

PARABOLIC ANTENNA SIMULATIONS USING NEC2C

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30.12.2020

ANTENNA&FEED1 GEOMETRY

4m parabolic antenna
 $F/D=0.41$

Dual dipole feed
70cm diameter round
reflector

Nec2 model:
14543 wire elements
total

Calc time ~1.5 hours

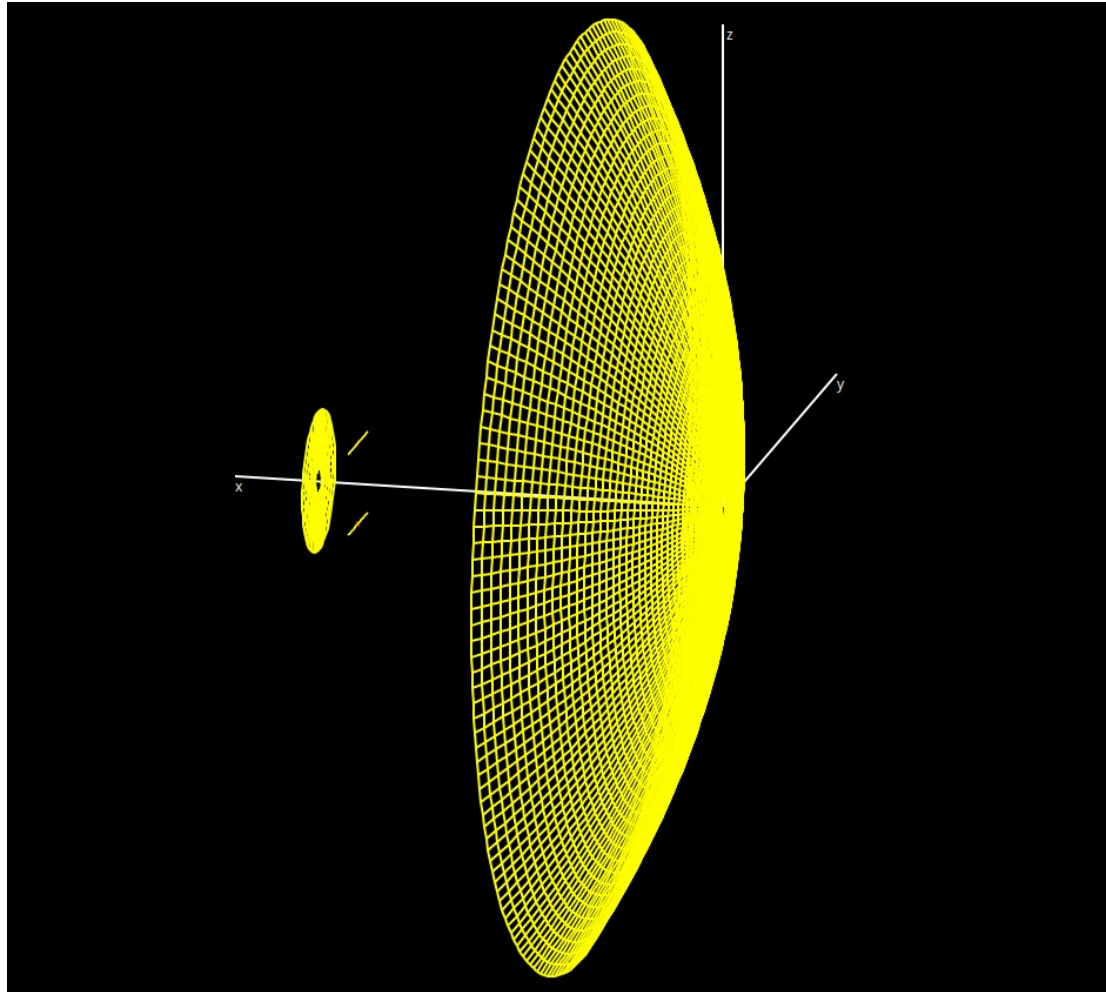
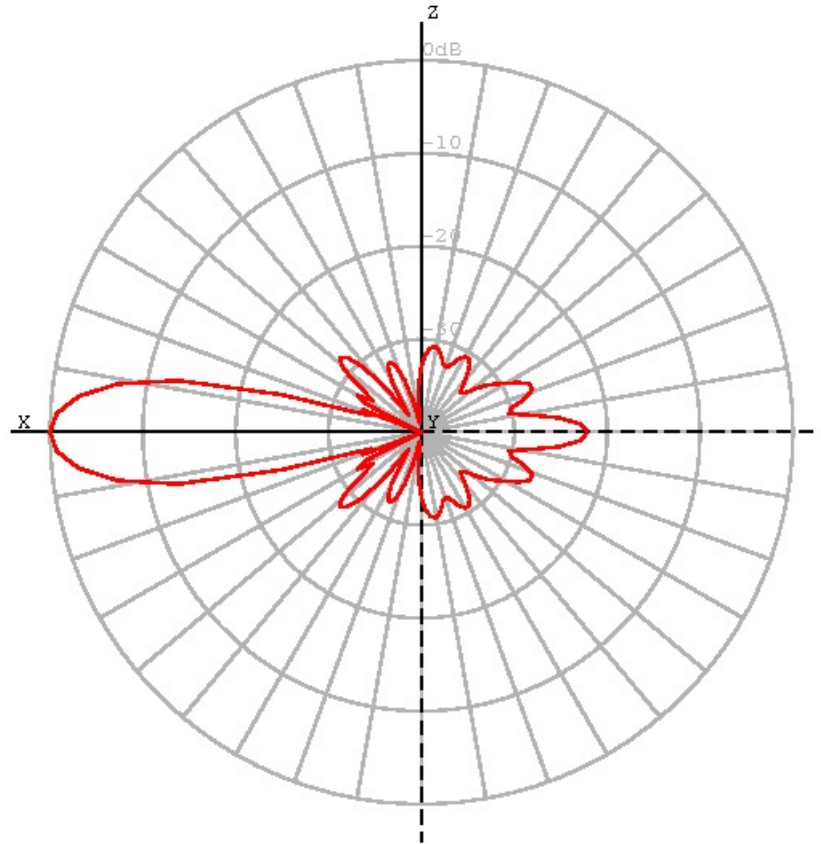


