Delta4 for DQA

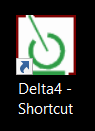
# Purpose

This procedure explains how to use the Delta4 software on the Delta4 computer (PONC066) to collect and analyze DQA dose delivery information. It is meant for use in the [Tomo](DQA%20on%20Tomo.docx) and [Elekta](DQA%20on%20Elekta.docx) DQA procedures in [T:\Physics\QA & Procedures\DQA](file:///T:\Physics\QA%20&%20Procedures\DQA).

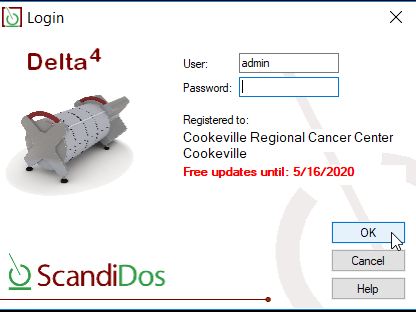
For DQA troubleshooting tips, see [DQA Troubleshooting](DQA%20Troubleshooting.docx) in [T:\Physics\QA & Procedures\DQA](file:///T:\Physics\QA%20&%20Procedures\DQA).

# Collecting Dose

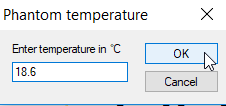
1. Open the DQA plan in Delta4.
   1. Double-click the Delta4 icon on the desktop of the Delta4 computer.



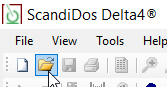
* 1. Log in with username admin and blank password.

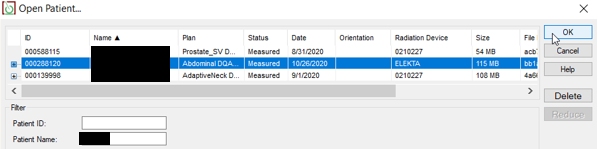


* 1. If Delta4 is set to use a temperature correction, you should be prompted for the temperature. (If this takes a minute, do not be alarmed.) Enter the temperature that you measured on the phantom.

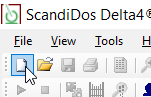


* 1. Click the folder in the top left corner and search the patient’s name.

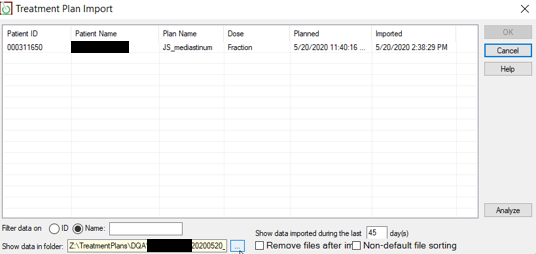


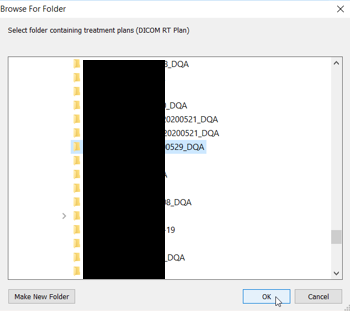


* If the patient exists in the database:
  1. Select the patient’s name and click **OK**.
  2. Go to **Edit** > **Add Measurement Plan**. Even if you are reshooting a plan (e.g., on a different machine), you should still **Add Measurement Plan**instead of **Add Measurement Course** as the latter automatically applies the phantom shifts from the plan that was last shot.
* If the patient does not exist, click the piece of paper in the top left corner to create a new patient.

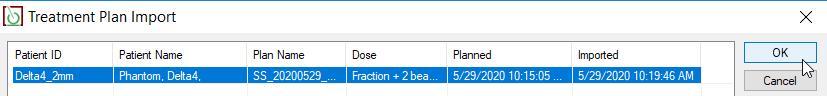


* 1. Click the browse button and navigate to the folder containing the DQA plan.





