

Specification

MSL	LEAD FREE	BFRs-FREE, Halogen-FREE
MSL 1		

Product Name	INTENNA		Image
Model Name	01CG10	Top	
P/N Code	PBGSCGMS100		
	-		
Type	LDS Antenna		
Revision	Ver 0.2	Bottom	
Weight	0.165g (Unit)		
Frequency	Bluetooth (BLE 2.4G)		
Classification	Main		

	Drafter	Examination	Admission
HW	JS YUN	J.K KIM	T.W KIM
	Yun Jin Seok	Kim Jong Gwang	
Mechanical	J. H. Lee	-	Kim Tae Won
	Lee Jeong Hwan	-	

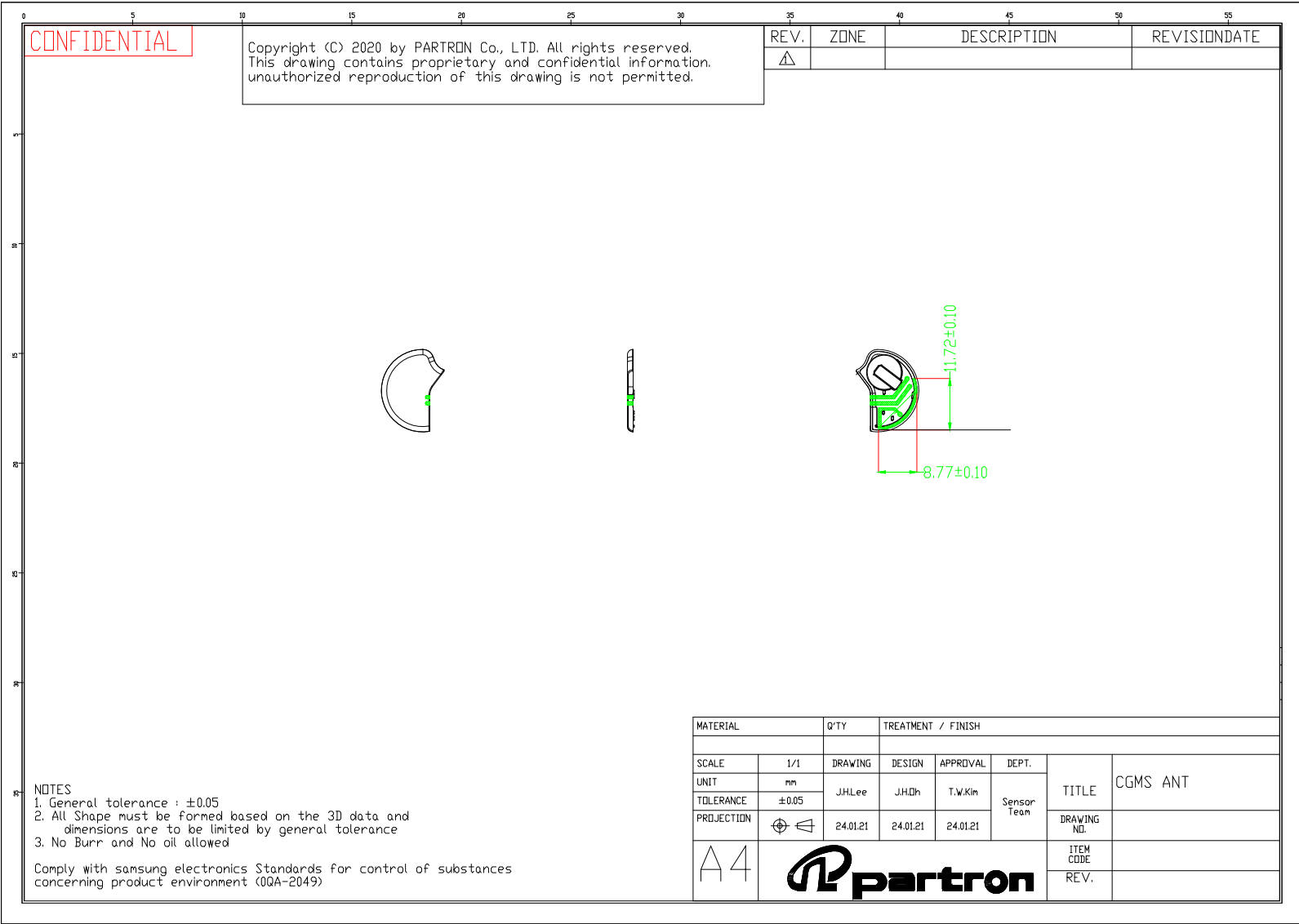
[Contents]

