

Matrix-Vector Product vs. Outer Product

Version 0.1-draft-20241013

The Computation Intensity (CI) of MVA is a constant 5.935, and not included in the table. The CI of OPA is  $\frac{1}{2}T$  and is included in the table.

| Comparison of Matrix-Vector Product with Outer Product Accumulators |      |      |       |       |          |      |     |     |       |      |      |      |      |       |       |      |       |      |    |       |       |       |
|---------------------------------------------------------------------|------|------|-------|-------|----------|------|-----|-----|-------|------|------|------|------|-------|-------|------|-------|------|----|-------|-------|-------|
| Base                                                                |      | VRF  |       |       | Datatype |      |     | RVV |       |      | MVA  |      |      |       | OPA   |      |       |      |    |       |       |       |
| IPC                                                                 | DLEN | VLEN | VRF   |       | SEW      | EEW  | Δ   |     | MAC   | MAC  |      | loop | MAC  | RVV   | load  |      | acc   | MAC  | CI | RVV   | MVA   | load  |
|                                                                     | bits | bits | bytes | ports | bits     | bits | cyc |     | C     | /cyc |      | B    | /cyc | ratio | ratio |      | bytes | /cyc |    | ratio | ratio | ratio |
| 1                                                                   | 128  | 128  | 512   | 3R1W  | 8        | 8    | 1   |     | 16×16 | 16   | 7.3  | 8×16 | 86   | 34    | 4.7×  | 0.7× |       |      |    |       |       |       |
| 1                                                                   | 128  | 128  | 512   | 3R1W  | 8        | 16   | 1   |     | 8×16  | 16   | 6.7  | 8×16 | 86   | 34    | 5.1×  | 1.1× |       |      |    |       |       |       |
| 1                                                                   | 128  | 128  | 512   | 3R1W  | 8        | 16   | 2   |     | 8×16  | 16   | 6.7  | -    | -    | -     | -     | -    |       |      |    |       |       |       |
| 1                                                                   | 128  | 128  | 512   | 3R1W  | 8        | 16   | 4   |     | 8×16  | 16   | 6.7  | -    | -    | -     | -     | -    |       |      |    |       |       |       |
| 1                                                                   | 128  | 128  | 512   | 3R1W  | 8        | 32   | 1   |     | -     | -    | -    | 8×16 | 86   | 34    | -     | -    |       |      |    |       |       |       |
| 1                                                                   | 128  | 128  | 512   | 3R1W  | 8        | 32   | 2   |     | -     | -    | -    | -    | -    | -     | -     | -    |       |      |    |       |       |       |
| 1                                                                   | 128  | 128  | 512   | 3R1W  | 8        | 32   | 4   |     | -     | -    | -    | -    | -    | -     | -     | -    |       |      |    |       |       |       |
| 1                                                                   | 128  | 128  | 512   | 3R1W  | 16       | 16   | 1   |     | 16×8  | 8    | 3.7  | 8×8  | 86   | 17    | 4.7×  | 1.1× |       |      |    |       |       |       |
| 1                                                                   | 128  | 128  | 512   | 3R1W  | 16       | 16   | 2   |     | 16×8  | 8    | 3.7  | -    | -    | -     | -     | -    |       |      |    |       |       |       |
| 1                                                                   | 128  | 128  | 512   | 3R1W  | 16       | 16   | 4   |     | 16×8  | 8    | 3.7  | -    | -    | -     | -     | -    |       |      |    |       |       |       |
| 1                                                                   | 128  | 128  | 512   | 3R1W  | 16       | 32   | 1   |     | 8×8   | 8    | 3.4  | 8×8  | 86   | 17    | 5.1×  | 1.5× |       |      |    |       |       |       |
| 1                                                                   | 128  | 128  | 512   | 3R1W  | 16       | 32   | 2   |     | 8×8   | 8    | 3.4  | -    | -    | -     | -     | -    |       |      |    |       |       |       |
| 1                                                                   | 128  | 128  | 512   | 3R1W  | 16       | 32   | 4   |     | 8×8   | 8    | 3.4  | -    | -    | -     | -     | -    |       |      |    |       |       |       |
| 1                                                                   | 128  | 128  | 512   | 3R1W  | 32       | 32   | 1   |     | 16×4  | 4    | 1.8  | 8×4  | 86   | 9     | 4.7×  | 1.8× |       |      |    |       |       |       |
| 1                                                                   | 128  | 128  | 512   | 3R1W  | 32       | 32   | 2   |     | 16×4  | 4    | 1.8  | -    | -    | -     | -     | -    |       |      |    |       |       |       |
| 1                                                                   | 128  | 128  | 512   | 3R1W  | 32       | 32   | 4   |     | 16×4  | 4    | 1.8  | -    | -    | -     | -     | -    |       |      |    |       |       |       |
| 1                                                                   | 128  | 256  | 1024  | 3R1W  | 8        | 8    | 1   |     | 16×32 | 16   | 14.6 | 8×32 | 62   | 95    | 6.5×  | 0.5× |       |      |    |       |       |       |
| 1                                                                   | 128  | 256  | 1024  | 3R1W  | 8        | 16   | 1   |     | 8×32  | 16   | 13.5 | 8×32 | 62   | 95    | 7.0×  | 0.9× |       |      |    |       |       |       |
| 1                                                                   | 128  | 256  | 1024  | 3R1W  | 8        | 16   | 2   |     | 8×32  | 16   | 13.5 | -    | -    | -     | -     | -    |       |      |    |       |       |       |
| 1                                                                   | 128  | 256  | 1024  | 3R1W  | 8        | 16   | 4   |     | 8×32  | 16   | 13.5 | -    | -    | -     | -     | -    |       |      |    |       |       |       |
| 1                                                                   | 128  | 256  | 1024  | 3R1W  | 8        | 32   | 1   |     | -     | -    | -    | 8×32 | 62   | 95    | -     | -    |       |      |    |       |       |       |
| 1                                                                   | 128  | 256  | 1024  | 3R1W  | 8        | 32   | 2   |     | -     | -    | -    | -    | -    | -     | -     | -    |       |      |    |       |       |       |
| 1                                                                   | 128  | 256  | 1024  | 3R1W  | 8        | 32   | 4   |     | -     | -    | -    | -    | -    | -     | -     | -    |       |      |    |       |       |       |
| 1                                                                   | 128  | 256  | 1024  | 3R1W  | 16       | 16   | 1   |     | 16×16 | 8    | 7.3  | 8×16 | 62   | 47    | 6.5×  | 0.7× |       |      |    |       |       |       |
| 1                                                                   | 128  | 256  | 1024  | 3R1W  | 16       | 16   | 2   |     | 16×16 | 8    | 7.3  | -    | -    | -     | -     | -    |       |      |    |       |       |       |
| 1                                                                   | 128  | 256  | 1024  | 3R1W  | 16       | 16   | 4   |     | 16×16 | 8    | 7.3  | -    | -    | -     | -     | -    |       |      |    |       |       |       |
| 1                                                                   | 128  | 256  | 1024  | 3R1W  | 16       | 32   | 1   |     | 8×16  | 8    | 6.7  | 8×16 | 62   | 47    | 7.0×  | 1.1× |       |      |    |       |       |       |
