

S.O. 24662

Report of Test 6810-1-DA

for

FAMILY WORSHIP CENTER CHURCH, INC.

WFFL 91.7 MHz PANAMA CITY, FL

## OBJECTIVE:

The objective of this test was to demonstrate the directional characteristics of a 6810-1-DA to meet the needs of WFFL and to comply with the requirements of the FCC construction permit, file number BMPED-20060908AAY.

## RESULTS:

The measured azimuth pattern for the 6810-1-DA is shown in Figure 1. Figure 1A shows the Tabulation of the Horizontal Polarization. Figure 1B shows the Tabulation of the Vertical Polarization. The calculated elevation pattern of the antenna is shown in Figure 3. Construction permit file number BMPED-20060908AAY indicates that the Horizontal radiation component shall not exceed 0.31 kW at any azimuth and is restricted to the following values at the azimuths specified:

80 Degrees T: 0.010 kW

From Figure 1, the maximum radiation of the Horizontal component occurs at 280 Degrees T to 284 Degrees T. At the restricted azimuth of 80 Degrees T the Horizontal component is 15.65 dB down from the maximum of 0.31 kW, or 0.008 kW.

The R.M.S. of the Horizontal component is 0.656. The total Horizontal power gain is 1.146. The R.M.S. of the Vertical component is 0.612. The total Vertical power gain is 1.123. See Figure 4 for calculations. The R.M.S. of the FCC composite pattern is 0.756. The R.M.S. of the measured composite pattern is 0.674. Eighty-five percent (85%) of the original authorized FCC composite pattern is 0.643. Therefore this pattern complies with the FCC requirement of 73.316(c)(2)(ix)(A).

**METHOD OF DIRECTIONALIZATION:**

The 6810-1-DA was mounted on a precision scale model of the Paul J. Ford designed monopole at the WFFL site. The spacing of the antenna to the pole was varied to achieve the vertical pattern shown in Figure 1. A horizontal parasitic element was placed directly under the bay. The position of this horizontal parasitic element was changed until the horizontal pattern shown in Figure 1 was achieved. See Figure 2 for mechanical details. There is an additional tower at the site located 20 feet away at an azimuth of 186°T. This was included in the pattern study at the precise scale distance and azimuth from the WFFL antenna.

**METHOD OF MEASUREMENT:**

As allowed by the construction permit, file number BMPED-20060908AAY, a single level of the 6810-1-DA was set up on the Howell Laboratories scale model antenna pattern measuring range. A scale of 4.5:1 was used.

**SUPERVISION:**

Mr. Surette was graduated from Lowell Technological Institute, Lowell, Massachusetts in 1973 with the degree of Bachelor of Science in Electrical Engineering. He has been directly involved with design and development of broadcast antennas, filter systems and RF transmission components since 1974, as an RF Engineer for six years with the original Shively Labs in Raymond, ME and for a short period of time with Dielectric Communications. He is currently an Associate Member of the AFCCE and a Senior Member of IEEE. He has authored a chapter on filters and combining systems for the latest edition of the CRC Electronics Handbook and for the 9<sup>th</sup> Edition of the NAB Handbook.

**EQUIPMENT:**

The scale model pattern range consists of a wooden rotating pedestal equipped with a position indicator. The scale model bay is placed on the top of this pedestal and is used in the transmission mode at approximately 20 feet above ground level. The receiving corner reflector is spaced 50 feet away from the rotating pedestal at the same level above ground as the transmitting model. The transmitting and receiving signals are carried to a control building by means of RG-9/U double shielded coax cable.

The control building is equipped with:

Hewlett Packard Model 8753 Network Analyzer  
PC Based Controller  
Hewlett Packard 7550A Graphics Plotter

The test equipment is calibrated to ANSI/NCSL Z540-1-1994.

**TEST PROCEDURES:**

The corner reflector is mounted so that the horizontal and vertical azimuth patterns are measured independently by rotating the corner reflector by 90 degrees. The network analyzer was set to 412.65 MHz. Calibrated pads are used to check the linearity of the measuring system. For example, 6 dB padding yields a scale reading of 50 from an unpadded reading of 100 in voltage. From the recorded patterns, the R.M.S. values are calculated and recorded as shown in Figure 1.

