Cambium
PMP 450 Series
PMP 430 / PTP 230 Series
PMP/PTP 100 Series
Release Notes

System Release 13.1.3

Cambium Networks

1 INTRODUCTION

This document provides information for the Cambium Networks PMP 450, PMP 430 / PTP 230 and PMP/PTP 100 Series System Release 13.1.3. This release primarily contains improvements and enhancements to the 3.65 GHz Listen Before Talk (LBT) functionality in addition to a few minor defects fixes.

Software updates for PMP products are available from:

https://support.cambiumnetworks.com/files

The information in this document is subject to change without notice. The recommendations, technical data, configurations and statements in this document are believed to be reliable and accurate, but are presented without implied or express warranty. Users must take full responsibility for their applications of any product specified in this document. The information in this document is proprietary to Cambium Networks Ltd.

2 PMP VARIANTS

System Release 13.1.3 is compatible with PMP 450, PMP 430, PTP 230 and PMP/PTP 100 Series modules. This document covers Release Notes for all equipment. For more information on System Release 13.1.3 and PMP 450 Series modules, see:

https://support.cambiumnetworks.com/files

2.1 Embedded software

PMP 450

- CANOPY131_3BUILDOFFICIAL_MIMO_DESAES_S.pkg3

PMP 430

- DES Encryption: CANOPY131_3BUILDOFFICIAL_OFDM_DES.pkg3
- AES Encryption: CANOPY131_3BUILDOFFICIAL_OFDM_AES.pkg3

PTP 230

- DES Encryption: CANOPY131_3BUILDOFFICIAL_OFDM_DES.pkg3
- AES Encryption: CANOPY131_3BUILDOFFICIAL_OFDM_AES.pkg3

PMP/PTP 100

- DES Encryption: CANOPY131_3BUILDOFFICIAL_DES.pkg3
- AES Encryption: CANOPY131_3BUILDOFFICIAL_AES.pkg3

⚠ CAUTION

In order to use the interoperability feature, the PMP 430 AP and SMs running System Release 11.2.1 or earlier need to first be upgraded to System Release 12.1, and then they can be upgraded to System Release 12.2.2 or later. In addition, all PMP 430 SMs will have to be on Release 12.2.2 or later for CNUT SM auto-update to work normally. PTP 230 series of radios must also be upgraded to System Release 12.1 first and then can be upgraded to System Release 12.2.2 or later.

⚠ CAUTION

When the PMP 450 AP and all the PMP 430 and PMP 450 SMs connected to it have been upgraded to System Release 12.2.2 or later, it is not possible to downgrade the sector to a release prior to System Release 12.2.2. The reason is that System Release 12.2.2 is the first that supports the interoperability feature, and with any prior release the PMP 430 SMs would no longer be able to connect to the PMP 450 AP.

If downgrading the PMP 430 SMs is necessary, the PMP 450 AP has to be replaced by a PMP 430 AP. In this case, downgrading becomes possible and the sector is again a PMP 430 sector. If any PMP 450 SMs were deployed in the sector, they will not be able to connect to a PMP 430 AP.

2.2 Canopy Network Updater (CNUT) software

CNUT 4.5 or later should be used to upgrade PMP 450, PMP 430, PTP 230 and PMP/PTP 100 networks.

http://www.cambiumnetworks.com/support/management-tools/cnut/

2.3 System Documentation

Provided with System Release 13.1.3 are two reference documents:

- PMP 450, PMP 430 / PTP 230 and PMP/PTP 100 Series Release Notes
- PMP 450 Configuration and User Guide

These documents are available at https://support.cambiumnetworks.com/files

3 NEW FEATURES

Table 1 System Release 13.1.3 introduces the following new features

Regions Affected	Products Affected	Feature	Description
FCC and Canada	AP	Listen-Before-Talk (LBT) for 3.6GHz Access Point (Enhancements)	System Release 13.1.3 improves and enhances the Listen-Before-Talk (LBT) feature on the PMP450 3.6GHz platform first introduced in System Release 13.1.

