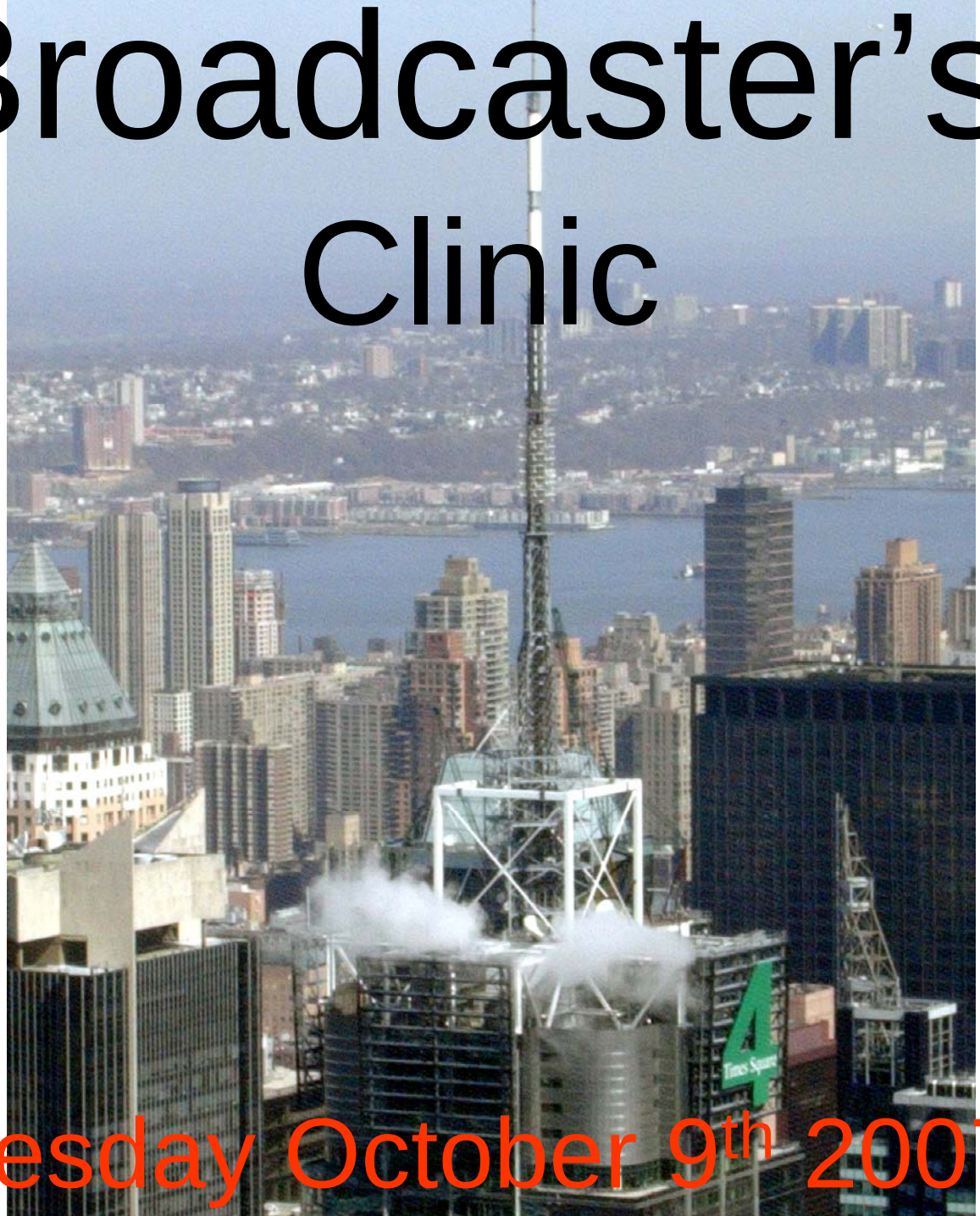
Broadcaster's Clinic

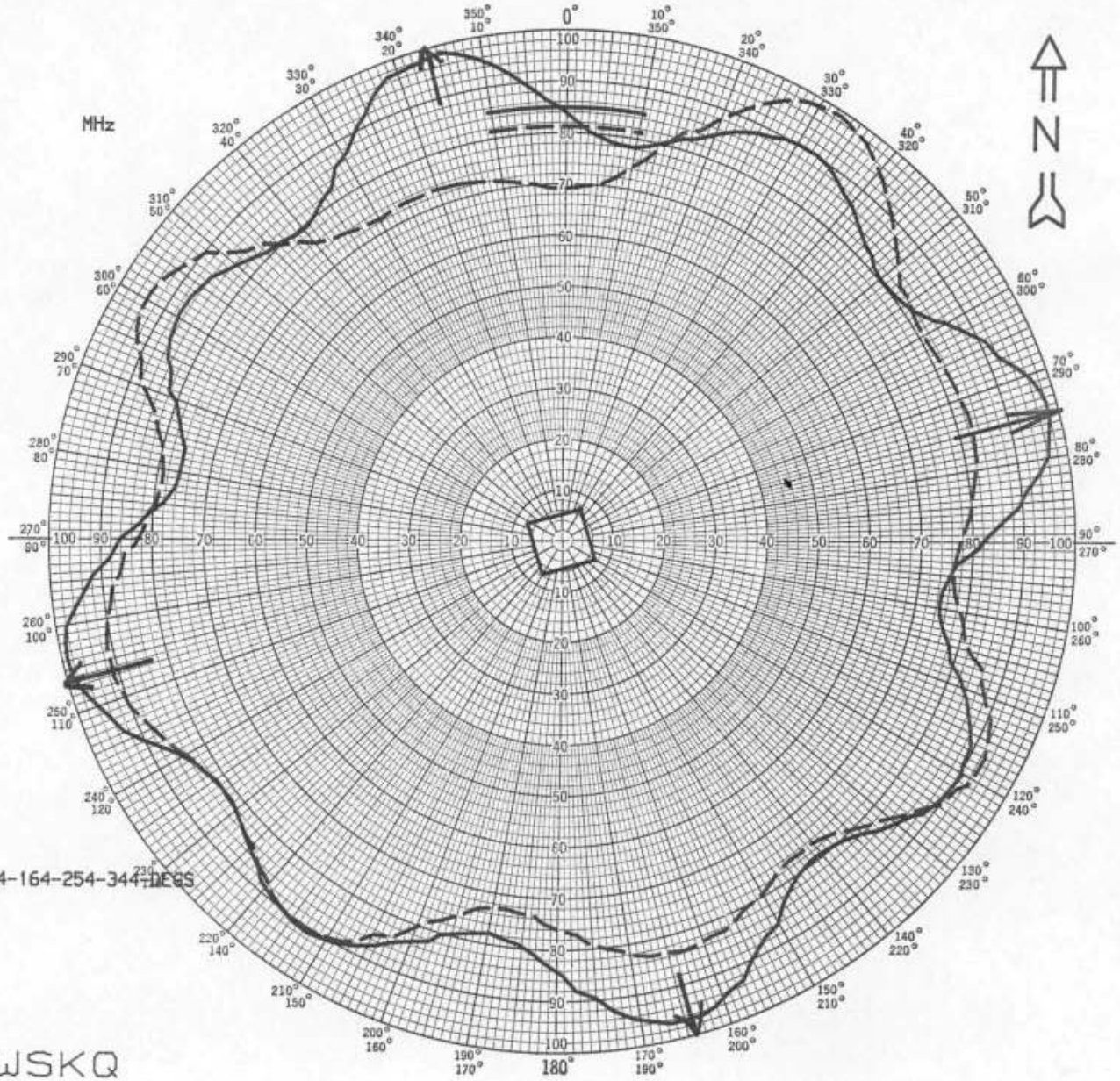


Tuesday October 9th 2007

Shively Labs

Shively Labs

DISC NO: 2288111H
DATE: 17 JULY 2003
SHOP ORDER: 22881
STATION: N/A
FREQ: 97.9/440.55 MHz
HV RATIO: 1
ANT TYPE: 6016-SPECIAL
TOWER: 5-FT SQ
MOUNT: PAN MT'S
MT REMK:
GRND STRAP: NO
'A' DIM: N/A IN



REMARKS: -

REMARKS: -

PLOT TYPE: RF

VERTICAL: — — — .
V RMS: 82.9

HORIZONTAL: ————
H RMS: 86.431

1ST LEG AZIMUTH 29-DEGS

<— = ANTENNA HEADING 74-164-254-344-DEGS

L = LADDER N/A

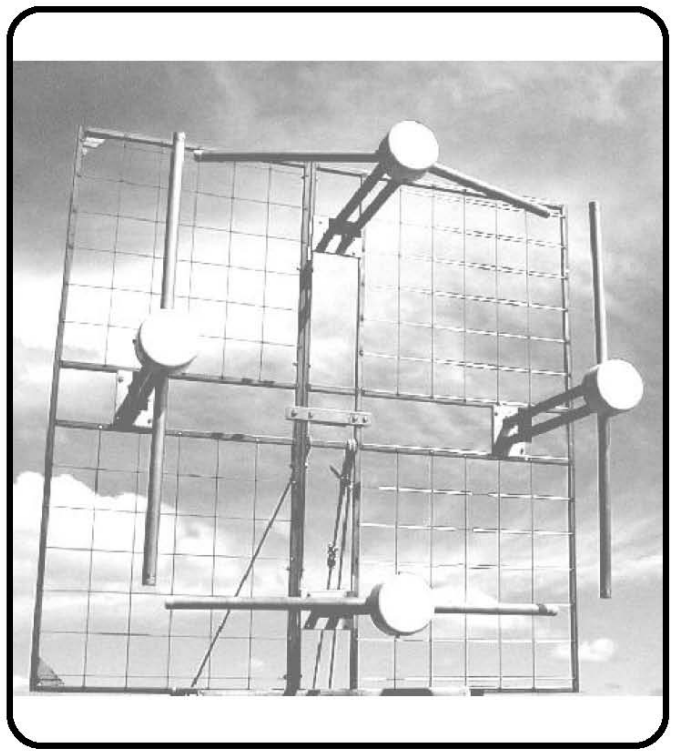
PATTERN NUMBER:

SHIVELY-12-WSKQ

Shively Labs®

FM Broadband Panel Broadcast Antenna

6016 Series

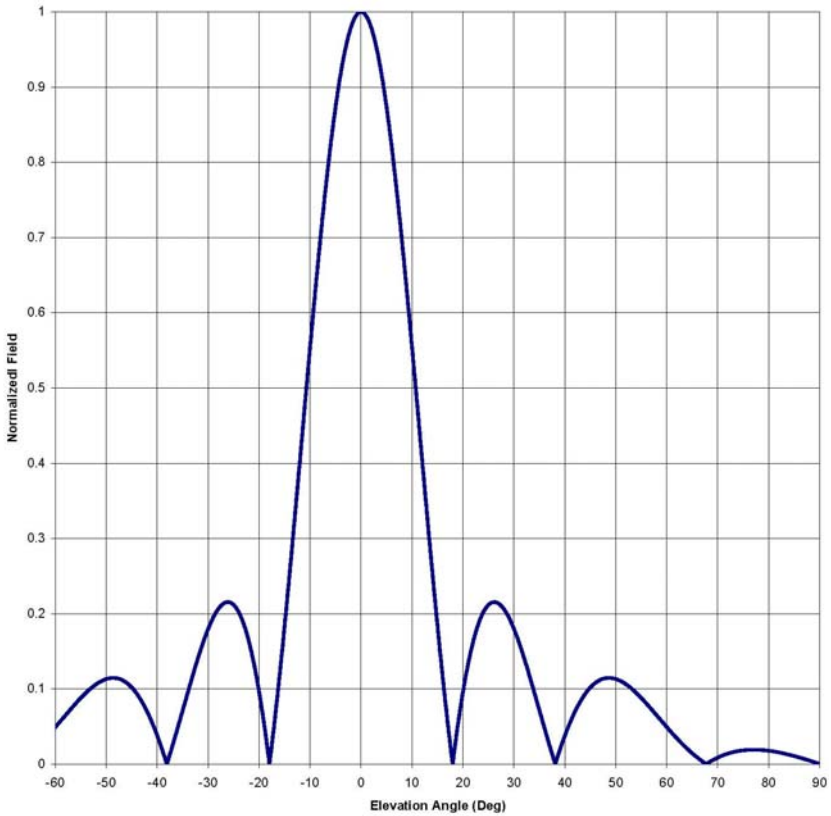


Instruction Manual
Installation, Operation, & Maintenance

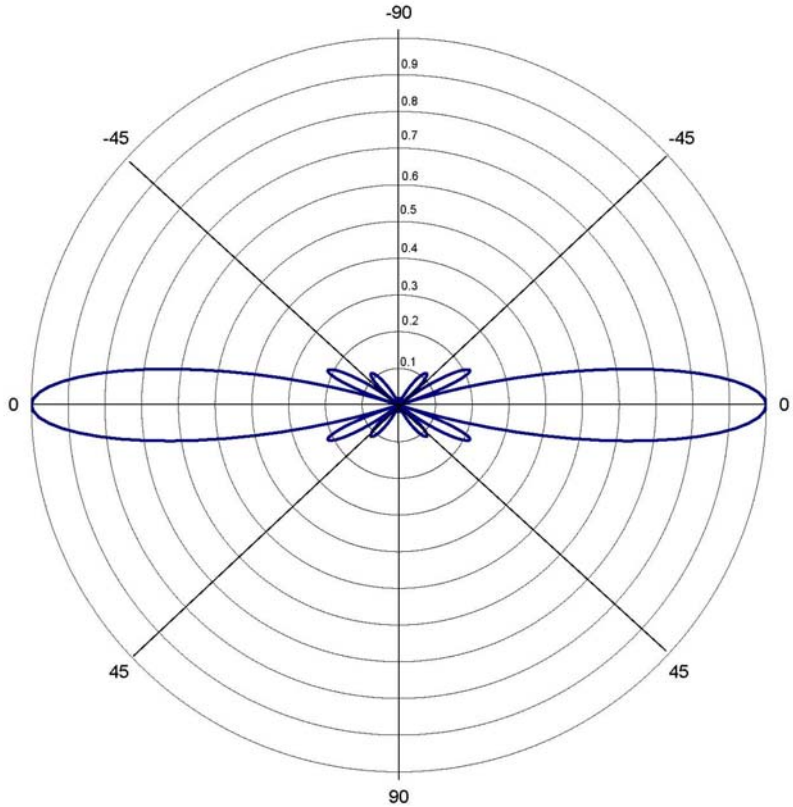
Antenna Mfg.: Shively Labs
Antenna Type: 6016-3/4
Station: 4 Times Square
Frequency: 98.1
Channel #: 251
Figure: 3

Date: 9/10/2007

Beam Tilt	0	
Gain (Max)	2.076	3.173 dB
Gain (Horizon)	2.076	3.173 dB



ANTENNA ELEVATION PATTERN



Polar Plot

Antenna Mfg: Shively Labs
Antenna Type: 6016-3/4
Station: 4 Times Square
Frequecy: 98.1
Channel: 251
Figure: 3

Date: 9/10/2007

Beam Tilt	0	
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Shively Labs

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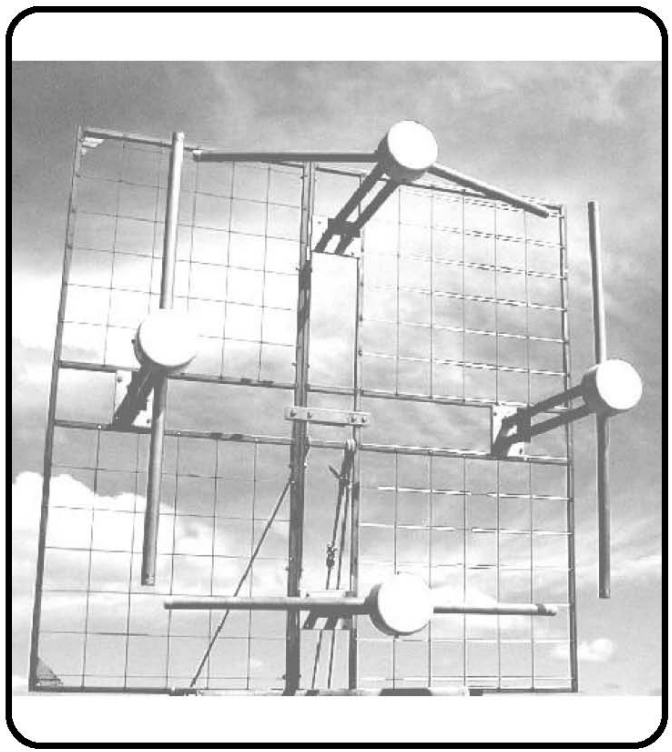
Shively Labs®