Respectfully submitted by:



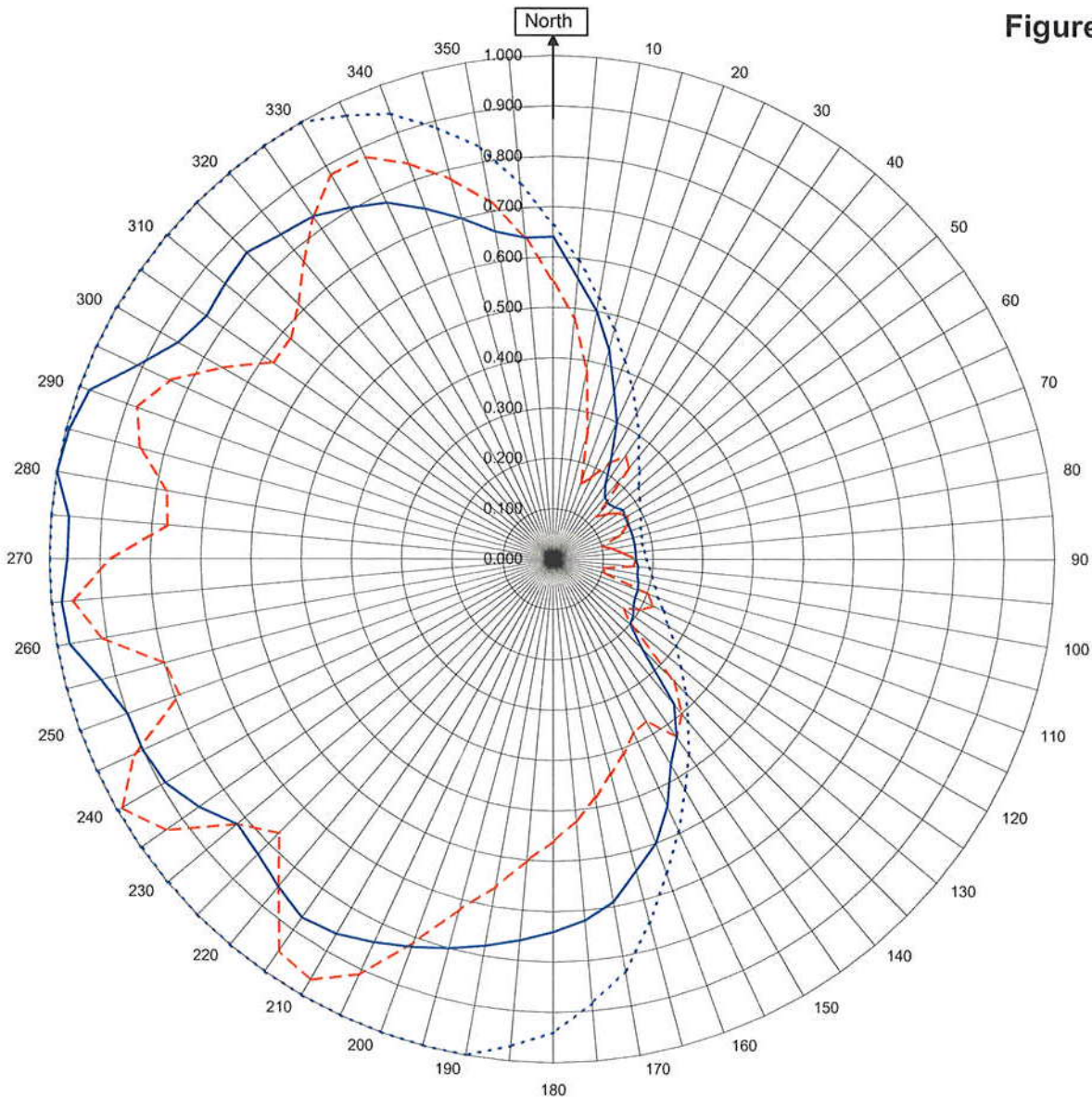
Robert A. Surette  
Director of Sales Engineering  
S/O 24662  
December 13, 2006



# Shively Labs

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

Figure 1



## WFFL Panama City, FL

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December 13, 2006

Horizontal RMS	0.656	Frequency	91.7 / 412.65 MHz
Vertical RMS	0.612	Plot	Relative Field
H/V Composite RMS	0.674	Scale	4.5 : 1
FCC Composite RMS	0.756	See Figure 2 for Mechanical Details	

