The other interesting observation was that the average speed increase from 2 to 4 and 4 to 8 hovered around a 35% increase while the increase between 8 to 12 dropped down to 20%. This shows that there is a significant speed increase up until 8 threads, but beyond that, the speedup begins to become less prevalent.

4.4.3. FPGA Results

As is evident from the benchmarks run on the FPGA, they do not usually perform as complex tasks as the CPU and GPU benchmarks show. The applications they are used for are generally specific and are used to enhance applications for other processes.

Benchmark	Clk Period (MHz)	Clk Cycles	Throughput (ns)	Delay for valid data (Clock Cycles)	Delay (ns)
FFT	101	1	9.87	12	118
AES	376	1	2.66	1	2.66
FIR	710	1	1.41	8	1.13
FP Mul	550	9	16.4	9	46.4
FIR Core	550	11	20.0	20	36.4

Table 16 - FPGA Results

As the Table above shows, the majority of applications run on the FPGA do not take much time between outputs, but there is usually a larger delay before the output is actually available. All of these benchmarks were designed using a pipelining implementation. This allowed the FPGA to use the ability to break up tasks and use internal storage to speed up the overall throughput.

FPGAs are very useful to high performance computing, however on an application specific basis. The advantage of having a higher processing power

compared to CPU and the ability to customize the data transfer method to meet your needs is great. However, it is vital in today's computing to find the board that has the proper computational slices to meet the needs of your application.

5. Future Work

For future projects similar to this one, the main topics to focus on would be a broader spectrum of benchmarks capable of running across all three platforms as well as possibly looking into newer technologies, such as an Accelerated Processing Unit (APU). Benchmarking of clusters or testing a single benchmark using multiple platforms for speedup would also be of use in future research.

While most of today's benchmarks lie in the realm of scientific and mathematical algorithms, it would be beneficial to create cross platform benchmarks across other types of general processing. Examples of general processing benchmarks could be ones that handle word processing, weather tracking, molecule design, encryption, and data compression, all with the capability of running on all three platforms.

Newer technologies have allowed designers to put both CPUs and GPUs on the same die, the concept behind APUs. This decreases data transfer times and allows for newer instruction sets to incorporate both units. These new devices have the ability to provide substantial performance increases to the processing world. With this is mind, it would be beneficial to benchmark these new platforms against their predecessors.

6. Conclusion

High Performance Computing is a rapidly growing field that will require more research to understand. The technology surrounding CPUs, GPUs, and FPGAs is still rapidly evolving and will continue in future years. Benchmarking will be a constant process to stratify different systems as well as different devices. With the information in this report, some light is shed on the processing power for different applications between CPUs, GPUs, and FPGAs.

Overall, 66 benchmarks were investigated over eight suites and sources to gather information. These results are useful to compare the three systems discussed as well as in comparison with other devices during future studies. The world of High Performance Computing is a constantly evolving field that will play a significant role in the years to come in many diverse fields.

7. Appendices

7.1. Parboil Results 9800 GTX+

Parboil	Iteration 1	Iteration 2	Iteration 3	Average	SD
CUTCP					
IO	0.039047	0.047604	0.042384	0.0430117	0.00431289
GPU	0.036803	0.036811	0.036804	0.036806	4.3589E-06
Copy	0.006495	0.006459	0.006479	0.0064777	1.8037E-05
Driver	0.000139	0.000141	0.000141	0.0001403	1.1547E-06
Compute	0.199751	0.199162	0.199347	0.19942	0.00030121
CPU Overlap	0.036803	0.036811	0.036804	0.036806	4.3589E-06
LBM - long					
IO	0.040944	0.040932	0.040948	0.0409413	8.3267E-06
GPU	93.829116	93.867864	93.88745	93.861477	0.02968691
Copy	0.335708	0.333089	0.333924	0.3342403	0.00133785
Driver	77.793763	77.834447	77.81375	77.813987	0.02034303
Compute	1.016244	1.009388	1.009609	1.011747	0.00389608
CPU Overlap	78.004436	78.050671	78.00946	78.021522	0.02536816
LBM - short					
IO	0.049419	0.051679	0.051344	0.050814	0.00121966
GPU	3.121433	3.125452	3.125203	3.1240293	0.00225193
Copy	0.331451	0.332959	0.331987	0.3321323	0.00076443
Driver	0.000734	0.000679	0.000699	0.000704	2.7839E-05
Compute	0.920874	0.976684	0.968332	0.9552967	0.03010198
CPU Overlap	0.124557	0.125872	0.12585	0.1254263	0.00075295
MM - long					
IO	3.084938	3.099593	3.09249	3.0923403	0.00732865
GPU	0.01076	0.010734	0.010758	0.0107507	1.4468E-05
Copy	0.010821	0.010749	0.010811	0.0107937	3.9004E-05
Driver	0.000104	0.000124	0.000121	0.0001163	1.0786E-05
Compute	0.051372	0.051629	0.051597	0.0515327	0.00014006
CPU Overlap	0.000146	0.000169	0.000159	0.000158	1.1533E-05
GFLOPS	1.55E-13	1.55E-13	1.55E-13	1.554E-13	1.4673E-16
SAD					
IO	0.166941	0.20198	0.198754	0.189225	0.0193658
GPU	0.00221	0.002185	0.002198	0.0021977	1.2503E-05

Copy	0.063778	0.064767	0.063908	0.064151	0.00053742
Driver	0.00003	0.000031	0.000029	0.00003	0.000001
Compute	0.000727	0.00849	0.007983	0.0057333	0.00434302
CPU Overlap	0.000042	0.000042	0.000041	4.167E-05	5.7735E-07
SPVM - large					
IO	0.142549	0.087202	0.113094	0.1142817	0.02769261
GPU	0.000319	0.000319	0.00032	0.0003193	5.7735E-07
Copy	0.053893	0.054192	0.053967	0.0540173	0.00015573
Driver	0.000063	0.000062	0.000062	6.233E-05	5.7735E-07
Compute	0.004965	0.004981	0.004978	0.0049747	8.5049E-06
CPU Overlap	0.000079	0.000079	0.00008	7.933E-05	5.7735E-07
SPVM - medium					
IO	0.024611	0.02542	0.02499	0.025007	0.00040477
GPU	0.000117	0.000112	0.000113	0.000114	2.6458E-06
Copy	0.047665	0.047027	0.04739	0.0473607	0.00032001
Driver	0.000064	0.00006	0.000061	6.167E-05	2.0817E-06
Compute	0.002742	0.002828	0.00279	0.0027867	4.3097E-05
CPU Overlap	0.00008	0.000075	0.000079	0.000078	2.6458E-06
SPVM - small					
IO	0.021669	0.000503	0.02007	0.0140807	0.01178575
GPU	0.000051	0.000048	0.000049	4.933E-05	1.5275E-06
Copy	0.045435	0.045306	0.04539	0.045377	6.5475E-05
Driver	0.000043	0.000041	0.000041	4.167E-05	1.1547E-06
Compute	0.002261	0.002294	0.002278	0.0022777	1.6503E-05
CPU Overlap	0.000054	0.000052	0.000052	5.267E-05	1.1547E-06
TPACF					
IO	1.129532	1.067352	1.07802	1.0916347	0.03325068
GPU	1.343114	1.343151	1.343123	1.3431293	1.9296E-05
Copy	0.051403	0.051871	0.05156	0.0516113	0.00023819
Driver	0.000093	0.000089	0.00009	9.067E-05	2.0817E-06
Compute	0.019158	0.0188	0.019022	0.0189933	0.00018071
CPU Overlap	0.000137	0.000129	0.000131	0.0001323	4.1633E-06

7.2. Parboil Results GTX 460

Parboil	Iteration 1	Iteration 2	Iteration 3	Average	SD
CUTCP					
IO	0.024785	0.026053	0.026624	0.025820667	0.000941257
GPU	0.037782	0.03735	0.037354	0.037495333	0.000248269
Copy	0.006324	0.006336	0.006925	0.006528333	0.000343576
Driver	0.000138	0.000148	0.000155	0.000147	8.544E-06
Compute	0.198731	0.199476	0.199039	0.199082	0.000374357
CPU Overlap	0.037782	0.03735	0.037354	0.037495333	0.000248269
FFT					
IO	0.052376	0.040751	0.041094	0.044740333	0.006614905
GPU	0.000813	0.000812	0.000813	0.000812667	5.7735E-07
Copy	0.074595	0.066348	0.066243	0.069062	0.004792006
Driver	0.000047	0.000048	0.000047	4.73333E-05	5.7735E-07
Compute	0.000353	0.000467	0.000369	0.000396333	6.17198E-05
CPU Overlap	0.000062	0.000064	0.000064	6.33333E-05	1.1547E-06
Histogram					
IO	0.152658	0.156614	0.158582	0.155951333	0.003017083
GPU	0.140838	0.140679	0.140491	0.140669333	0.000173702
Copy					
Driver	0.139518	0.139357	0.139178	0.139351	0.000170079
Compute	0.00043	0.000496	0.000457	0.000461	3.31813E-05
CPU Overlap	0.140838	0.140679	0.140491	0.140669333	0.000173702
LBM - long					
IO	0.047836	0.049771	0.049561	0.049056	0.001061756
GPU	30.16735	30.14701	30.16205	30.15880433	0.010548376
Copy	0.363583	0.352151	0.348986	0.354906667	0.007678761
Driver	24.9618	24.94686	24.94136	24.95000833	0.01057388
Compute	0.961555	0.996269	1.013636	0.990486667	0.02651762
CPU Overlap	25.16581	25.14708	25.14502	25.152638	0.011457143
LBM - short					
IO	0.054089	0.060643	0.075741	0.063491	0.011103405
GPU	1.005346	1.004551	1.008527	1.006141333	0.002103939
Copy	0.345664	0.336826	0.340031	0.340840333	0.00447424
Driver	0.000834	0.000976	0.000836	0.000882	8.14125E-05
Compute	1.020029	0.9414	0.927952	0.963127	0.049735203
CPU Overlap	0.125006	0.123213	0.112586	0.120268333	0.006713225
MM - long					
IO	3.195248	3.154655	3.190209	3.180037333	0.022125664
GPU	0.008869	0.008867	0.00886	0.008865333	4.72582E-06

