



Benchmark test

Industrial PCs

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Project Number:

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I Versions

Version	Date	Comment	Edited by
2.0	08.06.2005	First edition	GIA
2.1	26.09.2005	Document upgrade with B&R Automation Runtime (AR010 Version E2.82) tests	GIA
2.2	29.11.2005	Document upgrade with B&R Automation Runtime (AR106 Version B2.83) tests	GIA
2.3	19.03.2008	- Document changeover to BrManualTech V2.6 guideline - Document upgrade with APC810 (SiSoft Sandra 2007) tests	EBB
2.4	06.02.2009	Benchmark enhancements with PP300/400 (LX800-500)	MIK
2.5	28.04.2009	- Benchmark enhancements with APC810 (Intel Atom N270 + 945GME) - Benchmark enhancements with APC810 (Intel T9400 + GM45).	MIK
2.6	20.05.2009	- Benchmark enhancements with APC810 (Intel Atom N270 + 945GME) - Upgrade the document with SiSoft Sandra Pro Business 2007 benchmarkresults „Removeable Storage“.	RAM
2.7	23.06.2009	Benchmark enhancements with APC620 (Intel Atom N270 + 945GME)	MIK
2.8	11.08.2009	Benchmark enhancements with APC810 (Intel P8400 + GM45).	MIK
2.9	16.10.2009	Benchmark enhancements with INTEL Evalboard (Intel Z530 + US15W Chipset).	MIK
3.0	20.09.2010	Benchmark enhancements with PP500 (Intel Z520 + US15W Chipset).	MIK
3.1	31.08.2011	Benchmark enhancements with PP500 (Intel Z510 and Z530 + US15W Chipset).	MIK
3.2	22.06.2012	Benchmark enhancements with APC910 (Intel i7, i5, i3 and Celeron processors with SiSoft Sandra 2011 and Passmark Performance test)	BEM
3.3	16.10.2012	Benchmark enhancements with PPC800 (Intel Dual Core Atom N2800 + NM10 Chipset).	MIK

Table 1: Versions

II Distribution

Name	Company, Department	Amount	Remarks

Table 2: Distribution

III Safety notices

Safety notices in this document are organized as follows:

Safety notice	Description
Danger!	Disregarding the safety regulations and guidelines can be life-threatening.
Warning!	Disregarding the safety regulations and guidelines can result in severe injury or heavy damage to mate-

Safety notice	Description
	rial.
Caution!	Disregarding the safety regulations and guidelines can result in injury or damage to material.
Information:	Important information used to prevent errors.

Table 3: Safety notices

IV Test location

#	Company	Street	Postal code	City	Telephone	Contact
1	B&R	B&R Strasse 1	A-5142	Eggelsberg		

Table 4: Test location

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1 What's it all about?

This document is meant to show how the performance of different B&R industrial PCs to each other. The setup of information provided was based on a setup used by many popular magazines and web pages (e.g. Techchannel).

Information:

All results provided cannot be interpreted and used as absolute values. They should be considered comparison values that can vary slightly depending on the operating system and computer being used.

2 Hardware

The following hardware was used for the benchmark tests:

2.1 Devices being tested

#	CPU	RAM	VGA controller	Manuf.
Power Panel 100/200 (5PP120.1505-37)				
1	Geode SC2200 266 MHz	128 MB SD RAM	Geode SC2200 4MB (Shared)	B&R
IPC2001				
2	AMD 486DX2-66 MHz	8 MB DRAM	Chips & Technologies 65535 1MB	B&R
3	AMD 486DX5-133 MHz	32 MB DRAM	Chips & Technologies 65535 1MB	B&R
IPC5000C				
4	Intel Celeron 3 566 MHz 66 MHz FSB	256 MB SDRAM 100 MHz	Chips & Technologies 69000 2MB	B&R
5	Intel Celeron 3 850 MHz 66 MHz FSB	256 MB SDRAM 100 MHz	Chips & Technologies 69000 2MB	B&R
6	Intel Pentium 3 600 MHz 100 MHz FSB	256 MB SDRAM 100 MHz	Chips & Technologies 69000 2MB	B&R
7	Intel Pentium 3 850 MHz 100 MHz FSB	256 MB SDRAM 100 MHz	ATI Rage Mobility 4MB	B&R
APC680				
8	Intel Celeron 3 850 MHz 100 MHz FSB	256 MB SDRAM 133 MHz	Intel 815E Graphics Controller 32 MB	B&R
9	Intel Pentium 3 1.26 GHz 133 MHz FSB	512 MB SDRAM 133 MHz	Intel 815E Graphics Controller 32 MB	B&R
APC620 with INTEL 815E chipset				
10	Intel Celeron 3 400 MHz 100 MHz FSB	256 MD SDRAM 133 MHz	Intel 82815 Graphics Controller 32 MB	B&R
11	Intel Celeron 3 733 MHz 133 MHz FSB	512 MB SDRAM 133 MHz	Intel 82815 Graphics Controller 32 MB	B&R
12	Intel Celeron 3 1000 MHz 133 MHz FSB	512 MB SDRAM 133 MHz	Intel 82815 Graphics Controller 32 MB	B&R
APC620 with INTEL 855GME chipset				
13	Intel Celeron M 600 MHz 400 MHz FSB	256 MB DDR-SDRAM PC2700 333 MHz	Intel 82855 GME Graphic Controller 64 MB	B&R
14	Intel Celeron M 1000 MHz 400 MHz FSB	256 MB DDR-SDRAM PC2700 333MHz	Intel 82855 GME Graphic Controller 64 MB	B&R
15	Intel Pentium M 1.1 GHz 400 MHz FSB	1 GB DDR-SDRAM PC2700 333 MHz	Intel 82855 GME Graphic Controller 64 MB	B&R
16	Intel Pentium M 1.4 GHz 400 MHz FSB	512 MB DDR-SDRAM PC2700 333 MHz	Intel 82855 GME Graphic Controller 64 MB	B&R
17	Intel Pentium M 1.6 GHz 400 MHz FSB	1 GB DDR-SDRAM PC2700 333 MHz	Intel 82855 GME Graphic Controller 64 MB	B&R
18	Intel Pentium M 1.8 GHz 400 MHz FSB	512 MB DDR-SDRAM PC2700 333 MHz	Intel 82855 GME Graphic Controller 64 MB	B&R
Other test computers				
19	Intel Pentium 4 2.4 GHz 533 MHz FSB	512 MB DDR-SDRAM 333 MHz	Intel 82865G Graphics Controller 96 MB	HP
20	Intel Pentium 4 2.6 GHz 533 MHz FSB	512 MB DDR-SDRAM 333 MHz	Sapphire ATI Radeon 9600 Atlantis 256 MB DDR	HP
APC810 with INTEL 945GME chipset				
21	Celeron M 1.06 GHz 533 MHz FSB	512MB DDR2-SDRAM	Intel Graphics Media Accelerator 950 max. 224MB	B&R
22	Celeron M 1.06 GHz 533 MHz FSB	2x512MB DDR2-SDRAM	Intel Graphics Media Accelerator 950 max. 224MB	B&R

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#	CPU	RAM	VGA controller	Manuf.
23	Core 2 Duo 1.06 GHz 533 MHz FSB	2x1024MB DDR2-SDRAM	Intel Graphics Media Accelerator 950 max. 224MB	B&R
24	Core 2 Duo 1.50 GHz 667MHz FSB	2x512MB DDR2-SDRAM	Intel Graphics Media Accelerator 950 max. 224MB	B&R
25	Core Duo 1.66 GHz 667MHz FSB	2x1024MB DDR2-SDRAM	Intel Graphics Media Accelerator 950 max. 224MB	B&R
26	Core 2 Duo 2.16 GHz 667MHz FSB	1024MB DDR2-SDRAM	Intel Graphics Media Accelerator 950 max. 224MB	B&R
27	Core 2 Duo 2.16 GHz 667MHz FSB	2x1024MB DDR2-SDRAM	Intel Graphics Media Accelerator 950 max. 224MB	B&R
Power Panel 300/400 (5PP320.1214-39)				
28	AMD Geode LX800-500	256MB DDR-SDRAM 333MHz	AMD Geode LX800 4MB	B&R
APC810 with Intel 945GME chipset + Intel Atom N270				
29	Intel Atom N270 1,6GHz, 533MHz FSB, 512KB Cache	2 x 2048MB DDR2-SDRAM	Intel Graphics Media Accelerator 950 max. 224MB	B&R
APC810 with Intel GM45 chipset + Intel T9400				
30	Core 2 Duo 2,53GHz, 1066 MHz FSB, 6MB Cache	2 x 2048MB DDR3-SODIMM	Intel GM45	B&R
APC620 with Intel 945GME chipset + Intel Atom N270				
31	Intel Atom N270 1,6GHz, 533MHz FSB, 512KB Cache	1024MB DDR2-SDRAM	Intel Graphics Media Accelerator 950 max. 224MB	B&R
APC810 with Intel GM45 chipset + Intel P8400				
32	Core 2 Duo 2,26GHz, 1066 MHz FSB, 3MB Cache	2 x 2048MB DDR3-SODIMM	Intel GM45	B&R
INTEL Evalboard with INTEL US15W Chipsatz + INTEL Atom Z530				
33	Intel Atom Z530 1,6GHz, 533MHz FSB, 512KB Cache	1024MB DDR2-SDRAM	Intel US15W	INTEL
Power Panel 500 (5PP520.1505-00 + 5PP5CP.US15-01)				
34	Intel Atom Z520 1,33GHz, 533MHz FSB, 512KB Cache	2048MB DDR2-SDRAM	Intel US15W	B&R
Power Panel 500 (5PP520.1505-00 + 5PP5CP.US15-02)				
35	Intel Atom Z530 1,6GHz, 533MHz FSB, 512KB Cache	2048MB DDR2-SDRAM	Intel US15W	B&R
Power Panel 500 (5PP520.1505-00 + 5PP5CP.US15-00)				
36	Intel Atom Z510 1,1GHz, 400MHz FSB, 512KB Cache	2048MB DDR2-SDRAM	Intel US15W	B&R
APC910 with Intel QM77 Chipset				
37	i7-3615QE 4C 2.3/1.6GHz 6MB 45W	2 x 4096MB DDR3-SODIMM 1067MHz	Intel HD 4000	B&R
38	i7-3615QE 4C 2.3/1.6GHz 6MB 45W	2 x 4096MB DDR3-SODIMM 1600MHz	Intel HD 4000	B&R
39	i7-3612QE 4C 2.1/1.6GHz 6MB 35W	2 x 4096MB DDR3-SODIMM 1067MHz	Intel HD 4000	B&R
40	i7-3612QE 4C 2.1/1.6GHz 6MB 35W	2 x 4096MB DDR3-SODIMM 1600MHz	Intel HD 4000	B&R
41	i7-3555LE 2C 2.5/1.6GHz 4MB 25W	4096MB DDR3-SODIMM 1067MHz	Intel HD 4000	B&R
42	i7-3555LE 2C 2.5/1.6GHz 4MB 25W	4096MB DDR3-SODIMM 1600MHz	Intel HD 4000	B&R
43	i7-3555LE 2C 2.5/1.6GHz 4MB 25W	2 x 2048MB DDR3-SODIMM 1067MHz	Intel HD 4000	B&R
44	i7-3555LE 2C 2.5/1.6GHz 4MB 25W	2 x 4096MB DDR3-SODIMM 1600MHz	Intel HD 4000	B&R

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#	CPU	RAM	VGA controller	Manuf.
45	i7-3517UE 2C 1.7/1.6GHz 4MB 17W	2 x 2048MB DDR3-SODIMM 1067MHz	Intel HD 4000	B&R
46	i7-3517UE 2C 1.7/1.6GHz 4MB 17W	2 x 4096MB DDR3-SODIMM 1600MHz	Intel HD 4000	B&R
47	i5-3610ME 2C 2.7/1.6GHz 3MB 35W	2 x 2048MB DDR3-SODIMM 1067MHz	Intel HD 4000	B&R
48	i5-3610ME 2C 2.7/1.6GHz 3MB 35W	2 x 4096MB DDR3-SODIMM 1600MHz	Intel HD 4000	B&R
49	i3-3120ME 2C 2.4/1.6GHz 3MB 35W	2 x 2048MB DDR3-SODIMM 1067MHz	Intel HD 4000	B&R
50	i3-3120ME 2C 2.4/1.6GHz 3MB 35W	2 x 4096MB DDR3-SODIMM 1600MHz	Intel HD 4000	B&R
51	i3-3217UE 2C 1.6/1.6GHz 3MB 17W	2 x 2048MB DDR3-SODIMM 1067MHz	Intel HD 4000	B&R
52	i3-3217UE 2C 1.6/1.6GHz 3MB 17W	2 x 4096MB DDR3-SODIMM 1600MHz	Intel HD 4000	B&R
APC910 with Intel HM76 Chipset				
53	C-847 2C 1.1/1.3GHz 2MB 17W	2 x 2048MB DDR3-SODIMM 1067MHz	Intel HD 4000	B&R
54	C-847 2C 1.1/1.3GHz 2MB 17W	2 x 4096MB DDR3-SODIMM 1333MHz	Intel HD 4000	B&R
55	C-827E 1C 1.4/1.3GHz 1.5MB 17W	2 x 2048MB DDR3-SODIMM 1067MHz	Intel HD 4000	B&R
56	C-827E 1C 1.4/1.3GHz 1.5MB 17W	2 x 4096MB DDR3-SODIMM 1333MHz	Intel HD 4000	B&R
PPC800 with Intel NM10 Chipset+ Intel Dual Core Atom N2800				
57	Intel Dual Core Atom N2800 1,86GHz, 533MHz FSB, 1MB Cache	4096MB DDR3-SODIMM 1067MHz	Intel Graphics Media Accelerator 3600	B&R

Table 5: Devices being tested

2.2 Hard disks / removeable devices

#	Name	Storage capacity	Rotary speed / cache	Manufacturer
ICP5000C hard disks				
1	Slide-In HD MHK2060AT	5.6 GB	4200 (rpm) / 512 KB	Fujitsu/B&R
APC620 hard disks				
2	Add-On HD MHT2020AC	20 GB	4200 (rpm) / 2 MB	Fujitsu/B&R
3	Add-On HD MHT2030AR	30 GB	4200 (rpm) / 2 MB	Fujitsu/B&R
4	Slide-In HD MHT2020AC	20 GB	4200 (rpm) / 2 MB	Fujitsu/B&R
5	Slide-In HD MHT2030AR	30 GB	4200 (rpm) / 2 MB	Fujitsu/B&R
6	Travelstar	40 GB	7200 (rpm) / 8 MB	Hitachi
Reference hard disk				
7	ST340014A	40 GB	7200 (rpm) / 2 MB	Seagate
APC810 hard disks				
8	ST940817SM	40GB	5400 (U/min) / 8 MB	Seagate
Compact Flash cards				
1	5CFCRD.1024-03	1 GB	-	B&R
2	5CFCRD.1043-04	1 GB	-	B&R

Table 6: Hard disks and removeable devices used

3 Software

The following software products were used for the tests:

3.1 Benchmark programs

#	Name	Manufacturer	WEB link
1	Sandra 2002 Prof	Sisoft	http://www.sisoftware.net/
2	Sandra 2005 SR1 Lite	Sisoft	http://www.sisoftware.net/
3	PC Mark 2002	MadOnion.com Inc.	http://www.futuremark.com/
4	PC Mark04	Futuremark Coporation	http://www.futuremark.com/
5	WinBench99	ZD Net/Ziff-Davis	http://www.zdnet.de/
6	HDTACH V2.70	Simpli Software	http://www.simplisoftware.com/
7	3D Mark 2000	MadOnion.com Inc.	http://www.futuremark.com/
8	3D Mark 2001SE	MadOnion.com Inc.	http://www.futuremark.com/
9	B&R Automation Runtime	B&R	http://www.br-automation.com
10	B&R Automation Runtime AR106	B&R	http://www.br-automation.com
11	Sandra Pro Business 2007	Sisoft	http://www.sisoftware.net/
12	Sandra 2011 Lite	SiSoft	http://www.sisoftware.net/
13	Performance Test 7.0	Passmark	http://www.passmark.com

Table 7: Benchmark programs used and the corresponding WEB links

3.2 Operating system

Windows 98 was used as the operating system for IPC2001 computers.

Microsoft Windows XP Professional SP2 or SP3 was used for all other computers.

Microsoft Windows 7 Ultimate (32 or 64Bit, depending on the CPU) was used for the Sisoft Sandra 2011 and Passmark Performance Test 7.

4 Results

4.1 Sisoft Sandra 2002 Prof.

Sisoft Sandra provides many different tests.

For this reason, Sandra has become a very popular benchmark program and is used in nearly all performance tests.

4.1.1 CPU arithmetic

Here, the program determines the maximum number of operations per second. The result is output in MIPS (Million Instructions per Second).

At the same time, the maximum number of floating point operations per second is also determined. The result is shown in MFLOPS (Million Floating Point Operations per Second).

#	Test device	Dhrystone ALU (MIPS)	Whetstone FPU (MFLOPS)
VIA CPUs			
	VIA M6000, 600MHz	771 ¹	210 ¹
	VIA M10000, 1000 MHz	1592 ¹	367 ¹
Power Panel 100/200			
3	Geode 266 MHz, 128 MB RAM	329	202
IPC2001 computer			
4	AMD 486DX2 66 MHz 8 MB DRAM	85	30
5	AMD 486DX5 133 MHz 32 MB DRAM	169	60
IPC5000C computer			
6	Celeron 3 566 MHz, 256 MB SDRAM	1513	765
7	Celeron 3 850 MHz, 256 MB SDRAM	2267	1149
8	Pentium 3 600 MHz, 256 MB SDRAM	1614	810
9	Pentium 3 850 MHz, 256 MB SDRAM	2267	1149
APC680 with INTEL 815E chipset			
10	Celeron 3 850 MHz, 256 MB SDRAM	2283	1147
11	Pentium 3 1.26 GHz, 256 MB SDRAM	3482	1697
APC620 with INTEL 815E chipset			
12	Celeron 3 400 MHz, 256 MB SDRAM	1086	529
13	Celeron 3 733 MHz, 512 MB SDRAM	2002	976
14	Celeron 3 1 GHz, 256 MB SDRAM	2751	1340
APC620 with INTEL 855GME chipset			
15	Celeron M 600 MHz, 256 MB DDR-SDRAM	2008	1170
16	Celeron M 1 GHz, 256 MB DDR-SDRAM	3533	1948
17	Pentium M 1.1 GHz, 1GB DDR-SDRAM	4580	2149
18	Pentium M 1.4 GHz, 512 MB DDR-SDRAM	4945	2732
19	Pentium M 1.6 GHz, 1GB DDR-SDRAM	5363	3124
20	Pentium M 1.8 GHz, 512 MB DDR-SDRAM	6370	3511
Other test computers			
21	Pentium 4 2.4 GHz, 512 MB DDR-SDRAM	4634	2955
22	Pentium 4 2.6 GHz, 512 MB DDR-SDRAM	5168	3305

¹ Source: Tolly Group

Benchmark test Industrial PCs

#	Test device	Dhrystone ALU (MIPS)	Whetstone FPU (MFLOPS)
Power Panel 300/400			
28	AMD Geode LX800, 256 MB DDR-SDRAM	792	291

Table 8: Results for Sisoft Sandra 2002 Prof. CPU arithmetic

Sisoft Sandra 2002 Prof. CPU Arithmetic Test

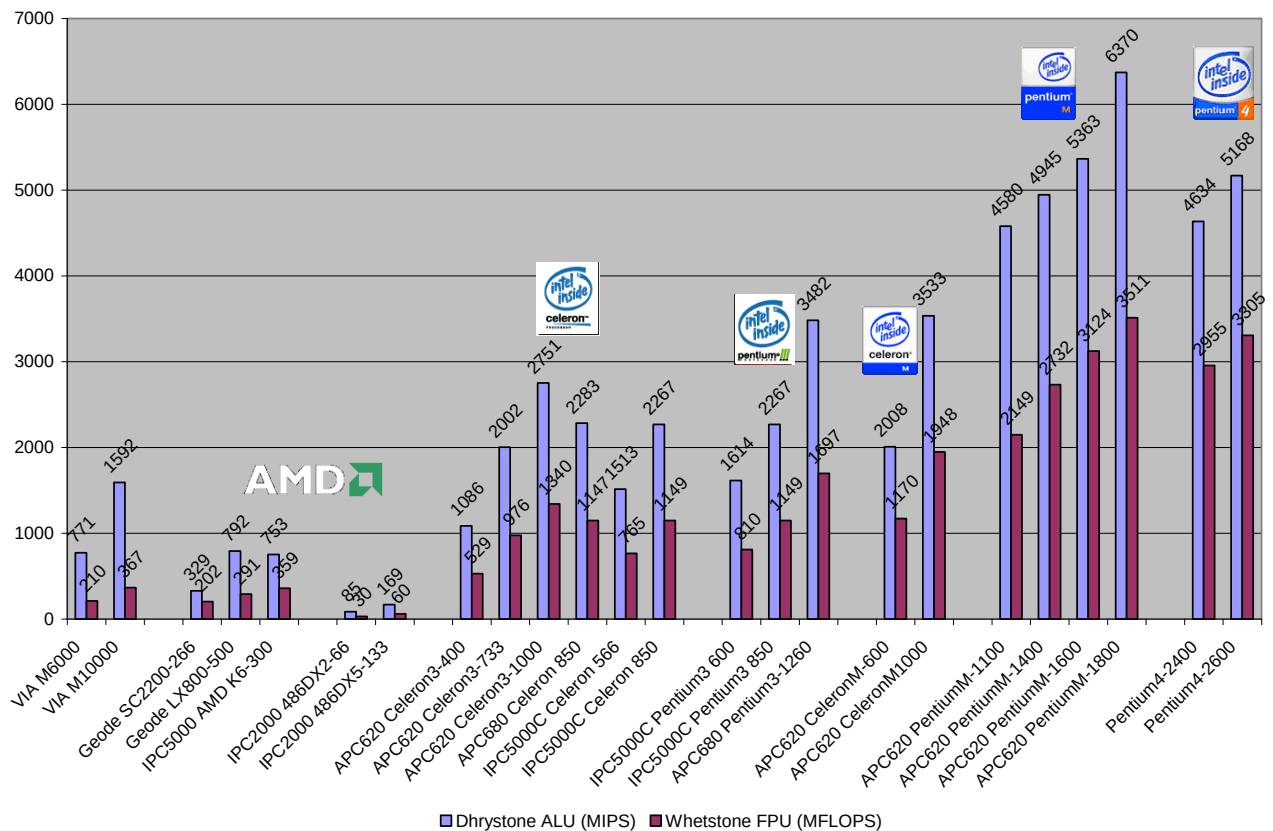


Figure 1 - Results for Sisoft Sandra 2002 Prof. CPU arithmetic

4.1.2 CPU multimedia

This test determines the multimedia performance of the CPU. During this test, the speed and performance are checked for the technologies used, such as MMX, SSE, SSE2 (depending on the processor).

#	Test device	Integer (it/s)	Floating Point (it/s)
VIA CPUs			
	VIA M6000, 600MHz	874 ²	1196 ²
	VIA M10000, 1000 MHz	2255 ²	1196 ²
Power Panel 100/200			
1	Geode 266 MHz, 128 MB RAM	412	118
IPC2001 computer			
2	AMD 486DX2 66 MHz 8 MB DRAM	22	18
3	AMD 486DX5 133 MHz 32 MB DRAM	44	36
IPC5000C computer			
4	Celeron 3 566 MHz, 256 MB SDRAM	3084	3772
5	Celeron 3 850 MHz, 256 MB SDRAM	4628	5661
6	Pentium 3 600 MHz, 256 MB SDRAM	3265	3995
7	Pentium 3 850 MHz, 256 MB SDRAM	4629	5663
APC680 with INTEL 815E chipset			
8	Celeron 3 850 MHz, 256 MB SDRAM	4621	5654
9	Pentium 3 1.26 GHz, 256 MB SDRAM	6884	8545
APC620 with INTEL 815E chipset			
10	Celeron 3 400 MHz, 256 MB SDRAM	2147	2665
11	Celeron 3 733 MHz, 512 MB SDRAM	3957	4913
12	Celeron 3 1 GHz, 256 MB SDRAM	4652	6153
APC620 with INTEL 855GME chipset			
13	Celeron M 600 MHz, 256 MB DDR-SDRAM	2662	3839
14	Celeron M 1 GHz, 256 MB DDR-SDRAM	4284	6381
15	Pentium M 1.1 GHz, 1GB DDR-SDRAM	4814	7038
16	Pentium M 1.4 GHz, 512 MB DDR-SDRAM	6009	8951
17	Pentium M 1.6 GHz, 1GB DDR-SDRAM	7002	10254
18	Pentium M 1.8 GHz, 512 MB DDR-SDRAM	7724	11504
Other test computers			
19	Pentium 4 2.4 GHz, 512 MB DDR-SDRAM	9386	11608
20	Pentium 4 2.6 GHz, 512 MB DDR-SDRAM	10400	12905
Power Panel 300/400			
28	AMD Geode LX800, 256 MB DDR-SDRAM	777	950

Table 9: Results for Sisoft Sandra 2002 Prof CPU multimedia

² Source: Tolly Group

Sisoft Sandra 2002 Prof. CPU Multimedia

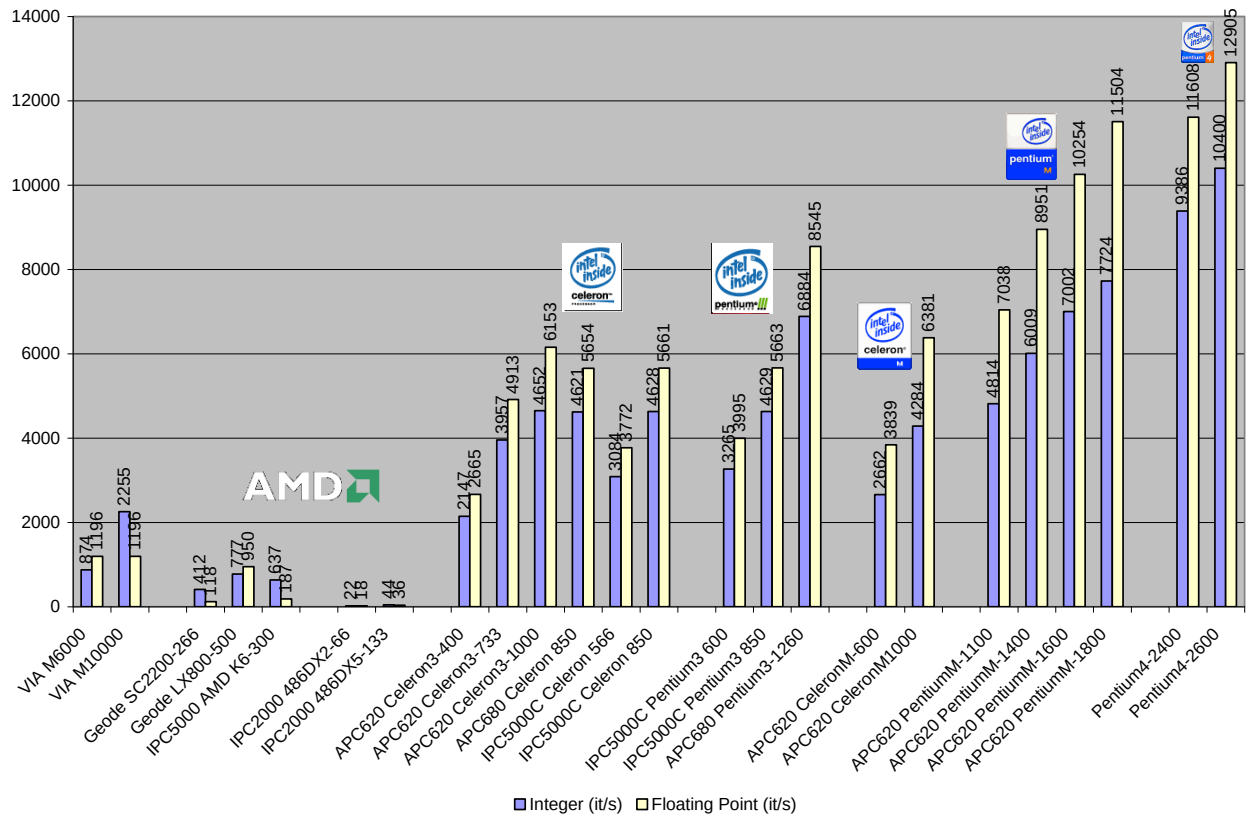


Figure 2 – Results for SiSoft Sandra 2002 Prof. CPU multimedia

4.1.3 Memory bandwidth

The performance of the system memory (main memory) is determined here. This is done by transferring a large amount of data. The result is the maximum "memory throughput" in MB/s.

#	Test device	RAM Bandwidth ALU (MB/s)	RAM Bandwidth FPU (MB/s)
VIA CPUs			
	VIA M6000, 600MHz	215 ³	243 ³
	VIA M10000, 1000 MHz	215 ³	243 ³
Power Panel 100/200			
1	Geode 266 MHz, 128 MB RAM	101	95
IPC2001 Rechner			
2	AMD 486DX2 66 MHz 8 MB DRAM	29	30
3	AMD 486DX5 133 MHz 32 MB DRAM	35	37
IPC5000C computer			
4	Celeron 3 566 MHz, 256 MB SDRAM	429	455
5	Celeron 3 850 MHz, 256 MB SDRAM	428	428
6	Pentium 3 600 MHz, 256 MB SDRAM	427	428
7	Pentium 3 850 MHz, 256 MB SDRAM	558	428
APC680 with INTEL 815E chipset			
8	Celeron 3 850 MHz, 256 MB SDRAM	584	570
9	Pentium 3 1.26 GHz, 256 MB SDRAM	762	752
APC620 with INTEL 815E chipset			
10	Celeron 3 400 MHz, 256 MB SDRAM	409	401
11	Celeron 3 733 MHz, 512 MB SDRAM	675	664
12	Celeron 3 1 GHz, 256 MB SDRAM	650	646
APC620 with INTEL 855GME chipset			
13	Celeron M 600 MHz, 256 MB DDR-SDRAM	1326	1340
14	Celeron M 1 GHz, 256 MB DDR-SDRAM	1395	1401
15	Pentium M 1.1 GHz, 1GB DDR-SDRAM	1353	1372
16	Pentium M 1.4 GHz, 512 MB DDR-SDRAM	1396	1401
17	Pentium M 1.6 GHz, 1GB DDR-SDRAM	1439	1411
18	Pentium M 1.8 GHz, 512 MB DDR-SDRAM	1601	1600
Other test computers			
19	Pentium 4 2.4 GHz, 512 MB DDR-SDRAM	1973	1948
20	Pentium 4 2.6 GHz, 512 MB DDR-SDRAM	3201	3206
Power Panel 300/400			
28	AMD Geode LX800, 256 MB DDR-SDRAM	404	334

Table 10: Results for Sisoft Sandra 2002 Prof CPU memory bandwidth

³ Source: Tolly Group

Sisoft Sandra 2002 Prof. Memory Bandwidth

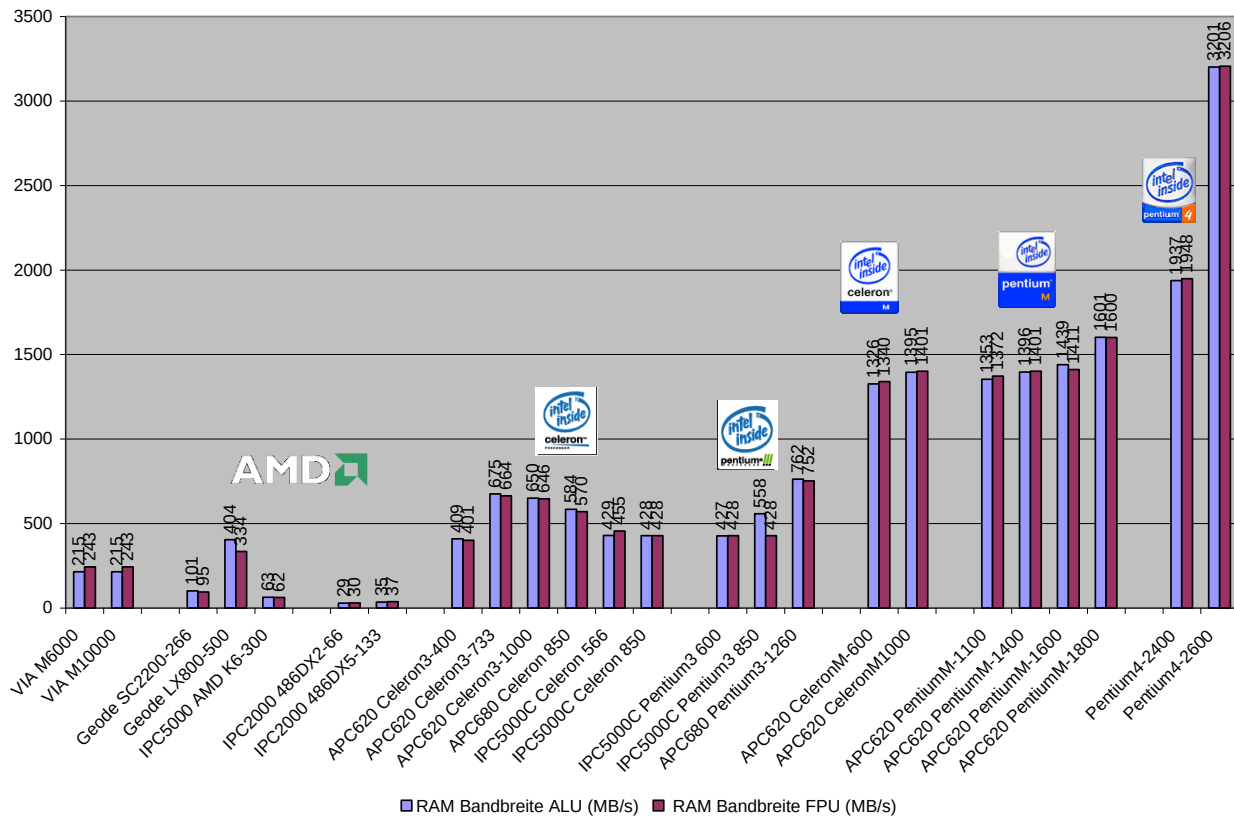


Figure 3 – Results for Sisoft Sandra 2002 Prof memory bandwidth

4.2 Sisoft Sandra 2005 SR1

Sisoft Sandra 2005 is the most current version of Sandra and supports the newest technologies (such as SSE3).

4.2.1 CPU arithmetic

Here, the program determines the maximum number of operations per second. The result is output in MIPS (Million Instructions per Second).

At the same time, the maximum number of floating point operations per second is also determined. The result is shown in MFLOPS (Million Floating Point Operations per Second).

#	Test device	Dhrystone ALU (MIPS)	Whetstone FPU (MFLOPS)
Power Panel 100/200			
1	Geode 266 MHz, 128 MB RAM	407	170
IPC5000C computer			
4	Celeron 3 566 MHz, 256 MB SDRAM	1928	743
5	Celeron 3 850 MHz, 256 MB SDRAM	2896	1122
6	Pentium 3 600 MHz, 256 MB SDRAM	2019	788
7	Pentium 3 850 MHz, 256 MB SDRAM	2913	1128
APC680 with INTEL 815E chipset			
8	Celeron 3 850 MHz, 256 MB SDRAM	2901	1119
9	Pentium 3 1.26 GHz, 256 MB SDRAM	4348	1731
APC620 with INTEL 815E chipset			
10	Celeron 3 400 MHz, 256 MB SDRAM	1344	536
11	Celeron 3 733 MHz, 512 MB SDRAM	2483	989
12	Celeron 3 1 GHz, 256 MB SDRAM	3432	1367
APC620 with INTEL 855GME chipset			
13	Celeron M 600 MHz, 256 MB DDR-SDRAM	2481	1064
14	Celeron M 1 GHz, 256 MB DDR-SDRAM	4304	1776
15	Pentium M 1.1 GHz, 1GB DDR-SDRAM	4580	1532
16	Pentium M 1.4 GHz, 512 MB DDR-SDRAM	6035	1947
17	Pentium M 1.6 GHz, 1GB DDR-SDRAM	6566	2844
18	Pentium M 1.8 GHz, 512 MB DDR-SDRAM	7758	3204
Other test computers			
19	Pentium 4 2.4 GHz, 512 MB DDR-SDRAM	6325	3212
20	Pentium 4 2.6 GHz, 512 MB DDR-SDRAM	7044	3577
Power Panel 300/400			
28	AMD Geode LX800, 256 MB DDR-SDRAM	1022	277

Table 11: Results for Sisoft Sandra 2005 SR1. CPU arithmetic

Sisoft Sandra 20005 SR1 CPU Arithmetic

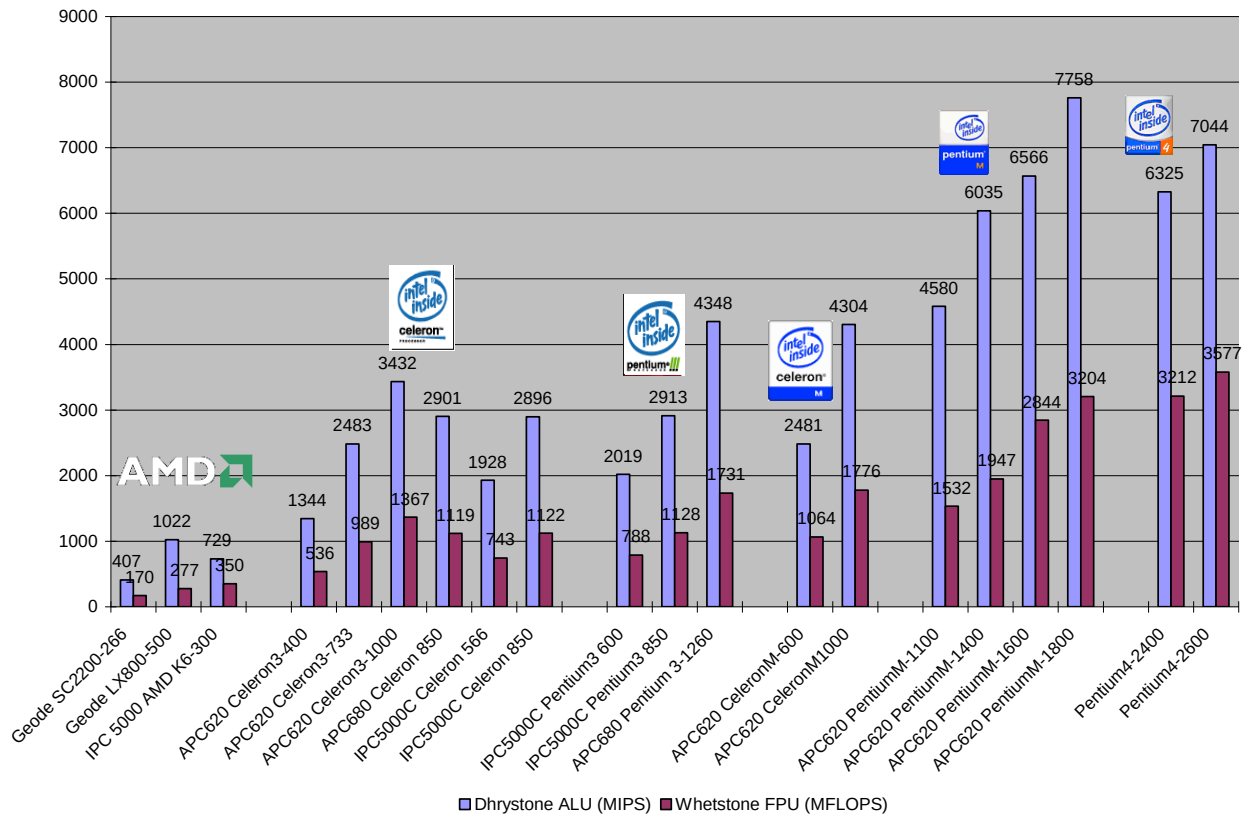


Figure 4 – Results for Sisoft Sandra 2005 SR1. CPU arithmetic

Information:

IPC2001 computers are not included in this test because Sisoft Sandra 2005 SR1 is not supported by Windows 98.

4.2.2 CPU multimedia

This test determines the multimedia performance of the CPU. During this test, the speed and performance are checked for the technologies used, such as MMX, SSE, SSE2, SSE3 (depending on the processor).

#	Test device	Integer (it/s)	Floating Point (it/s)
Power Panel 100/200			
1	Geode 266 MHz, 128 MB RAM	733	156
IPC5000C computer			
4	Celeron 3 566 MHz, 256 MB SDRAM	4621	5820
5	Celeron 3 850 MHz, 256 MB SDRAM	6959	8755
6	Pentium 3 600 MHz, 256 MB SDRAM	4910	6159
7	Pentium 3 850 MHz, 256 MB SDRAM	6985	8789
APC680 with INTEL 815E chipset			
8	Celeron 3 850 MHz, 256 MB SDRAM	6978	8788
9	Pentium 3 1.26 GHz, 256 MB SDRAM	11053	13311
APC620 with INTEL 815E chipset			
10	Celeron 3 400 MHz, 256 MB SDRAM	3419	4118
11	Celeron 3 733 MHz, 512 MB SDRAM	6314	7601
12	Celeron 3 1 GHz, 256 MB SDRAM	8721	10502
APC620 with INTEL 855GME chipset			
13	Celeron M 600 MHz, 256 MB DDR-SDRAM	5696	6258
14	Celeron M 1 GHz, 256 MB DDR-SDRAM	9523	10490
15	Pentium M 1.1 GHz, 1GB DDR-SDRAM	10475	11522
16	Pentium M 1.4 GHz, 512 MB DDR-SDRAM	13349	14707
17	Pentium M 1.6 GHz, 1GB DDR-SDRAM	15228	16755
18	Pentium M 1.8 GHz, 512 MB DDR-SDRAM	17159	18904
Other test computers			
19	Pentium 4 2.4 GHz, 512 MB DDR-SDRAM	14676	18351
20	Pentium 4 2.6 GHz, 512 MB DDR-SDRAM	16464	20635
Power Panel 300/400			
28	AMD Geode LX800, 256 MB DDR-SDRAM	1323	1721

Table 12: Results for Sisoft Sandra 2005 SR1. CPU multimedia

Sisoft Sandra 2005 SR1 CPU Multimedia

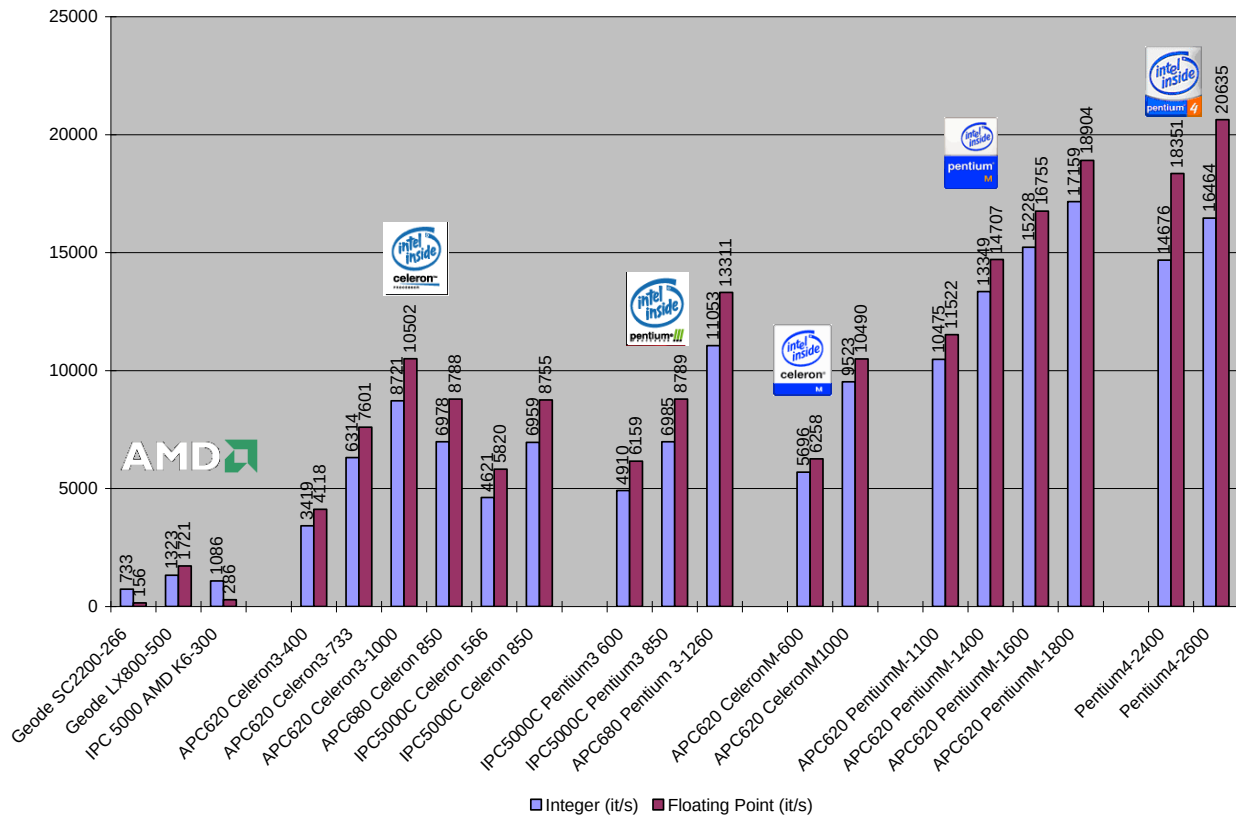


Figure 5 – Results for SiSoft Sandra 2005 SR1. CPU multimedia

Information:

IPC2001 computers are not included in this test because SiSoft Sandra 2005 SR1 is not supported by Windows 98.

4.2.3 Memory bandwidth

The performance of the system memory (main memory) is determined here. This is done by transferring a large amount of data. The result is the maximum "memory throughput" in MB/s.

