4 Analog Compatibility Test Procedures

The following subsections described the detailed analog compatibility test procedures.

4.1 Objective Evaluation of the Main Channel

Objectives

Characterize the performance of analog receivers in the presence of both analog and hybrid interferers. Quantify the *difference* between the impact of an analog interferer and the impact of a hybrid interferer on analog receivers.

Methodology

In order to achieve the objectives of this tests series, various interference scenarios shall be generated by the test platform and coupled into four analog test receivers. These interference scenarios will include 1st and 2nd adjacent analog and hybrid signals at varying power levels. IBOC sidebands will also be added to an analog "host" signal to evaluate the impact of these sidebands on the analog host. There shall be *no* multipath present in the interference scenarios of this test series.

The performance of the four analog receivers will then be objectively evaluated under each of these interference scenarios. For each scenario, the S/N ratio of each receiver will be measured. This S/N measurement may then be used as an objective measure of receiver performance. In some cases, the stereo separation of the received audio signal will also be measured. This stereo separation measurement may be used as an additional measure of receiver performance.

Upon completion of these tests, the test results data may be separated into cases with analog interferers and cases with hybrid interferers. All of the cases with analog interferers should be used as a baseline. The cases with hybrid interferers may then be compared against the baseline of analog interferers. The result of this comparison will provide the objectively evaluated *difference* between analog and hybrid interferers.

Test Conditions

Table 4-1 and Table 4-2 list all of the interference scenarios to be included in this test series. These scenarios were chosen by the NRSC DAB Subcommittee. The following information may be helpful in understanding the construction of these tables:

1. Each row of the table represents one test, and each test is assigned a unique identification number in the # column.
2. In the *Desired* column, the mode of the desired signal is indicated as: *Analog* or *Hybrid*. The power of the desired signal is also indicated: *Strong (-47dBm), Moderate (-62dBm),* or *Weak (-77dBm).*
3. In the interferer columns, the mode of the interferer is indicated: *Analog* or *Hybrid*. Next to the mode of the interferer is a D/U ratio, which indicates the power of the interferer in dB units with respect to the desired signal.
4. The *AWGN* column indicates the presence or absence of a broadband noise floor in the interference scenario. If there is to be no additional noise added, the caption *None* appears. If there is additional noise added, the absolute power level of the noise is indicated in Kelvin units.

Table 4-1 Single Interferer Scenarios (NRSC F.1 and F.2)

#	Lower 2nd adj.	Lower 1st adj.	Desired	Upper 1st adj.	Upper 2nd adj.	AWGN
1001		Analog: +16dB	Analog: Moderate			None
1002		Hybrid: +16dB	Analog: Moderate			None
1003		Analog: +6dB	Analog: Moderate			None
1004		Hybrid: +6dB	Analog: Moderate			None
1005		Analog: -4dB	Analog: Moderate			None
1006		Hybrid: -4dB	Analog: Moderate			None
1007		Analog: -14dB	Analog: Weak			None
1008		Hybrid: -14dB	Analog: Weak			None
1009		Analog: -24dB	Analog: Weak			None
1010		Hybrid: -24dB	Analog: Weak			None
1011		Analog: +16dB	Analog: Moderate			30,000K
1012		Hybrid: +16dB	Analog: Moderate			30,000K
1013		Analog: +6dB	Analog: Moderate			30,000K
1014		Hybrid: +6dB	Analog: Moderate			30,000K
1015		Analog: -4dB	Analog: Moderate			30,000K
1016		Hybrid: -4dB	Analog: Moderate			30,000K
1017		Analog: -14dB	Analog: Weak			30,000K
1018		Hybrid: -14dB	Analog: Weak			30,000K
1019		Analog: -24dB	Analog: Weak			30,000K
1020		Hybrid: -24dB	Analog: Weak			30,000K
1021			Analog: Moderate	Analog: +16dB		None
1022			Analog: Moderate	Hybrid: +16dB		None
1023			Analog: Moderate	Analog: +6dB		None
1024			Analog: Moderate	Hybrid: +6dB		None
1025			Analog: Moderate	Analog: -4dB		None
1026			Analog: Moderate	Hybrid: -4dB		None
1027			Analog: Weak	Analog: -14dB		None
1028			Analog: Weak	Hybrid: -14dB		None
1029			Analog: Weak	Analog: -24dB		None
1030			Analog: Weak	Hybrid: -24dB		None
1031			Analog: Moderate	Analog: +16dB		30,000K
1032			Analog: Moderate	Hybrid: +16dB		30,000K
1033			Analog: Moderate	Analog: +6dB		30,000K
1034			Analog: Moderate	Hybrid: +6dB		30,000K
1035			Analog: Moderate	Analog: -4dB		30,000K
1036			Analog: Moderate	Hybrid: -4dB		30,000K
1037			Analog: Weak	Analog: -14dB		30,000K
1038			Analog: Weak	Hybrid: -14dB		30,000K
1039			Analog: Weak	Analog: -24dB		30,000K
1040			Analog: Weak	Hybrid: -24dB		30,000K
1041	Analog: -20dB		Analog: Moderate			None
1042	Hybrid: -20dB		Analog: Moderate			None
1043	Analog: -25dB		Analog: Moderate			None
1044	Hybrid: -25dB		Analog: Moderate			None
1045	Analog: -30dB		Analog: Moderate			None
1046	Hybrid: -30dB		Analog: Moderate			None
1047	Analog: -35dB		Analog: Moderate			None
1048	Hybrid: -35dB		Analog: Moderate			None
1049	Analog: -40dB		Analog: Moderate			None
1050	Hybrid: -40dB		Analog: Moderate			None
1051	Analog: -20dB		Analog: Moderate			30,000K
1052	Hybrid: -20dB		Analog: Moderate			30,000K
1053	Analog: -25dB		Analog: Moderate			30,000K
1054	Hybrid: -25dB		Analog: Moderate			30,000K
1055	Analog: -30dB		Analog: Moderate			30,000K
1056	Hybrid: -30dB		Analog: Moderate			30,000K
1057	Analog: -35dB		Analog: Moderate			30,000K
1058	Hybrid: -35dB		Analog: Moderate			30,000K

