



GEX DOC# 100-251

INSTRUMENTS AND PERSONNEL CHARACTERIZATION

GEX Recommended Procedure

Eff. Date: 07/27/07

Rev.: C

Pg. 1 of 3

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1.0 PURPOSE

This procedure describes the methods of evaluating the uncertainty of instrumentation and personnel during dosimeter calibration and routine use.

2.0 MATERIALS


- 2.1 WINDose Dosimetry System
- 2.2 GEX Doc#100-252, Instruments and Personnel Characterization Form

3.0 FREQUENCY

- 3.1 During the dose response characterization of a batch of dosimeters.
- 3.2 Training of new hires.
- 3.3 Annual re-certification of employees.

4.0 WINDOSE DOSIMETER HOLDER VARIANCE TESTING

- 4.1 Remove the cuvette cup from the sample compartment and close the Genesys 20 Spectrophotometer sample compartment cover. Turn the instrument on from an off position and allow the instrument to go through its complete automated start-up sequence that will take about 3 minutes to complete. After the instrument has completed its start-up sequence, allow a full 30 minute warm-up period before attempting to use the instrument. Following completion of the warm-up period it is safe to replace the cuvette cup and zero the instrument at the appropriate absorbance measurement wavelength for use.
- 4.2 If using the WINDose dosimeter holder, insert the holder with the conical facing toward the light beam and zero the instrument. Practice inserting the holder several times and achieving “zero” readings until the comfortable with the placement technique.
- 4.2 Begin documenting the individual operator’s results. Insert the empty holder 32 times and record the readings (including positive and negative absorbance values) on the Instruments and Personnel Characterization Form.

 GEX CORPORATION	GEX DOC# 100-251		
	INSTRUMENTS AND PERSONNEL CHARACTERIZATION		
	GEX Recommended Procedure	Eff. Date: 07/27/07	Rev.: C

- 4.3 Successful performance of the test is met when no measurement greater than $\pm 0.003A$ or greater is observed during the 32 cycle test.

5.0 MEASUREMENT INSTRUMENTATION VARIANCE TESTING

- 5.1 Select a dosimeter that has been irradiated to approximately the middle of the range 25 and 50 kGy (or the middle portion of the calibrated range).
- 5.2 Measure the irradiated absorbance, A_i , of the test film by placing the dosimeter into the film holder positioning the holder into the sample cell holder of the Genesys 20, closing the lid and recording the displayed absorbance value. Open the sample compartment lid, remove the dosimeter holder from the instrument and repeat this cycle a minimum of 32 times in each spectrophotometer. Enter these values into the appropriate cells in the Instruments and Personnel Characterization Form or equivalent.
- 5.3 Remove and replace the dosimeter from the holder each time. This tests typical handling uncertainty during routine dosimeter measurements. Use care when handling the dosimeter so as to avoid dents, smudges, or the accumulation of particulate on the film during this test. A damaged or dirty dosimeter film may skew the test result.
- 5.4 The preformatted formulae in the Instruments and Personnel Characterization Form spreadsheet will calculate the mean, minimum, maximum, standard deviation, and coefficient of variance (CV) for the readings from the test films. Performing three consecutive tests for a single operator following the instruction in 5.1, 5.2 and 5.3 provides data necessary to determine an estimate of the measurement instrumentation (spectrophotometer and dosimeter holder) repeatability (single dosimeter, single instrument system single operator). This test can be repeated over several days with different operators to establish a reproducibility variance for the instrument system. The data collected from this testing can be used to establish a baseline for the instrument system. This information is also useful in understanding the contribution of the dosimeter system to overall dosimetry system uncertainty.
- 5.5 The instrument system should be expected to result in a repeatability CV of 0.3% or less at an absorbance of 0.250 or higher if using a DoseStix holder and 0.5% when using the WINdose holder.
- 5.6 The dosimeter may be discarded upon completion of testing.



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INSTRUMENTS AND PERSONNEL CHARACTERIZATION

GEX Recommended Procedure

Eff. Date: 07/27/07

Rev.: C

Pg. 3 of 3

6.0 REVISION HISTORY

Date	Revision	Change Description
07/27/07	C	Added explicit instrument warm –up instruction Changed language pertaining to system variance Changed test pass/fail criteria for system variance.