#	Test device	RAM Bandwidth ALU (MB/s)	RAM Bandwidth FPU (MB/s)
Power Panel 100/200			
1	Geode 266 MHz, 128 MB RAM	96	92
IPC5000C computer			
4	Celeron 3 566 MHz, 256 MB SDRAM	425	449
5	Celeron 3 850 MHz, 256 MB SDRAM	558	428
6	Pentium 3 600 MHz, 256 MB SDRAM	503	428
7	Pentium 3 850 MHz, 256 MB SDRAM	428	429
APC680 with INTEL 815E chipset			
8	Celeron 3 850 MHz, 256 MB SDRAM	585	570
9	Pentium 3 1.26 GHz, 256 MB SDRAM	753	742
APC620 with INTEL 815E chipset			
10	Celeron 3 400 MHz, 256 MB SDRAM	407	401
11	Celeron 3 733 MHz, 512 MB SDRAM	610	601
12	Celeron 3 1 GHz, 256 MB SDRAM	700	694
APC620 with INTEL 855GME chipset			
13	Celeron M 600 MHz, 256 MB DDR-SDRAM	1761	1761
14	Celeron M 1 GHz, 256 MB DDR-SDRAM	1751	1754
15	Pentium M 1.1 GHz, 1GB DDR-SDRAM	1713	1705
16	Pentium M 1.4 GHz, 512 MB DDR-SDRAM	1824	1820
17	Pentium M 1.6 GHz, 1GB DDR-SDRAM	1942	1949
18	Pentium M 1.8 GHz, 512 MB DDR-SDRAM	1977	1977
Other test computers			
19	Pentium 4 2.4 GHz, 512 MB DDR-SDRAM	1983	1987
20	Pentium 4 2.6 GHz, 512 MB DDR-SDRAM	3204	3211
Power Panel 300/400			
28	AMD Geode LX800, 256 MB DDR-SDRAM	633	506

Table 13: Results for SiSoft Sandra 2005 SR1. CPU memory bandwidth

Sisoft Sandra 2005 SR1 Memory Bandwidth

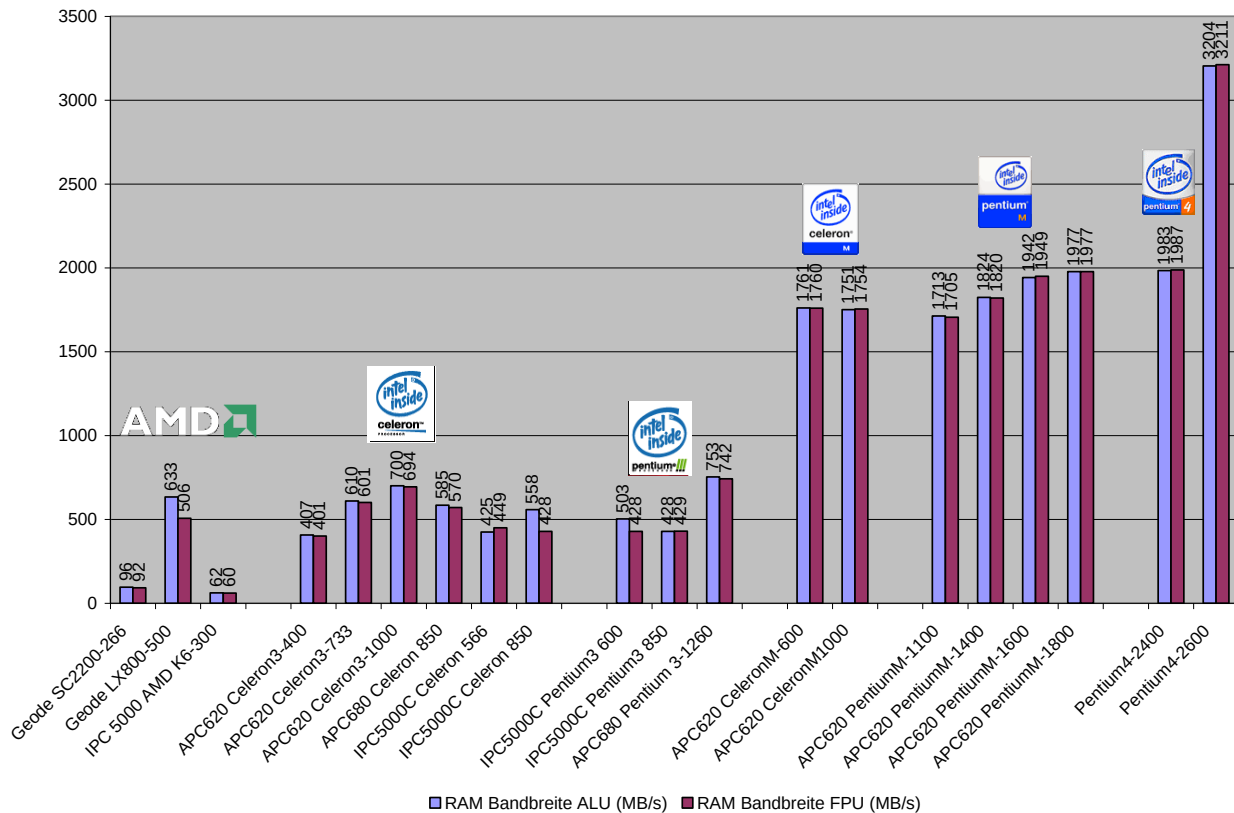


Figure 6 – Results for SiSoft Sandra 2005 SR1. Memory bandwidth

Information:

IPC2001 computers are not included in this test because SiSoft Sandra 2005 SR1 is not supported by Windows 98.

4.3 PCMark2002

PCMark2002 is a current benchmark that has many users and is therefore very good for comparing PC systems. It supports both new and older processors and, for this reason, provides a very good overview of the performance of various systems.

PCMark2002 tests the following system components:

- The CPU => both Integer and FPU
- Memory subsystems => main memory, L1 & L2 cache
- Graphics card => graphics card memory and AGP bus
- Hard drive
- Microsoft Windows XP GUI (Graphic User Interface)
- Video performance and quality
- Laptop battery (if PC Mark is being used on a laptop)

#	Test device	CPU (points)	Memory (points)
VIA CPUs			
	VIA M6000, 600MHz	584 ⁴	677 ⁴
	VIA M10000, 1000 MHz	1119 ⁴	869 ⁴
Power Panel			
1	Geode 266 MHz, 128 MB RAM	284	354
IPC5000C computer			
4	Celeron 3 566 MHz, 256 MB SDRAM	1480	737
5	Celeron 3 850 MHz, 256 MB SDRAM	2142	1045
6	Pentium 3 600 MHz, 256 MB SDRAM	1649	991
7	Pentium 3 850 MHz, 256 MB SDRAM	2256	1145
APC680 with INTEL 815E chipset			
8	Celeron 3 850 MHz, 256 MB SDRAM	1992	958
9	Pentium 3 1.26 GHz, 256 MB SDRAM	3892	2036
APC620 with INTEL 815E chipset			
10	Celeron 3 400 MHz, 256 MB SDRAM	1227	762
11	Celeron 3 733 MHz, 512 MB SDRAM	2225	1126
12	Celeron 3 1 GHz, 256 MB SDRAM	2968	1187
APC620 with INTEL 855GME chipset			
13	Celeron M 600 MHz, 256 MB DDR-SDRAM	1964	2593
14	Celeron M 1 GHz, 256 MB DDR-SDRAM	3314	3201
15	Pentium M 1.1 GHz, 1GB DDR-SDRAM	3572	3710
16	Pentium M 1.4 GHz, 512 MB DDR-SDRAM	4705	4694
17	Pentium M 1.6 GHz, 1GB DDR-SDRAM	5246	4727
18	Pentium M 1.8 GHz, 512 MB DDR-SDRAM	6070	6121
Other test computers			
19	Pentium 4 2.4 GHz, 512 MB DDR-SDRAM	5772	4849
20	Pentium 4 2.6 GHz, 512 MB DDR-SDRAM	6519	6678

Table 14: Results for PCMark2002

⁴ Source: Tolly Group

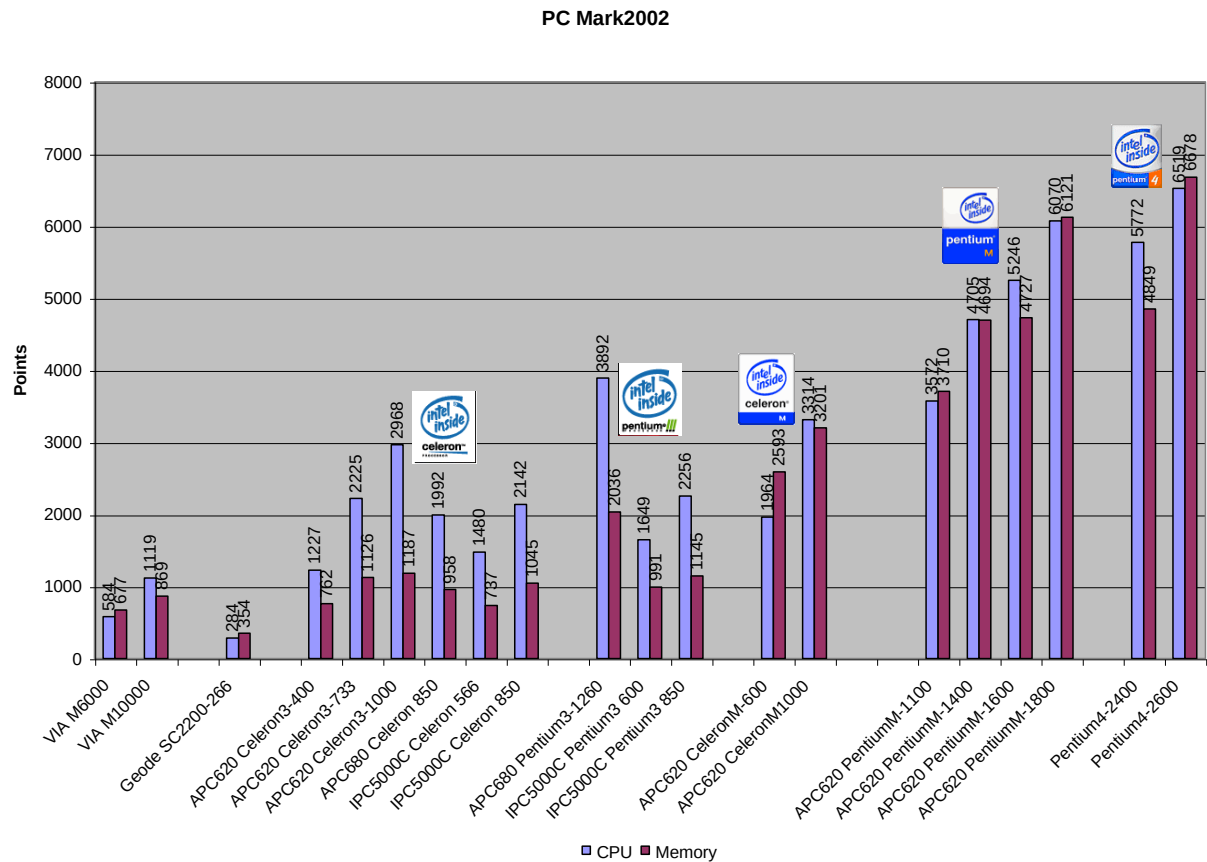


Figure 7 – Results for PCMark2002

Information:

IPC2001 computers are not included in this test because PC Mark 2002 requires at least a CPU with MMX technology.

4.4 PCMark04

PCMark04 is a benchmark from the newest generation. This program tests and supports the newest technologies (e.g. HT, SSE3) and takes the system to the limit of its performance.

The test criteria for PCMark04 are similar to the ones for PCMark2002.

All components tested with PCMark2002 are also tested with PCMark2004, however PCMark2004 determines the results with the help of coding and decoding processes for the individual media codecs (e.g. DivX, WMV Codec, etc.)

The manufacturer explicitly states that the test results from PCMark2002 and PCMark04 are not (!!!) comparable!

In addition, all systems can no longer be tested with this program.

The system must meet the following requirements (and others):

- Intel or AMD processor > 1 GHz
- At least 128 MB RAM
- Full DirectX 7 compatible graphics card
- Windows Media Player 9.0 + MS Encoder 9.0
- Microsoft Internet Explorer 6

#	Test device	Points
Power Panel		
1	Geode 266 MHz, 128 MB RAM	Not supported
IPC5000C computer		
4	Celeron 3 566 MHz, 256 MB SDRAM	Not supported
5	Celeron 3 850 MHz, 256 MB SDRAM	Not supported
6	Pentium 3 600 MHz, 256 MB SDRAM	Not supported
7	Pentium 3 850 MHz, 256 MB SDRAM	Not supported
APC680 computer		
8	Celeron 3 850 MHz, 256 MB SDRAM	Not supported
9	Pentium 3 1.26 GHz, 256 MB SDRAM	Not supported
APC620 with INTEL 815 E chipset		
10	Celeron 3 400 MHz, 256 MB SDRAM	Not supported
11	Celeron 3 733 MHz, 512 MB SDRAM	Not supported
12	Celeron 3 1000 MHz, 256 MB SDRAM	Not supported
APC620 with INTEL 855GME chipset		
13	Celeron M 600 MHz, 256 MB DDR-SDRAM	1326
14	Celeron M 1 GHz, 256 MB DDR-SDRAM	1826
15	Pentium M 1.1 GHz, 1 GB DDR-SDRAM	1961
16	Pentium M 1.4 GHz, 512 MB DDR-SDRAM	2461
17	Pentium M 1.6 GHz, 1GB DDR-SDRAM	2640
18	Pentium M 1.8 GHz, 512 MB DDR-SDRAM	2993
Other test computers		
19	Pentium 4 2.4 GHz, 512 MB DDR-SDRAM	2608
20	Pentium 4 2.6 GHz, 512 MB DDR-SDRAM	3452

Table 15: Results for PCMark04

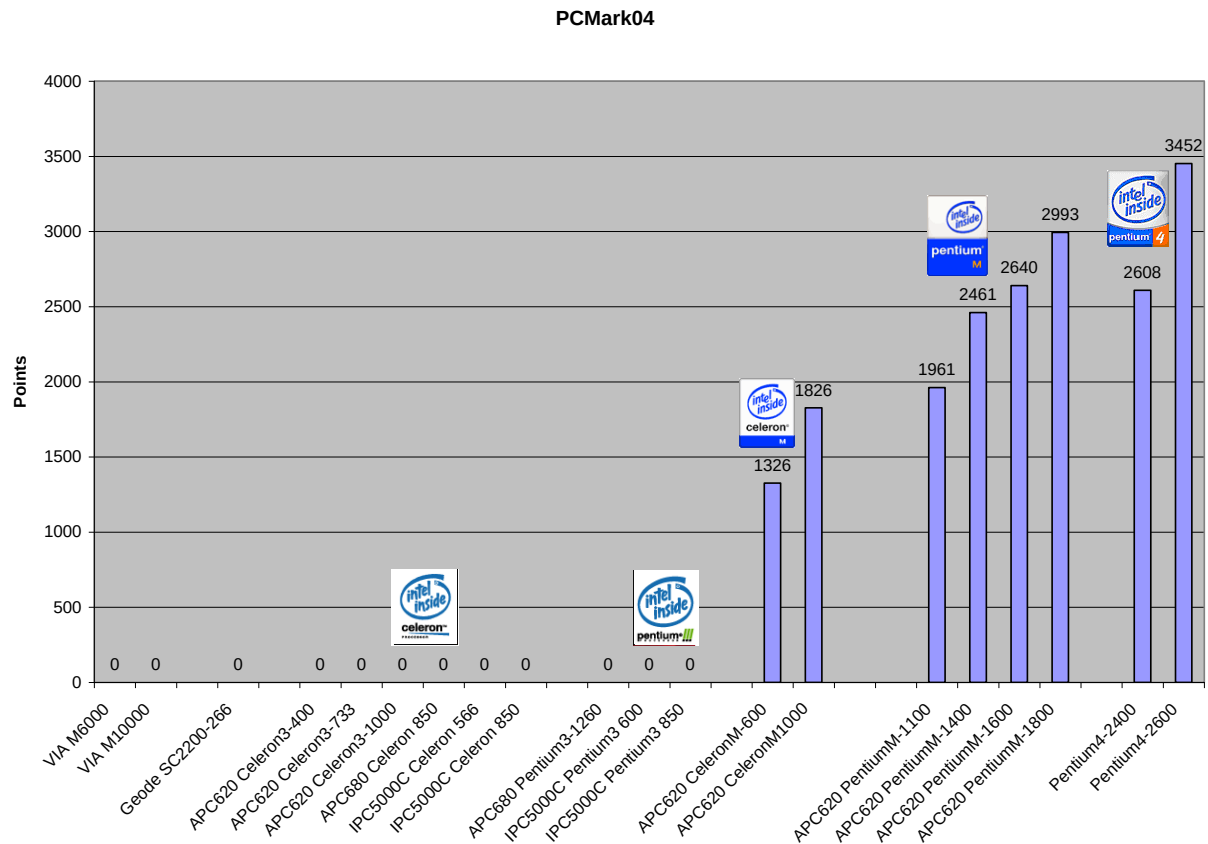


Figure 8 – Results for PCMark04

Information:

PCMark04 requires a graphics card that is fully DirectX7 compatible. This requirement is only met by the APC620 computers with an Intel 855GME chipset. Therefore there are no test results for Power Panel, IPC2001, IPC5000C, APC680 and APC620 (with Intel 815 E).

4.5 Winbench99

WinBench99 was developed together with ZD Net. However, the development was stopped in the middle of 2000.

Up to that point, WinBench was an important tool for comparing the performance measurements of PC systems. WinBench99 offers many subprograms that analyze certain aspects of the systems.

This program was used to create comparison values for "older" systems.

4.5.1 CPUMark99

CPUMark99 is a test that determines the computing power of the CPU. All arithmetic units on the CPU. As a result, the program calculates a number of points that can be used for further comparison.

#	Test device	Points
Power Panel		
1	Geode 266 MHz, 128 MB RAM	7.08
IPC2001 computer		
2	AMD 486DX2 66MHz, 8MB DRAM	3.21
3	AMD 486DX5 133 MHz, 32 MB DRAM	4.19
IPC5000C computer		
4	Celeron 3 566 MHz, 256 MB SDRAM	43.6
5	Celeron 3 850 MHz, 256 MB SDRAM	64.7
6	Pentium 3 600 MHz, 256 MB SDRAM	56.9
7	Pentium 3 850 MHz, 256 MB SDRAM	76.1
APC680 computer		
8	Celeron 3 850 MHz, 256 MB SDRAM	57.2
9	Pentium 3 1.26 GHz, 256 MB SDRAM	112
APC620 with INTEL 815 E chipset		
10	Celeron 3 400 MHz, 256 MB SDRAM	37.3
11	Celeron 3 733 MHz, 512 MB SDRAM	64.1
12	Celeron 3 1000 MHz, 256 MB SDRAM	85.8
APC620 with INTEL 855GME chipset		
13	Celeron M 600 MHz, 256 MB DDR-SDRAM	66.4
14	Celeron M 1 GHz, 256 MB DDR-SDRAM	111
15	Pentium M 1.1 GHz, 1 GB DDR-SDRAM	127
16	Pentium M 1.4 GHz, 512 MB DDR-SDRAM	171
17	Pentium M 1.6 GHz, 1GB DDR-SDRAM	184
18	Pentium M 1.8 GHz, 512 MB DDR-SDRAM	220
Other test computers		
19	Pentium 4 2.4 GHz, 512 MB DDR-SDRAM	Not supported
20	Pentium 4 2.6 GHz, 512 MB DDR-SDRAM	Not supported

Table 16: Results for WinBench99 CPUMark99

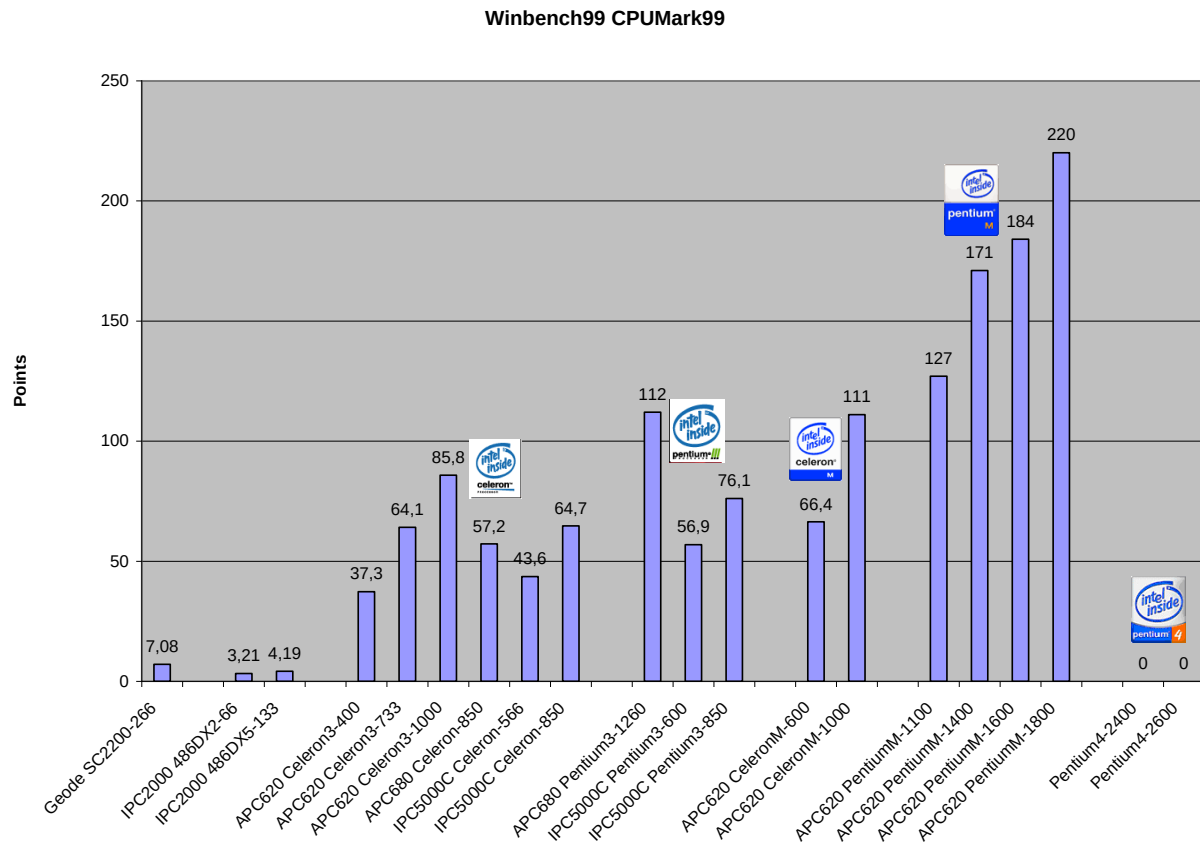


Figure 9 – Results for WinBench99 CPUMark99

Information:

Winbench99 could not be executed on Pentium 4 systems because the program had a problem with the CPU frequency.

4.5.2 FPUWinMark

As a special feature, FPUWinMark tests the FPU of the CPU being used. The speed and computing power, among other things, are determined. As a test result, the program calculates a number of points that can be used for further comparison.

#	Test device	Points
Power Panel		
1	Geode 266 MHz, 128 MB RAM	488
IPC2001 computer		
2	AMD 486DX2 66MHz, 8MB DRAM	93.5
3	AMD 486DX5 133 MHz, 32 MB DRAM	180
IPC5000C computer		
4	Celeron 3 566 MHz, 256 MB SDRAM	3000
5	Celeron 3 850 MHz, 256 MB SDRAM	4410
6	Pentium 3 600 MHz, 256 MB SDRAM	3190
7	Pentium 3 850 MHz, 256 MB SDRAM	4510
APC680 computer		
8	Celeron 3 850 MHz, 256 MB SDRAM	4510
9	Pentium 3 1.26 GHz, 256 MB SDRAM	6890
APC620 with INTEL 815E chipset		
10	Celeron 3 400 MHz, 256 MB SDRAM	2160
11	Celeron 3 733 MHz, 512 MB SDRAM	3950
12	Celeron 3 1000 MHz, 256 MB SDRAM	5430
APC620 with INTEL 855GME chipset		
13	Celeron M 600 MHz, 256 MB DDR-SDRAM	3310
14	Celeron M 1 GHz, 256 MB DDR-SDRAM	5590
15	Pentium M 1.1 GHz, 1 GB DDR-SDRAM	6100
16	Pentium M 1.4 GHz, 512 MB DDR-SDRAM	7830
17	Pentium M 1.6 GHz, 1GB DDR-SDRAM	8870
18	Pentium M 1.8 GHz, 512 MB DDR-SDRAM	10100
Other test computers		
19	Pentium 4 2.4 GHz, 512 MB DDR-SDRAM	Not supported
20	Pentium 4 2.6 GHz, 512 MB DDR-SDRAM	Not supported

Table 17: Results for WinBench99 FPUWinMark

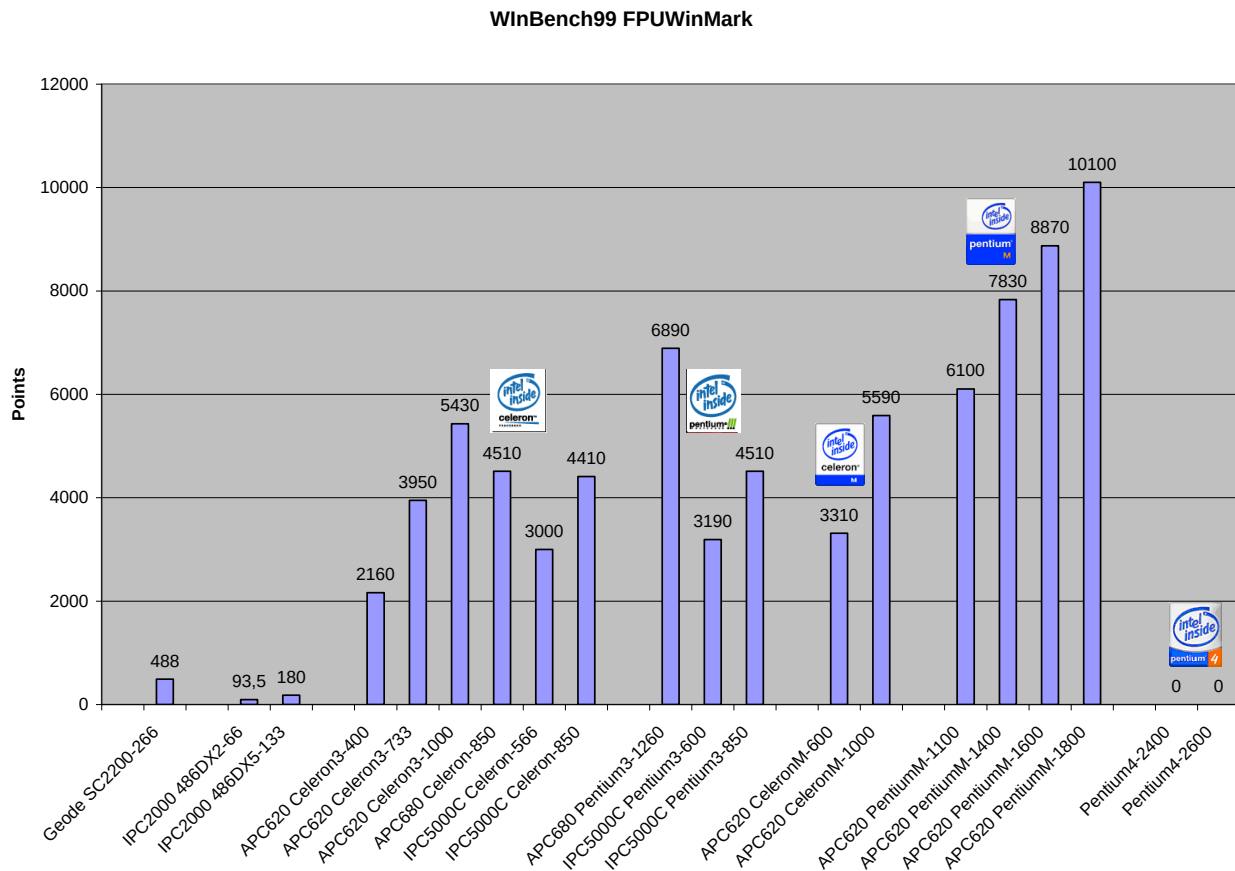


Figure 10 – Results for WinBench99 FPUWinMark

Information:

Winbench99 could not be executed on Pentium 4 systems because the program had a problem with the CPU frequency.

4.5.3 Direct Draw

With this test, the system is continually checked to determine how fast and how correct moving 2D/3D graphics are animated. All supported resolutions and color depths are determined and tested. The frames per second are measured. The maximum value reached is recorded at the end of the test report.

#	Test device	Direct Draw resolution 640x480	Direct Draw resolution 800x600
Power Panel			
1	Geode 266 MHz, 128 MB RAM	38.8	38.3
IPC2001 computer			
2	AMD 486DX2 66 MHz 8 MB DRAM	11.2	9.3
3	AMD 486DX5 133 MHz 32 MB DRAM	12.9	10.3
IPC5000C computer			
4	Celeron 3 566 MHz, 256 MB SDRAM	84.5	83
5	Celeron 3 850 MHz, 256 MB SDRAM	85.2	84.1
6	Pentium 3 600 MHz, 256 MB SDRAM	85.4	83.7
7	Pentium 3 850 MHz, 256 MB SDRAM	141	138
APC680 with INTEL 815E chipset			
8	Celeron 3 850 MHz, 256 MB SDRAM	273	265
9	Pentium 3 1.26 GHz, 256 MB SDRAM	292	288
APC620 with INTEL 815E chipset			
10	Celeron 3 400 MHz, 256 MB SDRAM	268	256
11	Celeron 3 733 MHz, 512 MB SDRAM	354	338
12	Celeron 3 1 GHz, 256 MB SDRAM	359	345
APC620 with INTEL 855GME chipset			
13	Celeron M 600 MHz, 256 MB DDR-SDRAM	542	538
14	Celeron M 1 GHz, 256 MB DDR-SDRAM	946	900
15	Pentium M 1.1 GHz, 1GB DDR-SDRAM	1190	1200
16	Pentium M 1.4 GHz, 512 MB DDR-SDRAM	1290	1290
17	Pentium M 1.6 GHz, 1GB DDR-SDRAM	1439	1411
18	Pentium M 1.8 GHz, 512 MB DDR-SDRAM	1410	1390
Other test computers			
19	Pentium 4 2.4 GHz, 512 MB DDR-SDRAM	Not supported	Not supported
20	Pentium 4 2.6 GHz, 512 MB DDR-SDRAM	Not supported	Not supported

Table 18: Results for WinBench99 Direct Draw

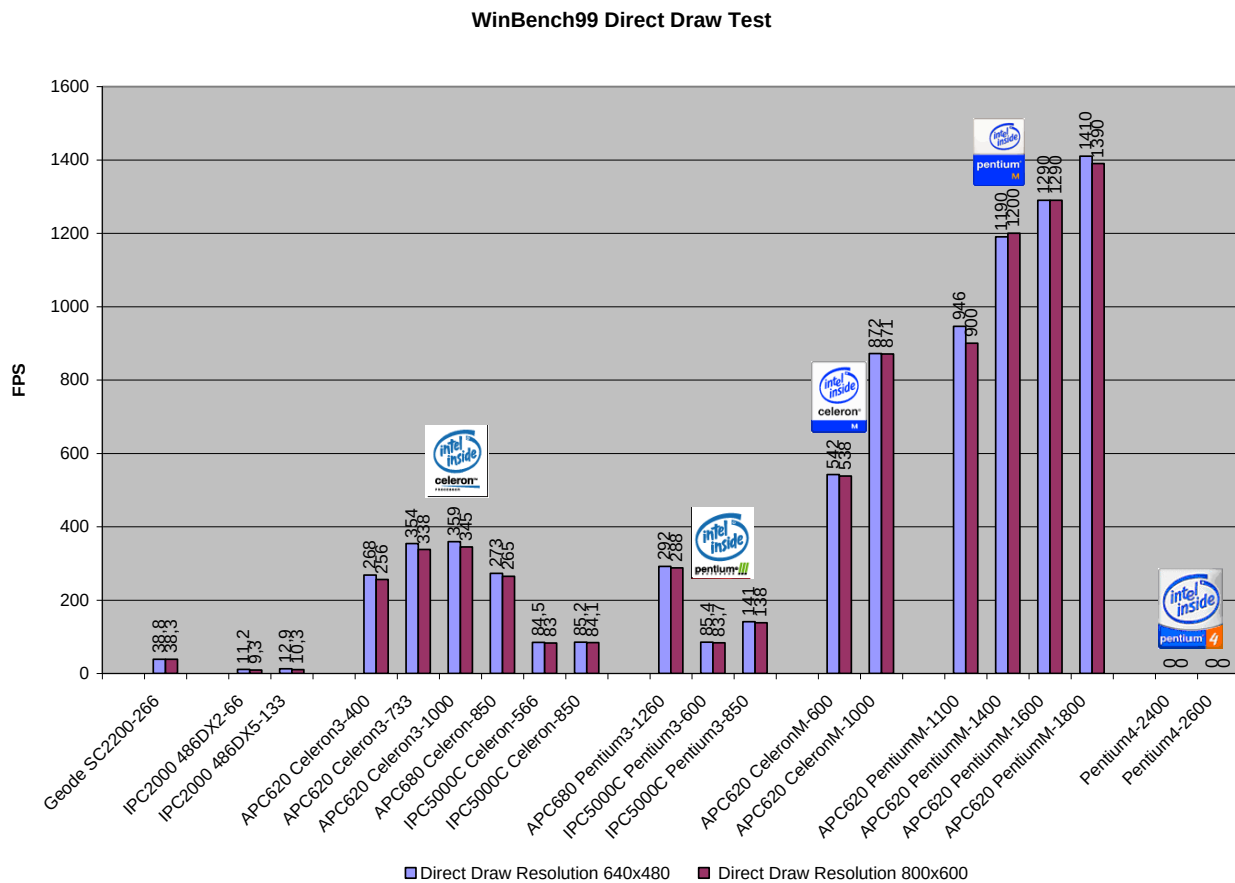


Figure 11 – Results for WinBench99 Direct Draw

Information:

Winbench99 could not be executed on Pentium 4 systems because the program had a problem with the CPU frequency.

4.5.4 Disk Inspection Test

During this test, the speed of the memory media being used (hard disk, CF, etc.) is determined. When doing this, the program writes a large amount of data to the memory and determines the data transfer rates in the individual sectors. The transfer rates reached are shown in a diagram during the test. The final result contains the maximum and the minimum data transfer rate as well as the average access time.

#	Test device	Data rate - start (MB/s)	Data rate - end (MB/s)	Access time (ms)
ICP5000C hard disks				
1	5.6 GB Fujitsu Slide-In (4200 rpm)	15.3	9.3	20.6
APC620 hard disks				
2	20 GB Fujitsu ADD ON (4200 rpm)	20.4	17.9	16
3	30 GB Fujitsu ADD ON (4200 rpm)	24.9	13.2	20
4	20 GB Fujitsu Slide-In (4200 rpm)	20.3	14	18.8
5	30 GB Fujitsu Slide-In (4200 rpm)	24.9	13.3	19.6
6	40 GB Hitachi Travelstar (7200 rpm)	60.3	31.2	13.2
Reference HDD				
7	40 GB Seagate ST340014A (7200 rpm)	Not supported	Not supported	Not supported

Table 19: Results for WinBench99 Disk Inspection Test

WinBench99 Disk Inspection Test

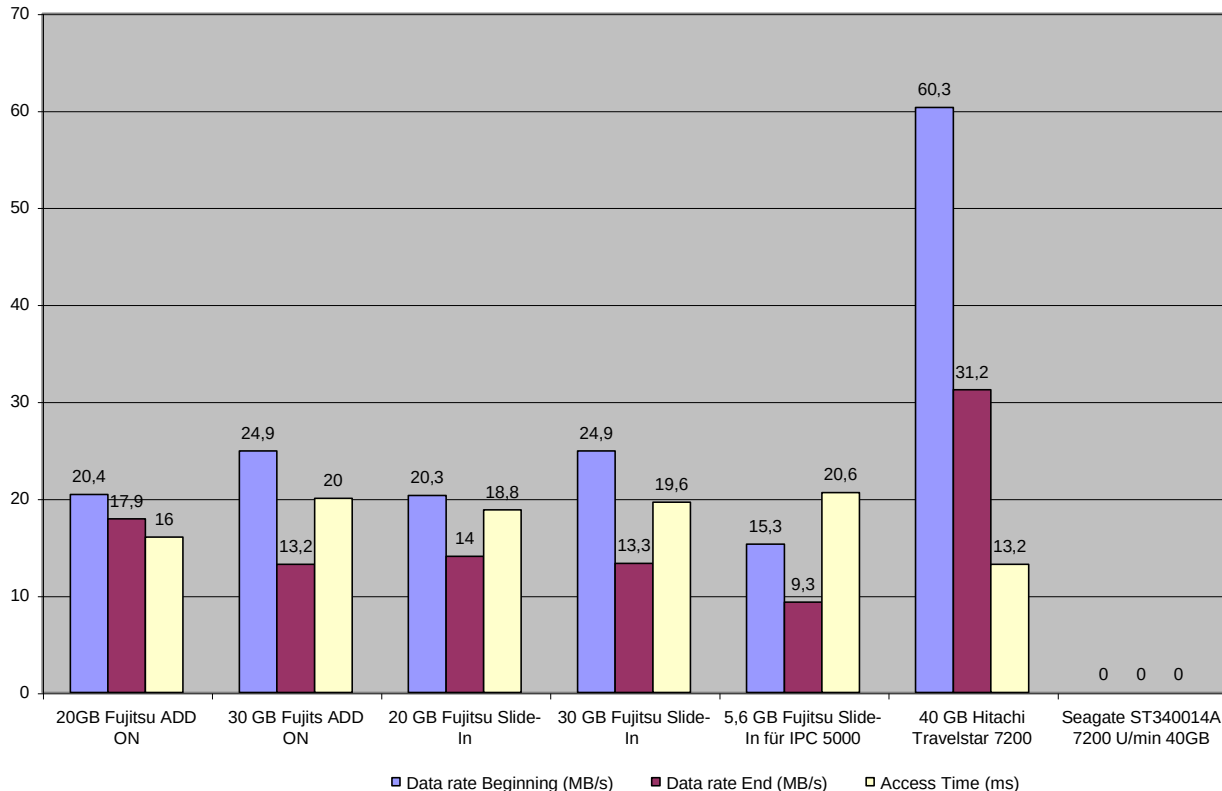


Figure 12 - Results for WinBench99 Disc Inspection Test

Information:

There are no results for the reference HDD because WinBench99 had a problem with the CPU frequency for the computer. Therefore the test could not be completed.

4.5.5 High End Disk WinMark99

This test determines the performance of the memory media under certain conditions. The program simulates individual applications (e.g. Frontpage98, VisualC++ 5.0, etc.) and determines the maximum data transfer rate in the individual environments.

As test result, the program provides the average of the data transfer rates achieved. These values can be used for comparison.

#	Test device	KBytes/s
ICP5000C hard disks		
1	5.6 GB Fujitsu Slide-In (4200 rpm)	5640
APC620 hard disks		
2	20 GB Fujitsu ADD ON (4200 rpm)	10400
3	30 GB Fujitsu ADD ON (4200 rpm)	12400
4	20 GB Fujitsu Slide-In (4200 rpm)	12400
5	30 GB Fujitsu Slide-In (4200 rpm)	13400
6	40 GB Hitachi Travelstar (7200 rpm)	22200
Reference HDD		
7	40 GB Seagate ST340014A (7200 rpm)	Not supported

Table 20: Results for WinBench99 High End Disk WinMark99

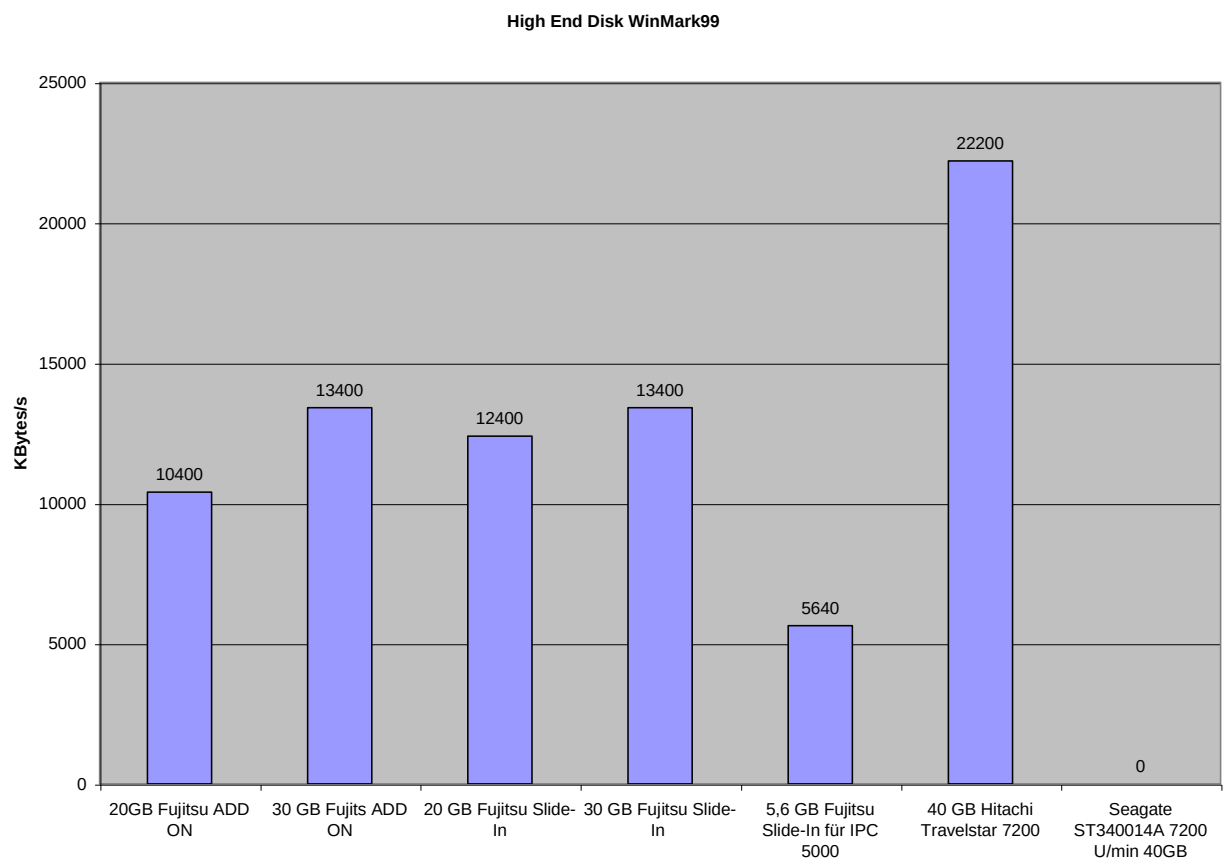


Figure 13 – Results for WinBench99 High End Disk WinMark99

Information:

There are no results for the reference HDD because WinBench99 had a problem with the CPU frequency for the computer. Therefore the test could not be completed.

4.5.6 Business Disk WinMark99

During this test, the memory media is tested especially for the performance for office and business application. As a result, an average data rate is determined that can be used for comparison.

#	Test device	KBytes/s
ICP5000C hard disks		
1	5.6 GB Fujitsu Slide-In (4200 rpm)	1730
APC620 hard disks		
2	20 GB Fujitsu ADD ON (4200 rpm)	3370
3	30 GB Fujitsu ADD ON (4200 rpm)	3370
4	20 GB Fujitsu Slide-In (4200 rpm)	3920
5	30 GB Fujitsu Slide-In (4200 rpm)	3920
6	40 GB Hitachi Travelstar (7200 rpm)	4800
Reference HDD		
7	40 GB Seagate ST340014A (7200 rpm)	Not supported

Table 21: Results for WinBench99 Business Disk Winmark99

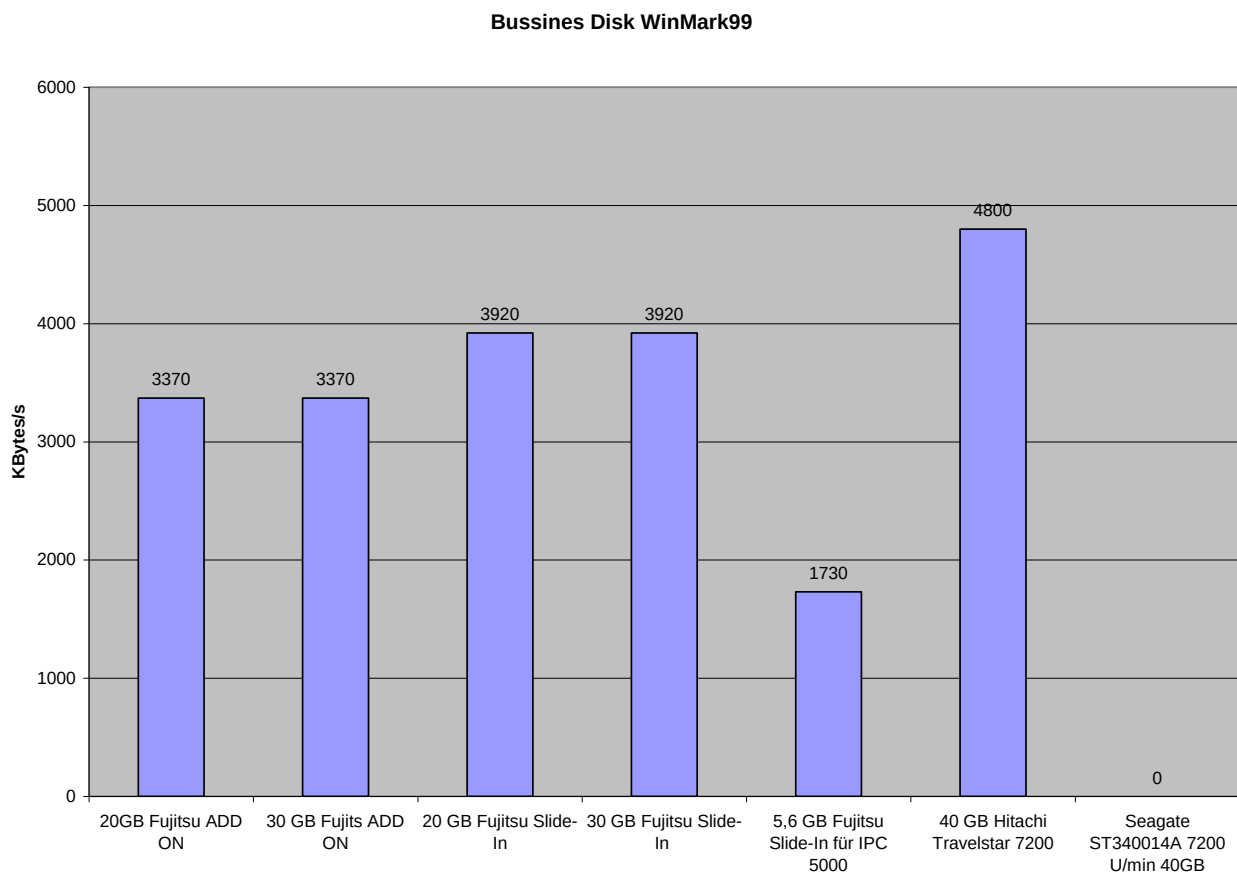


Figure 14 – Results for WinBench99 Business Disk WinMark99

Information:

There are no results for the reference HDD because WinBench99 had a problem with the CPU frequency for the computer. Therefore the test could not be completed.

4.6 HDTACH Version 2.70

HDTACH is a tool that can be used to determine the data transfer rate of memory media (e.g. hard disk). When doing this, the data is read from the media and the maximum, minimum and average data rate is output as the result.

