RAYSTATION 10A SP1

Release Notes

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1   INTRODUCTION

1.1   ABOUT THIS DOCUMENT

This document contains important notes about the RayStation 10A system. It contains information related to patient safety and lists new features, known issues and possible workarounds.

Every user of RayStation 10A must be familiar with these known issues. Contact the manufacturer for any questions about the content.

1.2   MANUFACTURER CONTACT INFORMATION
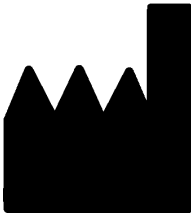
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1.3   REPORTING OF INCIDENTS AND ERRORS IN SYSTEM OPERATION

Report incidents and errors to the RaySearch support email: support@raysearchlabs.com 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 RAYSTATION 10A

This chapter describes the news and improvements in RayStation 10A compared to RayStation 9B SP1.

2.1   HIGHLIGHTS

• Planning for ocular proton treatments.

• Machine Learning optimization in the Plan explorer module.

• Proton Monte Carlo dose engine on GPU.

• Auto-navigation based on prioritized clinical goals for photon plans in the Multi-criteria optimization module (MCO).

• Support for arbitrary photon field openings in RayPhysics.

• Auto-modeling for electrons in RayPhysics.

• Calculation of relative EPID response for pre-treatment QA of photon plans.

2.2   PLANNING FOR PROTON OCULAR TREATMENTS

• Classical ocular gaze planning, but with CT/MR based patient modeling.

• Dedicated parameterized eye model including tantalum clips.

• Fundus view with registration of fundus photo.

• Target definition in Fundus view or using the standard delineation tools on CT/MR.

• Radiograph handling for clip position verification and setup.

• Dose grid resolution between 0.2 mm and 1.0 mm.

2.3   MACHINE LEARNING

• Possibility to use Machine Learning optimization in the Plan explorer module for single beam set models.

 - Machine Learning model is selected per plan.

 - Clinical goals are used for evaluation of the plans.

- Improved settings editor in RayMachine.

2.4   GENERAL SYSTEM IMPROVEMENTS

- Close plan is now available from the RayStation menu.

- When selecting an ROI or POI from a drop-down list it is now possible to more easily find the desired ROI/POI by typing one or more characters to filter the list of ROIs/POIs. When the drop-down list is opened, the current selection is replaced with a text entry field, initially showing the name of the currently selected ROI/POI. Start typing to reduce the size of the drop-down list. If only one ROI/POI remains in the list, it will be automatically selected. If the list becomes empty, the selection is cleared.

2.5   PATIENT MODELING

- The move POI tool has a new mode to prevent the POI to snap to the clicked slice. When pressing the ALT key while interacting, the POI remains at the distance to the current slice.

- The New ROI drop-down menu has been reordered for improved usability.

- Structure definition has a new workspace layout available. This layout is denoted *Combined* and enables the user to see both the primary and secondary image sets for all patient directions at once. The top left area can be switched between primary and fusion view.

2.6   PLAN SETUP

- Setup beams created for a fixed setup imaging device will get a default couch rotation when used with machines where only a single couch rotation value is allowed.

- Possibility to use fixed setup imaging device for treatment beam DRR generation (ions only).

2.7   GENERAL IMPROVEMENTS FOR LINAC TREATMENTS MACHINES

- Possibility to define minimum and maximum tip positions per leaf pair for MLCs in RayPhysics.

- Possibility to define minimum and maximum MU allowed for beams that use wedges. This is specified per wedge in RayPhysics. The functionality is mainly intended for Siemens virtual and Varian enhanced dynamic wedges, but it is possible to define minimum and maximum MU for all wedge types. For Elekta motorized wedge, the minimum/maximum MU will apply to the total MU per fraction and not to the wedge-in MU.

2.8   QA PREPARATION

- Possibility to compute relative EPID response for pre-treatment QA of photon plans. The response is exported as a DICOM RTImage, which can be compared to the measured EPID response in an external comparison software. The EPID QA functionality has been validated for Varian machines.

2.9   VIRTUAL SIMULATION

- Possibility to configure creation of external ROI geometry as well as dose grid assignment for the default plan creation. Configuration is done in Clinic Settings.

- Conformed beams will by default get no MU.

