



LEGAL AND OPEN SOURCE GUIDE

PMP/PTP 450 Series

System Release 16.0.1

Covers:

PMP 450 AP / PMP 450 SM / PTP 450 BH / PMP 450d

PMP 450i / PTP 450i

PMP 450b / PTP 450b

PMP 450m



Accuracy

While reasonable efforts have been made to assure the accuracy of this document, Cambium Networks assumes no liability resulting from any inaccuracies or omissions in this document, or from use of the information obtained herein. Cambium reserves the right to make changes to any products described herein to improve reliability, function, or design, and reserves the right to revise this document and to make changes from time to time in content hereof with no obligation to notify any person of revisions or changes. Cambium does not assume any liability arising out of the application or use of any product, software, or circuit described herein; neither does it convey license under its patent rights or the rights of others. It is possible that this publication may contain references to, or information about Cambium products (machines and programs), programming, or services that are not announced in your country. Such references or information must not be construed to mean that Cambium intends to announce such Cambium products, programming, or services in your country.

Copyrights

This document, Cambium products, and 3rd Party software products described in this document may include or describe copyrighted Cambium and other 3rd Party supplied computer programs stored in semiconductor memories or other media. Laws in the United States and other countries preserve for Cambium, its licensors, and other 3rd Party supplied software certain exclusive rights for copyrighted material, including the exclusive right to copy, reproduce in any form, distribute and make derivative works of the copyrighted material. Accordingly, any copyrighted material of Cambium, its licensors, or the 3rd Party software supplied material contained in the Cambium products described in this document may not be copied, reproduced, reverse engineered, distributed, merged or modified in any manner without the express written permission of Cambium. Furthermore, the purchase of Cambium products shall not be deemed to grant either directly or by implication, estoppel, or otherwise, any license under the copyrights, patents or patent applications of Cambium or other 3rd Party supplied software, except for the normal non-exclusive, royalty free license to use that arises by operation of law in the sale of a product.

Restrictions

Software and documentation are copyrighted materials. Making unauthorized copies is prohibited by law. No part of the software or documentation may be reproduced, transmitted, transcribed, stored in a retrieval system, or translated into any language or computer language, in any form or by any means, without prior written permission of Cambium.

License Agreements

The software described in this document is the property of Cambium and its licensors. It is furnished by express license agreement only and may be used only in accordance with the terms of such an agreement.

High Risk Materials

Cambium and its supplier(s) specifically disclaim any express or implied warranty of fitness for any high risk activities or uses of its products including, but not limited to, the operation of nuclear facilities, aircraft navigation or aircraft communication systems, air traffic control, life support, or weapons systems ("High Risk Use"). Any "High Risk Use" is unauthorized, is made at your own risk and you shall be responsible for any and all losses, damage or claims arising out of any High Risk Use.

© 2019 Cambium Networks Limited. All Rights Reserved.

Contents

About This User Guide.....	1
Contacting Cambium Networks	1
Purpose	2
Cross references.....	2
Feedback	2
Important regulatory information	2
Application software	2
USA specific information	2
Canada specific information.....	3
Renseignements spécifiques au Canada.....	4
EU Declaration of Conformity	5
Specific expertise and training for professional installers	5
Ethernet networking skills	5
Lightning protection.....	5
Training	6
Problems and warranty.....	6
Reporting problems.....	6
Repair and service.....	6
Hardware warranty	6
Security advice	7
Warnings, cautions, and notes.....	7
Warnings.....	7
Cautions	7
Notes	8
Caring for the environment	8
In EU countries.....	8
In non-EU countries	9
Standard FCC notices	10
Cambium Networks end user license agreement.....	11
Definitions.....	11
Acceptance of this agreement	11
Grant of license.....	11
Conditions of use	11
Title and restrictions.....	12
Confidentiality	13
Right to use Cambium's name	13
Transfer	13
Updates.....	13

Maintenance	13
Disclaimer	14
Limitation of liability	14
U.S. government	14
Term of license	15
Governing law	15
Assignment	15
Survival of provisions	15
Entire agreement	15
Third party software	16
Net SNMP.....	16
OpenSSL	20
Zlib	21
Libpng	22
Bzip2.....	23
USB library functions.....	24
Apache	25
D3 JS library	29
Compliance with safety standards	30
Electrical safety compliance	30
Electromagnetic compatibility (EMC) compliance	30
Human exposure to radio frequency energy	31
Power density exposure limit.....	31
Calculated distances and power compliance margins	33
Hazardous location compliance	42
ATEX.....	42
Compliance with radio regulations	43
Type approvals	44
Brazil specific information	45
Brazil notification	45
Brazil certification numbers	45
Australia Notification.....	45
Regulatory Requirements for CEPT Member States (www.cept.org).....	45

List of Tables

Table 1 Safety compliance specifications.....	30
Table 2 EMC emissions compliance	30
Table 3 FCC minimum safe distances – PMP 450m 3 GHz and 5 GHz (5.1 GHz, 5.2 GHz, 5.4 GHz and 5.8 GHz).....	33
Table 4 FCC minimum safe distances – PMP/PTP 450b 4.9 GHz, 5.1 GHz, 5.2 GHz, 5.4 GHz and 5.8 GHz.....	34
Table 5 ISED minimum safe distances – PMP 450m 3GHz and 5 GHz (5.4 GHz and 5.8 GHz).....	34
Table 6 ISEDC minimum safe distances – PMP/PTP 450b 4.9 GHz, 5.1 GHz, 5.2 GHz, 5.4 GHz and 5.8 GHz.....	35
Table 7 FCC minimum safe distances – PMP/PTP 450i 900 MHz, 3.65 GHz, 4.9 GHz, 5.1 GHz, 5.2 GHz, 5.4 GHz and 5.8 GHz	36
Table 8 ISEDC minimum safe distances – PMP/PTP 450i, 900 MHz, 3.5 GHz, 3.65 GHz, 4.9 GHz, 5.2 GHz, 5.4 GHz, and 5.8 GHz.....	37
Table 9 FCC minimum safe distances – PMP/PTP 450 900 MHz, 2.4 GHz, 3.65 GHz and 5 GHz	39
Table 10 ISEDC minimum safe distance – PMP/PTP 450 900 MHz, 2.4 GHz, 3.5/3.65 GHz and 5 GHz	40
Table 11 Radio certifications	44

About This User Guide

This guide describes about the end user license agreements and regulatory notifications for 450 platform products. It is intended for use by the system designer, system installer and system administrator.

The following topics are described in this guide:

- [Cambium Networks end user license agreement](#) on page 11 contains the Cambium and third-party license agreements for the 450 Platform Family ODUs.
- [Compliance with safety standards](#) on page 30 lists the safety specifications against which the 450 Platform Family has been tested and certified. It also describes how to keep RF exposure within safe limits.
- [Compliance with radio regulations](#) on page 43 describes how the 450 Platform Family complies with the radio regulations that are in force in various countries, and contains notifications made to regulatory bodies for the 450 Platform Family.

Contacting Cambium Networks

Support website:	https://support.cambiumnetworks.com
Main website:	http://www.cambiumnetworks.com
Sales enquiries:	solutions@cambiumnetworks.com
Support enquiries:	https://support.cambiumnetworks.com
Repair enquiries:	https://support.cambiumnetworks.com
Telephone number list:	http://www.cambiumnetworks.com/contact
Address:	Cambium Networks Limited, Linhay Business Park, Eastern Road, Ashburton, Devon, TQ13 7UP United Kingdom

Purpose

Cambium Networks Point-to-Multi-Point (PMP)/Point-To-Point (PTP) 450 documents are intended to instruct and assist personnel in the operation, installation and maintenance of the Cambium PMP/PTP equipment and ancillary devices of 450 Platform Family. It is recommended that all personnel engaged in such activities be properly trained.

Cambium disclaims all liability whatsoever, implied or express, for any risk of damage, loss or reduction in system performance arising directly or indirectly out of the failure of the customer, or anyone acting on the customer's behalf, to abide by the instructions, system parameters, or recommendations made in this document.

Cross references

References to external publications are shown in italics. Other cross references, emphasized in blue text in electronic versions, are active links to the references.

This document is divided into numbered chapters that are divided into sections. Sections are not numbered but are individually named at the top of each page and are listed in the table of contents.

Feedback

We appreciate feedback from the users of our documents. This includes feedback on the structure, content, accuracy, or completeness of our documents. To provide feedback, visit our support website: <https://support.cambiumnetworks.com>.

Important regulatory information

The 450 Platform Family products are certified as an unlicensed device in frequency bands where it is not allowed to cause interference to licensed services (called primary users of the bands).

Application software

Download the latest 450 Platform Family software and install it in the Outdoor Units (ODUs) before deploying the equipment. Instructions for installing software are provided in *450 Platform Planning and Installation Guide*.

USA specific information

The USA Federal Communications Commission (FCC) requires manufacturers to implement special features to prevent interference to weather radar systems that operate in the band 5600 MHz to 5650 MHz. These features must be implemented in all products able to operate outdoors in the band 5470 MHz to 5725 MHz.

Manufacturers must ensure that such radio products cannot be configured to operate outside of FCC rules; specifically, it must not be possible to disable or modify the radar protection functions that have been demonstrated to the FCC.

Cambium supplies variants of the 5GHz 450, 450i, 450b, and 450m Series specifically for operation in the USA to comply with FCC requirements (KDB 905462 D02 UNII DFS Compliance Procedures New Rules v02). These variants are only allowed to operate with license keys that comply with FCC rules.

To ensure compliance when using PMP 450 Series and PTP 450 Series, follow the recommendation in [Avoidance of weather radars \(USA only\)](#).

External antennas

When using a connectorized version of the product, the conducted transmit power may need to be reduced to ensure the regulatory limit on transmitter EIRP is not exceeded. The installer must have an understanding of how to compute the effective antenna gain from the actual antenna gain and the feeder cable losses.

