Full Publications List 2019

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Guidelines for the Testing and Calibration of Physiotherapy Ultrasound Machines

Others
Phototherapy Physics: Principles, Dosimetry, Sources and Safety
DICOM Image and Data Management for Nuclear Medicine, Physiological Measurements, Radiotherapy and Ultrasound
Physicists and Physicians: A History of Medical Physics from the Renaissance to Röntgen
The Gamma Camera: A Comprehensive Guide
Physical Properties of Tissue: A Comprehensive Reference Book
Vascular Laboratory Practice Part 1-4
Vascular Laboratory Practice Part 5
Vascular Laboratory Practice Part 6

Contact Details
A main theme of the report examines the response of departments providing equipment management services within the context of requirements of regulatory bodies such as the Care Quality Commission. Reference is also made to the emergence of accreditation systems likely to impact on Clinical Engineering departments. Specific elements referenced also include standardisation of nomenclature/device identification and a framework for assessment of relevance of RFID technologies. A review is included of the implementation and value of measures of performance which can, for example, have relevance as evidence for meeting regulatory requirements. The report includes a review of the framework of systems of calibration equipment typically used in Clinical Engineering departments. An analysis is included of ‘patient related’ risk associated with medical device use using fuzzy logic and where this risk is identified as a series of up to five independent elements. A detailed strategy for device evaluation and procurement provides a useful framework for local policy development. In addition there is included description of a framework for medical device design and manufacturing within the medical device directive.

The Report will be of interest to those with involvement in the life cycle management of medical equipment and also with involvement in device design and development.

Physicists and engineers who work in healthcare are finding that they need to know more and more about electromagnetic fields and electromagnetic compatibility, in order to assess occupational exposure, to design equipment that works without suffering from or causing interference, and to comply with an increasingly complex legislative framework. This report will help them do this. Starting with an overview of the relevant directives and guidelines, the publication next gives practical advice on how to design medical equipment for EMC, and describes the types of equipment that are available for measuring electric and magnetic fields. There are then more specific chapters on RF spectrum management, EMC at mains frequencies, mobile communications devices and magnetic resonant imaging. There is a concluding chapter on future applications of EM fields in medicine, and useful appendices including a list of suppliers of measurement equipment and a glossary of terms used in electromagnetics.

This report will be a valuable reference, particularly for those who design, purchase, install or operate electro-medical devices and equipment.
Guide to Electrical Safety Testing of Medical Equipment:
the why and the how and the Bench-top Guide to Electrical Safety Testing of Medical Equipment
Report 97
Published 2009  28 pages plus CD
ISBN  978 1 903613 36 8
£28.50  (IPEM Members £20)
ORDER CODE: RP97

This report is on electrical safety testing of medical equipment. It consists of a 28 page Bench-top Guide, designed as an 'aide memoire', with a CD containing the Guide to Electrical Safety Testing, which is a full detailed text explaining the why and the how of electrical safety testing.

This indispensable combined publication provides detailed information on the rationale of electrical safety testing, the effect of electricity on the body, detailed guidance on what to test and how to test it. The Guide includes testing of medical electrical systems and fixed installations as well as portable equipment. A full chapter of case studies rounds off the in-depth text. Appendices cover generic electrical safety testing devices, testing in an isolated mains area, testing mains on an Applied Part, the role of standards, the relevance of the Medical Devices Directive and a full bibliography of references cited and other useful documents. Buy a copy and we hope that the Bench-top Guide will reside on your bench for easy reference and the Guide to Electrical Safety Testing CD will open a door to fuller understanding of what electrical safety testing is about and how to ensure your test results are meaningful.

Risk Management and its Application to Medical Device Management
Report 95
Published 2007
122 pages
ISBN  978 1 903613 33 7
£35.00  (IPEM Members £24.50)
ORDER CODE: RP95

This report, in a single volume, provides an insight into the current risk management environment and offers practical guidance on issues to be considered when applying risk management techniques to medical equipment support and management. It begins with an overview of theoretical perspectives and then goes on to examine; human factors, device issues – design, function and clinical applicability, maintenance and modification, training and systems and processes. The final chapter provides a range of useful models, flowcharts and procedures. A comprehensive list of references is included.

