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Model	Type	Rev.	Startellabs	IR
SG1000	PCB+CABLE		Franklin Technology	IR

APPROVAL SHEET

Customer : Franklin Technology

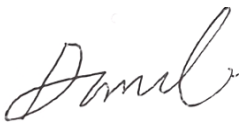
Company : Startellabs

Item : 5G LTE Antenna

Model : SG1000

Customer P/N :

Maker Code : STSG1KSUBANT

Department	Design	Check	Approval
Franklin Technology			
STARTELLABS			

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1.1 History List of Approval Sheet

[illegible]

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2. Circuit Specification

2.1 Test Setting

2.1.1 Test Environment (Condition+A338/Method)

① VSWR

Step 1. Connect ANT port with cable included adaptor to port1 of Network analyzer

Step 2. Point out markers on network analyzer display at target frequencies.

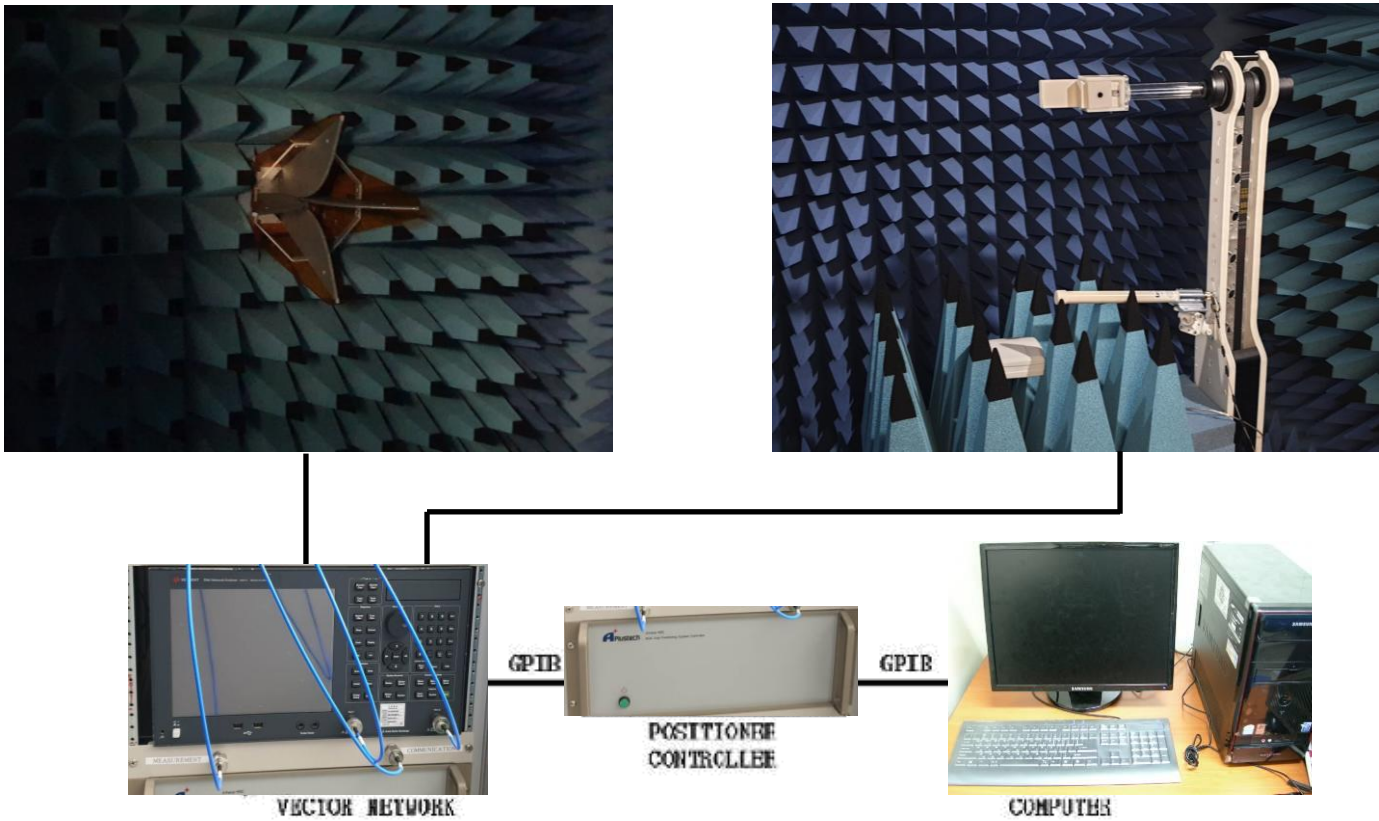
Step 3. Inspect VSWR



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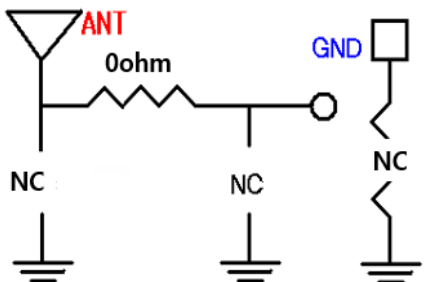
- ② Radiation Pattern adn Gain
- Step 1. Calibrate chamber system for gain measurement using horn antenna.
At the same time set up software program for chamber system control.
- Step 2. Change over from a horn antenna to measuring antenna on target positioner
- Step 3. Start a software program for chamber system control & measuring.



