



Propagation Systems, Inc.

Quality Broadcast Antenna Systems

**Directional FM Antenna
KRRN-FM2
Entravision Holdings, LLC
Las Vegas, NV**

A PSIFMP antenna model was used in conjunction with the customer's 60" face triangular tower to create the necessary directional radiation pattern. The final antenna consists of two vertically stacked panels of radiating elements each secured to the tower with custom mounting brackets. The antenna array is fed from an existing flexible transmission line.

Pattern testing was performed using a 1/3 scale model element and tower. The azimuth plane measurements were taken on a ground reflection test range. This type of test range utilizes the reflected signal and direct signal from the source antenna to form an interference pattern on the antenna under test. The antenna and tower under test was mounted to a turntable that allowed the structure to be rotated 360° in the azimuth plane. The source antenna was located approximately 75 ft. from the antenna under test. The source height above ground was adjusted to peak the first lobe of the interference pattern at the antenna under test.

The test antenna was mounted in the center of rotation of the turntable. The antenna and mounting structure were rotated clockwise while data was recorded in a counter clockwise direction. All feed cables to the antenna were secured and grounded during pattern measurements. A Hewlett Packard 8753E-network analyzer operating at 278.1 MHz was used as both the source and receiver. The level of the received signal was compared with a standard dipole to establish the directivity of the final pattern.

The antenna is to be mounted 90 meters (295 ft.) +2/-4 meters above ground level. The panels are to be positioned 115° True. No other antenna can be installed within 10 ft of any radiating element. Any guy wire that passes within 10 ft. of a radiating element must be changed to the appropriate non-metallic substitute. It is recommended that a broadcast engineer be present to supervise the installation of the antenna and that he or she certifies that the antenna has been installed according to the enclosed instructions.

An input power level of 4.85 kW will be required at the antenna input in order to reach the approved 20 kW ERP. The transmitter output power requirements are dependent upon the transmission line size and length used to feed the antenna. The final length of transmission line must be determined after installation.

Antenna Specifications

Antenna Model	PSIFMP-2-DA
Type	2-bay directional FM panel antenna
Frequency	92.7 MHz
Polarization	Circular
Composite RMS	.535
Gain (h-pol)	4.12 (6.15 dB)
Gain (v-pol)	4.04 (6.06 dB)
ERP	20 kW
Antenna input power	4.85 kW
Input	1-5/8" EIA
Power rating	12 kW
Length	16.61 ft.
Weight	361.75 lbs.
Wind Area	43.83 sq. ft.

