

Daily QA Procedure for TrueBeams with MMI integration of a Surface Guided Radiation Therapy (SGRT) system specifically AlignRT (Vision RT) or OSMS (Varian)

The following procedure should satisfy the following recommendations

TG-142

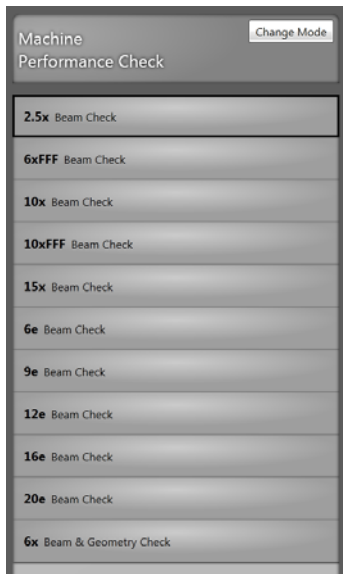
- X-ray output constancy (all energies)
- Electron output constancy (all energies)
- Radiation beam uniformity
- Radiation beam center shift
- Laser Localization
- Optical Distance Indicator (ODI) accuracy
- Collimator jaw size indicator
- Gantry and Collimator angle indicators
- Couch Positioning accuracy (6DoF or 4DoF)
- MLC setting vs radiation field
- Leaf position accuracy
- Leaf position repeatability
- EDW checkout for max and min angles
- Door Function and Interlock
- Audiovisual monitoring
- Radiation Area Monitor (if applicable)
- Beam on indicator
- Backup monitor constancy
- Gated beam output constancy
- Amplitude based beam control
- Gating interlock
- Collision Interlocks
- Imaging positioning and repositioning
- Imaging and treatment isocenter coincidence

TG-147

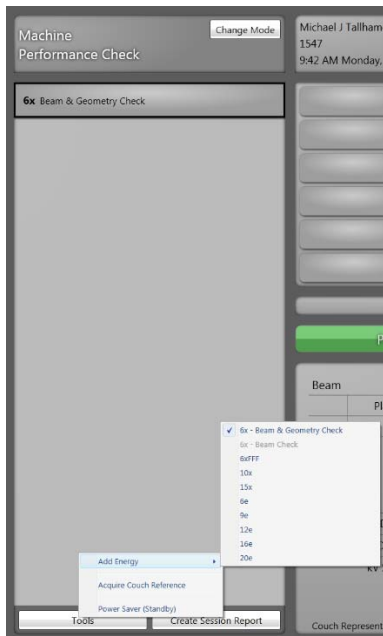
- Safety
- Static Localization
- Dynamic Localization
- Localization repeatability
- Positioning accuracy
- Camera obstruction testing
- Patient repositioning
- Dynamic gating
- System Integrity
- Data transfer
- Vendor Recommended Checks



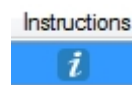
Daily Output / Mechanicals / Safety Checks

1. When you arrive in the morning, the TB should be in ready mode. It resets itself and warms up at 5:30 A.M. so you should be ready to go as soon as you arrive
2. Enter the room and verify that the area surrounding the machine is free of carts, chairs and stools
 - a. Give a cursory look around the floor and check for signs of a water leak before rotating the gantry to its upright position
3. If not already setup, setup the Isocal phantom on its holder, indexed to H2. The couch will be moved to the correct position automatically by Machine Performance Check.
4. Verify functionality of collision safety interlocks on couch and imaging system components and return to control room after clearing.
5. Launch MPC from the main menu screen on the Truebeam and login. You will see the list of tests to run



- a. If beam energies are not listed they can be added by selecting the missing energies from the **Tools – Add Energy** menu



6. Move the gantry and imaging arms to position, and beam on for each. A green check mark shows a passing result. A yellow check mark is also passing, but is close to the tolerance. A red X is a failed test. A failed test should be repeated. Do this by clicking the dropdown arrow to the right of the test name, and selecting Repeat. Then run the test again.
 - a. If a test repeatedly fails notify physics prior to treatment
 - b. The parameters that are causing the test to fail can be viewed by clicking on the red box  indicating the failed test in the screen to the right (OBI screen)
7. Complete all tests in MPC
8. Enter the treatment room and position the Isocal phantom to align it with the lasers. Note the couch vertical, longitudinal, and lateral to be recorded in Atlas. Verify the SSD is 88.3cm +/- 2mm.
9. Login to the physics computer and launch ATLAS  using [rttrtt/rttrtt](#) login
10. The software will open up to the list of daily tests that need to be performed. The first set of tests is the TB Mechanical Checks. There are detailed instructions for the tests if you click the  icon. Perform each test and change the drop down menu to either Pass/Fail. Record the couch positions for the Isocal phantom aligned with the lasers.
11. Save your progress when you finish the TB Mechanical Checks.