Copy	0.010757	0.010806	0.010652	0.010738333	7.86787E-05
Driver	0.000109	0.000132	0.000116	0.000119	1.17898E-05
Compute	0.092311	0.081318	0.080229	0.084619333	0.006683396
CPU Overlap	0.000153	0.000179	0.000158	0.000163333	1.37961E-05
GFLOPS	1.55E-13	1.55E-13	1.55E-13	1.55371E-13	1.15326E-17
SAD					
IO	0.213267	0.153	0.206935	0.191067333	0.033118952
GPU	0.001498	0.001493	0.001496	0.001495667	2.51661E-06
Copy	0.126214	0.102197	0.11946	0.115957	0.012385771
Driver	0.000038	0.000035	0.000035	0.000036	1.73205E-06
Compute	0.000981	0.000795	0.000721	0.000832333	0.00013396
CPU Overlap	0.000053	0.00005	0.000049	5.06667E-05	2.08167E-06
SPVM - large					
IO	0.146448	0.148342	0.148184	0.147658	0.001050864
GPU	0.000218	0.00022	0.00022	0.000219333	1.1547E-06
Copy	0.084568	0.075166	0.070208	0.076647333	0.007293707
Driver	0.000066	0.000068	0.000066	6.66667E-05	1.1547E-06
Compute	0.004543	0.004651	0.004879	0.004691	0.000171534
CPU Overlap	0.000081	0.000084	0.000082	8.23333E-05	1.52753E-06
SPVM - medium					
IO	0.023466	0.024767	0.024647	0.024293333	0.000719
GPU	0.000118	0.000116	0.000117	0.000117	1E-06
Copy	0.051357	0.05229	0.052244	0.051963667	0.000525892
Driver	0.000063	0.000061	0.000062	0.000062	0.000001
Compute	0.002235	0.002791	0.002609	0.002545	0.000283471
CPU Overlap	0.000078	0.000076	0.000077	0.000077	1E-06
SPVM - small					
IO	0.007575	0.014441	0.015238	0.012418	0.00421305
GPU	0.000048	0.000047	0.000047	4.73333E-05	5.7735E-07
Copy	0.049176	0.050157	0.050558	0.049963667	0.000710995
Driver	0.000043	0.000042	0.000043	4.26667E-05	5.7735E-07
Compute	0.001726	0.002104	0.00209	0.001973333	0.000214311
CPU Overlap	0.000055	0.000054	0.000054	5.43333E-05	5.7735E-07
TPACF					
IO	1.18402	1.18196	1.177699	1.181226333	0.003223734
GPU	1.361854	1.361822	1.361775	1.361817	3.97366E-05
Copy	0.095364	0.075245	0.075193	0.081934	0.01163075
Driver	0.000113	0.00011	0.0001	0.000107667	6.80686E-06
Compute	0.00904	0.01928	0.020788	0.016369333	0.006392015
CPU Overlap	0.000156	0.000152	0.000142	0.00015	7.2111E-06

7.3. Rodinia Results 9800 GTX+

Rodinia	Iteration 1	Iteration 2	Iteration 3	Average	SD
LUD	ms				
64	0.238	0.239	0.239	0.238666667	0.00057735
256	1.185	1.512	1.456	1.384333333	0.17488377
512	3.311	3.315	3.312	3.312666667	0.00208167
2048	34.445	34.534	34.511	34.49666667	0.04619885
Particle Float (naïve)	sec				
A					
send from GPU	0.02881	0.034164	0.032453	0.031809	0.00273448
send to GPU	0.037435	0.037895	0.03769	0.037673333	0.00023045
GPU execution	0.00016	0.000167	0.000166	0.000164333	3.7859E-06
Total	3.284789	3.280237	3.28295	3.282658667	0.00228994
B					
send from GPU	0.059425	0.060929	0.060115	0.060156333	0.00075285
send to GPU	0.074129	0.074013	0.074069	0.074070333	5.8011E-05
GPU execution	0.000162	0.000164	0.000164	0.000163333	1.1547E-06
Total	6.524812	6.702561	6.593282	6.606885	0.08965187
C					
send from GPU	0.146823	0.149165	0.148302	0.148096667	0.00118442
send to GPU	0.186539	0.184094	0.185983	0.185538667	0.00128163
GPU execution	0.000173	0.000169	0.00017	0.000170667	2.0817E-06
Total	16.691667	16.667685	16.682983	16.68077833	0.01214205
D					
send from GPU	0.029974	0.029582	0.029834	0.029796667	0.00019865
send to GPU	0.037564	0.037992	0.0376982	0.0377514	0.0002189
GPU execution	0.000154	0.000159	0.000156	0.000156333	2.5166E-06
Total	3.278011	3.289114	3.283495	3.28354	0.00555164
E					
send from GPU	0.058106	0.056998	0.057398	0.057500667	0.00056109
send to GPU	0.074384	0.073757	0.074287	0.074142667	0.0003375
GPU execution	0.000167	0.000159	0.000166	0.000164	4.3589E-06
Total	6.527779	6.501522	6.51213	6.513810333	0.0132089
F					
send from GPU	0.141125	0.139959	0.13997	0.140351333	0.00067004
send to GPU	0.184281	0.182941	0.183213	0.183478333	0.00070831
GPU execution	0.000169	0.000166	0.000168	0.000167667	1.5275E-06
Total	16.157624	16.205709	16.199371	16.187568	0.02612518
G					
send from GPU	0.029478	0.029737	0.029587	0.029600667	0.00013004
send to GPU	0.037714	0.037855	0.037729	0.037766	7.744E-05

GPU execution	0.000163	0.00016	0.000161	0.000161333	1.5275E-06
Total	3.286379	3.285156	3.285983	3.285839333	0.00062403
H					
send from GPU	0.058453	0.057608	0.057983	0.058014667	0.00042339
send to GPU	0.074478	0.074515	0.745983	0.298325333	0.38768291
GPU execution	0.000163	0.000173	0.001064	0.000466667	0.00051733
Total	6.700087	6.518035	6.690865	6.636329	0.10254933

7.4. Rodinia Results GTX 460

Rodinia	Iteration 1	Iteration 2	Iteration 3	Average	SD
Leukocyte	sec				
Detection					
computation	0.0185	0.01944	0.01946	0.019133333	0.000548574
dilation	0.01006	0.01068	0.01068	0.010473333	0.000357957
total	0.08415	0.09912	0.09981	0.09436	0.008848847
Tracking	sec				
computation	0.04268	0.04274	0.04282	0.042746667	7.02377E-05
evolution	0.01027	0.01027	0.01037	0.010303333	5.7735E-05
total	0.0655	0.06538	0.06544	0.06544	6E-05
TOTAL	4.01395	4.02195	4.02639	4.020763333	0.006304327
LUD	ms				
64	0.575	0.579	0.575	0.576333333	0.002309401
256	2.848	2.828	2.83	2.835333333	0.011015141
512	7.374	7.388	7.387	7.383	0.00781025
2048	115.623	115.375	117.59	116.196	1.213590953
Particle Float (float)	sec				
A					
send from GPU	0.484112	0.48184	0.480469	0.482140207	0.001840149
send to GPU	0.014158	0.013941	0.013862	0.013987	0.000153268
GPU execution	0.000251	0.000258	0.000255	0.000254667	3.51188E-06
Total	0.65792	0.584687	0.61418	0.618929	0.036846748
B					
send from GPU	0.977968	0.979106	0.973441	0.976838333	0.002996693
send to GPU	0.028367	0.027495	0.027456	0.027772667	0.000515077
GPU execution	0.000267	0.00024	0.000237	0.000248	1.65227E-05
Total	1.099265	1.099386	1.094044	1.097565	0.003049876
D					
send from GPU	21.25275	14.00893	30.37887	21.88018267	8.202989064

