**TECHNIQUES
IN
NUCLEAR STRUCTURE PHYSICS**

Part 1

Techniques
in
Nuclear Structure Physics

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Part 1

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TO MY WIFE

For much patience and understanding during the writing of this text

Introduction

This text is based on a series of discussions, tutorials, seminars and colloquia given by me to several generations of postgraduate research students in nuclear structure physics and to post-doctoral workers in associated fields. The original lectures and talks were meant to give the basic information on a number of the more important experimental techniques in the nuclear structure field and to list the source references on these topics. In preparing and updating these topics I have increasingly found that many of the more important recently developed techniques are not covered in any publications other than in the original research journals. Many of the long-established techniques have been refined and extended in recent years and again the information on these refinements is not contained in the usual undergraduate, or postgraduate, student texts.

In preparing this text I have tried to give the beginner the basic ideas, formulae, advantages and disadvantages and the general information on at least some of the modern techniques in nuclear structure physics. In attempting to do this I have kept the theoretical treatment to a ‘first-order’ minimum wherever possible and then listed the references where the more complete treatment can be found. In discussing the experimental techniques and equipment I have, wherever possible, given the original references, although in some cases I have quoted more recent examples where the original work was published in journals which are not easily obtainable. This original information on the techniques and instruments discussed in this text is scattered over very many publications. Some of these publications are readily accessible, some are not. I have attempted to summarise the contents of these many publications while retaining the detail in the form of the comprehensive bibliography given at the end of each chapter. Where good review articles have been published on a particular topic I have kept the discussion to a minimum and have directed the reader to the existing texts. This is particularly the case in chapter 6 where many excellent review articles and books have already been written on the subject of angular correlations.

This text does not attempt to cater for the expert in the field, nor does it attempt to cover all possible techniques. It is, rather, a text for the student or research worker who, coming new to the field with a good basic knowledge of physics, needs a starting point into the maze of the technology of nuclear structure physics. This is essentially a text for the final-year undergraduate and the first- and second-year postgraduate. To keep the text to a reasonable length I have, unfortunately, had to leave out from the discussion many important techniques not in the main stream of nuclear structure studies. The Mössbauer techniques, the

techniques of beam-foil spectroscopy and the techniques involved in the study of the capture gamma rays produced by the interaction of polarised thermal neutrons are three examples which I have reluctantly not included. I apologise in advance to all those expert readers who do not find the techniques of their special field included in this text. One disadvantage of any text of this kind is that it becomes out of date as new technical developments are reported. This has already happened to some sections of this text where comments on possible future developments have been overtaken by fact and have had to be redrafted. Most chapters have been brought up to a date line of mid 1972 and two have been further updated to late 1972. Nevertheless I hope that this text will be of some small use to new workers in the field of nuclear structure physics.

J.B.A. England
Birmingham, February 1973

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Contents—Part 1

INTRODUCTION	vii
ACKNOWLEDGEMENTS	ix
CHAPTER 1 DETECTORS AND METHODS OF DETECTION	1
1.1 The photographic method	1
1.2 Solid dielectric track detectors	13
1.3 Gas ionisation chambers	19
1.4 Scintillation detectors	41
1.5 Semiconductor detectors	74
1.6 Spark chambers	108
1.7 Čerenkov detectors	113
1.8 Neutron detectors	116
CHAPTER 2 GENERAL INSTRUMENTATION	
2.1 Particle beam detection, measurement and handling	131
2.2 Scattering chambers	195
2.3 Electronics	208
2.4 On-line computers	226
CHAPTER 3 ACCELERATORS	
3.1 Cockroft—Walton voltage doublers	242
3.2 The dynamitron	248
3.3 The SAMES generator	252
3.4 The Van de Graaff generator	254
3.5 Insulating core transformers	276
3.6 Linear accelerators	278
3.7 Cyclotrons	291
3.8 Cyclograaffs	302
FIGURE AND TABLE ACKNOWLEDGEMENTS	673

Contents—Part 2

CHAPTER 4 MAGNETIC SPECTROMETERS AND SPECTROGRAPHS

4.1	General design considerations and the theory of focusing of charged particles	313
4.2	Magnetic spectrometers for beta particles and electrons	349
4.3	Magnetic spectrometers for heavy ions	384

CHAPTER 5 PARTICLE IDENTIFICATION TECHNIQUES

5.1	Time-of-flight techniques	419
5.2	Single-detector identification techniques	449
5.3	Particle identification by telescope techniques	463
5.4	Particle identification problems associated with passing detectors	488

CHAPTER 6 COINCIDENCE MEASUREMENTS, ANGULAR CORRELATIONS AND LIFETIME MEASUREMENTS

6.1	General theory of the angular correlation	504
6.2	Gamma–gamma techniques	512
6.3	Beta–gamma correlations	528
6.4	Heavy-particle–gamma techniques	540
6.5	Correlations with oriented nuclei and in reactions induced by polarised particles	551
6.6	Particle–particle correlations	553
6.7	Measurement of nuclear lifetimes	555

CHAPTER 7 POLARISED BEAMS AND POLARISED TARGETS

7.1	Sources of polarised ions for the production of polarised beams	567
7.2	Polarised targets	620
7.3	Information about nuclear structure obtainable with polarised beams and targets	639

APPENDIXES	650
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FIGURE AND TABLE ACKNOWLEDGEMENTS	673
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INDEX	675
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