The range of permissible values for maximum antenna gain and feeder cable losses are included in this user guide together with a sample calculation. The product GUI automatically applies the correct conducted power limit to ensure that it is not possible for the installation to exceed the EIRP limit, when the appropriate values for antenna gain and feeder cable losses are entered into the GUI.

Avoidance of weather radars (USA only)

To comply with FCC rules (KDB 443999: Interim Plans to Approve UNII Devices Operating in the 5470 - 5725 MHz Band with Radar Detection and DFS Capabilities), units which are installed within 35 km (22 miles) of a Terminal Doppler Weather Radar (TDWR) system (or have a line of sight propagation path to such a system) must be configured to avoid any frequency within +30 MHz or -30 MHz of the frequency of the TDWR device. This requirement applies even if the master is outside the 35 km (22 miles) radius but communicates with outdoor clients which may be within the 35 km (22 miles) radius of the TDWRs. If interference is not eliminated, a distance limitation based on the line-of-sight from TDWR will need to be used. Devices with bandwidths greater than 20 MHz may require greater frequency separation.

When planning a link in the USA, visit <http://spectrumbridge.com/udia/home.aspx>, enter the location of the planned link and search for TDWR radars. If a TDWR system is located within 35 km (22 miles) or has line of sight propagation to the PTP device, perform the following tasks:

- Register the installation on <http://spectrumbridge.com/udia/home.aspx>.
- Make a list of channel center frequencies that must be barred, that is, those falling within +30 MHz or -30 MHz of the frequency of the TDWR radars.

The 450 Platform Family AP must be configured to not operate on the affected channels.

Canada specific information



Caution

This device complies with ISED's license-exempt RSSs. Operation is subject to the following two conditions:

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

ISED requires manufacturers to implement special features to prevent interference to weather radar systems that operate in the band 5600 MHz to 5650 MHz. These features must be implemented in all products able to operate outdoors in the band 5470 MHz to 5725 MHz.

Manufacturers must ensure that such radio products cannot be configured to operate outside of ISED rules; specifically it must not be possible to disable or modify the radar protection functions that have been demonstrated to ISED.

In order to comply with these ISED requirements, Cambium supplies variants of the 450 Platform Family for operation in Canada. These variants are only allowed to operate with license keys that comply with ISED rules. In particular, operation of radio channels overlapping the band 5600 MHz to 5650 MHz is not allowed and these channels are permanently barred.

In addition, other channels may also need to be barred when operating close to weather radar installations.

Other variants of the 450 Platform Family are available for use in the rest of the world, but these variants are not supplied to Canada except under strict controls, when they are needed for export and deployment outside Canada.

Renseignements spécifiques au Canada



Attention

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes :

- (1) l'appareil ne doit pas produire de brouillage, et
- (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

ISED a demandé aux fabricants de mettre en œuvre des mécanismes spécifiques pour éviter d'interférer avec des systèmes radar fonctionnant dans la bande 5600 MHz à 5650 MHz. Ces mécanismes doivent être mis en œuvre dans tous les produits capables de fonctionner à l'extérieur dans la bande 5470 MHz à 5725 MHz.

Les fabricants doivent s'assurer que les produits de radiocommunications ne peuvent pas être configurés pour fonctionner en dehors des règles ISED, en particulier, il ne doit pas être possible de désactiver ou modifier les fonctions de protection des radars qui ont été démontrés à ISED.

Afin de se conformer à ces exigences de ISED, Cambium fournit des variantes du 450 Platform Family exclusivement pour le Canada. Ces variantes ne permettent pas à l'équipement de fonctionner en dehors des règles de ISED. En particulier, le fonctionnement des canaux de radio qui chevauchent la bande 5600-5650 MHz est interdite et ces canaux sont définitivement exclus.

ISED Approved Antennas

The list of antennas used to obtain ISED approvals is provided in section Reference Information of *450 Platform Configuration Guide*.

Antennas externes

Lorsque vous utilisez une version du produit sans antenne intégrée, il peut être nécessaire de réduire la puissance d'émission pour garantir que la limite réglementaire de puissance isotrope rayonnée équivalente (PIRE) n'est pas dépassée. L'installateur doit avoir une bonne compréhension de la façon de calculer le gain de l'antenne réelle et les pertes dans les câbles de connections.

La plage de valeurs admissibles pour un gain maximal de l'antenne et des pertes de câbles de connections sont inclus dans ce guide d'utilisation avec un exemple de calcul. L'interface utilisateur du produit applique automatiquement la limite de puissance menée correct afin de s'assurer qu'il ne soit pas possible pour l'installation de dépasser la limite PIRE, lorsque les valeurs appropriées pour le gain d'antenne et les pertes de câbles d'alimentation sont entrées dans l'interface utilisateur.

Antennes approuvées par ISED

La liste des antennes approuvées pour l'opération au Canada est fournie dans le *450 Platform Configuration Guide*.

EU Declaration of Conformity

Hereby, Cambium Networks declares that the Cambium 450 Series, 450i Series and 450m Series Wireless Ethernet Bridge complies with the essential requirements and other relevant provisions of Radio Equipment Directive 2014/53/EU. The declaration of conformity may be consulted at:

https://www.cambiumnetworks.com/eu_dofc

Specific expertise and training for professional installers

To ensure that the 450 Platform Family products – PMP/PTP 450 Series, PMP/PTP 450i Series, PMP 450m Series are installed and configured in compliance with the requirements of ISED and the FCC, installers must have the radio engineering skills and training described in this section.

The Cambium Networks technical training program details can be accessed from below link:

<https://www.cambiumnetworks.com/training/>

Ethernet networking skills

The installer must have the ability to configure IP addressing on a PC and to set up and control products using a web browser interface.

Lightning protection

To protect outdoor radio installations from the impact of lightning strikes, the installer must be familiar with the normal procedures for site selection, bonding and grounding. Installation guidelines for the 450 Platform Family can be found in *450 Platform Planning and Installation Guide*.

Training

The installer needs to have basic competence in radio and IP network installation. The specific requirements applicable to the 450 Platform should be gained by reading:

- Chapter 4: Preparing for installation and Chapter 5: Installation of 450 Platform Planning and Installation Guide,
- Chapter 1: Configuration, Chapter 2: Tools, and Chapter 3: Operation of 450 Platform Configuration Guide,
- And by performing sample set ups at base workshop before live deployments.

The Cambium Networks technical training program details can be accessed from below link:

<https://www.cambiumnetworks.com/training/>

Problems and warranty

Reporting problems

If any problems are encountered when installing or operating this equipment, follow this procedure to investigate and report:

- 1 Search this document and the software release notes of supported releases.
- 2 Visit the support website.
- 3 Ask for assistance from the Cambium product supplier.
- 4 Gather information from affected units, such as any available diagnostic downloads.
- 5 Escalate the problem by emailing or telephoning support.

Repair and service

If unit failure is suspected, obtain details of the Return Material Authorization (RMA) process from the support website (<http://www.cambiumnetworks.com/support>).

Hardware warranty

Cambium's standard hardware warranty is for one (1) year from date of shipment from Cambium Networks or a Cambium distributor. Cambium Networks warrants that hardware will conform to the relevant published specifications and will be free from material defects in material and workmanship under normal use and service. Cambium shall within this time, at its own option, either repair or replace the defective product within thirty (30) days of receipt of the defective product. Repaired or replaced product will be subject to the original warranty period but not less than thirty (30) days.

To register PMP and PTP products or activate warranties, visit the support website. For warranty assistance, contact the reseller or distributor. The removal of the tamper-evident seal will void the warranty.

**Caution**

Using non-Cambium parts for repair could damage the equipment or void warranty. Contact Cambium for service and repair instructions.

Portions of Cambium equipment may be damaged from exposure to electrostatic discharge. Use precautions to prevent damage.

Security advice

Cambium Networks systems and equipment provide security parameters that can be configured by the operator based on their particular operating environment. Cambium recommends setting and using these parameters following industry recognized security practices. Security aspects to be considered are protecting the confidentiality, integrity, and availability of information and assets. Assets include the ability to communicate, information about the nature of the communications, and information about the parties involved. In certain instances, Cambium makes specific recommendations regarding security practices, however the implementation of these recommendations and final responsibility for the security of the system lies with the operator of the system.

Warnings, cautions, and notes

The following describes how warnings and cautions are used in this document and in all documents of the Cambium Networks document set.

Warnings

Warnings precede instructions that contain potentially hazardous situations. Warnings are used to alert the reader to possible hazards that could cause loss of life or physical injury. A warning has the following format:

**Warning**

Warning text and consequence for not following the instructions in the warning.

Cautions

Cautions precede instructions and are used when there is a possibility of damage to systems, software, or individual items of equipment within a system. However, this damage presents no danger to personnel. A caution has the following format:

**Caution**

Caution text and consequence for not following the instructions in the caution.

Notes

A note means that there is a possibility of an undesirable situation or provides additional information to help the reader understand a topic or concept. A note has the following format:

**Note**

Note text.

Caring for the environment

The following information describes national or regional requirements for the disposal of Cambium Networks supplied equipment and for the approved disposal of surplus packaging.

In EU countries

The following information is provided to enable regulatory compliance with the European Union (EU) directives identified and any amendments made to these directives when using Cambium equipment in EU countries.



Disposal of Cambium equipment

European Union (EU) Directive 2012/19/EU Waste Electrical and Electronic Equipment (WEEE)

Do not dispose of Cambium equipment in landfill sites. For disposal instructions, refer to

<https://www.cambiumnetworks.com/support/compliance/>

Disposal of surplus packaging

Do not dispose of surplus packaging in landfill sites. In the EU, it is the individual recipient's responsibility to ensure that packaging materials are collected and recycled according to the requirements of EU environmental law.

In non-EU countries

In non-EU countries, dispose of Cambium equipment and all surplus packaging in accordance with national and regional regulations.

Standard FCC notices

15.19:

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 UNDESIRE OPERATION.