The report will be of particular interest to front line Scientific, Engineering and Technologist staff in NHS Medical Physics, Clinical Engineering, Estates and Independent services. This publication will also be a valuable point of reference for staff that may not have an engineering bias, such as Risk Managers and Clinical Governance staff.
Safe Design, Construction and Modification of Electromedical Equipment
Guidelines for the application of BS EN 60601-1 to clinical instrumentation

Report 90
Published 2004 77 pages
ISBN 1 903613 22 1
£25.00 (IPEM Members £17.50)
ORDER CODE: RP90
Focusing primarily on safety this report updates the excellent Topic Group Report 37, published in 1983. The introduction of the Medical Devices Directive and many new and updated Standards since 1983 merited a guide encompassing these changes and their implications for clinical engineers and technologists. Many healthcare organisations carry out design, development and modification of electromedical equipment and there has always been a professional and moral obligation to ensure this equipment presents the minimum risk to the patient and user. With these principles in mind this report has been the joint work of many experienced and practicing clinical engineers, technologists and physicists.

This book is for you if you want to know more about:
- The background to electrical safety documentation
- BS EN 60601
- Physiological effects of electricity
- Constructional requirements
- The Medical Devices Directive
- Test protocols

Diagnostic Radiology

The Critical Examination of X-ray Generating Equipment in Diagnostic Radiology
Report 107
Published 2012
23 pages
ISBN 978 1 903613 52 8
£25.00 (IPEM Members £17.50)
ORDER CODE: RP107
This report aims to provide guidance on compliance with the legal requirement to undertake a critical examination of x-ray equipment used in diagnostic radiology. An update of the previous guidance (IPEM Report 79) was required due to a change in legislation and major advances in x-ray equipment since the publication of that report.

The report is intended for all those who have duties under the regulations - those who are responsible for ensuring a critical examination is undertaken, those performing critical examinations, and those who act as Radiation Protection Advisers for the radiation employers involved. Legislative requirements are first discussed and responsibilities are defined. Guidance is provided on situations when a critical examination is required, what the examination should consider and what constitutes a suitable report. Examples of common situations are discussed.
Recommended Standards for the Routine Performance Testing of Diagnostic X-Ray Systems
Report 91
Published 2005  94 pages
ISBN 1 903613 24 8
£25.00 (IPEM Members £17.50)
ORDER CODE: RP91

This Report replaces IPEM Report 77 and provides essential guidance for anyone responsible for diagnostic X-Ray equipment. This document gives clear advice on which routine performance tests are essential and which are desirable, where to get information on how to do them, who should be doing them and how often they should be done. For many tests it also gives guidance as to when the results indicate further action should be taken. This second edition takes into account the introduction of new technologies in medical imaging including CR, DDR and image display devices.

Catalogue of Diagnostic X-Ray Spectra and other data (CD)
Report 78
Published 1997 Updated 2015
ISBN 0904 181 88
£12.00 Members and non-members
ORDER CODE: RP78

The Commissioning and Routine Testing of Mammographic X-Ray Systems
A Technical Quality Control Protocol
Report 89
Published 2005
146 Pages
ISBN 1 903613 21 3
£30.00 (IPEM Members £21.00)
ORDER CODE: RP89

Report 89 revises and updates ‘The Commissioning and Routine Testing of Mammographic X-Ray Systems Report 59’ first published in 1989, a standard reference in UK Medical Physics Departments. The emphasis of Report 89 is the optimization and assessment of the system as a whole. The report includes a new chapter on the theory and technology of digital imaging. Other revisions have been made to incorporate the testing of x-ray units with automatic beam optimization software, changes to the new standard breast model, and to provide details on the methodology of image quality assessment.

Measurement of the Performance Characteristics of Diagnostic X-Ray Systems
Report 32 series
A series of revised reports that are essential reference for anyone involved in the testing of diagnostic X-ray equipment.

Part I: 2nd Edition: X-Ray Tubes and Generators, Published 1996, 28 pages, Out of Print    PDF copy available on CD £5.00

Part II: 2nd Edition: Image Intensifier TV Systems, Published 1996, 61 pages, Out of print    PDF copy available on CD £5.00
Part III: 2nd Edition: Computed Tomography X-Ray Scanners, Published 2003, 97 pages
ISBN 0 904181 76 6, £30.00  ORDER CODE: RP32P3

Part VI: 2nd Edition: Image Intensifier Fluorography Systems, Published 1996, 21 pages, Out of Print  PDF copy available on CD £5.00

£40.00 (Members £28.00)  Order Code RP32P7
This report is the latest report from IPEM on gamma camera quality control. This report is a major revision of IPEM Report 86: Quality Control of Gamma Camera Systems and encompasses a wide range of new material, reflecting advances in the field over the last decade.