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2.2 Electrical Specification

Antenna 3							
Frequency[MHz]	B66 Rx (2110~2200)	B2 Rx (1930~1990)	B25 Rx (1930~1995)	B41 Rx (2496~2690)	B48 Rx (3550~3700)	n77 Rx (3300~4200)	
VSWR	≤ 2.6	≤ 2.7	≤ 2.7	≤ 3.4	≤ 2.3	≤ 2.8	
Peak Gain[dBi]	+4.2	+3.8	+3.9	+3.7	-0.1	+4.6	
Avg Gain[dBi]	-2.3	-3.3	-3.3	-3.6	-5.6	-3.4	
Antenna 6							
Frequency[MHz]	B41 Rx (2496~2690)	n77 Rx (3300~4200)					
VSWR	≤ 5.7	≤ 5.0					
Peak Gain[dBi]	+1.9	+0.7					
Avg Gain[dBi]	-7.7	-7.6					
Antenna 7							
Frequency[MHz]	GPS L1 (1176.450)	GPS L2 (1575.42)	GNSS L1 (1602)				
VSWR	≤ 2.5	≤ 2.2	≤ 2.7				
Peak Gain[dBi]	-2.3	-1.7	-2.6				
Avg Gain[dBi]	-7.0	-7.6	-8.3				
Antenna 8							
Frequency[MHz]	B40 Rx (2300~2400)	B41 Rx (2496~2690)	n38 Rx (2570~2620)	n77 Rx (3300~4200)			
VSWR	≤ 4.3	≤ 4.2	≤ 3.4	≤ 3.6			
Peak Gain[dBi]	+0.8	+1.5	+1.5	-0.2			
Avg Gain[dBi]	-7.3	-7.6	-6.3	-7.9			
Directivity	Omni-directional						
Polarization	Linear						
Feed Impedance	50 Ohms						
Power Handing	2Watt						
Matching Value							

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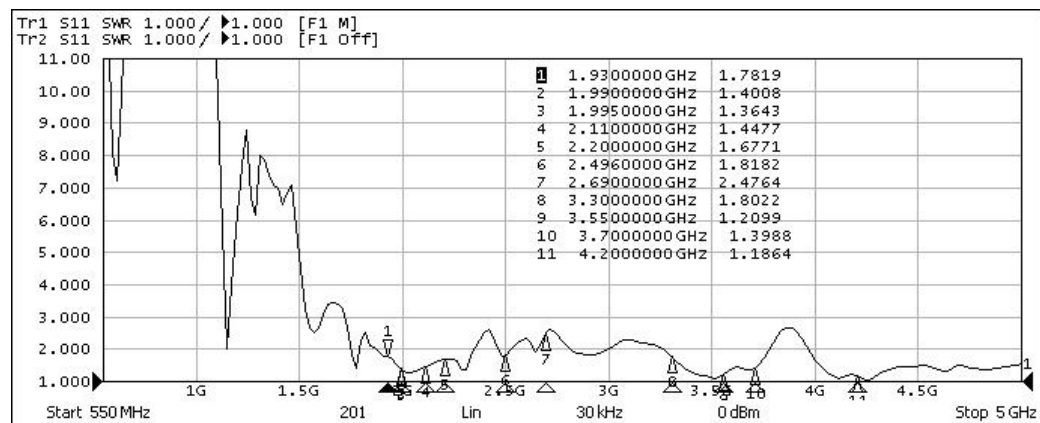
Antenna 9				
Frequency[MHz]	2.4G (2412~2484)	5G (5150~5885)	6G (5935~7125)	
VSWR	≤ 3.6	≤ 2.8	≤ 2.9	
Peak Gain[dBi]	+1.2	+3.1	+2.4	
Avg Gain[dBi]	-4.8	-3.6	-7.1	
Antenna 10				
Frequency[MHz]	2.4G (2412~2484)	5G (5150~5885)	6G (5935~7125)	
VSWR	≤ 3.6	≤ 2.8	≤ 3.1	
Peak Gain[dBi]	+0.2	+1.7	+4.1	
Avg Gain[dBi]	-6.9	-3.6	-3.2	
Directivity	Omni-directional			
Polarization	Linear			
Feed Impedance	50 Ohms			
Power Handling	2Watt			
Matching Value				

