

# RAYPLAN 2023B

Release Notes

# 2023 B



**RayPlan**  
RayStation

Traceback information:  
Workspace Main version a800  
Checked in 2023-07-05  
Skribenta version 5.5.026\_1

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### *Declaration of conformity*



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# TABLE OF CONTENTS

<b>1</b>	<b>INTRODUCTION .....</b>	<b>7</b>
1.1	About this document .....	7
1.2	Manufacturer contact information .....	7
1.3	Reporting of incidents and errors in system operation .....	7
<b>2</b>	<b>NEWS AND IMPROVEMENTS IN RAYPLAN 2023B .....</b>	<b>9</b>
2.1	General system improvements .....	9
2.2	Patient modeling .....	9
2.3	Brachytherapy planning .....	10
2.4	Virtual simulation .....	11
2.5	Plan optimization .....	11
2.6	TomoTherapy planning .....	11
2.7	CyberKnife planning .....	11
2.8	Electron planning .....	11
2.9	DICOM .....	11
2.10	Plan reports .....	12
2.11	RayPhysics .....	12
2.12	Dose engine updates .....	13
2.13	Changed behavior of previously released functionality .....	15
<b>3</b>	<b>KNOWN ISSUES RELATED TO PATIENT SAFETY .....</b>	<b>17</b>
<b>4</b>	<b>OTHER KNOWN ISSUES .....</b>	<b>19</b>
4.1	General .....	19
4.2	Import, export and plan reports .....	20
4.3	Patient modeling .....	21
4.4	Brachytherapy planning .....	21
4.5	Plan design and 3D-CRT beam design .....	22
4.6	Plan optimization .....	22
4.7	Plan evaluation .....	22
4.8	CyberKnife planning .....	23
4.9	RayPhysics .....	23



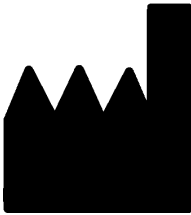
# 1 INTRODUCTION

## 1.1 ABOUT THIS DOCUMENT

This document contains important notes about the RayPlan 2023B system. It contains information related to patient safety and lists new features, known issues and possible workarounds.

**Every user of RayPlan 2023B must be familiar with these known issues.** Contact the manufacturer for any questions about the content.

## 1.2 MANUFACTURER CONTACT INFORMATION



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## 1.3 REPORTING OF INCIDENTS AND ERRORS IN SYSTEM OPERATION

Report incidents and errors to the RaySearch support email: [support@raysearchlabs.com](mailto:support@raysearchlabs.com) or to your local support organization via telephone.

Any serious incident that has occurred in relation to the device must be reported to the manufacturer.

Depending on applicable regulations, incidents may also need to be reported to national authorities. For the European Union, serious incidents must be reported to the competent authority of the European Union Member State in which the user and/or patient is established.





## 2 NEWS AND IMPROVEMENTS IN RAYPLAN 2023B

This chapter describes the news and improvements in RayPlan 2023B compared to RayPlan 12A.

### 2.1 GENERAL SYSTEM IMPROVEMENTS

- New function *Localize isocenter* available in the *Beams* list, *Setup beams* list and right-click menu on 2D patient views will scroll the 2D patient views to the position of the beam's isocenter.
- Color table dialog always displays both absolute and relative values.
- Performance improvements that speed up the opening and closing of patients with a lot of data.
- Performance improvements that result in faster copy, delete and undo delete for ROIs.
- The error message showing if there are overlapping material ROIs has been improved. The message now shows the names of the overlapping ROIs.
- The content in most drop-down lists and other lists (e.g. when listing ROIs, POIs, imaging systems etc.) is now sorted alphabetically by default.
- The patient data management workspace user interface has been improved.

