**Filter Design Results**

Generated by:   [http://www-users.cs.york.ac.uk/~fisher/mkfilter](http://www-users.cs.york.ac.uk/%7Efisher/mkfilter)

**Summary**

You specified the following parameters:

|  |  |  |
| --- | --- | --- |
| filtertype | = | Bessel |
| passtype | = | Lowpass |
| ripple | = |  |
| order | = | 1 |
| samplerate | = | 125 |
| corner1 | = | 20 |
| corner2 | = |  |
| adzero | = |  |
| logmin | = |  |

**Results**

Command line: /www/usr/fisher/helpers/mkfilter -Be -Lp -o 1 -a 1.6000000000e-01 0.0000000000e+00

raw alpha1 = 0.1600000000

raw alpha2 = 0.1600000000

warped alpha1 = 0.1749923408

warped alpha2 = 0.1749923408

gain at dc : mag = 2.818993247e+00 phase = 0.0000000000 pi

gain at centre: mag = 1.993329241e+00 phase = -0.2500000000 pi

gain at hf : mag = 0.000000000e+00

S-plane zeros:

S-plane poles:

-1.0995093044 + j 0.0000000000

Z-plane zeros:

-1.0000000000 + j 0.0000000000

Z-plane poles:

0.2905268567 + j 0.0000000000

Recurrence relation:

y[n] = ( 1 \* x[n- 1])

+ ( 1 \* x[n- 0])

+ ( 0.2905268567 \* y[n- 1])

**Filter Design Results**

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**Summary**

You specified the following parameters:

|  |  |  |
| --- | --- | --- |
| filtertype | = | Bessel |
| passtype | = | Lowpass |
| ripple | = |  |
| order | = | 2 |
| samplerate | = | 125 |
| corner1 | = | 20 |
| corner2 | = |  |
| adzero | = |  |
| logmin | = |  |

**Results**

Command line: /www/usr/fisher/helpers/mkfilter -Be -Lp -o 2 -a 1.6000000000e-01 0.0000000000e+00

raw alpha1 = 0.1600000000

raw alpha2 = 0.1600000000

warped alpha1 = 0.1749923408

warped alpha2 = 0.1749923408

gain at dc : mag = 5.521751241e+00 phase = 0.0000000000 pi

gain at centre: mag = 3.904467747e+00 phase = -0.4129462918 pi

gain at hf : mag = 0.000000000e+00

S-plane zeros:

S-plane poles:

-1.2112209127 + j 0.6992987200

-1.2112209127 + j -0.6992987200

Z-plane zeros:

-1.0000000000 + j 0.0000000000 2 times

Z-plane poles:

0.1892355396 + j 0.2589765430

0.1892355396 + j -0.2589765430

Recurrence relation:

y[n] = ( 1 \* x[n- 2])

+ ( 2 \* x[n- 1])

+ ( 1 \* x[n- 0])

+ ( -0.1028789393 \* y[n- 2])

+ ( 0.3784710793 \* y[n- 1])

**Filter Design Results**

Generated by:   [http://www-users.cs.york.ac.uk/~fisher/mkfilter](http://www-users.cs.york.ac.uk/%7Efisher/mkfilter)

**Summary**

You specified the following parameters:

|  |  |  |
| --- | --- | --- |
| filtertype | = | Bessel |
| passtype | = | Lowpass |
| ripple | = |  |
| order | = | 3 |
| samplerate | = | 125 |
| corner1 | = | 20 |
| corner2 | = |  |
| adzero | = |  |
| logmin | = |  |

**Results**

Command line: /www/usr/fisher/helpers/mkfilter -Be -Lp -o 3 -a 1.6000000000e-01 0.0000000000e+00

raw alpha1 = 0.1600000000

raw alpha2 = 0.1600000000

warped alpha1 = 0.1749923408

warped alpha2 = 0.1749923408

gain at dc : mag = 1.044443957e+01 phase = 0.0000000000 pi

gain at centre: mag = 7.385334048e+00 phase = -0.5526731752 pi

gain at hf : mag = 0.000000000e+00

S-plane zeros:

S-plane poles:

-1.4542943487 + j 0.0000000000

-1.1516361180 + j 1.0987005452

-1.1516361180 + j -1.0987005452

Z-plane zeros:

-1.0000000000 + j 0.0000000000 3 times

Z-plane poles:

0.1579789086 + j 0.0000000000

0.1316514845 + j 0.3945081400

0.1316514845 + j -0.3945081400

Recurrence relation:

y[n] = ( 1 \* x[n- 3])

+ ( 3 \* x[n- 2])

