TO TEAR FLEX RELEASE PAPER



1. Find cut line on flex back side, Bend flex slight along cut line



2. Tear release paper

REVISION:	ECR/ECN INFORMATION:		SHEET No.
	EC No: 644338	WIFI 6E Flex Cabled Side-Fed	
F	20110.	Antenna Application Specification	18 of 32
	DATE: 2020/08/31	Amerina Application Specification	16 of 32



5.2 CABLE BENDING

During the assembly of the antenna in a device, the cable needs to be positioned away from the antenna flex to achieve best performance. The cable must be away from the pattern at least 5mm as shown in figure 5.2.1. If the cable crosses into the antenna flex, the antenna performance will be degraded.

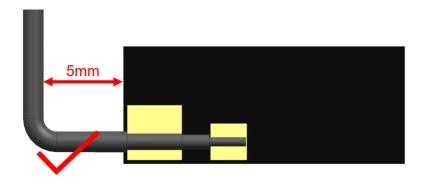


FIGURE 5.2.1 RECOMMENDED CABLE BENDING RANGE

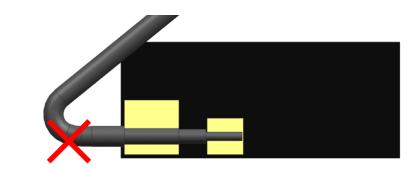


FIGURE 5.2.2 UNRECOMMENDED CABLE BENDING RANGE

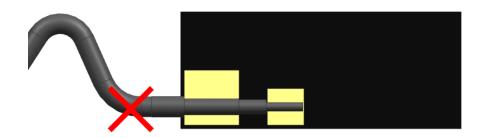


FIGURE 5.2.3 MULTIPLE BENDING OF CABLES IS NOT RECOMMENDED

REVISION :	ECR/ECN INFORMATION:		SHEET No.
_	EC No: 644338	WIFI 6E Flex Cabled Side	
E	DATE: 2020/08/31	Antenna Application Specif	ication 19 of 32



6.0 RF PERFORMANCE AS A FUNCTION OF IMPLEMENTATION

6.1 ANTENNA RF PERFORMANCE AS A FUNCTION OF DIFFERENT LOCATIONS WITH PARALLEL PLANE GROUND

Antenna performance will be degraded if the antenna is placed too close to a ground plane. Four locations from 5mm, 10mm, 15mm and 20mm with a parallel plane ground have been evaluated. The locations are shown in figure 6.1.1. The plane ground size is 90mm*90mm. The antenna performance is better with larger distance between antenna and parallel plane ground. The minimum distance between antenna and plane ground is recommended to be at least 10mm to achieve acceptable RF performance.

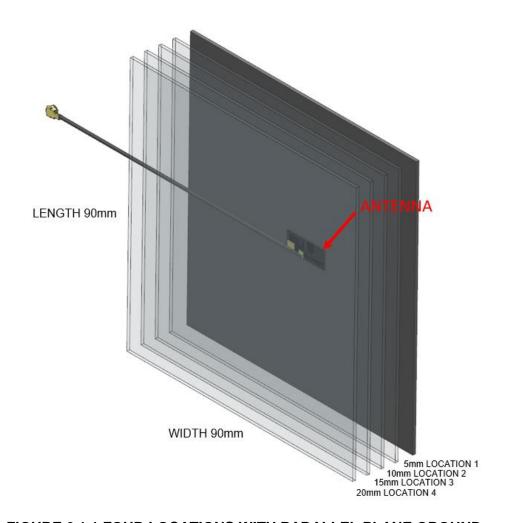


FIGURE 6.1.1 FOUR LOCATIONS WITH PARALLEL PLANE GROUND

REVISION:	ECR/ECN INFORMATION: EC No: 644338		WIFI 6E Flex Cabled Side-Fed Antenna Application Specification		SHEET No.
Ε	DATE: 2020/08/31	Antenna			20 of 32
DOCUMENT NUMBER:		CREATED / REVISED BY:	CHECKED BY:	APPROV	/ED BY:

