



LTE / WCDMA /GSM Wireless Module Cellular modem_LW-9880G Product Manual

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Revision History

Revision	Date	Authors	Description
V1.0	11/30/23	Song Jin Young	Initial Version

Table of Contents

Table of Contents.....	3
1. Executive Summary	4
1.1. Device Introduction.....	4
2. Electrical Specifications	4
2.1. General Specifications	4
2.2. HW Specifications	4
2.3. Environmental Specifications.....	6
3. Mechanical Specifications.....	6
3.1. Mechanical Appearance	6
3.1.1. Mechanical Dimensions.....	7
4. Cellular modem_LW-9880G Interface	8
4.1 Application Note of Cellular modem_LW-9880G Interface	8
4.1.1 Power Supply.....	8
4.1.2 UART Signal	8
4.1.3 USB Interface	9
4.1.4 E-SIM Interface	9
5. Antenna Approved Source.....	10
5.1 Description.....	10
5.2 Electrical Properties.....	10
5.2.1 Specification	10
5.2.2 Impedance`	10
5.2.2.1 Nominal Impedance.....	10
5.2.2.2 Measuring Method	10
5.2.2.3 Directive ness	11
5.2.2.4 Gain(Free Space)	11
5.2.2.5 Radiation Pattern (XY-Plane)	12

1. Executive Summary

1.1. Device Introduction

Cellular modem_LW-9880G is a telecommunication (PLS63-W) modem module that supports LTE / WCDMA / GSM with up to 10.2Mbps download, and 5.2Mbps upload.

2. Electrical Specifications

2.1. General Specifications

Main chipset	Cinterion®
Memory	-
Interface Type	High-speed USB 2.0
	UART serial interface
Common Air interface	FDD-LTE / TDD-LTE / WCDMA / GSM
Frequency band (LTE & WCDMA & GSM)	B2, 4, 5, 12, 13, 26, 66 / II, IV, V / 850, 1900
DC input operating voltage	Typical Input 5V, DC Converter output 3.8V
Maximum current @ +5VDC, Maximum TX Power (23dBm)	Under 1 A
Dimensions	33.0 x 29.0 x 2.5mm
Operating temperature(board temperature)	Normal operation: -30°C to +75°C Extended operation: -40°C to +85°C

Table 2-1 General Specifications

2.2. HW Specifications

ITEM		SPECIFICATION	
LTE	Standard	3GPP Release 9	
	UE Category	LTE Cat 1	
	LTE Support	LTE : 2, 4, 5, 12, 13, 26, 66 - FDD	

	Duplex Mode	HD-FDD / TDD	
	RF Paths	2 x Rx / 1 x Tx	
	Reference Sensitivity	3GPP Spec all meet	
	Maximum Tx Power	22.5dBm +3.2 / -2.2dBm	@Antenna Port
	Transmit Data Rate	Downlink : 10.2Mbps, Uplink : 5.2Mbps	

ITEM		SPECIFICATION	
WCDMA	Standard	3GPP Release 7	
	UE Category	WCDMA	
	WCDMA Support	Band 2, 4, 5	
	Duplex Mode	HD-FDD	
	RF Paths	2 x Rx / 1 x Tx	
	Reference Sensitivity	3GPP Spec all meet	
	Maximum Tx Power	24dBm +1.7/-3.7dBm	@Antenna Port
	UMTS Transmit Data Rate	PS data rate – 384 kbps DL / 384 kbps UL CS data rate – 64 kbps DL / 64 kbps UL	
	HSDPA Transmit Data Rate	DL 7.2Mbps, UL 5.7Mbps	

ITEM		SPECIFICATION	
GSM	Standard	GSM / GPRS / EDGE	
	GSM Support	850, 1900	
	Duplex Mode	Time Domain	
	RF Paths	1 x Rx / 1 x Tx	
	Max power	850 : +33dBm ±2 dBm 1900 : +30dBm ±2 dBm	@Antenna Port

