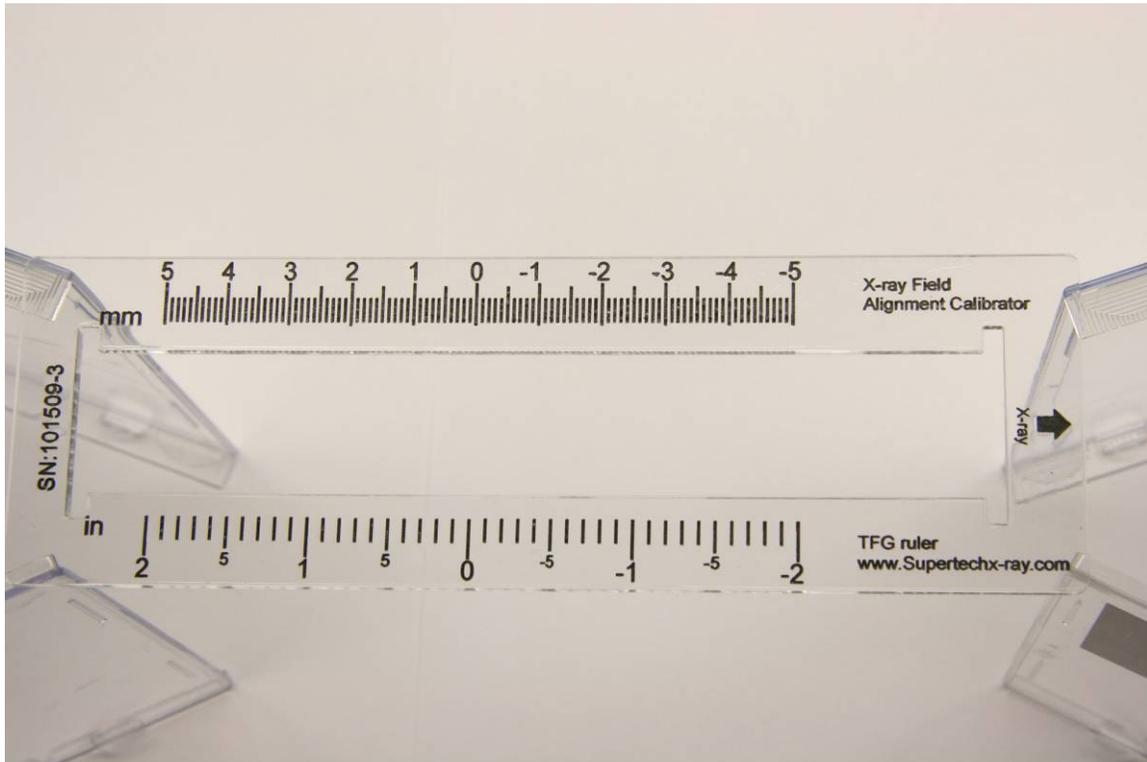


FFDM X-ray Field Overlap Measurement Utilizing the TFG ruler and DXR+ ruler method