send to GPU	0.013946	0.013852	0.013902	0.0139	4.70319E-05
GPU execution	0.000265	0.00253	0.000255	0.001016667	0.001310595
Total	21.34469	14.10073	30.46716	21.97086	8.201161321
E					
send from GPU	8.556762	8.546939	8.539814	8.547838333	0.008509717
send to GPU	0.027564	0.027571	0.027614	0.027583	2.7074E-05
GPU execution	0.000234	0.000244	0.000259	0.000245667	1.25831E-05
Total	8.675124	8.666531	8.660525	8.667393333	0.007337603
G					
send from GPU	32.85077	13.84569	14.8465	20.51432133	10.69539136
send to GPU	0.013938	0.013869	0.013931	0.013912667	3.79781E-05
GPU execution	0.000251	0.000245	0.000248	0.000248	3E-06
Total	32.94073	13.93179	14.93657	20.603027	10.69656602
H					
send from GPU	8.535585	8.5487	8.544959	8.543081333	0.006756111
send to GPU	0.027881	0.027692	0.027521	0.027698	0.000180075
GPU execution	0.000245	0.000236	0.000241	0.000240667	4.50925E-06
Total	8.656592	8.669315	8.670502	8.665469667	0.007711159
Particle Float (naïve)	sec				
A					
send from GPU	18.03987	11.67335	11.65105	13.78808867	3.682170995
send to GPU	0.037767	0.037449	0.037533	0.037583	0.000164791
GPU execution	0.00012	0.00012	0.000113	0.000117667	4.04145E-06
Total	21.40222	14.9382	14.92392	17.08811367	3.736133375
B					
send from GPU	8.695787	9.222604	9.195602	9.037997667	0.296670494
send to GPU	0.075593	0.075548	0.0736	0.074913667	0.001137891
GPU execution	0.000129	0.000118	0.000141	0.000129333	1.15036E-05
Total	15.20682	15.67589	15.67246	15.518391	0.269830416
C					
send from GPU	14.00524	8.159942	8.216452	10.12720967	3.358587309
send to GPU	0.187186	0.183569	0.185398	0.185384333	0.001808539
GPU execution	0.000135	0.000118	0.000126	0.000126333	8.5049E-06
Total	30.2434	24.24978	24.24987	26.247683	3.460390697
D					
send from GPU	12.49726	12.42138	12.48212	12.46691867	0.040157217
send to GPU	0.038156	0.037788	0.037667	0.037870333	0.000254685
GPU execution	0.000133	0.000117	0.000111	0.000120333	1.13725E-05
Total	15.77098	15.77281	15.74104	15.76160833	0.017839721
E					
send from GPU	10.85223	10.2257	9.016069	10.031332	0.933383694
send to GPU	0.075725	0.075797	0.07437	0.075297333	0.000803901

GPU execution	0.000135	0.000117	0.000124	0.000125333	9.07377E-06
Total	46.67132	16.67096	15.6721	26.33812367	17.6161456
F					
send from GPU	14.11983	15.16998	14.26351	14.51777167	0.56937989
send to GPU	0.18705	0.185197	0.183663	0.185303333	0.001696002
GPU execution	0.000129	0.00012	0.00012	0.000123	5.19615E-06
Total	30.24967	31.24654	30.24503	30.58041333	0.576885553
G					
send from GPU	13.49624	12.51239	12.51785	12.84216133	0.566457901
send to GPU	0.037861	0.037656	0.037663	0.037726667	0.000116389
GPU execution	0.000135	0.000125	0.000111	0.000123667	1.20554E-05
Total	16.7578	15.77179	15.77775	16.102446	0.567560183
H					
send from GPU	9.182923	10.20361	9.200904	9.529146333	0.584173588
send to GPU	0.075046	0.075518	0.074179	0.074914333	0.000679141
GPU execution	0.000136	0.000123	0.00013	0.000129667	6.50641E-06
Total	15.67639	16.6652	15.67365	16.00507867	0.571680899

7.5. SHOC Max Flops GTX 460

test	atts	units	median	mean	stddev	min	max	trial0	trial1	trial2	trial3	trial4	trial5	trial6	trial7	trial8	trial9
Add1-DP	Size:2097152	GFLOPS	37.7811	37.7811	6.28041e-05	37.781	37.7812	37.781	37.7812	37.7811	37.7812	37.781	37.7812	37.781	37.7811	37.7811	37.7811
Add1-SP	Size:2097152	GFLOPS	298.222	298.233	0.0364559	298.193	298.322	298.223	298.193	298.214	298.222	298.263	298.193	298.25	298.218	298.232	298.322
Add2-DP	Size:2097152	GFLOPS	37.7759	37.7759	4.89902e-05	37.7758	37.776	37.7759	37.7759	37.776	37.7759	37.776	37.776	37.7759	37.7759	37.7758	37.7759
Add2-SP	Size:2097152	GFLOPS	452.568	452.569	0.00851849	452.549	452.579	452.564	452.549	452.576	452.568	452.568	452.579	452.567	452.579	452.564	452.572
Add4-DP	Size:2097152	GFLOPS	37.7672	37.7672	5.91473e-05	37.7671	37.7673	37.7673	37.7672	37.7672	37.7671	37.7672	37.7672	37.7671	37.7672	37.7671	37.7671
Add4-SP	Size:2097152	GFLOPS	451.925	451.922	0.00596587	451.908	451.929	451.908	451.926	451.919	451.926	451.925	451.929	451.916	451.926	451.925	451.922
Add8-DP	Size:2097152	GFLOPS	37.7414	37.7414	0.00013747	37.7412	37.7417	37.7416	37.7415	37.7414	37.7414	37.7417	37.7415	37.7413	37.7412	37.7414	37.7414
Add8-SP	Size:2097152	GFLOPS	451.566	451.565	0.00516266	451.552	451.572	451.561	451.567	451.552	451.566	451.566	451.572	451.57	451.565	451.564	451.568
MAdd1-DP	Size:2097152	GFLOPS	75.5511	75.5511	8.77467e-05	75.5509	75.5513	75.5513	75.5511	75.5512	75.5512	75.5511	75.5512	75.5511	75.5509	75.551	75.5511
MAdd1-SP	Size:2097152	GFLOPS	595.109	595.112	0.122587	594.878	595.302	595.243	595.09	595.129	595.074	595.208	594.954	595.174	595.072	595.302	594.878
MAdd2-DP	Size:2097152	GFLOPS	75.5488	75.5488	5.76678e-05	75.5488	75.549	75.5489	75.5489	75.5488	75.5488	75.5488	75.549	75.5488	75.5488	75.5488	75.5489
MAdd2-SP	Size:2097152	GFLOPS	881.025	881.074	0.380338	880.478	881.587	881.574	880.715	881.037	881.587	880.609	880.934	881.4	881.395	881.013	880.478
MAdd4-DP	Size:2097152	GFLOPS	75.5051	75.5052	0.00023447	75.5049	75.5057	75.5053	75.5053	75.5057	75.505	75.5055	75.5051	75.5052	75.505	75.5051	75.5049
MAdd4-SP	Size:2097152	GFLOPS	885.019	885.01	0.0323639	884.918	885.037	884.918	885.021	885.032	885.018	885.013	885.037	885.022	885.025	885.016	885
MAdd8-DP	Size:2097152	GFLOPS	75.4606	75.4606	0.00021646	75.4603	75.461	75.4608	75.461	75.4603	75.4606	75.4608	75.4607	75.4604	75.4603	75.4606	75.4605
MAdd8-SP	Size:2097152	GFLOPS	869.364	869.232	0.275908	868.481	869.416	869.357	869.402	869.395	869.414	869.416	868.481	869.184	869.259	869.371	869.042
MAddU-DP	Size:4194304	GFLOPS	75.4371	75.4371	1.47598e-05	75.4371	75.4371	75.4371	75.4371	75.4371	75.4371	75.4371	75.4371	75.4371	75.4371	75.4371	75.4371
MAddU-SP	Size:4194304	GFLOPS	528.465	528.476	0.143183	528.253	528.696	528.696	528.317	528.408	528.343	528.253	528.554	528.422	528.616	528.648	528.509
Mul1-DP	Size:2097152	GFLOPS	37.7822	37.7822	1.90731e-05	37.7822	37.7823	37.7823	37.7823	37.7823	37.7823	37.7823	37.7822	37.7822	37.7822	37.7822	37.7822
Mul1-SP	Size:2097152	GFLOPS	300.036	300.037	0.0318387	299.989	300.1	299.989	300.048	300.032	299.997	300.027	300.016	300.04	300.054	300.1	300.072
Mul2-DP	Size:2097152	GFLOPS	37.7798	37.7798	3.16594e-05	37.7797	37.7798	37.7798	37.7798	37.7798	37.7798	37.7798	37.7798	37.7798	37.7798	37.7797	37.7798
Mul2-SP	Size:2097152	GFLOPS	449.894	449.967	0.122553	449.838	450.194	449.883	449.88	449.881	449.897	450.123	449.892	450.125	449.838	450.194	449.96
Mul4-DP	Size:2097152	GFLOPS	37.7696	37.7696	4.18636e-05	37.7695	37.7697	37.7697	37.7695	37.7697	37.7697	37.7696	37.7696	37.7696	37.7696	37.7696	37.7696
Mul4-SP	Size:2097152	GFLOPS	452.382	452.382	0.00149423	452.381	452.386	452.381	452.381	452.386	452.382	452.384	452.383	452.383	452.381	452.383	452.381
Mul8-DP	Size:2097152	GFLOPS	37.7576	37.7576	0.00013146	37.7574	37.7578	37.7575	37.7575	37.7574	37.7577	37.7576	37.7578	37.7578	37.7575	37.7576	37.7578
Mul8-SP	Size:2097152	GFLOPS	451.532	451.532	0.00179845	451.529	451.535	451.531	451.533	451.532	451.535	451.533	451.532	451.532	451.532	451.529	451.534
MulMAdd1-DP	Size:2097152	GFLOPS	56.6703	56.6703	4.64428e-05	56.6703	56.6704	56.6703	56.6704	56.6704	56.6704	56.6704	56.6704	56.6703	56.6703	56.6703	56.6703
MulMAdd1-SP	Size:2097152	GFLOPS	447.744	447.736	0.059606	447.638	447.857	447.857	447.644	447.638	447.778	447.728	447.752	447.736	447.72	447.753	447.754
MulMAdd2-DP	Size:2097152	GFLOPS	56.6687	56.6687	4.19358e-05	56.6686	56.6687	56.6687	56.6687	56.6687	56.6687	56.6687	56.6687	56.6686	56.6686	56.6687	56.6687
MulMAdd2-SP	Size:2097152	GFLOPS	671.839	671.837	0.00651623	671.826	671.844	671.831	671.836	671.844	671.843	671.839	671.839	671.826	671.844	671.826	671.841
MulMAdd4-DP	Size:2097152	GFLOPS	56.659	56.6589	0.000199583	56.6584	56.6591	56.659	56.659	56.659	56.659	56.6591	56.659	56.659	56.6584	56.6587	56.6591
MulMAdd4-SP	Size:2097152	GFLOPS	613.356	613.357	0.00715913	613.347	613.372	613.351	613.353	613.347	613.361	613.364	613.355	613.357	613.362	613.35	613.372
MulMAdd8-DP	Size:2097152	GFLOPS	56.6316	56.6316	0.000117022	56.6314	56.6318	56.6317	56.6314	56.6315	56.6316	56.6317	56.6316	56.6318	56.6316	56.6318	56.6315
MulMAdd8-SP	Size:2097152	GFLOPS	644.746	644.745	0.00695146	644.733	644.756	644.736	644.739	644.744	644.756	644.741	644.751	644.733	644.75	644.748	644.748
MulMAddU-DP	Size:4194304	GFLOPS	56.3124	56.3124	1.81655e-05	56.3123	56.3124	56.3124	56.3124	56.3123	56.3124	56.3124	56.3124	56.3124	56.3124	56.3124	56.3124
MulMAddU-SP	Size:4194304	GFLOPS	450.022	450.003	0.0502006	449.895	450.047	449.895	450.034	450.028	450.011	450.039	450.04	449.919	450.006	450.047	450.016