15.21:

The user manual for an intentional or unintentional radiator shall caution the user that changes, or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

(SAMPLE)

NOTE: THE GRANTEE IS NOT RESPONSIBLE FOR ANY CHANGES OR MODIFICATIONS NOT EXPRESSLY APPROVED BY THE PARTY RESPONSIBLE FOR COMPLIANCE. SUCH MODIFICATIONS COULD VOID THE USER'S AUTHORITY TO OPERATE THE EQUIPMENT.

15.105 (b):

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, 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.

Cambium Networks end user license agreement

Definitions

In this Agreement, the word “Software” refers to the set of instructions for computers, in executable form and in any media, (which may include diskette, CD-ROM, downloadable internet, hardware, or firmware) licensed to you. The word “Documentation” refers to electronic or printed manuals and accompanying instructional aids licensed to you. The word “Product” refers to Cambium Networks’ fixed wireless broadband devices for which the Software and Documentation is licensed for use.

Acceptance of this agreement

In connection with Cambium Networks’ delivery of certain proprietary software or products containing embedded or pre-loaded proprietary software, or both, Cambium Networks is willing to license this certain proprietary software and the accompanying documentation to you only on the condition that you accept all the terms in this End User License Agreement (“Agreement”).

IF YOU DO NOT AGREE TO THE TERMS OF THIS AGREEMENT, DO NOT USE THE PRODUCT OR INSTALL THE SOFTWARE. INSTEAD, YOU MAY, FOR A FULL REFUND, RETURN THIS PRODUCT TO THE LOCATION WHERE YOU ACQUIRED IT OR PROVIDE WRITTEN VERIFICATION OF DELETION OF ALL COPIES OF THE SOFTWARE. ANY USE OF THE SOFTWARE, INCLUDING BUT NOT LIMITED TO USE ON THE PRODUCT, WILL CONSTITUTE YOUR ACCEPTANCE TO THE TERMS OF THIS AGREEMENT.

Grant of license

Cambium Networks Limited (“Cambium”) grants you (“Licensee” or “you”) a personal, nonexclusive, non-transferable license to use the Software and Documentation subject to the Conditions of Use set forth in “**Conditions of use**” and the terms and conditions of this Agreement. Any terms or conditions relating to the Software and Documentation appearing on the face or reverse side of any purchase order, purchase order acknowledgment or other order document that are different from, or in addition to, the terms of this Agreement will not be binding on the parties, even if payment is accepted.

Conditions of use

Any use of the Software and Documentation outside of the conditions set forth in this Agreement is strictly prohibited and will be deemed a breach of this Agreement.

1. Only you, your employees or agents may use the Software and Documentation. You will take all necessary steps to ensure that your employees and agents abide by the terms of this Agreement.
2. You will use the Software and Documentation (i) only for your internal business purposes; (ii) only as described in the Software and Documentation; and (iii) in strict accordance with this Agreement.

3. You may use the Software and Documentation, provided that the use is in conformance with the terms set forth in this Agreement.
4. Portions of the Software and Documentation are protected by United States copyright laws, international treaty provisions, and other applicable laws. Therefore, you must treat the Software like any other copyrighted material (for example, a book or musical recording) except that you may either: (i) make 1 copy of the transportable part of the Software (which typically is supplied on diskette, CD-ROM, or downloadable internet), solely for back-up purposes; or (ii) copy the transportable part of the Software to a PC hard disk, provided you keep the original solely for back-up purposes. If the Documentation is in printed form, it may not be copied. If the Documentation is in electronic form, you may print out 1 copy, which then may not be copied. With regard to the copy made for backup or archival purposes, you agree to reproduce any Cambium Networks copyright notice, and other proprietary legends appearing thereon. Such copyright notice(s) may appear in any of several forms, including machine-readable form, and you agree to reproduce such notice in each form in which it appears, to the extent it is physically possible to do so. Unauthorized duplication of the Software or Documentation constitutes copyright infringement, and in the United States is punishable in federal court by fine and imprisonment.
5. You will not transfer, directly or indirectly, any product, technical data or software to any country for which the United States Government requires an export license or other governmental approval without first obtaining such license or approval.

Title and restrictions

If you transfer possession of any copy of the Software and Documentation to another party outside of the terms of this agreement, your license is automatically terminated. Title and copyrights to the Software and Documentation and any copies made by you remain with Cambium Networks and its licensors. You will not, and will not permit others to: (i) modify, translate, decompile, bootleg, reverse engineer, disassemble, or extract the inner workings of the Software or Documentation, (ii) copy the look-and-feel or functionality of the Software or Documentation; (iii) remove any proprietary notices, marks, labels, or logos from the Software or Documentation; (iv) rent or transfer all or some of the Software or Documentation to any other party without Cambium's prior written consent; or (v) utilize any computer software or hardware which is designed to defeat any copy protection device, should the Software and Documentation be equipped with such a protection device. If the Software and Documentation is provided on multiple types of media (such as diskette, CD-ROM, downloadable internet), then you will only use the medium which best meets your specific needs, and will not loan, rent, lease, or transfer the other media contained in the package without Cambium's written consent. Unauthorized copying of the Software or Documentation, or failure to comply with any of the provisions of this Agreement, will result in automatic termination of this license.

Confidentiality

You acknowledge that all Software and Documentation contain valuable proprietary information and trade secrets and that unauthorized or improper use of the Software and Documentation will result in irreparable harm to Cambium Networks for which monetary damages would be inadequate and for which Cambium Networks will be entitled to immediate injunctive relief. If applicable, you will limit access to the Software and Documentation to those of your employees and agents who need to use the Software and Documentation for your internal business purposes, and you will take appropriate action with those employees and agents to preserve the confidentiality of the Software and Documentation, using the same degree of care to avoid unauthorized or improper disclosure as you use for the protection of your own proprietary software, but in no event less than reasonable care.

You have no obligation to preserve the confidentiality of any proprietary information that: (i) was in the public domain at the time of disclosure; (ii) entered the public domain through no fault of yours; (iii) was given to you free of any obligation to keep it confidential; (iv) is independently developed by you; or (v) is disclosed as required by law provided that you notify Cambium Networks prior to such disclosure and provide Cambium Networks with a reasonable opportunity to respond.

Right to use Cambium's name

Except as required in “**Conditions of use**”, you will not, during the term of this Agreement or thereafter, use any trademark of Cambium Networks, or any word or symbol likely to be confused with any Cambium Networks trademark, either alone or in any combination with another word or words.

Transfer

The Software and Documentation may not be transferred to another party without the express written consent of Cambium Networks, regardless of whether or not such transfer is accomplished by physical or electronic means. Cambium's consent may be withheld at its discretion and may be conditioned upon transferee paying all applicable license fees and agreeing to be bound by this Agreement.

Updates

During the first 12 months after purchase of a Product, or during the term of any executed Maintenance and Support Agreement for the Product, you are entitled to receive Updates. An “Update” means any code in any form which is a bug fix, patch, error correction, or minor enhancement, but excludes any major feature added to the Software. Updates are available for download at the support website.

Major features may be available from time to time for an additional license fee. If Cambium Networks makes available to your major features and no other end user license agreement is provided, then the terms of this Agreement will apply.

Maintenance

Except as provided above, Cambium Networks is not responsible for maintenance or field service of the Software under this Agreement.

Disclaimer

CAMBIUM NETWORKS DISCLAIMS ALL WARRANTIES OF ANY KIND, WHETHER EXPRESS, IMPLIED, STATUTORY, OR IN ANY COMMUNICATION WITH YOU. CAMBIUM NETWORKS SPECIFICALLY DISCLAIMS ANY WARRANTY INCLUDING THE IMPLIED WARRANTIES OF MERCHANTABILITY, NONINFRINGEMENT, OR FITNESS FOR A PARTICULAR PURPOSE. THE SOFTWARE AND DOCUMENTATION ARE PROVIDED “AS IS.” CAMBIUM NETWORKS DOES NOT WARRANT THAT THE SOFTWARE WILL MEET YOUR REQUIREMENTS, OR THAT THE OPERATION OF THE SOFTWARE WILL BE UNINTERRUPTED OR ERROR FREE, OR THAT DEFECTS IN THE SOFTWARE WILL BE CORRECTED. CAMBIUM NETWORKS MAKES NO WARRANTY WITH RESPECT TO THE CORRECTNESS, ACCURACY, OR RELIABILITY OF THE SOFTWARE AND DOCUMENTATION. Some jurisdictions do not allow the exclusion of implied warranties, so the above exclusion may not apply to you.

Limitation of liability

IN NO EVENT SHALL CAMBIUM NETWORKS BE LIABLE TO YOU OR ANY OTHER PARTY FOR ANY DIRECT, INDIRECT, GENERAL, SPECIAL, INCIDENTAL, CONSEQUENTIAL, EXEMPLARY OR OTHER DAMAGE ARISING OUT OF THE USE OR INABILITY TO USE THE PRODUCT (INCLUDING, WITHOUT LIMITATION, DAMAGES FOR LOSS OF BUSINESS PROFITS, BUSINESS INTERRUPTION, LOSS OF BUSINESS INFORMATION OR ANY OTHER PECUNIARY LOSS, OR FROM ANY BREACH OF WARRANTY, EVEN IF CAMBIUM NETWORKS HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. (Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above exclusion or limitation may not apply to you.) IN NO CASE SHALL CAMBIUM’S LIABILITY EXCEED THE AMOUNT YOU PAID FOR THE PRODUCT.

U.S. government

If you are acquiring the Product on behalf of any unit or agency of the U.S. Government, the following applies. Use, duplication, or disclosure of the Software and Documentation is subject to the restrictions set forth in subparagraphs (c) (1) and (2) of the Commercial Computer Software – Restricted Rights clause at FAR 52.227-19 (JUNE 1987), if applicable, unless being provided to the Department of Defense. If being provided to the Department of Defense, use, duplication, or disclosure of the Products is subject to the restricted rights set forth in subparagraph (c) (1) (ii) of the Rights in Technical Data and Computer Software clause at DFARS 252.227-7013 (OCT 1988), if applicable. Software and Documentation may or may not include a Restricted Rights notice, or other notice referring specifically to the terms and conditions of this Agreement. The terms and conditions of this Agreement will each continue to apply, but only to the extent that such terms and conditions are not inconsistent with the rights provided to you under the aforementioned provisions of the FAR and DFARS, as applicable to the particular procuring agency and procurement transaction.