FM Broadband Panel Broadcast Antenna

6016 Series

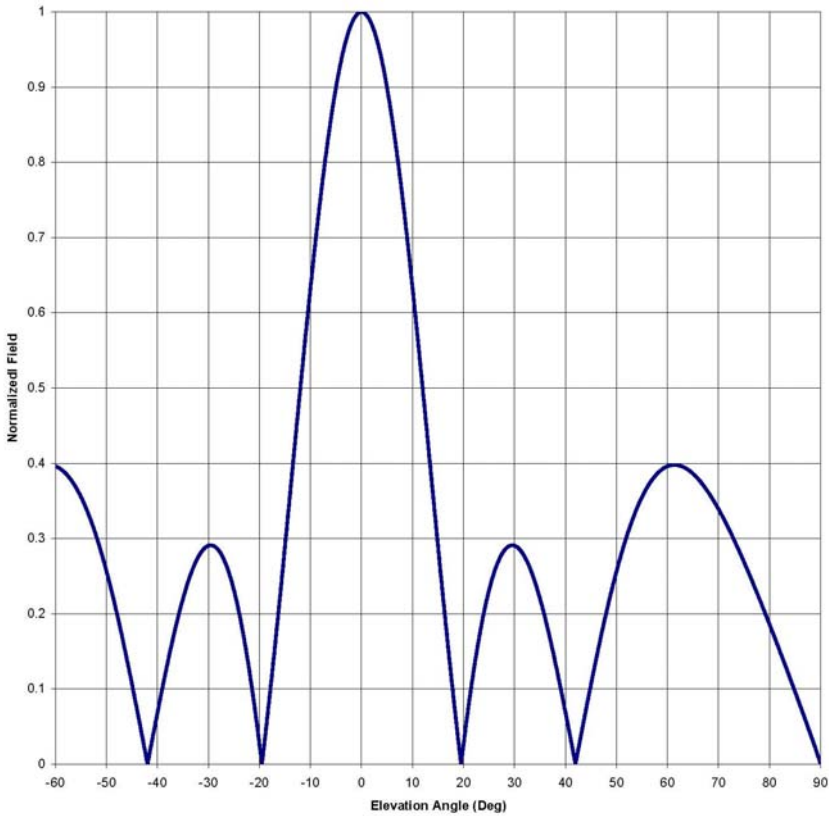


Instruction Manual
Installation, Operation, & Maintenance

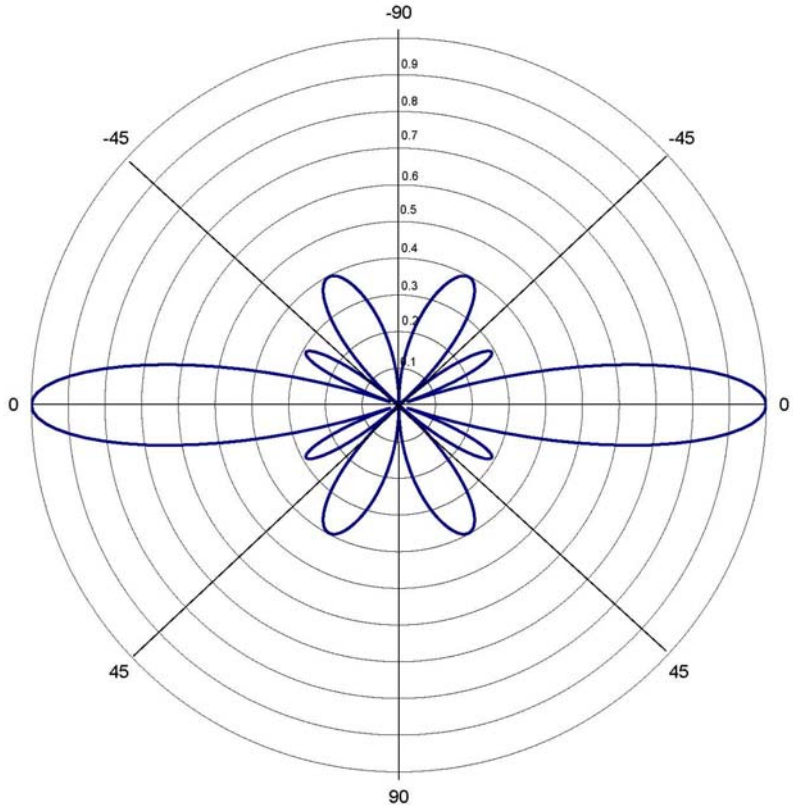
Antenna Mfg.: Shively Labs
Antenna Type: 6016-3/4
Station: 4 Times Square
Frequency: 98.1
Channel #: 251
Figure: Vertical

Date: 9/10/2007

Beam Tilt	0	
Gain (Max)	1.558	1.927 dB
Gain (Horizon)	1.558	1.927 dB



ANTENNA ELEVATION PATTERN



Polar Plot

Antenna Mfg: Shively Labs
Antenna Type: 6016-3/4
Station: 4 Times Square
Frequecy: 98.1
Channel: 251
Figure: Vertical

Date: 9/10/2007

Beam Tilt	0	
Gain (Max)	1.558	1.927 dB
Gain (Horizon)	1.558	1.927 dB

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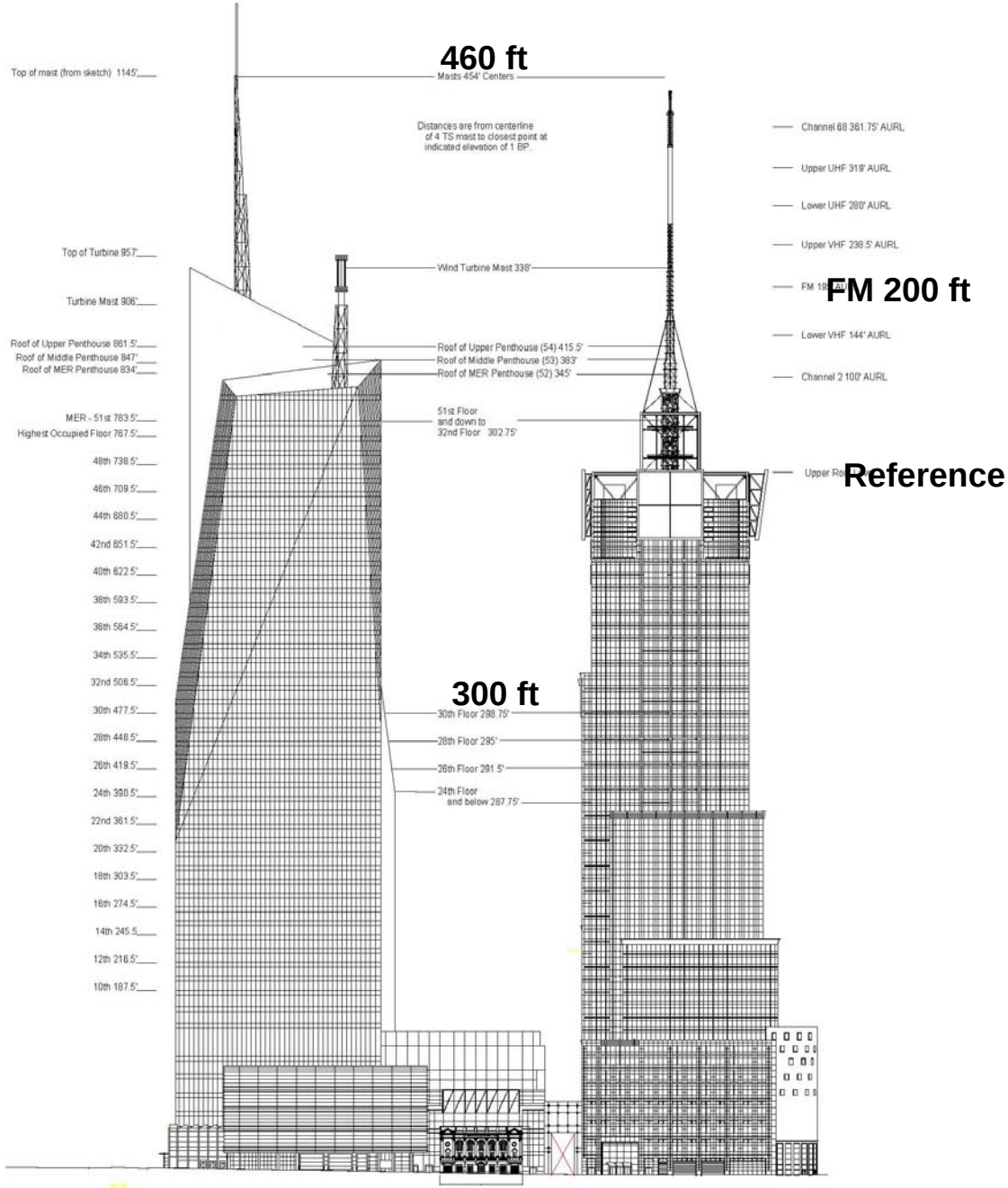
4
Times Square


4
Times Square

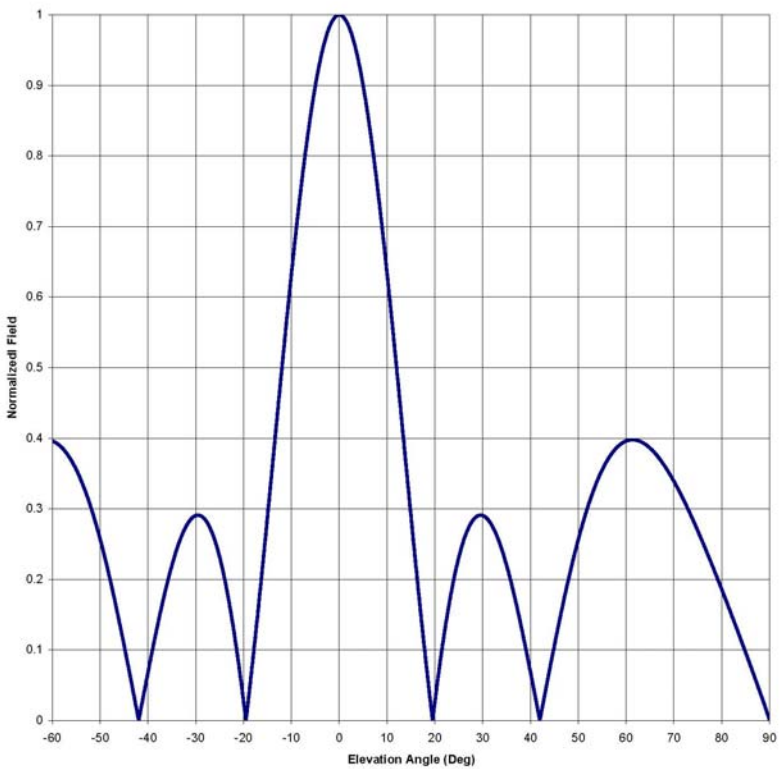

One Bryant Park 09/12/2007 16:12:40

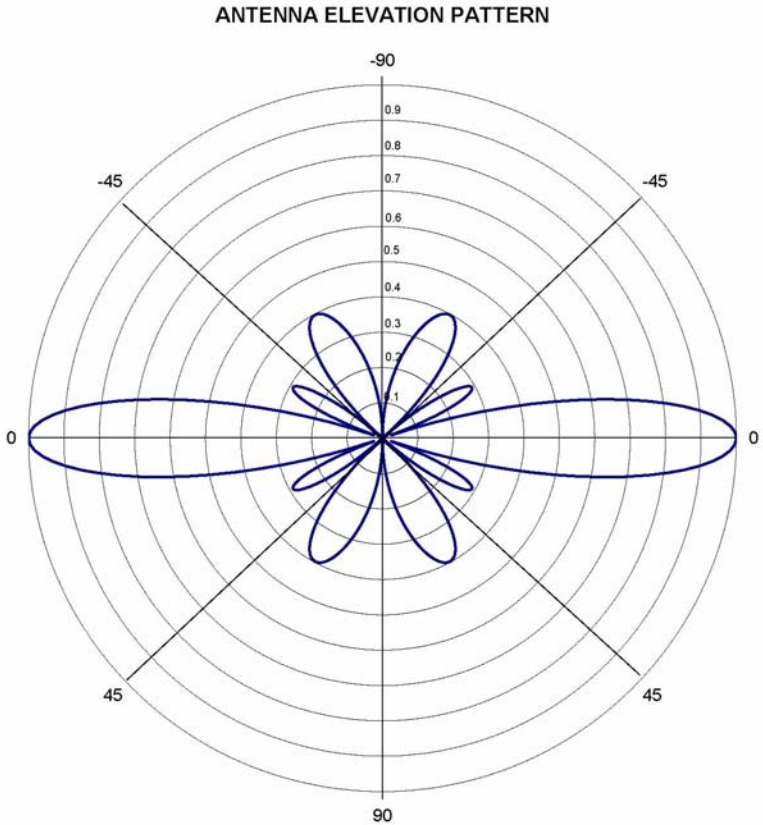

460 ft
Masts 454' Centers
Top of mast (from sketch) 1145'
Distances are from centerline of 4 TS mast to closest point at indicated elevation of 1 BP.
Channel 68 361.75' AURL
Upper UHF 319' AURL
Lower UHF 280' AURL
Upper VHF 239.5' AURL
FM 200 ft
Lower VHF 144' AURL
Channel 2 100' AURL
Reference
Top of Turbine 957'
Wind Turbine Mast 338'
Turbine Mast 906'
Roof of Upper Penthouse 861.5'
Roof of Middle Penthouse 847'
Roof of MER Penthouse 834'
Roof of Upper Penthouse (54) 415.5'
Roof of Middle Penthouse (53) 383'
Roof of MER Penthouse (52) 345'
MER - 51st 783.5'
Highest Occupied Floor 767.5'
51st Floor and down to 32nd Floor 302.75'
48th 738.5'
46th 709.5'
44th 680.5'
42nd 651.5'
40th 622.5'
38th 593.5'
36th 564.5'
34th 535.5'
32nd 506.5'
30th 477.5'
28th 448.5'
26th 419.5'
24th 390.5'
22nd 361.5'
20th 332.5'
18th 303.5'
16th 274.5'
14th 245.5
12th 216.5'
10th 187.5'
300 ft
30th Floor 298.75'
28th Floor 295'
26th Floor 291.5'
24th Floor and below 287.75'

Antenna Mfg.: Shively Labs
Antenna Type: 6016-3/4
Station: 4 Times Square
Frequency: 98.1
Channel #: 251
Figure: Vertical

Date: 9/10/2007

Beam Tilt	0	
Gain (Max)	1.558	1.927 dB
Gain (Horizon)	1.558	1.927 dB





Polar Plot

Antenna Mfg: Shively Labs
Antenna Type: 6016-3/4
Station: 4 Times Square
Frequecy: 98.1
Channel: 251
Figure: Vertical

