# Abstracts

## Analysis of Intermodulation Noise in Frequency Converters by Volterra Series

*R.B. Swerdlow. "Analysis of Intermodulation Noise in Frequency Converters by Volterra Series." 1978 Transactions on Microwave Theory and Techniques 26.4 (Apr. 1978 [T-MTT]): 305-313.*

Frequency converters produce intermodulation noise in the desired signal band which may be a serious problem for communications systems using amplitude modulation. In this paper, we introduce the Volterra series with time-varying kernels to treat intermodulation in frequency converters with one two-terminal nonlinearity. The method gives exact results up to the order calculated (third order here) for any nonlinearity expressable as a power series, will treat frequency dependence in the nonlinearity as well as the terminations, and leads to a convenient algorithm for computer calculation. The mathematics provides a physical picture of intermodulation of a specific order as being produced by the modulation of lower order products through the nonlinearity. In fact, the solution for a given order of intermodulation currents or charges is the solution of a set of linear equations where the driving functions are intermodulation currents of lower order. A program has been written for the specific but important case of an abrupt junction varactor upconverter. Results for an upconverter that may be used for single-sideband operation in the common carrier microwave band show that the largest contribution to intermodulation comes from currents which are at the sum and difference frequencies of the input (IF) signal corresponding to currents above the input port in frequency and currents in the bias circuitry. This paper documents previously unpublished work (1972) done as part of the exploratory study of single-sideband modulation on long-haul microwave radio transmission.

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