Image from
xnec2c

ANTENNA&FEED1 RADIATION PATTERN

Expected gain with 65%
efficiency = 23.3dBi



Data from
nec2c
Image from
xnecview

f - 432 MHz maxgain - 23.5 dBi vgain - -14.08 dBi

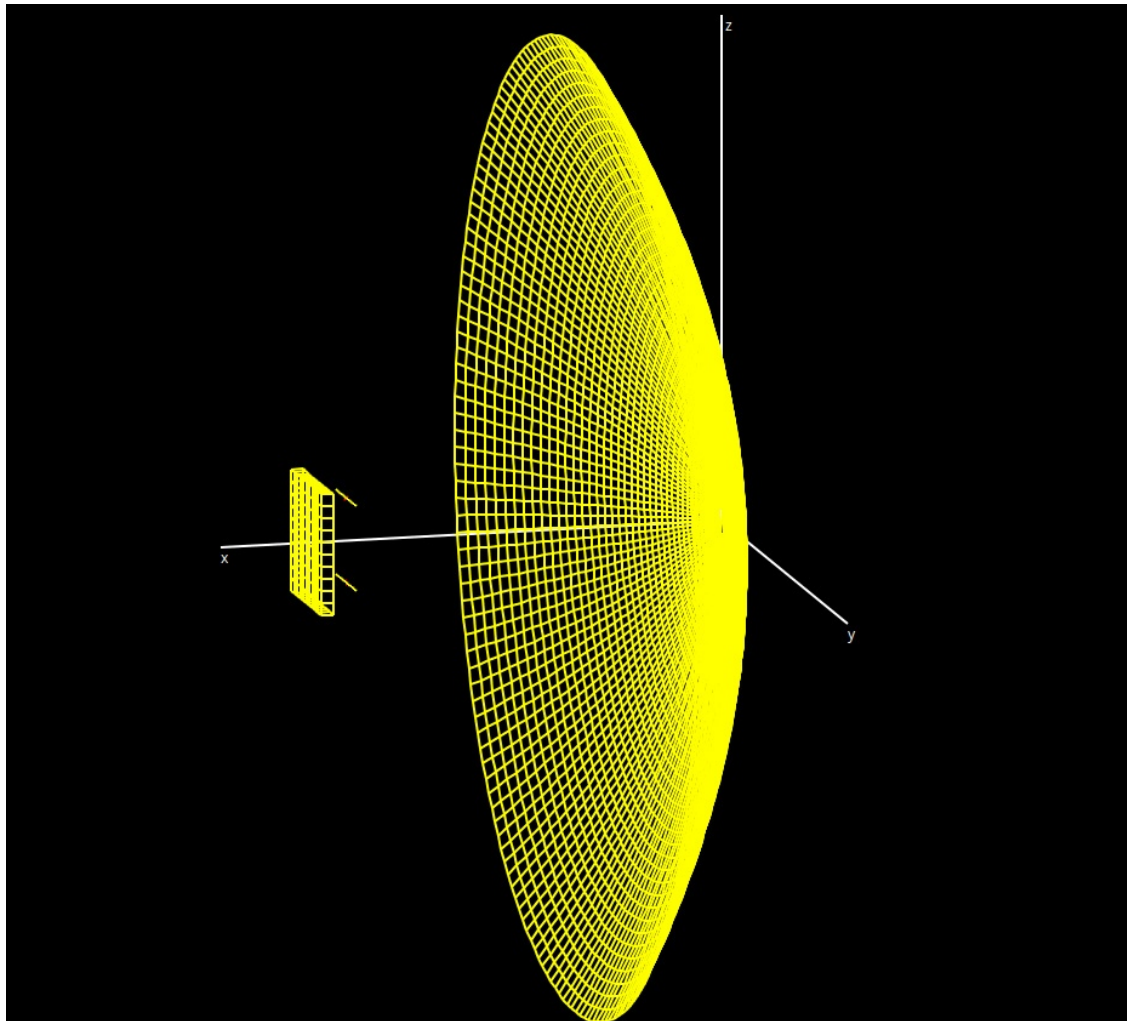
ANTENNA&FEED2 GEOMETRY

4m parabolic antenna
 $F/D=0.41$

Dual dipole feed
Square reflector 50x50 cm
and 5cm inward
walls/choke

Nec2 model:
14343 wire elements total
Radial type mesh model

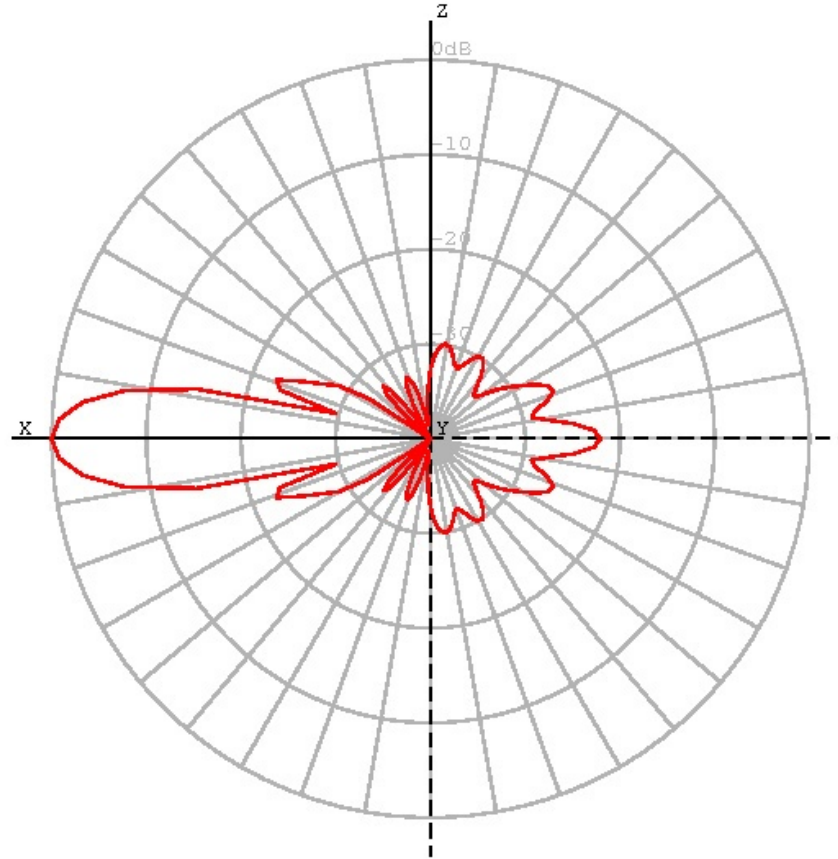
Calc time ~1.5 hours



ANTENNA&FEED2 RADIATION PATTERN

Expected gain with 65%
efficiency = 23.3dBi

+0.2dB gain vs
round reflector
feed



