



Office of the Chief Scientist

Research and Development

IEM 1x/EVDO Development Kit

User Guide

80-XXXXX-1 Rev. A
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January 2011

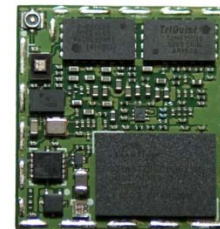
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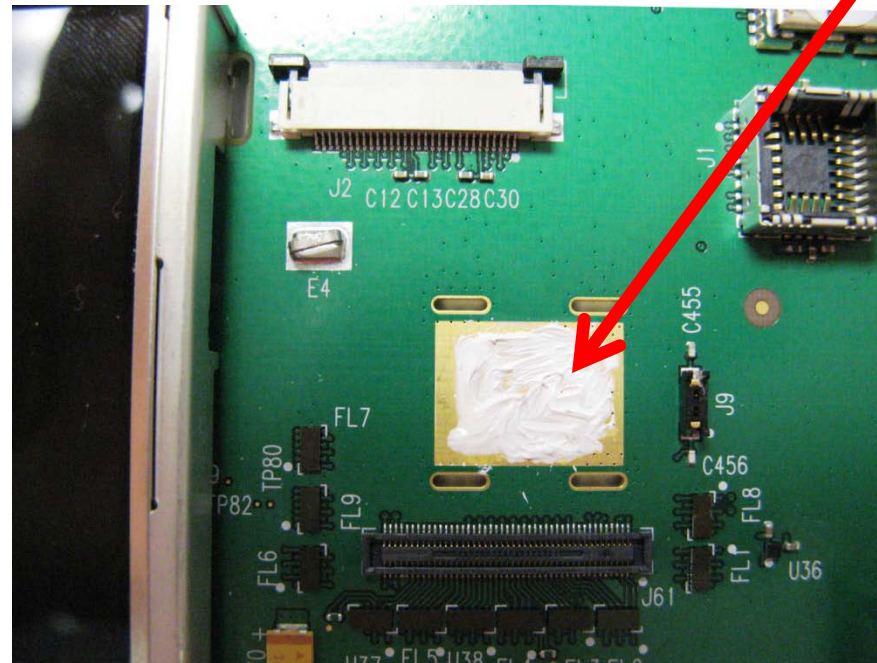
Introduction

- The IEM development kit enables telephone & Data functionality with the entire family of IEM modules.
- The Kit includes:
 - IEM Module
 - Test Nest fixture
 - RF Antenna
 - Battery Pack
 - QCT Software
 - Handset
 - External Power Cable
 - Micro USB cable



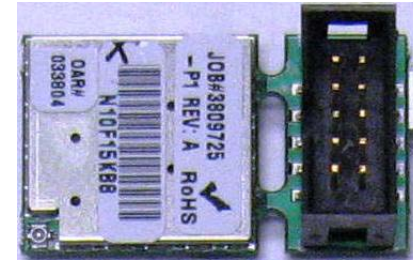
Getting Started

- Apply Thermal Grease to pad



Insert Module

- Insert the IEM module into the Test Nest fixture using the 90 pin connector with the JTAG connector still attached.

