

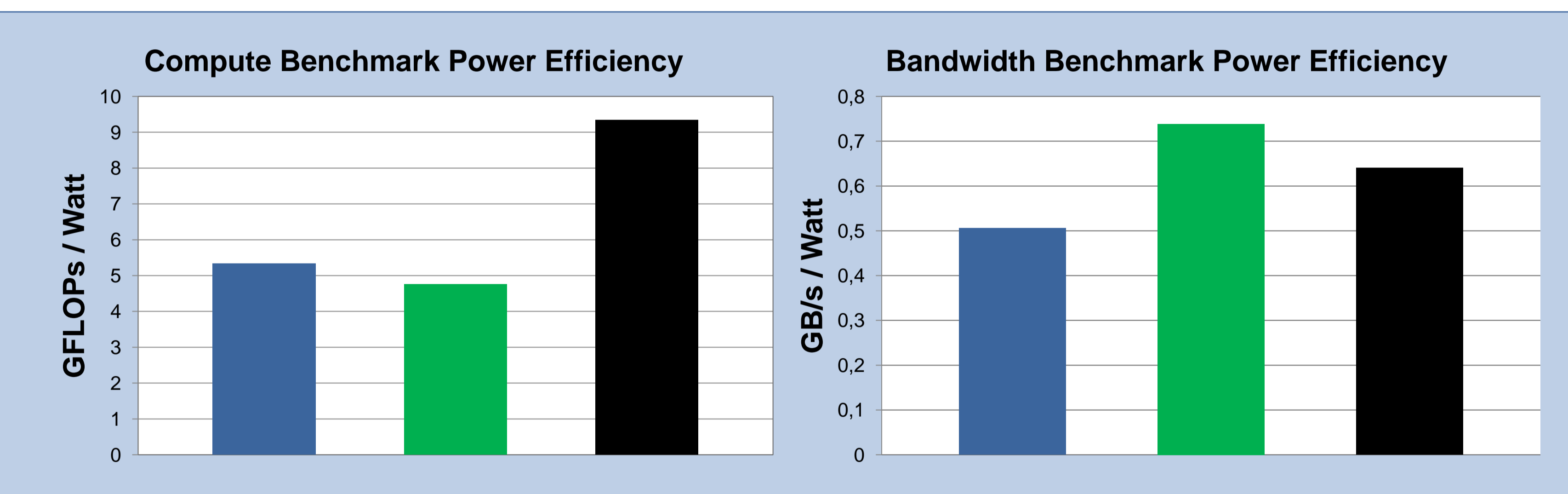


Purpose of Investigation

The purpose of the investigation is to clarify the relation between specified max power and actual power consumption under typical signal processing loads using different CUDA architectures.

Bandwidth and Compute Benchmark

Nvidia's SDK bandwidth test and Nvidia supplied high GFLOPs utilization code produce data for extreme cases of bandwidth and compute bound calculations.



| Test number | Test length | # of tests | Pattern length | # of patterns | SCALINGS |
|-------------|-------------|------------|----------------|---------------|----------|
| 1 | 128 | 5000 | 32 | 16 | 0 |
| 2 | 128 | 5000 | 32 | 32 | 0 |
| 3 | 256 | 5000 | 32 | 32 | 0 |
| 4 | 512 | 5000 | 32 | 16 | 0 |
| 5 | 512 | 5000 | 32 | 32 | 0 |
| 6 | 512 | 5000 | 32 | 16 | 1 |
| 7 | 512 | 5000 | 32 | 16 | 32 |
| 8 | 512 | 5000 | 64 | 16 | 0 |
| 9 | 512 | 5000 | 128 | 16 | 0 |
| 10 | 512 | 5000 | 256 | 16 | 0 |
| 11 | 512 | 5000 | 256 | 1 | 0 |
| 12 | 512 | 50000 | 512 | 2 | 0 |
| 13 | 256 | 50000 | 256 | 1 | 0 |

