



MROQC Lung Target Delineation Guidelines for Definitive, non-SBRT Cases

For patients simulated with 4DCT to be treated free breathing with photon external beam RT

Recommend planning dataset is Average Intensity Projection Image from 4DCT.

1. Contour an IGTV, which represents the motion encompassing gross tumor volume. This can be done by either :
 - a. Contouring on each phase (or a selection of phases) of 4DCT and making a composite structure
 - b. Contouring using the Maximum Projection Image (MIP)– this method should not be used in the mediastinum, near chestwall or diaphragm
 - c. Contouring while playing the 4DCT movie and editing to encompass the full motion

Note that IV contrast enhanced 4DCT may be considered and is acceptable for dose calculations. In the case of a separate simulation or diagnostic IV contrast scan, it is recommended to register the scan locally and use it as an aid to delineate the IGTV. In the case of PET or PET/CT, it is also suggested to use the scan as an aid for target delineation. In cases of atelectasis or collapsed lung, it may be helpful to use the registered PET directly for target delineation. Due to potential registration issues, caution is recommended when contouring directly on a PET. A standard protocol should be used for automatic thresholding of the PET contour when possible.

2. At the discretion of the treating physician, expand the IGTV approximately 5 mm (or more, if clinically warranted) to define the ICTV, which is the motion encompassed Clinical Tumor Volume. The ICTV may be edited to respect anatomical borders, but the entire IGTV should be included.
3. Expand the ICTV by at least 5 mm (or more, if not performing daily IGRT or clinically warranted) to define the PTV
4. CTV expansion is not typically employed in ablative cases

For patients simulated with 4DCT to be treated with gating

Recommend planning dataset is Average Intensity Projection Image from 4DCT phases within gating window. Patient specific QA is recommended to ensure reproducibility of the gating window and correlation of any external surrogates with tumor motion.

1. Contour an IGTV, which represents the motion encompassing gross tumor volume within the desired gating window. This can be done by either:
 - a. Contouring on each phase (or a selection of phases) of 4DCT within the gating window and making a composite structure
 - b. Contouring using the Maximum Projection Image (MIP) of phases within the gating window – this method should not be used in the mediastinum, near chestwall or diaphragm
 - c. Contouring while playing the 4DCT movie of phases in the gating window and editing to encompass the full motion

Note that IV contrast enhanced 4DCT may be considered and is acceptable for dose calculations. In the case of a separate simulation or diagnostic IV contrast scan, it is recommended to register the scan locally and use it as an aid to delineate the IGTV. In the case of PET or PET/CT, it is also suggested to use the scan as an aid for target delineation. In cases of atelectasis or collapsed lung, it may be helpful to use the registered PET directly for target delineation. Due to potential registration issues, caution is recommended when contouring directly on a PET. A standard protocol should be used for automatic thresholding of the PET contour when possible.

2. At the discretion of the treating physician, expand the IGTV approximately 5 mm (or more, if clinically warranted) to define the ICTV, which is the motion encompassed Clinical Tumor Volume. The ICTV may be edited to respect anatomical borders, but the entire IGTV should be included.
3. Expand the ICTV by at least 5 mm (or more, if not performing daily IGRT or clinically warranted) to define the PTV

For patients simulated with breath hold to be treated at breath hold

Recommend planning dataset is breath hold dataset; Reproducibility testing should be done to ensure patient breath hold position is reliable.

1. Contour a GTV, which represents gross tumor volume
 - a. If the breath hold position is not reliable, consider treating free-breathing or adding a margin to create an IGTV.

Note that IV contrast enhanced breath hold scans may be considered and are acceptable for dose calculations. In the case of a separate simulation or diagnostic IV contrast scan, it is recommended to register the scan locally and use it as an aid to delineate the IGTV. In the case of PET or PET/CT, it is also suggested to use the scan as an aid for target delineation. In cases of atelectasis or collapsed lung, it may be helpful to use the registered PET directly for target delineation. Due to potential registration issues, caution is recommended when contouring directly on a PET. A standard protocol should be used for automatic thresholding of the PET contour when possible. As PET generally includes motion, a direct PET contour is likely to overestimate a breath hold GTV.

2. At the discretion of the treating physician, expand the GTV approximately 5 mm (or more, if clinically warranted) to define the CTV, which is the Clinical Tumor Volume. The CTV may be edited to respect anatomical borders, but the entire GTV should be included.
3. Expand the CTV by at least 5 mm (or more, if not performing daily IGRT or clinically warranted) to define the PTV

It is not recommended to treat a patient free-breathing without a 4DCT or some form of motion assessment. In that situation, every effort should be made to assess tumor motion in order to generate an IGTV that can be used for planning. The planning dataset can be a free-breathing or slow CT scan. With a free-breathing CT scan, care should be taken to not rely on moving soft tissues for IGRT.