iba-dosimetry.com

MONTE CARLO QA

Patient Plan QA and Dose Check with SciMoCa™

Accuracy Ensured. Performance Ensured. Confidence Ensured.

DOSIMETRY

PROTECT +
ENHANCE +
SAVE LIVES

What if your patient QA provides...

... the accuracy of Monte Carlo?

... time savings and automation?

... confidence in your entire planning process?

SciMoCa™ delivers.

Find out how!

Robust Monte Carlo QA with SciMoCa™ fulfills your needs

Accuracy Ensured.

Monte Carlo QA dose calculation accuracy

SciMoCa™ establishes a new standard for accuracy in independent patient plan QA and secondary dose check software.[1] SciMoCa™ is powered by the superior accuracy of Monte Carlo dose calculation.

Performance Ensured.

Workflow efficiency and automated 3D dose calculations in < 2 minutes[2]

SciMoCa™ identifies TPS dose errors and discrepancies with limited direct user interaction. It provides instantaneous feedback regarding treatment plan quality and achievement of planning objectives.

Confidence Ensured.

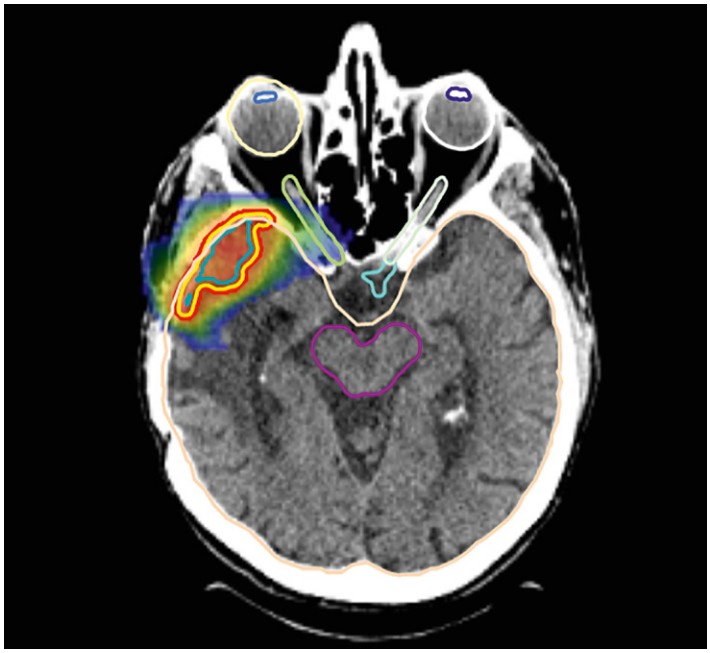
Independent QA of the whole treatment planning process

With SciMoCa™'s best-in-class Monte Carlo dose calculation algorithm and independent validation of the entire treatment planning process, you gain confidence and trust in your QA and your patient's safety.

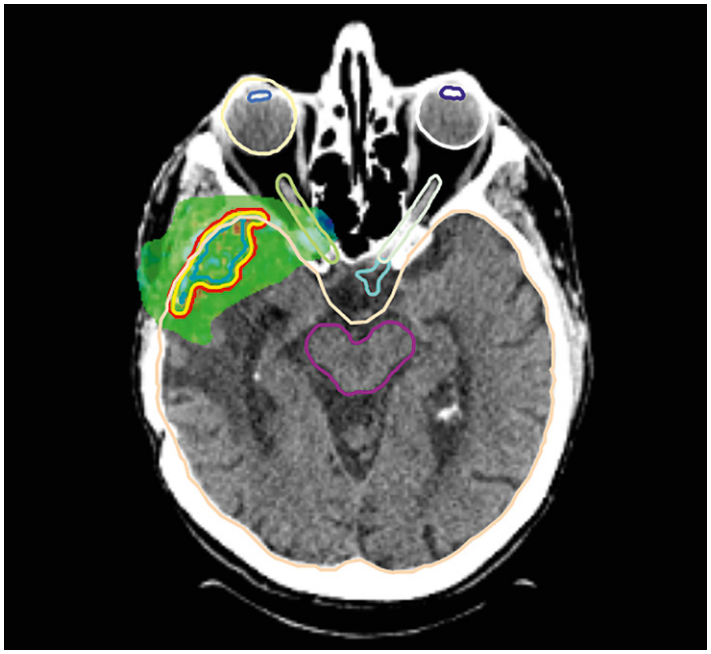
[1] Fotina et al. Clinical Comparison of Dose Calculation Using the Enhanced Collapsed Cone Algorithm vs. a New Monte Carlo Algorithm. Strahlenther Onkol 187, 433–441.

