

# FREQUENTLY ASKED QUESTIONS

## SunCHECK™: Enterprise Quality Management Software for Radiation Oncology

### The SunCHECK™ Platform

#### Q: How do I access SunCHECK in my clinic?

A: Simply direct a supported web browser to the network location where SunCHECK is installed.

#### Q: Why did Sun Nuclear select a web application architecture for the SunCHECK Platform?

A: A web application architecture was selected for the following reasons:

- Accessibility from any networked computer, with no external Internet connection needed, if used within the network
- Easier maintenance because you no longer need to download updates on multiple workstations
- Streamlined implementation on a dedicated server, with better system performance and more robust security

#### Q: Is SunCHECK (including Patient and Machine) a Cloud application?

A: SunCHECK is 'Cloud-enabled' because it is accessed from anywhere on your clinical network via a web browser. By running locally, system inter-connectivity and automation are easy to implement, and there is no reliance on external network infrastructure. However, Sun Nuclear is currently working on optimizing the SunCHECK software platform for Cloud-based implementation for possible commercial introduction in the future.

### SunCHECK™ Patient

#### Independent 3D Secondary Checks - DoseCHECK™

#### Q: How does SunCHECK Patient calculate dose?

A: DoseCHECK computes dose automatically from the DICOM objects of the approved treatment plan. This is an independent, 3D dose calculation using our proprietary collapsed cone convolution/ superposition algorithm for traditional C-arm linacs, exclusively licensed to SNC and GPU-accelerated. As a result, you get TPS-grade performance and a complete suite of comparison tools.

For TomoTherapy® plans, Sun Nuclear is pleased to offer a Monte Carlo dose calculation for independent 3D secondary checks.

#### Q: What types of plans does SunCHECK Patient support for the secondary calculation phase of patient QA?

A: SunCHECK Patient can be used for 3D conformal, IMRT, VMAT, SRS, SBRT – essentially any linac plan with standard collimation (MLC or jaws) or with Varian ICVI or BrainLab stereotactic cones. Monitor Unit and point dose comparisons for each field are provided as well as comprehensive 3D analysis. This includes 3D gamma analysis per total volume and individual structures, dose/volume goals for targets and organs at risk, as well as DVH comparisons and isodose displays. In addition to linac plans, SunCHECK Patient provides secondary check support for TomoTherapy and HDR Brachytherapy plans.



# Frequently Asked Questions

## Q: How does SunCHECK Patient handle beam modeling and needed adjustments?

A: From secondary checks through pre-treatment QA, SunCHECK Patient uses the same standard library of beam models, covering most commercial linac energy and MLC configurations. The beam model library uses beam data that is more specific and accurate than universal or 'golden' beam data provided by linac manufacturers.

For IMRT and VMAT plans, adjustments may be needed to account for system-specific MLC calibration parameters such as the leaf offset parameter. If a significant discrepancy is observed between the planned and SNC Dose Calculator (SDC) dose that is not due to real issue(s) with the TPS or TPS commissioning, our customer support team will work with you to adjust the SDC beam model as necessary.

## Phantomless Pre-Treatment QA & In-Vivo Monitoring - PerFRACTION™

### Q: Does SunCHECK Patient use log files?

A: SunCHECK Patient is available in two configurations for pre-treatment QA and in-vivo monitoring, dependent upon your needs and preference:

1. PerFRACTION Calculate uses log-file data for 3D-only pre-treatment QA and in-vivo monitoring.
2. PerFRACTION Measure uses EPID measurement data in conjunction with data obtained from the machine log files. (Specifically, monitor chamber dose rate and output data from the log files are used with independent MLC leaf position measurements acquired using the EPID.)

In cases when the EPID is not deployable for specific patient treatment beam(s) or the imaging technique used during delivery is not compatible with 3D reconstruction (i.e., if integrated imaging is used), SunCHECK Patient will perform log-based 3D dose reconstruction (if enabled through user selection.).

