Service Technician Level I Syllabus

Introduction and Overview

Instructor and student backgrounds. Purpose of the course, use of a simulator in learning about medical linear accelerators. Major manufacturers and the differences between their linac styles. Overview of major components: Electron Gun, Bending Magnet, Target, Klystron, Magnetron, Modulator, RF System (RF Waveguide, Circulator, Isolator), Water Cooling System, Pneumatic System, Dose Chamber, Gantry, Collimator, Carrousel, KV and MV imaging.
Learning objective: Understand the major components in a linear accelerator and their purpose

Electron Gun

Electron Beams: Injection into Accelerator, injection into klystron. Anode and cathode for each. Components: cathode heater, filament, electron cloud, grid, beam forming electrode. Gun emission: dispenser cathodes, thermionic diode, cathode characteristics. Gun operation: Using the grid, gun timing pulse, capture efficiency.
Learning objective: Understand the electron source and how it is controlled

Waveguide

Accelerator waveguide: Diagram, Gun input, Modulator input, transmission and accelerating waveguides, electric fields in cavities, accelerator timing, standing wave, traveling wave, how a standing waveguide is manufactured, energy switch, shunt impedance.
Learning objective: Understand the accelerating waveguide and its mode of operation

Bending Magnet, Target

Bending Magnet: poles, energy slit, achromatic focusing, electron bandwidth. Target: electrons, low-x, and hi-x, target materials, Bremsstrahlung. Carrousel: different filters, beam Shaping.
Learning objective: Understand the bending magnet, and how it affects the beam energy

Ion Chamber, Carrousel, Collimator, Jaws & MLC

Ion chamber components: Varian, Elekta. How an ion chamber works, triax cables. MLC: segments use to conform to tumor shape. Jaws: Field size definition.
Learning objective: Understand the beam delivery system

Klystron Overview

Learning objective: Understand what a klystron is and how it is used in a medical linac

Magnetron Overview

Learning objective: Understand what a magnetron is and how it is used in a medical linac

Modulator

Charging and discharging of PFN (use physics course space material)
Learning objective: Introduced to the charging and discharging cycles in a high voltage modulator