Book Review

BASIC NUCLEAR ELECTRONICS

by

Hai Hung Chiang
Wiley-Interscience
New York 1969

The book contains 342 pages and consists of four chapters entitled "Basic Electronic Devices and Circuits" (146 pp.), "Pulse Amplifiers and Single Channel Analyzers" (35 pp.), "Multichannel Pulse Height Analyzers" (37 pp.), and "Typical Nuclear and Electronic Instruments" (44 pp.).

According to the preface, the book is intended to bridge the gap between theory and practice in electronic instrumentation for nuclear measurements. Although the text is well written in the sense that the explanations are concise and flow smoothly, the book as a whole is disappointing. To begin with, the technology of nuclear electronics is moving very rapidly: the time from birth to obsolescence of a typical nuclear instrument is approximately three years. On this time scale, "Basic Nuclear Electronics" is out of date. Only one reference is given to a publication as recent as 1968, and the central theme of this paper is not mentioned in the text; all other references date from 1958 to 1967. Some of the circuits presented as typical contain modern silicon transistors, but many more are designed for germanium transistors popular ten years ago.

In many instances, the choice of material to be covered seems capricious, and the method of treatment is inconsistent from topic to topic. As an example of capricious choice, more than half of the last chapter is devoted to a detailed circuit description of the Tektronix Type 321 battery operated oscilloscope, which is not only out of place in a book of this type, but is too slow for general use with modern nuclear instruments. By contrast, pole-zero cancellation and baseline restoration, two circuit techniques which are critically important to high rate, high resolution gamma-ray spectrometry, are covered not at all in the chapter on basic circuits, and only in passing in the chapter on amplifiers. As an example of inconsistency, the basic logarithmic relationship between the voltage and current in a semiconductor diode is given on page 45, but on pp. 54 and 55, a computation of waveforms in a clamping circuit is made in which it is assumed that the diode equivalent circuit is that of a linear resistor. The operating conditions are far outside the limits of validity for such an assumption, with the result that the computed waveforms, while qualitatively correct, are quantitatively grossly in error. Ironically, the error hardly matters because the illustration chosen by the author has little practical significance for a designer of nuclear instruments and none at all for a user.

A serious shortcoming of the book is the choice of emphasis placed on various facets of circuit design: too much is left unsaid for the neophyte circuit designer and too much of the wrong kind of detail is given for the instrument user.

The bibliography is inadequate, consisting of a total of only 30 references, too few to be useful as source material in a book of this size and scope. None of the references is number keyed to the text; ten are to other books, 15 are to manufacturers' instruction manuals and internal reports of the Argonne and Brookhaven National Laboratories, and only five to papers published in technical journals. In this reviewer's opinion, several of the references included in the bibliography come much closer than Mr. Chiang to accomplishing his aim of bridging the gap between theory and practice, and do so with material substantially as current as that included in his book.

Edward Fairstein
Tennelec, Inc.
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