

Novatel Wireless, Inc. PCI Express Mini-card

Installation Guidelines for E371

Version 2.2

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Document Revision History

Rev.	Date	Brief Description of Change	Originator	Approved by
1.0	September 19, 2011	Initial Draft	Todd Gallagher	
2.0	November 14, 2011	Changes as requested during the FCC review.	Roman Olmos	Todd Gallagher
2.1	February 22, 2012	Update made to 1900MHz Antenna Gain Information	Roman Olmos	Todd Gallagher
2.2	February 24, 2012	Change to MPE limit in 824 band.	Roman Olmos	Todd Gallagher

FCC KDB Publication Reference

KDB Title	Version	Date	Attachment Number	Version Number
SAR Evaluation Considerations for Laptop/Notebook and Tablet computers	KDB 616217	11/13/2009	D03	V01
Mobile and Portable Device RF Exposure Procedures and Equipment Authorization Policies	KDB 447498	11/13/2009	D01	V04
SAR Considerations for LTE Handsets and Data modems	KDB 941225	12/15/2010	D05	V01
Modular Transmitter Approvals	KDB 996369	07/12/2011	D01	V01r03
Permissive Change Policy	KDB 178919	06/08/2011	D01	V05r01

E371 Module Installation and Collocation Guidelines for Host Devices

1.0 Introduction

This document provides module and antenna installation guidelines for notebook computers to be authorized for use with the E371 module through the FCC Class I or Class II Permissive Change process. As the grantee Novatel Wireless is responsible for all integrations and must be consulted on all regulatory matters involving the E371.

The module was originally granted by the FCC as a portable device with respect to RF Exposure compliance. This document outlines what RF Exposure considerations are required when integrating the E371 into a laptop type device for mobile or portable operation.

For other basics and details about FCC RF exposure compliance requirements for mobile and portable devices, see FCC OET Bulletin 65 Supplement C.

The following installation host configurations are addressed in this document.

- 1) The E371 module can be installed as a standalone transmitter in notebooks meeting the following conditions:
 - a. Mobile device notebooks where >20cm separation distance is provided between the E371 transmitting antenna and the end user. The technical parameters for mobile measurements are defined in Section 2.1.1.
 - b. Portable device notebooks where the separation distance is <20cm to ≥ 2.5 cm provided between the E371 transmitting antenna that meet the technical parameters defined in Section 2.1.2. These devices may not require SAR evaluation and are covered by the original FCC/IC application.
 - c. Portable device notebooks where the separation distance is <2.5cm provided between the E371 transmitting antenna that meet the technical parameters defined in Section 2.1.3. Devices require SAR evaluation and consultation by the grantee (Novatel Wireless) is required.

Note:

1. "Standalone" when referenced in this document is defined where a single transmitter is transmitting, as opposed to two or more transmitters transmitting simultaneously.
 2. Mobile Device Definition - FCC defines as a transmitting antenna located at a distance greater than ≥ 20 cm from the user.
 3. Portable Device Definition - FCC defines as a transmitting antenna is located at a distance less than ≤ 20 cm from the user.
- 2) Collocated transmitters that can operate simultaneously with the E371 module is only allowed if the technical requirements defined in Section 4.0 are satisfied.
 - 3) Should end-user installation be available module/notebook Two-Way Authentication is required. Please contact Novatel Wireless for additional details.
 - 4) The FCC and Industry Canada IDs must be permanently affixed on the exterior of the notebook or readily accessible under a panel or battery pack of the host device that cannot be separated from the host device itself.

The label must state:

- This device contains FCC ID: PKRNVWE371
 - This device contains IC:3229A-E371
- 5) **These installation guidelines are not applicable to non-notebook host devices or tablet PCs. The installation guidelines are applicable for notebook computers where the E371 antennas and collocated antennas are located in the display portion of a notebook computer. SAR evaluation is completed with the display open at a ninety-degree angle as defined in KDB pub 616217 and Section 4 of KDB pub 447498.**
- 6) **These guidelines do not apply to devices that require power reduction to meet SAR limits. These integrations must be coordinated directly through Novatel Wireless.**

2.0 Module Installation Guidelines

This section defines host installation limitations for mobile device and portable device hosts.

