

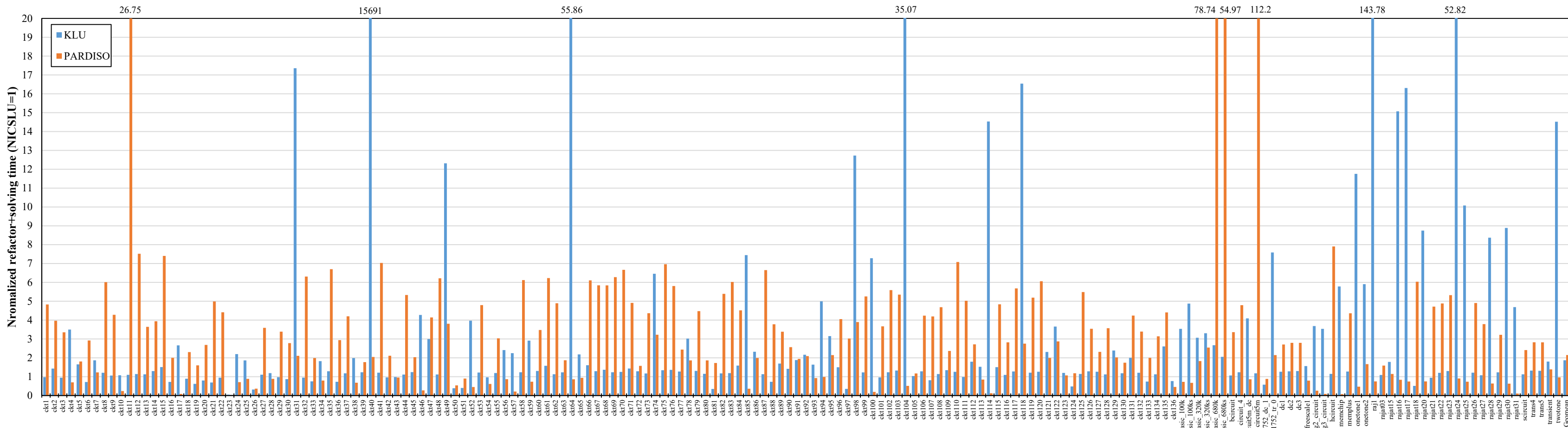
Performance Evaluation and Comparison on Circuit Matrices (NICSLU Version 201905B)

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Tests were conducted on Intel Gold 6132 CPU. We have tested 182 circuit matrices with various sparsity, 136 of which are from real circuit cases and the other 46 cases are from the SuiteSparse Matric Collection (<https://sparse.tamu.edu/>). All solvers use best configurations.

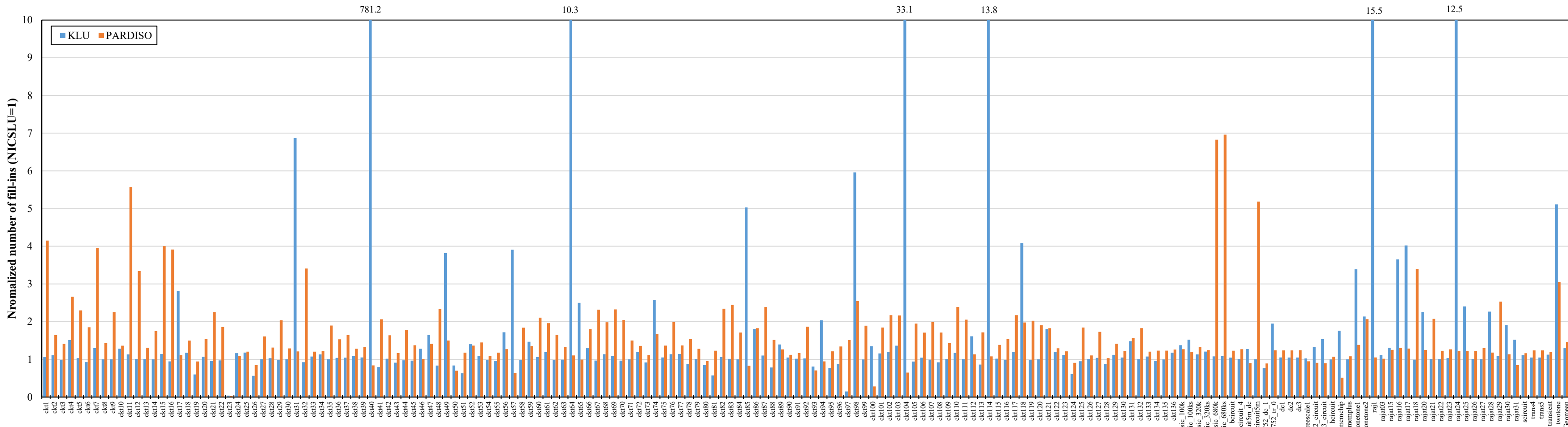
1. Performance

For the 182 circuit matrices, NICSLU achieves **2.15X** speedup over Intel MKL PARDISO and **1.87X** speedup over KLU, both on geometric mean. NICSLU outperforms KLU for 149 (82%) out of the 182 cases. NICSLU outperforms Intel MKL PARDISO for 134 (74%) out of the 182 cases.



2. Number of Fill-ins

For the 182 circuit matrices, KLU generates **29.6%** more fill-ins than NICSLU, while Intel MKL PARDISO generates **46.1%** more fill-ins than NICSLU, both on geometric mean. NICSLU generates fewer fill-ins than KLU for 132 (73%) out of the 182 matrices. NICSLU generates fewer fill-ins than Intel MKL PARDISO for 161 (88%) out of the 182 matrices.



3. Pre-analysis Performance

Pre-analysis is a one-time work in circuit simulation so the total simulation time is usually insensitive to the pre-analysis time. For the 182 circuit matrices, KLU spends **61%** less time on pre-analysis than NICSLU, while NICSLU spends **54%** less time on pre-analysis than Intel MKL PARDISO, both on geometric mean.

