vatives are required, since the variations of the individual median values as well as the individual decile values are important. It turns out, although it is more difficult to show, that the partials given by (24) and (25) serve as good approximations. Therefore, the σ_{D_μ} (SIGU) is given by

$$SIGU^2 = \left(\frac{\partial DU}{\partial DUA} SUA\right)^2 + \left(\frac{\partial DU}{\partial DUG} SUG\right)^2 + \left(\frac{\partial DU}{\partial DUM} SUM\right)^2 + \left(\frac{\partial DU}{\partial ATNOS} SMA\right)^2 + \left(\frac{\partial DU}{\partial GNOIS} SMG\right)^2 + \left(\frac{\partial DU}{\partial XNOIS} SMM\right)^2, \quad (41)$$

with a corresponding expression for σ_{D_ℓ} (SIGL).

The next section gives a few examples (paths) using IONCAP with and without the new GENOIS and with and without the new atmospheric noise and man-made noise estimates.

5. COMPARISONS AND CONCLUSIONS

As detailed in the previous sections, three major changes have been made in the noise portion of IONCAP via subroutine GENOIS: the replacement of the worldwide atmospheric radio noise estimates with the current, much improved estimates of CCIR Report 322-3; the replacement of the man-made noise estimates with the much more modern estimates of CCIR Report 258-4; and the means of summing the three noise contributions and determining the noise overall distribution and its statistical variations has been updated. While an unlimited number of examples to indicate the various changes due to the new GENOIS could be run, we show only a few here to indicate the kind of differences produced.

Table 2 shows the magnitude and direction of change between the old man-made noise model and the new man-made noise model (Figure 9). As we can see, the most significant difference is in the Business category and the difference decreases to a relatively small value in the quiet rural category. The correction in galactic noise is also displayed in Table 2 and shows a small increase from the old galactic noise values. To demonstrate the most significant effect of the changes in the man-made and galactic noise, IONCAP was run with both the old and new values and the results are displayed in Tables 3 to 6. For the Business category and the circuit shown in Tables 3 and 4, there is a significant increase in the reliability figures (REL), also the power necessary to achieve the required reliability (PRWRG) is reduced. For the Quiet Rural category and the circuit shown in Tables 5 and 6, the atmospheric noise is the dominant noise for hours 00, 06, and 12 UT. At 18 UT the man-made noise is the most significant noise, however, there is almost no difference between the old model (Table 5) and the new model (Table 6).

TABLE 2. Difference between the updated and corrected man-made noise and galactic noise values and the currently used values (i. e., new-old).

Frequency	Business	Residential	Rural	Quiet Rural	Galactic
2 MHz	-15.5 dB	-8.8	-2.1	+0.1	2.2
4	-15.4	-8.7	-2.0	-0.1	1.9
6	-15.3	-8.6	-1.9	-0.2	1.7
8	-15.3	-8.6	-1.9	-0.3	1.6
10	-15.3	-8.6	-1.9	-0.4	1.5
12	-15.2	-8.5	-1.8	-0.4	1.4
14	-15.2	-8.5	-1.8	-0.4	1.4
16	-15.2	-8.5	-1.8	-0.5	1.3
18	-15.2	-8.5	-1.8	-0.5	1.2
20	-15.2	-8.5	-1.8	-0.5	1.2
22	-15.2	-8.5	-1.8	-0.6	1.2
24	-15.1	-8.4	-1.7	-0.6	1.1
26	-15.1	-8.4	-1.7	-0.6	1.1
28	-15.1	-8.4	-1.7	-0.6	1.1
30	-15.1	-8.4	-1.7	-0.6	1.0

The changes in the atmospheric noise model described in Spaulding and Washburn (1985) affect noise levels worldwide, and in some particular areas of the world have a significant effect on the circuit performance predicted by the IONCAP program. To demonstrate the effect of this change a test point was chosen where the new coefficients significantly reduced the predicted value of the atmospheric noise. Table 7 shows the IONCAP output for the old atmospheric noise coefficients and Table 8 is a listing based on the new coefficients. At certain hours of the day, for example 00 UT, the man-made noise is more significant than the atmospheric noise and there is no detectable difference between the two models. At 1200 UT the old atmospheric noise model shows a noise level of -157 dBW at 3 MHz, while the new atmospheric model in Table 6 has a value less than the man-made noise which is a decrease of at least 7 dB. Since the atmospheric noise model at its minimum gives values close to or below the estimated man-made noise levels, there is no significant difference for this example.

Tables 9 and 10 show a communication circuit into an area where there is a considerable increase in the predicted value of the atmospheric noise. This increase is most pronounced on this circuit at hours 1200 and 1800 UT. The result of this change in the noise model is a more pessimistic prediction of circuit performance which is reflected in the service probability (S PRB) differences in Tables 9 and 10.

An example of the changes caused by correcting the computer subroutine calculation of the noise statistics is shown in Table 11. These changes are least significant when one type of noise is dominant and most significant when 2 or more of the 3 noise types are close in magnitude. Table 11 shows the changes in the statistical parameters that can be typically expected. The effect of these changes in the output of the IONCAP program may be seen by comparing Table 10 (the old model) and Table 11 (the corrected model). When one noise dominates (such as the atmospheric noise at hour 1800 UT) there is almost no difference between Tables 10 and 11.

The overall effect of the noise changes on the IONCAP predictions is restricted to the system performance parameters. One would expect a more optimistic prediction based on the man-made noise particularly in the business environment. The changes in the atmospheric noise model will give a reduction in predicted performance for some areas of the world. In areas of the world where the new atmospheric noise model gives lower values, the effect can either be miminal due to man-made and/or galactic noise dominating, or can be significant in areas where the old atmospheric noise estimates dominated.

Finally, typical differences between the old overall noise statistics and the new statistics are given in Table 12. Table 12 is for Boulder, Colorado for 1100 local time, January, for the various frequencies ranging from 2 to 30 MHz. The 3 MHz man-made noise was set at -160 dBW and the new atmospheric noise estimates were used throughout. As can be seen from Table 12, the greater differences occur when two or more of the noise levels are comparable in magnitude. Also, as noted previously, the greatest changes are in σ_{D_μ} and σ_{D_ℓ}.

All the above examples are for the month of January. Atmospheric noise is much higher in the summertime, but the above examples should serve to indicate the kind of changes the new GENOIS will produce.

TABLE 3. IONCAP output using current GENOIS, "Industrial" man-made noise and updated atmospheric noise estimates

METHOD 23 IONCAP PC.10 PAGE 1

JAN 1970 SSN = 100.