#	Lower 2nd adj.	Lower 1st adj.	Desired	Upper 1st adj.	Upper 2nd adj.	AWGN
1059	Analog: -40dB		Analog: Moderate			30,000K
1060	Hybrid: -40dB		Analog: Moderate			30,000K
1061			Analog: Moderate		Analog: -20dB	None
1062			Analog: Moderate		Hybrid: -20dB	None
1063			Analog: Moderate		Analog: -25dB	None
1064			Analog: Moderate		Hybrid: -25dB	None
1065			Analog: Moderate		Analog: -30dB	None
1066			Analog: Moderate		Hybrid: -30dB	None
1067			Analog: Moderate		Analog: -35dB	None
1068			Analog: Moderate		Hybrid: -35dB	None
1069			Analog: Moderate		Analog: -40dB	None
1070			Analog: Moderate		Hybrid: -40dB	None
1071			Analog: Moderate		Analog: -20dB	30,000K
1072			Analog: Moderate		Hybrid: -20dB	30,000K
1073			Analog: Moderate		Analog: -25dB	30,000K
1074			Analog: Moderate		Hybrid: -25dB	30,000K
1075			Analog: Moderate		Analog: -30dB	30,000K
1076			Analog: Moderate		Hybrid: -30dB	30,000K
1077			Analog: Moderate		Analog: -35dB	30,000K
1078			Analog: Moderate		Hybrid: -35dB	30,000K
1079			Analog: Moderate		Analog: -40dB	30,000K
1080			Analog: Moderate		Hybrid: -40dB	30,000K

Table 4-2 Host Compatibility Scenarios (NRSC J.1)

#	Lower 2nd adj.	Lower 1st adj.	Desired	Upper 1st adj.	Upper 2nd adj.	AWGN
1101			Analog: Strong			None
1102			Hybrid: Strong			None
1103			Analog: Strong			30,000K
1104			Hybrid: Strong			30,000K

Setup

Please refer to the test bed schematics and proof-of-performance record for details of the test platform setup. Note that SW7 thru SW12 shall be set such that the multipath simulators are bypassed. SW1 thru SW6 shall be used to set each channel to either analog, hybrid or off mode. AT1 thru AT3 shall be used to set D, U1 and U2 signal power levels in 0.25dB increments. Noise power levels shall be set with the AWGN generator's internal attenuator in 0.1dB increments.

