

11. WLAN Operational Description

Within USA: 802.11 b/g/n Mobile Hotspot(2.4GHz) 802.11a/n (5GHz), 802.11ac Wi-Fi
Direct, Wi-Fi Display

Although the chipset documentation may indicate possible functions, the following have been permanently hardware disabled in this device and cannot be enabled by the end user or service provider

- Mobile Hotspot(5GHz)

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The GT-I9200 supports the following frequency ranges and is only client device in 5GHz bands.

The following table lists the actual channel/frequency plan for the 2.4GHz and 5GHz operation in USA.

This device only supports Active scanning on non-DFS frequencies.

WLAN: 2412-2462 MHz. 5745 – 5825MHz

UNII: 5180 – 5240MHz, 5260 – 5320MHz, 5500 – 5700MHz

- 2.4 GHZ 20MHz BW

Channel	Freq.(MHz)	Scanning	Channel	Freq.(MHz)	Scanning
1	2412	Active	7	2442	Active
2	2417	Active	8	2447	Active
3	2422	Active	9	2452	Active
4	2427	Active	10	2457	Active
5	2432	Active	11	2462	Active
6	2437	Active			

- 5 GHZ 20MHz BW

Channel	Freq. (MHz)	Scanning	Channel	Freq. (MHz)	Scanning	Channel	Freq. (MHz)	Scanning
36	5180	Active	64	5320	Passive	136	5680	Passive
40	5200	Active	100	5500	Passive	140	5700	Passive
44	5220	Active	104	5520	Passive	149	5745	Active
48	5240	Active	108	5540	Passive	153	5765	Active
52	5260	Passive	112	5560	Passive	157	5785	Active
56	5280	Passive	116	5580	Passive	161	5805	Active
60	5300	Passive	132	5660	Passive	165	5825	Active

- 5 GHZ 40MHz BW

Channel	Freq. (MHz)	Scanning	Channel	Freq. (MHz)	Scanning
38	5190	Active	110	5550	Passive
46	5230	Active	134	5670	Passive
54	5270	Passive	151	5755	Active
62	5310	Passive	159	5795	Active
102	5510	Passive			

Ad-hoc or peer-to-peer modes are not supported operating in the UNII DFS bands(Band 2 and 3). This NII transmitter is a client-only device without radar detection capability in the DFS bands.

The client software and associated drivers can not initiate any transmission on DFS frequencies, which includes transmissions for beacon, ad-hoc, and peer-to-peer modes. Operation as an access point on non-DFS legacy frequencies is also not supported. The software is locked by the module manufacturer such that there is no access and the settings can not be changed by the integrator of the module or the end user of the device. When Hotspot Mode is activated by the end-user, all 5GHz WIFI bands are disabled.

- This device is under the control of a local master that is acting as an access point and is connected to AC Power in the NII Band 1 for indoor operation.

In 5GHz band, WLAN chipset works only for necessary data transmission. When data transmission is not needed, this device actually shutdown Tx path. So, This device automatically discontinues its transmission in case of either absence of information to transmit or operational failure.

WI-FI Direct Description

WI-FI Direct Channel

- All Channels in the 2.4 GHz band spectrum.
- Limited to Channels 149-165 in the 5 GHz band spectrum.

The main transmitter of the antenna on the device is not restricted from simultaneously transmitting with WI-FI while WI-FI Direct is enabled.

Wi-Fi Direct is not expected to be used simultaneously with another licensed transmitter held-to-ear, body-worn, or in the user's pocket. We expect Wi-Fi Direct to be used while in the person's hand (typical) or connected to the wall outlet (for more prolonged usage)

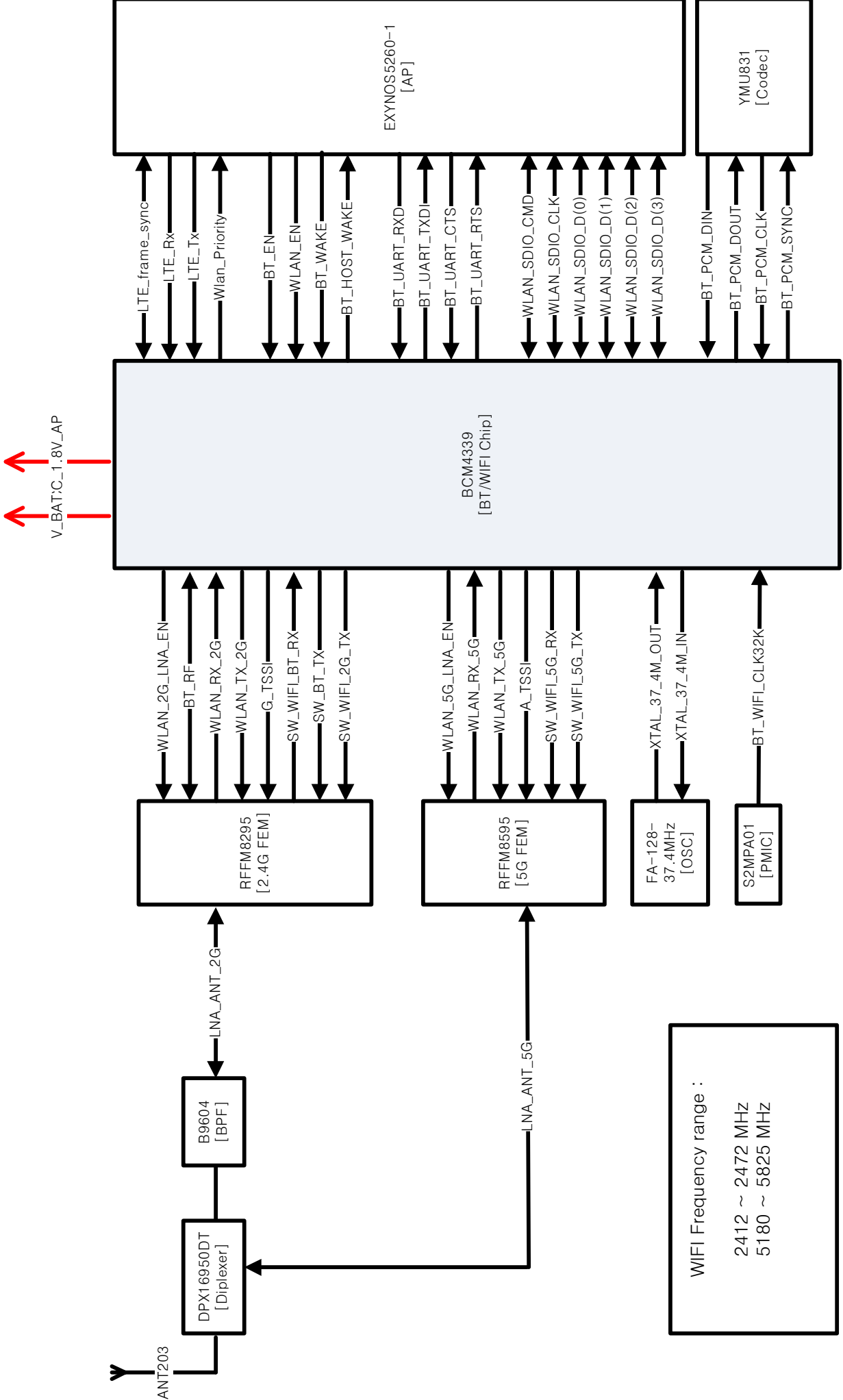
Wi-Fi Direct Certified devices can support either an infrastructure connection or a peer to peer connection. The devices connect by forming Groups that function like Infrastructure BSS (Basic Service Set).