BOULDER,COLORADO TO ST. LOUIS,MO. AZIMUTHS N. MI. KM

40.03 N 105.30 W - 38.67 N 90.25 W 91.84 281.42 702.6 1301.1

MINIMUM ANGLE .0 DEGREES

ITS- 1 ANTENNA PACKAGE

XMTR 2.0 TO 30.0 VER MONOPOLE H .00 L -.50 A .0 OFF AZ .0

RCVR 2.0 TO 30.0 VER MONOPOLE H .00 L -.25 A .0 OFF AZ .0

POWER = 30.000 KW 3 MHZ NOISE = -125.0 DBW REQ. REL = .90 REQ. SNR = 55.0

UT	MUF												
.0	16.3	2.0	3.0	5.0	7.5	10.0	12.5	15.0	17.5	20.0	25.0	30.0	FREQ
	1F2	1 E	1F2	1F2	1F2	1F2	1F2	1F2	1F2	1F2	1F2	1F2	MODE
	23.3	5.0	25.4	18.6	17.1	17.1	17.9	19.7	25.4	25.4	25.4	25.4	ANGLE
	-88	-93	-88	-85	-85	-86	-88	-88	-101	-124	-193	-198	S DBW
	-146	-120	-125	-131	-136	-140	-142	-145	-147	-148	-151	-153	N DBW
	57.	27.	37.	46.	51.	53.	55.	56.	45.	24.	-42.	-45.	SNR
	17.	37.	27.	17.	13.	11.	10.	10.	36.	57.	109.	110.	RPWRG
	.57	.00	.03	.17	.31	.41	.48	.55	.25	.07	.00	.00	REL
	.23	.01	.02	.10	.17	.21	.24	.26	.13	.03	.00	.00	S PRB
6.0	6.8	2.0	3.0	5.0	7.5	10.0	12.5	15.0	17.5	20.0	25.0	30.0	FREQ
	1F2	1F2	1F2	1F2	1F2	1ES	1ES	1ES	1ES	1F2	1F2	1F2	MODE
	25.9	21.2	19.8	20.4	27.1	6.6	6.6	6.6	6.6	27.1	27.1	27.1	ANGLE
	-73	-72	-72	-71	-83	-107	-119	-139	-174	-180	-182	-183	S DBW
	-135	-120	-125	-131	-136	-140	-142	-145	-147	-148	-151	-153	N DBW
	62.	48.	52.	59.	53.	33.	23.	6.	-27.	-32.	-31.	-30.	SNR
	5.	14.	10.	4.	16.	33.	44.	67.	93.	95.	94.	93.	RPWRG
	.77	.19	.38	.75	.42	.10	.06	.01	.00	.00	.00	.00	REL
	.34	.15	.22	.37	.21	.05	.01	.00	.00	.00	.00	.00	S PRB
12.0	5.8	2.0	3.0	5.0	7.5	10.0	12.5	15.0	17.5	20.0	25.0	30.0	FREQ
	1F2	1F2	1F2	1F2	1F2	1ES	1ES	1F2	1F2	1F2	1F2	1F2	MODE
	28.5	29.5	23.1	22.7	28.5	6.6	6.6	28.5	28.5	28.5	28.5	28.5	ANGLE
	-78	-74	-71	-72	-103	-119	-151	-175	-176	-177	-179	-180	S DBW
	-133	-120	-125	-131	-136	-140	-142	-145	-147	-148	-151	-153	N DBW
	54.	46.	54.	58.	33.	21.	-9.	-30.	-30.	-29.	-28.	-27.	SNR
	21.	17.	9.	7.	39.	60.	88.	94.	93.	92.	91.	91.	RPWRG
	.48	.16	.43	.66	.11	.05	.00	.00	.00	.00	.00	.00	REL
	.22	.11	.25	.33	.05	.04	.00	.00	.00	.00	.00	.00	S PRB
18.0	20.4	2.0	3.0	5.0	7.5	10.0	12.5	15.0	17.5	20.0	25.0	30.0	FREQ
	1F2	1 E	1 E	1ES	1ES	1F1	1F2	1F2	1F2	1F2	1F2	1F2	MODE
	21.0	4.0	4.5	6.6	6.6	18.7	17.6	16.8	17.4	19.8	25.1	25.1	ANGLE
	-87	-188	-181	-137	-111	-94	-91	-90	-90	-88	-125	-181	S DBW
	-148	-120	-125	-131	-136	-140	-142	-145	-147	-148	-151	-153	N DBW
	61.	-68.	-57.	-5.	25.	45.	51.	54.	56.	60.	26.	-28.	SNR
	9.	131.	120.	69.	39.	23.	12.	10.	7.	8.	55.	104.	RPWRG
	.69	.00	.00	.00	.00	.11	.29	.43	.58	.69	.08	.00	REL
	.30	.00	.00	.00	.00	.10	.17	.23	.28	.31	.04	.00	S PRB

TABLE 4. IONCAP output using new GENOIS, "Business" man-made noise and updated atmospheric noise estimates

METHOD 23 IONCAP PC.20 PAGE 1

JAN 1970 SSN = 100.
BOULDER,COLORADO TO ST. LOUIS,MO. AZIMUTHS N. MI. KM
40.03 N 105.30 W - 38.67 N 90.25 W 91.84 281.42 702.6 1301.1
MINIMUM ANGLE .0 DEGREES

ITS- 1 ANTENNA PACKAGE
XMTR 2.0 TO 30.0 VER MONOPOLE H .00 L -.50 A .0 OFF AZ .0
RCVR 2.0 TO 30.0 VER MONOPOLE H .00 L -.25 A .0 OFF AZ .0
POWER = 30.000 KW 3 MHZ NOISE = -140.4 DBW REQ. REL = .90 REQ. SNR = 55.0

UT	MUF												
.0	16.3	2.0	3.0	5.0	7.5	10.0	12.5	15.0	17.5	20.0	25.0	30.0	FREQ
	1F2	1 E	1F2	1F2	1F2	1F2	1F2	1F2	1F2	1F2	1F2	1F2	MODE
	23.3	5.0	25.4	18.6	17.1	17.1	17.9	19.7	25.4	25.4	25.4	25.4	ANGLE
	-88	-93	-88	-85	-85	-86	-88	-88	-101	-124	-193	-198	S DBW
	-160	-135	-140	-146	-151	-154	-157	-159	-161	-163	-166	-168	N DBW
	72.	42.	51.	61.	65.	68.	69.	71.	60.	39.	-27.	-30.	SNR
	1.	22.	11.	2.	-2.	-4.	-6.	-5.	20.	42.	94.	94.	RPWRG
	.88	.07	.36	.83	.95	.97	.98	.98	.60	.22	.00	.00	REL
	.44	.07	.17	.37	.47	.52	.56	.56	.26	.10	.00	.00	S PRB
6.0	6.8	2.0	3.0	5.0	7.5	10.0	12.5	15.0	17.5	20.0	25.0	30.0	FREQ
	1F2	1F2	1F2	1F2	1F2	1ES	1ES	1ES	1ES	1F2	1F2	1F2	MODE
	25.9	21.2	19.8	20.4	27.1	6.6	6.6	6.6	6.6	27.1	27.1	27.1	ANGLE
	-73	-72	-72	-71	-83	-107	-119	-139	-174	-180	-182	-183	S DBW
	-149	-133	-138	-145	-151	-155	-158	-160	-162	-163	-166	-168	N DBW
	76.	62.	66.	73.	67.	48.	38.	21.	-12.	-17.	-16.	-15.	SNR
	-10.	0.	-6.	-12.	1.	17.	29.	52.	77.	79.	78.	77.	RPWRG
	.99	.91	1.00	1.00	.88	.34	.21	.05	.00	.00	.00	.00	REL
	.61	.40	.53	.69	.44	.15	.08	.03	.00	.00	.00	.00	S PRB
12.0	5.8	2.0	3.0	5.0	7.5	10.0	12.5	15.0	17.5	20.0	25.0	30.0	FREQ
	1F2	1F2	1F2	1F2	1ES	1ES	1ES	1F2	1F2	1F2	1F2	1F2	MODE
	28.5	29.5	23.1	22.7	6.6	6.6	6.6	28.5	28.5	28.5	28.5	28.5	ANGLE
	-78	-74	-71	-72	-103	-119	-151	-175	-176	-177	-179	-180	S DBW
	-147	-135	-139	-146	-151	-155	-158	-160	-162	-163	-166	-168	N DBW
	69.	60.	68.	72.	48.	36.	6.	-15.	-15.	-14.	-13.	-12.	SNR
	6.	2.	-6.	-9.	24.	45.	72.	78.	77.	76.	75.	75.	RPWRG
	.81	.83	.99	.99	.34	.18	.01	.00	.00	.00	.00	.00	REL
	.40	.36	.57	.62	.15	.09	.02	.00	.00	.00	.00	.00	S PRB
18.0	20.4	2.0	3.0	5.0	7.5	10.0	12.5	15.0	17.5	20.0	25.0	30.0	FREQ
	1F2	1 E	1 E	1ES	1ES	1F1	1F2	1F2	1F2	1F2	1F2	1F2	MODE
	21.0	4.0	4.5	6.6	6.6	18.7	17.6	16.8	17.4	19.8	25.1	25.1	ANGLE
	-87	-188	-181	-137	-111	-94	-91	-90	-90	-88	-125	-181	S DBW
	-163	-136	-140	-147	-151	-155	-157	-159	-161	-163	-166	-168	N DBW
	76.	-52.	-42.	10.	40.	60.	66.	68.	71.	75.	41.	-13.	SNR
	-6.	114.	104.	52.	22.	8.	-3.	-6.	-9.	-8.	39.	89.	RPWRG
	.97	.00	.00	.00	.03	.69	.97	.99	1.00	.98	.26	.00	REL
	.56	.00	.00	.00	.06	.31	.50	.57	.63	.60	.11	.00	S PRB

TABLE 5. IONCAP output using current GENOIS, "Quiet Rural" man-made noise and updated atmospheric noise estimates.

