Standard Ranging Tone Times Files
OK Radiometer and Beacon Calibrations
11/03/93 - 5/31/95 OK CDFs
Excel Macro - ACTS01.xls

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June, 1995

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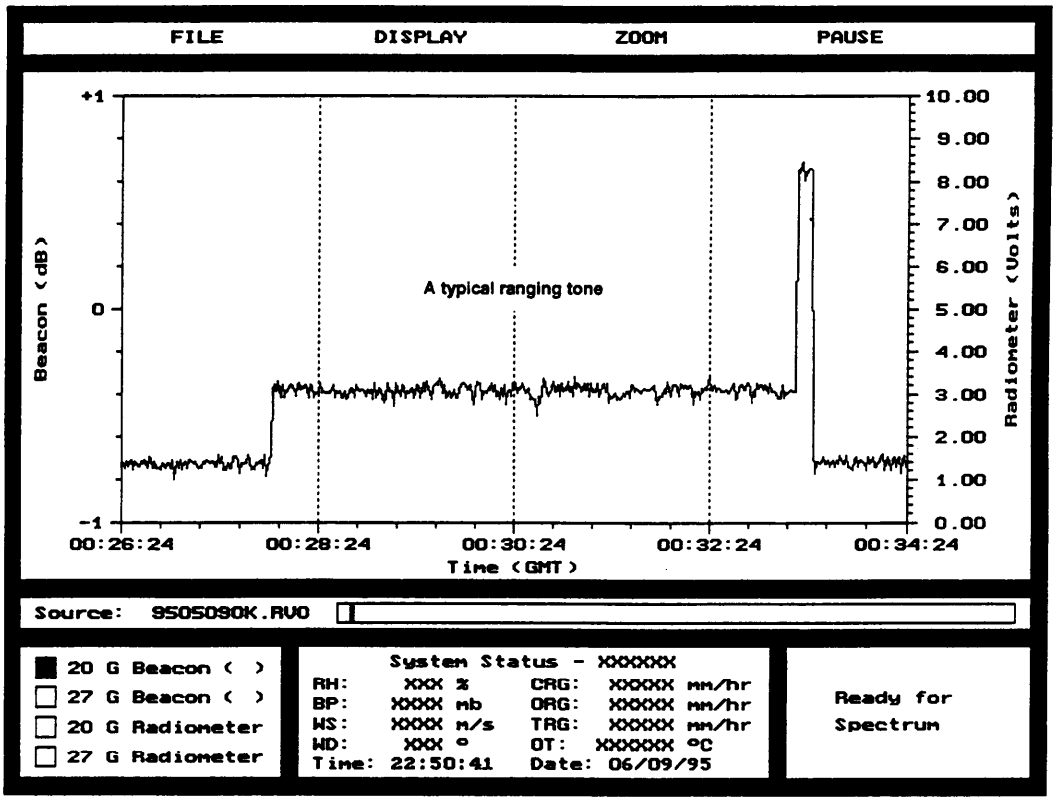
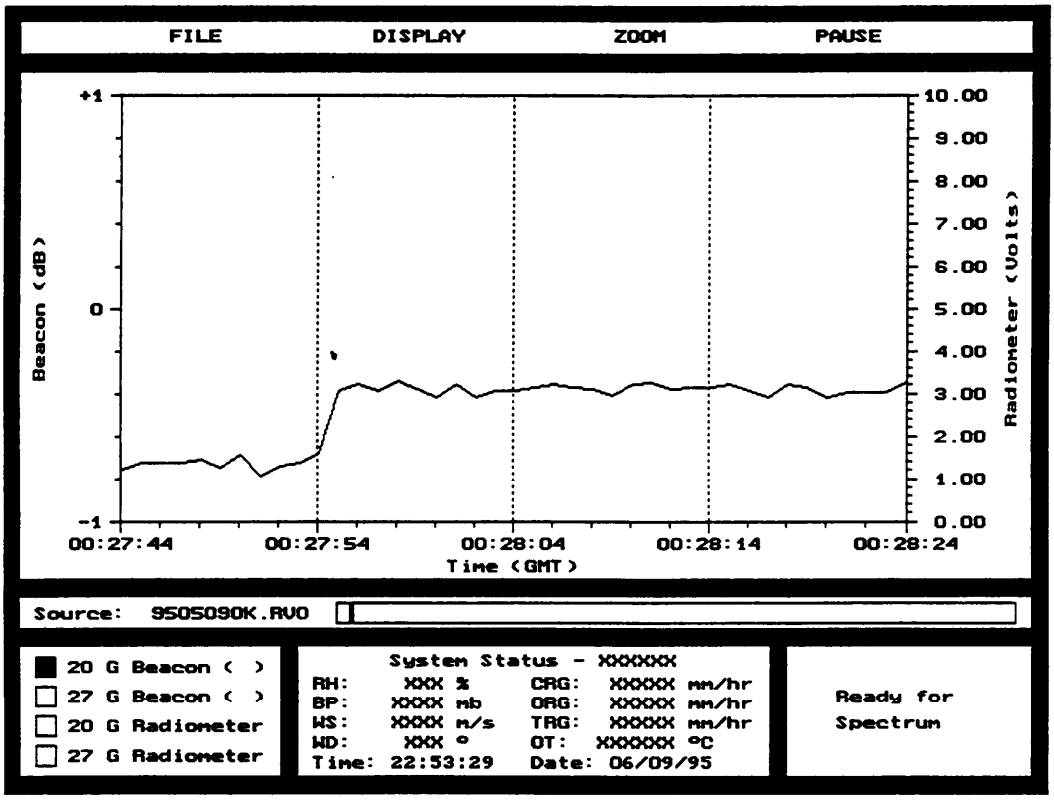
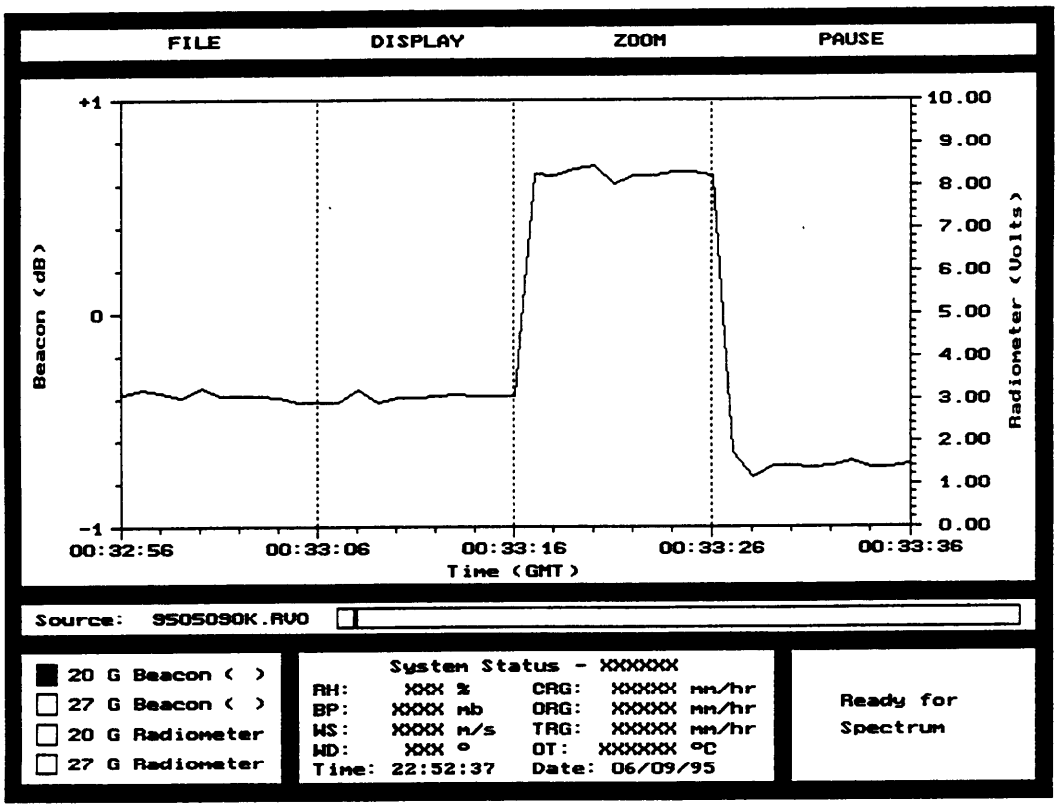
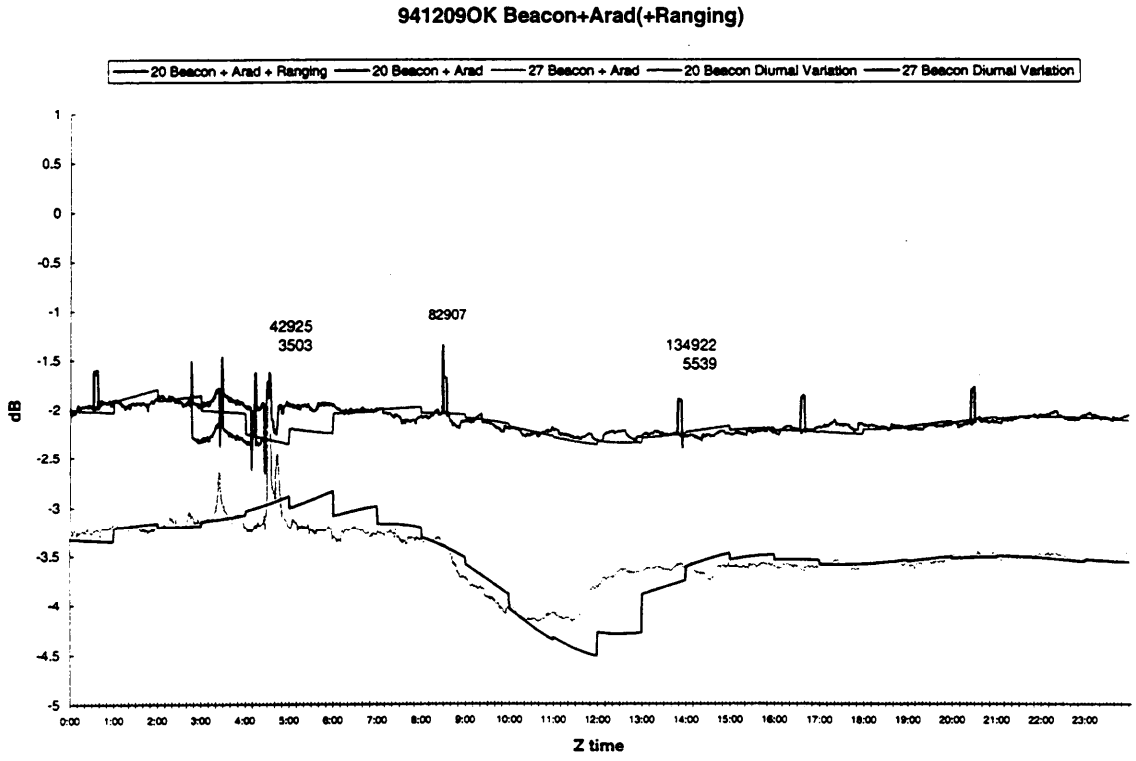
1. Standard Ranging Tone Times Files.

