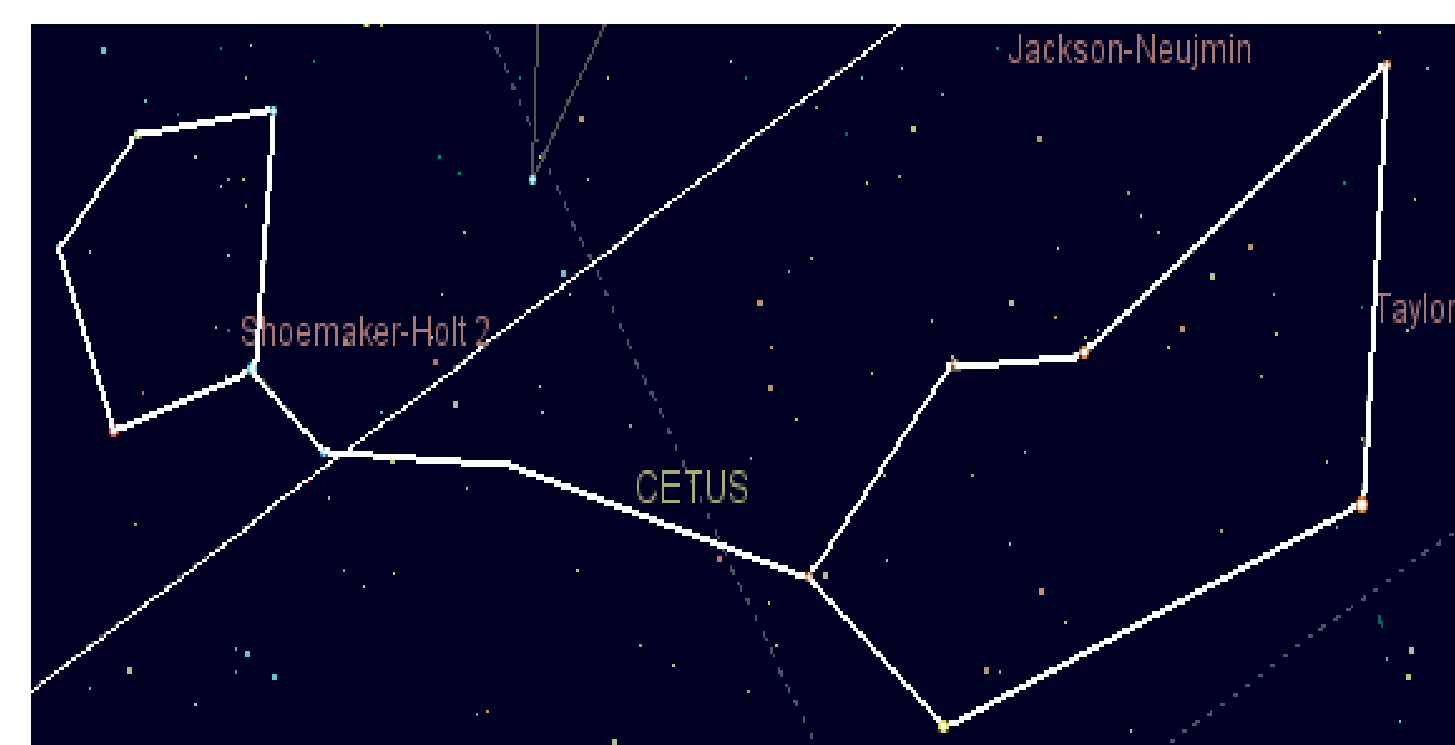


## What is Cetus?

- Source-to-source translator for programs written in the C language.
- Parallelizing compiler, translating C programs to equivalent C code annotated with OpenMP parallel directives.



## Objectives

- Analyze the overall performance of Cetus on benchmark applications
- Analyze the performance impact of Cetus techniques on benchmark applications.