| 1                                                                   | 128  | 256  | 1024  | 3R1W  | 16       | 32   | 2   |     | 8×16  | 8    | 6.7  | -    | -    | -     | -     | -    |       |      |    |       |       |       |
| 1                                                                   | 128  | 256  | 1024  | 3R1W  | 16       | 32   | 4   |     | 8×16  | 8    | 6.7  | -    | -    | -     | -     | -    |       |      |    |       |       |       |
| 1                                                                   | 128  | 256  | 1024  | 3R1W  | 32       | 32   | 1   |     | 16×8  | 4    | 3.7  | 8×8  | 62   | 24    | 6.5×  | 1.1× |       |      |    |       |       |       |
| 1                                                                   | 128  | 256  | 1024  | 3R1W  | 32       | 32   | 2   |     | 16×8  | 4    | 3.7  | -    | -    | -     | -     | -    |       |      |    |       |       |       |
| 1                                                                   | 128  | 256  | 1024  | 3R1W  | 32       | 32   | 4   |     | 16×8  | 4    | 3.7  | -    | -    | -     | -     | -    |       |      |    |       |       |       |
| 1                                                                   | 256  | 256  | 1024  | 3R1W  | 8        | 8    | 1   |     | 16×32 | 32   | 14.6 | 8×32 | 86   | 68    | 4.7×  | 0.5× |       |      |    |       |       |       |
| 1                                                                   | 256  | 256  | 1024  | 3R1W  | 8        | 16   | 1   |     | 8×32  | 32   | 13.5 | 8×32 | 86   | 68    | 5.1×  | 0.9× |       |      |    |       |       |       |
| 1                                                                   | 256  | 256  | 1024  | 3R1W  | 8        | 16   | 2   |     | 8×32  | 32   | 13.5 | -    | -    | -     | -     | -    |       |      |    |       |       |       |
| 1                                                                   | 256  | 256  | 1024  | 3R1W  | 8        | 16   | 4   |     | 8×32  | 32   | 13.5 | -    | -    | -     | -     | -    |       |      |    |       |       |       |
| 1                                                                   | 256  | 256  | 1024  | 3R1W  | 8        | 32   | 1   |     | -     | -    | -    | 8×32 | 86   | 68    | -     | -    |       |      |    |       |       |       |
| 1                                                                   | 256  | 256  | 1024  | 3R1W  | 8        | 32   | 2   |     | -     | -    | -    | -    | -    | -     | -     | -    |       |      |    |       |       |       |
| 1                                                                   | 256  | 256  | 1024  | 3R1W  | 8        | 32   | 4   |     | -     | -    | -    | -    | -    | -     | -     | -    |       |      |    |       |       |       |
| 1                                                                   | 256  | 256  | 1024  | 3R1W  | 16       | 16   | 1   |     | 16×16 | 16   | 7.3  | 8×16 | 86   | 34    | 4.7×  | 0.7× |       |      |    |       |       |       |

|   |     |      |      |      |    |    |   |        |    |      |       |    |     |      |      |
|---|-----|------|------|------|----|----|---|--------|----|------|-------|----|-----|------|------|
| 1 | 256 | 256  | 1024 | 3R1W | 16 | 16 | 2 | 16x16  | 16 | 7.3  | -     | -  | -   | -    | -    |
| 1 | 256 | 256  | 1024 | 3R1W | 16 | 16 | 4 | 16x16  | 16 | 7.3  | -     | -  | -   | -    | -    |
| 1 | 256 | 256  | 1024 | 3R1W | 16 | 32 | 1 | 8x16   | 16 | 6.7  | 8x16  | 86 | 34  | 5.1x | 1.1x |
| 1 | 256 | 256  | 1024 | 3R1W | 16 | 32 | 2 | 8x16   | 16 | 6.7  | -     | -  | -   | -    | -    |
| 1 | 256 | 256  | 1024 | 3R1W | 16 | 32 | 4 | 8x16   | 16 | 6.7  | -     | -  | -   | -    | -    |
| 1 | 256 | 256  | 1024 | 3R1W | 32 | 32 | 1 | 16x8   | 8  | 3.7  | 8x8   | 86 | 17  | 4.7x | 1.1x |
| 1 | 256 | 256  | 1024 | 3R1W | 32 | 32 | 2 | 16x8   | 8  | 3.7  | -     | -  | -   | -    | -    |
| 1 | 256 | 256  | 1024 | 3R1W | 32 | 32 | 4 | 16x8   | 8  | 3.7  | -     | -  | -   | -    | -    |
| 1 | 256 | 512  | 2048 | 3R1W | 8  | 8  | 1 | 16x64  | 32 | 29.3 | 8x64  | 62 | 190 | 6.5x | 0.5x |
| 1 | 256 | 512  | 2048 | 3R1W | 8  | 16 | 1 | 8x64   | 32 | 26.9 | 8x64  | 62 | 190 | 7.0x | 0.8x |
| 1 | 256 | 512  | 2048 | 3R1W | 8  | 16 | 2 | 8x64   | 32 | 26.9 | -     | -  | -   | -    | -    |
| 1 | 256 | 512  | 2048 | 3R1W | 8  | 16 | 4 | 8x64   | 32 | 26.9 | -     | -  | -   | -    | -    |
| 1 | 256 | 512  | 2048 | 3R1W | 8  | 32 | 1 | -      | -  | -    | 8x64  | 62 | 190 | -    | -    |
| 1 | 256 | 512  | 2048 | 3R1W | 8  | 32 | 2 | -      | -  | -    | -     | -  | -   | -    | -    |
| 1 | 256 | 512  | 2048 | 3R1W | 8  | 32 | 4 | -      | -  | -    | -     | -  | -   | -    | -    |
| 1 | 256 | 512  | 2048 | 3R1W | 16 | 16 | 1 | 16x32  | 16 | 14.6 | 8x32  | 62 | 95  | 6.5x | 0.5x |
| 1 | 256 | 512  | 2048 | 3R1W | 16 | 16 | 2 | 16x32  | 16 | 14.6 | -     | -  | -   | -    | -    |
| 1 | 256 | 512  | 2048 | 3R1W | 16 | 16 | 4 | 16x32  | 16 | 14.6 | -     | -  | -   | -    | -    |
| 1 | 256 | 512  | 2048 | 3R1W | 16 | 32 | 1 | 8x32   | 16 | 13.5 | 8x32  | 62 | 95  | 7.0x | 0.9x |
| 1 | 256 | 512  | 2048 | 3R1W | 16 | 32 | 2 | 8x32   | 16 | 13.5 | -     | -  | -   | -    | -    |
| 1 | 256 | 512  | 2048 | 3R1W | 16 | 32 | 4 | 8x32   | 16 | 13.5 | -     | -  | -   | -    | -    |
| 1 | 256 | 512  | 2048 | 3R1W | 32 | 32 | 1 | 16x16  | 8  | 7.3  | 8x16  | 62 | 47  | 6.5x | 0.7x |
| 1 | 256 | 512  | 2048 | 3R1W | 32 | 32 | 2 | 16x16  | 8  | 7.3  | -     | -  | -   | -    | -    |
| 1 | 256 | 512  | 2048 | 3R1W | 32 | 32 | 4 | 16x16  | 8  | 7.3  | -     | -  | -   | -    | -    |
| 1 | 512 | 512  | 2048 | 3R1W | 8  | 8  | 1 | 16x64  | 64 | 29.3 | 8x64  | 86 | 137 | 4.7x | 0.5x |
| 1 | 512 | 512  | 2048 | 3R1W | 8  | 16 | 1 | 8x64   | 64 | 26.9 | 8x64  | 86 | 137 | 5.1x | 0.8x |
| 1 | 512 | 512  | 2048 | 3R1W | 8  | 16 | 2 | 8x64   | 64 | 26.9 | -     | -  | -   | -    | -    |
| 1 | 512 | 512  | 2048 | 3R1W | 8  | 16 | 4 | 8x64   | 64 | 26.9 | -     | -  | -   | -    | -    |
| 1 | 512 | 512  | 2048 | 3R1W | 8  | 32 | 1 | -      | -  | -    | 8x64  | 86 | 137 | -    | -    |
| 1 | 512 | 512  | 2048 | 3R1W | 8  | 32 | 2 | -      | -  | -    | -     | -  | -   | -    | -    |
| 1 | 512 | 512  | 2048 | 3R1W | 8  | 32 | 4 | -      | -  | -    | -     | -  | -   | -    | -    |
| 1 | 512 | 512  | 2048 | 3R1W | 16 | 16 | 1 | 16x32  | 32 | 14.6 | 8x32  | 86 | 68  | 4.7x | 0.5x |
| 1 | 512 | 512  | 2048 | 3R1W | 16 | 16 | 2 | 16x32  | 32 | 14.6 | -     | -  | -   | -    | -    |
| 1 | 512 | 512  | 2048 | 3R1W | 16 | 16 | 4 | 16x32  | 32 | 14.6 | -     | -  | -   | -    | -    |
| 1 | 512 | 512  | 2048 | 3R1W | 16 | 32 | 1 | 8x32   | 32 | 13.5 | 8x32  | 86 | 68  | 5.1x | 0.9x |
| 1 | 512 | 512  | 2048 | 3R1W | 16 | 32 | 2 | 8x32   | 32 | 13.5 | -     | -  | -   | -    | -    |
| 1 | 512 | 512  | 2048 | 3R1W | 16 | 32 | 4 | 8x32   | 32 | 13.5 | -     | -  | -   | -    | -    |
| 1 | 512 | 512  | 2048 | 3R1W | 32 | 32 | 1 | 16x16  | 16 | 7.3  | 8x16  | 86 | 34  | 4.7x | 0.7x |
| 1 | 512 | 512  | 2048 | 3R1W | 32 | 32 | 2 | 16x16  | 16 | 7.3  | -     | -  | -   | -    | -    |
| 1 | 512 | 512  | 2048 | 3R1W | 32 | 32 | 4 | 16x16  | 16 | 7.3  | -     | -  | -   | -    | -    |
| 1 | 512 | 1024 | 4096 | 3R1W | 8  | 8  | 1 | 16x128 | 64 | 58.5 | 8x128 | 62 | 380 | 6.5x | 0.4x |
| 1 | 512 | 1024 | 4096 | 3R1W | 8  | 16 | 1 | 8x128  | 64 | 53.9 | 8x128 | 62 | 380 | 7.0x | 0.8x |
| 1 | 512 | 1024 | 4096 | 3R1W | 8  | 16 | 2 | 8x128  | 64 | 53.9 | -     | -  | -   | -    | -    |
| 1 | 512 | 1024 | 4096 | 3R1W | 8  | 16 | 4 | 8x128  | 64 | 53.9 | -     | -  | -   | -    | -    |
| 1 | 512 | 1024 | 4096 | 3R1W | 8  | 32 | 1 | -      | -  | -    | 8x128 | 62 | 380 | -    | -    |
| 1 | 512 | 1024 | 4096 | 3R1W | 8  | 32 | 2 | -      | -  | -    | -     | -  | -   | -    | -    |
