Purpose: Proton planning techniques of the in-field matching and the range-compensator-volume (RCV) were investigated to improve dosimetry on treating oropharynx tumors of head and neck cancers.

Methods: Irregularities of oropharynx tumors are dictated by patterns of contiguous and lymphatic spread over anatomical peculiarities. Proton plans with complex target volumes can result large dose non-uniformity to target and exceeding the tolerance of organs at risk (OARs). Proton boost plans, delivering an additional 20Gy to 95% PTV and 100% CTV volumes on escalating the IMRT dose of 50.4Gy to 70.4Gy, were performed over nine patients. Typical approach is using PTV with 6mm margin on forming the aperture and constructing the compensator with 5mm smearing; including 3mm patient-positioning error and irregularity of PTV. New approach is using techniques of the in-field matching and the RCV. The RCV was by copying and manually expanding of PTV and then used on constructing compensator. In-field matching technique allows for treating primary target with larger modulation and neck node with small modulation by sharing same compensator.

Results: Nine patients were cataloged into single-target-volume (STV) cases with no or homolateral node and multiple-target-volumes (MTV) cases with bi-lateral nodes. Plans using typical approach on complex PTV including single or both neck nodes in STV and MTV cases, the maximum doses to PTV can be over 30% of prescription. Maximum doses to PTV occur at regions between primary target and neck node where a gap or large volumetric change is seen. By applying new approach, the uniformity of PTV is within 13% for all of nine patients while OARs doses are reduced without largely increasing treatment time.

Conclusions: Although new approach on boost plans achieves clinical requirements, the uncertainty on proton beam ranges induced patient-positioning error on using in-filed matching and RCV need be investigated.