4.1.4x $N=11$, $M=11$, $d_x = d_y = \lambda/2$, $SL = -30$ dB

a) Recall separable Dolph-Chebychev (prob 4.1.4)

$$B(\psi_x, \psi_y) = T_{N-1}(x_0 \cos(\psi_x/2)) T_{N-1}(x_0 \cos(\psi_y/2))/R^2$$

$D = 135.6 = 21.3$ dB

b) Circular rotation I (Tseng-Cheng/Baklanov)

$$\cos(\psi/2) = \cos(\psi_x/2)\cos(\psi_y/2)$$

$$B(\psi_x, \psi_y) = T_{N-1}(x_0 \cos(\psi/2))/R = T_{N-1}(x_0 \cos(\psi_x/2)\cos(\psi_y/2))/R$$

$D = 132.7 = 21.2$ dB

Pattern has circularly symmetric main beam and sidelobes with -30 dB sidelobes

c) Circular rotation II (McClellan)

$$\cos(\psi) = \cos(\psi_x)\cos(\psi_y)$$

$$\Rightarrow \cos(\psi/2) = \cos\left(\tfrac{1}{2}\operatorname{acos}\left[\cos(\psi_x)\cos(\psi_y)\right]\right)$$

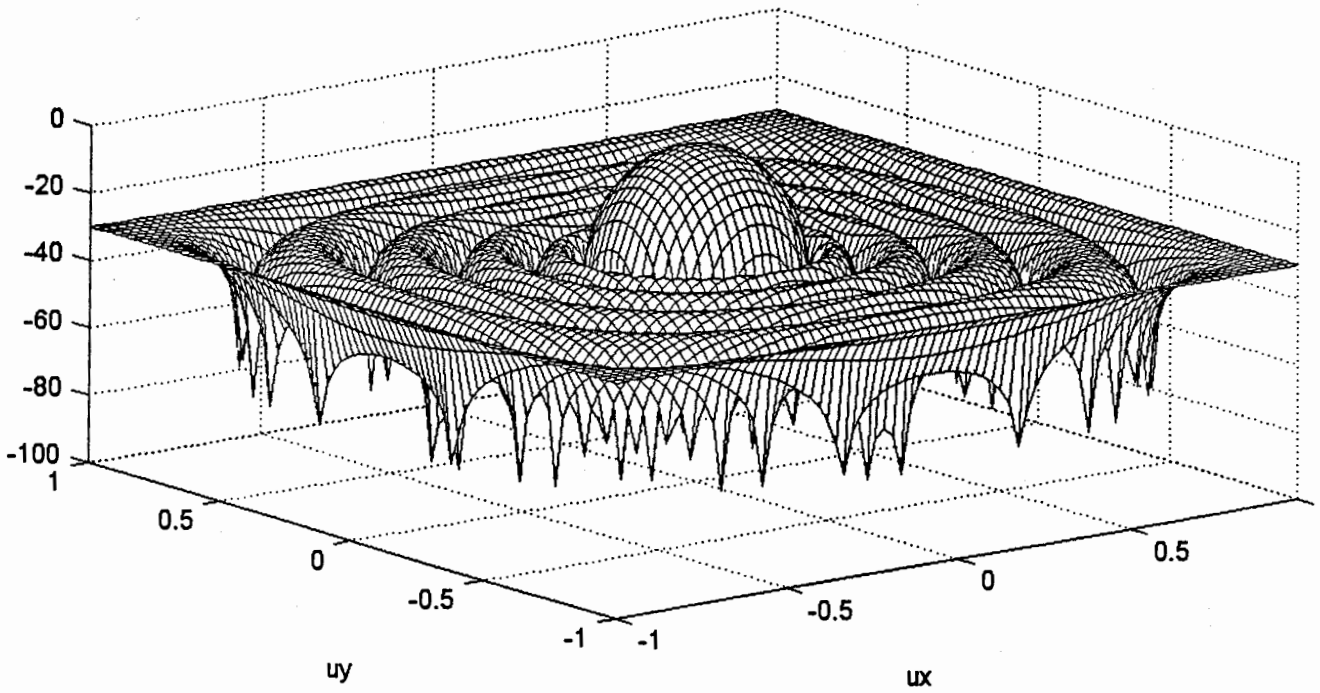
$$B(\psi_x, \psi_y) = T_{N-1}\left(x_0 \cos\left(\tfrac{1}{2}\operatorname{acos}\left[\cos(\psi_x)\cos(\psi_y)\right]\right)\right)$$