1. Revision History
2. Approval Drawing (Pattern Dimension)
3. Product specification (Electrical/Mechanical Characteristics)
 - 3-1 Measurement method (Setup)
 - 3-2 SET VSWR
 - 3-3 3D Radiation
 - 3-4 2D Polar Chart
 - 3.5 Dimension Verification DATA (CPK)
4. PART LIST
5. Reliability Guarantee Terms
6. Hazardous Substance Analysis Report
 - 6-1. Hazardous Substance Measurement Standards
 - 6-2. Caution

1. Revision History

Revision No.	Originator	Description of changes	Date of changes
Rev 0.1	YJS	Initial Release	2025.01.21
Rev 0.2	YJS	Antenna Optimization	2025.02.27

2. Approval Drawing (Pattern Dimension)



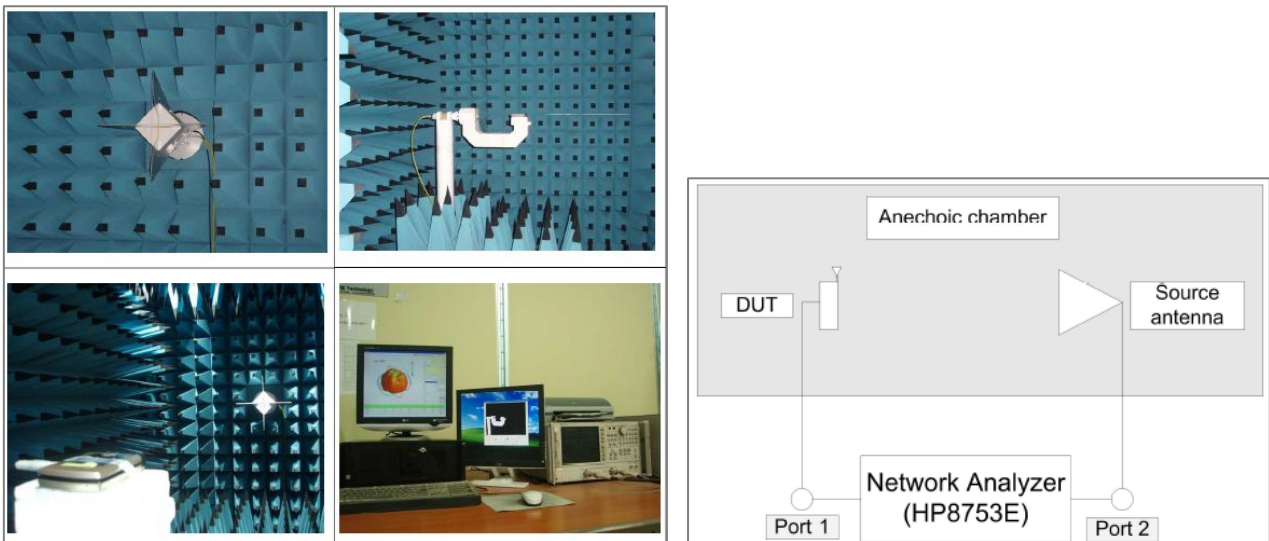
3. Product specification (Electrical/Mechanical Characteristics)

3-1 Measurement method (Setup)

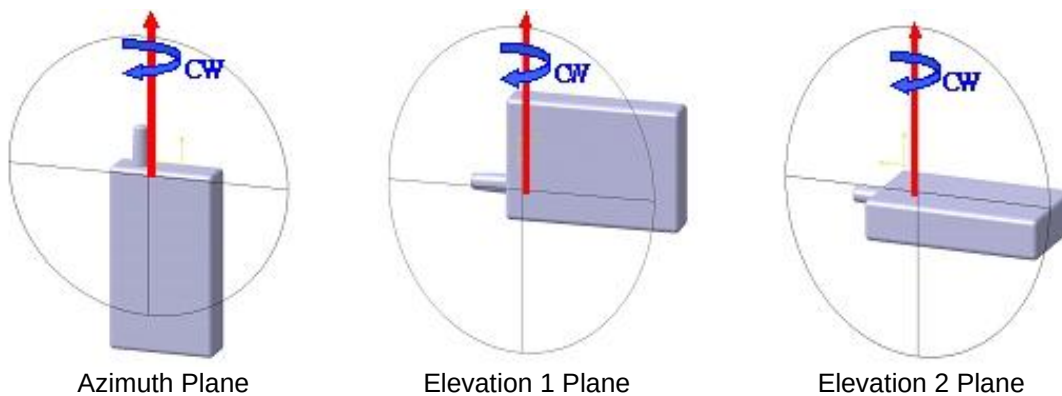
How to measure

- To measure the antenna, measure the frequency, VSWR using the network analyzer after installing it in the SET,
- Gain is measured in our anechoic chamber. (However, at the time of shipment inspection, the gain characteristic among the antenna characteristics is
- Replace the excluded Frequency and VSWR characteristics with Jig.)