Planar performance of a gamma camera is fundamental and this revision sees a complete rewrite of the Assessment of Planar Performance chapter, ensuring it remains relevant for current users. There are also major changes to the material covering software testing, wholebody and SPECT quality control. Importantly, with the now routine provision of combined modality imaging, there is new material covering gamma cameras with CT capability. This will be a must-read for most Nuclear Medicine departments. Looking to the future a chapter of this report is also dedicated to ‘novel’ gamma cameras. Introduced over the past few years these systems have little in the way of published material on quality control testing. Experts from across the UK share their experience with the reader. A final chapter then places each quality control test within the context of a gamma camera’s life span, from equipment specification to decommissioning. This report is thorough and practical, a vital reference for all aspects of gamma camera quality control.

This report covers the physics of medical cyclotrons and radiopharmaceutical production. It considers the installation, operational and decommissioning requirements for medical cyclotrons. It is intended to be read by scientific and technical staff and aims to provide a comprehensive overview of the theory and methodology of cyclotrons and radiopharmaceutical production. The topics presented should be of interest to both those who work with cyclotrons as well as those requiring a greater understanding of this important and growing area.

Starting with a brief history and general introduction to cyclotrons, the report continues with substantial in-depth chapters on the physics of cyclotrons and radiopharmaceutical production. This is followed by the regulatory requirements associated with the installation of cyclotrons, doses to staff during operation of the cyclotron and the matters to be considered during the decommissioning process.
Dosimetry for Radionuclide Therapy

Report 104
Published 2011
212 pages
ISBN 978 1 903613 46 7
£50.00 (IPEM Members £35.00)
ORDER CODE: RP104

The large amount of information in this title is presented in twelve chapters. The physics of small fields is explained and the potential error in delivering small fields is discussed. The challenges in absolute, reference and relative dosimetry are addressed in detail as well as the difficulties in making small field measurements. The potential errors in dose models is presented with a discussion on the necessary elements influence and dose calculation methods that are needed to model small collimator settings in order to achieve acceptable computational accuracy. Attention is drawn to relevant aspects of quality assurance for the treatment machine and collimating jaws. The characteristics of commercially available detectors for small field applications are summarised. The majority of the report presents established or newly proposed methodologies on the determination of dosimetric parameters (profiles, depth functions and output factors) for single narrow collimated fields.

Recommendations of good working practice to be consulted and used alongside the clinical experience, scientific judgement and existing expertise are provided. The report suggests future directions and future work required to reduce uncertainty in the determination of dose in small MV photon fields.

Mathematical Techniques in Nuclear Medicine

Report 100
Published 2011
296 pages
ISBN 978 1 903613 36 8
£55.00 IPEM Members £38.50
ORDER CODE: RP100

Report 100, Mathematical Techniques in Nuclear Medicine, is a revision of Report No. 73 which was published in 1996. In the intervening years advances in computing power have allowed the development and widespread introduction of powerful reconstruction, correction and analysis techniques. This has been advantageous for Nuclear Medicine as a speciality but provides a challenge for the Nuclear Medicine scientist. Many complex techniques are now readily available at the click of a button. Analysis is often built into automated workflows, where minimal operator interaction is required. Using these without understanding how they work could lead to errors and possible misinterpretation. It is essential that scientific staff working in Nuclear Medicine really understand the theory behind the techniques and how the results are produced. In this way we can produce high quality diagnostic studies which are of value to our clinical colleagues. This report covers the theory behind a wide range of in signal processing techniques used in Nuclear Medicine including; Image processing and display, quantitative measurements, image comparison, deconvolution, parametric images, factor analysis and SPECT reconstruction. Each chapter gives a comprehensive coverage of the underpinning theory as well as practical examples which aid understanding. The report is aimed at Clinical Scientists (from trainees through to senior members of staff) who work in Nuclear Medicine but would also be useful to technologists, radiographers, radiologists and physicians who are interested in understanding more about Nuclear Medicine.
In this book Professor Richard Lawson has brought together much of the material that he has used in over 30 years of teaching nuclear medicine to medical physicists, doctors, technicians and radiographers. It covers in depth everything that anyone working in nuclear medicine might wish to know about the operation of a gamma camera. There is much greater detail than can be found in general nuclear medicine textbooks, and indeed there are some concepts and explanations that are not to be found in any other book but which Richard has found to be helpful to his students over the years.