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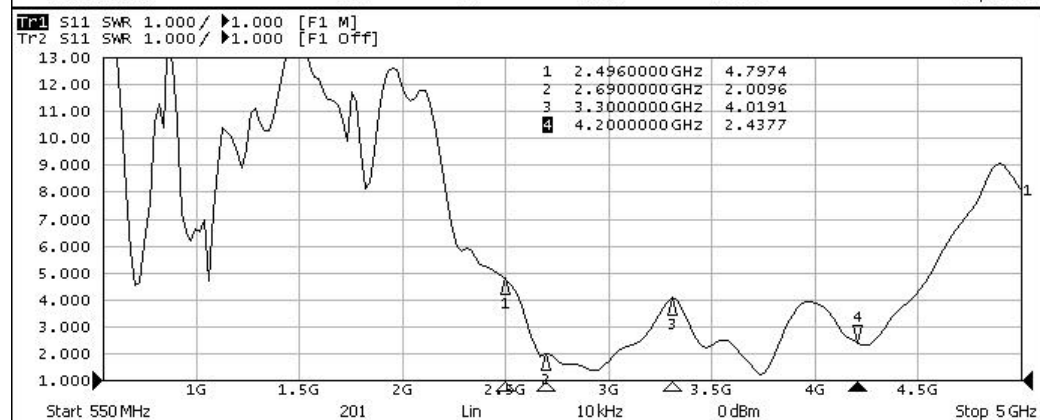
Model	Type	Rev.	Startellabs	IR
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2.2.1 Electrical Spec. of Set (With VSWR)

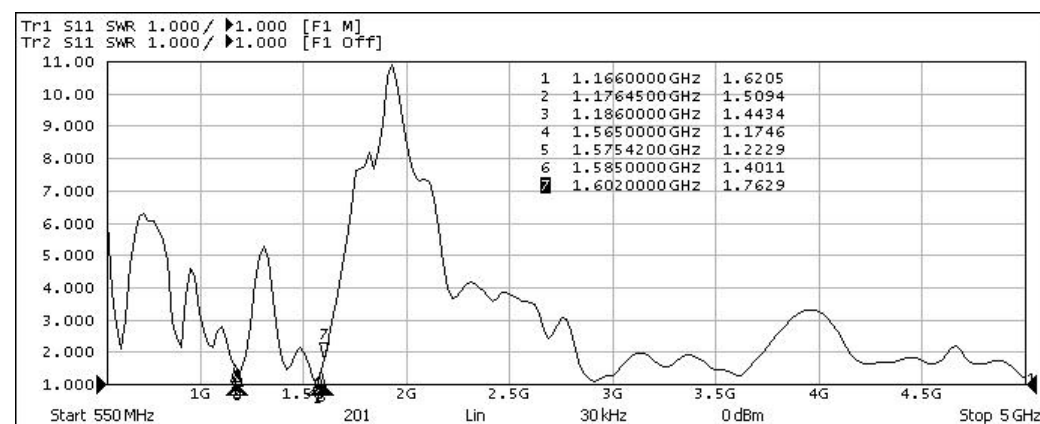
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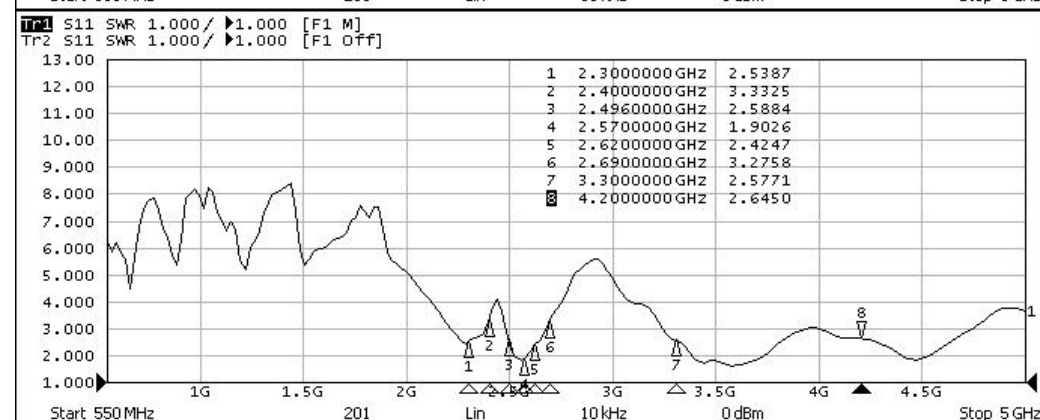
ANT 6



