Long-Term Performance and Propagation Measurements on Single and Tandem Digital Microwave Transmission Links

Volume III: Twelve-Month Network and Link-Characterization Results

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VOLUME III: TWELVE-MONTH NETWORK AND LINK-CHARACTERIZATION RESULTS

1. INTRODUCTION

The tables and graphs contained in this volume summarize the data collected by the Network/Link Performance Characterization hardware and software for the 12-month measurement period which began April 1, 1988. The data for the entire 18-month measurement period have also been analyzed and summarized in the same tables and graphs presented in this volume. It was decided that it would be more appropriate to present the 12-month summary than the 18-month summary for the following reason. Fading tends to be a seasonal phenomenon. We, therefore, had concern that the 18-month summary could bias conclusions drawn from the graphs and tables because some months would be included for 2 successive years, while some other months would be included only once.

Separate monthly volumes were generated for each month during the 18-month data collection period from April 1, 1988, through September 30, 1989. These monthly outputs contain the same types of tables and graphs that are contained in this volume. The information from these monthly volumes of output tables and graphs were used in the development of some of the figures and tables contained in Volume I of this report. The volume for January 1989 was found to be of particular interest because of the large amount of fading on the Schwarzenborn-Feldberg (SBN-FEL) link during that month. A copy of all monthly volumes has been provided to the project sponsoring agencies (Defense Communications Engineering Center and U.S. Air Force Electronic Systems Division).

2. DESCRIPTION OF TABLES CONTAINED IN VOLUME III

Each of the 18 monthly volumes of data is contained in 14 tables. The data for the first 12 months of the measurement period are summarized in 14 tables in this volume. These tables have the same formats as the 14 tables in the monthly volumes. The first 5 of these 14 tables summarize data collected on the Berlin-to-Feldberg (BLN-FEL) 64-kb/s end-to-end channel. The next 4 tables summarize data collected on the Linderhofe-to-Feldberg (LDF-FEL) channel. The last 4 tables summarize data obtained on the

Schwarzenborn-to-Feldberg (SBN-FEL) link. Further descriptions of these tables are provided in the following paragraphs.

Understanding the organization and content of the tables and figures requires an understanding of objectives of the error-allocation algorithm. As explained in Section 5.4 of Volume I, the errors measured on each of the two end-to-end channels were allocated to each of the component links and to the cause of the error by a sophisticated errorallocation algorithm. This algorithm is described in detail in Appendix D of Volume II of The Berlin-to-Feldberg channel is composed of the Berlin-Bocksberg this report. four tandem (BLN-BBG) troposcatter link and line-of-sight (LOS) links: Bocksberg-Koeterberg (BBG-KBG), Koeterberg-Rothwesten (KBG-RWN), Rothwesten-Schwarzenborn (RWN-SBN), and Schwarzenborn-Feldberg (SBN-FEL) links. The Linderhofe-to-Feldberg channel is composed of four tandem LOS links: Linderhofe-Koeterberg (LDF-KBG), Koeterberg-Rothwesten, Rothwesten-Schwarzenborn, and Schwarzenborn-Feldberg. The allocation algorithm takes the error information measured on the Berlin-to-Feldberg channel and allocates it to the five links comprising that channel (BLN-BBG, BBG-KBG, KBG-RWN, RWN-SBN, and SBN-FEL). The algorithm also allocates the errors measured on the Linderhofe-to-Feldberg channel to the four links comprising the LDF-FEL channel (LDF-KBG, KBG-RWN, RWN-SBN, and SBN-FEL). After allocating the errors to an individual link, the algorithm attempts further to allocate the errors to the cause--equipment problems, multipath fading, power fading, etc.

The table and column headings indicate the source of the data, the link, and the cause of the measured errors. For example, Table 1 takes the error information from the Berlin-to-Feldberg channel and allocates it to each of the component links as indicated by the column headings. As noted in the table heading, Table 1 contains all error data regardless of cause. The last column on the right contains data for the entire end-to-end channel (one tropo link and four LOS links in the case of the BLN-FEL channel).

The following list is a directory of the 14 tables in Volume III:

- Tables 1 5: Allocation of error data measured on the BLN-FEL channel
 - -Table 1: All Causes of Errors
 - -Table 2: Equipment Causes of Errors
 - -Table 3: Multipath Fading Causes of Errors
 - -Table 4: Troposcatter Propagation Causes of Errors
 - -Table 5: Power Fading Causes of Errors

• <u>Tables 6 - 9</u>: <u>Allocation of error data measured on the LDF-FEL channel</u>

-Table 6: All Causes of Errors

-Table 7: Equipment Causes of Errors

-Table 8: Multipath Fading Causes of Errors
-Table 9: Power Fading Causes of Errors

• Tables 10 - 14: Allocation of error data measured on the SBN-FEL link

-Table 10: All Causes of Errors

-Table 11: Equipment Causes of Errors

-Table 12: Multipath Fading Causes of Errors
-Table 13: Power Fading Causes of Errors

-Table 14: Multipath Fading Statistics for SBN-FEL Path

3. DESCRIPTION OF GRAPHS CONTAINED IN VOLUME III

Volume III contains 124 figures. While this initially may seem overwhelming, it becomes less so when the structure and organization of the figures are understood. Understanding the organization and content of these figures requires an understanding of the concept of the error allocation which was described in the previous section. Most of the figures are cumulative probability distributions, which were specified in the statement-of-work from the Defense Communications Engineering Center. Many of these figures contain multiple curves—one curve for each cause of error. For example Figure 1 has a curve for all causes, a curve for errors caused by equipment, and a curve for errors caused by troposcatter propagation. The sample-size numbers beneath these distributions are provided for each of the curves.

There are fifteen categories of figures. Within each category, several similar graphs are provided. The following list provides the structural organization of the 124 graphs, which are grouped into the fifteen categories.

• Figures 1 - 14: Distributions of consecutive errored-second occurrences

-Figures 1 - 6: Allocation of Berlin-Feldberg errored seconds

-Figures 7 - 11: Allocation of Linderhofe-Feldberg errored seconds

-Figures 12 - 14: SBN-FEL errors for receiver on line, Rx A, and Rx B

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Table 1. BLNFEL 64 kb/s Channel Statistics

Measurement Period: April 1, 1988 0:0:0 to April 1, 1989 0:0:0

Number of hours of valid data: 7866.00

From all causes

	BLNB8G	BBGKBG	KBGRWN	RUNSBN	SBNFEL	Unident. Link	BBGFEL	BLNFEL
No. of errored seconds, ES								
(with unavailability time)	1280879	54648	7558	4560	49914	853796	110676	2245346
(without unavailability time)	1101551	42310	622	1269	23662	736493	67491	1905530
No. of ES assigned to 2 links								
(with unavailability time)	5	6	4530	2386	5091	0	6009	6009
(without unavailability time)	5	6	30	354	359	. 0	377	377
Correlation coefficients for								
fraction of ES & average BER in								
consecutive 15-minute intervals								
(without unavailability time)	0.1018	0.0992	0.1005	0.1009	0.1084	0.1002	0.1016	0.1046
fraction of period that link is								
unavailable (by MIL-STD-188-323)	0.006333	0.000436	0.000245	0.000116	0.000927	0.004142	0.001525	0.012000
Fraction of period that link is								
unavailable (TRAMCON estimation)	0.000000	0.000000	0.000000	0.000021	0.000046	0.00000	0.000067	0.000067
No. of frame loss occurrences								
(with unavailability time)	911	0	- 0	0	0	0	0	911
(without unavailability time)	890	0	0	0	0	0	0	890
Fraction of period that link is unavailable (Rec. G.821)								0.003466
No. of severely errored seconds (Rec. G.821)								53598
Degraded minutes (Rec. G.821)								296304
Errored seconds (Rec. G.821)								2150214

Table 3. BLNFEL 64 kb/s Channel Statistics

Measurement Period: April 1, 1988 0:0:0 to April 1, 1989 0:0:0

Number of hours of valid data: 7866.00

Errors cause: Multipath

	BLNBBG	BBGKBG	KBGRWN	RWNSBN	SBNFEL	Unident. Link	BBGFEL	BLNFEL
No. of errored seconds, ES								
(with unavailability time),	0	21873	1012	2325	8292	0	31541	31541
(without unavailability time)	0	17439	112	21	544	0	18100	18100
No. of ES assigned to 2 links								
(with unavailability time)	0	0	907	1955	1060	0	1961	1961
(without unavailability time)	0	0	7	10	15	0	16	16
Correlation coefficients for								
fraction of ES & average BER in								
consecutive 15-minute intervals								•
(without unavailability time)	0.1025	0.1003	0.0995	0.1002	0.1000	0.1002	0.0991	0.0992
Fraction of period that link is								
unavailable (by MIL-STD-188-323)	0.000000	0.000157	0.000032	0.000081	0.000274	0.00000	0.000475	0.000475
Fraction of period that link is								
unavailable (TRAMCON estimation)	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
No. of frame loss occurrences								
(with unavailability time)	0	0	0	0	0	0	0	0
(without unavailability time)	0	0	0	0	0	Ò	0	0

Table 2. BLNFEL 64 kb/s Channel Statistics

Measurement Period: April 1, 1988 0:0:0 to April 1, 1989 0:0:0

Number of hours of valid data: 7866.00

Errors cause: Equipment

	BLNBBG	BBGK8G	KBGRWN	RWNSBN	SBNFEL	Unident. Link	BBGFEL	BLNFEL
No. of errored seconds, ES								
(with unavailability time)	28129	8239	6055	1233	32512	0	44016	72140
(without unavailability time)	19737	3170	320	1146	2255 8	0	26858	46590
No. of ES assigned to 2 links								
(with unavailability time)	5	3	3619	417	4012	0	4028	4028
(without unavailability time)	5	. 3	19	330	325	0	341	341
Correlation coefficients for								
fraction of ES & average BER in								
consecutive 15-minute intervals							~	
(without unavailability time)	0.1003	0.0999	0.1005	0.1009	0.1084	0.1002	0.1024	0.0989
Fraction of period that link is								
unavailable (by MIL-STD-188-323)	0.000296	0.000179	0.000203	0.000003	0.000352	0.000000	0.000606	0.000902
Fraction of period that link is								
unavailable (TRAMCON estimation)	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
No. of frame loss occurrences			,					
(with unavailability time)	31	0	0	0	0	0	0	31
(without unavailability time)	29	0	0	0	0	0	0.3	29

Table 4. BLNFEL 64 kb/s Channel Statistics
Measurement Period: April 1, 1988 0:0:0 to April 1, 1989 0:0:0
Number of hours of valid data: 7866.00
Errors cause: Tropospheric scatter propagation

	BLNBBG	BBGKBG	KBGRWN	RWNSBN	SBNFEL	Unident. Link	BBGFEL	BLNFEL
No. of errored seconds, ES					٠			
(with unavailability time) -	1252750	0	0	0	0	0	0	1252750
(without unavailability time)	1081814	0	0	0	0	0	0	1081814
No. of ES assigned to 2 links								
(with unavailability time)	0	0	0	0	0	0	0	0
(without unavailability time)	0	. 0	0	0	0 .	0	0	. 0
Correlation coefficients for								
fraction of ES & average BER in								
consecutive 15-minute intervals								
(without unavailability time)	0.1025	0.1018	0.0994	0.1002	0.1000	0.1002	0.0996	0.0997
Fraction of period that link is								
unavailable (by MIL-STD-188-323)	0.006036	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.006036
Fraction of period that link is								
unavailable (TRAMCON estimation)	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
No. of frame loss occurrences								
(with unavailability time)	880	0	0	0	0	0	0	880
(without unavailability time)	. 861	0	0	0	0	0	0	861

Table 5. BLNFEL 64 kb/s Channel Statistics

Measurement Period: April 1, 1988 0:0:0 to April 1, 1989 0:0:0

Number of hours of valid data: 7866.00

Errors cause: Power fading

	BLNBBG	BBGKBG	KBGRUN	RUNSBN	SBNFEL	Unident. Link	BBGFEL	BLNFEL
No. of errored seconds, ES								
(with unavailability time)	0	1662	1	2	5	0	1669	1669
(without unavailability time)	0	1662	1	2	5	0	1669	1669
No. of ES assigned to 2 links								
(with unavailability time)	0	0	0	1	1	0	1	1
(without unavailability time)	0	. 0	0	1	1	0	1	. 1
Correlation coefficients for								
fraction of ES & average BER in								
consecutive 15-minute intervals							. /	
(without unavailability time)	0.1025	0.1018	0.0994	0.1002	0.1000	0.1002	0.0995	0.0997
Fraction of period that link is								
unavailable (by MIL-STD-188-323)	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Fraction of period that link is								
unavailable (TRAMCON estimation)	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
No. of frame loss occurrences								
(with unavailability time)	0	0	0	0	0	0	0	0
(without unavailability time)	0	0	0	0	0	0	0	0

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Table 6. LDFFEL 64 kb/s Channel Statistics
Measurement Period: April 1, 1988 0:0:0 to April 1, 1989 0:0:0
Number of hours of valid data: 7866.00
From all causes

	LDFKBG	KBGRWN	RUNSBN	SBNFEL	Unident. Link	LDFFEL
No. of errored seconds, ES						
(with unavailability time)	9743	3741	1701	12334	97973	121255
(without unavailability time)	3506	367	686	4971	72332	81412
No. of ES assigned to 2 links						
(with unavailability time)	39	2838	1387	4210	0	4237
(without unavailability time)	39.	66	372	423	0	450
Correlation coefficients for fraction of ES & average BER in						
consecutive 15-minute intervals						
(without unavailability time)	0.3590	0.3583	0.4574	0.7412	0.4721	0.5111
Fraction of period that link is						
unavailable (by MIL-STD-188-323)	0.000220	0.000119	0.000036	0.000260	0.000905	0.001407
Fraction of period that link is						
unavailable (TRAMCON estimation)	0.000000	0.00000	0.000021	0.000046	0.000000	0.000067
No. of frame loss occurrences						
(with unavailability time)	0	0	0	0	0	0
(without unavailability time)	0	0	0	0	0	0
Fraction of period that link is unavailable (Rec. G.821)						0.002110
No. of severely errored seconds (Rec. G.821)						30543
Degraded minutes (Rec. G.821)						13511
Errored seconds (Rec. G.821)						64845

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Table 7. LDFFEL 64 kb/s Channel Statistics

Measurement Period: April 1, 1988 0:0:0 to April 1, 1989 0:0:0

Number of hours of valid data: 7866.00

Errors cause: Equipment

	LDFKBG	KBGRUN	RWNSBN	SBNFEL	Unident. Link	LDFFEL
No. of errored seconds, ES						
(with unavailability time)	9001	3556	1217	8348	0	18161
(without unavailability time)	2764	182	330	1862	0	4836
No. of ES assigned to 2 links						
(with unavailability time)	33	2824	1126	3939	0	3961
(without unavailability time)	33	52	239	280	0	302
Correlation coefficients for						
fraction of ES & average BER in						
consecutive 15-minute intervals						
(without unavailability time)	0.3537	0.3576	0.4573	0.6878	0.4721	0.4908
Fraction of period that link is						
unavailable (by MIL-STD-188-323)	0.000220	0.000119	0.000031	0.000229	0.000000	0.000471
Fraction of period that link is						
unavailable (TRAMCON estimation)	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
No. of frame loss occurrences						
(with unavailability time)	0	0	0	0	0	0
(without unavailability time)	0	0	0	. 0	. 0	0

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Table 8. LDFFEL 64 kb/s Channel Statistics
Measurement Period: April 1, 1988 0:0:0 to April 1, 1989 0:0:0
Number of hours of valid data: 7866.00
Errors cause: Multipath

	LDFKBG	KBGRWN	RUNSBN	SBNFEL	Unident. Link	LDFFEL
No. of errored seconds, ES						
(with unavailability time)	123	95	102	2202	0	2432
(without unavailability time)	123	95	102	2202	0	2432
No. of ES assigned to 2 links						
(with unavailability time)	1	10	83	86	0	90
(without unavailability time)	•	10	83	86	0	90
Correlation coefficients for						
fraction of ES & average BER in						
consecutive 15-minute intervals						
(without unavailability time)	0.5318	0.3581	0.4595	0.5745	0.4721	0.4795
fraction of period that link is						
unavailable (by MIL-STD-188-323)	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Fraction of period that link is						
unavailable (TRAMCON estimation)	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
No. of frame loss occurrences						
(with unavailability time)	0	0	0	0	0	0
(without unavailability time)	0	0	0	0	0	0

Table 9. LDFFEL 64 kb/s Channel Statistics

Measurement Period: April 1, 1988 0:0:0 to April 1, 1989 0:0:0

Number of hours of valid data: 7866.00

Errors cause: Power fading

	LDFK8G	KBGRWN	RUNSBN	SBNFEL	Unident, Link	LDFFEL
No. of errored seconds, ES						
(with unavailability time)	8	22	0	2	0	32
(without unavailability time)	8	22	0	2	0	32
No. of ES assigned to 2 links						
(with unavailability time)	0	0	0	0	0	0
(without unavailability time)	0	0	0	0	0	0
Correlation coefficients for						
fraction of ES & average BER in						
consecutive 15-minute intervals						
(without unavailability time)	0.4352	0.3588	0.4589	0.5139	0.4721	0.4772
Fraction of period that link is					*	
unavailable (by MIL-STD-188-323)	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Fraction of period that link is						
unavailable (TRAMCON estimation)	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
No. of frame loss occurrences						
(with unavailability time)	. 0	0	0	0	0	0
(without unavailability time)	0	0	0	0	0	0

Table 10. Errored Second Statistics for the SBNFEL 56 kb/s Channels
Measurement Period: April 1, 1988 0:0:0 to April 1, 1989 0:0:0
Number of hours of valid data: 7866.00
From all causes

Variable	Receiver On Line	A Receiver	B Receiver
No. of errored seconds, ES			
(with unavailability time)	2347	11813	9829
(without unavailability time)	1559	9989	8117
Total number of error events			
(with unavailability time)	601	2101	1747
(without unavailability time)	596	2089	1734
Correlation coefficients for			
fraction of ES & average BER in			
consecutive 15-minute intervals			
(without unavailability time)	0.8582	0.8920	0.8829
No. of seconds that RSL is			
less than BER threshold	748	5084	6151
Fraction of period that link is			
unavailable (by MIL-STD-188-323)	0.000028	0.000064	0.000060
No. of frame loss occurrences			
(with unavailability time)	64	623	548
(without unavailability time)	64	616	540
Fraction of period that link is			
unavailable (Rec. G.821)	0.000022	0.000168	0.000130
No. of severely errored seconds			
(Rec. G.821)	696	3432	2852
Degraded minutes (Rec. G.821)	192	789	641
Errored seconds (Rec. G.821)	1746	7146	6227

Table 11. Errored Second Statistics for the SBNFEL 56 kb/s Channels

Measurement Period: April 1, 1988 0:0:0 to April 1, 1989 0:0:0

Number of hours of valid data: 7866.00

Errors cause: Equipment

Variable	Receiver On Line	A Receiver	B Receiver
No. of errored seconds, ES			
(with unavailability time)	953	1492	1228
(without unavailability time)	165	170	138
Total number of error events			
(with unavailability time)	108	103	91
(without unavailability time)	103	97	85
Correlation coefficients for			
fraction of ES & average BER in			
consecutive 15-minute intervals			
(without unavailability time)	0.8597	0.8923	0.8830
No. of seconds that RSL is			
less than BER threshold	0	0	31
Fraction of period that link is			
unavailable (by MIL-STD-188-323)	0.000028	0.000047	0.000038
No. of frame loss occurrences			
(with unavailability time)	4	7	5
(without unavailability time)	4	6	4

Table 12. Errored Second Statistics for the SBNFEL 56 kb/s Channels
Measurement Period: April 1, 1988 0:0:0 to April 1, 1989 0:0:0
Number of hours of valid data: 7866.00
Errors cause: Multipath

Variable	Receiver On Line	A Receiver	B Receiver
No. of errored seconds, ES			
(with unavailability time)	1180	10008	8409
(without unavailability time)	1180	9506	7787
Total number of error events			
(with unavailability time)	360	1800	1551
(without unavailability time)	360	1794	1544
Correlation coefficients for			
fraction of ES & average BER in			
consecutive 15-minute intervals			
(without unavailability time)	0.8653	0.8923	0.8836
No. of seconds that RSL is			
less than BER threshold	748	5084	6120
Fraction of period that link is			
unavailable (by MIL-STD-188-323)	0.000000	0.000018	0.000022
No. of frame loss occurrences			
(with unavailability time)	59	614	539
(without unavailability time)	59	608	532

Table 13. Errored Second Statistics for the SBNFEL 56 kb/s Channels

Measurement Period: April 1, 1988 0:0:0 to April 1, 1989 0:0:0

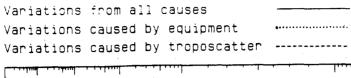
Number of hours of valid data: 7866.00

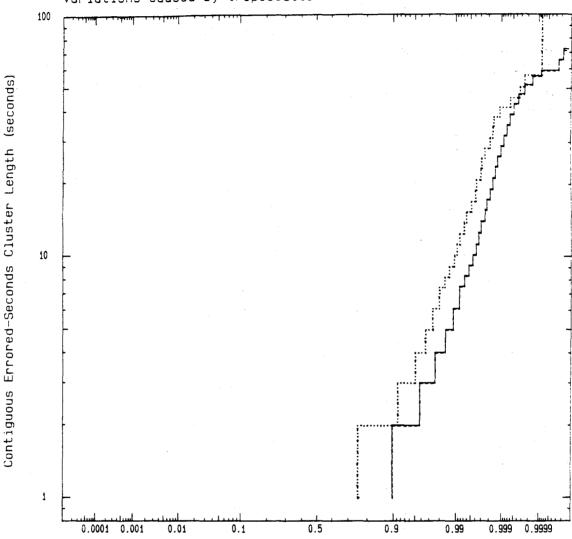
Errors cause: Power fading

Variable	Receiver	A	В
	On Line	Receiver	Receiver
No. of errored seconds, ES			
(with unavailability time)	0	0 .	0
(without unavailability time)	. 0	0	. · · · · · · · · · · · · · · · · · · ·
Total number of error events	•		
(with unavailability time)	0	0	0
(without unavailability time)	0	0	0
Correlation coefficients for			
fraction of ES & average BER in			
consecutive 15-minute intervals			
(without unavailability time)	0.7905	0.6151	0.8873
No. of seconds that RSL is		·	
less than BER threshold	0	0	0
Fraction of period that link is			
unavailable (by MIL-STD-188-323)	0.000000	0.000000	0.000000
No. of frame loss occurrences			
(with unavailability time)	0	0	0
(without unavailability time)	0	0 .	0
•			

Table 14. Multipath fading Period Statistics for the SBNFEL Link
Measurement Period: April 1, 1988 0:0:0 to April 1, 1989 0:0:0
Number of hours of multipath fading valid data: 4.86

Unavailable fraction (MIL-STD-188-323) of the multipath fading period	0.0000000
Number of seconds that RSL is below BER threshold for the A receiver	5340
Number of seconds that RSL is below BER threshold for the B receiver	6671
Number of seconds that both receivers are simultaneously below BER threshold	1323
Composite fade margin for A receiver at BER = 0.0000156	67.310
Composite fade margin for B receiver at BER = 0.0000156	69.118
Dispersive fade margin for A receiver at BER = 0.0000156	71.901
Dispersive fade margin for B receiver at BER = 0.0000156	87.608
Fraction of errored seconds that has a notch in the bandwidth for the A receiver	0.0534572
Fraction of errored seconds that has a notch in the bandwidth for the B receiver	0.0605304
No. of errored seconds there would be if the receivers were switched based on the smallest BER	1569
No. of errored seconds there are using the current diversity switching system	1813
No. of errored seconds there would be if the receivers were switched based on largest fade depth	1951
No. of errored seconds there would be if the receivers were switched based on the smallest slope distortion measured using the IF band filters	8199
No. of errored seconds there would be if the receivers were switched based on largest SQM voltage	2745

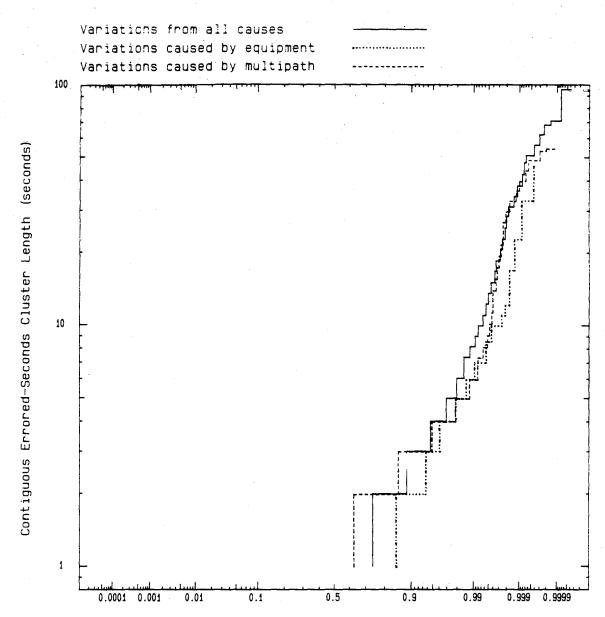




Fraction of Samples That Had Values Less Than the Ordinate

Figure 1. Distribution of consecutive errored-second occurrences for:

- Test period from 4/1/88 00:00:00 to 4/1/89 00:00:00
- Sample size of 868090, 12181, 855897
- Does not include MIL-STD-188-323 unavailability time
- Availability for this test period was 0.993667
- The 64 kb/s channel from Berlin to Feldberg
- Link from Berlin to Bocksberg (tropospheric scatter)



Fraction of Samples That Had Values Less Than the Ordinate

Figure 2. Distribution of consecutive errored-second occurrences for:

- Test period from 4/1/88 00:00:00 to 4/1/89 00:00:00
- Sample size of 26243, 2343, 10302
- Does not include MIL-STD-188-323 unavailability time
- Availability for this test period was 0.999564
- The 64 kb/s channel from Berlin to Feldberg
- Link from Bocksberg to Koeterberg

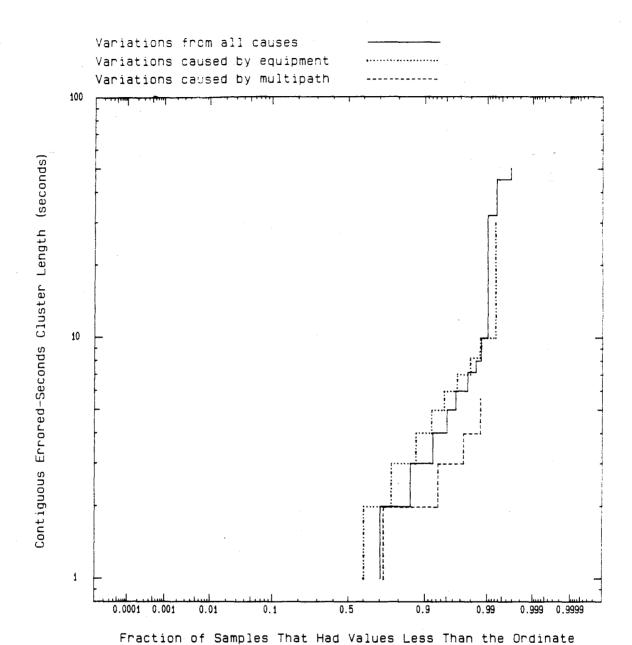
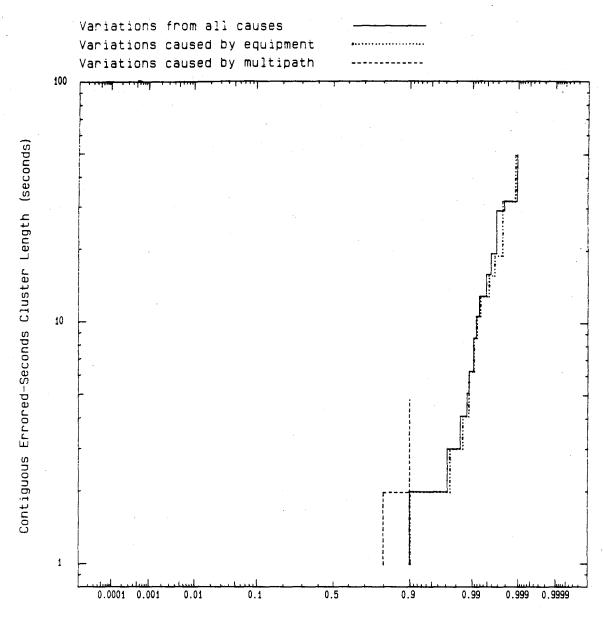


