

# Tables of simulation results

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## Simple random sampling

Type I errors ( $n = 500$ )

|        | Name         | No. repl. | Converged | Rank def. | Rejection rate |       |       |
|--------|--------------|-----------|-----------|-----------|----------------|-------|-------|
|        |              |           |           |           | 10%            | 5%    | 1%    |
| 1F 5V  |              |           |           |           |                |       |       |
|        | Wald         | 1000      | 1000      | 1         | 0.098          | 0.053 | 0.014 |
|        | WaldVCF      | 1000      | 1000      | 1         | 0.095          | 0.051 | 0.014 |
|        | WaldDiag,MM3 | 1000      | 1000      | 1         | 0.051          | 0.026 | 0.000 |
|        | Pearson,MM3  | 1000      | 1000      | 1         | 0.099          | 0.047 | 0.012 |
|        | RSS,MM3      | 1000      | 1000      | 1         | 0.097          | 0.052 | 0.012 |
|        | Multn,MM3    | 1000      | 1000      | 1         | 0.085          | 0.046 | 0.014 |
| 1F 8V  |              |           |           |           |                |       |       |
|        | Wald         | 1000      | 1000      | 1         | 0.100          | 0.056 | 0.012 |
|        | WaldVCF      | 1000      | 1000      | 1         | 0.100          | 0.054 | 0.012 |
|        | WaldDiag,MM3 | 1000      | 1000      | 1         | 0.055          | 0.025 | 0.003 |
|        | Pearson,MM3  | 1000      | 1000      | 1         | 0.092          | 0.054 | 0.016 |
|        | RSS,MM3      | 1000      | 1000      | 1         | 0.095          | 0.061 | 0.015 |
|        | Multn,MM3    | 1000      | 1000      | 1         | 0.098          | 0.051 | 0.012 |
| 1F 15V |              |           |           |           |                |       |       |
|        | Wald         | 1000      | 1000      | 8         | 0.117          | 0.066 | 0.016 |
|        | WaldVCF      | 1000      | 1000      | 8         | 0.112          | 0.061 | 0.015 |
|        | WaldDiag,MM3 | 1000      | 1000      | 8         | 0.066          | 0.034 | 0.006 |
|        | Pearson,MM3  | 1000      | 1000      | 8         | 0.099          | 0.056 | 0.015 |
|        | RSS,MM3      | 1000      | 1000      | 8         | 0.107          | 0.060 | 0.019 |
|        | Multn,MM3    | 1000      | 1000      | 8         | 0.112          | 0.060 | 0.014 |
| 2F 10V |              |           |           |           |                |       |       |
|        | Wald         | 1000      | 1000      | 10        | 0.107          | 0.049 | 0.009 |
|        | WaldVCF      | 1000      | 1000      | 10        | 0.102          | 0.049 | 0.008 |
|        | WaldDiag,MM3 | 1000      | 1000      | 10        | 0.025          | 0.008 | 0.000 |
|        | Pearson,MM3  | 1000      | 1000      | 10        | 0.096          | 0.042 | 0.005 |
|        | RSS,MM3      | 1000      | 1000      | 10        | 0.089          | 0.039 | 0.004 |
|        | Multn,MM3    | 1000      | 1000      | 10        | 0.091          | 0.043 | 0.006 |
| 3F 15V |              |           |           |           |                |       |       |
|        | Wald         | 1000      | 1000      | 21        | 0.115          | 0.053 | 0.018 |
|        | WaldVCF      | 1000      | 1000      | 21        | 0.108          | 0.050 | 0.018 |
|        | WaldDiag,MM3 | 1000      | 1000      | 21        | 0.025          | 0.012 | 0.006 |
|        | Pearson,MM3  | 1000      | 1000      | 21        | 0.082          | 0.036 | 0.009 |
|        | RSS,MM3      | 1000      | 1000      | 21        | 0.089          | 0.036 | 0.008 |
|        | Multn,MM3    | 1000      | 1000      | 21        | 0.094          | 0.044 | 0.015 |

# Type I errors ( $n = 1000$ )

|        | Name         | No. repl. | Converged | Rank def. | Rejection rate |       |       |
|--------|--------------|-----------|-----------|-----------|----------------|-------|-------|
|        |              |           |           |           | 10%            | 5%    | 1%    |
| 1F 5V  |              |           |           |           |                |       |       |
|        | Wald         | 1000      | 1000      | 1         | 0.094          | 0.044 | 0.011 |
|        | WaldVCF      | 1000      | 1000      | 1         | 0.093          | 0.044 | 0.010 |
|        | WaldDiag,MM3 | 1000      | 1000      | 1         | 0.055          | 0.023 | 0.002 |
|        | Pearson,MM3  | 1000      | 1000      | 1         | 0.083          | 0.038 | 0.006 |
|        | RSS,MM3      | 1000      | 1000      | 1         | 0.085          | 0.037 | 0.007 |
|        | Multn,MM3    | 1000      | 1000      | 1         | 0.087          | 0.040 | 0.008 |
| 1F 8V  |              |           |           |           |                |       |       |
|        | Wald         | 1000      | 1000      | 2         | 0.091          | 0.047 | 0.017 |
|        | WaldVCF      | 1000      | 1000      | 2         | 0.088          | 0.047 | 0.017 |
|        | WaldDiag,MM3 | 1000      | 1000      | 2         | 0.065          | 0.031 | 0.008 |
|        | Pearson,MM3  | 1000      | 1000      | 2         | 0.087          | 0.042 | 0.009 |
|        | RSS,MM3      | 1000      | 1000      | 2         | 0.087          | 0.045 | 0.012 |
|        | Multn,MM3    | 1000      | 1000      | 2         | 0.087          | 0.045 | 0.017 |
| 1F 15V |              |           |           |           |                |       |       |
|        | Wald         | 1000      | 1000      | 10        | 0.094          | 0.044 | 0.006 |
|        | WaldVCF      | 1000      | 1000      | 10        | 0.093          | 0.041 | 0.005 |
|        | WaldDiag,MM3 | 1000      | 1000      | 10        | 0.068          | 0.028 | 0.003 |
|        | Pearson,MM3  | 1000      | 1000      | 10        | 0.082          | 0.033 | 0.003 |
|        | RSS,MM3      | 1000      | 1000      | 10        | 0.074          | 0.036 | 0.004 |
|        | Multn,MM3    | 1000      | 1000      | 10        | 0.092          | 0.041 | 0.006 |
| 2F 10V |              |           |           |           |                |       |       |
|        | Wald         | 1000      | 1000      | 11        | 0.096          | 0.050 | 0.009 |
|        | WaldVCF      | 1000      | 1000      | 11        | 0.092          | 0.044 | 0.009 |
|        | WaldDiag,MM3 | 1000      | 1000      | 11        | 0.045          | 0.024 | 0.003 |
|        | Pearson,MM3  | 1000      | 1000      | 11        | 0.100          | 0.044 | 0.006 |
|        | RSS,MM3      | 1000      | 1000      | 11        | 0.092          | 0.046 | 0.005 |
|        | Multn,MM3    | 1000      | 1000      | 11        | 0.088          | 0.039 | 0.009 |
| 3F 15V |              |           |           |           |                |       |       |
|        | Wald         | 1000      | 1000      | 31        | 0.110          | 0.052 | 0.008 |
|        | WaldVCF      | 1000      | 1000      | 31        | 0.101          | 0.045 | 0.006 |
|        | WaldDiag,MM3 | 1000      | 1000      | 31        | 0.059          | 0.027 | 0.003 |
|        | Pearson,MM3  | 1000      | 1000      | 31        | 0.094          | 0.047 | 0.009 |
|        | RSS,MM3      | 1000      | 1000      | 31        | 0.093          | 0.045 | 0.009 |
|        | Multn,MM3    | 1000      | 1000      | 31        | 0.091          | 0.043 | 0.006 |

# Type I errors ( $n = 2500$ )

|        | Name         | No. repl. | Converged | Rank def. | Rejection rate |       |       |
|--------|--------------|-----------|-----------|-----------|----------------|-------|-------|
|        |              |           |           |           | 10%            | 5%    | 1%    |
| 1F 5V  |              |           |           |           |                |       |       |
|        | Wald         | 1000      | 1000      | 2         | 0.091          | 0.059 | 0.009 |
|        | WaldVCF      | 1000      | 1000      | 2         | 0.090          | 0.058 | 0.009 |
|        | WaldDiag,MM3 | 1000      | 1000      | 2         | 0.075          | 0.034 | 0.008 |
|        | Pearson,MM3  | 1000      | 1000      | 2         | 0.095          | 0.048 | 0.013 |
|        | RSS,MM3      | 1000      | 1000      | 2         | 0.096          | 0.046 | 0.013 |
|        | Multn,MM3    | 1000      | 1000      | 2         | 0.090          | 0.056 | 0.009 |
| 1F 8V  |              |           |           |           |                |       |       |
|        | Wald         | 1000      | 1000      | 1         | 0.106          | 0.051 | 0.013 |
|        | WaldVCF      | 1000      | 1000      | 1         | 0.106          | 0.051 | 0.013 |
|        | WaldDiag,MM3 | 1000      | 1000      | 1         | 0.092          | 0.051 | 0.007 |
|        | Pearson,MM3  | 1000      | 1000      | 1         | 0.098          | 0.047 | 0.012 |
|        | RSS,MM3      | 1000      | 1000      | 1         | 0.099          | 0.049 | 0.011 |
|        | Multn,MM3    | 1000      | 1000      | 1         | 0.104          | 0.051 | 0.012 |
| 1F 15V |              |           |           |           |                |       |       |
|        | Wald         | 1000      | 1000      | 23        | 0.116          | 0.068 | 0.009 |
|        | WaldVCF      | 1000      | 1000      | 23        | 0.114          | 0.066 | 0.008 |
|        | WaldDiag,MM3 | 1000      | 1000      | 23        | 0.094          | 0.046 | 0.008 |
|        | Pearson,MM3  | 1000      | 1000      | 23        | 0.111          | 0.050 | 0.007 |
|        | RSS,MM3      | 1000      | 1000      | 23        | 0.117          | 0.056 | 0.007 |
|        | Multn,MM3    | 1000      | 1000      | 23        | 0.114          | 0.066 | 0.008 |
| 2F 10V |              |           |           |           |                |       |       |
|        | Wald         | 1000      | 1000      | 21        | 0.102          | 0.047 | 0.009 |
|        | WaldVCF      | 1000      | 1000      | 21        | 0.096          | 0.043 | 0.008 |
|        | WaldDiag,MM3 | 1000      | 1000      | 21        | 0.086          | 0.037 | 0.007 |
|        | Pearson,MM3  | 1000      | 1000      | 21        | 0.090          | 0.051 | 0.010 |
|        | RSS,MM3      | 1000      | 1000      | 21        | 0.092          | 0.051 | 0.010 |
|        | Multn,MM3    | 1000      | 1000      | 21        | 0.095          | 0.043 | 0.008 |
| 3F 15V |              |           |           |           |                |       |       |
|        | Wald         | 1000      | 1000      | 53        | 0.094          | 0.053 | 0.010 |
|        | WaldVCF      | 1000      | 1000      | 53        | 0.086          | 0.045 | 0.009 |
|        | WaldDiag,MM3 | 1000      | 1000      | 53        | 0.068          | 0.022 | 0.004 |
|        | Pearson,MM3  | 1000      | 1000      | 53        | 0.080          | 0.039 | 0.008 |
|        | RSS,MM3      | 1000      | 1000      | 53        | 0.087          | 0.039 | 0.008 |
|        | Multn,MM3    | 1000      | 1000      | 53        | 0.083          | 0.042 | 0.008 |

# Type I errors ( $n = 5000$ )

|        | Name         | No. repl. | Converged | Rank def. | Rejection rate |       |       |
|--------|--------------|-----------|-----------|-----------|----------------|-------|-------|
|        |              |           |           |           | 10%            | 5%    | 1%    |
| 1F 5V  |              |           |           |           |                |       |       |
|        | Wald         | 1000      | 1000      | 1         | 0.096          | 0.049 | 0.006 |
|        | WaldVCF      | 1000      | 1000      | 1         | 0.093          | 0.047 | 0.006 |
|        | WaldDiag,MM3 | 1000      | 1000      | 1         | 0.080          | 0.032 | 0.007 |
|        | Pearson,MM3  | 1000      | 1000      | 1         | 0.084          | 0.042 | 0.005 |
|        | RSS,MM3      | 1000      | 1000      | 1         | 0.086          | 0.045 | 0.005 |
|        | Multn,MM3    | 1000      | 1000      | 1         | 0.092          | 0.047 | 0.006 |
| 1F 8V  |              |           |           |           |                |       |       |
|        | Wald         | 1000      | 1000      | 1         | 0.092          | 0.046 | 0.006 |
|        | WaldVCF      | 1000      | 1000      | 1         | 0.092          | 0.045 | 0.004 |
|        | WaldDiag,MM3 | 1000      | 1000      | 1         | 0.073          | 0.041 | 0.009 |
|        | Pearson,MM3  | 1000      | 1000      | 1         | 0.090          | 0.042 | 0.007 |
|        | RSS,MM3      | 1000      | 1000      | 1         | 0.093          | 0.043 | 0.010 |
|        | Multn,MM3    | 1000      | 1000      | 1         | 0.092          | 0.045 | 0.004 |
| 1F 15V |              |           |           |           |                |       |       |
|        | Wald         | 1000      | 1000      | 17        | 0.113          | 0.048 | 0.005 |
|        | WaldVCF      | 1000      | 1000      | 17        | 0.109          | 0.045 | 0.005 |
|        | WaldDiag,MM3 | 1000      | 1000      | 17        | 0.099          | 0.048 | 0.004 |
|        | Pearson,MM3  | 1000      | 1000      | 17        | 0.099          | 0.050 | 0.004 |
|        | RSS,MM3      | 1000      | 1000      | 17        | 0.105          | 0.049 | 0.003 |
|        | Multn,MM3    | 1000      | 1000      | 17        | 0.109          | 0.045 | 0.005 |
| 2F 10V |              |           |           |           |                |       |       |
|        | Wald         | 1000      | 1000      | 25        | 0.115          | 0.058 | 0.014 |
|        | WaldVCF      | 1000      | 1000      | 25        | 0.107          | 0.054 | 0.014 |
|        | WaldDiag,MM3 | 1000      | 1000      | 25        | 0.098          | 0.045 | 0.007 |
|        | Pearson,MM3  | 1000      | 1000      | 25        | 0.092          | 0.038 | 0.006 |
|        | RSS,MM3      | 1000      | 1000      | 25        | 0.088          | 0.042 | 0.006 |
|        | Multn,MM3    | 1000      | 1000      | 25        | 0.106          | 0.053 | 0.013 |
| 3F 15V |              |           |           |           |                |       |       |
|        | Wald         | 1000      | 1000      | 56        | 0.098          | 0.049 | 0.010 |
|        | WaldVCF      | 1000      | 1000      | 56        | 0.087          | 0.043 | 0.008 |
|        | WaldDiag,MM3 | 1000      | 1000      | 56        | 0.080          | 0.041 | 0.006 |
|        | Pearson,MM3  | 1000      | 1000      | 56        | 0.097          | 0.043 | 0.013 |
|        | RSS,MM3      | 1000      | 1000      | 56        | 0.101          | 0.042 | 0.012 |
|        | Multn,MM3    | 1000      | 1000      | 56        | 0.087          | 0.042 | 0.007 |

# Type I errors ( $n = 10000$ )

|        | Name         | No. repl. | Converged | Rank def. | Rejection rate |       |       |
|--------|--------------|-----------|-----------|-----------|----------------|-------|-------|
|        |              |           |           |           | 10%            | 5%    | 1%    |
| 1F 5V  |              |           |           |           |                |       |       |
|        | Wald         | 1000      | 1000      | 2         | 0.093          | 0.057 | 0.010 |
|        | WaldVCF      | 1000      | 1000      | 2         | 0.092          | 0.056 | 0.010 |
|        | WaldDiag,MM3 | 1000      | 1000      | 2         | 0.088          | 0.049 | 0.009 |
|        | Pearson,MM3  | 1000      | 1000      | 2         | 0.105          | 0.053 | 0.013 |
|        | RSS,MM3      | 1000      | 1000      | 2         | 0.101          | 0.056 | 0.012 |
|        | Multn,MM3    | 1000      | 1000      | 2         | 0.092          | 0.056 | 0.010 |
| 1F 8V  |              |           |           |           |                |       |       |
|        | Wald         | 1000      | 1000      | 5         | 0.103          | 0.055 | 0.013 |
|        | WaldVCF      | 1000      | 1000      | 5         | 0.102          | 0.055 | 0.013 |
|        | WaldDiag,MM3 | 1000      | 1000      | 5         | 0.092          | 0.046 | 0.010 |
|        | Pearson,MM3  | 1000      | 1000      | 5         | 0.112          | 0.059 | 0.015 |
|        | RSS,MM3      | 1000      | 1000      | 5         | 0.104          | 0.055 | 0.015 |
|        | Multn,MM3    | 1000      | 1000      | 5         | 0.100          | 0.054 | 0.013 |
| 1F 15V |              |           |           |           |                |       |       |
|        | Wald         | 1000      | 1000      | 37        | 0.106          | 0.054 | 0.011 |
|        | WaldVCF      | 1000      | 1000      | 37        | 0.104          | 0.053 | 0.010 |
|        | WaldDiag,MM3 | 1000      | 1000      | 37        | 0.117          | 0.062 | 0.013 |
|        | Pearson,MM3  | 1000      | 1000      | 37        | 0.091          | 0.049 | 0.011 |
|        | RSS,MM3      | 1000      | 1000      | 37        | 0.094          | 0.047 | 0.013 |
|        | Multn,MM3    | 1000      | 1000      | 37        | 0.104          | 0.053 | 0.010 |
| 2F 10V |              |           |           |           |                |       |       |
|        | Wald         | 1000      | 1000      | 24        | 0.115          | 0.060 | 0.015 |
|        | WaldVCF      | 1000      | 1000      | 24        | 0.108          | 0.059 | 0.011 |
|        | WaldDiag,MM3 | 1000      | 1000      | 24        | 0.104          | 0.052 | 0.010 |
|        | Pearson,MM3  | 1000      | 1000      | 24        | 0.106          | 0.051 | 0.015 |
|        | RSS,MM3      | 1000      | 1000      | 24        | 0.104          | 0.053 | 0.015 |
|        | Multn,MM3    | 1000      | 1000      | 24        | 0.108          | 0.058 | 0.011 |
| 3F 15V |              |           |           |           |                |       |       |
|        | Wald         | 1000      | 1000      | 97        | 0.106          | 0.052 | 0.007 |
|        | WaldVCF      | 1000      | 1000      | 97        | 0.088          | 0.043 | 0.006 |
|        | WaldDiag,MM3 | 1000      | 1000      | 97        | 0.082          | 0.039 | 0.009 |
|        | Pearson,MM3  | 1000      | 1000      | 97        | 0.091          | 0.045 | 0.011 |
|        | RSS,MM3      | 1000      | 1000      | 97        | 0.090          | 0.043 | 0.008 |
|        | Multn,MM3    | 1000      | 1000      | 97        | 0.087          | 0.042 | 0.006 |