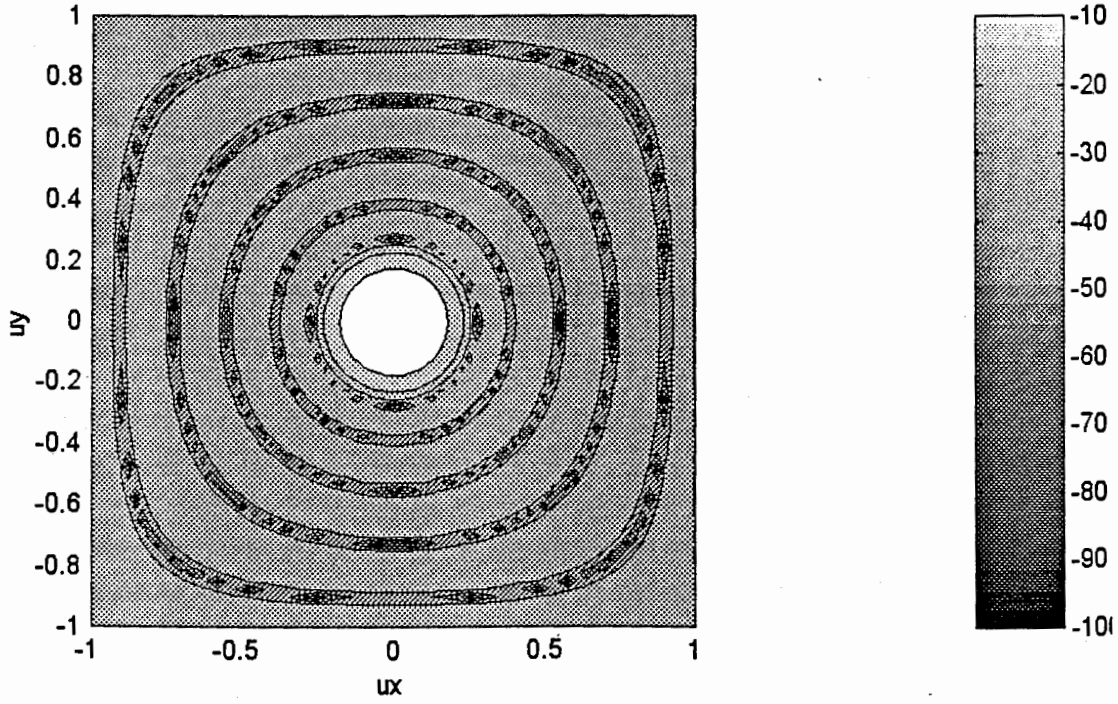
$D = 131.4 = 21.2$ dB

Pattern has circularly symmetric mainbeam, and -30 dB sidelobes. Can see grating lobes just outside of visible region

