Simulating J-PET detector on NVidia Ray Tracing Hardware

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Monte-Carlo — Geant4/GATE

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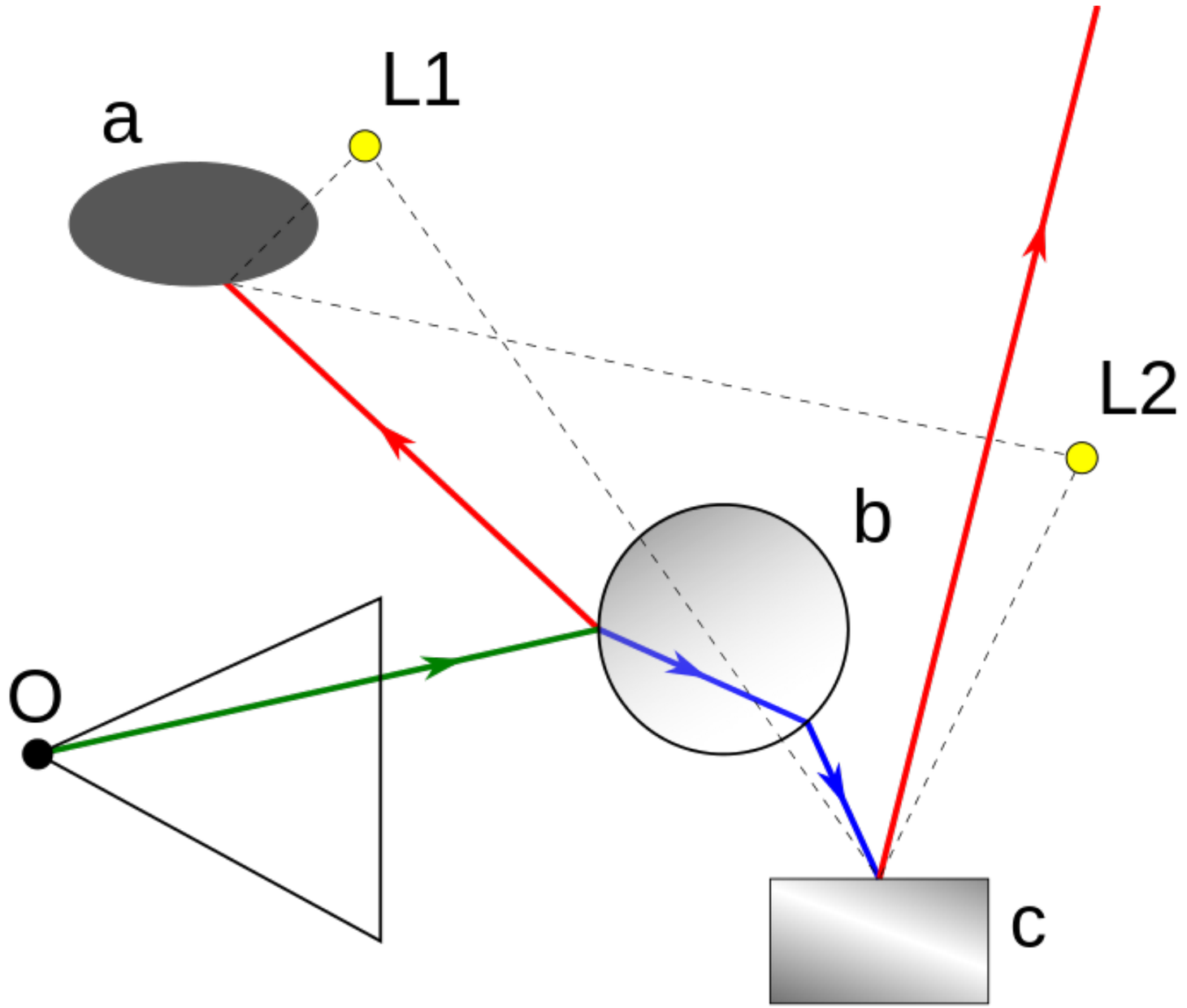
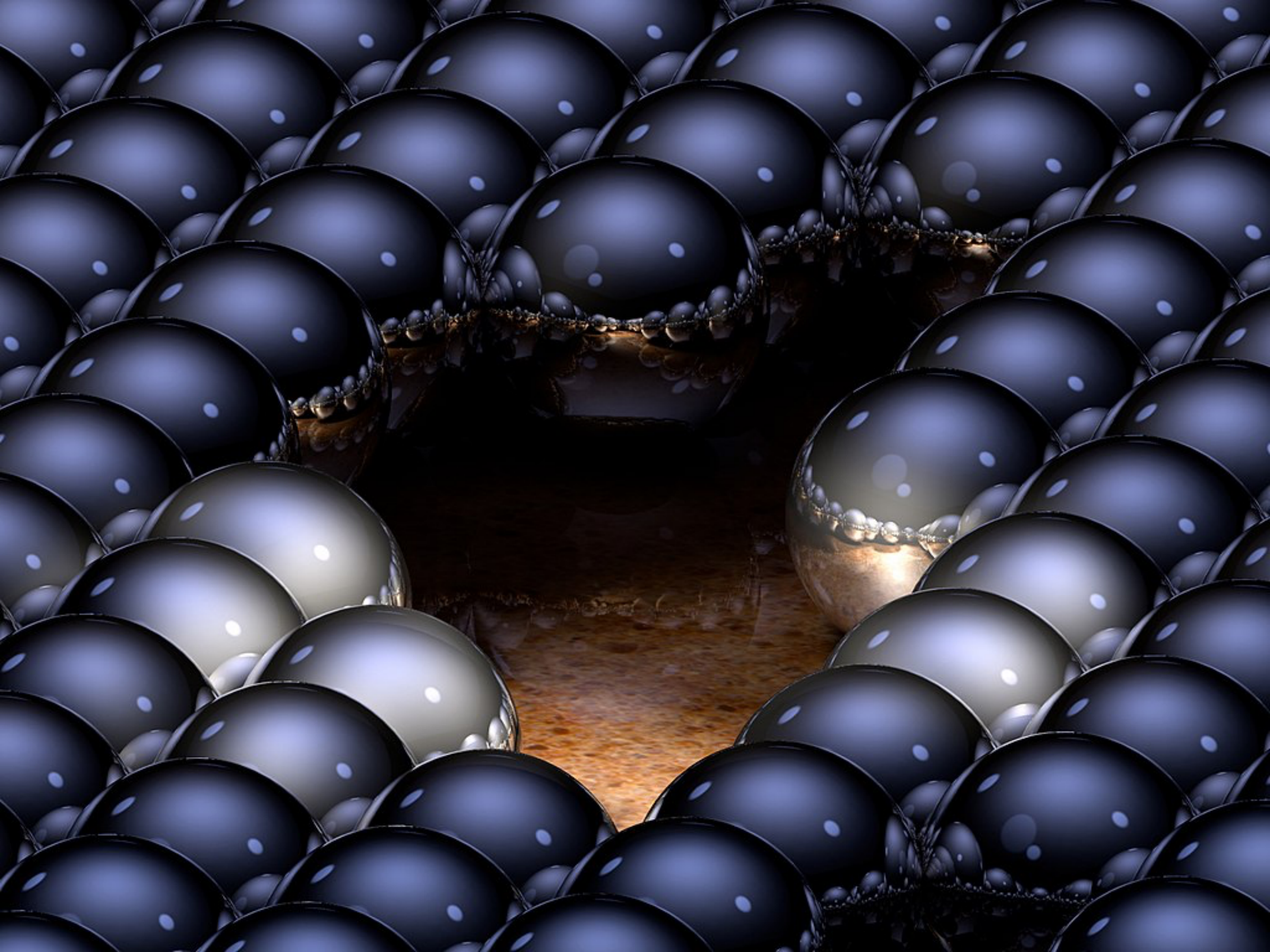
- Not vectorised - does not take advantage of newest hardware.
- CPU - AVX
- GPU