Table 2-2 HW Specifications

2.3. Environmental Specifications

Parameter	Conditions	Min	Max	Unit
Operating Temperature		-30	+75	°C
Storage Temperature		-40	+85	°C
Automatic shutdown2 Temperature measured on PLS63 Board	Non-condensing	<-40	>+95	°C

Table 2-3 Temperature & Humidity Specifications

3. Mechanical Specifications

Dimensions	140.0 mm(W) x 45.0 mm(H) x 13.8mm(T)
Weight	122.0g
Mounting Hole	2 holes (Φ4.5)

Table 3-1 Mechanical Specifications

3.1. Mechanical Appearance



Figure 3-1 Cellular modem_LW-9880G Top

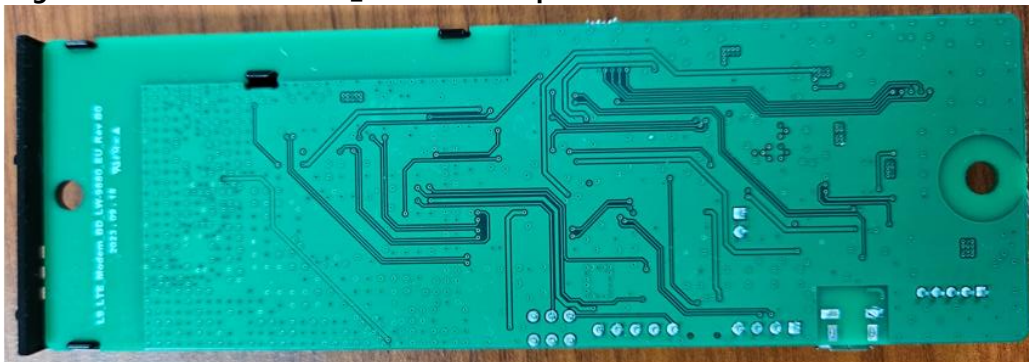


Figure 3-2 Cellular modem_LW-9880G Bottom

3.1.1. Mechanical Dimensions

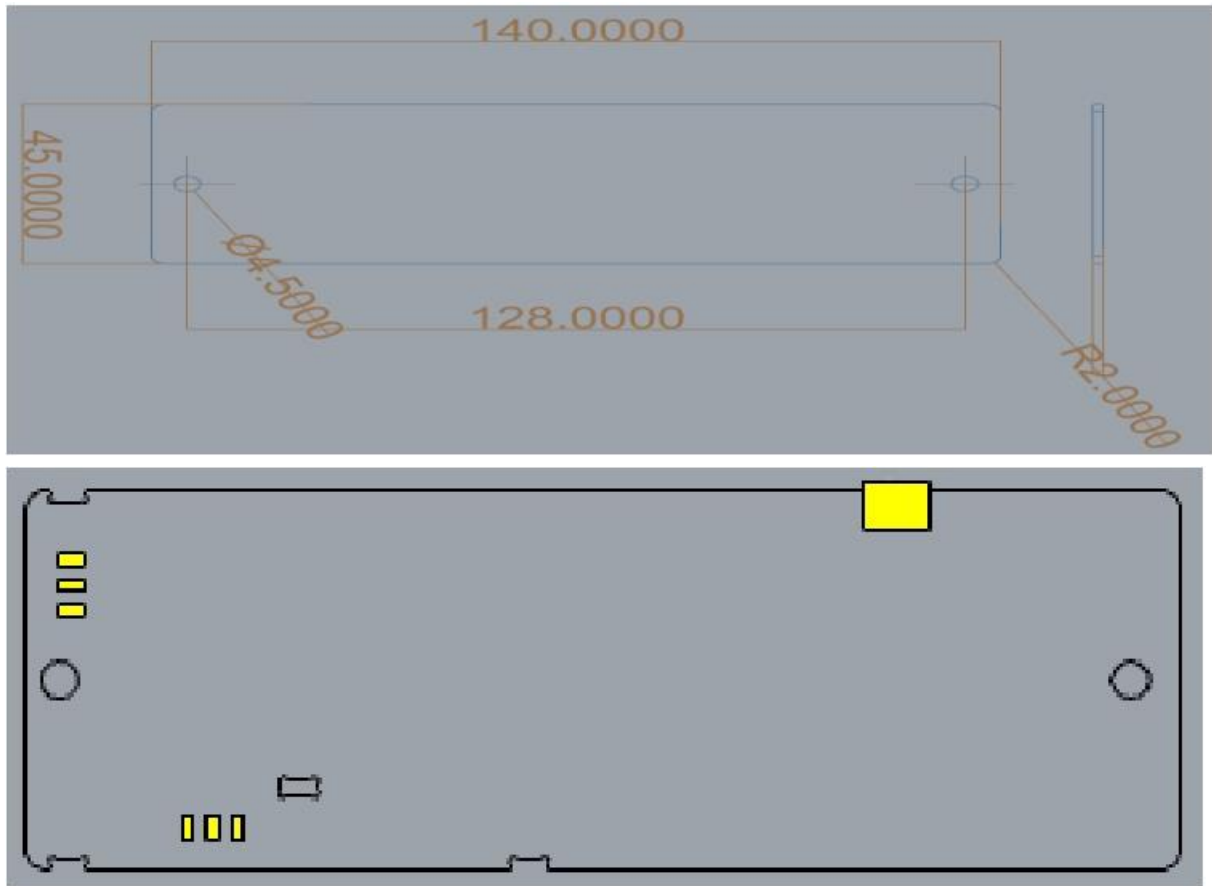


Figure 3-3 Cellular modem_LW-9880G Exterior Dimensions

4. Cellular modem_LW-9880G Interface

4.1 Application Note of Cellular modem_LW-9880G Interface

4.1.1 Power Supply

The input power of Cellular modem_LW-9880G is Typical DC+5.0V. (+5% / -5%)

4.1.2 UART Signal

Data communication between HOST and Cellular modem_LW-9880G is through TTL Level (3.3V). The signals and specifications are as stated below.

Pin Function	Pin No.	Description	Direction
N.C	1	-	
TX_DATA	2	Transmit Data	H-to-M
RX_DATA	3	Receive Data	M-to-H
GND	4	GND	

* M : Module H : HOST * **Signal name is based on module**

