§ 15.405 Cross reference.
(a) The provisions of subparts A, B, and C of this part apply to unlicensed U-NII devices, except where specific provisions are contained in subpart E. Manufacturers should note that this includes the provisions of §§15.203 and 15.205.
(b) The requirements of subpart E apply only to the radio transmitter contained in the U-NII device. Other aspects of the operation of a U-NII device may be subject to requirements contained elsewhere in this chapter. In particular, a U-NII device that includes digital circuitry not directly associated with the radio transmitter also is subject to the requirements for unintentional radiators in subpart B.

§ 15.407 General technical requirements.
(a) Power limits:
(1) For the band 5.15–5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 50 mW or 4 dBm + 10 log B, where B is the 26-dB emission bandwidth in MHz. In addition, the peak power spectral density shall not exceed 4 dBm in any 1–MHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain up to 23 dBi without any corresponding reduction in the transmitter peak output power or peak power spectral density. For fixed, point-to-point U-NII transmitters that employ a directional antenna gain greater than 23 dBi, a 1 dB reduction in peak transmitter power and peak power spectral density for each 1 dB of antenna gain in excess of 23 dBi would be required. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

NOTE TO PARAGRAPH (a)(3): The Commission strongly recommends that parties employing U-NII devices to provide critical communications services should determine if there are any nearby Government radar systems that could affect their operation.

(2) For the 5.25–5.35 GHz and 5.47–5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in megahertz. In addition, the peak power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(3) For the band 5.725–5.825 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 1 W or 17 dBm + 10 log B, where B is the 26-dB emission bandwidth in MHz. In addition, the peak power spectral density shall not exceed 17 dBm in any 1–MHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain up to 23 dBi without any corresponding reduction in the transmitter peak output power or peak power spectral density. For fixed, point-to-point U-NII transmitters that employ a directional antenna gain greater than 23 dBi, a 1 dB reduction in peak transmitter power and peak power spectral density for each 1 dB of antenna gain in excess of 23 dBi would be required. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

(4) The maximum conducted output power must be measured over any interval of continuous transmission using instrumentation calibrated in terms of an rms-equivalent voltage. The measurement results shall be properly adjusted for any instrument limitations, such as detector response times, limited resolution bandwidth capability when compared to the emission bandwidth, sensitivity, etc., so as to obtain a true peak measurement conforming to the above definitions for the emission in question.

(5) The peak power spectral density is measured as a conducted emission by
direct connection of a calibrated test
device to the equipment under
test. If the device cannot be connected
directly, alternative techniques accept-
table to the Commission may be used.

Measurements are made over a band-
width of 1 MHz or the 26 dB emission
bandwidth of the device, whichever is
less. A resolution bandwidth less than
the measurement bandwidth can be
used, provided that the measured
power is integrated to show total
power over the measurement band-
width. If the resolution bandwidth is
approximately equal to the measure-
ment bandwidth, and much less than
the emission bandwidth of the equip-
ment under test, the measured results
shall be corrected to account for any
difference between the resolution band-
width of the test instrument and its ac-
tual noise bandwidth.

(6) The ratio of the peak excursion of
the modulation envelope (measured
using a peak hold function) to the max-
imum conducted output power (meas-
ured as specified above) shall not ex-
ceed 13 dB across any 1 MHz bandwidth
or the emission bandwidth whichever is
less.

(b) Undesirable emission limits: Except
as shown in paragraph (b)(6) of this sec-
tion, the peak emissions outside of the
frequency bands of operation shall be
attenuated in accordance with the fol-
lowing limits:

(1) For transmitters operating in the
5.15–5.25 GHz band: all emissions out-
side of the 5.15–5.35 GHz band shall not
exceed an EIRP of –27 dBm/MHz.

(2) For transmitters operating in the
5.25–5.35 GHz band: all emissions out-
side of the 5.15–5.35 GHz band shall not
exceed an EIRP of –27 dBm/MHz. De-
vices operating in the 5.25–5.35 GHz
band that generate emissions in the
5.15–5.25 GHz band must meet all appli-
cable technical requirements for opera-
tion in the 5.15–5.25 GHz band (includ-
ing indoor use) or alternatively meet
an out-of-band emission EIRP limit of
–27 dBm/MHz in the 5.15–5.25 GHz band.