METHOD 23 IONCAP PC.10 PAGE 1

JAN 1970 SSN = 100.
BOULDER,COLORADO TO ST. LOUIS,MO. AZIMUTHS N. MI. KM
40.03 N 105.30 W - 38.67 N 90.25 W 91.84 281.42 702.6 1301.1
MINIMUM ANGLE .0 DEGREES
ITS- 1 ANTENNA PACKAGE
XMTR 2.0 TO 30.0 VER MONOPOLE H .00 L -.50 A .0 OFF AZ .0
RCVR 2.0 TO 30.0 VER MONOPOLE H .00 L -.25 A .0 OFF AZ .0
POWER = 30.000 KW 3 MHZ NOISE = -164.0 DBW REQ. REL = .90 REQ. SNR = 55.0

UT	MUF												
.0	16.3	2.0	3.0	5.0	7.5	10.0	12.5	15.0	17.5	20.0	25.0	30.0	FREQ
	1F2	2 E	1F2	1F2	1F2	1F2	1F2	1F2	1F2	1F2	1F2	1F2	MODE
	23.3	14.9	25.4	18.6	17.1	17.1	17.9	19.7	25.4	25.4	25.4	25.4	ANGLE
	-88	-93	-88	-85	-85	-86	-88	-88	-101	-124	-193	-198	S DBW
	-171	-149	-153	-157	-160	-162	-165	-169	-173	-177	-183	-186	N DBW
	83.	56.	65.	72.	75.	76.	78.	80.	72.	53.	-10.	-12.	SNR
	-9.	11.	1.	-7.	-10.	-11.	-13.	-14.	9.	28.	[illegible]	75.	RPWRG
	.97	.54	.87	.98	.99	1.00	1.00	1.00	.80	.46	.00	.00	REL
	.62	.23	.41	.62	.69	.74	.78	.79	.38	.18	.00	.00	S PRB
6.0	6.8	2.0	3.0	5.0	7.5	10.0	12.5	15.0	17.5	20.0	25.0	30.0	FREQ
	1F2	1F2	1F2	1F2	1F2	1ES	1ES	1ES	1ES	1F2	1F2	1F2	MODE
	25.9	21.2	19.8	20.4	27.1	6.6	6.6	6.6	6.6	27.1	27.1	27.1	ANGLE
	-73	-72	-72	-71	-83	-107	-119	-139	-174	-180	-182	-183	S DBW
	-156	-140	-145	-151	-158	-165	-171	-176	-179	-181	-184	-186	N DBW
	83.	68.	72.	79.	74.	58.	51.	37.	6.	1.	2.	3.	SNR
	-16.	-5.	-10.	-17.	-6.	7.	15.	35.	58.	59.	58.	57.	RPWRG
	1.00	.98	1.00	1.00	.97	.65	.43	.19	.00	.00	.00	.00	REL
	.76	.54	.68	.84	.59	.32	.20	.07	.01	.00	.00	.00	S PRB
12.0	5.8	2.0	3.0	5.0	7.5	10.0	12.5	15.0	17.5	20.0	25.0	30.0	FREQ
	1F2	1F2	1F2	1F2	1ES	1ES	1ES	1F2	1F2	1F2	1F2	1F2	MODE
	28.5	29.5	23.1	22.7	6.6	6.6	6.6	28.5	28.5	28.5	28.5	28.5	ANGLE
	-78	-74	-71	-72	-103	-119	-151	-175	-176	-177	-179	-180	S DBW
	-156	-147	-150	-154	-160	-166	-172	-177	-180	-182	-184	-186	N DBW
	77.	72.	78.	81.	57.	47.	21.	2.	4.	4.	5.	5.	SNR
	-2.	-7.	-13.	-16.	15.	33.	58.	60.	58.	57.	56.	55.	RPWRG
	.92	.98	1.00	1.00	.55	.35	.04	.00	.00	.00	.00	.00	REL
	.52	.57	.74	.78	.25	.15	.03	.00	.00	.00	.00	.00	S PRB
18.0	20.4	2.0	3.0	5.0	7.5	10.0	12.5	15.0	17.5	20.0	25.0	30.0	FREQ
	1F2	1 E	1 E	1ES	2F2	1F1	1F2	1F2	1F2	1F2	1F2	1F2	MODE
	21.0	4.0	4.5	6.6	35.5	18.7	17.6	16.8	17.4	19.8	25.1	25.1	ANGLE
	-87	-188	-181	-137	-111	-94	-91	-90	-90	-88	-125	-181	S DBW
	-179	-159	-164	-170	-171	-169	-168	-170	-173	-178	-184	-186	N DBW
	91.	-29.	-18.	33.	59.	74.	76.	79.	83.	90.	59.	5.	SNR
	-22.	92.	82.	30.	4.	-6.	-13.	-16.	-20.	-23.	21.	71.	RPWRG
	1.00	.00	.00	.00	.72	.97	1.00	1.00	1.00	1.00	.59	.01	REL
	.86	.00	.00	.01	.32	.57	.78	.83	.91	.91	.24	.00	S PRB

TABLE 6. IONCAP output using new GENOIS, "Quiet Rural" man-made noise and updated atmospheric noise estimates

METHOD 23 IONCAP PC.20 PAGE 1

```
          JAN     1970              SSN = 100.
BOULDER,COLORADO TO ST. LOUIS,MO.              AZIMUTHS              N. MI.      KM
40.03 N  105.30 W - 38.67 N   90.25 W     91.84  281.42         702.6    1301.1
                                 MINIMUM ANGLE    .0  DEGREES
ITS- 1 ANTENNA PACKAGE
XMTR   2.0  TO  30.0  VER MONOPOLE H        .00 L     -.50 A      .0  OFF AZ      .0
RCVR   2.0  TO  30.0  VER MONOPOLE H        .00 L     -.25 A      .0  OFF AZ      .0
POWER =  30.000 KW  3 MHZ NOISE = -163.6 DBW   REQ. REL = .90  REQ. SNR = 55.0
```

