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nvidia-linux-gpu-performance-20212

AMD Ryzen 9 5950X 16-Core testing with a ASUS ROG CROSSHAIR VIII HERO (WI-FI) (3202 BIOS) and NVIDIA GeForce RTX 2080 Ti 11GB on Ubuntu 20.10 via the Phoronix Test Suite.

Automated Executive Summary

RTX 3080 had the most wins, coming in first place for 78% of the tests.

The results with the greatest spread from best to worst included:

Chaos Group V-RAY (Mode: NVIDIA CUDA GPU) at 3.386x
Chaos Group V-RAY (Mode: NVIDIA RTX GPU) at 2.978x
Ray Tracing In Vulkan (Resolution: 3840 x 2160 - Scene: Cornell Box + Lucy) at 2.751x
Ray Tracing In Vulkan (Resolution: 2560 x 1440 - Scene: Cornell Box + Lucy) at 2.729x
Ray Tracing In Vulkan (Resolution: 1920 x 1200 - Scene: Cornell Box + Lucy) at 2.714x
Ray Tracing In Vulkan (Resolution: 1920 x 1080 - Scene: Cornell Box + Lucy) at 2.706x
Ray Tracing In Vulkan (Resolution: 1920 x 1080 - Scene: Lucy In One Weekend) at 2.481x
Ray Tracing In Vulkan (Resolution: 1920 x 1200 - Scene: Lucy In One Weekend) at 2.414x
Ray Tracing In Vulkan (Resolution: 2560 x 1440 - Scene: Lucy In One Weekend) at 2.403x
Ray Tracing In Vulkan (Resolution: 3840 x 2160 - Scene: Lucy In One Weekend) at 2.391x.

Test Systems:

RTX 3080

Processor: AMD Ryzen 9 5950X 16-Core @ 3.40GHz (16 Cores / 32 Threads), Motherboard: ASUS ROG CROSSHAIR VIII HERO (WI-FI) (3202 BIOS), Chipset: AMD Starship/Matisse, Memory: 32GB, Disk: 2000GB Corsair Force MP600 + 2000GB, Graphics: NVIDIA GeForce RTX 3080 10GB (1710/9501MHz), Audio: NVIDIA Device 1aef, Monitor: ASUS MG28U, Network: Realtek RTL8125 2.5GbE + Intel I211 + Intel Wi-Fi 6 AX200

OS: Ubuntu 20.10, Kernel: 5.8.0-41-generic (x86_64), Desktop: GNOME Shell 3.38.2, Display Server: X Server 1.20.9, Display Driver: NVIDIA 460.39, OpenGL: 4.6.0, OpenCL: OpenCL 1.2 CUDA 11.2.136, Vulkan: 1.2.155, Compiler: GCC 10.2.0 + Clang 11.0.1-1~oibaf~g, File-System: ext4, Screen Resolution: 3840x2160

Kernel Notes: Transparent Huge Pages: madvise
Compiler Notes: --build=x86_64-linux-gnu --disable-vtable-verify --disable-werror --enable-checking=release --enable-clocale=gnu --enable-default-pie --enable-gnu-unique-object --enable-languages=c,ada,c++,go,brig,d,fortran,objc,obj-c++,m2 --enable-libphobos-checking=release --enable-libstdcxx-debug --enable-libstdcxx-time=yes --enable-multiarch --enable-multilib --enable-nls --enable-objc-gc=auto --enable-offload-targets=nvptx-none=/build/gcc-10-JvwpWM/gcc-10-10.2.0/debian/tmp-nvptx/usr,amdgcn-amdhsa=/build/gcc-10-JvwpWM/gcc-10-10.2.0/debian/tmp-gcn/usr,hsa --enable-plugin --enable-shared --enable-threads=posix --host=x86_64-linux-gnu --program-prefix=x86_64-linux-gnu- --target=x86_64-linux-gnu --with-abi=m64 --with-arch-32=i686 --with-default-libstdcxx-abi=new --with-gcc-major-version-only --with-multilib-list=m32,m64,mx32 --with-target-system-zlib=auto --with-tune=generic --without-cuda-driver -v
Processor Notes: Scaling Governor: acpi-cpufreq performance (Boost: Enabled) - CPU Microcode: 0xa201009
OpenCL Notes: GPU Compute Cores: 8704
Python Notes: Python 3.8.6
Security Notes: itlb_multihit: Not affected + l1tf: Not affected + mds: Not affected + meltdown: Not affected + spec_store_bypass: Mitigation of SSB disabled via prctl and seccomp + spectre_v1: Mitigation of usercopy/swapgs barriers and __user pointer sanitization + spectre_v2: Mitigation of Full AMD retpoline IBPB: conditional IBRS_FW STIBP: always-on RSB filling + srbds: Not affected + tsx_async_abort: Not affected

RTX 3060 Ti

Processor: AMD Ryzen 9 5950X 16-Core @ 3.40GHz (16 Cores / 32 Threads), Motherboard: ASUS ROG CROSSHAIR VIII HERO (WI-FI) (3202 BIOS), Chipset: AMD Starship/Matisse, Memory: 32GB, Disk: 2000GB Corsair Force MP600 + 2000GB, Graphics: NVIDIA GeForce RTX 3060 Ti 8GB (345/405MHz), Audio: NVIDIA Device 228b, Monitor: ASUS MG28U, Network: Realtek RTL8125 2.5GbE + Intel I211 + Intel Wi-Fi 6 AX200

OS: Ubuntu 20.10, Kernel: 5.8.0-41-generic (x86_64), Desktop: GNOME Shell 3.38.2, Display Server: X Server 1.20.9, Display Driver: NVIDIA 460.39, OpenGL: 4.6.0, OpenCL: OpenCL 1.2 CUDA 11.2.136, Vulkan: 1.2.155, Compiler: GCC 10.2.0 + Clang 11.0.1-1~oibaf~g, File-System: ext4, Screen Resolution: 3840x2160

Kernel Notes: Transparent Huge Pages: madvise
Compiler Notes: --build=x86_64-linux-gnu --disable-vtable-verify --disable-werror --enable-checking=release --enable-clocale=gnu --enable-default-pie --enable-gnu-unique-object --enable-languages=c,ada,c++,go,brig,d,fortran,objc,obj-c++,m2 --enable-libphobos-checking=release --enable-libstdcxx-debug --enable-libstdcxx-time=yes --enable-multiarch --enable-multilib --enable-nls --enable-objc-gc=auto --enable-offload-targets=nvptx-none=/build/gcc-10-JvwpWM/gcc-10-10.2.0/debian/tmp-nvptx/usr,amdgcn-amdhsa=/build/gcc-10-JvwpWM/gcc-10-10.2.0/debian/tmp-gcn/usr,hsa --enable-plugin --enable-shared --enable-threads=posix --host=x86_64-linux-gnu --program-prefix=x86_64-linux-gnu- --target=x86_64-linux-gnu --with-abi=m64 --with-arch-32=i686 --with-default-libstdcxx-abi=new --with-gcc-major-version-only --with-multilib-list=m32,m64,mx32 --with-target-system-zlib=auto --with-tune=generic --without-cuda-driver -v
Processor Notes: Scaling Governor: acpi-cpufreq ondemand (Boost: Enabled) - CPU Microcode: 0xa201009
OpenCL Notes: GPU Compute Cores: 4864
Python Notes: Python 3.8.6
Security Notes: itlb_multihit: Not affected + l1tf: Not affected + mds: Not affected + meltdown: Not affected + spec_store_bypass: Mitigation of SSB disabled via prctl and seccomp + spectre_v1: Mitigation of usercopy/swapgs barriers and __user pointer sanitization + spectre_v2: Mitigation of Full AMD retpoline IBPB: conditional IBRS_FW STIBP: always-on RSB filling + srbds: Not affected + tsx_async_abort: Not affected

NVIDIA GeForce RTX 3060 Ti

Processor: AMD Ryzen 9 5950X 16-Core @ 3.40GHz (16 Cores / 32 Threads), Motherboard: ASUS ROG CROSSHAIR VIII HERO (WI-FI) (3202 BIOS), Chipset: AMD Starship/Matisse, Memory: 32GB, Disk: 2000GB Corsair Force MP600 + 2000GB, Graphics: NVIDIA GeForce RTX 3060 Ti 8GB (360/405MHz), Audio: NVIDIA Device 228b, Monitor: ASUS MG28U, Network: Realtek RTL8125 2.5GbE + Intel I211 + Intel Wi-Fi 6 AX200

OS: Ubuntu 20.10, Kernel: 5.8.0-41-generic (x86_64), Desktop: GNOME Shell 3.38.2, Display Server: X Server 1.20.9, Display Driver: NVIDIA 460.39, OpenGL: 4.6.0, OpenCL: OpenCL 1.2 CUDA 11.2.136, Vulkan: 1.2.155, Compiler: GCC 10.2.0 + Clang 11.0.1-1~oibaf~g, File-System: ext4, Screen Resolution: 3840x2160

Kernel Notes: Transparent Huge Pages: madvise
Compiler Notes: --build=x86_64-linux-gnu --disable-vtable-verify --disable-werror --enable-checking=release --enable-clocale=gnu --enable-default-pie --enable-gnu-unique-object --enable-languages=c,ada,c++,go,brig,d,fortran,objc,obj-c++,m2 --enable-libphobos-checking=release --enable-libstdcxx-debug --enable-libstdcxx-time=yes --enable-multiarch --enable-multilib --enable-nls --enable-objc-gc=auto --enable-offload-targets=nvptx-none=/build/gcc-10-JvwpWM/gcc-10-10.2.0/debian/tmp-nvptx/usr,amdgcn-amdhsa=/build/gcc-10-JvwpWM/gcc-10-10.2.0/debian/tmp-gcn/usr,hsa --enable-plugin --enable-shared --enable-threads=posix --host=x86_64-linux-gnu --program-prefix=x86_64-linux-gnu- --target=x86_64-linux-gnu --with-abi=m64 --with-arch-32=i686 --with-default-libstdcxx-abi=new --with-gcc-major-version-only --with-multilib-list=m32,m64,mx32 --with-target-system-zlib=auto --with-tune=generic --without-cuda-driver -v
Processor Notes: Scaling Governor: acpi-cpufreq ondemand (Boost: Enabled) - CPU Microcode: 0xa201009
Security Notes: itlb_multihit: Not affected + l1tf: Not affected + mds: Not affected + meltdown: Not affected + spec_store_bypass: Mitigation of SSB disabled via prctl and seccomp + spectre_v1: Mitigation of usercopy/swapgs barriers and __user pointer sanitization + spectre_v2: Mitigation of Full AMD retpoline IBPB: conditional IBRS_FW STIBP: always-on RSB filling + srbds: Not affected + tsx_async_abort: Not affected

RTX 2070 SUPER

Processor: AMD Ryzen 9 5950X 16-Core @ 3.40GHz (16 Cores / 32 Threads), Motherboard: ASUS ROG CROSSHAIR VIII HERO (WI-FI) (3202 BIOS), Chipset: AMD Starship/Matisse, Memory: 32GB, Disk: 2000GB Corsair Force MP600 + 2000GB, Graphics: NVIDIA GeForce RTX 2070 SUPER 8GB (1605/7000MHz), Audio: NVIDIA TU104 HD Audio, Monitor: ASUS MG28U, Network: Realtek RTL8125 2.5GbE + Intel I211 + Intel Wi-Fi 6 AX200

OS: Ubuntu 20.10, Kernel: 5.8.0-41-generic (x86_64), Desktop: GNOME Shell 3.38.2, Display Server: X Server 1.20.9, Display Driver: NVIDIA 460.39, OpenGL: 4.6.0, OpenCL: OpenCL 1.2 CUDA 11.2.136, Vulkan: 1.2.155, Compiler: GCC 10.2.0 + Clang 11.0.1-1~oibaf~g, File-System: ext4, Screen Resolution: 3840x2160

Kernel Notes: Transparent Huge Pages: madvise
Compiler Notes: --build=x86_64-linux-gnu --disable-vtable-verify --disable-werror --enable-checking=release --enable-clocale=gnu --enable-default-pie --enable-gnu-unique-object --enable-languages=c,ada,c++,go,brig,d,fortran,objc,obj-c++,m2 --enable-libphobos-checking=release --enable-libstdcxx-debug --enable-libstdcxx-time=yes --enable-multiarch --enable-multilib --enable-nls --enable-objc-gc=auto --enable-offload-targets=nvptx-none=/build/gcc-10-JvwpWM/gcc-10-10.2.0/debian/tmp-nvptx/usr,amdgcn-amdhsa=/build/gcc-10-JvwpWM/gcc-10-10.2.0/debian/tmp-gcn/usr,hsa --enable-plugin --enable-shared --enable-threads=posix --host=x86_64-linux-gnu --program-prefix=x86_64-linux-gnu- --target=x86_64-linux-gnu --with-abi=m64 --with-arch-32=i686 --with-default-libstdcxx-abi=new --with-gcc-major-version-only --with-multilib-list=m32,m64,mx32 --with-target-system-zlib=auto --with-tune=generic --without-cuda-driver -v
Processor Notes: Scaling Governor: acpi-cpufreq performance (Boost: Enabled) - CPU Microcode: 0xa201009
OpenCL Notes: GPU Compute Cores: 2560
Python Notes: Python 3.8.6
Security Notes: itlb_multihit: Not affected + l1tf: Not affected + mds: Not affected + meltdown: Not affected + spec_store_bypass: Mitigation of SSB disabled via prctl and seccomp + spectre_v1: Mitigation of usercopy/swapgs barriers and __user pointer sanitization + spectre_v2: Mitigation of Full AMD retpoline IBPB: conditional IBRS_FW STIBP: always-on RSB filling + srbds: Not affected + tsx_async_abort: Not affected

RTX 2060 SUPER

Processor: AMD Ryzen 9 5950X 16-Core @ 3.40GHz (16 Cores / 32 Threads), Motherboard: ASUS ROG CROSSHAIR VIII HERO (WI-FI) (3202 BIOS), Chipset: AMD Starship/Matisse, Memory: 32GB, Disk: 2000GB Corsair Force MP600 + 2000GB, Graphics: NVIDIA GeForce RTX 2060 SUPER 8GB (390/405MHz), Audio: NVIDIA TU106 HD Audio, Monitor: ASUS MG28U, Network: Realtek RTL8125 2.5GbE + Intel I211 + Intel Wi-Fi 6 AX200

OS: Ubuntu 20.10, Kernel: 5.8.0-41-generic (x86_64), Desktop: GNOME Shell 3.38.2, Display Server: X Server 1.20.9, Display Driver: NVIDIA 460.39, OpenGL: 4.6.0, OpenCL: OpenCL 1.2 CUDA 11.2.136, Vulkan: 1.2.155, Compiler: GCC 10.2.0 + Clang 11.0.1-1~oibaf~g, File-System: ext4, Screen Resolution: 3840x2160

Kernel Notes: Transparent Huge Pages: madvise
Compiler Notes: --build=x86_64-linux-gnu --disable-vtable-verify --disable-werror --enable-checking=release --enable-clocale=gnu --enable-default-pie --enable-gnu-unique-object --enable-languages=c,ada,c++,go,brig,d,fortran,objc,obj-c++,m2 --enable-libphobos-checking=release --enable-libstdcxx-debug --enable-libstdcxx-time=yes --enable-multiarch --enable-multilib --enable-nls --enable-objc-gc=auto --enable-offload-targets=nvptx-none=/build/gcc-10-JvwpWM/gcc-10-10.2.0/debian/tmp-nvptx/usr,amdgcn-amdhsa=/build/gcc-10-JvwpWM/gcc-10-10.2.0/debian/tmp-gcn/usr,hsa --enable-plugin --enable-shared --enable-threads=posix --host=x86_64-linux-gnu --program-prefix=x86_64-linux-gnu- --target=x86_64-linux-gnu --with-abi=m64 --with-arch-32=i686 --with-default-libstdcxx-abi=new --with-gcc-major-version-only --with-multilib-list=m32,m64,mx32 --with-target-system-zlib=auto --with-tune=generic --without-cuda-driver -v
Processor Notes: Scaling Governor: acpi-cpufreq performance (Boost: Enabled) - CPU Microcode: 0xa201009
OpenCL Notes: GPU Compute Cores: 2176

Python Notes: Python 3.8.6
Security Notes: itlb_multihit: Not affected + l1tf: Not affected + mds: Not affected + meltdown: Not affected + spec_store_bypass: Mitigation of SSB disabled via prctl and seccomp + spectre_v1: Mitigation of usercopy/swapgs barriers and __user pointer sanitization + spectre_v2: Mitigation of Full AMD retpoline IBPB: conditional IBRS_FW STIBP: always-on RSB filling + srbds: Not affected + tsx_async_abort: Not affected

RTX 2080 SUPER

Processor: AMD Ryzen 9 5950X 16-Core @ 3.40GHz (16 Cores / 32 Threads), Motherboard: ASUS ROG CROSSHAIR VIII HERO (WI-FI) (3202 BIOS), Chipset: AMD Starship/Matisse, Memory: 32GB, Disk: 2000GB Corsair Force MP600 + 2000GB, Graphics: NVIDIA GeForce RTX 2080 SUPER 8GB (1650/7750MHz), Audio: NVIDIA TU104 HD Audio, Monitor: ASUS MG28U, Network: Realtek RTL8125 2.5GbE + Intel I211 + Intel Wi-Fi 6 AX200

OS: Ubuntu 20.10, Kernel: 5.8.0-41-generic (x86_64), Desktop: GNOME Shell 3.38.2, Display Server: X Server 1.20.9, Display Driver: NVIDIA 460.39, OpenGL: 4.6.0, OpenCL: OpenCL 1.2 CUDA 11.2.136, Vulkan: 1.2.155, Compiler: GCC 10.2.0 + Clang 11.0.1-1~oibaf~g, File-System: ext4, Screen Resolution: 3840x2160

Kernel Notes: Transparent Huge Pages: madvise
Compiler Notes: --build=x86_64-linux-gnu --disable-vtable-verify --disable-werror --enable-checking=release --enable-clocale=gnu --enable-default-pie --enable-gnu-unique-object --enable-languages=c,ada,c++,go,brig,d,fortran,objc,obj-c++,m2 --enable-libphobos-checking=release --enable-libstdcxx-debug --enable-libstdcxx-time=yes --enable-multiarch --enable-multilib --enable-nls --enable-objc-gc=auto --enable-offload-targets=nvptx-none=/build/gcc-10-JvwpWM/gcc-10-10.2.0/debian/tmp-nvptx/usr,amdgcn-amdhsa=/build/gcc-10-JvwpWM/gcc-10-10.2.0/debian/tmp-gcn/usr,hsa --enable-plugin --enable-shared --enable-threads=posix --host=x86_64-linux-gnu --program-prefix=x86_64-linux-gnu- --target=x86_64-linux-gnu --with-abi=m64 --with-arch-32=i686 --with-default-libstdcxx-abi=new --with-gcc-major-version-only --with-multilib-list=m32,m64,mx32 --with-target-system-zlib=auto --with-tune=generic --without-cuda-driver -v
Processor Notes: Scaling Governor: acpi-cpufreq performance (Boost: Enabled) - CPU Microcode: 0xa201009
OpenCL Notes: GPU Compute Cores: 3072
Python Notes: Python 3.8.6
Security Notes: itlb_multihit: Not affected + l1tf: Not affected + mds: Not affected + meltdown: Not affected + spec_store_bypass: Mitigation of SSB disabled via prctl and seccomp + spectre_v1: Mitigation of usercopy/swapgs barriers and __user pointer sanitization + spectre_v2: Mitigation of Full AMD retpoline IBPB: conditional IBRS_FW STIBP: always-on RSB filling + srbds: Not affected + tsx_async_abort: Not affected

RTX 2080 Ti

Processor: AMD Ryzen 9 5950X 16-Core @ 3.40GHz (16 Cores / 32 Threads), Motherboard: ASUS ROG CROSSHAIR VIII HERO (WI-FI) (3202 BIOS), Chipset: AMD Starship/Matisse, Memory: 32GB, Disk: 2000GB Corsair Force MP600 + 2000GB, Graphics: NVIDIA GeForce RTX 2080 Ti 11GB (1350/7000MHz), Audio: NVIDIA TU102 HD Audio, Monitor: ASUS MG28U, Network: Realtek RTL8125 2.5GbE + Intel I211 + Intel Wi-Fi 6 AX200

OS: Ubuntu 20.10, Kernel: 5.8.0-41-generic (x86_64), Desktop: GNOME Shell 3.38.2, Display Server: X Server 1.20.9, Display Driver: NVIDIA 460.39, OpenGL: 4.6.0, OpenCL: OpenCL 1.2 CUDA 11.2.136, Vulkan: 1.2.155, Compiler: GCC 10.2.0 + Clang 11.0.1-1~oibaf~g, File-System: ext4, Screen Resolution: 3840x2160

Kernel Notes: Transparent Huge Pages: madvise
Compiler Notes: --build=x86_64-linux-gnu --disable-vtable-verify --disable-werror --enable-checking=release --enable-clocale=gnu --enable-default-pie --enable-gnu-unique-object --enable-languages=c,ada,c++,go,brig,d,fortran,objc,obj-c++,m2 --enable-libphobos-checking=release --enable-libstdcxx-debug --enable-libstdcxx-time=yes --enable-multiarch --enable-multilib --enable-nls --enable-objc-gc=auto --enable-offload-targets=nvptx-none=/build/gcc-10-JvwpWM/gcc-10-10.2.0/debian/tmp-nvptx/usr,amdgcn-amdhsa=/build/gcc-10-JvwpWM/gcc-10-10.2.0/debian/tmp-gcn/usr,hsa --enable-plugin --enable-shared --enable-threads=posix --host=x86_64-linux-gnu --program-prefix=x86_64-linux-gnu- --target=x86_64-linux-gnu --with-abi=m64 --with-arch-32=i686 --with-default-libstdcxx-abi=new --with-gcc-major-version-only --with-multilib-list=m32,m64,mx32 --with-target-system-zlib=auto --with-tune=generic --without-cuda-driver -v
Processor Notes: Scaling Governor: acpi-cpufreq performance (Boost: Enabled) - CPU Microcode: 0xa201009
OpenCL Notes: GPU Compute Cores: 4352
Python Notes: Python 3.8.6
Security Notes: itlb_multihit: Not affected + l1tf: Not affected + mds: Not affected + meltdown: Not affected + spec_store_bypass: Mitigation of SSB disabled via prctl and seccomp + spectre_v1: Mitigation of usercopy/swapgs barriers and __user pointer sanitization + spectre_v2: Mitigation of Full AMD retpoline IBPB: conditional IBRS_FW STIBP: always-on RSB filling + srbds: Not affected + tsx_async_abort: Not affected

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	RTX 3080	RTX 3060 Ti	NVIDIA GeForce RTX 3060 Ti	RTX 2070 SUPER	RTX 2060 SUPER	RTX 2080 SUPER	RTX 2080 Ti
RealSR-NCNN - 4x - No (sec)	**6.250**	8.761		9.901	**11.501**	9.010	7.506
Normalized	100%	71.34%		63.12%	54.34%	69.37%	83.27%
Standard Deviation	1.2%	1.1%		0.7%	2.3%	10%	1.3%
RealSR-NCNN - 4x - Yes (sec)	**34.114**	54.096		63.020	**75.755**	54.895	43.816
Normalized	100%	63.06%		54.13%	45.03%	62.14%	77.86%
Standard Deviation	0.4%	0.3%		0.8%	0.7%	0.5%	0.9%
Waifu2x-NCNN Vulkan - 2x - 3 - Yes (sec)	**3.439**	4.372		4.689	**5.262**	4.347	3.776
Normalized	100%	78.66%		73.34%	65.36%	79.11%	91.08%
Standard Deviation	0.3%	0.2%		0.6%	2.2%	0.8%	0.5%
VkFFT (Benchmark Score)	**56583**	35228		32063	**31000**	34719	42152
Normalized	100%	62.26%		56.67%	54.79%	61.36%	74.5%
Standard Deviation	0.1%	0.1%		0.7%	0%	0%	0.5%
Hashcat - MD5 (H/s)	**56039666667**	32940366667		35398166667	**29280266667**	42393033333	55298100000
Normalized	100%	58.78%		63.17%	52.25%	75.65%	98.68%
Standard Deviation	0.2%	0.2%		0.1%	0.1%	0.2%	0.1%
Hashcat - SHA1 (H/s)	**19098866667**	11068233333		11121466667	**9341766667**	13420400000	17718433333
Normalized	100%	57.95%		58.23%	48.91%	70.27%	92.77%
Standard Deviation	0.2%	0.1%		0.2%	0.1%	0%	0.3%
Hashcat - 7-Zip (H/s)	**990567**	585967		596367	**495567**	692500	894867
Normalized	100%	59.15%		60.2%	50.03%	69.91%	90.34%
Standard Deviation	0.3%	0.3%		0.3%	0.4%	1.7%	0.4%
Hashcat - SHA-512 (H/s)	**2420400000**	1414633333		1424200000	**1187933333**	1708433333	2239266667
Normalized	100%	58.45%		58.84%	49.08%	70.58%	92.52%
Standard Deviation	0.2%	0.1%		0.2%	0.1%	0.2%	0.1%
Hashcat - T.R.X (H/s)	**721867**	426700		426200	**351200**	520673	657067
Normalized	100%	59.11%		59.04%	48.65%	72.13%	91.02%
Standard Deviation	0.1%	0.4%		0.1%	0.1%	3.2%	0.2%
NAMD CUDA - ATPase Simulation - 327,506 Atoms (days/ns)	**0.13291**	0.13614		0.14823	**0.15857**	0.14894	0.14084
Normalized	100%	97.63%		89.66%	83.82%	89.24%	94.37%
Standard Deviation	1.7%	0.2%		0.4%	0.3%	0.6%	0.1%
Betsy GPU Compressor - ETC1 - Highest (sec)	**3.328**	5.009		5.456	**6.032**	5.296	3.822
Normalized	100%	66.44%		61%	55.17%	62.84%	87.07%
Standard Deviation	1.2%	1.4%		0.7%	0.5%	0.9%	2.5%
Betsy GPU Compressor - ETC2 RGB - Highest (sec)	**4.416**	6.794		7.330	**8.394**	6.831	5.008
Normalized	100%	65%		60.25%	52.61%	64.65%	88.18%
Standard Deviation	0.4%	0.2%		0.3%	0.2%	0.1%	0.2%
VkResample - 2x - Double (ms)	**148.005**	266.210		262.249	**309.185**	217.311	155.743
Normalized	100%	55.6%		56.44%	47.87%	68.11%	95.03%
Standard Deviation	0.1%	0.1%		0.4%	0.1%	0.4%	0.1%

VkResample - 2x - Single (ms)	**11.232**	17.658	19.469	**22.234**	17.779	14.780
Normalized	100%	63.61%	57.69%	50.52%	63.18%	75.99%
Standard Deviation	0.3%	0.2%	0.1%	0.2%	0.3%	0.4%
Warsow - 1920 x 1080 (FPS)	**963.6**	**980.4**	979.2	977.5	979.7	979.3
Normalized	98.29%	100%	99.88%	99.7%	99.93%	99.89%
Standard Deviation	2.4%	0.9%	1.1%	1.2%	1.2%	1.1%
Warsow - 1920 x 1200 (FPS)	985.7	**974.5**	**986.0**	985.2	985.7	985.9
Normalized	99.97%	98.83%	100%	99.92%	99.97%	99.99%
Standard Deviation	0.1%	1%	0.1%	0.1%	0.1%	0%
Warsow - 2560 x 1440 (FPS)	984.8	983.3	953.3	**696.3**	983.2	**985.7**
Normalized	99.91%	99.76%	96.71%	70.64%	99.75%	100%
Standard Deviation	0%	0.1%	0.2%	0.6%	0.1%	0.1%
Warsow - 3840 x 2160 (FPS)	**830.2**	499.6	437.6	**353.3**	494.2	553.5
Normalized	100%	60.18%	52.71%	42.56%	59.53%	66.67%
Standard Deviation	0.5%	0.4%	0.1%	0.4%	0.2%	0.2%
OctaneBench - Total Score (Score)	**562.818641**	382.736651	261.261302	**241.445325**	262.843677	358.549904
Normalized	100%	68%	46.42%	42.9%	46.7%	63.71%
RedShift Demo (sec)	**164**	241	348	**379**	328	246
Normalized	100%	68.05%	47.13%	43.27%	50%	66.67%
Standard Deviation		0.4%	0.2%	0.3%		0.2%
Ray Tracing In Vulkan - 1920 x 1080 - Cornell Box (FPS)	**117.919**	68.3205	61.7059	**52.1534**	75.2446	102.060
Normalized	100%	57.94%	52.33%	44.23%	63.81%	86.55%
Standard Deviation	0.1%	0.3%	0.3%	0%	0%	0.2%
Ray Tracing In Vulkan - 1920 x 1200 - Cornell Box (FPS)	**97.1997**	55.7661	50.7312	**42.9372**	61.6809	84.0012
Normalized	100%	57.37%	52.19%	44.17%	63.46%	86.42%
Standard Deviation	0.1%	0.4%	0.1%	0%	0%	0.1%
Ray Tracing In Vulkan - 2560 x 1440 - Cornell Box (FPS)	**67.4759**	38.5985	35.2750	**29.8870**	42.8800	57.9535
Normalized	100%	57.2%	52.28%	44.29%	63.55%	85.89%
Standard Deviation	0.5%	0.4%	0%	0.2%	0%	0.1%
Ray Tracing In Vulkan - 3840 x 2160 - Cornell Box (FPS)	**31.9668**	18.4943	16.7912	**14.1848**	20.3361	27.5750
Normalized	100%	57.85%	52.53%	44.37%	63.62%	86.26%
Standard Deviation	0%	0%	0%	0%	0%	0.1%
Ray Tracing In Vulkan - 1920 x 1080 - Cornell Box + Lucy (FPS)	**59.0920**	34.0683	24.5964	**21.8369**	25.7529	37.7862
Normalized	100%	57.65%	41.62%	36.95%	43.58%	63.94%
Standard Deviation	0.3%	0.1%	0.1%	0.2%	0.2%	0.3%