Date: 9/10/2007

Beam Tilt	0	
Gain (Max)	1.558	1.927 dB
Gain (Horizon)	1.558	1.927 dB

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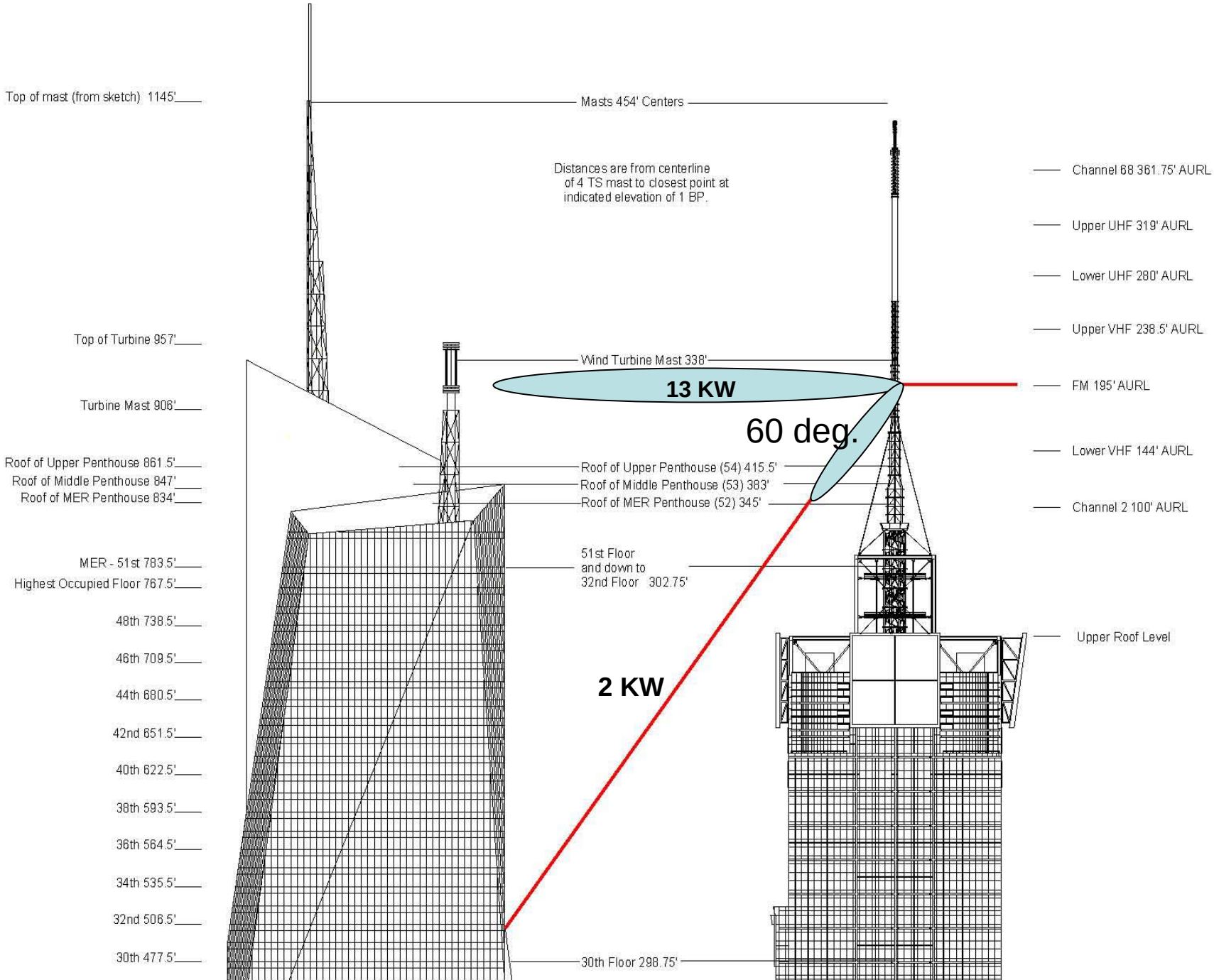
Height above reference / Tangent of depression Angle = distance out from antenna

200 ft / tan 60 degrees =115 ft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Lower UHF 280' AURL
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Top of Turbine 957'
Wind Turbine Mast 338'
13 KW
FM 195' AURL
Turbine Mast 906'
60 deg.
Lower VHF 144' AURL
Roof of Upper Penthouse 861.5'
Roof of Upper Penthouse (54) 415.5'
Roof of Middle Penthouse 847'
Roof of Middle Penthouse (53) 383'
Roof of MER Penthouse 834'
Roof of MER Penthouse (52) 345'
Channel 2 100' AURL
MER - 51st 783.5'
51st Floor and down to 32nd Floor 302.75'
Highest Occupied Floor 767.5'
48th 738.5'
Upper Roof Level
46th 709.5'
2 KW
44th 680.5'
42nd 651.5'
40th 622.5'
38th 593.5'
36th 564.5'
34th 535.5'
32nd 506.5'
30th 477.5'
30th Floor 298.75'

Antenna Mfg.: Shively Labs
Antenna Type: 6016-3/4
Station: 4 Times Square
Frequency: 98.1
Channel #: 251
Figure: Vertical

Date: 9/10/2007

Beam Tilt	0	
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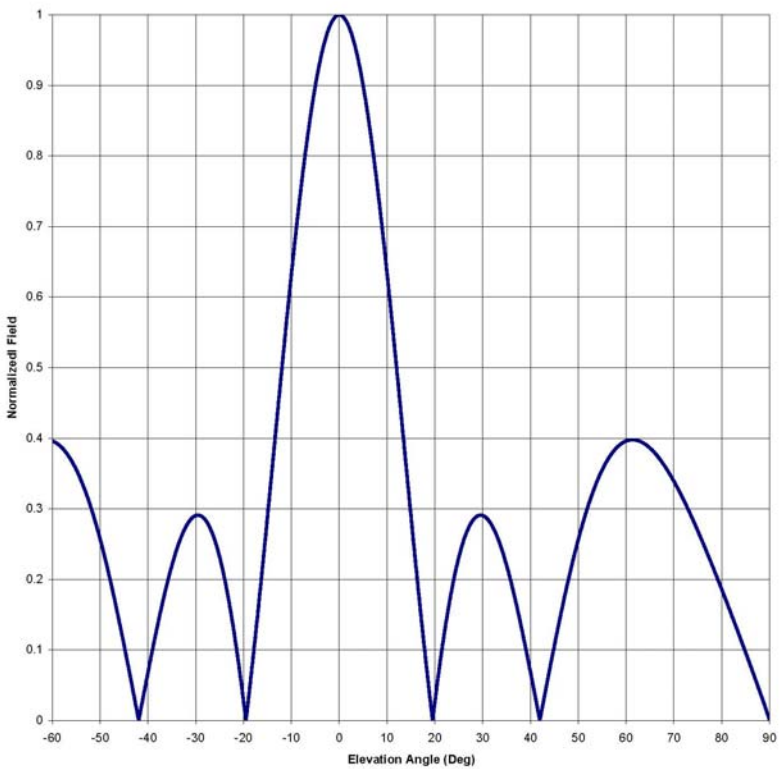

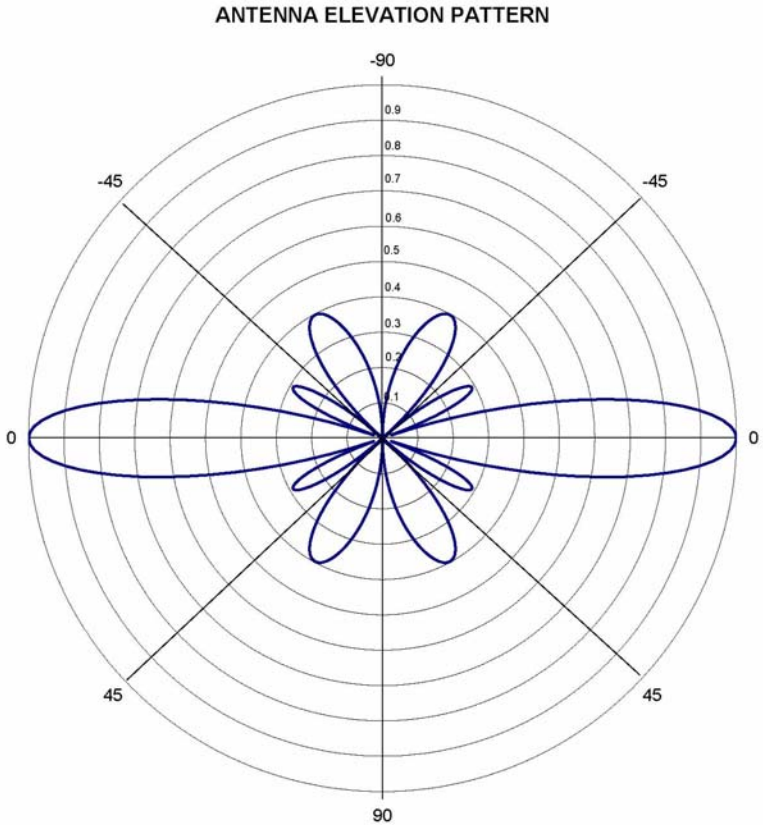

Full wave spaced antennas

60 degrees / No. of bays = angle of 1st null

200 ft / tan 20 degrees =550 ft

Polar Plot

Antenna Mfg: Shively Labs
Antenna Type: 6016-3/4
Station: 4 Times Square
Frequecy: 98.1
Channel: 251
Figure: Vertical

Date: 9/10/2007

Beam Tilt	0	
Gain (Max)	1.558	1.927 dB
Gain (Horizon)	1.558	1.927 dB

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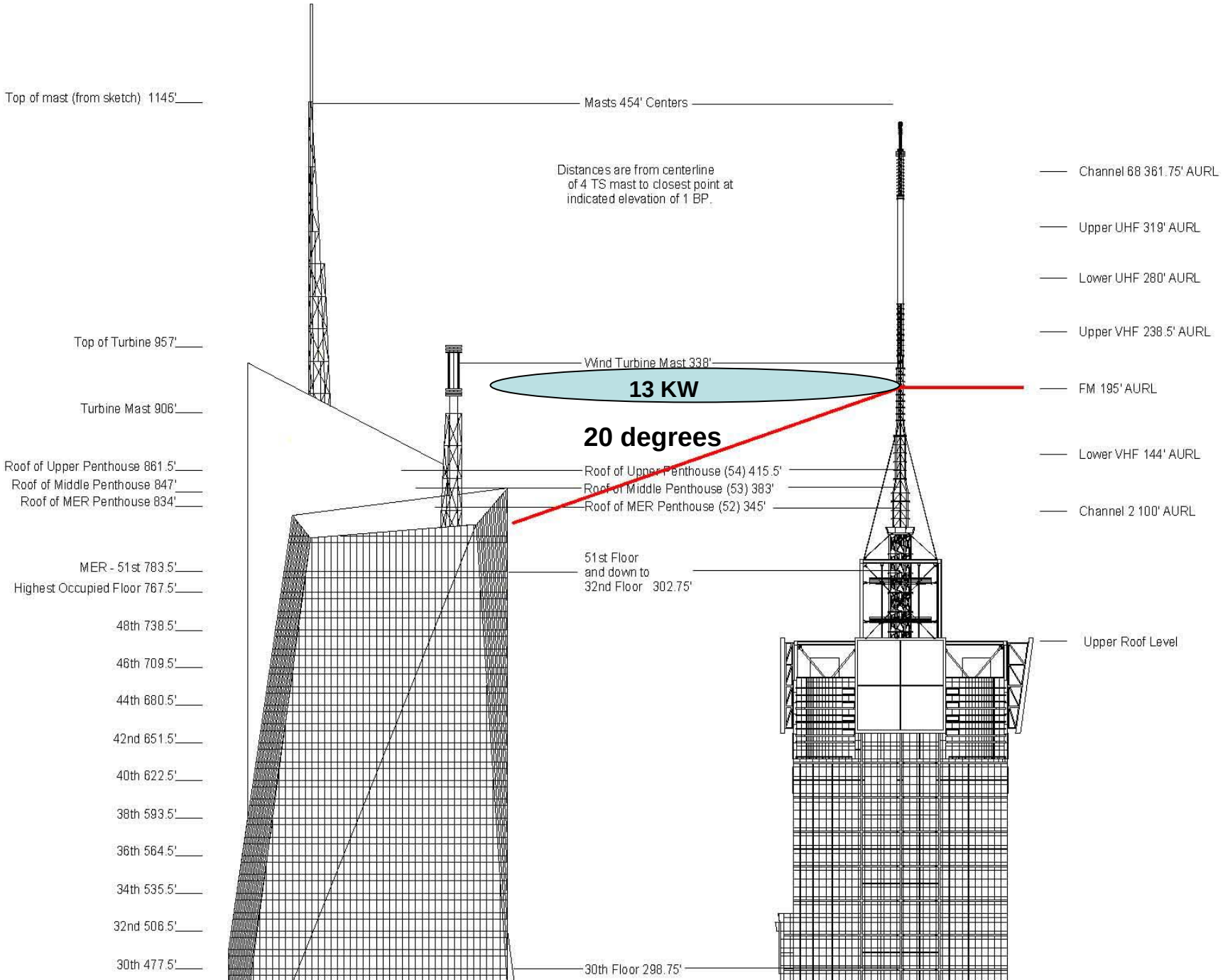
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Masts 454' Centers
Distances are from centerline
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Channel 68 361.75' AURL
Upper UHF 319' AURL
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Top of Turbine 957'
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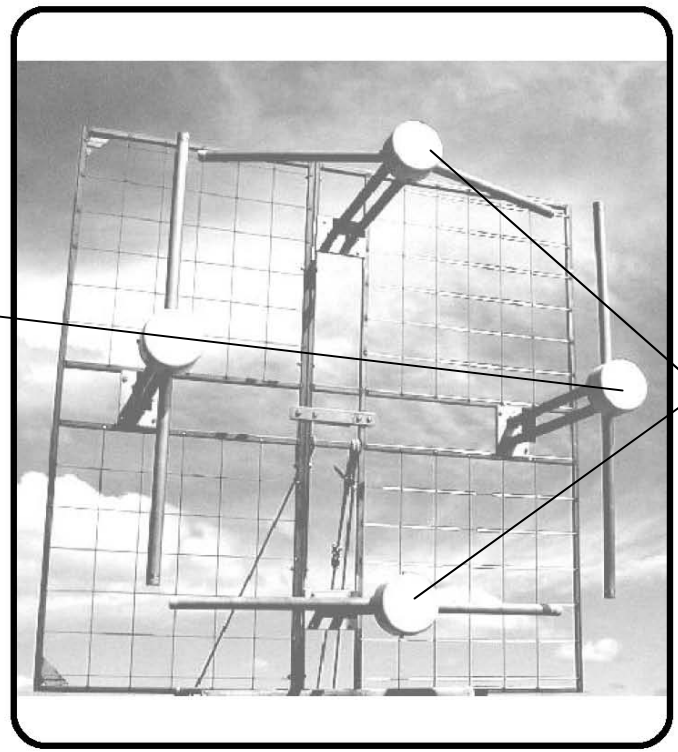
FM 195' AURL
Turbine Mast 906'
20 degrees
Lower VHF 144' AURL
Roof of Upper Penthouse 861.5'
Roof of Middle Penthouse 847'
Roof of MER Penthouse 834'
Roof of Upper Penthouse (54) 415.5'
Roof of Middle Penthouse (53) 383'
Roof of MER Penthouse (52) 345'
Channel 2 100' AURL
MER - 51st 783.5'
Highest Occupied Floor 767.5'
51st Floor
and down to
32nd Floor 302.75'
48th 738.5'
Upper Roof Level
46th 709.5'
44th 680.5'
42nd 651.5'
40th 622.5'
38th 593.5'
36th 564.5'
34th 535.5'
32nd 506.5'
30th 477.5'
30th Floor 298.75'

