AERIAL DESIGN

Arrays of Cylindrical Dipoles

By Ronald W. P. King, Richard B. Mack and Sheldon S. Sandler. Pp. xiii + 494. (Cambridge University Press: London, November 1968.) 130*s*; $19·50.

IT is important to realize that some of the common assumptions made in practical aerial design have doubtful validity. For instance, the radiation pattern of a paraboloid or horn aerial may be obtained by assuming a field distribution across an aperture and applying simple diffraction theory. In general, the form of the assumed field (particularly at the edges of the aperture) is inconsistent with Maxwell's equations; nevertheless a good approximation is generally obtained provided the dimensions of the aperture are sufficiently large compared with the wavelength. Another example is that of arrays of dipoles, when it is conventional to assume a current distribution from which both radiation patterns and driving point impedance are evaluated. An example of this latter is the isolated thin dipole, for which it is conventional to assume a sinusoidal current distribution of constant phase. Because in this case the electric field is found to have a tangential component at the surface of the dipole it cannot strictly apply to a dipole driven by a single lumped generator. While it is possible to formulate the radiation problem in a general way (imposing suitable boundary conditions) the solution may be extremely complicated for practical aerial configurations.

The work under review describes approximate methods developed by Professor King and his colleagues for the treatment of arrays of cylindrical rod aerials in which the general integral equation, relating the vector potential and the current distribution, is solved approximately. The method yields trigonometric formulae representing the currents in arbitrarily driven elements in an array, which take into account also the mutual interactions; the leading term is, of course, the simple sinusoid which is normally assumed.

The theory is shown to give good agreement with experiment for simple configurations (half and full wave dipoles, two element arrays) and is extended to multi-element circular and curtain arrays, Yagi and log-periodic aerials and three dimensional arrays including staggered and co-linear elements. Examples of computer programmes and calculations are given for representative cases.

While this work will be of most value to those concerned with the fundamentals of aerials, it should also be near to the desk of all concerned with practical aerial design, if only to remind them of the limitations of the procedures they normally use. T. R. KAISER

SMALL PARTICLES

Interactions of Photons and Leptons with Matter

By R. R. Roy and Robert D. Reed. Pp. xi + 319. (Academic Press: New York and London, January 1969.) 135*s* 4*d*.

ONE useful assessment of a book is to determine how it measures against the intentions of the authors as avowed in their preface. The authors correctly discerned the need for a treatment, within a single volume, of photon and lepton interactions with matter. This is no inanition, as they choose to call it, because there is no lack of nourishment in the general literature for this topic. When they next discount, in advance, their own text by saying that it "posits no claim to occlude this hiatus", I felt that they should either simply fill the gap or leave it alone. Fortunately, they have gone a long way towards filling it.

There are many experimental data and theoretical analyses concerning the electromagnetic interactions of electrons and positrons with matter. The first three chapters deal adequately with single scattering by electrons and nuclei, through a sage choice of material backed up by detailed reference lists. Some topics, such as sum rules for electron scattering by nuclei, have not been taken as far as published work antedating 1966 would allow. This is regrettable because the interpretation of some high energy experiments using complex nuclear targets is aided by knowledge of the response function of the target.

The next two chapters deal with multiple scattering and the ionization energy loss of electrons and positrons. Again, the treatment is sound and easily extended by use of the references to the literature at large. A novice might be confused by the juxtaposition of items dealing with very different energy ranges of the incident particles, but a lot has been compressed into these pages and the effort of concentration is well repaid.

There follows a chapter neatly transferring attention from electrons to photons by a discussion of the bremsstrahlung process. This is succeeded by five chapters detailing the interactions of photons with matter under the headings of photoelectric effect, Compton effect, pair production, triplet production and total photon absorption. The aim of the authors to give a readable account, pointing out the salient features of their subject, is fulfilled here.

The final chapter treats muon and neutrino interactions in a somewhat cursory fashion and apparently to justify the word lepton in the title of the book. The appetite of the reader is merely whetted and it is to be hoped that the authors will be persuaded to expand this chapter into the book the topic richly deserves.

This book creditably achieves most of its purposes. There is a dilemma always to be faced by the author of a unifying text as to what to include and what to reject after critical analysis. A little more of the latter would have been appropriate so that experimental data now superseded or even suspect are not further superannuated. Every minute, however, devoted to the study of this book will be rewarded for the tyro and expert alike.

G. R. BISHOP

COOKBOOK OF STATISTICS

Practical Statistics for Chemical Research

By John D. Hinchen. Pp. vii + 116. (Methuen: London, March 1969.) 36*s* cloth; 18*s* paper.

THIS short book is, in the author's words, designed to provide a "cookbook" approach to the application of statistical methods to practical industrial situations. It is regrettably true that many of those who make use of statistical calculations in practical work have no curiosity about the real basis of the numbers which they take from tables and use as criteria for determining significance. This book is a manual for such incurious experimenters and industrial workers.

The cookbook approach is emphasized by informality in expression, some of which becomes tedious through repetition. Every time the author introduces a calculation based on range in place of standard deviation he refers to it as a "quick and dirty" method. After reading this expression many times, one wishes for something long and clean.

There seems little justification, in these days of automatic squaring and programmable calculations, for putting so much emphasis on the use of range as a measure of the dispersion of a set of results. It is sometimes a completely misleading criterion and the probability basis of range comparisons is much more complicated and obscure than that for the traditional comparisons based on variance and standard error. In the book, the author discusses both "instant" and more detailed methods and