Table 4-1 UART Interface description

4.1.3 USB Interface

Cellular modem_LW-9880G supports USB 2.0 High speed via 5 Pin Connector.

Signal Name	Pin No.	Description
USB_VBUS	1	USB_VBUS
USB_DM	2	USB Data -
USB_DP	3	USB Data +
USB_ID	4	-
GND	5	GND

Table 4-2 USB Interface description

4.1.4 E-SIM Interface

Cellular modem_LW-9880G supports E-SIM interface via 8 Pin.

Pin Function	Pin No.	Description
E-SIM _GND	1	E-SIM GND
E-SIM _N.C	2	-
E-SIM _DATA	3	E-SIM DATA
E-SIM _N.C	4	-
E-SIM _N.C	5	-
E-SIM _CLK	6	E-SIM Clock
E-SIM _RST	7	E-SIM RESET
E-SIM _VDD	8	E-SIM VDD

Table 4-3 E-SIM Interface Description

5. Antenna Approved Source

5.1 Description

This is the product specification of Internal Antenna applied to Set

5.2 Electrical Properties

5.2.1 Specification

Item		Specifications
Antenna	Center Frequency	699~960, 1710~2700 $\pm$ 1MHz
	Band Width	261, 9900 MHz
	Polarization	Linear (Omni)
	Dimension	45.26 * 70.13 * 13.5 mm
	Working Temperature	-40~ + 75°C
	Storage Temperature	-20~ + 40°C

5.2.2 Impedance`

5.2.2.1 Nominal Impedance

- R = 50 Ω

5.2.2.2 Measuring Method

By using Network analyzer , connect the antenna-installed handset to the reflection Point of Analyzer and measure the impedance value within the designated frequency band.