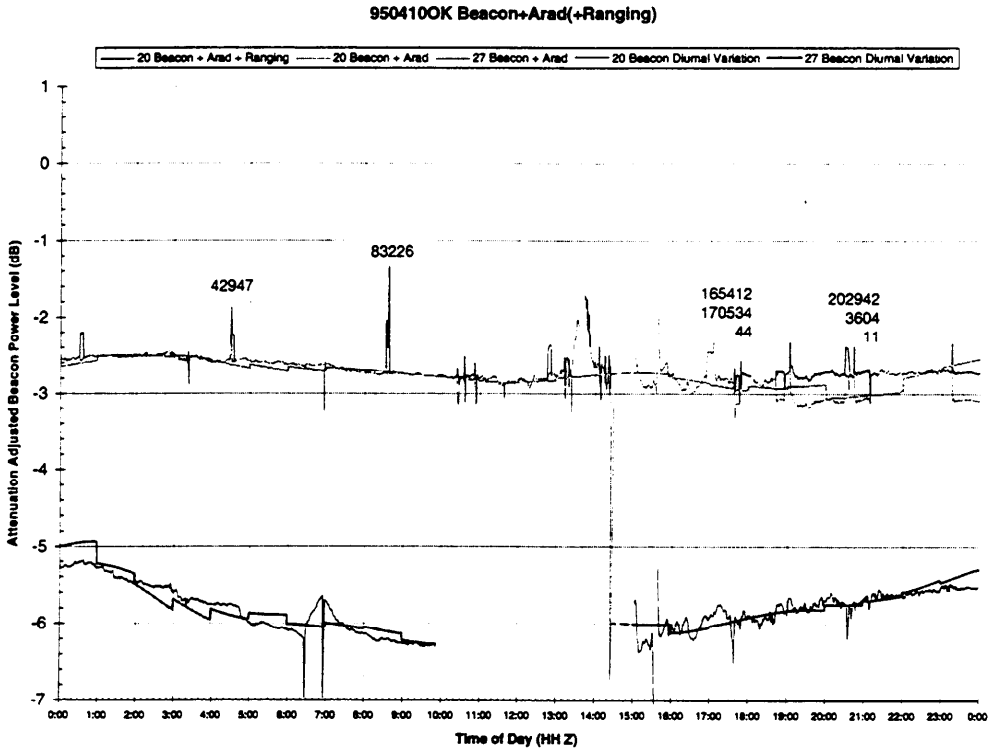
1) A ranging tone is typically switched on around the half hour with 0.36 dB increase in 20G beacon power level, switched off either with or without about 10 seconds 1.4 dB increase in the power level about 5 - 6 minutes later.
2) ACTSPP can find most ranging tones successfully, but fail occasionally, especially during deep fading and system maintenance.
3) ACTSVIEW is used to find the mis-detected ranging tones. But during deep fading and system operation this method is almost useless.
4) By checking with the .rv0 files of the same period from other sites, the missing tones in 3) can be found.
5) Problem arises when the timestamps of these cross-checking sites are not synchronized together. How to handle this problem needs suggestion.
6) Need access to most recent .rv0 files of other sites (at least two sites), so that the standard ranging tone times file can be posted at the end of the month.

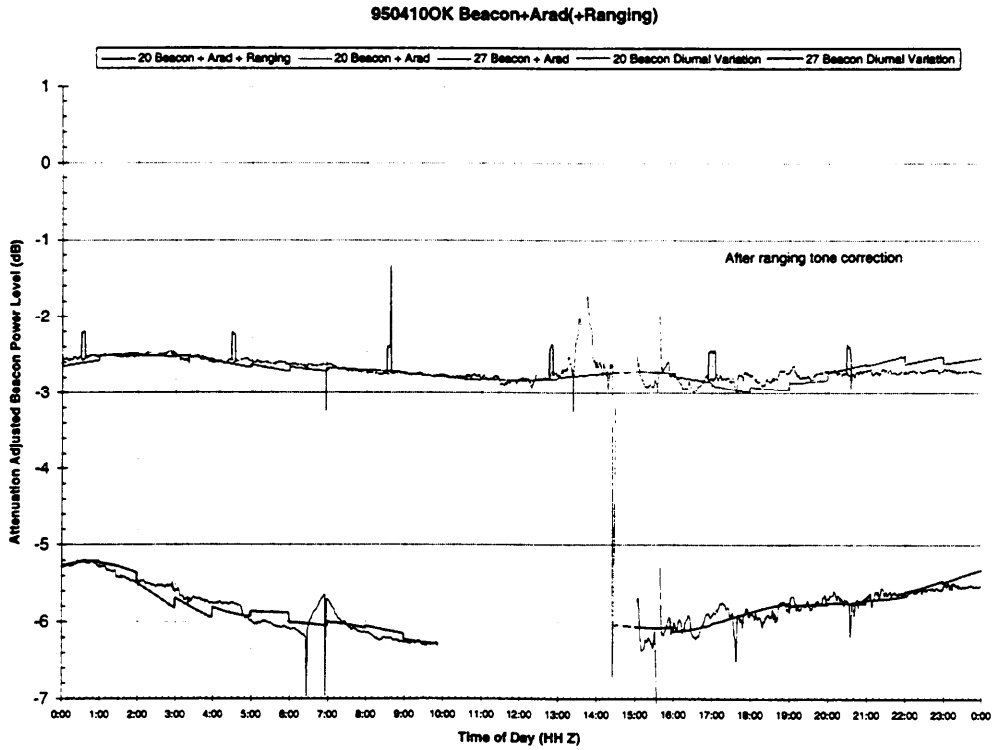

FILE
DISPLAY
ZOOM
PAUSE
+1
0
-1
Beacon (dB)
10.00
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
Radiometer (Volts)
A typical ranging tone
00:26:24
00:28:24
00:30:24
00:32:24
00:34:24
Time (GMT)
Source: 9505090K.RVO
20 G Beacon ( )
27 G Beacon ( )
20 G Radiometer
27 G Radiometer
System Status - XXXXXX
RH: XXX %
BP: XXXX mb
WS: XXXX m/s
WD: XXX °
Time: 22:50:41
CRG: XXXXX mm/hr
ORG: XXXXX mm/hr
TRG: XXXXX mm/hr
OT: XXXXXX °C
Date: 06/09/95
Ready for
Spectrum

