

**Interim Guidance for Equipment Authorization of Devices with Channel Bandwidths
Combined Across Two Contiguous Service Rule Allocations**
OET/Lab/EACB, June 6, 2013

This guidance is intended to apply for example to devices supporting LTE band 26 operations, as described in the following provisions.

- 1) 3GPP LTE standards define E-UTRA Band 5 as 824-849 MHz uplink paired with 869-894 MHz downlink. In terms of FCC allocations and service rules, this LTE band 5 corresponds directly to the Cellular Radiotelephone Service (22-H) bands defined in 22.905. Part 2 subpart J (2-J) equipment authorizations are handled accordingly using 22-H service rules.

22.905(a): 824-835 MHz UL / 869-880 MHz DL (2 x 11)
22.905(b): 835-845 MHz UL / 880-890 MHz DL (2 x 10)
22.905(a): 845-846.5 MHz UL / 890-891.5 MHz DL (2 x 1.5)
22.905(b): 846.5-849 MHz UL / 891.5-894 MHz DL (2 x 2.5)
∴ 22.905 overall: 824-849 MHz UL / 869-894 MHz DL (2 x 25)

- 2) Recently devices are being developed to support 3GPP E-UTRA Band 26, which is 814-849 MHz uplink paired with 859-894 MHz downlink. In terms of FCC radio services, LTE band 26 represents an aggregation of the contiguous Enhanced Specialized Mobile Radio (ESMR) bands [90.614(b), 90.614(c); 90-S] combined with the 22-H bands.

90.614(b): 817-824 MHz UL / 862-869 MHz DL (2 x 7) [90.613 ch. nos. 551-830]
90.614(c): 813.5-824 MHz UL / 858.5-869 MHz DL (2 x 10.5) [90.613 ch. nos. 411-830]

{90-S ESMR + 22-H} overall: 814-849 MHz UL / 859-894 MHz DL (2 x 35)

- 3) For EMC and radio parameter purposes in equipment authorizations, 90-S and 22-H differ individually mainly by the output power limit quantity (conducted, ERP) and the unwanted emissions limits; the attached matrix has a convenient summary of the service rules.
- 4) Along with the basic KDB 634817 test frequency provisions and test data for the outer edges of the device overall transmit band, applications should contain EMC/radio test data for:
 - a) Upper band edge for emissions with bandwidths contained in the 90-S band (adjacent to 22-H lower band edge).
 - b) Lower band edge for emission with bandwidths contained in the 22-H band (adjacent to 90-S upper band edge).
 - c) Unless it is demonstrated in an application that a device does not support it, emissions with bandwidths centered at the allocation boundary, i.e. with the channel bandwidth spanning both rule parts.
- 5) For SAR measurement purposes, and subject to the following conditions, LTE band 26 (814-849 MHz) may be treated as a single band to determine the number of test channels, using the formula in KDB 447498.
 - a) The same RF paths and components are used for 814-849 MHz.
 - b) Probe calibration and tissue liquid parameters meet KDB 865664 requirements for the entire 814-849 MHz band.
 - c) Variation in maximum output power across all channels transmitted by a device in 814-849 MHz for all modes must be in accordance with all applicable KDB 447498 requirements; for example, within 1 dB for simultaneous transmission considerations and ½ dB to select middle or highest output channel for SAR test reduction and test exclusion or other considerations.

For convenience, below shows a side-by-side comparison of 90 subpart S and 22 subpart H device requirements. Requirements for only mobile/portable station equipment are shown; similar comparison / considerations apply for fixed-station equipment. Actual CFR rules text must be applied for compliance demonstrations in test reports.