Hai Liu 2020/08/31

AS-2069940100

TEMPLATE FILENAME: APPLICATION_SPEC[SIZE_A](V.1).DOC



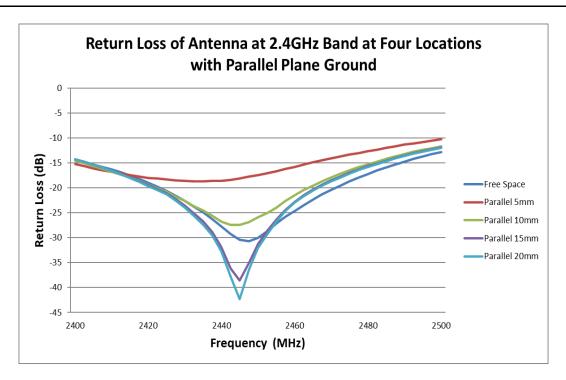


FIGURE 6.1.2 RETURN LOSS OF ANTENNA AT WIFI 2.4GHZ BAND AT FOUR LOCATIONS WITH PARALLEL PLANE GROUND

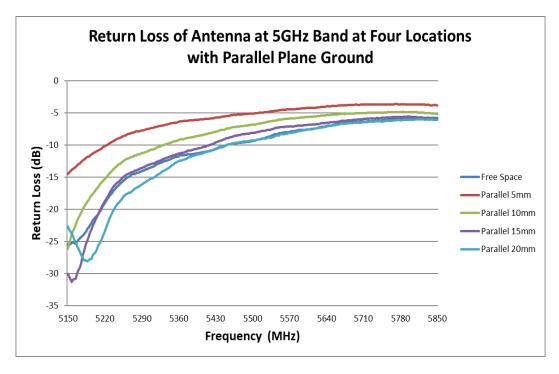


FIGURE 6.1.3 RETURN LOSS OF ANTENNA AT WIFI 5GHZ BAND AT FOUR LOCATIONS WITH PARALLEL PLANE GROUND

REVISION:	ECR/ECN INFORMATION: EC No: 644338 DATE: 2020/08/31	WIFI 6	E Flex Cabled Side Application Specif		21 of 32
DOCUMENT NUMBER:		CREATED / REVISED BY:	CHECKED BY:	APPRO\	/ED BY:



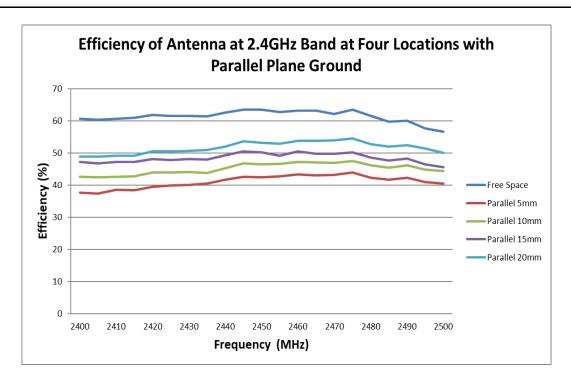


FIGURE 6.1.4 EFFICIENCY OF ANTENNA AT WIFI 2.4GHZ BAND AT FOUR LOCATIONS WITH PARALLEL PLANE GROUND

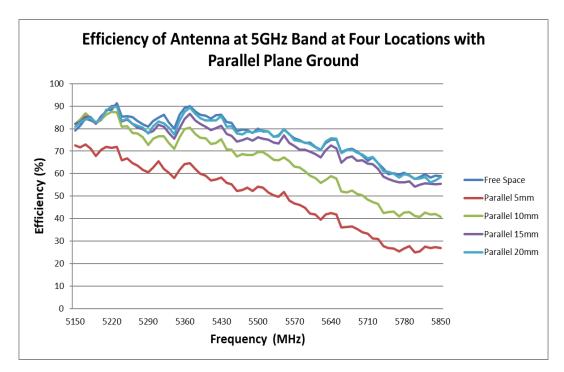


FIGURE 6.1.5 EFFICIENCY OF ANTENNA AT WIFI 5GHZ BAND AT FOUR LOCATIONS
WITH PARALLEL PLANE GROUND

REVISION:	ECR/ECN INFORMATION:	TITLE:	Tlay Cablad Cida	Fod.	SHEET No.
_	EC No: 644338		WIFI 6E Flex Cabled Side-Fed Antenna Application Specification		
	DATE: 2020/08/31	Antenna	Application Specif	ication	22 of 32
DOCUMENT NUMBER:		CREATED / REVISED BY:	CHECKED BY:	APPROV	<u>ED BY:</u>

Hai Liu 2020/08/31

AS-2069940100



6.2 ANTENNA RF PERFORMANCE AS A FUNCTION OF DIFFERENT LOCATIONS WITH VERTICAL PLANE GROUND

Antenna performance will be degraded if the antenna is placed too close to a ground plane. Four locations of 5mm, 10mm, 15mm and 20mm away from the vertical plane ground have been evaluated. These locations are shown in figure 6.2.1. The plane ground size is 90mm*90mm. The antenna performance is better with larger distance between antenna and vertical plane ground. The minimum distance between antenna and plane ground is recommended to be at least 5mm to achieve acceptable RF performance.

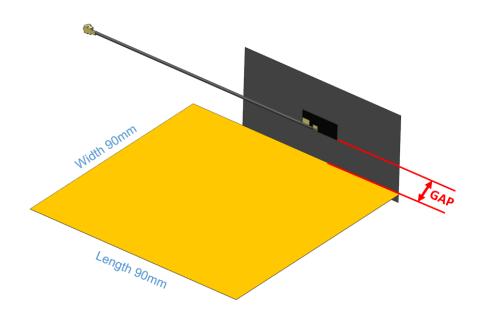


FIGURE 6.2.1 FOUR LOCATIONS WITH VERTICAL PLANE GROUND

Ground size: 90mm*90mm;

Location 1: Distance between antenna and plane (GAP) ground is about 5mm; Location 2: Distance between antenna and plane (GAP) ground is about 10mm; Location 3: Distance between antenna and plane (GAP) ground is about 15mm; Location 4: Distance between antenna and plane (GAP) ground is about 20mm.

EC No: 644338
DATE: 2020/08/31

| ECR/ECN INFORMATION: TITLE: WIFI 6E Flex Cabled Side-Fed Antenna Application Specification | 23 of 32