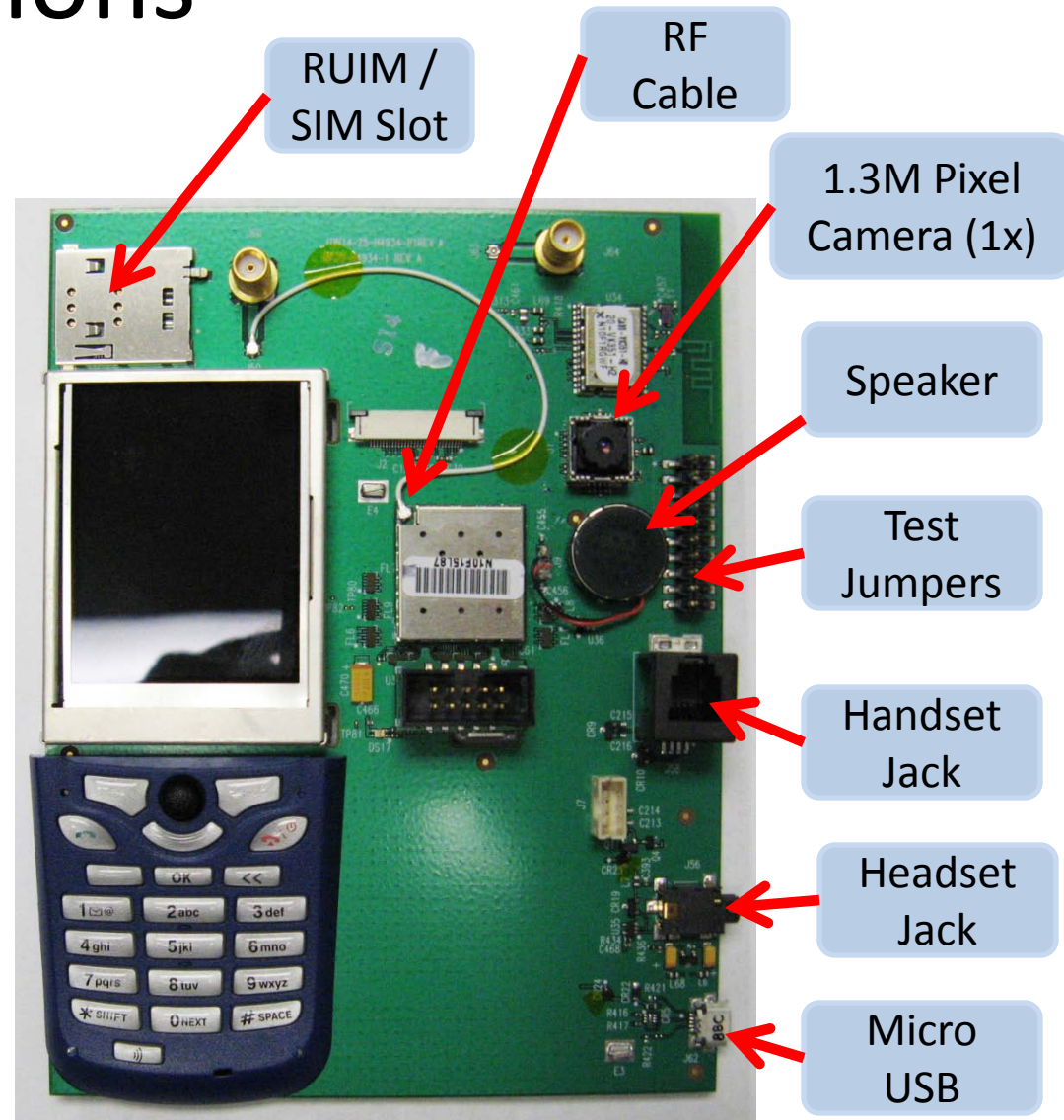


WMD Module



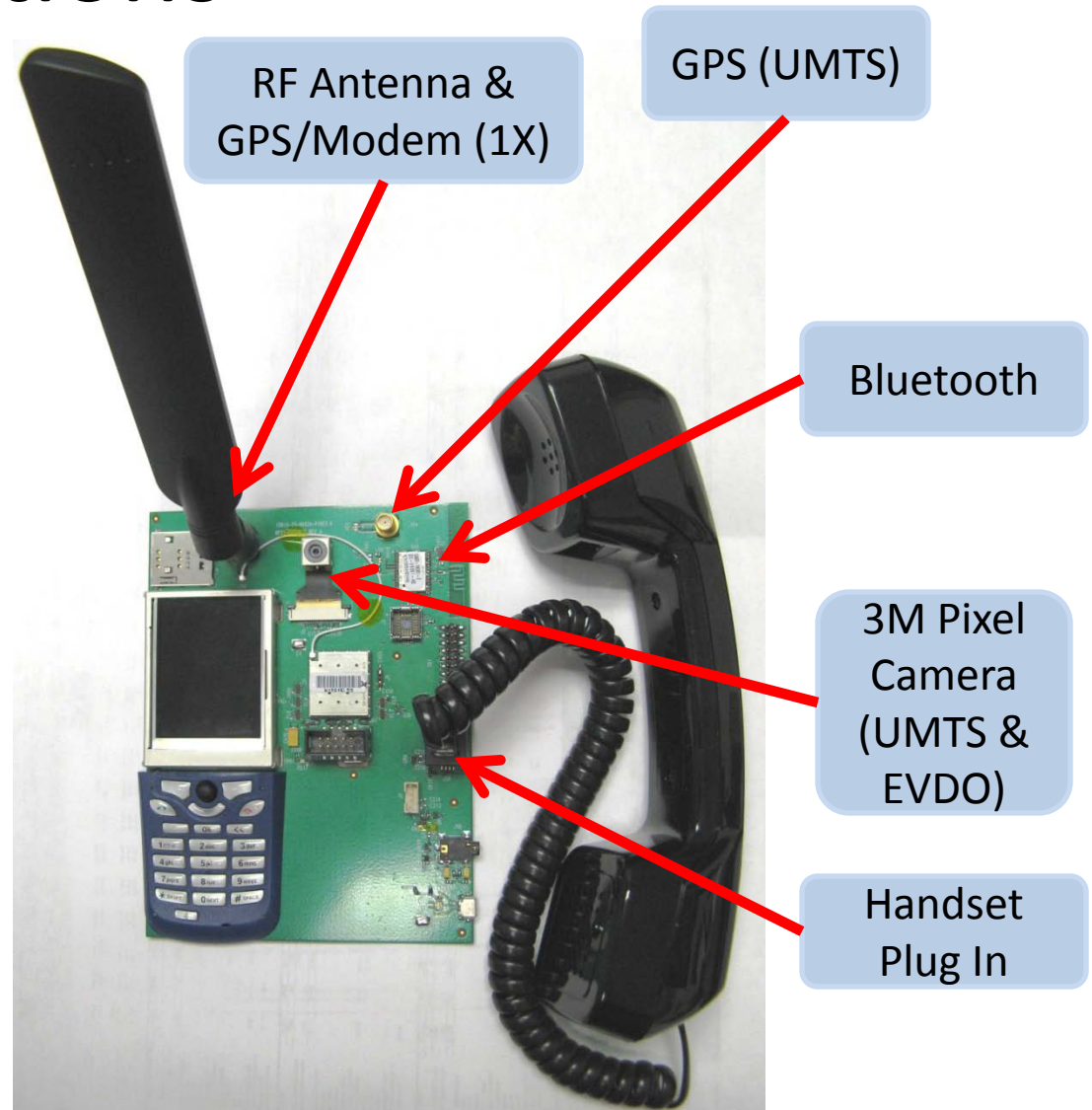
Cable Connections

- Connect the internal RF cable



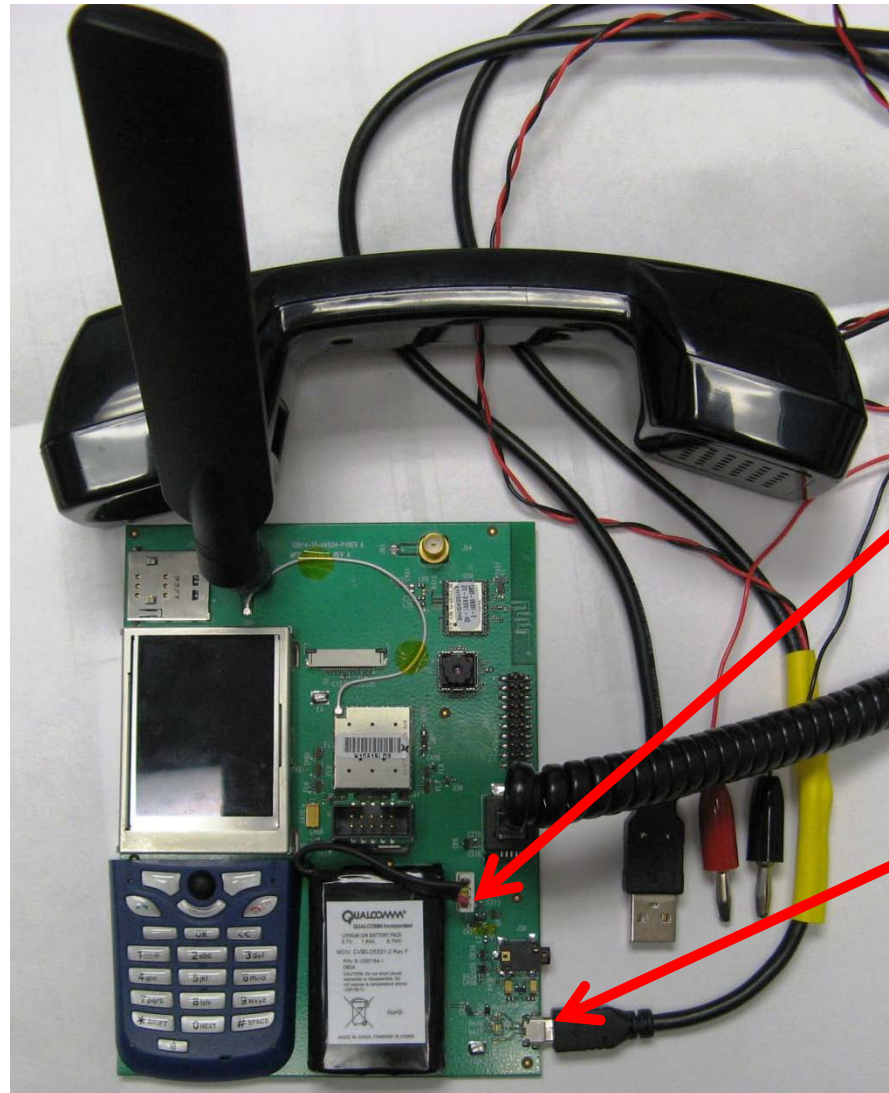
Cable Connections

- Connect the external antenna