ANT 7



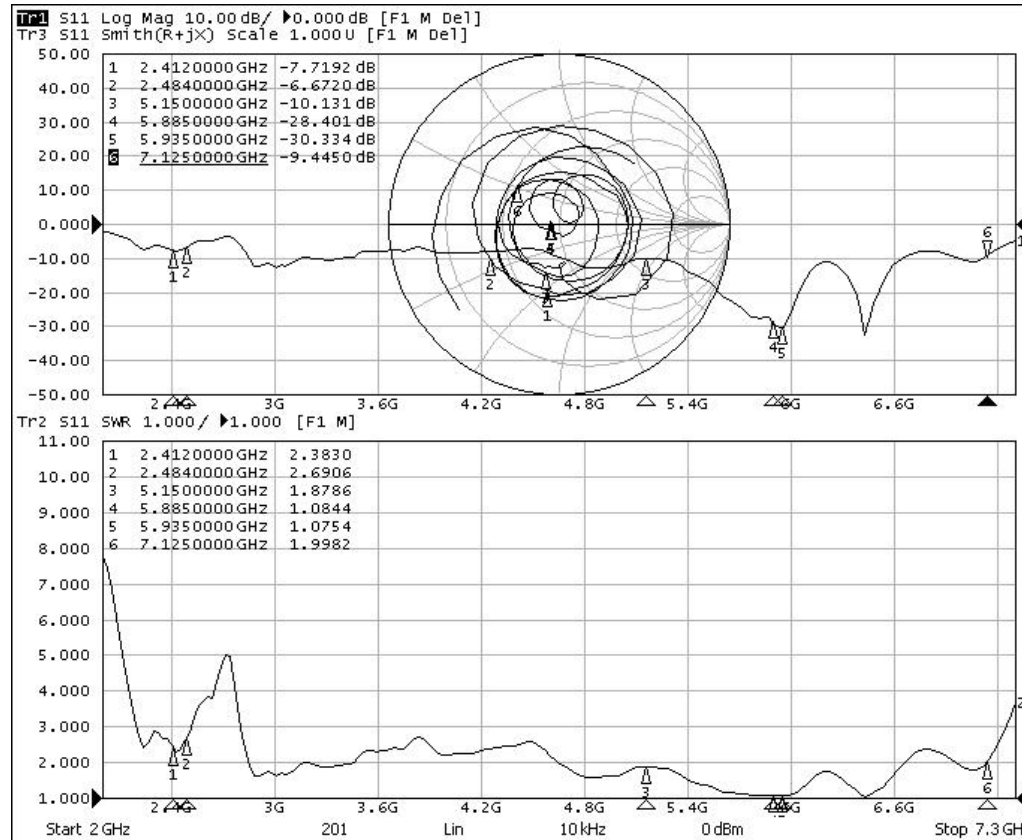
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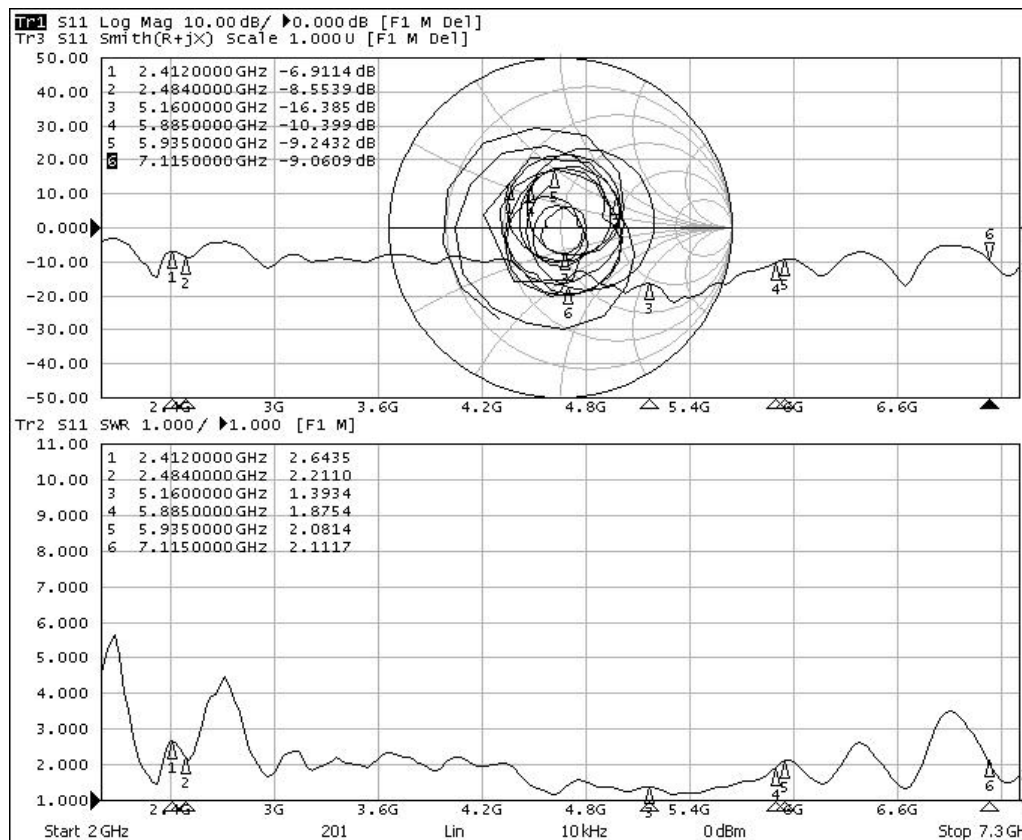
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ANT 9