Keep in mind that Wi-Fi Direct devices don't have full Wi-Fi functionality like you would find in Access Points. Consider a Peer to Peer Group that is made up of a legacy Wi-Fi device and a couple of Wi-Fi Direct devices.

One of the Wi-Fi Direct devices has to serve as the Group owner.

As part of the specification, there are multiple mandatory mechanisms that must be filled by devices in the group.

1. Group Formation is the mechanism to determine which Wi-Fi Direct device is the leader of the group.
2. Device Discovery is the mechanism to locate Wi-Fi Direct devices and exchange pertinent information about each device in the group.
3. Client Discovery is the mechanism that enables a Wi-Fi Direct device to determine all the devices in the group.



WIFI Frequency range :
 2412 ~ 2472 MHz
 5180 ~ 5825 MHz

Receiver Path

The BCM4339 has a wide dynamic range, direct conversion receiver that employs high order on-chip channel filtering to ensure reliable operation in the noisy 2.4 GHz ISM band or the entire 5 GHz U-NII band. An on-chip low-noise amplifier (LNA) in the 2.4 GHz path is shared between the Bluetooth and WLAN receivers, while the 5 GHz receive path has a dedicated on-chip LNA. Control signals are available that can support the use of optional LNAs for each band, which can increase the receive sensitivity by several dB.

Transmit Path

Baseband data is modulated and upconverted to the 2.4 GHz ISM or 5-GHz U-NII bands, respectively. Linear on-chip power amplifiers are included, which are capable of delivering high output powers while meeting IEEE 802.11ac and IEEE 802.11a/b/g/n specifications without the need for external PAs. When using the internal PAs, closed-loop output power control is completely integrated. As an option, external PAs can be used for even higher output power, in which case the closed-loop output power control is provided by means of a-band and g-band TSSI inputs from external power detectors.

Calibration

The BCM4339 features dynamic and automatic on-chip calibration to continually compensate for temperature and process variations across components. These calibration routines are performed periodically in the course of normal radio operation. Examples of some of the automatic calibration algorithms are baseband filter calibration for optimum transmit and receive performance, and LOFT calibration for carrier leakage reduction. In addition, I/Q Calibration, R Calibration, and VCO Calibration are performed on-chip. No per-board calibration is required in manufacturing test, which helps to minimize the test time and cost in large volume production.