Antenna Model	6810-1-DA
Pattern Type	Directional Azimuth

Figure 1a

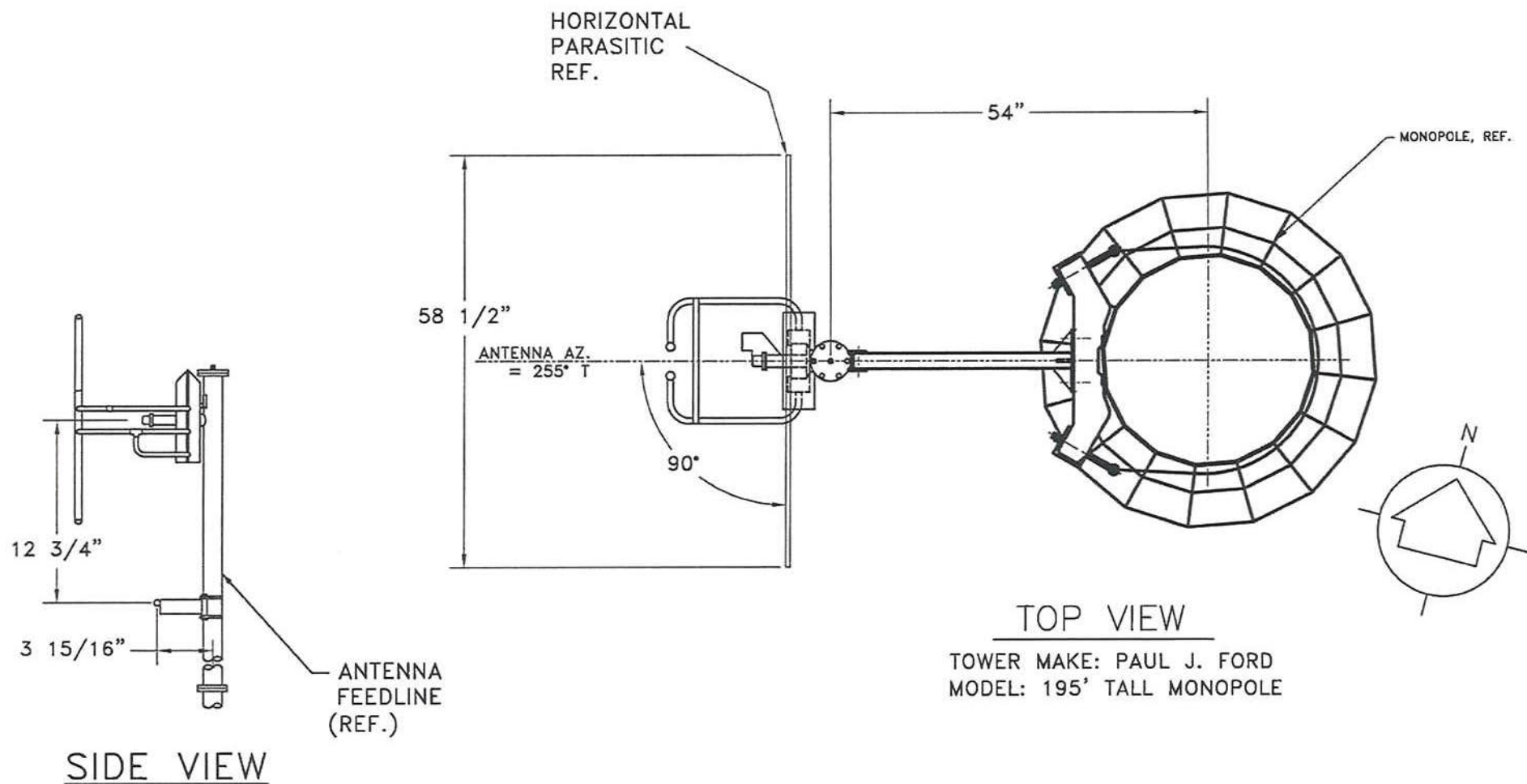
Tabulation of Horizontal Azimuth Pattern  
WFFL Panama City, FL

Azimuth	Rel Field	Azimuth	Rel Field
0	0.640	180	0.740
10	0.500	190	0.780
20	0.355	200	0.820
30	0.230	210	0.860
40	0.160	220	0.850
45	0.155	225	0.830
50	0.160	230	0.820
60	0.165	240	0.890
70	0.165	250	0.900
80	0.165	260	0.975
90	0.165	270	0.965
100	0.170	280	1.000
110	0.180	290	0.980
120	0.185	300	0.860
130	0.200	310	0.850
135	0.250	315	0.860
140	0.375	320	0.840
150	0.470	330	0.805
160	0.600	340	0.740
170	0.690	350	0.660

