Simulation d'une antenne filaire par des composants R,L,C

1. Antenne fictive

Source : https://www.carnets-tsf.fr/antenne-fictive.html

(Joseph-Henri Lévy) 16/03/2024

Les postes de radio se dérèglent quelques fois. Cela se traduit par un écart entre la station captée et la fréquence (ou longueur d'onde) affiché au cadran. Je ne parle ici des noms de station du cadran, dont beaucoup d'entre elles ont disparu de la gamme GO.

Pour réaligner (c'est le terme usité) le poste TSF, il faut envoyer un signal HF issu d'un générateur désigné par le terme « hétérodyne ». Ce signal HF est réglable en fréquence entre 540KHz et 1600KHz.

Il est, de plus modulé, à une fréquence audible (entre 400 et 1000Hz). Cela permet à l'opérateur de régler son poste « à l'oreille ». S'il est munit d'un multimètre, il pourra ainsi mesurer la tension BF aux bornes du haut-parleur.

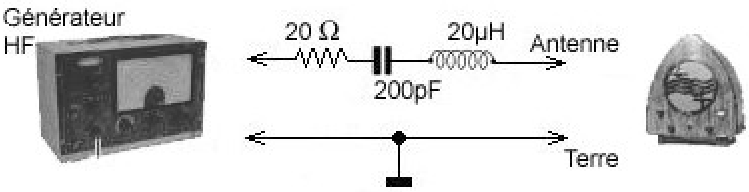
En mode de réception normal, une antenne réelle dérègle et amortit le circuit d'accord d'entrée des postes. C'est pourquoi, il est nécessaire lors d'une opération d'alignement et pour s'approcher des conditions réelles, d'insérer une antenne fictive entre le générateur HF et le poste.

C'est cette antenne « fictive » qui est décrite ici.

Attention! Il faut blinder l'antenne fictive en plaçant les circuits RLC, décrits plus bas, dans un tube métallique par exemple.
Le générateur HF (hétérodyne) devra produire un signal modulé à 30% pour se placer dans des conditions moyennes de réception AM.

Commune

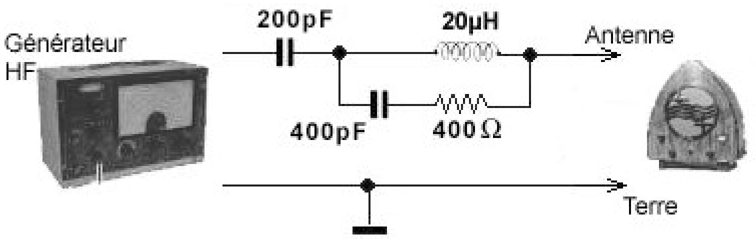
(Terman — Radio Engineers'HandBook)



Le poste de radio «voit» le générateur HF comme une antenne de type long-fil d'une longueur donnée et placée à une hauteur donnée. Elle est appliquée pour des fréquences de 540KHz à 1600KHz.

Modèle RMA

(Terman — Radio Engineers'HandBook)

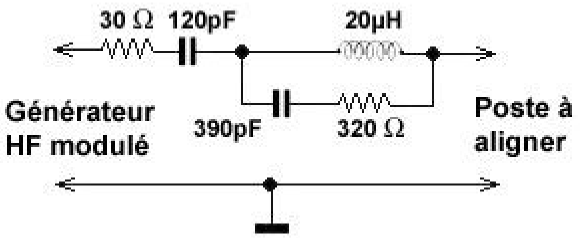


Ce schéma est extrait des procédures de test standard utilisées en Angleterre et décrites dans le document R. M. A. (Wireless Proc., Vol. 12, p. 179, September, 1937).
Il est destiné à spécifier les tests d'évaluation du rendement global des récepteurs radio.

Extrait de Radio Engeneers handbook -- Terman (289Ko) EN

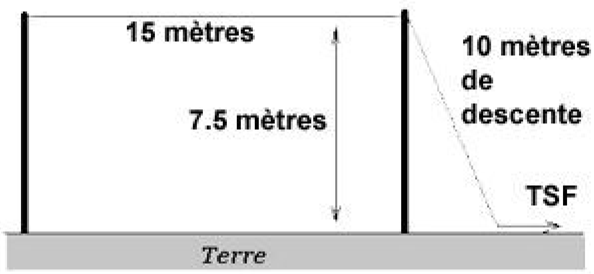
Modèle IRE

(USA - Source Handbook ARRL)



Un modèle d'antenne fictive — circuit ci-contre — a été défini par l'IRE (USA). Il simule l'impédance que présenterait une antenne d'environ 15 mètres de fil de cuivre (ø:1.5mm) tendu à 7,5 mètres du sol et relié au récepteur par 10 mètres de fil.

