- 4 Conformance specification of special devices
 - 4.1 Tunnel radio systems: An intentional radiator utilized as a communication transceiver by the people work in the tunnel.
 - 4.1.1 Frequency bands: use spectra in Section 2.7 and frequency
 - 4.1.2 Installation regulation: Operation of a tunnel radio system including intentional radiator and all connecting wires shall be contained solely within a tunnel.
 - 4.1.3 Radiated emission limits: The total electromagnetic field from a tunnel radio system on any frequency or frequencies appearing outside of the tunnel shall be less than or equal the limits shown in Section 2.8. and shall comply with Section 2.3 should voltage be applied on the public utility power lines.
 - 4.1.4 The antenna specification is not subject to the requirement of Section 2.2
 - 4.2 Cable locating equipment: An intentional radiator used intermittently by trained operators to locate buried cables, lines, pipes and similar structures or elements. Operation entails coupling a radio frequency signal onto the cable, pipe, etc. and using a receiver to detect the location of that structure or element.
 - 4.2.1 Frequency bands: 9 kHz~490 kHz.
 - 4.2.2 The peak output power: Under any type of modulation technique shall be less than or equal to the following limits.
 - 4.2.2.1 9 kHz~45 (exclusive) kHz: 10 watt.
 - 4.2.2.2 45 kHz~490kHz: 1 watt.
 - 4.2.3 Modulation technique: any kind of non-voice modulation technique.
 - 4.2.4 It shall follows Section 2.3 if apply voltage on the public utility power lines.
 - 4.2.5 The antenna specification is not subject to the requirement of Section 2.2.
 - 4.3 Radio control devices: including the remote controlled devices for model toys, industrial purposes and also the radio data transceivers.
 - 4.3.1 The remote controlled devices for model toys: including a model aircraft device or a model

surface craft device on the ground or water.

- 4.3.1.1 Frequency bands:
 - The frequencies listed below are for any type of remote device operation: 26.995 MHz, 27.045 MHz, 27.095 MHz, 27.120 MHz, 27.136 MHz, 27.145 MHz, 27.195 MHz and 27.245 MHz.
 - (2) The frequencies listed below are for any type of model aircraft device operation only: 72.00 MHz~72.99 MHz, a channel interval: 20 kHz.
 - (3) The frequencies listed below are for any type of model surface craft device operation: 75.41MHz~75.99 MHz, a channel interval: 20 kHz.
- 4.3.1.2 Effective radiated power (ERP): Under any modulation technique, the carrier power of the radio controlled device shall be less than or equal to the following limits.
 - (1) 26.995 MHz~27.245 MHz band: model surface craft device: 4 W, model aircraft device: 0.75 W.
 - (2) 72.00 MHz~72.99 MHz band: 0.75 W.
 - (3) 75.41 MHz~75.99 MHz band: 0.75 W.
- 4.3.1.3 Modulation technique: any kind of non-voice modulation technique.
- 4.3.1.4 Bandwidth: within 8 kHz.
- 4.3.1.5 The frequency tolerance:
 - (1) 26.995 MHz~27.245 MHz band: The frequency tolerance of the carrier shall be ±0.005 %. This frequency tolerance shall be maintained for a temperature variation of -20 °C~50 °C at normal supply voltage, and for a variation in the primary supply voltage within ±15 % of the rated supply voltage at a temperature of 20 °C. For battery operated equipment, the equipment tests shall be performed using a new battery. In the meantime, it shall meet the requirement of Section 5.18.
 - (2) 72.00 MHz~72.99 MHz and 75.41 MHz~75.99 MHz bands: The frequency tolerance of the carrier shall be ±0.002 %. This frequency tolerance shall be maintained for a temperature variation of -20 °C~50 °C at normal supply voltage, and for a variation in the primary supply voltage within ±15 % of the rated supply voltage at a temperature of 20 °C. For battery operated equipment, the equipment tests shall be performed using a new battery. In the meantime, it shall meet the requirement of Section 5.18.
- 4.3.1.6 Unwanted emission:
 - (1) 26.995 MHz~27.245 MHz band:
 - (A) Emissions $\pm 4 \text{ kHz}$ (exclusive) to $\pm 8 \text{ kHz}$ (exclusive) from the channel center frequency: At least 25 dB.
 - (B) Emissions ±8 kHz (exclusive) to ±20 kHz (exclusive) from the channel center frequency: at least 35 dB.
 - (C) Emissions more than \pm 20 kHz (exclusive) from the channel center frequency: at least 43 + 10 log (max. output power) dB.
 - (2) 72.00 MHz~72.99 MHz and 75.41 MHz~75.99 MHz bands:
 - (A) Emissions ±4 kHz (exclusive) to ±8 kHz (inclusive) from the channel center frequency: at least 25 dB.
 - (B) Emissions $\pm 8 \text{ kHz}$ (exclusive) to $\pm 10 \text{ kHz}$ (inclusive) from the channel center frequency: at least 45 dB.
 - (C) Emissions ±10 kHz (exclusive) to ±20 kHz (inclusive) from the channel center frequency: at least 55 dB.

(D) Emissions more than \pm 20 kHz (exclusive) from the channel center frequency: at least 56 + 10 log (max. output power) dB.

4.3.1.7 Limits:

- (1) One-way control only.
- (2) Compliance with the regulations in Section 2.10.5.

4.3.2 Radio controlled devices for industry: Radio frequency transceiver used only in the factory building for transmitting digital control signal.

Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	480.050	7	480.200
2	480.075	8	480.225
3	480.100	9	480.250
4	480.125	10	480.275
5	480.150	11	480.350
6	480.175	12	480.400

4.3.2.1 Frequency bands: Limited to the following frequency.

- 4.3.2.2 Effective radiated power (ERP): shall not exceed 10 mW.
- 4.3.2.3 Modulation technique : F1D and F2D.
- 4.3.2.4 Bandwidth: within 8.5 kHz.
- 4.3.2.5 Frequency tolerance: within 4ppm. This frequency tolerance shall be maintained for a temperature variation of -20 °C ~50 °C at normal supply voltage, and for a variation in the primary supply voltage within ±15 % of the rated supply voltage at a temperature of 20 °C. For battery operated equipment, the equipment tests shall be performed using a new battery. In the mean time, it shall comply with the requirements set forth in Section 5.18.
- 4.3.2.6 Spurious emissions: less than 2.5 uW (ERP) measured by the average detector.
- 4.3.3 Radio data transceiver: Radio transceiver used restricted inside the building for voice, images and data communication.
 - 4.3.3.1 Frequency bands:
 - (1) Restricted to the 6 channels below only,

Channel	Frequency (MHz)
1	429.1750
2	429.1875
3	429.2000
4	429.2125
5	429.2250
6	429.2375

(2) Restricted to the 10 channels below only,

Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	429.8125 / 449.7125	6	429.8750 / 449.7750
2	429.8250 / 449.7250	7	429.8875 / 449.7875
3	429.8375 / 449.7375	8	429.9000 / 449.8000
4	429.8500 / 449.7500	9	429.9125 / 449.8125
5	429.8625 / 449.7625	10	429.9250 / 449.8250

Note: The 10th channel is for control purpose.