Procedure

1) All four analog receivers (see Appendix A) shall be used for this test series.
2) Table 4-1 and Table 4-2 shall be used as a guide for setting up each interference scenario. Each row of these tables shall be executed individually.
3) Establish the noise floor according to the AWGN column of the test grid. Refer to section 2.1.17 for a definition of AWGN noise, and 3.1.5 for the procedures of AWGN noise power measurement.
4) Establish the signal strength, frequency, and mode of the desired signal as indicated in the test grid. For a complete definition of the desired analog and desired hybrid signals, refer to 2.1.1 and 2.1.7, respectively. The procedures for measuring FM power may be found in 3.1.1 and 3.1.2.
5) Establish the signal strength, frequency, and mode of the interfering signals as indicated in the test grid. For a complete definition of the undesired analog interferer

and undesired hybrid interferer signals, refer to 2.1.13 and 2.1.15, respectively. The procedures for measuring FM power may be found in 3.1.1 and 3.1.2.

6) Modulate the interferers with the CD recordings of clipped pink noise (2.2.1).
7) Perform S/N measurements on the main channel audio of the analog test receivers according to the procedure detailed in 3.2.1.
8) For tests 1101 thru 1104 only, make a measurement of stereo separation on the main channel.

Presentation of Data

The S/N ratio and stereo separation shall both be expressed in dB units and rounded to the nearest 0.1dB. Note that the S/N reading is actually an average of multiple noise readings, as described in 3.2.1.

4.2 Subjective Evaluation of the Main Channel with No Multipath

Objectives

Characterize the performance of analog receivers in the presence of both analog and hybrid interferers. Quantify the *difference* between the impact of an analog interferer and the impact of a hybrid interferer on analog receivers.

Methodology

The objectives of this test series are identical to those of section 4.1. However, rather than using objective evaluation, the methodology is changed to accommodate subjective evaluation. The reader may then use the objective test results of 4.1 in concert with the subjective test results of 4.2 to achieve the aforementioned objectives.

As was the case for section 4.1, various interference scenarios shall be generated by the test platform and coupled into four analog test receivers. These interference scenarios will include 1st and 2nd adjacent analog and hybrid signals at varying power levels. IBOC sidebands will also be added to an analog "host" signal to evaluate the impact of these sidebands on the analog host. There shall be *no* multipath present in the interference scenarios of this test series.

The performance of the four analog receivers will then be *subjectively* evaluated under each of these interference scenarios. For each scenario, various audio recordings will be made of the analog receivers' outputs. These recordings may then be used for subjective scoring.

Upon completion of these tests and the subjective scoring of the recordings, the scores may be separated into cases with analog interferers and cases with hybrid interferers. All of the cases with analog interferers should be used as a baseline. The cases with hybrid interferers may then be compared against the baseline of analog interferers. The result of this comparison will provide the subjectively evaluated *difference* between analog and hybrid interferers.

Test Conditions

Table 4-3 and Table 4-4 list all of the interference scenarios to be included in this test series. These scenarios were chosen by the NRSC DAB Subcommittee. The following information may be helpful in understanding the construction of these tables:

1. Each row of the table represents one test, and each test is assigned a unique identification number in the # column.
2. In the *Desired* column, the mode of the desired signal is indicated as: *Analog* or *Hybrid*. The power of the desired signal is also indicated: *Strong (-47dBm), Moderate (-62dBm),* or *Weak (-77dBm).*
3. In the interferer columns, the mode of the interferer is indicated: *Analog* or *Hybrid*. Next to the mode of the interferer is a D/U ratio, which indicates the power of the interferer in dB units with respect to the desired signal.
4. The *AWGN* column indicates the presence or absence of a broadband noise floor in the interference scenario. If there is to be no additional noise added, the caption *None* appears. If there is additional noise added, the absolute power level of the noise is indicated in Kelvin units.
5. The *Audio Cut* column indicates the audio material which shall be played on the desired channel, and ultimately recorded from the output of the analog receivers under test. Please refer to Appendix B for an index of the audio material.

Table 4-3 Single Interferer Scenarios (NRSC F.3 and F.4)