3.1 Listen-Before-Talk (LBT) for 3.6GHz Access Point (Enhancements)

In the Unites States the 3650-3700 MHz band is licensed on a non-exclusive basis. Operators have the responsibility to minimize the potential of interference to deployed systems. System Release 13.1.3 introduces the Listen-Before-Talk(LBT) feature on the PMP450 3.6GHz platform to enable operators in United States (including Other FCC regions) and Canada to follow these regulations.

3.1.1 STANDARDS

In FCC Part 90, Subpart Z[*], the FCC requires that all systems implement a contention-based protocol which would stop transmission if the system detects transmissions from other systems. In Canada, the IC adopted the FCC's definition of a contention-based protocol and adopted the same requirements as the FCC[†] in the 3650-3700 MHz band.

In FCC Part 90, Subpart Z two categories of contention-based protocols are defined: restricted and un-restricted. A restricted contention-based protocol describes the ability to detect interference from products of similar contention technology. An un-restricted contention-based protocol describes the ability to detect interference from products with dissimilar contention technology. Systems incorporating a restricted contention-based protocol are allowed to operate in the lower 25 MHz of this frequency band (i.e. 3650-3675 MHz), while systems incorporating an un-restricted contention-based protocol are allowed to use the full 50 MHz (i.e. 3650-3700MHz) of this frequency band. The 3.6 GHz PMP 450 operates over the full 50 MHz of this frequency band; and hence complies with the un-restricted contention-based protocol solution.

Guidelines for FCC approval of devices operating in the 3650-3700 MHz band are provided in a publication from the FCC Office of Engineering and Technology[‡]. The guidance addresses several questions to help determine the contention based protocol capability of a device.

3.1.2 PMP 450 COMPLIANCE

The LBT feature is an AP requirement in the 3.6 band for North America and Canada. Currently the PMP 450 only supports DFS for the Europe and ETSI regions. The LBT feature is closely modelled after the current implementation of DFS. The Access Point for the PMP 450 system uses a LBT protocol that is embedded into a TDD/TDMA frame structure. Energy detection is done at a regular time interval of once every 2.5 ms defined by the frame structure of the PMP 450 air interface.

---

[*] FCC Title 47 of the Code of Federal Regulations Part 90 Subpart Z – Wireless Broadband Services in the 3650-3700 MHz Band

[†] SP 3650 MHz – Spectrum Utilization Policy, Technical and Licensing Requirements for Wireless Broadband Services (WBS) in the Band 3650-3700 MHz

[‡] FCC Office of Engineering and Technology Knowledge Database (KDB) Publication Number 552295 "CBP Guidance for 3650-3700 Band v02r02"

The system will use a fixed time interval at the end of the receive portion of each frame for sensing energy present in the channel on both MIMO paths. The sensed energy is measured and stored as a running average and compared to a pre-determined detection threshold. When the average energy exceeds the detection threshold on either MIMO path, the system will respond in such a way to cause the Access Point to cease transmission on the current channel and switch to the next channel on its prioritized list of alternate channel frequencies.

A channel availability check is performed over a pre-determined time interval on any alternate channel before the Access Point is allowed to initiate transmission. If no alternate channels are configured, the Access Point will wait a pre-determined channel back-off time on the existing channel before attempting to initiate transmission. If the running average of the energy sensed during the channel back-off time is below the detection threshold, the Access Point is allowed to initiate transmission.

3.1.3 LBT DETECTION THRESHOLD CALCULATION

The energy detection threshold used for LBT is proportional to the maximum transmit power of the transmitter. For a 23 dBm EIRP transmitter the detection threshold is -73 dBm/MHz at the input to the receiver (assuming a 0 dBi receive antenna). At start up the system monitors the channel frequency for 1 second before determining if the channel is busy.

