CELLULAR QUAD BAND FLEX ANTENNA

1.0 SCOPE

This specification describes the antenna application and surroundings for the Cellular Quad Band Flex Antenna. The information in this document is for reference and benchmark purposes only. The user is responsible for verifying antenna RF performance based on user's actual implementation.

All measurements are done of the antenna mounted on a PC/ABS material block of 1mm thickness with VNA Agilent 5071C and OTA chamber. All measurements are done with the part no. 1461850100 with a cable length of 100mm.

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

A. DEFINITIONS OF TERMS

The overall antenna size is 84mm*15mm (Figure 1).

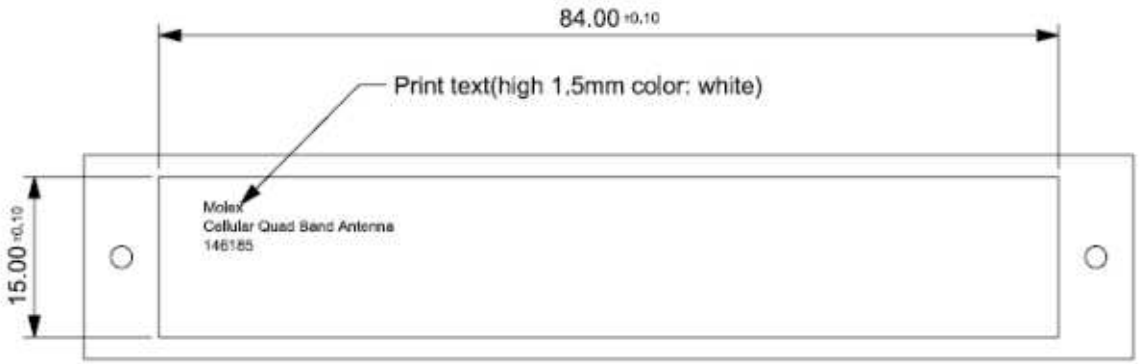


FIGURE 1. DIMENSION OF CELLULAR QUAD BAND FLEX ANTENNA



FIGURE 2. CABLE LINE VIEW OF CELLULAR QUAD BAND FLEX ANTENNA

B. RF PERFORMANCE OF ANTENNA LOADED WITH PC/ABS MATERIAL BLOCK OF 1MM THICKNESS IN FREE SPACE

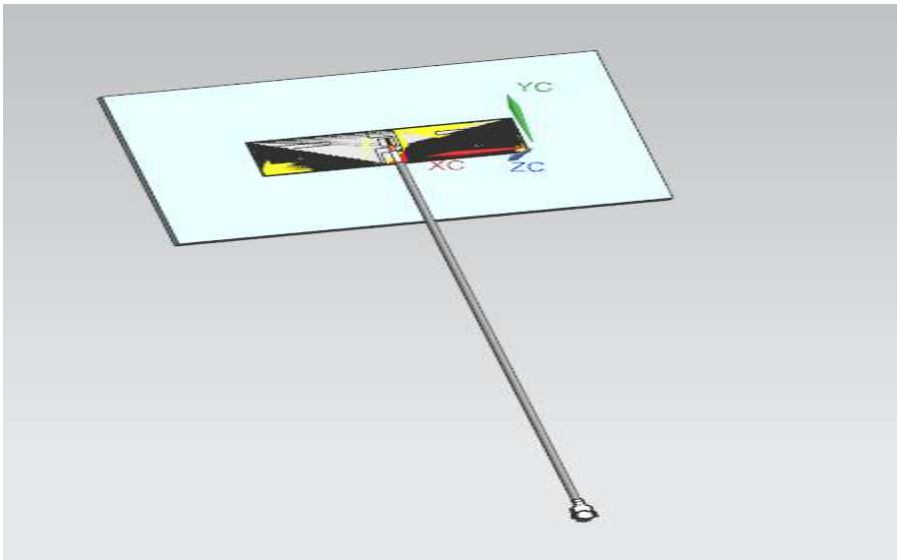


FIGURE 2.1 ANTENNA LOADED WITH PC/ABS BLOCK OF 1MM THICKNESS

Description	Test Condition	Requirements	
Frequency Range	Measure antenna on recommended PCB through VNA E5071C	824MHz~960MHz	1.7GHz~2.7GHz
Return Loss	Measure antenna on recommended PCB through VNA E5071C	< -4 dB	< -4 dB
Peak Gain (Max)	Measure antenna on recommended PCB through OTA chamber	1.4dBi	3dBi
Avg. Total Efficiency	Measure antenna on recommended PCB through OTA chamber	>60%	>65%
Polarization	Measure antenna on recommended PCB through OTA chamber	Linear	
Input Impedance	Measure antenna on recommended PCB through VNA E5071C	50 Ohms	