#	Lower 2nd adj.	Lower 1st adj.	Desired	Upper 1st adj.	Upper 2nd adj.	AWGN	Audio Cut
1201		Analog: +16dB	Analog: Moderate			None	Carmen
1202		Hybrid: +16dB	Analog: Moderate			None	Carmen
1203		Analog: +16dB	Analog: Moderate			None	Grant
1204		Hybrid: +16dB	Analog: Moderate			None	Grant
1205		Analog: +16dB	Analog: Moderate			None	Woman
1206		Hybrid: +16dB	Analog: Moderate			None	Woman
1207		Analog: +16dB	Analog: Moderate			30,000K	Debussy
1208		Hybrid: +16dB	Analog: Moderate			30,000K	Debussy
1209		Analog: +16dB	Analog: Moderate			30,000K	REO
1210		Hybrid: +16dB	Analog: Moderate			30,000K	REO
1211		Analog: +16dB	Analog: Moderate			30,000K	Man
1212		Hybrid: +16dB	Analog: Moderate			30,000K	Man
1213		Analog: +6dB	Analog: Moderate			None	Carmen
1214		Hybrid: +6dB	Analog: Moderate			None	Carmen
1215		Analog: +6dB	Analog: Moderate			None	Grant
1216		Hybrid: +6dB	Analog: Moderate			None	Grant
1217		Analog: +6dB	Analog: Moderate			None	Woman
1218		Hybrid: +6dB	Analog: Moderate			None	Woman
1219		Analog: +6dB	Analog: Moderate			30,000K	Debussy
1220		Hybrid: +6dB	Analog: Moderate			30,000K	Debussy
1221		Analog: +6dB	Analog: Moderate			30,000K	REO
1222		Hybrid: +6dB	Analog: Moderate			30,000K	REO
1223		Analog: +6dB	Analog: Moderate			30,000K	Man
1224		Hybrid: +6dB	Analog: Moderate			30,000K	Man
1225		Analog: -4dB	Analog: Moderate			None	Carmen
1226		Hybrid: -4dB	Analog: Moderate			None	Carmen
1227		Analog: -4dB	Analog: Moderate			None	Grant
1228		Hybrid: -4dB	Analog: Moderate			None	Grant
1229		Analog: -4dB	Analog: Moderate			None	Woman
1230		Hybrid: -4dB	Analog: Moderate			None	Woman

#	Lower 2nd adj.	Lower 1st adj.	Desired	Upper 1st adj.	Upper 2nd adj.	AWGN	Audio Cut
1231		Analog: -4dB	Analog: Moderate			30,000K	Debussy
1232		Hybrid: -4dB	Analog: Moderate			30,000K	Debussy
1233		Analog: -4dB	Analog: Moderate			30,000K	REO
1234		Hybrid: -4dB	Analog: Moderate			30,000K	REO
1235		Analog: -4dB	Analog: Moderate			30,000K	Man
1236		Hybrid: -4dB	Analog: Moderate			30,000K	Man
1237			Analog: Moderate	Analog: +16dB		None	Bach
1238			Analog: Moderate	Hybrid: +16dB		None	Bach
1239			Analog: Moderate	Analog: +16dB		None	Santana
1240			Analog: Moderate	Hybrid: +16dB		None	Santana
1241			Analog: Moderate	Analog: +16dB		None	Brokaw
1242			Analog: Moderate	Hybrid: +16dB		None	Brokaw
1243			Analog: Moderate	Analog: +16dB		30,000K	Ibert
1244			Analog: Moderate	Hybrid: +16dB		30,000K	Ibert
1245			Analog: Moderate	Analog: +16dB		30,000K	Vega
1246			Analog: Moderate	Hybrid: +16dB		30,000K	Vega
1247			Analog: Moderate	Analog: +16dB		30,000K	Brokaw
1248			Analog: Moderate	Hybrid: +16dB		30,000K	Brokaw
1249			Analog: Moderate	Analog: +6dB		None	Bach
1250			Analog: Moderate	Hybrid: +6dB		None	Bach
1251			Analog: Moderate	Analog: +6dB		None	Santana
1252			Analog: Moderate	Hybrid: +6dB		None	Santana
1253			Analog: Moderate	Analog: +6dB		None	Brokaw
1254			Analog: Moderate	Hybrid: +6dB		None	Brokaw
1255			Analog: Moderate	Analog: +6dB		30,000K	Ibert
1256			Analog: Moderate	Hybrid: +6dB		30,000K	Ibert
1257			Analog: Moderate	Analog: +6dB		30,000K	Vega
1258			Analog: Moderate	Hybrid: +6dB		30,000K	Vega
1259			Analog: Moderate	Analog: +6dB		30,000K	Brokaw
1260			Analog: Moderate	Hybrid: +6dB		30,000K	Brokaw
1261			Analog: Moderate	Analog: -4dB		None	Bach
1262			Analog: Moderate	Hybrid: -4dB		None	Bach
1263			Analog: Moderate	Analog: -4dB		None	Santana
1264			Analog: Moderate	Hybrid: -4dB		None	Santana
1265			Analog: Moderate	Analog: -4dB		None	Brokaw
1266			Analog: Moderate	Hybrid: -4dB		None	Brokaw
1267			Analog: Moderate	Analog: -4dB		30,000K	Ibert
1268			Analog: Moderate	Hybrid: -4dB		30,000K	Ibert
1269			Analog: Moderate	Analog: -4dB		30,000K	Vega
1270			Analog: Moderate	Hybrid: -4dB		30,000K	Vega
1271			Analog: Moderate	Analog: -4dB		30,000K	Brokaw
1272			Analog: Moderate	Hybrid: -4dB		30,000K	Brokaw
1273	Analog: -20dB		Analog: Moderate			None	Messiah
1274	Hybrid: -20dB		Analog: Moderate			None	Messiah
1275	Analog: -20dB		Analog: Moderate			None	MMW
1276	Hybrid: -20dB		Analog: Moderate			None	MMW
1277	Analog: -20dB		Analog: Moderate			None	Woman
1278	Hybrid: -20dB		Analog: Moderate			None	Woman
1279	Analog: -20dB		Analog: Moderate			30,000K	1812
1280	Hybrid: -20dB		Analog: Moderate			30,000K	1812
1281	Analog: -20dB		Analog: Moderate			30,000K	Cray
1282	Hybrid: -20dB		Analog: Moderate			30,000K	Cray
1283	Analog: -20dB		Analog: Moderate			30,000K	Brokaw
1284	Hybrid: -20dB		Analog: Moderate			30,000K	Brokaw
1285	Analog: -40dB		Analog: Moderate			None	Messiah
1286	Hybrid: -40dB		Analog: Moderate			None	Messiah
1287	Analog: -40dB		Analog: Moderate			None	MMW
1288	Hybrid: -40dB		Analog: Moderate			None	MMW
1289	Analog: -40dB		Analog: Moderate			None	Woman
1290	Hybrid: -40dB		Analog: Moderate			None	Woman