The book starts with a historical overview of the development of the gamma camera and then explains the operation of individual designs, from the basic Anger camera to modern solid state cameras. It continues with chapters on quality control, data acquisition modes, SPECT and hybrid SPECT-CT. It is illustrated throughout with many of Richard’s own photographs and diagrams.

PET and PET/CT and MRI

This report covers guidance on performance measurements of PET/CT systems. It is intended to be read by scientific staff involved in commissioning, setting up quality assurance programs and providing support for clinical PET/CT services and clinical research. The report aims to define the minimum recommended quality control standards for clinical studies and single and multi-centre trials using PET and PET/CT, based on a review of existing practice and consultation with relevant experts. Starting with a brief overview of the physics and technology of PET/CT systems, the report continues with an outline of acquisition techniques and clinical applications. A further chapter focuses on the purchase evaluation and acceptance testing of PET/CT systems along with the requirements for quality control testing. Subsequent chapters address data management, image display and ancillary equipment relevant to PET/CT. Report 108 is a valuable reference for scientists supporting PET services.
This Report is an authoritative, comprehensive and practical guide for all medical imaging professionals with an interest in evaluating and assuring image quality and scanner performance in MRI. Written by leading UK experts, the report is a major revision of IPEM Report 80: Quality Control in Magnetic Resonance Imaging.

The report is two parts. Part I deals with quality control, with chapters on test object design and test materials, signal parameter measurement (signal-to-noise ratio, ghosting, etc.), geometric parameters (resolution, distortion), slice parameters (position, width and profile), relaxometry and contrast. For each parameter a consistent and systematic structure provides a literature review with reference to current international standards, parameter definition, description of test methods, practical guidance including frequency of measurement, analysis and interpretation of results, and pitfalls. A specialist QC chapter is a new and unique feature providing guidance relating to specific clinical and research techniques: field mapping, diffusion, BOLD fMRI, voxel-based morphometry, dynamic contrast-enhanced MRI, quantitative velocity mapping, spectroscopy, and ultra-high field MRI. Part II provides a comprehensive and exhaustive encyclopaedia of MRI artefacts both common and rare arising from technical limitations and faults, patient and organ motion, tissue properties, intrinsic MR physics, and reconstruction limitations. Pictorial examples of each artefact from clinical or phantom images are provided along with a detailed explanation of the causes and advice on reducing, avoiding or removing the artefact. A summary table of artefact appearance, causes and remediation will enable readers to diagnose and solve their own artefact problems. The practical nature of the report is underpinned by academic rigour with 269 references and a comprehensive index.

Quality Control and Artefacts in Magnetic Resonance is an essential reference for all MRI departments and MRI professionals.

Radiation Protection

This report aims to provide comprehensive guidance on the radiation protection requirements for Nuclear Medicine. The current legislative framework is introduced early, with further administrative detail (practical and operational aspects) in each chapter. The therapeutic characteristics of unsealed radionuclides are discussed, followed by all aspects of their use. This includes preparation, dispensing, transport and storage, imaging and associated procedures, monitoring and disposal. Discussion includes PET and cyclotron facilities. Some chapters cover radiation protection for specific clinical areas such as paediatric nuclear medicine. Often practical examples are used, and content covers the handling of clinical incidents and emergencies.
This Report is of interest to Radiation Protection Advisors/Supervisors with Nuclear Medicine responsibility, or conversely to those who work in Nuclear Medicine departments with an interest in or responsibility for radiation protection. Those involved in teaching and training will also find this Report useful.

