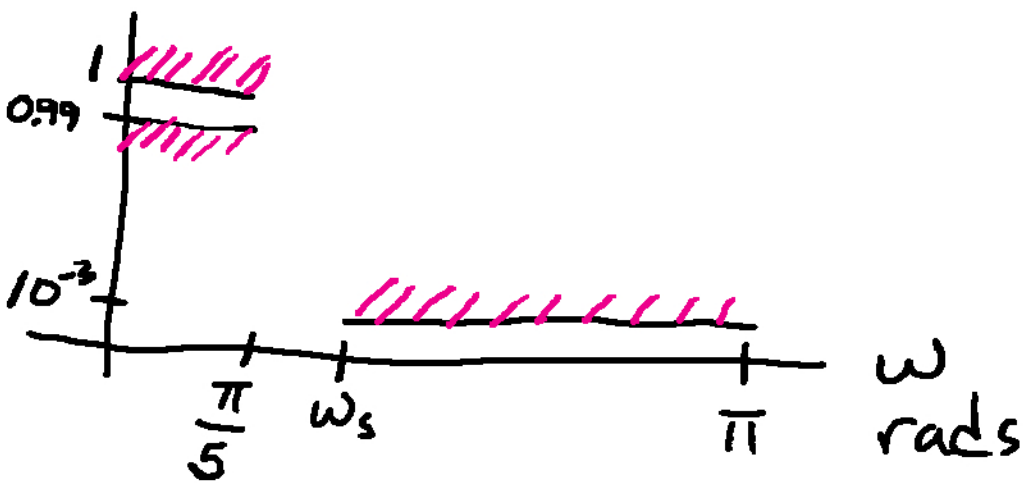
Bad IIR Filter Designs

Always verify that your design satisfies the specifications!