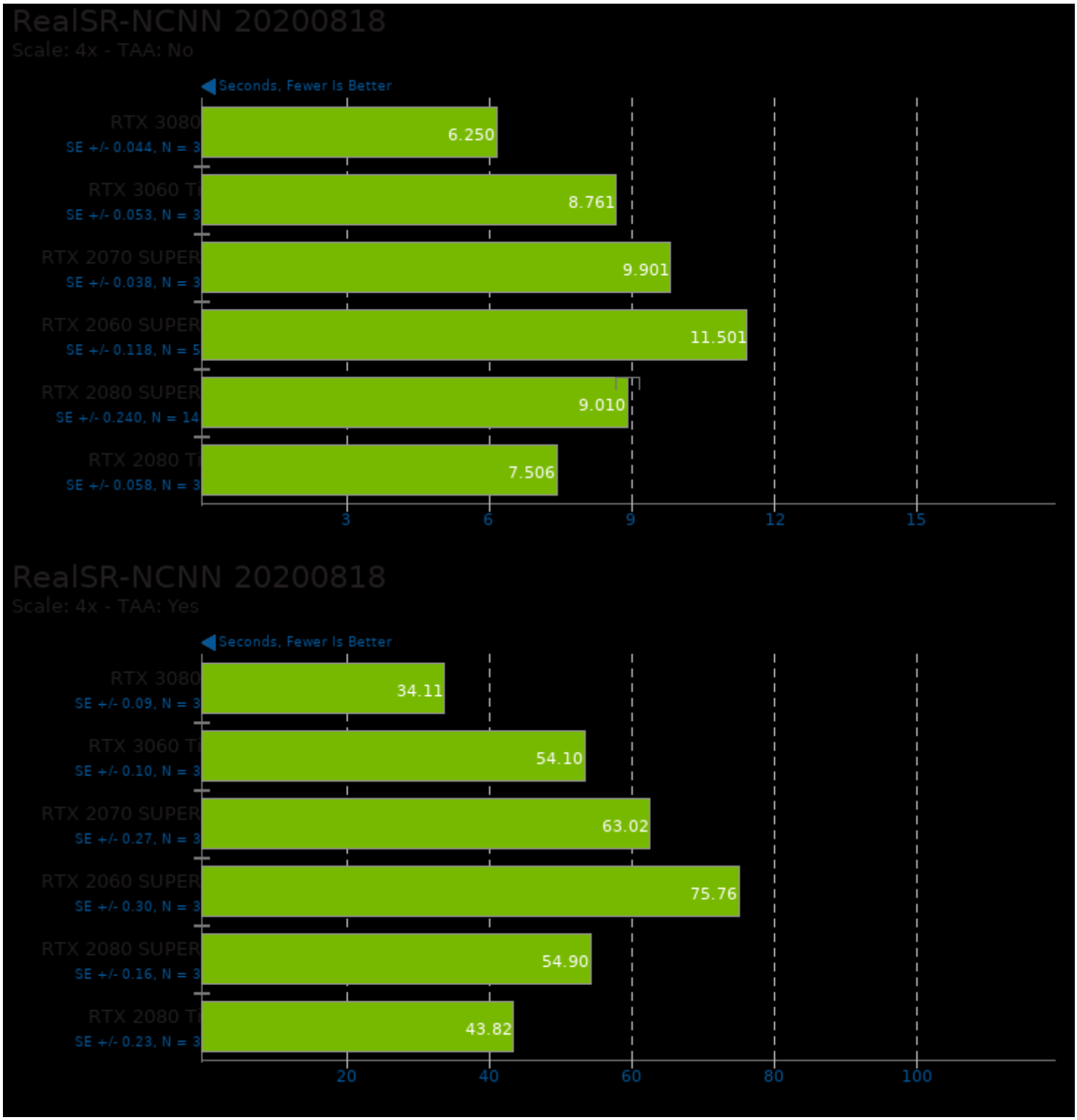
Ray Tracing In Vulkan - 1920 x 1200 - Cornell Box + Lucy (FPS)	**48.4290**	27.8946	20.0635	**17.8450**	21.1197	31.0242
Normalized	100%	57.6%	41.43%	36.85%	43.61%	64.06%
Standard Deviation	0.1%	0.1%	0.3%	0.1%	0.1%	0.2%
Ray Tracing In Vulkan - 2560 x 1440 - Cornell Box + Lucy (FPS)	**33.9422**	19.5451	14.1030	**12.4373**	14.8708	21.8005
Normalized	100%	57.58%	41.55%	36.64%	43.81%	64.23%
Standard Deviation	0.1%	0.1%	0.1%	0.3%	0.1%	0.2%
Ray Tracing In Vulkan - 3840 x 2160 - Cornell Box + Lucy (FPS)	**16.4413**	9.39314	6.77717	**5.97602**	7.14784	10.5369
Normalized	100%	57.13%	41.22%	36.35%	43.47%	64.09%
Standard Deviation	0.1%	0%	0.3%	0.1%	0.1%	0.1%
Ray Tracing In Vulkan - 1920 x 1080 - L.I.O.W (FPS)	**57.8223**	33.7196	26.2753	**23.3070**	28.4471	40.4178
Normalized	100%	58.32%	45.44%	40.31%	49.2%	69.9%
Standard Deviation	0.5%	0.1%	0.1%	0.3%	0.2%	0.1%
Ray Tracing In Vulkan - 1920 x 1200 - L.I.O.W (FPS)	**48.6939**	29.0999	22.7902	**20.1725**	24.5890	35.0178
Normalized	100%	59.76%	46.8%	41.43%	50.5%	71.91%
Standard Deviation	0.1%	0.2%	0.1%	0.1%	0.1%	0.1%
Ray Tracing In Vulkan - 2560 x 1440 - L.I.O.W (FPS)	**33.0545**	19.5287	15.6550	**13.7568**	17.1498	24.3719
Normalized	100%	59.08%	47.36%	41.62%	51.88%	73.73%
Standard Deviation	0.1%	0.1%	0%	0%	0.1%	0.2%
Ray Tracing In Vulkan - 3840 x 2160 - L.I.O.W (FPS)	**16.4312**	9.60781	7.93153	**6.87206**	8.82616	12.4673
Normalized	100%	58.47%	48.27%	41.82%	53.72%	75.88%
Standard Deviation	0.1%	0%	0%	0.1%	0.1%	0.1%
Ray Tracing In Vulkan - 1920 x 1080 - P.I.O.W (FPS)	63.7969	36.7365	39.9825	**33.8886**	48.3452	**64.4970**
Normalized	98.91%	56.96%	61.99%	52.54%	74.96%	100%
Standard Deviation	0.3%	0%	0%	0%	0%	0.6%
Ray Tracing In Vulkan - 1920 x 1200 - P.I.O.W (FPS)	57.1482	32.5992	35.4654	**30.1809**	43.0463	**57.4290**
Normalized	99.51%	56.76%	61.76%	52.55%	74.96%	100%
Standard Deviation	0.5%	0%	0%	0%	0%	0.1%
Ray Tracing In Vulkan - 2560 x 1440 - P.I.O.W (FPS)	36.5362	20.9757	22.7453	**19.3343**	27.5123	**36.7571**
Normalized	99.4%	57.07%	61.88%	52.6%	74.85%	100%
Standard Deviation	0.1%	0%	0%	0%	0%	0.1%

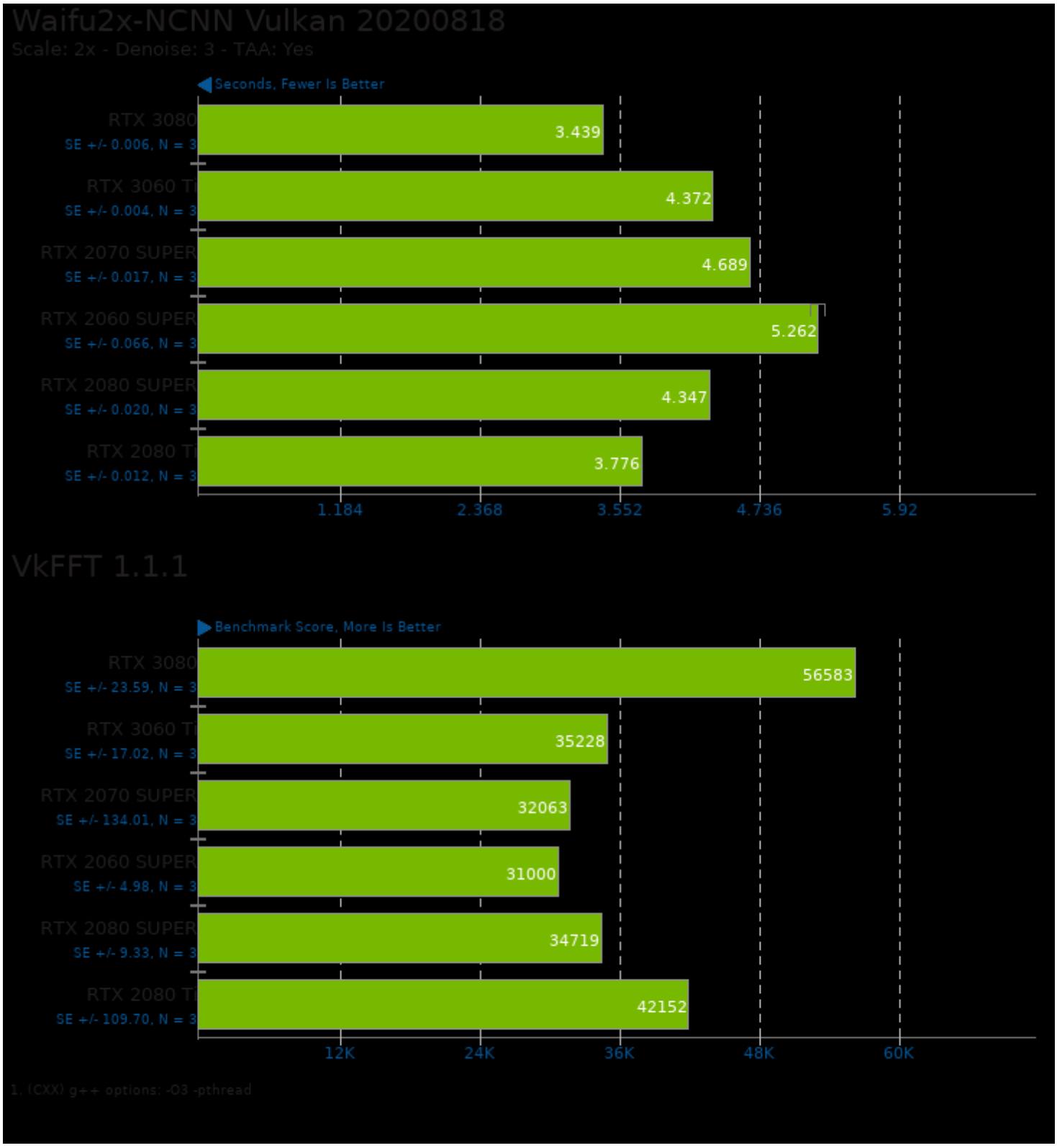
Ray Tracing In Vulkan - 3840 x 2160 - P.I.O.W (FPS)	17.5512	9.99652	10.8262	**9.17886**	13.1467	**17.6370**
Normalized	99.51%	56.68%	61.38%	52.04%	74.54%	100%
Standard Deviation	0.1%	0%	0%	0.2%	0%	0.1%
Ray Tracing In Vulkan - 1920 x 1080 - R.T.I.O.W (FPS)	62.7312	35.8823	39.1433	**33.2083**	47.5230	**63.3046**
Normalized	99.09%	56.68%	61.83%	52.46%	75.07%	100%
Standard Deviation	0.6%	0%	0%	0%	0%	0.4%
Ray Tracing In Vulkan - 1920 x 1200 - R.T.I.O.W (FPS)	55.5417	31.8033	34.6587	**29.4861**	42.0649	**56.2395**
Normalized	98.76%	56.55%	61.63%	52.43%	74.8%	100%
Standard Deviation	0.1%	0.1%	0%	0.1%	0.1%	0.2%
Ray Tracing In Vulkan - 2560 x 1440 - R.T.I.O.W (FPS)	35.6185	20.4810	22.2612	**18.9526**	26.9538	**36.0794**
Normalized	98.72%	56.77%	61.7%	52.53%	74.71%	100%
Standard Deviation	0%	0%	0%	0%	0%	0.1%
Ray Tracing In Vulkan - 3840 x 2160 - R.T.I.O.W (FPS)	17.1359	9.76038	10.6371	**8.99633**	12.8719	**17.3073**
Normalized	99.01%	56.39%	61.46%	51.98%	74.37%	100%
Standard Deviation	0%	0%	0.4%	0%	0%	0.1%
ParaView - Many Spheres - 1920 x 1080 (Frames /	**78.21**	44.64	44.88	**38.15**	54.32	74.50
Normalized	100%	57.08%	57.38%	48.78%	69.45%	95.26%
Standard Deviation	0.4%	0.1%	0.4%	0.4%	0.5%	0.4%
ParaView - Many Spheres - 1920 x 1080 (MiPolys /	**7841**	4476	4499	**3825**	5446	7469
Normalized	100%	57.08%	57.38%	48.77%	69.46%	95.26%
Standard Deviation	0.4%	0.1%	0.4%	0.4%	0.5%	0.4%
ParaView - Many Spheres - 3840 x 2160 (Frames /	**76.61**	44.40	43.96	**37.39**	53.10	72.78
Normalized	100%	57.96%	57.38%	48.81%	69.31%	95%
Standard Deviation	0.3%	0.2%	0.1%	0.1%	0%	0.2%
ParaView - Many Spheres - 3840 x 2160 (MiPolys /	**7681**	4452	4407	**3749**	5323	7297
Normalized	100%	57.96%	57.38%	48.81%	69.31%	95%
Standard Deviation	0.3%	0.2%	0.1%	0.1%	0.1%	0.2%
ParaView - Wavelet Volume - 1920 x 1080 (Frames / Sec)	**662.92**	473.63	482.20	**426.74**	534.48	600.41
Normalized	100%	71.45%	72.74%	64.37%	80.63%	90.57%
Standard Deviation	0.6%	2.4%	0.5%	0.7%	0.3%	1.3%
ParaView - Wavelet Volume - 1920 x 1080 (MiVoxels / Sec)	**10607**	7578	7715	**6828**	8552	9607
Normalized	100%	71.45%	72.74%	64.37%	80.63%	90.57%
Standard Deviation	0.6%	2.4%	0.5%	0.7%	0.3%	1.3%

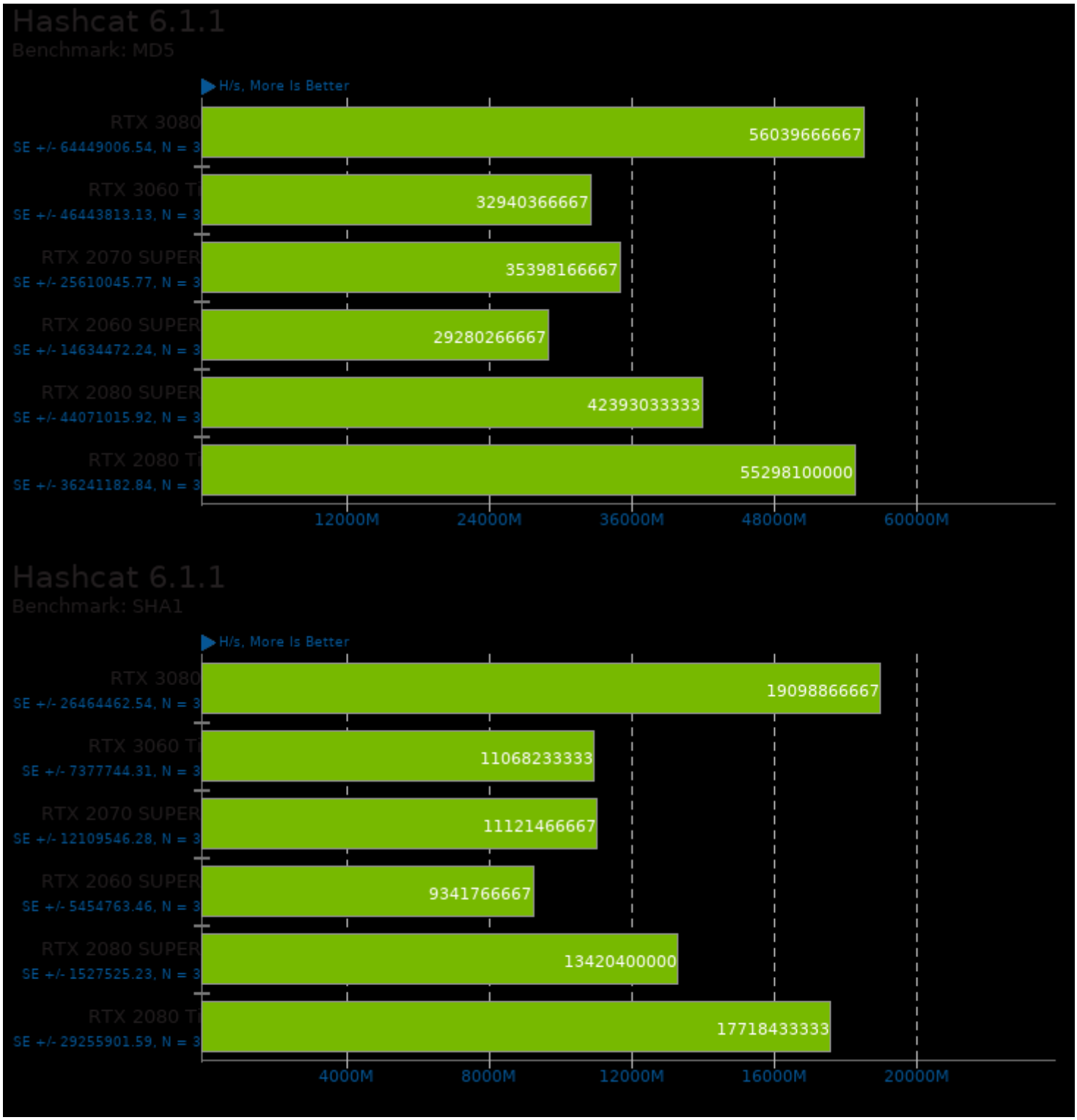
ParaView - Wavelet Volume - 3840 x 2160 (Frames / Sec)	**339.42**	208.93	205.52	**177.97**	240.83	308.48
Normalized	100%	61.56%	60.55%	52.43%	70.95%	90.88%
Standard Deviation	0.7%	1%	0.4%	0.2%	0.6%	1%
ParaView - Wavelet Volume - 3840 x 2160 (MiVoxels / Sec)	**5431**	3343	3288	**2847**	3853	4936
Normalized	100%	61.56%	60.55%	52.43%	70.96%	90.89%
Standard Deviation	0.7%	1%	0.4%	0.2%	0.6%	1%
ParaView - Wavelet Contour - 1920 x 1080 (Frames / Sec)	**515.65**	304.13	354.21	**274.70**	405.49	450.11
Normalized	100%	58.98%	68.69%	53.27%	78.64%	87.29%
Standard Deviation	1.2%	0.9%	0.5%	0.9%	1.5%	0.3%
ParaView - Wavelet Contour - 1920 x 1080 (MiPolys / Sec)	**5374**	3169	3691	**2863**	4226	4691
Normalized	100%	58.98%	68.69%	53.27%	78.64%	87.29%
Standard Deviation	1.2%	0.9%	0.5%	0.9%	1.5%	0.3%
ParaView - Wavelet Contour - 3840 x 2160 (Frames / Sec)	**333.82**	216.01	220.65	**178.45**	251.05	293.63
Normalized	100%	64.71%	66.1%	53.46%	75.21%	87.96%
Standard Deviation	3.2%	2%	0.9%	1.2%	2.4%	0.7%
ParaView - Wavelet Contour - 3840 x 2160 (MiPolys / Sec)	**3479**	2251	2299	**1860**	2616	3060
Normalized	100%	64.71%	66.1%	53.46%	75.2%	87.96%
Standard Deviation	3.2%	2%	0.9%	1.2%	2.4%	0.7%
FAHBench (Ns/Day)	**321.9986**	237.0623	232.7775	**208.7075**	257.9896	307.2028
Normalized	100%	73.62%	72.29%	64.82%	80.12%	95.41%
Standard Deviation	0.3%	0.2%	0.6%	0.4%	0.4%	0.5%
LeelaChessZero - OpenCL (Nodes/s)	31897					
Standard Deviation	1.4%					
FinanceBench - Monte-Carlo OpenCL (ms)	**386.046997**	461.676341	816.009990	752.413981	**843.452657**	649.820658
Normalized	100%	83.62%	47.31%	51.31%	45.77%	59.41%
Standard Deviation	0.5%	0.6%	0.1%	0.1%	0.2%	0.2%
FinanceBench - B.S.O	**7.307**	13.138	12.804	**16.486333**	10.610	9.226
Normalized	100%	55.62%	57.07%	44.32%	68.87%	79.2%
Standard Deviation	0.3%	2.4%	1.1%	2.1%	2.4%	0.3%
Darktable - Boat - OpenCL (sec)	**1.282**	1.713	1.709	**1.716**	1.591	1.485
Normalized	100%	74.84%	75.01%	74.71%	80.58%	86.33%
Standard Deviation	0.8%	0.4%	0.8%	0.5%	0.8%	1.2%
Darktable - Masskrug - OpenCL (sec)	2.090	2.121	2.156	2.118	**2.169**	**2.084**
Normalized	99.71%	98.26%	96.66%	98.39%	96.08%	100%
Standard Deviation	0.5%	0.3%	0.6%	0.2%	0.8%	0.5%

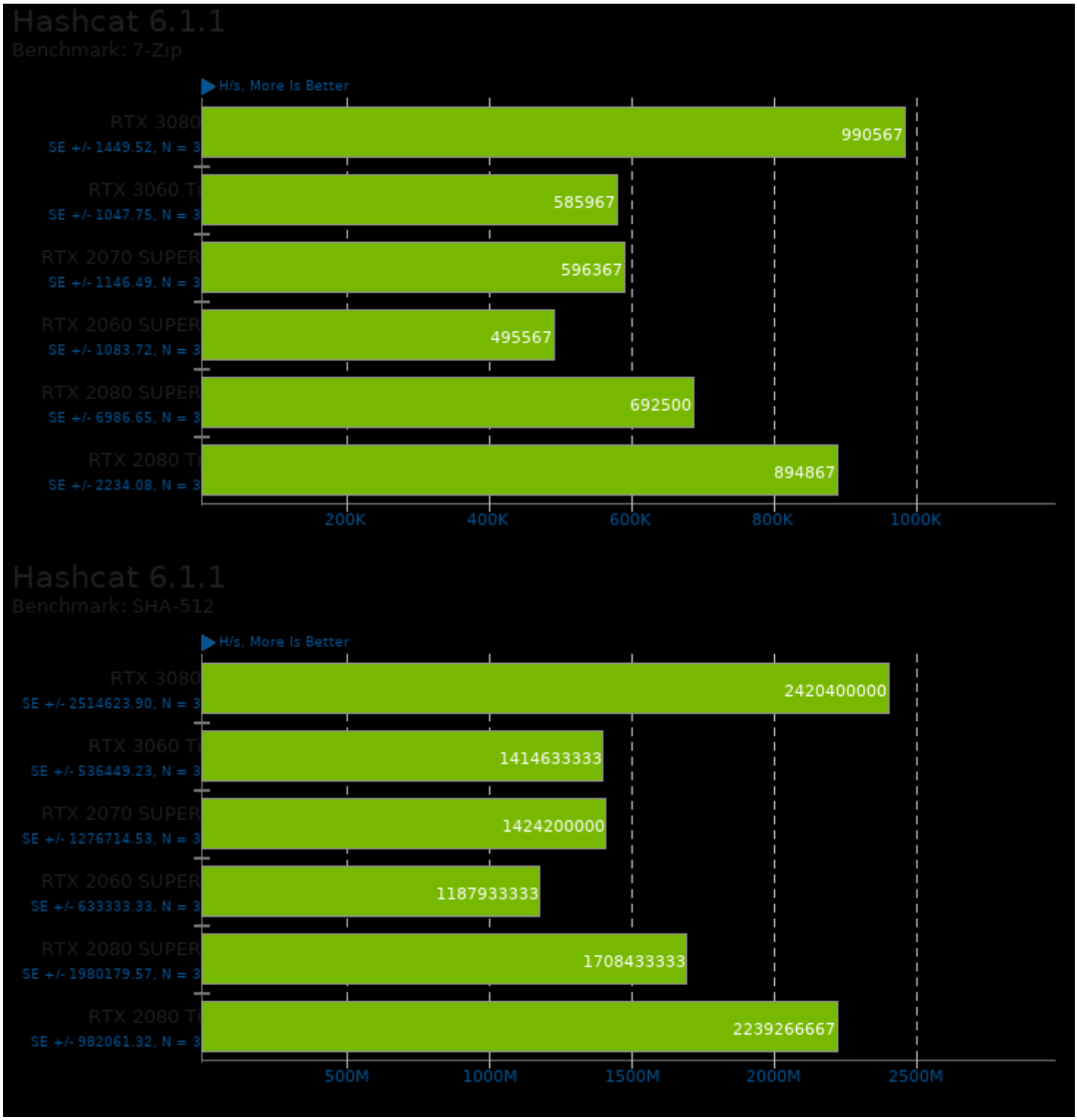
Darktable - Server Rack - OpenCL (sec)	**0.095**	**0.101**	0.097	0.097	0.097	0.096
Normalized	100%	94.06%	97.94%	97.94%	97.94%	98.96%
Standard Deviation	0%	0%	1.8%	1.2%	1%	0.6%
Darktable - Server Room - OpenCL (sec)	**0.706**	**0.777**	0.776	0.723	0.756	0.710
Normalized	100%	90.86%	90.98%	97.65%	93.39%	99.44%
Standard Deviation	0.2%	0.3%	0.8%	0.5%	1%	1.7%
NCNN - Vulkan GPU - mobilenet (ms)	**12.20**	13.27	12.87	12.53	**13.31**	12.97
Normalized	100%	91.94%	94.79%	97.37%	91.66%	94.06%
Standard Deviation	2.9%	2.5%	1.9%	3%	1.2%	2.5%
NCNN - Vulkan GPU-v2-v2 - mobilenet-v2 (ms)	**4.48**	4.50	4.58	4.50	**4.61**	4.50
Normalized	100%	99.56%	97.82%	99.56%	97.18%	99.56%
Standard Deviation	0.2%	0.3%	2.8%	0.3%	0.2%	0.3%
NCNN - Vulkan GPU-v3-v3 - mobilenet-v3 (ms)	4.21	**4.14**	4.21	4.21	**4.25**	4.19
Normalized	98.34%	100%	98.34%	98.34%	97.41%	98.81%
Standard Deviation	1.5%	0.4%	1.6%	1.5%	0.5%	1%
NCNN - Vulkan GPU - shufflenet-v2 (ms)	**4.44**	**4.44**	4.46	4.46	**4.57**	4.47
Normalized	100%	100%	99.55%	99.55%	97.16%	99.33%
Standard Deviation	0.5%	0.7%	0.6%	0.7%	0%	1.2%
NCNN - Vulkan GPU - mnasnet (ms)	3.99	**3.98**	4.07	4.01	**4.09**	4.03
Normalized	99.75%	100%	97.79%	99.25%	97.31%	98.76%
Standard Deviation	0.5%	0.4%	3.4%	1.1%	0.4%	3.8%
NCNN - Vulkan GPU - efficientnet-b0 (ms)	**5.41**	5.42	5.50	5.45	**5.57**	5.45
Normalized	100%	99.82%	98.36%	99.27%	97.13%	99.27%
Standard Deviation	0.5%	0.5%	2.4%	1.2%	0.4%	2.7%
NCNN - Vulkan GPU - blazeface (ms)	1.85	**1.88**	1.86	1.87	1.87	**1.84**
Normalized	99.46%	97.87%	98.92%	98.4%	98.4%	100%
Standard Deviation	2.1%	3%	2.3%	2.2%	0.6%	1.8%
NCNN - Vulkan GPU - googlenet (ms)	**12.82**	**13.59**	13.44	12.85	13.57	13.29
Normalized	100%	94.33%	95.39%	99.77%	94.47%	96.46%
Standard Deviation	0.5%	9.8%	8.7%	1.2%	2.7%	6.8%
NCNN - Vulkan GPU - vgg16 (ms)	58.83	58.90	**58.49**	58.99	**61.11**	59.02
Normalized	99.42%	99.3%	100%	99.15%	95.71%	99.1%
Standard Deviation	0.4%	0.5%	1.2%	0.3%	1.4%	0.3%
NCNN - Vulkan GPU - resnet18 (ms)	**14.43**	14.78	14.70	14.44	**15.15**	14.51
Normalized	100%	97.63%	98.16%	99.93%	95.25%	99.45%
Standard Deviation	0.6%	5.3%	4.3%	1.5%	1.7%	3.7%
NCNN - Vulkan GPU - alexnet (ms)	**11.12**	11.72	12.09	11.15	**12.26**	11.20
Normalized	100%	94.88%	91.98%	99.73%	90.7%	99.29%
Standard Deviation	3.4%	8.4%	8.8%	5%	7.8%	6%