* 1. Select the plan and click OK.

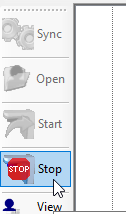


1. Shoot a beam.
   1. Select the beam.





* 1. Click **Start**. Then shoot the field on the machine.
  2. When the beam finishes, click **Stop**.



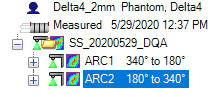
# Analyzing Dose

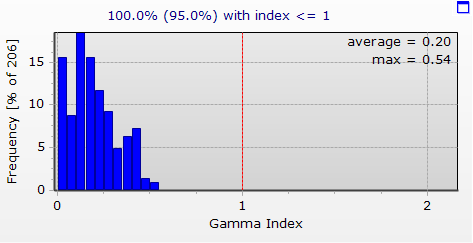
In accordance with [TG-218](../../../../Physics%20Papers,%20etc/AAPM_TG%20Reports/TG-218%20(Patient-Specific%20QA)), CRMC uses the following action and tolerance levels.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Plan type** | **Gamma pass ratio tolerance level (%)** | **Gamma pass ratio action level (%)** | **Dose difference action level (%)** | **DTA tolerance level (mm)** | **DTA action level (mm)** |
| SABR (incl. SBRT, SRT, and SRS) | 95 | 90 | 3 | N/A | 2 |
| Non-SABR | 95 | 90 | 3 | 2 | 3 |

The beam is green if it passes, red if it fails (is out of tolerance). Most physicists think it is more important than the individual beams to pass than the overall plan.

**Example:** Both beams pass.





100% ≥ 95%, so plan passes

1. Write down the initial dose deviation, DTA, and gamma pass rates, as well as the gamma average.
2. Rescale beam doses.
   1. Calculate the scale factor to four decimal places.

* For Tomo:
  + 1. Open the latest Tomo TG-51 calibration [spreadsheet](../../../../QA%20&%20Procedures/Tomo/Tomotherapy%20Monthly%20QA/Tomo%20Monthly%20Output%20Records/2022).
    2. Divide the measured output by the expected output. Round to four decimal places.



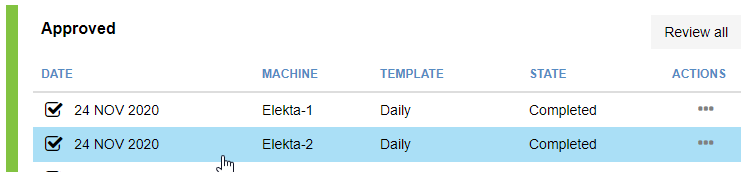
Example: 901.728 / 881 ≈ 1.0235

The output factor and the date it was obtained should also be on a sticky note on the Delta4 computer.

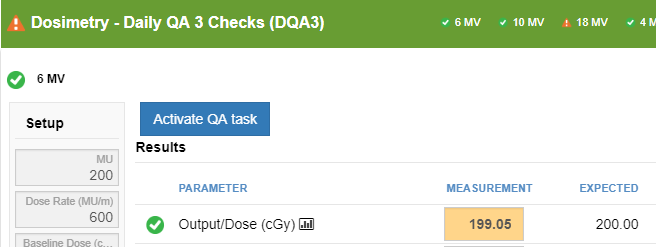
* For Elekta:
  + If daily QA was performed in SunCheck:
    1. In SunCheck, click **Home**.



* + 1. Click today’s approved daily QA for the appropriate machine.

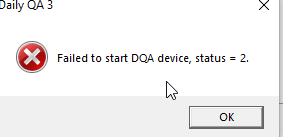


* + 1. For the appropriate energy (6MV in this example), divide the measured output by the expected output. Round to four decimal places.