2.1 Installation Guidelines

2.1.1 Mobile Device Hosts (WWAN to user separation distance >20cm)

The E371 module can be installed for use in any authenticated mobile device notebook as long as the antenna gain of the host antenna does not exceed the gain listed in table 1. The modem must not be collocated with other antennas or transmitters unless the guidelines are followed within this document. Please refer to section 4.0 for collocated information.

The maximum E371 conducted power and host antenna gain is listed in Table 1.

Table 1 Maximum conducted power and antenna gain

Technology	Frequency (MHz)	Maximum Conducted Power (dBm)	Conducted Power (W)	Maximum Antenna Gain (dBi)
LTE Band 17	706.5	24.50	0.282	5.0
GPRS 1 UL	824	33.0	1.99	3.5
UMTS	824	25.0	0.282	3.5
LTE Band 4	1710.7	24.50	0.282	5.0
UMTS (AWS)	1700	24.5	0.282	5.0
GPRS 1 UL	1850	30.0	1.0	3.0
UMTS	1850	24.5	0.282	3.0

2.1.2 Portable Device Hosts (WWAN to user separation distance $\leq 20\text{cm}$ or $\geq 2.5\text{cm}$)

The E371 module can be installed for use in a portable device notebook as a Class I change if the antenna separation distance is $\leq 20\text{cm}$ or $\geq 2.5\text{cm}$. Table 2.0 describes the limitations if there are no collocated transmitters. For collocated restrictions please see section 4.0.

Table 2 Portable Device Notebook Limitations – No collocated transmitters

Parameter	Requirement	RF Exposure Justification
Device type	Notebook	
Display size	Any	
Antenna type	PIFA	
WWAN Antenna locations	Display	
Exterior Display Material	(Non metal)	
WWAN module location	Anywhere	
Minimum WWAN to User Distance	$\geq 2.5\text{cm}$	Section 3.0
Maximum WWAN to User Distance (Portable application)	$\leq 20\text{cm}$	
SAR evaluation required	No	
Collocated Transmitter Condition	Restricted.	Section 4.0

2.1.3 Portable Device Hosts (WWAN to user separation distance $\leq 2.5\text{cm}$)

The E371 module can be installed for use in a portable device notebook as a Class II change if the antenna separation distance from the user is $\leq 2.5\text{cm}$. Table 3.0 describes the limitations if there are no collocated transmitters. Collocated radios must be considered as per FCC KDB 616217 D03 and section 3 of KDB 447498. Section 2.1.3 does not apply to tablets or non-notebook devices or devices that require power reduction to meet SAR.

Table 3 Portable Device Notebook Limitations – No collocated transmitters

Parameter	Requirement	RF Exposure Justification
Device type	Notebook	
Display size	Any	
Antenna type	PIFA	
WWAN Antenna locations	Display	
Exterior Display Material	(Non metal)	
WWAN module location	Anywhere	
Maximum WWAN to User Distance	$< 2.5\text{cm}^\dagger$	Section 3.0
SAR evaluation required	Yes	
Collocated Transmitter Condition	KDB 616217 D03 KDB 447498 section 3.	Section 4.0

[†]Based on the SAR data collected during the original application.

2.1.4 End User Installation

Two-way authentication documentation has been submitted as part of a Class II permissive change allowing end-user installation into notebooks that utilize the method of authentication.

Authentication occurs in two methods:

1. Software installed on the modem:
 - a) Installation Software including list of pre-approved Notebooks and Modules.
 - b) PID/VID identification numbers in Module: Factory Installed
 - c) Module identification numbers in Notebook: Factory Installed
2. Implementation:

When a Module Upgrade Kit is procured the module is available for End-User installation in approved Notebook computers.

The connection manager software is run on the Notebook and the Module ID numbers are checked against a pre-determined list of approved ID numbers in the installation software. Both the Notebook and the Module are checked. If either ID does not match, the installation of the Driver is halted and the Module will not work.

Moving the Module to other NON approved notebooks will not allow the module to operate. Since the driver will ONLY operate in pre-approved Notebooks with the proper ID and while a properly ID-checked Module is resident, you cannot load the driver for NON-approved Modules or Notebooks.

2.1.5 User Instructions

Installers and end user must be provided with specific information regarding FCC RF exposure requirements for Mobile or portable devices.