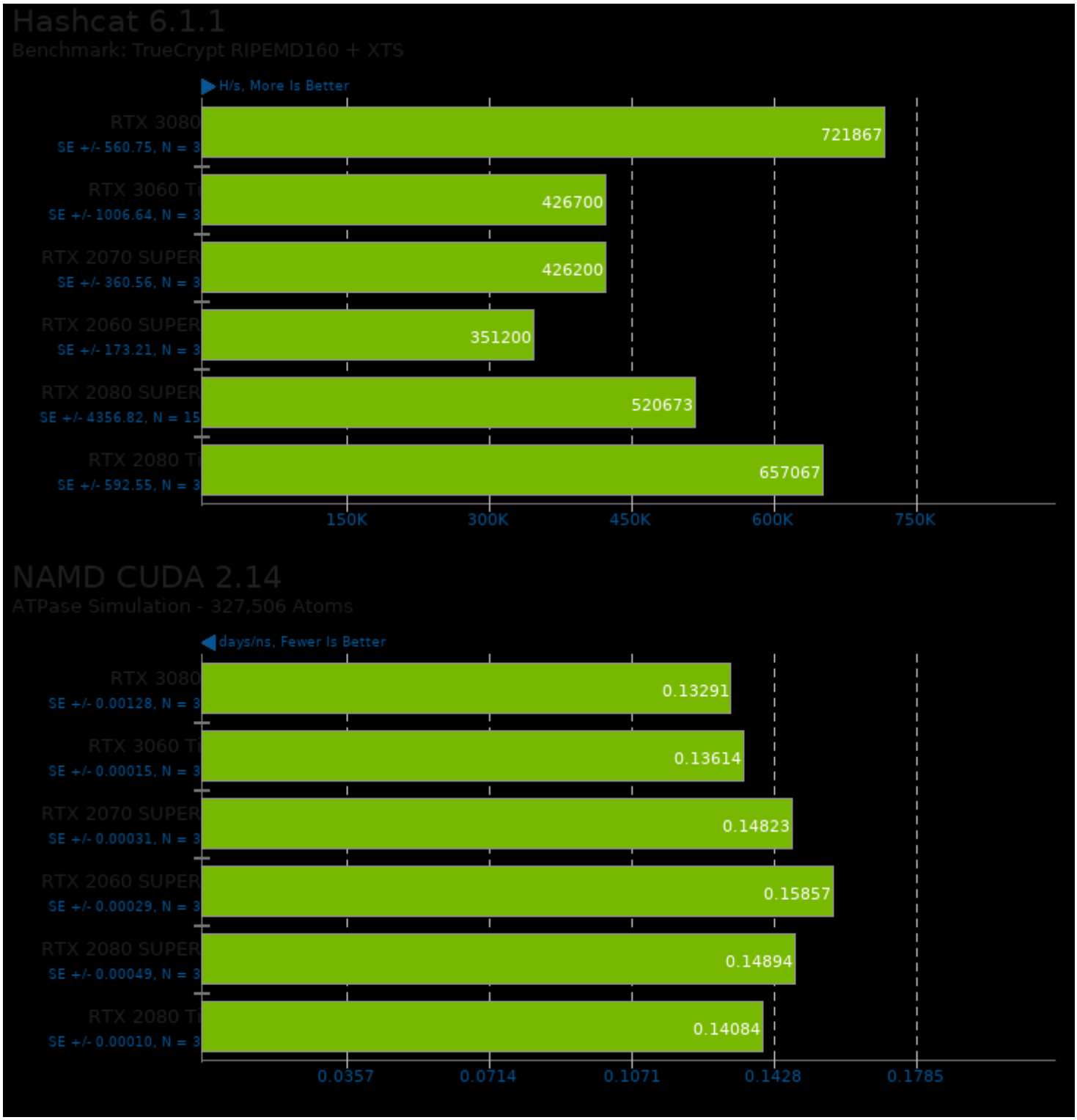
NCNN - Vulkan GPU - resnet50 (ms)	**24.97**	**26.98**		25.63	25.39	26.63	24.98
Normalized	100%	92.55%		97.42%	98.35%	93.77%	99.96%
Standard Deviation	3.4%	0.9%		2.4%	4.1%	3.9%	3.6%
NCNN - Vulkan GPU - yolov4-tiny (ms)	**21.38**	**23.38**		22.39	21.94	23.07	22.08
Normalized	100%	91.45%		95.49%	97.45%	92.67%	96.83%
Standard Deviation	3.9%	0.6%		4.6%	4.8%	5.8%	5.1%
NCNN - Vulkan GPU - squeezenet_ssd (ms)	14.48	**14.74**		**14.27**	14.47	14.67	14.41
Normalized	98.55%	96.81%		100%	98.62%	97.27%	99.03%
Standard Deviation	1.7%	2.4%		1%	1.4%	0.5%	1.3%
NCNN - Vulkan GPU - regnety_400m (ms)	**17.85**	18.00		17.96	17.98	**18.65**	18.00
Normalized	100%	99.17%		99.39%	99.28%	95.71%	99.17%
Standard Deviation	0.4%	0.6%		0.2%	0.6%	1.4%	1.5%
IndigoBench - OpenCL GPU - Bedroom (M samples/s)	**17.650**		11.452	7.776	**7.392**	7.845	11.012
Normalized	100%		64.88%	44.06%	41.88%	44.45%	62.39%
Standard Deviation	0.4%		0.2%	0.1%	0.3%	0%	0.2%
IndigoBench - OpenCL GPU - Supercar (M samples/s)	**46.405**		33.992	24.706	**23.311**	25.326	33.236
Normalized	100%		73.25%	53.24%	50.23%	54.58%	71.62%
Standard Deviation	0.1%		0.2%	0.1%	0%	0.2%	0.1%
Chaos Group V-RAY - NVIDIA RTX GPU (vrays)	**2183**		1550	977	**733**	905	1246
Normalized	100%		71%	44.75%	33.58%	41.46%	57.08%
Standard Deviation	0.5%		0.2%			0.2%	
Chaos Group V-RAY - NVIDIA CUDA GPU (vpaths)	**1666**		1185	785	**492**	742	926
Normalized	100%		71.13%	47.12%	29.53%	44.54%	55.58%
Standard Deviation	0.1%			0.1%	0.1%	0.1%	0.1%

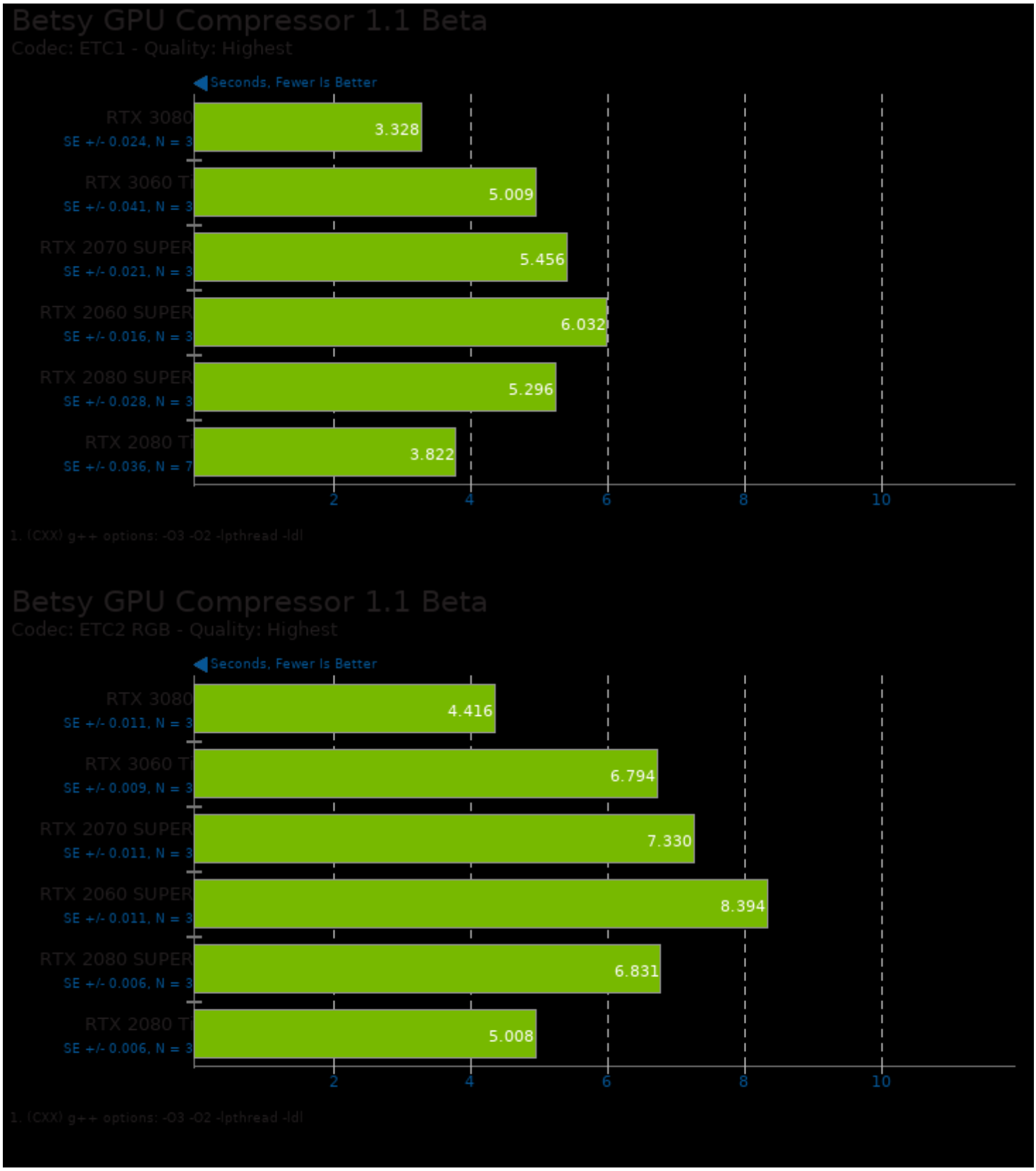

RealSR-NCNN 20200818
Scale: 4x - TAA: No
Seconds, Fewer Is Better
RTX 3080
SE +/- 0.044, N = 3
6.250
RTX 3060 Ti
SE +/- 0.053, N = 3
8.761
RTX 2070 SUPER
SE +/- 0.038, N = 3
9.901
RTX 2060 SUPER
SE +/- 0.118, N = 5
11.501
RTX 2080 SUPER
SE +/- 0.240, N = 14
9.010
RTX 2080 Ti
SE +/- 0.058, N = 3
7.506
3
6
9
12
15
RealSR-NCNN 20200818
Scale: 4x - TAA: Yes
Seconds, Fewer Is Better
RTX 3080
SE +/- 0.09, N = 3
34.11
RTX 3060 Ti
SE +/- 0.10, N = 3
54.10
RTX 2070 SUPER
SE +/- 0.27, N = 3
63.02
RTX 2060 SUPER
SE +/- 0.30, N = 3
75.76
RTX 2080 SUPER
SE +/- 0.16, N = 3
54.90
RTX 2080 Ti
SE +/- 0.23, N = 3
43.82
20
40
60
80
100

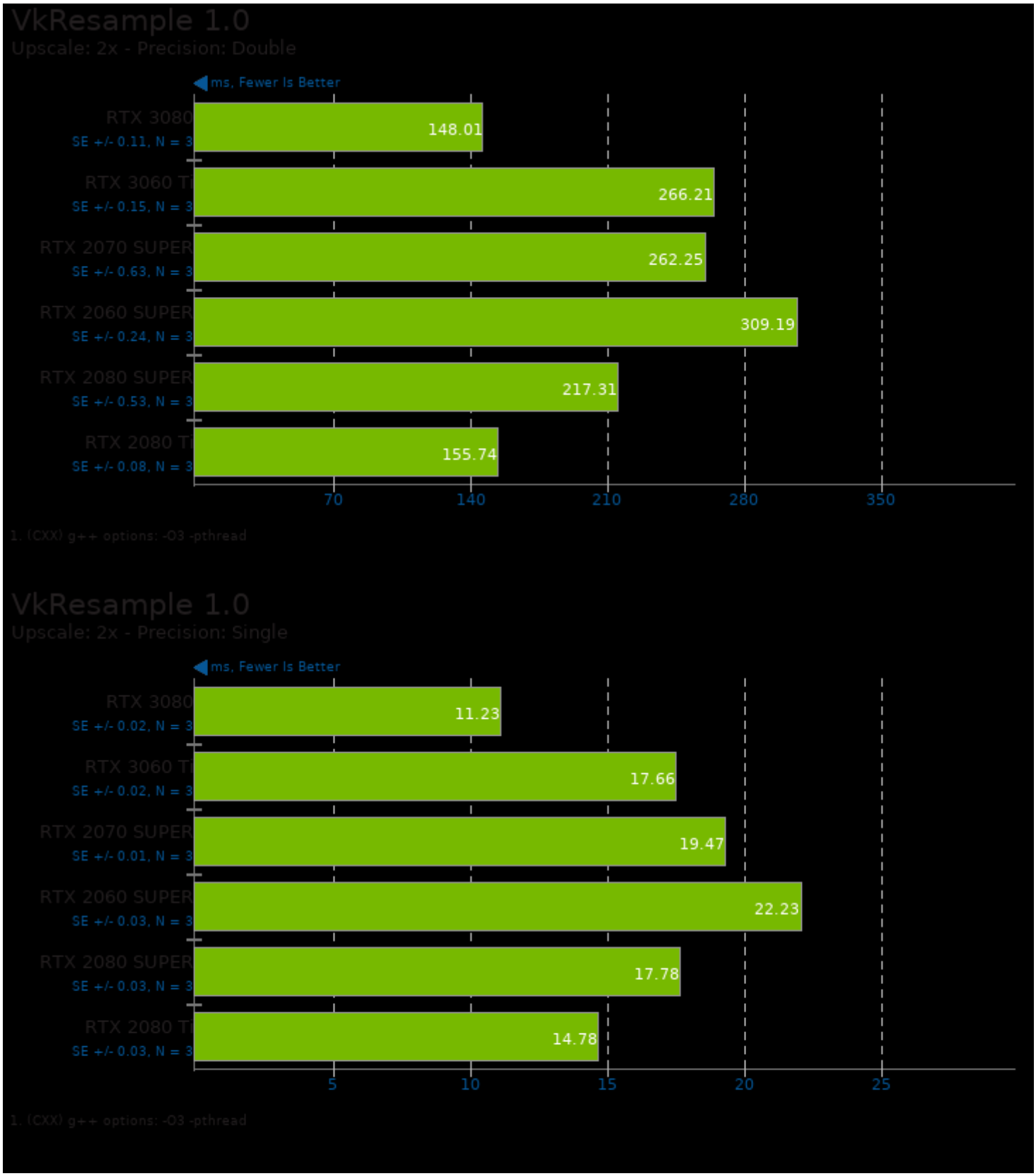

Waifu2x-NCNN Vulkan 20200818
Scale: 2x - Denoise: 3 - TAA: Yes
Seconds, Fewer Is Better
RTX 3080
SE +/- 0.006, N = 3
3.439
RTX 3060 Ti
SE +/- 0.004, N = 3
4.372
RTX 2070 SUPER
SE +/- 0.017, N = 3
4.689
RTX 2060 SUPER
SE +/- 0.066, N = 3
5.262
RTX 2080 SUPER
SE +/- 0.020, N = 3
4.347
RTX 2080 Ti
SE +/- 0.012, N = 3
3.776
1.184
2.368
3.552
4.736
5.92
VkFFT 1.1.1
Benchmark Score, More Is Better
RTX 3080
SE +/- 23.59, N = 3
56583
RTX 3060 Ti
SE +/- 17.02, N = 3
35228
RTX 2070 SUPER
SE +/- 134.01, N = 3
32063
RTX 2060 SUPER
SE +/- 4.98, N = 3
31000
RTX 2080 SUPER
SE +/- 9.33, N = 3
34719
RTX 2080 Ti
SE +/- 109.70, N = 3
42152
12K
24K
36K
48K
60K
1. (CXX) g++ options: -O3 -pthread

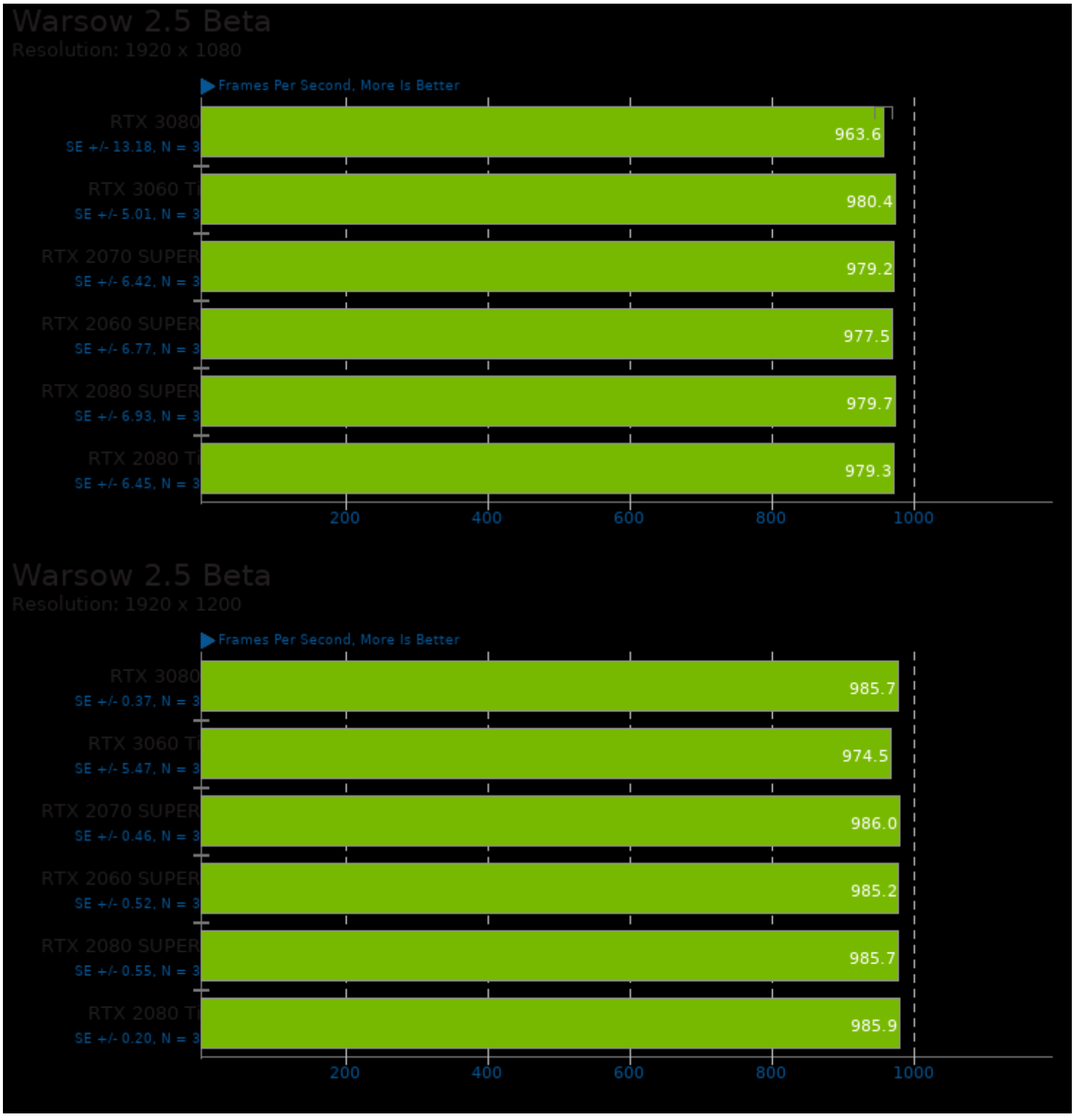

Hashcat 6.1.1
Benchmark: MD5
H/s, More Is Better
RTX 3080
SE +/- 64449006.54, N = 3
56039666667
RTX 3060 Ti
SE +/- 46443813.13, N = 3
32940366667
RTX 2070 SUPER
SE +/- 25610045.77, N = 3
35398166667
RTX 2060 SUPER
SE +/- 14634472.24, N = 3
29280266667
RTX 2080 SUPER
SE +/- 44071015.92, N = 3
42393033333
RTX 2080 Ti
SE +/- 36241182.84, N = 3
55298100000
12000M
24000M
36000M
48000M
60000M
Hashcat 6.1.1
Benchmark: SHA1
H/s, More Is Better
RTX 3080
SE +/- 26464462.54, N = 3
19098866667
RTX 3060 Ti
SE +/- 7377744.31, N = 3
11068233333
RTX 2070 SUPER
SE +/- 12109546.28, N = 3
11121466667
RTX 2060 SUPER
SE +/- 5454763.46, N = 3
9341766667
RTX 2080 SUPER
SE +/- 1527525.23, N = 3
13420400000
RTX 2080 Ti
SE +/- 29255901.59, N = 3
17718433333
4000M
8000M
12000M
16000M
20000M


Hashcat 6.1.1
Benchmark: 7-Zip
H/s, More Is Better
RTX 3080
SE +/- 1449.52, N = 3
990567
RTX 3060 Ti
SE +/- 1047.75, N = 3
585967
RTX 2070 SUPER
SE +/- 1146.49, N = 3
596367
RTX 2060 SUPER
SE +/- 1083.72, N = 3
495567
RTX 2080 SUPER
SE +/- 6986.65, N = 3
692500
RTX 2080 Ti
SE +/- 2234.08, N = 3
894867
200K
400K
600K
800K
1000K
Hashcat 6.1.1
Benchmark: SHA-512
H/s, More Is Better
RTX 3080
SE +/- 2514623.90, N = 3
2420400000
RTX 3060 Ti
SE +/- 536449.23, N = 3
1414633333
RTX 2070 SUPER
SE +/- 1276714.53, N = 3
1424200000
RTX 2060 SUPER
SE +/- 633333.33, N = 3
1187933333
RTX 2080 SUPER
SE +/- 1980179.57, N = 3
1708433333
RTX 2080 Ti
SE +/- 982061.32, N = 3
2239266667
500M
1000M
1500M
2000M
2500M

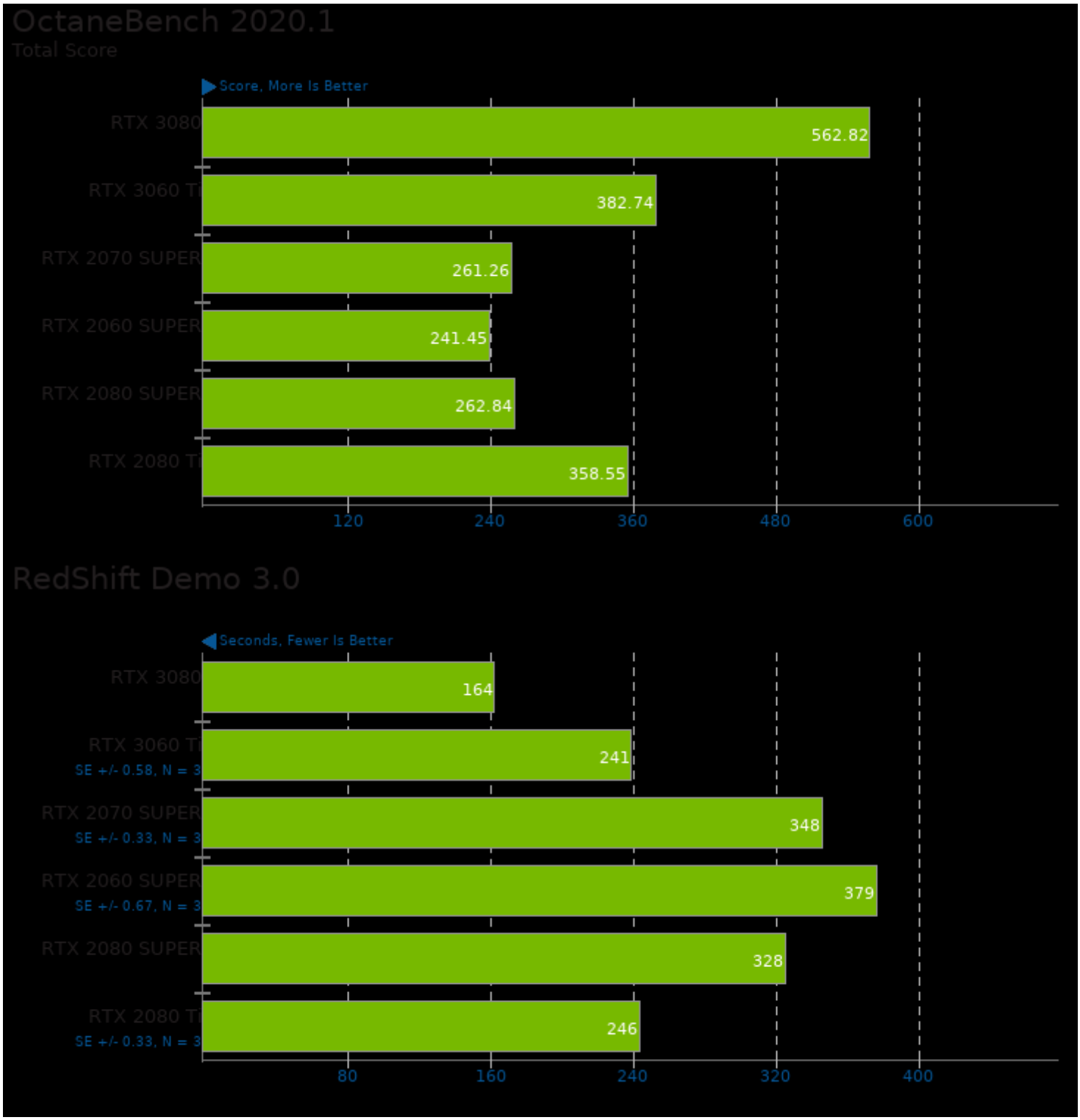

Hashcat 6.1.1
Benchmark: TrueCrypt RIPEMD160 + XTS
H/s, More Is Better
RTX 3080
SE +/- 560.75, N = 3
721867
RTX 3060 Ti
SE +/- 1006.64, N = 3
426700
RTX 2070 SUPER
SE +/- 360.56, N = 3
426200
RTX 2060 SUPER
SE +/- 173.21, N = 3
351200
RTX 2080 SUPER
SE +/- 4356.82, N = 15
520673
RTX 2080 Ti
SE +/- 592.55, N = 3
657067
150K
300K
450K
600K
750K
NAMD CUDA 2.14
ATPase Simulation - 327,506 Atoms
days/ns, Fewer Is Better
RTX 3080
SE +/- 0.00128, N = 3
0.13291
RTX 3060 Ti
SE +/- 0.00015, N = 3
0.13614
RTX 2070 SUPER
SE +/- 0.00031, N = 3
0.14823
RTX 2060 SUPER
SE +/- 0.00029, N = 3
0.15857
RTX 2080 SUPER
SE +/- 0.00049, N = 3
0.14894
RTX 2080 Ti
SE +/- 0.00010, N = 3
0.14084
0.0357
0.0714
0.1071
0.1428
0.1785

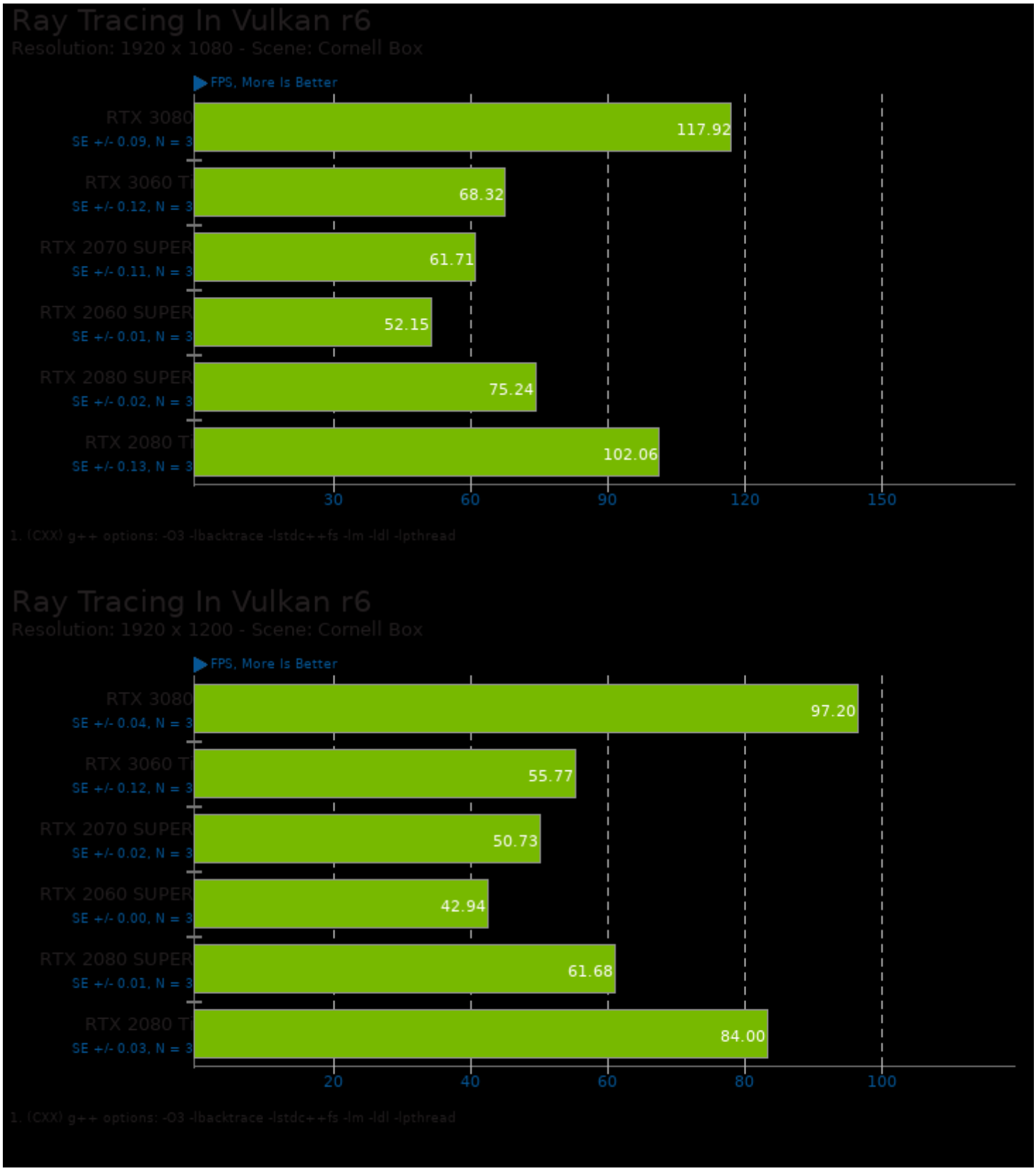

Betsy GPU Compressor 1.1 Beta
Codec: ETC1 - Quality: Highest
Seconds, Fewer Is Better
RTX 3080
SE +/- 0.024, N = 3
3.328
RTX 3060 Ti
SE +/- 0.041, N = 3
5.009
RTX 2070 SUPER
SE +/- 0.021, N = 3
5.456
RTX 2060 SUPER
SE +/- 0.016, N = 3
6.032
RTX 2080 SUPER
SE +/- 0.028, N = 3
5.296
RTX 2080 Ti
SE +/- 0.036, N = 7
3.822
2
4
6
8
10
1. (CXX) g++ options: -O3 -O2 -lpthread -ldl
Betsy GPU Compressor 1.1 Beta
Codec: ETC2 RGB - Quality: Highest
Seconds, Fewer Is Better
RTX 3080
SE +/- 0.011, N = 3
4.416
RTX 3060 Ti
SE +/- 0.009, N = 3
6.794
RTX 2070 SUPER
SE +/- 0.011, N = 3
7.330
RTX 2060 SUPER
SE +/- 0.011, N = 3
8.394
RTX 2080 SUPER
SE +/- 0.006, N = 3
6.831
RTX 2080 Ti
SE +/- 0.006, N = 3
5.008
2
4
6
8
10
1. (CXX) g++ options: -O3 -O2 -lpthread -ldl