**Power** ( $n = 500$ )

|        | Name         | No. repl. | Converged | Rank def. | Rejection rate |       |       |
|--------|--------------|-----------|-----------|-----------|----------------|-------|-------|
|        |              |           |           |           | 10%            | 5%    | 1%    |
| 1F 5V  |              |           |           |           |                |       |       |
|        | Wald         | 1000      | 1000      | 0         | 0.334          | 0.228 | 0.081 |
|        | WaldVCF      | 1000      | 1000      | 0         | 0.332          | 0.225 | 0.079 |
|        | WaldDiag,MM3 | 1000      | 1000      | 0         | 0.154          | 0.061 | 0.007 |
|        | Pearson,MM3  | 1000      | 1000      | 0         | 0.354          | 0.220 | 0.069 |
|        | RSS,MM3      | 1000      | 1000      | 0         | 0.357          | 0.236 | 0.075 |
|        | Multn,MM3    | 1000      | 1000      | 0         | 0.317          | 0.203 | 0.058 |
| 1F 8V  |              |           |           |           |                |       |       |
|        | Wald         | 1000      | 1000      | 1         | 0.622          | 0.506 | 0.286 |
|        | WaldVCF      | 1000      | 1000      | 1         | 0.617          | 0.503 | 0.283 |
|        | WaldDiag,MM3 | 1000      | 1000      | 1         | 0.401          | 0.266 | 0.083 |
|        | Pearson,MM3  | 1000      | 1000      | 1         | 0.373          | 0.240 | 0.077 |
|        | RSS,MM3      | 1000      | 1000      | 1         | 0.441          | 0.322 | 0.129 |
|        | Multn,MM3    | 1000      | 1000      | 1         | 0.616          | 0.497 | 0.279 |
| 1F 15V |              |           |           |           |                |       |       |
|        | Wald         | 1000      | 1000      | 4         | 0.425          | 0.300 | 0.128 |
|        | WaldVCF      | 1000      | 1000      | 4         | 0.416          | 0.292 | 0.121 |
|        | WaldDiag,MM3 | 1000      | 1000      | 4         | 0.264          | 0.180 | 0.059 |
|        | Pearson,MM3  | 1000      | 1000      | 4         | 0.551          | 0.437 | 0.242 |
|        | RSS,MM3      | 1000      | 1000      | 4         | 0.552          | 0.442 | 0.229 |
|        | Multn,MM3    | 1000      | 1000      | 4         | 0.412          | 0.286 | 0.119 |
| 2F 10V |              |           |           |           |                |       |       |
|        | Wald         | 1000      | 1000      | 10        | 0.206          | 0.119 | 0.036 |
|        | WaldVCF      | 1000      | 1000      | 10        | 0.194          | 0.110 | 0.033 |
|        | WaldDiag,MM3 | 1000      | 1000      | 10        | 0.096          | 0.050 | 0.010 |
|        | Pearson,MM3  | 1000      | 1000      | 10        | 0.233          | 0.141 | 0.039 |
|        | RSS,MM3      | 1000      | 1000      | 10        | 0.237          | 0.137 | 0.043 |
|        | Multn,MM3    | 1000      | 1000      | 10        | 0.179          | 0.097 | 0.027 |
| 3F 15V |              |           |           |           |                |       |       |
|        | Wald         | 1000      | 999       | 26        | 0.218          | 0.137 | 0.043 |
|        | WaldVCF      | 1000      | 999       | 26        | 0.199          | 0.127 | 0.035 |
|        | WaldDiag,MM3 | 1000      | 999       | 26        | 0.111          | 0.054 | 0.012 |
|        | Pearson,MM3  | 1000      | 999       | 26        | 0.255          | 0.173 | 0.072 |
|        | RSS,MM3      | 1000      | 999       | 26        | 0.256          | 0.176 | 0.069 |
|        | Multn,MM3    | 1000      | 999       | 26        | 0.184          | 0.112 | 0.027 |



Power ( $n = 1000$ )

|               | Name         | No. repl. | Converged | Rank def. | Rejection rate |       |       |
|---------------|--------------|-----------|-----------|-----------|----------------|-------|-------|
|               |              |           |           |           | 10%            | 5%    | 1%    |
| <b>1F 5V</b>  |              |           |           |           |                |       |       |
|               | Wald         | 1000      | 1000      | 0         | 0.511          | 0.382 | 0.203 |
|               | WaldVCF      | 1000      | 1000      | 0         | 0.508          | 0.382 | 0.203 |
|               | WaldDiag,MM3 | 1000      | 1000      | 0         | 0.342          | 0.221 | 0.076 |
|               | Pearson,MM3  | 1000      | 1000      | 0         | 0.545          | 0.422 | 0.229 |
|               | RSS,MM3      | 1000      | 1000      | 0         | 0.560          | 0.428 | 0.244 |
|               | Multn,MM3    | 1000      | 1000      | 0         | 0.497          | 0.374 | 0.194 |
| <b>1F 8V</b>  |              |           |           |           |                |       |       |
|               | Wald         | 1000      | 1000      | 1         | 0.904          | 0.832 | 0.658 |
|               | WaldVCF      | 1000      | 1000      | 1         | 0.901          | 0.831 | 0.657 |
|               | WaldDiag,MM3 | 1000      | 1000      | 1         | 0.768          | 0.653 | 0.374 |
|               | Pearson,MM3  | 1000      | 1000      | 1         | 0.629          | 0.474 | 0.224 |
|               | RSS,MM3      | 1000      | 1000      | 1         | 0.762          | 0.639 | 0.365 |
|               | Multn,MM3    | 1000      | 1000      | 1         | 0.898          | 0.827 | 0.655 |
| <b>1F 15V</b> |              |           |           |           |                |       |       |
|               | Wald         | 1000      | 1000      | 8         | 0.731          | 0.598 | 0.368 |
|               | WaldVCF      | 1000      | 1000      | 8         | 0.721          | 0.586 | 0.360 |
|               | WaldDiag,MM3 | 1000      | 1000      | 8         | 0.575          | 0.433 | 0.224 |
|               | Pearson,MM3  | 1000      | 1000      | 8         | 0.877          | 0.792 | 0.592 |
|               | RSS,MM3      | 1000      | 1000      | 8         | 0.877          | 0.776 | 0.581 |
|               | Multn,MM3    | 1000      | 1000      | 8         | 0.720          | 0.582 | 0.361 |
| <b>2F 10V</b> |              |           |           |           |                |       |       |
|               | Wald         | 1000      | 1000      | 5         | 0.346          | 0.240 | 0.095 |
|               | WaldVCF      | 1000      | 1000      | 5         | 0.330          | 0.234 | 0.085 |
|               | WaldDiag,MM3 | 1000      | 1000      | 5         | 0.290          | 0.181 | 0.059 |
|               | Pearson,MM3  | 1000      | 1000      | 5         | 0.412          | 0.303 | 0.137 |
|               | RSS,MM3      | 1000      | 1000      | 5         | 0.431          | 0.332 | 0.164 |
|               | Multn,MM3    | 1000      | 1000      | 5         | 0.324          | 0.227 | 0.085 |
| <b>3F 15V</b> |              |           |           |           |                |       |       |
|               | Wald         | 1000      | 1000      | 24        | 0.408          | 0.285 | 0.118 |
|               | WaldVCF      | 1000      | 1000      | 24        | 0.400          | 0.269 | 0.105 |
|               | WaldDiag,MM3 | 1000      | 1000      | 24        | 0.370          | 0.250 | 0.098 |
|               | Pearson,MM3  | 1000      | 1000      | 24        | 0.483          | 0.365 | 0.204 |
|               | RSS,MM3      | 1000      | 1000      | 24        | 0.499          | 0.396 | 0.227 |
|               | Multn,MM3    | 1000      | 1000      | 24        | 0.386          | 0.262 | 0.096 |

**Power** ( $n = 2500$ )

|               | Name         | No. repl. | Converged | Rank def. | Rejection rate |       |       |
|---------------|--------------|-----------|-----------|-----------|----------------|-------|-------|
|               |              |           |           |           | 10%            | 5%    | 1%    |
| <b>1F 5V</b>  |              |           |           |           |                |       |       |
|               | Wald         | 1000      | 1000      | 1         | 0.891          | 0.827 | 0.671 |
|               | WaldVCF      | 1000      | 1000      | 1         | 0.890          | 0.827 | 0.670 |
|               | WaldDiag,MM3 | 1000      | 1000      | 1         | 0.808          | 0.709 | 0.425 |
|               | Pearson,MM3  | 1000      | 1000      | 1         | 0.902          | 0.844 | 0.688 |
|               | RSS,MM3      | 1000      | 1000      | 1         | 0.918          | 0.854 | 0.712 |
|               | Multn,MM3    | 1000      | 1000      | 1         | 0.890          | 0.826 | 0.668 |
| <b>1F 8V</b>  |              |           |           |           |                |       |       |
|               | Wald         | 1000      | 1000      | 5         | 1.000          | 0.999 | 0.996 |
|               | WaldVCF      | 1000      | 1000      | 5         | 1.000          | 0.999 | 0.996 |
|               | WaldDiag,MM3 | 1000      | 1000      | 5         | 0.998          | 0.995 | 0.966 |
|               | Pearson,MM3  | 1000      | 1000      | 5         | 0.980          | 0.955 | 0.831 |
|               | RSS,MM3      | 1000      | 1000      | 5         | 0.994          | 0.985 | 0.946 |
|               | Multn,MM3    | 1000      | 1000      | 5         | 1.000          | 0.998 | 0.996 |
| <b>1F 15V</b> |              |           |           |           |                |       |       |
|               | Wald         | 1000      | 1000      | 11        | 0.995          | 0.990 | 0.957 |
|               | WaldVCF      | 1000      | 1000      | 11        | 0.995          | 0.988 | 0.956 |
|               | WaldDiag,MM3 | 1000      | 1000      | 11        | 0.983          | 0.968 | 0.871 |
|               | Pearson,MM3  | 1000      | 1000      | 11        | 1.000          | 0.998 | 0.995 |
|               | RSS,MM3      | 1000      | 1000      | 11        | 1.000          | 1.000 | 0.994 |
|               | Multn,MM3    | 1000      | 1000      | 11        | 0.995          | 0.988 | 0.956 |
| <b>2F 10V</b> |              |           |           |           |                |       |       |
|               | Wald         | 1000      | 1000      | 10        | 0.577          | 0.484 | 0.294 |
|               | WaldVCF      | 1000      | 1000      | 10        | 0.560          | 0.466 | 0.278 |
|               | WaldDiag,MM3 | 1000      | 1000      | 10        | 0.592          | 0.490 | 0.327 |
|               | Pearson,MM3  | 1000      | 1000      | 10        | 0.668          | 0.560 | 0.402 |
|               | RSS,MM3      | 1000      | 1000      | 10        | 0.698          | 0.601 | 0.438 |
|               | Multn,MM3    | 1000      | 1000      | 10        | 0.565          | 0.473 | 0.284 |
| <b>3F 15V</b> |              |           |           |           |                |       |       |
|               | Wald         | 1000      | 1000      | 37        | 0.743          | 0.653 | 0.462 |
|               | WaldVCF      | 1000      | 1000      | 37        | 0.730          | 0.636 | 0.439 |
|               | WaldDiag,MM3 | 1000      | 1000      | 37        | 0.773          | 0.687 | 0.509 |
|               | Pearson,MM3  | 1000      | 1000      | 37        | 0.814          | 0.745 | 0.605 |
|               | RSS,MM3      | 1000      | 1000      | 37        | 0.847          | 0.783 | 0.640 |
|               | Multn,MM3    | 1000      | 1000      | 37        | 0.732          | 0.637 | 0.443 |

**Power** ( $n = 5000$ )

|        | Name         | No. repl. | Converged | Rank def. | Rejection rate |       |       |
|--------|--------------|-----------|-----------|-----------|----------------|-------|-------|
|        |              |           |           |           | 10%            | 5%    | 1%    |
| 1F 5V  |              |           |           |           |                |       |       |
|        | Wald         | 1000      | 1000      | 1         | 0.986          | 0.979 | 0.938 |
|        | WaldVCF      | 1000      | 1000      | 1         | 0.986          | 0.979 | 0.938 |
|        | WaldDiag,MM3 | 1000      | 1000      | 1         | 0.982          | 0.950 | 0.836 |
|        | Pearson,MM3  | 1000      | 1000      | 1         | 0.985          | 0.979 | 0.942 |
|        | RSS,MM3      | 1000      | 1000      | 1         | 0.987          | 0.982 | 0.948 |
|        | Multn,MM3    | 1000      | 1000      | 1         | 0.986          | 0.978 | 0.938 |
| 1F 8V  |              |           |           |           |                |       |       |
|        | Wald         | 1000      | 1000      | 4         | 1.000          | 1.000 | 1.000 |
|        | WaldVCF      | 1000      | 1000      | 4         | 1.000          | 1.000 | 1.000 |
|        | WaldDiag,MM3 | 1000      | 1000      | 4         | 1.000          | 1.000 | 1.000 |
|        | Pearson,MM3  | 1000      | 1000      | 4         | 1.000          | 1.000 | 0.996 |
|        | RSS,MM3      | 1000      | 1000      | 4         | 1.000          | 1.000 | 1.000 |
|        | Multn,MM3    | 1000      | 1000      | 4         | 1.000          | 1.000 | 1.000 |
| 1F 15V |              |           |           |           |                |       |       |
|        | Wald         | 1000      | 1000      | 19        | 1.000          | 1.000 | 1.000 |
|        | WaldVCF      | 1000      | 1000      | 19        | 1.000          | 1.000 | 1.000 |
|        | WaldDiag,MM3 | 1000      | 1000      | 19        | 1.000          | 1.000 | 1.000 |
|        | Pearson,MM3  | 1000      | 1000      | 19        | 1.000          | 1.000 | 1.000 |
|        | RSS,MM3      | 1000      | 1000      | 19        | 1.000          | 1.000 | 1.000 |
|        | Multn,MM3    | 1000      | 1000      | 19        | 1.000          | 1.000 | 1.000 |
| 2F 10V |              |           |           |           |                |       |       |
|        | Wald         | 1000      | 1000      | 12        | 0.801          | 0.730 | 0.598 |
|        | WaldVCF      | 1000      | 1000      | 12        | 0.790          | 0.723 | 0.584 |
|        | WaldDiag,MM3 | 1000      | 1000      | 12        | 0.814          | 0.751 | 0.610 |
|        | Pearson,MM3  | 1000      | 1000      | 12        | 0.843          | 0.792 | 0.688 |
|        | RSS,MM3      | 1000      | 1000      | 12        | 0.862          | 0.823 | 0.720 |
|        | Multn,MM3    | 1000      | 1000      | 12        | 0.794          | 0.726 | 0.591 |
| 3F 15V |              |           |           |           |                |       |       |
|        | Wald         | 1000      | 1000      | 45        | 0.929          | 0.890 | 0.805 |
|        | WaldVCF      | 1000      | 1000      | 45        | 0.923          | 0.885 | 0.796 |
|        | WaldDiag,MM3 | 1000      | 1000      | 45        | 0.947          | 0.916 | 0.834 |
|        | Pearson,MM3  | 1000      | 1000      | 45        | 0.959          | 0.926 | 0.857 |
|        | RSS,MM3      | 1000      | 1000      | 45        | 0.964          | 0.944 | 0.881 |
|        | Multn,MM3    | 1000      | 1000      | 45        | 0.924          | 0.885 | 0.799 |

Power ( $n = 10000$ )

|        | Name         | No. repl. | Converged | Rank def. | Rejection rate |       |       |
|--------|--------------|-----------|-----------|-----------|----------------|-------|-------|
|        |              |           |           |           | 10%            | 5%    | 1%    |
| 1F 5V  |              |           |           |           |                |       |       |
|        | Wald         | 1000      | 1000      | 0         | 1.000          | 0.999 | 0.995 |
|        | WaldVCF      | 1000      | 1000      | 0         | 1.000          | 0.999 | 0.995 |
|        | WaldDiag,MM3 | 1000      | 1000      | 0         | 0.999          | 0.996 | 0.989 |
|        | Pearson,MM3  | 1000      | 1000      | 0         | 1.000          | 0.999 | 0.994 |
|        | RSS,MM3      | 1000      | 1000      | 0         | 1.000          | 0.999 | 0.998 |
|        | Multn,MM3    | 1000      | 1000      | 0         | 1.000          | 0.999 | 0.995 |
| 1F 8V  |              |           |           |           |                |       |       |
|        | Wald         | 1000      | 1000      | 4         | 1.000          | 1.000 | 1.000 |
|        | WaldVCF      | 1000      | 1000      | 4         | 1.000          | 1.000 | 1.000 |
|        | WaldDiag,MM3 | 1000      | 1000      | 4         | 1.000          | 1.000 | 1.000 |
|        | Pearson,MM3  | 1000      | 1000      | 4         | 1.000          | 1.000 | 1.000 |
|        | RSS,MM3      | 1000      | 1000      | 4         | 1.000          | 1.000 | 1.000 |
|        | Multn,MM3    | 1000      | 1000      | 4         | 1.000          | 1.000 | 1.000 |
| 1F 15V |              |           |           |           |                |       |       |
|        | Wald         | 1000      | 1000      | 23        | 1.000          | 1.000 | 1.000 |
|        | WaldVCF      | 1000      | 1000      | 23        | 1.000          | 1.000 | 1.000 |
|        | WaldDiag,MM3 | 1000      | 1000      | 23        | 1.000          | 1.000 | 1.000 |
|        | Pearson,MM3  | 1000      | 1000      | 23        | 1.000          | 1.000 | 1.000 |
|        | RSS,MM3      | 1000      | 1000      | 23        | 1.000          | 1.000 | 1.000 |
|        | Multn,MM3    | 1000      | 1000      | 23        | 1.000          | 1.000 | 1.000 |
| 2F 10V |              |           |           |           |                |       |       |
|        | Wald         | 1000      | 1000      | 14        | 0.937          | 0.913 | 0.843 |
|        | WaldVCF      | 1000      | 1000      | 14        | 0.932          | 0.906 | 0.833 |
|        | WaldDiag,MM3 | 1000      | 1000      | 14        | 0.945          | 0.921 | 0.848 |
|        | Pearson,MM3  | 1000      | 1000      | 14        | 0.946          | 0.929 | 0.866 |
|        | RSS,MM3      | 1000      | 1000      | 14        | 0.954          | 0.941 | 0.895 |
|        | Multn,MM3    | 1000      | 1000      | 14        | 0.932          | 0.910 | 0.839 |
| 3F 15V |              |           |           |           |                |       |       |
|        | Wald         | 1000      | 1000      | 61        | 0.988          | 0.982 | 0.969 |
|        | WaldVCF      | 1000      | 1000      | 61        | 0.987          | 0.981 | 0.965 |
|        | WaldDiag,MM3 | 1000      | 1000      | 61        | 0.987          | 0.984 | 0.974 |
|        | Pearson,MM3  | 1000      | 1000      | 61        | 0.992          | 0.986 | 0.978 |
|        | RSS,MM3      | 1000      | 1000      | 61        | 0.992          | 0.991 | 0.980 |
|        | Multn,MM3    | 1000      | 1000      | 61        | 0.987          | 0.981 | 0.967 |