As an example the following text should be provided in the user guide with the regulatory information:

*This device has been evaluated for and shown compliant with the FCC RF Exposure limits under **mobile** exposure conditions (antennas are greater than 20cm from a person's body). This device has also been evaluated for and shown compliant with the FCC RF exposure limits under **portable** exposure conditions (antennas are within 20 cm of a person's body) when installed in certain specific configurations.*

Before this device is made available for sale to the public, it was evaluated to ensure that it does not exceed the limit established by the government-adopted requirement for safe exposure.

3.0 Individual SAR Evaluation

Portable RF exposure evaluation has been completed based on SAR measurements on a representative PIFA antenna in a representative notebook computer. Integrations that provided $\geq 2.5\text{cm}$ of separation distance between the edge of the WWAN antenna and the end user orientated at 90 degrees as illustrated in Figure 1-1 and 1-2 do not require additional SAR testing. The measured SAR value at 2.5cm was 0.374W/kg.

As indicated in KDB 447498 section 2 a), i) when SAR values are $< 0.4\text{W/kg}$ for a conservative exposure measurement the devices can be used in portable host platforms with no restrictions. These instructions are restricted to laptop and notebook type devices. Please refer to section 4.0 for collocation guidelines.

Figure 1-1

Portable Device Notebook Antenna Location – Horizontal orientation (Note 1)