ANT 10



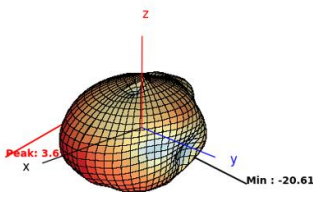
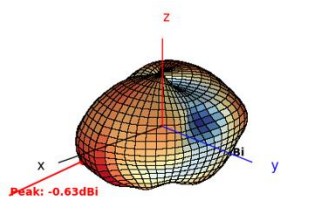
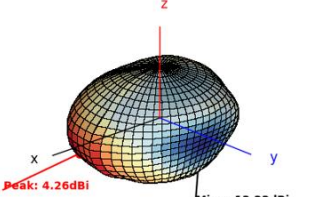
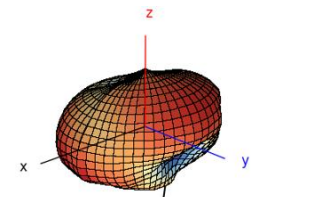
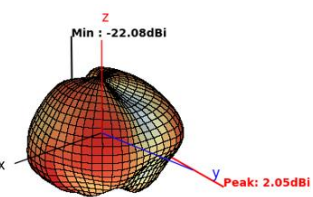
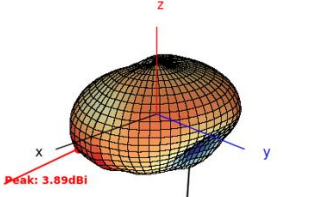
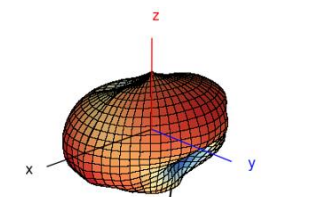
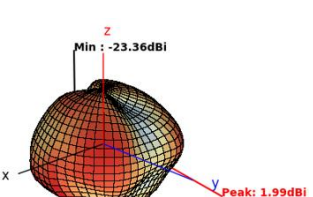
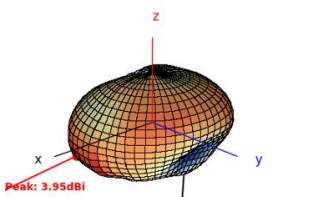
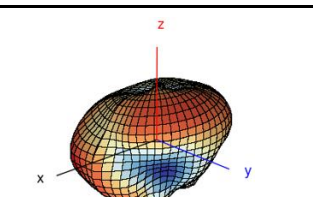
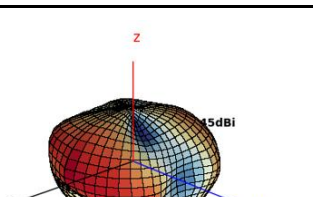
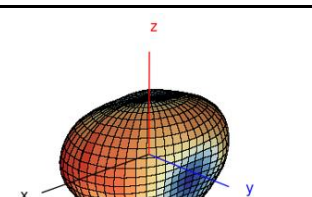
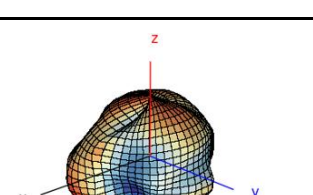
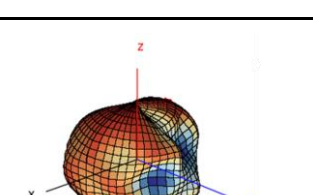
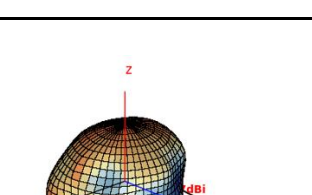
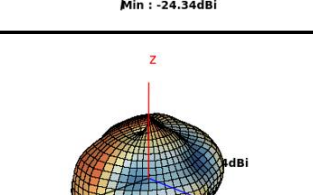
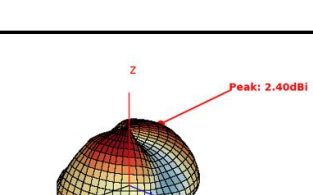
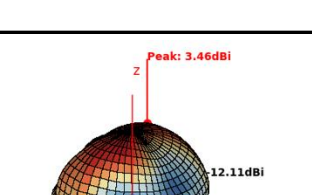
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2.2.2 Passive Gain & 3D Pattern