3 MEASUREMENT RESULTS

Typical VSWR curve of SM-N075 BT/Wi-Fi antenna are shown on figure below

3.1 VSWR of Hand-set

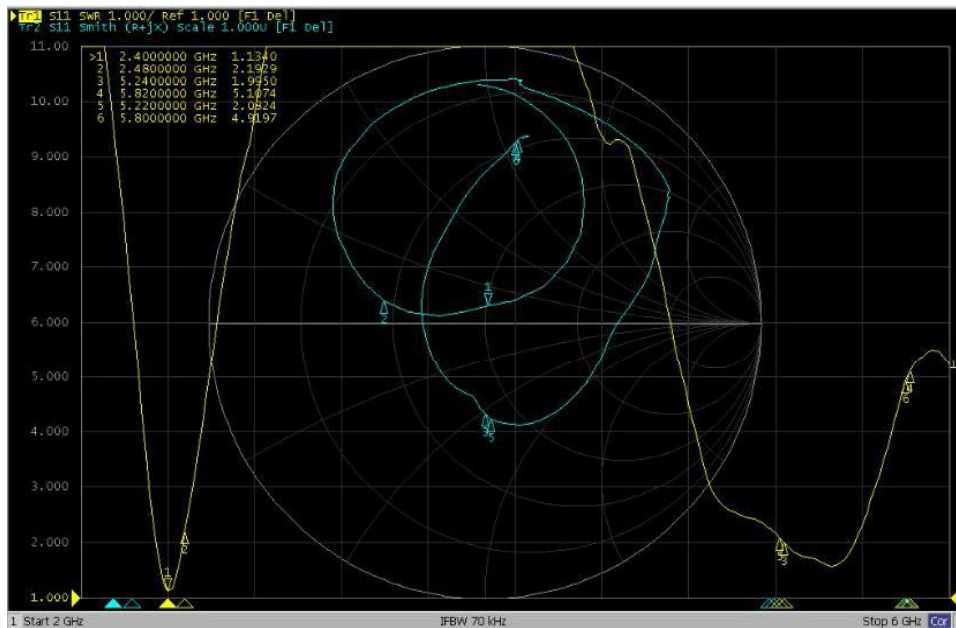


Figure 3-1.1. Typical Main curve of Hand Set

3.2 VSWR of Jig (Only Antenna)

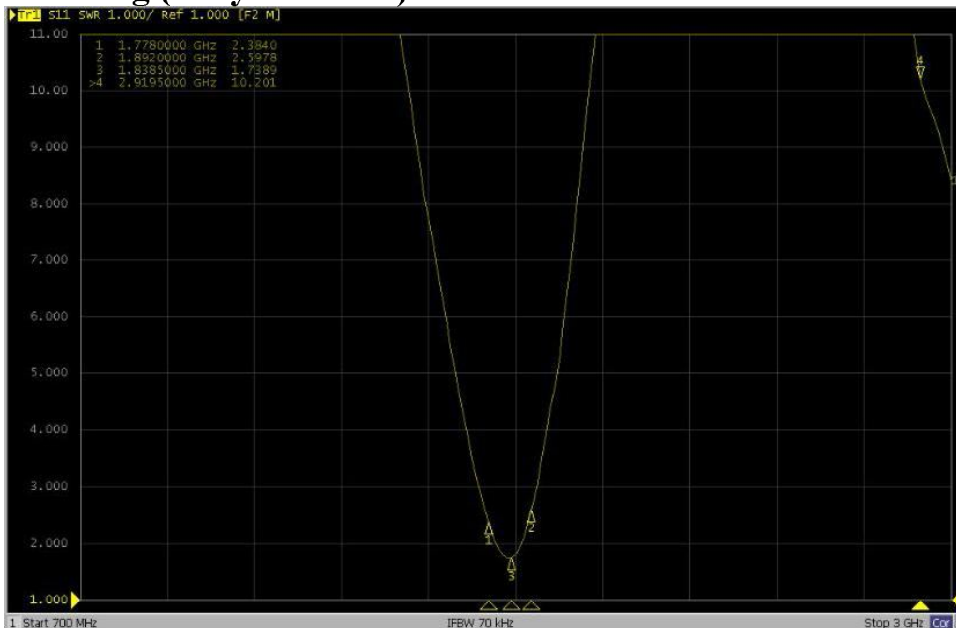
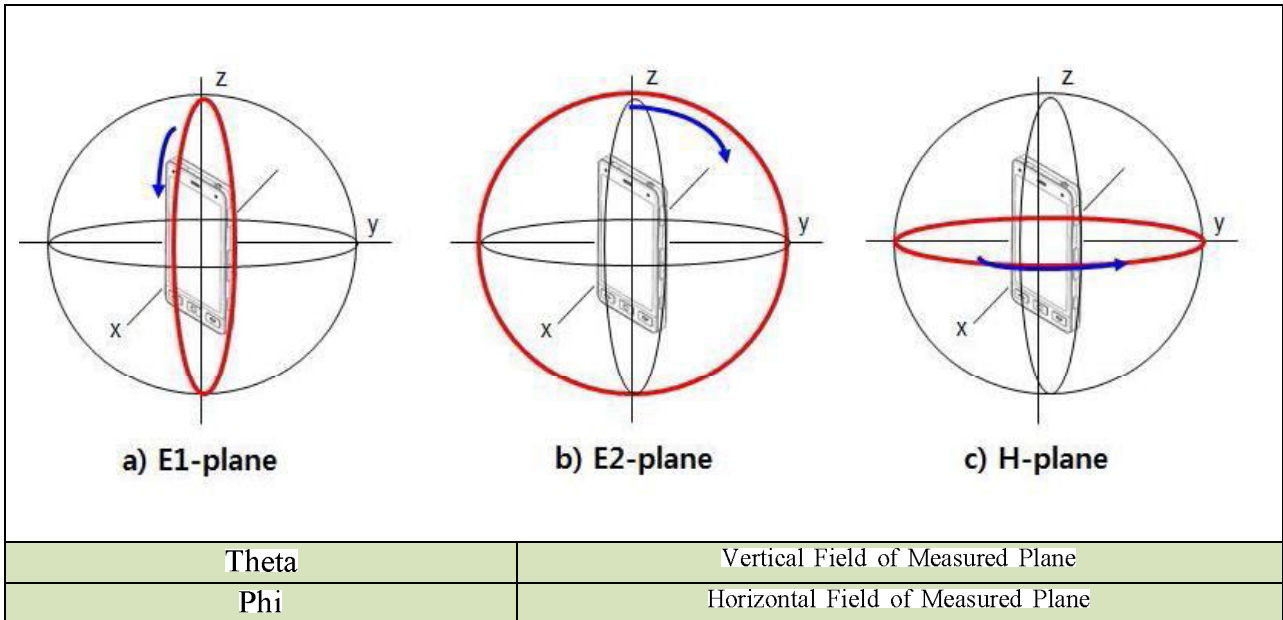


Figure 3-2.1. Typical Main curve of Jig (Only Antenna)