Term of license

Your right to use the Software will continue in perpetuity unless terminated as follows. Your right to use the Software will terminate immediately without notice upon a breach of this Agreement by you. Within 30 days after termination of this Agreement, you will certify to Cambium Networks in writing that through your best efforts, and to the best of your knowledge, the original and all copies, in whole or in part, in any form, of the Software and all related material and Documentation, have been destroyed, except that, with prior written consent from Cambium Networks, you may retain one copy for archival or backup purposes. You may not sublicense, assign or transfer the license or the Product, except as expressly provided in this Agreement. Any attempt to otherwise sublicense, assign or transfer any of the rights, duties or obligations hereunder is null and void.

Governing law

This Agreement is governed by the laws of the United States of America to the extent that they apply and otherwise by the laws of the State of Illinois.

Assignment

This agreement may not be assigned by you without Cambium's prior written consent.

Survival of provisions

The parties agree that where the context of any provision indicates an intent that it survives the term of this Agreement, then it will survive.

Entire agreement

This agreement contains the parties' entire agreement regarding your use of the Software and may be amended only in writing signed by both parties, except that Cambium Networks may modify this Agreement as necessary to comply with applicable laws.

Third party software

The software may contain one or more items of Third-Party Software supplied by other third-party suppliers. The terms of this Agreement govern your use of any Third-Party Software UNLESS A SEPARATE THIRD-PARTY SOFTWARE LICENSE IS INCLUDED, IN WHICH CASE YOUR USE OF THE THIRD-PARTY SOFTWARE WILL THEN BE GOVERNED BY THE SEPARATE THIRD-PARTY LICENSE.

Net SNMP

Various copyrights apply to this package, listed in various separate parts below. Please make sure that you read all the parts.

---- Part 1: CMU/UCD copyright notice: (BSD like) ----

Copyright 1989, 1991, 1992 by Carnegie Mellon University

Derivative Work - 1996, 1998-2000

Copyright 1996, 1998-2000 The Regents of the University of California

All Rights Reserved

Permission to use, copy, modify and distribute this software and its documentation for any purpose and without fee is hereby granted, provided that the above copyright notice appears in all copies and that both that copyright notice and this permission notice appear in supporting documentation, and that the name of CMU and The Regents of the University of California not be used in advertising or publicity pertaining to distribution of the software without specific written permission.

CMU AND THE REGENTS OF THE UNIVERSITY OF CALIFORNIA DISCLAIM ALL WARRANTIES WITH REGARD TO THIS SOFTWARE, INCLUDING ALL IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS. IN NO EVENT SHALL CMU OR THE REGENTS OF THE UNIVERSITY OF CALIFORNIA BE LIABLE FOR ANY SPECIAL, INDIRECT OR CONSEQUENTIAL DAMAGES OR ANY DAMAGES WHATSOEVER RESULTING FROM THE LOSS OF USE, DATA OR PROFITS, WHETHER IN AN ACTION OF CONTRACT, NEGLIGENCE OR OTHER TORTIOUS ACTION, ARISING OUT OF OR IN CONNECTION WITH THE USE OR PERFORMANCE OF THIS SOFTWARE.

---- Part 2: Networks Associates Technology, Inc copyright notice (BSD) ----

Copyright © 2001-2003, Networks Associates Technology, Inc

All rights reserved.

Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:

- Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimer.
- Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution.
- Neither the name of the Networks Associates Technology, Inc nor the names of its contributors may be used to endorse or promote products derived from this software without specific prior written permission.

THIS SOFTWARE IS PROVIDED BY THE COPYRIGHT HOLDERS AND CONTRIBUTORS "AS IS" AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE COPYRIGHT HOLDERS OR CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

---- Part 3: Cambridge Broadband Ltd. copyright notice (BSD) ----

Portions of this code are copyright © 2001-2003, Cambridge Broadband Ltd.

All rights reserved.

Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:

- Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimer.
- Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution.
- The name of Cambridge Broadband Ltd. may not be used to endorse or promote products derived from this software without specific prior written permission.

THIS SOFTWARE IS PROVIDED BY THE COPYRIGHT HOLDER "AS IS" AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE COPYRIGHT HOLDER BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

---- Part 4: Sun Microsystems, Inc. copyright notice (BSD) ----

Copyright © 2003 Sun Microsystems, Inc., 4150 Network Circle, Santa Clara,
California 95054, U.S.A. All rights reserved.

Use is subject to license terms below.

This distribution may include materials developed by third parties.

Sun, Sun Microsystems, the Sun logo and Solaris are trademarks or registered trademarks of Sun Microsystems, Inc. in the U.S. and other countries.

Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:

- Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimer.
- Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution.

- Neither the name of the Sun Microsystems, Inc. nor the names of its contributors may be used to endorse or promote products derived from this software without specific prior written permission.

THIS SOFTWARE IS PROVIDED BY THE COPYRIGHT HOLDERS AND CONTRIBUTORS "AS IS" AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE COPYRIGHT HOLDERS OR CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

---- Part 5: Sparta, Inc copyright notice (BSD) ----

Copyright © 2003-2008, Sparta, Inc

All rights reserved.

Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:

- Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimer.
- Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution.
- Neither the name of Sparta, Inc nor the names of its contributors may be used to endorse or promote products derived from this software without specific prior written permission.

THIS SOFTWARE IS PROVIDED BY THE COPYRIGHT HOLDERS AND CONTRIBUTORS "AS IS" AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE COPYRIGHT HOLDERS OR CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

---- Part 6: Cisco/BUPTNIC copyright notice (BSD) ----

Copyright © 2004, Cisco, Inc and Information Network

Center of Beijing University of Posts and Telecommunications.

All rights reserved.

Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:

- Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimer.
- Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution.

- Neither the name of Cisco, Inc, Beijing University of Posts and Telecommunications, nor the names of their contributors may be used to endorse or promote products derived from this software without specific prior written permission.

THIS SOFTWARE IS PROVIDED BY THE COPYRIGHT HOLDERS AND CONTRIBUTORS "AS IS" AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE COPYRIGHT HOLDERS OR CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

---- Part 7: Fabasoft R&D Software GmbH & Co KG copyright notice (BSD) ----

Copyright © Fabasoft R&D Software GmbH & Co KG, 2003

oss@fabasoft.com

Author: Bernhard Penz

Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:

- Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimer.
- Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution.
- The name of Fabasoft R&D Software GmbH & Co KG or any of its subsidiaries, brand or product names may not be used to endorse or promote products derived from this software without specific prior written permission.

THIS SOFTWARE IS PROVIDED BY THE COPYRIGHT HOLDER "AS IS" AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE COPYRIGHT HOLDER BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

OpenSSL

Copyright (c) 1998-2008 The OpenSSL Project. All rights reserved.

Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:

1. Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimer.
2. Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution.
3. All advertising materials mentioning features or use of this software must display the following acknowledgment:

“This product includes software developed by the OpenSSL Project for use in the OpenSSL Toolkit.
(<http://www.openssl.org/>)”

4. The names “OpenSSL Toolkit” and “OpenSSL Project” must not be used to endorse or promote products derived from this software without prior written permission. For written permission, please contact openssl-core@openssl.org.

5. Products derived from this software may not be called “OpenSSL” nor may “OpenSSL” appear in their names without prior written permission of the OpenSSL Project.

6. Redistributions of any form whatsoever must retain the following acknowledgment:

“This product includes software developed by the OpenSSL Project for use in the OpenSSL Toolkit
(<http://www.openssl.org/>)”

THIS SOFTWARE IS PROVIDED BY THE OpenSSL PROJECT “AS IS” AND ANY EXPRESSED OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE OpenSSL PROJECT OR ITS CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

This product includes cryptographic software written by Eric Young (eay@cryptsoft.com). This product includes software written by Tim Hudson (tjh@cryptsoft.com).

Original SSLeay License

Copyright © 1995-1998 Eric Young (eay@cryptsoft.com)

All rights reserved.

This package is an SSL implementation written by Eric Young (eay@cryptsoft.com). The implementation was written so as to conform with Netscapes SSL.

This library is free for commercial and non-commercial use as long as the following conditions are adhered to. The following conditions apply to all code found in this distribution, be it the RC4, RSA, lhash, DES, etc., code; not just the SSL code. The SSL documentation included with this distribution is covered by the same copyright terms except that the holder is Tim Hudson (tjh@cryptsoft.com).

Copyright remains Eric Young's, and as such any Copyright notices in the code are not to be removed.

If this package is used in a product, Eric Young should be given attribution as the author of the parts of the library used. This can be in the form of a textual message at program startup or in documentation (online or textual) provided with the package.

Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:

1. Redistributions of source code must retain the copyright notice, this list of conditions and the following disclaimer.
2. Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution.
3. All advertising materials mentioning features or use of this software must display the following acknowledgement:

"This product includes cryptographic software written by Eric Young (eay@cryptsoft.com)"

The word 'cryptographic' can be left out if the routines from the library being used are not cryptographic related.

4. If you include any Windows specific code (or a derivative thereof) from the apps directory (application code) you must include an acknowledgement:

"This product includes software written by Tim Hudson (tjh@cryptsoft.com)"

THIS SOFTWARE IS PROVIDED BY ERIC YOUNG "AS IS" AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE AUTHOR OR CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

The license and distribution terms for any publically available version or derivative of this code cannot be changed. i.e. this code cannot simply be copied and put under another distribution license [including the GNU Public License.]

Zlib

Copyright © 1995-2005 Jean-loup Gailly and Mark Adler

This software is provided 'as-is', without any express or implied warranty. In no event will the authors be held liable for any damages arising from the use of this software.

