

CCITT SGXV
Working Party XV/4
Specialists Group on Coding for Visual Telephony

Doc. # 477

Source : NL.
Title : Simulation results RM7

Enclosed you will find the simulation results of Reference Model 7.

Introduction :

This document gives the simulation results of RM7 with $q = 1$ i.e. a bitrate of 64 kbit/s.

Annexed to this document for the CLAIRE, MISS AMERICA, SWING, SALESMAN and BLUE JACKET sequence are:

- The statistics of RM7
- The signal to noise ratio plots RM7 (YUV)
- The signal to noise ratio plots RM6 and RM7 (Y)
- The statistics for the block patterns.

Conclusion :

- Although due to the new first frame procedure RM6 and RM7 are different for the first few frames the results are similar for the CLAIRE, MISS AMERICA and SALESMAN sequences
- For the SWING and BLUE JACKET sequences buffer overflows occur due to the buffer regulation. This results in a better performance of RM6 over RM7. A more suitable buffer regulation should prevent buffer overflow.

Statistics Reference Model 7

PTT Research Neher Laboratories
Visual Communications Research
Date : 6 - 2 - 1989

Sequence : Claire

Modification : RM7

Number of tracks for statistics : 78

Temporal resolution : 10 Hz

RM6

RM7

Item		15th pict.	mean seq	15th pict.	mean seq
1.	RMS for luminance	3.141	3.280	3.236	3.254
2.	SNR for luminance	38.191	37.845	37.932	37.894
	SNR for chrominance(U)	39.975	39.533	39.444	39.265
	SNR for chrominance(V)	43.774	43.457	42.687	42.687
3.	Mean value of step size	17.222	19.931	18.000	19.709
4.	Mean value of the number of non-zero coefficients	3.181	2.949	2.456	2.914
5.	Mean value of the number of zero-coefficients	7.302	5.865	5.703	5.741
6.	Block type of Macro				
	Fixed	281	273	240	272
	Coded MC	61	52	41	52
	Fixed MC	6	8	5	8
	Coded	48	63	110	64
	Intra	0	0	0	0
7.	Block type of Y				
	Fixed	1245	1247	1252	1249
	Coded MC	156	132	112	133
	Fixed MC	112	108	72	106
	Coded	71	96	148	96
	Intra	0	1	0	0
8.	Block type of UV				
	Fixed	652	661	679	661
	Coded MC	32	23	15	24
	Fixed MC	102	97	77	96
	Coded	6	11	21	11
	Intra	0	0	0	0
9.	Number of bits				
	Macro attributes	739	785	1075	834
	End of block	736	748	872	759
	Motion vectors	275	341	240	360
	Coefficients	Y	4246	3780	3614
		U	186	160	138
		V	88	67	90
		Total	4520	4007	3842
	Total	6270	5881	6029	5925

Bits for first frame	58218
Number of forced to fixed mb's	0
Bits stuffed due to buffer underflow	0

Statistics Reference Model 7

PTT Research Neher Laboratories
Visual Communications Research
Date : 6 - 2 - 1989

Sequence : Miss America

Modification : RM7

Number of tracks for statistics : 49

Temporal resolution : 10 Hz

RM6

RM7

Item		15th pict.	mean seq	15th pict.	mean seq		
1.	RMS for luminance	3.044	3.133	3.054	3.163		
2.	SNR for luminance	38.461	38.227	38.433	38.135		
	SNR for chrominance(U)	39.019	38.816	39.029	38.730		
	SNR for chrominance(V)	40.217	39.659	39.979	39.380		
3.	Mean value of step size	17.111	18.664	16.667	18.823		
4.	Mean value of the number of non-zero coefficients	2.164	1.994	2.039	2.001		
5.	Mean value of the number of zero-coefficients	2.910	3.008	2.487	2.889		
6.	Block type of Macro	Fixed	236	210	219		
		Coded MC	51	75	47		
		Fixed MC	6	22	7		
		Coded	102	89	123		
		Intra	1	0	0		
7.	Block type of Y	Fixed	1253	1114	1251		
		Coded MC	112	131	86		
		Fixed MC	116	258	130		
		Coded	99	81	117		
		Intra	4	0	0		
8.	Block type of UV	Fixed	606	536	609		
		Coded MC	24	48	26		
		Fixed MC	90	147	82		
		Coded	70	61	75		
		Intra	2	0	0		
9.	Number of bits	Macro attributes		1163	1227	1302	1304
		End of block		952	1016	1004	1022
		Motion vectors		321	578	295	596
		Coefficients	Y	2912	2422	2581	2411
			U	263	275	315	275
			V	181	318	147	297
			Total	3356	3015	3043	2983
	Total		5792	5836	5644	5905	

Bits for first frame	50479
Number of forced to fixed mb's	0
Bits stuffed due to buffer underflow	0

Sequence : Swing

Modification : RM7

Number of tracks for statistics : 124

Temporal resolution : 10 Hz

RM6

RM7

Item		15th pict.	mean seq	15th pict.	mean seq
1.	RMS for luminance	7.948	5.801	5.124	4.526
2.	SNR for luminance	30.126	33.876	33.938	35.248
	SNR for chrominance(U)	32.456	36.485	35.673	38.064
	SNR for chrominance(V)	33.852	37.422	36.467	38.807
3.	Mean value of step size	26.333	20.450	18.833	21.723
4.	Mean value of the number of non-zero coefficients	2.102	2.476	2.190	2.971
5.	Mean value of the number of zero-coefficients	15.815	17.963	17.074	20.623
6.	Block type of Macro				
	Fixed	252	282	285	303
	Coded MC	0	7	0	5
	Fixed MC	1	2	0	2
	Coded	143	105	111	86
	Intra	0	1	0	1
7.	Block type of Y				
	Fixed	1376	1374	1390	1394
	Coded MC	0	17	0	12
	Fixed MC	4	18	0	15
	Coded	204	170	194	160
	Intra	0	4	0	4
8.	Block type of UV				
	Fixed	740	741	717	745
	Coded MC	0	7	0	5
	Fixed MC	2	11	0	8
	Coded	50	31	75	31
	Intra	0	2	0	2
9.	Number of bits				
	Macro attributes	1104	849	840	691
	End of block	848	708	844	625
	Motion vectors	9	87	0	61
	Coefficients	Y	3262	3641	3465
		U	406	375	569
		V	192	221	267
		Total	3860	4237	4535
	Total	5821	5881	5985	5912

Bits for first frame	105408
Number of forced to fixed mb's	245
Bits stuffed due to buffer underflow	0

Statistics Reference Model 7

PTT Research Neher Laboratories
Visual Communications Research
Date : 6 - 2 - 1989