4.6.1 HDTACH read speed

#	Test device	Maximum data rate (MB/s)	Average data rate (MB/s)	Minimum data rate (MB/s)
ICP5000C hard disks				
1	5.6 GB Fujitsu Slide-In (4200 rpm)	16	12.4	2.3
APC620 hard disks				
2	20 GB Fujitsu ADD ON (4200 rpm)	20.6	17.5	13.5
3	30 GB Fujitsu ADD ON (4200 rpm)	26	20.4	12.1
4	20 GB Fujitsu Slide-In (4200 rpm)	20.6	17.6	13.3
5	30 GB Fujitsu Slide-In (4200 rpm)	26	20.3	12.1
6	40 GB Hitachi Travelstar (7200 rpm)	39.9	34.5	26.7
Reference HDD				
7	40 GB Seagate ST340014A (7200 rpm)	62.2	47.1	30.4

Table 22: Results for HDTACH 2.70 read speed

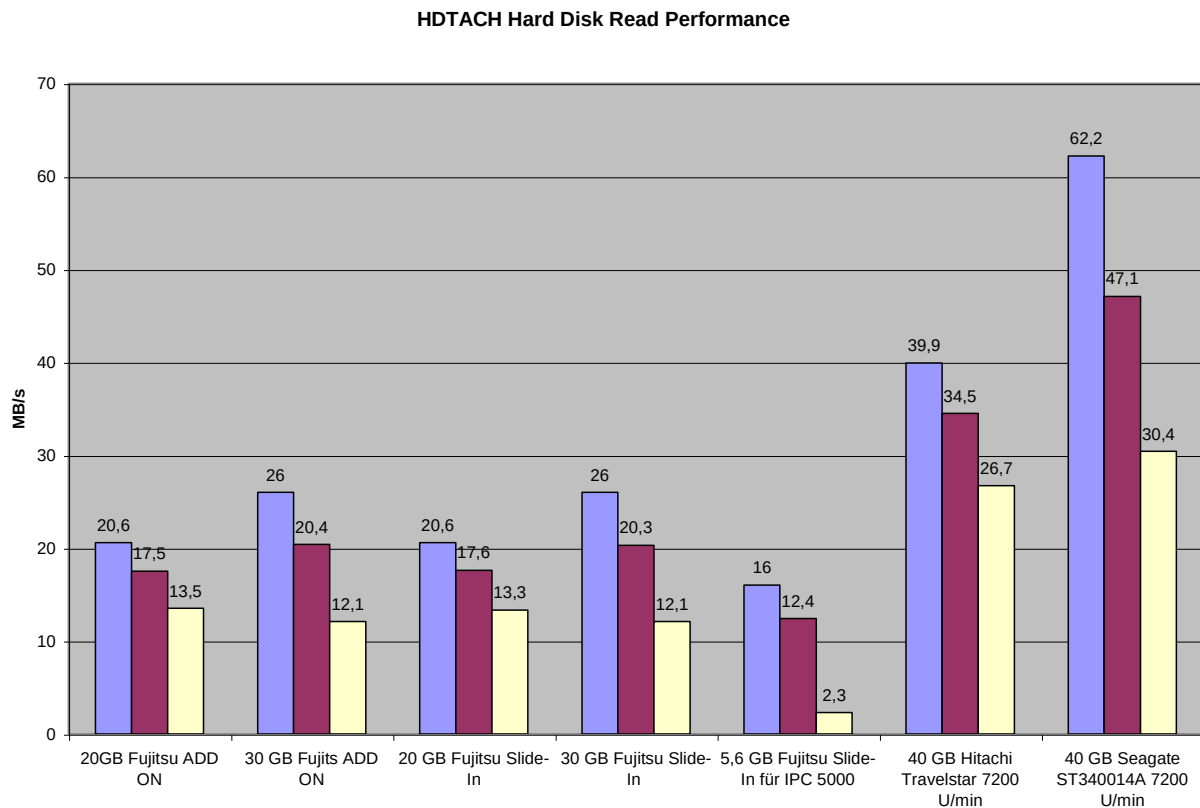


Figure 15 – Results for HDTACH read speed

4.6.2 HDTACH access time measurement

#	Test device	Access time (ms)
ICP5000C hard disks		
1	5.6 GB Fujitsu Slide-In (4200 rpm)	20.4
APC620 hard disks		
2	20 GB Fujitsu ADD ON (4200 rpm)	18.3
3	30 GB Fujitsu ADD ON (4200 rpm)	19.9
4	20 GB Fujitsu Slide-In (4200 rpm)	18.4
5	30 GB Fujitsu Slide-In (4200 rpm)	18.5
6	40 GB Hitachi Travelstar (7200 rpm)	16.7
Reference HDD		
7	40 GB Seagate ST340014A (7200 rpm)	12.5

Table 23: Results for HDTACH access time measurement

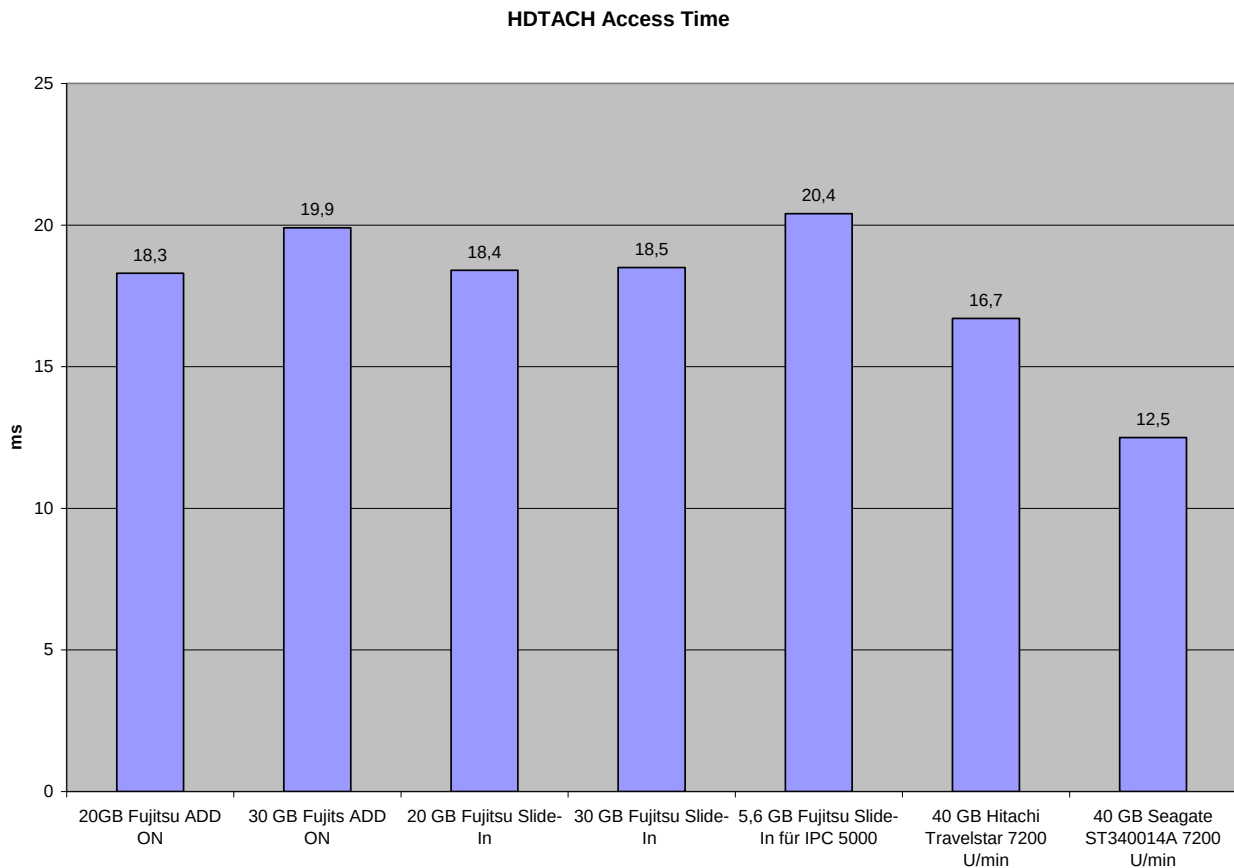


Figure 16 – Results for HDTACH access time measurement

4.7 3D Mark 2000

Originally, 3D Mark 2000 (like all later 3D Mark versions) was a benchmark that specialized on the performance of 3D games on PC systems.

However, this benchmark generally provides a very good representation of the 3D performance of a system.

For this reason, the 3D Mark line was also included in this performance test.

3D Mark 2000 does not have any special requirements (except for MMX technology) and supports a wide range of systems. This makes it possible to compare many systems and system types

#	Test device	Points
Power Panel		
1	Geode 266 MHz, 128 MB RAM	Not supported
IPC5000C computer		
4	Celeron 3 566 MHz, 256 MB SDRAM	Not supported
5	Celeron 3 850 MHz, 256 MB SDRAM	Not supported
6	Pentium 3 600 MHz, 256 MB SDRAM	Not supported
7	Pentium 3 850 MHz, 256 MB SDRAM	737
APC680 computer		
8	Celeron 3 850 MHz, 256 MB SDRAM	773
9	Pentium 3 1.26 GHz, 256 MB SDRAM	851
APC620 with INTEL 815E chipset		
10	Celeron 3 400 MHz, 256 MB SDRAM	739
11	Celeron 3 733 MHz, 512 MB SDRAM	790
12	Celeron 3 1000 MHz, 256 MB SDRAM	796
APC620 with INTEL 855GME chipset		
13	Celeron M 600 MHz, 256 MB DDR-SDRAM	3622
14	Celeron M 1 GHz, 256 MB DDR-SDRAM	4013
15	Pentium M 1.1 GHz, 1 GB DDR-SDRAM	4467
16	Pentium M 1.4 GHz, 512 MB DDR-SDRAM	4520
17	Pentium M 1.6 GHz, 1GB DDR-SDRAM	4610
18	Pentium M 1.8 GHz, 512 MB DDR-SDRAM	4768
Other test computers		
19	Pentium 4 2.4 GHz, 512 MB DDR-SDRAM	4674
20	Pentium 4 2.6 GHz, 512 MB DDR-SDRAM	11364

Table 24: Results for 3D Mark 2000

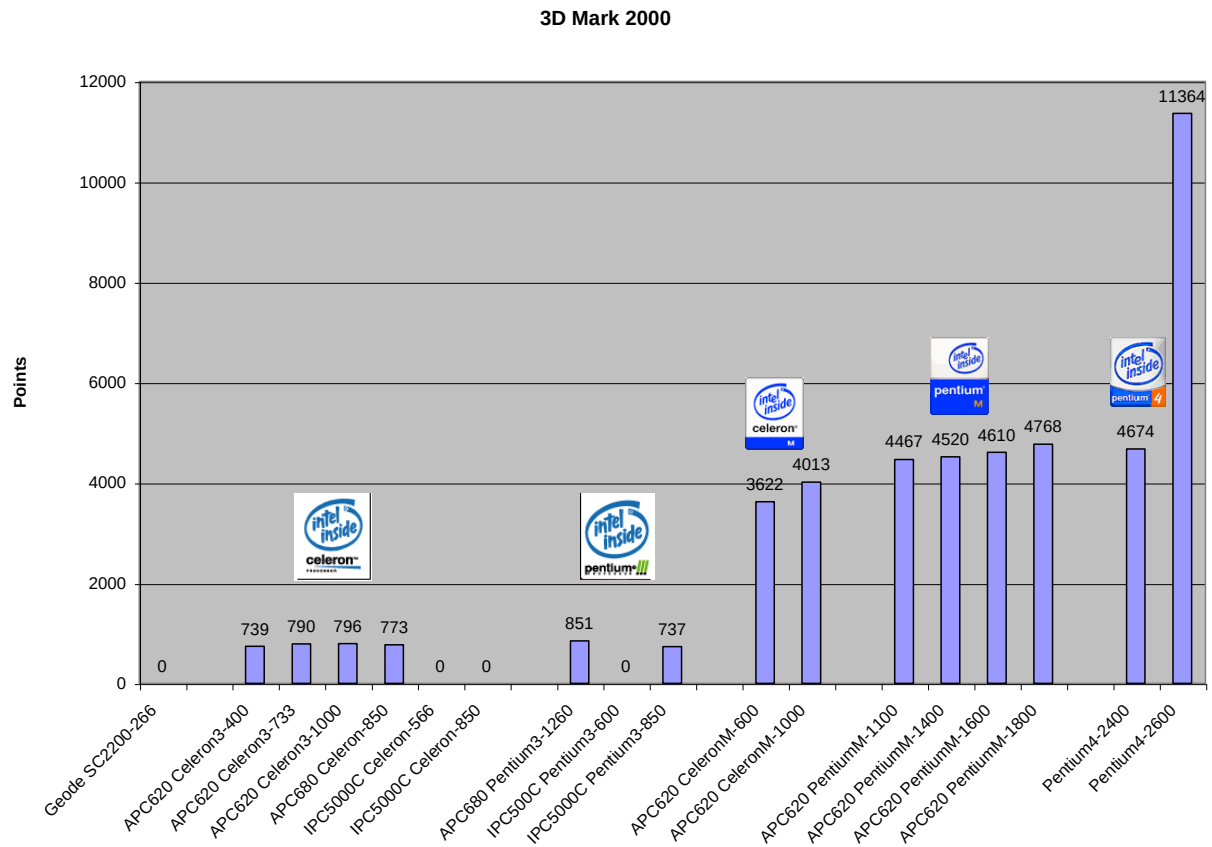


Figure 17 – Results for 3D Mark 2000

Information:

On computers without test results, the graphics controller does not meet the minimum requirements.

4.8 3D Mark 2001SE

3D Mark2001 SE is a further development of 3D Mark 2000 and supports newer technologies (SSE2) and processors (P4, etc.). The test specializes on these new technologies and therefore the benchmark cannot be used for all systems.

The results achieved provide a good comparison of the 3D performance as compared to current systems (systems with Pentium 4, Pentium M, AMD AthlonXP, etc.).

#	Test device	Points
Power Panel		
1	Geode 266 MHz, 128 MB RAM	Not supported
IPC5000C computer		
4	Celeron 3 566 MHz, 256 MB SDRAM	Not supported
5	Celeron 3 850 MHz, 256 MB SDRAM	Not supported
6	Pentium 3 600 MHz, 256 MB SDRAM	Not supported
7	Pentium 3 850 MHz, 256 MB SDRAM	Not supported
APC680 computer		
8	Celeron 3 850 MHz, 256 MB SDRAM	503
9	Pentium 3 1.26 GHz, 256 MB SDRAM	651
APC620 with INTEL 815E chipset		
10	Celeron 3 400 MHz, 256 MB SDRAM	438
11	Celeron 3 733 MHz, 512 MB SDRAM	557
12	Celeron 3 1000 MHz, 256 MB SDRAM	565
APC620 with INTEL 855GME chipset		
13	Celeron M 600 MHz, 256 MB DDR-SDRAM	1627
14	Celeron M 1 GHz, 256 MB DDR-SDRAM	1731
15	Pentium M 1.1 GHz, 1 GB DDR-SDRAM	1947
16	Pentium M 1.4 GHz, 512 MB DDR-SDRAM	2120
17	Pentium M 1.6 GHz, 1GB DDR-SDRAM	2250
18	Pentium M 1.8 GHz, 512 MB DDR-SDRAM	2383
Other test computers		
19	Pentium 4 2.4 GHz, 512 MB DDR-SDRAM	2225
20	Pentium 4 2.6 GHz, 512 MB DDR-SDRAM	9389

Table 25: Results for 3D Mark 2001SE

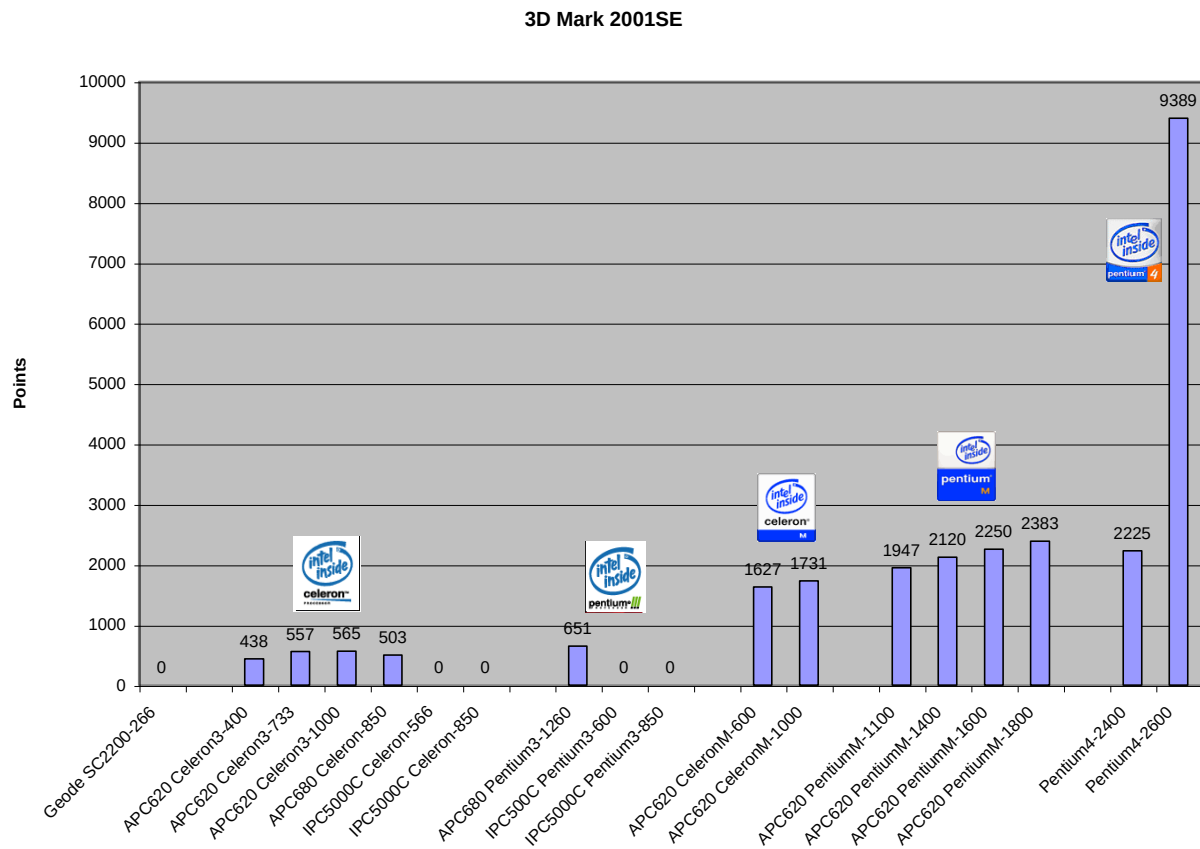


Figure 18 – Results for 3D Mark 2001SE

Information:

On computers without test results, the graphics controller does not meet the minimum requirements.

4.9 B&R Automation Runtime AR010 Version E2.82

Since the APC620 is not only used as a Windows computer, it was necessary to determine the performance using Automation Runtime. The Windows-based system AR010 Version E2.82 was used. To determine the performance of the computer, a project was created containing intensive integer and floating point operations. A visualization application was also created, which was executed in a high priority class. All tasks were executed without(!) tolerance times. This way, system overloads are recognized immediately.

The APC620 with Intel Celeron 3, 400 MHz was used as the reference device. The application was adjusted so that the computer ran at nearly 100% system load. In order to determine the system load, the B&R Profiler was used.

After the recording, only the hardware was exchanged, and the project was left the same. This allows the measurements to be easily compared with each other.

#	Test device	CPU load in percent (%)
APC620 with INTEL 815E chipset		
10	Celeron 3 400 MHz, 256 MB SDRAM	99.72
11	Celeron 3 733 MHz, 512 MB SDRAM	58.75
12	Celeron 3 1000 MHz, 256 MB SDRAM	49.08
APC620 with INTEL 855GME chipset		
13	Celeron M 600 MHz, 256 MB DDR-SDRAM	85.25
14	Celeron M 1 GHz, 256 MB DDR-SDRAM	50.53
15	Pentium M 1.1 GHz, 1 GB DDR-SDRAM	41.84
16	Pentium M 1.4 GHz, 512 MB DDR-SDRAM	37.58
17	Pentium M 1.6 GHz, 1GB DDR-SDRAM	32.96
18	Pentium M 1.8 GHz, 512 MB DDR-SDRAM	28.96

Table 26: Results for AR010 Version E2.82

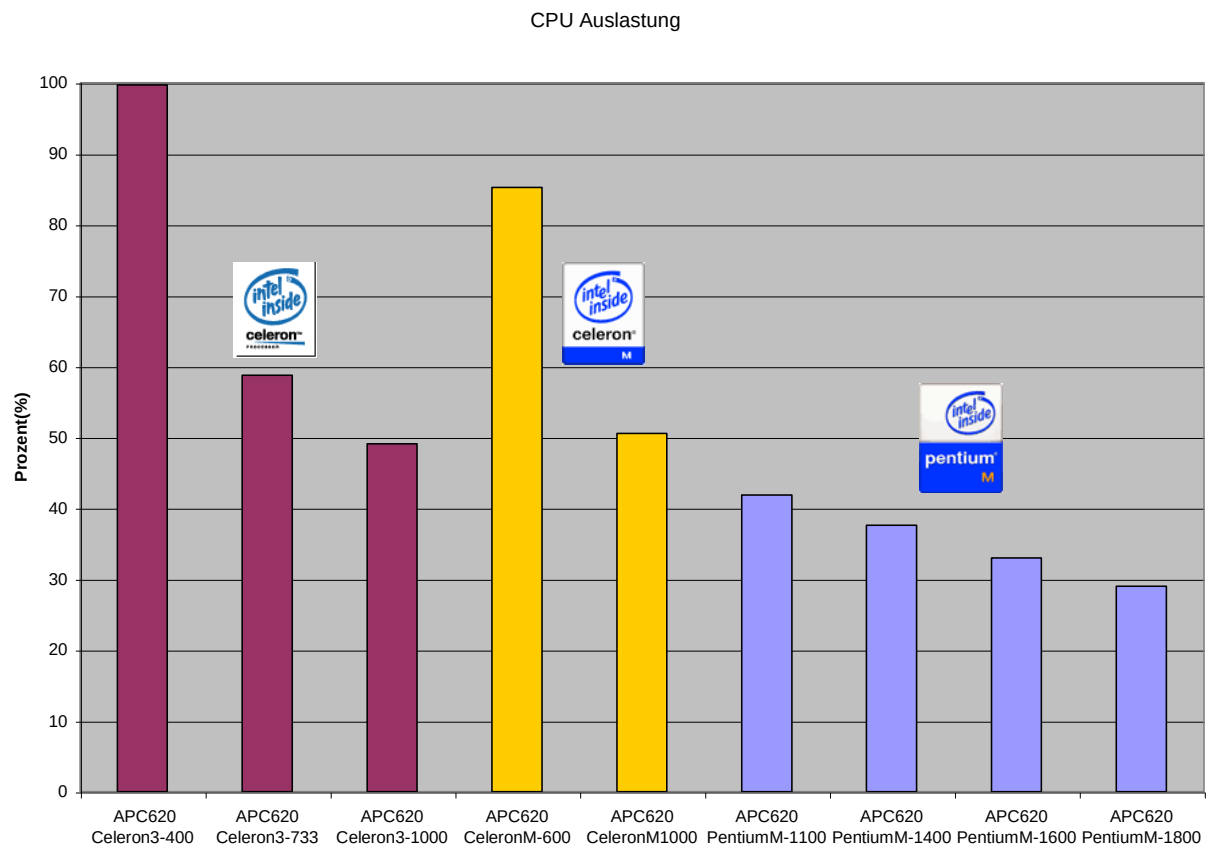
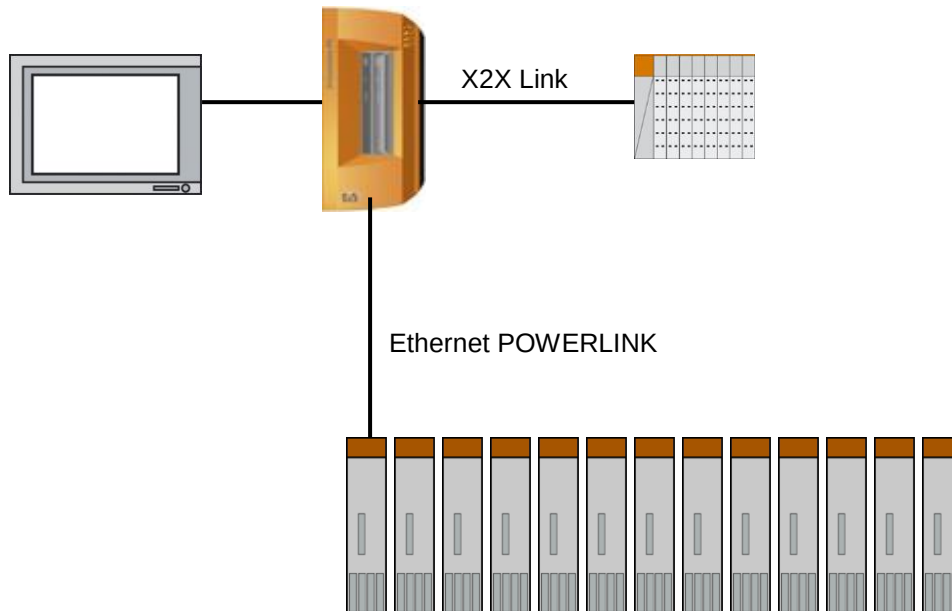


Figure 19 – B&R Automation Runtime AR010 Version E2.82

4.10 B&R Automation Runtime AR106 Version B2.83

4.10.1 Structure of the test



The following elements were used for the test:

4.10.1.1 Automation Panel AP920.1505-01

The panel was used to check that the visualization was displayed correctly

4.10.1.2 36 ACOPOS 1045 axes

To create a high computation load, 36 ACOPOS axes were operated simultaneously. Ethernet POWERLINK was used as the bus system

4.10.1.3 26 X20IOs

Since real-time applications require operation of large numbers of I/Os, the X20 I/O system was used in order to make the test realistic. All available modules were used. These included analog/digital inputs and outputs, temperature modules, and encoder/counter modules.

4.10.2 Test procedure

During this test, emphasis was placed on demonstrating the performance of the APC series as realistically as possible. An application was created that reflects realistic demands placed on a system in the field. Not only computational performance is important, but also a large number of accesses to individual sub-systems must also take place (e.g. PCI access for operating bus systems).

To create a complex load on the computer, 5 different task classes with different timings were used. Various cyclic programs were executed. The cycle times ranged from 1.6 ms in the highest priority task class #1 to 200 ms in task class #5.

A visualization application was also created containing a large number of pages.

As an additional load on the system, 36 ACOPOS axes were operated simultaneously via Ethernet POWERLINK.

The size of the project was adjusted in such a way that an APC620 with an INTEL Celeron3 400 MHz reaches a load of approximately 90%. Once the project is activated, a profiler measurement was started for a duration of one minute. Then the results of the measurement were evaluated and saved. After the test, the CF was removed and another target system was connected. The project was left unchanged (same structure, same software) in order to achieve consistent results (the project „APC620p.pgp“ used can be found here in the benchmark folder).

4.10.3 Results

#	Test device	CPU load in percent (%)
APC620 with INTEL 815E chipset		
10	Celeron 3 400 MHz, 256 MB SDRAM	84.39
11	Celeron 3 733 MHz, 512 MB SDRAM	60.8
12	Celeron 3 1000 MHz, 256 MB SDRAM	54.35
APC620 with INTEL 855GME chipset		
13	Celeron M 600 MHz, 256 MB DDR-SDRAM	48.69
14	Celeron M 1 GHz, 256 MB DDR-SDRAM	42.07
15	Pentium M 1.1 GHz, 1 GB DDR-SDRAM	34.43
16	Pentium M 1.4 GHz, 512 MB DDR-SDRAM	33.29
17	Pentium M 1.6 GHz, 1GB DDR-SDRAM	30.14
18	Pentium M 1.8 GHz, 512 MB DDR-SDRAM	29.15

Table 27: Results for B&R AR106 Version B2.83

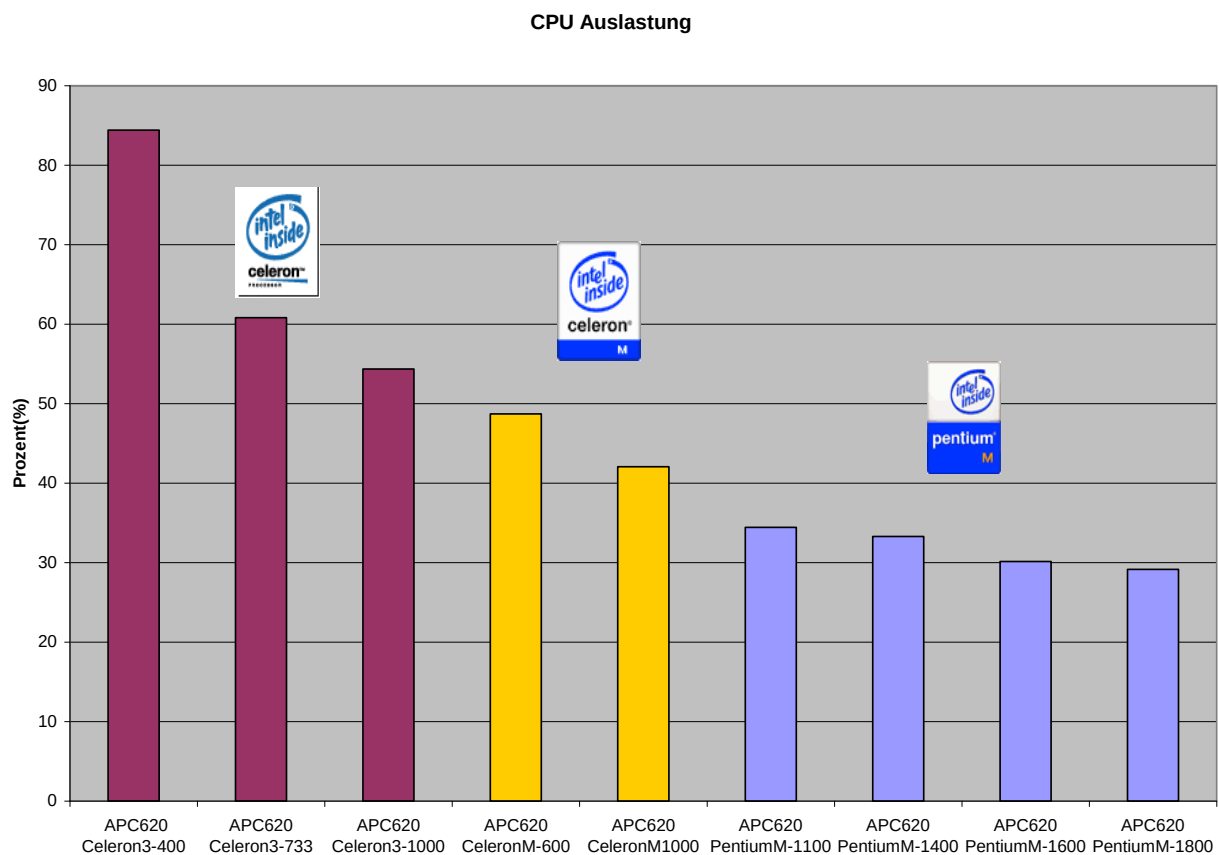


Figure 20 – B&R Automation Runtime AR106 Version B2.83

4.11 Sisoft Sandra Pro Business 2007

4.11.1 CPU arithmetic

Here, the program determines the maximum number of operations per second. The result is output in MIPS (Million Instructions per Second).

At the same time, the maximum number of floating point operations per second is also determined. The result is shown in MFLOPS (Million Floating Point Operations per Second).

#	Test device	Dhrystone ALU (MIPS)	Whetstone FPU (MFLOPS)
APC620 with INTEL 855GME chipset			
13	Celeron M 600 MHz, 512MB DDR-SDRAM	1956	1456
14	Celeron M 1000 MHz, 512MB DDR-SDRAM	3250	2429
15	Pentium M 1.1 GHz, 512MB DDR-SDRAM	3623	2697
16	Pentium M 1,4 GHz, 512MB DDR-SDRAM	4563	3409
18	Pentium M 1.8 GHz, 1024MB DDR-SDRAM	5845	4383
APC810 with INTEL 945GME chipset			
21	Celeron M 1.06 GHz, 512MB DDR2-SDRAM	3636	2680
22	Celeron M 1.06 GHz, 2x512MB DDR2-SDRAM	3636	2681
23	Core 2 Duo 1.06 GHz, 2x1024MB DDR2-SDRAM	9800	6800
24	Core 2 Duo 1.50 GHz, 2x512MB DDR2-SDRAM	13764	9554
25	Core Duo 1.66 GHz, 2x1024MB DDR2-SDRAM	11348	8398
26	Core 2 Duo 2.16 GHz, 1024MB DDR2-SDRAM	19846	13778
27	Core 2 Duo 2.16 GHz, 2x1024MB DDR2-SDRAM	19919	13795
29	Atom N270 1,6GHz, 2x2048MB DDR2-SDRAM	4035	3370
APC810 with INTEL GM45 chipset			
30	Core 2 Duo 2,53 GHz, 2x2048MB DDR3-SODIMM	23349	18754
32	Core 2 Duo 2,26 GHz, 2x2048MB DDR3-SODIMM	20881	16755
APC620 with INTEL 945GME chipset			
31	Atom N270 1,6GHz, 1024MB DDR2-SDRAM	4039	3361
INTEL Evalboard with INTEL US15W Chipsatz			
33	Atom Z530 1,6GHz, 1024MB DDR2-SDRAM	3998	3345
PP500 (5PP520.1505-00 + 5PP5CP.US15-01)			
34	Atom Z520 1,33GHz, 2048MB DDR2-SDRAM	3363	2809
PP500 (5PP520.1505-00 + 5PP5CP.US15-02)			
35	Atom Z530 1,6GHz, 2048MB DDR2-SDRAM	4050	3376
PP500 (5PP520.1505-00 + 5PP5CP.US15-00)			
36	Atom Z510 1,1GHz, 2048MB DDR2-SDRAM	2778	2322
PPC800 with INTEL NM10 Chipsatz			
57	Dual Core Atom N2800 1,86GHz, 4096MB DDR3-SODIMM	9530	7887

Table 28: Results for Sisoft Sandra Pro Business 2007, CPU Arithmetic

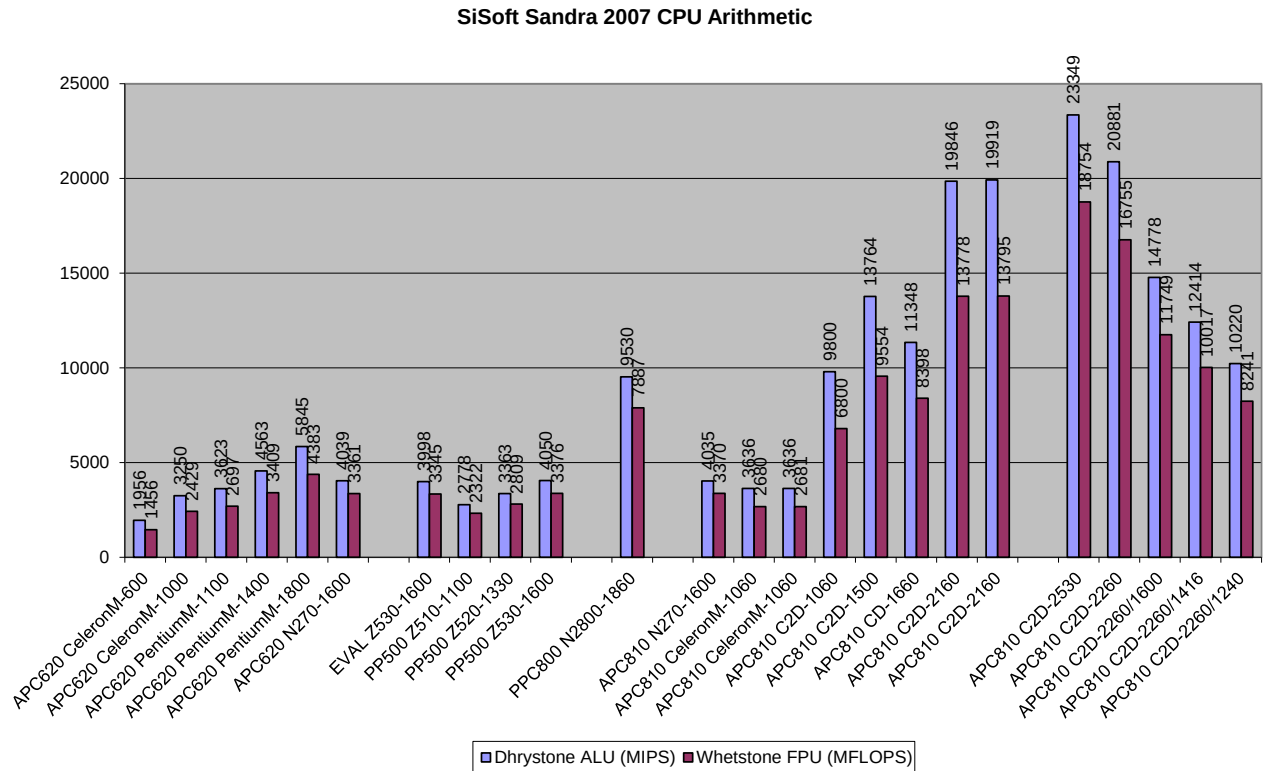


Figure 21 - Results for Sisoft Sandra Pro Business 2007 CPU Arithmetic

4.11.2 CPU multimedia

This test determines the multimedia performance of the CPU. During this test, the speed and performance are checked for the technologies used, such as MMX, SSE, SSE2 (depending on the processor).

#	Test device	Integer (it/s)	Floating Point (it/s)
APC620 with INTEL 855GME chipset			
13	Celeron M 600 MHz, 512MB DDR-SDRAM	5559	6288
14	Celeron M 1000 MHz, 512MB DDR-SDRAM	9300	10513
15	Pentium M 1.1 GHz, 512MB DDR-SDRAM	10287	11639
16	Pentium M 1,4 GHz, 512MB DDR-SDRAM	13044	14753
18	Pentium M 1.8 GHz, 1024MB DDR-SDRAM	16782	18953
APC810 with INTEL 945GM chipset			
21	Celeron M 1.06 GHz, 512MB DDR2-SDRAM	8324	11311
22	Celeron M 1.06 GHz, 2x512MB DDR2-SDRAM	8322	11294
23	Core 2 Duo 1.06 GHz, 2x1024MB DDR2-SDRAM	58703	31642
24	Core 2 Duo 1.50 GHz, 2x512MB DDR2-SDRAM	82474	44468
25	Core Duo 1.66 GHz, 2x1024MB DDR2-SDRAM	25981	35376
26	Core 2 Duo 2.16 GHz, 1024MB DDR2-SDRAM	119063	64213
27	Core 2 Duo 2.16 GHz, 2x1024MB DDR2-SDRAM	119128	64224
29	Atom N270 1,6GHz, 2x2048MB DDR2-SDRAM	29487	19806
APC810 with INTEL GM45 chipset			
30	Core 2 Duo 2,53 GHz, 2x2048MB DDR3-SODIMM	140199	75771
32	Core 2 Duo 2,26 GHz, 2x2048MB DDR3-SODIMM	125342	67757
APC620 with INTEL 945GME chipset			
31	Atom N270 1,6GHz, 1024MB DDR2-SDRAM	29569	19880
INTEL Evalboard with INTEL US15W Chipsatz			
33	Atom Z530 1,6GHz, 1024MB DDR2-SDRAM	29249	19650
PP500 (5PP520.1505-00 + 5PP5CP.US15-01)			
34	Atom Z520 1,33GHz, 2048MB DDR2-SDRAM	24634	16550
PP500 (5PP520.1505-00 + 5PP5CP.US15-02)			
35	Atom Z530 1,6GHz, 2048MB DDR2-SDRAM	29587	19883
PP500 (5PP520.1505-00 + 5PP5CP.US15-00)			
36	Atom Z510 1,1GHz, 2048MB DDR2-SDRAM	20311	13644
PPC800 mit INTEL NM10 Chipsatz			
57	Dual Core Atom N2800 1,86GHz, 4096MB DDR3-SODIMM	69462	46347

Table 29: Results for Sisoft Sandra Pro Business 2007, CPU Multimedia

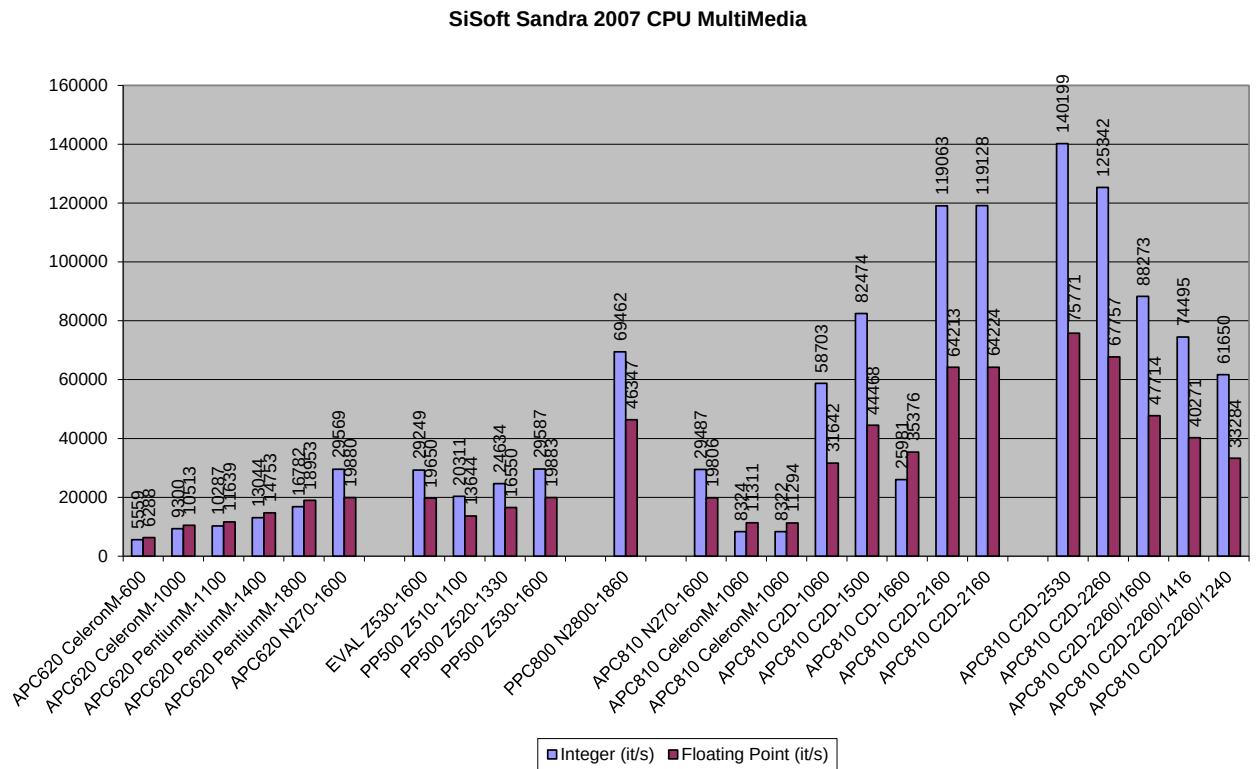


Figure 22 - Results for Sisoft Sandra Pro Business 2007, CPU Multi Media

4.11.3 Memory bandwidth

The performance of the system memory (main memory) is determined here. This is done by transferring a large amount of data. The result is the maximum "memory throughput" in MB/s.

#	Test device	RAM Bandwidth ALU (MB/s)	RAM Bandwidth FPU (MB/s)
APC620 with INTEL 855GME chipset			
13	Celeron M 600 MHz, 512MB DDR-SDRAM	1701	1836
14	Celeron M 1000 MHz, 512MB DDR-SDRAM	2072	2077
15	Pentium M 1.1 GHz, 512MB DDR-SDRAM ¹	2057	2057
16	Pentium M 1,4 GHz, 512MB DDR-SDRAM	1681	1694
18	Pentium M 1.8 GHz, 1024MB DDR-SDRAM ¹	1541	1549
APC810 with INTEL 945GM chipset			
21	Celeron M 1.06 GHz, 512MB DDR2-SDRAM	2548	2545
22	Celeron M 1.06 GHz, 2x512MB DDR2-SDRAM	2694	2692
23	Core 2 Duo 1.06 GHz, 2x1024MB DDR2-SDRAM	2912	2921
24	Core 2 Duo 1.50 GHz, 2x512MB DDR2-SDRAM	3531	3533
25	Core Duo 1.66 GHz, 2x1024MB DDR2-SDRAM	3644	3616
26	Core 2 Duo 2.16 GHz, 1024MB DDR2-SDRAM	3712	3716
27	Core 2 Duo 2.16 GHz, 2x1024MB DDR2-SDRAM	3972	3978
29	Atom N270 1,6GHz, 2x2048MB DDR2-SDRAM	3224	2792
APC810 with INTEL GM45 chipset			
30	Core 2 Duo 2,53 GHz, 2x2048MB DDR3-SODIMM	5966	5957
32	Core 2 Duo 2,26 GHz, 2x2048MB DDR3-SODIMM	5819	5830
APC620 with INTEL 945GME chipset			
31	Atom N270 1,6GHz, 1024MB DDR2-SDRAM	2931	2587
INTEL Evalboard with INTEL US15W Chipsatz			
33	Atom Z530 1,6GHz, 1024MB DDR2-SDRAM	2863	2468
PP500 (5PP520.1505-00 + 5PP5CP.US15-01)			
34	Atom Z520 1,33GHz, 2048MB DDR2-SDRAM	2752	2407
PP500 (5PP520.1505-00 + 5PP5CP.US15-02)			
35	Atom Z530 1,6GHz, 2048MB DDR2-SDRAM	2927	2621
PP500 (5PP520.1505-00 + 5PP5CP.US15-00)			
36	Atom Z510 1,1GHz, 2048MB DDR2-SDRAM	2203	1930
PPC800 mit INTEL NM10 Chipsatz			
57	Dual Core Atom N2800 1,86GHz, 4096MB DDR3-SODIMM	4237	3582

1) See information

Table 30: Results for Sisoft Sandra Pro Business 2007, CPU Memory Bandwidth

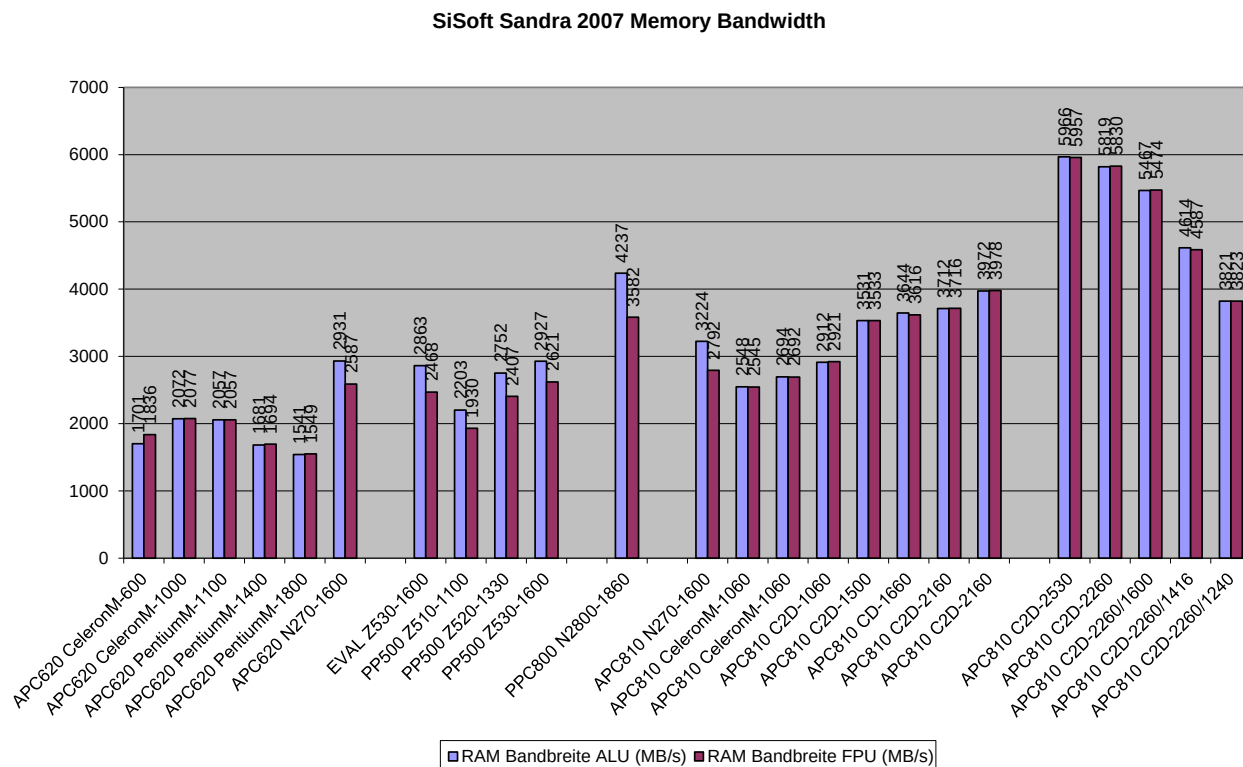


Figure 23 - Results for Sisoft Sandra Pro Business 2007, CPU Memory Bandwidth

Information:

The memory bandwidth test for the APC620 with PM-1100, PM-1400 and PM-1800 returns values that are "not plausible", since according to this test the PM-1100 would be faster than the PM-1400 and PM-1800. With the benchmark tests with Sisoft Sandra 2002 and 2005 the values are correct.