- Parallelisation:
    - Doing several things at once.
- Vectorisation:
    - Doing same things (with different data) at once.

Ray Tracing

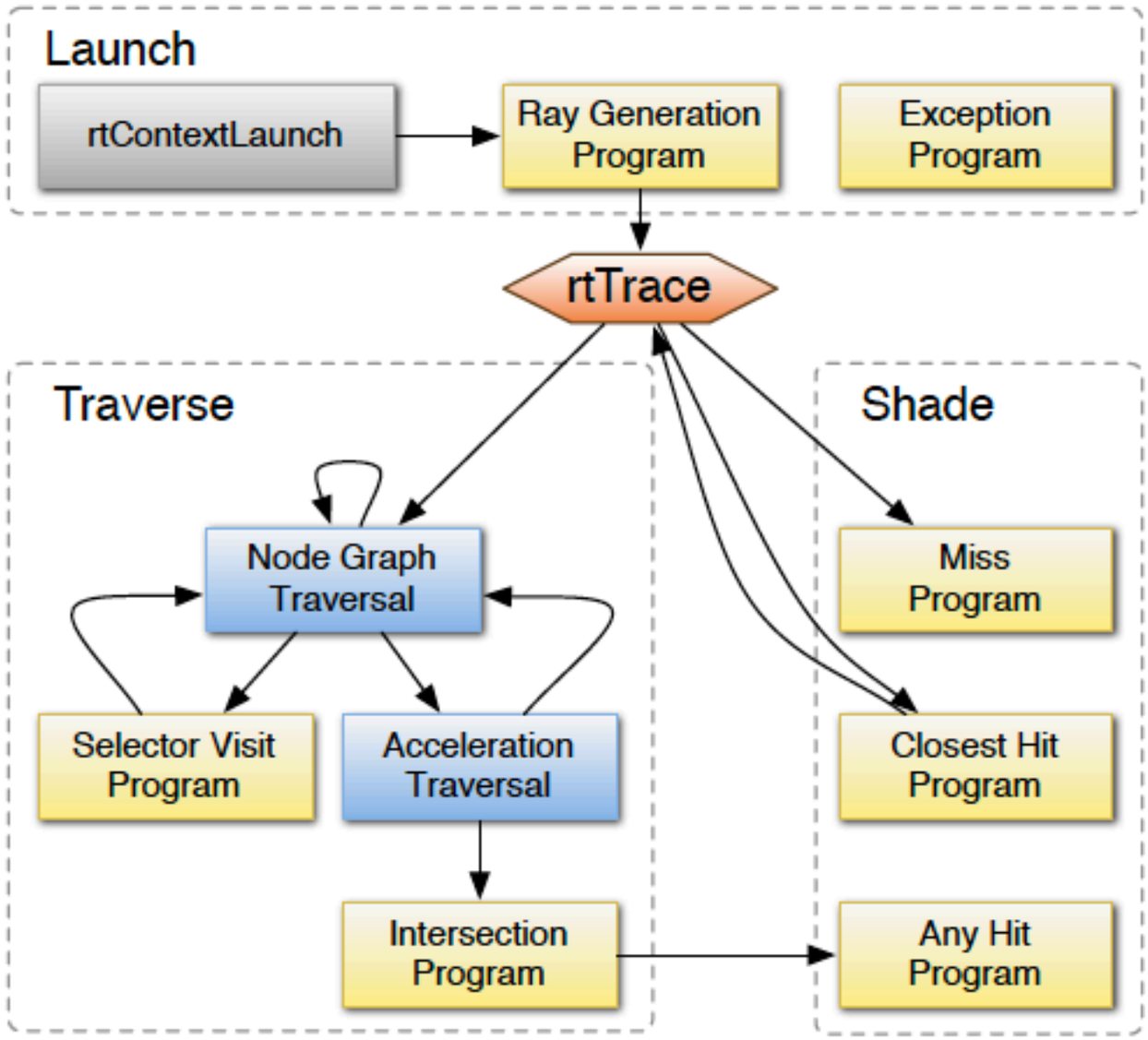