Sequence : Salesman

Modification : RM7

Number of tracks for statistics : 74

Temporal resolution : 10 Hz

RM6			RM7			
Item		15th pict.	mean seq	15th pict.	mean seq	
1. RMS for luminance		7.998	7.651	7.331	6.978	
2. SNR for luminance		30.072	30.585	30.828	31.275	
SNR for chrominance(U)		38.041	38.578	38.220	38.627	
SNR for chrominance(V)		39.049	39.392	38.875	39.291	
3. Mean value of step size		30.222	29.942	28.500	27.849	
4. Mean value of the number of non-zero coefficients		2.460	2.345	2.591	2.522	
5. Mean value of the number of zero-coefficients		6.709	7.387	8.193	7.973	
6. Block type of Macro	Fixed	236	245	256	258	
	Coded MC	44	40	47	40	
	Fixed MC	13	10	7	9	
	Coded	101	99	82	86	
	Intra	2	2	4	2	
7. Block type of Y	Fixed	1177	1217	1231	1241	
	Coded MC	101	99	111	100	
	Fixed MC	127	100	105	96	
	Coded	171	158	121	138	
	Intra	8	10	16	9	
8. Block type of UV	Fixed	672	679	664	678	
	Coded MC	5	4	3	5	
	Fixed MC	109	95	105	93	
	Coded	2	9	12	11	
	Intra	4	5	8	5	
9. Number of bits	Macro attributes		987	965	996	949
	End of block		852	822	780	767
	Motion vectors		387	349	319	337
	Coefficients	Y	3829	3651	3948	3760
		U	18	39	52	47
		V	9	28	50	36
		Total	3856	3718	4050	3843
	Total		6082	5854	6145	5896

Bits for first frame	71647
Number of forced to fixed mb's	0
Bits stuffed due to buffer underflow	0

Statistics Reference Model 7

PTT Research Neher Laboratories
Visual Communications Research
Date : 6 - 2 - 1989

Sequence : Blue Jacket

Modification : RM7

Number of tracks for statistics : 74

Temporal resolution : 10 Hz

RM6

RM7

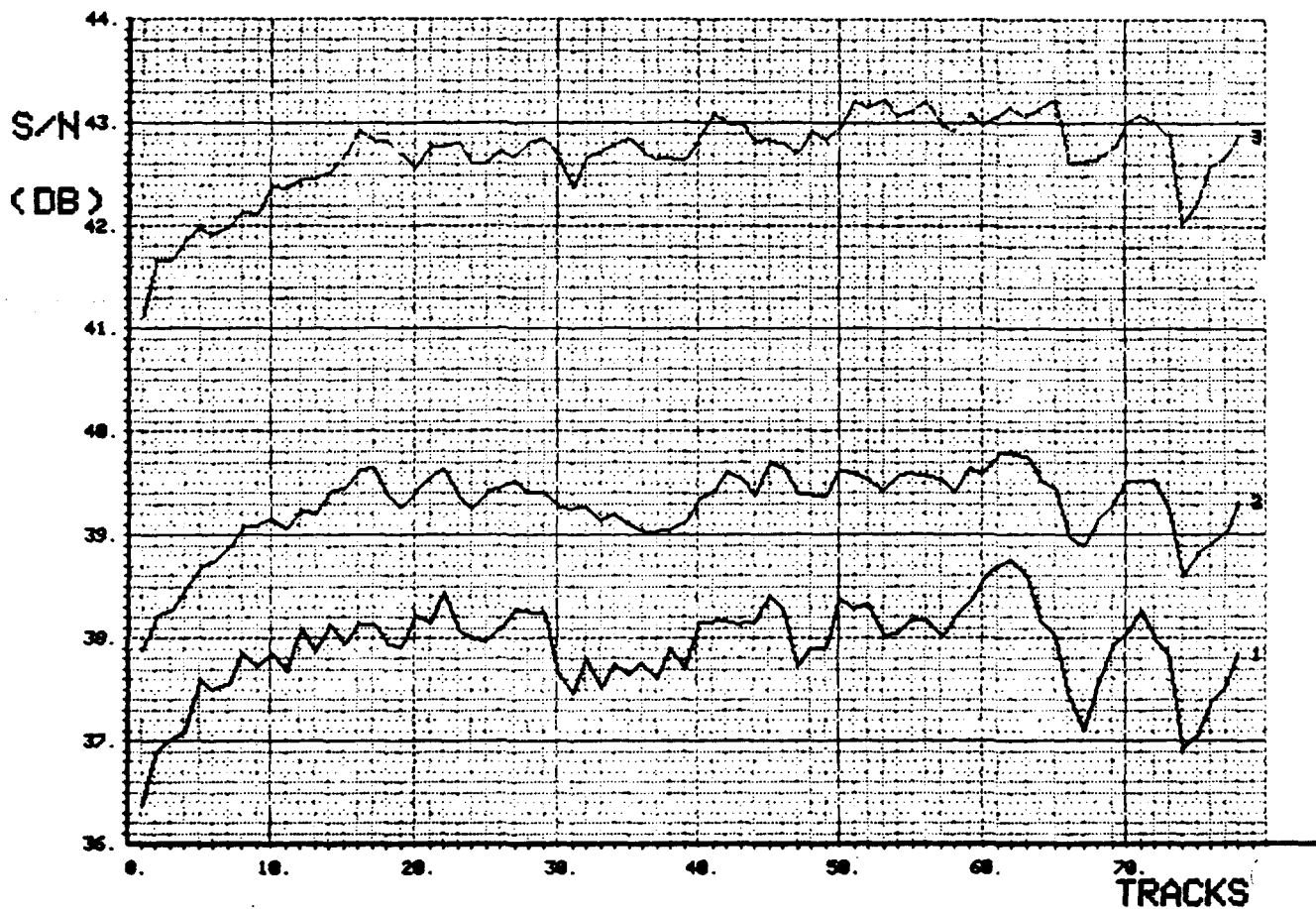
Item		15th pict.	mean seq	15th pict.	mean seq
1.	RMS for luminance	5.011	5.418	4.982	5.493
2.	SNR for luminance	34.132	33.520	34.183	33.347
	SNR for chrominance(U)	40.188	39.857	39.865	39.615
	SNR for chrominance(V)	39.165	38.900	39.081	38.629
3.	Mean value of step size	18.333	24.164	20.833	28.788
4.	Mean value of the number of non-zero coefficients	3.124	3.483	3.505	4.735
5.	Mean value of the number of zero-coefficients	7.610	8.241	9.233	9.373
6.	Block type of Macro				
	Fixed	270	287	297	312
	Coded MC	19	22	19	20
	Fixed MC	4	4	3	5
	Coded	103	82	77	59
	Intra	0	1	0	1
7.	Block type of Y				
	Fixed	1331	1333	1376	1379
	Coded MC	59	57	58	51
	Fixed MC	33	48	30	47
	Coded	161	143	120	104
	Intra	0	3	0	3
8.	Block type of UV				
	Fixed	725	720	731	727
	Coded MC	8	9	15	9
	Fixed MC	38	44	29	40
	Coded	21	18	17	14
	Intra	0	1	0	1
9.	Number of bits				
	Macro attributes	869	741	708	590
	End of block	736	662	628	511
	Motion vectors	133	175	149	155
	Coefficients	Y	4020	4112	4009
		U	88	78	117
		V	92	101	97
		Total	4200	4291	4683
	Total	5938	5869	5708	5939

