Shively Labs
a division of Howell Laboratories,Inc.

P. O. Box 389 Harrison Rd.,
Bridgton, Maine 04009 USA

- An Employee-Owned Company -

(207) 647-3327
888-SHIVELY
Fax: (207) 647-8273
E-mail: sales@shively.com
Web site: www.shively.com

S.O. 23723

Report of Test SCALA YA7-FM/RM

for

EDUCATIONAL MEDIA FOUNDATION

KGRI 88.1 MHz LEBANON, OR

OBJECTIVE:

The objective of this test was to demonstrate the directional characteristics of a Scala YA7-FM/RM to meet the needs of KGRI and to comply with the requirements of the FCC construction permit, file number BPED-19980826MI.

RESULTS:

The measured azimuth pattern for the Scala YA7-FM/RM is shown in Figure 1. Figure 1A shows the Tabulation of the Vertical Polarization. The calculated elevation pattern of the antenna is shown in Figure 3. Construction permit file number BPED-19980826MI indicates that the Vertical radiation component shall not exceed 0.17 kW at any azimuth and is restricted to the following values at the azimuths specified:

210 - 230 Degrees T: 0.0054 kW

From Figure 1, the maximum radiation of the Vertical component occurs at 358 Degrees T to 002 Degrees T. At the restricted azimuth of 210 - 230 Degrees T the Vertical component is 15.9 dB down from the maximum of 0.17 kW, or 0.0044 kW.

The R.M.S. of the Vertical component is 0.590. The total Vertical power gain is 4.841. See Figure 4 for calculations. The R.M.S. of the FCC composite pattern is 0.6946. Therefore this Pattern complies with the FCC requirement of 73.316(c)(2)(ix)(A).

METHOD OF DIRECTIONALIZATION:

The Scala YA7-FM/RM was mounted on the Northeast leg of a tower of exact scale to a Microflect tower at the KGRI/KLVU transmitter site. The azimuth pattern for KGRI was measured with a single bay of the KLVU's Jampro 6 bay non-directional antenna mounted on the Northwest leg of the tower at the same elevation. The spacing of the KGRI antenna to the tower was varied to achieve the vertical azimuth pattern shown in Figure 1. See Figure 2 for mechanical details.

METHOD OF MEASUREMENT:

As allowed by the construction permit, file number BPED-19980826MI, a single level of the Scala YA7-FM/RM 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 9th 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.