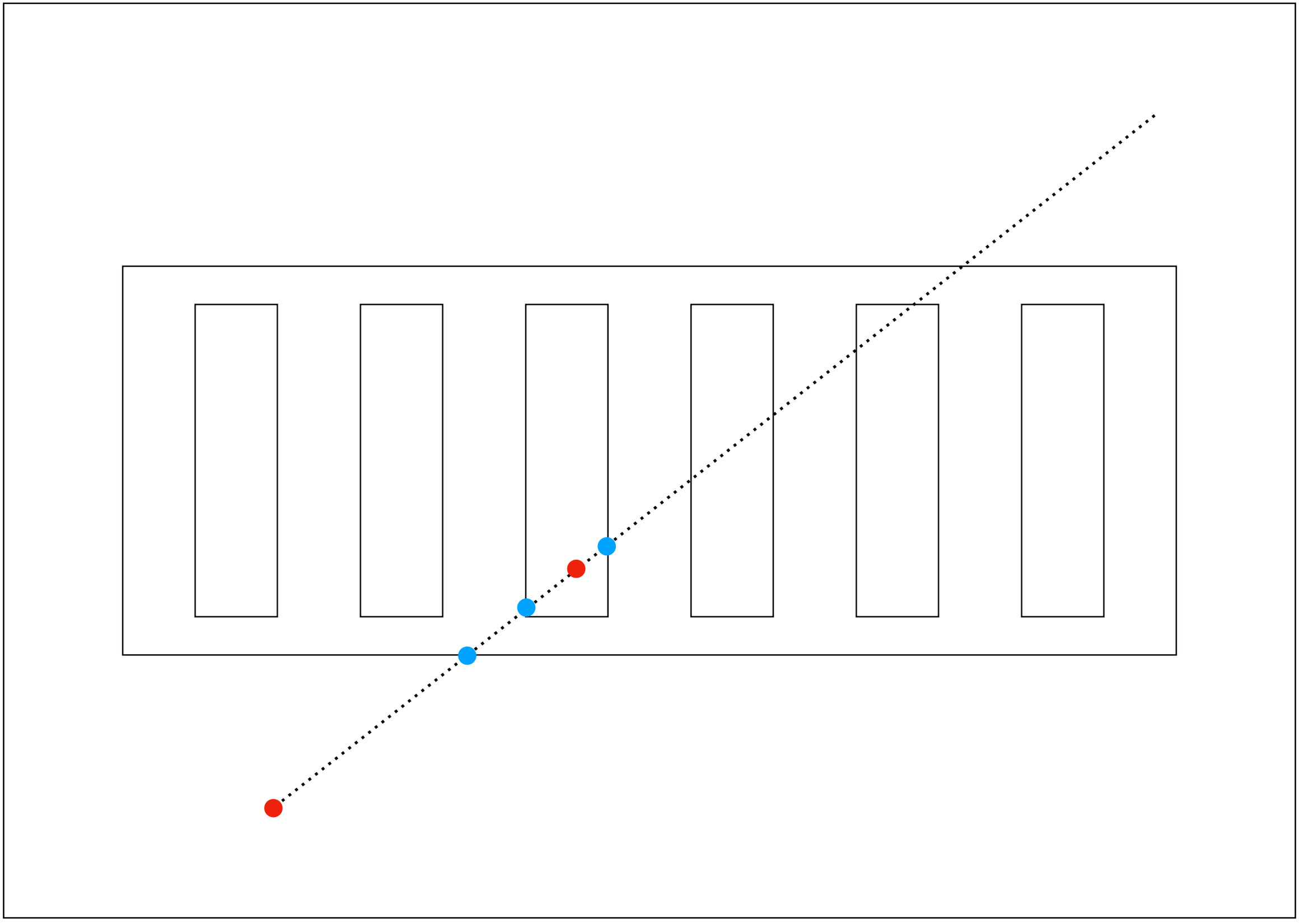


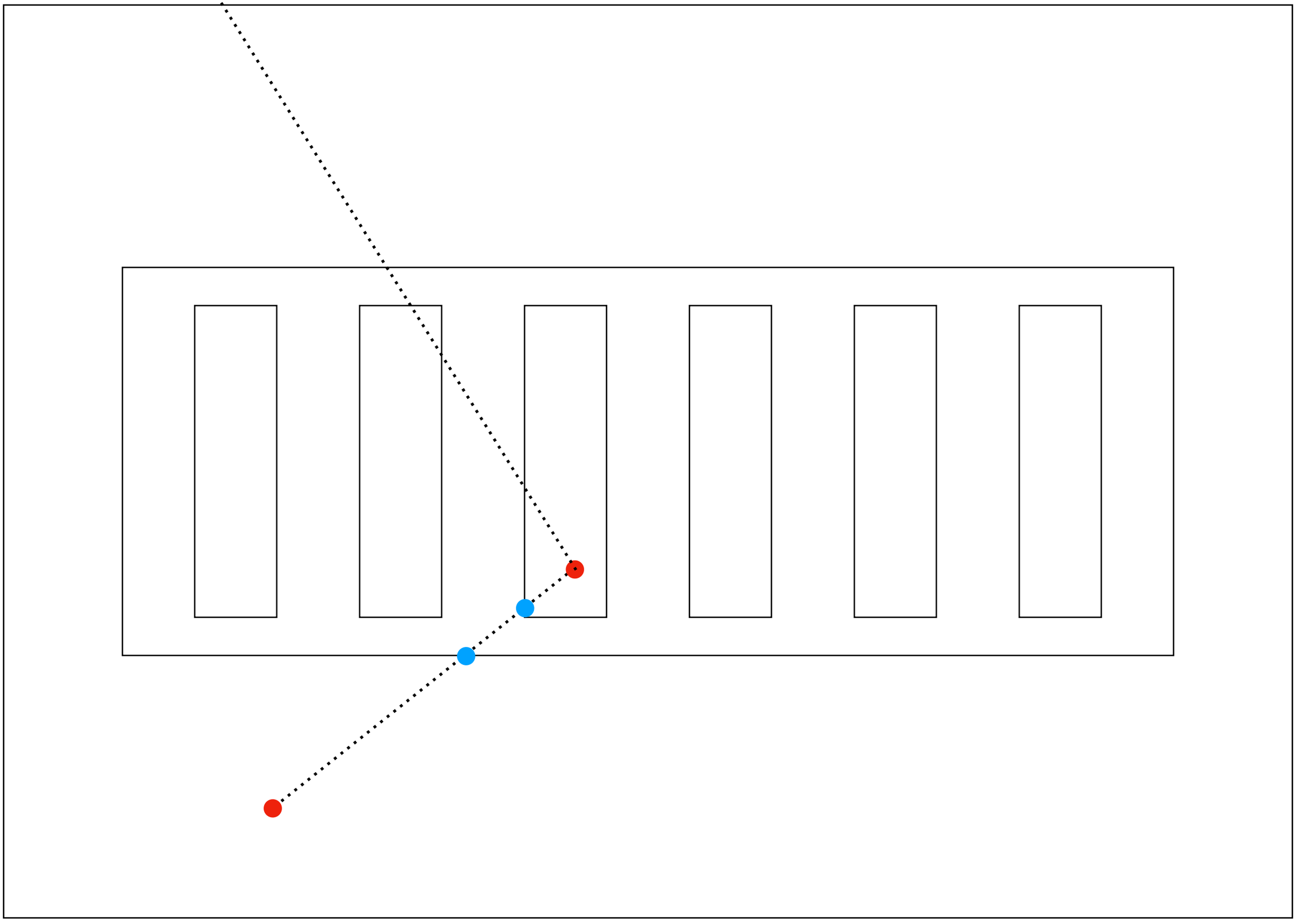
NVIDIA®

OPTIX™

RTX 2080 Ti
GEFORCE RTX

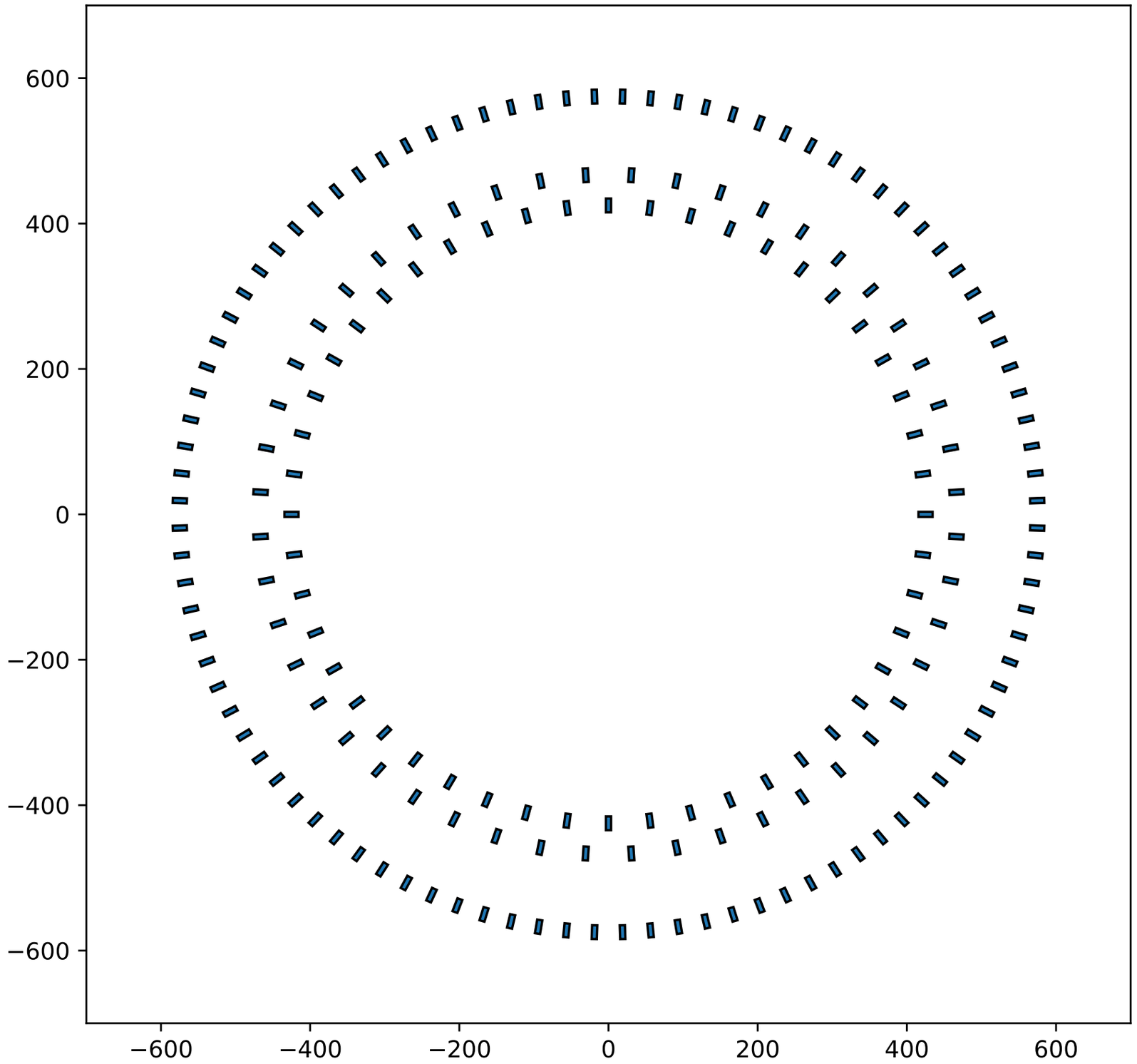

Launch
rtContextLaunch
Ray Generation Program
Exception Program
rtTrace
Traverse
Node Graph Traversal
Selector Visit Program
Acceleration Traversal
Intersection Program
Shade
Miss Program
Closest Hit Program
Any Hit Program