## Stratified sampling

Type I errors ( $n = 500$ )

| Name          | No. repl. | Converged | Rank def. | Rejection rate |       |       |
|---------------|-----------|-----------|-----------|----------------|-------|-------|
|               |           |           |           | 10%            | 5%    | 1%    |
| <b>1F 5V</b>  |           |           |           |                |       |       |
| Wald          | 1000      | 1000      | 2         | 0.130          | 0.073 | 0.015 |
| WaldVCF       | 1000      | 1000      | 2         | 0.128          | 0.073 | 0.015 |
| WaldDiag,MM3  | 1000      | 1000      | 2         | 0.048          | 0.021 | 0.002 |
| Pearson,MM3   | 1000      | 1000      | 2         | 0.119          | 0.068 | 0.010 |
| RSS,MM3       | 1000      | 1000      | 2         | 0.120          | 0.067 | 0.011 |
| Multn,MM3     | 1000      | 1000      | 2         | 0.111          | 0.064 | 0.011 |
| <b>1F 8V</b>  |           |           |           |                |       |       |
| Wald          | 1000      | 1000      | 3         | 0.151          | 0.092 | 0.029 |
| WaldVCF       | 1000      | 1000      | 3         | 0.149          | 0.091 | 0.029 |
| WaldDiag,MM3  | 1000      | 1000      | 3         | 0.077          | 0.040 | 0.008 |
| Pearson,MM3   | 1000      | 1000      | 3         | 0.166          | 0.091 | 0.024 |
| RSS,MM3       | 1000      | 1000      | 3         | 0.165          | 0.098 | 0.025 |
| Multn,MM3     | 1000      | 1000      | 3         | 0.144          | 0.087 | 0.029 |
| <b>1F 15V</b> |           |           |           |                |       |       |
| Wald          | 1000      | 1000      | 8         | 0.267          | 0.180 | 0.052 |
| WaldVCF       | 1000      | 1000      | 8         | 0.263          | 0.175 | 0.051 |
| WaldDiag,MM3  | 1000      | 1000      | 8         | 0.173          | 0.092 | 0.017 |
| Pearson,MM3   | 1000      | 1000      | 8         | 0.309          | 0.214 | 0.090 |
| RSS,MM3       | 1000      | 1000      | 8         | 0.317          | 0.224 | 0.089 |
| Multn,MM3     | 1000      | 1000      | 8         | 0.260          | 0.174 | 0.051 |
| <b>2F 10V</b> |           |           |           |                |       |       |
| Wald          | 1000      | 1000      | 9         | 0.210          | 0.120 | 0.029 |
| WaldVCF       | 1000      | 1000      | 9         | 0.201          | 0.110 | 0.028 |
| WaldDiag,MM3  | 1000      | 1000      | 9         | 0.062          | 0.029 | 0.001 |
| Pearson,MM3   | 1000      | 1000      | 9         | 0.181          | 0.095 | 0.020 |
| RSS,MM3       | 1000      | 1000      | 9         | 0.193          | 0.102 | 0.023 |
| Multn,MM3     | 1000      | 1000      | 9         | 0.190          | 0.104 | 0.023 |
| <b>3F 15V</b> |           |           |           |                |       |       |
| Wald          | 1000      | 1000      | 21        | 0.285          | 0.168 | 0.058 |
| WaldVCF       | 1000      | 1000      | 21        | 0.265          | 0.157 | 0.051 |
| WaldDiag,MM3  | 1000      | 1000      | 21        | 0.098          | 0.040 | 0.009 |
| Pearson,MM3   | 1000      | 1000      | 21        | 0.241          | 0.141 | 0.037 |
| RSS,MM3       | 1000      | 1000      | 21        | 0.247          | 0.151 | 0.037 |
| Multn,MM3     | 1000      | 1000      | 21        | 0.244          | 0.141 | 0.049 |

# Type I errors ( $n = 1000$ )

| Name         | No. repl. | Converged | Rank def. | Rejection rate |       |       |
|--------------|-----------|-----------|-----------|----------------|-------|-------|
|              |           |           |           | 10%            | 5%    | 1%    |
| 1F 5V        |           |           |           |                |       |       |
| Wald         | 1000      | 1000      | 2         | 0.113          | 0.056 | 0.014 |
| WaldVCF      | 1000      | 1000      | 2         | 0.112          | 0.055 | 0.014 |
| WaldDiag,MM3 | 1000      | 1000      | 2         | 0.070          | 0.035 | 0.002 |
| Pearson,MM3  | 1000      | 1000      | 2         | 0.114          | 0.061 | 0.011 |
| RSS,MM3      | 1000      | 1000      | 2         | 0.114          | 0.059 | 0.007 |
| Multn,MM3    | 1000      | 1000      | 2         | 0.104          | 0.050 | 0.011 |
| 1F 8V        |           |           |           |                |       |       |
| Wald         | 1000      | 1000      | 3         | 0.178          | 0.113 | 0.025 |
| WaldVCF      | 1000      | 1000      | 3         | 0.176          | 0.112 | 0.025 |
| WaldDiag,MM3 | 1000      | 1000      | 3         | 0.126          | 0.060 | 0.010 |
| Pearson,MM3  | 1000      | 1000      | 3         | 0.189          | 0.114 | 0.026 |
| RSS,MM3      | 1000      | 1000      | 3         | 0.202          | 0.118 | 0.037 |
| Multn,MM3    | 1000      | 1000      | 3         | 0.175          | 0.111 | 0.025 |
| 1F 15V       |           |           |           |                |       |       |
| Wald         | 1000      | 1000      | 17        | 0.262          | 0.159 | 0.056 |
| WaldVCF      | 1000      | 1000      | 17        | 0.258          | 0.157 | 0.054 |
| WaldDiag,MM3 | 1000      | 1000      | 17        | 0.183          | 0.099 | 0.026 |
| Pearson,MM3  | 1000      | 1000      | 17        | 0.315          | 0.197 | 0.076 |
| RSS,MM3      | 1000      | 1000      | 17        | 0.318          | 0.201 | 0.079 |
| Multn,MM3    | 1000      | 1000      | 17        | 0.255          | 0.155 | 0.054 |
| 2F 10V       |           |           |           |                |       |       |
| Wald         | 1000      | 1000      | 8         | 0.192          | 0.115 | 0.031 |
| WaldVCF      | 1000      | 1000      | 8         | 0.184          | 0.108 | 0.029 |
| WaldDiag,MM3 | 1000      | 1000      | 8         | 0.107          | 0.045 | 0.007 |
| Pearson,MM3  | 1000      | 1000      | 8         | 0.181          | 0.107 | 0.024 |
| RSS,MM3      | 1000      | 1000      | 8         | 0.182          | 0.108 | 0.024 |
| Multn,MM3    | 1000      | 1000      | 8         | 0.179          | 0.106 | 0.026 |
| 3F 15V       |           |           |           |                |       |       |
| Wald         | 1000      | 1000      | 27        | 0.309          | 0.193 | 0.065 |
| WaldVCF      | 1000      | 1000      | 27        | 0.297          | 0.180 | 0.061 |
| WaldDiag,MM3 | 1000      | 1000      | 27        | 0.155          | 0.088 | 0.017 |
| Pearson,MM3  | 1000      | 1000      | 27        | 0.257          | 0.165 | 0.053 |
| RSS,MM3      | 1000      | 1000      | 27        | 0.260          | 0.177 | 0.059 |
| Multn,MM3    | 1000      | 1000      | 27        | 0.287          | 0.177 | 0.055 |

# Type I errors ( $n = 2500$ )

| Name          | No. repl. | Converged | Rank def. | Rejection rate |       |       |
|---------------|-----------|-----------|-----------|----------------|-------|-------|
|               |           |           |           | 10%            | 5%    | 1%    |
| <b>1F 5V</b>  |           |           |           |                |       |       |
| Wald          | 1000      | 1000      | 1         | 0.152          | 0.075 | 0.017 |
| WaldVCF       | 1000      | 1000      | 1         | 0.152          | 0.075 | 0.017 |
| WaldDiag,MM3  | 1000      | 1000      | 1         | 0.119          | 0.054 | 0.010 |
| Pearson,MM3   | 1000      | 1000      | 1         | 0.138          | 0.071 | 0.017 |
| RSS,MM3       | 1000      | 1000      | 1         | 0.143          | 0.068 | 0.018 |
| Multn,MM3     | 1000      | 1000      | 1         | 0.151          | 0.073 | 0.017 |
| <b>1F 8V</b>  |           |           |           |                |       |       |
| Wald          | 1000      | 1000      | 4         | 0.137          | 0.070 | 0.017 |
| WaldVCF       | 1000      | 1000      | 4         | 0.136          | 0.068 | 0.016 |
| WaldDiag,MM3  | 1000      | 1000      | 4         | 0.097          | 0.047 | 0.012 |
| Pearson,MM3   | 1000      | 1000      | 4         | 0.145          | 0.083 | 0.021 |
| RSS,MM3       | 1000      | 1000      | 4         | 0.151          | 0.082 | 0.022 |
| Multn,MM3     | 1000      | 1000      | 4         | 0.134          | 0.068 | 0.016 |
| <b>1F 15V</b> |           |           |           |                |       |       |
| Wald          | 1000      | 1000      | 16        | 0.258          | 0.160 | 0.056 |
| WaldVCF       | 1000      | 1000      | 16        | 0.255          | 0.158 | 0.055 |
| WaldDiag,MM3  | 1000      | 1000      | 16        | 0.200          | 0.115 | 0.034 |
| Pearson,MM3   | 1000      | 1000      | 16        | 0.311          | 0.204 | 0.062 |
| RSS,MM3       | 1000      | 1000      | 16        | 0.321          | 0.206 | 0.071 |
| Multn,MM3     | 1000      | 1000      | 16        | 0.255          | 0.158 | 0.055 |
| <b>2F 10V</b> |           |           |           |                |       |       |
| Wald          | 1000      | 1000      | 17        | 0.210          | 0.120 | 0.041 |
| WaldVCF       | 1000      | 1000      | 17        | 0.200          | 0.114 | 0.037 |
| WaldDiag,MM3  | 1000      | 1000      | 17        | 0.140          | 0.076 | 0.016 |
| Pearson,MM3   | 1000      | 1000      | 17        | 0.194          | 0.111 | 0.028 |
| RSS,MM3       | 1000      | 1000      | 17        | 0.201          | 0.118 | 0.032 |
| Multn,MM3     | 1000      | 1000      | 17        | 0.196          | 0.113 | 0.037 |
| <b>3F 15V</b> |           |           |           |                |       |       |
| Wald          | 1000      | 1000      | 50        | 0.328          | 0.230 | 0.082 |
| WaldVCF       | 1000      | 1000      | 50        | 0.318          | 0.218 | 0.070 |
| WaldDiag,MM3  | 1000      | 1000      | 50        | 0.217          | 0.119 | 0.027 |
| Pearson,MM3   | 1000      | 1000      | 50        | 0.309          | 0.194 | 0.065 |
| RSS,MM3       | 1000      | 1000      | 50        | 0.324          | 0.212 | 0.066 |
| Multn,MM3     | 1000      | 1000      | 50        | 0.312          | 0.212 | 0.066 |

# Type I errors ( $n = 5000$ )

| Name         | No. repl. | Converged | Rank def. | Rejection rate |       |       |
|--------------|-----------|-----------|-----------|----------------|-------|-------|
|              |           |           |           | 10%            | 5%    | 1%    |
| 1F 5V        |           |           |           |                |       |       |
| Wald         | 1000      | 1000      | 2         | 0.134          | 0.069 | 0.017 |
| WaldVCF      | 1000      | 1000      | 2         | 0.134          | 0.068 | 0.017 |
| WaldDiag,MM3 | 1000      | 1000      | 2         | 0.114          | 0.065 | 0.013 |
| Pearson,MM3  | 1000      | 1000      | 2         | 0.134          | 0.061 | 0.017 |
| RSS,MM3      | 1000      | 1000      | 2         | 0.136          | 0.063 | 0.017 |
| Multn,MM3    | 1000      | 1000      | 2         | 0.134          | 0.068 | 0.016 |
| 1F 8V        |           |           |           |                |       |       |
| Wald         | 1000      | 1000      | 3         | 0.169          | 0.097 | 0.026 |
| WaldVCF      | 1000      | 1000      | 3         | 0.167          | 0.095 | 0.024 |
| WaldDiag,MM3 | 1000      | 1000      | 3         | 0.129          | 0.063 | 0.010 |
| Pearson,MM3  | 1000      | 1000      | 3         | 0.182          | 0.104 | 0.027 |
| RSS,MM3      | 1000      | 1000      | 3         | 0.182          | 0.113 | 0.033 |
| Multn,MM3    | 1000      | 1000      | 3         | 0.164          | 0.094 | 0.024 |
| 1F 15V       |           |           |           |                |       |       |
| Wald         | 1000      | 1000      | 20        | 0.286          | 0.165 | 0.054 |
| WaldVCF      | 1000      | 1000      | 20        | 0.283          | 0.164 | 0.054 |
| WaldDiag,MM3 | 1000      | 1000      | 20        | 0.222          | 0.121 | 0.039 |
| Pearson,MM3  | 1000      | 1000      | 20        | 0.330          | 0.213 | 0.080 |
| RSS,MM3      | 1000      | 1000      | 20        | 0.345          | 0.225 | 0.075 |
| Multn,MM3    | 1000      | 1000      | 20        | 0.283          | 0.163 | 0.054 |
| 2F 10V       |           |           |           |                |       |       |
| Wald         | 1000      | 1000      | 22        | 0.219          | 0.137 | 0.040 |
| WaldVCF      | 1000      | 1000      | 22        | 0.207          | 0.128 | 0.037 |
| WaldDiag,MM3 | 1000      | 1000      | 22        | 0.166          | 0.089 | 0.015 |
| Pearson,MM3  | 1000      | 1000      | 22        | 0.182          | 0.112 | 0.030 |
| RSS,MM3      | 1000      | 1000      | 22        | 0.204          | 0.126 | 0.030 |
| Multn,MM3    | 1000      | 1000      | 22        | 0.206          | 0.128 | 0.038 |
| 3F 15V       |           |           |           |                |       |       |
| Wald         | 1000      | 1000      | 62        | 0.315          | 0.199 | 0.066 |
| WaldVCF      | 1000      | 1000      | 62        | 0.300          | 0.186 | 0.061 |
| WaldDiag,MM3 | 1000      | 1000      | 62        | 0.226          | 0.126 | 0.038 |
| Pearson,MM3  | 1000      | 1000      | 62        | 0.294          | 0.178 | 0.055 |
| RSS,MM3      | 1000      | 1000      | 62        | 0.294          | 0.188 | 0.057 |
| Multn,MM3    | 1000      | 1000      | 62        | 0.297          | 0.184 | 0.059 |



# Type I errors ( $n = 10000$ )

| Name          | No. repl. | Converged | Rank def. | Rejection rate |       |       |
|---------------|-----------|-----------|-----------|----------------|-------|-------|
|               |           |           |           | 10%            | 5%    | 1%    |
| <b>1F 5V</b>  |           |           |           |                |       |       |
| Wald          | 1000      | 1000      | 3         | 0.148          | 0.086 | 0.011 |
| WaldVCF       | 1000      | 1000      | 3         | 0.147          | 0.086 | 0.011 |
| WaldDiag,MM3  | 1000      | 1000      | 3         | 0.132          | 0.069 | 0.010 |
| Pearson,MM3   | 1000      | 1000      | 3         | 0.152          | 0.079 | 0.021 |
| RSS,MM3       | 1000      | 1000      | 3         | 0.153          | 0.079 | 0.021 |
| Multn,MM3     | 1000      | 1000      | 3         | 0.147          | 0.085 | 0.011 |
| <b>1F 8V</b>  |           |           |           |                |       |       |
| Wald          | 1000      | 1000      | 5         | 0.156          | 0.089 | 0.032 |
| WaldVCF       | 1000      | 1000      | 5         | 0.155          | 0.088 | 0.031 |
| WaldDiag,MM3  | 1000      | 1000      | 5         | 0.138          | 0.071 | 0.015 |
| Pearson,MM3   | 1000      | 1000      | 5         | 0.183          | 0.123 | 0.041 |
| RSS,MM3       | 1000      | 1000      | 5         | 0.190          | 0.116 | 0.043 |
| Multn,MM3     | 1000      | 1000      | 5         | 0.155          | 0.088 | 0.030 |
| <b>1F 15V</b> |           |           |           |                |       |       |
| Wald          | 1000      | 1000      | 36        | 0.255          | 0.158 | 0.058 |
| WaldVCF       | 1000      | 1000      | 36        | 0.250          | 0.158 | 0.055 |
| WaldDiag,MM3  | 1000      | 1000      | 36        | 0.226          | 0.124 | 0.033 |
| Pearson,MM3   | 1000      | 1000      | 36        | 0.310          | 0.199 | 0.060 |
| RSS,MM3       | 1000      | 1000      | 36        | 0.321          | 0.200 | 0.075 |
| Multn,MM3     | 1000      | 1000      | 36        | 0.248          | 0.157 | 0.055 |
| <b>2F 10V</b> |           |           |           |                |       |       |
| Wald          | 1000      | 1000      | 38        | 0.189          | 0.108 | 0.028 |
| WaldVCF       | 1000      | 1000      | 38        | 0.181          | 0.104 | 0.023 |
| WaldDiag,MM3  | 1000      | 1000      | 38        | 0.156          | 0.095 | 0.021 |
| Pearson,MM3   | 1000      | 1000      | 38        | 0.185          | 0.101 | 0.023 |
| RSS,MM3       | 1000      | 1000      | 38        | 0.187          | 0.100 | 0.026 |
| Multn,MM3     | 1000      | 1000      | 38        | 0.179          | 0.104 | 0.025 |
| <b>3F 15V</b> |           |           |           |                |       |       |
| Wald          | 1000      | 1000      | 83        | 0.295          | 0.170 | 0.057 |
| WaldVCF       | 1000      | 1000      | 83        | 0.266          | 0.156 | 0.047 |
| WaldDiag,MM3  | 1000      | 1000      | 83        | 0.217          | 0.116 | 0.029 |
| Pearson,MM3   | 1000      | 1000      | 83        | 0.270          | 0.163 | 0.051 |
| RSS,MM3       | 1000      | 1000      | 83        | 0.271          | 0.168 | 0.054 |
| Multn,MM3     | 1000      | 1000      | 83        | 0.264          | 0.154 | 0.046 |