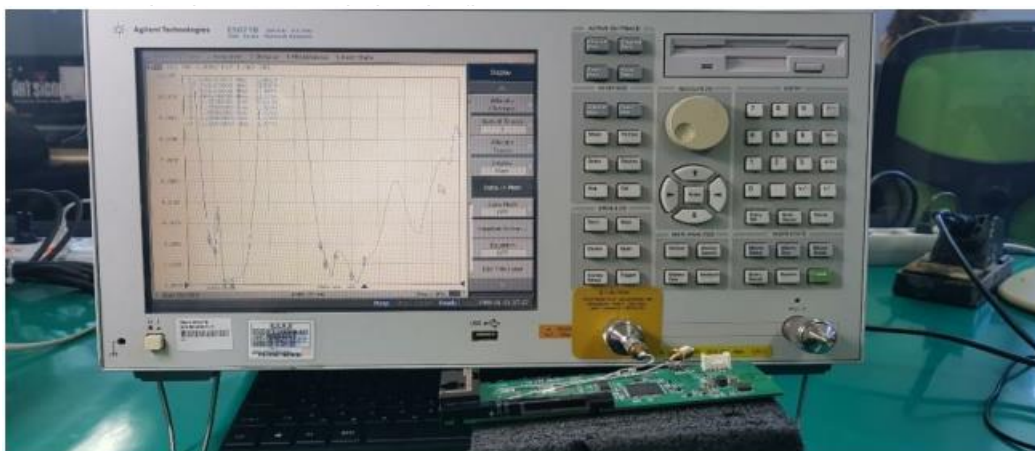


Figure 5.2.1 Test by network analyzer

5.2.2.3 Directive ness Omni-directional

5.2.2.4 Gain(Free Space)

Service Mode(dBi)	Primary LTE Antenna									
Freq.(MHz)	699	748	803	824	894	960	1710	1785	1805	1880
PEAK	3.08	1.88	1.08	1.11	1.37	1.18	1.57	2.25	2.43	1.97
AVG	0.29	-0.81	-1.57	-1.63	-1.36	-1.70	-2.71	-2.18	-1.94	-2.45
SPEC	0.79	-1.31	-2.07	-2.13	-1.86	-2.20	-3.21	-2.68	-2.44	-2.95
Service Mode(dBi)	Primary LTE Antenna									
Freq.(MHz)	1910	1980	2110	2170	2300	2350	2400	2500	2600	2700
PEAK	1.86	2.31	1.10	2.15	1.63	2.29	3.03	3.30	2.85	0.94
AVG	-2.77	-2.10	-3.68	-2.91	-3.65	-2.96	-2.55	-2.70	-2.57	-3.30
SPEC	-3.27	-2.60	-4.18	-3.41	-4.15	-3.46	-3.05	-3.20	-3.07	-3.80

Service Mode(dBi)	Diversity LTE Antenna									
Freq.(MHz)	699	748	803	824	894	960	1710	1785	1805	1880
PEAK	-3.90	-0.98	-0.35	-0.98	-3.21	-3.98	-7.67	-6.39	-5.90	-4.43
AVG	-7.13	-4.47	-4.05	-4.63	-6.33	-7.09	-11.61	-9.96	-9.29	-7.26
SPEC	-7.63	-4.97	-4.55	-5.13	-6.83	-7.59	-12.11	-10.46	-9.79	-7.76
Service Mode(dBi)	Diversity LTE Antenna									
Freq.(MHz)	1910	1980	2110	2170	2300	2350	2400	2500	2600	2700
PEAK	-4.33	-2.31	-1.64	-1.06	-1.33	0.01	1.54	3.08	3.78	1.96
AVG	-7.02	-5.05	-4.43	-3.76	-4.39	-3.03	-2.16	-1.88	-2.02	-3.40
SPEC	-7.52	-5.55	-4.93	-4.26	-4.89	-3.53	-2.66	-2.38	-2.52	-3.90