### 2.2 PATIENT MODELING

- The *Simplify contours* dialog has been updated:
  - Pre-selected ROIs are displayed at the top of the list when the dialog is opened.
  - Counter is added to see how many ROIs are selected.
  - Confirmation is required when removing holes from fixation and support ROIs.
- Possibility to delete multiple contours has been added:
  - Contours in several slices for the selected ROI can be deleted, keeping contours in e.g. every 2nd, 3rd or 5th slice. Optionally, it is possible to define a limited range of image slices within which to do this.
- Possibility to delete multiple ROIs/POIs/geometries in *Structure definition* has been added, both in the toolbar and the ROI/POI list:

- If multiple ROIs/POIs are selected in the ROI/POI list, it is possible to delete all of them or their geometry on the primary image set at the same time. This is done either by clicking the *Delete* button in the toolbar or by right-clicking in the ROI/POI list and selecting *Delete ROI(s)/Delete POI(s)/Delete geometries*.
- The option to delete a geometry from the ROI/POI list is only available in the *Structure definition* module.
- The template material list has been updated:
  - The following materials have changed names:
    - + *Aluminum 1* to *Aluminum [Al]*
    - + *Aluminum 2* to *Aluminum +*
    - + *Bone 1* to *Bone*
    - + *Bone 2* to *Bone +*
    - + *Gold* to *Gold [Au]*
    - + *Iron* to *Iron [Fe]*
    - + *Lead* to *Lead [Pb]*
    - + *Silicon* to *Silicon [Si]*
    - + *Silver* to *Silver [Ag]*
    - + *Tantalum* to *Tantalum [Ta]*
    - + *Titanium* to *Titanium [Ti]*
- The following template materials have been removed:
  - Carbon fiber
  - Cork
  - PMI foam
- It is now possible to filter both the A and B list of ROIs in the *ROI algebra* dialog.
- It is now only possible to display Material for primary images. The option has been removed for secondary images.

## 2.3 BRACHYTHERAPY PLANNING

- Point based optimization: It is now possible to add objectives and constraints relating to the dose at points of interest.

## 2.4 VIRTUAL SIMULATION

- Setup beams and DRRs are now shown in the *Virtual Simulation* module. Note that DRRs will not be exported.

## 2.5 PLAN OPTIMIZATION

- The speed of VMAT optimization for machines without backup jaw in combination with protect ROIs or constraints has been improved. Such optimization may be many times faster than previously for some cases.
- Sliding window sequencing for VMAT has been changed to create segments where the MLC leaves conform more closely to the target volume than previously. Note that the segment-based mode in the MCO module is affected by this change as it always uses sliding window sequencing to create VMAT segments.
- It is now possible to run segment MU optimization and beam MU optimization using the photon Monte Carlo dose engine.

## 2.6 TOMOTHERAPY PLANNING

- Better dose centering during delivery when using Motion Synchronization for Radixact treatment machines.

## 2.7 CYBERKNIFE PLANNING

- Optimization of cone and iris plans is now substantially faster. In the initial stage of the optimization, dose is computed with the fast SVD dose engine. In the later stage, the clinical dose engine is used.
- Optimization of a CyberKnife plan can now be continued, even if the plan does not reference the latest RAMP file, as long as it remains feasible for delivery.

## 2.8 ELECTRON PLANNING

- Support for dose computation using multiple GPUs has been added.

## 2.9 DICOM

- The issues described in FSN 109886 regarding Virtual Simulation export and import have been fixed.
- The DICOM filter *RSL-D-61-450 Remove Pixel Intensity Relationship and Sign* is no longer needed. A checkbox configuration in RayPlan Physics replaces the filter.
- It is now possible to define a default value for the *Delete after successful import* selection in the import dialogs for Storage SCP.

- It is now possible to set both default import source and default export target in Clinic Settings. This configures which source/target is pre-selected when opening the import/export dialogs in RayPlan.
- Export of nominal dose rate for each control point for VMAT and Conformal Arc plans is now supported. There is a checkbox configuration in RayPlan Physics for this.
- It is now possible to export symmetrical jaw positions with values X/Y for plans where the jaw positions are symmetrical for all segments in all beams. There is a checkbox configuration in RayPlan Physics for this.
- It is now possible to omit MLC from export for cone plans with fully retracted MLC. There is a checkbox configuration in RayPlan Physics for this.
- The sorting order of studies and series in the import dialog has been updated to show the newest study/series first.
- When doing Query/Retrieve from a PACS system, where only a single patient was returned by the query, RayPlan will now only automatically query for studies within the patient (not for all series in all studies).

