Cone-beam CT (CBCT) is a fundamental technology of modern radiotherapy along with modulated treatments such as RapidArc® radiotherapy technology and intensity-modulated radiation therapy (IMRT). The ability to verify patient position in terms of internal anatomy and to deliver highly conformal dose distributions has redefined cancer care.

As treatment protocols become ever more demanding, clinicians, physicists and radiation therapists seek higher image quality to support the required treatment decisions.

Iterative cone-beam CT seeks to address these demands by improving upon traditional CBCT methods and achieving new levels of image quality. This award winning* technology — available on the TrueBeam® system platform — provides greater visibility of soft-tissue structures, confidence in managing patient and target position, and opportunities for future applications such as adaptive radiotherapy.

**ITERATIVE CONE-BEAM CT**

**Improved visualization of soft tissue structures**

**Improved image quality**

**Soft-tissue structures in stationary anatomy**

- Clearer boundaries; reduced noise and streaks; improved HU uniformity; and increased contrast-to-noise ratio
- Sharp delineation of structures and edges

**Specific regions**

- Head and neck: Decreased streaks from dental fillings (metal artifacts) and vertebrae (cone-beam artifacts); and better uniformity around shoulders
- Pelvis: Reduced noise and streaks due to low beam penetration (photon starvation); and better uniformity in bladder and prostate
Technology overview

The innovation behind iterative CBCT is the combination of two key technologies: Acuros CTS and statistical reconstruction.

Acuros CTS

Acuros CTS (Computed Tomography Scatter) shares much of Varian’s Acuros® XB dose calculation engine. Acuros CTS uses deterministic methods to estimate the scatter generated in each projection image. A standard CBCT reconstruction generates a first estimate of the patient anatomy. Acuros CTS then models the kV beam transport through the patient model and calculates the primary and scatter components in the projections. Subtracting the calculated scatter contribution from acquired projections corrects for scatter. Acuros CTS has similar accuracy to Monte Carlo methods, while significantly reducing computation time from hours with Monte Carlo to seconds.***

Statistical reconstruction

Statistical reconstruction places more weight on higher fidelity regions of the projection images. If the measured signal is larger, there is more statistical certainty in the signal and the larger signals contribute more to the final reconstructed image. At the same time, image processing is incorporated to reduce noise while preserving edges. Graphics processing unit (GPU) technology minimizes the time taken for the several iterations needed to produce the final image.

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*Figure 1: Less noise and better uniformity in the bladder region

*Figure 2: Reduced cone-beam artifact from high-contrast structures such as vertebrae and skull base

*Figure 3: Reduced metal artifact streaks from dental fillings in head and neck scans
Not all features or products are available in all markets and are subject to change.

**Intended Use Summary**

Varian Medical Systems’ linear accelerators are intended to provide stereotactic radiosurgery and precision radiotherapy for lesions, tumors, and conditions anywhere in the body where radiation treatment is indicated.

**Safety Statement**

Radiation treatments may cause side effects that can vary depending on the part of the body being treated. The most frequent ones are typically temporary and may include, but are not limited to, irritation to the respiratory, digestive, urinary or reproductive systems, fatigue, nausea, skin irritation, and hair loss. In some patients, they can be severe. Treatment sessions may vary in complexity and time. Radiation treatment is not appropriate for all cancers.