VisionRT Calibration Daily Verification

1. Place the AlignRT/OSMS calibration plate on the couch at reference conditions (100 cm SSD with the arrow pointing towards the gantry)
 - a. Consult your physicist as to whether your institution's reference conditions are set to lasers or to the crosshairs of the linac
2. Login to AlignRT/OSMS as [rttrtt/rttrtt](#)
3. Go into [System Maintenance](#) and run [Daily QA](#)

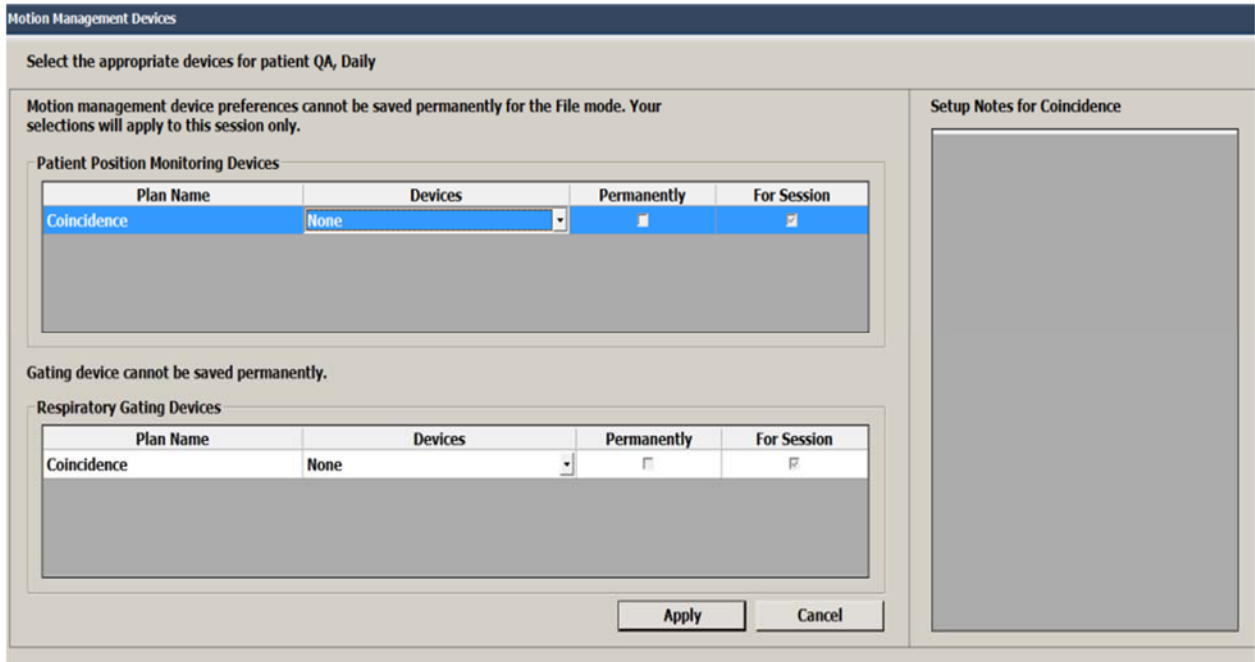


4. Follow the prompts to complete the daily QA
5. Generate a QA report with your name
6. If the QA fails, review the setup and try again. If it fails a second time, notify physics immediately