+ ( 3 \* x[n- 1])

+ ( 1 \* x[n- 0])

+ ( 0.0273254200 \* y[n- 3])

+ ( -0.2145651016 \* y[n- 2])

+ ( 0.4212818776 \* y[n- 1])

**Filter Design Results**

Generated by:   [http://www-users.cs.york.ac.uk/~fisher/mkfilter](http://www-users.cs.york.ac.uk/%7Efisher/mkfilter)

**Summary**

You specified the following parameters:

|  |  |  |
| --- | --- | --- |
| filtertype | = | Bessel |
| passtype | = | Lowpass |
| ripple | = |  |
| order | = | 4 |
| samplerate | = | 125 |
| corner1 | = | 20 |
| corner2 | = |  |
| adzero | = |  |
| logmin | = |  |

**Results**

Command line: /www/usr/fisher/helpers/mkfilter -Be -Lp -o 4 -a 1.6000000000e-01 0.0000000000e+00

raw alpha1 = 0.1600000000

raw alpha2 = 0.1600000000

warped alpha1 = 0.1749923408

warped alpha2 = 0.1749923408

gain at dc : mag = 1.867853237e+01 phase = 0.0000000000 pi

gain at centre: mag = 1.320771690e+01 phase = -0.6713254167 pi

gain at hf : mag = 0.000000000e+00

S-plane zeros:

S-plane poles:

-1.5064023273 + j 0.4510733815

-1.5064023273 + j -0.4510733815

-1.0942412962 + j 1.3821994571

-1.0942412962 + j -1.3821994571

Z-plane zeros:

-1.0000000000 + j 0.0000000000 4 times

Z-plane poles:

0.1221991664 + j 0.1443628327

0.1221991664 + j -0.1443628327

0.0776818311 + j 0.4814011253

0.0776818311 + j -0.4814011253

Recurrence relation:

y[n] = ( 1 \* x[n- 4])

+ ( 4 \* x[n- 3])

+ ( 6 \* x[n- 2])

+ ( 4 \* x[n- 1])

+ ( 1 \* x[n- 0])

+ ( -0.0085062207 \* y[n- 4])

+ ( 0.0636712700 \* y[n- 3])

+ ( -0.3115253941 \* y[n- 2])

+ ( 0.3997619950 \* y[n- 1])

**Filter Design Results**

Generated by:   [http://www-users.cs.york.ac.uk/~fisher/mkfilter](http://www-users.cs.york.ac.uk/%7Efisher/mkfilter)

**Summary**

You specified the following parameters:

|  |  |  |
| --- | --- | --- |
| filtertype | = | Bessel |
| passtype | = | Lowpass |
| ripple | = |  |
| order | = | 5 |
| samplerate | = | 125 |
| corner1 | = | 20 |
| corner2 | = |  |
| adzero | = |  |
| logmin | = |  |

**Results**

Command line: /www/usr/fisher/helpers/mkfilter -Be -Lp -o 5 -a 1.6000000000e-01 0.0000000000e+00

raw alpha1 = 0.1600000000

raw alpha2 = 0.1600000000

warped alpha1 = 0.1749923408

warped alpha2 = 0.1749923408

gain at dc : mag = 3.145461275e+01 phase = -0.0000000000 pi

gain at centre: mag = 2.224176997e+01 phase = -0.7723549982 pi

gain at hf : mag = 0.000000000e+00

S-plane zeros:

S-plane poles:

-1.6518107186 + j 0.0000000000

-1.5182874680 + j 0.7893482713

-1.5182874680 + j -0.7893482713

-1.0529742757 + j 1.6175148786

-1.0529742757 + j -1.6175148786

Z-plane zeros:

-1.0000000000 + j 0.0000000000 5 times

Z-plane poles:

0.0953470232 + j 0.0000000000

0.0824319717 + j 0.2428499130

0.0824319717 + j -0.2428499130

0.0230284533 + j 0.5420169300

0.0230284533 + j -0.5420169300

Recurrence relation:

y[n] = ( 1 \* x[n- 5])

+ ( 5 \* x[n- 4])

+ ( 10 \* x[n- 3])

+ ( 10 \* x[n- 2])

+ ( 5 \* x[n- 1])

+ ( 1 \* x[n- 0])

+ ( 0.0018456581 \* y[n- 5])

+ ( -0.0242724820 \* y[n- 4])

+ ( 0.0866076574 \* y[n- 3])

+ ( -0.3877875707 \* y[n- 2])

+ ( 0.3062678732 \* y[n- 1])

