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Performance Case Study: the mkFit Particle Tracking Code

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In this case study, we consider how a physics application may be restructured to take better advantage of vectorization. In particular, we focus on the Matriplex concept that is used to implement parallel Kalman filtering in our collaboration's particle tracking R&D project called mkFit. The mkFit code is now part of the production software for CMS in LHC Run 3. Drastic changes to data structures and loops were required to help the compiler find the SIMD opportunities in the algorithm. We conclude by looking at how Intel VTune and Advisor, together with simple test codes, played a role in identifying and resolving trouble spots that affected performance.

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