Very tight specs can result in meaningless designs

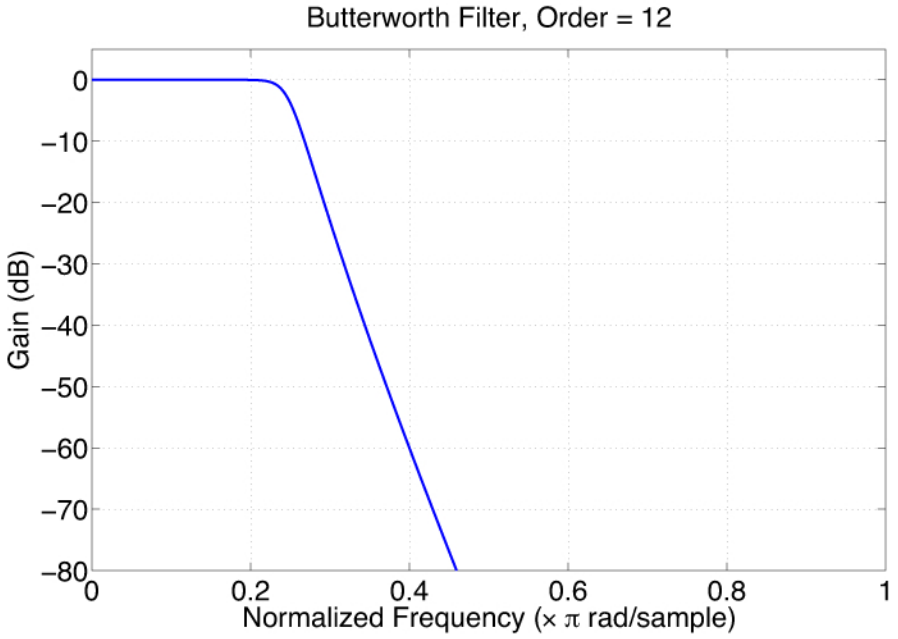
Example: Low pass Butterworth

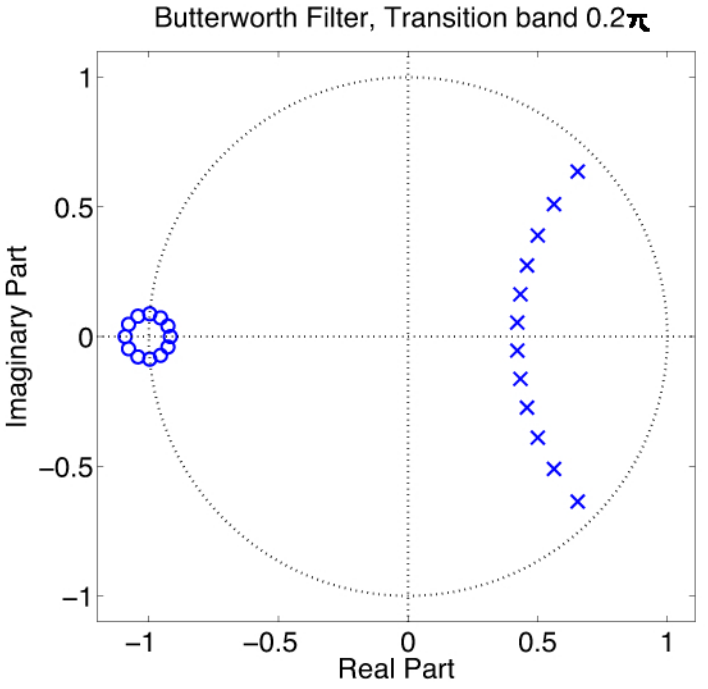


Case 1: $\omega_s = 0.4\pi$ rads

Case 2: $\omega_s = 0.24\pi$ rads

Case 1: Transition band 0.2π rads





Coefficients, transition band 0.2pi

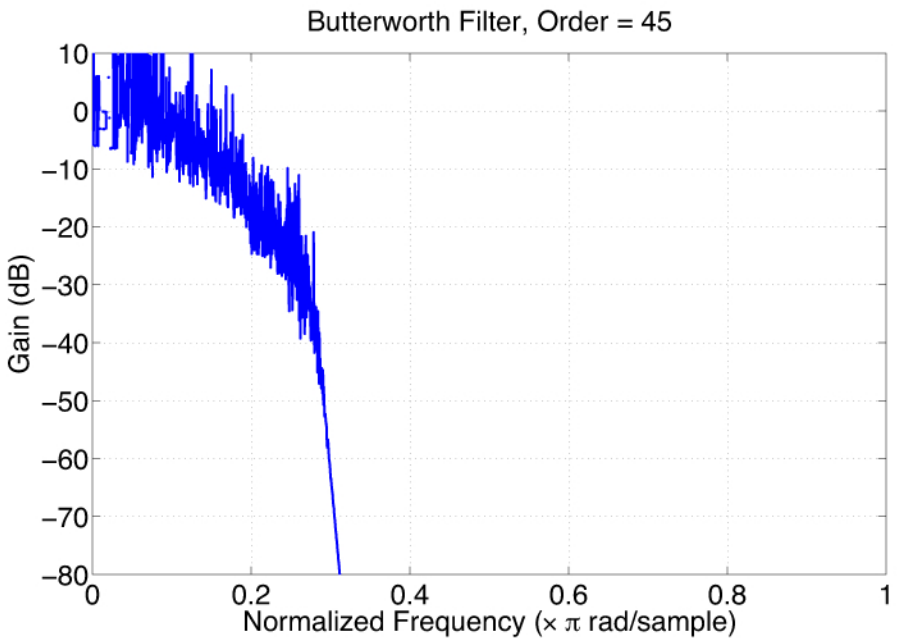
B = 1.0e-03 *

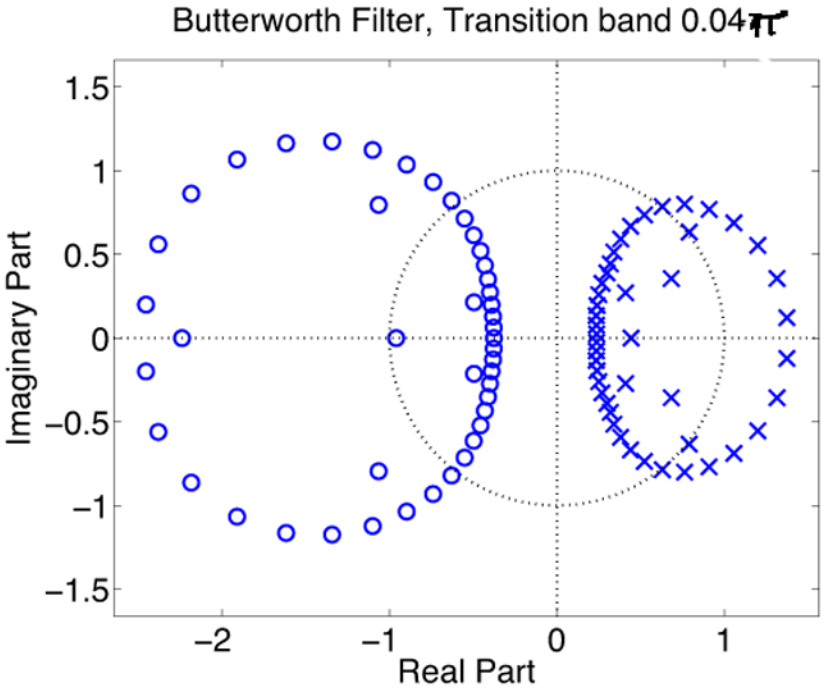
0.0010 0.0120 0.0660 0.2200 0.4950 0.7921 0.9241 0.7921 0.4950 0.2200 0.0660 0.0120 0.0010

A =

1.0000 -6.0629 17.7293 -32.6911 42.0486 -39.5581 27.8126 -14.6843 5.7654 -1.6386 0.3195 -0.0383 0.0021