UT	MUF												
.0	16.3	2.0	3.0	5.0	7.5	10.0	12.5	15.0	17.5	20.0	25.0	30.0	FREQ
	1F2	2 E	1F2	1F2	1F2	1F2	1F2	1F2	1F2	1F2	1F2	1F2	MODE
	23.3	14.9	25.4	18.6	17.1	17.1	17.9	19.7	25.4	25.4	25.4	25.4	ANGLE
	-88	-93	-88	-85	-85	-86	-88	-88	-101	-124	-193	-198	S DBW
	-171	-149	-153	-157	-160	-162	-165	-169	-172	-176	-183	-187	N DBW
	82.	56.	65.	72.	74.	76.	77.	80.	71.	52.	-10.	-12.	SNR
	-8.	11.	1.	-7.	-9.	-11.	-13.	-14.	10.	29.	75.	73.	RPWRG
	.97	.54	.87	.98	.99	1.00	1.00	1.00	.79	.44	.00	.00	REL
	.61	.24	.41	.61	.69	.74	.78	.79	.38	.18	.00	.00	S PRB
6.0	6.8	2.0	3.0	5.0	7.5	10.0	12.5	15.0	17.5	20.0	25.0	30.0	FREQ
	1F2	1F2	1F2	1F2	1F2	1ES	1ES	1ES	1ES	1F2	1F2	1F2	MODE
	25.9	21.2	19.8	20.4	27.1	6.6	6.6	6.6	6.6	27.1	27.1	27.1	ANGLE
	-73	-72	-72	-71	-83	-107	-119	-139	-174	-180	-182	-183	S DBW
	-156	-140	-145	-151	-158	-164	-170	-176	-180	-182	-185	-187	N DBW
	83.	68.	72.	78.	74.	58.	51.	37.	6.	2.	3.	3.	SNR
	-16.	-5.	-10.	-17.	-6.	7.	15.	35.	57.	57.	56.	56.	RPWRG
	1.00	.98	1.00	1.00	.97	.63	.41	.19	.01	.00	.00	.00	REL
	.76	.54	.68	.85	.59	.31	.19	.07	.01	.00	.00	.00	S PRB
12.0	5.8	2.0	3.0	5.0	7.5	10.0	12.5	15.0	17.5	20.0	25.0	30.0	FREQ
	1F2	1F2	1F2	1F2	1ES	1ES	1ES	1F2	1F2	1F2	1F2	1F2	MODE
	28.5	29.5	23.1	22.7	6.6	6.6	6.6	28.5	28.5	28.5	28.5	28.5	ANGLE
	-78	-74	-71	-72	-103	-119	-151	-175	-176	-177	-179	-180	S DBW
	-156	-147	-150	-154	-160	-166	-171	-177	-180	-182	-185	-187	N DBW
	77.	72.	78.	81.	57.	47.	20.	2.	4.	5.	6.	6.	SNR
	-2.	-7.	-13.	-16.	16.	34.	58.	59.	56.	55.	54.	54.	RPWRG
	.92	.98	1.00	1.00	.55	.34	.04	.00	.00	.00	.00	.00	REL
	.51	.57	.74	.78	.24	.15	.03	.00	.00	.00	.00	.00	S PRB
18.0	20.4	2.0	3.0	5.0	7.5	10.0	12.5	15.0	17.5	20.0	25.0	30.0	FREQ
	1F2	1 E	1 E	1ES	2F2	1F1	1F2	1F2	1F2	1F2	1F2	1F2	MODE
	21.0	4.0	4.5	6.6	35.5	18.7	17.6	16.8	17.4	19.8	25.1	25.1	ANGLE
	-87	-188	-181	-137	-111	-94	-91	-90	-90	-88	-125	-181	S DBW
	-178	-159	-164	-170	-170	-168	-168	-169	-173	-177	-185	-187	N DBW
	91.	-29.	-18.	33.	58.	74.	76.	78.	83.	89.	60.	6.	SNR
	-21.	91.	81.	29.	5.	-6.	-13.	-16.	-20.	-23.	20.	70.	RPWRG
	1.00	.00	.00	.00	.69	.97	1.00	1.00	1.00	1.00	.60	.01	REL
	.86	.00	.00	.02	.31	.56	.78	.84	.91	.90	.24	.00	S PRB

TABLE 7. IONCAP output using current GENOIS, "Quiet Rural" man-made noise and old atmospheric noise estimates (low atmospheric noise region)

METHOD 23 IONCAP PC.10 PAGE 1

JAN 1970 SSN = 100.
CANTON, CHINA TO TEST PT. ONE AZIMUTHS N. MI. KM
23.00 N 113.03 E - 62.00 N 155.00 E 24.90 235.64 2894.8 5360.8
MINIMUM ANGLE .0 DEGREES
ITS- 1 ANTENNA PACKAGE
XMTR 2.0 TO 30.0 VER MONOPOLE H .00 L -.50 A .0 OFF AZ .0
RCVR 2.0 TO 30.0 VER MONOPOLE H .00 L -.25 A .0 OFF AZ .0
POWER = 30.000 KW 3 MHZ NOISE = -164.0 DBW REQ. REL = .90 REQ. SNR = 55.0

UT	MUF												
.0	23.5	2.0	3.0	5.0	7.5	10.0	12.5	15.0	17.5	20.0	25.0	30.0	FREQ
	2F2	3 E	3 E	3 E	3F2	3F2	3F2	3F2	3F2	2F2	2F2	2F2	MODE
	7.8	1.3	1.6	2.0	14.5	11.0	10.5	10.9	12.3	4.6	9.3	9.3	ANGLE
	-124	-267	-248	-184	-142	-129	-123	-120	-120	-124	-148	-236	S DBW
	-183	-159	-164	-170	-172	-170	-170	-173	-177	-180	-184	-186	N DBW
	58.	****	-85.	-14.	30.	40.	47.	52.	57.	57.	36.	-50.	SNR
	22.	174.	150.	78.	33.	23.	17.	13.	12.	11.	45.	131.	RPWRG
	.57	.00	.00	.00	.00	.01	.12	.35	.58	.57	.16	.00	REL
	.21	.00	.00	.00	.01	.04	.10	.19	.23	.26	.06	.00	S PRB
6.0	25.8	2.0	3.0	5.0	7.5	10.0	12.5	15.0	17.5	20.0	25.0	30.0	FREQ
	2F2	3 E	3 E	3 E	3F2	2F2	2F2	2F2	3F2	3F2	2F2	2F2	MODE
	7.9	1.4	1.7	2.0	13.5	6.7	3.9	3.7	11.4	13.5	6.6	9.6	ANGLE
	-125	-355	-339	-220	-163	-142	-133	-127	-124	-123	-124	-190	S DBW
	-184	-159	-163	-168	-168	-168	-170	-173	-176	-180	-184	-186	N DBW
	59.	****	****	-53.	5.	25.	37.	45.	52.	57.	59.	-5.	SNR
	21.	258.	241.	116.	58.	37.	26.	18.	12.	10.	21.	85.	RPWRG
	.59	.00	.00	.00	.00	.00	.01	.08	.33	.58	.58	.00	REL
	.22	.00	.00	.00	.00	.00	.02	.08	.18	.20	.23	.00	S PRB
12.0	8.9	2.0	3.0	5.0	7.5	10.0	12.5	15.0	17.5	20.0	25.0	30.0	FREQ
	2F2	3F2	3F2	3F2	2F2	2F2	2F2	2F2	2F2	2F2	2F2	2F2	MODE
	11.5	17.9	14.2	13.9	7.0	11.5	11.5	11.5	11.5	11.5	11.5	11.5	ANGLE
	-121	-118	-110	-107	-112	-134	-188	-270	-360	-401	-402	-404	S DBW
	-168	-155	-157	-159	-164	-171	-175	-178	-180	-182	-184	-186	N DBW
	47.	37.	47.	52.	53.	36.	-12.	-92.	****	****	****	****	SNR
	34.	25.	16.	10.	13.	44.	93.	172.	260.	278.	277.	277.	RPWRG
	.31	.02	.16	.32	.37	.17	.00	.00	.00	.00	.00	.00	REL
	.15	.03	.12	.18	.23	.08	.00	.00	.00	.00	.00	.00	S PRB
18.0	9.4	2.0	3.0	5.0	7.5	10.0	12.5	15.0	17.5	20.0	25.0	30.0	FREQ
	2F2	3F2	3F2	3F2	2F2	2F2	2F2	2F2	2F2	2F2	2F2	2F2	MODE
	12.5	21.5	16.1	15.1	7.6	12.5	12.5	12.5	12.5	12.5	12.5	12.5	ANGLE
	-120	-119	-108	-105	-109	-131	-221	-354	-387	-388	-389	-391	S DBW
	-171	-156	-158	-161	-166	-172	-176	-179	-180	-182	-184	-186	N DBW
	51.	37.	50.	56.	58.	41.	-45.	****	****	****	****	****	SNR
	29.	28.	14.	6.	5.	39.	126.	255.	266.	265.	264.	264.	RPWRG
	.39	.02	.28	.55	.66	.25	.00	.00	.00	.00	.00	.00	REL
	.18	.03	.16	.25	.34	.11	.00	.00	.00	.00	.00	.00	S PRB