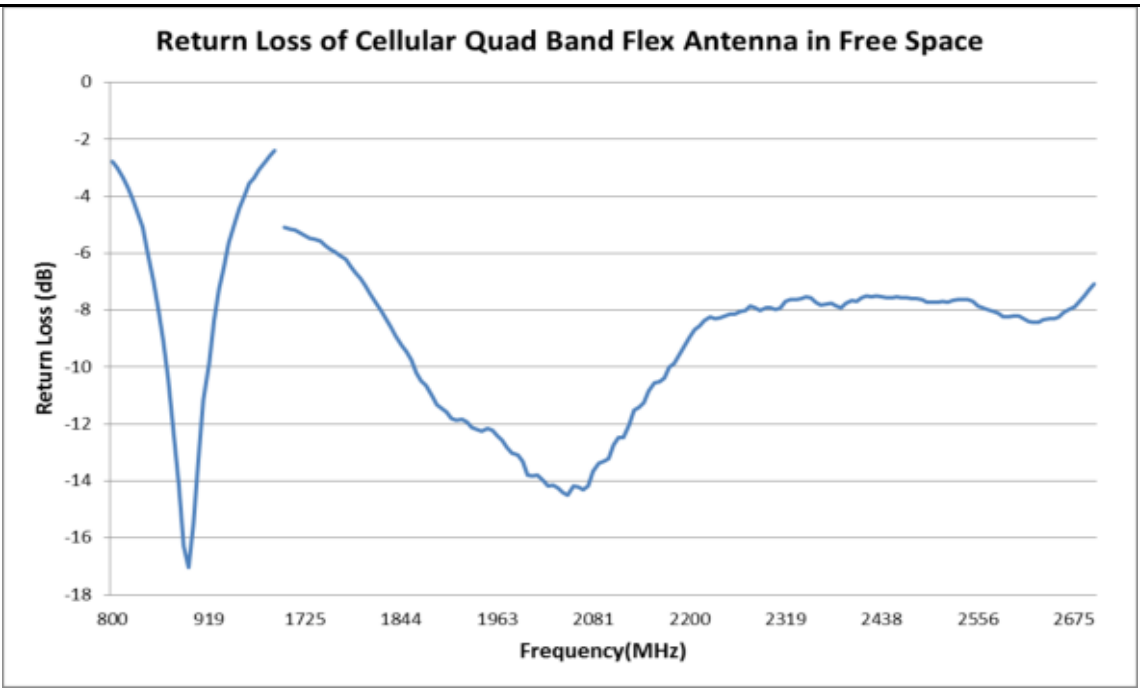


FIGURE 2.2 RETURN LOSS OF ANTENNA IN FREE SPACE

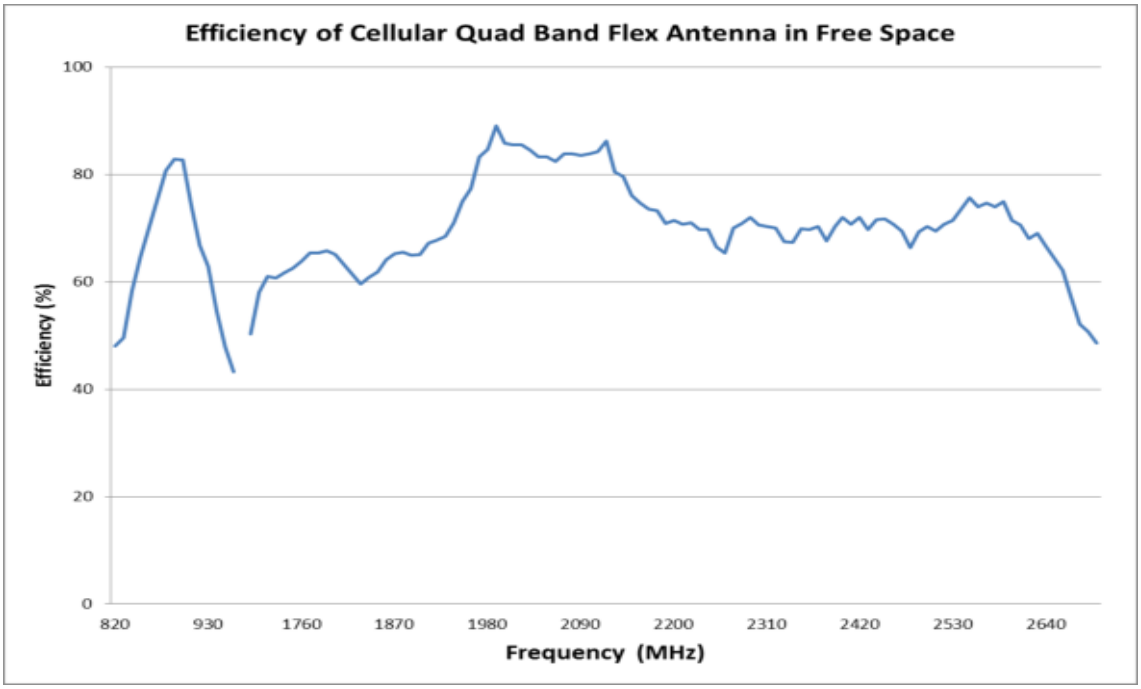


FIGURE 2.3 EFFICIENCY OF ANTENNA IN FREE SPACE

3.0 REFERENCE DOCUMENTS

- Sales Drawing: SD-1461850100
- Product Specification: PS-1461850100
- Packaging Information – Refer to the Molex related packaging drawings.

4.0 RF PERFORMANCE AS A FUNCTION OF IMPLEMENTATION

4.1 ANTENNA RF PERFORMANCE AS A FUNCTION OF DIFFERENT DISTANCES WITH VERTICAL GROUND

Four ground distances with vertical ground from the antenna have been evaluated, and these distances are shown in figure 4.1. The PCB ground size is 90mm*90mm and we move the PCB to four locations for each test.

According to the results, the minimum ground distance from antenna is recommended to be 30mm to achieve acceptable antenna performance.

