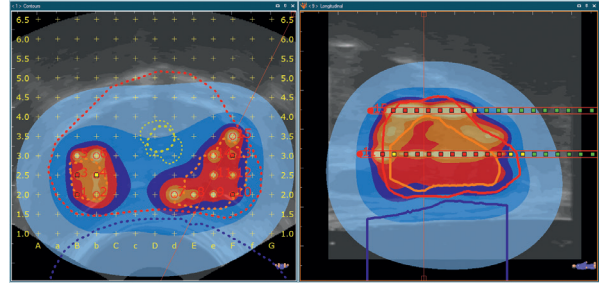# One Platform for HDR Treatment Planning

SagiNova®
The comprehensive treatment planning software (TPS) for all HDR applications, including real-time prostate treatment.

One TPS for all HDR brachytherapy treatments, with modern user interface and advanced planning features for an efficient and fast workflow.

Ease of Use

SagiPlan provides an intuitive multilingual user interface. The customized layout and configuration of parameters for user preferences and treatment settings make planning both fast and easy.

Multimodality Imaging and Image Registration

SagiPlan supports various image formats and modalities, including CT, MR and radiographic films. With advanced image registration methods (manual, automatic, landmarks), data can be fused and displayed simultaneously for reliable target definition and plan evaluation.

Applicator Reconstruction

All applicators delivered by BEBIG Mediical and Mick Radio-Nuclear Instruments are implemented in the SagiPlan Applicator Library with full 3D geometric data, allowing for easy, fast and accurate reconstruction. Flexible applicators are easily reconstructed with automatic image processing based on CT image data.

Full and Flexible Connectivity

SagiPlan provides full DICOM connectivity features with DICOM RT images, structures, plan and dose data. The DICOM Query and Retrieve features, together with the DICOM RT plan export to SagiNova, enable a seamless workflow.

Plan Templates

Plan Templates offer the possibility of saving 3D arrangements of applicators, needles, catheters and control points. Along with stored dwell times, the Plan Templates are ready to use in new, similar studies to significantly speed up the planning process.

Extensive Dose Calculation and Optimization Features

SagiPlan is compliant with AAPM TG-43 and the HEBD Working Group recommendations. It enables dose calculations for both cobalt-60 and iridium-192 sources with individual applicator at-tenuation and shielding. Manual and automatic dose optimization can be achieved with a variety of tools, such as manual isodose shaping, geometric optimization and inverse planning, for reliable control of the target coverage. The fast simulated annealing algorithm optimizes dwell times with respect to user-defined dose objectives.

Integrated Prostate Module

Exclusive

The Prostate Module is fully integrated into SagiPlan and enables interactive real-time planning of the prostate in the same user interface.

Unique BED and EQD2 Feature

Exclusive

SagiPlan calculates the biologically effective dose (BED) and the equivalent dose in 2-Gy fractions (EQD2) for structures and control points with individually assignable α/β ratios, which enables the easy assessment of HDR fractionation with the calculated total BED and total EQD2 over all fractions. Combination therapies of EBRT and HDR can be planned by importing EBRT plans via DICOM import and considering them in the Total BED and Total EQD2 calculations. A unique BED monitor will instantly update BED/EQD2 calculations with every plan change, showing respective constraint fulfillment at a glance.

Inverse Irradiation Planning with DVH, BED, EQD2

Exclusive

By means of DVH parameters, which can also be specified directly in BED or EQD2, inverse planning can also be carried out for combined EBRT + HDR radiotherapy.

EBRT plan import	→	SagiPlan® inverse planning based on BED or EQD2

SagiPlan®

User Interface & Access Control

- Multilingual user interface
- User account administration to set privileges
- Plan approval with e-signature

Connectivity

- DICOM Query and Retrieve, Store SCU and Store SCP functions
- DICOM 3.0 RT import of CT, MR, US, CBCT and PET images, (external beam) plan, structures and dose, as well as DICOM RT export of images, plan, dose and structures
- Support of BMP, JPEG, TIFF, PNG and other image formats
- Support of analog and digital frame grabbers, including a simulator frame grabber and stepper for training purposes
- Ability to perform centralized and distributed planning with server-based patient database and floating licenses
- ATC/RTOG compliant anonymized data export
- Afterloader Co-60 source dongle support

Contouring

- Continuous, by points, circular or spherical mode
- Contour interpolation and projected structure outline
- Structure editing in arbitrary planes
- Automatic contouring
- 3D VOI modifications in arbitrary planes
- Transfer of structures to other coordinate systems and registered image sets
- Logical Boolean operators for structure generation
- 3D margining tool for isotropic and non-isotropic margins

Image Registration

- Image fusion for CT, MR, US and PET images
- Manual, landmark-based and automatic image registration

Reconstruction Techniques

- 2D reconstruction without images, non-isocentric (reconstruction box), isocentric and isocentric with deviation, multiple image sets, manual and automatic pixel determination, corresponding projection lines
- 3D reconstruction on image sequences with and without template, and reconstruction on fused images
- Creation of up to 4 DRRs from CT images at user-defined angles

Applicators

- All applicators from BEBIG Medical and Mick Radio-Nuclear Instruments available within Applicator Library, including quick search feature
- Reconstruction of applicators in arbitrary planes, including DRR images
- Automatic reconstruction of flexible applicators
- Easy positioning with mouse click, three-point method or coordinate entry
- Hybrid TG-43 dose calculation for the BEBIG Medical Valencia Applicator

Planning

- Flexible control points positioning by mouse click, coordinates, along the line, within structure volumes and on structure surfaces
- Basal dose points (Paris System) and Manchester-based (A and B points)
- Editing of dwell positions and properties on images, automatic activation based on contours, control points or distance from applicator tip
- Dwell position separation between 1.0–15.0 mm, with activation of any positions, depending on applicator type
- All applicators, control points and dwell position information are saved as Plan Templates

Dose Calculation and Optimization

- Compliant with AAPM TG-43 and the HEBD Working Group 2012 recommendations
- Approximations for the effect of applicator and shielding attenuations
- Display of source strength and apparent activity for planning vs. calibration date
- Manual editing of dwell times via bars or value entries
- Geometrical and control point-based optimization
- Isodose shaper
- Dose Prescription Protocol

Inverse Planning

- Inverse planning with fast simulated annealing algorithm based on DVH parameters and BED/EQD2
- Inverse planning also for summation plans

Dose Evaluation

- Evaluation of isodose lines in any arbitrary plane
- Live dose cursor and hot-cold dose display
- 3D isodose cloud display and 3D surface depiction with dose
- Real-time update of dose-volume histograms and user-defined parameters (V100, D90, D_{2cm3})
- COIN, dose volume, DNR, overdose volume and dose homogeneity indices are calculated and updated automatically
- Graphical and acoustical dose alerts
- Multiple plan comparison with synchronized dose display
- Customizable report printout
- BED and EQD2 calculation for selected points, organs and Total BED and EQD2 for external beam and brachy-therapy treatments and their summation

Prostate Module

- Add-on, fully integrated software module
- Includes image registration with live US images with any other image modality
- Includes prostate simulator for demonstration and training purposes
- Automatic needle sorting and labelling according to template position

User Defaults and Treatment Defaults

- Configurable settings for contouring, isodose line display, applicators, etc. are saved as User Default
- User-defined treatment defaults for respective anatomi-cal sides with fractionation, contouring presets, structure names and DVH parameters for plan analysis