Frequency, VSWR, Gain measurement



Azimuth



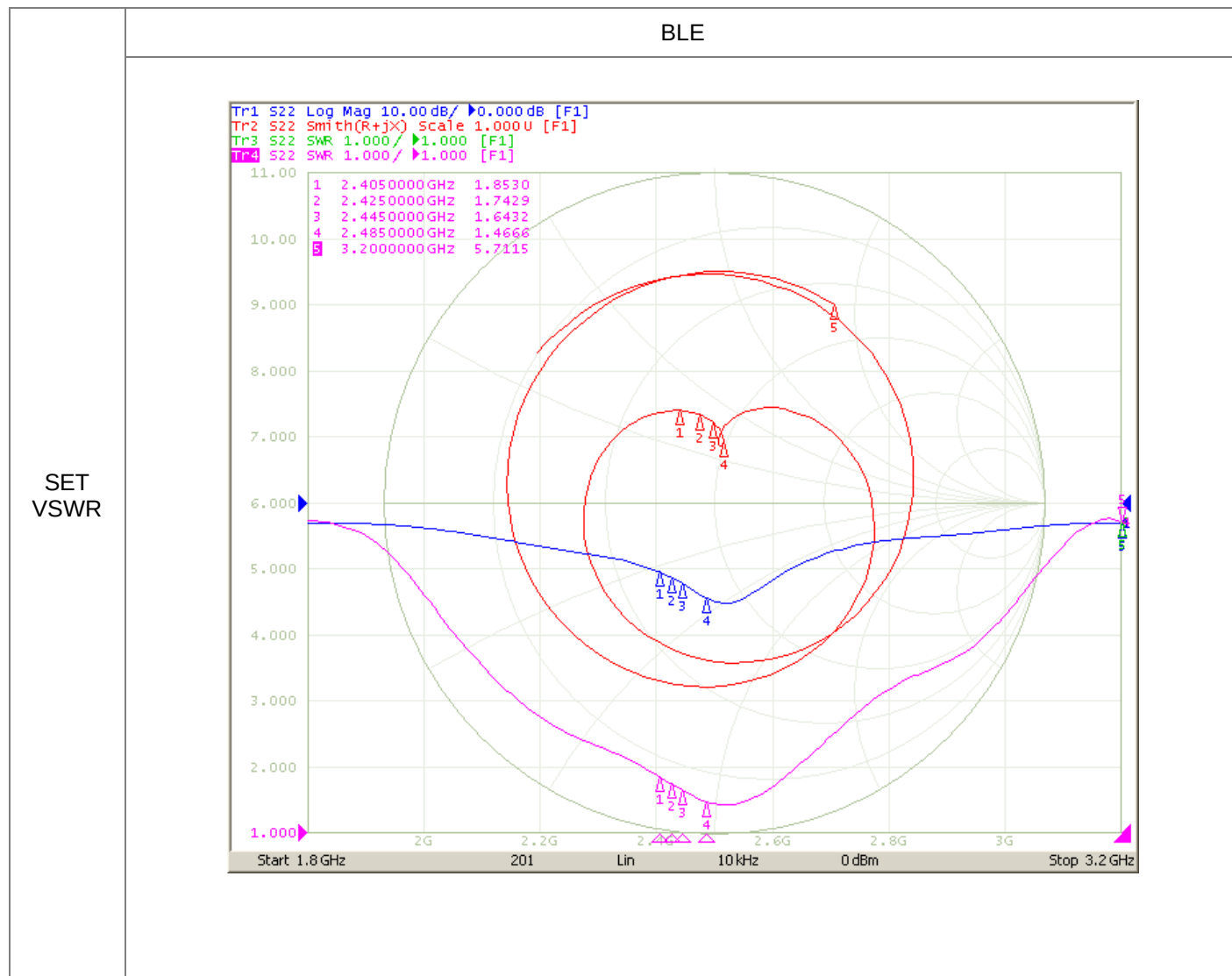
• Meaning of Co-Polarization and Cross-Polarization

• Co-Polarization (Co-Pol): The source antenna is converted to Vertical and Horizontal Polarization. When radiated, Ave. Polarization when the gain value is high.

• Cross-Polarization (Cross-Pol): The source antenna is converted to Vertical and Horizontal Polarization. When radiated, Ave. Polarization when the gain value is low.