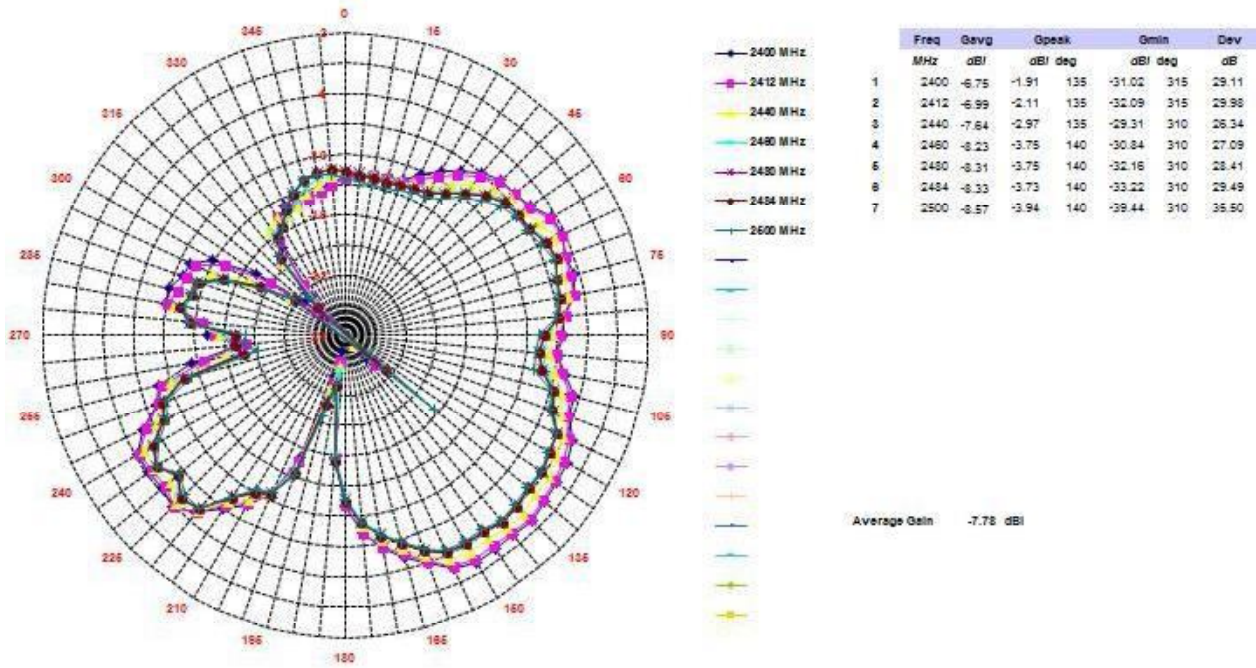
4 FREE SPACE 2D GAIN

These typical results are measured in Samsung SM-N750 BT/Wi-Fi Chassis rev.0.1

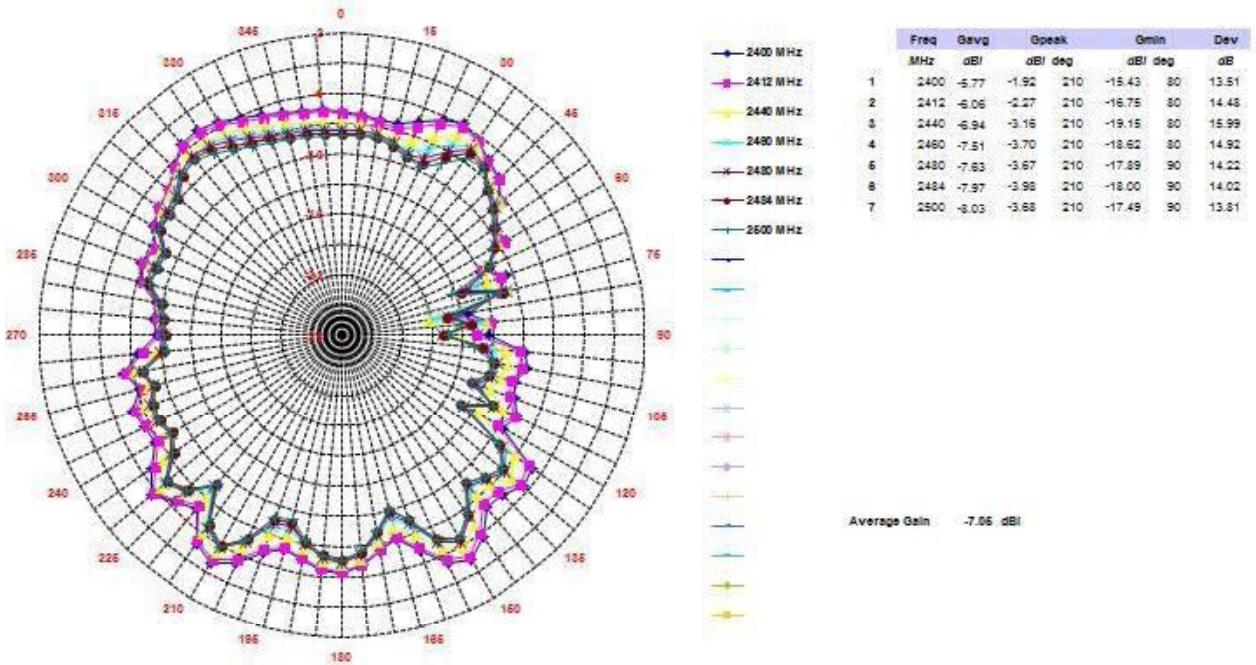
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Frequency(MHz)		2400	2412	2440	2460	2480	2484	2500	5150	5250	5350	5450	5550	5650	5750	5825
Hθ	AVG	-7.82	-8.05	-8.63	-9.30	-9.50	-9.58	-9.91	-2.15	-2.36	-3.54	-2.82	-3.14	-2.51	-4.60	-5.21
	Peak	-3.85	-4.02	-4.43	-5.12	-5.40	-5.48	-5.75	2.08	1.63	0.32	1.61	1.51	2.09	0.01	-0.78
	Min	-23.28	-22.31	-21.63	-22.35	-21.51	-21.23	-21.10	-14.68	-15.50	-22.93	-45.43	-32.81	-22.77	-31.29	-31.88
E1θ	AVG	-6.75	-6.99	-7.64	-8.23	-8.31	-8.33	-8.57	-3.68	-3.92	-5.31	-4.36	-4.68	-4.01	-5.79	-6.48
	Peak	-1.91	-2.11	-2.97	-3.75	-3.75	-3.73	-3.94	1.90	1.85	0.02	1.43	1.17	1.42	-0.09	-0.72
	Min	-31.02	-32.09	-29.31	-30.84	-32.16	-33.22	-39.44	-24.42	-17.57	-21.72	-22.58	-26.25	-20.93	-27.78	-23.44
E2θ	AVG	-5.39	-5.65	-6.39	-7.03	-7.18	-7.21	-7.50	-5.21	-5.46	-6.55	-5.54	-6.03	-5.20	-7.22	-7.76
	Peak	-1.51	-1.80	-2.76	-3.24	-3.19	-3.21	-3.50	-0.08	-0.33	-1.08	-0.27	-0.24	0.37	-1.23	-2.03
	Min	-20.54	-25.58	-45.46	-27.73	-26.64	-27.18	-28.00	-22.45	-22.14	-25.36	-21.93	-26.88	-21.80	-23.47	-26.43
Hϕ	AVG	-11.28	-11.75	-12.75	-13.14	-12.90	-13.22	-13.12	-7.10	-8.22	-10.09	-10.06	-8.26	-6.04	-7.91	-6.96
	Peak	-8.19	-8.74	-7.84	-8.13	-7.84	-8.15	-8.07	-1.99	-3.87	-5.66	-5.70	-4.07	-1.15	-2.33	-1.76
	Min	-21.03	-21.23	-20.34	-22.85	-25.04	-26.09	-27.82	-35.08	-26.75	-23.15	-22.79	-23.23	-29.51	-20.75	-22.84
E1ϕ	AVG	-5.77	-6.06	-6.94	-7.51	-7.63	-7.97	-8.03	-6.26	-7.40	-8.82	-8.24	-7.19	-4.71	-6.11	-5.24
	Peak	-1.92	-2.27	-3.16	-3.70	-3.67	-3.98	-3.68	-1.94	-3.19	-4.51	-4.11	-3.19	-0.71	-2.14	-1.22
	Min	-15.43	-16.75	-19.15	-18.52	-17.89	-18.00	-17.49	-30.94	-25.56	-23.86	-26.09	-25.29	-31.52	-37.55	-22.31
E2ϕ	AVG	-12.69	-12.96	-13.51	-13.71	-13.41	-13.69	-13.54	-9.65	-9.82	-10.51	-9.92	-8.70	-6.45	-7.65	-7.01
	Peak	-10.35	-10.30	-10.32	-10.82	-10.82	-11.05	-11.22	-3.28	-4.86	-5.01	-4.97	-4.18	-2.62	-3.79	-2.77
	Min	-18.95	-20.43	-24.09	-25.67	-26.03	-26.16	-26.88	-33.84	-24.08	-26.98	-27.77	-27.78	-14.49	-16.99	-14.73



