RADIATION ONCOLOGY RESIDENCY PROGRAM
Competency Evaluation of Resident

Resident's Name:	
Rotation:	PHYS 701: Clinical Rotation 1
Inclusive dates of rotation:	Aug. 25, 2015 – Feb. 25, 2016
Director or Associate Director:	

Evaluation criteria	**Not Competent**	**Marginally Competent**	**Fully Competent**	**Explanatory Notes & Mentor Signature**
Ethics and Professionalism **Resident shall provide the certificate of completion for each module below available from: http://www.aapm.org/education/onlinemodules.asp**				
a. Attributes of Professions and Professionalism				
b. Physician/Patient/Colleague Relationships				
c. Personal Behavior and Employee Relationships				
d. Conflicts of Interest				
e. Ethics of Research				
f. Human Subjects Research				
g. Research with Animals				
h. Relationships with Vendors				
i. Publication Ethics				
j. Ethics of Education: Teacher and student				
Leadership				
a. Attended resident session and/or Medical Physics Seminar on Leadership				

Equipment selection				
a. Understands theory of operation of megavoltage electron and proton accelerators currently used in radiation oncology treatment and their limitations				
b. Understands major subsystems and uses of cobalt units				
c. Understands major subsystems and components of megavoltage accelerators				
d. Knows the steps required to select a new megavoltage unit for use in radiation oncology on the basis of an understanding of performance specifications and features comparisons				
e. Knows the mechanical and architectural considerations when installing a new particle accelerator in both new and existing vaults (with discussion addressing heating, ventilation, and air conditioning [HVAC] openings, cabling for communication and dosimetry systems, electrical ports, plumbing, and skyshine)				
Protection				
a. Understands the federal (e.g., Nuclear Regulatory Commission [NRC], Canadian Nuclear Safety Commission [CNSC]) and state licensing requirements for by-product materials and x-ray-producing devices				
b. Explains the principles behind a radiation protection program, including the rationale for the dose limits for radiation workers and members of the public				
c. Understands federal, state/provincial, local, and institutional regulatory requirements				
d. Explains the concept of ALARA				
e. Understands site planning and how to supervise construction (i.e., key				

elements to monitor)				
f. Understands structural shielding designs relevant to a radiotherapy department (e.g., NCRP 151) and discusses the key parameters necessary to perform a shielding calculation				
g. Performs shielding calculations for an accelerator vault, including primary and secondary barrier transmission calculations				
h. Discusses the shielding requirements for the maze and door of a high-energy room				
i. Performs a radiation survey of a facility that includes low-energy and high- energy (greater than 10 MV) units				
j. Explains the advantages and disadvantages of various materials that may be used for shielding				
k. Explains how special procedures such as TBI and SBRT may impact shielding parameters				
Acceptance/commissioning				
a. Competently performs the mechanical, safety, and radiation tests required during accelerator acceptance and commissioning				
b. Understands the process for defining the treatment beam isocenter of a gantry-based particle accelerator and its relation to the gantry's mechanical isocenter and any on-board imaging isocenters				
c. Explains and/or performs treatment unit head radiation leakage and shielding adequacy tests				
d. Independently sets up and performs water tank scans for photon and electron beam measurements that calibrate and characterize those external beams to facilitate computerized treatment planning and hand calculations of radiation dose to a point				

e. Analyzes water tank scans and understands the results of these scans, including typically accepted tolerances for each test performed				
f. Understands acceptance, commissioning, and on-going annual QA requirements for radiation treatment planning system modules dealing with external beam treatments				
Calibration				
a. Demonstrates an understanding of and an ability to use the instrumentation (e.g., theory of operation, limitations) and protocols that may be employed in calibrating of radiation treatment beams of energy in the megavoltage range				
b. Understands how and why phantoms are used for physical measurements				
c. Understands the correction factors used for photon and electron calibration measurements				
d. Competently calibrates megavoltage external beams of photons and electrons using a recognized national or international protocol (e.g., TG-51)				
Quality Assurance Activities				
a. Understands the pertinent recommendations for quality assurance of linacs used in radiation therapy				
b. Understands in-house quality assurance documentation and procedures				
c. Competently performs routine (daily/weekly/monthly/annual) quality assurance tests of external beam treatment units				
d. Competently analyzes routine quality assurance tests of external beam treatment units				
e. Understands the basis of accepted tolerances for routine quality				