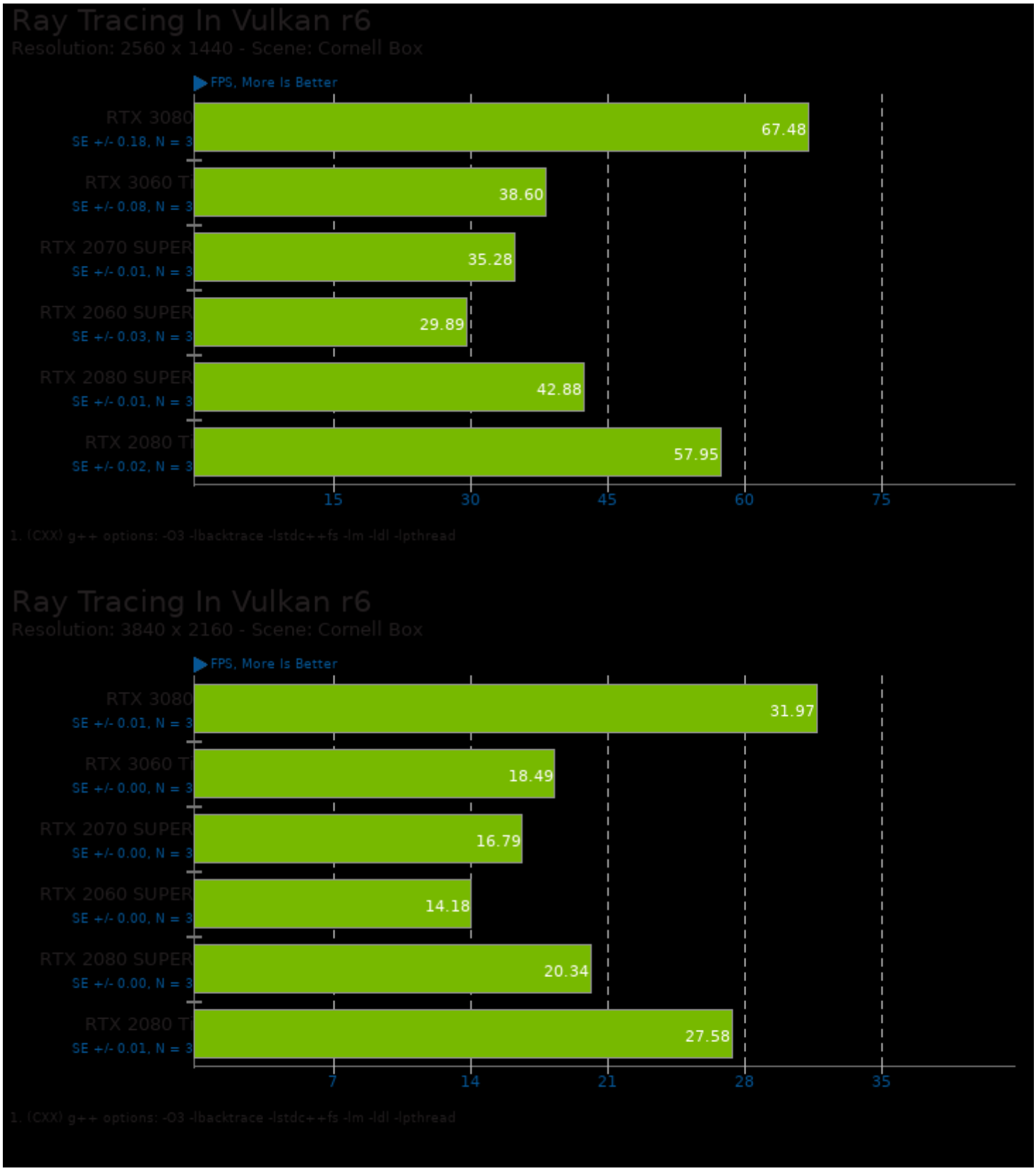

VkResample 1.0
Upscale: 2x - Precision: Double
ms, Fewer Is Better
RTX 3080
SE +/- 0.11, N = 3
148.01
RTX 3060 Ti
SE +/- 0.15, N = 3
266.21
RTX 2070 SUPER
SE +/- 0.63, N = 3
262.25
RTX 2060 SUPER
SE +/- 0.24, N = 3
309.19
RTX 2080 SUPER
SE +/- 0.53, N = 3
217.31
RTX 2080 Ti
SE +/- 0.08, N = 3
155.74
70
140
210
280
350
1. (CXX) g++ options: -O3 -pthread
VkResample 1.0
Upscale: 2x - Precision: Single
ms, Fewer Is Better
RTX 3080
SE +/- 0.02, N = 3
11.23
RTX 3060 Ti
SE +/- 0.02, N = 3
17.66
RTX 2070 SUPER
SE +/- 0.01, N = 3
19.47
RTX 2060 SUPER
SE +/- 0.03, N = 3
22.23
RTX 2080 SUPER
SE +/- 0.03, N = 3
17.78
RTX 2080 Ti
SE +/- 0.03, N = 3
14.78
5
10
15
20
25
1. (CXX) g++ options: -O3 -pthread

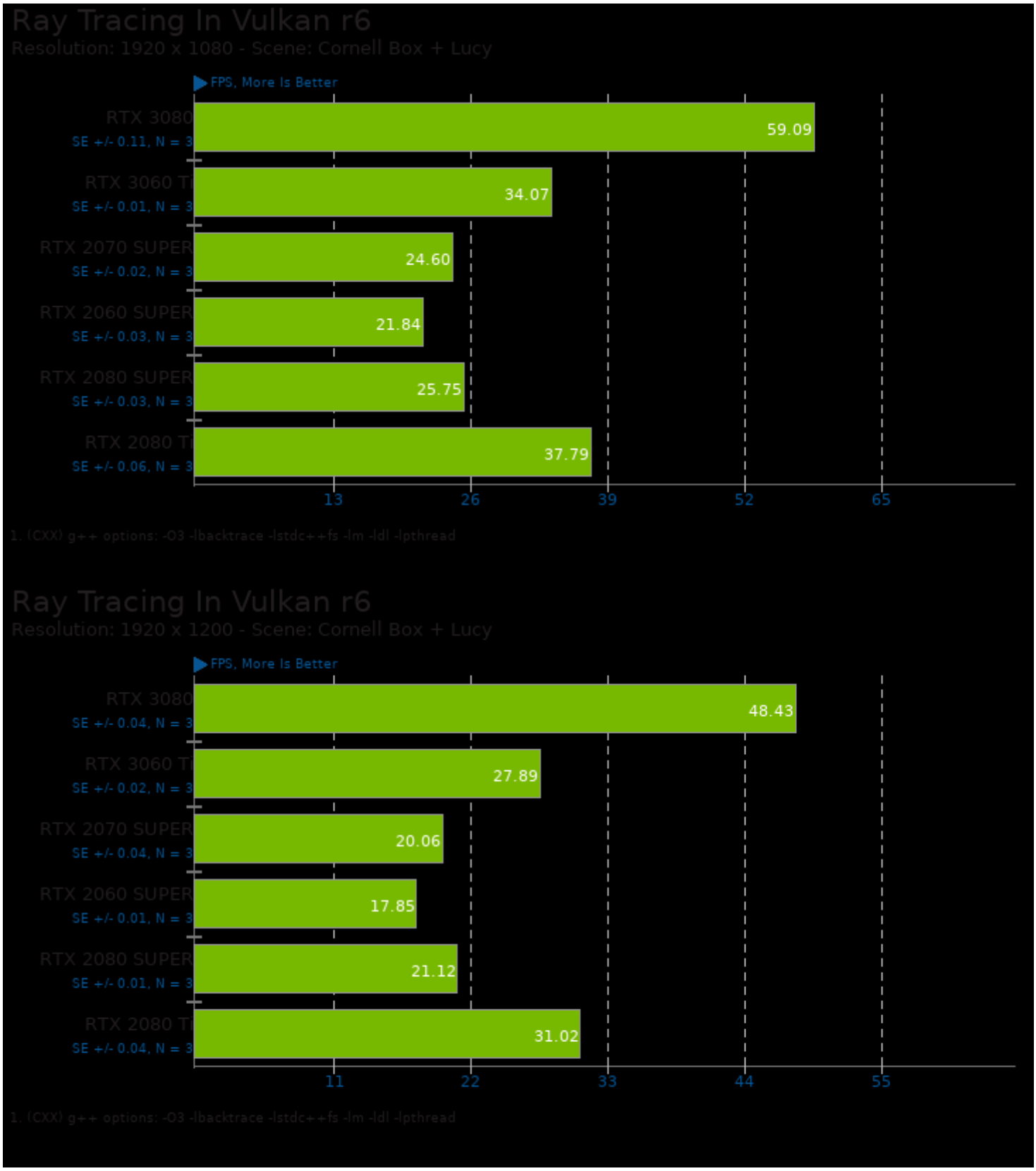

Warsow 2.5 Beta
Resolution: 1920 x 1080
Frames Per Second, More Is Better
RTX 3080
SE +/- 13.18, N = 3
963.6
RTX 3060 Ti
SE +/- 5.01, N = 3
980.4
RTX 2070 SUPER
SE +/- 6.42, N = 3
979.2
RTX 2060 SUPER
SE +/- 6.77, N = 3
977.5
RTX 2080 SUPER
SE +/- 6.93, N = 3
979.7
RTX 2080 Ti
SE +/- 6.45, N = 3
979.3
200
400
600
800
1000
Warsow 2.5 Beta
Resolution: 1920 x 1200
Frames Per Second, More Is Better
RTX 3080
SE +/- 0.37, N = 3
985.7
RTX 3060 Ti
SE +/- 5.47, N = 3
974.5
RTX 2070 SUPER
SE +/- 0.46, N = 3
986.0
RTX 2060 SUPER
SE +/- 0.52, N = 3
985.2
RTX 2080 SUPER
SE +/- 0.55, N = 3
985.7
RTX 2080 Ti
SE +/- 0.20, N = 3
985.9
200
400
600
800
1000

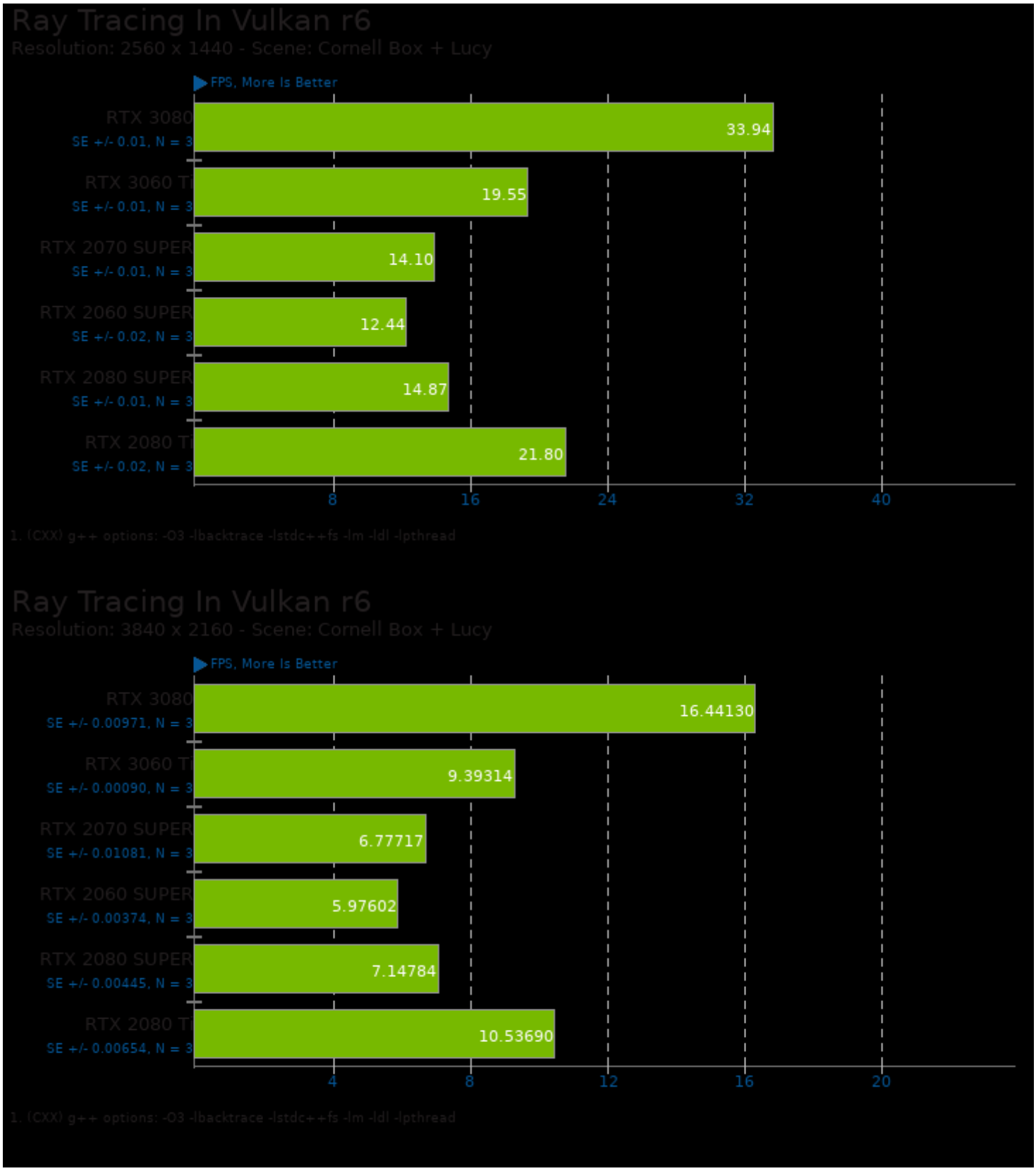
Warsow 2.5 Beta
Resolution: 2560 x 1440
Frames Per Second, More Is Better
RTX 3080
SE +/- 0.15, N = 3
984.8
RTX 3060 Ti
SE +/- 0.68, N = 3
983.3
RTX 2070 SUPER
SE +/- 0.97, N = 3
953.3
RTX 2060 SUPER
SE +/- 2.47, N = 3
696.3
RTX 2080 SUPER
SE +/- 0.29, N = 3
983.2
RTX 2080 Ti
SE +/- 0.33, N = 3
985.7
200
400
600
800
1000
Warsow 2.5 Beta
Resolution: 3840 x 2160
Frames Per Second, More Is Better
RTX 3080
SE +/- 2.63, N = 3
830.2
RTX 3060 Ti
SE +/- 1.22, N = 3
499.6
RTX 2070 SUPER
SE +/- 0.30, N = 3
437.6
RTX 2060 SUPER
SE +/- 0.73, N = 3
353.3
RTX 2080 SUPER
SE +/- 0.52, N = 3
494.2
RTX 2080 Ti
SE +/- 0.61, N = 3
553.5
200
400
600
800
1000

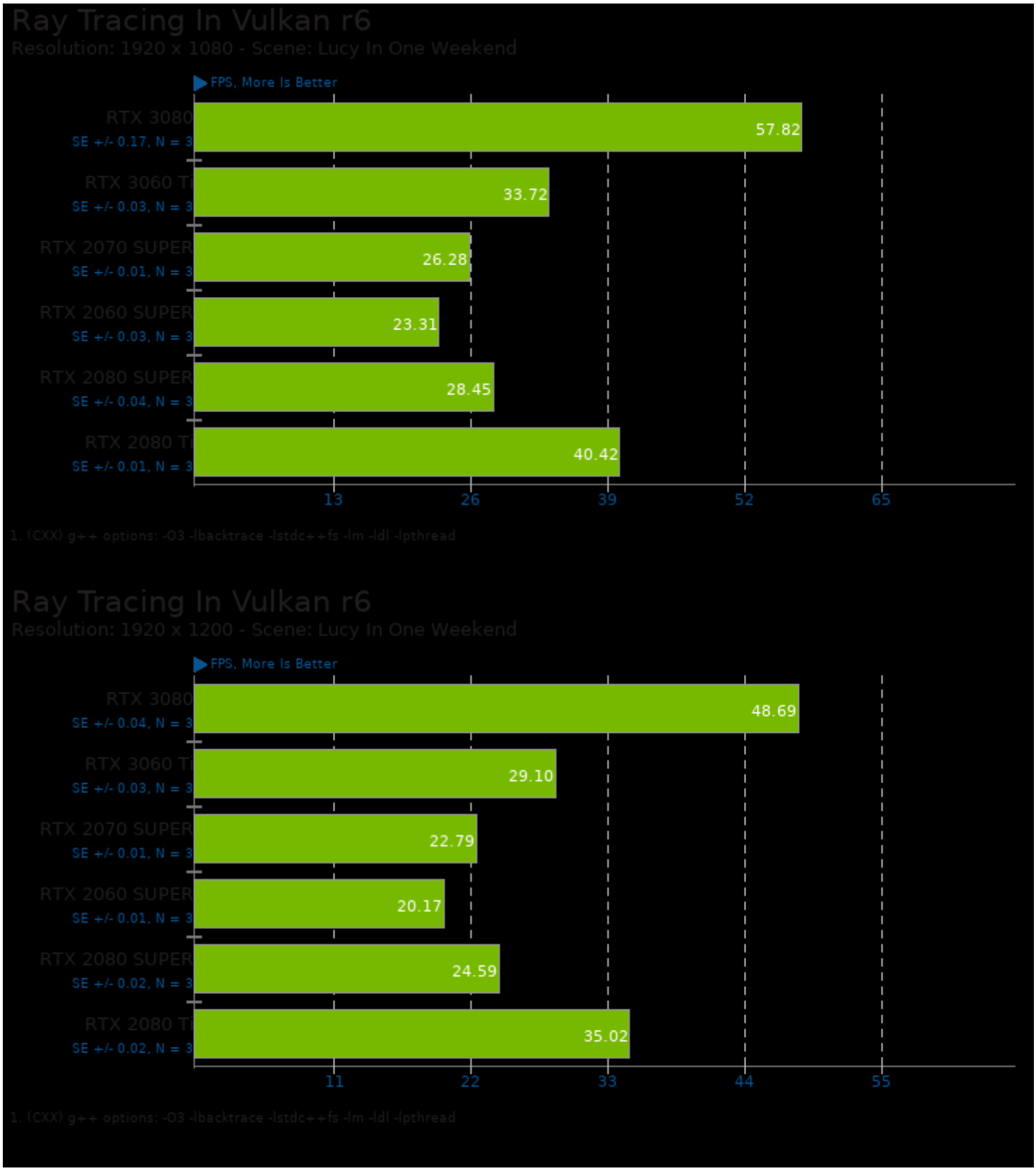

OctaneBench 2020.1
Total Score
Score, More Is Better
RTX 3080
562.82
RTX 3060 Ti
382.74
RTX 2070 SUPER
261.26
RTX 2060 SUPER
241.45
RTX 2080 SUPER
262.84
RTX 2080 Ti
358.55
120
240
360
480
600
RedShift Demo 3.0
Seconds, Fewer Is Better
RTX 3080
164
RTX 3060 Ti
SE +/- 0.58, N = 3
241
RTX 2070 SUPER
SE +/- 0.33, N = 3
348
RTX 2060 SUPER
SE +/- 0.67, N = 3
379
RTX 2080 SUPER
328
RTX 2080 Ti
SE +/- 0.33, N = 3
246
80
160
240
320
400

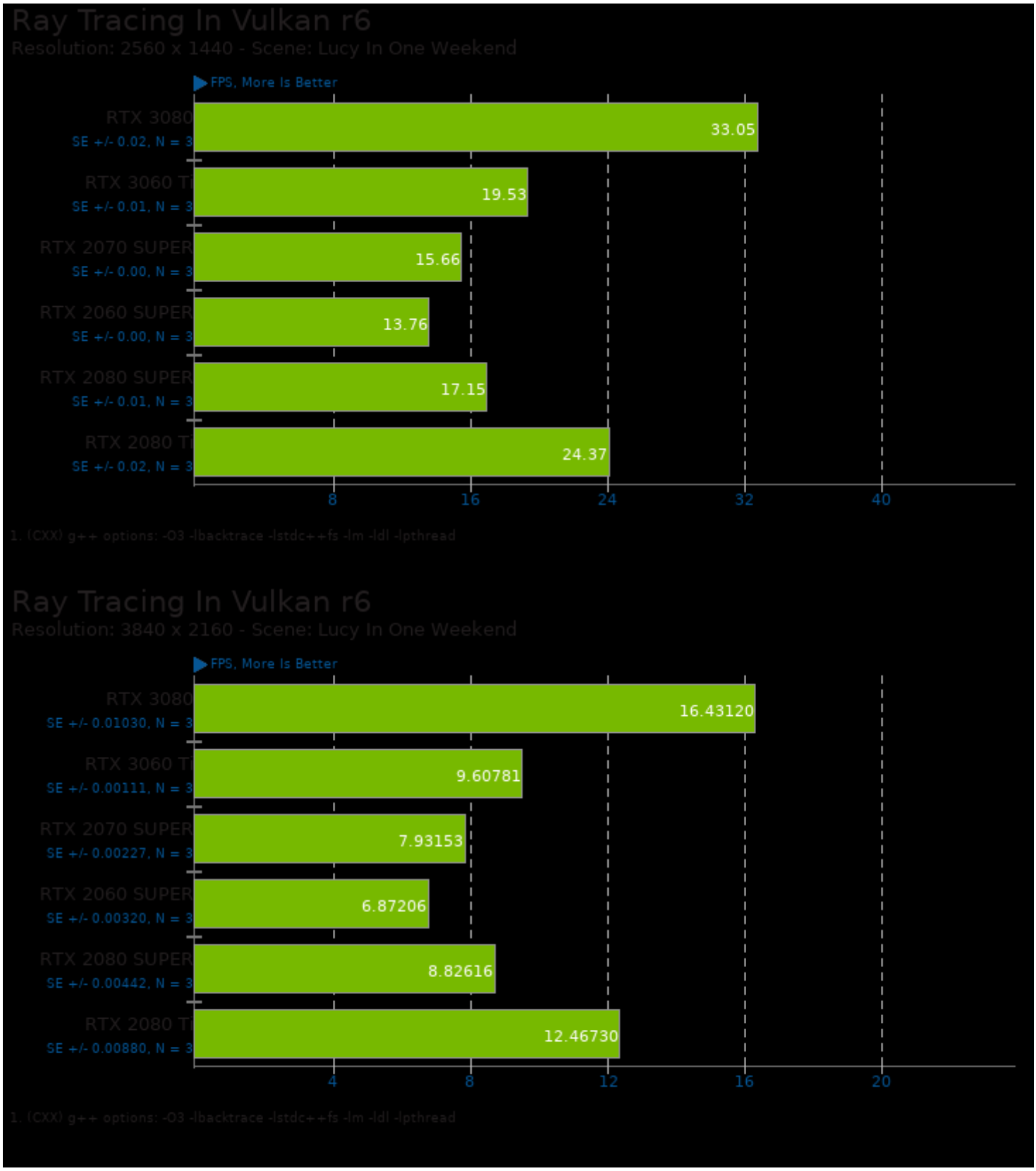

Ray Tracing In Vulkan r6
Resolution: 1920 x 1080 - Scene: Cornell Box
FPS, More Is Better
RTX 3080
SE +/- 0.09, N = 3
117.92
RTX 3060 Ti
SE +/- 0.12, N = 3
68.32
RTX 2070 SUPER
SE +/- 0.11, N = 3
61.71
RTX 2060 SUPER
SE +/- 0.01, N = 3
52.15
RTX 2080 SUPER
SE +/- 0.02, N = 3
75.24
RTX 2080 Ti
SE +/- 0.13, N = 3
102.06
30
60
90
120
150
1. (CXX) g++ options: -O3 -lbacktrace -lstdc++fs -lm -ldl -lpthread
Ray Tracing In Vulkan r6
Resolution: 1920 x 1200 - Scene: Cornell Box
FPS, More Is Better
RTX 3080
SE +/- 0.04, N = 3
97.20
RTX 3060 Ti
SE +/- 0.12, N = 3
55.77
RTX 2070 SUPER
SE +/- 0.02, N = 3
50.73
RTX 2060 SUPER
SE +/- 0.00, N = 3
42.94
RTX 2080 SUPER
SE +/- 0.01, N = 3
61.68
RTX 2080 Ti
SE +/- 0.03, N = 3
84.00
20
40
60
80
100
1. (CXX) g++ options: -O3 -lbacktrace -lstdc++fs -lm -ldl -lpthread

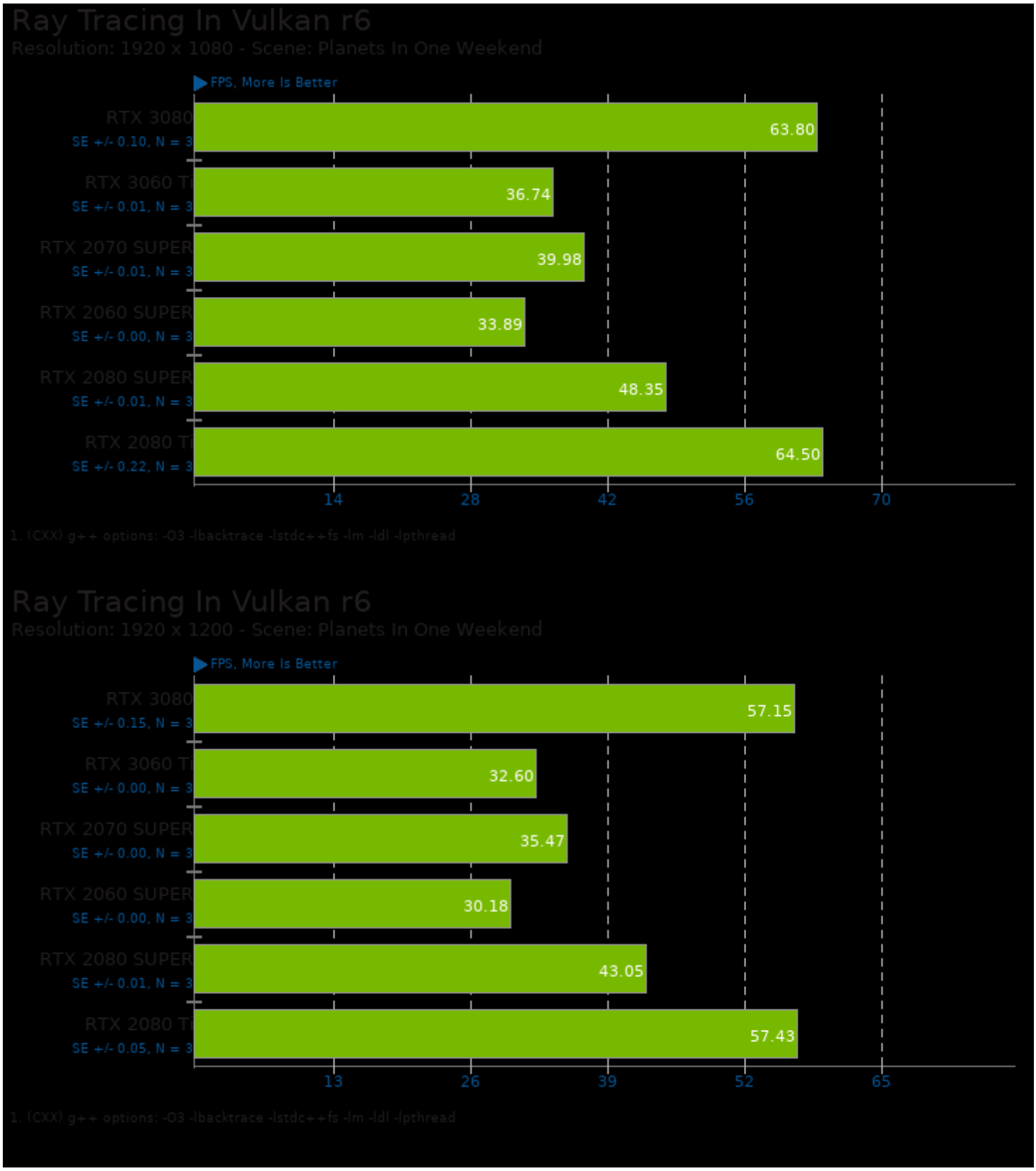

Ray Tracing In Vulkan r6
Resolution: 2560 x 1440 - Scene: Cornell Box
FPS, More Is Better
RTX 3080
SE +/- 0.18, N = 3
67.48
RTX 3060 Ti
SE +/- 0.08, N = 3
38.60
RTX 2070 SUPER
SE +/- 0.01, N = 3
35.28
RTX 2060 SUPER
SE +/- 0.03, N = 3
29.89
RTX 2080 SUPER
SE +/- 0.01, N = 3
42.88
RTX 2080 Ti
SE +/- 0.02, N = 3
57.95
15
30
45
60
75
1. (CXX) g++ options: -O3 -lbacktrace -lstdc++fs -lm -ldl -lpthread
Ray Tracing In Vulkan r6
Resolution: 3840 x 2160 - Scene: Cornell Box
FPS, More Is Better
RTX 3080
SE +/- 0.01, N = 3
31.97
RTX 3060 Ti
SE +/- 0.00, N = 3
18.49
RTX 2070 SUPER
SE +/- 0.00, N = 3
16.79
RTX 2060 SUPER
SE +/- 0.00, N = 3
14.18
RTX 2080 SUPER
SE +/- 0.00, N = 3
20.34
RTX 2080 Ti
SE +/- 0.01, N = 3
27.58
7
14
21
28
35
1. (CXX) g++ options: -O3 -lbacktrace -lstdc++fs -lm -ldl -lpthread