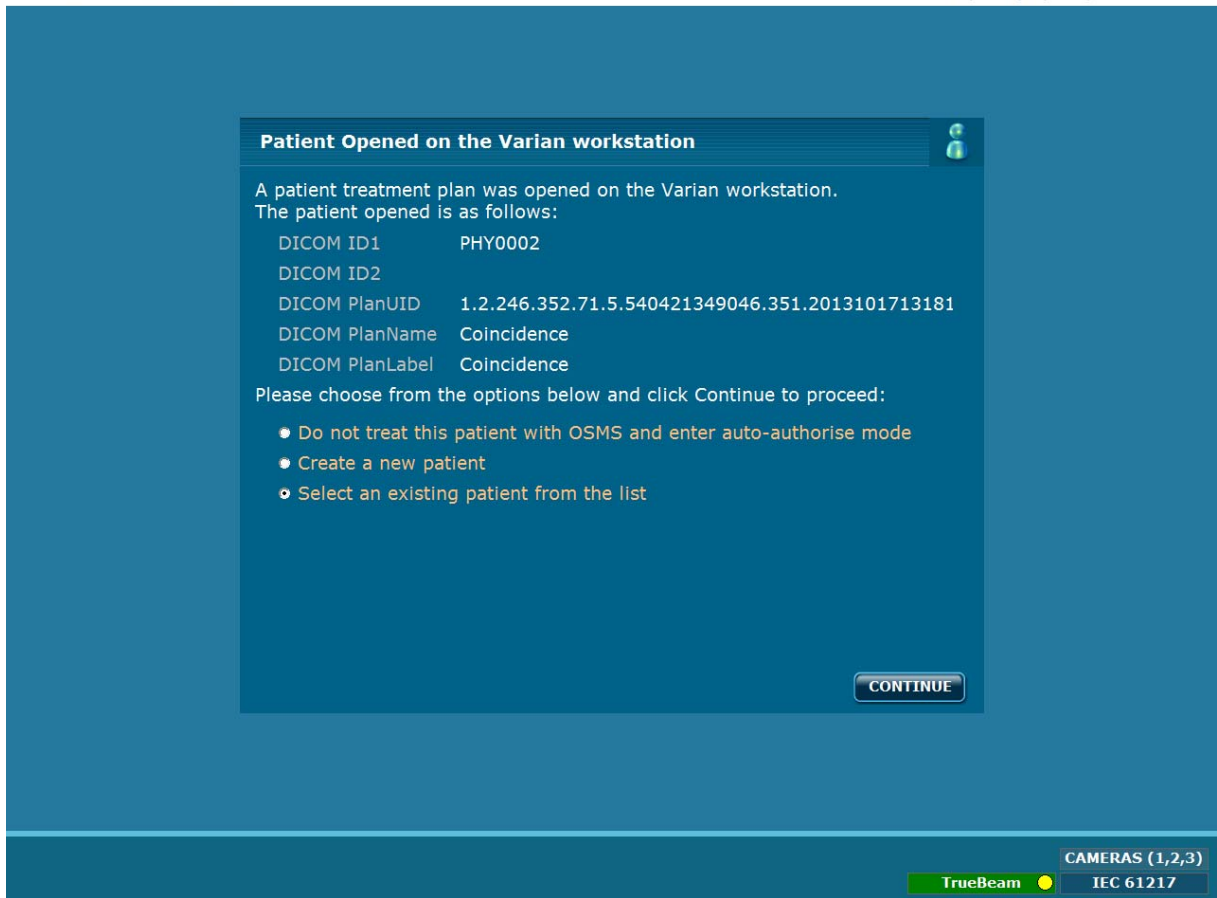
Imaging QA

1. Place the Mimi phantom on the table and align it to the prescribed offset position as indicated on the phantom using the phantom markings.
 - a. If you are using the Vision RT isocenter phantom, align to the marked offset position (Isocenter 2).
2. On the TB console go to Machine QA mode and login.