Permission is granted to anyone to use this software for any purpose, including commercial applications, and to alter it and redistribute it freely, subject to the following restrictions:

1. The origin of this software must not be misrepresented; you must not claim that you wrote the original software. If you use this software in a product, an acknowledgment in the product documentation would be appreciated but is not required.

2. Altered source versions must be plainly marked as such, and must not be misrepresented as being the original software.

3. This notice may not be removed or altered from any source distribution.

Jean-loup Gailly jloup@gzip.org

Mark Adler madler@alumni.caltech.edu

Libpng

libpng versions 1.2.6, August 15, 2004, through 1.2.35, February 14, 2009, are Copyright © 2004, 2006-2008 Glenn Randers-Pehrson, and are distributed according to the same disclaimer and license as libpng-1.2.5 with the following individual added to the list of Contributing Authors

Cosmin Truta

libpng versions 1.0.7, July 1, 2000, through 1.2.5 - October 3, 2002, are Copyright © 2000-2002 Glenn Randers-Pehrson, and are distributed according to the same disclaimer and license as libpng-1.0.6 with the following individuals added to the list of Contributing Authors

Simon-Pierre Cadieux

Eric S. Raymond

Gilles Vollant

and with the following additions to the disclaimer:

There is no warranty against interference with your enjoyment of the library or against infringement. There is no warranty that our efforts or the library will fulfil any of your particular purposes or needs. This library is provided with all faults, and the entire risk of satisfactory quality, performance, accuracy, and effort is with the user.

libpng versions 0.97, January 1998, through 1.0.6, March 20, 2000, are Copyright © 1998, 1999 Glenn Randers-Pehrson, and are distributed according to the same disclaimer and license as libpng-0.96, with the following individuals added to the list of Contributing Authors:

Tom Lane

Glenn Randers-Pehrson

Willem van Schaik

libpng versions 0.89, June 1996, through 0.96, May 1997, are Copyright © 1996, 1997 Andreas Dilger

Distributed according to the same disclaimer and license as libpng-0.88, with the following individuals added to the list of Contributing Authors:

John Bowler

Kevin Bracey

Sam Bushell

Magnus Holmgren

Greg Roelofs

Tom Tanner

libpng versions 0.5, May 1995, through 0.88, January 1996, are Copyright © 1995, 1996 Guy Eric Schalnat, Group 42, Inc.

For the purposes of this copyright and license, “Contributing Authors” is defined as the following set of individuals:

Andreas Dilger

Dave Martindale

Guy Eric Schlnat

Paul Schmidt

Tim Wegner

The PNG Reference Library is supplied “AS IS”. The Contributing Authors and Group 42, Inc. disclaim all warranties, expressed or implied, including, without limitation, the warranties of merchantability and of fitness for any purpose. The Contributing Authors and Group 42, Inc. assume no liability for direct, indirect, incidental, special, exemplary, or consequential damages, which may result from the use of the PNG Reference Library, even if advised of the possibility of such damage.

Permission is hereby granted to use, copy, modify, and distribute this source code, or portions hereof, for any purpose, without fee, subject to the following restrictions:

1. The origin of this source code must not be misrepresented.
2. Altered versions must be plainly marked as such and must not be misrepresented as being the original source.
3. This Copyright notice may not be removed or altered from any source or altered source distribution.

The Contributing Authors and Group 42, Inc. specifically permit, without fee, and encourage the use of this source code as a component to supporting the PNG file format in commercial products. If you use this source code in a product, acknowledgment is not required but would be appreciated.

A “png_get_copyright” function is available, for convenient use in “about” boxes and the like:

```
printf("%s",png_get_copyright(NULL));
```

Also, the PNG logo (in PNG format, of course) is supplied in the files “pngbar.png” and “pngbar.jpg (88x31) and “pngnow.png” (98x31).

Libpng is OSI Certified Open Source Software. OSI Certified Open Source is a certification mark of the Open Source Initiative.

Glenn Randers-Pehrson

glennrp at users.sourceforge.net

February 14, 2009

Bzip2

This program, “bzip2”, the associated library “libbzip2”, and all documentation, are copyright (C) 1996-2007 Julian R Seward. All rights reserved.

Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:

1. Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimer.

2. The origin of this software must not be misrepresented; you must not claim that you wrote the original software. If you use this software in a product, an acknowledgment in the product documentation would be appreciated but is not required.
3. Altered source versions must be plainly marked as such, and must not be misrepresented as being the original software.
4. The name of the author may not be used to endorse or promote products derived from this software without specific prior written permission.

THIS SOFTWARE IS PROVIDED BY THE AUTHOR "AS IS" AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE AUTHOR BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

Julian Seward, jseward@bzip.org

USB library functions

Atmel Corporation
2325 Orchard Parkway
San Jose, Ca 95131
Copyright (c) 2004 Atmel

Apache

Apache License
Version 2.0, January 2004
<http://www.apache.org/licenses/>

TERMS AND CONDITIONS FOR USE, REPRODUCTION, AND DISTRIBUTION

1. Definitions.

"License" shall mean the terms and conditions for use, reproduction, and distribution as defined by Sections 1 through 9 of this document.

"Licensor" shall mean the copyright owner or entity authorized by the copyright owner that is granting the License.

"Legal Entity" shall mean the union of the acting entity and all other entities that control, are controlled by, or are under common control with that entity. For the purposes of this definition, "control" means (i) the power, direct or indirect, to cause the direction or management of such entity, whether by contract or otherwise, or (ii) ownership of fifty percent (50%) or more of the outstanding shares, or (iii) beneficial ownership of such entity.

"You" (or "Your") shall mean an individual or Legal Entity exercising permissions granted by this License.

"Source" form shall mean the preferred form for making modifications, including but not limited to software source code, documentation source, and configuration files.

"Object" form shall mean any form resulting from mechanical transformation or translation of a Source form, including but not limited to compiled object code, generated documentation, and conversions to other media types.

"Work" shall mean the work of authorship, whether in Source or Object form, made available under the License, as indicated by a copyright notice that is included in or attached to the work (an example is provided in the Appendix below).

"Derivative Works" shall mean any work, whether in Source or Object form, that is based on (or derived from) the Work and for which the editorial revisions, annotations, elaborations, or other modifications represent, as a whole, an original work of authorship. For the purposes of this License, Derivative Works shall not include works that remain separable from, or merely link (or bind by name) to the interfaces of, the Work and Derivative Works thereof.

"Contribution" shall mean any work of authorship, including the original version of the Work and any modifications or additions to that Work or Derivative Works thereof, that is intentionally submitted to Licensor for inclusion in the Work by the copyright owner or by an individual or Legal Entity authorized to submit on behalf of the copyright owner. For the purposes of this definition, "submitted"

means any form of electronic, verbal, or written communication sent to the Licensor or its representatives, including but not limited to communication on electronic mailing lists, source code control systems, and issue tracking systems that are managed by, or on behalf of, the Licensor for the purpose of discussing and improving the Work, but excluding communication that is conspicuously marked or otherwise designated in writing by the copyright owner as "Not a Contribution."

"Contributor" shall mean Licensor and any individual or Legal Entity on behalf of whom a Contribution has been received by Licensor and subsequently incorporated within the Work.

2. Grant of Copyright License. Subject to the terms and conditions of this License, each Contributor hereby grants to You a perpetual, worldwide, non-exclusive, no-charge, royalty-free, irrevocable copyright license to reproduce, prepare Derivative Works of, publicly display, publicly perform, sublicense, and distribute the Work and such Derivative Works in Source or Object form.
3. Grant of Patent License. Subject to the terms and conditions of this License, each Contributor hereby grants to You a perpetual, worldwide, non-exclusive, no-charge, royalty-free, irrevocable (except as stated in this section) patent license to make, have made, use, offer to sell, sell, import, and otherwise transfer the Work, where such license applies only to those patent claims licensable by such Contributor that are necessarily infringed by their Contribution(s) alone or by combination of their Contribution(s) with the Work to which such Contribution(s) was submitted. If You institute patent litigation against any entity (including a cross-claim or counterclaim in a lawsuit) alleging that the Work or a Contribution incorporated within the Work constitutes direct or contributory patent infringement, then any patent licenses granted to You under this License for that Work shall terminate as of the date such litigation is filed.
4. Redistribution. You may reproduce and distribute copies of the Work or Derivative Works thereof in any medium, with or without modifications, and in Source or Object form, provided that You meet the following conditions:
 - (a) You must give any other recipients of the Work or Derivative Works a copy of this License; and
 - (b) You must cause any modified files to carry prominent notices stating that You changed the files; and
 - (c) You must retain, in the Source form of any Derivative Works that You distribute, all copyright, patent, trademark, and attribution notices from the Source form of the Work, excluding those notices that do not pertain to any part of the Derivative Works; and
 - (d) If the Work includes a "NOTICE" text file as part of its distribution, then any Derivative Works that You distribute must include a readable copy of the attribution notices contained within such NOTICE file, excluding those notices that do not pertain to any part of the Derivative Works, in at least one

of the following places: within a NOTICE text file distributed as part of the Derivative Works; within the Source form or documentation, if provided along with the Derivative Works; or, within a display generated by the Derivative Works, if and wherever such third-party notices normally appear. The contents of the NOTICE file are for informational purposes only and do not modify the License. You may add Your own attribution notices within Derivative Works that You distribute, alongside or as an addendum to the NOTICE text from the Work, provided that such additional attribution notices cannot be construed as modifying the License.

You may add Your own copyright statement to Your modifications and may provide additional or different license terms and conditions for use, reproduction, or distribution of Your modifications, or for any such Derivative Works as a whole, provided Your use, reproduction, and distribution of the Work otherwise complies with the conditions stated in this License.