Shively Labs®

FM Broadband Panel Broadcast Antenna

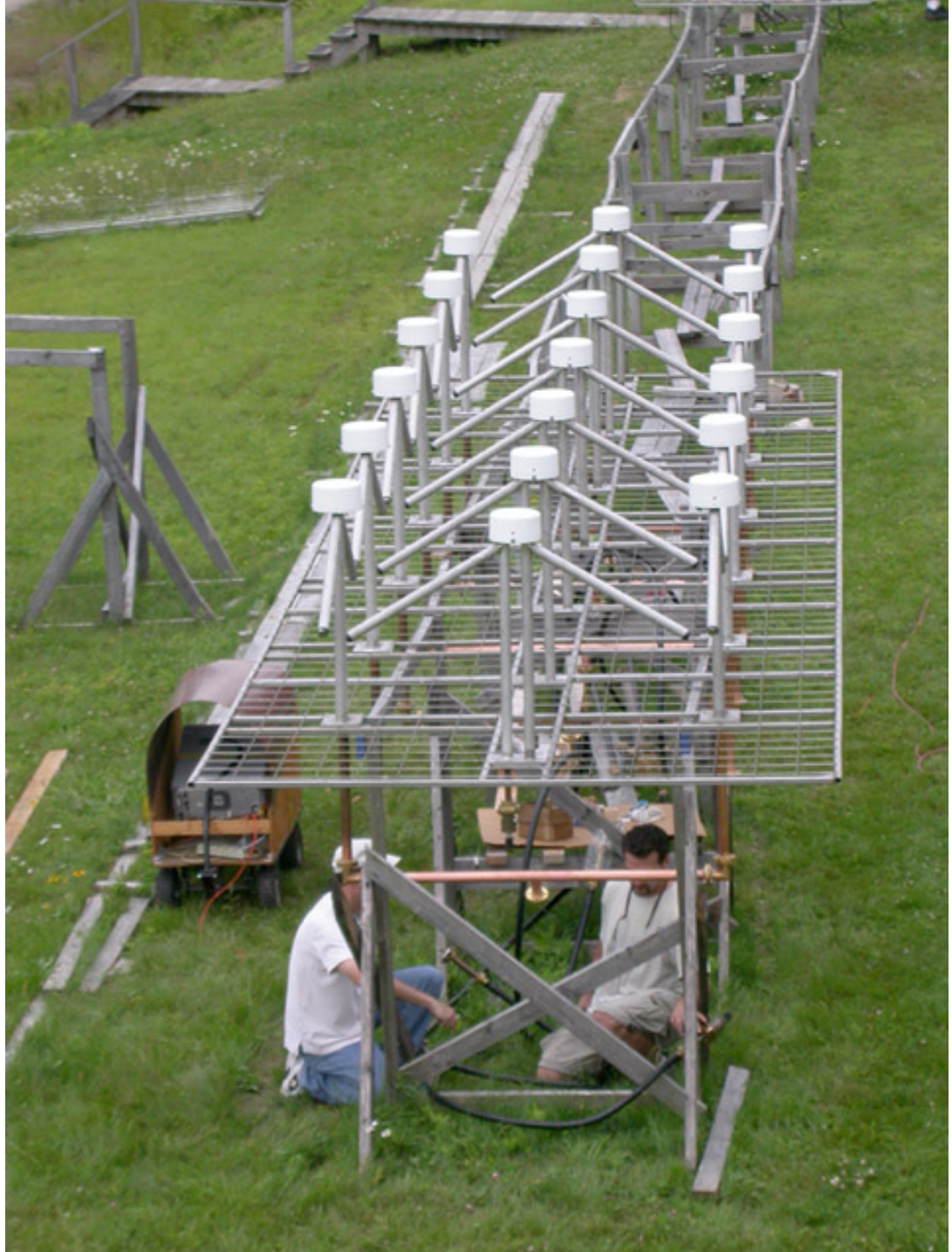
6016 Series

Full Wave Vertical Dipoles



1/2 Wave Horizontal Dipoles

Instruction Manual
Installation, Operation, & Maintenance



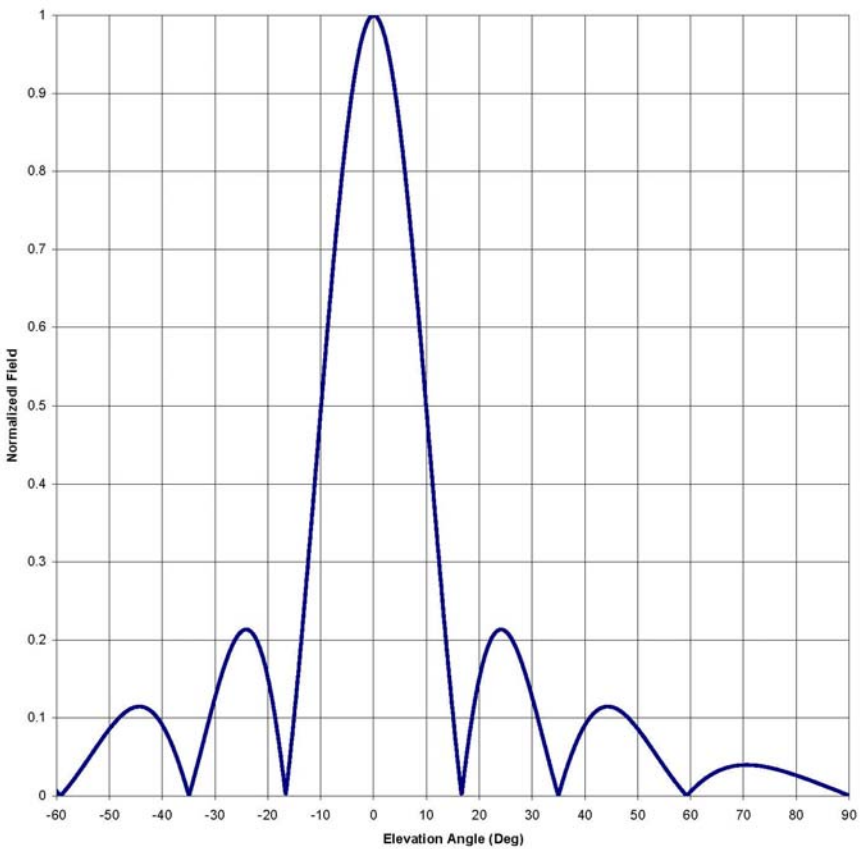
Shively Labs

Shively Labs

Antenna Mfg.: Shively Labs
Antenna Type: 6016-3/4-Special
Station: 4 Times Square
Frequency: 98.1
Channel #: 251
Figure: Horizontal Polarization

Date: 9/7/2007

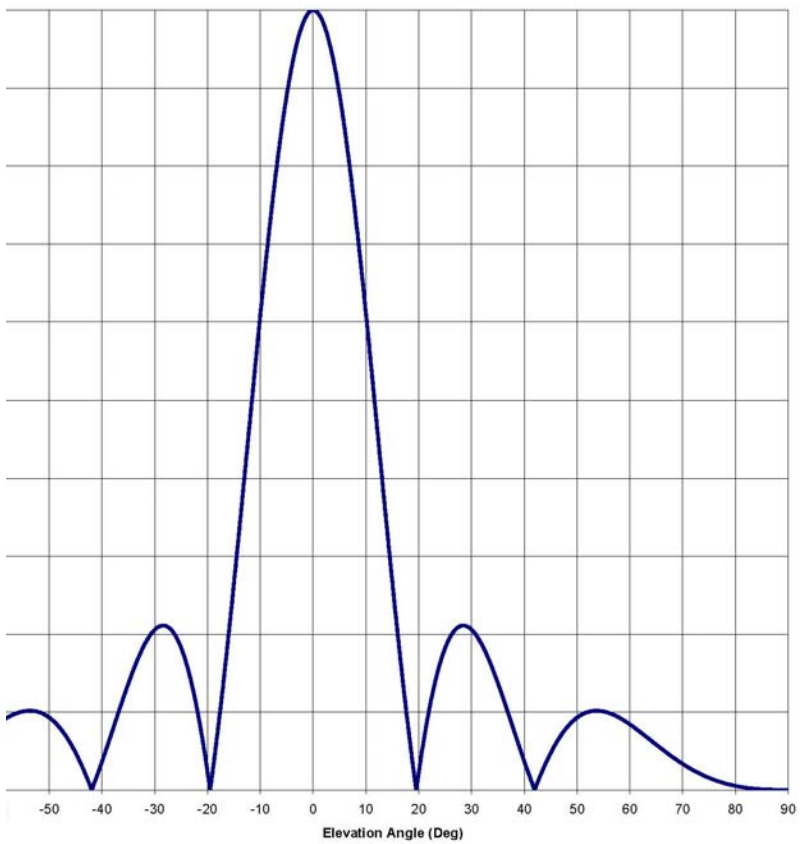
Beam Tilt	0	
Gain (Max)	2.231	3.484 dB
Gain (Horizon)	2.231	3.484 dB



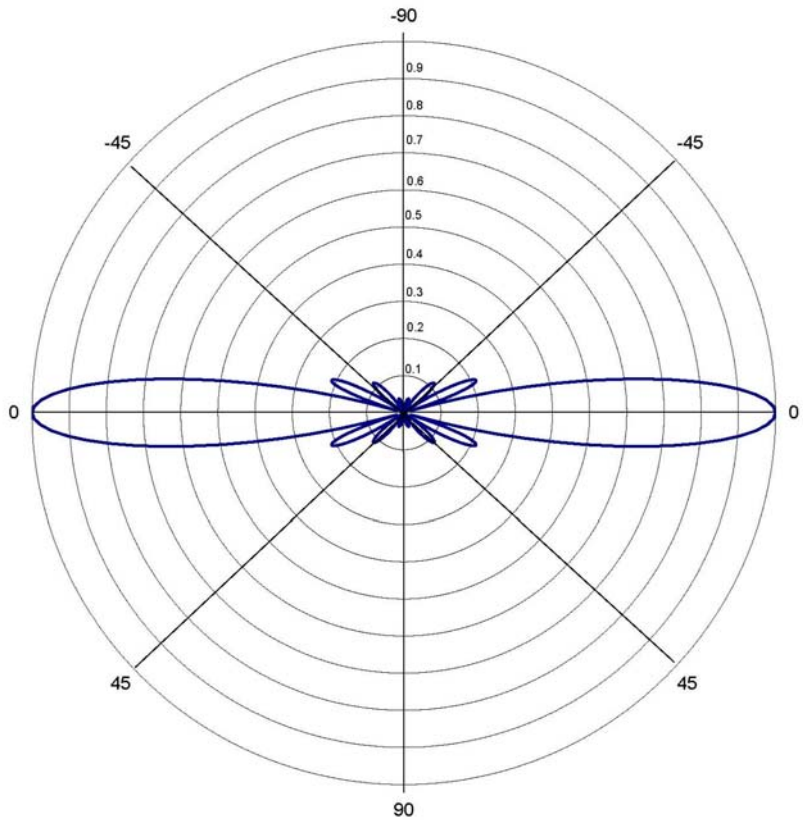
Antenna Mfg.: Shively Labs
Antenna Type: 6016-3/4-Special
Station: 4 Times Square
Frequency: 98.1
Channel #: 251
Figure: Vertical Polarization

Date: 9/5/2007

Beam Tilt	0	
Gain (Max)	1.925	2.843 dB
Gain (Horizon)	1.925	2.843 dB



ANTENNA ELEVATION PATTERN



Polar Plot

Antenna Mfg: Shively Labs
Antenna Type: 6016-3/4-Special
Station: 4 Times Square
Frequecy: 98.1
Channel: 251
Figure: Horizontal Polari

Date: 9/5/2007

Beam Tilt	0	
Gain (Max)	2.231	3.484 dB
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Shively Labs

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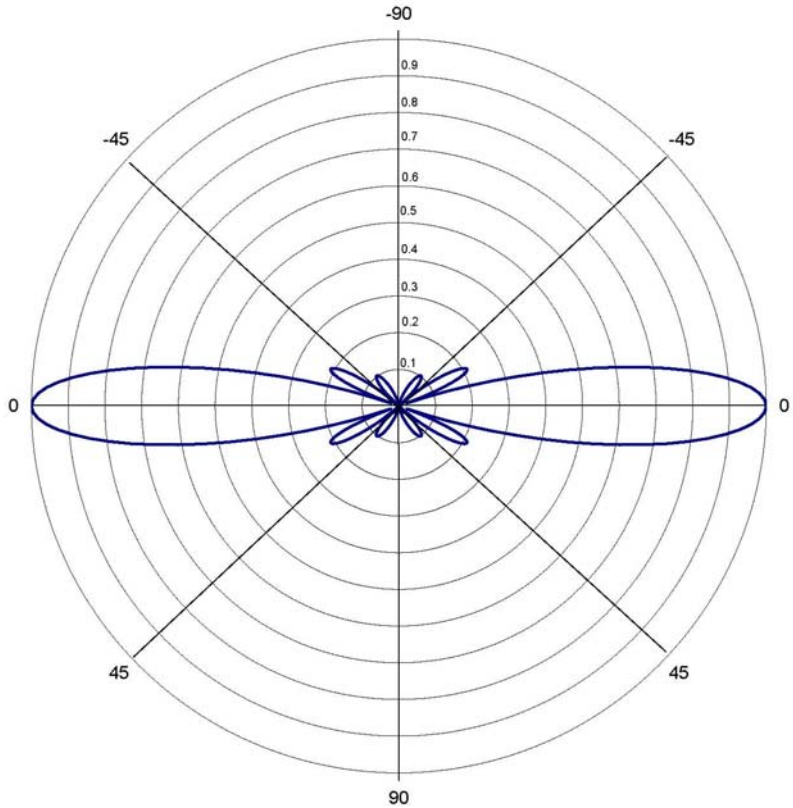
ANTENNA ELEVATION PATTERN



Polar Plot

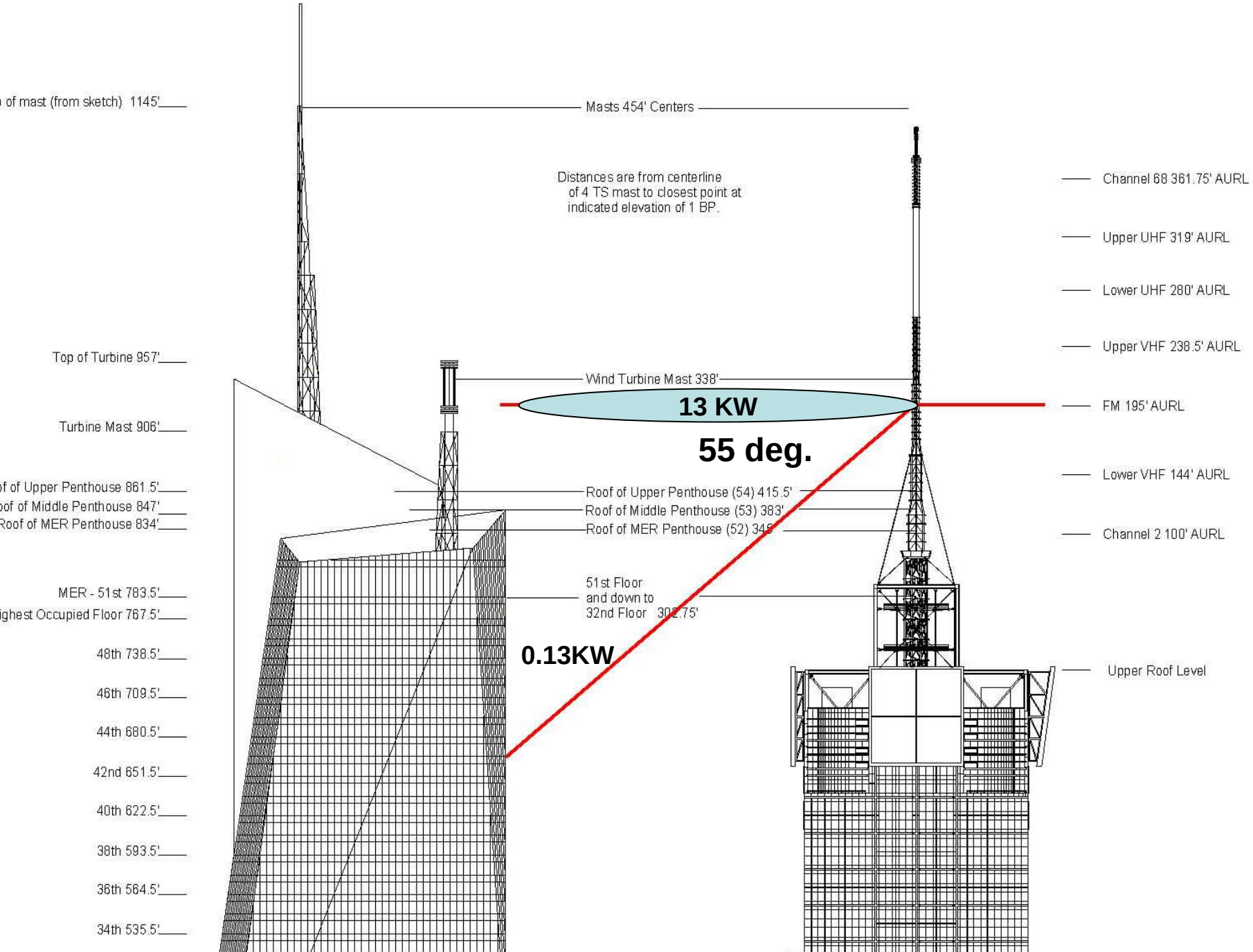
Antenna Mfg: Shively Labs
Antenna Type: 6016-3/4-Special
Station: 4 Times Square
Frequecy: 98.1
Channel: 251
Figure: Vertical Polarizati