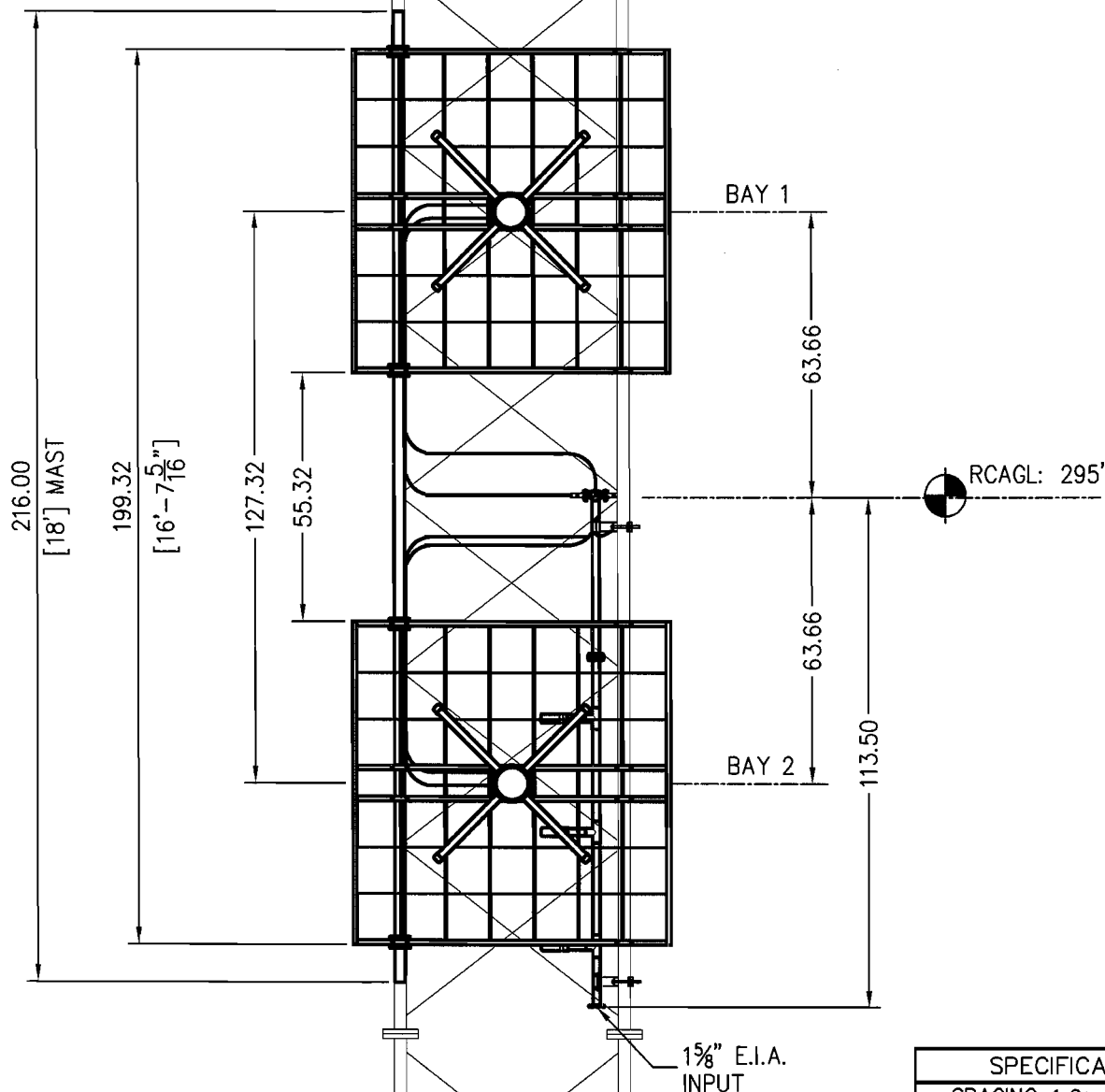
Statement of Certification

This is to certify the antenna has been designed, fabricated and tested under my supervision and it meets the required envelope pattern limitations set forth in the stations construction permit.



12/15/2013

Douglas A. Ross
President
Propagation Systems Inc.



SPECIFICATIONS
SPACING: 1.0λ