- 4.3.3.2 Effective radiated power (ERP): shall not exceed 10 mW.
- 4.3.3.3 Modulation technique:F1D, F2D,F1E,F2E,F1F,及 F2F.
- 4.3.3.4 Bandwidth: within 8.5 kHz.
- 4.3.3.5 Adjacent Channel Leakage Ratio: The emission power in the central frequency ±4.25 kHz for adjacent channel shall be lower over 40 dB than the carrier power.
- 4.3.3.6 For control channel, the duration of each transmission shall be less than 0.2 seconds and the silent period shall be greater than 2 seconds. For other channel, the duration of each transmission shall be less than 40 seconds and the silent period shall be greater than 2 seconds.
- 4.3.3.7 Frequency tolerance: within 4 ppm. This frequency tolerance shall be maintained for a temperature variation of -20 °C ~50 °C at normal supply voltage, and for a variation in the primary supply voltage within ±15 % of the rated supply voltage at a temperature of 20 °C. For battery operated equipment, the equipment tests shall be performed using a new battery. In the meantime, it shall comply with the requirements set forth in Section 5.18.
- 4.3.3.8 Spurious emissions: less than 2.5 uW (ERP) measured by the average detector.
- 4.3.4. Special note for compliance approval.
 - 4.3.4.1 The module compliance approval shall be conducted if the end user can gain access to replace plug-in type detector module. Each module should contain the whole frequency detection circuit including the oscillator. Plug-in type oscillation crystal is not part of the frequency detector module and cannot be altered by the user.
 - 4.3.4.2 The antenna must be integral attached onto the Low-power radio-frequency devices. External antenna shall be prohibited. It shall be vertical polarization and zero gain compared to half-wave dipole antenna.
 - 4.3.4.3 The frequency of the Low-power radio-frequency devices should be generated by crystal.
- 4.4 Citizens Band Radio Service (CBRS)
 - 4.4.1 Transmitter:
 - 4.4.1.1 Frequency bands: from 26.965 MHz~27.405 MHz in total 40 channels (as table below). The channel 9 shall be specially marked for emergency call only.

Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
	(MHz)		(MHz)		(MHz)		(MHz)
1	26.965	11	27.085	21	27.215	31	27.315
2	26.975	12	27.105	22	27.225	32	27.325
3	26.985	13	27.115	23	27.235	33	27.335
4	27.005	14	27.125	24	27.245	34	27.345
5	27.015	15	27.135	25	27.255	35	27.355
6	27.025	16	27.155	26	27.265	36	27.365
7	27.035	17	27.165	27	27.275	37	27.375
8	27.055	18	27.175	28	27.285	38	27.385
9	27.065	19	27.185	29	27.295	39	27.395
10	27.075	20	27.205	30	27.305	40	27.405

- 4.4.1.2 Modulation technique:
 - (1) AM (A3E): amplitude modulation below ± 100 %.
 - (2) FM (F3E): peak frequency deviation within ± 2.5 kHz.
- 4.4.1.3 Bandwidth:
 - AM (A3E): 8 kHz.

FM (F3E): 10 kHz.

4.4.1.4 The frequency tolerance: within 0.005 %. This frequency tolerance shall be maintained for a

temperature variation of -20 $^{\circ}$ C ~50 $^{\circ}$ C at normal supply voltage, and for a variation in the primary supply voltage within ±15% of the rated supply voltage at a temperature of 20 $^{\circ}$ C. For battery operated equipment, the equipment tests shall be performed using a new battery. In the meantime, it shall comply with the requirements set forth in Section 5.18.

4.4.1.5 Effective radiated power (ERP):

AM (A3E): within 4 W.

FM (F3E): within 5 W.

- 4.4.1.6 Power in the adjacent channels:
 - (1) AM (A3E): the same as 4.4.1.7(1).
 - (2) FM (F3E): less than or equal to 20 nW under normal testing conditions.
- 4.4.1.7 Unwanted emission:
- (1) AM (A3E):
 - (A) Emissions ±4 kHz~±8 kHz from the channel center frequency : minimum 25 dB.
 - (B) Emissions ±8 kHz~±20 kHz from the channel center frequency : minimum 35 dB.
 - (C) Emissions more than ±20 kHz from the channel center frequency: at I minimum 53 + 10 log (maximum output power) dB.
- (2) FM (F3E):
 - (A) When the transmitter is operating, the spurious power in the following frequency bands shall be less than or equal to 4 nW (ERP): 41 MHz~68 MHz, 87.5 MHz~118 MHz, 162 MHz~230 MHz and 470 MHz~862 MHz.
 - (B) In addition to those specified in (A) above, the ERP of spurious power in the frequencies from 25 MHz~1 GHz shall be less than or equal to 0.25 μ W (ERP).
 - (C) In addition to those specified in (A) and (B) above, the ERP of spurious power in the frequencies from 1 GHz~2 GHz shall be less than or equal to 1 uW (ERP).
 - (D) When the transmitter is in standby, the ERP of spurious power in the frequencies from 25 MHz~1 GHz shall be less than or equal to 2 nW (ERP), and in the frequencies from 1 GHz~2 GHz shall be less than or equal to 20 nW (ERP).

4.4.2 The receiver:

- 4.4.2.1 Unwanted emission: The field strength of unwanted emissions shall not exceed the general radiated emission limits in Section 2.8.
- 4.5 Family Radio Service (FRS)
 - 4.5.1 Frequency bands: It is limited to the following 14 channels (the total channel number displayed shall I be less than or equal to 14).

Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	467.5125	8	467.60
2	467.525	9	467.6125
3	467.5375	10	467.625
4	467.550	11	467.6375
5	467.5625	12	467.650
6	467.575	13	467.6625
7	467.5875	14	467.675

- 4.5.2 Modulation technique:F3E/F2D.
- 4.5.3 Effective radiated power (ERP): below 1 Watt.
- 4.5.4 Bandwidth: within 12.5 kHz.
- 4.5.5 The frequency tolerance: within ±2.5 ppm. This frequency tolerance shall be maintained for a temperature variation of -20 °C ~50 °C at normal supply voltage, and for a variation in the primary

supply voltage within ± 15 % of the rated supply voltage at a temperature of 20 °C. For battery operated equipment, the equipment tests shall be performed using a new battery. In the mean time, it shall meet the requirement of Section 5.18.

- 4.5.6 Peak frequency deviation of F3E: within ±2.5 kHz.
- 4.5.7 Audio frequency response of F3E: within 3.125 kHz.
- 4.5.8 Unwanted emission:
- 4.5.8.1 F3E:
 - (1) Emissions ±6.25 kHz (exclusive) to ±12.5 kHz (inclusive) from the channel center frequency attenuated over 25 dB.
 - (2) Emissions ±12.25 kHz (exclusive) to ±31.5 kHz (inclusive) from the channel center frequency attenuated over 35 dB.
 - (3) Emissions more than ±31.25 kHz from the channel center frequency shall be attenuated over 43+10log (maximum output power) dB.
- 4.5.8.2 F2D: within 50 uW (ERP).
- 4.5.9 Receiver: Effective radiated power (ERP) within 20 nW.
- 4.5.10 Any antenna and power amplifier connected to FRS transmitter can be used with FRS in this section after approved by he committee.
- 4.5.11 The connecting to the external power is allowed, but the effective radiated power (ERP) shall be less than or equal to 1 Watt.
- 4.5.12 FRS shall be permitted for one-way or two-way voice or no-voice communications.
- 4.5.13 One-way voice or non-voice communications shall be limited to establish voice communications, send text messages, emergency messages, or location information.
- 4.5.14 Non-voice communications:
- 4.5.14.1 A non-voice emission is limited to squelch tones, such as CTCSS (Continuous Tone Controlled Squelch System) and CDCSS (Continuous Digital Controlled Squelch System) to establish or continue communications. If the audible tones are more than 300 Hertz, it shall not last longer than 15 seconds at one time; if the audible tones are less than or equal to 300 Hertz, the restriction shall not apply.
- 4.5.14.2 The FRS unit may transmit digital data containing text messages, emergency messages, GPS information, or requesting location information from one or more other FRS units. Digital data transmissions must be initiated manually or by command of a user, except in the case of an FRS unit receiving an interrogation request to automatically respond with its location. Digital data transmissions shall be less than or equal to one second, and shall be limited to less than or equal to one digital transmission within a thirty-second period, except in the case an FRS unit automatically respond to one interrogation request, which shall not be limited. FRS units are prohibited from transmitting data in store-and-forward packet operation mode.
- 4.5.15 Connecting to public telecommunications system is prohibited.
- 4.6 Low-Power Wireless Microphone and Wireless Earphone: A low power wireless microphone is used for transmission of voice or music by radio waves to remote receiving equipments.
 - 4.6.1 Frequency bands: 227.1 MHz~227.4 MHz, 229.4 MHz~230.0 MHz, 231.0 MHz~231.9 MHz, 510 MHz~530 MHz, 748 MHz~758 MHz, 803 MHz~806 MHz, 1790 MHz~1805 MHz
 - 4.6.2 Necessary bandwidth:
 - 4.6.2.1 The necessary bandwidth for the system with the operating frequency (fc) less than 1 GHz shall be less than or equal to 200 kHz, and shall comply with the mask standards in the following two tables.