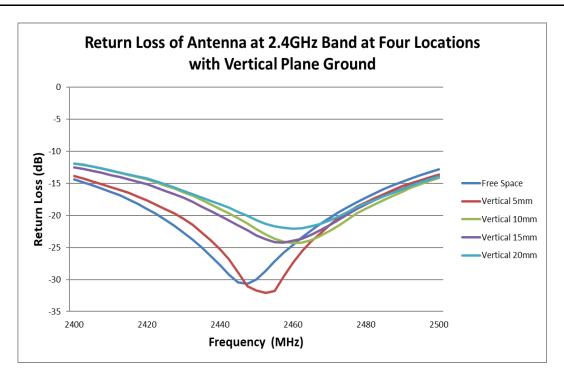


FIGURE 6.2.2 RETURN LOSS OF ANTENNA AT WIFI 2.4GHZ BAND AT FOUR LOCATIONS
WITH VERTICAL PLANE GROUND

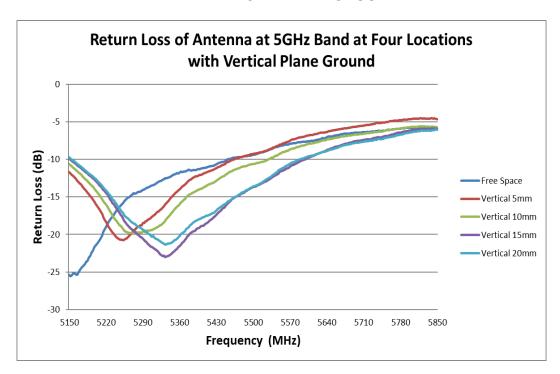


FIGURE 6.2.3 RETURN LOSS OF ANTENNA AT WIFI 5GHZ BAND AT FOUR LOCATIONS WITH VERTICAL PLANE GROUND

REVISION:	ECR/ECN INFORMATION: EC No: 644338 DATE: 2020/08/31		E Flex Cabled Side Application Specif		SHEET No.24 of 32
DOCUMENT NUMBER:		CREATED / REVISED BY:	CHECKED BY:	APPROV	'ED BY:

AS-2069940100 Hai Liu 2020/08/31 Cheng Kang 2020/08/31 Andy Zhang 2020/08/31



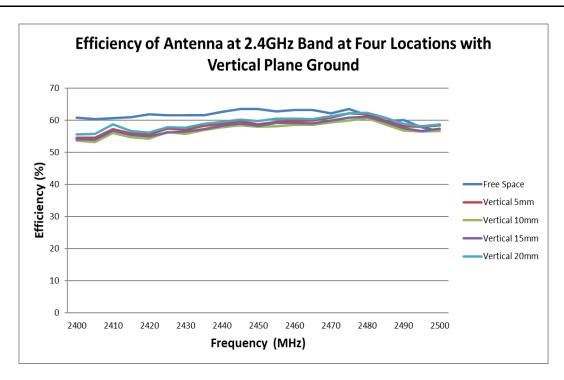


FIGURE 6.2.4 EFFICIENCY OF ANTENNA AT WIFI 2.4GHZ BAND AT FOUR LOCATIONS WITH VERTICAL PLANE GROUND

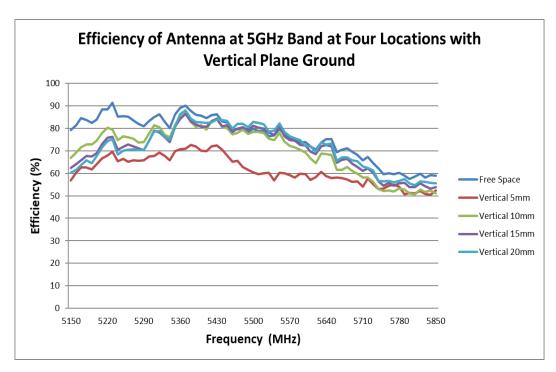


FIGURE 6.2.5 EFFICIENCY OF ANTENNA AT WIFI 5GHZ BAND AT FOUR LOCATIONS WITH VERTICAL PLANE GROUND

REVISION:	ECR/ECN INFORMATION: EC No: 644338 DATE: 2020/08/31	_	E Flex Cabled Side Application Specif		25 of 32
DOCUMENT NUMBER:		CREATED / REVISED BY:	CHECKED BY:	<u>APPROV</u>	ED BY:

Hai Liu 2020/08/31

AS-2069940100

TEMPLATE FILENAME: APPLICATION_SPEC[SIZE_A](V.1).DOC



6.3 ANTENNA RF PERFORMANCE AS A FUNCTION OF DIFFERENT DISTANCES WITH PARALLEL PLANE GROUND

Antenna performance will be degraded if the antenna is placed too close to a ground plane. Four locations 5mm,10mm,15mm and 20mm from a parallel plane ground have been evaluated. These locations are shown in figure 6.3.1. The plane ground size is 90mm*90mm. The antenna performance is better with larger distance between the antenna and the parallel plane ground. The minimum distance between the antenna and the plane ground is recommended to be at least 5mm to achieve acceptable RF performance.