[2] Typical calculation times of SciMoCa™ Monte Carlo: 1-2 minutes using recommended hardware.

Accuracy Ensured.



Accuray InCise2™ CyberKnife® dose distribution by SciMoCa™



SciMoCa™ compared against Accuray Precision 1.0 [Monte Carlo], gamma analysis 2%/1 mm

Why accuracy matters

- ✓ Fully trust the results of your secondary dose calculation.
- ✓ Exceptional QA sensitivity and specificity to define meaningful action levels.
- ✓ Find actual errors and not deviations caused by sub-standard dose calculations.[2]
- ✓ Avoid investigating false failing cases due to non-accurate patient QA methods.[3]

< 1 % Accuracy of Monte Carlo QA dose calculation[1]

- The SciMoCa™ Monte Carlo algorithm matches the precision of top-tier solutions like Varian´s Acuros® and Accuray´s Precision® Monte Carlo.#
- Extraordinary accuracy due to:
  - Customized machine-specific beam models
  - Quality of the beam modeling process
  - Specific Monte Carlo implementation
- SciMoCa™ Monte Carlo is extremely accurate, especially in complex geometries with inhomogeneities and outside of commissioning conditions.
- Linac beam models are generated specifically for each customer using proprietary processes and dedicated expert tools, backed by extensive expertise.

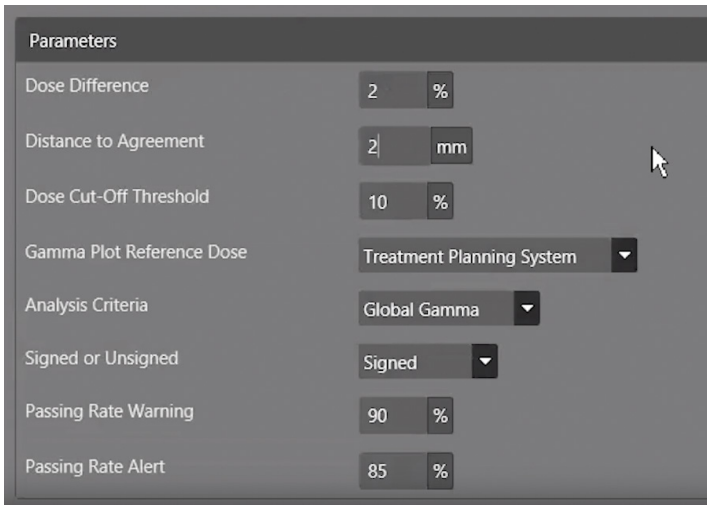
[1] SciMoCa™ achieves an accuracy of < 1 % and matches the precision of such top-tier algorithms as Varian´s Acuros® and Accuray´s Precision® Monte Carlo. SciMoCa™ published results: Gamma 2 % / 2 mm pass > 97 %, with deviation SciMoCa™ vs. Acuros® of mean dose in patients < 1%: Hoffmann et al., Validation of the Acuros® XB dose calculation algorithm versus Monte Carlo for clinical treatment plans. Med Phys. 2018 June 16.

[2] Kry et al. (2019). Independent recalculation outperforms traditional measurement-based IMRT QA methods in detecting unacceptable plans. Medical Physics. 46. 10.1002/mp.13638.

