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Modules

EM7590

Hardware Integration Guide

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Sierra Wireless

Semtech Corporation purchased Sierra Wireless in January 2023. The Sierra Wireless brand is gradually being phased out. During the phase-out period, references to both “Semtech” and “Sierra Wireless” may appear in product documentation.

Contact Information

Sales information and technical support, including warranty and returns	Web: sierrawireless.com/company/contact-us/ Global toll-free number: 1-877-687-7795 6:00 am to 5:00 pm PST
Corporate and product information	Web: sierrawireless.com

Revision History

Revision number	Release date	Changes
1	Jul 2022	Creation
2	Apr 2024	Update for ISED RSS-192 Issue 5
3	Jan 2025	Add LTE B106

1: Introduction

The Semtech EM7590 is a compact, lightweight, wireless modem that provides LTE, UMTS, and GNSS connectivity for M2M applications, notebook, ultrabook and tablet computers over several radio frequency bands.

1.1 Accessories

A hardware development kit is available for MC-series modules. The kit contains hardware components for evaluating and developing with the module, including:

- Development board
- Cables
- Antennas (Additional antennas may be required to support all bands.)

  Note: For over-the-air LTE testing, ensure that suitable antennas are used.

- Other accessories

1.2 Required Connectors

Table 1-1 describes the connectors used to integrate the EM7590 PCI Express Mini Card into your host device.

Table 1-1: Required Host-Module Connectors[a]

Connector type	Description
RF cables	▪ Mate with M.2-spec connectors ▪ Three connector jacks (I-PEX 20448-001R-081 or equivalent)
EDGE (52-pin)	▪ Slot B compatible — Per the M.2 standard (*PCI Express NGFF (M.2) Specification Revision 1.0*), a generic M.2 Slot B-compatible edge connector on the motherboard uses a mechanical key to mate with the 67-pin notched module connector. ▪ Manufacturers include LOTES (part #APCI0018-P001A01), Kyocera, JAE, Tyco, and Longwell.
SIM	▪ Industry-standard connector. Type depends on how host device exposes the SIM socket

a. Manufacturers/part numbers are for reference only and are subject to change. Choose connectors that are appropriate for your own design.

2: Power

2.1 Power Supply

The host provides power to the EM7590 module through multiple power and ground pins. The host must provide safe and continuous power at all times; the module does not have an independent power supply, or protection circuits to guard against electrical issues.

For detailed pinout and voltage/current requirements of this module, refer to *EM759X Product Technical Specification (Doc# 41114425)*.

2.2 Module Power States

The module has four basic power states, as described in Table 2-1.

Table 2-1: Module Power States

State	Details	Host is powered	Module is powered	USB interface active	Radio enabled
Normal (Default state)	▪ Module is active ▪ Default state. Occurs when VCC is first applied in the absence of W_DISABLE_N control ▪ Module is capable of placing/receiving calls, or establishing data connections on the wireless network ▪ Current consumption is affected by several factors, including: · Radio band being used · Transmit power · Receive gain settings · Data rate · Number of active Tx time slots	Y	Y	Y	Y
Low power (Airplane mode)	▪ Module is active ▪ Module enters this state: · Under host interface control: · Host issues AT+CFUN=0, or · Host issues AT!PCOFFEN=0 (configures the modem to enter low power mode when W_DISABLE_N is asserted), and then asserts W_DISABLE_N · Automatically, when critical temperature or voltage trigger limits have been reached.	Y	Y	Y	Y
Sleep	▪ Normal state of module between calls or data connections ▪ Module cycles between wake (polling the network) and sleep, at network provider-determined interval.	Y	Y	Y[a]	Y
Disconnected	▪ Host power source is disconnected from the module and all voltages associated with the module are at 0 V.	Y	Y	Y[b]	Y

a. USB interface is suspended.
b. USB interface is disconnected.