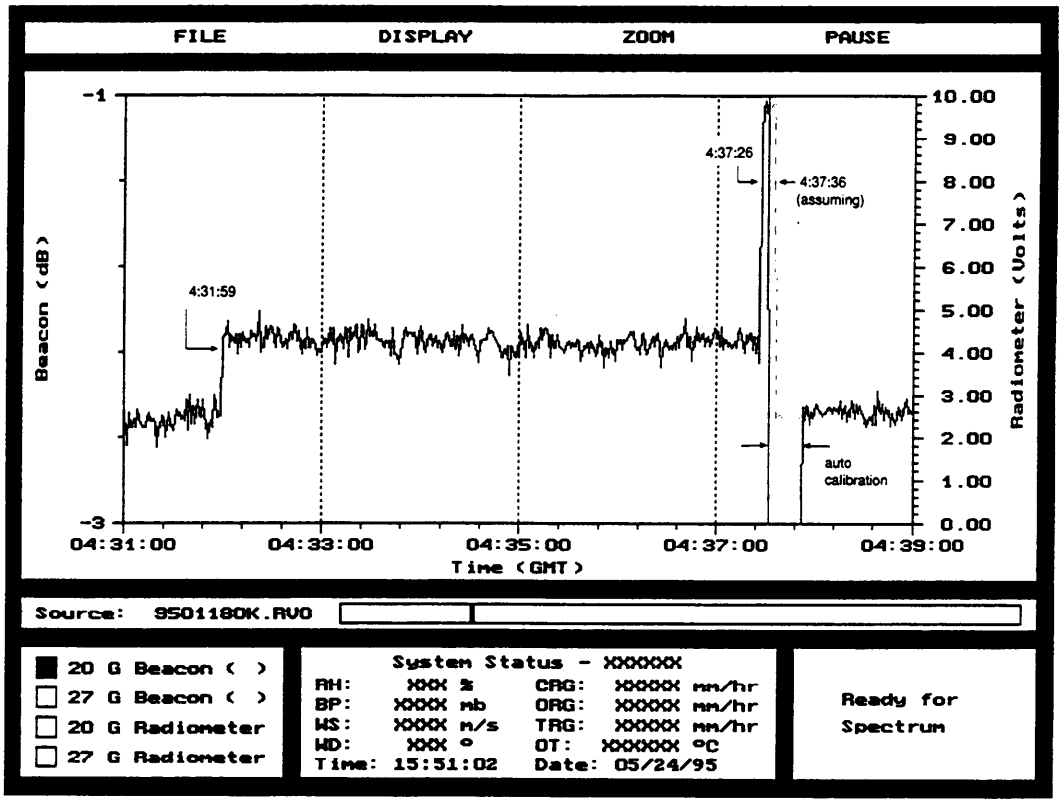

FILE
DISPLAY
ZOOM
PAUSE
+1
0
-1
Beacon (dB)
10.00
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
Radiometer (Volts)
00:27:44
00:27:54
00:28:04
00:28:14
00:28:24
Time (GMT)
Source: 9505090K.RVO
20 G Beacon ( )
27 G Beacon ( )
20 G Radiometer
27 G Radiometer
System Status - XXXXXX
RH: XXX %
BP: XXXX mb
WS: XXXX m/s
WD: XXX °
Time: 22:53:29
CRG: XXXXX mm/hr
ORG: XXXXX mm/hr
TRG: XXXXX mm/hr
OT: XXXXXX °C
Date: 06/09/95
Ready for
Spectrum

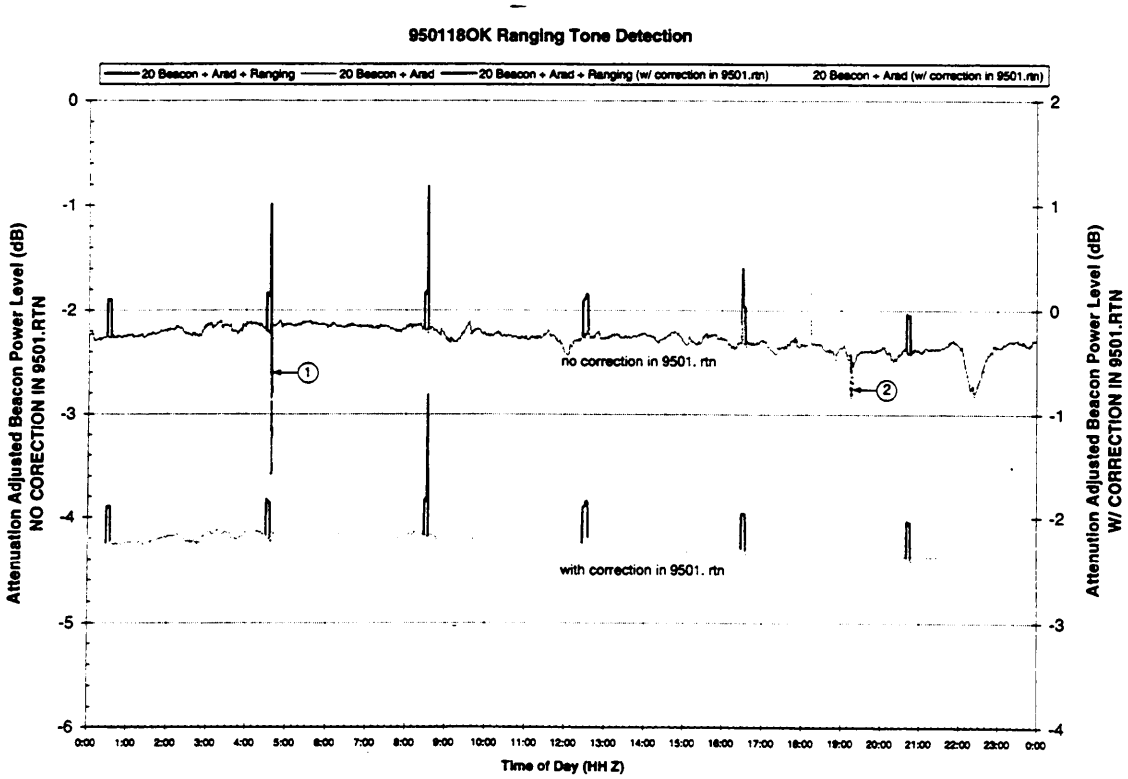

FILE
DISPLAY
ZOOM
PAUSE
+1
0
-1
Beacon (dB)
10.00
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
Radiometer (Volts)
00:32:56
00:33:06
00:33:16
00:33:26
00:33:36
Time (GMT)
Source: 9505090K.RVO
20 G Beacon ( )
27 G Beacon ( )
20 G Radiometer
27 G Radiometer
System Status - XXXXX
RH: XXX %
BP: XXXX mb
WS: XXXX m/s
WD: XXX °
Time: 22:52:37
CRG: XXXXX mm/hr
ORG: XXXXX mm/hr
TRG: XXXXX mm/hr
OT: XXXXX °C
Date: 06/09/95
Ready for
Spectrum

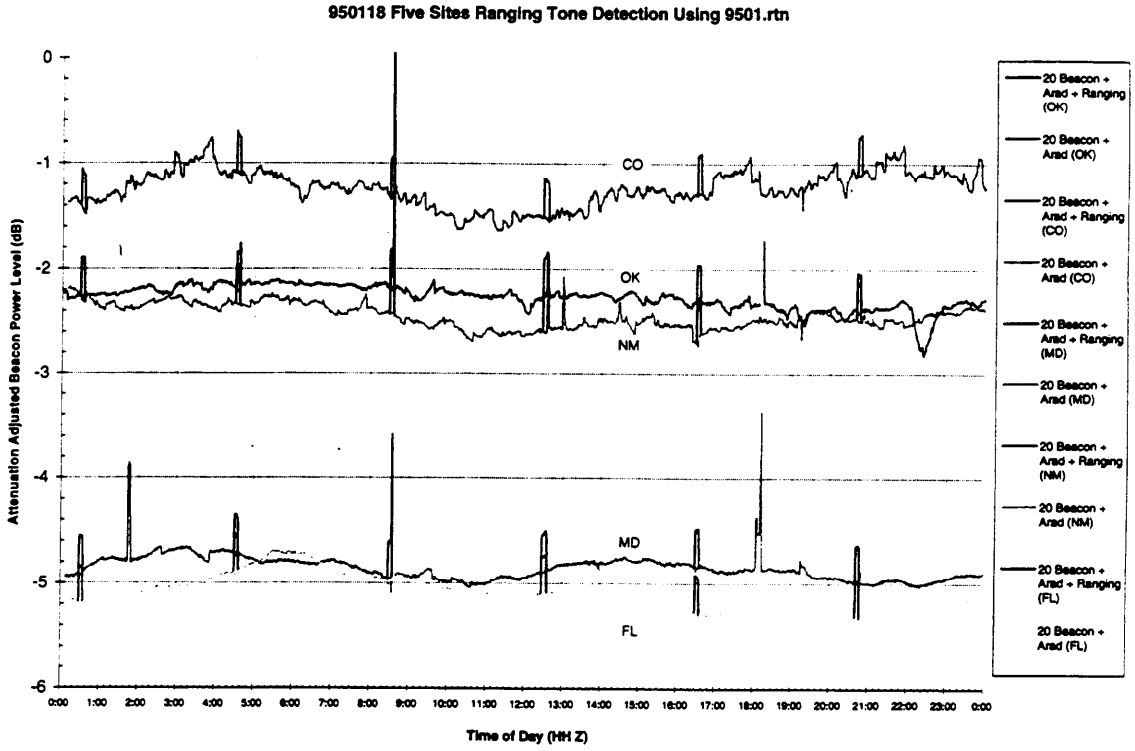

941209OK Beacon+Arad(+Ranging)
20 Beacon + Arad + Ranging
20 Beacon + Arad
27 Beacon + Arad
20 Beacon Diurnal Variation
27 Beacon Diurnal Variation
dB
42925
3503
82907
134922
5539
Z time