4.11.4 Cache and memory bandwidth

#	Test device	Combined index (MB/s)	Speed factor
APC620 with INTEL 855GME chipset			
13	Celeron M 600 MHz, 512MB DDR-SDRAM	2597	8,2
14	Celeron M 1000 MHz, 512MB DDR-SDRAM	3315	13,3
15	Pentium M 1.1 GHz, 512MB DDR-SDRAM	3517	19,0
16	Pentium M 1,4 GHz, 512MB DDR-SDRAM	4310	19,8
18	Pentium M 1.8 GHz, 1024MB DDR-SDRAM	4229	36,3
APC810 with INTEL 945GM chipset			
21	Celeron M 1.06 GHz, 512MB DDR2-SDRAM	4819	9,0
22	Celeron M 1.06 GHz, 2x512MB DDR2-SDRAM	5247	7,4
23	Core 2 Duo 1.06 GHz, 2x1024MB DDR2-SDRAM	10944	32,6
24	Core 2 Duo 1.50 GHz, 2x512MB DDR2-SDRAM	15753	39,7
25	Core Duo 1.66 GHz, 2x1024MB DDR2-SDRAM	11501	17,4
26	Core 2 Duo 2.16 GHz, 1024MB DDR2-SDRAM	18528	66,7
27	Core 2 Duo 2.16 GHz, 2x1024MB DDR2-SDRAM	20465	51,9
29	Atom N270 1,6GHz, 2x2048MB DDR2-SDRAM	4844	4,9
APC810 with INTEL GM45 chipset			
30	Core 2 Duo 2,53 GHz, 2x2048MB DDR3-SODIMM	26899	39
32	Core 2 Duo 2,26 GHz, 2x2048MB DDR3-SODIMM	24064	35,2
APC620 with INTEL 945GME chipset			
31	Atom N270 1,6GHz, 1024MB DDR2-SDRAM	4299	6,2
INTEL Evalboard mit INTEL US15W Chipsatz			
33	Atom Z530 1,6GHz, 1024MB DDR2-SDRAM	3766	7,4
PP500 (5PP520.1505-00 + 5PP5CP.US15-01)			
34	Atom Z520 1,33GHz, 2048MB DDR2-SDRAM	3714	6
PP500 (5PP520.1505-00 + 5PP5CP.US15-02)			
35	Atom Z530 1,6GHz, 2048MB DDR2-SDRAM	3971	7,3
PP500 (5PP520.1505-00 + 5PP5CP.US15-00)			
36	Atom Z510 1,1GHz, 2048MB DDR2-SDRAM	3086	5,7
PPC800 mit INTEL NM10 Chipsatz			
57	Dual Core Atom N2800 1,86GHz, 4096MB DDR3-SODIMM	8097	10,9

Table 31: Results for Sisoft Sandra Pro Business 2007, cache and memory bandwidth

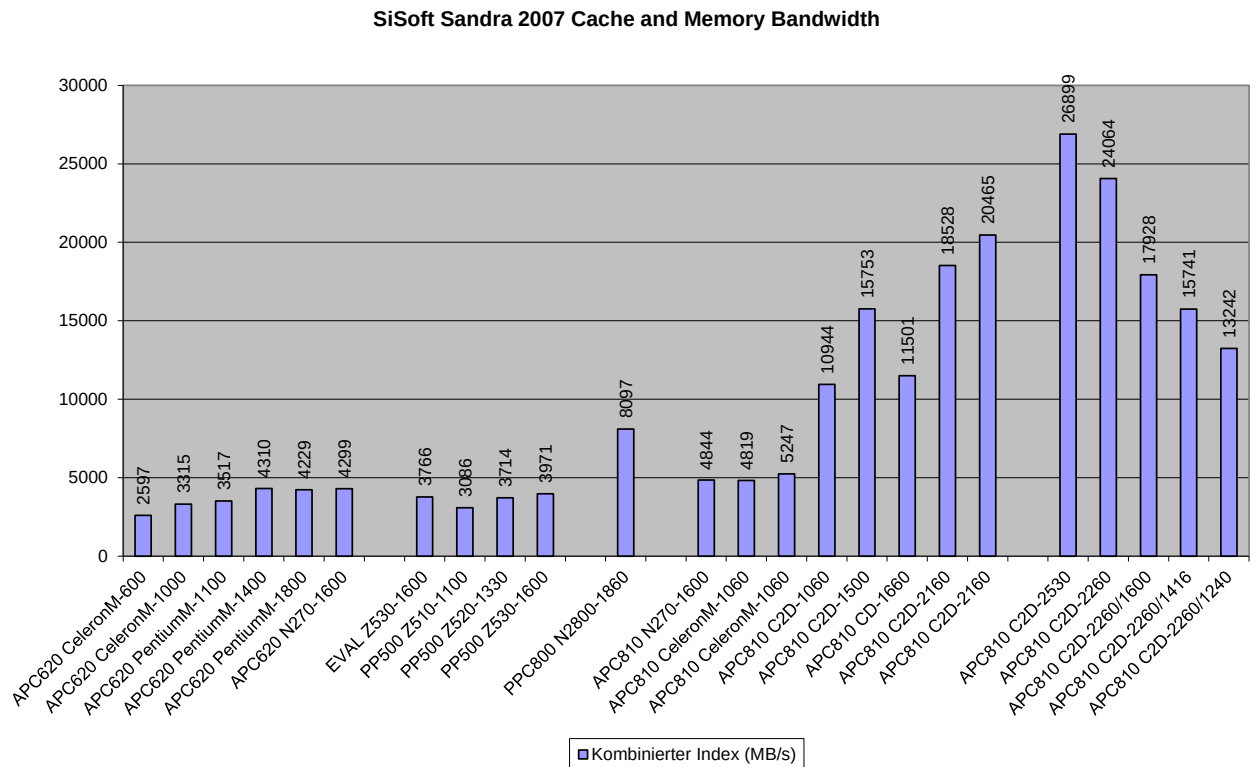


Figure 24 - Results for SiSoft Sandra Pro Business 2007, cache and memory bandwidth

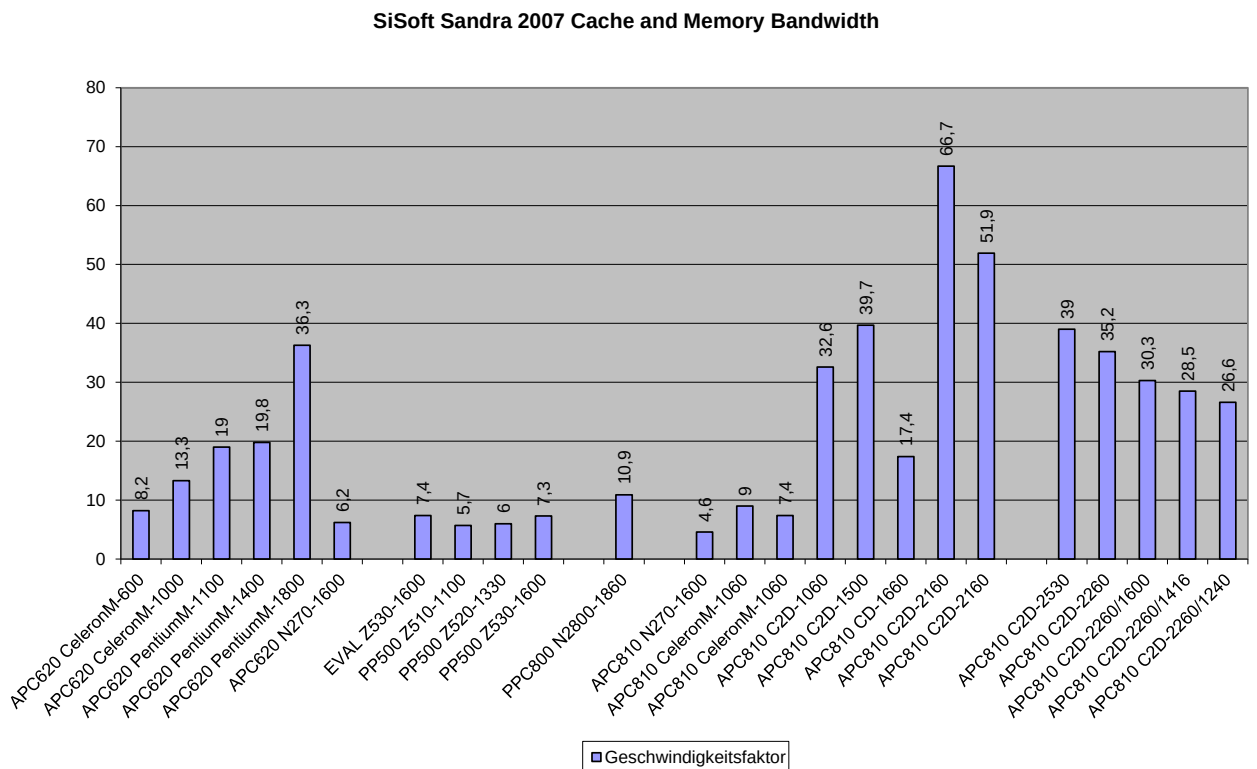


Figure 25 – Results for SiSoft Sandra Pro Business 2007, cache and memory bandwidth

4.11.5 Physical devices / removeable devices

This test determines the performance of physical devices (HDD) and removeable devices (compact flash, USB memory stick). Therefore big datapackages are being transferd (reading speed / writing speed). The result ist the maximal performance in MB/s.

#	Test device	Reading speed (MB/s)	Writing speed (MB/s)
APC620 with INTEL 855GME chipset			
30	Pentium M 1,4 GHz, 1024MB DDR-SDRAM Siliconsystems INC 1 GB card (NTFS)	9,83	4,36
30	Pentium M 1,4 GHz, 1024MB DDR-SDRAM B&R Compact Flash 1 GB card (NTFS)	37,13	9,83
APC810 with INTEL GM45 chipset			
29	Core 2 Duo 2,53 GHz, 2x2048MB DDR3-SODIMM Siliconsystems INC 1 GB card (NTFS)	9,83	4,36
29	Core 2 Duo 2,53 GHz, 2x2048MB DDR3-SODIMM B&R Compact Flash 1 GB card (NTFS)	37,13	9,83
APC810 with INTEL 945GME chipset			
24	Core 2 Duo 1,50 GHz, 2x512MB DDR2-SDRAM Siliconsystems INC 1 GB card (NTFS)	9,83	4,36
24	Core 2 Duo 1,50 GHz, 2x512MB DDR2-SDRAM B&R Compact Flash 1 GB card (NTFS)	37,13	9,83
24	Core 2 Duo 1,50 GHz, 2x512MB DDR2-SDRAM Compact Slide In SATA 40 GB HDD (NTFS)	41,52	38,23
24	Core 2 Duo 1,50 GHz, 2x512MB DDR2-SDRAM USB 2.0 Memory Stick 1 GB (5MMUSB.1024-01)	18,57	6,55

Table 32: Results for Sisoft Sandra Pro Business 2007, physical devices / removeable devices

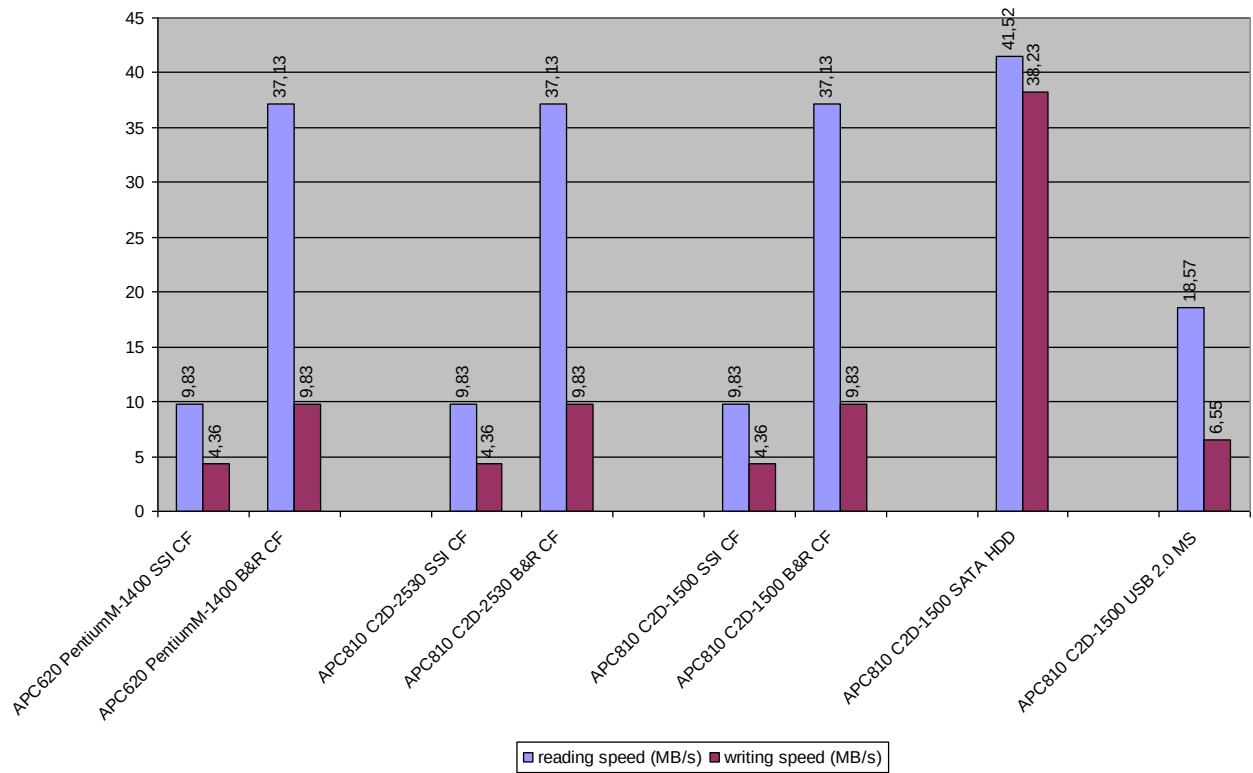


Figure 26 – Results for Sisoft Sandra Pro Business 2007, physical devices / removeable devices

4.12 SiSoft Sandra 2011 Lite

4.12.1 CPU Arithmetic

Benchmarks the ALU and FPU processor units. Shows how your processors handle arithmetic and floating point instructions in comparison to other typical processors. Such operations are used by software in typical tasks.

Higher scores are better

#	Test device	Arithmetic Performance (GOPS)	Dhrystone iSSE4.2 (GIPS)	Whetstone iSSE3 (GFLOPS)
APC910 with INTEL QM77 Chipset				
37	i7-3615QE 4C 2.3/1.6GHz 6MB 45W 2x4096MB DDR3-SODIMM 1067MHz	94,58	118,74	75,33
38	i7-3615QE 4C 2.3/1.6GHz 6MB 45W 2x4096MB DDR3-SODIMM 1600MHz	95,55	120,59	75,71
39	i7-3612QE 4C 2.1/1.6GHz 6MB 35W, 2x4096MB DDR3-SODIMM 1067MHz	85,69	107,54	68,28
40	i7-3612QE 4C 2.1/1.6GHz 6MB 35W, 2x4096MB DDR3-SODIMM 1600MHz	85,43	107,31	68
41	i7-3555LE 2C 2.5/1.6GHz 4MB 25W, 4096MB DDR3-SODIMM 1067MHz	46	57,31	36,86
42	i7-3555LE 2C 2.5/1.6GHz 4MB 25W, 4096MB DDR3-SODIMM 1600MHz	45,9	57,28	36,78
43	i7-3555LE 2C 2.5/1.6GHz 4MB 25W, 2x2048MB DDR3-SODIMM 1067MHz	46	57,52	36,7
44	i7-3555LE 2C 2.5/1.6GHz 4MB 25W, 2x4096MB DDR3-SODIMM 1600MHz	45,83	57,5	36,52
45	i7-3517UE 2C 1.7/1.6GHz 4MB 17W, 2x2048MB DDR3-SODIMM 1067MHz	40,29	51	31,83
46	i7-3517UE 2C 1.7/1.6GHz 4MB 17W, 2x4096MB DDR3-SODIMM 1600MHz	39,83	50	31,75
47	i5-3610ME 2C 2.7/1.6GHz 3MB 35W, 2x2048MB DDR3-SODIMM 1067MHz	47,89	59,28	38
48	i5-3610ME 2C 2.7/1.6GHz 3MB 35W, 2x4096MB DDR3-SODIMM 1600MHz	47,39	59,42	37,8
49	i3-3120ME 2C 2.4/1.6GHz 3MB 35W, 2x2048MB DDR3-SODIMM 1067MHz	38,4	48,15	30,61
50	i3-3120ME 2C 2.4/1.6GHz 3MB 35W, 2x4096MB DDR3-SODIMM 1600MHz	38,38	48	30,71
51	i3-3217UE 2C 1.6/1.6GHz 3MB 17W, 2x2048MB DDR3-SODIMM 1067MHz	24,77	31,33	19,59
52	i3-3217UE 2C 1.6/1.6GHz 3MB 17W, 2x4096MB DDR3-SODIMM 1600MHz	24,8	31,33	19,64
APC910 with INTEL HM76 Chipset				
53	C-847E 2C 1.1/1.3GHz 2MB 17W 2x2048MB DDR3-SODIMM 1067MHz	11,39	16,43	7,9
54	C-847E 2C 1.1/1.3GHz 2MB 17W 2x4096MB DDR3-SODIMM 1333MHz	11,39	16,43	7,9
55	C-827E 1C 1.4/1.3GHz 1.5MB 17W 2x2048MB DDR3-SODIMM 1067MHz	7,18	10,46	5
56	C-827E 1C 1.4/1.3GHz 1.5MB 17W 2x4096MB DDR3-SODIMM 1333MHz	7,18	10,46	5

Table 33: Results for SiSoft Sandra 2011, CPU Arithmetic

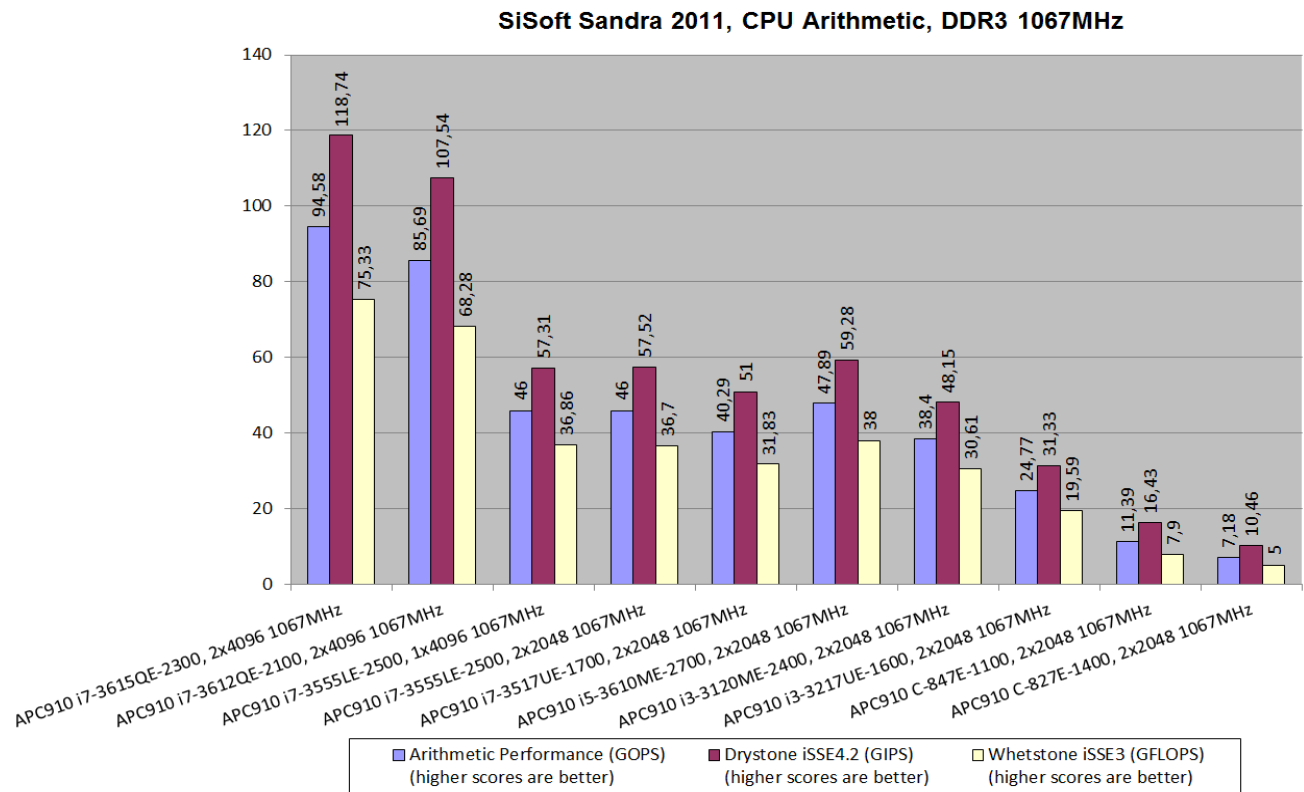


Figure 27: Results for SiSoft Sandra 2011, CPU Arithmetic, DDR3 1067MHz

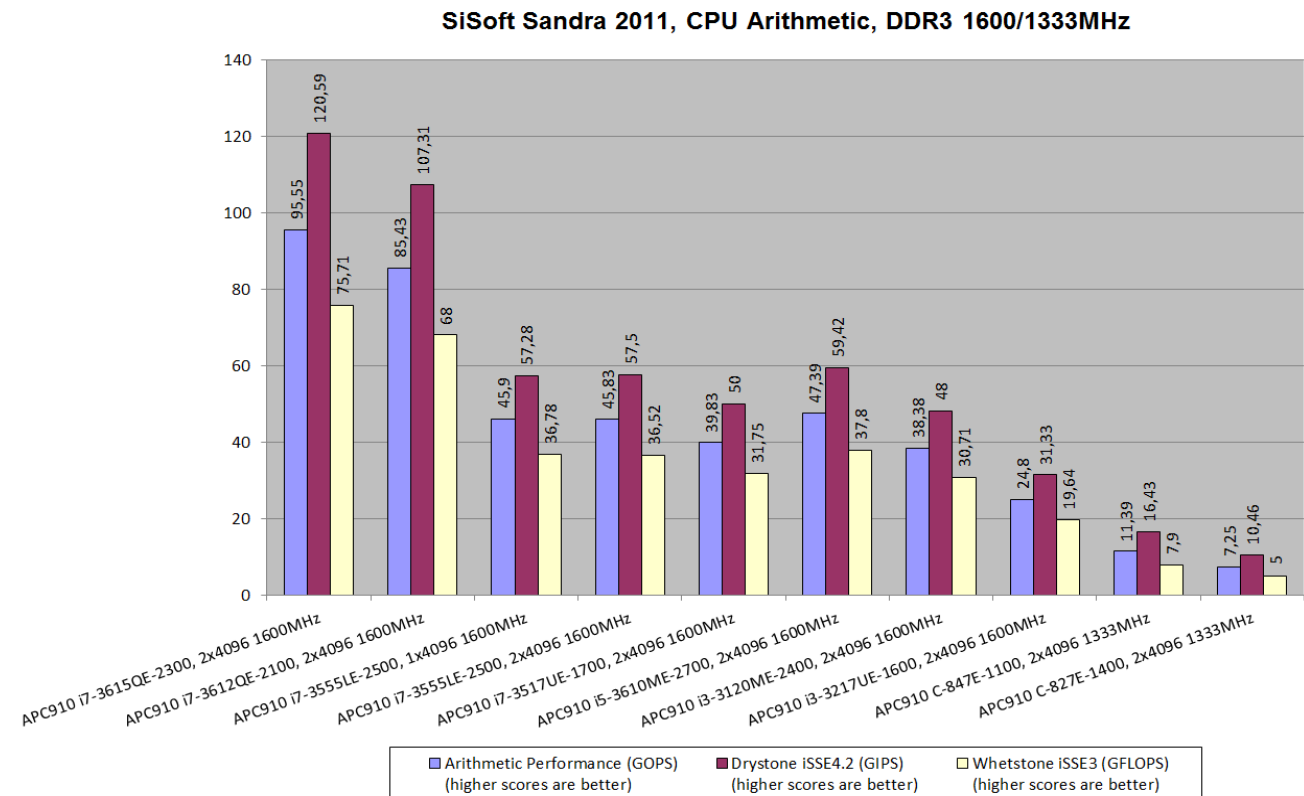


Figure 28: Results for SiSoft Sandra 2011, CPU Arithmetic, DDR3 1600/1333MHz

4.12.2 Processor Multi-media

Benchmark the SIMD processor units. Shows how your processors handle multi-media instructions and data in comparison to other typical processors. Such operations are used by more specialized software, e.g. image manipulation, video decoders/encoders and games.

Higher scores are better

#	Test device	Multimedia Performance (MPixel/s)	Integer x32 iAVX (MPixel/s)	Float x16 iAVX (MPixel/s)	Multimedia Double x8 iAVX (MPixel/s)
APC910 with INTEL QM77 Chipset					
37	i7-3615QE 4C 2.3/1.6GHz 6MB 45W 2x4096MB DDR3-SODIMM 1067MHz	219,1	186,32	257,66	145,1
38	i7-3615QE 4C 2.3/1.6GHz 6MB 45W 2x4096MB DDR3-SODIMM 1600MHz	219,26	186,57	257,67	145,2
39	i7-3612QE 4C 2.1/1.6GHz 6MB 35W, 2x4096MB DDR3-SODIMM 1067MHz	198	168,53	232,5	131,15
40	i7-3612QE 4C 2.1/1.6GHz 6MB 35W, 2x4096MB DDR3-SODIMM 1600MHz	197,75	168,42	232,2	131
41	i7-3555LE 2C 2.5/1.6GHz 4MB 25W, 4096MB DDR3-SODIMM 1067MHz	105,26	88,8	124,79	70,28
42	i7-3555LE 2C 2.5/1.6GHz 4MB 25W, 4096MB DDR3-SODIMM 1600MHz	105,27	88,83	124,75	70,28
43	i7-3555LE 2C 2.5/1.6GHz 4MB 25W, 2x2048MB DDR3-SODIMM 1067MHz	105,3	88,83	124,82	70,28
44	i7-3555LE 2C 2.5/1.6GHz 4MB 25W, 2x4096MB DDR3-SODIMM 1600MHz	105,28	88,79	124,83	70,2
45	i7-3517UE 2C 1.7/1.6GHz 4MB 17W, 2x2048MB DDR3-SODIMM 1067MHz	91,24	77	108,15	60,9
46	i7-3517UE 2C 1.7/1.6GHz 4MB 17W, 2x4096MB DDR3-SODIMM 1600MHz	91,21	77	108	60,84
47	i5-3610ME 2C 2.7/1.6GHz 3MB 35W, 2x2048MB DDR3-SODIMM 1067MHz	108,68	91,63	128,29	72,55
48	i5-3610ME 2C 2.7/1.6GHz 3MB 35W, 2x4096MB DDR3-SODIMM 1600MHz	108,81	91,79	129	72,63
49	i3-3120ME 2C 2.4/1.6GHz 3MB 35W, 2x2048MB DDR3-SODIMM 1067MHz	87,71	74	104	58,58
50	i3-3120ME 2C 2.4/1.6GHz 3MB 35W, 2x4096MB DDR3-SODIMM 1600MHz	87,66	74	103,86	58,58
51	i3-3217UE 2C 1.6/1.6GHz 3MB 17W, 2x2048MB DDR3-SODIMM 1067MHz	56	47,33	66,5	37,43
52	i3-3217UE 2C 1.6/1.6GHz 3MB 17W, 2x4096MB DDR3-SODIMM 1600MHz	56	47,32	66,41	37,41
		Multimedia Performance (MPixel/s)	Integer x16 iSSE4.1 (MPixel/s)	Float x8 iSSE2 (MPixel/s)	Multimedia Double x4 iSSE2 (MPixel/s)
APC910 with INTEL HM76 Chipset					
53	C-847E 2C 1.1/1.3GHz 2MB 17W 2x2048MB DDR3-SODIMM 1067MHz	20,65	24,44	17,45	9,33
54	C-847E 2C 1.1/1.3GHz 2MB 17W 2x4096MB DDR3-SODIMM 1333MHz	20,64	24,44	17,43	9,33
55	C-827E 1C 1.4/1.3GHz 1.5MB 17W 2x2048MB DDR3-SODIMM 1067MHz	13,16	15,59	11,11	6
56	C-827E 1C 1.4/1.3GHz 1.5MB 17W 2x4096MB DDR3-SODIMM 1333MHz	13,17	15,61	11,11	6

Table 34: Results for SiSoft Sandra 2011, Processor Multi-Media

SiSoft Sandra 2011, Processor Multimedia, DDR3 1067MHz

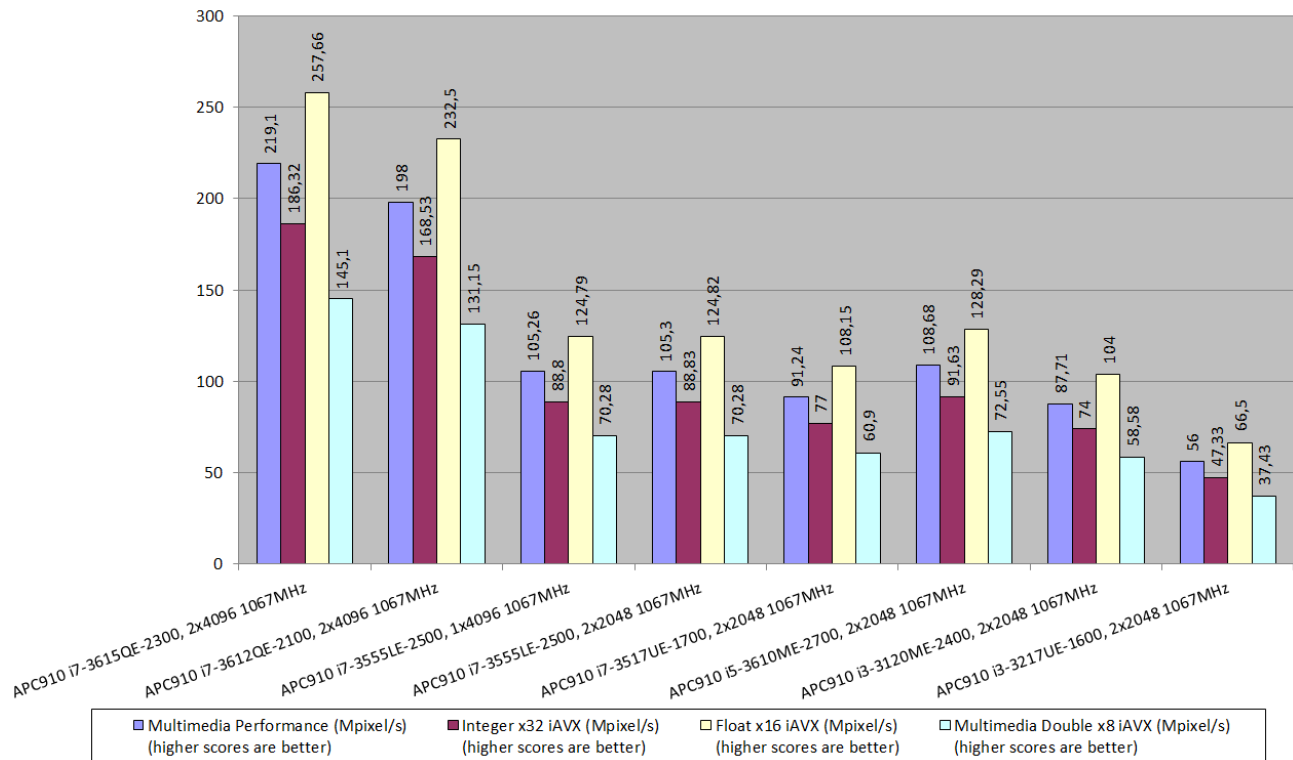


Figure 29: Results for SiSoft Sandra 2011, Processor Multi-Media (HM77 Chipset), DDR3 1067MHz

SiSoft Sandra 2011, Processor Multimedia, DDR3 1600Mhz

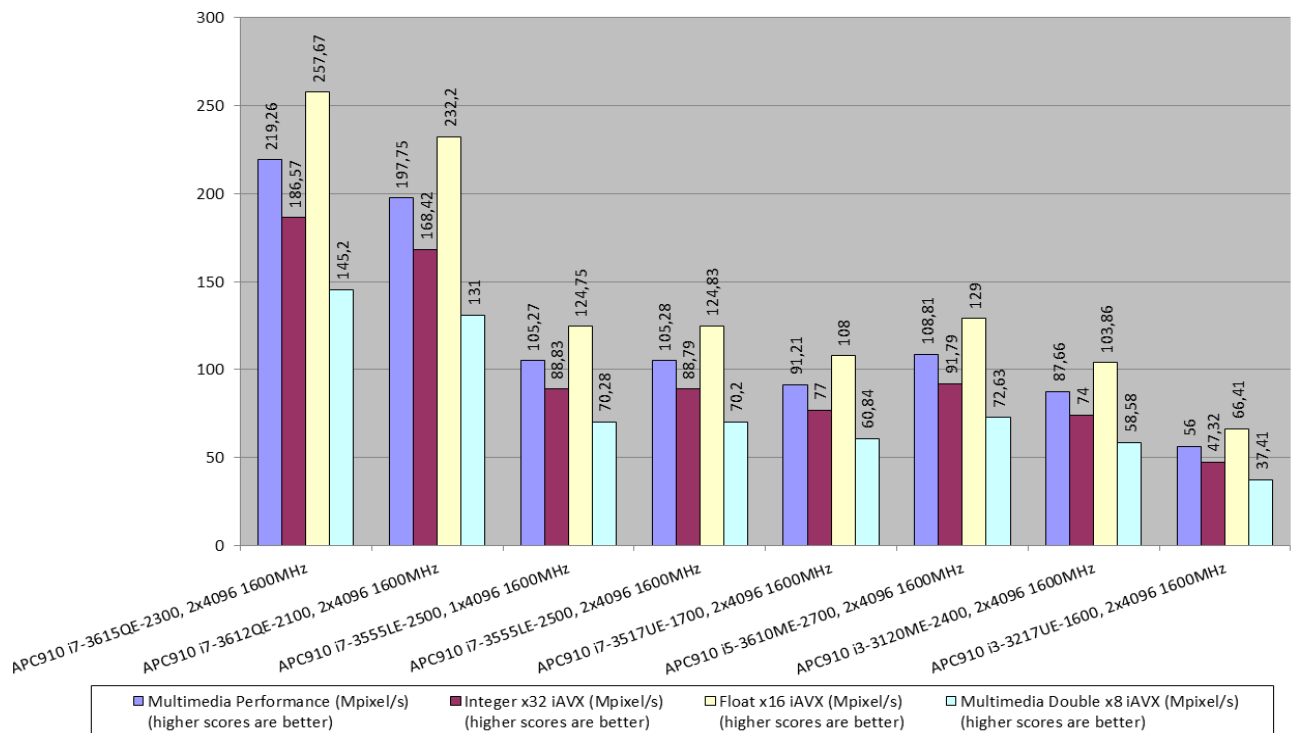


Figure 30: Results for SiSoft Sandra 2011, Processor Multi-Media (HM77 Chipset), DDR3 1600MHz

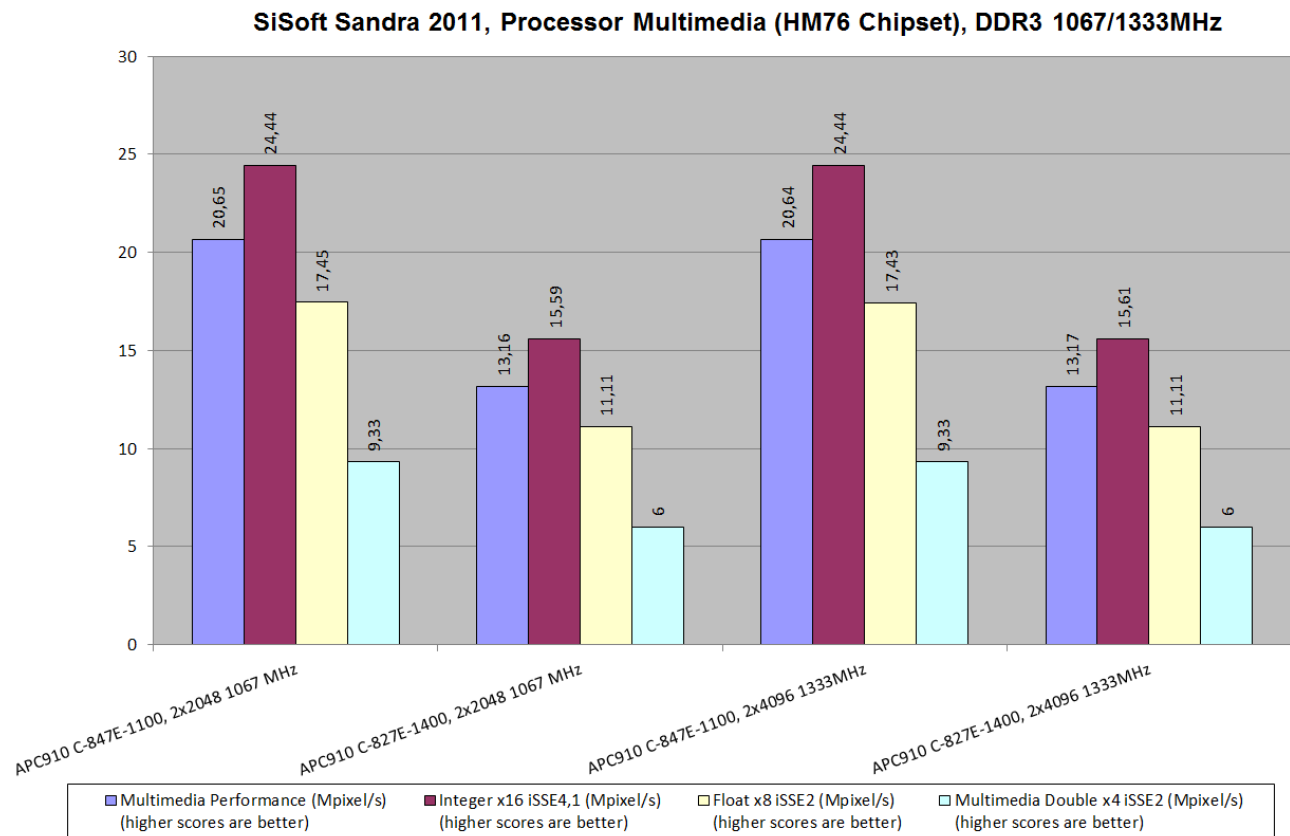


Figure 31: Results for SiSoft Sandra 2011, Processor Multi-Media (HM76 Chipset), DDR3 1067/1333MHz

4.12.3 Multi-Core Efficiency

Benchmark the multi-core efficiency of the processors. Shows how efficient the processor cores and their inter – connects are in comparison to other types to other typical processors. The ability of the cores to process data blocks and pass them to another core for processing of different sizes and different chain sizes is measured. The efficiency of the inter – connect between cores is thus benchmarked. The number of cores also counts as more data buffers can be processed simultaneously.

#	Test device	Inter-Core Bandwidth (GB/s) (higher scores are better)	Inter-Core Latency (ns) (lower scores are better)
APC910 with INTEL QM77 Chipset			
37	i7-3615QE 4C 2.3/1.6GHz 6MB 45W 2x4096MB DDR3-SODIMM 1067MHz	18,35	45,5
38	i7-3615QE 4C 2.3/1.6GHz 6MB 45W 2x4096MB DDR3-SODIMM 1600MHz	20,58	51
39	i7-3612QE 4C 2.1/1.6GHz 6MB 35W, 2x4096MB DDR3-SODIMM 1067MHz	16,87	42,2
40	i7-3612QE 4C 2.1/1.6GHz 6MB 35W, 2x4096MB DDR3-SODIMM 1600MHz	19,42	51,1
41	i7-3555LE 2C 2.5/1.6GHz 4MB 25W, 4096MB DDR3-SODIMM 1067MHz	9,33	37,4
42	i7-3555LE 2C 2.5/1.6GHz 4MB 25W, 4096MB DDR3-SODIMM 1600MHz	10,36	37,5
43	i7-3555LE 2C 2.5/1.6GHz 4MB 25W, 2x2048MB DDR3-SODIMM 1067MHz	11,34	33,7
44	i7-3555LE 2C 2.5/1.6GHz 4MB 25W, 2x4096MB DDR3-SODIMM 1600MHz	12,89	34,9
45	i7-3517UE 2C 1.7/1.6GHz 4MB 17W, 2x2048MB DDR3-SODIMM 1067MHz	10,23	50,1
46	i7-3517UE 2C 1.7/1.6GHz 4MB 17W, 2x4096MB DDR3-SODIMM 1600MHz	11,56	43,9
47	i5-3610ME 2C 2.7/1.6GHz 3MB 35W, 2x2048MB DDR3-SODIMM 1067MHz	11,16	35,5
48	i5-3610ME 2C 2.7/1.6GHz 3MB 35W, 2x4096MB DDR3-SODIMM 1600MHz	13	34,3
49	i3-3120ME 2C 2.4/1.6GHz 3MB 35W, 2x2048MB DDR3-SODIMM 1067MHz	9,85	52,4
50	i3-3120ME 2C 2.4/1.6GHz 3MB 35W, 2x4096MB DDR3-SODIMM 1600MHz	11	45,7
51	i3-3217UE 2C 1.6/1.6GHz 3MB 17W, 2x2048MB DDR3-SODIMM 1067MHz	7,22	67,3
52	i3-3217UE 2C 1.6/1.6GHz 3MB 17W, 2x4096MB DDR3-SODIMM 1600MHz	8	71,2
APC910 with INTEL HM76 Chipset			
53	C-847E 2C 1.1/1.3GHz 2MB 17W 2x2048MB DDR3- SODIMM 1067MHz	2	133,2
54	C-847E 2C 1.1/1.3GHz 2MB 17W 2x4096MB DDR3- SODIMM 1333MHz	2	141,4
55	C-827E 1C 1.4/1.3GHz 1.5MB 17W 2x2048MB DDR3-SODIMM 1067MHz	-	-
56	C-827E 1C 1.4/1.3GHz 1.5MB 17W 2x4096MB DDR3-SODIMM 1333MHz	-	-

Table 35: Results for SiSoft Sandra 2011, Multi-Core Efficiency

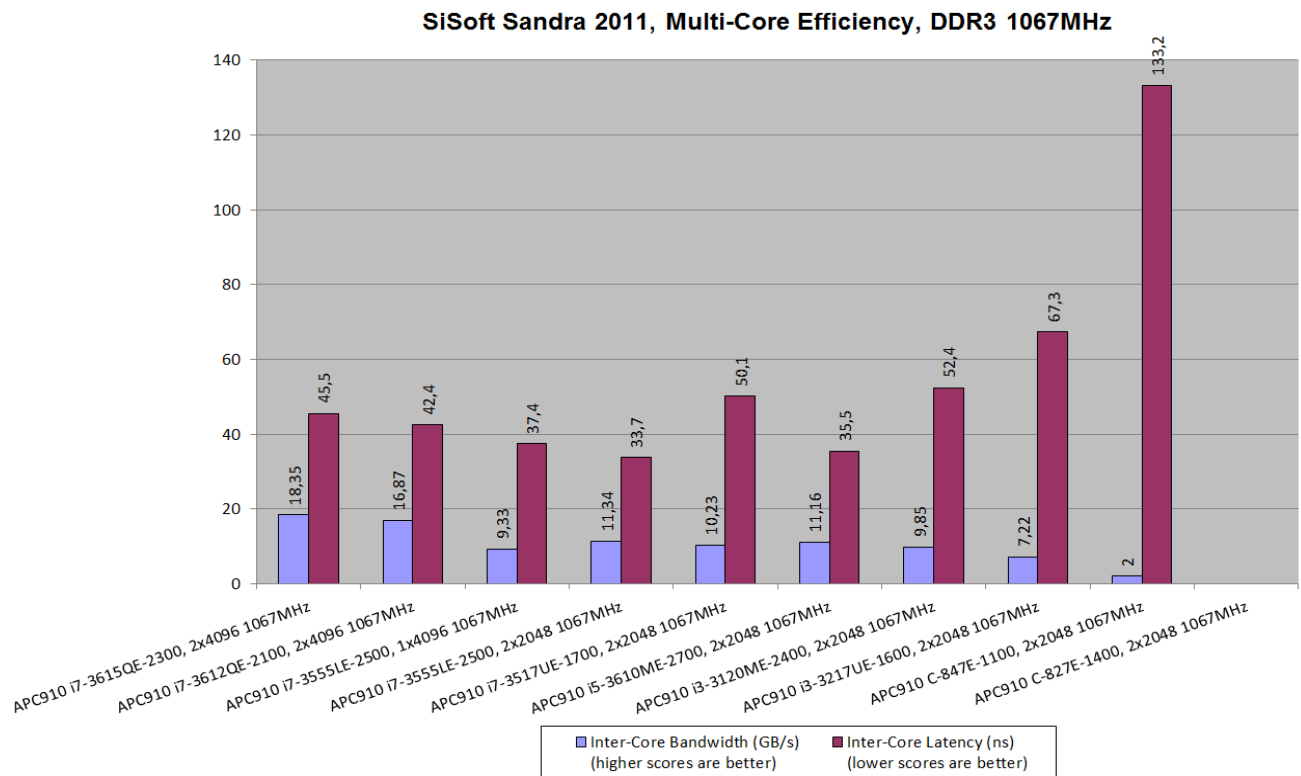


Figure 32: Results for SiSoft Sandra 2011, Multi-Core Efficiency, DDR3 1067MHz

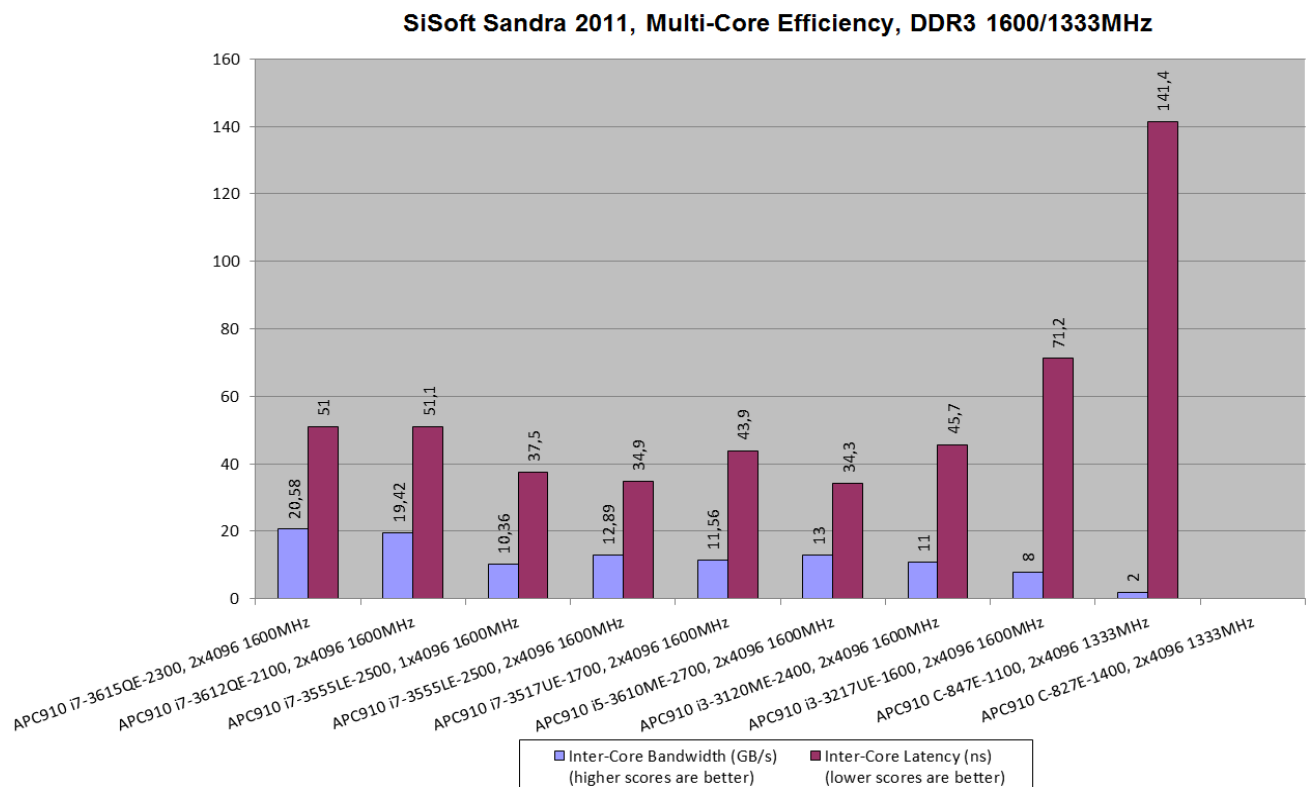


Figure 33: Results for SiSoft Sandra 2011, Multi-Core Efficiency, DDR3 1600/1333MHz

4.12.4 Cryptography

Measures the cryptography efficiency of the processor units: encryption, decryption and hashing. Shows how your processors handle cryptographic operations in comparison to other typical processors. Such operations are used by software in most operations that handle sensitive data.