7.6. SHOC Bus Download Speed GTX 460

test	atts	units	median	mean	stddev	min	max	\trial0	trial1	trial2	trial3	trial4	trial5	trial6
DownloadSpeed	1kB	GB/sec	0.0968232	0.0944747	0.00719869	0.0728929	0.0972644	0.0728929	0.0966767	0.0972644	0.0969697	0.0963855	0.0969697	0.0969697
DownloadSpeed	2kB	GB/sec	0.191908	0.172397	0.0523309	0.0161575	0.193939	0.180791	0.189349	0.0161575	0.192771	0.179272	0.193353	0.193353
DownloadSpeed	4kB	GB/sec	0.339974	0.337767	0.00640744	0.321608	0.343164	0.331606	0.321608	0.343164	0.335079	0.339523	0.341333	0.342246
DownloadSpeed	8kB	GB/sec	0.607356	0.605821	0.00527627	0.591224	0.609524	0.608076	0.606635	0.606635	0.591224	0.609524	0.606635	0.609524
DownloadSpeed	16kB	GB/sec	1.09871	1.08759	0.0318089	0.996109	1.11063	1.07338	1.09871	1.09636	1.11063	0.996109	1.10108	1.09871
DownloadSpeed	32kB	GB/sec	1.58391	1.46017	0.362414	0.373586	1.59502	1.56815	1.59502	1.58269	1.54917	0.373586	1.58514	1.59253
DownloadSpeed	64kB	GB/sec	2.13223	2.13755	0.0215719	2.11789	2.19979	2.1289	2.12669	2.13556	2.11979	2.11789	2.12669	2.13779
DownloadSpeed	128kB	GB/sec	2.57772	2.39463	0.490279	0.936015	2.58586	2.57772	2.369	2.5826	0.936015	2.57286	2.58586	2.57772
DownloadSpeed	256kB	GB/sec	2.88248	2.75776	0.378052	1.62443	2.90393	2.89572	2.84741	2.88349	1.62443	2.89368	2.87741	2.89061
DownloadSpeed	512kB	GB/sec	3.08724	2.8824	0.373859	2.02697	3.09424	3.08841	2.02697	3.08841	2.26423	2.99689	3.08608	3.08957
DownloadSpeed	1024kB	GB/sec	3.17105	3.05058	0.218715	2.61433	3.18136	3.14291	2.61433	3.17519	2.6206	3.07334	3.17766	3.17827
DownloadSpeed	2048kB	GB/sec	3.17726	3.08654	0.161202	2.84481	3.23427	3.22933	2.93739	3.23012	2.84654	2.95847	2.84481	3.23427
DownloadSpeed	4096kB	GB/sec	3.17691	3.11632	0.150924	2.88317	3.26058	3.25655	3.9265	3.27214	2.97276	3.09673	2.99203	3.26058
DownloadSpeed	8192kB	GB/sec	3.22724	3.2079	0.0765973	3.01776	3.27385	3.25467	3.17608	3.27214	3.15981	3.18368	3.01776	3.27385
DownloadSpeed	16384kB	GB/sec	3.25523	3.24591	0.0397178	3.14735	3.27897	3.27698	3.23343	3.2767	3.22434	3.27854	3.23138	3.27897
DownloadSpeed	32768kB	GB/sec	3.23577	3.23798	0.0220416	3.20851	3.26634	3.21462	3.28235	3.28235	3.21581	3.20851	3.24159	3.24768
DownloadSpeed	65536kB	GB/sec	3.26963	3.27041	0.0122743	3.25417	3.28475	3.25417	3.28308	3.28475	3.26398	3.28321	3.27528	3.28464
DownloadSpeed	131072kB	GB/sec	3.27329	3.25049	0.0552959	3.09411	3.28578	3.28155	3.27094	3.26677	3.22422	3.28262	3.27564	3.28578
DownloadSpeed	262144kB	GB/sec	3.27809	3.27352	0.013592	3.2426	3.28625	3.26977	3.27759	3.2426	3.25421	3.28623	3.27855	3.28625
DownloadSpeed	524288kB	GB/sec	3.27825	3.27474	0.00933627	3.2542	3.28322	3.26876	3.28271	3.27434	3.28152	3.263	3.27812	3.2542
DownloadTime	1kB	ms	0.010576	0.0109184	0.00104359	0.010528	0.014048	0.014048	0.010592	0.010528	0.0106	0.010624	0.01056	0.01056
DownloadTime	2kB	ms	0.010672	0.0222968	0.0347864	0.01056	0.126752	0.011328	0.010816	0.126752	0.010624	0.011424	0.010592	0.010592
DownloadTime	4kB	ms	0.012048	0.012312	0.000237081	0.011936	0.012736	0.012352	0.012736	0.011936	0.012224	0.012064	0.012	0.011968
DownloadTime	8kB	ms	0.013488	0.013532	0.000119904	0.01344	0.013856	0.013472	0.013504	0.013504	0.013856	0.01344	0.013504	0.01344
DownloadTime	16kB	ms	0.014912	0.0150784	0.000473297	0.014752	0.016448	0.015264	0.014912	0.014944	0.014752	0.016448	0.01488	0.014912
DownloadTime	32kB	ms	0.020688	0.0274272	0.0200956	0.020544	0.087712	0.020896	0.020544	0.020704	0.021152	0.087712	0.020672	0.020576
DownloadTime	64kB	ms	0.030736	0.0306624	0.000302498	0.029792	0.030944	0.030784	0.030816	0.030688	0.029792	0.030944	0.030816	0.030656
DownloadTime	128kB	ms	0.050848	0.060176	0.026653	0.050688	0.140032	0.050848	0.053328	0.050752	0.140032	0.050944	0.050688	0.050848
DownloadTime	256kB	ms	0.090944	0.0979552	0.0211452	0.090272	0.161376	0.090528	0.092064	0.090912	0.161376	0.09056	0.091104	0.090688
DownloadTime	512kB	ms	0.169824	0.185818	0.0303219	0.16944	0.258656	0.16976	0.258656	0.16976	0.231552	0.174944	0.169888	0.169696
DownloadTime	1024kB	ms	0.330672	0.345712	0.0276447	0.3296	0.401088	0.333632	0.401088	0.33024	0.400128	0.341184	0.329984	0.32992
DownloadTime	2048kB	ms	0.660224	0.681354	0.0364573	0.648416	0.737184	0.649408	0.713952	0.649248	0.736736	0.708864	0.737184	0.648416
DownloadTime	4096kB	ms	1.32109	1.34913	0.0663402	1.28637	1.45475	1.28717	1.43322	1.28723	1.41091	1.35443	1.40182	1.28637
DownloadTime	8192kB	ms	2.5995	2.61652	0.064568	2.5823	2.77974	2.57741	2.64118	2.56365	2.65478	2.63488	2.77974	2.5823
DownloadTime	16384kB	ms	5.15414	5.1695	0.0642949	5.11661	5.33659	5.11971	5.18867	5.12016	5.2033	5.11728	5.19197	5.11661
DownloadTime	32768kB	ms	10.3698	10.3632	0.070276	10.2227	10.458	10.4381	10.2278	10.2227	10.4342	10.458	10.3512	10.3318
DownloadTime	65536kB	ms	20.525	20.5203	0.077016	20.4365	20.6224	20.4408	20.6224	20.4305	20.5604	20.44	20.4895	20.4311
DownloadTime	131072kB	ms	41.004	41.3039	0.725913	40.848	43.3784	40.9607	41.0334	41.0857	41.6279	40.8874	40.9746	40.848
DownloadTime	262144kB	ms	81.8878	82.0036	0.342271	81.6844	82.784	82.0961	81.9003	82.784	82.4886	81.6849	81.8762	81.6844
DownloadTime	524288kB	ms	163.768	163.945	0.468787	163.52	164.978	164.243	163.545	163.963	163.604	164.533	163.774	164.978