The detection threshold is proportional to the maximum transmit power of the transmitter. The detection threshold is modified according to the following formula:

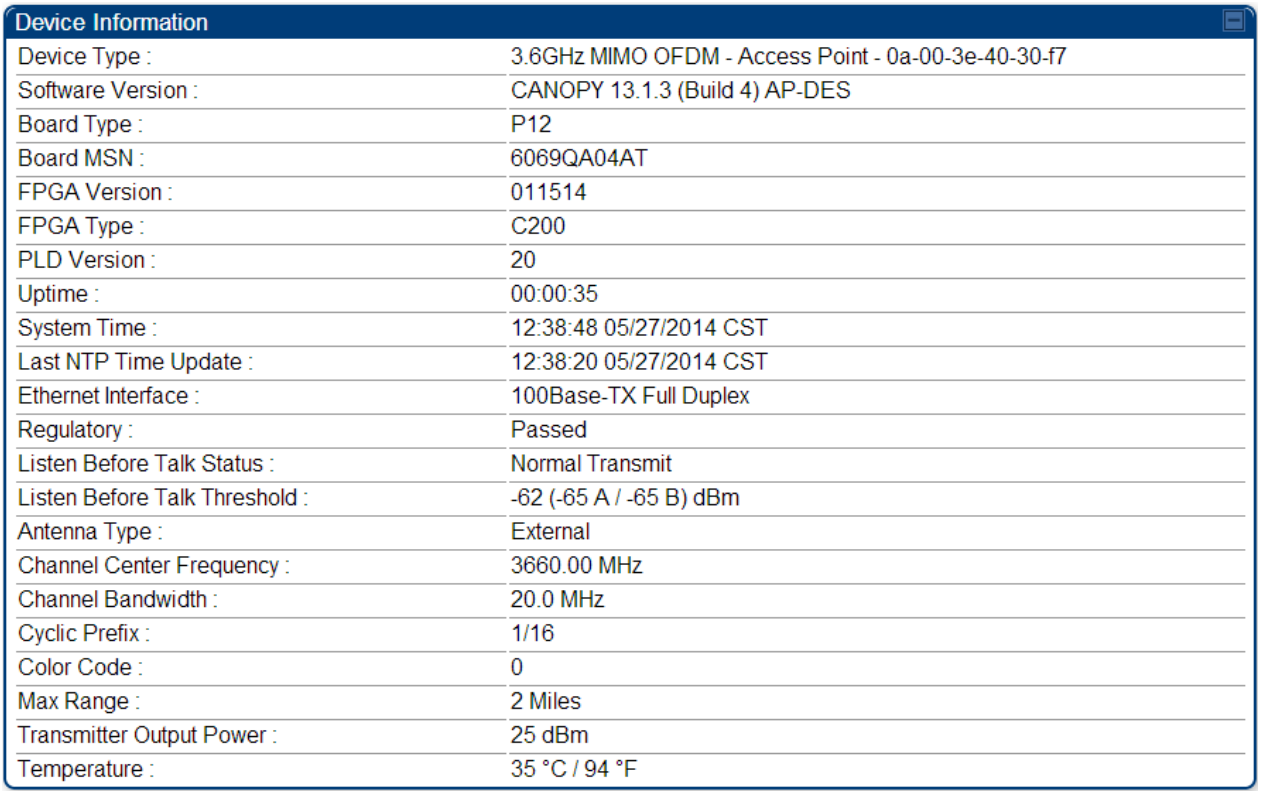
$$\text{Detection Threshold (dBm)} = -73\ \text{dBm/MHz} + 10\log_{10}(B) + 23 - P_T + A$$

Where:	Is:
B	Monitored bandwidth in MHz
P_T	maximum transmit power in dBm EIRP
A	receive antenna gain in dBi

The receive antenna gain A is set equal to the external antenna gain. As part of the radio configuration for LBT the operator must enter the maximum desired conducted power P_c, the external antenna gain A and the channel bandwidth B. The PMP 450 Access Point will ensure that the sum of the actual conducted power and the external antenna gain used to calculate P_T does not exceed the regulatory EIRP limit.

The current LBT Status and LBT Threshold are displayed on the AP (located in tab **Home, General**).

Figure 1 LBT AP status



Device Information	
Device Type :	3.6GHz MIMO OFDM - Access Point - 0a-00-3e-40-30-f7
Software Version :	CANOPY 13.1.3 (Build 4) AP-DES
Board Type :	P12
Board MSN :	6069QA04AT
FPGA Version :	011514
FPGA Type :	C200
PLD Version :	20
Uptime :	00:00:35
System Time :	12:38:48 05/27/2014 CST
Last NTP Time Update :	12:38:20 05/27/2014 CST
Ethernet Interface :	100Base-TX Full Duplex
Regulatory :	Passed
Listen Before Talk Status :	Normal Transmit
Listen Before Talk Threshold :	-62 (-65 A / -65 B) dBm
Antenna Type :	External
Channel Center Frequency :	3660.00 MHz
Channel Bandwidth :	20.0 MHz
Cyclic Prefix :	1/16
Color Code :	0
Max Range :	2 Miles
Transmitter Output Power :	25 dBm
Temperature :	35 °C / 94 °F

The following table summarizes all possible status messages this parameter might display.