**Power** ( $n = 500$ )

| Name          | No. repl. | Converged | Rank def. | Rejection rate |       |       |
|---------------|-----------|-----------|-----------|----------------|-------|-------|
|               |           |           |           | 10%            | 5%    | 1%    |
| <b>1F 5V</b>  |           |           |           |                |       |       |
| Wald          | 1000      | 1000      | 2         | 0.326          | 0.218 | 0.082 |
| WaldVCF       | 1000      | 1000      | 2         | 0.325          | 0.216 | 0.080 |
| WaldDiag,MM3  | 1000      | 1000      | 2         | 0.152          | 0.073 | 0.009 |
| Pearson,MM3   | 1000      | 1000      | 2         | 0.329          | 0.223 | 0.090 |
| RSS,MM3       | 1000      | 1000      | 2         | 0.331          | 0.230 | 0.088 |
| Multn,MM3     | 1000      | 1000      | 2         | 0.306          | 0.192 | 0.062 |
| <b>1F 8V</b>  |           |           |           |                |       |       |
| Wald          | 1000      | 1000      | 1         | 0.795          | 0.680 | 0.451 |
| WaldVCF       | 1000      | 1000      | 1         | 0.790          | 0.672 | 0.441 |
| WaldDiag,MM3  | 1000      | 1000      | 1         | 0.578          | 0.413 | 0.159 |
| Pearson,MM3   | 1000      | 1000      | 1         | 0.555          | 0.402 | 0.173 |
| RSS,MM3       | 1000      | 1000      | 1         | 0.668          | 0.504 | 0.266 |
| Multn,MM3     | 1000      | 1000      | 1         | 0.789          | 0.668 | 0.435 |
| <b>1F 15V</b> |           |           |           |                |       |       |
| Wald          | 1000      | 1000      | 8         | 0.688          | 0.543 | 0.299 |
| WaldVCF       | 1000      | 1000      | 8         | 0.678          | 0.532 | 0.293 |
| WaldDiag,MM3  | 1000      | 1000      | 8         | 0.510          | 0.359 | 0.157 |
| Pearson,MM3   | 1000      | 1000      | 8         | 0.755          | 0.638 | 0.395 |
| RSS,MM3       | 1000      | 1000      | 8         | 0.756          | 0.642 | 0.411 |
| Multn,MM3     | 1000      | 1000      | 8         | 0.668          | 0.529 | 0.291 |
| <b>2F 10V</b> |           |           |           |                |       |       |
| Wald          | 1000      | 1000      | 5         | 0.260          | 0.167 | 0.053 |
| WaldVCF       | 1000      | 1000      | 5         | 0.250          | 0.163 | 0.052 |
| WaldDiag,MM3  | 1000      | 1000      | 5         | 0.110          | 0.064 | 0.010 |
| Pearson,MM3   | 1000      | 1000      | 5         | 0.214          | 0.124 | 0.039 |
| RSS,MM3       | 1000      | 1000      | 5         | 0.238          | 0.148 | 0.042 |
| Multn,MM3     | 1000      | 1000      | 5         | 0.235          | 0.148 | 0.044 |
| <b>3F 15V</b> |           |           |           |                |       |       |
| Wald          | 1000      | 1000      | 28        | 0.704          | 0.584 | 0.342 |
| WaldVCF       | 1000      | 1000      | 28        | 0.685          | 0.555 | 0.312 |
| WaldDiag,MM3  | 1000      | 1000      | 28        | 0.504          | 0.355 | 0.120 |
| Pearson,MM3   | 1000      | 1000      | 28        | 0.737          | 0.626 | 0.389 |
| RSS,MM3       | 1000      | 1000      | 28        | 0.756          | 0.644 | 0.404 |
| Multn,MM3     | 1000      | 1000      | 28        | 0.656          | 0.515 | 0.265 |

**Power** ( $n = 1000$ )

| Name          | No. repl. | Converged | Rank def. | Rejection rate |       |       |
|---------------|-----------|-----------|-----------|----------------|-------|-------|
|               |           |           |           | 10%            | 5%    | 1%    |
| <b>1F 5V</b>  |           |           |           |                |       |       |
| Wald          | 1000      | 1000      | 2         | 0.413          | 0.302 | 0.130 |
| WaldVCF       | 1000      | 1000      | 2         | 0.411          | 0.300 | 0.130 |
| WaldDiag,MM3  | 1000      | 1000      | 2         | 0.278          | 0.161 | 0.039 |
| Pearson,MM3   | 1000      | 1000      | 2         | 0.395          | 0.273 | 0.108 |
| RSS,MM3       | 1000      | 1000      | 2         | 0.426          | 0.289 | 0.122 |
| Multn,MM3     | 1000      | 1000      | 2         | 0.400          | 0.295 | 0.122 |
| <b>1F 8V</b>  |           |           |           |                |       |       |
| Wald          | 1000      | 1000      | 2         | 0.958          | 0.919 | 0.787 |
| WaldVCF       | 1000      | 1000      | 2         | 0.958          | 0.919 | 0.784 |
| WaldDiag,MM3  | 1000      | 1000      | 2         | 0.880          | 0.784 | 0.513 |
| Pearson,MM3   | 1000      | 1000      | 2         | 0.840          | 0.744 | 0.468 |
| RSS,MM3       | 1000      | 1000      | 2         | 0.903          | 0.824 | 0.619 |
| Multn,MM3     | 1000      | 1000      | 2         | 0.958          | 0.918 | 0.785 |
| <b>1F 15V</b> |           |           |           |                |       |       |
| Wald          | 1000      | 1000      | 8         | 0.872          | 0.794 | 0.615 |
| WaldVCF       | 1000      | 1000      | 8         | 0.868          | 0.787 | 0.608 |
| WaldDiag,MM3  | 1000      | 1000      | 8         | 0.802          | 0.704 | 0.487 |
| Pearson,MM3   | 1000      | 1000      | 8         | 0.942          | 0.891 | 0.755 |
| RSS,MM3       | 1000      | 1000      | 8         | 0.943          | 0.894 | 0.764 |
| Multn,MM3     | 1000      | 1000      | 8         | 0.867          | 0.786 | 0.610 |
| <b>2F 10V</b> |           |           |           |                |       |       |
| Wald          | 1000      | 1000      | 9         | 0.481          | 0.352 | 0.140 |
| WaldVCF       | 1000      | 1000      | 9         | 0.465          | 0.327 | 0.125 |
| WaldDiag,MM3  | 1000      | 1000      | 9         | 0.361          | 0.237 | 0.074 |
| Pearson,MM3   | 1000      | 1000      | 9         | 0.446          | 0.316 | 0.124 |
| RSS,MM3       | 1000      | 1000      | 9         | 0.515          | 0.379 | 0.173 |
| Multn,MM3     | 1000      | 1000      | 9         | 0.458          | 0.323 | 0.118 |
| <b>3F 15V</b> |           |           |           |                |       |       |
| Wald          | 1000      | 1000      | 31        | 0.460          | 0.337 | 0.143 |
| WaldVCF       | 1000      | 1000      | 31        | 0.440          | 0.314 | 0.132 |
| WaldDiag,MM3  | 1000      | 1000      | 31        | 0.333          | 0.213 | 0.071 |
| Pearson,MM3   | 1000      | 1000      | 31        | 0.463          | 0.335 | 0.151 |
| RSS,MM3       | 1000      | 1000      | 31        | 0.503          | 0.379 | 0.185 |
| Multn,MM3     | 1000      | 1000      | 31        | 0.430          | 0.307 | 0.126 |

**Power** ( $n = 2500$ )

| Name          | No. repl. | Converged | Rank def. | Rejection rate |       |       |
|---------------|-----------|-----------|-----------|----------------|-------|-------|
|               |           |           |           | 10%            | 5%    | 1%    |
| <b>1F 5V</b>  |           |           |           |                |       |       |
| Wald          | 1000      | 1000      | 0         | 0.871          | 0.800 | 0.619 |
| WaldVCF       | 1000      | 1000      | 0         | 0.870          | 0.799 | 0.619 |
| WaldDiag,MM3  | 1000      | 1000      | 0         | 0.812          | 0.715 | 0.500 |
| Pearson,MM3   | 1000      | 1000      | 0         | 0.887          | 0.821 | 0.667 |
| RSS,MM3       | 1000      | 1000      | 0         | 0.891          | 0.829 | 0.686 |
| Multn,MM3     | 1000      | 1000      | 0         | 0.869          | 0.796 | 0.615 |
| <b>1F 8V</b>  |           |           |           |                |       |       |
| Wald          | 1000      | 1000      | 1         | 0.998          | 0.997 | 0.983 |
| WaldVCF       | 1000      | 1000      | 1         | 0.998          | 0.997 | 0.983 |
| WaldDiag,MM3  | 1000      | 1000      | 1         | 0.990          | 0.984 | 0.915 |
| Pearson,MM3   | 1000      | 1000      | 1         | 0.983          | 0.958 | 0.848 |
| RSS,MM3       | 1000      | 1000      | 1         | 0.991          | 0.979 | 0.933 |
| Multn,MM3     | 1000      | 1000      | 1         | 0.998          | 0.997 | 0.983 |
| <b>1F 15V</b> |           |           |           |                |       |       |
| Wald          | 1000      | 1000      | 8         | 0.995          | 0.982 | 0.941 |
| WaldVCF       | 1000      | 1000      | 8         | 0.995          | 0.981 | 0.940 |
| WaldDiag,MM3  | 1000      | 1000      | 8         | 0.982          | 0.960 | 0.858 |
| Pearson,MM3   | 1000      | 1000      | 8         | 0.999          | 0.997 | 0.989 |
| RSS,MM3       | 1000      | 1000      | 8         | 0.999          | 0.997 | 0.987 |
| Multn,MM3     | 1000      | 1000      | 8         | 0.994          | 0.981 | 0.939 |
| <b>2F 10V</b> |           |           |           |                |       |       |
| Wald          | 1000      | 1000      | 14        | 0.771          | 0.651 | 0.411 |
| WaldVCF       | 1000      | 1000      | 14        | 0.759          | 0.635 | 0.393 |
| WaldDiag,MM3  | 1000      | 1000      | 14        | 0.712          | 0.579 | 0.338 |
| Pearson,MM3   | 1000      | 1000      | 14        | 0.847          | 0.754 | 0.536 |
| RSS,MM3       | 1000      | 1000      | 14        | 0.875          | 0.809 | 0.610 |
| Multn,MM3     | 1000      | 1000      | 14        | 0.761          | 0.636 | 0.397 |
| <b>3F 15V</b> |           |           |           |                |       |       |
| Wald          | 1000      | 1000      | 36        | 0.847          | 0.748 | 0.514 |
| WaldVCF       | 1000      | 1000      | 36        | 0.841          | 0.733 | 0.497 |
| WaldDiag,MM3  | 1000      | 1000      | 36        | 0.806          | 0.682 | 0.435 |
| Pearson,MM3   | 1000      | 1000      | 36        | 0.793          | 0.671 | 0.422 |
| RSS,MM3       | 1000      | 1000      | 36        | 0.868          | 0.760 | 0.543 |
| Multn,MM3     | 1000      | 1000      | 36        | 0.839          | 0.725 | 0.493 |

Power ( $n = 5000$ )

| Name          | No. repl. | Converged | Rank def. | Rejection rate |       |       |
|---------------|-----------|-----------|-----------|----------------|-------|-------|
|               |           |           |           | 10%            | 5%    | 1%    |
| <b>1F 5V</b>  |           |           |           |                |       |       |
| Wald          | 1000      | 1000      | 0         | 0.986          | 0.972 | 0.896 |
| WaldVCF       | 1000      | 1000      | 0         | 0.986          | 0.972 | 0.896 |
| WaldDiag,MM3  | 1000      | 1000      | 0         | 0.949          | 0.899 | 0.729 |
| Pearson,MM3   | 1000      | 1000      | 0         | 0.991          | 0.980 | 0.922 |
| RSS,MM3       | 1000      | 1000      | 0         | 0.991          | 0.984 | 0.935 |
| Multn,MM3     | 1000      | 1000      | 0         | 0.986          | 0.972 | 0.895 |
| <b>1F 8V</b>  |           |           |           |                |       |       |
| Wald          | 1000      | 1000      | 1         | 1.000          | 1.000 | 1.000 |
| WaldVCF       | 1000      | 1000      | 1         | 1.000          | 1.000 | 1.000 |
| WaldDiag,MM3  | 1000      | 1000      | 1         | 1.000          | 1.000 | 1.000 |
| Pearson,MM3   | 1000      | 1000      | 1         | 1.000          | 1.000 | 1.000 |
| RSS,MM3       | 1000      | 1000      | 1         | 1.000          | 1.000 | 1.000 |
| Multn,MM3     | 1000      | 1000      | 1         | 1.000          | 1.000 | 1.000 |
| <b>1F 15V</b> |           |           |           |                |       |       |
| Wald          | 1000      | 1000      | 11        | 1.000          | 1.000 | 1.000 |
| WaldVCF       | 1000      | 1000      | 11        | 1.000          | 1.000 | 1.000 |
| WaldDiag,MM3  | 1000      | 1000      | 11        | 1.000          | 1.000 | 0.997 |
| Pearson,MM3   | 1000      | 1000      | 11        | 1.000          | 1.000 | 1.000 |
| RSS,MM3       | 1000      | 1000      | 11        | 1.000          | 1.000 | 1.000 |
| Multn,MM3     | 1000      | 1000      | 11        | 1.000          | 1.000 | 1.000 |
| <b>2F 10V</b> |           |           |           |                |       |       |
| Wald          | 1000      | 1000      | 12        | 0.927          | 0.866 | 0.685 |
| WaldVCF       | 1000      | 1000      | 12        | 0.917          | 0.857 | 0.658 |
| WaldDiag,MM3  | 1000      | 1000      | 12        | 0.921          | 0.856 | 0.642 |
| Pearson,MM3   | 1000      | 1000      | 12        | 0.938          | 0.889 | 0.720 |
| RSS,MM3       | 1000      | 1000      | 12        | 0.953          | 0.912 | 0.781 |
| Multn,MM3     | 1000      | 1000      | 12        | 0.922          | 0.861 | 0.675 |
| <b>3F 15V</b> |           |           |           |                |       |       |
| Wald          | 1000      | 1000      | 37        | 0.908          | 0.853 | 0.695 |
| WaldVCF       | 1000      | 1000      | 37        | 0.895          | 0.838 | 0.669 |
| WaldDiag,MM3  | 1000      | 1000      | 37        | 0.938          | 0.885 | 0.751 |
| Pearson,MM3   | 1000      | 1000      | 37        | 0.947          | 0.892 | 0.788 |
| RSS,MM3       | 1000      | 1000      | 37        | 0.949          | 0.912 | 0.812 |
| Multn,MM3     | 1000      | 1000      | 37        | 0.899          | 0.839 | 0.677 |

**Power** ( $n = 10000$ )

| Name          | No. repl. | Converged | Rank def. | Rejection rate |       |       |
|---------------|-----------|-----------|-----------|----------------|-------|-------|
|               |           |           |           | 10%            | 5%    | 1%    |
| <b>1F 5V</b>  |           |           |           |                |       |       |
| Wald          | 1000      | 1000      | 0         | 0.999          | 0.998 | 0.986 |
| WaldVCF       | 1000      | 1000      | 0         | 0.999          | 0.998 | 0.986 |
| WaldDiag,MM3  | 1000      | 1000      | 0         | 0.995          | 0.988 | 0.926 |
| Pearson,MM3   | 1000      | 1000      | 0         | 0.999          | 0.998 | 0.981 |
| RSS,MM3       | 1000      | 1000      | 0         | 0.999          | 0.998 | 0.983 |
| Multn,MM3     | 1000      | 1000      | 0         | 0.999          | 0.998 | 0.986 |
| <b>1F 8V</b>  |           |           |           |                |       |       |
| Wald          | 1000      | 1000      | 0         | 1.000          | 1.000 | 1.000 |
| WaldVCF       | 1000      | 1000      | 0         | 1.000          | 1.000 | 1.000 |
| WaldDiag,MM3  | 1000      | 1000      | 0         | 1.000          | 1.000 | 1.000 |
| Pearson,MM3   | 1000      | 1000      | 0         | 1.000          | 1.000 | 1.000 |
| RSS,MM3       | 1000      | 1000      | 0         | 1.000          | 1.000 | 1.000 |
| Multn,MM3     | 1000      | 1000      | 0         | 1.000          | 1.000 | 1.000 |
| <b>1F 15V</b> |           |           |           |                |       |       |
| Wald          | 1000      | 1000      | 18        | 1.000          | 1.000 | 1.000 |
| WaldVCF       | 1000      | 1000      | 18        | 1.000          | 1.000 | 1.000 |
| WaldDiag,MM3  | 1000      | 1000      | 18        | 1.000          | 1.000 | 1.000 |
| Pearson,MM3   | 1000      | 1000      | 18        | 1.000          | 1.000 | 1.000 |
| RSS,MM3       | 1000      | 1000      | 18        | 1.000          | 1.000 | 1.000 |
| Multn,MM3     | 1000      | 1000      | 18        | 1.000          | 1.000 | 1.000 |
| <b>2F 10V</b> |           |           |           |                |       |       |
| Wald          | 1000      | 1000      | 18        | 0.996          | 0.983 | 0.946 |
| WaldVCF       | 1000      | 1000      | 18        | 0.993          | 0.982 | 0.940 |
| WaldDiag,MM3  | 1000      | 1000      | 18        | 0.991          | 0.978 | 0.921 |
| Pearson,MM3   | 1000      | 1000      | 18        | 0.998          | 0.993 | 0.971 |
| RSS,MM3       | 1000      | 1000      | 18        | 0.999          | 0.998 | 0.983 |
| Multn,MM3     | 1000      | 1000      | 18        | 0.994          | 0.982 | 0.943 |
| <b>3F 15V</b> |           |           |           |                |       |       |
| Wald          | 1000      | 1000      | 65        | 1.000          | 1.000 | 1.000 |
| WaldVCF       | 1000      | 1000      | 65        | 1.000          | 1.000 | 1.000 |
| WaldDiag,MM3  | 1000      | 1000      | 65        | 1.000          | 1.000 | 1.000 |
| Pearson,MM3   | 1000      | 1000      | 65        | 1.000          | 1.000 | 1.000 |
| RSS,MM3       | 1000      | 1000      | 65        | 1.000          | 1.000 | 1.000 |
| Multn,MM3     | 1000      | 1000      | 65        | 1.000          | 1.000 | 1.000 |