	90-S	22-H
2.911(b) written application required	Each application shall be accompanied by all information required by this subpart [i.e. 2 subpart J] and by (all information required by) those parts of the rules governing operation of the equipment [i.e. service rules] , and by requisite test data, diagrams, etc., as specified in this subpart [i.e. 2.1033(c)(14), etc.] and (by requisite test data, diagrams, etc., as specified) in those sections of rules whereunder the equipment is to be operated [i.e. service rules] .	
Alloc.	<p>§ 90.614 Segments of the 806-824/851-869 MHz band for non-border areas. The 806-824/851-869 MHz band ("800 MHz band") will be divided as follows at locations farther than 110 km (68.4 miles) from the U.S./Mexico border and 140 km (87 miles) from the U.S./Canadian border ("non-border areas")</p> <p>(a) 800 MHz high density cellular systems—as defined in § 90.7—are prohibited from operating on channels 1-550 in non-border areas.</p> <p>(b) 800 MHz high density cellular systems—as defined in § 90.7—are permitted to operate on channels 551-830 in non-border areas.</p> <p>[i.e. 817-824 MHz mobile / 862-869 base, per 90.613]</p> <p>(c) In the following counties and parishes, 800 MHz high density cellular systems—as defined in § 90.7—are permitted to operate on channels 411-830: [i.e. 813.5-824 MHz mobile / 858.5-869 base, per 90.613]</p> <p>...</p>	<p>§ 22.905 Channels for cellular service. The following frequency bands are allocated for assignment to service providers in the Cellular Radiotelephone Service.</p> <p>(a) Channel Block A: 869–880 MHz paired with 824–835 MHz, and 890–891.5 MHz paired with 845–846.5 MHz.</p> <p>(b) Channel Block B: 880–890 MHz paired with 835–845 MHz, and 891.5–894 MHz paired with 846.5–849 MHz.</p>
Power	<p>90.205(k) 806-824 MHz, 851-869 MHz, 896-901 MHz and 935-940 MHz. Power and (antenna) height limitations are specified in § 90.635.</p> <p>90.205(s) The output power shall not exceed by more than 20 percent either the output power shown in the Radio Equipment List [available in accordance with § 90.203(a)(1)] for transmitters included in this list or when not so listed, the manufacturer's rated output power for the particular transmitter specifically listed on the authorization.</p> <p>[Max. output is needed for SAR tests, per 447498 etc.]</p> <p>90.635(b) The maximum output power of the transmitter for mobile stations is 100 watts (20 dBw).</p> <p>[NOTE: What is now 90 subpart S was originated by rulemaking document FCC-74-740; context therein indicates 90.635(b) refers to conducted not radiated output power.]</p>	<p>§ 22.913 Effective radiated power limits. The effective radiated power (ERP) of transmitters in the Cellular Radiotelephone Service must not exceed the limits in this section.</p> <p>...</p> <p>(a)(2) ... The ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 Watts.</p> <p>[NOTE: Conducted power test is also needed per 2.911(b) with 2.1046.]</p>
Emissions types	90.207(n) Other emissions. Requests for emissions other than those listed in paragraphs (c) through (e) of this section will be considered on a case-by-case basis to ensure that the requested emission will not cause more interference than other currently permitted emissions.	<p>§ 22.357 Emission types. Any authorized station in the Public Mobile Services may transmit emissions of any type(s) that comply with the applicable emission rule, i.e. ... § 22.917.</p>