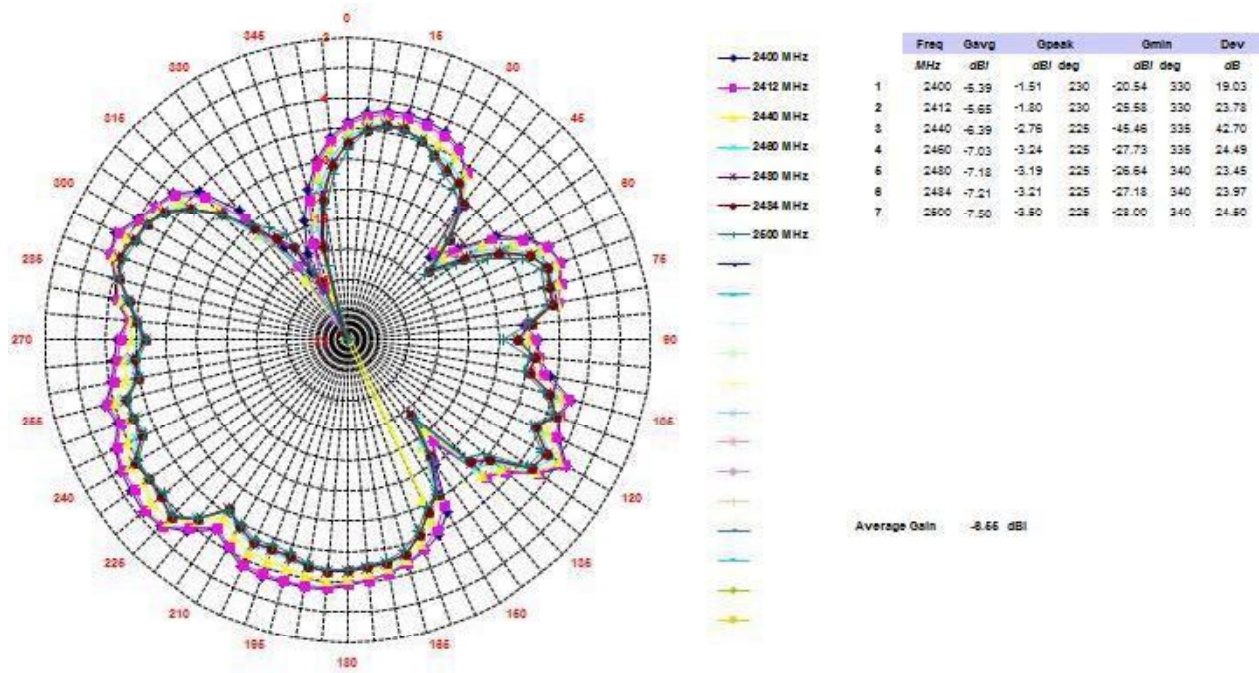
4.1 Radiation pattern of 2GHz 대역 [E1-Field (Theta)]



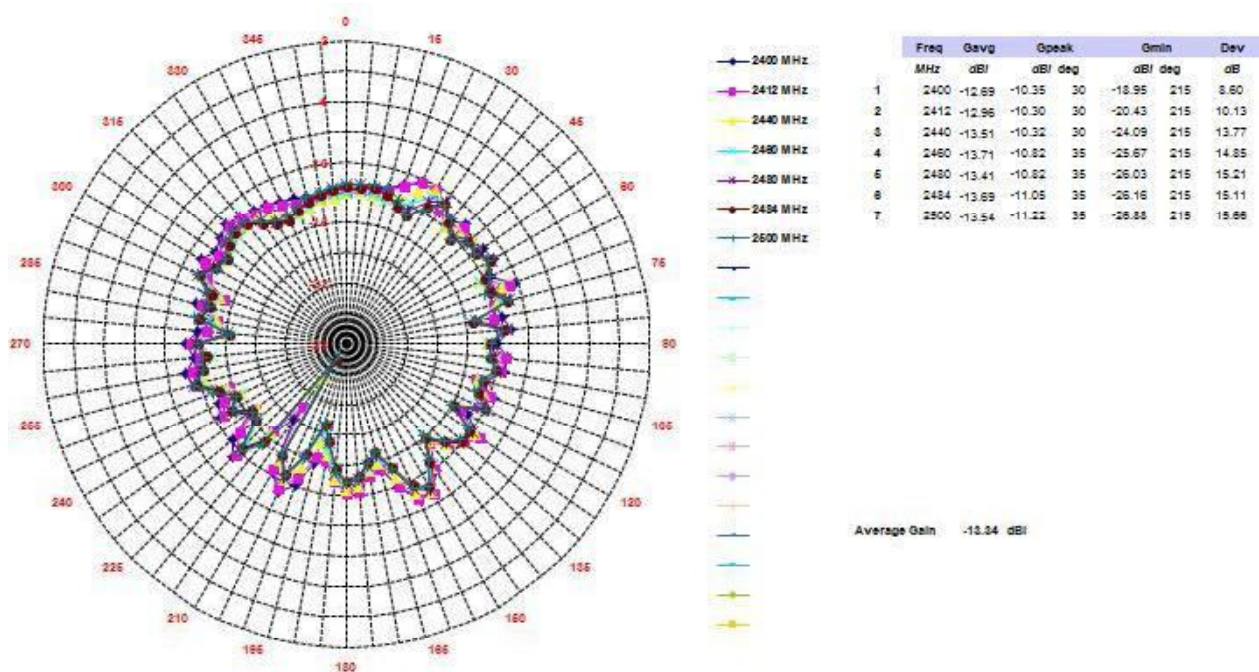
4.2 Radiation pattern of 2GHz 대역 [E1-Field(Phi)]



