

LINACVIEW™

Version 3.20.0

Standard Imaging, INC.
3120 Deming Way
Middleton, WI 53562-1461

TEL 800.261.446
TEL 608.831.0025
FAX 608.831.2202



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www.standardimaging.com

General Precautions

Warnings and Cautions alert users to dangerous conditions that can occur if instructions in the manual are not obeyed. Warnings are conditions that can cause injury to the patient or the operator, while Cautions can cause damage to the equipment.



CAUTION: Federal law in the U.S.A., and Canadian law restricts the sale, distribution, or use of this product to, by, or on the order of a licensed medical practitioner. This product should be used under the guidance of a medical physicist.



CAUTION: The “Save” and “Save As” functions of the LinacView System are intended solely to save solutions of interest or potential reuse. Specific patient information or identifiers should not be saved using these functions.



CAUTION: For professional use only. As desired by the IAEA, English is the default language for labeling and manuals. If translated versions are available, resolve any differences in favor of the English versions.



CAUTION: Proper use of LinacView requires that LogFileSync is deployed properly.



CAUTION: Errors and accuracy will be linear accelerator system-specific.



WARNING: Proper use of this product depends on careful reading of all instructions and labels.



WARNING: Issues identified through the use of this product must be investigated and appropriately resolved and/or noted.



WARNING: Where applicable, Standard Imaging products are designed to be used with the versions of common radiation delivery devices, treatment planning systems, and other common computer software products or systems used in the delivery of ionizing radiation, available at the time the Standard Imaging product is released. Standard Imaging does not assume responsibility, liability, and/or warrant against problems with the use, reliability, safety or effectiveness that arise due to the evolution, updates, or changes to these products or systems in the future. It is the responsibility of the customer or user to determine if the Standard Imaging product can be properly used with these products or systems.



WARNING: Proper use of LinacView requires that an Administrator of the software be designated. This Administrator must be an expert in quality control of the medical devices which will be managed by LinacView and therefore must be able to:

- Correctly parameterize the software,
- Evaluate and verify LinacView results,
- Determine the appropriate LinacView user level for each staff member,
- Set policies on the use of LinacView and interpretation of results,
- Educate and verify the competence of staff to use LinacView.

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1 Introduction

1.1 Overview

LinacView analyzes logfiles generated by Varian and Elekta linear accelerators during radiation treatments. Logfile analysis can be compared to the “prescription” DICOM RT Plan. In addition, a reference logfile may be selected and compared to each subsequent treatment fraction. Initial logfiles that may be created for pre-treatment IMRT QA can be excluded from treatment session analysis.

The preferred method of running LinacView is in “batch” mode. In this mode, LinacView automatically processes logfiles and analyzes them, audibly notifying and sending emails to designated staff for non-compliant results. Emails can optionally contain reports (either short or comprehensive) for non-compliant results.

LinacView allows verification for every treatment, in real time. Alert or failure notifications are based upon the following parameters:

- Position of each MLC leaf,
- Position of MLC carriages and jaws,
- Percentage of monitor units delivered,
- Gantry rotation angle,
- Collimator rotation angle,
- Beam on/off statistics,
- Reconstructed integrated fluence.

Additionally, after any number of treatments has been analyzed, you will be able to create RT Plans that can simulate the composite behavior of the analyzed logfiles. These RT Plans can be imported into your treatment planning system to compare intended doses with those actually

delivered.¹ PDF reports documenting machine performance can be created at any point during treatment.

At the end of a course of treatment, when you close the treatment series, a composite RT Plan will be automatically created that summarizes the composite behavior of all analyzed logfiles as well as a two final reports (short and comprehensive) that document all aspects of the treatment course.

Step and Shoot, Sliding Window, and Volumetric Modulated Arc Therapy (VMAT) IMRT techniques are supported.

RT Plans created for LINACs that contain a single or dual banks of leaves are supported.

1.2 Supported Logfile Types

LinacView currently allows you to analyze three types of linac logfiles in real time. All logfiles, no matter the vendor or machine type, are composed of a series of records that capture machine performance at set, periodic intervals. The following table describes the different logfile types from Elekta and Varian.

Vendor	Linacs	Logfile Format	Sampling Size (Hz)
Varian	Clinac Series	DynaLog (*.dlg)	20
	Truebeams, Halcyon, Ethos	Trajectory (*.bin and *.txt)	50
Elekta	All Recent Linacs	iCom-vx	4

1.2.1 Varian DynaLog Files

DynaLog files are created by Varian Clinac linacs. Two DynaLog files, one for the “A” bank and one for the “B” bank of MLC are produced for each treatment of each beam. The file extension is “.dlg” and the content is in comma separated variable (CSV) format.

The DynaLog file header contains the identity of the treated patient (Lastname, Firstname, PatientID), the unique identifier (SOP Instance UID) of the RT Plan file associated with the radiation session, and the beam number as it appears in the associated RT Plan file. This header information is used to automatically associate DynaLog files with the RT Plans for analysis.

Records of machine performance are captured at a rate of one every 50 ms.

Further documentation on DynaLog files is available through your “MyVarian” account.

¹ This estimate dose will not include dosimetric changes due to patient setup and geometry changes.

1.2.2 Varian Trajectory Logfiles

Trajectory Logfiles are created by Varian TrueBeam linacs. One Trajectory logfile is typically produced for each treatment of each beam.² The file extension is “.bin” and the content is in binary format.

Unlike the Dynalog files, Trajectory Logfiles headers do not contain the header information to directly associate logfiles with RT Plans. This information needed to associate the logfiles to the RTPlan is found in a supplementary “.txt” that is paired with “.bin” files. These files are named identically except that their extensions are different. Recent updates from Varian no longer produce the supplementary “.txt” file such that the method to link logfiles with RT Plans for TrueBeams is Patient ID and 1st Control Point for leaf positions, gantry, collimator, and table angles.

Records of machine performance are captured every 25 ms.

Further documentation on Trajectory logfiles is available through your “MyVarian” account.

1.2.3 Elekta iCom-VX Logfiles

A standalone program LogFileSync communicates with Elekta linacs through iCom-VX to generate logfiles. One logfile is produced for each treatment of each beam. A binary file with an extension “.ivx” is generated by LogFileSync.

Since these files are generated in real time in clinical mode, they can be processed by LinacView's batch mode. Each file contains header information to automatically associate with the correct RT Plans.

Records of machine performance are captured at a rate of one every 250 ms.

1.3 About DICOM RT Plans

Within LinacView, logfiles are compared to DICOM RT Plans and to other logfiles (e.g., a reference logfile).

There is usually one RT Plan and many logfiles per treatment, and typically one logfile one per beam per treatment. Both RT Plans and logfiles contain information about MLC positions, gantry angles, collimator angles, beam status, and monitor units delivered among other things.

Arguably, the most important comparison between logfiles and RT Plans is for pre-treatment IMRT QA in which the capability of the linear accelerator to deliver the intended treatment (the prescription) is verified. This is also an opportunity to use the “Modulation Complexity Score” of a plan to understand its relative complexity with respect to other plans of its type. After pre-treatment IMRT QA, logfiles and RT Plan specification continue to be verified in batch mode in

² It is possible to have more than one beam in a Trajectory logfile. Splitting into beams is carried out in the middle of the transition, each beam taking with it half of the transition phase.

addition to comparisons that can be made between a reference logfile (from the first treatment session) and logfiles from subsequent treatment sessions.

DICOM RT Plans are also used to summarize the composite behavior of all analyzed logfiles (See Section 5, Exporting RT Plans).

1.4 Minimal Configuration of Host Computer

- MS Windows 10 64-bit strongly recommended,
- 4 Gb free RAM or greater for real-time display of the dynamic MLC view,
- Intel i7 – 2.5 GHz or greater,
- JAVA JRE version 1.6.0_43 or later,
- Read and write permissions for all users on data and database folders,
- Minimal screen resolution 1920x1080 pixels,
- Local area network/Internet connection,
- Speakers for audible alert (if desired),
- Adobe Acrobat Reader v. 9,
- 50 Gb Hard Drive.

Estimating Patient Data Memory Requirements³

Assume 30 patients per day. Assume 30 fractions per patient.

- Treatments per year = $30 \times 52 \times 5 = 7800$
- Patients per year = $7800 / 30 = 260$

Approximate Memory Usage per Treatment

- 6 – 12 Beams for IMRT treatments, 0.5 Mb per logfile (3-6 Mb per day, per patient),
- 2 Arcs for VMAT treatments, 3.5 Mb per logfile (7 Mb per day, per patient),
- 300 Kb per RT Plan, per patient.

Maximum Required Storage

- All IMRT: $260 \times 300 \text{ Kb} + 7800 \times 6\text{Mb} = 0.78\text{Gb} + 46.8 \text{ Gb} = 48 \text{ Gb}$
- All VMAT: $260 \times 300 \text{ Kb} + 7800 \times 7\text{Mb} = 0.78\text{Gb} + 54.6 \text{ Gb} = 56 \text{ Gb}$

1.5 LogFileSync

LogFileSync is a preferred synchronization utility provided with LinacView that transfers logfiles from a linac's source directory to the target directory scanned by LinacView when in batch mode.

LogFileSync

- Notifies user when synchronization with a linac is lost,

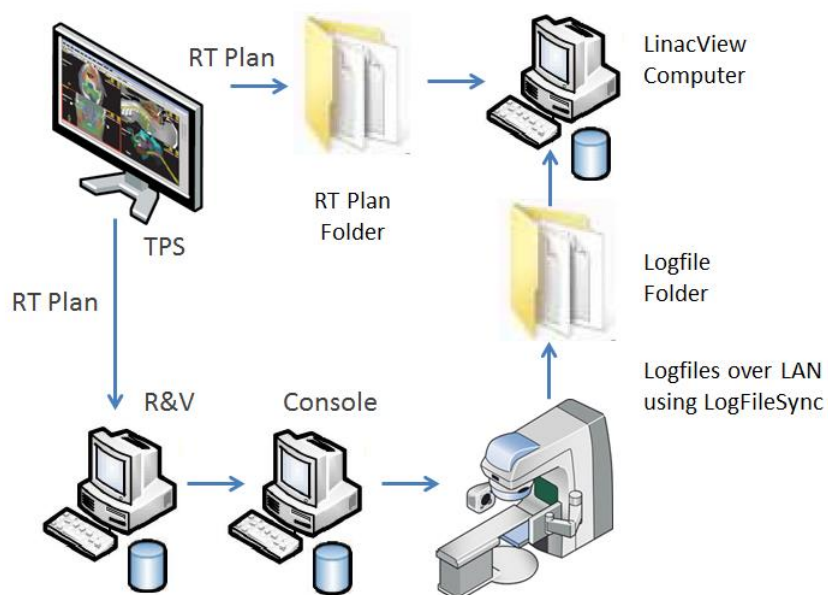
³ Memory requirements for results in database are orders of magnitude less than logfile and RT Plan storage requirements.

- Guarantees the logfile comes from the correct linac,
- Guarantees data integrity in the linac logfile source directory.

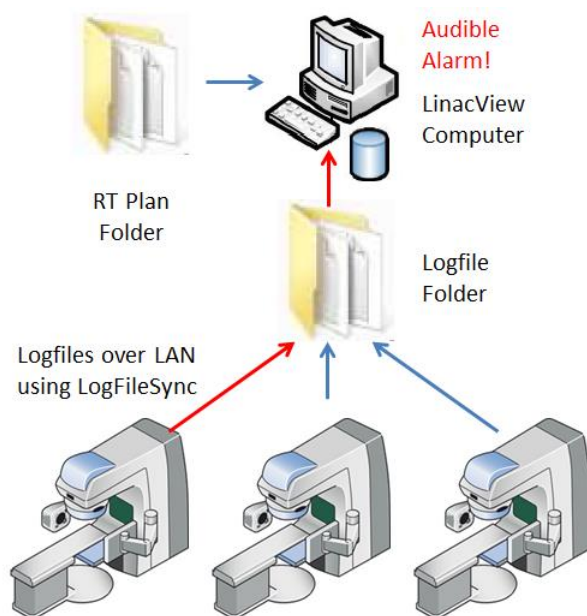
Occasionally, linac vendors or their service engineers may feel uncomfortable installing LogFileSync on a linac console as they may have their own preferred synchronization software. When other synchronization utilities are installed, they should deposit logfiles in an intermediate folder that LogFileSync will, in turn, synchronize with the LinacView target directory. This is necessary for LinacView to function properly.

Note that when you use another synchronization utility besides (or in addition to) LogFileSync, we do not guarantee its performance. Lost data and notifications may occur.

1.6 Typical Network Topology



General, single linac, one-workstation setup of LinacView



Simplified, multiple linac setup of LinacView

1.7 Cybersecurity

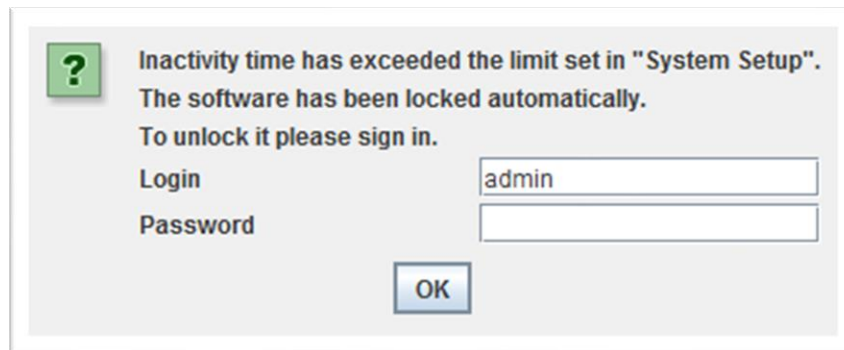
To help address unwanted access or intrusions into LinacView, the following are highly recommended:

- The use of complex passwords,
- The use of anti-virus and anti-malware software, and
- The use of firewalls

In the event of a virus or malware alert, and/or unwanted access or intrusions into LinacView, the following are highly recommended:

- Physically disconnect the computer from the network,
- Unplug the computer, especially if unable to disconnect from the network, and
- Contact IT immediately.

Additionally, when a user that can change settings is logged in (*i.e.*, security level “Advanced” or higher), a dialog that forces a re-login by a user with “Advanced” or higher security level is presented after a user-settable period of time (See Section 3.1, General Tab). This keeps unauthorized staff from making changes to settings.



2 Installation

Installation will be done by qualified service personnel from Standard Imaging, Inc.

3 System Setup Function

Skip to Section 4, LinacView Operation, if you are not an Administrator or Superuser.

Only LinacView users with the Administrator designation can access all the functions in System Setup. Superusers may only access the Analysis and Licenses & Linacs Tabs. An Administrator can allow an intermediate level user to access the Analysis and Licenses & Linacs Tabs also. No other users may access System Setup. (See, Section 3.7, User Rights Tab)

You should be able to use LinacView with very little configuration from the start. As an Administrator, you will want at a minimum to:

Create users and passwords with appropriate permissions configured. (See, Section 0,

- Users Tab, 3.7, Users Tab),
- Check that the folder paths used by the system are correct. (See, Sections 3.2, Logfile Import Tab, 3.3, RT Plan Import Tab),
- Update your SMTP settings to enable email sending through your clinic's SMTP host and server. (See, Section 3.2, Logfile Import Tab), and
- Confirm that the default analysis template alert and failure thresholds are consistent with the policies of your clinic. (See, Section 3.6, Analysis Tab).

3.1 General Tab

The screenshot shows the 'General' tab of the LINACVIEW configuration window. The tabs at the top are: General, Logfile Import, Import RT Plans, Generate RT Plans, Backup, Analysis, User Rights, Users, Notifications, and Licenses & Linacs.

Settings in the General tab include:

- Display time of analysis summary tooltips (s): 10
- Display time of informative notifications (s): 20
- Display time of error notifications (s): 20
- Latency of Batch folder scans and attempt to send emails (s): 5
- Maximum latency between .txt and .bin VARIAN-TrueBeam files of the same session (s): 1
- Inactivity time that automatically locks the software (User level > Intermediate) (min): 15000
- Hide non accessible buttons: ☒
- Close analysing folders of inactive treatments:
 - Keep temporary files (RT Plans, PDF Reports): ☐
 - Keep PDF reports of review: ☒
- Type of closing:

The delay characterising a treatment as being "Inactive" and the periodicity at which LINACWATCH will propose to close these inactive treatments, are specified in the section "Close analysing folders of inactive treatments" of the tab "Licenses & Linacs"

When closing is proposed "Periodically", propose it Every days at hours minutes

Default type of closing: ☐ None ☒ Quick ☐ With PDF
- "Load" function: filter by default
 - Session dates: ☐ Since Months ☒ All
 - Result status: ☒ Selection ☐ All parameters
 - ☒ Include beams (RT Plan) without sessions (Log)

At the bottom right are 'Save' and 'Cancel' buttons.

- Display time of analysis summary tooltips (s) – 20-25 seconds is adequate.
- Display time of informative notifications (s) – 20-25 seconds is adequate.
- Display time of error notifications (s) – 20-25 seconds is adequate.
- Latency of Batch folder access and attempt to send emails (s) – 5 seconds is recommended.
- Maximum latency between .txt and .bin Varian TrueBeam files of the same session(s) – 1 second is recommended. Some Trajectory (.bin files) have an accompanying .txt file that contains human readable information about the beam delivery.

- **Inactivity time that automatically locks the software (User level > Intermediate) (min)** – After this period of time, when a user whose level is higher than “Advanced” or higher is logged in, a dialog presents that forces a re-login by a user whose level is “Advanced” or higher (the same or a different user).
- **Hide non accessible buttons** – ignore, leave checked.
- **Close analysis folders of inactive treatments** – Allows automatic closure of treatments after a period of inactivity and selection of prompts to remind the user to close inactive treatments. Additional functionality allows the user to select the time of day which is important for adaptive workflow. Note that closure is customized per LINAC (see “Licenses & Linacs” for location to set additional closing details for each LINAC).
- **“Load” function filter by default** – Allows user to select if RT Plans with logfiles will appear and customize results status as well as time period to load.

3.2 Logfile Import Tab

General Logfile Import Import RT Plans Generate RT Plans Backup Analysis User Rights Users Notifications Licenses & Linacs

Logfile import with the Batch mode: Settings

Start Batch processing when LINACVIEW starts ☒

Batch folder scanned by LINACVIEW (LogFileSync target folder) C:\DataBaseDemo-LINACVIEW2-LNW-LogFiles-DepositBatch

Delete Logfiles from Batch folder after import to LINACVIEW database ☒

Import to LINACVIEW database Logfiles added in the Batch folder when the Batch mode was OFF ☒

Logfile import with the "Import" function: Settings

Default folder path C:\DataBaseDemo-LINACVIEW2-LNW-LogFiles-DepositBatch

Last folder path C:\DataBaseDemo-LINACVIEW2-LNW-LogFiles-DepositBatch

Remember the last folder path ☒

Delete Logfiles from folder after import to LINACVIEW database ☐

3.2.1 Batch Mode Logfile Settings

- **Start batch processing when LinacView starts** – Choose whether to start batch processing when LinacView starts. This option is recommended.
- **Batch folder scanned by LinacView** – Choose the folder in which LogFilesSync will deposit logfiles generated by linacs. This “buffer” folder must be the same as the “target”

folder designated in LogFilesSync. This buffer folder is scanned at the frequency set in the General Tab.

- **Delete logfiles from buffer folder after import to LinacView DB** – Choose whether to delete logfiles after they have been imported to the LinacView database. This option is recommended.
- **Import to LinacView DB logfiles added in buffer folder while batch was off** – Choose whether to import logfiles to database when batch mode is off. This option is recommended.

By selecting **[Clear batch folder]** non-analyzable logfiles are moved to “...\DataBase-LINACVIEW\clearBATCH”.

3.2.2 Logfile Import Settings

- **Default folder path**– Choose the default folder for logfile import. When you select the Import Function, this folder is the initial destination of the logfile import dialog if the last import folder either no longer exists or the “**Remember last folder**” option is not selected.
- **Last folder path**– Choose the last folder used for logfile import. In normal use, this selection is automatically updated as logfiles are imported from different folders.
- **Remember the last folder path**– Choose whether to remember the last folder selected. If this option is selected, the next time you select the Import Function, the initial destination of the logfile import dialog is the last folder used for import. If it is not selected, the initial destination of the logfile import dialog is the default folder.
- **Remove from this folder the logfiles imported in DB** – Choose whether to delete logfiles after they have been imported to the LinacView database. This option is recommended.

3.3 RT Plan Import Tab

The screenshot shows the 'Import RT Plans' tab in the LinacView software. The interface includes a top navigation bar with tabs: General, Logfile Import, Import RT Plans (selected), Generate RT Plans, Backup, Analysis, User Rights, Users, Notifications, and Licenses & Linacs. The main content area is divided into three sections:

- Take into account the leaf width in the MCS calculation** (checked).
- RT Plan import with the Batch mode: Settings**
 - Batch folder scanned by LINACVIEW**: A text field containing 'C:\DataBaseDemo-LINACVIEW\3-LNW-RTplan-DepositBatch' with a 'Browse' button.
 - Delete RT Plan from Batch folder after import to LINACVIEW database** (checked).
 - Use the "Default-Treatment" type of treatment when no type has been associated with the RT Plan either by a keyword recognized in the RT Plan and defined in the "Analysis" tab, or manually in the BATCH or by the "Import" function** (checked).
- Original RT Plan import with the "Import" function: Settings**
 - Default folder path**: A text field with a 'Browse' button.
 - Last folder path**: A text field containing 'C:\DataBaseDemo-LINACVIEW\0-RTplans' with a 'Browse' button.
 - Remember the last folder path** (checked).
 - Delete RT Plan from folder after import to LINACVIEW database** (unchecked).
- DICOM transfer via network listening**
 - Port opening**: A dropdown menu set to 'Manual'.
 - Port number**: A text field containing '4008'.
 - AE title**: A text field containing 'LINACVIEW'.

At the bottom right, there are 'Save' and 'Cancel' buttons.

3.3.1 Batch Mode RT Plan Settings

- **Consider the leaf width in the MCS calculation** – when calculating the MCS (Modulation Complexity Score) leaf widths are taken into account when calculating the AAV (Aperture Area Variability).
- **Batch folder scanned by LinacView** – Choose the folder in which you or your treatment planning system will deposit RT Plans. This buffer folder is scanned at the frequency set in the General Tab.
- **Delete RT Plan from batch folder after import to LinacView database** – Choose whether to delete RT Plans after they have been imported to the LinacView database. This option is recommended.
- **Use the "Default Treatment" type when no treatment type has been previously associated with the RT Plan** – On import, if no treatment type is assigned to an RT Plan, the default treatment template is used.

3.3.2 RT Plan Import Settings

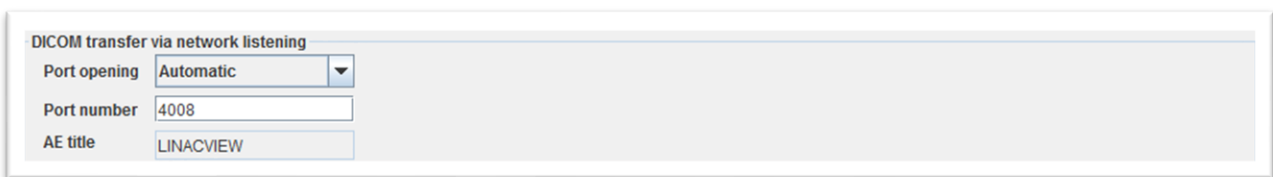
- **Default folder path** – Choose the default folder for RT Plan import. When you select the Import Function, this folder is the initial destination of the RT Plan import dialog if the

last import folder either no longer exists or the “Remember last folder” option is not selected.

- **Last folder path** – Choose the last folder used for RT Plan import. In normal use, this is selection is automatically updated as RT Plans are imported from different folders.
- **Remember the last folder path** – Choose whether to remember the last folder selected. If this option is selected, the next time you select the Import Function, the initial destination of the RT Plan import dialog is the last folder used for import. If it is not selected, the initial destination of the RT Plan import dialog is the default folder.
- **Delete RT Plans from folder after import to LinacView database** – Choose whether to delete RT Plans after they have been imported to the LinacView database. This option is recommended.

3.3.3 RT Plan Transfer via DICOM Push

LinacView has a built-in DICOM listener that allows RT Plan DICOM files to be pushed from your Treatment Planning System to LinacView. To configure the listener, choose an open port on the computer where LinacView software is installed. The Port Opening option should be set to Automatic to allow the software to ensure that the port is open on the computer for incoming traffic. If Manual is selected for Port Opening, the firewall must be open for that port and the port cannot already be in use on the LinacView computer.



The screenshot shows a configuration window titled "DICOM transfer via network listening". It contains three fields: "Port opening" is a dropdown menu set to "Automatic"; "Port number" is a text box containing "4008"; and "AE title" is a text box containing "LINACVIEW".

The AE Title is set by default to be LINACVIEW.

A static IP address is required on the LinacView computer. Run “cmd ipconfig” to determine your computer’s static IP. Find its IPv4 address, for instance 10.26.1.123.

Continuing with this example, set up the export filter in your TPS to push to the following:

IP Address: 10.26.1.123

Port: 4008

AE Title: LINACVIEW

You will now be able to push RT Plans to the LinacView computer and The DICOM listener will automatically save the RT plans pushed to it in the RT Plan Batch folder scanned by LinacView.

If the push does not seem to work, check the connection between the TPS and LinacView by doing a “ping” of the LinacView IP Address from the TPS computer (e.g., cmd ping 10.26.1.123). If you can “ping” but do not receive data, then check the Windows Firewall and disable it to allow for the incoming traffic.

3.4 RT Plan Generation

This subsection sets the defaults for RT Plan generation. Most parameters cannot be overridden at the time plans are generated. The number of Control Points can be modified at the time of plan generation.

The screenshot shows the 'Generate RT Plans' tab in the LinacView software. The interface is divided into two main sections: 'Predefined writing rules for generating RT plans' and 'Fixed writing rules for generating RT plans'.

Predefined writing rules for generating RT plans: These rules could be modified while generating RT Plans.

- Number of Control Points (CPs): As many as in the Logfiles (dropdown menu)
- MLC weight: 1 (text input)
- Gantry weight: 1 (text input)
- MU weight: 1 (text input)
- Number of Control Points (CPs): 200 (text input)
- Gantry angle increment (degrees): 1 (text input)
- ☐ Oversample if needed to respect gantry angle increment

Fixed writing rules for generating RT plans: These rules could not be modified while generating RT Plans.

- The undelivered beams present in the prescribed RT Plan will be kept identically (dropdown menu) in the generated RT Plan
- When the Beam Type of the original RT Plan is at STATIC, it must be forced to DYNAMIC in the generated RT Plan ☐
- Force to CW or CCW the "Gantry Rotation Direction" tag in the 2 first CP of the generated RT Plan file when this tag is at NONE at the beginning of the LOG file but the gantry is described as being in motion in the original RT Plan file ☐
- Replace positions of overlapping leaves by an average of positions ☒

Tested parameter	Exists only in the 1st CP of the original RT Plan
Gantry	To write only in the 1st CP of the RT Plan generated with the median value of all LOG CPs in BEAM ON (dropdown menu)
Colli	To write only in the 1st CP of the RT Plan generated with the median value of all LOG CPs in BEAM ON (dropdown menu)
Leaves (distal)	To write only in the 1st CP of the RT Plan generated with the median value of all LOG CPs in BEAM ON (dropdown menu)
Leaves (proximal)	To write only in the 1st CP of the RT Plan generated with the median value of all LOG CPs in BEAM ON (dropdown menu)
Jaw X	To write only in the 1st CP of the RT Plan generated with the median value of all LOG CPs in BEAM ON (dropdown menu)
Jaw Y	To write only in the 1st CP of the RT Plan generated with the median value of all LOG CPs in BEAM ON (dropdown menu)
Table: Angle	To write only in the 1st CP of the RT Plan generated with the median value of all LOG CPs in BEAM ON (dropdown menu)
Table: Position	To write only in the 1st CP of the RT Plan generated with the median value of all LOG CPs in BEAM ON (dropdown menu)

Note: if the tested parameter exists in all the CPs of the original RT Plan, then it will be written in all CPs of the generated RT Plan

Write gantry rotation angles: By smoothing the changes of direction with rotating gantry (dropdown menu)

3.4.1 Predefined Writing Rules for Generating RT Plans

An important aspect of RT Plan generation is specifying the number of control points. The choices are:

- As many as in the logfiles
- As many as in the original RT Plan
- Configurable
- A CP every gantry angle increment

The first choice is not recommended because there may be a considerable number of control points, especially when a completed treatment is used to generate an RT Plan file. An RT Plan with thousands of control points may not be readable by your treatment planning system.

