



GEX DOC# 100-261

E-BEAM PROCESS UNIFORMITY MEASUREMENT

GEX Recommended Procedure

Eff. Date: 07/27/07

Rev.: C

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NOTICE: This document is version controlled and was produced as a part of the GEX Information Program which requires that all Series 100 documents be reviewed periodically to maintain currency and continuity of information. Appropriate Technical Memorandum are used to provide information detail in support of the Product Data Sheets as well as GEX Recommended Procedures and to provide technical information in support of GEX Marketing documents.

1.0 PURPOSE

To describe the method of dose uniformity measurement using the GEX B3 WINdose B3106 Uniformity Measurement dosimeter strips with the WINdose for Excel Dosimetry Program provided by GEX Corporation. The B3106 strips contain 2 inch wide 10 inch long cards with B3WINdose dosimeters spaced at one inch intervals. The X and Y Uniformity WINdose for Excel worksheets are used to read the optical absorbances of numbered dosimeters provided in the strip arrays. The B3106 strip arrays may be joined to form strips of continuous lengths or staggered/overlapped to increase the measurement interval resolution.

2.0 SCOPE

- 2.1 This procedure is relevant to scan width/length dose uniformity measurement and can also be used for conveyor travel dose uniformity measurement.
- 2.3 Dose uniformity techniques and requirements are described in both ISO/ASTM 51649 and ISO/ASTM 51818.
- 2.4 The WINdose for Excel template is not protected to allow user flexibility. Cells are unlocked to allow some formulas to work properly and to permit user adjustment. Users should have a working knowledge of basic Microsoft Excel functions and charts in order to use the worksheets and manipulate the charts effectively.

3.0 MATERIALS

- 3.1 GEX Part# B3106 (Uniformity Measurement Strip Array)
- 3.2 GEX WINdose Dosimetry System

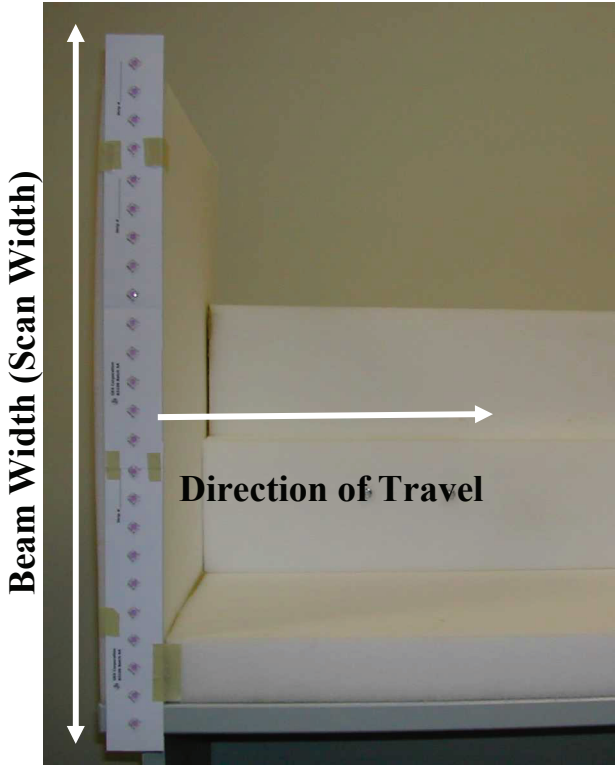
4.0 PROCEDURE

- 4.1 Keep the B3106 package containing the dosimeter strip arrays sealed until just prior to use in order to maintain the best environmental conditions for the dosimeters.
- 4.2 When ready to run the test, open the B3106 packages and remove the strip arrays. Unfold the strips. Strips may be taped end to end until the desired length is



obtained. The standard distance between dosimeters is 1 inch. If closer resolution is required, tape strips at the appropriate offset, side by side.

4.2.1 **SCAN WIDTH/LENGTH:** If possible, the strip assembly should be longer (or taller) than the expected scan in order to determine full scan coverage. Orient the strip or assembly so that it is lined up perpendicular to the direction of travel through the electron beam (i.e. carrier travel). Mark the orientation of the strip on at least one end to identify the proper order in which to measure the dosimeters and perform the analysis.



4.2.2 **CONVEYOR UNIFORMITY:** This test is used to measure dose uniformity in the direction of material transport. Overlapping strips can also be used in experiments to measure the impact of planned and unplanned process interruptions. Orient the strip or assembly so that it is lined up in the direction of travel through the electron beam (i.e. carrier travel). Tape both ends of the strip and the center if necessary so that it is snug against its carrier material as it passes through the beam. Mark the leading edge of the strip to identify the proper order in which to measure the dosimeters and perform the analysis.



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- 4.3 Attach the strip/strip assembly to a uniform density material that will fit in the carrier (typically a validated test fixture). Tape the strip securely in place against the test fixture to ensure a valid test result.

NOTE: Use a uniform backing material that is designed to minimize back and side scatter such as polyethylene foam.

- 4.4 Place the test fixture in the carrier. Whenever possible, minimize the time between taking the strips from a controlled environment (such as a dosimetry lab) and placing the fixture into the carrier. If necessary, place a thin sheet of paper over the strip to reduce UV contamination to the dosimeters from the production area lighting.
- 4.5 Perform a single-sided irradiation of the test fixture. Target the dose to approximately 30 kGy.
- 4.6 Remove the test fixture from the carrier as soon as possible after irradiation. Return the strip(s) to the dosimetry laboratory.
- 4.7 Follow the methodology described in GEX recommended procedure #100-258 Measuring GEX Dosimeters, to perform and record dosimeter measurements.
- 4.8 Open the WINdose for Excel Calibration Specific Workbook and select the appropriate 'Uniformity' worksheet from the tabs at the bottom of the screen. Enter the processing information in the top section of the worksheet.
- 4.9 The default worksheet length is 100 dosimeters / 100 inches and the default resolution (distance between dosimeters) is 1 inch. If the test requires distances that are longer, shorter, or if the test requires a different resolution, edit the worksheet as described in the WINdose for Excel Installation and Operations Manual – B3106 Appendix.



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NOTE: Any of these changes may alter the print format. Be sure to check page setup before printing the worksheet.)

- 4.10 The worksheet automatically calculates the average dose, the standard deviation of the doses, and the coefficient of variance (CV) of this average. The CV is the expression of the variation across the strip.
- 4.11 The worksheet automatically calculates the relative dose for use in the graphical plot of the data. The relative dose is calculated by dividing each measured dose by the average of all the measured doses.
- 4.12 In a scan width/length measurement, it may be necessary to select the “usable” portion of the curve (or the maximum scan distances) and eliminate any overscan tails for the uniformity measurement. See the WINdose for Excel Installation and Operations Manual for details.
- 4.13 In a horizontal uniformity measurement, no further adjustments to the worksheet are required.
- 4.14 Using values for pass/fail acceptance criteria developed during facility IQ/OQ, assess the test results.

5.0 REVISION HISTORY

Date	Revision	Change Description
07/27/07	C	Document Title changed A few editorial changes and clarification of statements