| 1 | 512 | 1024 | 4096 | 3R1W | 8  | 32 | 4 | -      | -  | -    | -     | -  | -   | -    | -    |
| 1 | 512 | 1024 | 4096 | 3R1W | 16 | 16 | 1 | 16x64  | 32 | 29.3 | 8x64  | 62 | 190 | 6.5x | 0.5x |
| 1 | 512 | 1024 | 4096 | 3R1W | 16 | 16 | 2 | 16x64  | 32 | 29.3 | -     | -  | -   | -    | -    |
| 1 | 512 | 1024 | 4096 | 3R1W | 16 | 16 | 4 | 16x64  | 32 | 29.3 | -     | -  | -   | -    | -    |
| 1 | 512 | 1024 | 4096 | 3R1W | 16 | 32 | 1 | 8x64   | 32 | 26.9 | 8x64  | 62 | 190 | 7.0x | 0.8x |
| 1 | 512 | 1024 | 4096 | 3R1W | 16 | 32 | 2 | 8x64   | 32 | 26.9 | -     | -  | -   | -    | -    |

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|   |     |     |      |      |    |    |   |       |    |      |      |    |     | 4 cycle variant of OPA |      |         |       |      |    | 16x16 | 1024  | 32    | 8 | 8x | 1.3x | 1.4x |
|---|-----|-----|------|------|----|----|---|-------|----|------|------|----|-----|------------------------|------|---------|-------|------|----|-------|-------|-------|---|----|------|------|
| 2 | 256 | 256 | 1024 | 3R1W | 8  | 8  | 1 | 16x32 | 32 | 26.9 | 8x32 | 46 | 128 | 4.8x                   | 0.5x | 32x32   | 1024  | 512  | 16 | 19.0x | 4.0x  | 2.8x  |   |    |      |      |
| 2 | 256 | 256 | 1024 | 3R1W | 8  | 16 | 1 | 8x32  | 32 | 23.3 | 8x32 | 46 | 128 | 5.5x                   | 0.9x | 32x32   | 2048  | 512  | 16 | 22.0x | 4.0x  | 2.8x  |   |    |      |      |
| 2 | 256 | 256 | 1024 | 3R1W | 8  | 16 | 2 | 8x32  | 32 | 23.3 | -    | -  | -   | -                      | -    | 32x32   | 2048  | 512  | 16 | 22.0x | 4.0x  | 2.8x  |   |    |      |      |
| 2 | 256 | 256 | 1024 | 3R1W | 8  | 16 | 4 | 8x32  | 32 | 23.3 | -    | -  | -   | -                      | -    | 64x64   | 8192  | 1024 | 32 | 44.0x | 8.0x  | 5.5x  |   |    |      |      |
| 2 | 256 | 256 | 1024 | 3R1W | 8  | 32 | 1 | -     | -  | -    | 8x32 | 46 | 128 | -                      | -    | 32x32   | 4096  | 512  | 16 | -     | 4.0x  | 2.8x  |   |    |      |      |
| 2 | 256 | 256 | 1024 | 3R1W | 8  | 32 | 2 | -     | -  | -    | -    | -  | -   | -                      | -    | 32x32   | 4096  | 512  | 16 | -     | 4.0x  | 2.8x  |   |    |      |      |
| 2 | 256 | 256 | 1024 | 3R1W | 8  | 32 | 4 | -     | -  | -    | -    | -  | -   | -                      | -    | 64x64   | 16384 | 1024 | 32 | -     | 8.0x  | 5.5x  |   |    |      |      |
| 2 | 256 | 256 | 1024 | 3R1W | 16 | 16 | 1 | 16x16 | 16 | 13.5 | 8x16 | 46 | 64  | 4.8x                   | 0.7x | 16x16   | 512   | 128  | 8  | 9.5x  | 2.0x  | 1.4x  |   |    |      |      |
| 2 | 256 | 256 | 1024 | 3R1W | 16 | 16 | 2 | 16x16 | 16 | 13.5 | -    | -  | -   | -                      | -    | 16x16   | 512   | 128  | 8  | 9.5x  | 2.0x  | 1.4x  |   |    |      |      |
| 2 | 256 | 256 | 1024 | 3R1W | 16 | 16 | 4 | 16x16 | 16 | 13.5 | -    | -  | -   | -                      | -    | 32x32   | 2048  | 256  | 16 | 19.0x | 4.0x  | 2.8x  |   |    |      |      |
| 2 | 256 | 256 | 1024 | 3R1W | 16 | 32 | 1 | 8x16  | 16 | 11.6 | 8x16 | 46 | 64  | 5.5x                   | 1.1x | 16x16   | 1024  | 128  | 8  | 11.0x | 2.0x  | 1.4x  |   |    |      |      |
| 2 | 256 | 256 | 1024 | 3R1W | 16 | 32 | 2 | 8x16  | 16 | 11.6 | -    | -  | -   | -                      | -    | 16x16   | 1024  | 128  | 8  | 11.0x | 2.0x  | 1.4x  |   |    |      |      |
| 2 | 256 | 256 | 1024 | 3R1W | 16 | 32 | 4 | 8x16  | 16 | 11.6 | -    | -  | -   | -                      | -    | 32x32   | 4096  | 256  | 16 | 22.0x | 4.0x  | 2.8x  |   |    |      |      |
| 2 | 256 | 256 | 1024 | 3R1W | 32 | 32 | 1 | 16x8  | 8  | 6.7  | 8x8  | 46 | 32  | 4.8x                   | 1.1x | 8x8     | 256   | 32   | 4  | 4.8x  | 1.0x  | 0.7x  |   |    |      |      |
|   |     |     |      |      |    |    |   |       |    |      |      |    |     | 4 cycle variant of OPA |      |         |       |      |    | 16x16 | 1024  | 64    | 8 | 8x | 2.0x | 1.4x |
| 2 | 256 | 256 | 1024 | 3R1W | 32 | 32 | 2 | 16x8  | 8  | 6.7  | -    | -  | -   | -                      | -    | 8x8     | 256   | 32   | 4  | 4.8x  | 1.0x  | 0.7x  |   |    |      |      |
|   |     |     |      |      |    |    |   |       |    |      |      |    |     | 4 cycle variant of OPA |      |         |       |      |    | 16x16 | 1024  | 64    | 8 | 8x | 2.0x | 1.4x |
| 2 | 256 | 256 | 1024 | 3R1W | 32 | 32 | 4 | 16x8  | 8  | 6.7  | -    | -  | -   | -                      | -    | 16x16   | 1024  | 64   | 8  | 9.5x  | 2.0x  | 1.4x  |   |    |      |      |
| 2 | 256 | 512 | 2048 | 3R1W | 8  | 8  | 1 | 16x64 | 32 | 32.0 | 8x64 | 62 | 190 | 5.9x                   | 0.5x | 32x32   | 1024  | 512  | 16 | 16.0x | 2.7x  | 2.8x  |   |    |      |      |
| 2 | 256 | 512 | 2048 | 3R1W | 8  | 16 | 1 | 8x64  | 32 | 32.0 | 8x64 | 62 | 190 | 5.9x                   | 0.8x | 32x32   | 2048  | 512  | 16 | 16.0x | 2.7x  | 2.8x  |   |    |      |      |
| 2 | 256 | 512 | 2048 | 3R1W | 8  | 16 | 2 | 8x64  | 32 | 32.0 | -    | -  | -   | -                      | -    | 32x32   | 2048  | 512  | 16 | 16.0x | 2.7x  | 2.8x  |   |    |      |      |
| 2 | 256 | 512 | 2048 | 3R1W | 8  | 16 | 4 | 8x64  | 32 | 32.0 | -    | -  | -   | -                      | -    | 64x64   | 8192  | 1024 | 32 | 32.0x | 5.4x  | 5.5x  |   |    |      |      |
| 2 | 256 | 512 | 2048 | 3R1W | 8  | 32 | 1 | -     | -  | -    | 8x64 | 62 | 190 | -                      | -    | 32x32   | 4096  | 512  | 16 | -     | 2.7x  | 2.8x  |   |    |      |      |
| 2 | 256 | 512 | 2048 | 3R1W | 8  | 32 | 2 | -     | -  | -    | -    | -  | -   | -                      | -    | 32x32   | 4096  | 512  | 16 | -     | 2.7x  | 2.8x  |   |    |      |      |
| 2 | 256 | 512 | 2048 | 3R1W | 8  | 32 | 4 | -     | -  | -    | -    | -  | -   | -                      | -    | 64x64   | 16384 | 1024 | 32 | -     | 5.4x  | 5.5x  |   |    |      |      |
| 2 | 256 | 512 | 2048 | 3R1W | 16 | 16 | 1 | 16x32 | 16 | 16.0 | 8x32 | 62 | 95  | 5.9x                   | 0.5x | 16x16   | 512   | 128  | 8  | 8.0x  | 1.3x  | 1.4x  |   |    |      |      |
| 2 | 256 | 512 | 2048 | 3R1W | 16 | 16 | 2 | 16x32 | 16 | 16.0 | -    | -  | -   | -                      | -    | 16x16   | 512   | 128  | 8  | 8.0x  | 1.3x  | 1.4x  |   |    |      |      |
| 2 | 256 | 512 | 2048 | 3R1W | 16 | 16 | 4 | 16x32 | 16 | 16.0 | -    | -  | -   | -                      | -    | 32x32   | 2048  | 256  | 16 | 16.0x | 2.7x  | 2.8x  |   |    |      |      |
| 2 | 256 | 512 | 2048 | 3R1W | 16 | 32 | 1 | 8x32  | 16 | 16.0 | 8x32 | 62 | 95  | 5.9x                   | 0.9x | 16x16   | 1024  | 128  | 8  | 8.0x  | 1.3x  | 1.4x  |   |    |      |      |
| 2 | 256 | 512 | 2048 | 3R1W | 16 | 32 | 2 | 8x32  | 16 | 16.0 | -    | -  | -   | -                      | -    | 16x16   | 1024  | 128  | 8  | 8.0x  | 1.3x  | 1.4x  |   |    |      |      |
| 2 | 256 | 512 | 2048 | 3R1W | 16 | 32 | 4 | 8x32  | 16 | 16.0 | -    | -  | -   | -                      | -    | 32x32   | 4096  | 256  | 16 | 16.0x | 2.7x  | 2.8x  |   |    |      |      |
| 2 | 256 | 512 | 2048 | 3R1W | 32 | 32 | 1 | 16x16 | 8  | 8.0  | 8x16 | 62 | 47  | 5.9x                   | 0.7x | 8x8     | 256   | 32   | 4  | 4.0x  | 0.7x  | 0.7x  |   |    |      |      |
|   |     |     |      |      |    |    |   |       |    |      |      |    |     | 4 cycle variant of OPA |      |         |       |      |    | 16x16 | 1024  | 64    | 8 | 8x | 1.3x | 1.4x |
| 2 | 256 | 512 | 2048 | 3R1W | 32 | 32 | 2 | 16x16 | 8  | 8.0  | -    | -  | -   | -                      | -    | 8x8     | 256   | 32   | 4  | 4.0x  | 0.7x  | 0.7x  |   |    |      |      |
|   |     |     |      |      |    |    |   |       |    |      |      |    |     | 4 cycle variant of OPA |      |         |       |      |    | 16x16 | 1024  | 64    | 8 | 8x | 1.3x | 1.4x |