f - 432 MHz maxgain - 23.68 dBi vgain - -10.84 dBi

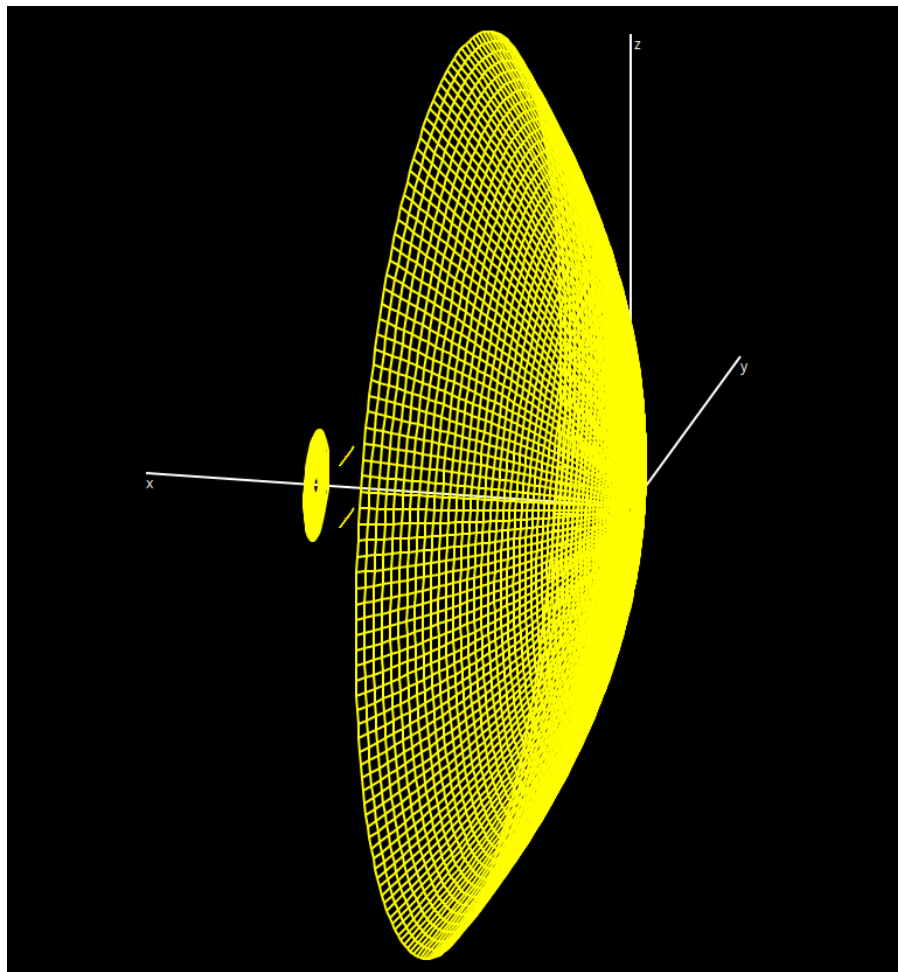
ANTENNA EXTENDED TO 5 METERS

Additional 0.5m extension
around 4.0m dish

4m+1m=5.0m parabolic
antenna
 $F/D=0.33$

Dual dipole feed
70cm diameter round
reflector

Nec2 model:
18143 wire elements total

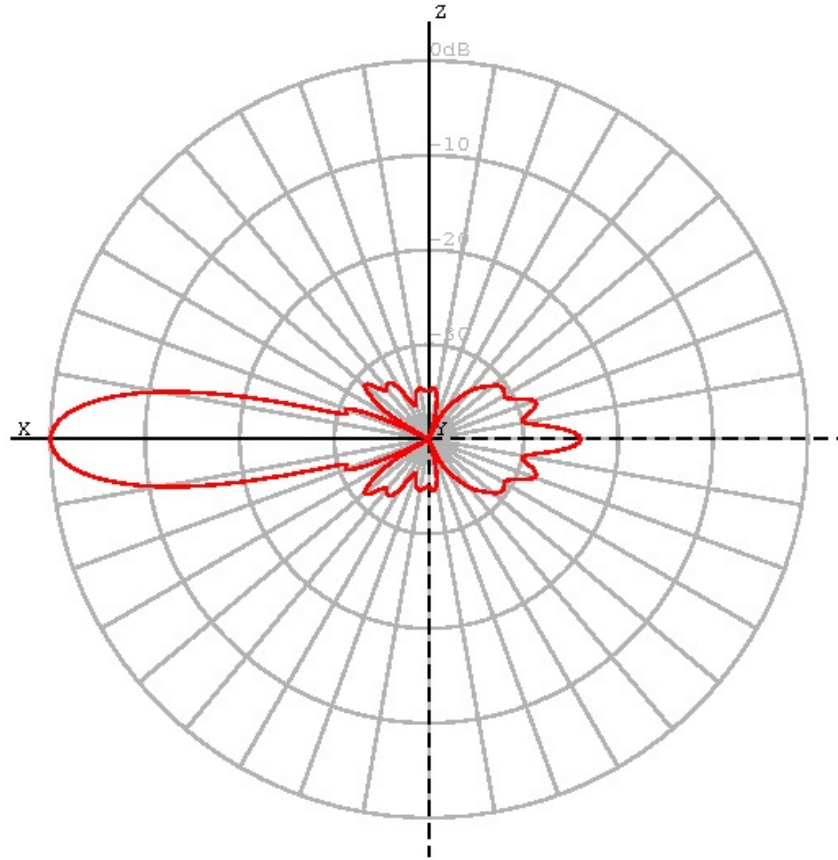


ANTENNA EXTENDED TO 5 METERS

Expected gain with 65%
efficiency = 25.2dBi

→ 0.8dB missing

→ efficiency 54%



f = 432 MHz maxgain = 24.39 dBi vgain = -12.7 dBi

ANTENNA EXTENDED TO 6 METERS

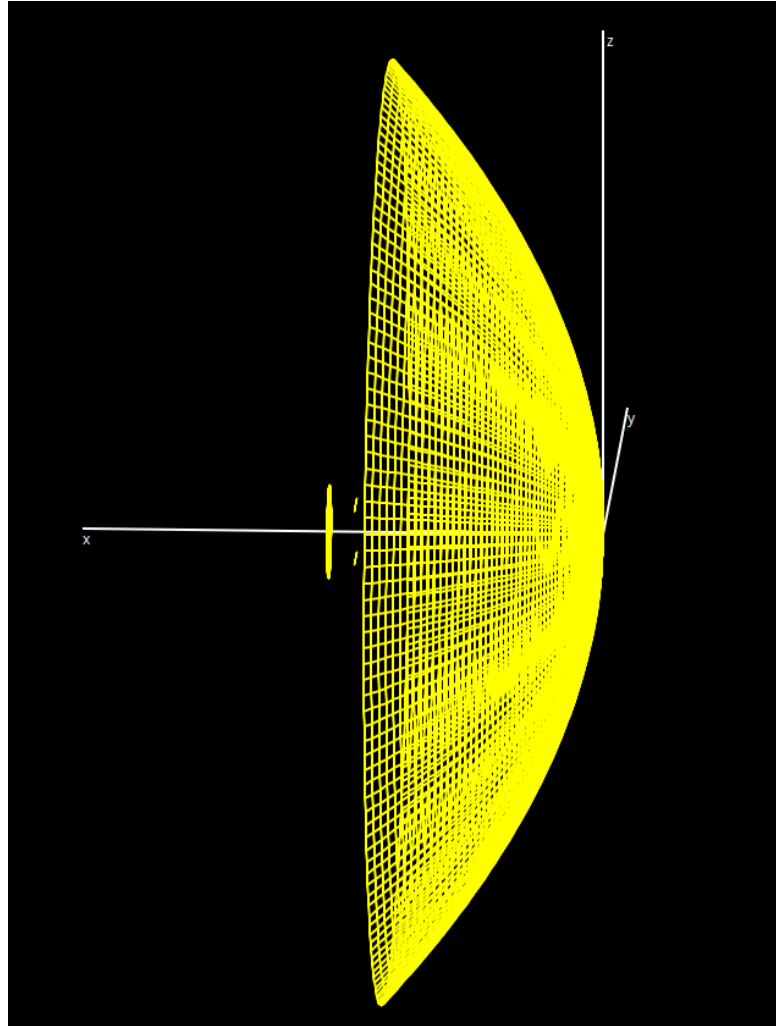
Additional 1.0m extension
around 4.0m dish