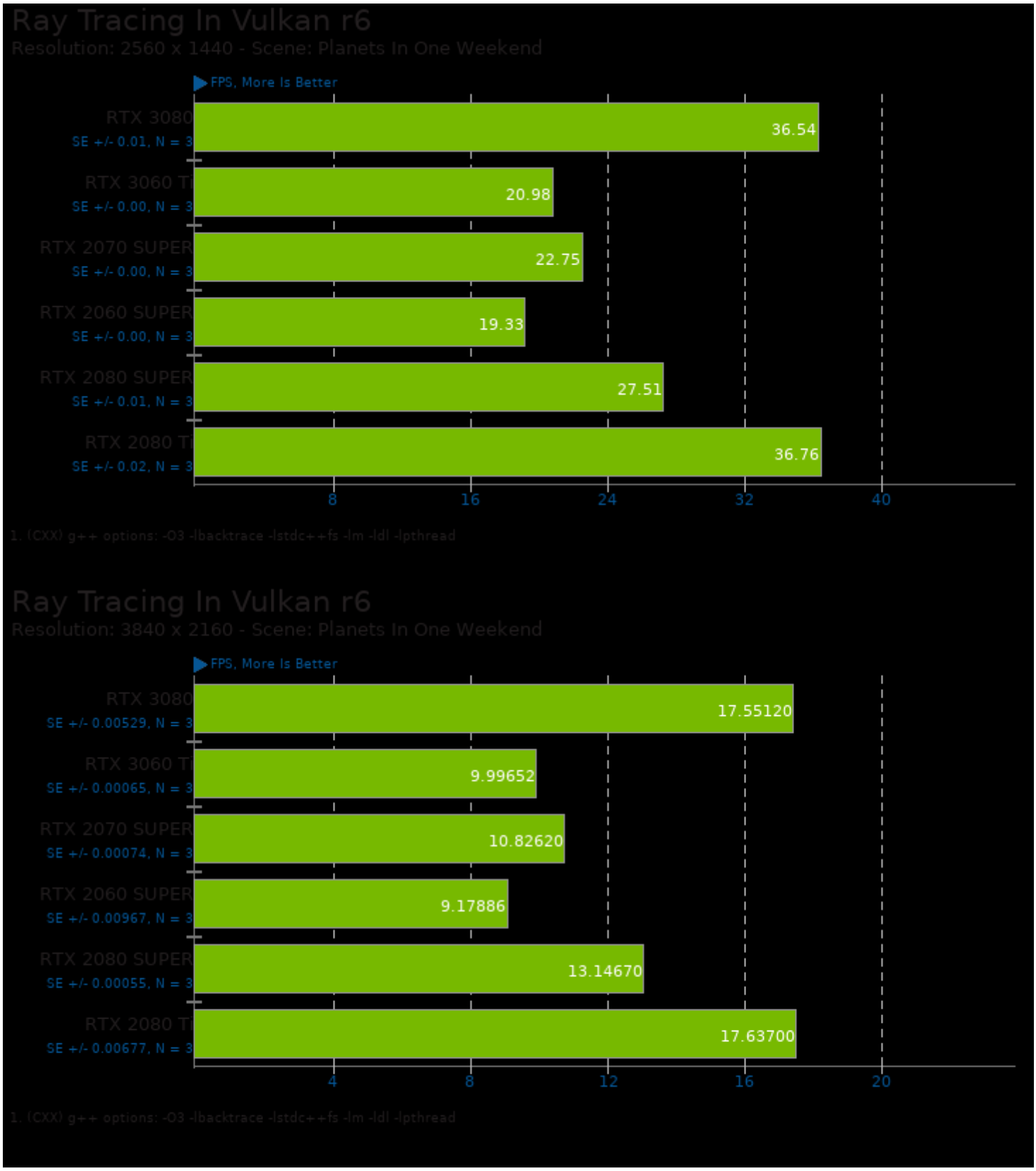

Ray Tracing In Vulkan r6
Resolution: 1920 x 1080 - Scene: Cornell Box + Lucy
FPS, More Is Better
RTX 3080
SE +/- 0.11, N = 3
59.09
RTX 3060 Ti
SE +/- 0.01, N = 3
34.07
RTX 2070 SUPER
SE +/- 0.02, N = 3
24.60
RTX 2060 SUPER
SE +/- 0.03, N = 3
21.84
RTX 2080 SUPER
SE +/- 0.03, N = 3
25.75
RTX 2080 Ti
SE +/- 0.06, N = 3
37.79
13
26
39
52
65
1. (CXX) g++ options: -O3 -lbacktrace -lstdc++fs -lm -ldl -lpthread
Ray Tracing In Vulkan r6
Resolution: 1920 x 1200 - Scene: Cornell Box + Lucy
FPS, More Is Better
RTX 3080
SE +/- 0.04, N = 3
48.43
RTX 3060 Ti
SE +/- 0.02, N = 3
27.89
RTX 2070 SUPER
SE +/- 0.04, N = 3
20.06
RTX 2060 SUPER
SE +/- 0.01, N = 3
17.85
RTX 2080 SUPER
SE +/- 0.01, N = 3
21.12
RTX 2080 Ti
SE +/- 0.04, N = 3
31.02
11
22
33
44
55
1. (CXX) g++ options: -O3 -lbacktrace -lstdc++fs -lm -ldl -lpthread

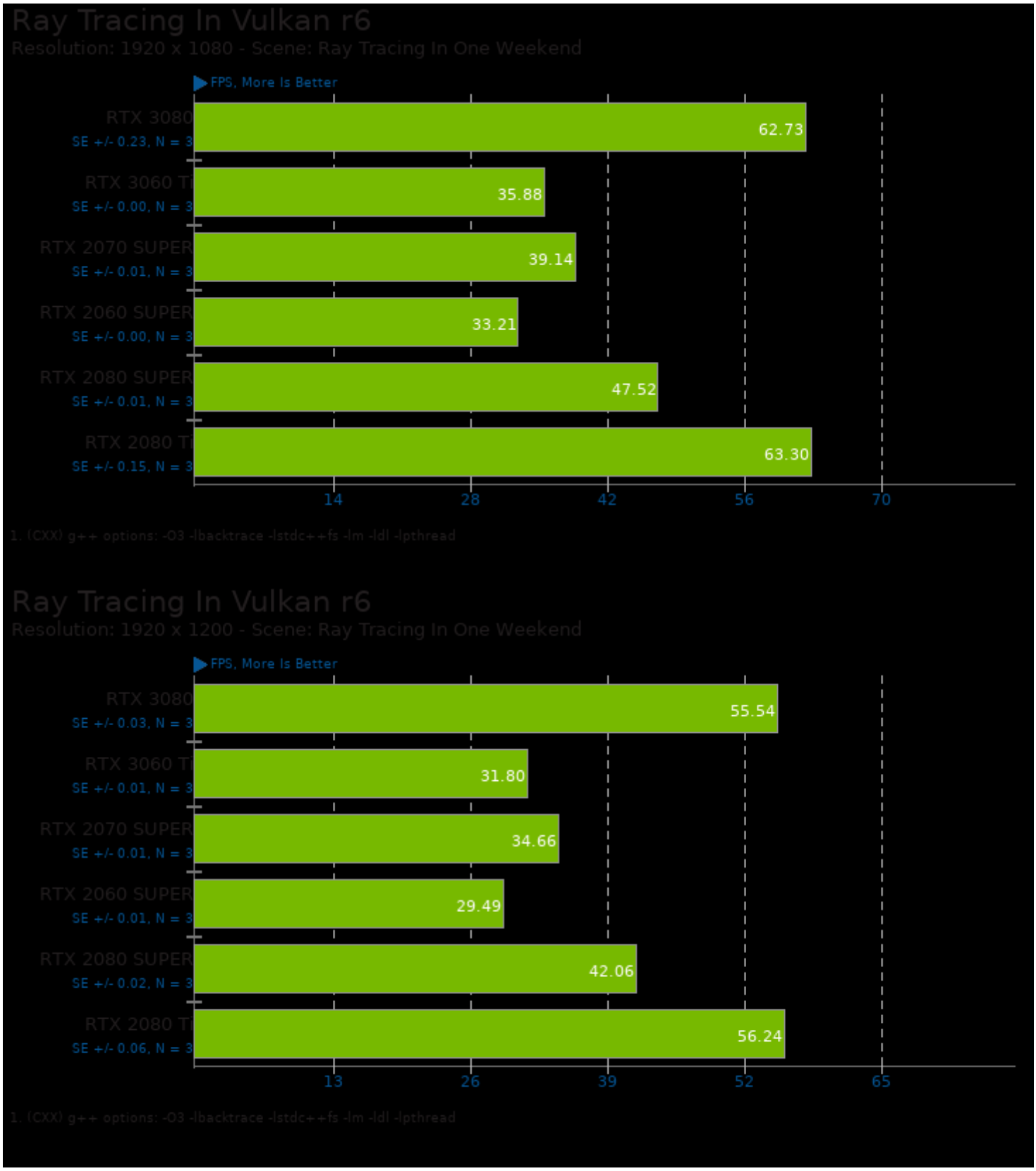

Ray Tracing In Vulkan r6
Resolution: 2560 x 1440 - Scene: Cornell Box + Lucy
FPS, More Is Better
RTX 3080
SE +/- 0.01, N = 3
33.94
RTX 3060 Ti
SE +/- 0.01, N = 3
19.55
RTX 2070 SUPER
SE +/- 0.01, N = 3
14.10
RTX 2060 SUPER
SE +/- 0.02, N = 3
12.44
RTX 2080 SUPER
SE +/- 0.01, N = 3
14.87
RTX 2080 Ti
SE +/- 0.02, N = 3
21.80
8
16
24
32
40
1. (CXX) g++ options: -O3 -lbacktrace -lstdc++fs -lm -ldl -lpthread
Ray Tracing In Vulkan r6
Resolution: 3840 x 2160 - Scene: Cornell Box + Lucy
FPS, More Is Better
RTX 3080
SE +/- 0.00971, N = 3
16.44130
RTX 3060 Ti
SE +/- 0.00090, N = 3
9.39314
RTX 2070 SUPER
SE +/- 0.01081, N = 3
6.77717
RTX 2060 SUPER
SE +/- 0.00374, N = 3
5.97602
RTX 2080 SUPER
SE +/- 0.00445, N = 3
7.14784
RTX 2080 Ti
SE +/- 0.00654, N = 3
10.53690
4
8
12
16
20
1. (CXX) g++ options: -O3 -lbacktrace -lstdc++fs -lm -ldl -lpthread

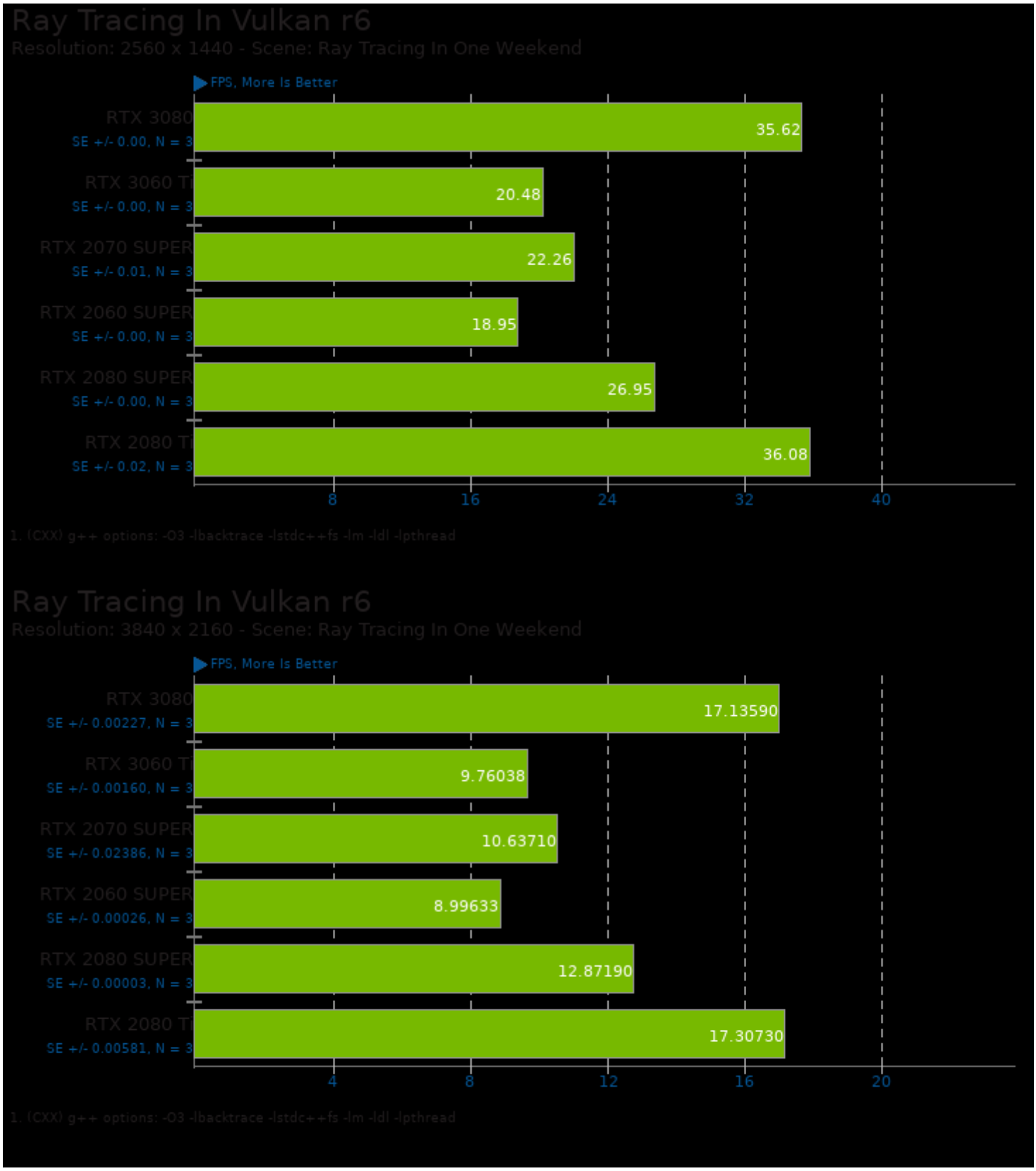

Ray Tracing In Vulkan r6
Resolution: 1920 x 1080 - Scene: Lucy In One Weekend
FPS, More Is Better
RTX 3080
SE +/- 0.17, N = 3
57.82
RTX 3060 Ti
SE +/- 0.03, N = 3
33.72
RTX 2070 SUPER
SE +/- 0.01, N = 3
26.28
RTX 2060 SUPER
SE +/- 0.03, N = 3
23.31
RTX 2080 SUPER
SE +/- 0.04, N = 3
28.45
RTX 2080 Ti
SE +/- 0.01, N = 3
40.42
13
26
39
52
65
1. (CXX) g++ options: -O3 -lbacktrace -lstdc++fs -lm -ldl -lpthread
Ray Tracing In Vulkan r6
Resolution: 1920 x 1200 - Scene: Lucy In One Weekend
FPS, More Is Better
RTX 3080
SE +/- 0.04, N = 3
48.69
RTX 3060 Ti
SE +/- 0.03, N = 3
29.10
RTX 2070 SUPER
SE +/- 0.01, N = 3
22.79
RTX 2060 SUPER
SE +/- 0.01, N = 3
20.17
RTX 2080 SUPER
SE +/- 0.02, N = 3
24.59
RTX 2080 Ti
SE +/- 0.02, N = 3
35.02
11
22
33
44
55
1. (CXX) g++ options: -O3 -lbacktrace -lstdc++fs -lm -ldl -lpthread

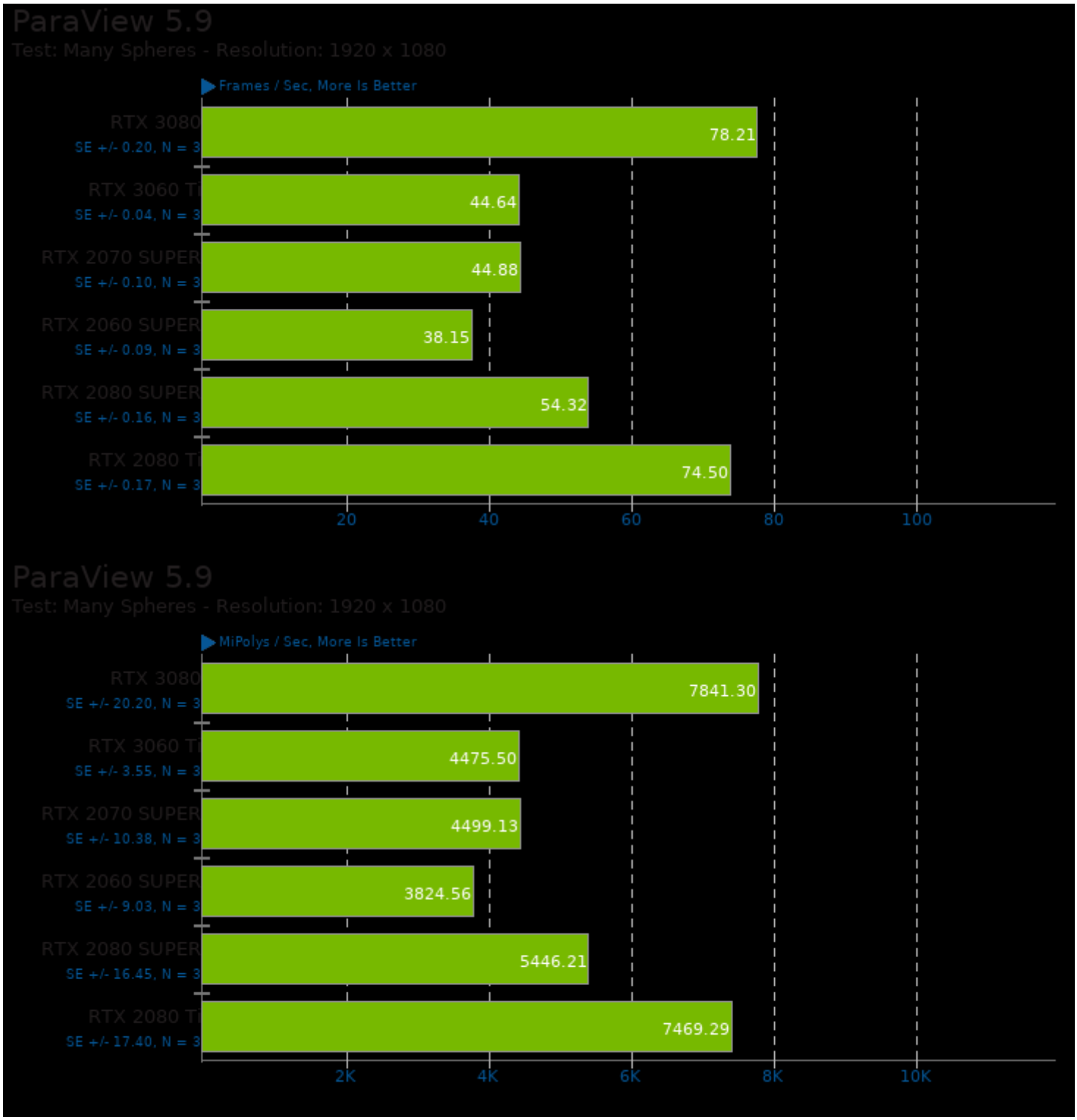

Ray Tracing In Vulkan r6
Resolution: 2560 x 1440 - Scene: Lucy In One Weekend
FPS, More Is Better
RTX 3080
SE +/- 0.02, N = 3
33.05
RTX 3060 Ti
SE +/- 0.01, N = 3
19.53
RTX 2070 SUPER
SE +/- 0.00, N = 3
15.66
RTX 2060 SUPER
SE +/- 0.00, N = 3
13.76
RTX 2080 SUPER
SE +/- 0.01, N = 3
17.15
RTX 2080 Ti
SE +/- 0.02, N = 3
24.37
8
16
24
32
40
1. (CXX) g++ options: -O3 -lbacktrace -lstdc++fs -lm -ldl -lpthread
Ray Tracing In Vulkan r6
Resolution: 3840 x 2160 - Scene: Lucy In One Weekend
FPS, More Is Better
RTX 3080
SE +/- 0.01030, N = 3
16.43120
RTX 3060 Ti
SE +/- 0.00111, N = 3
9.60781
RTX 2070 SUPER
SE +/- 0.00227, N = 3
7.93153
RTX 2060 SUPER
SE +/- 0.00320, N = 3
6.87206
RTX 2080 SUPER
SE +/- 0.00442, N = 3
8.82616
RTX 2080 Ti
SE +/- 0.00880, N = 3
12.46730
4
8
12
16
20
1. (CXX) g++ options: -O3 -lbacktrace -lstdc++fs -lm -ldl -lpthread

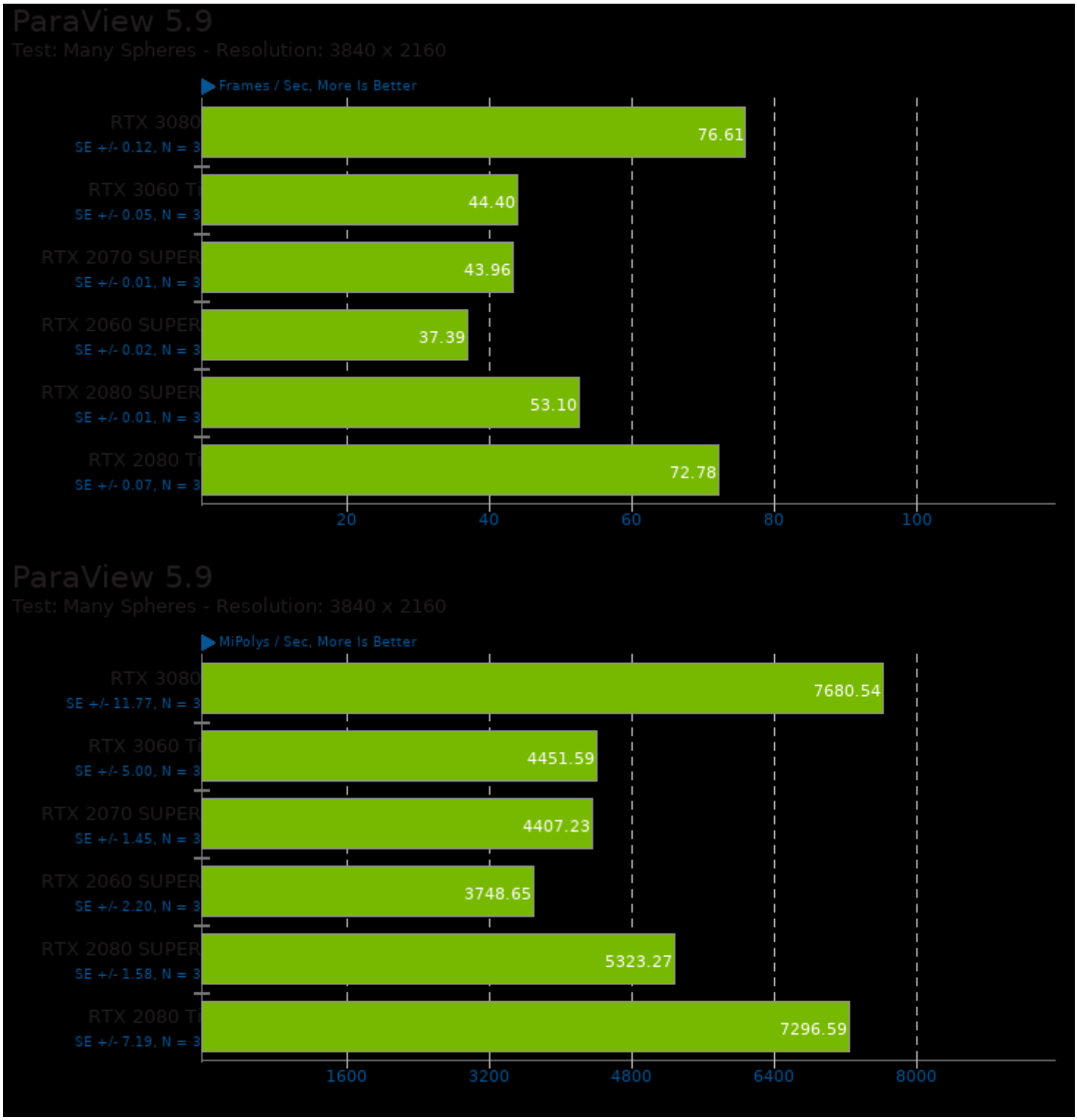

Ray Tracing In Vulkan r6
Resolution: 1920 x 1080 - Scene: Planets In One Weekend
FPS, More Is Better
RTX 3080
SE +/- 0.10, N = 3
63.80
RTX 3060 Ti
SE +/- 0.01, N = 3
36.74
RTX 2070 SUPER
SE +/- 0.01, N = 3
39.98
RTX 2060 SUPER
SE +/- 0.00, N = 3
33.89
RTX 2080 SUPER
SE +/- 0.01, N = 3
48.35
RTX 2080 Ti
SE +/- 0.22, N = 3
64.50
14
28
42
56
70
1. (CXX) g++ options: -O3 -lbacktrace -lstdc++fs -lm -ldl -lpthread
Ray Tracing In Vulkan r6
Resolution: 1920 x 1200 - Scene: Planets In One Weekend
FPS, More Is Better
RTX 3080
SE +/- 0.15, N = 3
57.15
RTX 3060 Ti
SE +/- 0.00, N = 3
32.60
RTX 2070 SUPER
SE +/- 0.00, N = 3
35.47
RTX 2060 SUPER
SE +/- 0.00, N = 3
30.18
RTX 2080 SUPER
SE +/- 0.01, N = 3
43.05
RTX 2080 Ti
SE +/- 0.05, N = 3
57.43
13
26
39
52
65
1. (CXX) g++ options: -O3 -lbacktrace -lstdc++fs -lm -ldl -lpthread

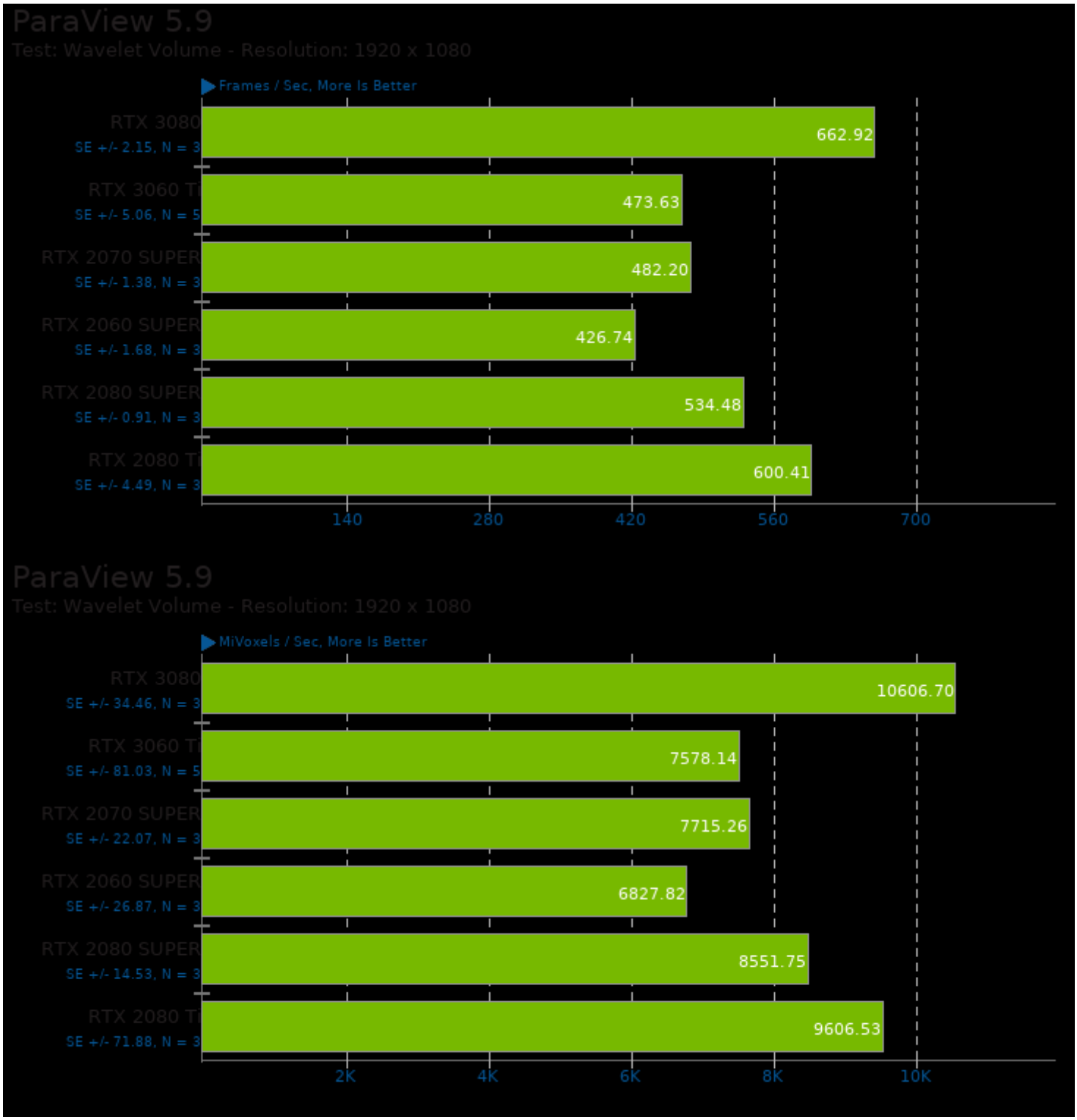

Ray Tracing In Vulkan r6
Resolution: 2560 x 1440 - Scene: Planets In One Weekend
FPS, More Is Better
RTX 3080
SE +/- 0.01, N = 3
36.54
RTX 3060 Ti
SE +/- 0.00, N = 3
20.98
RTX 2070 SUPER
SE +/- 0.00, N = 3
22.75
RTX 2060 SUPER
SE +/- 0.00, N = 3
19.33
RTX 2080 SUPER
SE +/- 0.01, N = 3
27.51
RTX 2080 Ti
SE +/- 0.02, N = 3
36.76
8
16
24
32
40
1. (CXX) g++ options: -O3 -lbacktrace -lstdc++fs -lm -ldl -lpthread
Ray Tracing In Vulkan r6
Resolution: 3840 x 2160 - Scene: Planets In One Weekend
FPS, More Is Better
RTX 3080
SE +/- 0.00529, N = 3
17.55120
RTX 3060 Ti
SE +/- 0.00065, N = 3
9.99652
RTX 2070 SUPER
SE +/- 0.00074, N = 3
10.82620
RTX 2060 SUPER
SE +/- 0.00967, N = 3
9.17886
RTX 2080 SUPER
SE +/- 0.00055, N = 3
13.14670
RTX 2080 Ti
SE +/- 0.00677, N = 3
17.63700
4
8
12
16
20
1. (CXX) g++ options: -O3 -lbacktrace -lstdc++fs -lm -ldl -lpthread