Date: 9/7/2007

Beam Tilt	0	
Gain (Max)	1.925	2.843 dB
Gain (Horizon)	1.925	2.843 dB

Shively Labs

A Division of Howell Laboratories Bridgton, ME 207-647-3327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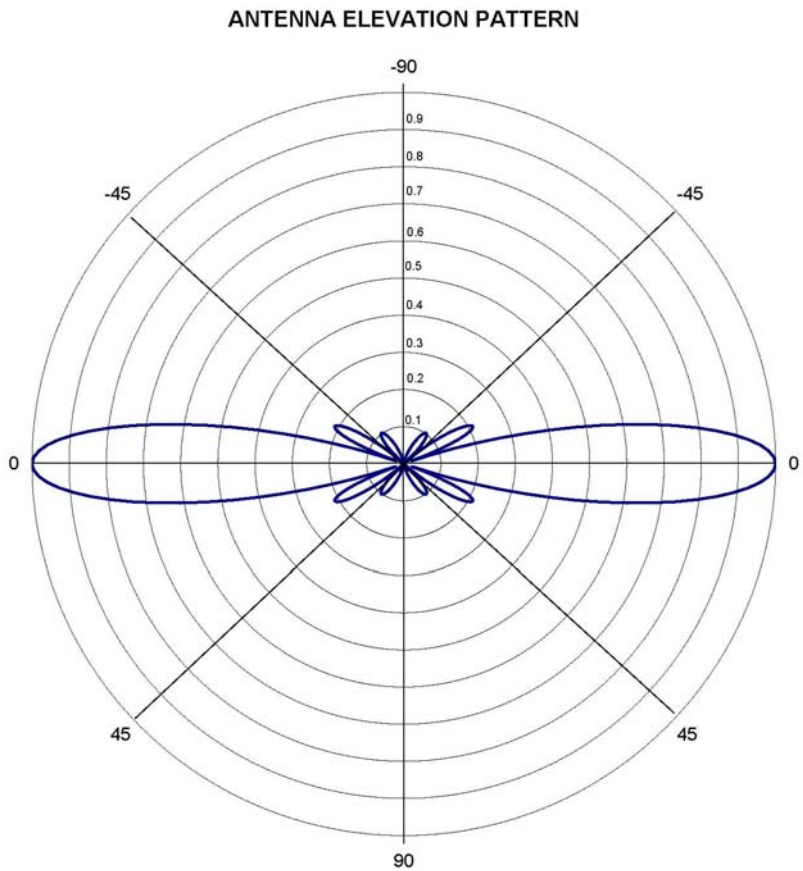
Questions



Polar Plot

Antenna Mfg: Shively Labs
Antenna Type: 6016-3/4-Special
Station: 4 Times Square
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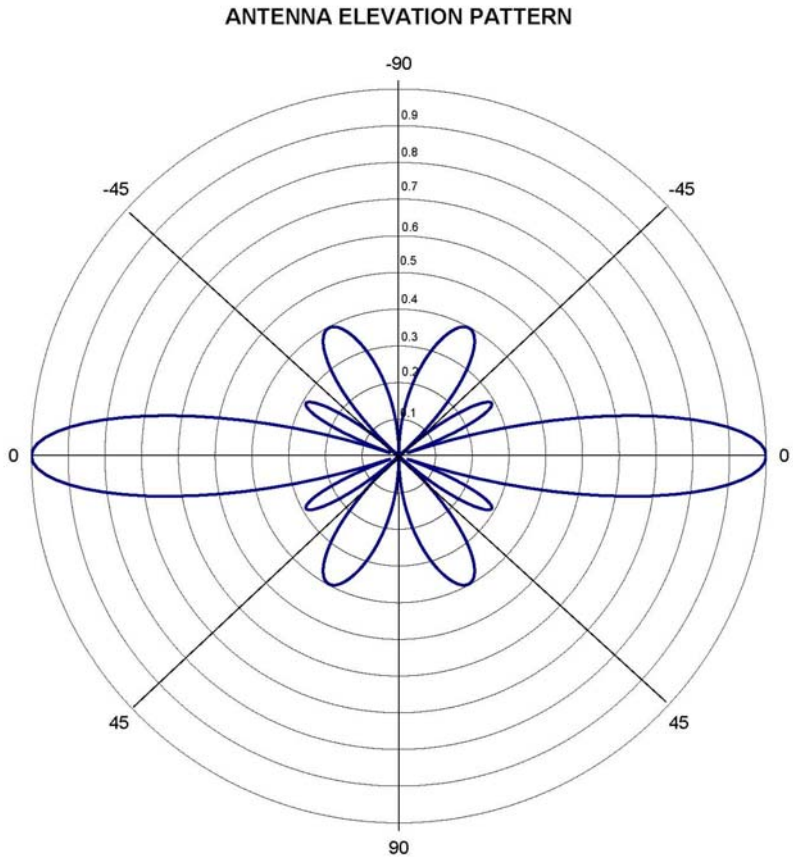


Polar Plot

Antenna Mfg: Shively Labs
Antenna Type: 6016-3/4
Station: 4 Times Square
Frequecy: 98.1
Channel: 251
Figure: Vertical

Date: 9/10/2007

Beam Tilt	0	
Gain (Max)	1.558	1.927 dB
Gain (Horizon)	1.558	1.927 dB

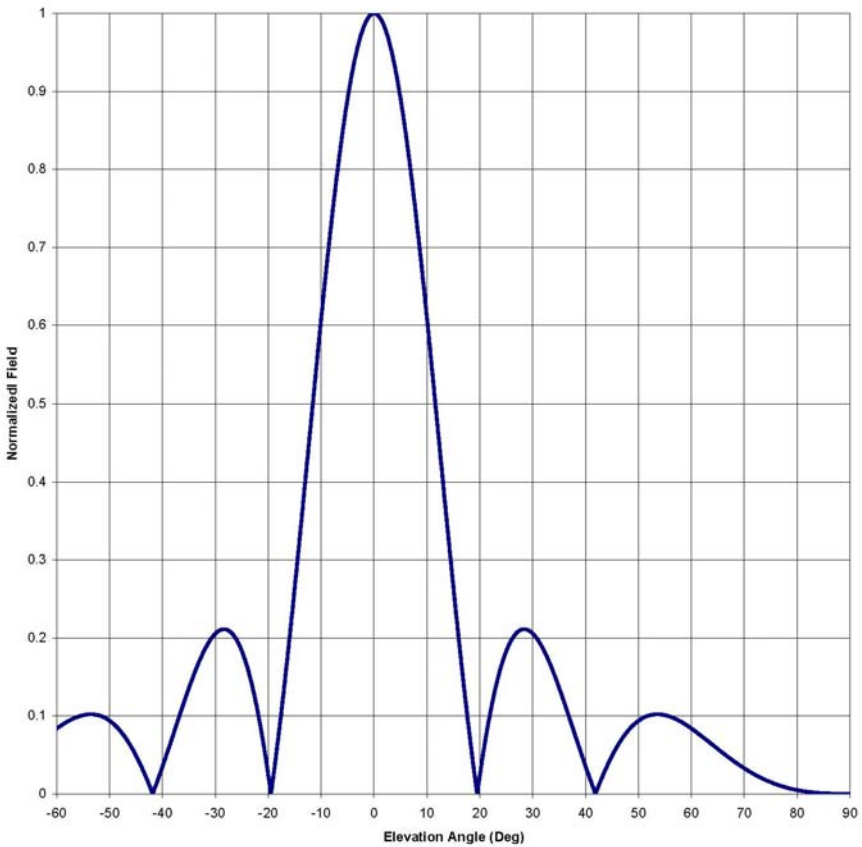
Shively Labs

A Division of Howell Laboratories Bridgton, ME 207-647-3327

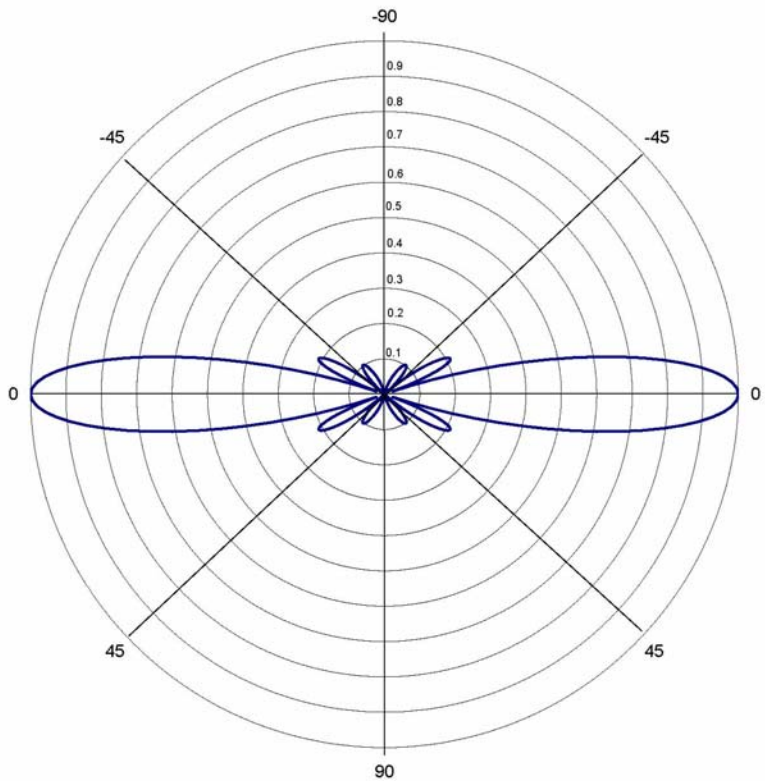
Antenna Mfg.: Shively Labs
Antenna Type: 6810-6-0.5
Station: WFUV
Frequency: 90.7
Channel #: 214
Figure: 0

Date: 9/7/2007

Beam Tilt	0	
Gain (Max)	1.927	2.850 dB
Gain (Horizon)	1.927	2.850 dB



ANTENNA ELEVATION PATTERN



Polar Plot

Antenna Mfg: Shively Labs
Antenna Type: 6810-6-0.5
Station: WFUV
Frequecy: 90.7
Channel: 214
Figure: 3

Date: 9/5/2007

Beam Tilt	0	
Gain (Max)	1.927	2.850 dB
Gain (Horizon)	1.927	2.850 dB

Shively Labs

A Division of Howell Laboratories Bridgton, ME 207-647-3327

Pascal's Triangle

1
1 1
1 2 1
1 3 3 1
1 4 6 4 1
1 5 10 10 5 1
1 6 15 20 15 6 1
1 7 21 35 35 21 7 1
1 8 28 56 70 56 28 8 1
1 9 36 84 126 126 84 36 9 1

Binomial progression for 6 bay antenna

1 5 10 10 5 1

Normalize to 1

0.1 0.5 1.0 1.0 0.5 0.1

User specified data is entered only in yellow highlighted cells

Antenna Manufacturer	Shively Labs
Antenna Type	6810-6-0.5
Station	WFUV
Frequency (MHz)	90.7
Channel #	214
Wavelength (in)	130.1
Number of Bays	6
Bay Spacing (in)	65
Beam Tilt Angle (Deg)	0
Center (1) or End (0) Fed	1
End Bay Line Length Delta (in)	0
Tee Offset Length for Center Fed (in)	0
Computed (0) or Custom (1) Excitation	1
Figure	3

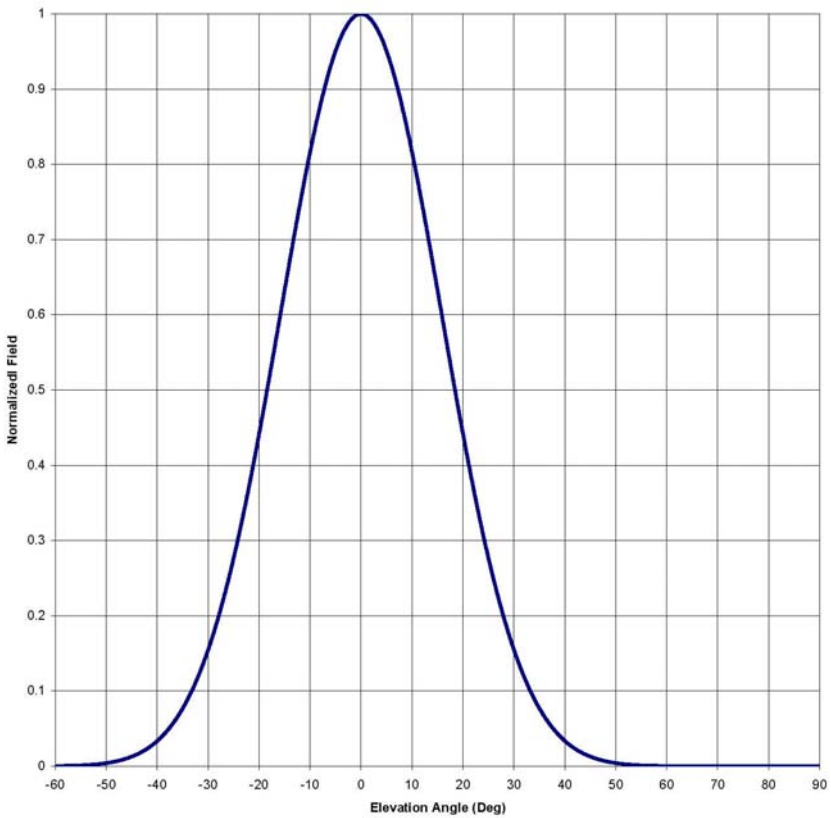
Total Gain	1.238
Azimuth Gain	1
Computed Elevation Gain	1.238

Computed Array Excitation			Custom Excitation			
Bay #	Bay Amp.	Bay Phase (Deg)	Bay Amp.	Bay Phase (Deg)	Phase for Null Fill	Phase for Beam Tilt
1	0.1	0.00	0.1	0.00	0.00	0.00
2	0.5	0.00	0.5	0.00	0.00	0.00
3	1	0.00	1	0.00	0.00	0.00
4	1	0.00	1	0.00	0.00	0.00
5	0.5	0.00	0.5	0.00	0.00	0.00
6	0.1	0.00	0.1	0.00	0.00	0.00