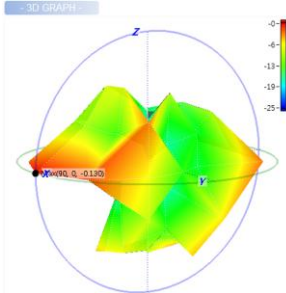
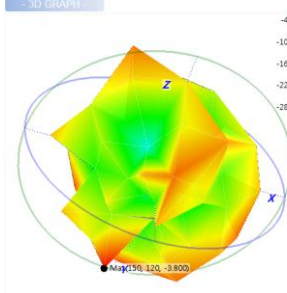
3-2 SET VSWR

Frequency bands (MHz)		Bluetooth	
		2405 MHz	2485 MHz
VSWR	SET	1.85	1.46
Input impedance		50 ohm	
Polarity		Vertical polarization	
Radiated pattern		Non-Directional	

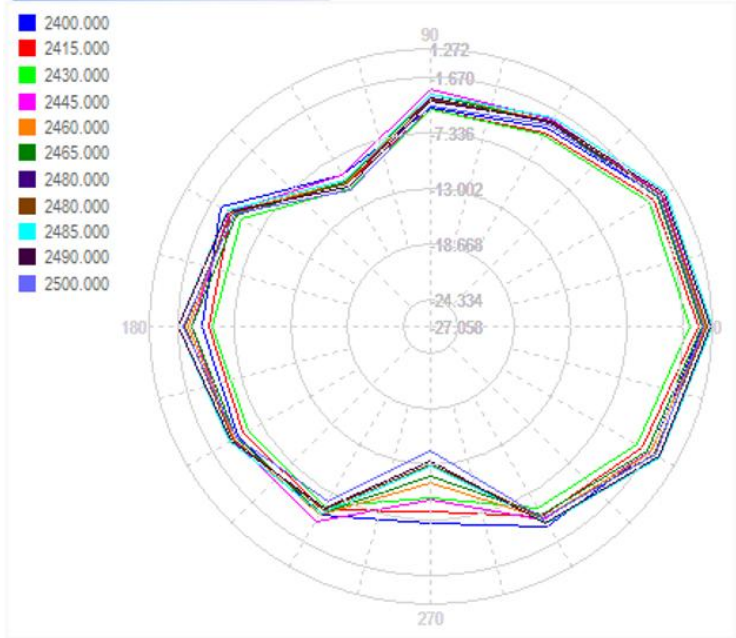


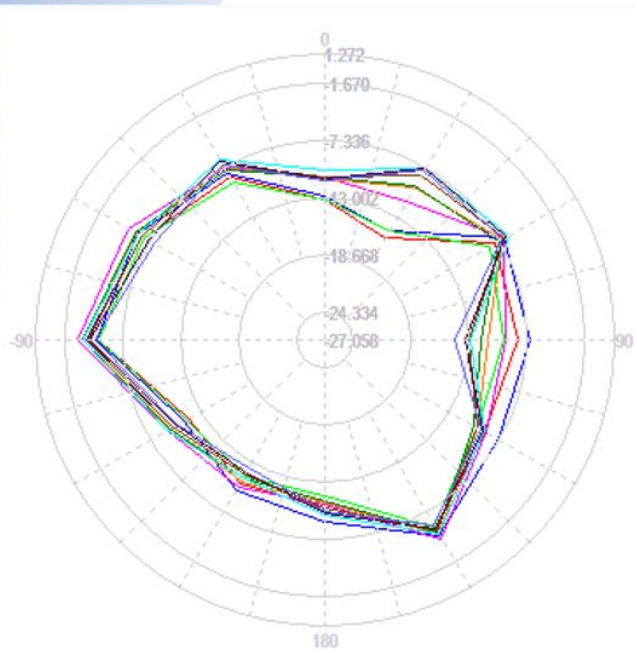
3-3 3D Radiation

No	Frequency	Peak Value		Minimum Value		Avg. Gain	Efficiency
	[MHz]	Value[dBi]	Degree	Value[dBi]	Degree	[dBi]	[%]
1	2400.000	0.490652	90 / 0	-16.227304	30 / 210	-5.588549	27.615006
2	2415.000	-0.165568	90 / 0	-18.546599	120 / 240	-6.394907	22.935560
3	2430.000	-0.895793	90 / 0	-24.127432	60 / 210	-6.988162	20.007084
4	2445.000	0.681371	90 / 0	-27.058289	60 / 210	-5.420169	28.706689
5	2460.000	0.666874	90 / 0	-20.836375	60 / 210	-5.707780	26.867175
6	2465.000	0.250773	90 / 0	-18.812983	60 / 210	-5.965218	25.320848
7	2480.000	0.697382	90 / 0	-15.275585	60 / 210	-5.740445	26.665857
8	2480.000	0.700662	90 / 0	-15.283925	60 / 210	-5.744279	26.642322
9	2485.000	1.271524	90 / 0	-14.631665	60 / 0	-5.203102	30.177953
10	2490.000	1.059659	90 / 0	-15.250924	60 / 0	-5.549222	27.866201
11	2500.000	0.469965	90 / 0	-16.260770	60 / 0	-6.012096	25.049003