Bits for first frame	64800
Number of forced to fixed mb's	217
Bits stuffed due to buffer underflow	0

CLAIRE

1: RND (Y)
2: RND (U)
3: RND (U)

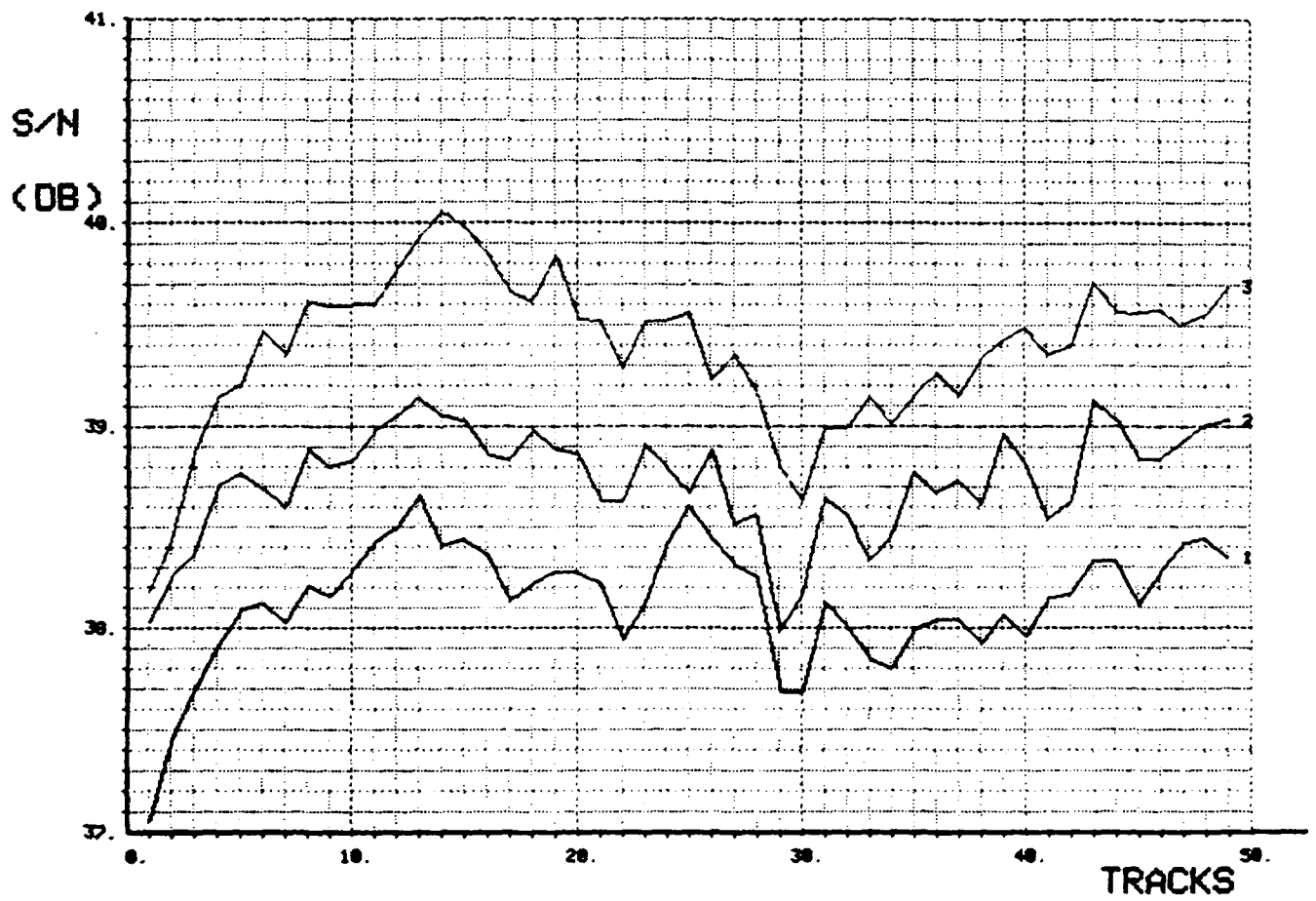
6-2-89



MISS

1 : RND (Y)
2 : RND (U)
3 : RND (U)

