NRSC REPORT

NATIONAL RADIO SYSTEMS COMMITTEE

NRSC-R33
High-speed Subcarrier (Digital) HSSC Laboratory Test Report
May 1997

Part I - Report

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FOREWORD

NRSC-R33, High-speed Subcarrier (Digital) HSSC Laboratory Test Report, is the first of three test reports submitted to the NRSC's High-Speed FM Subcarrier (HSSC) Subcommittee. Three digital FM subcarrier systems were evaluated during these tests—DARC (submitted by Digital DJ, Inc.), STIC (submitted by Mitre Corporation), and HSDS (submitted by Seiko, Inc.). The co-chairmen of the HSSC Subcommittee at the time of the submission of NRSC-R33 were Michael Rau and David Kelly. The NRSC Chairman at the time of the submission of NRSC-R33 was Charles Morgan.

The NRSC is jointly sponsored by the Consumer Electronics Association and the National Association of Broadcasters. It serves as an industry-wide standards-setting body for technical aspects of terrestrial over-the-air radio broadcasting systems in the United States.

NRSC HIGH-SPEED FM SUBCARRIER SUBCOMMITTEE

High-Speed Subcarrier

(Digital)

HSSC

Laboratory Test Report

Published by:
Consumer Electronics Manufacturers Association

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CONSUMER ELECTRONICS MANUFACTURERS ASSOCIATION
A sector of the
ELECTRONIC INDUSTRIES ASSOCIATION

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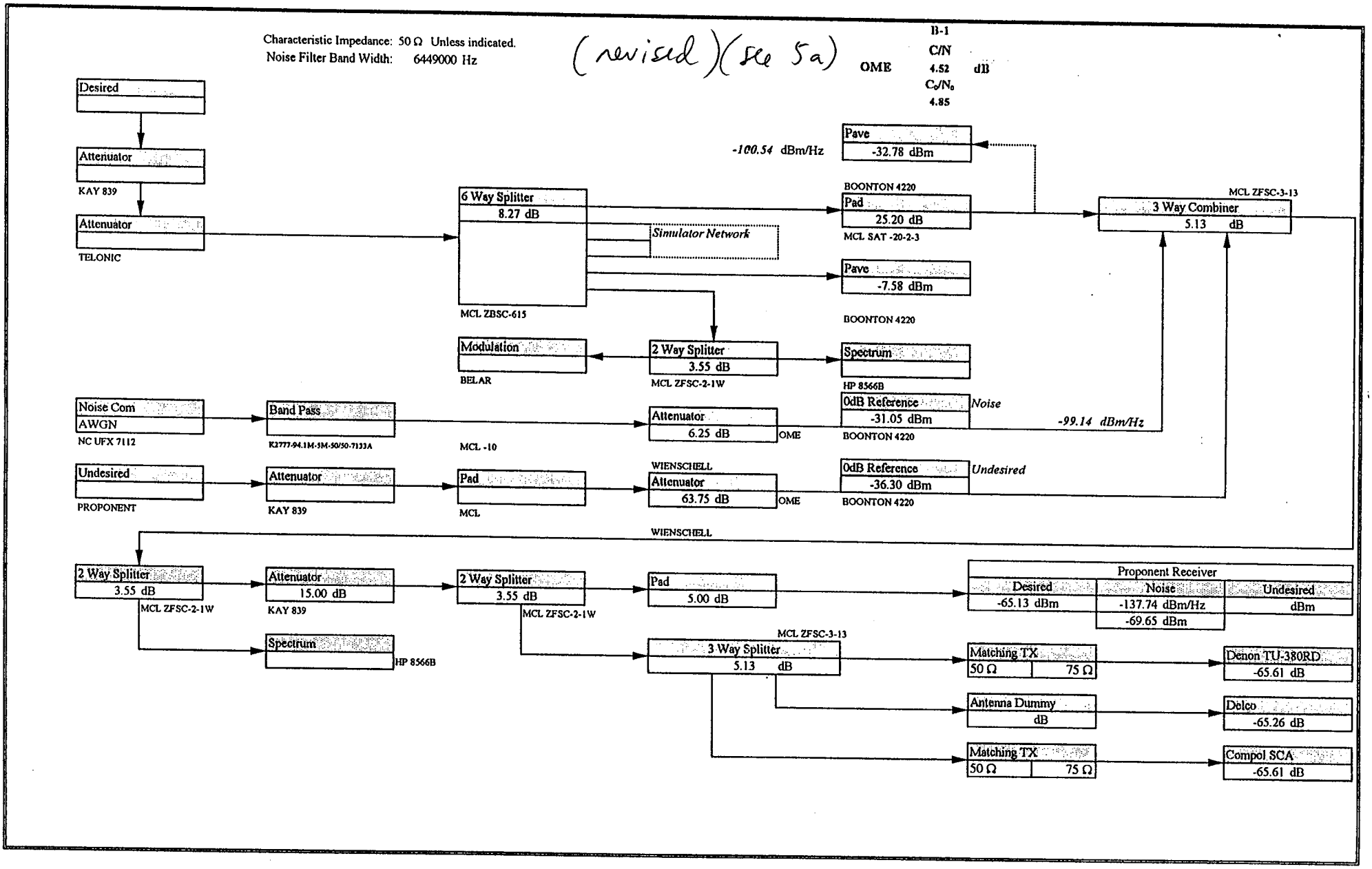
Digital Radio Test Laboratory



Digital Radio Test Laboratory

(revised) (see 6a)

B-1 Additive White Gaussian Noise
Characterization of HS Digital Subcarrier Signal Failure

Basic Test Parameters:

SIGNAL

Sig. Lev: -65dBm
Main Ch. Mod: CPN
SCA Group: Proponent Only
Error Meas. Duration: 5 Min.

PROPONENT SPECIFIC

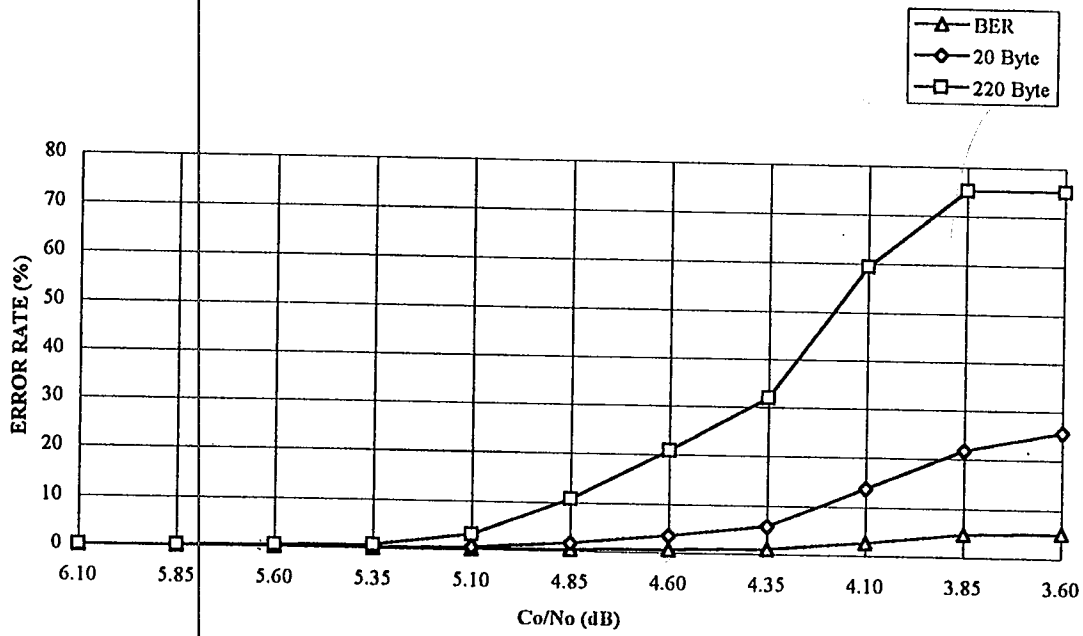
Analog Receivers: Delco RX 1
Compol 92KHz SCA Receiver
Denon RX 2 RBDS Receiver W/RDS Check software utilty

COMPOSITE SIGNAL

ORBAN #1
COMP OUT 1: Not Used
COMP OUT 2: Not Used
5-Band Medium Processed
ORBAN #2
COMP OUT 1: Proponent Only
COMP OUT 2: Prop + SCA
Main Channel modulation
adjusted for 110%

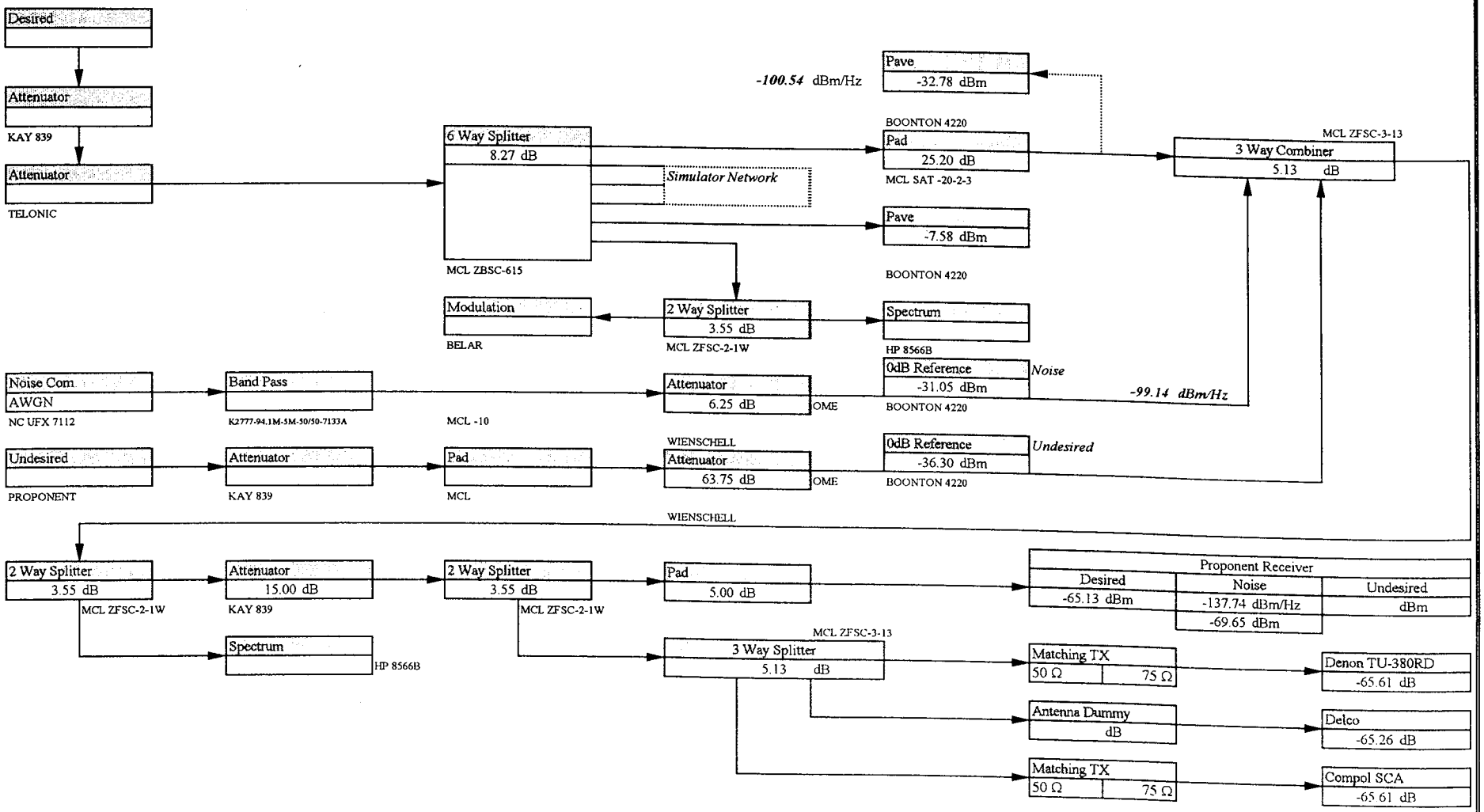
B1.1 Noise Failure Characterization

Noise Level		Error Level (%)			
C_o/N_o	Attn	BER	20 Byte	220 Byte	
62.35	63.75	0	0	0	
6.10	7.50	0	0	0	
5.85	7.25	0.004	0.026	0.143	OME
5.60	7.00	0.016	0.078	0.429	
5.35	6.75	0.017	0.117	0.714	
5.10	6.50	0.101	0.508	3.143	
4.85	6.25	0.345	1.721	10.857	
4.60	6.00	0.662	3.467	20.857	
4.35	5.75	1.071	5.696	32.00	
4.10	5.50	2.666	13.74	59.29	
3.85	5.25	4.667	21.74	75.14	
3.60	5.00	5.022	25.600	75.143	



Characteristic Impedance: 50 Ω Unless indicated.
Noise Filter Band Width: 6449000 Hz

B-1
C/N_0
OME 72.61 dB



Digital Radio Test Laboratory

6a

B-1 Additive White Gaussian Noise
Characterization of HS Digital Subcarrier Signal Failure

Basic Test Parameters:

SIGNAL

Sig. Lev: -65dBm
Main Ch. Mod: CPN
SCA Group: Proponent Only
Error Meas. Duration: 5 Min.

Analog Receivers: Delco RX 1
Compol 92KHz SCA Receiver
Denon RX 2 RBDS Receiver W/RDS Check software utilty

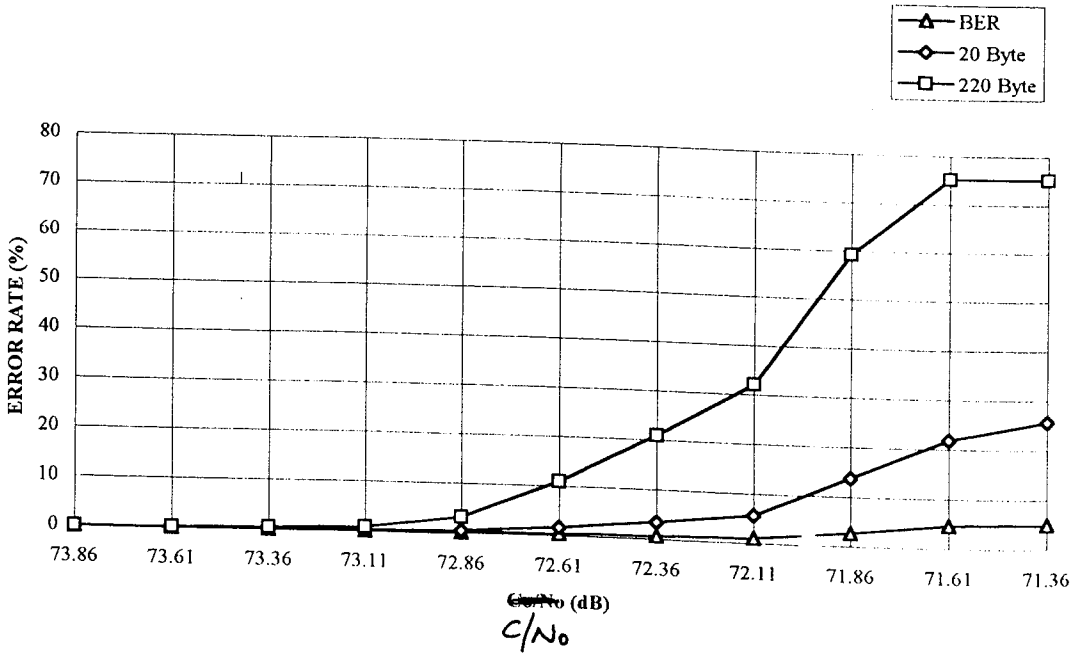
PROPONENT SPECIFIC

COMPOSITE SIGNAL

ORBAN #1
COMP OUT 1: Not Used
COMP OUT 2: Not Used
5-Band Medium Processed
ORBAN #2
COMP OUT 1: Proponent Only
COMP OUT 2: Prop + SCA
Main Channel modulation
adjusted for 110%

B1.1 Noise Failure Characterization

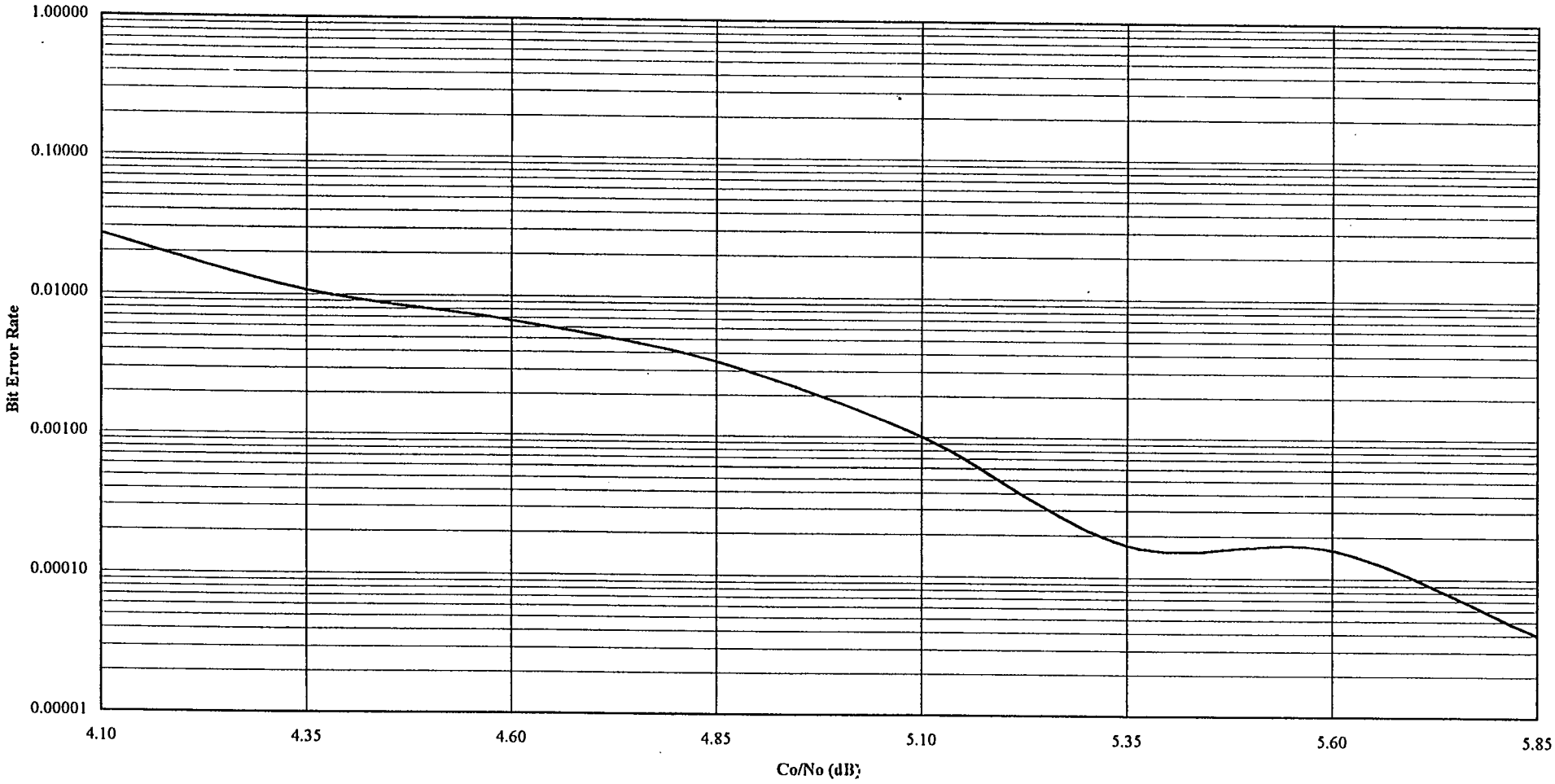
Noise Level		Error Level (%)			
C/N_0	Attn	BER	20 Byte	220 Byte	
130.11	63.75	0	0	0	
73.86	7.50	0	0	0	
73.61	7.25	0.004	0.026	0.143	**OME**
73.36	7.00	0.016	0.078	0.429	
73.11	6.75	0.017	0.117	0.714	
72.86	6.50	0.101	0.508	3.143	
72.61	6.25	0.345	1.721	10.857	
72.36	6.00	0.662	3.467	20.857	
72.11	5.75	1.071	5.696	32.00	
71.86	5.50	2.666	13.74	59.29	
71.61	5.25	4.667	21.74	75.14	
71.36	5.00	5.022	25.600	75.143	



Digital Radio Test Laboratory

(revised)(Sec 7a)

Digital DJ



Digital Radio Test Laboratory

B1.2 **Onset of Error with other SCAs** 10/2/96 (revised) (see 8a)

Main Ch. Mod: CPN
SCA Group: A

Noise Level Atten. Set	Error Level (%) BER	20byte	220byte	
7.75 dB	0	0	0	
7.50 dB	0.003	0.026	0.143	OME

(6.10 c/No based on data on pg. 6)

Main Ch. Mod: CPN
SCA Group: B

Noise Level Atten. Set	Error Level (%) BER	20byte	220byte	
8.00 dB	0	0	0	
7.75 dB	0.003	0.026	0.143	OME

(6.35 c/No based on data on pg. 6)

B1.3a **92KHz S/N ratio** (Compol 92 kHz SCA Rec.)
SCA Group: A

	S/N (dB)
Best Case RBDS & 92 kHz Only	48.5
With Proponent Group A	42.7
at OME	16

EO&C
Rushing noise heard from SCA receiver
Without other SCA

B1.3b **Main ch. S/N ratio** (Denon RX 2)
SCA Group: A 59 dB RMS No Filter

0dB taken with 1 kHz Mod Souce

With Grp A and B1.1 noise level: 35.3 dB OME

B1.4a **RBDS Block Error Level**

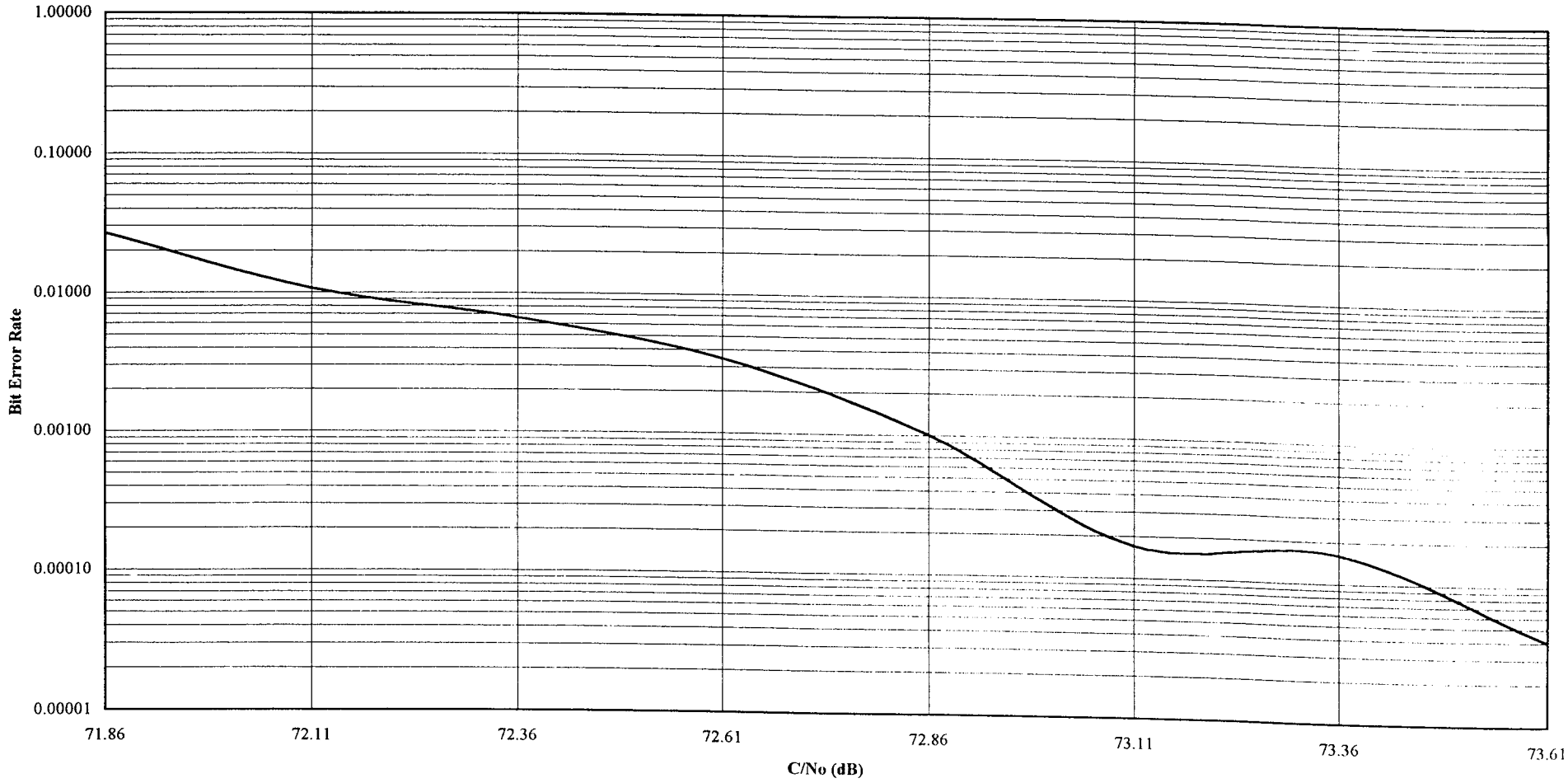
C_o/N_o	Attn		Target	Meas
6.60	8.00	dB	5	5

Noise Level for 5% ± 2% maximum block errors per 100 blocks (measured for a period of 5 minutes)

B1.4b **RBDS error measurement at B1.4 noise level**
MAX error measurement: 5 % Without Proponent

7a

Digital DJ



Digital Radio Test Laboratory

B1.2 Onset of Error with other SCAs 10/2/96

Main Ch. Mod: CPN
SCA Group: A

Noise Level Atten. Set	Error Level (%) BER	20byte	220byte	
7.75 dB	0	0	0	
7.50 dB	0.003	0.026	0.143	OME

Main Ch. Mod: CPN
SCA Group: B

Noise Level Atten. Set	Error Level (%) BER	20byte	220byte	
8.00 dB	0	0	0	
7.75 dB	0.003	0.026	0.143	OME

B1.3a 92KHz S/N ratio (Compol 92 kHz SCA Rec.)
SCA Group: A

	S/N (dB)
Best Case RBDS & 92 kHz Only	48.5
With Proponent Group A	42.7
at OME	16

EO&C
Rushing noise heard from SCA receiver
Without other SCA

B1.3b Main ch. S/N ratio (Denon RX 2)

SCA Group: A 59 dB RMS No Filter 0dB taken with 1 kHz Mod Souce

With Grp A and B1.1 noise level: 35.3 dB OME

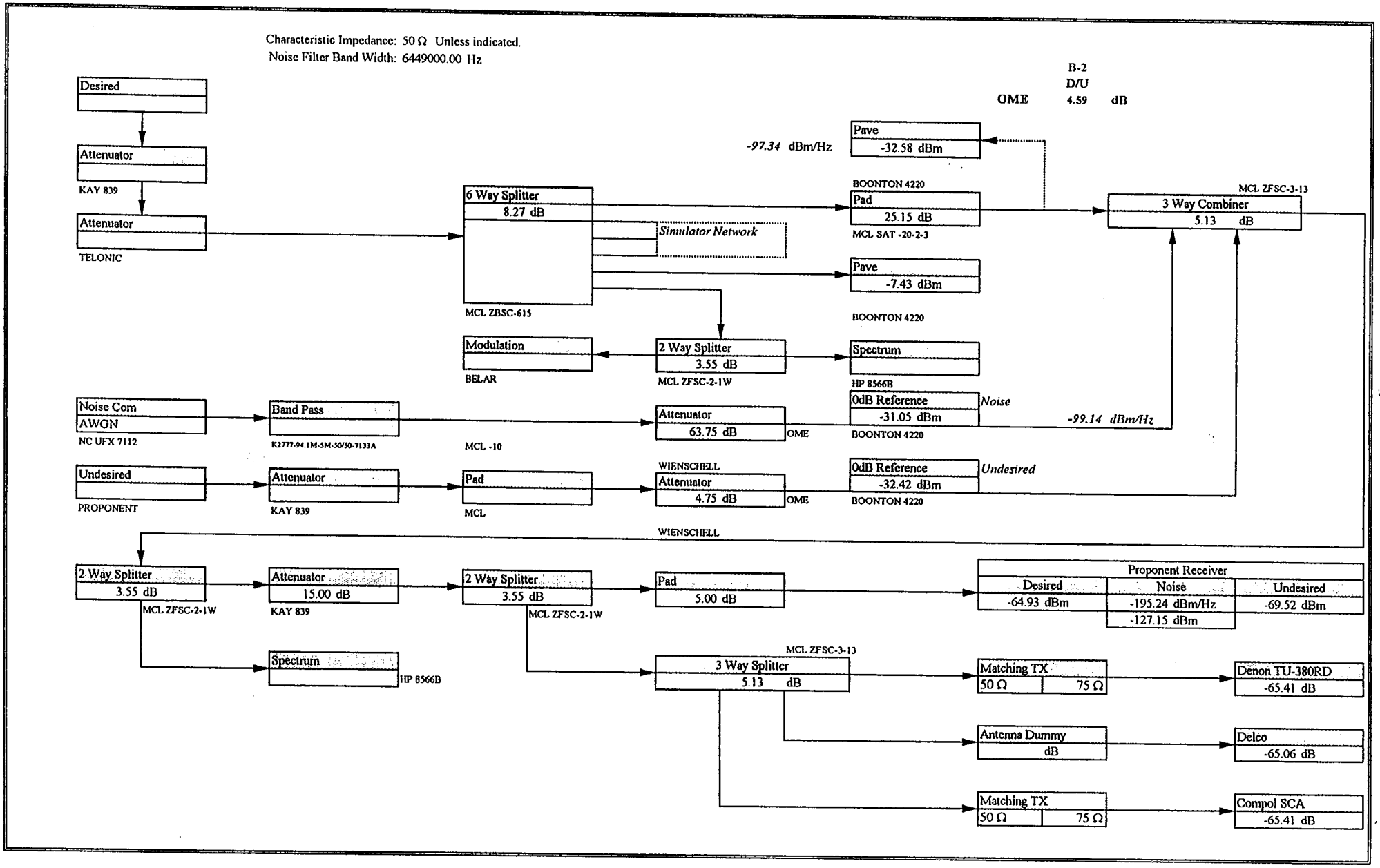
B1.4a RBDS Block Error Level

C/N_0	Attn		Target	Meas
74.36	8.00	dB	5	5

Noise Level for 5% ± 2% maximum block errors per 100 blocks (measured for a period of 5 minutes)

B1.4b RBDS error measurement at B1.4 noise level

MAX error measurement: 5 % Without Proponent


Characteristic Impedance: 50 Ω Unless indicated.
Noise Filter Band Width: 6449000.00 Hz
B-2
D/U
OME 4.59 dB
Desired
Attenuator
KAY 839
Attenuator
TELONIC
-97.34 dBm/Hz
Pave
-32.58 dBm
BOONTON 4220
Pad
25.15 dB
MCL SAT -20-2-3
MCL ZFSC-3-13
3 Way Combiner
5.13 dB
6 Way Splitter
8.27 dB
Simulator Network
MCL ZBSC-615
Pave
-7.43 dBm
BOONTON 4220
Modulation
BELAR
2 Way Splitter
3.55 dB
MCL ZFSC-2-1W
Spectrum
HP 8566B
Noise Com
AWGN
NC UFX 7112
Band Pass
K2777-94.1M-5M-50/50-7133A
MCL -10
Attenuator
63.75 dB
OME
0dB Reference
-31.05 dBm
BOONTON 4220
Noise
-99.14 dBm/Hz
Undesired
PROPONENT
Attenuator
KAY 839
Pad
MCL
WIENSCHELL
Attenuator
4.75 dB
OME
0dB Reference
-32.42 dBm
BOONTON 4220
Undesired
WIENSCHELL
2 Way Splitter
3.55 dB
MCL ZFSC-2-1W
Attenuator
15.00 dB
KAY 839
2 Way Splitter
3.55 dB
MCL ZFSC-2-1W
Pad
5.00 dB
Proponent Receiver
Desired
-64.93 dBm
Noise
-195.24 dBm/Hz
-127.15 dBm
Undesired
-69.52 dBm
Spectrum
HP 8566B
MCL ZFSC-3-13
3 Way Splitter
5.13 dB
Matching TX
50 Ω
75 Ω
Denon TU-380RD
-65.41 dB
Antenna Dummy
dB
Delco
-65.06 dB
Matching TX
50 Ω
75 Ω
Compol SCA
-65.41 dB

B-2 Co-Channel
Characterization of HS Digital Subcarrier Signal Failure

PROPONENT SPECIFIC

COMPOSITE SIGNAL

ORBAN #1
COMP OUT 1: Prop + SCA
COMP OUT 2: Proponent Only

ORBAN #2
COMP OUT 1: Proponent Only
COMP OUT 2: Prop + SCA

Main Channel modulation adjusted for 110%

B2.1 Co-Channnel Analog Reference

Desired Signal Parameters

RF Key Point Meas.: -32.58 dBm
RX RF Level: -65 dBm
Main Channel Modulation: 1 kHz
Modulation Level: 100 % 0 dB Reference
SCA Group: None
Measurement: 45dB S/N ratio target on main analog channel receiver

Undesired Signal Parameters

RF Key Point Meas.: -32.42 dBm
Main Channel Modulation: CPN
Modulation Level: 110 %
SCA Group: 67 & 92 kHz
SCA Modulation: 0.4 & 1 kHz
(Measurement is rms w/15 kHz LPF)

	Delco RX 1	d/u	Denon RX 2	d/u
Best Case S/N:	55.70 dB		60.60 dB	
S/N:	45.00 dB		45.00 dB	
Reference: Atten:	26.00 dB	**25.84 dB**	31.00 dB	**30.84 dB**

B2.2a Co-Channnel HSD Interference

Desired Signal Parameters

RF Level: -65dBm
Modulation Type: None
Modulation Level: None
SCA Group: None

Undesired Signal Parameters

Modulation Type: CPN
Modulation Level: 110%
SCA Group: Group A

	Delco RX 1	d/u	Denon RX 2	d/u
S/N:	45.00 dB		45.00 dB	
Group A: Atten:	26.00 dB	**25.84 dB**	31.00 dB	**30.84 dB**

B2.2b Co-Channnel HSD Interference

Desired Signal Parameters

RF Level: -65dBm
Modulation Type: None
Modulation Level: None
SCA Group: None

Undesired Signal Parameters

Modulation Type: CPN
Modulation Level: 110%
SCA Group: Group B

Measurement: Target Signal-to-Noise Ratio

	Delco RX 1		d/u	Denon RX 2		d/u
	S/N:	45.00 dB		S/N:	45.00 dB	
Group B:	Atten:	26.00 dB	**25.84 dB**	Atten:	31.00 dB	**30.84 dB**

B2.2c Co-Channnel HSD -> Analog Interference

Desired Signal Parameters

RF Level: -65dBm
Modulation Type: None
Modulation Level: None
SCA Group: None

Undesired Signal Parameters

Modulation Type: CPN
Modulation Level: 110%
SCA Group: Proponent Only

Measurement: Target Signal-to-Noise Ratio

	Delco RX 1		d/u	Denon RX 2		d/u
	S/N:	45.00 dB		S/N:	45.00 dB	
	Atten:	25.75 dB	**25.59 dB**	Atten:	30.50 dB	**30.34 dB**

B2.3 **Co-Channel Analog -> HSD interference**

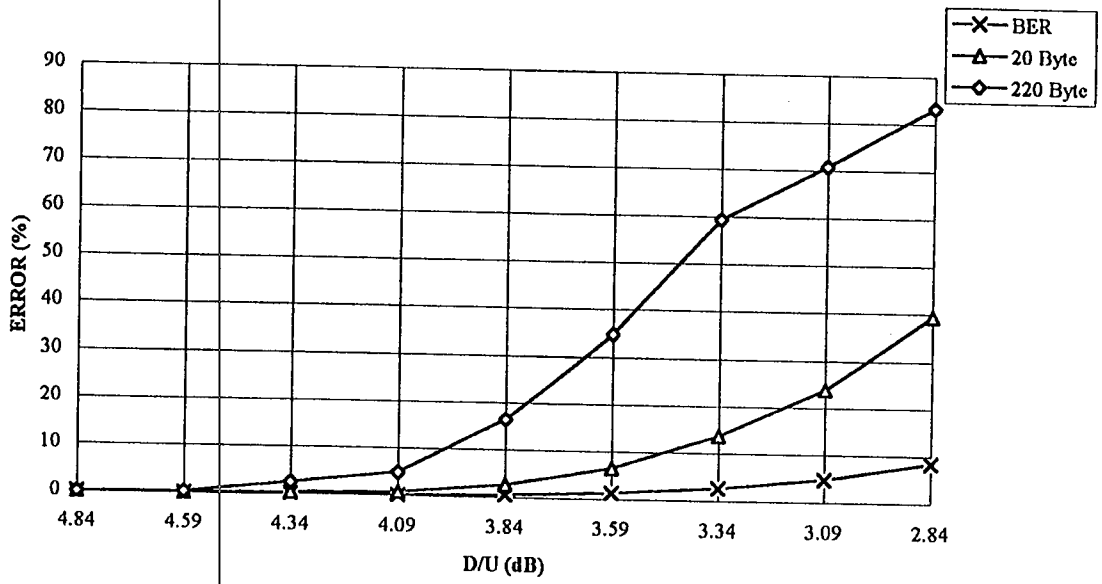
Desired Signal Parameters

RF Level: -65 dBm
Modulation Type: CPN
Modulation Level: 110 %
SCA Group: Proponent Only

Undesired Signal Parameters

Modulation Type: CPN
Modulation Level: 110 %
SCA Group: 67 &92 kHz

Co-Chan. D/U	Level Attn	Cum. Error Level BER	20 Byte	220 Byte	
4.84	5.00	0	0	0	
4.59	4.75	0.014	0.052	0.286	OME
4.34	4.50	0.082	0.391	2.571	
4.09	4.25	0.168	0.834	5.000	
3.84	4.00	0.520	2.633	16.43	
3.59	3.75	1.278	6.52	34.86	
3.34	3.50	2.623	13.67	59.29	
3.09	3.25	4.797	23.88	70.71	
2.84	3.00	8.425	39.42	83.29	



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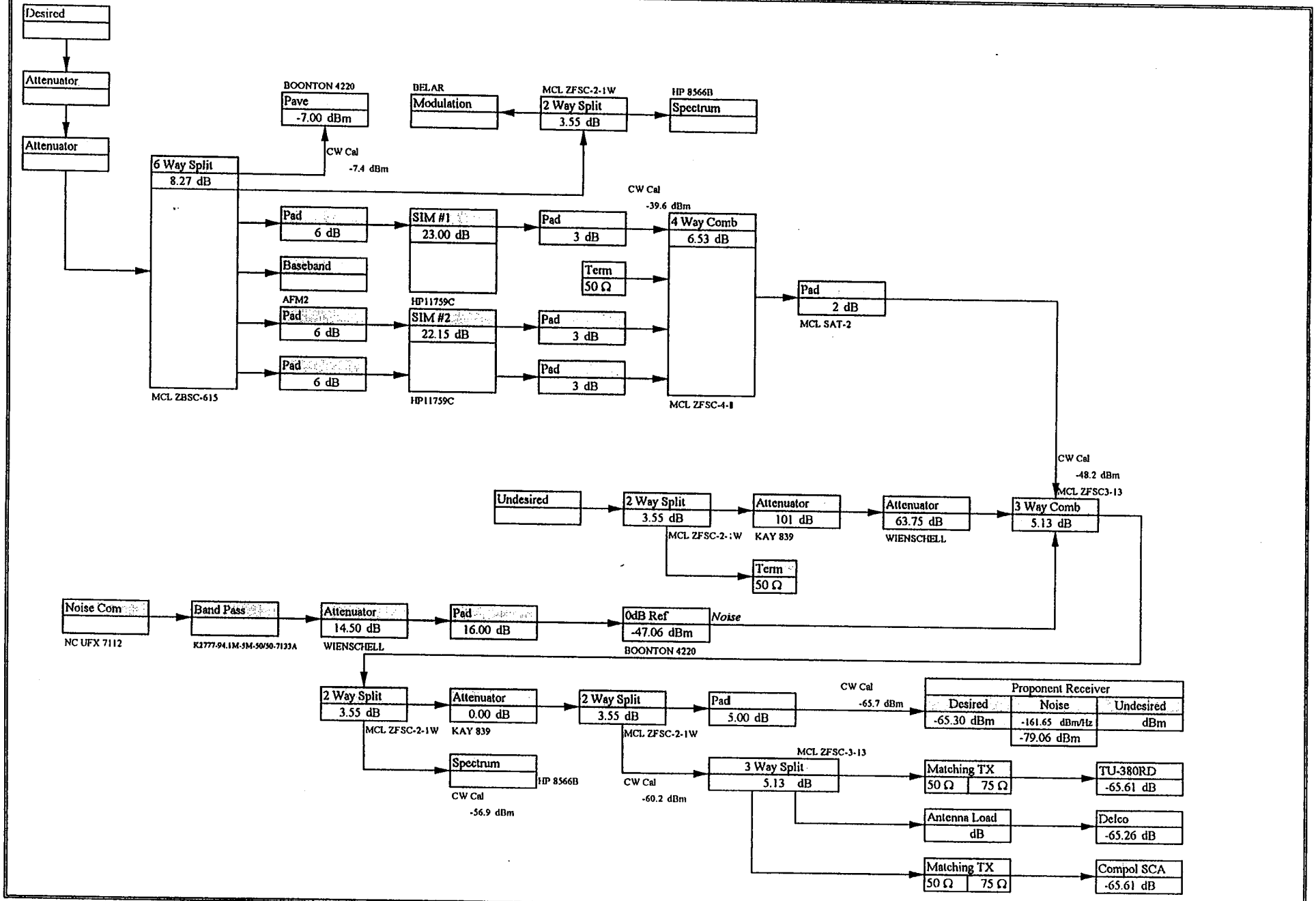

Digital Radio Test Laboratory (revised)

B-3 Multipath
Characterization of HS Digital Subcarrier Signal Failure

Basic Test Parameters: **SIGNAL** **PROPONENT SPECIFIC** **COMPOSITE SIGNAL**

One Path Zero Phase Reference: -65dBm
Main Channel Mod: CPN
SCA Group: A
Error Measurement Duration: 5 Min.

Analog Receivers: Delco RX 1
Compol 92KHz SCA Receiver
Denon RX 2 RBDS Receiver W/RDS Check software utilty

ORBAN #1
COMP OUT 1: Not Used
COMP OUT 2: Not Used
5-Band Medium Processed
ORBAN #2
COMP OUT 1: Proponent Only
COMP OUT 2: Prop + SCA
Main Channel modulation
adjusted for 110%

	Noise Level		Error Level (%)			EO&C
	C_o/N_o	Attn	BER	20 Byte	220 Byte	
Urban Slow	63.34	63.75	0.1450	0.6000	2.1430	Performance impaired without added noise. MAX RBDS Block Error= 11 %
Urban Fast	63.34	63.75	1.2230	6.595	33.57	Performance impaired without added noise. MAX RBDS Block Error= 14 %
Rural Fast	63.34	63.75	0.5030	2.815	17.00	Performance impaired without added noise. MAX RBDS Block Error= 16 %
Obstructed	63.34	63.75	100.0	100.0	100.0	Receiver does not acquire signal consistently. MAX RBDS Block Error= 98 %

Digital Radio Test Laboratory

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B-3 Multipath
Characterization of HS Digital Subcarrier Signal Failure

Basic Test Parameters: **SIGNAL**

One Path Zero Phase Reference: -65dBm
Main Channel Mod: CPN
SCA Group: A
Error Measurement Duration: 5 Min.

Analog Receivers: Delco RX 1
Compol 92KHz SCA Receiver
Denon RX 2 RBDS Receiver W/RDS Check software utilty

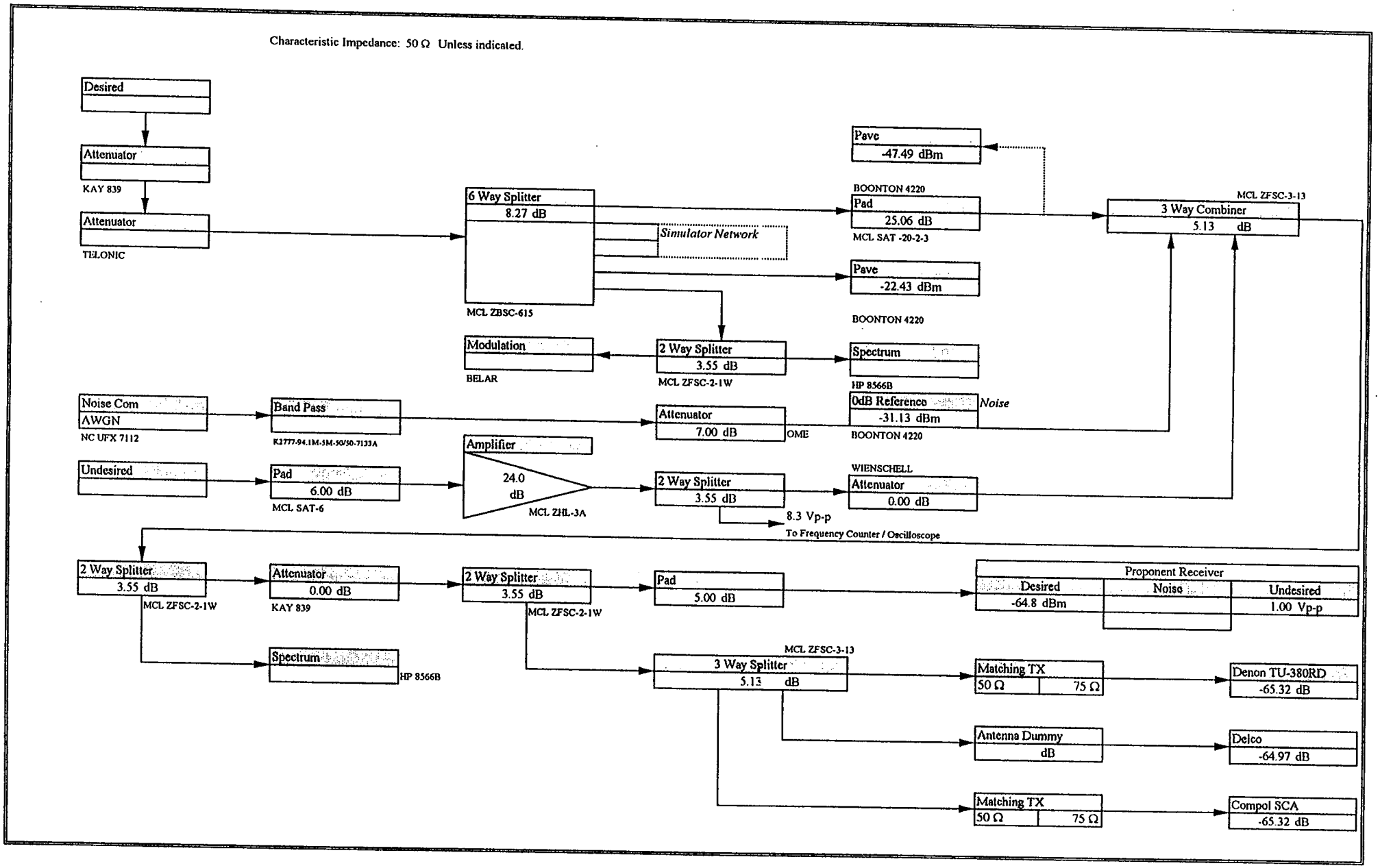
PROPONENT SPECIFIC

COMPOSITE SIGNAL

ORBAN #1
COMP OUT 1: Not Used
COMP OUT 2: Not Used
5-Band Medium Processed
ORBAN #2
COMP OUT 1: Proponent Only
COMP OUT 2: Prop + SCA
Main Channel modulation
adjusted for 110%

	Noise Level		Error Level (%)			EO&C
	C/N_0	Attn	BER	20 Byte	220 Byte	
Urban Slow	**131.10**	63.75	0.1450	0.6000	2.1430	Performance impaired without added noise. MAX RBDS Block Error= 11 %
Urban Fast	**131.10**	63.75	1.2230	6.595	33.57	Performance impaired without added noise. MAX RBDS Block Error= 14 %
Rural Fast	**131.10**	63.75	0.5030	2.815	17.00	Performance impaired without added noise. MAX RBDS Block Error= 16 %
Obstructed	**131.10**	63.75	100.0	100.0	100.0	Receiver does not acquire signal consistently. MAX RBDS Block Error= 98 %

Digital Radio Test Laboratory



B-4 Impulse Noise 11/6/96

Desired Signal

-65 dBm at receiver input.
Group A subcarriers.

Results accumulated over 5 minute measurement period.