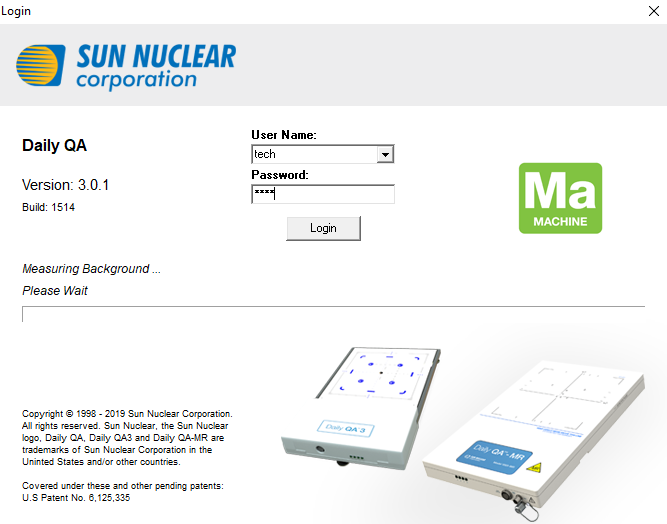


Example: 199.05 / 200.00 ≈ 0.9953

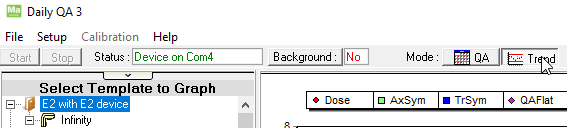
* + If daily QA was performed in DailyQA3:
    1. Open the DailyQA3 software. Since you are not measuring anything, you may ignore the following error:



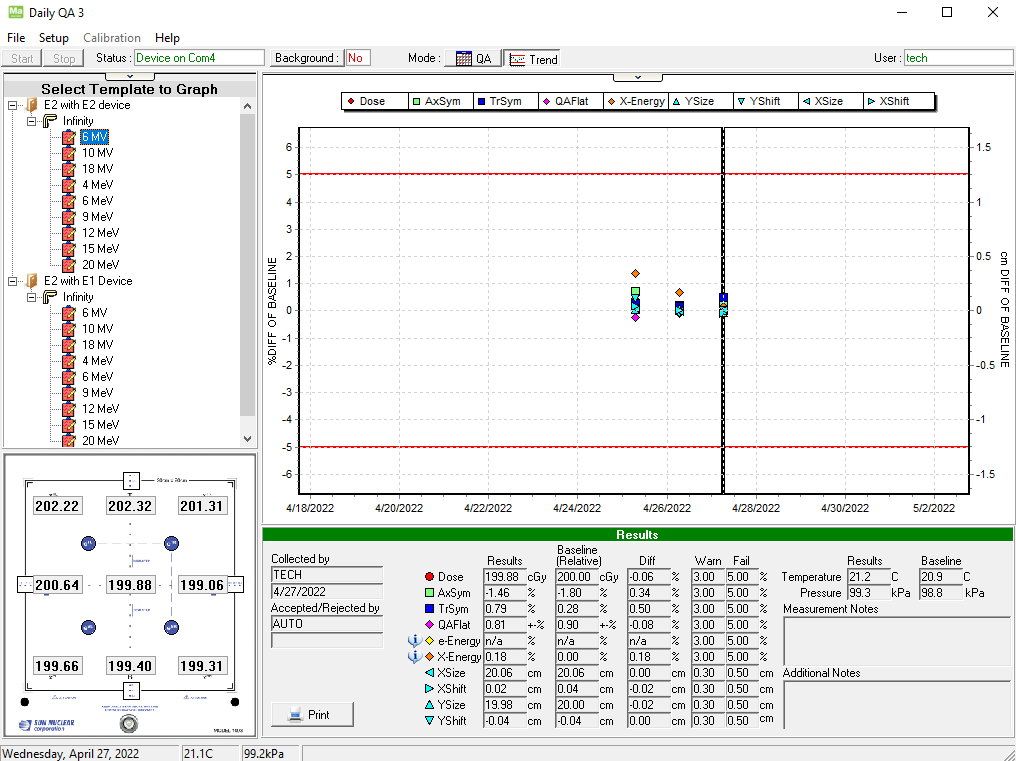
* + 1. Log in with username and password *tech*.