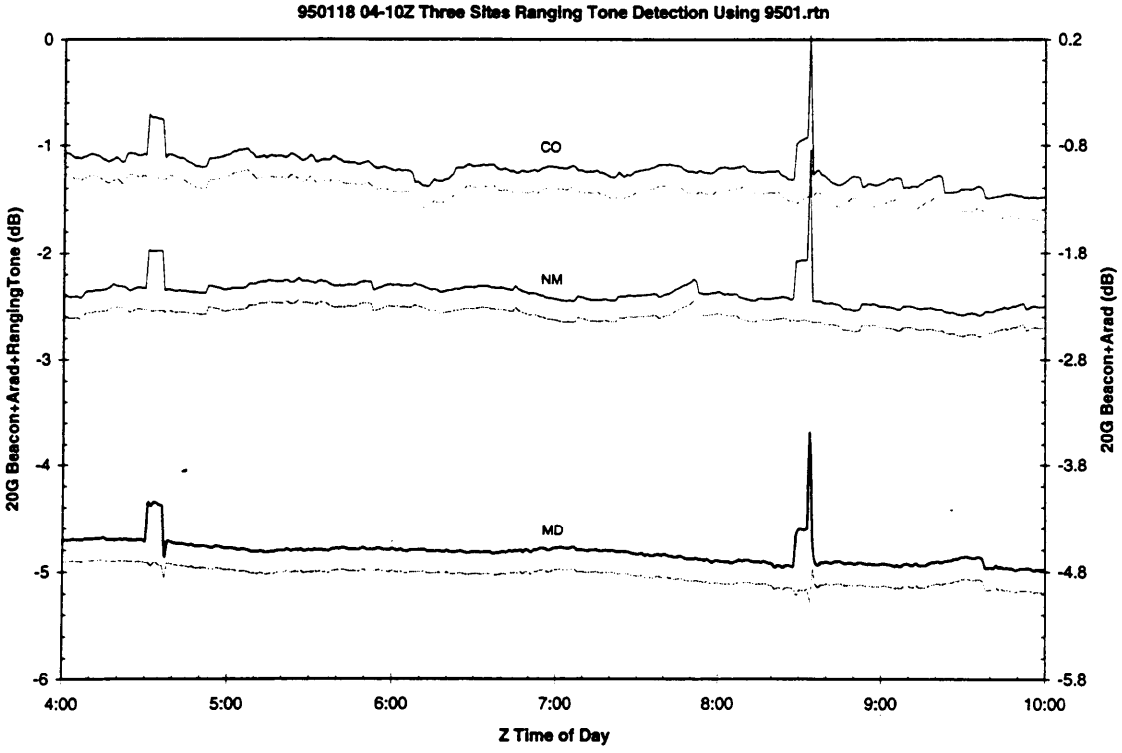

950410OK Beacon+Arad(+Ranging)
20 Beacon + Arad + Ranging
20 Beacon + Arad
27 Beacon + Arad
20 Beacon Diurnal Variation
27 Beacon Diurnal Variation
Attenuation Adjusted Beacon Power Level (dB)
42947
83226
165412
170534
44
202942
3604
11
Time of Day (HH Z)

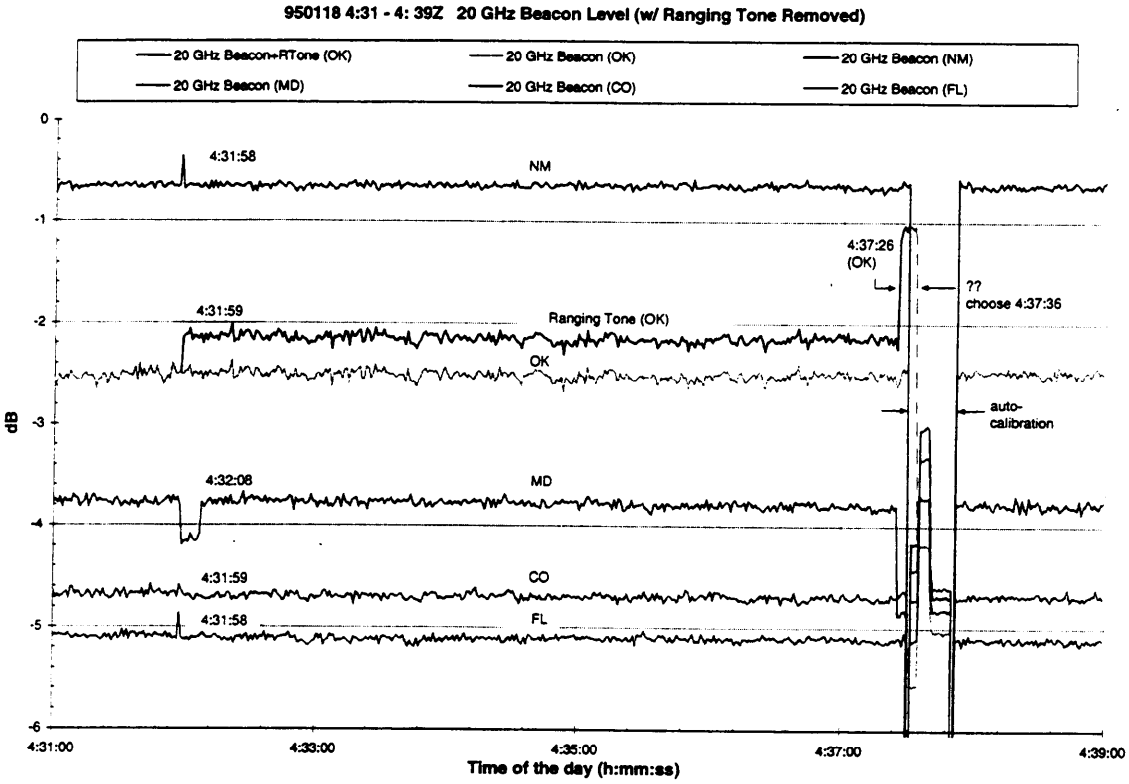

950410OK Beacon+Arad(+Ranging)
20 Beacon + Arad + Ranging
20 Beacon + Arad
27 Beacon + Arad
20 Beacon Diurnal Variation
27 Beacon Diurnal Variation
Attenuation Adjusted Beacon Power Level (dB)
After ranging tone correction
Time of Day (HH Z)


FILE
DISPLAY
ZOOM
PAUSE
Beacon (dB)
Radiometer (Volts)
4:31:59
4:37:26
4:37:36
(assuming)
auto
calibration
04:31:00
04:33:00
04:35:00
04:37:00
04:39:00
Time (GMT)
Source: 9501180K.RVO
20 G Beacon ( )
27 G Beacon ( )
20 G Radiometer
27 G Radiometer
System Status - XXXXX
RH: XXX %
BP: XXXX mb
WS: XXXX m/s
WD: XXX °
Time: 15:51:02
CRG: XXXXX mm/hr
ORG: XXXXX mm/hr
TRG: XXXXX mm/hr
OT: XXXXX °C
Date: 05/24/95
Ready for
Spectrum


950118OK Ranging Tone Detection
20 Beacon + Arad + Ranging
20 Beacon + Arad
20 Beacon + Arad + Ranging (w/ correction in 9501.rtn)
20 Beacon + Arad (w/ correction in 9501.rtn)
Attenuation Adjusted Beacon Power Level (dB)
NO CORECTION IN 9501.RTN
Attenuation Adjusted Beacon Power Level (dB)
W/ CORRECTION IN 9501.RTN
no correction in 9501. rtn
with correction in 9501. rtn
Time of Day (HH Z)


950118 Five Sites Ranging Tone Detection Using 9501.rtn
Attenuation Adjusted Beacon Power Level (dB)
Time of Day (HH Z)
CO
OK
NM
MD
FL
20 Beacon + Arad + Ranging (OK)
20 Beacon + Arad (OK)
20 Beacon + Arad + Ranging (CO)
20 Beacon + Arad (CO)
20 Beacon + Arad + Ranging (MD)
20 Beacon + Arad (MD)
20 Beacon + Arad + Ranging (NM)
20 Beacon + Arad (NM)
20 Beacon + Arad + Ranging (FL)
20 Beacon + Arad (FL)


950118 04-10Z Three Sites Ranging Tone Detection Using 9501.rtn
20G Beacon+Arad+RangingTone (dB)
20G Beacon+Arad (dB)
Z Time of Day
CO
NM
MD



2. Beacon and Radiometer Calibrations at OK

1) On Feb. 14 and May 10, 1995, Dave helped us replaced our 20G LNA and adjusted RF enclosure polarization angle respectively. So calibration constants need to be adjusted for these operations.

2) To correctly calibrate beacon and radiometer, several .rv0 files of 'good' rain days and clear days need to be carefully chosen.

3) The .sum files of the rain days are first generated from ACTSPP. Then beacon to radiometer attenuation ratios are checked graphically for both frequencies. If the ratios are not close to one, re-run the ACTSPP with option 'NC' and change the antenna efficiencies, finally the ratios are adjusted to one.