## HPC resources used for experiments

- Compute node with a 20 core Intel Xeon Gold 6230 processors in a dual socket configuration, with a processor base frequency of 2.1 GHz, 27.5MB cache and we used up to 1 GB of DDR4 memory.

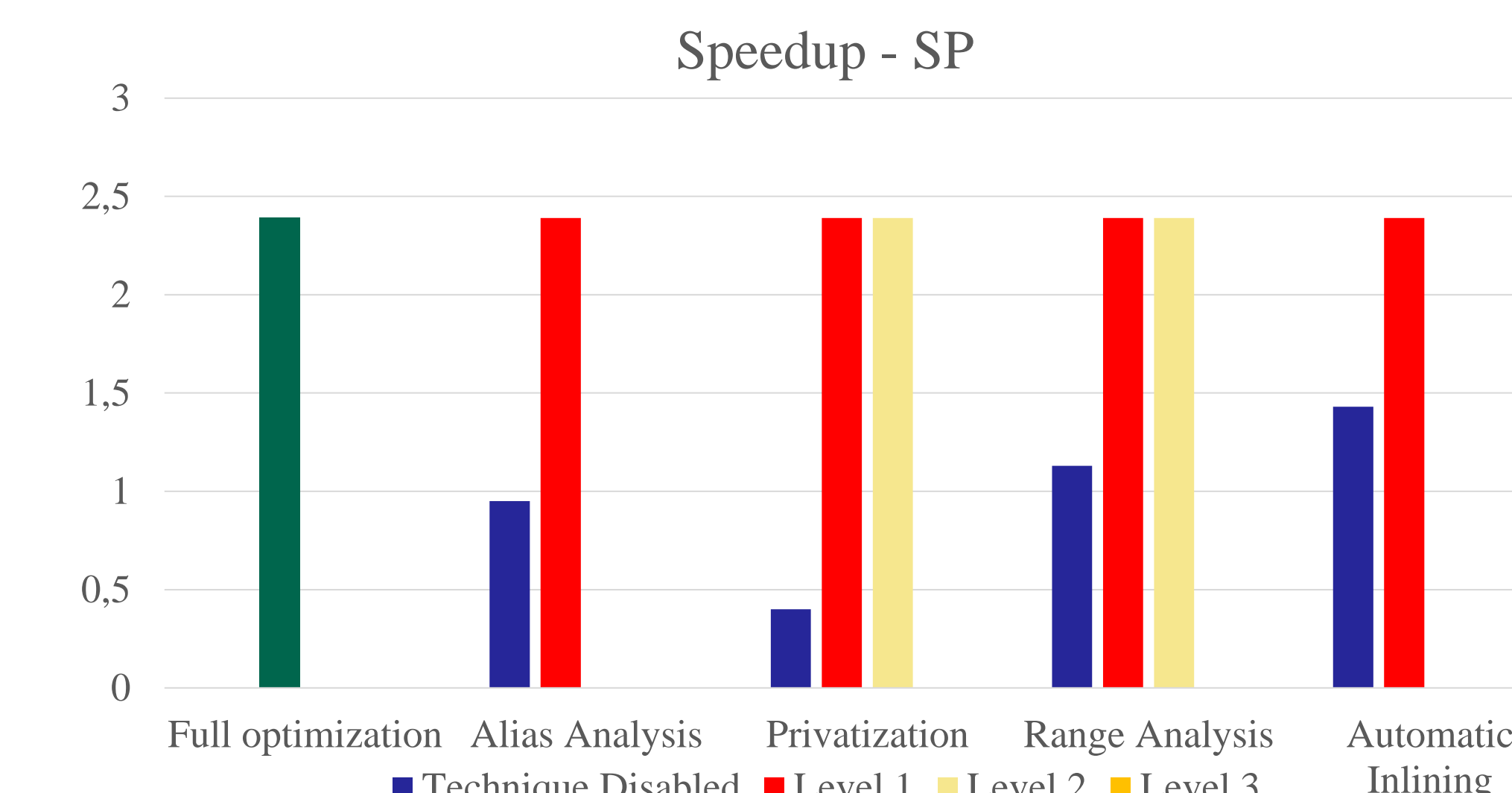
