

Bring Monaco® into Your Clinical Practice

Monaco® enables the practice of evidence-based medicine. Uniquely, Monaco improves clinical efficiency by optimizing treatment planning and workflow processes, redefining the management of information to enhance personalized patient care.

Leading the Way to Better IMRT

The practice of IMRT challenges the clinical team's time and energy, particularly in the trial-and-error process of IMRT treatment planning. Fortunately, there is a better way to master inverse planning of IMRT plans. Monaco is a fundamentally new approach to IMRT planning that brings innovative treatment planning concepts to the clinic. These concepts provide sophisticated tools to make planning easier, reproducible and clinically reliable, resulting in a higher standard of patient care.

Monaco integrates innovative biological cost functions with multicriterial constrained optimization, a powerful leaf-sequence optimizer and a robust Monte Carlo dose calculation algorithm to create the most advanced IMRT planning solution available today.

Monaco also can be used effectively in any clinical environment. As a vendor neutral IMRT planning platform, Monaco supports all major linear accelerators and connects to any record and verify information system, including Elekta's MOSAIQ® Oncology Information System. Monaco includes the core features of the Focal platform and integrates with advanced multi-modality image fusion, segmentation and contouring, virtual simulation and plan review capabilities.

Leading the Way to New Treatment Technologies

With the addition of VMAT (Volumetric Modulated Arc Therapy) functionality, Monaco can optimize single or multiple non-coplanar arcs simultaneously, providing the flexibility and control needed for more complex treatment plans. Arc plans can be delivered with a single button push at the linear accelerator console. Gantry directions are automatically sorted and all control points are seamlessly integrated into a single deliverable arc sequence.

Only Monaco offers the XVMC Monte Carlo dose engine for a continuous arc calculation as a single beam, rather than just dose approximations that occur with many discrete (control point) gantry angle positions. Monaco now offers the Dynamic Conformal Arc feature.

Personalized Services Beyond Standard Support

Elekta employs the largest, full-time staff of dedicated Radiation Treatment Planning professionals in the industry in the fields of research & development and customer support. Our Physics Services for beam data modeling will enhance the Monaco user experience and create efficiencies in moving to clinical use status.

When you select our solutions, you gain access to our entire team:

- PhD and MS physicists
- PhD mathematicians
- CMDs and RTTs
- Professional software and hardware engineers

Support activities include:

- Global live and Web-Support
- Customer training conducted from RT professionals

For more information, contact your local Elekta representative.

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Human Care Makes the Future Possible



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Monaco®
State-of-the-art planning



Redefine treatment precision
and conformance



Biological Modeling

Monaco uses a wide range of cost functions for the optimization, including volume based and biological cost function. The optimization does not only take into account the response of tissues to dose per fraction but also the volume effect of organs by means of Equivalent Uniform Dose and iso-effective volumes. These types of constraints allow for a complete control of the DVHs for healthy tissue and tumor volumes within the optimization.

Monte Carlo Dose Engine

The XVMC Monte Carlo dose engine – a unique feature - is used during the segment shape and weight optimization phase –Monte Carlo is the most accurate dose calculation currently available. Monaco uses a fast pencil beam dose engine during ‘ideal’ fluence optimization that was created specifically for IMRT.

Multi-criterial Goals

Monaco will automatically try to achieve better normal tissue sparing by tightening constraints during the optimization as long as the target dose exceeds the prescription. A Monaco prescription includes dose objectives for target(s) and dose limits (hard constraints) to the OARs with normal (unspecified) tissue.

Constrained Optimization

Constrained Optimization ensures that the dose limits on the OARs are satisfied. A change in any one of the constraints in the Monaco prescription does not effect the other normal tissue constraints, only the dose to target(s). The prescription also allows for enhanced voxel controls to guide dose gradients between structures making further “technical” volumes unnecessary.

Sensitivity Analysis

Inverse planning often fails to achieve the dose distribution which is the desired compromise between uniform dose to target(s) with limiting dose to OARs and normal tissue. Artificial and non-intuitive weight factors are time consuming methods to achieve any reasonable compromise. Monaco guides the user with an unique sensitivity analysis tool to easily solve the conflicts between target dose objective and dose limiting constraints. The interdependence of each constraint and each objective on the target dose coverage is made visible by this unique optimization evaluation tool.

Smart Sequencing®

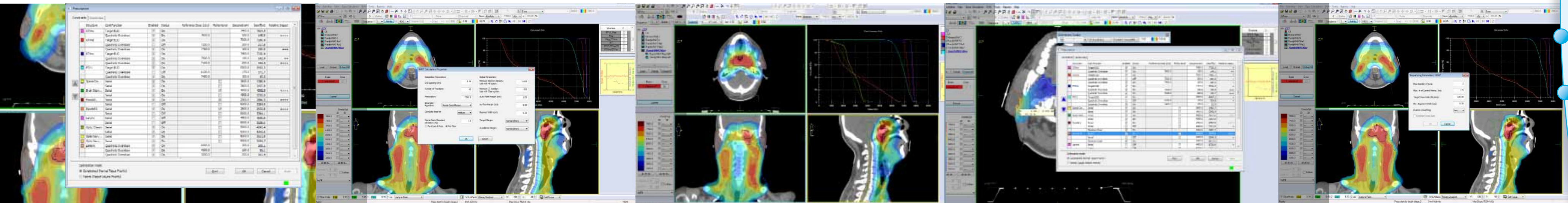
Segmentation (creation of deliverable MLC segments) of IMRT plans often introduces an unwelcome reduction in the quality of dose distributions. Monaco overcomes this limitation using fluence smoothing in the first stage optimization and segment shape and weight optimization in the final stage of the optimization, to deliver fewer segments and lower Monitor Units without loss of quality in the dose distribution – directly translating into faster Quality Assurance and less time for patients on the treatment couch. Combined with Monte Carlo dose calculation, deliverable fields are determined with optimal precision subject to the physicians dose prescription to the patient.

“Monaco introduces a new standard of care for patients in SBRT and outpatient settings with excellent dose conformance coupled with faster delivery.”

William Dezarn, PhD
Medical Physicist
Medical Radiation Physics Inc
Riverside Health System
Newport News, VA

Why Monaco®?

- Monte Carlo dose engine
- Biological modeling
- Improves dose conformity
- Increased planning flexibility
- Increased patient throughput
- Greater degrees of freedom



Multi-criterial Goals & Biological Modeling

Monte Carlo Dose Engine

Constrained Optimization

Sensitivity Analysis

Smart Sequencing®

A Reliable Partnership Produces an Innovative Product

Monaco® originated from a collaboration between Elekta and the Eberhard Karls University of Tuebingen (UKT) in Germany to commercialize the Hyperion project. The result is an advanced IMRT planning system backed by the innovative research capabilities of a leading European University. The collaboration continues to evolve and now includes support for VMAT and research into other emerging technologies.