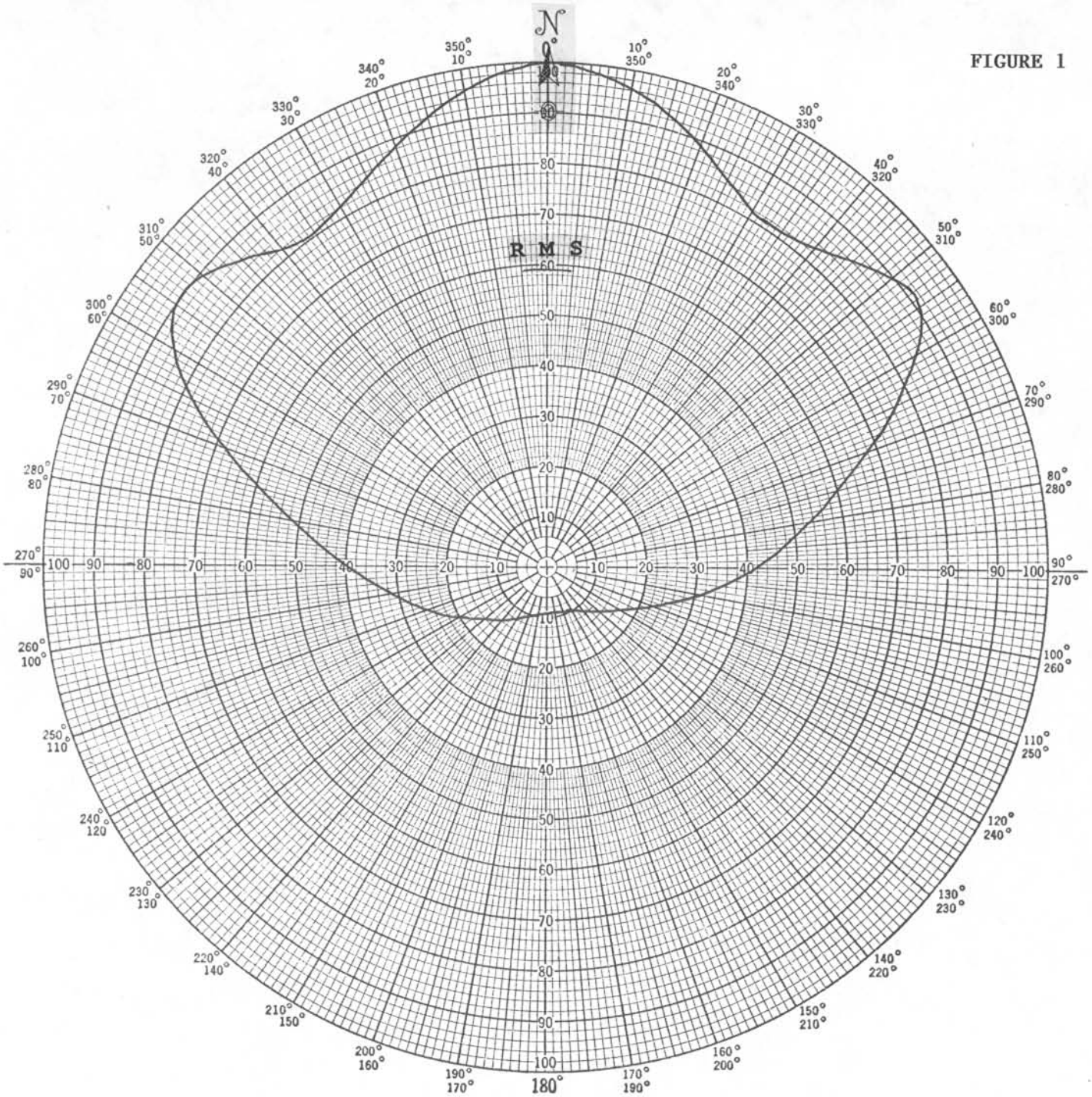
TEST PROCEDURES:

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 396.45 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
Manager of RF Engineering
S/O 23723
March 30, 2005

FIGURE 1



Shively Labs

PROJECT NAME KGRI LEBANON, OR

PROJECT NUMBER 23723 DATE 12/29/04

MODEL (X) FULL SCALE ( ) FREQUENCY 396.45/88.1 MHz

POLARIZATION VERTICAL

CURVE PLOTTED IN: VOLTAGE (X) POWER( ) DB( )

OBSERVER RAS

ANTENNA TYPE SCALA YA7-FM/RM

PATTERN TYPE DIRECTIONAL AZIMUTH

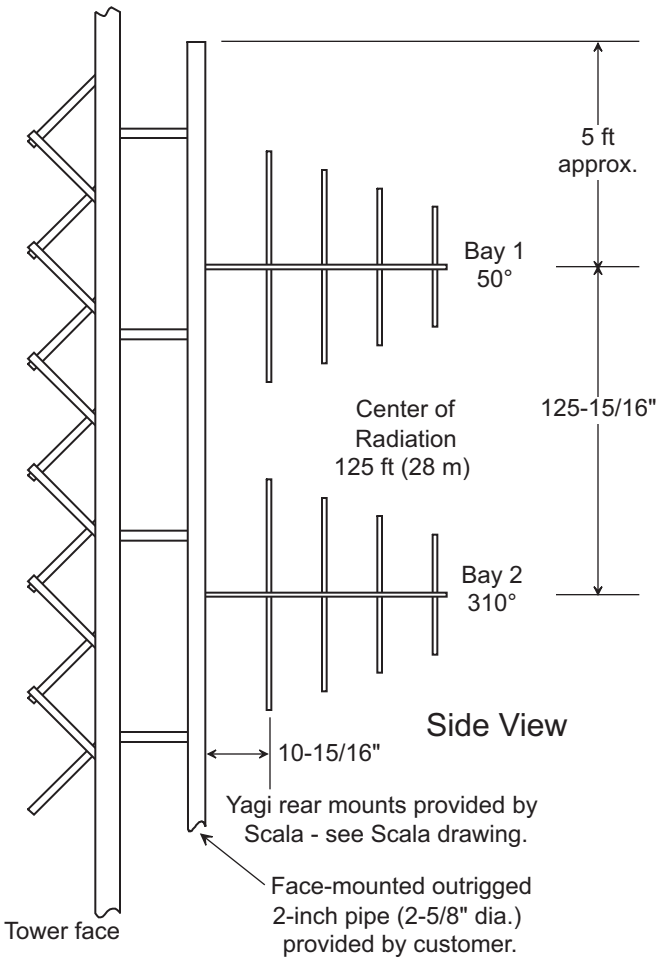
REMARKS: SEE FIGURE 2 FOR MECHANICAL DETAILS