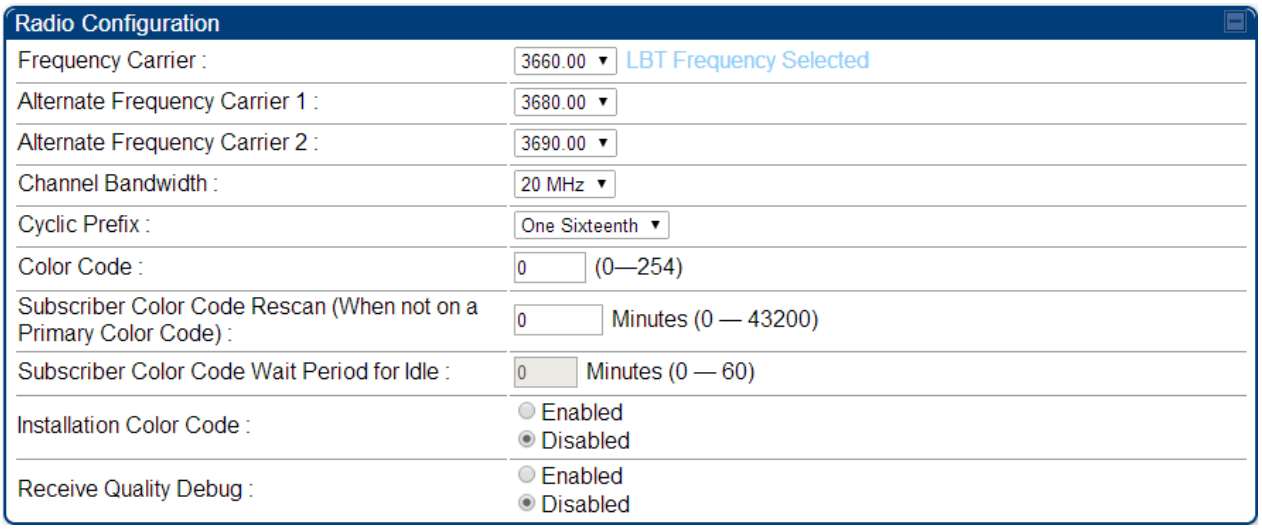
Table 2 LBT Status

LBT Status Messages	Definition
Normal Transmit	Channel interference has not been detected.
Radar Detected, Stop Transmitting	Channel interference has been detected and the AP is no longer transmitting.
Preparing for Transmit	Initialization required before the Channel Availability Check.
Checking Channel Availability	Currently listening to the receive power levels to detect if there is any other channels broadcasting on this frequency.
Idle	LBT is not currently running.

3.1.4 CONFIGURING ALTERNATE CHANNEL FREQUENCIES

The alternate channels can be configured on the AP (located in tab **Configuration, Radio**). It is not possible to configure the same channel twice for Frequency Carrier, Alternate Channel 1 or 2.

Figure 2 LBT AP configuration

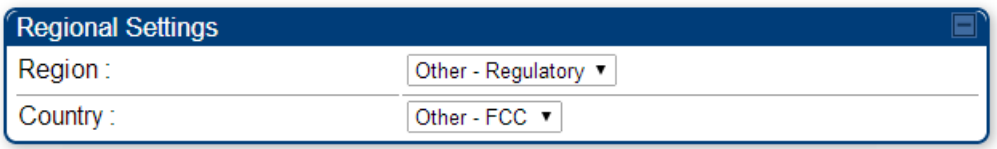


In order to enable LBT, the Country code will have to be configured for Other-FCC, United States or Canada (located in tab **Configuration, General**) as described in Table 3.