## 2.10 PLAN REPORTS

- It is now possible to define a default folder where generated reports will be stored. The folder is defined in Clinic settings.
- In the plan report, there is a new table for each beam set displaying the used support and fixation ROIs and their material properties. The *ROI properties* table for *Plan* will no longer contain material information for fixation and support ROIs. Make sure that the new *Fixation & support ROIs* table becomes included in a suitable location when updating existing report templates. (In the Report designer, the table is displayed in *Data modules: Tables > Beam set > Fixation & support ROIs*. It requires scope *Beam set*).

## 2.11 RAYPHYSICS

### *Photon beam commissioning*

- It is now possible to see dose difference curves together with measured and computed curves in the dose curve graph. It is also possible to export the dose difference curves.
- It is now possible to see gamma curves together with measured and computed curves in the dose curve graph. It is also possible to export the gamma curves.
- Two additional MLC parameters have been introduced: leaf tip transmission and corner transmission. This will allow improved modeling of the MLC leaf tip region for MLCs with tilted surface between the leaves, for example the Elekta Agility MLC. The new parameters have default values set which will result in equivalent computed dose as in previous RayPlan versions.
- Template machines have been updated.

- It is now possible to set several machine parameters per energy: maximum DMMLC dose rate, minimum and maximum static arc dose rate, minimum MU per leaf travel distance, minimum and maximum MU per gantry degree, minimum MU per arc segment.
- It is now possible to commission machines which have only the backup jaw fixed. This is done by setting the minimum and maximum backup jaw limit to the same value.
- It is now possible to use different phantom size in x, y and depth directions for dose curve calculations in RayPlan Physics.
- It is now possible to have a maximum field size larger than 40 cm for machines (up to 64 cm).

### *Electron beam commissioning*

- It is now possible to see dose difference curves together with measured and computed curves in the dose curve graph. It is also possible to export the dose difference curves.
- It is now possible to see gamma curves together with measured and computed curves in the dose curve graph. It is also possible to export the gamma curves.
- It is now possible to select different shapes (rounded or focused) for MLC leaf/jaw tips. Previously, focused was always used. Setting rounded collimators makes the modeling better for machines with such collimator shape.
- It is now possible to select the additional materials Zinc-Aluminum and Lead for applicator scraper layers.
- Template applicators for Varian and Elekta have been updated.
- Template machines have been updated.

## 2.12 DOSE ENGINE UPDATES

The changes to the dose engines for RayPlan 2023B are listed below.

The dose effect refers to the effect when recommissioning of the machine is not performed. After successful recommissioning the dose changes should be minor.

Dose engine	Version 12A SP1	Version 2023B	Dose effect	Comment
All	-	-	-	New voxel volume algorithm version due to an update of the conversion algorithm used when converting an ROI from mesh representation to voxel representation. When ROIs are modified, the resulting ROI volumes might be slightly different compared to the same operation in previous versions of RayPlan.

Dose engine	Version 12A SP1	Version 2023B	Dose effect	Comment
Photon Collapsed Cone	5.7	5.8	Minor	<p>Adjustment to the MLC transmission map has been made: The leaf tip region now has a separate, user editable, transmission and a new region called the corner region with a separate transmission has been added.</p> <p>Existing machine models are automatically updated to give the same transmission regions as before.</p> <p>Minor additional improvements and adjustments have been made to the transmission map to improve performance. For example, Elekta Motorized Wedge fluence is minimally reduced: Only the open region is now considered, compared to all MLC regions from RayPlan 12A and earlier.</p> <p>Changes at the level of 0.3% have been seen for 1 cm x 1 cm<sup>2</sup> square fields due to the transmission map changes (size of output change depends on beam model).</p> <p>The changes are small enough so that recommissioning is not required.</p>
Photon Monte Carlo	2.0	3.0	Major	<p>Improved handling of positron physics. For external beam treatment energies, the difference is small. The most noticeable difference is changed output for large field sizes.</p> <p>Improved handling of multiple coulomb scattering.</p> <p>The same fluence map updates as described above for Collapsed Cone are also introduced for Photon Monte Carlo. Existing machine models need to be recommissioned.</p>