When the "Number of Control Points (CPs)" is "Configurable", a text field is enabled, allowing you to select several CPs between that of the original RT Plan file (prescription RT Plan) and the maximum number of CPs your TPS can handle. You can also change the "importance weights" for calculating the RT Plan (e.g., MLC (leaf) weight, Gantry weight, MU weight). Discussion of the

interplay of these weights and their MUMU effect on RT Plan results is beyond the scope of this manual.

When the **"Number of Control Points (CPs)"** is **"A CP every gantry angle"**, a dropdown is enabled, allowing you to select angles between 1 and 4 degrees as the gantry angle increment.

One can select an option to "Oversample if needed to respect gantry angle movement" that will allow interpolation between the pairs of CPs in the logfile that exceed the gantry angle increment selected by the user.

Undelivered beam(s) can, by default, be **"kept identically"** or **"removed"** from the generated RT Plan, depending on the actual delivery condition. If, for example, the remainder of the beam was delivered and LinacView is having an issue with the recombination, then the undelivered beam may be "kept identically" to simulate the most realistic condition. When consecutive incomplete sessions are loaded, these sessions are now merged and analyzed as a complete session. In other cases, when the beam remains undelivered, the "removed" option may be a more appropriate default.

For some systems, the original RT Plan specifies a STATIC beam, but to calculate in Pinnacle, the Beam Type must be forced to DYNAMIC. This can be accomplished by checking the box. This is useful for generating plans for import into Pinnacle. The beam type remains Dynamic Arc when the DICOM tag (300A,00C4) Beam type is DYNAMIC, but it is now Static if this DICOM tag is STATIC, and it has only 2 control points and finally, the beam type is Step and shoot in other cases.

The logfile may record multiple changes in direction particularly when the rotation begins due to the sensitivity of the readings recorded in the logfiles. Many TPS will not recalculate when the gantry rotation changes direction too many times. For generation of RT Plans, one can select via checkbox an option to force the tag for gantry angle rotation of the first two CP of the generated RT Plan to CW or CCW when these CP would be NONE based on the logfile information. This option is possible when the arc is in motion in the RT Plan.

You can also specify the writing of gantry rotation angles. The choices are:

- Smoothing of the changes of direction with rotating gantry.
- Keeping data from logfiles.

The first choice is recommended as it will tend to remove changes in gantry direction during delivery that some treatment planning systems will reject.

As you can imagine, you will get different results with different choices. When you generate RT Plans, you will be able to compare "Exported" fluence (as would result for the generated RT Plan with limited CPs) with the "Delivered" fluence (constructed with all of the CPs of all of the LOG files of the loaded sessions). This comparison allows you to judge the quality of the RT Plan and perhaps reconsider your RT Plan creation criteria.

The option to select “As many as in the original RTPlan” for the “Number of control Points (CP)” is no longer available for static beams. This option creates generated RT Plans that very poorly reflect the session performed and is disabled.

Options that cannot be modified while generating RT Plans are shown in the next section. Undelivered beams specified in the original RT Plan can be written out unchanged or removed from the LinacView-generated RT Plan. By selecting “kept identically” or “removed”.

One can elect to maintain the beam type from the original RT Plan as STATIC, or it can be forced to DYNAMIC in the generated RT Plan via a checkbox.

A change that improves compatibility of the generated RT Plan files for Monaco TPS is an option to force the gantry rotation direction of the first two CP of the plan when they are listed at NONE, and the gantry is described as being in motion in the original RT Plan. The user can select the option via a checkbox.

For a logfile measured parameter that is defined by the original RT Plan as not changing during delivery, one can elect to write the value for all CPs in or only with the 1st CP in the generated plan. The value to be written can be selected for each tested parameter (gantry, collimator, distal leaves, proximal leaves, X-jaw, Y-jaw, table angle, and table position) to write the parameter for all CPs, in the 1st CP the median of the logfile CPs, or in the 1st CP the 1st recorded logfile value. Note that if a parameter exists in all CPs of the original RT Plan, the generated RT Plan will also contain the parameter in all CPs.

For an Elekta LINAC, the positions near the stop position may be presented in the logfile beyond the stop specified in the TPS. In these cases, the TPS will refuse to calculate. In some cases, the CP was specified in the original plan as STATIC.

Very small changes in gantry position may be interpreted as changes in direction. To avoid this, one can elect to write gantry rotation angles “By smoothing the changes of direction with rotation gantry” or keep data reported by logfiles by selecting “While keeping the data of the Logfiles”.

3.4.2 RT Plan Evaluation

You may select and specify the comparison indices used to compare “Exported” versus “Delivered” fluence as well as pass, alert, and fail criteria. For a complete description of comparison indices, see Section 3.6.6, Fluence Comparisons: Test & Chart Settings. The comparison may be % of pass rate, mean or max for the Gamm, Chi, or Delta comparison index. One can select if the generated RT Plan does not reflect the treatment by based on Alert or Fail if one of the criteria selected is not met. Radial button for Alert or Fail can be selected.

General | Logfile Import | Import RT Plans | **Generate RT Plans** | Backup | Analysis | User Rights | Users | Notifications | Licenses & Linacs

Evaluation of the generated RT Plan by comparing Delivered fluence (CPs of Logfiles) Vs Exported fluence (CPs of generated RT Plan)

Criteria to test if the generated RT Plan reflects the treatment

Selected criteria		Target value	Error	Alert (%)	Test type
Pass rate (% of pixels with Index ≤ 1)	☒	100.0	2.0	80.0	≥
Mean Index	☒	0.0	0.3	80.0	≤
Max Index	☒	0.0	1.5	80.0	≤

The generate RT plan do not reflect the treatment if one of the criteria is ☐ Alert ☒ Fail

Index Computation

Index choice ☐ Gamma (γ) ☐ Chi (χ) ☐ Delta A (δ-a) ☒ Delta B (δ-b)

Distance criterion: DTA (mm) Search radius/DTA

Ratio DTA / Pixel size

Dose criterion (%) Cutoff (%) Global/Local Threshold (%)

* If local, the criterion in absolute dose is obtained by multiplying this % by the expected dose (or the delivered dose if the expected dose is null) at the given point.
If global, the criterion in absolute dose is obtained by multiplying this % by the "Global/Local Threshold", then by the maximum expected dose.

Remarks:

- The "absolute dose" is expressed in % Total MU.
- Global/Local Threshold = 100% signifies that the calculation is purely global.
- Global/Local Threshold = 0% signifies that the calculation is purely local.

3.4.3 RT Plan Export Paths

RT Plan export format can be DICOM RT Plan or in Pinnacle format. If you select "Choice", the system will ask you to select a format each time you export.

Format

Default folder path

- **Default folder path** – Choose the default folder for RT Plan export. When you select the Generate RT Plan Function, this folder is the initial destination of the RT Plan export dialog if the last export folder either no longer exists or the "Remember last folder" option is not selected.
- **Last folder path** – Choose the last folder used for RT Plan export. In normal use, this is selection is automatically updated as RT Plans are exported to different folders.
- **Remember the last folder path** – Choose whether to remember the last folder selected. If this option is selected, the next time you select the Generate RT Plan function, the initial destination of the RT Plan export dialog is the last folder used for export. If it is not selected, the initial destination of the RT Plan export dialog is the default folder.
- **Automatic opening** of the PDF report evaluating the goodness of the generated RT Plan can be optionally automatically opened or not via checkbox. As pdf opening can be slow, by default this option is off.

Format

Choice Choice

Location of *.Script and *.dat files in Pinnacle /home/p3rtp

Path of the folder containing exported RT Plans files

Default folder path Browse

Last folder path Browse

Remember the last folder path ☒

PDF report

☐ Automatic opening

3.5 Backup Tab

It is good practice to back up data on a regular basis. The Backup Tab allows defaults to be set that will be displayed in the Backup dialog when the backup option is selected.

General Logfile Import Import RT Plans Generate RT Plans **Backup** Analysis User Rights Users Notifications Licenses & Linacs

Path C:\Program Files (x86)\Standard Imaging\LinacView\backups Browse

Backup proposal selected by default

settings	☒
data	☐
archives	☐
LogFiles	☐
RTPlans	☐
icons	☒
LINACVIEW	☐
temp	☐
clearBATCH	☐

Export in .csv format

Column splitter :

Path of the export folder

Default folder path Browse

Last folder path Browse

Remember the last folder path ☒

The path of the backup directory is user-specified. You may select **[Browse]** to change the default path. The root directory for most items that can be saved is “C:\DataBase-LINACVIEW\backups”.

You may choose to back up:

- Data – the data typically stored in “\$root\data”.
- Settings – the data typically stored in “\$root/settings”.
- Logfiles – the data typically stored in “\$root\logfiles”.
- RT Plans – the data typically stored in “\$root\rtplans”.
- Archives – the data typically stored in “\$root\archives”.

Although it is possible to back up LinacView, this is unnecessary as Standard Imaging can remotely reinstall the program at any time. If you were to back up LinacView, it would save the contents of the program, which is typically installed in the “C:\Program Files\ LinacView” folder.

3.6 Analysis Tab

The Analysis Tab, which is only available to Administrators and Superusers, is used to control the general parameters for LinacView tests and to create and maintain analysis templates.

3.6.1 Analysis Templates

Analysis templates can be created or edited from the top of the Analysis Tab.

PDF analysis reports

Automatic opening
Short PDF

Analysis results included in short reports
☐ All
☒ Only "Selection" ("With email")

Analysis results included in comprehensive reports
☐ All
☒ Only "Selection" ("With email")

☒ Include comments in short reports

Include trend curves of tested parameters you have ticked in the following table and which
☐ are selected to send an email ("With email")
☒ are displayed in trends of "Analyze"

Tested parameters		Deselect all ☒
Carriages - RMS Error (mm)	☐	
Carriages - Nth Percentile (mm)	☐	
Carriages - "Maximum" (mm)	☐	
Jaws - RMS Error (mm)	☐	
Jaws - Nth Percentile (mm)	☐	
Jaws - "Maximum" (mm)	☐	
Leaves - RMSE: Maximum (mm)	☐	
Leaves - RMSE for the bank (mm)	☐	
Leaves - Nth Percentile (mm)	☐	

Generate PDF reports automatically
☐ No
☒ Yes if at least one result from the "Selection" ("With email") is
Failed or Alert

Report type
Comprehensive

☒ Attach PDF reports automatically generated to alarm email

Trend curves

Add curves from tested parameters not selected to send an email ("With Email") ☒

Amplitude : Bound surrounding Target value
☐ Extreme value (Points)
☐ Target value
☒ Extreme value (Target, Points)

Amplitude : Bound surrounding Tolerance level
☐ Extreme value (Points)
☐ Tolerance Level
☒ Extreme value (Tolerance level, Points)

Ordinates : Bound surrounding Target value (% Amplitude)
5

Ordinates : Bound surrounding Tolerance level (% Amplitude)
5

Analysis general settings

Store in the database, results from incomplete sessions
☒

Minimum pixel size for index x, y, δ calculation (mm)
0.2

Number of decimals displayed in the "View" screen for the rates of failed sessions and beams
1

These templates represent a highly customizable method to:

- Select items to be included in PDF reports,
- specify trend curve displays,
- select the tests that will be run,
- select which test will have email notifications,

- set pass, alert, and fail thresholds for individual tests,
- set criterion for an incomplete session,
- control the display of results.

Automatic opening of the report can be set to none, short pdf, comprehensive pdf, or both. The PDF report can be automatically generated and attached to alert or failure emails when the option to send email for failure or alerts is selected. Trends of selected parameters can also be included. The option for either short or long reports is customizable for emails. The fluence and MU graphs in these reports are zoomed to open field areas.

Analysis templates are now versioned. This versioning limits database recalculation to only open sessions using the modified analysis templates. Prior to this change, any modifications of the analysis templates resulted in the complete recalculation of all unclosed treatment sessions in the database. When a change is made to the currently active template, a dialog is presented, which shows at the bottom:



There are only two choices: “**Do not recalculate,**” in which the database is not immediately recalculated, but whatever results are loaded using the Load Function are updated to match the new testing criteria or display specifications. “**Stop the Batch and Start the recalculation**” does just that. Eventually, through messages on shutdown or startup, you will need to recalculate the database. The advantage in selecting “**Do not recalculate**” is that you can look at the results of your changes on a few patients’ treatments and perhaps adjust them before committing to a complete database recalculation.

3.6.2 Creating Custom Templates

Your LinacView installation comes with default templates that can be used from the start; however, you will soon want to tailor templates to your clinical needs. Templates can be generally applicable or machine or site specific. A specific treatment type may be specified in the DICOM file by a RT Plan name DICOM tag (300A,0003), Study Description DICOM tag (0008,1030) or RTPlan Label DICOM tag (300A,0002) as selected by the user. The keyword in the specified position is input by the user for treatment types by selecting Edit next to the treatment types. For example:

Choice of analysis templates

Treatment types ? DICOM tag of the RT plan in which the keyword linked with the treatment type is searched RT Plan Name ▾

Center choice LucyHospital ▾

Treatment type ▲	UNIQUE1	Clinac1
Default-Treatment	Gamma-Clinac ▾	Gamma-Clinac ▾
ELEKTA Complex	Gamma-Clinac ▾	Gamma-Clinac ▾
IMRT- Head & Neck	Gamma-Clinac ▾	Gamma-Clinac ▾
STATIC - Metastasis	Gamma-Clinac ▾	Gamma-Clinac ▾
STATIC beams	Gamma-Clinac ▾	Gamma-Clinac ▾
VMAT- Breast + Nodes	Gamma-Clinac ▾	Gamma-Clinac ▾

Save Cancel

Name STATIC - Metastasis 19 / 48

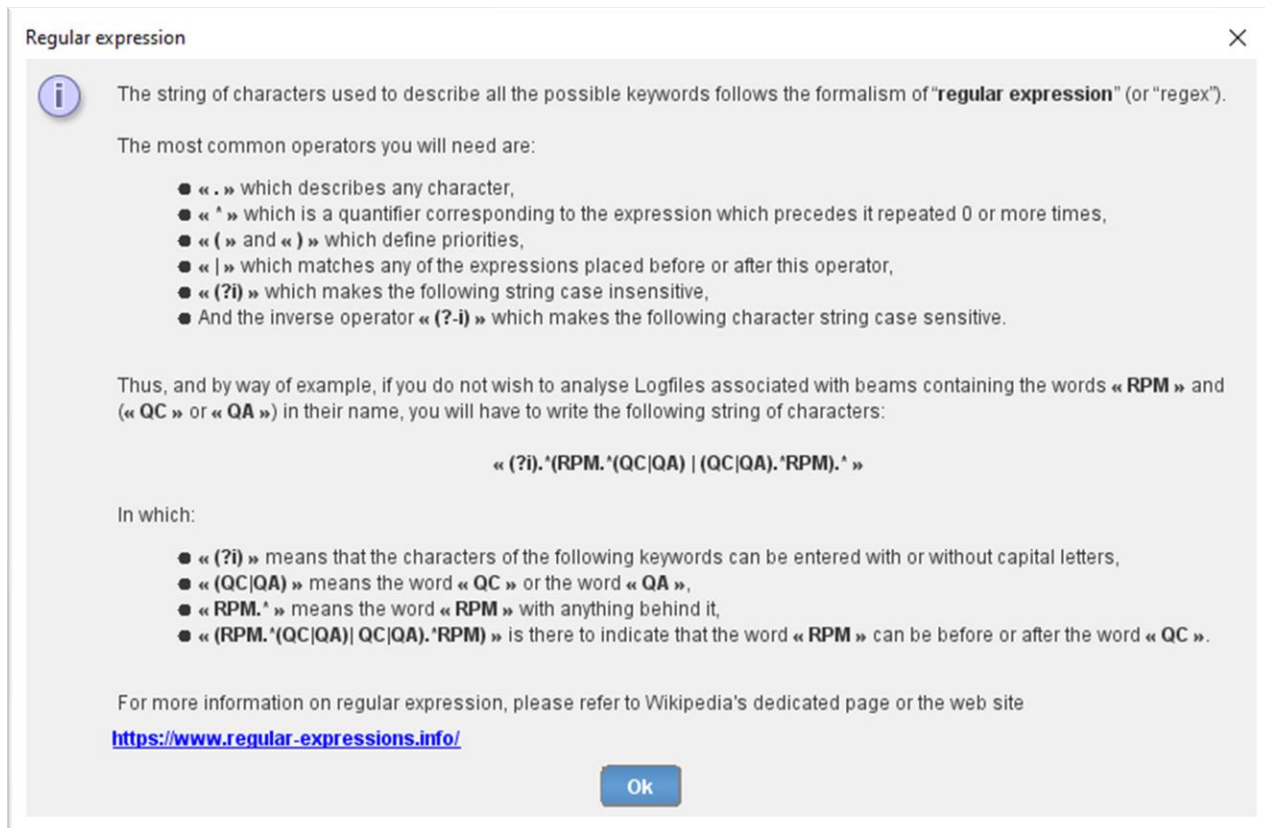
Comment MCS > 0.60 10 / 160

Keywords ? meta 4 / 64

	Tested	Target	Tolerance (%)	Alert (%)	Test Type
MCS	☒	0.500	10	20	>
Total MUs	☐	1000.000	40	50	≤
Number of CPs	☐	360	40	50	≤

Confirm Cancel

The keyword for a plan is specified in this dialog to be used when the RT Plan name is used to link the template. The keywords used to automatically associate a prescribed Plan file have been revised to use regular expressions, such as “.” “^” or “=” as defined at <https://www.regular-expressions.info/> and as described via tooltips in the application:



Here, one can select metrics for Tolerance and Alert based upon plan complexity. The metrics available for tests are:

- Modulation Complexity Score (MCS)
- Total Number of MU in the plan
- Number of Control Points (CPs)

The plan complexity tests do not produce a failure or alert in the dashboard. The Tolerance and Alert values, as well as Test Type, can be customized. For example, should one desire an Alert for MCS values above 0.6, then one could specify a target MCS of "0.50" and alert (%) of "20" with a test type of ">". Alternatively, one could specify a target MCS of "0.60" and alert (%) of "0". In either case, the box in the "Tested" column must be checked. Select "Confirm" to save changes to name, keywords, and tests for the treatment type analysis template.

The illustration below shows the customizable options when editing a template.

Control Points (CPs) of Log files taken into account for analysis	⌵
Not completed Sessions	⌵
Jaws	⌵
Carriages	⌵
Leaves	⌵
Monitor Units (MU)	⌵
Gantry	⌵
Colli	⌵
Table	⌵
Beam Off	⌵
Fluence Comparisons: Test & Chart Settings	⌵
Fluence Comparisons: Index computation	⌵
Fluence Comparisons: Calculation & Display	⌵

Expanding the first three options is illustrated below:

Control Points (CPs) of Log files taken into account for analysis

Ignore Beam Off CPs for Jaw, Carriage, Leaf, Gantry, Collimator and Table analysis ☒

Ignore Beam Off CPs for Monitor Units and Integrated Fluence analysis ☐

Not completed Sessions

Criterion qualifying a session as incomplete: Comparison of **% Total MU** Tolerance **0.5**

Jaws

Planned Jaws positions coming from **RT Plan**

Chart: ordinate axis definitions

Chart type	Signed ordinates	Minimum ordinate	Maximum ordinate
Deviations (mm)	☒	-0.9	0.9

Tested Parameters: Selection & Tolerances

Position Deviations (mm)	Analyze (All parameters)	With Email (Selection)	Target value	Error	Alert (%)	Test type
RMS Error	☒	☐	0.0	0.5	80.0	≤
"Maximum"	☒	☐	0.0	0.8	80.0	≤
N th Percentile	☒	☐	0.0	0.6	80.0	≤

Tested Parameters: Definitions

"Maximum" deviation definition:

Moving average of this number of Logfile Control Points **1**

Nth Percentile: N= **95**

Result Precision (Decimals) **1**

Index choice ☐ Gamma (γ) ☐ Chi (χ) ☐ Delta A (δ-a) ☒ Delta B (δ-b)

Position criterion (mm) **0.8** (Tolerance on "maximum" deviation)

Time criterion (s) **0.2 (= 1.0 / 5.0)** Tolerance (mm) **1** at maximum speed (mm/s) **5**

Carriages

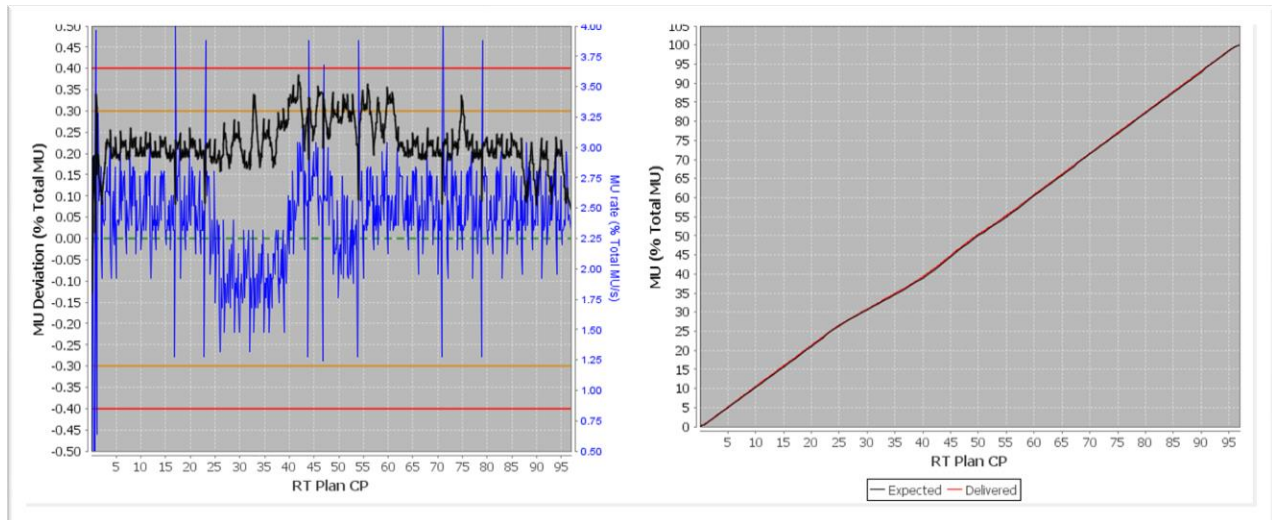
In the first expander, the two check boxes allow you to ignore errors that occur when the beam is off. Checking the first box and unchecking the second is recommended. In the second expander, the user can select the not completed session criterion, which is determined using % Total MU or CP Number, along with a tolerance.

3.6.3 Jaws, Carriages, Monitor Units, Gantry, Collimator, Table

Immediately following these two areas is an area where jaw-related tests are specified. This area is very similar to the specification areas for all other tested items except "Leaves", "Beam On/Off", and "Integrated Fluence", which will be discussed separately.

"Planned Jaws positions coming from" – The planned jaw positions can be specified as coming either from the RT Plan or a reference logfile. The RT Plan is the usual and recommended choice. Other tested items offer this flexibility and should also be set to RT Plan.

"Chart ordinate axis definitions" – "Signed ordinates" along with "Minimum ordinate" and "Maximum ordinate" allow you to specify the range of deviation values that will be displayed in the Analyze Function.



“Tested Parameters: Selection and Tolerances” – All tests are run whenever new logfiles are deposited in the batch folder or imported. However, only tests with “Analyze” checked are compared with thresholds. The subset of these tests with “With Email” checked is shown to Intermediate and Basic-level users and results in emails being sent to responsible individuals. These checkbox choices affect the results tooltip contents, as shown below. Plan complexity tests (MCS, # MU, and CP) will also appear here if “Tested” is checked next to these in the template.



Using “Maximum”, above, as an example, the “Target” value is 0, an “Error” occurs when the absolute value of the difference between actual and expected values is greater than 1.0. An “Alert” occurs when the absolute value is greater than 0.8.

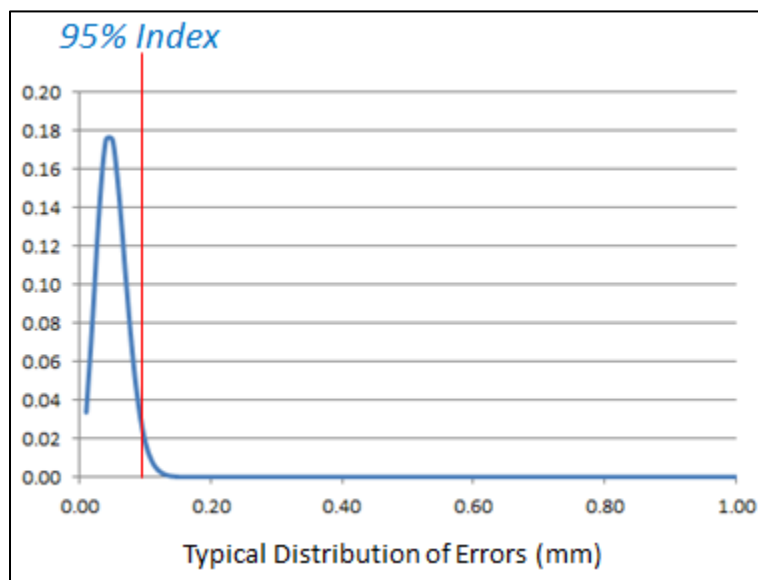
“Tested Parameters: Definitions”

The “RMS Error” (Root Mean Square Error) is defined below:

$$RMS\ Error = \sqrt{\frac{\sum_{m=1}^{ControlPoints} \sum_{n=1}^{TestedItems} Error(m,n)^2}{m \times n}}$$

The RMS Error is similar to a standard deviation calculation, where the deviation from a mean value is replaced by the deviation from expected values. The items summed will depend on the control point selection (though the “ignore” checkboxes) at the top of this template editing dialog. When leaves are the tested item, the items summed also depend on the setting of the “Ignore leaf position analyses for static leaves”.

The “Maximum” deviation is calculated using a moving average. Typical averaged samples are between 1 and 3. When calculating these deviations, the smoothed logfile results are compared to unsmoothed RT Plan or reference logfile expected values. Smoothing removes some “noise” from the results.



The “Nth Percentile” calculation requires a certain percentage of deviations to be less than the error and alert settings. Above is shown a typical deviation distribution and the 95% index. In this case the “Nth Percentile” value is approximately 0.1.

3.6.4 “Leaves” – Special Tests

The “Skip analysis of leaves under Jaws which move in the Same direction as Leaves” option, if checked, will prevent calculation of fluence beyond the jaws as there is no impact on the patient. The leaf RMS statistics will also be prevented beyond the jaw when checking this option. For example, the Elekta Unity logfiles do not generate backup jaw positions, and so the mid-field

leaves that have both banks parked under the backup jaw are not excluded from analysis. This option is useful for other LINAC types.

The “Skip analysis of leaves under Jaws which move perpendicular to the movement of the Leaves” is useful when the LINAC delivery system controls these leaves rather than the TPS. See Licenses & Linacs Tab for special options for Elekta guard leaves.

The Leaves section allows you to specify in detail the distribution of deviations that you desire.

Leaves

☐ Skip analysis of leaves under Jaws which move in the same direction than Leaves*

☒ Skip analysis of leaves under Jaws which move perpendicular to the movement of the Leaves*

(*): If you check this box, the fluence will not be calculated beyond the jaws concerned.