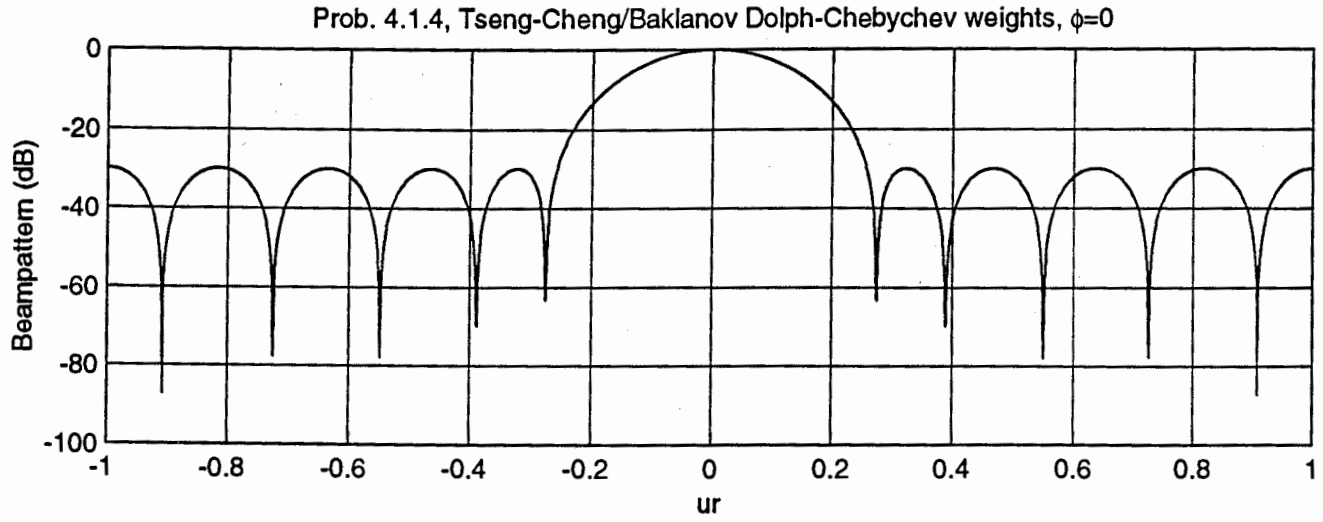
4.1.4(2)

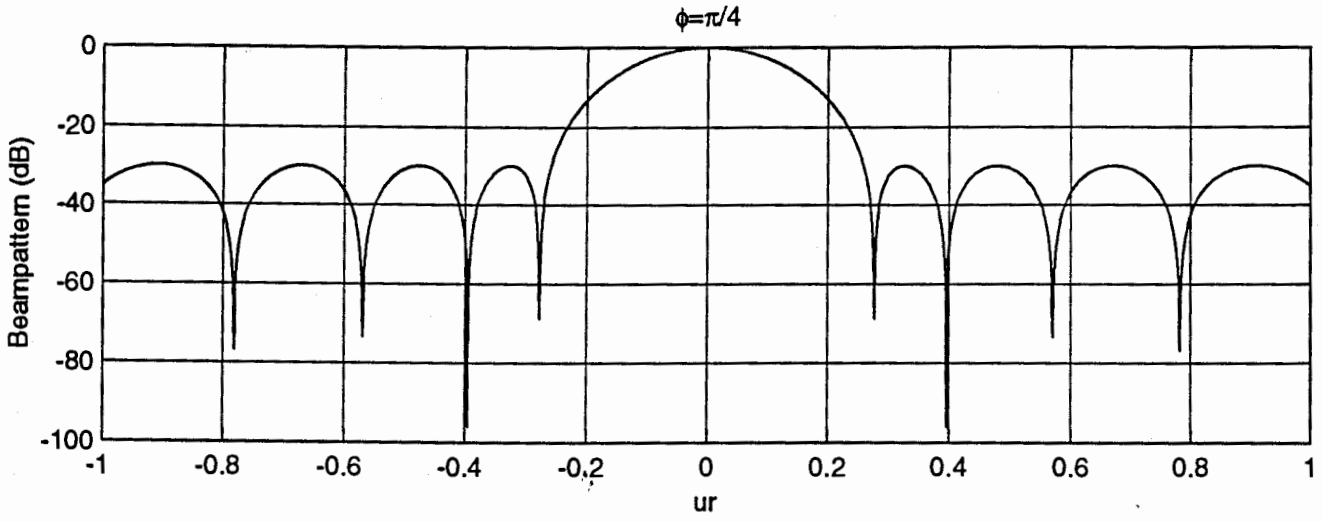
Prob. 4.1.4, Tseng-Cheng/Baklanov Dolph-Chebychev weights