2.10   3D-CRT BEAM DESIGN

- Support for automated collimator angle selection for conformal arcs to facilitate stereotactic planning. The angle selection is based on target projection with the goal to minimize the exposure of healthy tissue in-between targets. The feature, Smart angles, is an option in the Treat tab and is used in combination with the Conform function.

- Improved positioning of closed leaf pairs for Conformal Arcs.

- Workflow improvement for copied beams. Dose computations performed in the 3D-CRT Beam Design module will assign a default value of 1 MU to 3D-CRT beams.

- Aperture creation for new 3D-CRT-beams no longer give the new beam a default MU value. Computed plan dose for existing beams will be preserved.

- Reset beam(s) in the 3D-CRT beam design module will preserve beam MU.

- When adding/copying a beam with a wedge with a defined minimum MU, the new beam will get MU set to the minimum wedge MU.

- When assigning a wedge with a defined minimum MU to a beam in the Beams list, the beam MU will be set to the minimum wedge MU if the beam MU is below the minimum wedge MU.

2.11   PLAN OPTIMIZATION

- Robustness can be used in combination with the Treat functionality.

- Improved jaw positioning during optimization for LINACs with jaw positions per segment.

2.12   MULTI CRITERIA OPTIMIZATION (MCO)

- Support for automatic navigation of Pareto plans where the navigation state is optimized to fulfill clinical goals in order of priority (photons only).

2.13   PROTON PENCIL BEAM SCANNING PLANNING

- Monte Carlo dose computation for final dose and optimization moved to GPU.

2.14   SCRIPTING

- Improvements to scripting methods for rigid registration.

- Possibility to set primary and secondary image sets from scripting.

2.15 CLINIC SETTINGS

- Clinic Settings now uses the same dark theme as RayStation.

- The tab System admin has been added. It contains settings related to system administrative tasks, most of which were previously found in the Preferences tab. The System admin tab also contains the settings from the HPC tab (removed).

- General dose settings have moved to the Preferences tab.

- The layout of Clinic Settings has been changed to reduce the amount of scrolling and make better use of the window area.

- All tabs now handle resizing of the window. Most tabs have two columns instead of one and the columns can be resized.

- Possibility to select if an external ROI geometry should be created and if a dose grid should be applied when a default Virtual simulation plan is created.

2.16 RAYPHYSICS

2.16.1 Photon beam commissioning

- Possibility to set statistical uncertainty per auto modeling step for Photon MC beam models.

- Support for arbitrary field openings in dose curve computation and auto-modeling. Corresponding dose curves can be imported.

- Possibility to set leaf tip width, tongue-and-groove width, offset, gain, curvature and orthogonal offset per MLC layer for dual layer MLC machines.

- The random number generator used for the photon MC dose engine has been changed. This will lead to differences in computed dose curves for Photon MC beam models in RayStation 10A compared to previous versions. For a dose calculation with high statistical uncertainty, differences up to 10% have been seen in individual points. When running the dose calculation with low statistical uncertainty, the differences are negligible. It is not required to re-commission previous beam models.

- Possibility to define minimum and maximum tip positions per leaf pair for MLCs.

- Possibility to define minimum and maximum allowed beam MU for wedges.

2.16.2 Electron beam commissioning

- The auto-modeling dialog is now available for electrons. There are new auto-modeling steps to optimize the electron source phase space parameters and the energy spectrum parameters using the applicator curves. Note that MC calculation of the applicator curves is slow, so these steps are long-running. Resolution and number of histories can be set per step.

2.16.3   Ion beam commissioning

- Improved estimate of statistical uncertainty for proton absolute dosimetry points computed with the Monte Carlo dose engine.

- New implementation of fixed setup imaging devices.

- Possibility to use fixed setup imaging device for treatment beam DRR generation.

2.17   DOSE ENGINE UPDATES

2.17.1   RayStation 10A dose engine updates

The changes to the dose engines for RayStation 10A are listed below.

Dose engine	RS 9B SP1	RS 10A	Dose effect	Comment
All	-	-	Minor	A performance optimization and refactoring of material handling has been done, which might give small differences in dose computed in RayStation for all modalities. It is not required to re-commission existing beam models based on this change. For additional changes in each dose engine, see below.
Photon Collapsed Cone	5.2	5.3	Negligible	For LINACs with dual layer MLCs, the transmission is changed in the intersection of the leaf tip and the tongue-and-groove region for a single leaf. No changes to dose curves in beam commissioning. Machines are upgraded to give identical dose in all cases if leaf tip is zero and/or tongue and groove is zero. Existing machine models do not need to be re-commissioned.

