

**PROCEDURE FOR MEASUREMENT OF THE LEVEL OF RF ENERGY
EMITTED BY A RADIO CONTROL FOR A DOOR OPENER**
(Excerpted from Report No. T-7001)

This bulletin sets out a standard procedure for making measurements above 25 MHz under open-field conditions as opposed to those of a "typical installation". The procedure described herein may be used to measure the emission individually from the transmitter and receiver parts of the control. Compliance with the Commission's limits when measured by the open-field method described herein, gives reasonable assurance that the device will comply when installed. The open-field method also permits comparison of results at different sites by other observers. Emissions below 25 MHz shall be measured using conducted techniques.

SOURCES OF RADIATED ENERGY. Besides radiating energy on its fundamental or operating frequency, the transmitter part of the radio control may be a source of radiated energy on other frequencies including one or more harmonics or subharmonics of the fundamental. Tests of the radio control are not complete if only the transmitter emission is measured. The radiation from the receiver is of equal, or greater importance, considering that it operates continuously. The receiver radiation is also limited by provisions of Part 15 of the FCC Rules. In systems using a superheterodyne receiver, energy may be radiated as CW signals on the oscillator fundamental and harmonics. In systems using a superregenerative receiver the radiated energy may occur as a pulsed RF carrier, occupying bands of frequencies more than 5 MHz wide in the vicinity of the operating frequency and its harmonics. In addition, energy may be emitted on the "quench" frequency in the range 5-1,000 kHz, and on harmonics thereof. In both classes of receiver, the radiation may be excessive unless adequate shielding and other design measures are provided. In general, the amplitude of the radiation cannot be predicted, but must be ascertained by measurement.

TEST SITE. An open area shall be used having, as a minimum, the dimensions shown in FIG. 1. This area must have a low ambient radio noise and must be free of metallic or other objects such as buildings, trees, and bushes which might cause field distortions.

POWER SUPPLY. Power lines to both the unit under test and the field strength meter shall be kept as short as possible. Electrical service to the area preferably should be underground. Adequate isolation shall be incorporated to prevent coupling signals into the field strength meter via the power lines. The power supply shall be maintained within 5% of nominal voltage.

UNIT MOUNT. The unit under test shall be set on a framework preferably mounted on a platform capable of being rotated about its vertical axis and remotely controlled from the measuring position. The framework shall be made of wood or of other nonconducting material. The power cable to the unit shall be routed up the center of the framework to the unit under test. If a rotatable platform is not used, provision shall be made for manually orienting the supporting structure, or for moving the field strength meter around the supporting structure.

The receiver under test shall be placed on the framework at a height of 7 feet above ground to simulate a typical installation. If the control signals to the door operator are carried over a cable (operator control cable) separate from the power supply cable, this operator control cable shall be attached to the receiver and extended horizontally for one wavelength.

The transmitter under test shall be placed on the framework at a height of 4 feet above ground to simulate a typical installation. The transmitter shall be tested both in a horizontal position and in a vertical position.

INSTRUMENTATION. Standard field strength meters together with the calibrated antenna and other accessories furnished by the manufacturer of the meter shall be used. The field strength antenna shall be capable of adjustment for either vertical or horizontal polarization, and its height above ground shall be variable from 3 to 15 feet. The support used to achieve this variation in antenna height shall be a structure constructed from nonconducting material may be used. To the extent practicable, the transmission line from the field strength meter antenna shall be routed horizontally for a distance of 2 feet in a direction away from the unit under test, then dropped vertically to the field strength meter.

PROCEDURE. The unit to be tested complete with its usual antenna shall be placed on the framework at the specified height. With the unit and measuring equipment warmed-up and operating, the framework shall be rotated until maximum radiation is indicated on the field strength meter, which has been tuned to the frequency being measured. If a rotatable platform is not used, the field strength shall be measured around the device to find the direction of maximum radiation. At least eight equispaced locations shall be used. The height of the measuring antenna is then varied between 3 and 15 feet, measured to the center of the antenna, for both horizontal and vertical polarization. The maximum reading shall be recorded.

The spectrum shall be scanned from the lowest frequency generated in the unit to 1000 MHz. The maximum level of each signal found in this range shall be determined and reported.

AVERAGE DETECTOR TO BE USED. The value to be recorded in each case is the indication of the measuring instrument when operated in its "AVERAGE" or "FIELD STRENGTH" mode rather than "QUASI-PEAK" or "PEAK". This choice has little or no effect on the indication of oscillator radiation from superheterodyne receivers, but is considered desirable in the case of superregenerative receiver radiation, since it tends to give better agreement in comparisons of measurements with instruments of differing bandwidth. Moreover, measurements of radiated RF energy from superregenerative receivers, using the "average" mode give a reasonable weight to both the duty cycle and the peak value of such emissions, both of which contribute significantly to the interfering effect. On the other hand, the "quasi-peak" and "peak" indications may give excessive weight to the peak value and inadequate weight to the duty cycle.