Undesired Signal

10 ns wide 1.0 Vp-p pulse at receiver input
Repetition Rate Variable

Pilot Only

Repetition Rate (Hz)	BER	20 Byte	220 Byte
100	0.0000	0.0000	0.0000
200	0.0000	0.0000	0.0000
300	0.0000	0.0000	0.0000
600	0.0000	0.0000	0.0000
1000	0.1780	0.9120	6.286
1000	0.0060	0.0260	0.1430
1000	0.0000	0.0000	0.0000

Attenuator Setting (dB)	Voltage (Vp-p)
0	1.0000
0	1.0000
0	1.0000
0	1.0000
0	1.0000
10	0.3162
15	0.1778

Clipped Pink Noise (Stereo)

Repetition Rate (Hz)	BER	20 Byte	220 Byte
100	0.0000	0.0000	0.0000
200	0.0000	0.0000	0.0000
300	0.0000	0.0000	0.0000
600	0.0000	0.0000	0.0000
1000	0.1320	0.6520	4.286
1000	0.0070	0.0260	0.1430
1000	0.0060	0.0260	0.1430
1000	0.0000	0.0000	0.0000

Attenuator Setting (dB)	Voltage (Vp-p)
0	1.000
0	1.000
0	1.000
0	1.000
0	1.000
10	0.3162
15	0.1778
20	0.1000

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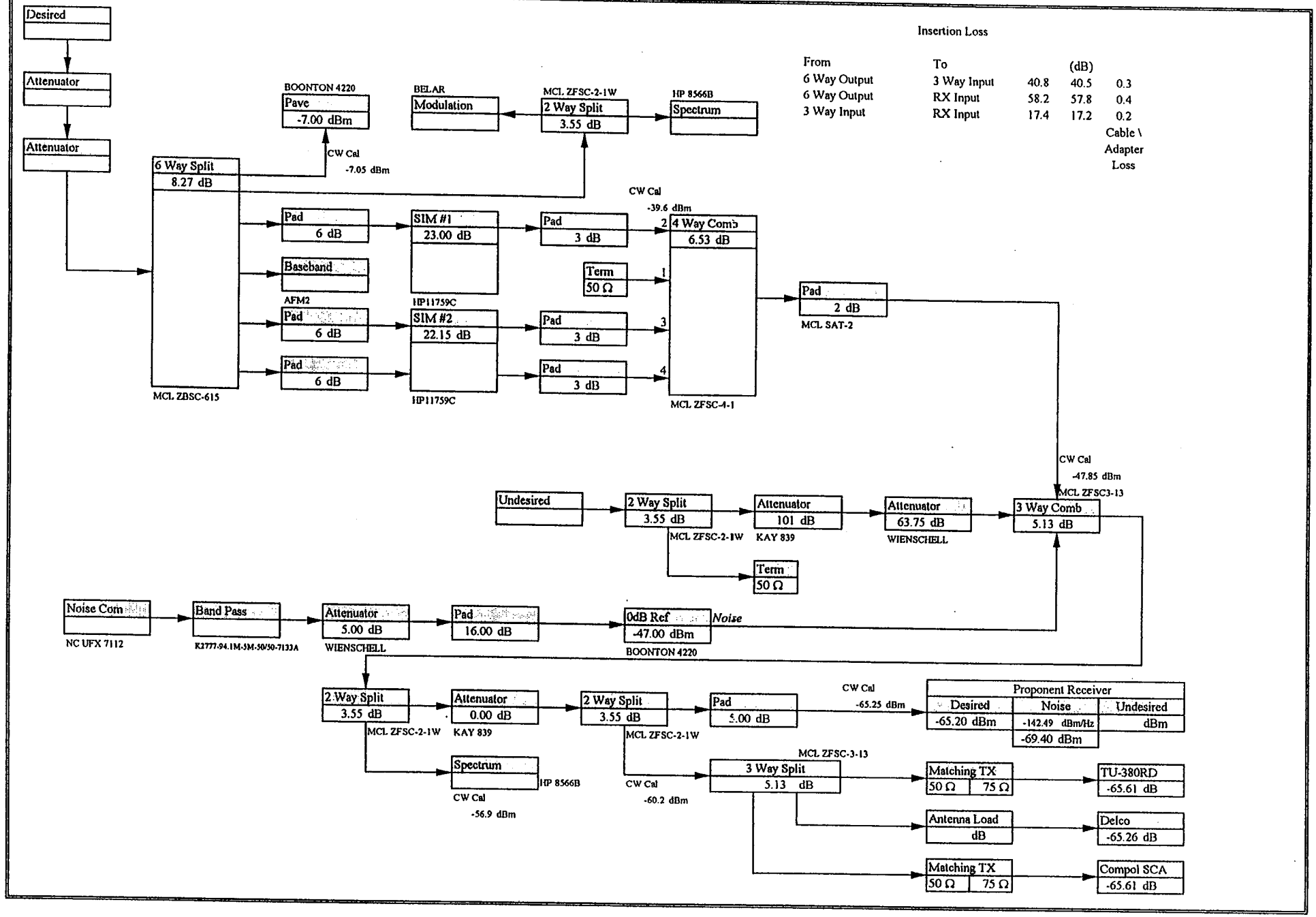

Test	B-5	Airplane Flutter							
Scenario	Reflected Path	Medium Signal Strength							
		CPN			Pilot Only				
#1	400 km/h Doppler 27.5 µs Delay 8.00 dB	BER 100.00	20 Byte 100.00	220Byte 100.00	BER 0.00	20 Byte 0.00	220Byte 0.00	%	System does not acquire signal with CPN on main channel. System performs error free with pilot only.
#2	200 km/h Doppler 13.7 µs Delay 6.00 dB	BER 12.29	20 Byte 54.47	220Byte 99.00	BER 0.00	20 Byte 0.00	220Byte 0.00	%	System performs error free with pilot only.
#3	100 km/h Doppler 6.8 µs Delay 4.00 dB	BER 2.76	20 Byte 14.89	220Byte 66.00	BER 0.00	20 Byte 0.00	220Byte 0.00	%	System performs error free with pilot only.
Test Date: 22-Oct-96 ngineer(s): DML Main Channel Mod: Clipped Pink Noise									

B-6 Weak Signal
Characterization of HS Digital Subcarrier Signal Failure

pilot:	9 %	9 %	9 %
proponent:	10 %	10 %	10 %
57 kHz:	%	3 %	10 %
92 kHz:	%	7 %	%
Total Injection:	19 %	29 %	29 %
Group	Proponent Only	A	B
Signal Level:	-92 ≤OME< -91 dBm	-92 ≤OME< -91 dBm	-92 ≤OME< -91 dBm

C-1 Re-Acquisition 11/4/96

	Re-Acquisition Time (s)		
	POF-2dB	POF-4dB	POF-6dB
	2.2	2.8	2.6
	2.4	1.5	2.1
	2.8	2.8	1.9
	3.8	2.6	1.2
	1.1	2.4	2.0
Average	2.5	2.4	2.0

Point Of Failure Attenuator Setting	3.00 dB
Desired Signal Reference Level	-47.83 dBm
Noise 0 dB Reference	-47.1 dBm
Desired Signal Level at Receiver	-65 dBm

POF Noise Level is defined as the level which causes 220 byte Packet Error Rate of 95% ± 5%.

ABBA Used as Modulation Source on Main Channel

Connection is broken for at least 30 seconds.

Test	C-2	Re-Acquisition with Multipath Urban Slow Rayleigh		
		Re-Acquisition Time (s)		
Tsim (s)		POF-2	POF-4	POF-6
5		2.9	1.3	2.2
10		2.7	1.8	2.3
15		2.5	1.9	3.0
20		1.9	3.0	1.9
Average		2.5	2.0	2.4

POF Attenuator Setting: 12 dB

EO&C

Point of Failure (POF) defined as:
220 Byte Message Error Rate ≥ 50 %

Test Date: 24-Oct-96
ngineer(s): DML

Test	C-2	Re-Acquisition with Multipath Urban Fast Rayleigh

Tsim (s)	Re-Acquisition Time (s) POF-2	POF-4	POF-6
5	2.1	2.1	1.2
10	2.1	2.5	1.8
15	4.8	4.7	3.1
20	3.6	2.3	2.5
Average	3.2	2.9	2.2

POF Attenuator Setting: 18 dB

EO&C

Test Date: 24-Oct-96
ngineer(s): DML

Test C-2 Re-Acquisition with Multipath
Rural Fast Rayleigh

Tsim (s)	Re-Acquisition Time (s) POF-2	POF-4	POF-6
5	3.0	3.1	2.1
10	1.7	2.7	5.2
15	1.8	3.0	2.2
20	4.2	3.1	1.8
Average	2.7	3.0	2.8

POF Attenuator Setting: 20 dB

EO&C

Test Date: 24-Oct-96
ngineer(s): DML

Test	C-2	Re-Acquisition with Multipath Obstructed Rayleigh

Tsim (s)	Re-Acquisition Time (s) POF
5	
10	
15	
20	
Average	0.0

EO&C

System only re-acquires for short bursts which are not long enough to determine re-acquisition time accurately.

Test Date: 24-Oct-96

ngineer(s): DML

Digital Radio Test Laboratory (revised)

E-2 **Host Analog Program -› HSDS with Multipath**

Engineer(s): DML Date: 24-Oct-96

Basic Test Parameters: **SIGNAL** **PROPONENT SPECIFIC** **COMPOSITE SIGNAL**

One Path Zero Phase Reference: -65dBm
Main Channel Mod: CPN
SCA Group: A
Error Measurement Duration: 5 minutes
92 kHz: Track 48 on EBU SQAM Disk

5-Band Medium Processed
ORBAN #2
COMP OUT 1: Proponent Only
COMP OUT 2: Prop + SCA
Main Channel modulation
adjusted for 110%

		Noise Level C_o/N_o	Attn	Error Level (%) BER	20 Byte	220 Byte	EO&C
Urban Slow	CPN	**63.28**	63.75	0.8300	2.646	4.571	
	Pilot Only	**63.28**	63.75	0.00	0.00	0.00	Pilot only on main channel produces error free operation.
Urban Fast	CPN	**63.28**	63.75	1.247	6.348	34.29	
	Pilot Only	**63.28**	63.75	0.0510	0.2740	1.857	Improvement without main channel modulation.
Rural Fast	CPN	**63.28**	63.75	0.4980	2.685	16.43	
	Pilot Only	**63.28**	63.75	0.0670	0.3130	2.429	Improvement without main channel modulation.
Obstructed	CPN	**63.28**	63.75	17.36	65.51	98.00	4 out of 28 possible iterations of file transfers made it. Statistics listed are based on the 4 files that made it
	Pilot Only	**63.28**	63.75	3.182	15.56	63.86	Improvement without main channel modulation.

Digital Radio Test Laboratory

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E-2 Host Analog Program -› HSDS with Multipath

Engineer(s): DML Date: 24-Oct-96

Basic Test Parameters: **SIGNAL** **PROPONENT SPECIFIC** **COMPOSITE SIGNAL**

One Path Zero Phase Reference: -65dBm
Main Channel Mod: CPN
SCA Group: A
Error Measurement Duration: 5 minutes
92 kHz: Track 48 on EBU SQAM Disk

5-Band Medium Processed
ORBAN #2
COMP OUT 1: Proponent Only
COMP OUT 2: Prop + SCA
Main Channel modulation
adjusted for 110%

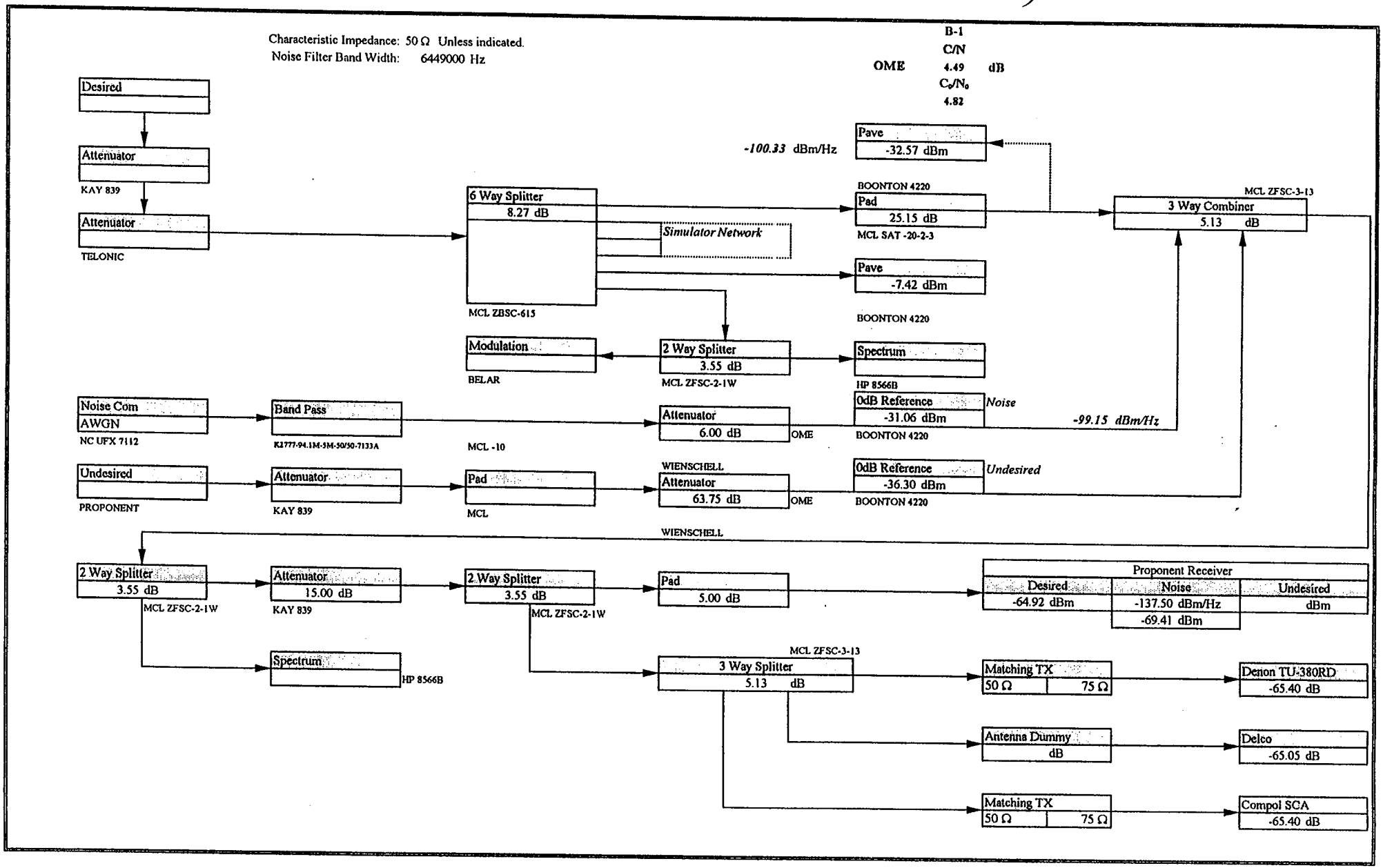
		Noise Level		Error Level (%)			
		C/N_0	Attn	BER	20 Byte	220 Byte	EO&C
Urban Slow	CPN	**131.04**	63.75	0.8300	2.646	4.571	
	Pilot Only	**131.04**	63.75	0.00	0.00	0.00	Pilot only on main channel produces error free operation.
Urban Fast	CPN	**131.04**	63.75	1.247	6.348	34.29	
	Pilot Only	**131.04**	63.75	0.0510	0.2740	1.857	Improvement without main channel modulation.
Rural Fast	CPN	**131.04**	63.75	0.4980	2.685	16.43	
	Pilot Only	**131.04**	63.75	0.0670	0.3130	2.429	Improvement without main channel modulation.
Obstructed	CPN	**131.04**	63.75	17.36	65.51	98.00	4 out of 28 possible iterations of file transfers made i
	Pilot Only	**131.04**	63.75	3.182	15.56	63.86	Statistics listed are based on the 4 files that made it Improvement without main channel modulation.

MITRE

TESTS

B, C, & E-2

Digital Radio Test Laboratory (revised)



Digital Radio Test Laboratory

B-1 Additive White Gaussian Noise
Characterization of HS Digital Subcarrier Signal Failure

(revised)

Test Date: 11/5/96
Engineer(s): DML

Basic Test Parameters:

SIGNAL

Sig. Lev: -65dBm
Main Ch. Mod: CPN
SCA Group: Prop. Only
Error Meas. Duration: 5 Min.

PROPONENT SPECIFIC

Interleaver Level 2

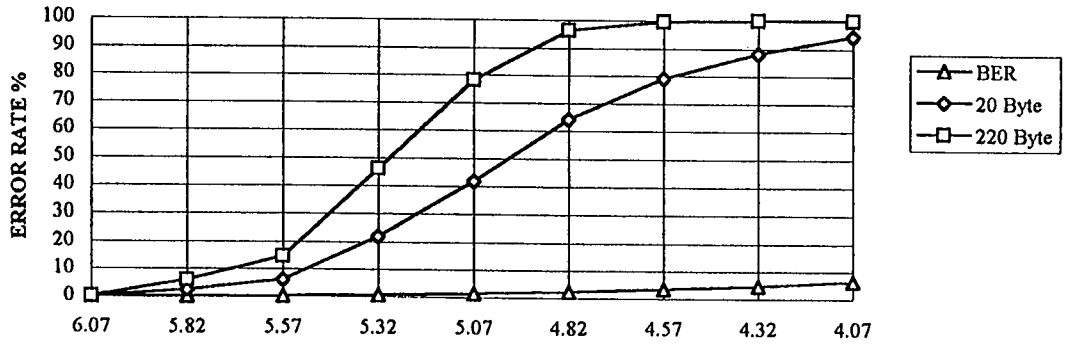
COMPOSITE SIGNAL

5-Band Medium Processed
ORBAN #2
COMP OUT 1: Proponent Only
COMP OUT 2: Prop + SCA
Main Channel modulation
adjusted for 110%

Analog Receivers: Delco RX 1
Compol 92KHz SCA Receiver
Denon RX 2 RBDS Receiver W/RDS Check software utilty

B1.1 Noise Failure Characterization

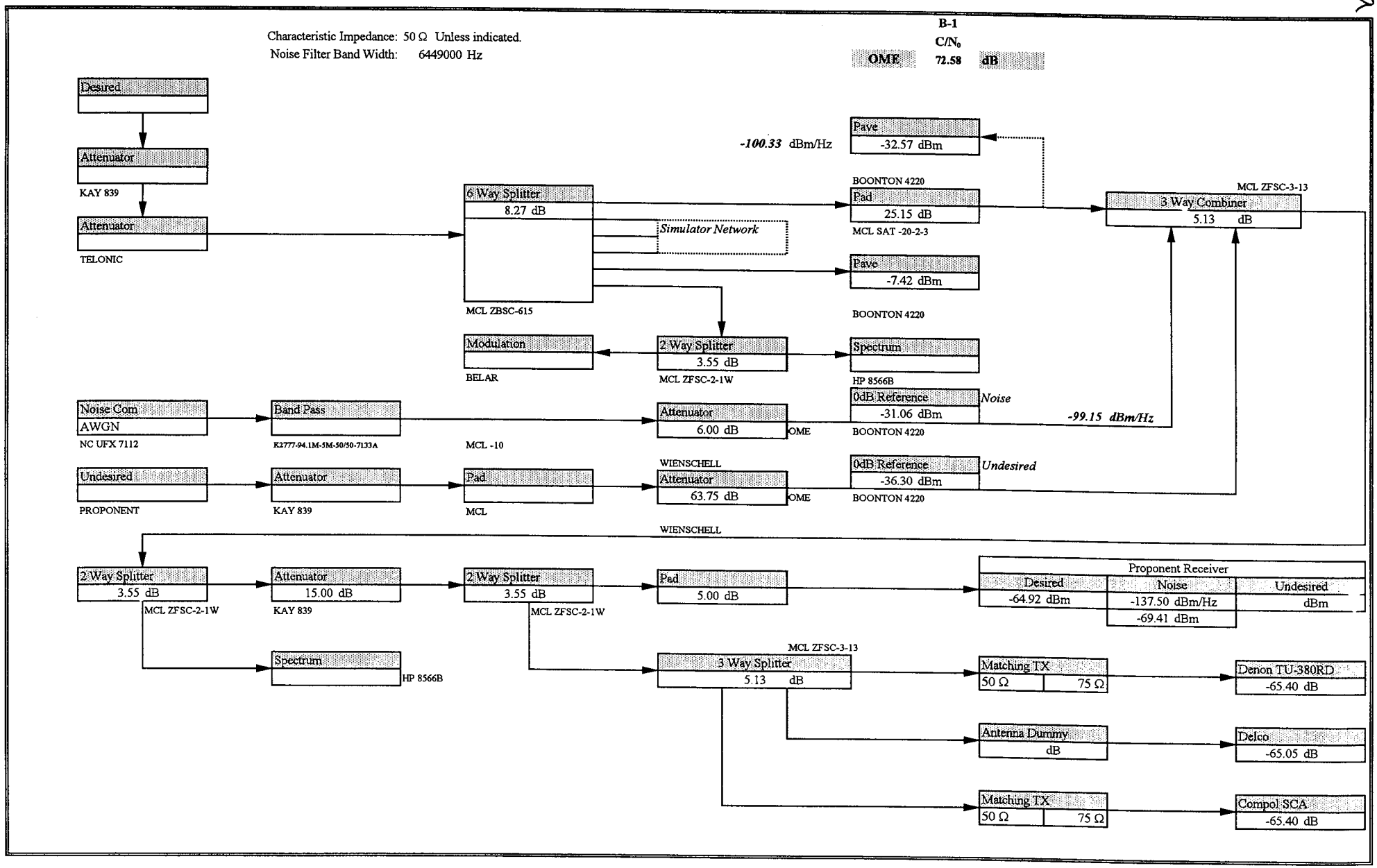
Noise Level		Error Level (%)			
C_0/N_0	Attn	BER	20 Byte	220 Byte	
62.57	63.75	0	0	0	
6.07	7.25	0	0	0	
5.82	7.00	0.064	2.345	6.000	OME
5.57	6.75	0.164	6.103	14.741	
5.32	6.50	0.646	22.01	46.07	
5.07	6.25	1.307	41.72	78.15	
4.82	6.00	2.304	64.19	96.44	
4.57	5.75	3.468	79.01	99.48	
4.32	5.50	4.649	88.02	100.0	
4.07	5.25	6.407	94.56	100.0	



Digital Radio Test Laboratory

Characteristic Impedance: 50 Ω Unless indicated.
Noise Filter Band Width: 6449000 Hz

B-1
C/N_0
OME 72.58 dB



Digital Radio Test Laboratory

B-1 Additive White Gaussian Noise
Characterization of HS Digital Subcarrier Signal Failure

Test Date	Engineer(s):
11/5/96	DML

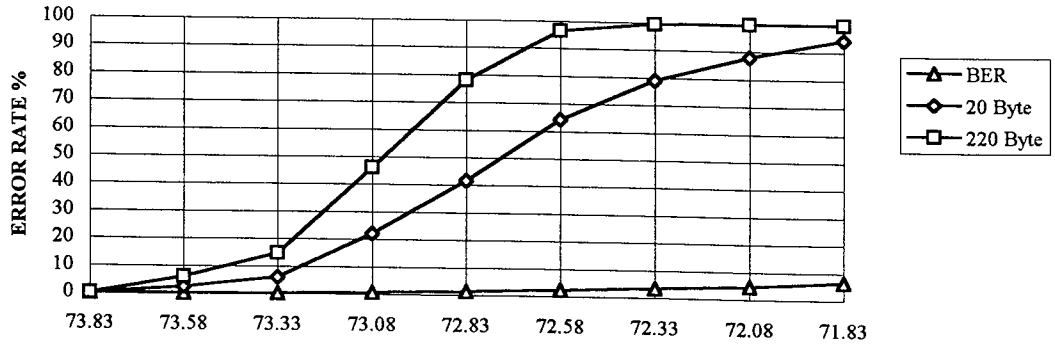
Basic Test Parameters:

SIGNAL	PROPONENT SPECIFIC	COMPOSITE SIGNAL
Sig. Lev: -65dBm	Interleaver Level 2	5-Band Medium Processed
Main Ch. Mod: CPN		ORBAN #2
SCA Group: Prop. Only		COMP OUT 1: Proponent Only
Error Meas. Duration: 5 Min.		COMP OUT 2: Prop + SCA
		Main Channel modulation adjusted for 110%

Analog Receivers: Delco RX 1
Compol 92KHz SCA Receiver
Denon RX 2 RBDS Receiver W/RDS Check software utilty

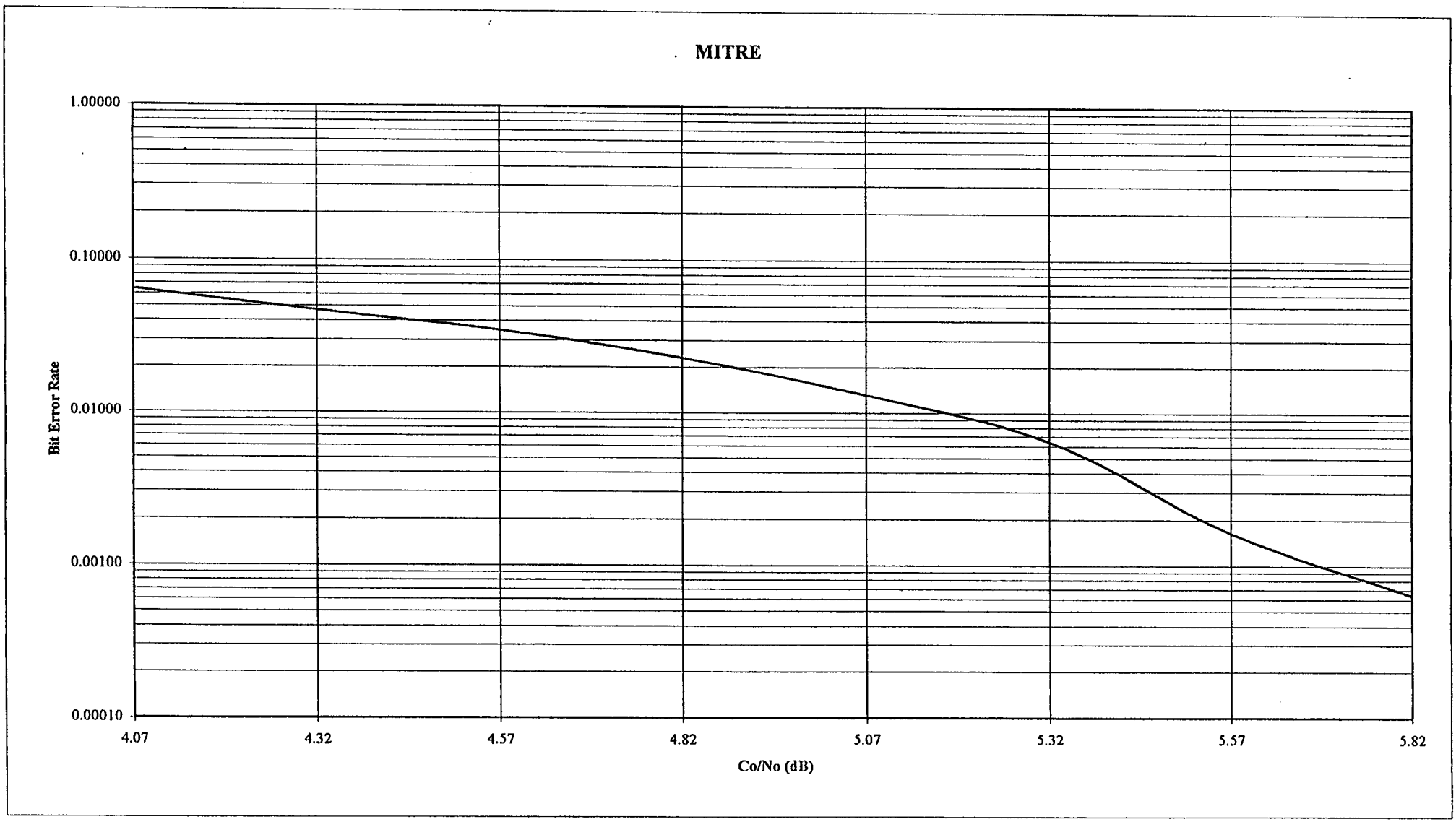
B1.1 Noise Failure Characterization

Noise Level		Error Level (%)			
C/N_0	Attn	BER	20 Byte	220 Byte	
130.33	63.75	0	0	0	
73.83	7.25	0	0	0	
73.58	7.00	0.064	2.345	6.000	**OME**
73.33	6.75	0.164	6.103	14.741	
73.08	6.50	0.646	22.01	46.07	
72.83	6.25	1.307	41.72	78.15	
72.58	6.00	2.304	64.19	96.44	
72.33	5.75	3.468	79.01	99.48	
72.08	5.50	4.649	88.02	100.0	
71.83	5.25	6.407	94.56	100.0	



Digital Radio Test Laboratory

(revised)



Digital Radio Test Laboratory

B1.2 **Onset of Error with other SCAs** (revised)

Main Ch. Mod: CPN
SCA Group: A

Noise Level Attn	Error Level (%) BER	20byte	220byte
7.25 dB	0	0	0
7.00 dB	0.00051	0.03379	0.14815

(C/N_0 = 5.82 dB - see pg. 28)

Main Ch. Mod: CPN
SCA Group: B

Noise Level Atten. Set	Error Level (%) BER	20byte	220byte
7.50 dB	0	0	0
7.25 dB	0.00165	0.05407	0.14815

(C/N_0 = 6.07 dB - see pg. 28)

B1.3a **92KHz S/N ratio** (Compol 92 kHz SCA Receiver)
SCA Group: A

	S/N (dB)
Best Case RBDS & 92 kHz Only	49
With Proponent Group A	49
at OME	17

EO&C
Deviation = 5.5 kHz: Fmod=1 kHz: 624 mV into SCA Modulator
0 dB Reference at 317 mV RMS
Static noise at OME. CPN On main channel has no effect.

B1.3b **Main ch. S/N ratio** (Denon RX 2)
SCA Group: A 57.8 dB RMS No Filter 0dB taken with 1 kHz Mod Souce

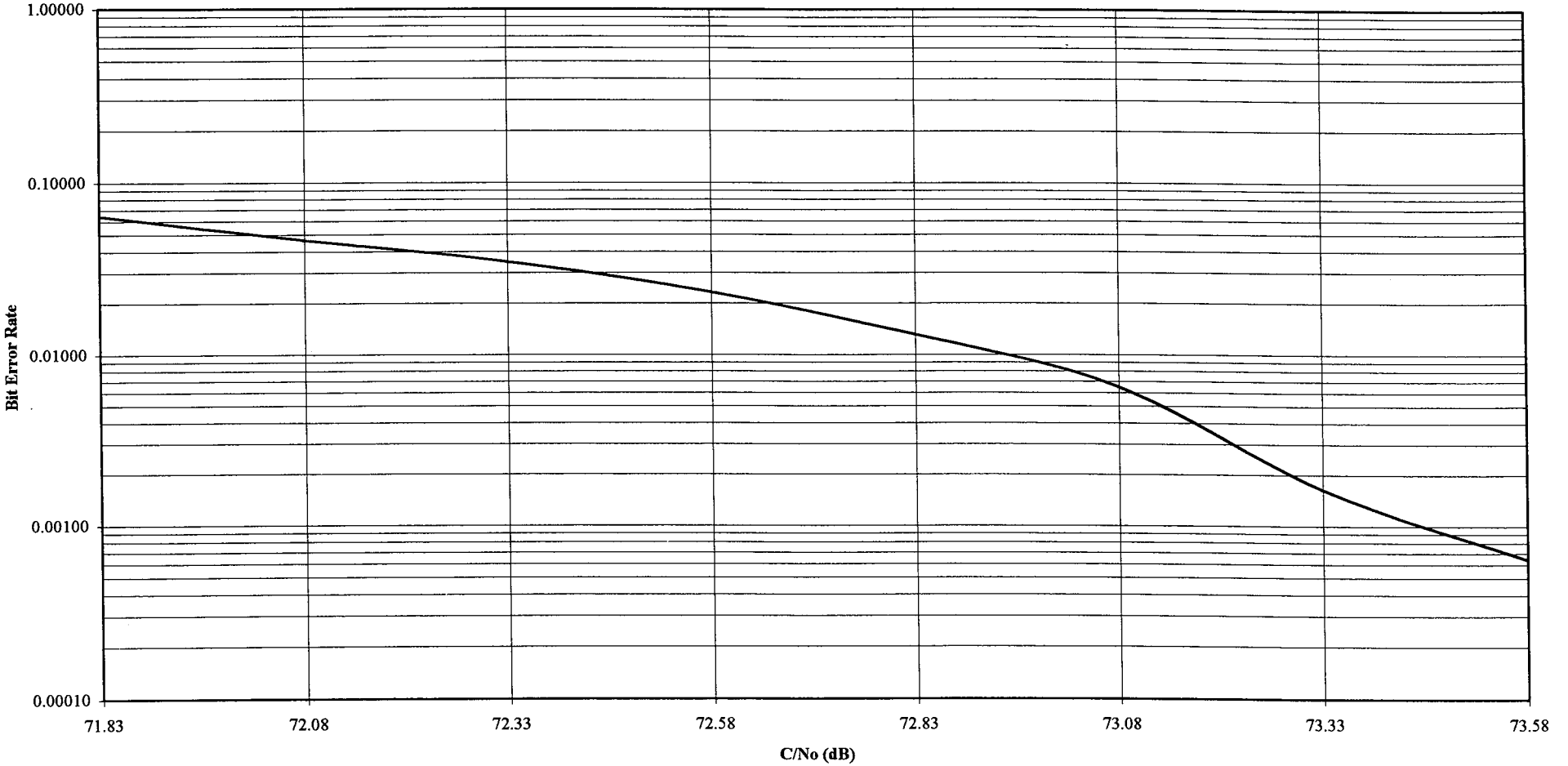
With Grp A and B1.1 noise level: 35.6 dB OME

B1.4a **RBDS Block Error Level**

C_0/N_0	Attn		Target	Meas
5.82	7.00	dB	5	5

Noise Level for 5% ± 2% maximum block errors per 100 blocks (measured for a period of 5 minutes)

B1.4b **RBDS error measurement at B1.4 noise level**
MAX error measurement: 5 % Without Proponent


MITRE
1.00000
0.10000
0.01000
0.00100
0.00010
Bit Error Rate
71.83
72.08
72.33
72.58
72.83
73.08
73.33
73.58
C/No (dB)

Digital Radio Test Laboratory

B1.2 Onset of Error with other SCAs

Main Ch. Mod: CPN
SCA Group: A

Noise Level Attn	Error Level (%) BER	20byte	220byte
7.25 dB	0	0	0
7.00 dB	0.00051	0.03379	0.14815

Main Ch. Mod: CPN
SCA Group: B

Noise Level Atten. Set	Error Level (%) BER	20byte	220byte
7.50 dB	0	0	0
7.25 dB	0.00165	0.05407	0.14815

B1.3a 92KHz S/N ratio (Compol 92 kHz SCA Receiver)

SCA Group: A

	S/N (dB)	EO&C
Best Case RBDS & 92 kHz Only	49	Deviation = 5.5 kHz: Fmod=1 kHz: 624 mV into SCA Modulator
With Proponent Group A	49	0 dB Reference at 317 mV RMS
at OME	17	Static noise at OME. CPN On main channel has no effect.

B1.3b Main ch. S/N ratio (Denon RX 2)

SCA Group: A	57.8 dB	RMS No Filter	0dB taken with 1 kHz Mod Souce
With Grp A and B1.1 noise level:	35.6 dB	OME	

B1.4a RBDS Block Error Level

C/N_0	Attn		Target	Meas	
73.58	7.00	dB	5	5	Noise Level for 5% ± 2% maximum block errors per 100 blocks (measured for a period of 5 minutes)

B1.4b RBDS error measurement at B1.4 noise level

MAX error measurement: 5 % Without Proponent

30a

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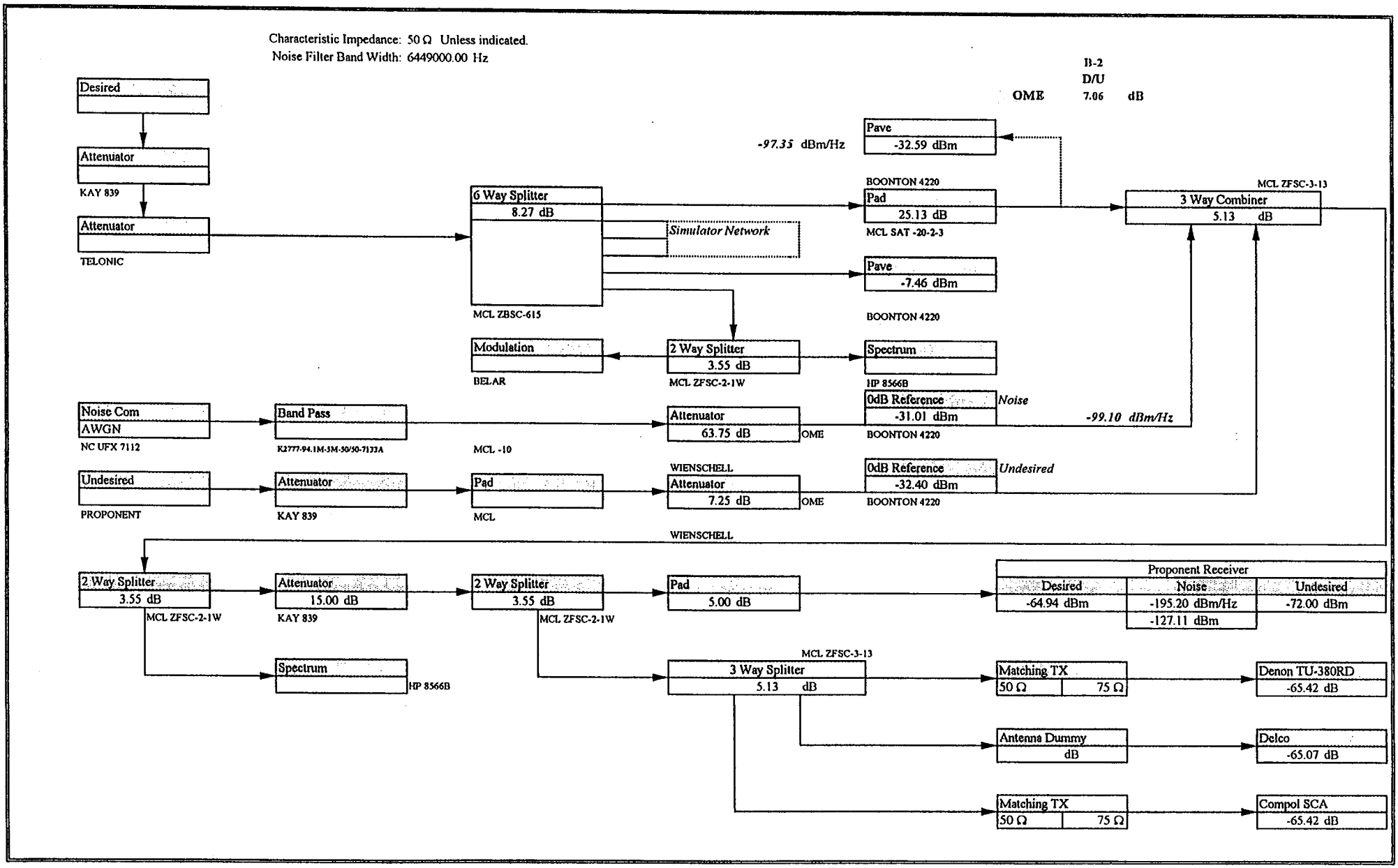


B-2 Co-Channel

PROPONENT SPECIFIC

Interleaver Level 2

COMPOSITE SIGNAL

ORBAN #1
COMP OUT 1: Prop + SCA
COMP OUT 2: Proponent Only

ORBAN #2
COMP OUT 1: Proponent Only
COMP OUT 2: Prop + SCA

Main Channel modulation adjusted for 110%

B2.1 Co-Channnel Analog Reference

Desired Signal Parameters

RF Key Point Meas.: -32.59 dBm
RX RF Level: -65 dBm
Main Channel Modulation: 1 kHz
Modulation Level: 100 % 0 dB Reference
SCA Group: None

Undesired Signal Parameters

RF Key Point Meas.: -32.40 dBm
Main Channel Modulation: CPN
Modulation Level: 110 %
SCA Group: 67 & 92 kHz
SCA Modulation: 0.4 & 1 kHz

Measurement: 45dB S/N ratio target on main analog channel receiver
(Measurement is rms w/15 kHz LPF)

	No Filter		Filter	
	Delco RX 1	**d/u**	**Denon RX 2**	**d/u**
	Best Case S/N: 56.30 dB		Best Case S/N: 60.30 dB	
	S/N: 45.00 dB		S/N: 45.00 dB	
Reference:	Atten: 26.00 dB	**25.81 dB**	Atten: 31.00 dB	**30.81 dB**

B2.2a Co-Channnel HSD Interference

Desired Signal Parameters

RF Level: -65dBm
Modulation Type: None
Modulation Level: None
SCA Group: None

Undesired Signal Parameters

Modulation Type: CPN
Modulation Level: 110%
SCA Group: Group A

	Delco RX 1	**d/u**	**Denon RX 2**	**d/u**
	S/N: 45.00 dB		S/N: 45.00 dB	
Group A:	Atten: 26.00 dB	**25.81 dB**	Atten: 31.00 dB	**30.81 dB**

B2.2b Co-Channnel HSD Interference

Desired Signal Parameters

RF Level: -65dBm
Modulation Type: None
Modulation Level: None
SCA Group: None

Undesired Signal Parameters

Modulation Type: CPN
Modulation Level: 110%
SCA Group: Group B

Measurement: Target Signal-to-Noise Ratio

	Delco RX 1		d/u	Denon RX 2		d/u
	S/N:	45.00 dB		S/N:	45.00 dB	
Group B:	Atten:	26.00 dB	**25.81 dB**	Atten:	31.00 dB	**30.81 dB**

B2.2c Co-Channnel HSD -> Analog Interference

Desired Signal Parameters

RF Level: -65dBm
Modulation Type: None
Modulation Level: None
SCA Group: None

Undesired Signal Parameters

Modulation Type: CPN
Modulation Level: 110%
SCA Group: Proponent Only

Measurement: Target Signal-to-Noise Ratio

	Delco RX 1		d/u	Denon RX 2		d/u
	S/N:	45.00 dB		S/N:	45.00 dB	
	Atten:	26.00 dB	**25.81 dB**	Atten:	30.75 dB	**30.56 dB**

B2.3 **Co-Channel Analog -> HSD interference**

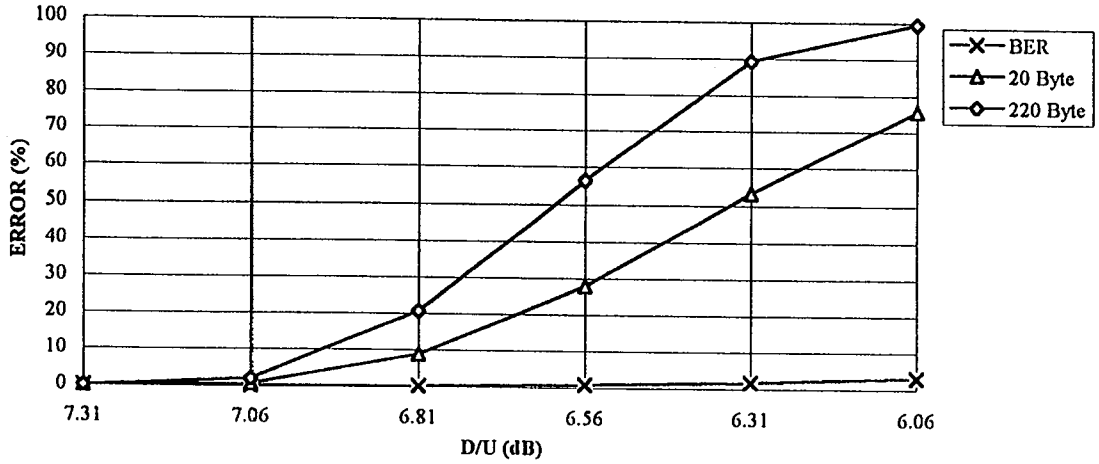
Desired Signal Parameters

RF Level: -65 dBm
Modulation Type: CPN
Modulation Level: 110 %
SCA Group: Proponent Only

Undesired Signal Parameters

Modulation Type: CPN
Modulation Level: 110 %
SCA Group: 67 &92 kHz

Co-Chan. D/U	Level Attn	Cum. Error Level BER	20 Byte	220 Byte	
7.31	7.50	0	0	0	
7.06	7.25	0.016	0.595	1.926	OME
6.81	7.00	0.245	8.800	20.815	
6.56	6.75	0.811	27.79	56.37	
6.31	6.50	1.696	53.204	89.26	
6.06	6.25	3.081	75.58	99.41	



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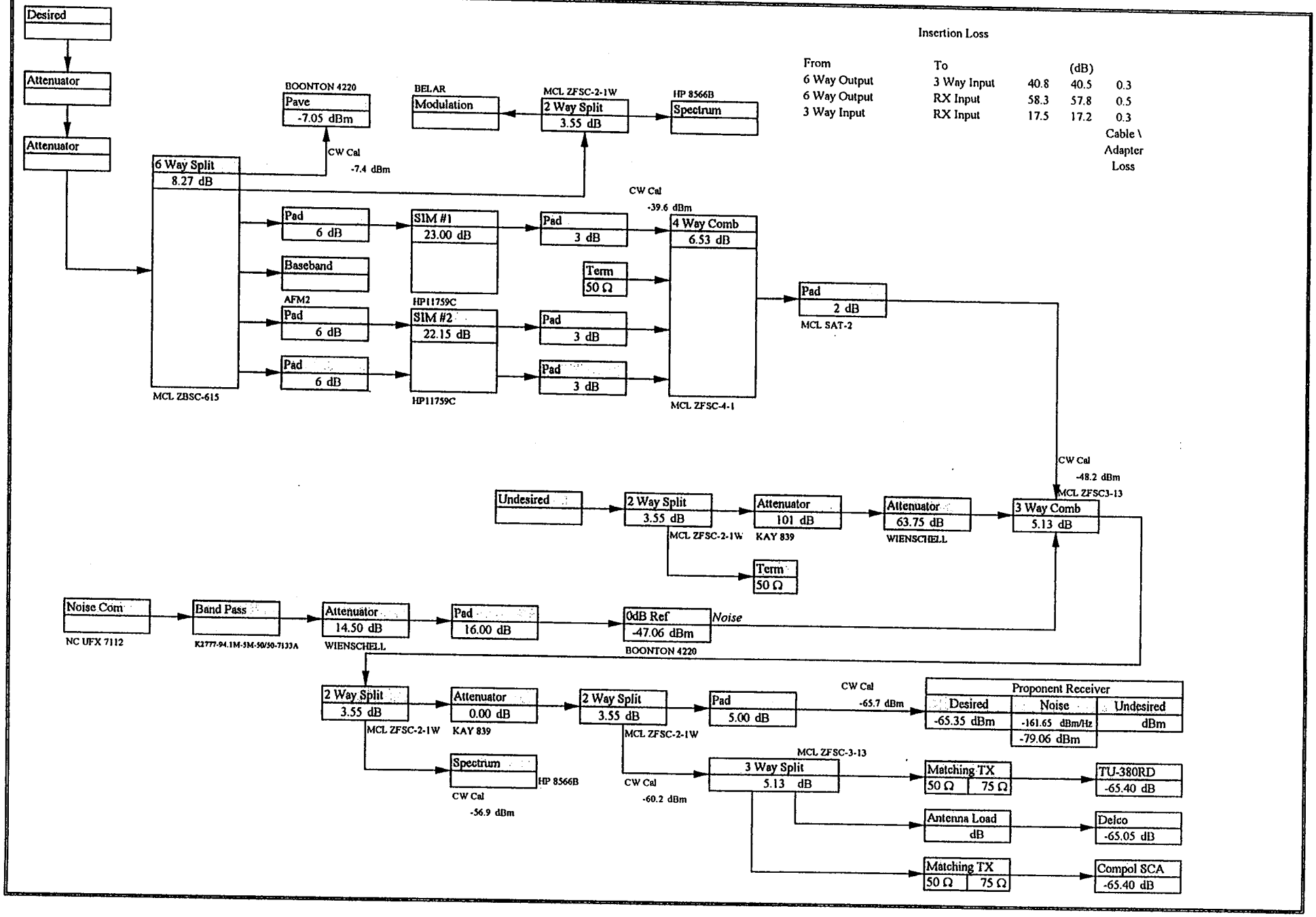

Digital Radio Test Laboratory

(revised)

B-3 Multipath
Characterization of HS Digital Subcarrier Signal Failure

Basic Test Parameters: **SIGNAL** **PROPONENT SPECIFIC** **COMPOSITE SIGNAL**

One Path Zero Phase Reference: -65dBm
Main Channel Mod: CPN
SCA Group: A
Error Measurement Duration: 5 minutes

Analog Receivers: Denon TU-380RD RBDS Receiver W/RDS Check software utilty

ORBAN #1
COMP OUT 1: Not Used
COMP OUT 2: Not Used
5-Band Medium Processed
ORBAN #2
COMP OUT 1: Proponent Only
COMP OUT 2: Prop + SCA
Main Channel modulation
adjusted for 110%

	C/No	Noise Level C_o/N_o	Attn	Error Level (%) BER	20 Byte	220 Byte		EO&C
Urban Slow	131.05	**63.29**	63.75	0.0000	0.0000	0.0000		Error Free performance without added noise.
	83.8	**16.04**	16.50	0.0000	0.0000	0.0000		MAX RBDS Block Error= 54 % at OME.
	83.3	**15.54**	16.00	0.0024	0.1014	0.2963		
Urban Fast	131.05	**63.29**	63.75	0.0000	0.0000	0.0000	(-2 dB)	Error Free performance without added noise.
	81.8	**14.04**	14.50	0.0000	0.0000	0.0000		MAX RBDS Block Error= 36 % at OME.
	81.3	**13.54**	14.00	0.0294	1.1287	3.2593		
Rural Fast	131.05	**63.29**	63.75	0.0000	0.0000	0.0000	(+1.5 dB)	Error Free performance without added noise.
	85.3	**17.54**	18.00	0.0000	0.0000	0.0000		MAX RBDS Block Error= 40 % at OME.
	84.8	**17.04**	17.50	0.0222	0.8043	2.7407		
Obstructed	131.05	**63.29**	63.75	49.72	100.0	100.0		Performance impaired without added noise.
								MAX RBDS Block Error= 97 % at OME.
								Does not remain synchronized throughout 5 minute measurement period.

Digital Radio Test Laboratory

B-3 Multipath
Characterization of HS Digital Subcarrier Signal Failure

Basic Test Parameters: **SIGNAL** **PROPONENT SPECIFIC** **COMPOSITE SIGNAL**

One Path Zero Phase Reference: -65dBm
Main Channel Mod: CPN
SCA Group: A
Error Measurement Duration: 5 minutes

Analog Receivers: Denon TU-380RD RBDS Receiver W/RDS Check software utilty

ORBAN #1
COMP OUT 1: Not Used
COMP OUT 2: Not Used
5-Band Medium Processed
ORBAN #2
COMP OUT 1: Proponent Only
COMP OUT 2: Prop + SCA
Main Channel modulation
adjusted for 110%

	Noise Level		Error Level (%)			EO&C
	C/N_0	Attn	BER	20 Byte	220 Byte	
Urban Slow	**131.05**	63.75	0.0000	0.0000	0.0000	Error Free performance without added noise.
	83.80	16.50	0.0000	0.0000	0.0000	MAX RBDS Block Error= 54 % at OME.
	83.30	16.00	0.0024	0.1014	0.2963	
Urban Fast	**131.05**	63.75	0.0000	0.0000	0.0000	Error Free performance without added noise.
	81.80	14.50	0.0000	0.0000	0.0000	MAX RBDS Block Error= 36 % at OME.
	81.30	14.00	0.0294	1.1287	3.2593	
Rural Fast	**131.05**	63.75	0.0000	0.0000	0.0000	Error Free performance without added noise.
	85.30	18.00	0.0000	0.0000	0.0000	MAX RBDS Block Error= 40 % at OME.
	84.80	17.50	0.0222	0.8043	2.7407	
Obstructed	**131.05**	63.75	49.72	100.0	100.0	Performance impaired without added noise.
						MAX RBDS Block Error= 97 % at OME.
						Does not remain synchronized throughout 5 minute measurement period.

