Source: https://en.wikipedia.org/wiki/List_of_WLAN_channels

List of WLAN channels

Tools
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Wireless LAN (WLAN) channels are frequently accessed using IEEE 802.11 protocols, and equipment that does so is sold mostly under the trademark Wi-Fi. Other equipment also accesses the same channels, such as Bluetooth. The radio frequency (RF) spectrum is vital for wireless communications infrastructure.

The 802.11 standard provides several distinct radio frequency bands for use in Wi-Fi communications: 860/900 MHz, 2.4 GHz, 3.6 GHz, 4.9 GHz, 5 GHz, 5.9 GHz, 6 GHz, 45 GHz and 60 GHz. Each range is divided into a multitude of channels. In the standards, channels are numbered at 5 MHz spacing within a band (except in the 45/60 GHz band, where they are 0.54/1.08/2.16 GHz apart), and the number linearly relates to the centre frequency of the channel. Although channels are numbered at 5 MHz spacing, transmitters generally occupy at least 20 MHz, and standards allow for channels to be bonded together to form wider channels for faster throughput.

Countries apply their own regulations to the allowable channels, allowed users and maximum power levels within these frequency ranges. The ISM band ranges are also often used.

\\section separation\\

860/900 MHz (802.11ah)

802.11ah operates in sub-gigahertz unlicensed bands. Each world region supports different sub-bands, and the channels number depends on the starting frequency of the sub-band it belongs to. Thus, there is no global channels numbering plan, and the channels numbers are incompatible between world regions (and even between sub-bands of a same world region).

The following sub-bands are defined in the 802.11ah specifications:

Image source: Manuals/WLAN Manual/WLAN Images/Image_802.11ah_file.png

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2.4 GHz (802.11b/g/n/ax)
See also: Electromagnetic interference at 2.4 GHz § Wi-Fi
Fourteen channels are designated in the 2.4 GHz range, spaced 5 MHz apart from each other except for a 12 MHz space before channel 14.

Image source: Manuals/WLAN Manual/WLAN Images/Image_802.11b:g:n:ax_file.png
Notes:
^A In the 2.4 GHz bands bonded 40 MHz channels are uniquely named by the primary and secondary 20 MHz channels, e.g. 9+13. In the 5 GHz bands they are denoted by the center of the wider band and the primary 20 MHz channel e.g. 42[40]

^B In the US, 802.11 operation on channels 12 and 13 is allowed under low power conditions. The 2.4 GHz Part 15 band in the US allows spread-spectrum operation as long as the 50 dB bandwidth of the signal is within the range of 2,400–2,483.5 MHz[11] which fully encompasses channels 1 through 13. A Federal Communications Commission (FCC) document clarifies that only channel 14 is forbidden and that low-power transmitters with low-gain antennas may operate legally in channels 12 and 13.[12] Channels 12 and 13 are nevertheless not normally used in order to avoid any potential interference in the adjacent restricted frequency band, 2,483.5–2,500 MHz,[13] which is subject to strict emission limits set out in 47 CFR § 15.205.[14] Per recent FCC Order 16–181, "an authorized access point device can only operate in the 2483.5–2495 MHz band when it is operating under the control of a Globalstar Network Operating Center and that a client device can only operate in the 2483.5–2495 MHz band when it is operating under the control of an authorized access point"[15]

^C Channel 14 is valid only for DSSS and CCK modes (Clause 18 a.k.a. 802.11b) in Japan. OFDM (i.e., 802.11g) may not be used. (IEEE 802.11-2007 §19.4.2)

Nations apply their own RF emission regulations to the allowable channels, allowed users and maximum power levels within these frequency ranges. Network operators should consult their local authorities as these regulations may be out of date as they are subject to change at any time. Most of the world will allow the first thirteen channels in the spectrum.

Interference happens when two networks try to operate in the same band, or when their bands overlap. The two modulation methods used have different characteristics of band usage and therefore occupy different widths:

The DSSS method used by legacy 802.11 and 802.11b (and the 11b-compatible rates of 11g) use 22 MHz of bandwidth. This is from the 11 MHz chip rate used by the coding system. No guard band is prescribed;[16] the channel definition provides 3 MHz between 1, 6, and 11.
The OFDM method used by 802.11a/b/g/n occupies a bandwidth of 16.25 MHz. The nameplate bandwidth is set to be 20 MHz, rounding up to a multiple of channel width and providing some guard band for signal to attenuation along the edge of the band.[17] This guardband is mainly used to accommodate older routers with modem chipsets prone to full channel occupancy, as most modern Wi-Fi modems are not prone to excessive channel occupancy.

While overlapping frequencies can be configured at a location and will usually work, it can cause interference resulting in slowdowns, sometimes severe, particularly in heavy use. Certain subsets of frequencies can be used simultaneously at any one location without interference (see

diagrams for typical allocations). The consideration of spacing stems from both the basic bandwidth occupation (described above), which depends on the protocol, and from attenuation of interfering signals over distance. In the worst case, using every fourth or fifth channel by leaving three or four channels clear between used channels causes minimal interference, and narrower spacing still can be used at further distances.[18][19] (The "interference" is usually not actual bit-errors, but the wireless transmitters making space for each other. The requirement of the standard is for a transmitter to yield when it detects another at a level of 3 dB above the noise floor,[20] and when the level is higher than a threshold Pth which, for non Wi-Fi 6 systems, is between -76 and -80 dBm.[19] Interference resulting in bit-error is rare.[19])

As shown in the diagram, bonding two 20 MHz channels to form a 40 MHz channel is permitted in the 2.4 GHz bands. These are generally referred to by the centres of the primary 20 MHz channel and the adjacent secondary 20 MHz channel (e.g. 1+5, 9+13, 13–9, 5–1). The primary 20 MHz channel is used for signalling and backwards compatibility, the secondary is only used when sending data at full speed.

Image source: Manuals/WLAN Manual/WLAN Images/Image_2.4Ghz_file.png

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3.65 GHz (802.11y)
Except where noted, all information taken from Annex J of IEEE 802.11y-2008

This range is documented as only being allowed as a licensed band in the United States. However, not in the original specification, under newer frequency allocations from the FCC, it falls under the 3.55–3.7Ghz Citizens Broadband Radio Service band. This allows for unlicensed use, under Tier 3 GAA rules, provided that the user doesn't cause harmful interference to Incumbent Access users or Priority Access Licensees and accepts all interference from these users,[21] and also follows of all the technical requirements in CFR 47 Part 96 Subpart E

A 40 MHz band is available from 3655 to 3695 MHz. It may be divided into eight 5 MHz channels, four 10 MHz channels, or two 20 MHz channels, as follows:

Image source: Manuals/WLAN Manual/WLAN Images/Image_802.11y_file.png

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4.9–5.0 GHz (802.11j) WLAN

Image source: Manuals/WLAN Manual/WLAN Images/Image_802.11j_file.png

In Japan starting in 2002, 100 MHz of spectrum from 4900 to 5000 MHz can be used for both indoor and outdoor connection once registered. Originally, another spectrum of 5030–5091 MHz

was also available for use, however, it has been re-purposed and cannot be used after 2017.[22]

50 MHz of spectrum from 4940 to 4990 MHz (WLAN channels 20–26) are in use by public safety entities in the United States. Within this spectrum there are two non-overlapping channels allocated, each 20 MHz wide. The most commonly used channels are 22 and 26.

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