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Study on the Stability of Oscillation Frequency in Terms of the Image Parameters

Hisayuki HASHIMOTO*

The author presents the frequency stability and the oscillation domain of LC oscillators with image parameters. It is shown how to choose the values of 1) the ratio L/C of lumped inductance and capacitance in the circuits, and 2) input and output impedances of the active network to maintain the frequency constant of the oscillator under the changes of supplied voltages or temperature variations. These two conditions for stabilization have just the opposite tendency in π and T circuits. Namely, in the π circuit, the frequency is stabilized with reducing the ratio L/C and increasing the input and output impedances of the network. On the other hand, in the T circuit, the conditions are completely reversed. The hybrid circuit suggested by F. B. Llewellyn's reactance stabilizing method is considered to have the characteristics of both π and T circuits. It is shown that this circuit is stable when it has the characteristics of π or T type circuit, and unstable when it has the characteristics of both π and T type. It is concluded that the nearer the oscillation frequency approaches to a pole or zero point of the image impedance by the proper choice of these two values, the greater stability is achieved. The experimental data show Llewellyn's stabilizing reactances insure a considerable frequency stability but a marked improvement is attained when these two values are chosen properly. Moreover, it is seen that no stabilizing reactance is needed in the oscillator with the properly chosen L/C value. As for the oscillation domain theory, the aspect of the breadth of oscillation domain is presented by a function of the ratio L/C . It should be noted that the condition for enlarging the oscillation domain coincides with the condition for stability of the oscillation frequency.

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