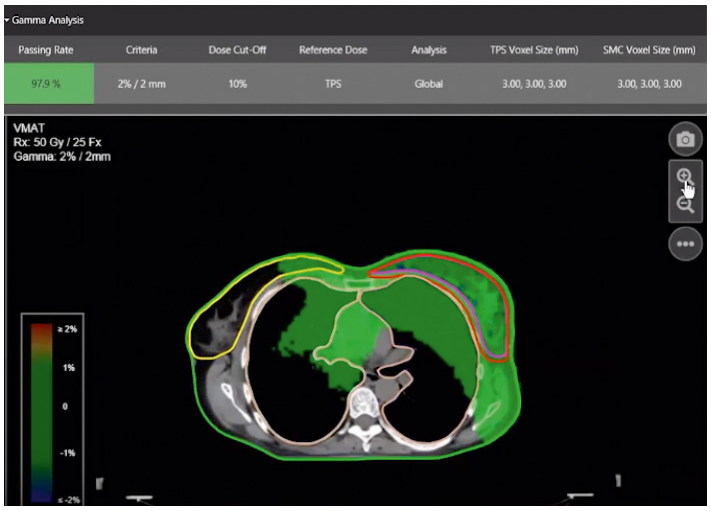
[3] M.T.W. Milder et al. Validation and clinical use of a Monte Carlo algorithm for Cyberknife patient-specific QA. ESTRO 2019 EP-1767. Conclusion: "A commercially available 3D dose re-calculation for individual Cyberknife MLC plan QA has been successfully implemented in the clinic, replacing time-consuming SRS1000 measurements, with fewer false alarms and similar sensitivity."

Tight Gamma - High Pass Rates

- Excellent agreement of Monte Carlo dose with TPS dose even for tight gamma criteria



Variety of settings for comprehensive gamma analysis



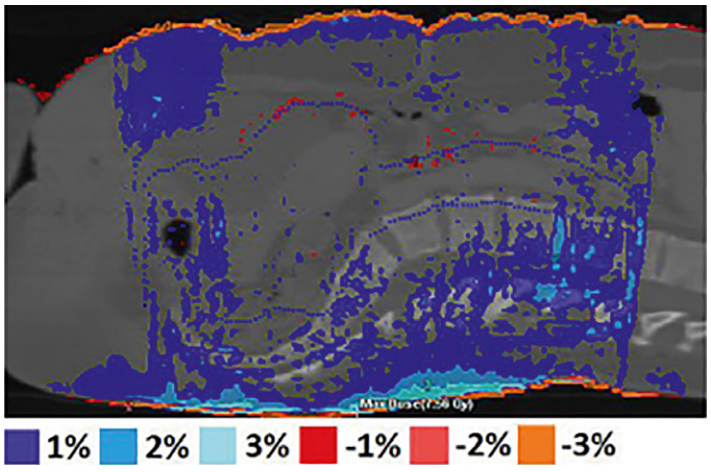
Gamma distribution map

SciMoCa™ Accuracy Published

Validation of the Acuros XB dose calculation algorithm versus Monte Carlo for clinical treatment plan. Lone Hoffmann, Markus Alber, Matthias Söhn, Ulrik Vindelev Elstrøm

Med. Phys. 45 (8), August 2018

Click/scan to read the open access publication



Dose difference plot in % (Acuros™ – SciMoCa™ Monte Carlo) for a cervix patient showing no deviations exceeding 1% in the treatment area.

Monte Carlo Calculation Speed

"SciMoCa™ offers an impressive calculation speed – a full 3D dose calculated by a Monte Carlo dose engine within minutes! In addition, the plan QA process is automated. Once we sent the final DICOM plan from the TPS, SciMoCa™ automatically performs the Monte Carlo calculation and analysis of our plans, which is very valuable in a busy RT department."

Nadir Kucuk, MSc, Head of Medical Physics, Anadolu Medical Center, Turkey.
Center of Excellence for Accuray and in affiliation with Johns Hopkins Medicine, USA

Performance Ensured.

Click/scan to watch the workflow video (4 min)

Automated 3D Monte Carlo dose calculations in < 2 minutes[1]

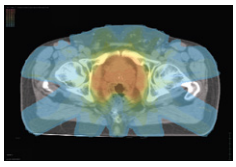
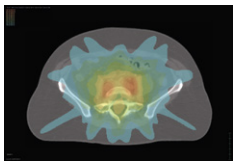
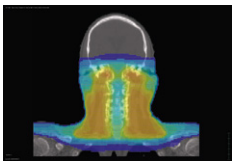
- The speed of the SciMoCa™ Monte Carlo engine for full 3D dose calculation is truly impressive.
- The algorithm makes optimum use of modern processing hardware architecture.
- Outstanding performance is enabled through the fast dose engine, automated workflow, and background calculations.