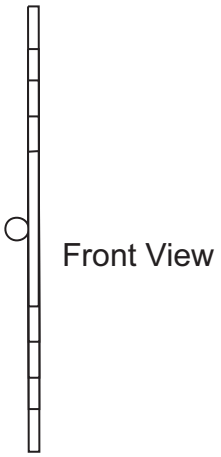
Figure 1A

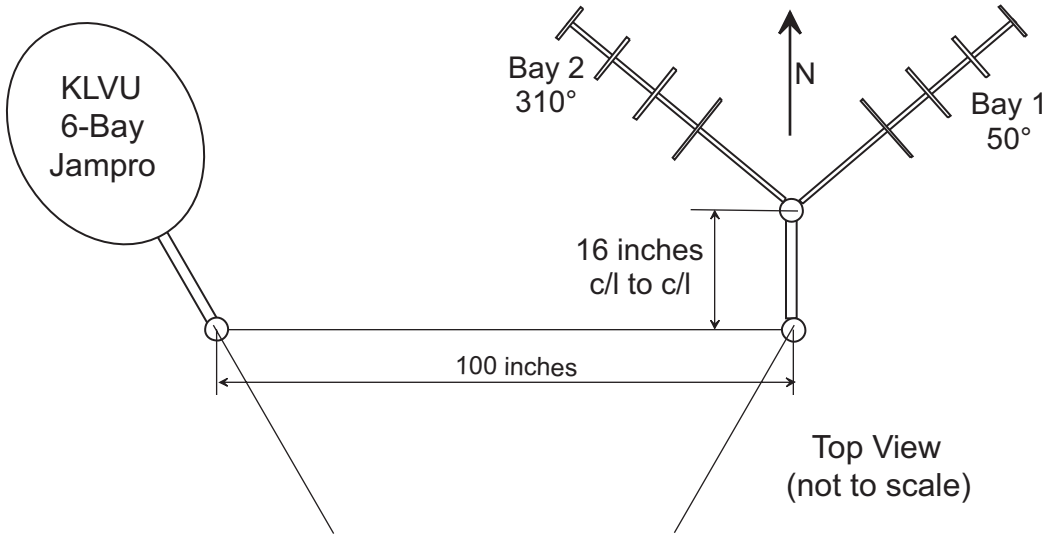
S/O 23723
TABULATION OF VERTICAL POLARIZATION
KGRI LEBANON, OR

DEGREE	RELATIVE FIELD	DEGREE	RELATIVE FIELD
0	1.000	180	0.090
10	0.965	190	0.100
20	0.890	200	0.105
30	0.820	210	0.120
40	0.830	220	0.140
45	0.860	225	0.150
50	0.900	230	0.160
60	0.850	240	0.200
70	0.680	250	0.255
80	0.530	260	0.315
90	0.420	270	0.400
100	0.310	280	0.515
110	0.230	290	0.680
120	0.170	300	0.855
130	0.140	310	0.895
135	0.125	315	0.855
140	0.115	320	0.820
150	0.100	330	0.825
160	0.095	340	0.885
170	0.090	350	0.955

REV	DESCRIPTION	DATE	SIG
A	ANTENNA MOUNT WAS TWO-LEG-PICKUP.	3/23/05	
B	FRONT VIEW WAS 4.4° FROM VERTICAL.	3/29/05	
C	ADDED KLVU ANTENNA OUTLINE.	10/11/05	







NOTE: ORIENTATION PER SHIVELY LABS PATTERN #5, 11/18/04.

