

RCF Scanning Protocols

Things to note:

1. Always use the same cardboard/plastic frame to position the films on the scanner.
2. Always use the same distance/coordinate when positioning the frame on the scanner (make landmarks on the scanner for easier day-to-day positioning).
3. Ideally, always scan newly irradiated films together with a blank film from the same production lot/batch and an irradiated film with a known dose/dose rate.
4. Ideally, put an additional thin (3-4 mm) transparent glass plate to minimise the Callier effect. The glass plate should be free of visual defects and cover the entire glass window of the scanner, **including the calibration area where the scan begins**. For EBT3, plain plate glass is sufficient.
5. Waiting time after irradiation → The waiting time between irradiation and scanning application films must be the same as that for the calibration films. It should be around 24 hours.

*Special note on the frame:

It is preferable that the holes in the frame be aligned horizontally, with their centres lying on the same horizontal line, to minimise the lateral response artifact (LRA).



(Example picture generated by AI)

Data Acquisition Options:

- 16 bits per color channel. TIFF/TIF Format.
- A resolution of 72 dpi is adequate (faster scan time). → **Make sure to always use the same resolution throughout the whole experiment**

Scanner Operations:

A. Phase I: Preparation (Pre-scan)

1. Ensure the scanner bed is clean and free of defects (can be cleaned with isopropyl alcohol and a microfiber cloth).
2. **Electronics warmup:**
Wait at least 30 minutes after the scanner power is turned on. The other option is leaving the scanner permanently powered on.
3. **Light source warmup:**
5-10 warmups scan before placing and scanning a film. (Use the same number of warmups every session!).

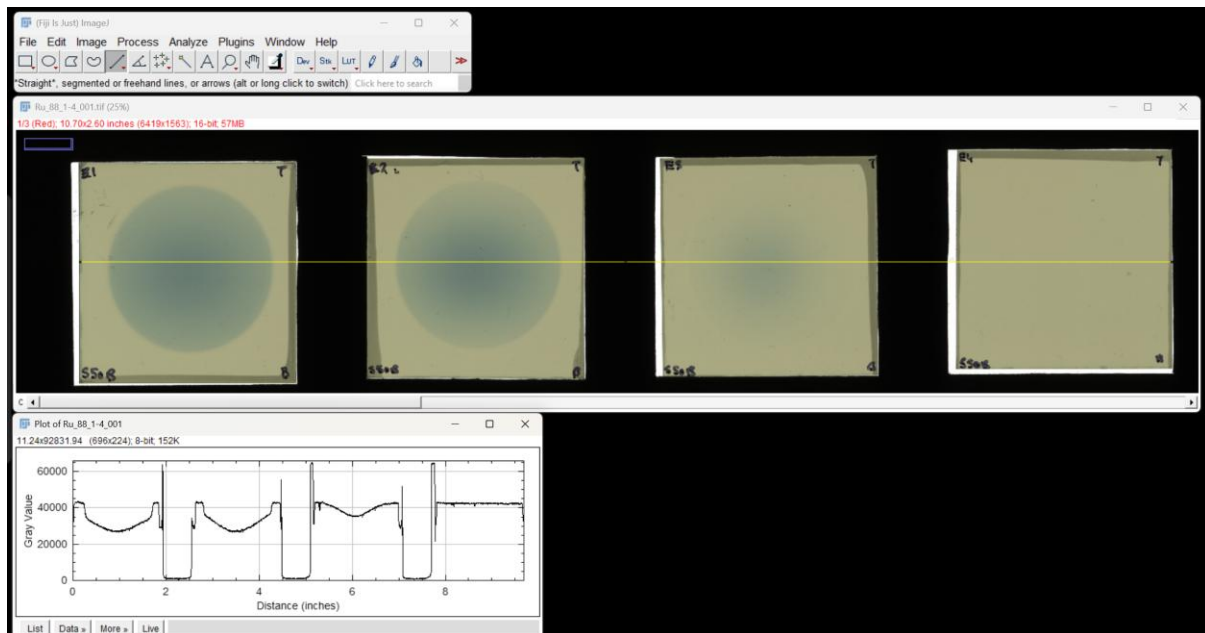
B. Phase II: Handling & Positioning

4. **Handling**
Use gloves while handling film.
5. **Light source calibration:**
This is automatically initiated and immediately calibrated by the scanner before the start of each scan. It occurs in a small portion (~1.5 cm) of the glass window in the region where the scan starts.
Keep a 1.5cm-wide region, starting at the initial position of the light source (position the frame beyond this distance), so as to not interfere with the initial calibration of the light source.
6. **Film Orientation**
 - Place the film, keeping the same orientation of the irradiated face relative to the scanner light that was used for scanning the calibration films.
 - Scan each film, at a minimum, in two different orientations. One, the reference (“straight”), and the other in a 90-degree counter-clockwise direction.

C. Phase III: Acquisition & Storage:

7. Check the gray values of the scanned images using Fiji or ImageJ by:
 - 1) opening the image in either software;
 - 2) selecting the straight-line selection tool;
 - 3) drawing a line across the scanned image parallel to the scan direction;
 - 4) analyze → plot profile (ctrl+K).

This can be used to measure/confirm the beam profile in the case of an expected beam shape. Otherwise, it can also be used to diagnose the Lateral Response Artifact (LRA) effect in the case of a uniformly irradiated film, where, if LRA is present, a parabolic or U-shaped curve will arise.



Screenshot example of phase C point 7.

8. Remove the films immediately after scanning and store them in the dark to minimise potential colour change.

Further reading:

1. Niroomand-Rad, A., et al. (1998), Radiochromic film dosimetry: Recommendations of AAPM Radiation Therapy Committee Task Group 55. Med. Phys., 25: 2093-2115. <https://doi.org/10.1118/1.598407>
2. Niroomand-Rad, A., et al. (2020), Report of AAPM Task Group 235 Radiochromic Film Dosimetry: An Update to TG-55. Med. Phys., 47: 5986-6025. <https://doi.org/10.1002/mp.14497>