LENGTH: 16.61 Ft
APERTURE: 10.61 Ft.
RATING: 12 kW
GAIN: 4.12 (6.15 dB)
WEIGHT: 361.75 Lbs
WINDAREA: 43.83 Sq. Ft.
TIA-222-F (NO ICE)
NOTE:

REV.	MADE BY CHECKED BY	DATE	CHANGE

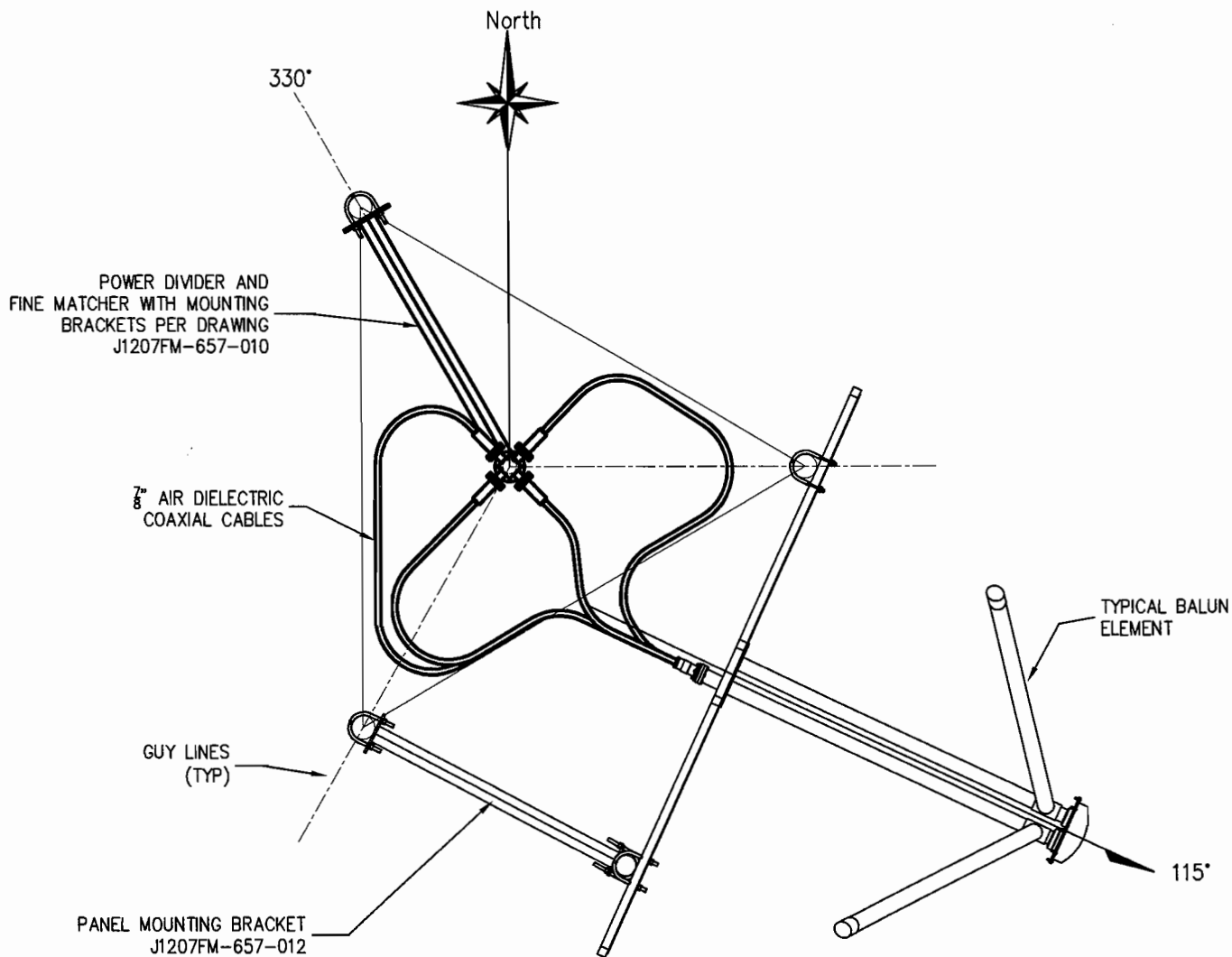
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SIZE
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PROPAGATION SYSTEMS, INC.