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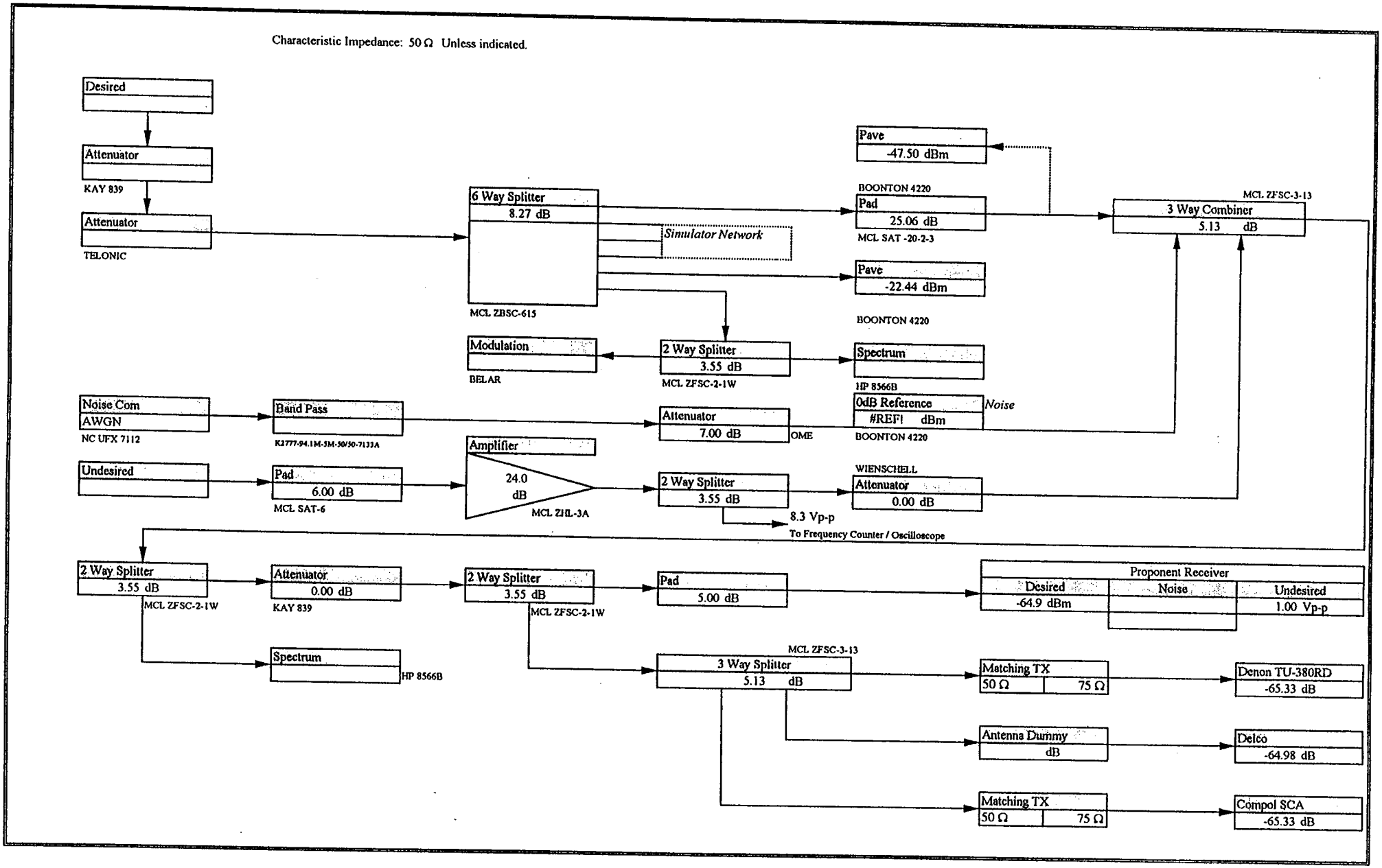
Digital Radio Test Labcratory



Digital Radio Test Laboratory

B-4 Impulse Noise 11/6/96

See also supplemental data.

Desired Signal
-65 dBm at Receiver Input
Group A Subcarriers

Undesired Signal
10 ns wide 1.0 Vp-p pulse at receiver input
Repetition Rate Variable

Results accumulated over 5 minute measurement period.

Pilot Only

Repetition Rate (Hz)	BER	20 Byte	220 Byte	Attenuator Setting (dB)	Voltage (Vp-p)	
100	0.0000	0.0000	0.0000	0	1.0000	
200	0.0000	0.0000	0.0000	0	1.0000	
300	0.2338	8.915	20.07	0	1.0000	
300	0.0815	3.177	7.704	10	0.3162	see Plot
300	0.0000	0.0000	0.0000	15	0.1778	
600	0.0000	0.0000	0.0000	0	1.0000	
1000	0.0000	0.0000	0.0000	0	1.0000	

Clipped Pink Noise (Stereo)

Repetition Rate (Hz)	BER	20 Byte	220 Byte	Attenuator Setting (dB)	Voltage (Vp-p)
100	0.0000	0.0000	0.0000	0	1.0000
200	0.0086	0.3244	0.5926	0	1.0000
200	0.0000	0.0000	0.0000	5	0.5623
300	0.3131	11.87	26.67	0	1.0000
300	0.0387	1.345	3.333	10	0.3162
300	0.0000	0.0000	0.0000	15	0.1778
600	0.0000	0.0000	0.0000	0	1.0000
1000	0.0000	0.0000	0.0000	0	1.0000

Digital Radio Test Laboratory

SUPPLEMENTAL DATA

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B-4 Impulse Noise

Ammended: 3/11/97

Desired Signal

-65 dBm at Receiver Input
Group A Subcarriers

Undesired Signal

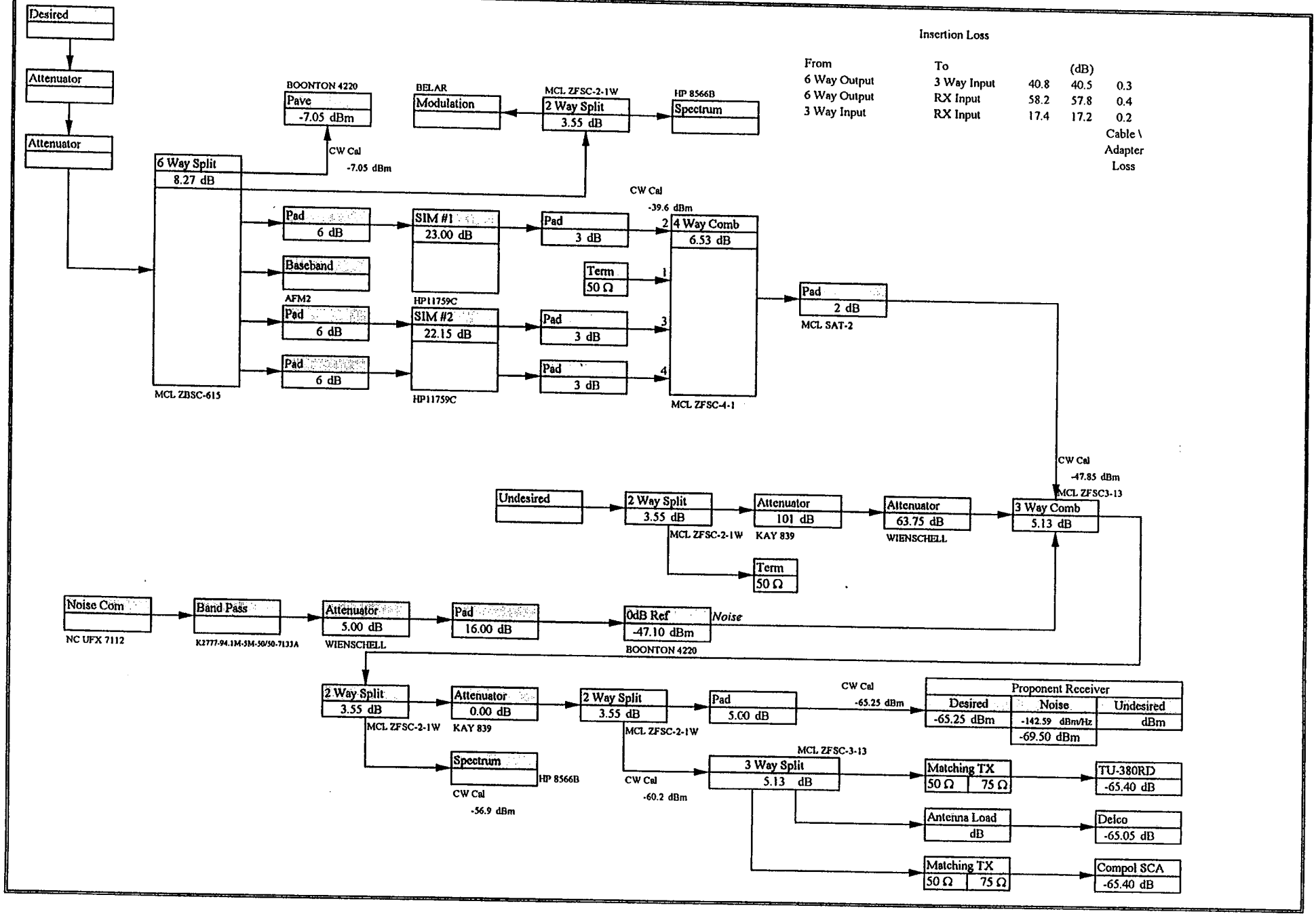
10 ns wide 1.0 Vp-p pulse at receiver input
Repetition Rate Variable

Results accumulated over 5 minute measurement period.

Pilot Only

Repetition Rate (Hz)	BER	20 Byte	220 Byte	Attenuator Setting (dB)	Voltage (Vp-p)
198	0.000	0.000	0.000	0	1.0000
202	0.000	0.000	0.000	0	1.0000
297	0.000	0.000	0.000	0	1.0000
303	0.000	0.000	0.000	0	1.0000
625	0.000	0.000	0.000	0	1.0000

Digital Radio Test Laboratory



Test B-5 Airplane Flutter								
Scenario	Reflected Path	Medium Signal Strength						
		CPN			Pilot Only			
#1	400 km/h Doppler 27.5 µs Delay 8.00 dB	BER 100.0	20 Byte 100.0	220Byte 100.0	BER 0.000	20 Byte 0.000	220Byte 0.000	% Not tracking STIC with CPN on main channel.
#2	200 km/h Doppler 13.7 µs Delay 6.00 dB	BER 32.22	20 Byte 100.0	220Byte 100.0	BER 0.000	20 Byte 0.000	220Byte 0.000	%
#3	100 km/h Doppler 6.8 µs Delay 4.00 dB	BER 21.21	20 Byte 99.97	220Byte 100.0	BER 0.000	20 Byte 0.000	220Byte 0.000	%
Test Date: 29-Oct-96 ngineer(s): DML Main Channel Mod: Clipped Pink Noise or Pilot Only								

Digital Radio Test Laboratory

B-6 Weak Signal
Characterization of HS Digital Subcarrier Signal Failure

pilot:	9 %	9 %	9 %
proponent:	10 %	10 %	10 %
57 kHz:	%	3 %	10 %
92 kHz:	%	7 %	%
Total Injection:	19 %	29 %	29 %
	Proponent Only	A	B
Signal Level:	-93 ≤OME< -92 dBm	-93 ≤OME< -92 dBm	-93 ≤OME< -92 dBm

Digital Radio Test Laboratory

C-1 Re-Acquisition 8/14/96

	Re-Acquisition Time (s)		
	POF-2dB	POF-4dB	POF-6dB
	18.8	20.6	22.7
	23.5	15.3	18.0
	14.9	18.0	17.1
	14.4	17.6	15.4
	23.4	16.3	18.8
Average	19.0	17.6	18.4

Point Of Failure Attenuator Setting	3.75 dB
Desired Signal Reference Level	-32.77 dBm
Noise 0 dB Reference	-31.0 dBm
Desired Signal Level at Receiver	-65 dBm

POF Noise Level is defined as the level which causes 20 and 220 byte Packet Error Rates of 95% ± 5%.

ABBA Used as Modulation Source on Main Channel

Connection is broken for at least 30 seconds.

Test	C-2	Re-Acquisition with Multipath Urban Slow Rayleigh

	Re-Acquisition Time (s)		
Tsim (s)	POF-2	POF-4	POF-6
5	18.7	18.4	17.1
10	19.7	22.8	17.5
15	23.8	22.3	16.4
20	17.1	21.3	16.6
Average	19.8	21.2	16.9

POF Attenuator Setting: 12 dB

EO&C

Point of Failure (POF) defined as:
220 Byte Message Error Rate ≥ 50 %

Test Date: 25-Oct-96
ngineer(s): DML

Test C-2 Re-Acquisition with Multipath
Urban Fast Rayleigh

Tsim (s)	Re-Acquisition Time (s) POF-2	POF-4	POF-6
5	23.3	23.7	18.7
10	24.9	13.6	13.3
15	15.4	15.0	14.0
20	15.8	18.1	21.9
Average	19.9	17.6	17.0

POF Attenuator Setting: 12 dB

EO&C

Test Date: 25-Oct-96
ngineer(s): DML

Test	C-2	Re-Acquisition with Multipath Rural Fast Rayleigh

Tsim (s)	Re-Acquisition Time (s) POF-2	POF-4	POF-6
5	24.6	15.4	16.1
10	18.7	14.5	18.6
15	16.8	22.0	24.0
20	22.7	18.0	14.3
Average	20.7	17.5	18.3

POF Attenuator Setting: 16 dB

EO&C

Test Date: 25-Oct-96
ngineer(s): DML

Test	C-2	Re-Acquisition with Multipath Obstructed Rayleigh

Tsim (s)	Re-Acquisition Time (s) POF
5	
10	
15	
20	
Average	0.0

EO&C

System did not re-acquire 5 minutes into this simulation.

Test Date: 25-Oct-96
ngineer(s): DML

Digital Radio Test Laboratory

(revised)

E-2 **Host Analog Program -› HSSC with Multipath**

Engineer(s): DML Date: 24-Oct-96

Basic Test Parameters:

SIGNAL

One Path Zero Phase Reference: -65dBm
Main Channel Mod: CPN (Unbalanced)
SCA Group: A
Error Measurement Duration: 5 minutes
92 kHz: Track 48 on EBU SQAM Disk

PROPONENT SPECIFIC

COMPOSITE SIGNAL

5-Band Medium Processed
ORBAN #2
COMP OUT 1: Proponent Only
COMP OUT 2: Prop + SCA

		Noise Level C_o/N_o	Attn	BER	Error Level (%) 20 Byte	220 Byte	EO&C
Urban Slow		**63.29**	63.75	0.0000	0.0000	0.0000	
	CPN	**15.04**	15.50	0.0000	0.0000	0.0000	
		14.54	15.00	0.0007	0.0270	0.1482	
		63.29	63.75	0.0000	0.0000	0.0000	
	Pilot Only	**13.04**	13.50	0.0000	0.0000	0.0000	
		12.54	13.00	0.0044	0.1825	0.5185	
Urban Fast		**63.29**	63.75	0.0000	0.0000	0.0000	
	CPN	**13.54**	14.00	0.0000	0.0000	0.0000	
		13.04	13.50	0.0158	0.6517	1.643	
		63.29	63.75	0.0000	0.0000	0.0000	
	Pilot Only	**11.54**	12.00	0.0000	0.0000	0.0000	
		11.04	11.50	0.0314	1.190	3.407	

Digital Radio Test Laboratory

(revised)

		Noise Level C_o/N_o	Attn	Error Level (%) BER	20 Byte	220 Byte	EO&C
Rural Fast	CPN	**63.29**	63.75	0.0000	0.0000	0.0000	
		17.54	18.00	0.0000	0.0000	0.0000	
		17.04	17.50	0.0030	0.1014	0.2963	
	Pilot Only	**63.29**	63.75	0.0000	0.0000	0.0000	
		16.04	16.50	0.0000	0.0000	0.0000	
		15.54	16.00	0.0009	0.0406	0.1482	
Obstructed Fast	CPN	**63.29**	63.75	100.00	100.0	100.0	System would not re-acquire
	Pilot Only	**63.29**	63.75	0.0000	0.0000	0.0000	
		17.54	18.00	0.0000	0.0000	0.0000	
		17.04	17.50	0.0009	0.0473	0.7404	

Digital Radio Test Laboratory

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E-2 Host Analog Program -› HSSC with Multipath

Engineer(s): DML Date: 24-Oct-96

Basic Test Parameters: **SIGNAL** **PROPONENT SPECIFIC** **COMPOSITE SIGNAL**

One Path Zero Phase Reference: -65dBm
Main Channel Mod: CPN (Unbalanced)
SCA Group: A
Error Measurement Duration: 5 minutes
92 kHz: Track 48 on EBU SQAM Disk

5-Band Medium Processed
ORBAN #2
COMP OUT 1: Proponent Only
COMP OUT 2: Prop + SCA

		Noise Level C/N_0	Attn	BER	Error Level (%) 20 Byte	220 Byte	EO&C
		131.05	63.75	0.0000	0.0000	0.0000	
	CPN	**82.80**	15.50	0.0000	0.0000	0.0000	
		82.30	15.00	0.0007	0.0270	0.1482	
Urban Slow							
		131.05	63.75	0.0000	0.0000	0.0000	
	Pilot Only	**80.80**	13.50	0.0000	0.0000	0.0000	
		80.30	13.00	0.0044	0.1825	0.5185	
		131.05	63.75	0.0000	0.0000	0.0000	
	CPN	**81.30**	14.00	0.0000	0.0000	0.0000	
		80.80	13.50	0.0158	0.6517	1.643	
Urban Fast							
		131.05	63.75	0.0000	0.0000	0.0000	
	Pilot Only	**79.30**	12.00	0.0000	0.0000	0.0000	
		78.80	11.50	0.0314	1.190	3.407	

Digital Radio Test Laboratory

		Noise Level C/N_0	Attn	Error Level (%) BER	20 Byte	220 Byte	EO&C
		131.05	63.75	0.0000	0.0000	0.0000	
	CPN	**85.30**	18.00	0.0000	0.0000	0.0000	
		84.80	17.50	0.0030	0.1014	0.2963	
Rural Fast							
		131.05	63.75	0.0000	0.0000	0.0000	
	Pilot Only	**83.80**	16.50	0.0000	0.0000	0.0000	
		83.30	16.00	0.0009	0.0406	0.1482	
	CPN	**131.05**	63.75	100.00	100.0	100.0	System would not re-acquire
Obstructed Fast							
		131.05	63.75	0.0000	0.0000	0.0000	
	Pilot Only	**85.30**	18.00	0.0000	0.0000	0.0000	
		84.80	17.50	0.0009	0.0473	0.7404	

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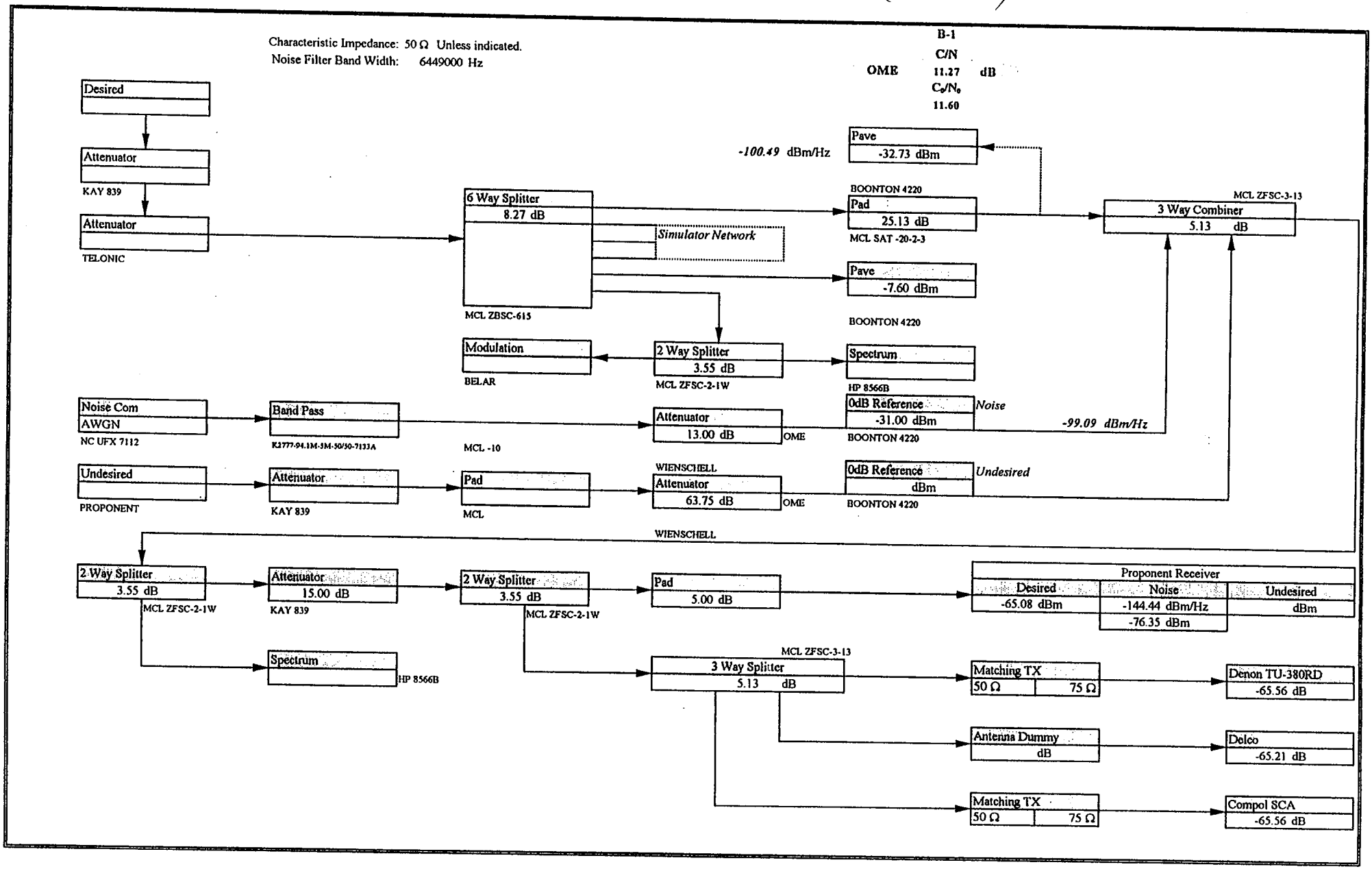
SEIKO

TESTS

B, C, & E-2

Digital Radio Test Laboratory (revised)



B-1 Additive White Gaussian Noise
Characterization of HS Digital Subcarrier Signal Failure
9/17/96 DML

Digital Radio Test Laboratory

(revised)

Basic Test Parameters:

SIGNAL
Sig. Lev: -65dBm
Main Ch. Mod: CPN
SCA Group: Prop. Only
Error Meas. Duration: 5 Min.

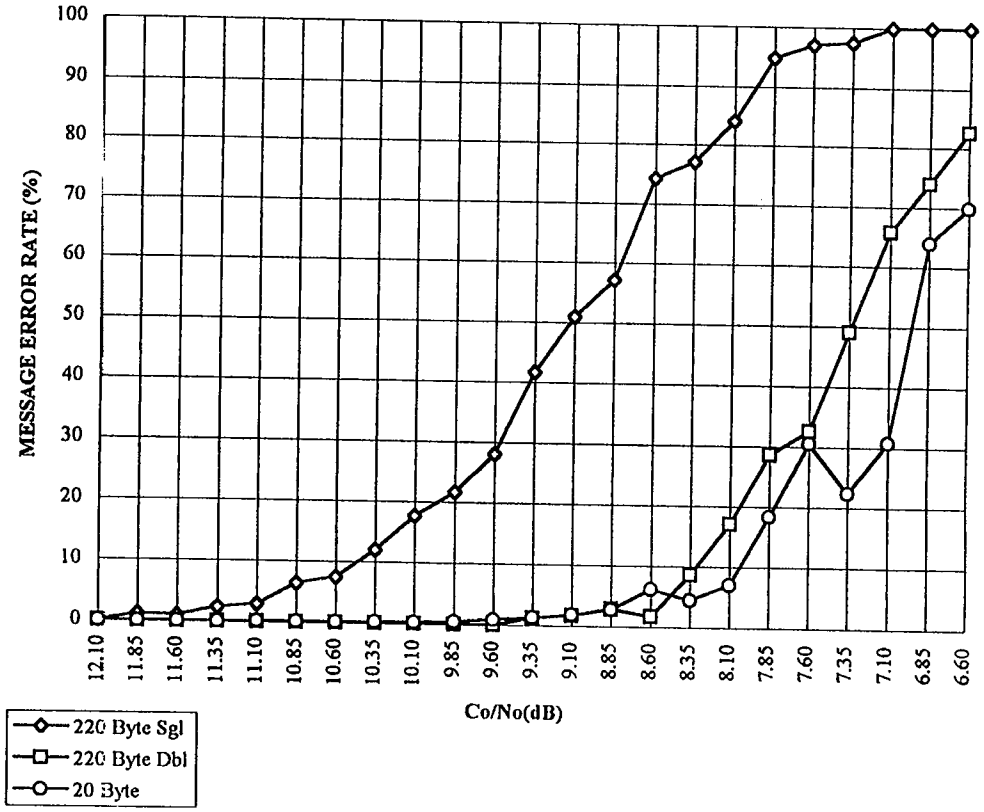
PROPONENT SPECIFIC
PCR average weighting 4096
PCR averaged over 5 minute period.
BCR averaged over 5 minute period.

COMPOSITE SIGNAL
ORBAN #1
COMP OUT 1: Not Used
COMP OUT 2: Not Used
5-Band Medium Processed
ORBAN #2
COMP OUT 1: Proponent Only
COMP OUT 2: Prop + SCA
Main Channel modulation
adjusted for 110%

Analog Receivers: Delco RX 1
Compol 92KHz SCA Receiver
Denon RX 2 RBDS Receiver W/RDS Check software utilty

B1.1 Noise Failure Characterization

		Error (%)			Completion (%)		
			Single	Double		Single	Double
C_o/N_o	Attn	20 Byte	220 Byte	220 Byte	20 Byte	220 Byte	220 Byte
12.10	13.50	0.000	0.000	0.000	100.0	100.0	100
11.85	13.25	0.000	1.140	0.000	100.0	98.86	100
11.60	13.00	0.000	1.000	0.000	100.0	99.00	100
11.35	12.75	0.000	2.290	0.000	100.0	97.71	100
11.10	12.50	0.100	2.860	0.000	99.90	97.14	100
10.85	12.25	0.100	6.400	0.000	99.90	93.60	100
10.60	12.00	0.100	7.430	0.000	99.90	92.57	100
10.35	11.75	0.200	12.00	0.000	99.80	88.00	100
10.10	11.50	0.200	17.71	0.000	99.80	82.29	100
9.85	11.25	0.400	21.71	0.000	99.60	78.29	100
9.60	11.00	0.800	28.00	0.000	99.20	72.00	100
9.35	10.75	1.300	41.71	1.140	98.70	58.29	98.86
9.10	10.50	1.800	50.86	1.710	98.20	49.14	98.29
8.85	10.25	2.800	57.14	2.860	97.20	42.86	97.14
8.60	10.00	6.100	74.29	1.710	93.90	25.71	98.29
8.35	9.75	4.40	77.14	8.570	95.60	22.86	91.43
8.10	9.50	7.00	84.00	17.00	93.00	16.00	83.00
7.85	9.25	18.30	94.86	28.57	81.70	5.140	71.43
7.60	9.00	30.50	97.00	32.50	69.50	3.000	67.50
7.35	8.75	22.30	97.50	49.00	77.70	2.500	51.00
7.10	8.50	30.7	100.0	65.71	69.30	0.000	34.29
6.85	8.25	63.9	100.0	74.00	36.10	0.000	26.00
6.60	8.00	69.8	100.0	82.50	30.20	0.000	17.50



Little confidence in 20 byte due to visual hits not included in average: even though instantaneous PCR goes to 92.3% average stays at 100%.

File Name: SEIKO.XLS

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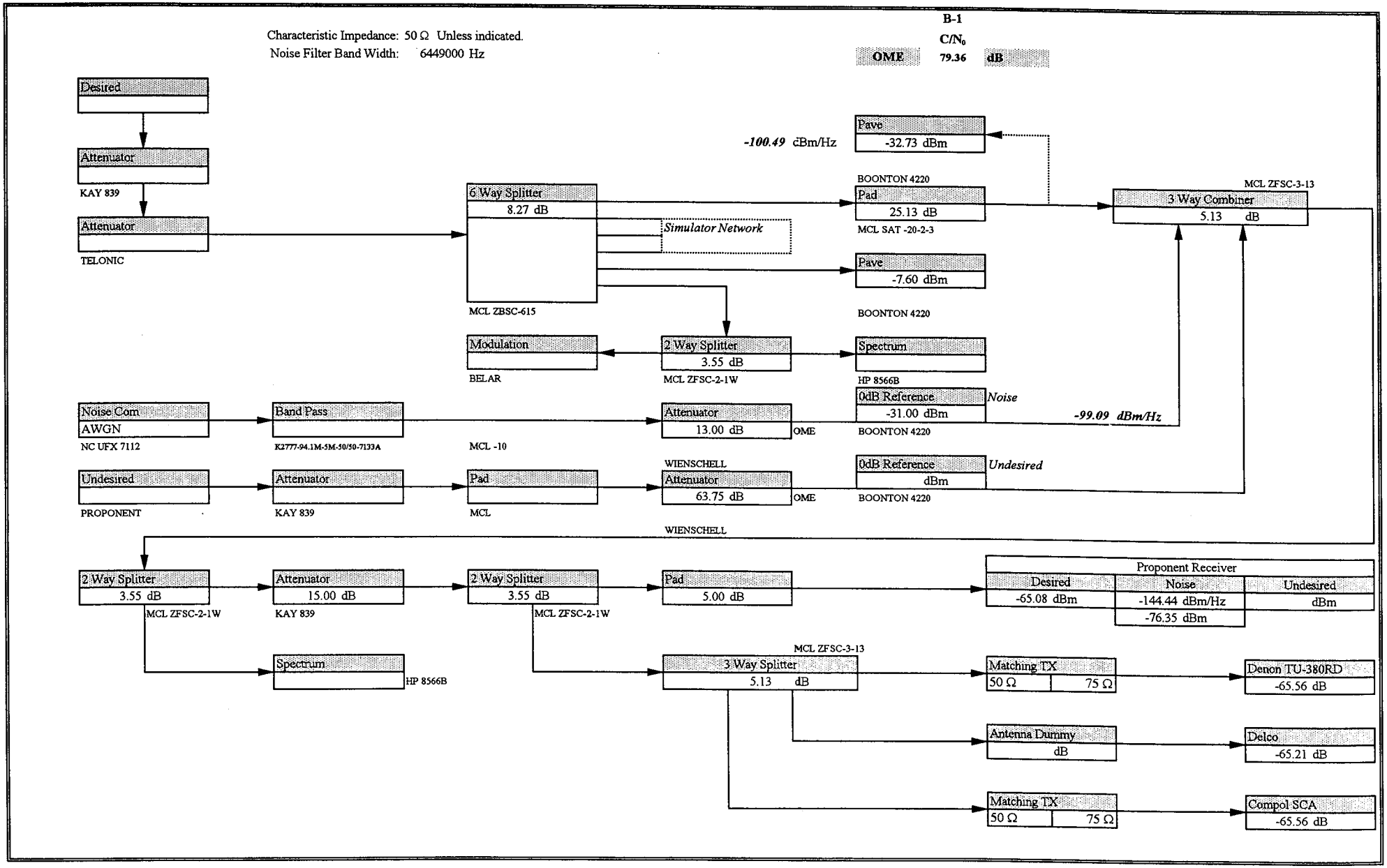

Characteristic Impedance: 50 Ω Unless indicated.
Noise Filter Band Width: 6449000 Hz
B-1
C/N0
OME 79.36 dB
Desired
Attenuator
KAY 839
Attenuator
TELONIC
6 Way Splitter
8.27 dB
MCL ZBSC-615
Simulator Network
-100.49 dBm/Hz
Pave
-32.73 dBm
BOONTON 4220
Pad
25.13 dB
MCL SAT -20-2-3
Pave
-7.60 dBm
BOONTON 4220
MCL ZFSC-3-13
3 Way Combiner
5.13 dB
Modulation
BELAR
2 Way Splitter
3.55 dB
MCL ZFSC-2-1W
Spectrum
HP 8566B
Noise Com
AWGN
NC UFX 7112
Band Pass
K2777-94.1M-5M-50/50-7133A
MCL -10
Attenuator
13.00 dB
OME
0dB Reference
-31.00 dBm
BOONTON 4220
Noise
-99.09 dBm/Hz
WIENSCHELL
Undesired
PROPONENT
Attenuator
KAY 839
Pad
MCL
Attenuator
63.75 dB
OME
0dB Reference
dBm
BOONTON 4220
Undesired
WIENSCHELL
2 Way Splitter
3.55 dB
MCL ZFSC-2-1W
Attenuator
15.00 dB
KAY 839
2 Way Splitter
3.55 dB
MCL ZFSC-2-1W
Pad
5.00 dB
Proponent Receiver
Desired
-65.08 dBm
Noise
-144.44 dBm/Hz
-76.35 dBm
Undesired
dBm
Spectrum
HP 8566B
MCL ZFSC-3-13
3 Way Splitter
5.13 dB
Matching TX
50 Ω
75 Ω
Denon TU-380RD
-65.56 dB
Antenna Dummy
dB
Delco
-65.21 dB
Matching TX
50 Ω
75 Ω
Compol SCA
-65.56 dB

B-1 Additive White Gaussian Noise
Characterization of HS Digital Subcarrier Signal Failure
9/17/96 DML

Digital Radio Test Laboratory

Basic Test Parameters:

SIGNAL
Sig. Lev: -65dBm
Main Ch. Mod: CPN
SCA Group: Prop. Only
Error Meas. Duration: 5 Min.

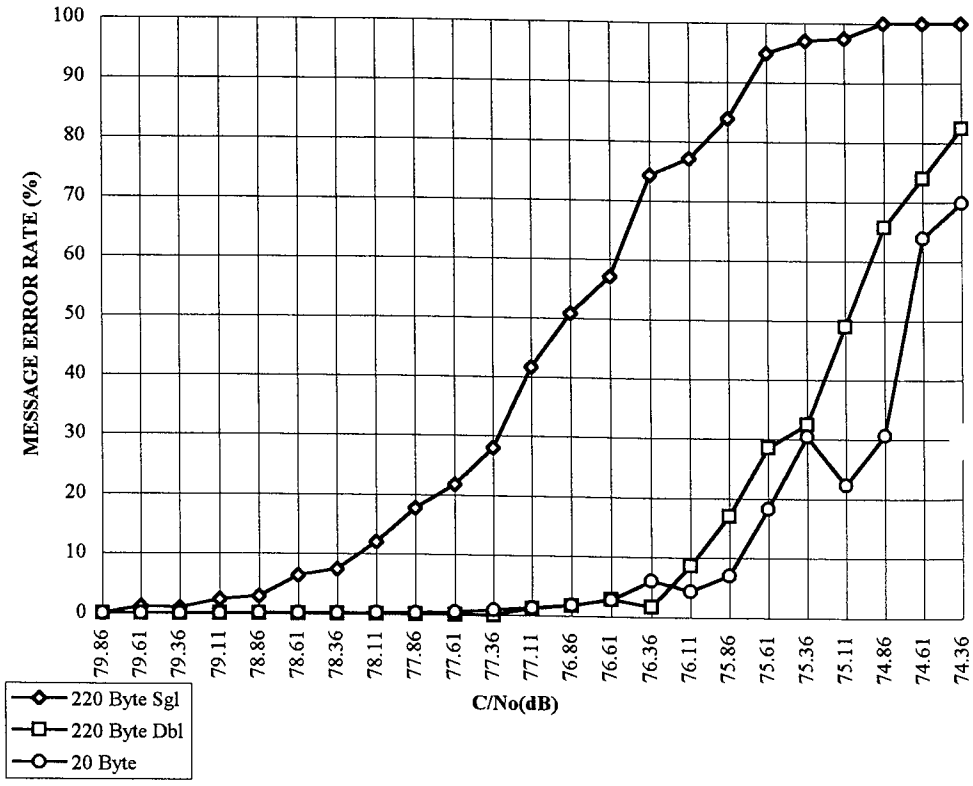
PROPONENT SPECIFIC
PCR average weighting 4096
PCR averaged over 5 minute period.
BCR averaged over 5 minute period.

COMPOSITE SIGNAL
ORBAN #1
COMP OUT 1: Not Used
COMP OUT 2: Not Used
5-Band Medium Processed
ORBAN #2
COMP OUT 1: Proponent Only
COMP OUT 2: Prop + SCA
Main Channel modulation
adjusted for 110%

Analog Receivers: Delco RX 1
Compol 92KHz SCA Receiver
Denon RX 2 RBDS Receiver W/RDS Check software utilty

B1.1 Noise Failure Characterization

		Error (%)			Completion (%)		
			Single	Double		Single	Double
C/N_0	Attn	20 Byte	220 Byte	220 Byte	20 Byte	220 Byte	220 Byte
79.86	13.50	0.000	0.000	0.000	100.0	100.0	100
79.61	13.25	0.000	1.140	0.000	100.0	98.86	100
79.36	13.00	0.000	1.000	0.000	100.0	99.00	100
79.11	12.75	0.000	2.290	0.000	100.0	97.71	100
78.86	12.50	0.100	2.860	0.000	99.90	97.14	100
78.61	12.25	0.100	6.400	0.000	99.90	93.60	100
78.36	12.00	0.100	7.430	0.000	99.90	92.57	100
78.11	11.75	0.200	12.00	0.000	99.80	88.00	100
77.86	11.50	0.200	17.71	0.000	99.80	82.29	100
77.61	11.25	0.400	21.71	0.000	99.60	78.29	100
77.36	11.00	0.800	28.00	0.000	99.20	72.00	100
77.11	10.75	1.300	41.71	1.140	98.70	58.29	98.86
76.86	10.50	1.800	50.86	1.710	98.20	49.14	98.29
76.61	10.25	2.800	57.14	2.860	97.20	42.86	97.14
76.36	10.00	6.100	74.29	1.710	93.90	25.71	98.29
76.11	9.75	4.40	77.14	8.570	95.60	22.86	91.43
75.86	9.50	7.00	84.00	17.00	93.00	16.00	83.00
75.61	9.25	18.30	94.86	28.57	81.70	5.140	71.43
75.36	9.00	30.50	97.00	32.50	69.50	3.000	67.50
75.11	8.75	22.30	97.50	49.00	77.70	2.500	51.00
74.86	8.50	30.7	100.0	65.71	69.30	0.000	34.29
74.61	8.25	63.9	100.0	74.00	36.10	0.000	26.00
74.36	8.00	69.8	100.0	82.50	30.20	0.000	17.50



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Digital Radio Test Laboratory (revised)

B1.2 Onset of Error with other SCAs 9/17/96 (also see supplemental data)

Main Ch. Mod: CPN
SCA Group: A
SCA Mod: 1kHz

C_o/N_o	Attn	Error (%) 20 Byte	Error (%) Single 220 Byte	Error (%) Double 220 Byte	Completion (%) 20 Byte	Completion (%) Single 220 Byte	Completion (%) Double 220 Byte
13.10	14.50		0.000	0.000		100.0	100
12.85	14.25		0.500	0.000		99.50	100

Main Ch. Mod: CPN
SCA Group: B

C_o/N_o	Attn	Error (%) 20 Byte	Error (%) Single 220 Byte	Error (%) Double 220 Byte	Completion (%) 20 Byte	Completion (%) Single 220 Byte	Completion (%) Double 220 Byte
62.35	63.75		7.50	7.00		92.50	93.00

Errors occur without significant noise added.
57 kHz uneffected.

B1.3a 92KHz S/N ratio (Compol 92KHz SCA Rec.)
SCA Group: A

S/N (dB)

Best case RBDS & 92kHz Only 49
With Proponent Group A: 49
at OME: 23.7

EO&C
Rushing noise heard from SCA receiver

B1.3b Main ch. S/N ratio (Denon RX 2)
SCA Group: A 57.9 dB RMS No Filter 0dB taken with 1 kHz Mod Souce

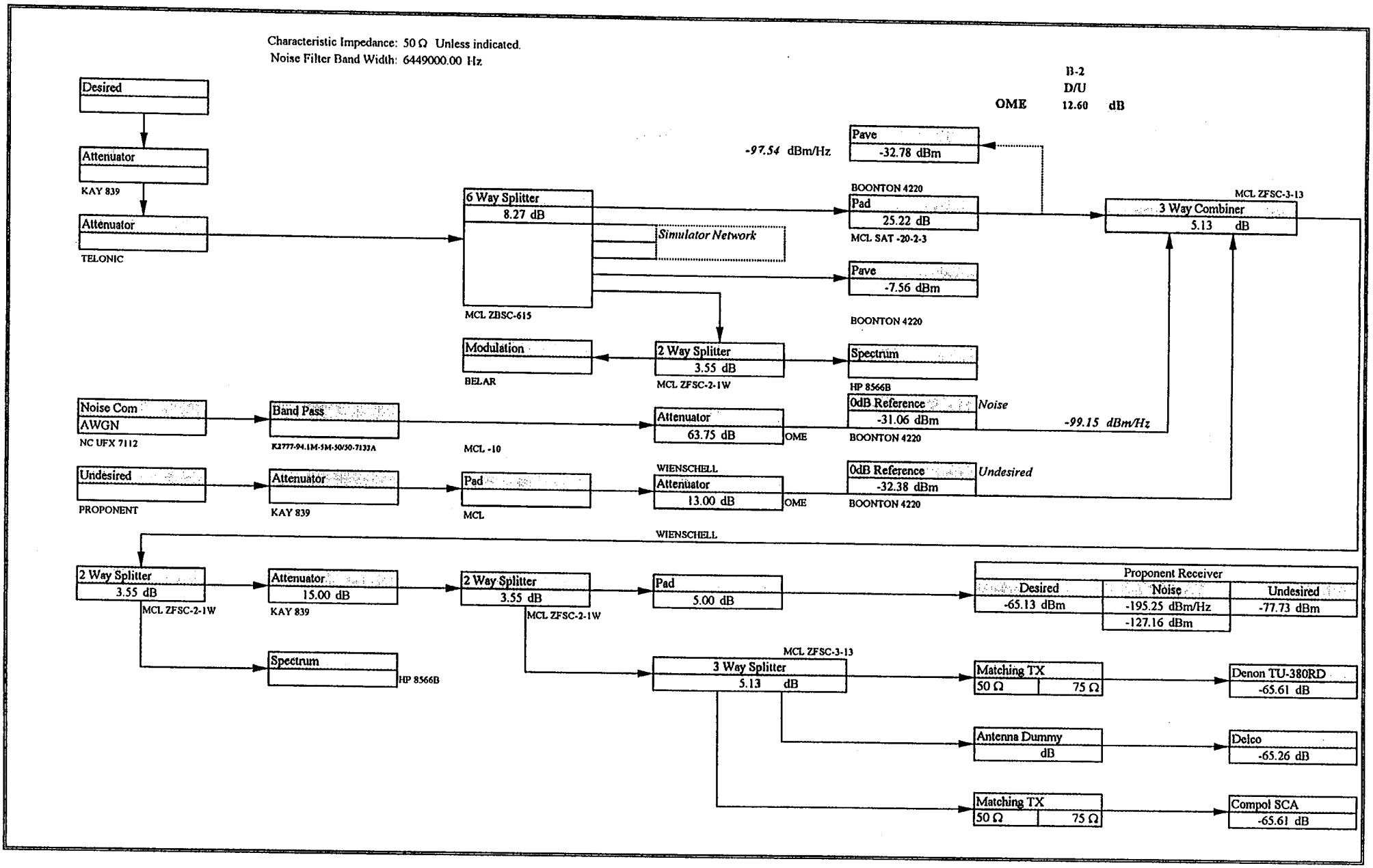
With Grp A and B1.1 noise level: 38.7 dB OME

B1.4a RBDS Block Error Level

Noise Level for 5% ± 2% maximum block errors per 100 blocks (measured for a period of 5 minutes)

C_o/N_o	Attn		Target	Meas
6.10	7.50	dB	5	5

B1.4b RBDS error measurement at B1.4 noise level
MAX error measurement: 5 % Without Proponent


Characteristic Impedance: 50 Ω Unless indicated.
Noise Filter Band Width: 6449000.00 Hz
B-2
D/U
OME 12.60 dB
Desired
Attenuator
KAY 839
Attenuator
TELONIC
-97.54 dBm/Hz
Pave
-32.78 dBm
BOONTON 4220
Pad
25.22 dB
MCL SAT -20-2-3
MCL ZFSC-3-13
3 Way Combiner
5.13 dB
6 Way Splitter
8.27 dB
Simulator Network
MCL ZBSC-615
Pave
-7.56 dBm
BOONTON 4220
Modulation
BELAR
2 Way Splitter
3.55 dB
MCL ZFSC-2-1W
Spectrum
HP 8566B
Noise Com
AWGN
NC UFX 7112
Band Pass
K2777-94.1M-5M-50/50-7133A
MCL -10
Attenuator
63.75 dB
OME
0dB Reference
-31.06 dBm
Noise
BOONTON 4220
-99.15 dBm/Hz
Undesired
PROPONENT
Attenuator
KAY 839
Pad
MCL
WIENSCHELL
Attenuator
13.00 dB
OME
0dB Reference
-32.38 dBm
Undesired
BOONTON 4220
WIENSCHELL
2 Way Splitter
3.55 dB
MCL ZFSC-2-1W
Attenuator
15.00 dB
KAY 839
2 Way Splitter
3.55 dB
MCL ZFSC-2-1W
Pad
5.00 dB
Proponent Receiver
Desired
-65.13 dBm
Noise
-195.25 dBm/Hz
-127.16 dBm
Undesired
-77.73 dBm
Spectrum
HP 8566B
MCL ZFSC-3-13
3 Way Splitter
5.13 dB
Matching TX
50 Ω
75 Ω
Denon TU-380RD
-65.61 dB
Antenna Dummy
dB
Delco
-65.26 dB
Matching TX
50 Ω
75 Ω
Compol SCA
-65.61 dB

Digital Radio Test Laboratory

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B1.2 Onset of Error with other SCAs 9/17/96 Amended 2/26/97

Main Ch. Mod: CPN
SCA Group: A
SCA Mod: 1kHz

			Error (%)			Completion (%)	
			Single	Double		Single	Double
C/N_0	**Attn**	**20 Byte**	**220 Byte**	**220 Byte**	**20 Byte**	**220 Byte**	**220 Byte**
77.61	11.25		0.000	0.000		100.0	100
77.36	11.00		25.14	1.710		74.86	98.29

Main Ch. Mod: CPN
SCA Group: B

			Error (%)			Completion (%)	
			Single	Double		Single	Double
C/N_0	**Attn**	**20 Byte**	**220 Byte**	**220 Byte**	**20 Byte**	**220 Byte**	**220 Byte**
82.36	16.00		0.000	0.000		100.0	100
82.11	15.75		32.57	1.710		67.43	98

B1.3a 92KHz S/N ratio (Compol 92KHz SCA Rec.)
SCA Group: A S/N (dB)

Best case RBDS & 92kHz Only	49
With Proponent Group A:	49
at OME:	23.7

EO&C
Rushing noise heard from SCA receiver

B1.3b Main ch. S/N ratio (Denon RX 2)
SCA Group: A 57.9 dB RMS No Filter 0dB taken with 1 kHz Mod Souce

With Grp A and B1.1 noise level: 38.7 dB OME

B1.4a RBDS Block Error Level

C/N_0	Attn		Target	Meas
73.86	7.50	dB	5	5

Noise Level for 5% ± 2% maximum block errors per 100 blocks (measured for a period of 5 minutes)

B1.4b RBDS error measurement at B1.4 noise level
MAX error measurement: 5 % Without Proponent

Digital Radio Test Laboratory

(with RDS phasing set correctly)

B1.2 Onset of Error with other SCAs 9/17/96 Ammended 2/26/97

Main Ch. Mod: CPN
SCA Group: A
SCA Mod: 1kHz

			Error (%)			Completion (%)	
			Single	Double		Single	Double
C_0/N_0	Attn	20 Byte	220 Byte	220 Byte	20 Byte	220 Byte	220 Byte
9.85	11.25		0.000	0.000		100.0	100
9.60	11.00		25.14	1.710		74.86	98.29

Main Ch. Mod: CPN
SCA Group: B

			Error (%)			Completion (%)	
			Single	Double		Single	Double
C_0/N_0	Attn	20 Byte	220 Byte	220 Byte	20 Byte	220 Byte	220 Byte
14.60	16.00		0.000	0.000		100.0	100
14.35	15.75		32.57	1.710		67.43	98

B1.3a 92KHz S/N ratio (Compol 92KHz SCA Rec.)
SCA Group: A

	S/N (dB)
Best case RBDS & 92kHz Only	49
With Proponent Group A:	49
at OME:	23.7

EO&C
Rushing noise heard from SCA receiver

B1.3b Main ch. S/N ratio (Denon RX 2)

SCA Group: A	57.9 dB	RMS No Filter	0dB taken with 1 kHz Mod Souce
With Grp A and B1.1 noise level:	38.7 dB	OME	

B1.4a RBDS Block Error Level

Noise Level for 5% ± 2% maximum block errors per 100 blocks (measured for a period of 5 minutes)

C_0/N_0	Attn		Target	Meas
6.10	7.50	dB	5	5

B1.4b RBDS error measurement at B1.4 noise level

MAX error measurement: 5 % Without Proponent

(+ Harmonic)

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Digital Radio Test Laboratory

B-2 Co-Channel
Characterization of HS Digital Subcarrier Signal Failure

Date: 9/18/96
Engineer(s): DML

PROPONENT SPECIFIC

COMPOSITE SIGNAL

ORBAN #1
COMP OUT 1: Prop + SCA
COMP OUT 2: Proponent Only

ORBAN #2
COMP OUT 1: Proponent Only
COMP OUT 2: Prop + SCA

Main Channel modulation adjusted for 110%

B2.1 Co-Channnel Analog Reference

Desired Signal Parameters

RF Key Point Meas.: -32.78 dBm
RX RF Level: -65 dBm
Main Channel Modulation: 1 kHz
Modulation Level: 100 %
SCA Group: None
Measurement: 45dB S/N ratio target on main analog channel receiver

0 dB Reference

Undesired Signal Parameters

RF Key Point Meas.: -32.38 dBm
Main Channel Modulation: CPN
Modulation Level: 110 %
SCA Group: 67 & 92 kHz
SCA Modulation: 0.4 & 1 kHz
(Measurement is rms w/15 kHz LPF)

	Delco RX 1		d/u	Denon RX 2		d/u
	Best Case S/N:	57.30 dB		Best Case S/N:	60.00 dB	
	S/N:	45.00 dB		S/N:	45.00 dB	
Reference:	Atten:	25.50 dB	**25.10 dB**	Atten:	30.00 dB	**29.60 dB**

B2.2a Co-Channnel HSD Interference

Desired Signal Parameters

RF Level: -65dBm
Modulation Type: None
Modulation Level: None
SCA Group: None

Undesired Signal Parameters

Modulation Type: CPN
Modulation Level: 110%
SCA Group: Group A

	Delco RX 1		d/u	Denon RX 2		d/u
	S/N:	45.00 dB		S/N:	45.00 dB	
Group A:	Atten:	25.50 dB	**25.10 dB**	Atten:	30.00 dB	**29.60 dB**

B2.2b **Co-Channnel HSD Interference**

Desired Signal Parameters

RF Level: -65dBm
Modulation Type: None
Modulation Level: None
SCA Group: None

Undesired Signal Parameters

Modulation Type: CPN
Modulation Level: 110%
SCA Group: Group B

Measurement: Target Signal-to-Noise Ratio

	Delco RX 1		d/u	Denon RX 2		d/u
	S/N:	45.00 dB		S/N:	45.00 dB	
Group B:	Atten:	25.50 dB	**25.10 dB**	Atten:	30.00 dB	**29.60 dB**