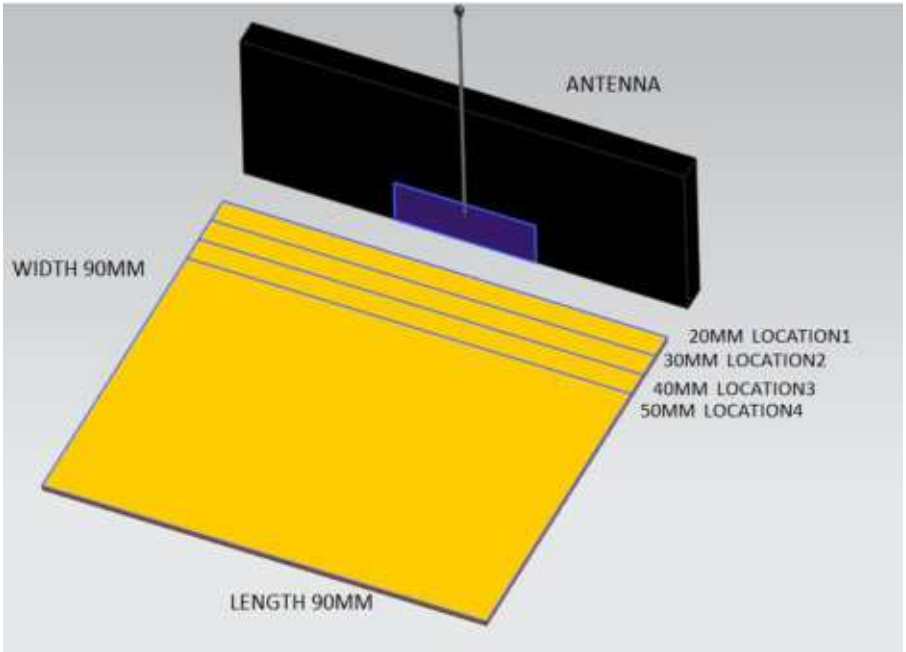


FIGURE 4.1 FOUR LOCATIONS WITH VERTICAL GROUND

Ground Area: 90mm*90mm;
Location 1: Distance between antenna and ground is about 20mm;
Location 2: Distance between antenna and ground is about 30mm;
Location 3: Distance between antenna and ground is about 40mm;
Location 4: Distance between antenna and ground is about 50mm.