Eroquency deviation	Analog system							
	Limit (dBc)	RBW	VBW	Detector	Trace	Span		
± (0 ≤ ∆f ≤ 0.35B)	0 ~ -20 (Note 1)	1 kHz	1 kHz	RMS	Max Hold	fc ± 1 MHz		
± (0.35B ≤ ∆f ≤ 0.5B)	-20 ~ -60 (Note 1)	1 kHz	1 kHz	RMS	Max Hold	fc ± 1 MHz		
± (0.5B ≤ ∆f ≤ B)	-60 ~ -80 (Note 1)	1 kHz	1 kHz	RMS	Max Hold	fc ± 1 MHz		
\pm (B ≤ ∆f ≤ 1MHz) -80 ~ -90 (Note1) 1 kHz 1 kHz RMS Average fc ± 1 MHz								
Note: 1. For the limits calculated by linear interpolations, please see Figure 1.								
2. The tighter lim	it applies at the band	overlap.						

3. B indicates the bandwidth stated by the supplier.





Frequency	Digital system (<1 GHz)							
deviation ∆f	Limit (dBc)	RBW	VBW	Detector	Trace	Span	Sweep Time	
± (0 ≤ ∆f < 0.5B)	0	1 kHz	1 kHz	RMS	Max Hold	≥ 5 x B	≥ 2 seconds	
± (0.5B ≤ ∆f ≤ 1.75B)	-30 ~ -80 (Note 1)	1 kHz	1 kHz	RMS	Max Hold	≥ 5 x B	≥ 2 seconds	
± (1.75B ≤ ∆f ≤ 5B)	-80 ~ -90 (Note 1)	1 kHz	1 kHz	RMS	Average	± (1.75B ≤ ∆f ≤ 5B)	2 seconds Per 200 kHz	
						-		

Note: 1. For the limits calculated by linear interpolations, please see Figure 2. 2. The tighter limit applies at the band overlap.

3. B indicates the bandwidth stated by the supplier.



4.6.2.2 The necessary bandwidth for the system with the operating frequency (fc) greater than 1 GHz shall be less than or equal to 600 kHz, and comply with the mask standard in the table below.

Frequency	Digital system (>1 GHz)							
∆f	Limit (dBc)	RBW	VBW	Detector	Trace	Span	Sweep Time	
± (0 ≤ ∆f < 0.5B)	0	1 kHz	1 kHz	RMS	Max Hold	≥5 x B	≥ 2 seconds	
$\pm (0.5B \le \Delta f \le B)$	-40 ~ -60 (Note 1)	1 kHz	1 kHz	RMS	Max Hold	≥ 5 x B	≥ 2 seconds	
$\begin{array}{c c c c c c c c c c c c c c c c c c c $								
Note: 1. For the limits calculated by linear interpolations, please see Figure 3.								

2. The tighter limit applies at the band overlap.3. B indicates the bandwidth stated by the supplier.



Figure 3



- 4.6.3 Fundamental emission (ERP):
- 4.6.3.1 Operation within the bands 227.1 MHz~227.4 MHz, 229.4 MHz~230.0 MHz, 231.0 MHz~231.9 MHz:

Channel Bandwidth	ERP limit
No more than 50kHz	No more than 10mW.
Below 200kHz, above 50kHz (exclusive)	No more than 5mW

- 4.6.3.2 Operation within the 510.0 MHz~530.0 MHz band: below 50 mW.
- 4.6.3.3 Operation within the 748.0 MHz~758.0 MHz band: below 10 mW.
- 4.6.3.4 Operation within the 803.0 MHz~806.0 MHz band: below 10 mW.
- 4.6.3.5 Operation within the 1790.0 MHz~1805.0 MHz band: below 10 mW.
- 4.6.3.6 The carrier power must be operated according to the table below when measuring the channel width.

Carrier power measurement						
Central emission frequency	RBW	VBW	Detector	Trace	Span	Sweep Time
fc	5 x B	5 x B	RMS	Average	Zero Span	≥ 2 seconds
Remark: B represents the emission bandwidth.						

- 4.6.4 Frequency deviation: less than or equal to ±75 kHz, solely applied to analog system.
- 4.6.5 Frequency stability:
- 4.6.5.1 Operating frequency less than 1 GHz: 20 ppm
- 4.6.5.2 Operating frequency greater than 1 GHz: 15 ppm
- 4.6.6 Spurious emission (ERP):

	Frequency						
	47 MHz~74 MHz, 87.5 MHz~137 MHz, 174 MHz~230 MHz, 470 MHz~862 MHz	< 1 GHz	>1 GHz				
Operating state	Below 4 nW	Below 250 nW	Below 1 uW				
Standby state	Below 2 nW	Below 2 nW	Below 20 nW				

- 4.6.7 Spurious emission of receiver (ERP): below 2 nW (inclusive).
- 4.6.8 The antenna attached to transmitter shall be an integral structure.
- 4.6.9 The frequency stability shall be maintained over a temperature variation of -10 °C ~45 °C at normal supply voltage, and for a variation in the primary supply voltage within ±15 % of the rated supply voltage at a temperature of 20 °C. For battery operated equipment, the equipment tests shall be performed using a new battery. In the meantime, it shall conform to the requirement of Section 5.18.
- 4.7 Unlicensed National Information Infrastructure: Use wideband digital modulation techniques and provide a wide array of high data rate mobile and fixed communications for individuals, businesses, and organizations.
 - 4.7.1 Operating frequencies: 5.15 GHz~5.25 GHz, 5.25 GHz~5.35 GHz, 5.470 GHz~5.725 GHz and 5.725 GHz~5.85 GHz.
 - 4.7.2 Terminology:
 - 4.7.2.1 Average symbol envelope power: The average symbol envelope power is the average, taken over all symbols in the signaling alphabet, of the envelope power for each symbol.
 - 4.7.2.2 Digital modulation: The process by which the characteristics of a carrier wave are varied among a set of predetermined discrete values in accordance with a digital modulating function as specified in document ANSI C63.17-1998.
 - 4.7.2.3 Emission bandwidth: For purposes of this subpart the emission bandwidth shall be determined by measuring the width of the signal between two points (one below and one above the carrier center frequency) that are 26 dB down relative to the maximum level of the modulated carrier. Determination of the emissions bandwidth is based on the use of measurement instrumentation employing a peak detector function with an instrument resolution bandwidth approximately equal to 1 % of the emission bandwidth of the device being measured.
 - 4.7.2.4 Access Point (AP): A U-NII transceiver that operates either as a bridge in a peer-to-peer connection or as a connector between the wired and wireless segments of the network.
 - 4.7.2.5 Available Channel: A radio channel on which a Channel Availability Check has not identified the presence of radar.
 - 4.7.2.6 Power spectral density: The power spectral density is the total energy output per unit bandwidth from a pulse or sequence of pulses for which the transmit power is at its maximum level, divided by the total duration of the pulses. This total time does not include the time between pulses during which the transmit power is off or below its maximum level.