Frequency Band	BLE	
	2402 – 2480 MHz	
3D Radiation Pattern		
Avg Gain [dBi]	-5.84	
Efficiency [%]	26.16%	
Peak Gain [dBi]	0.475	

3-4 2D Polar Chart

Frequency Band	BLE																																																																																																																																												
H Plane (Vertical + Horizontal) Polar Chart																																																																																																																																													
Horizontal + Vertical	- H Plane Polar/Line Chart - 2400.000 2415.000 2430.000 2445.000 2460.000 2465.000 2480.000 2480.000 2485.000 2490.000 2500.000 																																																																																																																																												
	Gain	<table><tr><th colspan="10">H Plane (Vertical + Horizontal)</th></tr><tr><th rowspan="2">No</th><th>Frequency</th><th colspan="3">Maximum Value</th><th colspan="3">Minimum Value</th><th>Avg. Gain</th><th>Efficiency</th></tr><tr><th>[MHz]</th><th>Θ [Deg]</th><th>Φ[Deg]</th><th>Value[dBi]</th><th>Θ [Deg]</th><th>Φ[Deg]</th><th>Value[dBi]</th><th>[dBi]</th><th>[%]</th></tr><tr><td>1</td><td>2400</td><td>90</td><td>0</td><td>0.49</td><td>90</td><td>120</td><td>-9.18</td><td>-3.13</td><td>48.68</td></tr><tr><td>2</td><td>2415</td><td>90</td><td>0</td><td>-0.17</td><td>90</td><td>120</td><td>-10.19</td><td>-3.87</td><td>41.00</td></tr><tr><td>3</td><td>2430</td><td>90</td><td>0</td><td>-0.90</td><td>90</td><td>120</td><td>-10.81</td><td>-4.48</td><td>35.65</td></tr><tr><td>4</td><td>2445</td><td>90</td><td>0</td><td>0.68</td><td>90</td><td>270</td><td>-9.29</td><td>-2.88</td><td>51.56</td></tr><tr><td>5</td><td>2460</td><td>90</td><td>0</td><td>0.67</td><td>90</td><td>270</td><td>-11.02</td><td>-3.02</td><td>49.93</td></tr><tr><td>6</td><td>2465</td><td>90</td><td>0</td><td>0.25</td><td>90</td><td>270</td><td>-11.83</td><td>-3.35</td><td>46.20</td></tr><tr><td>7</td><td>2480</td><td>90</td><td>0</td><td>0.70</td><td>90</td><td>270</td><td>-12.92</td><td>-3.01</td><td>50.00</td></tr><tr><td>8</td><td>2480</td><td>90</td><td>0</td><td>0.70</td><td>90</td><td>270</td><td>-12.95</td><td>-3.01</td><td>49.99</td></tr><tr><td>9</td><td>2485</td><td>90</td><td>0</td><td>1.27</td><td>90</td><td>270</td><td>-12.77</td><td>-2.45</td><td>56.87</td></tr><tr><td>10</td><td>2490</td><td>90</td><td>0</td><td>1.06</td><td>90</td><td>270</td><td>-13.34</td><td>-2.71</td><td>53.60</td></tr><tr><td>11</td><td>2500</td><td>90</td><td>0</td><td>0.47</td><td>90</td><td>270</td><td>-14.37</td><td>-3.22</td><td>47.62</td></tr></table>	H Plane (Vertical + Horizontal)										No	Frequency	Maximum Value			Minimum Value			Avg. Gain	Efficiency	[MHz]	Θ [Deg]	Φ [Deg]	Value[dBi]	Θ [Deg]	Φ [Deg]	Value[dBi]	[dBi]	[%]	1	2400	90	0	0.49	90	120	-9.18	-3.13	48.68	2	2415	90	0	-0.17	90	120	-10.19	-3.87	41.00	3	2430	90	0	-0.90	90	120	-10.81	-4.48	35.65	4	2445	90	0	0.68	90	270	-9.29	-2.88	51.56	5	2460	90	0	0.67	90	270	-11.02	-3.02	49.93	6	2465	90	0	0.25	90	270	-11.83	-3.35	46.20	7	2480	90	0	0.70	90	270	-12.92	-3.01	50.00	8	2480	90	0	0.70	90	270	-12.95	-3.01	49.99	9	2485	90	0	1.27	90	270	-12.77	-2.45	56.87	10	2490	90	0	1.06	90	270	-13.34	-2.71	53.60	11	2500	90	0	0.47	90	270	-14.37	-3.22	47.62
		H Plane (Vertical + Horizontal)																																																																																																																																											
		No	Frequency	Maximum Value			Minimum Value			Avg. Gain	Efficiency																																																																																																																																		
			[MHz]	Θ [Deg]	Φ [Deg]	Value[dBi]	Θ [Deg]	Φ [Deg]	Value[dBi]	[dBi]	[%]																																																																																																																																		
		1	2400	90	0	0.49	90	120	-9.18	-3.13	48.68																																																																																																																																		
		2	2415	90	0	-0.17	90	120	-10.19	-3.87	41.00																																																																																																																																		
		3	2430	90	0	-0.90	90	120	-10.81	-4.48	35.65																																																																																																																																		
		4	2445	90	0	0.68	90	270	-9.29	-2.88	51.56																																																																																																																																		
		5	2460	90	0	0.67	90	270	-11.02	-3.02	49.93																																																																																																																																		
6		2465	90	0	0.25	90	270	-11.83	-3.35	46.20																																																																																																																																			
7		2480	90	0	0.70	90	270	-12.92	-3.01	50.00																																																																																																																																			
8	2480	90	0	0.70	90	270	-12.95	-3.01	49.99																																																																																																																																				
9	2485	90	0	1.27	90	270	-12.77	-2.45	56.87																																																																																																																																				
10	2490	90	0	1.06	90	270	-13.34	-2.71	53.60																																																																																																																																				
11	2500	90	0	0.47	90	270	-14.37	-3.22	47.62																																																																																																																																				