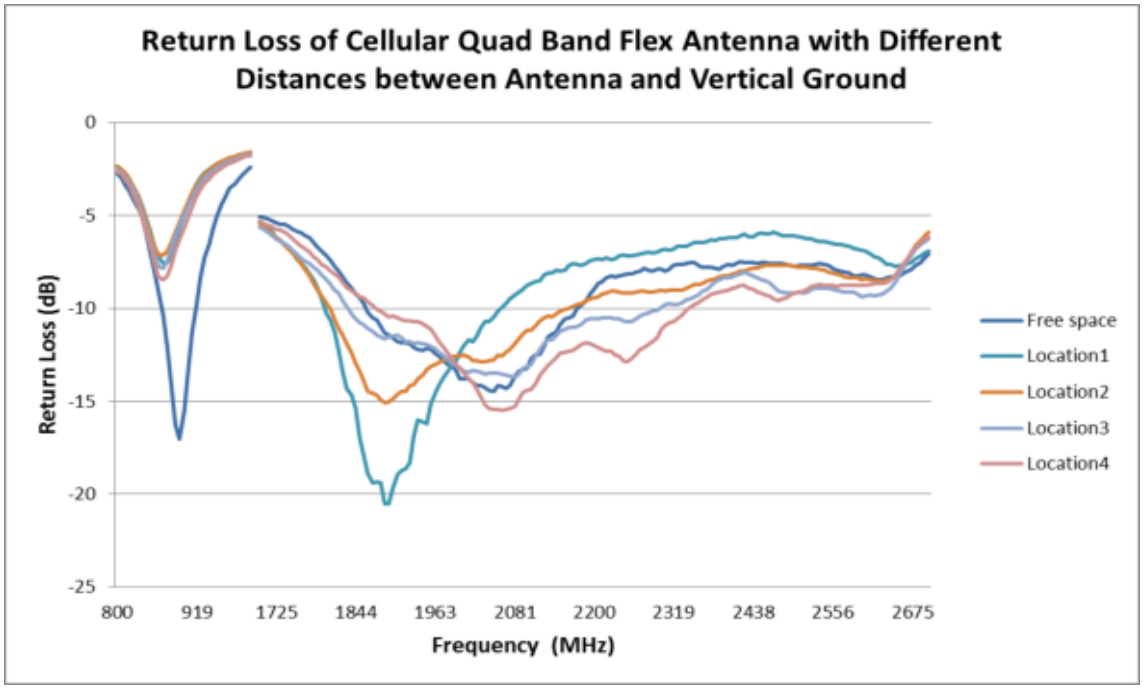


FIGURE 4.1.1 RETURN LOSS OF ANTENNA AT FOUR LOCATIONS WITH VERTICAL GROUND

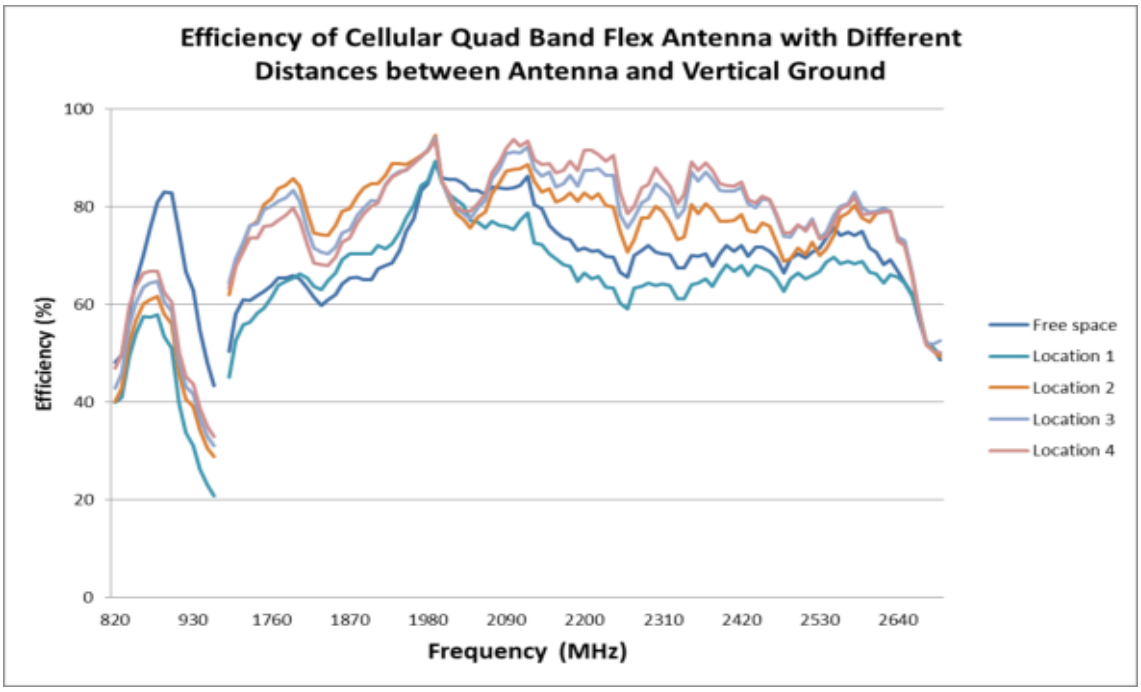


FIGURE 4.1.2 EFFICIENCY OF ANTENNA AT FOUR LOCATIONS WITH VERTICAL GROUND

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

Four ground distances from the antenna with parallel ground have been evaluated, and these distances are shown in figure 4.2. The PCB ground size is 90mm*90mm and we move the PCB to four locations for each test.

According to the results, the minimum ground distance from antenna is recommended to be 40mm to achieve acceptable antenna performance.

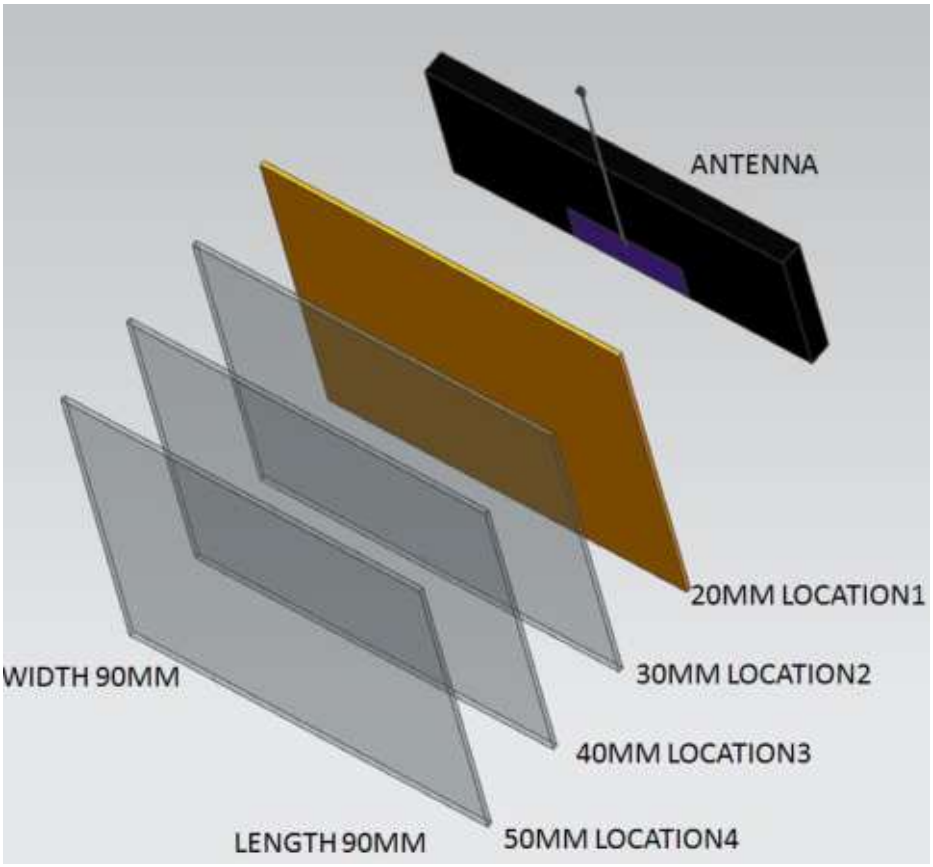


FIGURE 4.2 FOUR LOCATIONS WITH PARALLEL GROUND

Ground Area: 90mm*90mm;
Location 1: Distance between antenna and ground is about 20mm;
Location 2: Distance between antenna and ground is about 30mm;
Location 3: Distance between antenna and ground is about 40mm;
Location 4: Distance between antenna and ground is about 50mm.