B2.2c **Co-Channnel HSD -> Analog Interference**

Desired Signal Parameters

RF Level: -65dBm
Modulation Type: None
Modulation Level: None
SCA Group: None

Undesired Signal Parameters

Modulation Type: CPN
Modulation Level: 110%
SCA Group: Proponent Only

Measurement: Target Signal-to-Noise Ratio

	Delco RX 1		d/u	Denon RX 2		d/u
	S/N:	45.00 dB		S/N:	45.00 dB	
	Atten:	25.50 dB	**25.10 dB**	Atten:	29.75 dB	**29.35 dB**

Digital Radio Test Laboratory

B2.3 **Co-Channel Analog -> HSD interference**

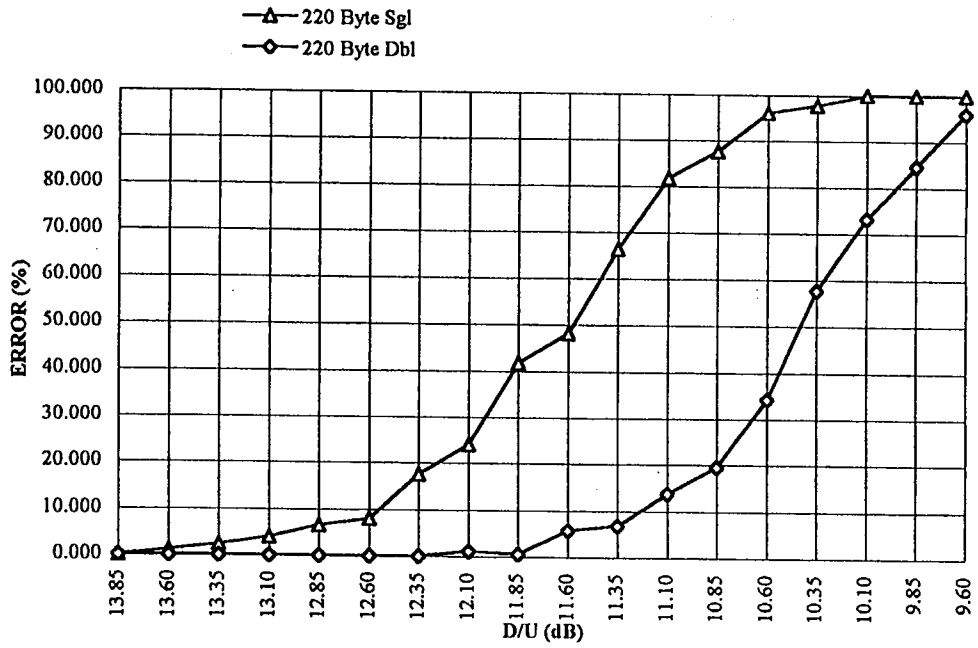
Desired Signal Parameters

RF Level: -65 dBm
Modulation Type: CPN
Modulation Level: 110 %
SCA Group: Proponent Only

Undesired Signal Parameters

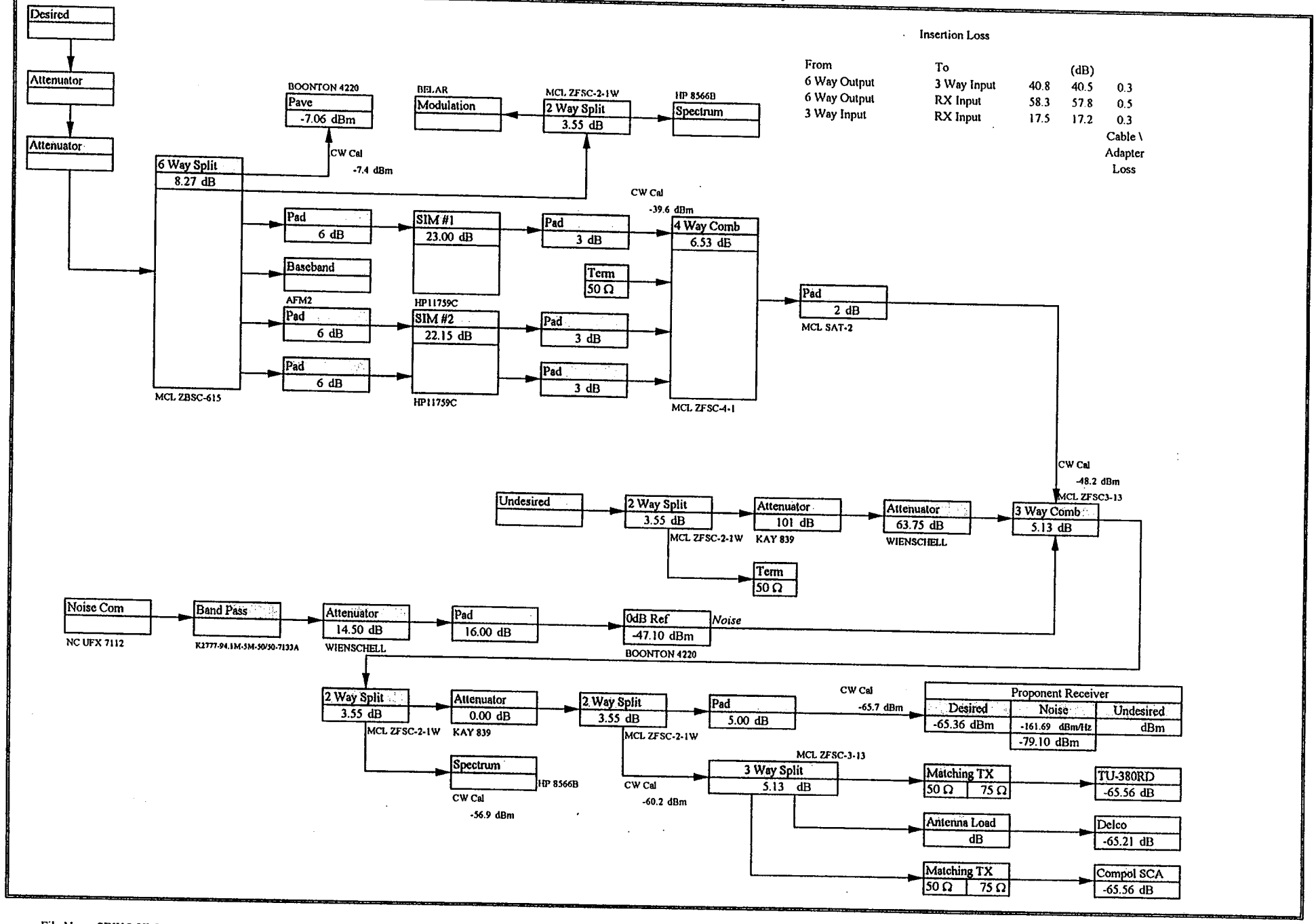
Modulation Type: CPN
Modulation Level: 110 %
SCA Group: 67 &92 kHz

-Chan. Level		Error (%)			Completion (%)		
			Single	Double		Single	Double
D/U	Attn	20 Byte	220 Byte	220 Byte	20 Byte	220 Byte	220 Byte
13.85	14.25		0.000	0.000		100.0	100.0
13.60	14.00		1.140	0.000		98.86	100.0
13.35	13.75		2.290	0.000		97.71	100.0
13.10	13.50		4.000	0.000		96.00	100.0
12.85	13.25		6.500	0.000		93.50	100.0
12.60	13.00		8.000	0.000		92.00	100.0
12.35	12.75		17.50	0.000		82.50	100.0
12.10	12.50		24.00	1.140		76.00	98.86
11.85	12.25		41.71	0.570		58.29	99.43
11.60	12.00		48.00	5.710		52.00	94.29
11.35	11.75		66.29	6.860		33.71	93.14
11.10	11.50		81.71	13.710		18.29	86.29
10.85	11.25		87.50	19.500		12.50	80.50
10.60	11.00		96.00	34.290		4.000	65.71
10.35	10.75		97.71	57.710		2.290	42.29
10.10	10.50		100.00	73.140		0.000	26.86
9.85	10.25		100.00	84.500		0.000	15.50
9.60	10.00		100.00	96.000		0.000	4.000



This data amended - refer to amended data

Digital Radio Test Laboratory



Digital Radio Test Laboratory

SUPPLEMENTAL DATA

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B2.3 Co-Channel Analog -> HSD interference Ammended 3/7/97

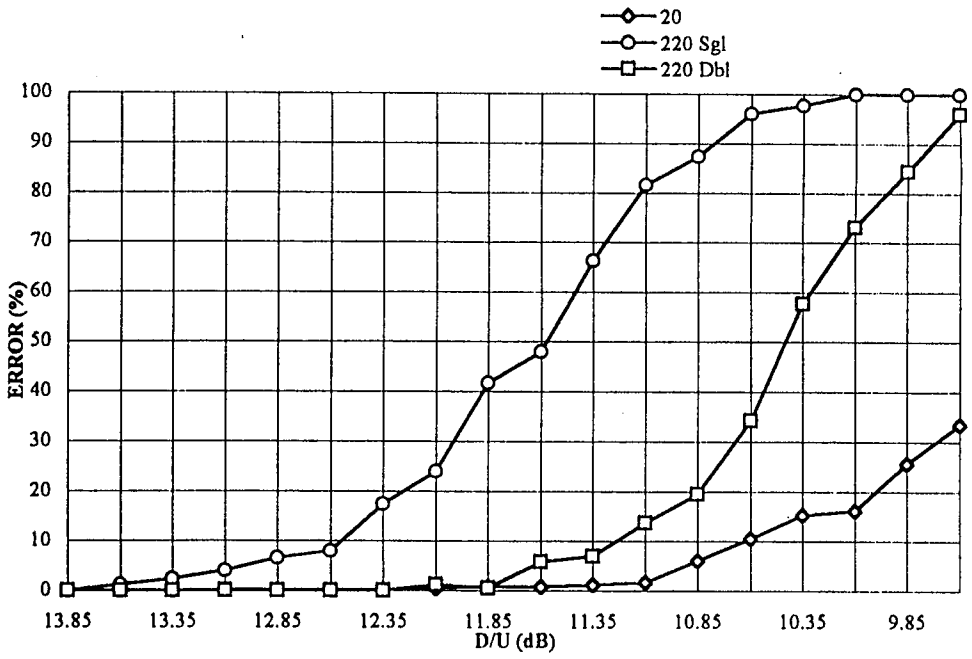
Desired Signal Parameters

RF Level: -65 dBm Weighting
Modulation Type: CPN 512
Modulation Level: 110 %
SCA Group: Proponent Only

Undesired Signal Parameters

Modulation Type: CPN
Modulation Level: 110 %
SCA Group: 67 &92 kHz

-Chan.	Level		Error (%)			Completion (%)	
			Single	Double		Single	Double
D/U	Attn	20 Byte	220 Byte	220 Byte	20 Byte	220 Byte	220 Byte
13.85	14.25	0.0	0.000	0.000	100.0	100.0	100.0
13.60	14.00	0.0	1.140	0.000	100.0	98.86	100.0
13.35	13.75	0.0	2.290	0.000	100.0	97.71	100.0
13.10	13.50	0.1	4.000	0.000	99.9	96.00	100.0
12.85	13.25	0.1	6.500	0.000	99.9	93.50	100.0
12.60	13.00	0.1	8.000	0.000	99.9	92.00	100.0
12.35	12.75	0.2	17.50	0.000	99.8	82.50	100.0
12.10	12.50	0.4	24.00	1.140	99.6	76.00	98.86
11.85	12.25	0.9	41.71	0.570	99.1	58.29	99.43
11.60	12.00	0.8	48.00	5.710	99.2	52.00	94.29
11.35	11.75	1.2	66.29	6.860	98.8	33.71	93.14
11.10	11.50	1.7	81.71	13.71	98.3	18.29	86.29
10.85	11.25	6.0	87.50	19.50	94.0	12.50	80.50
10.60	11.00	10.5	96.00	34.29	89.5	4.000	65.71
10.35	10.75	15.2	97.71	57.71	84.8	2.290	42.29
10.10	10.50	16.2	100.0	73.14	83.8	0.000	26.86
9.85	10.25	25.6	100.0	84.50	74.4	0.000	15.50
9.60	10.00	33.5	100.0	96.00	66.5	0.000	4.000



Digital Radio Test Laboratory

(revised)

B-3 Multipath
Characterization of HS Digital Subcarrier Signal Failure

Basic Test Parameters: **SIGNAL**

One Path Zero Phase Reference: -65dBm
Main Channel Mod: CPN
SCA Group: A
Error Measurement Duration: 5 minutes

PROPONENT SPECIFIC

COMPOSITE SIGNAL

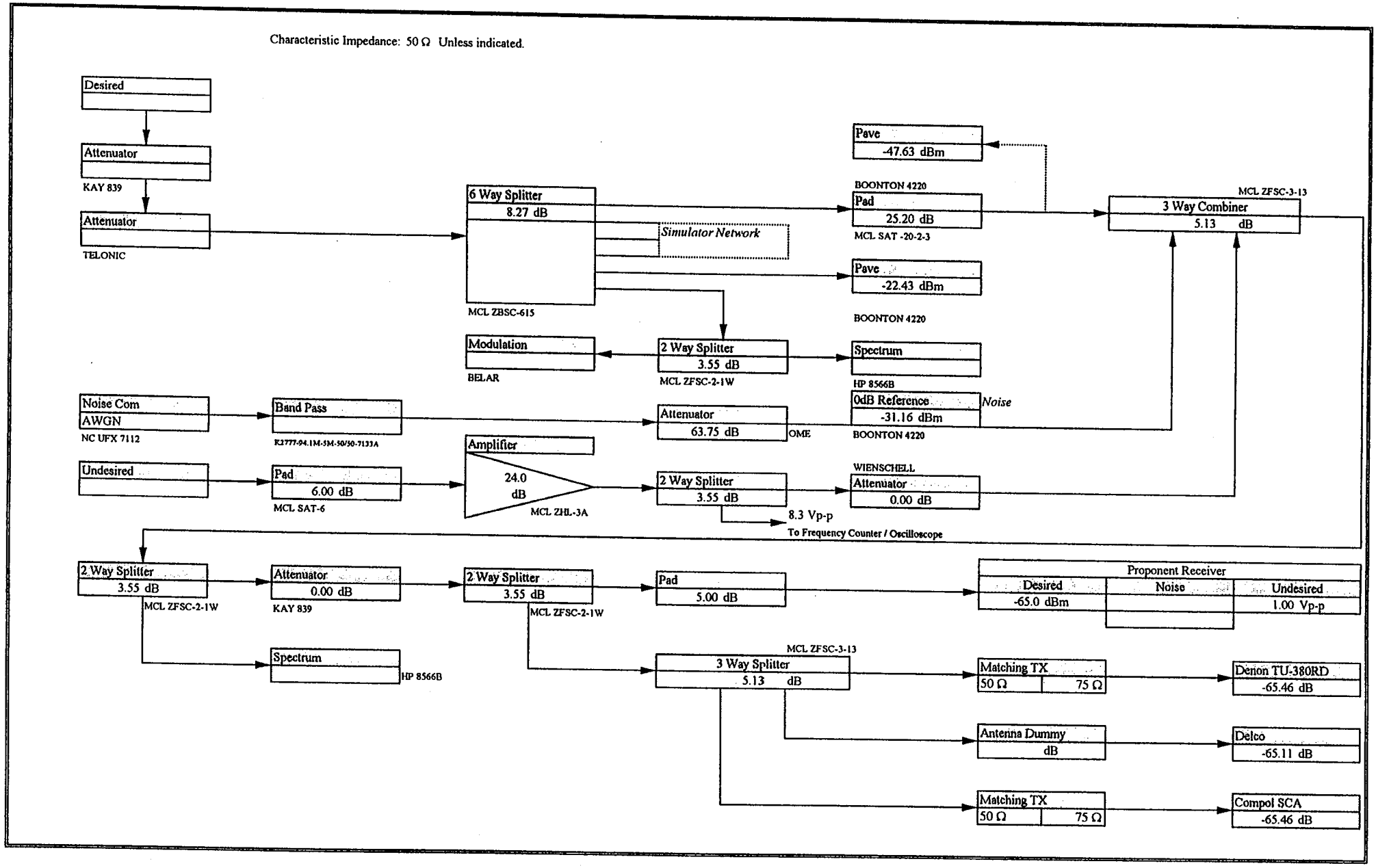
ORBAN #1
COMP OUT 1: Not Used
COMP OUT 2: Not Used
5-Band Medium Processed
ORBAN #2
COMP OUT 1: Proponent Only
COMP OUT 2: Prop + SCA
Main Channel modulation
adjusted for 110%

Analog Receivers: Denon TU-380RD RBDS Receiver W/RDS Check software utilty

This data amended - refer to amended data

	Noise Level		Error Level (%)			EO&C
	C/N_0	Attn	20 Byte	Single 220 Byte	Double 220 Byte	
Urban Slow	**63.32**	63.75	-	10.86	10.29	Performance impaired without added noise. MAX RBDS Block Error= 10 % at OME.
Urban Fast	**63.32**	63.75	-	94.86	93.71	Performance impaired without added noise. MAX RBDS Block Error= 17 % at OME.
Rural Fast	**63.32**	63.75	-	80.00	54.86	Performance impaired without added noise. MAX RBDS Block Error= 14 % at OME.
Obstructed	**63.32**	63.75	-	100.0	100.0	Only briefly re-acquired signal. MAX RBDS Block Error= 97 % at OME. No difference with pilot only on Main Channel.

Digital Radio Test Laboratory



Digital Radio Test Laboratory

B-3 Multipath
Characterization of HS Digital Subcarrier Signal Failure

Basic Test Parameters: **SIGNAL** **PROPONENT SPECIFIC** **COMPOSITE SIGNAL**

One Path Zero Phase Reference: -65dBm
Main Channel Mod: CPN
SCA Group: A
Error Measurement Duration: 5 minutes

Analog Receivers: Denon TU-380RD RBDS Receiver W/RDS Check software utilty
Ammended: 3/10/97

ORBAN #1
COMP OUT 1: Not Used
COMP OUT 2: Not Used
5-Band Medium Processed
ORBAN #2
COMP OUT 1: Proponent Only
COMP OUT 2: Prop + SCA
Main Channel modulation
adjusted for 110%

	Noise Level		Error Level (%)			EO&C
	C/N_0	Attn	20 Byte	Single 220 Byte	Double 220 Byte	
Urban Slow	**131.08**	63.75	1.300	10.86	10.29	Performance impaired without added noise. MAX RBDS Block Error= 10 % at OME.
			1.040 ← Calc			
Urban Fast	**131.08**	63.75	23.20	94.86	93.71	Performance impaired without added noise. MAX RBDS Block Error= 17 % at OME.
			23.60 ← Calc			
Rural Fast	**131.08**	63.75	14.60	80.00	54.86	Performance impaired without added noise. MAX RBDS Block Error= 14 % at OME.
			13.60 ← Calc			
Obstructed	**131.08**	63.75	100.0	100.0	100.0	Only briefly re-acquired signal. MAX RBDS Block Error= 97 % at OME. No difference with pilot only on Main Channel.
			100.0 ← Calc			

Digital Radio Test Laboratory

SUPPLEMENTAL DATA

B-3 Multipath
Characterization of HS Digital Subcarrier Signal Failure

Basic Test Parameters:

SIGNAL

One Path Zero Phase Reference: -65dBm
Main Channel Mod: CPN
SCA Group: A
Error Measurement Duration: 5 minutes

Analog Receivers: Denon TU-380RD RBDS Receiver W/RDS Check software utilty
Ammended: 3/10/97

PROPONENT SPECIFIC

COMPOSITE SIGNAL

ORBAN #1
COMP OUT 1: Not Used
COMP OUT 2: Not Used
5-Band Medium Processed
ORBAN #2
COMP OUT 1: Proponent Only
COMP OUT 2: Prop + SCA
Main Channel modulation
adjusted for 110%

		Noise Level		Error Level (%)			
	C/N	C_o/N_o	Attn	20 Byte	Single 220 Byte	Double 220 Byte	EO&C
Urban Slow	131.08	63.32	63.75	1.300	10.86	10.29	Performance impaired without added noise. MAX RBDS Block Error= 10 % at OME.
				1.040 ◄ Calc			
Urban Fast	131.08	63.32	63.75	23.20	94.86	93.71	Performance impaired without added noise. MAX RBDS Block Error= 17 % at OME.
				23.60 ◄ Calc			
Rural Fast	131.08	63.32	63.75	14.60	80.00	54.86	Performance impaired without added noise. MAX RBDS Block Error= 14 % at OME.
				13.60 ◄ Calc			
Obstructed	131.08	63.32	63.75	100.0	100.0	100.0	Only briefly re-acquired signal. MAX RBDS Block Error= 97 % at OME. No difference with pilot only on Main Channel.
				100.0 ◄ Calc			

Digital Radio Test Laboratory

B-4 Impulse Noise 11/6/96

Desired Signal

-65 dBm at receiver input.
Group A subcarriers.

Undesired Signal

10 ns wide 1.0 Vp-p pulse at receiver input
Repetition Rate Variable

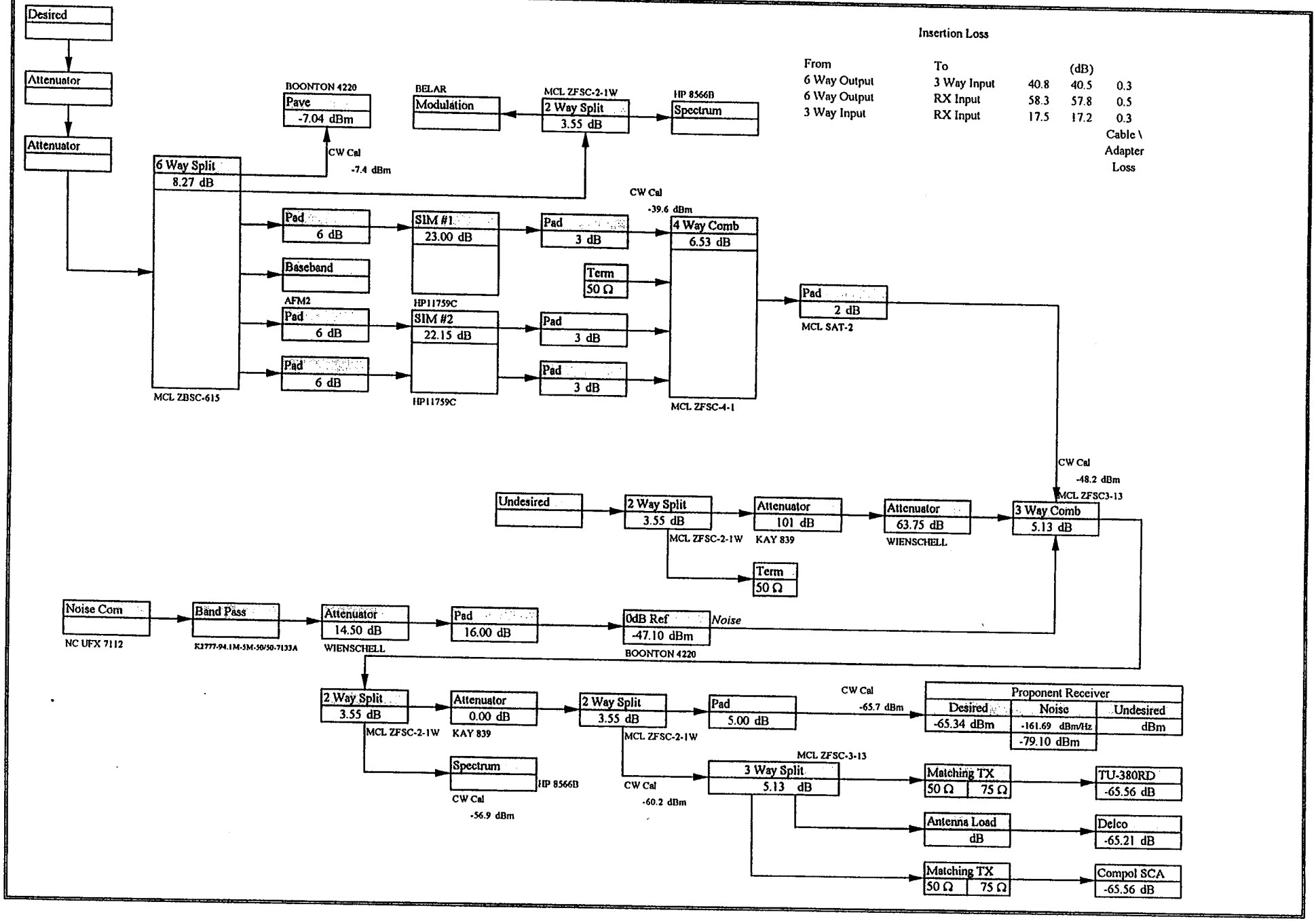
Results accumulated over 5 minute measurement period.

Pilot Only

Repetition Rate (Hz)	220 Byte Sgl	220 Byte Dbl	Attenuator Setting (dB)	Voltage (Vp-p)
100	0.0000	0.0000	0	1.0000
200	0.0000	0.0000	0	1.0000
300	0.0000	0.0000	0	1.0000
600	0.0000	0.0000	0	1.0000
1000	8.000	0.0000	0	1.0000
1000	0.5700	0.0000	10	0.3162
1000	0.0000	0.0000	15	0.1778

Clipped Pink Noise (Stereo)

Repetition Rate (Hz)	220 Byte Sgl	220 Byte Dbl	Attenuator Setting (dB)	Voltage (Vp-p)
100	0.0000	0.0000	0	1.000
200	0.0000	0.0000	0	1.000
300	0.0000	0.0000	0	1.000
600	0.0000	0.0000	0	1.000
1000	8.000	0.5700	0	1.0000
1000	2.860	0.0000	10	0.3162
1000	0.5700	0.0000	15	0.1778
1000	0.0000	0.0000	20	0.1000


Desired
Attenuator
Attenuator
BOONTON 4220
Pave
-7.04 dBm
CW Cal
-7.4 dBm
BELAR
Modulation
MCL ZFSC-2-1W
2 Way Split
3.55 dB
HP 8566B
Spectrum
Insertion Loss
From
To
(dB)
6 Way Output
3 Way Input
40.8
40.5
0.3
6 Way Output
RX Input
58.3
57.8
0.5
3 Way Input
RX Input
17.5
17.2
0.3
Cable \ Adapter Loss
6 Way Split
8.27 dB
MCL ZBSC-615
CW Cal
-39.6 dBm
Pad
6 dB
SIM #1
23.00 dB
HP11759C
Pad
3 dB
4 Way Comb
6.53 dB
MCL ZFSC-4-1
Baseband
AFM2
Term
50 Ω
Pad
6 dB
SIM #2
22.15 dB
HP11759C
Pad
3 dB
Pad
6 dB
Pad
3 dB
Pad
2 dB
MCL SAT-2
CW Cal
-48.2 dBm
MCL ZFSC3-13
Undesired
2 Way Split
3.55 dB
MCL ZFSC-2-1W
Attenuator
101 dB
KAY 839
Attenuator
63.75 dB
WIENSCHELL
3 Way Comb
5.13 dB
Term
50 Ω
Noise Com
NC UFX 7112
Band Pass
K2777-94.1M-5M-50/50-7133A
Attenuator
14.50 dB
WIENSCHELL
Pad
16.00 dB
0dB Ref
-47.10 dBm
BOONTON 4220
Noise
2 Way Split
3.55 dB
MCL ZFSC-2-1W
Attenuator
0.00 dB
KAY 839
2 Way Split
3.55 dB
MCL ZFSC-2-1W
Pad
5.00 dB
CW Cal
-65.7 dBm
Proponent Receiver
Desired
Noise
Undesired
-65.34 dBm
-161.69 dBm/Hz
-79.10 dBm
dBm
Spectrum
HP 8566B
CW Cal
-56.9 dBm
CW Cal
-60.2 dBm
MCL ZFSC-3-13
3 Way Split
5.13 dB
Matching TX
50 Ω
75 Ω
TU-380RD
-65.56 dB
Antenna Load
dB
Delco
-65.21 dB
Matching TX
50 Ω
75 Ω
Compol SCA
-65.56 dB

Digital Radio Test Laboratory

B-4 Impulse Noise 1/21/97

Desired Signal

-65 dBm at receiver input.
Group A subcarriers.

Undesired Signal

10 ns wide 1.0 Vp-p pulse at receiver input
Repetition Rate Variable

Results accumulated over 5 minute measurement period.

Repetition Rate (kHz)	Error Rate (%) Sgl 220 Byte	Dbl 220 Byte	Attenuator Setting (dB)	Voltage (Vp-p)
1.3	98.40	47.20	0	1.0000
1.3	88.57	24.00	15	0.1778
1.3	9.330	0.4400	20	0.1000
1.3	0.000	0.000	25	0.0562
1.6	96.80	26.00	0	1.0000
1.6	70.86	3.430	15	0.1778
1.6	1.500	0.0000	20	0.1000

Test	B-5	Airplane Flutter				
Scenario	Reflected Path	Medium Signal Strength				
		CPN		Pilot Only		
#1	400 km/h Doppler 27.5 µs Delay 8.00 dB	220 S 99.25 Without main channel modulation the system performs error free. With Clipped Pink Noise on the main channel error rates are listed .	220 D 99.25	220 S 0	220 D 0	%
#2	200 km/h Doppler 13.7 µs Delay 6.00 dB	220 S 100.00 Without main channel modulation the system performs error free. With Clipped Pink Noise on the main channel error rates are listed .	220 D 100.00	220 S 0	220 D 0	%
#3	100 km/h Doppler 6.8 µs Delay 4.00 dB	220 S 100.00 With and without main channel modulation the error rates are listed above. Complete message loss.	220 D 100.00	220 S 0	220 D 0	%
Test Date: 22-Oct-96 ngineer(s): DML						

(see also supplemental data)

B-6 Weak Signal
Characterization of HS Digital Subcarrier Signal Failure

pilot:	9 %			9 %			9 %	
proponent:	10 %			10 %			10 %	
57 kHz:	%			3 %			10 %	
92 kHz:	%			7 %			%	
Total Injection:	19 %			29 %			29 %	
	Proponent Only			A			B	
Signal Level:	-83 ≤OME<	-82	dBm	-83 ≤OME<	-82	dBm	Can not achieve error free performance.	

SUPPLEMENTAL DATA

B-6 Weak Signal Ammended 2/26/97

Characterization of HS Digital Subcarrier Signal Failure

pilot:	9 %	9 %	9 %
proponent:	10 %	10 %	10 %
57 kHz:	%	3 %	10 %
92 kHz:	%	7 %	%
Total Injection:	19 %	29 %	29 %
	Proponent Only	A	B
Signal Level:	-83 ≤OME< -82 dBm	-83 ≤OME< -82 dBm	-79 ≤OME< -78 dBm

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Digital Radio Test Laboratory

C-1 Re-Acquisition 10/22/96

	Re-Acquisition Time (s)		
	POF-2dB	POF-4dB	POF-6dB
	42.7	28.9	26.5
	27.7	27.5	27.5
	24.9	25.2	26.7
	6.8	29.5	23.6
	26.9	24.5	26.1
Average	25.8	27.1	26.1

Point Of Failure Attenuator Setting	6.50 dB
Desired Signal Reference Level	-47.84 dBm
Noise 0 dB Reference	-47.0 dBm
Desired Signal Level at Receiver	-65 dBm

POF Noise Level is defined as the level which causes
220 byte Packet Error Rate of 95% ± 5%.

ABBA Used as Modulation Source on Main Channel

Connection is broken for at least 30 seconds.

Test **C-2** Re-Acquisition with Multipath
Urban Slow Rayleigh

Tsim (s)	Re-Acquisition Time (s) POF-2	POF-4	POF-6
5	11.7	13.1	20.1
10	46.7	16.2	30.3
15	35.8	53.7	15.1
20	17.5	7.8	10.5
Average	27.9	22.7	19.0

POF Attenuator Setting: 12 dB

EO&C

Point of Failure (POF) defined as:
220 Byte Message Error Rate ≥ 50 %

Test Date: 22-Oct-96
ngineer(s): DML

Test	C-2	Re-Acquisition with Multipath Urban Fast Rayleigh

Tsim (s)	Re-Acquisition Time (s) POF
5	12.3
10	21.9
15	22.4
20	27.2
Average	21.0

POF Attenuator Setting: 63.75 dB

EO&C

Without added noise the performance is beyond point of failure.

Test Date: 23-Oct-96

ngineer(s): DML

Test	C-2	Re-Acquisition with Multipath Rural Fast Rayleigh

Tsim (s)	Re-Acquisition Time (s) POF
5	13.5
10	35.0
15	30.9
20	43.8
Average	30.8

POF Attenuator Setting: 63.75 dB

EO&C

Without added noise the performance is at or beyond point of failure.

Test Date: 23-Oct-96

ngineer(s): DML

Test	C-2	Re-Acquisition with Multipath Obstructed Rayleigh

Tsim (s)	Re-Acquisition Time (s) POF
5	
10	
15	
20	
Average	0.0

EO&C

System does not re-acquire after 5 minutes of this multipath scenario.

Test Date: 23-Oct-96

ngineer(s): DML

Digital Radio Test Laboratory

(revised)

E-2 **Host Analog Program -› HSDS with Multipath**

Engineer(s): DML Date: 10/23/96

Basic Test Parameters: **SIGNAL** **PROPONENT SPECIFIC** **COMPOSITE SIGNAL**

One Path Zero Phase Reference: -65dBm
Main Channel Mod: CPN
SCA Group: A
Error Measurement Duration: 5 minutes
92 kHz: Track 48 on EBU SQAM Disk

5-Band Medium Processed
ORBAN #2
COMP OUT 1: Proponent Only
COMP OUT 2: Prop + SCA
Main Channel modulation
adjusted for 110%

		Noise Level		Error Level (%)			EO&C
		C_o/N_o	Attn	20 Byte	Single 220 Byte	Double 220 Byte	
Urban Slow	CPN	**63.32**	63.75	-	12.00	10.29	Improvement without main channel modulation.
	Pilot Only	**63.32**	63.75		3.43	0.00	
Urban Fast	CPN	**63.32**	63.75	-	94.29	93.71	Improvement without main channel modulation.
	Pilot Only	**63.32**	63.75		82.86	77.71	
Rural Fast	CPN	**63.32**	63.75	-	85.71	62.29	Improvement without main channel modulation.
	Pilot Only	**63.32**	63.75		75.43	58.29	
Obstructed	CPN	**63.32**	63.75	-	100.0	100.0	No difference.
	Pilot Only	**63.32**	63.75		100.0	100.0	

Digital Radio Test Laboratory

E-2 Host Analog Program -› HSDS with Multipath

Engineer(s): DML Date: 10/23/96

Basic Test Parameters: **SIGNAL** **PROPONENT SPECIFIC** **COMPOSITE SIGNAL**

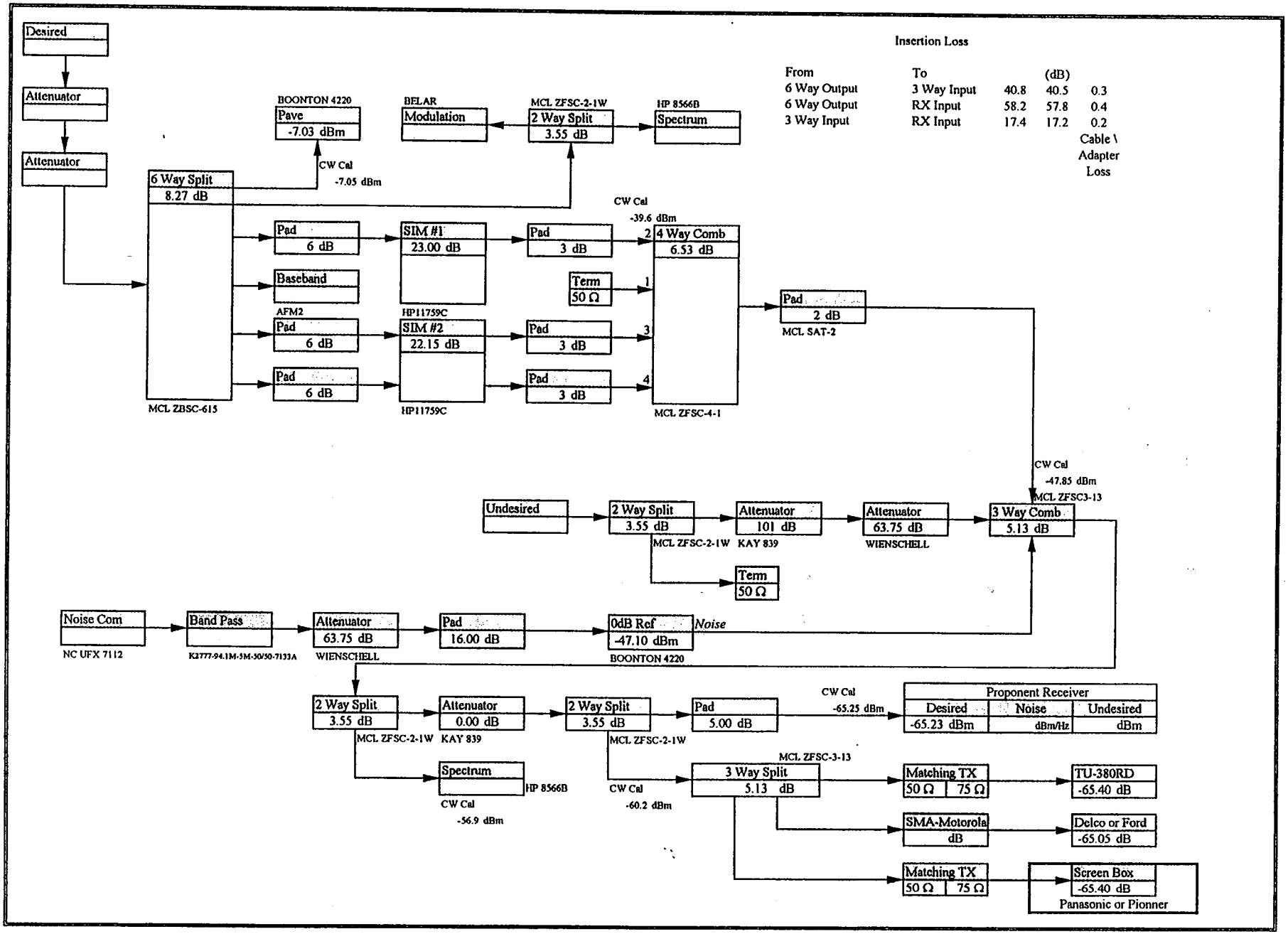
One Path Zero Phase Reference: -65dBm
Main Channel Mod: CPN
SCA Group: A
Error Measurement Duration: 5 minutes
92 kHz: Track 48 on EBU SQAM Disk

5-Band Medium Processed
ORBAN #2
COMP OUT 1: Proponent Only
COMP OUT 2: Prop + SCA
Main Channel modulation
adjusted for 110%

		Noise Level		Error Level (%)			EO&C
		C/N_0	Attn	20 Byte	Single 220 Byte	Double 220 Byte	
Urban Slow	CPN	**131.08**	63.75	-	12.00	10.29	Improvement without main channel modulation.
	Pilot Only	**131.08**	63.75		3.43	0.00	
Urban Fast	CPN	**131.08**	63.75	-	94.29	93.71	Improvement without main channel modulation.
	Pilot Only	**131.08**	63.75		82.86	77.71	
Rural Fast	CPN	**131.08**	63.75	-	85.71	62.29	Improvement without main channel modulation.
	Pilot Only	**131.08**	63.75		75.43	58.29	
Obstructed	CPN	**131.08**	63.75	-	100.0	100.0	No difference.
	Pilot Only	**131.08**	63.75		100.0	100.0	

TESTS

D


Desired
Attenuator
Attenuator
BOONTON 4220
Pave
-7.03 dBm
CW Cal
-7.05 dBm
BELAR
Modulation
MCL ZFSC-2-1W
2 Way Split
3.55 dB
HP 8566B
Spectrum
Insertion Loss
From To (dB)
6 Way Output 3 Way Input 40.8 40.5 0.3
6 Way Output RX Input 58.2 57.8 0.4
3 Way Input RX Input 17.4 17.2 0.2
Cable \ Adapter Loss
6 Way Split
8.27 dB
MCL ZBSC-615
Pad
6 dB
Baseband
AFM2
Pad
6 dB
Pad
6 dB
SIM #1
23.00 dB
SIM #2
22.15 dB
HP11759C
Pad
3 dB
Term
50 Ω
Pad
3 dB
Pad
3 dB
CW Cal
-39.6 dBm
4 Way Comb
6.53 dB
MCL ZFSC-4-1
Pad
2 dB
MCL SAT-2
CW Cal
-47.85 dBm
MCL ZFSC3-13
Undesired
2 Way Split
3.55 dB
MCL ZFSC-2-1W
Attenuator
101 dB
KAY 839
Attenuator
63.75 dB
WIENSCHELL
3 Way Comb
5.13 dB
Term
50 Ω
Noise Com
NC UFX 7112
Band Pass
K1777-94.1M-5M-50/50-7133A
Attenuator
63.75 dB
WIENSCHELL
Pad
16.00 dB
0dB Ref
-47.10 dBm
BOONTON 4220
Noise
2 Way Split
3.55 dB
MCL ZFSC-2-1W
Attenuator
0.00 dB
KAY 839
Spectrum
HP 8566B
CW Cal
-56.9 dBm
2 Way Split
3.55 dB
MCL ZFSC-2-1W
Pad
5.00 dB
CW Cal
-65.25 dBm
CW Cal
-60.2 dBm
Proponent Receiver
Desired Noise Undesired
-65.23 dBm dBm/Hz dBm
MCL ZFSC-3-13
3 Way Split
5.13 dB
Matching TX
50 Ω 75 Ω
TU-380RD
-65.40 dB
SMA-Motorola
dB
Delco or Ford
-65.05 dB
Matching TX
50 Ω 75 Ω
Screen Box
-65.40 dB
Panasonic or Pionner

D-1 HSSC -› Host Analog

Main Channel:	91	%		91	%		81	%		81	%	
Pilot:	9	%		9	%		9	%		9	%	
92 kHz:	0	%		0	%		7	%		0	%	
57 kHz:	0	%		0	%		3	%		10	%	
Proponent:	0	%		10	%		10	%		10	%	
Total:	100	%		110	%		110	%		110	%	

	0 dB= 2.40 V					0 dB= 2.25 V					
	Pilot Only		Proponent + Pilot			Group A			Group B		
RF Level dBm	S/N	Units	MITRE S/N (dB)	DDJ S/N (dB)	SEIKO S/N (dB)	MITRE S/N (dB)	DDJ S/N (dB)	SEIKO S/N (dB)	MITRE S/N (dB)	DDJ S/N (dB)	SEIKO S/N (dB)
-65	50.8	dB	50.7	50.7	50.7	50.0	50.0	50.0	49.8	49.8	49.8
-75	47.6	dB	47.5	47.5	47.5	46.8	46.8	46.8	46.7	46.7	46.7

Measurements made psophometrically (Q-Peak detected with CCIR weighting and 15 kHz low pass filters).
0 dB Reference Measurements made with 1 kHz Mod Source on Main Channel L+R.
Measurements made on Left Channel.
Orban #2 Composite output #1 Set for 91% Main Channel Modulation
Orban #2 Composite output #2 Set for 81% Main Channel Modulation
Unit Not in Screen Box
Clipped Pink Noise on 92 kHz SCA.
Engineer(s): DML, TBK
Tests Conducted: 11/13/1996, 11/18/96, 11/22/96

Digital Radio Test Laboratory

DAT File Number	Time Code Start	Time Code Stop	ID			Description	Grade
HS40100.DAT	11/13/96						
	0:00	0:30	1			Delco Radio 0 dB Reference Track 1kHz@91% Pilot@9%	
						2.4 Vrms=-14 dB on DAT Input Monitor Level Meters	
	0:30	1:00	2			Noise Reference No SCA	
	1:05	3:06	3			Reference	
	3:12	5:12	4			MITRE D-1	
							0
	5:19	7:20	5			Reference	
	7:27	9:27	6			DDJ D-1	
							0
	9:34	11:35	7			Reference	
	11:42	13:41	8			SEIKO D-1	
							0
	13:45	15:46	9			Reference	
	15:52	17:52	10			SEIKO Group A	
							0
	17:58	20:00	11			Reference	
	20:06	22:07	12			DDJ Group A	
							0
	22:13	24:13	13			Reference	
	24:19	26:20	14			MITRE Group A	
							0
	26:26	28:26	15			Reference	
	28:32	30:32	16			MITRE Group B	
							0
	30:38	32:39	17			Reference	
	32:45	34:45	18			DDJ Group B	
							0
	34:50	36:52	19			Reference	
	36:58	38:58	20			SEIKO Group B	
							0

DAT File Number	Time Code Start	Time Code Stop	ID			Description	Grade
HS40101.DAT	11/18/96					Proponent Only	
	0:06	2:06	1			Urban Slow Reference	
	2:12	4:12	2			Urban Slow SEIKO	0
	4:18	6:18	3			Urban Slow DDJ	0
	6:24	8:24	4			Urban Slow MITRE	0
	8:30	10:30	5			Urban Fast Reference	
	10:36	12:36	6			Urban Fast MITRE	0
	12:42	14:42	7			Urban Fast DDJ	0
	14:48	16:48	8			Urban Fast SEIKO	0
	16:54	18:54	9			Rural Fast Reference	
	19:00	21:00	10			Rural Fast SEIKO	0
	21:06	23:06	11			Rural Fast DDJ	0
	23:12	25:12	12			Rural Fast MITRE	0
	25:18	27:24	13			Obstructed Reference	
	27:30	29:30	14			Obstructed MITRE	0
	29:36	31:36	15			Obstructed DDJ	0
	31:42	33:42	16			Obstructed SEIKO	0

Digital Radio Test Laboratory

DAT File Number	Time Code Start	Time Code Stop	ID			Description	Grade
HS40102.DAT	11/18/96					Group A	
	0:05	2:06	1			Urban Slow Reference	
	2:11	4:12	2			Urban Slow SEIKO	0
	4:18	6:19	3			Urban Slow DDJ	0
	6:24	8:25	4			Urban Slow MITRE	0
	8:30	10:31	5			Urban Fast Reference	
	10:36	12:37	6			Urban Fast MITRE	0
	12:42	14:43	7			Urban Fast DDJ	0
	14:48	16:49	8			Urban Fast SEIKO	0
	16:54	18:55	9			Rural Fast Reference	
	19:00	21:01	10			Rural Fast SEIKO	0
	21:06	23:07	11			Rural Fast DDJ	0
	23:12	25:13	12			Rural Fast MITRE	0
	25:19	27:19	13			Obstructed Reference	
	27:24	29:27	14			Obstructed MITRE	0
	29:32	31:34	15			Obstructed DDJ	0
	31:39	33:41	16			Obstructed SEIKO	0

DAT File Number	Time Code Start	Time Code Stop	ID			Description	Grade
HS40103.DAT	11/18/96					Group B	
	0:05	2:05	1			Urban Slow Reference	
	2:10	4:11	2			Urban Slow SEIKO	0
	4:15	6:17	3			Urban Slow DDJ	0
	6:22	8:23	4			Urban Slow MITRE	0
	8:28	10:29	5			Urban Fast Reference	
	10:34	12:34	6			Urban Fast MITRE	0
	12:41	14:41	7			Urban Fast DDJ	0
	14:46	16:47	8			Urban Fast SEIKO	0
	16:55	18:54	9			Rural Fast Reference	
	18:59	21:00	10			Rural Fast SEIKO	0
	21:06	23:06	11			Rural Fast DDJ	0
	23:12	25:13	12			Rural Fast MITRE	0
	25:18	27:18	13			Obstructed Reference	
	27:24	29:25	14			Obstructed MITRE: Multipath more pronounced.	-1.5
	29:30	31:31	15			Obstructed DDJ: Multipath more pronounced.	-1.5
	31:36	33:37	16			Obstructed SEIKO: Multipath more pronounced.	-1.5

Digital Radio Test Laboratory

D-1 HSSC -› Host Analog

(See supplemental data)

Main Channel:	91 %		91 %		81 %		81 %
Pilot:	9 %		9 %		9 %		9 %
92 kHz:	0 %		0 %		7 %		0 %
57 kHz:	0 %		0 %		3 %		10 %
Proponent:	0 %		10 %		10 %		10 %
Total:	100 %		110 %		110 %		110 %

	0 dB= 2.26 V					0 dB= 2.02 V					
	Pilot Only		Proponent + Pilot			Group A			Group B		
RF Level dBm	S/N	Units	MITRE S/N (dB)	DDJ S/N (dB)	SEIKO S/N (dB)	MITRE S/N (dB)	DDJ S/N (dB)	SEIKO S/N (dB)	MITRE S/N (dB)	DDJ S/N (dB)	SEIKO S/N (dB)
-65	55.4	dB	53.4	55.2	51.9	53.3	54.2	51.8	52.0	53.0	50.0
-75	54.6	dB	53.6	54.4	52.7	53.3	53.7	52.4	52.9	53.4	51.5

Measurements made Q-Peak detected with CCIR weighting and 15 kHz low pass filters (psophometric).
0 dB Reference Measurements made with 1 kHz Mod Source on Main Channel L+R.
Measurements on Left Channel
Orban #2 Composite output #1 Set for 91% Main Channel Modulation
Orban #2 Composite output #2 Set for 81% Main Channel Modulation
Unit Not in Screen Box

Engineer(s): DML
Tests Conducted: 11/21/96

DAT File Number	Time Code Start	Time Code Stop	ID			Description	Grade
HS40800.DAT	11/21/96						
	0:00	0:30	1			Ford Radio 0 dB Reference Track 1kHz@91% Pilot@9%	
						2.25 Vrms=-15 dB on DAT Input Monitor Level Meters	
	0:30	1:00	2			Noise Reference No SCA	
						Proponent Only	
	1:05	3:05	3			Reference	
	3:10	5:11	4			MITRE: Slight increase in noise floor or change in noise character.	-0.5
	5:16	7:17	5			DDJ	0
	7:22	9:23	6			SEIKO: Slight increase in noise floor or change in noise character.	-0.5
						Group A	
	9:28	11:28	7			Reference	
	11:34	13:34	8			SEIKO Group A: Slight increase in noise floor or change in noise character.	-0.5
	13:40	15:40	9			DDJ Group A: Slight increase in noise floor.	-0.1
	15:46	17:46	10			MITRE Group A: Slight increase in noise floor.	-0.3
						Group B	
	17:51	19:52	11			Reference	
	19:57	21:58	12			MITRE Group B: Low level tone.	-1
	22:03	24:03	13			DDJ Group B: Low level tone.	-1
	24:09	26:09	14			SEIKO Group B: Low level tone and increase in noise floor.	-1.5

Digital Radio Test Laboratory (Supplemental Data)

D-1 HSSC -› Host Analog

Main Channel:	91 %	91 %	81 %	81 %
Pilot:	9 %	9 %	9 %	9 %
92 kHz:	0 %	0 %	7 %	0 %
57 kHz:	0 %	0 %	3 %	10 %
Proponent:	0 %	10 %	10 %	10 %
Total:	100 %	110 %	110 %	110 %

RF Level dBm	0 dB= 1.90 V					0 dB= 1.73 V					
	Pilot Only		Proponent + Pilot			Group A			Group B		
	S/N	Units	MITRE S/N (dB)	DDJ S/N (dB)	SEIKO S/N (dB)	MITRE S/N (dB)	DDJ S/N (dB)	SEIKO S/N (dB)	MITRE S/N (dB)	DDJ S/N (dB)	SEIKO S/N (dB)
-50	56.7	dB	54.1	56.5	51.6	53.5	54.3	51.2	50.8	51.5	48.5
-65	55.7	dB	53.6	55.5	52.1	53.2	53.8	51.7	51.6	52.6	49.6
-75	54.7	dB	53.5	54.3	52.6	53.2	53.6	52.4	52.7	53.3	51.3

