



Harris® LTE

PBM-100 Band 14 PCI Express Mini Module

PBM-102 Band 14/12 PCI Express Mini Module



MANUAL REVISION HISTORY

REV	DATE	REASON FOR CHANGE
-	Nov/11	Initial release.
A	Dec/11	Minor corrections.
B	Jan/12	Modified sections 2.2.2 and 2.2.3.
C	Jan/12	Modified Section 3.3.

CREDITS

Harris and assuredcommunications are registered trademarks of Harris Corporation. All other brand and product names are trademarks, registered trademarks, or service marks of their respective owners.

NOTICE!

The material contained herein is subject to U.S. export approval. No export or re-export is permitted without written approval from the U.S. Government. Rated: EAR99; in accordance with U.S. Dept. of Commerce regulations 15CFR774, Export Administration Regulations.

Information and descriptions contained herein are the property of Harris Corporation. Such information and descriptions may not be copied or reproduced by any means, or disseminated or distributed without the express prior written permission of Harris Corporation, PSpC Business, 221 Jefferson Ridge Parkway, Lynchburg, VA 24501.

Repairs to this equipment should be made only by an authorized service technician or facility designated by the supplier. Any repairs, alterations or substitutions of recommended parts made by the user to this equipment not approved by the manufacturer could void the user's authority to operate the equipment in addition to the manufacturer's warranty.



This product conforms to the European Union WEEE Directive 2002/96/EC. Do not dispose of this product in a public landfill. Take it to a recycling center at the end of its life.

This manual is published by **Harris Corporation** without any warranty. Improvements and changes to this manual necessitated by typographical errors, inaccuracies of current information, or improvements to programs and/or equipment, may be made by **Harris Corporation** at any time and without notice. Such changes will be incorporated into new editions of this manual. No part of this manual may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying and recording, for any purpose, without the express written permission of **Harris Corporation**.

TABLE OF CONTENTS

<u>Section</u>	<u>Page</u>
1 INTRODUCTION.....	4
1.1 DESCRIPTION	4
1.2 SCOPE	4
2 REGULATORY AND SAFETY INFORMATION.....	5
2.1 REGULATORY APPROVALS	5
2.1.1 Transmitter	5
2.1.2 Receiver	5
2.1.3 FCC Compliance	5
2.1.4 Industry Canada	5
2.1.5 Labeling	6
2.2 RF ENERGY EXPOSURE INFORMATION	6
2.2.1 Maximum Permissible Exposure Limits	6
2.2.2 MPE Calculation for Mobile Device Installation	7
2.2.3 Maximum Allowed Antenna Gain	7
3 INSTALLATION GUIDELINES.....	8
3.1 INTRODUCTION	8
3.2 MOBILE HOST	8
3.3 PORTABLE HOST	8
3.4 COLLOCATED TRANSMITTERS	8
4 SPECIFICATIONS.....	9
4.1 GENERAL SPECIFICATIONS	9
4.2 TRANSMITTER SPECIFICATIONS.....	9
4.3 RECEIVER SPECIFICATIONS	9
5 CUSTOMER SERVICE.....	10
5.1 CUSTOMER CARE	10
5.2 TECHNICAL ASSISTANCE	10

FIGURES

Figure 1-1: PCI Express Mini (PEM) Module	4
Figure 2-1: FCC Labeling	6

TABLES

Table 2-1: MPE Limits.....	7
----------------------------	---

Harris Corporation, Public Safety and Professional Communications (PSPC) Business continually evaluates its technical publications for completeness, technical accuracy, and organization. You can assist in this process by submitting your comments and suggestions to the following:

Harris Corporation
PSPC Business
Technical Publications
221 Jefferson Ridge Parkway
Lynchburg, VA 24501

fax your comments to: 1-434-455-6851
or
e-mail us at: PSPC_TechPubs@harris.com

1 INTRODUCTION

1.1 DESCRIPTION

The PCI Express Mini (PEM) module functions as LTE User Equipment (UE) capable of interoperating with the Harris LTE network and is deployed by integrating into the current generation of laptop computers and mobile data terminals. The PEM is capable of dual-band operation supporting UMTS bands 14 and 12, and conforms to the PCI Express Mini specification as a Type F1 Full-Mini ($50.9 \times 30.0 \times 5.0 \text{ mm}^3$), as shown below, for integration into devices as a USB modem. The PEM card is a modular transmitter and is not shipped with antennas.