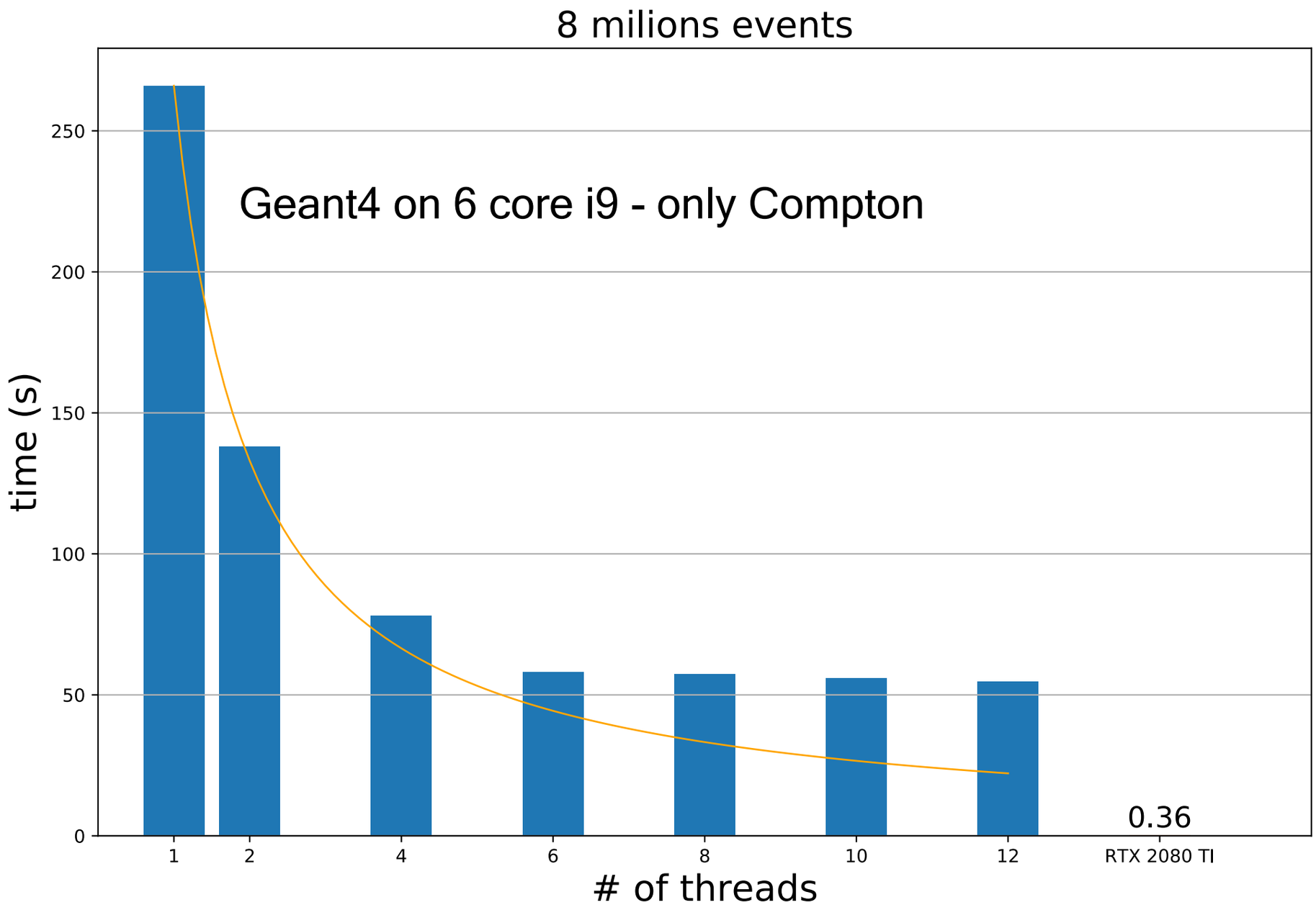


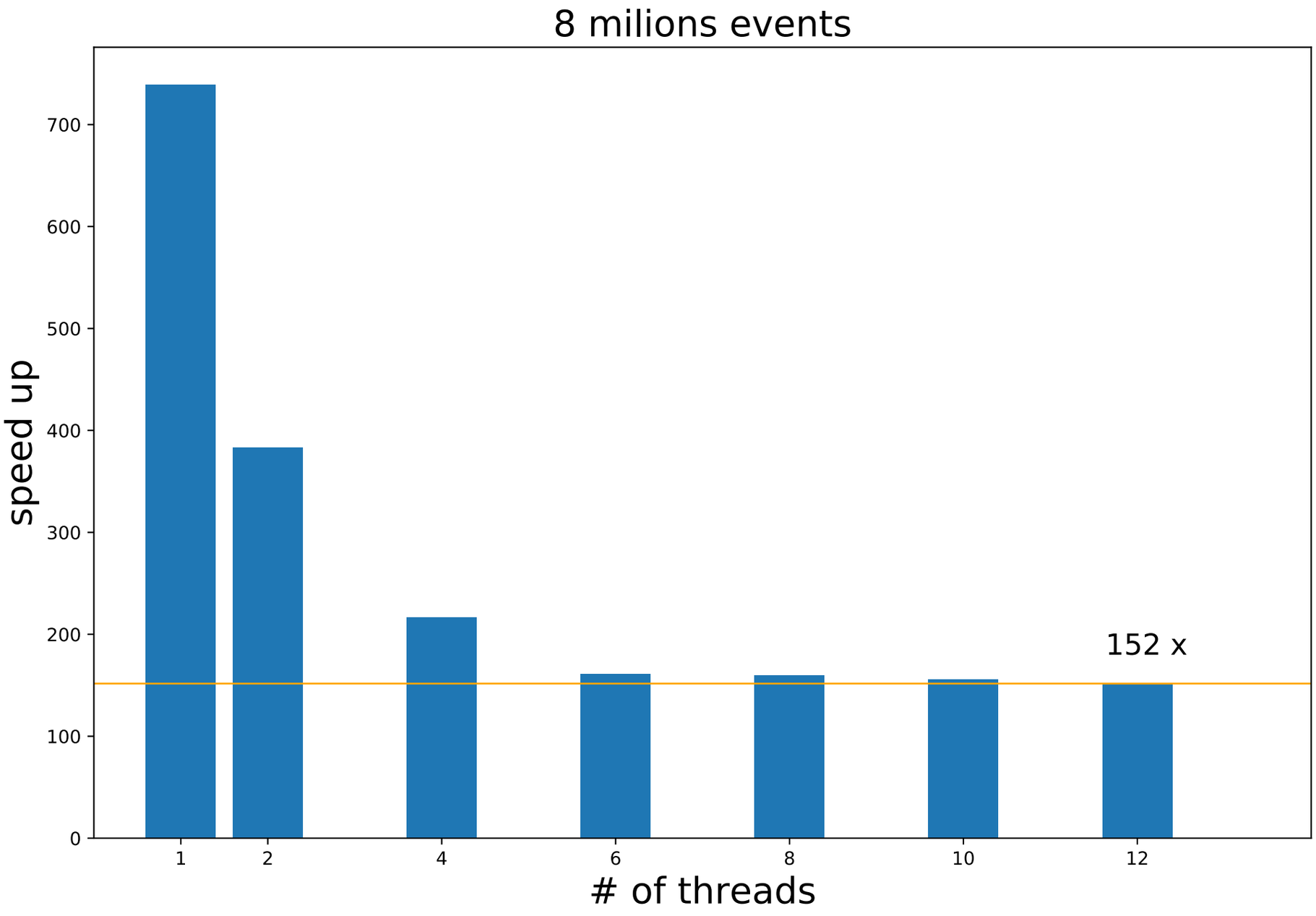


- J-PET three layers „Big Barrel”

- Compton scattering only (for now).


600
400
200
0
−200
−400
−600
−600
−400
−200
0
200
400
600


8 milions events
Geant4 on 6 core i9 - only Compton
time (s)
250
200
150
100
50
0
1
2
4
6
8
