



**CORNELL-DUBILIER ELECTRONICS DIVISION**

FEDERAL PACIFIC ELECTRIC COMPANY • 1605 RODNEY FRENCH BLVD., NEW BEDFORD, MASS.

November 28, 1960

To: Members of IRE Subcommittee 27.4

Enclosed please find a draft of part three of our proposed Standard on Measuring Interference Output. My apologies for not having written this proposed draft sooner, but I hope this does not prevent you from reviewing it before our scheduled meeting on December 2, 1960.

At this meeting we should approve part one, continue our review of part three, and time permitting start on the enclosed part two.

Very truly yours,

A handwritten signature in blue ink that reads 'V.J. Mancino'.

V.J. Mancino, Chairman  
Subcommittee, 27.4

VJM:js

WATER

Methods of Measurement of Transmitter External Winding Spurious Output  
IEEE 27.4 Proposed Standards

5. Spurious Output appearing on Transmitter External Winding

5.1 General. The spurious output appearing on the external

winding of a transmitter which may consist of harmonic (or non-

harmonic) components, may be measured by measuring the voltage

developed across a known impedance network with the use of a

calibrated frequency-selective voltmeter or receiver.

5.2 Equipment required:

5.2.1 Impedance Network. The spurious output appearing on

external wiring should be measured with the use of an impedance

network whose characteristics is known. This network shall be inserted

in the external lead whose spurious output is to be measured, at a

convenient point close to the point of entry of the wire to the

transmitter hardware, such that the spurious output voltage is

developed from the wire to ground. The network must have a connection

means for cables to the calibrated frequency-selective voltmeter

or receiver. The circuit of this network is shown in Figure 3.

5.2.2 Interference-Free Area. If the frequency-selective

voltmeter or receiver is overloaded by the transmitter carrier, it

shall be placed in an area sufficiently free from ambient interference

for the purposes of this measurement. It is desirable that the

ambient interference level during testing be at least 6 db below

the interference limits specified in the appropriate specifications.

However, in the event that at the time of measurement the levels of

ambient interference plus the spurious output of the item under

test are not above the specified limit, such testing item shall be

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considered to comply with the specified requirements. In addition any frequency whose identity is definitely established such as a broadcast station is exempt from this requirement.

5.2.3 Variable Attenuator. ✓ A calibrated variable attenuator is needed to provide a means for adjusting the output indication level of the measuring instrument so as not to overload the frequency selective voltmeter or receiver.

5.2.4 Frequency-selective voltmeter or receiver. ✓ A frequency-selective voltmeter or receiver (may be more than one) which can tune to the carrier and any spurious output frequency of interest, is needed. If a receiver is used, it must have an output indicator. The receiver cabinet should incorporate good shielding techniques and the power lines should be well filtered.

5.2.5 Coaxial Switches. ✓ Coaxial switches (or suitable means for changing connections) may be required when using a calibrated signal generator for calibration purposes.

5.2.6 Measuring Equipment Enclosure. ✓ To prevent pickup of extraneous radiations during the measurements, the measuring equipment should (if necessary) be enclosed within a suitable shielded enclosure and the signal from the pickup device brought into the shielded enclosure through a well-shielded cable.

5.2.7 Calibrated Signal Generator. ✓ A calibrated signal generator (or generators) to cover the carrier frequency and any spurious frequencies of interest is needed.

### 5.3 Measurement Procedure.

5.3.1 Standard Method. NOTE: The standard method measures the <sup>voltage of the</sup> spurious output developed across a known impedance network.

5.3.1.1 Connect the equipment as shown in figure 1.

5.3.1.2 Operate the transmitter under test in its intended manner with its output connected to a shielded dummy load.

5.3.1.3 Tune the frequency-selective voltmeter or receiver through the frequency range of interest with the variable attenuator adjusted for maximum sensitivity of the measuring circuit. When a spurious output is found, adjust the attenuator to obtain a suitable reference ~~reading~~ <sup>indication</sup> on the output indicator of the measuring instrument.

*Cautious Note*  
5.3.1.4 With the use of the coaxial switches connect a calibrated signal generator or other suitable source of controlled oscillation to supply the substituted power.

*rewrite as per Sec 6*

5.3.1.5 Energize the calibrated signal generator and tune to the preset frequency on the frequency selective voltmeter or receiver obtained in 5.3.1.3.

5.3.1.6 Adjust the level of the calibrated signal generator to give the same reading at the frequency-selective voltmeter or receiver which was noted in 5.3.1.3.

*ad*

5.3.1.7 The spurious output level is calculated as follows:

(a) CW Spurious Output

Spurious Output Level (DB above 1uV) = meter reading  
(or substituted signal generator reading) + cable loss

(b) Broadband Spurious Output

Spurious Output Level (DB above 1uV per MC) =  
meter reading (or substituted signal generator) + cable loss  
impulse bandwidth

*see section 6*

5.3.2 Alternate Method. NOTE: The alternate method is used when it is inconvenient to use the standard method due to reasons of inaccessibility or due to the large current carrying capacity of the external wiring. For this method a clamp on current probe

of known characteristics is used. The spurious output is determined by measuring the current induced in the current probe.