Extrait de Radiotron Designers handbook -- Langford-Smith (2Mo) EN



Sources et références

[1] F. E. TERMAN, "Radio Engineer's Handbook", McGraw-Hill, New York, 1943.

[2] F. LANGFORD-SMITH, "Radiotron Designer's Handbook", Radio Corporation of America - Harrison, New Jersey, 1953.

1.

2. **La normalisation SPIRE 1939 :**

Source : https://maignan-daniel.e-monsite.com/pages/articles-techniques/la-normalisation-des-recepteurs.html

La norme SPIRE 1939, adoptée le 24 novembre 1938 et entrée en vigueur le 1er février 1939, définissait les caractéristiques des éléments suivants (voir Note) :

Trois types d'antennes fictives :

- Antenne maximum (normale IRE, voir la figure 2)
- Antenne minimum : 50 pF en série avec résistance de 250 ohms.
- Antenne type, soit l'antenne de l'IRE avec câble et capacité de 100 pF à l'entrée du récepteur.

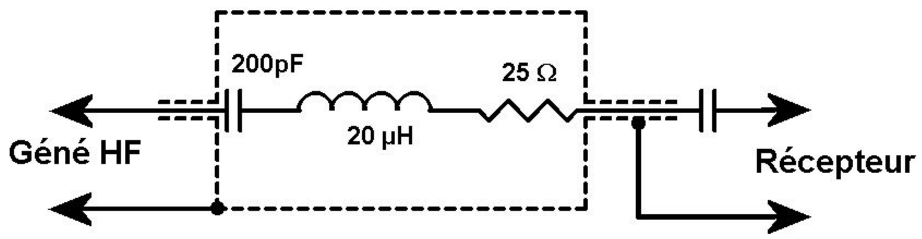
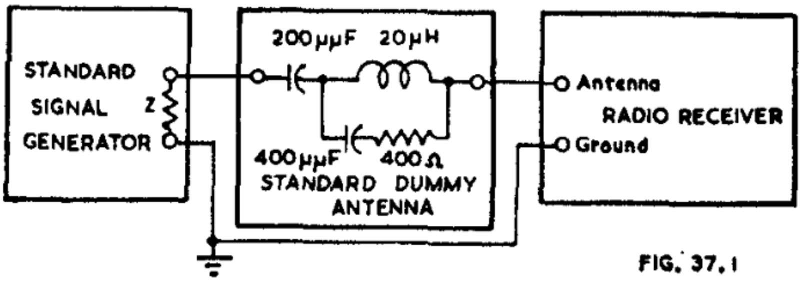


Figure 2 - Antenne fictive normale IRE

3. **Source : Radioton-chapter37 https://www.carnets-tsf.fr/docs/radioton-chapter37.pdf**

Fig. 37.1. *Standard dummy antenna and method of connection (from Ref.* 1).



(B) Standard dummy antenna (I.R.E.) " The elements of the standard dummy antenna are capacitors (C_1 and C_2) of 200 and 400 micromicrofarads, respectively, an inductor L of 20 microhenrys, and a resistor R of 400 ohms, connected as shown in Fig. 37.1. The effective values of R, L, and C should be within 10% of the nominal values. The stray capacitance between any two points must be so small as to be negligible at operating frequencies, and the dummy antenna must be so devised as to avoid coupling to other equipment. If the output impedance of the attenuator of the signal generator is not negligible with respect to that of the dummy antenna, this impedance should be deducted from the respective constants thereof.

The leads used in connecting the standard-signal generator through the dummy antenna to the receiver should be so short as to introduce negligible voltage drop. They should be shielded to reduce external fields."