TABLE 8. IONCAP output using current GENOIS, "Quiet Rural" man-made noise and updated atmospheric noise estimates (low atmospheric noise region)

METHOD 23 IONCAP PC.10 PAGE 1

JAN 1970 SSN = 100.
CANTON, CHINA TO TEST PT. ONE AZIMUTHS N. MI. KM
23.00 N 113.03 E - 62.00 N 155.00 E 24.90 235.64 2894.8 5360.8
MINIMUM ANGLE .0 DEGREES
ITS- 1 ANTENNA PACKAGE
XMTR 2.0 TO 30.0 VER MONOPOLE H .00 L -.50 A .0 OFF AZ .0
RCVR 2.0 TO 30.0 VER MONOPOLE H .00 L -.25 A .0 OFF AZ .0
POWER = 30.000 KW 3 MHZ NOISE = -164.0 DBW REQ. REL = .90 REQ. SNR = 55.0

UT	MUF												
.0	23.5	2.0	3.0	5.0	7.5	10.0	12.5	15.0	17.5	20.0	25.0	30.0	FREQ
	2F2	3 E	3 E	3 E	3F2	3F2	3F2	3F2	3F2	2F2	2F2	2F2	MODE
	7.8	1.3	1.6	2.0	14.5	11.0	10.5	10.9	12.3	4.6	9.3	9.3	ANGLE
	-124	-267	-248	-184	-142	-129	-123	-120	-120	-124	-148	-236	S DBW
	-183	-159	-164	-170	-173	-171	-172	-175	-178	-181	-184	-186	N DBW
	58.	****	-85.	-14.	31.	41.	48.	54.	59.	57.	36.	-50.	SNR
	22.	174.	150.	78.	32.	22.	15.	11.	10.	10.	45.	131.	RPWRG
	.57	.00	.00	.00	.00	.02	.17	.45	.64	.60	.16	.00	REL
	.21	.00	.00	.00	.01	.04	.11	.21	.24	.27	.06	.00	S PRB
6.0	25.8	2.0	3.0	5.0	7.5	10.0	12.5	15.0	17.5	20.0	25.0	30.0	FREQ
	2F2	3 E	3 E	3 E	3F2	2F2	2F2	3F2	3F2	3F2	2F2	2F2	MODE
	7.9	1.4	1.7	2.0	13.5	6.7	3.9	10.6	11.4	13.5	6.6	9.6	ANGLE
	-125	-355	-339	-220	-163	-142	-133	-127	-124	-123	-124	-190	S DBW
	-184	-159	-164	-170	-173	-173	-175	-178	-180	-182	-184	-186	N DBW
	59.	****	****	-51.	9.	30.	42.	51.	56.	58.	59.	-5.	SNR
	21.	258.	240.	113.	53.	31.	20.	12.	8.	8.	21.	85.	RPWRG
	.59	.00	.00	.00	.00	.00	.03	.23	.54	.65	.59	.00	REL
	.22	.00	.00	.00	.00	.00	.03	.12	.23	.21	.23	.00	S PRB
12.0	8.9	2.0	3.0	5.0	7.5	10.0	12.5	15.0	17.5	20.0	25.0	30.0	FREQ
	2F2	3F2	3F2	3F2	2F2	2F2	2F2	2F2	2F2	2F2	2F2	2F2	MODE
	11.5	17.9	14.2	13.9	7.0	11.5	11.5	11.5	11.5	11.5	11.5	11.5	ANGLE
	-121	-118	-110	-107	-112	-134	-188	-270	-360	-401	-402	-404	S DBW
	-172	-159	-164	-165	-170	-174	-177	-179	-180	-182	-184	-186	N DBW
	51.	41.	53.	58.	58.	40.	-11.	-91.	****	****	****	****	SNR
	29.	21.	9.	3.	7.	41.	91.	172.	260.	278.	277.	277.	RPWRG
	.41	.05	.42	.74	.65	.22	.00	.00	.00	.00	.00	.00	REL
	.18	.05	.21	.31	.32	.10	.00	.00	.00	.00	.00	.00	S PRB
18.0	9.4	2.0	3.0	5.0	7.5	10.0	12.5	15.0	17.5	20.0	25.0	30.0	FREQ
	2F2	3F2	3F2	3F2	2F2	2F2	2F2	2F2	2F2	2F2	2F2	2F2	MODE
	12.5	21.5	16.1	15.1	7.6	12.5	12.5	12.5	12.5	12.5	12.5	12.5	ANGLE
	-120	-119	-108	-105	-109	-131	-221	-354	-387	-388	-389	-391	S DBW
	-173	-159	-164	-166	-170	-174	-177	-179	-180	-182	-184	-186	N DBW
	54.	40.	55.	61.	62.	44.	-44.	****	****	****	****	****	SNR
	27.	23.	8.	0.	1.	37.	125.	255.	266.	265.	264.	264.	RPWRG
	.46	.04	.50	.90	.88	.28	.00	.00	.00	.00	.00	.00	REL
	.20	.04	.24	.38	.45	.12	.00	.00	.00	.00	.00	.00	S PRB

TABLE 9. IONCAP output using current GENOIS, "Quiet Rural" man-made noise and old atmospheric noise estimates (high atmospheric noise region)

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                                   METHOD 23   IONCAP PC.10   PAGE  2