Without Proponent

RF Level dBm	DDJ Variable	DDJ Variable	Variable
-50	56.7	54.0	51.0
-65	55.6	53.5	52.0
-75	54.0	53.0	52.4

Measurements made Q-Peak detected with CCIR weighting and 15 kHz low pass filters (psophometric).
0 dB Reference Measurements made with 1 kHz Mod Source on Main Channel L+R.
Measurements on Left Channel
Orban #2 Composite output #1 Set for 91% Main Channel Modulation

Digital Radio Test Laboratory

DAT File Number	Time Code Start	Time Code Stop	ID			Description	Grade
HS40801.DAT	11/21/96					Proponent Only	
	0:05	2:05	1			Urban Slow Reference	
	2:11	4:13	2			Urban Slow SEIKO: Slight increase in noise floor.	-1
	4:18	6:19	3			Urban Slow DDJ	0
	6:25	8:25	4			Urban Slow MITRE: Slight increase in noise floor.	-1
	8:31	10:31	5			Urban Fast Reference	
	10:35	12:36	6			Urban Fast MITRE: Slight increase in noise floor.	-1
	12:42	14:42	7			Urban Fast DDJ	0
	14:47	16:48	8			Urban Fast SEIKO: Slight increase in noise floor.	-1
	16:53	18:54	9			Rural Fast Reference	
	19:00	21:00	10			Rural Fast SEIKO: Slight increase in noise floor.	-1
	21:06	23:06	11			Rural Fast DDJ	0
	23:11	25:12	12			Rural Fast MITRE: Slight increase in noise floor.	-0.5
	25:17	27:17	13			Obstructed Reference	
	27:23	29:23	14			Obstructed MITRE	0
	29:28	31:30	15			Obstructed DDJ	0
	31:35	33:35	16			Obstructed SEIKO	0

DAT File Number	Time Code Start	Time Code Stop	ID			Description	Grade
HS40802.DAT	11/21/96					Group A	
	0:05	2:05	1			Urban Slow Reference	
	2:10	4:11	2			Urban Slow SEIKO: Slight increase in noise floor.	-0.5
	4:16	6:16	3			Urban Slow DDJ	0
	6:21	8:21	4			Urban Slow MITRE: Slight increase in noise floor.	-0.5
	8:27	10:27	5			Urban Fast Reference	
	10:33	12:33	6			Urban Fast MITRE: Slight increase in noise floor.	-0.5
	12:38	14:38	7			Urban Fast DDJ	0
	14:44	16:44	8			Urban Fast SEIKO: Slight increase in noise floor.	-1
	16:50	18:50	9			Rural Fast Reference	
	18:56	20:56	10			Rural Fast SEIKO: Slight increase in noise floor.	-1
	21:02	23:02	11			Rural Fast DDJ	0
	23:07	25:07	12			Rural Fast MITRE: Slight increase in noise floor.	-0.5
	25:13	27:13	13			Obstructed Reference	
	27:19	29:19	14			Obstructed MITRE	0
	29:25	31:25	15			Obstructed DDJ	0
	31:31	33:31	16			Obstructed SEIKO	0

Digital Radio Test Laboratory

DAT File Number	Time Code Start	Time Code Stop	ID			Description	Grade
HS40803.DAT	11/21/96					Group B	
	0:06	2:06	1			Urban Slow Reference	
	2:12	4:12	2			Urban Slow SEIKO: Low level tone.	-1
	4:18	6:18	3			Urban Slow DDJ: Low level tone.	-1
	6:23	8:23	4			Urban Slow MITRE: Low level tone.	-1
	8:29	10:29	5			Urban Fast Reference	
	10:35	12:35	6			Urban Fast MITRE: Low level tone.	-1
	12:40	14:40	7			Urban Fast DDJ: Low level tone.	-1
	14:46	16:46	8			Urban Fast SEIKO: Low level tone.	-1
	16:52	18:52	9			Rural Fast Reference	
	18:57	20:57	10			Rural Fast SEIKO: Low level tone and slight increase in noise floor.	-1.5
	21:03	23:03	11			Rural Fast DDJ: Low level tone.	-1
	23:09	25:09	12			Rural Fast MITRE: Low level tone and slight increase in noise floor.	-1.5
	25:15	27:15	13			Obstructed Reference	
	27:21	29:21	14			Obstructed MITRE: Low level tone.	-1
	29:27	31:27	15			Obstructed DDJ: Low level tone.	-1
	31:33	33:33	16			Obstructed SEIKO: Low level tone.	-1

~~(See Supplemental data)~~

D-1 HSSC -› Host Analog

Main Channel:	91 %	91 %	81 %	81 %
Pilot:	9 %	9 %	9 %	9 %
92 kHz:	0 %	0 %	7 %	0 %
57 kHz:	0 %	0 %	3 %	10 %
Proponent:	0 %	10 %	10 %	10 %
Total:	100 %	110 %	110 %	110 %

	0 dB= 755.0 mV					0 dB= 699.0 mV					
	Pilot Only		Proponent + Pilot			Group A			Group B		
RF Level dBm	S/N	Units	MITRE S/N (dB)	DDJ S/N (dB)	SEIKO S/N (dB)	MITRE S/N (dB)	DDJ S/N (dB)	SEIKO S/N (dB)	MITRE S/N (dB)	DDJ S/N (dB)	SEIKO S/N (dB)
-65	49.3	dB	49.1	49.1	49.1	48.0	47.9	47.8	48.4	48.4	48.2
-75	39.3	dB	39.4	39.4	39.4	38.5	38.5	38.5	38.7	38.7	38.7

Measurements made Q-Peak detected with CCIR weighting filter (psophometric).
0 dB Reference Measurements made with 1 kHz Mod Source on Main Channel L+R.
Measurements on Left Channel
Orban #2 Composite output #1 Set for 91% Main Channel Modulation
Orban #2 Composite output #2 Set for 81% Main Channel Modulation
Unit Not in Screen Box

Engineer(s): DML,TBK
Tests Conducted: 11/19/96

Digital Radio Test Laboratory

DAT File Number	Time Code Start	Time Code Stop	ID	Description	Grade
HS40200.DAT	11/19/96				
	0:00	0:30	1	Denon Radio 0 dB Reference Track 1kHz@91% Pilot@9%	
				755 mVrms=-24 dB on DAT Input Monitor Level Meters	
	0:30	1:00	2	Noise Reference No SCA	
				Proponent Only	
	1:05	3:06	3	Reference	
	3:11	5:11	4	MITRE	0
	5:17	7:17	5	DDJ	0
	7:23	9:22	6	SEIKO	0
				Group A	
	9:28	11:28	7	Reference	
	11:34	13:34	8	SEIKO Group A	0
	13:40	15:40	9	DDJ Group A	0
	15:45	17:46	10	MITRE Group A	0
				Group B	
	17:52	19:51	11	Reference	
	19:57	21:57	12	MITRE Group B: Change in the characteristic of noise.	-0.1
	22:03	24:03	13	DDJ Group B: Change in the characteristic of noise.	-0.1
	24:09	26:09	14	SEIKO Group B: Change in the characteristic of noise.	-0.1
				Proponent Only	
	26:14	28:15	15	Urban Slow Reference	
	28:20	30:21	16	Urban Slow SEIKO	0
	30:26	32:27	17	Urban Slow DDJ	0
	32:32	34:33	18	Urban Slow MITRE	0
				Group A	
	34:38	36:38	19	Urban Slow Reference	
	36:43	38:43	20	Urban Slow SEIKO	0
	38:48	40:48	21	Urban Slow DDJ	0
	40:54	42:54	22	Urban Slow MITRE	0
				Group B	
	43:00	45:00	23	Urban Slow Reference	
	45:06	47:06	24	Urban Slow SEIKO: Change in the characteristic of noise.	-0.1
	47:11	49:11	25	Urban Slow DDJ: Change in the characteristic of noise.	-0.1
	49:17	51:17	26	Urban Slow MITRE: Change in the characteristic of noise.	-0.1

(See supplemental data)

D-1 HSSC -› Host Analog

Main Channel:	91 %	91 %	81 %	81 %
Pilot:	9 %	9 %	9 %	9 %
92 kHz:	0 %	0 %	7 %	0 %
57 kHz:	0 %	0 %	3 %	10 %
Proponent:	0 %	10 %	10 %	10 %
Total:	100 %	110 %	110 %	110 %

	0 dB= 654.0 mV					0 dB= 604.0 mV					
	Pilot Only		Proponent + Pilot			Group A			Group B		
RF Level dBm	S/N	Units	MITRE S/N (dB)	DDJ S/N (dB)	SEIKO S/N (dB)	MITRE S/N (dB)	DDJ S/N (dB)	SEIKO S/N (dB)	MITRE S/N (dB)	DDJ S/N (dB)	SEIKO S/N (dB)
-65	52.1	dB	51.8	51.8	51.1	50.1	50.1	49.4	50.6	50.6	49.6
-75	42.9	dB	42.9	42.9	42.8	42.0	42.1	41.8	42.1	42.1	42.0

Measurements made Q-Peak detected with CCIR weighting and 15 kHz low pass filters (psophometric).
0 dB Reference Measurements made with 1 kHz Mod Source on Main Channel L+R.
Measurements on Left Channel
Orban #2 Composite output #1 Set for 91% Main Channel Modulation
Orban #2 Composite output #2 Set for 81% Main Channel Modulation

Engineer(s): DML, TBK
Tests Conducted: 11/19/96

Digital Radio Test Laboratory (Supplemental data)

D-1 HSSC -› Host Analog

Main Channel:	91 %		91 %		81 %		81 %
Pilot:	9 %		9 %		9 %		9 %
92 kHz:	0 %		0 %		7 %		0 %
57 kHz:	0 %		0 %		3 %		10 %
Proponent:	0 %		10 %		10 %		10 %
Total:	100 %		110 %		110 %		110 %

	0 dB= 655.00 mV					0 dB= 605.00 mV					
	Pilot Only		Proponent + Pilot			Group A			Group B		
RF Level dBm	S/N	Units	MITRE S/N (dB)	DDJ S/N (dB)	SEIKO S/N (dB)	MITRE S/N (dB)	DDJ S/N (dB)	SEIKO S/N (dB)	MITRE S/N (dB)	DDJ S/N (dB)	SEIKO S/N (dB)
-50	60.9		59.5	59.4	56.4	55.8	55.8	54.0	54.5	54.6	52.6
-65	52.7	dB	52.4	52.4	51.5	50.7	50.7	50.0	50.1	50.1	49.4
-75	43.1	dB	43.0	43.0	42.9	42.0	42.0	42.0	42.0	42.0	41.9
									Without Proponent	50.2	
										42.0	

	DDJ Variable	DDJ Variable	Variable
-50	60.4	56.2	54.8
-65	52.6	50.8	50.2
-75	43.0	42.0	41.8

Measurements made Q-Peak detected with CCIR weighting and 15 kHz low pass filters (psophometric).
0 dB Reference Measurements made with 1 kHz Mod Source on Main Channel L+R.
Measurements on Left Channel
Orban #2 Composite output #1 Set for 91% Main Channel Modulation

85A

Digital Radio Test Laboratory

DAT File Number	Time Code Start	Time Code Stop	ID			Description	Grade
HS40400.DAT	11/19/96						
	0:00	0:30	1			Pioneer Radio 0 dB Reference Track 1kHz@91% Pilot@9%	
						680 mVrms=-26 dB on DAT Input Monitor Level Meters	
	0:30	1:00	2			Noise Reference No SCA	
						Proponent Only	
	1:06	3:07	3			Reference	
	3:12	5:12	4			MITRE	0
	5:18	7:20	5			DDJ	0
	7:25	9:25	6			SEIKO	0
						Group A	
	9:31	11:31	7			Reference	
	11:37	13:37	8			SEIKO Group A : Slight increase in noise floor. Tone when Program on 92 kHz SCA back tracks. Mod Peaks detected.	-0.1
	13:42	15:43	9			DDJ Group A : Slight increase in noise floor. Tone when Program on 92 kHz SCA back tracks. Mod Peaks detected.	-0.1
	15:48	17:49	10			MITRE Group A : Slight increase in noise floor. Tone when Program on 92 kHz SCA back tracks. Mod Peaks detected.	-0.1
						Group B	
	17:54	19:56	11			Reference	
	20:01	22:02	12			MITRE Group B :Small increase in noise floor.	-0.2
	22:08	24:08	13			DDJ Group B :Small increase in noise floor.	-0.2
	24:14	26:14	14			SEIKO Group B :Small increase in noise floor.	-0.2
						Proponent Only	
	26:20	28:22	15			Urban Slow Reference	
	28:27	30:27	16			Urban Slow SEIKO	0
	30:32	32:33	17			Urban Slow DDJ	0
	32:41	34:41	18			Urban Slow MITRE	0
						Group A	
	34:46	36:47	19			Urban Slow Reference	
	36:52	38:52	20			Urban Slow MITRE	0
	38:58	40:58	21			Urban Slow DDJ	0
	41:04	43:04	22			Urban Slow SEIKO	0
						Group B	
	43:10	45:10	23			Urban Slow Reference	
	45:15	47:15	24			Urban Slow SEIKO	0
	47:21	49:21	25			Urban Slow DDJ	0
	49:26	51:26	26			Urban Slow MITRE	0

DAT File Number	Time Code Start	Time Code Stop	ID			Description	Grade
HS40401.DAT	11/19/96					**Strong Signal Level**	
						Proponent Only	
	0:00	2:05	1			Reference	
	2:12	4:12	2			MITRE	0
	4:18	6:18	3			DDJ	0
	6:23	8:24	4			SEIKO	0
						Group A	
	8:30	10:30	5			SEIKO :Hear modulation peaks on 92kHz SCA and low level tone when CD back tracks.	-0.4
	10:38	12:38	6			DDJ :Hear modulation peaks on 92kHz SCA and low level tone when CD back tracks.	-0.4
	12:44	14:45	7			MITRE :Hear modulation peaks on 92kHz SCA and low level tone when CD back tracks.	-0.4
						Group B	
	14:50	16:50	8			MITRE :Increase in noise floor.	-0.4
	16:55	18:55	9			DDJ :Increase in noise floor.	-0.4
	19:01	21:01	10			SEIKO :Increase in noise floor.	-0.4

D-1 HSSC -› Host Analog

Main Channel:	91	%		91	%		81	%		81	%	
Pilot:	9	%		9	%		9	%		9	%	
92 kHz:	0	%		0	%		7	%		0	%	
57 kHz:	0	%		0	%		3	%		10	%	
Proponent:	0	%		10	%		10	%		10	%	
Total:	100	%		110	%		110	%		110	%	

	0 dB= 2.03 V					0 dB= 1.88 V					
	Pilot Only		Proponent + Pilot			Group A			Group B		
RF Level dBm	S/N	Units	MITRE S/N (dB)	DDJ S/N (dB)	SEIKO S/N (dB)	MITRE S/N (dB)	DDJ S/N (dB)	SEIKO S/N (dB)	MITRE S/N (dB)	DDJ S/N (dB)	SEIKO S/N (dB)
-65	51.4	dB	51.4	51.4	51.2	50.4	50.4	50.2	50.7	50.6	50.4
-75	42.1	dB	42.1	42.1	42.1	41.3	41.3	41.3	41.3	41.3	41.3

Measurements made Q-Peak detected with CCIR weighting and 15 kHz low pass filters (psophometric).
0 dB Reference Measurements made with 1 kHz Mod Source on Main Channel L+R.
Measurements on Left Channel
Orban #2 Composite output #1 Set for 91% Main Channel Modulation
Orban #2 Composite output #2 Set for 81% Main Channel Modulation

Engineer(s): DML, TBK
Tests Conducted: 11/20/96

Digital Radio Test Laboratory

DAT File Number	Time Code Start	Time Code Stop	ID			Description	Grade
HS40300.DAT	11/20/96						
	0:00	0:30	1			Panasonic Radio 0 dB Reference Track 1kHz@91% Pilot@9%	
						2 Vrms=-15 dB on DAT Input Monitor Level Meters	
	0:30	1:00	2			Noise Reference No SCA	
						Proponent Only	
	1:06	3:06	3			Reference	
	3:11	5:12	4			MITRE	0
	5:18	7:18	5			DDJ	0
	7:24	9:24	6			SEIKO	0
						Group A	
	9:30	11:30	7			Reference	
	11:36	13:36	8			SEIKO Group A	0
	13:41	15:42	9			DDJ Group A	0
	15:48	17:48	10			MITRE Group A	0
						Group B	
	17:53	19:53	11			Reference	
	19:59	21:59	12			MITRE Group B	0
	22:05	24:05	13			DDJ Group B	0
	24:10	26:11	14			SEIKO Group B	0
						Proponent Only	
	26:17	28:17	15			Urban Slow Reference	
	28:22	30:22	16			Urban Slow SEIKO	0
	30:27	32:28	17			Urban Slow DDJ	0
	32:34	34:35	18			Urban Slow MITRE	0
						Group A	
	34:40	36:41	19			Urban Slow Reference	
	36:47	38:47	20			Urban Slow SEIKO	0
	38:53	40:53	21			Urban Slow DDJ	0
	40:59	42:59	22			Urban Slow MITRE	0
						Group B	
	43:04	45:06	23			Urban Slow Reference	
	45:11	47:11	24			Urban Slow SEIKO	0
	47:16	49:16	25			Urban Slow DDJ	0
	49:22	51:23	26			Urban Slow MITRE	0

File Name: HS_D.XLS
Index: Panasonic DAT

f_s=44.1kHz

TESTS

E-1

Digital Radio Test Laboratory (revised)

E-1 Analog Program -› HSSC

	Group A	Group B	Group A 92 kHz Off	Group A 57 kHz Off	57 kHz Reduced
Main Channel:	81 %	81 %	81 %	81 %	81 %
Pilot:	9 %	9 %	9 %	9 %	9 %
92 kHz:	7 %	%	0 %	7 %	%
57 kHz:	3 %	10 %	3 %	0 %	6 %
Proponent:	10 %	10 %	10 %	10 %	10 %
Total Deviation:	110 %	110 %	103 %	107 %	106 %

	ATTN	C_o/N_o	Units	ATTN	C_o/N_o	Units						
DDJ:	7.00	5.75	dB	7.50	6.25	dB	NA		NA		NA	
	ATTN	C_o/N_o	Units	ATTN	C_o/N_o	Units						
MITRE:	6.75	5.50	dB	7.00	5.75	dB	NA		NA		NA	
	ATTN	C_o/N_o	Units	220 S	220 D	Units					ATTN	C_o/N_o Units
SEIKO:	13.25	12.88	dB	82.86	82.86	%	NA		NA		14.75	14.38 dB

Main Channel: Clipped Pink Noise

HSSC Performance Monitored for 5 minute period.

(see supplemental data)

E-1 Analog Program -› HSSC

	Group A	Group B	Group A 92 kHz Off	Group A 57 kHz Off	57 kHz Reduced
Main Channel:	81 %	81 %	81 %	81 %	81 %
Pilot:	9 %	9 %	9 %	9 %	9 %
92 kHz:	7 %	%	0 %	7 %	%
57 kHz:	3 %	10 %	3 %	0 %	6 %
Proponent:	10 %	10 %	10 %	10 %	10 %
Total Deviation:	110 %	110 %	103 %	107 %	106 %

	ATTN	C_o/N_o	Units	ATTN	C_o/N_o	Units						
DDJ:	6.75	5.50	dB	7.00	5.75	dB	NA			NA		
	ATTN	C_o/N_o	Units	ATTN	C_o/N_o	Units						
MITRE:	6.50	5.25	dB	7.00	5.75	dB	NA			NA		
	ATTN	C_o/N_o	Units	220 S	220 D	Units					ATTN	C_o/N_o Units
SEIKO:	13.75	13.38	dB	74.86	74.86	%	NA			NA	14.75	14.38 dB

Main Channel: ABBA 5-Band Medium Fast Processing

(see supplemental data)

92

E-1 Analog Program -> HSSC

	Group A	Group B	Group A 92 kHz Off	Group A 57 kHz Off	57 kHz Reduced
Main Channel:	81 %	81 %	81 %	81 %	81 %
Pilot:	9 %	9 %	9 %	9 %	9 %
92 kHz:	7 %	%	0 %	7 %	%
57 kHz:	3 %	10 %	3 %	0 %	6 %
Proponent:	10 %	10 %	10 %	10 %	10 %
Total Deviation:	110 %	110 %	103 %	107 %	106 %

	ATTN	C/N_0	Units	ATTN	C/N_0	Units						
10/17/96 DDJ:	7.00	73.51	dB	7.50	74.01	dB	NA		NA		NA	
	ATTN	C/N_0	Units	ATTN	C/N_0	Units						
10/18/96 MITRE:	6.75	73.26	dB	7.00	73.51	dB	NA		NA		NA	
	ATTN	C/N_0	Units	ATTN	C/N_0	Units						
10/21/96 SEIKO:	11.50	78.11	dB	15.25	81.86	dB	NA		NA		NA	

Main Channel: Clipped Pink Noise

Revision: 3/6/97 OME consistent definition.
Revision: 11/10/97 Changed Co/No to C/No.

Digital Radio Test Laboratory

E-1 Analog Program -› HSSC

	Group A	Group B	Group A 92 kHz Off	Group A 57 kHz Off	57 kHz Reduced
Main Channel:	81 %	81 %	81 %	81 %	81 %
Pilot:	9 %	9 %	9 %	9 %	9 %
92 kHz:	7 %	%	0 %	7 %	%
57 kHz:	3 %	10 %	3 %	0 %	6 %
Proponent:	10 %	10 %	10 %	10 %	10 %
Total Deviation:	110 %	110 %	103 %	107 %	106 %

	ATTN C_o/N_o Units	ATTN C_o/N_o Units			
DDJ:	7.00 5.75 dB	7.50 6.25 dB	NA	NA	NA
	ATTN C_o/N_o Units	ATTN C_o/N_o Units			
MITRE:	6.75 5.50 dB	7.00 5.75 dB	NA	NA	NA
	ATTN C_o/N_o Units	ATTN C_o/N_o Units			
SEIKO:	11.50 11.22 dB	15.25 14.97 dB	NA	NA	NA

Main Channel: Clipped Pink Noise
Ammended: 3/6/97

SUPPLEMENTAL DATA

(with RDS phasing set correctly for seiko)

914

E-1 Analog Program -› HSSC

	Group A	Group B	Group A 92 kHz Off	Group A 57 kHz Off	57 kHz Reduced
Main Channel:	81 %	81 %	81 %	81 %	81 %
Pilot:	9 %	9 %	9 %	9 %	9 %
92 kHz:	7 %	%	0 %	7 %	%
57 kHz:	3 %	10 %	3 %	0 %	6 %
Proponent:	10 %	10 %	10 %	10 %	10 %
Total Deviation:	110 %	110 %	103 %	107 %	106 %

	ATTN	C/N_0	Units	ATTN	C/N_0	Units						
10/17/96 DDJ:	6.75	73.26	dB	7.00	73.51	dB	NA			NA		
	ATTN	C/N_0	Units	ATTN	C/N_0	Units						
10/18/96 MITRE:	6.50	73.01	dB	7.00	73.51	dB	NA			NA		
	ATTN	C/N_0	Units	ATTN	C/N_0	Units						
10/21/96 SEIKO:	11.50	78.11	dB	15.25	81.86	dB	NA			NA		

Main Channel: ABBA 5-Band Medium Fast Processing

Revision: 3/6/97 OME consistent definition.
Revision: 11/10/97 Changed Co/No to C/No.

92a

E-1 Analog Program -› HSSC

	Group A	Group B	Group A 92 kHz Off	Group A 57 kHz Off	57 kHz Reduced
Main Channel:	81 %	81 %	81 %	81 %	81 %
Pilot:	9 %	9 %	9 %	9 %	9 %
92 kHz:	7 %	%	0 %	7 %	%
57 kHz:	3 %	10 %	3 %	0 %	6 %
Proponent:	10 %	10 %	10 %	10 %	10 %
Total Deviation:	110 %	110 %	103 %	107 %	106 %

	ATTN	C_o/N_o	Units	ATTN	C_o/N_o	Units					
DDJ:	6.75	5.50	dB	7.00	5.75	dB	NA		NA		NA
	ATTN	C_o/N_o	Units	ATTN	C_o/N_o	Units					
MITRE:	6.50	5.25	dB	7.00	5.75	dB	NA		NA		NA
	ATTN	C_o/N_o	Units	ATTN	C_o/N_o	Units					
SEIKO:	11.50	11.22	dB	15.25	14.97	dB	NA		NA		NA

Main Channel: ABBA 5-Band Medium Fast Processing
Ammended: 3/6/97

SUPPLEMENTAL DATA

(with RDS phasing set correctly for Seiko)

92A

Digital Radio Test Laboratory (revised)

E-1 Analog Program -› HSSC

	Group A	Group B	Group A 92 kHz Off	Group A 57 kHz Off	57 kHz Reduced
Main Channel:	81 %	81 %	81 %	81 %	81 %
Pilot:	9 %	9 %	9 %	9 %	9 %
92 kHz:	7 %	%	0 %	7 %	%
57 kHz:	3 %	10 %	3 %	0 %	6 %
Proponent:	10 %	10 %	10 %	10 %	10 %
Total Deviation:	110 %	110 %	103 %	107 %	106 %

	ATTN C_o/N_o Units	ATTN C_o/N_o Units			
DDJ:	7.25 6.00 dB	6.75 5.50 dB	NA	NA	NA
	ATTN C_o/N_o Units	ATTN C_o/N_o Units			
MITRE:	6.25 5.00 dB	6.50 5.25 dB	NA	NA	NA
	ATTN C_o/N_o Units	220 S 220 D Units			ATTN C_o/N_o Units
SEIKO:	13.50 13.13 dB	74.86 74.86 %	NA	NA	14.75 14.38 dB

Main Channel: Unbalanced Clipped Pink Noise

(See supplemental data)

93a

E-1 Analog Program -› HSSC

	Group A	Group B	Group A 92 kHz Off	Group A 57 kHz Off	57 kHz Reduced
Main Channel:	81 %	81 %	81 %	81 %	81 %
Pilot:	9 %	9 %	9 %	9 %	9 %
92 kHz:	7 %	%	0 %	7 %	%
57 kHz:	3 %	10 %	3 %	0 %	6 %
Proponent:	10 %	10 %	10 %	10 %	10 %
Total Deviation:	110 %	110 %	103 %	107 %	106 %

	ATTN	C/N_0	Units	ATTN	C/N_0	Units			
10/17/96 DDJ:	7.25	73.76	dB	6.75	73.26	dB	NA	NA	NA
	ATTN	C/N_0	Units	ATTN	C/N_0	Units			
10/18/96 MITRE:	6.25	72.76	dB	6.50	73.01	dB	NA	NA	NA
	ATTN	C/N_0	Units	ATTN	C/N_0	Units			
10/21/96 SEIKO:	11.50	78.11	dB	15.00	81.61	dB	NA	NA	NA

Main Channel: Unbalanced Clipped Pink Noise

Revision: 3/6/97 OME consistent definition.
Revision: 11/10/97 Changed Co/No to C/No.

E-1 Analog Program -› HSSC

	Group A	Group B	Group A 92 kHz Off	Group A 57 kHz Off	57 kHz Reduced
Main Channel:	81 %	81 %	81 %	81 %	81 %
Pilot:	9 %	9 %	9 %	9 %	9 %
92 kHz:	7 %	%	0 %	7 %	%
57 kHz:	3 %	10 %	3 %	0 %	6 %
Proponent:	10 %	10 %	10 %	10 %	10 %
Total Deviation:	110 %	110 %	103 %	107 %	106 %

	ATTN	C_o/N_o	Units	ATTN	C_o/N_o	Units				
DDJ:	7.25	6.00	dB	6.75	5.50	dB	NA		NA	NA
	ATTN	C_o/N_o	Units	ATTN	C_o/N_o	Units				
MITRE:	6.25	5.00	dB	6.50	5.25	dB	NA		NA	NA
	ATTN	C_o/N_o	Units	ATTN	C_o/N_o	Units				
SEIKO:	11.50	11.22	dB	15.00	14.72	dB	NA		NA	NA

Main Channel: Unbalanced Clipped Pink Noise
Ammended: 3/6/97

SUPPLEMENTAL DATA

(with RDS phasing set correctly for Seiko)

934

TESTS

F

F-1 HSSC -› Analog SCA Test Date: 10/16/96 Engineer(s): DML

	Group A	HSDS Off	RBDS Off
Main Channel:	81 %	81 %	81 %
Pilot:	9 %	9 %	9 %
92 kHz:	7 %	7 %	7 %
57 kHz:	3 %	3 %	0 %
Proponent:	10 %	0 %	10 %
Total Modulation:	110 %	100 %	107 %

	92 kHz S/N (dB)		92 kHz S/N (dB)		92 kHz S/N (dB)	
	Medium	Weak	Medium	Weak	Medium	Weak
SEIKO:	48.7	41.2	49.0	41.5	48.8	41.3
DDJ:	43.1	39.5			43.1	39.6
MITRE:	48.7	41.3			48.8	41.3

Main Channel: Clipped Pink Noise
92 kHz: 1 kHz THD+Noise: 2.4 %

S/N measurements made RMS detected with out filter.

THD+Noise measurement made RMS without filter.

Digital Radio Test Laboratory

DAT File Number	Time Code Start	Time Code Stop	Program ID Number	Description	Signal (dBm)	CCIR 1
HS40110.DAT						
16-Oct-96						
	0:00	00:30	1	0 dB 1 kHz Reference: M=5.5: fmod=1 kHz:	-65	
	00:30	01:00	2	Group A Noise Reference without Proponent: S/N=38.5 dB	-65	
	01:00	01:57	3	Group A with MITRE Gated ON - OFF	-65	0
	02:00	02:58	4	Group A with DDJ Gated ON - OFF	-65	-2
	03:00	03:58	5	Group A with SEIKO Gated ON - OFF	-65	0
	04:00	04:58	6	SEIKO Group A with RBDS Gated ON - OFF	-65	0
	05:00	05:54	7	DDJ Group A with RBDS Gated ON - OFF	-65	0
	06:00	06:55	8	MITRE Group A with RBDS Gated ON - OFF	-65	
				CCIR Grade used as a comparison of the Gated On Signal as compared to the Gated Off Signal		
				Track 48 of the EBU SQAM Disk used for program material.		
				Peak Deviation set for 5.5 kHz.		

F-2 HSSC ->RBDS Test Date: 10/16/96 Engineer(s): DML

	Group A	HSDS Off	92 kHz Off
Main Channel:	81 %	81 %	81 %
Pilot:	9 %	9 %	9 %
92 kHz:	7 %	7 %	0 %
57 kHz:	3 %	3 %	3 %
Proponent:	10 %	0 %	10 %
Total Deviation:	110 %	100 %	103 %

	Maximum Block Error Independent of Error Correction					
	RBDS Block Error (%)		RBDS Block Error (%)		RBDS Block Error (%)	
	Medium	Weak	Medium	Weak	Medium	Weak
DDJ:	5	7			4	6
MITRE:	4	6	5	5	5	5
SEIKO:	6	6			6	7

Main Channel: Clipped Pink Noise
Noise Attenuator: 8.00 dB

Noise	Signal Reference	
0 dB Ref	3W in	6W out
-30.97 dBm	-32.58 dBm	-7.38 dBm

Errors accumulated over a 5 minute measurement period.
EBU SQAM Disk Track 48 used to exercise the 92 kHz SCA.

F-3 HSSC -› 57 kHz Paging

Test Date: 10/16/96 Engineer(s): DML

	Group B	HSDS Off
Main Channel:	81 %	81 %
Pilot:	9 %	9 %
57 kHz:	10 %	10 %
Proponent:	10 %	0 %
Total Deviation:	110 %	100 %

	Maximum Uncorrected Block Error			
	Block Error (%)		Block Error (%)	
	Medium	Weak	Medium	Weak
DDJ:	1	2		
MITRE:	1	2	1	2
SEIKO:	2	2		

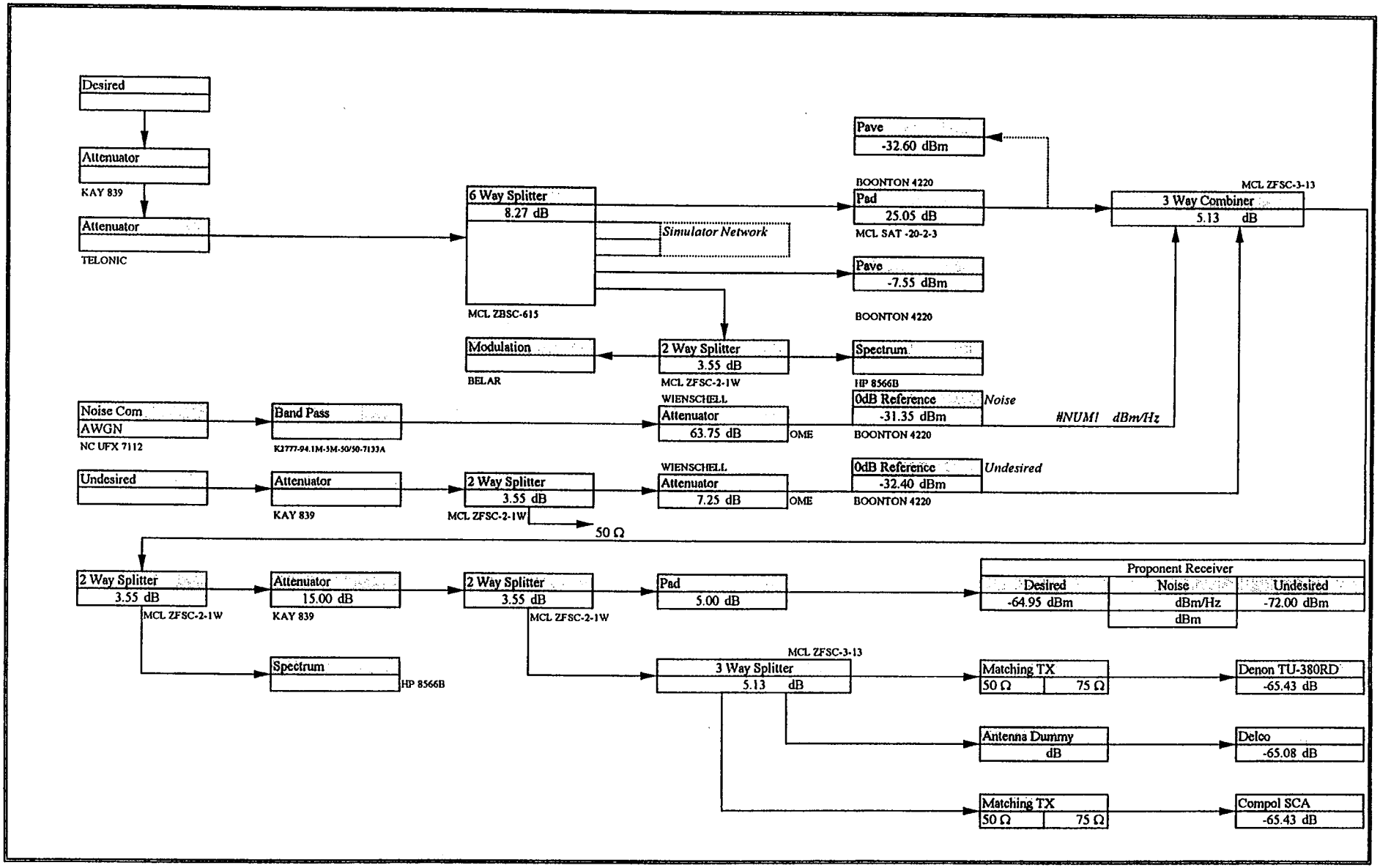
Main Channel: Clipped Pink Noise
Noise Attenuator: 0.00 dB

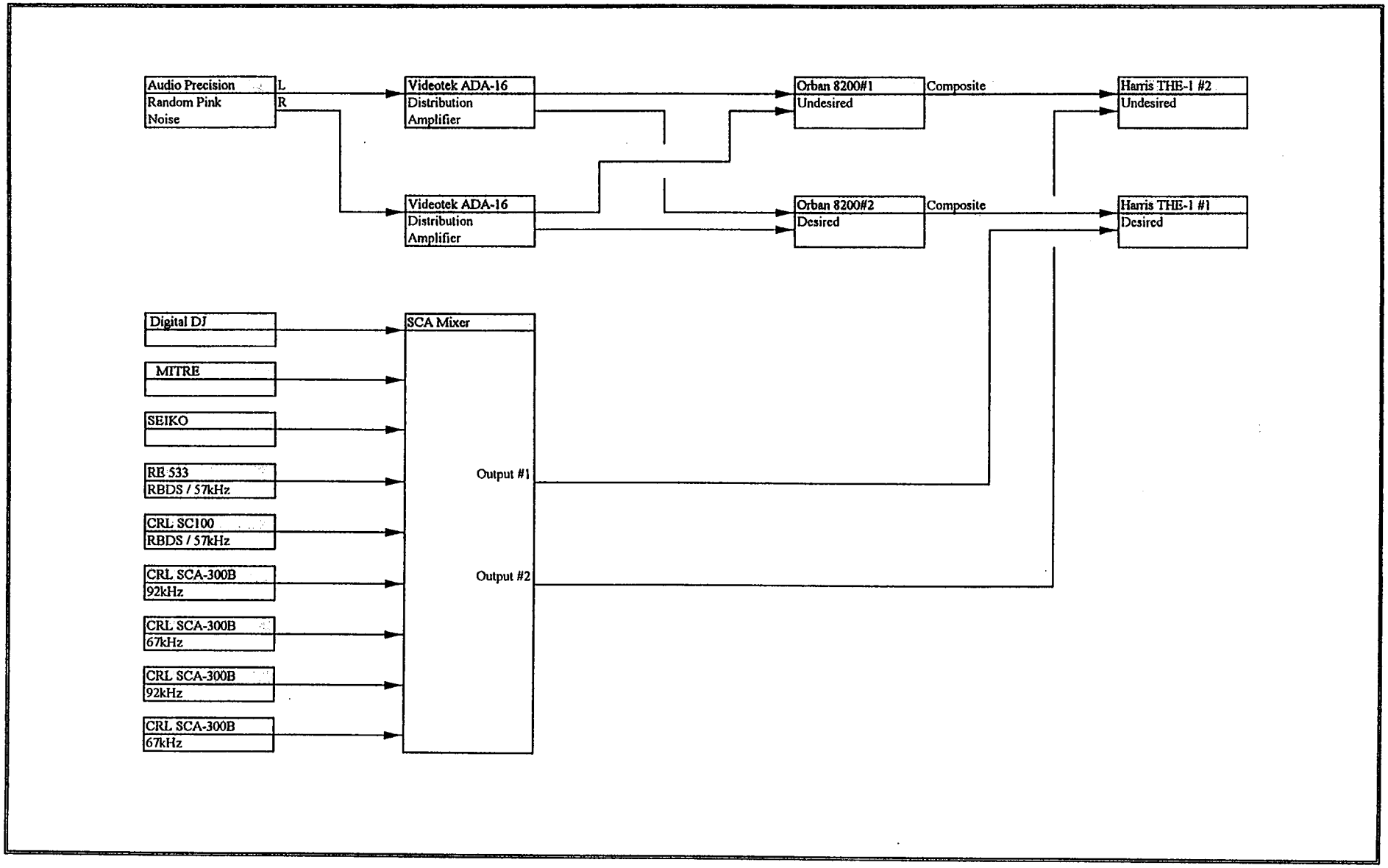
Errors accumulated over a 5 minute measurement period.

TESTS

G

Digital Radio Test Laboratory





File Name:HS_G.XLS
Index: COMP

G-1 Lower First Adjacent

Analog -› HSSC	Desired	93.9 MHz Undesired	
Main Channel:	81	81	%
Pilot:	9	9	%
67 kHz:	0	10	%
92 kHz:	7	10	%
57 kHz:	3	0	%
Proponent:	10	0	%
Total Deviation:	110	110	%

	ATTN (dB)	OME D/U (dB)
MITRE:	12.00	-8.20
SEIKO:	18.00	-2.15
DDJ:	9.50	-10.65

G-1 Upper First Adjacent

Analog -› HSSC	Desired	94.3 MHz Undesired	
Main Channel:	81	81	%
Pilot:	9	9	%
67 kHz:	0	10	%
92 kHz:	7	10	%
57 kHz:	3	0	%
Proponent:	10	0	%
Total Deviation:	110	110	%

	ATTN (dB)	OME D/U (dB)
MITRE:	5.00	-15.20
SEIKO:	16.50	-3.65
DDJ:	12.00	-8.15

EO&C

G-2 Lower Second Adjacent

Analog -› HSSC	Desired	93.7 MHz Undesired	
Main Channel:	81	81	%
Pilot:	9	9	%
67 kHz:	0	10	%
92 kHz:	7	10	%
57 kHz:	3	0	%
Proponent:	10	0	%
Total Deviation:	110	110	%

	ATTN (dB)	OME D/U (dB)
MITRE:	0.00	-50.20
SEIKO:	6.50	-43.65
DDJ:	12.00	-38.15

G-1 Upper Second Adjacent

Analog -› HSSC	Desired	94.5 MHz Undesired	
Main Channel:	81	81	%
Pilot:	9	9	%
67 kHz:	0	10	%
92 kHz:	7	10	%
57 kHz:	3	0	%
Proponent:	10	0	%
Total Deviation:	110	110	%

	ATTN (dB)	OME D/U (dB)
MITRE:	0.00	-50.20
SEIKO:	4.50	-45.65
DDJ:	13.50	-36.65

EO&C

Could not achieve OME .

-37.65 dB Upper 2nd without modulation on 92kHz SCA.

G-1 First Adjacent

Analog -> Analog & HSSC -> Analog

	Desired	Undesired		Desired	Undesired		Desired	Undesired	
Main Channel:	81	81	%	81	81	%	81	81	%
Pilot:	9	9	%	9	9	%	9	9	%
67 kHz:	10	10	%	10	0	%	10	0	%
92 kHz:	10	10	%	10	7	%	10	0	%
57 kHz:	0	0	%	0	3	%	0	10	%
Proponent:	0	0	%	0	10	%	0	10	%
Total Deviation:	110	110	%	110	110	%	110	110	%
3 W Input	-32.4	-32.4	dBm						
Kay #3		51.0	dB						
		18.6							

Main Channel measurements are Q Peak detected with CCIR filter.

94.3 MHz UPPER D = 94.1 MHz	Analog -> Analog Reference D/U (dB) s/n=45dB	Reference S/N (dB) 67 kHz	Reference S/N (dB) 92 kHz	HSSC -> Analog Group B D/U (dB) s/n=45dB	Group B S/N (dB) 67 kHz	Group B S/N (dB) 92 kHz	
SC S/N NO INTERFERENCE		36	52	-1	17	23	DDJ:
SC S/N WITH 0 dB D/U UPPER FIRST	0	15	24	-1	17	24	MITRE:
				-1	19	24	SEIKO:

What is the difference between these two sets of numbers?

93.9 MHz LOWER D = 94.1 MHz	Analog -> Analog Reference D/U (dB) s/n=45dB	Reference S/N (dB) 67 kHz	Reference S/N (dB) 92 kHz	HSSC -> Analog Group B D/U (dB) s/n=45dB	Group B S/N (dB) 67 kHz	Group B S/N (dB) 92 kHz	
S/N NO FIRST		36	53	5	17	34	
S/N WITH FIRST	5	17	33	5	17	34	
				5	18	34	

5	18	32
5	18	32
5	19	33

DDJ:
MITRE:
SEIKO:

G-1 First Adjacent

Analog -› Analog & HSSC -› Analog

	Desired	Undesired		Desired	Undesired		Desired	Undesired	
Main Channel:	81	81	%	81	81	%	81	81	%
Pilot:	9	9	%	9	9	%	9	9	%
67 kHz:	10	10	%	10	0	%	10	0	%
92 kHz:	10	10	%	10	7	%	10	0	%
57 kHz:	0	0	%	0	3	%	0	10	%
Proponent:	0	0	%	0	10	%	0	10	%
Total Deviation:	110	110	%	110	110	%	110	110	%
3 W Input	-32.4	-32.4	dBm						
Kay #3		51.0	dB						
		18.6							

Main Channel measurements are Q-Peak detected with CCIR filter .
SCA Measurements are RMS.
Measurements are unstable and vary.

94.3 MHz	Analog -› Analog Reference D/U (dB) s/n=45dB	Analog -› Analog Reference S/N (dB) 67 kHz	Analog -› Analog Reference S/N (dB) 92 kHz	HSSC -› Analog Group A D/U (dB) s/n=45dB	HSSC -› Analog Group A S/N (dB) 67 kHz	HSSC -› Analog Group A S/N (dB) 92 kHz	HSSC -› Analog Group B D/U (dB) s/n=45dB	HSSC -› Analog Group B S/N (dB) 67 kHz	HSSC -› Analog Group B S/N (dB) 92 kHz	
		36	52	-1	15	25	-1	17	23	DDJ:
	0			-1	16	25	-1	17	24	MITRE:
		15	24	-1	18	26	-1	19	24	SEIKO:

93.9 MHz	Analog -› Analog Reference D/U (dB) s/n=45dB	Analog -› Analog Reference S/N (dB) 67 kHz	Analog -› Analog Reference S/N (dB) 92 kHz	HSSC -› Analog Group A D/U (dB) s/n=45dB	HSSC -› Analog Group A S/N (dB) 67 kHz	HSSC -› Analog Group A S/N (dB) 92 kHz	HSSC -› Analog Group B D/U (dB) s/n=45dB	HSSC -› Analog Group B S/N (dB) 67 kHz	HSSC -› Analog Group B S/N (dB) 92 kHz	
		36	53	5	17	34	5	18	32	DDJ:
	5			5	17	34	5	18	32	MITRE:
		17	33	5	18	34	5	19	33	SEIKO:

G-2 Second Adjacent

Analog -› Analog & HSSC -› Analog

	Desired	Undesired		Desired	Undesired		Desired	Undesired	
Main Channel:	81	81	%	81	81	%	81	81	%
Pilot:	9	9	%	9	9	%	9	9	%
67 kHz:	10	10	%	10	0	%	10	0	%
92 kHz:	10	10	%	10	7	%	10	0	%
57 kHz:	0	0	%	0	3	%	0	10	%
Proponent:	0	0	%	0	10	%	0	10	%
Total Deviation:	110	110	%	110	110	%	110	110	%

3 W Input	-32.4	-32.4	dBm
Kay #3		51.0	dB
		18.6	

Main Channel measurements are Q-Peak detected with CCIR filter .
SCA Measurements are RMS.
-40 dB D/U produces a S/N of approximately 47 dB.

94.5 MHz	Analog -› Analog			HSSC -› Analog			HSSC -› Analog			
	Reference			Group A			Group B			
	D/U (dB) s/n=45dB	S/N (dB) 67 kHz	S/N (dB) 92 kHz	D/U (dB) s/n=45dB	S/N (dB) 67 kHz	S/N (dB) 92 kHz	D/U (dB) s/n=45dB	S/N (dB) 67 kHz	S/N (dB) 92 kHz	
		36	52	-40	24	7	-40	24	4	DDJ:
	-40			-40	24	8	-40	24	4	MITRE:
		24	10	-40	24	9	-40	24	3	SEIKO:

93.7 MHz	Analog -› Analog			HSSC -› Analog			HSSC -› Analog			
	Reference			Group A			Group B			
	D/U (dB) s/n=45dB	S/N (dB) 67 kHz	S/N (dB) 92 kHz	D/U (dB) s/n=45dB	S/N (dB) 67 kHz	S/N (dB) 92 kHz	D/U (dB) s/n=45dB	S/N (dB) 67 kHz	S/N (dB) 92 kHz	
		36	52	-40	13	6	-40	16	4	DDJ:
	-40			-40	14	6	-40	18	4	MITRE:
		10	7	-40	16	7	-40	20	4	SEIKO:

G-1 First Adjacent

Analog -› Analog & HSSC -› Analog

	Desired	Undesired		Desired	Undesired		Desired	Undesired	
Main Channel:	81	81	%	81	81	%	81	81	%
Pilot:	9	9	%	9	9	%	9	9	%
67 kHz:	10	10	%	10	0	%	10	0	%
92 kHz:	10	10	%	10	7	%	10	0	%
57 kHz:	0	0	%	0	3	%	0	10	%
Proponent:	0	0	%	0	10	%	0	10	%
Total Deviation:	110	110	%	110	110	%	110	110	%
3 W Input	-32.4	-32.4	dBm						
Kay #3		51.0	dB						
		18.6							

Main Channel measurements are Q-Peak detected with CCIR filter .
SCA Measurements are RMS.