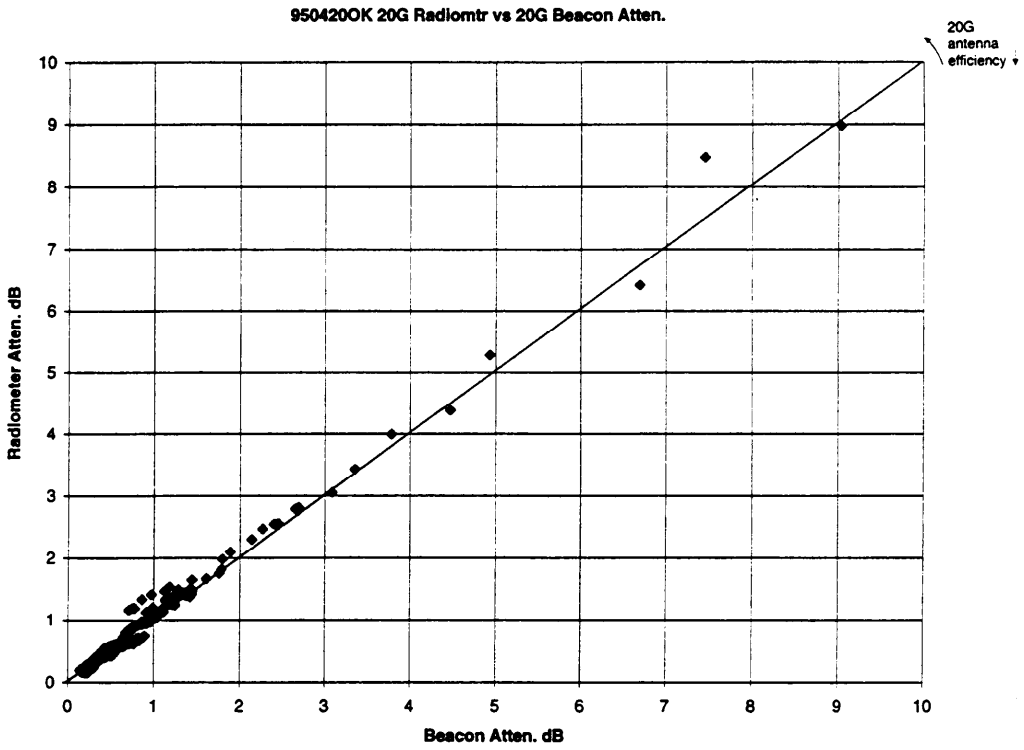
4) Next with this new calfile, both radiometer attenuations must be close to the estimated gaseous absorptions at the two frequencies for the clear days. If not, spillover temperatures are changed from ACTSPP 'NC' option.

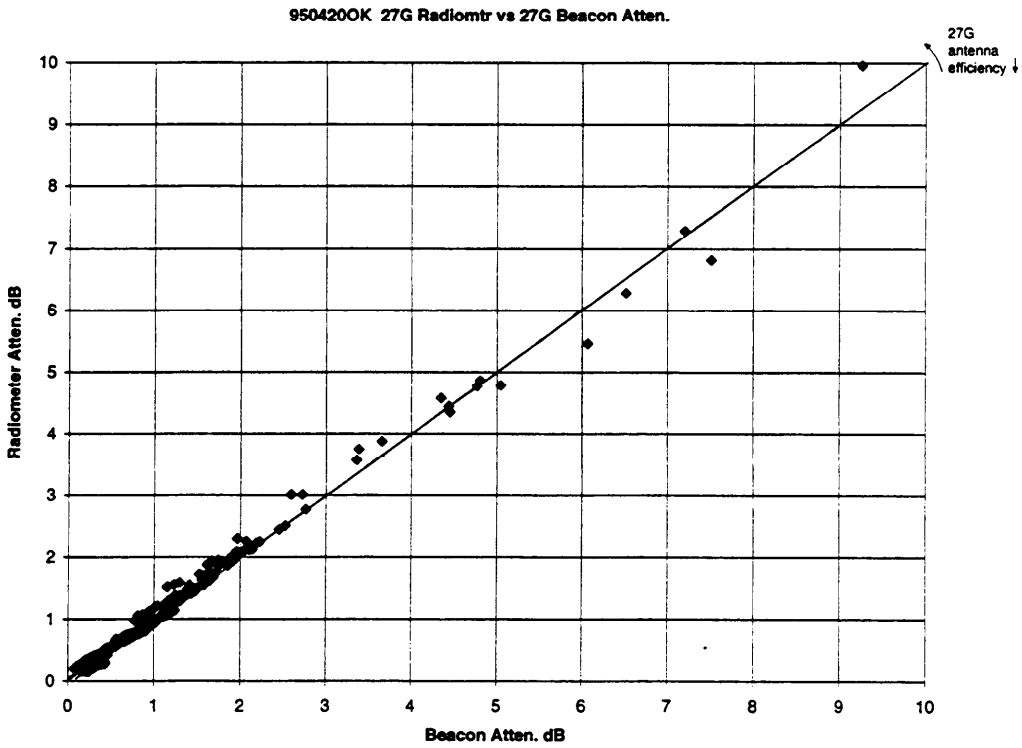
5) Step 3) and 4) are repeated until both criteria are satisfied.

6) Excel macro for above graphical checking purpose is available.

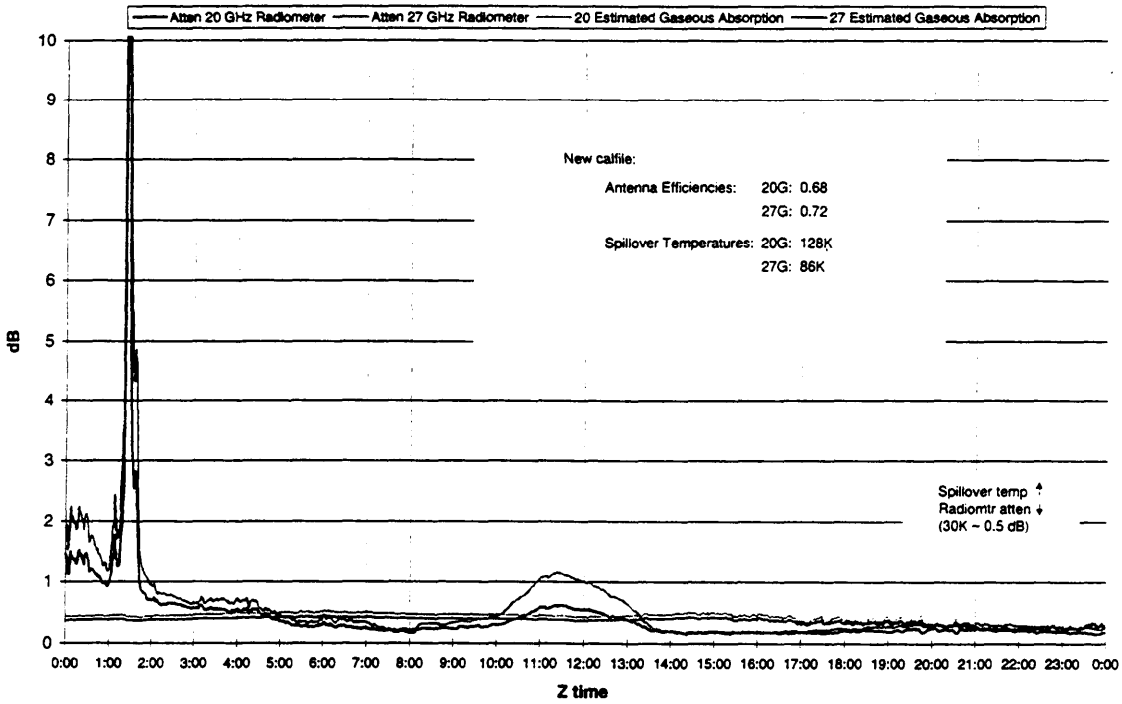
7) Finally whole month the sky brightness temperatures as measured by APT are compared with the sky brightness temperatures calculated from radiosode data.

8) Due to the drifting in noise diodes, we need adjust the noise diode adjustment factors almost every month. (from ACTSPP choosing "NA" option)


950420OK 20G Radiomtr vs 20G Beacon Atten.
20G antenna efficiency
Radiometer Atten. dB
Beacon Atten. dB
0
1
2
3
4
5
6
7
8
9
10


950420OK 27G Radiomtr vs 27G Beacon Atten.
27G antenna efficiency
Radiometer Atten. dB
Beacon Atten. dB
0
1
2
3
4
5
6
7
8
9
10