Ebensburg, Pennsylvania USA 814-472-5540

ELEVATIONS AND SPECIFICATIONS			
MODEL:	PSIFMP-2-DA	DRAWN BY:	D.G. Kellar
CHANNEL/ FREQUENCY:	92.7 MHz	APPROVED BY:	
SCALE:	1:40	DRAWING NO.:	657-1-001
		DATE:	12/2013
		DATE:	
		REV.	



REV.	MADE BY CHECKED BY	DATE	CHANGE

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SIZE

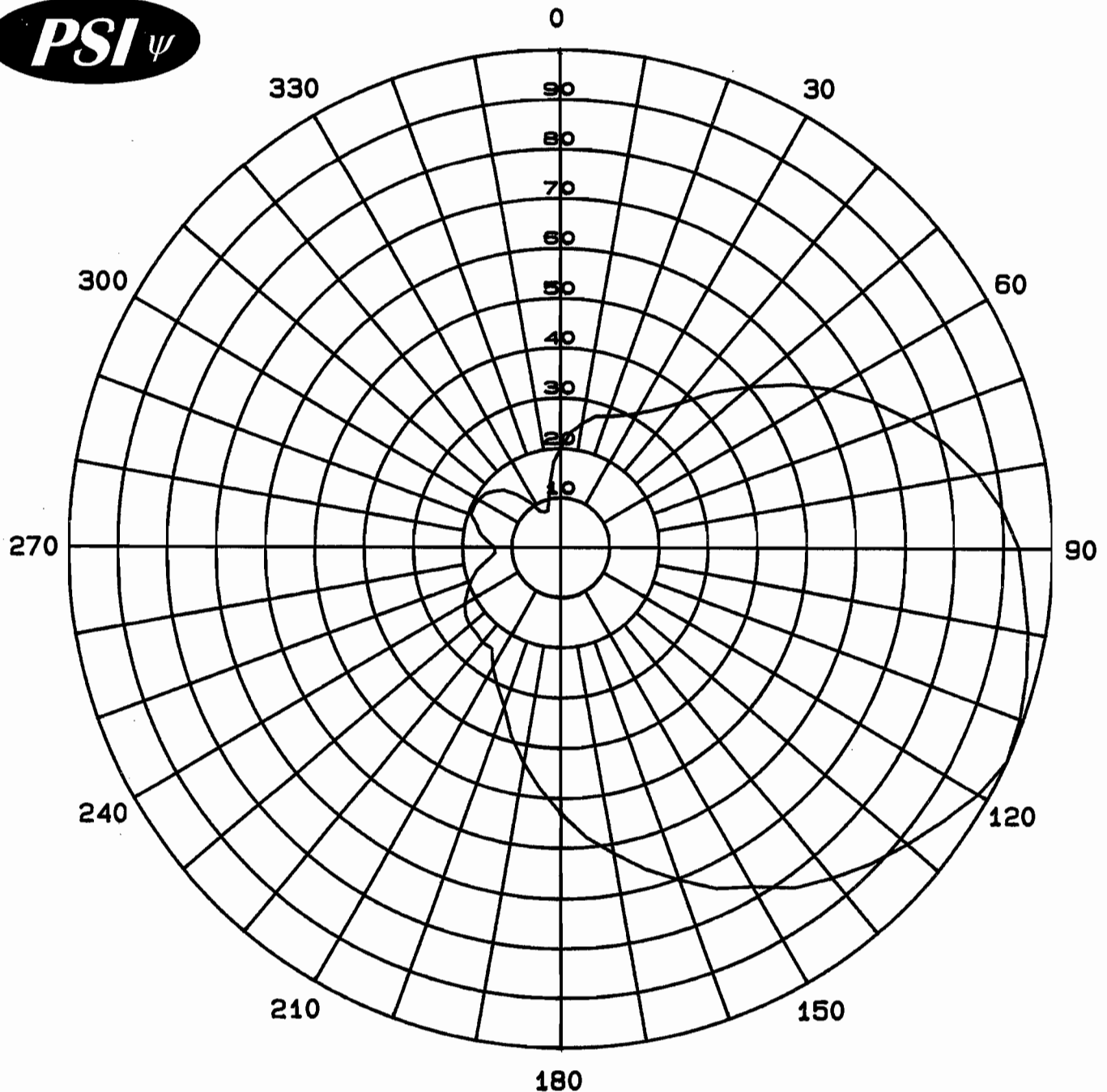
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PROPAGATION SYSTEMS, INC.