| 2 | 256 | 512 | 2048 | 3R1W | 32 | 32 | 4 | 16x16 | 8  | 8.0  | -    | -  | -   | -                      | -    | 16x16   | 1024  | 64   | 8  | 8.0x  | 1.3x  | 1.4x  |   |    |      |      |
| 2 | 512 | 512 | 2048 | 3R1W | 8  | 8  | 1 | 16x64 | 64 | 53.9 | 8x64 | 46 | 256 | 4.8x                   | 0.5x | 64x64   | 4096  | 2048 | 32 | 38.0x | 8.0x  | 5.5x  |   |    |      |      |
| 2 | 512 | 512 | 2048 | 3R1W | 8  | 16 | 1 | 8x64  | 64 | 46.5 | 8x64 | 46 | 256 | 5.5x                   | 0.8x | 64x64   | 8192  | 2048 | 32 | 44.0x | 8.0x  | 5.5x  |   |    |      |      |
| 2 | 512 | 512 | 2048 | 3R1W | 8  | 16 | 2 | 8x64  | 64 | 46.5 | -    | -  | -   | -                      | -    | 64x64   | 8192  | 2048 | 32 | 44.0x | 8.0x  | 5.5x  |   |    |      |      |
| 2 | 512 | 512 | 2048 | 3R1W | 8  | 16 | 4 | 8x64  | 64 | 46.5 | -    | -  | -   | -                      | -    | 128x128 | 32768 | 4096 | 64 | 88.0x | 16.0x | 11.0x |   |    |      |      |
| 2 | 512 | 512 | 2048 | 3R1W | 8  | 32 | 1 | -     | -  | -    | 8x64 | 46 | 256 | -                      | -    | 64x64   | 16384 | 2048 | 32 | -     | 8.0x  | 5.5x  |   |    |      |      |
| 2 | 512 | 512 | 2048 | 3R1W | 8  | 32 | 2 | -     | -  | -    | -    | -  | -   | -                      | -    | 64x64   | 16384 | 2048 | 32 | -     | 8.0x  | 5.5x  |   |    |      |      |
| 2 | 512 | 512 | 2048 | 3R1W | 8  | 32 | 4 | -     | -  | -    | -    | -  | -   | -                      | -    | 128x128 | 65536 | 4096 | 64 | -     | 16.0x | 11.0x |   |    |      |      |
| 2 | 512 | 512 | 2048 | 3R1W | 16 | 16 | 1 | 16x32 | 32 | 26.9 | 8x32 | 46 | 128 | 4.8x                   | 0.5x | 32x32   | 2048  | 512  | 16 | 19.0x | 4.0x  | 2.8x  |   |    |      |      |
| 2 | 512 | 512 | 2048 | 3R1W | 16 | 16 | 2 | 16x32 | 32 | 26.9 | -    | -  | -   | -                      | -    | 32x32   | 2048  | 512  | 16 | 19.0x | 4.0x  | 2.8x  |   |    |      |      |
| 2 | 512 | 512 | 2048 | 3R1W | 16 | 16 | 4 | 16x32 | 32 | 26.9 | -    | -  | -   | -                      | -    | 64x64   | 8192  | 1024 | 32 | 38.0x | 8.0x  | 5.5x  |   |    |      |      |
| 2 | 512 | 512 | 2048 | 3R1W | 16 | 32 | 1 | 8x32  | 32 | 23.3 | 8x32 | 46 | 128 | 5.5x                   | 0.9x | 32x32   | 4096  | 512  | 16 | 22.0x | 4.0x  | 2.8x  |   |    |      |      |
| 2 | 512 | 512 | 2048 | 3R1W | 16 | 32 | 2 | 8x32  | 32 | 23.3 | -    | -  | -   | -                      | -    | 32x32   | 4096  | 512  | 16 | 22.0x | 4.0x  | 2.8x  |   |    |      |      |
| 2 | 512 | 512 | 2048 | 3R1W | 16 | 32 | 4 | 8x32  | 32 | 23.3 | -    | -  | -   | -                      | -    | 64x64   | 16384 | 1024 | 32 | 44.0x | 8.0x  | 5.5x  |   |    |      |      |
| 2 | 512 | 512 | 2048 | 3R1W | 32 | 32 | 1 | 16x16 | 16 | 13.5 | 8x16 | 46 | 64  | 4.8x                   | 0.7x | 16x16   | 1024  | 128  | 8  | 9.5x  | 2.0x  | 1.4x  |   |    |      |      |
| 2 | 512 | 512 | 2048 | 3R1W | 32 | 32 | 2 | 16x16 | 16 | 13.5 | -    | -  | -   | -                      | -    | 16x16   | 1024  | 128  | 8  | 9.5x  | 2.0x  | 1.4x  |   |    |      |      |

|                        |      |      |       |       |          |      |     |        |    |      |       |    |      |      |       |         |       |      |       |       |       |       |       |       |
|------------------------|------|------|-------|-------|----------|------|-----|--------|----|------|-------|----|------|------|-------|---------|-------|------|-------|-------|-------|-------|-------|-------|
| 2                      | 512  | 512  | 2048  | 3R1W  | 32       | 32   | 4   | 16x16  | 16 | 13.5 | -     | -  | -    | -    | -     | 32x32   | 4096  | 256  | 16    | 19.0x | 4.0x  | 2.8x  |       |       |
| 2                      | 512  | 1024 | 4096  | 3R1W  | 8        | 8    | 1   | 16x128 | 64 | 64.0 | 8x128 | 62 | 380  | 5.9x | 0.4x  | 64x64   | 4096  | 2048 | 32    | 32.0x | 5.4x  | 5.5x  |       |       |
| 2                      | 512  | 1024 | 4096  | 3R1W  | 8        | 16   | 1   | 8x128  | 64 | 64.0 | 8x128 | 62 | 380  | 5.9x | 0.8x  | 64x64   | 8192  | 2048 | 32    | 32.0x | 5.4x  | 5.5x  |       |       |
| 2                      | 512  | 1024 | 4096  | 3R1W  | 8        | 16   | 2   | 8x128  | 64 | 64.0 | -     | -  | -    | -    | -     | 64x64   | 8192  | 2048 | 32    | 32.0x | 5.4x  | 5.5x  |       |       |
| 2                      | 512  | 1024 | 4096  | 3R1W  | 8        | 16   | 4   | 8x128  | 64 | 64.0 | -     | -  | -    | -    | -     | 128x128 | 32768 | 4096 | 64    | 64.0x | 10.8x | 11.0x |       |       |
| 2                      | 512  | 1024 | 4096  | 3R1W  | 8        | 32   | 1   | -      | -  | -    | 8x128 | 62 | 380  | -    | -     | 64x64   | 16384 | 2048 | 32    | -     | 5.4x  | 5.5x  |       |       |
| 2                      | 512  | 1024 | 4096  | 3R1W  | 8        | 32   | 2   | -      | -  | -    | -     | -  | -    | -    | -     | 64x64   | 16384 | 2048 | 32    | -     | 5.4x  | 5.5x  |       |       |
| 2                      | 512  | 1024 | 4096  | 3R1W  | 8        | 32   | 4   | -      | -  | -    | -     | -  | -    | -    | -     | 128x128 | 65536 | 4096 | 64    | -     | 10.8x | 11.0x |       |       |
| 2                      | 512  | 1024 | 4096  | 3R1W  | 16       | 16   | 1   | 16x64  | 32 | 32.0 | 8x64  | 62 | 190  | 5.9x | 0.5x  | 32x32   | 2048  | 512  | 16    | 16.0x | 2.7x  | 2.8x  |       |       |
| 2                      | 512  | 1024 | 4096  | 3R1W  | 16       | 16   | 2   | 16x64  | 32 | 32.0 | -     | -  | -    | -    | -     | 32x32   | 2048  | 512  | 16    | 16.0x | 2.7x  | 2.8x  |       |       |
| 2                      | 512  | 1024 | 4096  | 3R1W  | 16       | 16   | 4   | 16x64  | 32 | 32.0 | -     | -  | -    | -    | -     | 64x64   | 8192  | 1024 | 32    | 32.0x | 5.4x  | 5.5x  |       |       |
| 2                      | 512  | 1024 | 4096  | 3R1W  | 16       | 32   | 1   | 8x64   | 32 | 32.0 | 8x64  | 62 | 190  | 5.9x | 0.8x  | 32x32   | 4096  | 512  | 16    | 16.0x | 2.7x  | 2.8x  |       |       |
| 2                      | 512  | 1024 | 4096  | 3R1W  | 16       | 32   | 2   | 8x64   | 32 | 32.0 | -     | -  | -    | -    | -     | 32x32   | 4096  | 512  | 16    | 16.0x | 2.7x  | 2.8x  |       |       |
| 2                      | 512  | 1024 | 4096  | 3R1W  | 16       | 32   | 4   | 8x64   | 32 | 32.0 | -     | -  | -    | -    | -     | 64x64   | 16384 | 1024 | 32    | 32.0x | 5.4x  | 5.5x  |       |       |
| 2                      | 512  | 1024 | 4096  | 3R1W  | 32       | 32   | 1   | 16x32  | 16 | 16.0 | 8x32  | 62 | 95   | 5.9x | 0.5x  | 16x16   | 1024  | 128  | 8     | 8.0x  | 1.3x  | 1.4x  |       |       |
| 2                      | 512  | 1024 | 4096  | 3R1W  | 32       | 32   | 2   | 16x32  | 16 | 16.0 | -     | -  | -    | -    | -     | 16x16   | 1024  | 128  | 8     | 8.0x  | 1.3x  | 1.4x  |       |       |
| 2                      | 512  | 1024 | 4096  | 3R1W  | 32       | 32   | 4   | 16x32  | 16 | 16.0 | -     | -  | -    | -    | -     | 32x32   | 4096  | 256  | 16    | 16.0x | 2.7x  | 2.8x  |       |       |
| Base                   | VRF  |      |       |       | Datatype |      |     | RVV    |    |      | MVA   |    |      |      | OPA   |         |       |      |       |       |       |       |       |       |
| IPC                    | DLEN | VLEN | VRF   | ports | SEW      | EEW  | Δ   |        | C  | MAC  | MAC   | B  | loop | MAC  | RVV   | load    |       | acc  | acc   | MAC   | CI    | RVV   | MVA   | load  |
|                        | bits | bits | bytes |       | bits     | bits | cyc |        |    | /cyc | /cyc  |    | cyc  | /cyc | ratio | ratio   |       |      | bytes | /cyc  |       | ratio | ratio | ratio |
| 3                      | 128  | 128  | 512   | 3R1W  | 8        | 8    | 1   | 16x16  | 16 | 16.0 | 8x16  | 46 | 64   | 4.0x | 0.7x  | 16x16   | 256   | 128  | 8     | 8.0x  | 2.0x  | 1.4x  |       |       |