Planned Leaf positions coming from **RT Plan**

Chart: ordinate axis definitions

Chart type	Signed ordinates	Minimum ordinate	Maximum ordinate
Deviations (mm)	☒	-3.4	3.4
RMSE (mm)	☐	0	2.4
"Maximum" deviation (mm)	☐	0	3.6
Deviation frequencies (%)	☐	0	105

Deviation Histogram & Tolerances

Dev. bound (mm)	Selected	Target value (%)	Error	Alert (%)	Test type
0.0	☐	10.0	1.0	80.0	IV
0.05	☐	20.0	1.0	80.0	IV
0.1	☐	30.0	1.0	80.0	IV
0.15	☐	40.0	1.0	80.0	IV
0.2	☒	55.0	5.0	80.0	IV
0.25	☐	60.0	1.0	80.0	IV
0.3	☐	70.0	1.0	80.0	IV
0.35	☐	75.0	1.0	80.0	IV
0.4	☐	80.0	1.0	80.0	IV
0.45	☐	85.0	1.0	80.0	IV
0.5	☐	90.0	1.0	80.0	IV
1.0	☒	95.0	5.0	80.0	IV
2.0	☐	100.0	1.0	80.0	IV

Tested Parameters: Selection & Tolerances

Position Deviations (mm)	Analyze (All parameters)	With Email (Selection)	Target value	Error	Alert (%)	Test type
RMSE for the bank	☒	☐	0.0	1.0	80.0	≤
RMSE: Maximum for the bank	☒	☐	0.0	1.5	80.0	≤
"Maximum" for the bank	☒	☐	0.0	3.0	67.0	≤
N th Percentile for the bank	☒	☐	0.0	1.7	80.0	≤

Tested Parameters: Definitions

RMSE for the bank ☒ The bank A and the bank B separately ☒ Banks A&B together **RMSE: Global (RMSE of all leaves together)**

"Maximum" deviation definition:

Moving average of this number of Logfile Control Points

Nth Percentile: N=

Result Precision for positions (Decimals)

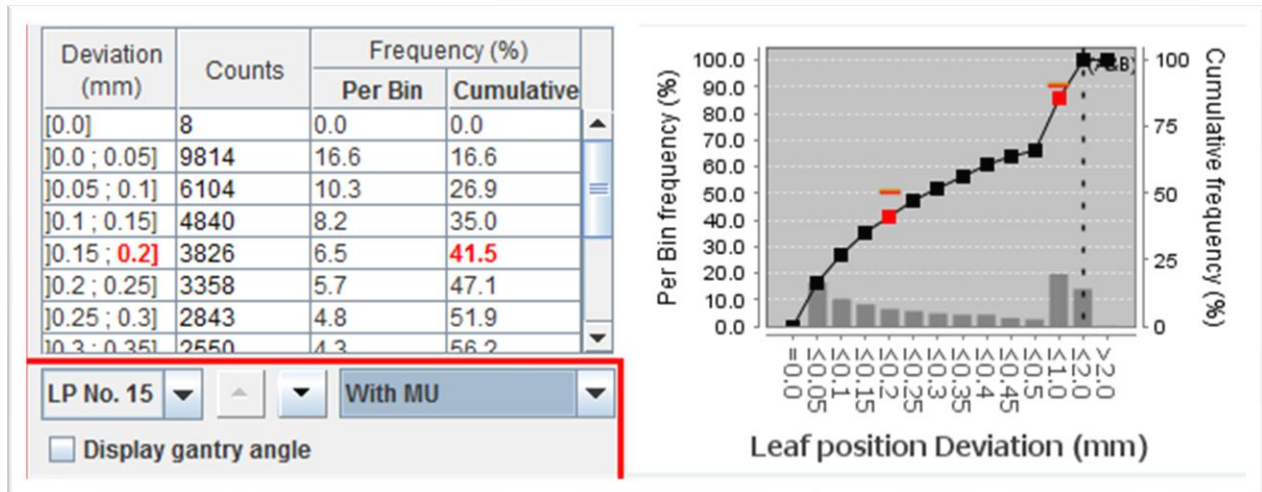
Result Precision for frequencies (Decimals)

Index choice ☐ Gamma (γ) ☐ Chi (χ) ☐ Delta A (δ-a) ☒ Delta B (δ-b)

Position criterion (mm) (Tolerance on "maximum" deviation)

Time criterion (s) Tolerance (mm) at maximum speed (mm/s)

The table above shows that the user wants at least 55% of leaf deviations to be less than 0.2 mm. Errors occur when there are less than 50% (55 – 5) and alerts occur when there are less than 51% (55 – 5 * 0.8).



The deviation histogram table and graph above (from the Analyze Tab) show that only 41.5% of leaf errors were less than 0.2mm; the error levels are shown on the graph as red bars. The explanation for the 95% target is analogous.

The user can select if the “RMSE for the bank” will be a combination of Banks A&B or if the Banks will be analyzed separately. Leaf RMSE: can be specified as Global (RMSE of all leaves together) or Average (Average value of the Leaf RMSE).

The maximum deviation definition can be specified here for the moving average of control points, which is by default 1. The Nth Percentile deviation is defined by default to be 95th, but is user-modifiable. The position precision and frequency precision results can be specified for display using 0 to 4 decimal places.

The analysis index choice is selectable here, along with criteria as described elsewhere in the manual. As with the leaf analysis, options are present after expanding the Monitor Units (MU), Gantry, Collimator, and Table Tabs for the same deviation definition described and shown for the Jaw Tab.

3.6.5 “Beam On/Off” – Special Tests

Beam Off

Criterion describing the Beam Off state

Give preference to the Beam Off state described in the VARIAN Logfile to the Pseudo Beam Off state described below ☐

MU rate comparable to the Pseudo Beam Off state: % of the 95th percentile on the MU rate values found in all CPs of the Logfile

Tested Parameters: Selection & Tolerances

Beam Off lags (ms)	Analyze (All parameters)	With Email (Selection)	Alert level (ms)	Error (ms)
Total duration	☒	☒	350	450
Maximum duration	☒	☒	200	250

“Total duration” – The sum of all beam off lags.

“Maximum duration” – The longest of all beam off lags.

3.6.6 Fluence Comparisons: Test & Chart Settings

After opening the “Fluence Comparisons: Test & Chart Settings”, the user can define chart minimum and maximum ordinates. The user can select which fluence parameters to analyze and send emails for alerts and failures. The “Fluence Comparison: Index computation” allows users to select the index choice (Gamma, Chi, or Delta) as well as the criteria to be used for the index analysis. Analysis parameters include the distance to agreement (DTA), dose criteria, search radius for the DTA, and cutoff percentages.

Fluence Comparisons: Test & Chart Settings

Chart: ordinate axis definitions

Chart type	Minimum ordinate	Maximum ordinate
Pass Rate (%) - Integrated: Vs Plan	0	100
Pass Rate (%) - Integrated: Vs S1	0	100
Pass Rate (%) - Integrated: Vs Sn	0	100
Mean [Index] - Integrated: Vs Plan	0	1.5
Mean [Index] - Integrated: Vs S1	0	1.5
Mean [Index] - Integrated: Vs Sn	0	1.5
Max [Index] - Integrated: Vs Plan	0	4
Max [Index] - Integrated: Vs S1	0	4
Max [Index] - Integrated: Vs Sn	0	4

Tested Parameters: Selection & Tolerances

	Analyze (All parameters)	With Email (Selection)	Target value	Tolerance Max	Alert (%)	Test type
Pass Rate (%) - Integrated: Vs Plan	☒	☒	100.0	2.0	80.0	IV
Pass Rate (%) - Integrated: Vs S1	☒	☒	100.0	2.0	80.0	IV
Pass Rate (%) - Integrated: Vs Sn	☒	☒	100.0	2.0	80.0	IV
Mean [Index] - Integrated: Vs Plan	☒	☒	0.0	0.3	80.0	IA
Mean [Index] - Integrated: Vs S1	☒	☒	0.0	0.3	80.0	IA
Mean [Index] - Integrated: Vs Sn	☒	☒	0.0	0.3	80.0	IA
Max [Index] - Integrated: Vs Plan	☐	☐	0.0	1.5	80.0	IA
Max [Index] - Integrated: Vs S1	☐	☐	0.0	1.5	80.0	IA
Max [Index] - Integrated: Vs Sn	☐	☐	0.0	1.5	80.0	IA

☐ Tolerance according to MCS

Edit

If "Reference 1st session" exists, must be tested: ☐ Only "Fluence: Vs S1" ☒ Both: "Fluence: Vs S1" & "Fluence: Vs Plan"

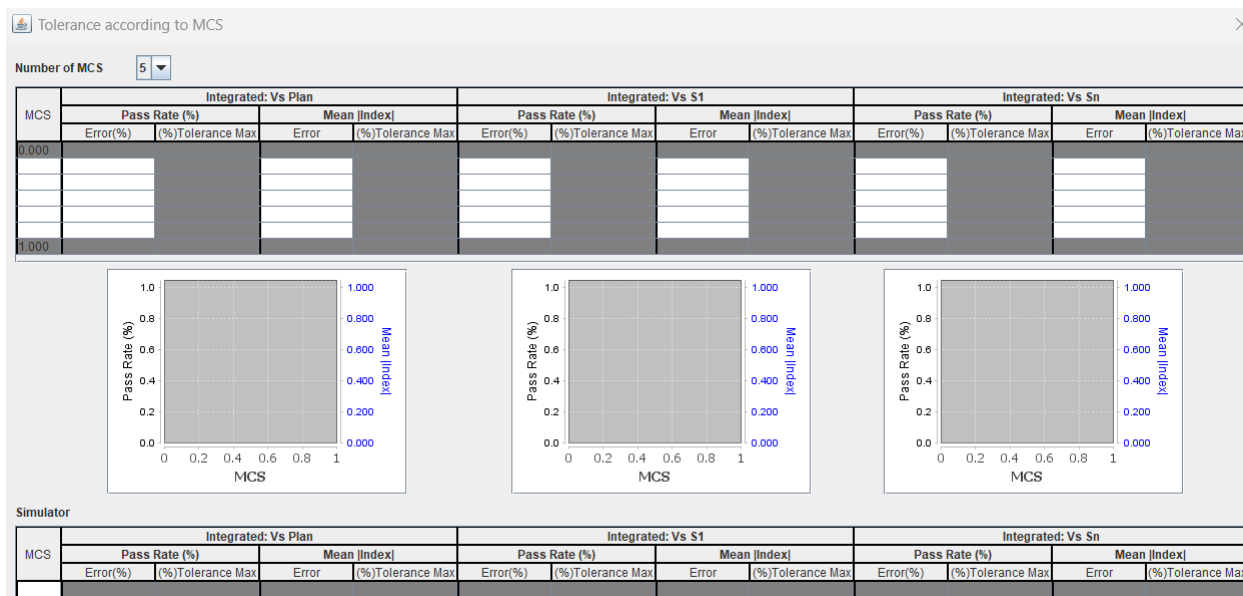
Result Precision for Pass rate (Decimals)

1

Result Precision for Index (Decimals)

3

In addition, the tolerances can be set according to the MCS, with the % pass rate and mean index specified as a function of MCS. Select the check box for “Tolerance according to MCS” to select this option and specify desired values.



Options are available to test “Only Fluence Vs S1” or Both “Fluence Vs. S1” & “Fluence: Vs Plan” where S1 is session one. The precision for this comparison can be specified in 0-4 decimal places.

3.6.7 Fluence Comparisons: Index computation

LinacView supports three different fluence comparison indices: Gamma [Low et al., 1998], Chi [Bakai et al., 2003], and Delta [Blanpain and Mercier, 2009]. This section allows you to choose which indices you will use and parameterize them. Each index uses the concepts of “**Distance to Agreement**” (DTA) and a “**Dose Criterion**” in percent. For each point in a fluence map, the indices combine the DTA and dose criterion into a single number that to pass needs to be between [0,1] for Gamma and Chi and [-1, 1] for Delta. Besides the pass rate, the Mean and Max values for each index are both available for analysis. The gamma pass rate, mean, and max values for each index can be used to compare to preset tolerances to generate alerts and failures.

Fluence Comparisons: Index computation

Integrated: Vs Plan

Index choice: ☐ Gamma (γ) ☐ Chi (χ) ☐ Delta A (δ-a) ☒ Delta B (δ-b)

Distance criterion: DTA (mm): 2.8 Search radius/DTA: 8

Ratio DTA / Pixel size: 7

Dose criterion (%): 2.8 Cutoff (%): 5 Global/Local Threshold (%): 0

Integrated: Vs S1

Index choice: ☐ Gamma (γ) ☐ Chi (χ) ☐ Delta A (δ-a) ☒ Delta B (δ-b)

Distance criterion: DTA (mm): 0.8 Search radius/DTA: 8

Ratio DTA / Pixel size: 2

Dose criterion (%): 0.8 Cutoff (%): 2 Global/Local Threshold (%): 0

Integrated: Vs Sn

Index choice: ☐ Gamma (γ) ☐ Chi (χ) ☐ Delta A (δ-a) ☒ Delta B (δ-b)

Distance criterion: DTA (mm): 1.6 Search radius/DTA: 8

Ratio DTA / Pixel size: 4

Dose criterion (%): 1.6 Cutoff (%): 3 Global/Local Threshold (%): 0

*If local, the criterion in absolute dose is obtained by multiplying this % by the expected dose (or the delivered dose if the expected dose is null) at the given point.
If global, the criterion in absolute dose is obtained by multiplying this % by the "Global/Local Threshold", then by the maximum expected dose.

Remarks:

- The "absolute dose" is expressed in % Total MU.
- Global/Local Threshold = 100% signifies that the calculation is purely global.
- Global/Local Threshold = 0% signifies that the calculation is purely local.

"Cutoff (%)" – sets the percent of maximum dose below which indices are not calculated.

"Global/Local threshold (%)" – sets the percent of maximum dose where the dose criterion changes from global to local.

$$GlobalDosePercent = \frac{DoseActual - DoseExpected}{DoseMax} * 100\%$$

$$LocalDosePercent = \frac{DoseActual - DoseExpected}{DoseExpected} * 100\%$$

"Ratio DTA/Pixel size" – determines the pixel size of the fluence maps. In the proceeding screen capture, the "Ratio DTA/Pixel size" for the Gamma index is 4 and the "Distance criteria: DTA (mm)" is 2mm. Therefore, the fluence map pixel size will be 0.5mm.

"Search radius/DTA" – determines how far the index will search for an agreement in fluence. In the proceeding screen capture, the "Search radius/DTA" for the Gamma index is 8 and the "Distance criteria: DTA (mm)" is 2mm. Therefore, the index will search a maximum of 16mm for a matching dose.

"Mean Index" – sums the index (gamma, chi, or delta) for each pixel and divides by the total number of pixels.

"Max Index" – specifies the maximum pixel value for the index (gamma, chi, or delta).

3.6.8 Fluence Comparison: Calculation and Display

The fluence map comparison displays can be customized. One can adjust settings to ensure impact and understanding of each change. The default settings are reasonable, but the user is encouraged to review and adjust the settings to meet their specific clinical needs. A signed fluence map can be optionally selected. Notice that for “Histograms,” either the number of bins or the bin width may be set.

Fluence Comparisons: Calculation & Display

Pixel size (only along abscissa) for integrated fluence maps display (mm)

Normalisation of delivered or planned integrated fluence maps: ☒ % Total MU* ☐ % Max. Planned

*: This is the default setting and it is the most common because in this case, the integrated fluence maps are normalized with respect to the Total MUs entered in the RT Plan file. With this setting, for a pixel of the planned integrated fluence map to have its intensity equal to 100, it must be irradiated during the entire session.

Fluence

Red fluence ☒ Max Fluence

Blue fluence ☒ Min Fluence

Min Max **Display**

Index Chi (x) & Delta (δ)

Index > acceptable max

Max index ☐ Max χ , δ ☒ Max $|\chi$, $\delta|$

Max color

Min index

Min color

acceptable min < index < acceptable max

Max color

Middle color

Min color

Index < acceptable min

Max index

Max color

Min index ☐ Min χ , δ ☒ -Max $|\chi$, $\delta|$

Min color

Min χ , δ Max χ , δ **Display**

Index Gamma (γ)

γ > acceptable max

Max γ ☒ Max γ

Max color

Min γ

Min color

γ < acceptable max

Max color

Min color

Max Gamma **Display**

Sign fluence deviations map ☐

Colors for integrated fluence maps

Zones always hidden by a leaf or a jaw

Colors for χ , γ or δ index not calculated

Zones always hidden by a leaf or a jaw

Zones under the cutoff dose

Histogram

Bins

☒ Number

☐ Width

Background color

3.6.9 Tolerances applied during reviews and closing

Tolerances applied during reviews and closing

Please enter below the multiplying coefficients to be applied to the tolerances corresponding to a single session

Fluence Analysis Results

Multiplying coefficient	Review	Closing
Pass Rate (%)	0.8	0.8
Mean [Index]	0.67	0.67
Max [Index]	0.8	0.8

When reviewing or closing plans for a single session, results can be adjusted to be less stringent when compared to numerous sessions. Averaging is expected for multiple sessions to be more forgiving of small delivery deviation. This multiplier can be used to compensate for larger single

session deviations. For single or few-session treatments, these values should be carefully considered and adjusted.

3.7 User Rights Tab

General Logfile Import Import RT Plans Generate RT Plans Backup Analysis User Rights Users Notifications Licenses & Linacs						
Functions	Function and button access	Levels				
		Basic	Intermediate	Advanced	Super user	Administrator
"Batch is ON"	Accessible from?	☒	☒	☒	☒	☒
	"Batch dashboard" - "Analyzed parameters": only "Selection"	☒	☒	☒	☒	☒
	"Batch dashboard" - Import RT Plans / Choose Treatment type	☒	☒	☒	☒	☒
	"Clear journal"	☐	☐	☐	☒	☒
	"Delete" session	☐	☐	☐	☒	☒
"Import"	"Load" session	☐	☒	☒	☒	☒
	"Batch ON" / "Batch OFF"	☐	☐	☐	☒	☒
	Accessible from?	☐	☐	☐	☒	☒
	"RT Plans"	☐	☐	☐	☒	☒
	Logfiles	☐	☐	☐	☒	☒
"Load"	Accessible from?	☐	☐	☒	☒	☒
	Use Reference session	☐	☐	☒	☒	☒
	Delete a session	☐	☐	☐	☒	☒
	Move a session to the Batch folder	☐	☐	☐	☒	☒
	Accessible from "Batch dashboard"?	☐	☒	☒	☒	☒
"Analyze"	Accessible from "Load"?	☐	☐	☒	☒	☒
	"Generate temporary files" / "RT Plan"	☐	☐	☒	☒	☒
	"Generate temporary files" / "PDF reports"	☐	☐	☐	☒	☒
	"Close analysis folder"	☐	☐	☐	☒	☒
	Modify RT Plan generation writing rules	☐	☐	☐	☒	☒
"View"	Accessible from?	☐	☐	☒	☒	☒
	"Reopen the analysis folder"	☐	☐	☐	☒	☒
	"Delete the analysis folder"	☐	☐	☐	☒	☒
	"Delete PDF reports"	☐	☐	☐	☒	☒
	"Delete RT Plans"	☐	☐	☐	☒	☒
"Backup"	Export only RT Plans for which all beams reflect the treatment	☐	☐	☒	☒	☒
	Export all RT Plans	☐	☐	☐	☒	☒
	Accessible from?	☐	☐	☐	☒	☒
	"System Setup"	☐	☐	☐	☒	☒
	Accessible from?	☐	☐	☐	☒	☒
"System Setup"	"Analysis" tab	☐	☐	☐	☒	☒
	"Licenses & Linacs" tab	☐	☐	☐	☒	☒
	All tabs	☐	☐	☐	☐	☒
	Open/Close session	☐	☐	☐	☒	☒
	Automatically close inactive treatments	☐	☐	☐	☒	☒
"Constancy Mode"	Consult results from "Constancy" mode	☐	☐	☐	☒	☒
	Add typical sessions into the "Constancy" mode	☐	☐	☐	☒	☒
	Recalculate typical sessions from the "Constancy" mode	☐	☐	☐	☒	☒
	Delete typical sessions from the "Constancy" mode	☐	☐	☐	☒	☒
		☐	☐	☐	☒	☒

Save

Cancel

LinacView has five different user classes. All user rights are fixed except for those designated with a "*". These permissions can be set by a user designated as an Administrator.

- **Administrators** may access all LinacView functions.
- **Superusers** have the same rights as **Administrators** except that the only System Setup tabs that **Superusers** may access are "Analysis" and "Licenses & Linacs".
- **Advanced** users have the default user rights of Intermediate users. **Administrators** can give **Advanced** users rights up to and including Superuser rights through the User Rights Tab.
- **Intermediate** users may load a Treatment Session from the Batch Dashboards to view its results in the Analyze Function.
- **Basic** users may only view the status of the Batch Dashboards.

		Levels				
Functions	Function and/or accessible buttons	Basic	Intermediate	Advanced	Super User	Administrator
« BATCH IS ON »	Access the au « BATCH dashboard »	✓	✓	✓	✓	✓
	« Clear journal »	x	x	*	✓	✓
	See only the « Selection » type « Analysed parameters »	*	*	*	*	*
	« Import RT Plans » and « Choose a type of treatment » to it	*	*	*	*	*
	Activate or deactivate BATCH analysis « BATCH OFF » / « BATCH ON »	x	x	*	✓	✓
« Import »	Accessible?	x	x	*	✓	✓
	« RT-Plans »	x	x	*	✓	✓
	« Log » files	x	x	*	✓	✓
« Load »	Accessible?	x	x	*	✓	✓
	Activate or deactivate a « Reference session »	x	x	*	✓	✓
	« Delete session »	x	x	*	✓	✓
	« Move a session in the Batch folder »	x	x	*	✓	✓
	« Close analysis folder »	x	x	*	✓	✓
	« Generate PDF reports of review »	x	x	*	✓	✓
« Analyse »	Accessible by the « Load » button from the « BATCH Dashboard »	x	✓	✓	✓	✓
	Accessible by the « Load » function	x	x	*	✓	✓
	« Generate temporary files » / RT Plan »	x	x	*	✓	✓
	« Generate temporary files » / PDF reports »	x	x	*	✓	✓
	Modify the « RT Plan generation writing rules »	x	x	*	✓	✓
	« Close analysis folder »	x	x	*	✓	✓
« View »	Accessible?	x	x	*	✓	✓
	« Reopen the analysis folder »	x	x	*	✓	✓
	« Delete analysis folder »	x	x	x	✓	✓
	« Delete PDF reports »	x	x	*	✓	✓
	« Delete RT Plans »	x	x	*	✓	✓
	« Export RT-Plan » for which all beams reflect the treatment	x	x	*	✓	✓
	« Export RT-Plan » without distinction	x	x	*	✓	✓
« Backup »	Accessible?	x	x	*	✓	✓
« System Setup »	Accessible?	x	x	*	✓	✓
	« Analysis » tab	x	x	*	✓	✓
	« Licenses & UNACs » tab	x	x	*	✓	✓
	Access all tabs in « System Setup »	x	x	x	x	✓
Open/Close a session	Automatically closes analysis folders of inactive treatments	x	x	x	✓	✓

« Constancy Mode »	Consult results from the « Constancy » mode	x	x	*	*	✓
	Add typical sessions into the « Constancy » mode	x	x	*	*	✓
	Recalculate typical sessions from the « Constancy » mode	x	x	*	*	✓
	« Delete » typical sessions from the « Constancy » mode	x	x	*	*	✓

3.8 Users Tab

An Administrator can create new users, assign passwords, enable sending of emails to a particular user and specify linacs for which a user is responsible. The default username and password for the Administrator is admin, admin. There is only one Administrator, but the Administrator can appoint a single “deputy” Administrator using the checkbox at the bottom of the page.

Add custom users for your clinic by selecting the “Add” button. “Delete” the default users if additional security is desired or any users no longer using LinacView.

Level	First name	Last name	Email	Login	Reset password	Receive emails	From
Administrator	Admin	Admin	linacwatch.sb@gmail.com	admin	☐	☒	LINACs
Basic	Basic	Basic	Basic@mail.com	basic	☐	☐	LINACs
Intermediate	Inter	Inter	3143242630@messaging.spr...	inter	☐	☒	LINACs
Advanced	Advan	Advan	Advan@mail.com	advan	☐	☐	LINACs
Super user	Super	Super	Super@gmail.com	super	☐	☐	LINACs

Deputy administrator

☐ Designate a deputy administrator

Select “Receive Email” so that a user will receive email alerts and/or warnings according to “Selection” tests. When a user can receive emails, the “LINACs” button under “From” becomes active. Selecting “LINACs” presents a dialog, which will allow you to specify which linacs’ alerts or failures will result in emails being sent to a particular user.

Department	Linac	Select
OncologyCityCenter	CLINAC_3	☒
OncologyCityCenter	CLINAC4	☒
OncologyCityCenter	Novalis_1	☐

Note that emails can often be sent as text messages if your telephone service supports email to text messages. For instance, if your phone number was 123-456-7890 and you are a Sprint customer, you may be able to send texts to yourself by setting your email address to 123-456-7890@sprintpcs.com.

Designating one of the users defined above as the deputy administrator will allow a 2nd person in the clinic these rights in case the primary administrator is not available.

3.9 Notifications

Audible or email notification settings are configured in the Notifications tab for user selectable events such as starting and stopping batch mode, for alert or failure status, incomplete sessions, logfile not analyzed, loss of LINAC connection and loss of LogFileSync connection.

3.9.1 Notifications – Email

The “SMTP Settings” are used to declare the settings of your mail server for notification emails that can be sent automatically in the event of non-compliant analysis results.

- **Send email when batch mode starts or stops** – Check box to send email notifications when batch mode starts or stops.
- **Email notification following a session import** – One can choose pull down options to send emails with/without identifying the concerned patient **or not at all**. Choose whether or not patient name is displayed in notification emails.

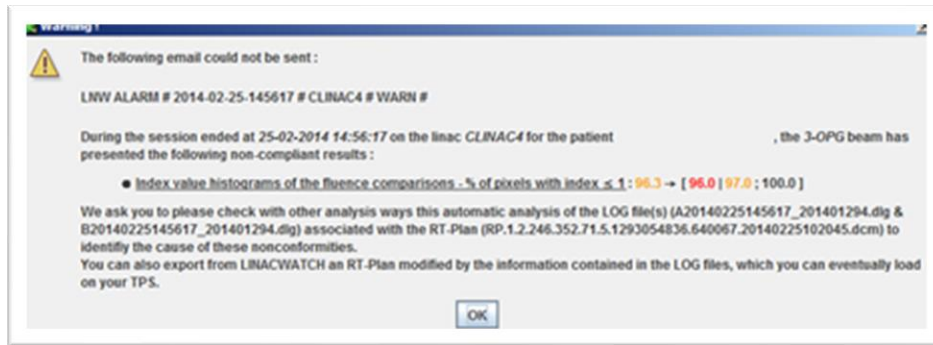
With patient information:



Without patient information:



- **Send email if results state is** – Choose when to send email based on results status. The two choices are “Alert or Fail” or “Fail”. This applies to “Selection” class results.
- **Send email if a logfile is not analyzed within (s)** – Enter the maximum time allowed for logfile analysis before an email notification is sent. 60 seconds is recommended. When this time is exceeded, it typically means that there was an error in processing.
- **Send email if incomplete session** – Check to enable email sending if criteria is met for incomplete session.
- **Send email if connection with LINAC is lost** – Check to enable email sending if connection with LINAC is lost.
- **Send email if connection with LogFileSync is lost** – Check to enable an email if the connection with LogFileSync is lost.
- **Show popup email if emails fail to send** – Check to show a popup dialog when an email notification failed to send. Pictured below is an example of popup displayed by LinacView.



Note that the absence of these popups does not guarantee that emails were received. It only means that there were no detectable errors when notification emails were sent.

- Since LinacView will send email alerts which contain Patient Name and Patient ID, it is strongly recommended that you select a facility based and protected email address and modify these parameters on this email service prior to any use of LinacView with patients.
- It is the responsibility of the customer to ensure that the protection of this selected email service complies with the patient privacy requirements of the facility and applicable patient privacy regulations.

3.9.2 Notifications – Sound Alarms

Audible alarms are a very useful feature of LinacView as they allow the user to run LinacView in the background and only be notified if there is an event that warrants immediate attention. The events that fall into this category are completely user-defined as are the “soundtracks” that can be specified for each category of alarm. Sound clips that are somewhat unexpected or jarring are to be preferred as “easy listening” (e.g. Vivaldi Four Seasons) tracks may not be heeded. As the screen below illustrates, sound alarms can be selected for each of the same notifications that can be selected for email alerts. One also sets permissions via a pull-down, based user credential level, to be able to stop audible alarms.

Audible notifications

Context

Audibly notify when the following screen is open: "BATCH IS ON" screen

Audibly notify in the event of:

- ☒ Result status
- ☒ Incomplete sessions
- ☒ Logfile not analyzed
- ☒ Loss of a Linac connection
- ☒ Loss of a LogFileSync connection
- ☒ Email not sent

Minimum user level to stop audible notifications: Intermediate

Repetition

Repetition in the event of result status alert: None

Repetition in the event of result status fail: Until stopped

Repetition in the event of incomplete sessions: 3 times

Repetition in the event of a Logfile not analyzed: 1 time

Repetition in the event of the loss of a Linac connection: Until stopped

Repetition in the event of the loss of a LogFileSync connection: 5 times

Repetition in the event of an email not sent: None

Import & Listening

Result status alert	Alert.mp3	Browse	Play
Result status fail	OutOfTolerance.mp3	Browse	Play
Incomplete sessions	SessionNotCompleted.mp3	Browse	Play
Logfile not analyzed	NotAnalysed.mp3	Browse	Play
Loss of a Linac connection	LinacConnectionFailed.mp3	Browse	Play
Loss of a LogFileSync connection	LogFileSyncFailed.mp3	Browse	Play
Email not sent	InternetConnectionFailed.mp3	Browse	Play

Save Cancel

Additional audible alarm repetition and selection of alarm for each different alarm can be selected under the Import & Listening section.

3.10 Licenses & Linacs Tab

3.10.1 General

Administrators and Superusers can use this tab to check their LinacView licenses.

The “**Buyer name**” and “**Reference Person identification**” also appear in the headings of analysis reports.

When use of the software is not limited by any date, the “**Expiration date**” is displayed as “00/00/0000”.

“**Last date for use without LogFileSync**”, is the date by which users must use LogFileSync to deposit logfiles in the folder scanned by LinacView in batch mode. This short exclusion period allows for initial testing and setup of the system. This date is specified via the license and is intentionally short, because LogFileSync, an application developed by QUALIFORMED, avoids security flaws found in the other file transfer solutions.