Ebensburg, Pennsylvania USA 814-472-5540

ANTENNA PLAN VIEW AND ORIENTATION

MODEL:	PSIFMP-2-DA	DRAWN BY:	D.G. Kellar	DATE:	12/2013
CHANNEL/ FREQUENCY:	92.7 MHz	APPROVED BY:		DATE:	
SCALE:	1:20	DRAWING NO.:	657-1-002	REV.	



Measured Composite
Azimuth Plane Pattern
Antenna: PSIFMP-2-DA
Type: 2-Bay Directional FM Antenna
ERP: 20.0 kW (13.01 dBk)
RMS Composite: .535
Frequency: 92.7 MHz
KRRN-FM2 Las Vegas, NV

Propagation Systems Inc.
PO Box 113
Ebensburg, PA 15931

Composite Pattern Tabulation

Antenna: PSIFMP-2-DA

Entravision Holdings, LLC

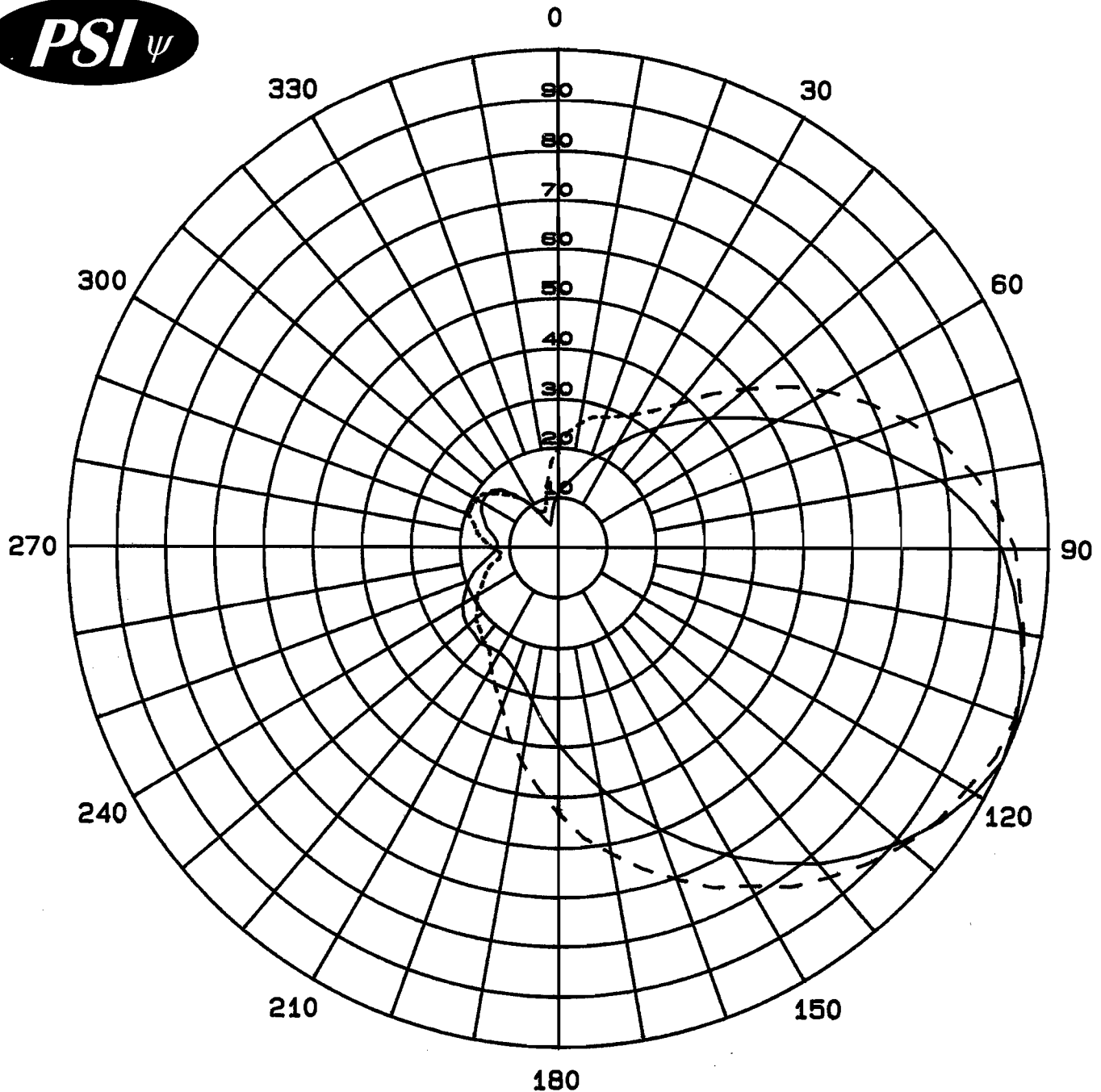
Station: KRRN-FM2

Frequency: 92.7 MHz

Location: Las Vegas, NV

Maximum ERP: 20.0 kW (13.01 dBk)

Angle	Relative Field	ERP (kW)	ERP (dBk)
0	0.202	0.82	-0.88
10	0.254	1.29	1.11
20	0.280	1.57	1.95
30	0.311	1.93	2.87
40	0.379	2.87	4.58
50	0.501	5.02	7.01
60	0.635	8.06	9.07
70	0.757	11.46	10.59
80	0.859	14.76	11.69
90	0.931	17.34	12.39
100	0.964	18.59	12.69
110	0.993	19.72	12.95
120	0.979	19.17	12.83
130	0.918	16.85	12.27
140	0.857	14.69	11.67
150	0.779	12.14	10.84
160	0.705	9.94	9.97
170	0.620	7.69	8.86
180	0.531	5.64	7.51
190	0.435	3.78	5.78
200	0.336	2.26	3.54
210	0.275	1.51	1.80
220	0.247	1.22	0.86
230	0.242	1.17	0.69
240	0.226	1.02	0.09
250	0.195	0.76	-1.19
260	0.152	0.46	-3.35
270	0.135	0.36	-4.38
280	0.167	0.56	-2.54
290	0.195	0.76	-1.19
300	0.193	0.74	-1.28
310	0.177	0.63	-2.03
320	0.139	0.39	-4.13
330	0.084	0.14	-8.50
340	0.079	0.12	-9.04
350	0.131	0.34	-4.64



Measured Relative Field
Azimuth Plane Pattern
Antenna: PSIFMP-2-DA
Type: 2-Bay Directional FM Antenna
Gain H-pol (solid): 4.12 (6.15 dB)
Gain V-pol (dash): 4.04 (6.06 dB)
Frequency: 92.7 MHz
KRRN-FM2 Las Vegas, NV

Propagation Systems Inc.
PO Box 113
Ebensburg, PA 15931

Measured Relative Field Tabulation

Antenna: PSIFMP-2-DA
 Entravision Holdings, LLC
 Station: KRRN-FM2
 Frequency: 92.7 MHz
 Location: Las Vegas, NV

Horizontal Polarization

Angle	Relative Field	Power Gain	Gain (dB)
0	0.110	0.050	-13.02
10	0.137	0.077	-11.12
20	0.185	0.141	-8.51
30	0.240	0.237	-6.25
40	0.318	0.417	-3.80
50	0.410	0.693	-1.60
60	0.518	1.105	0.44
70	0.645	1.714	2.34
80	0.790	2.571	4.10
90	0.904	3.367	5.27
100	0.957	3.773	5.77
110	0.993	4.063	6.09
120	0.979	3.949	5.96
130	0.909	3.404	5.32
140	0.822	2.784	4.45
150	0.711	2.083	3.19
160	0.596	1.463	1.65
170	0.489	0.985	-0.06
180	0.394	0.640	-1.94
190	0.309	0.393	-4.05
200	0.259	0.276	-5.59
210	0.239	0.235	-6.28
220	0.247	0.251	-6.00
230	0.242	0.241	-6.17
240	0.226	0.210	-6.77
250	0.195	0.157	-8.05
260	0.152	0.095	-10.21
270	0.124	0.063	-11.98
280	0.134	0.074	-11.31
290	0.161	0.107	-9.71
300	0.180	0.133	-8.75
310	0.177	0.129	-8.89
320	0.139	0.080	-10.99
330	0.084	0.029	-15.37
340	0.049	0.010	-20.05
350	0.074	0.023	-16.47