3: RF Specifications

3.1 RF Bands

The EM7590 module, based on Qualcomm's SDX12 baseband processor, support data operation on LTE and UMTS networks over the bands described in Table 3-1, with LTE carrier aggregation (CA) as described in Table 3-2, Table 3-3 and Table 3-4.

Table 3-1: Supported RF Bands

RAT	Bands																														
	1	2	3	4	5	6	7	8	9	12	13	14	18	19	20	25	26	28	29	32	38	39	40	41	42	43	48	66	71	106
LTE[a]	F	F	F	F	F	—	F	F	—	F	F	F	F	F	F	F	F	F	F[b]	F[b]	T	T	T	T	T	T	T	F	F	F
UMTS[c]	Y	Y	—	Y	Y	Y	—	Y	Y	—	—	—	—	Y	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
GNSS	▪ GPS: 1575.42 MHz ▪ GLONASS: 1602 MHz ▪ BeiDou: 1561.098 MHz ▪ Galileo: 1575.42 MHz ▪ QZSS: 1575.42 MHz																													

a. (LTE) Downlink MIMO support (2x2; 4x2) F=FDD; T=TDD
Data rates: Downlink (Cat 13 with 2CA, 256QAM=400 Mbps), Uplink (Cat 13 with 2CA contiguous, 64QAM=150 Mbps)
b. Downlink only
c. UMTS (DC-HSPA+, HSPA+, HSPA, UMTS) Diversity support
Data rates: Downlink (Cat 24, up to 42 Mbps), Uplink (Cat 6, up to 5.76 Mbps)

Table 3-2: Carrier Aggregation (2CC) Downlink Combinations

1 Band / 2 CC		2 Bands / 2CC			
CA_1A-1A	CA_42C	CA_1A-3A	CA_2A-66A	CA_5A-25A	CA_14A-66A
CA_1C	CA_43C	CA_1A-5A	CA_2A-71A	CA_5A-38A	CA_19A-1A
CA_2A-2A	CA_48C	CA_1A-7A	CA_3A-5A	CA_5A-40A	CA_19A-3A
CA_2C	CA_66A-66A	CA_1A-8A	CA_3A-7A	CA_5A-41A	CA_19A-42A
CA_3A-3A	CA_66B	CA_1A-18A	CA_3A-8A	CA_5A-48A	CA_20A-32A
CA_3C	CA_66C	CA_1A-19A	CA_3A-19A	CA_5A-66A	CA_20A-38A
CA_4A-4A	—	CA_1A-20A	CA_3A-20A	CA_7A-8A	CA_20A-40A
CA_5A-5A	—	CA_1A-26A	CA_3A-26A	CA_7A-12A	CA_20A-42A
CA_5B	—	CA_1A-28A	CA_3A-28A	CA_7A-20A	CA_25A-26A
CA_7A-7A	—	CA_1A-32A	CA_3A-38A	CA_7A-28A	CA_26A-41A
CA_7B	—	CA_1A-38A	CA_3A-40A	CA_7A-32A	CA_28A-38A

Table 3-2: Carrier Aggregation (2CC) Downlink Combinations (Continued)

1 Band / 2 CC		2 Bands / 2CC			
CA_7C	—	CA_1A-40A	CA_3A-41A	CA_7A-40A	CA_28A-40A
CA_8B	—	CA_1A-41A	CA_3A-42A	CA_7A-42A	CA_28A-41A
CA_12A-12A	—	CA_1A-42A	CA_4A-5A	CA_8A-32A	CA_28A-42A
CA_12B	—	CA_2A-4A	CA_4A-7A	CA_8A-38A	CA_29A-66A
CA_25A-25A	—	CA_2A-5A	CA_4A-12A	CA_8A-39A	CA_38A-40A
CA_38C	—	CA_2A-7A	CA_4A-13A	CA_8A-40A	CA_39A-41A
CA_39C	—	CA_2A-12A	CA_4A-28A	CA_8A-41A	CA_40A-42A
CA_40A-40A	—	CA_2A-13A	CA_4A-29A	CA_8A-42A	CA_41A-42A
CA_40C	—	CA_2A-14A	CA_4A-48A	CA_12A-25A	CA_48A-66A
CA_41A-41A	—	CA_2A-28A	CA_4A-71A	CA_12A-66A	CA_66A-71A
CA_41C	—	CA_2A-29A	CA_5A-7A	CA_13A-66A	—