3.10.2 Machine Specific Setup

By expanding the tree on the left-hand side of the display under the Licenses & Linac Tab, example linac setup and organization by department/location can be found. The sound alarm for a particular LINAC is turned on or off via checkbox. The patient treatment timeslot is specified for each treatment machine as times on different LINAC models within a clinic may be different. This is referred to the “**Maximum latency between two sessions(min)**” and is helpful for LinacView alerts to ensure the maximum expected time between logfiles can be used as a check to ensure no treatment logfiles are missed.

Inactive treatment closing times are set here with proposed checks for closing for “Never”, “Upon opening”, “Upon closing”, “Upon opening and closing”, and “Periodically”. A time period in days can be input to specify “**Time period qualifying a treatment as inactive**”. LogFile and RTPlan linking is specified here with options based upon LINAC type. Further explanation is given below.

Machine specific configuration for the UI for jaw and collimator naming as well as SAD and Source to Leaf distances are user modifiable. Supported logfiles are listed here. For those with the optional “**Auto-Plan license**” one will be able to activate via the check box and set the destination folder for the auto generated RT plan. The Auto-PLAN option can be selected “**For all Patients**” or “**For selected Patients**”. In addition, the Format (DICOM or Pinnacle) is set here. Other export options such number of control points for exports, are set under the RT Plan Import & Generation tab.

Regular expressions (<https://www.regular-expressions.info/>) can be used to exclude logfiles with specific names such as a logfile from a setup beam specified as “.*(_Setup),*” or if the letters QA or QC are in the patient name, beam name, or RT Plan name. One can specify a folder for storage of any plans not processed due to logic in the Rejected Logfiles section.

General	Logfile Import	Import RT Plans	Generate RT Plans	Backup	Analysis	User Rights	Users	Notifications	Licenses & Linacs
Centers & Linacs - LucyHospital - UNIQUE1 - Clinac1 - Memorial Sloan Kettering Cancer Center - OncologyCityCenter - Paracelsus-Krh. Ruit - Sainte-Elisabeth									
Sound alarms for this Linac ☒									
Maximum latency between two treatment sessions (min)* 30 (*): This time is used as a criterion signifying the loss of connection with a Linac, and as a delay during which LINACVIEW waits for a Logfile completing an interrupted session described by a Logfile analysed previously.									
Alert in case of loss of connection (LogFileSync, Linac) ☒									
Close analysing folders of inactive treatments									
Propose ☐ Never ☐ Upon opening ☒ Upon closing ☐ Upon opening and closing ☐ Periodically									
Time period qualifying a treatment as inactive (in days) 14									
Linac type VARIAN-Clinac Logfile type ☒ .dlg (DynaLog)									
Link between Logfiles & RT Plans									
Tag linking Logfiles with RT Plans DICOM Tag [0008,0018] SOP Instance UID									
Max(RMSE[leaf positions, CP0]) (mm) 2 Max(Deviation[colli angle, CP0]) (°) 2									
Max(Deviation[gantry angle, CP0]) (°) 2									
Ignore leaves under Jaws ☒									
Collimator configuration									
Source Leaves Distance (mm) 510									
Source Axe of rotation Distance (mm) 1000									
Leaf banks name (on fluence map) Left B Right A									
Naming of Leaves and Jaws Left* X1 Right* X2									
Down* Y1 Up* Y2									
(*): These 4 directions correspond to that of the screen used to display the fluence maps									
Supported Logfiles									
☒ Dynamic beams									
Rejected Logfiles									
Do not analyse the Logfile when one of the 4 Regular Expressions entered below is found in:									
Name of the Logfiles									
Patient name in RT Plan									
Beam name in RT Plan									
RT plan name									
Do not analyse when MUs are less than included, and the beam is Static									
☒ Rejected Logfiles are stored in the folder ...\\DataBase-LINACWATCH\\clearBATCH\\dustbin\\NotProcessed									

Note: When Varian linacs are managed by Elekta Mosaik Record & Verify systems, temporary RT Plan files may be created for use at the Linac. When this occurs, the temporary RT Plan SOP Instance UID in the logfiles will not match the prescription RT Plan SOP Instance UID. The link between logfiles and the prescription RT Plan is therefore broken and analysis logfile results with respect to the prescription RT Plan cannot be done without an alternative method of linking them.

3.10.2.1 Varian logfile linking

The Varian-Clinac and TrueBeam linking between Logfiles and RT Plans is set in this tab. For Varian Clinac, the link between logfiles and prescription RT Plans can be made in two ways:

- DicomTag [0008, 0018] SOP Instance UID – Use this if there is no problem with temporary RT Plans created by Mosaiq. This is the default method.
- DicomTag [0010, 0020] Patient ID + RMSE [leaf positions, CP0] + Deviation [gantry, collimator, and table angle, CP0] – Use this if there is a problem with temporary RT Plans or for TrueBeam without *.txt files.

The second criterion, RMSE [leaf positions, CP0], corresponds to the Root Mean Square Error (RMSE) of leaf positions between the first Control Point (CP) of the logfile and the first control point of the RT Plan prescription file. The deviation of the gantry, collimator and table angle was added to further disambiguate similar treatment plans. Testing these values prevents misidentification of RT Plans, when more than one RT Plan exists for the same patient. The default RMSE maximum value is 2 mm, and the default maximum angle deviation is 2 degrees.

General	Logfile Import	Import RT Plans	Generate RT Plans	Backup	Analysis	User Rights	Users	Notifications	Licenses & Linacs
Centers & Linacs - LucyHospital - UNIQUE1 - Clinac1 - Memorial Sloan Kettering Cancer Center - OncologyCityCenter - Paracelsus-Krh. Ruit - Sainte-Elisabeth									
Sound alarms for this Linac ☒									
Maximum latency between two treatment sessions (min)* 30 (*): This time is used as a criterion signifying the loss of connection with a Linac, and as a delay during which LINACVIEW waits for a Logfile completing an interrupted session described by a Logfile analysed previously.									
Alert in case of loss of connection (LogFileSync, Linac) ☒									
Close analysing folders of inactive treatments									
Propose ☐ Never ☐ Upon opening ☒ Upon closing ☐ Upon opening and closing ☐ Periodically									
Time period qualifying a treatment as inactive (in days) 14									
Linac type VARIAN-Clinac Logfile type ☒ .dlg (DynaLog)									
Link between Logfiles & RT Plans									
Tag linking Logfiles with RT Plans DICOM Tag [0008,0018] SOP Instance UID									
Max(RMSE[leaf positions, CP0]) (mm) 2 Max(Deviation[colli angle, CP0]) (°) 2									
Max(Deviation[gantry angle, CP0]) (°) 2									
Ignore leaves under Jaws ☒									
Collimator configuration									
Source Leaves Distance (mm) 510									
Source Axe of rotation Distance (mm) 1000									
Leaf banks name (on fluence map) Left B Right A									
Naming of Leaves and Jaws Left* X1 Right* X2									
Down* Y1 Up* Y2									
(*): These 4 directions correspond to that of the screen used to display the fluence maps									
Supported Logfiles									
☒ Dynamic beams									
Rejected Logfiles									
Do not analyse the Logfile when one of the 4 Regular Expressions entered below is found in: ?									
Name of the Logfiles									
Patient name in RT Plan									
Beam name in RT Plan									
RT plan name									
Do not analyse when MUs are less than included, and the beam is Static									
☒ Rejected Logfiles are stored in the folder ...\\DataBase-LINACWATCH\\clearBATCH\\dustbin\\NotProcessed									

For TrueBeam the options are identical with the exception that in addition to dynamic beams, static and setup beam can also be analyzed if desired.

The criterion for determination of a static beam is customizable per Linac and based upon no leaf position prescribed on the last RT Plan control point, a beam type of static, and number of RT Plan control points less than or equal to a user specified number. In addition, a minimum number of MUs can be set as a requirement for analysis. One can determine if static beams are displayed in the dashboard by checking or unchecking the option. Note that even when the user selects to see static beam displayed in the batch dashboard, static beam sessions are deleted from the batch folder automatically when analysis of static beams has been deactivated.

Linac type VARIAN-TrueBeam & Halcyon Logfile type ☒ .bin

Link between Logfiles & RT Plans

Tag linking Logfiles with RT Plans DICOM Tag [0010,0020] Patient ID + RMSE[leaf positions, CP0] + Deviations[gantry, colli and table angles, CP0]

Max(RMSE[leaf positions, CP0]) (mm) Max(Deviation[colli angle, CP0]) (°)

Max(Deviation[gantry angle, CP0]) (°) Max(Deviation[table angle, CP0]) (°)

Ignore leaves under Jaws ☒

Collimator configuration

Leaf banks name (on fluence map) Left Right

Naming of Leaves and Jaws Left* Right*

Down* Up*

(*) : These 4 directions correspond to that of the screen used to display the fluence maps

Supported Logfiles

☒ Dynamic beams

☒ Static beams ☒ Displayed in BATCH dashboard

Consider as static if

☒ OR No leaf position prescribed on the last RT Plan CP

☒ OR (Beam Type = Static AND Number of RT Plan CPs ≤

Rejected Logfiles

Do not analyse the Logfile when one of the 4 Regular Expressions entered below is found in: ?

Name of the Logfiles

Patient name in RT Plan

Beam name in RT Plan

RT plan name

Do not analyse when MUs are less than included, and the beam is Static

☒ Rejected Logfiles are stored in the folder ...\\DataBase-LINACWATCH\\clearBATCH\\dustbin\\NotProcessed

AUTO-PLAN license for automatic generation and export of RT Plan

AUTO-PLAN licence ☐ ☒ For all patients ☐ For selected patients

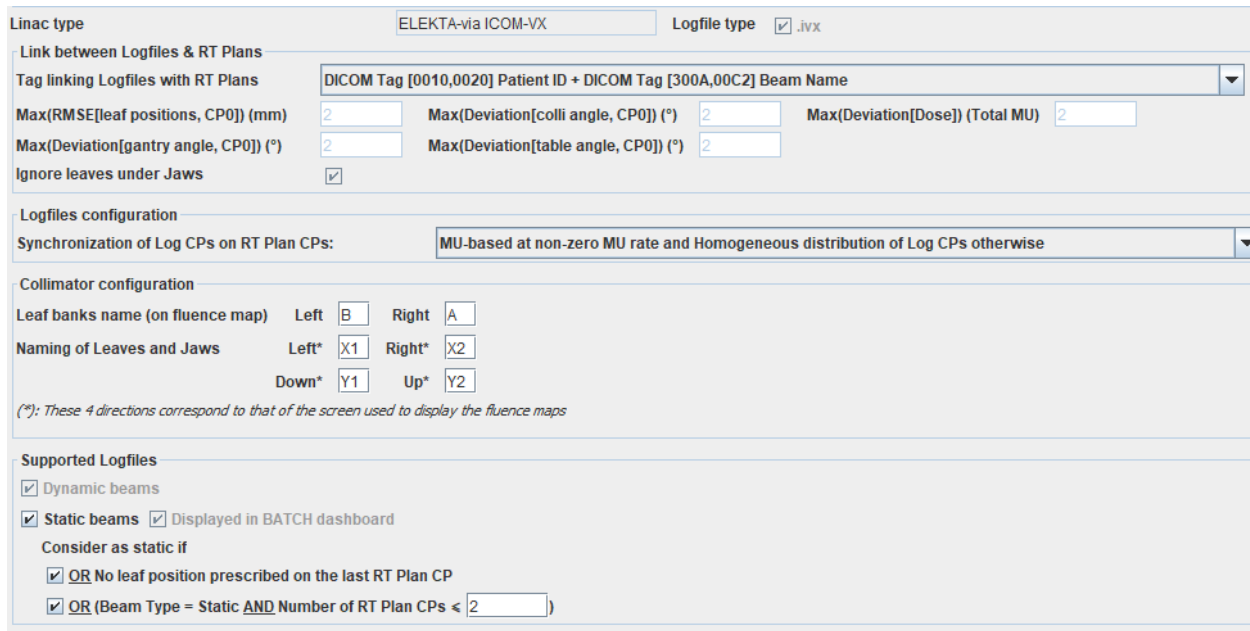
Destination folder of RT plans to be exported Browse

Format of RT plans to be exported ☒ Dicom (*.dcm) ☐ Pinnacle (*.Script, *.dat)

MLC leaf positions in DynaLog files are recorded in the MLC plane, that is, a 1mm movement of a leaf is just that. It is not projected to the isocenter plane. To make that projection correctly, the “Source Leaves Distance (mm)” and the “Source Axis of rotation Distance (mm)” must be specified. Values of 510 mm and 1000 mm are typically used resulting in a magnification factor of approximately 1.96.

3.10.2.2 Elekta logfile linking

The Elekta systems have similar options.



Use of Automatic Field Sequencing (AFS) is compatible with LinacView. Please note that only one *.ivx file is created when using AFS. Otherwise *.ivx files will be created for each beam and automatically associated with the plan.

“Tag linking Logfiles with RT Plans” allows the user to link to the log files based on two methods. With the 2nd being similar to the previously described method for Varian LINACs. Additional options are:

- DicomTag [0008, 0020] PatientID + DICOM Tag [300A,00C2] Beam Name.
- DicomTag [0010, 0020] Patient ID + RMSE [leaf positions, CP0] + Deviation [gantry, colli and table angles, CP0 + Dev. [Dose].

The last CP in in the iCom state is used for the retrieve of the iCom patient ID tags and beam name. Versions prior to 3.11 used the 1st CP for this information.

“Synchronization of Log CP’s on RT-Plan CPs” has four choices:

- “Homogeneous distribution of Log CP’s belonging to the same RT-Plan segment” evenly distributes logfile CP information in the RT-Plan time frame to which they belong.
- “System time recorded by LogFileSync for each Log CP” uses the time stamp of each log CP to place the logfile CP information in the RT-Plan time frame, likely unevenly.
- “MU-based at non-zero MU rate and homogeneous distribution of log CPs otherwise” and
- “MU based even at zero MU rate” which uses the MU delivered to match parameters such as leaf position to the RTPlan.

The third option, “MU-based at non-zero MU rate and homogeneous distribution of log CPs otherwise”, is recommended as the Elekta controller is designed to deliver the plan based on MU delivered. The exception is the Unity which uses step and shoot IMRT such that “Homogeneous distribution of Log CP belonging to the same RT Plan segment” is suggested.⁴ In addition, for the Elekta Unity it is recommended to set the “close analyzing folders of inactive treatments” to “periodically” with a time period less than a day, in order for the user to be reminded to close all inactive treatments at a specified time.

General | **Logfile Import** | **RT Plan Import & Generation** | **Backup** | **Analysis** | **User Rights** | **Users** | **Notifications** | **Licenses & Linacs**

Software license

Buyer name: Buyer

Reference Person identification: Adviser

Expiration date: 15/01/2023

Last date for use without LogFileSync:

Batch mode license: ☒

Installation verification file received by: support@qualiformed.com

Linacs

- Unity
- OncologyCityCenter
 - CLINAC_3
 - CLINAC4
 - Novalis_1
- Paracelsus-Krh. Ruit

Sound alarms for this Linac: ☒

Maximum latency between two sessions (min): 30

Close analysing folders of inactive treatments

Propose: ☐ Never ☐ Upon opening ☒ Upon closing ☐ Upon opening and closing ☐ Periodically

Time period qualifying a treatment as inactive (in days): 14

Linac type: ELEKTA-via ICOM-VX

Logfile type: ☒ .jvx

Export of RT plans generated by AUTO-PLAN

AUTO-PLAN licence: ☐

☒ For all patients ☐ For selected patients

Destination folder of RT plans to be exported:

Format of RT plans to be exported: ☒ Dicom (*.dcm) ☐ Pinnacle (*.Script, *.dat)

Link between Logfiles & RT Plans

Tag linking Logfiles with RT Plans: DICOM Tag [0010,0020] Patient ID + DICOM Tag [300A,00C2] Beam Name

Max(RMSE[leaf positions, CP0]) (mm): 2

Max(Deviation[colli angle, CP0]) (°): 2

Max(Deviation[Dose]) (Total MU): 2

Max(Deviation[gantry angle, CP0]) (°): 2

Max(Deviation[table angle, CP0]) (°): 2

Ignore leaves under Jaws: ☒

Logfiles configuration

Synchronization of Log CPs on RT Plan CPs: MU-based

Collimator configuration

Leaf banks name (on fluence map) Left: B Right: A

Naming of Leaves and Jaws Left*: X1 Right*: X2

Down*: Y1 Up*: Y2

Depending on the proposed setting you will then be prompted to confirm closing the analysis folders with the following dialog. Select Exit if you do not wish to close the plan of the treatment session. Otherwise select the option to close the treatment sessions.

Automatic closing of analysis folders without recent session

The 1 following treatments are inactive.

Linac / Department	Patient	RT Plan	Treatment type	Last session ▼	Quick ☒	With PDF ☐
Unity / Unity Center	NAME60,,ProstPreClin1	01 QAtestJL-QA1	Default-Treatment	2020-02-17	☒	☐

Progression of the closing of the selected treatments

0%

Details Stop

Close the selected treatments Exit

3.10.2.3 Rejected Logfiles

This section allows use regular expressions to reject analysis of logfiles based upon Logfile name, Patient name in RT Plan, Beam name in RT Plan or RT Plan name. In addition, Logfiles may be rejected by specifying minimum MU and whether a beam is specified as “static”, “dynamic” or a combination of the two. A checkbox option also exists to specify a storage location for rejected logfiles. The regular expressions for use are defined in the tool tip.

Rejected Logfiles

Do not analyse the Logfile when one of the 4 Regular Expressions entered below is found in: ?

Name of the Logfiles

Patient name in RT Plan

Beam name in RT Plan

RT plan name

Do not analyse when MUs are less than included, and the beam is

☒ Rejected Logfiles are stored in the folder ...\\DataBase-LINACWATCH\\clearBATCH\\dustbin\\NotProcessed

3.10.3 Custom Institutional Logos

When a center is selected in the tree structure, a browse button appears that allows you to specify a custom logo for analysis reports for that institution.

General
Logfile Import
RT Plan Import & Generation
Backup
Analysis
User Rights
Users
Notifications
Licenses & Linacs

Software license

Buyer name

Buyer

Reference Person identification

Adviser

Expiration date

15/01/2022

?

Last date for use without LogFileSync

?

Batch mode license

☒

Installation verification file received by

support@qualiformed.com

Linacs

LucyHospital

OncologyCityCenter

Paracelsus-Krh. Ruit

Sainte Elisabeth

Thiais

Unity Center

Universitätsspital Basel

PDF analysis reports logo

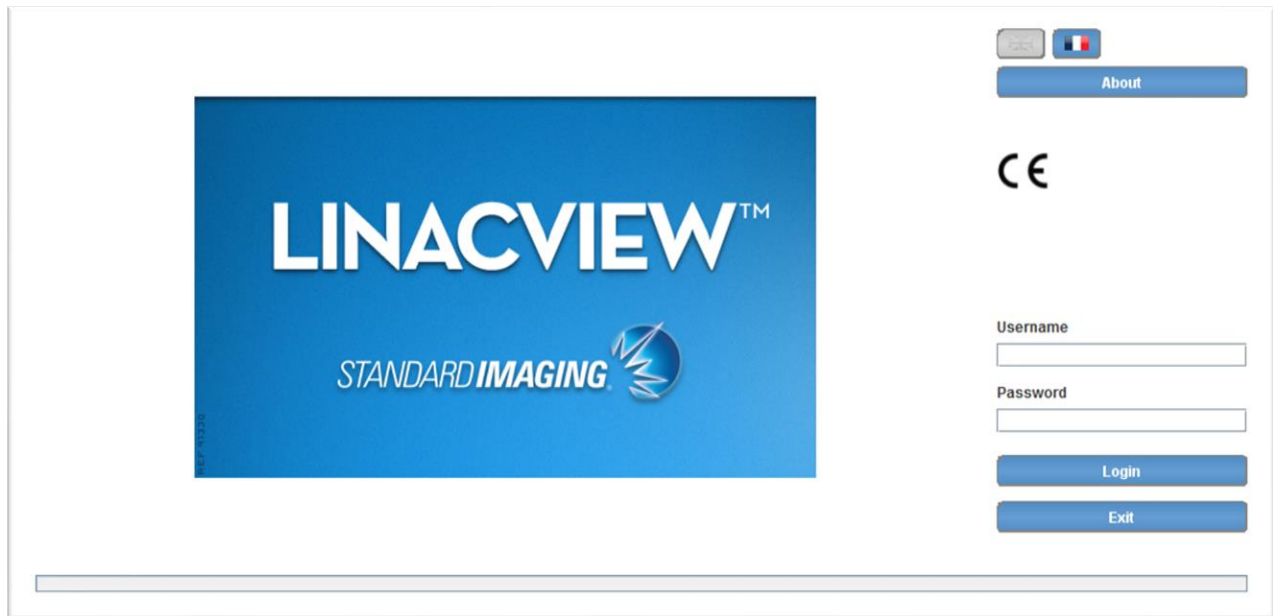
Browse

Save

Cancel

4 LinacView Operation

4.1 The Startup Dialog

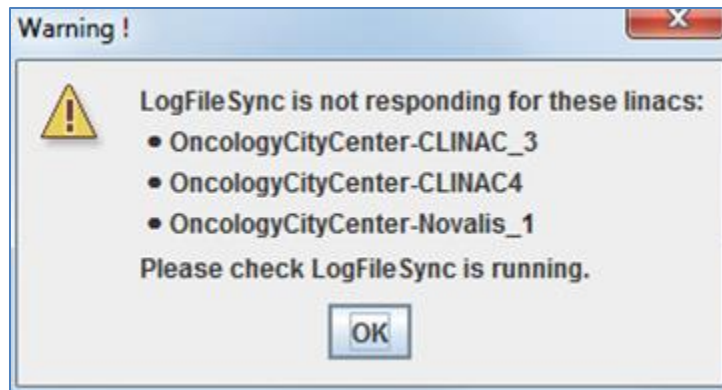


The Startup dialog appears when the LinacView application is started. It allows you to:

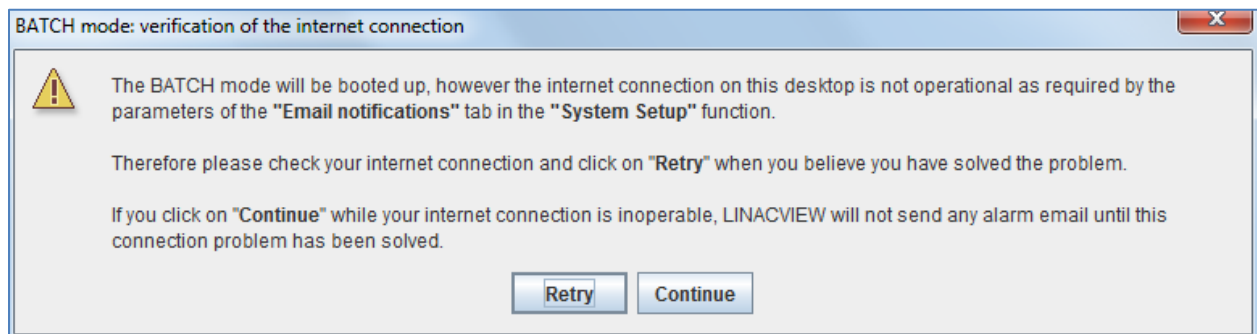
- Select the program language (English and French versions are currently available),
- Access version and contact information by selecting [About],
- Enter your Username and Password,
- Launch LinacView by selecting [Login].

Your login will be provided by an Administrator, but your password is known only by you. If necessary, an Administrator can reset your password at any time.

When LinacView launches, it verifies the connections to its treatment machines through the LogFileSync utility. Each installed LogFileSync (one per linac) sends a .txt file to the directory scanned in batch mode by LinacView. If LinacView does not receive the .txt file originating from the associated linac, a warning message is presented declaring loss of linac connection. This is the same message that might appear during operation of LinacView, if, for instance, there was a network problem.



When LinacView launches, batch mode may automatically start depending on selections made by the Administrator in the System Setup Function. In batch mode, email messages are sent to users via the internet for non-compliant results. If there is a problem with your internet connection, the following message will appear:



If you select [Continue], you accept that no internet connection is available to LinacView and that batch mode will not be able to send emails for non-compliant results. Another option is to check the internet connection, fix it, and then select [Retry] to retest the connections.

If there is no internet connection, or if the connection with one of the linacs is broken, the [BATCH IS ON] button on the welcome will be colored orange rather than green, reminding you that there may be a problem with the internet connection.

4.2 The Welcome Screen



The top-level LinacView functions, depending on user rights, are:

- **Batch Mode** – indicated by the “Batch” button on the top left of the screen. It has three modes:
 - **Batch Is On** – The typical mode, as batch mode is the preferred method of using LinacView.
 - **Batch Is Off** – This mode may indicate that someone has inadvertently turned off batch mode.
 - **Batch Dashboard** – If either [Batch Is On] or [Batch Is Off] is selected, the display shows the record of logfiles that have been analyzed by LinacView.
- **Import** – allows logfiles and RT Plans to be manually imported to the LinacView database. Importing bypasses the normal batch mode processing. Results are calculated and may be displayed using the Load and Analyze Functions.
- **Load** – allows one or more radiation sessions currently in the LinacView database (associated with the same RT Plan) to be selected for analysis by LinacView,
- **Analyze** – shows results of the sessions selected by the Load Function. Reports and RT Plans for incomplete treatments can be exported.
- **View** – allows access to archived patient reports and RT Plans for selected treatments.

Basic users do not have access to any of the top-level LinacView functions, except **Batch Mode**. **Intermediate** users have access to **Batch Mode** and **Analyze**. **Advanced** users have access to **Batch Mode**, **Analyze**, and **View**.

4.3 Batch Mode and Batch Dashboards

In batch mode, logfiles that are deposited in the user-specified target directory by a LogFileSync utility. The logfiles are then automatically analyzed by LinacView if corresponding RT Plans exist in the LinacView RT Plan batch folder or the database. Depending on settings in templates defined in the Analyze Tab of the System Setup Function, non-compliant results (alert or fail) are sent via email alerts to users that the Administrator has identified in the Users Tab of the System Setup Function.

Selecting [Batch Is On] on the Welcome Screen switches you to the Batch Dashboard, which shows the logfiles that are currently being analyzed by LinacView (one file per record). Within System Setup it is possible to configure whether or not to analyze the Log files according to a number of MUs reached at the end of the session and according to the type of beam « Static », « Dynamic » or both.

The Batch Dashboard is ordered such that Fail and Alert sessions are grouped at the top of the dashboard to ensure that a failure is most prominent.

Batch dashboard

Message
Batch mode of LINACVIEW is currently active. The software automatically imports and analyses Logfiles of Linacs for which you have purchased a license.