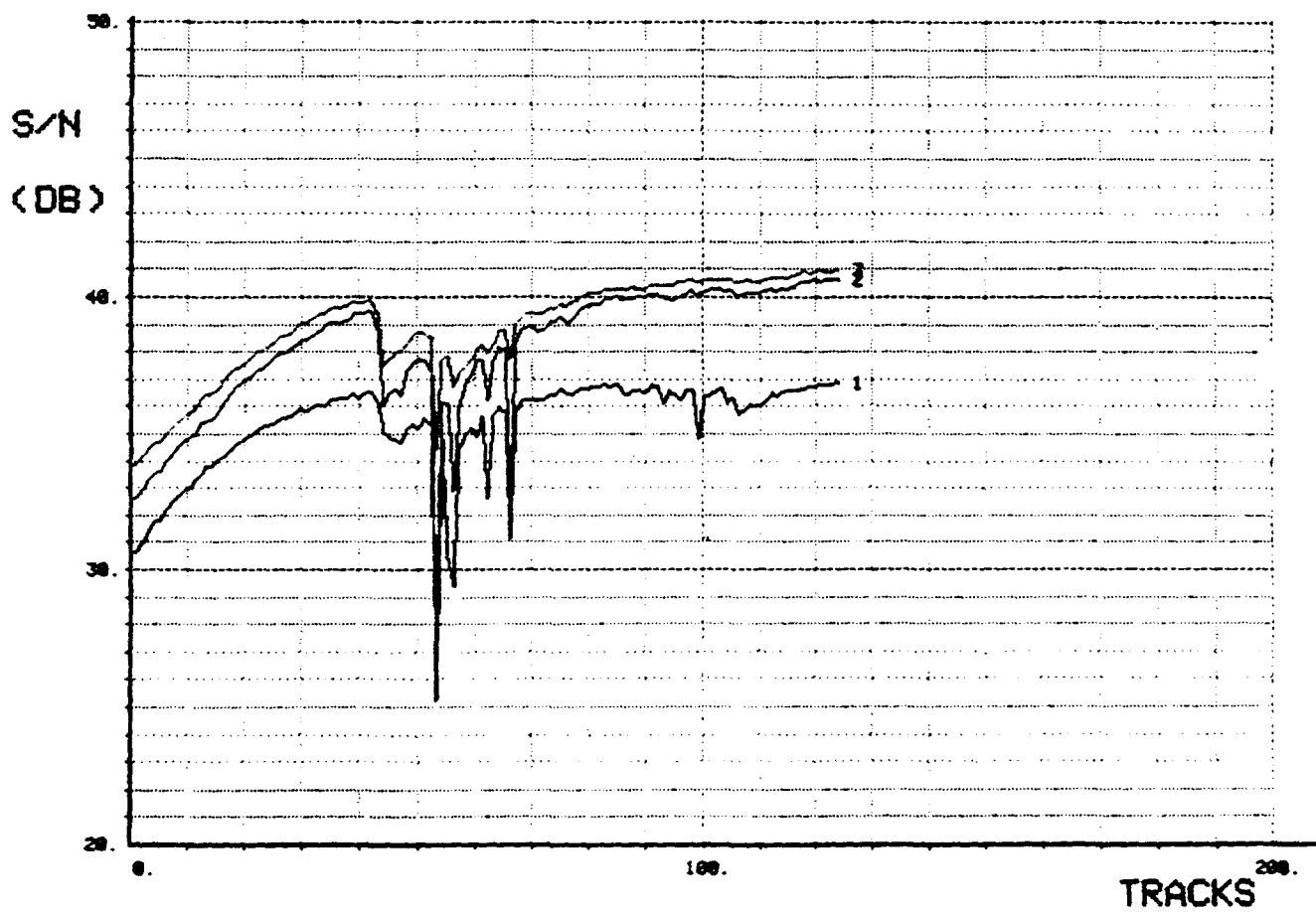
6-2-89



SWING

1: RPD (Y)
2: RPD (U)
3: RPD (U)

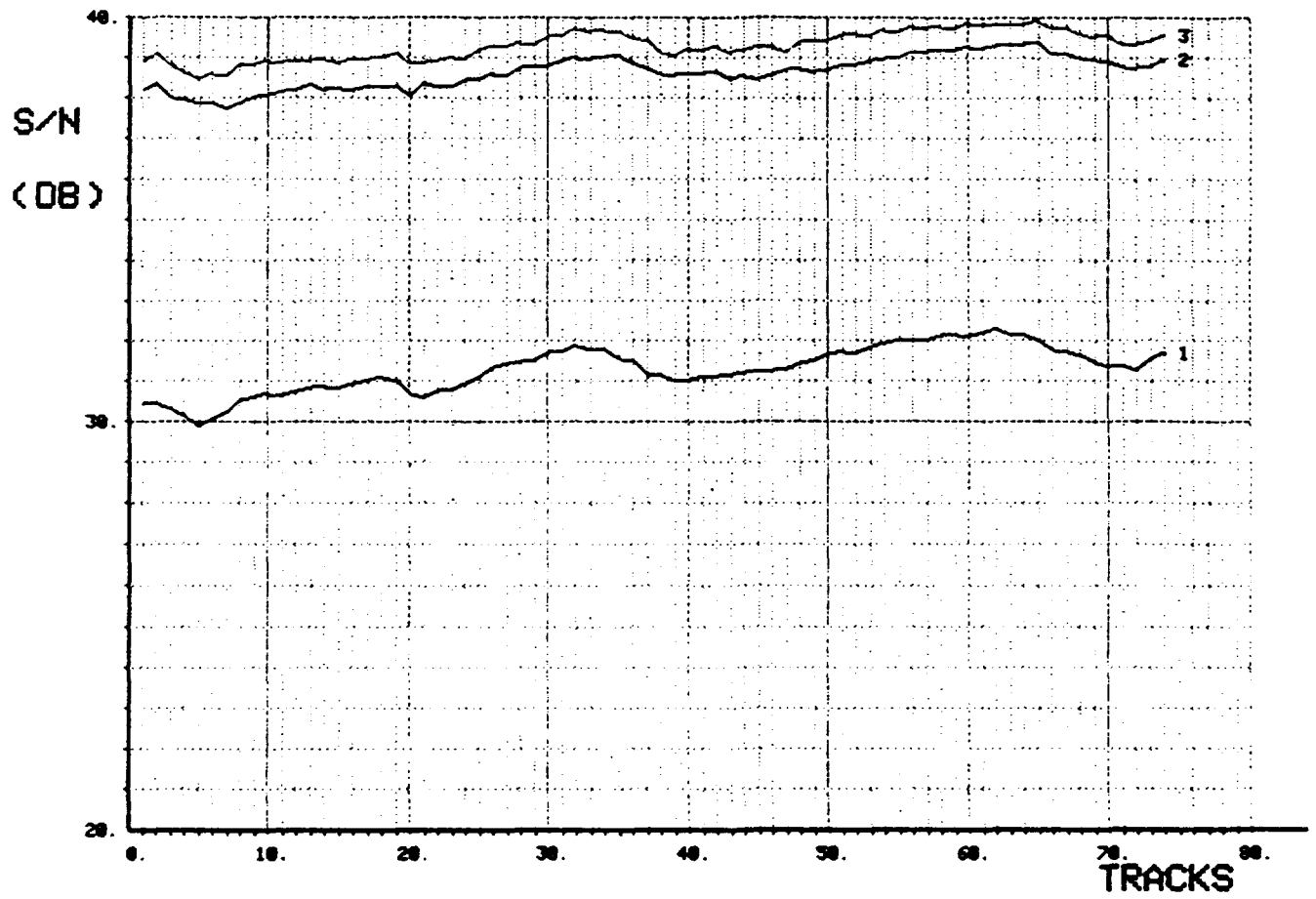
6-2-89



SALESMAN

1: RND (Y)
2: RND (U)
3: RND (U)