7.7. SHOC Device Memory GTX 460

test	atts	units	median	mean	stddev	min	max	trial0	trial1	trial2	trial3	trial4	trial5	trial6	trial7	trial8	trial9
TextureRepeatedCacheHit	16kB	GB/sec	249.817	249.972	1.0569	248.319	252.22	248.319	249.606	249.638	248.922	249.995	249.154	250.473	252.22	250.888	250.501
TextureRepeatedCacheHit	64kB	GB/sec	680.911	677.807	10.5231	646.709	684.922	679.146	681.132	646.709	684.922	680.689	678.437	679.739	682.069	682.718	682.504
TextureRepeatedCacheHit	256kB	GB/sec	705.515	704.972	2.36999	700.024	708.999	702.573	704.752	703.304	706.43	706.768	705.208	708.999	705.822	705.84	700.024
TextureRepeatedCacheHit	1024kB	GB/sec	868.979	861.764	16.494	827.49	873.594	871.612	830.498	827.49	869.365	866.879	868.593	871.143	873.594	870.024	868.44
TextureRepeatedCacheHit	4096kB	GB/sec	908.485	907.896	2.04231	904.699	910.857	908.82	910.857	908.242	905.301	904.699	909.598	908.728	906.416	910.283	906.015
TextureRepeatedLinearAccess	16kB	GB/sec	68.73	68.7563	0.0747196	68.6649	68.8988	68.7206	68.6981	68.8313	68.7043	68.6649	68.792	68.8362	68.6773	68.7393	68.8988
TextureRepeatedLinearAccess	64kB	GB/sec	166.242	166.155	0.276027	165.414	166.452	166.452	166.194	165.414	166.148	166.243	166.309	165.951	166.318	166.242	166.28
TextureRepeatedLinearAccess	256kB	GB/sec	103.855	103.657	0.347234	103.032	103.96	103.896	103.032	103.923	103.135	103.814	103.762	103.96	103.896	103.904	103.245
TextureRepeatedLinearAccess	1024kB	GB/sec	121.317	121.14	0.429301	120.335	121.613	121.533	120.443	120.335	120.83	121.437	121.371	121.419	121.613	121.158	121.263
TextureRepeatedLinearAccess	4096kB	GB/sec	123.961	123.98	0.0820779	123.881	124.169	124.169	123.881	123.899	123.951	124.023	123.963	124.054	123.96	123.902	124.003
TextureRepeatedRandomAccess	16kB	GB/sec	36.8203	36.7924	0.103581	36.4856	36.859	36.4856	36.859	36.8269	36.8141	36.8026	36.8184	36.8511	36.8135	36.8222	36.8311
TextureRepeatedRandomAccess	64kB	GB/sec	50.5226	50.4675	0.181774	49.925	50.5699	50.5423	50.5699	50.5347	49.925	50.5164	50.5018	50.5143	50.5096	50.5323	50.5288
TextureRepeatedRandomAccess	256kB	GB/sec	48.4988	48.4683	0.135681	48.099	48.5867	48.5366	48.5525	48.5867	48.461	48.099	48.4503	48.4411	48.4247	48.571	48.5599
TextureRepeatedRandomAccess	1024kB	GB/sec	25.0025	25.0074	0.0185024	24.9785	25.0325	24.9844	24.9785	24.9945	25.0044	25.0325	25.0312	24.9998	25.0006	25.0281	25.02
TextureRepeatedRandomAccess	4096kB	GB/sec	18.3725	18.3726	0.00210641	18.3694	18.3757	18.3704	18.3757	18.3734	18.3708	18.3715	18.3738	18.3757	18.3713	18.3737	18.3694
readGlobalMemoryCoalesced	blockSize:032	GB/s	79.4664	79.4403	0.227365	79.0545	79.8856	79.5709	79.2872	79.0545	79.6659	79.2205	79.4665	79.8856	79.5026	79.4663	79.2827
readGlobalMemoryCoalesced	blockSize:064	GB/s	95.3313	95.3931	0.370008	94.8193	96.16	95.5424	95.1413	95.3639	95.2987	94.8193	95.1258	95.1563	95.4562	95.8673	96.16
readGlobalMemoryCoalesced	blockSize:128	GB/s	95.86	95.8892	0.146875	95.6285	96.1455	95.8593	96.0451	95.8026	95.962	96.024	96.1455	95.8154	95.8608	95.7491	95.6285
readGlobalMemoryCoalesced	blockSize:256	GB/s	95.3288	95.33	0.00923051	95.3187	95.3491	95.3357	95.3202	95.3491	95.3346	95.3276	95.32	95.3187	95.33	95.339	95.3248
readGlobalMemoryCoalesced	blockSize:512	GB/s	92.4885	92.4903	0.0102933	92.4789	92.5118	92.5118	92.5041	92.491	92.4863	92.4797	92.4789	92.4955	92.4812	92.4907	92.4842
readGlobalMemoryUnit	blockSize:032	GB/s	7.40374	7.40064	0.0176191	7.37095	7.43441	7.41345	7.41215	7.38937	7.40532	7.40459	7.39723	7.37095	7.37605	7.43441	7.40288
readGlobalMemoryUnit	blockSize:064	GB/s	5.8348	5.83442	0.0122876	5.81516	5.85731	5.84059	5.84253	5.84661	5.81516	5.83919	5.85731	5.82196	5.82501	5.83041	5.82548
readGlobalMemoryUnit	blockSize:128	GB/s	4.77861	4.78074	0.0104245	4.76814	4.80264	4.77545	4.76814	4.76849	4.78169	4.80264	4.78444	4.77553	4.77329	4.78429	4.79342
readGlobalMemoryUnit	blockSize:256	GB/s	4.31423	4.3133	0.0046518	4.30446	4.31935	4.31935	4.31413	4.31433	4.31593	4.31484	4.30446	4.30978	4.31401	4.31923	4.30698
readGlobalMemoryUnit	blockSize:512	GB/s	4.053	4.04979	0.0218373	3.99878	4.07445	4.05253	4.05213	4.02782	4.07445	4.05724	4.07177	4.07001	4.05348	3.99878	4.03971
readLocalMemory	blockSize:032	GB/s	190.042	190.05	0.095262	189.889	190.232	190.107	189.948	190.004	190.232	190.158	190.042	189.889	189.993	190.042	190.084
readLocalMemory	blockSize:064	GB/s	288.244	288.243	0.0196789	288.219	288.278	288.241	288.222	288.278	288.219	288.248	288.247	288.252	288.227	288.225	288.274
readLocalMemory	blockSize:128	GB/s	299.656	299.658	0.0666282	299.645	299.667	299.656	299.66	299.665	299.655	299.645	299.653	299.653	299.667	299.666	299.656
readLocalMemory	blockSize:256	GB/s	289.272	284.612	5.90403	277.221	289.743	277.437	289.511	277.221	277.431	289.272	289.271	289.743	277.446	289.513	289.277
readLocalMemory	blockSize:512	GB/s	277.151	277.239	0.183945	276.917	277.562	276.917	277.474	277.139	277.562	277.163	277.139	277.137	277.14	277.356	277.364
writeGlobalMemoryCoalesced	blockSize:032	GB/s	92.6863	92.7431	0.17521	92.518	93.1587	92.7906	93.1587	92.518	92.5952	92.6565	92.731	92.6758	92.6969	92.9414	92.6667
writeGlobalMemoryCoalesced	blockSize:064	GB/s	91.3822	91.3367	0.199681	90.9287	91.6185	91.171	91.4988	90.9287	91.108	91.3985	91.3659	91.3167	91.4691	91.6185	91.4923
writeGlobalMemoryCoalesced	blockSize:128	GB/s	92.7195	92.7199	0.0349922	92.6621	92.7808	92.7263	92.7632	92.6912	92.7808	92.7348	92.6621	92.7443	92.6902	92.6932	92.7126
writeGlobalMemoryCoalesced	blockSize:256	GB/s	92.8269	92.8266	0.0308942	92.777	92.886	92.788	92.886	92.8017	92.777	92.8242	92.8404	92.8268	92.8269	92.8335	92.8613
writeGlobalMemoryCoalesced	blockSize:512	GB/s	91.9003	91.8954	0.0322305	91.8444	91.94	91.8444	91.94	91.8551	91.8865	91.9152	91.9083	91.8586	91.8923	91.9172	91.9367
writeGlobalMemoryUnit	blockSize:032	GB/s	3.67295	3.67445	0.0143484	3.65556	3.70246	3.67774	3.66864	3.65556	3.66201	3.67331	3.6726	3.68569	3.69036	3.70246	3.65617
writeGlobalMemoryUnit	blockSize:064	GB/s	3.47009	3.46721	0.0176114	3.43398	3.49727	3.46598	3.47792	3.49727	3.45724	3.48	3.47419	3.43398	3.45849	3.48029	3.44674
writeGlobalMemoryUnit	blockSize:128	GB/s	3.44127	3.44122	0.00360111	3.43461	3.44946	3.44333	3.43936	3.44274	3.44108	3.43461	3.43923	3.44946	3.44145	3.4393	3.44167
writeGlobalMemoryUnit	blockSize:256	GB/s	3.42033	3.42198	0.0070682	3.41015	3.43686	3.41914	3.41686	3.43086	3.41858	3.43686	3.41015	3.42464	3.42104	3.41962	3.42206
writeGlobalMemoryUnit	blockSize:512	GB/s	3.31071	3.3137	0.023414	3.29073	3.37801	3.31299	3.32027	3.29147	3.2988	3.37801	3.3117	3.30971	3.29073	3.30758	3.31576
writeLocalMemory	blockSize:032	GB/s	181.766	181.757	0.0437495	181.689	181.82	181.717	181.77	181.82	181.743	181.689	181.815	181.768	181.695	181.765	181.791
writeLocalMemory	blockSize:064	GB/s	328.684	328.689	0.0293	328.649	328.752	328.703	328.673	328.702	328.649	328.653	328.716	328.691	328.676	328.752	328.678
writeLocalMemory	blockSize:128	GB/s	388.966	388.961	0.0411515	388.862	389.014	388.937	388.973	388.862	388.934	388.994	389.001	389.014	388.96	388.959	388.973
writeLocalMemory	blockSize:256	GB/s	385.716	385.713	0.0394536	385.626	385.781	385.781	385.626	385.718	385.714	385.703	385.738	385.675	385.735	385.701	385.738
writeLocalMemory	blockSize:512	GB/s	368.518	368.462	0.156346	368.007	368.584	368.517	368.452	368.527	368.007	368.453	368.541	368.584	368.519	368.535	368.485