| 3                      | 128  | 128  | 512   | 3R1W  | 8        | 16   | 1   | 8x16   | 16 | 16.0 | 8x16  | 46 | 64   | 4.0x | 1.1x  | 16x16   | 512   | 128  | 8     | 8.0x  | 2.0x  | 1.4x  |       |       |
| 3                      | 128  | 128  | 512   | 3R1W  | 8        | 16   | 2   | 8x16   | 16 | 16.0 | -     | -  | -    | -    | -     | 16x16   | 512   | 128  | 8     | 8.0x  | 2.0x  | 1.4x  |       |       |
| 3                      | 128  | 128  | 512   | 3R1W  | 8        | 16   | 4   | 8x16   | 16 | 16.0 | -     | -  | -    | -    | -     | 32x32   | 2048  | 256  | 16    | 16.0x | 4.0x  | 2.8x  |       |       |
| 3                      | 128  | 128  | 512   | 3R1W  | 8        | 32   | 1   | -      | -  | -    | 8x16  | 46 | 64   | -    | -     | 16x16   | 1024  | 128  | 8     | -     | 2.0x  | 1.4x  |       |       |
| 3                      | 128  | 128  | 512   | 3R1W  | 8        | 32   | 2   | -      | -  | -    | -     | -  | -    | -    | -     | 16x16   | 1024  | 128  | 8     | -     | 2.0x  | 1.4x  |       |       |
| 3                      | 128  | 128  | 512   | 3R1W  | 8        | 32   | 4   | -      | -  | -    | -     | -  | -    | -    | -     | 32x32   | 4096  | 256  | 16    | -     | 4.0x  | 2.8x  |       |       |
| 3                      | 128  | 128  | 512   | 3R1W  | 16       | 16   | 1   | 16x8   | 8  | 8.0  | 8x8   | 46 | 32   | 4.0x | 1.1x  | 8x8     | 128   | 32   | 4     | 4.0x  | 1.0x  | 0.7x  |       |       |
| 4 cycle variant of OPA |      |      |       |       |          |      |     |        |    |      |       |    |      |      |       | 16x16   | 512   | 64   | 8     | 8x    | 2.0x  | 1.4x  |       |       |
| 3                      | 128  | 128  | 512   | 3R1W  | 16       | 16   | 2   | 16x8   | 8  | 8.0  | -     | -  | -    | -    | -     | 8x8     | 128   | 32   | 4     | 4.0x  | 1.0x  | 0.7x  |       |       |
| 4 cycle variant of OPA |      |      |       |       |          |      |     |        |    |      |       |    |      |      |       | 16x16   | 512   | 64   | 8     | 8x    | 2.0x  | 1.4x  |       |       |
| 3                      | 128  | 128  | 512   | 3R1W  | 16       | 16   | 4   | 16x8   | 8  | 8.0  | -     | -  | -    | -    | -     | 16x16   | 512   | 64   | 8     | 8.0x  | 2.0x  | 1.4x  |       |       |
| 3                      | 128  | 128  | 512   | 3R1W  | 16       | 32   | 1   | 8x8    | 8  | 8.0  | 8x8   | 46 | 32   | 4.0x | 1.5x  | 8x8     | 256   | 32   | 4     | 4.0x  | 1.0x  | 0.7x  |       |       |
| 4 cycle variant of OPA |      |      |       |       |          |      |     |        |    |      |       |    |      |      |       | 16x16   | 1024  | 64   | 8     | 8x    | 2.0x  | 1.4x  |       |       |
| 3                      | 128  | 128  | 512   | 3R1W  | 16       | 32   | 2   | 8x8    | 8  | 8.0  | -     | -  | -    | -    | -     | 8x8     | 256   | 32   | 4     | 4.0x  | 1.0x  | 0.7x  |       |       |
| 4 cycle variant of OPA |      |      |       |       |          |      |     |        |    |      |       |    |      |      |       | 16x16   | 1024  | 64   | 8     | 8x    | 2.0x  | 1.4x  |       |       |
| 3                      | 128  | 128  | 512   | 3R1W  | 16       | 32   | 4   | 8x8    | 8  | 8.0  | -     | -  | -    | -    | -     | 16x16   | 1024  | 64   | 8     | 8.0x  | 2.0x  | 1.4x  |       |       |
| 3                      | 128  | 128  | 512   | 3R1W  | 32       | 32   | 1   | 16x4   | 4  | 4.0  | 8x4   | 46 | 16   | 4.0x | 1.8x  | 4x4     | 64    | 8    | 2     | 2.0x  | 0.5x  | 0.3x  |       |       |
| 4 cycle variant of OPA |      |      |       |       |          |      |     |        |    |      |       |    |      |      |       | 8x8     | 256   | 16   | 4     | 4x    | 1.0x  | 0.7x  |       |       |
| 3                      | 128  | 128  | 512   | 3R1W  | 32       | 32   | 2   | 16x4   | 4  | 4.0  | -     | -  | -    | -    | -     | 4x4     | 64    | 8    | 2     | 2.0x  | 0.5x  | 0.3x  |       |       |
| 4 cycle variant of OPA |      |      |       |       |          |      |     |        |    |      |       |    |      |      |       | 8x8     | 256   | 16   | 4     | 4x    | 1.0x  | 0.7x  |       |       |
| 3                      | 128  | 128  | 512   | 3R1W  | 32       | 32   | 4   | 16x4   | 4  | 4.0  | -     | -  | -    | -    | -     | 8x8     | 256   | 16   | 4     | 4.0x  | 1.0x  | 0.7x  |       |       |
| 4 cycle variant of OPA |      |      |       |       |          |      |     |        |    |      |       |    |      |      |       | 16x16   | 1024  | 32   | 8     | 8x    | 2.0x  | 1.4x  |       |       |
| 3                      | 128  | 128  | 512   | 6R1W  | 8        | 8    | 1   | 16x16  | 16 | 16.0 | 8x16  | 31 | 95   | 5.9x | 0.7x  | 16x16   | 256   | 128  | 8     | 8.0x  | 1.3x  | 1.4x  |       |       |
| 3                      | 128  | 128  | 512   | 6R1W  | 8        | 16   | 1   | 8x16   | 16 | 16.0 | 8x16  | 31 | 95   | 5.9x | 1.1x  | 16x16   | 512   | 128  | 8     | 8.0x  | 1.3x  | 1.4x  |       |       |
| 3                      | 128  | 128  | 512   | 6R1W  | 8        | 16   | 2   | 8x16   | 16 | 16.0 | -     | -  | -    | -    | -     | 16x16   | 512   | 128  | 8     | 8.0x  | 1.3x  | 1.4x  |       |       |
| 3                      | 128  | 128  | 512   | 6R1W  | 8        | 16   | 4   | 8x16   | 16 | 16.0 | -     | -  | -    | -    | -     | 32x32   | 2048  | 256  | 16    | 16.0x | 2.7x  | 2.8x  |       |       |
| 3                      | 128  | 128  | 512   | 6R1W  | 8        | 32   | 1   | -      | -  | -    | 8x16  | 31 | 95   | -    | -     | 16x16   | 1024  | 128  | 8     | -     | 1.3x  | 1.4x  |       |       |
| 3                      | 128  | 128  | 512   | 6R1W  | 8        | 32   | 2   | -      | -  | -    | -     | -  | -    | -    | -     | 16x16   | 1024  | 128  | 8     | -     | 1.3x  | 1.4x  |       |       |
| 3                      | 128  | 128  | 512   | 6R1W  | 8        | 32   | 4   | -      | -  | -    | -     | -  | -    | -    | -     | 32x32   | 4096  | 256  | 16    | -     | 2.7x  | 2.8x  |       |       |
| 3                      | 128  | 128  | 512   | 6R1W  | 16       | 16   | 1   | 16x8   | 8  | 8.0  | 8x8   | 31 | 47   | 5.9x | 1.1x  | 8x8     | 128   | 32   | 4     | 4.0x  | 0.7x  | 0.7x  |       |       |
| 4 cycle variant of OPA |      |      |       |       |          |      |     |        |    |      |       |    |      |      |       | 16x16   | 512   | 64   | 8     | 8x    | 1.3x  | 1.4x  |       |       |

|                        |     |     |      |      |    |    |   |       |    |      |      |    |    |      |      |       |      |     |    |       |      |      |
|------------------------|-----|-----|------|------|----|----|---|-------|----|------|------|----|----|------|------|-------|------|-----|----|-------|------|------|
| 3                      | 128 | 128 | 512  | 6R1W | 16 | 16 | 2 | 16x8  | 8  | 8.0  | -    | -  | -  | -    | -    | 8x8   | 128  | 32  | 4  | 4.0x  | 0.7x | 0.7x |
| 4 cycle variant of OPA |     |     |      |      |    |    |   |       |    |      |      |    |    |      |      | 16x16 | 512  | 64  | 8  | 8x    | 1.3x | 1.4x |
| 3                      | 128 | 128 | 512  | 6R1W | 16 | 16 | 4 | 16x8  | 8  | 8.0  | -    | -  | -  | -    | -    | 16x16 | 512  | 64  | 8  | 8.0x  | 1.3x | 1.4x |
| 3                      | 128 | 128 | 512  | 6R1W | 16 | 32 | 1 | 8x8   | 8  | 8.0  | 8x8  | 31 | 47 | 5.9x | 1.5x | 8x8   | 256  | 32  | 4  | 4.0x  | 0.7x | 0.7x |
| 4 cycle variant of OPA |     |     |      |      |    |    |   |       |    |      |      |    |    |      |      | 16x16 | 1024 | 64  | 8  | 8x    | 1.3x | 1.4x |
| 3                      | 128 | 128 | 512  | 6R1W | 16 | 32 | 2 | 8x8   | 8  | 8.0  | -    | -  | -  | -    | -    | 8x8   | 256  | 32  | 4  | 4.0x  | 0.7x | 0.7x |