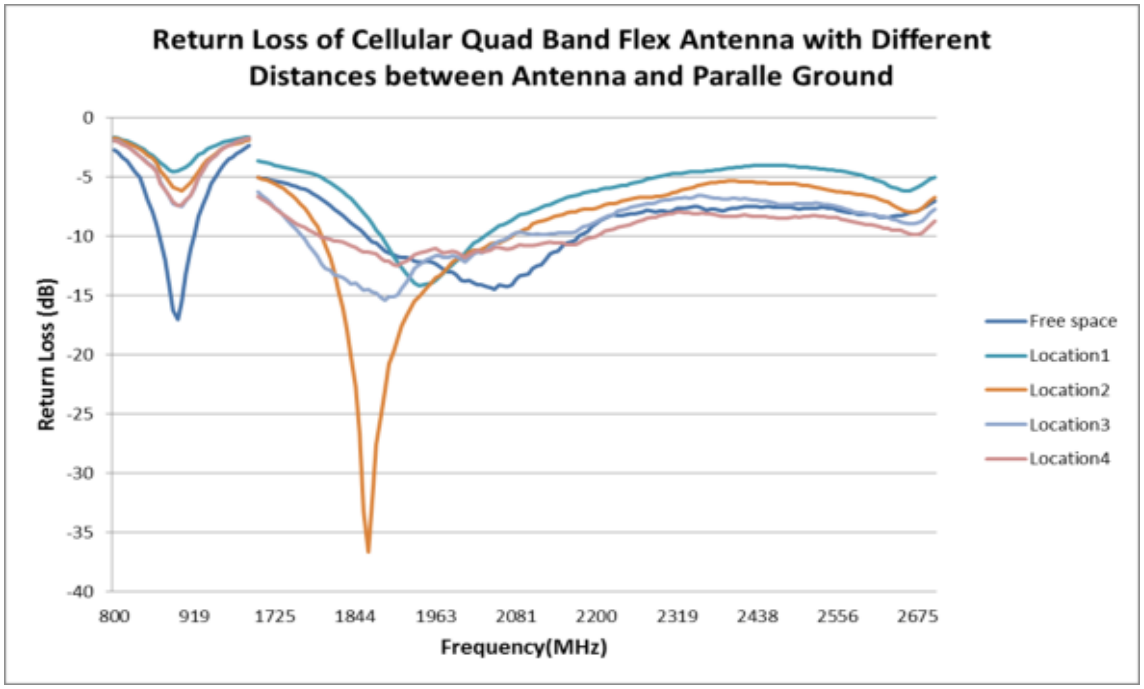


FIGURE 4.2.1 RETURN LOSS OF ANTENNA AT FOUR LOCATIONS WITH PARALLEL GROUND

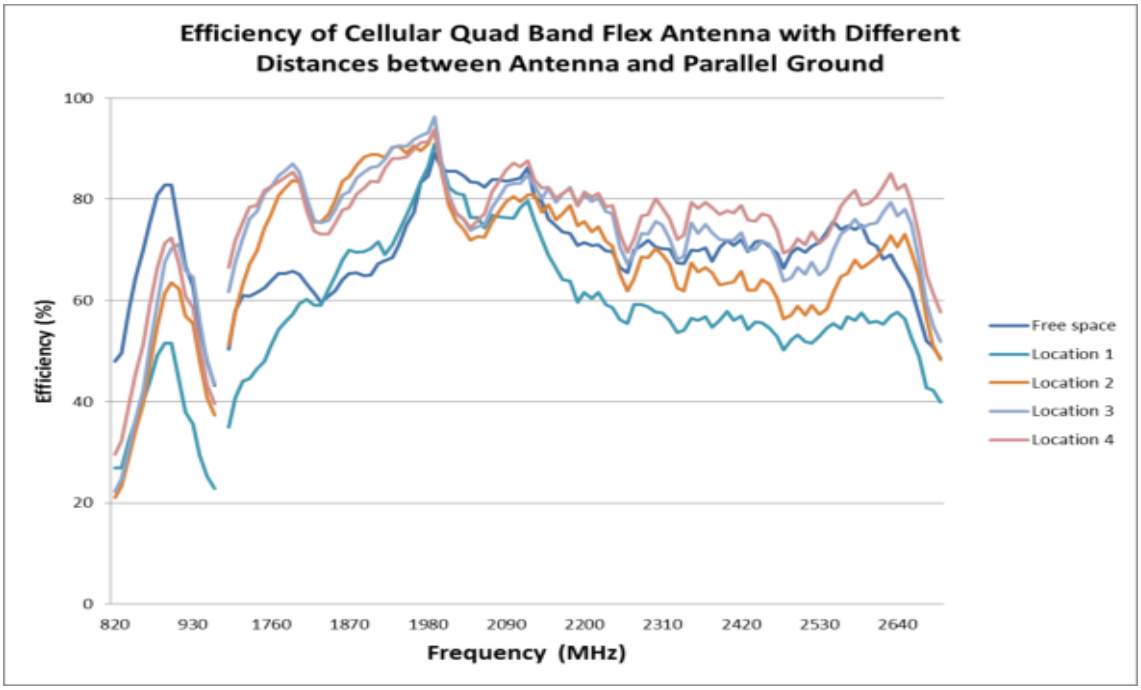


FIGURE 4.2.2 EFFICIENCY OF ANTENNA AT FOUR LOCATIONS WITH PARALLEL GROUND

4.3 ANTENNA RF PERFORMANCE AS A FUNCTION OF DIFFERENT DISTANCES WITH THE SAME PLANE GROUND

Four ground distances with the same plane ground have been evaluated and these distances are shown in figure 4.3. The PCB ground size is 90mm*90mm and we move the PCB to four locations for each test.

According to the results, the minimum ground distance from antenna is recommended to be 30mm to achieve acceptable antenna performance.