Figure 1-1: PCI Express Mini (PEM) Module

The module is supplied under two part product codes:

- The PBM-100 is a single LTE band device operating in 3GPP band 14 in the spectrum dedicated to public safety.
- The PBM-102 is a dual LTE band device which has the capability of operation in 3GPP band 14 and band 12.

1.2 SCOPE

This document outlines the use and installation guidelines for the PEM module into host devices.

2 REGULATORY AND SAFETY INFORMATION

2.1 REGULATORY APPROVALS

2.1.1 Transmitter

The transmitting devices listed below have been tested and meet the following regulatory requirements:

MODEL	DESCRIPTION	BW (MHz)	FCC ID (PART 90)	INDUSTRY CANADA (RSS-119)
PBM-100	700 MHz LTE B14 PEM Module	5	BV8BBPBM100	3670A-BBPBM100
PBM-102	700 MHz LTE B14/12 PEM Module	5 or 10		

2.1.2 Receiver

The receiver associated with this transmitting device has been tested and declared to meet the regulatory requirements.

2.1.3 FCC Compliance

This device complies with Part 15 of the FCC Rules. Operation is subject to the condition that this device does not cause harmful interference.

The user should take caution that changes or modifications not expressly approved by Harris could void the user's authority to operate this equipment. All required software and operating conditions must not be violated by the installer/user and is an express condition of use for this equipment.

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.
- Consult an experienced radio/TV technician for help.

2.1.4 Industry Canada

This Class B digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada.

The installer of this radio equipment must ensure that the antenna is located or pointed such that it does not emit RF field in excess of Health Canada limits for the general population; consult Safety Code 6, obtainable from Health Canada's website www.hc-sc.gc.ca/rpb.

2.1.5 Labeling

The FCC labeling of the PEM module is shown below. When integrating the module into a host, the label must be visible through a window, visible through an access panel that is easily removed, or a second label must be placed on the outside of the host device that contains the following text: Contains FCC ID: BV8BBPBM100. Labelling for Canada must include the following text: Contains IC: 3670A-BBPBM100.



Figure 2-1: FCC Labeling

2.2 RF ENERGY EXPOSURE INFORMATION

2.2.1 Maximum Permissible Exposure Limits

Mobile devices are defined by the FCC as transmitters with a separation distance of at least 20 centimeters between radiating structures and the body of the user. At least 20 centimeters of separation between the antenna and the users body must be maintained at all times.

The FCC defines portable devices as transmitters whose radiating structures are designed to be used within 20 centimeters of the body of the user. These portable devices are to be evaluated with respect to limits for specific absorption rate (SAR) and requires separate approval.

The Maximum Permissible Exposure (MPE) is based on a mobile device installation and is based on “Limits for General Population/Uncontrolled Exposure” as specified in FCC rules 47 CFR 1.1310. The limit for **Uncontrolled Exposure Power Density (P_d)** is 0.527 mW/cm^2 for UMTS Band 14 operation. . The limit for **Uncontrolled Exposure Power Density (P_d)** is 0.467 mW/cm^2 for UMTS Band 12 operation.

2.2.2 MPE Calculation for Mobile Device Installation

Given the limit for power density, we can calculate the maximum antenna gain allowed for use in a mobile installation. This MPE Maximum Gain Calculation is based on a mobile device antenna at a distance of 20 cm or greater between the radiating structure and the user. Friis transmission equation is used to perform the calculation.

Friis Transmission Equation:

$$p_r = \frac{P_T G_T}{4\pi R^2}$$

Rearranging the equation to solve for gain and substituting, the calculation indicates that the maximum gain allowed when operating in Band 14 is:

$$G_T = \frac{0.527 \frac{mW}{cm^2}}{316 mW} \cdot 4\pi (20 cm)^2$$

$$G_T = 9.23 dBi$$

Where:

G_T is the Maximum Antenna Gain

P_T is the Maximum Transmitted Power = 316 mW

p_r is the Maximum Received Power Density = 0.527 W/cm²

R is the Minimum Distance between User and Antenna = 20 cm

2.2.3 Maximum Allowed Antenna Gain

The following table summarizes the maximum gain allowed for use in mobile installations at each band of operation. When designing the antenna system for the PEM, the gain of the host antenna must not exceed these values.