Dose engine	Version 12A SP1	Version 2023B	Dose effect	Comment
Electron Monte Carlo	4.0	5.0	Major	Improved handling of positron physics. Improved handling of scatter electrons from scraper layers. Improved handling of multiple coulomb scattering. Existing machine models need to be re-commissioned.
Brachy TG43	1.3	1.4	Negligible	No relevant changes to the dose computation algorithm in brachytherapy plans.

### 2.13 CHANGED BEHAVIOR OF PREVIOUSLY RELEASED FUNCTIONALITY

- A bolus is no longer visualized in 3D views if not used in the currently selected beam set.
- Note that RayPlan 11A introduced some changes regarding prescriptions. This information is important if upgrading from a RayPlan version earlier than 11A:
  - Prescriptions will always prescribe dose for each beam set separately. Prescriptions defined in RayPlan versions prior to 11A relating to beam set + background dose are obsolete. Beam sets with such prescriptions cannot be approved and the prescription will not be included when the beam set is DICOM exported.
  - Prescription percentage is no longer included in exported prescription dose levels. In RayPlan versions prior to 11A, the Prescription percentage defined in RayPlan was included in the exported Target Prescription Dose. This has been changed so that only the Prescribed dose defined in RayPlan is exported as Target Prescription Dose. This change also affects exported nominal dose contributions.
  - In RayPlan versions prior to 11A, the Dose Reference UID exported in RayPlan plans was based on the SOP Instance UID of the RT Plan/RT Ion Plan. This has been changed so that different prescriptions can have the same Dose Reference UID. Because of this change, the Dose Reference UID of plans exported prior to 11A has been updated so that if the plan is re-exported a different value will be used.
- Note that RayPlan 11A introduced some changes regarding Setup imaging systems. This information is important if upgrading from a RayPlan version earlier than 11A:
  - A Setup imaging system (in earlier versions called Setup imaging device) can now have one or several Setup imagers. This enables multiple setup DRRs for treatment beams as well as a separate identifier name per setup imager.
    - + Setup imagers can be gantry-mounted or fixed.
    - + Each setup imager has a unique name which is shown in its corresponding DRR view and is exported as a DICOM-RT Image.

- + A beam using a setup imaging system with multiple imagers will get multiple DRRs, one for each imager. This is available for both setup beams and treatment beams.
- Note that RayPlan 11B introduced changes in the dose statistics calculations. This means that small differences in evaluated dose statistics are expected when comparing to a prior version.

This affects:

- DVHs
- Dose statistics
- Clinical goals
- Prescription evaluation
- Optimization objective values

This change also applies to approved beam sets and plans, meaning that, for example, prescription and clinical goals fulfillment may change when opening a previously approved beam set or plan from a RayPlan version prior to 11B.

The dose statistics accuracy improvement is more noticeable with increasing dose range (difference between minimum and maximum dose within an ROI), and only minor differences are expected for ROIs with dose ranges smaller than 100 Gy. The updated dose statistics no longer interpolates values for Dose at volume,  $D(v)$ , and Volume at dose,  $V(d)$ . For  $D(v)$ , the minimum dose received by the accumulated volume  $v$  is instead returned. For  $V(d)$ , the accumulated volume that receives at least the dose  $d$  is returned. When the number of voxels within an ROI is small, the discretization of the volume will become apparent in the resulting dose statistics. Multiple dose statistics measures [e.g., D5 and D2] may get the same value when there are steep dose gradients within the ROI, and similarly, the dose ranges lacking volume will appear as horizontal steps in the DVH.



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## 3 KNOWN ISSUES RELATED TO PATIENT SAFETY

There are no known issues related to patient safety in RayPlan 2023B.