(3) For transmitters operating in the
5.47–5.725 GHz band: all emissions out-
side of the 5.47–5.725 GHz band shall not
exceed an EIRP of –27 dBm/MHz.

(d) [Reserved]

(e) Within the 5.15–5.25 GHz band, U-
NII devices will be restricted to indoor
operations to reduce any potential for
harmful interference to co-channel
MSS operations.

(f) U-NII devices are subject to the
radio frequency radiation exposure re-
quirements specified in §1.1307(b),
§2.1091 and §2.1093 of this chapter, as
appropriate. All equipment shall be
considered to operate in a "general
population/uncontrolled" environment.

Applications for equipment authoriza-
tion of devices operating under this
section shall be filed with the
Commission as provided in §15.205.
section must contain a statement confirming compliance with these requirements for both fundamental emissions and unwanted emissions. Technical information showing the basis for this statement must be submitted to the Commission upon request.

(g) Manufacturers of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the users manual.

(h) Transmit Power Control (TPC) and Dynamic Frequency Selection (DFS).

(i) Transmit power control (TPC). U-NII devices operating in the 5.25–5.35 GHz band and the 5.47–5.725 GHz band shall employ a TPC mechanism. The U-NII device is required to have the capability to operate at least 6 dB below the mean EIRP value of 30 dBm. A TPC mechanism is not required for systems with an e.i.r.p. of less than 500 mW.

(2) Radar Detection Function of Dynamic Frequency Selection (DFS). U-NII devices operating in the 5.25–5.35 GHz and 5.47–5.725 GHz bands shall employ a DFS radar detection mechanism to detect the presence of radar systems and to avoid co-channel operation with radar systems. The minimum DFS detection threshold for devices with a maximum e.i.r.p. of 200 mW to 1 W is -64 dBm. For devices that operate with less than 200 mW e.i.r.p. the minimum detection threshold is -62 dBm. The detection threshold is the received power averaged over 1 microsecond referenced to a 0 dBi antenna. The DFS process shall be required to provide a uniform spreading of the loading over all the available channels.

(i) Operational Modes. The DFS requirement applies to the following operational modes:

(A) The requirement for channel availability check time applies in the master operational mode.

(B) The requirement for channel move time applies in both the master and slave operational modes.

(ii) Channel Availability Check Time. A U-NII device shall check if there is a radar system already operating on the channel before it can initiate a transmission on a channel and when it has to move to a new channel. The U-NII device may start using the channel if no radar signal with a power level greater than the interference threshold values listed in paragraph (h)(2) of this part, is detected within 60 seconds.

(iii) Channel Move Time. After a radar’s presence is detected, all transmissions shall cease on the operating channel within 10 seconds. Transmissions during this period shall consist of normal traffic for a maximum of 200 ms after detection of the radar signal. In addition, intermittent management and control signals can be sent during the remaining time to facilitate vacating the operating channel.

(iv) Non-occupancy Period. A channel that has been flagged as containing a radar system, either by a channel availability check or in-service monitoring, is subject to a non-occupancy period of at least 30 minutes. The non-occupancy period starts at the time when the radar system is detected.


Subpart F—Ultra-Wideband Operation

SOURCE: 67 FR 34856, May 16, 2002, unless otherwise noted.

§ 15.501 Scope.

This subpart sets out the regulations for unlicensed ultra-wideband transmission systems.

§ 15.503 Definitions.

(a) UWB bandwidth. For the purpose of this subpart, the UWB bandwidth is the frequency band bounded by the points that are 10 dB below the highest radiated emission, as based on the complete transmission system including the antenna. The upper boundary is designated $f_u$ and the lower boundary is designated $f_l$. The frequency at which the highest radiated emission occurs is designated $f_m$.

(b) Center frequency. The center frequency, $f_c$, equals $(f_u + f_l)/2$.

(c) Fractional bandwidth. The fractional bandwidth equals $2(f_u - f_l)/(f_u + f_l)$. 47 CFR Ch. I (10–1–12 Edition)