CORRECTION OF MEASURED VALUES. This paragraph applies only to measurements of emission from a superregenerative receiver made with the Singer-Metrics (Empire) NF-105 used in the carrier detector position. It has been determined through test that the detector characteristics of this meter when operated in the carrier mode give some peak detection when measuring a superregenerative signal. Therefore, the readings of the NF-105 in this case may be reduced by 3dB to make them comparable to readings obtained on the Stoddart NM-30A.

Corrections for other meters may be obtained by comparing measurements made with such other meter with those made with a Stoddart NM-30A. If such a correction is used, attach to the report of measurements a description of the procedure used and the data on which such correction is based.

EXTRAPOLATION TO 100 FEET. The values of field strength measured at the distance of 30 feet shall be extrapolated to 100 feet to determine compliance with the requirements of Part 15. The equivalent field strength at 100 feet shall be taken to be 0.3 times the field strength measured at 30 feet (or -10.5dB).

Where it has been determined that a field strength decay factor other than -10.5dB would apply for extrapolation to 100 feet, the actual measured decay factor may be used. If a measured decay factor is used, a description of the procedure used to calibrate the site and the data on which the measured decay factor is based, should be included with the report of measurements.

CONDUCTED RF MEASUREMENTS. Conducted measurements over the frequency range 450 kHz to 25 MHz are required for all devices intended to be connected to power lines of public utility systems. Conducted measurements may be made in accordance with IEEE Standard 213 (formerly 61 IRE 27SI) or any equivalent method. If the procedure of IEEE 213 is not followed, the actual measurement procedure used must be described in detail in the report of measurements.

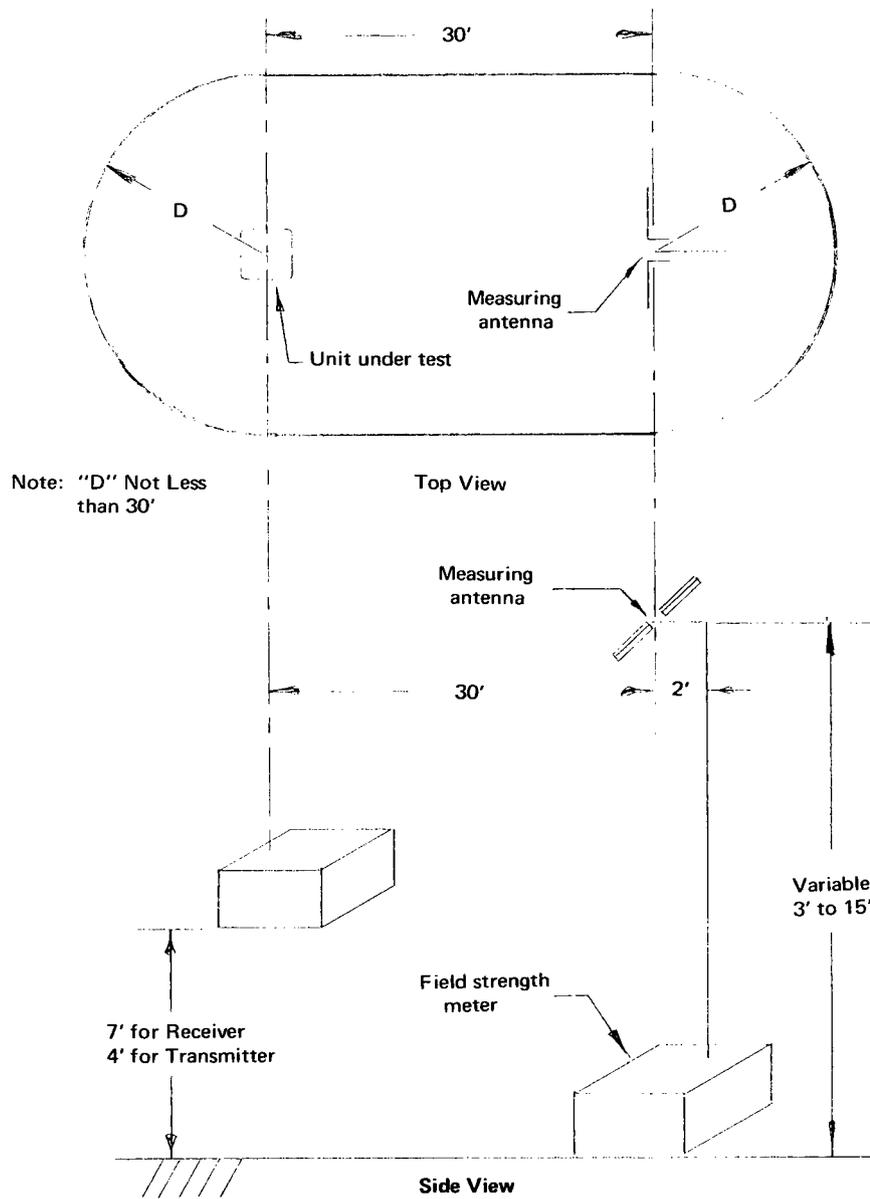


Figure 1. Test-site and Equipment Arrangement for Open-field Measurement of a Radio Controlled Door Opener.