#	Lower 2nd adj.	Lower 1st adj.	Desired	Upper 1st adj.	Upper 2nd adj.	AWGN	Audio Cut
1291	Analog: -40dB		Analog: Moderate			30,000K	1812
1292	Hybrid: -40dB		Analog: Moderate			30,000K	1812
1293	Analog: -40dB		Analog: Moderate			30,000K	Cray
1294	Hybrid: -40dB		Analog: Moderate			30,000K	Cray
1295	Analog: -40dB		Analog: Moderate			30,000K	Brokaw
1296	Hybrid: -40dB		Analog: Moderate			30,000K	Brokaw
1297			Analog: Moderate		Analog: -20dB	None	Persian
1298			Analog: Moderate		Hybrid: -20dB	None	Persian
1299			Analog: Moderate		Analog: -20dB	None	Crowded
1300			Analog: Moderate		Hybrid: -20dB	None	Crowded
1301			Analog: Moderate		Analog: -20dB	None	Man
1302			Analog: Moderate		Hybrid: -20dB	None	Man
1303			Analog: Moderate		Analog: -20dB	30,000K	Carmen
1304			Analog: Moderate		Hybrid: -20dB	30,000K	Carmen
1305			Analog: Moderate		Analog: -20dB	30,000K	CSNY
1306			Analog: Moderate		Hybrid: -20dB	30,000K	CSNY
1307			Analog: Moderate		Analog: -20dB	30,000K	Man
1308			Analog: Moderate		Hybrid: -20dB	30,000K	Man
1309			Analog: Moderate		Analog: -40dB	None	Persian
1310			Analog: Moderate		Hybrid: -40dB	None	Persian
1311			Analog: Moderate		Analog: -40dB	None	Crowded
1312			Analog: Moderate		Hybrid: -40dB	None	Crowded
1313			Analog: Moderate		Analog: -40dB	None	Man
1314			Analog: Moderate		Hybrid: -40dB	None	Man
1315			Analog: Moderate		Analog: -40dB	30,000K	Carmen
1316			Analog: Moderate		Hybrid: -40dB	30,000K	Carmen
1317			Analog: Moderate		Analog: -40dB	30,000K	CSNY
1318			Analog: Moderate		Hybrid: -40dB	30,000K	CSNY
1319			Analog: Moderate		Analog: -40dB	30,000K	Man
1320			Analog: Moderate		Hybrid: -40dB	30,000K	Man
1321	Analog: -30dB		Analog: Moderate			None	Messiah
1322	Hybrid: -30dB		Analog: Moderate			None	Messiah
1323	Analog: -30dB		Analog: Moderate			None	MMW
1324	Hybrid: -30dB		Analog: Moderate			None	MMW
1325	Analog: -30dB		Analog: Moderate			None	Woman
1326	Hybrid: -30dB		Analog: Moderate			None	Woman
1327	Analog: -30dB		Analog: Moderate			30,000K	1812
1328	Hybrid: -30dB		Analog: Moderate			30,000K	1812
1329	Analog: -30dB		Analog: Moderate			30,000K	Cray
1330	Hybrid: -30dB		Analog: Moderate			30,000K	Cray
1331	Analog: -30dB		Analog: Moderate			30,000K	Brokaw
1332	Hybrid: -30dB		Analog: Moderate			30,000K	Brokaw
1333			Analog: Moderate		Analog: -30dB	None	Persian
1334			Analog: Moderate		Hybrid: -30dB	None	Persian
1335			Analog: Moderate		Analog: -30dB	None	Crowded
1336			Analog: Moderate		Hybrid: -30dB	None	Crowded
1337			Analog: Moderate		Analog: -30dB	None	Man
1338			Analog: Moderate		Hybrid: -30dB	None	Man
1339			Analog: Moderate		Analog: -30dB	30,000K	Carmen
1340			Analog: Moderate		Hybrid: -30dB	30,000K	Carmen
1341			Analog: Moderate		Analog: -30dB	30,000K	CSNY
1342			Analog: Moderate		Hybrid: -30dB	30,000K	CSNY
1343			Analog: Moderate		Analog: -30dB	30,000K	Man
1344			Analog: Moderate		Hybrid: -30dB	30,000K	Man