Higher scores are better

#	Test device	Cryptographic Bandwidth (GB/s)	AES256-ECB iAES Cryptographic Bandwidth (GB/s)	SHA256 iAVX Hashing Bandwidth (GB/s)
APC910 with INTEL QM77 Chipset				
37	i7-3615QE 4C 2.3/1.6GHz 6MB 45W 2x4096MB DDR3-SODIMM 1067MHz	2,22	4,72	1
38	i7-3615QE 4C 2.3/1.6GHz 6MB 45W 2x4096MB DDR3-SODIMM 1600MHz	2,62	6,58	1
39	i7-3612QE 4C 2.1/1.6GHz 6MB 35W, 2x4096MB DDR3-SODIMM 1067MHz	2	4,4	0,961
40	i7-3612QE 4C 2.1/1.6GHz 6MB 35W, 2x4096MB DDR3-SODIMM 1600MHz	2,48	6,57	0,962
41	i7-3555LE 2C 2.5/1.6GHz 4MB 25W, 4096MB DDR3-SODIMM 1067MHz	1,1	2,44	0,515
42	i7-3555LE 2C 2.5/1.6GHz 4MB 25W, 4096MB DDR3-SODIMM 1600MHz	1,33	3,53	0,515
43	i7-3555LE 2C 2.5/1.6GHz 4MB 25W, 2x2048MB DDR3-SODIMM 1067MHz	1,47	4,32	0,515
44	i7-3555LE 2C 2.5/1.6GHz 4MB 25W, 2x4096MB DDR3-SODIMM 1600MHz	1,78	6,31	0,515
45	i7-3517UE 2C 1.7/1.6GHz 4MB 17W, 2x2048MB DDR3-SODIMM 1067MHz	1,37	4,3	0,447
46	i7-3517UE 2C 1.7/1.6GHz 4MB 17W, 2x4096MB DDR3-SODIMM 1600MHz	1,63	6	0,477
47	i5-3610ME 2C 2.7/1.6GHz 3MB 35W, 2x2048MB DDR3-SODIMM 1067MHz	1,5	4,33	0,532
48	i5-3610ME 2C 2.7/1.6GHz 3MB 35W, 2x4096MB DDR3-SODIMM 1600MHz	1,8	6,33	0,524
49	i3-3120ME 2C 2.4/1.6GHz 3MB 35W, 2x2048MB DDR3-SODIMM 1067MHz	1,34	4,3	0,429
50	i3-3120ME 2C 2.4/1.6GHz 3MB 35W, 2x4096MB DDR3-SODIMM 1600MHz	1,57	6	0,429
51	i3-3217UE 2C 1.6/1.6GHz 3MB 17W, 2x2048MB DDR3-SODIMM 1067MHz	1	3,77	0,274
52	i3-3217UE 2C 1.6/1.6GHz 3MB 17W, 2x4096MB DDR3-SODIMM 1600MHz	1	3,83	0,274
		Cryptographic Bandwidth (GB/s)	AES256-ECB ALU Cryptographic Bandwidth (GB/s)	SHA256 iSSE4 Hashing Bandwidth (GB/s)
APC910 with INTEL HM76 Chipset				
53	C-847E 2C 1.1/1.3GHz 2MB 17W 2x2048MB DDR3-SODIMM 1067MHz	0,129	0,129	0,13
54	C-847E 2C 1.1/1.3GHz 2MB 17W 2x4096MB DDR3-SODIMM 1333MHz	0,129	0,129	0,129
55	C-827E 1C 1.4/1.3GHz 1.5MB 17W 2x2048MB DDR3-SODIMM 1067MHz	0,082	0,082	0,082
56	C-827E 1C 1.4/1.3GHz 1.5MB 17W 2x4096MB DDR3-SODIMM 1333MHz	0,082	0,082	0,083

Table 36: Results for SiSoft Sandra 2011, Cryptography

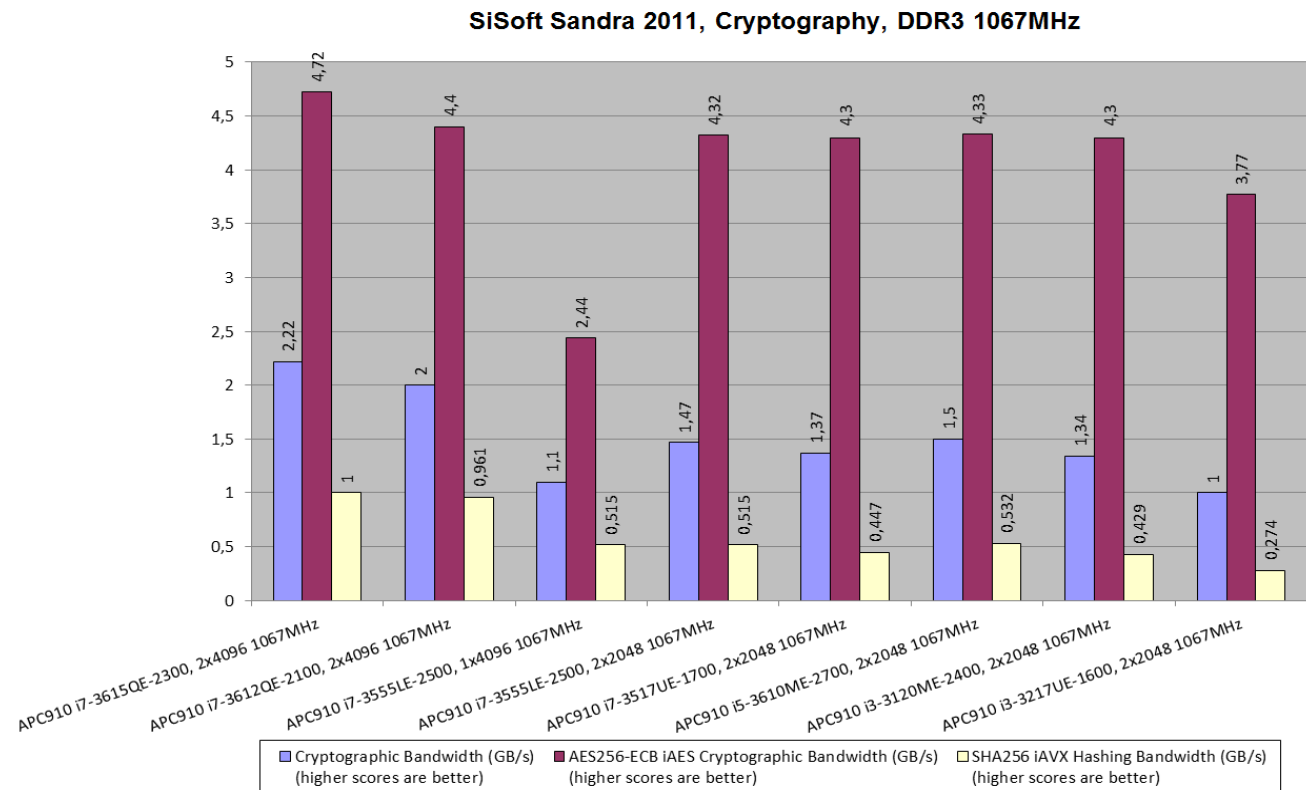


Figure 34: Results for SiSoft Sandra 2011, Cryptography, DDR3 1067MHz

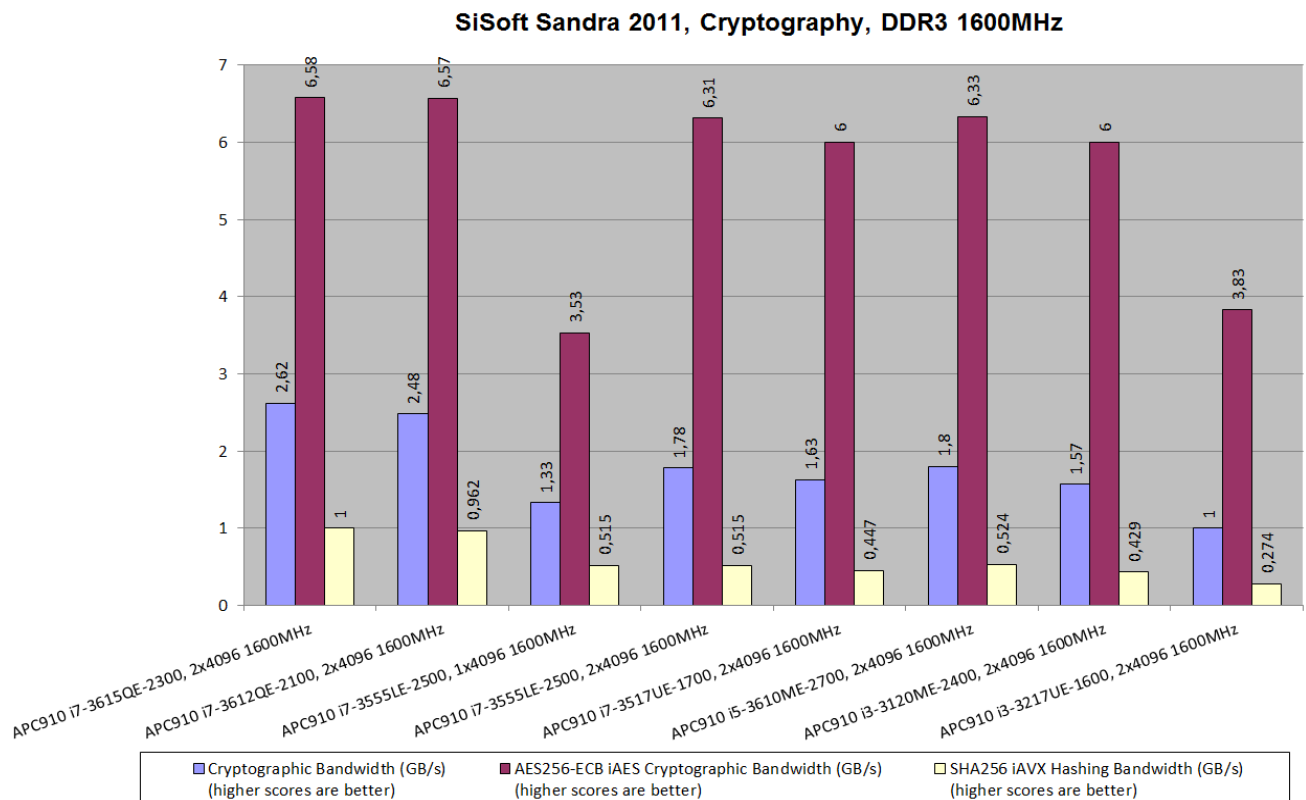


Figure 35: Results for SiSoft Sandra 2011, Cryptography, DDR3 1600MHz

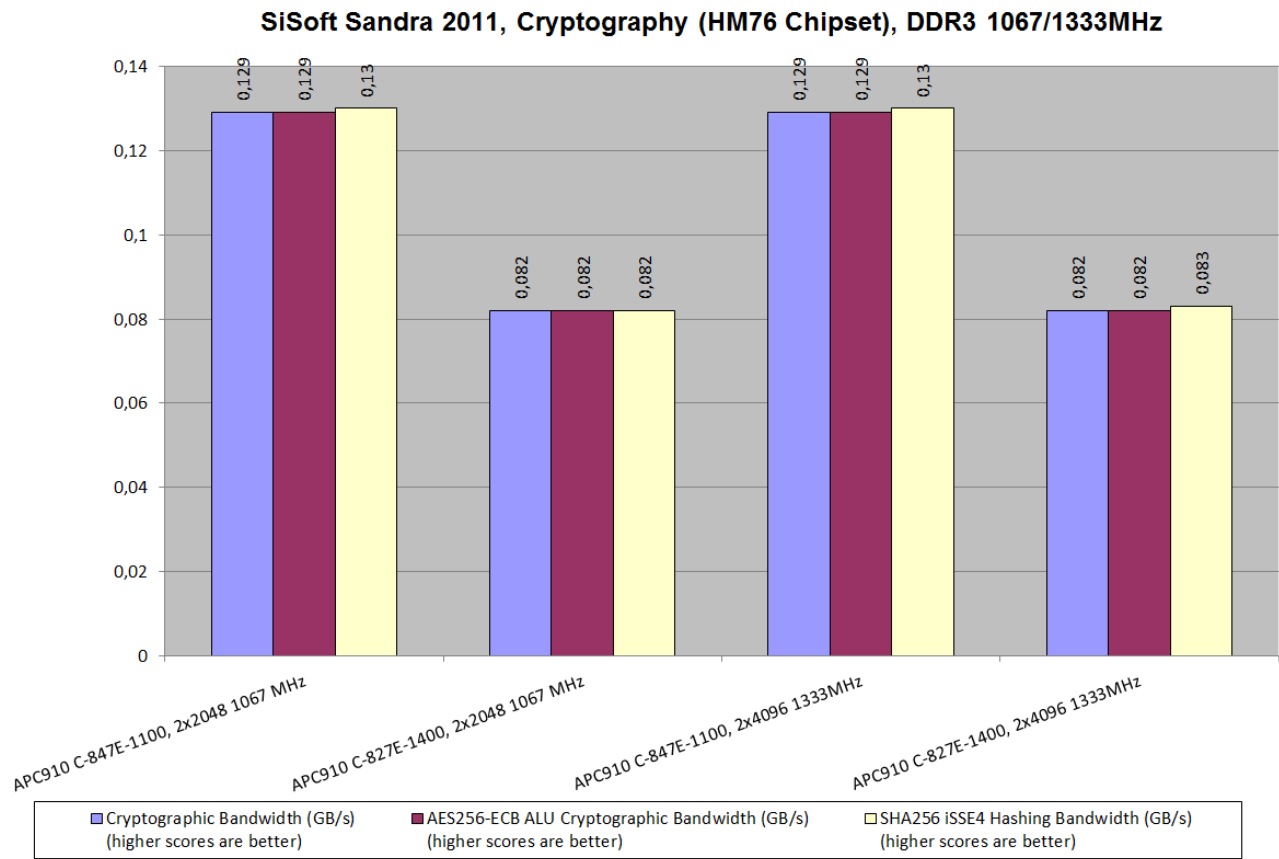


Figure 36: Results for SiSoft Sandra 2011, Cryptography (HM76 Chipset), DDR3 1067/1333MHz

4.12.5 Video Rendering

Benchmark the graphics performance of the video adapters (GFXs). Shows how your graphics processors handle rendering in comparison to other typical graphics processors. Such operations are used by all graphics software, image manipulation, video decoders/encoders, games and modern operating systems.

Higher scores are better

		Direct3D 9c			Direct3D 10		
#	Test Device	Shader Performance (MPixel/s)	Native Float Shader (MPixel/s)	Emulated Double Shader (MPixel/s)	Shader Performance (MPixel/s)	Native Float Shader (MPixel/s)	Emulated Double Shader (MPixel/s)
APC910 with INTEL QM77 Chipset							
37	i7-3615QE 4C 2.3/1.6GHz 6MB 45W 2x4096MB DDR3-SODIMM 1067MHz	55,74	144,13	21,56	53,42	131,54	21,7
38	i7-3615QE 4C 2.3/1.6GHz 6MB 45W 2x4096MB DDR3-SODIMM 1600MHz	56,1	145,87	21,58	53,69	132,54	21,5
39	i7-3612QE 4C 2.1/1.6GHz 6MB 35W, 2x4096MB DDR3-SODIMM 1067MHz	55,66	143,83	21,54	53,36	131,24	21,7
40	i7-3612QE 4C 2.1/1.6GHz 6MB 35W, 2x4096MB DDR3-SODIMM 1600MHz	56	145,73	21,57	53,72	132,7	21,75
41	i7-3555LE 2C 2.5/1.6GHz 4MB 25W, 4096MB DDR3-SODIMM 1067MHz	51,63	131	20,35	47,62	112	20,24
42	i7-3555LE 2C 2.5/1.6GHz 4MB 25W, 4096MB DDR3-SODIMM 1600MHz	52,54	135	20,43	49	117,3	20,4
43	i7-3555LE 2C 2.5/1.6GHz 4MB 25W, 2x2048MB DDR3-SODIMM 1067MHz	53	137,2	20,48	49,74	121	20,45
44	i7-3555LE 2C 2.5/1.6GHz 4MB 25W, 2x4096MB DDR3-SODIMM 1600MHz	53,37	138,84	20,52	50,55	124,19	20,57
45	i7-3517UE 2C 1.7/1.6GHz 4MB 17W, 2x2048MB DDR3-SODIMM 1067MHz	50,32	130,47	19,4	47,38	115,28	19,47
46	i7-3517UE 2C 1.7/1.6GHz 4MB 17W, 2x4096MB DDR3-SODIMM 1600MHz	50,52	131,17	19,46	48	117,9	19,58
47	i5-3610ME 2C 2.7/1.6GHz 3MB 35W, 2x2048MB DDR3-SODIMM 1067MHz	53	137	20,46	49,57	120,2	20,44
48	i5-3610ME 2C 2.7/1.6GHz 3MB 35W, 2x4096MB DDR3-SODIMM 1600MHz	53,38	139	20,51	50,53	124	20,58
49	i3-3120ME 2C 2.4/1.6GHz 3MB 35W, 2x2048MB DDR3-SODIMM 1067MHz	50,43	131	19,4	47,2	114,76	19,4
50	i3-3120ME 2C 2.4/1.6GHz 3MB 35W, 2x4096MB DDR3-SODIMM 1600MHz	50,87	133	19,45	48	117,75	19,53
51	i3-3217UE 2C 1.6/1.6GHz 3MB 17W, 2x2048MB DDR3-SODIMM 1067MHz	50,3	130,38	19,4	47	114	19,4
52	i3-3217UE 2C 1.6/1.6GHz 3MB 17W, 2x4096MB DDR3-SODIMM 1600MHz	50,5	131	19,45	47,61	116,36	19,48
APC910 with INTEL HM76 Chipset							
53	C-847E 2C 1.1/1.3GHz 2MB 17W 2x2048MB DDR3-SODIMM 1067MHz	9,49	26,24	3,43	9,4	25,54	3,46
54	C-847E 2C 1.1/1.3GHz 2MB 17W 2x4096MB DDR3-SODIMM 1333MHz	9,5	26,31	3,43	9,4	25,53	3,46
55	C-827E 1C 1.4/1.3GHz 1.5MB 17W 2x2048MB DDR3-SODIMM 1067MHz	9,46	26,23	3,41	9,4	25,35	3,48
56	C-827E 1C 1.4/1.3GHz 1.5MB 17W 2x4096MB DDR3-SODIMM 1333MHz	9,46	26,26	3,41	9,4	25,34	3,49

Table 37: Results for SiSoft Sandra 2011, Video Rendering (Direct3D 9c/10 Devices)

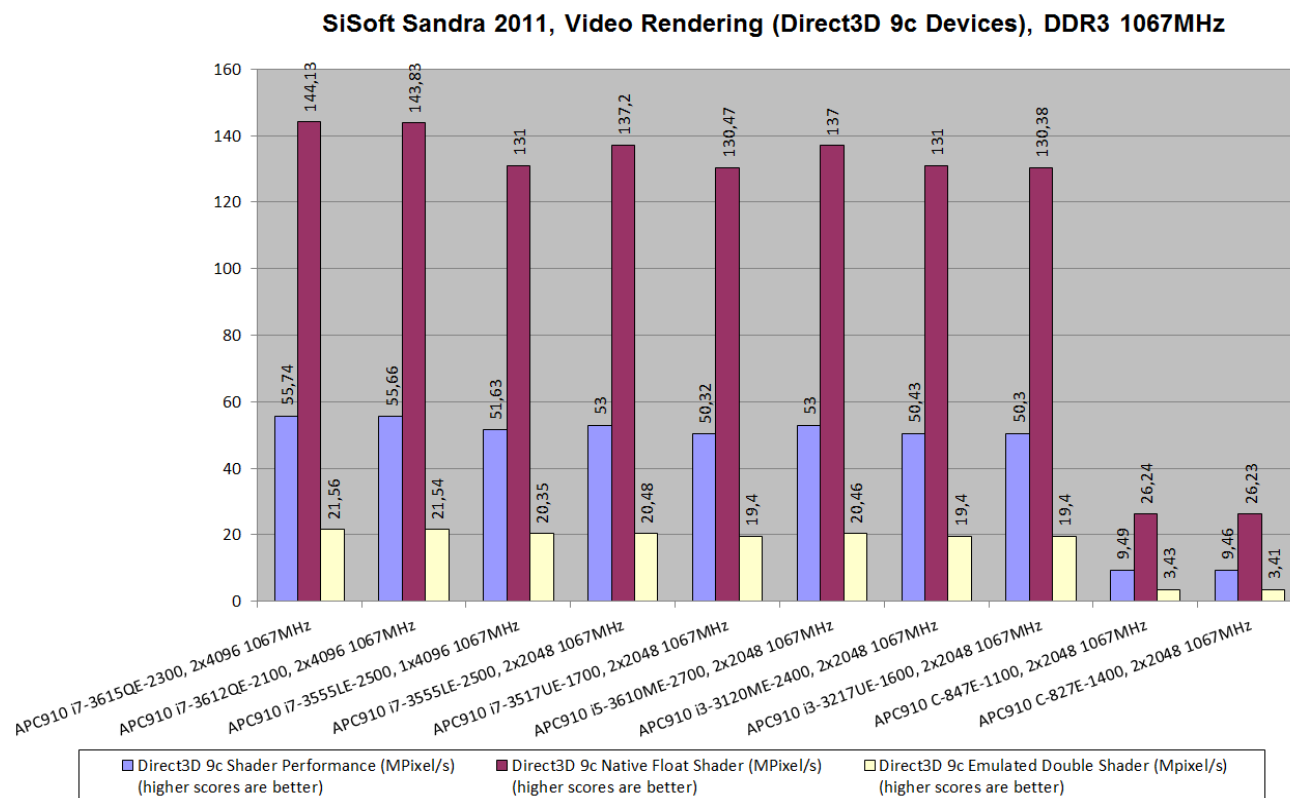


Figure 37: Results for SiSoft Sandra 2011, Video Rendering (Direct3D 9c Devices), DDR3 1067MHz

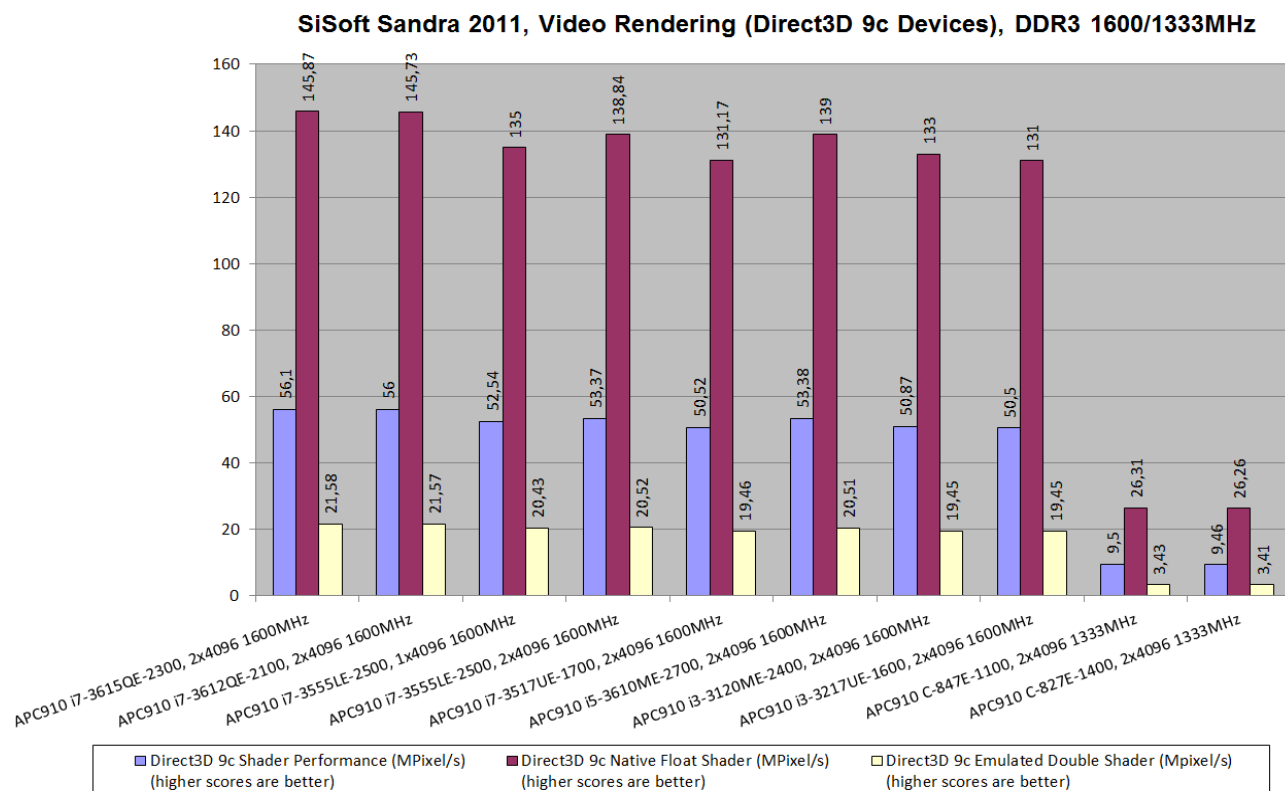


Figure 38: Results for SiSoft Sandra 2011, Video Rendering (Direct3D 9c Devices), DDR3 1600/1333MHz

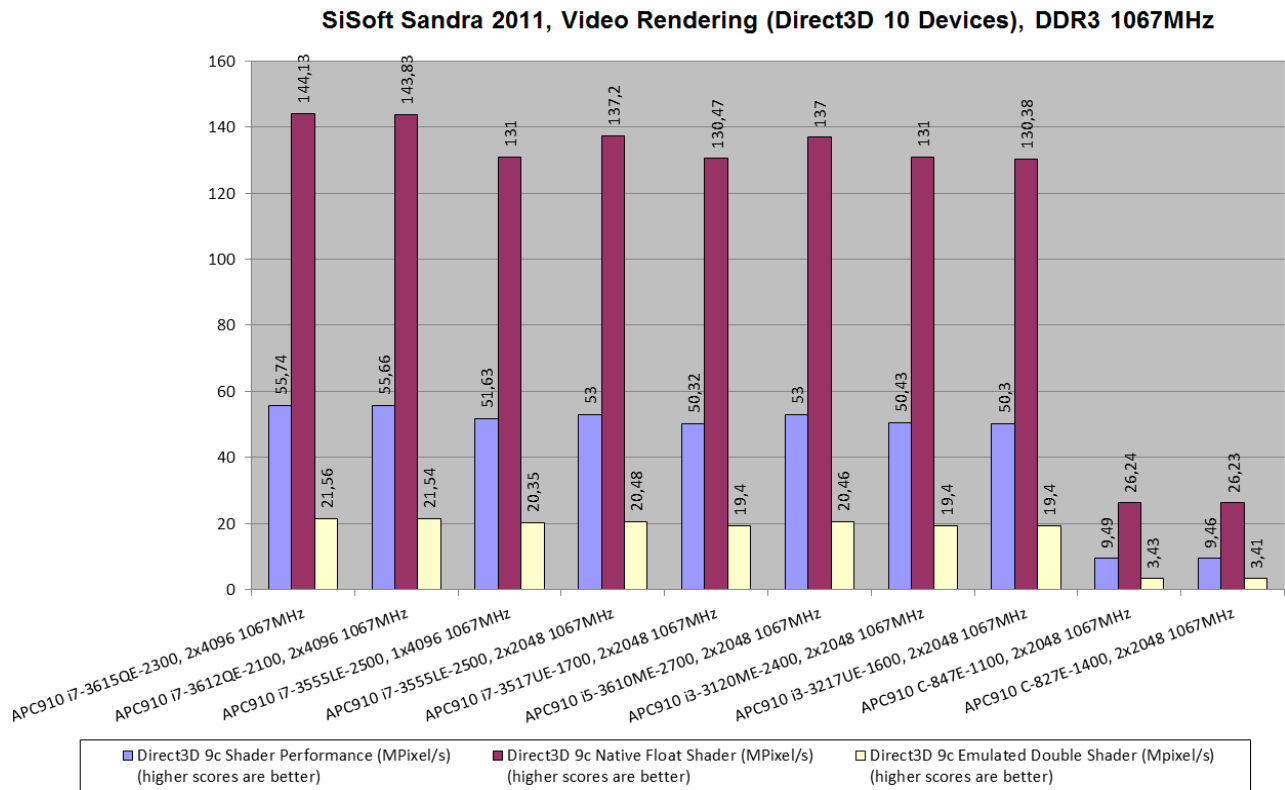


Figure 39: Results for SiSoft Sandra 2011, Video Rendering (Direct3D 10 Devices), DDR3 1067MHz

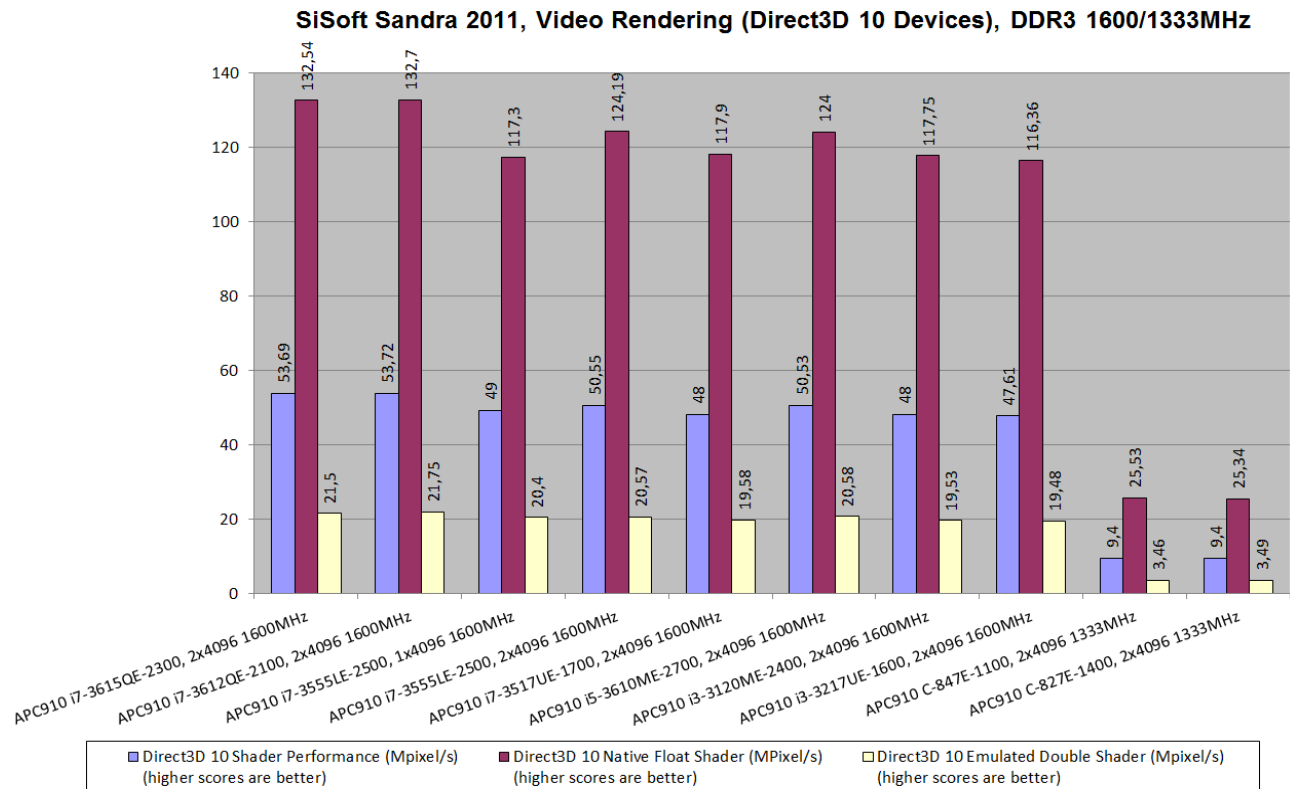


Figure 40: Results for SiSoft Sandra 2011, Video Rendering (Direct3D 10 Devices), DDR3 1600/1333MHz

Benchmark test
Industrial PCs

Higher scores are better

		Direct3D 10.1			Direct3D 11		
#	Test Device	Shader Performance (MPixel/s)	Native Float Shader (MPixel/s)	Emulated Double Shader (MPixel/s)	Shader Performance (MPixel/s)	Native Float Shader (MPixel/s)	Emulated Double Shader (MPixel/s)
APC910 with INTEL QM77 Chipset							
37	i7-3615QE 4C 2.3/1.6GHz 6MB 45W 2x4096MB DDR3-SODIMM 1067MHz	53,48	131,88	21,69	69,53	131	36,89
38	i7-3615QE 4C 2.3/1.6GHz 6MB 45W 2x4096MB DDR3-SODIMM 1600MHz	53,73	132,77	21,75	70,22	133	37
39	i7-3612QE 4C 2.1/1.6GHz 6MB 35W, 2x4096MB DDR3-SODIMM 1067MHz	53,37	131,4	21,68	69,33	130,83	36,74
40	i7-3612QE 4C 2.1/1.6GHz 6MB 35W, 2x4096MB DDR3-SODIMM 1600MHz	53,7	132,7	21,73	70,16	132,85	37
41	i7-3555LE 2C 2.5/1.6GHz 4MB 25W, 4096MB DDR3-SODIMM 1067MHz	47,64	112	20,26	61,53	112,14	33,76
42	i7-3555LE 2C 2.5/1.6GHz 4MB 25W, 4096MB DDR3-SODIMM 1600MHz	49	117,34	20,4	63,6	117,38	34,46
43	i7-3555LE 2C 2.5/1.6GHz 4MB 25W, 2x2048MB DDR3-SODIMM 1067MHz	49,77	121	20,47	65	121,16	34,87
44	i7-3555LE 2C 2.5/1.6GHz 4MB 25W, 2x4096MB DDR3-SODIMM 1600MHz	50,56	124,2	20,58	66	124,24	35
45	i7-3517UE 2C 1.7/1.6GHz 4MB 17W, 2x2048MB DDR3-SODIMM 1067MHz	47,35	115,3	19,44	61,88	115,6	33,13
46	i7-3517UE 2C 1.7/1.6GHz 4MB 17W, 2x4096MB DDR3-SODIMM 1600MHz	48	117,88	19,58	62,63	118	33,25
47	i5-3610ME 2C 2.7/1.6GHz 3MB 35W, 2x2048MB DDR3-SODIMM 1067MHz	49,63	120,46	20,44	64,74	120,66	34,74
48	i5-3610ME 2C 2.7/1.6GHz 3MB 35W, 2x4096MB DDR3-SODIMM 1600MHz	50,52	124	20,56	66	124,23	35
49	i3-3120ME 2C 2.4/1.6GHz 3MB 35W, 2x2048MB DDR3-SODIMM 1067MHz	47,2	114,71	19,42	61,4	114,86	32,81
50	i3-3120ME 2C 2.4/1.6GHz 3MB 35W, 2x4096MB DDR3-SODIMM 1600MHz	48	117,76	19,53	62,53	117,83	33,18
51	i3-3217UE 2C 1.6/1.6GHz 3MB 17W, 2x2048MB DDR3-SODIMM 1067MHz	47	114	19,4	61,25	114,29	32,82
52	i3-3217UE 2C 1.6/1.6GHz 3MB 17W, 2x4096MB DDR3-SODIMM 1600MHz	47,63	116,43	19,48	62,19	116,62	33,16
APC910 with INTEL HM76 Chipset							
53	C-847E 2C 1.1/1.3GHz 2MB 17W 2x2048MB DDR3-SODIMM 1067MHz	9,4	25,52	3,46	-	-	-
54	C-847E 2C 1.1/1.3GHz 2MB 17W 2x4096MB DDR3-SODIMM 1333MHz	9,4	25,55	3,46	-	-	-
55	C-827E 1C 1.4/1.3GHz 1.5MB 17W 2x2048MB DDR3-SODIMM 1067MHz	9,35	25,33	3,45	-	-	-
56	C-827E 1C 1.4/1.3GHz 1.5MB 17W 2x4096MB DDR3-SODIMM 1333MHz	9,38	25,24	3,49	-	-	-

Table 38: Results for SiSoft Sandra 2011, Video Rendering (Direct3D 10.1/11 Devices)

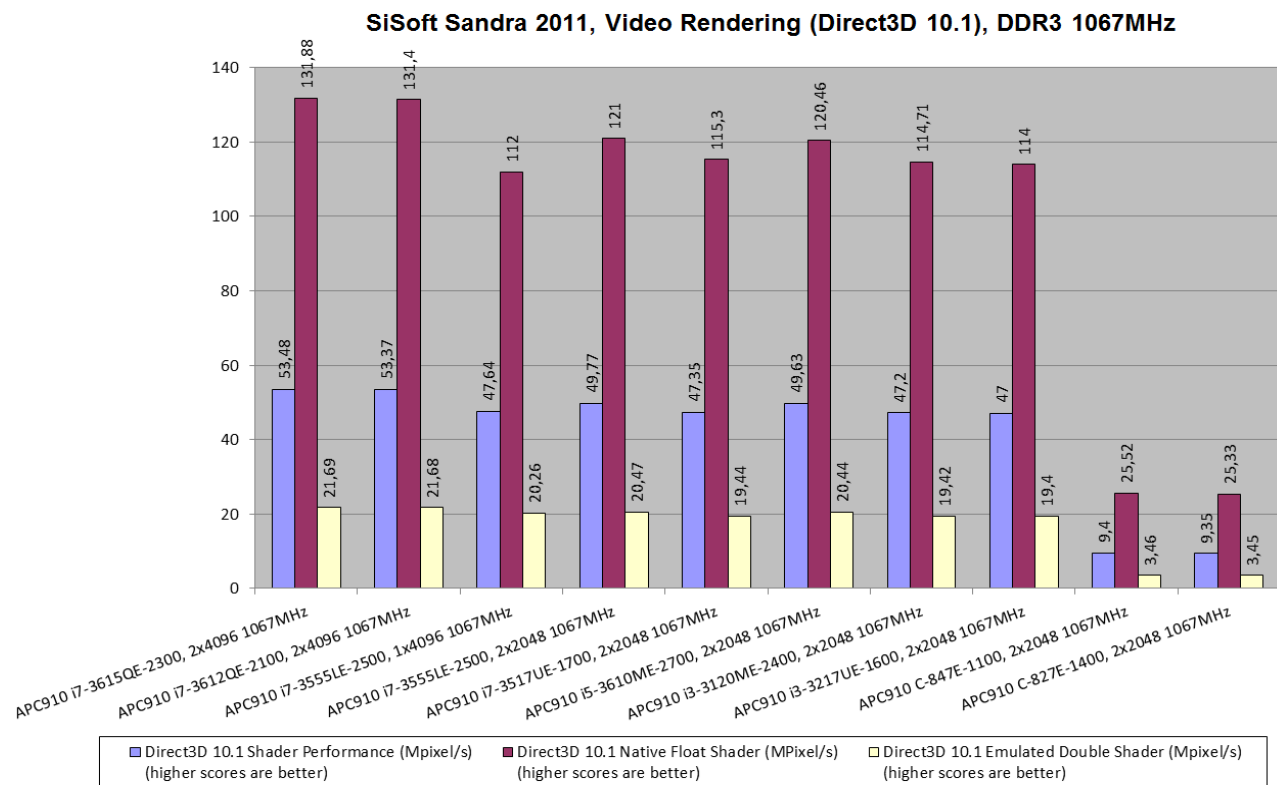


Figure 41: Results for SiSoft Sandra 2011, Video Rendering (Direct3D 10.1 Devices), DDR3 1067MHz

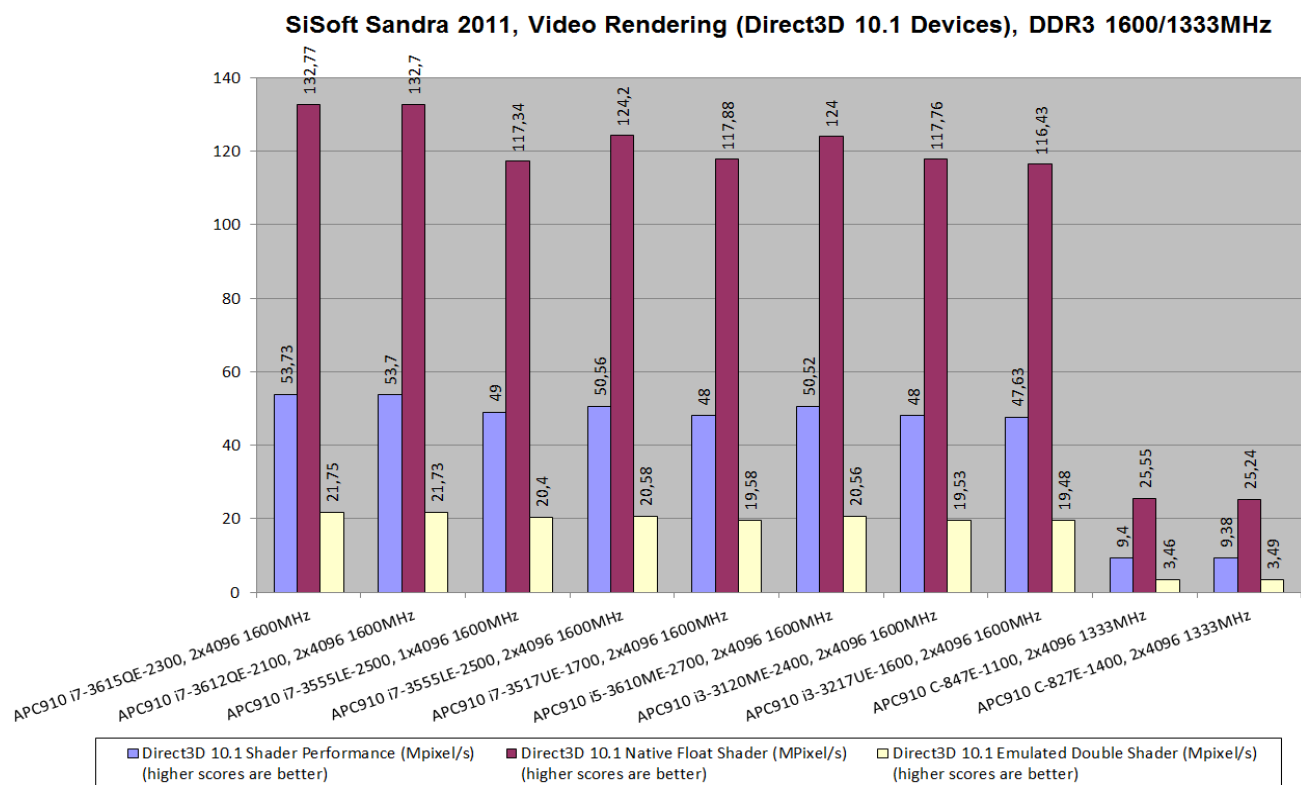


Figure 42: Results for SiSoft Sandra 2011, Video Rendering (Direct3D 10.1 Devices), DDR3 1600/1333MHz

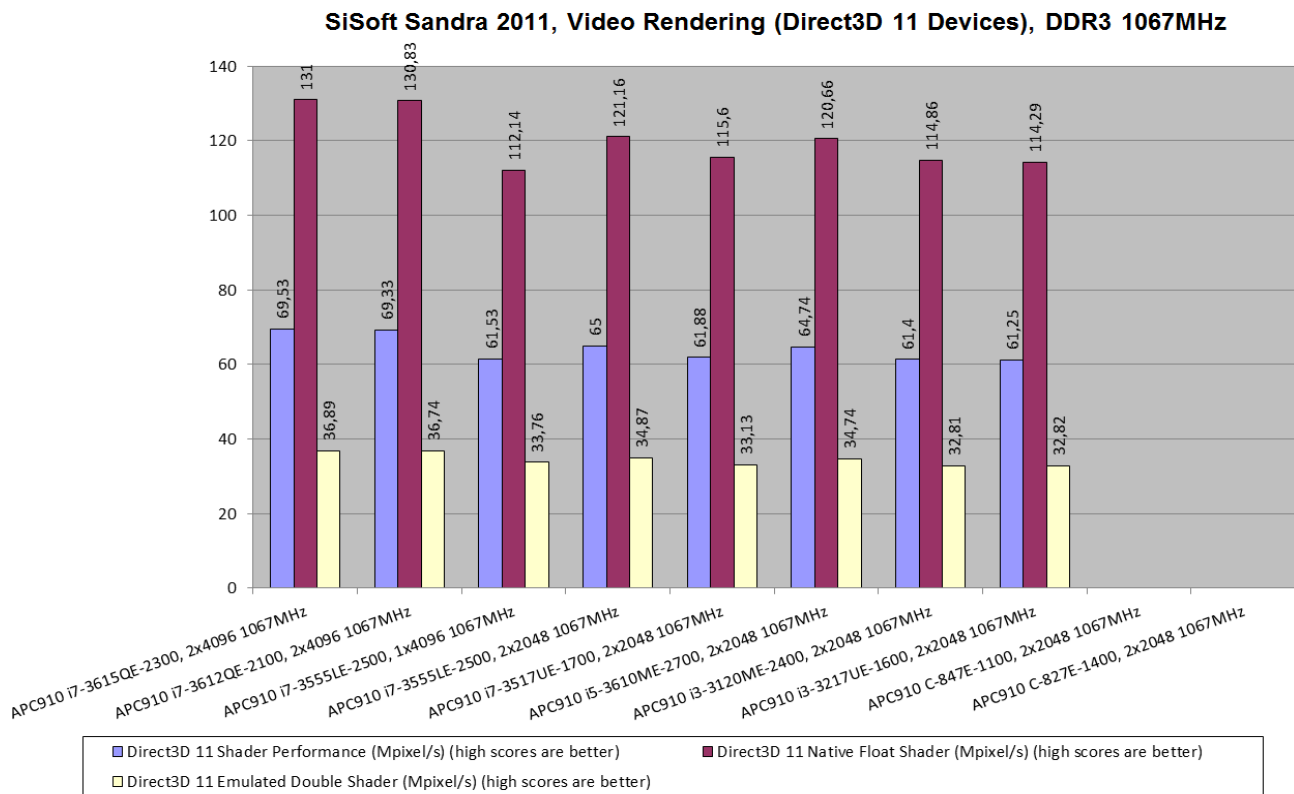


Figure 43: Results for SiSoft Sandra 2011, Video Rendering (Direct3D 11 Devices), DDR3 1067MHz

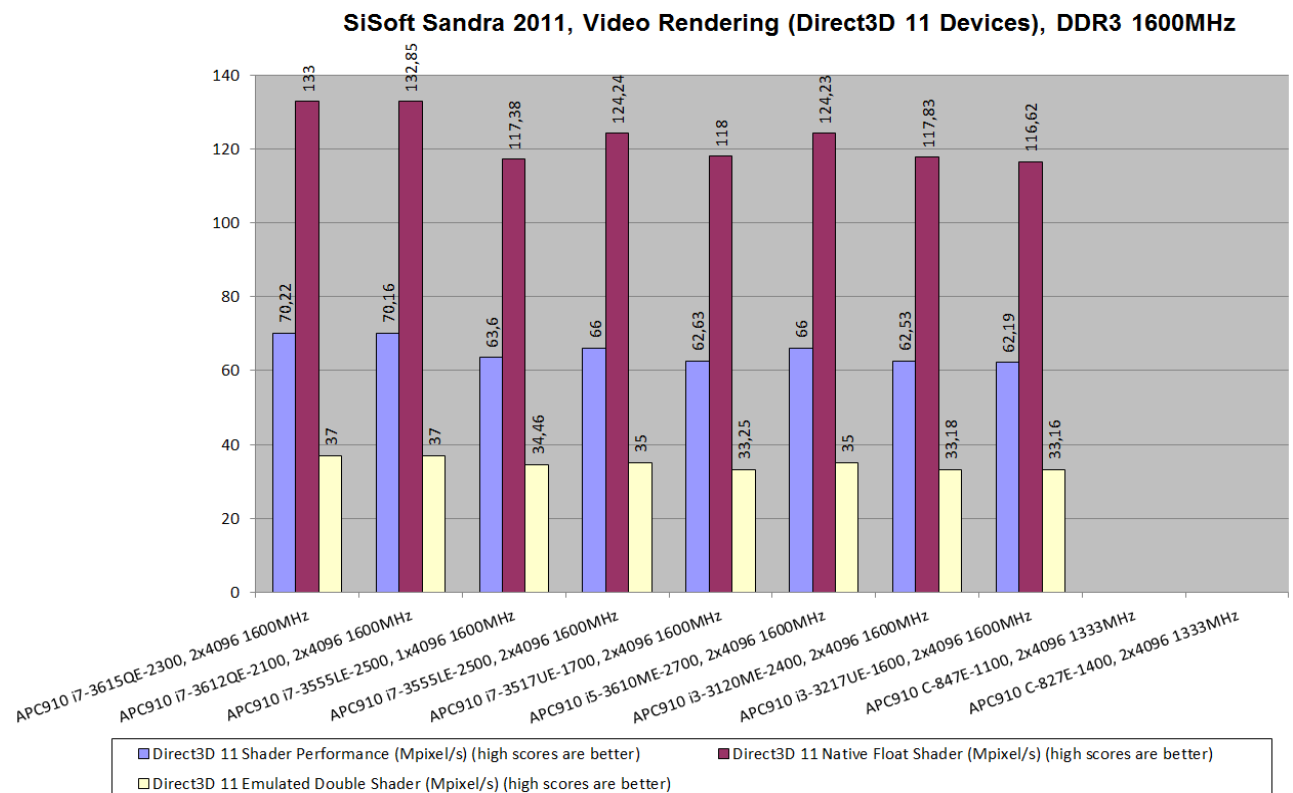


Figure 44: Results for SiSoft Sandra 2011, Video Rendering (Direct3D 11 Devices), DDR3 1600MHz

4.12.6 Video Memory Bandwidth

Benchmark the bandwidth of the memory of the video adapters (GFXs) and the bandwidth of the bus that connects them to your computer. Shows how your video adapters' memory bandwidth compares to other video sub-systems in terms of bandwidth.