UK Guidance on Radiation Protection Issues following Permanent Iodine-125 Seed Prostate Brachytherapy

Report 106
Published 2012
73 pages
ISBN 978 1 903613 49 8
£30.00 (IPEM Members £21.00)
ORDER CODE: RP106

This report covers guidance on how to approach the radiation protection issues which may arise following brachytherapy of the prostate using permanent implantation of radioactive iodine-125 seeds. It is intended to be read by scientific staff, but will also have valuable information for medical practitioners who perform brachytherapy. The report aims to provide a common approach to these issues in the UK to ensure uniform compliance with national and international regulations. Starting with a brief overview of the prostate brachytherapy procedure, the report continues with an outline of the relevant information and guidance which must be given to the appropriate people on patient discharge. An in-depth chapter focuses on the assessment of risks and environmental impact associated with cremation of the patient’s body post implant, including when it is safe to cremate and recommendations on procedures when it is not. A further chapter addresses the risks around post implant surgical intervention in the pelvic region. Subsequent chapters cover additional requirements for the brachytherapy centre and the information which should be disseminated to the relevant people. The appendices include example dose calculations and example documentation. Report 106 will be a valuable reference for all radiotherapy departments undertaking brachytherapy and to all medical physics departments who provide radiation protection services.

Medical and Dental Guidance Notes
Edited by Penny Allisy-Roberts
Published 2002
225 pages
ISBN 1 903613 09 4
£20.00
ORDER CODE: MDGN

This publication has been commissioned and published by the Institute of Physics and Engineering in Medicine with the support of the regulatory government and professional bodies to provide a good practice guide on all aspects of ionising radiation protection in the clinical environment. The first two chapters lay the foundation for the main ionising radiation regulations. There are a further seventeen chapters relating to each specialty or specialist radiation protection application. Some specific advice is summarised in the twenty-one Appendices, which also contain pro formas, flow charts, contact details and over 150 references.

The Medical and Dental Guidance Notes will be an essential reference book for all those working with ionising radiation in medical or dental practice, including medical and dental staff, radiographers, scientific and technical staff, and their employers.

Produced jointly by the Institute of Physics and Engineering in Medicine and the Royal College of Nursing. Ionising Radiation Safety is aimed at nurses who become involved in diagnostic and therapeutic procedures using ionising radiation, in Radiology, Nuclear Medicine and Radiotherapy. It covers the nature of ionising radiation, radiation safety and common ways to reduce exposure, during pregnancy and breastfeeding, the main procedures involving radiation and questions often asked by nurses and patients.

It is written to be accessible and easy to read with clear use of diagrams and rapid look-up tables. It covers all the common situations that a ward nurse is likely to meet involving radiation using a minimum of jargon.

“This Handbook will be a welcome addition to what is currently a very sparse selection of resources to which nurses can refer when attempting to meet their responsibilities to keep knowledgeable and up to date on issues around radiation”. Dr Beverley Malone, General Secretary, Royal College of Nursing.

Radiotherapy

Small Field MV Photon Dosimetry
Report 103
Published 2010
196 pages
ISBN 978 1 903613 45 0
£50.00 (IPEM Members £35.00)

ORDER CODE: RP103

The large amount of information in this title is presented in twelve chapters. The physics of small fields is explained and the potential error in delivering small fields is discussed. The challenges in absolute, reference and relative dosimetry are addressed in detail as well as the difficulties in making small field measurements. The potential errors in dose models is presented with a discussion on the necessary elements influence and dose calculation methods that are needed to model small collimator settings in order to achieve acceptable computational accuracy. Attention is drawn to relevant aspects of quality assurance for the treatment machine and collimating jaws. The characteristics of commercially available detectors for small field applications are summarised. The majority of the report presents established or newly proposed methodologies on the determination of dosimetric parameters (profiles, depth functions and output factors) for single narrow collimated fields. Recommendations of good working practice to be consulted and used alongside the clinical experience, scientific judgement and existing expertise are provided. The report suggests future directions and future work required to reduce uncertainty in the determination of dose in small MV photon fields.