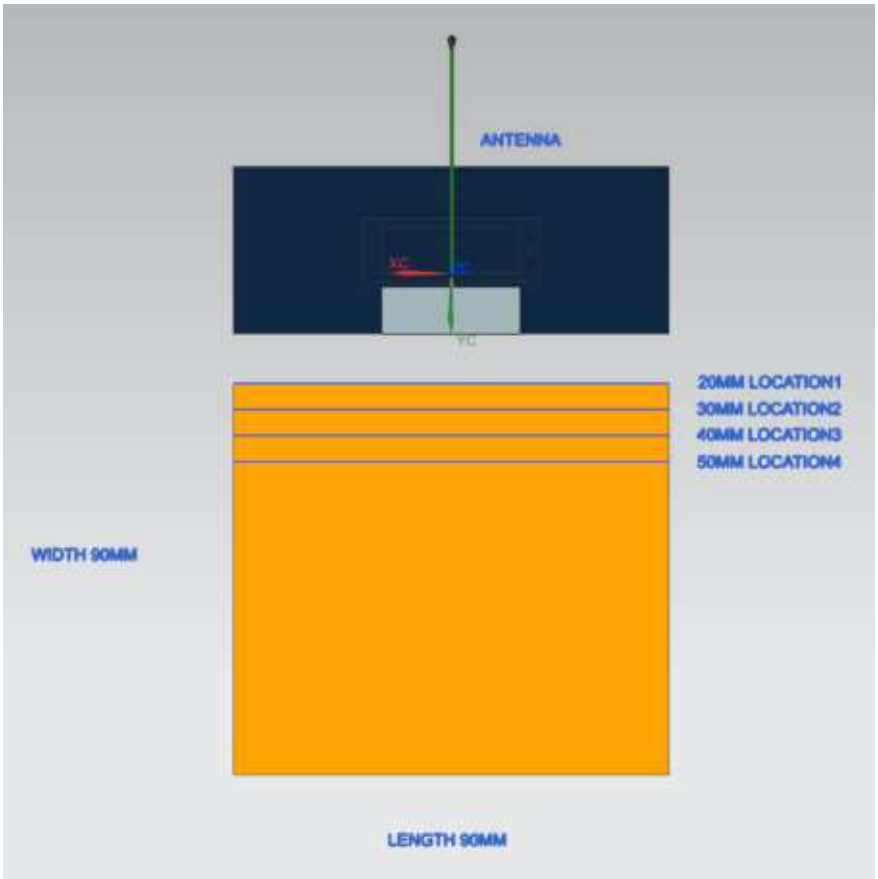


FIGURE 4.3 FOUR LOCATIONS WITH SAME PLANE GROUND

Ground Area: 90mm*90mm
Location 1: Distance between antenna and ground is about 20mm
Location 2: Distance between antenna and ground is about 30mm.
Location 3: Distance between antenna and ground is about 40mm.
Location 4: Distance between antenna and ground is about 50mm.