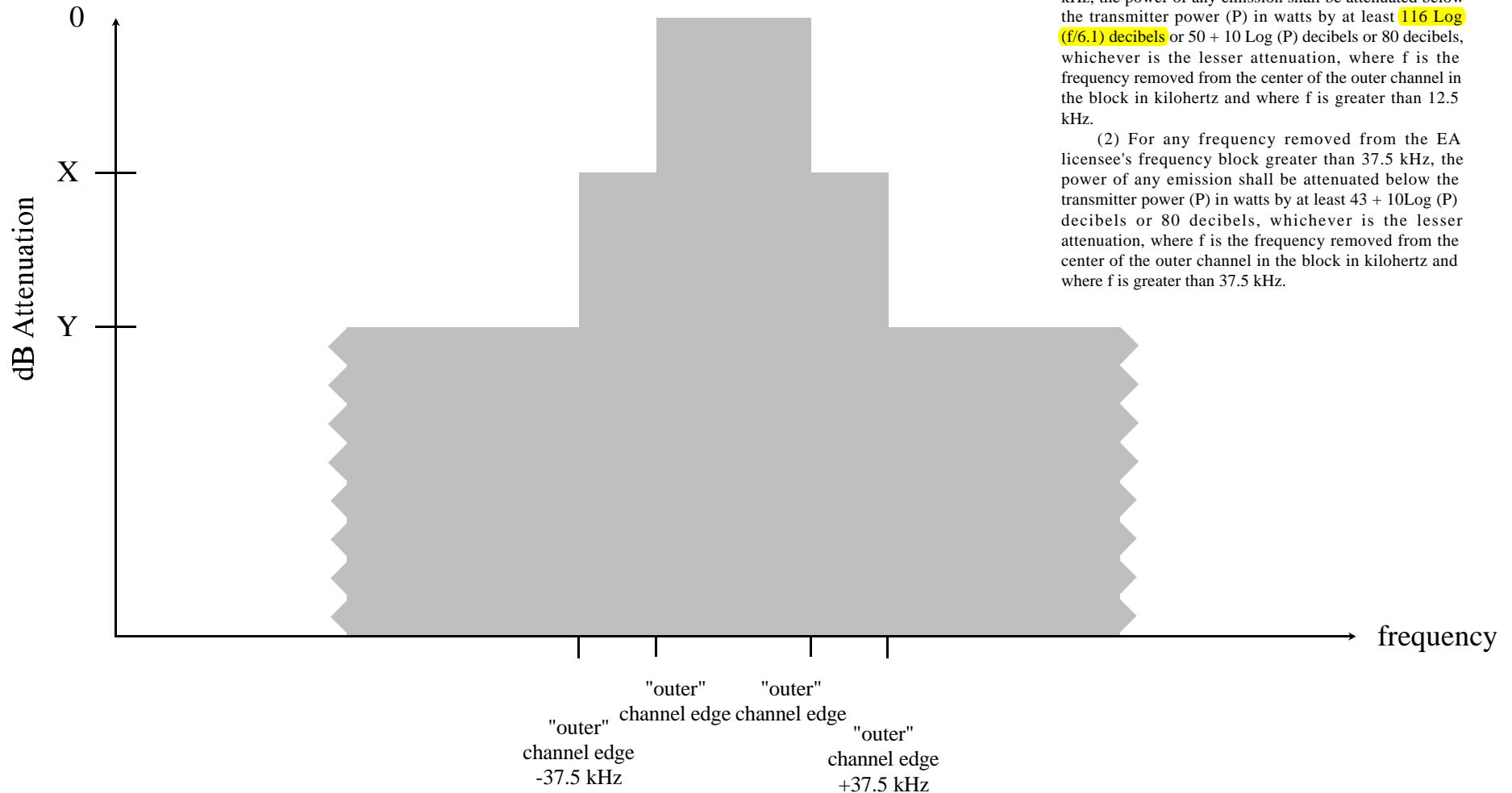
	90-S	22-H
Bandwidth	<p>90.209(a) Each authorization issued to a station licensed under this part will show an emission designator representing the class of emission authorized. The designator will be prefixed by a specified necessary bandwidth. This number does not necessarily indicate the bandwidth occupied by the emission at any instant.</p> <p>In those cases where § 2.202 of this chapter does not provide a formula for the computation of necessary bandwidth, the occupied bandwidth, as defined in part 2 of this chapter, may be used in lieu of the necessary bandwidth.</p> <p>90.209(b) The maximum authorized single channel bandwidth of emission corresponding to the type of emission specified in § 90.207 is as follows:</p> <p>...</p> <p>90.209(b)(7) Economic Area (EA)-based licensees in frequencies 817–824/862–869 MHz (813.5–824/858.5–869 MHz in the counties listed in § 90.614(c)) may exceed the standard channel spacing and authorized bandwidth listed in paragraph (b)(5) of this section <u>i.e. 25 kHz, 20 kHz, resp.</u> in any National Public Safety Planning Advisory Committee Region when all 800 MHz public safety licensees in the Region have completed band reconfiguration consistent with this part.</p> <p>In any National Public Safety Planning Advisory Committee Region where the 800 MHz band reconfiguration is incomplete, EA-based licensees in frequencies 817–821/862–866 MHz (813.5–821/858.5–866 MHz in the counties listed in § 90.614(c)) may exceed the standard channel spacing and authorized bandwidth listed in paragraph (b)(5) of this section.</p> <p>Upon all 800 MHz public safety licensees in a National Public Safety Planning Advisory Committee Region completing band reconfiguration, EA-based 800 MHz SMR licensees in the 821–824/866–869 MHz band may exceed the channel spacing and authorized bandwidth in paragraph (b)(5) of this section.</p> <p>Licensees authorized to exceed the standard channel spacing and authorized bandwidth under this paragraph must provide at least 30 days written notice prior to initiating such service in the bands listed herein to every 800 MHz public safety licensee with a base station in an affected National Public Safety Planning Advisory Committee Region, and every 800 MHz public safety licensee with a base station within 113 kilometers (70 miles) of an affected National Public Safety Planning Advisory Committee Region.</p> <p>Such notice shall include the estimated date upon which the EA-based 800 MHz SMR licensee intends to begin operations that exceed the channel spacing and authorized bandwidth in paragraph (b)(5) of this section.</p>	<p>22.917 Emission limitations for cellular equipment.</p> <p>...</p> <p>(b) Measurement procedure.</p> <p>...</p> <p>The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.</p>