Maximum Value

Field 1.000
 Gain 4.12 (6.15 dB)
 Azimuth Bearing 115 degrees

Minimum Field

Field 0.049
 Gain .010 (-20.05 dB)
 Azimuth Bearing 340 degrees

Vertical Polarization

Angle	Relative Field	Power Gain	Gain (dB)
0	0.202	0.168	-7.74
10	0.254	0.266	-5.75
20	0.280	0.323	-4.91
30	0.311	0.398	-4.00
40	0.379	0.592	-2.28
50	0.501	1.034	0.15
60	0.635	1.661	2.20
70	0.757	2.361	3.73
80	0.859	3.040	4.83
90	0.931	3.571	5.53
100	0.964	3.829	5.83
110	0.990	4.038	6.06
120	0.961	3.805	5.80
130	0.918	3.472	5.41
140	0.857	3.026	4.81
150	0.779	2.500	3.98
160	0.705	2.048	3.11
170	0.620	1.584	2.00
180	0.531	1.162	0.65
190	0.435	0.780	-1.08
200	0.336	0.465	-3.32
210	0.275	0.312	-5.06
220	0.239	0.235	-6.28
230	0.220	0.199	-7.00
240	0.192	0.152	-8.19
250	0.159	0.104	-9.82
260	0.121	0.060	-12.20
270	0.135	0.075	-11.24
280	0.167	0.115	-9.40
290	0.195	0.157	-8.05
300	0.193	0.153	-8.14
310	0.170	0.119	-9.24
320	0.134	0.074	-11.31
330	0.083	0.028	-15.47
340	0.079	0.026	-15.90
350	0.131	0.071	-11.51

Maximum Value

Field 0.990
 Gain 4.04 (6.06 dB)
 Azimuth Bearing 110 degrees

Minimum Field

Field 0.079
 Gain .026 (-15.90 dB)
 Azimuth Bearing 335-340 degrees

ERP Tabulation

Antenna: PSIFMP-2-DA
Entravision Holdings, LLC
Station: KRRN-FM2
Frequency: 92.7 MHz
Location: Las Vegas, NV
Maximum ERP: 20.0 kW (13.01 dBk)

Horizontal Polarization

Angle	Relative Field	ERP (kW)	ERP (dBk)
0	0.110	0.24	-6.16
10	0.137	0.38	-4.26
20	0.185	0.68	-1.65
30	0.240	1.15	0.61
40	0.318	2.02	3.06
50	0.410	3.36	5.27
60	0.518	5.37	7.30
70	0.645	8.32	9.20
80	0.790	12.48	10.96
90	0.904	16.34	12.13
100	0.957	18.32	12.63
110	0.993	19.72	12.95
120	0.979	19.17	12.83
130	0.909	16.53	12.18
140	0.822	13.51	11.31
150	0.711	10.11	10.05
160	0.596	7.10	8.52
170	0.489	4.78	6.80
180	0.394	3.10	4.92
190	0.309	1.91	2.81
200	0.259	1.34	1.28
210	0.239	1.14	0.58
220	0.247	1.22	0.86
230	0.242	1.17	0.69
240	0.226	1.02	0.09
250	0.195	0.76	-1.19
260	0.152	0.46	-3.35
270	0.124	0.31	-5.12
280	0.134	0.36	-4.45
290	0.161	0.52	-2.85
300	0.180	0.65	-1.88
310	0.177	0.63	-2.03
320	0.139	0.39	-4.13
330	0.084	0.14	-8.50
340	0.049	0.05	-13.19
350	0.074	0.11	-9.61

Maximum Value (H-pol)

Field 1.00
ERP 20 kW (13.01 dBk)
Azimuth Bearing 115 degrees

Minimum Field (H-pol)