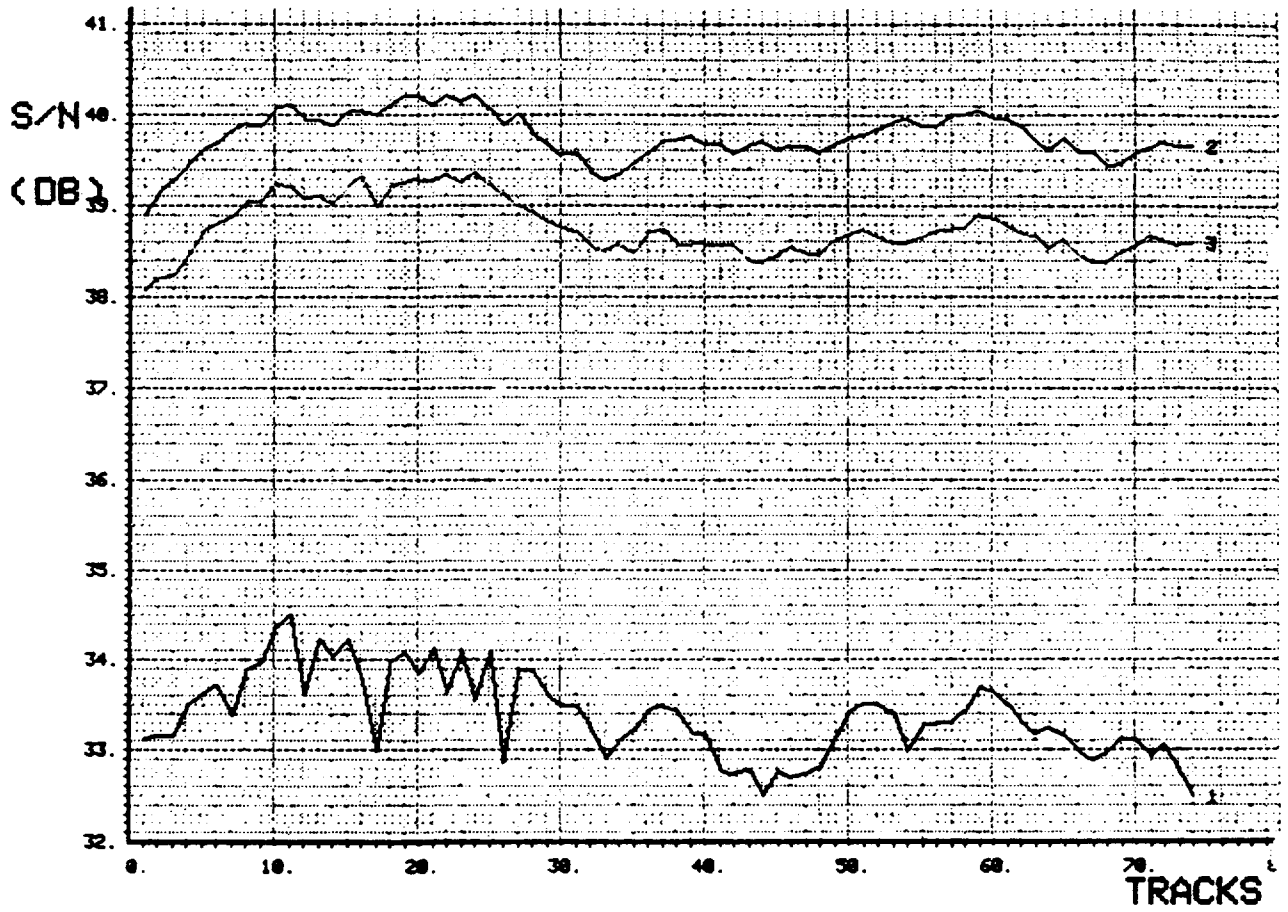
6-2-69



BLUE JACKET

- 1: RND (Y)
- 2: RND (U)
- 3: RND (U)