Guidance for the Clinical Implementation of Intensity Modulated Radiation Therapy
Report 96
Published 2008
111 pages
ISBN 978 1 903613 34 4
£40.00 (IPEM Members £28)
ORDER CODE: RP96

This Report gives radiotherapy departments guidance on commissioning and clinically implementing intensity modulated radiation therapy (IMRT) based on established methods. It covers both inverse and forward treatment planning and optimisation, and delivery of IMRT using conventional linear accelerators with multi-leaf collimators. However the principles and processes described can be applied to other forms of delivery. The Report gives a general overview of IMRT from a clinical perspective and outlines an implementation model. Commissioning of the delivery aspects of IMRT and the treatment planning system is examined, highlighting the inter-relation between the two. Subsequent chapters cover each stage of the IMRT process including pre-treatment considerations, treatment planning and optimisation, quality assurance and treatment delivery and verification. It also explores how IMRT is developing and how it sits alongside other technological advances in radiotherapy. The Report will be of particular interest to Radiotherapy Clinical Scientists and Clinical Technologists, however it does acknowledge that IMRT is a multi-disciplinary task and successful implementation requires a multi-disciplinary approach. Consequently it will also be of interest to Radiation Oncologists, Radiographers and Managers.

Acceptance Testing and Commissioning of Linear Accelerators
Report 94
Published 2006
238 pages
ISBN 978 1 903613 30 6
£45.00 (IPEM Members £31.50)
ORDER CODE: RP94

This Report gives guidance for the acceptance testing and commissioning of radiotherapy linear accelerators and comprises a comprehensive account, including some of the most recent clinical facilities available on the linear accelerator, in a single volume. The Report examines issues common to all installations such as management of the process, critical examination, electrical, mechanical and radiation safety, mechanical and optical tests, and dosimetric measurements. Later chapters consider specific components of the modern linear accelerator including systems for multileaf collimation, electronic portal imaging, dynamic wedging, record and verify, intensity modulation and stereotaxis. A comprehensive list of references is included. The Report is a companion volume to IPEM Report 81 (Physics Aspects of Quality Control in Radiotherapy) and will be of particular interest to Radiotherapy Clinical Scientists, Clinical Technologists and Managers involved in the planning, acceptance testing and commissioning of the modern linear accelerator.

Guidance for the Commissioning and Quality Assurance of a Networked Radiotherapy Department
Report 93
Published 2006
184 pages
ISBN 1 903613 28 0 (10 Digit) ISBN 978 1 903613 28 3 (13 Digit)
£40.00 (IPEM Members £28.00)
ORDER CODE: RP93
This report gives guidance for commissioning and subsequent quality assurance of the networked radiotherapy department. It examines common issues for network commissioning and testing, gives comprehensive guidance on hospital IT issues (including network and data security) and examines specific functional aspects along a typical patient pathway; from patient data acquisition and treatment planning/definition, right through to treatment delivery and verification. The guidance is structured so the user can select the sections most relevant to the part of the radiotherapy network being tested. The report will be of interest to all healthcare professionals (particularly physicists, IT professionals, technologists and radiographers) involved in commissioning, testing and implementing the electronic passage of data throughout the radiotherapy department.

Design and Shielding of Radiotherapy Treatment Facilities
Report 75 2nd Edition
Published 2017
Ebook 978 0 7503 1440 4
Print 978 0 7503 1441 1
Mobi 978 0 7503 1442 8

Order from the Institute of Physics Publishing Website

Design and Shielding of Radiotherapy Treatment Facilities provides readers with a single point of reference for protection advice to the construction and modification of radiotherapy facilities. The book assembles a faculty of national and international experts on all modalities including megavoltage and kilovoltage photons, brachytherapy and high-energy particles, and on conventional and Monte Carlo shielding calculations. This book is a comprehensive reference for qualified experts and radiation-shielding designers in radiation physics and also useful to anyone involved in the design of radiotherapy facilities.

Physics Aspects of Quality Control in Radiotherapy 2nd Edition
Report 81 2nd Edition
Published 2018
570 pages
ISBN  978 1 903613 65 8
£100.00 (IPEM Members £70.00)

ORDER CODE: RP 81 2nd Edition

Since the 1st Edition of Report 81 was published in 1999 by IPEM there have been significant advances in radiotherapy technology. The second edition of Report 81 continues with the aim of providing a reference text to cover quality control (QC) of radiotherapy equipment and guidance on action limits to apply to the QC checks.

The updated report includes new content on QC of Tomotherapy, Gammaknife and Cyberknife units as well as updates to previous text on QC of linear accelerators and other radiotherapy equipment. In addition the report discusses implementation of a quality framework and alternative approaches to developing quality control schedules, such as, utilising failure mode and effects analysis. It
includes a chapter on management of radiotherapy computer systems and clinical software development provided by IPEM’s Informatics and Computing SIG.