## Cluster sampling

Type I errors ( $n = 500$ )

| Name          | No. repl. | Converged | Rank def. | Rejection rate |       |       |
|---------------|-----------|-----------|-----------|----------------|-------|-------|
|               |           |           |           | 10%            | 5%    | 1%    |
| <b>1F 5V</b>  |           |           |           |                |       |       |
| Wald          | 1000      | 1000      | 0         | 0.100          | 0.056 | 0.012 |
| WaldVCF       | 1000      | 1000      | 0         | 0.098          | 0.056 | 0.012 |
| WaldDiag,MM3  | 1000      | 1000      | 0         | 0.034          | 0.006 | 0.000 |
| Pearson,MM3   | 1000      | 1000      | 0         | 0.091          | 0.037 | 0.005 |
| RSS,MM3       | 1000      | 1000      | 0         | 0.093          | 0.041 | 0.004 |
| Multn,MM3     | 1000      | 1000      | 0         | 0.090          | 0.046 | 0.007 |
| <b>1F 8V</b>  |           |           |           |                |       |       |
| Wald          | 1000      | 1000      | 3         | 0.132          | 0.070 | 0.012 |
| WaldVCF       | 1000      | 1000      | 3         | 0.129          | 0.069 | 0.012 |
| WaldDiag,MM3  | 1000      | 1000      | 3         | 0.072          | 0.034 | 0.002 |
| Pearson,MM3   | 1000      | 1000      | 3         | 0.089          | 0.054 | 0.009 |
| RSS,MM3       | 1000      | 1000      | 3         | 0.102          | 0.051 | 0.007 |
| Multn,MM3     | 1000      | 1000      | 3         | 0.122          | 0.068 | 0.009 |
| <b>1F 15V</b> |           |           |           |                |       |       |
| Wald          | 1000      | 1000      | 11        | 0.134          | 0.068 | 0.015 |
| WaldVCF       | 1000      | 1000      | 11        | 0.133          | 0.066 | 0.014 |
| WaldDiag,MM3  | 1000      | 1000      | 11        | 0.080          | 0.038 | 0.010 |
| Pearson,MM3   | 1000      | 1000      | 11        | 0.096          | 0.059 | 0.017 |
| RSS,MM3       | 1000      | 1000      | 11        | 0.101          | 0.056 | 0.014 |
| Multn,MM3     | 1000      | 1000      | 11        | 0.128          | 0.064 | 0.014 |
| <b>2F 10V</b> |           |           |           |                |       |       |
| Wald          | 1000      | 1000      | 12        | 0.112          | 0.060 | 0.015 |
| WaldVCF       | 1000      | 1000      | 12        | 0.106          | 0.058 | 0.014 |
| WaldDiag,MM3  | 1000      | 1000      | 12        | 0.028          | 0.008 | 0.000 |
| Pearson,MM3   | 1000      | 1000      | 12        | 0.094          | 0.044 | 0.013 |
| RSS,MM3       | 1000      | 1000      | 12        | 0.084          | 0.047 | 0.009 |
| Multn,MM3     | 1000      | 1000      | 12        | 0.092          | 0.048 | 0.008 |
| <b>3F 15V</b> |           |           |           |                |       |       |
| Wald          | 1000      | 1000      | 38        | 0.129          | 0.067 | 0.017 |
| WaldVCF       | 1000      | 1000      | 38        | 0.115          | 0.057 | 0.016 |
| WaldDiag,MM3  | 1000      | 1000      | 38        | 0.035          | 0.017 | 0.004 |
| Pearson,MM3   | 1000      | 1000      | 38        | 0.093          | 0.043 | 0.012 |
| RSS,MM3       | 1000      | 1000      | 38        | 0.088          | 0.039 | 0.011 |
| Multn,MM3     | 1000      | 1000      | 38        | 0.098          | 0.049 | 0.013 |

# Type I errors ( $n = 1000$ )

| Name         | No. repl. | Converged | Rank def. | Rejection rate |       |       |
|--------------|-----------|-----------|-----------|----------------|-------|-------|
|              |           |           |           | 10%            | 5%    | 1%    |
| 1F 5V        |           |           |           |                |       |       |
| Wald         | 1000      | 1000      | 0         | 0.116          | 0.059 | 0.012 |
| WaldVCF      | 1000      | 1000      | 0         | 0.115          | 0.059 | 0.012 |
| WaldDiag,MM3 | 1000      | 1000      | 0         | 0.073          | 0.034 | 0.001 |
| Pearson,MM3  | 1000      | 1000      | 0         | 0.098          | 0.045 | 0.010 |
| RSS,MM3      | 1000      | 1000      | 0         | 0.103          | 0.048 | 0.008 |
| Multn,MM3    | 1000      | 1000      | 0         | 0.111          | 0.056 | 0.012 |
| 1F 8V        |           |           |           |                |       |       |
| Wald         | 1000      | 1000      | 1         | 0.102          | 0.054 | 0.015 |
| WaldVCF      | 1000      | 1000      | 1         | 0.101          | 0.053 | 0.015 |
| WaldDiag,MM3 | 1000      | 1000      | 1         | 0.093          | 0.036 | 0.008 |
| Pearson,MM3  | 1000      | 1000      | 1         | 0.089          | 0.042 | 0.006 |
| RSS,MM3      | 1000      | 1000      | 1         | 0.093          | 0.041 | 0.006 |
| Multn,MM3    | 1000      | 1000      | 1         | 0.101          | 0.051 | 0.013 |
| 1F 15V       |           |           |           |                |       |       |
| Wald         | 1000      | 1000      | 14        | 0.128          | 0.069 | 0.014 |
| WaldVCF      | 1000      | 1000      | 14        | 0.126          | 0.064 | 0.014 |
| WaldDiag,MM3 | 1000      | 1000      | 14        | 0.096          | 0.043 | 0.006 |
| Pearson,MM3  | 1000      | 1000      | 14        | 0.098          | 0.043 | 0.009 |
| RSS,MM3      | 1000      | 1000      | 14        | 0.102          | 0.048 | 0.007 |
| Multn,MM3    | 1000      | 1000      | 14        | 0.126          | 0.064 | 0.012 |
| 2F 10V       |           |           |           |                |       |       |
| Wald         | 1000      | 1000      | 6         | 0.113          | 0.055 | 0.012 |
| WaldVCF      | 1000      | 1000      | 6         | 0.106          | 0.050 | 0.011 |
| WaldDiag,MM3 | 1000      | 1000      | 6         | 0.054          | 0.023 | 0.006 |
| Pearson,MM3  | 1000      | 1000      | 6         | 0.104          | 0.049 | 0.009 |
| RSS,MM3      | 1000      | 1000      | 6         | 0.106          | 0.052 | 0.010 |
| Multn,MM3    | 1000      | 1000      | 6         | 0.102          | 0.048 | 0.011 |
| 3F 15V       |           |           |           |                |       |       |
| Wald         | 1000      | 1000      | 29        | 0.153          | 0.088 | 0.015 |
| WaldVCF      | 1000      | 1000      | 29        | 0.139          | 0.083 | 0.012 |
| WaldDiag,MM3 | 1000      | 1000      | 29        | 0.081          | 0.035 | 0.005 |
| Pearson,MM3  | 1000      | 1000      | 29        | 0.110          | 0.070 | 0.016 |
| RSS,MM3      | 1000      | 1000      | 29        | 0.113          | 0.069 | 0.015 |
| Multn,MM3    | 1000      | 1000      | 29        | 0.127          | 0.078 | 0.011 |



# Type I errors ( $n = 2500$ )

| Name         | No. repl. | Converged | Rank def. | Rejection rate |       |       |
|--------------|-----------|-----------|-----------|----------------|-------|-------|
|              |           |           |           | 10%            | 5%    | 1%    |
| 1F 5V        |           |           |           |                |       |       |
| Wald         | 1000      | 1000      | 1         | 0.103          | 0.053 | 0.006 |
| WaldVCF      | 1000      | 1000      | 1         | 0.101          | 0.053 | 0.006 |
| WaldDiag,MM3 | 1000      | 1000      | 1         | 0.100          | 0.039 | 0.003 |
| Pearson,MM3  | 1000      | 1000      | 1         | 0.104          | 0.051 | 0.010 |
| RSS,MM3      | 1000      | 1000      | 1         | 0.103          | 0.048 | 0.011 |
| Multn,MM3    | 1000      | 1000      | 1         | 0.099          | 0.053 | 0.006 |
| 1F 8V        |           |           |           |                |       |       |
| Wald         | 1000      | 1000      | 5         | 0.104          | 0.052 | 0.009 |
| WaldVCF      | 1000      | 1000      | 5         | 0.102          | 0.052 | 0.009 |
| WaldDiag,MM3 | 1000      | 1000      | 5         | 0.102          | 0.054 | 0.012 |
| Pearson,MM3  | 1000      | 1000      | 5         | 0.093          | 0.046 | 0.014 |
| RSS,MM3      | 1000      | 1000      | 5         | 0.099          | 0.043 | 0.012 |
| Multn,MM3    | 1000      | 1000      | 5         | 0.100          | 0.052 | 0.009 |
| 1F 15V       |           |           |           |                |       |       |
| Wald         | 1000      | 1000      | 19        | 0.123          | 0.073 | 0.020 |
| WaldVCF      | 1000      | 1000      | 19        | 0.121          | 0.072 | 0.020 |
| WaldDiag,MM3 | 1000      | 1000      | 19        | 0.117          | 0.058 | 0.015 |
| Pearson,MM3  | 1000      | 1000      | 19        | 0.104          | 0.055 | 0.011 |
| RSS,MM3      | 1000      | 1000      | 19        | 0.108          | 0.054 | 0.015 |
| Multn,MM3    | 1000      | 1000      | 19        | 0.121          | 0.072 | 0.019 |
| 2F 10V       |           |           |           |                |       |       |
| Wald         | 1000      | 1000      | 18        | 0.119          | 0.062 | 0.024 |
| WaldVCF      | 1000      | 1000      | 18        | 0.112          | 0.059 | 0.023 |
| WaldDiag,MM3 | 1000      | 1000      | 18        | 0.101          | 0.052 | 0.007 |
| Pearson,MM3  | 1000      | 1000      | 18        | 0.111          | 0.061 | 0.012 |
| RSS,MM3      | 1000      | 1000      | 18        | 0.111          | 0.053 | 0.015 |
| Multn,MM3    | 1000      | 1000      | 18        | 0.108          | 0.059 | 0.022 |
| 3F 15V       |           |           |           |                |       |       |
| Wald         | 1000      | 1000      | 50        | 0.124          | 0.063 | 0.009 |
| WaldVCF      | 1000      | 1000      | 50        | 0.114          | 0.052 | 0.005 |
| WaldDiag,MM3 | 1000      | 1000      | 50        | 0.081          | 0.033 | 0.003 |
| Pearson,MM3  | 1000      | 1000      | 50        | 0.092          | 0.042 | 0.012 |
| RSS,MM3      | 1000      | 1000      | 50        | 0.095          | 0.042 | 0.008 |
| Multn,MM3    | 1000      | 1000      | 50        | 0.111          | 0.049 | 0.006 |

# Type I errors ( $n = 5000$ )

| Name          | No. repl. | Converged | Rank def. | Rejection rate |       |       |
|---------------|-----------|-----------|-----------|----------------|-------|-------|
|               |           |           |           | 10%            | 5%    | 1%    |
| <b>1F 5V</b>  |           |           |           |                |       |       |
| Wald          | 1000      | 1000      | 0         | 0.108          | 0.052 | 0.013 |
| WaldVCF       | 1000      | 1000      | 0         | 0.108          | 0.051 | 0.013 |
| WaldDiag,MM3  | 1000      | 1000      | 0         | 0.088          | 0.045 | 0.011 |
| Pearson,MM3   | 1000      | 1000      | 0         | 0.107          | 0.051 | 0.010 |
| RSS,MM3       | 1000      | 1000      | 0         | 0.109          | 0.054 | 0.009 |
| Multn,MM3     | 1000      | 1000      | 0         | 0.108          | 0.050 | 0.013 |
| <b>1F 8V</b>  |           |           |           |                |       |       |
| Wald          | 1000      | 1000      | 9         | 0.104          | 0.049 | 0.010 |
| WaldVCF       | 1000      | 1000      | 9         | 0.102          | 0.049 | 0.010 |
| WaldDiag,MM3  | 1000      | 1000      | 9         | 0.103          | 0.050 | 0.014 |
| Pearson,MM3   | 1000      | 1000      | 9         | 0.094          | 0.047 | 0.006 |
| RSS,MM3       | 1000      | 1000      | 9         | 0.093          | 0.042 | 0.008 |
| Multn,MM3     | 1000      | 1000      | 9         | 0.102          | 0.049 | 0.010 |
| <b>1F 15V</b> |           |           |           |                |       |       |
| Wald          | 1000      | 1000      | 33        | 0.129          | 0.063 | 0.020 |
| WaldVCF       | 1000      | 1000      | 33        | 0.127          | 0.060 | 0.020 |
| WaldDiag,MM3  | 1000      | 1000      | 33        | 0.121          | 0.064 | 0.021 |
| Pearson,MM3   | 1000      | 1000      | 33        | 0.101          | 0.051 | 0.010 |
| RSS,MM3       | 1000      | 1000      | 33        | 0.109          | 0.056 | 0.013 |
| Multn,MM3     | 1000      | 1000      | 33        | 0.127          | 0.060 | 0.020 |
| <b>2F 10V</b> |           |           |           |                |       |       |
| Wald          | 1000      | 1000      | 26        | 0.134          | 0.062 | 0.012 |
| WaldVCF       | 1000      | 1000      | 26        | 0.130          | 0.058 | 0.011 |
| WaldDiag,MM3  | 1000      | 1000      | 26        | 0.105          | 0.057 | 0.012 |
| Pearson,MM3   | 1000      | 1000      | 26        | 0.112          | 0.055 | 0.013 |
| RSS,MM3       | 1000      | 1000      | 26        | 0.115          | 0.058 | 0.011 |
| Multn,MM3     | 1000      | 1000      | 26        | 0.128          | 0.058 | 0.011 |
| <b>3F 15V</b> |           |           |           |                |       |       |
| Wald          | 1000      | 1000      | 52        | 0.121          | 0.057 | 0.013 |
| WaldVCF       | 1000      | 1000      | 52        | 0.112          | 0.051 | 0.010 |
| WaldDiag,MM3  | 1000      | 1000      | 52        | 0.107          | 0.054 | 0.010 |
| Pearson,MM3   | 1000      | 1000      | 52        | 0.106          | 0.048 | 0.011 |
| RSS,MM3       | 1000      | 1000      | 52        | 0.098          | 0.051 | 0.012 |
| Multn,MM3     | 1000      | 1000      | 52        | 0.115          | 0.051 | 0.011 |

# Type I errors ( $n = 10000$ )

| Name          | No. repl. | Converged | Rank def. | Rejection rate |       |       |
|---------------|-----------|-----------|-----------|----------------|-------|-------|
|               |           |           |           | 10%            | 5%    | 1%    |
| <b>1F 5V</b>  |           |           |           |                |       |       |
| Wald          | 1000      | 1000      | 4         | 0.116          | 0.060 | 0.010 |
| WaldVCF       | 1000      | 1000      | 4         | 0.116          | 0.060 | 0.010 |
| WaldDiag,MM3  | 1000      | 1000      | 4         | 0.094          | 0.051 | 0.013 |
| Pearson,MM3   | 1000      | 1000      | 4         | 0.103          | 0.055 | 0.011 |
| RSS,MM3       | 1000      | 1000      | 4         | 0.107          | 0.058 | 0.009 |
| Multn,MM3     | 1000      | 1000      | 4         | 0.116          | 0.059 | 0.010 |
| <b>1F 8V</b>  |           |           |           |                |       |       |
| Wald          | 1000      | 1000      | 3         | 0.121          | 0.058 | 0.016 |
| WaldVCF       | 1000      | 1000      | 3         | 0.118          | 0.057 | 0.016 |
| WaldDiag,MM3  | 1000      | 1000      | 3         | 0.112          | 0.052 | 0.010 |
| Pearson,MM3   | 1000      | 1000      | 3         | 0.107          | 0.051 | 0.015 |
| RSS,MM3       | 1000      | 1000      | 3         | 0.108          | 0.056 | 0.017 |
| Multn,MM3     | 1000      | 1000      | 3         | 0.119          | 0.057 | 0.016 |
| <b>1F 15V</b> |           |           |           |                |       |       |
| Wald          | 1000      | 1000      | 35        | 0.118          | 0.053 | 0.011 |
| WaldVCF       | 1000      | 1000      | 35        | 0.115          | 0.051 | 0.011 |
| WaldDiag,MM3  | 1000      | 1000      | 35        | 0.108          | 0.058 | 0.010 |
| Pearson,MM3   | 1000      | 1000      | 35        | 0.079          | 0.040 | 0.004 |
| RSS,MM3       | 1000      | 1000      | 35        | 0.089          | 0.042 | 0.006 |
| Multn,MM3     | 1000      | 1000      | 35        | 0.116          | 0.050 | 0.011 |
| <b>2F 10V</b> |           |           |           |                |       |       |
| Wald          | 1000      | 1000      | 32        | 0.130          | 0.061 | 0.011 |
| WaldVCF       | 1000      | 1000      | 32        | 0.123          | 0.057 | 0.010 |
| WaldDiag,MM3  | 1000      | 1000      | 32        | 0.102          | 0.048 | 0.012 |
| Pearson,MM3   | 1000      | 1000      | 32        | 0.102          | 0.051 | 0.008 |
| RSS,MM3       | 1000      | 1000      | 32        | 0.111          | 0.050 | 0.013 |
| Multn,MM3     | 1000      | 1000      | 32        | 0.123          | 0.056 | 0.010 |
| <b>3F 15V</b> |           |           |           |                |       |       |
| Wald          | 1000      | 1000      | 88        | 0.134          | 0.075 | 0.011 |
| WaldVCF       | 1000      | 1000      | 88        | 0.121          | 0.066 | 0.010 |
| WaldDiag,MM3  | 1000      | 1000      | 88        | 0.104          | 0.051 | 0.010 |
| Pearson,MM3   | 1000      | 1000      | 88        | 0.095          | 0.048 | 0.006 |
| RSS,MM3       | 1000      | 1000      | 88        | 0.099          | 0.051 | 0.010 |
| Multn,MM3     | 1000      | 1000      | 88        | 0.121          | 0.067 | 0.010 |

