



DOSIMETRY WORKSHOP OVERVIEW

Dosimetry Workshop Overview

The three-day dosimetry workshop program uses a balance of lectures, Q&A, demonstration and hands-on training to provide an interactive and lively environment for training and information exchange. GEX Dosimetry Workshops are conducted in our well equipped training facility that includes data conferencing capability to allow leading industry experts to participate remotely in presentation and interactive Q&A sessions. Each workshop is limited to a maximum of eight persons and casual dress code is encouraged to create a relaxing environment.

A three-ring notebook containing the Workshop slides is initially provided to facilitate note taking. During hands-on sessions, participants work in pairs on well-equipped computer/spectrophotometer integrated dosimetry workstations that also capture session work that is printed and distributed to the participant.

The GEX Dosimetry Workshops begin on Tuesday mornings at 8:30am and end Thursdays at 4:00pm. A message board is posted with any urgent messages you may receive during the session times. Twenty minutes of morning and afternoon refreshment breaks with a full one hour lunch at the facility is provided to allow time to relax and enjoy our famous Colorado outdoors or to handle any urgent voice and e-mail messages.

WORKSHOP OUTLINE

Introductions and Course Overview

Logistics and Other Pertinent Information

Dosimetry System(s) Selection and Dosimetry Lab Setup

Overview of commonly used dosimeters: *lecture and discussion*

- Classification and types - alanine; chemical; radiochromic; calorimetry
- Typical applications - sterilization; food irradiation; curing and crosslinking
- Dosimeter selection criteria
- Dose traceability to a national standard
- Overview of pertinent reference and guidance documents
- The dosimetry laboratory: *lecture, lab tour and discussion*
 - Determination of dosimetry lab requirements and specifications
 - Lab set-up and commissioning using local purchase equipment and supplies
 - Instrumentation and equipment set-up
 - Review of lab protocols
- Dosimetry lab instrumentation calibration: *hands-on instruction*
 - Spectrophotometer/holder, thickness gauge, multi-meter etc.



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- Use of instrumentation training: *hands-on instruction*
 - Personnel training and testing
 - measurement repeatability and reproducibility
- Establishing the dosimetry lab maintenance and calibration program : *lecture*
 - Review of the procedures and protocols handouts

Calibrating Routine Dosimeter Batches

- Dosimeter Batch Calibration; *lecture and discussion*
 - Dose traceability requirements and laboratory selection options
- Selecting a calibration method: *lecture and discussion*
 - Laboratory calibration method
 - In-plant or insitu calibration method
- Developing a dosimeter batch calibration plan: *lecture and discussion*
 - Define requirements and acceptance criteria
 - Review of calibration protocol handout
- Using standardized calibration holders: *hands-on instruction*
 - gamma
 - electron beam
- Develop a user site specific calibration protocol: *hands-on instruction*
- Receiving/inspection for incoming dosimeter batches: *hands-on instruction*
 - Selecting representative batch samples
 - Determining an average batch thickness or mass
 - Determining an average initial signal background optical absorbance
- Preparing the calibration holders; *hands-on instruction*
 - Measuring calibration irradiation temperatures - options
- Set-up and control of the calibration irradiations: *lecture and demonstration*
 - Documentation of the calibration conditions on the handout worksheet
 - Conducting the calibration irradiations: *lecture and discussion*



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- Gamma and Electron Beam – *lecture and discussion*
- Returning the reference dosimeters: *hands-on instruction*
- Measuring the calibrated batch dosimeters: *hands-on instruction*
 - Post irradiation dosimeter handling
 - Spectrophotometer preparation and verification testing
 - using the handout worksheet to record measurements
- Reviewing the dose laboratory report of doses: *hands-on instruction*
 - inserting doses reported from calibration lab into the handout worksheet
- Validating the calibration data sets: *hands-on instruction*
- Curve fitting and analysis: *lecture and demonstration*
- Interpreting the calibration curve fitting results: *hands-on instruction*
- Review and validation of the calibration: *hands-on instruction and discussion*
 - Detail review of calibration handout workbook items
 - Applying the calibration plan acceptance criteria
 - Establishing usable calibration curve dose limits
 - Determining the calibration curve uncertainty
 - Applying calibration curve uncertainty limits
- Using the calibration curve to estimate dose: *lecture and discussion*
 - Elements and layout of a dose worksheet report
 - Using a simple graph to estimate dose
 - Using and validating a calibration curve “look-up table
 - Using and validating computer software to estimate dose
- Installation and validation of calibration software: *hands-on instruction*
- Maintenance of calibration validation: *lecture and discussion*
 - Review maintenance of calibration protocol handout
 - Establishing and using verification audit intervals - seasonal effects
 - Setting and using pass/fail calibration audit criteria



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Dose Mapping Applications: (break-out into application and radiation source teams)

- Irradiator Facility Qualification (IQ / OQ) dosimetry: *lecture and discussion*
 - Developing IQ / OQ dose measurement test protocols
 - Review of handout protocols
- Facility Dose Maps - types of tests: *lecture and discussion*
 - review protocol handouts:
 - gamma approach
 - electron beam approach
- Preparation of the irradiator qualification dose map tests: *hands-on instruction*
- Product Process Qualification (PQ) dosimetry: *lectures and discussions*
- Dose Mapping for Product and Materials Qualification Testing: *hands-on instruction*
 - prepare product materials dose map protocol
 - prepare actual product and material test set-up
 - review and validation of example reports and record keeping requirements
- Dose Mapping for Dose Setting Qualification Testing: *hands-on instruction*
 - prepare a sub-lethal dose map protocol
 - prepare actual sub-lethal dose test set-up
 - review and validation of example reports and record keeping requirements
- Product Process Qualification Dosimetry: *lecture and discussion*
 - Product configuration and orientation
 - gamma and x-ray issues
 - electron beam issues
- Develop a user product specific protocol: *hands-on instruction*
- Preparing product dose map tests: *hands-on instruction*
- Conducting the dose map irradiations: *demonstration and discussion*
 - Site visit to BeamOne 10 MeV E-Beam facility to perform tests



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- Record process parameters and document dose test conditions
- Retrieve and verify dosimeter placement recovery
- Post irradiation dosimeter treatment

Dose Map Dosimeter Measurement and Report Preparation

- Measure irradiator facility dose map dosimeters : *hands-on instruction*
 - Measure the irradiator facility dosimeters and prepare reports
 - Review and analysis of irradiator facility dose map test results
- Measure materials test dose map dosimeters : *hands-on instruction*
 - Measure the materials test dosimeters and prepare reports
 - Review and analysis of materials test dose map results
- Measure dose setting dose map dosimeters : *hands-on instruction*
 - Measure the dose setting test dosimeters and prepare reports
 - Review and analysis of dose setting dose map test results
- Measure product process dose map dosimeters: *hands-on instruction*
 - Measure the product process dose map test dosimeters and prepare reports
 - Review and analysis of product process dose map dose map data

Applying and Using Dose Map Data in Routine Processing

- Record retention and data management requirements: *lecture and discussion*
 - General ISO documentation requirements
 - Using and integrating dose map results with routine processing
 - Routine process record forms and databases
- Develop and manage a computer database systems: *demonstration and discussion*

Discussion of Dosimetry Database Software and Awarding of Certificates

- Discussion: How software integration and databases can improve your dosimetry program
- Overview of dosimetry market needs: open discussion

Presentation of dosimetry workshop certificates and workshop wrap-up discussions