10
12
0.36
RTX 2080 TI
# of threads


8 milions events
speed up
0
100
200
300
400
500
600
700
1
2
4
6
8
10
12
# of threads
152 x

Caveats

- Neutral particles or no magnetic field.

- Hardware support for triangles.

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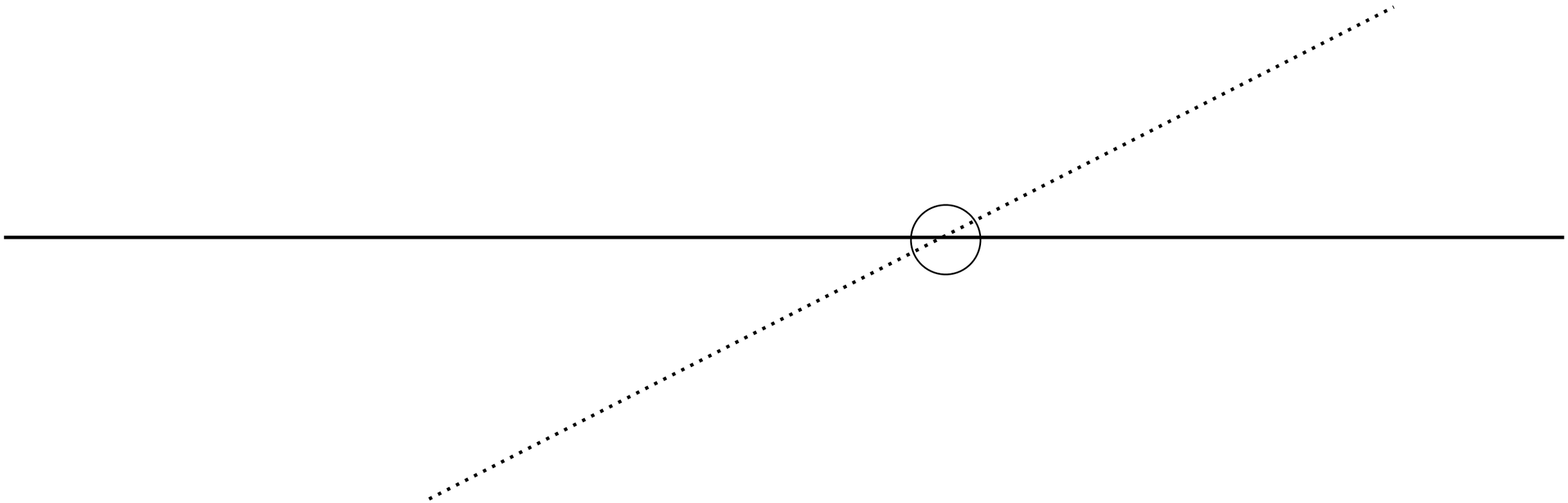

