CAMBRIDGE

Cambridge University Press
978-1-316-50981-4 - A Survey of the Principles & Practice of Wave Guides
L. G. H. Huxley
Frontmatter
More information

MODERN RADIO TECHNIQUE

General Editor: J. A. RATCLIFFE

A SURVEY OF THE PRINCIPLES & PRACTICE OF WAVE GUIDES

© in this web service Cambridge University Press www.cambridge.org

CAMBRIDGE

Cambridge University Press
978-1-316-50981-4 - A Survey of the Principles & Practice of Wave Guides
L. G. H. Huxley
Frontmatter
More information

© in this web service Cambridge University Press www.cambridge.org

CAMBRIDGE

Cambridge University Press
978-1-316-50981-4 - A Survey of the Principles & Practice of Wave Guides
L. G. H. Huxley
Frontmatter
More information

A SURVEY OF THE PRINCIPLES & PRACTICE OF WAVE GUIDES

BY

L. G. H. HUXLEY, M.A., D.PHIL.

Reader in Electromagnetism in the University of Birmingham
Formerly Principal Scientific Officer, Ministry of Aircraft Production

CAMBRIDGE
AT THE UNIVERSITY PRESS
1947

© in this web service Cambridge University Press www.cambridge.org

CAMBRIDGE

Cambridge University Press
978-1-316-50981-4 - A Survey of the Principles & Practice of Wave Guides
L. G. H. Huxley
Frontmatter
More information

To

E. M. H.

CAMBRIDGE
UNIVERSITY PRESS

University Printing House, Cambridge CB2 8BS, United Kingdom

Cambridge University Press is part of the University of Cambridge.

It furthers the University's mission by disseminating knowledge in the pursuit of education, learning and research at the highest international levels of excellence.

www.cambridge.org
Information on this title: www.cambridge.org/9781316509814

© Cambridge University Press 1947

This publication is in copyright. Subject to statutory exception and to the provisions of relevant collective licensing agreements, no reproduction of any part may take place without the written permission of Cambridge University Press.

First published 1947
First paperback edition 2015

A catalogue record for this publication is available from the British Library

ISBN 978-1-316-50981-4 Paperback

Cambridge University Press has no responsibility for the persistence or accuracy of URLs for external or third-party internet websites referred to in this publication, and does not guarantee that any content on such websites is, or will remain, accurate or appropriate.

© in this web service Cambridge University Press www.cambridge.org

CAMBRIDGE

Cambridge University Press
978-1-316-50981-4 - A Survey of the Principles & Practice of Wave Guides
L. G. H. Huxley
Frontmatter
More information

PREFACE

Although the propagation of electromagnetic waves in metal tubes —or wave guides as they are now called—has been studied for some fifty years, until recently the subject was in the main of theoretical, rather than of practical, interest. However, with the development of the first microwave radar equipment during 1940–1 the subject was suddenly transformed to one of prime practical importance, and in the following years was developed at a phenomenal rate, both in Britain and the United States. This book is written to provide an introductory survey of these recent developments.

The treatment in the first six chapters is based on courses on microwave techniques which were given during the war at the Radar School of the Telecommunications Research Establishment (T.R.E.), and it is believed that the book has lost nothing of importance in content and rigour through this elementary and physical approach to the subject. Chapter 7 has been included for those readers who may prefer a more formal treatment.

The physical interpretation, given in § 5·4, of the normalized admittance or impedance of an obstacle or other discontinuity in a wave guide, in terms of scattering coefficient, has the advantage of relating these quantities immediately to the experimental data obtained with a standing wave indicator. It was the subject of a paper that I read before a technical colloquium at T.R.E. during the war. The treatment of Babinet's Principle in Chapter 7 is also believed to be original.

When this book was written, the greater proportion of the technical developments described were hidden in secret reports and memoranda which are not available to the general reader. No reference is made to this literature, and very few of the many contributors to the development of the subject have been mentioned by name. Accounts of confidential work done during the war are

© in this web service Cambridge University Press www.cambridge.org

CAMBRIDGE

Cambridge University Press
978-1-316-50981-4 - A Survey of the Principles & Practice of Wave Guides
L. G. H. Huxley
Frontmatter
More information

now appearing in technical journals, and the reader can obtain more detailed information on particular matters from these. Attention is drawn in particular to *The Proceedings of the Radiolocation Convention*, March–May 1946, *J. Instn Elect. Engrs*, vol. 93, part III A, nos. 1, 3 and 4, 1946.