$4\text{m} + 2\text{m} = 6.0\text{m}$ parabolic
antenna
 $F/D = 0.27$

Dual dipole feed
70cm diameter round reflector

Nec2 model:
21743 wire elements total
Radial type mesh model

Model grid $\sim 0.1\text{m}$ in outer rim
($6\text{m} * \pi / 180$ elements)



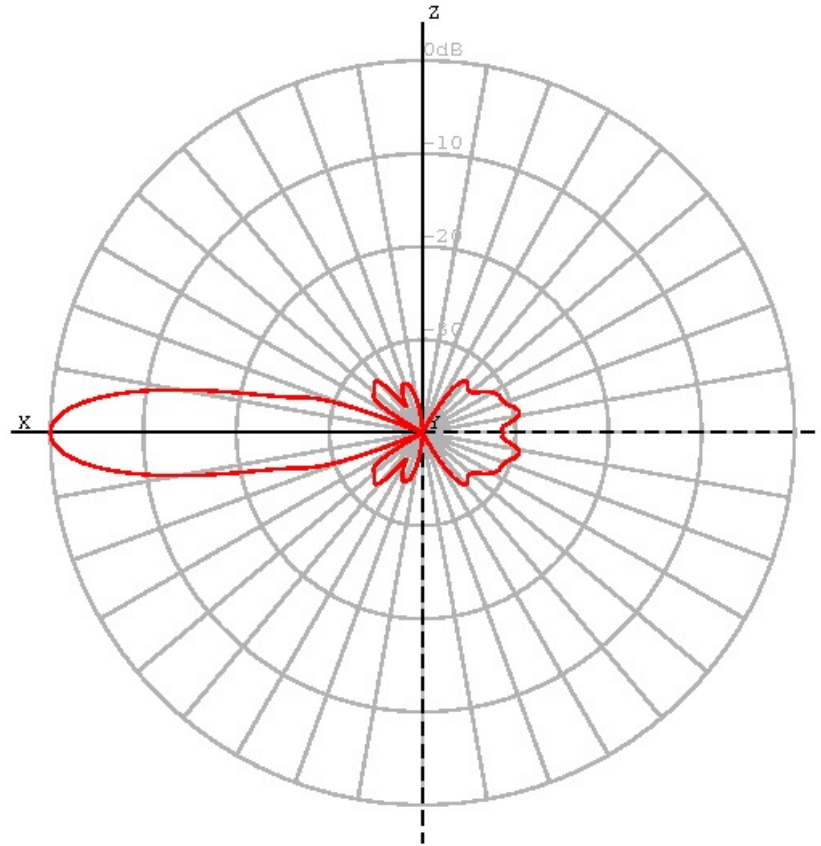