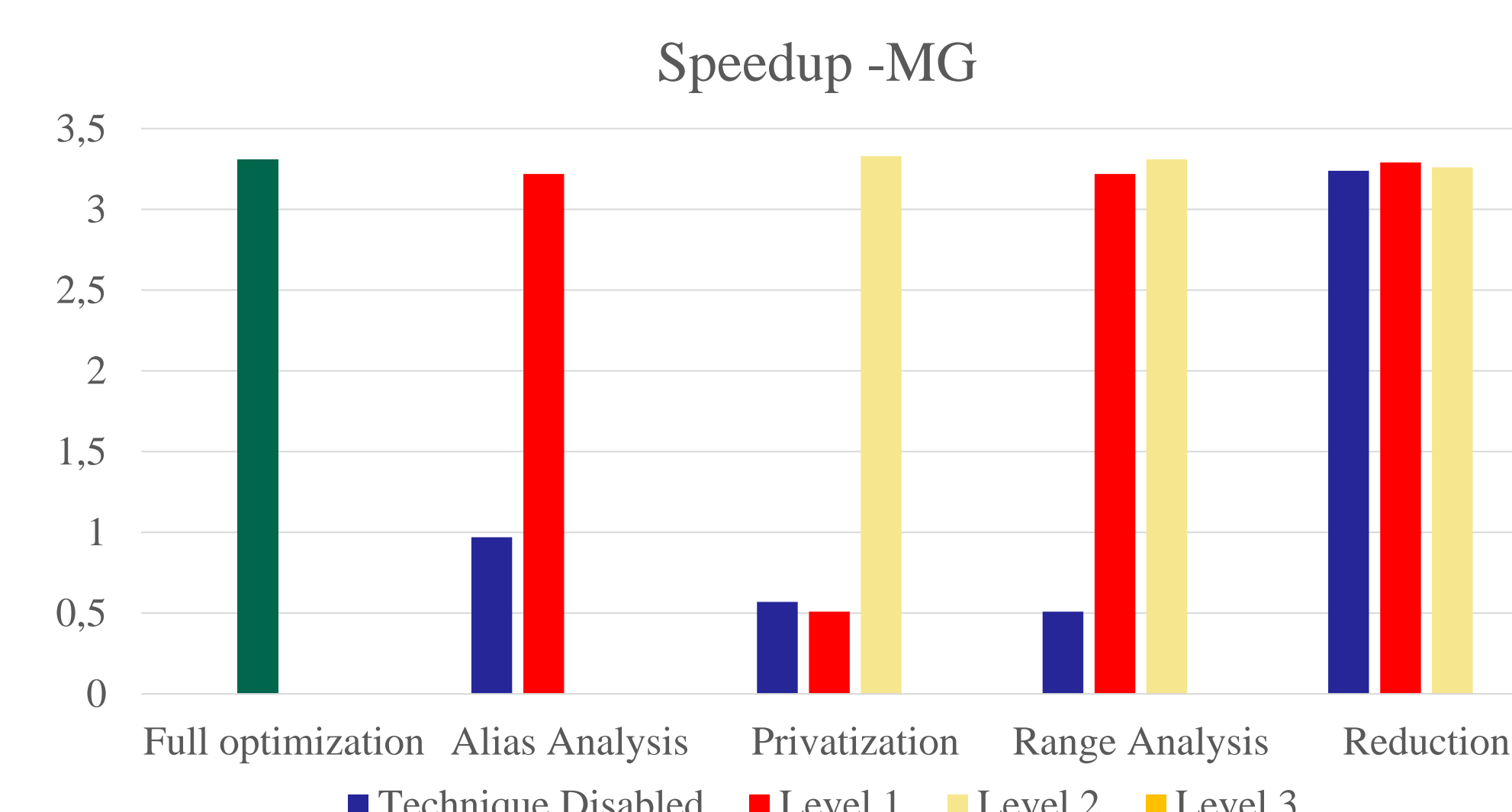
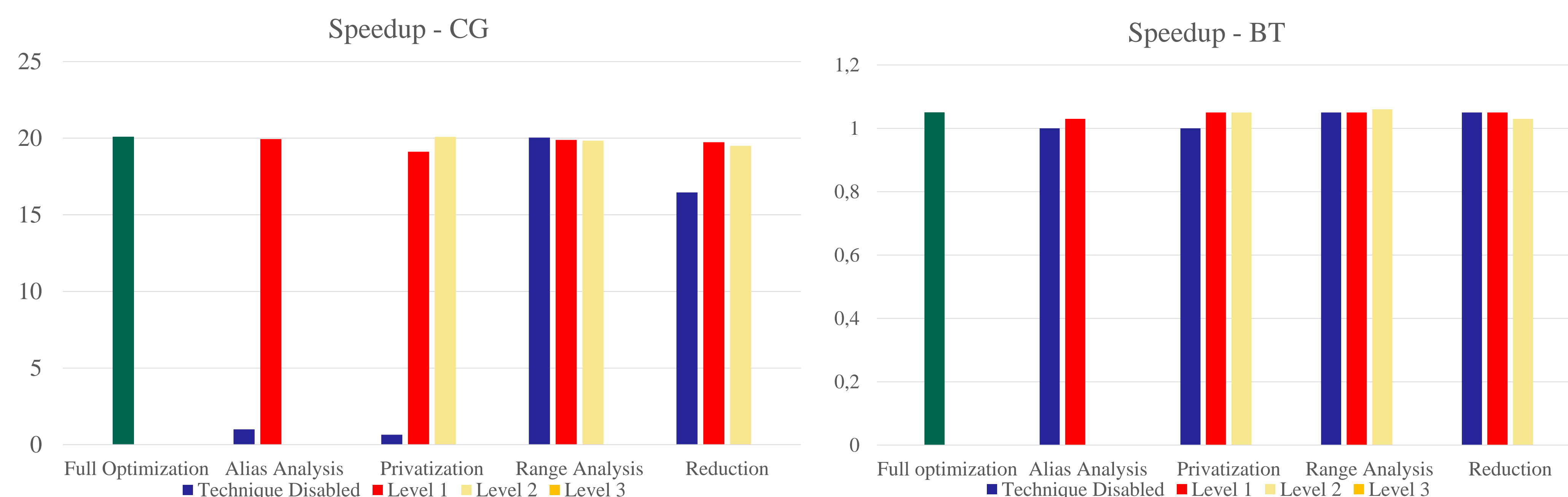
## Evaluation Results