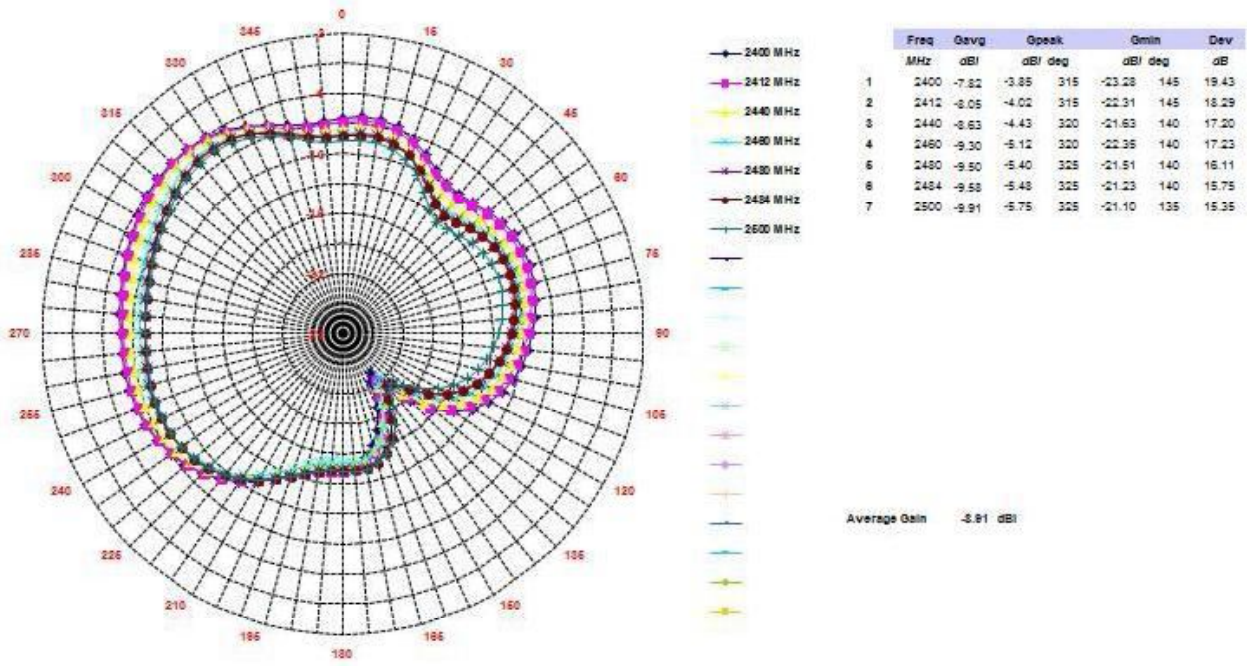
4.3 Radiation pattern of 2GHz 대역 [E2-Field(Theta)]



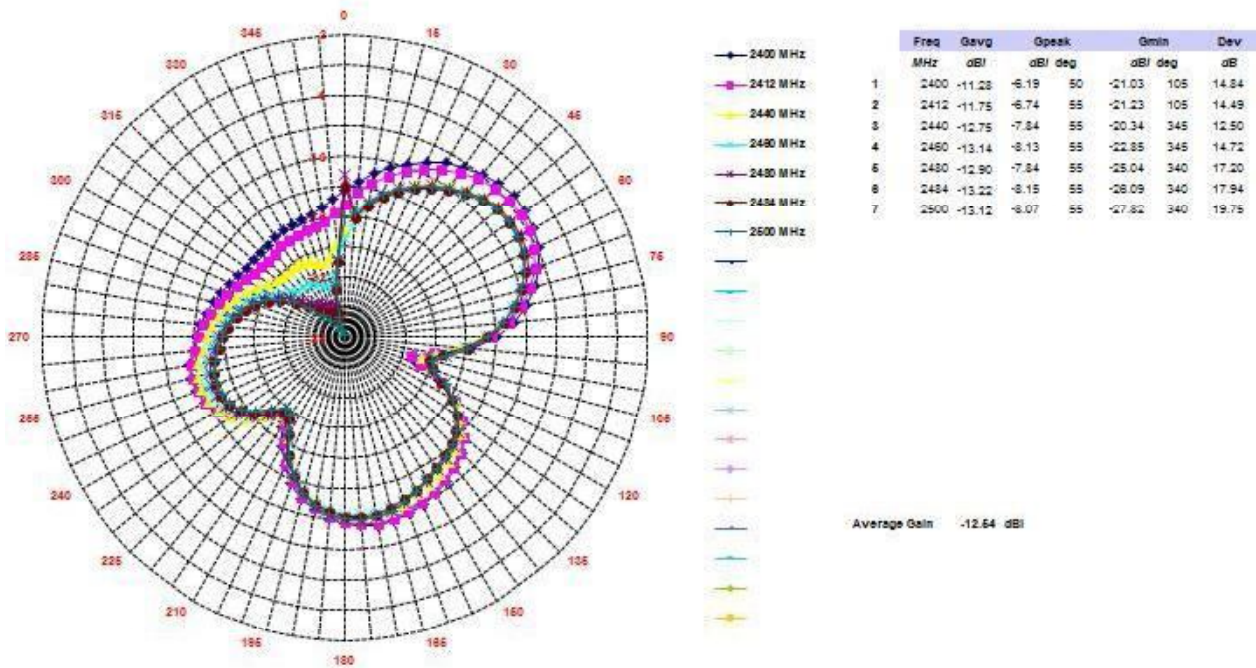
4.4 Radiation pattern of 2GHz 대역 [E2-Field(Phi)]



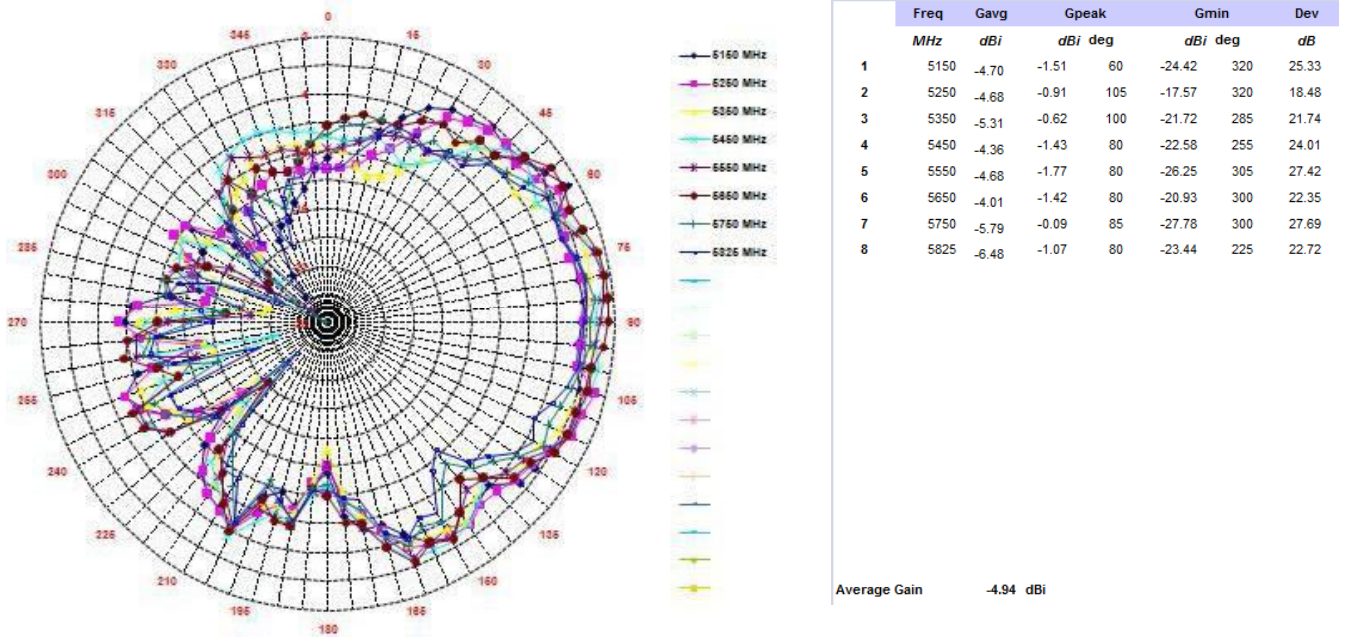
4.5 Radiation pattern of 2GHz 대역 [H-Field(Theta)]