Dose engine	RS 9B SP1	RS 10A	Dose effect	Comment
Photon Monte Carlo	1.2	1.3	Minor if calculated with low uncertainty	For LINACs with dual layer MLCs, the transmission is changed in the intersection of the leaf tip and the tongue-and-groove region for a single leaf. No changes to dose curves in beam commissioning. Machines are upgraded to give identical dose in all cases if leaf tip is zero and/or tongue and groove is zero. The random number generator used for the photon MC dose engine has been changed. This will lead to differences in computed dose for Photon MC in RayStation 10A compared to previous versions. For a dose calculation with high statistical uncertainty, differences up to 10% has been seen in individual points. When running the dose calculation with low statistical uncertainty, the differences are negligible. Example dose curves calculated with the different random number generators are shown in the section below. Existing machine models do not need to be re-commissioned.
Electron Monte Carlo	3.6	3.7	Negligible	Existing machine models do not need to be re-commissioned.
Proton PBS Pencil Beam	5.2	6.0	Major	The dose for spots with a central axis that does not intersect the External ROI geometry is now taken into account, addressing the problem reported in FSN #60564. Dose will be contributed for each sub-spot where the central axis intersects the External ROI. Updated integrated depth dose data, reflecting new GPU Monte Carlo. Existing machine models need to be re-commissioned

Dose engine	RS 9B SP1	RS 10A	Dose effect	Comment
Proton PBS Monte Carlo	4.5	5.0	Major	Dose engine algorithms moved to GPU. Statistical changes expected. Minor systematic differences in range expected due to improved stopping power modelling. New beam models required. Improved modelling of dynamic aperture. Updated Mevion SMC (affects Mevion Hyperscan only). Existing machine models need to be re-commissioned
Proton US/DS/Wobbling Pencil Beam	4.4	4.5	Negligible	Existing machine models do not need to be re-commissioned.
Carbon PBS Pencil Beam	4.1	4.1	-	No change. Existing machine models do not need to be re-commissioned.

2.17.2 Example of differences in dose curves for Photon Monte Carlo between RayStation 10A and previous versions

In RayStation 10A the random number generator for the Photon Monte Carlo dose engine has been changed. The reason for the change is that the Proton Monte Carlo dose engine has been migrated to GPU, and testing revealed that the random number generator used for Photon Monte Carlo did not suffice for Proton Monte Carlo. No issues with using the previous random number generator for Photon Monte Carlo have been found, but it was nevertheless decided to change so that Photon Monte Carlo uses the same random number generator as Proton Monte Carlo. This will lead to differences in the Photon Monte Carlo dose computed in RayStation 10A compared to previous versions. The Photon Monte Carlo dose calculation itself has not changed, but for calculations with high statistical uncertainty, there can be large differences in individual voxels. When running the dose calculation with low statistical uncertainty, the differences are negligible.

Figure 1 and Figure 2 below show examples of dose curves computed with the previous and current random number generator. The field is 10x10 cm^2 and one depth dose curve and an x-profile at 10 cm depth is visualized. In Figure 1, the uncertainty is 2% and large differences can be seen. In Figure 2, uncertainty 0.2% has been used, and the dose curves are almost identical.

