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J William Helton* (helton@math.ucsd.edu), Math Dept, UC San Diego, 9500 Gilman, La Jolla, CA 92093, and **Jiawang Nie** (njw@math.ucsd.edu), same, CA. *Sets which lift to a set with an LMI representation.*

A set C in n -dimensional space has an Linear Matrix Inequality (LMI) representation provided there is a linear pencil L for which C is the set of solutions x to $L(x)$ is positive semidefinite PSD. It is known that many convex semialgebraic sets do not have an LMI representation.

A set C has an LMI representable lift provided C equals the projection of a set K in higher (but finite dimensional) space which has an Linear Matrix Inequality (LMI) representation. The original book of Nesterov and Nemirovski which introduced LMIs had for examples sets with LMI lifts. Clearly, if C has an LMI representable lift, then C must be convex and semialgebraic (it is describable by conjunctions and disjunctions of polynomial equalities or inequalities).

For a compact convex semialgebraic set C to have an LMI representable lift we prove sufficient is: the boundary of C is a nonsingular algebraic curve which is strictly positively curved. Note on the necessary side, the boundary of any convex set has nonnegative curvature at smooth points. Thus the gap between necessary and sufficient now only exists for degenerate cases. (Received February 29, 2008)