Figure 1b

Tabulation of Vertical Azimuth Pattern  
WFFL Panama City, FL

Azimuth	Rel Field	Azimuth	Rel Field
0	0.550	180	0.560
10	0.380	190	0.660
20	0.160	200	0.810
30	0.220	210	0.965
40	0.235	220	0.850
45	0.120	225	0.770
50	0.140	230	0.820
60	0.170	240	0.990
70	0.140	250	0.790
80	0.120	260	0.910
90	0.165	270	0.880
100	0.100	280	0.780
110	0.200	290	0.880
120	0.200	300	0.760
130	0.200	310	0.680
135	0.340	315	0.715
140	0.400	320	0.770
150	0.370	330	0.880
160	0.410	340	0.835
170	0.480	350	0.720



ANTENNA HEADING: 255° TRUE NORTH

SHIVELY LABS			
A DIVISION OF HOWELL LABORATORIES INC., BRIDGTON, MAINE			
SHOP ORDER:	FREQUENCY:	SCALE:	DRAWN BY:
24662	91.7	N.T.S.	ASP
TITLE:			APPROVED BY:
MODEL-6810-1-DIRECTIONAL ANTENNA			DAB
DATE:	FIGURE 2		
11/21/06			

Antenna Mfg.: Shively Labs

Antenna Type: 6810-1-DA

Station: WFFL

Frequency: 91.7

Channel #: 219

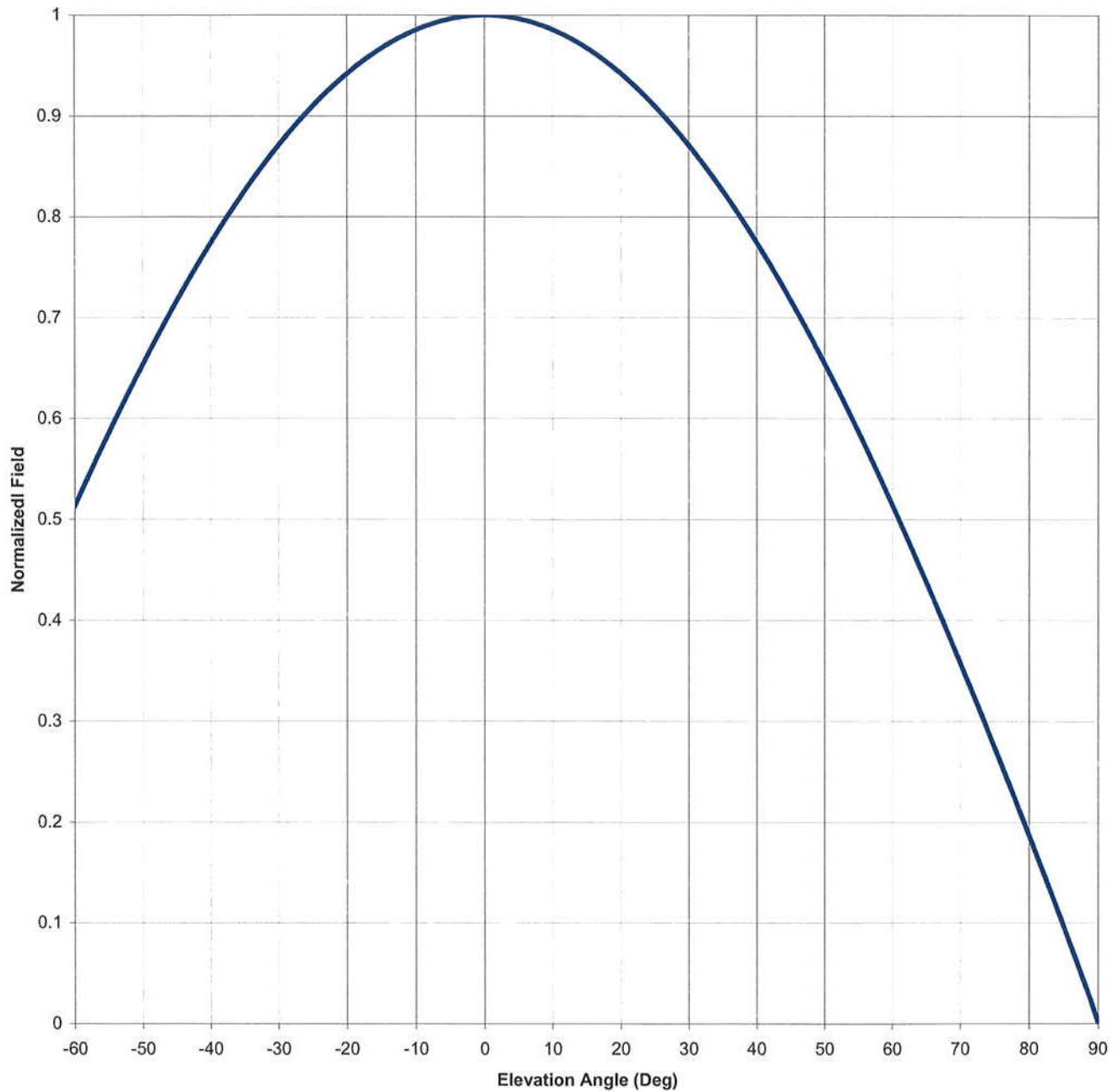
Figure: 3

Date: 12/13/2006

Beam Tilt 0

Gain (Max) 1.146 0.591 dB

Gain (Horizon) 1.146 0.591 dB





Antenna Mfg.: Shively Labs  
Antenna Type: 6810-1-DA

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Station: WFFL

Beam Tilt 0

Frequency: 91.7

Gain (Max) 1.146

0.591 dB

Channel #: 219

Gain (Horizon) 1.146

0.591 dB

Figure: 3

Angle of Depression (Deg)	Relative Field	Angle of Depression (Deg)	Relative Field	Angle of Depression (Deg)	Relative Field	Angle of Depression (Deg)	Relative Field
-90	0.000	-44	0.729	0	1.000	46	0.705
-89	0.021	-43	0.741	1	1.000	47	0.693
-88	0.040	-42	0.752	2	0.999	48	0.680
-87	0.059	-41	0.763	3	0.999	49	0.667