Figure 3. Distribution of consecutive errored-second occurrences for:

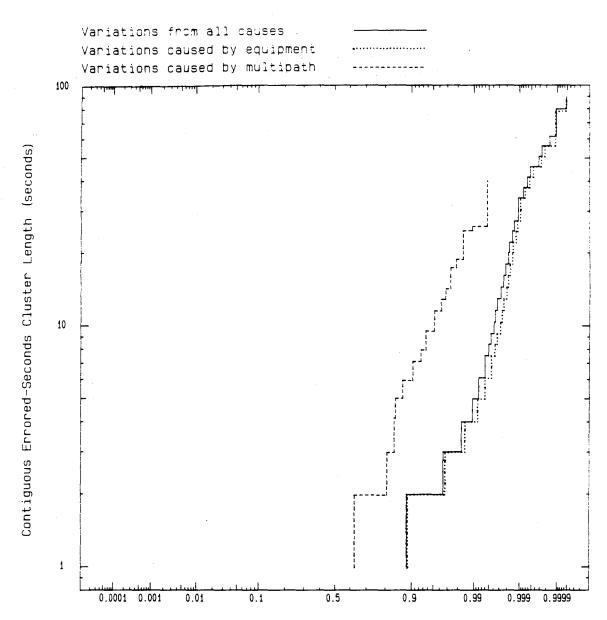
- Test period from 4/1/88 00:00:00 to 4/1/89 00:00:00
- Sample size of 307, 149, 76
- Does not include MIL-STD-188-323 unavailability time
- Availability for this test period was 0.999755
- The 64 kb/s channel from Berlin to Feldberg
- Link from Koeterberg to Rothwesten



Fraction of Samples That Had Values Less Than the Ordinate

Figure 4. Distribution of consecutive errored-second occurrences for:

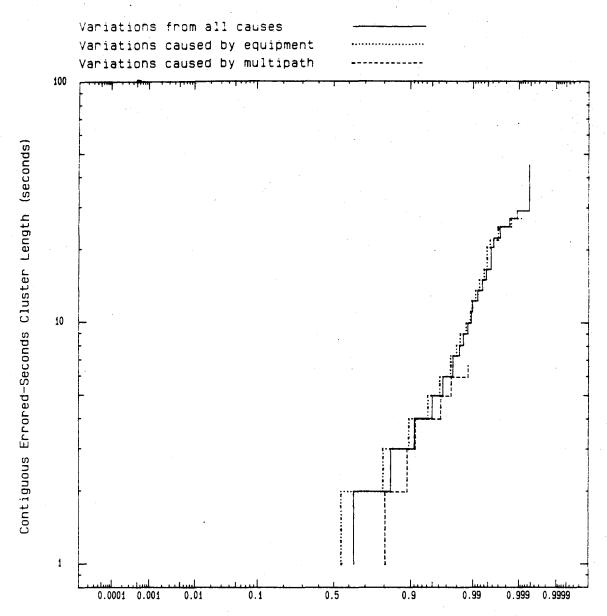
- Test period from 4/1/88 00:00:00 to 4/1/89 00:00:00
- Sample size of 956, 879, 10
- Does not include MIL-STD-188-323 unavailability time
- Availability for this test period was 0.999884
- The 64 kb/s channel from Berlin to Feldberg
- Link from Rothwesten to Schwarzenborn



Fraction of Samples That Had Values Less Than the Ordinate

Figure 5. Distribution of consecutive errored-second occurrences for:

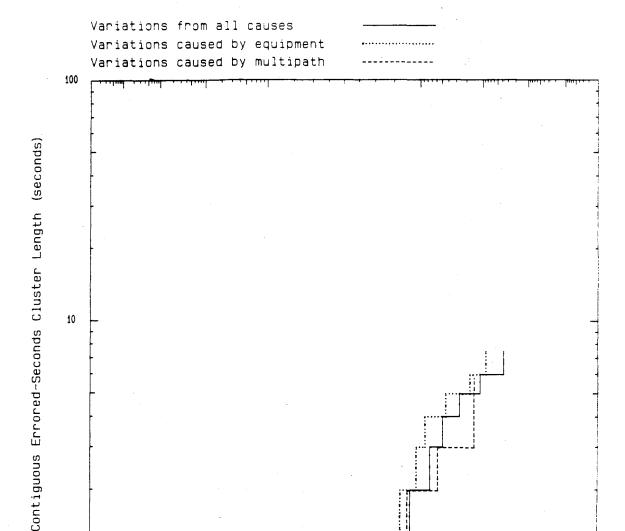
- Test period from 4/1/88 00:00:00 to 4/1/89 00:00:00
- Sample size of 18718, 18291, 189
- Does not include MIL-STD-188-323 unavailability time
- Availability for this test period was 0.999073
- The 64 kb/s channel from Berlin to Feldberg
- Link from Schwarzenborn to Feldberg



Fraction of Samples That Had Values Less Than the Ordinate

Figure 7. Distribution of consecutive errored-second occurrences for:

- Test period from 4/1/88 00:00:00 to 4/1/89 00:00:00
- Sample size of 1861, 1351, 82
- Does not include MIL-STD-188-323 unavailability time
- Availability for this test period was 0.999780
- The 64 kb/s channel from Linderhofe to Feldberg
- Link from Linderhofe to Koeterberg



Fraction of Samples That Had Values Less Than the Ordinate

0.5

0.999

Figure 8. Distribution of consecutive errored-second occurrences for:

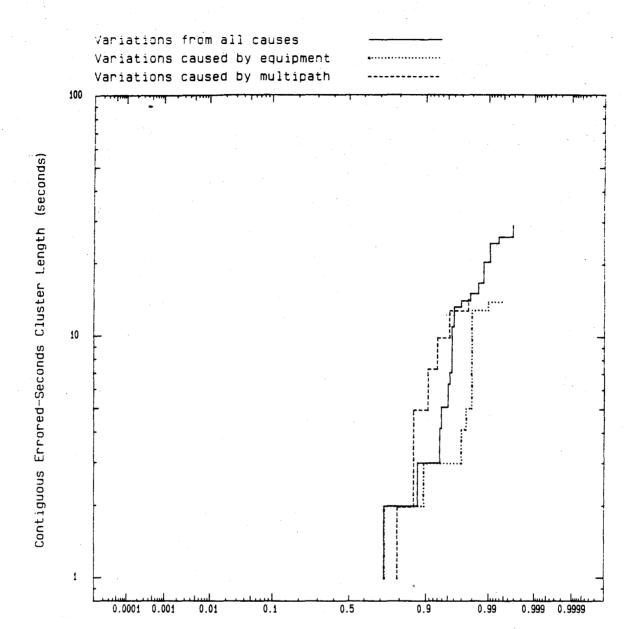
- Test period from 4/1/88 00:00:00 to 4/1/89 00:00:00
- Sample size of 269, 116, 70

0.01

- Does not include MIL-STD-188-323 unavailability time
- Availability for this test period was 0.999881
- The 64 kb/s channel from Linderhofe to Feldberg
- Link from Koeterberg to Rothwesten

1

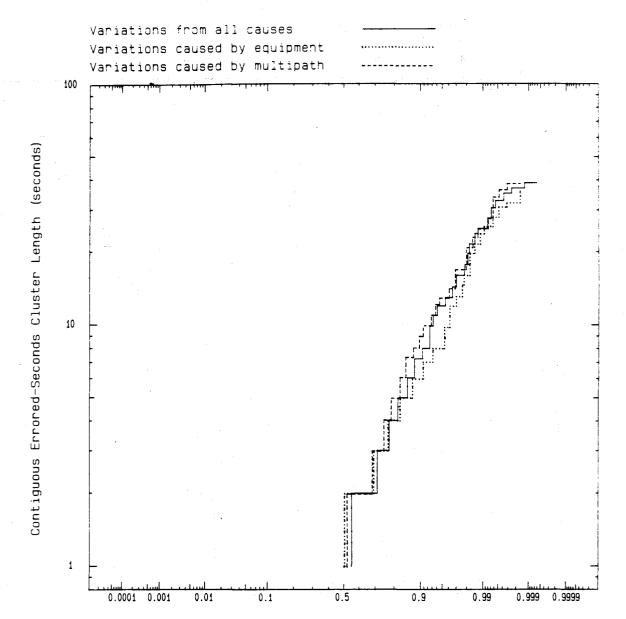
0.0001 0.001



Fraction of Samples That Had Values Less Than the Ordinate

Figure 9. Distribution of consecutive errored-second occurrences for:

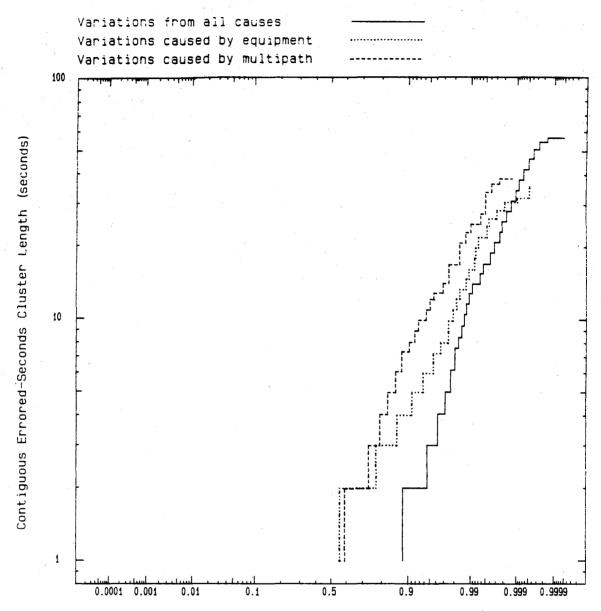
- Test period from 4/1/88 00:00:00 to 4/1/89 00:00:00
- Sample size of 325, 198, 43
- Does not include MIL-STD-188-323 unavailability time
- Availability for this test period was 0.999964
- The 64 kb/s channel from Linderhofe to Feldberg
- Link from Rothwesten to Schwarzenborn



Fraction of Samples That Had Values Less Than the Ordinate

Figure 10. Distribution of consecutive errored-second occurrences for:

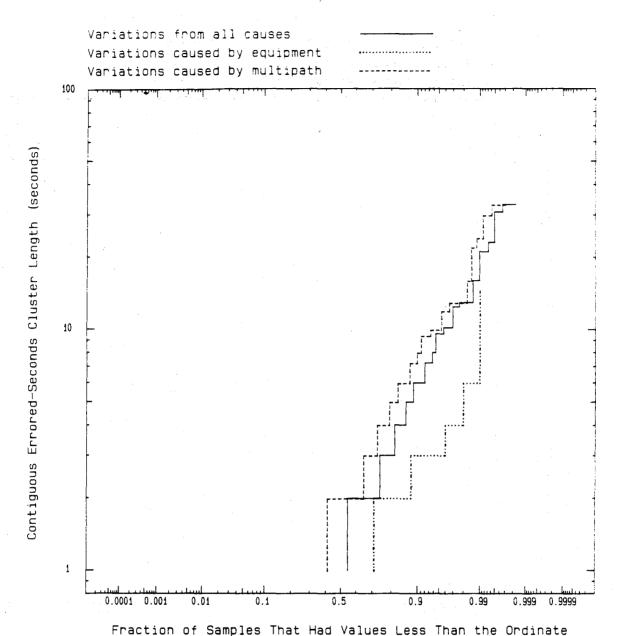
- Test period from 4/1/88 00:00:00 to 4/1/89 00:00:00
- Sample size of 1589, 626, 639
- Does not include MIL-STD-188-323 unavailability time
- Availability for this test period was 0.999740
- The 64 kb/s channel from Linderhofe to Feldberg
- Link from Schwarzenborn to Feldberg



Fraction of Samples That Had Values Less Than the Ordinate

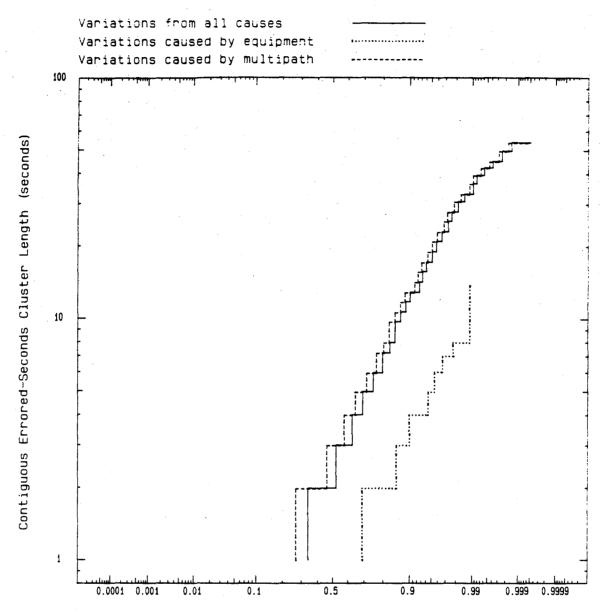
Figure 11. Distribution of consecutive errored-second occurrences for:

- Test period from 4/1/88 00:00:00 to 4/1/89 00:00:00
- Sample size of 57142, 2145, 813
- Does not include MIL-STD-188-323 unavailability time
- Availability for this test period was 0.998593
- The 64 kb/s channel from Linderhofe to Feldberg
- Link from Linderhofe to Feldberg (tandem links)



Distribuţion of consecutive errored-second occurrences for: Figure 12.

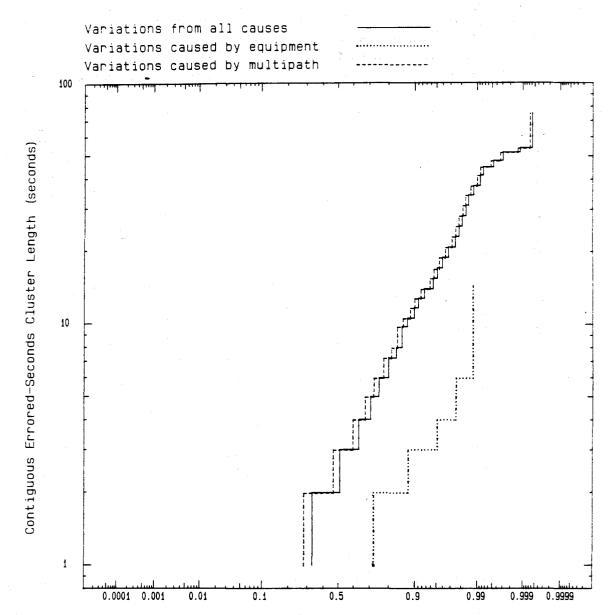
- Test period from 4/1/88 00:00:00 to 4/1/89 00:00:00
- Sample size of 587, 100, 349
- Does not include MIL-STD-188-323 unavailability time
- Availability for this test period was 0.999972
- The 56 kb/s, receiver-on-line channel
- Link from Schwarzenborn to Feldberg



Fraction of Samples That Had Values Less Than the Ordinate

Figure 13. Distribution of consecutive errored-second occurrences for:

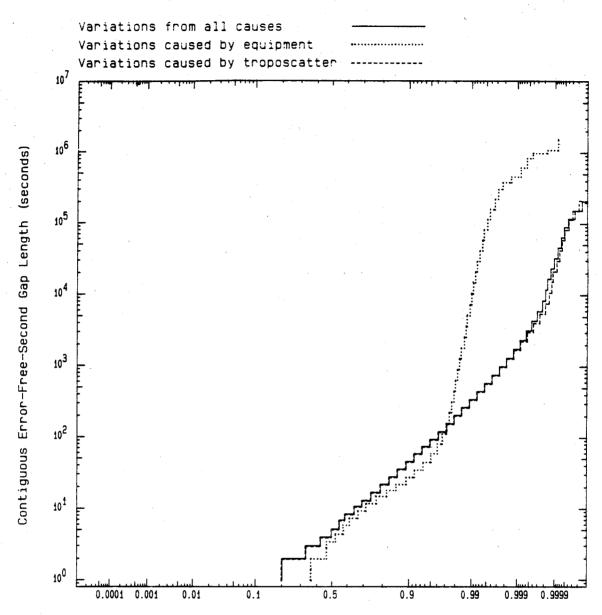
- Test period from 4/1/88 00:00:00 to 4/1/89 00:00:00
- Sample size of 2078, 90, 1781
- Does not include MIL-STD-188-323 unavailability time
- Availability for this test period was 0.999936
- The 56 kb/s, receiver A channel
- Link from Schwarzenborn to Feldberg



Fraction of Samples That Had Values Less Than the Ordinate

Figure 14. Distribution of consecutive errored-second occurrences for:

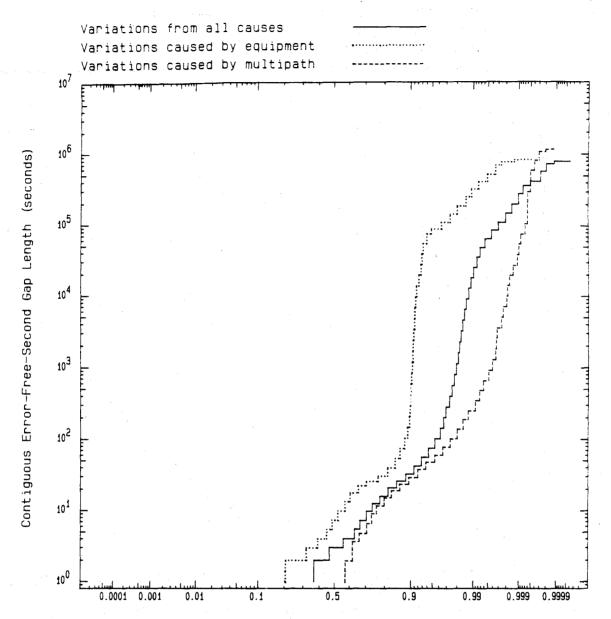
- Test period from 4/1/88 00:00:00 to 4/1/89 00:00:00
- Sample size of 1724, 83, 1531
- Does not include MIL-STD-188-323 unavailability time
- Availability for this test period was 0.999940
- The 56 kb/s, receiver B channel
- Link from Schwarzenborn to Feldberg



Fraction of Samples That Had Values Less Than the Ordinate

Figure 15. Distribution of consecutive error-free-second occurrences for:

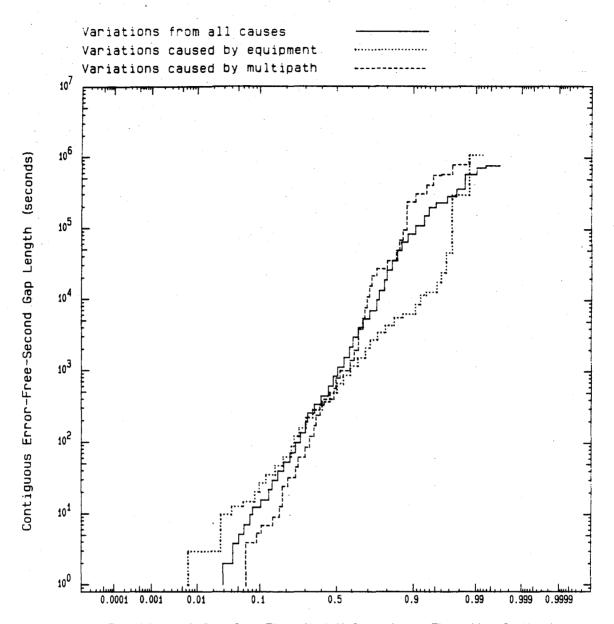
- Test period from 4/1/88 00:00:00 to 4/1/89 00:00:00
- Sample size of 868740, 12196, 856532
- Does not include MIL-STD-188-323 unavailability time
- Availability for this test period was 0.993667
- The 64 kb/s channel from Berlin to Feldberg
- Link from Berlin to Bocksberg (tropospheric scatter)



Fraction of Samples That Had Values Less Than the Ordinate

Figure 16. Distribution of consecutive error-free-second occurrences for:

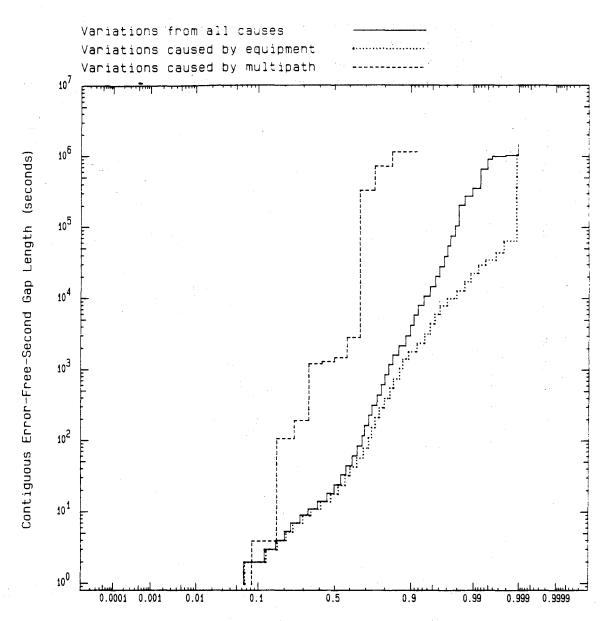
- Test period from 4/1/88 00:00:00 to 4/1/89 00:00:00
- Sample size of 26291, 2353, 10326
- Does not include MIL-STD-188-323 unavailability time
- Availability for this test period was 0.999564
- The 64 kb/s channel from Berlin to Feldberg
- Link -from Bocksberg to Koeterberg



Fraction of Samples That Had Values Less Than the Ordinate

Figure 17. Distribution of consecutive error-free-second occurrences for:

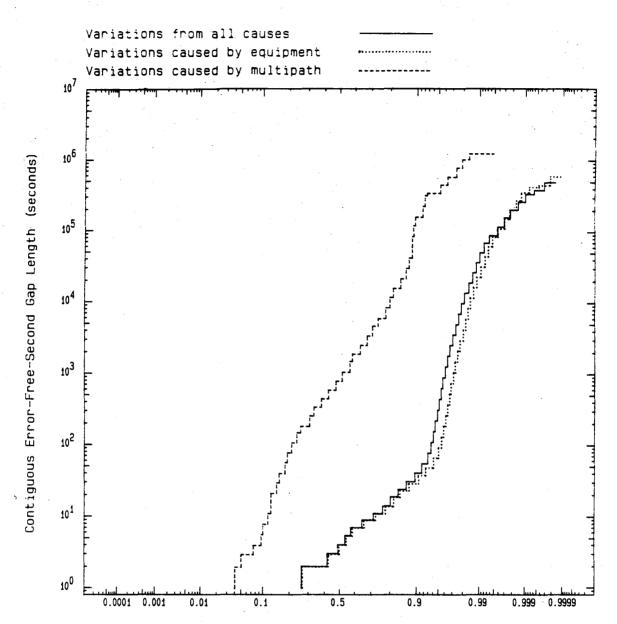
- Test period from 4/1/88 00:00:00 to 4/1/89 00:00:00
- Sample size of 311, 150, 76
- Does not include MIL-STD-188-323 unavailability time
- Availability for this test period was 0.999755
- The 64 kb/s channel from Berlin to Feldberg
- Link from Koeterberg to Rothwesten



Fraction of Samples That Had Values Less Than the Ordinate

Figure 18. Distribution of consecutive error-free-second occurrences for:

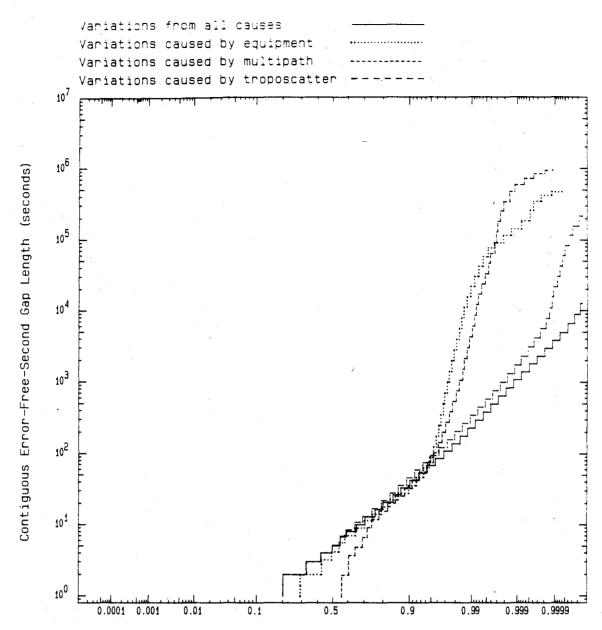
- Test period from 4/1/88 00:00:00 to 4/1/89 00:00:00
- Sample size of 961, 880, 12
- Does not include MIL-STD-188-323 unavailability time
- Availability for this test period was 0.999884
- The 64 kb/s channel from Berlin to Feldberg
- Link from Rothwesten to Schwarzenborn



Fraction of Samples That Had Values Less Than the Ordinate

Figure 19. Distribution of consecutive error-free-second occurrences for:

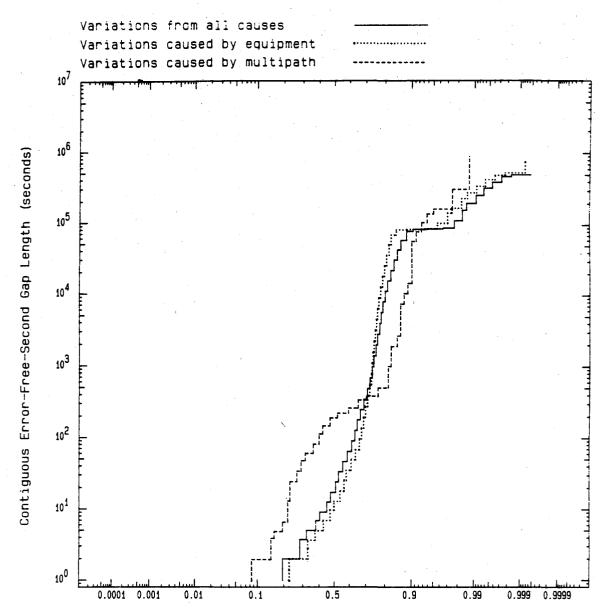
- Test period from 4/1/88 00:00:00 to 4/1/89 00:00:00
- Sample size of 18747, 18309, 196
- Does not include MIL-STD-188-323 unavailability time
- Availability for this test period was 0.999073
- The 64 kb/s channel from Berlin to Feldberg
- Link from Schwarzenborn to Feldberg



Fraction of Samples That Had Values Less Than the Ordinate

Figure 20. Distribution of consecutive error-free-second occurrences for:

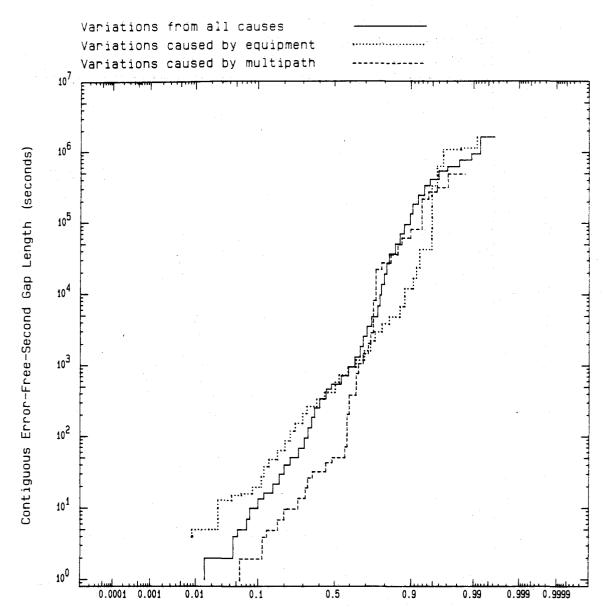
- Test period from 4/1/88 00:00:00 to 4/1/89 00:00:00
- Sample size of 1486386, 33738, 10618, 856532
- Does not include MIL-STD-188-323 unavailability time
- Availability for this test period was 0.988000
- The 64 kb/s channel from Berlin to Feldberg
- Link_from Berlin to Feldberg (tandem links)



Fraction of Samples That Had Values Less Than the Ordinate

Figure 21. Distribution of consecutive error-free-second occurrences for:

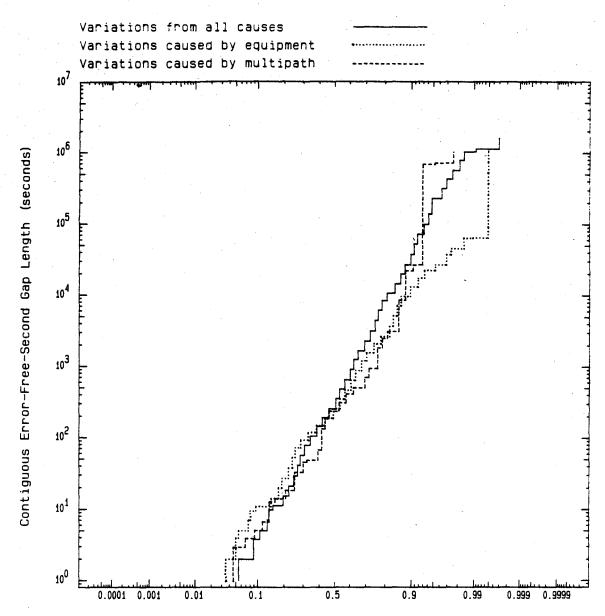
- Test period from 4/1/88 00:00:00 to 4/1/89 00:00:00
- Sample size of 1871, 1361, 82
- Does not include MIL-STD-188-323 unavailability time
- Availability for this test period was 0.999780
- The 64 kb/s channel from Linderhofe to Feldberg
- Link from Linderhofe to Koeterberg



Fraction of Samples That Had Values Less Than the Ordinate

Figure 22. Distribution of consecutive error-free-second occurrences for:

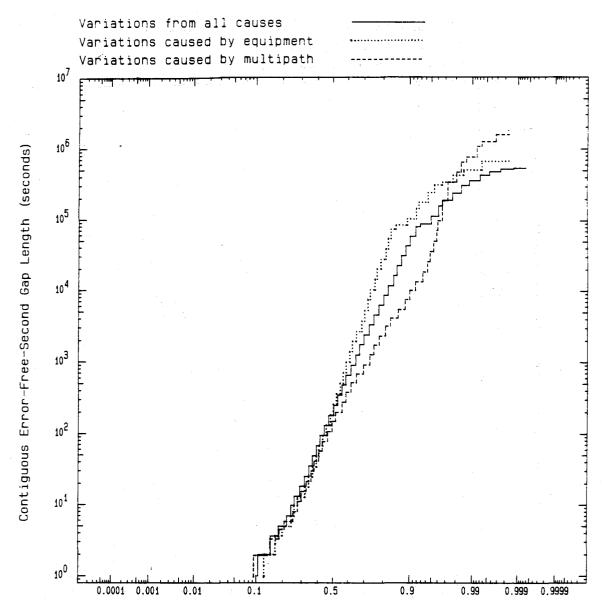
- ▶ Test period from 4/1/88 00:00:00 to 4/1/89 00:00:00
- Sample size of 271, 117, 70
- Does not include MIL-STD-188-323 unavailability time
- Availability for this test period was 0.999881
- ▶ The 64 kb/s channel from Linderhofe to Feldberg
- Link from Koeterberg to Rothwesten



Fraction of Samples That Had Values Less Than the Ordinate

Figure 23. Distribution of consecutive error-free-second occurrences for:

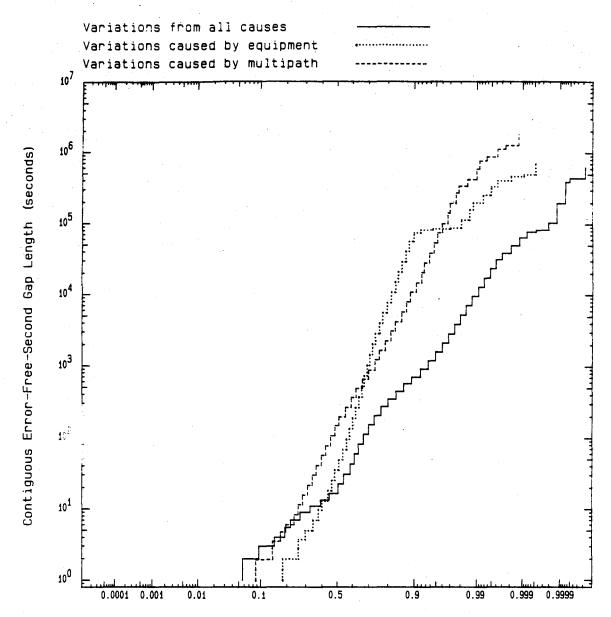
- Test period from 4/1/88 00:00:00 to 4/1/89 00:00:00
- Sample size of 327, 198, 43
- Does not include MIL-STD-188-323 unavailability time
- Availability for this test period was 0.999964
- The 64 kb/s channel from Linderhofe to Feldberg
- Link from Rothwesten to Schwarzenborn



Fraction of Samples That Had Values Less Than the Ordinate

Figure 24. Distribution of consecutive error-free-second occurrences for:

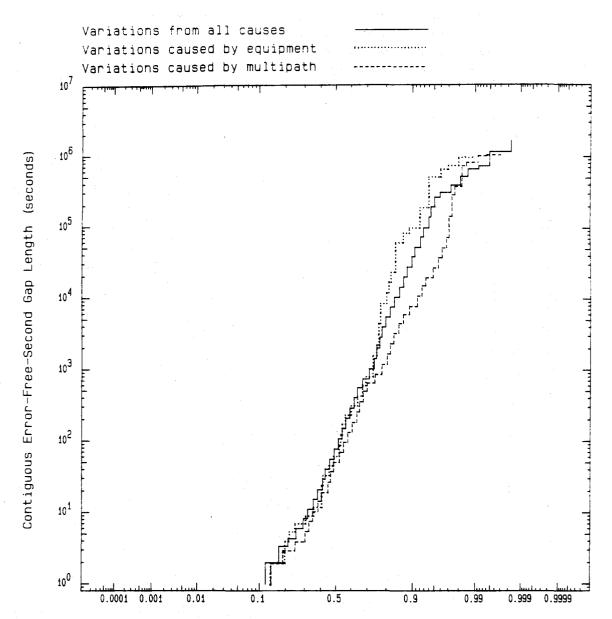
- Test period from 4/1/88 00:00:00 to 4/1/89 00:00:00
- Sample size of 1604, 637, 639
- Does not include MIL-STD-188-323 unavailability time
- Availability for this test period was 0.999740
- ▶ The 64 kb/s channel from Linderhofe to Feldberg
- Link_from Schwarzenborn to Feldberg



Fraction of Samples That Had Values Less Than the Ordinate

Figure 25. Distribution of consecutive error-free-second occurrences for:

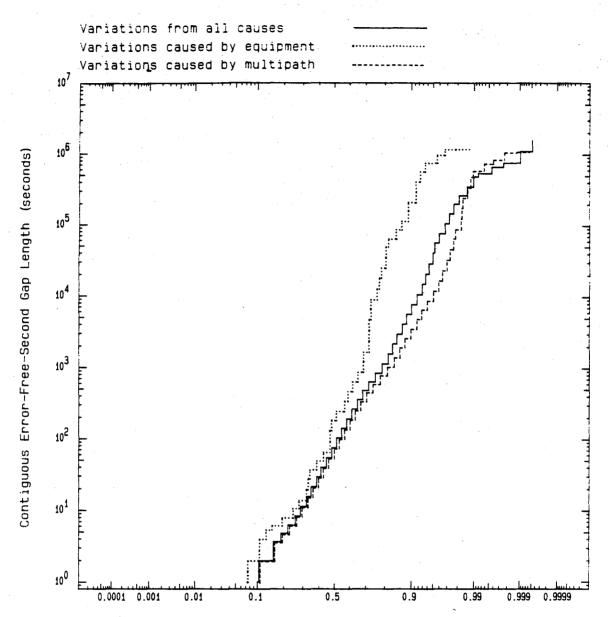
- Test period from 4/1/88 00:00:00 to 4/1/89 00:00:00
- Sample size of 57208, 2167, 813
- Does not include MIL-STD-188-323 unavailability time
- Availability for this test period was 0.998593
- ▶ The 64 kb/s channel from Linderhofe to Feldberg
- Link from Linderhofe to Feldberg (tandem links)



Fraction of Samples That Had Values Less Than the Ordinate

Figure 26. Distribution of consecutive error-free-second occurrences for:

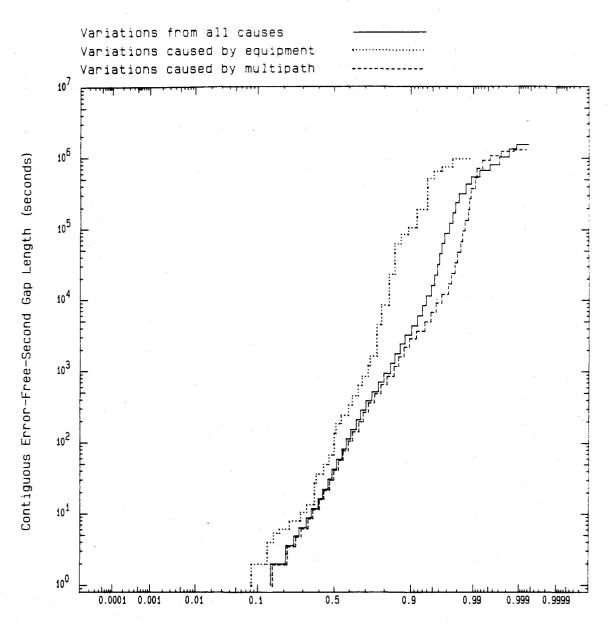
- Test period from 4/1/88 00:00:00 to 4/1/89 00:00:00
- Sample size of 589, 101, 349
- Does not include MIL-STD-188-323 unavailability time
- Availability for this test period was 0.999972
- The 56 kb/s, receiver-on-line channel
- Link from Schwarzenborn to Feldberg



Fraction of Samples That Had Values Less Than the Ordinate

Figure 27. Distribution of consecutive error-free-second occurrences for:

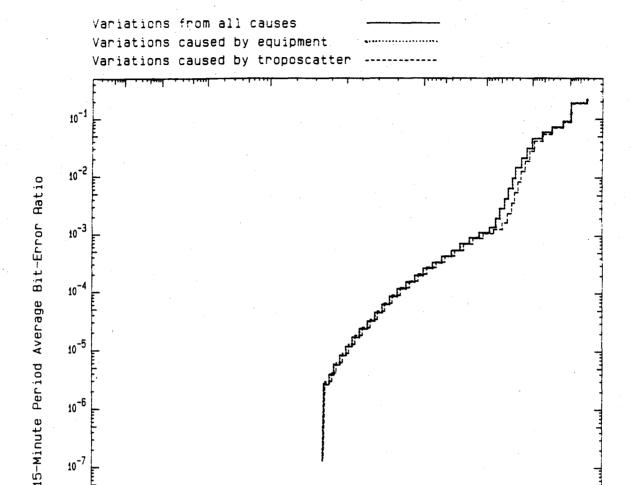
- Test period from 4/1/88 00:00:00 to 4/1/89 00:00:00
- Sample size of 2084, 93, 1783
- Does not include MIL-STD-188-323 unavailability time
- Availability for this test period was 0.999936
- The 56 kb/s, receiver A channel
- Link from Schwarzenborn to Feldberg



Fraction of Samples That Had Values Less Than the Ordinate

Figure 28. Distribution of consecutive error-free-second occurrences for:

- Test period from 4/1/88 00:00:00 to 4/1/89 00:00:00
- Sample size of 1728, 84, 1532
- Does not include MIL-STD-188-323 unavailability time
- Availability for this test period was 0.999940
- The 56 kb/s, receiver B channel
- Link ~from Schwarzenborn to Feldberg



Fraction of Samples That Had Values Less Than the Ordinate

Figure 29. Distribution of consecutive fixed 15-minute interval average BER for:

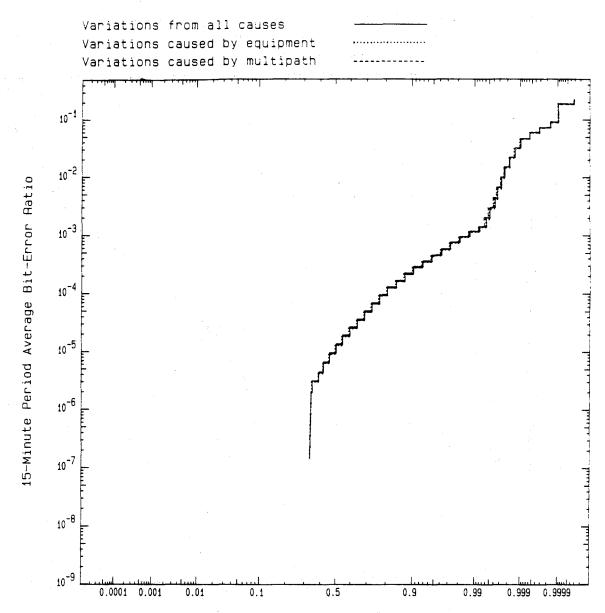
- Test period from 4/1/88 00:00:00 to 4/1/89 00:00:00
- Total number of 15 minute blocks: 31464
- Does not include MIL-STD-188-323 unavailability time
- Availability for this test period was 0.993667
- The 64 kb/s channel from Berlin to Feldberg
- Link from Berlin to Bocksberg (tropospheric scatter)

10-8

10-9

0.001

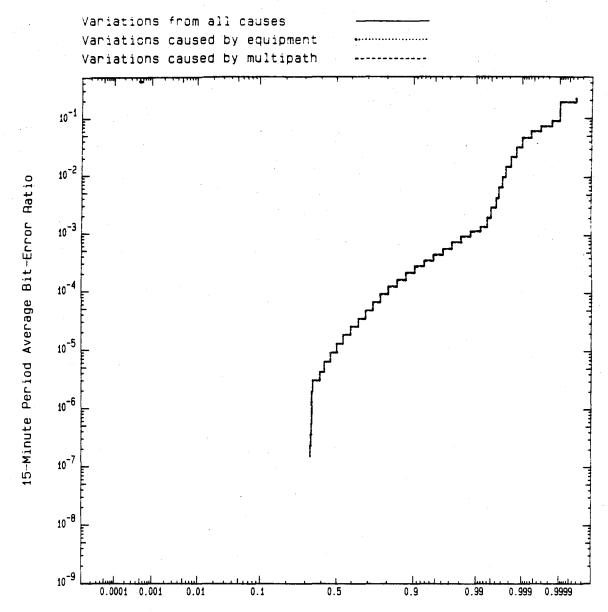
0.01



Fraction of Samples That Had Values Less Than the Ordinate

Figure 30. Distribution of consecutive fixed 15-minute interval average BER for:

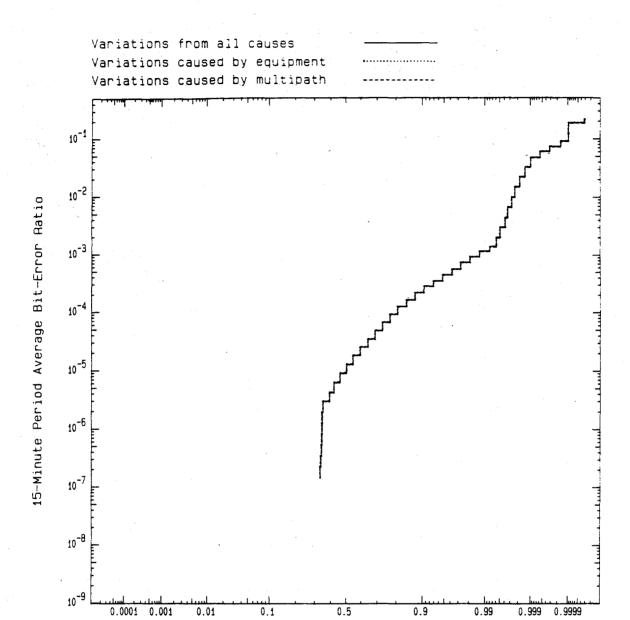
- Test period from 4/1/88 00:00:00 to 4/1/89 00:00:00
- Total number of 15 minute blocks: 31464
- Does not include MIL-STD-188-323 unavailability time
- Availability for this test period was 0.999564
- The 64 kb/s channel from Berlin to Feldberg
- Link from Bocksberg to Koeterberg



Fraction of Samples That Had Values Less Than the Ordinate

Figure 31. Distribution of consecutive fixed 15-minute interval average BER for:

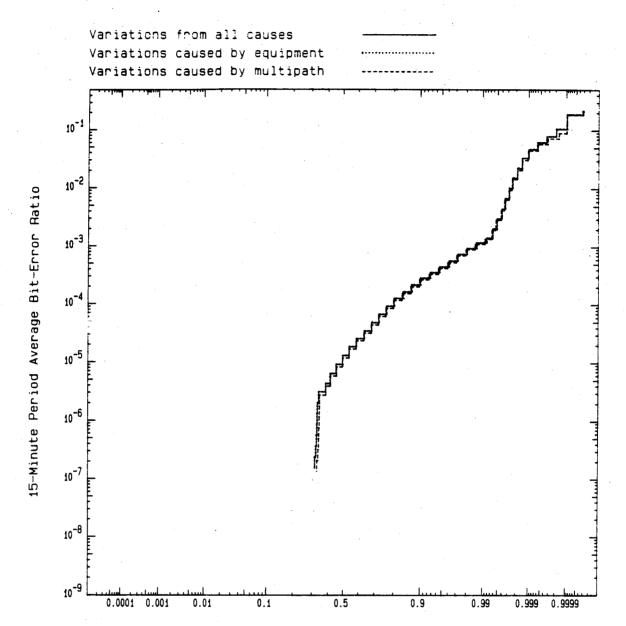
- Test period from 4/1/88 00:00:00 to 4/1/89 00:00:00
- Total number of 15 minute blocks: 31464
- Does not include MIL-STD-188-323 unavailability time
- Availability for this test period was 0.999755
- The 64 kb/s channel from Berlin to Feldberg
- Link from Koeterberg to Rothwesten



Fraction of Samples That Had Values Less Than the Ordinate

Figure 32. Distribution of consecutive fixed 15-minute interval average BER for:

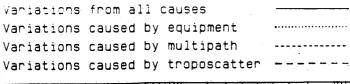
- Test period from 4/1/88 00:00:00 to 4/1/89 00:00:00
- Total number of 15 minute blocks: 31464
- Does not include MIL-STD-188-323 unavailability time
- Availability for this test period was 0.999884
- The 64 kb/s channel from Berlin to Feldberg
- Link from Rothwesten to Schwarzenborn

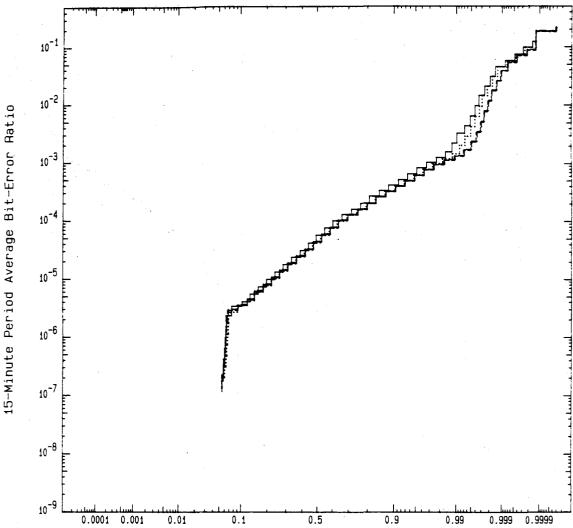


Fraction of Samples That Had Values Less Than the Ordinate

Figure 33. Distribution of consecutive fixed 15-minute interval average BER for:

- Test period from 4/1/88 00:00:00 to 4/1/89 00:00:00
- Total number of 15 minute blocks: 31464
- Does not include MIL-STD-188-323 unavailability time
- Availability for this test period was 0.999073
- The 64 kb/s channel from Berlin to Feldberg
- Link from Schwarzenborn to Feldberg

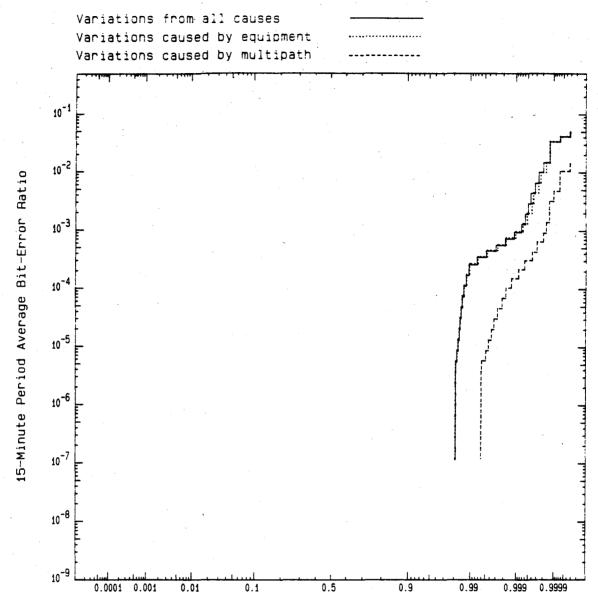




Fraction of Samples That Had Values Less Than the Ordinate

Figure 34. Distribution of consecutive fixed 15-minute interval average BER for:

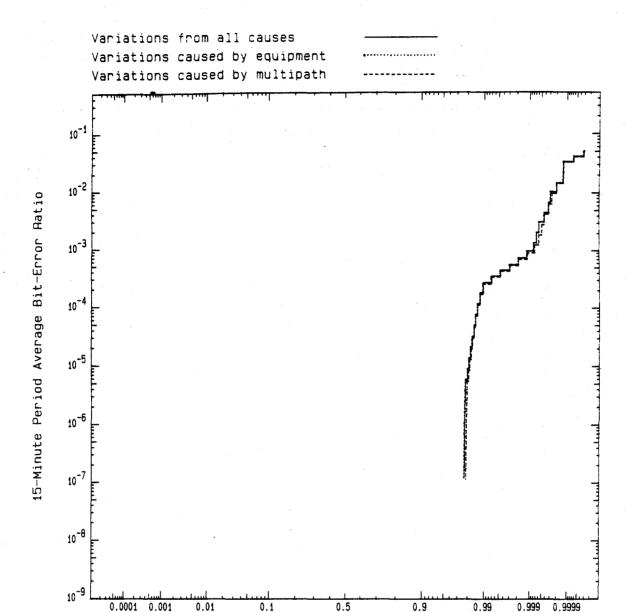
- Test period from 4/1/88 00:00:00 to 4/1/89 00:00:00
- Total number of 15 minute blocks: 31464
- Does not include MIL-STD-188-323 unavailability time
- Availability for this test period was 0.988000
- The 64 kb/s channel from Berlin to Feldberg
- Link from Berlin to Feldberg (tandem links)



Fraction of Samples That Had Values Less Than the Ordinate

Figure 35. Distribution of consecutive fixed 15-minute interval average BER for:

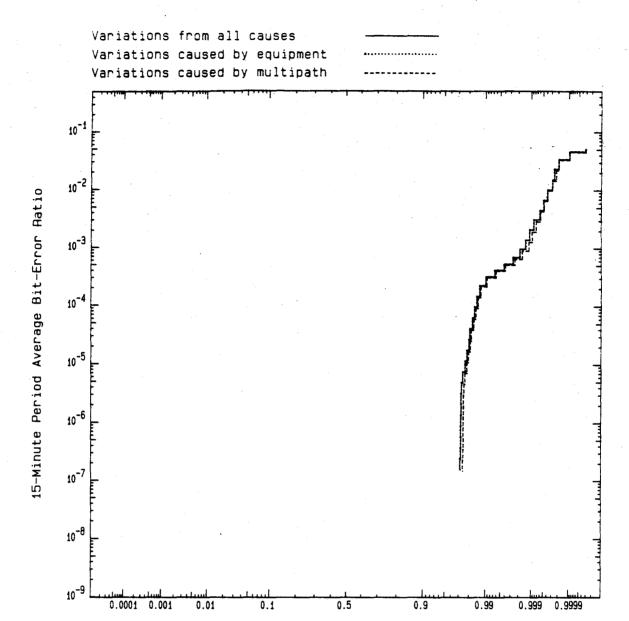
- Test period from 4/1/88 00:00:00 to 4/1/89 00:00:00
- Total number of 15 minute blocks: 31464
- Does not include MIL-STD-188-323 unavailability time
- Availability for this test period was 0.999780
- The 64 kb/s channel from Linderhofe to Feldberg
- Link from Linderhofe to Koeterberg



Fraction of Samples That Had Values Less Than the Ordinate

Figure 36. Distribution of consecutive fixed 15-minute interval average BER for:

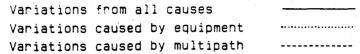
- Test period from 4/1/88 00:00:00 to 4/1/89 00:00:00
- Total number of 15 minute blocks: 31464
- Does not include MIL-STD-188-323 unavailability time
- Availability for this test period was 0.999881
- The 64 kb/s channel from Linderhofe to Feldberg
- Link from Koeterberg to Rothwesten

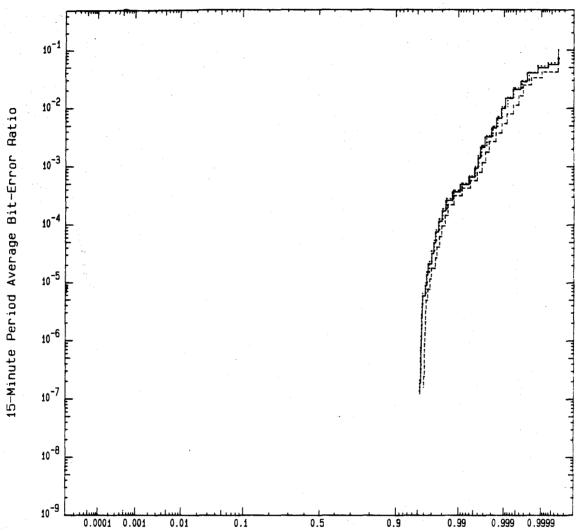


Fraction of Samples That Had Values Less Than the Ordinate

Figure 37. Distribution of consecutive fixed 15-minute interval average BER for:

- Test period from 4/1/88 00:00:00 to 4/1/89 00:00:00
- Total number of 15 minute blocks: 31464
- Does not include MIL-STD-188-323 unavailability time
- Availability for this test period was 0.999964
- The 64 kb/s channel from Linderhofe to Feldberg
- Link from Rothwesten to Schwarzenborn