          JAN     1970             SSN = 100.
CANTON, CHINA TO TEST PT. TWO                 AZIMUTHS            N. MI.      KM
23.00 N  113.03 E - 15.00 N  140.00 E     102.63  291.58     1601.4    2965.6
                                   MINIMUM ANGLE    .0  DEGREES
ITS- 1 ANTENNA PACKAGE
XMTR   2.0  TO  30.0  VER MONOPOLE H      .00 L     -.50 A      .0  OFF AZ      .0
RCVR   2.0  TO  30.0  VER MONOPOLE H      .00 L     -.25 A      .0  OFF AZ      .0
POWER =  30.000 KW  3 MHZ NOISE = -164.0 DBW   REQ. REL = .90  REQ. SNR = 55.0
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UT	MUF												
.0	33.1	2.0	3.0	5.0	7.5	10.0	12.5	15.0	17.5	20.0	25.0	30.0	FREQ
	1F2	2 E	2 E	2ES	2F2	2F2	2F2	2F2	2F2	2F2	1F2	1F2	MODE
	7.7	3.0	3.4	5.0	18.5	15.1	14.1	14.1	14.7	16.0	2.8	4.1	ANGLE
	-112	-248	-235	-145	-117	-107	-102	-100	-103	-102	-123	-114	S DBW
	-187	-159	-164	-169	-171	-170	-171	-174	-178	-181	-184	-186	N DBW
	75.	-89.	-72.	24.	53.	63.	68.	72.	74.	78.	61.	70.	SNR
	5.	154.	137.	39.	11.	2.	-3.	-7.	-10.	-12.	3.	-1.	RPWRG
	.85	.00	.00	.00	.42	.85	.96	.98	1.00	1.00	.82	.91	REL
	.41	.00	.00	.00	.15	.35	.48	.59	.73	.78	.40	.50	S PRB
6.0	36.5	2.0	3.0	5.0	7.5	10.0	12.5	15.0	17.5	20.0	25.0	30.0	FREQ
	1F2	2 E	2 E	2ES	2F2	2F2	2F2	2F2	2F2	2F2	1F2	1F2	MODE
	8.8	2.8	3.2	5.0	23.9	18.9	17.0	16.5	16.7	17.5	3.8	4.5	ANGLE
	-110	-339	-328	-193	-133	-118	-110	-106	-103	-104	-121	-118	S DBW
	-188	-159	-164	-169	-169	-168	-168	-170	-174	-179	-184	-186	N DBW
	78.	****	****	-24.	36.	50.	58.	64.	70.	73.	63.	68.	SNR
	-5.	245.	229.	87.	27.	13.	6.	0.	-5.	-9.	-1.	-5.	RPWRG
	.95	.00	.00	.00	.01	.23	.66	.91	.97	1.00	.93	.98	REL
	.57	.00	.00	.00	.02	.13	.26	.40	.57	.73	.52	.63	S PRB
12.0	33.6	2.0	3.0	5.0	7.5	10.0	12.5	15.0	17.5	20.0	25.0	30.0	FREQ
	1F2	2 E	3F2	3F2	2F2	2F2	2F2	2F2	2F2	2F2	1F2	1F2	MODE
	8.7	4.3	23.6	23.0	14.1	14.3	14.6	15.1	15.9	17.2	3.4	4.7	ANGLE
	-116	-103	-99	-92	-90	-90	-91	-92	-96	-98	-117	-116	S DBW
	-187	-145	-149	-154	-159	-164	-169	-174	-178	-181	-184	-186	N DBW
	71.	41.	50.	62.	69.	74.	78.	81.	82.	82.	66.	70.	SNR
	3.	22.	13.	1.	-5.	-10.	-12.	-14.	-14.	-10.	0.	2.	RPWRG
	.87	.11	.32	.86	.98	1.00	1.00	1.00	.99	.98	.89	.87	REL
	.46	.08	.19	.41	.55	.64	.71	.76	.75	.64	.48	.46	S PRB
18.0	18.1	2.0	3.0	5.0	7.5	10.0	12.5	15.0	17.5	20.0	25.0	30.0	FREQ
	1F2	3F2	3F2	3F2	2F2	2F2	1F2	1F2	1F2	1F2	1F2	1F2	MODE
	7.9	22.8	22.1	22.4	14.0	15.3	2.6	3.5	10.1	7.9	7.9	7.9	ANGLE
	-113	-96	-92	-88	-89	-93	-117	-115	-107	-118	-138	-167	S DBW
	-180	-143	-147	-153	-160	-167	-173	-177	-180	-182	-184	-186	N DBW
	68.	46.	54.	63.	70.	72.	56.	63.	72.	64.	46.	19.	SNR
	11.	18.	9.	1.	-1.	1.	12.	10.	6.	17.	34.	61.	RPWRG
	.76	.24	.45	.87	.91	.89	.56	.71	.83	.67	.33	.03	REL
	.36	.13	.26	.41	.48	.48	.27	.33	.40	.30	.14	.03	S PRB

TABLE 10. IONCAP output using current GENOIS, "Quiet Rural" man-made noise and updated atmospheric noise estimates (high atmospheric noise region)

METHOD 23 IONCAP PC.10 PAGE 2

JAN 1970 SSN = 100.

CANTON, CHINA TO TEST PT. TWO AZIMUTHS N. MI. KM

23.00 N 113.03 E - 15.00 N 140.00 E 102.63 291.58 1601.4 2965.6

MINIMUM ANGLE .0 DEGREES

ITS- 1 ANTENNA PACKAGE

XMTR 2.0 TO 30.0 VER MONOPOLE H .00 L -.50 A .0 OFF AZ .0

RCVR 2.0 TO 30.0 VER MONOPOLE H .00 L -.25 A .0 OFF AZ .0

POWER = 30.000 KW 3 MHZ NOISE = -164.0 DBW REQ. REL = .90 REQ. SNR = 55.0

UT	MUF												
.0	33.1	2.0	3.0	5.0	7.5	10.0	12.5	15.0	17.5	20.0	25.0	30.0	FREQ
	1F2	2 E	2 E	2ES	2F2	3F2	3F2	2F2	2F2	2F2	1F2	1F2	MODE
	7.7	3.0	3.4	5.0	18.5	22.9	23.4	14.1	14.7	16.0	2.8	4.1	ANGLE
	-112	-248	-235	-145	-117	-107	-102	-100	-103	-102	-123	-114	S DBW
	-187	-158	-163	-168	-168	-167	-167	-170	-174	-178	-184	-186	N DBW
	75.	-90.	-74.	22.	51.	60.	65.	68.	70.	76.	61.	70.	SNR
	5.	155.	139.	41.	13.	5.	0.	-3.	-5.	-10.	3.	-1.	RPWRG
	.85	.00	.00	.00	.30	.74	.89	.95	.98	.99	.81	.91	REL
	.41	.00	.00	.00	.13	.28	.40	.48	.62	.71	.40	.50	S PRB
6.0	36.5	2.0	3.0	5.0	7.5	10.0	12.5	15.0	17.5	20.0	25.0	30.0	FREQ
	1F2	2 E	2 E	2ES	2F2	2F2	2F2	2F2	2F2	2F2	1F2	1F2	MODE
	8.8	2.8	3.2	5.0	23.9	18.9	17.0	16.5	16.7	17.5	3.8	4.5	ANGLE
	-110	-339	-328	-193	-133	-118	-110	-106	-103	-104	-121	-118	S DBW
	-188	-152	-159	-163	-163	-162	-161	-161	-164	-169	-181	-186	N DBW
	78.	****	****	-29.	30.	43.	50.	55.	60.	64.	60.	68.	SNR
	-5.	252.	235.	92.	33.	20.	13.	9.	5.	1.	3.	-5.	RPWRG
	.95	.00	.00	.00	.00	.05	.25	.51	.73	.87	.78	.98	REL
	.57	.00	.00	.00	.01	.07	.14	.22	.33	.46	.39	.62	S PRB
12.0	33.6	2.0	3.0	5.0	7.5	10.0	12.5	15.0	17.5	20.0	25.0	30.0	FREQ
	1F2	2 E	1F2	3F2	3F2	3F2	2F2	2F2	2F2	2F2	1F2	1F2	MODE
	8.7	4.3	5.9	23.0	23.2	23.8	14.6	15.1	15.9	17.2	3.4	4.7	ANGLE
	-116	-103	-99	-92	-90	-90	-91	-92	-96	-98	-117	-116	S DBW
	-187	-124	-133	-142	-148	-152	-155	-159	-163	-169	-180	-186	N DBW
	71.	20.	33.	50.	58.	61.	63.	65.	67.	70.	63.	70.	SNR
	3.	43.	30.	13.	6.	3.	3.	2.	2.	3.	4.	3.	RPWRG
	.87	.00	.03	.29	.66	.81	.83	.85	.86	.85	.80	.86	REL
	.46	.01	.03	.18	.31	.37	.38	.43	.46	.44	.41	.45	S PRB
18.0	18.1	2.0	3.0	5.0	7.5	10.0	12.5	15.0	17.5	20.0	25.0	30.0	FREQ
	1F2	2F2	3F2	3F2	2F2	2F2	1F2	1F2	1F2	1F2	1F2	1F2	MODE
	7.9	15.5	22.1	22.4	14.0	15.3	2.6	3.5	10.1	7.9	7.9	7.9	ANGLE
	-113	-96	-92	-88	-89	-93	-117	-115	-107	-118	-138	-167	S DBW
	-178	-127	-134	-143	-151	-158	-165	-171	-177	-180	-184	-186	N DBW
	65.	30.	41.	54.	62.	64.	48.	56.	69.	62.	46.	19.	SNR
	13.	34.	22.	11.	7.	9.	20.	16.	9.	18.	34.	61.	RPWRG
	.71	.03	.08	.45	.73	.73	.13	.54	.78	.65	.33	.03	REL
	.32	.02	.08	.23	.32	.35	.16	.25	.35	.28	.14	.03	S PRB

TABLE 11. IONCAP output using new GENOIS, "Quiet Rural" man-made noise and updated atmospheric noise estimates (high atmospheric noise region)

The circuit and ionospheric parameters are the same as in Tables 9 and 10.