3. Click **Open Plan** button at the bottom left
4. Under the DailyQA directory, Open the **_Therapists** folder, then the **_Daily_Imaging** folder, and then **_Daily_Imaging.dcm**
5. If your TrueBeam has a gating device configured through MMI you will be prompted on the TrueBeam select "None" from the patient position monitoring devices.
 - a. If you do not have gating device configured through MMI you will not see this prompt



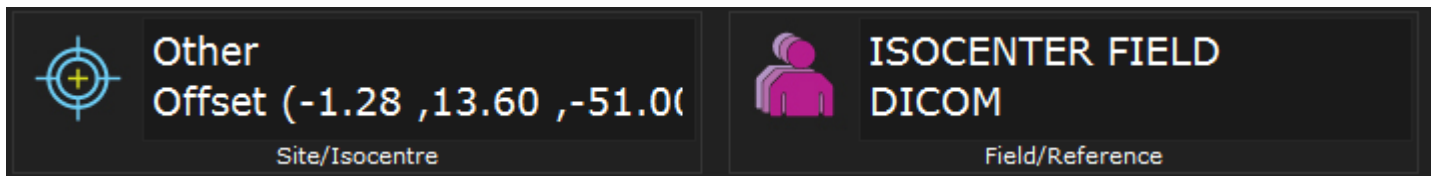
6. Select "Apply".
7. For MMI users AlignRT/OSMS will now identify the patient loaded on the Truebeam. Select "Continue".
 - a. If you do not have MMI you will have to open the Daily QA patient manually from the AlignRT/OSMS screen before continuing



8. Select the DailyQA patient on AlignRT/OSMS and press the **Treatment** button.

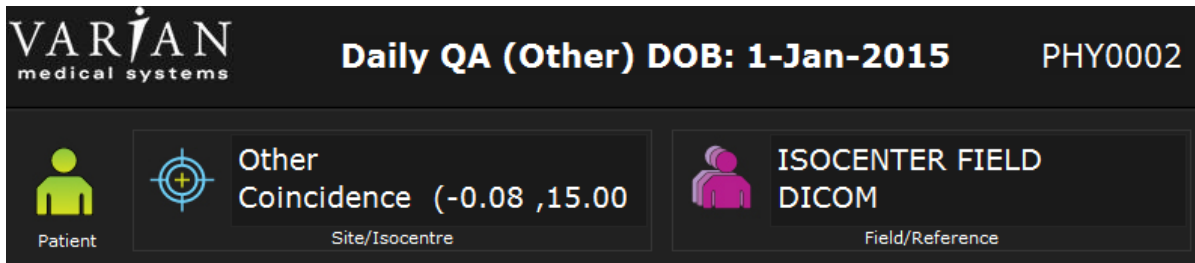
9. Select DICOM ISOCENTER FIELD from the Field/Reference drop down. Click the **Monitoring**  button and verify that the position of the phantom is within tolerance (1mm/1degree) and stop monitoring.

- a. Be sure that you are using the offset plan with the DICOM surface, not the coincidence plan or any treatment surfaces (DICOM ISOCENTER FIELD should be selected, not VRT ISOCENTER FIELD).



10. Pause monitoring and Select Capture/Reference, ensure the ROI transfers to the cube only and then resume monitoring.
 - a. If the ROI does not transfer properly alert physics.
11. Highlight the kV CBCT field, and press the **Prepare** button on the console (MMI users remember to authorize within AlignRT/OSMS).
12. The gantry and imager buttons should be red indicating that they need to move to position.
13. Click both buttons and **Motion Enable** to move the gantry and kV system into position.
14. Press the **kV Beam On** button on the console to acquire the CBCT.
15. During CBCT delivery verify AlignRT/OSMS functionality with maximum camera obstruction

