Cambium Networks™

How to configure ePMP's "Frequency Reuse" feature in a frequency reuse deployment

The Frequency Reuse feature supported by ePMP is one of the major differentiating features compared to other outdoor broadband wireless access products based on 802.11 technology. This document shows how to configure ePMP for optimal frequency reuse deployment.

The Frequency Reuse feature supported by ePMP is one of the major differentiating features compared to other outdoor broadband wireless access products based on 802.11 technology. In a frequency reuse deployment similar to the one shown in Figure 1 below, the operator needs to enable the “Frequency Reuse” feature at “some” of the APs. This document helps the operator determine which APs to enable this feature on to achieve the best performance across the network.

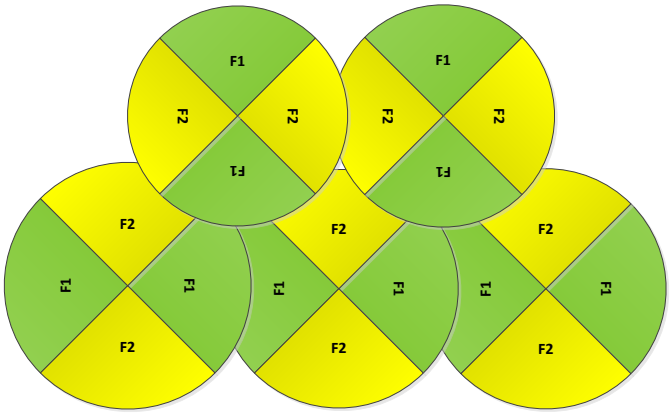

Figure 1: Frequency Reuse Deployment

The set of APs to enable the “Frequency Reuse” option on is dependent on the GPS synchronization sources in the whole network, CMM3, CMM4 or “onboard GPS” (GUI options are: GPS or CMM).

The GPS sync source is the same on all APs or is a combination of "onboard GPS" and CMM4

In this configuration the GPS sync source in the whole network is one of the following:

1- "onboard GPS" or
2- CMM4 or
3- CMM3 or
4- Mix of "onboard GPS" and CMM4 (but NOT CMM3)

Figure 2 below shows on which APs to enable the "Frequency Reuse" feature

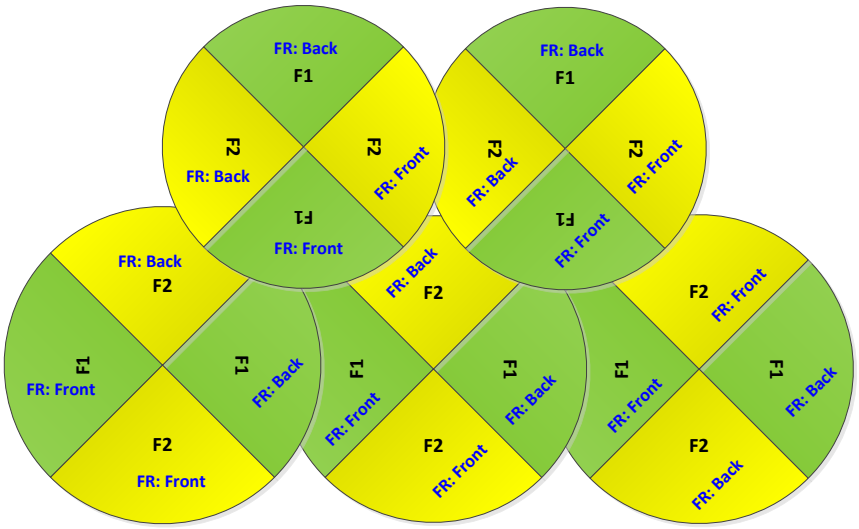

Figure 2: Frequency Reuse Configuration Example

The rules in selecting the APs to enabling the "Frequency Reuse" in this deployment are:

1- Only ONE of the APs on the same tower configured with the same frequency must have the "**Frequency Reuse - Back**" ON; the other AP shall have the "**Frequency Reuse – Front**" ON.
2- Only ONE of the APs on different towers facing each other with overlapped coverage must have the "**Frequency Reuse - Back**" ON.

The GPS sync source is a mixture of all types (CMM3, CMM4 & "onboard GPS")

In this configuration the GPS sync source in the whole network is one of the following:

1- (CMM3 and "onboard GPS") or
2- (CMM3 and CMM4) or
3- (CMM3 and CMM4 and "onboard GPS")

Figure 3 and Figure 4 show examples of which APs to enable the "Frequency Reuse" feature in this mixture of sync sources.