5.3.2.1 Connect the equipment as shown in figure 2.

5.3.2.2 Operate the transmitter under test in its intended manner with its output connected to a dummy load.

5.3.2.3 Tune the frequency-selective voltmeter or receiver through the frequency range of interest with the variable attenuator adjusted for maximum sensitivity of the measuring circuit. When a spurious output is found, adjust the attenuator to obtain a suitable reference reading on the output indicator.

CAUTION: In all frequency-selective voltmeters or receivers spurious responses may occur by: (1) desensitization of the receiver by the entry of a strong off-channel signal through the antenna input. (2) By the entry of a strong on-channel signal through the receiver case or power lines and by-passing its calibrated input attenuator. These responses must be known or determined for the particular device used.

In addition care must be taken to insure that the spurious signal being measured can be actually attributed to the equipment under test. This is easily determined by momentarily turning off the equipment under test.

5.3.2.4 If the frequency-selective voltmeter or receiver is of the type that can be calibrated internally, then calibrate it according to the recommended manufacturer's procedure and measure the spurious radiated signal.

5.3.2.5 If the substitution method is used then substitute the calibrated signal generator for the transmitter, adjust its output frequency to the spurious frequency, and operate it at a power output level which will enable the reference level of 5.3.2.3 to be obtained

with variation of the variable attenuator.

5.3.2.6 The spurious output level is calibrated as follows:

(a) CW Spurious Output

Spurious Output Level (DB above  $\mu A$ ) = meter reading (or substituted generator reading) + cable loss + voltage to current conversion factor.

(b) Broadband Spurious Output

Spurious Output Level (DB above  $1\mu A$  per MC) =  
meter reading (or sub. sig. gen. rd.) + cable loss + current conv. factor  
impulse bandwidth