**Ultrasound**

**Quality Assurance of Ultrasound Imaging Systems**
Report 102  
Published 2010  
98 pages  
ISBN 978 1 903613 43 6  
£40.00 IPEM Members £28.00

**ORDER CODE: RP102**

This report is the IPEM publication on quality assurance of ultrasound imaging systems. The purpose of the report is twofold, firstly to provide a group of robust simple tests which can be performed quickly by the user for regular checking of a clinical ultrasound scanner. Secondly, it provides guidance to ultrasound professionals for performing complex testing appropriate to acceptance or queries relating to system performance. The first four chapters cover the introduction and background, followed by guidance for B-mode, Doppler and safety measurements. The final chapter is intended to inform and hopefully inspire research into methodologies for measuring the performance of increasingly complex ultrasound imaging systems. The publication is aimed at all users of ultrasound imaging systems but will be of particular use to clinical scientists responsible for the acceptance and ongoing support of such systems. A number of appendices provide information on the testing equipment needed to perform the specialist tests. All of the user tests can be performed with no special equipment.

**Guidelines for the Testing and Calibration of Physiotherapy Ultrasound Machines**
By Stephen Pye and Bajram Zeqiri
Report 84  
Published 2001  
67 pages  
ISBN 0 904181 98 7  
£20.00

**ORDER CODE: RP84**

This is the first publication providing a comprehensive guide to the testing and calibration of physiotherapy ultrasound machines with acoustic frequencies in the range of 0.5–5.0 MHz. It contains practical advice, examples and illustrations of acoustic calibration, presented within a framework of international standards and clinical practice.

It revises and updates the information and advice contained in IPSM Report 58 and the Chartered Society of Physiotherapists Guidelines (1990).

This new report from the Institute of Physics and Engineering in Medicine should be essential reading for physiotherapists, podiatrists, medical physicists, clinical technologists, electro and biomedical engineers, estates staff as well as manufacturers and suppliers of ultrasound equipment.

**Other Publications**
Phototherapy Physics: Principles, Dosimetry, Sources and Safety

The report is an update and expansion of the earlier IPEM Report 76, which covered UV and blue-light phototherapy. The content has been revised in the light of other published work and changes to clinical practice. Starting with a chapter on the physics and biology of UV phototherapy, subsequent chapters deal with the principles of UV phototherapy, UV measurement and dosimetry, and UV safety. Following this there is a new chapter on photodynamic therapy, providing an introduction to the applications, mechanisms of action, sources, dosimetry, measurement, meters, field size and uniformity, and safety. The final section of the book deals with blue-light phototherapy, with chapters on the physics and biology of blue-light phototherapy, its application to the treatment of neonatal jaundice, and the treatment of Crigler-Najjar Syndrome. The final chapter discusses blue-light safety issues. There is an extensive reference section. This publication is aimed at clinical scientists working in phototherapy physics in any of its aspects, but is likely to be of interest to other clinical groups needing to access source material on these therapies.

DICOM Image and Data Management for Nuclear Medicine, Physiological Measurements, Radiotherapy and Ultrasound

This report is the IPEM publication on the use of the DICOM standard in Image and Data Management across the areas of Nuclear Medicine, Physiological Measurement, Radiotherapy and Ultrasound. Starting with a general overview of DICOM the report seeks to indicate some of the problems of working with PACS and the DICOM standard, with particular attention being given to areas outside Diagnostic Radiology. There follows separate chapters on Nuclear Medicine and Positron Emission Tomography, Physiological Measurement, Radiotherapy, and Ultrasound. The final chapter discusses some technical aspects of PACS, while appendices provide a set of proposals concerning the development of the use of PACS in Radiotherapy, a list of the parts of the DICOM standard and a glossary of acronyms commonly found in the PACS/DICOM literature. This publication is aimed at Clinical Scientists and Engineers who are required to commission or integrate DICOM Medical Devices but is likely to be of interest to anybody involved in the pursuit of DICOM integration.
This comprehensive data book, covering the physical properties of a wide range of normal tissues, was originally published in 1990, but has been out of print for many years. The IPEM has decided to make this unique book available in a print-on-demand version. It contains a total of 138 tables of the physical properties of tissue, including thermal, optical, acoustic (including ultrasonic), mechanical, dielectric and magnetic (including NMR) and those of ionizing radiations. Appendices on tissue pH and normal blood flow are included. For each property, values for body fluids, soft tissues and bone are included, together with predictive formulae and information on tissue mimics Dependencies on temperature, donor age, in-vivo or in-vitro state, constituents such as fat and water, time after death and state of fixation are given. The data is fully supported by extensive references. Since its publication, new studies have largely served to improve knowledge on normal ranges or have explored a particular property over a wider range of radiation or tissue type. The extensive range of values tabulated in this book remains valid, however, since it was originally selected from well-performed experiments, giving a reliable basic resource to which new observations continue to be added.