Frequency Band		BLE								
		E1 Plane (Vertical + Horizontal) Polar Chart								
Horizontal + Vertical		- E1 Plane Polar/Line Chart - 2400.000 2415.000 2430.000 2445.000 2460.000 2465.000 2480.000 2480.000 2485.000 2490.000 2500.000 								
Gain	E1 Plane (Vertical + Horizontal)									
	No	Frequency	Maximum Value			Minimum Value			Avg. Gain	Efficiency
		[MHz]	Θ [Deg]	Φ [Deg]	Value[dBi]	Θ [Deg]	Φ [Deg]	Value[dBi]	[dBi]	[%]
	1	2400	90	-150	-4.65	90	-30	-14.53	-7.62	17.31
	2	2415	90	90	-4.96	90	-30	-15.37	-8.40	14.45
	3	2430	90	90	-4.83	90	-30	-14.61	-8.80	13.19
	4	2445	90	90	-2.88	90	-30	-11.11	-7.16	19.23
	5	2460	90	90	-3.42	90	0	-11.09	-7.65	17.20
	6	2465	90	90	-3.44	90	-90	-11.83	-7.76	16.75
	7	2480	90	90	-3.78	90	-90	-12.92	-7.78	16.69
	8	2480	90	90	-3.80	90	-90	-12.95	-7.79	16.65
	9	2485	90	90	-3.38	90	-90	-12.77	-7.27	18.76
	10	2490	90	90	-4.12	90	-90	-13.34	-7.79	16.62
11	2500	90	90	-4.63	90	-90	-14.37	-8.20	15.15	