7.8. SHOC SPMV GTX 460

test	atts	units	median	mean	stddev	min	max	trial0	trial1	trial2	trial3	trial4
CSR-Scalar-DP	10485_elements_1024_rows	Gflop/s	0.603019	0.602467	0.00163314	0.597629	0.603274	0.597629	0.602736	0.603069	0.603235	0.602414
CSR-Scalar-DP_PCIe	10485_elements_1024_rows	Gflop/s	0.145213	0.14508	0.000386159	0.144008	0.145399	0.144008	0.145166	0.144993	0.145259	0.145276
CSR-Scalar-SP_1	10485_elements_1024_rows	Gflop/s	0.738709	0.7375	0.00358396	0.726768	0.738988	0.726768	0.738322	0.738405	0.738455	0.738838
CSR-Scalar-SP_PCIe	10485_elements_1024_rows	Gflop/s	0.163498	0.162918	0.0016143	0.157957	0.163673	0.157957	0.163071	0.163319	0.163607	0.163503
CSR-Vector-DP	10485_elements_1024_rows	Gflop/s	1.1145	1.11463	0.000883064	1.11336	1.1162	1.1148	1.1162	1.11448	1.1152	1.11508
CSR-Vector-DP_PCIe	10485_elements_1024_rows	Gflop/s	0.163419	0.163423	1.89766e-05	0.163396	0.163457	0.163418	0.163457	0.16342	0.163435	0.163452
CSR-Vector-SP	10485_elements_1024_rows	Gflop/s	1.3298	1.33005	0.00096298	1.32859	1.33191	1.32964	1.32859	1.33133	1.33012	1.32969
CSR-Vector-SP_PCIe	10485_elements_1024_rows	Gflop/s	0.181337	0.181341	1.82905e-05	0.181314	0.181376	0.181334	0.181314	0.181369	0.181343	0.181335
ELLPACKR-DP	10485_elements_1024_rows	Gflop/s	0.544524	0.544062	0.0014322	0.539769	0.544655	0.539769	0.544442	0.544623	0.544573	0.544528
ELLPACKR-SP	10485_elements_1024_rows	Gflop/s	0.551276	0.550913	0.00122221	0.547257	0.551531	0.547257	0.551215	0.551239	0.551262	0.551355
Padded_CSR-Scalar-DP	16832_elements_1024_rows	Gflop/s	0.551077	0.551203	0.000423255	0.550719	0.552115	0.550719	0.550967	0.551663	0.551507	0.552115
Padded_CSR-Scalar-DP_PCIe	16832_elements_1024_rows	Gflop/s	0.187201	0.187194	7.61091e-05	0.187043	0.187299	0.187248	0.187043	0.187257	0.187139	0.187275
Padded_CSR-Scalar-SP	16832_elements_1024_rows	Gflop/s	0.73395	0.729391	0.0150044	0.684464	0.736592	0.733709	0.734314	0.734027	0.73416	0.733459
Padded_CSR-Scalar-SP_PCIe	16832_elements_1024_rows	Gflop/s	0.238387	0.23196	0.0110696	0.208988	0.238758	0.238397	0.238461	0.238376	0.237636	0.238587
Padded_CSR-Vector-DP	16832_elements_1024_rows	Gflop/s	1.83573	1.83565	0.000895882	1.83438	1.83746	1.8363	1.83589	1.83438	1.83467	1.8363
Padded_CSR-Vector-DP_PCIe	16832_elements_1024_rows	Gflop/s	0.245504	0.245502	1.60219e-05	0.24548	0.245535	0.245514	0.245506	0.24548	0.245485	0.245514
Padded_CSR-Vector-SP	16832_elements_1024_rows	Gflop/s	2.16307	2.14816	0.0453347	2.0122	2.16554	2.0122	2.16305	2.1623	2.16336	2.1631
Padded_CSR-Vector-SP_PCIe	16832_elements_1024_rows	Gflop/s	0.298411	0.298108	0.000917896	0.295355	0.298457	0.295355	0.29841	0.298396	0.298416	0.298411