**Power** ( $n = 500$ )

| Name          | No. repl. | Converged | Rank def. | Rejection rate |       |       |
|---------------|-----------|-----------|-----------|----------------|-------|-------|
|               |           |           |           | 10%            | 5%    | 1%    |
| <b>1F 5V</b>  |           |           |           |                |       |       |
| Wald          | 1000      | 1000      | 1         | 0.250          | 0.155 | 0.052 |
| WaldVCF       | 1000      | 1000      | 1         | 0.249          | 0.154 | 0.049 |
| WaldDiag,MM3  | 1000      | 1000      | 1         | 0.106          | 0.036 | 0.003 |
| Pearson,MM3   | 1000      | 1000      | 1         | 0.251          | 0.160 | 0.055 |
| RSS,MM3       | 1000      | 1000      | 1         | 0.260          | 0.160 | 0.054 |
| Multn,MM3     | 1000      | 1000      | 1         | 0.230          | 0.140 | 0.039 |
| <b>1F 8V</b>  |           |           |           |                |       |       |
| Wald          | 1000      | 1000      | 4         | 0.604          | 0.500 | 0.287 |
| WaldVCF       | 1000      | 1000      | 4         | 0.604          | 0.496 | 0.282 |
| WaldDiag,MM3  | 1000      | 1000      | 4         | 0.409          | 0.297 | 0.092 |
| Pearson,MM3   | 1000      | 1000      | 4         | 0.360          | 0.224 | 0.069 |
| RSS,MM3       | 1000      | 1000      | 4         | 0.452          | 0.309 | 0.117 |
| Multn,MM3     | 1000      | 1000      | 4         | 0.598          | 0.490 | 0.276 |
| <b>1F 15V</b> |           |           |           |                |       |       |
| Wald          | 1000      | 1000      | 11        | 0.633          | 0.492 | 0.271 |
| WaldVCF       | 1000      | 1000      | 11        | 0.624          | 0.484 | 0.260 |
| WaldDiag,MM3  | 1000      | 1000      | 11        | 0.455          | 0.319 | 0.130 |
| Pearson,MM3   | 1000      | 1000      | 11        | 0.773          | 0.665 | 0.461 |
| RSS,MM3       | 1000      | 1000      | 11        | 0.757          | 0.649 | 0.433 |
| Multn,MM3     | 1000      | 1000      | 11        | 0.614          | 0.482 | 0.256 |
| <b>2F 10V</b> |           |           |           |                |       |       |
| Wald          | 999       | 998       | 17        | 0.571          | 0.463 | 0.267 |
| WaldVCF       | 999       | 998       | 17        | 0.277          | 0.175 | 0.033 |
| WaldDiag,MM3  | 999       | 998       | 17        | 0.156          | 0.073 | 0.009 |
| Pearson,MM3   | 999       | 998       | 17        | 0.280          | 0.172 | 0.042 |
| RSS,MM3       | 999       | 998       | 17        | 0.305          | 0.192 | 0.053 |
| Multn,MM3     | 999       | 998       | 17        | 0.451          | 0.344 | 0.151 |
| <b>3F 15V</b> |           |           |           |                |       |       |
| Wald          | 1000      | 1000      | 32        | 0.190          | 0.108 | 0.023 |
| WaldVCF       | 1000      | 1000      | 32        | 0.176          | 0.097 | 0.018 |
| WaldDiag,MM3  | 1000      | 1000      | 32        | 0.071          | 0.024 | 0.002 |
| Pearson,MM3   | 1000      | 1000      | 32        | 0.150          | 0.071 | 0.019 |
| RSS,MM3       | 1000      | 1000      | 32        | 0.159          | 0.086 | 0.023 |
| Multn,MM3     | 1000      | 1000      | 32        | 0.156          | 0.083 | 0.012 |

**Power** ( $n = 1000$ )

| Name          | No. repl. | Converged | Rank def. | Rejection rate |       |       |
|---------------|-----------|-----------|-----------|----------------|-------|-------|
|               |           |           |           | 10%            | 5%    | 1%    |
| <b>1F 5V</b>  |           |           |           |                |       |       |
| Wald          | 1000      | 1000      | 2         | 0.318          | 0.218 | 0.080 |
| WaldVCF       | 1000      | 1000      | 2         | 0.318          | 0.215 | 0.080 |
| WaldDiag,MM3  | 1000      | 1000      | 2         | 0.195          | 0.107 | 0.020 |
| Pearson,MM3   | 1000      | 1000      | 2         | 0.319          | 0.214 | 0.089 |
| RSS,MM3       | 1000      | 1000      | 2         | 0.337          | 0.220 | 0.096 |
| Multn,MM3     | 1000      | 1000      | 2         | 0.309          | 0.210 | 0.079 |
| <b>1F 8V</b>  |           |           |           |                |       |       |
| Wald          | 1000      | 1000      | 1         | 0.918          | 0.883 | 0.724 |
| WaldVCF       | 1000      | 1000      | 1         | 0.915          | 0.880 | 0.721 |
| WaldDiag,MM3  | 1000      | 1000      | 1         | 0.823          | 0.678 | 0.417 |
| Pearson,MM3   | 1000      | 1000      | 1         | 0.757          | 0.631 | 0.359 |
| RSS,MM3       | 1000      | 1000      | 1         | 0.849          | 0.746 | 0.532 |
| Multn,MM3     | 1000      | 1000      | 1         | 0.915          | 0.879 | 0.717 |
| <b>1F 15V</b> |           |           |           |                |       |       |
| Wald          | 1000      | 1000      | 7         | 0.805          | 0.710 | 0.518 |
| WaldVCF       | 1000      | 1000      | 7         | 0.799          | 0.705 | 0.512 |
| WaldDiag,MM3  | 1000      | 1000      | 7         | 0.674          | 0.547 | 0.301 |
| Pearson,MM3   | 1000      | 1000      | 7         | 0.924          | 0.873 | 0.714 |
| RSS,MM3       | 1000      | 1000      | 7         | 0.918          | 0.874 | 0.718 |
| Multn,MM3     | 1000      | 1000      | 7         | 0.798          | 0.705 | 0.512 |
| <b>2F 10V</b> |           |           |           |                |       |       |
| Wald          | 1000      | 1000      | 8         | 0.413          | 0.279 | 0.129 |
| WaldVCF       | 1000      | 1000      | 8         | 0.267          | 0.170 | 0.057 |
| WaldDiag,MM3  | 1000      | 1000      | 8         | 0.251          | 0.153 | 0.031 |
| Pearson,MM3   | 1000      | 1000      | 8         | 0.374          | 0.252 | 0.113 |
| RSS,MM3       | 1000      | 1000      | 8         | 0.369          | 0.253 | 0.103 |
| Multn,MM3     | 1000      | 1000      | 8         | 0.383          | 0.257 | 0.114 |
| <b>3F 15V</b> |           |           |           |                |       |       |
| Wald          | 1000      | 1000      | 30        | 0.639          | 0.496 | 0.253 |
| WaldVCF       | 1000      | 1000      | 30        | 0.616          | 0.471 | 0.235 |
| WaldDiag,MM3  | 1000      | 1000      | 30        | 0.624          | 0.493 | 0.274 |
| Pearson,MM3   | 1000      | 1000      | 30        | 0.727          | 0.621 | 0.373 |
| RSS,MM3       | 1000      | 1000      | 30        | 0.768          | 0.658 | 0.436 |
| Multn,MM3     | 1000      | 1000      | 30        | 0.614          | 0.468 | 0.230 |

**Power** ( $n = 2500$ )

| Name          | No. repl. | Converged | Rank def. | Rejection rate |       |       |
|---------------|-----------|-----------|-----------|----------------|-------|-------|
|               |           |           |           | 10%            | 5%    | 1%    |
| <b>1F 5V</b>  |           |           |           |                |       |       |
| Wald          | 1000      | 1000      | 1         | 0.956          | 0.921 | 0.822 |
| WaldVCF       | 1000      | 1000      | 1         | 0.956          | 0.921 | 0.821 |
| WaldDiag,MM3  | 1000      | 1000      | 1         | 0.882          | 0.791 | 0.555 |
| Pearson,MM3   | 1000      | 1000      | 1         | 0.955          | 0.923 | 0.811 |
| RSS,MM3       | 1000      | 1000      | 1         | 0.964          | 0.938 | 0.843 |
| Multn,MM3     | 1000      | 1000      | 1         | 0.956          | 0.920 | 0.818 |
| <b>1F 8V</b>  |           |           |           |                |       |       |
| Wald          | 1000      | 1000      | 3         | 1.000          | 1.000 | 1.000 |
| WaldVCF       | 1000      | 1000      | 3         | 1.000          | 1.000 | 1.000 |
| WaldDiag,MM3  | 1000      | 1000      | 3         | 1.000          | 1.000 | 0.999 |
| Pearson,MM3   | 1000      | 1000      | 3         | 1.000          | 1.000 | 1.000 |
| RSS,MM3       | 1000      | 1000      | 3         | 1.000          | 1.000 | 1.000 |
| Multn,MM3     | 1000      | 1000      | 3         | 1.000          | 1.000 | 1.000 |
| <b>1F 15V</b> |           |           |           |                |       |       |
| Wald          | 1000      | 1000      | 8         | 0.992          | 0.985 | 0.934 |
| WaldVCF       | 1000      | 1000      | 8         | 0.991          | 0.985 | 0.932 |
| WaldDiag,MM3  | 1000      | 1000      | 8         | 0.968          | 0.928 | 0.804 |
| Pearson,MM3   | 1000      | 1000      | 8         | 1.000          | 1.000 | 0.998 |
| RSS,MM3       | 1000      | 1000      | 8         | 1.000          | 1.000 | 0.998 |
| Multn,MM3     | 1000      | 1000      | 8         | 0.991          | 0.985 | 0.931 |
| <b>2F 10V</b> |           |           |           |                |       |       |
| Wald          | 1000      | 1000      | 6         | 0.577          | 0.435 | 0.230 |
| WaldVCF       | 1000      | 1000      | 6         | 0.533          | 0.392 | 0.190 |
| WaldDiag,MM3  | 1000      | 1000      | 6         | 0.607          | 0.475 | 0.240 |
| Pearson,MM3   | 1000      | 1000      | 6         | 0.812          | 0.718 | 0.514 |
| RSS,MM3       | 1000      | 1000      | 6         | 0.780          | 0.693 | 0.501 |
| Multn,MM3     | 1000      | 1000      | 6         | 0.568          | 0.432 | 0.229 |
| <b>3F 15V</b> |           |           |           |                |       |       |
| Wald          | 1000      | 1000      | 37        | 0.974          | 0.948 | 0.834 |
| WaldVCF       | 1000      | 1000      | 37        | 0.968          | 0.944 | 0.813 |
| WaldDiag,MM3  | 1000      | 1000      | 37        | 0.987          | 0.971 | 0.884 |
| Pearson,MM3   | 1000      | 1000      | 37        | 0.991          | 0.985 | 0.943 |
| RSS,MM3       | 1000      | 1000      | 37        | 0.994          | 0.990 | 0.965 |
| Multn,MM3     | 1000      | 1000      | 37        | 0.967          | 0.943 | 0.815 |

**Power** ( $n = 5000$ )

| Name          | No. repl. | Converged | Rank def. | Rejection rate |       |       |
|---------------|-----------|-----------|-----------|----------------|-------|-------|
|               |           |           |           | 10%            | 5%    | 1%    |
| <b>1F 5V</b>  |           |           |           |                |       |       |
| Wald          | 1000      | 1000      | 0         | 0.983          | 0.969 | 0.916 |
| WaldVCF       | 1000      | 1000      | 0         | 0.983          | 0.969 | 0.916 |
| WaldDiag,MM3  | 1000      | 1000      | 0         | 0.967          | 0.937 | 0.757 |
| Pearson,MM3   | 1000      | 1000      | 0         | 0.980          | 0.954 | 0.854 |
| RSS,MM3       | 1000      | 1000      | 0         | 0.987          | 0.967 | 0.911 |
| Multn,MM3     | 1000      | 1000      | 0         | 0.982          | 0.969 | 0.915 |
| <b>1F 8V</b>  |           |           |           |                |       |       |
| Wald          | 1000      | 1000      | 1         | 1.000          | 1.000 | 1.000 |
| WaldVCF       | 1000      | 1000      | 1         | 1.000          | 1.000 | 1.000 |
| WaldDiag,MM3  | 1000      | 1000      | 1         | 1.000          | 1.000 | 1.000 |
| Pearson,MM3   | 1000      | 1000      | 1         | 1.000          | 0.999 | 0.996 |
| RSS,MM3       | 1000      | 1000      | 1         | 1.000          | 1.000 | 1.000 |
| Multn,MM3     | 1000      | 1000      | 1         | 1.000          | 1.000 | 1.000 |
| <b>1F 15V</b> |           |           |           |                |       |       |
| Wald          | 1000      | 1000      | 20        | 1.000          | 1.000 | 1.000 |
| WaldVCF       | 1000      | 1000      | 20        | 1.000          | 1.000 | 1.000 |
| WaldDiag,MM3  | 1000      | 1000      | 20        | 1.000          | 1.000 | 1.000 |
| Pearson,MM3   | 1000      | 1000      | 20        | 1.000          | 1.000 | 1.000 |
| RSS,MM3       | 1000      | 1000      | 20        | 1.000          | 1.000 | 1.000 |
| Multn,MM3     | 1000      | 1000      | 20        | 1.000          | 1.000 | 1.000 |
| <b>2F 10V</b> |           |           |           |                |       |       |
| Wald          | 1000      | 1000      | 7         | 0.997          | 0.991 | 0.942 |
| WaldVCF       | 1000      | 1000      | 7         | 0.995          | 0.989 | 0.934 |
| WaldDiag,MM3  | 1000      | 1000      | 7         | 0.999          | 0.996 | 0.946 |
| Pearson,MM3   | 1000      | 1000      | 7         | 0.999          | 0.998 | 0.995 |
| RSS,MM3       | 1000      | 1000      | 7         | 0.999          | 0.999 | 0.996 |
| Multn,MM3     | 1000      | 1000      | 7         | 0.997          | 0.990 | 0.943 |
| <b>3F 15V</b> |           |           |           |                |       |       |
| Wald          | 1000      | 1000      | 41        | 0.997          | 0.989 | 0.960 |
| WaldVCF       | 1000      | 1000      | 41        | 0.997          | 0.986 | 0.958 |
| WaldDiag,MM3  | 1000      | 1000      | 41        | 0.998          | 0.996 | 0.980 |
| Pearson,MM3   | 1000      | 1000      | 41        | 0.998          | 0.997 | 0.980 |
| RSS,MM3       | 1000      | 1000      | 41        | 0.999          | 0.999 | 0.993 |
| Multn,MM3     | 1000      | 1000      | 41        | 0.997          | 0.986 | 0.957 |

Power ( $n = 10000$ )

| Name          | No. repl. | Converged | Rank def. | Rejection rate |    |    |
|---------------|-----------|-----------|-----------|----------------|----|----|
|               |           |           |           | 10%            | 5% | 1% |
| <b>1F 5V</b>  |           |           |           |                |    |    |
| Wald          | 1000      | 1000      | 1         | 1              | 1  | 1  |
| WaldVCF       | 1000      | 1000      | 1         | 1              | 1  | 1  |
| WaldDiag,MM3  | 1000      | 1000      | 1         | 1              | 1  | 1  |
| Pearson,MM3   | 1000      | 1000      | 1         | 1              | 1  | 1  |
| RSS,MM3       | 1000      | 1000      | 1         | 1              | 1  | 1  |
| Multn,MM3     | 1000      | 1000      | 1         | 1              | 1  | 1  |
| <b>1F 8V</b>  |           |           |           |                |    |    |
| Wald          | 1000      | 1000      | 4         | 1              | 1  | 1  |
| WaldVCF       | 1000      | 1000      | 4         | 1              | 1  | 1  |
| WaldDiag,MM3  | 1000      | 1000      | 4         | 1              | 1  | 1  |
| Pearson,MM3   | 1000      | 1000      | 4         | 1              | 1  | 1  |
| RSS,MM3       | 1000      | 1000      | 4         | 1              | 1  | 1  |
| Multn,MM3     | 1000      | 1000      | 4         | 1              | 1  | 1  |
| <b>1F 15V</b> |           |           |           |                |    |    |
| Wald          | 1000      | 1000      | 25        | 1              | 1  | 1  |
| WaldVCF       | 1000      | 1000      | 25        | 1              | 1  | 1  |
| WaldDiag,MM3  | 1000      | 1000      | 25        | 1              | 1  | 1  |
| Pearson,MM3   | 1000      | 1000      | 25        | 1              | 1  | 1  |
| RSS,MM3       | 1000      | 1000      | 25        | 1              | 1  | 1  |
| Multn,MM3     | 1000      | 1000      | 25        | 1              | 1  | 1  |
| <b>2F 10V</b> |           |           |           |                |    |    |
| Wald          | 1000      | 1000      | 13        | 1              | 1  | 1  |
| WaldVCF       | 1000      | 1000      | 13        | 1              | 1  | 1  |
| WaldDiag,MM3  | 1000      | 1000      | 13        | 1              | 1  | 1  |
| Pearson,MM3   | 1000      | 1000      | 13        | 1              | 1  | 1  |
| RSS,MM3       | 1000      | 1000      | 13        | 1              | 1  | 1  |
| Multn,MM3     | 1000      | 1000      | 13        | 1              | 1  | 1  |
| <b>3F 15V</b> |           |           |           |                |    |    |
| Wald          | 1000      | 1000      | 57        | 1              | 1  | 1  |
| WaldVCF       | 1000      | 1000      | 57        | 1              | 1  | 1  |
| WaldDiag,MM3  | 1000      | 1000      | 57        | 1              | 1  | 1  |
| Pearson,MM3   | 1000      | 1000      | 57        | 1              | 1  | 1  |
| RSS,MM3       | 1000      | 1000      | 57        | 1              | 1  | 1  |
| Multn,MM3     | 1000      | 1000      | 57        | 1              | 1  | 1  |