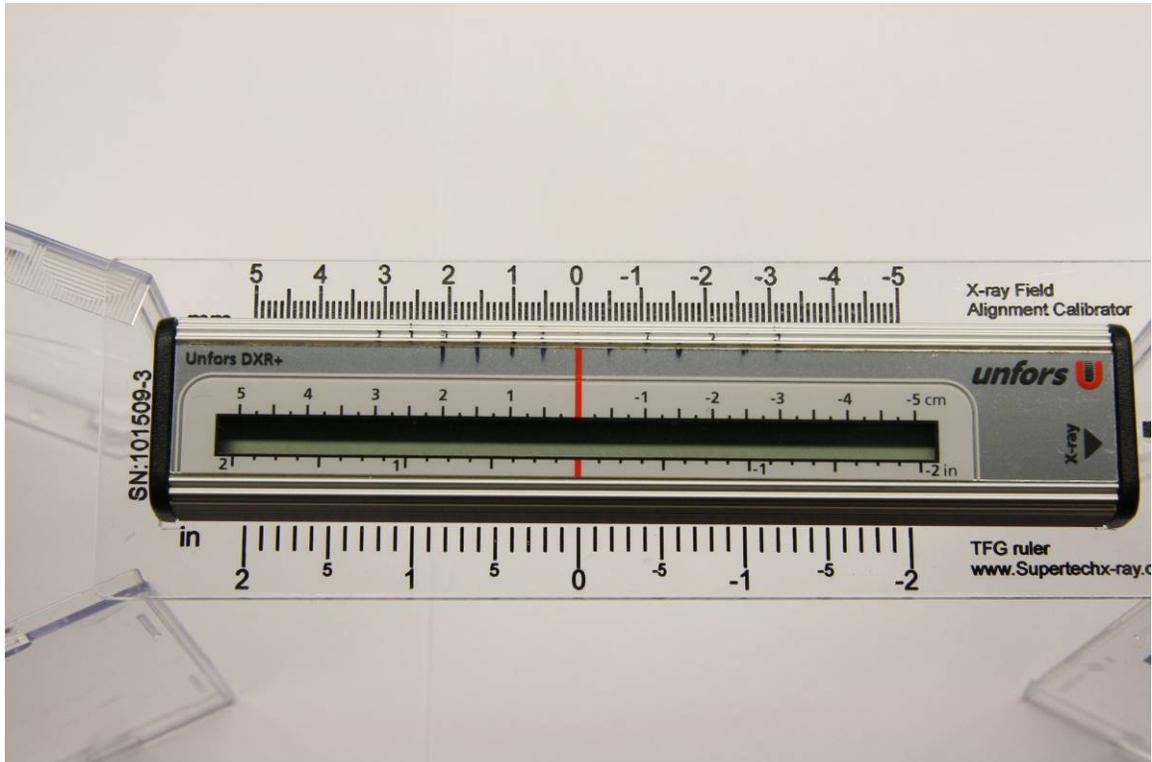
Background-

Unfors DXR+ ruler—designed for x-ray/light field alignment measurements, this ruler has an array of detectors that detect and display where x-rays are present. An analog ruler scale is used to determine the position of the x-ray field border. By using this digital ruler as an x-ray detector, it is used to determine where the edge of the x-ray field is located.

TFG Ruler—developed as an adjunct to evaluate x-ray field overlap on full field digital mammography machines. The TFG Ruler is a radiopaque ruler that has the same ruler scale as the DXR+ ruler. The TFG ruler is certified by the National Institute of Standards (NIST). Each ruler has a unique serial number that can be traced to the NIST standard. The TFG ruler has a cavity cut out of the center that allows for the DXR+ ruler to set into it, which allows the two devices to work in tandem. Once the DXR+ ruler is placed into the TFG ruler, the two rulers' scales align perfectly. The TFG ruler will be used as a radiopaque indicator that will give a visual reference as to where the edge of the digital detector is located.