### 1. NAS Parallel Benchmarks (NPB)

- The NAS benchmarks developed and maintained by the NASA Advanced Supercomputing Division.
- The benchmark suite consists of five kernels, three pseudo applications, two benchmarks for unstructured computation

Benchmarks evaluated: IS (Integer Sort), MG (Multi-Grid on Meshes), CG (Conjugate Gradient), BT (Block Tri-diagonal Solver) and SP (Scalar Penta-Diagonal Solver)

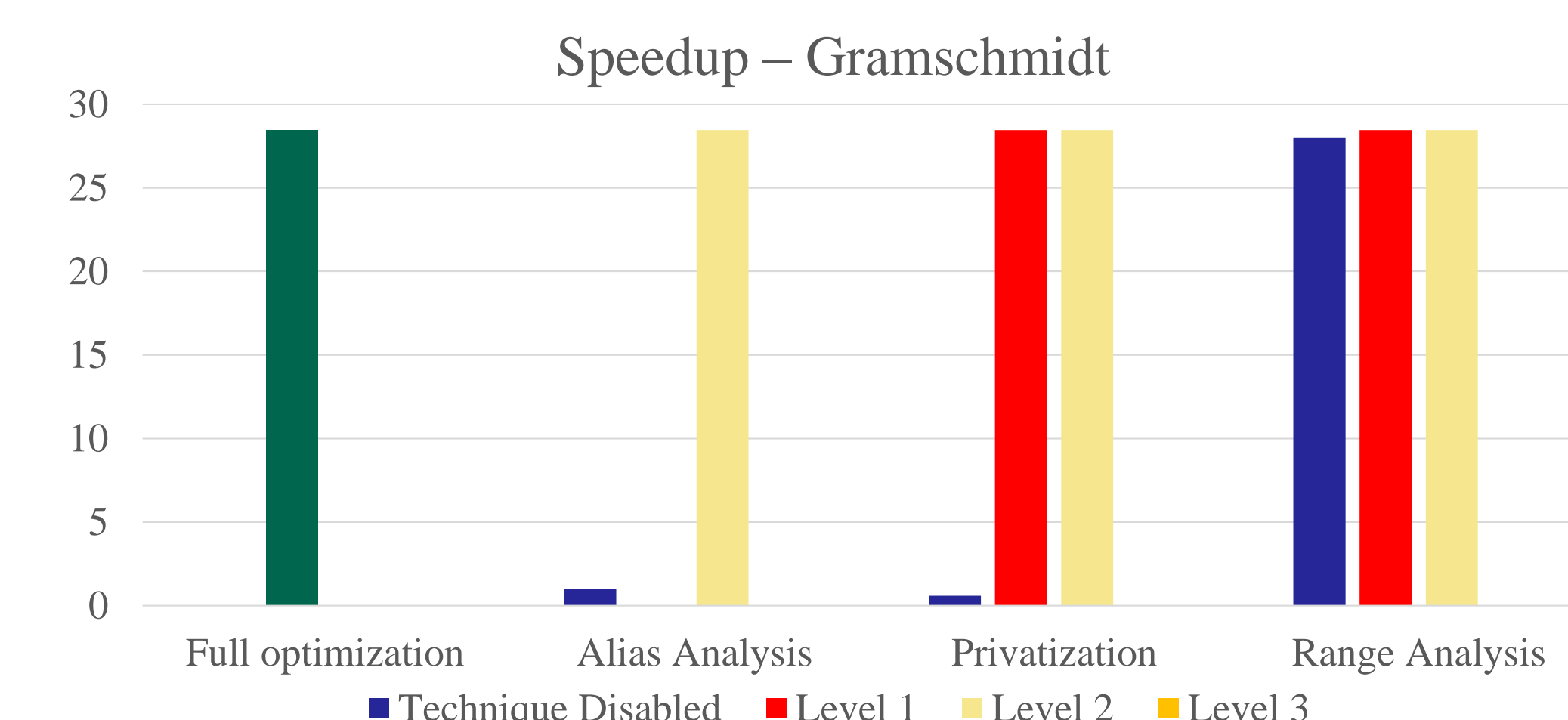
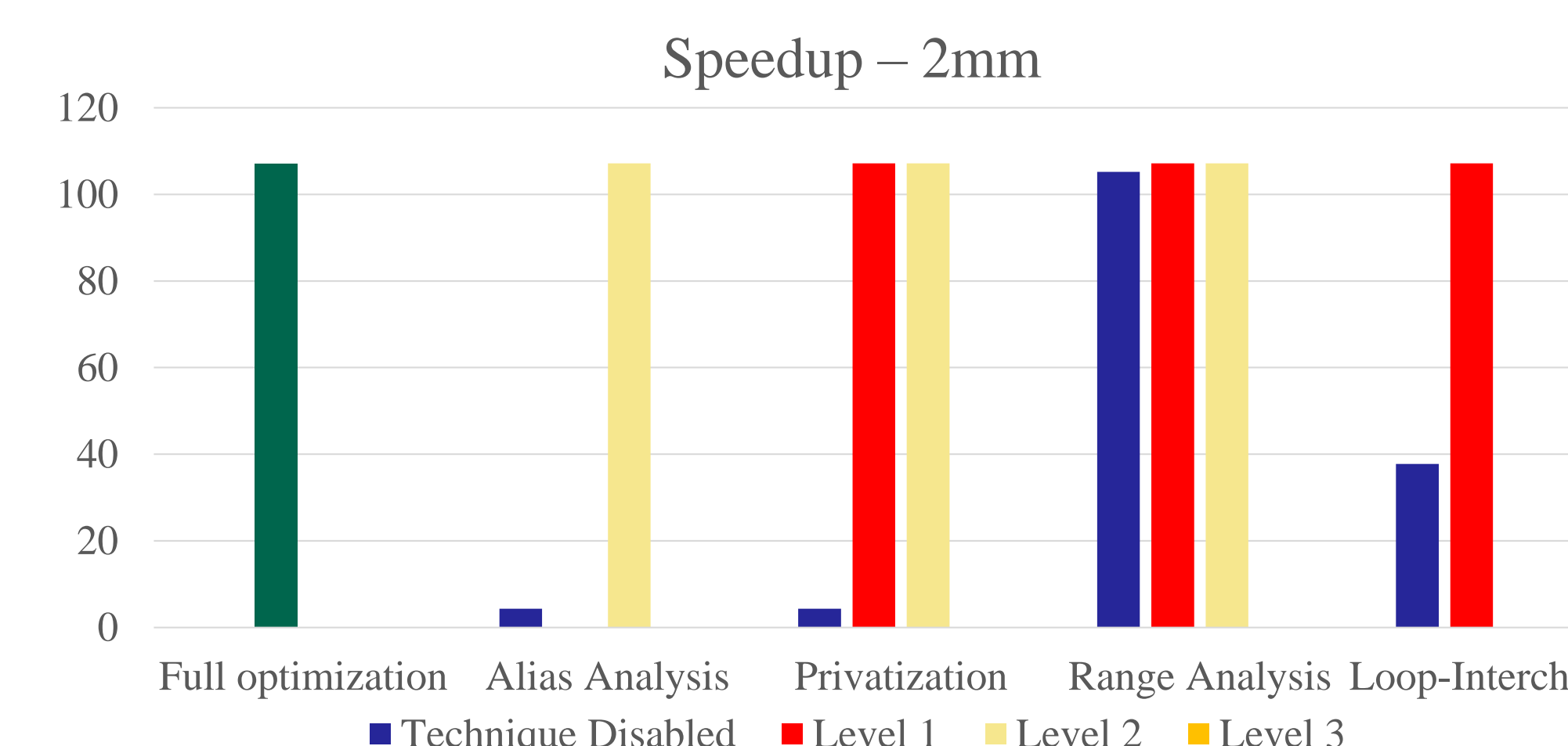
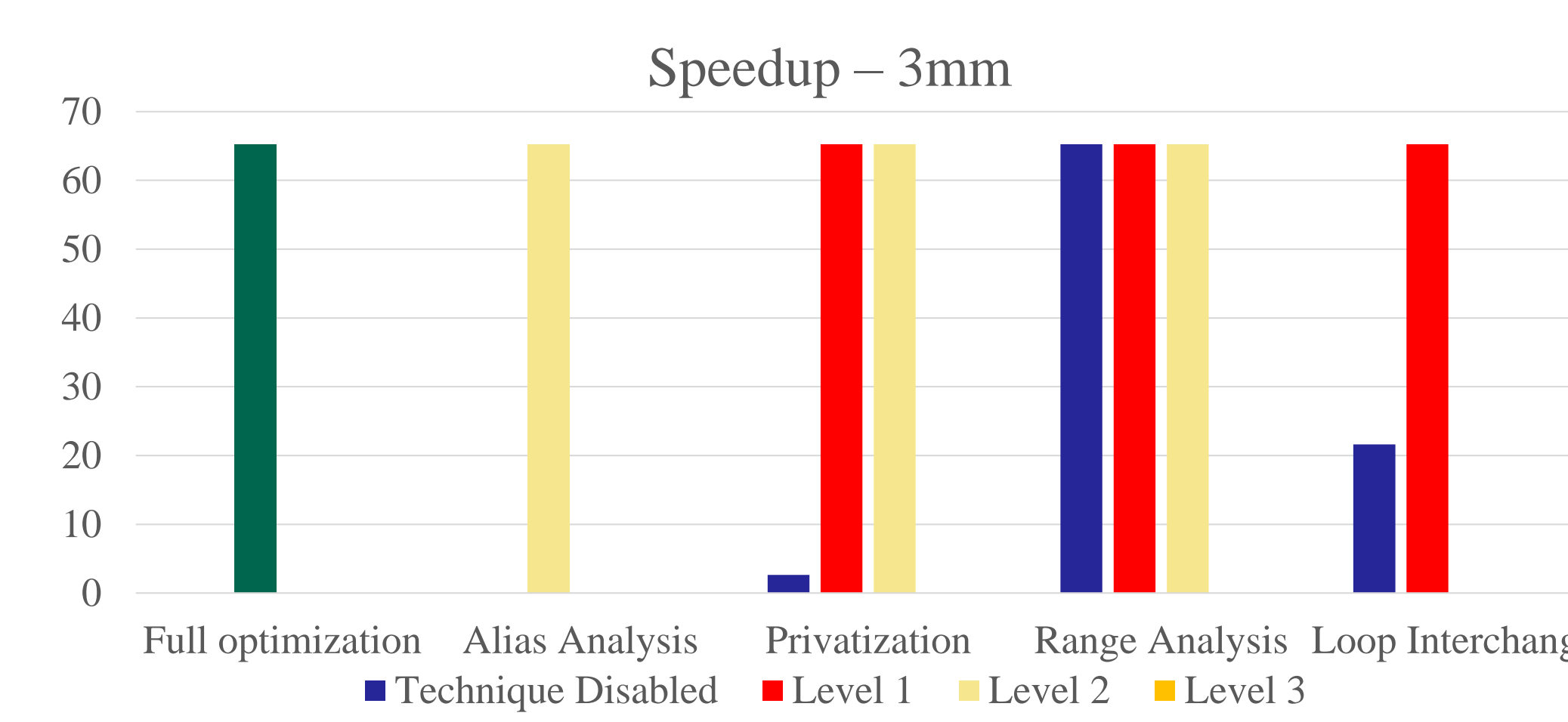
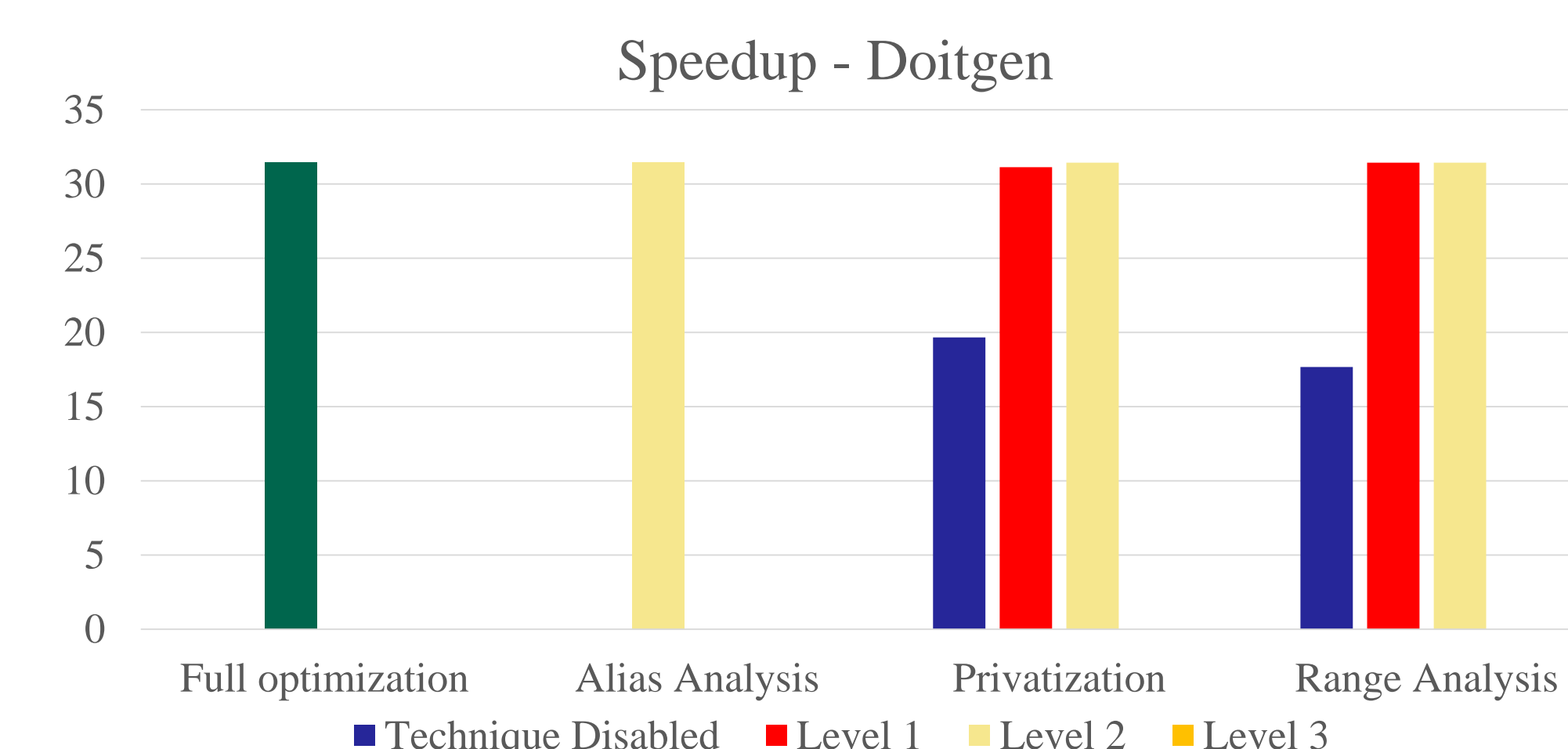
Lower bar means a higher impact of the techniques



### • PolyBench/C Benchmarks

PolyBench is a benchmark suite of 30 numerical computations extracted from operations in various application domains (linear algebra computations, image processing, physics simulation, dynamic programming, statistics, etc.).

Benchmarks evaluated: Correlation, 3mm, 2mm, dotigen and grandschmidt



## Findings

- Scalar and Array Privatization is the most important technique, affecting the performance of 9 out of the 11 benchmark codes tested.
- Reduction Parallelization affects the performance of three applications in the NAS benchmark suite.
- Induction Variable Substitution has little to no impact on both benchmark suites.
- Disabling Range Analysis substantially deteriorates the performance of MG and has a slight impact on the performances of SP and BT.
- Alias Analysis affects almost all of the benchmarks.
- Loop interchange does not show any impact on the performance of the NAS benchmarks, whereas in the PolyBench suite, disabling the loop interchange leads to a reduction in performance of codes 2mm and 3mm.