**Note:** *Additional release notes may potentially be distributed shortly after installation.*



## 4 OTHER KNOWN ISSUES

### 4.1 GENERAL

#### *The auto recovery feature does not handle all types of crashes*

The auto recovery feature does not handle all types of crashes and sometimes when trying to recover from a crash RayPlan will show an error message with the text "Unfortunately auto recovery does not work for this case yet". If RayPlan crashes during auto recovery, the auto recovery screen will pop up next time RayPlan is started. If this is the case, discard the changes or try to apply a limited number of actions to prevent RayPlan from crashing.

[144699]

#### *Limitations when using RayPlan with large image set*

RayPlan now supports import of large image sets (>2GB), but some functionality will be slow or cause crashes when using such large image sets:

- Smart brush/Smart contour/2D region growing are slow when a new slice is loaded
- Creating large ROIs with gray-level thresholding might cause a crash

[144212]

#### *Slight inconsistency in dose display*

The following applies to all patient views where dose can be viewed on a patient image slice. If a slice is positioned exactly on the border between two voxels, and dose interpolation is disabled, the dose value presented in the view by the "Dose: XX Gy" annotation can differ from the actual presented color, with regards to the dose color table.

This is caused by the text value and the rendered dose color being fetched from different voxels. Both values are essentially correct, but they are not consistent.

The same can occur in the dose difference view, where the difference might seem larger than it actually is, because of neighboring voxels being compared.

[284619]

#### *Cut plane indicators are not displayed in 2D patient views*

The cut planes, used to limit the CT data used for computing a DRR, are not visualized in regular 2D patient views. To be able to view and use cut planes, use the DRR settings window.

[146375]

### *Fixation and Support ROIs added after beam set approval will have no effect when computing evaluation dose for the beam set*

It is possible to add Fixation and Support ROIs to a case with approved plans or beam sets. Geometries for such ROIs cannot be added to the image set used for the approved beam set, but can be added to other image sets. Dose computation on other image sets (in the Plan evaluation module and in the Dose tracking module) will only consider the Fixation and Support ROIs that existed at the time of beam set approval. Density values for new Fixation and Support ROIs will not be taken into account. Fixation and support ROIs not included in the dose computation are indicated by a dashed line in the patient views. The material view will show that the excluded Fixation and Support ROIs have no effect on the density considered for dose computation.

**Note:** Geometries added on additional image sets for a Fixation or Support ROI that existed at the time of beam set approval will be included in dose computation for the evaluation dose.

[?26053]

### *No warning is given when deleting a case containing approved plans*

When a patient containing an approved plan is selected for deletion, the user will be notified and given the opportunity to cancel the deletion. However, if a case containing an approved plan is selected for deletion for a patient with multiple cases, no warning will be given to the user that an approved plan is about to be deleted.

[770318]

## **4.2 IMPORT, EXPORT AND PLAN REPORTS**

### *Import of approved plan causes all existing ROIs to be approved*

When importing an approved plan to a patient with existing unapproved ROIs, the existing ROIs can become automatically approved. If this occurs, a UI message is given at import stating that the plan approval status will be transferred to the RTStruct.

336266

### *Laser export not possible for decubitus patients*

Using the laser export functionality in the Virtual simulation module with a decubitus patient causes RayPlan to crash.

[331880]

### *RayPlan sometimes reports a successful TomoTherapy plan export as failed*

When sending a RayPlan TomoTherapy plan to iDMS via RayGateway, there is a timeout in the connection between RayPlan and RayGateway after 10 minutes. If the transfer is still ongoing when the timeout starts, RayPlan will report a failed plan export even though the transfer is still in progress.

If this happens, review the RayGateway log to determine if the transfer was successful or not.

338918

### **Report Templates must be upgraded after upgrade to RayPlan 2023B**

The upgrade to RayPlan 2023B requires upgrade of all Report Templates. Also note that if a Report Template from an older version is added using Clinic Settings, this template must be upgraded to be used for report generation.

Report Templates are upgraded using the Report Designer. Export the Report Template from Clinic Settings and open it in the Report Designer. Save the upgraded Report Template and add it in Clinic Settings. Do not forget to delete the old version of the Report Template.