## Strat-clust sampling

Type I errors ( $n = 500$ )

| Name          | No. repl. | Converged | Rank def. | Rejection rate |       |       |
|---------------|-----------|-----------|-----------|----------------|-------|-------|
|               |           |           |           | 10%            | 5%    | 1%    |
| <b>1F 5V</b>  |           |           |           |                |       |       |
| Wald          | 1000      | 1000      | 2         | 0.121          | 0.070 | 0.014 |
| WaldVCF       | 1000      | 1000      | 2         | 0.119          | 0.069 | 0.014 |
| WaldDiag,MM3  | 1000      | 1000      | 2         | 0.058          | 0.020 | 0.000 |
| Pearson,MM3   | 1000      | 1000      | 2         | 0.112          | 0.055 | 0.011 |
| RSS,MM3       | 1000      | 1000      | 2         | 0.109          | 0.053 | 0.007 |
| Multn,MM3     | 1000      | 1000      | 2         | 0.108          | 0.060 | 0.011 |
| <b>1F 8V</b>  |           |           |           |                |       |       |
| Wald          | 1000      | 1000      | 2         | 0.134          | 0.071 | 0.022 |
| WaldVCF       | 1000      | 1000      | 2         | 0.132          | 0.069 | 0.020 |
| WaldDiag,MM3  | 1000      | 1000      | 2         | 0.074          | 0.039 | 0.005 |
| Pearson,MM3   | 1000      | 1000      | 2         | 0.127          | 0.071 | 0.015 |
| RSS,MM3       | 1000      | 1000      | 2         | 0.128          | 0.069 | 0.016 |
| Multn,MM3     | 1000      | 1000      | 2         | 0.128          | 0.067 | 0.018 |
| <b>1F 15V</b> |           |           |           |                |       |       |
| Wald          | 1000      | 1000      | 15        | 0.171          | 0.092 | 0.022 |
| WaldVCF       | 1000      | 1000      | 15        | 0.169          | 0.088 | 0.022 |
| WaldDiag,MM3  | 1000      | 1000      | 15        | 0.088          | 0.036 | 0.007 |
| Pearson,MM3   | 1000      | 1000      | 15        | 0.190          | 0.105 | 0.024 |
| RSS,MM3       | 1000      | 1000      | 15        | 0.190          | 0.097 | 0.024 |
| Multn,MM3     | 1000      | 1000      | 15        | 0.167          | 0.087 | 0.021 |
| <b>2F 10V</b> |           |           |           |                |       |       |
| Wald          | 1000      | 1000      | 10        | 0.161          | 0.088 | 0.025 |
| WaldVCF       | 1000      | 1000      | 10        | 0.155          | 0.086 | 0.023 |
| WaldDiag,MM3  | 1000      | 1000      | 10        | 0.046          | 0.020 | 0.002 |
| Pearson,MM3   | 1000      | 1000      | 10        | 0.133          | 0.069 | 0.020 |
| RSS,MM3       | 1000      | 1000      | 10        | 0.135          | 0.081 | 0.019 |
| Multn,MM3     | 1000      | 1000      | 10        | 0.137          | 0.078 | 0.019 |
| <b>3F 15V</b> |           |           |           |                |       |       |
| Wald          | 1000      | 1000      | 36        | 0.178          | 0.100 | 0.020 |
| WaldVCF       | 1000      | 1000      | 36        | 0.163          | 0.085 | 0.018 |
| WaldDiag,MM3  | 1000      | 1000      | 36        | 0.038          | 0.015 | 0.002 |
| Pearson,MM3   | 1000      | 1000      | 36        | 0.132          | 0.084 | 0.026 |
| RSS,MM3       | 1000      | 1000      | 36        | 0.137          | 0.077 | 0.020 |
| Multn,MM3     | 1000      | 1000      | 36        | 0.148          | 0.066 | 0.016 |

# Type I errors ( $n = 1000$ )

| Name         | No. repl. | Converged | Rank def. | Rejection rate |       |       |
|--------------|-----------|-----------|-----------|----------------|-------|-------|
|              |           |           |           | 10%            | 5%    | 1%    |
| 1F 5V        |           |           |           |                |       |       |
| Wald         | 1000      | 1000      | 2         | 0.113          | 0.066 | 0.016 |
| WaldVCF      | 1000      | 1000      | 2         | 0.111          | 0.066 | 0.016 |
| WaldDiag,MM3 | 1000      | 1000      | 2         | 0.073          | 0.030 | 0.008 |
| Pearson,MM3  | 1000      | 1000      | 2         | 0.104          | 0.068 | 0.020 |
| RSS,MM3      | 1000      | 1000      | 2         | 0.105          | 0.062 | 0.025 |
| Multn,MM3    | 1000      | 1000      | 2         | 0.109          | 0.065 | 0.016 |
| 1F 8V        |           |           |           |                |       |       |
| Wald         | 1000      | 1000      | 4         | 0.131          | 0.052 | 0.011 |
| WaldVCF      | 1000      | 1000      | 4         | 0.128          | 0.052 | 0.011 |
| WaldDiag,MM3 | 1000      | 1000      | 4         | 0.085          | 0.046 | 0.003 |
| Pearson,MM3  | 1000      | 1000      | 4         | 0.123          | 0.071 | 0.015 |
| RSS,MM3      | 1000      | 1000      | 4         | 0.138          | 0.073 | 0.012 |
| Multn,MM3    | 1000      | 1000      | 4         | 0.125          | 0.050 | 0.011 |
| 1F 15V       |           |           |           |                |       |       |
| Wald         | 1000      | 1000      | 12        | 0.133          | 0.068 | 0.023 |
| WaldVCF      | 1000      | 1000      | 12        | 0.131          | 0.068 | 0.023 |
| WaldDiag,MM3 | 1000      | 1000      | 12        | 0.088          | 0.044 | 0.013 |
| Pearson,MM3  | 1000      | 1000      | 12        | 0.179          | 0.100 | 0.027 |
| RSS,MM3      | 1000      | 1000      | 12        | 0.174          | 0.089 | 0.021 |
| Multn,MM3    | 1000      | 1000      | 12        | 0.130          | 0.068 | 0.023 |
| 2F 10V       |           |           |           |                |       |       |
| Wald         | 1000      | 1000      | 14        | 0.147          | 0.080 | 0.029 |
| WaldVCF      | 1000      | 1000      | 14        | 0.141          | 0.076 | 0.025 |
| WaldDiag,MM3 | 1000      | 1000      | 14        | 0.080          | 0.041 | 0.005 |
| Pearson,MM3  | 1000      | 1000      | 14        | 0.135          | 0.073 | 0.020 |
| RSS,MM3      | 1000      | 1000      | 14        | 0.141          | 0.071 | 0.020 |
| Multn,MM3    | 1000      | 1000      | 14        | 0.134          | 0.074 | 0.023 |
| 3F 15V       |           |           |           |                |       |       |
| Wald         | 1000      | 1000      | 37        | 0.182          | 0.100 | 0.025 |
| WaldVCF      | 1000      | 1000      | 37        | 0.172          | 0.089 | 0.023 |
| WaldDiag,MM3 | 1000      | 1000      | 37        | 0.084          | 0.043 | 0.008 |
| Pearson,MM3  | 1000      | 1000      | 37        | 0.160          | 0.089 | 0.018 |
| RSS,MM3      | 1000      | 1000      | 37        | 0.165          | 0.089 | 0.020 |
| Multn,MM3    | 1000      | 1000      | 37        | 0.162          | 0.085 | 0.022 |

# Type I errors ( $n = 2500$ )

| Name         | No. repl. | Converged | Rank def. | Rejection rate |       |       |
|--------------|-----------|-----------|-----------|----------------|-------|-------|
|              |           |           |           | 10%            | 5%    | 1%    |
| 1F 5V        |           |           |           |                |       |       |
| Wald         | 1000      | 1000      | 1         | 0.106          | 0.066 | 0.019 |
| WaldVCF      | 1000      | 1000      | 1         | 0.105          | 0.065 | 0.019 |
| WaldDiag,MM3 | 1000      | 1000      | 1         | 0.104          | 0.044 | 0.014 |
| Pearson,MM3  | 1000      | 1000      | 1         | 0.117          | 0.067 | 0.019 |
| RSS,MM3      | 1000      | 1000      | 1         | 0.115          | 0.065 | 0.022 |
| Multn,MM3    | 1000      | 1000      | 1         | 0.104          | 0.065 | 0.019 |
| 1F 8V        |           |           |           |                |       |       |
| Wald         | 1000      | 1000      | 8         | 0.134          | 0.071 | 0.016 |
| WaldVCF      | 1000      | 1000      | 8         | 0.132          | 0.070 | 0.016 |
| WaldDiag,MM3 | 1000      | 1000      | 8         | 0.098          | 0.043 | 0.011 |
| Pearson,MM3  | 1000      | 1000      | 8         | 0.130          | 0.070 | 0.016 |
| RSS,MM3      | 1000      | 1000      | 8         | 0.136          | 0.069 | 0.020 |
| Multn,MM3    | 1000      | 1000      | 8         | 0.132          | 0.070 | 0.016 |
| 1F 15V       |           |           |           |                |       |       |
| Wald         | 1000      | 1000      | 11        | 0.193          | 0.114 | 0.026 |
| WaldVCF      | 1000      | 1000      | 11        | 0.191          | 0.111 | 0.024 |
| WaldDiag,MM3 | 1000      | 1000      | 11        | 0.155          | 0.082 | 0.023 |
| Pearson,MM3  | 1000      | 1000      | 11        | 0.203          | 0.123 | 0.029 |
| RSS,MM3      | 1000      | 1000      | 11        | 0.217          | 0.118 | 0.028 |
| Multn,MM3    | 1000      | 1000      | 11        | 0.192          | 0.111 | 0.024 |
| 2F 10V       |           |           |           |                |       |       |
| Wald         | 1000      | 1000      | 9         | 0.139          | 0.064 | 0.015 |
| WaldVCF      | 1000      | 1000      | 9         | 0.134          | 0.059 | 0.014 |
| WaldDiag,MM3 | 1000      | 1000      | 9         | 0.089          | 0.041 | 0.009 |
| Pearson,MM3  | 1000      | 1000      | 9         | 0.121          | 0.056 | 0.013 |
| RSS,MM3      | 1000      | 1000      | 9         | 0.128          | 0.061 | 0.014 |
| Multn,MM3    | 1000      | 1000      | 9         | 0.131          | 0.058 | 0.014 |
| 3F 15V       |           |           |           |                |       |       |
| Wald         | 1000      | 1000      | 45        | 0.208          | 0.114 | 0.038 |
| WaldVCF      | 1000      | 1000      | 45        | 0.200          | 0.105 | 0.037 |
| WaldDiag,MM3 | 1000      | 1000      | 45        | 0.134          | 0.073 | 0.021 |
| Pearson,MM3  | 1000      | 1000      | 45        | 0.179          | 0.100 | 0.025 |
| RSS,MM3      | 1000      | 1000      | 45        | 0.185          | 0.105 | 0.029 |
| Multn,MM3    | 1000      | 1000      | 45        | 0.197          | 0.103 | 0.035 |

# Type I errors ( $n = 5000$ )

| Name         | No. repl. | Converged | Rank def. | Rejection rate |       |       |
|--------------|-----------|-----------|-----------|----------------|-------|-------|
|              |           |           |           | 10%            | 5%    | 1%    |
| 1F 5V        |           |           |           |                |       |       |
| Wald         | 1000      | 1000      | 2         | 0.126          | 0.074 | 0.018 |
| WaldVCF      | 1000      | 1000      | 2         | 0.125          | 0.074 | 0.018 |
| WaldDiag,MM3 | 1000      | 1000      | 2         | 0.108          | 0.051 | 0.007 |
| Pearson,MM3  | 1000      | 1000      | 2         | 0.128          | 0.071 | 0.020 |
| RSS,MM3      | 1000      | 1000      | 2         | 0.133          | 0.062 | 0.018 |
| Multn,MM3    | 1000      | 1000      | 2         | 0.125          | 0.074 | 0.018 |
| 1F 8V        |           |           |           |                |       |       |
| Wald         | 1000      | 1000      | 4         | 0.130          | 0.067 | 0.017 |
| WaldVCF      | 1000      | 1000      | 4         | 0.128          | 0.065 | 0.017 |
| WaldDiag,MM3 | 1000      | 1000      | 4         | 0.113          | 0.057 | 0.014 |
| Pearson,MM3  | 1000      | 1000      | 4         | 0.146          | 0.078 | 0.018 |
| RSS,MM3      | 1000      | 1000      | 4         | 0.153          | 0.083 | 0.018 |
| Multn,MM3    | 1000      | 1000      | 4         | 0.128          | 0.065 | 0.017 |
| 1F 15V       |           |           |           |                |       |       |
| Wald         | 1000      | 1000      | 34        | 0.173          | 0.097 | 0.021 |
| WaldVCF      | 1000      | 1000      | 34        | 0.172          | 0.095 | 0.020 |
| WaldDiag,MM3 | 1000      | 1000      | 34        | 0.145          | 0.083 | 0.020 |
| Pearson,MM3  | 1000      | 1000      | 34        | 0.192          | 0.105 | 0.031 |
| RSS,MM3      | 1000      | 1000      | 34        | 0.199          | 0.107 | 0.028 |
| Multn,MM3    | 1000      | 1000      | 34        | 0.173          | 0.094 | 0.020 |
| 2F 10V       |           |           |           |                |       |       |
| Wald         | 1000      | 1000      | 30        | 0.138          | 0.076 | 0.024 |
| WaldVCF      | 1000      | 1000      | 30        | 0.133          | 0.070 | 0.024 |
| WaldDiag,MM3 | 1000      | 1000      | 30        | 0.111          | 0.061 | 0.018 |
| Pearson,MM3  | 1000      | 1000      | 30        | 0.131          | 0.077 | 0.022 |
| RSS,MM3      | 1000      | 1000      | 30        | 0.148          | 0.071 | 0.026 |
| Multn,MM3    | 1000      | 1000      | 30        | 0.131          | 0.068 | 0.022 |
| 3F 15V       |           |           |           |                |       |       |
| Wald         | 1000      | 1000      | 64        | 0.183          | 0.103 | 0.029 |
| WaldVCF      | 1000      | 1000      | 64        | 0.169          | 0.096 | 0.026 |
| WaldDiag,MM3 | 1000      | 1000      | 64        | 0.133          | 0.069 | 0.017 |
| Pearson,MM3  | 1000      | 1000      | 64        | 0.160          | 0.088 | 0.023 |
| RSS,MM3      | 1000      | 1000      | 64        | 0.161          | 0.094 | 0.025 |
| Multn,MM3    | 1000      | 1000      | 64        | 0.169          | 0.096 | 0.026 |

# Type I errors ( $n = 10000$ )

| Name          | No. repl. | Converged | Rank def. | Rejection rate |       |       |
|---------------|-----------|-----------|-----------|----------------|-------|-------|
|               |           |           |           | 10%            | 5%    | 1%    |
| <b>1F 5V</b>  |           |           |           |                |       |       |
| Wald          | 1000      | 1000      | 2         | 0.115          | 0.056 | 0.015 |
| WaldVCF       | 1000      | 1000      | 2         | 0.113          | 0.056 | 0.014 |
| WaldDiag,MM3  | 1000      | 1000      | 2         | 0.112          | 0.054 | 0.012 |
| Pearson,MM3   | 1000      | 1000      | 2         | 0.110          | 0.062 | 0.013 |
| RSS,MM3       | 1000      | 1000      | 2         | 0.112          | 0.061 | 0.015 |
| Multn,MM3     | 1000      | 1000      | 2         | 0.114          | 0.056 | 0.014 |
| <b>1F 8V</b>  |           |           |           |                |       |       |
| Wald          | 1000      | 1000      | 5         | 0.125          | 0.059 | 0.015 |
| WaldVCF       | 1000      | 1000      | 5         | 0.123          | 0.059 | 0.015 |
| WaldDiag,MM3  | 1000      | 1000      | 5         | 0.103          | 0.053 | 0.011 |
| Pearson,MM3   | 1000      | 1000      | 5         | 0.136          | 0.078 | 0.019 |
| RSS,MM3       | 1000      | 1000      | 5         | 0.139          | 0.076 | 0.016 |
| Multn,MM3     | 1000      | 1000      | 5         | 0.123          | 0.059 | 0.015 |
| <b>1F 15V</b> |           |           |           |                |       |       |
| Wald          | 1000      | 1000      | 33        | 0.113          | 0.063 | 0.012 |
| WaldVCF       | 1000      | 1000      | 33        | 0.110          | 0.062 | 0.012 |
| WaldDiag,MM3  | 1000      | 1000      | 33        | 0.112          | 0.058 | 0.015 |
| Pearson,MM3   | 1000      | 1000      | 33        | 0.154          | 0.089 | 0.021 |
| RSS,MM3       | 1000      | 1000      | 33        | 0.146          | 0.080 | 0.018 |
| Multn,MM3     | 1000      | 1000      | 33        | 0.110          | 0.062 | 0.012 |
| <b>2F 10V</b> |           |           |           |                |       |       |
| Wald          | 1000      | 1000      | 25        | 0.170          | 0.098 | 0.028 |
| WaldVCF       | 1000      | 1000      | 25        | 0.166          | 0.093 | 0.026 |
| WaldDiag,MM3  | 1000      | 1000      | 25        | 0.153          | 0.078 | 0.019 |
| Pearson,MM3   | 1000      | 1000      | 25        | 0.141          | 0.075 | 0.032 |
| RSS,MM3       | 1000      | 1000      | 25        | 0.156          | 0.085 | 0.029 |
| Multn,MM3     | 1000      | 1000      | 25        | 0.165          | 0.093 | 0.026 |
| <b>3F 15V</b> |           |           |           |                |       |       |
| Wald          | 1000      | 1000      | 85        | 0.182          | 0.108 | 0.032 |
| WaldVCF       | 1000      | 1000      | 85        | 0.168          | 0.094 | 0.031 |
| WaldDiag,MM3  | 1000      | 1000      | 85        | 0.126          | 0.077 | 0.024 |
| Pearson,MM3   | 1000      | 1000      | 85        | 0.170          | 0.102 | 0.024 |
| RSS,MM3       | 1000      | 1000      | 85        | 0.172          | 0.106 | 0.027 |
| Multn,MM3     | 1000      | 1000      | 85        | 0.164          | 0.093 | 0.030 |