* + 1. Select today’s date on the calendar (it should already be selected) and click **Trend**.



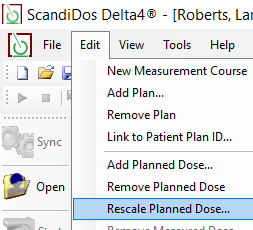
* + 1. Select the 6 MV energy under the device used. Navigate to today’s date on the graph. Divide the measured dose by the expected dose. Round to four decimal places.



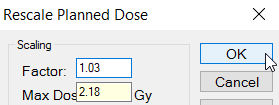
Example: 199.88 / 200 = 0.9994

* 1. Write down the scale factor.
  2. For each beam:
     1. With the beam selected, go to **Edit** > **Rescale Planned Dose…**

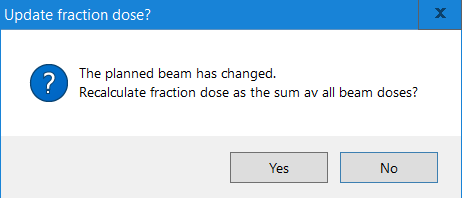




* + 1. Enter the scale factor in the **Factor** field and click **OK**.

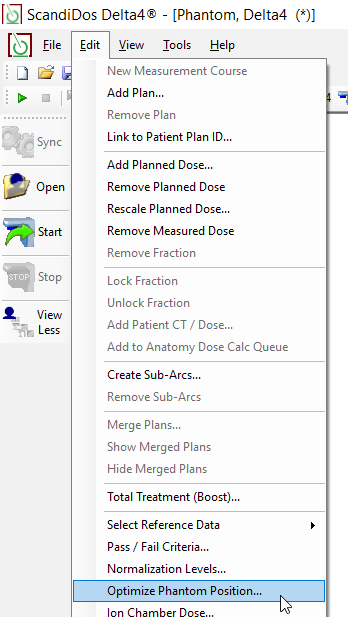


* + 1. When prompted, click **Yes**.

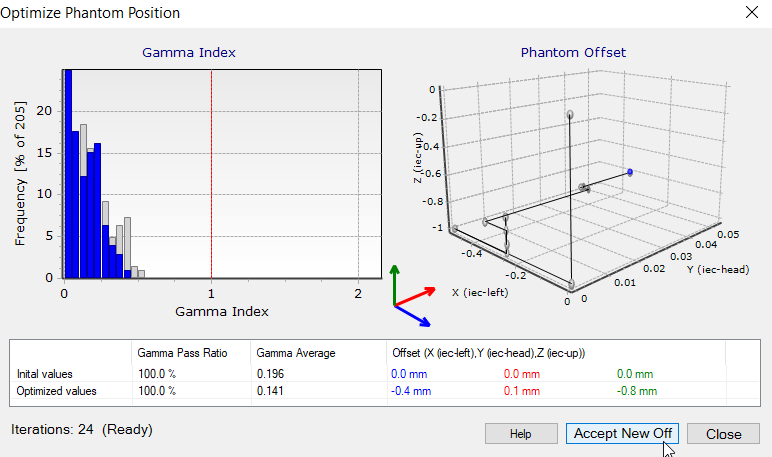


* 1. Write down the new dose deviation, DTA, and gamma pass rates, as well as the gamma average for the plan dose.