Figure 1. Dose curves computed with uncertainty 2%. Curves for the random number generator in RayStation 10A are shown in blue, and for previous versions in red. The curves to the left show dose related to depth, and to the right dose related to x-position.
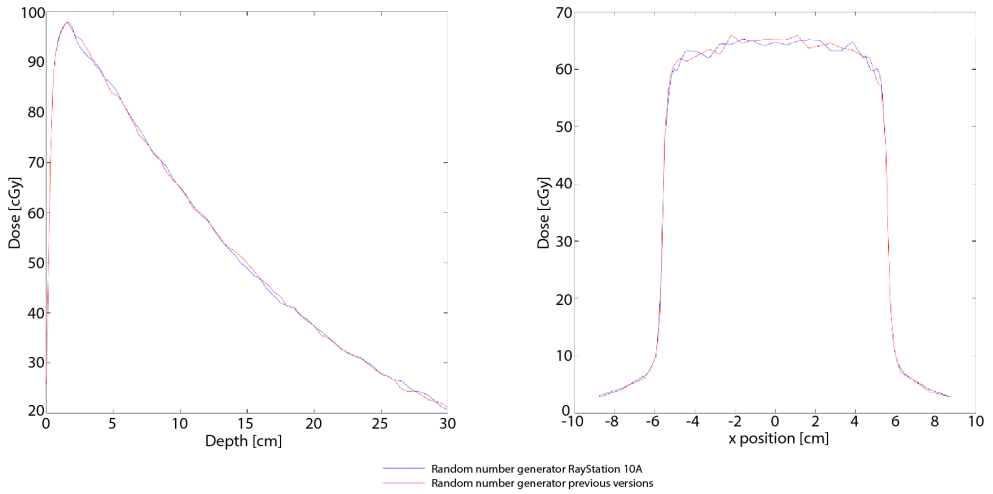

Figure 2. Dose curves computed with uncertainty 0.2%. Curves for the random number generator in RayStation 10A are shown in blue, and for previous versions in red. The curves to the left show dose related to depth, and to the right dose related to x-position.
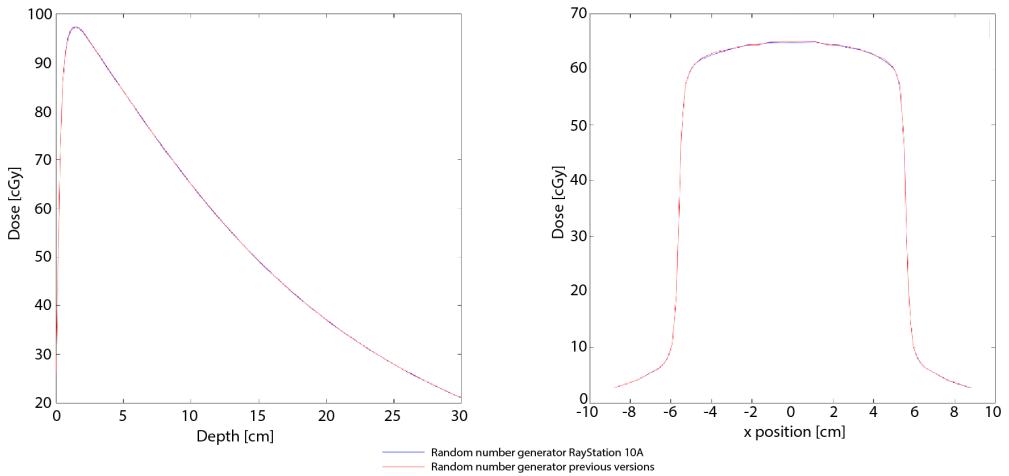
2.17.3 Changed behavior of previously relseased functionality

- The allowed field opening for dose calculation with Siemens virtual wedge has been limited. The y-jaw positions in the fully open field are limited to retracted positions between 3 cm and 10 cm. This is a safety precaution introduced due to the problem described in FSN #56089.

- New implementation of fixed setup imaging devices. Fixed setup imaging devices created with earlier versions of RayStation will be deleted when upgrading to 10A.

- It is no longer possible to generate multiple plans in one click in the Machine Learning optimization module (the functionality is replaced with support for Machine learning optimization in the Plan explorer module).

- The Compute Function Values button has moved from the toolbar to just above the list of objectives/constraints and is now named Compute values.

- In optimization with the proton MC dose engine, the dose from spots with a central axis that does not intersect the External ROI geometry is now taken into account. This was not the case in previous versions, as reported in FSN #60564.

- Note that RayStation 8B introduced handling of effective dose (RBE dose) for protons. This information is important for proton users if upgrading to 10A from a RayStation version earlier than 8B:

  - Existing proton machines in the system will be converted to RBE type, i.e., it is assumed that a constant factor of 1.1 has been used. Contact RaySearch if this is not valid for any machine in the database.

  - Import of RaySearch RT Ion Plan and RT Dose of Modality Proton and with dose type PHYSICAL from RayStation versions earlier than 8B will be treated as RBE level if the machine name in the RT Ion Plan refers to an existing RBE machine.