PerFRACTION is also available with 2D absolute dose options for both pre-treatment QA and in-vivo monitoring, and for these options, log-file data is not needed or used.

## Q: Does SunCHECK Patient calculate absolute or relative dose?

A: Both. 3D dose reconstruction is always absolute. 2D absolute dose is a powerful option for pre-treatment IMRT/VMAT QA. Absolute 2D transit dose measurements are now also available as an option. Without these absolute dose options, 2D relative analysis is available for in-vivo monitoring.

## Q: Can SunCHECK Patient provide a true measurement-based in-vivo dosimetry solution?

A: Yes. SunCHECK Patient provides a true measurement-based in-vivo dosimetry solution through the 2D Transit Dosimetry option. This is consistent with the accepted definition in the literature as presented in a comprehensive review by van Elmpt, et al, 2008:18

*"in-vivo dosimetry: measurement or determination of the dose inside the patient. Measurements performed during treatment can be performed invasively, i.e. inside the patient, or non-invasively, i.e. on or at some distance from the patient, whereby the in vivo dose at the point of interest is obtained by extrapolation."*

For customers in the European Union, the Transit Dosimetry option allows compliance with 2013/59/EURATOM Article 83, which states that, "Member States shall ensure that depending on the medical radiological practice, the medical physics expert takes responsibility for dosimetry, including physical measurements for evaluation of the dose delivered to the patient."

Note that SunCHECK Patient In-Vivo Monitoring employs a forward-projection technique. An in-vivo solution that uses back-projected EPID data is simply using different inputs to provide the representation of the delivered patient dose. It is noteworthy that such back-projection solutions actually make it harder to discern sources of potential error since all sources — linac output, MLC leaves, jaws, and patient — are combined in the EPID signal.

Interested readers can refer to the Sun Nuclear white paper. *On the Matter of Forward Versus Back Projection* for further details.

Further considerations for the use of EPIDs for in-vivo dosimetry is presented in the *AAPM Vision 20/20* paper.

**Q: A recent publication<sup>1</sup> found that a high percentage of errors can be detected during the first fraction. How can SunCHECK Patient detect these errors if the comparison baseline is the first fraction?**

A: The SunCHECK Patient Transit Dosimetry option for in-vivo monitoring allows a predicted planar dose to be calculated for the patient's first treatment fraction and the delivered fractional dose to be compared to this predicted dose. Following delivery of the first fraction, the user may choose the first fraction delivery as a baseline for comparison to subsequent measurements, or each fraction may be compared to the predicted dose.

**Q: Can I recalculate dose on the patient's CBCT images?**

A: Yes, using SunCHECK Patient, you have the option to retrieve and recalculate dose on the CBCT instead of the treatment planning CT. This is an automated process and easy to set up in the system preferences. The system will default to the most recent acquired CBCT for dose reconstruction and analysis when this feature is active.

**Q: Is the use of SunCHECK Patient a good way to spend my limited QA time?**

A: Yes. A 2015 study from University of Washington<sup>1</sup> reviewed 30 months of failure mode data. From the analysis, 343 incidents were rated as "potentially severe" or "critical." Of these incidents:

- 6% were detected by EPID-based pre-treatment QA
- 74% were detected by EPID-based in-vivo QA for the first fraction
- 20% were detected through EPID-based in-vivo QA following the first fraction

Clearly, routine measurement-based patient QA using the EPID can improve your ability to discover and reduce the impact of the 94% of potentially severe common treatment errors not detected by pre-treatment QA alone, thus improving patient safety.

**Q: 2D image to image comparison for pre-treatment QA can be done with my Varian linac with Portal Dosimetry. How is SunCHECK Patient different?**

A: In addition to full independence, SunCHECK Patient offers several important advantages in efficiency and clinical value:

**Automated.** Portal Dosimetry requires manual initiation of the calculation/comparison. With PerFRACTION, the analysis and alerts are fully automated.

**Flexible.** Point dose, 2D, and 3D analysis tasks can be simultaneously performed using different methods and settings. This streamlined, automated workflow makes it more likely that analysis can and will be performed daily for all patients.

