

apply for radio station licenses are contained in Part 17 of this chapter (Construction, Marking, and Lighting of Antenna Structures).

[28 FR 13623, Dec. 14, 1963, as amended at 41 FR 22943, June 8, 1976; 49 FR 38131, Sept. 27, 1984; 49 FR 45146, Nov. 15, 1984; 51 FR 9965, Mar. 24, 1986; 52 FR 10570, Apr. 2, 1987; 65 FR 79778, Dec. 20, 2000]

### § 73.316 FM antenna systems.

(a) It shall be standard to employ horizontal polarization; however, circular or elliptical polarization may be employed if desired. Clockwise or counterclockwise rotation may be used. The supplemental vertically polarized effective radiated power required for circular or elliptical polarization shall in no event exceed the effective radiated power authorized.

(b) *Directional antennas.* A directional antenna is an antenna that is designed or altered for the purpose of obtaining a non-circular radiation pattern.

(1) Applications for the use of directional antennas that propose a ratio of maximum to minimum radiation in the horizontal plane of more than 15 dB will not be accepted.

(2) Directional antennas used to protect short-spaced stations pursuant to § 73.213 or § 73.215 of the rules, that have a radiation pattern which varies more than 2 dB per 10 degrees of azimuth will not be authorized.

(c) *Applications for directional antennas.* (1) Applications for construction permit proposing the use of directional antenna systems must include a tabulation of the composite antenna pattern for the proposed directional antenna. A value of 1.0 must be used to correspond to the direction of maximum radiation. The pattern must be tabulated such that 0° corresponds to the direction of maximum radiation or alternatively, in the case of an asymmetrical antenna pattern, the pattern must be tabulated such that 0° corresponds to the actual azimuth with respect to true North. In the case of a composite antenna composed of two or more individual antennas, the pattern required is that for the composite antenna, not the patterns for each of the individual antennas. Applications must include valuations tabulated at intervals of not greater than ten (10) de-

grees. In addition, tabulated values of all maximas and minimas, with their corresponding azimuths, must be submitted.

(2) Applications for license upon completion of antenna construction must include the following:

(i) A complete description of the antenna system, including the manufacturer and model number of the directional antenna. It is not sufficient to label the antenna with only a generic term such as "dipole." In the case of individually designed antennas with no model number, or in the case of a composite antenna composed of two or more individual antennas, the antenna must be described as a "custom" or "composite" antenna, as appropriate. A full description of the design of the antenna must also be submitted.

(ii) A plot of the composite pattern of the directional antenna. A value of 1.0 must be used to correspond to the direction of maximum radiation. The plot of the pattern must be oriented such that 0° corresponds to the direction of maximum radiation or alternatively, in the case of an asymmetrical antenna pattern, the plot must be oriented such that 0° corresponds to the actual azimuth with respect to true North. The horizontal plane pattern must be plotted to the largest scale possible on unglazed letter-size polar coordinate paper (main engraving approximately 18 cm × 25 cm (7 inches × 10 inches)) using only scale divisions and subdivisions of 1, 2, 2.5, or 5 times 10<sup>th</sup>. Values of field strength less than 10% of the maximum field strength plotted on that pattern must be shown on an enlarged scale. In the case of a composite antenna composed of two or more individual antennas, the composite antenna pattern should be provided, and not the pattern for each of the individual antennas.

(iii) A tabulation of the measured relative field pattern required in paragraph (c)(1) of this section. The tabulation must use the same zero degree reference as the plotted pattern, and must contain values for at least every 10 degrees. Sufficient vertical patterns to indicate clearly the radiation characteristics of the antenna above and below the horizontal plane. Complete

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information and patterns must be provided for angles of  $-10$  deg. from the horizontal plane and sufficient additional information must be included on that portion of the pattern lying between  $+10$  deg. and the zenith and  $-10$  deg. and the nadir, to conclusively demonstrate the absence of undesirable lobes in these areas. The vertical plane pattern must be plotted on rectangular coordinate paper with reference to the horizontal plane. In the case of a composite antenna composed of two or more individual antennas, the composite antenna pattern should be used, and not the pattern for each of the individual antennas.

(iv) A statement that the antenna is mounted on the top of an antenna tower recommended by the antenna manufacturer, or is side-mounted on a particular type of antenna tower in accordance with specific instructions provided by the antenna manufacturer.

(v) A statement that the directional antenna is not mounted on the top of an antenna tower which includes a top-mounted platform larger than the nominal cross-sectional area of the tower in the horizontal plane.

(vi) A statement that no other antenna of any type is mounted on the same tower level as a directional antenna, and that no antenna of any type is mounted within any horizontal or vertical distance specified by the antenna manufacturer as being necessary for proper directional operation.

(vii) A statement from an engineer listing such individual engineer's qualifications and certifying that the antenna has been installed pursuant to the manufacturer's instructions.

(viii) A statement from a licensed surveyor that the installed antenna is properly oriented.

(ix)(A) For a station authorized pursuant to §73.215 or Sec. §73.509, a showing that the root mean square (RMS) of the measured composite antenna pattern (encompassing both the horizontally and vertically polarized radiation components (in relative field)) is at least 85 percent of the RMS of the authorized composite directional antenna pattern (in relative field). The RMS value, for a composite antenna pattern specified in relative field val-

ues, may be determined from the following formula:

RMS = the square root of:

$[(\text{relative field value } 1)^2 + (\text{relative field value } 2)^2 + \dots + (\text{last relative field value})^2]$

total number of relative field values

(B) where the relative field values are taken from at least 36 evenly spaced radials for the entire 360 degrees of azimuth. The application for license must also demonstrate that coverage of the community of license by the 70 dBu contour is maintained for stations authorized pursuant to §73.215 on Channels 221 through 300, as required by §73.315(a), while noncommercial educational stations operating on Channels 201 through 220 must show that the 60 dBu contour covers at least a portion of the community of license.

(d) Applications proposing the use of FM transmitting antennas in the immediate vicinity (*i.e.* 60 meters or less) of other FM or TV broadcast antennas must include a showing as to the expected effect, if any, of such approximate operation.

(e) Where an FM licensee or permittee proposes to mount its antenna on or near an AM tower, as defined in §1.30002, the FM licensee or permittee must comply with §1.30003 or §1.30002, depending on whether the antenna is proposed to be mounted on an AM tower (§1.30003) or near an AM tower (§1.30002).

[28 FR 13623, Dec. 14, 1963, as amended at 34 FR 14222, Sept. 10, 1969; 37 FR 25841, Dec. 5, 1972; 43 FR 53738, Nov. 17, 1978; 48 FR 29508, June 27, 1983; 51 FR 17028, May 8, 1986; 54 FR 9804, Mar. 8, 1989; 56 FR 57294, Nov. 8, 1991; 62 FR 51058, Sept. 30, 1997; 63 FR 70047, Dec. 18, 1998; 78 FR 66298, Nov. 5, 2013]

### §73.317 FM transmission system requirements.

(a) FM broadcast stations employing transmitters authorized after January 1, 1960, must maintain the bandwidth occupied by their emissions in accordance with the specification detailed below. FM broadcast stations employing transmitters installed or type accepted before January 1, 1960, must achieve the highest degree of compliance with these specifications practicable with their existing equipment.