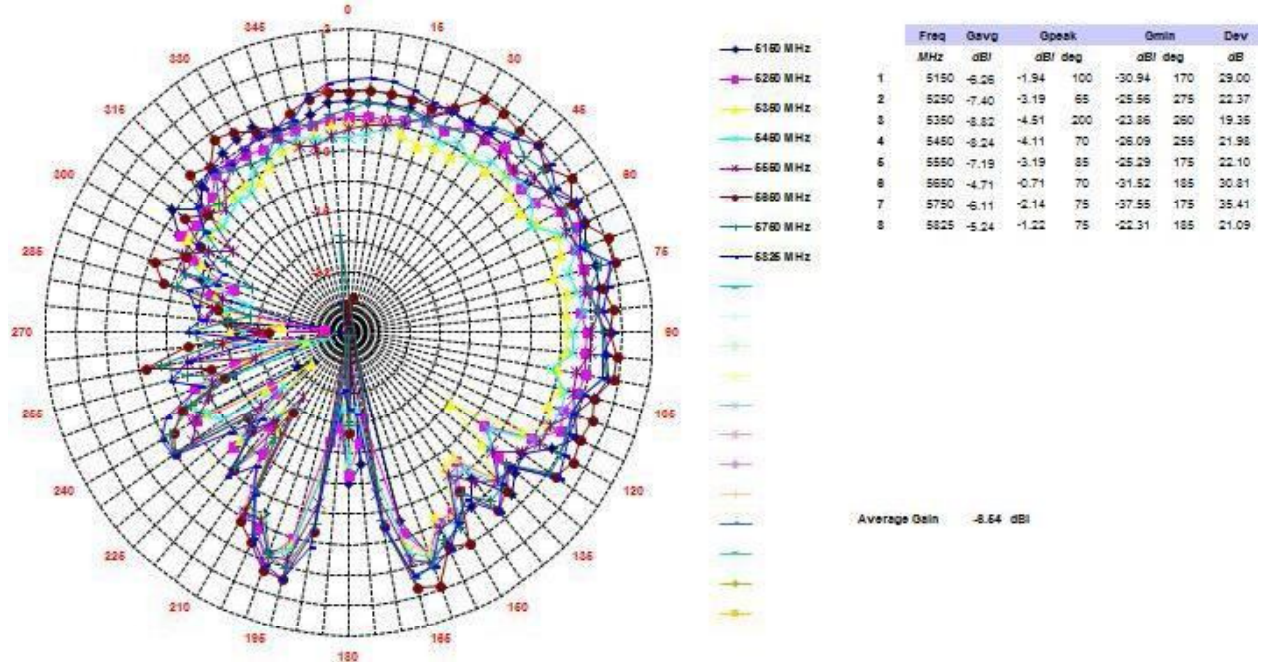
4.6 Radiation pattern of 2GHz 대역 [H-Field(Phi)]



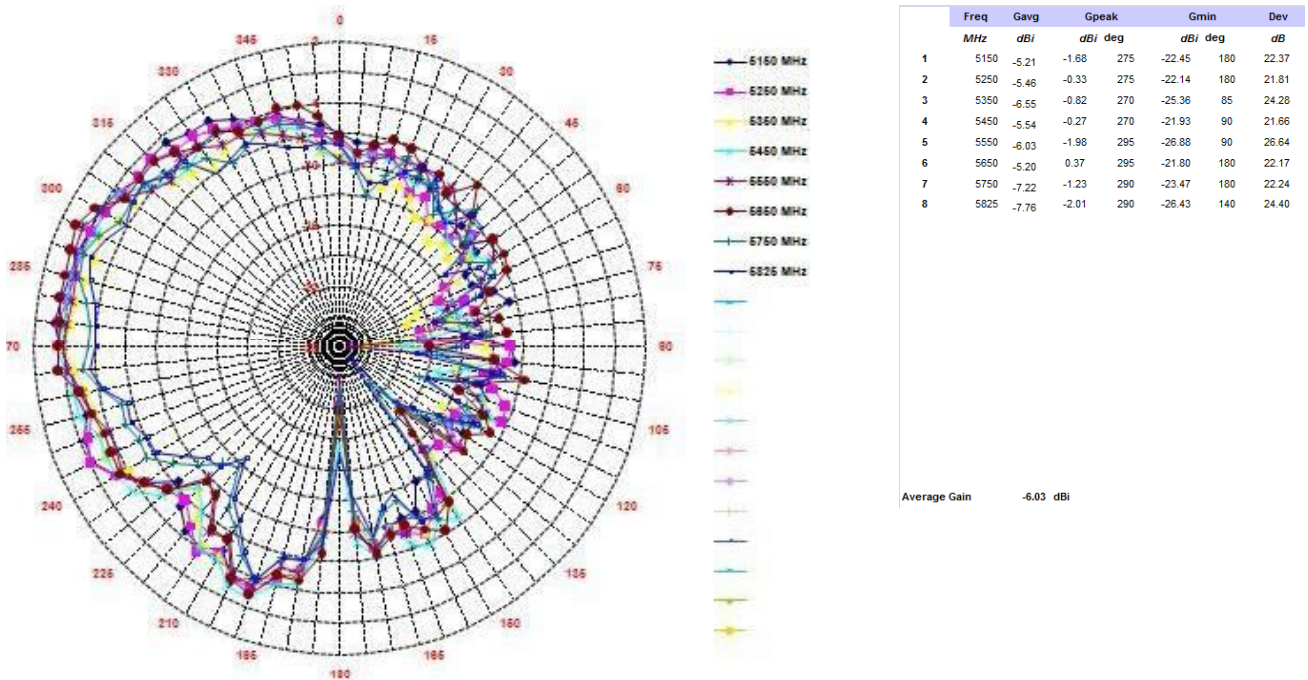
4.7 Radiation pattern of 5GHz 대역 [E1-Field (Theta)]