7.9. SHOC MD GTX 460

test	atts	units	median	mean	stddev	min	max	trial0	trial1	trial2	trial3	trial4	trial5	trial6	trial7	trial8	trial9
MD-LJ	12288_atoms	GFLOPS	52.4619	52.4502	0.0402902	52.3673	52.5033	52.4019	52.3673	52.4339	52.4579	52.4712	52.4285	52.4659	52.4766	52.5033	52.4953
MD-LJ-Bandwidth	12288_atoms	GB/s	40.2452	40.2363	0.030908	40.1727	40.277	40.1992	40.1727	40.2238	40.2422	40.2524	40.2197	40.2483	40.2565	40.277	40.2709
MD-LJ-Bandwidth_PCIe	12288_atoms	GB/s	9.38313	9.38264	0.00168132	9.37918	9.38486	9.38063	9.37918	9.38197	9.38297	9.38352	9.38174	9.3833	9.38375	9.38486	9.38453
MD-LJ-DP	12288_atoms	GFLOPS	34.14	34.1355	0.0269753	34.0824	34.1751	34.14	34.0824	34.14	34.1649	34.1751	34.1536	34.096	34.1422	34.1321	34.1287
MD-LJ-DP-Bandwidth	12288_atoms	GB/s	45.8705	45.8645	0.036244	45.7932	45.9176	45.8705	45.7932	45.8705	45.9039	45.9176	45.8887	45.8114	45.8735	45.8599	45.8553
MD-LJ-DP-Bandwidth_PCIe	12288_atoms	GB/s	14.0789	14.0783	0.00341607	14.0716	14.0833	14.0789	14.0716	14.0789	14.082	14.0833	14.0806	14.0733	14.0791	14.0779	14.0774
MD-LJ-DP_PCIe	12288_atoms	GFLOPS	10.4785	10.478	0.00254247	10.473	10.4818	10.4785	10.473	10.4785	10.4808	10.4818	10.4797	10.4743	10.4787	10.4777	10.4774
MD-LJ-DP_Parity	12288_atoms	N	2.25811	2.25781	0.00178422	2.25431	2.26043	2.25811	2.25431	2.25811	2.25976	2.26043	2.25901	2.2552	2.25826	2.25759	2.25736
MD-LJ_PCIe	12288_atoms	GFLOPS	12.2314	12.2308	0.0021917	12.2263	12.2337	12.2282	12.2263	12.2299	12.2312	12.2319	12.2296	12.2316	12.2322	12.2337	12.2332
MD-LJ_Parity	12288_atoms	N	3.2891	3.28837	0.002526	3.28317	3.2917	3.28534	3.28317	3.28735	3.28885	3.28969	3.28701	3.28936	3.29003	3.2917	3.2912

7.10. SHOC Reduction GTX 460

test	atts	units	median	mean	stddev	min	max	trial0	trial1	trial2	trial3	trial4	trial5	trial6	trial7	trial8	trial9
Reduction	262144_items	GB/s	62.8407	62.8136	0.166818	62.3359	62.996	62.3359	62.8365	62.8878	62.8431	62.996	62.8092	62.894	62.8384	62.8638	62.8318
Reduction-DP	131072_items	GB/s	61.6712	61.7126	0.102425	61.5786	61.8985	61.5786	61.8985	61.6492	61.6941	61.6819	61.7691	61.6442	61.6605	61.6551	61.8948
Reduction-DP_PCIe	131072_items	GB/s	2.87049	2.86534	0.0185665	2.81098	2.87957	2.81098	2.87026	2.87526	2.86781	2.87332	2.87957	2.87072	2.86673	2.87351	2.86523
Reduction-DP_Parity	131072_items	N	20.4912	20.5385	0.132249	20.4412	20.9064	20.9064	20.5655	20.4412	20.5126	20.4671	20.4508	20.4735	20.509	20.4564	20.602
Reduction_PCIe	262144_items	GB/s	2.88511	2.86744	0.0479907	2.72484	2.89162	2.72484	2.86923	2.89162	2.88389	2.87283	2.88916	2.88425	2.88642	2.88597	2.88615
Reduction_Parity	262144_items	N	20.7868	20.9113	0.327234	20.7396	21.8769	21.8769	20.9001	20.7483	20.7911	20.9282	20.7396	20.806	20.7703	20.7826	20.7701

7.11. SHOC S3D GTX 460

test	atts	units	median	mean	stddev	min	max	trial0	trial1	trial2	trial3	trial4	trial5	trial6
S3D-DP	4096_gridPoints	GFLOPS	14.9961	14.9782	0.0392359	14.8882	15.0237	14.8882	14.9493	15.0237	14.939	15.0023	15.0015	14.998
S3D-DP_PCIe	4096_gridPoints	GFLOPS	12.4294	12.4159	0.0302911	12.3435	12.4476	12.3435	12.396	12.4476	12.3907	12.4361	12.4329	12.4389
S3D-DP_Parity	4096_gridPoints	N	0.206389	0.20637	0.00036282	0.206556	0.20651	0.206155	0.205973	0.20651	0.205656	0.206353	0.206598	0.206598
S3D-SP	13824_gridPoints	GFLOPS	29.9089	29.8943	0.0727289	29.6901	29.964	29.6901	29.9068	29.8805	29.9111	29.9507	29.964	29.9339
S3D-SP_PCIe	13824_gridPoints	GFLOPS	24.9594	24.948	0.0530374	24.7982	24.9957	24.7982	24.9606	24.9384	24.9583	24.9903	24.9957	24.9763
S3D-SP_Parity	13824_gridPoints	N	0.198331	0.198263	0.00038098	0.197267	0.198768	0.197267	0.19816	0.198173	0.198445	0.198493	0.198768	0.198492

7.12. SHOC Scan GTX 460

test	atts	units	median	mean	stddev	min	max	trial0	trial1	trial2	trial3	trial4	trial5	trial6
Scan	262144items	GB/s	17.1424	17.1388	0.0120004	17.1068	17.1555	17.1068	17.1423	17.1555	17.1345	17.1448	17.1368	17.1448
Scan-DP	131072items	GB/s	13.8939	13.8921	0.00993379	13.8738	13.905	13.8839	13.905	13.8958	13.8945	13.8812	13.8933	13.8738
Scan-DP_PCIe	131072items	GB/s	0.00257527	0.00257527	3.41444e-10	0.00257527	0.00257527	0.00257527	0.00257527	0.00257527	0.00257527	0.00257527	0.00257527	0.00257527
Scan_DP_Parity	131072items	N	5394.13	5393.43	3.85667	5386.32	5398.43	5390.26	5398.43	5384.88	5394.35	5389.21	5393.9	5386.32
Scan_PCIe	262144items	GB/s	0.0025617	0.0025617	2.69126e-10	0.0025617	0.0025617	0.0025617	0.0025617	0.0025617	0.0025617	0.0025617	0.0025617	0.0025617
Scan_Parity	262144items	N	6681.74	6680.34	4.67752	6667.88	6686.85	6667.88	6681.71	6686.85	6678.65	6682.68	6679.55	6682.69

7.13. SHOC SGEMM GTX 460

test	atts	units	median	mean	stddev	min	max	trial0	trial1	trial2	trial3	trial4	trial5	trial6	trial7	trial8	trial9
DGEMM-N	128	GFlops	50.4949	50.5374	0.293406	50.0896	51.0753	50.1567	50.0896	50.4511	50.6314	51.0753	50.7097	50.4026	50.4026	50.5387	50.9166
DGEMM-N_PCIe	128	GFlops	17.5706	17.5756	0.0354535	17.5212	17.6403	17.5294	17.5212	17.5653	17.5871	17.6403	17.5965	17.5594	17.5594	17.5759	17.6213
DGEMM-N_Parity	128	N	1.87383	1.87541	0.0108881	1.85879	1.89537	1.86128	1.85879	1.87221	1.8789	1.89537	1.88181	1.87041	1.87041	1.87546	1.88948
DGEMM-T	128	GFlops	50.6195	50.6161	0.259669	50.1999	50.976	50.9166	50.1999	50.3445	50.4948	50.7441	50.456	50.976	50.8622	50.7933	50.3736
DGEMM-T_PCIe	128	GFlops	17.5856	17.5851	0.0313531	17.5347	17.6285	17.6213	17.5347	17.5523	17.5706	17.6006	17.5659	17.6285	17.6148	17.6066	17.5559
DGEMM-T_Parity	128	N	1.87846	1.87833	0.00963617	1.86289	1.89169	1.88948	1.86289	1.86825	1.87383	1.88308	1.87239	1.89169	1.88747	1.88491	1.86933
SGEMM-N	256	GFlops	202.765	202.635	0.314203	202.038	203.026	202.233	202.741	202.976	202.486	202.389	203.026	202.79	202.8	202.038	202.868
SGEMM-N_PCIe	256	GFlops	69.8381	69.8226	0.0373269	69.7516	69.869	69.7748	69.8352	69.8631	69.805	69.7934	69.869	69.841	69.8422	69.7516	69.8504
SGEMM-N_Parity	256	N	1.90336	1.90213	0.00294943	1.89653	1.9058	1.89836	1.90313	1.90534	1.90074	1.89983	1.9058	1.90359	1.90368	1.89653	1.90433
SGEMM-T	256	GFlops	196.271	194.471	3.39911	188.001	197.101	197.101	195.996	196.611	195.539	196.547	192.629	188.288	196.934	188.001	197.064
SGEMM-T_PCIe	256	GFlops	69.0512	68.8222	0.431297	67.9988	69.1536	69.1536	69.017	69.0932	68.9603	69.0853	68.5949	68.0363	69.1331	67.9988	69.149
SGEMM-T_Parity	256	N	1.8424	1.8255	0.0319075	1.76477	1.85019	1.85019	1.83981	1.84559	1.83552	1.84499	1.80821	1.76746	1.84862	1.76477	1.84984