Frequency Band	BLE																																																																																																																																												
E2 Plane (Vertical + Horizontal) Polar Chart																																																																																																																																													
Horizontal + Vertical	- E2 Plane Polar/Line Chart -																																																																																																																																												
	Gain	<table><tr><th colspan="10">E2 Plane (Vertical + Horizontal)</th></tr><tr><th rowspan="2">No</th><th>Frequency</th><th colspan="3">Maximum Value</th><th colspan="3">Minimum Value</th><th>Avg. Gain</th><th>Efficiency</th></tr><tr><th>[MHz]</th><th>Θ [Deg]</th><th>Φ [Deg]</th><th>Value[dBi]</th><th>Θ [Deg]</th><th>Φ [Deg]</th><th>Value[dBi]</th><th>[dBi]</th><th>[%]</th></tr><tr><td>1</td><td>2400</td><td>90</td><td>90</td><td>0.49</td><td>90</td><td>-30</td><td>-15.73</td><td>-5.87</td><td>25.86</td></tr><tr><td>2</td><td>2415</td><td>90</td><td>90</td><td>-0.17</td><td>90</td><td>-30</td><td>-16.49</td><td>-6.71</td><td>21.33</td></tr><tr><td>3</td><td>2430</td><td>90</td><td>90</td><td>-0.90</td><td>90</td><td>-30</td><td>-16.45</td><td>-7.46</td><td>17.93</td></tr><tr><td>4</td><td>2445</td><td>90</td><td>90</td><td>0.68</td><td>90</td><td>-30</td><td>-14.77</td><td>-5.89</td><td>25.73</td></tr><tr><td>5</td><td>2460</td><td>90</td><td>90</td><td>0.67</td><td>90</td><td>-30</td><td>-15.23</td><td>-5.93</td><td>25.53</td></tr><tr><td>6</td><td>2465</td><td>90</td><td>90</td><td>0.25</td><td>90</td><td>-30</td><td>-15.10</td><td>-6.26</td><td>23.65</td></tr><tr><td>7</td><td>2480</td><td>90</td><td>90</td><td>0.70</td><td>90</td><td>60</td><td>-14.89</td><td>-5.80</td><td>26.33</td></tr><tr><td>8</td><td>2480</td><td>90</td><td>90</td><td>0.70</td><td>90</td><td>60</td><td>-14.94</td><td>-5.79</td><td>26.36</td></tr><tr><td>9</td><td>2485</td><td>90</td><td>90</td><td>1.27</td><td>90</td><td>60</td><td>-14.63</td><td>-5.21</td><td>30.12</td></tr><tr><td>10</td><td>2490</td><td>90</td><td>90</td><td>1.06</td><td>90</td><td>60</td><td>-15.25</td><td>-5.44</td><td>28.60</td></tr><tr><td>11</td><td>2500</td><td>90</td><td>90</td><td>0.47</td><td>90</td><td>60</td><td>-16.26</td><td>-5.93</td><td>25.53</td></tr></table>	E2 Plane (Vertical + Horizontal)										No	Frequency	Maximum Value			Minimum Value			Avg. Gain	Efficiency	[MHz]	Θ [Deg]	Φ [Deg]	Value[dBi]	Θ [Deg]	Φ [Deg]	Value[dBi]	[dBi]	[%]	1	2400	90	90	0.49	90	-30	-15.73	-5.87	25.86	2	2415	90	90	-0.17	90	-30	-16.49	-6.71	21.33	3	2430	90	90	-0.90	90	-30	-16.45	-7.46	17.93	4	2445	90	90	0.68	90	-30	-14.77	-5.89	25.73	5	2460	90	90	0.67	90	-30	-15.23	-5.93	25.53	6	2465	90	90	0.25	90	-30	-15.10	-6.26	23.65	7	2480	90	90	0.70	90	60	-14.89	-5.80	26.33	8	2480	90	90	0.70	90	60	-14.94	-5.79	26.36	9	2485	90	90	1.27	90	60	-14.63	-5.21	30.12	10	2490	90	90	1.06	90	60	-15.25	-5.44	28.60	11	2500	90	90	0.47	90	60	-16.26	-5.93	25.53
		E2 Plane (Vertical + Horizontal)																																																																																																																																											
		No	Frequency	Maximum Value			Minimum Value			Avg. Gain	Efficiency																																																																																																																																		
			[MHz]	Θ [Deg]	Φ [Deg]	Value[dBi]	Θ [Deg]	Φ [Deg]	Value[dBi]	[dBi]	[%]																																																																																																																																		
		1	2400	90	90	0.49	90	-30	-15.73	-5.87	25.86																																																																																																																																		
		2	2415	90	90	-0.17	90	-30	-16.49	-6.71	21.33																																																																																																																																		
		3	2430	90	90	-0.90	90	-30	-16.45	-7.46	17.93																																																																																																																																		
		4	2445	90	90	0.68	90	-30	-14.77	-5.89	25.73																																																																																																																																		
		5	2460	90	90	0.67	90	-30	-15.23	-5.93	25.53																																																																																																																																		
6		2465	90	90	0.25	90	-30	-15.10	-6.26	23.65																																																																																																																																			
7		2480	90	90	0.70	90	60	-14.89	-5.80	26.33																																																																																																																																			
8	2480	90	90	0.70	90	60	-14.94	-5.79	26.36																																																																																																																																				
9	2485	90	90	1.27	90	60	-14.63	-5.21	30.12																																																																																																																																				
10	2490	90	90	1.06	90	60	-15.25	-5.44	28.60																																																																																																																																				
11	2500	90	90	0.47	90	60	-16.26	-5.93	25.53																																																																																																																																				