Action	Analized parameters	Data from Logfiles	Email							
Status of last action	Date	Time	Selection	All	Sessions	Linac / Department	Patient	Treatment type	Beam	Email sent
Session analysed	16-12-2020	18:58:08	Fail	Fail	2018-10-02-115144	Neptune IX / Sainte	NAME48*Geraldine,2464435	Default-Treatment	Tg Int-1 IB1...	
Session analysed	16-12-2020	18:58:17	Alert	Alert	2016-08-31-170822	SL2 / ELEKTA ICOM-VX	NAME40*Luigia,30005882	Default-Treatment	03	
Session analysed	16-12-2020	18:57:48	Pass	Alert	2014-03-13-145010	UNIQUE1 / LucyHospital	NAME05*Gerard,20140072	Default-Treatment	Arc 2	
Session analysed	16-12-2020	18:57:48	Pass	Alert	2014-03-14-144015	UNIQUE1 / LucyHospital	NAME05*Gerard,20140072	Default-Treatment	Arc 2	
Session analysed	16-12-2020	18:57:49	Pass	Alert	2014-03-17-170550	UNIQUE1 / LucyHospital	NAME05*Gerard,20140072	Default-Treatment	Arc 2	
Session analysed	16-12-2020	18:57:50	Pass	Alert	2014-03-18-143229	UNIQUE1 / LucyHospital	NAME05*Gerard,20140072	Default-Treatment	Arc 2	
Session analysed	16-12-2020	18:57:52	Pass	Alert	2014-03-19-110544	UNIQUE1 / LucyHospital	NAME05*Gerard,20140072	Default-Treatment	Arc 2	
Session analysed	16-12-2020	18:57:53	Pass	Alert	2014-03-20-142500	UNIQUE1 / LucyHospital	NAME05*Gerard,20140072	Default-Treatment	Arc 2	
Session analysed	16-12-2020	18:58:00	Pass	Fail	2015-07-21-123855	Varian5 / Institut du	NAME20*ANDRE,0105526	Default-Treatment	2ra	
Session analysed	16-12-2020	18:58:02	Pass	Fail	2015-07-22-121748	Varian5 / Institut du	NAME20*ANDRE,0105526	Default-Treatment	2ra	
Session analysed	16-12-2020	18:58:04	Pass	Fail	2015-07-23-122559	Varian5 / Institut du	NAME20*ANDRE,0105526	Default-Treatment	2ra	
Session analysed	16-12-2020	18:58:06	Pass	Fail	2015-07-24-121658	Varian5 / Institut du	NAME20*ANDRE,0105526	Default-Treatment	2ra	
Session analysed	16-12-2020	18:58:16	Pass	Pass	2016-08-31-170622	SL2 / ELEKTA ICOM-VX	NAME40*Luigia,30005882	Default-Treatment	02	
Session analysed	16-12-2020	22:25:39	Pass	Pass	2020-09-30-093713	LINAC1 / Gemelli Molise	NAME75 Prostate 013811	ELEKTA Complex	ARC1	
Session analysed	16-12-2020	22:25:40	Pass	Pass	2020-10-07-092655	LINAC1 / Gemelli Molise	NAME75 Prostate 013811	ELEKTA Complex	ARC1	
Session analysed	16-12-2020	22:25:40	Pass	Pass	2020-09-25-092128	LINAC1 / Gemelli Molise	NAME75 Prostate 013811	ELEKTA Complex	ARC2	
Session analysed	16-12-2020	22:25:40	Pass	Pass	2020-09-28-092913	LINAC1 / Gemelli Molise	NAME75 Prostate 013811	ELEKTA Complex	ARC2	
Session analysed	16-12-2020	22:25:41	Pass	Pass	2020-09-30-093530	LINAC1 / Gemelli Molise	NAME75 Prostate 013811	ELEKTA Complex	ARC2	
Session analysed	16-12-2020	22:25:41	Pass	Pass	2020-10-01-093044	LINAC1 / Gemelli Molise	NAME75 Prostate 013811	ELEKTA Complex	ARC2	
Session analysed	16-12-2020	22:25:41	Pass	Pass	2020-10-02-090947	LINAC1 / Gemelli Molise	NAME75 Prostate 013811	ELEKTA Complex	ARC2	
Session analysed	16-12-2020	22:25:42	Pass	Pass	# Selection # 2020-10-01-093044					
Session analysed	16-12-2020	22:25:42	Pass	Pass	NAME75,Prostate,013811 / Gemelli Molise / LINAC1 / PROSTAT.0 / ARC2					
Session analysed	16-12-2020	22:25:42	Pass	Pass	Total MU = 316.10 - MCS = 0.190 (LSV 0.819 & AAV 0.230) - Treatment type = ELEKTA Complex - Analysis template = Elekta-PassRate95					
Session analysed	16-12-2020	22:25:42	Pass	Pass	Monitor Units (MU) - Total MU's (% Total MU) : 100.0 → [99.7 99.6 100.0 100.3]					
Session analysed	16-12-2020	22:25:48	Pass	Pass	Fluence Comparisons - Integrated Vs Plan - Pass Rate (%) : 96.7 → [95.0 96.0 100.0]					
Session analysed	16-12-2020	22:25:49	Pass	Pass	Fluence Comparisons - Integrated Vs Plan - Mean Index : 0.216 → [0.000 0.240 0.300]					
Session analysed	16-12-2020	22:25:49	Pass	Pass	2020-10-08-093421	LINAC1 / Gemelli Molise	NAME75 Prostate 013811	ELEKTA Complex	ARC1	
Session analysed	16-12-2020	22:25:49	Pass	Pass	2020-09-28-092729	LINAC1 / Gemelli Molise	NAME75 Prostate 013811	ELEKTA Complex	ARC1	
Session analysed	16-12-2020	22:25:50	Pass	Pass	2020-10-01-092903	LINAC1 / Gemelli Molise	NAME75 Prostate 013811	ELEKTA Complex	ARC1	
Session analysed	16-12-2020	22:25:50	Pass	Pass	2020-09-25-091951	LINAC1 / Gemelli Molise	NAME75 Prostate 013811	ELEKTA Complex	ARC1	
Session analysed	16-12-2020	22:25:50	Pass	Pass	2020-10-09-090344	LINAC1 / Gemelli Molise	NAME75 Prostate 013811	ELEKTA Complex	ARC1	

Sort Clear journal Network listening Connection tests: LogFileSync from all Linacs All Linacs Emails sending Load session Batch OFF

- **Status** – shows the results of the analysis.
 - Completed analyses are shown as “Session analyzed”.
 - Analyses that cannot be done are labelled with the reason for failure.
- **Date** – shows the date when the session was analyzed.
- **Time** – shows the time when the session was analyzed.
- **Selection** – shows results for the subset of all tests that require email notifications.
- **All** – shows the overall results of all selected tests.

- **Sessions** – shows the date and time at which logfiles were produced at the linac.
- **Department** – shows the name of the department in which the linac is located.
- **Linac** – shows the name of the treating linac.
- **Patient** – shows the name of the patient treated.
- **Treatment type** - shows the template used for analysis of logfile(s). Red coloration designates a default template with no keyword association. Automated DICOM tag keyword template matching is available.
- **Beam** - shows the name of the beam associated with the logfile.
- **Email Sent** – shows “Yes” in green type or “No” in red type. Emails will not be sent when there is an interruption of internet service. All unsent emails will be sent once the internet service is restored.

Department and **Linac** become “**No license**” when logfiles originate from an unlicensed linac.

Analysis, under column 1, **Status**, may not be successful for the following reasons:

- “**Incomplete logfiles**” – this message presents when a session was not completed relative to the prescription in the RT Plan.
- “**Bank A/B not found**” – Varian DynaLog logging uses separate logfiles for the A and B banks. This message presents when a logfile corresponding to one of the banks is missing (or not yet present) in the target folder.
- “**Associated RT Plan not found**” – this message presents when logfiles do not have an associated RT Plan. To remedy this situation, the user can at any time import the required RT Plan using the “Import > RT Plans” function. Once the correct RT Plan is imported, the associated logfiles will be immediately analyzed in Batch Mode.
- “**No license**” – this message presents when logfiles came from a linac with no LinacView license.
- “**Deadline without LogFileSync has expired**” – LinacView requires use of the LogFileSync synchronization utility, because it guarantees that data in the linac’s source folder will not be modified. However, for your convenience, LinacView allows you to use other synchronization utilities for a limited time.
- “**Incorrect header completion**” – the LogFileSync synchronization utility writes information in logfile headers. This message presents if any essential information is illegible to LinacView.
- “**Incomplete header**” – this message presents if any essential information in the logfile headers is either missing or illegible to LinacView.
- “**Closed treatment**” – this message presents when logfiles are part of a closed treatment.

Tooltips giving a summary of analyzed parameters and their compliance relative to the tolerance intervals are displayed by hovering the mouse over “Analyzed parameters / Selection” and “Analyzed parameters / All”.

When consecutive incomplete sessions are loaded, these sessions are merged and analyzed as a complete session.

For simplicity, you may decide to only display analysis results that issue email alerts. An Administrator can set this in the User Rights Tab of the System Setup Function.

Analysis results can pass, alert, or fail. Thresholds that determine these results, as well as the selection of analysis results that issue email alerts are set using “templates” in the Analysis Tab of the System Setup Function.

The **[Clear Reports]** button clears the display for records in batch mode.

The **[Load Session]** button loads all analyzed beams of the session associated with a record selected in the table. It is possible to load a beam containing several sessions, one of which has been interrupted.

If **[Batch Off]** is presented, an authorized user (not Basic or Intermediate) can turn off batch mode.

If **[Batch On]** is presented, an authorized user (not Basic or Intermediate) can turn on batch mode.

The lines of the dashboard can be sorted in ascending or descending order of any one of the journal’s columns by clicking on the title for the column.

4.4 The Import Function

The Import Function allows Administrators and Superusers to “manually” import RT Plan files and logfiles into the LinacView database.⁵ When logfiles or RT Plans are imported, they are analyzed using the current analysis template. The results are not shown in the Dashboard. To view results, sessions must be loaded using the Load Function and analyzed. Logfiles that are manually created in service mode (e.g., Elekta *.xml files) must be imported manually.

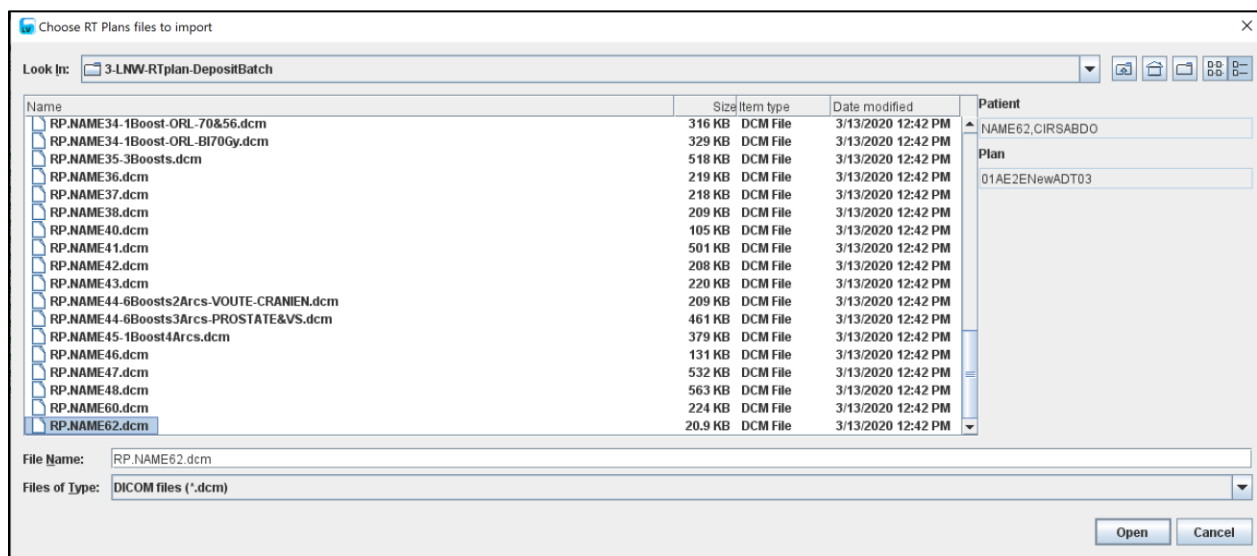
If logfiles arrive before corresponding RT Plans have been brought into the database, analysis will not occur. When the missing RT Plan is imported into the database, analysis will occur immediately.

RT Plans and logfiles can be imported while Batch mode is active, without disturbing its operation.

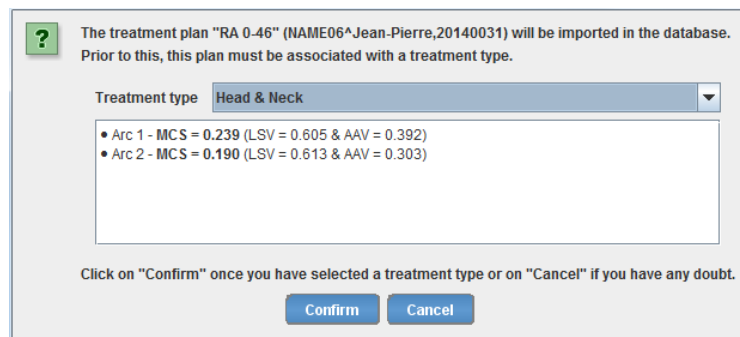
4.4.1 Importing RT Plans

When you select **[RT Plans]**, a file browser is presented. Unless the initial folder is the one that holds your RT Plans, use the file browser to navigate to the RT Plans folder. Select one or more RT Plans to import and select **[Open]**. If an RT Plan is already saved in the database, the user will be prompted with a question of whether to overwrite the RT Plan before choosing the treatment type.

⁵ We use the term “database” here, when we really mean a collection of folders. LinacView also has a relational database for storing results, settings, and other data.



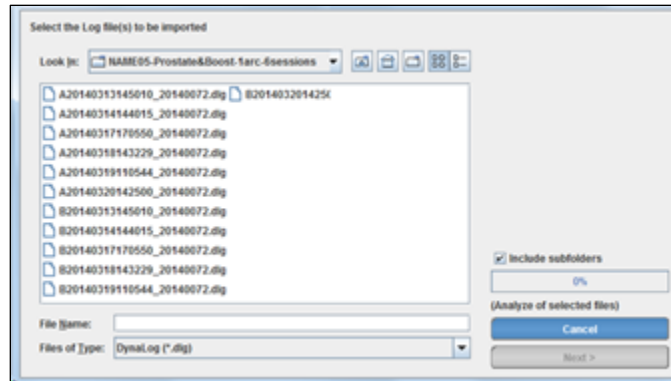
If any of the RT Plans you wish to import are already present in the database, a dialog will inform you of this and ask you if you wish to replace the current RT Plan files by the files to be imported.



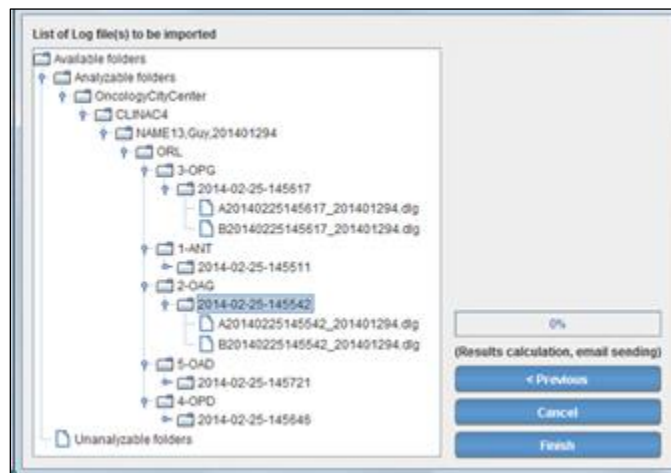
If you have defined any custom treatment types, you can assign them to RT Plans on import.

4.4.2 Importing Logfiles

When you select any of the logfile import options, a file browser is presented. Unless the initial folder is the one that holds your logfiles, use the file browser to navigate to the logfiles folder. Select one or more logfiles to import and select [Next]. A progress bar on the file browser shows progress for analysis process of the selected logfiles.

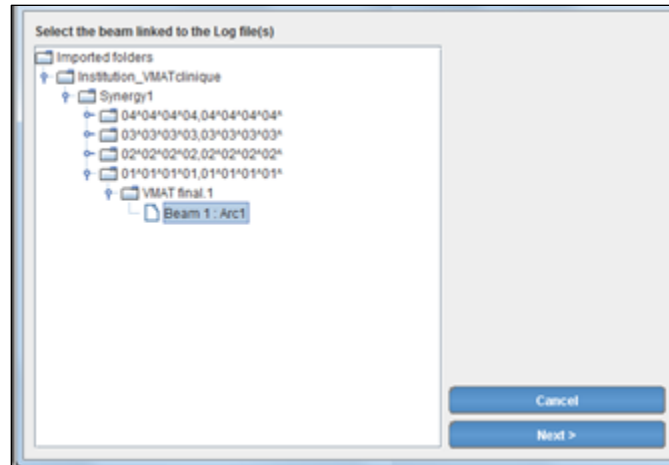


After analysis is complete a second dialog appears that shows logfile destinations in “Analyzable folders” and “Unanalyzable folders”. Select [Finish] and you will be able to track progress of the integrated fluence computations associated with analyzable logfiles and dispatch of emails in the case of non-compliant results.



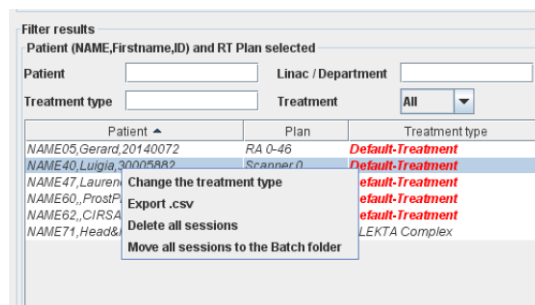
4.4.3 Importing Elekta XML Logfiles

Elekta XML logfiles are imported in the same way as logfiles generated in clinical mode except that there is an initial dialog that allows you to identify the RT Plan file that matches the logfile(s) that you want to import. This is necessary, because, unlike Elekta logfiles generated in clinical mode, these “service mode” logfiles do not have any information that can be used to automatically deduce the corresponding RT Plan.



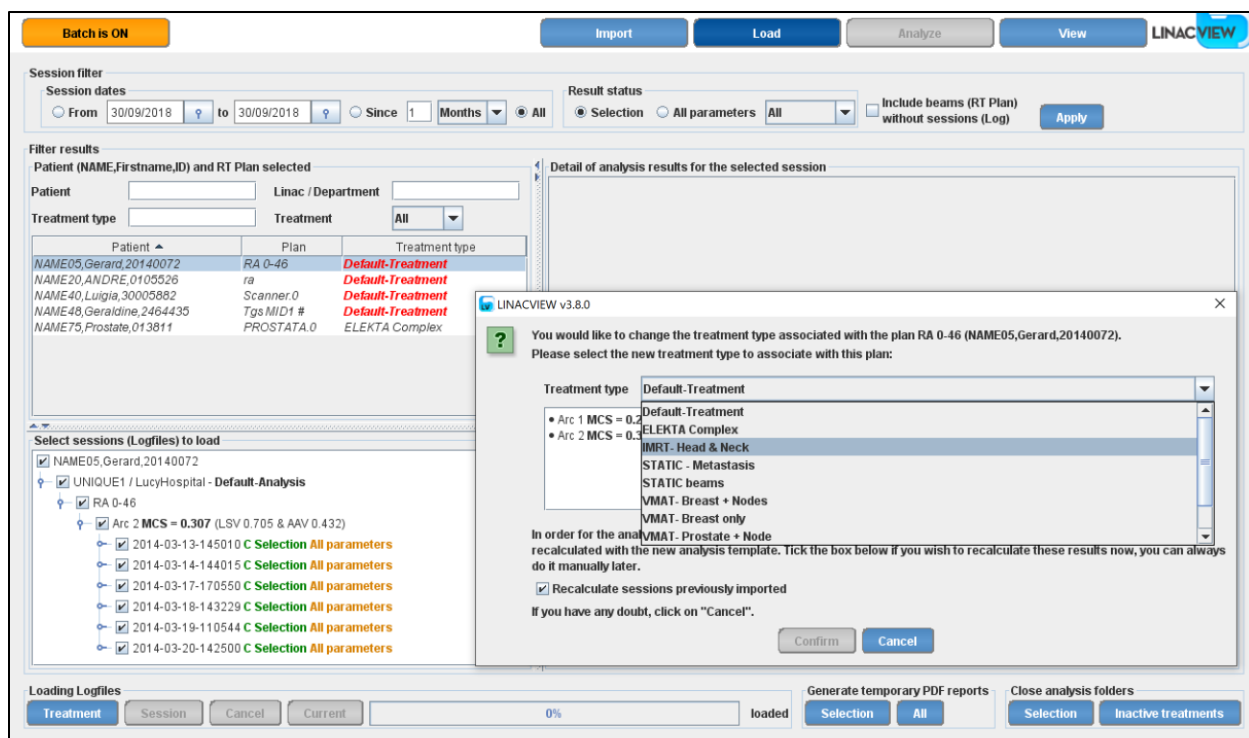
4.5 The Load Function

The Load Function allows one to browse and load treatment sessions currently stored in the LinacView database. If you right click on a treatment, one can change the treatment type which is associated with the analysis template, export the current analysis results for a series of sessions to a “CSV” file, delete all sessions, or move all session to the batch folder.⁶ The treatment type in red designates that no RTPlan specific keyword association was used to determine the analysis template and the default template for the LINAC is in use.



After select and right click on Change the treatment type

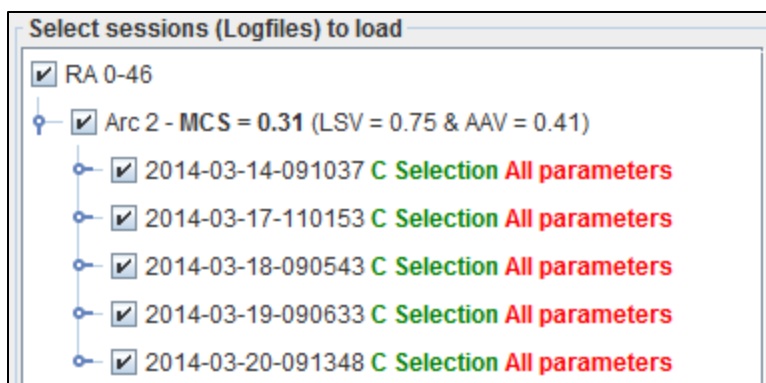
⁶ With LinacView Version 3.15.0, the activation by a right click of the option “**AUTO-PLAN for this patient treated on this linac**” automatically generates the RT-Plans files corresponding to sessions already imported (analyzed).



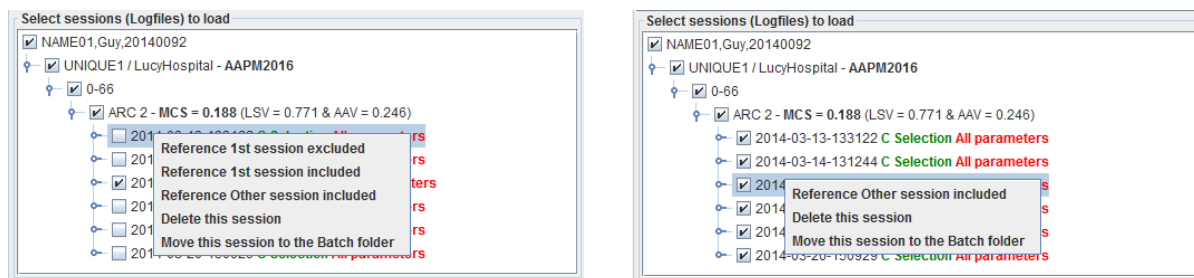
The first part of the session selection process involves 1) selecting a date range and 2) selecting a results status. The results status allows selection of all results criteria or only those criteria designated to send email on alerts or failures. You can also show all sessions or only those whose results were “Fail” or “Alert or Fail”. RT Plans that are imported, but do not yet have any session logfiles can also be reviewed.

After selecting your date range and results status, you may select [Apply]. You will be presented with patients matching your selection criteria.

To further limit the patients that you match immediately, you can apply different filters as shown in the “Filter results” area of the page.



The sessions in the list are identified by the date and time. Completed sessions are marked with a “C”. Incomplete sessions are marked with “NC”, for not complete. When consecutive incomplete sessions are loaded, these sessions are merged and analyzed as a complete session. You can choose to see results for any or all sessions by selecting session checkboxes. Double clicking a session selects that session and deselects all other sessions. A summary of results will be presented if you select a single session.



You can designate any completed session as a reference session. If you right click on the first session in the “Select sessions (logfiles) to be loaded” region, you can designate the first session for all beams as a reference session to compare subsequent sessions against. Setting a reference session activates the Vs. 1st session Tab in the Analyze Function. You can also do this for other sessions.

The options that present in a popup dialog:

- Use Reference 1st session excluded – the first session is not analyzed and is not part of data that might be used to create a summary RT Plan.
- Use Reference 1st session included – the first session is analyzed and is part of data that might be used to create a summary RT Plan.
- Reference Other session included – another session is analyzed and is part of data that might be used to create a summary RT Plan.
- Delete this session – remove session logfiles from LinacView database and results.
- Move this session to the Batch folder – move session logfiles back to the batch folder for re-analysis.

To clear a reference session, right click on the session and select “Clear Reference...”.

The reason that you would choose the “exclude” option is that the first session was used for pre-treatment QA (irradiation without the patient) and you do not want to include it in the analysis or summary RT Plan for the patient.

If you right click on a session other than the first session in the “Select sessions (logfiles) to be loaded” region, you can designate the other session as a reference. Setting an “other” reference session activates the Vs. Other session Tab in the Analyze Function. To clear the “other” session, right click and select ‘Clear “Reference 1st session included”’.

The following command buttons are located at the bottom of the screen:

- Select [Load treatment] to load the selected treatment and switch to the Analyze Function,
- Select [Load session] to load the selected session (single logfile) and switch to the Analyze Function,
- Select [Cancel] to interrupt session loading in process,
- Select [Current loading] to return to the Analyze Function without loading new session data.

4.6 The Analyze Function

The Analyze Function can be started by either selecting [Load Session] in batch mode (loading a single beam of a session) or using the Load Function (loading one or more beams and sessions) described in the previous section.

Buyer Constancy | Backup | System Setup | User Manuals | About | Logout

Batch is ON Import Load Analyze View LINACVIEW

Beam 4 : 2ra NAME20,ANDRE,0105526 / Institut du Cancer de Montpellier / Varian5 / ra / 2ra Analysis template : Default-Analysis-v1

Total MU 578.65 - MCS 0.075 - Number of CPs 178 - Treatment type : Default-Treatment

Sessions Trends Summary Jaws Carriages MU Fluence: Vs Plan Gantry Coll Table

Carriages

Position Deviations (mm)	Bank A	Bank B	Banks A&B	Tolerances
RMS Error	0.0	0.0	0.0	[0.0 ; 0.4 0.5]
"Maximum"	0.0	0.0	0.0	[0.0 ; 0.6 0.8]
95 th Percentile	0.0	0.0	0.0	[0.0 ; 0.5 0.6]

Jaws

Position Deviations (mm)	X1	X2	X1&X2	Y1	Y2	Y1&Y2	Tolerances
RMS Error	0.0	0.0	0.0	0.0	0.0	0.0	[0.0 ; 0.4 0.5]
"Maximum"	0.1	0.1	0.1	0.2	0.3	0.3	[0.0 ; 0.6 0.8]
95 th Percentile	0.1	0.1	0.1	0.0	0.1	0.0	[0.0 ; 0.5 0.6]

Monitor Units (MU)

Deviations (% Total MU)	Tolerances
RMS Error	0.0 [0.0 ; 0.4 0.5]
"Maximum"	0.0 [0.0 ; 0.6 0.8]
95 th Percentile	0.0 [0.0 ; 0.5 0.6]
Total MU	100.0 [99.8 ; 99.9 ; 100.0 ; 100.1 100.2]

Fluence Comparisons

Integrated: Vs Plan	Tolerances
Pass Rate (%)	100.0 [98.0 ; 98.4 ; 100.0]
Mean [Index]	0.006 [0.000 ; 0.240 0.300]
Max [Index]	0.973

Gantry

Angle Deviations (degrees)	Tolerances
RMS Error	0.1 [0.0 ; 0.4 0.5]
"Maximum"	0.2 [0.0 ; 1.0 1.2]
95 th Percentile	0.1 [0.0 ; 0.6 0.8]

Coll

Angle Deviations (degrees)	Tolerances
RMS Error	0.0 [0.0 ; 0.2 0.3]
"Maximum"	0.0 [0.0 ; 0.5 0.6]
95 th Percentile	0.0 [0.0 ; 0.3 0.4]

Table

Angle Deviations (degrees)	Tolerances
RMS Error	0.4
"Maximum"	0.4
95 th Percentile	0.4

Generate temporary files RT Plan PDF reports

The Summary Tab always presents first. Information common to all tabs appears at the top of the window, going from left to right: department, linac, patient identification, treatment name, and, very importantly, the analysis template used.

Notice the selection box that can be used to switch between analyzed beams. Also, notice that some of the tabs are colored. Colored tabs correspond to "Selected" parameters; that is, the parameters that are of most interest to the treatment of the patient.

4.6.1 Subtab Activation

Different analysis subtabs are active depending on whether single sessions or multiple sessions are loaded.

	Sessions	Trends	Summary	Dynamic View	Jaws	Carriages	Leaves	%MU	Vs. Planned	Vs. 1st session ⁷	Vs. Other session ⁸	Gantry	Collimator	Beam Statistics
Single	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Multiple	✓	✓	✓		✓	✓		✓	✓	✓	✓	✓	✓	

When loading single sessions, the Trends Tab is inactive, because there are no trends to show...trends show changes among more than one session. When loading multiple sessions, the Trends Tab is active, but other tabs disappear. These tabs no longer appear because they display information that only pertains to single sessions. This is by design. By comparing information in the Dynamic View, Leaves, %MU and Beam Statistics tabs, you may be able to uncover actionable information about specific beam delivery problems.

The contents of the Summary Tab are limited to the currently analyzable parameters (i.e., the active tabs).

4.6.2 Control Points and Gantry Angles

In previous versions of LinacView, time was used for the “x-axis” of graphs, when individual treatment sessions were analyzed. When multiple sessions were analyzed, monitor units were used for the “x-axis” of graphs. Gantry angle for the “x-axis” was also supported for rotational treatments.

The current version uses control points for the “x-axis”, instead of time or monitor units, because both time and monitor units can be mapped to control points of RT Plans. RT Plans control points are set and invariable and are used to “bin” monitor units. Gantry angle for the “x-axis” continues to be supported for rotational treatments.