  - RT Dose of dose type PHYSICAL from other systems or from RayStation versions earlier than 8B with a machine that does not have the RBE included in the beam model will be imported as in earlier versions and will not be displayed as RBE dose in RayStation. The same applies if the referenced machine does not exist in the database. It is the responsibility of the user to know if the dose should be treated as physical or as RBE/photon equivalent. However, if such a dose is used as background dose in subsequent planning, it will be treated as an effective dose.

2.18 NEWS AND IMPROVEMENTS IN RAYSTATION 9B SP1

Helium ion treatment planning
Helium ion treatment planning is now supported.

Improved carbon and helium dose computation

- Carbon and helium beam models now support a double Gaussian spot representation in air, to enable improved characterization of non-Gaussian spot profiles.

- Improved performance.

Improved RBE optimization for carbon and helium ions

- RBE derivatives replace the piecewise constant RBE during optimization.

- Improved convergence, especially for LEM IV and helium with MKM.

Dose engine upgrades
The Carbon PBS dose engine has been updated to a new version with only minor dose effect.

3   KNOWN ISSUES RELATED TO PATIENT SAFETY

Note: *Be aware that additional safety related release notes may be distributed separately within a month of software installation.*

Elekta guard leaf behavior

Elekta guard leaves are the first leaves behind the y-jaws that are moved to the same position as the last leaf pair in the field. All leaf positions must be fully specified in the prescription. Because of this, guard leaves are set by the Treatment Planning System (TPS).

However, the R&V system or the Treatment Control System (TCS) can have a feature that automatically sets guard leaf positions that will override the prescription from the TPS for those leaves. It might be possible to select this feature in the R&V system or in the TCS. Contact the suppliers of your R&V system and TCS for more information.

Be aware that the guard leaf positions in RayStation may vary for different plan types:

- When openings are created in the 3D-CRT module using "Treat and protect", RayStation does not open any additional leaf pair behind the y-jaws for Elekta machines. Similarly, when segments are manually edited (Edit MLC and jaws) – no additional leaf pair is opened.

- However, RayStation does open one additional leaf pair for Elekta machines in some other workflows:

    - Optimization: only for 3D-CRT and SMLC, not for DMLC and VMAT.

    - Create rectangular field

    Note that this will only occur for segments where the y-jaws are positioned exactly at the edge of a leaf.

There is no setting in RayPhysics that allows the user to set if an additional leaf pair shall be opened. The decision is based on the relative positions of the MLC and the jaws; if the MLC is closer to the source than the jaws, the jaws are considered to be "the primary collimator" and the leaves open to get a sharper penumbra.

(146818)

Clinical goals for co-optimized beam sets incorrectly labeled in treatment report

For co-optimized beam sets, the treatment report incorrectly states that the clinical goals are reported and evaluated on beam set dose. However, the clinical goals are reported and evaluated on beam set + co-optimized beam set dose.

(276201)

4 OTHER KNOWN ISSUES

4.1 GENERAL

Do not use Fiducial in ROI/POI names when using TomoHelical with Synchrony

For TomoHelical plans using real-time tracking and motion management support - avoid having POIs with "Fiducial" in the name. The Treatment delivery system identifies which fiducials to track by this naming convention. Using the name "Fiducial" in POI names might cause problems on the delivery side with incorrect POIs to be set as tracked as well as duplicate POI names.

Incorrect fiducial usage will result in failure to deliver.

(146823)

Report Templates must be upgraded after upgrade to RayStation 10A

The upgrade to RayStation 10A 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)

No Room View machine model displayed if couch pitch angle or couch roll angle differ from zero

The Room View does not yet have support for pitch and roll of the treatment couch. Therefore, if couch pitch angle or couch roll angle differ from zero the Room View machine model will not be shown.

(144697)

Relative DVH x-axis not properly updated when changing number of fractions

When changing the number of fractions in a plan, the DVH x-axis is not updated correspondingly when relative dose is displayed. A workaround is to switch the Dose axis to 'Absolute' and then back to 'Relative'.

(138539)

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 RayStation will show an error message with the text "Unfortunately auto recovery

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does not work for this case yet". If RayStation crashes during auto recovery, the auto recovery screen will pop up next time RayStation is started. If this is the case, discard the changes or try to apply a limited number of actions to prevent RayStation from crashing.