1. Optimize phantom position.
   1. With the plan selected, go to **Edit** > **Optimize phantom position**.

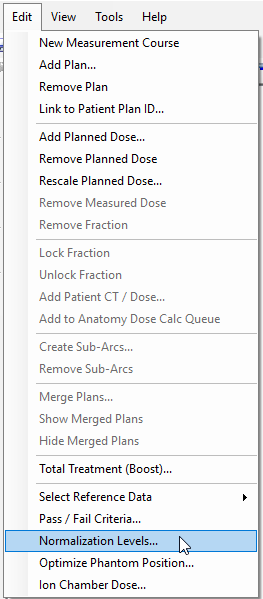
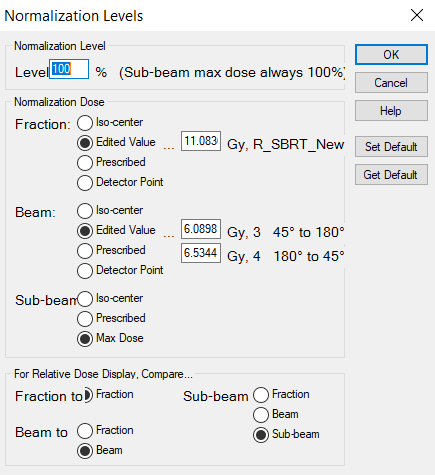


* 1. Wait until you see “Ready.” Shifts should be within tolerance according to DTA criterion. (Shifts are generally greater on Tomo than on Elekta.) Write down the initial and optimized X, Y, and Z offsets. Click **Accept New Off**.

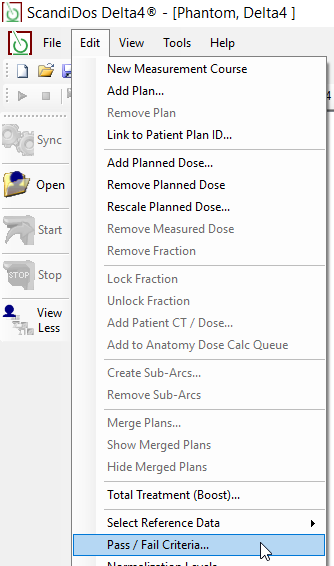
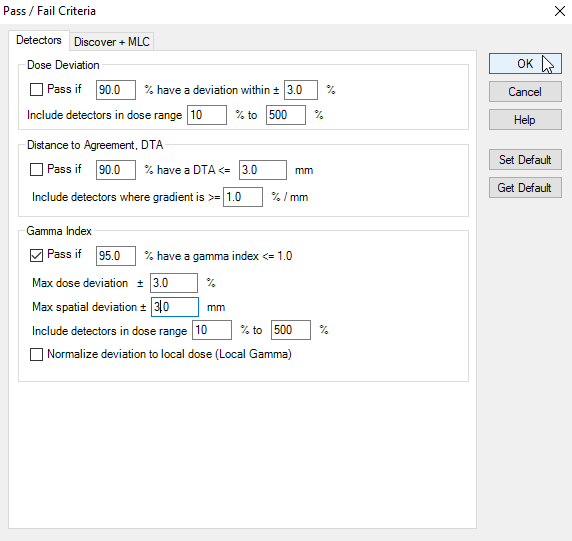


* 1. Write down the new dose deviation, DTA, and gamma pass rates, as well as the gamma average. For an Elekta plan, also write down the beam gamma pass ratios.

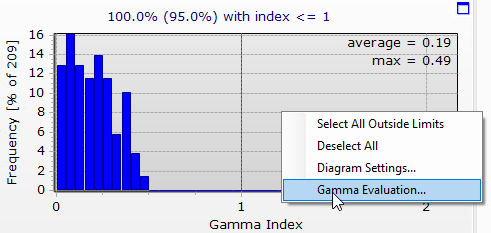
1. If plan is still at action level even after rescale and optimization, ensure that both fraction and beam dose are normalized to max dose (“Edited Value”), not isocenter.

1. For a non-SABR plan, if the pass ratio is still out of tolerance, change the DTA pass criterion to the action level. Note that the DTA must be changed in addition to gamma, in order to update all graphs.