Higher scores are better

		Direct3D 10			Direct3D 10.1		
#	Test device	Performance (GB/s)	Bandwidth internal Memory (GB/s)	Data Transfer (GB/s)	Performance (GB/s)	Bandwidth internal Memory (GB/s)	Data Transfer (GB/s)
APC910 with INTEL QM77 Chipset							
37	i7-3615QE 4C 2.3/1.6GHz 6MB 45W 2x4096MB DDR3-SODIMM 1067MHz	8,5	15,39	4,7	8,47	15,24	4,7
38	i7-3615QE 4C 2.3/1.6GHz 6MB 45W 2x4096MB DDR3-SODIMM 1600MHz	10,4	20,44	5,29	10,36	20,68	5,18
39	i7-3612QE 4C 2.1/1.6GHz 6MB 35W, 2x4096MB DDR3-SODIMM 1067MHz	8	14,14	4,46	8	14,22	4,44
40	i7-3612QE 4C 2.1/1.6GHz 6MB 35W, 2x4096MB DDR3-SODIMM 1600MHz	10,24	20,17	5,2	10,26	20,18	5,21
41	i7-3555LE 2C 2.5/1.6GHz 4MB 25W, 4096MB DDR3-SODIMM 1067MHz	4	6,86	2,3	4	6,85	2,33
42	i7-3555LE 2C 2.5/1.6GHz 4MB 25W, 4096MB DDR3-SODIMM 1600MHz	5,4	9	3,2	5,4	9,17	3,2
43	i7-3555LE 2C 2.5/1.6GHz 4MB 25W, 2x2048MB DDR3-SODIMM 1067MHz	7	12	4,17	7	12	4,13
44	i7-3555LE 2C 2.5/1.6GHz 4MB 25W, 2x4096MB DDR3-SODIMM 1600MHz	9	17,37	4,76	8,87	16,4	4,8
45	i7-3517UE 2C 1.7/1.6GHz 4MB 17W, 2x2048MB DDR3-SODIMM 1067MHz	7	12,17	4	7	12,2	4
46	i7-3517UE 2C 1.7/1.6GHz 4MB 17W, 2x4096MB DDR3-SODIMM 1600MHz	8,88	17	4,64	8,81	16,75	4,64
47	i5-3610ME 2C 2.7/1.6GHz 3MB 35W, 2x2048MB DDR3-SODIMM 1067MHz	7,12	12,15	4,17	7	12	4
48	i5-3610ME 2C 2.7/1.6GHz 3MB 35W, 2x4096MB DDR3-SODIMM 1600MHz	9	16,87	4,81	9,16	17	5
49	i3-3120ME 2C 2.4/1.6GHz 3MB 35W, 2x2048MB DDR3-SODIMM 1067MHz	7	12	4	6,9	12	4
50	i3-3120ME 2C 2.4/1.6GHz 3MB 35W, 2x4096MB DDR3-SODIMM 1600MHz	8,67	16,22	4,36	8,72	16,67	4,56
51	i3-3217UE 2C 1.6/1.6GHz 3MB 17W, 2x2048MB DDR3-SODIMM 1067MHz	6,52	11,3	3,77	6,5	11,3	3,74
52	i3-3217UE 2C 1.6/1.6GHz 3MB 17W, 2x4096MB DDR3-SODIMM 1600MHz	7,56	13,58	4,2	7,53	13,59	4,18
APC910 with INTEL HM76 Chipset							
53	C-847E 2C 1.1/1.3GHz 2MB 17W 2x2048MB DDR3-SODIMM 1067MHz	3,1	6,47	1,5	3,13	6,54	1,5
54	C-847E 2C 1.1/1.3GHz 2MB 17W 2x4096MB DDR3-SODIMM 1333MHz	3,17	6,63	1,52	3,16	6,62	1,51
55	C-827E 1C 1.4/1.3GHz 1.5MB 17W 2x2048MB DDR3-SODIMM 1067MHz	2,76	5,12	1,49	2,77	5,13	1,49
56	C-827E 1C 1.4/1.3GHz 1.5MB 17W 2x4096MB DDR3-SODIMM 1333MHz	2,82	5,23	1,52	2,82	5,25	1,52

Table 39: Results for SiSoft Sandra 2011, Video Memory Bandwidth (Direct3D 10/10.1 Devices)

Higher scores are better

#	Test device	Direct3D 11 Performance (GB/s)	Direct3D 11 Bandwidth internal Memory (GB/s)	Direct3D 11 Data Transfer (GB/s)
APC910 with INTEL QM77 Chipset				
37	i7-3615QE 4C 2.3/1.6GHz 6MB 45W 2x4096MB DDR3-SODIMM 1067MHz	8,68	15,4	4,9
38	i7-3615QE 4C 2.3/1.6GHz 6MB 45W 2x4096MB DDR3-SODIMM 1600MHz	10,52	20,44	5,4
39	i7-3612QE 4C 2.1/1.6GHz 6MB 35W, 2x4096MB DDR3-SODIMM 1067MHz	8	14,1	4,6
40	i7-3612QE 4C 2.1/1.6GHz 6MB 35W, 2x4096MB DDR3-SODIMM 1600MHz	10,39	20,15	5,35
41	i7-3555LE 2C 2.5/1.6GHz 4MB 25W, 4096MB DDR3-SODIMM 1067MHz	4	6,89	2,34
42	i7-3555LE 2C 2.5/1.6GHz 4MB 25W, 4096MB DDR3-SODIMM 1600MHz	5,47	9,2	3,2
43	i7-3555LE 2C 2.5/1.6GHz 4MB 25W, 2x2048MB DDR3-SODIMM 1067MHz	7,16	12	4,26
44	i7-3555LE 2C 2.5/1.6GHz 4MB 25W, 2x4096MB DDR3-SODIMM 1600MHz	9	16,46	4,89
45	i7-3517UE 2C 1.7/1.6GHz 4MB 17W, 2x2048MB DDR3-SODIMM 1067MHz	7	12,15	4,26
46	i7-3517UE 2C 1.7/1.6GHz 4MB 17W, 2x4096MB DDR3-SODIMM 1600MHz	9	16,86	4,7
47	i5-3610ME 2C 2.7/1.6GHz 3MB 35W, 2x2048MB DDR3-SODIMM 1067MHz	7,18	12,23	4,22
48	i5-3610ME 2C 2.7/1.6GHz 3MB 35W, 2x4096MB DDR3-SODIMM 1600MHz	9,14	16,83	5
49	i3-3120ME 2C 2.4/1.6GHz 3MB 35W, 2x2048MB DDR3-SODIMM 1067MHz	7	12	4
50	i3-3120ME 2C 2.4/1.6GHz 3MB 35W, 2x4096MB DDR3-SODIMM 1600MHz	8,77	16,6	4,63
51	i3-3217UE 2C 1.6/1.6GHz 3MB 17W, 2x2048MB DDR3-SODIMM 1067MHz	6,55	11,28	3,8
52	i3-3217UE 2C 1.6/1.6GHz 3MB 17W, 2x4096MB DDR3-SODIMM 1600MHz	7,68	13,59	4,34
APC910 with INTEL HM76 Chipset				
53	C-847E 2C 1.1/1.3GHz 2MB 17W 2x2048MB DDR3-SODIMM 1067MHz	3,14	6,56	1,49
54	C-847E 2C 1.1/1.3GHz 2MB 17W 2x4096MB DDR3-SODIMM 1333MHz	3,19	6,64	1,51
55	C-827E 1C 1.4/1.3GHz 1.5MB 17W 2x2048MB DDR3-SODIMM 1067MHz	2,8	5,14	1,52
56	C-827E 1C 1.4/1.3GHz 1.5MB 17W 2x4096MB DDR3-SODIMM 1333MHz	2,84	5,28	1,52

Table 40: Results SiSoft Sandra 2011, Video Memory Bandwidth (Direct3D 11 Devices)

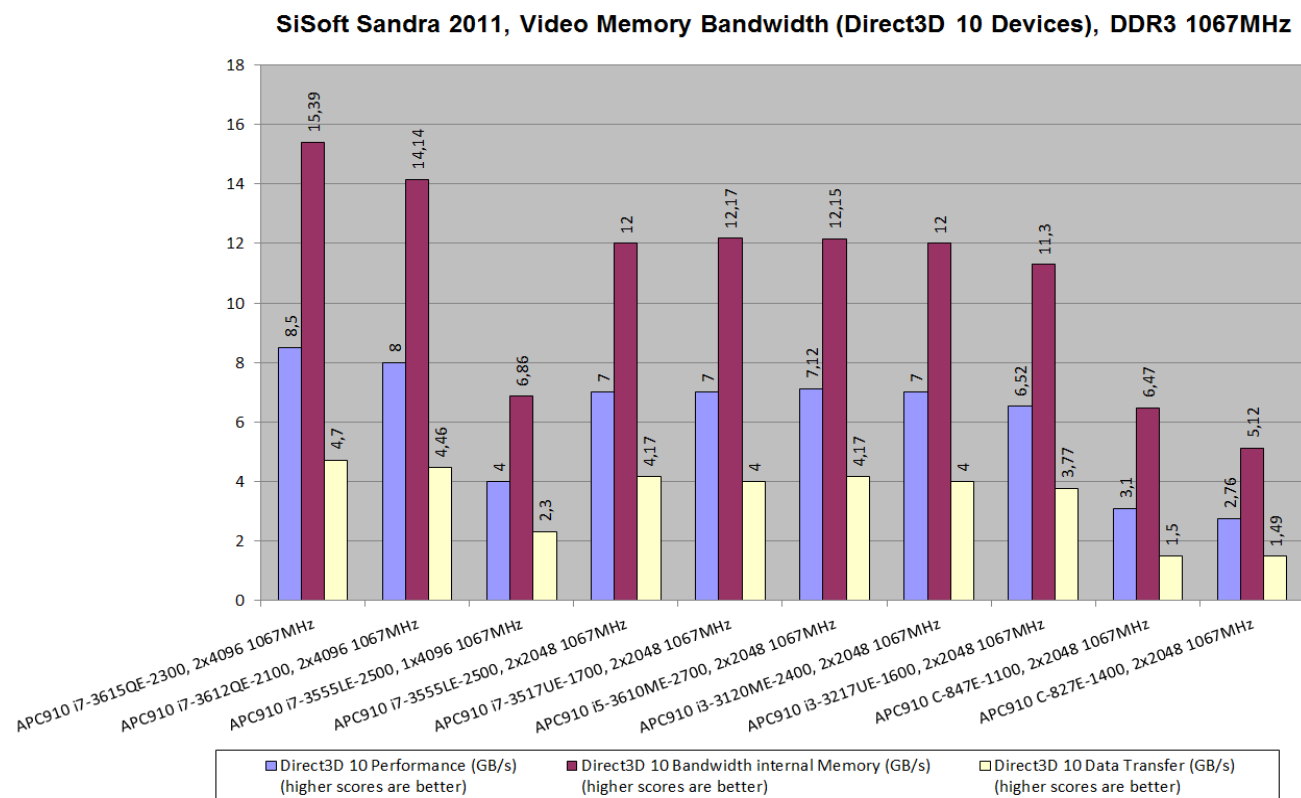


Figure 45: Results for SiSoft Sandra 2011, Video Memory Bandwidth (Direct3D 10 Devices), DDR3 1067MHz

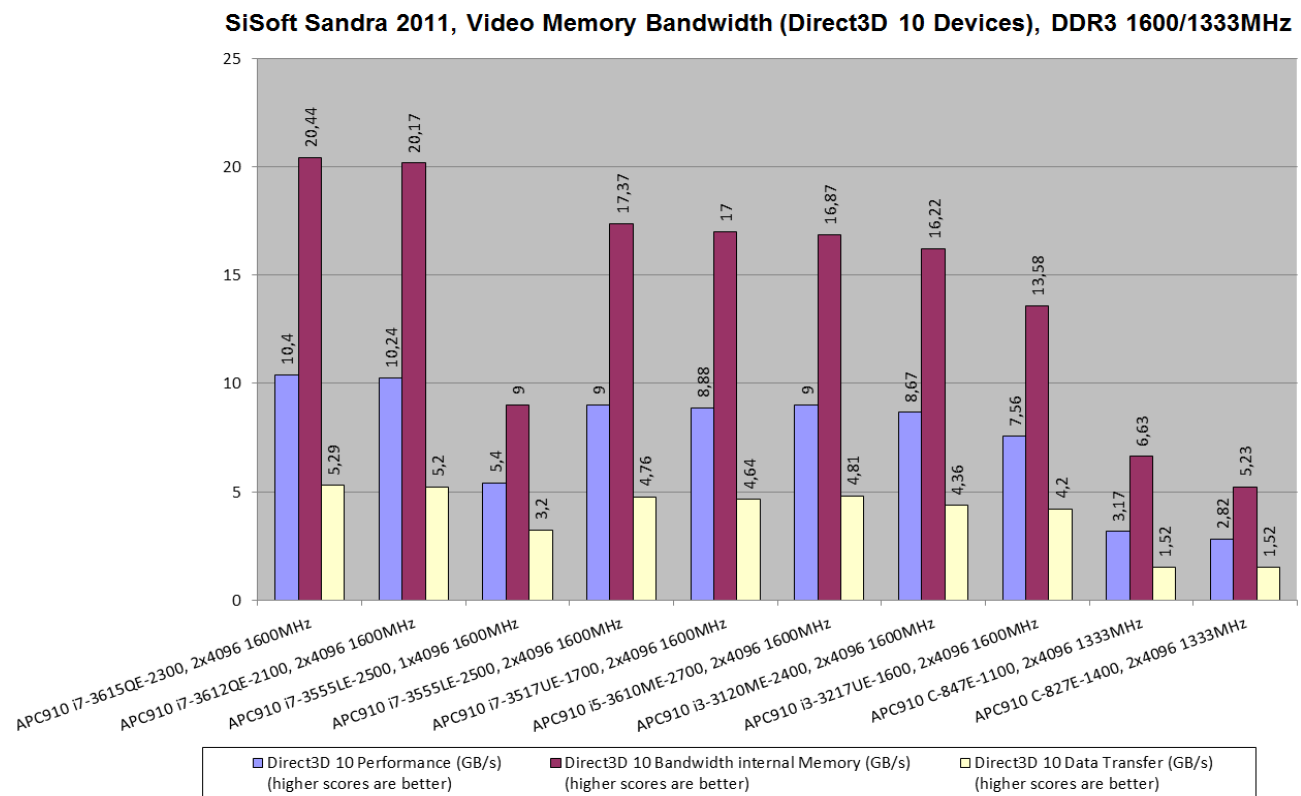


Figure 46: Results for SiSoft Sandra 2011, Video Memory Bandwidth (Direct3D 10 Devices), DDR3 1600/1333MHz

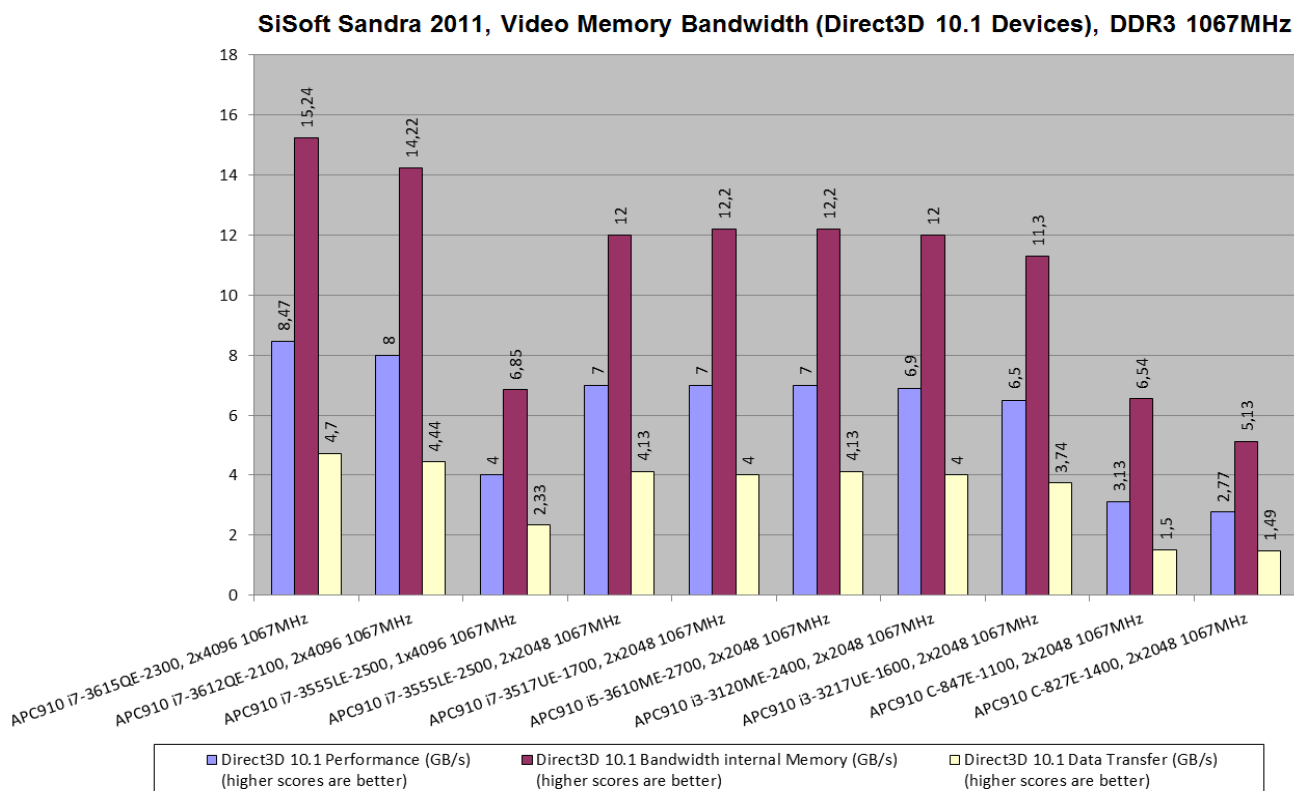


Figure 47: Results SiSoft Sandra 2011, Video Memory Bandwidth (Direct3D 10.1 Devices), DDR3 1067MHz

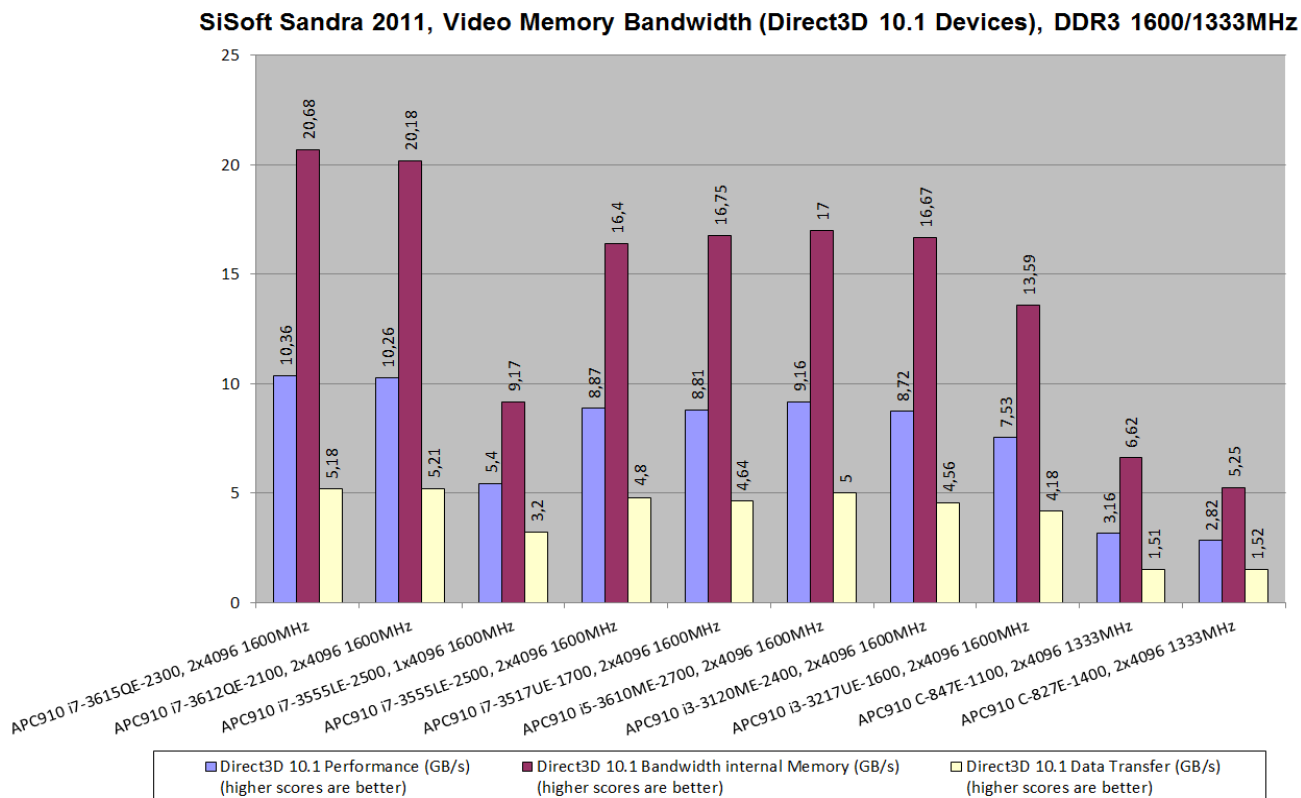


Figure 48: Results for SiSoft Sandra 2011, Video Memory Bandwidth (Direct3D 10.1 Devices), DDR3 1600/1333MHz

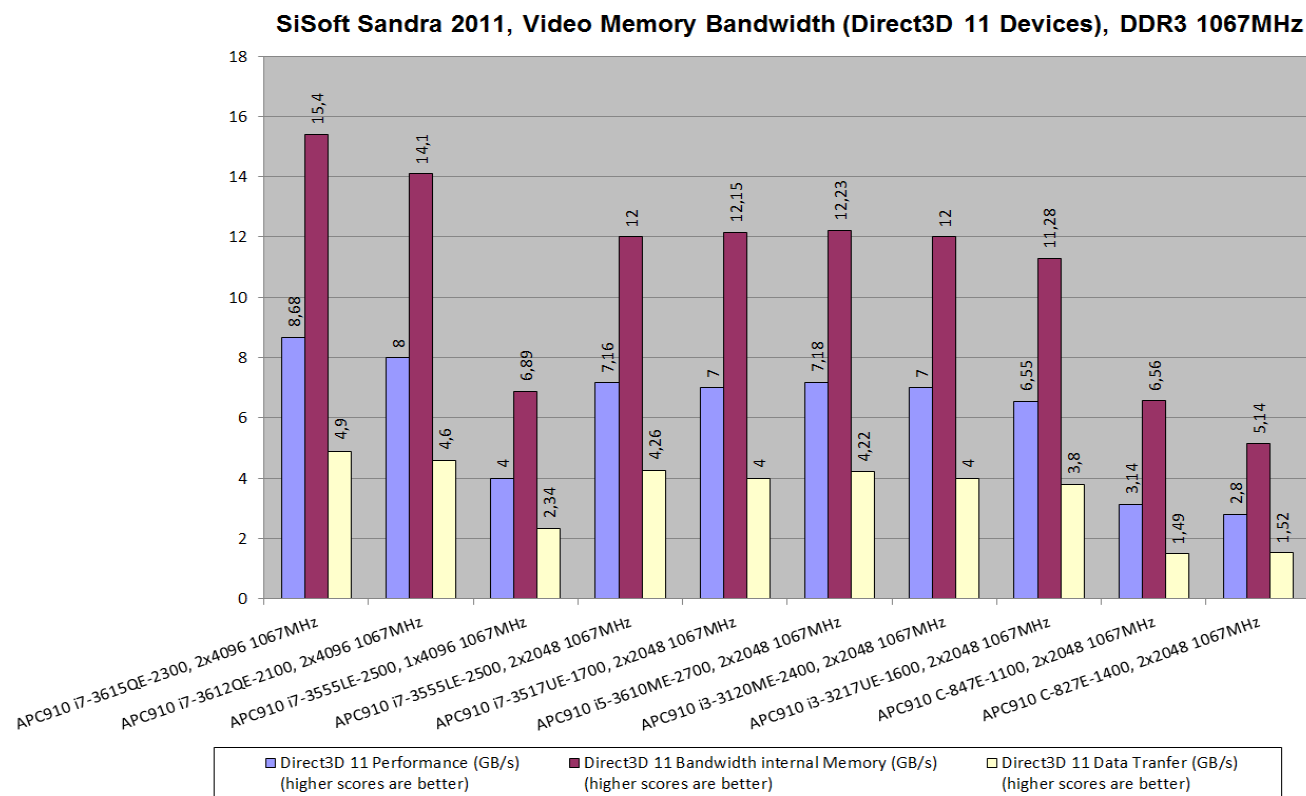


Figure 49: Results for SiSoft Sandra 2011, Video Memory Bandwidth (Direct3D 11 Devices), DDR3 1067MHz

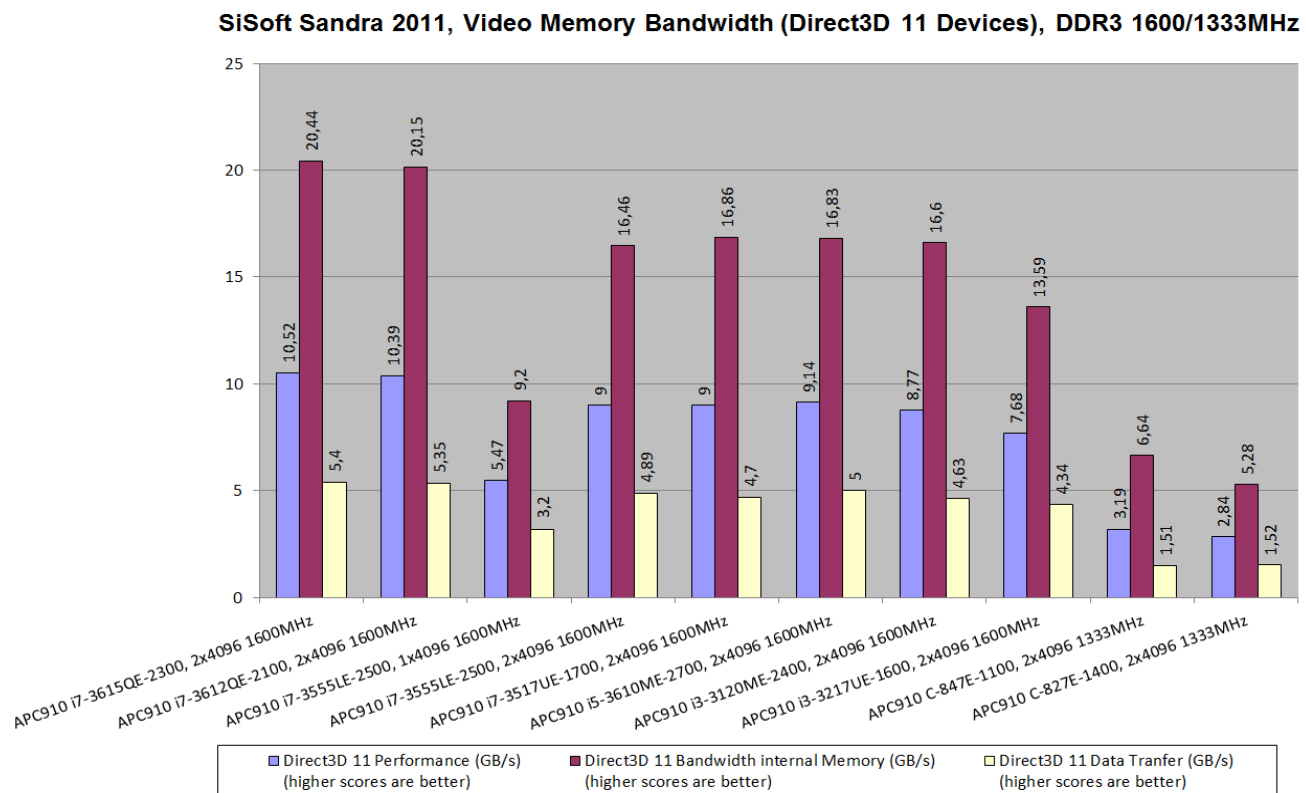


Figure 50: Results for SiSoft Sandra 2011, Video Memory Bandwidth (Direct3D 11 Devices), DDR3 1600/1333MHz

4.12.7 Memory Bandwidth

Benchmark the memory bandwidth of your computer. Shows how your memory sub-systems compare to other computers in terms of bandwidth.

Higher scores are better

#	Test device	Memory Performance (GB/s)	Integer B/F iAVX/128 Memory Bandwidth (GB/s)	Float B/F iAVX/128 Memory Bandwidth (GB/s)
APC910 with INTEL QM77 Chipset				
37	i7-3615QE 4C 2.3/1.6GHz 6MB 45W 2x4096MB DDR3-SODIMM 1067MHz	14,18	14,18	14,19
38	i7-3615QE 4C 2.3/1.6GHz 6MB 45W 2x4096MB DDR3-SODIMM 1600MHz	20,1	20,1	20,1
39	i7-3612QE 4C 2.1/1.6GHz 6MB 35W, 2x4096MB DDR3-SODIMM 1067MHz	13,39	13,39	13,39
40	i7-3612QE 4C 2.1/1.6GHz 6MB 35W, 2x4096MB DDR3-SODIMM 1600MHz	20	20	20
41	i7-3555LE 2C 2.5/1.6GHz 4MB 25W, 4096MB DDR3-SODIMM 1067MHz	7,23	7,22	7,24
42	i7-3555LE 2C 2.5/1.6GHz 4MB 25W, 4096MB DDR3-SODIMM 1600MHz	10,66	10,66	10,66
43	i7-3555LE 2C 2.5/1.6GHz 4MB 25W, 2x2048MB DDR3-SODIMM 1067MHz	13,4	13,42	13,38
44	i7-3555LE 2C 2.5/1.6GHz 4MB 25W, 2x4096MB DDR3-SODIMM 1600MHz	20,27	20,25	20,28
45	i7-3517UE 2C 1.7/1.6GHz 4MB 17W, 2x2048MB DDR3-SODIMM 1067MHz	13,42	13,41	13,43
46	i7-3517UE 2C 1.7/1.6GHz 4MB 17W, 2x4096MB DDR3-SODIMM 1600MHz	20,19	20,2	20,19
47	i5-3610ME 2C 2.7/1.6GHz 3MB 35W, 2x2048MB DDR3-SODIMM 1067MHz	13,38	13,36	13,4
48	i5-3610ME 2C 2.7/1.6GHz 3MB 35W, 2x4096MB DDR3-SODIMM 1600MHz	20,28	20,28	20,27
49	i3-3120ME 2C 2.4/1.6GHz 3MB 35W, 2x2048MB DDR3-SODIMM 1067MHz	13,3	13,3	13,3
50	i3-3120ME 2C 2.4/1.6GHz 3MB 35W, 2x4096MB DDR3-SODIMM 1600MHz	19,72	19,75	19,68
51	i3-3217UE 2C 1.6/1.6GHz 3MB 17W, 2x2048MB DDR3-SODIMM 1067MHz	13	13	13
52	i3-3217UE 2C 1.6/1.6GHz 3MB 17W, 2x4096MB DDR3-SODIMM 1600MHz	15,73	16	15,42
		Memory Performance (GB/s)	Integer B/F iSSE2 Memory Bandwidth (GB/s)	Float B/F iSSE2 Memory Bandwidth (GB/s)
APC910 with INTEL HM76 Chipset				
53	C-847E 2C 1.1/1.3GHz 2MB 17W 2x2048MB DDR3-SODIMM 1067MHz	10	10	10
54	C-847E 2C 1.1/1.3GHz 2MB 17W 2x4096MB DDR3-SODIMM 1333MHz	10,26	10,26	10,26
55	C-827E 1C 1.4/1.3GHz 1.5MB 17W 2x2048MB DDR3-SODIMM 1067MHz	6,28	6,28	6,27
56	C-827E 1C 1.4/1.3GHz 1.5MB 17W 2x4096MB DDR3-SODIMM 1333MHz	6,38	6,37	6,38

Table 41: Results for SiSoft Sandra 2011, Memory Bandwidth

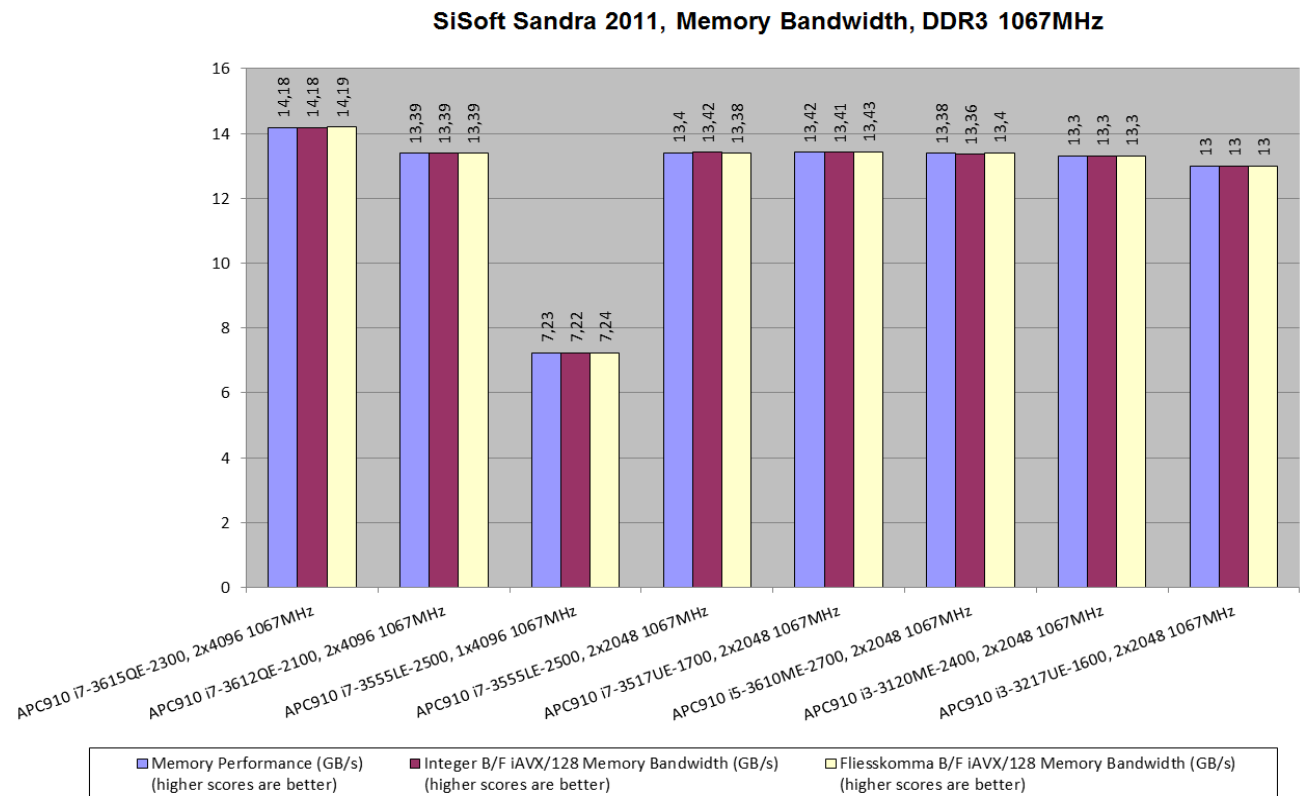


Figure 51: Results for SiSoft Sandra 2011, Memory Bandwidth (QM77 Chipset), DDR3 1067MHz

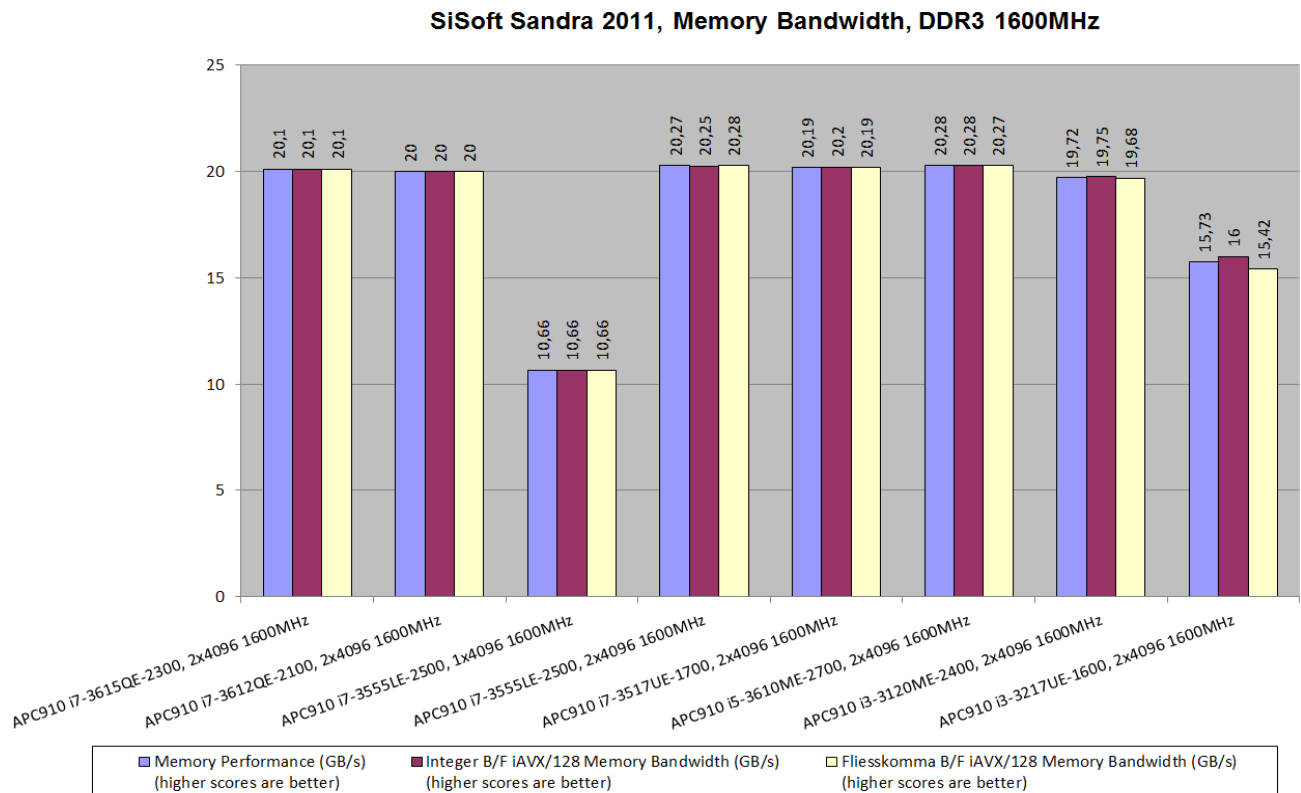


Figure 52: Results for SiSoft Sandra 2011, Memory Bandwidth (QM77 Chipset), DDR3 1600MHz

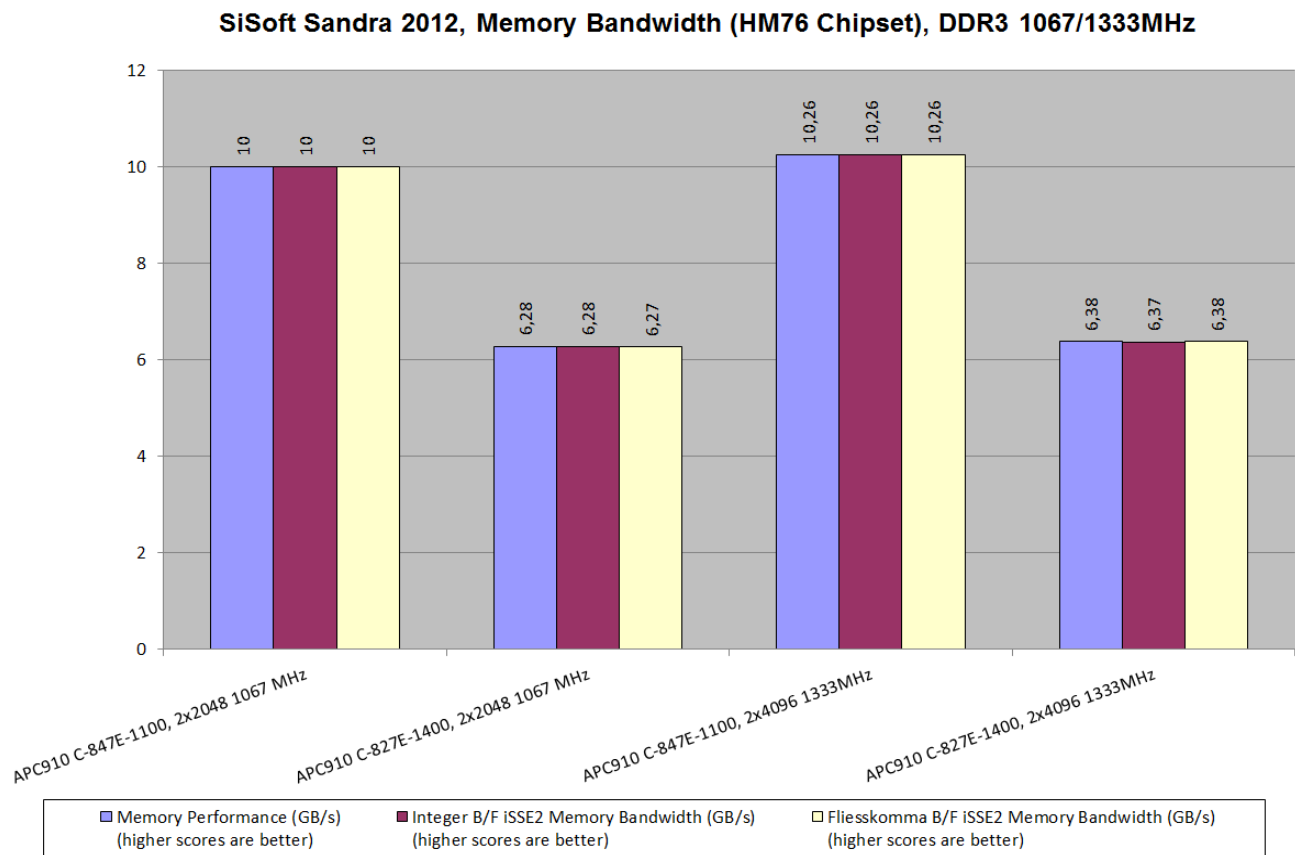


Figure 53: Results for SiSoft Sandra 2011, Memory Bandwidth (HM76 Chipset), DDR3 1067/1333MHz

4.12.8 Memory Latency

Benchmark the latency (response time) of processors' caches and memory. Shows how your processors' caches and memory sub-systems compare to other computers in terms of latency. The latency of caches is measured in processor clocks (i.e. how many clocks it takes for the data to be ready) as it is dependent on the processor clock speed. The latency of memory is measured in nanoseconds as it is typically independent on processor clock speed.