4. **Source : terman-dummy-antenna https://www.carnets-tsf.fr/docs/terman-dummy-antenna.pdf**

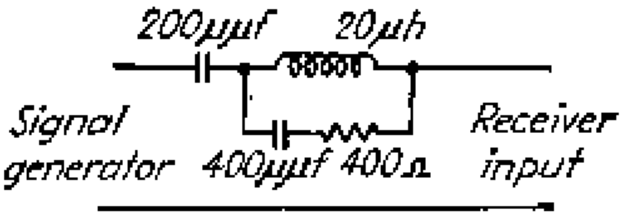
MEASUREMENTS ON RADIO RECEIVERS

35. Receiver Characteristics and Their Determination. 1—Radio receivers are tested by employing an artificial signal from a standard signal generator to provide a voltage corresponding to that induced in the receiving antenna. This voltage is ordinarily applied to the receiver through a network, termed a dummy antenna, having characteristics such that the receiver views substantially the same impedance as it would in normal operation with an actual antenna. The receiver output is then observed by replacing the loud-speaker or telephone receivers by a suitable resistance load, with which is associated a power indicator.

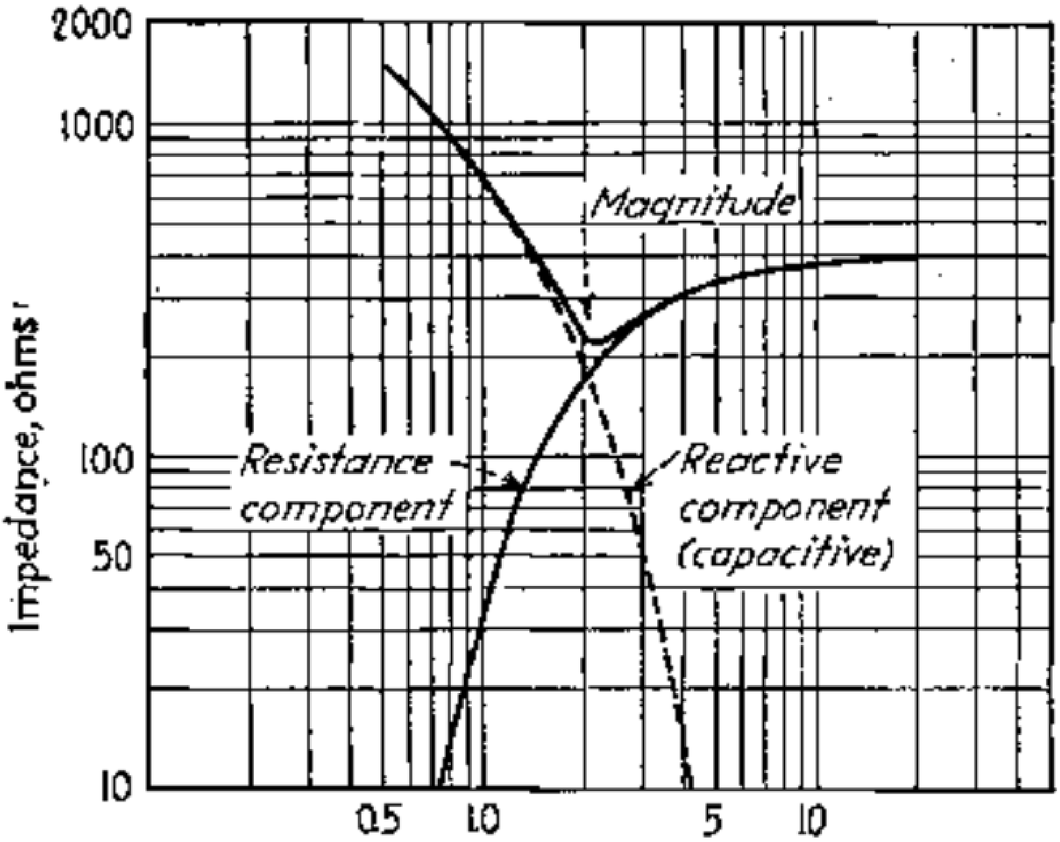
The dummy antenna recommended for use in testing broadcast receivers is given in Fig. 78. 2 The impedance of this network in the frequency range 540 to 1,600 kc approximates that of the typical open-wire antenna resonant at about 2,500 kc, and having a capacity of the order of 200 μμf. At higher frequencies the network approaches a constant impedance of 400 ohms, and so resembles a nonresonant transmission line of corresponding impedance.