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```
          JAN      1970            SSN = 100.
CANTON, CHINA TO TEST PT. TWO                AZIMUTHS            N. MI.      KM
23.00 N  113.03 E - 15.00 N  140.00 E    102.63  291.58     1601.4    2965.6
                                 MINIMUM ANGLE     .0  DEGREES
ITS- 1 ANTENNA PACKAGE
XMTR    2.0  TO  30.0  VER MONOPOLE H       .00 L     -.50 A      .0  OFF AZ      .0
RCVR    2.0  TO  30.0  VER MONOPOLE H       .00 L     -.25 A      .0  OFF AZ      .0
POWER =  30.000 KW  3 MHZ NOISE = -163.6 DBW    REQ. REL = .90  REQ. SNR = 55.0
```

UT	MUF												
.0	33.1	2.0	3.0	5.0	7.5	10.0	12.5	15.0	17.5	20.0	25.0	30.0	FREQ
	1F2	2 E	2 E	2ES	2F2	3F2	3F2	2F2	2F2	2F2	1F2	1F2	MODE
	7.7	3.0	3.4	5.0	18.5	22.9	23.4	14.1	14.7	16.0	2.8	4.1	ANGLE
	-112	-248	-235	-145	-117	-107	-102	-100	-103	-102	-123	-114	S DBW
	-188	-157	-162	-166	-167	-167	-167	-169	-173	-178	-185	-187	N DBW
	76.	-91.	-74.	21.	50.	59.	64.	68.	69.	75.	62.	71.	SNR
	4.	155.	138.	41.	14.	5.	1.	-2.	-5.	-9.	1.	-2.	RPWRG
	.86	.00	.00	.00	.24	.72	.88	.94	.97	.99	.85	.92	REL
	.42	.00	.00	.00	.11	.27	.39	.48	.61	.70	.39	.50	S PRB
6.0	36.5	2.0	3.0	5.0	7.5	10.0	12.5	15.0	17.5	20.0	25.0	30.0	FREQ
	1F2	2 E	2 E	2ES	2F2	2F2	2F2	2F2	2F2	2F2	1F2	1F2	MODE
	8.8	2.8	3.2	5.0	23.9	18.9	17.0	16.5	16.7	17.5	3.8	4.5	ANGLE
	-110	-339	-328	-193	-133	-118	-110	-106	-103	-104	-121	-118	S DBW
	-189	-152	-158	-163	-163	-161	-161	-161	-164	-169	-180	-186	N DBW
	79.	****	****	-30.	29.	43.	50.	55.	60.	63.	59.	68.	SNR
	-6.	252.	235.	93.	34.	20.	13.	9.	5.	1.	4.	-6.	RPWRG
	.96	.00	.00	.00	.00	.05	.24	.51	.73	.87	.75	.99	REL
	.56	.00	.00	.00	.01	.06	.14	.22	.32	.46	.38	.59	S PRB
12.0	33.6	2.0	3.0	5.0	7.5	10.0	12.5	15.0	17.5	20.0	25.0	30.0	FREQ
	1F2	2 E	1F2	3F2	3F2	3F2	2F2	2F2	2F2	2F2	1F2	1F2	MODE
	8.7	4.3	5.9	23.0	23.2	23.8	14.6	15.1	15.9	17.2	3.4	4.7	ANGLE
	-116	-103	-99	-92	-90	-90	-91	-92	-96	-98	-117	-116	S DBW
	-188	-124	-133	-142	-148	-152	-155	-159	-163	-168	-180	-186	N DBW
	72.	20.	33.	50.	58.	61.	63.	65.	67.	70.	63.	70.	SNR
	2.	43.	30.	13.	6.	3.	3.	2.	2.	3.	4.	2.	RPWRG
	.88	.00	.03	.29	.66	.81	.83	.85	.86	.85	.79	.88	REL
	.46	.01	.03	.18	.31	.37	.38	.42	.45	.44	.40	.45	S PRB
18.0	18.1	2.0	3.0	5.0	7.5	10.0	12.5	15.0	17.5	20.0	25.0	30.0	FREQ
	1F2	2F2	3F2	3F2	2F2	2F2	1F2	1F2	1F2	1F2	1F2	1F2	MODE
	7.9	15.5	22.1	22.4	14.0	15.3	2.6	3.5	10.1	7.9	7.9	7.9	ANGLE
	-113	-96	-92	-88	-89	-93	-117	-115	-107	-118	-138	-167	S DBW
	-178	-127	-134	-143	-151	-158	-165	-171	-176	-181	-185	-187	N DBW
	65.	30.	41.	54.	61.	64.	48.	56.	69.	63.	47.	20.	SNR
	13.	34.	22.	11.	7.	10.	20.	17.	9.	17.	33.	60.	RPWRG
	.71	.03	.08	.45	.72	.73	.12	.52	.78	.65	.35	.04	REL
	.32	.02	.08	.23	.32	.35	.16	.24	.35	.29	.15	.03	S PRB

TABLE 12. An example of the differences in the noise parameters calculated by the current GENOIS and the new GENOIS (updated atmospheric noise estimates used in both cases and the 3 MHz man-made noise set at -160 dB)

			Month	Lat.	Long.	LMT	XNOIS			
			1	40.0	254.7	11.0	160			
Freq.	ATNOS	GNOIS	XNOIS	XRNSE	DU	DL	SIGU	SIGL	SIGM	
2.0	-179.4	-161.1	-155.1	-154.1	8.2	6.4	1.0	1.1	2.4	← Old GENOIS
	-179.4	-158.9	-155.1	-154.3	9.4	5.2	1.4	1.7	4.5	← New GENOIS
	.0	2.2	.0	-.2	1.2	-1.2	.3	.7	2.1	← Difference
4.0	-181.2	-167.7	-163.5	-162.1	7.9	6.1	.9	.9	2.2	
	-181.2	-165.8	-163.5	-162.3	9.3	4.9	1.3	1.9	4.1	
	.0	1.9	.0	-.2	1.3	-1.2	.5	1.0	2.0	
6.0	-177.3	-171.6	-168.4	-166.4	7.8	6.0	.7	.7	1.9	
	-177.3	-169.9	-168.3	-166.4	9.0	4.5	1.3	2.0	3.5	
	.0	1.7	.1	-.1	1.2	-1.5	.7	1.4	1.6	
8.0	-173.2	-174.4	-171.9	-168.3	7.8	6.2	.5	.4	2.2	
	-173.2	-172.8	-171.8	-167.7	8.2	4.6	1.5	2.1	2.6	
	.0	1.6	.1	.6	.4	-1.6	1.0	1.6	.4	
10.0	-170.5	-176.5	-174.6	-168.4	7.9	6.3	1.3	1.0	3.4	
	-170.5	-175.0	-174.5	-167.3	7.4	5.3	2.1	1.9	2.8	
	.0	1.5	.2	1.1	-.4	-1.0	.8	.9	-.6	
12.0	-169.7	-178.2	-176.9	-168.4	7.8	6.4	1.9	1.4	4.2	
	-169.7	-176.8	-176.7	-167.5	7.3	5.9	2.4	1.9	3.4	
	.0	1.4	.2	1.0	-.5	-.6	.6	.5	-.8	
14.0	-170.7	-179.7	-178.7	-169.6	7.6	6.5	2.0	1.5	4.3	
	-170.7	-178.4	-178.5	-168.7	7.1	6.0	2.5	1.9	3.6	
	.0	1.4	.2	.9	-.5	-.5	.5	.4	-.8	
16.0	-173.4	-181.0	-180.4	-172.0	7.3	6.4	1.7	1.3	4.0	
	-173.4	-179.7	-180.1	-171.1	6.9	5.8	2.3	1.9	3.3	
	.0	1.3	.2	.9	-.4	-.6	.6	.6	-.7	
18.0	-177.7	-182.1	-181.8	-175.3	7.1	6.1	1.1	.9	3.2	
	-177.7	-180.9	-181.6	-174.6	7.2	5.2	1.9	2.1	2.9	
	.0	1.2	.2	.7	.1	-1.0	.8	1.2	-.3	
20.0	-183.3	-183.1	-183.1	-178.4	6.8	5.7	.4	.4	2.1	
	-183.3	-181.9	-182.8	-178.4	8.0	4.2	1.5	2.4	2.7	
	.0	1.2	.3	.0	1.2	-1.6	1.1	2.0	.6	
22.0	-190.0	-184.0	-184.2	-180.6	6.7	5.3	.4	.4	1.5	
	-190.0	-182.9	-184.0	-181.1	8.6	3.8	1.3	2.4	2.9	
	.0	1.2	.3	-.5	1.9	-1.5	1.0	2.0	1.4	
24.0	-197.4	-184.9	-185.3	-181.9	6.6	5.1	.4	.4	1.4	
	-197.4	-183.7	-185.0	-182.6	8.8	4.0	1.3	2.3	3.1	
	.0	1.1	.3	-.6	2.2	-1.2	.9	1.9	1.7	
26.0	-205.4	-185.6	-186.3	-182.9	6.6	5.0	.4	.4	1.4	
	-205.4	-184.5	-186.0	-183.6	8.8	4.0	1.3	2.3	3.1	
	.0	1.1	.3	-.7	2.2	-1.0	.9	1.8	1.7	
28.0	-213.6	-186.3	-187.2	-183.7	6.5	5.0	.4	.4	1.4	
	-213.6	-185.3	-186.9	-184.4	8.8	4.0	1.3	2.3	3.1	
	.0	1.1	.3	-.7	2.3	-1.0	.9	1.9	1.7	

6. REFERENCES

Barghausen, A.F., J.W. Finney, L.L. Procter, and L.D. Schultz (1969), Predicting long-term operational parameters of high-frequency sky-wave telecommunications systems, ESSA Technical Report ERL 110-ITS 78, U. S. Dept. of Commerce, Boulder, CO 80303 (NTIS Order No. N70-24144).