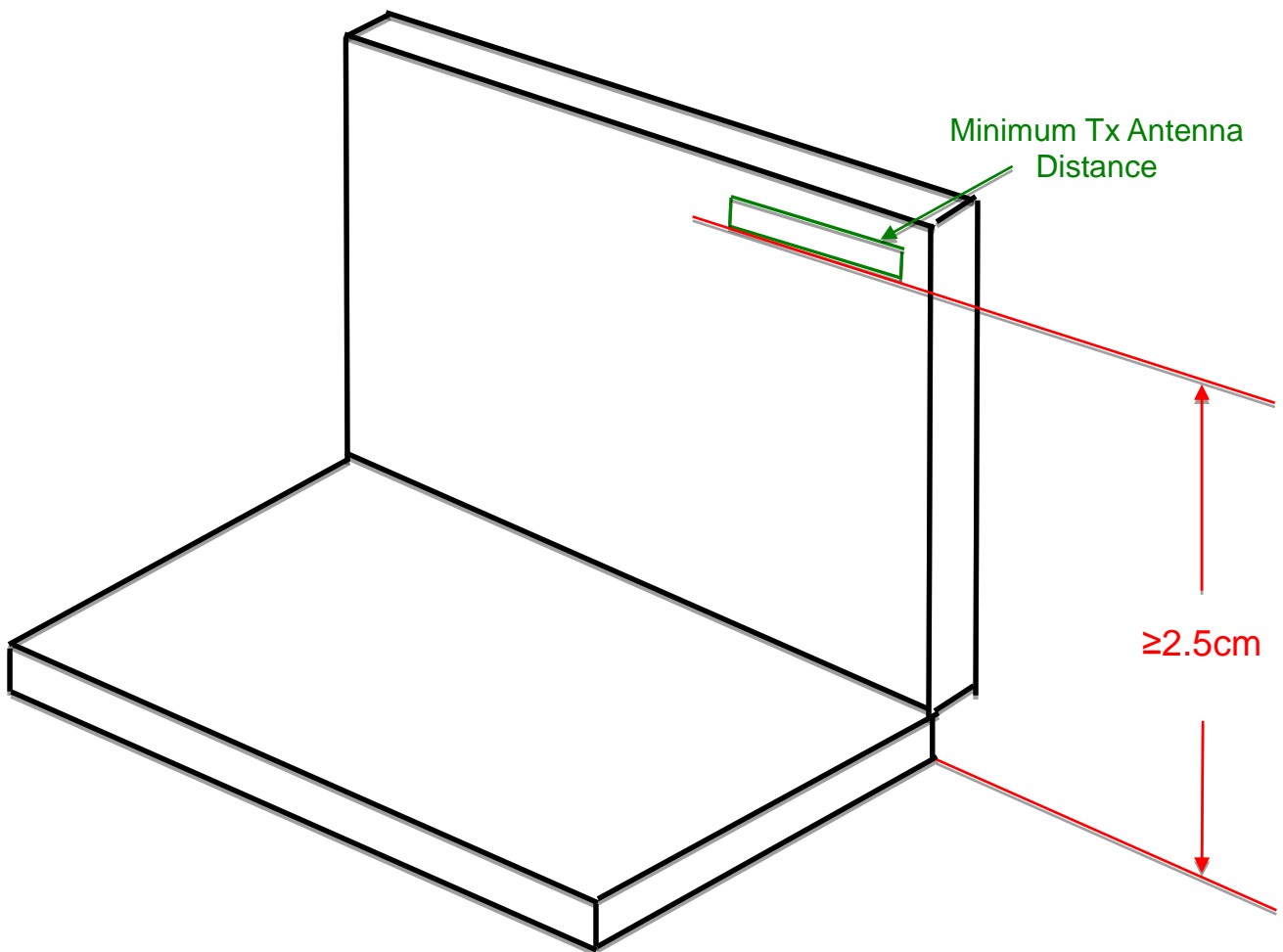
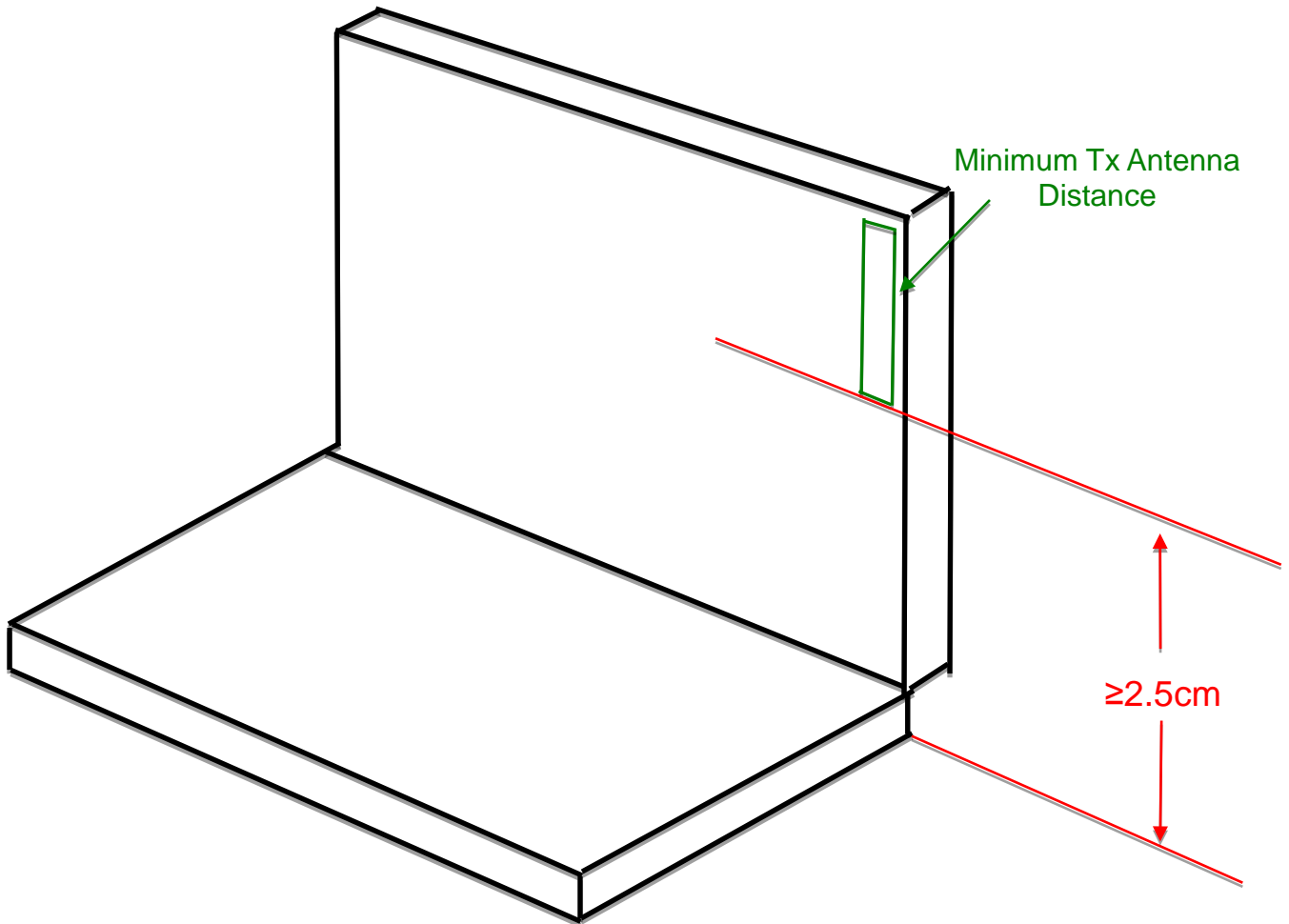