Table 3-3: Carrier Aggregation (3CC) Downlink Combinations

1 Band / 3 CC	2 Bands / 3CC				3 Bands / 3CC	
CA_40D	CA_1A-1A-5A	CA_3A-3A-28A	CA_5A-40C	CA_38A-40C	CA_1A-3A-5A	CA_2A-7A-12A
CA_41D	CA_1A-1A-7A	CA_3A-3A-41A	CA_5A-48C	CA_39A-41C	CA_1A-3A-7A	CA_2A-12A-66A
CA_42D	CA_1A-1A-28A	CA_3A-7A-7A	CA_5A-66A-66A	CA_39C-41A	CA_1A-3A-8A	CA_2A-13A-48A
CA_48D	CA_1A-3C	CA_3A-7B	CA_5A-66B	CA_40A-40C	CA_1A-3A-19A	CA_2A-13A-66A
CA_66D	CA_1A-7A-7A	CA_3A-7C	CA_5A-66C	CA_40A-42C	CA_1A-3A-20A	CA_2A-14A-66A
—	CA_1A-7C	CA_3A-38C	CA_5B-66A	CA_40C-42A	CA_1A-3A-26A	CA_2A-66A-71A
—	CA_1A-40C	CA_3A-40A-40A	CA_7A-7A-8A	CA_41A-41C	CA_1A-3A-28A	CA_3A-5A-7A
—	CA_1A-41C	CA_3A-40C	CA_7A-40C	CA_41A-42C	CA_1A-3A-38A	CA_3A-5A-38A
—	CA_1A-42C	CA_3A-41C	CA_7B-28A	CA_41C-42A	CA_1A-3A-40A	CA_3A-5A-40A
—	CA_1C-3A	CA_3A-42C	CA_7C-8A	CA_48A-66A-66A	CA_1A-3A-41A	CA_3A-7A-8A
—	CA_1C-41A	CA_3C-5A	CA_7C-20A	CA_48A-66B	CA_1A-3A-42A	CA_3A-7A-20A
—	CA_2A-2A-5A	CA_3C-7A	CA_7C-28A	CA_48A-66C	CA_1A-5A-7A	CA_3A-7A-28A
—	CA_2A-2A-12A	CA_3C-8A	CA_8A-39C	CA_48C-66A	CA_1A-5A-38A	CA_3A-7A-40A
—	CA_2A-2A-13A	CA_3C-20A	CA_8A-40C	CA_66A-66A-71A	CA_1A-5A-40A	CA_3A-7A-42A
—	CA_2A-2A-14A	CA_3C-28A	CA_8A-41C	CA_66A-66B	CA_1A-7A-8A	CA_3A-8A-38A
—	CA_2A-2A-29A	CA_3C-32A	CA_8A-42C	CA_66A-66C	CA_1A-7A-20A	CA_3A-8A-40A
—	CA_2A-2A-71A	CA_3C-40A	CA_12A-66A-66A	CA_66C-71A	CA_1A-7A-28A	CA_3A-19A-42A

Table 3-3: Carrier Aggregation (3CC) Downlink Combinations (Continued)