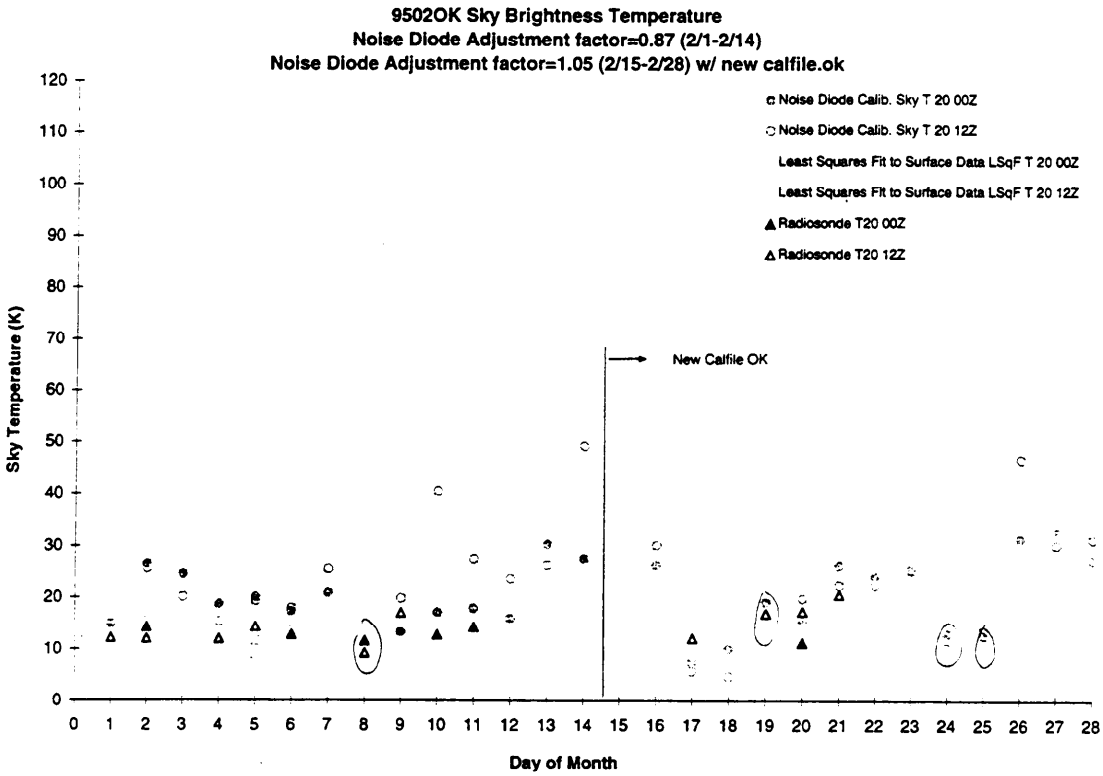
950420OK Radiometer Atten vs Estimated Gas Absorption in dB

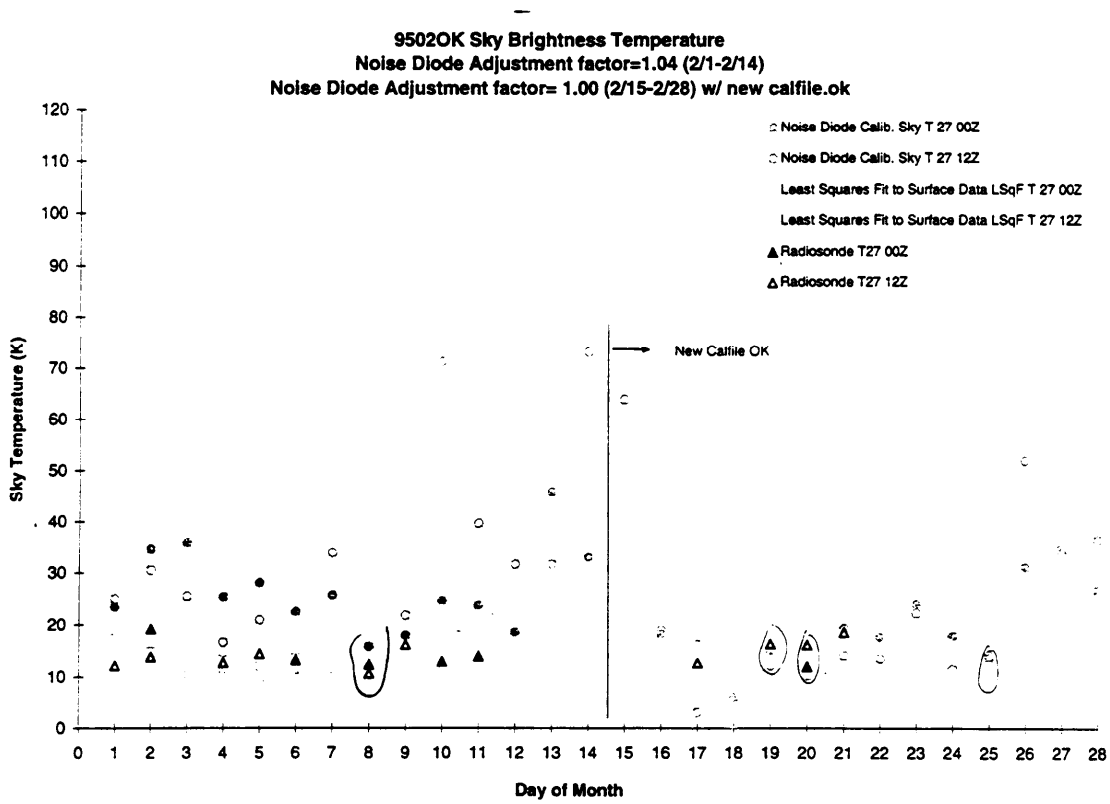


Sky Brightness Temperature, etc Calculated from Radiosode Data (Norman, OK)

By P. C. Robinson

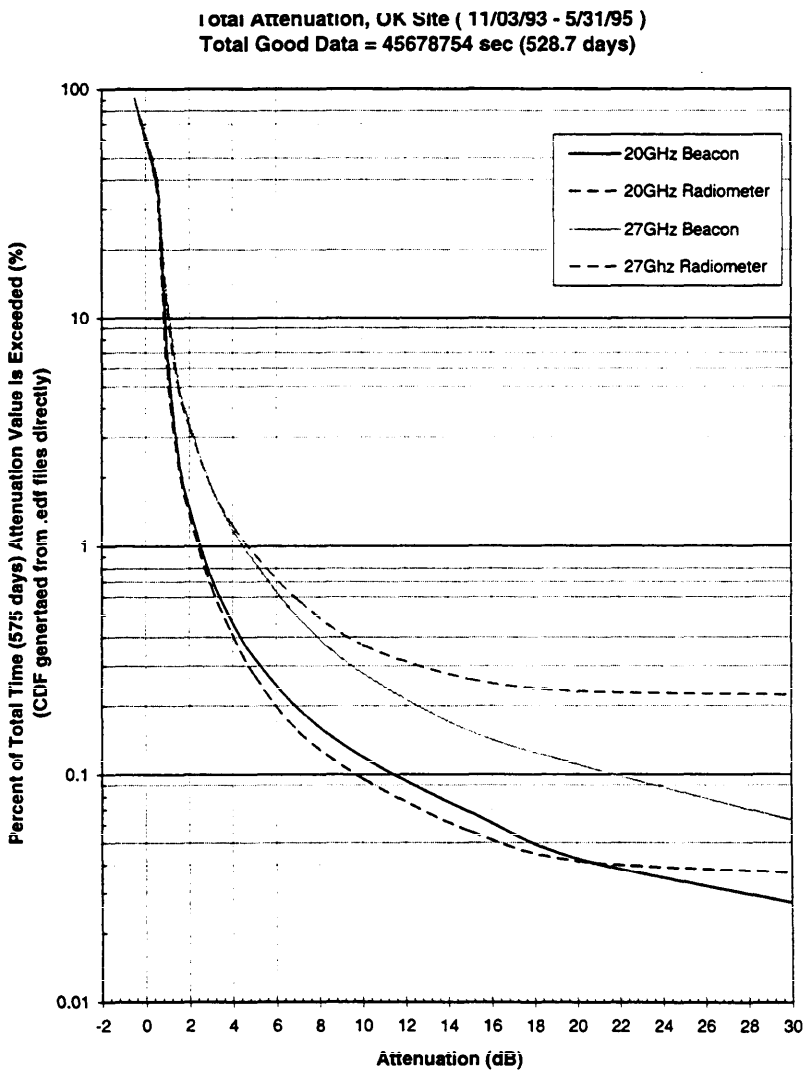
Date	Precip (in)	20GHz Tb (K)	Tau (dB)	Tm (K)	27GHz Tb (K)	Tau (dB)	Tm (K)	Remarks
95011500	.2856	14.75	.2014	267.51	14.31	.1951	265.89	
95011512	.3595	17.29	.2420	271.12	16.10	.2231	269.35	Cs-sct.
95011712	.3075	15.27	.2100	267.92	14.62	.2004	265.88	Cs-sct.
95012000	.2027	12.50	.1645	265.21	12.90	.1726	263.19	
95012012	.2394	13.37	.1790	265.90	13.53	.1831	263.76	
95012312	.2155	12.96	.1742	262.42	13.68	.1884	260.21	
95012400	.1010	9.52	.1151	261.88	10.81	.1381	260.18	
95013100	.1982	12.32	.1609	265.83	12.89	.1724	263.35	
95013112	.1273	10.47	.1289	266.68	11.42	.1464	264.19	
95020112	.1963	12.16	.1548	271.54	12.19	.1560	270.28	Ci-sct.
95020200	.4885	21.39	.3056	277.13	19.16	.2700	275.02	
95020212	.2692	14.25	.1888	273.18	13.82	.1833	270.56	Ci--sct.
95020412	.1880	12.03	.1558	266.02	12.76	.1698	263.73	
95020512	.2735	14.38	.1956	266.84	14.42	.1981	264.35	
95020600	.2173	12.84	.1701	265.35	13.19	.1778	262.90	Cs sct.
95020800	.1764	11.61	.1504	263.16	12.37	.1646	261.30	
95020812	.0926	9.29	.1118	260.16	10.64	.1359	258.86	Cs-sct.
95020912	.3602	17.01	.2391	269.04	16.14	.2259	266.84	
95021000	.2187	12.79	.1668	269.32	12.92	.1703	267.25	Ci-sct.
95021100	.2666	14.23	.1927	267.26	13.94	.1894	265.11	Ci-sct.
95021712	.1803	12.04	.1565	265.19	12.65	.1685	262.86	
95021912	.3471	16.92	.2361	270.65	16.28	.2273	268.20	
95022000	.1521	11.19	.1398	269.21	11.96	.1544	266.38	Ci-sct.
95022012	.3622	17.27	.2388	274.07	16.07	.2207	271.58	Cs-sct.
95022112	.4772	20.59	.2972	272.40	18.50	.2633	270.41	Ci-sct.
95030800	.1831	11.66	.1528	260.65	12.43	.1674	258.93	Cs-sct.
95030812	.1432	10.01	.1251	258.54	11.01	.1437	256.59	
95030900	.2097	12.73	.1684	265.12	13.08	.1758	263.18	Cs-sct.
95030912	.2093	12.81	.1694	265.70	13.09	.1755	263.68	Cs-sct.
95031000	.2041	12.54	.1623	269.80	12.73	.1668	267.48	
95031012	.1892	12.37	.1595	269.60	12.72	.1669	267.17	
95031712	.5128	22.36	.3222	277.00	20.51	.2932	274.74	Cs-ovc.
95032112	.4969	21.47	.3072	276.88	18.83	.2643	275.00	Cs-sct.
95032700	.3785	18.11	.2518	275.40	17.17	.2380	273.08	
95032712	.2475	14.01	.1881	268.42	14.09	.1912	266.12	
95040212	.3247	15.94	.2170	273.41	15.09	.2045	271.05	
95040700	.6585	26.63	.3904	280.60	23.44	.3382	279.02	
95040812	.5789	24.55	.3528	282.11	21.74	.3079	280.14	
95041112	.2428	13.56	.1838	263.56	13.62	.1862	261.86	
95041200	.3083	15.12	.2073	268.27	14.32	.1940	267.63	
95041812	.3000	15.86	.2149	274.31	15.14	.2046	271.97	
95041900	.4135	19.12	.2675	276.71	17.62	.2442	274.69	
95041912	.3635	17.57	.2441	273.87	16.51	.2279	271.79	
95042512	.4187	19.12	.2715	272.82	18.13	.2570	270.44	
95050912	.6208	25.51	.3753	277.63	22.09	.3186	276.11	
95051112	.6608	26.31	.3912	276.23	23.30	.3407	275.14	Cs-sct.
95051312	.8214	32.30	.4779	286.32	28.17	.4092	285.39	