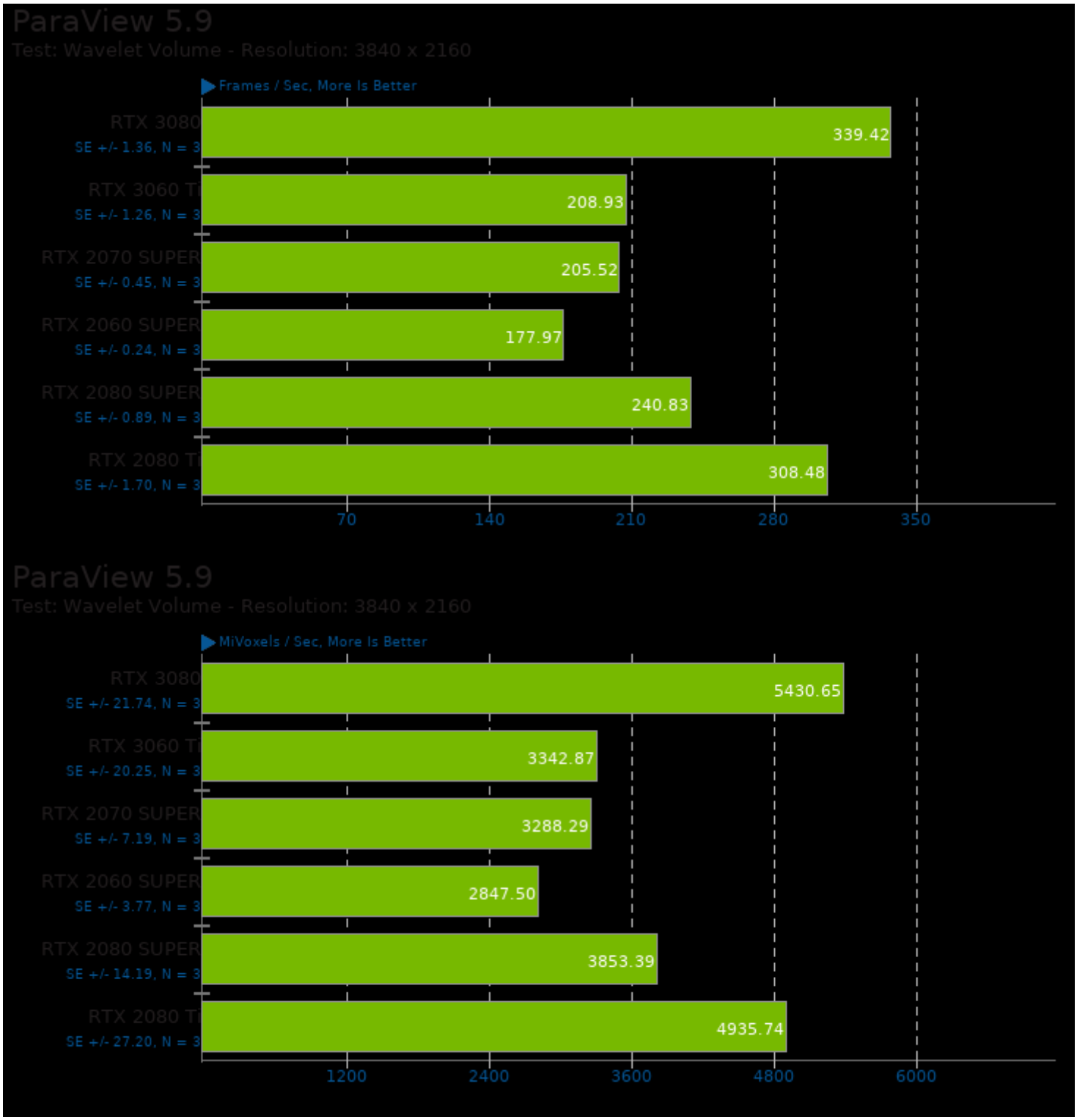

Ray Tracing In Vulkan r6
Resolution: 1920 x 1080 - Scene: Ray Tracing In One Weekend
FPS, More Is Better
RTX 3080
SE +/- 0.23, N = 3
62.73
RTX 3060 Ti
SE +/- 0.00, N = 3
35.88
RTX 2070 SUPER
SE +/- 0.01, N = 3
39.14
RTX 2060 SUPER
SE +/- 0.00, N = 3
33.21
RTX 2080 SUPER
SE +/- 0.01, N = 3
47.52
RTX 2080 Ti
SE +/- 0.15, N = 3
63.30
14
28
42
56
70
1. (CXX) g++ options: -O3 -lbacktrace -lstdc++fs -lm -ldl -lpthread
Ray Tracing In Vulkan r6
Resolution: 1920 x 1200 - Scene: Ray Tracing In One Weekend
FPS, More Is Better
RTX 3080
SE +/- 0.03, N = 3
55.54
RTX 3060 Ti
SE +/- 0.01, N = 3
31.80
RTX 2070 SUPER
SE +/- 0.01, N = 3
34.66
RTX 2060 SUPER
SE +/- 0.01, N = 3
29.49
RTX 2080 SUPER
SE +/- 0.02, N = 3
42.06
RTX 2080 Ti
SE +/- 0.06, N = 3
56.24
13
26
39
52
65
1. (CXX) g++ options: -O3 -lbacktrace -lstdc++fs -lm -ldl -lpthread

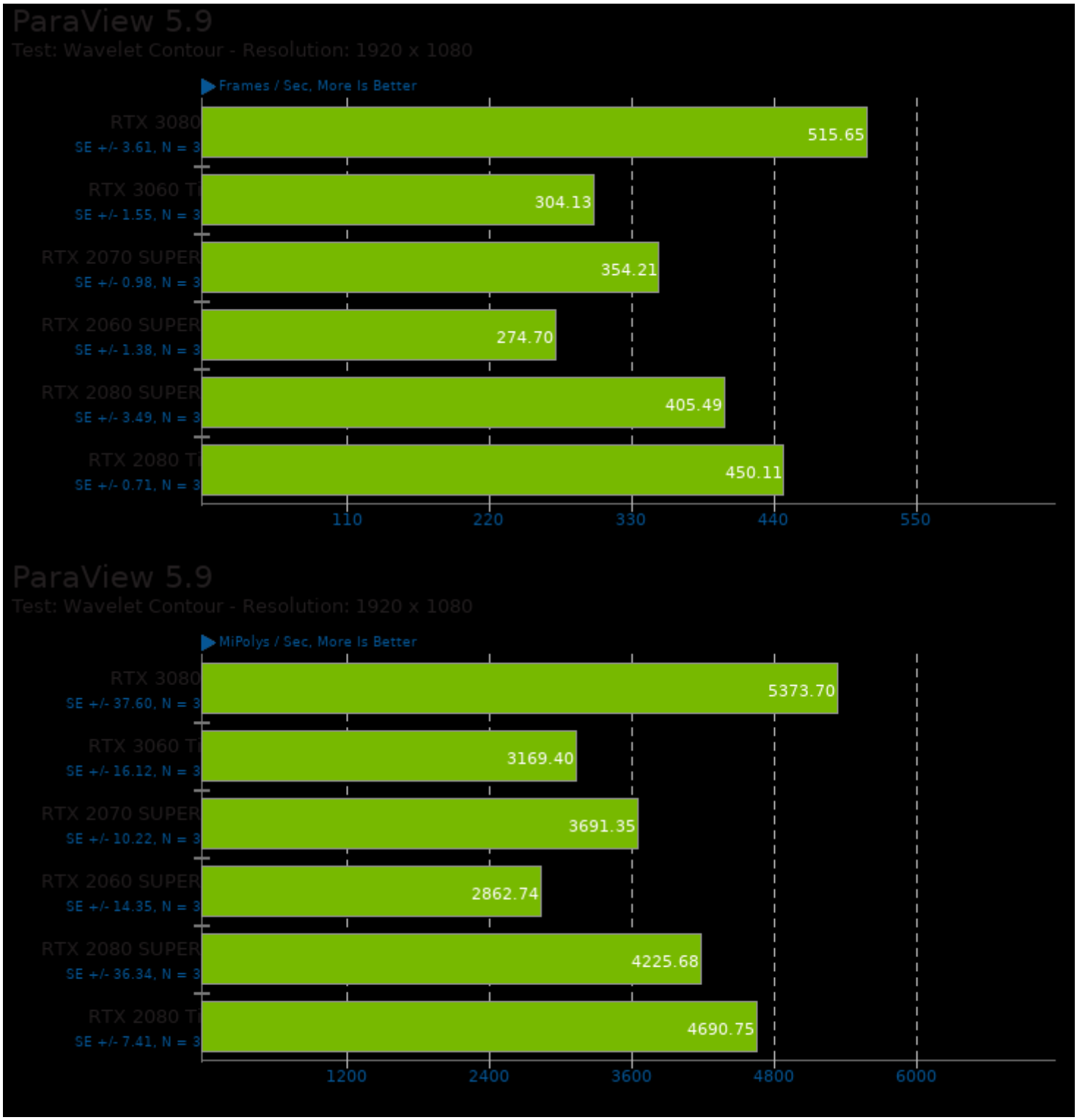

Ray Tracing In Vulkan r6
Resolution: 2560 x 1440 - Scene: Ray Tracing In One Weekend
FPS, More Is Better
RTX 3080
SE +/- 0.00, N = 3
35.62
RTX 3060 Ti
SE +/- 0.00, N = 3
20.48
RTX 2070 SUPER
SE +/- 0.01, N = 3
22.26
RTX 2060 SUPER
SE +/- 0.00, N = 3
18.95
RTX 2080 SUPER
SE +/- 0.00, N = 3
26.95
RTX 2080 Ti
SE +/- 0.02, N = 3
36.08
8
16
24
32
40
1. (CXX) g++ options: -O3 -lbacktrace -lstdc++fs -lm -ldl -lpthread
Ray Tracing In Vulkan r6
Resolution: 3840 x 2160 - Scene: Ray Tracing In One Weekend
FPS, More Is Better
RTX 3080
SE +/- 0.00227, N = 3
17.13590
RTX 3060 Ti
SE +/- 0.00160, N = 3
9.76038
RTX 2070 SUPER
SE +/- 0.02386, N = 3
10.63710
RTX 2060 SUPER
SE +/- 0.00026, N = 3
8.99633
RTX 2080 SUPER
SE +/- 0.00003, N = 3
12.87190
RTX 2080 Ti
SE +/- 0.00581, N = 3
17.30730
4
8
12
16
20
1. (CXX) g++ options: -O3 -lbacktrace -lstdc++fs -lm -ldl -lpthread

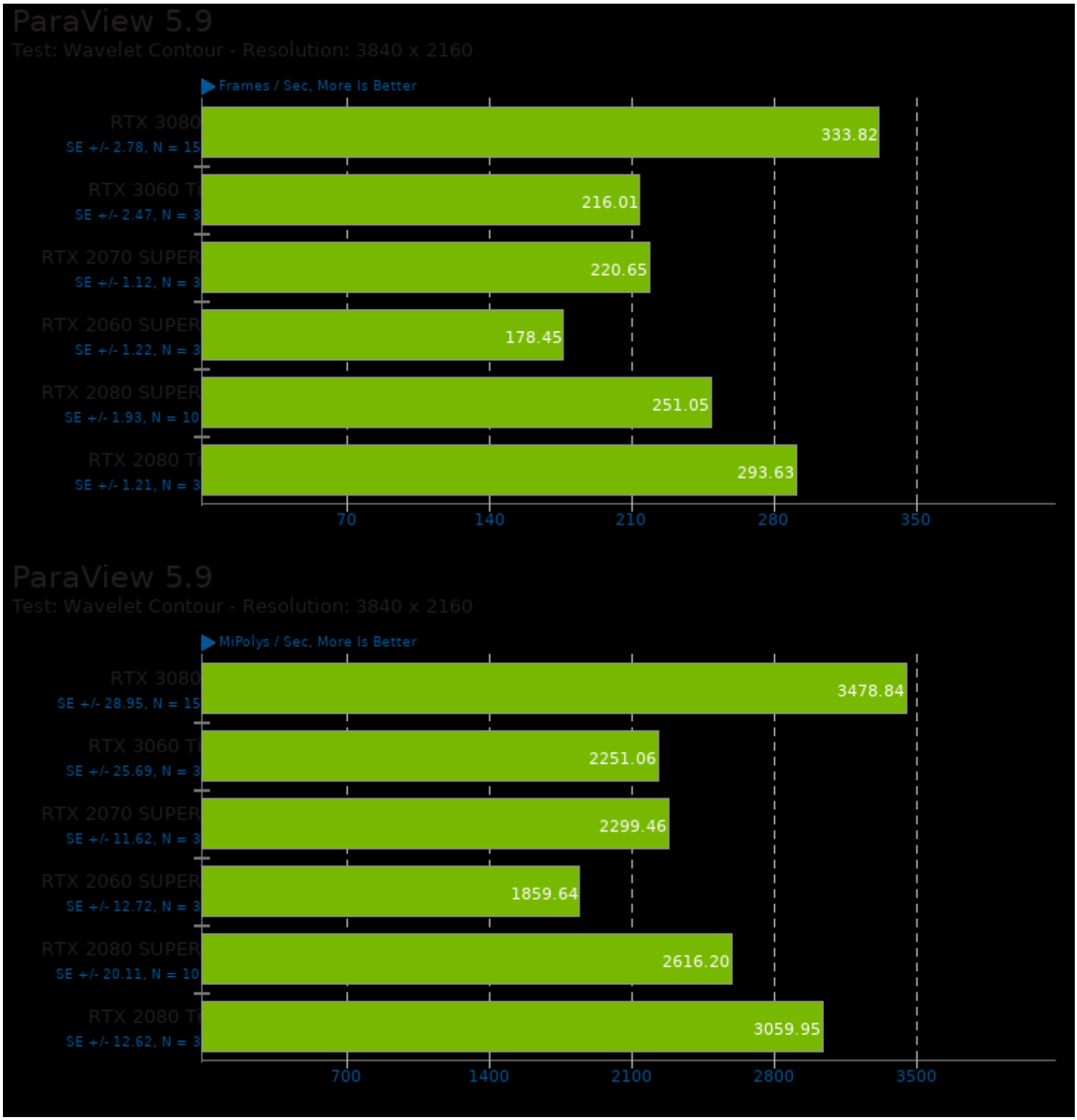

ParaView 5.9
Test: Many Spheres - Resolution: 1920 x 1080
Frames / Sec, More Is Better
RTX 3080
SE +/- 0.20, N = 3
78.21
RTX 3060 Ti
SE +/- 0.04, N = 3
44.64
RTX 2070 SUPER
SE +/- 0.10, N = 3
44.88
RTX 2060 SUPER
SE +/- 0.09, N = 3
38.15
RTX 2080 SUPER
SE +/- 0.16, N = 3
54.32
RTX 2080 Ti
SE +/- 0.17, N = 3
74.50
20
40
60
80
100
ParaView 5.9
Test: Many Spheres - Resolution: 1920 x 1080
MiPolys / Sec, More Is Better
RTX 3080
SE +/- 20.20, N = 3
7841.30
RTX 3060 Ti
SE +/- 3.55, N = 3
4475.50
RTX 2070 SUPER
SE +/- 10.38, N = 3
4499.13
RTX 2060 SUPER
SE +/- 9.03, N = 3
3824.56
RTX 2080 SUPER
SE +/- 16.45, N = 3
5446.21
RTX 2080 Ti
SE +/- 17.40, N = 3
7469.29
2K
4K
6K
8K
10K

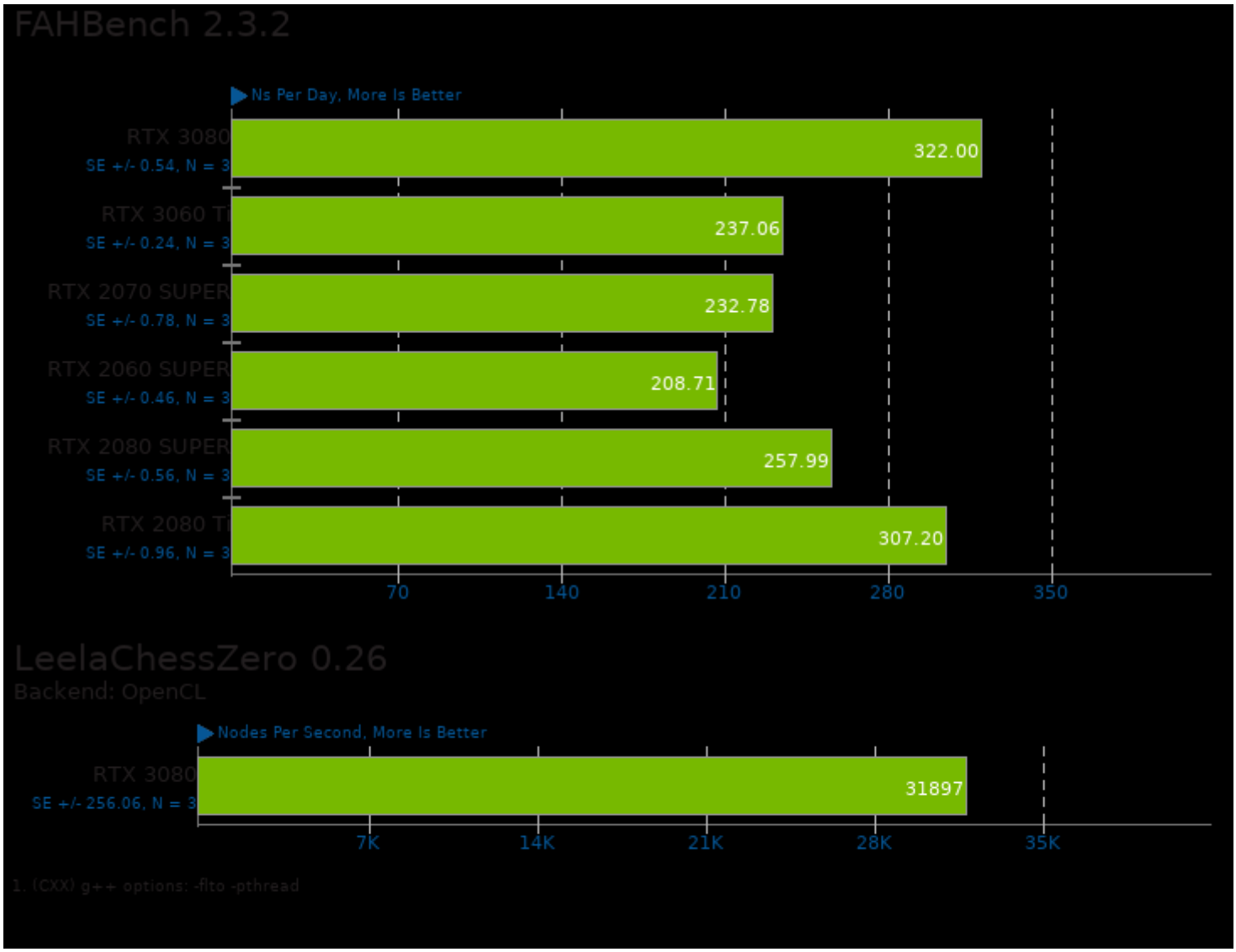

ParaView 5.9
Test: Many Spheres - Resolution: 3840 x 2160
Frames / Sec, More Is Better
RTX 3080
SE +/- 0.12, N = 3
76.61
RTX 3060 Ti
SE +/- 0.05, N = 3
44.40
RTX 2070 SUPER
SE +/- 0.01, N = 3
43.96
RTX 2060 SUPER
SE +/- 0.02, N = 3
37.39
RTX 2080 SUPER
SE +/- 0.01, N = 3
53.10
RTX 2080 Ti
SE +/- 0.07, N = 3
72.78
20
40
60
80
100
ParaView 5.9
Test: Many Spheres - Resolution: 3840 x 2160
MiPolys / Sec, More Is Better
RTX 3080
SE +/- 11.77, N = 3
7680.54
RTX 3060 Ti
SE +/- 5.00, N = 3
4451.59
RTX 2070 SUPER
SE +/- 1.45, N = 3
4407.23
RTX 2060 SUPER
SE +/- 2.20, N = 3
3748.65
RTX 2080 SUPER
SE +/- 1.58, N = 3
5323.27
RTX 2080 Ti
SE +/- 7.19, N = 3
7296.59
1600
3200
4800
6400
8000

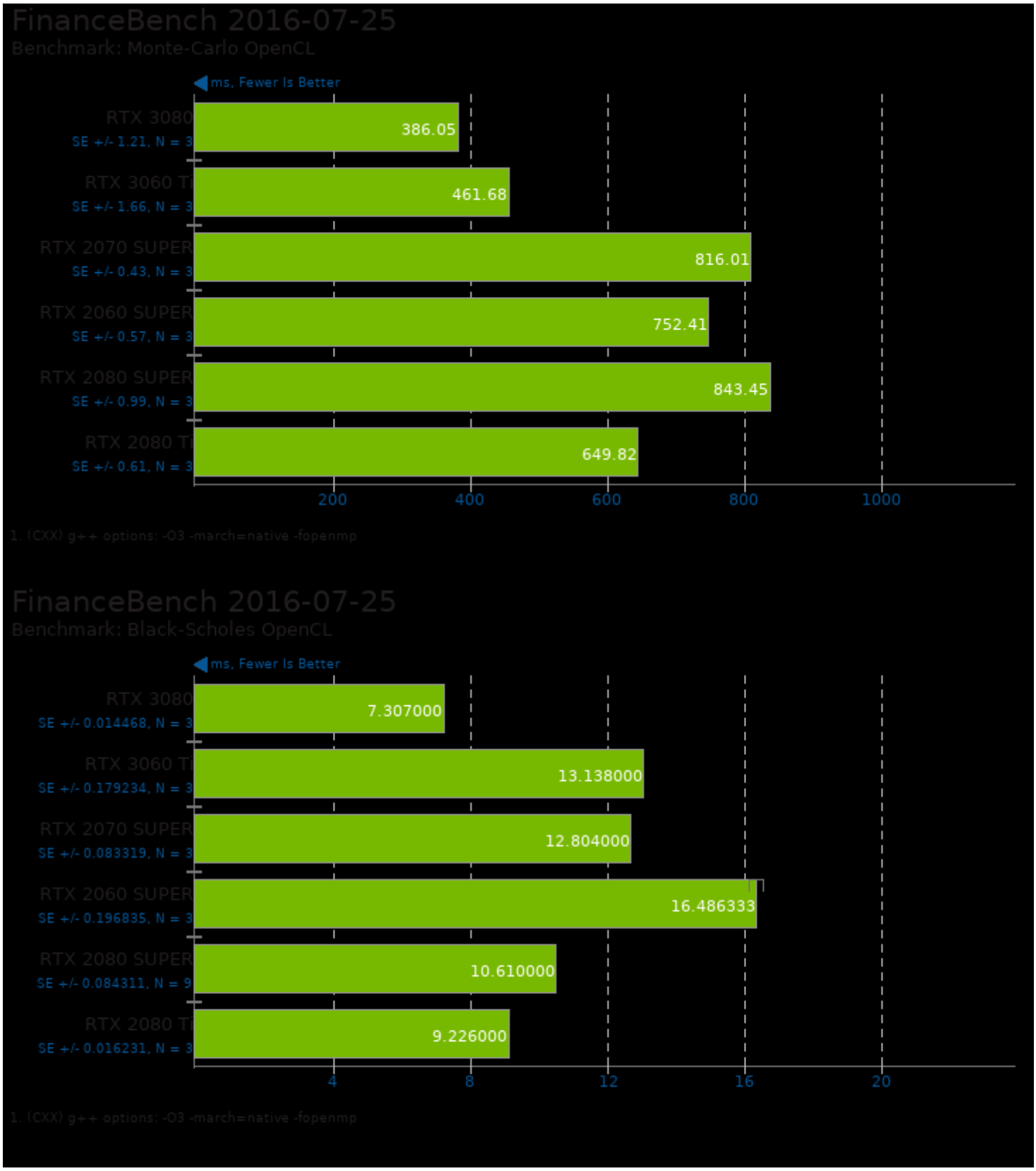

ParaView 5.9
Test: Wavelet Volume - Resolution: 1920 x 1080
Frames / Sec, More Is Better
RTX 3080
SE +/- 2.15, N = 3
662.92
RTX 3060 Ti
SE +/- 5.06, N = 5
473.63
RTX 2070 SUPER
SE +/- 1.38, N = 3
482.20
RTX 2060 SUPER
SE +/- 1.68, N = 3
426.74
RTX 2080 SUPER
SE +/- 0.91, N = 3
534.48
RTX 2080 Ti
SE +/- 4.49, N = 3
600.41
140
280
420
560
700
ParaView 5.9
Test: Wavelet Volume - Resolution: 1920 x 1080
MiVoxels / Sec, More Is Better
RTX 3080
SE +/- 34.46, N = 3
10606.70
RTX 3060 Ti
SE +/- 81.03, N = 5
7578.14
RTX 2070 SUPER
SE +/- 22.07, N = 3
7715.26
RTX 2060 SUPER
SE +/- 26.87, N = 3
6827.82
RTX 2080 SUPER
SE +/- 14.53, N = 3
8551.75
RTX 2080 Ti
SE +/- 71.88, N = 3
9606.53
2K
4K
6K
8K
10K

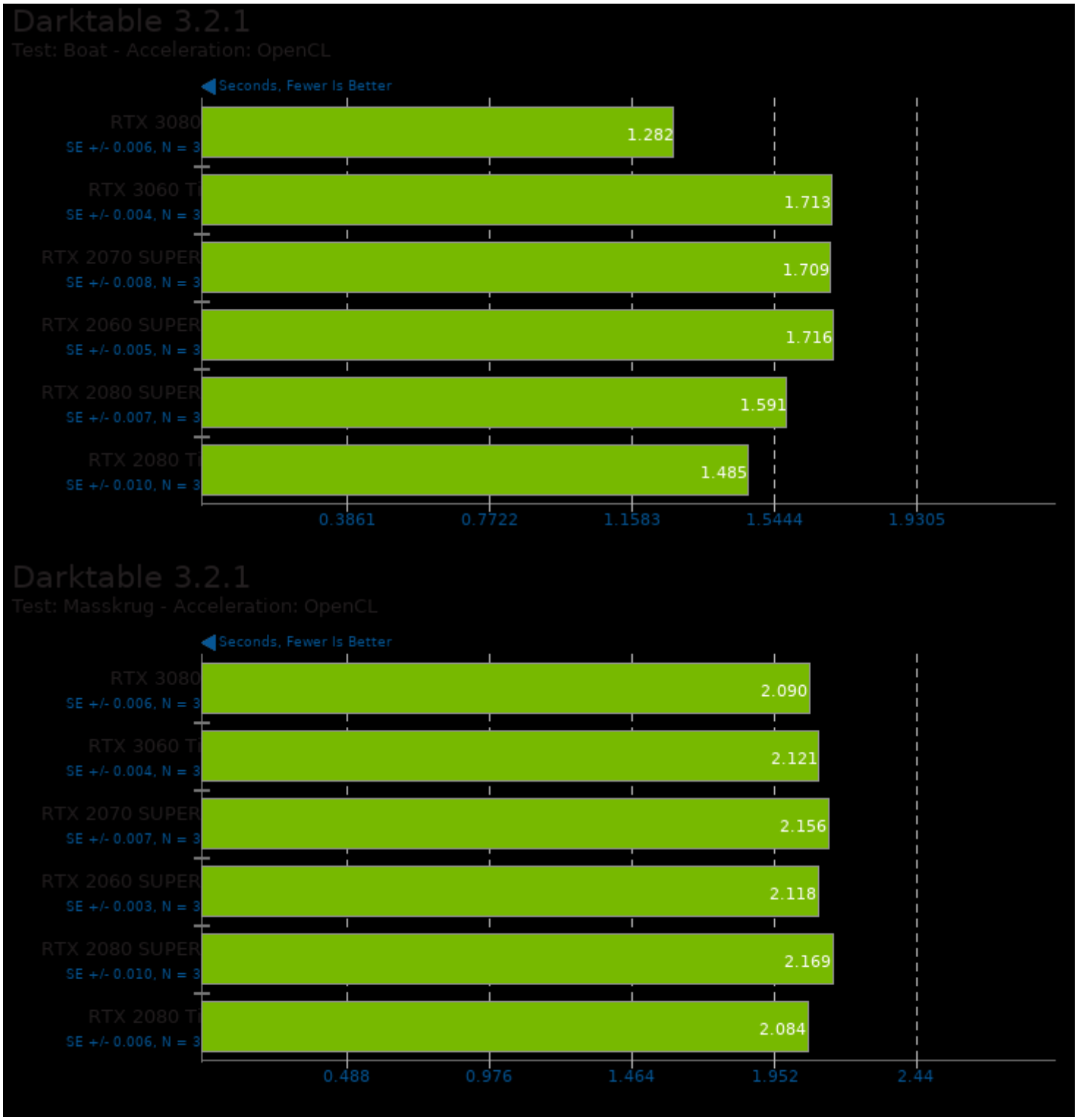

ParaView 5.9
Test: Wavelet Volume - Resolution: 3840 x 2160
Frames / Sec, More Is Better
RTX 3080
SE +/- 1.36, N = 3
339.42
RTX 3060 Ti
SE +/- 1.26, N = 3
208.93
RTX 2070 SUPER
SE +/- 0.45, N = 3
205.52
RTX 2060 SUPER
SE +/- 0.24, N = 3
177.97
RTX 2080 SUPER
SE +/- 0.89, N = 3
240.83
RTX 2080 Ti
SE +/- 1.70, N = 3
308.48
70
140
210
280
350
ParaView 5.9
Test: Wavelet Volume - Resolution: 3840 x 2160
MiVoxels / Sec, More Is Better
RTX 3080
SE +/- 21.74, N = 3
5430.65
RTX 3060 Ti
SE +/- 20.25, N = 3
3342.87
RTX 2070 SUPER
SE +/- 7.19, N = 3
3288.29
RTX 2060 SUPER
SE +/- 3.77, N = 3
2847.50
RTX 2080 SUPER
SE +/- 14.19, N = 3
3853.39
RTX 2080 Ti
SE +/- 27.20, N = 3
4935.74
1200
2400
3600
4800
6000

