

Prova orale A)

1. Il candidato illustri una o più tecniche/geometrie sperimentali che sfruttano sorgenti di raggi X.
2. Il candidato illustri uno o più metodi per monitorare da remoto le attività di laboratorio e/o di calcolo in corso.
3. Il candidato legga e traduca il brano in lingua inglese evidenziato nella seconda pagina.
4. La caratteristica principale di Excel è:
 - a) relazionare mediante formule il contenuto delle celle e ottenere (eventualmente) grafici
 - b) formattare in modo rapido dati tabellati
 - c) ordinare liste molto lunghe di nomi e/o numeri

Handwritten signatures and initials in black ink, including 'MS', 'JH', a stylized signature, and 'LQ'.

Prova orale B)

1. Il candidato illustri uno o più metodi per la rilevazione di raggi X.
2. Il candidato illustri uno o più software per la gestione di una strumentazione di laboratorio e/o il possibile accesso da remoto.
3. Il candidato legga e traduca il brano in lingua inglese evidenziato nella seconda pagina.
4. L'estensione di un file sono le ultime 3 lettere del nome dopo il punto. Modificando l'estensione il file:
 - a) È definitivamente danneggiato e inutilizzabile
 - b) È accessibile solo dopo aver ripristinato l'estensione originale
 - c) È comunque sempre accessibile dagli opportuni programmi tramite il menù file/apri

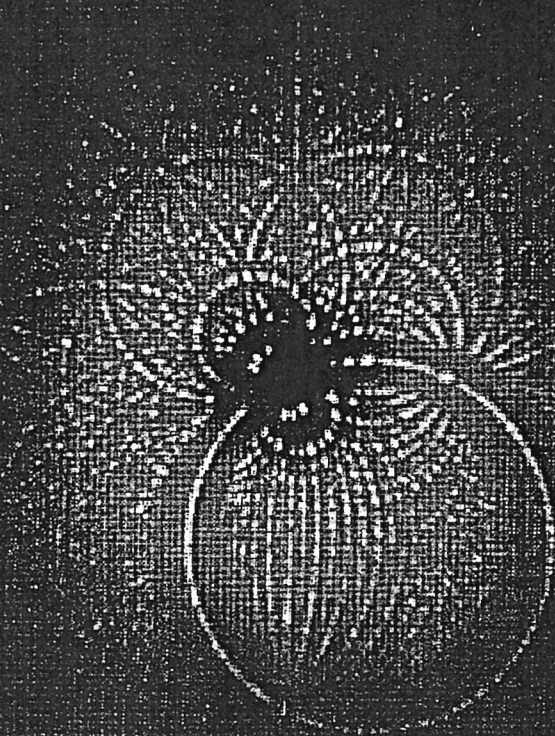
ms AE AB Le

Prova orale C)

1. Il candidato illustri uno o più metodi per la produzione di raggi X.
2. Il candidato illustri una o più soluzioni per l'interfacciamento di componenti hardware di una strumentazione di laboratorio e/o relativa interfaccia grafica.
3. Il candidato legga e traduca il brano in lingua inglese evidenziato nella seconda pagina.
4. Posso generare un file in formato PDF:
 - a) tramite un apposito programma
 - b) con "salva con nome" dal programma WORD
 - c) cambiando l'estensione del file in ".PDF"

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Elements of Modern X-Ray Physics



 WILEY

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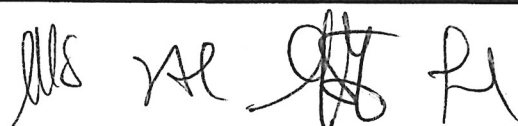
Preface

The construction of the first dedicated X-ray beamlines at synchrotron sources in the late 1970's heralded the start of a new era in X-ray science. In the intervening years tremendous progress has been made, both with respect to improvements to the sources, and with our knowledge of how to exploit them. Today's third-generation sources deliver extremely bright beams of radiation over the entire X-ray band (c. 1-500 keV), and with properties such as polarization, energy resolution, etc., that can be tailored to meet almost any requirement. These improvements have driven a surge of activity in X-ray science, and phenomena over a diverse range of disciplines can now be studied with X-rays that were undreamt of before the advent of synchrotron sources.

In light of these developments we believed that it was timely to produce a textbook at an introductory level. Our intention is to offer a coherent overview, which covers the basic physical principles underlying the production of X-rays, their interaction with matter, and also to explain how these properties are used in a range of applications. The main target audience for this book are final year undergraduates, and first year research students. Although the book has been written from the perspective of two physicists, we hope that it will be useful to the wider community of biologists, chemists, material scientists, etc., who work at synchrotron radiation facilities around the world. The main challenge in writing for a wider audience has been to convey the physical concepts without obscuring them in too much mathematical rigour. Therefore, many of the more difficult mathematical manipulations and theorems are explained in shaded boxes that may be studied separately. In addition appendices covering some of the required introductory physics have been included.

It is also our hope that this book will have appeal to more experienced research workers. Synchrotron radiation facilities are large laboratories where many different groups work on disparate areas of science. Cross fertilization of ideas is often the driving force of scientific progress. In order that these different groups, often working on neighbouring beamlines, can communicate their ideas a common background is required. It is our intention that this book should provide at least some of this background knowledge. In addition, many X-ray techniques are becoming viewed as standard analytical tools, and it is no longer necessary to understand every aspect of the design of an instrument in order to be able to perform experiments. While this is undoubtedly a positive development, it can also be argued that a greater knowledge of the underlying principles not only adds to the overall feeling of satisfaction, but also allows better experiments to be designed.

This book has emerged from a lecture course that has been running for several years at the University of Copenhagen. The material covered in this book



Handwritten signatures of the authors, including 'MS', 'AE', and 'R'. There is a large black rectangular redaction at the bottom of the page.

is taught in one semester, and is augmented by practical lessons both in an X-ray laboratory at the university, and also during a week long trip to the HASYLAB synchrotron facility. The list of subjects covered in this book inevitably reflects to some degree our own areas of specialization. There is, for example, very little on the vast and important subject of imaging.] It was also decided at an early stage not to focus on subjects, such as classical crystallography, that we felt were well described in other texts. In spite of these shortcomings we hope that the reader, whatever his or her background, will learn something by studying this book, and be inspired to think of new ways to exploit the great opportunities that the development of synchrotron radiation offers.

Jens Als-Nielsen and Des McMorrow

Copenhagen, September 2000

Handwritten signatures of the authors, Jens Als-Nielsen and Des McMorrow, in cursive script.