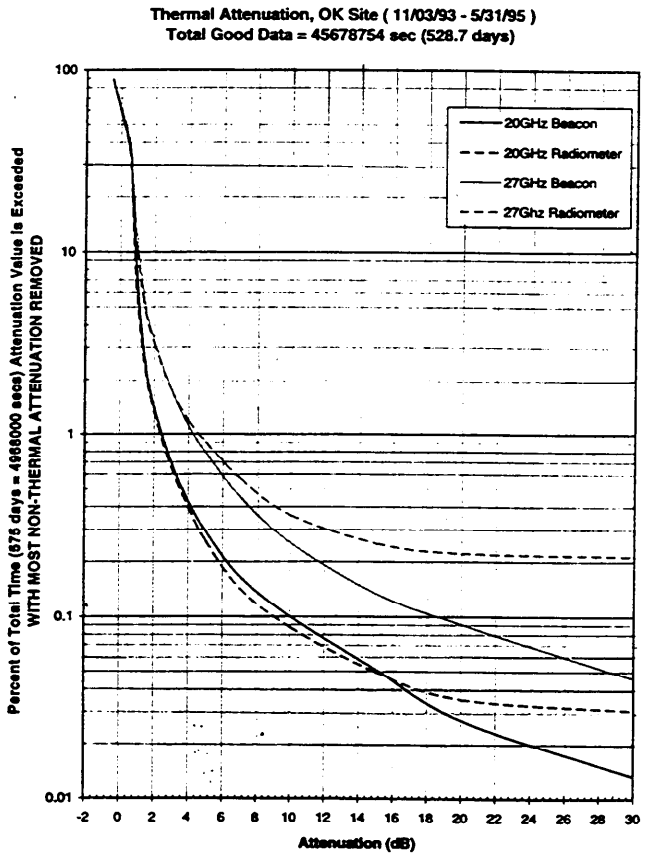

9502OK Sky Brightness Temperature
Noise Diode Adjustment factor=0.87 (2/1-2/14)
Noise Diode Adjustment factor=1.05 (2/15-2/28) w/ new calfile.ok
Noise Diode Calib. Sky T 20 00Z
Noise Diode Calib. Sky T 20 12Z
Least Squares Fit to Surface Data LSqF T 20 00Z
Least Squares Fit to Surface Data LSqF T 20 12Z
Radiosonde T20 00Z
Radiosonde T20 12Z
New Calfile OK
Sky Temperature (K)
Day of Month

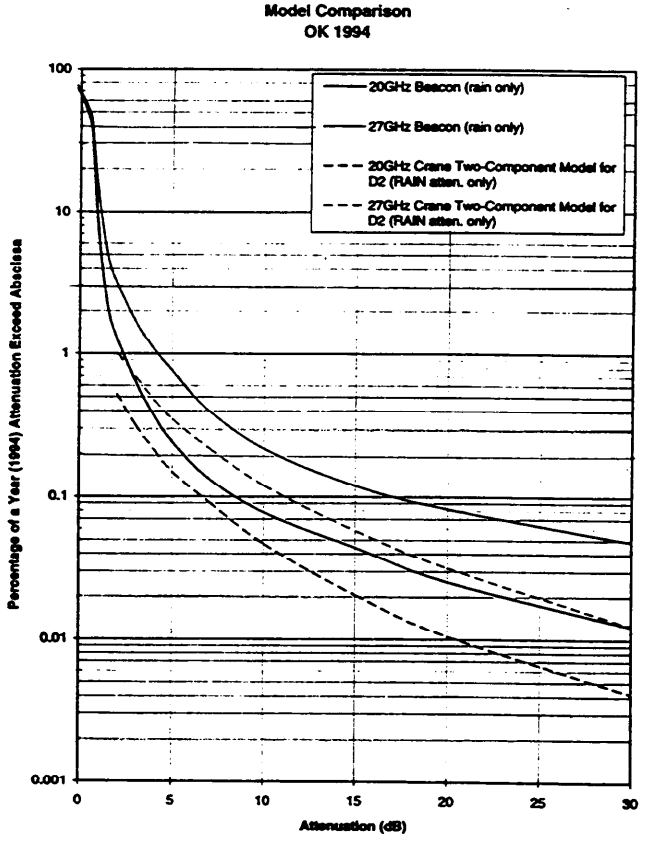

9502OK Sky Brightness Temperature
Noise Diode Adjustment factor=1.04 (2/1-2/14)
Noise Diode Adjustment factor= 1.00 (2/15-2/28) w/ new calfile.ok
Noise Diode Calib. Sky T 27 00Z
Noise Diode Calib. Sky T 27 12Z
Least Squares Fit to Surface Data LSqF T 27 00Z
Least Squares Fit to Surface Data LSqF T 27 12Z
Radiosonde T27 00Z
Radiosonde T27 12Z
New Calfile OK
Sky Temperature (K)
Day of Month

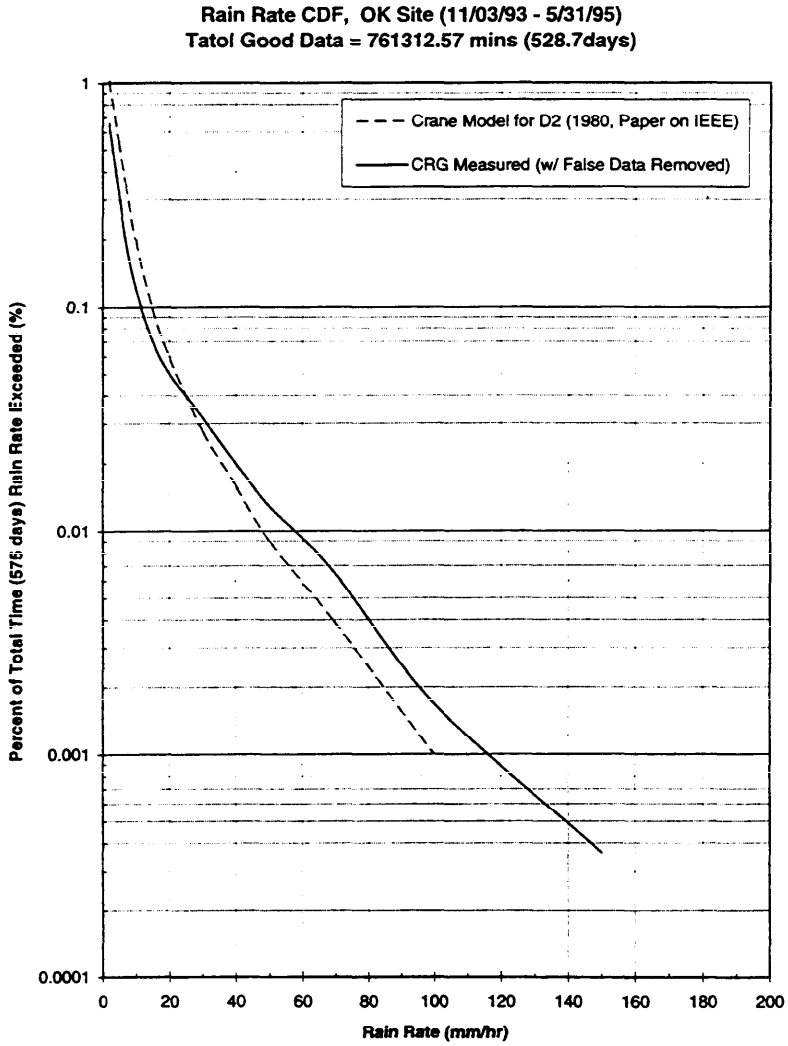
3. 11/03/93 - 5/31/95 OK Experiment CDFs

1) By using the .edf files from ACTSPP, now generating cdfs is a rather easy job.
2) Non-thermal attenuation from system faults/operation, beacon drop-outs, sun/moon intrusions, etc. should be removed from attenuation cdfs.
3) By examining the standard deviation, attenuation charts of each day (which we using the Excel macros as mentioned below to generate), rain, fog, cloud, and condensation events can be roughly distinguished.
4) The 'pure' rain attenuation cdf for 1994 is compared with Crane Tow Component Model. It looks like that the model underestimates the rain attenuation.
5) Rain rate cdf as measured by OK CRG is comparable with Crane's Global Model.