- Connect the handset



Power Supply Connections

- Connect the power supply cable & or plug in battery connector
- Set power supply voltage to 3.7 volts – no battery
- Battery will charge if power supply is set to 5 volts

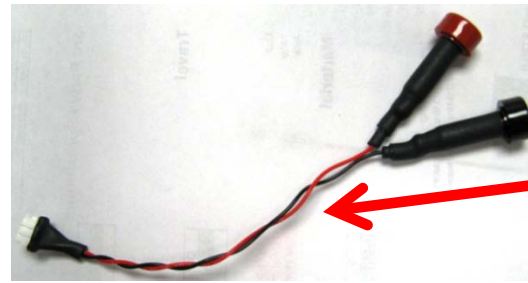


Battery Connector

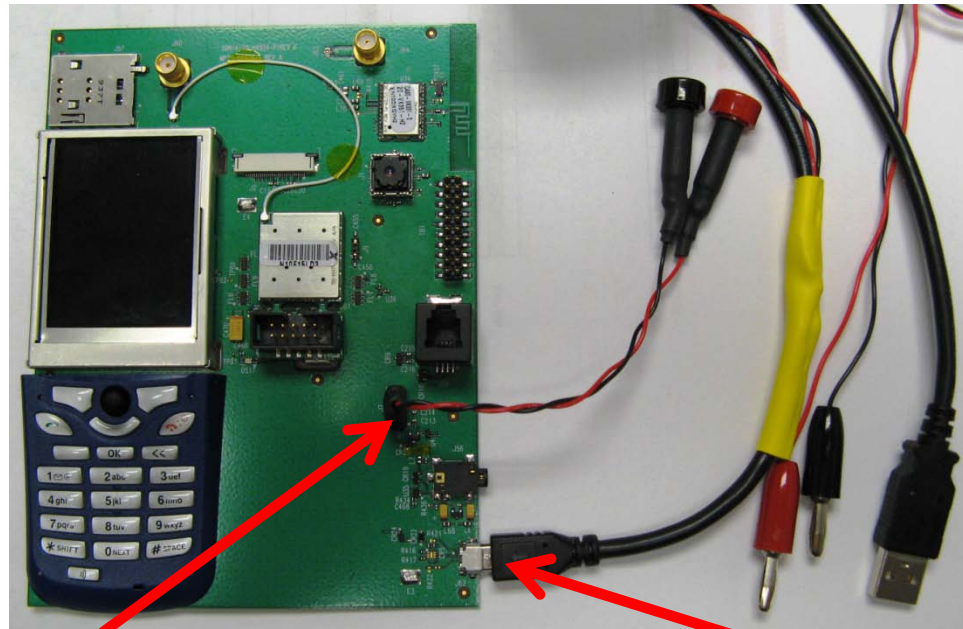
Micro USB PWR Cable

Power Supply Connections - Alt

- Alternate power connection to replace battery
- Set power supply voltage to 3.7 volts