Since we want LinacView to be able to compare events from multiple sessions where dose delivery events may not be identically timed, control point synchronization is ideal. To accomplish this, when multiple sessions are loaded, LinacView makes a composite logfile for each beam from all loaded sessions that synchronize events based on control points. Displays and analysis are based on this composite logfile.

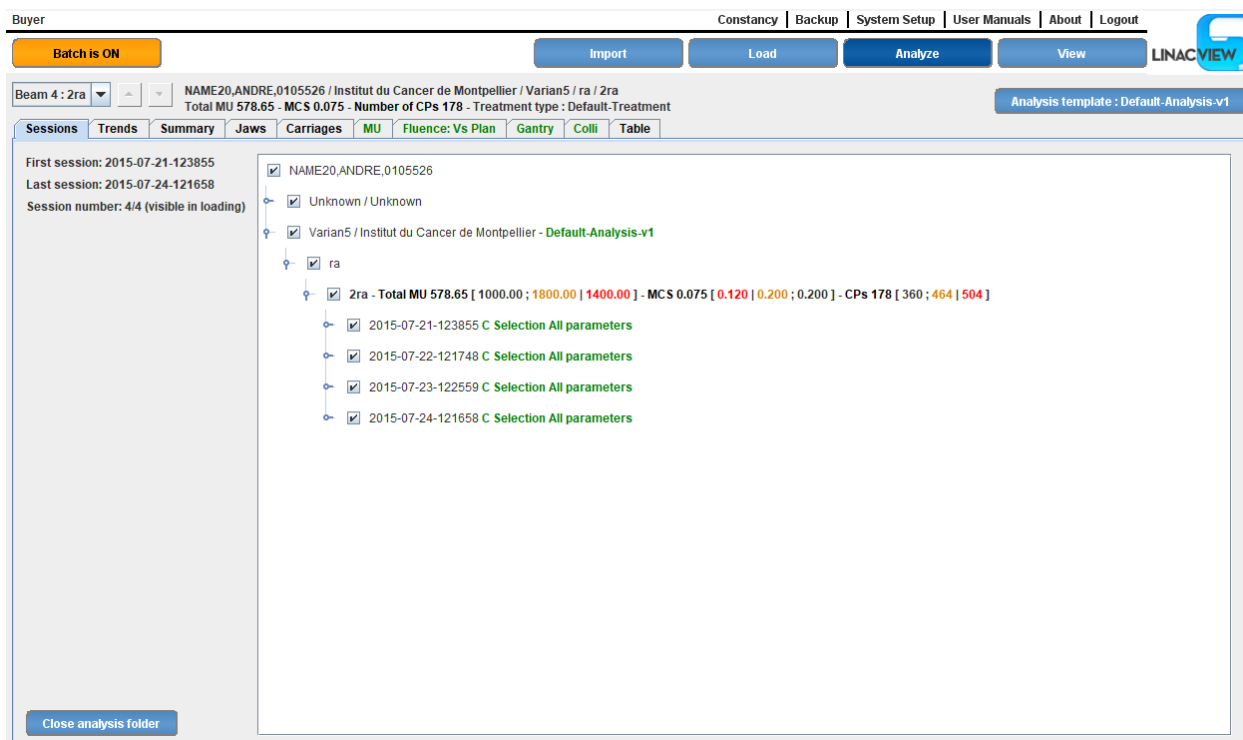
4.6.3 The Sessions Tab

The Sessions Tab provides a summary of all treatment sessions delivered to date. A list of sessions is presented in the form of a tree as in the Load Function. As with the Load Function,

⁷ “Vs. 1st session” tab activates if a “Reference 1st session” option is selected in the Load Function.

⁸ “Vs. Other session” tab activates if the “Reference Other session” option is selected in the Load Function.

hovering the mouse over All Parameters and Selection, tooltips give a summary of analyzed parameters and their compliance relative to the tolerance intervals.



At the bottom of the tab you will find the **[Close analysis folder]** button, which will allow you to complete analysis of a series of treatment sessions when a treatment course is completed.

When you select **[Close analysis folder]**, LinacView will:

- Automatically zip and archive all logfiles and RT Plans,
- Automatically produce a short and comprehensive PDF report summarizing treatment.
- Optionally allow you to delete temporary reports and RT Plans.
- Optionally generate an RT Plan file summarizing the treatment as specified in all analyzed logfiles.

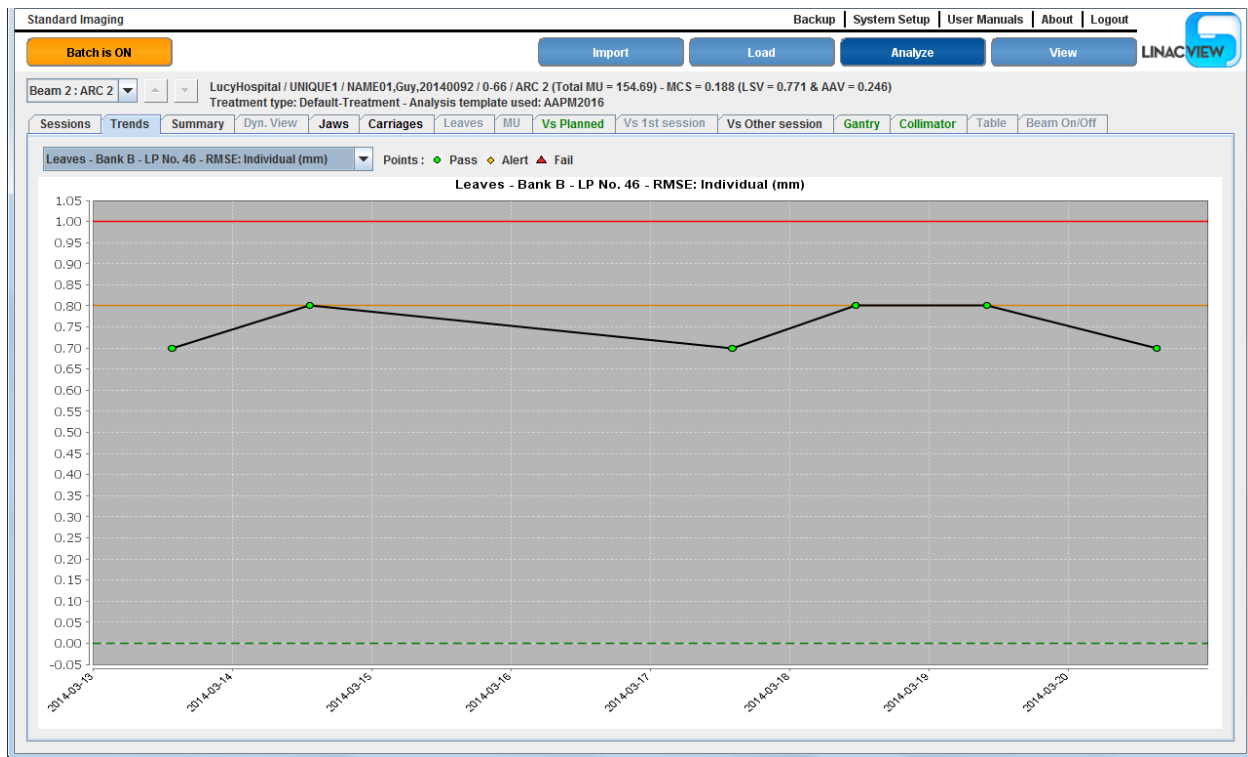
When an analysis folder is closed, LinacView will not:

- Display the corresponding treatment plan in the Load Function,
- Analyze the logfiles associated with this treatment course.

Analysis folders can be reactivated by selecting **[Reopen]** in the View Function. This may be useful to re-analyze logfiles after treatments have been completed.

4.6.4 The Trends Tab

The Trends Tab allows you to view changes in tested parameters over multiple sessions.



Three menus are provided at the top of the screen to enable you to select parameters to view:

Parameter Selection (shows “Leaves, Bank B, LP – RMSE: Individual (mm)” above)

- Carriages
- Jaws
- Leaves – Many variations
- Monitor Units (MU)
- Vs. Planned
- Vs. 1st session
- Vs. Other session
- Gantry
- Collimator
- Table
- Beam Statistics

Result Type

	Jaws	Carriages	Leaves	%MU	Vs. Planned	Vs. 1st session	Vs. Other session	Gantry	Collimator	Table	Beam Statistics
RMS Error	✓	✓	✓	✓				✓	✓	✓	
Nth Percentile	✓	✓	✓	✓				✓	✓	✓	
Maximum Deviation	✓	✓	✓	✓				✓	✓	✓	
RMSE Global			✓								
RMSE Individual			✓								
% Pixels with index ≤ 1					✓	✓	✓				
Beam Off lags (Total)											✓
Beam Off lags (Max)											✓

Trending for the Table is split into results for table position and angle.

Supplemental Choices

	Jaws	Carriages	Leaves	%MU	Vs. Planned	Vs. 1st session	Gantry	Collimator	Beam Statistics
Jaw X1	✓						✓	✓	
Jaw X2	✓						✓	✓	
Jaw X1 & X2	✓						✓	✓	
Jaw Y1	✓								
Jaw Y2	✓								
Jaw Y1 & Y2	✓								
Bank A		✓	✓						
Bank B		✓	✓						
Bank A & B		✓	✓						

4.6.5 The Summary Tab

This tab shows the results of all analyzed parameters, whether or not they were tested with respect to tolerances.

Buyer

Constancy | Backup | System Setup | User Manuals | About | Logout

Batch is ON

Import Load Analyze View

Beam 4 : 2ra NAME20.ANDRE.0105526 / Institut du Cancer de Montpellier / Varian5 / ra / 2ra
Total MU 578.65 - MCS 0.075 - Number of CPs 178 - Treatment type : Default-Treatment

Analysis template : Default-Analysis.v1

Sessions Trends Summary Jaws Carriages MU Fluence: Vs Plan Gantry Colli Table

Carriages

Position Deviations (mm)	Bank A	Bank B	Banks A&B	Tolerances
RMS Error	0.0	0.0	0.0	[0.0 ; 0.4 0.5]
"Maximum"	0.0	0.0	0.0	[0.0 ; 0.6 0.8]
95 th Percentile	0.0	0.0	0.0	[0.0 ; 0.5 0.6]

Jaws

Position Deviations (mm)	X1	X2	X1&X2	Y1	Y2	Y1&Y2	Tolerances
RMS Error	0.0	0.0	0.0	0.0	0.0	0.0	[0.0 ; 0.4 0.5]
"Maximum"	0.1	0.1	0.1	0.2	0.3	0.3	[0.0 ; 0.6 0.8]
95 th Percentile	0.1	0.1	0.1	0.0	0.1	0.0	[0.0 ; 0.5 0.6]

Monitor Units (MU)

Deviations (% Total MU)	Tolerances
RMS Error	0.0 [0.0 ; 0.4 0.5]
"Maximum"	0.0 [0.0 ; 0.6 0.8]
95 th Percentile	0.0 [0.0 ; 0.5 0.6]
Total MU	100.0 [99.8 ; 99.9 ; 100.0 ; 100.1 100.2]

Fluence Comparisons

Integrated: Vs Plan

	Tolerances
Pass Rate (%)	100.0 [98.0 ; 98.4 ; 100.0]
Mean [Index]	0.006 [0.000 ; 0.240 0.300]
Max [Index]	0.973

Gantry

Angle Deviations (degrees)	Tolerances
RMS Error	0.1 [0.0 ; 0.4 0.5]
"Maximum"	0.2 [0.0 ; 1.0 1.2]
95 th Percentile	0.1 [0.0 ; 0.6 0.8]

Colli

Angle Deviations (degrees)	Tolerances
RMS Error	0.0 [0.0 ; 0.2 0.3]
"Maximum"	0.0 [0.0 ; 0.5 0.6]
95 th Percentile	0.0 [0.0 ; 0.3 0.4]

Table

Angle Deviations (degrees)	Tolerances
RMS Error	0.4
"Maximum"	0.4
95 th Percentile	0.4

Generate temporary files RT Plan PDF reports

The title of a parameter is underlined if has led to an email alert, for non-compliant results. Numerical results are displayed in **green**, **amber** or **red**, according to pass, alert or fail status. For tolerance intervals, the target value is displayed in **black**; alert and fail tolerance levels are displayed in **amber** and **red**.

4.6.6 Creating Temporary RT Plans

On the Summary Tab, next to "Generate temporary files", select [RT Plan] to create an RT Plan that summarizes all of the logfile information obtained thus far. A dialog presents that summarizes this information. Select [Generate] to create the RT Plan.

The exported RTPlan generated by LinacView contains the prefix "LNW" in the RTPlanLevel and RTPlanName. Additionally, the RTPlanRelationship keyword "ALTERNATIVE" is used to map to the original RTPlan.

These files are termed "temporary" as opposed to the final files generated when a patient treatment is closed. Temporary RT Plans are typically deleted after a treatment is closed.

4.6.7 Creating Temporary PDF Reports

On the Summary Tab, next to "Generate temporary files", select [PDF reports] to produce two PDF reports: a short report that only contains Summary Tab results and a comprehensive report that contains details of results for all tabs of the Analyze Function. These files are termed

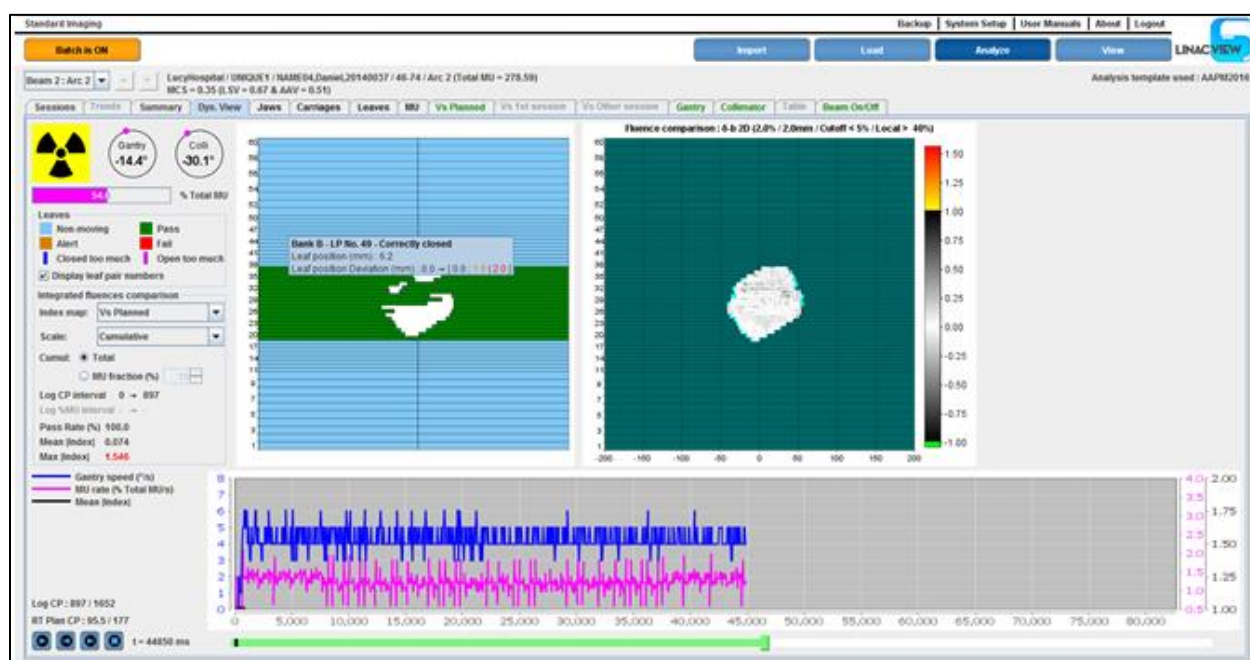
“temporary” as opposed to the final files generated when a patient treatment is closed. Temporary PDF reports are typically deleted after a treatment is closed.

In the screen for selecting treatments for which the generation of review PDF reports has been requested with the « All » option, the following applies:

- By default, treatments that have beams with less than 2 sessions are now presented in the interface but cannot be selected.
- Selectable treatments are checked by default.
- The checkbox in the header makes it possible to check all selectable treatments.
- Checkboxes are no longer editable during review PDF generation.

4.6.8 The Dynamic View Tab

The Dynamic View Tab shows the progress of treatment for a beam through five animated displays.



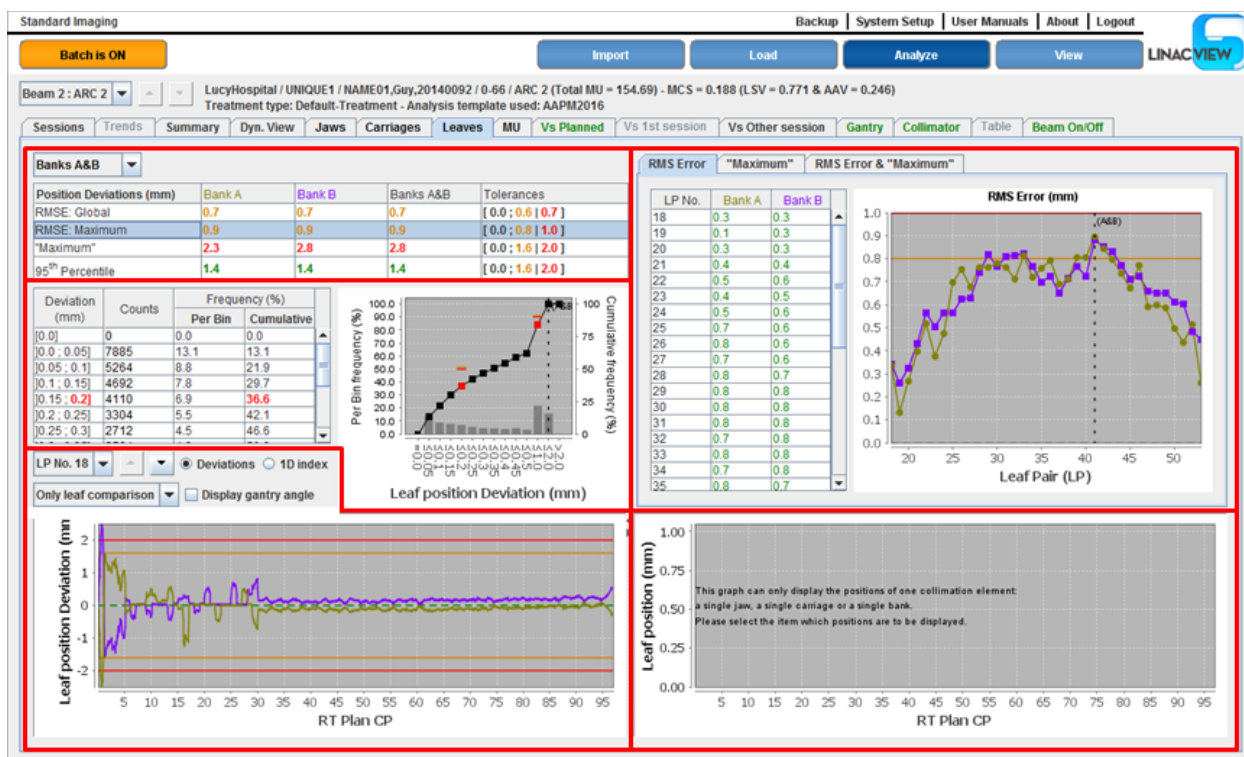
- Upper left-most section shows a “trefoil” that activates when the beam is on and displays gantry and collimator angle.
- Upper left graph shows a “real-time” simulation of leaf positions including, on a leaf-by-leaf basis, showing whether individual leaves are closed too much, open too much, non-moving, or in pass, alert, or fail status with relationship to leaf constraints.
- Upper right graph shows a “real-time” calculation of a selected index (Gamma, Chi, Delta) comparing logfile-recorded segmental fluences to predicted segmental fluences from the RT Plan.
- Bottom top graph shows gantry speed.

- Bottom-most graph shows percent monitor units delivered and percent monitor unit rate.

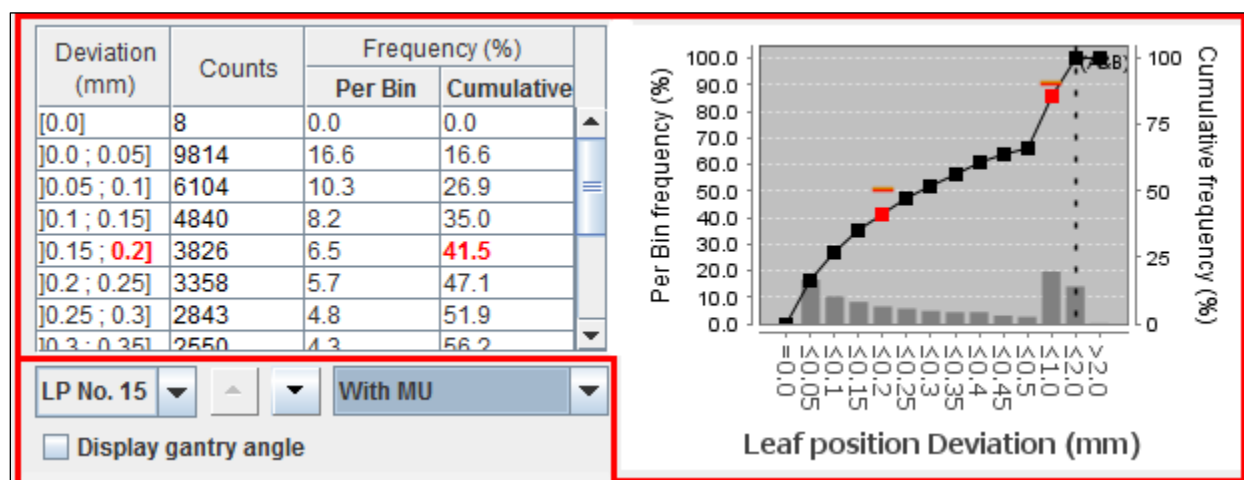
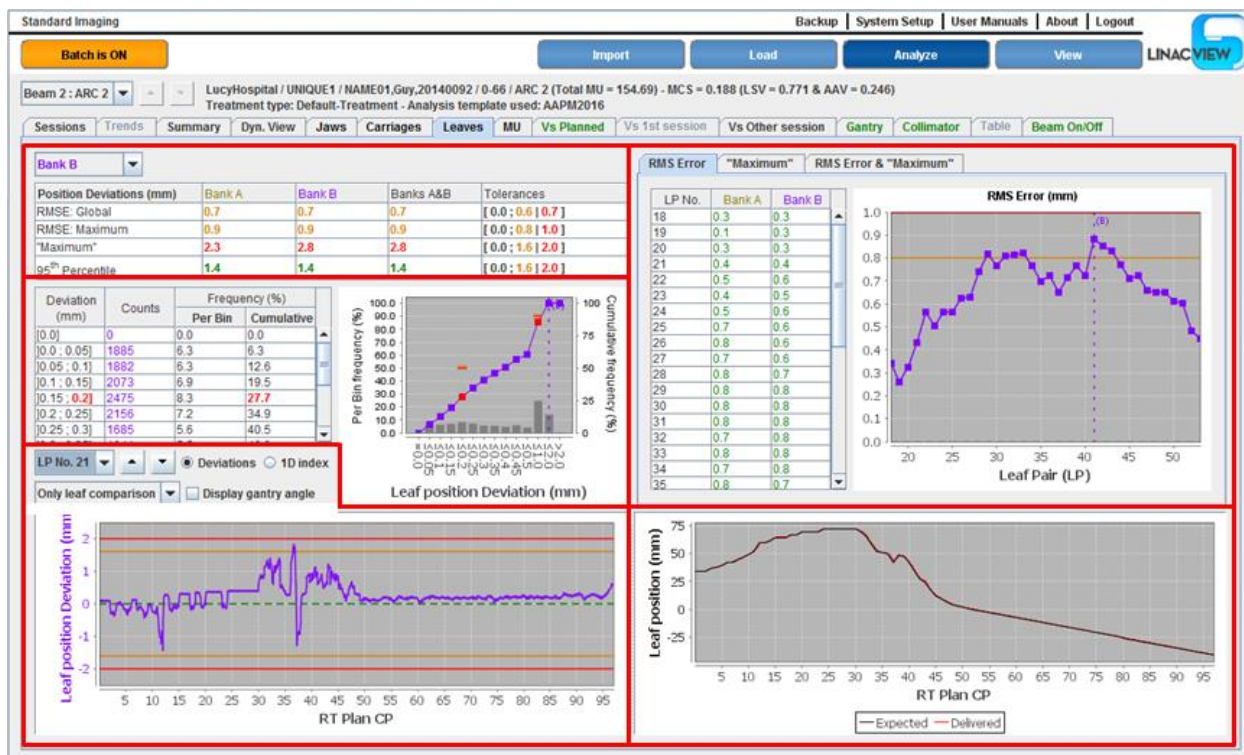
Animations are controlled by buttons at the lower left-hand corner of the display.

4.6.9 The Leaves Tab

In the Leaves Tab, deviations are based on the error differences calculated from RT Plan prescribed leaf positions. Results are displayed by leaf bank and by combined results.



- Upper left-hand corner – Shows tabular leaf position results that are the same as on the Summary Tab.
- Upper right-hand corner – Shows plots of active leaf Root Mean Square (RMS) Error, "Maximum" error, and a combination of both. Above, leaves 18 through 35 are active (moving during treatment).
- Middle left – Shows tabular histogram and cumulative histogram of leaf errors.
- Lower left-hand corner – Shows a graph of leaf deviations for individual leaf pairs. A dropdown is provided, just above the graph and to the left, to select leaf pairs of interest. As with other graphs, you may choose to graphically show related parameters as well and plot with respect to gantry angle for VMAT beams.
- Lower right-hand corner – Shows the actual vs. expected positions of a leaf when a single leaf pair (in this case 21) and a single bank (in this case Bank B) is selected.



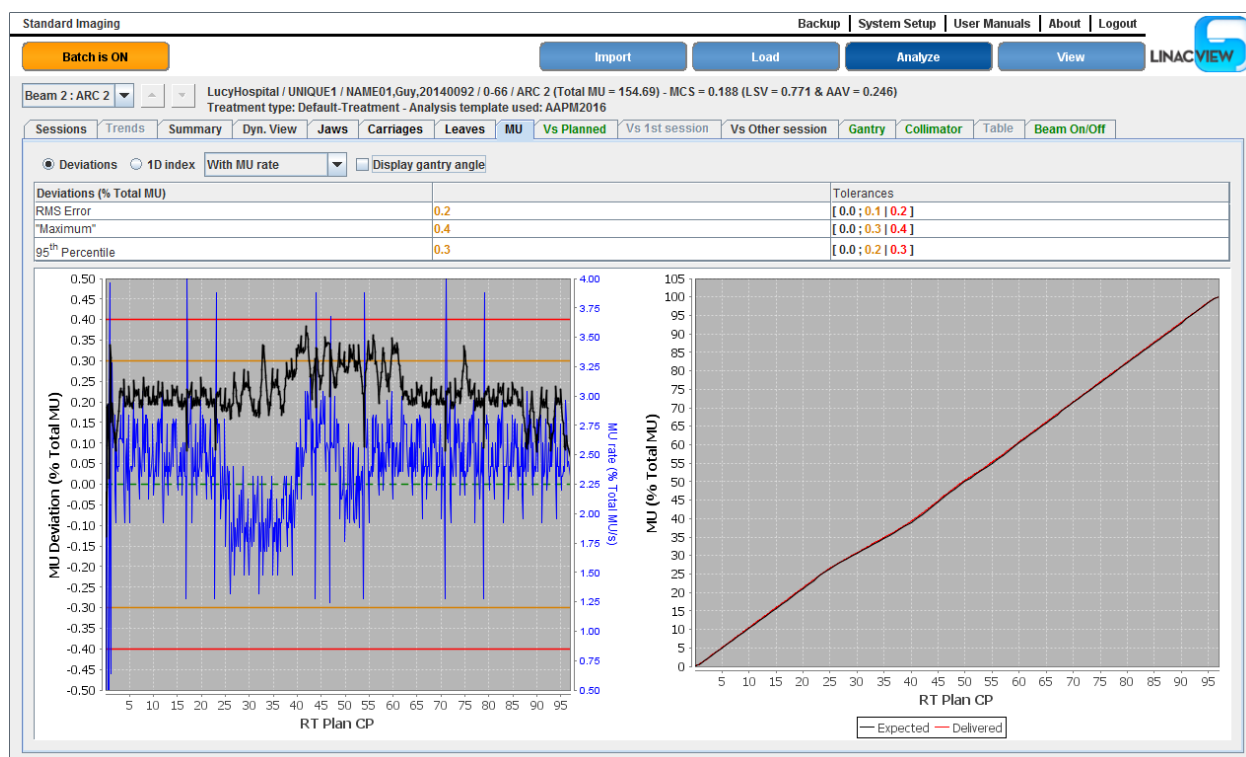
A little further explanation is needed for the middle left plane. Notice the red numbers in the table and the red boxes on the graph. They are related to settings in the currently active template.