5. **Submission of Contributions.** Unless You explicitly state otherwise, any Contribution intentionally submitted for inclusion in the Work by You to the Licensor shall be under the terms and conditions of this License, without any additional terms or conditions. Notwithstanding the above, nothing herein shall supersede or modify the terms of any separate license agreement you may have executed with Licensor regarding such Contributions.
6. **Trademarks.** This License does not grant permission to use the trade names, trademarks, service marks, or product names of the Licensor, except as required for reasonable and customary use in describing the origin of the Work and reproducing the content of the NOTICE file.
7. **Disclaimer of Warranty.** Unless required by applicable law or agreed to in writing, Licensor provides the Work (and each Contributor provides its Contributions) on an "AS IS" BASIS, WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied, including, without limitation, any warranties or conditions of TITLE, NON-INFRINGEMENT, MERCHANTABILITY, or FITNESS FOR A PARTICULAR PURPOSE. You are solely responsible for determining the appropriateness of using or redistributing the Work and assume any risks associated with Your exercise of permissions under this License.
8. **Limitation of Liability.** In no event and under no legal theory, whether in tort (including negligence), contract, or otherwise, unless required by applicable law (such as deliberate and grossly negligent acts) or agreed to in writing, shall any Contributor be liable to You for damages, including any direct, indirect, special, incidental, or consequential damages of any character arising as a result of this License or out of the use or inability to use the Work (including but not limited to damages for loss of goodwill, work stoppage, computer failure or malfunction, or any and all other commercial damages or losses), even if such Contributor has been advised of the possibility of such damages.
9. **Accepting Warranty or Additional Liability.** While redistributing the Work or Derivative Works thereof, You may choose to offer, and charge a fee for, acceptance of support, warranty, indemnity,

or other liability obligations and/or rights consistent with this License. However, in accepting such obligations, You may act only on Your own behalf and on Your sole responsibility, not on behalf of any other Contributor, and only if You agree to indemnify, defend, and hold each Contributor harmless for any liability incurred by, or claims asserted against, such Contributor by reason of your accepting any such warranty or additional liability.

END OF TERMS AND CONDITIONS

APPENDIX: How to apply the Apache License to your work.

To apply the Apache License to your work, attach the following boilerplate notice, with the fields enclosed by brackets "[]" replaced with your own identifying information. (Don't include the brackets!) The text should be enclosed in the appropriate comment syntax for the file format. We also recommend that a file or class name and description of purpose be included on the same "printed page" as the copyright notice for easier identification within third-party archives.

Copyright [yyyy] [name of copyright owner]

Licensed under the Apache License, Version 2.0 (the "License");
you may not use this file except in compliance with the License.
You may obtain a copy of the License at

<http://www.apache.org/licenses/LICENSE-2.0>

Unless required by applicable law or agreed to in writing, software distributed under the License is distributed on an "AS IS" BASIS, WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied. See the License for the specific language governing permissions and limitations under the License.

D3 JS library

Copyright (c) 2013, Michael Bostock

All rights reserved.

Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:

- * Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimer.
- * Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution.
- * The name Michael Bostock may not be used to endorse or promote products derived from this software without specific prior written permission.

THIS SOFTWARE IS PROVIDED BY THE COPYRIGHT HOLDERS AND CONTRIBUTORS "AS IS" AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL MICHAEL BOSTOCK BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

Compliance with safety standards

This section lists the safety specifications against which the 450 Platform Family has been tested and certified. It also describes how to keep RF exposure within safe limits.

Electrical safety compliance

The 450 Platform Family hardware has been tested for compliance to the electrical safety specifications listed in [Table 1](#).

Table 1 Safety compliance specifications

Region	Specification
USA	UL 60950-1 or UL 62368-1, UL 60950-22
Canada	CSA C22.2 No. 60950-1 or 62368-1, CSA C22.2 No 60950-22
International	CB certified & certificate to IEC 60950-1 or IEC 62368-1, IEC 60950-22

Electromagnetic compatibility (EMC) compliance

The EMC specification type approvals that have been granted for 450 Platform Family are listed under [Table 2](#).

Table 2 EMC emissions compliance

Region	Specification
USA	FCC Part 15 Class B
Canada	RSS Gen; RSS-247, RSS-192, and RSS-197
International	EN 301 489-1 V2.1.1
	EN 301 489-17 V3.1.1
	EN 301 489-4 V3.1.1

Human exposure to radio frequency energy

Relevant standards (USA and EC) applicable when working with RF equipment are:

- ANSI IEEE C95.1-2005, IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz.
- US FCC limits for the general population. See the FCC web site at <http://www.fcc.gov>, and the policies, guidelines, and requirements in Part 1 of Title 47 of the Code of Federal Regulations, as well as the guidelines and suggestions for evaluating compliance in FCC OET Bulletin 65.
- Health Canada limits for the general population. See the Health Canada web site at <https://www.canada.ca/en/health-canada/services/environmental-workplace-health/consultations/limits-human-exposure-radiofrequency-electromagnetic-energy-frequency-range-3-300.html> and Safety Code 6.
- BS EN 50385:2017 Product standard to demonstrate the compliances of radio base stations and fixed terminal stations for wireless telecommunication systems with the basic restrictions or the reference levels related to human exposure to radio frequency electromagnetic fields (110 MHz – 40 GHz) – general public.
- ICNIRP (International Commission on Non-Ionizing Radiation Protection) guidelines for the general public. See the ICNIRP web site at <https://www.icnirp.org/cms/upload/publications/ICNIRPemfgdl.pdf> and Guidelines for Limiting Exposure to Time-Varying Electric, Magnetic, and Electromagnetic Fields.

Power density exposure limit

Install the radios for the 450 Platform Family of wireless solutions so as to provide and maintain the minimum separation distances from all persons.

The applicable FCC power density exposure limit for RF energy in the 3, 4.9, 5.4 and 5.8 GHz frequency bands is **10 W/m²** and in 900 MHz frequency band is **6 W/m²**. For more information, see [Human exposure to radio frequency energy](#) on page 31.

The applicable ISED power density exposure limit for RF energy in unlicensed bands is $0.02619 * (f^{0.6834})$, where f is the lowest frequency of the supported band. For licensed bands, the power density exposure limit is $0.6455 * (f^{0.5})$, where f is the lowest frequency of the supported band.

Calculation of power density

The following calculation is based on the ANSI IEEE C95.1-1991 method, as that provides a worst-case analysis. Details of the assessment to EN50383:2002 can be provided, if required.

Peak power density in the far field of a radio frequency point source is calculated as follows:

$$S = \frac{P.G}{4\pi d^2}$$

Where:

Is:

S	power density in W/m ²
P	maximum average transmit power capability of the radio, in W
G	total Tx gain as a factor, converted from dB
d	distance from point source, in m

Rearranging terms to solve for distance yields:

$$d = \sqrt{\frac{P.G}{4\pi.S}}$$

Calculated distances and power compliance margins

The following tables show calculated minimum separation distances, recommended distances and resulting margins for each frequency band and antenna combination for the USA and Canada. These are conservative distances that include compliance margins. At these and greater separation distances, the power density from the RF field is below generally accepted limits for the general population.

450 Platform Family ODU adheres to all applicable EIRP limits for transmit power when operating in MIMO mode. Separation distances and compliance margins include compensation for both transmitters.

Explanation of terms used in the following tables:

P burst – maximum average transmit power during transmit burst (Watt)

P – maximum average transmit power of the radio (Watt)

G – total transmit gain as a factor, converted from dB

S – power density (Watt/m²)

d – minimum safe separation distance from point source (meters)

Table 3 FCC minimum safe distances – PMP 450m 3 GHz and 5 GHz (5.1 GHz, 5.2 GHz, 5.4 GHz and 5.8 GHz)

Band (GHz)	Antenna	PG (W)	S (W/ m ²)	d (m)
3.65	90° sector	33.9	10	0.52
5.1	90° sector	3.38	10	0.16
5.2	90° sector	0.85	10	0.08
5.4	90° sector	0.85	10	0.08
5.8	90° sector	3.38	10	0.16

Table 4 FCC minimum safe distances – PMP/PTP 450b 4.9 GHz, 5.1 GHz, 5.2 GHz, 5.4 GHz and 5.8 GHz

Band (GHz)	Antenna	P (W)	G (dBi)	S (W/ m ²)	d (m)
4.9	Dish	0.501	24	10	1.00
	Patch Array	0.501	17	10	0.45
	On-board	0.501	0	10	0.06
5.1	Dish	0.501	24	10	1.00
	Patch Array	0.501	17	10	0.45
	On-board	0.501	0	10	0.06
5.2	Dish	0.004	24	10	0.09
	Patch Array	0.020	17	10	0.09
	On-board	0.251	0	10	0.04
5.4	Dish	0.004	24	10	0.09
	Patch Array	0.020	17	10	0.09
	On-board	0.501	0	10	0.06
5.8	Dish	0.501	24	10	1.00
	Patch Array	0.501	17	10	0.45
	On-board	0.501	0	10	0.06

Table 5 ISED minimum safe distances – PMP 450m 3GHz and 5 GHz (5.4 GHz and 5.8 GHz)

Band (GHz)	Antenna	PG (W)	S (W/ m ²)	d (m)
3.45	90° sector	851	6.85	3.14
3.65	90° sector	33.84	7.12	0.61
5.4	90° sector	0.85	9.39	0.08
5.8	90° sector	3.38	9.83	0.17

Table 6 ISEDC minimum safe distances - PMP/PTP 450b 4.9 GHz, 5.1 GHz, 5.2 GHz, 5.4 GHz and 5.8 GHz