[138338]

## **4.3 PATIENT MODELING**

### **Floating view in Image registration module**

The floating view in the Image registration module is now a fusion view that only displays the secondary image set and contours. The change of the view type has changed how the view works/displays information. The following have changed:

- It is not possible to edit the PET color table from the floating view. The PET color table in the Secondary image set can be changed via Fusion tab instead.
- Scrolling in the floating view is limited to the Primary image set, e.g., if the Secondary image set is larger or does not overlap the Primary in the fusion views it will not be possible to scroll through all slices.
- Position, Direction (transversal/sagittal/coronal), Patient direction letters, Imaging system name and Slice number are no longer displayed in the floating view.
- Image value in the floating view is not displayed if there is no registration between the Primary and Secondary image sets.

[409518]

## **4.4 BRACHYTHERAPY PLANNING**

### **Mismatch of planned number of fractions and prescription between RayPlan and SagiNova**

There is a mismatch in the interpretation of the DICOM RT Plan attributes *Planned number of fractions* (300A,0078) and *Target prescription dose* (300A,0026) in RayPlan compared to the brachytherapy afterloading system SagiNova. This applies specifically to SagiNova versions 2.1.4.0 or earlier. If the clinic is using a version later than 2.1.4.0, contact customer support to verify whether the issue persists.

When exporting plans from RayPlan:

- The target prescription dose is exported as the prescription dose per fraction multiplied by the number of fractions of the beam set.
- The planned number of fractions is exported as the number of fractions for the beam set.

When importing plans into SagiNova for treatment delivery:

- The prescription is interpreted as the prescription dose per fraction.
- The number of fractions is interpreted as the total number of fractions, including fractions for any previously delivered plans.

Possible consequences are:

- At treatment delivery, what is displayed as prescription per fraction on the SagiNova console is actually the total prescription dose for all fractions.
- It might not be possible to deliver more than one plan for each patient.

Consult with SagiNova application specialists for appropriate solutions.

[285641]

## 4.5 PLAN DESIGN AND 3D-CRT BEAM DESIGN

### *Center beam in field and collimator rotation may not keep the desired beam openings for certain MLCs*

Center beam in field and collimator rotation in combination with "Keep edited opening" might expand the opening. Review apertures after use and if possible use a collimator rotation state with "Auto conform".

[144701]

## 4.6 PLAN OPTIMIZATION

### *No feasibility check of max leaf speed performed for DMMLC beams after dose scaling*

DMMLC plans that result from an optimization are feasible with respect to all machine constraints. However, manual rescaling of dose [MU] after optimization may result in violation of the maximum leaf speed depending on the dose rate used during treatment delivery.

[138830]

## 4.7 PLAN EVALUATION

### *Material view in Approval window*

There are no tabs to select to display the material view in the Approval window. The material view can be selected instead by clicking on the image set name in a view and then selecting material in the drop-down that appears.

[409734]

## 4.8 CYBERKNIFE PLANNING

### *Verifying deliverability of CyberKnife plans*

CyberKnife plans created in RayPlan may, for about 1% of the cases, fail the deliverability validation. Such plans will not be deliverable. The affected beam angles will be identified by the deliverability checks that are run at plan approval and plan export.

[344672]

## 4.9 RAYPHYSICS

### *Updated recommendations for detector height usage*

Between RayPlan 11A and RayPlan 11B, recommendations on the usage of detector height and depth offset for depth dose curves have been updated. If the previous recommendations were followed, the modeling of the build-up region for photon beam models could lead to surface dose overestimation in computed 3D dose. When upgrading to a RayPlan version newer than 11A, it is recommended to review and, if needed, update photon beam models with respect to the new recommendations. Refer to section *Detector height and depth offset* in *RSL-D-RP-2023B-REF*, *RayPlan 2023B Reference Manual*, section *Depth offset and detector height* in *RSL-D-RP-2023B-RPHY*, *RayPlan 2023B RayPlan Physics Manual* and *RSL-D-RP-2023B-BCDS*, *RayPlan 2023B Beam Commissioning Data Specification* for information about the new recommendations.

[410561]









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