Alt Power Cable



Alt Power Connector

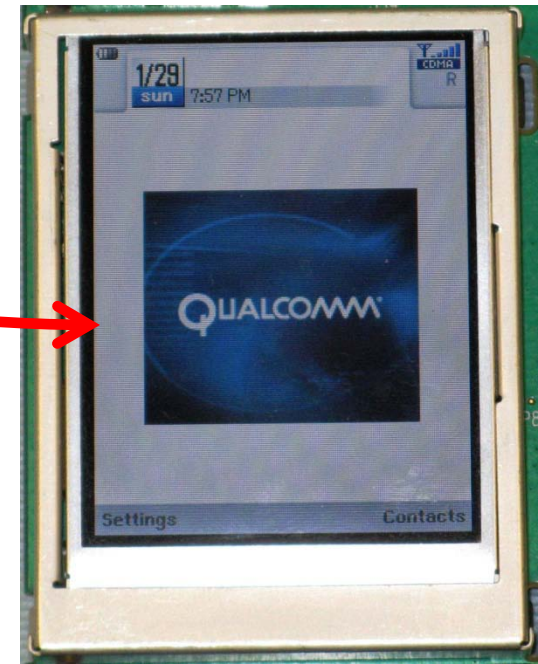
Micro USB Power/Data Cable

Module Power Up

- Now power up the module by pressing the pwr button on the keypad
- LCD and backlight turn on



PWR button



Telephone & Data Call Testing

- Now the Module is ready for basic telephone & Data call functionality
- Use keypad or USB/RF interfaces to initiate and end voice or data calls



Standards

The IEM module conforms to the following standards requirements:

- CDMA
 - TIA/EIA IS-98E (CDMA2000 1x)
 - IS-856 Release A (1xEV-DO)

- FCC
 - 47 CFR Part 1 – RF radiation exposure limits
 - 47 CFR Part 2 – Equipment authorization
 - 47 CFR Part 15 – Intentional and unintentional radiators
 - 47 CFR Part 22 – Cellular
 - 47 CFR Part 24 - PCS

- Open Device Initiative Certification w/ VZW

Regulatory Compliance

Safety Warnings

Do not operate the IEM module in the following environments:

- In active blasting areas.
- In potentially explosive environments such as refueling points, fuel depots or chemical plants.
- Near medical equipment, especially life support equipment that might be susceptible to radio interference.
- In an aircraft.
 - The IEM module transmissions could interfere with aircraft electrical and communication systems. Like cell phones, using the IEM module in an aircraft is illegal in some jurisdictions.
 - If cell phone usage is permitted while the aircraft is on the ground, normal IEM module operation is permitted as well.

Regulatory Compliance

The IEM module has been approved for mobile applications in the United States.

- Maintain at least 20 cm separation between the antennas and the user's body.
- Maximum antenna gain (including cable loss):
 - Cellular band < 3 dBi
 - PCS band < 3 dBi
- A label with the following (or similar) statement must be attached to the host end product: This device contains Tx FCC ID:J9CIEMEVD0.
- Note: 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,

Regulatory Compliance

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 to help.
-
- Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the IEM module.

Internet of Everything Module (IEM) Installation and Collocation Guidelines

The following provides module installation guidelines for devices to be authorized for use with the IEM6085 through a FCC Class I Permissive Change process in accordance with FCC procedures, for the following installation host configurations.

- 1) The IEM6085 can be installed as a **standalone transmitter** in devices meeting the following conditions:
 - Fixed-mount or mobile host devices[‡] where a minimum of 20 cm separation distance is provided between the transmitting antenna and the end user that can be installed without a **Class I** or **Class II Permissive Change** process.
 - Portable hosts in accordance with KDB Publication 447498^{*} through a **Class II Permissive Change** or new FCC certification.
- 2) The IEM6085 can be installed with **collocated transmission devices** for fixed and mobile host devices approved under FCC ID J9CIEMEVDO through a **Class I Permissive Change** process. The collocated transmitters must meet the technical requirements defined in Section 2. Mobile collocation is allowed without a Class I or Class II FCC process.