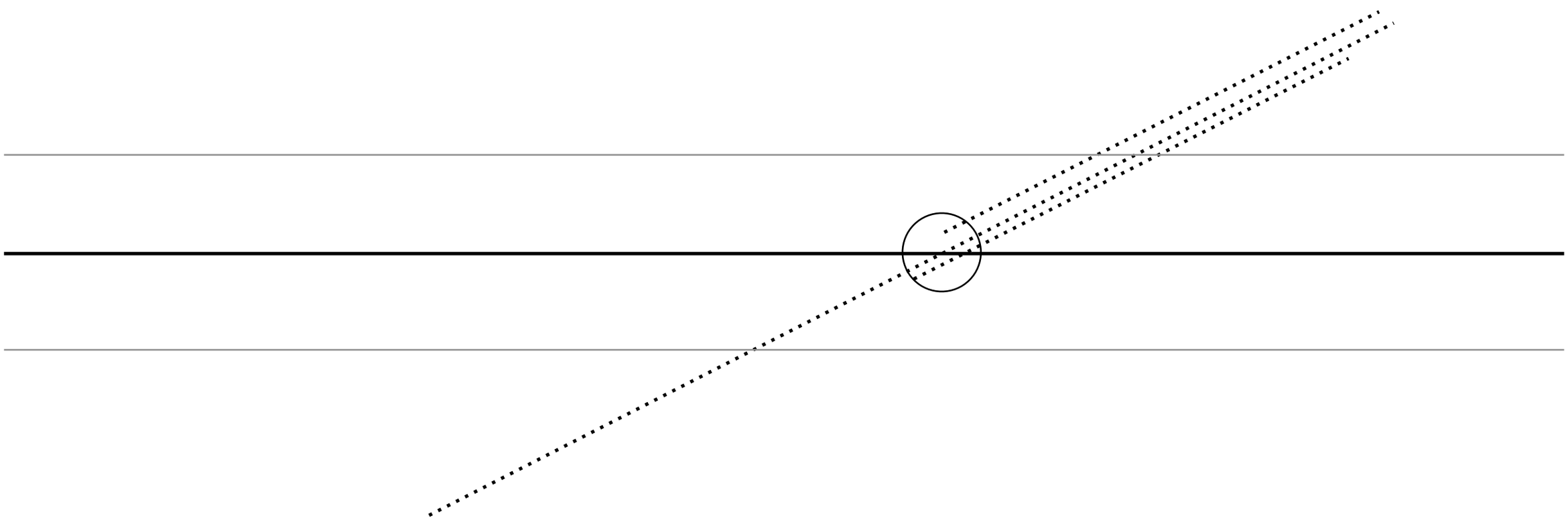

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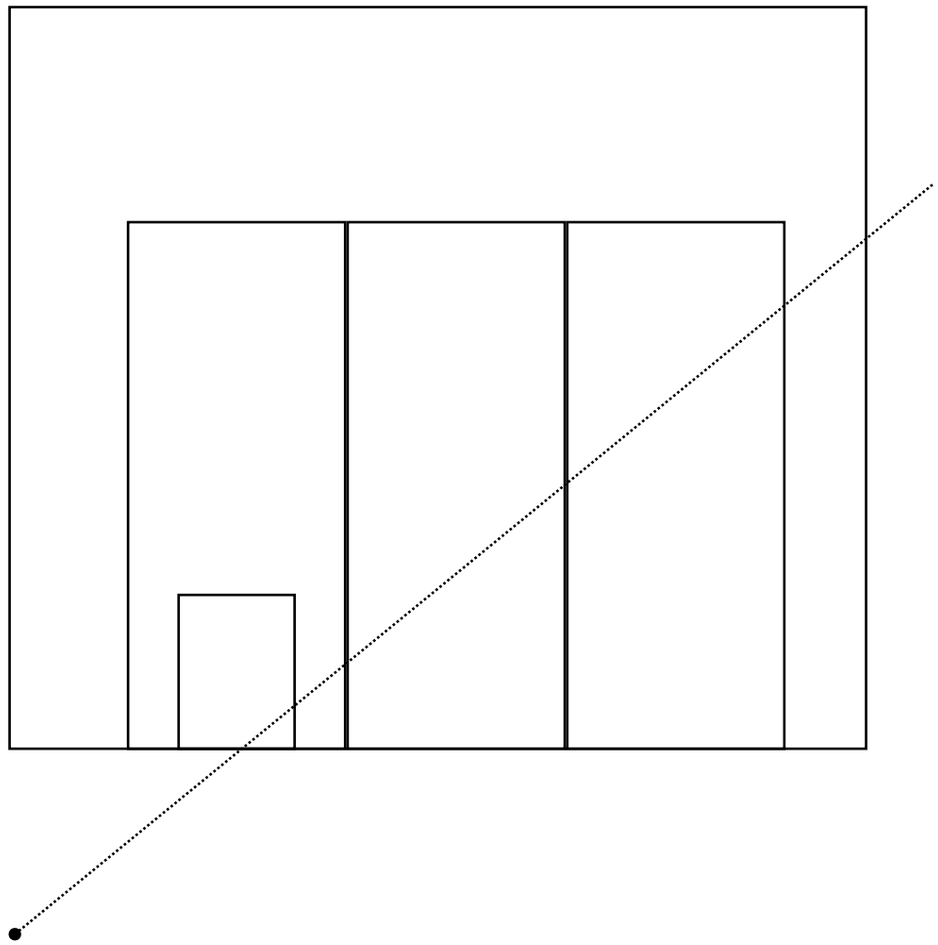