Field 0.049
ERP .05 kW (-13.19 dBk)
Azimuth Bearing 340 degrees

Vertical Polarization

Angle	Relative Field	ERP (kW)	ERP (dBk)
0	0.202	0.82	-0.88
10	0.254	1.29	1.11
20	0.280	1.57	1.95
30	0.311	1.93	2.87
40	0.379	2.87	4.58
50	0.501	5.02	7.01
60	0.635	8.06	9.07
70	0.757	11.46	10.59
80	0.859	14.76	11.69
90	0.931	17.34	12.39
100	0.964	18.59	12.69
110	0.990	19.60	12.92
120	0.961	18.47	12.66
130	0.918	16.85	12.27
140	0.857	14.69	11.67
150	0.779	12.14	10.84
160	0.705	9.94	9.97
170	0.620	7.69	8.86
180	0.531	5.64	7.51
190	0.435	3.78	5.78
200	0.336	2.26	3.54
210	0.275	1.51	1.80
220	0.239	1.14	0.58
230	0.220	0.97	-0.14
240	0.192	0.74	-1.32
250	0.159	0.51	-2.96
260	0.121	0.29	-5.33
270	0.135	0.36	-4.38
280	0.167	0.56	-2.54
290	0.195	0.76	-1.19
300	0.193	0.74	-1.28
310	0.170	0.58	-2.38
320	0.134	0.36	-4.45
330	0.083	0.14	-8.61
340	0.079	0.12	-9.04
350	0.131	0.34	-4.64

Maximum Value (V-pol)

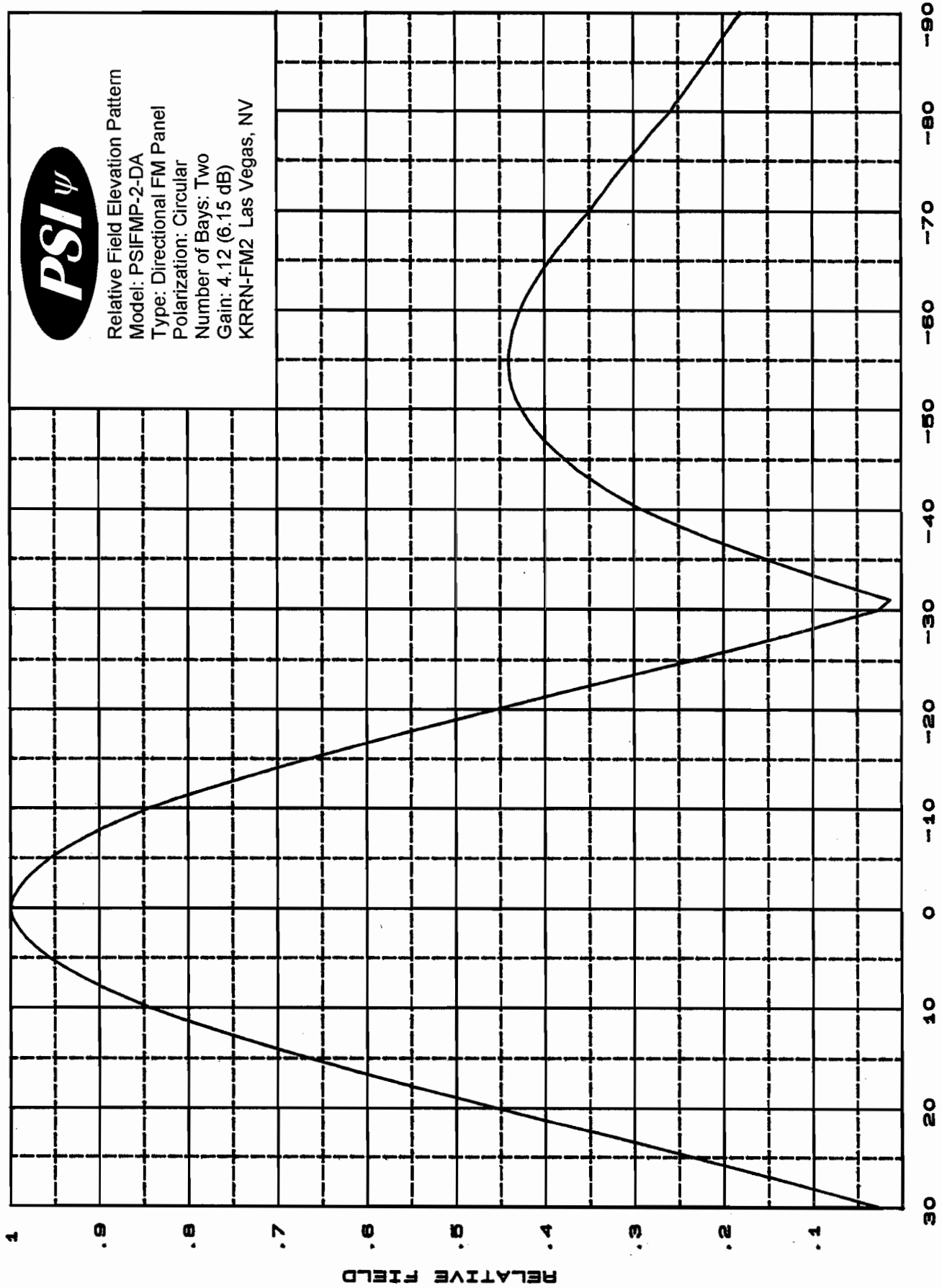
Field 0.990
ERP 19.60 kW (12.92 dBk)
Azimuth Bearing 110 degrees