1 Band / 3 CC	2 Bands / 3CC				3 Bands / 3CC	
—	CA_2A-5B	CA_3C-41A	CA_12A-66B	—	CA_1A-7A-32A	CA_3A-20A-38A
—	CA_2A-7A-7A	CA_4A-4A-5A	CA_12A-66C	—	CA_1A-7A-40A	CA_3A-20A-42A
—	CA_2A-7C	CA_4A-4A-7A	CA_13A-48C	—	CA_1A-7A-42A	CA_3A-28A-38A
—	CA_2A-12A-12A	CA_4A-4A-12A	CA_13A-66A-66A	—	CA_1A-8A-40A	CA_3A-28A-40A
—	CA_2A-12B	CA_4A-4A-13A	CA_13A-66B	—	CA_1A-19A-42A	CA_3A-28A-41A
—	CA_2A-48C	CA_4A-4A-71A	CA_13A-66C	—	CA_1A-20A-32A	CA_3A-28A-42A
—	CA_2A-66B	CA_4A-5B	CA_14A-66A-66A	—	CA_1A-20A-42A	CA_3A-41A-42A
—	CA_2A-66C	CA_4A-7A-7A	CA_19A-42C	—	CA_1A-26A-41A	CA_4A-7A-12A
—	CA_2C-5A	CA_4A-7C	CA_20A-38C	—	CA_1A-28A-42A	CA_5A-48A-66A
—	CA_2C-12A	CA_4A-12A-12A	CA_20A-40C	—	CA_1A-41A-42A	CA_7A-8A-40A
—	CA_2C-29A	CA_4A-12B	CA_25A-25A-26A	—	CA_2A-4A-5A	CA_7A-20A-32A
—	CA_2C-66A	CA_4A-48C	CA_26A-41A-41A	—	CA_2A-4A-12A	CA_7A-20A-42A
—	CA_3A-3A-5A	CA_5A-5A-66A	CA_26A-41C	—	CA_2A-4A-13A	CA_13A-48A-66A
—	CA_3A-3A-7A	CA_5A-7A-7A	CA_28A-40C	—	CA_2A-4A-71A	CA_20A-38A-40A
—	CA_3A-3A-8A	CA_5A-7C	CA_28A-41C	—	CA_2A-5A-48A	CA_28A-41A-42A
—	CA_3A-3A-20A	CA_5A-40A-40A	CA_28A-42C	—	CA_2A-5A-66A	—

Table 3-4: Carrier Aggregation Uplink Combinations

CA_1C
CA_3C
CA_5B
CA_7C
CA_39C
CA_41C
CA_42C
CA_43C
CA_48C

3.2 RF Connections

When attaching antennas to the module:

- Use RF plug connectors that are compatible with I-PEX (20449-001E (MHF4)) RF receptacle connectors.
- Match coaxial connections between the module and the antenna to 50 Ω.
- Minimize RF cable losses to the antenna; the recommended maximum cable loss for antenna cabling is 0.5 dB.

- To ensure best thermal performance, use the mounting hole (if possible) to attach (ground) the device to a metal chassis.

Note: If the antenna connection is shorted or open, the modem will not sustain permanent damage.

3.2.1 Shielding

The module is fully shielded to protect against EMI. The shielding must not be removed.

3.3 Antennas and Cabling

When selecting the antenna and cable, it is critical to RF performance to match antenna gain and cable loss.

3.3.1 Choosing the Correct Antenna and Cabling

When matching antennas and cabling:
- The antenna (and associated circuitry) should have a nominal impedance of 50 Ω with a return loss of better than 10 dB across each frequency band of operation.
- The system gain value affects both radiated power and regulatory (FCC, IC, CE, etc.) test results.

3.3.2 Designing Custom Antennas

Consider the following points when designing custom antennas:
- A skilled RF engineer should do the development to ensure that the RF performance is maintained.

3.3.3 Determining the Antenna's Location

When deciding where to put the antennas:
- Antenna location may affect RF performance. Although the module is shielded to prevent interference in most host platforms, the antenna placement is still very important — if the host platform is insufficiently shielded, high levels of broadband or spurious noise can degrade the module's performance.
- Connecting cables between the module and the antenna must have 50 Ω impedance. If the impedance of the module is mismatched, RF performance is reduced significantly.
- Antenna cables should be routed, if possible, away from noise sources (switching power supplies, LCD assemblies, etc.). If the cables are near the noise sources, the noise may be coupled into the RF cable and into the antenna.