Workflow efficiency

- Simply send your plans from the TPS - Check the results whenever you have time.
- Get almost instant results - in case you need them right away.
- SciMoCa™ provides the full and immediate overview whether the treatment plan is within constraints or not.
- Reduce your patient QA time so you can concentrate on other relevant tasks.
- Use linac time efficiently by minimizing patient QA measurements with sensitive and accurate Monte Carlo QA.

Monte Carlo Calculation Speed and Accuracy[2]

	prostate, static IMRT (8 beams, 44 segments)	prostate/LN, dMLC (7 beams, 140 control points)	head & neck, VMAT (2 arcs, 293 control points)	
PTV volume	193.3 cc	979.8 cc	834.4 cc	
voxel size	3 mm	3 mm	3 mm	2 mm
calculation time	15.8 sec	55.6 sec	40.9 sec	118.9 sec

[1] *Typical calculation times of SciMoCa™ Monte Carlo: 1-2 minutes using recommended hardware.*
[2] *Calculation times on dual 8-core Intel Xeon E5-2690 server with hyperthreading (32 logical cores) for dose calculation with final statistical uncertainty of 1%.*

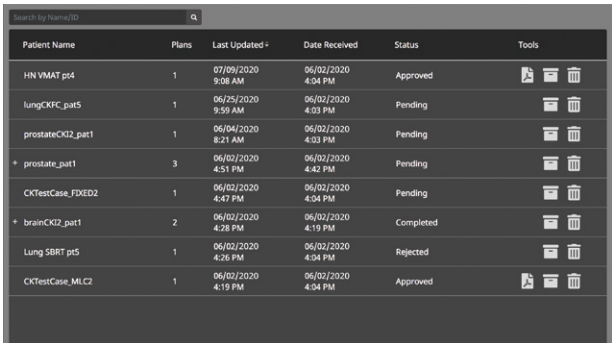
AUTOMATED WORKFLOW — APPLICATION SIMPLICITY

1 Automatic process & calculation

Treatment plans are simply exported via DICOM from your TPS to the SciMoCa™ dose calculation server. SciMoCa™ then starts the Monte Carlo calculation automatically.

The patient worklist is automatically updated to keep the user informed about the current QA status of each patient plan.

Automated status emails will alert you and allow you to review your QA results anytime and anywhere in your hospital network.



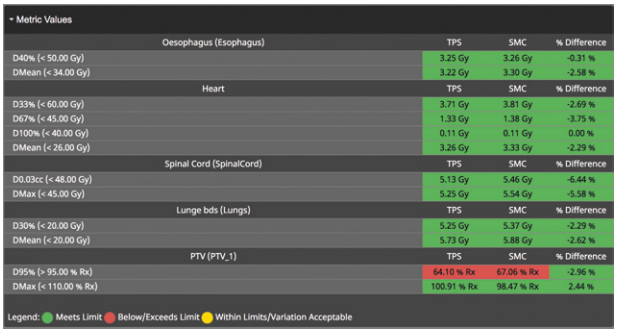
Patient Name	Plans	Last Updated	Date Received	Status	Tools
HN VMAT pt4	1	07/09/2020 9:08 AM	06/02/2020 4:04 PM	Approved	
lungCKFC_pat5	1	06/25/2020 9:59 AM	06/02/2020 4:03 PM	Pending	
prostateCKI2_pat1	1	06/04/2020 8:21 AM	06/02/2020 4:03 PM	Pending	
+ prostate_pat1	3	06/02/2020 4:51 PM	06/02/2020 4:42 PM	Pending	
CKTestCase_FIXED2	1	06/02/2020 4:47 PM	06/02/2020 4:04 PM	Pending	
+ brainCKI2_pat1	2	06/02/2020 4:28 PM	06/02/2020 4:19 PM	Completed	
Lung SBRT pt5	1	06/02/2020 4:26 PM	06/02/2020 4:04 PM	Rejected	
CKTestCase_MLC2	1	06/02/2020 4:19 PM	06/02/2020 4:04 PM	Approved	

The patient worklist provides instant overview of each patient QA

2 Automatic analysis

SciMoCa™ provides automated plan quality and dose difference evaluation based on customizable protocols for both PTVs and OARs. This allows users to evaluate plan quality as well as identify dose discrepancies based on user-defined, dose-difference thresholds.