	90-S	22-H
Mask - general	<p>§ 90.210 Emission masks.</p> <p>Except as indicated elsewhere in this part, transmitters used in the radio services governed by this part must comply with the emission masks outlined in this section.</p> <p>Unless otherwise stated, per paragraphs (d)(4), (e)(4), and (o) of this section, measurements of emission power can be expressed in either peak or average values provided that emission powers are expressed with the same parameters used to specify the unmodulated transmitter carrier power.</p> <p>For transmitters that do not produce a full power unmodulated carrier, reference to the unmodulated transmitter carrier power refers to the total power contained in the channel bandwidth.</p> <p>Unless indicated elsewhere in this part, the table in this section specifies the emission masks for equipment operating in the frequency bands governed under this part.</p> <p>APPLICABLE EMISSION MASKS</p> <p>...</p> <p>806–809/851–854B, H</p> <p>809–824/854–869^{3 5}B, G</p> <p>...</p> <p>³ Equipment used in this licensed to EA or non-EA systems shall comply with the emission mask provisions of § 90.691.</p> <p>...</p> <p>⁵ Equipment may alternatively meet the Adjacent Channel Power limits of § 90.221.</p> <p>...</p> <p>(o) Instrumentation. The reference level for showing compliance with the emission mask shall be established, except as indicated in §§ 90.210 (d), (e), and (k), using standard engineering practices for the modulation characteristic used by the equipment under test.</p> <p>When measuring emissions in the 150-174 MHz and 421-512 MHz bands the following procedures will apply.</p> <p>A sufficient number of sweeps must be measured to insure that the emission profile is developed. If video filtering is used, its bandwidth must not be less than the instrument resolution bandwidth. For frequencies more than 50 kHz removed from the edge of the authorized bandwidth a resolution of at least 100 kHz must be used for frequencies below 1000 MHz. Above 1000 MHz the resolution bandwidth of the instrumentation must be at least 1 MHz.</p> <p>If it can be shown that use of the above instrumentation settings do not accurately represent the true interference potential of the equipment under test, then an alternate procedure may be used provided prior Commission approval is obtained.</p>	

	90-S	22-H
Freq. stability	<p>§ 90.213 Frequency stability.</p> <p>(a) Unless noted elsewhere, transmitters used in the services governed by this part must have a minimum frequency stability as specified in the following table.</p> <p>...</p> <p>90.213(b) For the purpose of determining the frequency stability limits, the power of a transmitter is considered to be the maximum rated output power as specified by the manufacturer.</p>	<p>§ 22.355 Frequency tolerance.</p> <p>Except as otherwise provided in this part, the carrier frequency of each transmitter in the Public Mobile Services must be maintained within the tolerances given in Table C-1 of this section.</p> <p>...</p>
Adjacent channel power	<p>§ 90.221 Adjacent channel power limits.</p> <p>(a) For the frequency bands indicated below, operations using equipment designed to operate with a 25 kHz channel bandwidth may be authorized up to a 22 kHz bandwidth if the equipment meets the adjacent channel power (ACP) limits below. The table specifies a value for the ACP as a function of the displacement from the channel center frequency and a measurement bandwidth of 18 kHz.</p> <p>...</p>	
Station ID	<p>90.647(d) Notwithstanding the requirements set forth in this paragraph, systems operated by geographic area CMRS licensees are subject only to the station identification requirements of § 90.425(e).</p>	<p>§ 22.313 The licensee of each station in the Public Mobile Services must ensure that the transmissions of that station are identified in accordance with the requirements of this section.</p> <p>(a) Station identification is not required for transmission by:</p> <p>(1) Stations in the Cellular Radiotelephone Service;</p> <p>...</p>
Mask / OOB – specific	<p>§ 90.691 Emission mask requirements for EA-based systems.</p> <p>(a) Out-of-band emission requirement shall apply only to the “outer” channels included in an EA license and to spectrum adjacent to interior channels used by incumbent licensees.</p> <p>The emission limits are as follows:</p> <p>(1) For any frequency removed from the EA licensee’s frequency block by up to and including 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least $116 \text{ Log}_{10}(f/6.1)$ decibels or $50 + 10 \text{ Log}_{10}(P)$ decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 12.5 kHz.</p> <p>(2) For any frequency removed from the EA licensee’s frequency block greater than 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least $43 + 10 \text{ Log}_{10}(P)$ decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 37.5 kHz.</p> <p><u>(NOTE: Use 100 kHz reference bandwidth.)</u></p>	<p>22.917 Emission limitations for cellular equipment.</p> <p>The rules in this section govern the spectral characteristics of emissions in the Cellular Radiotelephone Service.</p> <p>(a) Out of band emissions.</p> <p>The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \text{ log}(P)$ dB.</p> <p>(b) Measurement procedure.</p> <p>Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater.</p> <p>In the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed.</p> <p>A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (i.e. 100 kHz or 1 percent of emission bandwidth, as specified).</p> <p>The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.</p> <p>...</p>