Table 3 LBT Status

Region	Country Code
North America	United States
	Canada
Other - Regulatory	Other - FCC

Figure 3 LBT AP Region and Country Code



The LBT logs (located under **Logs, Listen Before Talk**) will display the following, in the event any channel interference is detected.

Figure 4 Example LBT Log (with no alternate frequencies configured)

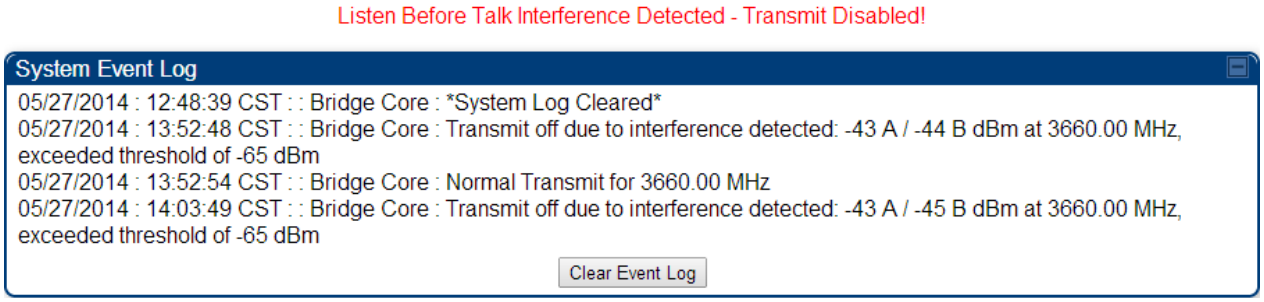
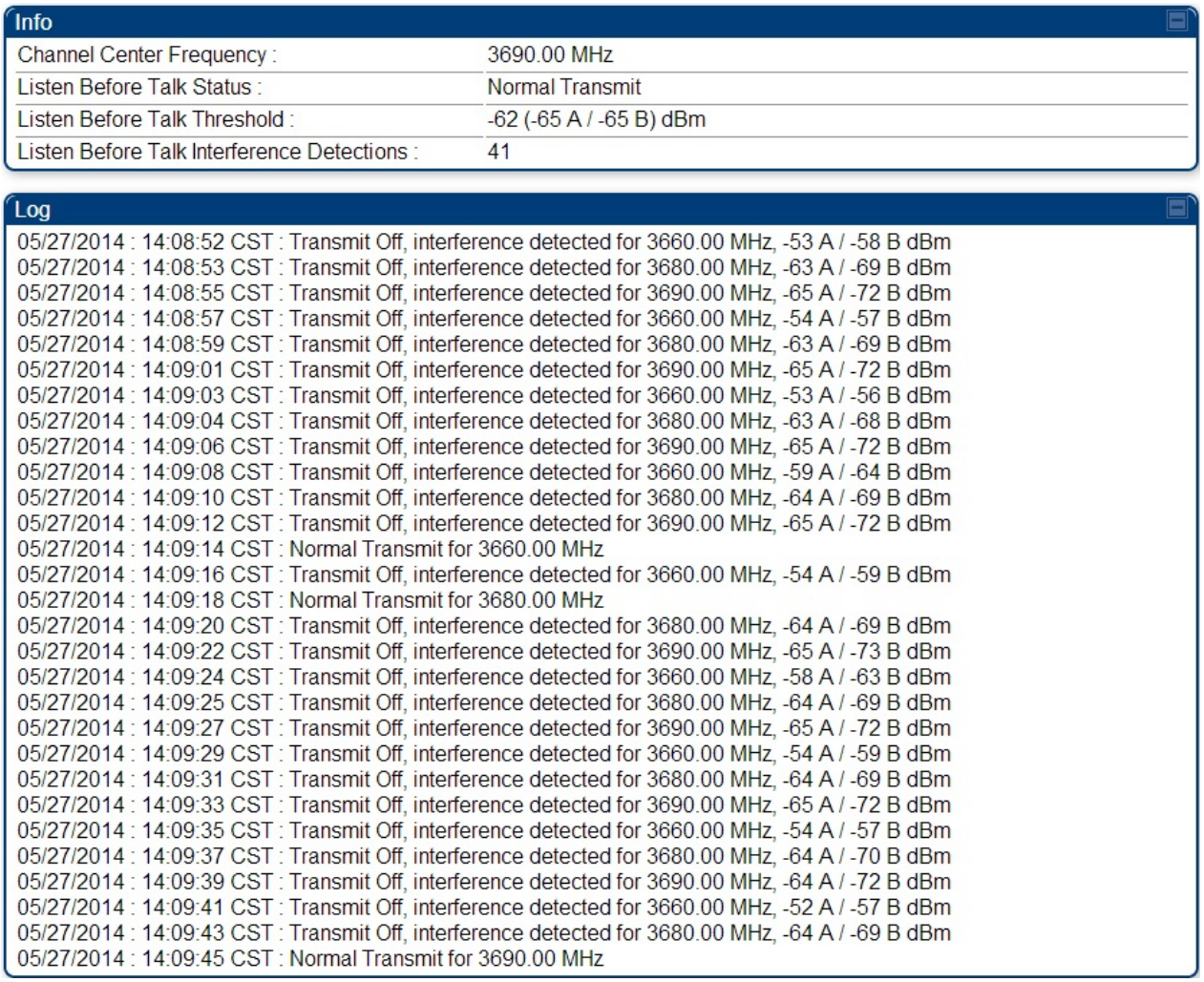
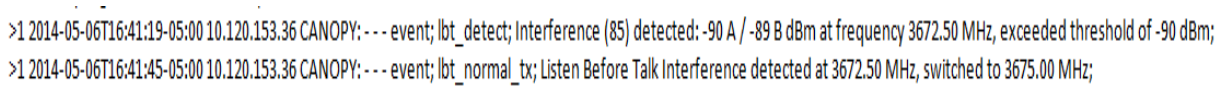