ANT 3

Frequency [MHz]	1930	1990	1995	2110	2200	2496	2690	3300	3550	3700	4200
Efficiency [dB]	-2.37	-1.09	-1.08	-1.12	-1.36	-1.73	-2.63	-1.62	-3.88	-4.65	-2.05
Efficiency [%]	57.9	77.9	77.9	77.3	73.2	67.1	54.5	68.8	40.9	34.3	62.4
Peak Gain [dBi]	1.85	3.89	3.95	4.26	3.00	2.62	3.73	3.68	-0.11	-0.03	3.46

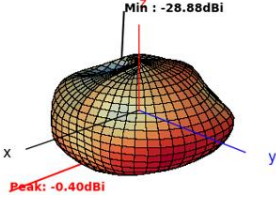
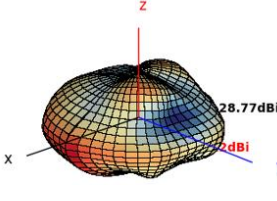
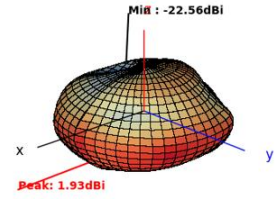
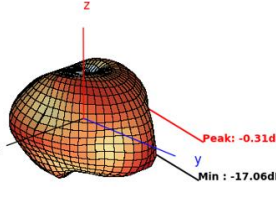
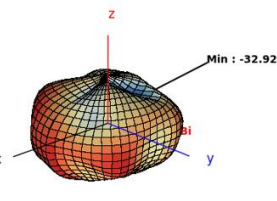
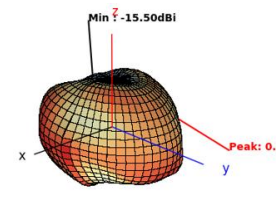
3D Radiation Pattern			
Band[MHz]	Theta Pol	Phi Pol	Total
B66 Rx (2110~2200)			
B2 Rx (1930~1990)			
B25 Rx (1930~1995)			
B41 Rx (2496~2690)			
B48 Rx (3550~3700)			
n77 Rx (3300~4200)			

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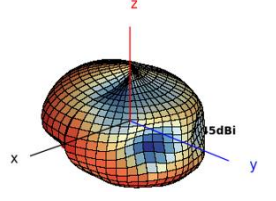
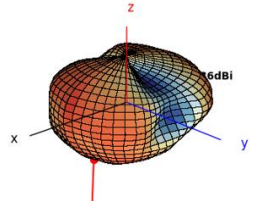
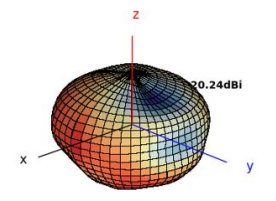
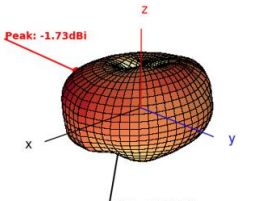
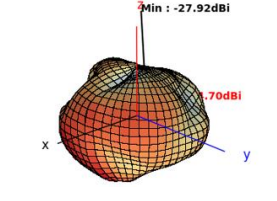
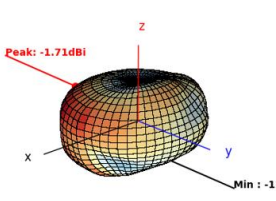
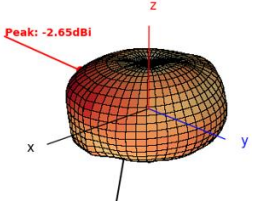
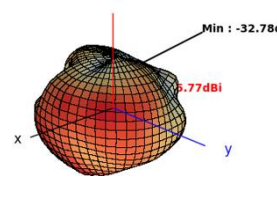
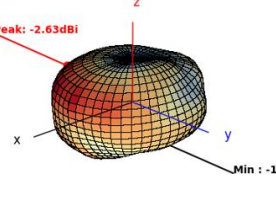
ANT 6

Frequency [MHz]	2496	2690	3300	4200
Efficiency [dB]	-6.70	-3.93	-3.59	-6.60
Efficiency [%]	21.4	40.5	43.7	21.9
Peak Gain [dBi]	-0.84	1.93	0.79	-2.46

3D Radiation Pattern			
Band[MHz]	Theta Pol	Phi Pol	Total
B41 Rx (2496~2690)			
n77 Rx (3300~4200)			