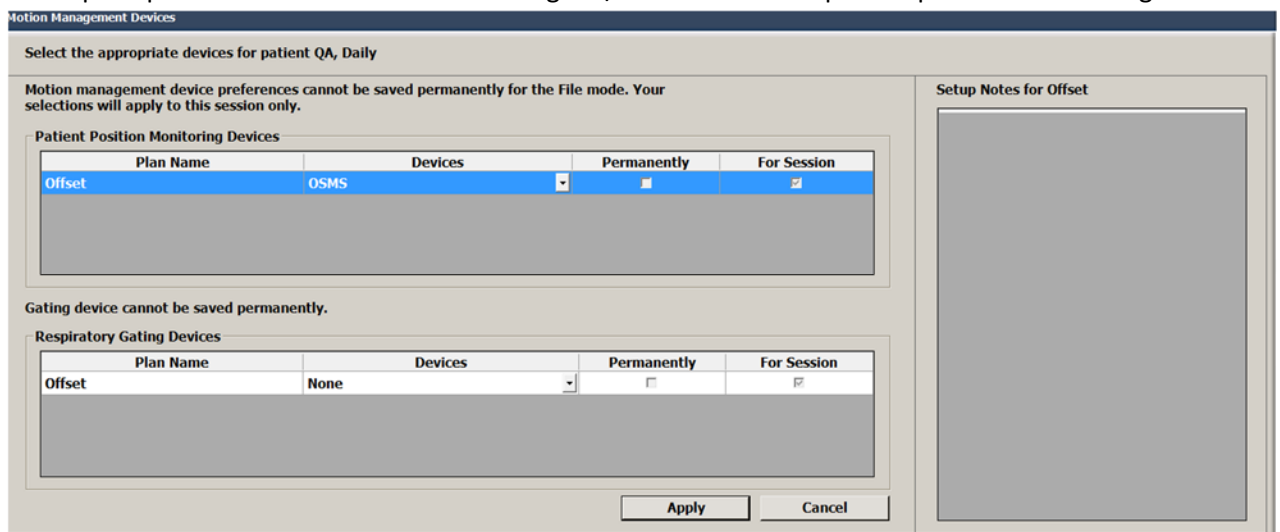
- a. Check for stable delta values throughout the CBCT acquisition
16. When the CBCT is done, use the IGRT tools to align the phantom.
17. If you have a 6-D couch de-select include Pitch/Roll in the shifts.
18. Apply the shift and record the values of the shift in ATLAS under the TB Imaging QA test set
 - a. You should also verify that the AlignRT/OSMS reported shifts during dynamic monitoring match the shifts applied with the CBCT (both correct magnitude and direction)
19. Retract the kV imaging arms.
20. Select Coincidence site/isocenter and the DICOM ISOCENTER FIELD from the Field/Reference drop down.



21. Click the **Monitoring** button and verify that the offset of the phantom is within tolerance.
 - a. Be sure that you are using the coincidence plan with the DICOM surface, not the offset plan or any treatment surfaces (DICOM ISOCENTER FIELD should be selected, not VRT ISOCENTER FIELD).
22. Verify values on AlignRT/OSMS are within tolerance (1mm/1degree) and stop monitoring.
23. Capture a treatment surface.
24. Go to **Surface Tools** -> **FSD** and compute the FSD value and make sure it's within 1mm of planned.
25. When finished, close the patient on the Truebeam. It is not necessary to save the plan so you can press Cancel at the prompt.
26. Close out of the Daily QA patient on AlignRT/OSMS and go to the main screen.