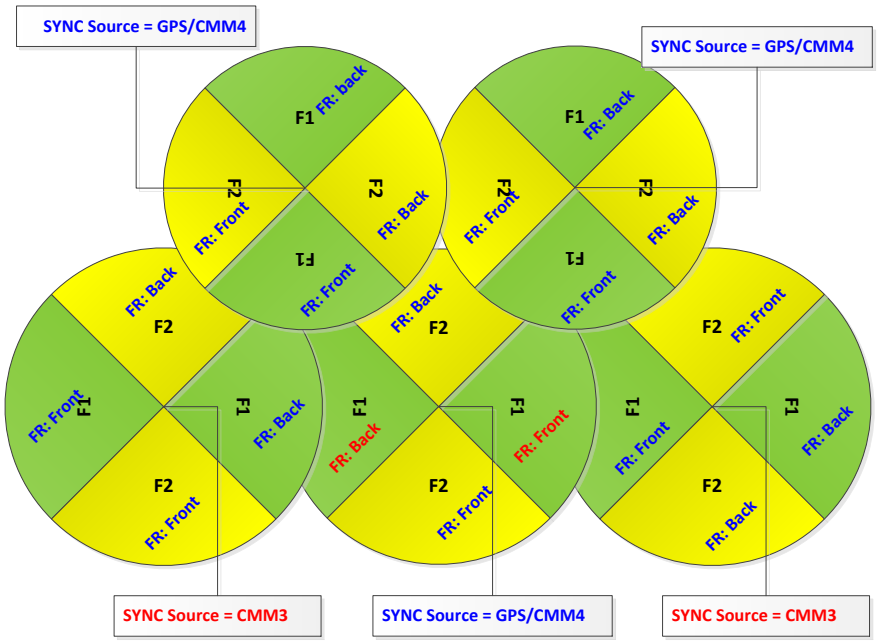

Figure 3: Example 1 - Frequency Reuse Configuration with Mixture of GPS sources

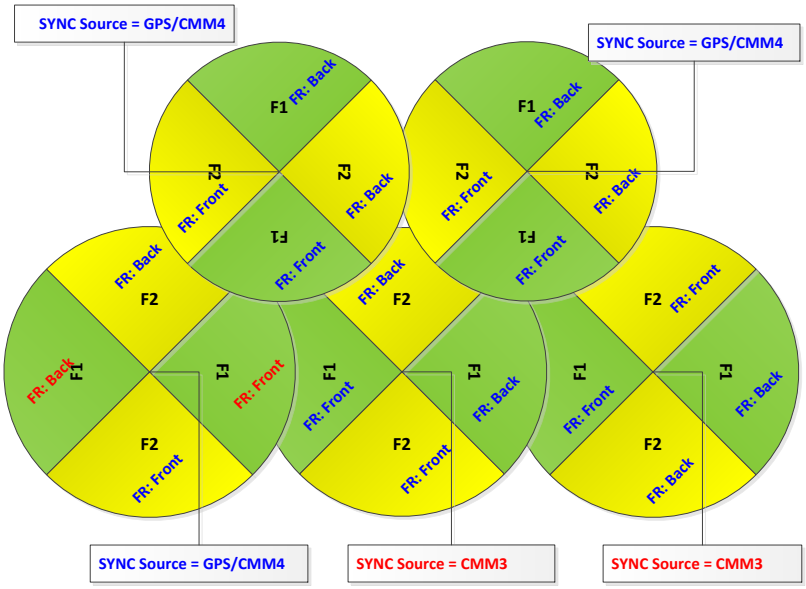

Figure 4: Example 2 - Frequency Reuse Configuration with Mixture of GPS sources

The rules in selecting the APs to enabling the “Frequency Reuse” in a mixture of sync sources deployment are:

1- Only ONE of the APs on the same tower configured with the same frequency must have the “Frequency Reuse - Back” ON if the sync source of both APs is the same or the sync is a combination of “onboard GPS” and CMM4; the other AP shall have the “**Frequency Reuse – Front**” ON.

2- For the APs on different towers facing each other with overlapped coverage:

   a. If both APs have the same sync source then only ONE of them must have the “**Frequency Reuse - Back**” ON; the other AP shall have the “**Frequency Reuse – Front**” ON.

   b. If one AP has “onboard GPS” as sync source and the other one has CMM4 then only ONE of them must have the “**Frequency Reuse - Back**” ON; the other AP shall have the “**Frequency Reuse – Front**” ON.

   c. If one AP has “onboard GPS” or CMM4 as sync source and the other one has CMM3 then:

      i. If the AP with CMM3 sync source has the “**Frequency Reuse - Back**” ON, then the other AP (with “onboard GPS” or CMM4 sync source) must have the “**Frequency Reuse – Back**” ON.

      ii. If the AP with CMM3 sync source has the “**Frequency Reuse - Back**” OFF, then the other AP (with “onboard GPS” or CMM4 sync source) must have the “**Frequency Reuse - Back**” OFF.

