Purpose: To investigate the effects on dose to critical structures for density corrected planning on simple (APPA and off-cord) and conformal (4-5 field) lung plans compared to historical experience assuming homogeneous density.

Methods and Materials: Ten patients were planned using both techniques with XIO CMS software. The conformal plans were normalized to percentage coverage of target volumes and the simple plans were calculated to midplane. All plans were calculated using homogeneous density as the standard. After planning, CT density corrections were implemented and monitor units were matched to the homogeneous plan; the plans were not re-optimized. Dose volume histograms were reviewed for critical structures of cord, "hot spot" D5(PTV), and V20(lung). Plan uniformity was assessed by the slope of the PTV dose curve using the equation [(D5-D95)/Dmean].

Results: The V20 increased with corrections: 23.7±1.7 to 24.6±7.2 for complex plans; 25.2±10.8 to 26.1±11.3 for simple plans. The conformal plans degraded in uniformity by a factor twice that of the simple plans and D5 increased accordingly. Cord dose increased slightly in conformal plans (33.65Gy±12.0Gy to 34.38±12.2Gy) and remains similar in simple plans (37.83±16.5Gy to 38.11±16.8Gy). The range of cord dose variations in corrected conformal plans was from -0.22-3.24Gy; one increase raised the cord V1% from 45.95Gy to 48.84Gy. Additionally, since the simple plans historically were assumed to approximate zero cord dose for the off-cord obliques, the calculated/delivered cord dose is much higher. The effect of density corrections increased notably in the conformal plans where more beams transverse the lung.

Conclusions: Although the effect of homogeneity corrections are well documented, the outcome on plan uniformity and critical structure tolerances should be further examined when transitioning from simple to multi-field beam arrangements including IMRT. This study provides clinical dosimetric reference for adoption of heterogeneity corrected planning.