Private Land Mobile Radio Services

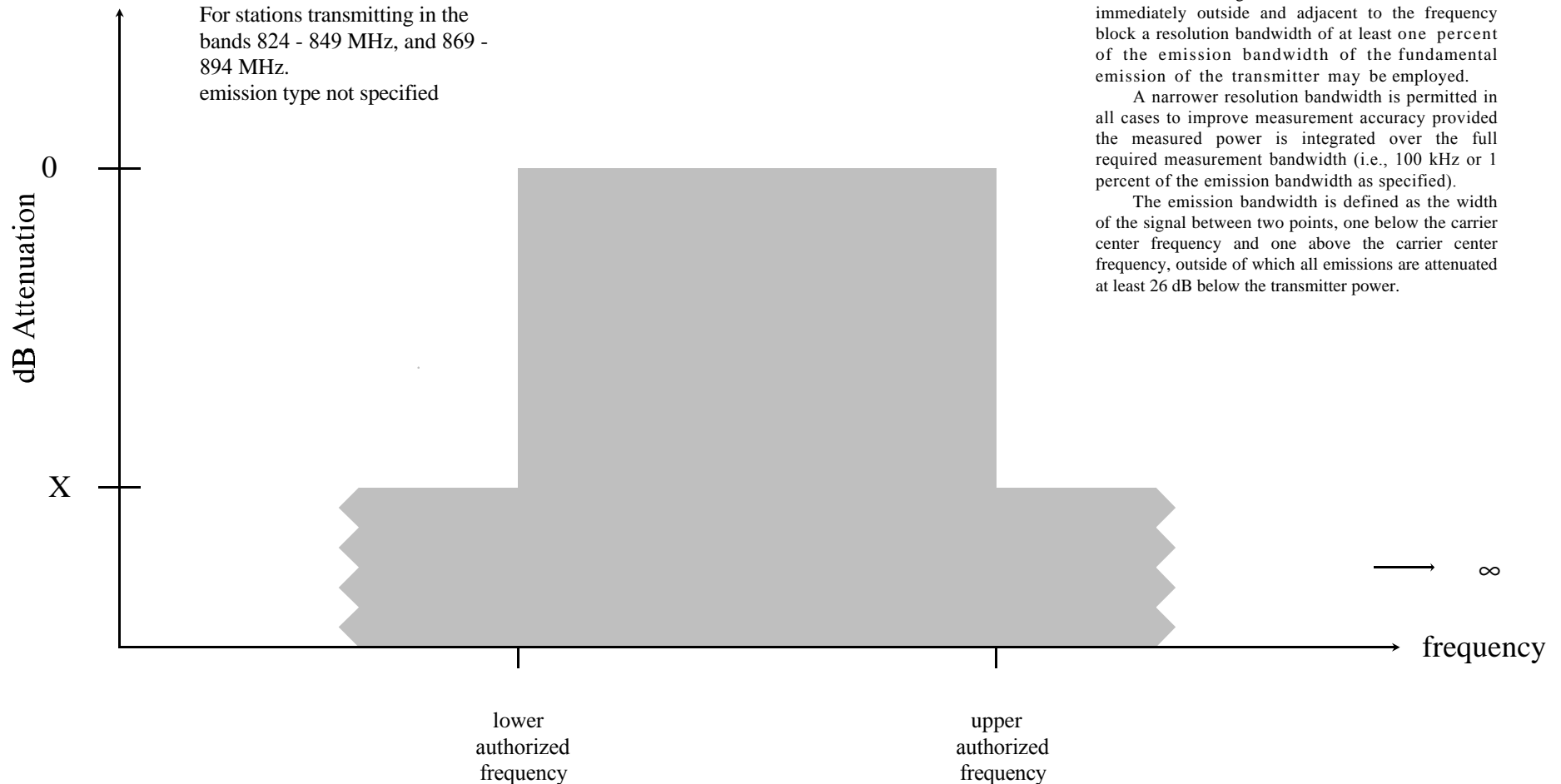
§ 90.691 Emission limits



X, Y, (see paragraph)

Cellular Radiotelephone Service

§ 22.917 Emission limitations



$$X \text{ (dB)} = 43 + 10 \log (P)$$