- [‡] Mobile equipment, as defined in CFR 47 §2.1091(b). Fixed-mount hosts are non-mobile equipment that are either fixed in place or large equipment that is not easily moved.
- ^{*} KDB = Knowledge Database; KDB Publication 447498 D01 is the FCC procedure *Mobile and Portable Device, RF Exposure Procedures and Equipment Authorization Policies*.

For equipment in which the RF exposure classification is unclear (see CFR 47 §2.1091(d)(4)), consult with the module OEM and/or the FCC for guidance.

- 4) Allow end-user installation provided module/device Two-Way Authentication has been addressed so that modules can only be activated in approved hosts.

The IEM6085 is not intended for installation into notebook computers as described in KDB Publication 616217^{**} and associated supplemental procedures.

Any collocated transmitter or antenna that does not meet the technical requirements defined in this document requires a Class II permissive change to authorize simultaneous transmission.

- ^{**} KDB 616217 is the FCC procedure *SAR Evaluation Considerations for Laptop Computers with Antennas Built-in on Display Screens*.

Module Installation Guidelines

This section defines host installation limitations for mobile hosts. Supporting RF exposure information is located in Section 3.

Host Installation Guidelines

Label Requirements

The FCC and Industry Canada IDs must be permanently affixed on the exterior of the host device or readily accessible under a panel or battery pack of the host device that cannot be separated from the host device itself.

Fixed-mount and Mobile Hosts (WWAN to user separation distance $\geq 20\text{cm}$)

The IEM6085 can be installed for use in any authenticated fixed-mount or mobile host device. The maximum WWAN conducted power and antenna gain is listed in Table 1. Any antenna type is acceptable for use as long as the conditions for peak gain are met. The integrator must consult with the module OEM and/or the FCC for equipment or application in which the 20 cm antenna-to-user separation distance is unclear (see CFR 47 §2.1091(d)(4)).

Table 1

Technology	Frequency (MHz)	Maximum Conducted Power (dBm)	Conducted Power (W)	Maximum Antenna Gain (dBi)	Duty Cycle	Average EIRP (dBm)	Average EIRP (W)	Average ERP (dBm)	Average ERP (W)	FCC Limit
CDMA2000	824	24.60	0.288	3.00	1.00	27.60	0.58	25.430	0.349	22.913(a)(2) is 7 W ERP
CDMA2000	1850	24.60	0.288	3.00	1.00	27.60	0.58	25.430	1.000	24.232(c) 2 W EIRP

Antenna-to-antenna separation requirements – According to KDB 447498, collocated antennas are permitted without test as long as the antenna-to-antenna separation distance is at least 20 cm. Smaller separation distances are permitted without test as long as specific conditions are met in which combined MPE values are under the FCC’s limits. These conditions are described in the calculations in the section *Simultaneous RF Exposure Evaluation Guidelines for Collocated Transmitters Allowable through a Class I Permissive Change*.

Portable Hosts (WWAN to user separation distance <20cm)

The IEM6085 can only be installed in portable hosts under a Class II Permissive Change, in accordance with KDB Publication 447498, or under a new FCC certification.

End User Installation

End user installation into a product with pre-installed antennas is prohibited per KDB Publication 996369 D01^{††} unless a two-way authentication scheme is enabled to ensure that only approved module/host combinations can be used together. A supporting Class II permissive change with appropriate documentation is also required to support this end user installation option and to document the authentication scheme.

Simultaneous RF Exposure Evaluation Guidelines For Collocated Transmitters Allowable through a Class I Permissive change (Mobile/Fixed Hosts only)

This section defines conditions in which the IEM6085 may be integrated into a host with simultaneously transmitting antennas without further test, pursuant to KDB 447498, 8)a)ii).

