

Advanced 3D ultrasound IGRT system for Prostate, Breast, Bladder and Cervix Simulation and Verification

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The possible clinical uses of advanced 3D ultrasound (U/S) for IGRT are explored. The system is based on the principle of *mutual referencing*. Daily 3D U/S structures from the treatment room are compared to an initial 3D U/S data set acquired on the day of simulation in the CT-Sim room. As such, this is the only intra-modality (i.e. comparing 3D U/S to 3D U/S) IGRT system currently available.

The initial 3D U/S data set called a U/S-Sim is acquired in the same coordinate system as the CT and so is *implicitly registered* to the treatment planning CT-Sim. The U/S-Sim can be used for improved and quicker GTV and OAR definition on the systems multi-modality workstation or on the clinic's own TPS.

This system was first implemented for prostate localization and correcting patient setup but now has modules that enable breast, bladder and cervix 3D anatomic structure-based IGRT. The system also allows for MLC volume coverage calculations which allows for treatment monitoring that could enable interesting adaptive radiotherapy applications.