| 4 cycle variant of OPA |     |     |      |      |    |    |   |       |    |      |      |    |    |      |      | 16x16 | 1024 | 64  | 8  | 8x    | 1.3x | 1.4x |
| 3                      | 128 | 128 | 512  | 6R1W | 16 | 32 | 4 | 8x8   | 8  | 8.0  | -    | -  | -  | -    | -    | 16x16 | 1024 | 64  | 8  | 8.0x  | 1.3x | 1.4x |
| 3                      | 128 | 128 | 512  | 6R1W | 32 | 32 | 1 | 16x4  | 4  | 4.0  | 8x4  | 31 | 24 | 5.9x | 1.8x | 4x4   | 64   | 8   | 2  | 2.0x  | 0.3x | 0.3x |
| 4 cycle variant of OPA |     |     |      |      |    |    |   |       |    |      |      |    |    |      |      | 8x8   | 256  | 16  | 4  | 4x    | 0.7x | 0.7x |
| 3                      | 128 | 128 | 512  | 6R1W | 32 | 32 | 2 | 16x4  | 4  | 4.0  | -    | -  | -  | -    | -    | 4x4   | 64   | 8   | 2  | 2.0x  | 0.3x | 0.3x |
| 4 cycle variant of OPA |     |     |      |      |    |    |   |       |    |      |      |    |    |      |      | 8x8   | 256  | 16  | 4  | 4x    | 0.7x | 0.7x |
| 3                      | 128 | 128 | 512  | 6R1W | 32 | 32 | 4 | 16x4  | 4  | 4.0  | -    | -  | -  | -    | -    | 8x8   | 256  | 16  | 4  | 4.0x  | 0.7x | 0.7x |
| 4 cycle variant of OPA |     |     |      |      |    |    |   |       |    |      |      |    |    |      |      | 16x16 | 1024 | 32  | 8  | 8x    | 1.3x | 1.4x |
| 3                      | 128 | 256 | 1024 | 3R1W | 8  | 8  | 1 | 16x32 | 16 | 16.0 | 8x32 | 62 | 95 | 5.9x | 0.5x | 16x16 | 256  | 128 | 8  | 8.0x  | 1.3x | 1.4x |
| 3                      | 128 | 256 | 1024 | 3R1W | 8  | 16 | 1 | 8x32  | 16 | 16.0 | 8x32 | 62 | 95 | 5.9x | 0.9x | 16x16 | 512  | 128 | 8  | 8.0x  | 1.3x | 1.4x |
| 3                      | 128 | 256 | 1024 | 3R1W | 8  | 16 | 2 | 8x32  | 16 | 16.0 | -    | -  | -  | -    | -    | 16x16 | 512  | 128 | 8  | 8.0x  | 1.3x | 1.4x |
| 3                      | 128 | 256 | 1024 | 3R1W | 8  | 16 | 4 | 8x32  | 16 | 16.0 | -    | -  | -  | -    | -    | 32x32 | 2048 | 256 | 16 | 16.0x | 2.7x | 2.8x |
| 3                      | 128 | 256 | 1024 | 3R1W | 8  | 32 | 1 | -     | -  | -    | 8x32 | 62 | 95 | -    | -    | 16x16 | 1024 | 128 | 8  | -     | 1.3x | 1.4x |
| 3                      | 128 | 256 | 1024 | 3R1W | 8  | 32 | 2 | -     | -  | -    | -    | -  | -  | -    | -    | 16x16 | 1024 | 128 | 8  | -     | 1.3x | 1.4x |
| 3                      | 128 | 256 | 1024 | 3R1W | 8  | 32 | 4 | -     | -  | -    | -    | -  | -  | -    | -    | 32x32 | 4096 | 256 | 16 | -     | 2.7x | 2.8x |
| 3                      | 128 | 256 | 1024 | 3R1W | 16 | 16 | 1 | 16x16 | 8  | 8.0  | 8x16 | 62 | 47 | 5.9x | 0.7x | 8x8   | 128  | 32  | 4  | 4.0x  | 0.7x | 0.7x |
| 4 cycle variant of OPA |     |     |      |      |    |    |   |       |    |      |      |    |    |      |      | 16x16 | 512  | 64  | 8  | 8x    | 1.3x | 1.4x |
| 3                      | 128 | 256 | 1024 | 3R1W | 16 | 16 | 2 | 16x16 | 8  | 8.0  | -    | -  | -  | -    | -    | 8x8   | 128  | 32  | 4  | 4.0x  | 0.7x | 0.7x |
| 4 cycle variant of OPA |     |     |      |      |    |    |   |       |    |      |      |    |    |      |      | 16x16 | 512  | 64  | 8  | 8x    | 1.3x | 1.4x |
| 3                      | 128 | 256 | 1024 | 3R1W | 16 | 16 | 4 | 16x16 | 8  | 8.0  | -    | -  | -  | -    | -    | 16x16 | 512  | 64  | 8  | 8.0x  | 1.3x | 1.4x |
| 3                      | 128 | 256 | 1024 | 3R1W | 16 | 32 | 1 | 8x16  | 8  | 8.0  | 8x16 | 62 | 47 | 5.9x | 1.1x | 8x8   | 256  | 32  | 4  | 4.0x  | 0.7x | 0.7x |
| 4 cycle variant of OPA |     |     |      |      |    |    |   |       |    |      |      |    |    |      |      | 16x16 | 1024 | 64  | 8  | 8x    | 1.3x | 1.4x |
| 3                      | 128 | 256 | 1024 | 3R1W | 16 | 32 | 2 | 8x16  | 8  | 8.0  | -    | -  | -  | -    | -    | 8x8   | 256  | 32  | 4  | 4.0x  | 0.7x | 0.7x |
| 4 cycle variant of OPA |     |     |      |      |    |    |   |       |    |      |      |    |    |      |      | 16x16 | 1024 | 64  | 8  | 8x    | 1.3x | 1.4x |
| 3                      | 128 | 256 | 1024 | 3R1W | 16 | 32 | 4 | 8x16  | 8  | 8.0  | -    | -  | -  | -    | -    | 16x16 | 1024 | 64  | 8  | 8.0x  | 1.3x | 1.4x |
| 3                      | 128 | 256 | 1024 | 3R1W | 32 | 32 | 1 | 16x8  | 4  | 4.0  | 8x8  | 62 | 24 | 5.9x | 1.1x | 4x4   | 64   | 8   | 2  | 2.0x  | 0.3x | 0.3x |
| 4 cycle variant of OPA |     |     |      |      |    |    |   |       |    |      |      |    |    |      |      | 8x8   | 256  | 16  | 4  | 4x    | 0.7x | 0.7x |
| 3                      | 128 | 256 | 1024 | 3R1W | 32 | 32 | 2 | 16x8  | 4  | 4.0  | -    | -  | -  | -    | -    | 4x4   | 64   | 8   | 2  | 2.0x  | 0.3x | 0.3x |
| 4 cycle variant of OPA |     |     |      |      |    |    |   |       |    |      |      |    |    |      |      | 8x8   | 256  | 16  | 4  | 4x    | 0.7x | 0.7x |
| 3                      | 128 | 256 | 1024 | 3R1W | 32 | 32 | 4 | 16x8  | 4  | 4.0  | -    | -  | -  | -    | -    | 8x8   | 256  | 16  | 4  | 4.0x  | 0.7x | 0.7x |
| 4 cycle variant of OPA |     |     |      |      |    |    |   |       |    |      |      |    |    |      |      | 16x16 | 1024 | 32  | 8  | 8x    | 1.3x | 1.4x |
| 3                      | 128 | 256 | 1024 | 6R1W | 8  | 8  | 1 | 16x32 | 16 | 16.0 | 8x32 | 62 | 95 | 5.9x | 0.5x | 16x16 | 256  | 128 | 8  | 8.0x  | 1.3x | 1.4x |
| 3                      | 128 | 256 | 1024 | 6R1W | 8  | 16 | 1 | 8x32  | 16 | 16.0 | 8x32 | 62 | 95 | 5.9x | 0.9x | 16x16 | 512  | 128 | 8  | 8.0x  | 1.3x | 1.4x |
| 3                      | 128 | 256 | 1024 | 6R1W | 8  | 16 | 2 | 8x32  | 16 | 16.0 | -    | -  | -  | -    | -    | 16x16 | 512  | 128 | 8  | 8.0x  | 1.3x | 1.4x |
| 3                      | 128 | 256 | 1024 | 6R1W | 8  | 16 | 4 | 8x32  | 16 | 16.0 | -    | -  | -  | -    | -    | 32x32 | 2048 | 256 | 16 | 16.0x | 2.7x | 2.8x |
| 3                      | 128 | 256 | 1024 | 6R1W | 8  | 32 | 1 | -     | -  | -    | 8x32 | 62 | 95 | -    | -    | 16x16 | 1024 | 128 | 8  | -     | 1.3x | 1.4x |
| 3                      | 128 | 256 | 1024 | 6R1W | 8  | 32 | 2 | -     | -  | -    | -    | -  | -  | -    | -    | 16x16 | 1024 | 128 | 8  | -     | 1.3x | 1.4x |
| 3                      | 128 | 256 | 1024 | 6R1W | 8  | 32 | 4 | -     | -  | -    | -    | -  | -  | -    | -    | 32x32 | 4096 | 256 | 16 | -     | 2.7x | 2.8x |
| 3                      | 128 | 256 | 1024 | 6R1W | 16 | 16 | 1 | 16x16 | 8  | 8.0  | 8x16 | 62 | 47 | 5.9x | 0.7x | 8x8   | 128  | 32  | 4  | 4.0x  | 0.7x | 0.7x |
| 4 cycle variant of OPA |     |     |      |      |    |    |   |       |    |      |      |    |    |      |      | 16x16 | 512  | 64  | 8  | 8x    | 1.3x | 1.4x |
| 3                      | 128 | 256 | 1024 | 6R1W | 16 | 16 | 2 | 16x16 | 8  | 8.0  | -    | -  | -  | -    | -    | 8x8   | 128  | 32  | 4  | 4.0x  | 0.7x | 0.7x |
| 4 cycle variant of OPA |     |     |      |      |    |    |   |       |    |      |      |    |    |      |      | 16x16 | 512  | 64  | 8  | 8x    | 1.3x | 1.4x |
| 3                      | 128 | 256 | 1024 | 6R1W | 16 | 16 | 4 | 16x16 | 8  | 8.0  | -    | -  | -  | -    | -    | 16x16 | 512  | 64  | 8  | 8.0x  | 1.3x | 1.4x |
| 3                      | 128 | 256 | 1024 | 6R1W | 16 | 32 | 1 | 8x16  | 8  | 8.0  | 8x16 | 62 | 47 | 5.9x | 1.1x | 8x8   | 256  | 32  | 4  | 4.0x  | 0.7x | 0.7x |
| 4 cycle variant of OPA |     |     |      |      |    |    |   |       |    |      |      |    |    |      |      | 16x16 | 1024 | 64  | 8  | 8x    | 1.3x | 1.4x |
| 3                      | 128 | 256 | 1024 | 6R1W | 16 | 32 | 2 | 8x16  | 8  | 8.0  | -    | -  | -  | -    | -    | 8x8   | 256  | 32  | 4  | 4.0x  | 0.7x | 0.7x |

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|                        |     |     |      |      |    |    |   |       |    |      |      |    |     |      |      |         |       |      |    |       |       |       |