ANTENNA EXTENDED TO 6 METERS

Expected gain with 65%
efficiency = 26.8dBi

→ 1.4dB missing

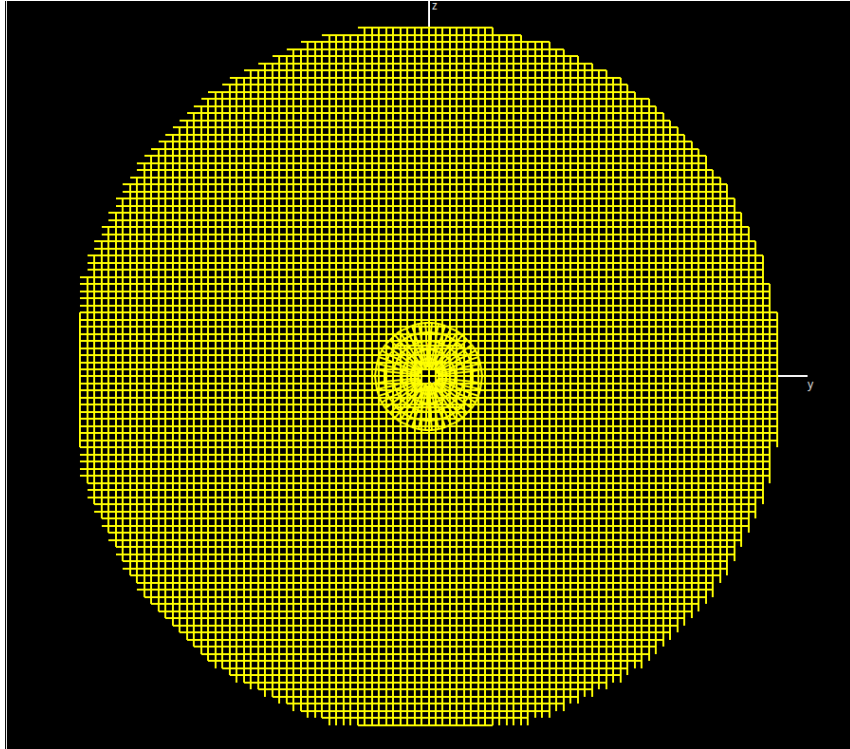
→ efficiency 47%

→ 1.9dB improvement
over original 4m dish

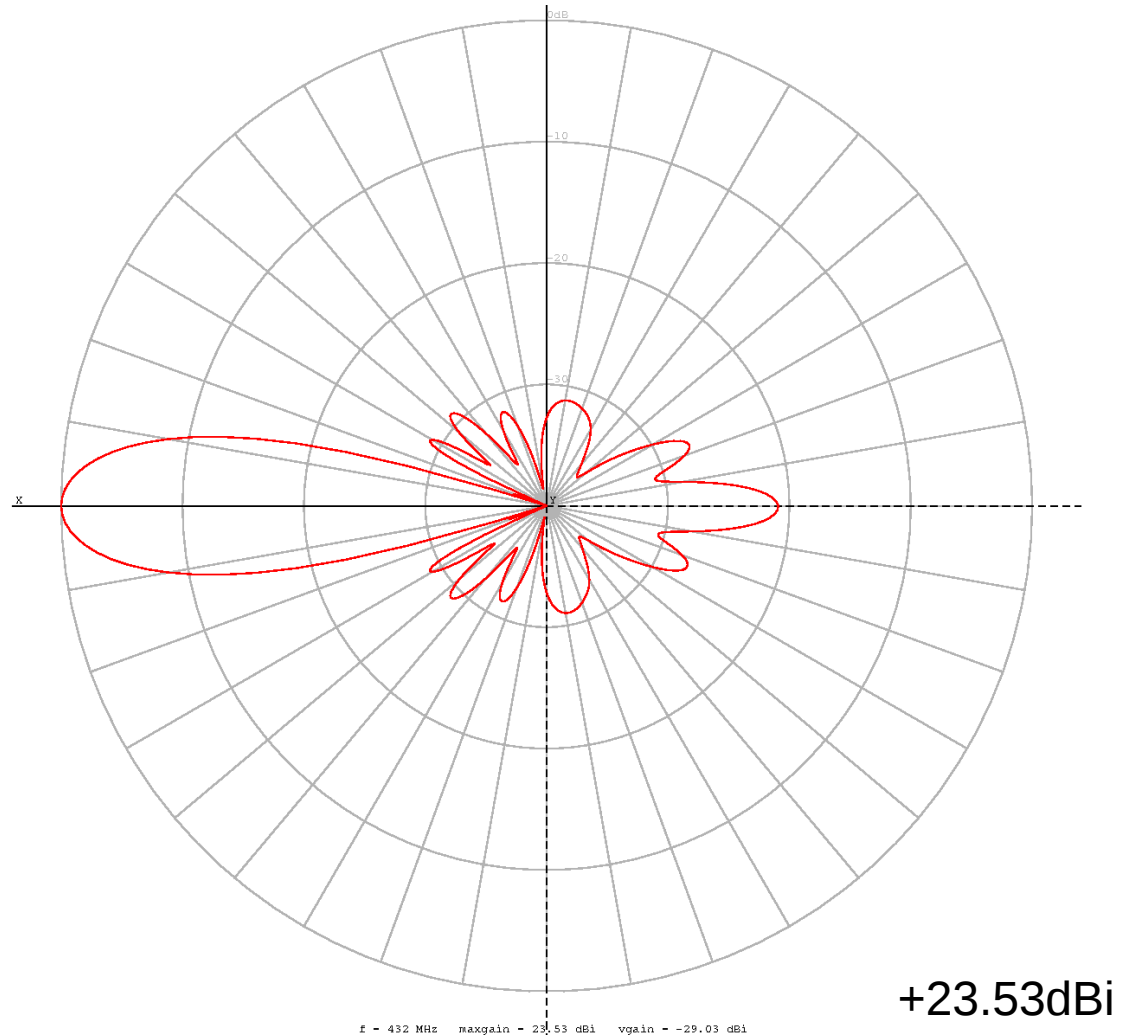


f - 432 MHz maxgain - 25.42 dBi vgain - -23.2 dBi