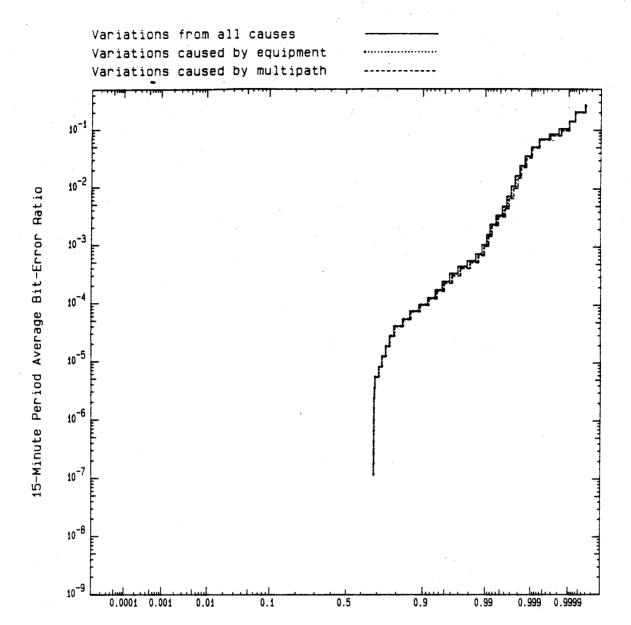




Fraction of Samples That Had Values Less Than the Ordinate

Figure 38. Distribution of consecutive fixed 15-minute interval average BER for:

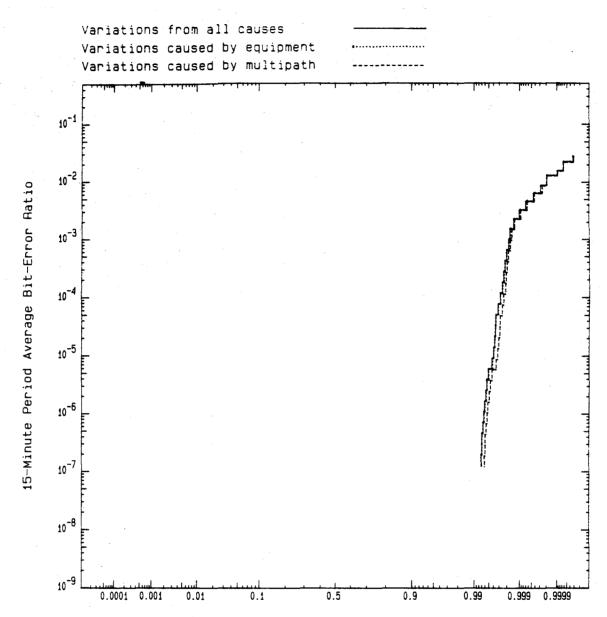
- Test period from 4/1/88 00:00:00 to 4/1/89 00:00:00
- Total number of 15 minute blocks: 31464
- Does not include MIL-STD-188-323 unavailability time
- Availability for this test period was 0.999740
- The 64 kb/s channel from Linderhofe to Feldberg
- Link from Schwarzenborn to Feldberg



Fraction of Samples That Had Values Less Than the Ordinate

Figure 39. Distribution of consecutive fixed 15-minute interval average BER for:

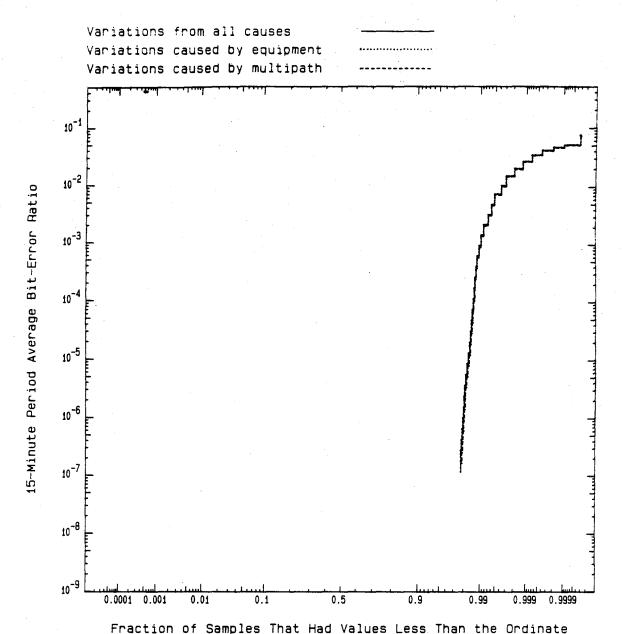
- Test period from 4/1/88 00:00:00 to 4/1/89 00:00:00
- Total number of 15 minute blocks: 31464
- Includes periods between error events containing unavailability
- Distribution of estimated mission bit stream error ratio for:
- The 64 kb/s channel from Linderhofe to Feldberg
- Link from Linderhofe to Feldberg (tandem links)



Fraction of Samples That Had Values Less Than the Ordinate

Figure 40. Distribution of consecutive fixed 15-minute interval average BER for:

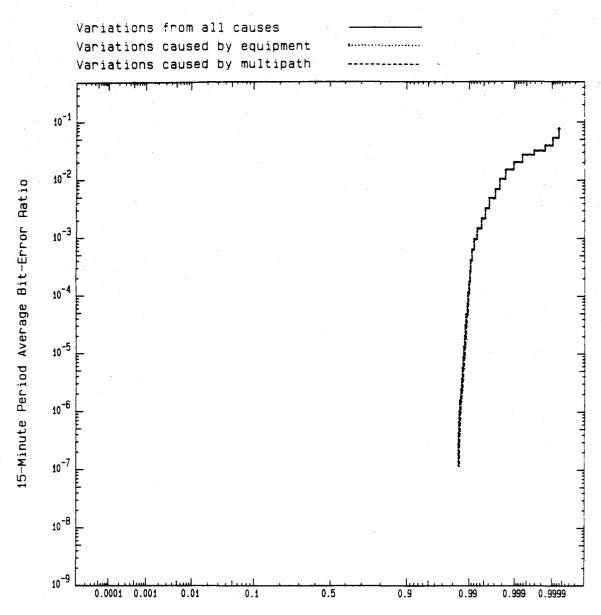
- Test period from 4/1/88 00:00:00 to 4/1/89 00:00:00
- Total number of 15 minute blocks: 31464
- Does not include MIL-STD-188-323 unavailability time
- Availability for this test period was 0.999972
- The 56 kb/s, receiver-on-line channel
- Link from Schwarzenborn to Feldberg



rraction of Samples that had values less than the Ordinate

Figure 41. Distribution of consecutive fixed 15-minute interval average BER⁻for:

- Test period from 4/1/88 00:00:00 to 4/1/89 00:00:00
- Total number of 15 minute blocks: 31464
- Does not include MIL-STD-188-323 unavailability time
- Availability for this test period was 0.999936
- The 56 kb/s, receiver A channel
- Link from Schwarzenborn to Feldberg



Fraction of Samples That Had Values Less Than the Ordinate

Figure 42. Distribution of consecutive fixed 15-minute interval average BER for:

- Test period from 4/1/88 00:00:00 to 4/1/89 00:00:00
- Total number of 15 minute blocks: 31464
- Does not include MIL-STD-188-323 unavailability time
- Availability for this test period was 0.999940
- The 56 kb/s, receiver B channel
- Link from Schwarzenborn to Feldberg

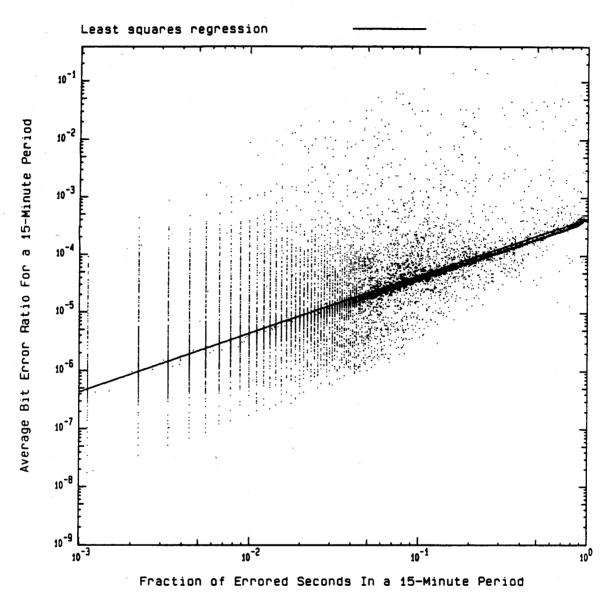


Figure 43. Correlation between fraction of errored seconds and average BER in consecutive fixed 15-minute intervals for:

- Test period from 4/1/88 00:00:00 to 10/1/89 00:00:00
- Sample size of 35289
- Does not include MIL-STD-188-323 unavailability time
- Availability for this test period was 0.991349
- The 64 kb/s channel from Berlin to Feldberg
- Link from Berlin to Bocksberg (tropospheric scatter)
- All causes

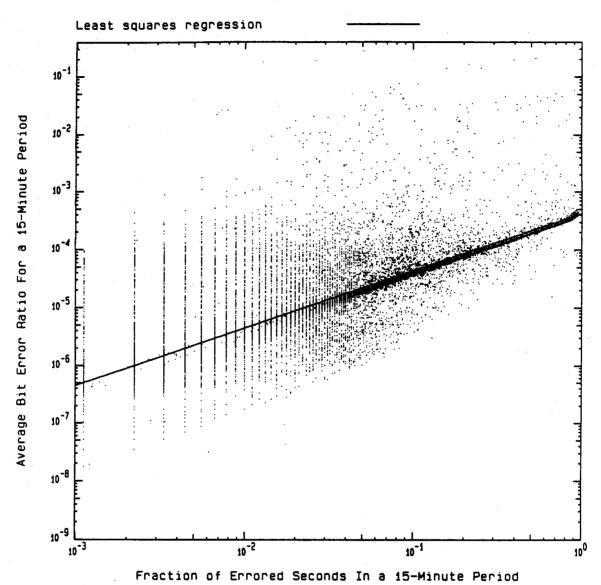
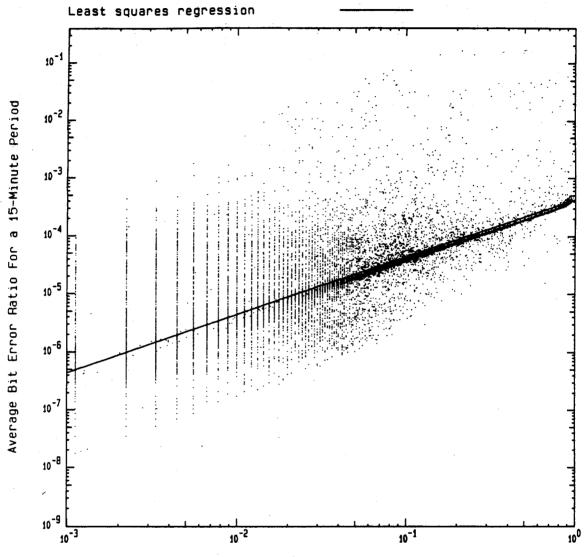


Figure 44. Correlation between fraction of errored seconds and average BER in consecutive fixed 15-minute intervals for:

- Test period from 4/1/88 00:00:00 to 10/1/89 00:00:00
- Sample size of 36709
- Does not include MIL-STD-188-323 unavailability time
- Availability for this test period was 0.999353
- The 64 kb/s channel from Berlin to Feldberg
- Link from Bocksberg to Koeterberg
- All causes



Fraction of Errored Seconds In a 15-Minute Period

Figure 45. Correlation between fraction of errored seconds and average BER in consecutive fixed 15-minute intervals for:

- Test period from 4/1/88 00:00:00 to 10/1/89 00:00:00
- Sample size of 36723
- Does not include MIL-STD-188-323 unavailability time
- Availability for this test period was 0.999838
- The 64 kb/s channel from Berlin to Feldberg
- Link from Koeterberg to Rothwesten
- All causes

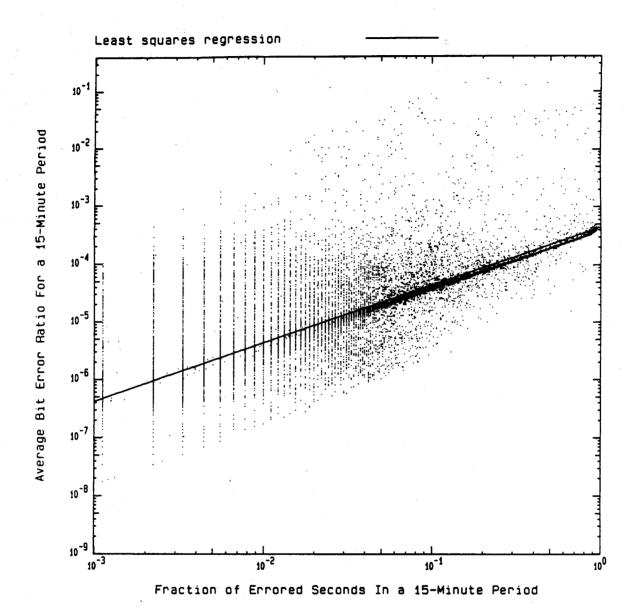
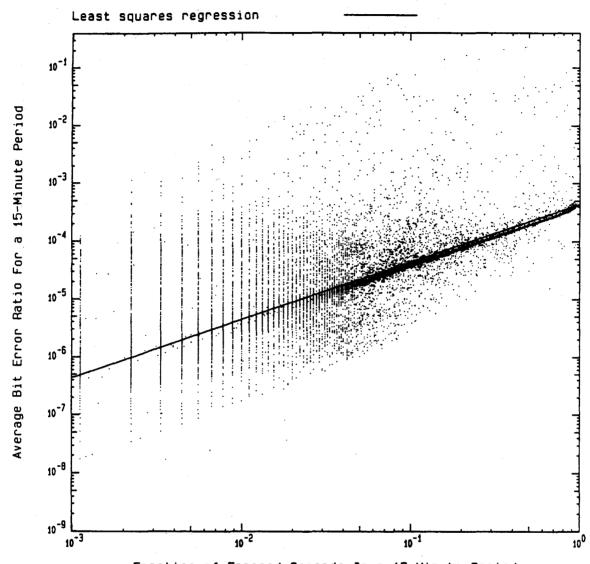


Figure 45. Correlation between fraction of errored seconds and average BER in consecutive fixed 15-minute intervals for:

- Test period from 4/1/88 00:00:00 to 10/1/89 00:00:00
- Sample size of 36732
- Does not include MIL-STD-188-323 unavailability time
- Availability for this test period was 0.999809
- The 64~kb/s channel from Berlin to Feldberg
- Link from Rothwesten to Schwarzenborn
- All causes



Fraction of Errored Seconds In a 15-Minute Period

Figure 47. Correlation between fraction of errored seconds and average BER in consecutive fixed 15-minute intervals for:

- Test period from 4/1/88 00:00:00 to 10/1/89 00:00:00
- Sample size of 37193
- Does not include MIL-STD-188-323 unavailability time
- Availability for this test period was 0.999194
- The 64 kb/s channel from Berlin to Feldberg
- Link from Schwarzenborn to Feldberg
- All causes

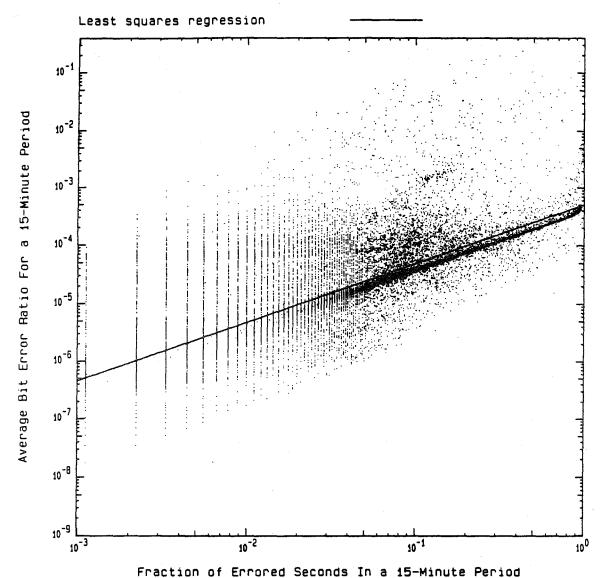


Figure 48. Correlation between fraction of errored seconds and average BER in consecutive fixed 15-minute intervals for:

- Test period from 4/1/88 00:00:00 to 10/1/89 00:00:00
- Sample size of 45509
- Does not include MIL-STD-188-323 unavailability time
- Availability for this test period was 0.986370
- The 64 kb/s channel from Berlin to Feldberg
- Link from Berlin to Feldberg (tandem links)
- All causes

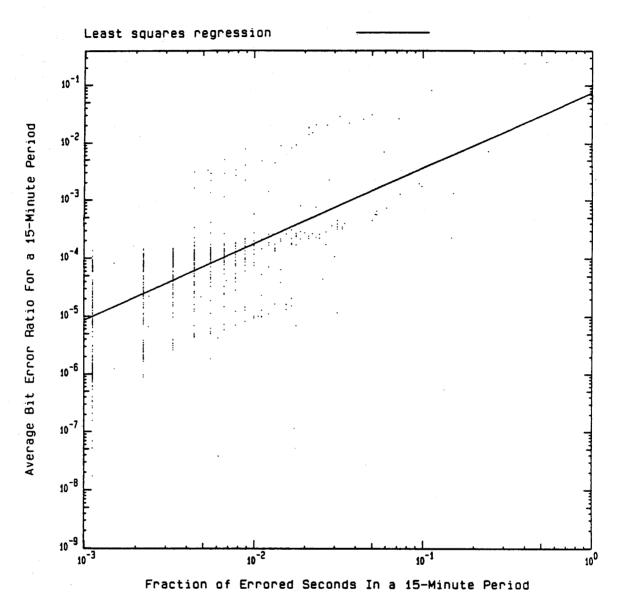


Figure 49. Correlation between fraction of errored seconds and average BER in consecutive fixed 15-minute intervals for:

- Test period from 4/1/88 00:00:00 to 10/1/89 00:00:00
- Sample size of 930
- Does not include MIL-STD-188-323 unavailability time
- Availability for this test period was 0.999601
- The 64 kb/s channel from Linderhofe to Feldberg
- Link from Linderhofe to Koeterberg
- All causes

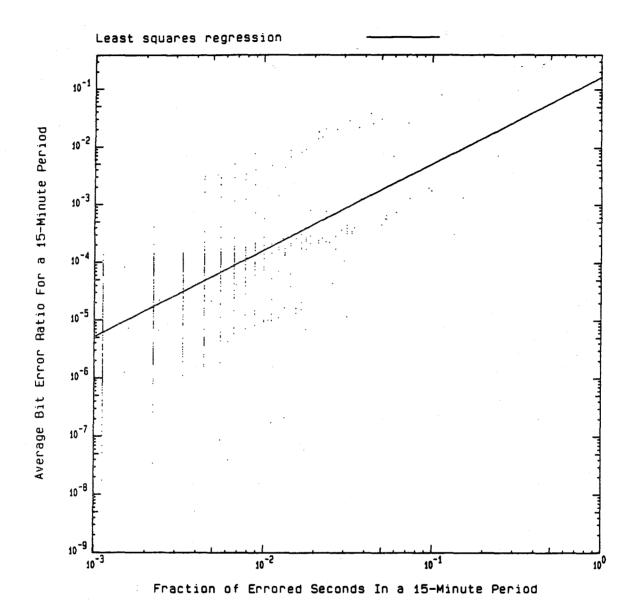
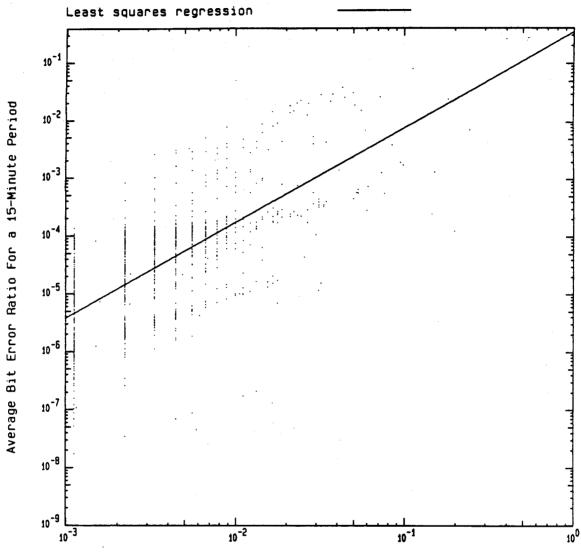


Figure 50. Correlation between fraction of errored seconds and average BER in consecutive fixed 15-minute intervals for:

- Test period from 4/1/88 00:00:00 to 10/1/89 00:00:00
- Sample size of 1125
- Does not include MIL-STD-188-323 unavailability time
- Availability for this test period was 0.999921
- The 64 kb/s channel from Linderhofe to Feldberg
- Link from Koeterberg to Rothwesten
- All causes



Fraction of Errored Seconds In a 15-Minute Period

Figure 51. Correlation between fraction of errored seconds and average BER in consecutive fixed 15-minute intervals for:

- Test period from 4/1/88 00:00:00 to 10/1/89 00:00:00
- Sample size of 1444
- Does not include MIL-STD-188-323 unavailability time
- Availability for this test period was 0.999724
- The 64 kb/s channel from Linderhofe to Feldberg
- Link from Rothwesten to Schwarzenborn
- All causes

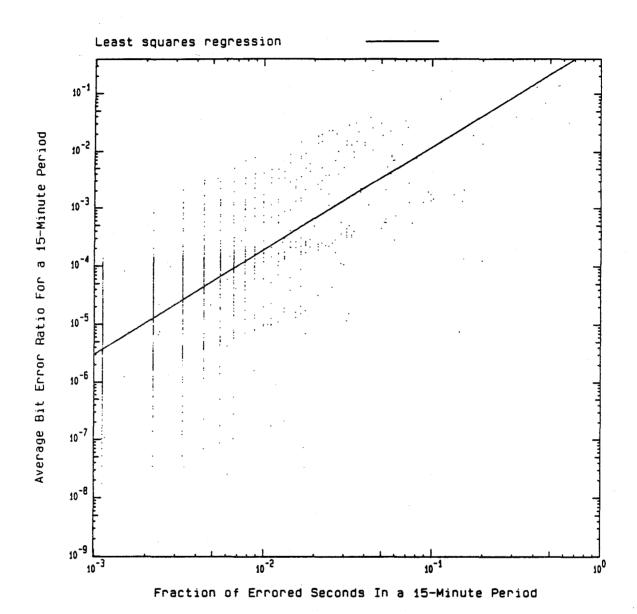
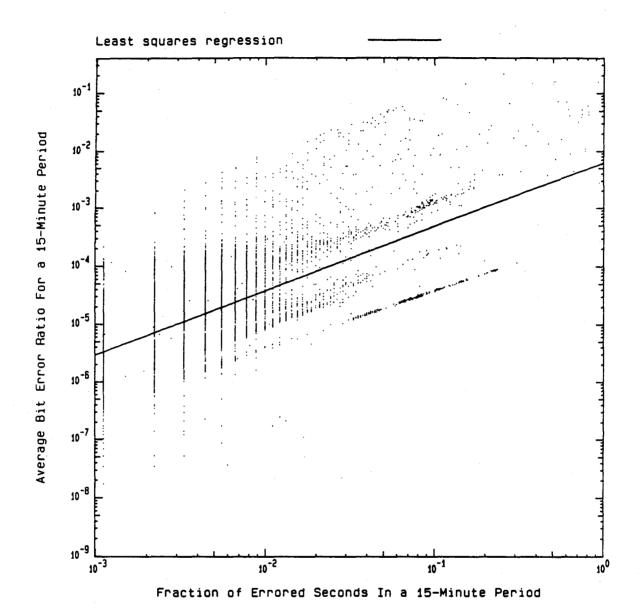
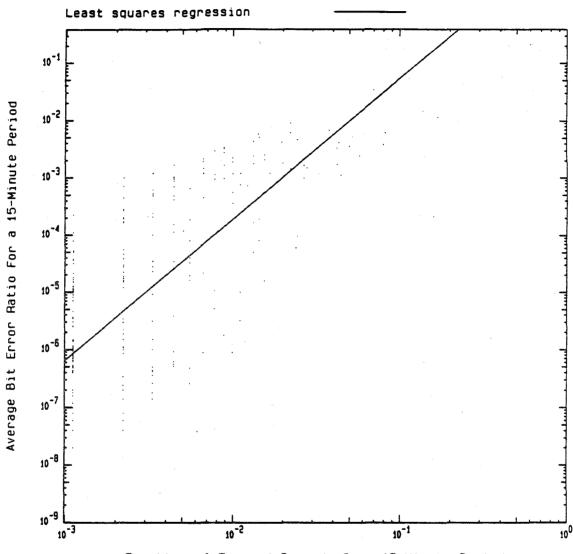


Figure 52. Correlation between fraction of errored seconds and average BER in consecutive fixed 15-minute intervals for:

- Test period from 4/1/88 00:00:00 to 10/1/89 00:00:00
- Sample size of 2195
- Does not include MIL-STD-188-323 unavailability time
- Availability for this test period was 0.999605
- The 64 kb/s channel from Linderhofe to Feldberg
- Link from Schwarzenborn to Feldberg
- All causes



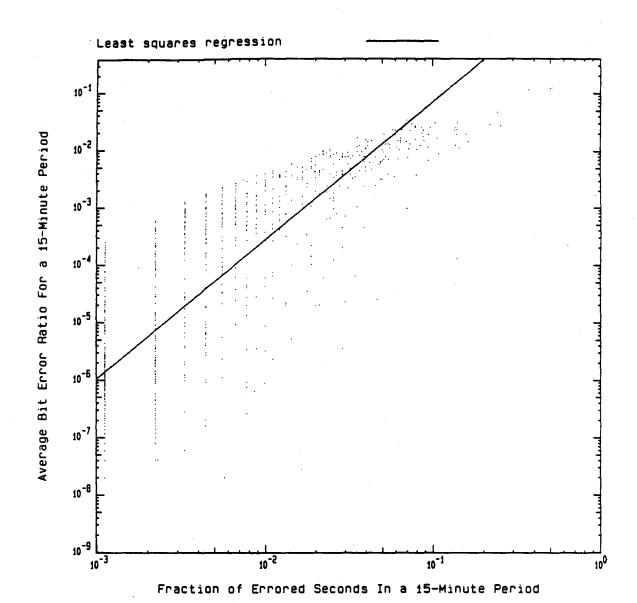
- Figure 53. Correlation between fraction of errored seconds and average BER in consecutive fixed 15-minute intervals for:
 - Test period from 4/1/88 00:00:00 to 10/1/89 00:00:00
 - Sample size of 13859
 - Does not include MIL-STD-188-323 unavailability time
 - Availability for this test period was 0.998568
 - The 64 kb/s channel from Linderhofe to Feldberg
 - Link from Linderhofe to Feldberg (tandem links)
 - All causes



Fraction of Errored Seconds In a 15-Minute Period

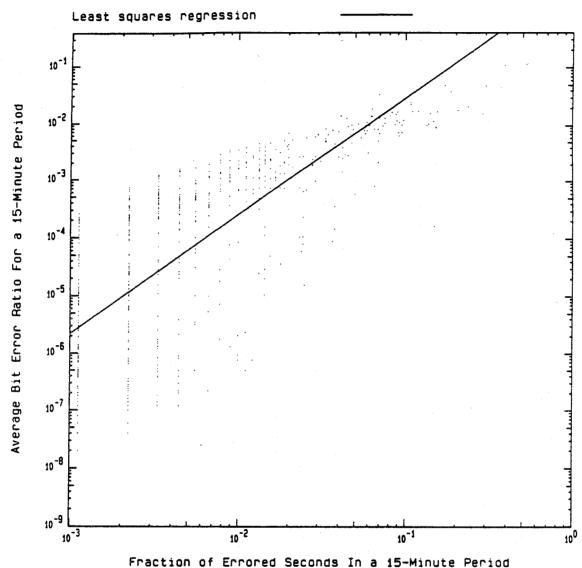
Figure 54. Correlation between fraction of errored seconds and average BER in consecutive fixed 15-minute intervals for:

- Test period from 4/1/88 00:00:00 to 10/1/89 00:00:00
- Sample size of 287
- Does not include MIL-STD-188-323 unavailability time
- Availability for this test period was 0.991349
- The 56 kb/s, receiver-on-line channel
- Link from Schwarzenborn to Feldberg
- All causes



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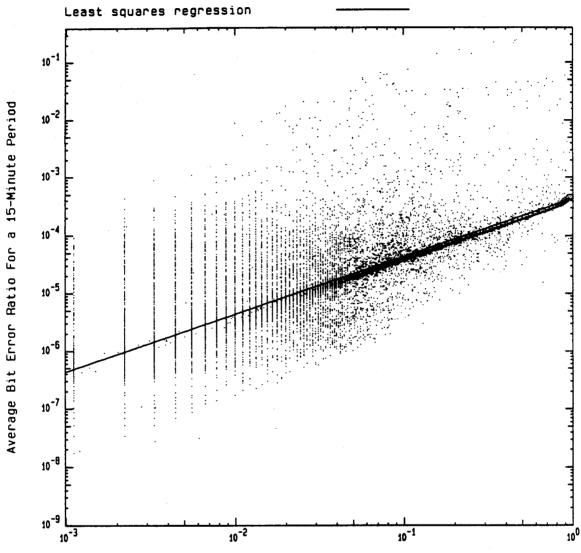
- Figure 55. Correlation between fraction of errored seconds and average BER in consecutive fixed 15-minute intervals for:
 - Test period from 4/1/88 00:00:00 to 10/1/89 00:00:00
 - Sample size of 827
 - Does not include MIL-STD-188-323 unavailability time
 - Availability for this test period was 0.999353
 - The 56 kb/s, receiver A channel
 - Link from Schwarzenborn to Feldberg
 - All causes



reaction of Errored Seconds in a 15-minute Period

Figure 56. Correlation between fraction of errored seconds and average BER in consecutive fixed 15-minute intervals for:

- Test period from 4/1/88 00:00:00 to 10/1/89 00:00:00
- Sample size of 618
- Does not include MIL-STD-188-323 unavailability time
- Availability for this test period was 0.999838
- The 56 kb/s, receiver B channel
- Link from Schwarzenborn to Feldberg
- All causes



Fraction of Errored Seconds In a 15-Minute Period

Figure 57. Correlation between fraction of errored seconds and average BER in consecutive fixed 15-minute intervals for:

- Test period from 4/1/88 00:00:00 to 10/1/89 00:00:00
- Sample size of 36668
- Does not include MIL-STD-188-323 unavailability time
- Availability for this test period was 0.999353
- The 64 kb/s channel from Berlin to Feldberg
- Link from Bocksberg to Koeterberg
- Variations caused by multipath

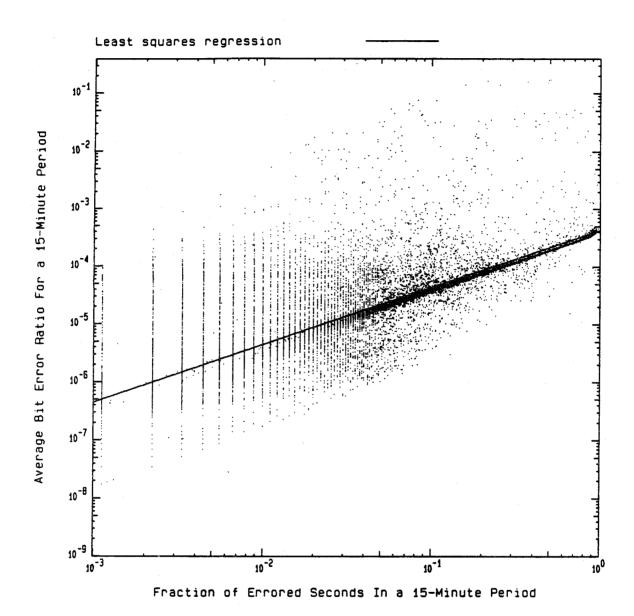
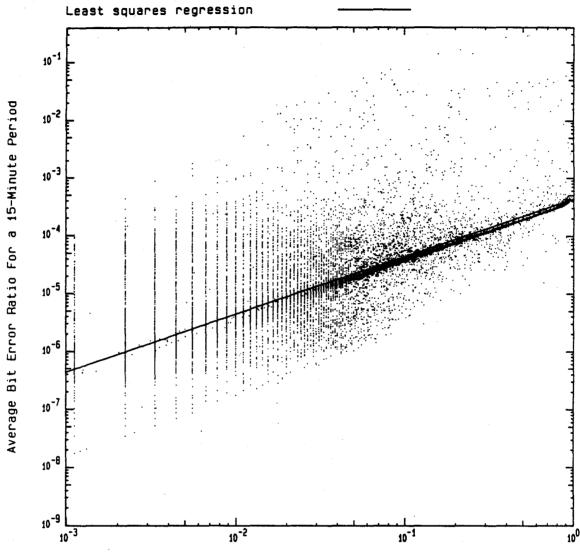


Figure 58. Correlation between fraction of errored seconds and average BER in consecutive fixed 15-minute intervals for:

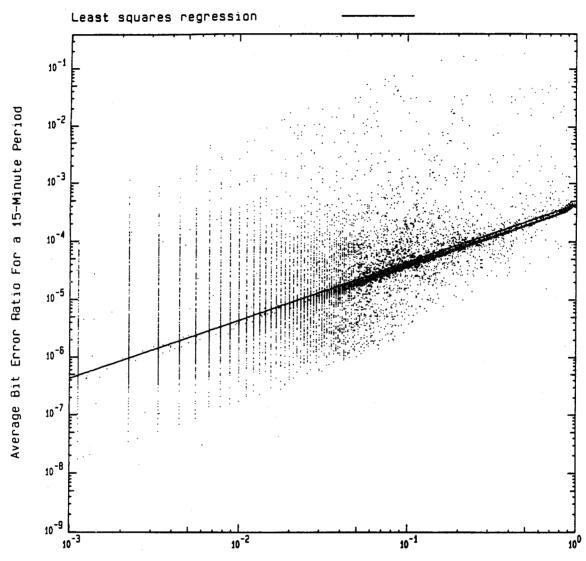
- Test period from 4/1/88 00:00:00 to 10/1/89 00:00:00
- Sample size of 36714
- Does not include MIL-STD-188-323 unavailability time
- Availability for this test period was 0.999838
- The 64 kb/s channel from Berlin to Feldberg
- Link from Koeterberg to Rothwesten
- Variations caused by multipath



Fraction of Errored Seconds In a 15-Minute Period

Figure 59. Correlation between fraction of errored seconds and average BER in consecutive fixed 15-minute intervals for:

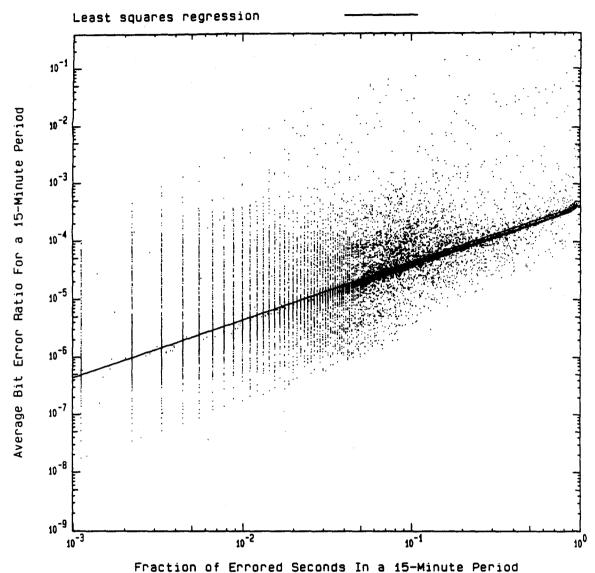
- Test period from 4/1/88 00:00:00 to 10/1/89 00:00:00
- Sample size of 36727
- Does not include MIL-STD-188-323 unavailability time
- Availability for this test period was 0.999809
- The 64 kb/s channel from Berlin to Feldberg
- Link from Rothwesten to Schwarzenborn
- Variations caused by multipath



Fraction of Errored Seconds In a 15-Minute Period

Figure 60. Correlation between fraction of errored seconds and average BER in consecutive fixed 15-minute intervals for:

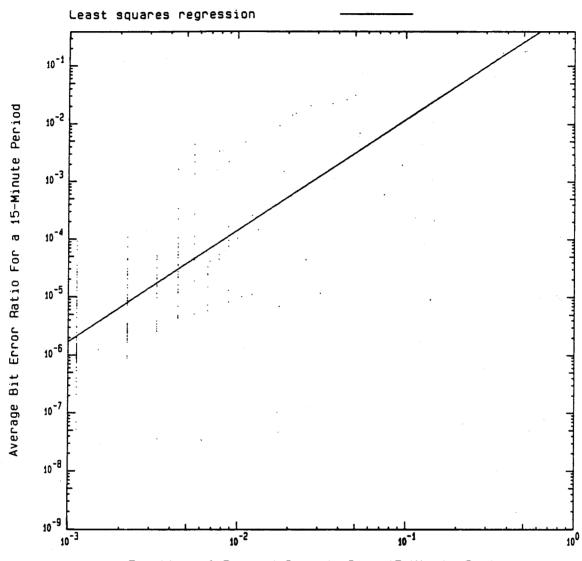
- Test period from 4/1/88 00:00:00 to 10/1/89 00:00:00
- Sample size of 36742
- Does not include MIL-STD-188-323 unavailability time
- Availability for this test period was 0.999194
- The 64 kb/s channel from Berlin to Feldberg
- Link from Schwarzenborn to Feldberg
- Variations caused by multipath



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Figure 61. Correlation between fraction of errored seconds and average BER in consecutive fixed 15-minute intervals for:

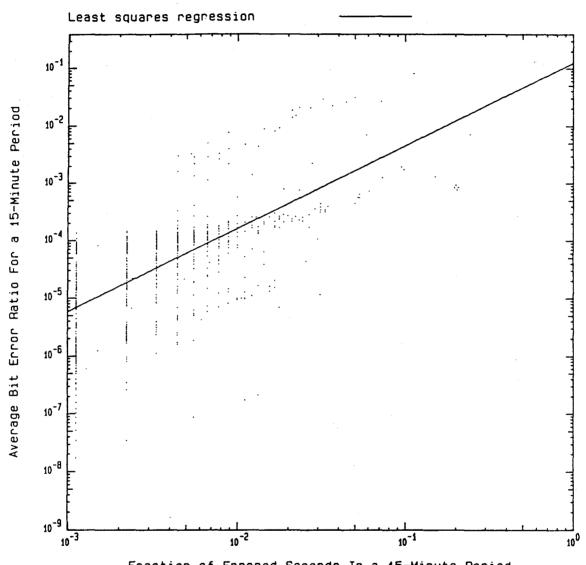
- Test period from 4/1/88 00:00:00 to 10/1/89 00:00:00
- Sample size of 45509
- Does not include MIL-STD-188-323 unavailability time
- Availability for this test period was 0.986370
- The 64 kb/s channel from Berlin to Feldberg
- Link from Berlin to Feldberg (tandem links)
- Variations caused by multipath



Fraction of Errored Seconds In a 15-Minute Period

Figure 62. Correlation between fraction of errored seconds and average BER in consecutive fixed 15-minute intervals for:

- Test period from 4/1/88 00:00:00 to 10/1/89 00:00:00
- Sample size of 284
- Does not include MIL-STD-188-323 unavailability time
- Availability for this test period was 0.999601
- The 64 kb/s channel from Linderhofe to Feldberg
- Link from Linderhofe to Koeterberg
- Variations caused by multipath



Fraction of Errored Seconds In a 15-Minute Period

Figure 63. Correlation between fraction of errored seconds and average BER in consecutive fixed 15-minute intervals for:

- Test period from 4/1/88 00:00:00 to 10/1/89 00:00:00
- Sample size of 1045
- Does not include MIL-STD-188-323 unavailability time
- Availability for this test period was 0.999921
- The 64 kb/s channel from Linderhofe to Feldberg
- Link from Koeterberg to Rothwesten
- Variations caused by multipath

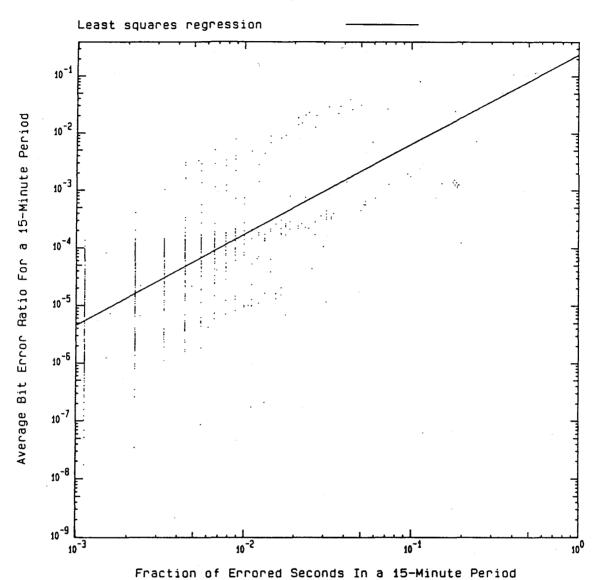


Figure 64. Correlation between fraction of errored seconds and average BER in consecutive fixed 15-minute intervals for:

- Test period from 4/1/88 00:00:00 to 10/1/89 00:00:00
- Sample size of 1236
- Does not include MIL-STD-188-323 unavailability time
- Availability for this test period was 0.999724
- The 64 kb/s channel from Linderhofe to Feldberg
- Link from Rothwesten to Schwarzenborn
- Variations caused by multipath

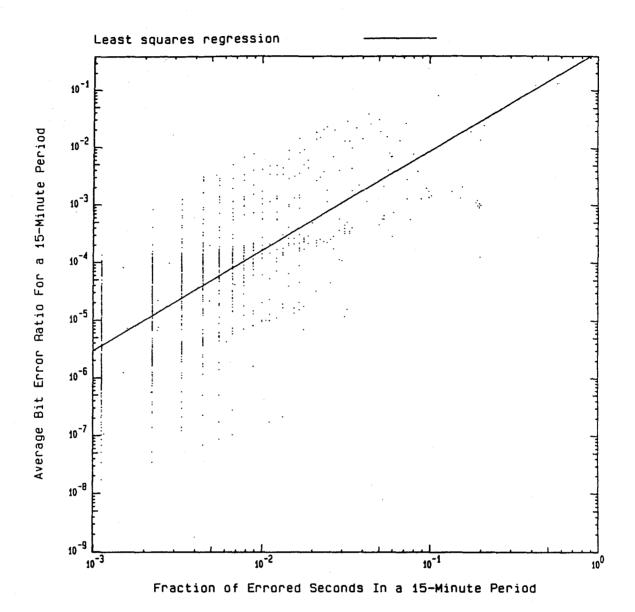
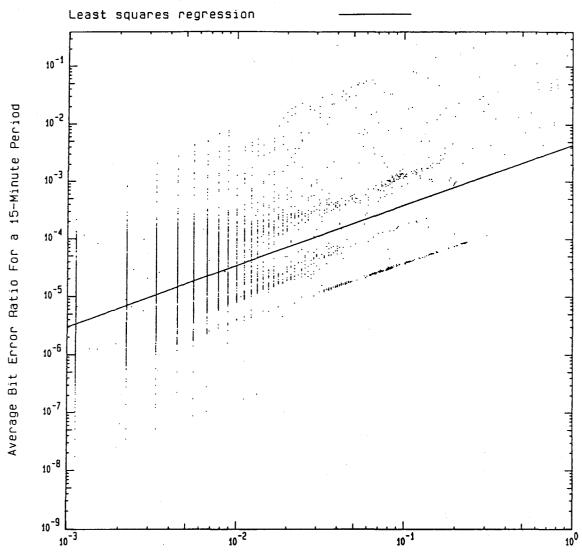


Figure 65. Correlation between fraction of errored seconds and average BER in consecutive fixed 15-minute intervals for:

- Test period from 4/1/88 00:00:00 to 10/1/89 00:00:00
- Sample size of 1934
- Does not include MIL-STD-188-323 unavailability time
- Availability for this test period was 0.999605
- The 64 kb/s channel from Linderhofe to Feldberg
- Link from Schwarzenborn to Feldberg
- Variations caused by multipath



Fraction of Errored Seconds In a 15-Minute Period

Figure 66. Correlation between fraction of errored seconds and average BER in consecutive fixed 15-minute intervals for:

- Test period from 4/1/88 00:00:00 to 10/1/89 00:00:00
- Sample size of 13859
- Does not include MIL-STD-188-323 unavailability time
- Availability for this test period was 0.998568
- The 64 kb/s channel from Linderhofe to Feldberg
- Link from Linderhofe to Feldberg (tandem links)
- Variations caused by multipath

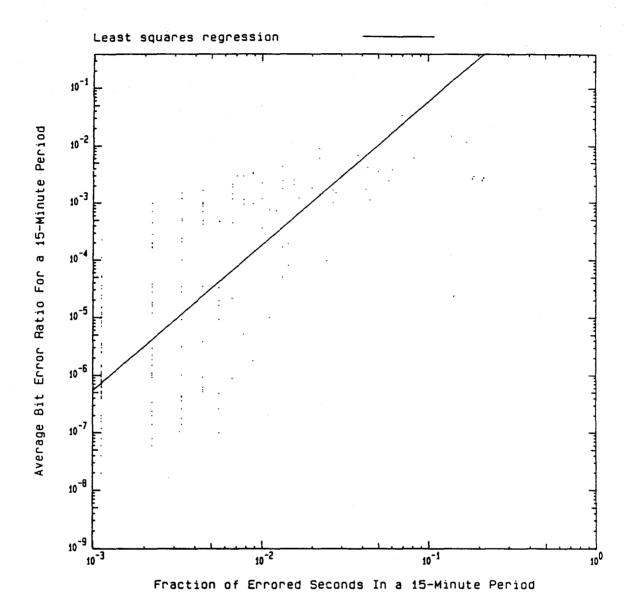


Figure 67. Correlation between fraction of errored seconds and average BER in consecutive fixed 15-minute intervals for:

- Test period from 4/1/88 00:00:00 to 10/1/89 00:00:00
- Sample size of 230
- Does not include MIL-STD-188-323 unavailability time
- Availability for this test period was 0.998361
- The 56 kb/s, receiver-on-line channel
- Link from Schwarzenborn to Feldberg
- Variations caused by multipath

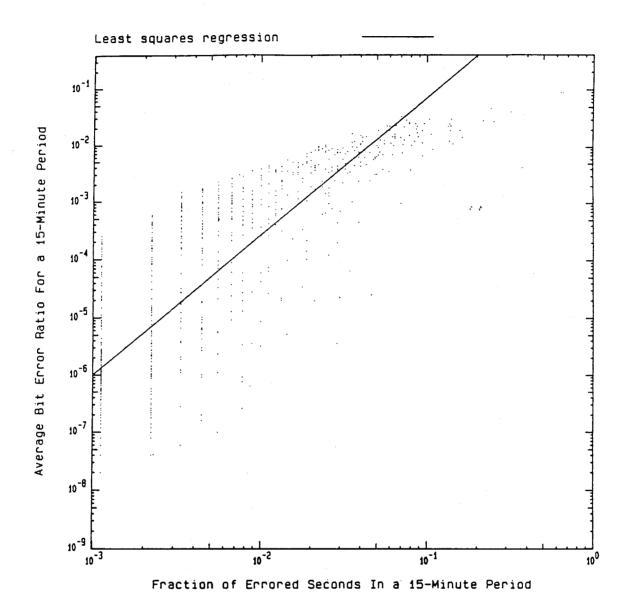


Figure 68. Correlation between fraction of errored seconds and average

- BER in consecutive fixed 15-minute intervals for:

 ◆ Test period from 4/1/88 00:00:00 to 10/1/89 00:00:00
 - Sample size of 764
 - Does not include MIL-STD-188-323 unavailability time
 - Availability for this test period was 0.986370
 - The 56 kb/s, receiver A channel
 - Link from Schwarzenborn to Feldberg
 - Variations caused by multipath

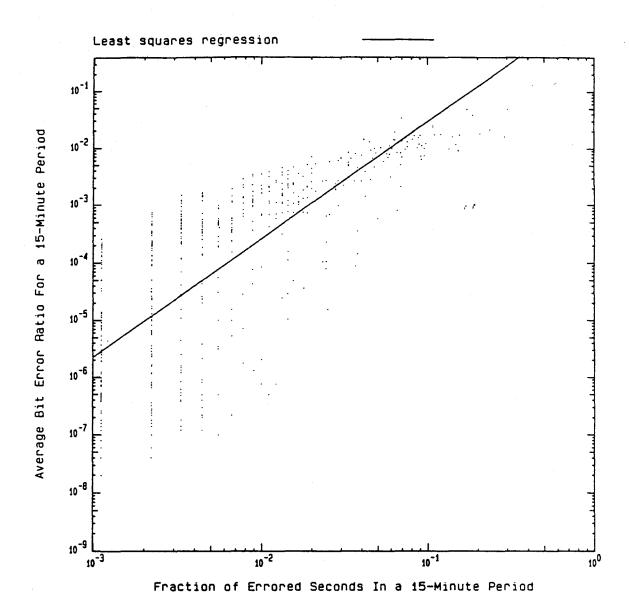


Figure 69. Correlation between fraction of errored seconds and average BER in consecutive fixed 15-minute intervals for:

- Test period from 4/1/88 00:00:00 to 10/1/89 00:00:00
- Sample size of 564
- Does not include MIL-STD-188-323 unavailability time
- Availability for this test period was 0.999501
- The 56 kb/s, receiver 8 channel
- ◆ Link from Schwarzenborn to Feldberg
- Variations caused by multipath

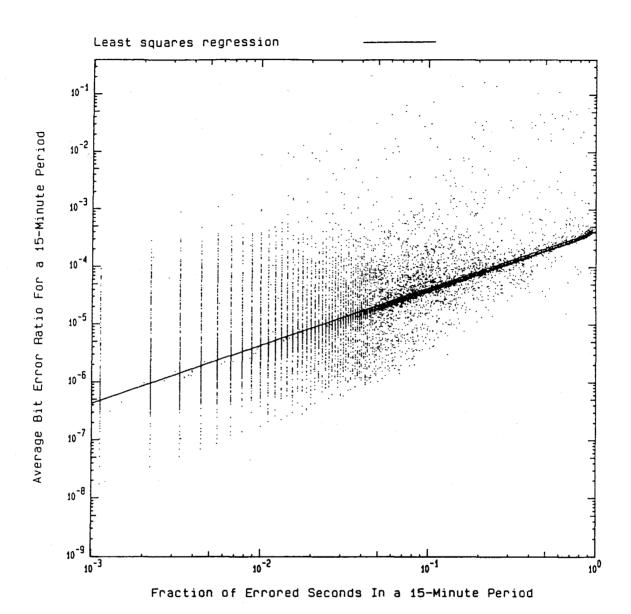
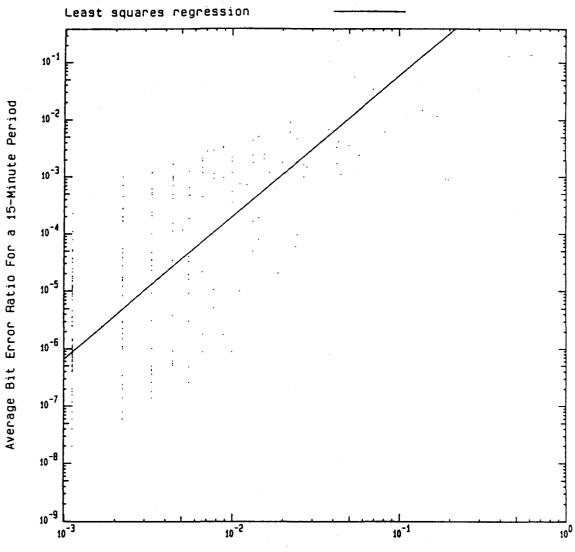


Figure 70. Correlation between fraction of errored seconds and average BER in consecutive fixed 15-minute intervals for:

- Test period from 4/1/88 00:00:00 to 10/1/89 00:00:00
- Sample size of 36072
- Does not include MIL-STD-188-323 unavailability time
- Availability for this test period was 0.991349
- The 64 kb/s channel from Berlin to Feldberg
- Link from Berlin to Bocksberg (tropospheric scatter)
- Variations caused by troposcatter



Fraction of Errored Seconds In a 15-Minute Period

Figure 71. Correlation between fraction of errored seconds and average BER in consecutive fixed 15-minute intervals for:

- Test period from 4/1/88 00:00:00 to 10/1/89 00:00:00
- Sample size of 287
- Does not include MIL-STD-188-323 unavailability time
- Availability for this test period was 0.999809
- The 56 kb/s, receiver-on-line channel
- Link from Schwarzenborn to Feldberg
- Variations caused by equipment

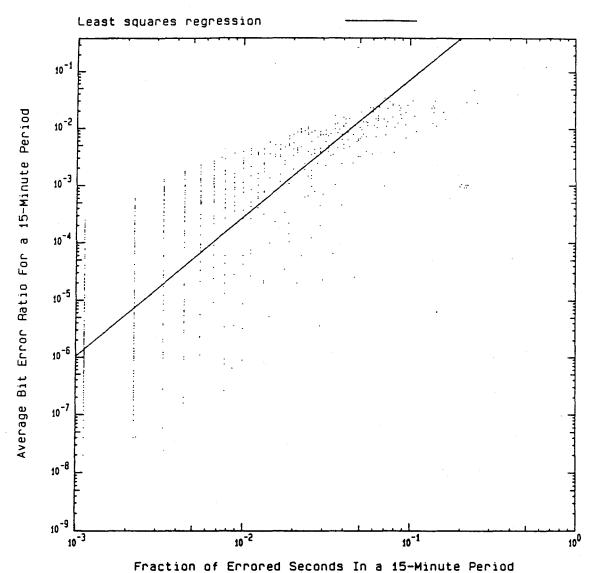
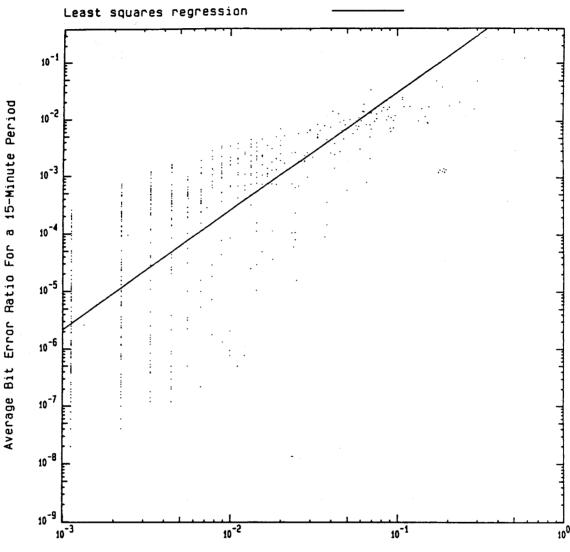


Figure 72. Correlation between fraction of errored seconds and average BER in consecutive fixed 15-minute intervals for:

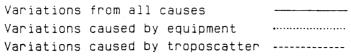
- Test period from 4/1/88 00:00:00 to 10/1/89 00:00:00
- Sample size of 827
- Does not include MIL-STD-188-323 unavailability time
- Availability for this test period was 0.999194
- The 56 kb/s, receiver A channel
- Link from Schwarzenborn to Feldberg
- Variations caused by equipment