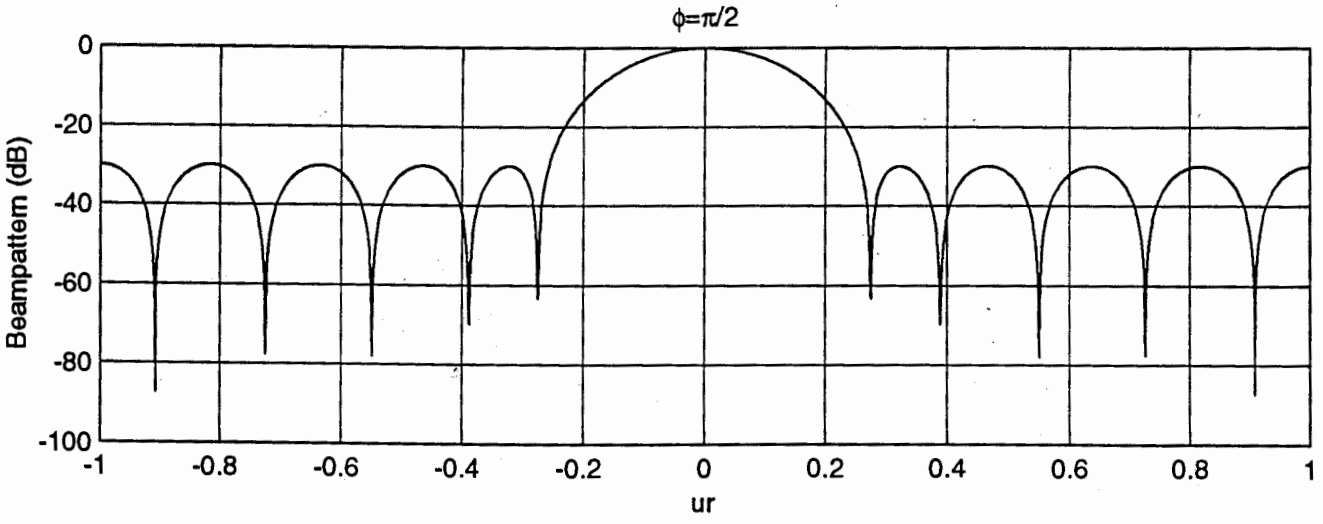




4.1.4x (3)