PARABOLIC ANTENNA SKELETON MODEL

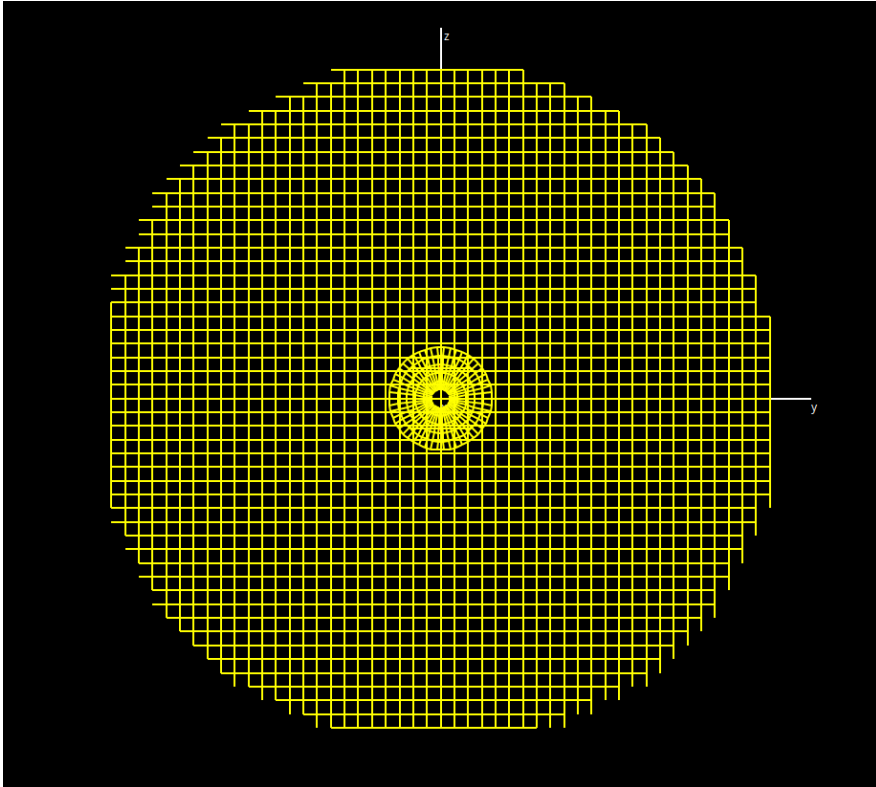


Freq 432 MHz
100x100 wire elements mesh
16139 elements tot
4cm holes

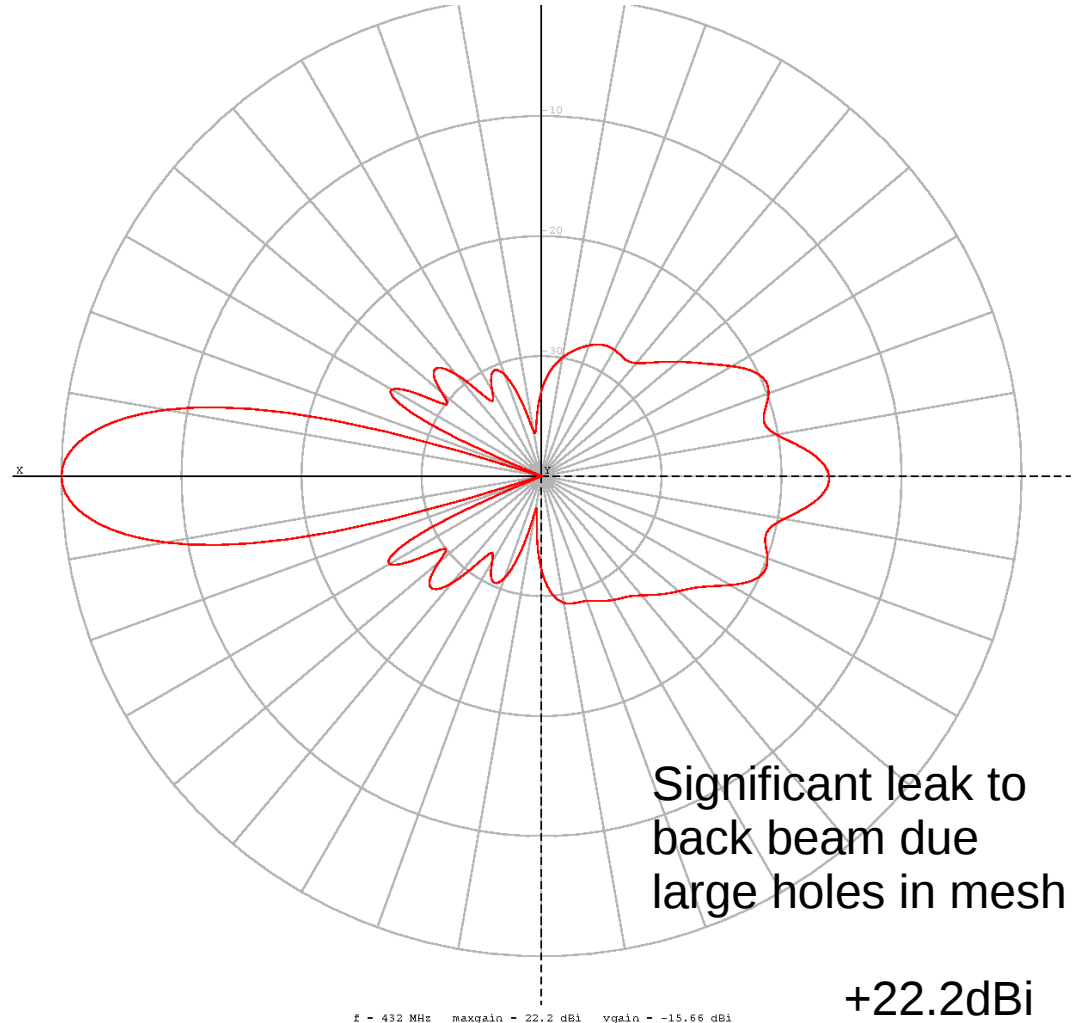


+23.53dBi

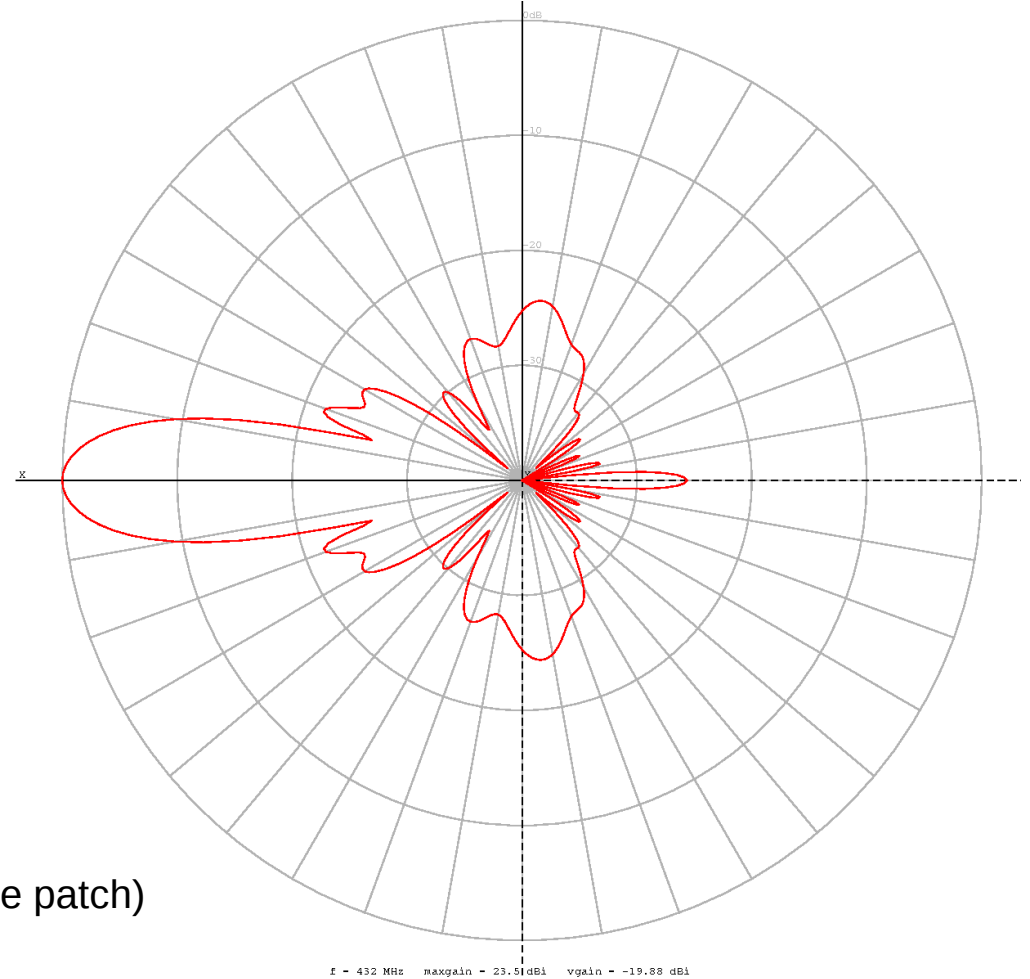
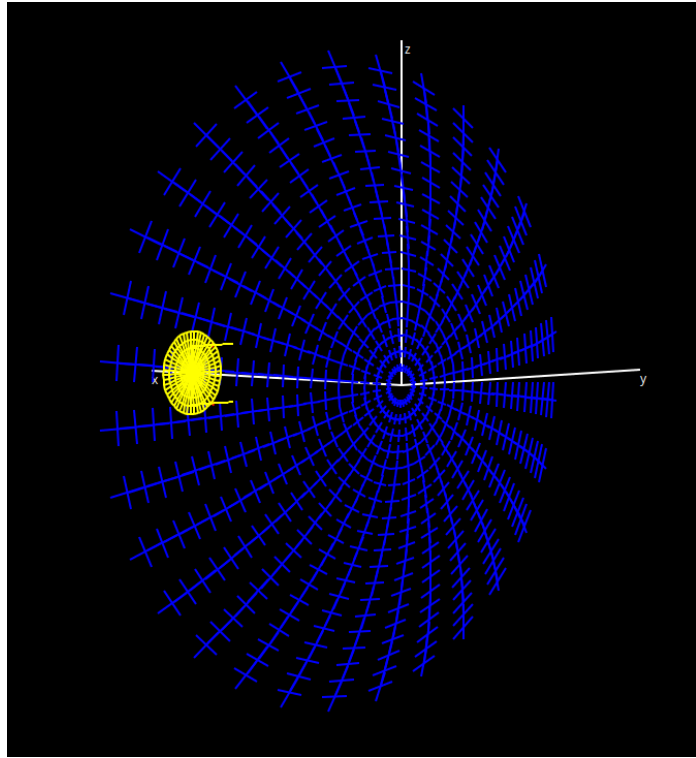
PARABOLIC ANTENNA SKELETON MODEL