Band (GHz)	Antenna	P (W)	G (dBi)	S (W/ m ²)	d (m)	S @ 20 cm (W/ m ²)
4.9	Dish	0.501	24	8.76	1.07	250.5
	Patch Array	0.501	17	8.76	0.48	50.0
	On-board	0.501	0	8.76	0.07	1.0
5.1	Dish	0.501	24	9.01	1.05	250.5
	Patch Array	0.501	17	9.01	0.47	50.0
	On-board	0.501	0	9.01	0.07	1.0
5.2	Dish	0.004	24	9.13	0.09	2.0
	Patch Array	0.020	17	9.13	0.09	2.0
	On-board	0.251	0	9.13	0.05	0.5
5.4	Dish	0.004	24	9.39	0.09	2.0
	Patch Array	0.020	17	9.39	0.09	2.0
	On-board	0.501	0	9.39	0.07	1.0
5.8	Dish	0.501	24	9.69	1.02	250.5
	Patch Array	0.501	17	9.69	0.45	50.0
	On-board	0.501	0	9.69	0.06	1.0

Table 7 FCC minimum safe distances – PMP/PTP 450i 900 MHz, 3.65 GHz, 4.9 GHz, 5.1 GHz, 5.2 GHz, 5.4 GHz and 5.8 GHz

Band	Antenna	P burst (W)	P (W)	G (dBi)	S (W/ m ²)	d (m)
900 MHz	Sector antenna	-	0.19	22.75 (13 dBi)	6.0	0.27
3.65 GHz	90° sector antenna, integrated	-	0.316	50.0 (17 dBi)	10.0	0.36
	90° sector antenna, connectorized	-	0.316	40.0 (16 dBi)	10.0	0.32
	Panel, integrated	-	0.251	79.0 (19 dBi)	10.0	0.40
4.9 GHz	Omni-directional	0.2138	0.2512	20.0 (13 dBi)	10.0	0.17
	90° sector antenna	0.2138	0.2512	50.0 (17 dBi)	10.0	0.26
	2ft directional flat plate	0.2138	0.2512	631.0 (28 dBi)	10.0	0.93
	4ft directional parabolic	0.851	0.1000	2344.0 (34.9 dBi)	10.0	1.14
	6ft directional parabolic	0.1413	0.1659	5248.0 (37.2 dBi)	10.0	2.19
5.1 GHz	Omni-directional	0.170	0.200	20.0 (13.0 dBi)	10	0.15
	90° sector	0.034	0.040	50.1 (17.0 dBi)	10	0.10
	2ft directional flat plate	0.002	0.002	707.9 (28.5 dBi)	10	0.09
	4ft directional parabolic	0.011	0.013	2818.4 (34.5 dBi)	10	0.44
5.2 GHz	Omni-directional	0.036	0.042	20.0 (13.0 dBi)	10	0.07
	90° sector	0.014	0.017	50.1 (17.0 dBi)	10	0.07
	2ft directional flat plate	0.001	0.001	707.9 (28.5 dBi)	10	0.07
	4ft directional parabolic	0.000	0.000	2818.4 (34.5 dBi)	10	0.06
5.4 GHz	Omni-directional	0.036	0.042	20.0 (13.0 dBi)	10	0.07
	90° sector	0.014	0.017	50.1 (17.0 dBi)	10	0.07
	2ft directional flat plate	0.001	0.001	707.9 (28.5 dBi)	10	0.07
	2ft directional parabolic	0.001	0.001	707.9 (28.5 dBi)	10	0.08
5.8 GHz	Omni-directional	0.24	0.28	20.0 (13 dBi)	10.0	0.18
	90° sector	0.10	0.12	50.0 (17 dBi)	10.0	0.18
	2ft directional flat plate	0.54	0.63	708.0 (28.5 dBi)	10.0	1.57
	4ft directional parabolic	0.54	0.63	3388.0 (35.3 dBi)	10.0	3.43
	6ft directional parabolic	0.54	0.63	6457.0 (38.1 dBi)	10.0	4.74

Table 8 ISEDC minimum safe distances - PMP/PTP 450i, 900 MHz, 3.5 GHz, 3.65 GHz, 4.9 GHz, 5.2 GHz, 5.4 GHz, and 5.8 GHz

Band	Antenna	P burst (W)	P (W)	G (dBi)	S (W/ m ²)	d (m)
900 MHz	Sector	-	.02	20.0 (13 dBi)	2.74	0.11
3.5 GHz	90° sector antenna, integrated	-	0.794	50.0 (17 dBi)	6.99	0.62
	90° sector antenna, connectorized	-	0.794	40.0 (16 dBi)	6.99	0.55
	Panel, integrated	-	0.794	79.0 (19 dBi)	6.99	0.78
3.65 GHz (Lower Canada)	90° sector antenna, integrated	-	0.794	50.0 (17 dBi)	7.13	0.67
	90° sector antenna, connectorized	-	0.794	40.0 (16 dBi)	7.13	0.59
	Panel, integrated	-	0.794	79.0 (19 dBi)	7.13	0.84
3.65 GHz (Upper Canada)	90° sector antenna, integrated	-	0.316	50.0 (17 dBi)	7.13	0.42
	90° sector antenna, connectorized	-	0.316	40.0 (16 dBi)	7.13	0.37
	Panel, integrated	-	0.251	79.0 (19 dBi)	7.13	0.47
4.9 GHz	Omni-directional	0.214	0.251	20.0 (13 dBi)	8.71	0.20
	90° sector	0.214	0.251	50.1 (17 dBi)	8.71	0.31
	2ft directional flat plate	0.214	0.251	631.0 (28 dBi)	8.71	1.11
	6ft directional parabolic	0.141	0.166	5248.0 (37.2 dBi)	8.71	2.60
5.2 GHz	Omni-directional	0.009	0.011	20.0 (13.0 dBi)	9.13	0.04
	90° sector	0.012	0.014	50.1 (17.0 dBi)	9.13	0.06
	2ft directional flat plate	0.001	0.001	707.9 (28.5 dBi)	9.13	0.07
	2ft directional parabolic	0.001	0.001	707.9 (28.5 dBi)	9.13	0.06

Band	Antenna	P burst (W)	P (W)	G (dBi)	S (W/ m ²)	d (m)
5.4 GHz	Omni-directional	0.036	0.042	20.0 (13.0 dBi)	9.39	0.07
	90° sector	0.014	0.017	50.1 (17.0 dBi)	9.39	0.07
	2ft directional flat plate	0.001	0.001	707.9 (28.5 dBi)	9.39	0.07
	2ft directional parabolic	0.001	0.001	707.9 (28.5 dBi)	9.39	0.06
5.8 GHz	Omni-directional	0.24	0.28	20.0 (13 dBi)	9.69	0.20
	90° sector	0.10	0.12	50.1 (17 dBi)	9.69	0.20
	2ft directional flat plate	0.54	0.63	707.9 (28.5 dBi)	9.69	1.67
	4ft directional parabolic	0.54	0.63	3388.4 (35.3 dBi)	9.69	4.82

Table 9 FCC minimum safe distances - PMP/PTP 450 900 MHz, 2.4 GHz, 3.65 GHz and 5 GHz

Band	Antenna	P burst (W)	G (dBi)	S (W/ m ²)	d (m)
900 MHz	Yagi	0.032	13 (11 dBi)	6	0.07
	Sector Antenna	0.079	50 (17 dBi)	10	0.18
2.4 GHz	Integrated	0.158	6 (8 dBi)	10	0.09
	Reflector	0.040	100 (20 dBi)	10	0.18
3.65 GHz	Sector Antenna	0.316	32 (15 dBi)	10	0.28
	Integrated	0.316	6 (8 dBi)	10	0.12
	Reflector	0.25	100 (20 dBi)	10	0.45
	High Gain Ruggedized	0.25	79 (19 dBi)	10	0.40
5.4 GHz	Sector	0.025	40 (16 dBi)	10	0.09
	Integrated	0.126	8 (9 dBi)	10	0.09
	Reflector	0.003	316 (25 dBi)	10	0.09
	CLIP	0.020	50 (17 dBi)	10	0.09
	LENS	0.032	28 (14.5 dBi)	10	0.08
	Integrated Dish (450d)	0.0032	316 (25 dBi)	10	0.09
5.8 GHz	Sector	0.079	40 (16 dBi)	10	0.16
	Integrated	0.158	8 (9 dBi)	10	0.10
	Reflector	0.158	316 (25 dBi)	10	0.63
	CLIP	0.158	50 (17 dBi)	10	0.25
	LENS	0.158	28 (14.5 dBi)	10	0.19
	Integrated Dish (450d)	0.158	316 (25 dBi)	10	0.63

Table 10 ISED minimum safe distance - PMP/PTP 450 900 MHz, 2.4 GHz, 3.5/3.65 GHz and 5 GHz

Band	Antenna	P burst (W)	G (dBi)	S (W/ m ²)	d (m)
900 MHz	Yagi	0.316	13 (11 dBi)	2.74	0.35
2.4 GHz	Sector Antenna	0.079	50 (17 dBi)	5.35	0.24
	Integrated	0.158	6 (8 dBi)	5.35	0.12
	Reflector	0.040	100 (20 dBi)	5.35	0.24
3.5 GHz	Sector	0.316	32 (15 dBi)	37.10	0.15
	Integrated	0.316	6 (8 dBi)	37.10	0.06
	Reflector	0.316	100 (20 dBi)	37.10	0.26
	High Gain Ruggedized	0.316	79 (19 dBi)	37.10	0.23
3.65 GHz (lower Canada)	Sector	0.316	32 (15 dBi)	38.20	0.15
	Integrated	0.316	6 (8 dBi)	38.20	0.06
	Reflector	0.316	100 (20 dBi)	38.20	0.26
	High Gain Ruggedized	0.316	79 (19 dBi)	38.20	0.23
3.65 GHz (upper Canada)	Sector	0.316	32 (15 dBi)	38.20	0.14
	Integrated	0.316	6 (8 dBi)	38.20	0.06
	Reflector	0.20	100 (20 dBi)	38.20	0.20
	High Gain Ruggedized	0.003	79 (19 dBi)	38.20	0.23
5.4 GHz	Sector	0.025	40 (16 dBi)	9.39	0.09
	Integrated	0.126	8 (9 dBi)	9.39	0.09
	Reflector	0.003	316 (25 dBi)	9.39	0.09
	CLIP	0.020	50 (17 dBi)	9.39	0.09
	LENS	0.032	28 (14.5 dBi)	9.39	0.09
	Integrated Dish (450d)	0.0032	316 (25 dBi)	9.39	0.09
5.8 GHz	Sector	.079	40 (16 dBi)	9.69	0.16
	Integrated	0.158	8 (9 dBi)	9.69	0.10
	Reflector	0.158	316 (25 dBi)	9.69	0.064
	CLIP	0.158	50 (17 dBi)	9.69	0.25
	LENS	0.158	28 (14.5 dBi)	9.69	0.19
	Integrated Dish (450d)	0.158	316 (25 dBi)	9.69	0.64

(*1) P: maximum average transmit power capability of the radio including cable loss (Watt)

**Note**

Gain of antenna in dBi = $10 * \log(G)$.