Case 2: Transition Band 0.04π rads





Coefficients, transition band 0.04pi

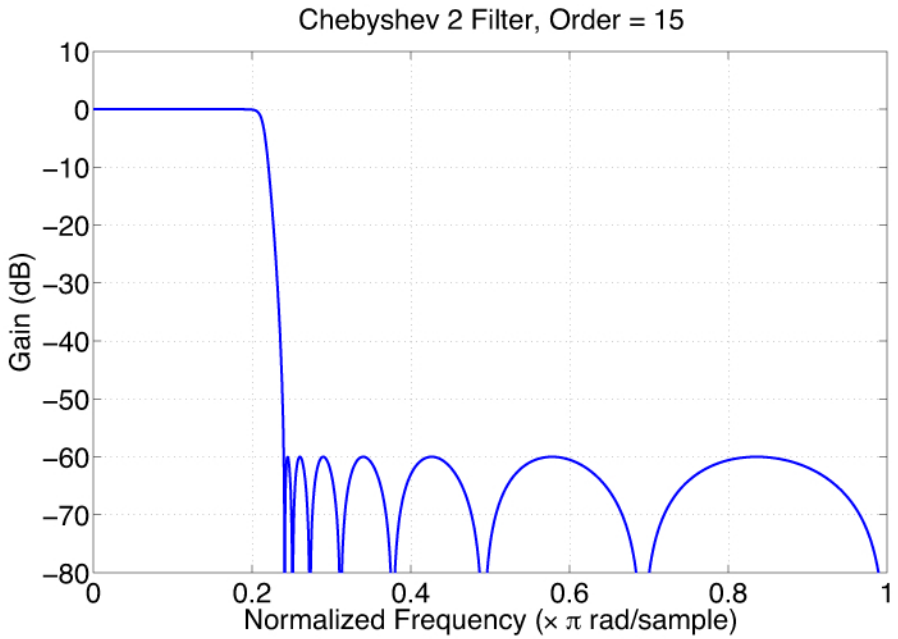
B = 1.0e-07 *

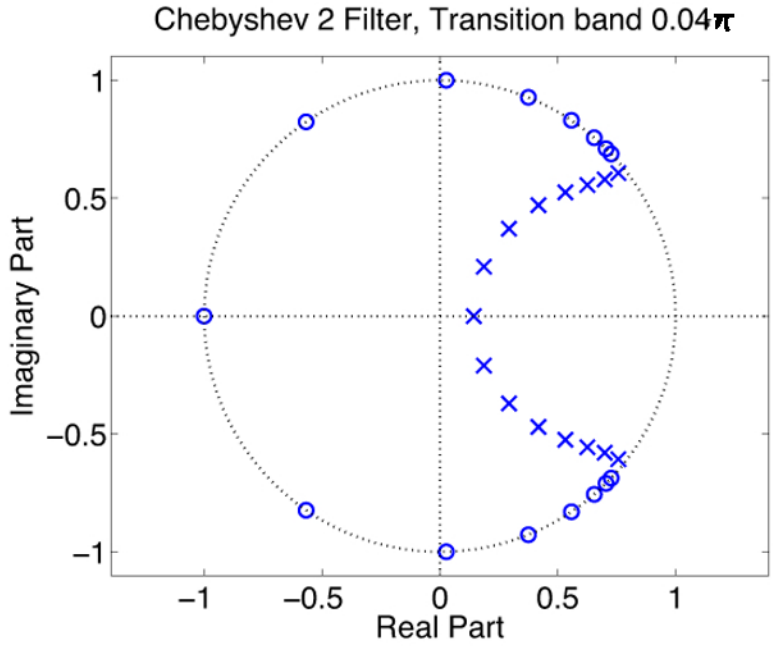
-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0001	-0.0003
-0.0010	-0.0025	-0.0057	-0.0117	-0.0219	-0.0374	-0.0581	-0.0826	-0.1074	-0.1279	-0.1395	-0.1395
-0.1279	-0.1074	-0.0826	-0.0581	-0.0374	-0.0219	-0.0117	-0.0057	-0.0025	-0.0010	-0.0003	-0.0001
-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000		

A = 1.0e+08 *

0.0000	-0.0000	0.0000	-0.0000	0.0002	-0.0009	0.0036	-0.0121	0.0352	-0.0889	0.1981	-0.3923
0.6953	-1.1100	1.6037	-2.1052	2.5192	-2.7555	2.7609	-2.5383	2.1441	-1.6655	1.1904	-0.7831
0.4740	-0.2640	0.1351	-0.0635	0.0274	-0.0108	0.0039	-0.0013	0.0004	-0.0001	0.0000	-0.0000
0.0000	-0.0000	0.0000	-0.0000	0.0000	-0.0000	0.0000	-0.0000	0.0000	-0.0000		

Chebyshev 2 design: Transition band 0.04π rads 5





Chebyshev 2 Coefficients

B =

0.0029 -0.0114 0.0285 -0.0461 0.0577 -0.0528 0.0377 -0.0122 -0.0122 0.0377 -0.0528 0.0577
-0.0461 0.0285 -0.0114 0.0029

A =

1.0000 -7.1645 25.3133 -57.6380 93.8983 -115.3399 109.9630 -82.6252 49.2266 -23.2124 8.5801 -2.438
0.5151 -0.0763 0.0071 -0.0003

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