1 Many of the tests and test procedures commonly used with radio receivers, particularly broadcast receivers, have been standardized to ensure uniformity. These standards are described in " Standards on Radio Receivers," Institute of Radio Engineers, New York, 1938.
The standard test procedures used in England are described in the paper R. M. A. Specification for Testing and Expressing the Overall Performance of Radio Receivers, Jour. Vol. 81, p. 104, 1937 {Wireless Proc., Vol. 12, p. 179, September, 1937).
2 Where tests are to be made only in the standard broadcast frequency range, an alternative network consisting of a capacity of 200 µµf, resistance of 25 ohms, and an inductance of 20 µh, all connected in series, is commonly used. Such a dummy antenna has practically the same impedance as the recom-mended network in this frequency range.

With loop antennas, the signal-generator voltage can be introduced into the receiver loop by use of a known mutual inductance, as in Fig. 79a, or can be inserted directly in series with the loop circuit, as in Fig. 79b [1] .The former arrangement is preferable, because it requires no correction for distributed capacity of the loop. In this mutual-inductance method, if the reactance of the primary inductance Xp is at least three times the internal impedance Rp of the signal generator, then the strength
Frequency in Megacycles



(a) Circuit



(b) Impedance characteristics

FIG. 78.—Standard dummy antenna used for testing broadcast receivers, together with its
impedance characteristic.

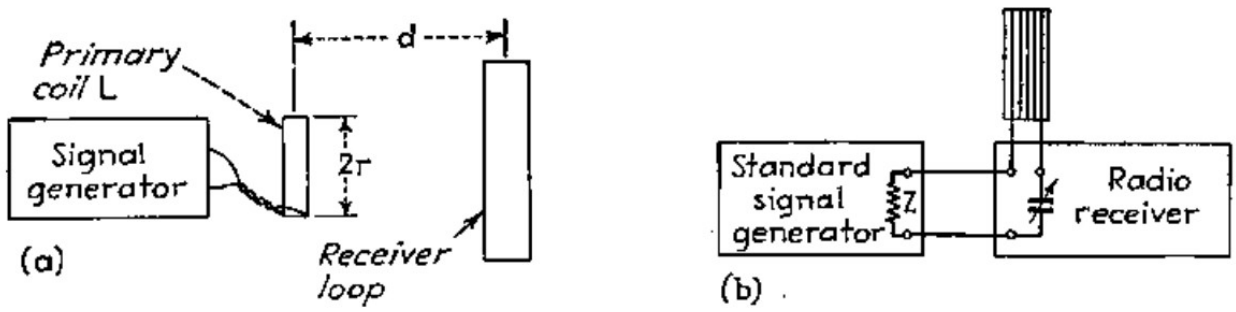


FIG. 79.—Methods of introducing signal-generator voltage into a loop antenna. of the radio field E required to induce in the loop the same voltage as does the signal generator is [2]

$$\epsilon = \frac{18.85 N_p r_p^2}{d^3} \frac{E}{X_p}$$

where :

ϵ = strength of radio field, microvolts per meter.

Np = number of turns in primary coil Lp.

r_p = radius of primary coil, cm.

d = distance, meters, between center of primary coil *L* and center of loop antenna.

E = signal-generator voltage, millivolts.

X_P = reactance of primary coil *L*.

The distance *d* should be at least twice the largest dimension of the loop or primary coil, but should be much less than a wave length.

When the signal-generator voltage is inserted directly in series with the loop, as in Fig. 79b, then the intensity of the radio field that would produce the same effect in the radio receiver as does the signal generator, is

$$\epsilon = \frac{47{,}750E}{N_2Af} \qquad (43)$$

where ϵ and *E* have the same meaning as in Eq. (42), N_2 is the number of turns in the loop antenna, *f* the frequency in kilocycles, and *A* the cross-sectional area of the loop in square meters.

[1] Further details on receiver measurements when loop antennas are used are given by W. O. Swinyard, Measurement of Loop Antenna Receivers, *Proc. I.R.E.*, Vol. 29, p. 382, July, 1941.

[2] When this relation is not satisfied, then one should substitute $\sqrt{X_{p^2} + R_{p^2}}$ in place on Xp in Eq. (42).