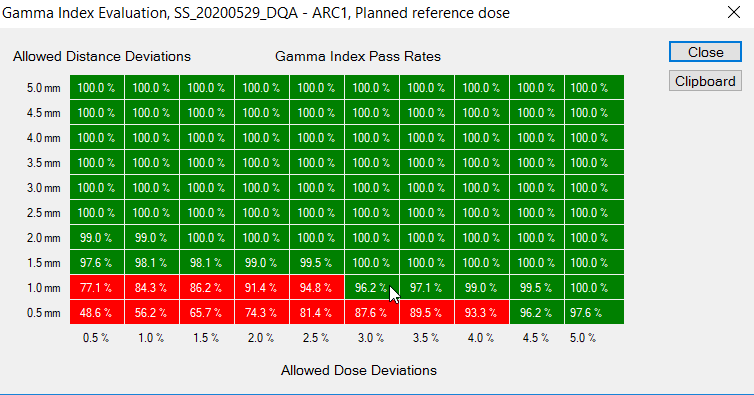
 

1. If the plan is still at action level, inform a physicist. They will likely suggest changing the pass/fail criteria (again). Estimate the criteria that will enable a pass by examining the **Gamma Evaluation** for the overall plan and individual beams.
   1. For each the overall plan and each beam, right-click the gamma histogram and select **Gamma Evaluation**.

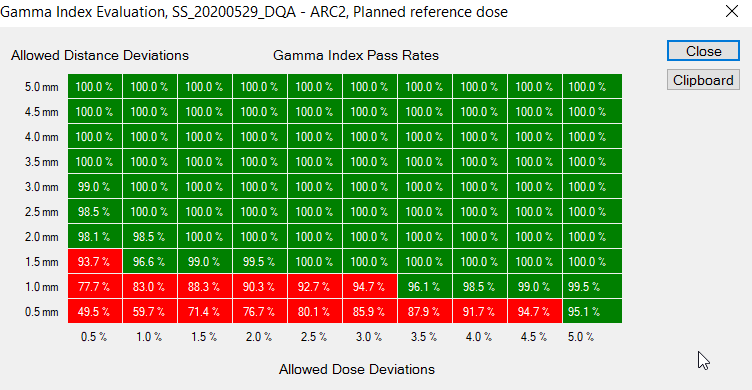


* 1. Find the most stringent distance deviation and DTA that enable a pass, such that both dose deviation and DTA are below action limit.

**Beam 1:**



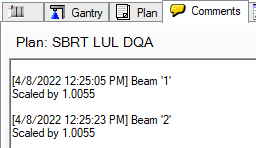
**Beam 2:**



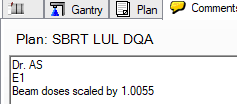
* 1. If the determined deviations are acceptable, change the pass/fail criteria.

# Printing a Report

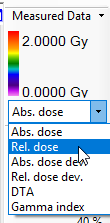
1. After you rescale the beam doses, the Comments should auto-populate (but occasionally do not):



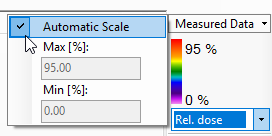
Clean this up and add the MD initials and the machine name.



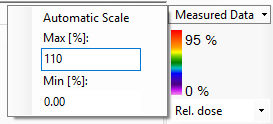
1. Change the dose display.
   1. Change the display from **Abs. dose** to **Rel. dose**.



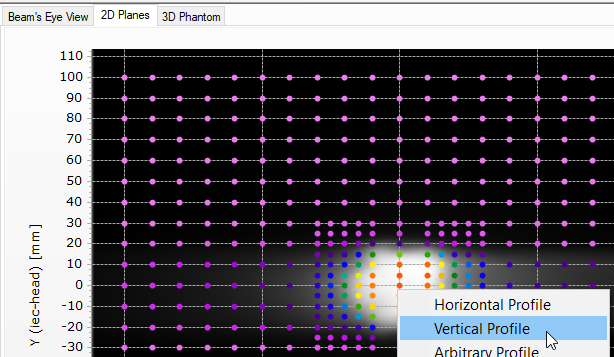
* 1. Turn off **Automatic Scale**.