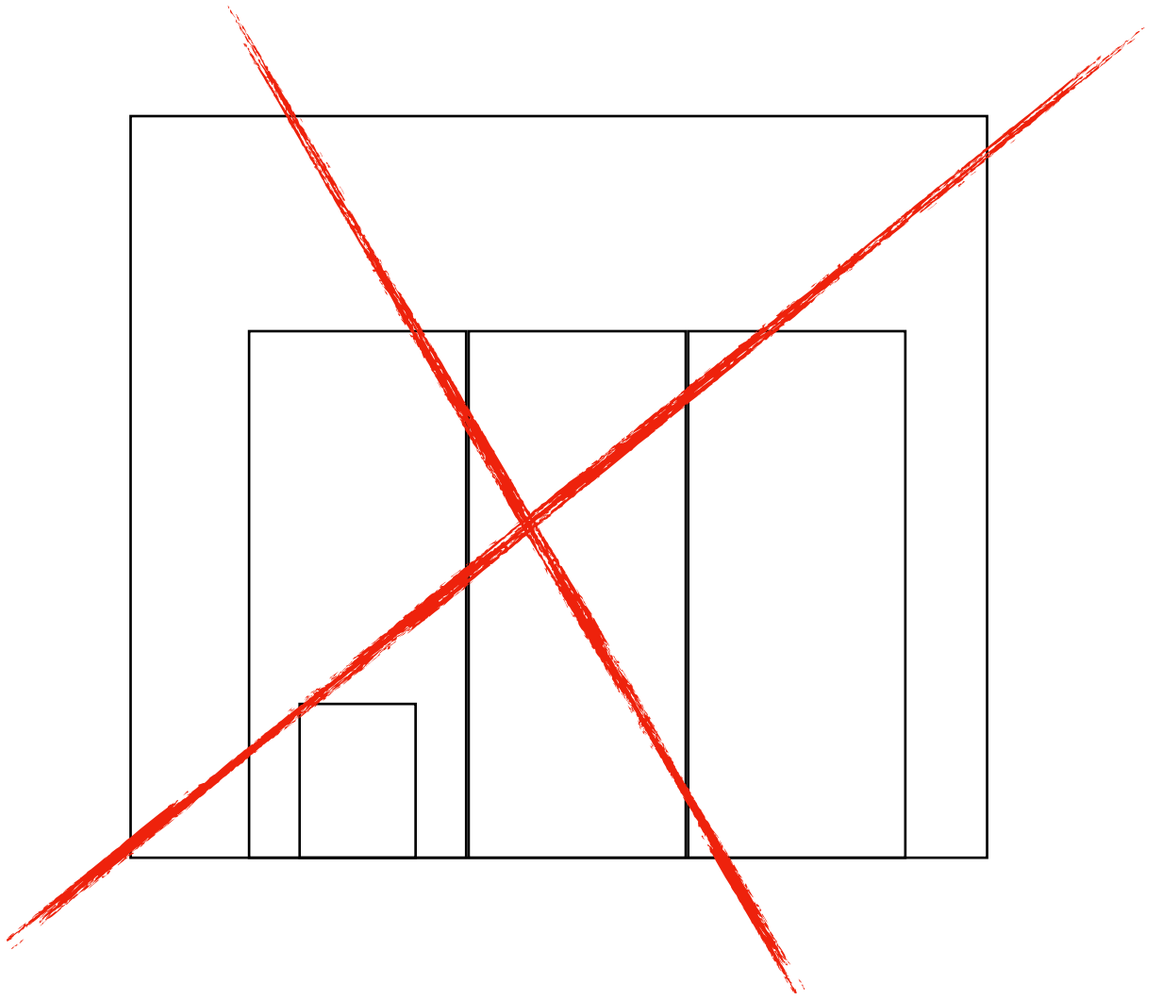

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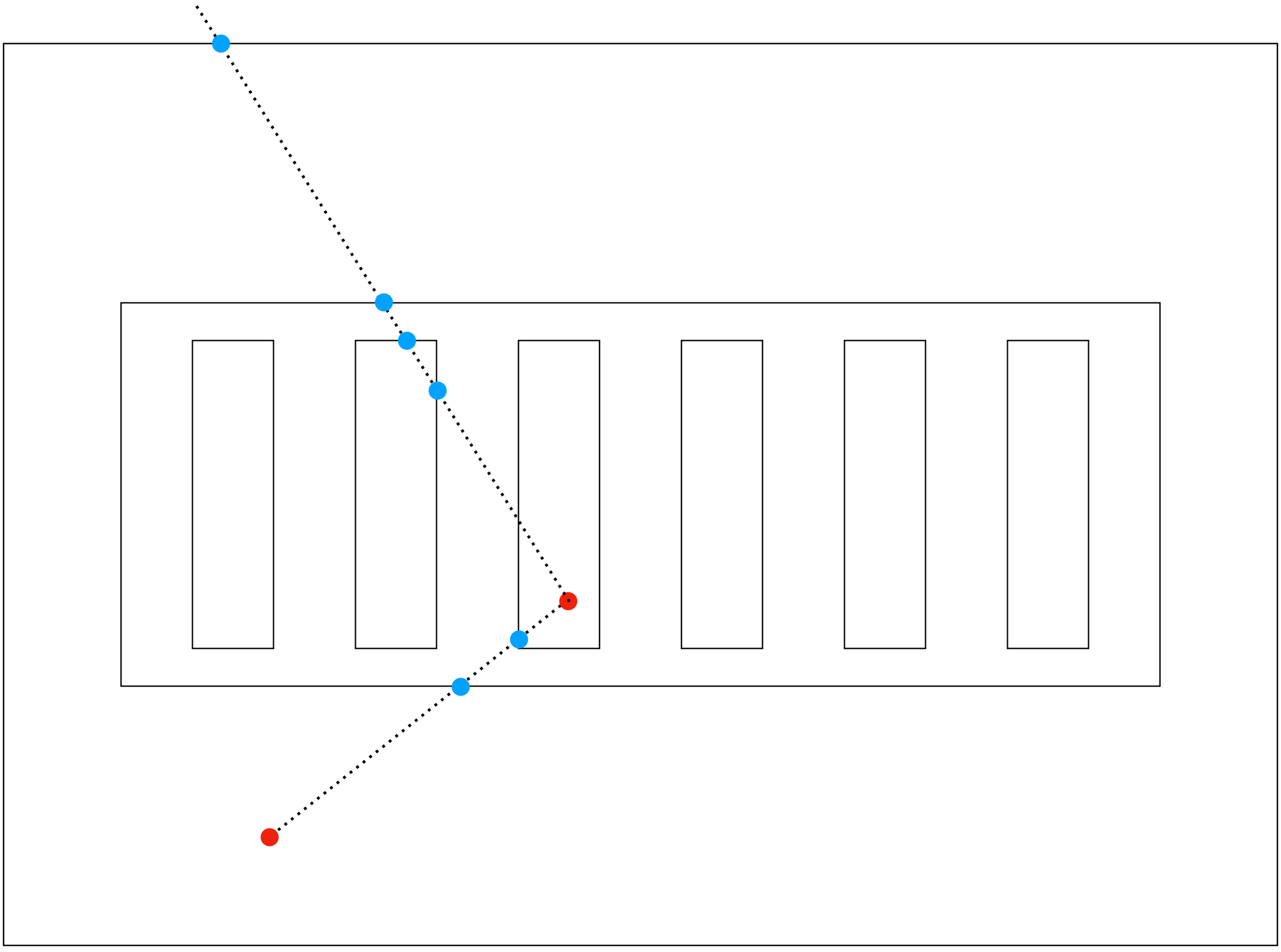

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- Work in progress on Vulkan based version.