An intuitive, color-coded pass/fail display ensures verification efficiency.



Metric Values	TPS	SMC	% Difference
Oesophagus (Esophagus)			
D40% (< 50.00 Gy)	3.25 Gy	3.26 Gy	-0.31 %
DMean (< 34.00 Gy)	3.22 Gy	3.30 Gy	-2.58 %
Heart			
D33% (< 60.00 Gy)	3.71 Gy	3.81 Gy	-2.69 %
D67% (< 45.00 Gy)	1.33 Gy	1.38 Gy	-3.75 %
D100% (< 40.00 Gy)	0.11 Gy	0.11 Gy	0.00 %
DMean (< 26.00 Gy)	3.26 Gy	3.33 Gy	-2.29 %
Spinal Cord (SpinalCord)			
D0.03cc (< 48.00 Gy)	5.13 Gy	5.46 Gy	-6.44 %
DMax (< 45.00 Gy)	5.25 Gy	5.54 Gy	-5.58 %
Lunge bds (Lungs)			
D30% (< 20.00 Gy)	5.25 Gy	5.37 Gy	-2.29 %
DMean (< 20.00 Gy)	5.73 Gy	5.88 Gy	-2.62 %
PTV (PTV_1)			
D95% (> 95.00 % Rx)	64.10 % Rx	67.06 % Rx	-2.96 %
DMax (< 110.00 % Rx)	100.91 % Rx	98.47 % Rx	2.44 %

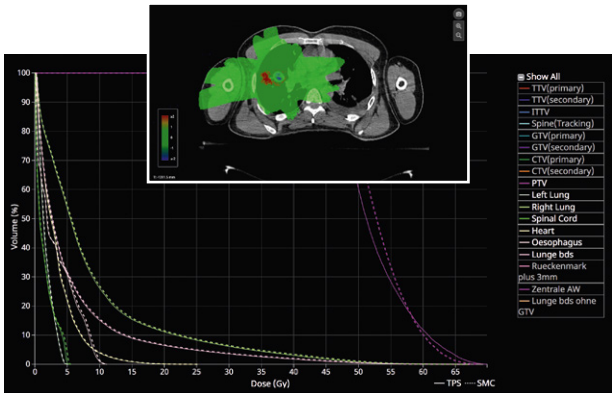
Legend: Meets Limit · Below/Exceeds Limit · Within Limits/Variation Acceptable

Automatic analysis and display of dose verification results

3 Additional step: 3D image visualization & comparative DVH

DVHs for the treatment plan as well as the independent SciMoCa™ dose are compared. The DVH viewer enables a detailed evaluation of individual OARs and targets.

To evaluate dose discrepancies on the patient anatomy level, SciMoCa™ includes a slice viewer to visualize the TPS dose, SciMoCa™ recalculated Monte Carlo dose, and gamma index distribution map.



DVH & dose difference of TPS vs. independent Monte Carlo dose

4 MU check / Plan complexity scores

Comparison of TPS MU vs. Monte Carlo-calculated MU.

Access the plan complexity and the need for additional patient QA.

TPS MU	192.21	259.21
SMC MU	192.96	259.21

Beam	1	2
Beam Name	1A01	1A02
Min Gantry	180.00°	50.00°
Max Gantry	300.00°	180.00°
Gantry Arc	240.00°	260.00°
TPS MU	192.21	259.21
SMC MU	192.96	259.21
TPS Beam Dose (Gy)	0.95	1.02
SMC Beam Dose (Gy)	0.94	1.02
Beam Dose Difference	0.39%	0.39%
Field Irregularity	2.85	2.77
Small Field Contribution	1.19	1.42
Off Axis Contribution	1155.53	896.23
Leaf Travel Variability	0.04	0.02
Leaf Gantry Synchronization	0.06	0.04
Max Leaf Travel Per MU	20.70	29.18
Max Gantry Rotation Per MU	5.01	5.96

Confidence Ensured.