Table 2-1: MPE Limits

UMTS Operating Band	Transmitter Frequency	Uncontrolled Exposure Power Density	Maximum Antenna Gain
12	700.5 MHz	0.467 mW/cm ²	8.71 dBi
14	790.5 MHz	0.527 mW/cm ²	9.23 dBi

3 INSTALLATION GUIDELINES

3.1 INTRODUCTION

Careful planning and preparation of any installation will always benefit the end result; always read and follow all installation instructions. Follow ESD precautions and prepare an ESD safe workspace for installation. Turn the power to the host off and ground yourself to dissipate static charge.

Mount only in sockets and locations intended for Type F1 Full-Mini cards and consult Harris on thermal management recommendations for the PEM mounted within the host.

All instructions relating to the integration of the module described on the FCC Grant notes must be followed.

3.2 MOBILE HOST

The PEM can be installed in host devices as a standalone transmitter where the distance between the antenna and the body of the user is greater than 20 centimeters and the antenna gain is less than the value shown in section 2.2.3. Labeling requirements are given in section 2.1.5.

3.3 PORTABLE HOST

In host devices where the distance between the antenna and the body of the user is equal to or less than 20 centimeters, the device must be evaluated using specific FCC and Industry Canada test procedures for SAR and requires separate approval. Users are required to consult with Harris for all portable installations.

3.4 COLLOCATED TRANSMITTERS

This module can be incorporated in mobile host devices containing other transmitters if:

- The separation among all simultaneous transmitting antennas is ≥ 20 cm.
- OR
- Antennas comply with MPE limits as specified in the application filing and simultaneously transmitting antennas must be ≥ 5 cm from each other.

As with any mobile installation, all antennas must be at least 20 cm from users and nearby persons.

All collocated transmitter installations must be evaluated by Harris.

4 SPECIFICATIONS

4.1 GENERAL SPECIFICATIONS

Model Number:

PBM-100/PBM-102

Physical Characteristics:

Electrical Power:	3.3 Vdc
Power Consumption:	3.5 Watts maximum
Size (H x W x D):	50.9 × 30.0 × 4.2 mm (2.0 x 1.18 x .17 in)
Weight:	13 g (.46 oz)

Environmental Specifications:

Operating Temperature:	-30°C to +60°C (-22°F to +140°F)
Storage Temperature:	-40°C to +85°C (-40°F to +185°F)
Altitude:	15,000 ft. (operational)

System Interfaces:

Host	PCI Express Mini (USB)
LTE	U.FL-R connector

4.2 TRANSMITTER SPECIFICATIONS

Frequency:	788 – 798 MHz, 698 – 716 MHz
Channel Bandwidth:	5 or 10 MHz
RF Power Output:	+23 dBm maximum
Output Power Control:	50 dB
FCC ID:	BV8BBPBM100
Industry Canada:	3670A-BBPBM100

4.3 RECEIVER SPECIFICATIONS

Frequency	758 – 768 MHz, 728 – 746 MHz
Channel Bandwidth:	5 or 10 MHz
Sensitivity (5MHz QPSK)	-97 dBm
Max RX Input Power:	-25 dBm
Max RX Input Power (no damage):	0 dBm

5 CUSTOMER SERVICE

5.1 CUSTOMER CARE

If any part of the system equipment is damaged on arrival, contact the shipper to conduct an inspection and prepare a damage report. Save the shipping container and all packing materials until the inspection and the damage report are completed. In addition, contact the Customer Care center to make arrangements for replacement equipment. Do not return any part of the shipment until you receive detailed instructions from a Harris representative.

Contact the Customer Care center at <http://www.pspc.harris.com/CustomerService> or:

North America:

Phone Number: 1-800-368-3277

Fax Number: 1-321-409-4393

E-mail: PSPC_CustomerFocus@harris.com

International:

Phone Number: 1-434-455-6403

Fax Number: 1-321-409-4394

E-mail: PSPC_InternationalCustomerFocus@harris.com

5.2 TECHNICAL ASSISTANCE

The Technical Assistance Center's (TAC) resources are available to help with overall system operation, maintenance, upgrades and product support. TAC is the point of contact when answers are needed to technical questions.

Product specialists, with detailed knowledge of product operation, maintenance and repair provide technical support via a toll-free (in North America) telephone number. Support is also available through mail, fax and e-mail.

For more information about technical assistance services, contact your sales representative, or call the Technical Assistance Center at:

North America: 1-800-528-7711

International: 1-434-385-2400

Fax: 1-434-455-6712

E-mail: PSPC_tac@harris.com

NOTES

