IGRT Remote Audit Procedure

Proton Version June 2024

This phantom tests two things: 1) your IGRT system's ability to image an object on the couch and align it with the imaging isocenter and 2) the coincidence of the imaging and radiation isocenters. The box you received contains a cube phantom (Fig 1) for each IGRT-capable machine or beamline in your clinic. The cubes have a ball bearing in the center and are loaded with radiochromic film. **DO NOT disassemble the cube.**

The goal is to deliver 2 beams (Rt Lat and AP) that transverse the cube and deposit dose to the films on the distal sides. You might wish to create a treatment plan for the cube irradiation, but you can also use a reference field that meets the following specifications:

1. The beam range should be *greater* than the thickness of the cube so dose is delivered to the distal side of the cube
2. The dose delivered to each film should be *greater* than 6 Gy
3. The field size should be $\leq 2 \times 2$ cm^2
4. The field shape can be circular or square, but should be symmetric

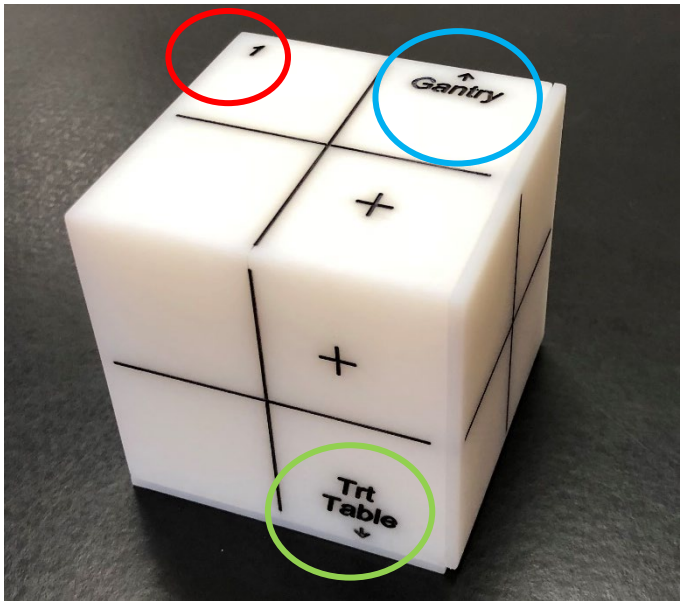


Figure 1: The IGRT remote audit cube phantom

1. You will need to have a reference image to align the phantom. You can either use a CT of the cube phantom or use any other reference image available to you such as your own IGRT cube image or a patient image. An easy approach to handling the reference image is to conduct a 2D/2D (or 3D/3D) alignment of the cube phantom with the reference image, but then window out the reference image so you are only looking at the cube phantom.

2. Set the cube phantom on the treatment couch ensuring that the arrow labeled "Gantry" (circled in blue in Fig 1.) points in the superior direction and the arrow labeled "Trt Table" (circled in green in Fig 1.) points to the treatment table. Align the cube using the lasers to the crosshairs on the cube (+) which are offset from the center of the cube phantom. The phantom should be square with the radiation field (i.e., normal incidence of the beams on

the faces of the phantom). The cube number (circled in red in Fig 1.) will be on the top of the phantom. Use the numbered cube assigned to the treatment room that you are using.

3. Choose whether you want to use planar kV or CBCT imaging. Perform your IGRT procedure. The goal is to locate the ball-bearing and center it at the imaging isocenter. Couch shifts should be done to align the phantom. No more than 2 imaging/alignment iterations may be conducted (i.e., if you want to re-image and re-shift because you are unsatisfied with the alignment, that is acceptable).

4. Once the phantom is aligned with the imaging isocenter, orthogonal kV images (AP and left Lat) should be taken of the phantom. Using the measurement tools in the imaging software, measure, as best as you can, the residual difference between the imaging isocenter and the edge of the ball bearing in each of the four directions and **record the values on the data sheets included with these instructions**. This residual difference measurement can be difficult due to the fuzziness of the ball bearing edge. You can try to adjust the contrast/ resolution/ window level to identify the edge better. Be sure to capture the correct orientation/direction of the residual difference. Take screen captures or pictures of the screen to document the residual differences. An example is shown in Fig 2.