- 4.7.2.7 Pulse: A pulse is a continuous transmission of a sequence of modulation symbols, during which the average symbol envelope power is constant.
- 4.7.2.8 Operating Channel: Once a U-NII device starts to operate on an Available Channel then that channel becomes the Operating Channel.
- 4.7.2.9 Transmit Power Control (TPC): A feature that enables a U-NII device to dynamically switch between several transmission power levels in the data transmission process.
- 4.7.2.10 Channel Availability Check: A check during which the U-NII device listens on a particular radio channel to identify whether there is a radar operating on that radio channel.
- 4.7.2.11 Dynamic Frequency Selection (DFS): A mechanism that dynamically detects signals from other systems and avoids co-channel operation with these systems (notably radar systems).
- 4.7.2.12 DFS Detection Threshold: The required detection level defined by detecting a received signal strength that is greater than a threshold specified, within the U-NII device channel bandwidth.
- 4.7.2.13 Channel Move Time: The time needed by a U-NII device to cease all transmissions on the current channel upon detection of a radar signal above the DFS detection threshold.
- 4.7.2.14 In-Service Monitoring: A mechanism to check a channel in use by the U-NII device for the presence of a radar.
- 4.7.2.15 Non-Occupancy Period: The required period in which, once a channel has been recognized as containing a radar signal by a U-NII device, the channel will not be selected as an available channel.
- 4.7.2.16 Maximum Power Spectral Density: The maximum power spectral density within the specified measurement bandwidth, within the U-NII device operating band.
- 4.7.3 Power limits
- 4.7.3.1 For the band 5.15 GHz~5.25 GHz
- (1) For outdoor access:
 - (A) The maximum conducted output power shall be less than or equal to 1 Watt.
 - (B) The maximum power spectral density shall be less than or equal to 17 dBm in any 1 MHz band.
 - (C) If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dBi that the directional gain of the antenna exceeds 6 dBi.
 - (D) The maximum EIRP at any elevation angle above 30 degrees as measured from the horizon shall be less than or equal to 21 dBm.
- (2) For indoor access:
 - (A) The maximum conducted output power over the frequency band of operation shall be less than or equal to 1 Watt.
 - (B) The maximum power spectral density shall be less than or equal to 17 dBm in any 1 MHz band.
 - (C) If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dBi that the directional gain of the antenna exceeds 6 dBi.
- (3) For fixed point-to-point access:
 - (A) The maximum conducted output power shall be less than or equal to 1 Watt.
 - (B) The maximum power spectral density shall be less than or equal to 17 dBm in any 1 MHz band.
 - (C) If transmitting antennas of directional gain greater than 23 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dBi that the directional gain of the antenna exceeds 23 dBi.
 - (D) Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information.

- (4) For client devices:
 - (A) The maximum conducted output power shall be less than or equal to 250 mW.
 - (B) The maximum power spectral density shall be less than or equal to 11 dBm in any 1 MHz band.
 - (C) If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dBi that the directional gain of the antenna exceeds 6 dBi.
- 4.7.3.2 For the 5.25 GHz~5.35 GHz and 5.470 GHz~5.725 GHz bands
- The maximum conducted output power shall be less than or equal to 250 mW or 11dBm+10log B (B is the 26 dB emission bandwidth with a unit of MHz) whichever is less.
- (2) The maximum power spectral density shall be less than or equal to 11 dBm in any 1 MHz band.
- (3) If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dBi that the directional gain of the antenna exceeds 6 dBi.
- 4.7.3.3 For the 5.725 GHz~5.850 GHz band
 - (1) The maximum conducted output power shall be less than or equal to 1 Watt.
 - (2) The maximum power spectral density shall be less than or equal to 30 dBm in any 500 kHz band.
 - (3) Fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power.
 - (4) In addition to (3), if transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dBi that the directional gain of the antenna exceeds 6 dBi.
- 4.7.3.4 Measurement regulations
- (1) The maximum conducted output power must be measured over any interval of continuous transmission using instrumentation calibrated in terms of a 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.
- (2) The measurement regulations for the peak power spectral density:
 - (A) A calibrated test instrument shall be directly connected to the equipment under test, measured as a conducted emission.
 - (B) In the 5.15 GHz~5.25 GHz, 5.25 GHz~5.35 GHz and 5.47 GHz~5.725 GHz bands, the bandwidth of a calibrated test instrument shall be set as 1 MHz bandwidth or 26 dB emission bandwidth for the equipment under test, whichever is less.
 - (C) In the 5.725 GHz~5.850 GHz band, the bandwidth of a calibrated test instrument shall be set as 500 kHz or 26 dB emission bandwidth for the equipment under test, whichever is less.
 - (D) When the resolution bandwidth is less than that in (B) or (C), the total power spectral density shall be calculated by the compensation.
- 4.7.4 Undesirable emission limits: The maximum emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:
- 4.7.4.1 For transmitters operating in the 5.15 GHz~5.35 GHz and 5.470 GHz~5.725 GHz bands: out-of-band EIRP \leq -27 dBm/MHz.
- 4.7.4.2 For transmitters operating in the 5.725 GHz~5.850 GHz band: All emissions within the

frequency range from the band edge to 5 MHz above or below the band edge shall be less than or equal to an EIRP of 27 dBm/MHz~15.6 dBm/MHz (limits corresponding to linear method); all emissions within the frequency range from the band edge to 5 MHz~25 MHz above or below the band edge shall be less than or equal to an EIRP of 15.6 dBm/MHz~10 dBm/MHz (limits corresponding to linear method); all emissions within the frequency range from the band edge to 25 MHz~25 MHz above or below the band edge shall be less than or equal to an EIRP of 15.6 dBm/MHz~10 dBm/MHz (limits corresponding to linear method); all emissions within the frequency range from the band edge to 25 MHz~75 MHz above or below the band edge shall be less than or equal to an EIRP of 10 dBm/MHz~ -27 dBm/MHz (limits corresponding to linear method); for frequencies 75 MHz or greater above or below the band edge, emissions shall be less than or equal to an EIRP of -27 dBm/MHz; for the mask limit, please see Figure 1.



Figure 1

- 4.7.4.3 When measuring unwanted emissions, the emission measurements shall be performed using a minimum resolution bandwidth of 1 MHz. A resolution bandwidth less than 1 MHz may be employed near the band edge, when necessary, and the total value is calculated by compensation.
- 4.7.4.4 When measuring the unwanted emission limits, the carrier frequency for the equipment under test shall be adjusted as close to the upper and lower frequency band edges as the design of the equipment permits.
- 4.7.4.5 The unwanted emissions below 1 GHz shall meet the requirement of Section 2.8. Any devices supplied by the commercial power must adhere to the power line conducted limit of Section 2.3.
- 4.7.4.6 The unwanted emissions operating in the band of Section 2.7 shall conform to the requirement of Section 2.8.
- 4.7.4.7 The devices operating in the 5.725 GHz~5.850 GHz band and the antenna gain greater than 10dBi must apply to the out-of-band radiated emission limits of Section 3.10.1.5 before March 2, 2017 ; those operating in the 5.725 GHz~5.850 GHz and the antenna gain less than or equal to 10dBi must apply for the out-of-band radiated emission limits of Section 3.10.1.5 before March 2, 2018.
- 4.7.5 Within the 5.725 GHz~5.850 GHz band, the minimum 6 dB bandwidth of U-NII devices shall be at least 500 kHz.
- 4.7.6 The device shall automatically discontinue transmission in case of "either absence of information to transmit" or "operational failure". These provisions are not intended to preclude the transmission of control or signaling information or the use of repetitive codes used by certain digital technologies to complete frame or burst intervals. Applicants shall include in their application for equipment authorization a description of how this requirement is met.
- 4.7.7 Other limits:
- 4.7.7.1 Transmit power control (TPC): U-NII devices operating in the 5.25 GHz~5.35 GHz and 5.470 GHz~5.725 GHz bands 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 EIRP of less than 500 mW.