- ^{††} KDB 996369 is *Transmitter Module Equipment Authorization Guide*

- The power density calculations for standalone transmitters at an exposure separation distance of 20 cm are shown Table 2 with the declared transmit power and antenna gain values. The calculations are based on a cable loss of 0 dB. The collocated transmitter values represent worst-case transmit power and antenna gains allowable for use with the IEM6085.
- For frequency dependent limits, the lowest transmitter frequency was used to represent the lowest MPE limit (e.g. 824MHz = 0.549 mW/cm²). The WLAN power levels listed represent the worst-case values for the corresponding frequency ranges.
- Per OET 65, when RF sources have different frequencies, the fraction of the FCC power density limit shall be determined and the sum of all fractional components shall be less than 1.

Table 2 WWAN and Collocated Device Standalone MPE Calculations

Technology	Frequency (MHz)	Maximum Conducted Power (dBm)	Conducted Power (W)	Maximum Antenna Gain (dBi)	Duty Cycle	Average EIRP (dBm)	Average EIRP (W)	Power Density @ 20cm (mW/cm ²)	FCC MPE Limit (mW/cm ²)
CDMA2000	824	24.60	0.288	3.00	1.00	27.60	0.58	0.114	0.549
CDMA2000	1850	24.60	0.288	3.00	1.00	27.60	0.58	0.114	1.000
SRR	900	10.00	0.010	5.00	1.00	15.00	0.03	0.006	0.600
WLAN	2400	29.00	0.794	5.00	1.00	34.00	2.51	0.500	1.000
WLAN	5150	29.00	0.794	5.00	1.00	34.00	2.51	0.500	1.000
WLAN	5250	29.00	0.794	5.00	1.00	34.00	2.51	0.500	1.000
WLAN	5500	29.00	0.794	5.00	1.00	34.00	2.51	0.500	1.000
WLAN	5725	29.00	0.794	5.00	1.00	34.00	2.51	0.500	1.000

Table 3 WWAN 850 MHz Collocation Power Density

WLAN Band	WLAN Pd (mW/cm ²)	FCC MPE Limit (mW/cm ²)	(WLAN Pd) / (MPE Limit)	850 MHz WWAN Pd (mW/cm ²)	FCC MPE Limit (mW/cm ²)	(WWAN 850 MHz) / MPE Limit	(850 MHz WWAN fraction) + (WLAN fraction)	Limit	Pass/Fail
0.9 GHz	0.006	1.000	0.006	0.208	1.000	0.208	0.214	1	Pass
2.4 GHz	0.500	1.000	0.500	0.208	1.000	0.604	0.708	1	Pass
5.1 GHz	0.500	1.000	0.500	0.208	1.000	0.604	0.708	1	Pass
5.2 GHz	0.500	1.000	0.500	0.208	1.000	0.604	0.708	1	Pass
5.5 GHz	0.500	1.000	0.500	0.208	1.000	0.604	0.708	1	Pass
5.8 GHz	0.500	1.000	0.500	0.208	1.000	0.604	0.708	1	Pass
0.9 GHz	0.006	1.000	0.006	0.208	1.000	0.604	0.214	1	Pass

Table 4 WWAN 1900 MHz Collocation Power Density

Band	WLAN Pd (mW/cm ²)	FCC MPE Limit (mW/cm ²)	(WLAN Pd) / (MPE Limit)	1900 MHz Pd (mW/cm ²)	FCC MPE Limit (mW/cm ²)	(WWAN 1900 MHz) / MPE Limit	(1900 MHz WWAN fraction) + (WLAN fraction)	Limit	Pass/Fail
0.9 GHz	0.006	1.000	0.006	0.114	1.000	0.114	0.121	1	Pass
2.4 GHz	0.500	1.000	0.500	0.114	1.000	0.114	0.614	1	Pass
5.1 GHz	0.500	1.000	0.500	0.114	1.000	0.114	0.614	1	Pass
5.2 GHz	0.500	1.000	0.500	0.114	1.000	0.114	0.614	1	Pass
5.5 GHz	0.500	1.000	0.500	0.114	1.000	0.114	0.614	1	Pass
5.8 GHz	0.500	1.000	0.500	0.114	1.000	0.114	0.614	1	Pass
0.9 GHz	0.006	1.000	0.006	0.114	1.000	0.114	0.121	1	Pass