Thermal Attenuation, OK Site (11/03/93 - 5/31/95)
Total Good Data = 45678754 sec (528.7 days)
Percent of Total Time (575 days = 4968000 secs) Attenuation Value Is Exceeded
WITH MOST NON-THERMAL ATTENUATION REMOVED
Attenuation (dB)
20GHz Beacon
20GHz Radiometer
27GHz Beacon
27Ghz Radiometer
100
10
1
0.1
0.01
-2
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30


Model Comparison
OK 1994
Percentage of a Year (1994) Attenuation Exceed Abscissa
Attenuation (dB)
20GHz Beacon (rain only)
27GHz Beacon (rain only)
20GHz Crane Two-Component Model for D2 (RAIN atten. only)
27GHz Crane Two-Component Model for D2 (RAIN atten. only)
100
10
1
0.1
0.01
0.001
0
5
10
15
20
25
30



4. Excel Macros - ACTS01.xls

1) Pervious version is a macro used to generate the plots of attenuation adjusted 20G beacon power level for NASA Lewis Center to check ranging tone times.

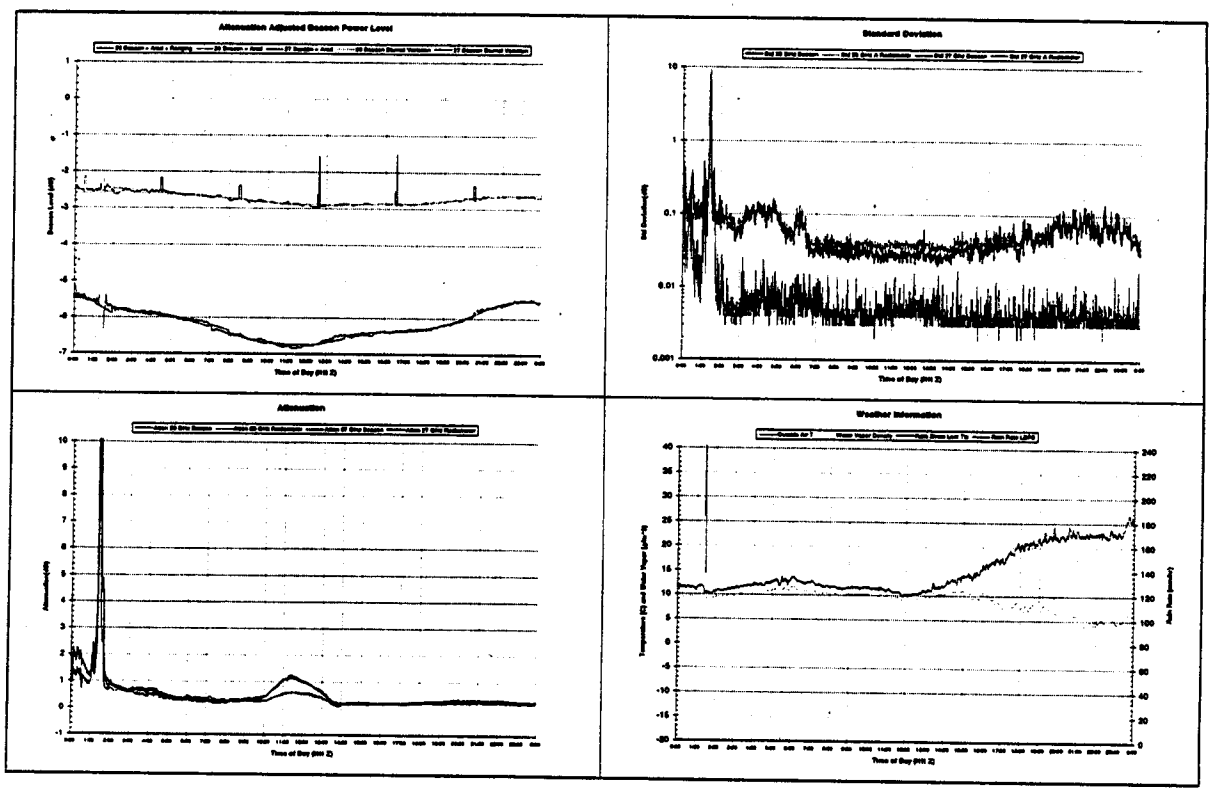
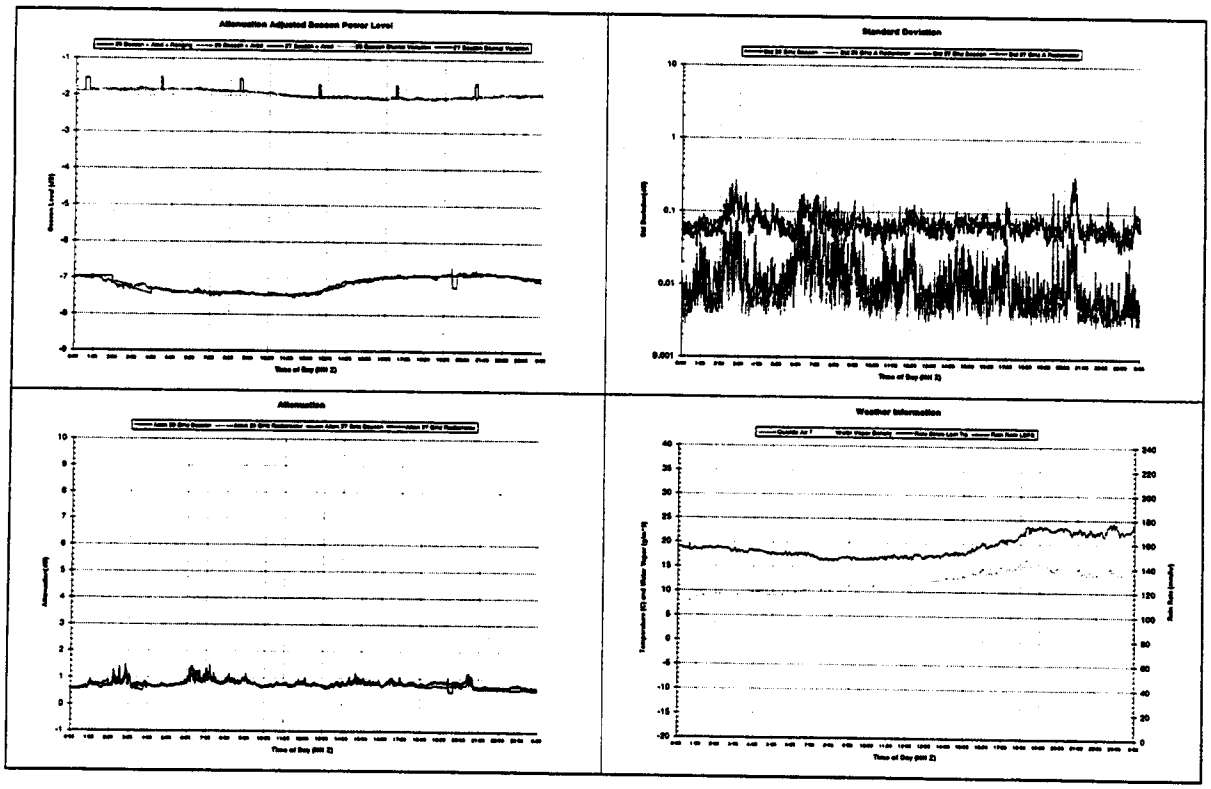
2) ACTS00.xls is written in response to the request of Bruce Dow (UBC). The macros can automatically generate up to a whole month daily summary plots for each day, beacon power level plots for each day, etc.

3) New ACTS01.xls has save option added in (also in response to Bruce's request).

4) There are still lots of useful columns in .sum file. So any suggestions on new functions, new charts, ..., which the macro should be added in are welcome.

5) Above macros can only run in Microsoft Excel Version 5.0 or up.

950420OK Daily Summuary Plots



950530OK Daily Summuary Plots