Dev. bound (mm)	Selected	Target value (%)	Error	Alert (%)	Test type
0.0	☐	10.0	1.0	80.0	IV
0.05	☐	20.0	1.0	80.0	IV
0.1	☐	30.0	1.0	80.0	IV
0.15	☐	40.0	1.0	80.0	IV
0.2	☒	55.0	5.0	80.0	IV
0.25	☐	60.0	1.0	80.0	IV
0.3	☐	70.0	1.0	80.0	IV
0.35	☐	75.0	1.0	80.0	IV
0.4	☐	80.0	1.0	80.0	IV
0.45	☐	85.0	1.0	80.0	IV
0.5	☐	90.0	1.0	80.0	IV
1.0	☒	95.0	5.0	80.0	IV
2.0	☐	100.0	1.0	80.0	IV

The reddish bars show the error thresholds ($55 - 5 = 50\%$, $95 - 5 = 90\%$). The table shows that only 41.5% of leaf errors were less than 0.2mm, whereas the user wanted at least 50% of leaf errors to be less than 0.2mm. The graph shows this as well as the error for the 95% target.

4.6.10 The Jaws, Carriages, Monitor Units, Gantry, and Collimator Tabs

These tabs are all organized the same and show similar results.



Each tab has a results table that corresponds to an identical results table on the Summary Tab. A dropdown allows each tested parameter to be plotted with:

- With MU
- With MU rate
- With gantry angle
- With gantry speed

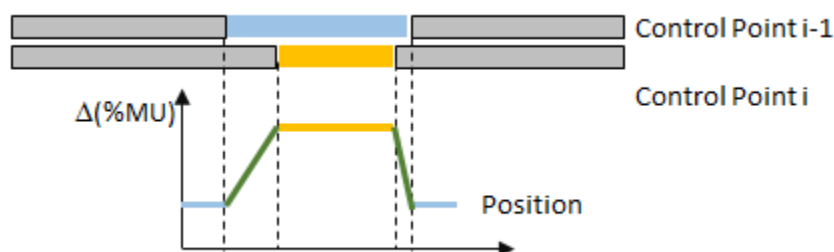
For VMAT beams, time in milliseconds, the x-axis coordinate system, can be changed to display gantry angle. When multiple beams are analyzed, the x-axis is expressed in RT Plan control points. Display in control points is necessary, because deliveries, perhaps with different timing, are synchronized by control points.

4.6.11 The Vs. Planned, Vs. 1st session, Vs Other session Tabs

All three tabs present essentially the same information, except that the Vs. Planned tab compares planned fluence (as specified in the RT Plan) to delivered fluence and the other tabs compare reference fluence (for the first fraction or another fraction) to delivered fluence.

How Fluence is Calculated

LinacView estimates integrated fluence at the radiation isocenter plane based on leaf positions and monitor units recorded in logfiles and RT Plans. This calculation is like recording integrated measured values for all dose fractions for a treatment using a planar device.



For each control point from a series of logfiles or the prescription RT Plan file, integrated fluence is estimated by "painting" the intensity of successive leaf apertures. Intensity between apertures is estimated by linear interpolation of MU over the regions where individual pairs of leaves have moved between control points.

For Vs. Planned

- The planned fluence is calculated using the RT Plan.
- The delivered fluence is calculated using one or more currently analyzed logfiles depending on whether a single or multiple sessions were loaded.

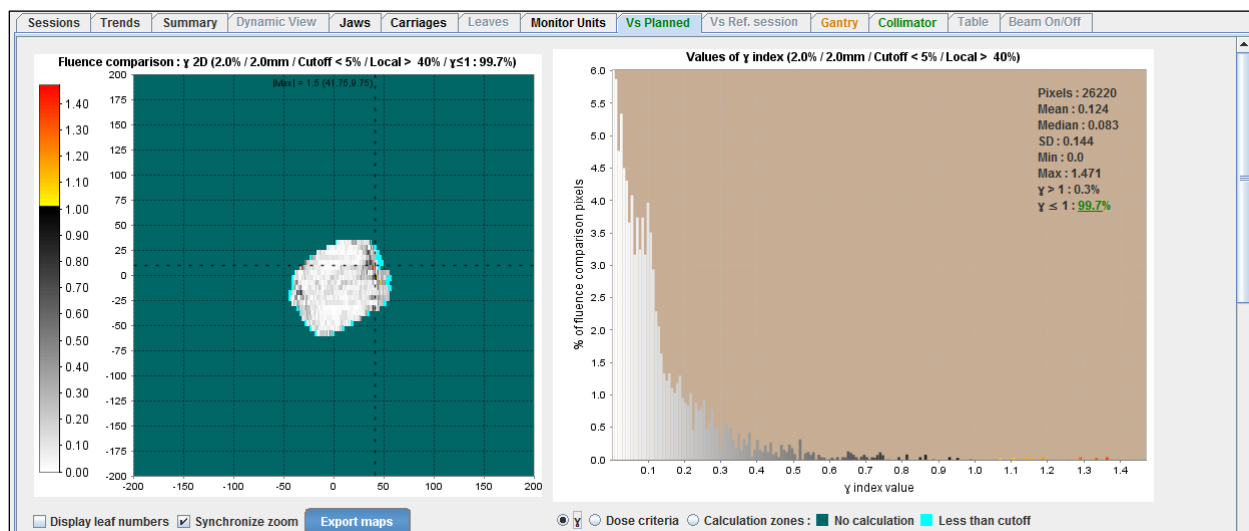
For Vs. 1st session

- The reference fluence is calculated using the first delivered fraction's logfile.
- As above, the delivered fluence is calculated using one or more currently analyzed logfiles.

For Vs. Other session

- The reference fluence is calculated using the first delivered fraction's logfile.

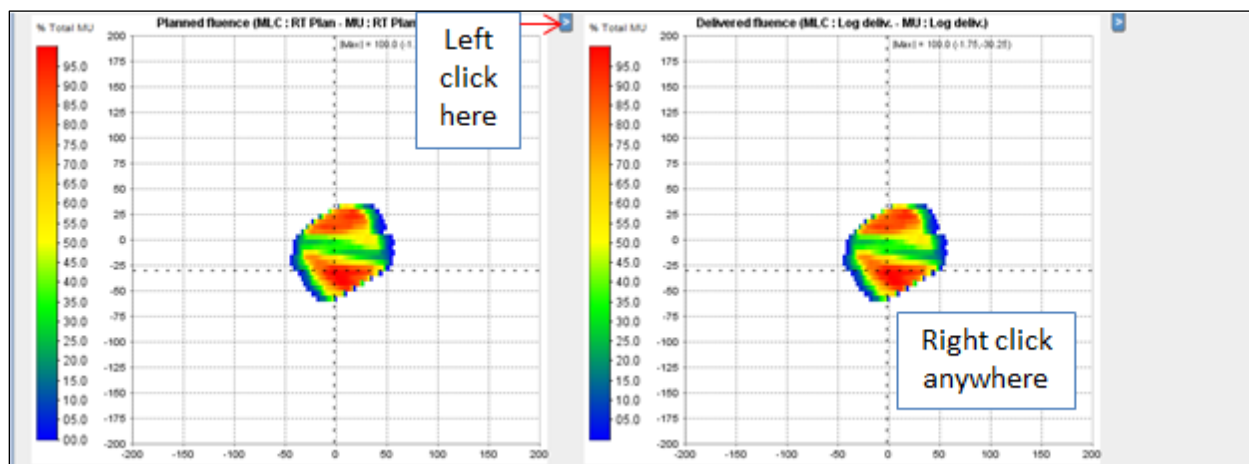
- As above, the delivered fluence is calculated using one or more currently analyzed logfiles.



The upper-left graphic (above) shows a 2D index calculation (Gamma, Chi, Delta) comparing the delivered fluence to planned or reference fluence. The upper-right graphic shows a histogram with statistics of the index calculation.

The check box labelled “Display leaf numbers” allows you to toggle between y-coordinates in mm and y-coordinates in terms of leaf pair numbers. Checking “Synchronize zoom” applies the same zoom factor to all graphs. “Export maps” creates comma-separated variable files containing fluence maps and comparison indices readable by Excel.

Using the radio buttons under the fluence comparison maps, you may toggle between maps of the comparison index, dose criteria, and calculations zones.

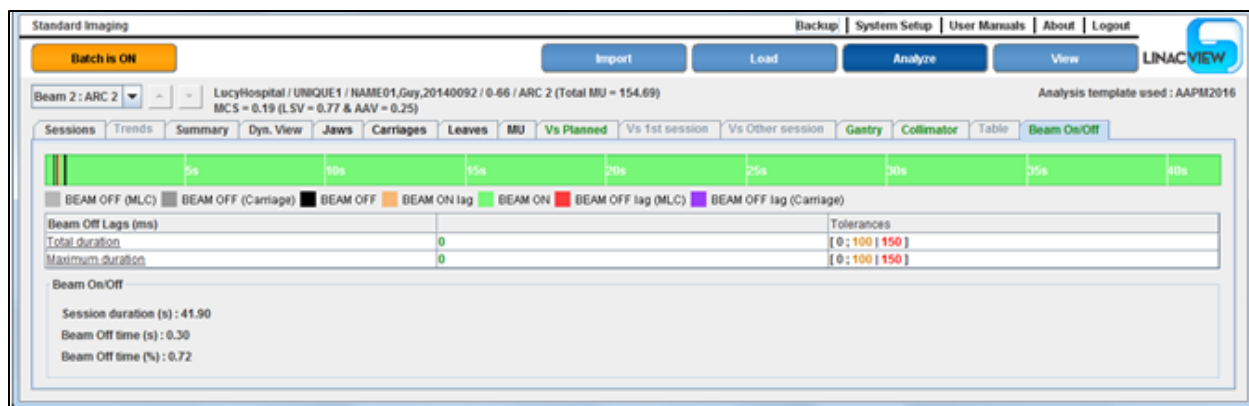


Integrated fluence maps may be displayed in delivered %MU or in normalized intensity relative to the maximum intensity of the integrated fluence map. This choice may be set in the Analysis Tab of the System Setup Function.

Selecting the arrow at the top right of each fluence map exposes a histogram of pixel intensities for the map. Use the double slider to adjust color mapping. Right click anywhere in a display to get zoom tools.

4.6.12 The Beam On/Off

The Beam On/Off tab reports information about the delivery of dose for a beam during treatment.



The bar chart at the top of the tab reports when dose was delivered (and when it was not delivered) during treatments. It also reports reasons and parameters for the beam being on or off.

For Varian DynaLog files

- Beam Off
- Beam On
- Beam Hold (MLC)
- Beam Hold (Carriage)
- Beam Off Lag (MLC)
- Beam Off Lag (Carriage)
- Beam On Lag

For Varian TrueBeam logfiles⁹

TrueBeam using “integrated boost” and back-to-back beams are addressed beam off states.

- Beam Off

⁹ Trajectory logfiles do not distinguish between beam holds that are due to carriage motions and those that are due to the inability of leaves to reach expected positions in physically realizable times.

- Beam On
- Beam Hold
- Beam Off Lag
- Beam On Lag

For Elekta logfiles¹⁰

- Beam Off
- Beam On

The beam being on or off during different parts of a treatment is a given. All treatments have a beam on at the start and a beam off at the end. For some treatments, either by design (as in Step and Shoot treatments), or by events that happen during treatment, there are periods when the beam is off between multiple beam on periods.

During some deliveries, the dose rate is reduced to a very low rate rather than stops. The beam off state for Elekta linacs is enabled based on low dose rate settings.

4.7 The View Function

The View Function allows display of previously created PDF reports for patient treatments and generated RT Plans. It also allows generated RT Plans to be exported to a folder of your choice.

¹⁰ Elekta logfiles do not have explicit Beam Holds.

Buyer
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Batch is ON
Import
Load
Analyze
View
LINACVIEW

Filter for PDF reports and generated RT Plans

Session dates
From 31/08/2016 to 10/10/2020
Since Days All

Patient
Linac / Department
Treatment type
Treatments: All Closed Not closed

Cancel previous filters on: All Dates Patient Linac / Department Treatment type

List of treatments having PDF analysis reports and/or generated RT Plans

Patient	Plan	Session dates		Linac / Department	Treatment type	Sessions Selection	Failed sessions (%)		Number of	
		First	Last				Fail	Alert	Sessions	Beams
NAME71_Head&Neck,013847	Plan_0.0	2020-10-06 10:48:09	2020-10-10 09:54:13	LINAC1 / Gemelli Molise	ELEKTA Complex					
NAME60_ProstPreClim1	01QAteStJL-QA1	2020-02-17 13:01:52	2020-02-17 13:13:28	Unity / Unity Center	Default-Treatment					
NAME62_CIRSABDO	01AE2ENewADT03	2020-01-09 15:10:40	2020-01-09 15:12:59	Unity / Unity Center	Default-Treatment					
NAME47_Laurence,5158144	1.SEIN GAU #	2018-10-02 12:53:26	2018-10-02 12:53:26	Neptune IX / Sainte Elisa...	Default-Treatment					
NAME40_Luigia,30005882	Scanner.0	2016-08-31 17:06:22	2016-08-31 17:08:22	SL2 / ELEKTA/COM-VX C...	Default-Treatment					

Detail
Reopen the analysis folder
Delete the analysis folder

List of generated RT Plans for the selected treatment

Generation Date	Last export date	Export format	State	Test if the generated RT Plan reflects the treatment: Worst beam result in the RT Plan
2021-09-09 17:32:23			Temporary	03 : γ±1 : 42.3% (0.5% / 0.5mm / Cutoff < 5% / Local > 0%)

Export RT Plan
Open RT Plan PDF
Delete RT Plans

List of reviews for the selected treatment

Creation Date	Session dates		PDF report	Beams Selection	Failed beams (%)		Number of	
	First	Last			Fail	Alert	Sessions	Beams
2021-09-07 18:37:06	2016-08-31 17:06:22	2016-08-31 17:08:22	Comprehensive	Fail	100.000	0.000	1	2 / 0 / 0
2021-09-07 18:37:06	2016-08-31 17:06:22	2016-08-31 17:08:22	Short	Fail	100.000	0.000	1	2 / 0 / 0
2021-09-07 18:35:44	2016-08-31 17:06:22	2016-08-31 17:08:22	Comprehensive	Fail	100.000	0.000	1	2 / 0 / 0
2021-09-07 18:35:43	2016-08-31 17:06:22	2016-08-31 17:08:22	Short	Fail	100.000	0.000	1	2 / 0 / 0

View PDF report
Delete PDF reports

Treatment courses can be selected according to date ranges and other identifiers. Valid matches appear below the selection area. Select a matched treatment course to view associated PDF reports, generate RT Plans, and summary results. Select a PDF report from the treatment course to view or delete it. Similarly, select a generated RT Plan from the treatment course to export it, view its PDF report, or delete it.

5 Modulation Complexity Score

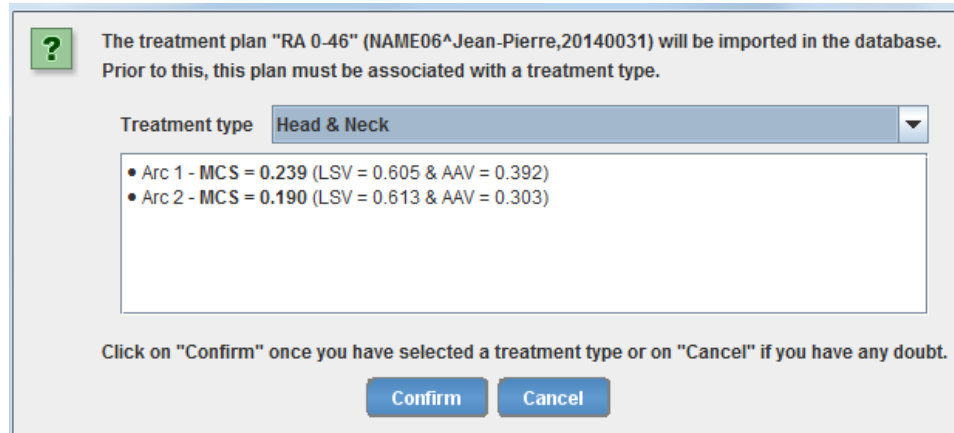
LinacView calculates a Modulation Complexity Score (MCS) for RT Plans. For "Step and Shoot" IMRT, the MCS is based on McNiven et al., 2010; for dynamic IMRT it is based on Masi et al., 2013. This index reports the possible complexity for the treatment machine to perform the treatment prescribed by the RT Plan file.

The MCS index ranges between 0 (highly complex treatment) and 1 (non-complex treatment). MCS is composed of two components:

- LSV (Leaf Sequence Variability) which reports the differences in position between two adjacent leaves of the bank,

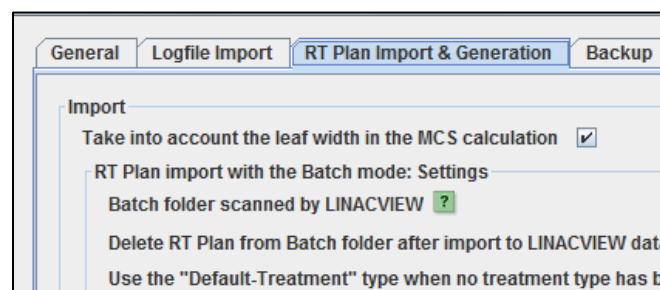
- AAV (Aperture Area Variability) which reports the surface irradiated by each segment of the RT-Plan relative to the total irradiated surface for all segments of the RT-plan.

The three MCS indices are presented during manual import of an RT-Plan, in the Analyze screen, in the PDF analysis reports, and in the screen opened by clicking on “Detail” of a closed treatment reviewed with the View function.



Custom analysis options may be defined using the index pass rate, mean or max as a function of MCS. This option can be accessed under the analysis template. See additional details under the System Setup associated with the Analysis tab and editing Analysis templates.

The AAV index as defined by McNiven and Masi does not consider the width of the leaves. Although not specified by the authors, the width of the leaves can be taken into consideration when LinacView calculates MCS. If you want to turn off this modification, you can deactivate it using the “Take into account the leaf width in the MCS calculation” option in the “RT Plan Import & Generation” tab of the “System Setup” function. In addition, if the leaf width information is missing from the DICOM tags the option for considering the leaf width will not be available.



6 Data Organization

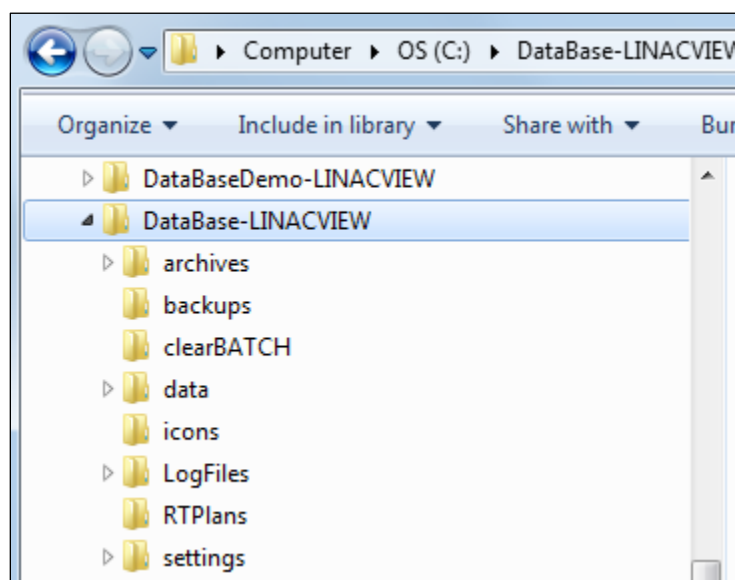
Several data folders are used by LinacView and can be located anywhere on your local area network. These locations are configurable in “System Setup”. Default locations as set during installation and usually do not need to be changed. However, in cases where the transfer rate

between the host station and the server is insufficient, we recommend storing the data on the server so that backups may be automatically scheduled, as this data is not easily reproduced.

Once data folder locations are set, the user should never modify any data used by LinacView by hand or through software other than LinacView. Standard Imaging does not guarantee that LinacView will function properly if any such changes are made. You may also lose data that will not be able to be restored.

6.1 Database-LinacView Folder

The location of this folder is set when LinacView is installed. No program function exists to modify this location and, therefore, it cannot be moved.



6.1.1 Archives Folder

The Archives folder has three subfolders that contain files associated with treatments that have been closed.

- “LogFiles&RTplans” stores zipped logfiles and RT Plans.
- “GeneratedRTPlans” stores RT Plan files generated when treatment are closed and PDF reports associated with these RT Plan files describing their capacity to reflect the closed treatment.
- “Reports” stores PDF reports which can be viewed using the View Function.

6.1.2 Backups Folder

The Backups folder is where backups are placed when the Backup Function on the welcome screen is selected. A separate backup “.zip” file is created for each selection. This folder also contains backups that occur before the database is automatically recalculated after modification of the analysis model. User-initiated backups start with the prefix “backup” and

backups before automatic recalculations start with the prefix “recalc”. All backups have a date and time stamp.

6.1.3 ClearBatch Folder

The ClearBatch folder contains an “errorsJournal.xml” file that lists all logfiles that could not be analyzed in batch mode. When an Administrator selects “**Clear BATCH folder**” in the Logfile Import Tab of the System Setup Function, logfiles that could not be analyzed will be moved to subfolders of the ClearBatch folder that could not be analyzed.

6.1.4 Data Folder

The Data folder contains the relational database used by LinacView. This database stores logfile analysis results for each parameter that you specified under “**Select Tests**” in the Analysis Tab of the System Setup Function for each treatment and beam.

6.1.5 Icons Folder

The Icons folder may contain logos for your organization, center, or department. These logos will appear in the headings of PDF analysis reports provided by the Administrator through the Licenses & Linacs Tab of the System Setup Function.

6.1.6 Logfile and RTPlans Folders

The Logfiles and RTPlans folders contain, respectively, the logfiles and RT Plans imported into LinacView using the Import Function or during batch mode. The Logfiles folder is organized according to the following tree: Department / Linac / Lastname, Firstname, PatientID / Plan Name / Beam Name / Date and time of radiation session. The RTPlans folder has no substructure and just contains a list of RT Plans.

6.1.7 Temp Folder

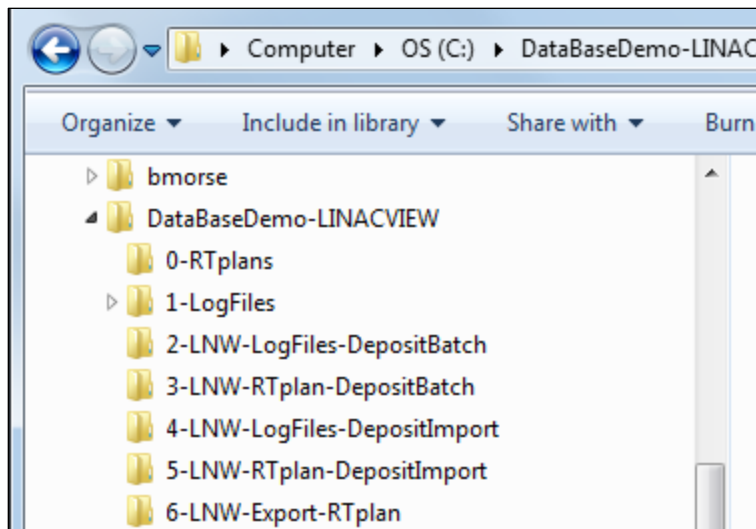
The Temp folder contains PDF reports and RT Plans for incomplete treatments. These PDF reports are viewed, and RT Plan files are exported via the View Function.

6.1.8 Settings Folder

The Settings folder contains all LinacView user settings in “.xml” format files.

6.2 Logfile, RT Plan, and Export Folders

The location of these folders can be modified by the program Administrator under the System Setup Function. After your system is installed and running for a while, this capability will probably not often be used. Folders 0 and 1, below, contain demo data.



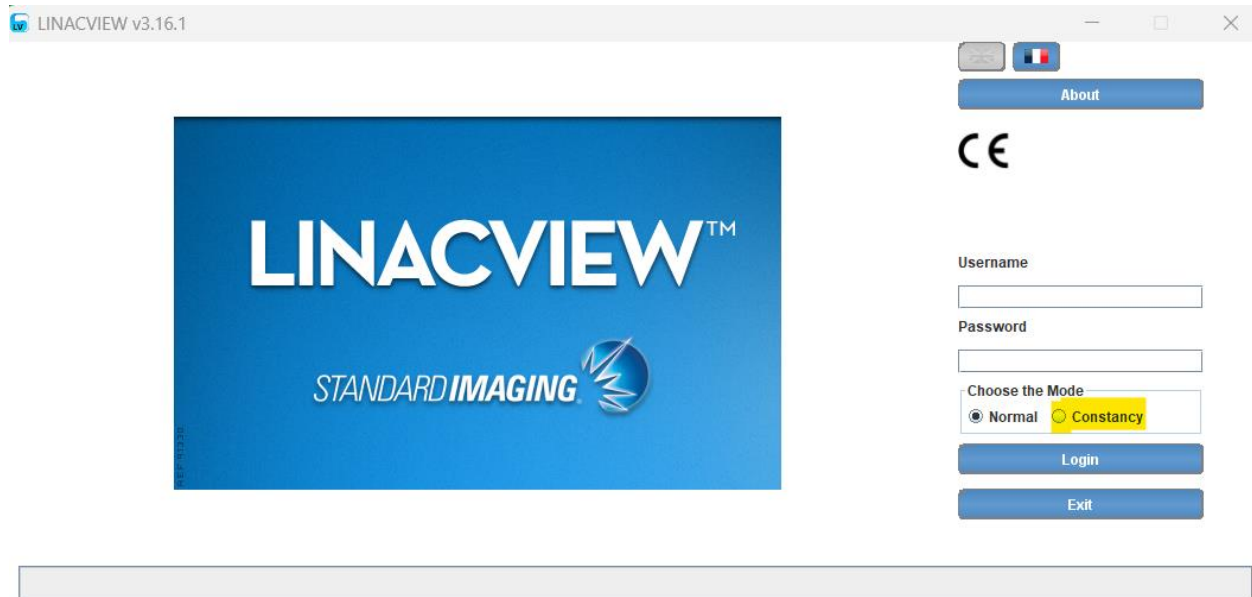
Folder Layout as Seen in Typical Installations

- **Logfile Batch Folder** – the LinacFilesSync target folder is also the folder automatically scanned by LinacView in batch mode. Number 2 above is set in the Logfile Import Tab.
- **RT Plans Batch Folder** – the folder that is automatically scanned by LinacView in batch mode. Number 3 above is set in the RT Plan Import & Generation Tab.
- **Logfile Import Folder** – the folder that is the default source when the Import Tab is selected. Number 4 above is set in the Logfiles Import Tab.
- **RT Plan Import Folder** – the folder that is the default source when the Import Tab is selected. Number 5 above is set using the RT Plan Import & Generation Tab.
- **Export RT Plan Default Folder** – the folder that is used as the default root for RT Plans generated when a treatment is closed. Number 6 above is set using the RT Plan Import & Generation Tab.

The system can be configured to remember last folder locations used to import logfiles and RT Plans. This allows the last folder selected to be the next default folder location. This is the default behavior of many commercial software systems, but it is an option in LinacView, so that, if there are several users of the system, they can all use the same default source directories.

7 Constancy Mode

The LinacView software has two login modes: Normal and Constancy. Constancy mode enables the user to compare the consistency of analysis results between version updates of the LinacView software. The user can select “typical sessions” from the normal treatment database from which the corresponding logs and RT Plans will be copied to the “Constancy” database.



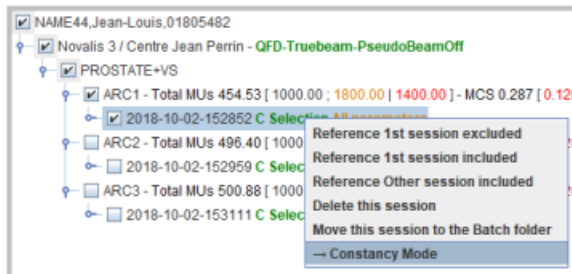
7.1 User Rights Linked to Constancy Mode

By default, Administrator and Super User level users have all rights to Constancy mode. These rights can also be given to Advanced level users, but not to Intermediate and Basic level users. User rights associated with the Constancy Mode can be assigned in the System Setup, User Rights, Constancy menu. The optional user rights are:

- **Consult Results** allows designated users to access Constancy mode via the login screen.
- **Add Typical Sessions** allows users to include a selected session in the Constancy Mode database so that the results of the analysis of this session are checked during LinacView software updates. This right can only be given to users who already have the right to Consult Results.
- **Recalculate Typical Sessions** allows the user to access Constancy mode and launch calculation of analysis results of the typical sessions existing in the Constancy mode Database for the current version of LinacView. This right, which can only be given to users who already have the right to **Consult Results**, allows the user to **Accept Differences** between versions.
- **Delete typical sessions** allows the user to delete sessions in the Constancy mode database. This right can only be given to users who already have the right to **Access to the mode to recalculate results**.