Figure 5 Example LBT Log (with 2 alternate frequencies configured and severe interference)



In addition, syslog has been improved:

Figure 6 Example LBT Syslog



3.1.5 LBT OPERATION OF PMP 450 SM

Only the PMP 450 Access Point (AP) performs the threshold detection. The PMP 450 system employs a proprietary media access layer that utilizes a TDD/TDMA scheduled transmission which is synchronously framed. The client PMP 450 Subscriber Module (SM) cannot transmit data until it is allocated bandwidth from the AP. If the AP detects co-channel signals, then the Access Point will not allocate any uplink data symbols to the SM.

In this system, since permission to transmit is granted by the AP, there is no hidden node problem like that experienced by purely contention based protocols (e.g. Wi-Fi using CSMA/CA in the Distributed Coordination Function mode). The AP is typically installed in a high location where it is most likely to receive co-channel interference and is most susceptible to detection.

3.1.6 LBT ON STARTUP VERSUS OPERATIONAL MODE

The same energy detection method is performed by the PMP 450 AP whether it is in start-up acquisition mode or operational mode. In start-up acquisition mode the Access Point monitors the channel frequency for 1 second before determining if the channel is unoccupied. In operational mode, if channel occupancy is detected and an alternate channel frequency is configured, the AP switches to the alternate channel and monitors that channel for 1 second before deciding if the channel is unoccupied. In operational mode, if channel occupancy is detected and no alternate channel frequencies are configured, the AP will cease transmission while continuing to monitor the existing channel frequency for 2 seconds before determining if the channel is unoccupied.