- 4.7.7.2 U-NII devices operating in the 5.25 GHz~5.35 GHz and 5.470 GHz~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 related regulations are as follows:
 - (1) Minimum DFS detection threshold
 - (A) For devices with a maximum EIRP of 200 mW~1 W, the minimum DFS detection threshold is -64 dBm.
 - (B) For devices that operate with less than a maximum EIRP of 200 mW and a power spectral density of less than 10 dBm in a 1 MHz band, the minimum DFS detection threshold shall be -62 dBm.
 - (C) For devices that operate with less than a maximum EIRP of 200 mW and a power spectral density of greater than or equal to 10 dBm in a 1 MHz band, the minimum DFS detection threshold shall be -64 dBm.
 - (D) The detection threshold is the received power averaged over 1 microsecond referenced to a 0 dBi antenna. For the initial channel setting, the manufacturers shall be permitted to provide for either random channel selection or manual channel selection.
 - (2) 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.
 - (3) 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 power level greater than the interference threshold values listed above is detected within 60 seconds.
 - (4) 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 200ms 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.
 - (5) 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 nonoccupancy period of at least 30 minutes. The non-occupancy period starts at the time when the radar system is detected.
- 4.7.7.3 A radio information transmission device must own the safety function to protect the software change from the party without authorization. The manufacturers shall propose the certificates or compliance statement that meets the regulations in this section.
- 4.7.7.4 The manufacturers operate the digital modulation system on the U-NII bands to provide the safety function, so that the third party is unable to overwrite program and set without approval. The software must avoid transmitters operating in the frequency, output power, modulation technique or other RF without approval. The manufacturers can operate the private network to download software only authorized by users and update the electronic signature by software or firmware by hardware. New software is permitted to be legally installed in the equipment. In the meantime, the items above can be met, and the authorization methods are described in the application.
- 4.7.7.5 The Manufacturers shall ensure DFS cannot be cancelled by a user who operates a radio information transmission device.
- 4.7.8 The antenna specifications shall not be subject to the requirement of Section 2.2.
- 4.7.9 The operation manuals or the specifications shall not only specify the items, except for the requirement of Section 2.10, but also the following items:

- 4.7.9.1 The operations near the radar system shall not be influenced.
- 4.7.9.2 The directed antenna with high gain must apply to the fixed point-to-point system only.
- 4.8 Radio Frequency Identification (RFID), radio beacon in seaside, and other IoT devices.
 - 4.8.1 Adopted frequency hopping system or digital modulation technique devices, excluding passive tag devices.
 - 4.8.1.1 Use Frequency:
 - (1) Radio frequency identification (RFID) devices: 920 MHz to 928 MHz •
 - (2) Radio beacon in seaside: 926 MHz to 928 MHz ·
 - (3) Other IoT devices: 920 MHz to 925 MHz °

4.8.1.2 Restrictions to power efficiency::

- (1) Installed areas and the maximum peak output power limit except the radio beacon in seaside.
 - (A) For devices installed indoors or at a specific area: the maximum peak output power limit shall be up to 1 W (inclusive).
 - (B) For devices installed outdoors: the maximum peak output power limit shall be up to 0.5 W (inclusive).
 - (C) As aforementioned in paragraph (A), "specific area" is specified to particular, closed and restricted fields with management (both indoors and outdoors).
- (2) The maximum peak output power of radio beacon in seaside shall be limited up to 0.5 W (inclusive).
- (3) If transmitting antennas of directional gain greater than 6 dBi are used, the maximum conducted output power from the intentional radiator shall be reduced by the amount in dB that exceeds 6 dBi.
- 4.8.1.3 The antenna specification shall not be subject to the requirement of Section 2.2.
- 4.8.1.4 Radiated emission limits:

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power shall be attenuated at least 20 dB and the measured RMS shall be 30 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. In addition, for radiated emissions that fall under Section 2.7 the restricted bands must also comply with the radiated emission limit specified in Section 2.8.

- 4.8.1.5 Other limits:
- (1) Frequency hopping systems:
 - (A) Frequency hopping systems shall include hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudo randomly ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter.
 - (B) Hopping channels and 20 dB bandwidth limits: If the 20 dB bandwidth of the hopping channel is less than or equal to 250 kHz, the system shall use at least X hopping frequencies. If the 20 dB bandwidth of the hopping channel is greater than 250 kHz, the system shall use at least X/2 hopping frequencies. The maximum allowed 20 dB bandwidth of the hopping channel shall be 500 kHz.

X=used frequency band (MHz) /26*50,

and adopted unconditional carry law to integer; besides, X≧10

- (C) Frequency hopping systems, the average time of occupancy on any frequency each time shall be less than or equal to 0.4 seconds within a time period in seconds equal to the number of hopping channels limit employed multiplied by 0.4.
- (2) Digital modulation techniques system:
 - (A) For digitally modulated systems, the minimum 6 dB bandwidth shall be at least 500 kHz.
 - (B) The power spectral density from the transmitter to the antenna in any 3 kHz bandwidth of the frequency band shall be less than or equal to 8 dBm.
- (3) The hybrid system: The hybrid systems employ a combination of both frequency hopping and digital modulation techniques.
 - (A) The frequency hopping operation of the hybrid system, with the direct sequence operation turned off, shall include an average time of occupancy on any frequency each time less than or equal 0.4 seconds within a time period in seconds equal to the number of hopping channels employed multiplied by 0.4.
 - (B) The digital modulation operation of the hybrid system, with the frequency hopping turned off, shall comply with the power spectrum density requirements of those specified in (B) of Digital modulation techniques system of Section 2 Other limits in this section 4.8.1.4.
- (4) Frequency hopping spread spectrum systems are not required to employ all available hopping channels during each transmission. However, the system, consisting of both the transmitter and the receiver, must be designed to comply with all of the regulations in section 4.8.1 should the transmitter be presented with a continuous data (or information) stream. In addition, a system employing short transmission bursts must comply with the definition of a frequency hopping system and must distribute its transmissions over the minimum number of hopping channels specified in section 4.8.1.
- (5) The incorporation of intelligence within a frequency hopping spread spectrum system that permits the system to recognize other users within the spectrum band so that it individually and independently chooses and adapts its hop sets to avoid hopping on occupied channels shall be permitted. The coordination of frequency hopping systems in any other manner for the express purpose of avoiding the simultaneous occupancy of individual hopping frequencies by multiple transmitters is not permitted.
- 4.8.2 Any transmission device.
- 4.8.2.1 Use frequency: same as 4.8.1.1.
- 4.8.2.2 Radiated emissions limits: All field strength limits are specified at a distance of 3 meters. The field strength of fundamental and harmonic emissions shall comply with the limits shown in the table below. Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50dB below the level of the fundamental or to the general radiated emission limits in Section 2.8, whichever is the lesser attenuation.

Field Strength of Fundamental	Field Strength of Harmonics
(mv/m)	Emission (μv/m)
50	500

- 4.8.2.3 The emission limits are based on measurement instrumentation employing an average detector. The provisions in Section 5.15.2 for limiting peak emissions shall apply.
- 4.9 Auto, motorcycle theft-proof remote control
 - 4.9.1 Frequency bands: 467.4625 MHz~467.4875 MHz
 - 4.9.2 Output power: No more than 0.5 W (ERP)
 - 4.9.3 Unwanted emission: The field strength of unwanted emissions shall not exceed the general radiated emission limits in Section 2.8.