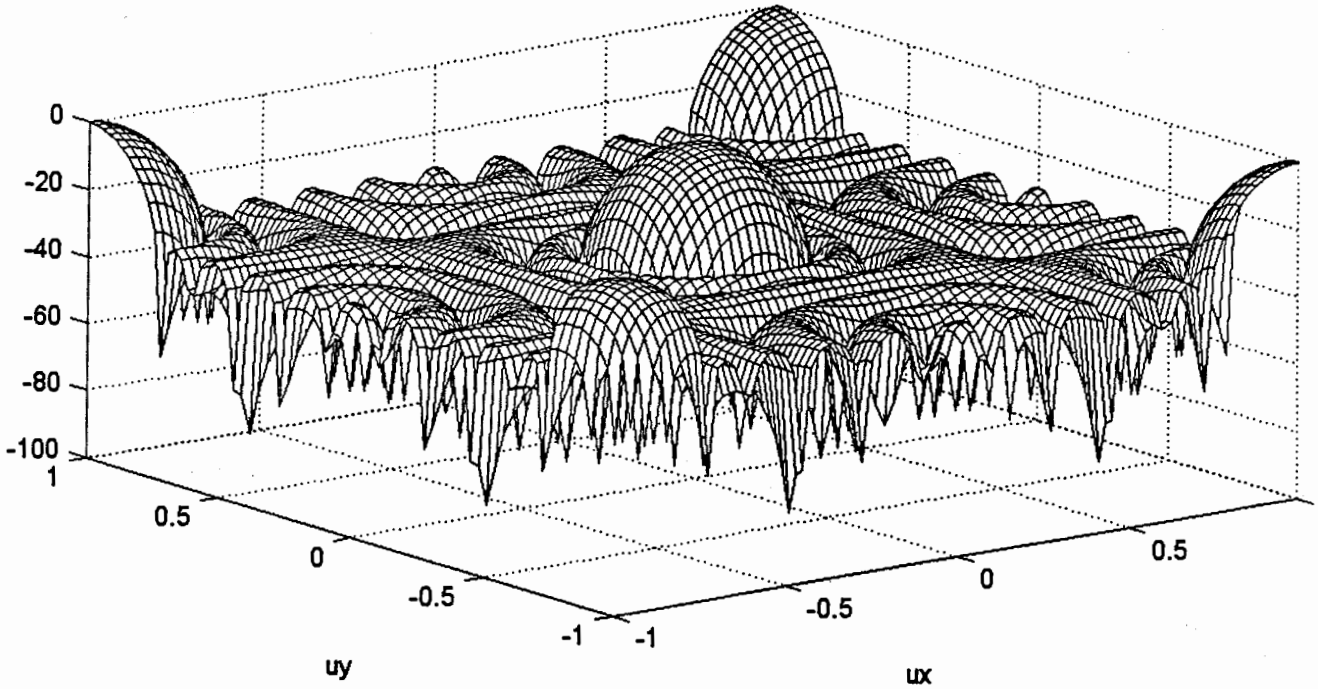

Prob. 4.1.4, Tseng-Cheng/Baklanov Dolph-Chebychev weights, ϕ=0
Beampattern (dB)
0
-20
-40
-60
-80
-100
-1
-0.8
-0.6
-0.4
-0.2
0
0.2
0.4
0.6
0.8
1
ur

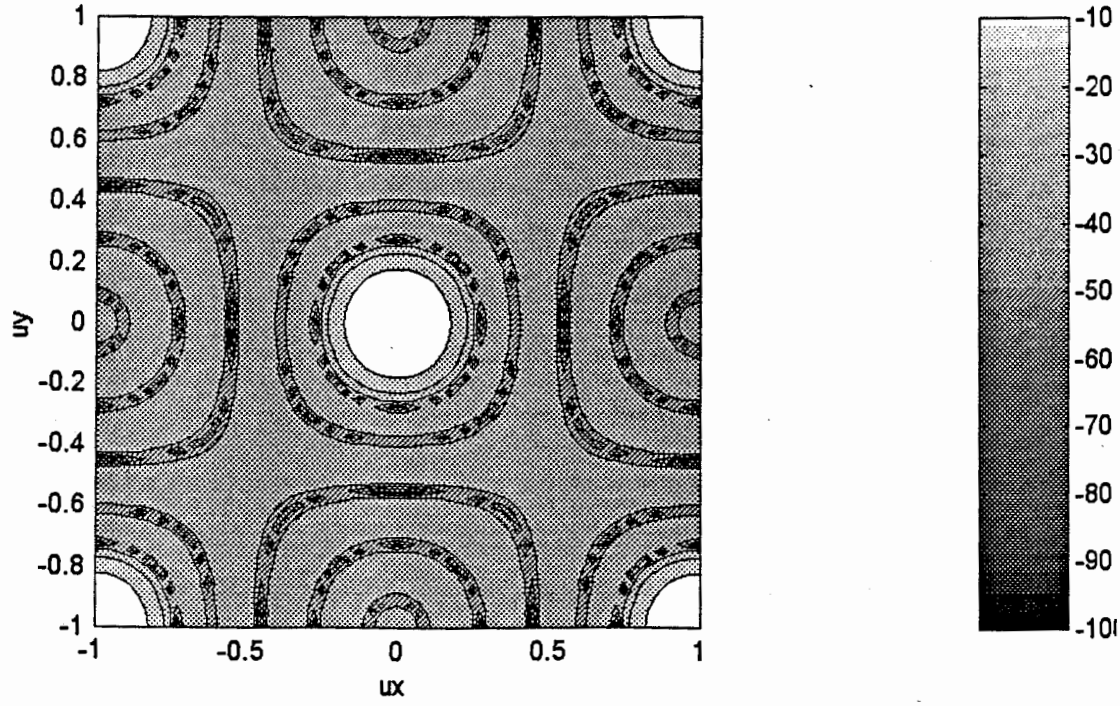

ϕ=π/4
Beampattern (dB)
0
-20
-40
-60
-80
-100
-1
-0.8
-0.6
-0.4
-0.2
0
0.2
0.4
0.6
0.8
1
ur