**Filter Design Results**

Generated by:   [http://www-users.cs.york.ac.uk/~fisher/mkfilter](http://www-users.cs.york.ac.uk/%7Efisher/mkfilter)

**Summary**

You specified the following parameters:

|  |  |  |
| --- | --- | --- |
| filtertype | = | Bessel |
| passtype | = | Lowpass |
| ripple | = |  |
| order | = | 6 |
| samplerate | = | 125 |
| corner1 | = | 20 |
| corner2 | = |  |
| adzero | = |  |
| logmin | = |  |

**Results**

Command line: /www/usr/fisher/helpers/mkfilter -Be -Lp -o 6 -a 1.6000000000e-01 0.0000000000e+00

raw alpha1 = 0.1600000000

raw alpha2 = 0.1600000000

warped alpha1 = 0.1749923408

warped alpha2 = 0.1749923408

gain at dc : mag = 5.030456623e+01 phase = -0.0000000000 pi

gain at centre: mag = 3.557069991e+01 phase = -0.8604658280 pi

gain at hf : mag = 0.000000000e+00

S-plane zeros:

S-plane poles:

-1.7278683205 + j 0.3528285492

-1.7278683205 + j -0.3528285492

-1.5193658357 + j 1.0681423828

-1.5193658357 + j -1.0681423828

-1.0232655062 + j 1.8272341268

-1.0232655062 + j -1.8272341268

Z-plane zeros:

-1.0000000000 + j 0.0000000000 6 times

Z-plane poles:

0.0634727885 + j 0.1006536521

0.0634727885 + j -0.1006536521

0.0407041356 + j 0.3158580969

0.0407041356 + j -0.3158580969

-0.0309206955 + j 0.5857027023

-0.0309206955 + j -0.5857027023

Recurrence relation:

y[n] = ( 1 \* x[n- 6])

+ ( 6 \* x[n- 5])

+ ( 15 \* x[n- 4])

+ ( 20 \* x[n- 3])

+ ( 15 \* x[n- 2])

+ ( 6 \* x[n- 1])

+ ( 1 \* x[n- 0])

+ ( -0.0004940400 \* y[n- 6])

+ ( 0.0047368572 \* y[n- 5])

+ ( -0.0438847428 \* y[n- 4])

+ ( 0.0779155478 \* y[n- 3])

+ ( -0.4570363897 \* y[n- 2])

+ ( 0.1465124572 \* y[n- 1])

**Filter Design Results**

Generated by:   [http://www-users.cs.york.ac.uk/~fisher/mkfilter](http://www-users.cs.york.ac.uk/%7Efisher/mkfilter)

**Summary**

You specified the following parameters:

|  |  |  |
| --- | --- | --- |
| filtertype | = | Bessel |
| passtype | = | Lowpass |
| ripple | = |  |
| order | = | 7 |
| samplerate | = | 125 |
| corner1 | = | 20 |
| corner2 | = |  |
| adzero | = |  |
| logmin | = |  |

**Results**

Command line: /www/usr/fisher/helpers/mkfilter -Be -Lp -o 7 -a 1.6000000000e-01 0.0000000000e+00

raw alpha1 = 0.1600000000

raw alpha2 = 0.1600000000

warped alpha1 = 0.1749923408

warped alpha2 = 0.1749923408

gain at dc : mag = 7.728697335e+01 phase = 0.0000000000 pi

gain at centre: mag = 5.465014296e+01 phase = -0.9395552122 pi

gain at hf : mag = 0.000000000e+00

S-plane zeros:

S-plane poles:

-1.8519784851 + j 0.0000000000

-1.7724516225 + j 0.6478798179

-1.7724516225 + j -0.6478798179

-1.5161169167 + j 1.3101387590

-1.5161169167 + j -1.3101387590

-1.0004080906 + j 2.0191953497

-1.0004080906 + j -2.0191953497

Z-plane zeros:

-1.0000000000 + j 0.0000000000 7 times

Z-plane poles:

0.0384273992 + j 0.0000000000

0.0299408102 + j 0.1768817553

0.0299408102 + j -0.1768817553

-0.0010706366 + j 0.3722106254

-0.0010706366 + j -0.3722106254

-0.0824158480 + j 0.6175098842

-0.0824158480 + j -0.6175098842

Recurrence relation:

y[n] = ( 1 \* x[n- 7])

+ ( 7 \* x[n- 6])

+ ( 21 \* x[n- 5])

+ ( 35 \* x[n- 4])

+ ( 35 \* x[n- 3])

+ ( 21 \* x[n- 2])

+ ( 7 \* x[n- 1])

+ ( 1 \* x[n- 0])