ANT 7

Frequency [MHz]	1166	1176.45	1186	1565	1575.42	1585	1602
Efficiency [dB]	-6.70	-6.08	-5.72	-6.40	-6.60	-6.82	-7.37
Efficiency [%]	21.4	24.7	26.8	22.9	21.9	20.8	18.3
Peak Gain [dBi]	-2.44	-2.37	-2.37	-1.45	-1.71	-2.04	-2.63

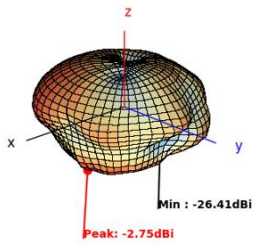
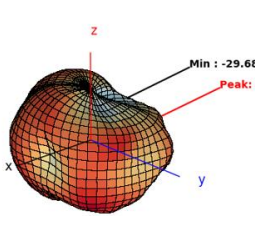
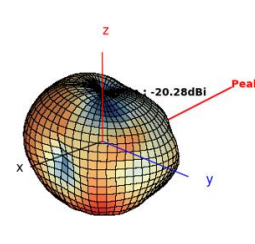
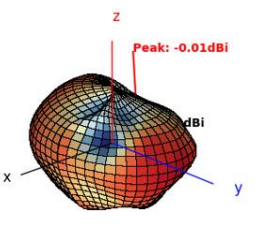
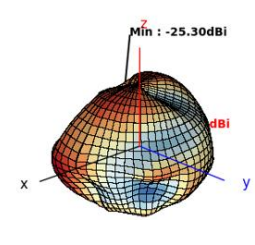
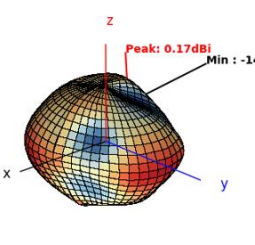
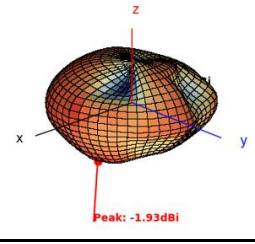
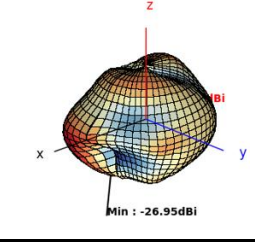
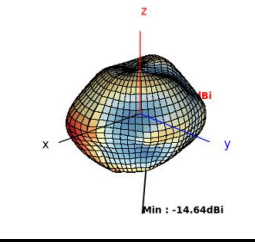
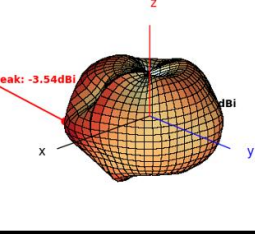
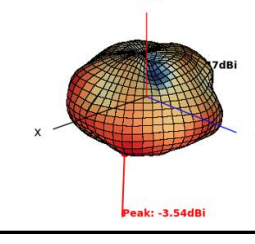
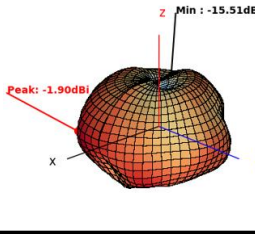
3D Radiation Pattern			
Band[MHz]	Theta Pol	Phi Pol	Total
GPS L1 (1176.45)			
GPS L2 (1575.42)			
GNSS L1 (1602)			

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Frequency [MHz]	2300	2400	2496	2570	2620	2690	3300	4200
Efficiency [dB]	-6.31	-5.12	-6.64	-5.31	-4.45	-3.85	-6.72	-6.99
Efficiency [%]	23.4	30.7	21.7	29.4	35.9	41.2	21.3	20.0
Peak Gain [dBi]	-0.97	0.80	-1.03	0.99	1.57	0.17	-0.26	-1.90

3D Radiation Pattern			
Band[MHz]	Theta Pol	Phi Pol	Total
B40 Rx (2300~2400)			
B41 Rx (2496~2690)			
B38 Rx (2570~2620)			
n77 Rx (3300~4200)			