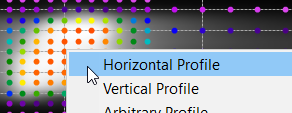
* 1. Change **Max [%]** to 110 for non-SABR and 125 for SABR.



1. Add dose profiles.
   1. On the first plane on the 2D Planes tab, right-click in the area of max dose and select **Vertical Profile**.



* 1. On the second plane, add a **Horizontal Profile**.

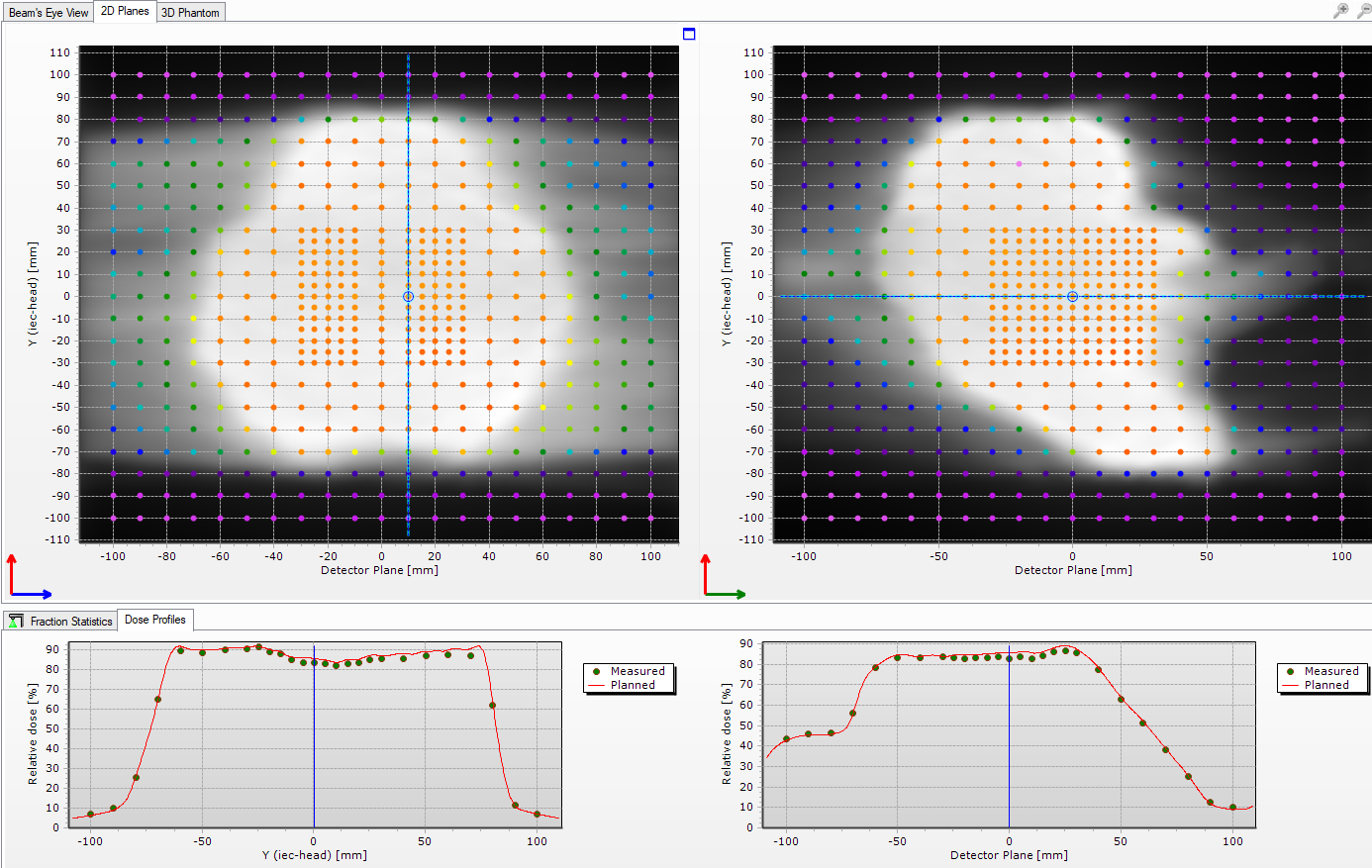


1. Ensure that the opposite dimension (horizontal for the vertical profile, and vice versa) is centered at zero. Drag the blue line on each profile to zero.

## Drag blue lines to 0

**Detector plane = 0**

## Y=0



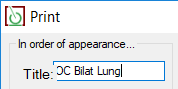
1. Save the patient using the save icon in the top left corner.



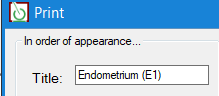
1. Print the Physics Report.
   1. Click the print icon in the top left corner.



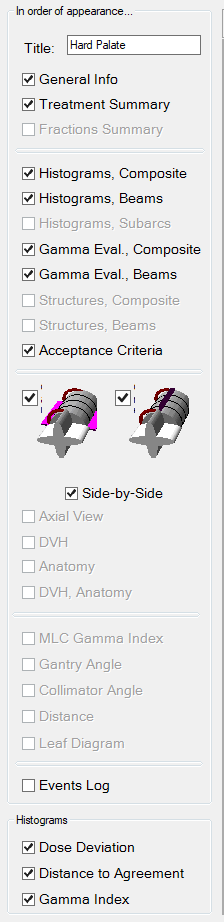
* 1. Change the name of the document to the plan name. If this is an Elekta plan, also include the machine name in parentheses. The machine name is not necessary for Tomo plans because the machine is unambiguous.