Figure 1-2

Portable Device Notebook Antenna Location – Vertical orientation (Note 1)



Notes:

1. Figures 1-1 and 1-2 are used to illustrate the proper separation distance with different antenna orientations. These illustrations are to be used as a design reference and are not to scale.
2. Mobile Device Definition - FCC defines as a transmitting antenna located at a distance greater than $\geq 20\text{cm}$ from the user.
3. Portable Device Definition - FCC defines as a transmitting antenna is located at a distance less than $\leq 20\text{cm}$ from the user.

4.0 Collocated Installation Guidelines

4.1 Collocated transmitter application

Collocated transmitters can be operated simultaneously with the E371 module, provided the technical parameters listed in Table 4 are maintained and the information specified in Section 5.0 is on file as part of a Class I permissive change. A Class II permissive change is required if the host device does not meet the requirements specified in Table 4 and in section 6.

Table 4 Host Device Limitations – Collocated transmitters

Parameter	Requirement	RF Exposure Justification
Device type	Notebook	
Display size	Any	
Antenna type	PIFA	
WWAN Antenna locations	Display	
Exterior Display Material	(Non metal)	
WWAN module location	Anywhere	
Minimum WWAN to User Distance	$\geq 2.5\text{cm}\dagger$	Section 3.0
Maximum WWAN SAR	0.374W/kg (1g)^*	Section 3.0
Maximum RF coaxial cable loss	1.41dBi*	
Mobile Collocated Transmitter Condition (Mixed mobile and WWAN portable)	$< 0.766\text{ W/kg (1g)}$	Section 6.5 and 6.6
Portable Collocated Transmitter Condition	$\text{SAR } < 1.226\text{W/kg (1g)}$	Section 6.4 and Section 6.6
Mobile Collocated antenna gain (mobile WWAN)	TBD based on conducted power and maximum MPE	Section 6.5 Table 0
Mobile Collocated antenna gain (Portable WWAN)	5 dBi	Section 6.1 and 6.2
Distance to external card slots	$> 5\text{cm}$	N/A

\dagger Based on the SAR data collected during the original application.

*Based on the original antenna tested with the module.

Other devices may be approved as collocated transmitters, provided the technical requirements of FCC KDB 616217 D03 are satisfied. Please contact Novatel Wireless for additional installation instructions.

5.0 Class I Permissive Change Documentation Requirements

The following documentation from KDB 616217 D03 must be supplied by the OEM and approved by the regulatory manager at Novatel Wireless as part of a Class I permissive change request. The following items are required address simultaneous transmission concerns. These documents will be kept on file at Novatel Wireless to support our Class I claim. A Class II permissive change is required if the technical requirements cannot be met.

1. List of all collocated transmitters with FCC and IC IDs
2. Verification that all WWAN and WLAN antennas are >5cm from external USB, PCMCIA or other notebook I/O ports that support an external plug-in transmitter.
3. Drawings showing antenna locations and separation distances
4. Antenna types with respective dimensions and far field antenna gains
5. Specific module to antenna RF coaxial cable losses
6. RF exposure analyses demonstrating compliance with Section 4 of FCC KDB 616217 D03 as shown below ;

For each simultaneous transmission configuration identified in (1) above, if the conditions in (a) or (b) below are satisfied and fully documented in the SAR report or Class I permissive change documentation, simultaneous transmission SAR evaluation is not required for that configuration¹¹