assurance tests performed on treatment units and of required actions should any of the checks fall out of tolerance				
f. Understands external beam treatment unit malfunction management				
g. Competently performs end-to-end checks of patient treatment plans using phan- tom images and data				
h. Understands the connectivity requirements of external beam treatment units to treatment simulators, on-board imaging systems, record and verify systems, and electronic medical records systems				
Detectors and dosimeters associated with external beam modalities				
a. Understands absorbed-dose calculation and measurement				
b. Understands Bragg–Gray, Spencer–Attix, and Burlin cavity theories				
c. Understands dosimeter design considerations (e.g., detection mechanism, sensitivity, size, shape, thickness of sensitive volume and wall, materials, energy dependence, detector/phantom media matching, dose and dose rate range, stability of reading)				
1. Ionization chambers				
a) Understands design considerations pertaining to cylindrical ionization chambers, including size, shape, materials, and electrical characteristics				
b) Understands design considerations pertaining to parallel-plate ionization chambers, including size, shape, materials, electrical characteristics, and use for measuring dose in the buildup region				
c) Understands the advantages and disadvantages of each ionization chamber design, including detector				

limitations				
d) Understands ionization chamber measurement techniques involving instruments such as electrometers, operational amplifiers, and triaxial cables and connections				
e) Performs acceptance testing for ionization chamber and electrometer involving measurements of leakage and evaluation of relevance, polarity effects, and stem effects				
f) Performs ionization chamber measurements using Farmer, parallel-plate, and scanning chambers, as well as large-volume survey ionization chambers				
g) Understands ion chamber correction factors, including P_{TP}, P_{pol}, P_{elec}, P_{ion}, P_{wall}, P_{grad}, P_{fl}, and P_{cel}				
h) Calculates corrected charge readings for ion chamber measurement using TG-51 formalism				
i) Understands the ion chamber calibration process on the basis of NIST/ADCL				
j) Understands design and characteristics of monitor chambers				
2. TLD/OSLD				
a) Understands the physical mechanisms involved in the process of radiation detection and readout using TLDs or OSLDs				
b) If possible, performs TLD or OSLD measurements and readout (including calibration) using standard irradiation				
c) Understands the method and rationale for TLD annealing				
d) Discusses the advantages and disadvantages of TLDs or OSLDs				
3. Diodes				
a) Understands the physical mechanisms involved in radiation				

detection and readout using semiconductor dosimeters				
b) If possible, performs diode measurements that include investigation of factors such as angular and dose rate dependence and temperature sensitivity				
c) Discusses the advantages and disadvantages of diodes, including their inherent limitations				
4. Film (silver bromide, radio chromic)				
a) Understands the physical mechanisms involved in radiation detection and measurement using film, including measurement of the optical density and its characteristics as a function of absorbed dose, and film's dependence on radiation energy, handling, and processor conditions				
b) If possible, performs film dosimetry including creation of calibration curve				
C) Discusses the advantages and disadvantages of using film, including its inherent limitations				
5. MOSFET detectors				
a) Understands the physical mechanisms involved in radiation detection and readout using MOSFET dosimeters				
b) Discusses the advantages and disadvantages of using MOSFETs, including their inherent limitations				
Introduction to Treatment Planning and Special Projects				
a. Introductory knowledge, observation and/or hands on experience in clinical treatment planning for external beam radiotherapy. Residents are expected to know basic anatomy.				
b. A special clinical project related to external beam radiotherapy				