the indirect method of power determination.

(e) The antenna input power is determined indirectly by applying an appropriate factor to the input power to the last radio-frequency power amplifier stage of the transmitter, using the following formula:

Where:

$$\text{Antenna input power} = Ep \times Ip \times F$$

Ep = DC input voltage of final radio stage.
Ip = Total DC input current of final radio stage.
F= Efficiency factor.

(1) If the above formula is not appropriate for the design of the transmitter final amplifier, use a formula specified by the transmitter manufacturer with other appropriate operating parameters.

(2) The value of *F* applicable to each mode of operation must be determined and a record kept thereof with a notation as to its derivation. This factor is to be established by one of the methods described in paragraph (f) of this section and retained in the station records.

(f) The value of *F* is to be determined by one of the following procedures listed in order of preference:

(1) If the station had previously been authorized and operating by determining the antenna input power by the direct method, the factor *F* is the ratio of the antenna input power (determined by the direct method) to the corresponding final radio frequency power amplifier input power.

(2) If a station has not been previously in regular operation with the power authorized for the period of indirect power determination, if a new transmitter has been installed, or if, for any other reason, the determination of the factor *F* by the method described in paragraph (f)(1) of this section is impracticable:

(i) The factor *F* as shown in the transmitter manufacturer's test report, if such a test report specifies a unique value of *F* for the power level and frequently used; or

(ii) The value determined by reference to the following table:

Factor(F)	Method of modulation	Maximum rated carrier power	Class of amplifier
0.70	Plate	1 kW or less	
.80	Plate	2.5 kW and over	
.35	Low level	0.25 kW and over	B
.65	Low level	0.25 kW and over	BC[1]
.35	Grid	0.25 kW and over	

[1] All linear amplifier operation where efficiency approaches that of class C operation.

[37 FR 7516, Apr. 15, 1972, as amended at 42 FR 36827, July 18, 1977; 42 FR 61863, Dec. 7, 1977; 44 FR 36036, June 20, 1979; 47 FR 28387, June 30, 1982; 48 FR 38477, Aug. 24, 1983; 48 FR 44805, Sept. 30, 1983; 49 FR 3999, Feb. 1, 1984; 49 FR 4210, Feb. 3, 1984; 49 FR 49850, Dec. 24, 1984; 50 FR 24521, June 11, 1985; 52 FR 10570, Apr. 2, 1987; 83 FR 48963, Sept. 28, 2018]

§ 73.53 Requirements for authorization of antenna monitors.

(a) Antenna monitors shall be approved with Supplier's Declaration of Conformity that demonstrates compliance with the technical requirements in this section. The procedure for Supplier's Declaration of Conformity is specified in subpart J of part 2 of this chapter.

NOTE 1 TO PARAGRAPH (a): The verification procedure has been replaced by Supplier's Declaration of Conformity. Antenna monitors previously authorized under subpart J of part 2 of this chapter may remain in use. See § 2.950 of this chapter.

(b) An antenna monitor shall meet the following specifications:

(1) The monitor shall be designed to operate in the 535–1705 kHz band.

(2) The monitor shall be capable of indicating any phase difference between two RF voltages of the same frequency over a range of from 0 to 360°.

(3) The monitor shall be capable of indicating the relative amplitude of two RF voltages.

(4) The device used to indicate phase differences shall indicate in degrees, and shall be graduated in increments of 2°, or less. If a digital indicator is provided, the smallest increment shall be 0.5°, or less.

(5) The device used to indicate relative amplitudes shall be graduated in increments which are 1 percent, or less, of the full scale value. If a digital indicator is provided, the smallest increment shall be 0.1 percent, or less, of the full scale value.

(6) The monitor shall be equipped with means, if necessary, to resolve ambiguities in indication.

(7) If the monitor is provided with more than one RF input terminal in addition to a reference input terminal, appropriate switching shall be provided in the monitor so that the signal at each of these RF inputs may be selected separately for comparison with the reference input signal.

(8) Each RF input of the monitor shall provide a termination of such characteristics that, when connected to a sampling line of an impedance specified by the manufacturer the voltage reflection coefficient shall be 3 percent or less.

(9) The monitor, if intended for use by stations operating directional antenna systems by remote control, shall be designed so that the switching functions required by paragraph (b)(7) of this section may be performed from a point external to the monitor, and phase and amplitude indications be provided by external meters. The indications of external meters furnished by the manufacturer shall meet the specifications for accuracy and repeatability of the monitor itself, and the connection of these meters to the monitor, or of other indicating instruments with electrical characteristics meeting the specifications of the monitor manufacturer shall not affect adversely the performance of the monitor in any respect.

(10) Complete and correct schematic diagrams and operating instructions shall be retained by the party responsible for Supplier's Declaration of Conformity of the equipment and submitted to the FCC upon request. For the purpose of equipment authorization, these diagrams and instructions shall be considered as part of the monitor.

(11) When an RF signal of an amplitude within a range specified by the manufacturer is applied to the reference RF input terminal of the monitor, and another RF signal of the same frequency and of equal or lower amplitude is applied to any other selected RF input terminal, indications shall be provided meeting the following specifications.

(i) The accuracy with which any difference in the phases of the applied signals is indicated shall be ±1°, or better, for signal amplitude ratios of from 2:1 to 1:1, and ±2°, or better, for signal amplitude ratios in excess of 2:1 and up to 5:1.