- 4.9.4 Only for transmitting control signals.
- 4.9.5 The frequency tolerance:

Shall be maintained within ± 3 ppm of the operating bands. This frequency tolerance shall be maintained for a temperature variation of -5 °C to +50 °C at normal supply voltage, and for a variation in the primary supply voltage within ± 15 % of the rated supply voltage at 20 °C. For battery-powered equipment, the equipment tests shall be performed using a new battery.

- 4.9.6 Types of operation:
- 4.9.6.1 Devices with manual operation must be fitted with a switch. Emissions shall be stopped within 5 seconds after you push and release the switch.
- 4.9.6.2 For devices with automatic control mechanism: The duration of each emission shall be less than 5 seconds. The off time between emission cycles shall be greater than 5 seconds. Emissions are prohibited after 2 minutes of each trigger or state change.
- 4.10 Assistive vision disabled communication devices
 - 4.10.1 Frequency bands: 475.5 MHz~476.5 MHz
 - 4.10.2 Output power: No more than 0.5 W (ERP)
 - 4.10.3 Unwanted emission: The field strength of unwanted emissions shall not exceed the general radiated emission limits in Section 2.8
 - 4.10.4 Frequency tolerance:

The frequency tolerance of the carrier shall be ± 0.01 %. This frequency tolerance shall be maintained for a temperature variation of -5 °C to +50 °C at normal supply voltage, and for a variation in the primary supply voltage within ± 15 % of the rated supply voltage at 20 °C. For battery-powered equipment, the equipment tests shall be performed using a new battery.

- 4.11 Medical Device Radio communication Service (MedRadio): is a medical service system specifically for transmitting data in support of diagnostic or therapeutic functions between an external programmer/control transceiver and an active medical implant or body-worn transceiver placed in the human body.
 - 4.11.1 Operating frequencies: 401 MHz~406 MHz,
 - 4.11.2 Terminology:
 - 4.11.2.1 Emission bandwidth: The emission bandwidth shall be determined by measuring the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, that are 20 dB down relative to the maximum level of the modulated carrier. Determination of the emissions bandwidth is based on the use of measurement instrumentation employing a peak detector function with an instrument resolution bandwidth approximately equal to 1 % of the emission bandwidth of the device under measurement.
 - 4.11.2.2 MedRadio communications session: is a collection of transmissions that may or may not be continuous, between co-operating MedRadio devices and accessories.
 - 4.11.2.3 MedRadio channel: is any continuous segment of spectrum that is equal to the emission bandwidth of the device with the largest bandwidth that is to participate in a MedRadio communications session.
 - 4.11.3 Requirement of MedRadio programmer/control transmitter:
 - 4.11.3.1 For frequency monitoring: Before the medical programmer/control transmitter begins the MedRadio communication session, the following conditions must be adhered to:
 - (1) The 20 dB bandwidth of the monitoring system must be greater than or equal to the wanted emission bandwidth.
 - (2) Within 5 seconds prior to initiating a communications session, the MedRadio must monitor the channel or channels the MedRadio system devices intend to occupy for a minimum of 10

milliseconds per channel.

- (3) Based on use of an isotropic monitoring system antenna, the monitoring threshold power level (P_{Th}) must be less than or equal to 10 logB (Hz) - 150 (dBm/Hz) + G (dBi) where B is the emission bandwidth of the MedRadio communication session transmitter having the widest emission and G is the programmer/control transmitter monitoring system antenna gain relative to an isotropic antenna. If using a non-isotropic monitoring system antenna, the monitoring threshold power level shall be modified.
- (4) If no signal in a MedRadio channel above the monitoring threshold power level is detected, the MedRadio programmer/control transmitter may initiate a MedRadio-communications session. The MedRadio communications session may continue as long as any silent period between consecutive data transmission bursts does not exceed 5 seconds. If a channel confirmed with the signals is higher than the monitoring threshold level, MedRadio transmitters shall cease the emission. The MedRadio transmitters that are capable of operating on multiple channels shall be applied as well. The device with the lowest monitored ambient power level must be changed to continue the communication sessions.
- (5) When a channel is selected prior to a MedRadio communications session, it is permissible to select an alternate channel for use if communications are interrupted, provided that the alternate channel selected is the next best choice using the above criteria. The alternate channel may be accessed in the event a communications session is interrupted by interference. The following criteria must be met:
 - (A) Before transmitting on the alternate channel, the channel must be monitored for a period of at least 10 milliseconds.
 - (B) The detected power level during this 10 milliseconds or greater monitoring period must be no higher than 6 dB above the power level detected when the channel has been selected as the alternate channel.
 - (C) In the event that this alternate channel provision is not used by the MedRadio system or if the criteria in paragraphs (A) and (B) are not met, a channel must be selected using the access criteria specified in 4.11.3.1(1)~(4).
- 4.11.3.2 MedRadio programmer/control transmitter shall be a mechanism to monitor frequency, and the communication session is started by the implant medical device operating under monitoring (including the monitoring channel or channel used by MedRadio), but the device or the communication session that meets one of the following conditions will not be limited here:
- (1) MedRadio devices operating in either the 401 MHz~401.85 MHz or 405 MHz~406 MHz bands, provided that the transmit power shall be less than or equal to 250 nW EIRP and the duty cycle for such transmissions need to be less than or equal to 0.1 %, based on the total transmission time during a one-hour interval, and a maximum of 100 transmissions per hour.
- (2) MedRadio devices operating in the 401.85 MHz~402 MHz band, provided that the transmit power shall be less than or equal to 25 uW EIRP and the duty cycle for such transmissions need to be less than or equal to 0.1 %, based on the total transmission time during a one hour interval, and a maximum of 100 transmissions per hour.
- (3) MedRadio devices operating with a total emission bandwidth not exceeding 300 kHz centered at 403.5 MHz~403.8 MHz, provided that the duty cycle for such transmissions need to be less than or equal to 0.01 %, based on the total transmission time during a one-hour interval, and a maximum of 10 transmissions per hour.
- 4.11.3.3 The measurement procedures to monitor MedRadio frequency shall refer to the requirement of ETSI EN 301 839-1, ETSI EN 302 537-1 or FCC 47CFR Part 95.627.
- 4.11.4 Operation band for MedRadio Station:
- 4.11.4.1 MedRadio Station is an associated device to connect to the medical radio transmitter.
- 4.11.4.2 MedRadio Station associated with medical implant devices and meeting 4.11.3.1 must use any frequencies in the 401 MHz~406 MHz band.