7.14. SHOC Sort GTX 460

test	atts	units	median	mean	stddev	min	max	trial0	trial1	trial2	trial3	trial4	trial5	trial6
Sort-Rate	2621441items	GB/s	0.987055	0.985707	0.0040278	0.974875	0.99003	0.974875	0.986676	0.987776	0.987628	0.99003	0.982667	0.98586
Sort-Rate_PCIe	2621441items	GB/s	0.580774	0.580171	0.00259622	0.572762	0.582444	0.572762	0.58037	0.581385	0.581477	0.582444	0.579365	0.580761
Sort-Rate_Parity	2621441items	N	0.698851	0.698998	0.00169846	0.69611	0.70206	0.70206	0.70008	0.699007	0.698479	0.699785	0.69611	0.69753

7.15. SHOC Stencil 2D GTX 460

test	atts	units	median	mean	stddev	min	max	trial0	trial1	trial2	trial3	trial4	trial5	trial6
DP_Sten2D	1000,768x768:16x16	s	0.35183	0.351729	0.000422792	0.351116	0.352377	0.352377	0.352262	0.351412	0.351324	0.351196	0.35181	0.351116
SP_Sten2D	1000,768x768:16x16	s	0.190368	0.195241	0.0148919	0.18994	0.239909	0.239909	0.19036	0.190376	0.189955	0.190759	0.190042	0.18994

7.16. SHOC Triad GTX 460

test	atts	units	median	mean	stddev	min	max	trial0	trial1	trial2	trial3	trial4	trial5
TriadBwth	Block:00064KB	GB/s	2.61981	2.56891	0.125201	2.24194	2.66794	2.63963	2.6331	2.61855	2.64104	2.57481	2.43406
TriadBwth	Block:00128KB	GB/s	2.77941	2.73973	0.138379	2.4166	2.85603	2.78851	2.84799	2.4166	2.85603	2.76886	2.76479
TriadBwth	Block:00256KB	GB/s	2.86521	2.86948	0.0211908	2.84296	2.92228	2.8578	2.87374	2.87549	2.85272	2.88512	2.92228
TriadBwth	Block:00512KB	GB/s	2.93342	2.91206	0.0598474	2.79159	2.96307	2.82526	2.98307	2.87132	2.79159	2.92946	2.9422
TriadBwth	Block:01024KB	GB/s	2.99822	2.99813	0.0060999	2.98672	3.00802	2.99388	2.99418	3.00147	2.99293	2.99882	3.00565
TriadBwth	Block:02048KB	GB/s	3.00692	2.9714	0.0489781	2.89608	3.0161	2.89608	3.01593	3.00924	2.92156	3.0161	3.00972
TriadBwth	Block:04096KB	GB/s	3.00581	2.96346	0.0647738	2.87331	3.0224	2.99626	3.01669	3.01536	3.0224	2.89317	2.87797
TriadBwth	Block:08192KB	GB/s	2.90042	2.93374	0.0601725	2.87543	3.02881	2.89952	3.01966	3.02596	3.02881	2.90579	2.89683
TriadBwth	Block:16384KB	GB/s	2.76109	2.66166	0.217612	2.34058	2.91214	2.91214	2.88207	2.79908	2.83783	2.4044	2.34058
TriadFlops	Block:00064KB	GFLOP/s	0.436634	0.428152	0.0208668	0.373657	0.444657	0.444657	0.439938	0.43885	0.436425	0.440173	0.429136	0.405676
TriadFlops	Block:00128KB	GFLOP/s	0.463236	0.456622	0.0230631	0.402766	0.476005	0.422323	0.464919	0.474664	0.402766	0.476005	0.461476	0.460798
TriadFlops	Block:00256KB	GFLOP/s	0.477536	0.478247	0.00353013	0.473826	0.487047	0.476301	0.478957	0.479248	0.475718	0.475454	0.480853	0.487047
TriadFlops	Block:00512KB	GFLOP/s	0.488903	0.485343	0.00997456	0.465264	0.497178	0.470876	0.497178	0.49522	0.47779	0.465264	0.488243	0.490367
TriadFlops	Block:01024KB	GFLOP/s	0.499703	0.499688	0.00101667	0.497786	0.501337	0.49898	0.499031	0.500245	0.497786	0.498822	0.499803	0.500941
TriadFlops	Block:02048KB	GFLOP/s	0.501154	0.495249	0.00816301	0.48268	0.502683	0.48268	0.502656	0.501539	0.484147	0.486927	0.502683	0.50162
TriadFlops	Block:04096KB	GFLOP/s	0.500969	0.49391	0.0107956	0.478885	0.503733	0.499377	0.502782	0.50256	0.503718	0.503733	0.482195	0.479661
TriadFlops	Block:08192KB	GFLOP/s	0.483403	0.488957	0.0100288	0.479239	0.504802	0.483254	0.503276	0.504326	0.504802	0.483553	0.484299	0.482805
TriadFlops	Block:16384KB	GFLOP/s	0.460182	0.44361	0.0362687	0.390097	0.485356	0.485356	0.480346	0.466513	0.47291	0.473605	0.400734	0.390097

7.17. SHOC Max Flops 9800 GTX+

test	atts	units	median	mean	stddev	min	max	trial0	trial1	trial2	trial3	trial4	trial5	trial6	trial7	trial8	trial9
Add1-SP	Size:2097152	GFLOPS	231.047	231.04	0.0528887	230.949	231.117	230.949	231.03	231.099	230.964	231.063	231.117	231.052	231.043	230.997	231.085
Add2-SP	Size:2097152	GFLOPS	231.156	231.149	0.0308438	231.097	231.196	231.196	231.133	231.154	231.097	231.159	231.184	231.157	231.167	231.142	231.098
Add4-SP	Size:2097152	GFLOPS	231.109	231.106	0.0340844	231.058	231.159	231.148	231.062	231.058	231.086	231.073	231.159	231.126	231.126	231.126	231.093
Add8-SP	Size:2097152	GFLOPS	230.715	230.711	0.0174072	230.679	230.735	230.707	230.723	230.716	230.679	230.684	230.706	230.735	230.731	230.72	230.713
MAdd1-SP	Size:2097152	GFLOPS	309.282	309.283	0.0316217	309.238	309.344	309.344	309.305	309.298	309.238	309.262	309.284	309.28	309.259	309.317	309.247
MAdd2-SP	Size:2097152	GFLOPS	309.277	309.274	0.0140903	309.249	309.291	309.28	309.27	309.265	309.287	309.274	309.288	309.249	309.286	309.291	309.253
MAdd4-SP	Size:2097152	GFLOPS	309.065	309.057	0.0254775	308.985	309.079	308.985	309.079	309.066	309.055	309.066	309.061	309.064	309.069	309.048	309.077
MAdd8-SP	Size:2097152	GFLOPS	308.846	308.851	0.0110059	308.837	308.867	308.867	308.847	308.867	308.861	308.837	308.856	308.846	308.84	308.845	308.838
MAddU-SP	Size:4194304	GFLOPS	388.453	388.507	1.22614	387.006	389.915	389.653	387.147	387.498	387.448	389.72	387.006	389.9	389.408	387.379	389.915
Mul1-SP	Size:2097152	GFLOPS	298.097	298.055	0.141668	297.725	298.24	297.97	298.042	298.24	298.112	298.098	298.095	298.213	297.935	297.725	298.117
Mul2-SP	Size:2097152	GFLOPS	276.89	276.894	0.0219902	276.849	276.928	276.928	276.887	276.877	276.91	276.878	276.889	276.891	276.918	276.91	276.849
Mul4-SP	Size:2097152	GFLOPS	278.497	278.491	0.0406902	278.409	278.542	278.481	278.531	278.535	278.496	278.499	278.527	278.409	278.518	278.471	278.542
Mul8-SP	Size:2097152	GFLOPS	280.209	280.207	0.0264508	280.147	280.244	280.194	280.203	280.244	280.147	280.235	280.186	280.214	280.22	280.226	280.198
MulMAdd1-SP	Size:2097152	GFLOPS	389.945	389.954	0.0435699	389.875	390.031	389.929	389.934	389.93	389.973	390.031	390.023	389.875	389.95	389.951	389.939
MulMAdd2-SP	Size:2097152	GFLOPS	378.69	378.687	0.0293214	378.634	378.728	378.655	378.715	378.661	378.68	378.721	378.68	378.634	378.701	378.728	378.699
MulMAdd4-SP	Size:2097152	GFLOPS	377.373	377.37	0.0300483	377.325	377.413	377.325	377.336	377.334	377.355	377.413	377.41	377.388	377.392	377.382	377.363
MulMAdd8-SP	Size:2097152	GFLOPS	378.334	378.333	0.032578	378.277	378.387	378.277	378.312	378.387	378.346	378.376	378.328	378.34	378.355	378.301	378.309
MulMAddU-SP	Size:4194304	GFLOPS	495.103	495.13	0.110516	494.991	495.407	495.067	495.042	494.991	495.063	495.152	495.079	495.127	495.158	495.209	495.407