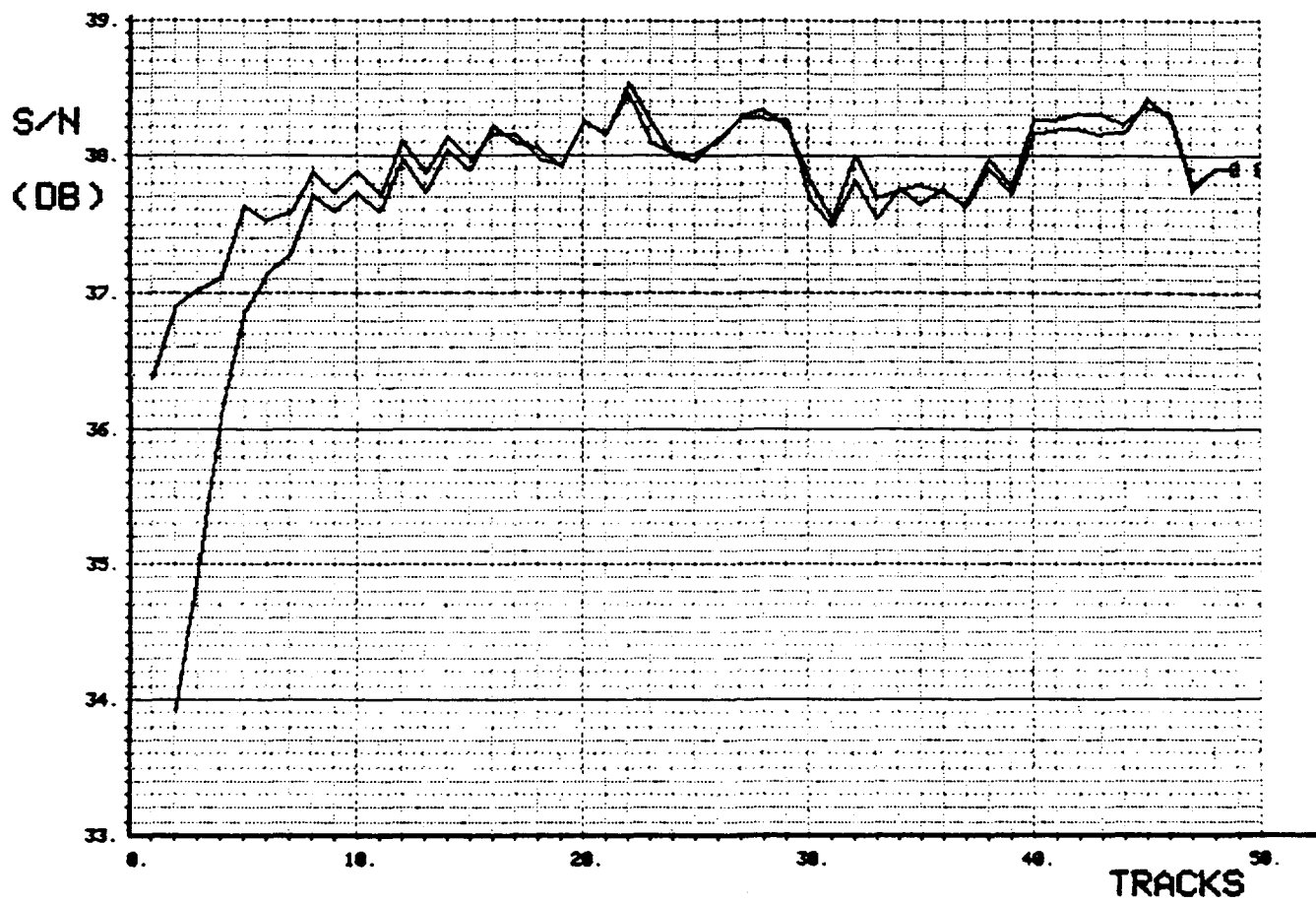
6-2-89



CLAIRE

1 : RM6
2 : RM7

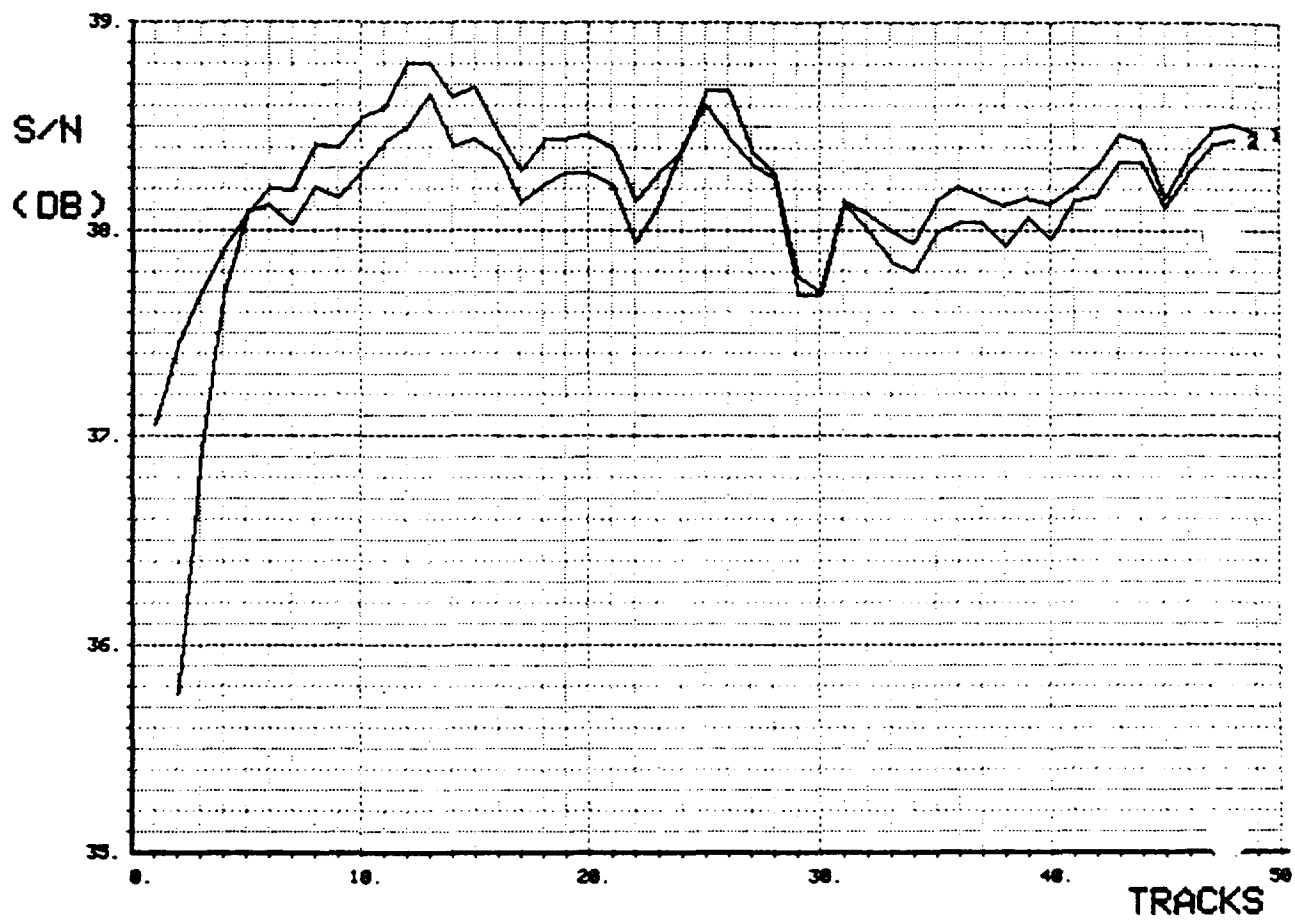
6-2-89



MISS AMERICA

1 - RM6
2 - RM7

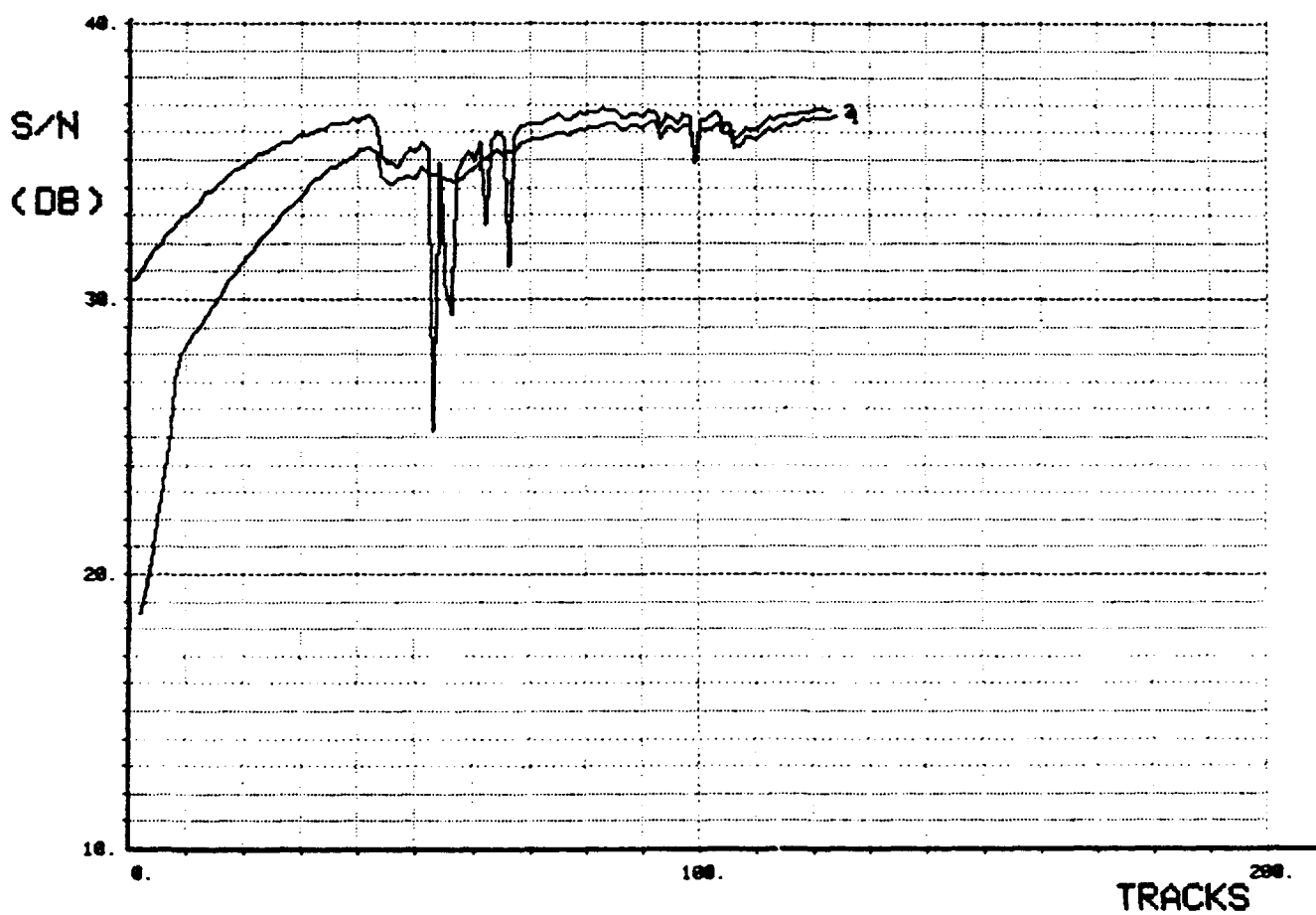
6-2-69



SWING

1 : RMS
2 : RMT

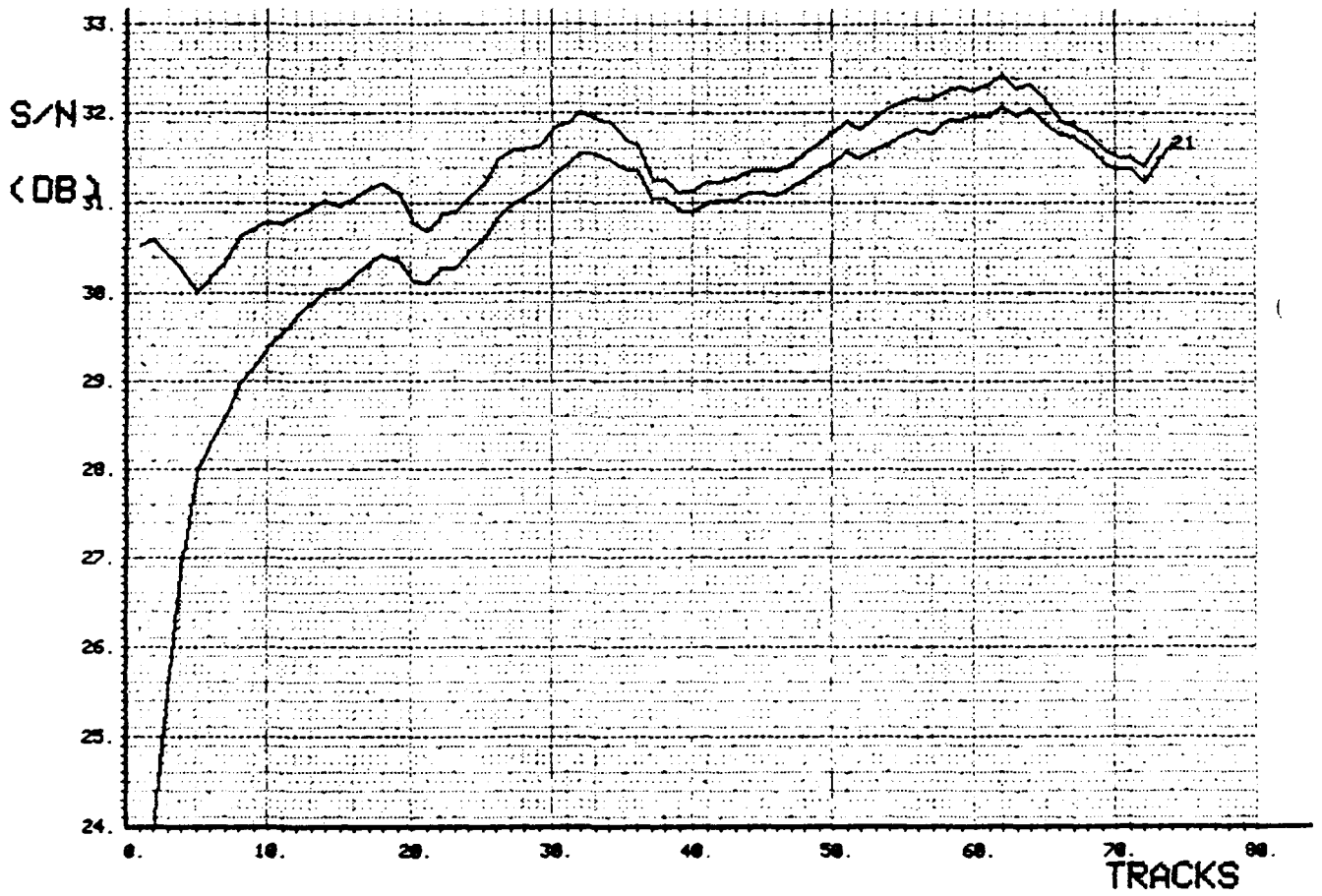
6-2-89



SALESMAN

1. RM6
2. RM7

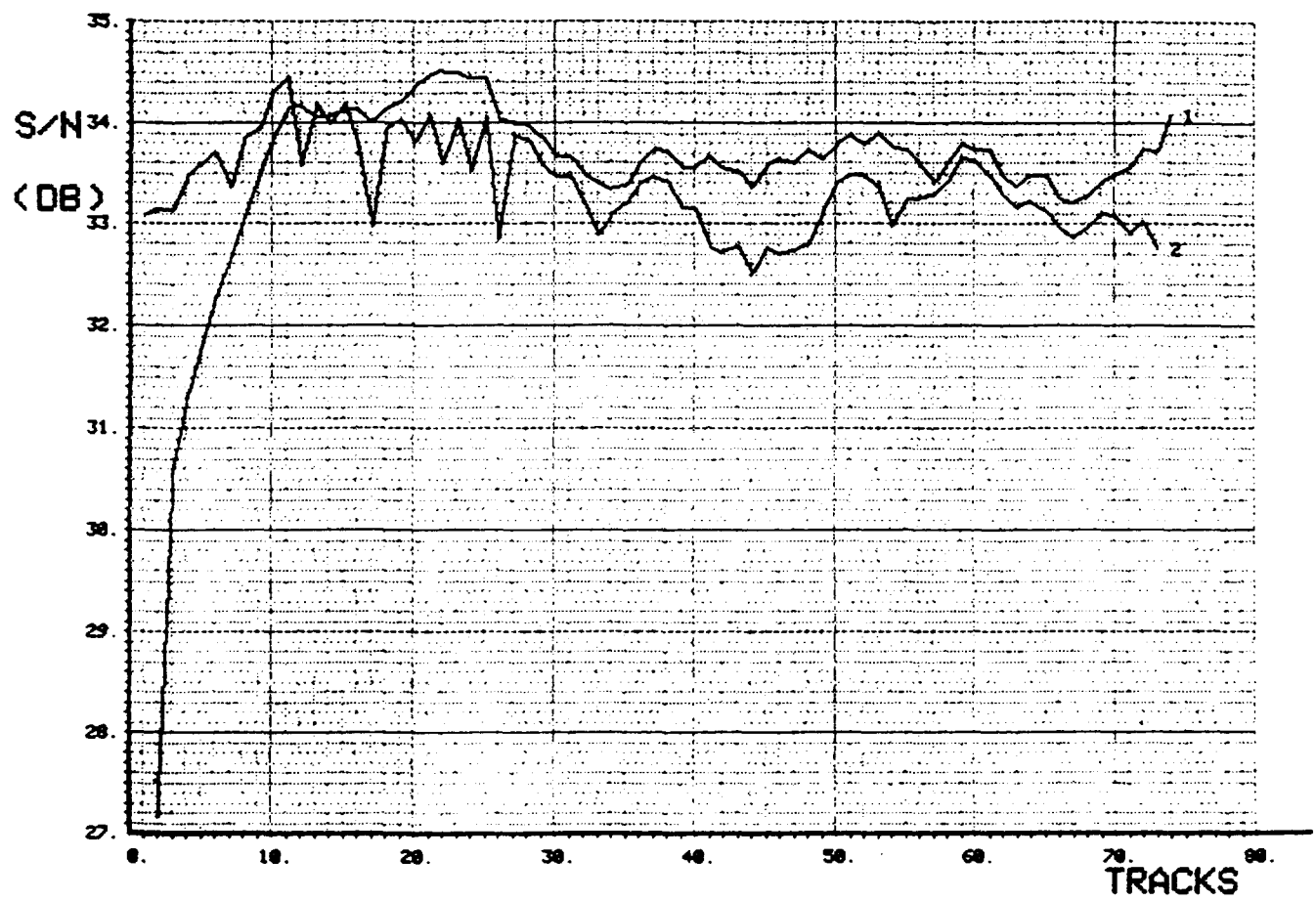
6-2-69



BLUE JACKET

1 : RMS
2 : RMD

6-2-89



Statistics Reference Model 7

PTT Research Neher Laboratories
Visual Communications Research
Date : 6 - 2 - 1989

Sequence : Claire

Modification : RM7

Number of tracks for statistics : 78

Temporal resolution : 10 Hz

Item	occurence	percent	pat.length	tot.length
pattern 1	302	3.2	4	8
pattern 2	2268	24.0	2	6
pattern 3	284	3.0	5	13
pattern 4	2089	22.1	2	6
pattern 5	332	3.5	5	13
pattern 6	2446	25.9	2	10
pattern 7	1738	18.4	3	15

average pattern length 2.44

average bits for pattern and eob 9.21

Statistics Reference Model 7

PTT Research Neher Laboratories
Visual Communications Research
