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Respiratory MotionSim™

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Understand Motion Effects on Estimated Patient Dose

Respiratory MotionSim (RMS) allows the clinician to simulate the dosimetric impact of target motion with proven accuracy.[1] Extending the patented 3DVH® 4D dose perturbation methodology, RMS allows the physicist to define motion trajectories and quantitatively evaluate the impact of organ motion on dose distribution.[2] RMS is an important tool for clinicians committed to evidence-based decision making and quality assurance of highly-modulated radiation therapy treatments where organ motion is a concern.

Respiratory MotionSim

Features and Benefits

- Uses proven Planned Dose Perturbation (PDP™) measurement-guided reconstruction method to estimate dynamic 4D dose
- Evaluate both 3D dose and DVH changes caused by motion to determine if motion management is necessary, and to QA motion management plans
  - Assure the Internal Target Volume (ITV) is of adequate size and shape
  - Determine if the target dose degrades due to interplay
  - Determine if neighboring critical organs are overdosed
  - Compare interplay effects of VMAT vs. IMRT
  - Calculate the gating breathing cycles that best balance dose delivery with delivery time
  - Simulate single fractions or entire course of treatment
- Use existing QA measurements and avoid bulky and attenuating mechanical motion phantoms to create simulations
  - Use existing, patient-specific plan, structures, dose and CT images
  - Define motion manually or automatically, using 4D CT images
  - Customize target volume, margin of motion, trajectories, and type of motion (one-time/cyclical)
  - Run simulations virtually and modify motion, including randomization, with one click
- Fully integrated with 3DVH Release 3.0
- No commissioning required

[1] See Publications, next page
[2] Requires ArcCHECK® and 3DVH

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Your Most Valuable QA and Dosimetry Tools

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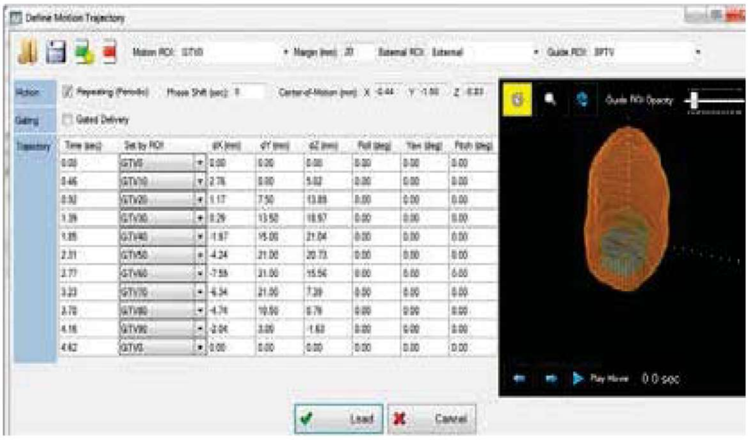
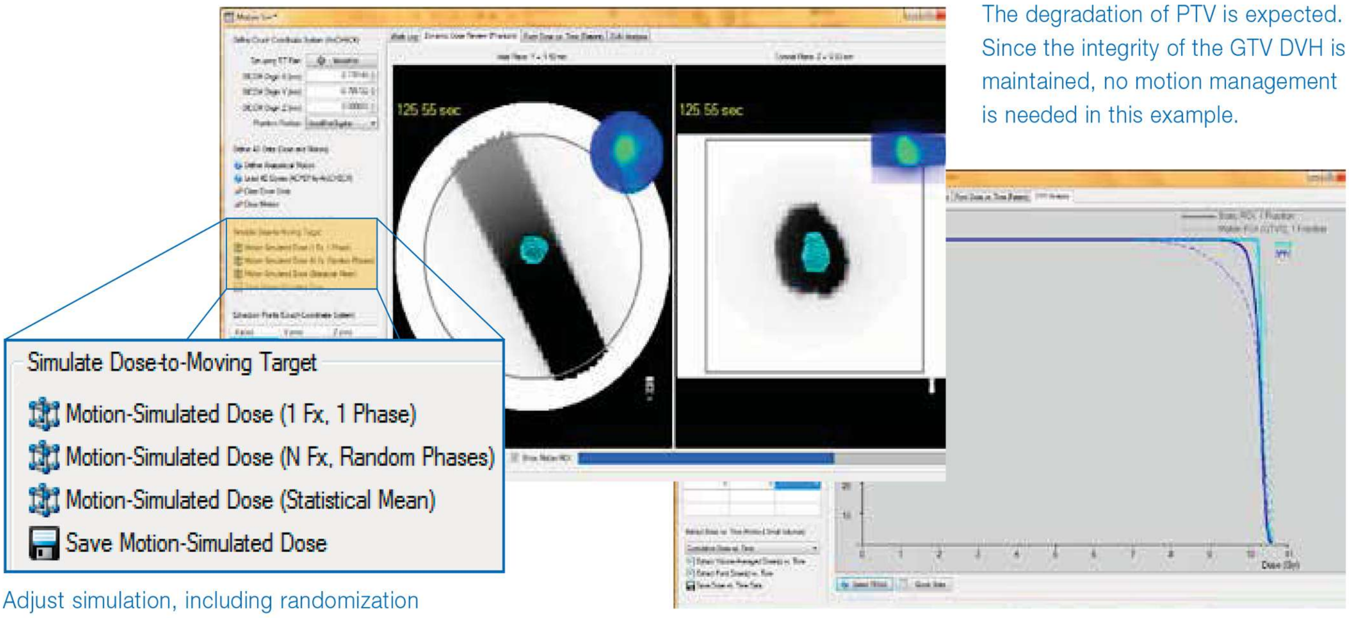
Motion Management in Three Steps

1. Generate high resolution 4D dose grids automatically as part of the 3DVH® and ArcCHECK® Planned Dose Perturbation process
2. Define patient-specific contours from 4D CT images



3. Simulate and compare dose DVH of moving target vs. stationary target by analyzing 3D dose, DVH, or point doses vs. time



The degradation of PTV is expected. Since the integrity of the GTV DVH is maintained, no motion management is needed in this example.

Adjust simulation, including randomization

Publications

- **"Motion as a perturbation: Measurement-guided dose estimates to moving patient voxels during modulated arc deliveries,"** V. Feygelman et al., Med. Phys. 40 (2), 021708 (2013)
- **"Experimentally studied dynamic dose interplay does not meaningfully affect target dose in VMAT SBRT lung treatments,"** C. Stambaugh et al., Med. Phys. 40 (9), 091710 (2013)
- **"VMAT QA: Measurement-guided 4D dose reconstruction on a patient,"** B. Nelms et al., Med. Phys. 39 (7), 4228 (2012)