* For a Tomo plan:



* For an Elekta plan:

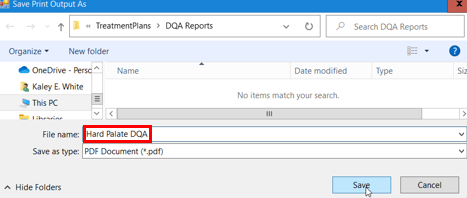


* 1. Use the following other print settings. These should be saved from last time.

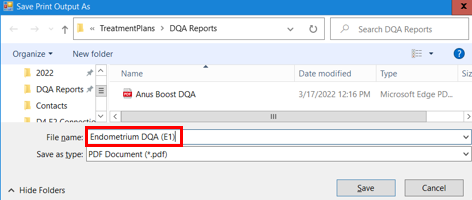


Click **OK**.

* 1. Save the document in **Z:\TreatmentPlans\DQA Reports** as <plan name> DQA for a Tomo plan, or <plan name> DQA (<machine name>) for an Elekta plan.
* For a Tomo plan:



* For an Elekta plan:



* 1. Files are deleted when they are uploaded into MOSAIQ as eSCAN documents, so copy the report to [T:\Physics\QA & Procedures\DQA\DQA Reports](file:///T:\Physics\QA%20&%20Procedures\DQA\DQA%20Reports).

1. Add the data you wrote down, to the DQA statistical analysis [spreadsheet](file:///\\vs20filesvr01\groups\CANCER\Physics\KW\med-phys-spreadsheets\PSQA%20Stats\PSQA%20Stats.xlsm). For an Elekta plan, also add the data to the Delta4 Absolute Cal PSQA Comparisons [spreadsheet](../../../med-phys-spreadsheets/Delta4%20Absolute%20Cal%20PSQA%20Comparisons.xlsx).