3.3.4 Disabling the Diversity Antenna

Certification testing of a device with an integrated EM7590 module may require the module's main and diversity antennas to be tested separately.

To facilitate this testing, receive diversity can be enabled/disabled using AT commands:
- !RXDEN — Used to enable/disable diversity for single-cell call (no carrier aggregation).
- !LTERXCONTROL — Used to enable/disable paths (in carrier aggregation scenarios) after a call is set up.

Important: *LTE networks expect modules to have more than one antenna enabled for proper operation. Therefore, customers must not commercially deploy their systems with the diversity antenna disabled.*

Note: A diversity antenna is used to improve connection quality and reliability through redundancy. Because two antennas may experience difference interference effects (signal distortion, delay, etc.), when one antenna receives a degraded signal, the other may not be similarly affected.

3.4 Ground Connection

When connecting the module to system ground:

- Prevent noise leakage by establishing a very good ground connection to the module through the host connector.
- Connect to system ground using the mounting hole at the top of the module.
- Minimize ground noise leakage into the RF.
  Depending on the host board design, noise could *potentially* be coupled to the module from the host board. This is mainly an issue for host designs that have signals traveling along the length of the module, or circuitry operating at both ends of the module interconnects.

3.5 Interference and Sensitivity

Interference sources can affect the module's RF performance (RF desense). Common sources include power supply noise and device-generated RF.

RF desense can be addressed through a combination of mitigation techniques (Methods to Mitigate Decreased Rx Performance on page 12) and radiated sensitivity measurement (Radiated Sensitivity Measurement on page 12).

3.5.1 Interference from Other Wireless Devices

Wireless devices operating inside the host device can cause interference that affects the module.

To determine the most suitable locations for antennas on your host device, evaluate each wireless device's radio system, considering the following:

- Any harmonics, sub-harmonics, or cross-products of signals generated by wireless devices that fall in the module's Rx range may cause spurious response, resulting in decreased Rx performance.
- The Tx power and corresponding broadband noise of other wireless devices may overload or increase the noise floor of the module's receiver, resulting in Rx desense.

The severity of this interference depends on the closeness of the other antennas to the module's antenna. To determine suitable locations for each wireless device's antenna, thoroughly evaluate your host device's design.

3.5.2 Host-generated RF Interference

All electronic computing devices generate RF interference that can negatively affect the receive sensitivity of the module.

Proximity of host electronics to the antenna in wireless devices can contribute to decreased Rx performance. Components that are most likely to cause this include:

- Microprocessor and memory
- Display panel and display drivers

- Switching-mode power supplies

3.5.3 Device-generated RF Interference

The module can cause interference with other devices. Wireless devices such as Semtech embedded modules transmit in bursts (pulse transients) for set durations (RF burst frequencies). Hearing aids and speakers convert these burst frequencies into audible frequencies, resulting in audible noise.

3.5.4 Methods to Mitigate Decreased Rx Performance

It is important to investigate sources of localized interference early in the design cycle. To reduce the effect of device-generated RF on Rx performance:

- Put the antenna as far as possible from interference sources. Note, however, that the module may be less convenient to use.
- Shield the host device. The module itself is well shielded to avoid external interference. However, the antenna cannot be shielded for obvious reasons. In most instances, it is necessary to employ shielding on host device components (such as the main processor and parallel bus) that have the highest RF emissions.
- Filter out unwanted high-order harmonic energy by using discrete filtering on low frequency lines.
- Form shielding layers around high-speed clock traces by using multi-layer PCBs.
- Route antenna cables away from noise sources.

3.5.5 Radiated Spurious Emissions (RSE)

When designing an antenna for use with Semtech embedded modules, the host device with a Semtech embedded module must satisfy any applicable standards/local regulatory bodies for radiated spurious emission (RSE) for receive-only mode and for transmit mode (transmitter is operating).