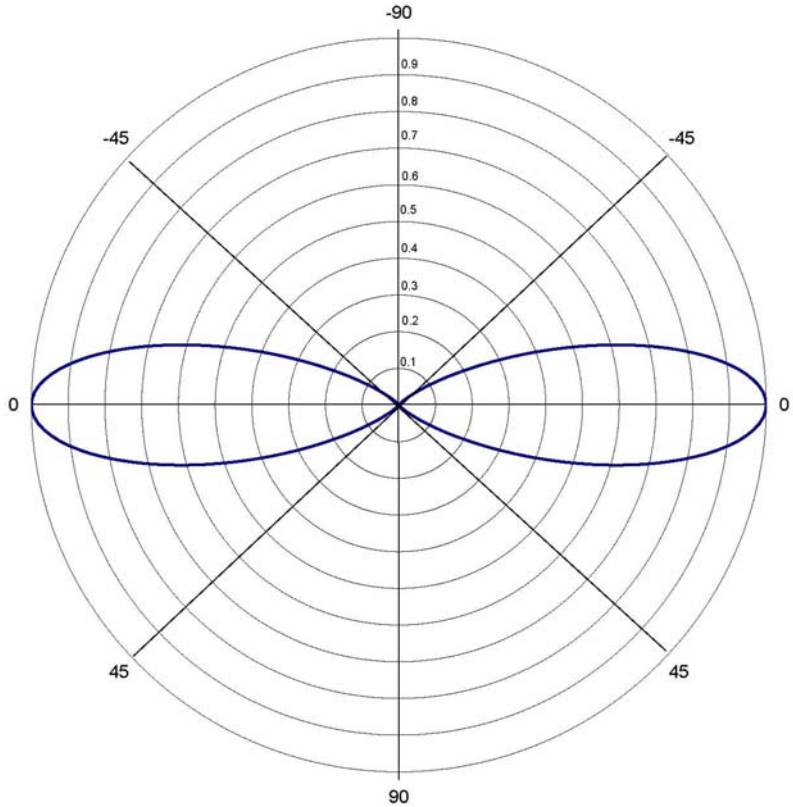
Antenna Mfg.: Shively Labs
Antenna Type: 6810-6-0.5
Station: WFUV
Frequency: 90.7
Channel #: 214
Figure: 3

Date: 9/7/2007

Beam Tilt	0	
Gain (Max)	1.238	0.927 dB
Gain (Horizon)	1.238	0.927 dB



ANTENNA ELEVATION PATTERN



Polar Plot

Antenna Mfg: Shively Labs
Antenna Type: 6810-6-0.5
Station: WFUV
Frequecy: 90.7
Channel: 214
Figure: 3

Date: 9/5/2007

Beam Tilt	0	
Gain (Max)	1.238	0.927 dB
Gain (Horizon)	1.238	0.927 dB

Shively Labs

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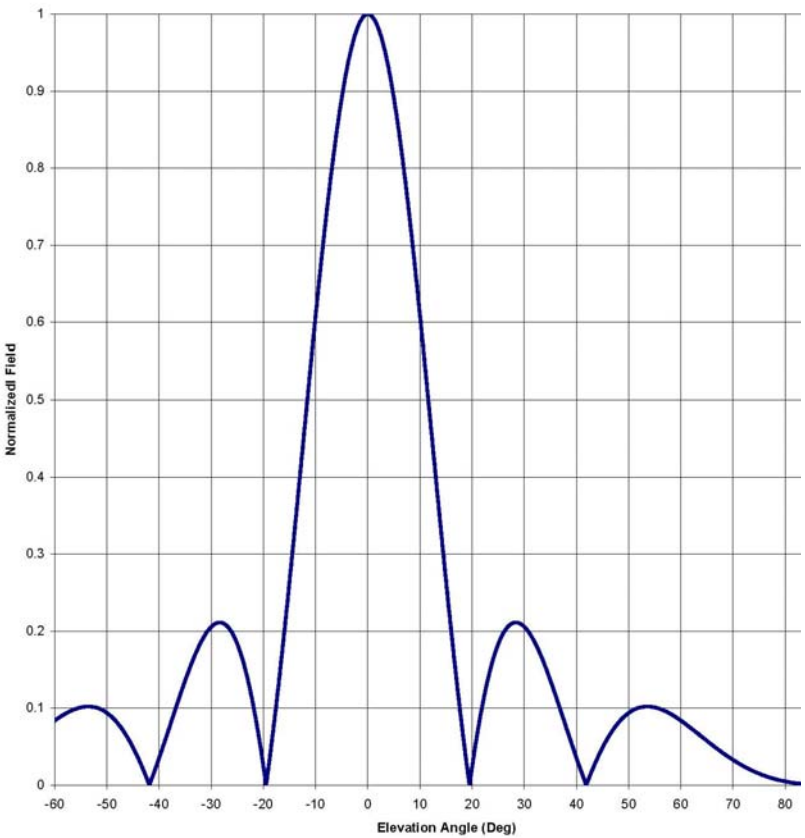
Antenna Mfg.: Shively Labs
Antenna Type: 6810-6-0.5
Station: WFUV
Frequency: 90.7
Channel #: 214
Figure: 0

Date: 9/7/2007

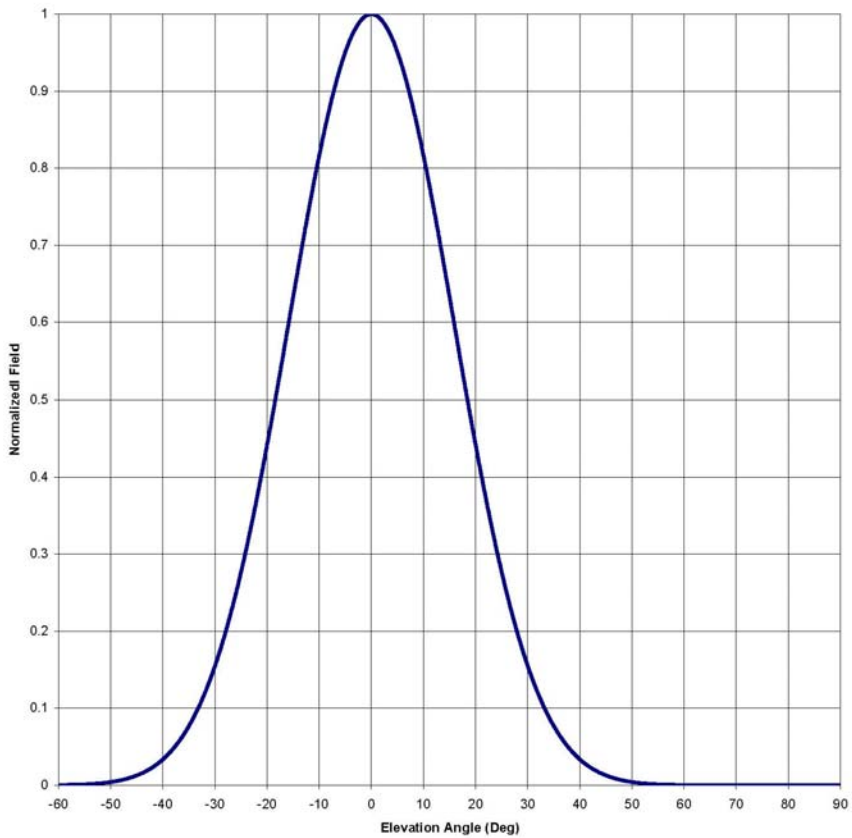
Beam Tilt	0	
Gain (Max)	1.927	2.850 dB
Gain (Horizon)	1.927	2.850 dB



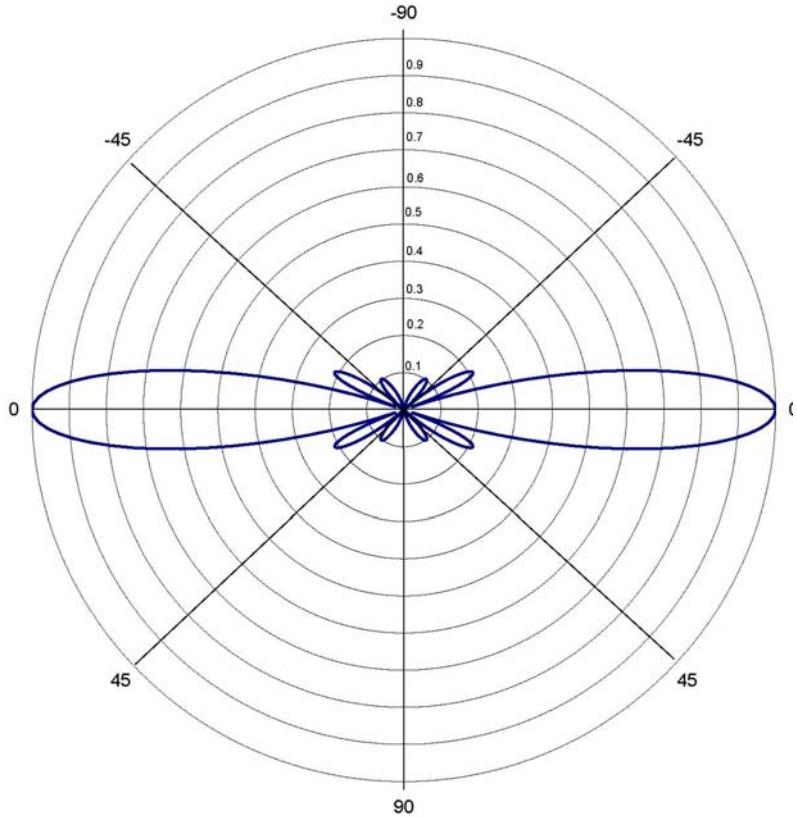
Antenna Mfg.: Shively Labs
Antenna Type: 6810-6-0.5
Station: WFUV
Frequency: 90.7
Channel #: 214
Figure: 3

Date: 9/7/2007

Beam Tilt	0	
Gain (Max)	1.238	0.927 dB
Gain (Horizon)	1.238	0.927 dB



ANTENNA ELEVATION PATTERN



Polar Plot

Antenna Mfg: Shively Labs
Antenna Type: 6810-6-0.5
Station: WFUV
Frequecy: 90.7
Channel: 214
Figure: 3

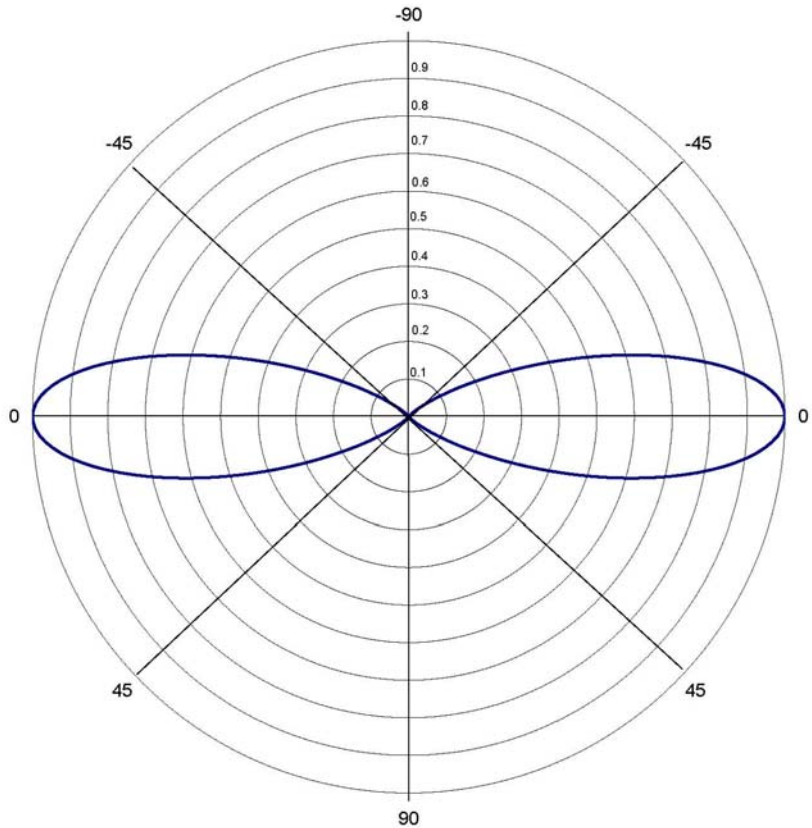
Date: 9/5/2007

Beam Tilt	0	
Gain (Max)	1.927	2.850 dB
Gain (Horizon)	1.927	2.850 dB

Shively Labs

A Division of Howell Laboratories Bridgton, ME 207-647-3327

ANTENNA ELEVATION PATTERN



Polar Plot

Antenna Mfg: Shively Labs
Antenna Type: 6810-6-0.5
Station: WFUV
Frequecy: 90.7
Channel: 214
Figure: 3

Date: 9/5/2007

Beam Tilt	0	
Gain (Max)	1.238	0.927 dB
Gain (Horizon)	1.238	0.927 dB

Shively Labs

A Division of Howell Laboratories Bridgton, ME 207-647-3327

User specified data is entered only in yellow highlighted cells

Antenna Manufacturer	Shively Labs
Antenna Type	6810-6-0.78-Spec.
Station	WFUV
Frequency (MHz)	90.7
Channel #	214
Wavelength (in)	130.1
Number of Bays	6
Bay Spacing (in)	101
Beam Tilt Angle (Deg)	0
Center (1) or End (0) Fed	1
End Bay Line Length Delta (in)	0
Tee Offset Length for Center Fed (in)	0
Computed (0) or Custom (1) Excitation	1
Figure	3

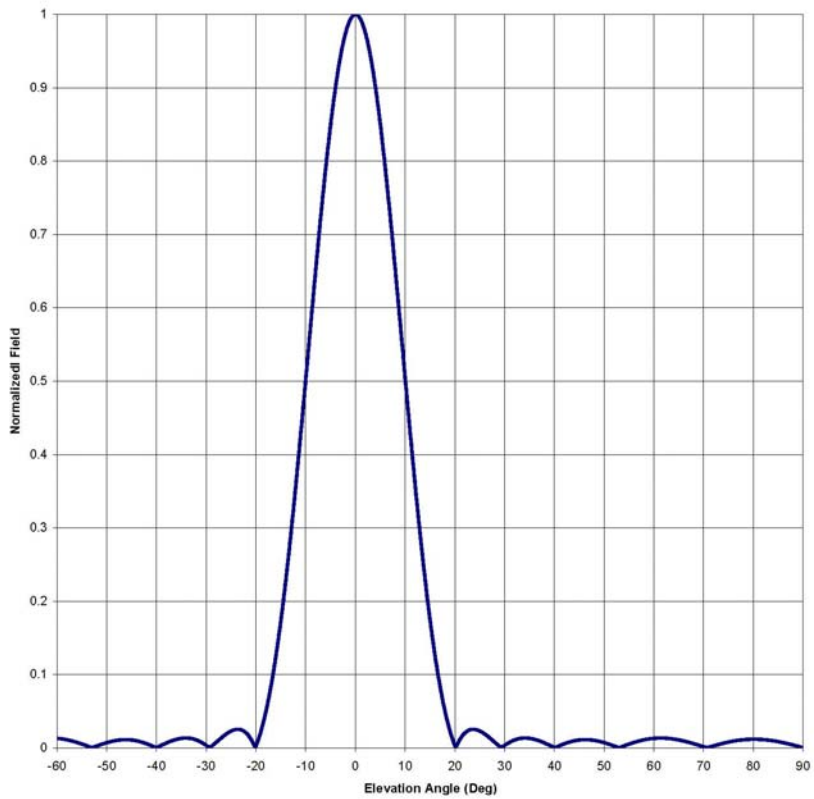
Total Gain	2.342
Azimuth Gain	1
Computed Elevation Gain	2.342

Computed Array Excitation			Custom Excitation			
Bay #	Bay Amp.	Bay Phase (Deg)	Bay Amp.	Bay Phase (Deg)	Phase for Null Fill	Phase for Beam Tilt
1	0.25	0.00	0.25	0.00	0.00	0.00
2	0.67	0.00	0.67	0.00	0.00	0.00
3	1	0.00	1	0.00	0.00	0.00
4	1	0.00	1	0.00	0.00	0.00
5	0.67	0.00	0.67	0.00	0.00	0.00
6	0.25	0.00	0.25	0.00	0.00	0.00