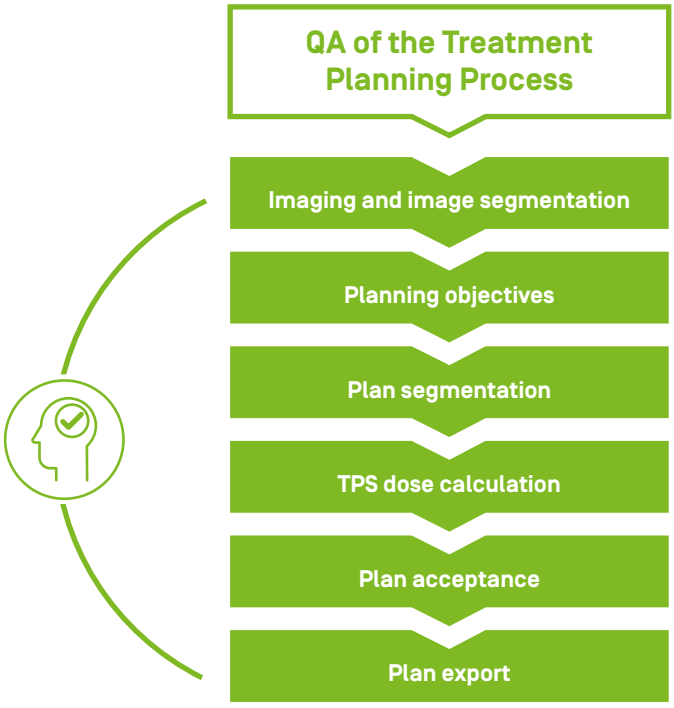
QA of the whole treatment planning process

SciMoCa™ provides a full end-to-end test of your treatment planning process without additional effort.

- Find all relevant errors from imaging to plan export.
- Overcome gaps seen in other patient QA methods and gain higher QA safety and efficiency as well as peace of mind for the entire treatment team.[1]
- Reliably find real errors based on SciMoCa™'s proven specificity and sensitivity to detect the clinically relevant issues.[1]
- Gain full confidence beyond the traditional QA of your TPS algorithm.