Note that antenna impedance affects radiated emissions, which must be compared against the conducted 50 Ω emissions baseline. (Semtech embedded modules meet the 50 Ω conducted emissions requirement.)

3.6 Radiated Sensitivity Measurement

A wireless host device contains many noise sources that contribute to a reduction in Rx performance.

To determine the extent of any receiver performance desensitization due to self-generated noise in the host device, over-the-air (OTA) or radiated testing is required. This testing can be performed by Semtech or you can use your own OTA test chamber for in-house testing.

4: Regulatory Compliance and Industry Certifications

This chapter describes the current certification status of the EM7590. Certifications in other countries may be attained upon customer request—contact your Semtech account representative for details.

Additional testing and certification may be required for the host product with an embedded EM7590 module and are the responsibility of the OEM. Sierra Wireless offers professional services-based assistance to OEMs with the testing and certification process, if required.

4.1 Regulatory Compliance

The EM7590 module meets the requirements of the following regulatory bodies and regulations, where applicable:

- Federal Communications Commission (FCC) of the United States
- Innovation, Science and Economic Development Canada (ISED)
- The National Communications Commission (NCC) of Taiwan, Republic of China
- Japan Ministry of Internal Affairs and Communications (MIC)
- Radio Equipment Directive (RED) of the European Union

4.2 Important Compliance Information for Canada

The EM7590 module has been granted modular approval for mobile applications under:

- IC: 2417C-EM75T

Integrators may use the EM7590 module in their host products without additional ISED certification if they meet the following conditions. Otherwise, additional ISED approvals must be obtained.

1. At least 20 cm separation distance between the antenna and the user's body must be maintained at all times.
2. To comply with ISED regulations limiting both maximum RF output power and human exposure to RF radiation, the maximum antenna gain including cable loss in a mobile-only exposure condition must not exceed the limits stipulated in Table 4-1 on page 13.
3. The EM7590 module may transmit simultaneously with other collocated radio transmitters within a host product, provided the following conditions are met:
   - Each collocated radio transmitter has been certified by ISED for mobile application.
   - At least 20 cm separation distance between the antennas of the collocated transmitters and the user's body must be maintained at all times.
   - The radiated power of a collocated transmitter must not exceed the EIRP limit stipulated in Table 4-1.

Table 4-1: ISED Antenna Gain and Collocated Radio Transmitter Specifications

	Operating mode	Tx Freq Range (MHz)		Antenna Gain Limit (dBi)	
				Standalone	Collocated
EM7590	WCDMA Band 2, LTE B2	1850	1910	9.00	7.30
	WCDMA Band 4, LTE B4	1710	1755	6.00	6.00

Table 4-1: ISED Antenna Gain and Collocated Radio Transmitter Specifications (Continued)

	Operating mode	Tx Freq Range (MHz)		Antenna Gain Limit (dBi)	
				Standalone	Collocated
	WCDMA Band 5, LTE B5	824	849	7.00	4.90
	LTE B7	2500	2570	9.00	8.20
	LTE B12	699	716	6.60	4.50
	LTE B13	777	787	6.90	4.80
	LTE B14	788	798	6.90	4.80
	LTE B25	1850	1915	9.00	7.30
	LTE B26	814	849	7.00	4.90
	LTE B41	2496	2690	9.00	8.20
	LTE B42	3450	3600	0.00	0.00
	LTE B43	3600	3800	0.00	0.00
	LTE B48	3550	3700	0.00	0.00
	LTE B66	1710	1780	6.00	6.00
	LTE B71	663	698	6.40	4.30
Collocated transmitters				Maximum EIRP (dBm)	
	WLAN 2.4 GHz	2400	2500	30	
	WLAN 5 GHz	5150	5850	30	
	WLAN 6 GHz	5955	7115	30	
	Bluetooth	2400	2500	16	

4. A label must be affixed to the outside of the end product into which the EM7590 module is incorporated, with a statement similar to the following:
   - **This device contains IC: 2417C-EM75T.**
5. A user manual with the end product must clearly indicate the operating requirements and conditions that must be observed to ensure compliance with current ISED RF exposure guidelines.