4 PROBLEMS AND LIMITATIONS CORRECTED

Table 4 System Release 13.1.3 problems and limitations corrected

Products Affected	Tracking	Description	Resolution
PMP 100 AP	22885 / 20160	PMP 100 SM cannot connect to PMP 100 AP (P9) when the region code is set to Other/Other-ETSI (Event Log displays "Exception Detected")	This problem has been resolved in System Release 13.1.3.
PMP 100 SM	22824	bandwidthScan SM OID for PMP 450 does not work when all 3 BW are selected.	This problem has been resolved in System Release 13.1.3.
PMP 450 AP	22811	If a Spectrum Analysis is executed with in the first few seconds after an AP boot up, it is not performed.	This problem has been resolved in System Release 13.1.3. The AP will not allow the operator to perform an SA scan until it has fully initialized.
PMP 100	22791	PMP 100 does not log fully log DFS radar events	This problem has been resolved in System Release 13.1.3 through enhancements to Event Log.
PMP 100	22643	When a PMP 100 SM is connected to certain routers (ex: Netgear N300), the SM may reboot when the Ethernet cable is unplugged.	This problem has been resolved in System Release 13.1.3.
PMP 450 AP	22651	On occasion, the 3.65GHz AP triggers an LBT even when it detects interference that is not periodic enough to exceed the threshold causing the transmitter to turn off (or move to an alternate frequency, if configured).	This problem has been resolved in System Release 13.1.3 through enhancements to the LBT algorithm.
PMP 450 AP	22570	On the 3.65GHz AP when there is interference at the AP causing it to be in continuous LBT detections, Spectrum Analyzer scan may not be possible. Workaround is to turn the AP transmitter off (set Frequency Carrier to "None"), then run a SA scan.	This problem has been resolved in System Release 13.1.3. Spectrum Analyzer can now be run any time after initialization has completed.

Products Affected	Tracking	Description	Resolution
All platforms	21697 / 19421	When using PPPoE/NAT, high priority traffic maybe dropped when there is heavy traffic on low priority VC	This problem has been resolved in System Release 13.1.3.

5 KNOWN PROBLEMS OR LIMITATIONS

Table 5 System Release 13.1.3 known problems and limitations

Products Affected	Tracking	Description
PMP 450 AP	22703	When 3.65GHz APs are deployed in an ABAB configuration, then if an AP is rebooted, it may trigger an LBT event once due to interference from the back sector. But once the AP has initialized and is synced with the back AP (and adjacent sectors), it will operate normally.
PMP 450 SM	22238	On rare occasion, when the channel bandwidth is configured for 5MHz or 10MHz, the SM may be unable to register to the AP. Workaround is to configure the SM to scan all three channel bandwidths (5/10/20MHz) under the **Channel Bandwidth Scan** field (located in tab **Configuration**, **Radio**).
CNUT PMP 100 SM	21681	Auto update does not work when upgrading 5.4GHz PMP 100 SMs from 11.2 to 12.1. Workaround is to manually upgrade the SMs. Once on 12.1, auto upgrade will work.
CNUT	21610	PMP430 SM is updated with PMP450 package only if this is the first package in the list of packages in CNUT.
PMP 450 SM	21228	Alignment Tone is not consistent when no data is passing through the link.
PMP 450 AP / SM	21127	SNMP Table whispBoxBridgeTable cannot report more than 255 mac addresses from the bridge table. Work around is to view the mac addresses on the GUI (Statistics, Bridging Table) which will report more than 255 mac addresses.
PMP 100	19809	On rare occasion, when using RADIUS, SMs may go into “Registering” state and does not pass traffic. Proxy access to the SM is still available. Workaround is to drop the session and allow the SM to re-register or disable RADIUS altogether.

6 TECHNICAL SUPPORT

For Technical Support, see:

http://www.cambiumnetworks.com/support

For PMP Technical Support helpdesk phone numbers, see:

http://www.cambiumnetworks.com/support/contact-support

Cambium Networks

Cambium Networks provides professional grade fixed wireless broadband and microwave solutions for customers around the world. Our solutions are deployed in thousands of networks in over 153 countries, with our innovative technologies providing reliable, secure, cost-effective connectivity that's easy to deploy and proven to deliver outstanding metrics.

Our flexible Point-to-Multipoint (PMP) solutions operate in the licensed, unlicensed and federal frequency bands, providing reliable, secure, cost effective access networks. With more than three million modules deployed in networks around the world, our PMP access network solutions prove themselves day-in and day-out in residential access, leased line replacement, video surveillance and smart grid infrastructure applications.

Our award-winning Point to Point (PTP) radio solutions operate in licensed, unlicensed and defined use frequency bands including specific FIPS 140-2 solutions for the U.S. Federal market. Ruggedized for 99.999% availability, our PTP solutions have an impeccable track record for delivering reliable high-speed backhaul connectivity even in the most challenging non-line-of-sight RF environments.

Cambium Networks solutions are proven, respected leaders in the wireless broadband industry. We design, deploy and deliver innovative data, voice and video connectivity solutions that enable and ensure the communications of life, empowering personal, commercial and community growth virtually everywhere in the world.

www.cambiumnetworks.com