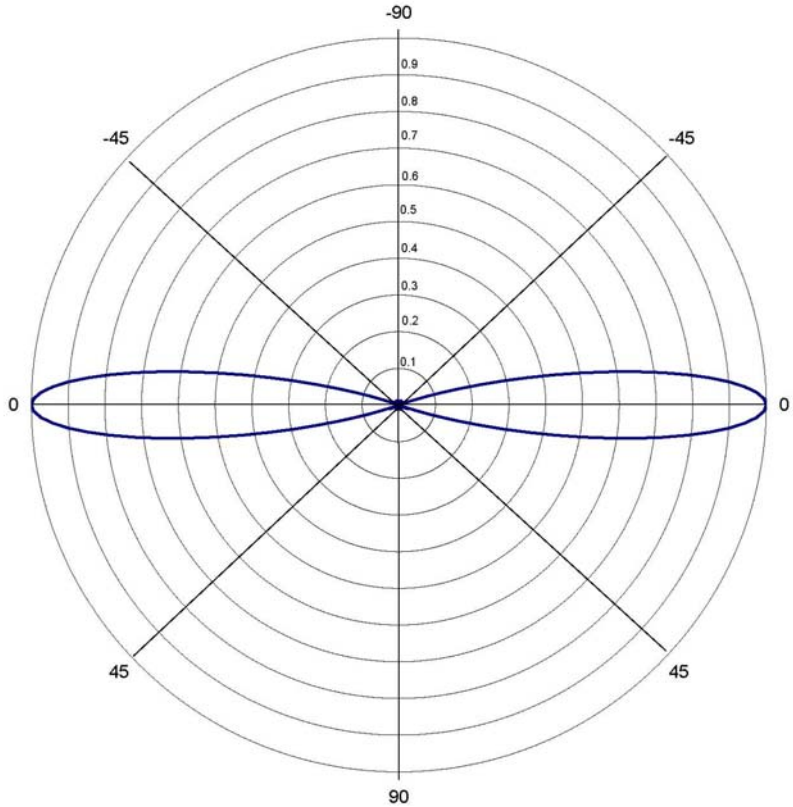
Antenna Mfg.: Shively Labs
Antenna Type: 6810-6-0.78-Spec.
Station: WFUV
Frequency: 90.7
Channel #: 214
Figure: 3

Date: 9/7/2007

Beam Tilt	0	
Gain (Max)	2.342	3.696 dB
Gain (Horizon)	2.342	3.696 dB



ANTENNA ELEVATION PATTERN



Polar Plot

Antenna Mfg: Shively Labs
Antenna Type: 6810-6-0.78-Spec
Station: WFUV
Frequecy: 90.7
Channel: 214
Figure: 3

Date: 9/5/2007

Beam Tilt	0	
Gain (Max)	2.342	3.696 dB
Gain (Horizon)	2.342	3.696 dB

Shively Labs

A Division of Howell Laboratories Bridgton, ME 207-647-3327

User specified data is entered only in yellow highlighted cells

Antenna Manufacturer	Shively Labs
Antenna Type	6810-6-0.78-Spec.
Station	WFUV
Frequency (MHz)	90.7
Channel #	214
Wavelength (in)	130.1
Number of Bays	6
Bay Spacing (in)	101
Beam Tilt Angle (Deg)	0.6
Center (1) or End (0) Fed	1
End Bay Line Length Delta (in)	0
Tee Offset Length for Center Fed (in)	1.45
Computed (0) or Custom (1) Excitation	1
Figure	3

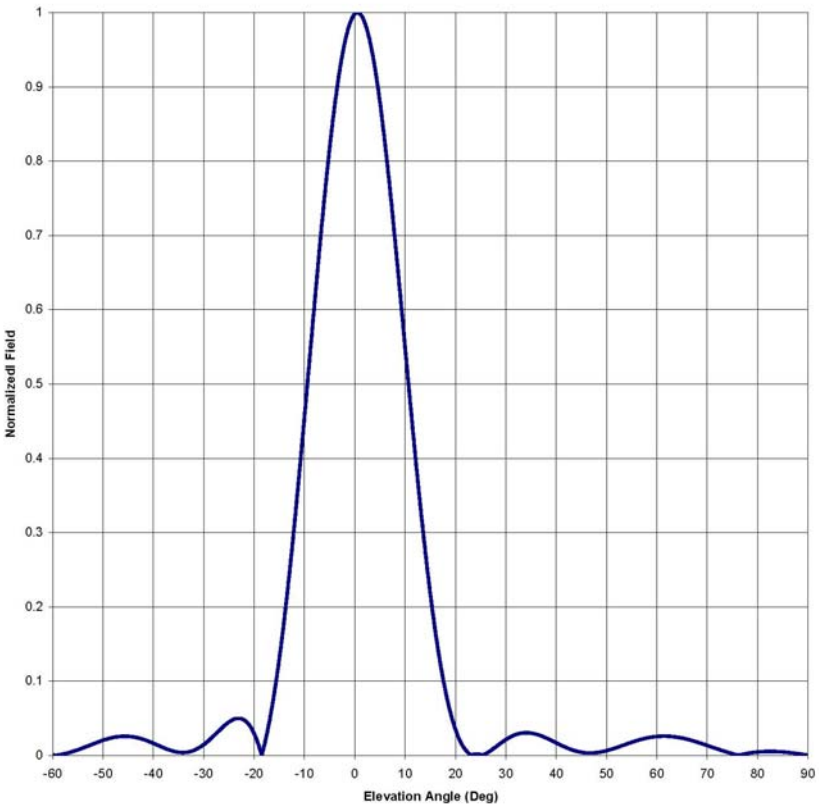
Total Gain	2.338
Azimuth Gain	1
Computed Elevation Gain	2.338

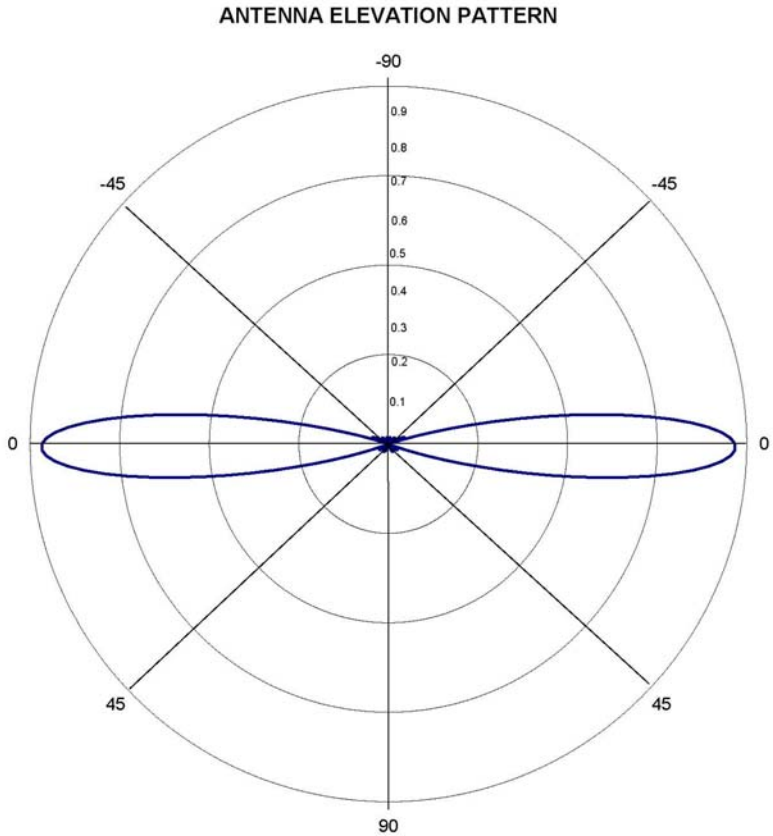
Computed Array Excitation			Custom Excitation			
Bay #	Bay Amp.	Bay Phase (Deg)	Bay Amp.	Bay Phase (Deg)	Phase for Null Fill	Phase for Beam Tilt
1	0.25	4.00	0.25	4.00	0.00	4.01
2	0.67	4.00	0.67	4.00	0.00	4.01
3	1	4.00	1	4.00	0.00	4.01
4	1	-4.00	1	-4.00	0.00	-4.01
5	0.67	-4.00	0.67	-4.00	0.00	-4.01
6	0.25	-4.00	0.25	-4.00	0.00	-4.01

Antenna Mfg.: Shively Labs
Antenna Type: 6810-6-0.78-Spec.
Station: WFUV
Frequency: 90.7
Channel #: 214
Figure: 3

Date: 9/7/2007

Beam Tilt	0.6	
Gain (Max)	2.338	3.689 dB
Gain (Horizon)	2.330	3.674 dB





Questions

Polar Plot

Antenna Mfg: Shively Labs
Antenna Type: 6810-6-0.78-Spec.
Station: WFUV
Frequecy: 90.7
Channel: 214
Figure: 3

Date: 9/11/2007

Beam Tilt	0.6	
Gain (Max)	2.338	3.689 dB
Gain (Horizon)	2.330	3.674 dB

Shively Labs
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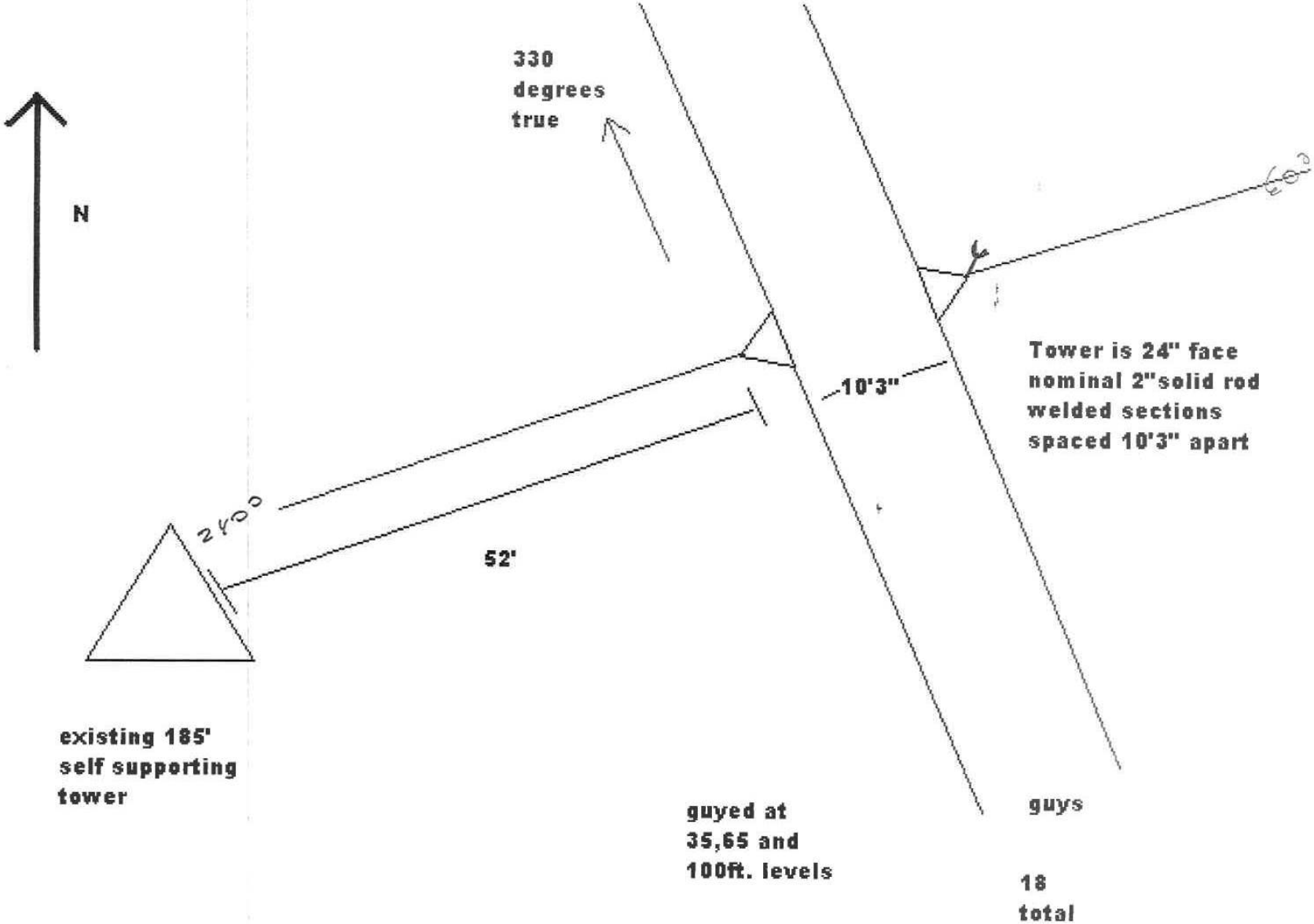
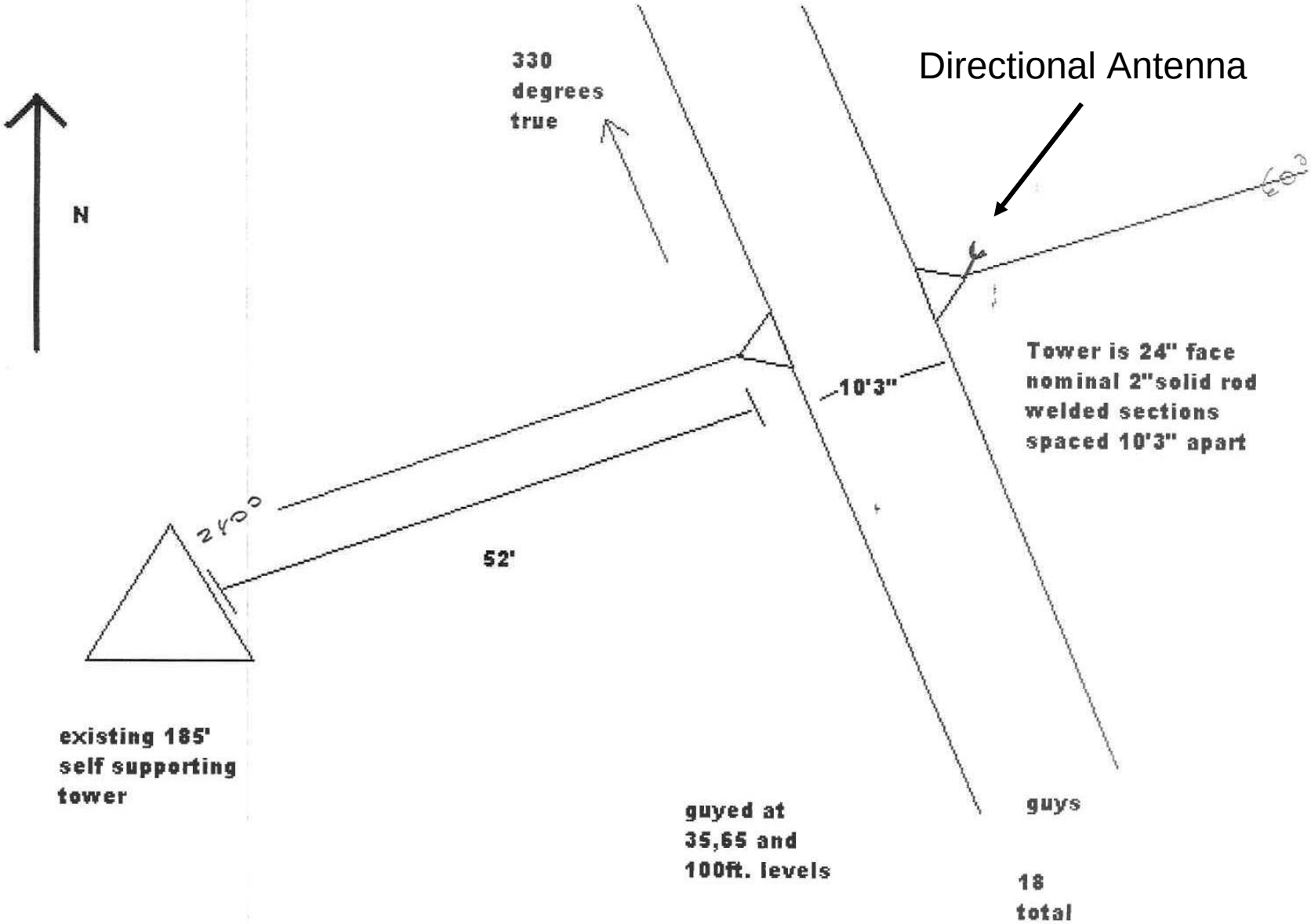
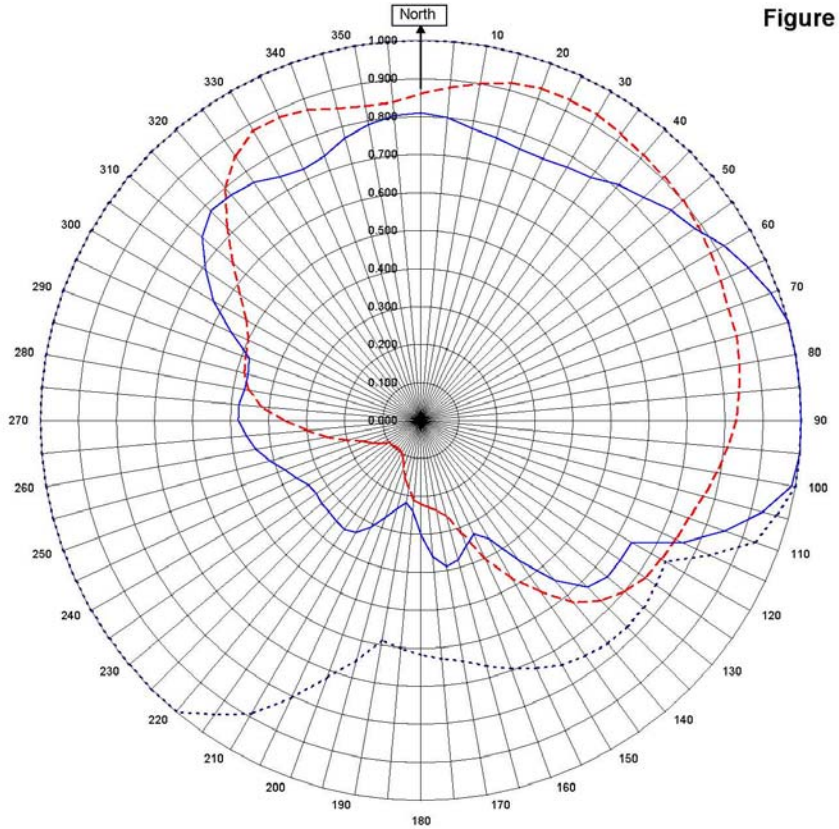