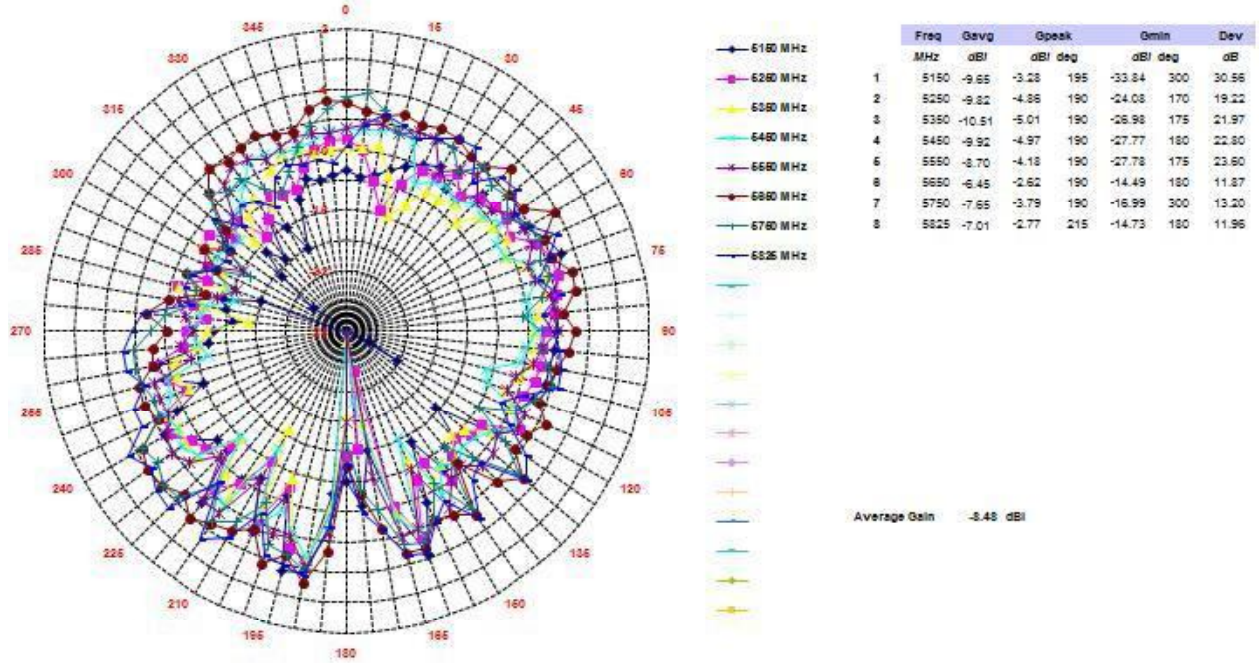
4.8 Radiation pattern of 5GHz 대역 [E1-Field (Phi)]



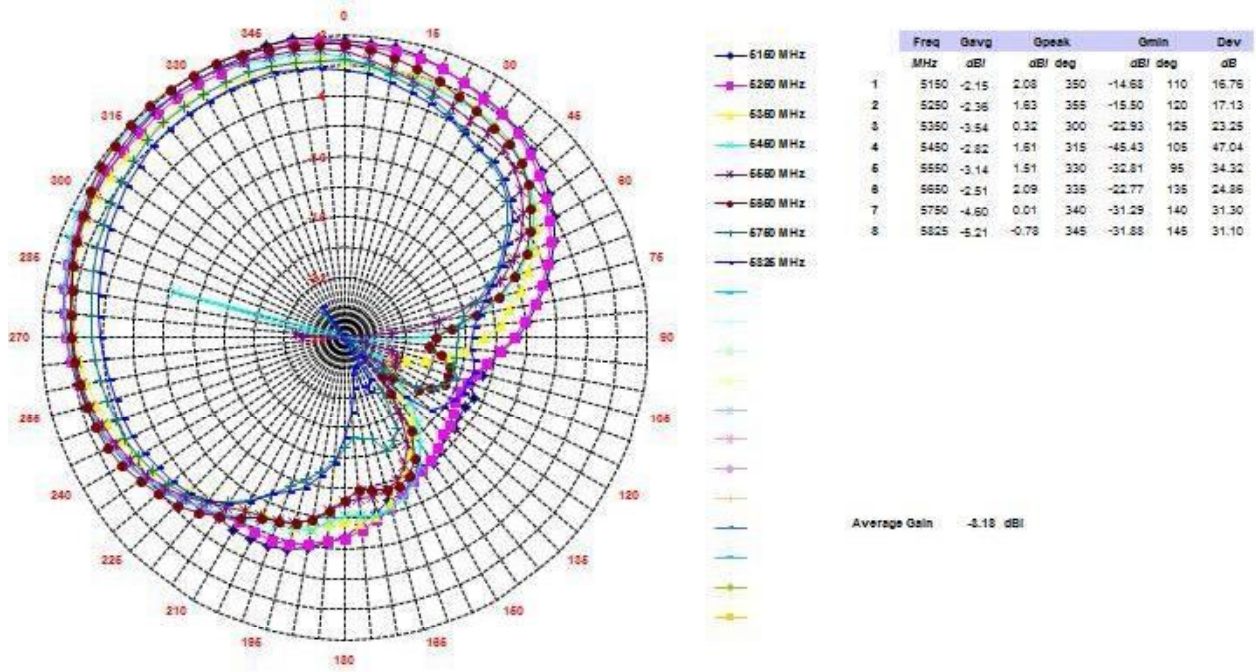
4.9 Radiation pattern of 5GHz 대역 [E2-Field (Theta)]



4.10 Radiation pattern of 5GHz 대역 [E2-Field (Phi)]



4.11 Radiation pattern of 5GHz 대역 [H-Field(Theta)]



4.12 Radiation pattern of 5GHz 대역 [H-Field(Phi)]