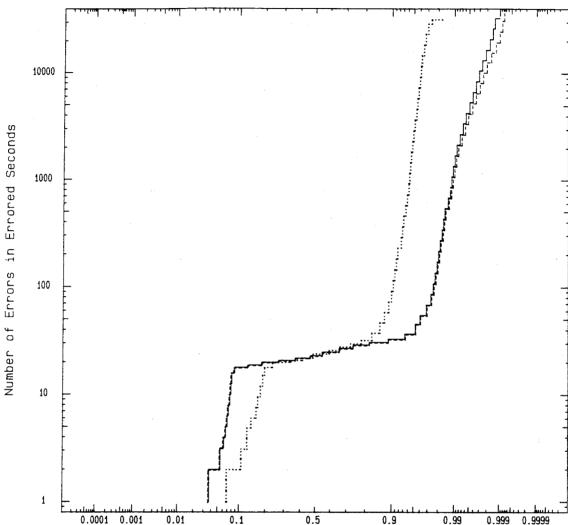


Fraction of Errored Seconds In a 15-Minute Period

Figure 73. Correlation between fraction of errored seconds and average BER in consecutive fixed 15-minute intervals for:

- Test period from 4/1/88 00:00:00 to 10/1/89 00:00:00
- Sample size of 618
- Does not include MIL-STD-188-323 unavailability time
- Availability for this test period was 0.996660
- The 56 kb/s, receiver B channel
- Link from Schwarzenborn to Feldberg
- Variations caused by equipment

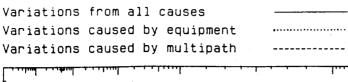


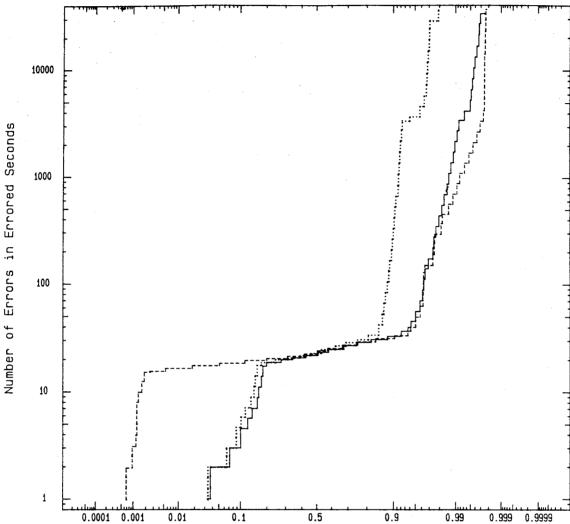


Fraction of Samples That Had Values Less Than the Ordinate

Figure 74. Distribution of errors occurring in errored seconds for:

- Test period from 4/1/88 00:00:00 to 4/1/89 00:00:00
- Sample size of 1101551, 19737, 1081814
- Does not include MIL-STD-188-323 unavailability time
- Availability for this test period was 0.993667
- The 64 kb/s channel from Berlin to Feldberg
- Link from Berlin to Bocksberg (tropospheric scatter)

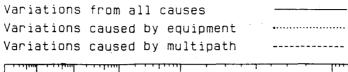


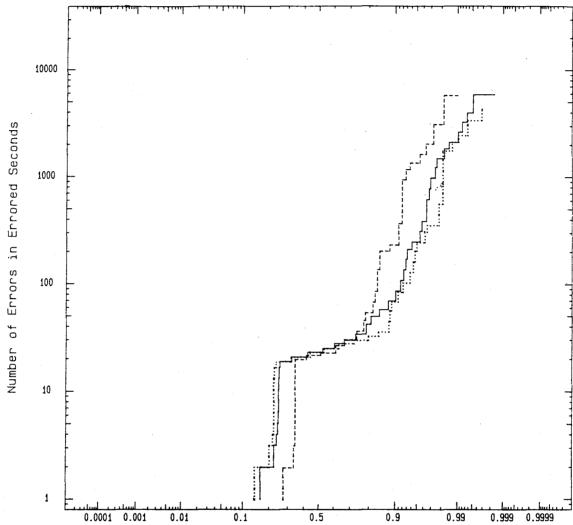


Fraction of Samples That Had Values Less Than the Ordinate

Figure 75. Distribution of errors occurring in errored seconds for:

- Test period from 4/1/88 00:00:00 to 4/1/89 00:00:00
- Sample size of 42310, 3170, 17439
- Does not include MIL-STD-188-323 unavailability time
- Availability for this test period was 0.999564
- The 64 kb/s channel from Berlin to Feldberg
- Link from Bocksberg to Koeterberg

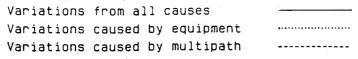


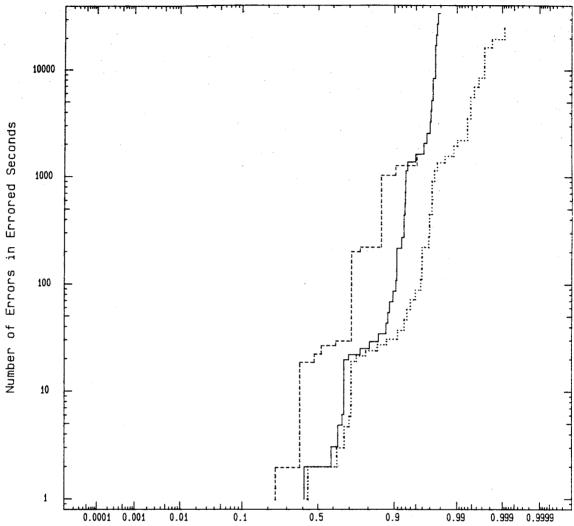


Fraction of Samples That Had Values Less Than the Ordinate

Figure 76. Distribution of errors occurring in errored seconds for:

- Test period from 4/1/88 00:00:00 to 4/1/89 00:00:00
- Sample size of 622, 320, 112
- Does not include MIL-STD-188-323 unavailability time
- Availability for this test period was 0.999755
- The 64 kb/s channel from Berlin to Feldberg
- Link from Koeterberg to Rothwesten

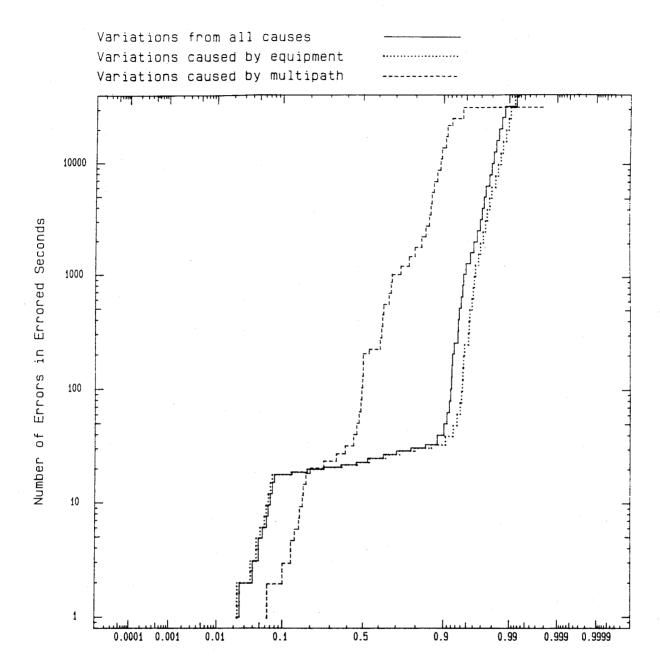




Fraction of Samples That Had Values Less Than the Ordinate

Figure 77. Distribution of errors occurring in errored seconds for:

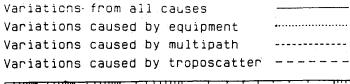
- Test period from 4/1/88 00:00:00 to 4/1/89 00:00:00
- Sample size of 1269, 1146, 21
- Does not include MIL-STD-188-323 unavailability time
- Availability for this test period was 0.999884
- The 64 kb/s channel from Berlin to Feldberg
- Link from Aothwesten to Schwarzenborn

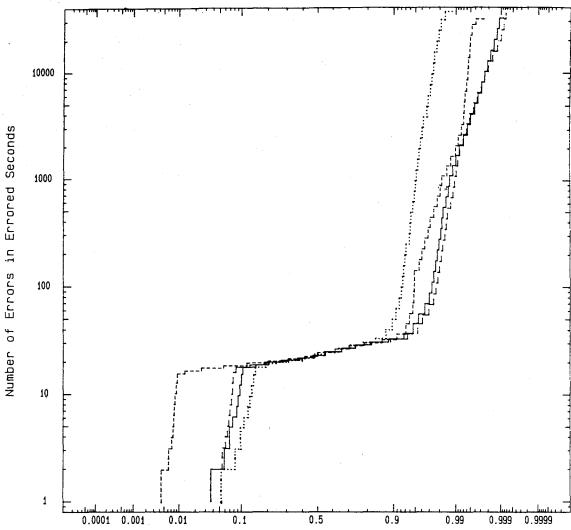


Fraction of Samples That Had Values Less Than the Ordinate

Figure 78. Distribution of errors occurring in errored seconds for:

- Test period from 4/1/88 00:00:00 to 4/1/89 00:00:00
- Sample size of 23662, 22558, 544
- Does not include MIL-STD-188-323 unavailability time
- Availability for this test period was 0.999073
- The 64 kb/s channel from Berlin to Feldberg
- Link from Schwarzenborn to Feldberg

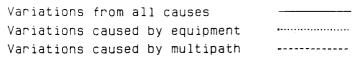


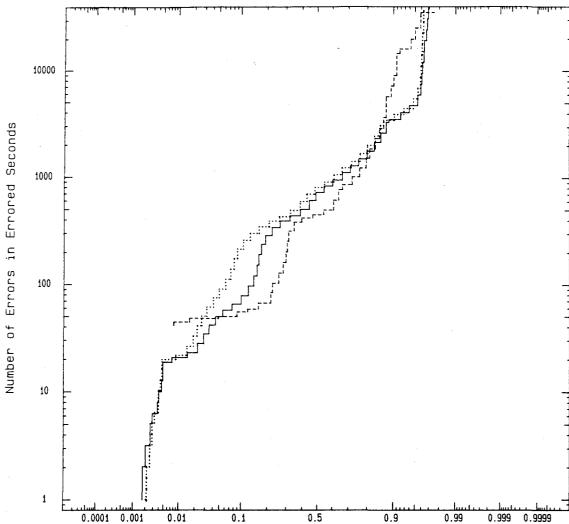


Fraction of Samples That Had Values Less Than the Ordinate

Figure 79. Distribution of errors occurring in errored seconds for:

- Test period from 4/1/88 00:00:00 to 4/1/89 00:00:00
- Sample size of 1905530, 46590, 18100, 1081814
- Does not include MIL-STD-188-323 unavailability time
- Availability for this test period was 0.988000
- The 64 kb/s channel from Berlin to Feldberg
- Link from Berlin to Feldberg (tandem links)





Fraction of Samples That Had Values Less Than the Ordinate

Figure 80. Distribution of errors occurring in errored seconds for:

- Test period from 4/1/88 00:00:00 to 4/1/89 00:00:00
- Sample size of 3506, 2764, 123
- Does not include MIL-STD-188-323 unavailability time
- Availability for this test period was 0.999780
- The 64 kb/s channel from Linderhofe to Feldberg
- Link from Linderhofe to Koeterberg

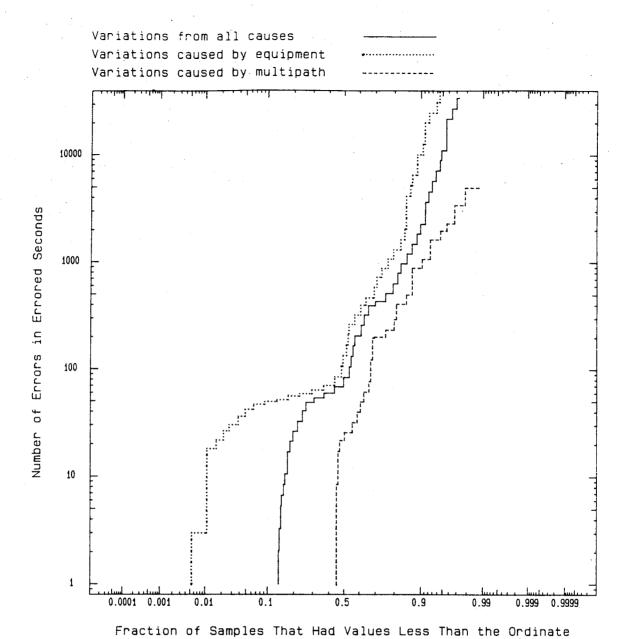
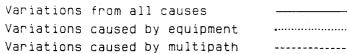
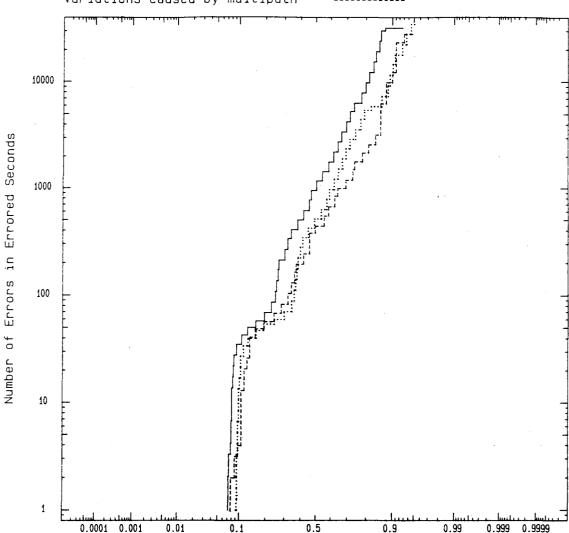


Figure 81. Distribution of errors occurring in errored seconds for:

- Test period from 4/1/88 00:00:00 to 4/1/89 00:00:00
- Sample size of 367, 182, 95
- Does not include MIL-STD-188-323 unavailability time
- Availability for this test period was 0.999881
- The 64 kb/s channel from Linderhofe to Feldberg
- Link from Koeterberg to Rothwesten

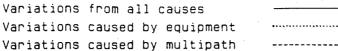


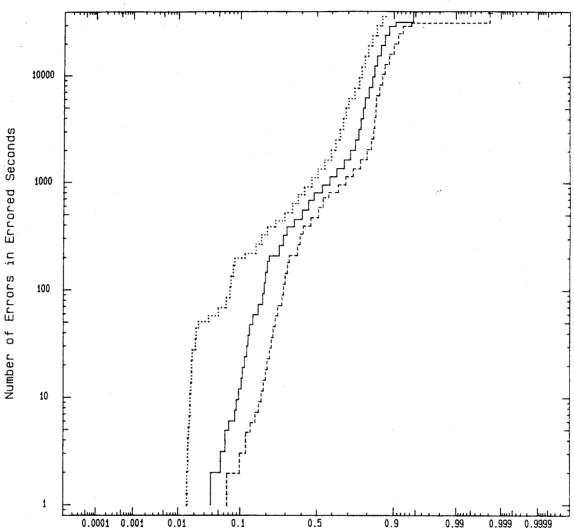


Fraction of Samples That Had Values Less Than the Ordinate

Figure 82. Distribution of errors occurring in errored seconds for:

- Test period from 4/1/88 00:00:00 to 4/1/89 00:00:00
- Sample size of 686, 330, 102
- Does not include MIL-STD-188-323 unavailability time
- Availability for this test period was 0.999964
- The 64 kb/s channel from Linderhofe to Feldberg
- Link from Rothwesten to Schwarzenborn

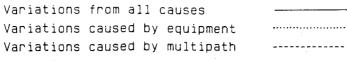


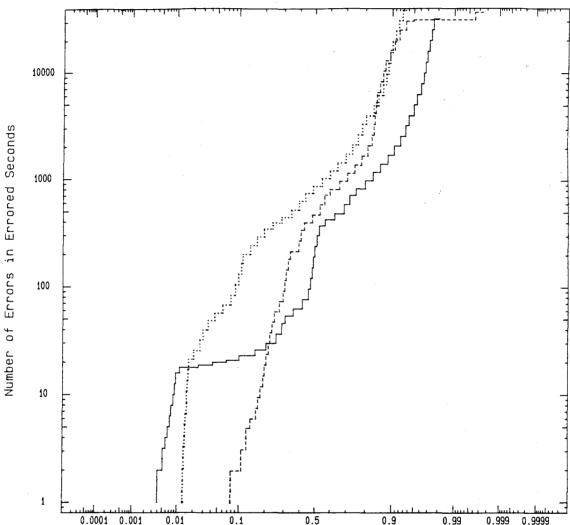


Fraction of Samples That Had Values Less Than the Ordinate

Figure 83. Distribution of errors occurring in errored seconds for:

- Test period from 4/1/88 00:00:00 to 4/1/89 00:00:00
- Sample size of 4971, 1862, 2202
- Does not include MIL-STD-188-323 unavailability time
- Availability for this test period was 0.999740
- The 64 kb/s channel from Linderhofe to Feldberg
- Link from Schwarzenborn to Feldberg

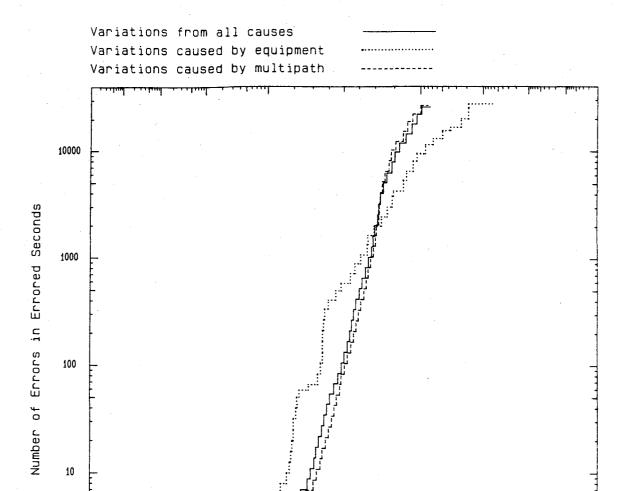




Fraction of Samples That Had Values Less Than the Ordinate

Figure 84. Distribution of errors occurring in errored seconds for:

- Test period from 4/1/88 00:00:00 to 4/1/89 00:00:00
- Sample size of 81412, 4836, 2432
- Does not include MIL-STD-188-323 unavailability time
- Availability for this test period was 0.998593
- The 64 kb/s channel from Linderhofe to Feldberg
- Link, from Linderhofe to Feldberg (tandem links)



Fraction of Samples That Had Values Less Than the Ordinate

0.5

Figure 85. Distribution of errors occurring in errored seconds for:

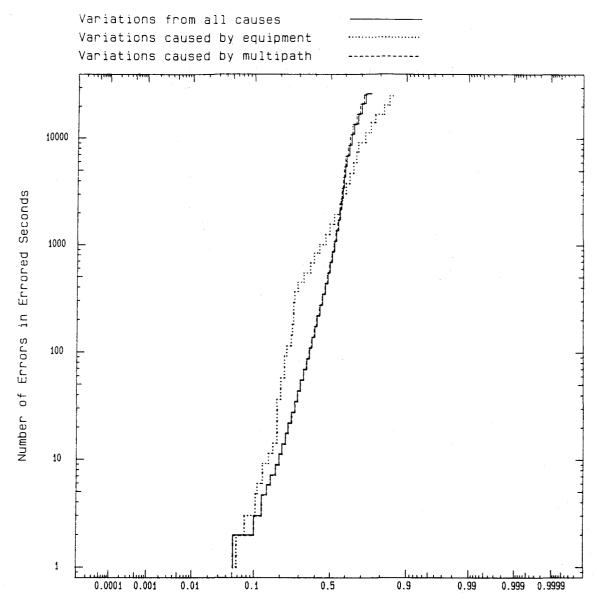
- Test period from 4/1/88 00:00:00 to 4/1/89 00:00:00
- Sample size of 1559, 165, 1180

0.0001 0.001

0.01

- Does not include MIL-STD-188-323 unavailability time
- Availability for this test period was 0.999972
- The 56 kb/s, receiver-on-line channel
- Link from Schwarzenborn to Feldberg

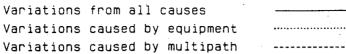
0.1

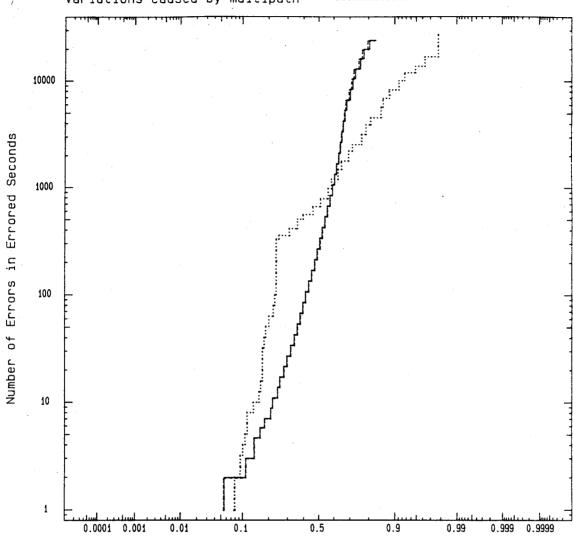


Fraction of Samples That Had Values Less Than the Ordinate

Figure 86. Distribution of errors occurring in errored seconds for:

- Test period from 4/1/88 00:00:00 to 4/1/89 00:00:00
- Sample size of 9989, 170, 9506
- Does not include MIL-STD-188-323 unavailability time
- Availability for this test period was 0.999936
- The 56 kb/s, receiver A channel
- Link from Schwarzenborn to Feldberg

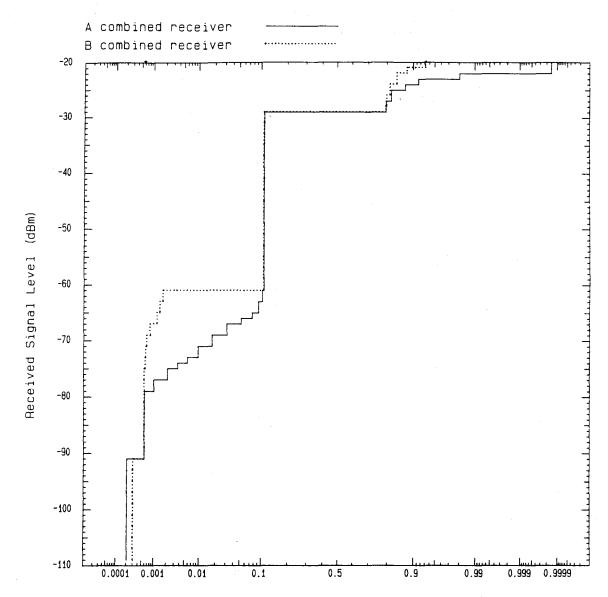




Fraction of Samples That Had Values Less Than the Ordinate

Figure 87. Distribution of errors occurring in errored seconds for:

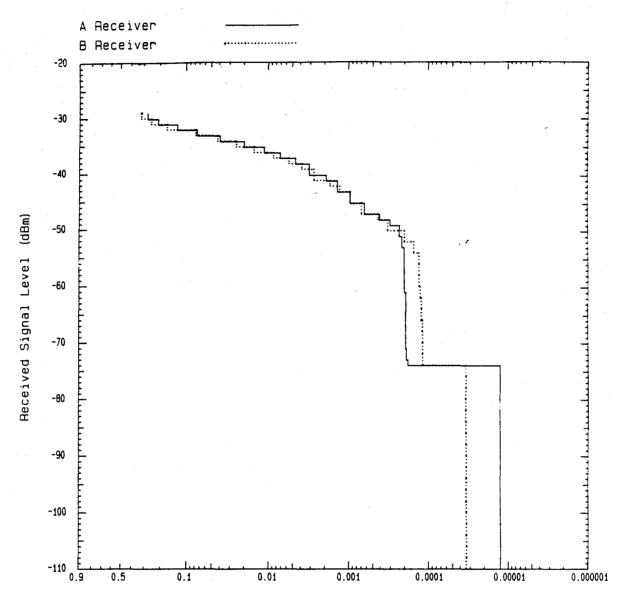
- Test period from 4/1/88 00:00:00 to 4/1/89 00:00:00
- Sample size of 8117, 138, 7787
- Does not include MIL-STD-188-323 unavailability time
- Availability for this test period was 0.999940
- The 56 kb/s, receiver B channel
- Link from Schwarzenborn to Feldberg



Fraction of Samples That Had Values Less Than the Ordinate

Figure 88. Distribution of received signal level for:

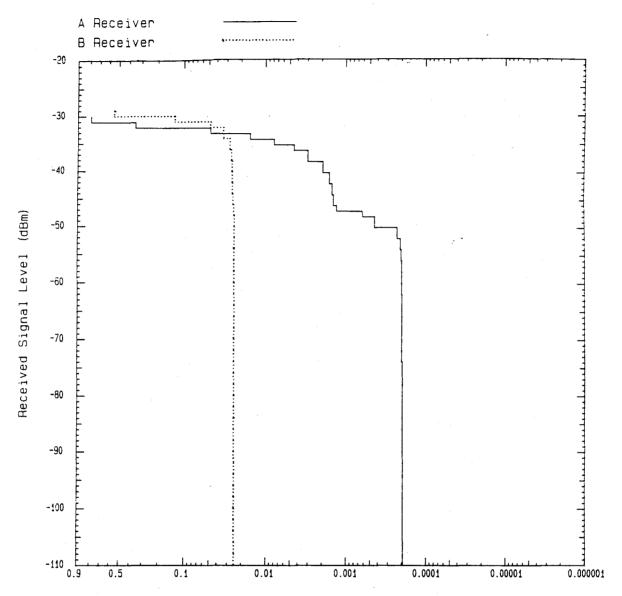
- Test period from 4/1/88 00:00:00 to 4/1/89 00:00:00
- Sample size of 241974, 241974
- The data from TRAMCON
- Link from Berlin to Bocksberg (tropospheric scatter)
- All Tramcon samples



Fraction of Samples That Had Values Less Than the Ordinate

Figure 89. Distribution of received signal level for:

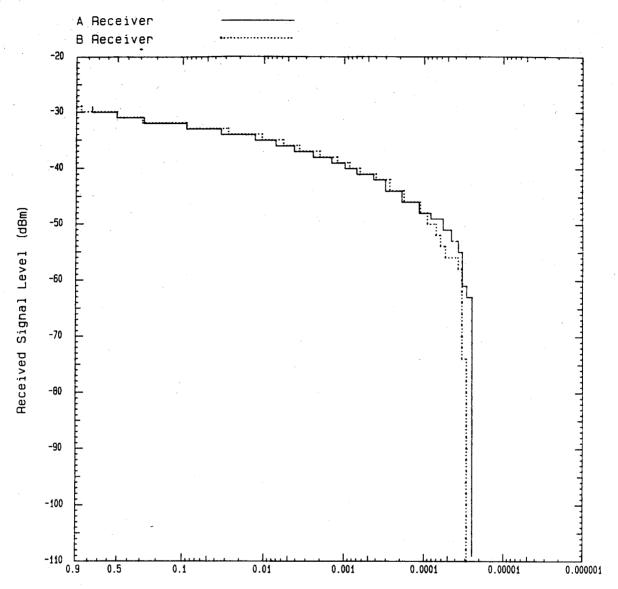
- Test period from 4/1/88 00:00:00 to 4/1/89 00:00:00
- Sample size of 238792, 238792
- The data from TRAMCON
- Link from Bocksberg to Koeterberg
- All Tramcon samples



Fraction of Samples That Had Values Less Than the Ordinate

Figure 90. Distribution of received signal level for:

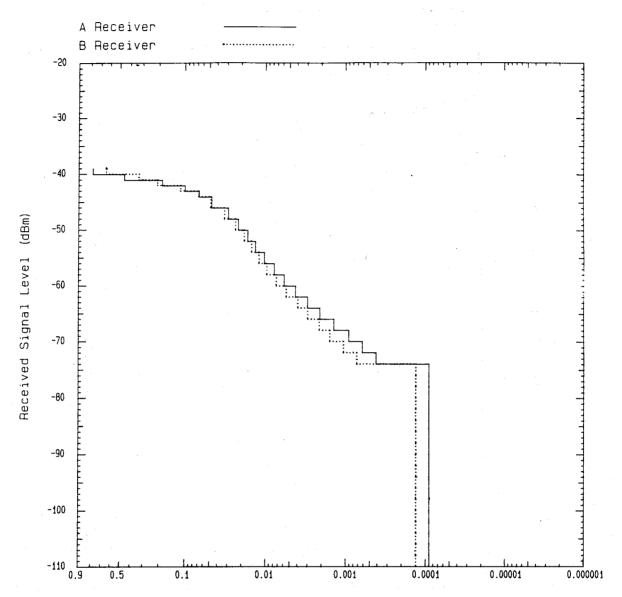
- Test period from 4/1/88 00:00:00 to 4/1/89 00:00:00
- Sample size of 245613, 245613
- The data from TRAMCON
- Link from Koeterberg to Rothwesten
- All Tramcon samples



Fraction of Samples That Had Values Less Than the Ordinate

Figure 91. Distribution of received signal level for:

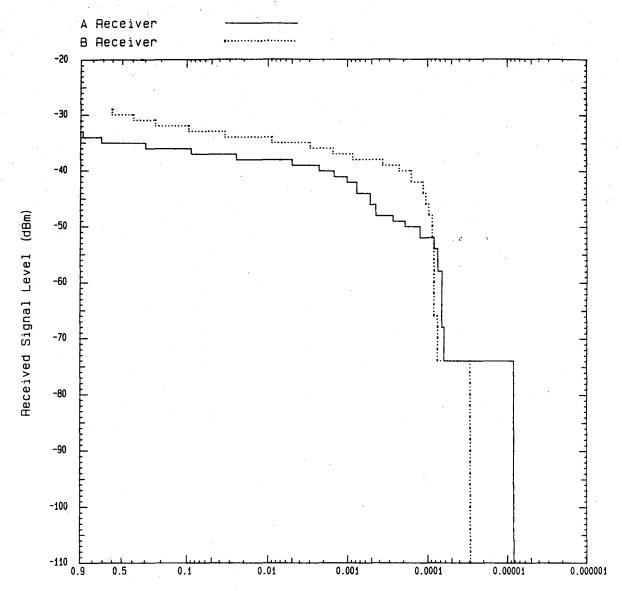
- Test period from 4/1/88 00:00:00 to 4/1/89 00:00:00
- Sample size of 243336, 243336
- The data from TRAMCON
- Link from Rothwesten to Schwarzenborn
- All Tramcon samples



Fraction of Samples That Had Values Less Than the Ordinate

Figure 92. Distribution of received signal level for:

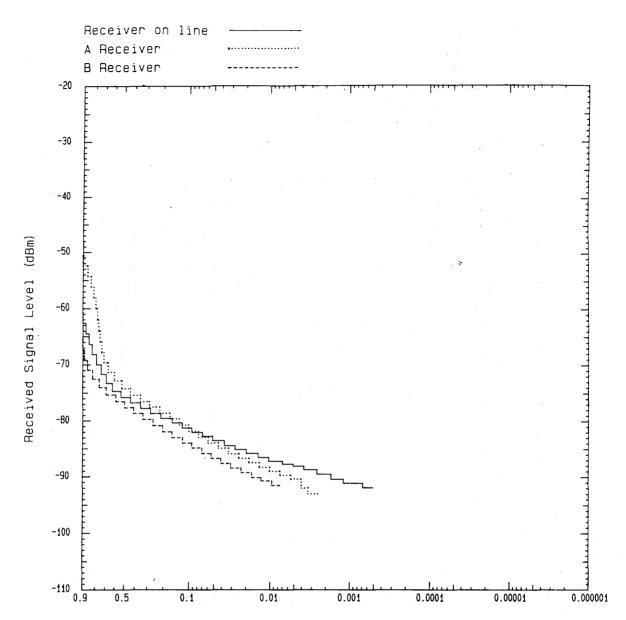
- Test period from 4/1/88 00:00:00 to 4/1/89 00:00:00
- Sample size of 243787, 243787
- The data from TRAMCON
- Link from Schwarzenborn to Feldberg
- All Tramcon samples



Fraction of Samples That Had Values Less Than the Ordinate

Figure 93. Distribution of received signal level for:

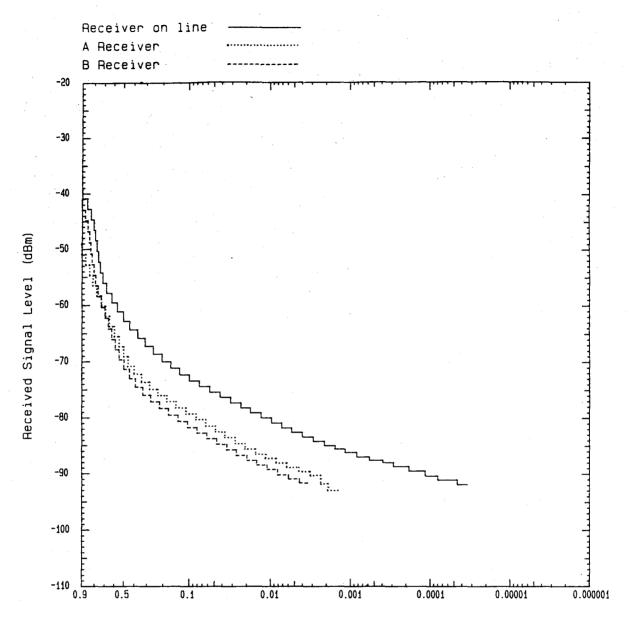
- Test period from 4/1/88 00:00:00 to 4/1/89 00:00:00
- Sample size of 239962, 239962
- The data from TRAMCON
- Link from Linderhofe to Koeterberg
- All Tramcon samples



Fraction of Samples That Had Values Less Than the Ordinate

Figure 94. Distribution of received signal level for:

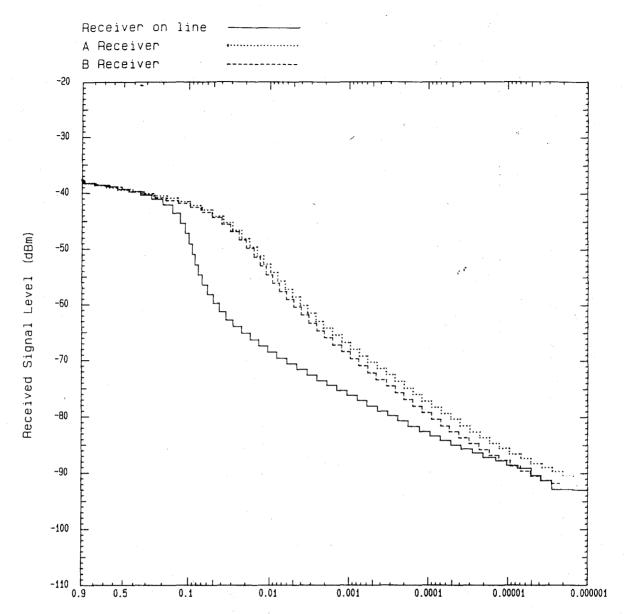
- Test period from 4/1/88 00:00:00 to 4/1/89 00:00:00
- Errored seconds of multipath fading periods
- Sample size of 5900, 50040, 42045
- Data measured at 5 samples per second
- Link from Schwarzenborn to Feldberg



Fraction of Samples That Had Values Less Than the Ordinate

Figure 95. Distribution of received signal level for:

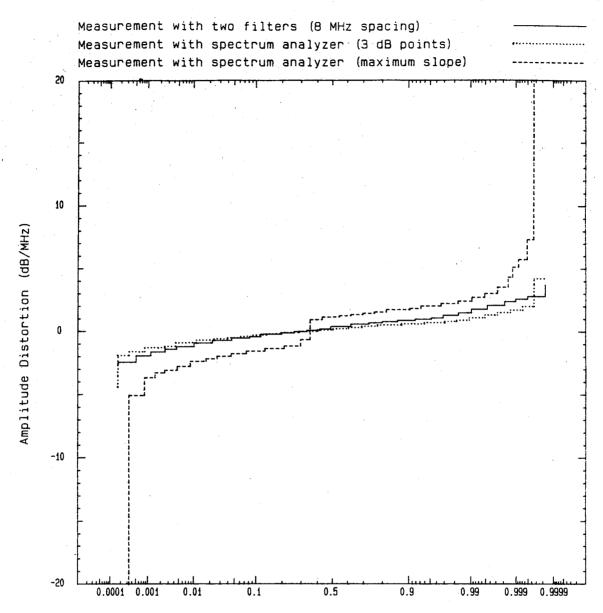
- Test period from 4/1/88 00:00:00 to 4/1/89 00:00:00
- Periods of multipath fading
- Sample size of 87470, 87470, 87470
- Data measured at 5 samples per second
- Link from Schwarzenborn to Feldberg



Fraction of Samples That Had Values Less Than the Ordinate

Figure 96. Distribution of received signal level for:

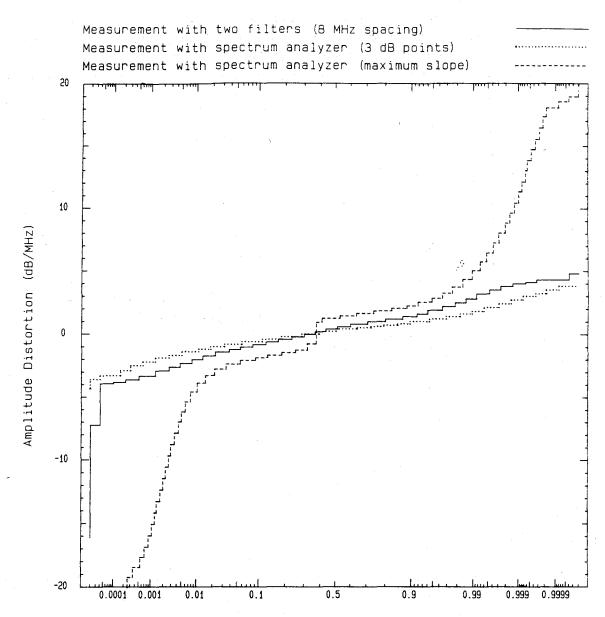
- Test period from 4/1/88 00:00:00 to 4/1/89 00:00:00
- All of valid test period
- Sample size of 3941820, 141588000, 141588000
- Data measured at 5 samples per second
- Link from Schwarzenborn to Feldberg



Fraction of Samples That Had Values Less Than the Ordinate

Figure 97. Distribution of measured IF amplitude distortion for:

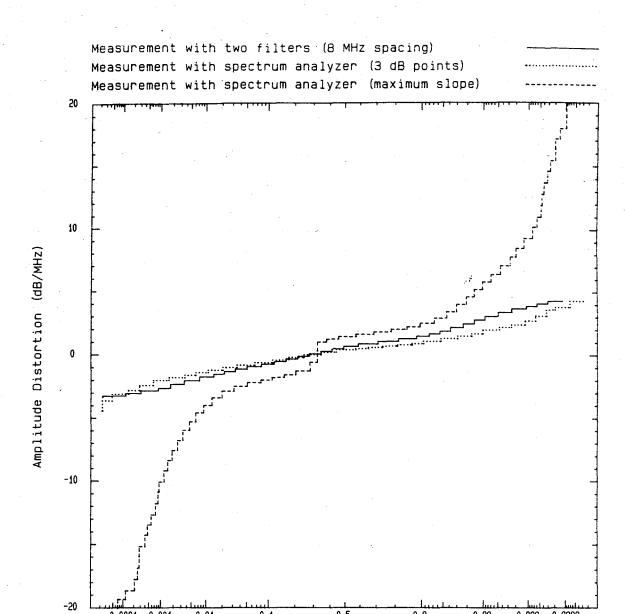
- Test period from 4/1/88 00:00:00 to 4/1/89 00:00:00
- Errored seconds of multipath fading periods
- Sample size of 5900, 5900, 5900
- Link from Schwarzenborn to Feldberg
- Receiver on line



Fraction of Samples That Had Values Less Than the Ordinate

Figure 98. Distribution of measured IF amplitude distortion for:

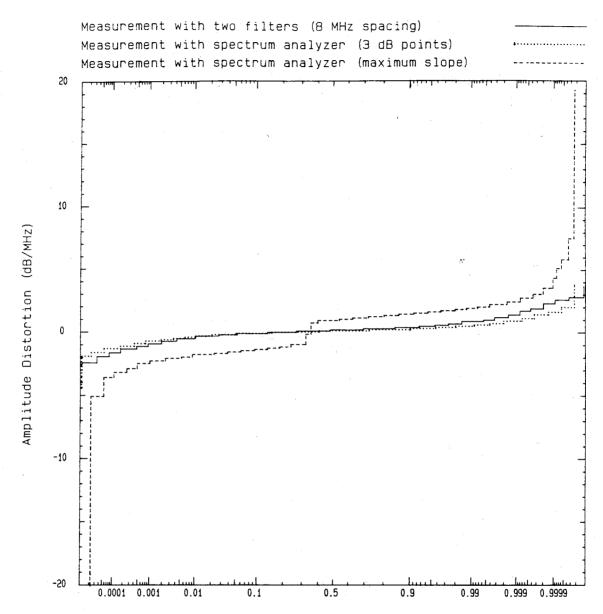
- Test period from 4/1/88 00:00:00 to 4/1/89 00:00:00
- Errored seconds of multipath fading periods
- Sample size of 50040, 50040, 50040
- Link from Schwarzenborn to Feldberg
- A Receiver



Fraction of Samples That Had Values Less Than the Ordinate

Figure 99. Distribution of measured IF amplitude distortion for:

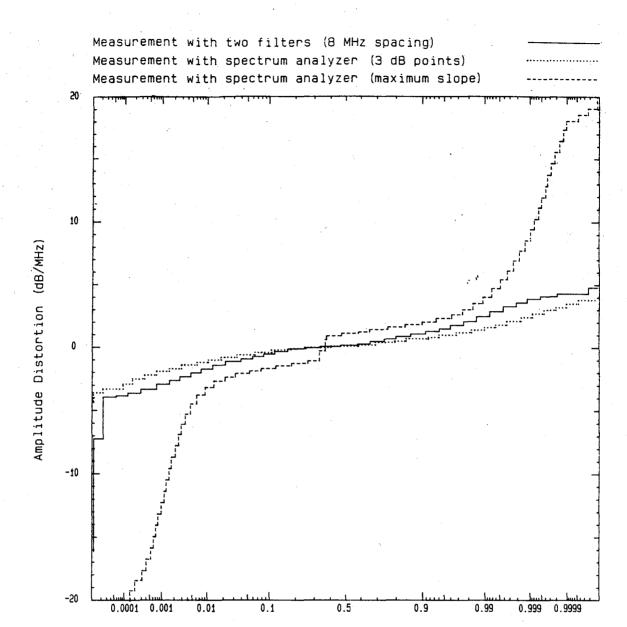
- Test period from 4/1/88 00:00:00 to 4/1/89 00:00:00
- Errored seconds of multipath fading periods
- Sample size of 42045, 42045, 42045
- Link from Schwarzenborn to Feldberg
- B Receiver



Fraction of Samples That Had Values Less Than the Ordinate

Figure 100. Distribution of measured IF amplitude distortion for:

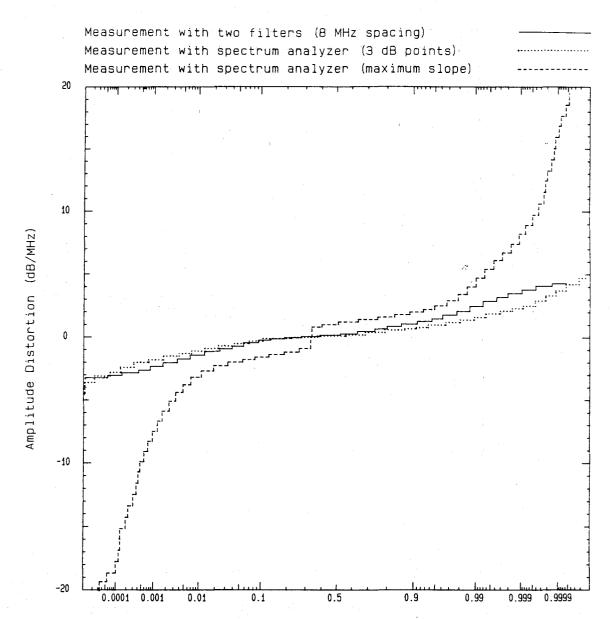
- Test period from 4/1/88 00:00:00 to 4/1/89 00:00:00
- Periods of multipath fading
- Sample size of 87470, 87470, 87470
- Link from Schwarzenborn to Feldberg
- Receiver on line



Fraction of Samples That Had Values Less Than the Ordinate

Figure 101. Distribution of measured IF amplitude distortion for:

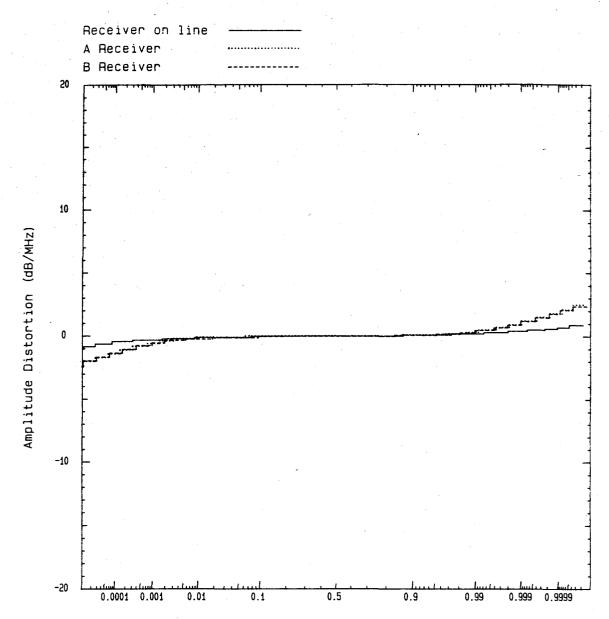
- Test period from 4/1/88 00:00:00 to 4/1/89 00:00:00
- Periods of multipath fading
- Sample size of 87470, 87470, 87470
- Link from Schwarzenborn to Feldberg
- A Receiver



Fraction of Samples That Had Values Less Than the Ordinate

Figure 102. Distribution of measured IF amplitude distortion for:

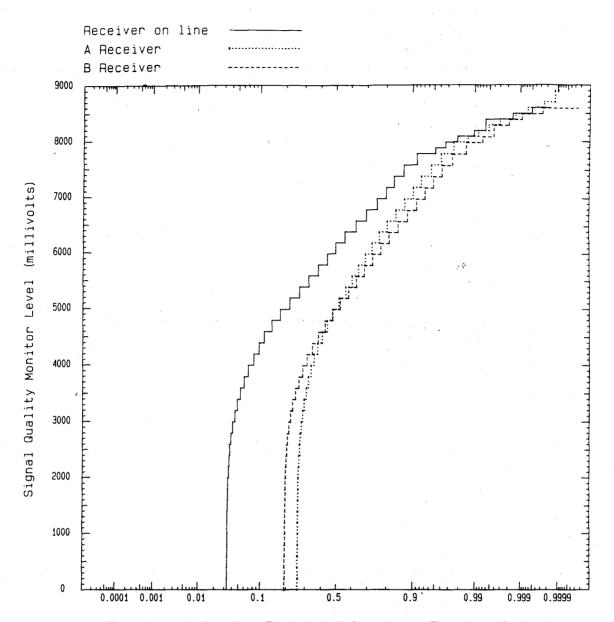
- Test period from 4/1/88 00:00:00 to 4/1/89 00:00:00
- Periods of multipath fading
- Sample size of 87470, 87470, 87470
- Link from Schwarzenborn to Feldberg
- B Receiver



Fraction of Samples That Had Values Less Than the Ordinate

Figure 103. Distribution of measured IF amplitude distortion (3 dB points) for:

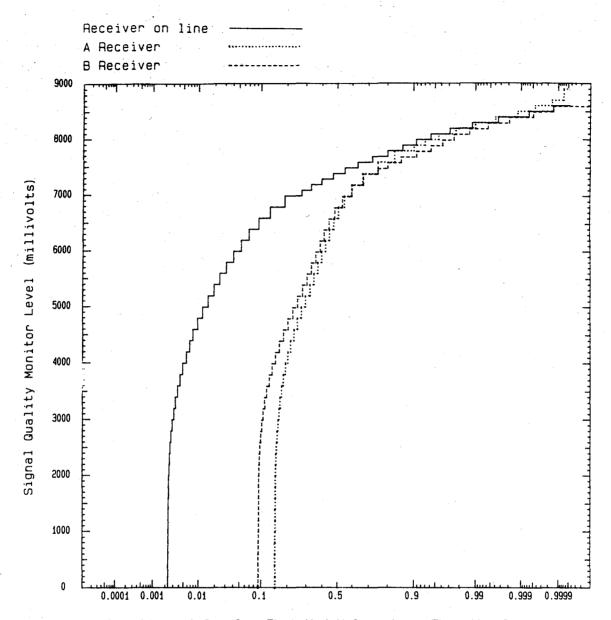
- Test period from 4/1/88 00:00:00 to 4/1/89 00:00:00
- All of valid test period
- Sample size of 3941820, 3941820, 3941820
- Link from Schwarzenborn to Feldberg.



Fraction of Samples That Had Values Less Than the Ordinate

Figure 104. Distribution of signal-quality-monitor levels for:

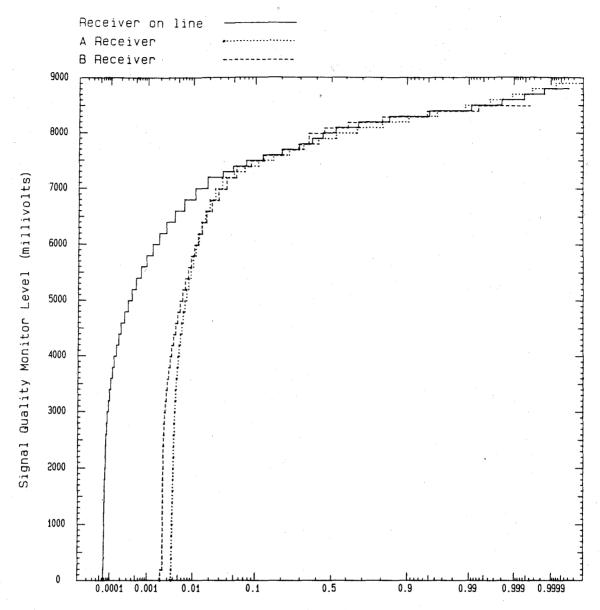
- Test period from 4/1/88 00:00:00 to 4/1/89 00:00:00
- Errored seconds of multipath fading periods
- Sample size of 5900, 50040, 42045
- Link from Schwarzenborn to Feldberg



Fraction of Samples That Had Values Less Than the Ordinate

Figure 105. Distribution of signal-quality-monitor levels for:

- Test period from 4/1/88 00:00:00 to 4/1/89 00:00:00
- Periods of multipath fading
- Sample size of 87470, 87470, 87470
- Link from Schwarzenborn to Feldberg



Fraction of Samples That Had Values Less Than the Ordinate

Figure 106. Distribution of signal-quality-monitor levels for:

- Test period from 4/1/88 00:00:00 to 4/1/89 00:00:00
- All of valid test period
- Sample size of 3941820, 3941820, 3941820
- Link from Schwarzenborn to Feldberg

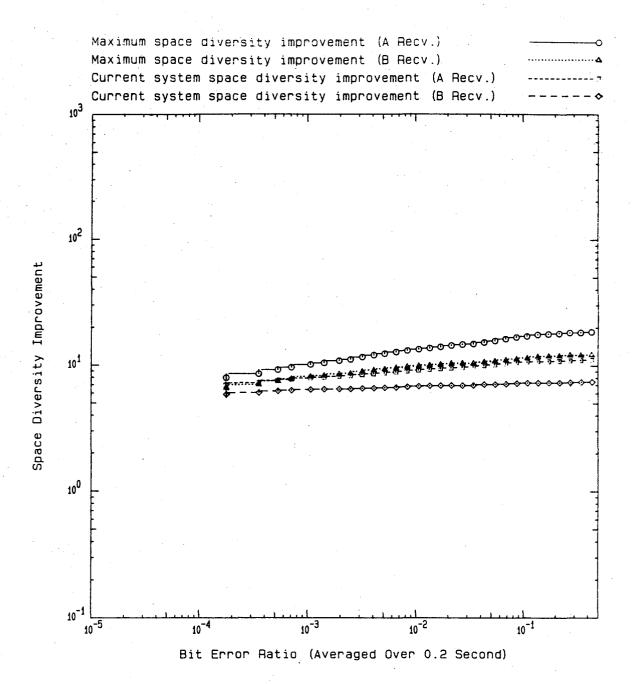


Figure 107. Current system space-diversity improvement for:

- Test period from 4/1/88 00:00:00 to 4/1/89 00:00:00
- Errored seconds of multipath fading periods
- Sample size of 69652, 69652, 69652, 69652
- Link from Schwarzenborn to Feldberg

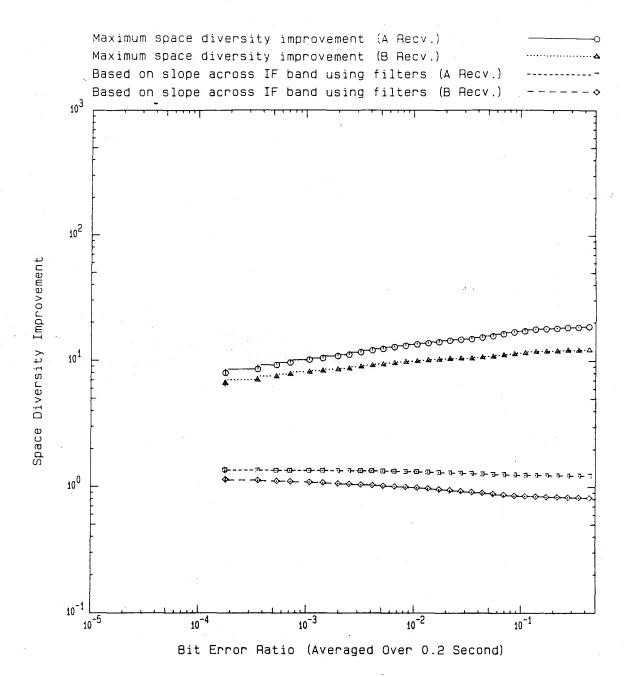


Figure 108. Hypothetical space-diversity improvement for:

- Test period from 4/1/88 00:00:00 to 4/1/89 00:00:00
- Errored seconds of multipath fading periods
- Sample size of 69652, 69652, 69652
- Link from Schwarzenborn to Feldberg

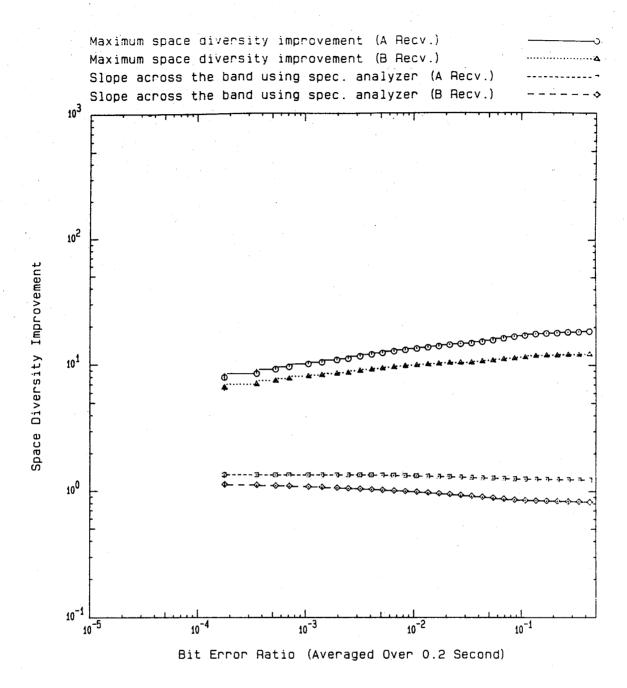


Figure 109. Hypothetical space-diversity improvement for:

- Test period from 4/1/88 00:00:00 to 4/1/89 00:00:00
- Errored seconds of multipath fading periods
- Sample size of 69652, 69652, 69652,
- Link from Schwarzenborn to Feldberg

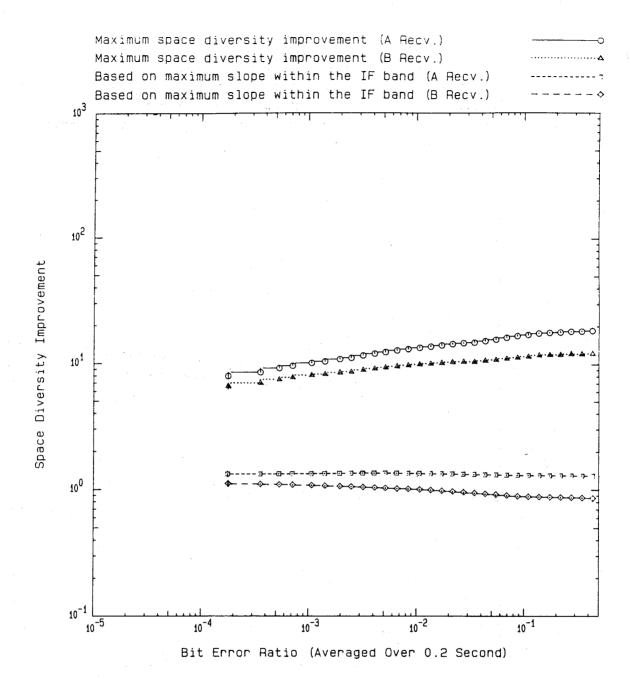


Figure 110. Hypothetical space-diversity improvement for:

- Test period from 4/1/88 00:00:00 to 4/1/89 00:00:00
- Errored seconds of multipath fading periods
- Sample size of 69652, 69652, 69652
- Link from Schwarzenborn to Feldberg

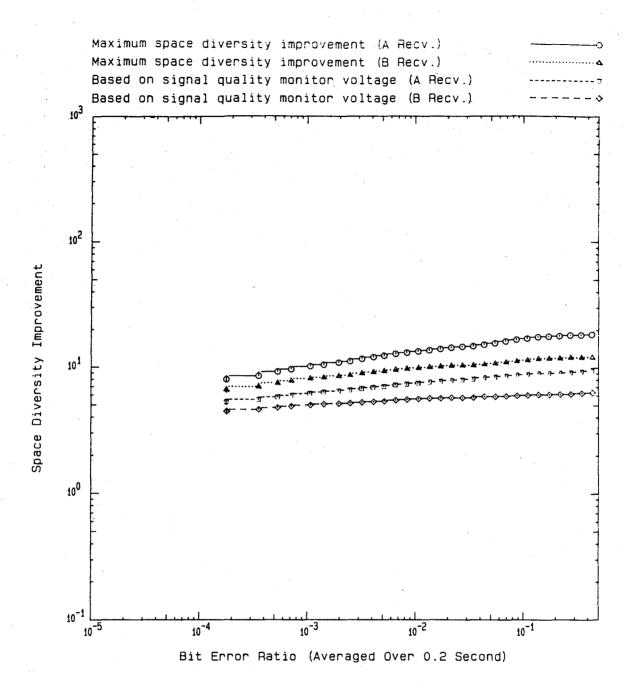


Figure 111. Hypothetical space-diversity improvement for:

- Test period from 4/1/88 00:00:00 to 4/1/89 00:00:00
- Errored seconds of multipath fading periods
- Sample size of 69652, 69652, 69652
- Link from Schwarzenborn to Feldberg

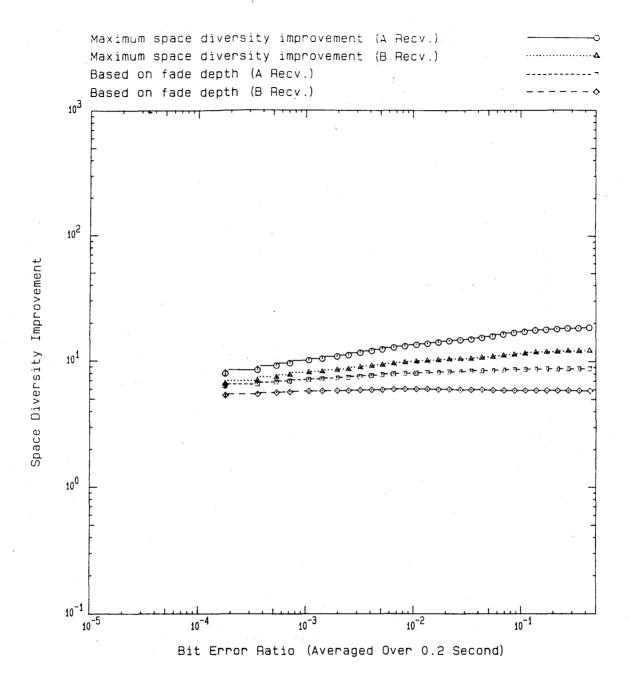
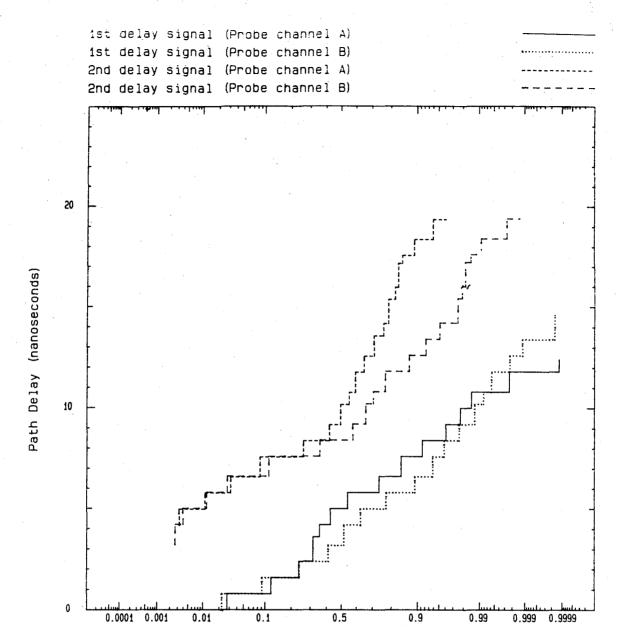


Figure 112. Hypothetical space-diversity improvement for:

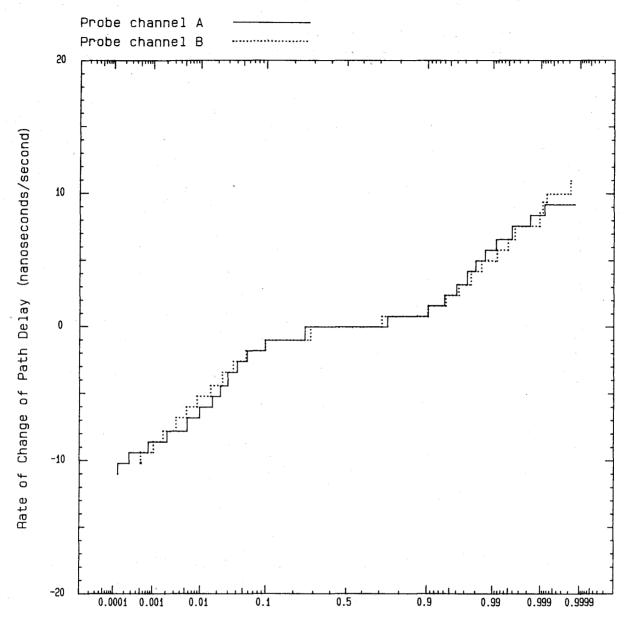
- Test period from 4/1/88 00:00:00 to 4/1/89 00:00:00
- Errored seconds of multipath fading periods
- Sample size of 69652, 69652, 69652
- Link from Schwarzenborn to Feldberg



Fraction of Samples That Had Values Less Than the Ordinate

Figure 113. Distribution of the path delay for:

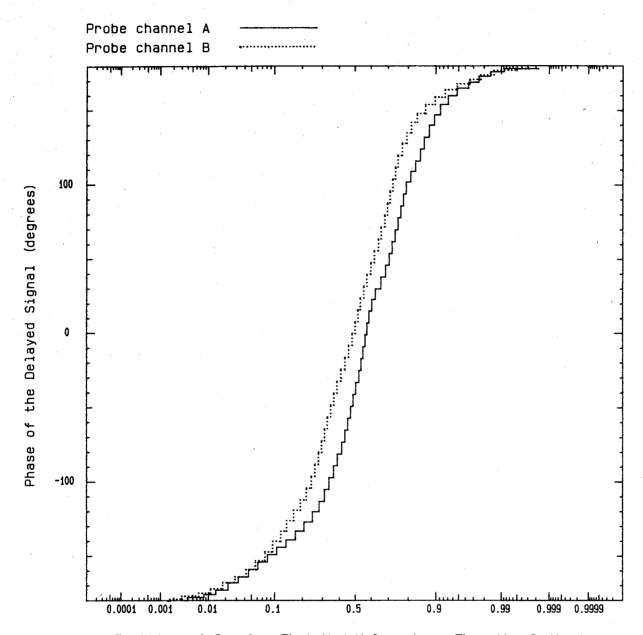
- Test period from 4/1/88 00:00:00 to 4/1/89 00:00:00
- Errored seconds of multipath fading periods
- Sample size of 8223, 6203, 1502, 763
- Link from Schwarzenborn to Feldberg
- Second delay signal data consists of distinct multipath only



Fraction of Samples That Had Values Less Than the Ordinate

Figure 114. Distribution rate of change of path delay for:

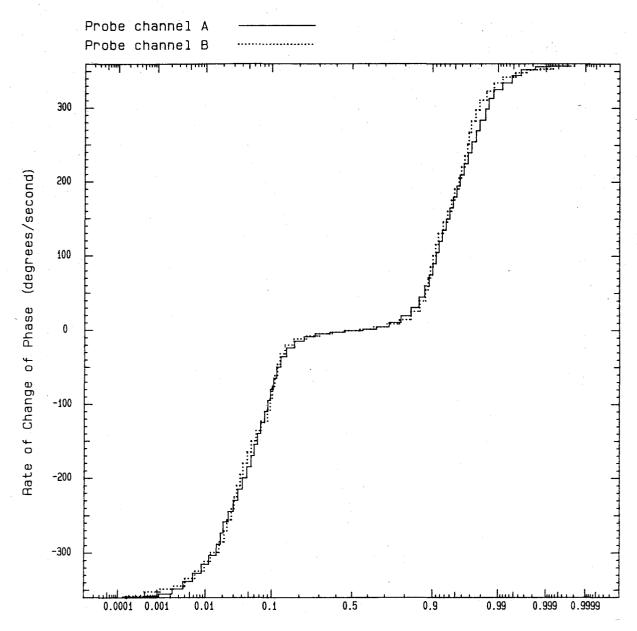
- Test period from 4/1/88 00:00:00 to 4/1/89 00:00:00
- Errored seconds of multipath fading periods
- Sample size of 7517, 5694
- Link from Schwarzenborn to Feldberg



Fraction of Samples That Had Values Less Than the Ordinate

Figure 115. Distribution of delayed signal phase values for:

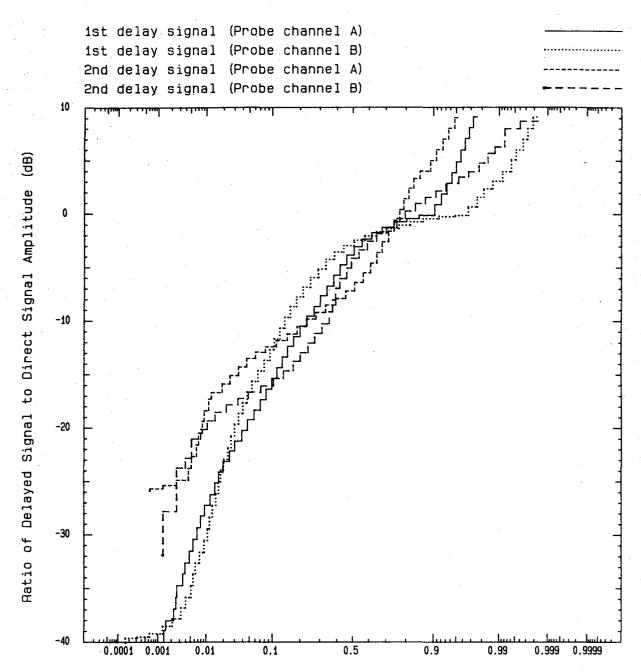
- Test period from 4/1/88 00:00:00 to 4/1/99 00:00:00
- Errored seconds of multipath fading periods
- Sample size of 7999, 6071
- Link from Schwarzenborn to Feldberg



Fraction of Samples That Had Values Less Than the Ordinate

Figure 116. Distribution of rate of change of delayed signal phase for:

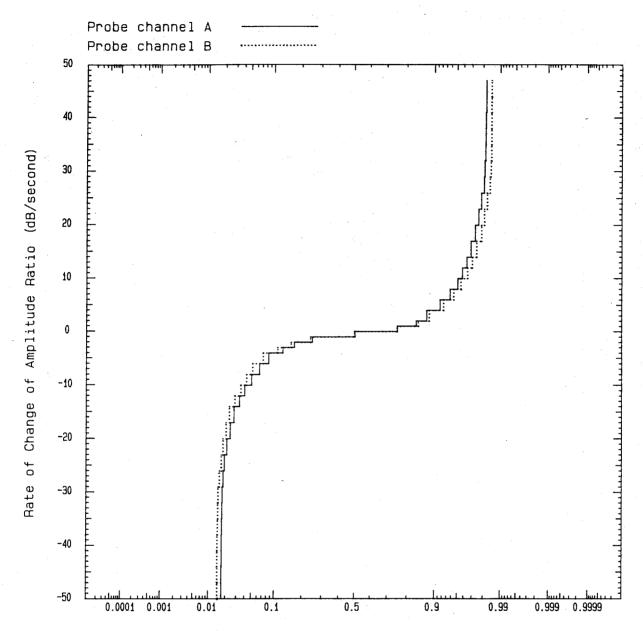
- Test period from 4/1/88 00:00:00 to 4/1/89 00:00:00
- Errored seconds of multipath fading periods
- Sample size of 7328, 5895
- Link from Schwarzenborn to Feldberg



Fraction of Samples That Had Values Less Than the Ordinate

Figure 117. Distribution of the ratio of delayed signal amplitude to direct signal amplitude for:

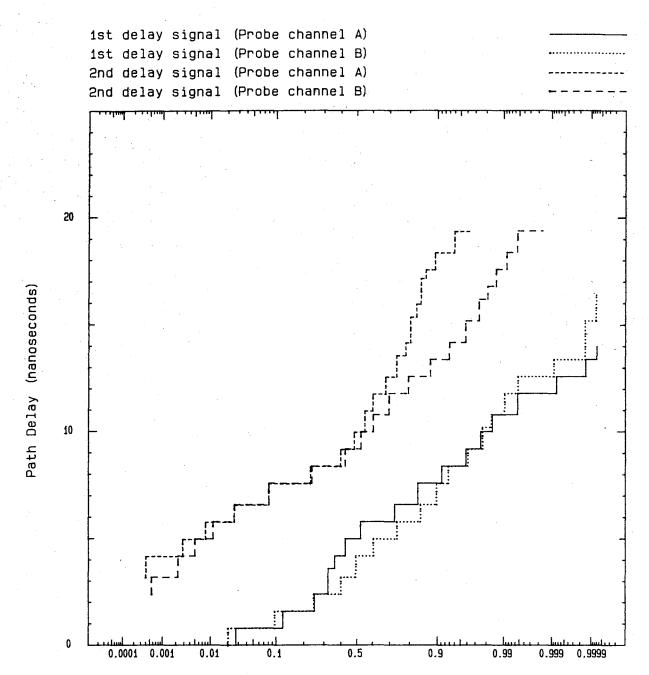
- Test period from 4/1/88 00:00:00 to 4/1/39 00:00:00
- Errored seconds of multipath fading periods
- Sample size of 8045, 6214, 1502, 763
- Link from Schwarzenborn to Feldberg
- Second delay signal data consists of distinct multipath only



Fraction of Samples That Had Values Less Than the Ordinate

Figure 118. Distribution of the rate of change of the ratio of delayed signal to direct signal amplitude for:

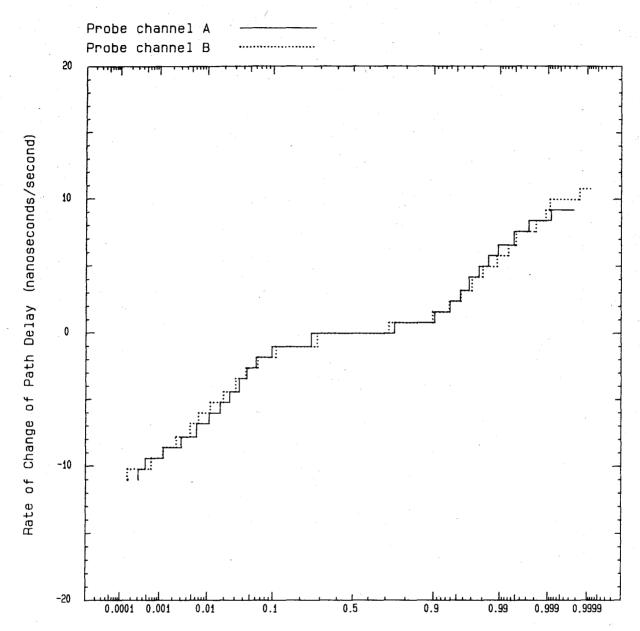
- Test period from 4/1/88 00:00:00 to 4/1/89 00:00:00
- Errored seconds of multipath fading periods
- Sample size of 7517, 5694
- Link from Schwarzenborn to Feldberg



Fraction of Samples That Had Values Less Than the Ordinate

Figure 119. Distribution of the path delay for:

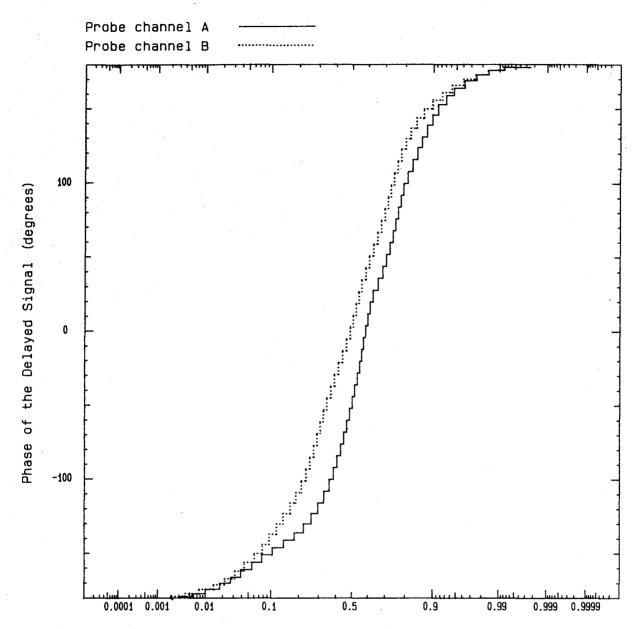
- Test period from 4/1/88 00:00:00 to 4/1/89 00:00:00
- Periods of multipath fading
- Sample size of 14235, 13596, 2452, 1812
- Link from Schwarzenborn to Feldberg
- Second delay signal data consists of distinct multipath only



Fraction of Samples That Had Values Less Than the Ordinate

Figure 120. Distribution rate of change of path delay for:

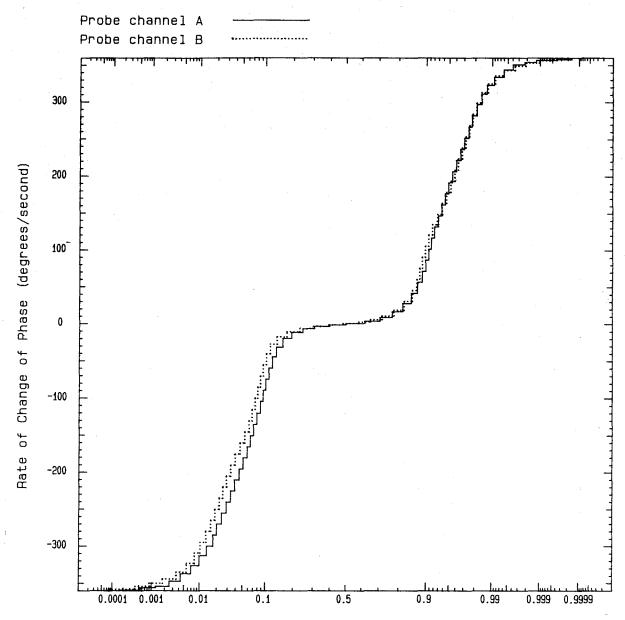
- Test period from 4/1/88 00:00:00 to 4/1/89 00:00:00
- Periods of multipath fading
- Sample size of 13039, 12381
- Link from Schwarzenborn to Feldberg



Fraction of Samples That Had Values Less Than the Ordinate

Figure 121. Distribution of delayed signal phase values for:

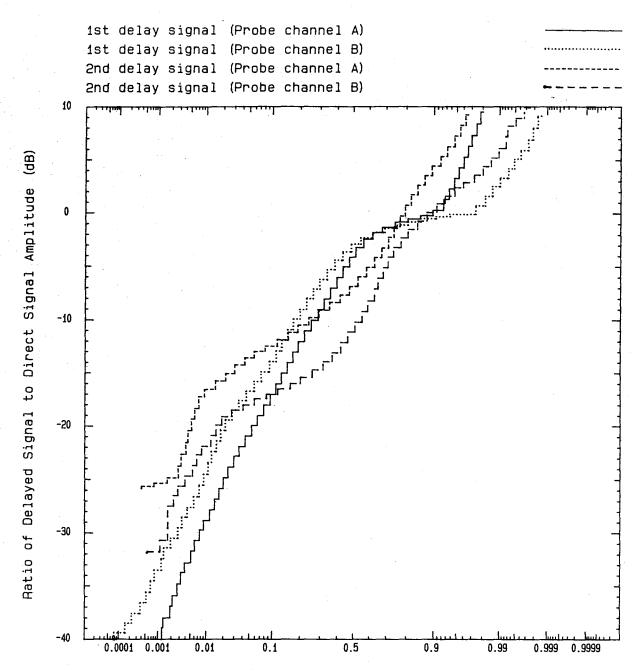
- Test period from 4/1/88 00:00:00 to 4/1/89 00:00:00
- Periods of multipath fading.
- Sample size of 13972, 13338
- Link from Schwarzenborn to Feldberg



Fraction of Samples That Had Values Less Than the Ordinate

Figure 122. Distribution of rate of change of delayed signal phase for:

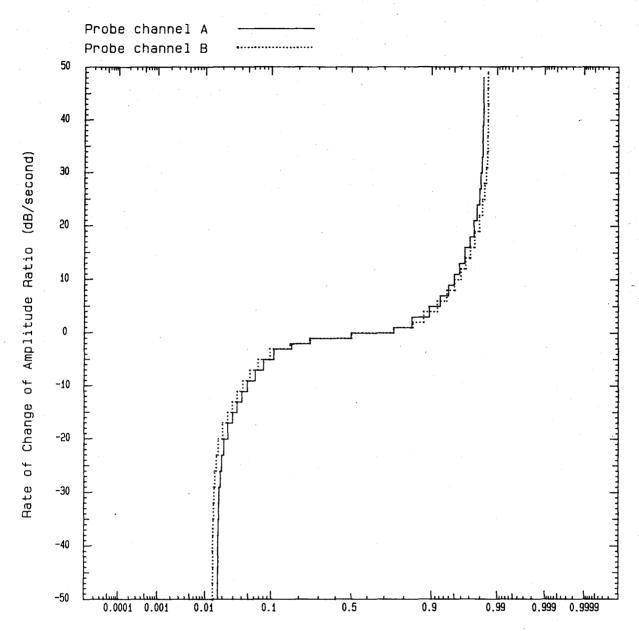
- ▶ Test period from 4/1/88 00:00:00 to 4/1/89 00:00:00
- Periods of multipath fading
- Sample size of 12806, 12260
- Link from Schwarzenborn to Feldberg



Fraction of Samples That Had Values Less Than the Ordinate

Figure 123. Distribution of the ratio of delayed signal amplitude to direct signal amplitude for:

- Test period from 4/1/88 00:00:00 to 4/1/89 00:00:00
- Periods of multipath fading
- Sample size of 13849, 13320, 2452, 1812
- Link from Schwarzenborn to Feldberg
- Second delay signal data consists of distinct multipath only



Fraction of Samples That Had Values Less Than the Ordinate

Figure 124. Distribution of the rate of change of the ratio of delayed signal to direct signal amplitude for:

- Test period from 4/1/88 00:00:00 to 4/1/89 00:00:00
- Errored seconds of multipath fading periods
- Sample size of 13039, 12381
- Link from Schwarzenborn to Feldberg

FORM	NT	IA-29
(4-80)		

14. SUPPLEMENTARY NOTES

BIBLIOGRAPHIC DATA SHEET

1. PUBLICATION NO.	2. Gov't Accession No.	Recipient's Accession No.
4 TITLE AND SUBTITLE Long-Term Performance and	Propagation	5. Publication Date
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1860 Wiehle Avenue, Reston, VA 22090-550	0	13.
,,		

15. ABSTRACT (A 200-word or less factual summary of most significant information. If document includes a significant bibliography or literature survey, mention it here.)

This report describes the results of an 18-month digital microwave radio performance and propagation measurement project that was conducted on a portion of the Defense Communications System in Germany. More than 6 gigabytes of data were collected between April 1988 and October 1989.

The collected data include end-to-end (user-to-user) performance data, radio performance and propagation data on one line-of-sight and one troposcatter link, and meteorological data. The end-to-end measurements are referred to as the Network Performance Characterization (NPC) data, and consist of error performance measurements on two separate 64 kb/s channels consisting of tandem terrestrial microwave links. The radio performance and propagation measurements are referred to as the Link Performance Characterization (LPC) data. These data consist of digital radio performance and propagation measurements made on a long (99-km) line-of-sight microwave link. The propagation measurements on this link include

16. Key Words (Alphabetical order, separated by semicolons)
Key words: CCITT; DEB; Digital European Backbone; digital microwave radio;
digital radio performance; DRAMA; IBPD; in-band dispersion; linear
amplitude difference; LOS propagation; MIL-STD; multipath fading;
propagation measurements; radio outages; transmission system

performance standards; troposcatter.

17. AVAILABILITY STATEMENT UNLIMITED.	18. Security Class. (This report) Unclassified	20. Number of pages Vol.III: 156 Total: 439
FOR OFFICIAL DISTRIBUTION.	19. Security Class. (This page) Unclassified	21. Price:

multipath delay spread, in-band power difference (IBPD), and receive signal level (rsl) measurements.

The report provides summaries of the long-term statistics of both radio performance and propagation data. The performance data are compared with both CCITT and Military Standard (MIL-STD) performance criteria. The propagation data are used in the assessment of the causes of digital radio outages. The propagation data are also useful for a variety of modeling purposes. These applications of the propagation data are described in the report.