



B3 FILM STRIPS OR SHEETS

Technical and Usage Information

B3 Film dosimeter products are the cornerstone of the WINdose and RisøScan dosimetry systems. Film Batches are manufactured under strict quality standards to ensure consistency and reliability. Below are some technical details and recommendations for successful use of the product. Contact GEX for additional details.

Usage:

Film Handling and Cutting: B3 film should be handled with extreme care at all times. The polymer in which the radiochromic dye is dissolved into is Polyvinyl Butyral, which has high tensile strength (it is used as a laminate to make automotive and architectural Safety Glass). However, because the product is soft it can be easily dented or scratched if not handled properly. When applying B3 film to any surface, clean the surface first using Isopropyl Alcohol and allow to dry thoroughly. GEX recommends wearing powder-free Latex gloves when handling the film to avoid leaving body oils or residues on the film surface.

The film has a polyester backing material attached. The film can be irradiated with the backing material still attached, but the backer must be removed before measurement.

The film is most easily cut into smaller sections using a Rotary paper trimmer. This is an inexpensive item, one manufacturer is Fiskars. Visit their website www.fiskars.com and search for rotary trimmers. Scissors can easily be used for cutting lengths of strips from a roll, but for cutting accurate and square sizes a rotary trimmer is extremely helpful and the units usually have measurement guides on them in both metric and standard units.

Wavelength and Measurement Readout Instructions: B3 dosimeters have historically been measured at 554nm over the entire range of use. The absorbance wavelength peak has more recently been approximated to be 552 nm. Because of the broad peak of the B3 film, measurement at any fixed wavelength between 550 – 555nm is considered acceptable. Alternatively the film can be scanned over the peak area and an average mean or median value can be obtained and used successfully. Dosimeters should be measured using a GEX manufactured dosimeter holder or an optical scanner validated for use with the RsoScan software.

B3 film thickness: GEX B3 dosimeters are manufactured in large, highly uniform batches that allow users to apply an average dosimeter thickness in the measurement process. An average thickness and variability is not specified for GEX B3 film strips and sheets. Contact GEX with questions related to the subject of B3 film thickness at sales@gexcorp.com.

Dose rate effects: There are no known dose rate affects.

Irradiation Temperature Caution: Use of B3 Film products in irradiation temperatures above 60°C are at the user's discretion.

Pre-Irradiation Storage: GEX provides irreversible thermal labels to monitor maximum temperature on all B3 film shipments. Report any recorded temperatures of 45°C or higher directly to GEX so that appropriate actions can be determined. The packaging provides protection for the film, however, the user should store the dosimeters in a controlled office or laboratory environment (refer to the Certificate of Compliance which accompanies each shipment).

Environmental Conditions: The response function of radiochromic film dosimeters is affected by the temperature and the water content in the film material at the time of irradiation.

UV Exposure: The B3 radiochromic film is sensitive to UV radiation. Therefore, it is recommended to control exposure of unprotected film dosimeters to daylight and fluorescent light sources.

Calibration: Calibrate under conditions approximating actual usage. This should include time and temperature conditions that approximate actual process conditions. For guidance, see: ISO/ASTM 51261 and NPL Report CIRM 29.

- **Usable Calibration Range:** 1.0 kGy - 140 kGy or as determined by user's application and uncertainty requirements. Using multiple replicate packaged dosimeters or calibrating multiple dose ranges can result in significant reductions in expanded uncertainty.

- **Recommendation:** GEX recommends using an in-situ calibration method designed to capture routine process conditions whenever possible. Use an appropriate calibration phantom or equivalent (as described in ISO/ASTM 51261 and NPL CIRM Report 29) to co-locate the transfer standard dosimeters in controlled proximity to the routine dosimeters being calibrated taking care to maintain a repeatable geometry with equilibrium conditions (see references).

The dosimeter batch calibration should be accomplished under normal process (including temperature) conditions. If a heat-treatment is not applied to the dosimeters post-irradiation (see below), dosimeters should be read at a time interval consistent with routine production dosimetry. This may include readings at multiple time intervals, which are analyzed to determine the specifics of the color development cycle and to establish a correction factor for color development if necessary.

Post Irradiation Stability: The coloration of B3 radiochromic film material may continue to develop for some period of time after irradiation, causing the measured response values to change. To complete the dosimeter response rapidly it is strongly recommended to apply post irradiation heat treatment to B3 film dosimeters to complete the color development cycle and render B3 dosimeters 100% post irradiation stable. Dosimeters that have been properly heat treated will remain stable for more than a year.

GEX recommends a post-irradiation heat treatment process be used for all B3 dosimeter products. The user should validate the heat treatment method used. Treatment of film sheets at 60-65°C is typically appropriate. Do not overlap films onto one another during the process to avoid the possibility that they may stick together.

Static and Radiochromic Film Surface: Static electricity conditions may cause particulate to be drawn to the dosimeter surface that can cause readout error. Remove visible particulate with a soft brush or piece of soft anti-static cloth.

References:

- 1) "A New Radiochromic Thin Film Dosimeter System", A. Miller et al, Radiation Physics and Chemistry Volume 31 pp. 491-496, 1988 International Journal Radiation Applications and Instrumentation, Part C. Printed in Great Britain.
- 2) ISO/ASTM Standard Practice 51275 - Standard Practice for Use of a Radiochromic Film Dosimetry System.
- 3) ISO/ASTM Standard Guide 51261 - Standard Guide for Selection and Calibration of Dosimetry Systems for Radiation Processing. NPL Report CIRM 29; Guidelines for the Calibration of Dosimeters for Use in Radiation Processing.
- 4) "Temperature, Humidity and Time. Combined Effects on Radiochromic Film Dosimeters", A. A. Abdel-Fattah and Arne Miller, Radiation. Phys. Chem. Vol. 47, No. 4, pp.611-621, 1996; Elsevier Science Ltd, Great Britain.
- 5) "Guidelines for the Calibration of Dosimeters for use in Radiation Processing", Peter Sharpe and Arne Miller, Report CIRM 29.