Minimum Field (V-pol)

Field 0.079
ERP .12 kW (-9.04 dBk)
Azimuth Bearing 335-340 degrees



Relative Field Elevation Pattern
Model: PSIFMP-2-DA
Type: Directional FM Panel
Polarization: Circular
Number of Bays: Two
Gain: 4.12 (6.15 dB)
KRRN-FM2 Las Vegas, NV



DEGREES BELOW HORIZONTAL

Propagation Systems Inc.

Relative Field Tabulation Elevation Pattern

Antenna Model: PSIFMP-2-DA

Gain: 4.12 (6.15 dBd)

KRRN-FM2

Angle	Field	dB	Angle	Field	dB	Angle	Field	dB
-90	0.180	-14.89	-50	0.425	-7.43	-10	0.977	0.84
-89	0.188	-14.52	-49	0.418	-7.58	-9	0.981	0.87
-88	0.196	-14.15	-48	0.410	-7.74	-8	0.985	0.90
-87	0.204	-13.81	-47	0.400	-7.96	-7	0.988	0.92
-86	0.211	-13.51	-46	0.389	-8.20	-6	0.991	0.94
-85	0.219	-13.19	-45	0.376	-8.50	-5	0.993	0.96
-84	0.227	-12.88	-44	0.363	-8.80	-4	0.996	0.97
-83	0.235	-12.58	-43	0.347	-9.19	-3	0.997	0.98
-82	0.243	-12.29	-42	0.330	-9.63	-2	0.998	0.99
-81	0.251	-12.01	-41	0.311	-10.14	-1	0.999	1.00
-80	0.258	-11.77	-40	0.290	-10.75	0	1.000	1.00
-79	0.268	-11.44	-39	0.265	-11.54	1	1.000	1.00
-78	0.278	-11.12	-38	0.239	-12.43	2	1.000	0.99
-77	0.287	-10.84	-37	0.212	-13.47	3	0.999	0.98
-76	0.296	-10.57	-36	0.182	-14.80	4	0.998	0.97
-75	0.306	-10.29	-35	0.151	-16.42	5	0.996	0.96
-74	0.315	-10.03	-34	0.119	-18.49	6	0.995	0.94
-73	0.324	-9.79	-33	0.085	-21.41	7	0.993	0.92
-72	0.332	-9.58	-32	0.049	-26.20	8	0.990	0.90
-71	0.341	-9.34	-31	0.012	-38.42	9	0.987	0.87
-70	0.349	-9.14	-30	0.026	-31.70	10	0.983	0.84
-69	0.359	-8.90	-29	0.066	-23.61	11	0.979	0.81
-68	0.368	-8.68	-28	0.106	-19.49	12	0.975	0.78
-67	0.377	-8.47	-27	0.148	-16.59	13	0.970	0.74
-66	0.386	-8.27	-26	0.191	-14.38	14	0.965	0.70
-65	0.394	-8.09	-25	0.234	-12.62	15	0.959	0.66
-64	0.402	-7.92	-24	0.278	-11.12	16	0.954	0.62
-63	0.409	-7.77	-23	0.322	-9.84	17	0.949	0.58
-62	0.416	-7.62	-22	0.367	-8.71	18	0.943	0.54
-61	0.422	-7.49	-21	0.411	-7.72	19	0.936	0.50
-60	0.427	-7.39	-20	0.455	-6.84	20	0.928	0.46
-59	0.431	-7.31	-19	0.498	-6.06	21	0.921	0.41
-58	0.435	-7.23	-18	0.541	-5.34	22	0.914	0.37
-57	0.437	-7.19	-17	0.583	-4.69	23	0.905	0.32
-56	0.439	-7.15	-16	0.624	-4.10	24	0.896	0.28
-55	0.440	-7.13	-15	0.664	-3.56	25	0.887	0.23
-54	0.439	-7.15	-14	0.703	-3.06	26	0.877	0.19
-53	0.438	-7.17	-13	0.740	-2.62	27	0.868	0.15
-52	0.435	-7.23	-12	0.776	-2.20	28	0.860	0.11
-51	0.431	-7.31	-11	0.811	-1.82	29	0.850	0.07