The SDX® System’s unique ability to pair a patient’s inspiration rate and lung volume measurement with clear visual biofeedback makes it possible to maximize the stability of internal organs and the tumor treatment zone. This allows for an increased dose to the tumor with decreased toxicity to vital organs. SDX® is a spirometry based system for managing thoracic and abdominal tumor motion during imaging and radiotherapy.

SDX® enables both voluntary breath hold and free breathing techniques for:

- Reducing tumor motion during imaging and treatment \(^{1-3}\)
- Enhancing tumor imaging and visualization \(^4\)
- Reducing treatment margins \(^6-8\)
- Increasing dose while decreasing toxicity to vital organs \(^8-10\)
- Repositioning vital organs out of the high dose region \(^6,8,10\)

**Lung Patient**

SDX® with DIBH allows dose escalation while reducing both lung and cardiac toxicity. \(^6,8,10\)

**Left Breast Patient**

SDX® with DIBH is a highly effective cardiac sparing technique to treat left-sided breast cancer. DIBH allows for the displacement of the heart during the isocenter planning process, thus allowing greater reduction in dose to the heart. With the use of this technique tangent radiation beams can effectively treat tumors while reducing dose to the heart. The liver can also be spared to a larger extent with DIBH for right sided breast cancer. \(^11\)
SDX® Voluntary Breath Hold Technique

Patient Training
The initial patient training session includes a detailed explanation of the procedure and verbal coaching on DIBH. The patient is then introduced to the SDX® System and breathes freely through the spirometer until instructed to take a full inspiration. The SDX® calculates a target inspiration zone, which is a percentage of the patient’s maximum inspiration capacity. This ensures the patient can comfortably maintain repeated breath holds of 20-25 seconds. The result is a repeatable breath hold, taken with the same inspiration volume every time.

CT Scanning & Treatment Planning
After training, the patient proceeds to the CT scanner for imaging. With the use of the video goggles, the patient is able to visualize the target inspiration zone. CT images are taken while the patient performs the breath hold, thereby reducing artifacts. SDX® with DIBH decreases the movement of organs within the thoracic cavity, allowing for enhanced tumor imaging and visualization. The acquired CT images are used to develop the treatment plan.

Patient Treatment
The process for treatment is the same as CT Scanning. With the SDX® System, the patient remains in control by voluntarily repeating breath holds during the course of treatment. The clinician monitors the breathing pattern to determine the optimal moment for delivering the radiation.

Optional Gating Modules (Varian® C-Series, Varian® ProBeam®, IBA™ Proteus®PLUS) pauses the beam if the patient cannot maintain his breath hold until the end of the radiation treatment.
SDX® Gating

Free Breathing Technique

Gating Modules (Optional)
The SDX® System can be used in manual or synchronized mode with the use of optional Gating Modules.

4D-CT reconstructions are often degraded due to poor abdominal motion. Compared with external systems, the respiratory signal obtained with the SDX® spirometer provides a high quality volumetric amplitude that is ideal for managing Free Breathing 4D-CT. The Gating Module links the SDX® to the scanner, driving 4D-CT acquisition. The Gating Module receives the two signals, X-Ray on and X-Ray off, defining the acquisition period. The resulting high quality respiratory data allows for superior 4D-CT reconstructions.

Gating Modules available for:
- Siemens®

The Gating Module continuously monitors the patient’s breathing and adjusts for motion in real time, delivering the dose only when the patient is in the breath hold zone. If the patient’s breath hold moves beyond the defined breath hold zone, the Gating Module signals the equipment to immediately pause the radiation beam; when the patient moves back into the breath hold zone, the equipment is triggered to resume the radiation. The Gating Module allows the patient to return to the defined breath hold zone as many times as required to complete the daily radiation plan.

Gating Modules available for:
- Varian® C-Series, Varian® ProBeam®, IBA® Proteus®PLUS

4D-CT

The optional Gating Module for Siemens® enables free breathing techniques for specific treatments. The patient is positioned for treatment and breathes freely without seeing the breathing curve in the video goggles. When the software identifies that the patient is breathing normally, it starts the process of image acquisition. The CT is configured based on the respiratory cycles. The image acquisition takes place between X-Ray on and X-Ray off. A specific vxp file is produced for treatment planning and can be used with the image reconstruction software (CT or TPS).
New SDX® 3.0 Custom Trolley

The new trolley design features a single connect combined power and data cable to enhance workflow efficiencies between multiple simulation and treatment modalities.

New SDX® 3.0 Software

New user friendly interface with touch screen design for enhanced usability.

References

SDX® Clinical Workflow Setup

PREPARATION PHASE

**Preparation Room**

- Custom Trolley
- SDX® Module
- Video goggles

**Control Room**

- Gating Module (Optional)

**Imaging Room**

- CT System Interface

**Notes:**

- Supplied by Clinical Site
- Supplied as part of SDX® System

- A: Maximum length - 50 meters between A&B
- B: Shielded Outlet RJ 45
- Electrical Outlet

Maximum length - 50 meters between A&B

Shielded Outlet RJ 45

Electrical Outlet
TREATMENT PHASE

Control Room

Local Data Extender
2m

Treatment System Interface

Gating Module (Optional)

Network

Local Data Extender
2m

CAT 5, 5e or 6 Shielded (FTP min)
43 meters max

Treatment Room

SDX® Module

Video goggles

Custom Trolley

Custom Trolley

5m

5m
Overview of the SDX® System

**NEW**

SDX® 3.0 - Trolley Package
Includes:
- SDX® 3.0 Module
- SDX® Custom Trolley
- Video Goggles (HDMI)
- Calibration Syringe
- Software Version 3.0

### SDX System:

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
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<tbody>
<tr>
<td>RT-4410-SDX-05</td>
<td>SDX® 3.0 - Trolley Package</td>
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<tr>
<td>RT-4410-SAV-03</td>
<td>Annual Maintenance of the SDX® Module (includes 1 year warranty extension – US)</td>
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<tr>
<td>RT-4410-SAV-04</td>
<td>Annual Maintenance of the SDX® Module (includes 1 year warranty extension – EU)</td>
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### Consumables*:

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<tbody>
<tr>
<td>RT-4410-FLTR-01</td>
<td>Bacterial Filter - Qty of 100</td>
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<td>RT-4410-MP-01</td>
<td>Mouthpiece - Qty of 100</td>
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<tr>
<td>RT-4410-NC-01</td>
<td>Nose Clip - Qty of 100</td>
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* Pictures shown may vary from actual product

### SDX Gating Modules Optional**:

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<th>Code</th>
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<tr>
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<td>SDX Gating Module - IBA® **</td>
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<td>RT-4410-SNC-02</td>
<td>SDX Gating Module - Varian® C-Series**</td>
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<tr>
<td>RT-4410-SNC-03</td>
<td>SDX Gating Module - Varian® ProBeam®**</td>
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<td>RT-4410-CT-01</td>
<td>SDX Gating Module - 4D-CT Siemens®**</td>
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**Please contact Qfix® for assistance in determining the prerequisites required to install the Gating Module with Varian®’s MMI for SDX®, or IBA®, Varian® ProBeam® and Siemens® interfaces.

### Desktop Computers:

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<tr>
<td>RT-4410-01</td>
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<td>Desktop Computer Monitor</td>
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<tr>
<td>RT-4410-03</td>
<td>Desktop Computer Speakers</td>
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