(144699)

Limitations when using RayStation with large image set

RayStation 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

- Hybrid deformable registration might run out of memory for large image sets

- Biomechanical deformable registration might crash for large image sets

- Automated Breast Planning does not work with large image sets

- Creating large ROIs with gray-level thresholding might cause a crash

(144212)

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)

Calculating dose on a copy of an imported approved plan can lead to a crash

Importing an approved plan, copying it, and subsequently unchecking "Consider imported dose clinical" can lead to a state where RayStation crashes if optimization or final dose calculation is performed. To be able to continue with optimization and dose computation, either unapprove the imported plan, or do a small edit of the dose grid in the copied plan.

(139944)

Limits for couch angles not validated for setup beams

Limits for couch rotation, couch pitch and couch roll angles for setup beams are not validated properly in RayStation. This means that it is possible to set unsupported couch angles for setup beams using scripting and in the *Setup beams* tab. The unsupported values are used when generating the corresponding DRR.

With scripting, unsupported couch pitch and couch roll angles for setup beams can be specified for machines that are not commissioned for couch pitch and couch roll movements. Unsupported couch pitch and couch roll angles for setup beams can also be defined in the *Setup beams* tab under specific circumstances. When switching from a plan created for a machine that allows couch pitch and couch roll movements to a plan for a machine that does not allow such movements, the couch pitch and couch roll angles will incorrectly still be visible and editable in the GUI table.

Unsupported values that have been entered manually or specified via scripting will be included in exported DICOM files. For machines that support couch pitch and couch roll movements, all specified

couch angles will be displayed in the GUI and in the report. For machines that do not support couch pitch and couch roll movements only the couch rotation value will be displayed in the GUI and in the report, but all defined couch angles will still be exported.

(283453)

4.2   PATIENT MODELING

Memory crashes can occur when running large hybrid deformable registration computations on GPU

GPU computation of deformable registration on large cases can result in memory related crashes when using the highest grid resolution. The occurrence depends on the GPU specification and the grid size.

(69150)

4.3   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)

4.4   PLAN OPTIMIZATION

No feasibility check of max leaf speed performed for DMLC beams after dose scaling

DMLC 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)

Plan approval and DICOM export of robust optimized plans might crash

After using robust optimization over additional image sets, some actions performed on the plan will cause subsequent plan approval and DICOM export to crash. Performing an optimization (zero iterations is enough) or unchecking the secondary image sets in the Robustness Settings dialog will correct this. Examples of actions that can trigger a crash are dose grid edits and version upgrade of RayStation.

(138537)

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4.5   PROTON AND LIGHT ION PLANNING

Beam line objects and beam parameters not updated when changing machine for an adapted plan

If the machine is changed when either creating a new adapted plan or when editing an existing adapted plan, then the beam line objects and spot tune ID of the beams in the adapted plan will not be updated automatically. The snout of the previous machine will remain in the beam list, which might be incompatible with the new machine. The range shifter might be listed as [Unknown]. In the case that the machine was changed when creating a new adapted plan, the range modulator might also be listed as [Unknown].

For any affected beam, open the Edit beam dialog and update the necessary beam line objects and spot tune ID and then click OK. Note that if only the range modulator is missing, it is enough to open the Edit beam dialog and close it again by clicking OK. This workaround will update the beam line objects and allow continued use of the beam.

224066

4.6   TREATMENT DELIVERY

Removing prescription when creating adapted plan does not work

When an adapted plan is created, the original plan's prescription will be kept even if dose prescription is de-selected during plan creation. The dose prescription can be removed afterwards using the Set Prescription dialog or the Edit Patient dialog.

(69235)

CT-reference in treatment course

In the Plan Evaluation module, the "Image set" column shows the image set for the computed dose. However, the "Images" column of a Treatment Course shows the acquired images on that fraction, not the image sets that were used for dose computation. The image set used for dose computation and the image set for deformed doses are displayed by clicking the arrow in the Dose column.

(62376)

4.7   AUTOMATED PLANNING

Protect setting always set to None in beam list after TomoTherapy optimization running HPC in Plan Explorer

After optimization of a TomoTherapy treatment plan using HPC in Plan Explorer, the Protect setting is always set to 'None'. However, protect settings selected prior to optimization are correctly used during the optimization.