5.2.2.5 Radiation Pattern (XY-Plane)

Primary	1	2	3	4	5	6	7	8	9	10
Frequency [MHz]	699	748	803	824	894	960	1710	1785	1805	1880
Efficiency [dB]	0.29	-0.81	-1.57	-1.63	-1.36	-1.70	-2.71	-2.18	-1.94	-2.45
Efficiency [%]	107.0	83.0	69.6	68.7	73.1	67.6	53.6	60.5	64.0	56.9
TRG _θ [dB]	0.14	-0.98	-1.74	-1.78	-1.55	-1.95	-6.27	-5.53	-5.34	-5.58
Gain _{θ Peak} [dB]	3.04	1.84	1.01	1.04	1.32	0.98	-0.52	-0.14	-0.03	-0.26
Gain _{θ Min} [dB]	-8.50	-11.96	-12.32	-12.39	-13.66	-12.67	-24.54	-19.36	-18.53	-18.02
TRG _φ [dB]	-14.38	-14.99	-15.64	-16.45	-15.17	-14.30	-5.23	-4.88	-4.59	-5.34
Gain _{φ Peak} [dB]	-8.53	-9.04	-9.64	-10.27	-8.11	-7.15	-0.81	0.09	0.36	-0.49
Gain _{φ Min} [dB]	-28.74	-30.97	-39.77	-43.43	-42.85	-37.59	-24.94	-24.82	-25.71	-20.10
UHRG [dB]	-2.97	-4.53	-5.51	-5.55	-5.47	-6.00	-7.44	-7.17	-6.89	-7.52
UHRG/TRG [%]	47.2	42.4	40.4	40.6	38.8	37.1	33.7	31.7	32.0	31.1
H-Plane	2.61	1.51	0.67	0.61	0.47	-0.32	-10.73	-9.67	-9.67	-10.23
E1-Plane, AVG [dB]	-1.44	-2.56	-3.27	-3.30	-2.99	-3.33	-6.09	-5.47	-5.30	-5.80
E2-Plane, AVG [dB]	-1.12	-2.24	-3.04	-3.05	-2.82	-3.21	-6.60	-5.76	-5.54	-5.67
Peak Gain [dB]	3.08	1.88	1.08	1.11	1.37	1.18	1.57	2.25	2.43	1.97
Directivity [dB]	2.79	2.69	2.65	2.74	2.73	2.88	4.28	4.44	4.37	4.42
Minimum Gain [dB]	-8.37	-11.54	-11.41	-11.25	-10.82	-10.12	-8.06	-8.38	-8.07	-8.89

Primary	11	12	13	14	15	16	17	18	19	20
Frequency [MHz]	1910	1980	2110	2170	2300	2350	2400	2500	2600	2700
Efficiency [dB]	-2.77	-2.10	-3.68	-2.91	-3.65	-2.96	-2.55	-2.70	-2.57	-3.30
Efficiency [%]	52.9	61.7	42.8	51.2	43.1	50.6	55.7	53.7	55.3	46.7
TRG _θ [dB]	-5.94	-5.15	-6.61	-6.05	-6.58	-5.92	-5.30	-5.56	-5.15	-5.14
Gain _{θ Peak} [dB]	-0.53	0.35	-0.54	0.12	-0.41	-0.04	0.78	0.93	1.48	-0.17
Gain _{θ Min} [dB]	-17.16	-13.33	-24.01	-24.39	-22.41	-22.59	-26.55	-31.04	-28.00	-24.63
TRG _φ [dB]	-5.63	-5.06	-6.77	-5.79	-6.75	-6.03	-5.82	-5.87	-6.07	-7.92
Gain _{φ Peak} [dB]	-0.49	-0.07	-1.57	-0.56	-1.67	-0.92	-0.52	-0.36	-0.66	-2.24
Gain _{φ Min} [dB]	-18.63	-21.04	-29.58	-29.66	-23.74	-29.18	-40.21	-30.12	-27.32	-31.33
UHRG [dB]	-8.02	-7.07	-8.62	-7.87	-8.65	-8.08	-7.88	-8.41	-7.73	-7.52
UHRG/TRG [%]	29.8	31.8	32.1	31.9	31.6	30.8	29.3	26.9	30.5	37.9
H-Plane	-10.88	-9.33	-10.56	-9.58	-8.39	-7.25	-6.20	-5.94	-5.22	-4.68
E1-Plane, AVG [dB]	-6.08	-5.41	-6.79	-6.15	-6.84	-6.21	-5.50	-5.37	-4.74	-5.29
E2-Plane, AVG [dB]	-6.11	-5.45	-6.78	-6.19	-6.42	-5.73	-5.22	-6.05	-5.82	-5.42
Peak Gain [dB]	1.86	2.31	1.10	2.15	1.63	2.29	3.03	3.30	2.85	0.94
Directivity [dB]	4.63	4.41	4.79	5.05	5.28	5.25	5.57	6.00	5.43	4.25
Minimum Gain [dB]	-10.32	-10.15	-12.61	-12.30	-12.74	-11.36	-12.92	-13.66	-8.76	-10.13