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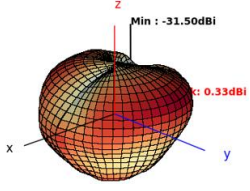
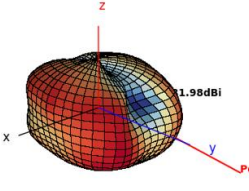
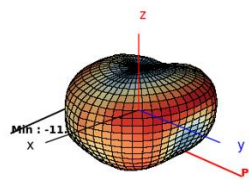
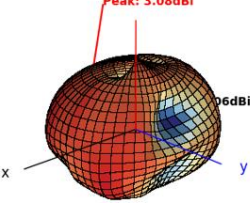
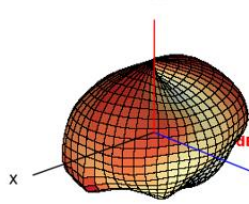
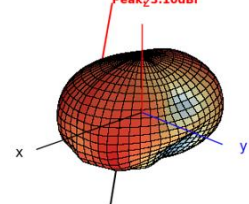
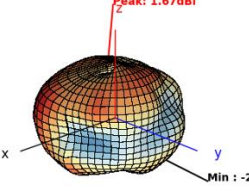
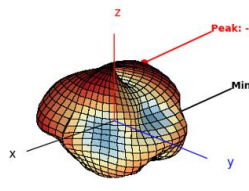
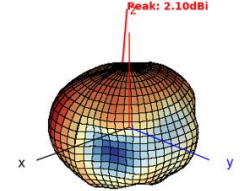
Model	Type	Rev.	Startellabs	IR
SG1000	PCB+CABLE		Franklin Technology	IR

ANT 9

Frequency [MHz]	2412	2432	2452	2484	5150	5260	5320	5470	5700	5745
Efficiency [dB]	-3.88	-3.66	-3.46	-3.20	-1.83	-2.26	-2.32	-2.01	-2.36	-2.38
Efficiency [%]	40.9	43.1	45.1	47.8	65.6	59.4	58.7	62.9	58.1	57.8
Peak Gain [dBi]	0.93	1.19	1.02	1.28	2.54	2.33	2.31	3.10	2.32	2.29

Frequency [MHz]	5835	5850	5885	5935	5945	6375	6425	6525	6635	6855
Efficiency [dB]	-2.31	-2.64	-2.60	-2.66	-2.70	-2.98	-2.65	-2.97	-2.99	-3.59
Efficiency [%]	58.7	54.5	54.9	54.1	53.7	50.3	54.3	50.5	50.2	43.7
Peak Gain [dBi]	1.52	1.16	1.40	1.25	1.41	2.03	2.45	1.73	1.54	2.10

Frequency [MHz]	7115	7125
Efficiency [dB]	-6.13	-5.55
Efficiency [%]	24.4	27.8
Peak Gain [dBi]	-0.81	-0.37

3D Radiation Pattern			
Band[MHz]	Theta Pol	Phi Pol	Total
2.4G (2412~2484)			
5G (5150~5885)			
6G (5935~7125)			

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Model	Type	Rev.	Startellabs	IR
SG1000	PCB+CABLE		Franklin Technology	IR

ANT 10

Frequency [MHz]	2412	2432	2452	2484	5150	5260	5320	5470	5700	5745
Efficiency [dB]	-1.95	-2.20	-1.93	-1.64	-1.45	-1.79	-1.89	-2.07	-2.00	-1.96
Efficiency [%]	63.8	60.2	64.2	68.5	71.6	66.2	64.8	62.1	63.1	63.7
Peak Gain [dBi]	1.14	1.04	1.47	1.47	3.15	2.66	2.85	2.56	3.66	3.74

Frequency [MHz]	5835	5850	5885	5935	5945	6375	6425	6525	6635	6855
Efficiency [dB]	-1.78	-2.06	-2.18	-2.08	-2.12	-2.33	-2.23	-1.91	-2.20	-4.01
Efficiency [%]	66.3	62.2	60.6	62.0	61.4	58.5	59.8	64.4	60.3	39.8
Peak Gain [dBi]	3.40	3.38	3.53	3.93	3.82	3.73	3.47	3.13	3.45	2.19

Frequency [MHz]	7115	7125
Efficiency [dB]	-6.69	-6.38
Efficiency [%]	21.4	23.0
Peak Gain [dBi]	-0.95	-0.84

3D Radiation Pattern			
Band[MHz]	Theta Pol	Phi Pol	Total
2.4G (2412~2484)			
5G (5150~5885)			
6G (5935~7125)			

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Model	Type	Rev.	Startellabs	IR
SG1000	PCB+CABLE		Franklin Technology	IR

3. Mechanical Specification

3.1 Material Certificate

Product Name		STSG1KSUBANT		
Ant Type		PCB+CABLE		
No	Part Name	Raw Material	FINISH/COLOR	REMARKS
1	Radiator	PCB	FR4(1.0T)/BLACK	-
2	Cable Ass'y	Connector Cable	A3:MHF4*Ø0.81*90mm/ BLACK A6:MHF4*Ø0.81*60mm/ BLACK A7:MHF4*Ø0.81*120mm/ BLACK A8:MHF4*Ø0.81*105mm/ BLACK A9:U.FL*Ø1.13*175mm/ BLACK A10:U.FL*Ø1.13*120mm/ BLACK	-

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Model	Type	Rev.	Startellabs	IR
SG1000	PCB+CABLE		Franklin Technology	IR

3.2 Assy Drawing