- a. when the $[(\sum \text{ of the highest measured 1-g SAR for each portable transmitter/antenna included in the simultaneous transmission configuration}) / 1.6 \text{ W/kg}] + \sum \text{ of } [(the \text{ highest MPE for each mobile transmitter/antenna included in the simultaneous transmission configuration}) / (the corresponding MPE limit)] < 1$; or
- b. for antennas included in the simultaneous transmitting configuration that require SAR evaluation, when the separation distance between each antenna pair is
 - i. greater than $5 \cdot [(SAR_1 + SAR_2) / 1.6]^{1.5}$ cm, rounded to the nearest cm, and
 - ii. the $\sum \text{ of } [(the \text{ highest MPE for each mobile transmitter/antenna included in the simultaneous transmission configuration}) / (the corresponding MPE limit)] < 1$

where: \sum in a. above excludes antennas that do not require SAR evaluation, and MPE does not apply to displays < 10" diagonal for both a. and b. above

6.0 Simultaneous RF Exposure Evaluation Guidelines For Collocated Transmitters Allowable through a Class I Permissive change

6.1 Mobile Simultaneous Transmission guidelines

Collocated transmitters can be operated simultaneously with the E371 module in mobile configurations, provided the technical parameters listed in KDB pub 447498 section 8 are met. These procedures apply to antennas in the display screen for laptop devices.

These parameters are:

- a) Transmitters and modules certified for mobile or portable exposure conditions and categorically excluded by § 2.1091(c) can be incorporated in mobile device notebooks without further testing or certification when:
 - i. The closest separation among all simultaneous (radiating) transmitting antennas is $\geq 20\text{cm}$, or
 - ii. The antenna separation distance and MPE compliance boundary requirements that enable all simultaneous transmitting antennas incorporated within the host to comply with MPE limits are specified in the application filing of at least one of the certified transmitters incorporated in the host device. In addition, when transmitters certified for portable use are incorporated in a mobile device notebook the antenna(s) must be $\geq 5\text{ cm}$ from all other simultaneous transmitting antennas.
- b) All transmitters in the final product must be at least 20cm from users and nearby persons.

6.2 Mobile Hosts calculations through power density calculations

This section can be used to select WWAN transmitters and antennas for use in Mobile device configurations. Simultaneous transmitters must be selected to ensure that the compliance evaluation will not result in issues with the WWAN transmitters or antennas.

The following tables provide guidance on maximum recommended gain and conducted powers of WLAN transmitters.

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. The fractional MPE calculation is also addressed in FCC KDB 616217 D03 (Simultaneous Transmission Considerations).

These tables are for reference only and are to be used as a guide.

Table 5 – The power density calculations for standalone transmitters at an exposure separation distance of 20 cm are shown in table 5 with the declared transmit power and antenna gain values. The calculations are based on a cable loss of 0 dBi. The collocated transmitter values represent worst-case transmit power and antenna gains allowable for use with the E371 WWAN module.

For frequency dependent limits, the lowest transmitter frequency was used to represent the lowest MPE limit (e.g. 706.5MHz = 0.4717mW/cm²). The WLAN power levels listed represent the worst-case values for the corresponding frequency ranges.

Table 6 - Based on the WWAN MPE calculations in table 5 this table provides guidance on the collocated power density with the various WWAN modems in the 700MHz band of the E371.

Table 7 - Based on the references in table 5, this table provides guidance on the collocated power density with the various WWAN modems in the 850MHz band of the E371.

Table 8 - Based on the references in table 5, this table provides guidance on the collocated power density with the various WWAN modems in the 1700MHz band of the E371.

Table 9 - Based on the references in table 5, this table provides guidance on the collocated power density with the various WWAN modems in the 1900MHz band of the E371.

Table 5 WWAN and WLAN 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)
LTE	706.5	24.50	0.282	5.0	1.00	29.50	0.891	0.177	0.471
GPRS	824	33.00	1.995	3.5	0.25	30.48	1.1177	0.222	0.55
UMTS	824	25.00	0.316	3.5	1.00	28.50	0.708	0.141	0.55
LTE	1710.7	24.50	0.282	5.0	1.00	29.50	0.891	0.177	1.000
UMTS	1700	24.50	0.282	5.0	1.00	29.50	0.891	0.177	1.000
GPRS	1850	30.00	1.06	3.0	0.25	26.98	0.499	0.099	1.000
UMTS	1850	24.50	0.266	3.0	1.00	27.50	0.562	0.112	1.000
WLAN	2400	29.00	0.794	5.0	1.00	34.00	2.512	0.500	1.000
WLAN	5150	29.00	0.794	5.0	1.00	34.00	2.512	0.500	1.000
WLAN	5250	29.00	0.794	5.0	1.00	34.00	2.512	0.500	1.000
WLAN	5500	29.00	0.794	5.0	1.00	34.00	2.512	0.500	1.000
WLAN	5800	29.00	0.794	5.0	1.00	34.00	2.512	0.500	1.000
WIMAX	2600	29.00	0.794	5.0	1.00	34.00	2.512	0.500	1.000

