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Spectroscopic evidence for temperature dependent relative movement of light and heavy hole valence bands of PbQ (Q=Te,Se,S) UTPAL CHATTERJEE, JUNJING ZHAO, University of Virginia, MERCOURI KANATZIDIS, CHRISTOS MALLIAKAS, Northwestern University — We have conducted temperature dependent Angle Resolved Photoemission Spectroscopy (ARPES) studies of the electronic structures of PbTe, PbSe and PbS. Our ARPES measurements provide direct evidences for the light hole upper valence bands (UVBs) and the so-called heavy hole lower valence bands (LVBs), and an unusual temperature dependent relative movement between their band maxima leading to a monotonic decrease in the energy separation between LVBs and UVBs with increase in temperature. This enables convergence of these valence bands and consequently an effective increase in the valley degeneracy in PbQ at higher temperatures, which has long been believed to be the driving factor behind their extraordinary thermoelectric performance.

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