|------------------------|-----|-----|------|------|----|----|---|-------|----|------|------|----|-----|------|------|---------|-------|------|----|-------|-------|-------|
| 3                      | 256 | 512 | 2048 | 3R1W | 16 | 16 | 2 | 16x32 | 16 | 16.0 | -    | -  | -   | -    | -    | 16x16   | 512   | 128  | 8  | 8.0x  | 1.3x  | 1.4x  |
| 3                      | 256 | 512 | 2048 | 3R1W | 16 | 16 | 4 | 16x32 | 16 | 16.0 | -    | -  | -   | -    | -    | 32x32   | 2048  | 256  | 16 | 16.0x | 2.7x  | 2.8x  |
| 3                      | 256 | 512 | 2048 | 3R1W | 16 | 32 | 1 | 8x32  | 16 | 16.0 | 8x32 | 62 | 95  | 5.9x | 0.9x | 16x16   | 1024  | 128  | 8  | 8.0x  | 1.3x  | 1.4x  |
| 3                      | 256 | 512 | 2048 | 3R1W | 16 | 32 | 2 | 8x32  | 16 | 16.0 | -    | -  | -   | -    | -    | 16x16   | 1024  | 128  | 8  | 8.0x  | 1.3x  | 1.4x  |
| 3                      | 256 | 512 | 2048 | 3R1W | 16 | 32 | 4 | 8x32  | 16 | 16.0 | -    | -  | -   | -    | -    | 32x32   | 4096  | 256  | 16 | 16.0x | 2.7x  | 2.8x  |
| 3                      | 256 | 512 | 2048 | 3R1W | 32 | 32 | 1 | 16x16 | 8  | 8.0  | 8x16 | 62 | 47  | 5.9x | 0.7x | 8x8     | 256   | 32   | 4  | 4.0x  | 0.7x  | 0.7x  |
| 4 cycle variant of OPA |     |     |      |      |    |    |   |       |    |      |      |    |     |      |      | 16x16   | 1024  | 64   | 8  | 8x    | 1.3x  | 1.4x  |
| 3                      | 256 | 512 | 2048 | 3R1W | 32 | 32 | 2 | 16x16 | 8  | 8.0  | -    | -  | -   | -    | -    | 8x8     | 256   | 32   | 4  | 4.0x  | 0.7x  | 0.7x  |
| 4 cycle variant of OPA |     |     |      |      |    |    |   |       |    |      |      |    |     |      |      | 16x16   | 1024  | 64   | 8  | 8x    | 1.3x  | 1.4x  |
| 3                      | 256 | 512 | 2048 | 3R1W | 32 | 32 | 4 | 16x16 | 8  | 8.0  | -    | -  | -   | -    | -    | 16x16   | 1024  | 64   | 8  | 8.0x  | 1.3x  | 1.4x  |
| 3                      | 256 | 512 | 2048 | 6R1W | 8  | 8  | 1 | 16x64 | 32 | 32.0 | 8x64 | 62 | 190 | 5.9x | 0.5x | 32x32   | 1024  | 512  | 16 | 16.0x | 2.7x  | 2.8x  |
| 3                      | 256 | 512 | 2048 | 6R1W | 8  | 16 | 1 | 8x64  | 32 | 32.0 | 8x64 | 62 | 190 | 5.9x | 0.8x | 32x32   | 2048  | 512  | 16 | 16.0x | 2.7x  | 2.8x  |
| 3                      | 256 | 512 | 2048 | 6R1W | 8  | 16 | 2 | 8x64  | 32 | 32.0 | -    | -  | -   | -    | -    | 32x32   | 2048  | 512  | 16 | 16.0x | 2.7x  | 2.8x  |
| 3                      | 256 | 512 | 2048 | 6R1W | 8  | 16 | 4 | 8x64  | 32 | 32.0 | -    | -  | -   | -    | -    | 64x64   | 8192  | 1024 | 32 | 32.0x | 5.4x  | 5.5x  |
| 3                      | 256 | 512 | 2048 | 6R1W | 8  | 32 | 1 | -     | -  | -    | 8x64 | 62 | 190 | -    | -    | 32x32   | 4096  | 512  | 16 | -     | 2.7x  | 2.8x  |
| 3                      | 256 | 512 | 2048 | 6R1W | 8  | 32 | 2 | -     | -  | -    | -    | -  | -   | -    | -    | 32x32   | 4096  | 512  | 16 | -     | 2.7x  | 2.8x  |
| 3                      | 256 | 512 | 2048 | 6R1W | 8  | 32 | 4 | -     | -  | -    | -    | -  | -   | -    | -    | 64x64   | 16384 | 1024 | 32 | -     | 5.4x  | 5.5x  |
| 3                      | 256 | 512 | 2048 | 6R1W | 16 | 16 | 1 | 16x32 | 16 | 16.0 | 8x32 | 62 | 95  | 5.9x | 0.5x | 16x16   | 512   | 128  | 8  | 8.0x  | 1.3x  | 1.4x  |
| 3                      | 256 | 512 | 2048 | 6R1W | 16 | 16 | 2 | 16x32 | 16 | 16.0 | -    | -  | -   | -    | -    | 16x16   | 512   | 128  | 8  | 8.0x  | 1.3x  | 1.4x  |
| 3                      | 256 | 512 | 2048 | 6R1W | 16 | 16 | 4 | 16x32 | 16 | 16.0 | -    | -  | -   | -    | -    | 32x32   | 2048  | 256  | 16 | 16.0x | 2.7x  | 2.8x  |
| 3                      | 256 | 512 | 2048 | 6R1W | 16 | 32 | 1 | 8x32  | 16 | 16.0 | 8x32 | 62 | 95  | 5.9x | 0.9x | 16x16   | 1024  | 128  | 8  | 8.0x  | 1.3x  | 1.4x  |
| 3                      | 256 | 512 | 2048 | 6R1W | 16 | 32 | 2 | 8x32  | 16 | 16.0 | -    | -  | -   | -    | -    | 16x16   | 1024  | 128  | 8  | 8.0x  | 1.3x  | 1.4x  |
| 3                      | 256 | 512 | 2048 | 6R1W | 16 | 32 | 4 | 8x32  | 16 | 16.0 | -    | -  | -   | -    | -    | 32x32   | 4096  | 256  | 16 | 16.0x | 2.7x  | 2.8x  |
| 3                      | 256 | 512 | 2048 | 6R1W | 32 | 32 | 1 | 16x16 | 8  | 8.0  | 8x16 | 62 | 47  | 5.9x | 0.7x | 8x8     | 256   | 32   | 4  | 4.0x  | 0.7x  | 0.7x  |
| 4 cycle variant of OPA |     |     |      |      |    |    |   |       |    |      |      |    |     |      |      | 16x16   | 1024  | 64   | 8  | 8x    | 1.3x  | 1.4x  |
| 3                      | 256 | 512 | 2048 | 6R1W | 32 | 32 | 2 | 16x16 | 8  | 8.0  | -    | -  | -   | -    | -    | 8x8     | 256   | 32   | 4  | 4.0x  | 0.7x  | 0.7x  |
| 4 cycle variant of OPA |     |     |      |      |    |    |   |       |    |      |      |    |     |      |      | 16x16   | 1024  | 64   | 8  | 8x    | 1.3x  | 1.4x  |
| 3                      | 256 | 512 | 2048 | 6R1W | 32 | 32 | 4 | 16x16 | 8  | 8.0  | -    | -  | -   | -    | -    | 16x16   | 1024  | 64   | 8  | 8.0x  | 1.3x  | 1.4x  |
| 3                      | 512 | 512 | 2048 | 3R1W | 8  | 8  | 1 | 16x64 | 64 | 64.0 | 8x64 | 46 | 256 | 4.0x | 0.5x | 64x64   | 4096  | 2048 | 32 | 32.0x | 8.0x  | 5.5x  |
| 3                      | 512 | 512 | 2048 | 3R1W | 8  | 16 | 1 | 8x64  | 64 | 64.0 | 8x64 | 46 | 256 | 4.0x | 0.8x | 64x64   | 8192  | 2048 | 32 | 32.0x | 8.0x  | 5.5x  |
| 3                      | 512 | 512 | 2048 | 3R1W | 8  | 16 | 2 | 8x64  | 64 | 64.0 | -    | -  | -   | -    | -    | 64x64   | 8192  | 2048 | 32 | 32.0x | 8.0x  | 5.5x  |
| 3                      | 512 | 512 | 2048 | 3R1W | 8  | 16 | 4 | 8x64  | 64 | 64.0 | -    | -  | -   | -    | -    | 128x128 | 32768 | 4096 | 64 | 64.0x | 16.0x | 11.0x |
| 3                      | 512 | 512 | 2048 | 3R1W | 8  | 32 | 1 | -     | -  | -    | 8x64 | 46 | 256 | -    | -    | 64x64   | 16384 | 2048 | 32 | -     | 8.0x  | 5.5x  |
| 3                      | 512 | 512 | 2048 | 3R1W | 8  | 32 | 2 | -     | -  | -    | -    | -  | -   | -    | -    | 64x64   | 16384 | 2048 | 32 | -     | 8.0x  | 5.5x  |
| 3                      | 512 | 512 | 2048 | 3R1W | 8  | 32 | 4 | -     | -  | -    | -    | -  | -   | -    | -    | 128x128 | 65536 | 4096 | 64 | -     | 16.0x | 11.0x |
| 3                      | 512 | 512 | 2048 | 3R1W | 16 | 16 | 1 | 16x32 | 32 | 32.0 | 8x32 | 46 | 128 | 4.0x | 0.5x | 32x32   | 2048  | 512  | 16 | 16.0x | 4.0x  | 2.8x  |
| 3                      | 512 | 512 | 2048 | 3R1W | 16 | 16 | 2 | 16x32 | 32 | 32.0 | -    | -  | -   | -    | -    | 32x32   | 2048  | 512  | 16 | 16.0x | 4.0x  | 2.8x  |
| 3                      | 512 | 512 | 2048 | 3R1W | 16 | 16 | 4 | 16x32 | 32 | 32.0 | -    | -  | -   | -    | -    | 64x64   | 8192  | 1024 | 32 | 32.0x | 8.0x  | 5.5x  |
| 3                      | 512 | 512 | 2048 | 3R1W | 16 | 32 | 1 | 8x32  | 32 | 32.0 | 8x32 | 46 | 128 | 4.0x | 0.9x | 32x32   | 4096  | 512  | 16 | 16.0x | 4.0x  | 2.8x  |
| 3                      | 512 | 512 | 2048 | 3R1W | 16 | 32 | 2 | 8x32  | 32 | 32.0 | -    | -  | -   | -    | -    | 32x32   | 4096  | 512  | 16 | 16.0x | 4.0x  | 2.8x  |
| 3                      | 512 | 512 | 2048 | 3R1W | 16 | 32 | 4 | 8x32  | 32 | 32.0 | -    | -  | -   | -    | -    | 64x64   | 16384 | 1024 | 32 | 32.0x | 8.0x  | 5.5x  |
| 3                      | 512 | 512 | 2048 | 3R1W | 32 | 32 | 1 | 16x16 | 16 | 16.0 | 8x16 | 46 | 64  | 4.0x | 0.7x | 16x16   | 1024  | 128  | 8  | 8.0x  | 2.0x  | 1.4x  |
| 3                      | 512 | 512 | 2048 | 3R1W | 32 | 32 | 2 | 16x16 | 16 | 16.0 | -    | -  | -   | -    | -    | 16x16   | 1024  | 128  | 8  | 8.0x  | 2.0x  | 1.4x  |
| 3                      | 512 | 512 | 2048 | 3R1W | 32 | 32 | 4 | 16x16 | 16 | 16.0 | -    | -  | -   | -    | -    | 32x32   | 4096  | 256  | 16 | 16.0x | 4.0x  | 2.8x  |