Note: Host product manufacturers are responsible for the overall compliance of the host products including, where applicable, all additional equipment authorization and testing not covered by the modular approval (e.g., ISED's Interference-Causing Equipment Standards, and RF exposure requirements for host products intended for use within 20 cm of the user's body.)

4.3 Important Compliance Information for the United States

The EM7590 module has been granted modular approval for mobile applications under:

- FCC ID: N7NEM75T

Integrators may use the EM7590 module in their host products without additional FCC certification if they meet the following conditions. Otherwise, additional FCC approvals must be obtained.

1. At least 20 cm separation distance between the antenna and the user's body must be maintained at all times.
2. To comply with FCC regulations limiting both maximum RF output power and human exposure to RF radiation, the maximum antenna gain including cable loss in a mobile-only exposure condition must not exceed the limits stipulated in Table 4-2 on page 15.
3. The EM7590 module may transmit simultaneously with other collocated radio transmitters within a host product, provided the following conditions are met:
   - Each collocated radio transmitter has been certified by FCC for mobile application.
   - At least 20 cm separation distance between the antennas of the collocated transmitters and the user's body must be maintained at all times.
   - The radiated power of a collocated transmitter must not exceed the EIRP limit stipulated in Table 4-2.

Table 4-2: FCC Antenna Gain and Collocated Radio Transmitter Specifications

	Operating mode	Tx Freq Range (MHz)		Antenna Gain Limit (dBi)	
				Standalone	Collocated
EM7590	WCDMA Band 2, LTE B2	1850	1910	9.00	7.30
	WCDMA Band 4, LTE B4	1710	1755	6.00	6.00
	WCDMA Band 5, LTE B5	824	849	7.00	4.90
	LTE B7	2500	2570	9.00	8.20
	LTE B12	699	716	6.60	4.50
	LTE B13	777	787	6.90	4.80
	LTE B14	788	798	6.90	4.80
	LTE B25	1850	1915	9.00	7.30
	LTE B26	814	849	7.00	4.90
	LTE B41	2496	2690	9.00	8.20
	LTE B48*	3550	3700	0.00	0.00
	LTE B66	1710	1780	6.00	6.00
	LTE B71	663	698	6.40	4.30
	LTE B106	897.5	900.5	10.70	9.70
Collocated transmitters				Maximum EIRP (dBm)	
	WLAN 2.4 GHz	2400	2500	30	
	WLAN 5 GHz	5150	5850	30	
	WLAN 6 GHz	5955	7115	30	
	Bluetooth	2400	2500	16	

***Important:** *Airborne operations in LTE Band 48 are prohibited.*

4. A label must be affixed to the outside of the end product into which the EM7590 module is incorporated, with a statement similar to the following:
   - **This device contains FCC ID: N7NEM75T.**
5. A user manual with the end product must clearly indicate the operating requirements and conditions that must be observed to ensure compliance with current FCC RF exposure guidelines.

Note: Host product manufacturers are responsible for the overall compliance of the host products including, where applicable, all additional equipment authorization and testing not covered by the modular approval (e.g., unintentional radiator FCC Part 15 Subpart B requirements, and RF exposure requirements for host products intended for use within 20 cm of the user's body.)

4.4 Industry Certifications

The EM7590 module complies with the mandatory requirements described in the following standards. The exact set of requirements supported is network operator-dependent.

Table 4-3: Standards Compliance

Technology	Standards
LTE	3GPP Release 12[a]
UMTS	3GPP Release 9

a. Some auxiliary functions support Release 13.

The following industry certifications have been obtained, where applicable:
- GCF
- PTCRB