-86	0.078	-40	0.774	4	0.998	50	0.654
-85	0.096	-39	0.785	5	0.996	51	0.641
-84	0.114	-38	0.796	6	0.995	52	0.628
-83	0.133	-37	0.806	7	0.993	53	0.614
-82	0.151	-36	0.816	8	0.991	54	0.600
-81	0.168	-35	0.826	9	0.988	55	0.586
-80	0.186	-34	0.835	10	0.985	56	0.572
-79	0.204	-33	0.845	11	0.982	57	0.558
-78	0.221	-32	0.854	12	0.979	58	0.544
-77	0.239	-31	0.862	13	0.975	59	0.529
-76	0.256	-30	0.871	14	0.971	60	0.514
-75	0.273	-29	0.879	15	0.967	61	0.499
-74	0.290	-28	0.887	16	0.963	62	0.484
-73	0.307	-27	0.895	17	0.958	63	0.469
-72	0.324	-26	0.903	18	0.953	64	0.453
-71	0.341	-25	0.910	19	0.948	65	0.437
-70	0.357	-24	0.917	20	0.942	66	0.422
-69	0.373	-23	0.924	21	0.936	67	0.406
-68	0.390	-22	0.930	22	0.930	68	0.390
-67	0.406	-21	0.936	23	0.924	69	0.373
-66	0.422	-20	0.942	24	0.917	70	0.357
-65	0.437	-19	0.948	25	0.910	71	0.341
-64	0.453	-18	0.953	26	0.903	72	0.324
-63	0.469	-17	0.958	27	0.895	73	0.307
-62	0.484	-16	0.963	28	0.887	74	0.290
-61	0.499	-15	0.967	29	0.879	75	0.273
-60	0.514	-14	0.971	30	0.871	76	0.256
-59	0.529	-13	0.975	31	0.862	77	0.239
-58	0.544	-12	0.979	32	0.854	78	0.221
-57	0.558	-11	0.982	33	0.845	79	0.204
-56	0.572	-10	0.985	34	0.835	80	0.186
-55	0.586	-9	0.988	35	0.826	81	0.168
-54	0.600	-8	0.991	36	0.816	82	0.151
-53	0.614	-7	0.993	37	0.806	83	0.133
-52	0.628	-6	0.995	38	0.796	84	0.114
-51	0.641	-5	0.996	39	0.785	85	0.096
-50	0.654	-4	0.998	40	0.774	86	0.078
-49	0.667	-3	0.999	41	0.763	87	0.059
-48	0.680	-2	0.999	42	0.752	88	0.040
-47	0.693	-1	1.000	43	0.741	89	0.021
-46	0.705	0	1.000	44	0.729	90	0.000
-45	0.717			45	0.717		