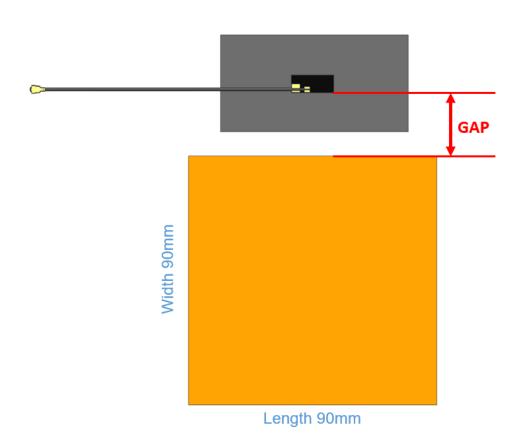


FIGURE 6.3.1 FOUR LOCATIONS WITH PARALLEL PLANE GROUND

Ground Size: 90mm*90mm;

AS-2069940100

Location 1: Distance between antenna and plane (GAP) ground is about 5mm; Location 2: Distance between antenna and plane (GAP) ground is about 10mm; Location 3: Distance between antenna and plane (GAP) ground is about 15mm; Location 4: Distance between antenna and plane (GAP) ground is about 20mm

Hai Liu 2020/08/31

REVISION:	ECR/ECN INFORMATION: EC No: 644338 DATE: 2020/08/31	WIFI 6	E Flex Cabled Side Application Specif		26 of 32
DOCUMENT NUMBER:		CREATED / REVISED BY:	CHECKED BY:	APPROV	/ED BY:

TEMPLATE FILENAME: APPLICATION_SPEC[SIZE_A](V.1).DOC



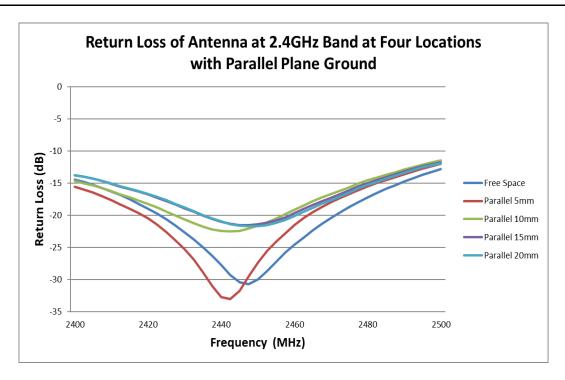


FIGURE 6.3.2 RETURN LOSS OF ANTENNA AT WIFI 2.4GHZ BAND AT FOUR LOCATIONS WITH PARALLEL PLANE GROUND

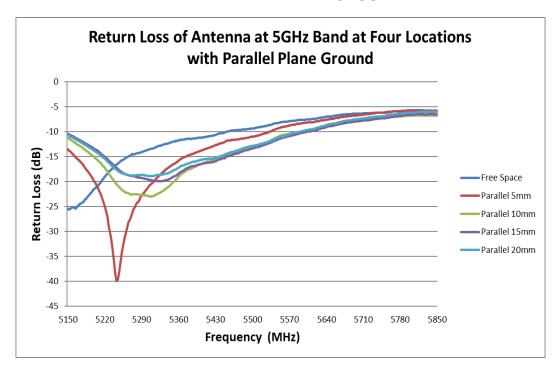


FIGURE 6.3.3 RETURN LOSS OF ANTENNA AT WIFI 5GHZ BAND AT FOUR LOCATIONS WITH PARALLEL PLANE GROUND

REVISION:	ECR/ECN INFORMATION: EC No: 644338 DATE: 2020/08/31		E Flex Cabled Side Application Specif		27 of 32
DOCUMENT NUMBER:		CREATED / REVISED BY:	CHECKED BY:	APPROV	ED BY:

Hai Liu 2020/08/31

AS-2069940100

TEMPLATE FILENAME: APPLICATION_SPEC[SIZE_A](V.1).DOC



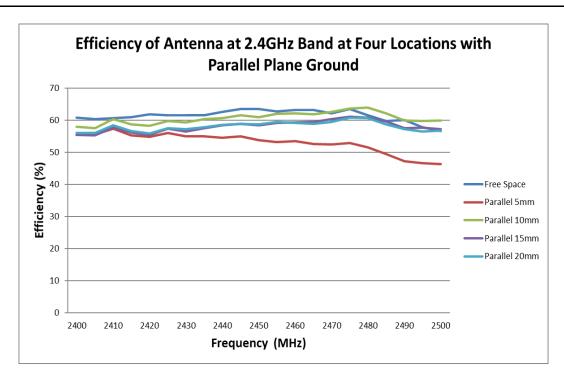


FIGURE 6.3.4 EFFICIENCY OF ANTENNA AT WIFI 2.4GHZ BAND AT FOUR LOCATIONS WITH PARALLEL PLANE GROUND

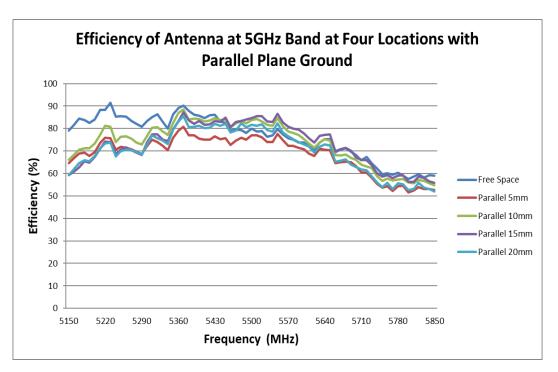


FIGURE 6.3.5 EFFICIENCY OF ANTENNA AT WIFI 5GHZ BAND AT FOUR LOCATIONS WITH PARALLEL PLANE GROUND

REVISION:	ECR/ECN INFORMATION: EC No: 644338 DATE: 2020/08/31	_	E Flex Cabled Side Application Specif		28 of 32
DOCUMENT NUMBER:		CREATED / REVISED BY:	CHECKED BY:	APPROV	'ED BY:

Hai Liu 2020/08/31

AS-2069940100



6.4 ANTENNA RF PERFORMANCE AS A FUNCTION OF DIFFERENT CABLE LENGTH

Four cable length have been evaluated and these states are shown in figure 6.4.1. The cable length "L" is 200mm, 150mm, 100mm(reference length) and 50mm. The cable length should be more than 50mm and less than 200mm. The resonance frequency shift to lower and the antenna performance will decrease obviously when the cable length is less than 50mm and more than 200mm.



FIGURE 6.3.1 FOUR DIFFERENT CABLE LENGTH

REVISION: BCCR/ECN INFORMATION: TITLE: WIFI 6E Flex Cabled Side-Fed Antenna Application Specification

DOCUMENT NUMBER: CREATED / REVISED BY: CHECKED BY: APPROVED BY:

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AS-2069940100 Hai Liu 2020/08/31 Cheng Kang 2020/08/31 Andy Zhang 2020/08/31