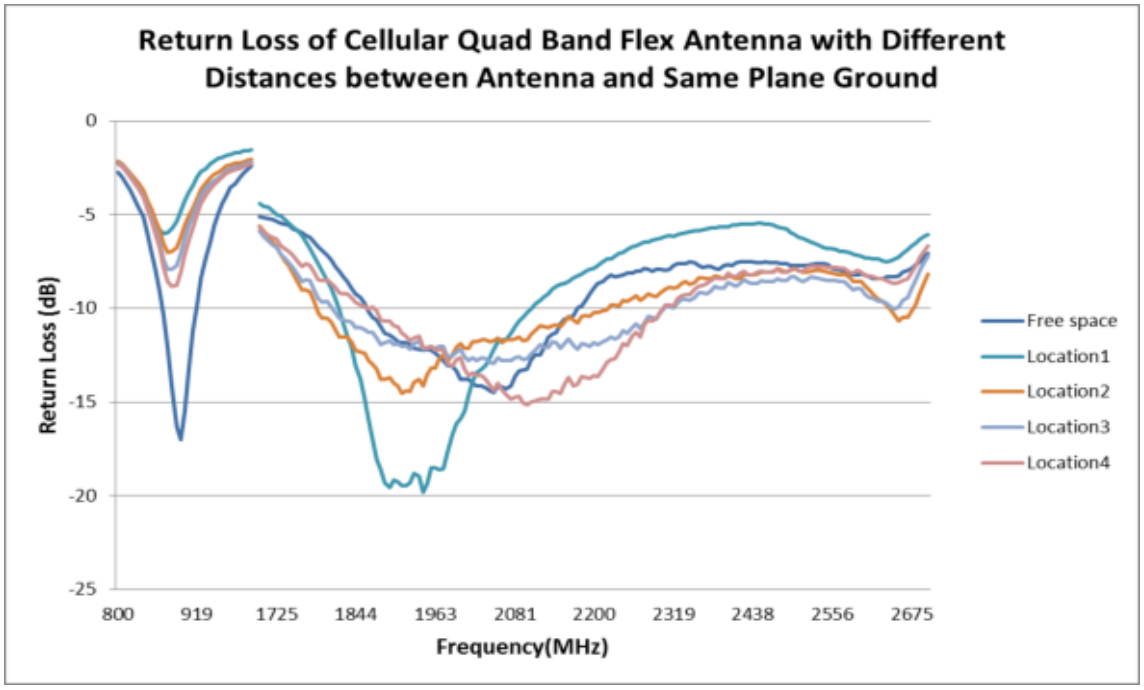


FIGURE 4.3.1 RETURN LOSS OF ANTENNA AT FOUR LOCATIONS WITH SAME PLANE GROUND

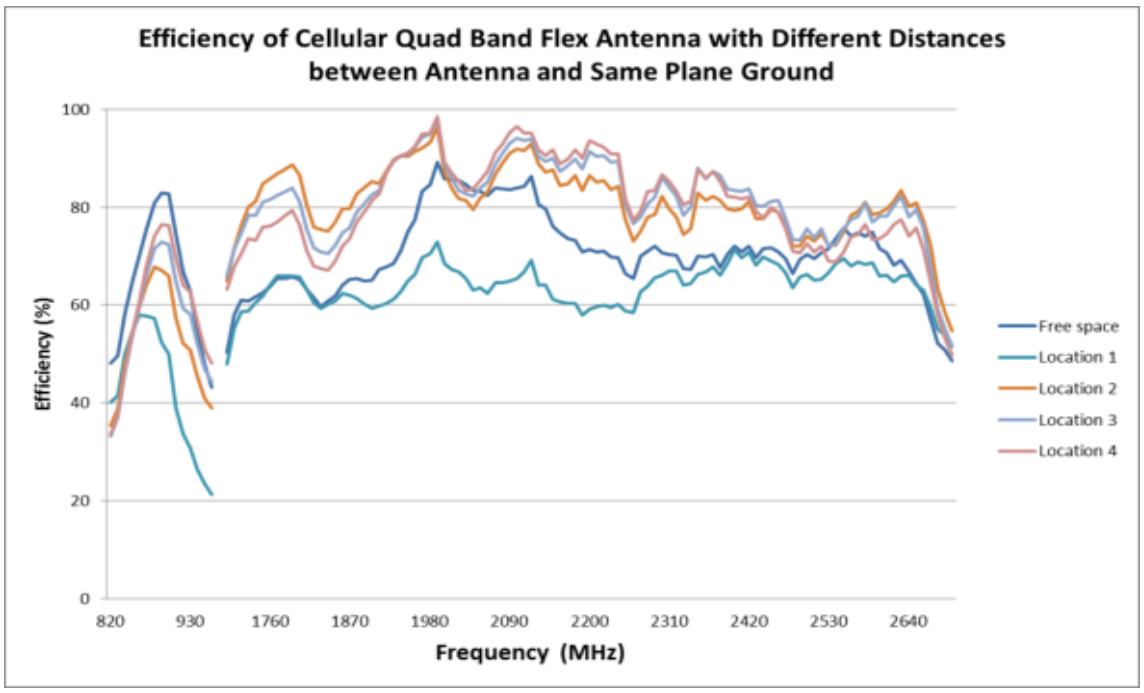


FIGURE 4.3.2 EFFICIENCY OF ANTENNA AT FOUR LOCATIONS WITH SAME PLANE GROUND

5.0 RADIATION PATTERN

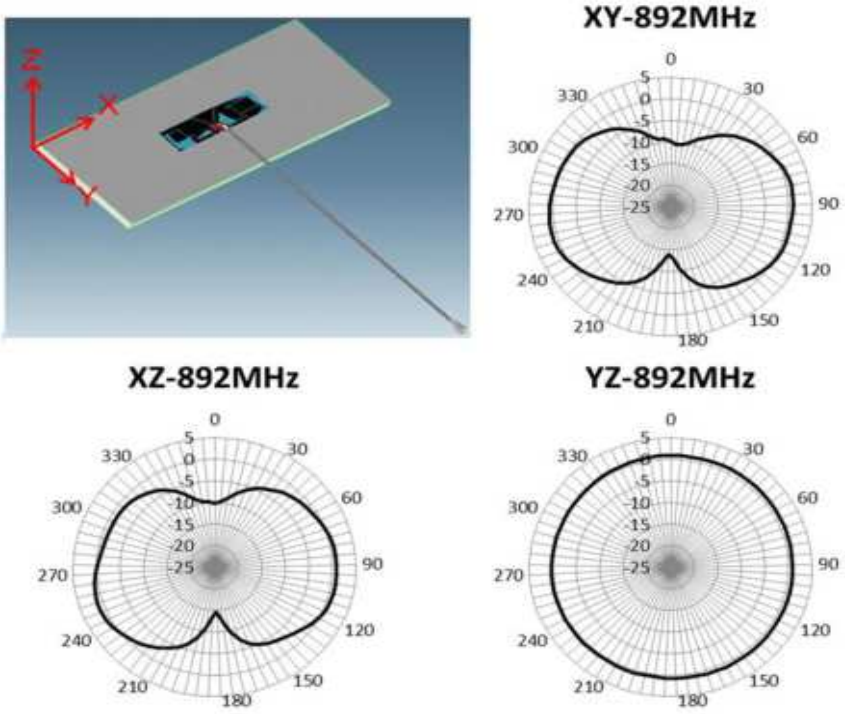


FIGURE 5.1 RADIATION PATTERN OF ANTENNA AT 892MHZ IN FREE SPACE

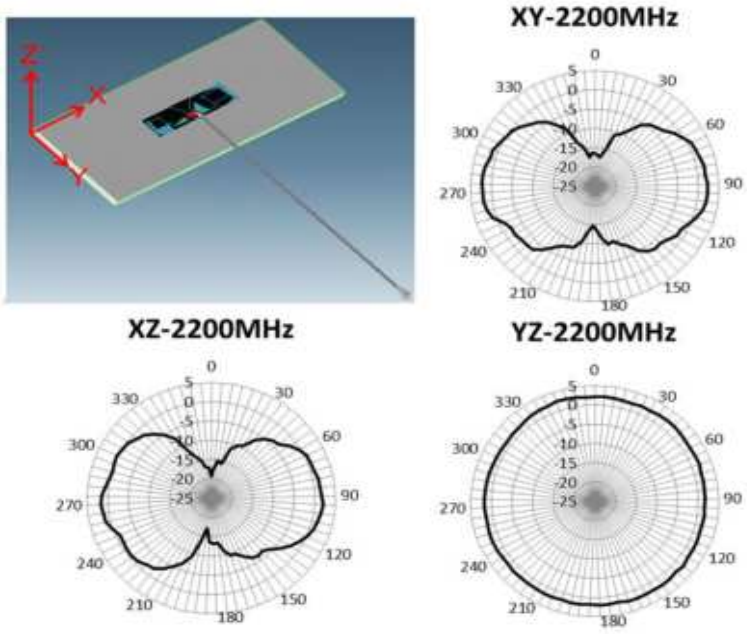


FIGURE 5.2 RADIATION PATTERN OF ANTENNA AT 2.2GHZ IN FREE SPACE

6.0 THE ANTENNA PERFORMANCE VARIATION WITH CABLE LENGTH

6.0.1 CABLE LOSS

ITEM	DESCRIPTION	TEST CONDITION	REQUIREMENT			
6.0.1.1	Frequency Range	824MHz~6GHz	824MHz~960 MHz	1.7GHz~2.7 GHz	3GHz~5GHz	5GHz~6GHz
6.0.1.2	Attenuation	1m cable measured by VNA5071C	≤1.8dB/m	≤3.5dB/m	≤4dB/m	≤5dB/m