GT 240

GTX 480

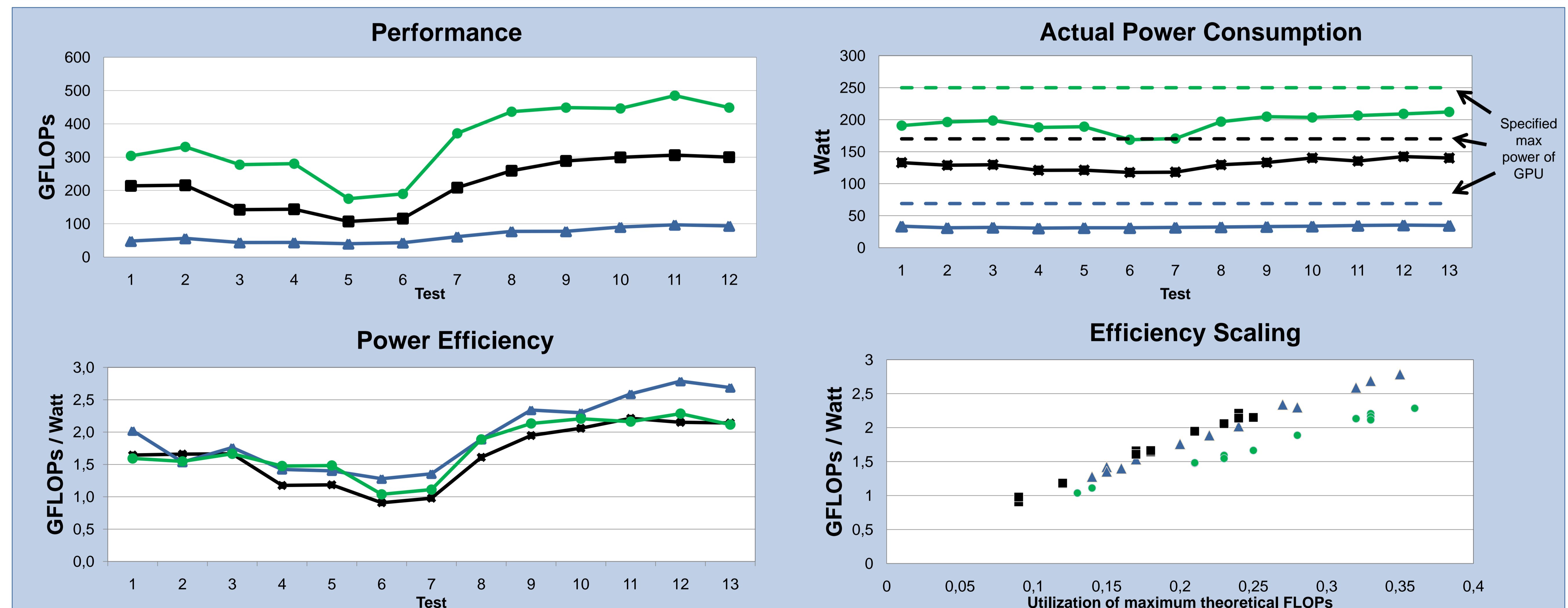
GTX 560

Conclusions

- Between 50 - 80 % of theoretical peak power is used.
- High utilization means high power efficiency. **Optimized code saves power!**
- Power consumption is fairly constant irrespective of load for the investigated algorithm.
- A peak of 2.8 GFLOPs / Watt is achieved in a typical signal processing algorithm.
- The Power Efficiency and Efficiency Scaling does not vary with CUDA architecture.

Pattern matching

PM matches patterns from a library to a signal. Once the optimal pattern has been found, amplitude scaling is performed to find the minimal error between the pattern and signal. The matching is done using the mean square error metric.



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Power Measurement Verification and Equipment

| | Idle power | Peak power achieved | Specified maximum |
|------------|------------|---------------------|-------------------|
| GTX 480 | 43.3 | 224.6 | 250 |
| GTX 560 Ti | 26.2 | 173.5 | 170 |
| GT 240 | 7.72 | 43.7 | 69 |

Equipment:
PCI-Express extender card with attached Multimeter.
Current sensing clamp meter.