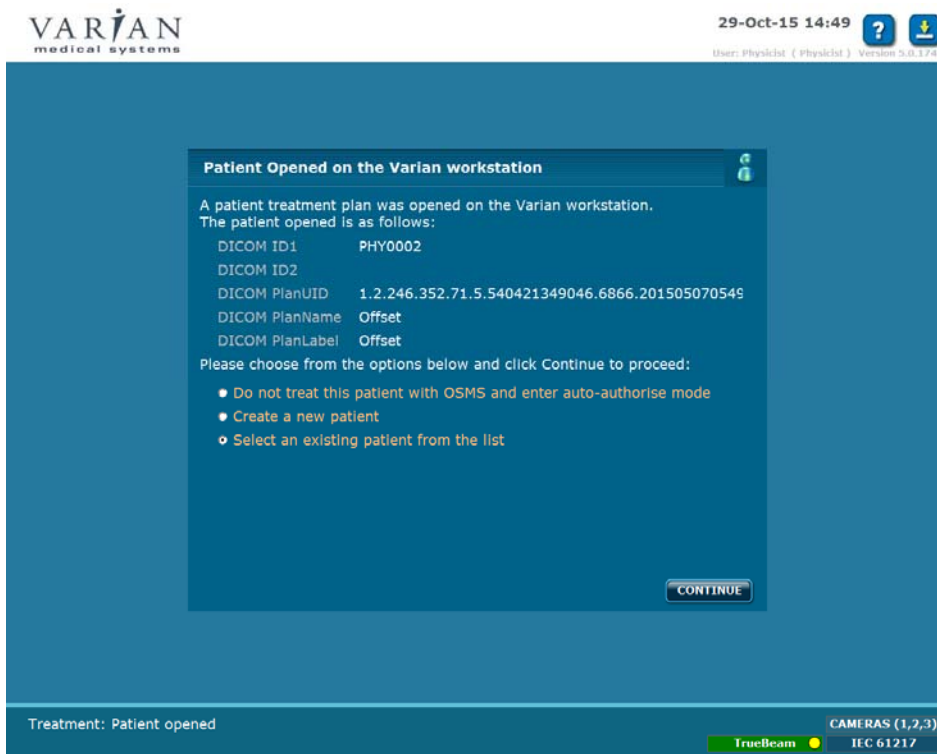
MMI QA

1. On the TrueBeam open the MMI plan by clicking **Open Plan** and going to the **_Daily_Imaging QA** folder and selecting the **_Daily_MMI.dcm** QA plan from the directory.
2. When prompted on the TrueBeam select "AlignRT/OSMS" from the patient position monitoring devices.

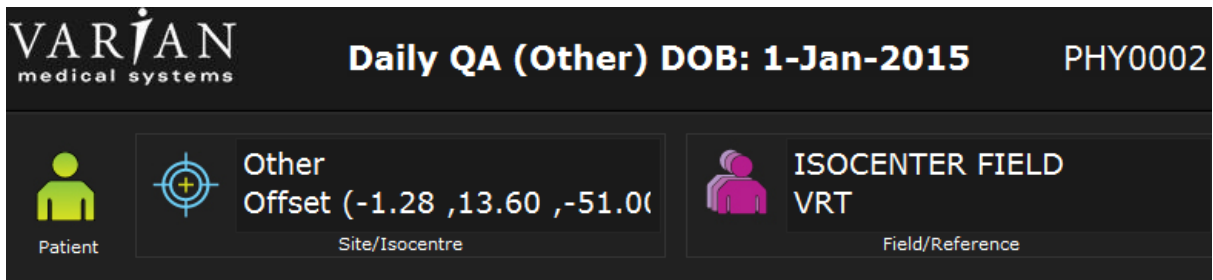


3. Select "Apply".

- AlignRT/OSMS will now identify the patient loaded on the Truebeam. Select "Continue".



- Make sure the Offset plan is loaded with the VRT ISOCENTER FIELD captured in step 10 of the Imaging QA section above (not DICOM). This is the reference surface you acquired at the beginning of imaging QA.



- Start monitoring.
- Hit Prepare on the Truebeam.
- The **Move Couch** button should now be active within AlignRT/OSMS.
- Click the **Move Couch** button and Apply the shifts sending them to the TrueBeam.
- On the Truebeam, motion enable to move the couch.
- Select **Done** within AlignRT/OSMS once they are applied.
- Verify that the translation is < 1mm within AlignRT/OSMS after the couch shifts were applied.
- Turn gating on by clicking Gate Beam. When disabled the icon is gray, when turned on it will be red.



- Hit MV Ready, and then MV Beam On to deliver the field.
- While delivering the field change the couch rotation selection drop down within AlignRT/OSMS to an alternate couch angle (for example 10 degrees).

16. Ensure that the beam is automatically turned off due to being out of tolerance. Set the couch angle back to zero and verify the beam resumes. Repeat this test two more times to ensure the gating works correctly.
 - a. Verify that MU1 and MU2 on the Truebeam as well as the backup indicator on the console indicate the full 200 MU was delivered.
17. Mode up and run the Door Interlock field. Verify the Above Door Light is functional, and open the door to interrupt the beam. Complete the beam delivery.
18. Mode up and run the 2 EDW check fields.
19. Complete the pass/fail tests in Atlas Daily Safety QA and EDW Check.
20. Close down the patient on the Truebeam and AlignRT/OSMS.
21. Go back in the vault and make sure the lasers are back on the offset markings where you setup the phantom within 1mm.

Shutdown (End of Treatment)

1. Rotate the gantry to 120 degrees and the collimator to 90 degrees
2. Retract the MLC leaves using either the pendant or the icons on the treatment mode screen
3. From the major mode window, put the machine into standby by clicking the green box in the upper right hand corner
4. Setup the MPC phantom
5. Be sure to leave the door closed or else it will not reset itself at 5:30 in the morning. If this is the case, you will have a time delay when you arrive