94.3 MHz	Analog -› Analog Reference D/U (dB) s/n=45dB	Reference S/N (dB) 67 kHz	Reference S/N (dB) 92 kHz	HSSC -› Analog Group A D/U (dB) s/n=45dB	Group A S/N (dB) 67 kHz	Group A S/N (dB) 92 kHz	HSSC -› Analog Group B D/U (dB) s/n=45dB	Group B S/N (dB) 67 kHz	Group B S/N (dB) 92 kHz	
		37	52	21	34	46	21	34	45	DDJ:
	21			21	34	47	21	35	46	MITRE:
		34	46	21	35	47	21	35	46	SEIKO:

93.9 MHz	Analog -› Analog Reference D/U (dB) s/n=45dB	Reference S/N (dB) 67 kHz	Reference S/N (dB) 92 kHz	HSSC -› Analog Group A D/U (dB) s/n=45dB	Group A S/N (dB) 67 kHz	Group A S/N (dB) 92 kHz	HSSC -› Analog Group B D/U (dB) s/n=45dB	Group B S/N (dB) 67 kHz	Group B S/N (dB) 92 kHz	
		37	52	32.5	36	52	32.5	36	52	DDJ:
	32.5			32.5	36	52	32.5	36	52	MITRE:
		36	52	32.5	36	52	32.5	36	52	SEIKO:

G-2 Second Adjacent

Analog -› Analog & HSSC -› Analog

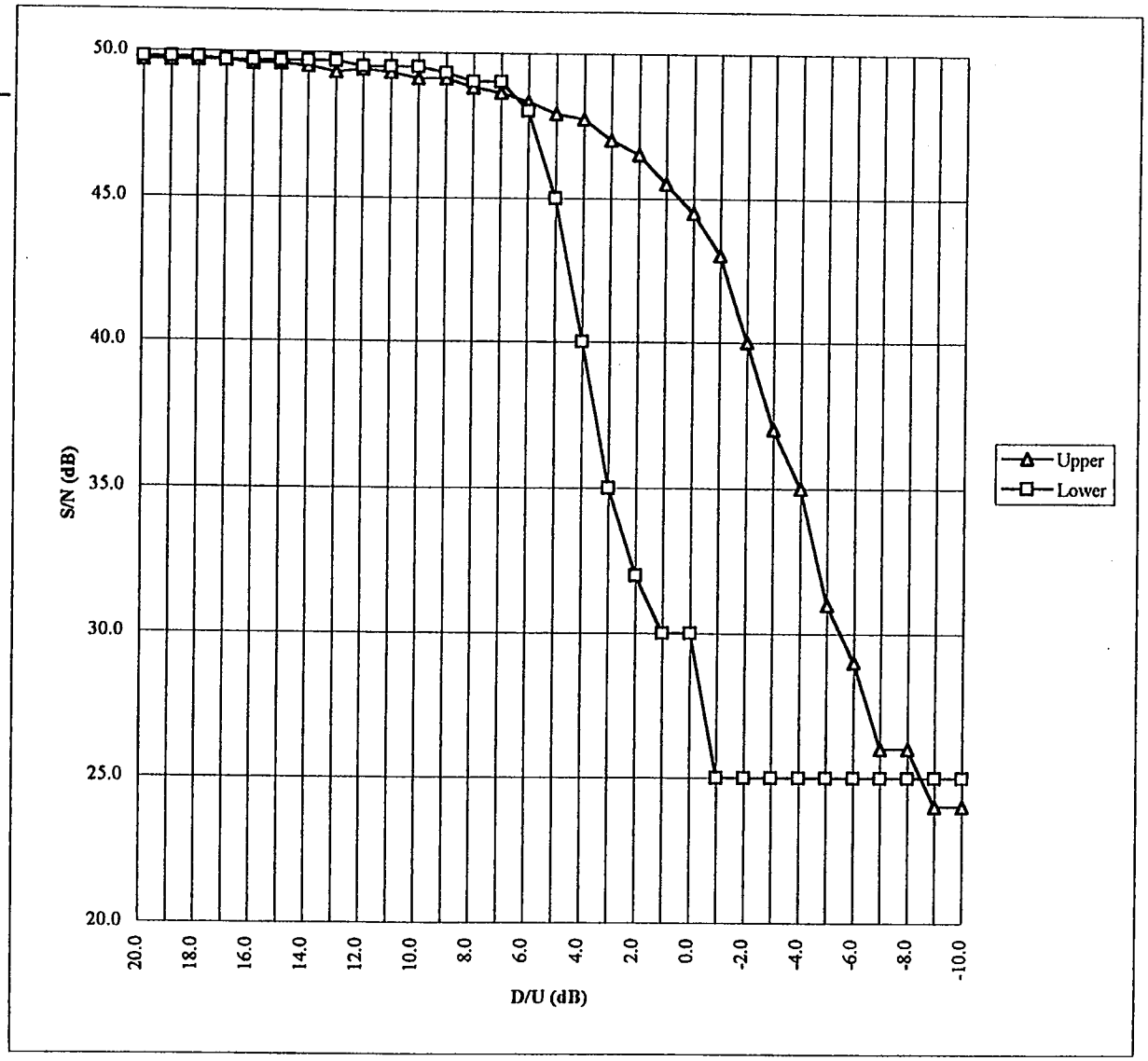
	Desired	Undesired		Desired	Undesired		Desired	Undesired	
Main Channel:	81	81	%	81	81	%	81	81	%
Pilot:	9	9	%	9	9	%	9	9	%
67 kHz:	10	10	%	10	0	%	10	0	%
92 kHz:	10	10	%	10	7	%	10	0	%
57 kHz:	0	0	%	0	3	%	0	10	%
Proponent:	0	0	%	0	10	%	0	10	%
Total Deviation:	110	110	%	110	110	%	110	110	%
3 W Input	-32.4	-32.4	dBm						
Kay #3		51.0	dB						
		18.6							

Main Channel measurements are Q-Peak detected with CCIR filter .
SCA Measurements are RMS.

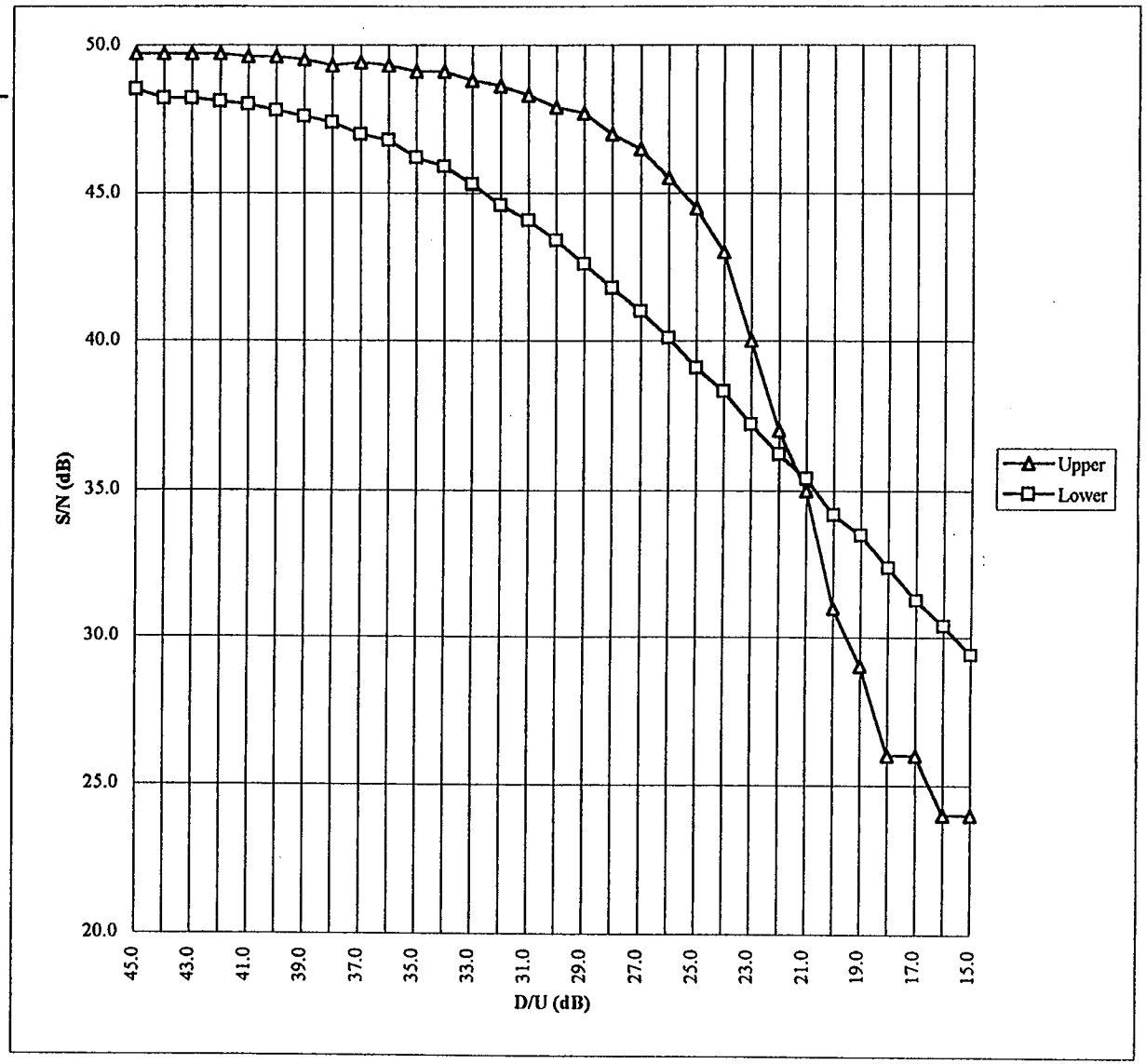
94.5 MHz	Analog -› Analog Reference			HSSC -› Analog Group A			HSSC -› Analog Group B			
	D/U (dB) s/n=45dB	S/N (dB) 67 kHz	S/N (dB) 92 kHz	D/U (dB) s/n=45dB	S/N (dB) 67 kHz	S/N (dB) 92 kHz	D/U (dB) s/n=45dB	S/N (dB) 67 kHz	S/N (dB) 92 kHz	
		37	52	-14	37	41	-14	37	43	DDJ:
	-14			-14	37	41	-14	37	43	MITRE:
		37	39	-14	37	41	-14	37	43	SEIKO:

93.7 MHz	Analog -› Analog Reference			HSSC -› Analog Group A			HSSC -› Analog Group B			
	D/U (dB) s/n=45dB	S/N (dB) 67 kHz	S/N (dB) 92 kHz	D/U (dB) s/n=45dB	S/N (dB) 67 kHz	S/N (dB) 92 kHz	D/U (dB) s/n=45dB	S/N (dB) 67 kHz	S/N (dB) 92 kHz	
		37	52	-13	37	48	-16	37	48	DDJ:
	-13			-14	37	48	-15	37	48	MITRE:
		37	48	-15	37	48	-18	37	48	SEIKO:

ATTN (dB)	41 D/U (dB)	Upper S/N (dB)	Lower S/N (dB)
30.00	20.0	49.7	49.8
29.00	19.0	49.7	49.8
28.00	18.0	49.7	49.8
27.00	17.0	49.7	49.7
26.00	16.0	49.6	49.7
25.00	15.0	49.6	49.7
24.00	14.0	49.5	49.7
23.00	13.0	49.3	49.7
22.00	12.0	49.4	49.5
21.00	11.0	49.3	49.5
20.00	10.0	49.1	49.5
19.00	9.0	49.1	49.3
18.00	8.0	48.8	49.0
17.00	7.0	48.6	49.0
16.00	6.0	48.3	48.0
15.00	5.0	47.9	45.0
14.00	4.0	47.7	40.0
13.00	3.0	47.0	35.0
12.00	2.0	46.5	32.0
11.00	1.0	45.5	30.0
10.00	0.0	44.5	30.0
9.00	-1.0	43.0	25.0
8.00	-2.0	40.0	25.0
7.00	-3.0	37.0	25.0
6.00	-4.0	35.0	25.0
5.00	-5.0	31.0	25.0
4.00	-6.0	29.0	25.0
3.00	-7.0	26.0	25.0
2.00	-8.0	26.0	25.0
1.00	-9.0	24.0	25.0
10.00	-10.0	24.0	25.0



ATTN (dB)	51 D/U (dB)	Upper S/N (dB)	Lower S/N (dB)
45.0	45.0	49.7	48.5
44.0	44.0	49.7	48.2
43.0	43.0	49.7	48.2
42.0	42.0	49.7	48.1
41.0	41.0	49.6	48.0
40.0	40.0	49.6	47.8
39.0	39.0	49.5	47.6
38.0	38.0	49.3	47.4
37.0	37.0	49.4	47.0
36.0	36.0	49.3	46.8
35.0	35.0	49.1	46.2
34.0	34.0	49.1	45.9
33.0	33.0	48.8	45.3
32.0	32.0	48.6	44.6
31.0	31.0	48.3	44.1
30.0	30.0	47.9	43.4
29.0	29.0	47.7	42.6
28.0	28.0	47.0	41.8
27.0	27.0	46.5	41.0
26.0	26.0	45.5	40.1
25.0	25.0	44.5	39.1
24.0	24.0	43.0	38.3
23.0	23.0	40.0	37.2
22.0	22.0	37.0	36.2
21.0	21.0	35.0	35.4
20.0	20.0	31.0	34.2
19.0	19.0	29.0	33.5
18.0	18.0	26.0	32.4
17.0	17.0	26.0	31.3
16.0	16.0	24.0	30.4
15.0	15.0	24.0	29.4



DIGITAL DJ

SYSTEM SPECIFIC

H-1 & H-3

B-1 Additive White Gaussian Noise
Characterization of HS Digital Subcarrier Signal Failure

Digital Radio Test Laboratory

(revised)

Test Date: 1/9/97
Engineer(s): DML

Basic Test Parameters:

SIGNAL

Sig. Lev: -65dBm
Main Ch. Mod: CPN
SCA Group: A
Error Meas. Duration: 5 Min.
Pilot: Not Locked

PROPONENT SPECIFIC

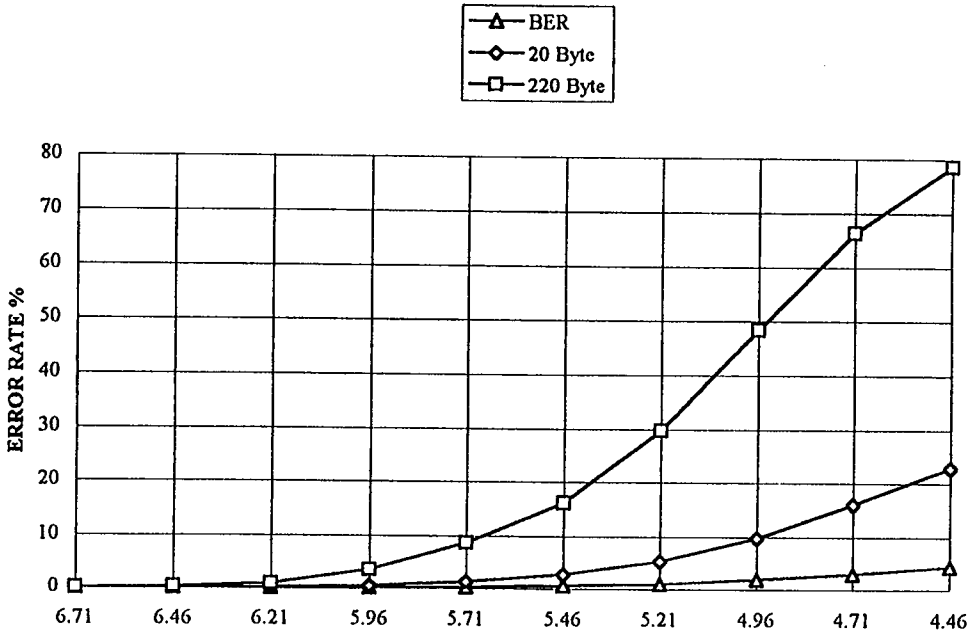
COMPOSITE SIGNA

5-Band Medium Process
ORBAN #2
COMP OUT 1: Proponent
COMP OUT 2: Prop + SC
Main Channel modulati
adjusted for 110%

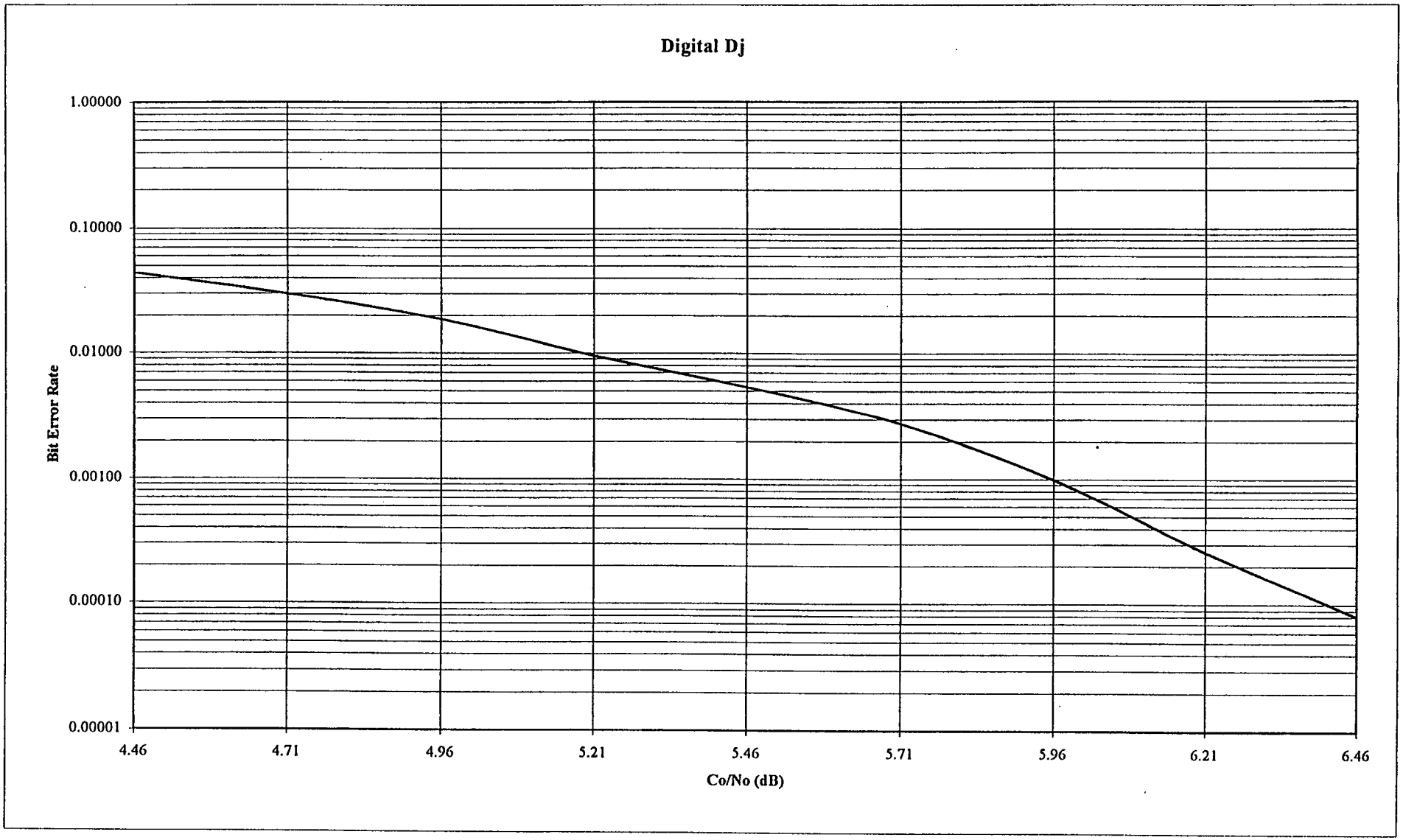
Analog Receivers: Delco RX 1
Compol 92KHz SCA Receiver
Denon RX 2 RBDS Receiver W/RDS Check software utilty

B1.1 Noise Failure Characterization

Noise Level		Error Level (%)		
C_o/N_o	Attn	BER	20 Byte	220 Byte
62.46	63.75	0	0	0
6.71	8.00	0	0	0
6.46	7.75	8.00E-03	5.20E-02	2.86E-01
6.21	7.50	2.60E-02	1.30E-01	8.57E-01
5.96	7.25	9.90E-02	5.21E-01	3.57E+00
5.71	7.00	2.76E-01	1.32E+00	8.71E+00
5.46	6.75	5.40E-01	2.71E+00	1.61E+01
5.21	6.50	9.51E-01	5.25E+00	2.97E+01
4.96	6.25	1.87E+00	9.74E+00	4.84E+01
4.71	6.00	2.98E+00	1.60E+01	6.64E+01
4.46	5.75	4.39E+00	2.28E+01	7.86E+01



(revised)


Digital Dj
1.00000
0.10000
0.01000
0.00100
0.00010
0.00001
Bit Error Rate
4.46
4.71
4.96
5.21
5.46
5.71
5.96
6.21
6.46
Co/No (dB)

Digital Radio Test Laboratory

B-1 Additive White Gaussian Noise
Characterization of HS Digital Subcarrier Signal Failure

1119

Test Date	Engineer(s):
1/9/97	DML

Basic Test Parameters:

SIGNAL

Sig. Lev: -65dBm
Main Ch. Mod: CPN
SCA Group: A
Error Meas. Duration: 5 Min.
Pilot: Not Locked

PROPONENT SPECIFIC

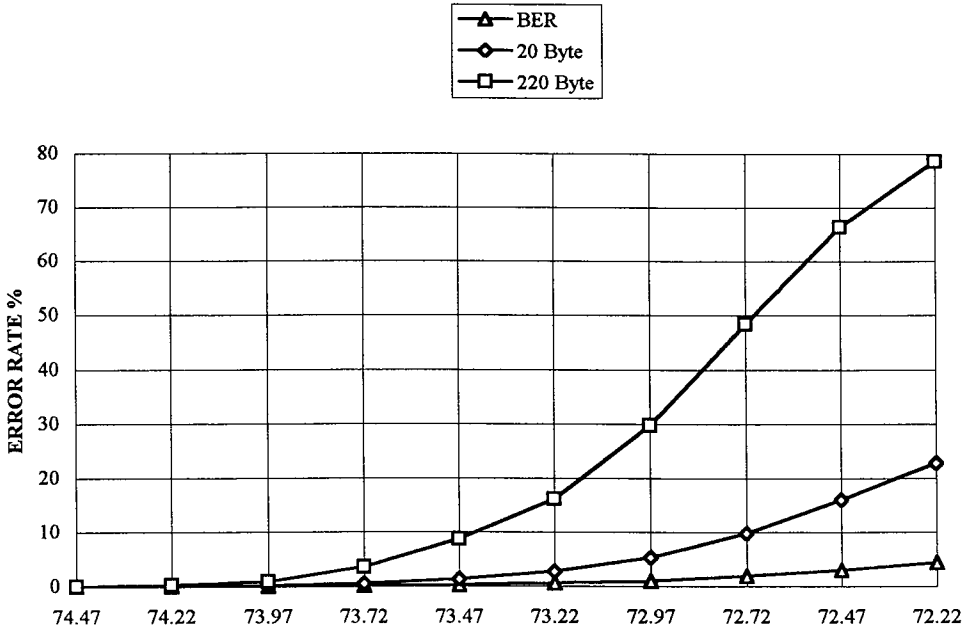
CC MPOSITE SIGNA

5-Band Medium Process
ORBAN #2
COMP OUT 1: Proponent
COMP OUT 2: Prop + SC
Main Channel modulati
adjusted for 110%

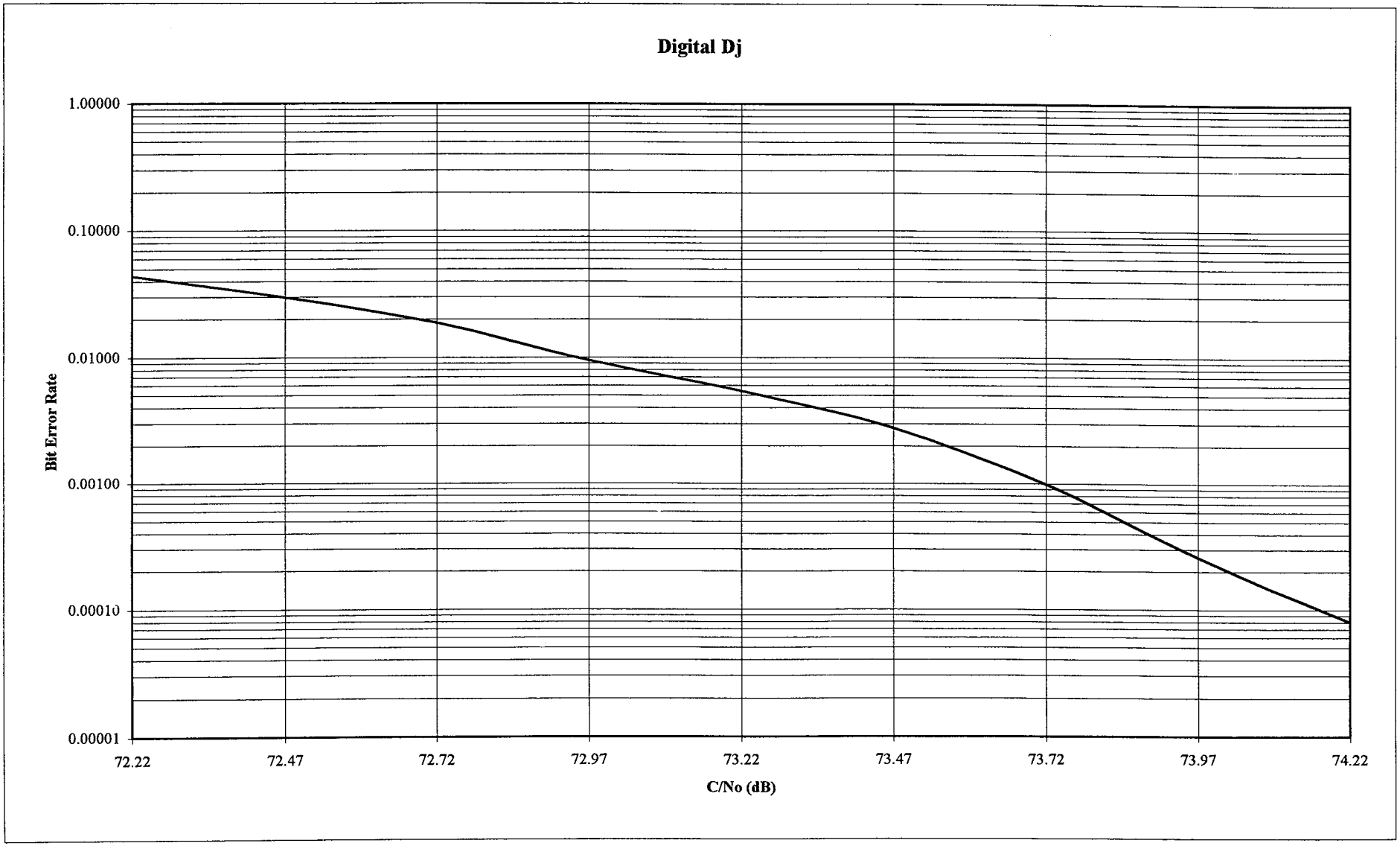
Analog Receivers: Delco RX 1
Compol 92KHz SCA Receiver
Denon RX 2 RBDS Receiver W/RDS Check software utilty

B1.1 Noise Failure Characterization

Noise Level		Error Level (%)		
C/N_0	**Attn**	**BER**	**20 Byte**	**220 Byte**
130.22	63.75	0	0	0
74.47	8.00	0	0	0
74.22	7.75	8.00E-03	5.20E-02	2.86E-01
73.97	7.50	2.60E-02	1.30E-01	8.57E-01
73.72	7.25	9.90E-02	5.21E-01	3.57E+00
73.47	7.00	2.76E-01	1.32E+00	8.71E+00
73.22	6.75	5.40E-01	2.71E+00	1.61E+01
72.97	6.50	9.51E-01	5.25E+00	2.97E+01
72.72	6.25	1.87E+00	9.74E+00	4.84E+01
72.47	6.00	2.98E+00	1.60E+01	6.64E+01
72.22	5.75	4.39E+00	2.28E+01	7.86E+01



Digital Radio Test Laboratory



112a

D-1 HS Data Subcarrier -› Host Analog

Main Channel:	91 %	91 %	81 %
Pilot:	9 %	9 %	9 %
92 kHz:	0 %	0 %	7 %
57 kHz:	0 %	0 %	3 %
Proponent:	0 %	10 %	10 %
Total:	100 %	110 %	110 %

RF Level dBm	0 dB= 2.25 V			0 dB= 2.08 V		
	Pilot Only		Proponent + Pilot		Group A	
	S/N	Units	DDJ S/N (dB)		DDJ S/N (dB)	
-65	55.9	dB	55.5		54.0	

Pilot Frequency (kHz)

Transmitter	Lock
18.99993	19.00003

DDJ

Slight increase in noise floor with group A.

Engineer(s): DML, TBK
Tests Conducted: 12/17/96

D-1 HS Data Subcarrier -› Host Analog

Main Channel:	91 %	91 %	81 %
Pilot:	9 %	9 %	9 %
92 kHz:	0 %	0 %	7 %
57 kHz:	0 %	0 %	3 %
Proponent:	0 %	10 %	10 %
Total:	100 %	110 %	110 %

RF Level dBm	0 dB= 642.0 mV			0 dB= 604.0 mV		
	Pilot Only		Proponent + Pilot		Group A	
	S/N	Units	DDJ S/N (dB)		DDJ S/N (dB)	
-65	52.7	dB	52.4		50.7	

Pilot Frequency (kHz)

Transmitter	Lock
18.99993	19.00003

Engineer(s): DML, TBK
Tests Conducted: 12/17/96

D-1 HS Data Subcarrier -› Host Analog

Main Channel:	91 %	91 %	81 %
Pilot:	9 %	9 %	9 %
92 kHz:	0 %	0 %	7 %
57 kHz:	0 %	0 %	3 %
Proponent:	0 %	10 %	10 %
Total:	100 %	110 %	110 %

RF Level dBm	0 dB= 755.0 mV			0 dB= 699.0 mV		
	Pilot Only		Proponent + Pilot		Group A	
	S/N	Units	DDJ S/N (dB)		DDJ S/N (dB)	
-65	50.3	dB	50.3		49.0	

Pilot Frequency (kHz)

Transmitter	Lock
18.99993	19.00003

Engineer(s): DML, TBK
Tests Conducted: 12/17/96

Digital Radio Test Laboratory

B-1 Additive White Gaussian Noise
Characterization of HS Digital Subcarrier Signal Failure

(revised)

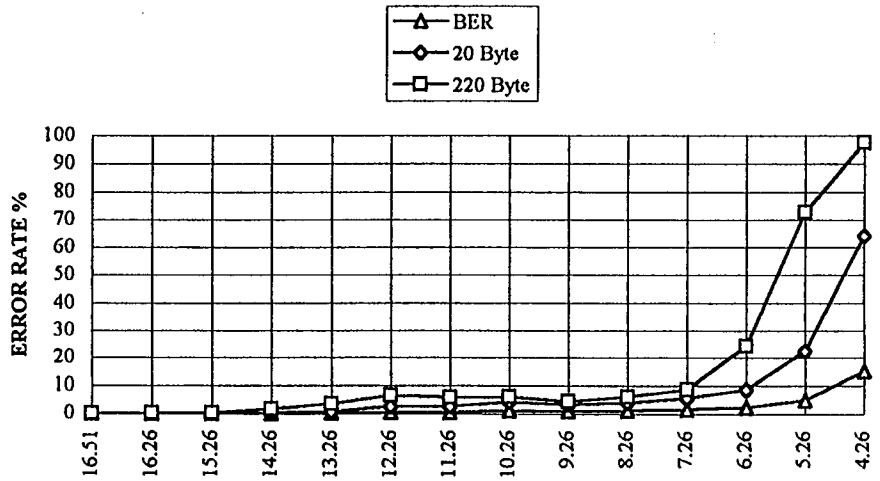
Test Date	Engineer(s):
12/20/96	DML

Basic Test Parameters:	SIGNAL	PROPONENT SPECIFIC	COMPOSITE SIGNAL
	Sig. Lev: -65dBm	Variable Injection	5-Band Medium Processed
	Main Ch. Mod: ABBA Medium CHR		ORBAN #2
	SCA Group: Group A		COMP OUT 1: Proponent Only
	Error Meas. Duration: 5 Min.		COMP OUT 2: Prop + SCA
			Main Channel modulation
			adjusted for 110%

Analog Receivers: Delco RX 1
Compol 92KHz SCA Receiver
Denon RX 2 RBDS Receiver W/RDS Check software utilty

B1.1 Noise Failure Characterization

Noise Level		Error Level (%)			
C_0/N_0	Attn	BER	20 Byte	220 Byte	
62.51	63.75	0	0	0	
16.51	17.75	0	0	0	
16.26	17.50	7.00E-03	1.30E-02	1.43E-01	**OME**
15.26	16.50	3.00E-03	2.60E-02	1.43E-01	
14.26	15.50	5.60E-02	3.13E-01	1.71E+00	
13.26	14.50	1.48E-01	7.95E-01	3.57E+00	
12.26	13.50	4.00E-01	2.61E+00	6.43E+00	
11.26	12.50	5.50E-01	2.61E+00	5.71E+00	
10.26	11.50	1.09E+00	4.09E+00	6.00E+00	
9.26	10.50	1.00E+00	3.29E+00	4.43E+00	
8.26	9.50	1.26E+00	3.96E+00	6.00E+00	
7.26	8.50	1.70E+00	5.50E+00	8.57E+00	
6.26	7.50	2.33E+00	8.58E+00	2.41E+01	
5.26	6.50	4.83E+00	2.22E+01	7.29E+01	
4.26	5.50	1.52E+01	6.42E+01	9.73E+01	



Digital Radio Test Laboratory

B-1 Additive White Gaussian Noise
Characterization of HS Digital Subcarrier Signal Failure

Test Date	Engineer(s):
12/20/96	DML

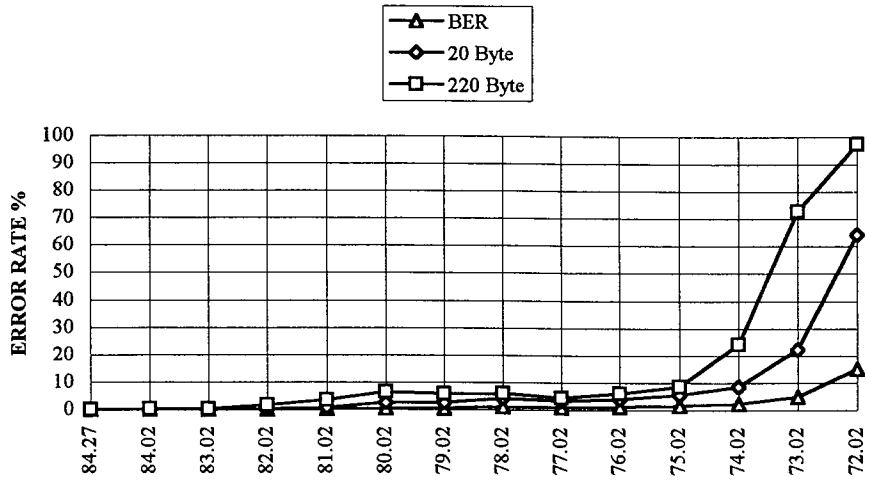
Basic Test Parameters:

SIGNAL		PROPONENT SPECIFIC	COMPOSITE SIGNAL
Sig. Lev: -65dBm		Variable Injection	5-Band Medium Processed
Main Ch. Mod: ABBA	Medium CHR		ORBAN #2
SCA Group: Group A			COMP OUT 1: Proponent Only
Error Meas. Duration: 5 Min.			COMP OUT 2: Prop + SCA
			Main Channel modulation
			adjusted for 110%

Analog Receivers: Delco RX 1
Compol 92KHz SCA Receiver
Denon RX 2 RBDS Receiver W/RDS Check software utilty

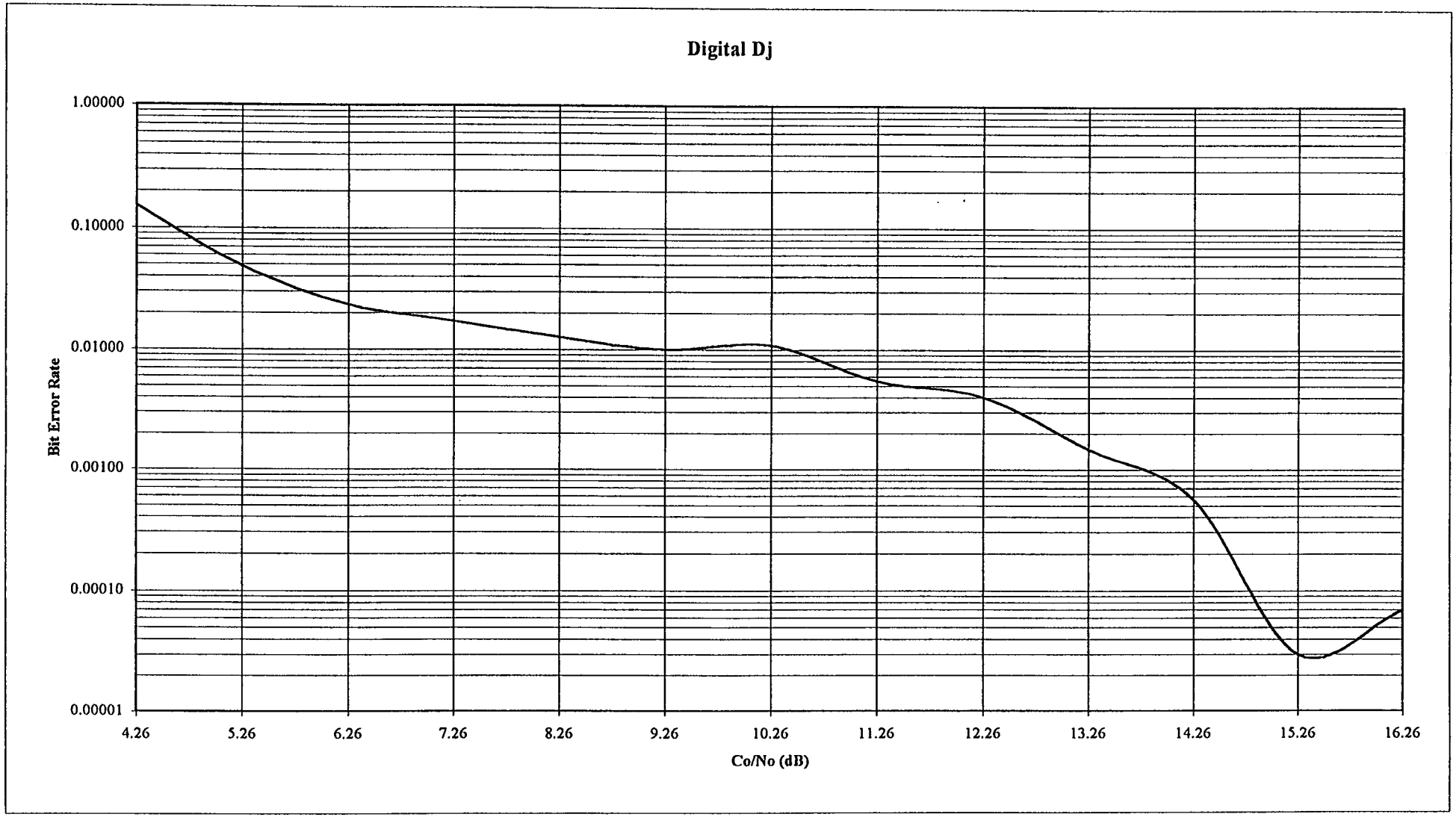
B1.1 Noise Failure Characterization

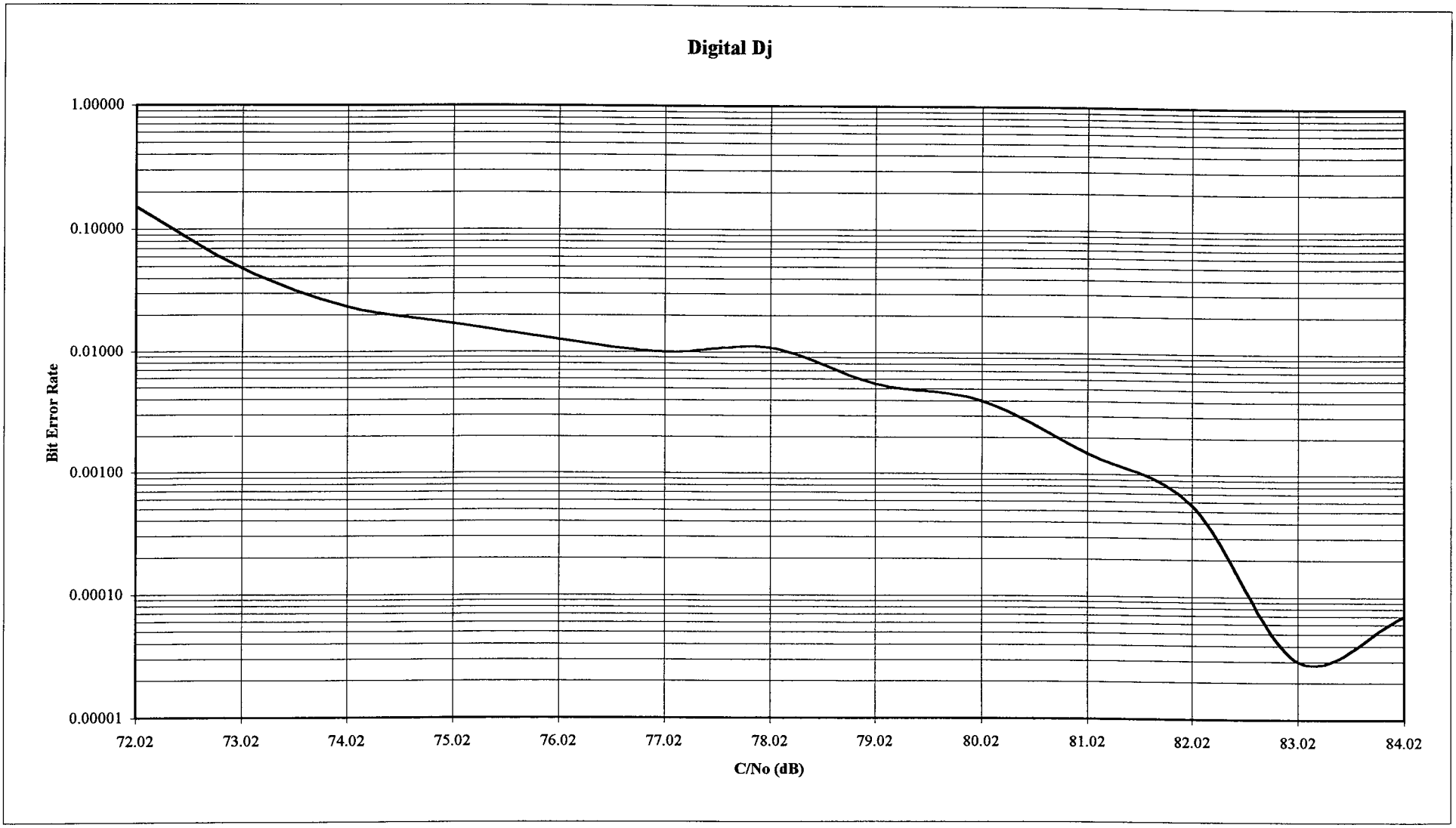
Noise Level		Error Level (%)			
C/N_0	**Attn**	**BER**	**20 Byte**	**220 Byte**	
130.27	63.75	0	0	0	
84.27	17.75	0	0	0	
84.02	17.50	7.00E-03	1.30E-02	1.43E-01	**OME**
83.02	16.50	3.00E-03	2.60E-02	1.43E-01	
82.02	15.50	5.60E-02	3.13E-01	1.71E+00	
81.02	14.50	1.48E-01	7.95E-01	3.57E+00	
80.02	13.50	4.00E-01	2.61E+00	6.43E+00	
79.02	12.50	5.50E-01	2.61E+00	5.71E+00	
78.02	11.50	1.09E+00	4.09E+00	6.00E+00	
77.02	10.50	1.00E+00	3.29E+00	4.43E+00	
76.02	9.50	1.26E+00	3.96E+00	6.00E+00	
75.02	8.50	1.70E+00	5.50E+00	8.57E+00	
74.02	7.50	2.33E+00	8.58E+00	2.41E+01	
73.02	6.50	4.83E+00	2.22E+01	7.29E+01	
72.02	5.50	1.52E+01	6.42E+01	9.73E+01	



Digital Radio Test Laboratory

(revised)




Digital Dj
1.00000
0.10000
0.01000
0.00100
0.00010
0.00001
Bit Error Rate
72.02
73.02
74.02
75.02
76.02
77.02
78.02
79.02
80.02
81.02
82.02
83.02
84.02
C/No (dB)

Digital Radio Test Laboratory

B-1 Additive White Gaussian Noise
Characterization of HS Digital Subcarrier Signal Failure

(revised)

Test Date: 2/5/97
Engineer(s): DML

Basic Test Parameters:

SIGNAL

Sig. Lev: -65dBm
Main Ch. Mod: ABBA Medium CHR
SCA Group: Proponent Only
Error Meas. Duration: 5 Min.

PROPONENT SPECIFIC

Variable Injection

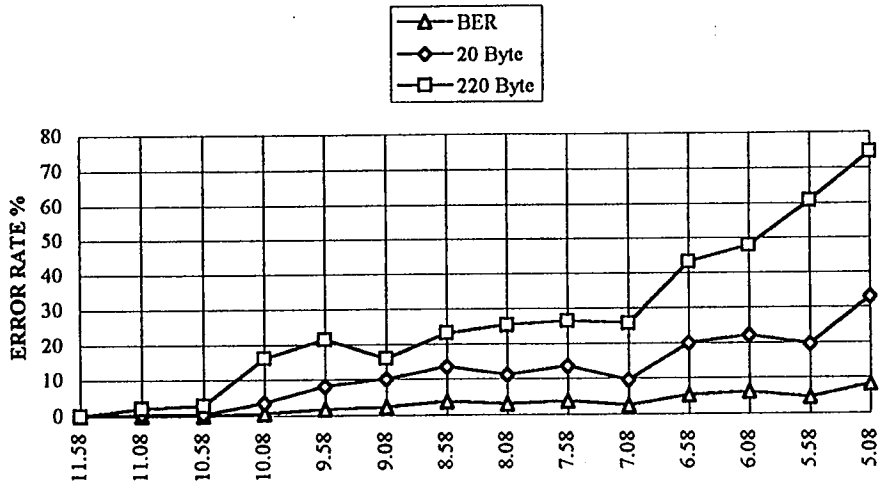
COMPOSITE SIGNAL

5-Band Medium Processed
ORBAN #2
COMP OUT 1: Proponent Only
COMP OUT 2: Prop + SCA
Main Channel modulation
adjusted for 110%

Analog Receivers: Delco RX 1
Compol 92KHz SCA Receiver
Denon RX 2 RBDS Receiver W/RDS Check software utilty

B1.1 Noise Failure Characterization

Noise Level		Error Level (%)			
C_o/N_o	Attn	BER	20 Byte	220 Byte	
63.33	63.75	0	0	0	
11.58	12.00	0	0	0	
11.08	11.50	4.23E-02	2.74E-01	2.00E+00	OME
10.58	11.00	8.80E-02	4.17E-01	2.71E+00	
10.08	10.50	6.15E-01	3.42E+00	1.61E+01	
9.58	10.00	1.62E+00	7.98E+00	2.13E+01	
9.08	9.50	2.28E+00	9.98E+00	1.59E+01	
8.58	9.00	3.63E+00	1.35E+01	2.30E+01	
8.08	8.50	2.88E+00	1.11E+01	2.51E+01	
7.58	8.00	3.68E+00	1.36E+01	2.63E+01	
7.08	7.50	2.33E+00	9.57E+00	2.56E+01	
6.58	7.00	5.14E+00	1.99E+01	4.31E+01	
6.08	6.50	6.08E+00	2.21E+01	4.79E+01	
5.58	6.00	4.34E+00	1.96E+01	6.07E+01	
5.08	5.50	8.05E+00	3.28E+01	7.44E+01	



Digital Radio Test Laboratory

B-1 Additive White Gaussian Noise
Characterization of HS Digital Subcarrier Signal Failure

Test Date	Engineer(s):
2/5/97	DML

Basic Test Parameters:

SIGNAL

Sig. Lev: -65dBm
Main Ch. Mod: ABBA Medium CHR
SCA Group: Proponent Only
Error Meas. Duration: 5 Min.