**Power** ( $n = 500$ )

| Name          | No. repl. | Converged | Rank def. | Rejection rate |       |       |
|---------------|-----------|-----------|-----------|----------------|-------|-------|
|               |           |           |           | 10%            | 5%    | 1%    |
| <b>1F 5V</b>  |           |           |           |                |       |       |
| Wald          | 1000      | 1000      | 0         | 0.310          | 0.207 | 0.076 |
| WaldVCF       | 1000      | 1000      | 0         | 0.307          | 0.207 | 0.075 |
| WaldDiag,MM3  | 1000      | 1000      | 0         | 0.137          | 0.064 | 0.006 |
| Pearson,MM3   | 1000      | 1000      | 0         | 0.319          | 0.206 | 0.085 |
| RSS,MM3       | 1000      | 1000      | 0         | 0.323          | 0.204 | 0.088 |
| Multn,MM3     | 1000      | 1000      | 0         | 0.290          | 0.181 | 0.061 |
| <b>1F 8V</b>  |           |           |           |                |       |       |
| Wald          | 1000      | 1000      | 0         | 0.686          | 0.552 | 0.310 |
| WaldVCF       | 1000      | 1000      | 0         | 0.684          | 0.547 | 0.306 |
| WaldDiag,MM3  | 1000      | 1000      | 0         | 0.454          | 0.306 | 0.105 |
| Pearson,MM3   | 1000      | 1000      | 0         | 0.415          | 0.272 | 0.098 |
| RSS,MM3       | 1000      | 1000      | 0         | 0.510          | 0.368 | 0.163 |
| Multn,MM3     | 1000      | 1000      | 0         | 0.677          | 0.542 | 0.299 |
| <b>1F 15V</b> |           |           |           |                |       |       |
| Wald          | 1000      | 1000      | 5         | 0.550          | 0.418 | 0.201 |
| WaldVCF       | 1000      | 1000      | 5         | 0.540          | 0.410 | 0.196 |
| WaldDiag,MM3  | 1000      | 1000      | 5         | 0.352          | 0.224 | 0.084 |
| Pearson,MM3   | 1000      | 1000      | 5         | 0.684          | 0.565 | 0.363 |
| RSS,MM3       | 1000      | 1000      | 5         | 0.678          | 0.565 | 0.358 |
| Multn,MM3     | 1000      | 1000      | 5         | 0.535          | 0.401 | 0.194 |
| <b>2F 10V</b> |           |           |           |                |       |       |
| Wald          | 1000      | 998       | 13        | 0.390          | 0.280 | 0.121 |
| WaldVCF       | 1000      | 998       | 13        | 0.171          | 0.091 | 0.017 |
| WaldDiag,MM3  | 1000      | 998       | 13        | 0.073          | 0.029 | 0.002 |
| Pearson,MM3   | 1000      | 998       | 13        | 0.112          | 0.051 | 0.009 |
| RSS,MM3       | 1000      | 998       | 13        | 0.115          | 0.052 | 0.008 |
| Multn,MM3     | 1000      | 998       | 13        | 0.329          | 0.234 | 0.102 |
| <b>3F 15V</b> |           |           |           |                |       |       |
| Wald          | 1000      | 999       | 20        | 0.334          | 0.231 | 0.085 |
| WaldVCF       | 1000      | 999       | 20        | 0.321          | 0.214 | 0.074 |
| WaldDiag,MM3  | 1000      | 999       | 20        | 0.178          | 0.097 | 0.021 |
| Pearson,MM3   | 1000      | 999       | 20        | 0.408          | 0.287 | 0.112 |
| RSS,MM3       | 1000      | 999       | 20        | 0.412          | 0.290 | 0.114 |
| Multn,MM3     | 1000      | 999       | 20        | 0.295          | 0.187 | 0.061 |

**Power** ( $n = 1000$ )

| Name          | No. repl. | Converged | Rank def. | Rejection rate |       |       |
|---------------|-----------|-----------|-----------|----------------|-------|-------|
|               |           |           |           | 10%            | 5%    | 1%    |
| <b>1F 5V</b>  |           |           |           |                |       |       |
| Wald          | 1000      | 1000      | 0         | 0.487          | 0.373 | 0.181 |
| WaldVCF       | 1000      | 1000      | 0         | 0.487          | 0.372 | 0.180 |
| WaldDiag,MM3  | 1000      | 1000      | 0         | 0.336          | 0.197 | 0.051 |
| Pearson,MM3   | 1000      | 1000      | 0         | 0.508          | 0.404 | 0.196 |
| RSS,MM3       | 1000      | 1000      | 0         | 0.520          | 0.418 | 0.212 |
| Multn,MM3     | 1000      | 1000      | 0         | 0.481          | 0.362 | 0.171 |
| <b>1F 8V</b>  |           |           |           |                |       |       |
| Wald          | 1000      | 1000      | 1         | 0.787          | 0.691 | 0.439 |
| WaldVCF       | 1000      | 1000      | 1         | 0.785          | 0.689 | 0.436 |
| WaldDiag,MM3  | 1000      | 1000      | 1         | 0.614          | 0.474 | 0.202 |
| Pearson,MM3   | 1000      | 1000      | 1         | 0.497          | 0.347 | 0.148 |
| RSS,MM3       | 1000      | 1000      | 1         | 0.625          | 0.462 | 0.222 |
| Multn,MM3     | 1000      | 1000      | 1         | 0.781          | 0.686 | 0.432 |
| <b>1F 15V</b> |           |           |           |                |       |       |
| Wald          | 1000      | 1000      | 4         | 0.794          | 0.694 | 0.457 |
| WaldVCF       | 1000      | 1000      | 4         | 0.786          | 0.688 | 0.455 |
| WaldDiag,MM3  | 1000      | 1000      | 4         | 0.712          | 0.569 | 0.316 |
| Pearson,MM3   | 1000      | 1000      | 4         | 0.896          | 0.837 | 0.673 |
| RSS,MM3       | 1000      | 1000      | 4         | 0.894          | 0.846 | 0.669 |
| Multn,MM3     | 1000      | 1000      | 4         | 0.784          | 0.689 | 0.453 |
| <b>2F 10V</b> |           |           |           |                |       |       |
| Wald          | 1000      | 1000      | 6         | 0.643          | 0.511 | 0.269 |
| WaldVCF       | 1000      | 1000      | 6         | 0.507          | 0.358 | 0.143 |
| WaldDiag,MM3  | 1000      | 1000      | 6         | 0.543          | 0.400 | 0.173 |
| Pearson,MM3   | 1000      | 1000      | 6         | 0.633          | 0.521 | 0.297 |
| RSS,MM3       | 1000      | 1000      | 6         | 0.639          | 0.512 | 0.288 |
| Multn,MM3     | 1000      | 1000      | 6         | 0.611          | 0.478 | 0.245 |
| <b>3F 15V</b> |           |           |           |                |       |       |
| Wald          | 1000      | 1000      | 30        | 0.440          | 0.312 | 0.125 |
| WaldVCF       | 1000      | 1000      | 30        | 0.425          | 0.294 | 0.113 |
| WaldDiag,MM3  | 1000      | 1000      | 30        | 0.356          | 0.236 | 0.074 |
| Pearson,MM3   | 1000      | 1000      | 30        | 0.556          | 0.431 | 0.226 |
| RSS,MM3       | 1000      | 1000      | 30        | 0.577          | 0.460 | 0.239 |
| Multn,MM3     | 1000      | 1000      | 30        | 0.412          | 0.285 | 0.109 |

Power ( $n = 2500$ )

| Name          | No. repl. | Converged | Rank def. | Rejection rate |       |       |
|---------------|-----------|-----------|-----------|----------------|-------|-------|
|               |           |           |           | 10%            | 5%    | 1%    |
| <b>1F 5V</b>  |           |           |           |                |       |       |
| Wald          | 1000      | 1000      | 2         | 0.886          | 0.813 | 0.607 |
| WaldVCF       | 1000      | 1000      | 2         | 0.886          | 0.813 | 0.607 |
| WaldDiag,MM3  | 1000      | 1000      | 2         | 0.778          | 0.650 | 0.383 |
| Pearson,MM3   | 1000      | 1000      | 2         | 0.919          | 0.857 | 0.697 |
| RSS,MM3       | 1000      | 1000      | 2         | 0.924          | 0.860 | 0.702 |
| Multn,MM3     | 1000      | 1000      | 2         | 0.884          | 0.811 | 0.604 |
| <b>1F 8V</b>  |           |           |           |                |       |       |
| Wald          | 1000      | 1000      | 0         | 1.000          | 1.000 | 0.996 |
| WaldVCF       | 1000      | 1000      | 0         | 1.000          | 1.000 | 0.996 |
| WaldDiag,MM3  | 1000      | 1000      | 0         | 0.997          | 0.996 | 0.952 |
| Pearson,MM3   | 1000      | 1000      | 0         | 0.978          | 0.948 | 0.790 |
| RSS,MM3       | 1000      | 1000      | 0         | 0.997          | 0.986 | 0.938 |
| Multn,MM3     | 1000      | 1000      | 0         | 1.000          | 1.000 | 0.996 |
| <b>1F 15V</b> |           |           |           |                |       |       |
| Wald          | 1000      | 1000      | 15        | 1.000          | 0.998 | 0.989 |
| WaldVCF       | 1000      | 1000      | 15        | 1.000          | 0.998 | 0.988 |
| WaldDiag,MM3  | 1000      | 1000      | 15        | 0.997          | 0.990 | 0.958 |
| Pearson,MM3   | 1000      | 1000      | 15        | 1.000          | 1.000 | 1.000 |
| RSS,MM3       | 1000      | 1000      | 15        | 1.000          | 1.000 | 1.000 |
| Multn,MM3     | 1000      | 1000      | 15        | 1.000          | 0.998 | 0.988 |
| <b>2F 10V</b> |           |           |           |                |       |       |
| Wald          | 1000      | 1000      | 9         | 0.423          | 0.293 | 0.114 |
| WaldVCF       | 1000      | 1000      | 9         | 0.371          | 0.244 | 0.091 |
| WaldDiag,MM3  | 1000      | 1000      | 9         | 0.437          | 0.307 | 0.120 |
| Pearson,MM3   | 1000      | 1000      | 9         | 0.431          | 0.309 | 0.123 |
| RSS,MM3       | 1000      | 1000      | 9         | 0.465          | 0.330 | 0.154 |
| Multn,MM3     | 1000      | 1000      | 9         | 0.423          | 0.291 | 0.115 |
| <b>3F 15V</b> |           |           |           |                |       |       |
| Wald          | 1000      | 1000      | 41        | 0.794          | 0.693 | 0.457 |
| WaldVCF       | 1000      | 1000      | 41        | 0.774          | 0.674 | 0.429 |
| WaldDiag,MM3  | 1000      | 1000      | 41        | 0.835          | 0.719 | 0.446 |
| Pearson,MM3   | 1000      | 1000      | 41        | 0.897          | 0.822 | 0.632 |
| RSS,MM3       | 1000      | 1000      | 41        | 0.933          | 0.886 | 0.736 |
| Multn,MM3     | 1000      | 1000      | 41        | 0.779          | 0.680 | 0.433 |



**Power** ( $n = 5000$ )

| Name          | No. repl. | Converged | Rank def. | Rejection rate |       |       |
|---------------|-----------|-----------|-----------|----------------|-------|-------|
|               |           |           |           | 10%            | 5%    | 1%    |
| <b>1F 5V</b>  |           |           |           |                |       |       |
| Wald          | 1000      | 1000      | 0         | 1.000          | 1.000 | 1.000 |
| WaldVCF       | 1000      | 1000      | 0         | 1.000          | 1.000 | 1.000 |
| WaldDiag,MM3  | 1000      | 1000      | 0         | 1.000          | 1.000 | 1.000 |
| Pearson,MM3   | 1000      | 1000      | 0         | 1.000          | 1.000 | 1.000 |
| RSS,MM3       | 1000      | 1000      | 0         | 1.000          | 1.000 | 1.000 |
| Multn,MM3     | 1000      | 1000      | 0         | 1.000          | 1.000 | 1.000 |
| <b>1F 8V</b>  |           |           |           |                |       |       |
| Wald          | 1000      | 1000      | 2         | 1.000          | 1.000 | 1.000 |
| WaldVCF       | 1000      | 1000      | 2         | 1.000          | 1.000 | 1.000 |
| WaldDiag,MM3  | 1000      | 1000      | 2         | 1.000          | 1.000 | 1.000 |
| Pearson,MM3   | 1000      | 1000      | 2         | 1.000          | 1.000 | 1.000 |
| RSS,MM3       | 1000      | 1000      | 2         | 1.000          | 1.000 | 1.000 |
| Multn,MM3     | 1000      | 1000      | 2         | 1.000          | 1.000 | 1.000 |
| <b>1F 15V</b> |           |           |           |                |       |       |
| Wald          | 1000      | 1000      | 21        | 1.000          | 1.000 | 1.000 |
| WaldVCF       | 1000      | 1000      | 21        | 1.000          | 1.000 | 1.000 |
| WaldDiag,MM3  | 1000      | 1000      | 21        | 1.000          | 1.000 | 1.000 |
| Pearson,MM3   | 1000      | 1000      | 21        | 1.000          | 1.000 | 1.000 |
| RSS,MM3       | 1000      | 1000      | 21        | 1.000          | 1.000 | 1.000 |
| Multn,MM3     | 1000      | 1000      | 21        | 1.000          | 1.000 | 1.000 |
| <b>2F 10V</b> |           |           |           |                |       |       |
| Wald          | 1000      | 1000      | 16        | 0.961          | 0.924 | 0.792 |
| WaldVCF       | 1000      | 1000      | 16        | 0.954          | 0.909 | 0.763 |
| WaldDiag,MM3  | 1000      | 1000      | 16        | 0.953          | 0.902 | 0.727 |
| Pearson,MM3   | 1000      | 1000      | 16        | 0.940          | 0.878 | 0.692 |
| RSS,MM3       | 1000      | 1000      | 16        | 0.969          | 0.937 | 0.827 |
| Multn,MM3     | 1000      | 1000      | 16        | 0.963          | 0.924 | 0.793 |
| <b>3F 15V</b> |           |           |           |                |       |       |
| Wald          | 1000      | 1000      | 38        | 0.869          | 0.783 | 0.563 |
| WaldVCF       | 1000      | 1000      | 38        | 0.855          | 0.764 | 0.531 |
| WaldDiag,MM3  | 1000      | 1000      | 38        | 0.937          | 0.877 | 0.684 |
| Pearson,MM3   | 1000      | 1000      | 38        | 0.939          | 0.889 | 0.742 |
| RSS,MM3       | 1000      | 1000      | 38        | 0.955          | 0.918 | 0.792 |
| Multn,MM3     | 1000      | 1000      | 38        | 0.860          | 0.767 | 0.540 |

**Power** ( $n = 10000$ )

| Name          | No. repl. | Converged | Rank def. | Rejection rate |       |       |
|---------------|-----------|-----------|-----------|----------------|-------|-------|
|               |           |           |           | 10%            | 5%    | 1%    |
| <b>1F 5V</b>  |           |           |           |                |       |       |
| Wald          | 1000      | 1000      | 0         | 1.000          | 0.998 | 0.998 |
| WaldVCF       | 1000      | 1000      | 0         | 1.000          | 0.998 | 0.998 |
| WaldDiag,MM3  | 1000      | 1000      | 0         | 0.998          | 0.997 | 0.973 |
| Pearson,MM3   | 1000      | 1000      | 0         | 1.000          | 0.999 | 0.996 |
| RSS,MM3       | 1000      | 1000      | 0         | 1.000          | 0.999 | 0.998 |
| Multn,MM3     | 1000      | 1000      | 0         | 1.000          | 0.998 | 0.998 |
| <b>1F 8V</b>  |           |           |           |                |       |       |
| Wald          | 1000      | 1000      | 3         | 1.000          | 1.000 | 1.000 |
| WaldVCF       | 1000      | 1000      | 3         | 1.000          | 1.000 | 1.000 |
| WaldDiag,MM3  | 1000      | 1000      | 3         | 1.000          | 1.000 | 1.000 |
| Pearson,MM3   | 1000      | 1000      | 3         | 1.000          | 1.000 | 1.000 |
| RSS,MM3       | 1000      | 1000      | 3         | 1.000          | 1.000 | 1.000 |
| Multn,MM3     | 1000      | 1000      | 3         | 1.000          | 1.000 | 1.000 |
| <b>1F 15V</b> |           |           |           |                |       |       |
| Wald          | 1000      | 1000      | 13        | 1.000          | 1.000 | 1.000 |
| WaldVCF       | 1000      | 1000      | 13        | 1.000          | 1.000 | 1.000 |
| WaldDiag,MM3  | 1000      | 1000      | 13        | 1.000          | 1.000 | 1.000 |
| Pearson,MM3   | 1000      | 1000      | 13        | 1.000          | 1.000 | 1.000 |
| RSS,MM3       | 1000      | 1000      | 13        | 1.000          | 1.000 | 1.000 |
| Multn,MM3     | 1000      | 1000      | 13        | 1.000          | 1.000 | 1.000 |
| <b>2F 10V</b> |           |           |           |                |       |       |
| Wald          | 1000      | 1000      | 13        | 0.856          | 0.772 | 0.571 |
| WaldVCF       | 1000      | 1000      | 13        | 0.835          | 0.745 | 0.525 |
| WaldDiag,MM3  | 1000      | 1000      | 13        | 0.893          | 0.821 | 0.594 |
| Pearson,MM3   | 1000      | 1000      | 13        | 0.886          | 0.813 | 0.588 |
| RSS,MM3       | 1000      | 1000      | 13        | 0.942          | 0.881 | 0.738 |
| Multn,MM3     | 1000      | 1000      | 13        | 0.851          | 0.767 | 0.567 |
| <b>3F 15V</b> |           |           |           |                |       |       |
| Wald          | 1000      | 1000      | 51        | 1.000          | 1.000 | 1.000 |
| WaldVCF       | 1000      | 1000      | 51        | 1.000          | 1.000 | 1.000 |
| WaldDiag,MM3  | 1000      | 1000      | 51        | 1.000          | 1.000 | 1.000 |
| Pearson,MM3   | 1000      | 1000      | 51        | 1.000          | 1.000 | 1.000 |
| RSS,MM3       | 1000      | 1000      | 51        | 1.000          | 1.000 | 1.000 |
| Multn,MM3     | 1000      | 1000      | 51        | 1.000          | 1.000 | 1.000 |