Freq 432 MHz
50x50 elements mesh
4383 elements tot
8cm holes



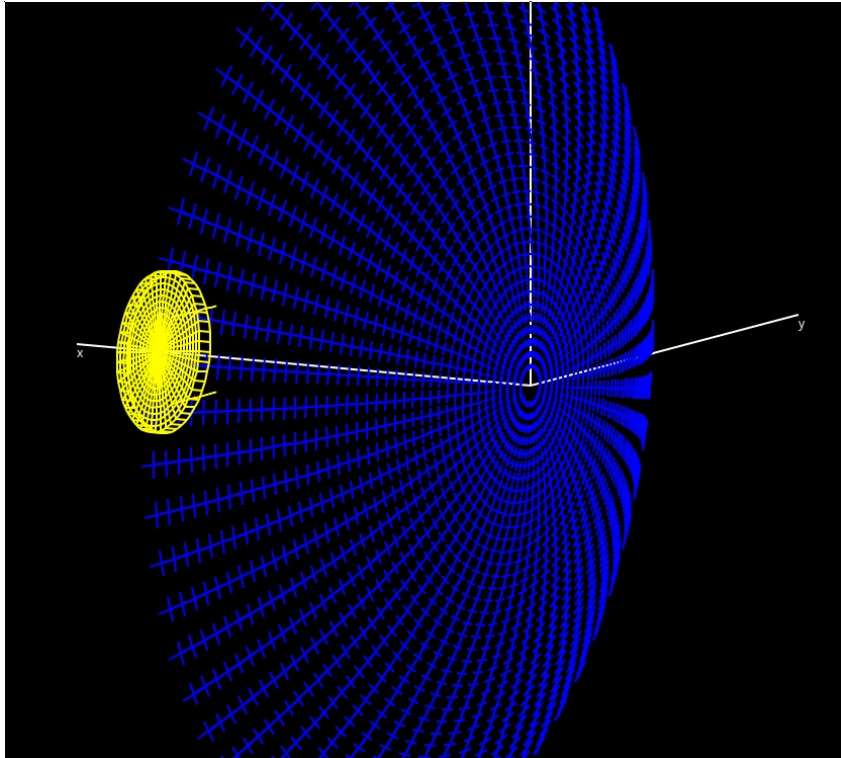
PARABOLIC ANTENNA RADIAL SP PATCH MODEL



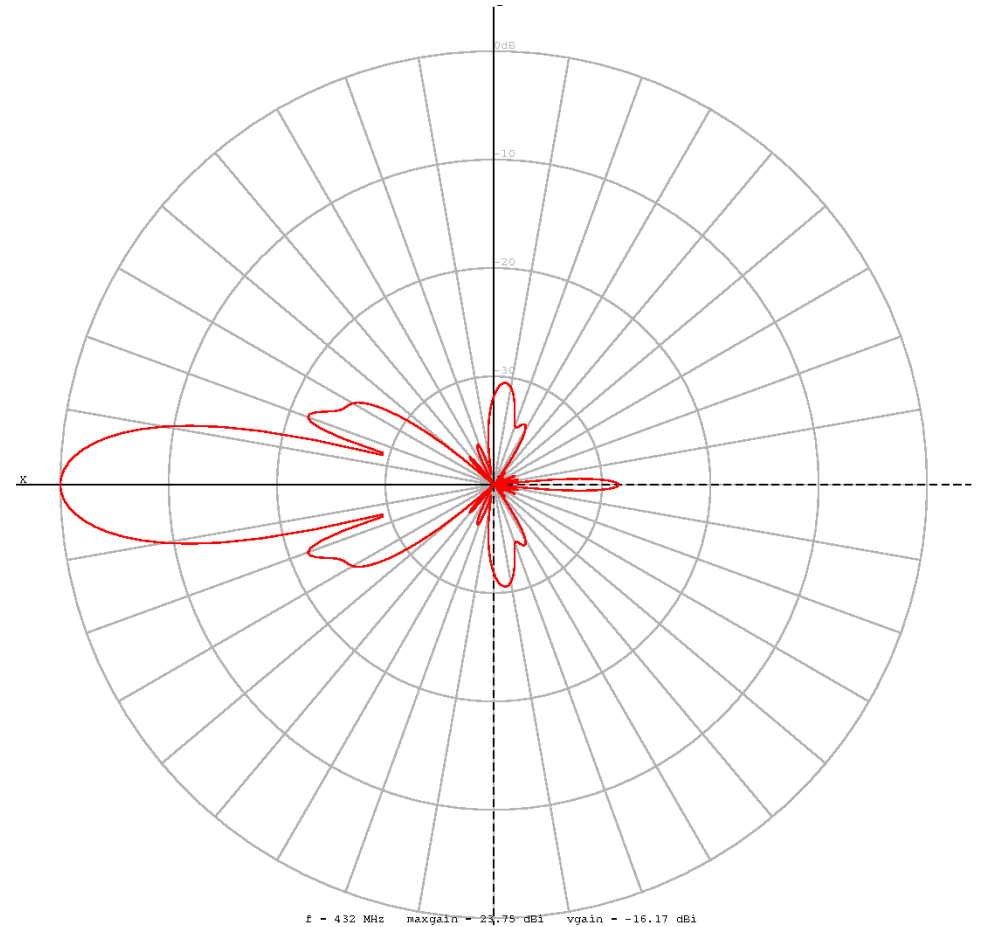
Freq 432 MHz
70cm Circular reflector, no choke
20x30 SP patch elements in 4m dish (SP=surface patch)
630 SP/SC elements tot
503 GW elements (feed+reflector)
Calc time ~15s

+23.5dBi

PARABOLIC ANTENNA RADIAL SP PATCH MODEL

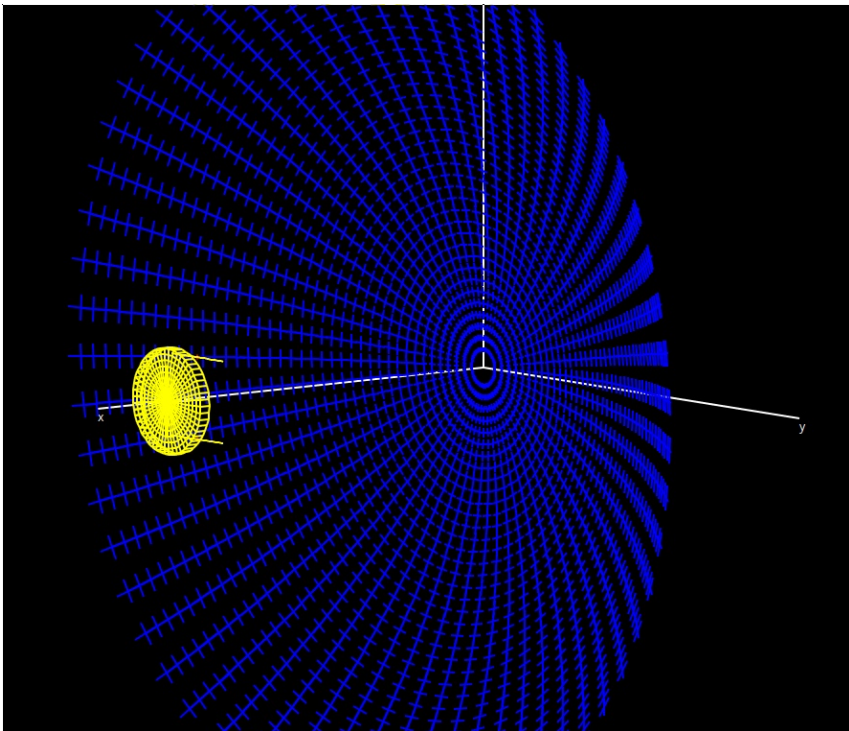


Freq 432 MHz
70cm Circular reflector with 5cm choke
40x60 SP patch elements in 4m dish
2440 SP/SC elements tot
1403 GW elements (feed+reflector)
Calc time ~6min

