Purpose: To describe a case report of lung radiosurgery in which defining a target using a maximal intensity projection CT omitted a portion of the target due to an overlapping projection of the diaphragm.

Methods: A Lung 4DCT was obtained, and all ten breathing phases from 0% to 90% were reconstructed. The gating window was set to treat phases 30% to 70%, and the corresponding Maximum Intensity Projection (MIP) was generated. An ITV was contoured on the MIP. Tumor GTVs were contoured on all phases. Another ITV was generated by using the overlapped projection of all GTVs in the gating window when suspicion arose that part of the target was omitted. The volumes of the ITVs and GTVs were calculated. DVHs were analyzed on the plan generated to cover the MIP ITV.

Results: The initial ITV based on the MIP omitted 15% of the target. Since the ITVs of the diaphragm and the tumor overlap in the MIP, and the imaging technique cannot differentiate them, contouring tumor only on MIP has risk of missing part of the tumor. We have also found that the volumes of all 10 phases fluctuate with a standard deviation of 5.6%. This indicates the imperfection of 4DCT generation. If the treatment plan was generated based on MIP ITV, DVH shows the lack of coverage for the true ITV.

Conclusions: We propose two methods to accurately delineate tumor ITV from 4DCT for cases in which the target is located adjacent to diaphragm. If it is desired to start with contouring ITV on MIP, thorough QA needs to be done by going through all gating phases to adjust the ITV accordingly. A more straightforward method is to contour the GTV on all gating phases and use the overlapped projections as the ITV.