Date : 6 - 2 - 1989

Sequence : Miss America

Modification : RM7

Number of tracks for statistics : 49

Temporal resolution : 10 Hz

Item	occurence	percent	pat.length	tot.length
pattern 1	2539	29.2	4	8
pattern 2	1197	13.8	2	6
pattern 3	586	6.7	5	13
pattern 4	1272	14.6	2	6
pattern 5	641	7.4	5	13
pattern 6	1109	12.8	2	10
pattern 7	1347	15.5	3	15

average pattern length 3.16

average bits for pattern and eob 9.48

Statistics Reference Model 7

PTT Research Neher Laboratories
Visual Communications Research
Date : 6 - 2 - 1989

Sequence : Swing

Modification : RM7

Number of tracks for statistics : 124

Temporal resolution : 10 Hz

Item	occurence	percent	pat.length	tot.length
pattern 1	473	4.0	4	8
pattern 2	2437	20.4	2	6
pattern 3	489	4.1	5	13
pattern 4	2173	18.2	2	6
pattern 5	432	3.6	5	13
pattern 6	3170	26.5	2	10
pattern 7	2797	23.4	3	15

average pattern length 2.54

average bits for pattern and eob 9.78

Statistics Reference Model 7

PTT Research Neher Laboratories
Visual Communications Research