+ ( 0.0000664986 \* y[n- 7])

+ ( -0.0018249591 \* y[n- 6])

+ ( 0.0051216481 \* y[n- 5])

+ ( -0.0694100491 \* y[n- 4])

+ ( 0.0236209834 \* y[n- 3])

+ ( -0.5450754282 \* y[n- 2])

+ ( -0.0686639497 \* y[n- 1])

**Filter Design Results**

Generated by:   [http://www-users.cs.york.ac.uk/~fisher/mkfilter](http://www-users.cs.york.ac.uk/%7Efisher/mkfilter)

**Summary**

You specified the following parameters:

|  |  |  |
| --- | --- | --- |
| filtertype | = | Bessel |
| passtype | = | Lowpass |
| ripple | = |  |
| order | = | 8 |
| samplerate | = | 125 |
| corner1 | = | 20 |
| corner2 | = |  |
| adzero | = |  |
| logmin | = |  |

**Results**

Command line: /www/usr/fisher/helpers/mkfilter -Be -Lp -o 8 -a 1.6000000000e-01 0.0000000000e+00

raw alpha1 = 0.1600000000

raw alpha2 = 0.1600000000

warped alpha1 = 0.1749923408

warped alpha2 = 0.1749923408

gain at dc : mag = 1.151047376e+02 phase = 0.0000000000 pi

gain at centre: mag = 8.139134051e+01 phase = 0.9878972531 pi

gain at hf : mag = 0.000000000e+00

S-plane zeros:

S-plane poles:

-1.9322868878 + j 0.3000204377

-1.9322868878 + j -0.3000204377

-1.7998301209 + j 0.9046714454

-1.7998301209 + j -0.9046714454

-1.5105512015 + j 1.5265109730

-1.5105512015 + j -1.5265109730

-0.9817185635 + j 2.1971778583

-0.9817185635 + j -2.1971778583

Z-plane zeros:

-1.0000000000 + j 0.0000000000 8 times

Z-plane poles:

0.0113326264 + j 0.0771613226

0.0113326264 + j -0.0771613226

-0.0037896284 + j 0.2371798339

-0.0037896284 + j -0.2371798339

-0.0417628021 + j 0.4166751924

-0.0417628021 + j -0.4166751924

-0.1305825225 + j 0.6406589993

-0.1305825225 + j -0.6406589993

Recurrence relation:

y[n] = ( 1 \* x[n- 8])

+ ( 8 \* x[n- 7])

+ ( 28 \* x[n- 6])

+ ( 56 \* x[n- 5])

+ ( 70 \* x[n- 4])

+ ( 56 \* x[n- 3])

+ ( 28 \* x[n- 2])

+ ( 8 \* x[n- 1])

+ ( 1 \* x[n- 0])

+ ( -0.0000256568 \* y[n- 8])

+ ( 0.0000642577 \* y[n- 7])

+ ( -0.0047749623 \* y[n- 6])

+ ( -0.0032870806 \* y[n- 5])

+ ( -0.1124971787 \* y[n- 4])

+ ( -0.0922848828 \* y[n- 3])

+ ( -0.6816512098 \* y[n- 2])

+ ( -0.3296046530 \* y[n- 1])

**Filter Design Results**

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**Summary**

You specified the following parameters:

|  |  |  |
| --- | --- | --- |
| filtertype | = | Bessel |
| passtype | = | Lowpass |
| ripple | = |  |
| order | = | 9 |
| samplerate | = | 125 |
| corner1 | = | 20 |
| corner2 | = |  |
| adzero | = |  |
| logmin | = |  |

**Results**

Command line: /www/usr/fisher/helpers/mkfilter -Be -Lp -o 9 -a 1.6000000000e-01 0.0000000000e+00

raw alpha1 = 0.1600000000

raw alpha2 = 0.1600000000

warped alpha1 = 0.1749923408

warped alpha2 = 0.1749923408

gain at dc : mag = 1.672013863e+02 phase = 0.0000000000 pi

gain at centre: mag = 1.182292341e+02 phase = 0.9203906334 pi

gain at hf : mag = 0.000000000e+00

S-plane zeros:

S-plane poles:

-2.0413495256 + j 0.0000000000

-1.9870008178 + j 0.5633706792

-1.9870008178 + j -0.5633706792

-1.8168253093 + j 1.1340224253

-1.8168253093 + j -1.1340224253

-1.5036760712 + j 1.7237378034

-1.5036760712 + j -1.7237378034

-0.9658081771 + j 2.3637256791

-0.9658081771 + j -2.3637256791

Z-plane zeros:

-1.0000000000 + j 0.0000000000 9 times

Z-plane poles:

-0.0102316133 + j 0.0000000000

-0.0163788051 + j 0.1389875162

-0.0163788051 + j -0.1389875162

-0.0370162141 + j 0.2861134896

-0.0370162141 + j -0.2861134896

-0.0808232626 + j 0.4522163745

-0.0808232626 + j -0.4522163745

-0.1752031191 + j 0.6573565959

-0.1752031191 + j -0.6573565959

Recurrence relation:

y[n] = ( 1 \* x[n- 9])

+ ( 9 \* x[n- 8])

+ ( 36 \* x[n- 7])

+ ( 84 \* x[n- 6])

+ (126 \* x[n- 5])

+ (126 \* x[n- 4])

+ ( 84 \* x[n- 3])

+ ( 36 \* x[n- 2])

+ ( 9 \* x[n- 1])

+ ( 1 \* x[n- 0])

+ ( -0.0000016290 \* y[n- 9])

+ ( -0.0001658689 \* y[n- 8])

+ ( -0.0007741157 \* y[n- 7])

+ ( -0.0123975797 \* y[n- 6])

+ ( -0.0319583011 \* y[n- 5])

+ ( -0.1971156008 \* y[n- 4])

+ ( -0.2939442869 \* y[n- 3])

+ ( -0.8967437709 \* y[n- 2])

+ ( -0.6290744149 \* y[n- 1])

**Filter Design Results**

Generated by:   [http://www-users.cs.york.ac.uk/~fisher/mkfilter](http://www-users.cs.york.ac.uk/%7Efisher/mkfilter)

**Summary**

You specified the following parameters:

|  |  |  |
| --- | --- | --- |
| filtertype | = | Bessel |
| passtype | = | Lowpass |
| ripple | = |  |
| order | = | 10 |
| samplerate | = | 125 |
| corner1 | = | 20 |
| corner2 | = |  |
| adzero | = |  |
| logmin | = |  |

**Results**

Command line: /www/usr/fisher/helpers/mkfilter -Be -Lp -o 10 -a 1.6000000000e-01 0.0000000000e+00

raw alpha1 = 0.1600000000

raw alpha2 = 0.1600000000

warped alpha1 = 0.1749923408

warped alpha2 = 0.1749923408

gain at dc : mag = 2.379046277e+02 phase = 0.0000000000 pi

gain at centre: mag = 1.682239755e+02 phase = 0.8569553843 pi

gain at hf : mag = 0.000000000e+00

S-plane zeros:

S-plane poles:

-2.1194357861 + j 0.2656672546

-2.1194357861 + j -0.2656672546

-2.0255119113 + j 0.7996264954

-2.0255119113 + j -0.7996264954

-1.8271758225 + j 1.3426110519

-1.8271758225 + j -1.3426110519

-1.4960938205 + j 1.9060056933

-1.4960938205 + j -1.9060056933

-0.9519077688 + j 2.5207403429

-0.9519077688 + j -2.5207403429

Z-plane zeros:

-1.0000000000 + j 0.0000000000 10 times

Z-plane poles:

-0.0330150374 + j 0.0623619965

-0.0330150374 + j -0.0623619965

-0.0440569036 + j 0.1898882539

-0.0440569036 + j -0.1898882539

-0.0693729059 + j 0.3264731697

-0.0693729059 + j -0.3264731697

-0.1180127348 + j 0.4808431453

-0.1180127348 + j -0.4808431453

-0.2163713688 + j 0.6691687069

-0.2163713688 + j -0.6691687069

Recurrence relation:

y[n] = ( 1 \* x[n-10])

+ ( 10 \* x[n- 9])

+ ( 45 \* x[n- 8])

+ (120 \* x[n- 7])

+ (210 \* x[n- 6])

+ (252 \* x[n- 5])

+ (210 \* x[n- 4])

+ (120 \* x[n- 3])

+ ( 45 \* x[n- 2])

+ ( 10 \* x[n- 1])

+ ( 1 \* x[n- 0])

+ ( -0.0000025554 \* y[n-10])

+ ( -0.0000476927 \* y[n- 9])

+ ( -0.0008283447 \* y[n- 8])

+ ( -0.0049173171 \* y[n- 7])

+ ( -0.0333452753 \* y[n- 6])

+ ( -0.1029986228 \* y[n- 5])

+ ( -0.3633921930 \* y[n- 4])

+ ( -0.6177219529 \* y[n- 3])

+ ( -1.2193339678 \* y[n- 2])

+ ( -0.9616579011 \* y[n- 1])