PROPONENT SPECIFIC

Variable Injection

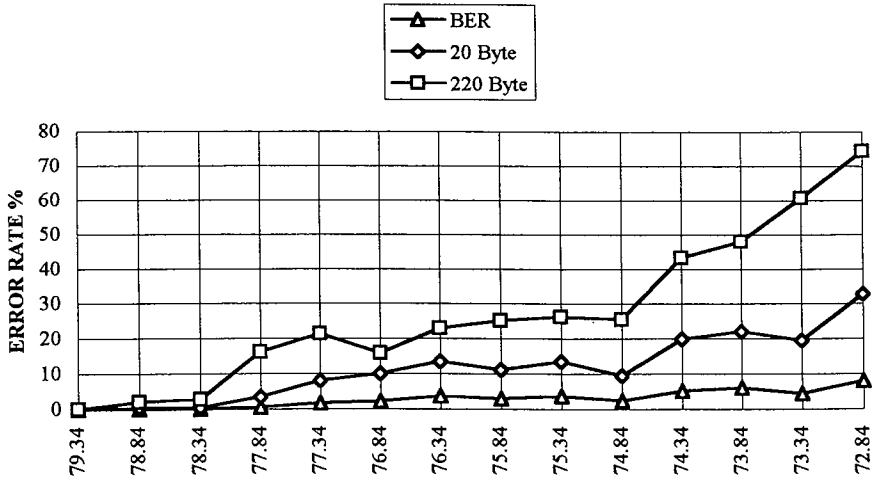
COMPOSITE SIGNAL

5-Band Medium Processed
ORBAN #2
COMP OUT 1: Proponent Only
COMP OUT 2: Prop + SCA
Main Channel modulation
adjusted for 110%

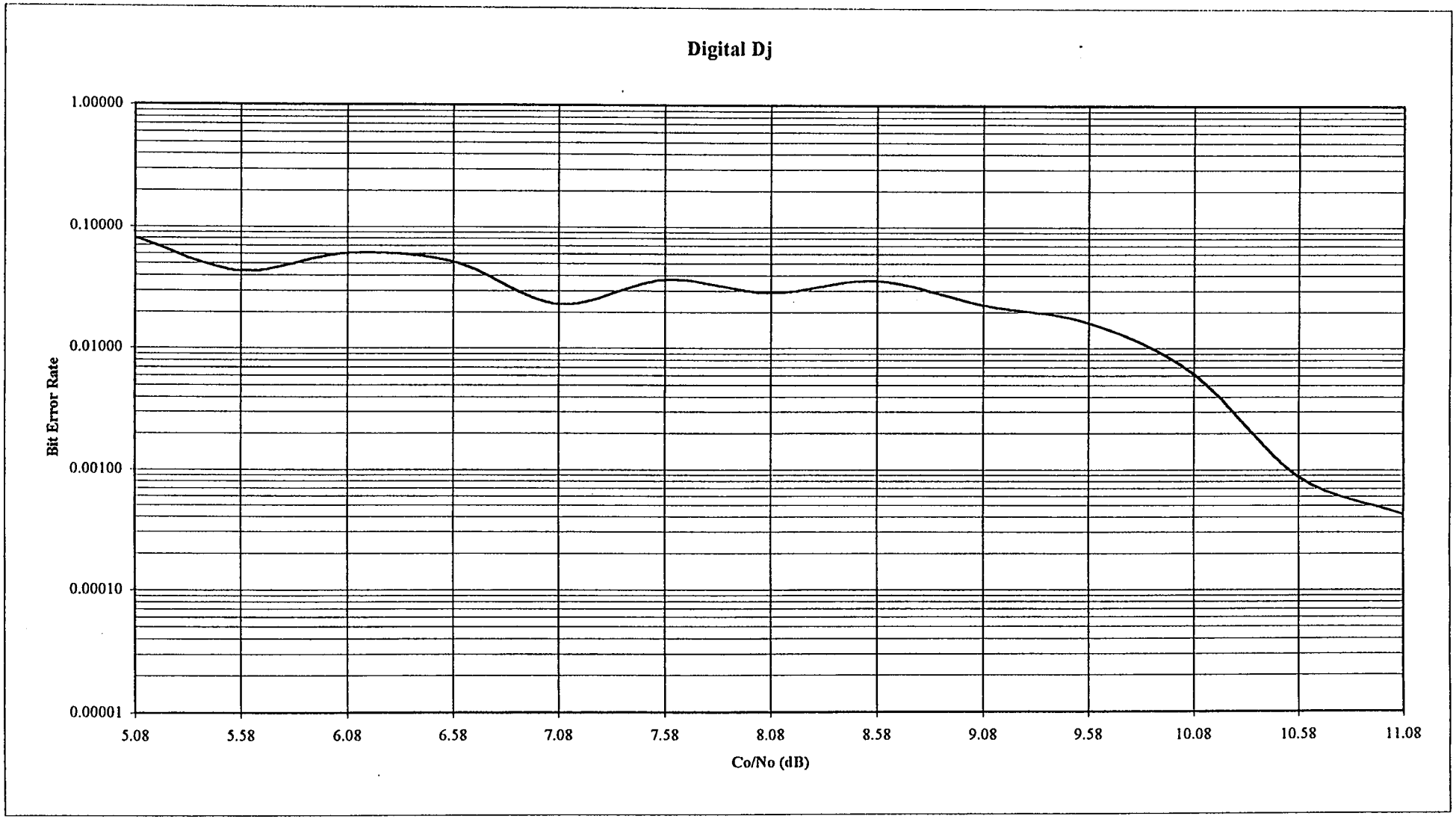
Analog Receivers: Delco RX 1
Compol 92KHz SCA Receiver
Denon RX 2 RBDS Receiver W/RDS Check software utilty

B1.1 Noise Failure Characterization

Noise Level		Error Level (%)			
C/N_0	Attn	BER	20 Byte	220 Byte	
131.09	63.75	0	0	0	
79.34	12.00	0	0	0	
78.84	11.50	4.23E-02	2.74E-01	2.00E+00	**OME**
78.34	11.00	8.80E-02	4.17E-01	2.71E+00	
77.84	10.50	6.15E-01	3.42E+00	1.61E+01	
77.34	10.00	1.62E+00	7.98E+00	2.13E+01	
76.84	9.50	2.28E+00	9.98E+00	1.59E+01	
76.34	9.00	3.63E+00	1.35E+01	2.30E+01	
75.84	8.50	2.88E+00	1.11E+01	2.51E+01	
75.34	8.00	3.68E+00	1.36E+01	2.63E+01	
74.84	7.50	2.33E+00	9.57E+00	2.56E+01	
74.34	7.00	5.14E+00	1.99E+01	4.31E+01	
73.84	6.50	6.08E+00	2.21E+01	4.79E+01	
73.34	6.00	4.34E+00	1.96E+01	6.07E+01	
72.84	5.50	8.05E+00	3.28E+01	7.44E+01	



Digital Radio Test Laboratory (revised)



B-2 Co-Channel

PROPONENT SPECIFIC
Variable Injection

COMPOSITE SIGNAL

ORBAN #1
COMP OUT 1: Prop + SCA
COMP OUT 2: Proponent Only

ORBAN #2
COMP OUT 1: Proponent Only
COMP OUT 2: Prop + SCA

Main Channel modulation adjusted for 110%

B2.3 Co-Channnel Analog Reference

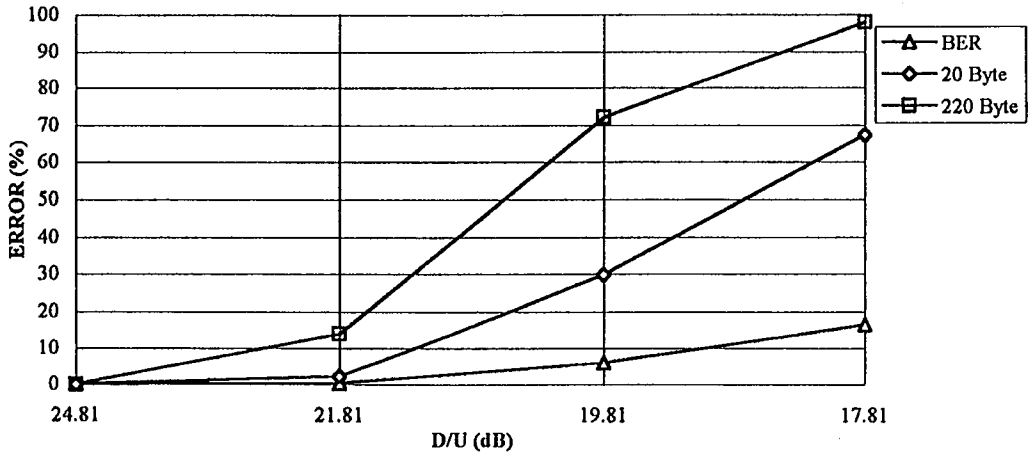
Desired Signal Parameters

RF Key Point Meas.:	-32.62 dBm
RX RF Level:	-65 dBm
Main Channel Modulation:	ABBA kHz
Modulation Level:	110 %
SCA Group:	Group A

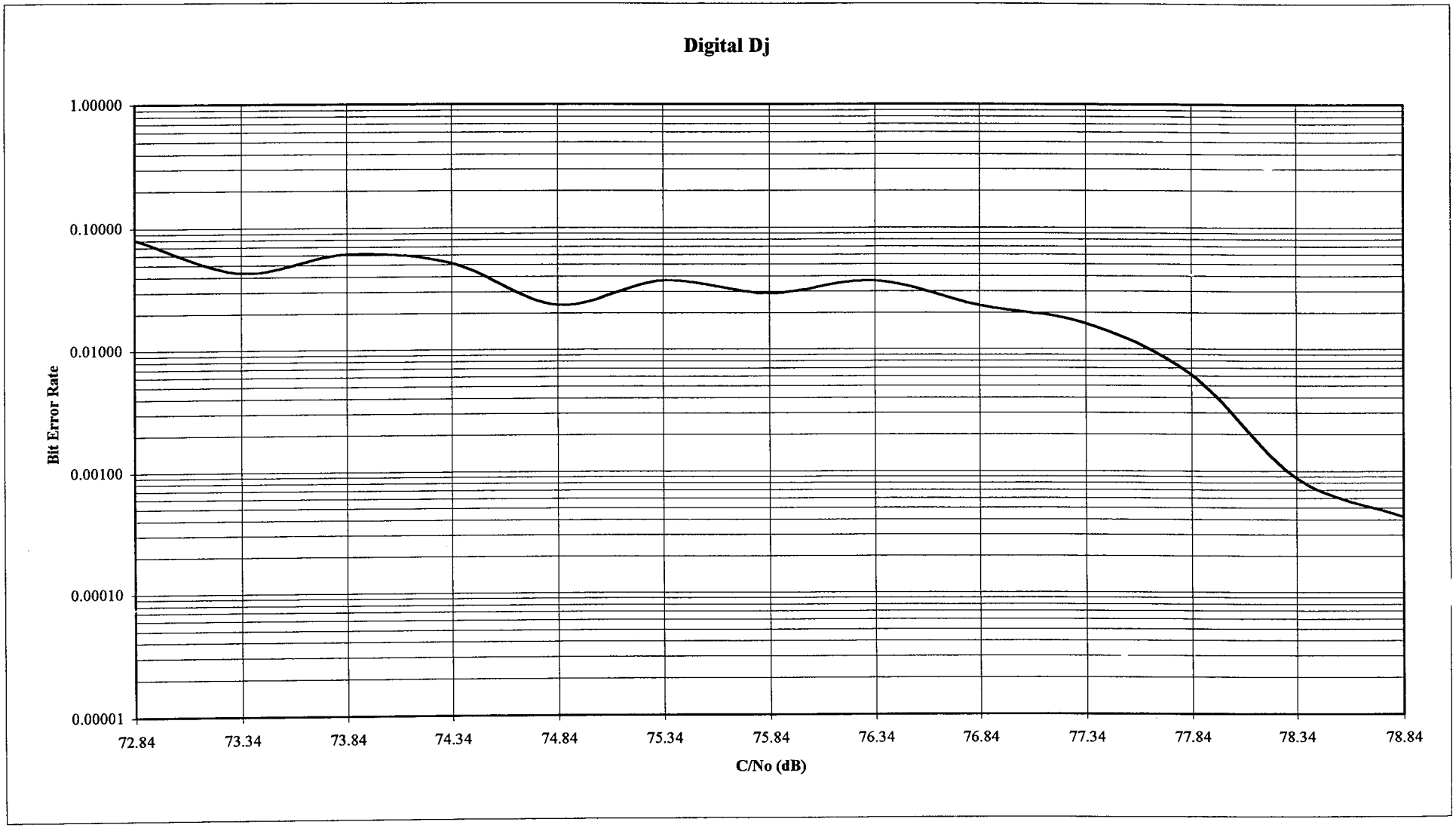
Undesired Signal Parameters

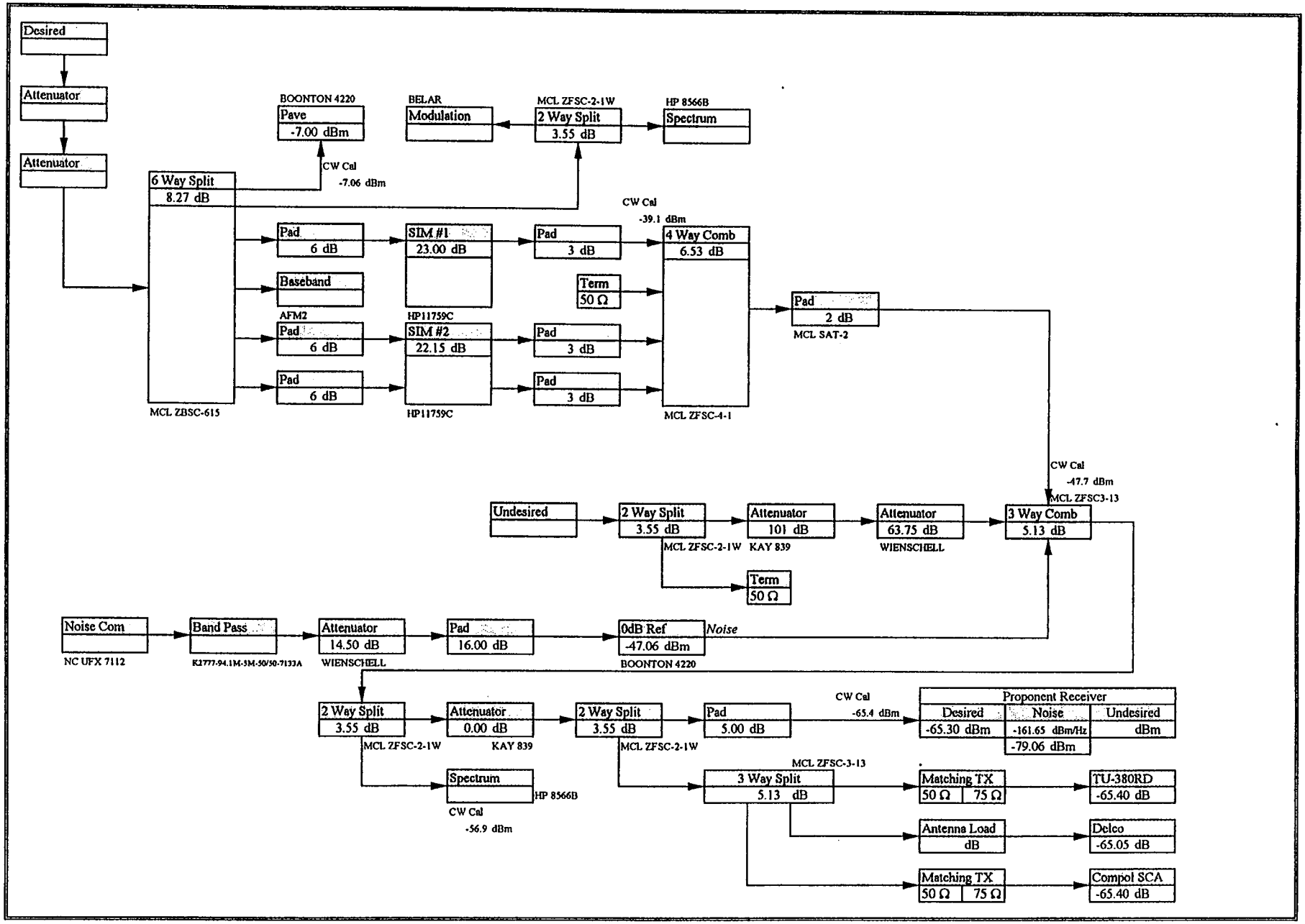
RF Key Point Meas.:	-32.43 dBm
Main Channel Modulation:	CPN
Modulation Level:	110 %
SCA Group:	67 & 92 kHz
SCA Modulation:	1 kHz

Co-Chan. D/U	Level Attn	Cum. Error Level BER	20 Byte	220 Byte
24.81	25.00	0	0	0
21.81	22.00	0.382	2.203	14.00
19.81	20.00	6.159	29.81	72.00
17.81	18.00	16.467	67.34	98.00



1119a


Digital Dj
1.00000
0.10000
0.01000
0.00100
0.00010
0.00001
Bit Error Rate
72.84
73.34
73.84
74.34
74.84
75.34
75.84
76.34
76.84
77.34
77.84
78.34
78.84
C/No (dB)


Desired
Attenuator
Attenuator
BOONTON 4220
Pave
-7.00 dBm
CW Cal
-7.06 dBm
BELAR
Modulation
MCL ZFSC-2-1W
2 Way Split
3.55 dB
HP 8566B
Spectrum
6 Way Split
8.27 dB
MCL ZBSC-615
CW Cal
-39.1 dBm
Pad
6 dB
Baseband
AFM2
Pad
6 dB
Pad
6 dB
SIM #1
23.00 dB
HP11759C
SIM #2
22.15 dB
HP11759C
Pad
3 dB
Term
50 Ω
Pad
3 dB
Pad
3 dB
4 Way Comb
6.53 dB
MCL ZFSC-4-1
Pad
2 dB
MCL SAT-2
CW Cal
-47.7 dBm
MCL ZFSC3-13
Undesired
2 Way Split
3.55 dB
MCL ZFSC-2-1W
Attenuator
101 dB
KAY 839
Attenuator
63.75 dB
WIENSCHELL
3 Way Comb
5.13 dB
Term
50 Ω
Noise Com
NC UFX 7112
Band Pass
K2777-94.1M-5M-50/50-7133A
Attenuator
14.50 dB
WIENSCHELL
Pad
16.00 dB
0dB Ref
-47.06 dBm
BOONTON 4220
Noise
2 Way Split
3.55 dB
MCL ZFSC-2-1W
Attenuator
0.00 dB
KAY 839
Spectrum
HP 8566B
CW Cal
-56.9 dBm
2 Way Split
3.55 dB
MCL ZFSC-2-1W
Pad
5.00 dB
CW Cal
-65.4 dBm
MCL ZFSC-3-13
3 Way Split
5.13 dB
Proponent Receiver
Desired
-65.30 dBm
Noise
-161.65 dBm/Hz
-79.06 dBm
Undesired
dBm
Matching TX
50 Ω
75 Ω
TU-380RD
-65.40 dB
Antenna Load
dB
Delco
-65.05 dB
Matching TX
50 Ω
75 Ω
Compol SCA
-65.40 dB

Digital Radio Test Laboratory

(revised)

B-3 Multipath
Characterization of HS Digital Subcarrier Signal Failure

Basic Test Parameters:	**SIGNAL**	**PROPONENT SPECIFIC**	**COMPOSITE SIGNAL**
	One Path Zero Phase Reference: -65dBm Main Channel Mod: CPN SCA Group: A Error Measurement Duration: 5 Min.	Variable Injection	ORBAN #1 COMP OUT 1: Not Used COMP OUT 2: Not Used 5-Band Medium Processed ORBAN #2 COMP OUT 1: Proponent Only COMP OUT 2: Prop + SCA Main Channel modulation adjusted for 110%

Analog Receivers: Delco RX 1
Compol 92KHz SCA Receiver
Denon RX 2 RBDS Receiver W/RDS Check software utilty

	Noise Level		**Error Level (%)**			**EO&C**
	C_o/N_o	**Attn**	**BER**	**20 Byte**	**220 Byte**	
Urban Slow	**58.00**	63.75	0.7470	2.294	3.571	Performance impaired without added noise.
Urban Fast	**58.00**	63.75	0.6450	3.193	18.71	Performance impaired without added noise.
Rural Fast	**58.00**	63.75	0.3800	2.112	12.00	Performance impaired without added noise.
Obstructed	**58.00**	63.75	100.0	100.0	100.0	Receiver does not acquire signal consistently. Statistics are calculated on completed files and not all files are completely transfered.

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Digital Radio Test Laboratory

B-3 Multipath
Characterization of HS Digital Subcarrier Signal Failure

Basic Test Parameters:	**SIGNAL**	**PROPONENT SPECIFIC**	**COMPOSITE SIGNAL**
	One Path Zero Phase Reference: -65dBm	Variable Injection	ORBAN #1
	Main Channel Mod: CPN		COMP OUT 1: Not Used
	SCA Group: A		COMP OUT 2: Not Used
	Error Measurement Duration: 5 Min.		5-Band Medium Processed
			ORBAN #2
Analog Receivers:	Delco RX 1		COMP OUT 1: Proponent Only
	Compol 92KHz SCA Receiver		COMP OUT 2: Prop + SCA
	Denon RX 2 RBDS Receiver W/RDS Check software utilty		Main Channel modulation adjusted for 110%

	Noise Level		**Error Level (%)**			**EO&C**
	C/N_0	**Attn**	**BER**	**20 Byte**	**220 Byte**	
Urban Slow	**125.76**	63.75	0.7470	2.294	3.571	Performance impaired without added noise.
Urban Fast	**125.76**	63.75	0.6450	3.193	18.71	Performance impaired without added noise.
Rural Fast	**125.76**	63.75	0.3800	2.112	12.00	Performance impaired without added noise.
Obstructed	**125.76**	63.75	100.0	100.0	100.0	Receiver does not acquire signal consistently. Statistics are calculated on completed files and not all files are completely transfered.

122a

Digital Radio Test Laboratory

(revised)

B-3 Multipath
Characterization of HS Digital Subcarrier Signal Failure

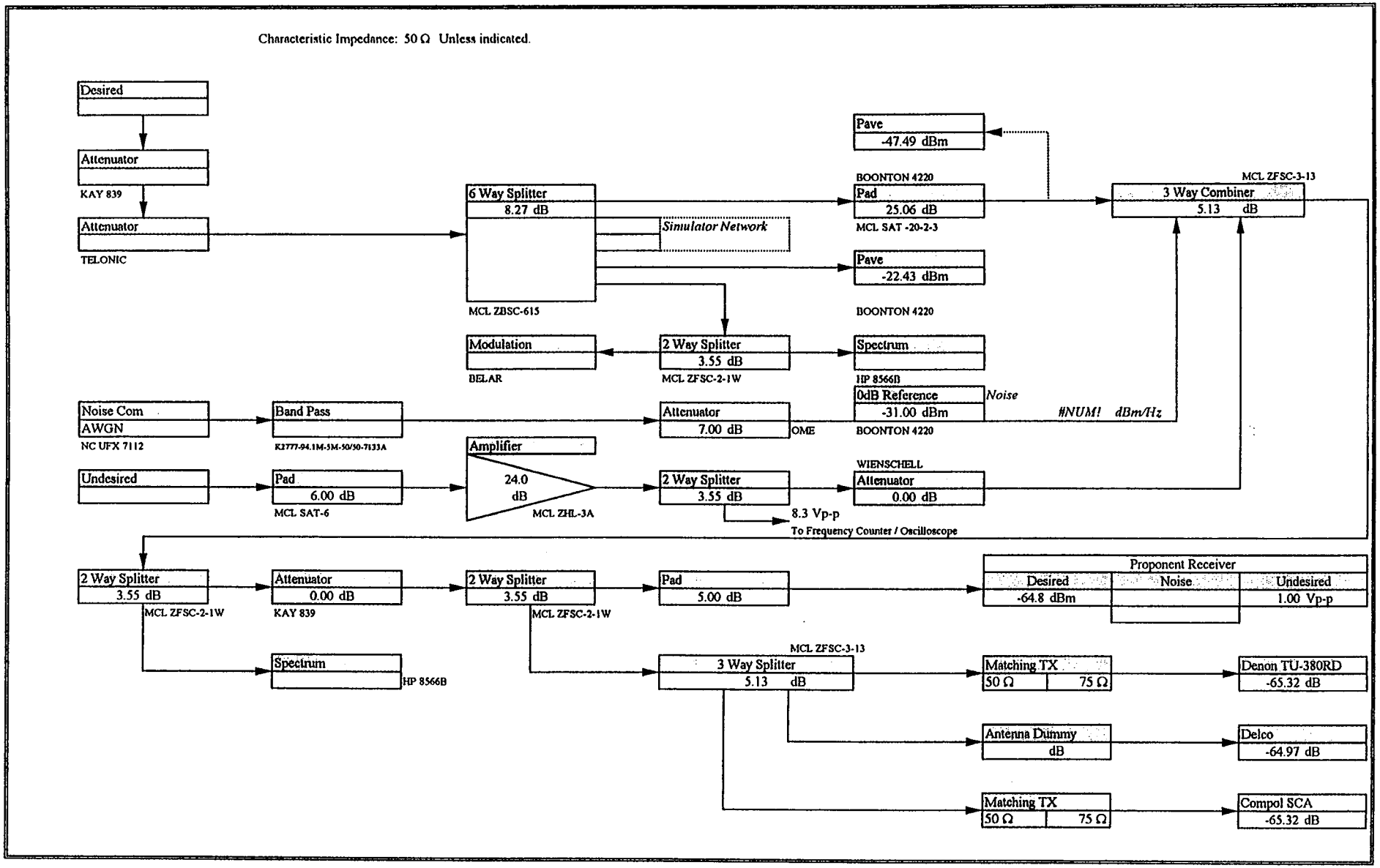
Basic Test Parameters: **SIGNAL** **PROPONENT SPECIFIC** **COMPOSITE SIGNAL**

One Path Zero Phase Reference: -65dBm — Variable Injection — ORBAN #1
Main Channel Mod: ABBA Medium CHR — COMP OUT 1: Not Used
SCA Group: Group A and Proponent Only — COMP OUT 2: Not Used
Error Measurement Duration: 5 Min. — 5-Band Medium Processed

ORBAN #2
COMP OUT 1: Proponent Only
COMP OUT 2: Prop + SCA
Main Channel modulation adjusted for 110%

Analog Receivers: Delco RX 1
Compol 92KHz SCA Receiver
Denon RX 2 RBDS Receiver W/RDS Check software utilty

	Noise Level		Error Level (%)			EO&C
	C_o/N_o	Attn	BER	20 Byte	220 Byte	
Grp A	**63.34**	63.75	0.7470	2.294	3.571	Performance impaired without added noise.
Urban Slow						
DDJ Only			0.3350	1.095	3.000	
Grp A	**63.34**	63.75	0.6450	3.193	18.71	Performance impaired without added noise.
Urban Fast						
DDJ Only			0.5650	2.815	15.57	
Grp A	**63.34**	63.75	0.3800	2.112	12.00	Performance impaired without added noise.
Rural Fast						
DDJ Only			0.2480	1.290	8.857	
Grp A	**63.34**	63.75	100.0	100.0	100.0	Receiver does not acquire signal consistently.
Obstructed						Statistics are calculated on completed files and not all
DDJ Only			100.0	100.0	100.0	files are completely transfered.


Characteristic Impedance: 50 Ω Unless indicated.
Desired
Attenuator
KAY 839
Attenuator
TELONIC
6 Way Splitter
8.27 dB
MCL ZBSC-615
Simulator Network
Pave
-47.49 dBm
BOONTON 4220
Pad
25.06 dB
MCL SAT -20-2-3
Pave
-22.43 dBm
BOONTON 4220
MCL ZFSC-3-13
3 Way Combiner
5.13 dB
Modulation
BELAR
2 Way Splitter
3.55 dB
MCL ZFSC-2-1W
Spectrum
HP 8566B
Noise Com
AWGN
NC UFX 7112
Band Pass
K2777-94.1M-5M-50/50-7133A
Attenuator
7.00 dB
OME
0dB Reference
-31.00 dBm
BOONTON 4220
Noise
#NUM! dBm/Hz
Amplifier
24.0
dB
MCL ZHL-3A
Undesired
Pad
6.00 dB
MCL SAT-6
2 Way Splitter
3.55 dB
WIENSCHELL
Attenuator
0.00 dB
8.3 Vp-p
To Frequency Counter / Oscilloscope
2 Way Splitter
3.55 dB
MCL ZFSC-2-1W
Attenuator
0.00 dB
KAY 839
2 Way Splitter
3.55 dB
MCL ZFSC-2-1W
Pad
5.00 dB
Proponent Receiver
Desired
-64.8 dBm
Noise
Undesired
1.00 Vp-p
Spectrum
HP 8566B
MCL ZFSC-3-13
3 Way Splitter
5.13 dB
Matching TX
50 Ω
75 Ω
Denon TU-380RD
-65.32 dB
Antenna Dummy
dB
Delco
-64.97 dB
Matching TX
50 Ω
75 Ω
Compol SCA
-65.32 dB

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Digital Radio Test Laboratory

1230

B-3 Multipath
Characterization of HS Digital Subcarrier Signal Failure

Basic Test Parameters:	**SIGNAL**	**PROPONENT SPECIFIC**	**COMPOSITE SIGNAL**
One Path Zero Phase Reference:	-65dBm	Variable Injection	ORBAN #1
Main Channel Mod:	ABBA Medium CHR		COMP OUT 1: Not Used
SCA Group:	Group A and Proponent Only		COMP OUT 2: Not Used
Error Measurement Duration:	5 Min.		5-Band Medium Processed
			ORBAN #2
Analog Receivers:	Delco RX 1		COMP OUT 1: Proponent Only
	Compol 92KHz SCA Receiver		COMP OUT 2: Prop + SCA
	Denon RX 2 RBDS Receiver W/RDS Check software utilty		Main Channel modulation adjusted for 110%

	Noise Level		**Error Level (%)**			**EO&C**
	C/N_0	**Attn**	**BER**	**20 Byte**	**220 Byte**	
Grp A	**131.10**	63.75	0.7470	2.294	3.571	Performance impaired without added noise.
Urban Slow						
DDJ Only			0.3350	1.095	3.000	
Grp A	**131.10**	63.75	0.6450	3.193	18.71	Performance impaired without added noise.
Urban Fast						
DDJ Only			0.5650	2.815	15.57	
Grp A	**131.10**	63.75	0.3800	2.112	12.00	Performance impaired without added noise.
Rural Fast						
DDJ Only			0.2480	1.290	8.857	
Grp A	**131.10**	63.75	100.0	100.0	100.0	Receiver does not acquire signal consistently.
Obstructed						Statistics are calculated on completed files and not all
DDJ Only			100.0	100.0	100.0	files are completely transfered.

B-4 Impulse Noise 12/23/96
Variable Injection
Desired Signal
-65 dBm at receiver input.
Group A subcarriers.

Undesired Signal
10 ns wide 1.0 Vp-p pulse at receiver input
Repetition Rate Variable

Results accumulated over 5 minute measurement period.

Repetition Rate (Hz)	BER	20 Byte	ABBA 220 Byte	Attenuator Setting (dB)	Voltage (Vp-p)
100	0.0000	0.0000	0.0000	0	1.000
200	0.0000	0.0000	0.0000	0	1.000
300	0.0000	0.0000	0.0000	0	1.000
600	0.0000	0.0000	0.0000	0	1.000
1000	0.0970	0.6520	3.857	0	1.000
1000	0.0650	0.3520	2.286	10	0.3162
1000	0.0310	0.1960	1.571	15	0.1778
1000	0.0000	0.0000	0.0000	20	0.1000

(revised)

Analog Out	Noise Level Attn	C_0/N_0	Error Level (%) BER	20 Byte	220 Byte	Main Channel Modulation Medium CHR	SCA Injection	Weak Signal Performance			
	7.50	**6.26**	0.0E+00	0.0E+00	0.0E+00				42	dB	
	7.25	**6.01**	3.00E-05	3.90E-04	2.86E-03	ABBA	10%	-92	≤OME<	-91	dBm
									31	dB	
p-c	18.25	**17.01**	4.00E-05	1.30E-04	1.43E-03	ABBA	Variable	-81	≤OME<	-80	dBm
									20	dB	
	28.75	**27.51**	9.00E-05	3.90E-04	2.86E-03	ABBA	4%	-70	≤OME<	-69	dBm
									30	dB	
flat	18.25	**17.01**	3.00E-05	1.30E-04	1.43E-03	ABBA	Variable	-80	≤OME<	-79	dBm

Digital Radio Test Laboratory

Analog Out	Noise Level Attn	C/N_0	Error Level (%) BER	20 Byte	220 Byte	Main Channel Modulation	SCA Injection	Weak Signal Performance	
						Medium CHR			
	7.50	**74.02**	0.0E+00	0.0E+00	0.0E+00			42 dB	
	7.25	**73.77**	3.00E-05	3.90E-04	2.86E-03	ABBA	10%	-92 ≤OME< -91	dBm
								31 dB	
p-e	18.25	**84.77**	4.00E-05	1.30E-04	1.43E-03	ABBA	Variable	-81 ≤OME< -80	dBm
								20 dB	
	28.75	**95.27**	9.00E-05	3.90E-04	2.86E-03	ABBA	4%	-70 ≤OME< -69	dBm
								30 dB	
flat	18.25	**84.77**	3.00E-05	1.30E-04	1.43E-03	ABBA	Variable	-80 ≤OME< -79	dBm

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Digital Radio Test Laboratory

C-1 Re-Acquisition
Variable Injection

12/23/96

	Re-Acquisition Time (s)		
	POF-2dB	POF-4dB	POF-6dB
	1.0	2.6	1.4
	1.6	1.0	3.1
	1.9	1.6	1.3
	6.3	1.3	1.0
	1.5	2.8	1.0
Average	2.4	1.9	1.5

Point Of Failure Attenuator Setting	5.50 dB
Desired Signal Reference Level	-32.62 dBm
Noise 0 dB Reference	-31.0 dBm
Desired Signal Level at Receiver	-65 dBm

POF Noise Level is defined as the level which causes 220 byte Packet Error Rate of 95% ± 5%.

ABBA Used as Modulation Source on Main Channel

Connection is broken for at least 30 seconds.

Test	C-2	Re-Acquisition with Multipath Urban Slow Rayleigh

	Re-Acquisition Time (s)		
Tsim (s)	POF-2	POF-4	POF-6
5	2.2	2.5	1.5
10	2.0	2.7	3.2
15	1.8	1.5	2.1
20	1.8	1.8	3.1
Average	1.9	2.2	2.5

POF Attenuator Setting: 12 dB

EO&C

Point of Failure (POF) defined as:
220 Byte Message Error Rate ≥ 50 %

Test Date: 23-Dec-96
ngineer(s): DML

Test	C-2	Re-Acquisition with Multipath Urban Fast Rayleigh

	Re-Acquisition Time (s)		
Tsim (s)	POF-2	POF-4	POF-6
5	3.1	2.1	2.4
10	3.2	4.8	5.7
15	1.5	2.9	1.3
20	3.1	1.7	2.6
Average	2.7	2.9	3.0

POF Attenuator Setting: 18 dB

EO&C

Test Date: 23-Dec-96
ngineer(s): DML

Test	C-2	Re-Acquisition with Multipath Rural Fast Rayleigh		
		Re-Acquisition Time (s)		
	Tsim (s)	POF-2	POF-4	POF-6
	5	3.8	3.0	4.0
	10	1.9	2.7	4.3
	15	3.0	3.1	2.0
	20	2.0	1.6	2.2
	Average	2.6	2.6	3.1

POF Attenuator Setting: 20 dB

EO&C

Test Date: 23-Dec-96
ngineer(s): DML

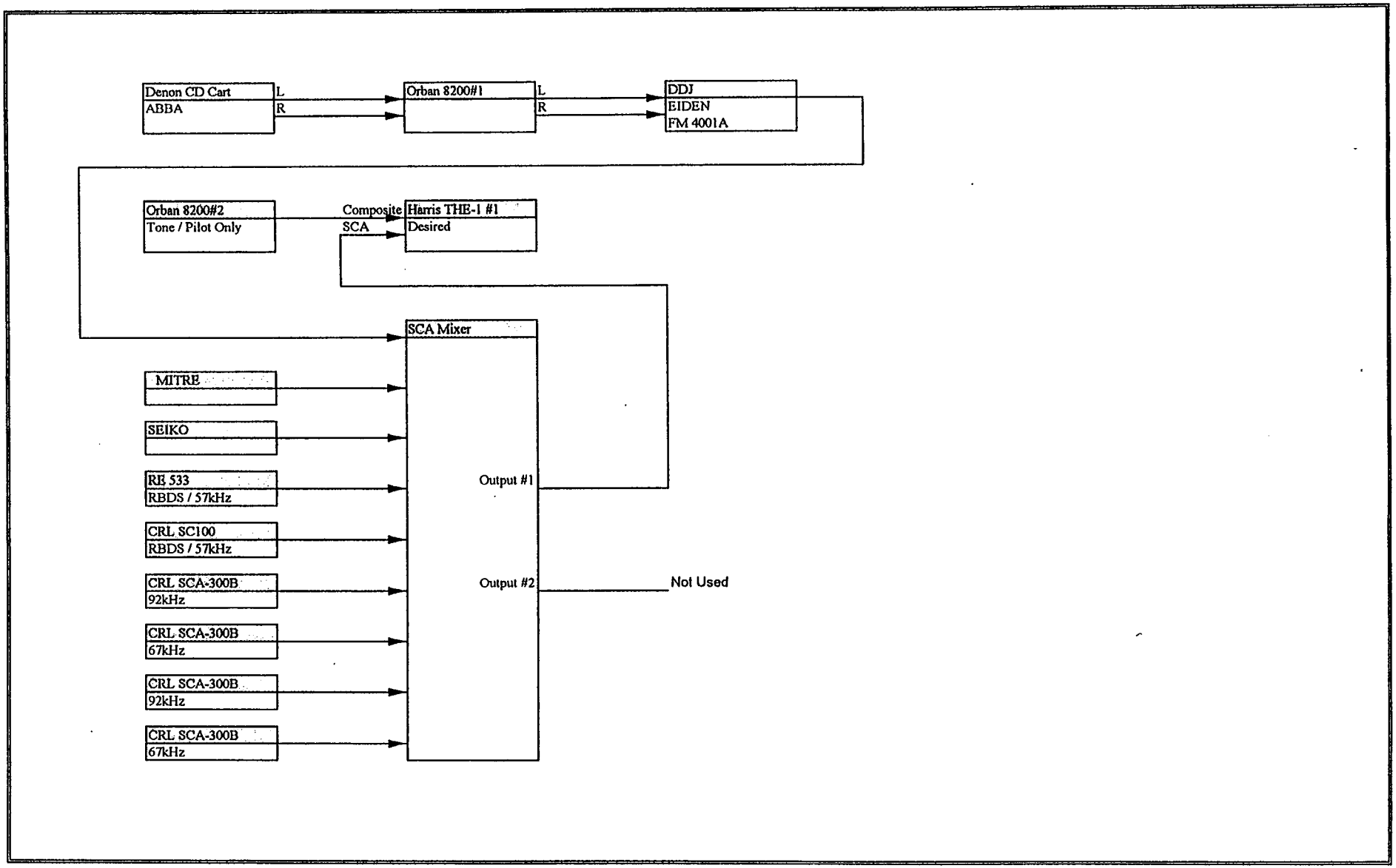
Test	C-2	Re-Acquisition with Multipath Obstructed Rayleigh

Tsim (s)	Re-Acquisition Time (s) POF
5	
10	
15	
20	
Average	0.0

EO&C

System only re-acquires for short bursts which are not long enough to determine re-acquisition time accurately.

Test Date: 23-Dec-96
ngineer(s): DML


Denon CD Cart
ABBA
L
R
Orban 8200#1
L
R
DDJ
EIDEN
FM 4001A
Orban 8200#2
Tone / Pilot Only
Composite
SCA
Harris THE-1 #1
Desired
SCA Mixer
MITRE
SEIKO
RE 533
RBDS / 57kHz
CRL SC100
RBDS / 57kHz
CRL SCA-300B
92kHz
CRL SCA-300B
67kHz
CRL SCA-300B
92kHz
CRL SCA-300B
67kHz
Output #1
Output #2
Not Used

D-1 HS Data Subcarrier -› Host Analog

Main Channel:	91 %	91 %	91 %
Pilot:	9 %	9 %	9 %
92 kHz:	0 %	0 %	0 %
57 kHz:	0 %	0 %	0 %
Proponent:	0 %	4 %	4-10 %
Total:	100 %	104 %	104-110 %

RF Level dBm	Pilot Only S/N	Pilot Only Units	Proponent + Pilot DDJ S/N (dB)	Proponent Variable + Pilot DDJ S/N (dB)
-50	57.3	dB	57.0	55.4
-65	55.6	dB	55.4	54.2

At strong and medium signal levels noise floor modulates to ABBA beat with variable injection.

Engineer(s): DML, TBK
Tests Conducted: 12/17/96

D-1 HS Data Subcarrier -› Host Analog

Main Channel:	91 %	91 %	91 %
Pilot:	9 %	9 %	9 %
92 kHz:	0 %	0 %	0 %
57 kHz:	0 %	0 %	0 %
Proponent:	0 %	4 %	4-10 %
Total:	100 %	104 %	104-110 %

RF Level dBm	Pilot Only S/N	Units	Proponent + Pilot DDJ S/N (dB)	Proponent Variable + Pilot DDJ S/N (dB)
-50	60.5	dB	60.2	59.4
-65	52.6	dB	52.6	52.4

Could not detect variable injection effect on noise floor at strong and medium signal levels.

Engineer(s): DML, TBK
Tests Conducted: 12/17/96

Digital Radio Test Laboratory

D-1 HS Data Subcarrier -› Host Analog

Main Channel:	91 %	91 %	91 %
Pilot:	9 %	9 %	9 %
92 kHz:	0 %	0 %	0 %
57 kHz:	0 %	0 %	0 %
Proponent:	0 %	4 %	4-10 %
Total:	100 %	104 %	104-110 %

RF Level dBm	Pilot Only S/N	Pilot Only Units	Proponent + Pilot DDJ S/N (dB)	Proponent Variable + Pilot DDJ S/N (dB)
-50	61.2	dB	61.0	60.5
-65	50.4	dB	50.2	50.1

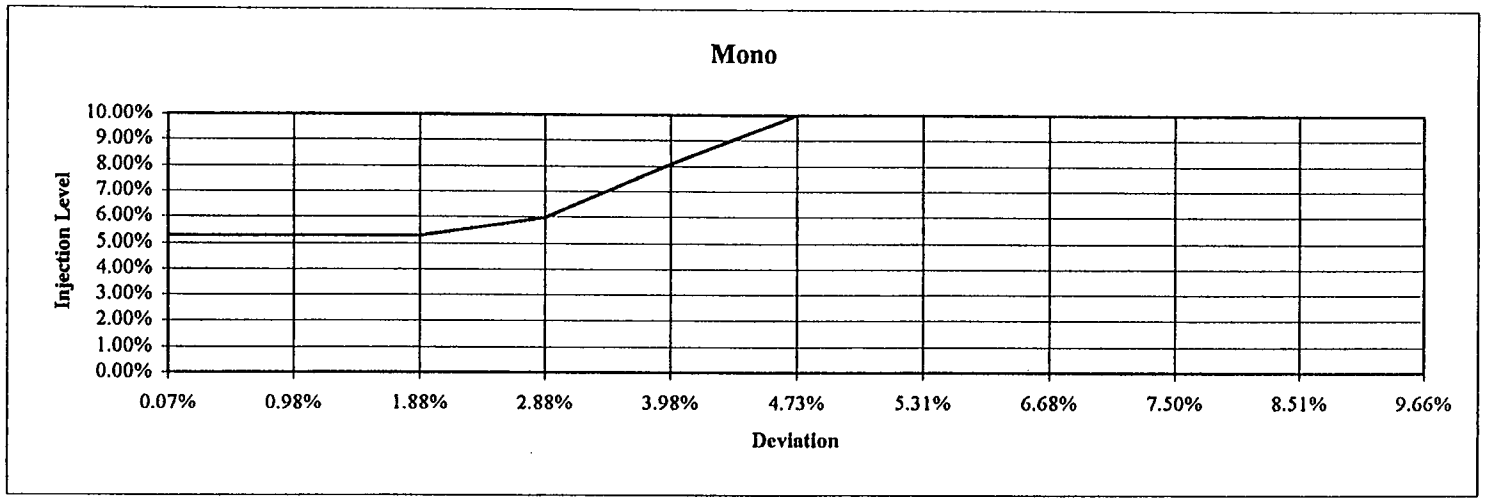
Slight increase in noise floor at strong signal level.
Could not detect variable injection effect on noise floor at medium signal level.

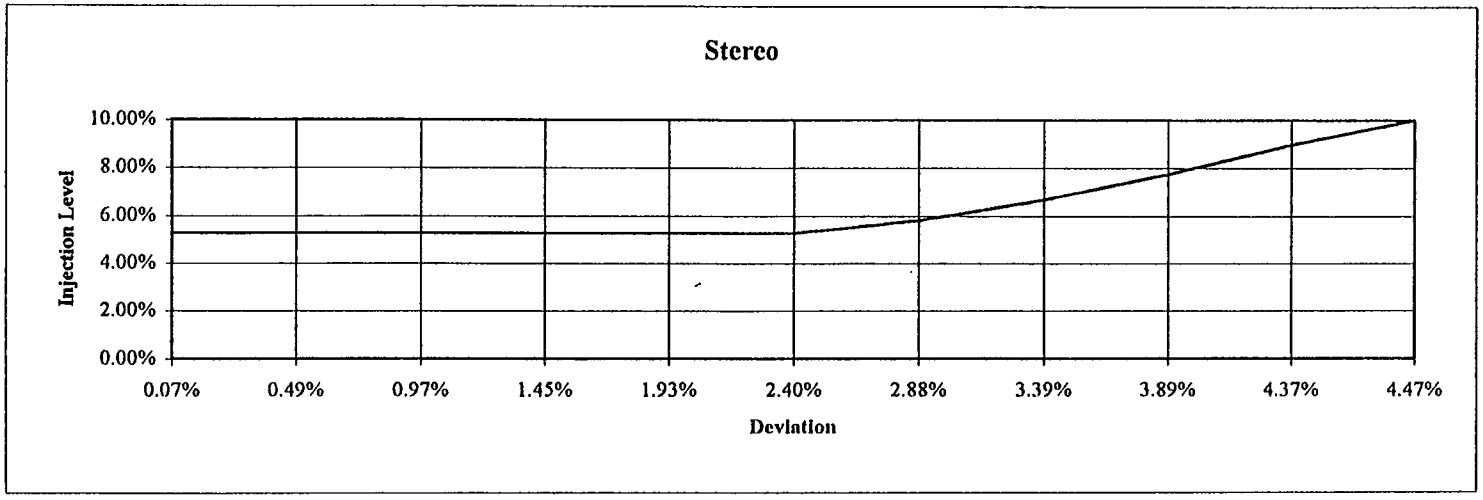
Engineer(s): DML, TBK
Tests Conducted: 12/17/96

Mono Deviation	SCA Injection	Vp-p
0.07%	5.26%	0.15
0.98%	5.26%	0.15
1.88%	5.26%	0.15
2.88%	5.96%	0.17
3.98%	8.07%	0.23
4.73%	10.00%	0.29
5.31%	10.00%	0.29
6.68%	10.00%	0.29
7.50%	10.00%	0.29
8.51%	10.00%	0.29
9.66%	10.00%	0.29

Stereo Deviation	SCA Injection	Vp-p
0.07%	5.26%	0.15
0.49%	5.26%	0.15
0.97%	5.26%	0.15
1.45%	5.26%	0.15
1.93%	5.26%	0.15
2.40%	5.26%	0.15
2.88%	5.79%	0.17
3.39%	6.67%	0.19
3.89%	7.72%	0.22
4.37%	8.95%	0.26
4.47%	10.00%	0.29

Engineer(s): DML, TBK
Tests Conducted: 12/17/96


Mono
Injection Level
10.00%
9.00%
8.00%
7.00%
6.00%
5.00%
4.00%
3.00%
2.00%
1.00%
0.00%
0.07%
0.98%
1.88%
2.88%
3.98%
4.73%
5.31%
6.68%
7.50%
8.51%
9.66%
Deviation


Stereo
Injection Level
10.00%
8.00%
6.00%
4.00%
2.00%
0.00%
0.07%
0.49%
0.97%
1.45%
1.93%
2.40%
2.88%
3.39%
3.89%
4.37%
4.47%
Deviation

SEIKO

SYSTEM SPECIFIC

H-1 & H-2

Digital Radio Test Laboratory

B-1 Additive White Gaussian Noise
Characterization of HS Digital Subcarrier Signal Failure

(revised)

Test Date: 1/9/97
Engineer(s): DML

Basic Test Parameters:

SIGNAL

Sig. Lev: -65dBm
Main Ch. Mod: CPN
SCA Group: A
Error Meas. Duration: 5 Min.
Pilot: Not Locked

PROPONENT SPECIFIC

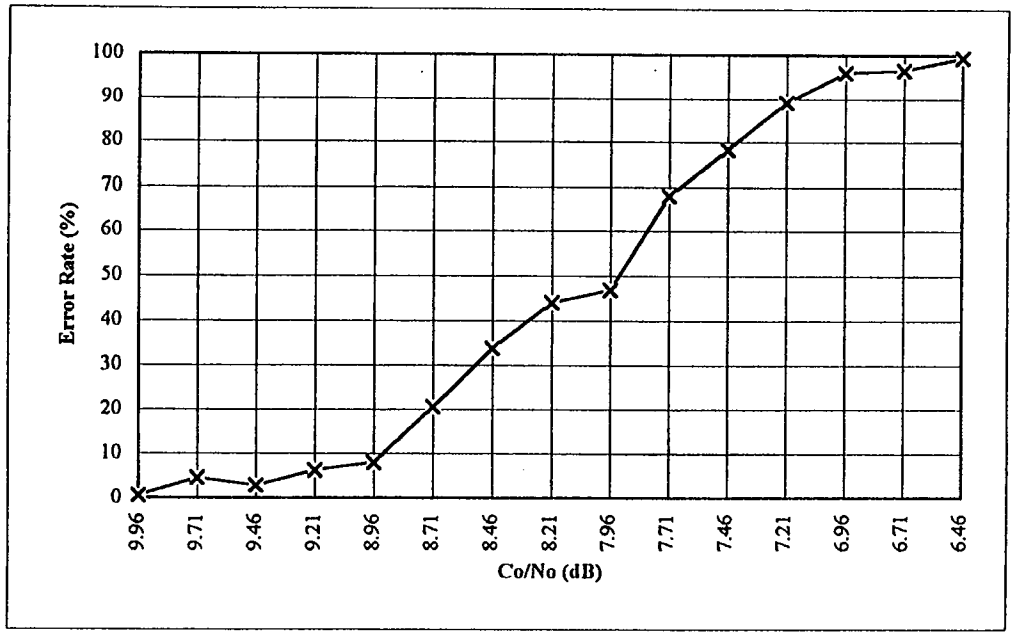
COMPOSITE SIGNAL

5-Band Medium Processed
ORBAN #2
COMP OUT 1: Proponent Only
COMP OUT 2: Prop + SCA
Main Channel modulation
adjusted for 110%

Analog Receivers: Delco RX 1
Compol 92KHz SCA Receiver
Denon RX 2 RBDS Receiver W/RDS Check software utilty

B1.1 Noise Failure Characterization

Noise Level		Error Level (%)		
C_o/N_o	Attn	BER	20 Byte	220 Byte
62.46	63.75			0
10.21	11.50			0.000
9.96	11.25			0.570
9.71	11.00			4.570
9.46	10.75			2.860
9.21	10.50			6.290
8.96	10.25			8.000
8.71	10.00			20.570
8.46	9.75			33.710
8.21	9.50			44.00
7.96	9.25			46.86
7.71	9.00			68.00
7.46	8.75			78.29
7.21	8.50			89.14
6.96	8.25			96.00
6.71	8.00			96.57
6.46	7.75			99.43



D-1 HS Data Subcarrier -› Host Analog

Main Channel:	91 %	91 %	81 %
Pilot:	9 %	9 %	9 %
92 kHz:	0 %	0 %	7 %
57 kHz:	0 %	0 %	3 %
Proponent:	0 %	10 %	10 %
Total:	100 %	110 %	110 %

	0 dB= 2.25 V			0 dB= 2.08 V		
	Pilot Only		Proponent + Pilot		Group A	
RF Level dBm	S/N	Units	SEIKO S/N (dB)		SEIKO S/N (dB)	
-65	55.9	dB	52.0		51.8	

Pilot Frequency (kHz)

Transmitter	Lock
18.99993	19.00003

Perceptable increase in noise floor proponent only and with group A.

SEIKO

Engineer(s): DML, TBK
Tests Conducted: 12/17/96

Digital Radio Test Laboratory

B-1 Additive White Gaussian Noise
Characterization of HS Digital Subcarrier Signal Failure

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Test Date	Engineer(s):
1/9/97	DML

Basic Test Parameters:

SIGNAL

Sig. Lev: -65dBm
Main Ch. Mod: CPN
SCA Group: A
Error Meas. Duration: 5 Min.
Pilot: Not Locked

Analog Receivers: Delco RX 1
Compol 92KHz SCA Receiver
Denon RX 2 RBDS Receiver W/RDS Check software utilty

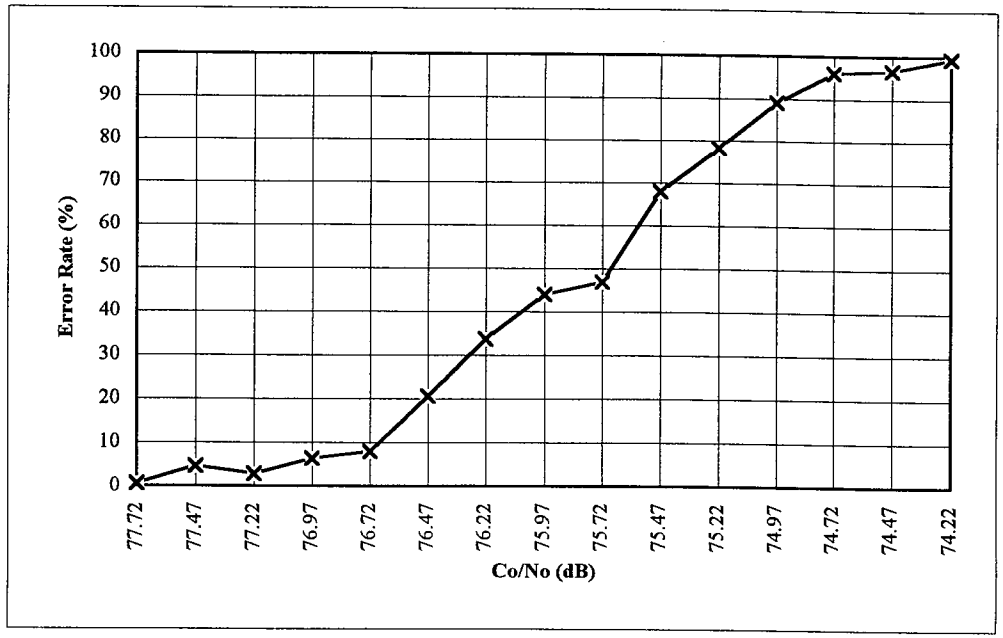
PROPONENT SPECIFIC

COMPOSITE SIGNAL

5-Band Medium Processed
ORBAN #2
COMP OUT 1: Proponent Only
COMP OUT 2: Prop + SCA
Main Channel modulation
adjusted for 110%

B1.1 Noise Failure Characterization

Noise Level		Error Level (%)		
C/N_0	Attn	BER	20 Byte	220 Byte
130.22	63.75			0
77.97	11.50			0.000
77.72	11.25			0.570
77.47	11.00			4.570
77.22	10.75			2.860
76.97	10.50			6.290
76.72	10.25			8.000
76.47	10.00			20.570
76.22	9.75			33.710
75.97	9.50			44.00
75.72	9.25			46.86
75.47	9.00			68.00
75.22	8.75			78.29
74.97	8.50			89.14
74.72	8.25			96.00
74.47	8.00			96.57
74.22	7.75			99.43



D-1 HS Data Subcarrier -› Host Analog

Main Channel:	91 %	91 %	81 %
Pilot:	9 %	9 %	9 %
92 kHz:	0 %	0 %	7 %
57 kHz:	0 %	0 %	3 %
Proponent:	0 %	10 %	10 %
Total:	100 %	110 %	110 %

RF Level dBm	0 dB= 642.0 mV				0 dB= 604.0 mV	
	Pilot Only		Proponent + Pilot		Group A	
	S/N	Units	SEIKO S/N (dB)		SEIKO S/N (dB)	
-65	52.7	dB	51.5		49.9	

Pilot Frequency (kHz)

Transmitter	Lock
18.99993	19.00003

Engineer(s): DML, TBK
Tests Conducted: 12/17/96

D-1 HS Data Subcarrier -› Host Analog

Main Channel:	91 %	91 %	81 %
Pilot:	9 %	9 %	9 %
92 kHz:	0 %	0 %	7 %
57 kHz:	0 %	0 %	3 %
Proponent:	0 %	10 %	10 %
Total:	100 %	110 %	110 %

	0 dB= 755.0 mV			0 dB= 699.0 mV	
	Pilot Only		Proponent + Pilot	Group A	
RF Level dBm	S/N Units		SEIKO S/N (dB)		SEIKO S/N (dB)
-65	50.3 dB		50.1		49.0

Pilot Frequency (kHz)

Transmitter	Lock
18.99993	19.00003

Engineer(s): DML, TBK
Tests Conducted: 12/17/96

Digital Radio Test Laboratory (revised)

B-1 Additive White Gaussian Noise
Characterization of HS Digital Subcarrier Signal Failure

Test Date: 12/11/96

Engineer(s): DML

Basic Test Parameters:

SIGNAL

Sig. Lev: -65dBm
Main Ch. Mod: CPN
SCA Group: Proponent @17% + RBDS
Error Meas. Duration: 5 Min.