- 4.11.4.3 MedRadio Station associated with medical implant devices but not meeting 4.11.3.1 must only use any frequencies in the 401 MHz~402 MHz and 405 MHz~406 MHz bands or 403.65 MHz in the 402 MHz~405 MHz band.
- 4.11.4.4 MedRadio Station associated with body-worn medical devices and using frequency monitoring in 4.11.3.1 can operate any frequencies in the 401 MHz~402 MHz or 405 MHz~406 MHz band.
- 4.11.4.5 MedRadio Station associated with multiple permanent implant medical devices and using frequency monitoring in 4.11.3.1 can operate any frequencies in the 402 MHz~405 MHz band:
- The maximum output power of the temporary body-worn device needs to be less than 200 nW EIRP; and
- (2) The temporary body-worn device must comply fully with all other MedRadio rules applicable with medical implant device operation in the 402 MHz~405 MHz band.
- 4.11.5 Emission bandwidth:
- 4.11.5.1 For MedRadio operating in the 402 MHz~405 MHz band, the maximum emission bandwidth is 300 kHz. The total bandwidth used in communication session shall be less than or equal to 300 kHz.
- 4.11.5.2 For MedRadio operating in the 401 MHz~401.85 MHz or 405 MHz~406 MHz band, the maximum emission bandwidth is 100 kHz. The total bandwidth used in communication session shall be less than or equal to 100 kHz.
- 4.11.5.3 For MedRadio operating in the 401.85 MHz~402 MHz band, the maximum emission bandwidth is 150 kHz. The total bandwidth used in communication session shall be less than or equal to 150 kHz.
- 4.11.5.4 For MedRadio operating in the 402 MHz~405 MHz band, the total amount of bandwidth utilized by a channel shall be less than or equal to 300 kHz. For MedRadio operating in the 401 MHz~402 MHz and 405 MHz~406 MHz bands, the total amount of bandwidth utilized by a channel shall be less than or equal to 100 kHz. Full duplex or half duplex communications shall be adopted.
- 4.11.6 For the EIRP, limits are summarized in Table 1:
- 4.11.6.1 The maximum emission power by a MedRadio transmitter operating in the 402 MHz~405 MHz band in any 300 kHz bandwidth or the 401 MHz~402 MHz or 405 MHz~406 MHz band in any 100 kHz bandwidth in compliance with 4.11.3.1 shall be less than or equal to 25 uW EIRP.
- 4.11.6.2 The maximum emission power by a MedRadio transmitter operating in the 403.5 MHz~403.8 MHz band in compliance with 4.11.3.2(3) shall be less than or equal to 100 nW EIRP.
- 4.11.6.3 The power radiated by a MedRadio transmitter operating in the 401 MHz~401.85 MHz or 405 MHz~406 MHz band in compliance with 4.11.3.2(1) shall be less than or equal to 250 nW EIRP in any 100 kHz bandwidth.
- 4.11.6.4 The power radiated by a MedRadio transmitter operating in the 401.85 MHz~402 MHz band in compliance with 4.11.3.2(2) shall be less than or equal to 25 uW EIRP in any 150 kHz bandwidth.
- 4.11.6.5 The EIRP measurements may be determined by connecting the MedRadio transmitter to the antenna and measuring the radiated field from the equipment under test at 3 meters and calculating the EIRP. The equivalent radiated field strength at 3 meters for 25 uW, 250 nW, 100 nW EIRP is 18.2 mV/m, 1.8 mV/m, 1.2 mV/m, respectively, when measured on an open area test site; or 9.1 mV/m, 0.9 mV/m, 0.6 mV/m, respectively, when measured on a test site equivalent to free space such as a fully anechoic test chamber.
- 4.11.6.6 Compliance with the maximum transmitter power requirements set forth shall be based on measurements using a peak detector function and measured over an interval of time when transmission is continuous and at its maximum power level.

	Monitoring		No monitoring			
Operating	acreting			Operating condition		
frequency band	BW	EIRP	BW	EIRP	Duty ovele	Times
frequency band					Duly cycle	Per hour
401~401.85	100 kHz	25 uW	100 kHz	250 nW	0.1 %	100

Table 1

					(3.6 s/hr)	
401.85~402	100 kHz	25 uW	150 kHz	25 uW	0.1 % (3.6 s/hr)	100
402~403.5	300 kHz	25 uW				
403.5~403.8	300 kHz	25 uW	300 kHz	100 nW	0.01 % (360 ms/hr)	10
403.8~405	300 kHz	25 uW				
405~406	100 kHz	25 uW	100 kHz	250 nW	0.1 % (3.6 s/hr)	100

4.11.7 Unwanted emission:

- 4.11.7.1 The unwanted emission power must be less than the fundamental emission power.
- 4.11.7.2 The field strength in the following circumstance shall conform to the requirements in Section 2.8.
- (1) MedRadio operating in the band 402 MHz~405 MHz that is more than 250 kHz away from the 402 MHz~405 MHz band.
- (2) MedRadio operating in the band 401 MHz~402 MHz or 405 MHz~406 MHz that is more than 100 kHz in the 406 MHz~406.1 MHz band and away from the bands 401 MHz~402 MHz and 405 MHz~406 MHz.
- 4.11.7.3 For MedRadio operating in the band 402 MHz~405 MHz that is more than 150 kHz away from the center frequency of the transmission, the emission power shall be attenuated below the maximum permitted output power over 20 dB.
- 4.11.7.4 MedRadio operating in the band 401 MHz~402 MHz or 405 MHz~406 MHz that is more than 50 kHz away from the center frequency of the transmission; for MedRadio operating in the band 401.85 MHz~402 MHz that is more than 75 kHz away from the center frequency of the transmission, the emission power shall be attenuated below the maximum permitted output power over 20 dB.
- 4.11.7.5 The emission powers in Section 4.11.7.3 and Section 4.11.7.4 are based on the use of measurement instrumentation employing a peak detector function with an instrument resolution bandwidth approximately equal to 1 % of the emission bandwidth of the device under measurement.
- 4.11.8 Frequency tolerance: Each transmitter in the MICS service must maintain a frequency stability of ±100 ppm of the operating frequency over the range: 25 °C ~45 °C in the case of medical implant transmitters; and 0 °C ~55 °C in the case of medical implant programmer/control and body-worn transmitters.
- 4.11.9 Measurement requirements on implant transmitters:
- 4.11.9.1 For a transmitter intended to be implanted in a human body, the following test fixture must be used to simulate operation of the implant under actual operating conditions.
- 4.11.9.2 For measurement purposes to determine compliance with emission limits, the radiating characteristics of an implant transmitter placed in a test fixture should approximate those of an implant transmitter placed in a human body. An appropriate human torso simulator for testing medical implant transmitters consists of a cylindrical Plexiglas container with a size of 30±0.5 cm by 76±0.5 cm with a sidewall thickness of 0.6±0.21 cm. It must be completely filled with a material that is sufficiently fluidic that it will flow around the implant without any voids, but not including the saline. The dielectric and conductivity properties of this material must match the dielectric and conductivity properties of human muscle tissue at 403.5 MHz. All emissions measurements will be made using the above specification at a nominal temperature of 22 °C ~38 °C. A stand for the implant inside the container must be provided that permits the radiating element or elements of the implant to be positioned vertically and horizontally. The implant transmitter shall be vertically placed in the container, and the antenna shall be mounted 6±0.5 cm from the sidewall. If it is horizontally set up, the antenna shall be readjusted to keep 6±0.5 cm from the sidewall. The above fixture shall be placed on a turntable such that the implant transmitter will be located at a nominal 1.5-meter height above ground and at a 3-meter distance from the measurement antenna. The above fixture shall be placed on a turntable such that the implant transmitter will be located at a nominal 1.5-meter height

above ground and at a 3-meter distance from the measurement antenna.