Date : 6 - 2 - 1989

Sequence : Salesman

Modification : RM7

Number of tracks for statistics : 74

Temporal resolution : 10 Hz

Item	occurence	percent	pat.length	tot.length
pattern 1	311	3.1	4	8
pattern 2	2358	23.7	2	6
pattern 3	135	1.4	5	13
pattern 4	2379	23.9	2	6
pattern 5	137	1.4	5	13
pattern 6	3629	36.5	2	10
pattern 7	998	10.0	3	15

average pattern length 2.24

average bits for pattern and eob 8.62

Statistics Reference Model 7

PTT Research Neher Laboratories
Visual Communications Research
Date : 6 - 2 - 1989

Sequence : Blue Jacket

Modification : RM7

Number of tracks for statistics : 74

Temporal resolution : 10 Hz

Item	occurence	percent	pat.length	tot.length
pattern 1	191	3.0	4	8
pattern 2	1437	22.2	2	6
pattern 3	172	2.7	5	13
pattern 4	1351	20.9	2	6
pattern 5	134	2.1	5	13
pattern 6	1701	26.3	2	10
pattern 7	1479	22.9	3	15

average pattern length 2.43

average bits for pattern and eob 9.50

References

- [1] , *Description Reference Model 7*,
CCITT doc 446
Source : The Netherlands