Primary ANT (Tx, Rx)

Diversity	1	2	3	4	5	6	7	8	9	10
Frequency [MHz]	699	748	803	824	894	960	1710	1785	1805	1880
Efficiency [dB]	-7.13	-4.47	-4.05	-4.63	-6.33	-7.09	-11.61	-9.96	-9.29	-7.26
Efficiency [%]	19.4	35.7	39.4	34.5	23.3	19.5	6.9	10.1	11.8	18.8
TRG _θ [dB]	-7.69	-5.00	-4.63	-5.21	-7.01	-7.72	-13.45	-12.33	-11.87	-10.24
Gain _{θ Peak} [dB]	-3.92	-1.01	-0.44	-1.07	-3.50	-4.25	-7.77	-6.48	-6.00	-4.70
Gain _{θ Min} [dB]	-27.69	-26.52	-25.58	-24.28	-26.74	-29.23	-29.64	-26.45	-25.61	-22.00
TRG _φ [dB]	-16.32	-13.86	-13.04	-13.60	-14.69	-15.77	-16.23	-13.72	-12.78	-10.29
Gain _{φ Peak} [dB]	-10.67	-8.17	-8.33	-9.20	-9.78	-10.67	-11.62	-9.80	-8.72	-6.31
Gain _{φ Min} [dB]	-33.94	-37.63	-36.36	-34.40	-36.64	-38.31	-37.45	-31.77	-33.03	-32.56
UHRG [dB]	-9.77	-7.07	-6.73	-7.33	-9.22	-10.20	-14.39	-12.62	-11.94	-9.99
UHRG/TRG [%]	54.4	55.0	53.9	53.7	51.4	48.9	52.7	54.2	54.3	53.2
H-Plane	-5.47	-2.82	-2.60	-3.19	-5.37	-6.38	-12.17	-10.98	-10.51	-8.95
E1-Plane, AVG [dB]	-9.82	-7.12	-6.61	-7.11	-8.68	-9.32	-16.66	-15.47	-14.85	-12.81
E2-Plane, AVG [dB]	-8.33	-5.63	-5.27	-5.92	-7.85	-8.64	-12.68	-11.55	-11.08	-9.41
Peak Gain [dB]	-3.90	-0.98	-0.35	-0.98	-3.21	-3.98	-7.67	-6.39	-5.90	-4.43
Directivity [dB]	3.23	3.49	3.70	3.65	3.12	3.11	3.94	3.57	3.39	2.83
Minimum Gain [dB]	-19.99	-17.84	-17.66	-18.07	-22.65	-23.57	-22.60	-17.07	-15.46	-12.26