I welcome this opportunity of expressing my appreciation of the considerable assistance that I received from numerous colleagues at the Telecommunications Research Establishment without which this book could not have been written, but I wish to record in particular my indebtedness to Dr G. G. Macfarlane and Dr W. Cochrane with whom I engaged in many stimulating discussions on the subject of wave guides. I am also indebted to Mr J. A. Ratcliffe, who first aroused my interest in the subject, for helpful criticism of the text.

I wish also to express my thanks to the Director-General of Scientific Research (Air), Ministry of Supply, for permission to publish this book, which follows closely a monograph written by me as a contribution to the Scientific War Records of the Ministry of Supply (Air).

It is recorded, in conclusion, that, although the book has received official scrutiny before publication, I accept full responsibility for all opinions and statements in it. Further, I acknowledge Crown Copyright in respect of all illustrations in the book.

L. G. H. HUXLEY

DEPARTMENT OF ELECTRICAL ENGINEERING
THE UNIVERSITY, EDGBASTON
BIRMINGHAM 15

28 *June* 1946

© in this web service Cambridge University Press www.cambridge.org

CAMBRIDGE

Cambridge University Press
978-1-316-50981-4 - A Survey of the Principles & Practice of Wave Guides
L. G. H. Huxley
Frontmatter
More information

CONTENTS

Chapter 1. THE ELECTROMAGNETIC FIELDS OF TEM-WAVES

Chapter 2. PROGRESSIVE ELECTROMAGNETIC WAVES IN WAVE GUIDES

© in this web service Cambridge University Press www.cambridge.org

CAMBRIDGE

Cambridge University Press
978-1-316-50981-4 - A Survey of the Principles & Practice of Wave Guides
L. G. H. Huxley
Frontmatter
More information

Chapter 3. FORMULAE FOR FIELD COMPONENTS—EVANESCENT MODES—ATTENUATORS—ATTENUATION DUE TO WALLS

Chapter 4. WAVE-GUIDE TECHNIQUES

© in this web service Cambridge University Press www.cambridge.org

CAMBRIDGE

Cambridge University Press
978-1-316-50981-4 - A Survey of the Principles & Practice of Wave Guides
L. G. H. Huxley
Frontmatter
More information

Chapter 5. WAVE-GUIDE IMPEDANCE AND FURTHER TECHNIQUES

© in this web service Cambridge University Press www.cambridge.org

CAMBRIDGE

Cambridge University Press
978-1-316-50981-4 - A Survey of the Principles & Practice of Wave Guides
L. G. H. Huxley
Frontmatter
More information

Chapter 6. CAVITY RESONATORS

Chapter 7. MATHEMATICAL TREATMENT OF SELECTED TOPICS

© in this web service Cambridge University Press www.cambridge.org

CAMBRIDGE

Cambridge University Press
978-1-316-50981-4 - A Survey of the Principles & Practice of Wave Guides
L. G. H. Huxley
Frontmatter
More information

© in this web service Cambridge University Press www.cambridge.org

CAMBRIDGE

Cambridge University Press
978-1-316-50981-4 - A Survey of the Principles & Practice of Wave Guides
L. G. H. Huxley
Frontmatter
More information

CORRIGENDA

p. 4, equation (3). *For* 10^{-8} *read* 10^{8}.

p. 5, 1·3, line 8. *For* $\mathbf{E}/q$ *read* $\mathbf{F}/q$.

p. 10, equation (7). *Omit 2 under radical.*

p. 18, line 16. *For* smallest *read* largest.

p. 22, line 22. *For* D *read* B.

p. 61, 6 lines from bottom. *For* fig. 4·29 (*c*) *read* fig. 4·29 (*a*).

p. 62, line 9. *For* oscillation *read* oscillator.

p. 70, line 3 from bottom. Cadmium plating is used externally, not internally.

p. 83, line 6 from bottom. *For* not used *read* not extensively used.