Table 6 WWAN 700 MHz Collocation Power Density

WLAN Band	WLAN Pd (mW/cm ²)	FCC MPE Limit (mW/cm ²)	(WLAN Pd) / (MPE Limit)	700 MHz WWAN Pd (mW/cm ²)	FCC MPE Limit (mW/cm ²)	(WWAN 700 MHz) / MPE Limit)	(700 MHz WWAN fraction) + (WLAN fraction)	Limit	Pass/Fail
2.4 GHz	0.500	1.000	0.500	0.177	0.471	0.378	0.878	1	Pass
5.1 GHz	0.500	1.000	0.500	0.177	0.471	0.378	0.878	1	Pass
5.2 GHz	0.500	1.000	0.500	0.177	0.471	0.378	0.878	1	Pass
5.5 GHz	0.500	1.000	0.500	0.177	0.471	0.378	0.878	1	Pass
5.8 GHz	0.500	1.000	0.500	0.177	0.471	0.378	0.878	1	Pass
2.6 GHz	0.500	1.000	0.500	0.177	0.471	0.378	0.878	1	Pass

Table 7 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
2.4 GHz	0.500	1.000	0.500	0.222	0.55	0.428	0.928	1	Pass
5.1 GHz	0.500	1.000	0.500	0.222	0.55	0.428	0.928	1	Pass
5.2 GHz	0.500	1.000	0.500	0.222	0.55	0.428	0.928	1	Pass
5.5 GHz	0.500	1.000	0.500	0.222	0.55	0.428	0.928	1	Pass
5.8 GHz	0.500	1.000	0.500	0.222	0.55	0.428	0.928	1	Pass
2.6 GHz	0.500	1.000	0.500	0.222	0.55	0.428	0.928	1	Pass

Table 8 WWAN 1700 MHz Collocation Power Density

Band	WLAN Pd (mW/cm ²)	FCC MPE Limit (mW/cm ²)	(WLAN Pd) / (MPE Limit)	1700 MHz Pd (mW/cm ²)	FCC MPE Limit (mW/cm ²)	(WWAN 1700 MHz) / MPE Limit)	(1700 MHz WWAN fraction) + (WLAN fraction)	Limit	Pass/Fail
2.4 GHz	0.500	1.000	0.500	0.177	1.000	0.177	0.677	1	Pass
5.1 GHz	0.500	1.000	0.500	0.177	1.000	0.177	0.677	1	Pass
5.2 GHz	0.500	1.000	0.500	0.177	1.000	0.177	0.677	1	Pass
5.5 GHz	0.500	1.000	0.500	0.177	1.000	0.177	0.677	1	Pass
5.8 GHz	0.500	1.000	0.500	0.177	1.000	0.177	0.677	1	Pass
2.6 GHz	0.500	1.000	0.500	0.177	1.000	0.177	0.677	1	Pass

Table 9 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
2.4 GHz	0.500	1.000	0.500	0.112	1.000	0.112	0.612	1	Pass
5.1 GHz	0.500	1.000	0.500	0.112	1.000	0.112	0.612	1	Pass
5.2 GHz	0.500	1.000	0.500	0.112	1.000	0.112	0.612	1	Pass
5.5 GHz	0.500	1.000	0.500	0.112	1.000	0.112	0.612	1	Pass
5.8 GHz	0.500	1.000	0.500	0.112	1.000	0.112	0.612	1	Pass
2.6 GHz	0.500	1.000	0.500	0.112	1.000	0.112	0.612	1	Pass

6.3 Portable Simultaneous Transmission guidelines

Collocated transmitters can be operated simultaneously with the E371 module in portable configurations. Evaluations of the simultaneous transmitters will be applied against KDB 616217 D03 or KDB 447498 D01. These procedures apply to antennas in the display screen for laptop devices.