3.5 Dimension Verification DATA (CPK)

Inspection items			
Spec.		[1] 8.77 ± 0.10	[2] 11.72 ± 0.10
		(CTF) ★	(CTF) ★
1	Lot #1	8.76	11.72
2		8.75	11.72
3		8.76	11.74
4		8.76	11.73
5		8.75	11.77
6		8.76	11.72
7		8.76	11.72
8		8.76	11.72
9	Lot #2	8.77	11.72
10		8.77	11.75
11		8.76	11.79
12		8.77	11.71
13		8.75	11.72
14		8.76	11.69
15		8.78	11.77
16		8.78	11.73
17	Lot #3	8.78	11.72
18		8.79	11.73
19		8.79	11.72
20		8.77	11.72
21		8.78	11.72
22		8.77	11.72
23		8.76	11.72
24	Lot#4	8.78	11.72
25		8.75	11.72
26		8.77	11.77
27		8.79	11.73
28		8.77	11.75
29		8.76	11.77
30		8.76	11.71
X		8.77	11.73
σ		0.01354	0.02255
CPK		2.31	1.31
PASS/FAIL		OK	OK

4. PART LIST

4-1. Base

Part Name	Processing Specifications	Classification	Quantity	Remark
Carrier	Raw material	PC		
	Product Name	LPC1001F 9360		
	Color	WH		
	supplier	LK 엔프라		
	Processing	QDM Tech		
	Location	South Korea		

4-2. Plating

Product Name	Plating Specifications	Plating		Quantity	Remark
Au	Raw material	Au	>0.05 μm	1	
Ni	Raw material	Ni	2.5 μm ~5 μm	1	
Cu	Raw material	1/3Oz Copper Foil	10~15 μm	1	

5. Reliability Guarantee Terms

5-1 Environmental conditions

Item	Condition	Remark
High temperature and humidity	80°C, 80% R.H. 120 Hours	1. Good external and internal appearance and VSWR
Thermal shock test	-40°C, 85°C (keep 30min) 72cycle/ → After visual inspection and VSWR measurement → After attaching the tape, in the vertical direction 1 strong pull	1. Good exterior and interior appearance and VSWR 2. No pattern peeling
Salt spray test	35°C, NaCl 5%, 48Hr → After visual inspection and VSWR measurement → After attaching the tape, in the vertical direction 1 strong pull	1. Good exterior and interior appearance and VSWR 2. No pattern peeling

5-2 Mechanical test

Item	Condition	Remark
X-cutting	TAPE adhesion after cross cut at 2mm intervals → Pull strongly once in the vertical direction	1. No pattern peeling
Fall test	300g weight, 30cm height once, use a seating jig → Measurement from the front → Manufacture development mold & mass production mold at least twice	1. No pattern and no injection cracks

6. Hazardous Substance Analysis Report

6-1. Hazardous Substance Measurement Standards

6-1-1. XRF test criteria

- 1) XRF If the measurement result exceeds the control criteria, the final judgment is made through detailed analysis.
- 2) Management standard (unit: ppm)

Item	RoHS·Halogen						Etc				
	Cd	Pb	Hg	Cr	Br	Cl	Sb	Sn	Ni	Co	S
organic	50	200 (140)	700	700	900 (630)	900	700	900	-	Peak	10,000
inorganic	70	700	700	700	-	-	700	-	700		

*1) Halogen and other substances, if there is a customer's requirements, follow the relevant standards.

**2) XRF Equipment error: based on $\pm 15\%$

***3) Pb Subject to permissible concentration among exceptions

Item	Allowable concentration (ppm)	Main use examples
Fe	3,500	Screw, Galvanized steel, iron alloy for machining
Al	4,000	S/W CD, aluminum alloys
Cu	40,000	Insert, Connector, Pin, electric motor, etc.
Solder	800	85% Contained in tin-lead solder containing more than one lead
	850,000 More than	Die bonding solder semiconductor, chip, etc.

****4) Sn If abnormality is detected, the final judgment is made through detailed analysis of 3 types of organotin (TBT, TPT, DBT)..

*****5) Brominated flame retardant, flame retardant chlorine regulation

6-2. Caution

Temperature Condition

	Temperature Range	Unit
Operating Temperature	-40 ~ +85	°C
Storage Temperature	-40 ~ +85	°C

MSL MEVEL (JEDEC J-STD-020C)

	Floor Life		Soak Requirements	
	Time	Conditions	Time	Conditions
1	Unlimited	= < 30°C/85%RH	168+5/-0	= < 85°C/85%RH