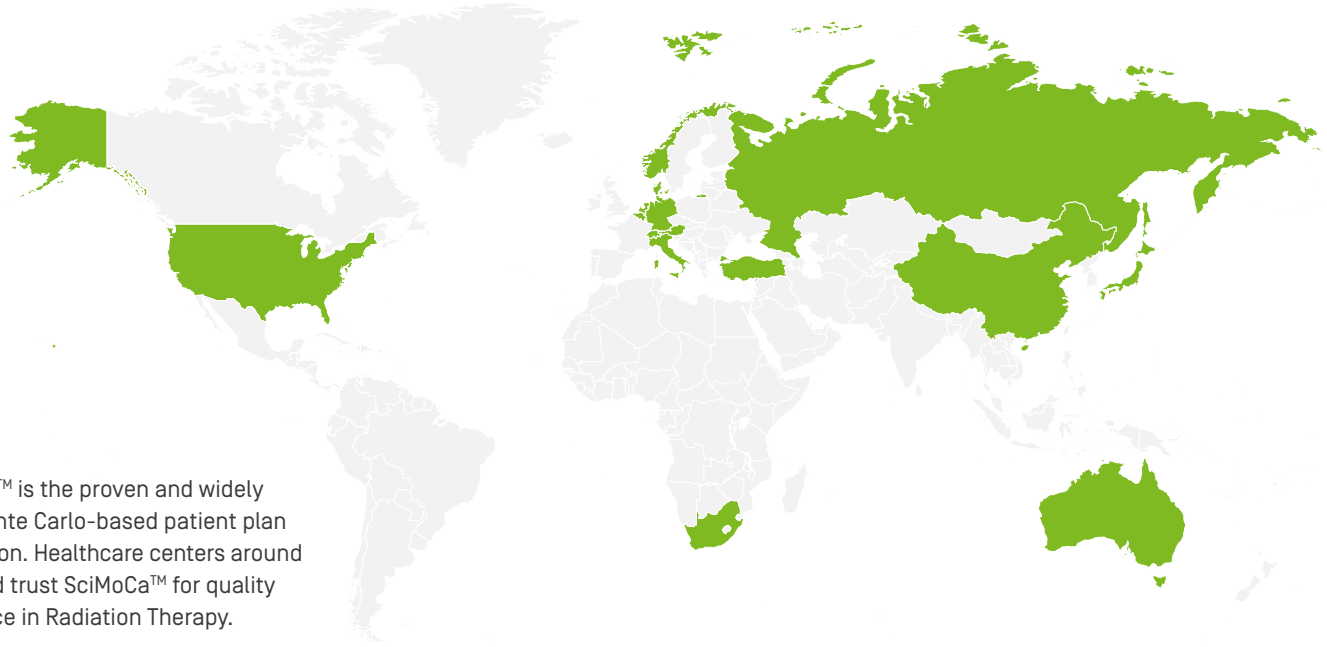
Confidence in your QA results

- Gain trust in the accuracy of your QA dose calculations.
- Clearly attribute the source of an error to planning process or to delivery.
- Be sure about your patient's safety and gain peace of mind.



[1] M.T.W. Milder et al. Validation and clinical use of a commercial Monte Carlo algorithm for Cyberknife patient-specific QA. ESTRO 2019 EP-1767.

SciMoCa™ around the world



SciMoCa™ is the proven and widely used Monte Carlo-based patient plan QA solution. Healthcare centers around the world trust SciMoCa™ for quality assurance in Radiation Therapy.

Independent Patient QA

SciMoCa™ Monte Carlo ensures fully independent quality assurance from your TPS and treatment machines, a fundamental requirement for user confidence in the accuracy and validity of the QA outcome.

Monte Carlo Accuracy with High Pass Rates

"SciMoCa™'s Monte Carlo accuracy allows us to use very tight plan evaluation criteria of 2 % / 1 mm gamma. Nonetheless, we still see consistently high pass rates of > 95 %. Based on our clinical experience with more than 150 patient plans, SciMoCa™ offers the specificity and sensitivity to capture the real errors."

Christoph Fuerweger Ph.D., Head of Medical Physics, European Cyberknife Center, Munich, Germany

Click/scan and watch the SciMoCa™ CyberKnife® webinar

Patient QA at your fingertips

Stay up to date and aware of your patient QA. Automated status emails will alert you and allow you to review your QA results anytime and anywhere in your hospital network.

Monte Carlo. Unlimited.

CUSTOMIZED BEAM MODELS

Support for all major RT treatment machines#

- All C-gantry-based conventional Linacs from Elekta™, Siemens, and Varian.
- Varian Halcyon™ / Ethos™.
- CyberKnife® (cones, Iris, and MLC).
- TomoTherapy® / Radixact®.

TPS Support

- SciMoCa™ supports all treatment planning systems that provide DICOM export, as well as the CyberKnife® TPS.

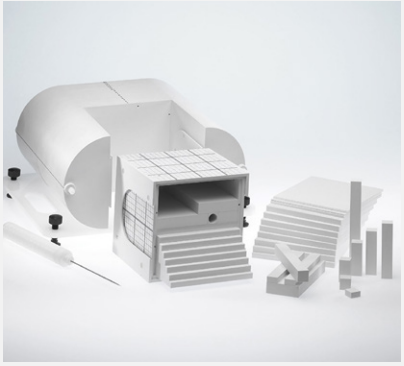
Application Support

- SciMoCa™ supports a wide range of treatment techniques such as 3D, IMRT, VMAT, SBRT/SRS, TomoTherapy®, and CyberKnife® treatments.

Complementary Solution: Add QA Measurements to your Monte Carlo Dose Calculation

Complement your efficient Monte Carlo dose calculation workflow with selective measurements as needed and when required.