(136436)

Incorrect Beam on interval might be set back without notification

In the Plan Explorer Edit Exploration Plan dialog, when editing the Beam on interval value in the Beam Optimization Settings tab, the value will change back to the previous value without notice if the

entered value is out of range. This could easily be missed, for example if the dialog is closed directly after entering an incorrect value. The Beam on interval value is only applicable for VMAT treatment machines commissioned for burst mode (mArc).

(144086)

4.8   DICOM

Failed SCP import wrongly deletes files

If importing data from DICOM storage SCP when the checkbox "Delete files after successful import" is checked, files that were not possible to import may also be removed. When sending data from external systems to RayStation SCP, do not delete the data in the external system until it is verified that it has been successfully imported to RayStation.

(138336)

4.9   BIOLOGICAL EVALUATION AND OPTIMIZATION

Biological evaluation of fractionation schedule can lead to crash when creating new adapted plan

If the fractionation schedule is edited from the Biological Evaluation module, the system will crash when creating an adapted plan. To perform biological evaluation, copy the plan and do the fractionation schedule changes on the copy.

(138535)

Undo/redo invalidates response curves in the Biological Evaluation module

In the Biological Evaluation module, the response curves are removed on undo/redo. Recompute the function values to restore the response curves.

(138536)

4.10   SCRIPTING

Version validation strings for virtual scripting environments based on CPython 3 interpreters need to be updated

For virtual scripting environments, version validation strings are used to verify that a scripting environment has not been changed in the database since the environment was copied to a folder on the user's computer. The structure of the version validation strings have changed for virtual environments based on CPython 3 interpreters. Therefore, RayStation 10A will always think that environments created in earlier versions of RayStation have changed even though the folder on the user's computer is up to date with the scripting environment in the database.

If the version validation strings are not updated in the database, the scripting environments will be saved to a folder on the user's computer each time a script is executed. This will add a few seconds to the run time of all scripts. The update of the scripting environment folder can also cause problems if two instances of RayStation are running scripts using the same virtual environment at the same time. When the second instance tries to start a script using the environment, it will try to delete all

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the files in the environment that is used by the first instance. This will fail as some of the files are locked. All files are however not locked, so some of the files in the scripting environment may be deleted. When the scripting environment is used after this, it will be updated again, so the deleted files should not cause any subsequent problems. The script execution in the first instance of RayStation may fail and the second instance of RayStation will crash.

The environment validation strings can be updated by opening all environments, that are based on CPython 3 interpreters, for editing and saving them to the database again. Then the environments will get updated version validation strings.

Here is a step-by-step instruction to update the version validation string for a single environment:

1.   Open Clinic Settings and go to the Scripting tab.

2.   Click the Edit button for the environment.

3.   Answer Yes in the warning dialog displaying that scripts will need to be re-validated.

4.   Type "Exit" to close the command window that can be used to edit the environment.

5.   Click the Save button to save the environment to the database.

The bug only affects virtual scripting environments based on CPython 3 interpreters. Neither virtual scripting environments based on CPython 2 interpreters nor script execution in installed Python interpreters are affected.

(146559)

5   UPDATES IN RAYSTATION 10A SP1

This chapter describes the updates in RayStation 10A SP1 as compared to RayStation 10A.

5.1   NEWS AND IMPROVEMENTS IN RAYSTATION 10A SP1

Validation of number of DICOM files prior to import from Storage SCP

RayStation will show a warning message if any DICOM file that has been received using the Storage SCP service is missing at import.

- The RayStation Storage SCP service has been updated to log information about received DICOM files in the DIRDATA.xml file that is generated for each association.

- The RayStation import for Storage SCP has been updated to validate the data displayed in the import wizard against the files logged in DIRDATA.xml. If the import wizard detects that any file is missing, the user will be informed. A warning icon is displayed next to the associated DICOM series or directory node and the user will be prompted with a warning dialog if the user proceeds with the import.

- In the case that one or several files are missing, the user should search again or restart the import wizard until the warning dialog disappears. If the warning dialog persists, validate that all expected DICOM files are present in the storage location (can be reached directly by right-clicking the folder in the import tree).

Note: *Warning 508830 in the RSL-D-RS-10A-IFU, RayStation 10A SP1 Instructions for Use still applies. DICOM provides no way of verifying that all image slices in an image series have been received. The user must still verify this manually after import.*

Dose engine updates

There have been no dose engine updates in RayStation 10A SP1 compared to RayStation 10A. The RayStation 10A dose engine versions are described in detail in *chapter 2 News and improvements in RayStation 10A*.