6.0.2 CABLE LENGTH AFFECT THE ANTENNA PERFORMANCE

Balance antenna resonance is insensitive by cable length, but the cable loss will affect total efficiency. Refer to 6.0.1

6.0.3 FOR EXAMPLE

Based on the 100mm cable performance, we can mostly calculate the 300mm cable's.

	100mm cable			300mm cable	
Frequency (MHz)	Efficiency (dB)	Efficiency (%)	cable loss	Efficiency (dB)	Efficiency (%)
	X		X-LOSS=Y	Y	
820	-3.18	48.05	0.2m*1.8dB/m	-3.54	44.22
830	-3.05	49.60		-3.41	45.65
840	-2.34	58.33		-2.70	53.69
850	-1.90	64.63		-2.26	59.49
860	-1.55	70.03		-1.91	64.46
870	-1.23	75.36		-1.59	69.37
880	-0.92	80.83		-1.28	74.40
890	-0.81	82.91		-1.17	76.31
900	-0.82	82.81		-1.18	76.22
910	-1.29	74.34		-1.65	68.43
920	-1.75	66.78		-2.11	61.47
930	-2.02	62.82		-2.38	57.82
940	-2.63	54.57		-2.99	50.23
950	-3.19	47.95		-3.55	44.14
960	-3.64	43.23		-4.00	39.79
1700	-2.98	50.36	0.2m*3.5dB/m	-3.68	42.87
1750	-2.04	62.53		-2.74	53.23
1800	-1.86	65.17		-2.56	55.47
1850	-2.09	61.86		-2.79	52.65
1900	-1.87	65.06		-2.57	55.38
1950	-1.25	74.96		-1.95	63.80
2000	-0.66	85.81		-1.36	73.04
2050	-0.79	83.29		-1.49	70.89
2100	-0.76	83.87		-1.46	71.38
2150	-1.19	76.09		-1.89	64.77
2200	-1.46	71.43		-2.16	60.80
2250	-1.77	66.50		-2.47	56.60
2300	-1.51	70.65		-2.21	60.13
2400	-1.55	69.95		-2.25	59.54
2450	-1.43	71.96		-2.13	61.25
2500	-1.44	71.72		-2.14	61.04
2550	-1.53	70.36		-2.23	59.89
2600	-1.21	75.69		-1.91	64.42
2650	-1.46	71.44		-2.16	60.81
2700	-1.91	64.44		-2.61	54.85

- The data is just for your reference, all accurate performance should be according to the test results in the OTA chamber.

7.0 ASSEMBLY GUIDELINES

During the assembly of the antenna in a device, the cable needs to be positioned away from the antenna flex. The antenna cable should not be close to the antenna flex. The cable has to be away from the pattern at least 5mm.

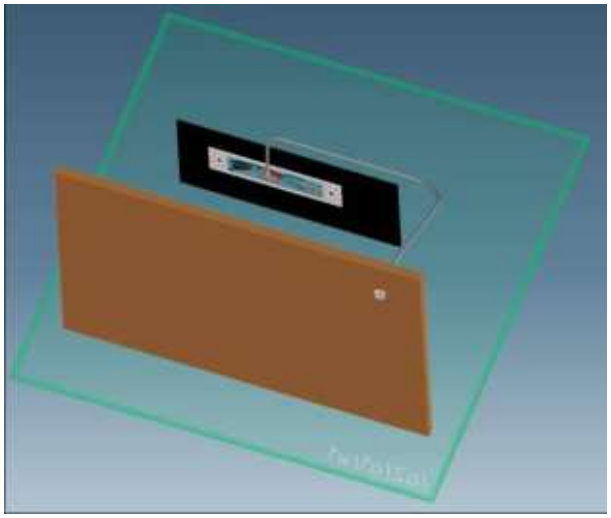


FIGURE 7.1 ASSEMBLY GUIDELINE

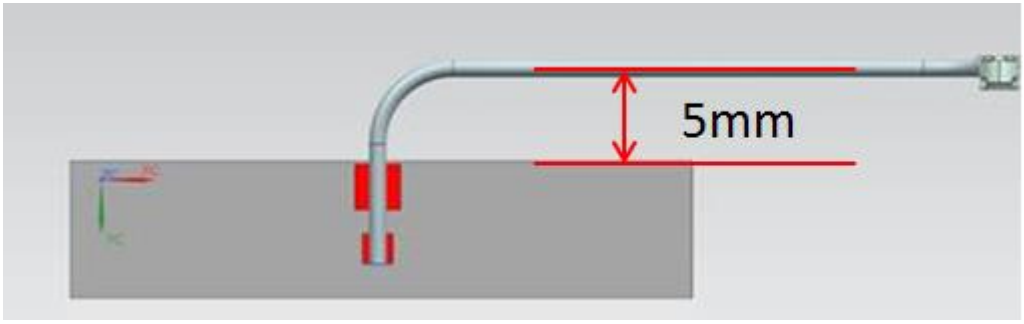


FIGURE 7.2 CABLE BENDING