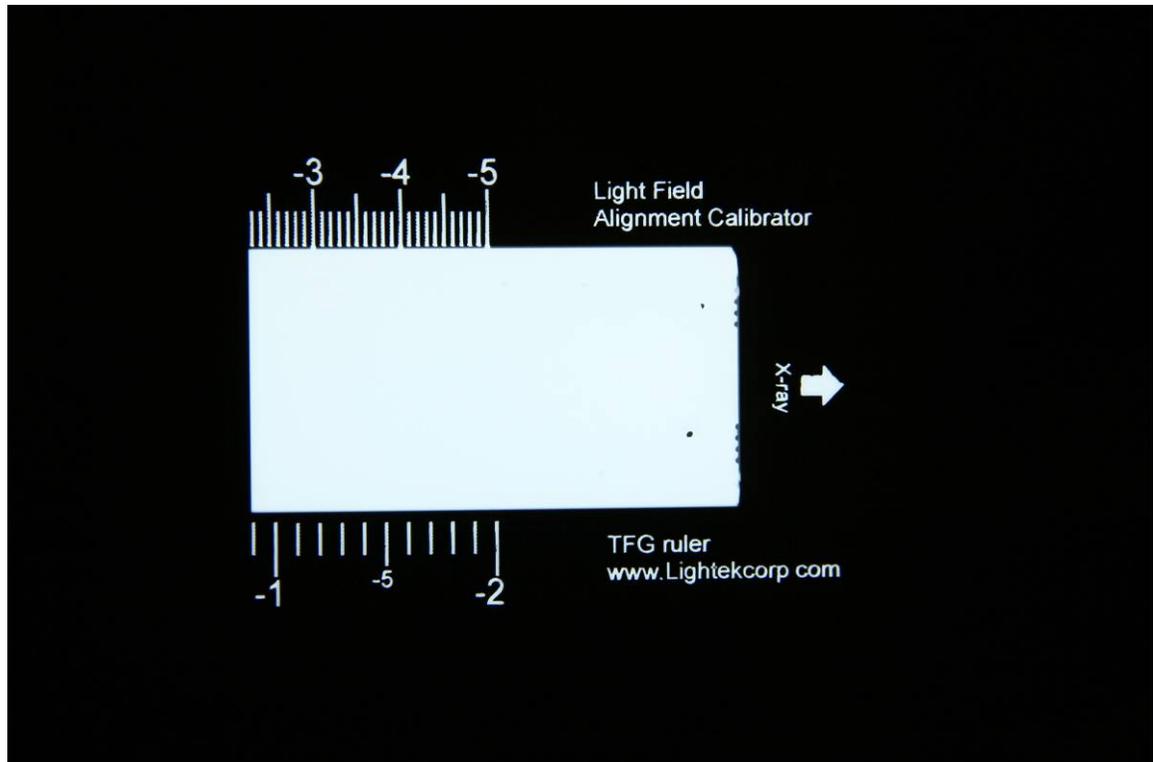
Methodology—With the two devices joined together, they will each be used to determine the x-ray field overlap on a single side as placed by the user. Using the DXR+ ruler to determine the edge of the x-ray field and the TFG ruler to determine the location of the digital detector edge; it becomes a matter of simple subtraction to calculate the x-ray field overlap.



Procedure—

1. **Place the protective sheet of aluminum onto the patient support.** This is done to protect the digital detector array from damage during testing.
2. **Select the smaller field size (18 x 24cm) for testing.** Depending on the manufacturer, this may be accomplished by depressing the collimation button on the tube gantry. This will step down the field size to the smaller field. On other machines, you may have to install the small compression paddle which will activate the collimator. Once the collimator has adjusted, you can remove the paddle and with most manufacturers, the field size will remain at that size.
3. **Place the DXR+ ruler into the cavity in the TFG ruler. Carefully inspect the ruler scales on both to make sure they align at the zero position.** Also make sure that the scales are matched (metric to metric & inches to inches). Another easy alignment mark is the X-Ray arrow direction markers. This is indicated on both rulers and should be pointed in the same direction toward the center of the x-ray field.
4. **Place the paired rulers on top of the aluminum sheet previously placed on the patient support.** As a general rule, align the light field edge with the zero line on the rulers. If the zero line cannot be aligned, then use the next closest line value and continue (i.e. 0.5, 1.0cm). You may begin with any edge of the field. You will have to evaluate each side separately.

5. Once aligned, expose the rulers using 26 kVp and 30 mAs. Record the readings from the centimeter scale on the DXR+ ruler noting the value and sign (+ or -), along with which edge was measured (left, right, etc.) ; this is the x-ray field edge. Remember that the DXR+ ruler centimeter scale is in increments of 0.25 cm.
6. Verify on the monitor that the TFG ruler appears clearly on the image without obstruction. Record the reading from the TFG ruler in millimeters noting the sign (+ or -) along with which edge was measured; this is the detector edge. Have the facility print a hardcopy for later measurement verification. If the facility does not have onsite printing capability, then a hardcopy may not be necessary.



****Image from monitor/hardcopy****

7. Continue the process for all sides (left, right, anterior, chest).
8. Once the values have been recorded for all four sides, calculations will be necessary to evaluate the x-ray field overlap. The x-ray field overlap is a comparison of the detector edge vs. the x-ray field edge measurements and subtracting the difference to evaluate for compliance. Some examples are below:

Example #1:

TFG ruler = 0.0 cm
 DXR+ ruler= 0.5 cm
 X-ray overlap = 5 mm

Example #2:

TFG ruler = -0.3 cm
 DXR+ ruler= 0.75 cm
 X-ray overlap = 1.05 cm

Example #3

TFG ruler = 0.5 cm
 DXR+ ruler= 2.0 cm
 X-ray overlap = 1.5 cm