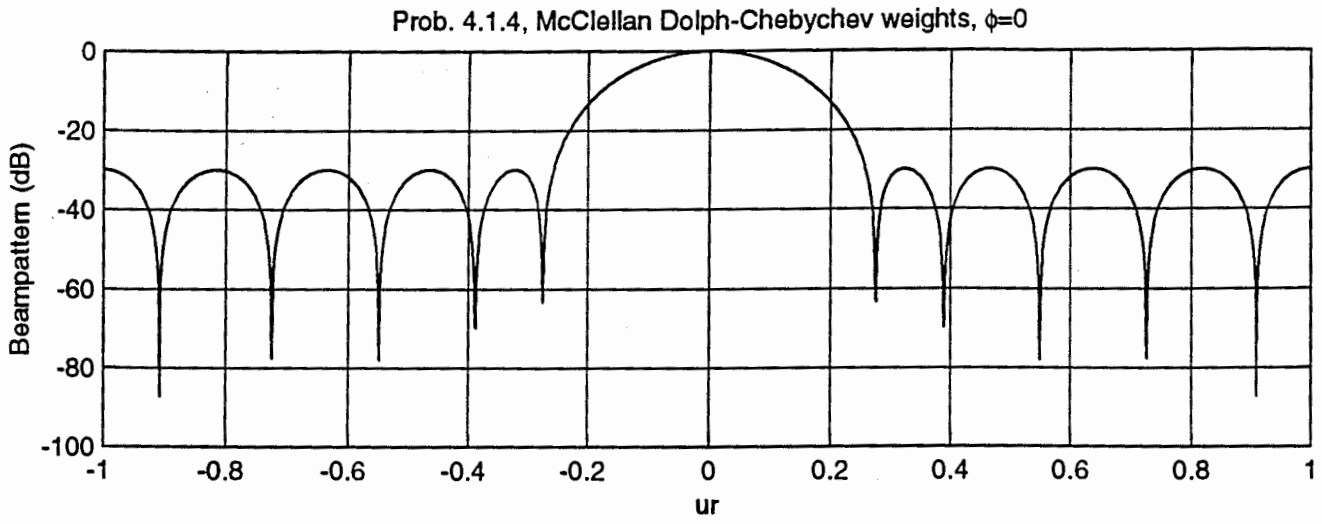

ϕ=π/2
Beampattern (dB)
0
-20
-40
-60
-80
-100
-1
-0.8
-0.6
-0.4
-0.2
0
0.2
0.4
0.6
0.8
1
ur

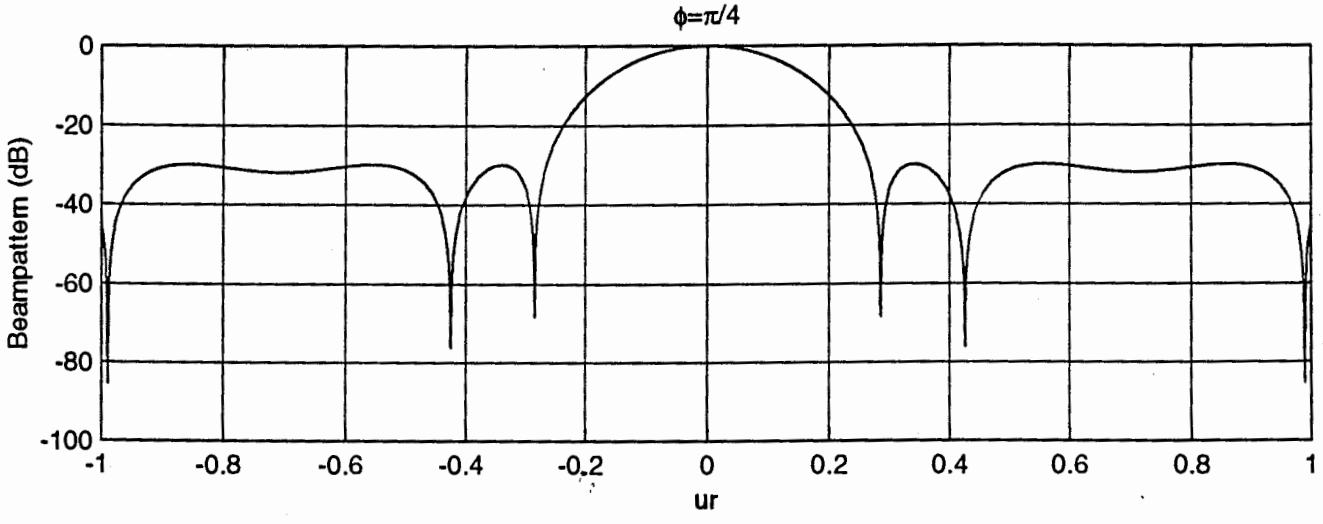
4.1.4x (4)