(ii) The repeatability of indication of any difference in the phases of the applied signals shall be ±1°, or better.

(iii) The accuracy with which the relative amplitudes of the applied signals is indicated, over a range in which the ratio of these amplitudes is between 2:1 and 1:1, shall be ±2 percent of the amplitude ratio, or better, and for amplitude ratios in excess of 2:1 and up to 5:1, ±5 percent of the ratio, or better.

(iv) The repeatability of indication of the relative amplitudes of the applied signals, over a range where the ratio of these amplitudes is between 5:1 and 1:1, shall be ±2 percent of the amplitude ratio, or better.

(v) The modulation of the RF signals by a sinusoidal wave of any frequency between 100 and 10,000 Hz, at any amplitude up to 90 percent shall cause no deviation in an indicated phase difference from its value, as determined without modulation, greater than ±0.5°.

(12) The performance specifications set forth in paragraph (b)(11) of this section, shall be met when the monitor is operated and tested under the following conditions.

(i) After continuous operation for 1 hour, the monitor shall be calibrated and adjusted in accordance with the manufacturer's instructions.

(ii) The monitor shall be subjected to variations in ambient temperature between the limits of 10 and 40 °C; external meters furnished by the manufacturer will be subjected to variations between 15 and 30 °C.

(iii) Powerline supply voltage shall be varied over a range of from 10 percent below to 10 percent above the rated supply voltage.

(iv) The amplitude of the reference signal shall be varied over the operating range specified by the manufacturer, and in any case over a range of maximum to minimum values of 3 to 1.

(v) The amplitude of the comparison signal shall be varied from a value which is 0.2 of the amplitude of the reference signal to a value which is equal in amplitude to the reference signal.

(vi) Accuracy shall be determined for the most adverse combination of conditions set forth above.

(vii) Repeatability shall be determined as that which may be achieved under the specified test conditions over a period of 7 days, during which no calibration or adjustment of the instrument, subsequent to the initial calibration, shall be made.

(viii) The effects of modulation of the RF signal shall be separately determined, and shall not be included in establishing values for accuracy and repeatability.

NOTE 1 TO PARAGRAPH (b): In paragraph (b)(1) of this section, the requirement that monitors be capable of operation in the 535–1705 kHz band shall apply only to equipment manufactured after July 1, 1992. Use of a monitor in the 1605–1705 kHz band which is not approved for such operation will be permitted pending the general availability of 535–1705 kHz band monitors if a manufacturer can demonstrate, in the interim, that its monitor performs in accordance with the standards in this section on these 10 channels.

(Secs. 4, 5, 303, 48 Stat., as amended, 1066, 1068, 1082 (47 U.S.C. 154, 155, 303))

[38 FR 1917, Jan. 19, 1973, as amended at 49 FR 3999, Feb. 1, 1984; 49 FR 29069, July 18, 1984; 50 FR 32416, Aug. 12, 1985; 50 FR 47054, Nov. 14, 1985; 51 FR 2707, Jan. 21, 1986; 56 FR 64859, Dec. 12, 1991; 57 FR 43290, Sept. 18, 1992; 60 FR 55480, Nov. 1, 1995; 63 FR 36604, July 7, 1998; 66 FR 20755, Apr. 25, 2001; 82 FR 50835, Nov. 2, 2017]

§ 73.54 Antenna resistance and reactance measurements.

(a) The resistance of an omnidirectional series fed antenna is measured at either the base of the antenna without intervening coupling or tuning networks, or at the point the transmission line connects to the output terminals of the transmitter. The resistance of a shunt excited antenna may be measured at the point the radio frequency energy is transferred to the feed wire circuit or at the output terminals of the transmitter.

(b) The resistance and reactance of a directional antenna shall be measured at the point of common radiofrequency input to the directional antenna system after the antenna has been finally adjusted for the required radiation pattern.

(c) A letter of notification must be filed with the FCC in Washington, DC, Attention: Audio Division, Media Bureau, when determining power by the direct method pursuant to §73.51. The letter must specify the antenna or common point resistance at the operating frequency. The following information must also be kept on file at the station:

(1) A full description of the method used to make measurements.

(2) A schematic diagram showing clearly all components of coupling circuits, the point of resistance measurement, the location of the antenna ammeter, connections to and characteristics of all tower lighting isolation circuits, static drains, and any other fixtures connected to and supported by the antenna, including other antennas and associated networks. Any network or circuit component used to dissipate radio frequency power shall be specifically identified, and the impedances of all components which control the level of power dissipation, and the effective input resistance of the network must be indicated.

(d) AM stations using direct reading power meters in accordance with §73.51, can either submit the information required by paragraph (c) of this section or submit a statement indicating that such a meter is being used. Subsequent station licenses will indicate the use of a direct reading power meter in lieu of the antenna resistance value in such a situation.

[66 FR 20755, Apr. 25, 2001,as amended at 67 FR 13231, Mar. 21, 2002]

§ 73.57 Remote reading antenna and common point ammeters.

Remote reading antenna and common point ammeters may be used without further authority according to the following conditions:

(a) Remote reading antenna or common point ammeters may be provided by:

(1) Inserting second radio frequency current sensing device directly in the antenna circuit with remote leads to the indicating instruments.

(2) Inductive coupling to radio frequency current sensing device for providing direct current to indicating instrument.