5.2   FOUND ISSUES

One new safety related issue has been found, 276201. It is described in detail in *chapter 3 Known issues related to patient safety*.

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One new issue (not safety related) has been found, 283453. It is described in detail in *chapter 4 Other known issues*.

5.3   RESOLVED ISSUES

5.3.1   DICOM

Resolved: In rare situations plan prescription can be linked to incorrect ROI during import, FSN 66704

If an ROI or a POI that was referenced from an imported *RT Plan/RT Ion Plan* was missing in the imported *RT Structure Set*, the reference could become linked to the wrong ROI or POI. This has now been resolved.

(278587)

5.3.2   Plan reports

Resolved: '% outside grid' for clinical goals not reported correctly in plan reports

There was an issue that led to an underestimation of the '% outside grid' value for clinical goals in the plan report. This issue has now been resolved.

(282974)

Resolved: Not possible to generate plan report using scripting

There was an issue making it impossible to generate plan reports using scripting. This has now been resolved.

(276629)

Resolved: Couch pitch and roll values are incorrectly reported to be non-IEC in plan reports

For machines commissioned with a non-IEC coordinate system for the couch (yaw) angle, the headers in the plan report incorrectly stated that also the values for couch pitch and couch roll were according to a non-IEC coordinate system. This issue has now been resolved.

(283056)

Resolved: Couch roll is not reported correctly for setup beams in plan reports

There was an issue where the value for couch rotation was incorrectly reported as the couch roll angle for setup beams in the plan report. This has now been resolved.

(281806)

Resolved: Couch pitch and roll are incorrect for setup beams in plan reports when a non-IEC coordinate system is used

There was an issue where the values for couch pitch and couch roll were incorrectly reported for setup beams in the plan report when a non-IEC coordinate system was used. This issue has now been resolved.

(282676)

5.3.3   Plan optimization

Resolved: Incorrect handling of beam coordinate system in robust optimization

There was an issue where an incorrect coordinate system transform was used for spot smearing and approximate dose computation during robust optimization of ion PBS plans. If a collimator angle ≠ 0 was used, together with a non-isotropic setup uncertainty, spots and auxiliary spots (for interpolation) were expanded into the wrong directions. This issue has now been resolved.

(280375)

Resolved: Independent direction setting in robust optimization is not used correctly

There was an issue with robust optimization using independent beams. If at least one direction was set to not be independent and the uncertainty was larger than 0.50001 cm, the robust optimization included scenarios in which the direction, that was set to not be independent, was handled as if the beams were independent. This has now been resolved.

(280839)

Resolved: Crash during optimization when combining RBE background dose and beam set specific objectives

There was an issue that made it impossible to run an optimization when having RBE background dose in combination with beam set specific objectives. This issue has now been resolved.

(282616)

5.3.4   Proton planning

Resolved: Issue with spot placement and OAR range margin

There was an issue in the spot placement behind an ROI selected for the 'OAR range margin' functionality when this function was used together with a distal margin setting for the spot selection. In some cases, spots were incorrectly placed behind the selected OAR and sometimes far outside of any target ROIs. This has now been resolved.

(280942)

Resolved: Crash in the Eye modeling module

There was an issue with the Eye modeling module in the Setup workspace where the toolbar was not displayed properly. This sometimes made RayStation crash on some workstations. This has now been resolved.

(276836)

5.3.5   Virtual simulation

Resolved: Plan generation protocols cannot be used for virtual simulation in RayStation Doctor

It was not possible to use plan generation protocols for virtual simulation in RayStation Doctor. This has now been resolved.

(282402)

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5.4   UPDATED MANUALS

The following manuals have been updated in RayStation 10A SP1:

- <u>RSL-D-RS-10A-IFU-2.0 RayStation 10A SP1 Instructions For Use</u>

- <u>RSL-D-RS-10A-RN-2.0 RayStation 10A SP1 Release Notes</u>

- <u>RSL-D-RS-10A-RTIFU-2.0 RayStation 10A SP1 RayTreat 4A SP1 Instructions For Use</u>

- <u>RSL-D-RS-10A-IFU-2.1 RayStation 10A SP1 Instructions For Use Radiotherapy Edition</u>

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