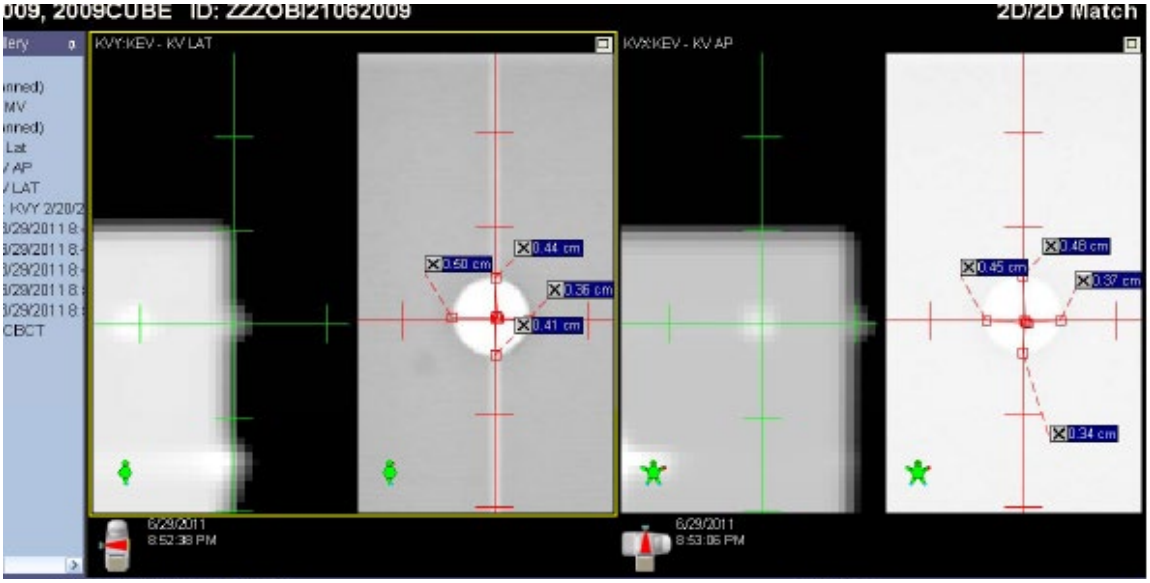


Figure 2: Screen image of residual difference measurements.

5. Once the residual differences have been recorded on the data sheet, deliver 6 Gy from the AP and 6 Gy from the right-lateral direction. *Please make sure that the field size is no larger than 2 cm x 2 cm. Note, the beam range should be greater than the thickness of the cube, so dose is delivered to the films on the distal edges of the cube.*

6. Return the cube to the box or mailing packet.

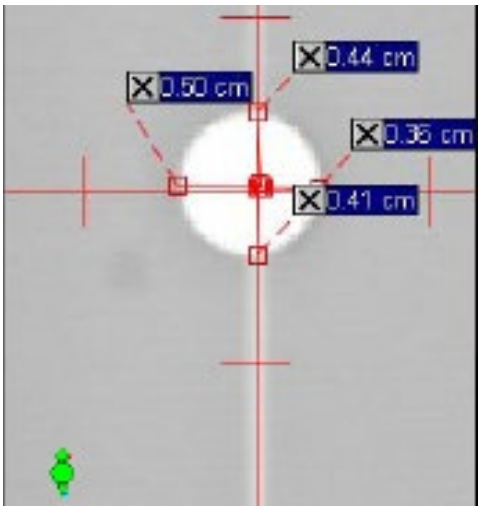
7. Repeat steps 2 – 6 for each IGRT capable machine or beamline.

8. Return the blocks to IROC using the enclosed shipping label.

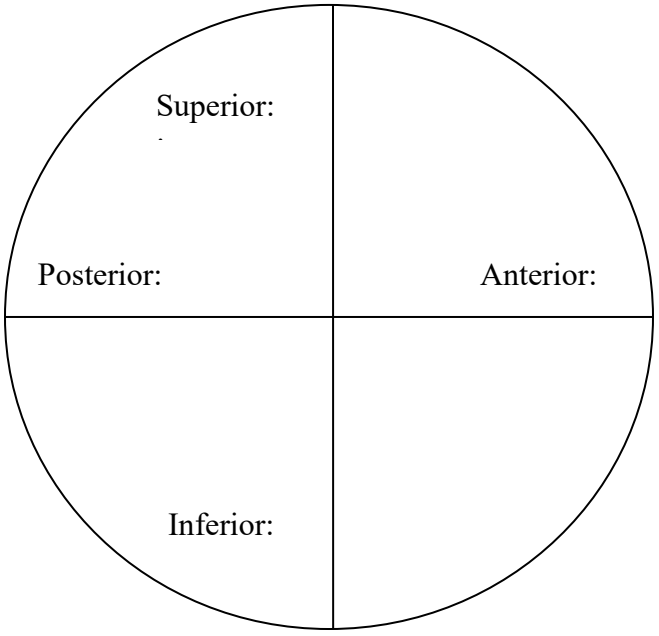
Residual Difference Data Sheet

Institution name: _____ **IROC#**_____
Machine/Beamline: _____ **RTF#**_____
Irradiated cube number: _____
IGRT technique used: _____
Name of person performing irradiation: _____ **Date:** _____

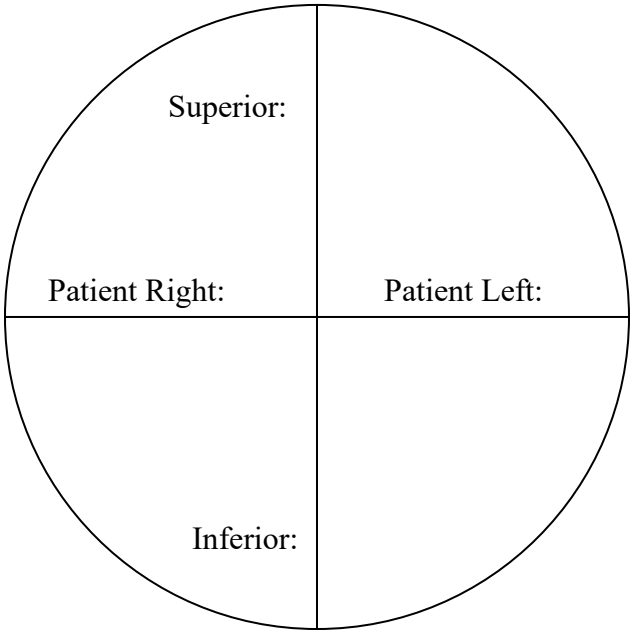
Collect the following data:
After the cube has been setup and shifted to isocenter, take a second set of kV images similar to the screen shot to the right. Record the alignment positions (in blue) on the following figures.



Gantry angle:



Gantry angle:



For Office Use Only	Cube #	Inst #	Date Sent	Date Rec'd