

# **Included Content**

## **Linac Operation Theory Textbook**

### Chapter 1: Accelerator waveguides

- Introduction
- Direct acceleration
- Series adding of electron energy
- Waveguides
- Phase velocity and guide wavelength
- Wave Impedance
- Acceleration timing
- Real accelerator structures
- Standing wave and travelling wave accelerating waveguides
- Energy Switch
- Summary
- Accelerator Waveguide Quiz

### Chapter 2: Electron Beams

- Electron Path Through the Medical Linac
- Gun Emission
- Electron energy gain
- Bending Magnet
- Summary
- Electron Beam Quiz

### Chapter 3: Photon Beams

- Classical Theory of Bremsstrahlung
- Quantum mechanical theory of Bremsstrahlung
- Energy dependence of angular photon distribution
- Thin and thick targets
- Thick target spectrum
- Beam quality specification
- Bremsstrahlung directional dependence
- Bremsstrahlung production efficiency
- Bremsstrahlung in SIMAC
- Results of bremsstrahlung calculations in SIMAC
- Beam flattening
- Energy dependence of beam flattening and beam flatness
- Beam symmetry

### Chapter 4: Medical Linac Configuration

- Medical Linac Configurations
- Treatment Head Configuration
- Linac Mode Configuration

### Chapter 5: Beam Steering

- Beam Symmetry
- The Elekta beam steering system

## Chapter 6: Beam Dosimetry & PRF

- Ion Chambers in Medical Linacs*
- Ion chamber current collection*
- Linac Calibration*
- Dose Rate Control*
- Dose rate servo*

## Chapter 7: Klystrons

- Microwave power sources for medical linear accelerators*
- Klystron overview*
- Description of the klystron's mode of operation*
- Bunching process*
- Klystron saturation*
- Klystron Modelling*
- Magnetic focusing*
- Klystron construction*

## Chapter 8: Magnetrons

- Mode of Oscillation*
- Magnetron anode and RF*
- Resonant modes*
- Mode separation*
- Magnetron cathode*
- Bunch formation in rotational motion*
- Output coupler and frequency tuning*
- Magnetron operating values*

## Chapter 9: Modulators

- Resonant Charging*
- Pulse Forming Network (PFN)*
- Thyratron switch*
- PFN Discharge*
- Pulse transformer*
- Pulse noise*

## Chapter 10: Waveforms

- Pulse timing in a medical linear accelerator*
- Pulsed nature of the linear accelerator*
- Relationship between gun injection, reflected RF power, and beam output*

# **Physics Quality Assurance Textbook**

Chapter 1: Maintaining the Quality of Radiotherapy Treatments

Chapter 2: Quality Assurance Protocols

Chapter 3: Frequency of Quality Assurance Testing

Chapter 4: Return to service Process

Chapter 5: Repairs and Return to Service

Chapter 6: Water Tank Measurements

Chapter 7: Beam Flatness and Symmetry

Chapter 8: Adjusting Beam Symmetry

*-The Varian Sterring System*

*-The Elekta Sterring System*

Chapter 9: Description of QA Tests

*-Output Constancy*

*-Radiation to Light field Coincidence*

*-Isocentre*

*-Treatment Table*

*-Laser Alignment*

*-Optical Distance Indicator*

*-Dosimetric Leaf Gap*

*-Picket Fence Test*

Chapter 10: Instruments for Linear Accelerator Quality Assurance

*-Ion Chambers and electrometers*

*-Water and Solid Water Phantoms*

*-Ion Chamber Arrays*

*-Devices for VMAT and Patient Specific Measurements*