**Comprehensive.** Pre-Treatment QA is just one part of an integrated patient QA workflow and user interface that SunCHECK Patient provides. Quality and clinical goals tracking is provided from Secondary Checks (DoseCHECK) to Pre-Treatment QA and through In-Vivo Monitoring (PerFRACTION). Furthermore, SunCHECK Patient operates within the larger integrated environment of the SunCHECK Platform.

## SunCHECK™ Machine

### Daily, Monthly and Annual QA - SNC Routine™

**Q. How does the direct device integration work? Which devices?**

A. Sun Nuclear's IC PROFILER™ and Daily QA™ 3 connect directly to SunCHECK Machine, and data collection can be taken using the SunCHECK Machine interface. Simply set up the device, run the SunCHECK software via web browser and collect, analyze and store your data. The SNC devices are interfaced to the SunCHECK server via a small software utility – the "PDI Host" – which runs on the host computer for the device in question. The application software for the device (e.g., the Daily QA 3 software), does not need to be run on the host computer at the same time.

**Q. What if I don't have the IC PROFILER or Daily QA 3 devices?**

A. SunCHECK Machine is also provided with manual versions of all the tasks that are possible with the IC PROFILER and Daily QA 3 devices.

# Frequently Asked Questions

## **Q. Will you provide similar direct connectivity for other devices? What about data from other manufacturers' devices?**

A: Yes – we will provide direct device and data integration for other Sun Nuclear devices in future releases of the software. Regarding data from other manufacturers' devices, this is currently under consideration for future development, though our top priority is to support other Sun Nuclear devices and data.

## **Q. How complete is the library of TG-142 tests in the Template?**

A. It is complete. SunCHECK Machine includes all 127 tasks defined in TG-142, Tables 1 through 6.

## **Q. Which other protocols are covered with templates? Can I create customized templates?**

A. Current templates include TG-51 and TG-142, however future templates are planned to include International standards, Medical Physics Practice Guidelines (MPGG) and other AAPM Task Groups such as TG-198 as they become available. You can also complete some template customization according to your requirements.

## **Q. Can I copy templates between machines to help standardize my QA program?**

A. Yes. Any templates you have configured for a given machine can be used as a basis for another machine – and if you need to make some modifications specific to the destination machine, that's also very easy to do. SunCHECK Machine allows you to standardize your QA program across machines, staff and all the facilities that connect to your SunCHECK database.

Imaging, MLC and VMAT QA - SNC Machine™

## **Q: Does SNC Machine integrate with SNC Routine?**

A: Yes, with SunCHECK Machine, SNC Machine is fully integrated with SNC Routine as part of the provided daily, monthly and annual QA templates provided by Sun Nuclear per TG-142. When upgrading to SunCHECK 2.0, existing SNC Machine QA tasks can be linked to the appropriate QA template to ensure a seamless transition to SNC Routine.

## **Q: Just how automated is SunCHECK Machine for imaging, MLC and VMAT QA?**

A: SunCHECK Machine listens for and captures your QA files, processes and analyzes the files, and saves the results to the database.

Simply log in and immediately view a dashboard of results. Accept results that pass, drill down into the analysis details for results that fail. It is that simple.

## **Q: Is it only for TG-142 testing?**

A: SunCHECK Machine offers additional tests beyond TG-142 such as a suite of convenient and automated VMAT tests recommended by Varian in their acceptance protocol.

## **Q: Does SunCHECK Machine trend my data?**

A: Yes. Any test, and any test sub-parameter, can be analyzed over time and compared to any other parameter trend, for any machine on the clinic's network.

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## References

<sup>1</sup> "A quantification of the effectiveness of EPID dosimetry and software-based plan verification systems in detecting incidents in radiotherapy" Bojchko C, Phillips M, Kalet A, Ford E.C., Department of Radiation Oncology, University of Washington, Med Phys 42(9), Sept 2015