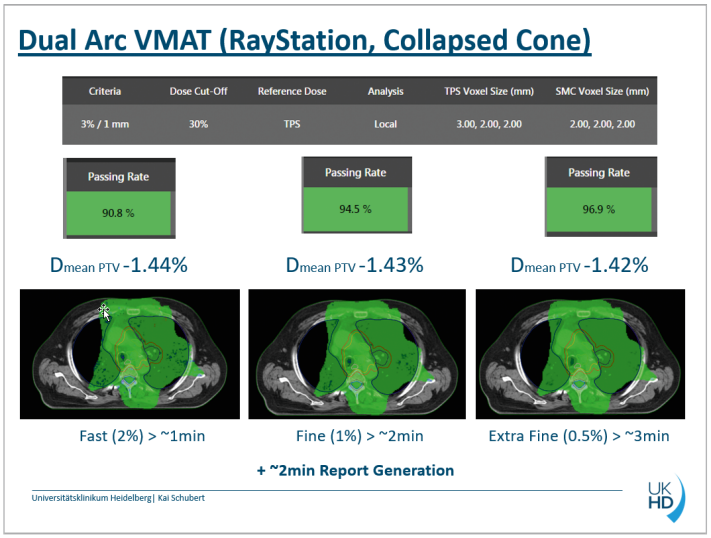
- The IBA Dosimetry Head & Neck Phantom offers full flexibility for ionization chamber and film measurements.
- Clearly identify the source of errors outside of the treatment planning process and data flow.
- Ideal for CyberKnife®: The combination of Monte Carlo dose calculation and QA measurements perfectly address the specific high-resolution QA needs.



Monte Carlo. Made Easy.

Effortless installation, seamless clinical integration

- SciMoCa™ only requires a small set of data.[1]
- Custom beam models created for your treatment machine.



Clinical Experience with Monte Carlo Plan QA

Watch the presentation of the implementation and clinical experience of SciMoCa™ at Heidelberg. From installation to workflow efficiency and the analysis of SciMoCa™ accuracy for Linac, TomoTherapy®, and CyberKnife® cases.#

Dr. Kai Schubert, Medical Physicist, Dept. of Radio-Oncology and RT, University Clinical Heidelberg, Germany

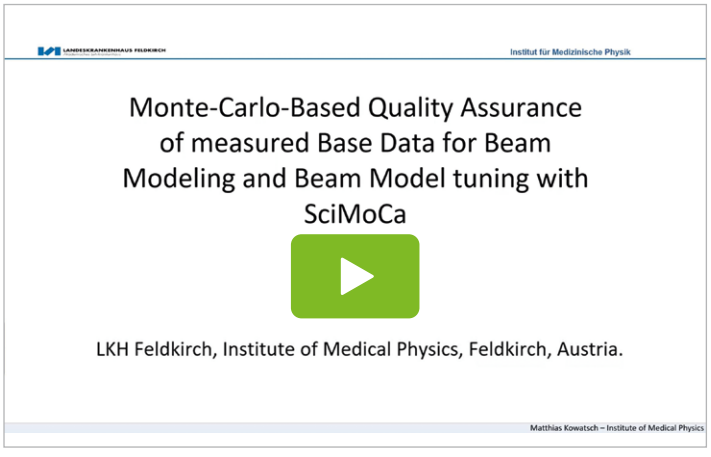
Click/scan to watch the webinar

Validation of your Beam Data Accuracy with Monte Carlo

Added value from your SciMoCa™ custom beam modeling:

- Monte Carlo verification of your existing beam data (audit), including validation report.
- Ensure your base beam data is correct for the most challenging treatment plans.

Click/scan to watch the webinar



Learn how SciMoCa™ Monte Carlo is used to independently validate commissioning beam data and to tune the TPS beam model for high accuracy dose planning.

[1] Data required: set of PDDs with output factors, cross and diagonal profiles, absolute dose calibration.

PROTECT +
ENHANCE +
SAVE LIVES

Patient Plan QA and Dose Check with SciMoCa™

SciMoCa™ Recommended System Requirements [v. 1.5 +]

	Minimum recommended specifications:	Recommended specifications:
CPU	x64-based processors 4C/8T, 1.4 GHz or faster	x64-based processors 8C/16T, 1.4 GHz or faster
RAM	12 GB of RAM	20 GB of RAM
Operating System	Windows™ Server 2012 R2 Standard or newer with IIS enabled#v	
Supported Web-Browser	Google Chrome, Internet Explorer, Mozilla Firefox, Microsoft Edge#	
Software	.NET 4.6.2, .NET 3.5 [Windows Server 2016+] IIS#	
Database	Microsoft SQL Server 2012 Express or newer#	Microsoft SQL Server 2012 Standard or newer#
Monitor	Medical grade with minimum native display resolution of 1024×768 and 32-bit color	
Language	English [US or UK]	
Free Hard Disk Space	20 GB	

Discover more about SciMoCa™:
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