Lower scores are better

#	Test device	CPU1 Memory Latency Random (ns)	CPU1 Speed Factor Random (ns)	CPU1 Memory Latency Linear (ns)	CPU1 Speed Factor Linear (ns)
APC910 with INTEL QM77 Chipset					
37	i7-3615QE 4C 2.3/1.6GHz 6MB 45W 2x4096MB DDR3-SODIMM 1067MHz	92,2	74,1	6,2	5
38	i7-3615QE 4C 2.3/1.6GHz 6MB 45W 2x4096MB DDR3-SODIMM 1600MHz	81,4	65,3	5,7	4,6
39	i7-3612QE 4C 2.1/1.6GHz 6MB 35W, 2x4096MB DDR3-SODIMM 1067MHz	91,2	68,5	6,5	4,9
40	i7-3612QE 4C 2.1/1.6GHz 6MB 35W, 2x4096MB DDR3-SODIMM 1600MHz	82,2	62,2	5,9	4,5
41	i7-3555LE 2C 2.5/1.6GHz 4MB 25W, 4096MB DDR3-SODIMM 1067MHz	85,4	66,7	8,5	6,6
42	i7-3555LE 2C 2.5/1.6GHz 4MB 25W, 4096MB DDR3-SODIMM 1600MHz	80,7	61	6,4	4,8
43	i7-3555LE 2C 2.5/1.6GHz 4MB 25W, 2x2048MB DDR3-SODIMM 1067MHz	88,6	69,2	6,1	4,8
44	i7-3555LE 2C 2.5/1.6GHz 4MB 25W, 2x4096MB DDR3-SODIMM 1600MHz	83,8	63,8	5,9	4,4
45	i7-3517UE 2C 1.7/1.6GHz 4MB 17W, 2x2048MB DDR3-SODIMM 1067MHz	97	63,5	7	4,6
46	i7-3517UE 2C 1.7/1.6GHz 4MB 17W, 2x4096MB DDR3-SODIMM 1600MHz	86,8	57,2	6,5	4,3
47	i5-3610ME 2C 2.7/1.6GHz 3MB 35W, 2x2048MB DDR3-SODIMM 1067MHz	92,9	72,3	6,2	4,8
48	i5-3610ME 2C 2.7/1.6GHz 3MB 35W, 2x4096MB DDR3-SODIMM 1600MHz	79,7	64,6	5,5	4,5
49	i3-3120ME 2C 2.4/1.6GHz 3MB 35W, 2x2048MB DDR3-SODIMM 1067MHz	93,1	61	6,9	4,5
50	i3-3120ME 2C 2.4/1.6GHz 3MB 35W, 2x4096MB DDR3-SODIMM 1600MHz	87,9	55,1	6,7	4,2
51	i3-3217UE 2C 1.6/1.6GHz 3MB 17W, 2x2048MB DDR3-SODIMM 1067MHz	106,3	42,4	10	4
52	i3-3217UE 2C 1.6/1.6GHz 3MB 17W, 2x4096MB DDR3-SODIMM 1600MHz	112,3	41,1	10,5	3,9
APC910 with INTEL HM76 Chipset					
53	C-847E 2C 1.1/1.3GHz 2MB 17W 2x2048MB DDR3-SODIMM 1067MHz	125,7	34,3	16,8	4,6
54	C-847E 2C 1.1/1.3GHz 2MB 17W 2x4096MB DDR3-SODIMM 1333MHz	132,2	36,1	16,8	4,6
55	C-827E 1C 1.4/1.3GHz 1.5MB 17W 2x2048MB DDR3-SODIMM 1067MHz	121,7	37,8	15,6	4,8
56	C-827E 1C 1.4/1.3GHz 1.5MB 17W 2x4096MB DDR3-SODIMM 1333MHz	117,2	36,2	15,2	4,7

Table 42: Results for SiSoft Sandra 2011, Memory Latency CPU1

Benchmark test Industrial PCs

#	Test device	CPU2 Memory Latency Random (ns)	CPU2 Speed Factor Random (ns)	CPU2 Memory Latency Linear (ns)	CPU2 Speed Factor Linear (ns)
APC910 with INTEL QM77 Chipset					
37	i7-3615QE 4C 2.3/1.6GHz 6MB 45W 2x4096MB DDR3-SODIMM 1067MHz	92,2	74,1	6,2	5
38	i7-3615QE 4C 2.3/1.6GHz 6MB 45W 2x4096MB DDR3-SODIMM 1600MHz	81,3	65,4	5,6	4,5
39	i7-3612QE 4C 2.1/1.6GHz 6MB 35W, 2x4096MB DDR3-SODIMM 1067MHz	91	68,3	6,4	4,8
40	i7-3612QE 4C 2.1/1.6GHz 6MB 35W, 2x4096MB DDR3-SODIMM 1600MHz	82	62,2	5,9	4,4
41	i7-3555LE 2C 2.5/1.6GHz 4MB 25W, 4096MB DDR3-SODIMM 1067MHz	89,3	67,5	8,7	6,5
42	i7-3555LE 2C 2.5/1.6GHz 4MB 25W, 4096MB DDR3-SODIMM 1600MHz	80,6	61	6,3	4,8
43	i7-3555LE 2C 2.5/1.6GHz 4MB 25W, 2x2048MB DDR3-SODIMM 1067MHz	88,7	69,4	6,1	4,7
44	i7-3555LE 2C 2.5/1.6GHz 4MB 25W, 2x4096MB DDR3-SODIMM 1600MHz	83,8	63,8	5,8	4,4
45	i7-3517UE 2C 1.7/1.6GHz 4MB 17W, 2x2048MB DDR3-SODIMM 1067MHz	96,9	63,3	6,9	4,5
46	i7-3517UE 2C 1.7/1.6GHz 4MB 17W, 2x4096MB DDR3-SODIMM 1600MHz	86,8	57,1	6,4	4,2
47	i5-3610ME 2C 2.7/1.6GHz 3MB 35W, 2x2048MB DDR3-SODIMM 1067MHz	92,8	71,6	6,2	4,8
48	i5-3610ME 2C 2.7/1.6GHz 3MB 35W, 2x4096MB DDR3-SODIMM 1600MHz	83,5	64,9	5,7	4,4
49	i3-3120ME 2C 2.4/1.6GHz 3MB 35W, 2x2048MB DDR3-SODIMM 1067MHz	93,1	61,1	6,8	4,4
50	i3-3120ME 2C 2.4/1.6GHz 3MB 35W, 2x4096MB DDR3-SODIMM 1600MHz	87,8	55,6	6,7	4,1
51	i3-3217UE 2C 1.6/1.6GHz 3MB 17W, 2x2048MB DDR3-SODIMM 1067MHz	116,5	43	10,7	3,9
52	i3-3217UE 2C 1.6/1.6GHz 3MB 17W, 2x4096MB DDR3-SODIMM 1600MHz	111,3	41	10,4	3,8
APC910 with INTEL HM76 Chipset					
53	C-847E 2C 1.1/1.3GHz 2MB 17W 2x2048MB DDR3-SODIMM 1067MHz	140,9	35,4	18,3	4,6
54	C-847E 2C 1.1/1.3GHz 2MB 17W 2x4096MB DDR3-SODIMM 1333MHz	133,8	32,8	18,4	4,5
55	C-827E 1C 1.4/1.3GHz 1.5MB 17W 2x2048MB DDR3-SODIMM 1067MHz	-	-	-	-
56	C-827E 1C 1.4/1.3GHz 1.5MB 17W 2x4096MB DDR3-SODIMM 1333MHz	-	-	-	-

Table 43: Results for SiSoft Sandra 2011, Memory Latency CPU2

SiSoft Sandra 2011, Memory Latency CPU 1, DDR3 1067MHz

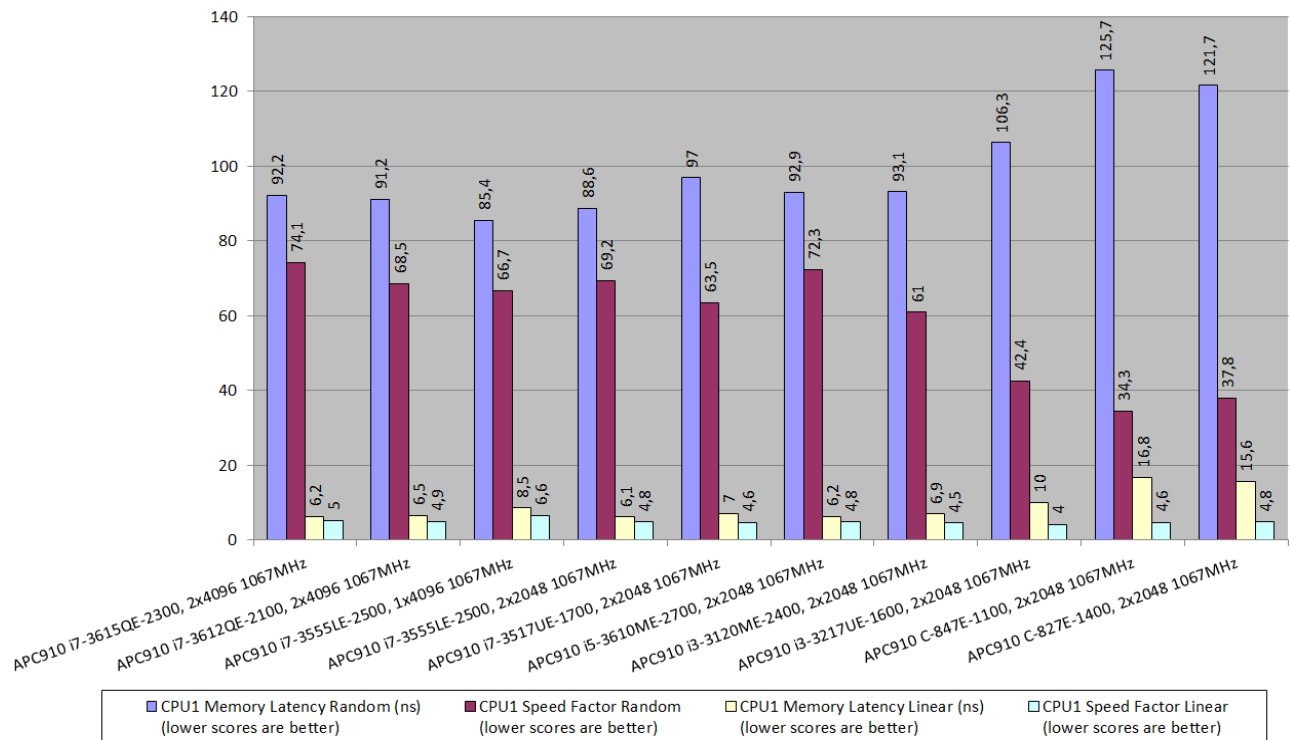


Figure 54: Results for SiSoft Sandra 2011, Memory Latency CPU1, DDR3 1067MHz

SiSoft Sandra 2011, Memory Latency CPU 1, DDR3 1600/1333MHz

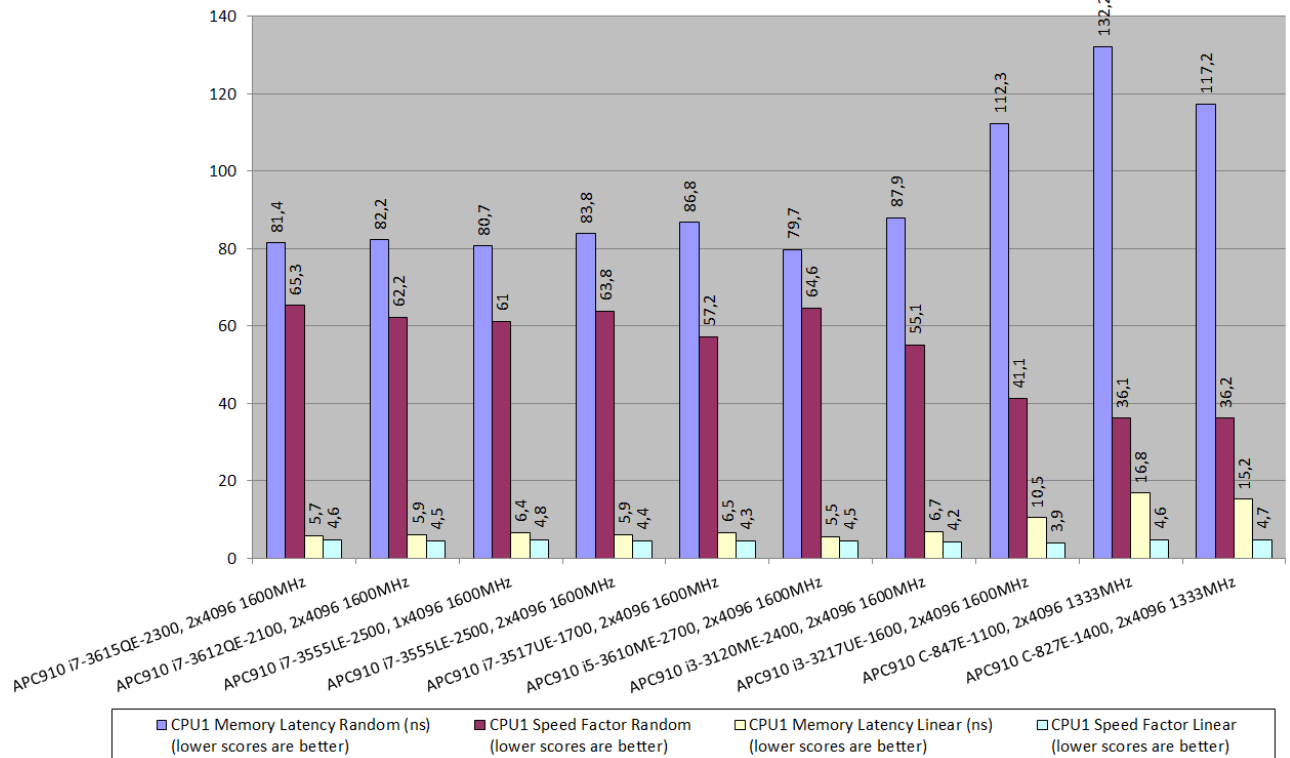


Figure 55: Results for SiSoft Sandra 2011, Memory Latency CPU1, DDR3 1600/1333MHz

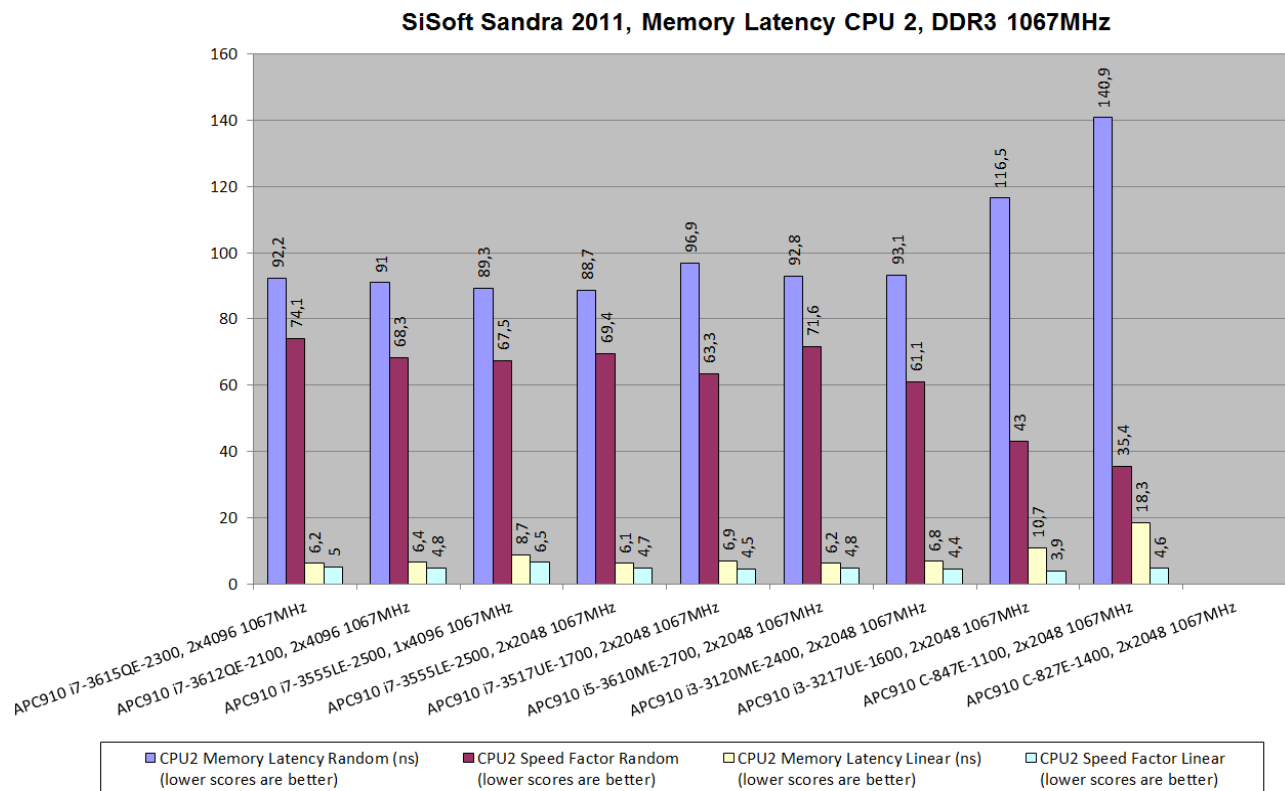


Figure 56: Results for SiSoft Sandra 2011, Memory Latency CPU2, DDR3 1067MHz

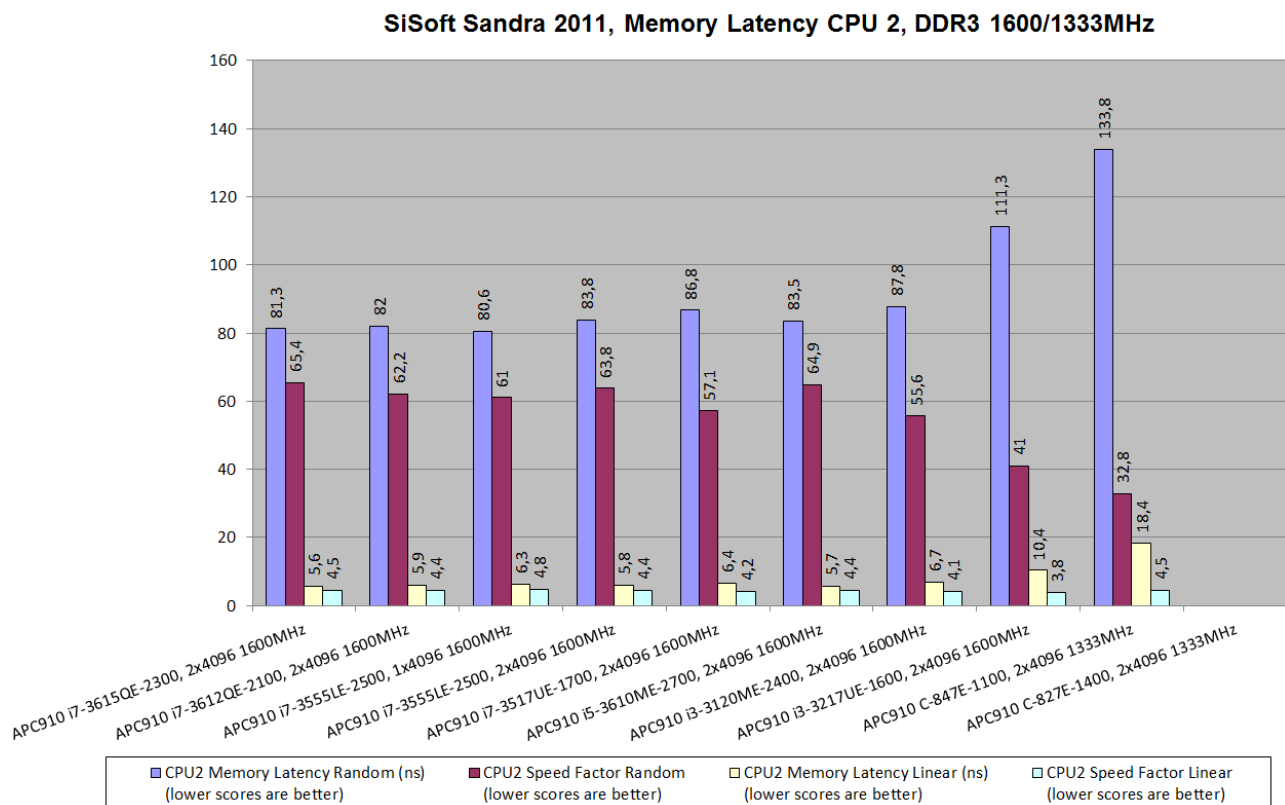


Figure 57: Results for SiSoft Sandra 2011, Memory Latency CPU2, DDR3 1600/1333MHz

4.12.9 Cache and Memory

Benchmark the processors' caches and memory access (transfer speed). Shows how your processors' caches and memory sub-systems compare to other computers in terms of access.

#	Test device	Cache/Memory Bandwidth (GB/s) (higher scores are better)	Speed Factor (lower scores are better)
APC910 with INTEL QM77 Chipset			
37	i7-3615QE 4C 2.3/1.6GHz 6MB 45W 2x4096MB DDR3-SODIMM 1067MHz	87,8	42,8
38	i7-3615QE 4C 2.3/1.6GHz 6MB 45W 2x4096MB DDR3-SODIMM 1600MHz	101	30,1
39	i7-3612QE 4C 2.1/1.6GHz 6MB 35W, 2x4096MB DDR3-SODIMM 1067MHz	80,23	41,4
40	i7-3612QE 4C 2.1/1.6GHz 6MB 35W, 2x4096MB DDR3-SODIMM 1600MHz	94,9	27,3
41	i7-3555LE 2C 2.5/1.6GHz 4MB 25W, 4096MB DDR3-SODIMM 1067MHz	40,63	41,2
42	i7-3555LE 2C 2.5/1.6GHz 4MB 25W, 4096MB DDR3-SODIMM 1600MHz	47,58	27,8
43	i7-3555LE 2C 2.5/1.6GHz 4MB 25W, 2x2048MB DDR3-SODIMM 1067MHz	51,65	22,6
44	i7-3555LE 2C 2.5/1.6GHz 4MB 25W, 2x4096MB DDR3-SODIMM 1600MHz	60,44	15,2
45	i7-3517UE 2C 1.7/1.6GHz 4MB 17W, 2x2048MB DDR3-SODIMM 1067MHz	47,16	19,6
46	i7-3517UE 2C 1.7/1.6GHz 4MB 17W, 2x4096MB DDR3-SODIMM 1600MHz	55	13,4
47	i5-3610ME 2C 2.7/1.6GHz 3MB 35W, 2x2048MB DDR3-SODIMM 1067MHz	50,78	23,3
48	i5-3610ME 2C 2.7/1.6GHz 3MB 35W, 2x4096MB DDR3-SODIMM 1600MHz	60,24	15,7
49	i3-3120ME 2C 2.4/1.6GHz 3MB 35W, 2x2048MB DDR3-SODIMM 1067MHz	45	19
50	i3-3120ME 2C 2.4/1.6GHz 3MB 35W, 2x4096MB DDR3-SODIMM 1600MHz	52,82	13
51	i3-3217UE 2C 1.6/1.6GHz 3MB 17W, 2x2048MB DDR3-SODIMM 1067MHz	34	12,5
52	i3-3217UE 2C 1.6/1.6GHz 3MB 17W, 2x4096MB DDR3-SODIMM 1600MHz	38,58	9,3
APC910 with INTEL HM76 Chipset			
53	C-847E 2C 1.1/1.3GHz 2MB 17W 2x2048MB DDR3-SODIMM 1067MHz	23,8	9,5
54	C-847E 2C 1.1/1.3GHz 2MB 17W 2x4096MB DDR3-SODIMM 1333MHz	14,48	9,1
55	C-827E 1C 1.4/1.3GHz 1.5MB 17W 2x2048MB DDR3-SODIMM 1067MHz	24,36	8,8
56	C-827E 1C 1.4/1.3GHz 1.5MB 17W 2x4096MB DDR3-SODIMM 1333MHz	14,33	8,9

Table 44: Results for SiSoft Sandra 2011, Cache and Memory

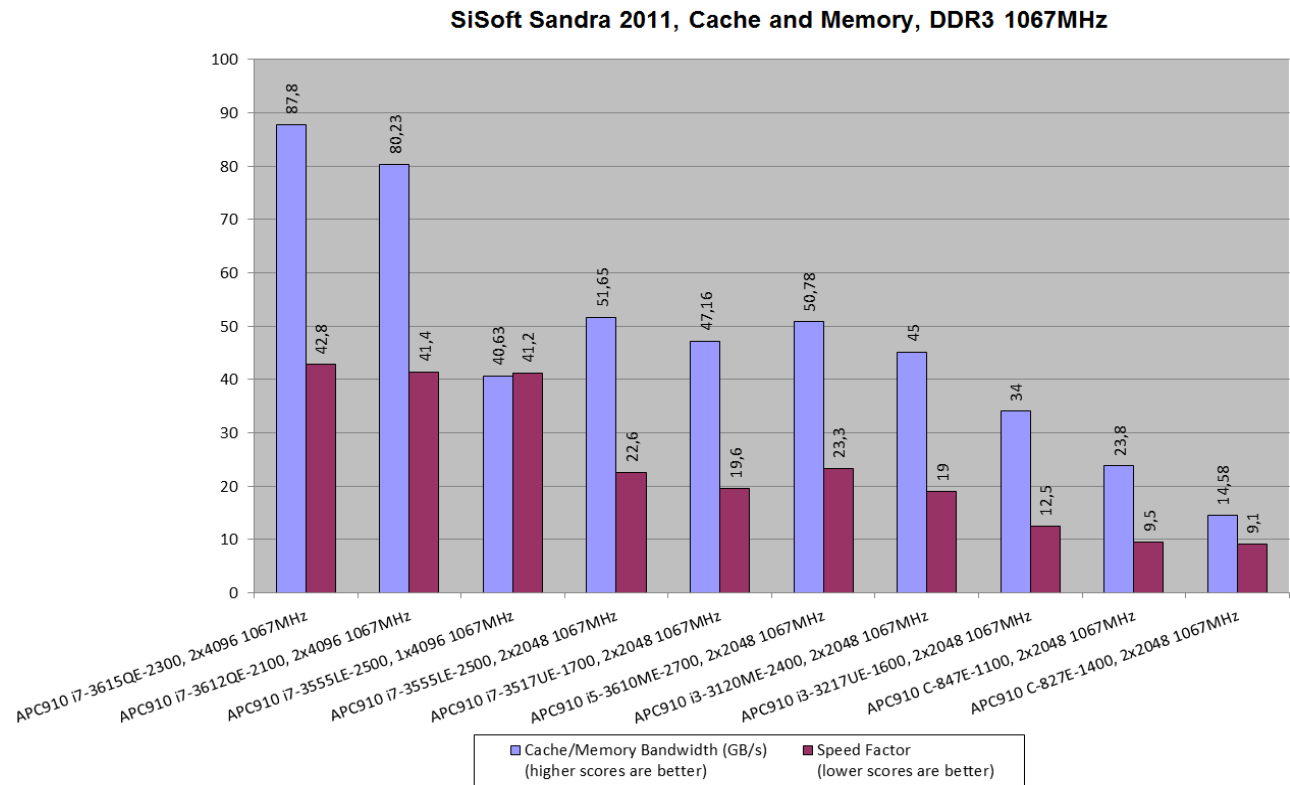


Figure 58: Results for SiSoft Sandra 2011, Cache and Memory, DDR3 1067MHz

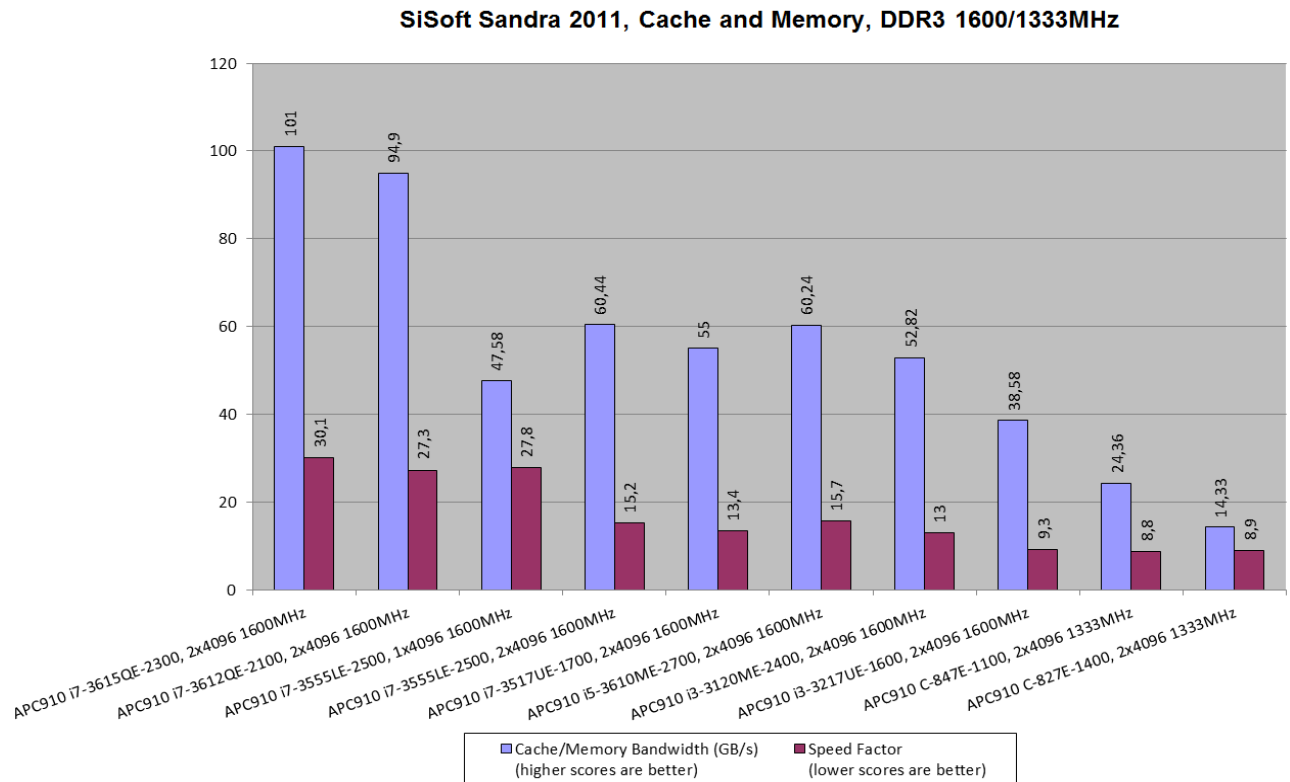


Figure 59: Results for SiSoft Sandra 2011, Cache and Memory, DDR3 1600/1333MHz

4.13 Passmark Performance Test 7.0

4.13.1 Passmark Rating

The PassMark rating is weighted average of all the other test results and gives a single overall indication of the computers performance. The bigger the number, the faster the computer. The PassMark rating can only be calculated if the results from all other tests are available. The value is calculated using a series of weighted averages where some components are considered to be more important than others: Disk 21%, CD/DVD 5%, Memory 19%, 3D Graphics 12%, 2D Graphics 14% and CPU 29%.

Higher scores are better

#	Test device	Passmark Rating
APC810 with INTEL GM45 Chipset		
30	Core 2 Duo 2,53 GHz, 2x2048MB DDR3-SODIMM	979,6
APC910 with INTEL QM77 Chipset		
37	i7-3615QE 4C 2.3/1.6GHz 6MB 45W 2x4096MB DDR3-SODIMM 1067MHz	2255,4
38	i7-3615QE 4C 2.3/1.6GHz 6MB 45W 2x4096MB DDR3-SODIMM 1600MHz	2299,3
39	i7-3612QE 4C 2.1/1.6GHz 6MB 35W, 2x4096MB DDR3-SODIMM 1067MHz	1940,8
40	i7-3612QE 4C 2.1/1.6GHz 6MB 35W, 2x4096MB DDR3-SODIMM 1600MHz	2156,8
41	i7-3555LE 2C 2.5/1.6GHz 4MB 25W, 4096MB DDR3-SODIMM 1067MHz	1508,6
42	i7-3555LE 2C 2.5/1.6GHz 4MB 25W, 4096MB DDR3-SODIMM 1600MHz	1644,6
43	i7-3555LE 2C 2.5/1.6GHz 4MB 25W, 2x2048MB DDR3-SODIMM 1067MHz	1670,4
44	i7-3555LE 2C 2.5/1.6GHz 4MB 25W, 2x4096MB DDR3-SODIMM 1600MHz	1836,8
45	i7-3517UE 2C 1.7/1.6GHz 4MB 17W, 2x2048MB DDR3-SODIMM 1067MHz	1490,2
46	i7-3517UE 2C 1.7/1.6GHz 4MB 17W, 2x4096MB DDR3-SODIMM 1600MHz	1640,8
47	i5-3610ME 2C 2.7/1.6GHz 3MB 35W, 2x2048MB DDR3-SODIMM 1067MHz	1706,9
48	i5-3610ME 2C 2.7/1.6GHz 3MB 35W, 2x4096MB DDR3-SODIMM 1600MHz	1889
49	i3-3120ME 2C 2.4/1.6GHz 3MB 35W, 2x2048MB DDR3-SODIMM 1067MHz	1487,7
50	i3-3120ME 2C 2.4/1.6GHz 3MB 35W, 2x4096MB DDR3-SODIMM 1600MHz	1641,5
51	i3-3217UE 2C 1.6/1.6GHz 3MB 17W, 2x2048MB DDR3-SODIMM 1067MHz	1051,3
52	i3-3217UE 2C 1.6/1.6GHz 3MB 17W, 2x4096MB DDR3-SODIMM 1600MHz	1140,4
APC910 with INTEL HM76 Chipset		
53	C-847E 2C 1.1/1.3GHz 2MB 17W 2x2048MB DDR3-SODIMM 1067MHz	600,5
54	C-847E 2C 1.1/1.3GHz 2MB 17W 2x4096MB DDR3-SODIMM 1333MHz	645
55	C-827E 1C 1.4/1.3GHz 1.5MB 17W 2x2048MB DDR3-SODIMM 1067MHz	495,9
56	C-827E 1C 1.4/1.3GHz 1.5MB 17W 2x4096MB DDR3-SODIMM 1333MHz	538

Table 45: Results for Passmark Performance Test 7.0, Passmark Rating

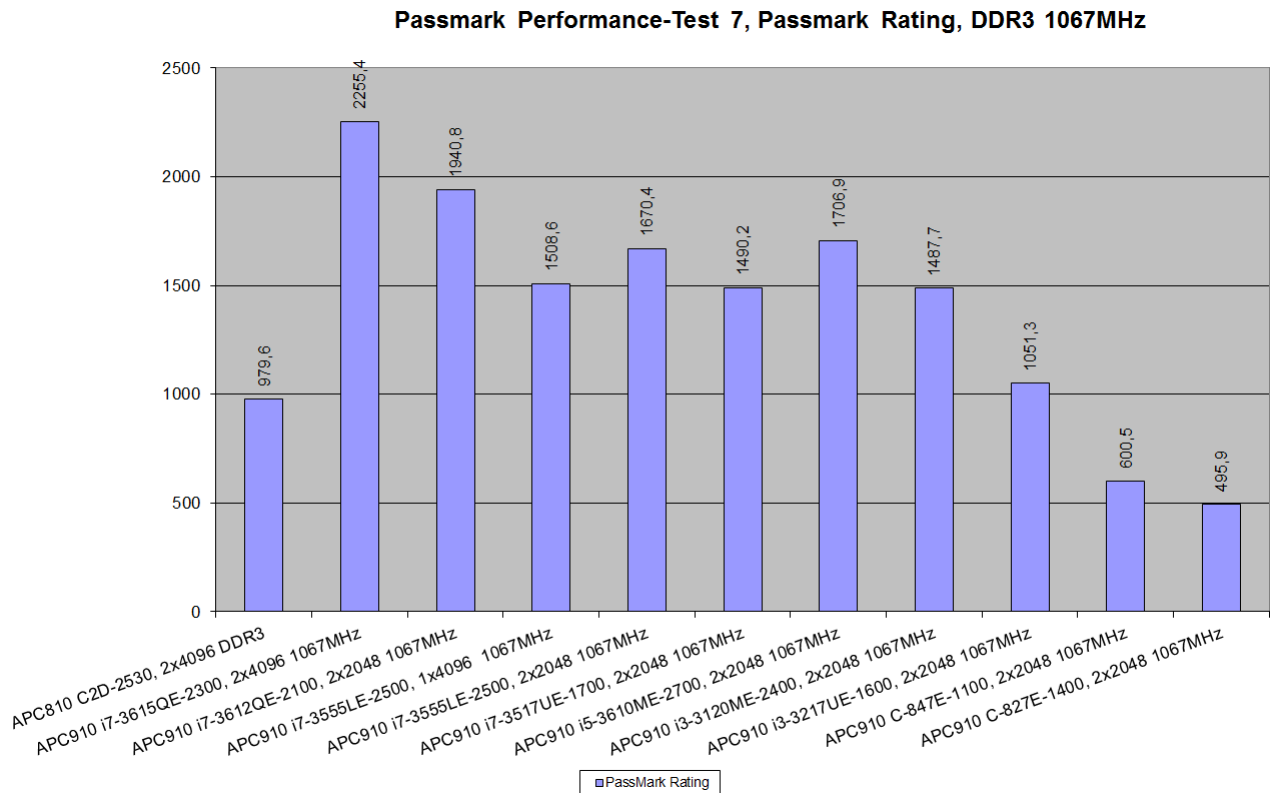


Figure 60: Results for Passmark Performance Test 7.0, Passmark Rating, DDR3 1067MHz

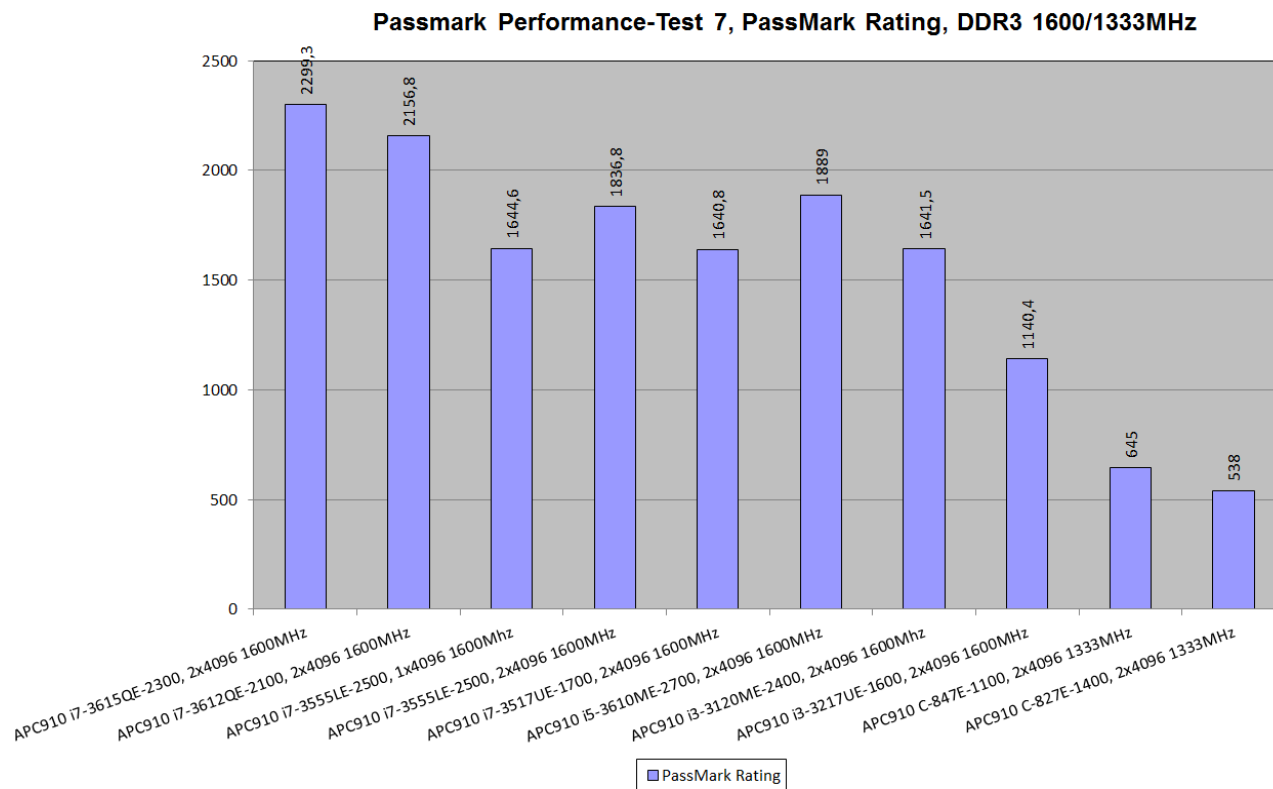


Figure 61: Results for Passmark Performance Test 7.0, Passmark Rating, DDR3 1600/1333MHz

4.13.2 CPU Mark

This suite contains multi-process CPU tests. The number of CPU test processes is configurable in Preferences. The following tests make up the suite: Integer (addition, subtraction, multiplication, division), Floating Point (addition, subtraction, multiplication, division), Multimedia Instructions (128-bit SSE operations such as addition, subtraction and multiplication), Find Prime numbers, Compression, Encryption, Physics, Random String Sorting

Higher scores are better

#	Test device	CPU Mark
APC810 with INTEL GM45 Chipset		
30	Core 2 Duo 2,53 GHz, 2x2048MB DDR3-SODIMM	2269,1
APC910 with INTEL QM77 Chipset		
37	i7-3615QE 4C 2.3/1.6GHz 6MB 45W 2x4096MB DDR3-SODIMM 1067MHz	8790,4
38	i7-3615QE 4C 2.3/1.6GHz 6MB 45W 2x4096MB DDR3-SODIMM 1600MHz	8921,9
39	i7-3612QE 4C 2.1/1.6GHz 6MB 35W, 2x4096MB DDR3-SODIMM 1067MHz	7945,4
40	i7-3612QE 4C 2.1/1.6GHz 6MB 35W, 2x4096MB DDR3-SODIMM 1600MHz	8107,9
41	i7-3555LE 2C 2.5/1.6GHz 4MB 25W, 4096MB DDR3-SODIMM 1067MHz	4356,8
42	i7-3555LE 2C 2.5/1.6GHz 4MB 25W, 4096MB DDR3-SODIMM 1600MHz	4431,9
43	i7-3555LE 2C 2.5/1.6GHz 4MB 25W, 2x2048MB DDR3-SODIMM 1067MHz	4378,2
44	i7-3555LE 2C 2.5/1.6GHz 4MB 25W, 2x4096MB DDR3-SODIMM 1600MHz	4480,3
45	i7-3517UE 2C 1.7/1.6GHz 4MB 17W, 2x2048MB DDR3-SODIMM 1067MHz	3860,4
46	i7-3517UE 2C 1.7/1.6GHz 4MB 17W, 2x4096MB DDR3-SODIMM 1600MHz	3899,9
47	i5-3610ME 2C 2.7/1.6GHz 3MB 35W, 2x2048MB DDR3-SODIMM 1067MHz	4533,4
48	i5-3610ME 2C 2.7/1.6GHz 3MB 35W, 2x4096MB DDR3-SODIMM 1600MHz	4587,3
49	i3-3120ME 2C 2.4/1.6GHz 3MB 35W, 2x2048MB DDR3-SODIMM 1067MHz	3688,5
50	i3-3120ME 2C 2.4/1.6GHz 3MB 35W, 2x4096MB DDR3-SODIMM 1600MHz	3724,1
51	i3-3217UE 2C 1.6/1.6GHz 3MB 17W, 2x2048MB DDR3-SODIMM 1067MHz	2396,2
52	i3-3217UE 2C 1.6/1.6GHz 3MB 17W, 2x4096MB DDR3-SODIMM 1600MHz	2407,5
APC910 with INTEL HM76 Chipset		
53	C-847E 2C 1.1/1.3GHz 2MB 17W 2x2048MB DDR3-SODIMM 1067MHz	1146,7
54	C-847E 2C 1.1/1.3GHz 2MB 17W 2x4096MB DDR3-SODIMM 1333MHz	1175,5
55	C-827E 1C 1.4/1.3GHz 1.5MB 17W 2x2048MB DDR3-SODIMM 1067MHz	771,3
56	C-827E 1C 1.4/1.3GHz 1.5MB 17W 2x4096MB DDR3-SODIMM 1333MHz	771,9

Table 46: Results for SiSoft Sandra 2011, CPU Mark

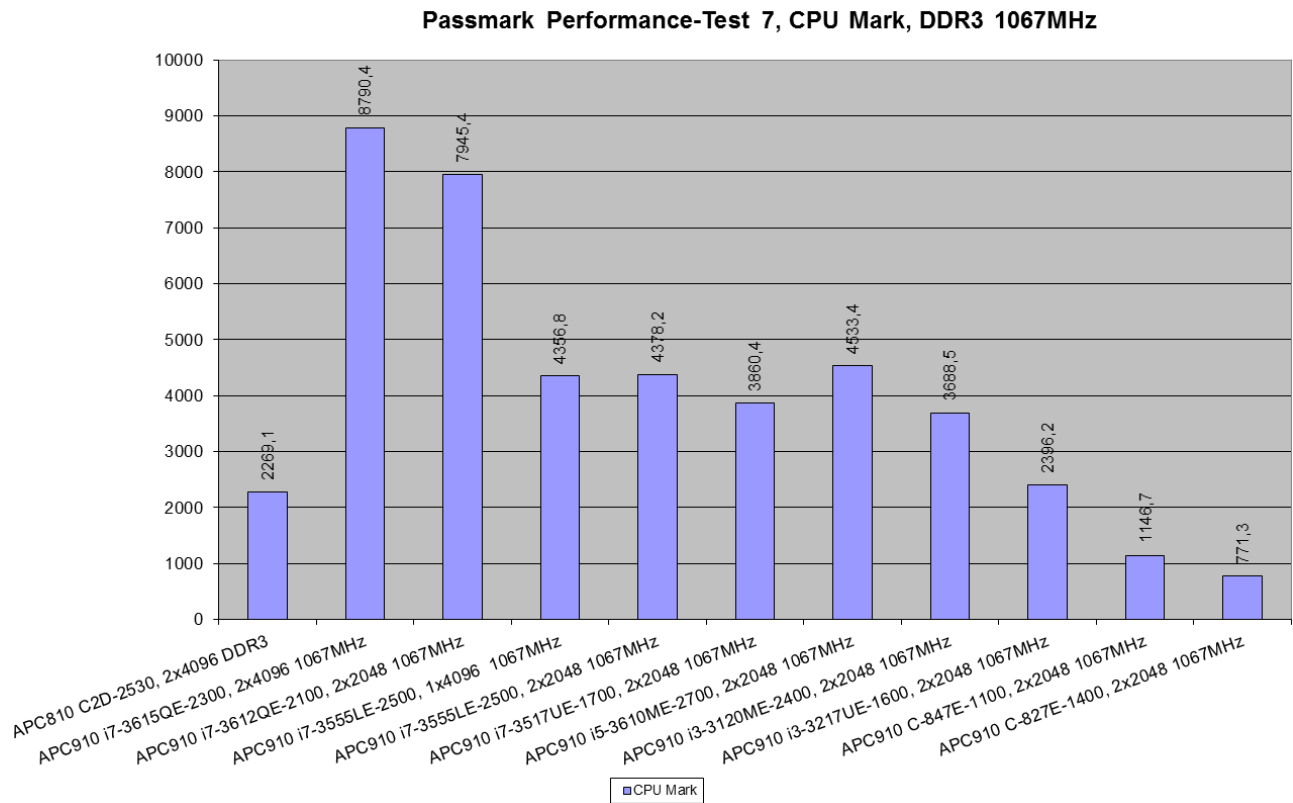


Figure 62: Results for Passmark Performance Test 7.0, CPU Mark, DDR3 1067MHz

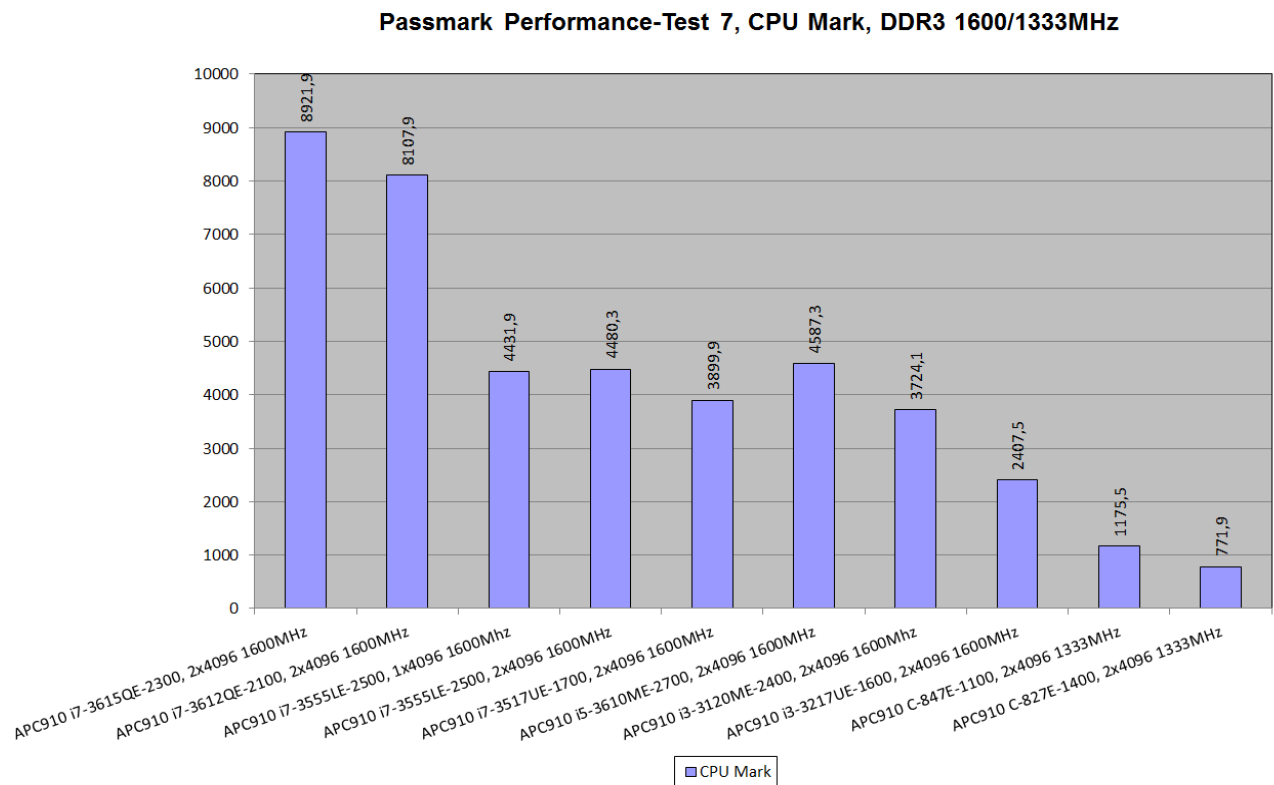


Figure 63: Results for Passmark Performance Test 7.0, CPU Mark, DDR3 1600/1333MHz

4.13.3 2D Graphics Mark

This suite contains a number of tests that exercise the standard Windows graphics functions. The results from this suite depend on the speed at which the video card can carry out 2D graphics operations and the color depth currently in use. This suite contains: Solid Vectors, Transparent Vectors, Complex Vectors, Fonts and Text, Windows Interface, Image Filters, Image Rendering.