Diversity	11	12	13	14	15	16	17	18	19	20
Frequency [MHz]	1910	1980	2110	2170	2300	2350	2400	2500	2600	2700
Efficiency [dB]	-7.02	-5.05	-4.43	-3.76	-4.39	-3.03	-2.16	-1.88	-2.02	-3.40
Efficiency [%]	19.9	31.2	36.0	42.1	36.4	49.8	60.8	64.9	62.7	45.8
TRG _θ [dB]	-10.19	-8.67	-8.60	-8.28	-8.70	-7.28	-5.91	-5.26	-4.94	-6.63
Gain _{θ Peak} [dB]	-5.12	-3.28	-2.57	-2.29	-2.74	-1.20	0.01	0.58	1.43	-0.07
Gain _{θ Min} [dB]	-23.71	-41.12	-20.76	-23.64	-23.55	-24.73	-22.16	-21.14	-26.35	-23.04
TRG _φ [dB]	-9.88	-7.53	-6.53	-5.65	-6.40	-5.07	-4.54	-4.55	-5.13	-6.20
Gain _{φ Peak} [dB]	-5.94	-3.33	-2.58	-1.57	-1.93	-0.62	-0.17	1.16	2.60	0.76
Gain _{φ Min} [dB]	-31.76	-22.70	-30.32	-28.24	-21.51	-17.63	-17.23	-18.94	-29.51	-28.27
UHRG [dB]	-9.76	-7.67	-6.93	-6.26	-6.99	-5.67	-4.98	-5.50	-7.93	-10.23
UHRG/TRG [%]	53.2	54.7	56.3	56.2	55.0	54.4	52.3	43.4	25.7	20.7
H-Plane	-8.95	-7.66	-8.08	-7.78	-8.99	-7.95	-7.21	-7.95	-8.58	-11.19
E1-Plane, AVG [dB]	-12.54	-10.30	-10.18	-9.91	-10.43	-9.16	-8.03	-8.05	-8.35	-10.12
E2-Plane, AVG [dB]	-9.40	-7.97	-7.71	-7.42	-7.57	-6.10	-4.62	-3.75	-3.38	-5.04
Peak Gain [dB]	-4.33	-2.31	-1.64	-1.06	-1.33	0.01	1.54	3.08	3.78	1.96
Directivity [dB]	2.69	2.75	2.79	2.69	3.05	3.04	3.70	4.96	5.80	5.35
Minimum Gain [dB]	-12.12	-10.96	-12.87	-12.30	-12.09	-11.84	-11.07	-7.37	-22.52	-11.67

Diversity ANT (Rx Only)

Compliance with FCC Rules and Regulations

FCC Identifier: BEJ-LW9880G

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

- (1) This device may not cause harmful interference and
- (2) This device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules.

These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Any changes or modifications in construction of this device which are not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Regulatory notice to host manufacturer according to KDB 996369 D03 OEM Manual

List of applicable FCC rules

- FCC Part 22, 24, 27, 90 of the FCC rules.

Summarize the specific operational use conditions

- The OEM integrator should use equivalent antennas which is the same type and equal or less gain than an antenna listed below this instruction manual.

Limited module procedures

- The module is a single module.

Trace antenna designs

- The module with trace antenna designs, and the Antenna Specification document includes the layout of trace design and measurement data.

RF exposure considerations

- This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.
- This equipment should be installed and operated with a minimum distance of 20 cm (7.8 inches) between the antenna and your body. Users must follow the specific operating instructions for satisfying RF exposure compliance.

Mobile use

- As long as the conditions above are met, further transmitter testing will not be required.
- OEM integrators should provide the minimum separation distance to end users in their end-product manuals.

Antennas:

- This module is certified with the following integrated antenna.
 - Max. Antenna gain: 3.08 dBi / Ant. Type: Carrier press Type
- Any new antenna type, higher gain than listed antenna should be met the requirements of FCC rule 15.203 and 2.1043 as permissive change procedure.

Label and compliance information

- The module is labeled with its own FCC ID. If the FCC ID is not visible when the module is installed inside another device, then the outside of the device into which the module is installed must also display a label referring to the enclosed module. In that case, the final end product must be labeled in a visible area with the following:

"Contains FCC ID: BEJ-LW9880G"

Information on test modes and additional testing requirements

- OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed (for example, digital device emissions, PC peripheral requirements, additional transmitter in the host, etc.).

Additional testing, Part 15 Subpart B disclaimer

- The final host product also requires Part 15 subpart B compliance testing with the modular transmitter installed to be properly authorized for operation as a Part 15 digital device.