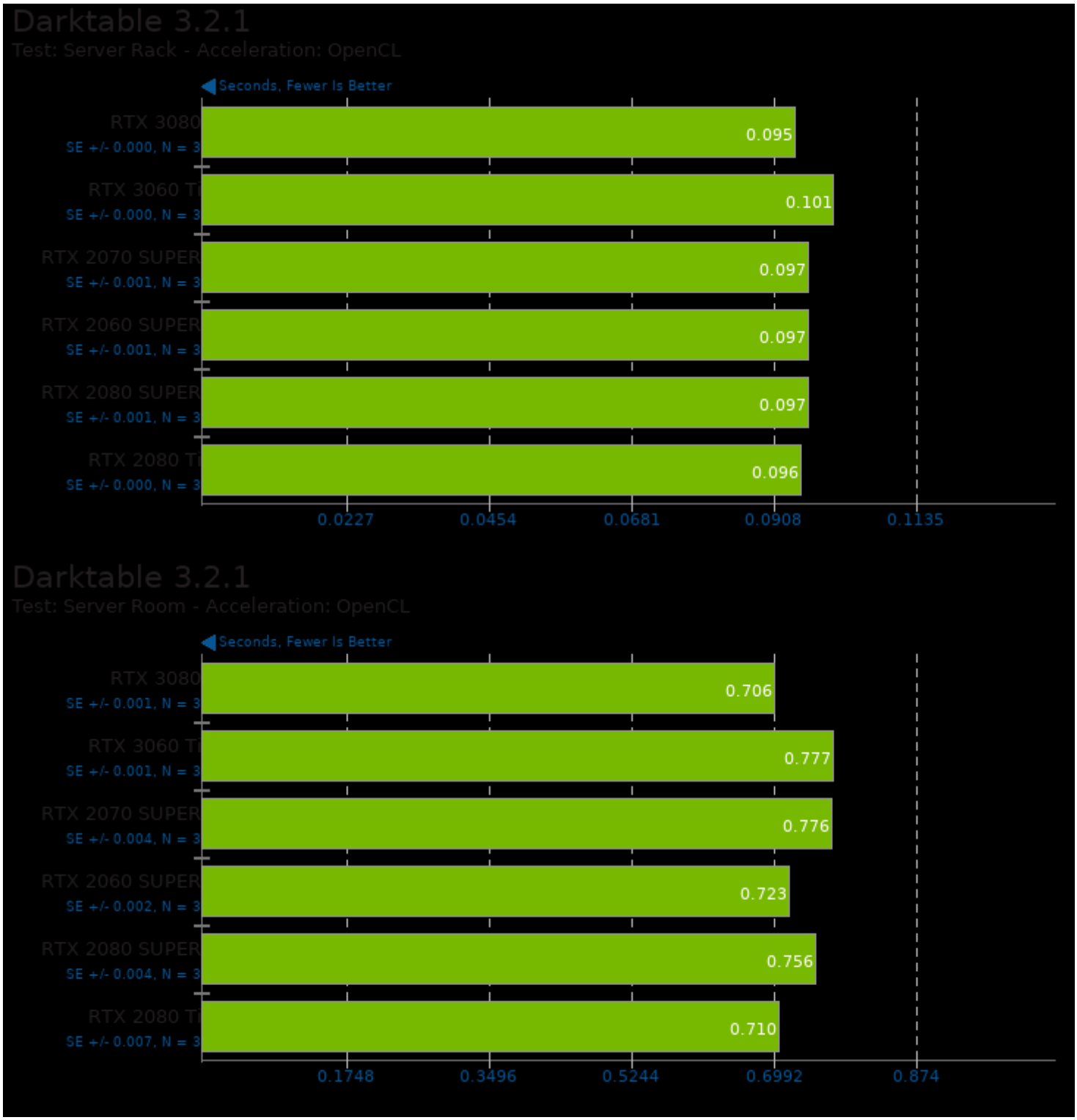

ParaView 5.9
Test: Wavelet Contour - Resolution: 1920 x 1080
Frames / Sec, More Is Better
RTX 3080
SE +/- 3.61, N = 3
515.65
RTX 3060 Ti
SE +/- 1.55, N = 3
304.13
RTX 2070 SUPER
SE +/- 0.98, N = 3
354.21
RTX 2060 SUPER
SE +/- 1.38, N = 3
274.70
RTX 2080 SUPER
SE +/- 3.49, N = 3
405.49
RTX 2080 Ti
SE +/- 0.71, N = 3
450.11
110
220
330
440
550
ParaView 5.9
Test: Wavelet Contour - Resolution: 1920 x 1080
MiPolys / Sec, More Is Better
RTX 3080
SE +/- 37.60, N = 3
5373.70
RTX 3060 Ti
SE +/- 16.12, N = 3
3169.40
RTX 2070 SUPER
SE +/- 10.22, N = 3
3691.35
RTX 2060 SUPER
SE +/- 14.35, N = 3
2862.74
RTX 2080 SUPER
SE +/- 36.34, N = 3
4225.68
RTX 2080 Ti
SE +/- 7.41, N = 3
4690.75
1200
2400
3600
4800
6000


ParaView 5.9
Test: Wavelet Contour - Resolution: 3840 x 2160
Frames / Sec, More Is Better
RTX 3080
SE +/- 2.78, N = 15
333.82
RTX 3060 Ti
SE +/- 2.47, N = 3
216.01
RTX 2070 SUPER
SE +/- 1.12, N = 3
220.65
RTX 2060 SUPER
SE +/- 1.22, N = 3
178.45
RTX 2080 SUPER
SE +/- 1.93, N = 10
251.05
RTX 2080 Ti
SE +/- 1.21, N = 3
293.63
70
140
210
280
350
ParaView 5.9
Test: Wavelet Contour - Resolution: 3840 x 2160
MiPolys / Sec, More Is Better
RTX 3080
SE +/- 28.95, N = 15
3478.84
RTX 3060 Ti
SE +/- 25.69, N = 3
2251.06
RTX 2070 SUPER
SE +/- 11.62, N = 3
2299.46
RTX 2060 SUPER
SE +/- 12.72, N = 3
1859.64
RTX 2080 SUPER
SE +/- 20.11, N = 10
2616.20
RTX 2080 Ti
SE +/- 12.62, N = 3
3059.95
700
1400
2100
2800
3500

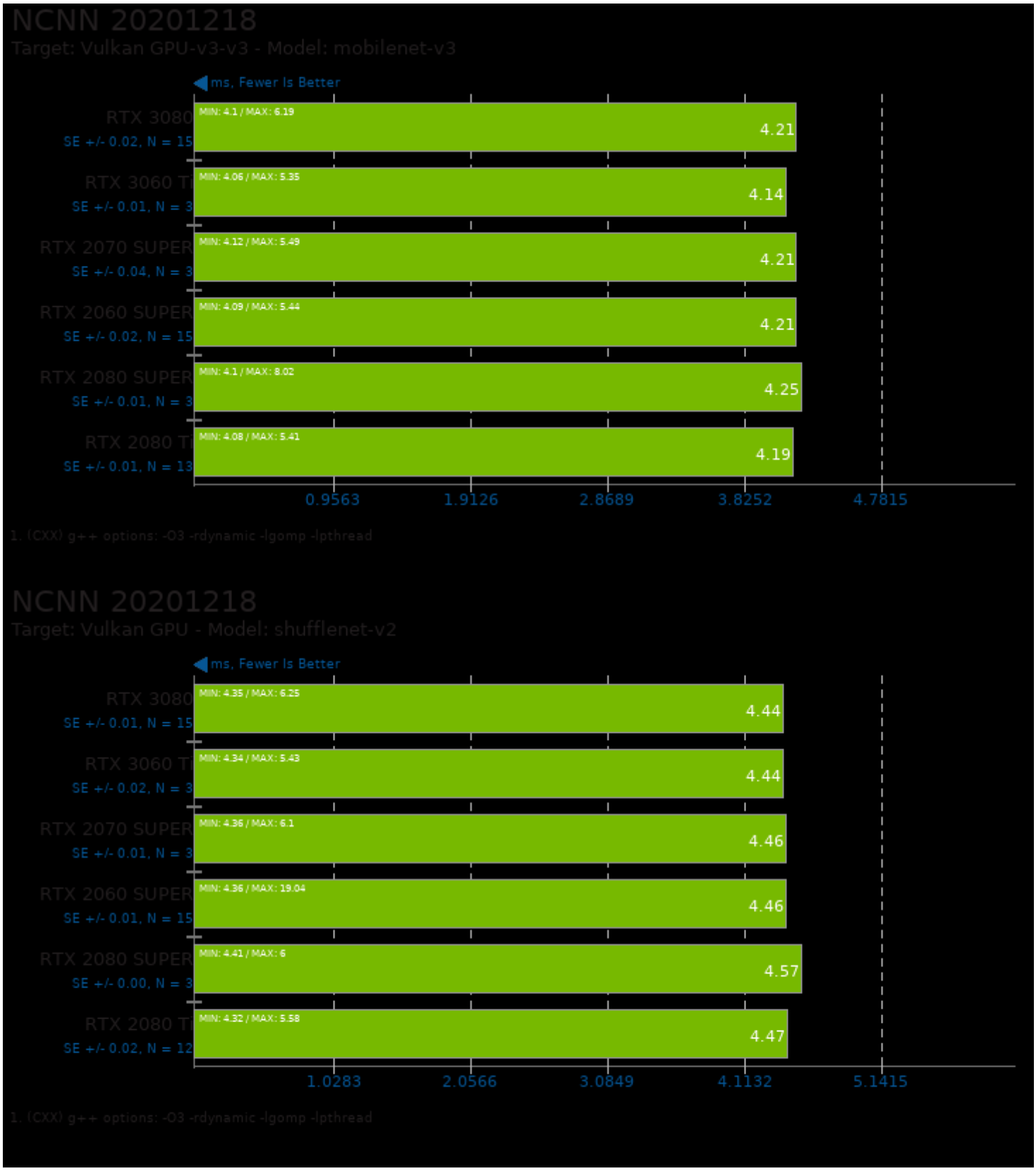

FAHBench 2.3.2
Ns Per Day, More Is Better
RTX 3080
SE +/- 0.54, N = 3
322.00
RTX 3060 Ti
SE +/- 0.24, N = 3
237.06
RTX 2070 SUPER
SE +/- 0.78, N = 3
232.78
RTX 2060 SUPER
SE +/- 0.46, N = 3
208.71
RTX 2080 SUPER
SE +/- 0.56, N = 3
257.99
RTX 2080 Ti
SE +/- 0.96, N = 3
307.20
70
140
210
280
350
LeelaChessZero 0.26
Backend: OpenCL
Nodes Per Second, More Is Better
RTX 3080
SE +/- 256.06, N = 3
31897
7K
14K
21K
28K
35K
1. (CXX) g++ options: -flto -pthread

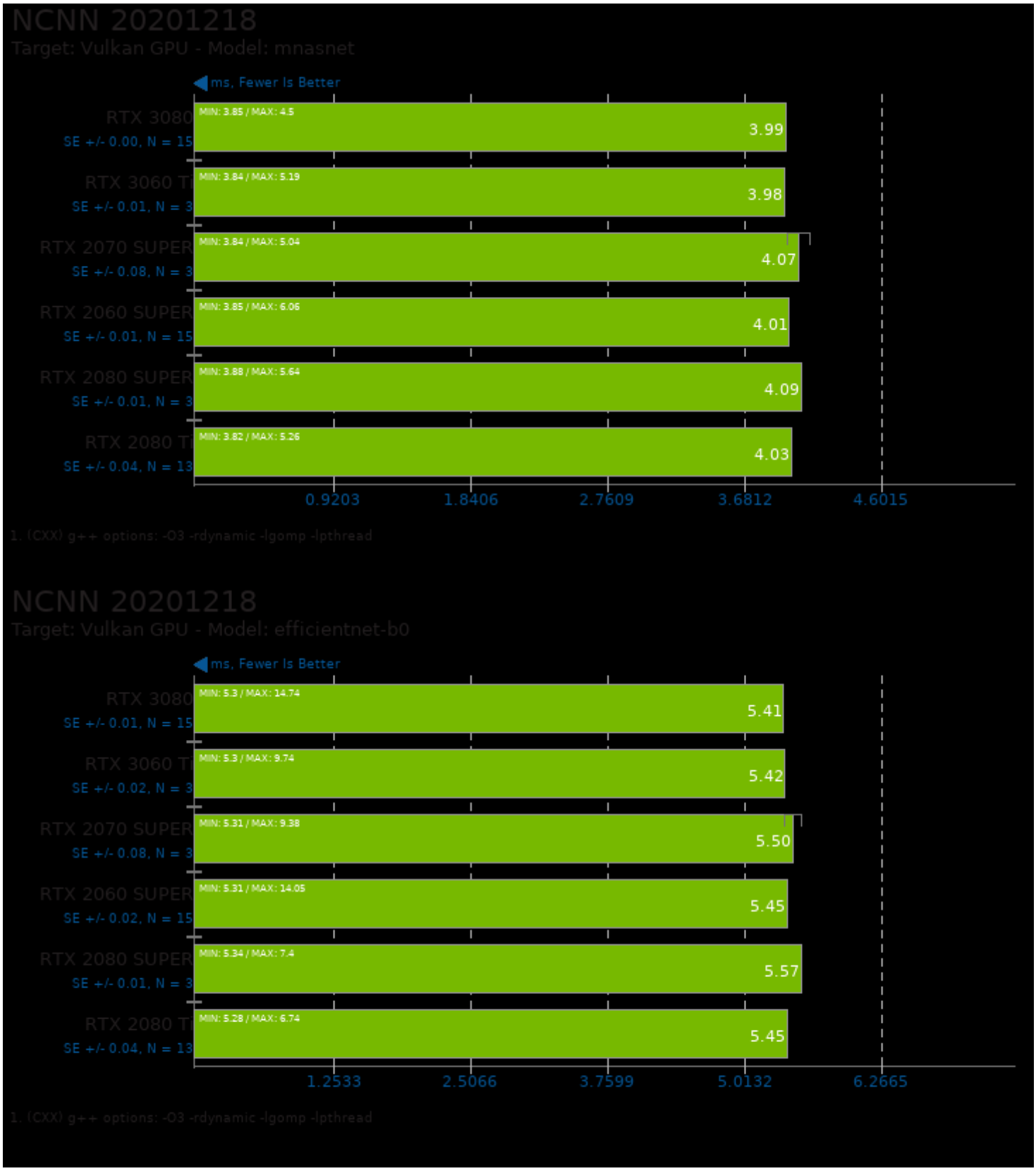

FinanceBench 2016-07-25
Benchmark: Monte-Carlo OpenCL
ms, Fewer Is Better
RTX 3080
SE +/- 1.21, N = 3
386.05
RTX 3060 Ti
SE +/- 1.66, N = 3
461.68
RTX 2070 SUPER
SE +/- 0.43, N = 3
816.01
RTX 2060 SUPER
SE +/- 0.57, N = 3
752.41
RTX 2080 SUPER
SE +/- 0.99, N = 3
843.45
RTX 2080 Ti
SE +/- 0.61, N = 3
649.82
200
400
600
800
1000
1. (CXX) g++ options: -O3 -march=native -fopenmp
FinanceBench 2016-07-25
Benchmark: Black-Scholes OpenCL
ms, Fewer Is Better
RTX 3080
SE +/- 0.014468, N = 3
7.307000
RTX 3060 Ti
SE +/- 0.179234, N = 3
13.138000
RTX 2070 SUPER
SE +/- 0.083319, N = 3
12.804000
RTX 2060 SUPER
SE +/- 0.196835, N = 3
16.486333
RTX 2080 SUPER
SE +/- 0.084311, N = 9
10.610000
RTX 2080 Ti
SE +/- 0.016231, N = 3
9.226000
4
8
12
16
20
1. (CXX) g++ options: -O3 -march=native -fopenmp

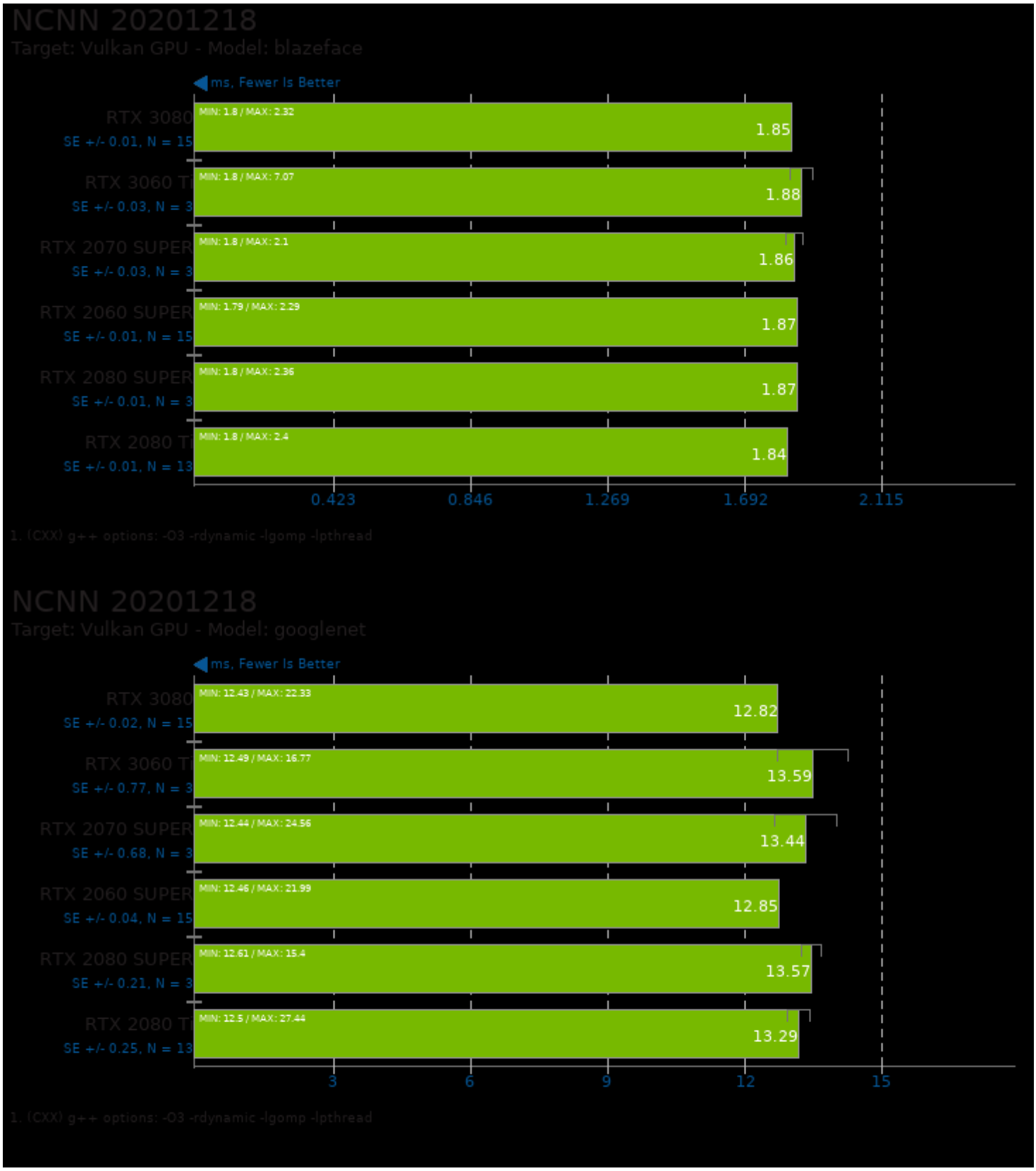

Darktable 3.2.1
Test: Boat - Acceleration: OpenCL
Seconds, Fewer Is Better
RTX 3080
SE +/- 0.006, N = 3
1.282
RTX 3060 Ti
SE +/- 0.004, N = 3
1.713
RTX 2070 SUPER
SE +/- 0.008, N = 3
1.709
RTX 2060 SUPER
SE +/- 0.005, N = 3
1.716
RTX 2080 SUPER
SE +/- 0.007, N = 3
1.591
RTX 2080 Ti
SE +/- 0.010, N = 3
1.485
0.3861
0.7722
1.1583
1.5444
1.9305
Darktable 3.2.1
Test: Masskrug - Acceleration: OpenCL
Seconds, Fewer Is Better
RTX 3080
SE +/- 0.006, N = 3
2.090
RTX 3060 Ti
SE +/- 0.004, N = 3
2.121
RTX 2070 SUPER
SE +/- 0.007, N = 3
2.156
RTX 2060 SUPER
SE +/- 0.003, N = 3
2.118
RTX 2080 SUPER
SE +/- 0.010, N = 3
2.169
RTX 2080 Ti
SE +/- 0.006, N = 3
2.084
0.488
0.976
1.464
1.952
2.44

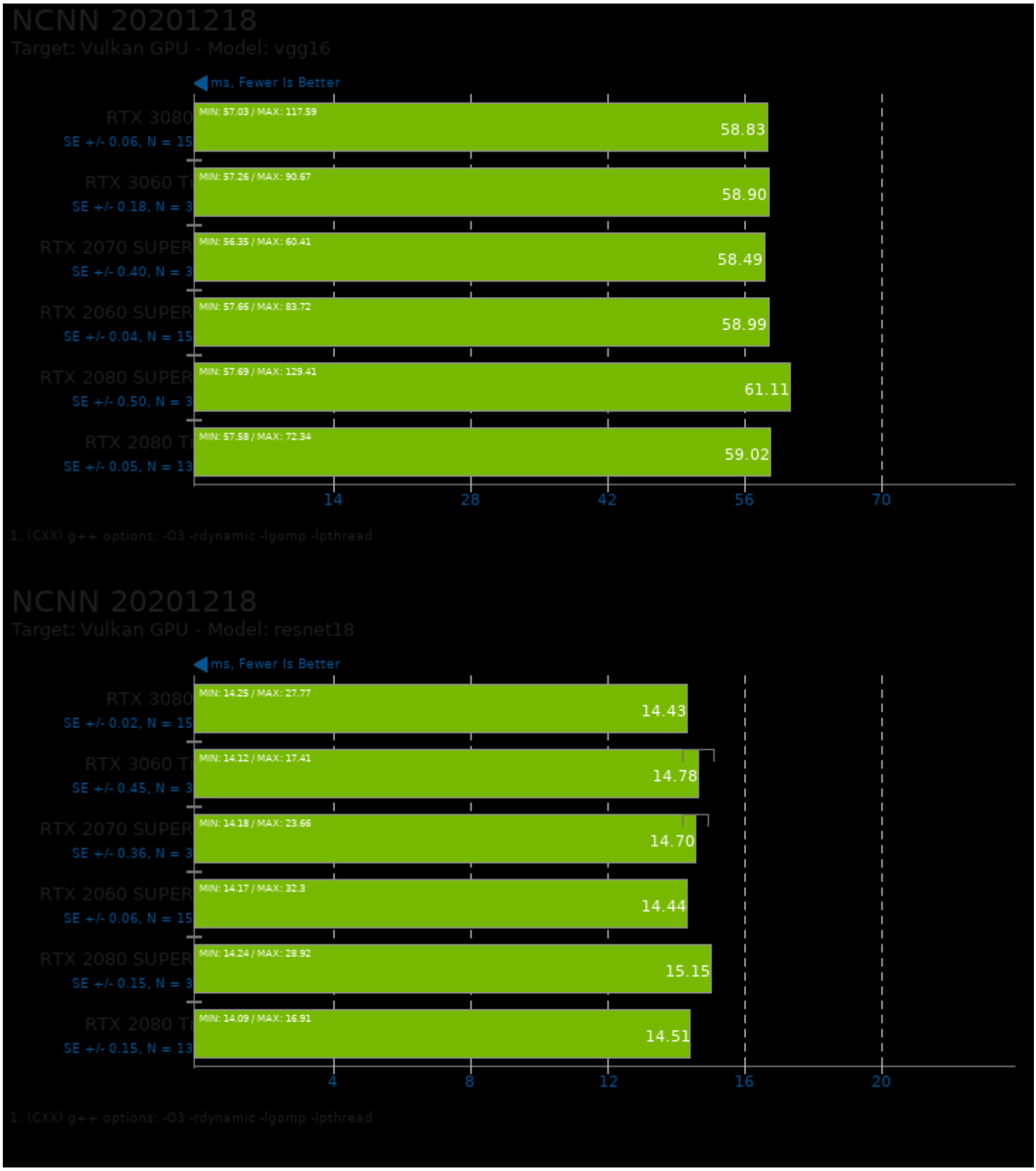

Darktable 3.2.1
Test: Server Rack - Acceleration: OpenCL
Seconds, Fewer Is Better
RTX 3080
SE +/- 0.000, N = 3
0.095
RTX 3060 Ti
SE +/- 0.000, N = 3
0.101
RTX 2070 SUPER
SE +/- 0.001, N = 3
0.097
RTX 2060 SUPER
SE +/- 0.001, N = 3
0.097
RTX 2080 SUPER
SE +/- 0.001, N = 3
0.097
RTX 2080 Ti
SE +/- 0.000, N = 3
0.096
0.0227
0.0454
0.0681
0.0908
0.1135
Darktable 3.2.1
Test: Server Room - Acceleration: OpenCL
Seconds, Fewer Is Better
RTX 3080
SE +/- 0.001, N = 3
0.706
RTX 3060 Ti
SE +/- 0.001, N = 3
0.777
RTX 2070 SUPER
SE +/- 0.004, N = 3
0.776
RTX 2060 SUPER
SE +/- 0.002, N = 3
0.723
RTX 2080 SUPER
SE +/- 0.004, N = 3
0.756
RTX 2080 Ti
SE +/- 0.007, N = 3
0.710
0.1748
0.3496
0.5244
0.6992
0.874

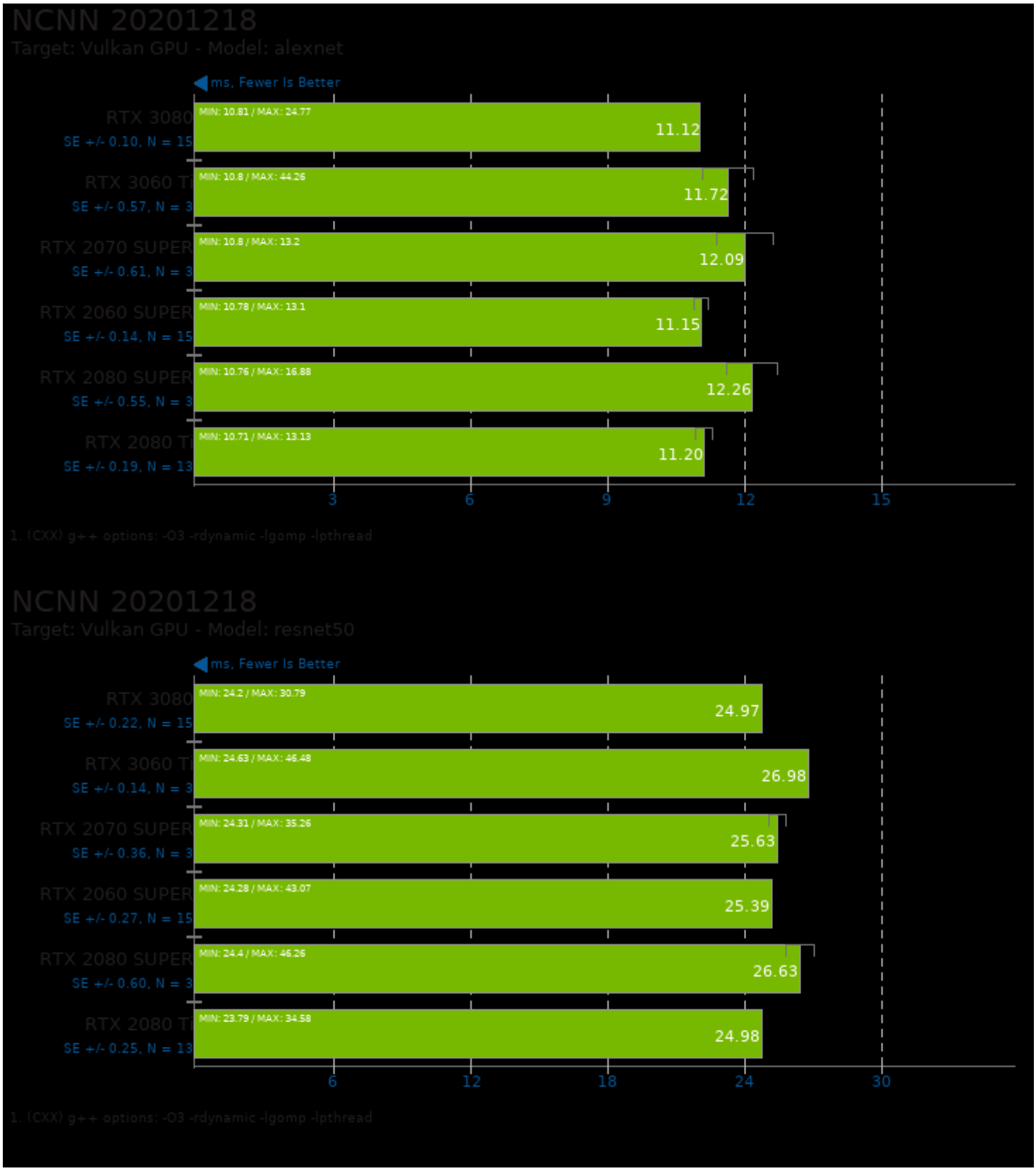
NCNN 20201218
Target: Vulkan GPU - Model: mobilenet
ms, Fewer Is Better
RTX 3080
SE +/- 0.09, N = 15
MIN: 11.81 / MAX: 13.49
12.20
RTX 3060 T
SE +/- 0.19, N = 3
MIN: 12.64 / MAX: 14.87
13.27
RTX 2070 SUPER
SE +/- 0.14, N = 3
MIN: 12.38 / MAX: 13.65
12.87
RTX 2060 SUPER
SE +/- 0.10, N = 15
MIN: 11.86 / MAX: 26
12.53
RTX 2080 SUPER
SE +/- 0.09, N = 3
MIN: 12.41 / MAX: 30.9
13.31
RTX 2080 T
SE +/- 0.09, N = 13
MIN: 12.36 / MAX: 22.3
12.97
3
6
9
12
15
1. (CXX) g++ options: -O3 -rdynamic -lgomp -lpthread
NCNN 20201218
Target: Vulkan GPU-v2-v2 - Model: mobilenet-v2
ms, Fewer Is Better
RTX 3080
SE +/- 0.00, N = 15
MIN: 4.3 / MAX: 5.1
4.48
RTX 3060 T
SE +/- 0.01, N = 3
MIN: 4.28 / MAX: 5.73
4.50
RTX 2070 SUPER
SE +/- 0.07, N = 3
MIN: 4.3 / MAX: 28.29
4.58
RTX 2060 SUPER
SE +/- 0.00, N = 15
MIN: 4.3 / MAX: 5.72
4.50
RTX 2080 SUPER
SE +/- 0.01, N = 3
MIN: 4.31 / MAX: 6.2
4.61
RTX 2080 T
SE +/- 0.00, N = 13
MIN: 4.29 / MAX: 6.08
4.50
1.0373
2.0746
3.1119
4.1492
5.1865
1. (CXX) g++ options: -O3 -rdynamic -lgomp -lpthread