Higher scores are better

#	Test device	2D Graphics Mark
APC810 with INTEL GM45 Chipset		
30	Core 2 Duo 2,53 GHz, 2x2048MB DDR3-SODIMM	288,8
APC910 with INTEL QM77 Chipset		
37	i7-3615QE 4C 2.3/1.6GHz 6MB 45W 2x4096MB DDR3-SODIMM 1067MHz	456,1
38	i7-3615QE 4C 2.3/1.6GHz 6MB 45W 2x4096MB DDR3-SODIMM 1600MHz	459,4
39	i7-3612QE 4C 2.1/1.6GHz 6MB 35W, 2x4096MB DDR3-SODIMM 1067MHz	402,6
40	i7-3612QE 4C 2.1/1.6GHz 6MB 35W, 2x4096MB DDR3-SODIMM 1600MHz	405,7
41	i7-3555LE 2C 2.5/1.6GHz 4MB 25W, 4096MB DDR3-SODIMM 1067MHz	381,8
42	i7-3555LE 2C 2.5/1.6GHz 4MB 25W, 4096MB DDR3-SODIMM 1600MHz	409,7
43	i7-3555LE 2C 2.5/1.6GHz 4MB 25W, 2x2048MB DDR3-SODIMM 1067MHz	403
44	i7-3555LE 2C 2.5/1.6GHz 4MB 25W, 2x4096MB DDR3-SODIMM 1600MHz	416,3
45	i7-3517UE 2C 1.7/1.6GHz 4MB 17W, 2x2048MB DDR3-SODIMM 1067MHz	344,6
46	i7-3517UE 2C 1.7/1.6GHz 4MB 17W, 2x4096MB DDR3-SODIMM 1600MHz	352,3
47	i5-3610ME 2C 2.7/1.6GHz 3MB 35W, 2x2048MB DDR3-SODIMM 1067MHz	426,5
48	i5-3610ME 2C 2.7/1.6GHz 3MB 35W, 2x4096MB DDR3-SODIMM 1600MHz	436,6
49	i3-3120ME 2C 2.4/1.6GHz 3MB 35W, 2x2048MB DDR3-SODIMM 1067MHz	360,4
50	i3-3120ME 2C 2.4/1.6GHz 3MB 35W, 2x4096MB DDR3-SODIMM 1600MHz	374,1
51	i3-3217UE 2C 1.6/1.6GHz 3MB 17W, 2x2048MB DDR3-SODIMM 1067MHz	237,2
52	i3-3217UE 2C 1.6/1.6GHz 3MB 17W, 2x4096MB DDR3-SODIMM 1600MHz	236,6
APC910 with INTEL HM76 Chipset		
53	C-847E 2C 1.1/1.3GHz 2MB 17W 2x2048MB DDR3 1067MHz	155,2
54	C-847E 2C 1.1/1.3GHz 2MB 17W 2x4096MB DDR3 1333MHz	157,3
55	C-827E 1C 1.4/1.3GHz 1.5MB 17W 2x2048MB DDR3 1067MHz	170,5
56	C-827E 1C 1.4/1.3GHz 1.5MB 17W 2x4096MB DDR3 1333MHz	172,4

Table 47: Results for Passmark Performance Test 7.0, 2D Graphics Mark

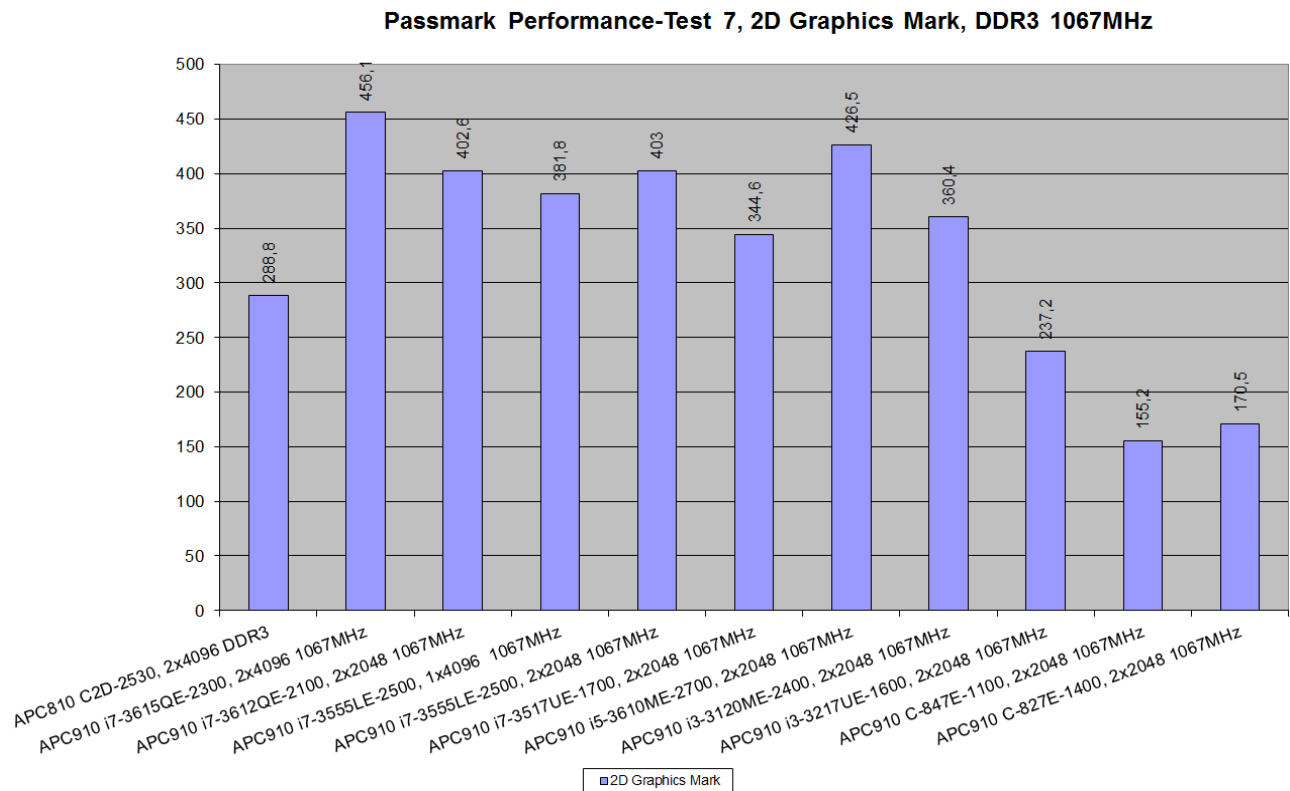


Figure 64: Results for Passmark Performance Test 7.0, 2D Graphics Mark, DDR3 1067MHz

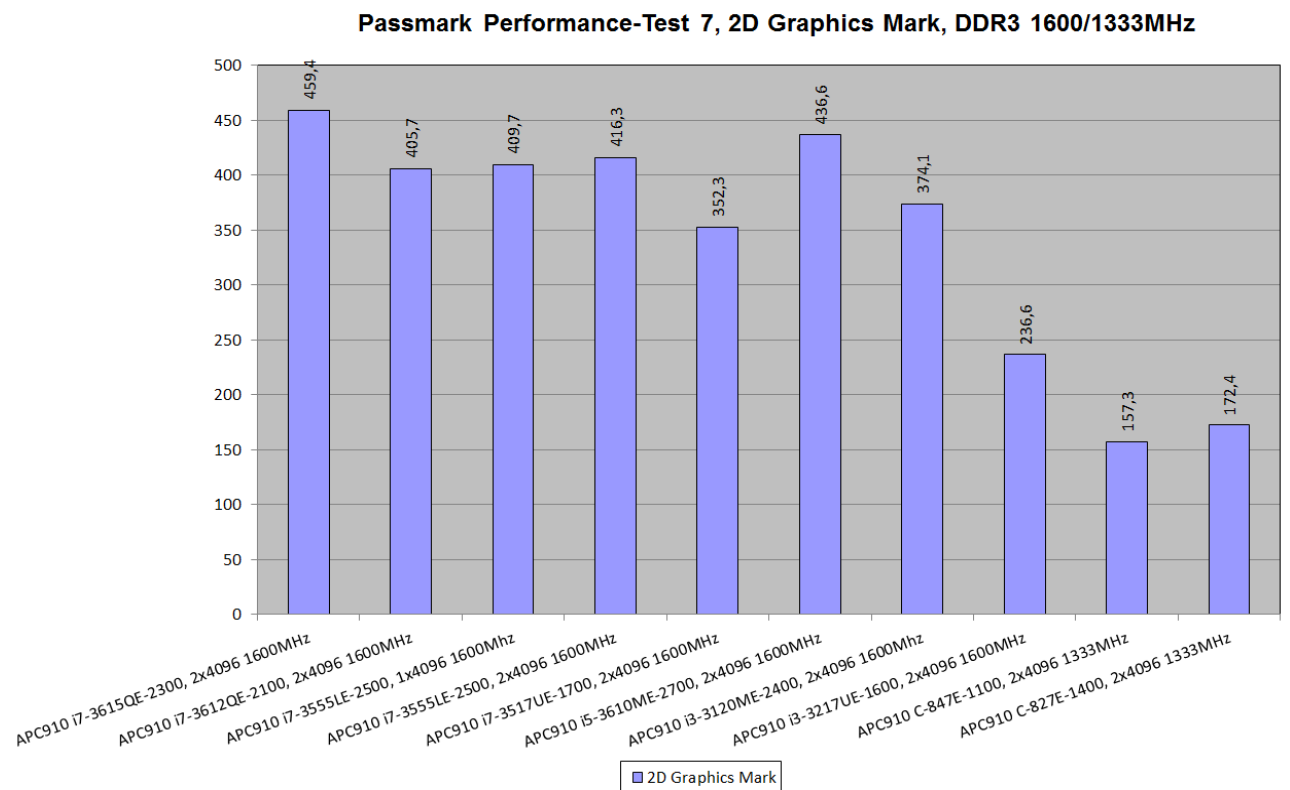


Figure 65: Results for Passmark Performance Test 7.0, 2D Graphics Mark, DDR3 1600/1333MHz

4.13.4 3D Graphics Mark

This test suite attempts to measure the performance of the 3D graphics hardware installed in the machine. This test suite makes full use of version 9 of the Microsoft DirectX 3D library. Without DirectX 9.0 or above it will not be possible to run these tests. Three standard tests have been defined: Simple, Medium, and Complex.

Higher scores are better

#	Test device	3D Graphics Mark
APC810 with INTEL GM45 Chipset		
30	Core 2 Duo 2,53 GHz, 2x2048MB DDR3-SODIMM	188
APC910 with INTEL QM77 Chipset		
37	i7-3615QE 4C 2.3/1.6GHz 6MB 45W 2x4096MB DDR3-SODIMM 1067MHz	434,6
38	i7-3615QE 4C 2.3/1.6GHz 6MB 45W 2x4096MB DDR3-SODIMM 1600MHz	461,9
39	i7-3612QE 4C 2.1/1.6GHz 6MB 35W, 2x4096MB DDR3-SODIMM 1067MHz	420,7
40	i7-3612QE 4C 2.1/1.6GHz 6MB 35W, 2x4096MB DDR3-SODIMM 1600MHz	461,2
41	i7-3555LE 2C 2.5/1.6GHz 4MB 25W, 4096MB DDR3-SODIMM 1067MHz	271,6
42	i7-3555LE 2C 2.5/1.6GHz 4MB 25W, 4096MB DDR3-SODIMM 1600MHz	334,5
43	i7-3555LE 2C 2.5/1.6GHz 4MB 25W, 2x2048MB DDR3-SODIMM 1067MHz	370
44	i7-3555LE 2C 2.5/1.6GHz 4MB 25W, 2x4096MB DDR3-SODIMM 1600MHz	414,6
45	i7-3517UE 2C 1.7/1.6GHz 4MB 17W, 2x2048MB DDR3-SODIMM 1067MHz	353,1
46	i7-3517UE 2C 1.7/1.6GHz 4MB 17W, 2x4096MB DDR3-SODIMM 1600MHz	390,8
47	i5-3610ME 2C 2.7/1.6GHz 3MB 35W, 2x2048MB DDR3-SODIMM 1067MHz	362,4
48	i5-3610ME 2C 2.7/1.6GHz 3MB 35W, 2x4096MB DDR3-SODIMM 1600MHz	411,6
49	i3-3120ME 2C 2.4/1.6GHz 3MB 35W, 2x2048MB DDR3-SODIMM 1067MHz	351,2
50	i3-3120ME 2C 2.4/1.6GHz 3MB 35W, 2x4096MB DDR3-SODIMM 1600MHz	390,7
51	i3-3217UE 2C 1.6/1.6GHz 3MB 17W, 2x2048MB DDR3-SODIMM 1067MHz	334,5
52	i3-3217UE 2C 1.6/1.6GHz 3MB 17W, 2x4096MB DDR3-SODIMM 1600MHz	366,1
APC910 with INTEL HM76 Chipset		
53	C-847E 2C 1.1/1.3GHz 2MB 17W 2x2048MB DDR3 1067MHz	168,4
54	C-847E 2C 1.1/1.3GHz 2MB 17W 2x4096MB DDR3 1333MHz	171,3
55	C-827E 1C 1.4/1.3GHz 1.5MB 17W 2x2048MB DDR3 1067MHz	140,8
56	C-827E 1C 1.4/1.3GHz 1.5MB 17W 2x4096MB DDR3 1333MHz	143,4

Table 48: Results for Passmark Performance Test 7.0, 3D Graphics Mark

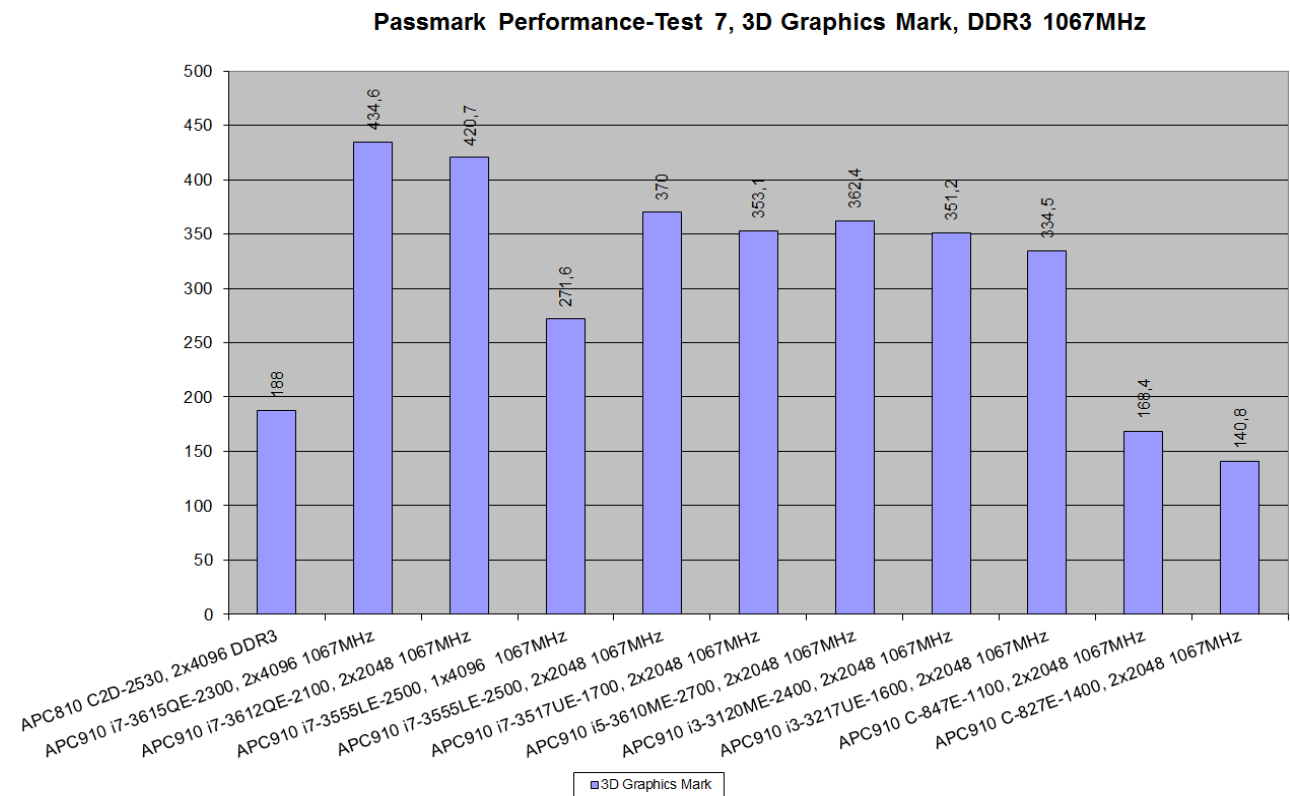


Figure 66: Results for Passmark Performance Test 7.0, 3D Graphics Mark, DDR3 1067MHz

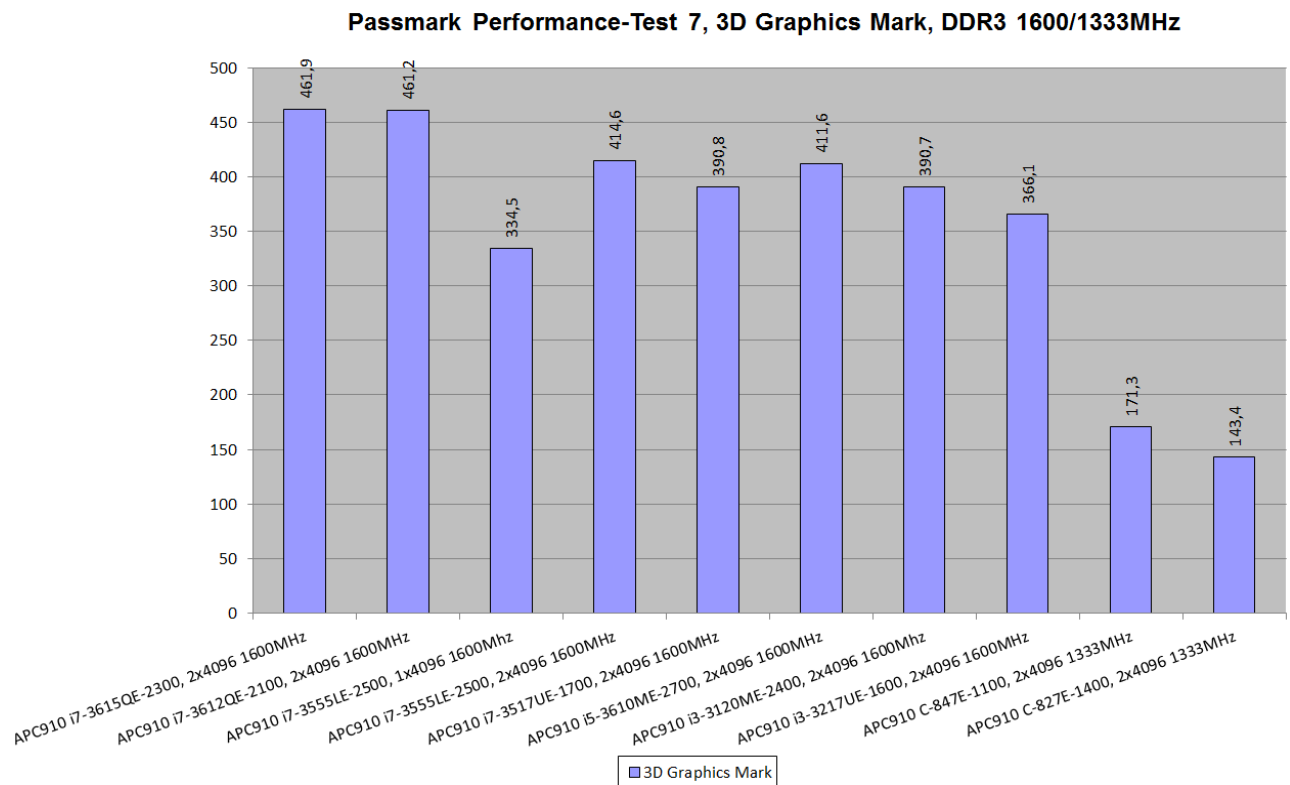


Figure 67: Results for Passmark Performance Test 7.0, 3D Graphics Mark, DDR3 1600/1333MHz

4.13.5 Memory Mark

This test suite contains a number of tests that exercise the memory sub-system of the computer. All tests use a combination of 32-bit and 64-bit data when reading or writing from or to RAM. It contains: Memory-Allocate small block, Memory-Cached, Memory-UnCached, Memory-Write and Memory-Large RAM.

Higher scores are better

#	Test device	Memory Mark
APC810 with INTEL GM45 Chipset		
30	Core 2 Duo 2,53 GHz, 2x2048MB DDR3-SODIMM	1461,7
APC910 with INTEL QM77 Chipset		
37	i7-3615QE 4C 2.3/1.6GHz 6MB 45W 2x4096MB DDR3-SODIMM 1067MHz	2246,8
38	i7-3615QE 4C 2.3/1.6GHz 6MB 45W 2x4096MB DDR3-SODIMM 1600MHz	2250
39	i7-3612QE 4C 2.1/1.6GHz 6MB 35W, 2x4096MB DDR3-SODIMM 1067MHz	1337,2
40	i7-3612QE 4C 2.1/1.6GHz 6MB 35W, 2x4096MB DDR3-SODIMM 1600MHz	2139,6
41	i7-3555LE 2C 2.5/1.6GHz 4MB 25W, 4096MB DDR3-SODIMM 1067MHz	1395,7
42	i7-3555LE 2C 2.5/1.6GHz 4MB 25W, 4096MB DDR3-SODIMM 1600MHz	1442,5
43	i7-3555LE 2C 2.5/1.6GHz 4MB 25W, 2x2048MB DDR3-SODIMM 1067MHz	1420,1
44	i7-3555LE 2C 2.5/1.6GHz 4MB 25W, 2x4096MB DDR3-SODIMM 1600MHz	2109,8
45	i7-3517UE 2C 1.7/1.6GHz 4MB 17W, 2x2048MB DDR3-SODIMM 1067MHz	1226,2
46	i7-3517UE 2C 1.7/1.6GHz 4MB 17W, 2x4096MB DDR3-SODIMM 1600MHz	1972,3
47	i5-3610ME 2C 2.7/1.6GHz 3MB 35W, 2x2048MB DDR3-SODIMM 1067MHz	1443,7
48	i5-3610ME 2C 2.7/1.6GHz 3MB 35W, 2x4096MB DDR3-SODIMM 1600MHz	2287,4
49	i3-3120ME 2C 2.4/1.6GHz 3MB 35W, 2x2048MB DDR3-SODIMM 1067MHz	1224
50	i3-3120ME 2C 2.4/1.6GHz 3MB 35W, 2x4096MB DDR3-SODIMM 1600MHz	1921,6
51	i3-3217UE 2C 1.6/1.6GHz 3MB 17W, 2x2048MB DDR3-SODIMM 1067MHz	752,5
52	i3-3217UE 2C 1.6/1.6GHz 3MB 17W, 2x4096MB DDR3-SODIMM 1600MHz	1114,6
APC910 with INTEL HM76 Chipset		
53	C-847E 2C 1.1/1.3GHz 2MB 17W 2x2048MB DDR3 1067MHz	508,7
54	C-847E 2C 1.1/1.3GHz 2MB 17W 2x4096MB DDR3 1333MHz	770,1
55	C-827E 1C 1.4/1.3GHz 1.5MB 17W 2x2048MB DDR3 1067MHz	458,5
56	C-827E 1C 1.4/1.3GHz 1.5MB 17W 2x4096MB DDR3 1333MHz	935,9

Table 49: Results for Passmark Performance Test 7.0, Memory Mark

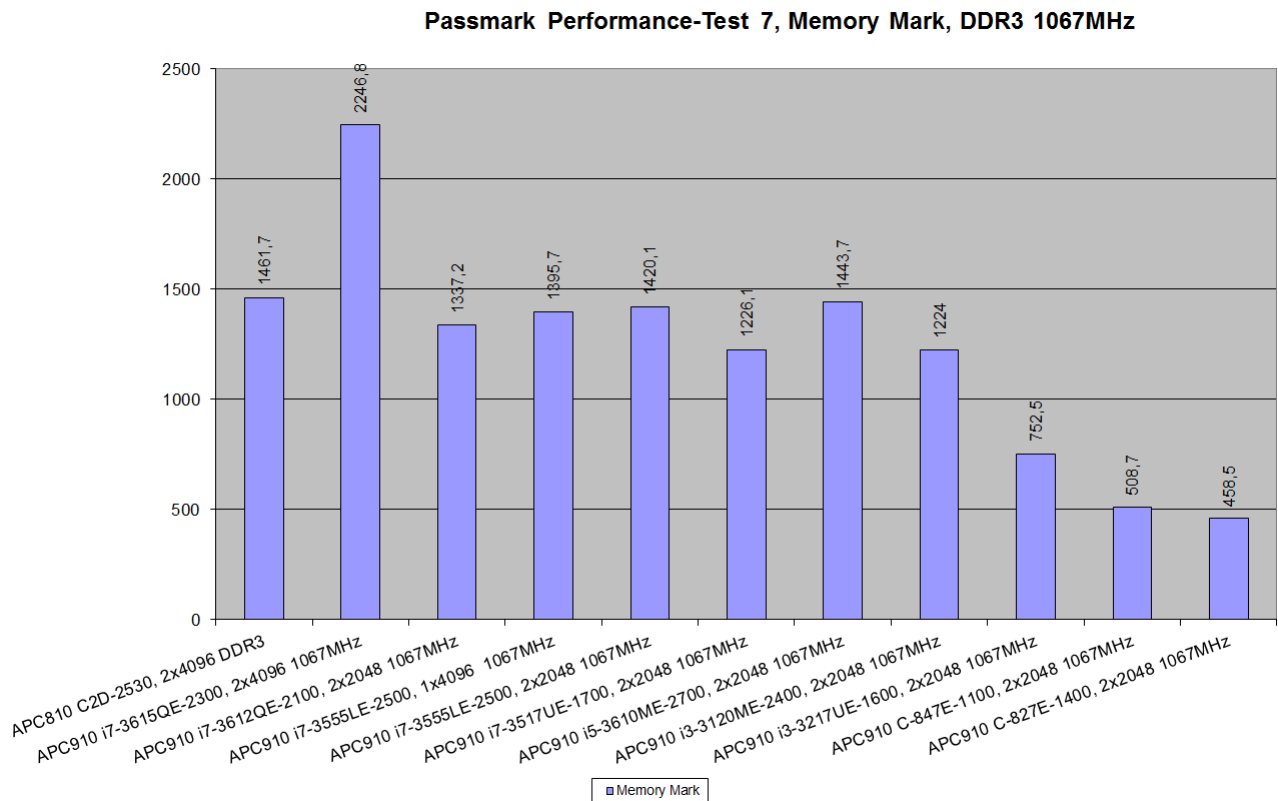


Figure 68: Results for Passmark Performance Test 7.0, Memory Mark, DDR3 1067MHz

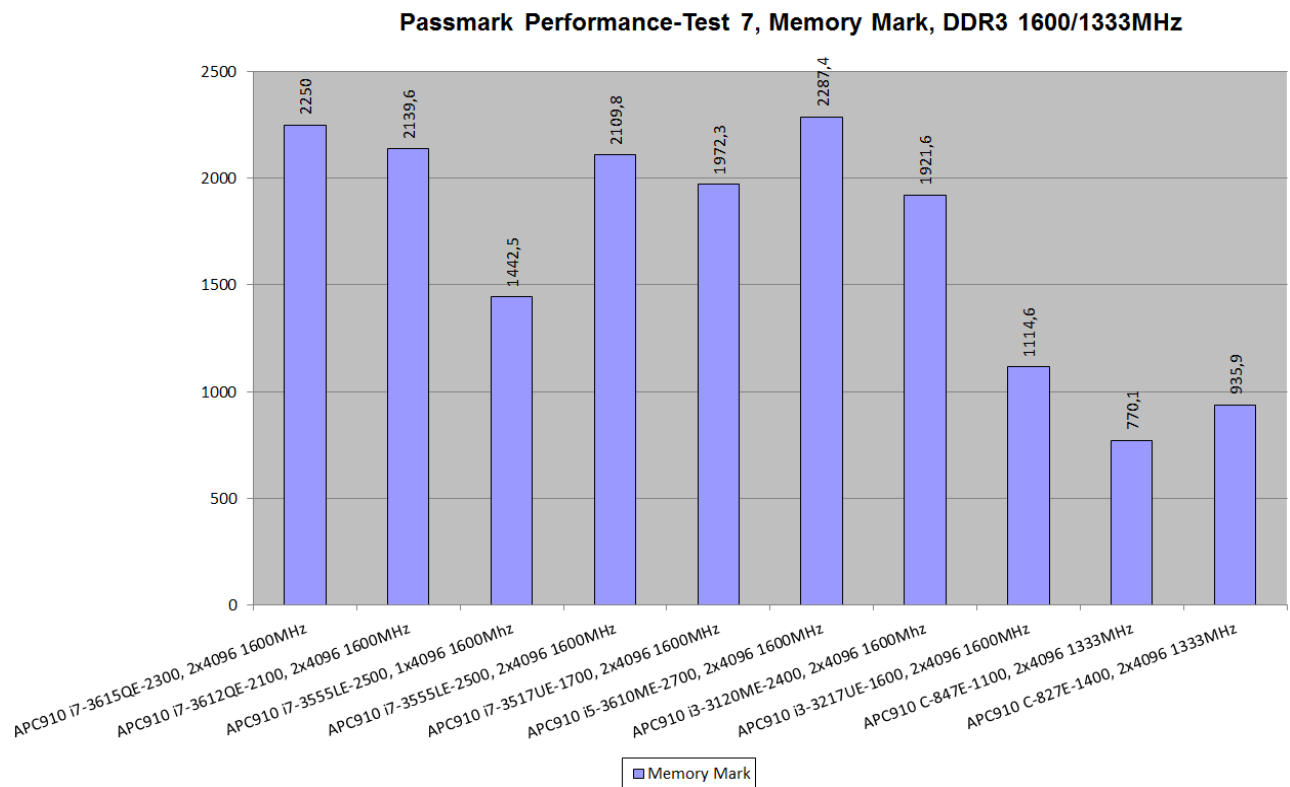


Figure 69: Results for Passmark Performance Test 7.0, Memory Mark, DDR3 1600/1333MHz

4.13.6 Disk Mark

This suite contains a number of tests that exercise the mass storage units connected to the computer. By default, the current user's application directory is used for the test. This suite contains: Disk Sequential Read, Disk Sequential Write and Disk Random Seek RW.

Higher scores are better

#	Test device	Disk Mark
APC810 with INTEL GM45 Chipset		
30	Core 2 Duo 2,53 GHz, 2x2048MB DDR3-SODIMM	947,4
APC910 with INTEL QM77 Chipset		
37	i7-3615QE 4C 2.3/1.6GHz 6MB 45W 2x4096MB DDR3-SODIMM 1067MHz	3156,1
38	i7-3615QE 4C 2.3/1.6GHz 6MB 45W 2x4096MB DDR3-SODIMM 1600MHz	3152,9
39	i7-3612QE 4C 2.1/1.6GHz 6MB 35W, 2x4096MB DDR3-SODIMM 1067MHz	3066,7
40	i7-3612QE 4C 2.1/1.6GHz 6MB 35W, 2x4096MB DDR3-SODIMM 1600MHz	3088,8
41	i7-3555LE 2C 2.5/1.6GHz 4MB 25W, 4096MB DDR3-SODIMM 1067MHz	2991,8
42	i7-3555LE 2C 2.5/1.6GHz 4MB 25W, 4096MB DDR3-SODIMM 1600MHz	3041,4
43	i7-3555LE 2C 2.5/1.6GHz 4MB 25W, 2x2048MB DDR3-SODIMM 1067MHz	3108,2
44	i7-3555LE 2C 2.5/1.6GHz 4MB 25W, 2x4096MB DDR3-SODIMM 1600MHz	3029,3
45	i7-3517UE 2C 1.7/1.6GHz 4MB 17W, 2x2048MB DDR3-SODIMM 1067MHz	3097,3
46	i7-3517UE 2C 1.7/1.6GHz 4MB 17W, 2x4096MB DDR3-SODIMM 1600MHz	3093
47	i5-3610ME 2C 2.7/1.6GHz 3MB 35W, 2x2048MB DDR3-SODIMM 1067MHz	3031,2
48	i5-3610ME 2C 2.7/1.6GHz 3MB 35W, 2x4096MB DDR3-SODIMM 1600MHz	2996,3
49	i3-3120ME 2C 2.4/1.6GHz 3MB 35W, 2x2048MB DDR3-SODIMM 1067MHz	3070,9
50	i3-3120ME 2C 2.4/1.6GHz 3MB 35W, 2x4096MB DDR3-SODIMM 1600MHz	3023,6
51	i3-3217UE 2C 1.6/1.6GHz 3MB 17W, 2x2048MB DDR3-SODIMM 1067MHz	3043,2
52	i3-3217UE 2C 1.6/1.6GHz 3MB 17W, 2x4096MB DDR3-SODIMM 1600MHz	3021,7
APC910 with INTEL HM76 Chipset		
53	C-847E 2C 1.1/1.3GHz 2MB 17W 2x2048MB DDR3 1067MHz	3128,6
54	C-847E 2C 1.1/1.3GHz 2MB 17W 2x4096MB DDR3 1333MHz	3091,9
55	C-827E 1C 1.4/1.3GHz 1.5MB 17W 2x2048MB DDR3 1067MHz	3112,1
56	C-827E 1C 1.4/1.3GHz 1.5MB 17W 2x4096MB DDR3 1333MHz	2856,4

Table 50: Results for Passmark Performance Test 7.0, Disk Mark

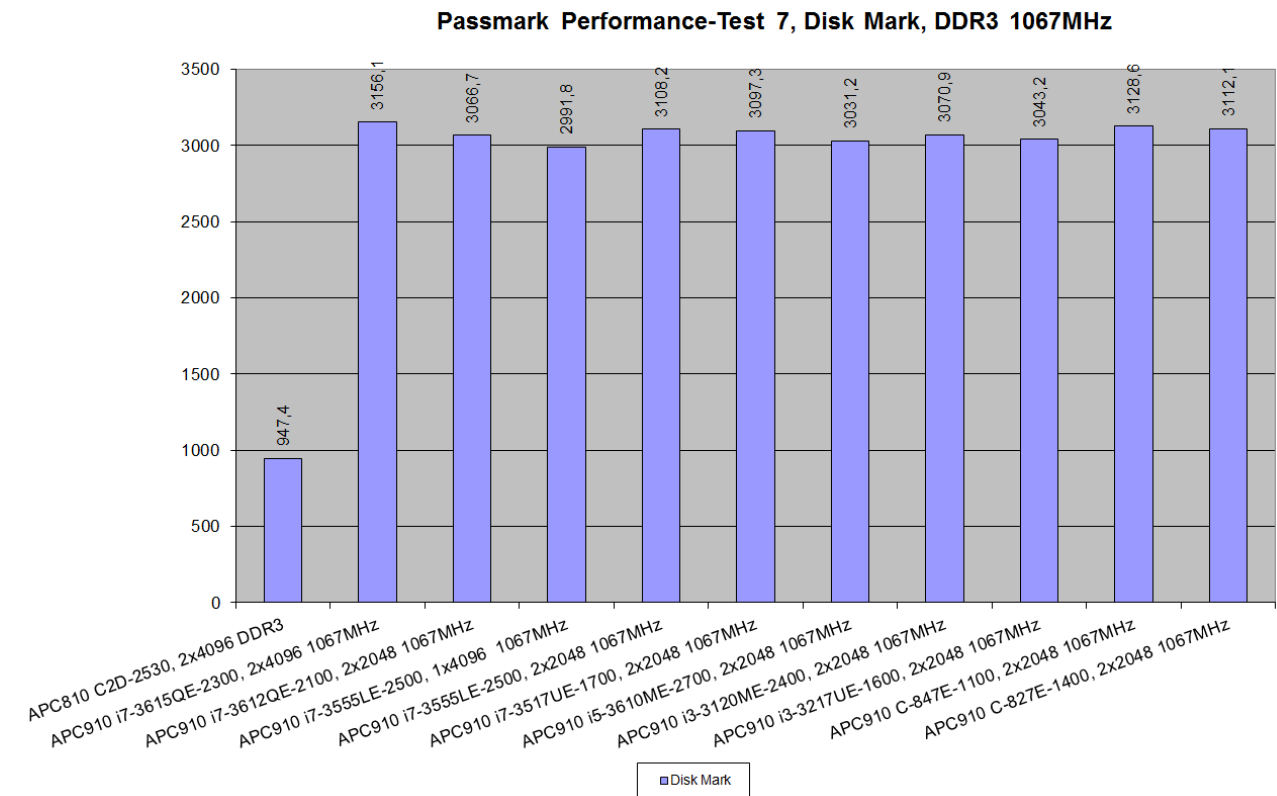


Figure 70: Results Passmark Performance Test 7.0, Disk Mark, DDR3 1067MHz

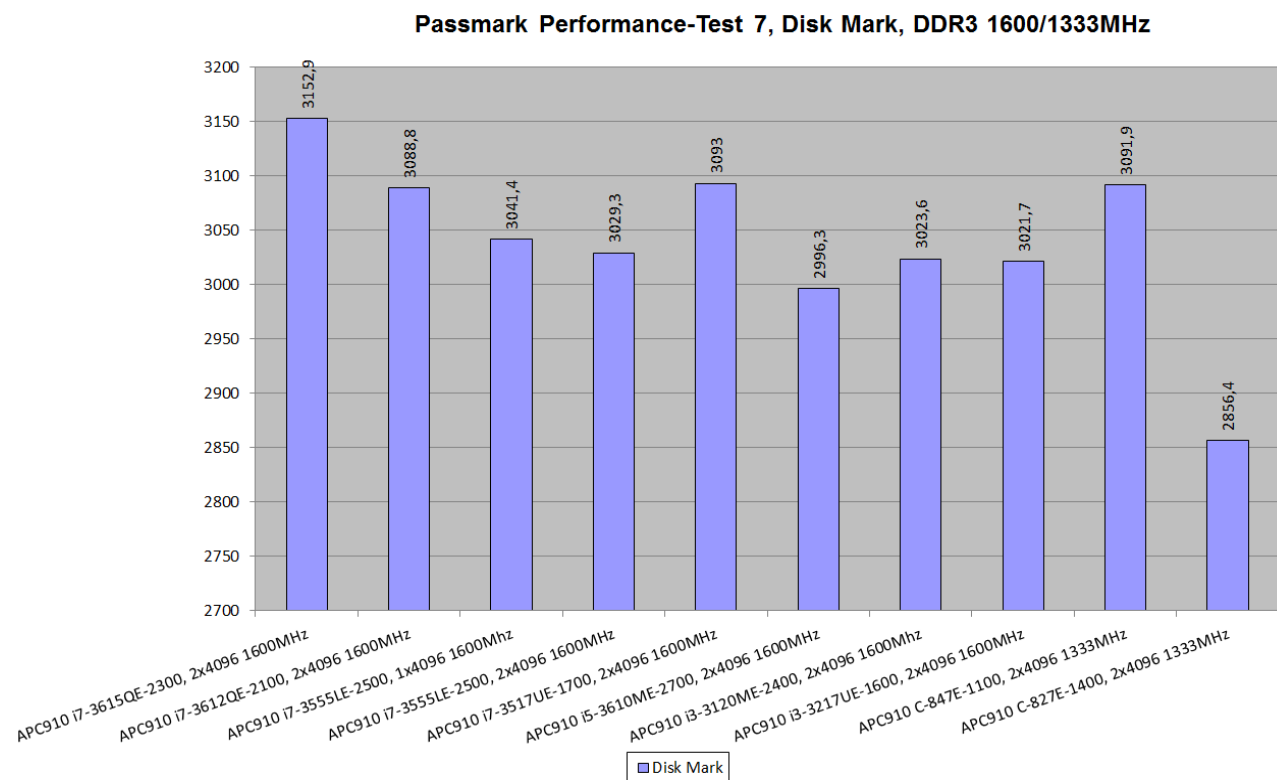


Figure 71: Results Passmark Performance Test 7.0, Disk Mark, DDR3 1600/1333MHz

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