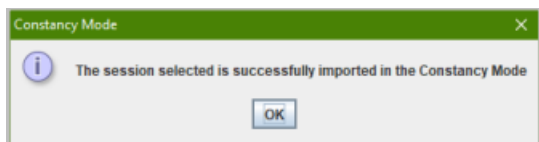
7.2 Adding “Typical Sessions” to the Constancy Mode Database

Only users with the right to Add Typical Sessions can add specified LogFiles and RTPlans to the Constancy Mode database. This is done using the **Load** function, by right-clicking on the desired session and choosing **Constancy Mode** to copy the corresponding files to the `\Database-LinacView \Constancy` directory according to the following subfolder arrangement:

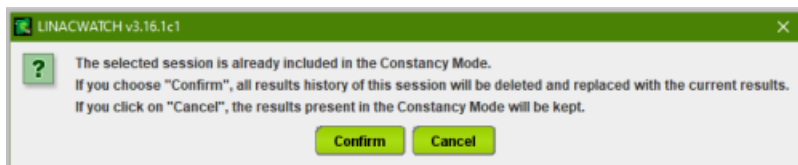


- The Log Files associated with the session are copied into the LogFiles subfolder.
- The RTPlan file associated with the session is copied into the \Original RT Plans subfolder.
- The results of the analysis of this session are copied into the \Analyze subfolder.
- The analysis template associated with this session is copied into the \settings subfolder so that the program can reanalyze this session with future versions of LinacView.

A confirmation message is displayed when copying all the selected data is complete.



Note: When adding a typical session, the system verifies whether this session already exists in the **Constancy** database. If this is the case, the system notifies the user that the addition of this session will erase the entire history of analyses already performed for this session from the **Constancy** database. The following message will be displayed, giving the user the option of cancelling the addition of the session by clicking on **Cancel** instead of **Confirm**.



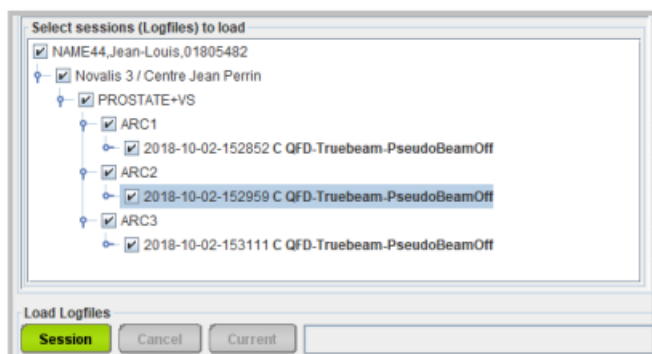
7.3 Loading and Analyzing Sessions in Constancy Mode Database

Upon receipt of a new version of LinacView, it is strongly recommended that sessions loaded into the **Constancy** database be analyzed with the new version to compare the analysis with previous version results and verify that they do not deviate from what is expected according to the update documentation (release note).

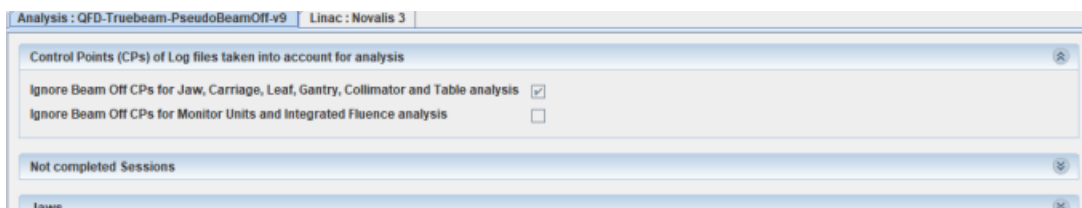
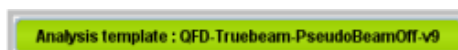
To access and analyze sessions stored in the Constancy mode database, the user must log in by selecting **Constancy** on the log in page. The user has the choice to either analyze sessions one by one, analyze them all at once, delete sessions or exit as outlined below.

7.3.1 Analyze Typical Sessions One By One

The user can add the analysis results generated by the current version of LinacView for each typical session existing in the **Constancy** Mode Database by selecting the desired session, then clicking on the **Session** button shown below.



Clicking on the **Analysis template:xxx** button in the **Summary** tab, LinacView opens a window with two tabs, one describing the analysis template used when exporting the session to the **Constancy** database from **Normal** mode, and the other the Linac settings as it was when the session was originally exported.

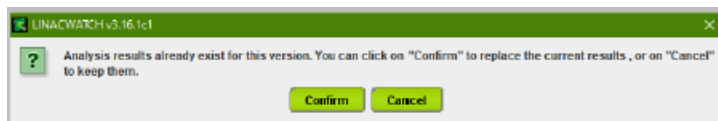


To save these analysis results go to the **Summary** tab and click on one of the following two buttons:

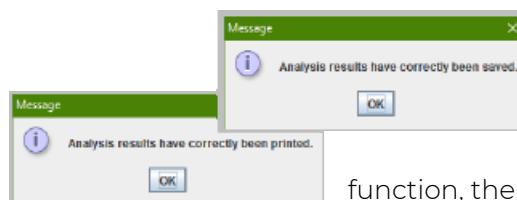
- **Close and Save** which makes it possible to save the results of the analysis of this session for the current version of LinacView.
- **Close, Save, and Print** which automatically generates and opens a report in .pdf format which lists all of the analysis results. This report is also copied to the subfolder \PDF reports & generated RTPlans\PDF reports within the **Database-LinacView\Constancy** directory.

To exit the **Analyze** function without saving these results click either the **Load** button or the **Close Without Saving** button.

If you attempt to save session analysis results that already exist for a current version of LinacView, the following message will be displayed.

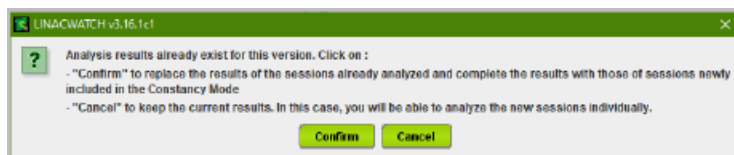


The following messages are displayed when the results and generation of PDF report have been successfully completed.

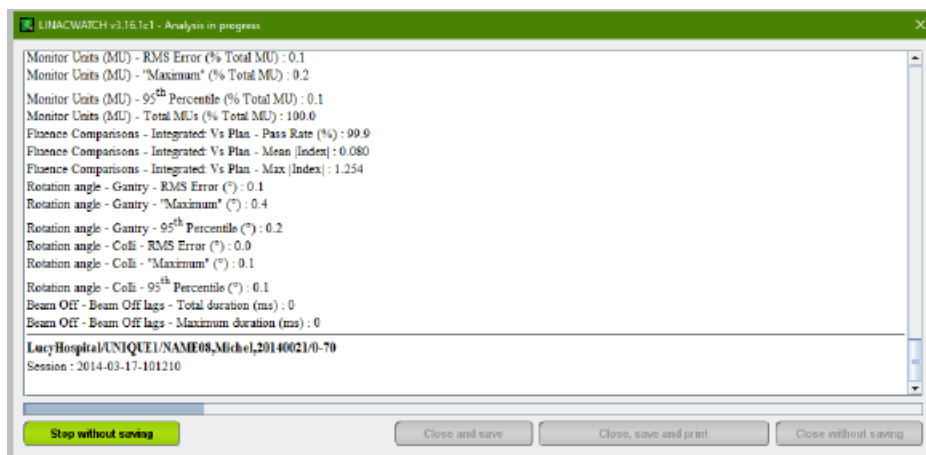


7.3.2 Analyze All Typical Sessions At Once

By clicking on the **Analyze all** button of the **Load** function, the user can analyze all the typical sessions in the **Constancy** mode database at once. If results already exist for the current version for one or more sessions, the following screen will appear to provide the option to **Confirm** or **Cancel**, to accept or exclude these sessions from the analysis.



The user can then follow the analysis of typical sessions progressively in the following screen which displays analysis results with the lower part of the screen corresponding to the last session analyzed.



Clicking on **Stop without saving** on this screen will end the analysis after the current typical session has completed. The corresponding results will be saved in the same way as the analyses already performed. After the analysis has completed, either by stopping or analysis completion for all sessions, three buttons will appear as previously in the Analyze function. These are **Close and Save**, **Close, save, and print**, and **Close without saving**.

7.3.3 Delete Typical Sessions From Analysis

To delete a typical session that the user no longer wants to follow in future versions of LinacView either right-click and select **Delete this session** on each typical session or right-click and select **Delete all sessions** on a treatment that will no longer be followed in future versions. This will delete all corresponding results in the **Constancy Mode** database regardless of the version that produced them.

The user will be prompted to **Confirm** or **Cancel** the deletion as shown below.



When deleting the typical session and associated analysis results in the **Constancy** mode database, LinacView will also ask the user to **Confirm** deletion of any associated analysis PDF reports which had been created within the **Constancy** mode.



7.3.4 Exit Constancy Mode

To return to the **Normal** mode database, log out of LinacView and choose **Normal** mode when logging back in.

The user can now view the comparison results generated by each version of LinacView by clicking the **Constancy** button at the top of the home screen.

7.4 Viewing Constancy Mode Results

Authorized users can view constancy mode results by clicking the **Constancy** button in the accessory bar located at the top right of the welcome screen. This button is available in both **Constancy** mode and **Normal** mode.

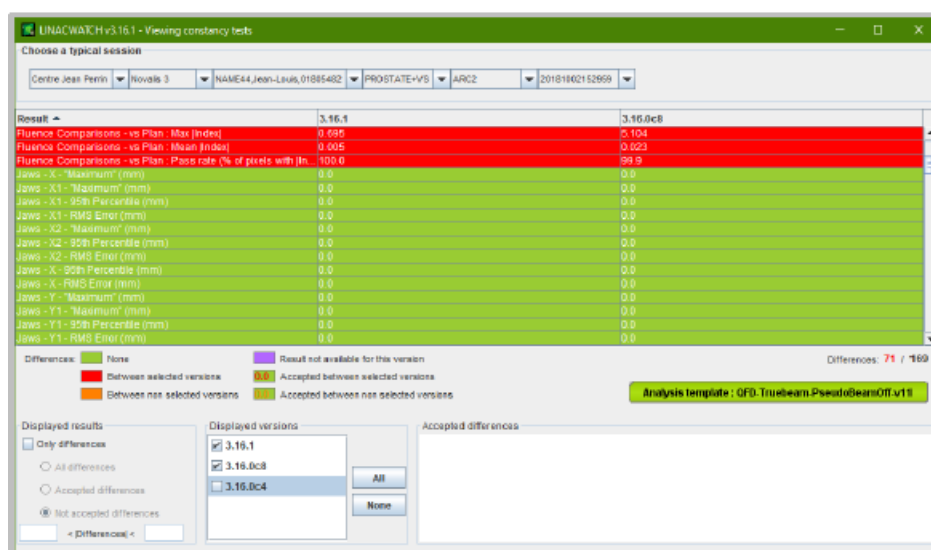
To view a specific typical session, go to the **Viewing constancy tests** screen **Choose a typical session** and select the desired **Center, Linac, Patient, Plan, Beam** and **Session**.

For the selected session, LinacView will display:

- A table containing the list of analysis results corresponding to the selected sessions and the available tested versions.
- The **Analysis template** and the corresponding version are displayed. The analysis template corresponds to the template that was associated with the original session import in the **Constancy** mode database. This template carries forward to all version analysis updates.

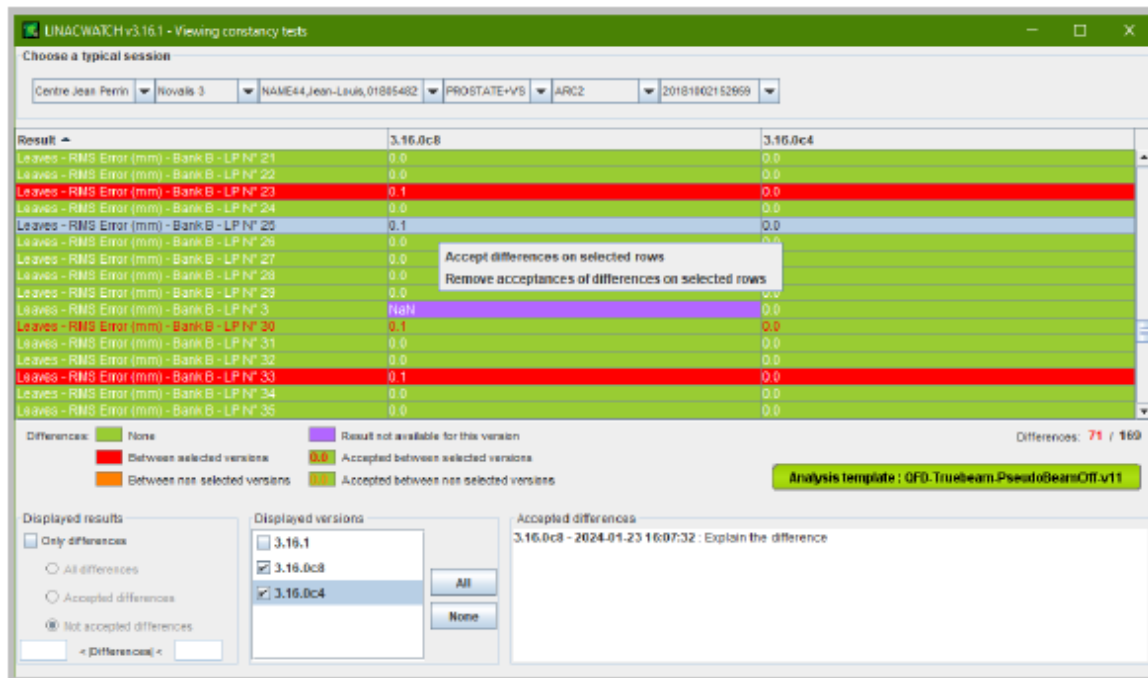
Important Note: The analysis template used by the **Constancy** mode is frozen in the version that was used when the typical session was added. To change the analysis

template, it is necessary to add the typical session again, in which case the history of comparisons previously tested between versions of LinacView will be lost.

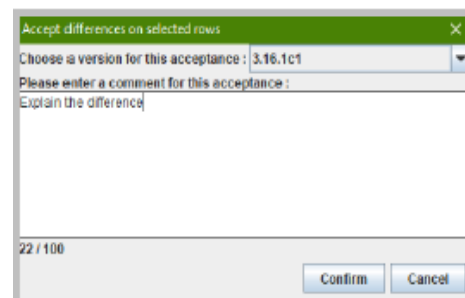


The **Displayed versions** section enables the user to choose the versions to be displayed in the table. The color code used in the results table is as follows:

- **Green** background is used for analysis results showing no difference between versions, whether displayed or not, since the last **Accepted difference**.
- **Green** background with either **Orange** or **Red** text signifies that there was a previous version **Accepted difference**. Orange signifies an Accepted difference between displayed versions and Red signifies and accepted difference between non-displayed versions.
- **Orange** background indicates that the non-displayed versions show differences for this analysis result since the last **Accepted difference**.
- **Red** background indicates that there are differences for this analysis result between the results associated with the displayed versions since the last **Accepted difference**.
- **Purple** background indicates that a result is not available for a version, either because this result did not exist yet, or because the result was deleted from the analysis from a version. In this case, the result value displays **NaN**.



When a difference is detected between two versions, the user (with appropriate rights) can signify the acceptance of the difference either because the corresponding Release Notes explains the difference, or the difference is insignificant. To accept a difference, right-click **Accept differences on selected rows** on the result considered. A pop-up screen will appear where the user will choose the version corresponding to the accepted difference along with a note to justify the decision.



When a result that has been subject to at least one acceptance is selected, the version for which the difference was accepted, and the corresponding date are displayed in the **Accepted difference** section.

This acceptance can be deleted at any time by selecting the results concerned and right-clicking **Remove acceptances of differences on selected rows**. The user will then have the choice to delete only **Acceptance linked to the most recent version** or to delete **All acceptances** that may have been made on the selected results, regardless of the versions.

By selecting **Only differences** in the **Displayed results** section, the table only displays the results presenting differences between all versions, displayed or not. The user can filter by choosing to display **All differences**, only **Accepted differences**, or only **Not accepted differences**.

Note: When a difference has been accepted on a version, the result value is displayed in green background. However, when a new difference appears for this result on a later version, the display returns to a red background, because the new difference has not yet been accepted.

Finally, there are two input boxes which indicate the differences above and/or below which you want to display results to narrow down displayed differences to those that are considered significant to the user.

8 Bibliography

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[Blanpain and Mercier, 2009] The delta envelope: a technique for dose distribution comparison. B Blanpain, D Mercier, Med Phys. 36, 797-808, 2009.

[Low et al., 1998] A technique for the quantitative evaluation of dose distributions, D. A. Low, W. B. Harms, S. Mutic, J. A. Purdy, Med. Phys. 25, 656–661, 1998.

[Masi et al., 2013] Impact of plan parameters on the dosimetric accuracy of volumetric modulated arc therapy, Masi L, Doro R, Favuzza V, Cipressi S, Livi L. Med Phys. 2013 Jul;40(7):071718.

[McNiven et al., 2010] A new metric for assessing IMRT modulation complexity and plan deliverability, McNiven AL, Sharpe MB, Purdie TG. Med Phys. 2010 Feb; 37(2):505-15.

9 WARRANTY STATEMENT- 4424-18

Standard Imaging, Inc. sells this product under the warranty herein set forth. The warranty is extended only to the buyer purchasing the product directly from Standard Imaging, Inc. or as a new product from an authorized dealer or distributor of Standard Imaging, Inc.

For a period provided in the table below from the date of original delivery to the purchaser or a distributor, this Standard Imaging, Inc. product, provided in the table, is warranted against functional defects in design, materials, and workmanship, provided it is properly operated under conditions of normal use, and that repairs and replacements are made in accordance herewith. The foregoing warranty shall not apply to normal wear and tear, or if the product has been altered, disassembled, or repaired other than by Standard Imaging, Inc. or if the product has been subject to abuse, misuse, off label use, negligence, or accident.

Product	Warranty Period
Standard Imaging Ionization Chambers	5 years
Standard Imaging Detectors	1 year

Standard Imaging Well Chambers	2 years
Standard Imaging Electrometers	5 years
Standard Imaging BeamChecker Products	2 years
TomoScanner and TomoElectrometer	2 years
Standard Imaging Software Products	1 year
All Other Standard Imaging Products	1 year
Standard Imaging Custom Products	1 year
Standard Imaging Remanufactured Products	180 days
Standard Imaging Custom Select Products	90 days
Consumables	90 days
Serviced Product	90 days (for service performed)
Resale Products	As defined by the Original Equipment Manufacturer
ADCL Product Calibration (Standard Imaging uses the UW-ADCL for recalibrations required under warranty, unless otherwise requested)	0 - 90 days = 100% of ADCL Calibration Costs 91 - 182 days = 75% of ADCL Calibration Costs 183 - 365 days = 50% of ADCL Calibration Costs 366 - 639 days = 25% of ADCL Calibration Costs (days from date of shipment to customer)

Standard Imaging's sole and exclusive obligation and the purchaser's sole and exclusive remedy under the above warranties are, at Standard Imaging's option, limited to repairing, replacing free of charge or revising labeling and manual content on, a product: (1) which contains a defect covered by the above warranties; (2) which are reported to Standard Imaging, Inc. not later than seven (7) days after the expiration date of the warranty period in the table; (3) which are returned to Standard Imaging, Inc. promptly after discovery of the defect; and (4) which are found to be defective upon examination by Standard Imaging Inc. All transportation charges (including customs, tariffs, duties, and brokerage fees) are the buyer's responsibility. This warranty extends to every part of the product excluding consumables (fuses, batteries, or glass breakage) or material reactions. Standard Imaging, Inc. shall not be otherwise liable for any damages, including but not limited to, incidental damage, consequential damages, or special damages. Repaired or replaced products are warranted for the balance of the original warranty period, or at least 90 days.

This warranty is in lieu of all other warranties, express or implied, whether statutory or otherwise, including any implied warranty of fitness for a particular purpose. In no event shall Standard Imaging, Inc. be liable for any incidental or consequential damages resulting from the use, misuse, or abuse of the product or caused by any defect, failure, malfunction, or material reactions of the product, whether a claim of such damages is based upon the warranty, contract, negligence, or otherwise.

This warranty represents the current standard warranty of Standard Imaging, Inc. Please refer to the labeling or instruction manual of your Standard Imaging, Inc. product or the Standard Imaging, Inc. web page for any warranty conditions unique to the product.

10 Serialization Information

Standard Imaging products that are serialized contain coded logic in the serial number which indicates the product, day and year of manufacture, and a sequential unit number for identification:

A YY DDD X

A Unique product ID

YY Last two digits of the year
(e.g. 1999 = 99, 2000 = 00)

DDD Day of the year ($1 \leq \text{DDD} \leq 365$)

X Unique unit ID number ($0 \leq X \leq 9$)



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- Will, at a minimum, provide technical support during its normal hours of operation.
- May, at its discretion, limit support of ancillary systems beyond its direct control, such as information technology systems, database management, and 3rd party programs.
- Will provide technical support for the product for a minimum of 7 years from the date of delivery or discontinuance.
- Will not provide technical support for obsolete products, those products that are 7 years past the date of discontinuance.
- Will provide technical support for any and all involving issues with significant product risk, regardless of product age.

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12 Customer Responsibility

This product and its components will perform properly and reliably only when operated and maintained in accordance with the instructions contained in this manual and accompanying labels. A defective device should not be used. Parts which may be broken or missing or are clearly worn, distorted, or contaminated should be replaced immediately with genuine replacement parts manufactured by or made available from Standard Imaging Inc.

-  CAUTION: Federal law in the U.S.A. and Canadian law restricts the sale, distribution, or use of this product to, by, or on the order of a licensed medical practitioner. The use of this product should be restricted to the supervision of a qualified medical physicist.
-  CAUTION: As desired by IAEA, English is the default language for labeling and manuals. If translated versions are available, resolve any differences in favor of the English versions.
-  WARNING: Measurement of high activity radioactive sources is potentially hazardous and should be performed by qualified personnel.
-  WARNING: Proper use of this device depends on careful reading of all instructions and labels.
-  WARNING: Standard Imaging products are intended for radiation quality assurance for healthcare uses. They are not designed and/or labeled for the purpose of medical diagnosis and/or treatment. Diagnosis and/or treatment decisions are the direct responsibility of the attending and licensed medical professional.
-  WARNING: Where applicable, Standard Imaging products are designed to be used with the versions of common radiation delivery devices, treatment planning systems and other products or systems used in the delivery of ionizing radiation, available at the time the Standard Imaging product is released. Standard Imaging does not assume responsibility, liability and/or warrant against, problems with the use, reliability, safety, or effectiveness that arise due to the evolution, updates or changes to these products or systems in the future. It is the responsibility of the customer or user to determine if the Standard Imaging product can be properly used with these products or systems.

Should repair or replacement of this product become necessary after the warranty period, the customer should seek advice from Standard Imaging Inc. prior to such repair or replacement. If this product is in need of repair, it should not be used until all repairs have been made and the product is functioning properly and ready for use. After repair, the product may need to be calibrated. The owner of this product has sole responsibility for any malfunction resulting from abuse, improper use or maintenance, or repair by anyone other than Standard Imaging Inc.

Standard Imaging will make numerous and reasonable attempts to contact a customer following completed manufacture or service of a product. Should a customer product remain at Standard Imaging for more than 1 year following its completed manufacture or service, Standard Imaging reserves the right to resell, restock, donate, discard or destroy the product.

If, in relation to the use of this product, a death or a serious deterioration of health has occurred, this should be reported to Standard Imaging, Inc. and the National Competent Authority of the country in which the incident occurred. If in doubt, please consult with an advisor or reach out to Standard Imaging, Inc. for further assistance.

The information in this manual is subject to change without notice. Please see www.standardimaging.com for the latest information. No part of this manual may be copied or reproduced in any form or by any means without prior written consent of Standard Imaging Inc.

13 Service Policy

If service, including recalibration, is required, please contact Standard Imaging's Customer Service department by phone or email prior to shipping the product. Standard Imaging's Customer Service and Technical Service staff will attempt to address the product issue via phone or email. If unable to address the issue, a return material authorization (RMA) number will be issued. With the RMA number, the product can be returned to Standard Imaging. It is the responsibility of the customer to properly package, insure and ship the product, with the RMA number clearly identified on the outside of the package. The customer must immediately file a claim with their carrier for any shipping damage or lost shipments. Return shipping and insurance is to be pre-paid or billed to the customer, and the customer may request a specific shipper. Items found to be out of warranty are subject to a minimum service fee of 1 hour labor (excluding recalibrations) for diagnostic efforts and require a purchase order (PO) before service is performed. With concurrence from customer, the product may be replaced if it is unserviceable or if the required service is cost prohibitive. Products incurring service charges may be held for payment. Standard Imaging does not provide loaner products. See the Standard Imaging Warranty and Customer Responsibility for additional information.

14 Return Policy

No merchandise will be accepted for credit without prior approval of return. Please contact Standard Imaging's Customer Service Department to receive a return authorization number before returning any merchandise for exchange or credit. Products manufactured by Standard Imaging must be returned within thirty days of receipt of order in 'like new' condition. No credit will be given for products returned after thirty days from receipt of order. A minimum twenty percent restocking fee will be charged on all returned merchandise. All materials returned must be shipped pre-paid. Credit for returned goods will be issued to customer's account for use against future purchases of merchandise only. Special orders, custom products, re-sale (not manufactured by Standard Imaging) products, and ADCL calibrations will not be accepted for return credit or exchange.

All products may not be registered, cleared, licensed or approved for sale in all countries or territories. Please contact Standard Imaging Customer Care for details.

15 SOFTWARE LICENSE AGREEMENT

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- b. Make backup copies of the product only for back-up, recovery and archival purposes.
- c. Authorize SI to use non-patient related data compiled, free of charge, from the Licensee's use of the product for its own use, shared use with other medical device manufacturers for quality assurance purposes and/or the independent promotion of scientific knowledge, provided that SI does not identify the name of the Licensee to the general public.
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- f. Reverse engineer the product to derive or appropriate for any reason or purpose the source code or any other trade secret or other proprietary information.
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The licensee shall be solely responsible for the installation of the product and any updates provided by SI. SI shall provide telephone technical support for the product for a period of (1) one year from the date of shipment. Any updates, upgrades, and new releases to the product within the period of (1) year from date of shipment will be provided at no additional costs. After the expiration of the period of (1) year from the date of shipment, SI will provide technical support, updates, upgrades, and new releases for an additional fee.

SI shall not be liable for any amount in excess of the product costs actually paid by the licensee, giving rise to any claims hereunder. In no event shall SI be liable, whether in contract, tort or otherwise, for any indirect, incidental, or consequential damages arising out of the subject matter of this agreement.

In the event of breach by Licensee of any of the terms and conditions of this software license agreement, SI shall be entitled to enforce all legal rights and remedies conferred upon it by State of Wisconsin, federal, and/or international law. SI and Licensee acknowledge that because breach by Licensee of any of the terms or conditions of this agreement will likely cause irreparable harm to SI, injunctive relief would be an appropriate remedy for SI resulting from any such breach by Licensee. In the event that action, suit, or legal proceedings are initiated or brought to enforce any or all of the provisions of this agreement, the prevailing party shall be entitled to such attorney's fees, costs, and disbursements as are deemed reasonable and proper by a court of law or an arbitrator. In the event of an appeal of an initial decision of a court or of an arbitrator, the prevailing party shall be entitled to such attorney's fees, costs, and disbursements as are deemed reasonable and proper by such appellate court.

Notwithstanding the foregoing, in the event of any breach by Licensee of the terms and conditions of this agreement, SI may, upon reasonable advance written notice to Licensee (which in no event shall be less than (30) thirty days), terminate this license. Upon such termination by SI, Licensee shall furnish SI with a sworn affidavit stating that all of the product, including, without limitation, its software program(s), documentation and other related material and any copies thereof, have been returned by certified mail, return receipt requested to SI or destroyed by Licensee.

This agreement shall be deemed executed in the State of Wisconsin and shall be interpreted and construed in accordance with the laws of the State of Wisconsin. If any provision of this

agreement is judicially declared to be invalid, unenforceable, or void by a court of competent jurisdiction, such decision shall not have the effect of invalidating or voiding the remainder of this agreement and the part or parts of this agreement so held to be invalid, unenforceable, or void shall be deemed to be deleted from this agreement and the remainder of this agreement shall have the same force and effect as if such part or parts had never been included.

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16 Manufacturer

Manufactured for Standard Imaging, Inc. by QualiFormeD SARL.



19 Impasse de la Boétie
85000 La Roche-sur-Yon
France