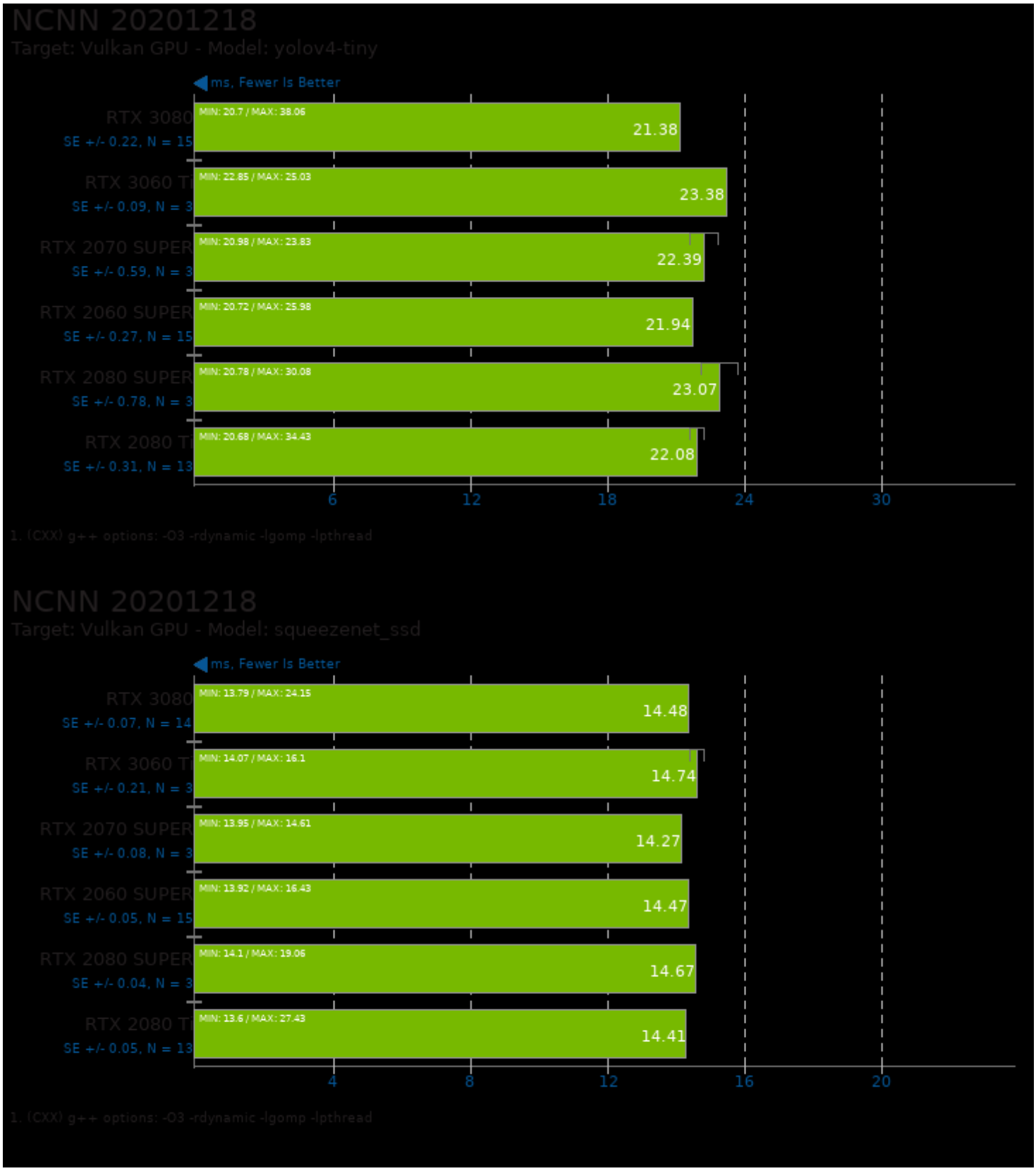

NCNN 20201218
Target: Vulkan GPU-v3-v3 - Model: mobilenet-v3
ms, Fewer Is Better
RTX 3080
SE +/- 0.02, N = 15
MIN: 4.1 / MAX: 6.19
4.21
RTX 3060 T
SE +/- 0.01, N = 3
MIN: 4.06 / MAX: 5.35
4.14
RTX 2070 SUPER
SE +/- 0.04, N = 3
MIN: 4.12 / MAX: 5.49
4.21
RTX 2060 SUPER
SE +/- 0.02, N = 15
MIN: 4.09 / MAX: 5.44
4.21
RTX 2080 SUPER
SE +/- 0.01, N = 3
MIN: 4.1 / MAX: 8.02
4.25
RTX 2080 T
SE +/- 0.01, N = 13
MIN: 4.08 / MAX: 5.41
4.19
0.9563
1.9126
2.8689
3.8252
4.7815
1. (CXX) g++ options: -O3 -rdynamic -lgomp -lpthread
NCNN 20201218
Target: Vulkan GPU - Model: shufflenet-v2
ms, Fewer Is Better
RTX 3080
SE +/- 0.01, N = 15
MIN: 4.35 / MAX: 6.25
4.44
RTX 3060 T
SE +/- 0.02, N = 3
MIN: 4.34 / MAX: 5.43
4.44
RTX 2070 SUPER
SE +/- 0.01, N = 3
MIN: 4.36 / MAX: 6.1
4.46
RTX 2060 SUPER
SE +/- 0.01, N = 15
MIN: 4.36 / MAX: 19.04
4.46
RTX 2080 SUPER
SE +/- 0.00, N = 3
MIN: 4.41 / MAX: 6
4.57
RTX 2080 T
SE +/- 0.02, N = 12
MIN: 4.32 / MAX: 5.58
4.47
1.0283
2.0566
3.0849
4.1132
5.1415
1. (CXX) g++ options: -O3 -rdynamic -lgomp -lpthread

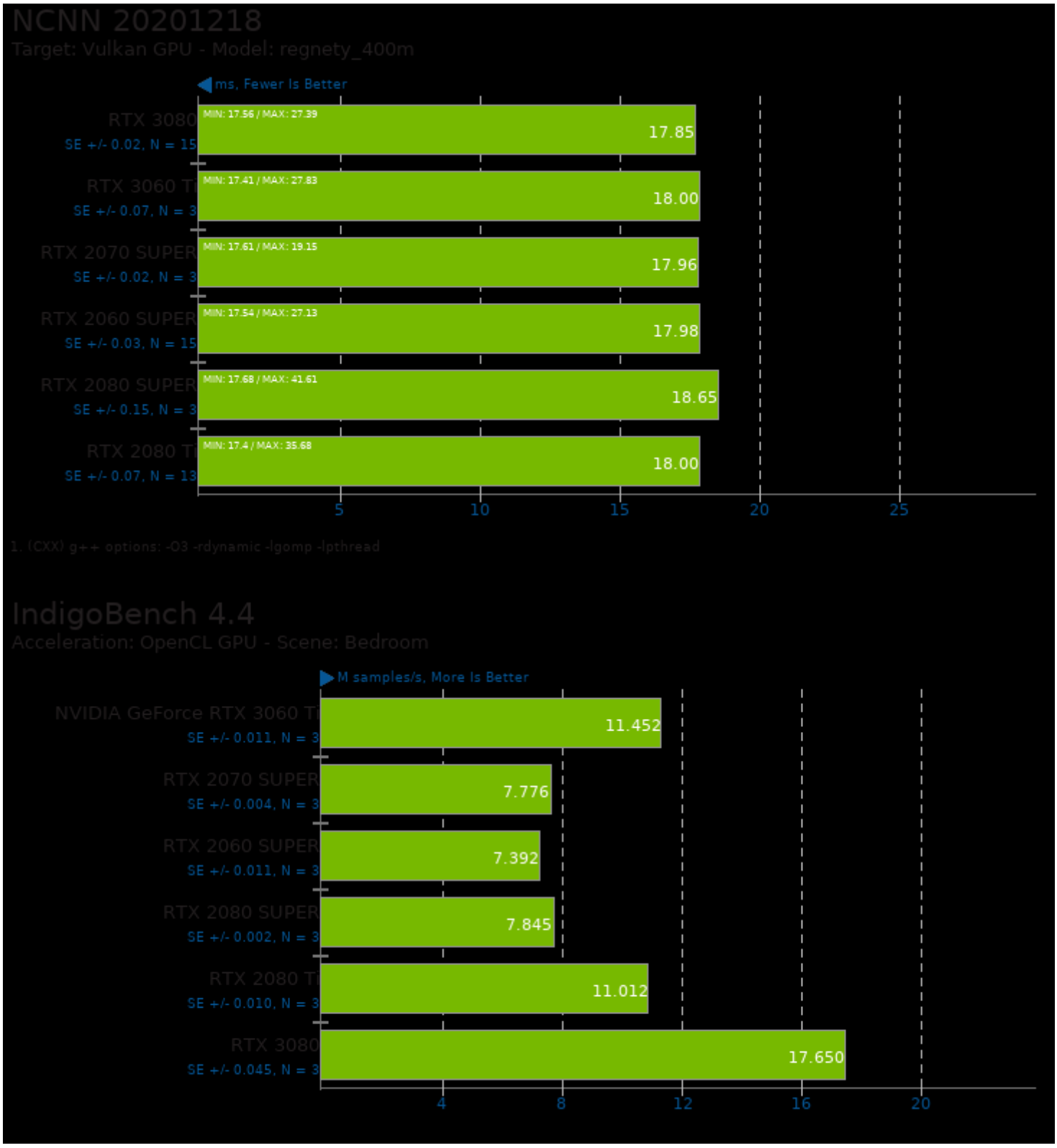

NCNN 20201218
Target: Vulkan GPU - Model: mnasnet
ms, Fewer Is Better
RTX 3080
SE +/- 0.00, N = 15
MIN: 3.85 / MAX: 4.5
3.99
RTX 3060 T
SE +/- 0.01, N = 3
MIN: 3.84 / MAX: 5.19
3.98
RTX 2070 SUPER
SE +/- 0.08, N = 3
MIN: 3.84 / MAX: 5.04
4.07
RTX 2060 SUPER
SE +/- 0.01, N = 15
MIN: 3.85 / MAX: 6.06
4.01
RTX 2080 SUPER
SE +/- 0.01, N = 3
MIN: 3.88 / MAX: 5.64
4.09
RTX 2080 T
SE +/- 0.04, N = 13
MIN: 3.82 / MAX: 5.26
4.03
0.9203
1.8406
2.7609
3.6812
4.6015
1. (CXX) g++ options: -O3 -rdynamic -lgomp -lpthread
NCNN 20201218
Target: Vulkan GPU - Model: efficientnet-b0
ms, Fewer Is Better
RTX 3080
SE +/- 0.01, N = 15
MIN: 5.3 / MAX: 14.74
5.41
RTX 3060 T
SE +/- 0.02, N = 3
MIN: 5.3 / MAX: 9.74
5.42
RTX 2070 SUPER
SE +/- 0.08, N = 3
MIN: 5.31 / MAX: 9.38
5.50
RTX 2060 SUPER
SE +/- 0.02, N = 15
MIN: 5.31 / MAX: 14.05
5.45
RTX 2080 SUPER
SE +/- 0.01, N = 3
MIN: 5.34 / MAX: 7.4
5.57
RTX 2080 T
SE +/- 0.04, N = 13
MIN: 5.28 / MAX: 6.74
5.45
1.2533
2.5066
3.7599
5.0132
6.2665
1. (CXX) g++ options: -O3 -rdynamic -lgomp -lpthread

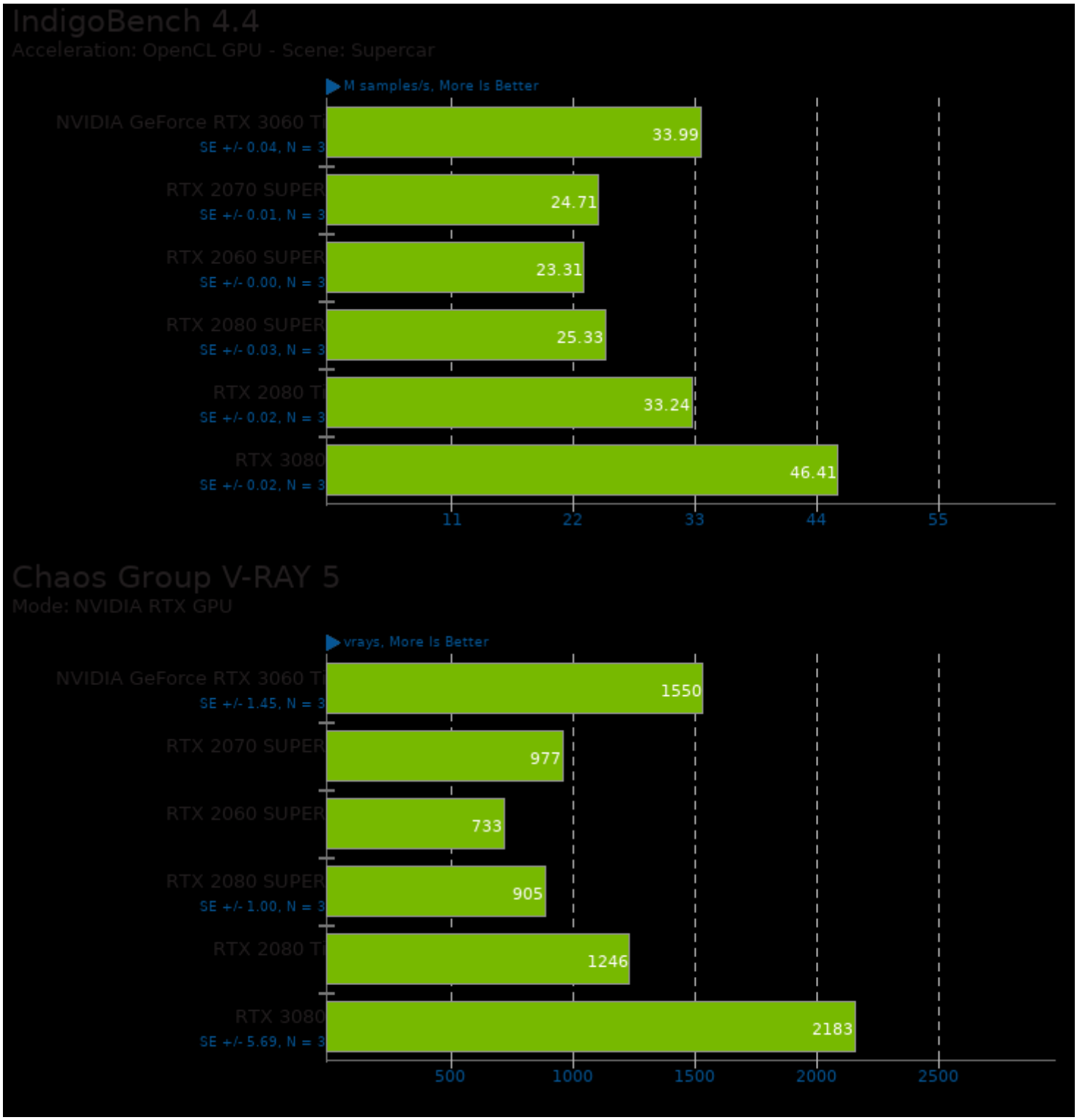

NCNN 20201218
Target: Vulkan GPU - Model: blazeface
ms, Fewer Is Better
RTX 3080
SE +/- 0.01, N = 15
MIN: 1.8 / MAX: 2.32
1.85
RTX 3060 T
SE +/- 0.03, N = 3
MIN: 1.8 / MAX: 7.07
1.88
RTX 2070 SUPER
SE +/- 0.03, N = 3
MIN: 1.8 / MAX: 2.1
1.86
RTX 2060 SUPER
SE +/- 0.01, N = 15
MIN: 1.79 / MAX: 2.29
1.87
RTX 2080 SUPER
SE +/- 0.01, N = 3
MIN: 1.8 / MAX: 2.36
1.87
RTX 2080 T
SE +/- 0.01, N = 13
MIN: 1.8 / MAX: 2.4
1.84
0.423
0.846
1.269
1.692
2.115
1. (CXX) g++ options: -O3 -rdynamic -lgomp -lpthread
NCNN 20201218
Target: Vulkan GPU - Model: googlenet
ms, Fewer Is Better
RTX 3080
SE +/- 0.02, N = 15
MIN: 12.43 / MAX: 22.33
12.82
RTX 3060 T
SE +/- 0.77, N = 3
MIN: 12.49 / MAX: 16.77
13.59
RTX 2070 SUPER
SE +/- 0.68, N = 3
MIN: 12.44 / MAX: 24.56
13.44
RTX 2060 SUPER
SE +/- 0.04, N = 15
MIN: 12.46 / MAX: 21.99
12.85
RTX 2080 SUPER
SE +/- 0.21, N = 3
MIN: 12.61 / MAX: 15.4
13.57
RTX 2080 T
SE +/- 0.25, N = 13
MIN: 12.5 / MAX: 27.44
13.29
3
6
9
12
15
1. (CXX) g++ options: -O3 -rdynamic -lgomp -lpthread

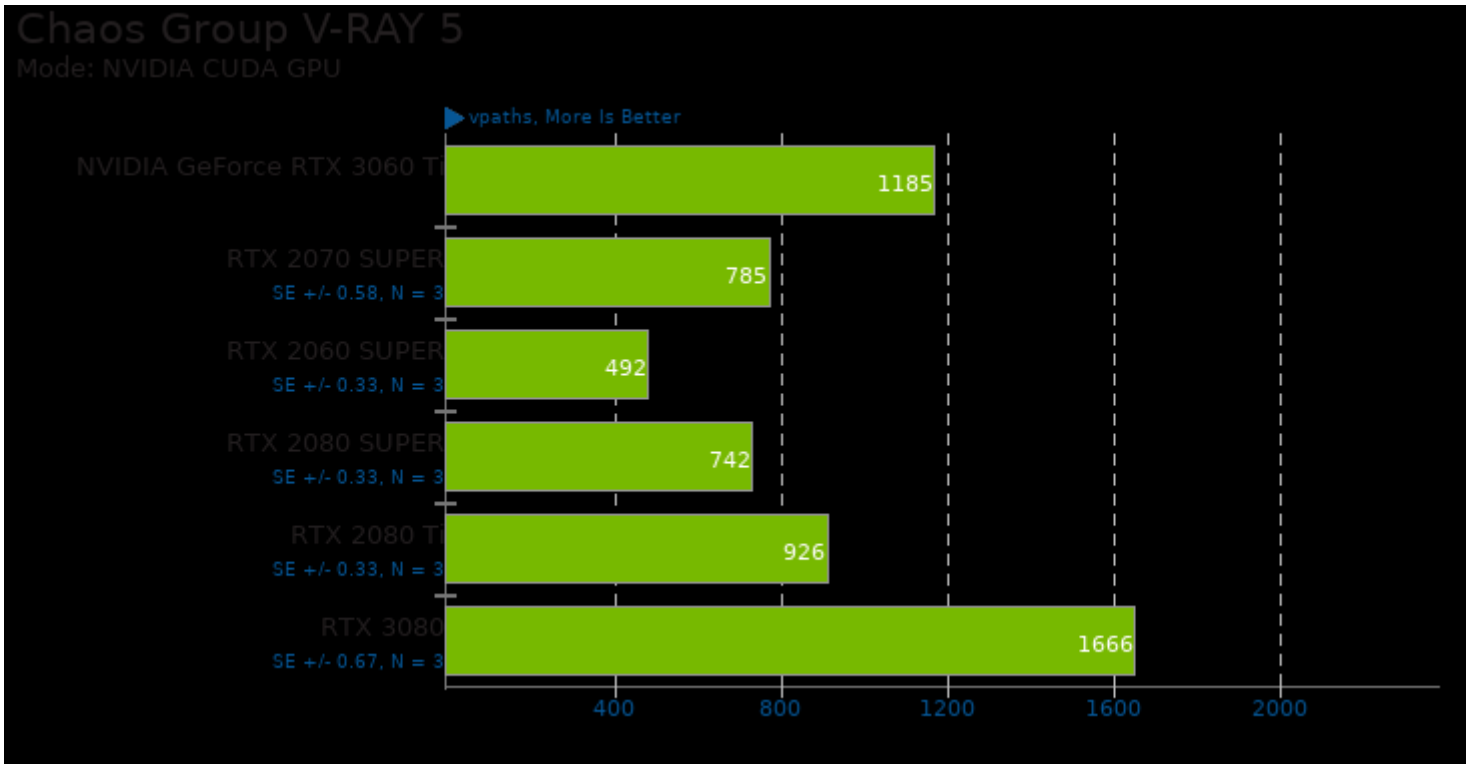

NCNN 20201218
Target: Vulkan GPU - Model: vgg16
ms, Fewer Is Better
RTX 3080
SE +/- 0.06, N = 15
MIN: 57.03 / MAX: 117.59
58.83
RTX 3060 T
SE +/- 0.18, N = 3
MIN: 57.26 / MAX: 90.67
58.90
RTX 2070 SUPER
SE +/- 0.40, N = 3
MIN: 56.35 / MAX: 60.41
58.49
RTX 2060 SUPER
SE +/- 0.04, N = 15
MIN: 57.66 / MAX: 83.72
58.99
RTX 2080 SUPER
SE +/- 0.50, N = 3
MIN: 57.69 / MAX: 129.41
61.11
RTX 2080 T
SE +/- 0.05, N = 13
MIN: 57.58 / MAX: 72.34
59.02
14
28
42
56
70
1. (CXX) g++ options: -O3 -rdynamic -lgomp -lpthread
NCNN 20201218
Target: Vulkan GPU - Model: resnet18
ms, Fewer Is Better
RTX 3080
SE +/- 0.02, N = 15
MIN: 14.25 / MAX: 27.77
14.43
RTX 3060 T
SE +/- 0.45, N = 3
MIN: 14.12 / MAX: 17.41
14.78
RTX 2070 SUPER
SE +/- 0.36, N = 3
MIN: 14.18 / MAX: 23.66
14.70
RTX 2060 SUPER
SE +/- 0.06, N = 15
MIN: 14.17 / MAX: 32.3
14.44
RTX 2080 SUPER
SE +/- 0.15, N = 3
MIN: 14.24 / MAX: 28.92
15.15
RTX 2080 T
SE +/- 0.15, N = 13
MIN: 14.09 / MAX: 16.91
14.51
4
8
12
16
20
1. (CXX) g++ options: -O3 -rdynamic -lgomp -lpthread


NCNN 20201218
Target: Vulkan GPU - Model: alexnet
ms, Fewer Is Better
RTX 3080
SE +/- 0.10, N = 15
MIN: 10.81 / MAX: 24.77
11.12
RTX 3060 T
SE +/- 0.57, N = 3
MIN: 10.8 / MAX: 44.26
11.72
RTX 2070 SUPER
SE +/- 0.61, N = 3
MIN: 10.8 / MAX: 13.2
12.09
RTX 2060 SUPER
SE +/- 0.14, N = 15
MIN: 10.78 / MAX: 13.1
11.15
RTX 2080 SUPER
SE +/- 0.55, N = 3
MIN: 10.76 / MAX: 16.88
12.26
RTX 2080 T
SE +/- 0.19, N = 13
MIN: 10.71 / MAX: 13.13
11.20
3
6
9
12
15
1. (CXX) g++ options: -O3 -rdynamic -lgomp -lpthread
NCNN 20201218
Target: Vulkan GPU - Model: resnet50
ms, Fewer Is Better
RTX 3080
SE +/- 0.22, N = 15
MIN: 24.2 / MAX: 30.79
24.97
RTX 3060 T
SE +/- 0.14, N = 3
MIN: 24.63 / MAX: 46.48
26.98
RTX 2070 SUPER
SE +/- 0.36, N = 3
MIN: 24.31 / MAX: 35.26
25.63
RTX 2060 SUPER
SE +/- 0.27, N = 15
MIN: 24.28 / MAX: 43.07
25.39
RTX 2080 SUPER
SE +/- 0.60, N = 3
MIN: 24.4 / MAX: 46.26
26.63
RTX 2080 T
SE +/- 0.25, N = 13
MIN: 23.79 / MAX: 34.58
24.98
6
12
18
24
30
1. (CXX) g++ options: -O3 -rdynamic -lgomp -lpthread


NCNN 20201218
Target: Vulkan GPU - Model: yolov4-tiny
ms, Fewer Is Better
RTX 3080
SE +/- 0.22, N = 15
MIN: 20.7 / MAX: 38.06
21.38
RTX 3060 T
SE +/- 0.09, N = 3
MIN: 22.85 / MAX: 25.03
23.38
RTX 2070 SUPER
SE +/- 0.59, N = 3
MIN: 20.98 / MAX: 23.83
22.39
RTX 2060 SUPER
SE +/- 0.27, N = 15
MIN: 20.72 / MAX: 25.98
21.94
RTX 2080 SUPER
SE +/- 0.78, N = 3
MIN: 20.78 / MAX: 30.08
23.07
RTX 2080 T
SE +/- 0.31, N = 13
MIN: 20.68 / MAX: 34.43
22.08
6
12
18
24
30
1. (CXX) g++ options: -O3 -rdynamic -lgomp -lpthread
NCNN 20201218
Target: Vulkan GPU - Model: squeezenet_ssd
ms, Fewer Is Better
RTX 3080
SE +/- 0.07, N = 14
MIN: 13.79 / MAX: 24.15
14.48
RTX 3060 T
SE +/- 0.21, N = 3
MIN: 14.07 / MAX: 16.1
14.74
RTX 2070 SUPER
SE +/- 0.08, N = 3
MIN: 13.95 / MAX: 14.61
14.27
RTX 2060 SUPER
SE +/- 0.05, N = 15
MIN: 13.92 / MAX: 16.43
14.47
RTX 2080 SUPER
SE +/- 0.04, N = 3
MIN: 14.1 / MAX: 19.06
14.67
RTX 2080 T
SE +/- 0.05, N = 13
MIN: 13.6 / MAX: 27.43
14.41
4
8
12
16
20
1. (CXX) g++ options: -O3 -rdynamic -lgomp -lpthread


NCNN 20201218
Target: Vulkan GPU - Model: regnety_400m
ms, Fewer Is Better
RTX 3080
SE +/- 0.02, N = 15
MIN: 17.56 / MAX: 27.39
17.85
RTX 3060 Ti
SE +/- 0.07, N = 3
MIN: 17.41 / MAX: 27.83
18.00
RTX 2070 SUPER
SE +/- 0.02, N = 3
MIN: 17.61 / MAX: 19.15
17.96
RTX 2060 SUPER
SE +/- 0.03, N = 15
MIN: 17.54 / MAX: 27.13
17.98
RTX 2080 SUPER
SE +/- 0.15, N = 3
MIN: 17.68 / MAX: 41.61
18.65
RTX 2080 Ti
SE +/- 0.07, N = 13
MIN: 17.4 / MAX: 35.68
18.00
5
10
15
20
25
1. (CXX) g++ options: -O3 -rdynamic -lgomp -lpthread
IndigoBench 4.4
Acceleration: OpenCL GPU - Scene: Bedroom
M samples/s, More Is Better
NVIDIA GeForce RTX 3060 Ti
SE +/- 0.011, N = 3
11.452
RTX 2070 SUPER
SE +/- 0.004, N = 3
7.776
RTX 2060 SUPER
SE +/- 0.011, N = 3
7.392
RTX 2080 SUPER
SE +/- 0.002, N = 3
7.845
RTX 2080 Ti
SE +/- 0.010, N = 3
11.012
RTX 3080
SE +/- 0.045, N = 3
17.650
4
8
12
16
20


IndigoBench 4.4
Acceleration: OpenCL GPU - Scene: Supercar
M samples/s, More Is Better
NVIDIA GeForce RTX 3060 Ti
SE +/- 0.04, N = 3
33.99
RTX 2070 SUPER
SE +/- 0.01, N = 3
24.71
RTX 2060 SUPER
SE +/- 0.00, N = 3
23.31
RTX 2080 SUPER
SE +/- 0.03, N = 3
25.33
RTX 2080 Ti
SE +/- 0.02, N = 3
33.24
RTX 3080
SE +/- 0.02, N = 3
46.41
11
22
33
44
55
Chaos Group V-RAY 5
Mode: NVIDIA RTX GPU
vrays, More Is Better
NVIDIA GeForce RTX 3060 Ti
SE +/- 1.45, N = 3
1550
RTX 2070 SUPER
977
RTX 2060 SUPER
733
RTX 2080 SUPER
SE +/- 1.00, N = 3
905
RTX 2080 Ti
1246
RTX 3080
SE +/- 5.69, N = 3
2183
500
1000
1500
2000
2500



This file was automatically generated via the Phoronix Test Suite benchmarking software on Thursday, 28 March 2024 14:16.