PROPONENT SPECIFIC

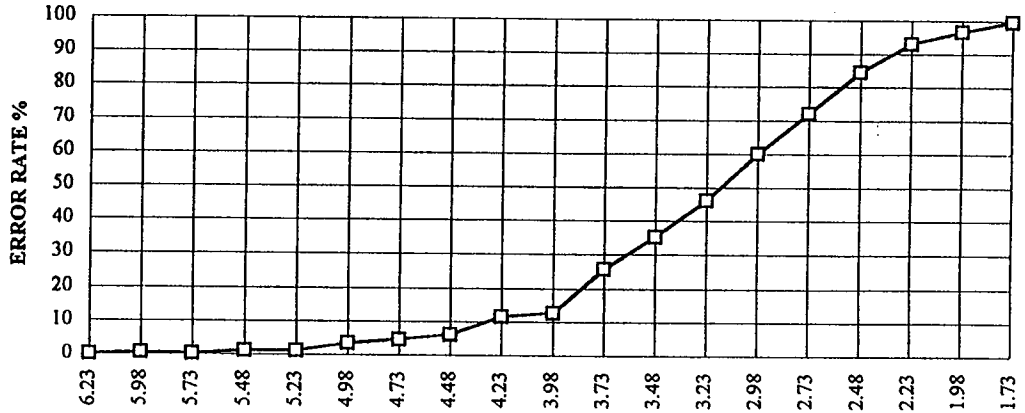
COMPOSITE SIGNAL

5-Band Medium Processed
ORBAN #2
COMP OUT 1: Proponent Only
COMP OUT 2: Prop + SCA
Main Channel modulation
adjusted for 110%

Analog Receivers: Delco RX 1
Compol 92KHz SCA Receiver
Denon RX 2 RBDS Receiver W/RDS Check software utilty

B1.1 Noise Failure Characterization

Noise Level		Error Level (%)		
C_o/N_o	Attn	BER	20 Byte	220 Byte
62.73	63.75			0
6.23	7.25			0.000
5.98	7.00			0.570
5.73	6.75			0.240
5.48	6.50			1.140
5.23	6.25			1.140
4.98	6.00			3.430
4.73	5.75			4.570
4.48	5.50			6.000
4.23	5.25			11.43
3.98	5.00			12.57
3.73	4.75			25.71
3.48	4.50			35.08
3.23	4.25			46.00
2.98	4.00			60.00
2.73	3.75			72.00
2.48	3.50			84.31
2.23	3.25			93.09
1.98	3.00			96.69
1.73	2.75			99.60



B-2 Co-Channel

PROPONENT SPECIFIC

COMPOSITE SIGNAL

ORBAN #1
COMP OUT 1: Prop + SCA
COMP OUT 2: Proponent Only

ORBAN #2
COMP OUT 1: Proponent Only
COMP OUT 2: Prop + SCA

Main Channel modulation adjusted for 110%

B2.1 Co-Channnel Analog Reference

Desired Signal Parameters

RF Key Point Meas.: -32.67 dBm
RX RF Level: -65 dBm
Main Channel Modulation: 1 kHz
Modulation Level: 100 %
SCA Group: None

0 dB Reference

Undesired Signal Parameters

RF Key Point Meas.: -32.53 dBm
Main Channel Modulation: CPN
Modulation Level: 110 %
SCA Group: 67 & 92 kHz
SCA Modulation: 1 kHz

Measurement: 45dB S/N ratio target on main analog channel receiver. (Measurement is rms with 15 kHz low pass filter)

	No Filter		Filter	
	Delco RX 1	**d/u**	**Denon RX 2**	**d/u**
Best Case S/N:	56.60 dB		61.00 dB	
S/N:	45.00 dB		45.00 dB	
Reference: Atten:	26.25 dB	**26.11 dB**	30.25 dB	**30.11 dB**

Desired Signal Parameters

RF Level: -65dBm
Modulation Type: None
Modulation Level: None
SCA Group: None

Undesired Signal Parameters

Modulation Type: CPN
Modulation Level: 110%
SCA Group: Non-Standard Injection

Measurement: Target Signal-to-Noise Ratio

	Delco RX 1	**d/u**	**Denon RX 2**	**d/u**
S/N:	45.00 dB		45.00 dB	
Atten:	26.25 dB	**26.11 dB**	30.25 dB	**30.11 dB**

Digital Radio Test Laboratory

B-1 Additive White Gaussian Noise
Characterization of HS Digital Subcarrier Signal Failure

Test Date: 12/11/96

Engineer(s): DML

Basic Test Parameters:

SIGNAL

Sig. Lev: -65dBm
Main Ch. Mod: CPN
SCA Group: Proponent @17% + RBDS
Error Meas. Duration: 5 Min.

PROPONENT SPECIFIC

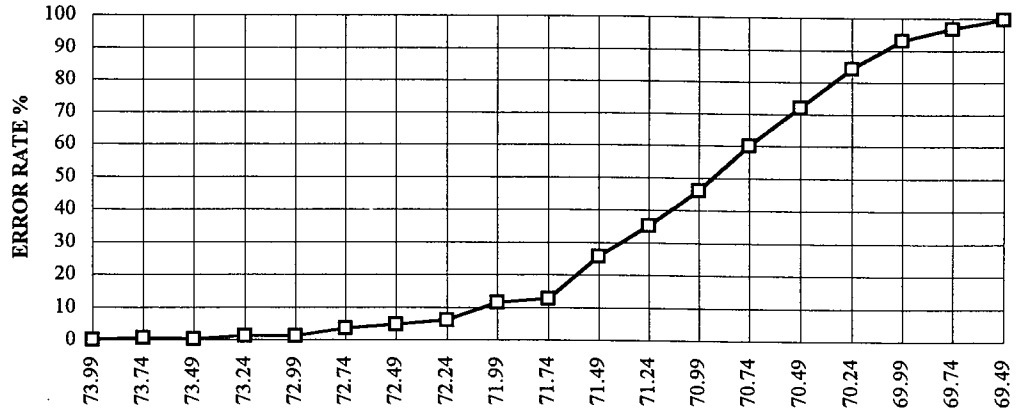
COMPOSITE SIGNAL

5-Band Medium Processed
ORBAN #2
COMP OUT 1: Proponent Only
COMP OUT 2: Prop + SCA
Main Channel modulation
adjusted for 110%

Analog Receivers: Delco RX 1
Compol 92KHz SCA Receiver
Denon RX 2 RBDS Receiver W/RDS Check software utilty

B1.1 Noise Failure Characterization

Noise Level		Error Level (%)		
C/N_0	**Attn**	**BER**	**20 Byte**	**220 Byte**
130.49	63.75			0
73.99	7.25			0.000
73.74	7.00			0.570
73.49	6.75			0.240
73.24	6.50			1.140
72.99	6.25			1.140
72.74	6.00			3.430
72.49	5.75			4.570
72.24	5.50			6.000
71.99	5.25			11.43
71.74	5.00			12.57
71.49	4.75			25.71
71.24	4.50			35.08
70.99	4.25			46.00
70.74	4.00			60.00
70.49	3.75			72.00
70.24	3.50			84.31
69.99	3.25			93.09
69.74	3.00			96.69
69.49	2.75			99.60



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B2.3 **Co-Channel Analog -> HSD interference**

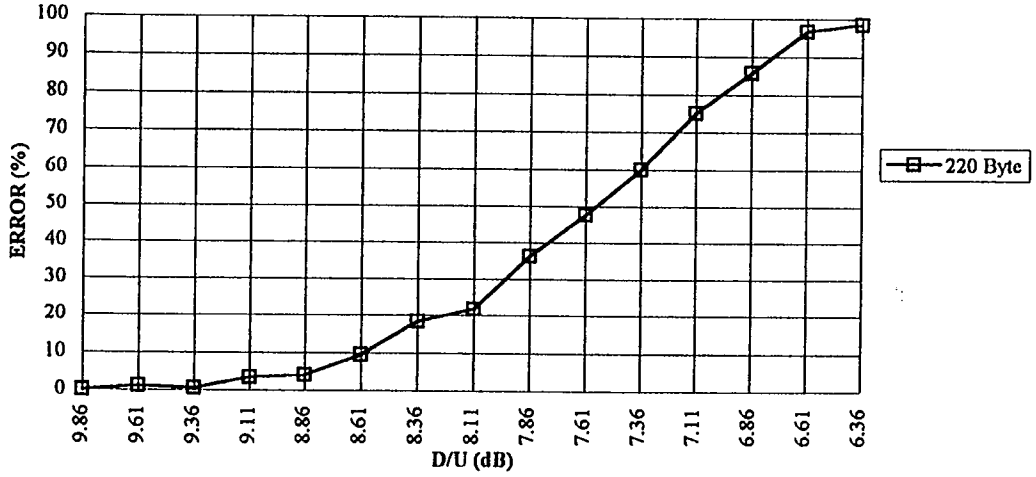
Desired Signal Parameters

RF Level: -65 dBm
Modulation Type: CPN
Modulation Level: 110 %
SCA Group: Non-Standard Injection

Undesired Signal Parameters

Modulation Type: CPN
Modulation Level: 110 %
SCA Group: 67 & 92 kHz

Co-Chan. D/U	Level Attn	Cum. Error Level BER	20 Byte	220 Byte	
9.86	10.00			0	
9.61	9.75			1.140	OME
9.36	9.50			0.570	
9.11	9.25			3.430	
8.86	9.00			4.000	
8.61	8.75			9.500	
8.36	8.50			18.29	
8.11	8.25			21.71	
7.86	8.00			36.40	
7.61	7.75			47.60	
7.36	7.50			60.00	
7.11	7.25			75.00	
6.86	7.00			85.71	
6.61	6.75			96.57	
6.36	6.50			98.40	



Weak Signal Performance

SCA Group: A

39 dB

-89 ≤OME< -88 dBm

D-1 HSSC -› Host Analog

Main Channel:	91 %	81 %
Pilot:	9 %	9 %
92 kHz:	0 %	%
57 kHz:	0 %	3 %
Proponent:	0 %	17 %
Total:	100 %	110 %

RF Level dBm	0 dB= 2.25 V Pilot Only S/N	Units	0 dB= 2.08 V Non-Standard Injection SEIKO S/N (dB)
-65	55.9	dB	49.5
-75	54.6	dB	51.2

Measurements made Q-Peak detected with CCIR weighting and 15 kHz low pass filters (psophometric).
0 dB Reference Measurements made with 1 kHz Mod Source on Main Channel L+R.
Measurements on Left Channel
Orban #2 Composite output #1 Set for 91% Main Channel Modulation
Orban #2 Composite output #2 Set for 81% Main Channel Modulation
Unit Not in Screen Box

Engineer(s): DML, TBK
Tests Conducted: 12/17/96

D-1 HSSC -› Host Analog

Main Channel:	91	%	81	%
Pilot:	9	%	9	%
92 kHz:	0	%		%
57 kHz:	0	%	3	%
Proponent:	0	%	17	%
Total:	100	%	110	%

	0 dB= 654.0 mV		0 dB= 604.0 mV	
	Pilot Only		Non-Standard Injection	
RF Level dBm	S/N	Units		SEIKO S/N (dB)
-65	52.9	dB		49.5
-75	43.4	dB		42.2

Measurements made Q-Peak detected with CCIR weighting and 15 kHz low pass filters (psophometric).
0 dB Reference Measurements made with 1 kHz Mod Source on Main Channel L+R.
Measurements on Left Channel
Orban #2 Composite output #1 Set for 91% Main Channel Modulation
Orban #2 Composite output #2 Set for 81% Main Channel Modulation

Engineer(s): DML, TBK
Tests Conducted: 12/17/96

D-1 HSSC -› Host Analog

Main Channel:	91 %	81 %
Pilot:	9 %	9 %
92 kHz:	0 %	%
57 kHz:	0 %	3 %
Proponent:	0 %	17 %
Total:	100 %	110 %

RF Level dBm	0 dB= 755.0 mV		0 dB= 699.0 mV	
	Pilot Only		Non-Standard Injection	
	S/N	Units		SEIKO S/N (dB)
-65	50.6	dB		49.2
-75	40.7	dB		40.0

Measurements made Q-Peak detected with CCIR weighting filter (psophometric).
0 dB Reference Measurements made with 1 kHz Mod Source on Main Channel L+R.
Measurements on Left Channel
Orban #2 Composite output #1 Set for 91% Main Channel Modulation
Orban #2 Composite output #2 Set for 81% Main Channel Modulation
Unit Not in Screen Box

Engineer(s): DML, TBK
Tests Conducted: 12/17/96

Digital Radio Test Laboratory

DAT File Number	Time Code Start	Time Code Stop	ID			Description	Grade
HS50800.DAT	12/17/96						
	0:00	0:30	1			Ford Radio 0 dB Reference Track 1kHz@91% Pilot@9%	
						2.25 Vrms=-15 dB on DAT Input Monitor Level Meters	
	0:30	1:00	2			Noise Reference No SCA	
						Non-Standard Injection FORD	
	1:05	3:05	3			Reference	
	5:16	5:11	4				
	5:16	7:17	5			SEIKO:Increase in noise floor and change in noise character (digital peaks detected).	-1.5
						Non-Standard Injection PIONEER	
	7:22	9:23	6			Reference	
	9:29	11:29	7				
	11:35	13:35	8			SEIKO:	-0.1
						Non-Standard Injection DENON	
	13:41	15:41	9			Reference	
	15:46	17:46	10				
	17:51	19:52	11			SEIKO:	0

G-1 Lower First Adjacent

Analog -› HSSC	Desired	93.9 MHz Undesired	
Main Channel:	81	81	%
Pilot:	9	9	%
67 kHz:	0	10	%
92 kHz:	0	10	%
57 kHz:	3	0	%
Proponent:	17	0	%
Total Deviation:	110	110	%

	ATTN (dB)	OME D/U (dB)
SEIKO:	17.00	-2.95

G-1 Upper First Adjacent

Analog -› HSSC	Desired	94.3 MHz Undesired	
Main Channel:	81	81	%
Pilot:	9	9	%
67 kHz:	0	10	%
92 kHz:	0	10	%
57 kHz:	3	0	%
Proponent:	17	0	%
Total Deviation:	110	110	%

	ATTN (dB)	OME D/U (dB)
SEIKO:	16.00	-3.95

EO&C

G-2 Lower Second Adjacent

Analog -› HSSC	Desired	93.7 MHz Undesired	
Main Channel:	81	81	%
Pilot:	9	9	%
67 kHz:	0	10	%
92 kHz:	0	10	%
57 kHz:	3	0	%
Proponent:	17	0	%
Total Deviation:	110	110	%

	ATTN (dB)	OME D/U (dB)
SEIKO:	2.50	-47.45

Upper Second Adjacent

Analog -› HSSC	Desired	94.5 MHz Undesired	
Main Channel:	81	81	%
Pilot:	9	9	%
67 kHz:	0	10	%
92 kHz:	0	10	%
57 kHz:	3	0	%
Proponent:	17	0	%
Total Deviation:	110	110	%

	ATTN (dB)	OME D/U (dB)
SEIKO:	2.50	-47.45

EO&C

G-1 First Adjacent

Analog -› Analog & HSSC -› Analog

	Desired	Undesired		Desired	Undesired	
Main Channel:	81	81	%	81	81	%
Pilot:	9	9	%	9	9	%
67 kHz:	10	10	%	10	0	%
92 kHz:	10	10	%	10	0	%
57 kHz:	0	0	%	0	3	%
Proponent:	0	0	%	0	17	%
Total Deviation:	110	110	%	110	110	%
3 W Input	-32.4	-32.4	dBm			
Kay #3		51.0	dB			
		18.6				

Main Channel measurements are Q-Peak detected with CCIR
SCA Measurements are RMS.

94.3 MHz	Analog -› Analog Reference			HSSC -› Analog Non -Standard Injection				
	D/U (dB) s/n=45dB	S/N (dB) 67 kHz	S/N (dB) 92 kHz	D/U (dB) s/n=45dB	S/N (dB) 67 kHz	S/N (dB) 92 kHz		
Best Case		36	52					
	0	48						
at D/U		15	24	-1	29	12		SEIKO:

93.9 MHz	Analog -› Analog Reference			HSSC -› Analog Non -Standard Injection				
	D/U (dB) s/n=45dB	S/N (dB) 67 kHz	S/N (dB) 92 kHz	D/U (dB) s/n=45dB	S/N (dB) 67 kHz	S/N (dB) 92 kHz		
Best Case		36	53					
	5	48						
at D/U		17	33	5	29	33		SEIKO:

G-2 Second Adjacent

Analog -› Analog & HSSC -› Analog

	Desired	Undesired		Desired	Undesired	
Main Channel:	81	81	%	81	81	%
Pilot:	9	9	%	9	9	%
67 kHz:	10	10	%	10	0	%
92 kHz:	10	10	%	10	0	%
57 kHz:	0	0	%	0	3	%
Proponent:	0	0	%	0	17	%
Total Deviation:	110	110	%	110	110	%
3 W Input	-32.4	-32.4	dBm			
Kay #3		51.0	dB			
		18.6				

Main Channel measurements are Q-Peak detected with CCIR
SCA Measurements are RMS.
-40 dB D/U produces a S/N of approximately 47 dB.

94.5 MHz	Analog -› Analog Reference D/U (dB) s/n=45dB	S/N (dB) 67 kHz	S/N (dB) 92 kHz	HSSC -› Analog Non -Standard Injection D/U (dB) s/n=45dB	S/N (dB) 67 kHz	S/N (dB) 92 kHz		
Best Case		36	52					
	-40	48						
at D/U		24	10	-40	43	5		SEIKO:

93.7 MHz	Analog -› Analog Reference D/U (dB) s/n=45dB	S/N (dB) 67 kHz	S/N (dB) 92 kHz	HSSC -› Analog Non -Standard Injection D/U (dB) s/n=45dB	S/N (dB) 67 kHz	S/N (dB) 92 kHz		
Best Case		36	52					
	-40	48						
at D/U		10	7	-40	28	4		SEIKO:

G-1 First Adjacent

Analog -› Analog & HSSC -› Analog

	Desired	Undesired		Desired	Undesired	
Main Channel:	81	81	%	81	81	%
Pilot:	9	9	%	9	9	%
67 kHz:	10	10	%	10	0	%
92 kHz:	10	10	%	10	0	%
57 kHz:	0	0	%	0	3	%
Proponent:	0	0	%	0	17	%
Total Deviation:	110	110	%	110	110	%
3 W Input	-32.4	-32.4	dBm			
Kay #3		51.0	dB			
		18.6				

Main Channel measurements are Q-Peak detected with CCIR
SCA Measurements are RMS.

94.3 MHz	Analog -› Analog Reference			HSSC -› Analog Non -Standard Injection			
	D/U (dB) s/n=45dB	S/N (dB) 67 kHz	S/N (dB) 92 kHz	D/U (dB) s/n=45dB	S/N (dB) 67 kHz	S/N (dB) 92 kHz	
Best Case	21	37 48	52				
at D/U		34	46	21	46	46	SEIKO:

93.9 MHz	Analog -› Analog Reference			HSSC -› Analog Non -Standard Injection			
	D/U (dB) s/n=45dB	S/N (dB) 67 kHz	S/N (dB) 92 kHz	D/U (dB) s/n=45dB	S/N (dB) 67 kHz	S/N (dB) 92 kHz	
Best Case	32.5	37 48	52				
at D/U		36	52	32.5	47	52	SEIKO:

G-2 Second Adjacent

Analog -› Analog & HSSC -› Analog

	Desired	Undesired		Desired	Undesired	
Main Channel:	81	81	%	81	81	%
Pilot:	9	9	%	9	9	%
67 kHz:	10	10	%	10	0	%
92 kHz:	10	10	%	10	0	%
57 kHz:	0	0	%	0	3	%
Proponent:	0	0	%	0	17	%
Total Deviation:	110	110	%	110	110	%
3 W Input	-32.4	-32.4	dBm			
Kay #3		51.0	dB			
		18.6				

Main Channel measurements are Q-Peak detected with CCIR
SCA Measurements are RMS.

94.5 MHz	Analog -› Analog Reference D/U (dB) s/n=45dB	Reference S/N (dB) 67 kHz	Reference S/N (dB) 92 kHz	HSSC -› Analog Non -Standard Injection D/U (dB) s/n=45dB	Non -Standard Injection S/N (dB) 67 kHz	Non -Standard Injection S/N (dB) 92 kHz	
Best Case		37	52				
	-14	48					
at D/U		37	39	-15	48	43	SEIKO:

93.7 MHz	Analog -› Analog Reference D/U (dB) s/n=45dB	Reference S/N (dB) 67 kHz	Reference S/N (dB) 92 kHz	HSSC -› Analog Non -Standard Injection D/U (dB) s/n=45dB	Non -Standard Injection S/N (dB) 67 kHz	Non -Standard Injection S/N (dB) 92 kHz	
Best Case		37	52				
	-13	48					
at D/U		37	48	-17	48	48	SEIKO:

MITRE

SYSTEM SPECIFIC

H-2

Digital Radio Test Laboratory

(revised)

B-1 Additive White Gaussian Noise
Characterization of HS Digital Subcarrier Signal Failure

Test Date	Engineer(s):
12/10/96	DML

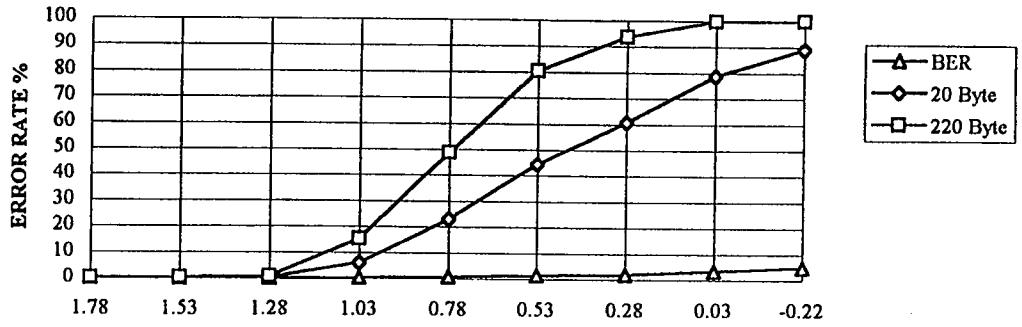
Basic Test Parameters:

SIGNAL	PROPONENT SPECIFIC	COMPOSITE SIGNAL
Sig. Lev: -65dBm Main Ch. Mod: CPN SCA Group: Proponent @ 17% + RBDS Error Meas. Duration: 5 Min.	Interleaver Level 2	5-Band Medium Processed ORBAN #2 COMP OUT 1: Proponent Only COMP OUT 2: Prop + SCA Main Channel modulation adjusted for 110%

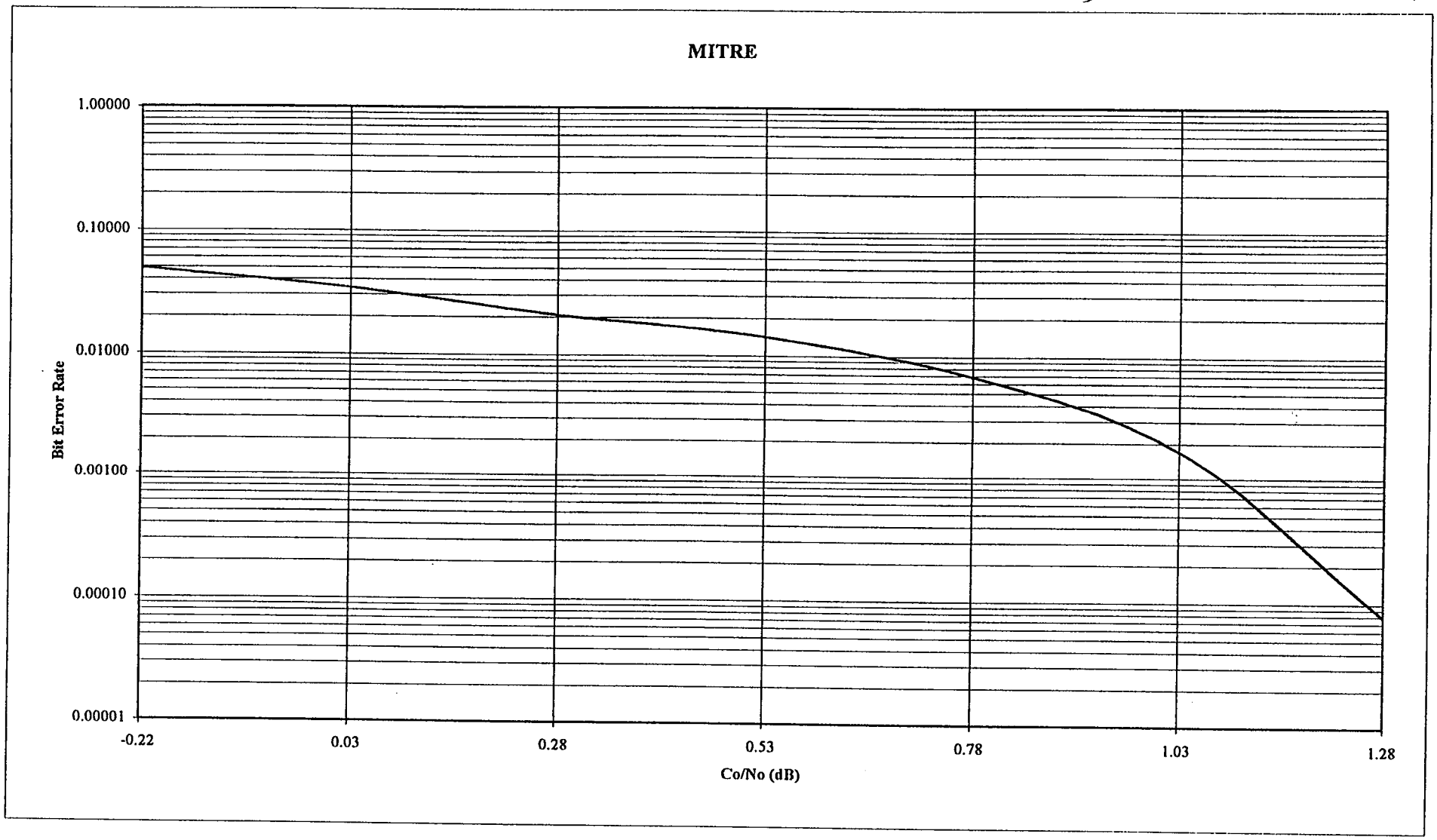
Analog Receivers: Delco RX 1
Compol 92KHz SCA Receiver
Denon RX 2 RBDS Receiver W/RDS Check software utilty

B1.1 Noise Failure Characterization

Noise Level		Error Level (%)		
C_o/N_o	Attn	BER	20 Byte	220 Byte
62.78	63.75	0	0	0
1.78	2.75	0	0	0
1.53	2.50	0.001	0.041	0.148
1.28	2.25	0.008	0.287	0.786
1.03	2.00	0.169	6.07	15.33
0.78	1.75	0.680	23.13	48.89
0.53	1.50	1.421	44.49	80.30
0.28	1.25	2.079	60.88	93.63
0.03	1.00	3.398	78.74	99.9
-0.22	0.75	4.886	89.04	100.0



(wired)


MITRE
1.00000
0.10000
0.01000
0.00100
0.00010
0.00001
Bit Error Rate
-0.22
0.03
0.28
0.53
0.78
1.03
1.28
Co/No (dB)

Digital Radio Test Laboratory

B-1 Additive White Gaussian Noise
Characterization of HS Digital Subcarrier Signal Failure

Test Date	Engineer(s):
12/10/96	DML

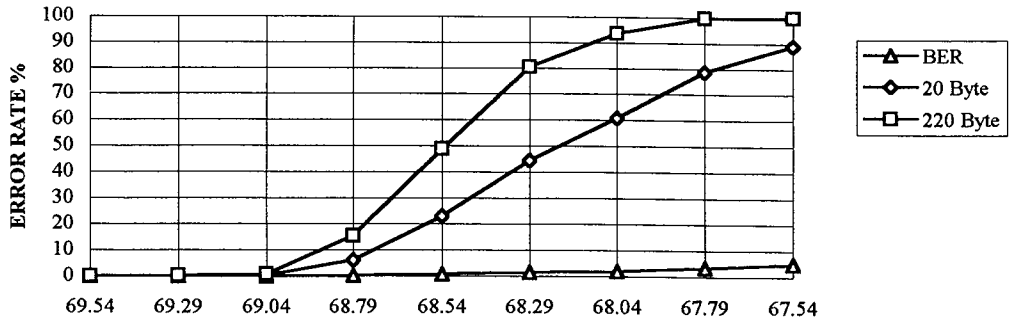
Basic Test Parameters:

SIGNAL	PROPONENT SPECIFIC	COMPOSITE SIGNAL
Sig. Lev: -65dBm	Interleaver Level 2	5-Band Medium Processed
Main Ch. Mod: CPN		ORBAN #2
SCA Group: Proponent @ 17% + RBDS		COMP OUT 1: Proponent Only
Error Meas. Duration: 5 Min.		COMP OUT 2: Prop + SCA
		Main Channel modulation
		adjusted for 110%

Analog Receivers: Delco RX 1
Compol 92KHz SCA Receiver
Denon RX 2 RBDS Receiver W/RDS Check software utilty

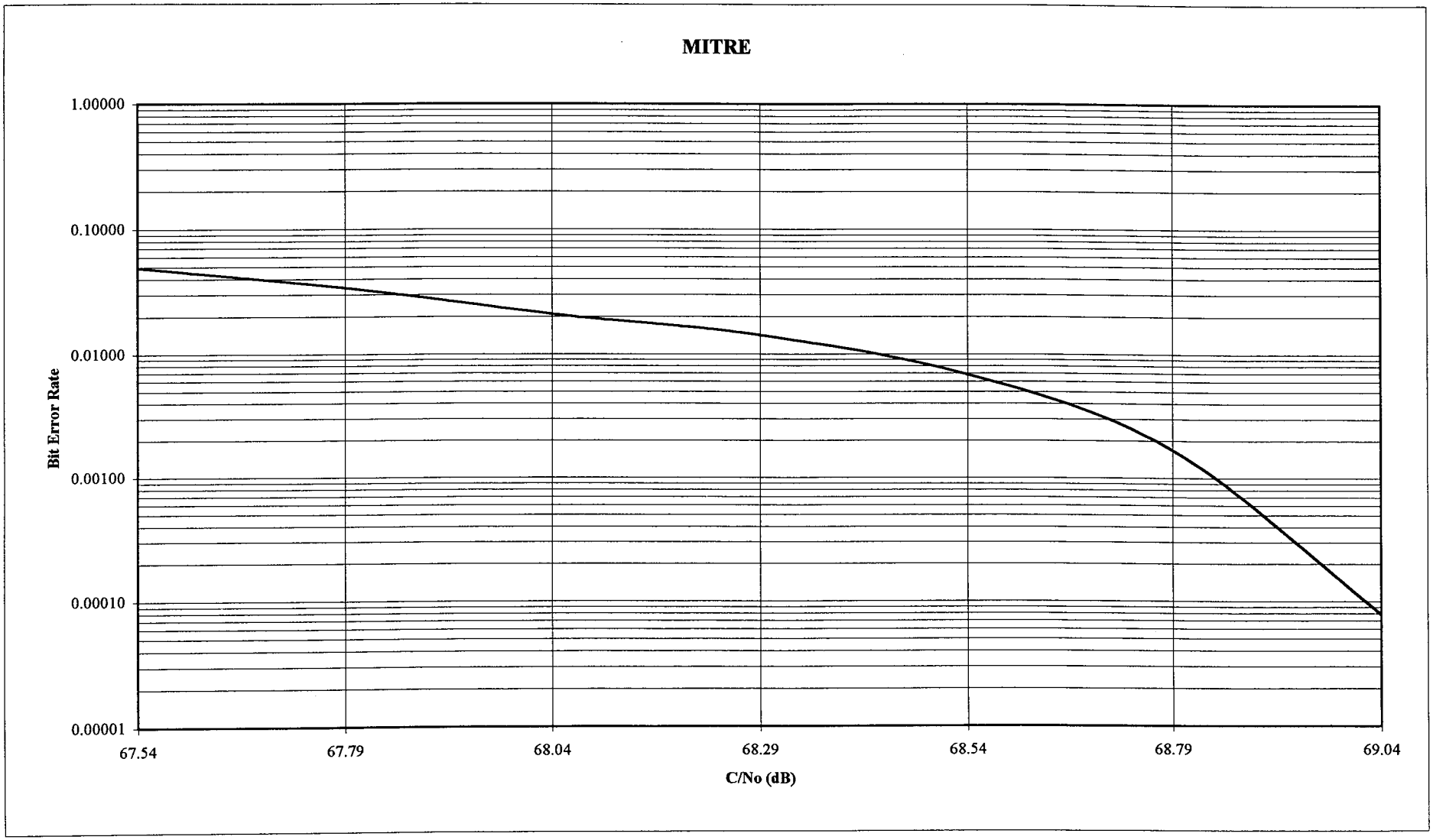
B1.1 Noise Failure Characterization

Noise Level		Error Level (%)		
C/N_0	**Attn**	**BER**	**20 Byte**	**220 Byte**
130.54	63.75	0	0	0
69.54	2.75	0	0	0
69.29	2.50	0.001	0.041	0.148
69.04	2.25	0.008	0.287	0.786
68.79	2.00	0.169	6.07	15.33
68.54	1.75	0.680	23.13	48.89
68.29	1.50	1.421	44.49	80.30
68.04	1.25	2.079	60.88	93.63
67.79	1.00	3.398	78.74	99.9
67.54	0.75	4.886	89.04	100.0



139a

140a


MITRE
1.00000
0.10000
0.01000
0.00100
0.00010
0.00001
Bit Error Rate
67.54
67.79
68.04
68.29
68.54
68.79
69.04
C/No (dB)

Digital Radio Test Laboratory

B-2 Co-Channel

PROPONENT SPECIFIC

Interleaver Level 2

COMPOSITE SIGNAL

ORBAN #1
COMP OUT 1: Prop + SCA
COMP OUT 2: Proponent Only

ORBAN #2
COMP OUT 1: Proponent Only
COMP OUT 2: Prop + SCA

Main Channel modulation adjusted for 110%

B2.1 Co-Channnel Analog Reference

Desired Signal Parameters			**Undesired Signal Parameters**	
RF Key Point Meas.:	-32.67 dBm		RF Key Point Meas.:	-32.54 dBm
RX RF Level:	-65 dBm		Main Channel Modulation:	CPN
Main Channel Modulation:	1 kHz		Modulation Level:	110 %
Modulation Level:	100 %	0 dB Reference	SCA Group:	67 & 92 kHz
SCA Group:	None		SCA Modulation:	1 kHz

Measurement: 45dB S/N ratio target on main analog channel receiver. (Measurement is rms with 15 kHz low pass filter)

	No Filter			Filter	
	Delco RX 1	**d/u**		**Denon RX 2**	**d/u**
Best Case S/N:	56.50 dB		Best Case S/N:	59.30 dB	
S/N:	45.00 dB		S/N:	45.00 dB	
Reference: Atten:	26.50 dB	**26.37 dB**	Atten:	30.25 dB	**30.12 dB**

Desired Signal Parameters		**Undesired Signal Parameters**	
RF Level:	-65dBm		
Modulation Type:	None	Modulation Type:	CPN
Modulation Level:	None	Modulation Level:	110%
SCA Group:	None	SCA Group:	Non-Standard Injection

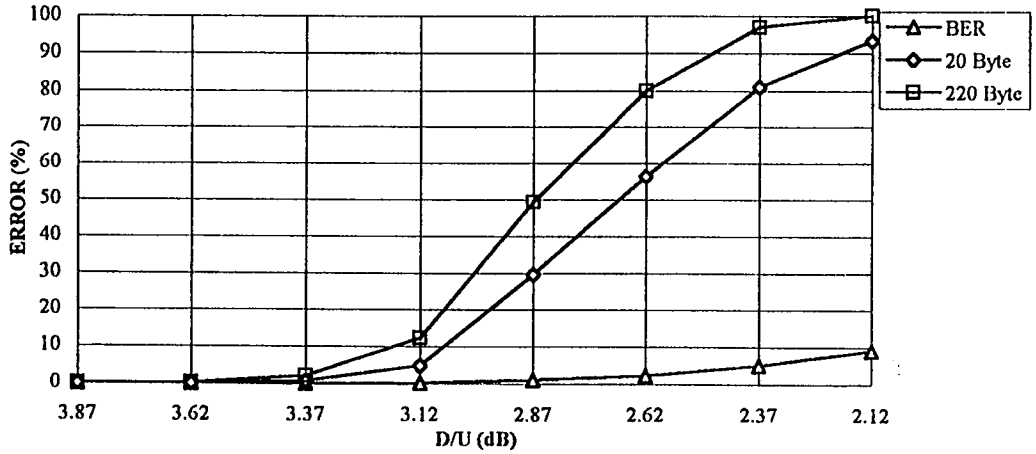
Measurement: Target Signal-to-Noise Ratio

	Delco RX 1	**d/u**	**Denon RX 2**	**d/u**
S/N:	45.00 dB		S/N:	45.00 dB	
Atten:	26.50 dB	**26.37 dB**	Atten:	30.25 dB	**30.12 dB**

B2.3 Co-Channel Analog -> HSD interference

Desired Signal Parameters		**Undesired Signal Parameters**	
RF Level:	-65 dBm		
Modulation Type:	CPN	Modulation Type:	CPN
Modulation Level:	110 %	Modulation Level:	110 %
SCA Group:	Non-Standard Injection	SCA Group:	67 &92 kHz

Co-Chan. D/U	Level Attn	Cum. Error Level BER	20 Byte	220 Byte	
3.87	4.00	0	0	0	
3.62	3.75	0.001	0.047	0.148	OME
3.37	3.50	0.020	0.764	2.074	
3.12	3.25	0.130	4.77	12.22	
2.87	3.00	1.016	29.66	49.33	
2.62	2.75	2.329	56.45	79.85	
2.37	2.50	4.986	80.95	96.89	
2.12	2.25	9.030	93.26	99.93	



Weak Signal Performance

SCA Group: A

48 dB
-98 ≤OME< -97 dBm

D-1 HSSC -› Host Analog

Main Channel:	91 %	81 %
Pilot:	9 %	9 %
92 kHz:	0 %	%
57 kHz:	0 %	3 %
Proponent:	0 %	17 %
Total:	100 %	110 %

RF Level dBm	0 dB= 2.25 V Pilot Only S/N	Units	0 dB= 2.08 V Non-Standard Injection MITRE S/N (dB)	
-65	55.9	dB	54.0	
-75	54.6	dB	54.2	

Measurements made Q-Peak detected with CCIR weighting and 15 kHz low pass filters (psophometric).
0 dB Reference Measurements made with 1 kHz Mod Source on Main Channel L+R.
Measurements on Left Channel
Orban #2 Composite output #1 Set for 91% Main Channel Modulation
Orban #2 Composite output #2 Set for 81% Main Channel Modulation
Unit Not in Screen Box

Engineer(s): DML, TBK
Tests Conducted: 12/17/96

D-1 HSSC -› Host Analog

Main Channel:	91 %	81 %
Pilot:	9 %	9 %
92 kHz:	0 %	%
57 kHz:	0 %	3 %
Proponent:	0 %	17 %
Total:	100 %	110 %

RF Level dBm	0 dB= 654.0 mV		0 dB= 604.0 mV	
	Pilot Only		Non-Standard Injection	
	S/N	Units	MITRE S/N (dB)	
-65	52.9	dB	51.4	
-75	43.4	dB	42.5	

Measurements made Q-Peak detected with CCIR weighting and 15 kHz low pass filters (psophometric).
0 dB Reference Measurements made with 1 kHz Mod Source on Main Channel L+R.
Measurements on Left Channel
Orban #2 Composite output #1 Set for 91% Main Channel Modulation
Orban #2 Composite output #2 Set for 81% Main Channel Modulation

Engineer(s): DML, TBK
Tests Conducted: 12/17/96

D-1 HSSC -› Host Analog

Main Channel:	91	%	81	%
Pilot:	9	%	9	%
92 kHz:	0	%		%
57 kHz:	0	%	3	%
Proponent:	0	%	17	%
Total:	100	%	110	%

RF Level dBm	0 dB= 755.0 mV		0 dB= 699.0 mV	
	Pilot Only		Non-Standard Injection	
	S/N	Units	MITRE S/N (dB)	
-65	50.6	dB	49.6	
-75	40.7	dB	40.0	

Measurements made Q-Peak detected with CCIR weighting filter (psophometric).
0 dB Reference Measurements made with 1 kHz Mod Source on Main Channel L+R.
Measurements on Left Channel
Orban #2 Composite output #1 Set for 91% Main Channel Modulation
Orban #2 Composite output #2 Set for 81% Main Channel Modulation
Unit Not in Screen Box

Engineer(s): DML, TBK
Tests Conducted: 12/17/96

Digital Radio Test Laboratory

DAT File Number	Time Code Start	Time Code Stop	ID			Description	Grade
HS50800.DAT	12/17/96						
	0:00	0:30	1			Ford Radio 0 dB Reference Track 1kHz@91% Pilot@9%	
						2.25 Vrms=-15 dB on DAT Input Monitor Level Meters	
	0:30	1:00	2			Noise Reference No SCA	
						Non-Standard Injection FORD	
	1:05	3:05	3			Reference	
	5:16	5:11	4			MITRE: Slight increase in noise floor.	-0.1
	5:16	7:17	5				
						Non-Standard Injection PIONEER	
	7:22	9:23	6			Reference	
	9:29	11:29	7			MITRE:	0
	11:35	13:35	8				
						Non-Standard Injection DENON	
	13:41	15:41	9			Reference	
	15:46	17:46	10			MITRE:	0
	17:51	19:52	11				

G-1 Lower First Adjacent

Analog -› HSSC	Desired	93.9 MHz Undesired	
Main Channel:	81	81	%
Pilot:	9	9	%
67 kHz:	0	10	%
92 kHz:	0	10	%
57 kHz:	3	0	%
Proponent:	17	0	%
Total Deviation:	110	110	%

	ATTN (dB)	OME D/U (dB)
MITRE:	11.50	-8.45

G-1 Upper First Adjacent

Analog -› HSSC	Desired	94.3 MHz Undesired	
Main Channel:	81	81	%
Pilot:	9	9	%
67 kHz:	0	10	%
92 kHz:	0	10	%
57 kHz:	3	0	%
Proponent:	17	0	%
Total Deviation:	110	110	%

	ATTN (dB)	OME D/U (dB)
MITRE:	5.00	-14.95

EO&C

G-2 Lower Second Adjacent

Analog -› HSSC	Desired	93.7 MHz Undesired	
Main Channel:	81	81	%
Pilot:	9	9	%
67 kHz:	0	10	%
92 kHz:	0	10	%
57 kHz:	3	0	%
Proponent:	17	0	%
Total Deviation:	110	110	%

	ATTN (dB)	OME D/U (dB)
MITRE:	0.00	-49.95

Upper Second Adjacent

Analog -› HSSC	Desired	94.5 MHz Undesired	
Main Channel:	81	81	%
Pilot:	9	9	%
67 kHz:	0	10	%
92 kHz:	0	10	%
57 kHz:	3	0	%
Proponent:	17	0	%
Total Deviation:	110	110	%

	ATTN (dB)	OME D/U (dB)
MITRE:	0.00	-49.95

EO&C

Could not achieve OME .

G-1 First Adjacent

Analog -› Analog & HSSC -› Analog

	Desired	Undesired		Desired	Undesired	
Main Channel:	81	81	%	81	81	%
Pilot:	9	9	%	9	9	%
67 kHz:	10	10	%	10	0	%
92 kHz:	10	10	%	10	0	%
57 kHz:	0	0	%	0	3	%
Proponent:	0	0	%	0	17	%
Total Deviation:	110	110	%	110	110	%
3 W Input	-32.4	-32.4	dBm			
Kay #3		51.0	dB			
		18.6				

Main Channel measurements are Q-Peak detected with CCIR SCA Measurements are RMS.

94.3 MHz	Analog -› Analog Reference		HSSC -› Analog Non -Standard Injection				
	D/U (dB) s/n=45dB	S/N (dB) 67 kHz	S/N (dB) 92 kHz	D/U (dB) s/n=45dB	S/N (dB) 67 kHz	S/N (dB) 92 kHz	
Best Case		36	52				
	0	48		-1	26	12	MITRE:
at D/U		15	24				

93.9 MHz	Analog -› Analog Reference		HSSC -› Analog Non -Standard Injection				
	D/U (dB) s/n=45dB	S/N (dB) 67 kHz	S/N (dB) 92 kHz	D/U (dB) s/n=45dB	S/N (dB) 67 kHz	S/N (dB) 92 kHz	
Best Case		36	53				
	5	48		5	28	32	MITRE:
at D/U		17	33				

G-2 Second Adjacent

Analog -› Analog & HSSC -› Analog

	Desired	Undesired		Desired	Undesired	
Main Channel:	81	81	%	81	81	%
Pilot:	9	9	%	9	9	%
67 kHz:	10	10	%	10	0	%
92 kHz:	10	10	%	10	0	%
57 kHz:	0	0	%	0	3	%
Proponent:	0	0	%	0	17	%
Total Deviation:	110	110	%	110	110	%
3 W Input	-32.4	-32.4	dBm			
Kay #3		51.0	dB			
		18.6				

Main Channel measurements are Q-Peak detected with CCIR
SCA Measurements are RMS.
-40 dB D/U produces a S/N of approximately 47 dB.

94.5 MHz	Analog -› Analog			HSSC -› Analog				
	Reference			Non -Standard Injection				
	D/U (dB) s/n=45dB	S/N (dB) 67 kHz	S/N (dB) 92 kHz	D/U (dB) s/n=45dB	S/N (dB) 67 kHz	S/N (dB) 92 kHz		
Best Case		36	52					
	-40	48		-40	43	5		MITRE:
at D/U		24	10					

93.7 MHz	Analog -› Analog			HSSC -› Analog				
	Reference			Non -Standard Injection				
	D/U (dB) s/n=45dB	S/N (dB) 67 kHz	S/N (dB) 92 kHz	D/U (dB) s/n=45dB	S/N (dB) 67 kHz	S/N (dB) 92 kHz		
Best Case		36	52					
	-40	48		-40	23	4		MITRE:
at D/U		10	7					

G-1 First Adjacent

Analog -› Analog & HSSC -› Analog

	Desired	Undesired		Desired	Undesired	
Main Channel:	81	81	%	81	81	%
Pilot:	9	9	%	9	9	%
67 kHz:	10	10	%	10	0	%
92 kHz:	10	10	%	10	0	%
57 kHz:	0	0	%	0	3	%
Proponent:	0	0	%	0	17	%
Total Deviation:	110	110	%	110	110	%
3 W Input	-32.4	-32.4	dBm			
Kay #3		51.0	dB			
		18.6				

Main Channel measurements are Q-Peak detected with CCIR SCA Measurements are RMS.

94.3 MHz	Analog -› Analog Reference			HSSC -› Analog Non -Standard Injection			
	D/U (dB) s/n=45dB	S/N (dB) 67 kHz	S/N (dB) 92 kHz	D/U (dB) s/n=45dB	S/N (dB) 67 kHz	S/N (dB) 92 kHz	
Best Case		37	52				
	21	48		21	45	46	MITRE:
at D/U		34	46				

93.9 MHz	Analog -› Analog Reference			HSSC -› Analog Non -Standard Injection			
	D/U (dB) s/n=45dB	S/N (dB) 67 kHz	S/N (dB) 92 kHz	D/U (dB) s/n=45dB	S/N (dB) 67 kHz	S/N (dB) 92 kHz	
Best Case		37	52				
	32.5	48		32.5	47	52	MITRE:
at D/U		36	52				

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G-2 Second Adjacent

Analog -› Analog & HSSC -› Analog

	Desired	Undesired		Desired	Undesired	
Main Channel:	81	81	%	81	81	%
Pilot:	9	9	%	9	9	%
67 kHz:	10	10	%	10	0	%
92 kHz:	10	10	%	10	0	%
57 kHz:	0	0	%	0	3	%
Proponent:	0	0	%	0	17	%
Total Deviation:	110	110	%	110	110	%
3 W Input	-32.4	-32.4	dBm			
Kay #3		51.0	dB			
		18.6				

Main Channel measurements are Q-Peak detected with CCIR
SCA Measurements are RMS.

94.5 MHz	Analog -› Analog Reference			HSSC -› Analog Non -Standard Injection			
	D/U (dB) s/n=45dB	S/N (dB) 67 kHz	S/N (dB) 92 kHz	D/U (dB) s/n=45dB	S/N (dB) 67 kHz	S/N (dB) 92 kHz	
Best Case		37	52				
	-14	48		-15	48	43	MITRE:
at D/U		37	39				

93.7 MHz	Analog -› Analog Reference			HSSC -› Analog Non -Standard Injection			
	D/U (dB) s/n=45dB	S/N (dB) 67 kHz	S/N (dB) 92 kHz	D/U (dB) s/n=45dB	S/N (dB) 67 kHz	S/N (dB) 92 kHz	
Best Case		37	52				
	-13	48		-14	48	48	MITRE:
at D/U		37	48				

NRSC Document Improvement Proposal

If in the review or use of this document a potential change appears needed for safety, health or technical reasons, please fill in the appropriate information below and email, mail or fax to:

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NAB
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