TRL (Target Receive Power Level) in Frequency Reuse Deployment

Target Receive Power Level (TRL) feature is one of the major components for successful frequency reuse deployment (ABAB configuration). STA's transmitting at high or maximum power will cause interference to other APs; therefore it is important to have the STA's UL transmissions received at the AP at the same power level. Furthermore in a frequency reuse deployment it is important to have the same TRL across the same-frequency APs. Figure 5 shows the TRL setting on the AP GUI (Configure ➔ Radio ➔ Advanced: Power Control section).

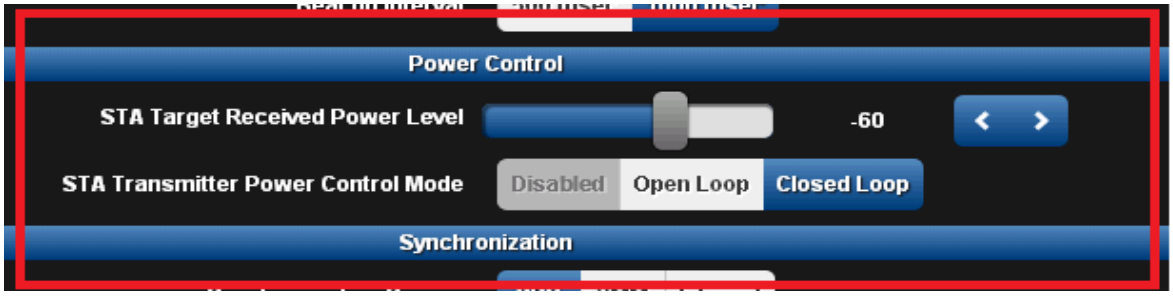

Figure 5: TRL GUI Settings

In frequency reuse deployment high TRL values (e.g. -50 dBm) may cause self-preamble-interference type to the back sector if the antenna front-back isolations is low. For RTL of -50 dBm the antenna front-back must be >40 to eliminate self-preamble-interference, for RTL of -60 dBm the antenna front-back must be >30 to eliminate self-preamble-interference.
Using Cambium's sector antenna it is recommended to configure TRL to -60 dBm in a frequency reuse deployment.

TPC (Transmit Power Control) in Frequency Reuse Deployment

Transmit power control is one of the major components for successful frequency reuse deployment (ABAB configuration). STA's transmitting at high or maximum power will cause interference to other APs, so it is important to control STA's transmit power.
TPC reduces self-interference by reducing the STA's transmit power to the minimum power needed to achieve the best performance.

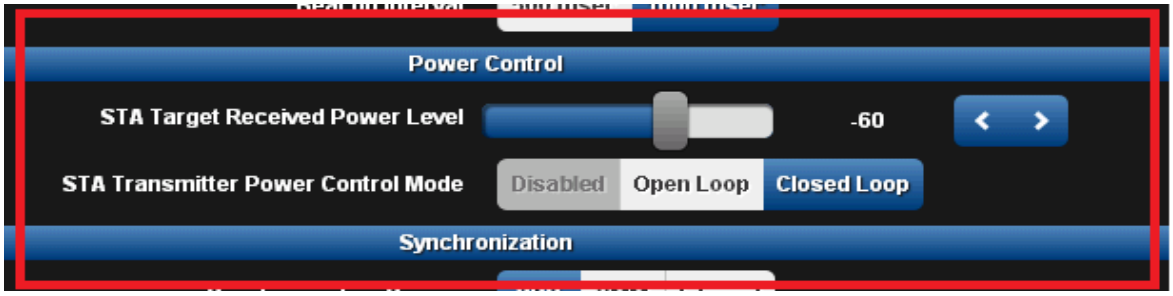

Figure 6: TPC GUI Settings

ePMP supports 3 modes of TPC configuration as shown in Figure 6:

i) Closed Loop: in which the AP constantly instructing the STA to regulate its transmit power.
ii) Open Loop: in which the STA adjusts its transmit power to achieve the RTL target RSSI at the AP without feedback from the AP.
iii) Disabled: the STA transmits at fixed power level. The operator configures the transmit power at the STA.

In an ABAB network deployment it is recommended to configure TPC to "Closed Loop" to allow the system to automatically minimize self-interference.