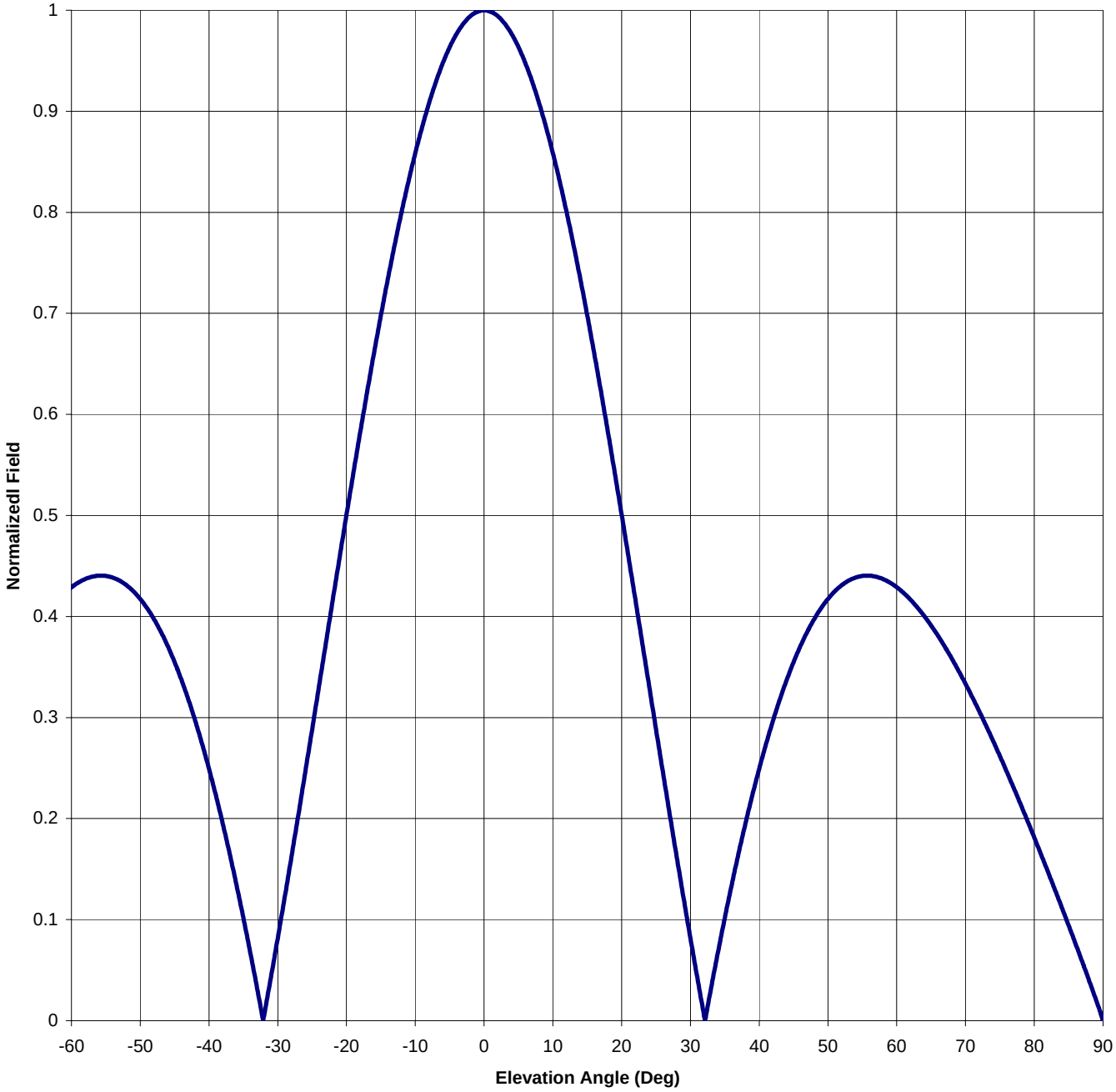
SHIVELY LABS

DIV. HOWELL LABS — BRIDGTON, MAINE USA

Figure 2 for KGRI, 88.1 MHz
Scala YA7-FM-RM Yagi Array

SIZE	CODE IDENT. NO.	DRAWING NO.	REV
A	26750	AGF041228-001	C
SCALE	23723	SHEET	

Antenna Mfg.:	**Shively Labs**			**Date: 3/29/2005**
Antenna Type:	**Scala YA7-FM/RM**			
Station:	**KGRI**	**Beam Tilt**	**0**	
Frequency:	**88.1**	**Gain (Max)**	**4.841**	**6.849 dB**
Channel #:	**201**	**Gain (Horizon)**	**4.841**	**6.849 dB**
Figure:	**3**			