CCIR (International Radio Consultative Committee) (1957), Revision of atmospheric radio noise data, CCIR Report 65 (International Telecommunication Union, Geneva, Switzerland).

CCIR (International Radio Consultative Committee) (1964), World distribution and characteristics of atmospheric radio noise, CCIR Report 322 (International Telecommunication Union, Geneva, Switzerland).

CCIR (International Radio Consultative Committee) (1966), Operating noise-threshold of a radio receiving system, CCIR Report 413 (International Telecommunication Union, Geneva, Switzerland).

CCIR (International Radio Consultative Committee) (1978), Worldwide minimum external noise levels, 0.1 Hz to 100 GHz, CCIR Report 670 (International Telecommunication Union, Geneva, Switzerland).

CCIR (International Radio Consultative Committee) (1982), Man-made radio noise, CCIR Report 258-4 (International Telecommunication Union, Geneva, Switzerland).

CCIR (International Radio Consultative Committee) (1983), Characteristics and applications of atmospheric radio noise data, CCIR Report 322-2 (International Telecommunication Union, Geneva, Switzerland).

CCIR (International Radio Consultative Committee) (1986), Characteristics and applications of atmospheric radio noise, CCIR Report 322-3 (International Telecommunication Union, Geneva, Switzerland).

Gierhart, G.D., R.W. Hubbard, and D.V. Glen (1970), Electrospace planning and engineering for the air traffic environment, FAA Report No. FAA-RD-70-71, December (NTIS Order No. AD718447).

Interservice Radio Propagation Service (1943), Radio Propagation Handbook, U.S. Department of Commerce, National Bureau of Standards, Washington, D. C.

JTAC (Joint Technical Advisory Committee) (1968), Spectrum Engineering - The Key to Progress, Supplement 9, Unintended Radiation, IEEE, New York, N. Y. (Library of Congress No. 68-8567).

Lauber, W.R., and J.M. Bertrand (1977), Preliminary urban VHF/UHF radio noise intensity measurements in Ottawa, Canada, Electromagnetic Compatibility 1977, Proc. of 2nd Symposium on EMC, Montreux, Switzerland, June 28-30, 357-362, IEEE Catalog No. 77CH1224-5 EMC.

Lucas, D.L., and J.D. Harper (1965), A numerical representation of CCIR Report 322: High frequency (3-30 Mc/s) atmosphere-radio data, NBS Technical Note 318, U. S. Department of Commerce, Washington, D. C.

Lucas, D.L., and G.W. Haydon (1966), Predicting statistical performance indexes for high frequency ionospheric telecommunication systems (I.T.S.A.-1), Institute for Telecommunication Sciences and Aeronomy, 325 Broadway, Boulder, Colorado, 80303 (NTIS Order No. AD644-827).

National Bureau of Standards (1948), Ionospheric radio propagation, Circular 462, U. S. Department of Commerce, Washington, D. C.

National Bureau of Standards (1955), World-wide noise levels expected in the frequency band 10 kc/s to 100 Mc/s, Circular 557, U. S. Department of Commerce, Washington, D. C.

National Bureau of Standards (1959-1966), Quarterly radio noise data, Technical Note 18 (1-32), U. S. Department of Commerce, Washington, D. C.

Norton, K.A., H. Staras, and M. Blum (1952), A statistical approach to the problem of multiple radio interference to FM and television service, IRE Trans. Ant. Prop. PGAP-1, 43-49.

Popoff, A.C. (1896), Apparatus for the detection and registration of electrical vibrations, Russian Physical and Chemical Societies' Journal 28, No. 1.

Radio Propagation Unit (1945), Minimum required field intensities for intelligent reception of radio telephony in presence of atmospheric or receiving set noise, Technical Report 5, Holabird Signal Depot, Baltimore, MD.

Sailors, D.B., and R.P. Brown (1982), Development of a minicomputer atmospheric radio noise model, NOSC Technical Report 778, Naval Ocean Systems Center, San Diego, California 92152.

Sailors, D.B., and R.P. Brown (1983), Development of a minicomputer atmospheric noise model, Radio Sci. 18, 625-637.

Spaulding, A.D., W.H. Ahlbeck, and L.R. Espeland (1971), Urban residential man-made radio noise analysis and predictions, OT/ITS Telecommunications Research and Engineering Report 14, (NTIS Order No. COM-75-10949/AS).

Spaulding, A.D. (1972), The determination of received noise levels from vehicular traffic statistics, IEEE, 1972 NTC Record, IEEE Cat. No. 72CHO601-5-NTC.

Spaulding, A.D., and R.T. Disney (1974), Man-made radio noise, Part 1: Estimates for business, residential, and rural areas, Office of Telecommunications Report 74-83 (NTIS Order No. COM75-10798/AS).

Spaulding, A.D., and J.S. Washburn (1985), Atmospheric radio noise: Worldwide levels and other characteristics, NTIA/ITS Report 85-173, (NTIS Order No. PB85-212942).

Teters, L.R., J.L. Lloyd, G.W. Haydon, and D.L. Lucas (1983), Estimating the performance of telecommunication systems using the ionospheric transmission channel, Ionospheric communications analysis and prediction program user's manual, NTIA Report 83-127, (NTIS Order No. PB84-111210).

Zacharisen, D.H., and W.B. Jones (1970), World maps of atmospheric radio noise in universal time by numerical mapping, Office of Telecommunications Research Report OT/ITS/TRR2, (NTIS Order No. COM75-11146/AS).