The regulations require that the power used for the calculations is the maximum power in the transmit burst subject to allowance for source-based time-averaging.

At 5.4 GHz and EU 5.8 GHz, the products are generally limited to a fixed EIRP which can be achieved with the Integrated Antenna. The calculations above assume that the maximum EIRP allowed by the regulations is being transmitted.

**Remarque**

Gain de l'antenne en dBi = $10 * \log(G)$.

Les règlements exigent que la puissance utilisée pour les calculs soit la puissance maximale de la rafale de transmission soumis à une réduction pour prendre en compte le rapport cyclique pour les signaux modulés dans le temps.

Pour une opération dans la CEE dans les bandes 5,4 GHz et 5,8 GHz, les produits sont généralement limités à une PIRE qui peut être atteinte avec l'antenne intégrée. Les calculs ci-dessus supposent que la PIRE maximale autorisée par la réglementation est atteinte.

**Note**

If there are no EIRP limits in the country of deployment, use the distance calculations for FCC 5.8 GHz for all frequency bands.

At FCC 5.8 GHz, for antennas between 0.6m (2ft) and 1.8m (6ft), alter the distance proportionally to the antenna gain.

**Remarque**

Si aucune limite de PIRE existe pour le pays de déploiement, utilisez les calculs de distance pour FCC 5,8 GHz pour toutes les bandes de fréquence.

Pour la band FCC 5,8 GHz et les antennes entre 0,6 m (2 pieds) et 1,8 m (6 pieds), modifier la distance proportionnellement au gain de l'antenne.

Capacité de puissance d'émission moyenne maximale de la radio comprenant la perte dans les câble de connexion (W)

(*2) G: total transmit gain as a factor, converted from dB

Gain total d'émission, converti à partir de la valeur en dB

(*3) S: power density (W/m²)

Densité de puissance (W/m²)

(*4) d: minimum distance from point source (meters)

Distance minimale de source ponctuelle (en mètres)

Hazardous location compliance

The PMP/PTP 450i series IECEx/ATEX/HAZLOC ODUs have been certified for operation in the following hazardous locations:

ATEX

The products have been approved under an “Intrinsic Safety” assessment as defined in EN60079-11:2012.

The approval is given by certificate number EMT126ATEX0003X, issued by Element Materials Technology, with the specific level of coverage shown below:

- II 3 G Ex ic IIC T4
- II - Equipment group (surface applications)
- 3 - Equipment category (infrequent exposure)
- G - Atmosphere (Gas)
- ic - Protection concept (intrinsic safety)
- IIC - Gas group (up to and including Hydrogen and Acetylene)
- T4 - Temperature class (135°C)

IECEx approvals - Certificate No, IECEx EMT 16.0001X

Marking - Ex ic IIC T4 Gc Tamb -40C to + 60C

Compliance with radio regulations

This section describes how the 450 Platform Family complies with the radio regulations that are in force in various countries.



Caution

Where necessary, the end user is responsible for obtaining any National licenses required to operate this product and these must be obtained before using the product in any country. Contact the appropriate national administrations for details of the conditions of use for the bands in question and any exceptions that might apply.



Caution

Changes or modifications not expressly approved by Cambium Networks could void the user's authority to operate the system.



Caution

For the connectorized version of the product and in order to reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the Effective Isotropically Radiated Power (EIRP) is not more than that permitted for successful communication.



Attention

Le cas échéant, l'utilisateur final est responsable de l'obtention des licences nationales nécessaires pour faire fonctionner ce produit. Celles-ci doivent être obtenus avant d'utiliser le produit dans un pays particulier. Contactez les administrations nationales concernées pour les détails des conditions d'utilisation des bandes en question, et toutes les exceptions qui pourraient s'appliquer



Attention

Les changements ou modifications non expressément approuvés par les réseaux de Cambium pourraient annuler l'autorité de l'utilisateur à faire fonctionner le système.



Attention

Pour la version du produit avec une antenne externe, et afin de réduire le risque d'interférence avec d'autres utilisateurs, le type d'antenne et son gain doivent être choisis afin que la puissance isotrope rayonnée équivalente (PIRE) ne soit pas supérieure au minimum nécessaire pour établir une liaison de la qualité requise.

Type approvals

This system has achieved Type Approval in various countries around the world. This means that the system has been tested against various local technical regulations and found to comply. The frequency bands in which the system operates may be ‘unlicensed’ and, in these bands, the system can be used provided it does not cause interference. The system is not guaranteed protection against interference from other products and installations.

The radio specification type approvals that have been granted for 450 Platform Family frequency variants are listed under [Table 11](#).

Table 11 Radio certifications

Region/Country	Band	Specification
Brazil	4.9 GHz	ANATEL, RESOLUÇÃO Nº 633, DE 14 DE MARÇO DE 2014
	5.4 GHz	ANATEL, RESOLUTION No. 506, FROM JULY 1, 2008
	5.8 GHz	ANATEL, RESOLUTION No. 506, FROM JULY 1, 2008
Mexico	900 MHz	NOM-121-SCT1-2009
	4.9 GHz	Protocol Between the UNITED STATES OF AMERICA and MEXICO - Use of 4940 to 4990 MHz band.
	5.4 GHz	Acuerdo del 27 de noviembre de 2012
	5.8 GHz	NOM-121-SCT1-2009
USA	900 MHz	FCC Part 15.247, FCC Part 15 Class B
	2.4 GHz	FCC Part 15.247, FCC Part 15 Class B
	3.6 GHz	FCC Part 96, FCC Part 15 Class B
	4.9 GHz	FCC 47 CFR Part 90, FCC Part 15 Class B
	5.1 GHz	FCC 47 CFR Part 15 E, FCC Part 15 Class B
	5.2 GHz	FCC 47 CFR Part 15 E, FCC Part 15 Class B
	5.4 GHz	FCC 47 CFR Part 15 E, FCC Part 15 Class B
	5.8 GHz	FCC 47 CFR Part 15 E
Canada	900 MHz	RSS Gen and RSS 210
	2.4 GHz	RSS Gen and RSS 210
	3.5 /3.6 GHz	RSS Gen, RSS-197 and RSS 192
	4.9 GHz	IC RSS-111, Issue 5
	5.8 GHz	IC RSS-247, Issue 2
Europe	3.5 GHz	ETSI EN 302 326-2 V1.2.2

5.4 GHz	ETSI EN 301 893 V2.1.1
5.8 GHz	ETSI EN 302 502 V2.1.1

Brazil specific information

Brazil notification

For compliant operation in the 5.4 GHz band, the Equivalent Isotropic Radiated Power from the integrated antenna or connectorized antenna shall not exceed 30 dBm (0.5 W).

The operator is responsible for enabling the DFS feature on any Canopy 5.4 GHz radio by setting the Country Code to “Brazil”, including after the module is reset to factory defaults.

Important Note: This equipment operates as a secondary application, so it has no rights against harmful interference, even if generated by similar equipment, and cannot cause harmful interference on systems operating as primary applications.

Brazil certification numbers

The Anatel certification number for Brazil for the PMP/PTP 450i Series is 2426-15-7745.

Australia Notification

900 MHz modules must be set to transmit and receive only on center channels of 920, 922, or 923 MHz to stay within the ACMA approved band of 915 MHz to 928 MHz for the class license and not interfere with other approved users.

After considering antenna gain (in dBi), 900 MHz modules’ transmitter output power (in dBm) must be set to stay within the legal regulatory limit of 30 dBm (1 W) EIRP for this 900 MHz frequency band.

Regulatory Requirements for CEPT Member States (www.cept.org)

When operated in accordance with the instructions for use, Cambium Wireless equipment operating in the 5.1 GHz and 5.4 GHz bands is compliant with CEPT Resolution 229 (REV. WRC-12).

Operating the 450 Platform Family in the bands 5150 to 5350 MHz and 5470 to 5725 MHz is granted providing it is not causing interference to the existing primary services allocated to those bands.

For compliant operation in the 5250 to 5350 MHz band, the transmit power from the integrated antenna or a connectorized antenna shall be limited to a maximum mean EIRP of 200 mW and a maximum mean EIRP density of 10 mW/MHz in any 1 MHz band.

For compliant operation in the 5470 to 5725 MHz band, the transmit power shall be restricted to a maximum of 250 mW with a maximum mean EIRP of 1 W and a maximum mean EIRP density of 50 mW/MHz in any 1 MHz band.

For compliant operation in the bands 5 250-5 350 MHz and 5 470-5 725 MHz, the 450 Platform Family employs transmitter power control (TCP) and Dynamic Frequency Selection (DFS).

For EU member states, RLAN equipment in the 5.4GHz bands is exempt from individual licensing under Commission Recommendation 2003/203/EC. Contact the appropriate national administrations for details on the conditions of use for the bands in question and any exceptions that might apply. Also see www.ero.dk for further information.

Cambium Radio equipment operating in the 5470 to 5725 MHz band are categorized as “Class 1” devices within the EU in accordance with ECC DEC(04)08 and are “CE” marked to show compliance with the European Radio Equipment Directive (RED) 2014/53/EU. The relevant Declaration of Conformity can be found at http://www.cambiumnetworks.com/ec_dofc/.