FCC Regulations Update

A new FCC Rule addressing Dynamic Frequency Selection (DFS) in the 5 GHz band will go into effect for the US and Canada on July 20, 2007. This document outlines the specifics of this rule and provides and overview of various WLAN product regulations for the FCC regulatory domain.

Dynamic Frequency Selection for 5 GHz WLAN in the US and Canada

The 5 GHz band is divided into several sections referred to as Unlicensed National Information Infrastructure (UNII) bands. The UNII-1 band is designated for indoor operations, the UNII-2 and UNII-2 extended bands are for indoor and outdoor operations, and the UNII-3/ISM band is intended for outdoor bridge products and may be used for indoor WLANs as well. In order to operate in the 5 GHZ bands radios must comply with two features that are part of the 802.11h specification-Dynamic Frequency Selection (DFS) and Transmitter Power Control (TPC).

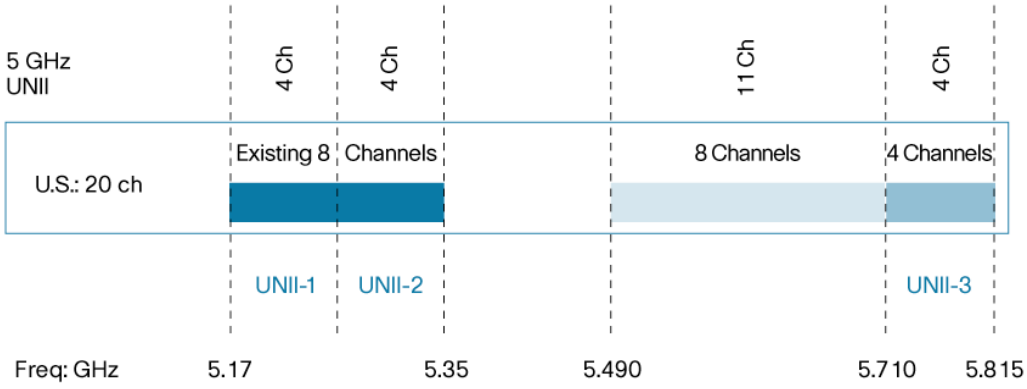
DFS dynamically instructs a transmitter to switch to another channel whenever a particular condition (such as the presence of a radar signal) is met. Prior to transmitting, a device's DFS mechanism monitors its available operating spectrum, listening for a radar signal. If a signal is detected, the channel associated with the radar signal will be vacated or flagged as unavailable for use by the transmitter. The transmitting device will continuously monitor the environment for the presence of radar, both prior to and during operation. Portions of the 5 GHz band are allocated to radar systems; this allows WLANs to avoid interference with incumbent radar users in instances where they are colocated. Such features can simplify enterprise installations, because the devices themselves can automatically optimize their channel reuse patterns.

FCC Rule # 15.407(h)(2) requires that products operating in the UNII-2 and UNII-2 extended bands (5.25-5.35 GHz and 5.47-5.725 GHz) must support Dynamic Frequency Selection (DFS), to detect and automatically adjusts channels to protect WLAN communications from interfering with military or weather radar systems. All WLAN products that ship in Canada and the US on or after July 20, 2007 must meet the DFS for FCC requirements.

Transmitter Power Control (TPC) technology has been used in the cellular telephone industry for many years. Setting the transmit power of the access point and the client adapter can be useful to allow for different coverage area sizes and, in the case of the client, to conserve battery life. In devices that have the ability to set power levels, the settings are usually static and independent of each other (access point and clients). For example, an access point can be set to a low 5mW transmit power to minimize cell size, which is useful in areas with high user density. The clients will, however, be transmitting at their previously assigned transmit power settings, which is likely more transmit power than is required to maintain association with the access point. This results in unnecessary RF energy transmitting from the clients, creating a higher level than is necessary of RF energy outside the access point's intended coverage area. With TPC, the client and access point exchange information, then the client device dynamically adjusts its transmit power such that it uses only enough energy to maintain association to the access point at a given data rate. The end result is that the client contributes less to adjacent cell interference, allowing for more densely

deployed high-performance WLANs. As a secondary benefit, the lower power on the client provides longer battery life-less power is used by the radio.

Figure 1. The 5 GHz WLAN Band



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Antenna Usage In the UNII-1 Band

The initial FCC regulations limited the use of the UNII-1 band to "integral" (permanently attached) antennas. With the October 2004 update of the FCC regulations, this regulation was removed, permitting the use of external antennas in the 5 GHz bands.

Third-Party Antenna Usage

In 1994 the FCC added regulations to the 2.4 and 5 GHz WLAN bands, requiring unique connectors or permanently attached antennas. A unique antenna connector was defined as a nonstandard RF connector, not readily available to the general public. At the same time, only antennas certified with a specific WLAN were permitted. The only exceptions to these rules were for transmitters that were certified for installation by a professional installer.

While the requirement for unique connectors remains, the regulations for certification of antennas have changed with the rules introduced in October 2004. These regulations permit any user to install any antenna that is of the same family or style, and equal or lower gain, than any certified antenna. For example: if a 10-dBi patch antenna is certified for use with a specific WLAN transmitter, any patch antenna with a gain of 10 dBi or less may also be used, regardless of its

manufacturer. Or if a Yagi directional antenna with a gain of 13.5 dBi is certified with a transmitter, any Yagi antenna with 13.5 or less gain may be used with that transmitter.

Customers can consult the Cisco Aironet Antenna and Accessory Guide for a list of antennas that have been approved for operation with Cisco Aironet devices.

Amplifiers Usage In The 2.4 And 5 Ghz WLAN Bands

Prior to October 2004, amplifiers used in 802.11 WLAN bands had to be certified, marketed, sold, and installed as a complete package, including the amplifier, the transmitter, the specific cable, and the specific antenna. All the products had to be sourced from a single vendor, in the configuration in which they were certified. Any changes required a new certification.

The October 2004 changes to the regulations eliminated the requirement for a single complete set, and permit the purchase of devices from separate sources. However, the amplifier must be certified with the specific transmitter and antenna it will be installed with, and it must follow the same Effective Isotopic Radiated Power (EIRP) limits as the transmitter itself.

Amplifiers must either comply with the unique connector requirement, prohibiting the use of standard connectors such as standard N, TNC, or SMA connectors, or must use some type of electronic signature between the transmitter and amplifier, ensuring the amplifier is used only with certified transmitters.

Other Notes

The FCC staff clarified that under the Communications Act, the FCC has exclusive authority to resolve matters involving RF interference (RFI) when unlicensed devices are being used, regardless of venue. The FCC also affirmed that the rights that consumers have under the FCC rules to install and operate customer antennas one meter or less in size apply to the operation of unlicensed equipment, such as Cisco and Linksys Wi-Fi access points.

This means that local municipalities, cities, or neighborhood groups cannot impose restrictions on installations of 802.11 WLAN products on property controlled by a user, except where public safety is a concern.

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