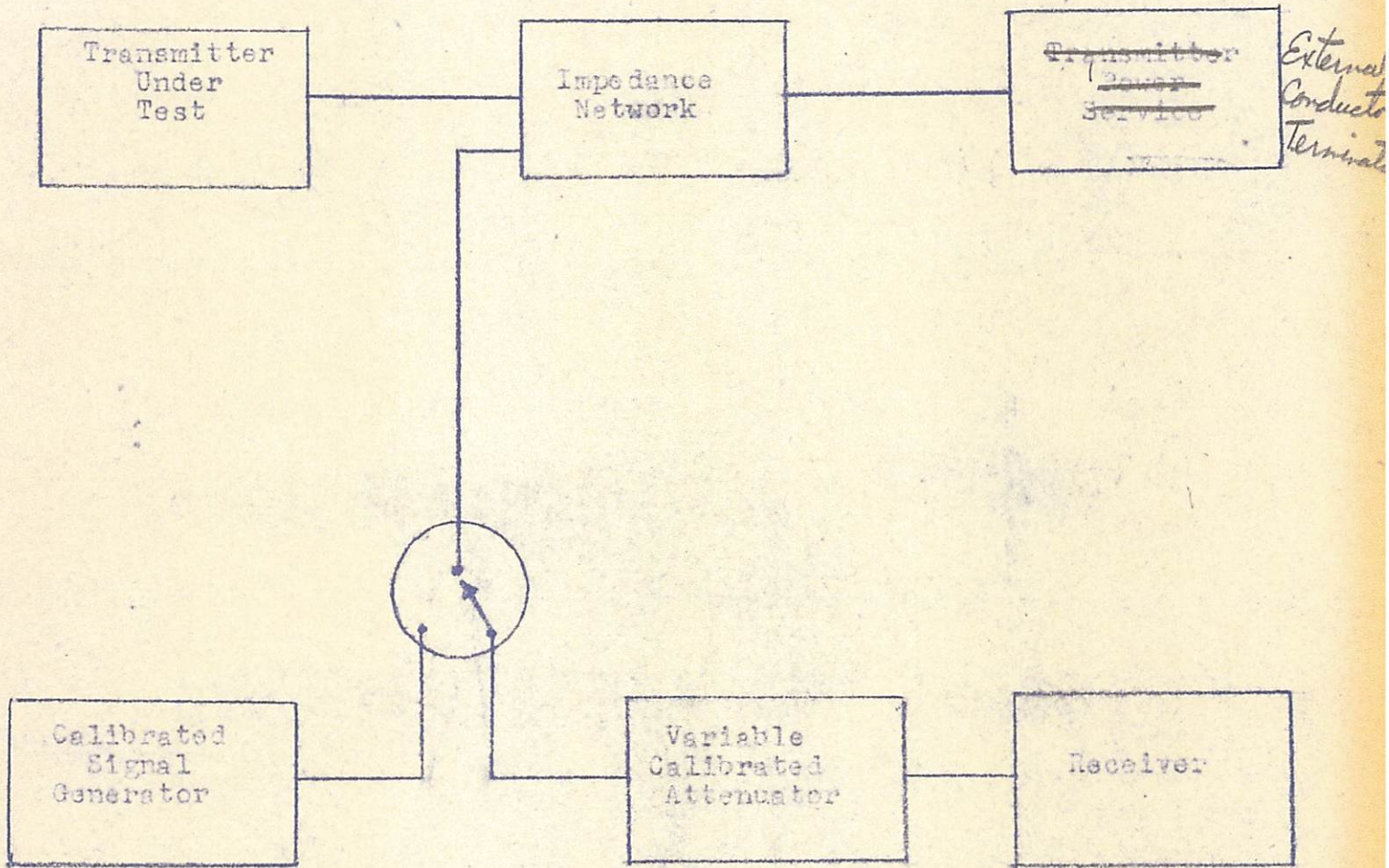


Figure I



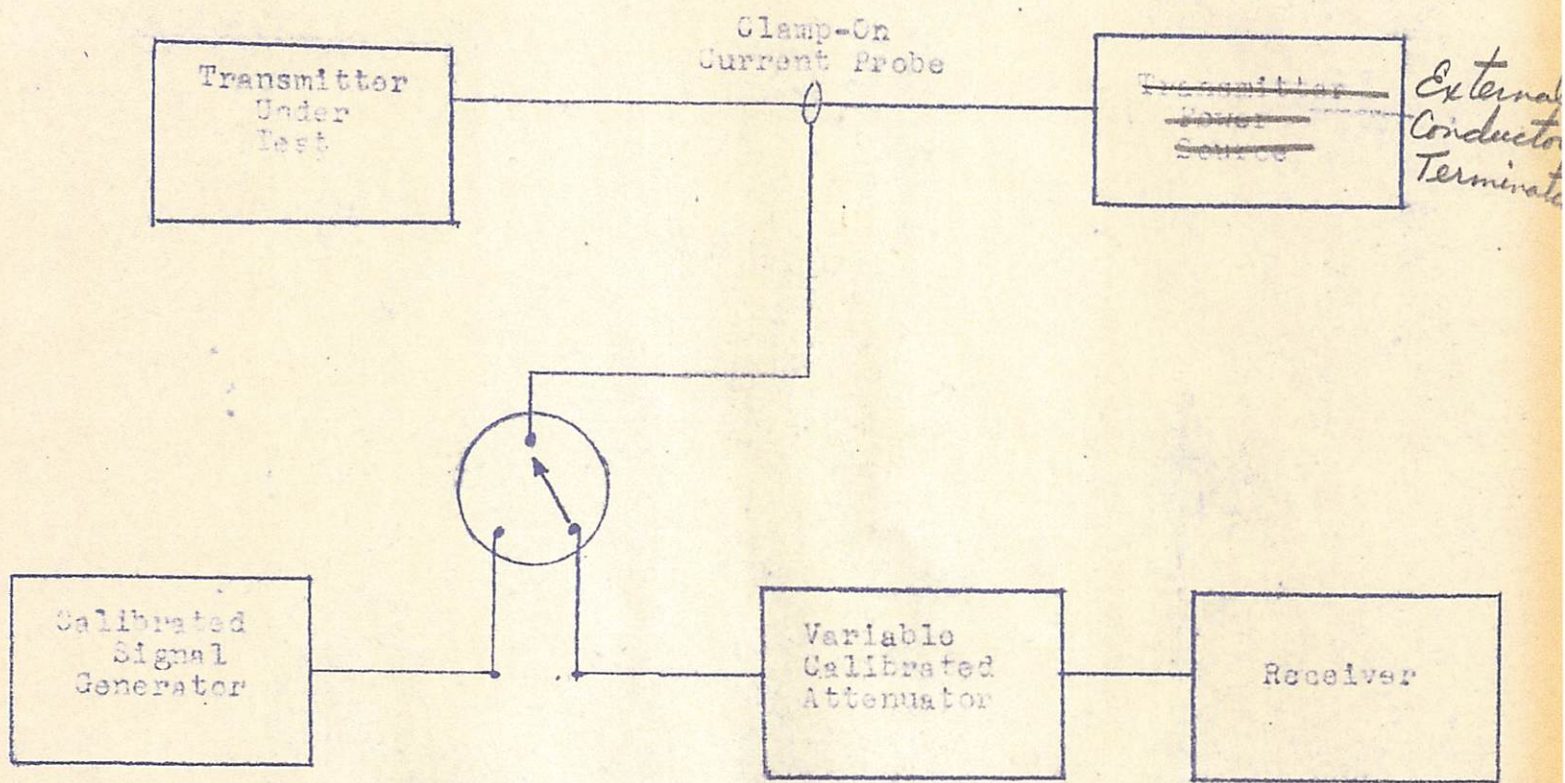


Figure II

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