To reduce the possibility of SAR testing of simultaneous transmitters the following steps should be applied:

1. Antennas that are located < 5 cm from persons
 - i. Keep the closest antenna separation distance ≥ 5 cm for all simultaneous transmitting antennas within the host or device; and
 - ii. If available calculate the sum of the 1-g SAR to ensure it is < 1.6 W/kg for all simultaneous transmitting antennas that require stand-alone SAR evaluation; and
 - iii. The output power is $\leq 60/f(\text{GHz})$ mW for any simultaneous transmitting antenna(s) for which stand-alone SAR evaluation is not required.
2. Antennas that are located ≥ 5 cm from persons may require additional review and consultation by the FCC.

The operating and installation requirements, including restrictions, must be provided for OEM integrators and end users to comply with simultaneous transmission SAR requirements.

6.4 Portable Device Hosts: Sum of Total SAR < SAR Limit

A portable collocated transmitter can be operated simultaneously with the WWAN transmitter provided the individual SAR results for the portable collocated transmitter are less than the value specified below based on Section 4)a) of the Supp note for FCC KDB 616217 D03. The maximum individual SAR value is based on the worst case SAR recorded on the external antenna at 2.5cm (0.374 W/kg).

$$SAR_{collocated} \leq 1.6 - SAR_{WWAN}$$

$$SAR_{collocated} \leq 1.6 - 0.374W / kg$$

$$SAR_{collocated} \leq 1.226W / kg$$

6.5 Portable Device Hosts Sum of WWAN SAR + Collocated MPE <1

(Mobile Collocated transmitter with a portable transmitter)

For mobile collocated transmitters operating greater than 1 GHz, mobile collocated transmitter can be operated simultaneously with the portable WWAN transmitter, provided the individual MPE results for the mobile collocated transmitter are less than the value specified below based on Section 4)a) of FCC KDB 616217 D03. The maximum individual SAR value is based on the worst case SAR recorded on the test antenna at 2.5cm (0.374 W/kg).

$$\frac{SAR_{WWAN}}{1.6} + \frac{MPE_{collocated}}{1} \leq 1$$

$$MPE_{collocated} \leq 1 - \frac{SAR_{WWAN}}{1.6}$$

$$MPE_{collocated} \leq 0.766W / kg$$

6.6 Portable Device Hosts Max Collocated SAR Vs. Distance

If the summation of SAR exceeds the FCC limit, collocation is permitted through a Class I permissive change provided the minimum allowable separation distance derived from the equation below is satisfied. An alternate equation provides the maximum collocated SAR based on a specified separation distance. In addition, the sum of the highest MPE must be less than the corresponding MPE limit as defined in section 4. B) ii) of FCC KDB 616217 D03.

Minimum separation distance for Collocated Transmitters

$$5 * \left(\left[\frac{SAR_{WWAN} + SAR_{collocated}}{1.6} \right]^{1.5} \right) \leq Ant_Separation_{WWAN-to-Collocated}$$

Maximum collocated SAR vs distance

$$5 * \left(\left[\frac{SAR_{WWAN} + SAR_{collocated}}{1.6} \right]^{1.5} \right) \leq Ant_Separation_{WWAN-to-Collocated}$$

$$SAR_{collocated} = 1.6 * \left(\frac{Separation_{WWAN-to-Collocated}}{1.5} \right)^{\frac{2}{3}} - SAR_{WWAN}$$

7.0 Regulatory Statements - Federal Communications Commission Notice (FCC—United States)

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.
- Contact your service provider for help.

Notice to Consumers: Changes or modifications made to this equipment not expressly approved by Novatel Wireless may void the FCC authorization to operate this equipment.

This device complies with Part 15 of the FCC Rules and with Industry Canada ICES-003.

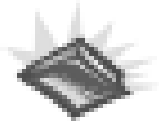
Operation is subject to the following two conditions:

1. this device may not cause harmful interference, and
2. this device must accept any interference received, including interference that may cause undesired operation.

The E371 is compliant to the relevant sections of the FCC rules:

- FCC CFR47 Part 2 (General Rules and Regulations, RF Exposure Evaluation)
- FCC CFR47 Part 15 (All Radio Frequency Devices)
- FCC CFR47 Part 24 (Narrow and wideband PCS modules)
- FCC CFR47 Part 22 (Cellular Service)
- FCCCFR47 Part 27 (Wireless Communications Services)

8.0 Technical Support Contacts



WWW: <http://www.nvtl.com/support/index.html>

Email: support@novatelwireless.com