- 4.11.9.3 A formula for a suitable tissue substitute material refers to FCC 95.627 or ETSI EN 301839-1, ETSI EN 302537-1.
- 4.11.10 Programmer/control receiver: shall conform to the regulations in Section 2.8.
- 4.11.11 Programmer/control devices using AC power line shall conform to the limits of power-line conducted emissions in Section 2.3.
- 4.11.12 The MedRadio Station can send any emission type that applies to non-voice communication service.
- 4.12 Ultra-wideband Devices:
 - 4.12.1 Frequency bands: 4.224 GHz~4.752 GHz, 6.336 GHz~7.920 GHz, 7.392 GHz~8.976 GHz.
 - 4.12.2 Terminology:
 - 4.12.2.1 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_H and the lower boundary is designated f_L . The frequency at which the highest radiated emission occurs is designated f_M .
 - 4.12.2.2 Center frequency: Central frequency f_C is equal to $(f_H+f_L)/2$.
 - 4.12.2.3 Fractional bandwidth: Fractional bandwidth is equal to 2 $(f_H-f_L) / (f_H+f_L)$.
 - 4.12.2.4 Ultra-wideband transmitter): An intentional radiator that, at any point in time, has a fractional bandwidth greater than 0.20 or has a UWB bandwidth greater than 500 MHz, regardless of the fractional bandwidth.
 - 4.12.2.5 Medical imaging system: A field disturbance sensor that is designed to detect the location or movement of objects within the body of a person or animal.
 - 4.12.2.6 Hand held device: A hand held device is a portable device, such as a lap top computer or a PDA
 - 4.12.3 Device type:
 - 4.12.3.1 Medical imaging systems
 - (1) Radiated emissions:
 - (A) The radiated emissions below 960 MHz from a device operating under the provisions of this section shall conform to the emission levels in Section 2.8.
 - (B) Radiated emissions above 960 MHz from a device operating under the provisions of this section shall be less than or equal to the following average limits when measured using a resolution bandwidth of 1 MHz:

Frequency (MHz)	EIRP (dBm)	
960~1610	-65.3	
1610~1990	-53.3	
1990~4224	-51.3	
4224~4752	-41.3	
4752~6336	-51.3	
6336~8976	-41.3	
Over 8976	-51.3	
Note: The tighter limit applies at the band overlap.		

(C) Radiated emission from GPS band: In addition to the radiated emission limits specified in the table in paragraph (A) and (B) of this section, UWB transmitters operating under the provisions of this section shall be less than or equal to the following average limits when measured using a resolution bandwidth over 1 kHz:

frequency	EIRP
(MHz)	(dBm)
1164~1240	-75.3
1559~1610	-75.3

- (2) Peak radiated emission limit: Within a 50 MHz bandwidth centered on the frequency at which the highest radiated emission occurs, f_M, the peak emission limit is 0 dBm EIRP. It is acceptable to employ a different resolution bandwidth, and a correspondingly different peak emission limit, following the procedures stipulated in 4.12.4.6.
- (3) A medical imaging system shall contain a manually operated switch or a remote emergency switch that causes the transmitter to cease operation within 10 seconds of being released by the operator.
- 4.12.3.2 Indoor UWB systems:
- (1) Radiated emissions:
 - (A) The radiated emissions at or below 960 MHz from a device operating under the provisions of this section shall conform to the emission levels in Section 2.8.
 - (B) The radiated emissions above 960 MHz from a device operating under the provisions of this section shall be less than or equal to the following average limits when measured using a resolution bandwidth of 1 MHz:

frequency	EIRP	
(MHz)	(dBm)	
960~1610	-75.3	
1610~1990	-53.3	
1990~4224	-51.3	
4224~4752	-41.3	
4752~6336	-51.3	
6336~8976	-41.3	
8976 以上	-51.3	
Note: The tighter limit applies		
at the band overlap.		

(C) Radiated emission from GPS band: In addition to the radiated emission limits specified in the table in paragraph (A) and (B) of this section, UWB transmitters operating under the provisions of this section shall be less than or equal to the following average limits when measured using a resolution bandwidth over 1 kHz:

frequency	EIRP
(MHz)	(dBm)
1164~1240	-85.3
1559~1610	-85.3

- (2) Peak radiated emission limit: Within a 50 MHz bandwidth centered on the frequency at which the highest radiated emission occurs, f_M, the peak emission limit is 0 dBm EIRP. It is acceptable to employ a different resolution bandwidth, and a correspondingly different peak emission limit, following the procedures described in 4.12.4.6.
- (3) Others:
 - (A) For indoor access.
 - (B) The emissions from equipment operated under this section shall not be intentionally

directed outside of the building in which the equipment is located (such as through a window or a doorway, to perform an outside function, such as the detection of persons about to enter a building).

- (C) The use of outdoor mounted antennas, e.g., antennas mounted on the outside of a building or on a telephone pole, or any other outdoors infrastructure is prohibited.
- (D) Field disturbance sensors installed inside of metal or underground storage tanks are considered to operate indoors provided the emissions are directed towards the ground.
- (E) A communications system shall transmit only when the intentional radiator is sending information to an associated receiver.
- (F) The UWB systems shall label the following or similar descriptions: "this device used for indoor only" at the obvious place where the device is installed or in the attached operation manual.
- 4.12.3.3 Hand held UWB systems
- (1) Radiated emission:
 - (A) The radiated emissions at or below 960 MHz from a device operating under the provisions of this section shall meet the emission levels in Section 2.8.
 - (B) The radiated emissions above 960 MHz from a device operating under the provisions of this section shall be less than or equal to the following average limits when measured using a resolution bandwidth of 1 MHz:

Frequency	EIRP	
(MHz)	(dBm)	
960~1610	-75.3	
1610~1990	-63.3	
1990~4224	-61.3	
4224~4752	-41.3	
4752~6336	-61.3	
6336~8976	-41.3	
8976 以上	-61.3	
Note: The tighter limit applies		
at the band overlap.		

(C) Radiated emission from the GPS band: In addition to the radiated emission limits specified in the table in paragraph (A) and (B) of this section, UWB transmitters operating under the provisions of this section shall be less than or equal to the following average limits when measured using a resolution bandwidth over 1 kHz:

frequency	EIRP
(MHz)	(dBm)
1164~1240	-85.3
1559~1610	-85.3

- (2) Peak radiated emission limit: Within a 50 MHz bandwidth centered on the frequency at which the highest radiated emission occurs, f_M, the peak emission limit is 0 dBm EIRP. It is acceptable to employ a different resolution bandwidth, and a correspondingly different peak emission limit, following the procedures described in 4.12.4.6.
- (3) Others:
 - (A) UWB devices operating under the provisions of this section must be hand held, i.e., they are relatively small devices that are primarily hand held while being operated and do not employ a fixed infrastructure.
 - (B) A UWB device operating under the provisions of this section shall transmit only when it is sending information to an associated receiver. The UWB intentional radiator shall cease transmission within 10 seconds unless it receives an acknowledgement from the associated receiver that its transmission is being received.

- 4.12.4 Other rules:
- 4.12.4.1 UWB devices must not be employed for the operation of toys. Operation onboard an aircraft, a ship or a satellite is prohibited.
- 4.12.4.2 The operation of the antenna shall conform to the regulations in Section 2.2.
- 4.12.4.3 If emissions from digital circuitry of UWB transmitter can be specified other than the emission from the antenna, the emissions shall conform to the regulations in Section 2.8. Emissions from associated digital devices shall be the same.
- 4.12.4.4 Within the tables in 4.12.3.1, 4.12.3.2, and 4.12.3.3, the tighter emission limit applies at the band edges. Radiated emission levels at and below 960 MHz are based on measurements employing a CISPR quasi-peak detector. Radiated emission levels above 960 MHz are based on RMS average measurements over a 1 MHz resolution bandwidth. The RMS average measurement is based on the use of a spectrum analyzer with a resolution bandwidth of 1 MHz, an RMS detector, and a 1 millisecond or less (inclusive) averaging time.
- 4.12.4.5 The frequency at which the highest radiated emission occurs, f_M , must be contained within the UWB bandwidth.
- 4.12.4.6 The measurement shall be centered on the frequency at which the highest radiated emission occurs, f_M. If a resolution bandwidth among 1 MHz~50 MHz is employed, the peak EIRP limit shall be 20 log (RBW/50) dBm. This may be converted to a peak field strength level at 3 meters using (dBuV/m) = P(dBm EIRP) + 95.2.
- 4.12.4.7 The highest frequency employed in Section 5.14 to determine the measurement range of the unnecessary emission e shall be based on the center frequency, fc.
- 4.12.4.8 The UWB devices shall not be applied to the requirement of Section 2.4.
- 4.12.4.9 Unless specified in 4.12, the UWB devices shall not be applied to the requirement of Section 5.1.5.3.