N
330
degrees
true
10'3"
Tower is 24" face
nominal 2"solid rod
welded sections
spaced 10'3" apart
52'
existing 185'
self supporting
tower
guyed at
35,65 and
100ft. levels
guys
18
total


N
330
degrees
true
Directional Antenna
Tower is 24" face
nominal 2"solid rod
welded sections
spaced 10'3" apart
10'3"
52'
existing 185'
self supporting
tower
guyed at
35,65 and
100ft. levels
guys
18
total

Shively Labs

Shively Labs, a division of Howell Laboratories, Inc. Bridgton, ME (207)647-3327

Figure 1



Horizontal RMS	0.664
Vertical RMS	0.650
H/V Composite RMS	0.705
FCC Composite RMS	0.929

Frequency	95.7 / 430.65 mHz
Plot	Relative Field
Scale	4.5 : 1
	See Figure 2 for Mechanical Details

Antenna is 26 M COR
House Elevation is 3 M Lower than Tower Base
House is 80 M away from Tower Base
House is 15 M wide
Fire Station and TX building omitted for clarity
Main Tower omitted for clarity

Drawing not to scale

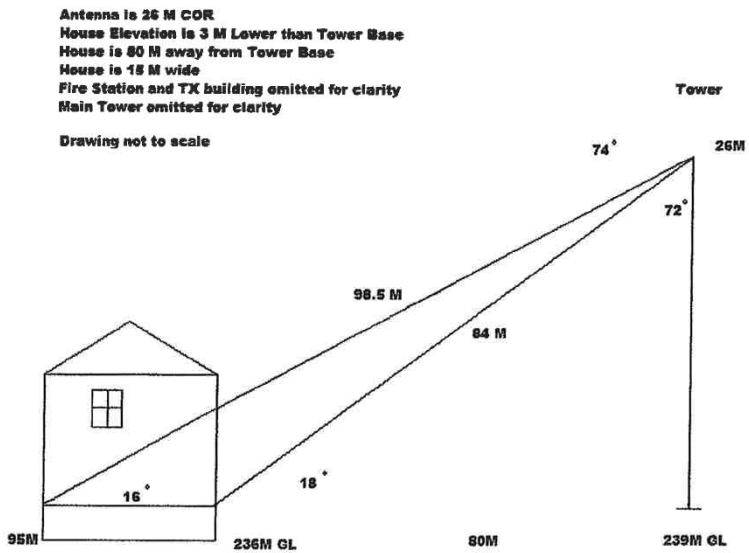
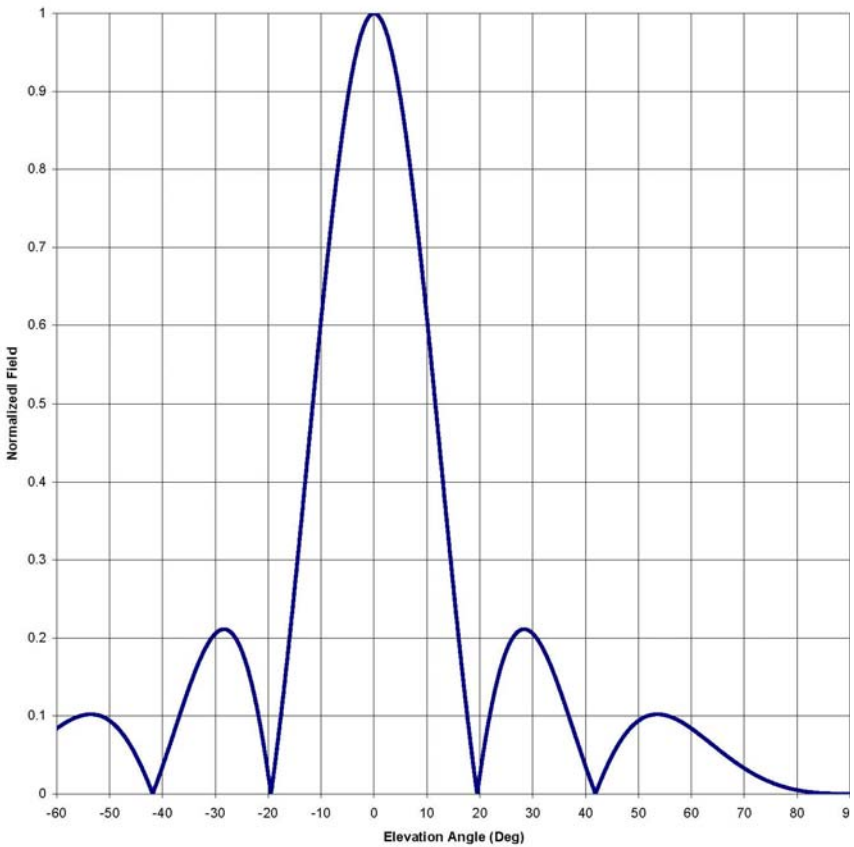



Image NASA
© 2007 Navteq
©2007 Google™
Pointer 32°50'21.13" N 117°15'01.51" W elev 772 ft
Streaming |||||||||| 100%
Eye alt 1248 ft

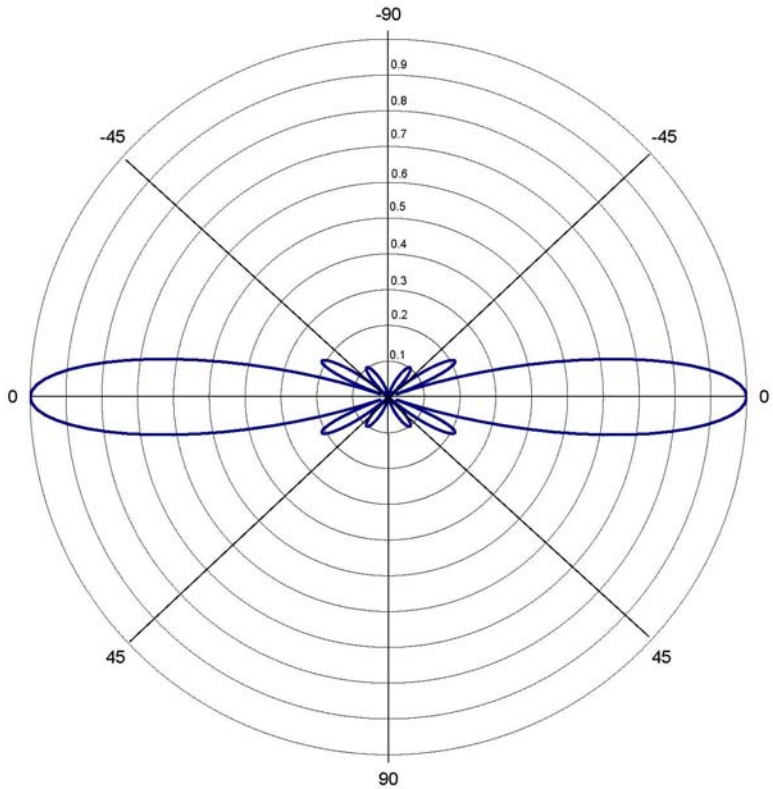
Antenna Mfg.: Shively Labs
Antenna Type: 6810-6-0.5
Station: WFUV
Frequency: 90.7
Channel #: 214
Figure: 0

Date: 9/7/2007

Beam Tilt	0	
Gain (Max)	1.927	2.850 dB
Gain (Horizon)	1.927	2.850 dB



ANTENNA ELEVATION PATTERN



Polar Plot

Antenna Mfg: Shively Labs
Antenna Type: 6810-6-0.5
Station: WFUV
Frequecy: 90.7
Channel: 214
Figure: 3

Date: 9/5/2007

Beam Tilt	0	
Gain (Max)	1.927	2.850 dB
Gain (Horizon)	1.927	2.850 dB

Shively Labs

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User specified data is entered only in yellow highlighted cells

Antenna Manufacturer	Shively Labs
Antenna Type	6810-6-SS-DA Spec
Station	
Frequency (MHz)	95.7
Channel #	239
Wavelength (in)	123.3
Number of Bays	6
Bay Spacing (in)	62.75
Beam Tilt Angle (Deg)	Up 1
Center (1) or End (0) Fed	0
End Bay Line Length Delta (in)	0
Tee Offset Length for Center Fed (in)	0
Computed (0) or Custom (1) Excitation	1
Figure	3

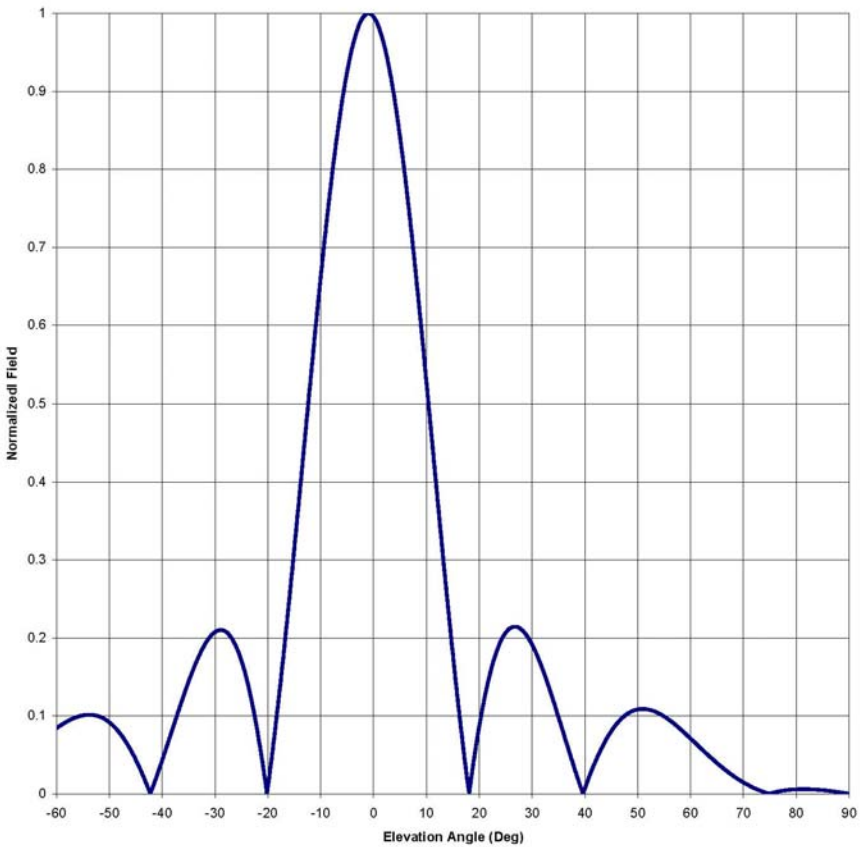
Total Gain	4.544
Azimuth Gain	2.317
Computed Elevation Gain	1.961

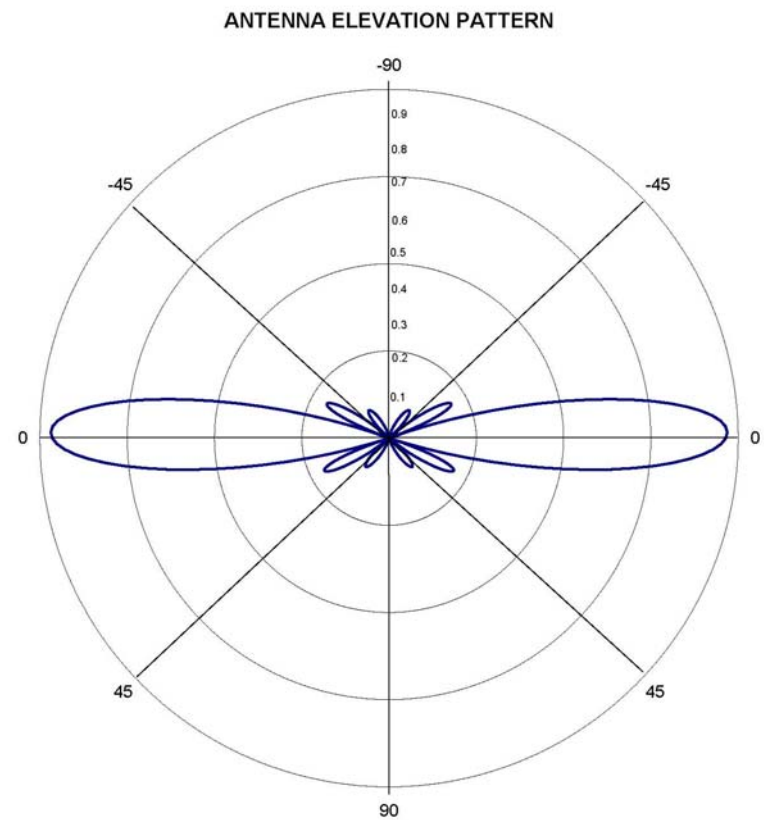
Computed Array Excitation			Custom Excitation			
Bay #	Bay Amp.	Bay Phase (Deg)	Bay Amp.	Bay Phase (Deg)	Phase for Null Fill	Phase for Beam Tilt
1	1	-16.00	1	-16.00	0.00	0.00
2	1	-12.80	1	-12.80	0.00	#VALUE!
3	1	-9.60	1	-9.60	0.00	#VALUE!
4	1	-6.40	1	-6.40	0.00	#VALUE!
5	1	-3.20	1	-3.20	0.00	#VALUE!
6	1	0.00	1	0.00	0.00	#VALUE!

Antenna Mfg.: Shively Labs
Antenna Type: 6810-6-SS-DA Spec
Station: 0
Frequency: 95.7
Channel #: 239
Figure: 3

Date: 9/6/2007

Beam Tilt	Up 1	
Gain (Max)	4.544	6.575 dB
Gain (Horizon)	4.504	6.536 dB





Polar Plot

Antenna Mfg: Shively Labs
Antenna Type: 6810-6-SS-DA Sp
Station: 0
Frequecy: 95.7
Channel: 239
Figure: 3

Date: 9/11/2007

Beam Tilt	Up 1	
Gain (Max)	4.544	6.575 dB
Gain (Horizon)	4.504	6.536 dB

Shively Labs

A Division of Howell Laboratories Bridgton, ME 207-647-3327

Final Questions