This publication has been commissioned by the Society for Vascular Technology and published in collaboration with IPEM to provide a set of national guidelines for the recommended working practice in vascular laboratories.

It takes the form of a modular “how to do it” manual of cerebrovascular, lower limb arterial and venous investigations. Each of the four parts describe how to perform each test in a step by step format, covers relevant anatomy, physiology and presenting symptoms, equipment required, interpretation of results, pitfalls and other aetiologies. Part 1 includes chapters on relevant physics topics, duplex ultrasound controls, safety issues and reporting standards, as well as a comprehensive glossary, references and bibliography.

Chapters on upper limb arterial and venous assessment and visceral vessel assessment are being written and will be published later, at additional cost, as two additional parts.

These guidelines from SVT should be essential reading for anyone working in a vascular laboratory, vascular radiologists and vascular nurses as well as manufacturers and suppliers of ultrasound equipment.
This publication has been commissioned by the Society for Vascular Technology and published in collaboration with IPEM to provide a set of national guidelines for the recommended working practice in vascular laboratories.

This informative and educational volume, one of a six part series, deals with the diverse range of normal and abnormal anatomy and pathology of the upper limb blood vessels. The step-by-step ‘How to do it’ protocols cover Duplex Ultrasound assessment of upper limb arterial and venous systems and the renal access fistula. This volume is packed with hundreds of colour figures and diagrams to further aid diagnosis by the vascular ultrasound specialist during the examination of normal and abnormal upper limb vessels – including entrapment syndromes, venous thrombosis, subclavian steal phenomena and many, many other rarely and routinely encountered arterial and venous pathologies.

These guidelines from SVT should be essential reading for anyone working in a vascular laboratory, vascular radiologists and vascular nurses as well as manufacturers and suppliers of ultrasound equipment.

This publication has been commissioned by the Society for Vascular Technology and published in collaboration with IPEM to provide a set of national guidelines for the recommended working practice in vascular laboratories.

This informative and educational volume, one of a six part series, deals with the normal and abnormal anatomy and pathology of Visceral blood vessels. The step-by-step ‘How-to-do-it’ protocols cover Duplex Ultrasound assessment of native renal arteries, the native kidney, the transplant kidney, the mesenteric arteries and the portal and hepatic venous systems. This volume is packed with colour figures and diagrams to further aid diagnosis by the vascular ultrasound specialist during the examination of normal and abnormal visceral vessels.

These guidelines from SVT should be essential reading for anyone working in a vascular laboratory, vascular radiologists and vascular nurses as well as manufacturers and suppliers of ultrasound equipment.
Physicists and Physicians: A History of Medical Physics from the Renaissance to Röntgen

Published 2013
312 pages
ISBN 978 1 903613 55 9
£35.00 (IPEM Members £24.50)

ORDER CODE: History

In this book, Professor Francis Duck has written a fascinating story of the origins of medical physics. It starts in Renaissance Italy and ends with the discovery of x-rays, as modern medical physics emerges. The book is a celebration of the lives and contributions of those who knew that the principles of physics are essential to clinical medicine. The stories of biomechanics, medical electricity, physiological measurement, physiological optics and bioenergetics are all told. The French Revolution forged them into a single discipline. The subsequent impact on medical education is recounted. National characteristics are shown to have affected the spread of medical physics to Germany, England, Scotland and eventually the USA.

The book includes 94 figures showing historical portraits, instruments and documents. It includes mini-biographies of 100 scientists and doctors and cites over 400 historical references. Previously untold, much of the material has been recovered from otherwise unpublished archive documents. It is a story of extraordinary people, each striving to apply their knowledge of physics in order to lift clinical medicine from its historical state of ignorance, guesswork and precedent.

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