p. 87, lines 8 and 13. *For* G *read* C.

p. 88. In the account of *choke couplings and plungers*, it should have been mentioned that loose contacts between the wall and the plunger or between the two portions of the coupler, are rendered innocuous since they are placed at a node of current in the half wave recess.

p. 93, line 22. *For* (*a*) *read* (*c*).

p. 115, line 5 from bottom. *For* 5·2·2 (1) and (2) *read* of 5·2·2.

p. 119, line 6. *For* § 7·16 *read* § 7·17.

p. 133, line 3 from bottom. *For* 10 (*a*) *read* 5·10 (*a*).

p. 137. Equation (2) *should read* $y_1 = jb_1 = -j\dfrac{\lambda_g}{W}\cot^2\left(\dfrac{\pi c}{2W}\right)$.

It is given correctly on the following page.

p. 141, fig. 5·16 (9). *Include term* -2 *within the square bracket.*

p. 141, fig. 5·16 (10). *For* R *read* r *and for* $2n-1\lambda$ *read* $(2n-1)\lambda$.

p. 144, line 8. *Correction as in* p. 83, line 6.

p. 145, fig. 5·18 (*a*). *Reflected components should read* (E_r, H_r).

p. 146. In formula following (1) *read* $(1-\rho)$.

p. 146, line 14 from bottom. *For* Z_H *read* $(Z_H)_2$.

p. 148, line 21. *For* fig. 5·16 *read* fig. 5·14.

p. 155, fig. 5·26 (*a*). *For* $\frac{4}{3}$ *read* $\frac{3}{4}$.

© in this web service Cambridge University Press www.cambridge.org

CAMBRIDGE

Cambridge University Press
978-1-316-50981-4 - A Survey of the Principles & Practice of Wave Guides
L. G. H. Huxley
Frontmatter
More information

CORRIGENDA

pp. 164, 165, near bottom of page. *For* $\frac{j(1+f_1f_2)}{f_3}$ *read* $\frac{j(1+f_1f_2)}{2f_2}$; *also make corresponding correction on* fig. 5·30 (*a*).

p. 167, line 5. *For* right-hand *read* left-hand.

p. 179, line 23. *For* *DE* *read* *BE*.

p. 181, line 2. *For* *DCHR* *read* *DCHK*.

p. 190, line 9. *For* cell *read* cells.

p. 191, line 2 from bottom. *For* mean *read* peak.

p. 192, bottom line. *For* power *read* peak power.

p. 196. *For* intrinsic impedance *read* *everywhere* total impedance. (Ref. p. 119.)

p. 198, line 3 from bottom. *For* $v=\sqrt{\frac{L}{C}}$ *read* $v=\frac{1}{\sqrt{LC}}$.

p. 202, line 5 from bottom. *For* Cuttler *read* Cutler.

p. 203, first formula. *For* *D* *read* *d* *within the round bracket*.

p. 214, line 4. *For* (*e*) *read* (*a*).

p. 224. The E-mode with the lowest frequency is the E_{110} not the E_{111} as stated. This correction is required also on p. 258. The component U of the Hertz vector for the E_{110} mode is

$$U=\sin\left(\frac{\pi x}{a}\right).\sin\left(\frac{\pi y}{b}\right)e^{j\omega t}.$$

p. 229, line 2. *Omit words* *C* opposite to *B*.

p. 235, centre of page, paragraph beginning 'the input impedance...'. Cause and effect are interchanged.

p. 248, § 7·3. In equation above (3) *for* $\epsilon\mathbf{E}$ *read* $\epsilon\dot{\mathbf{E}}$.

p. 253, equation (3). *For* $\frac{\partial}{\partial\mu_3}$ *read* $\frac{\partial}{\partial\mu_2}$ for first symbol within square bracket.

p. 275, end of § 7·10·7. The correct values of the roots are: $\rho_{11}=4{\cdot}49$, $\rho_{21}=5{\cdot}8$, $\rho_{12}=7{\cdot}64$, $\sigma_{11}=2{\cdot}75$.

p. 276, second line from bottom. *For* electric *read* magnetic.

p. 291, bottom line. *For* ν *read* σ.

© in this web service Cambridge University Press www.cambridge.org