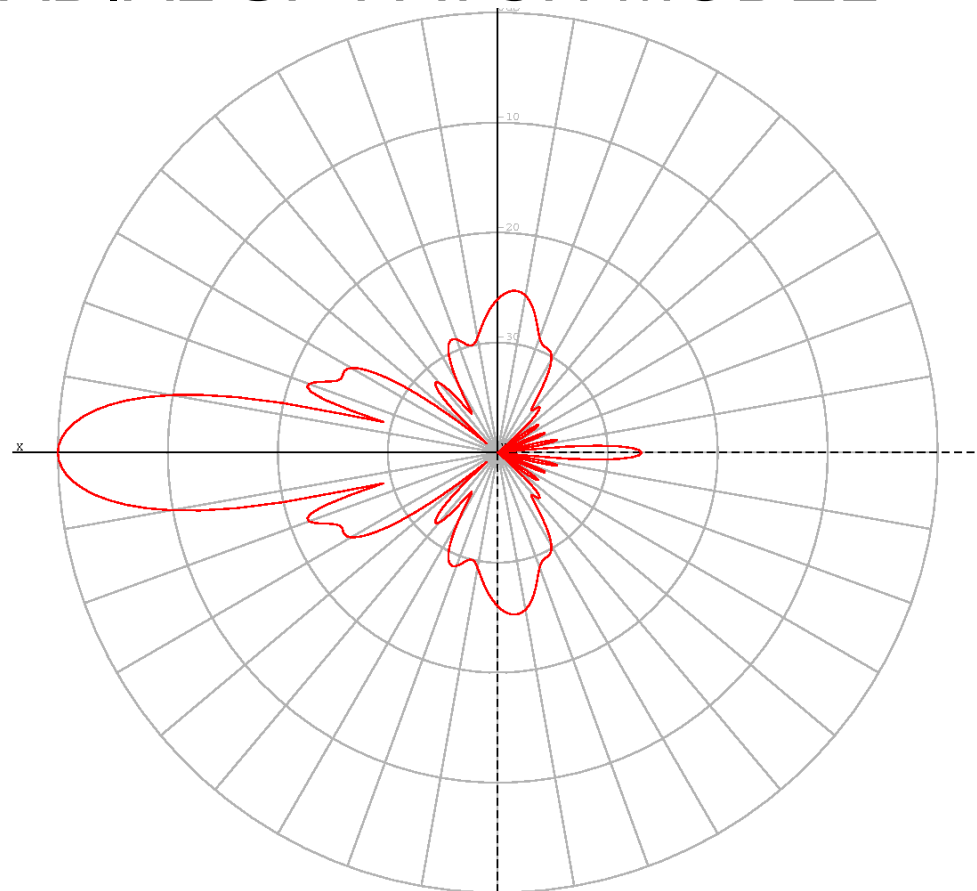


Gain +23.75dBi
F/B 28.45 dB

PARABOLIC ANTENNA RADIAL SP PATCH MODEL



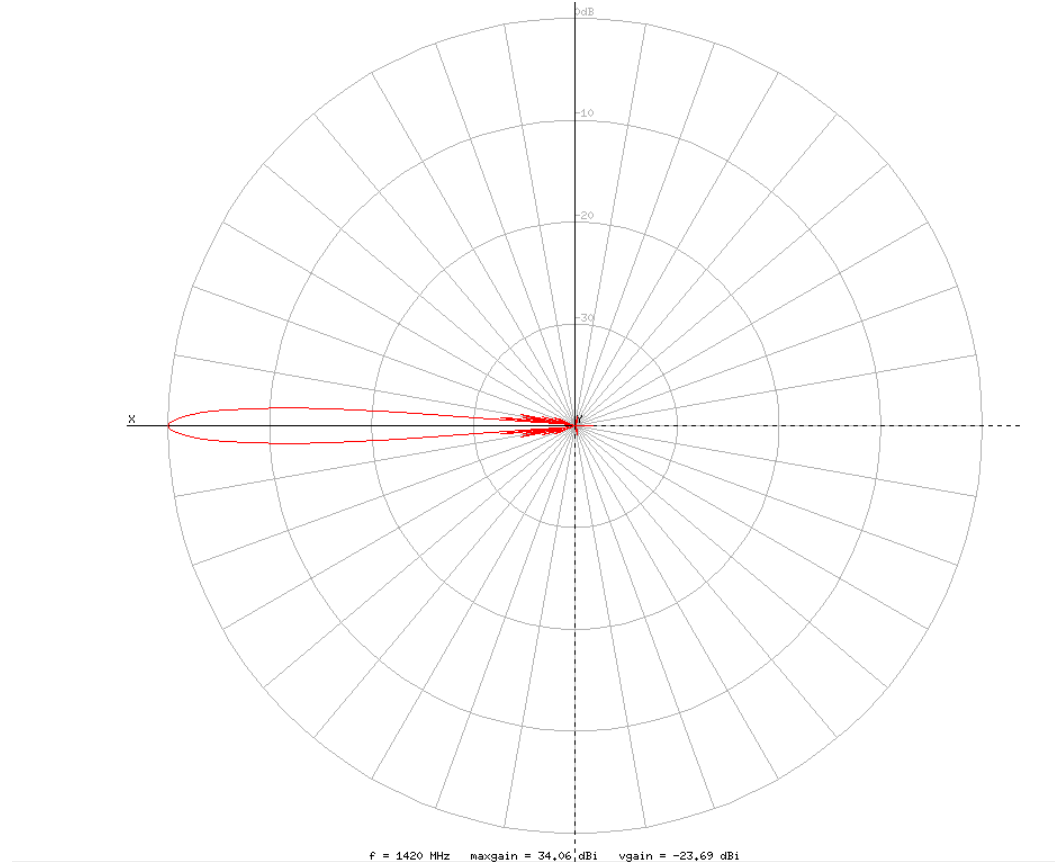
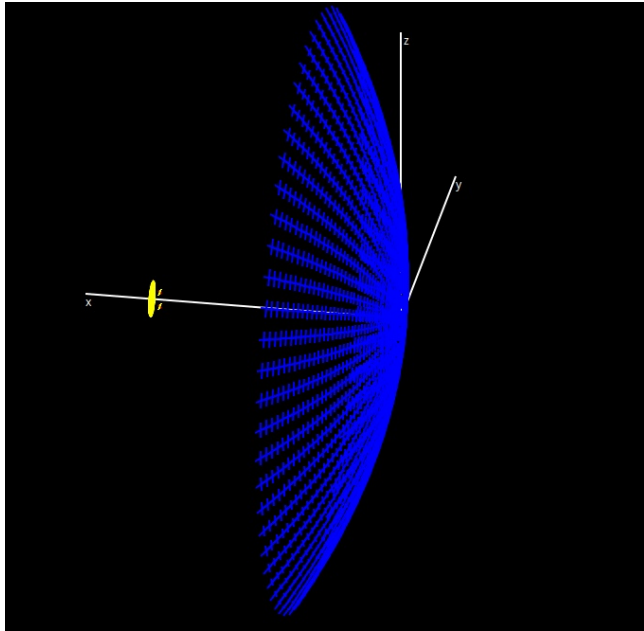
Freq 432 MHz
50cm Circular reflector with 5cm choke
40x60 SP patch elements in 4m dish
2440 SP/SC elements tot
1003 GW elements (feed+reflector)
Calc time ~5min



f - 432 MHz maxgain - 23.76 dBi vgain - -14.01 dBi

Gain +23.76dBi
F/B 26.9 dB

PARABOLIC ANTENNA RADIAL SP PATCH MODEL



Freq: 1420MHz
Dish diam: 4m
23cm Circular reflector, no choke
40x60 SP patch elements in dish
2501 SP/SC elements tot
1443 GW elements (feed+reflector)

Gain +34.06dBi
F/B 38.29 dB