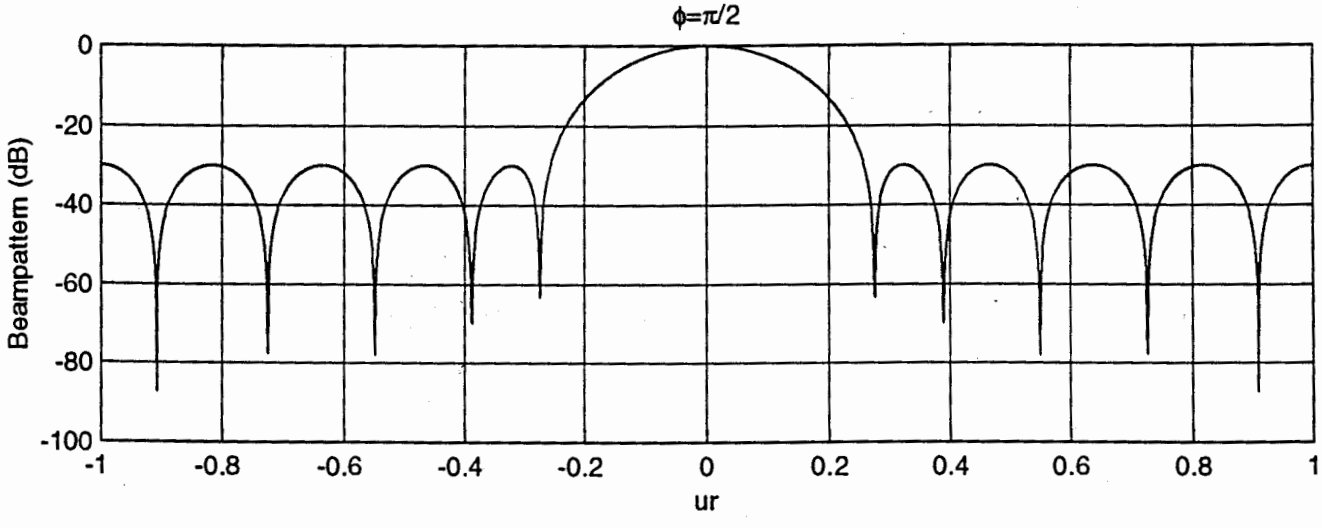
Prob. 4.1.4, McClellan Dolph-Chebychev weights






Prob. 4.1.4, McClellan Dolph-Chebychev weights, ϕ=0
Beampattern (dB)
0
-20
-40
-60
-80
-100
-1
-0.8
-0.6
-0.4
-0.2
0
0.2
0.4
0.6
0.8
1
ur


ϕ=π/4
Beampattern (dB)
0
-20
-40
-60
-80
-100
-1
-0.8
-0.6
-0.4
-0.2
0
0.2
0.4
0.6
0.8
1
ur


ϕ=π/2
Beampattern (dB)
0
-20
-40
-60
-80
-100
-1
-0.8
-0.6
-0.4
-0.2
0
0.2
0.4
0.6
0.8
1
ur