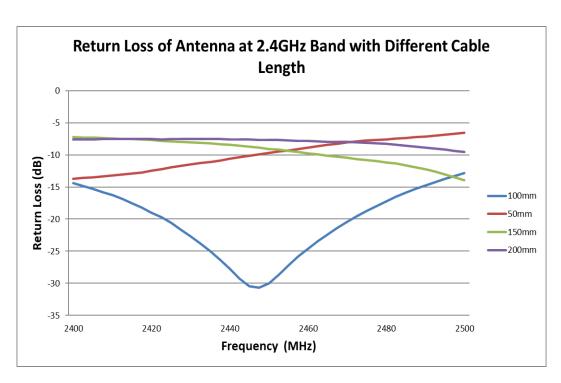


FIGURE 6.4.2 RETURN LOSS OF ANTENNA AT WIFI 2.4GHZ BAND WITH DIFFERENT CABLE LENGTH

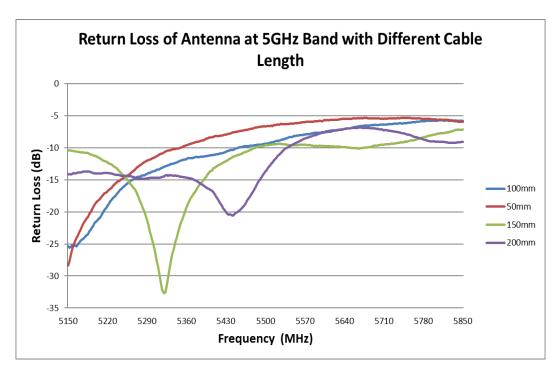


FIGURE 6.4.3 RETURN LOSS OF ANTENNA AT WIFI 5GHZ BAND WITH DIFFERENT CABLE LENGTH

REVISION:	ECR/ECN INFORMATION: EC No: 644338 DATE: 2020/08/31	WIFI 6E Flex Cabled Side-Fed Antenna Application Specification		30 of 32	
DOCUMENT NUMBER:		CREATED / REVISED BY:	CHECKED BY:	APPROV	<u>ED BY:</u>

Hai Liu 2020/08/31

AS-2069940100



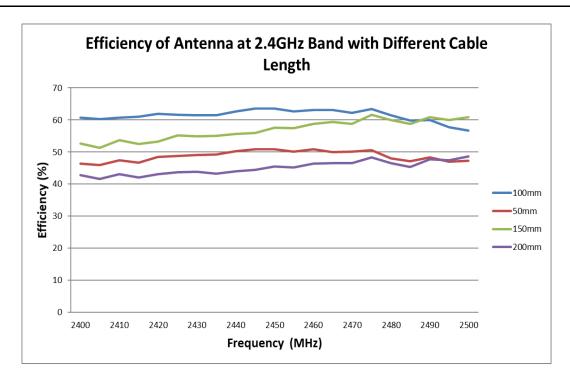


FIGURE 6.4.4 EFFICIENCY OF ANTENNA AT WIFI 2.4GHZ BAND WITH DIFFERENT CABLE LENGTH

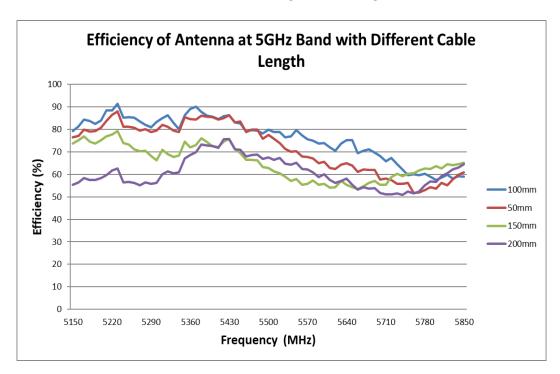


FIGURE 6.4.5 EFFICIENCY OF ANTENNA AT WIFI 5GHZ BAND WITH DIFFERENT CABLE LENGTH

REVISION:	ECR/ECN INFORMATION:	TITLE:		SHEET No.	
E	EC No: 644338 DATE: 2020/08/31	_	WIFI 6E Flex Cabled Side-Fed Antenna Application Specification		31 of 32
		CREATED / REVISED BY:	CHECKED BY:	APPROV	'ED BY:

Hai Liu 2020/08/31

AS-2069940100

TEMPLATE FILENAME: APPLICATION_SPEC[SIZE_A](V.1).DOC



7.0 CHANGE HISTORY

CHANGE HISTORY				
REV	DATA	DESCRIPTION		
D	2020/07/03	Update radiation pattern, add different cable length and 6-7.125GHz band		
E	2020/08/31	Optimized Part 4.2 Peak Gain & Efficiency		

REVISION:	ECR/ECN INFORMATION: EC No: 644338 DATE: 2020/08/31	WIFI 6E Flex Cabled Side-Fed Antenna Application Specification			32 of 32
DOCUMENT NUMBER:		CREATED / REVISED BY:	CHECKED BY:	APPROVED BY:	
AS-2069940100		Hai Liu 2020/08/31	Cheng Kang 2020/08/31	Andy Zhang 2020/08/3	