| 3                      | 512 | 512 | 2048 | 6R1W | 8  | 8  | 1 | 16x64 | 64 | 64.0 | 8x64 | 31 | 380 | 5.9x | 0.5x | 64x64   | 4096  | 2048 | 32 | 32.0x | 5.4x  | 5.5x  |
| 3                      | 512 | 512 | 2048 | 6R1W | 8  | 16 | 1 | 8x64  | 64 | 64.0 | 8x64 | 31 | 380 | 5.9x | 0.8x | 64x64   | 8192  | 2048 | 32 | 32.0x | 5.4x  | 5.5x  |
| 3                      | 512 | 512 | 2048 | 6R1W | 8  | 16 | 2 | 8x64  | 64 | 64.0 | -    | -  | -   | -    | -    | 64x64   | 8192  | 2048 | 32 | 32.0x | 5.4x  | 5.5x  |
| 3                      | 512 | 512 | 2048 | 6R1W | 8  | 16 | 4 | 8x64  | 64 | 64.0 | -    | -  | -   | -    | -    | 128x128 | 32768 | 4096 | 64 | 64.0x | 10.8x | 11.0x |
| 3                      | 512 | 512 | 2048 | 6R1W | 8  | 32 | 1 | -     | -  | -    | 8x64 | 31 | 380 | -    | -    | 64x64   | 16384 | 2048 | 32 | -     | 5.4x  | 5.5x  |
| 3                      | 512 | 512 | 2048 | 6R1W | 8  | 32 | 2 | -     | -  | -    | -    | -  | -   | -    | -    | 64x64   | 16384 | 2048 | 32 | -     | 5.4x  | 5.5x  |
| 3                      | 512 | 512 | 2048 | 6R1W | 8  | 32 | 4 | -     | -  | -    | -    | -  | -   | -    | -    | 128x128 | 65536 | 4096 | 64 | -     | 10.8x | 11.0x |
| 3                      | 512 | 512 | 2048 | 6R1W | 16 | 16 | 1 | 16x32 | 32 | 32.0 | 8x32 | 31 | 190 | 5.9x | 0.5x | 32x32   | 2048  | 512  | 16 | 16.0x | 2.7x  | 2.8x  |

|   |     |      |      |      |    |    |   |        |    |      |       |    |     |      |      |         |       |      |    |       |       |       |
|---|-----|------|------|------|----|----|---|--------|----|------|-------|----|-----|------|------|---------|-------|------|----|-------|-------|-------|
| 3 | 512 | 512  | 2048 | 6R1W | 16 | 16 | 2 | 16x32  | 32 | 32.0 | -     | -  | -   | -    | -    | 32x32   | 2048  | 512  | 16 | 16.0x | 2.7x  | 2.8x  |
| 3 | 512 | 512  | 2048 | 6R1W | 16 | 16 | 4 | 16x32  | 32 | 32.0 | -     | -  | -   | -    | -    | 64x64   | 8192  | 1024 | 32 | 32.0x | 5.4x  | 5.5x  |
| 3 | 512 | 512  | 2048 | 6R1W | 16 | 32 | 1 | 8x32   | 32 | 32.0 | 8x32  | 31 | 190 | 5.9x | 0.9x | 32x32   | 4096  | 512  | 16 | 16.0x | 2.7x  | 2.8x  |
| 3 | 512 | 512  | 2048 | 6R1W | 16 | 32 | 2 | 8x32   | 32 | 32.0 | -     | -  | -   | -    | -    | 32x32   | 4096  | 512  | 16 | 16.0x | 2.7x  | 2.8x  |
| 3 | 512 | 512  | 2048 | 6R1W | 16 | 32 | 4 | 8x32   | 32 | 32.0 | -     | -  | -   | -    | -    | 64x64   | 16384 | 1024 | 32 | 32.0x | 5.4x  | 5.5x  |
| 3 | 512 | 512  | 2048 | 6R1W | 32 | 32 | 1 | 16x16  | 16 | 16.0 | 8x16  | 31 | 95  | 5.9x | 0.7x | 16x16   | 1024  | 128  | 8  | 8.0x  | 1.3x  | 1.4x  |
| 3 | 512 | 512  | 2048 | 6R1W | 32 | 32 | 2 | 16x16  | 16 | 16.0 | -     | -  | -   | -    | -    | 16x16   | 1024  | 128  | 8  | 8.0x  | 1.3x  | 1.4x  |
| 3 | 512 | 512  | 2048 | 6R1W | 32 | 32 | 4 | 16x16  | 16 | 16.0 | -     | -  | -   | -    | -    | 32x32   | 4096  | 256  | 16 | 16.0x | 2.7x  | 2.8x  |
| 3 | 512 | 1024 | 4096 | 3R1W | 8  | 8  | 1 | 16x128 | 64 | 64.0 | 8x128 | 62 | 380 | 5.9x | 0.4x | 64x64   | 4096  | 2048 | 32 | 32.0x | 5.4x  | 5.5x  |
| 3 | 512 | 1024 | 4096 | 3R1W | 8  | 16 | 1 | 8x128  | 64 | 64.0 | 8x128 | 62 | 380 | 5.9x | 0.8x | 64x64   | 8192  | 2048 | 32 | 32.0x | 5.4x  | 5.5x  |
| 3 | 512 | 1024 | 4096 | 3R1W | 8  | 16 | 2 | 8x128  | 64 | 64.0 | -     | -  | -   | -    | -    | 64x64   | 8192  | 2048 | 32 | 32.0x | 5.4x  | 5.5x  |
| 3 | 512 | 1024 | 4096 | 3R1W | 8  | 16 | 4 | 8x128  | 64 | 64.0 | -     | -  | -   | -    | -    | 128x128 | 32768 | 4096 | 64 | 64.0x | 10.8x | 11.0x |
| 3 | 512 | 1024 | 4096 | 3R1W | 8  | 32 | 1 | -      | -  | -    | 8x128 | 62 | 380 | -    | -    | 64x64   | 16384 | 2048 | 32 | -     | 5.4x  | 5.5x  |
| 3 | 512 | 1024 | 4096 | 3R1W | 8  | 32 | 2 | -      | -  | -    | -     | -  | -   | -    | -    | 64x64   | 16384 | 2048 | 32 | -     | 5.4x  | 5.5x  |
| 3 | 512 | 1024 | 4096 | 3R1W | 8  | 32 | 4 | -      | -  | -    | -     | -  | -   | -    | -    | 128x128 | 65536 | 4096 | 64 | -     | 10.8x | 11.0x |
| 3 | 512 | 1024 | 4096 | 3R1W | 16 | 16 | 1 | 16x64  | 32 | 32.0 | 8x64  | 62 | 190 | 5.9x | 0.5x | 32x32   | 2048  | 512  | 16 | 16.0x | 2.7x  | 2.8x  |
| 3 | 512 | 1024 | 4096 | 3R1W | 16 | 16 | 2 | 16x64  | 32 | 32.0 | -     | -  | -   | -    | -    | 32x32   | 2048  | 512  | 16 | 16.0x | 2.7x  | 2.8x  |
| 3 | 512 | 1024 | 4096 | 3R1W | 16 | 16 | 4 | 16x64  | 32 | 32.0 | -     | -  | -   | -    | -    | 64x64   | 8192  | 1024 | 32 | 32.0x | 5.4x  | 5.5x  |
| 3 | 512 | 1024 | 4096 | 3R1W | 16 | 32 | 1 | 8x64   | 32 | 32.0 | 8x64  | 62 | 190 | 5.9x | 0.8x | 32x32   | 4096  | 512  | 16 | 16.0x | 2.7x  | 2.8x  |
| 3 | 512 | 1024 | 4096 | 3R1W | 16 | 32 | 2 | 8x64   | 32 | 32.0 | -     | -  | -   | -    | -    | 32x32   | 4096  | 512  | 16 | 16.0x | 2.7x  | 2.8x  |
| 3 | 512 | 1024 | 4096 | 3R1W | 16 | 32 | 4 | 8x64   | 32 | 32.0 | -     | -  | -   | -    | -    | 64x64   | 16384 | 1024 | 32 | 32.0x | 5.4x  | 5.5x  |
| 3 | 512 | 1024 | 4096 | 3R1W | 32 | 32 | 1 | 16x32  | 16 | 16.0 | 8x32  | 62 | 95  | 5.9x | 0.5x | 16x16   | 1024  | 128  | 8  | 8.0x  | 1.3x  | 1.4x  |
| 3 | 512 | 1024 | 4096 | 3R1W | 32 | 32 | 2 | 16x32  | 16 | 16.0 | -     | -  | -   | -    | -    | 16x16   | 1024  | 128  | 8  | 8.0x  | 1.3x  | 1.4x  |
| 3 | 512 | 1024 | 4096 | 3R1W | 32 | 32 | 4 | 16x32  | 16 | 16.0 | -     | -  | -   | -    | -    | 32x32   | 4096  | 256  | 16 | 16.0x | 2.7x  | 2.8x  |
| 3 | 512 | 1024 | 4096 | 6R1W | 8  | 8  | 1 | 16x128 | 64 | 64.0 | 8x128 | 62 | 380 | 5.9x | 0.4x | 64x64   | 4096  | 2048 | 32 | 32.0x | 5.4x  | 5.5x  |
| 3 | 512 | 1024 | 4096 | 6R1W | 8  | 16 | 1 | 8x128  | 64 | 64.0 | 8x128 | 62 | 380 | 5.9x | 0.8x | 64x64   | 8192  | 2048 | 32 | 32.0x | 5.4x  | 5.5x  |
| 3 | 512 | 1024 | 4096 | 6R1W | 8  | 16 | 2 | 8x128  | 64 | 64.0 | -     | -  | -   | -    | -    | 64x64   | 8192  | 2048 | 32 | 32.0x | 5.4x  | 5.5x  |
| 3 | 512 | 1024 | 4096 | 6R1W | 8  | 16 | 4 | 8x128  | 64 | 64.0 | -     | -  | -   | -    | -    | 128x128 | 32768 | 4096 | 64 | 64.0x | 10.8x | 11.0x |
| 3 | 512 | 1024 | 4096 | 6R1W | 8  | 32 | 1 | -      | -  | -    | 8x128 | 62 | 380 | -    | -    | 64x64   | 16384 | 2048 | 32 | -     | 5.4x  | 5.5x  |
| 3 | 512 | 1024 | 4096 | 6R1W | 8  | 32 | 2 | -      | -  | -    | -     | -  | -   | -    | -    | 64x64   | 16384 | 2048 | 32 | -     | 5.4x  | 5.5x  |
| 3 | 512 | 1024 | 4096 | 6R1W | 8  | 32 | 4 | -      | -  | -    | -     | -  | -   | -    | -    | 128x128 | 65536 | 4096 | 64 | -     | 10.8x | 11.0x |
| 3 | 512 | 1024 | 4096 | 6R1W | 16 | 16 | 1 | 16x64  | 32 | 32.0 | 8x64  | 62 | 190 | 5.9x | 0.5x | 32x32   | 2048  | 512  | 16 | 16.0x | 2.7x  | 2.8x  |
| 3 | 512 | 1024 | 4096 | 6R1W | 16 | 16 | 2 | 16x64  | 32 | 32.0 | -     | -  | -   | -    | -    | 32x32   | 2048  | 512  | 16 | 16.0x | 2.7x  | 2.8x  |
| 3 | 512 | 1024 | 4096 | 6R1W | 16 | 16 | 4 | 16x64  | 32 | 32.0 | -     | -  | -   | -    | -    | 64x64   | 8192  | 1024 | 32 | 32.0x | 5.4x  | 5.5x  |
| 3 | 512 | 1024 | 4096 | 6R1W | 16 | 32 | 1 | 8x64   | 32 | 32.0 | 8x64  | 62 | 190 | 5.9x | 0.8x | 32x32   | 4096  | 512  | 16 | 16.0x | 2.7x  | 2.8x  |
| 3 | 512 | 1024 | 4096 | 6R1W | 16 | 32 | 2 | 8x64   | 32 | 32.0 | -     | -  | -   | -    | -    | 32x32   | 4096  | 512  | 16 | 16.0x | 2.7x  | 2.8x  |
| 3 | 512 | 1024 | 4096 | 6R1W | 16 | 32 | 4 | 8x64   | 32 | 32.0 | -     | -  | -   | -    | -    | 64x64   | 16384 | 1024 | 32 | 32.0x | 5.4x  | 5.5x  |
| 3 | 512 | 1024 | 4096 | 6R1W | 32 | 32 | 1 | 16x32  | 16 | 16.0 | 8x32  | 62 | 95  | 5.9x | 0.5x | 16x16   | 1024  | 128  | 8  | 8.0x  | 1.3x  | 1.4x  |
| 3 | 512 | 1024 | 4096 | 6R1W | 32 | 32 | 2 | 16x32  | 16 | 16.0 | -     | -  | -   | -    | -    | 16x16   | 1024  | 128  | 8  | 8.0x  | 1.3x  | 1.4x  |
| 3 | 512 | 1024 | 4096 | 6R1W | 32 | 32 | 4 | 16x32  | 16 | 16.0 | -     | -  | -   | -    | -    | 32x32   | 4096  | 256  | 16 | 16.0x | 2.7x  | 2.8x  |