Antenna Mfg.: Shively Labs **Date:** 3/29/2005

Antenna Type: Scala YA7-FM/RM

Station: KGRI **Beam Tilt** 0

Frequency: 88.1 **Gain (Max)** 4.841 6.849 dB

Channel #: 201 **Gain (Horizon)** 4.841 6.849 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	0.337	0	1.000	46	0.371
-89	0.020	-43	0.318	1	0.999	47	0.385
-88	0.039	-42	0.297	2	0.994	48	0.397
-87	0.058	-41	0.274	3	0.987	49	0.408
-86	0.076	-40	0.249	4	0.977	50	0.417
-85	0.094	-39	0.223	5	0.964	51	0.425
-84	0.112	-38	0.195	6	0.948	52	0.431
-83	0.130	-37	0.165	7	0.929	53	0.435
-82	0.147	-36	0.134	8	0.908	54	0.439
-81	0.164	-35	0.102	9	0.885	55	0.440
-80	0.181	-34	0.068	10	0.859	56	0.440
-79	0.198	-33	0.032	11	0.830	57	0.439
-78	0.214	-32	0.005	12	0.800	58	0.437
-77	0.231	-31	0.043	13	0.768	59	0.434
-76	0.246	-30	0.082	14	0.734	60	0.429
-75	0.262	-29	0.122	15	0.698	61	0.423
-74	0.277	-28	0.162	16	0.661	62	0.417
-73	0.292	-27	0.204	17	0.622	63	0.409
-72	0.306	-26	0.246	18	0.583	64	0.400
-71	0.320	-25	0.288	19	0.542	65	0.391
-70	0.333	-24	0.331	20	0.501	66	0.381
-69	0.346	-23	0.374	21	0.459	67	0.370
-68	0.358	-22	0.416	22	0.416	68	0.358
-67	0.370	-21	0.459	23	0.374	69	0.346
-66	0.381	-20	0.501	24	0.331	70	0.333
-65	0.391	-19	0.542	25	0.288	71	0.320
-64	0.400	-18	0.583	26	0.246	72	0.306
-63	0.409	-17	0.622	27	0.204	73	0.292
-62	0.417	-16	0.661	28	0.162	74	0.277
-61	0.423	-15	0.698	29	0.122	75	0.262
-60	0.429	-14	0.734	30	0.082	76	0.246
-59	0.434	-13	0.768	31	0.043	77	0.231
-58	0.437	-12	0.800	32	0.005	78	0.214
-57	0.439	-11	0.830	33	0.032	79	0.198
-56	0.440	-10	0.859	34	0.068	80	0.181
-55	0.440	-9	0.885	35	0.102	81	0.164
-54	0.439	-8	0.908	36	0.134	82	0.147
-53	0.435	-7	0.929	37	0.165	83	0.130
-52	0.431	-6	0.948	38	0.195	84	0.112
-51	0.425	-5	0.964	39	0.223	85	0.094
-50	0.417	-4	0.977	40	0.249	86	0.076
-49	0.408	-3	0.987	41	0.274	87	0.058
-48	0.397	-2	0.994	42	0.297	88	0.039
-47	0.385	-1	0.999	43	0.318	89	0.020
-46	0.371	0	1.000	44	0.337	90	0.000
-45	0.355			45	0.355		

FIGURE 4

S.O. 23723

VALIDATION OF GAIN CALCULATION

KGRI LEBANON, OR

SCALA YA7-FM/RM

Elevation Gain of Scala YA7-FM/RM equals 4.812

The RMS values are calculated utilizing the data of a planimeter.

Elevation Gain of Vertical Component equals 1.685

Vertical Azimuth Gain equals $1/(RMS)^2$
$1/(0.59)^2 = 2.873$

*** Total Vertical Gain is Elevation Gain times Azimuth Gain**
1.685 x 2.873 = 4.841

ERP divided by Vertical Gain equals Antenna Input Power
0.17 kW ÷ 4.841 = 0.035