Table 4-4 Host Compatibility Scenarios (NRSC J.2)

#	Lower 2nd adj.	Lower 1st adj.	Desired	Upper 1st adj.	Upper 2nd adj.	AWGN	Audio Cut
1351			Analog: Strong			None	1812

#	Lower 2nd adj.	Lower 1st adj.	Desired	Upper 1st adj.	Upper 2nd adj.	AWGN	Audio Cut
1352			Hybrid: Strong			None	1812
1353			Analog: Strong			None	Fleetwood
1354			Hybrid: Strong			None	Fleetwood
1355			Analog: Strong			None	Woman
1356			Hybrid: Strong			None	Woman
1357			Analog: Strong			30,000K	1812
1358			Hybrid: Strong			30,000K	1812
1359			Analog: Strong			30,000K	Fleetwood
1360			Hybrid: Strong			30,000K	Fleetwood
1361			Analog: Strong			30,000K	Woman
1362			Hybrid: Strong			30,000K	Woman

Setup

Please refer to the test bed schematics and proof-of-performance record for details of the test platform setup. Note that SW7 thru SW12 shall be set such that the multipath simulators are bypassed. SW1 thru SW6 shall be used to set each channel to either analog, hybrid or off mode. AT1 thru AT3 shall be used to set D, U1 and U2 signal power levels in 0.25dB increments. Noise power levels shall be set with the AWGN generator's internal attenuator in 0.1dB increments.

Procedure

1) All four analog receivers (see Appendix A) shall be used for this test series.
2) Table 4-3 and Table 4-4 shall be used as a guide for setting up each interference scenario. Each row of these tables shall be executed individually.
3) Establish the noise floor according to the AWGN column of the test grid. Refer to section 2.1.17 for a definition of AWGN noise, and 3.1.5 for the procedures of AWGN noise power measurement.
4) Establish the signal strength, frequency, and mode of the desired signal as indicated in the test grid. For a complete definition of the desired analog and desired hybrid signals, refer to 2.1.2 and 2.1.8, respectively. The procedures for measuring FM power may be found in 3.1.1 and 3.1.2.
5) Establish the signal strength, frequency, and mode of the interfering signals as indicated in the test grid. For a complete definition of the undesired analog interferer and undesired hybrid interferer signals, refer to 2.1.14 and 2.1.16, respectively. The procedures for measuring FM power may be found in 3.1.1 and 3.1.2.
6) Set the audio dynamic range processing of the desired channel to a preset which corresponds to the audio cut indicated in the test grid. Refer to Appendix B for a list of presets that should be used with each audio cut.
7) Modulate the interferers with the CD recordings of processed rock (2.2.2).
8) Begin recording the output of the analog receiver(s) to digital audio tape according to 3.3.1.
9) Play the appropriate audio cut on the desired channel, as indicated in the test grid. The same audio cut shall be played twice under each test condition. The first audio loop gives the audio processor time to settle, and will be discarded during the evaluation process. The second audio loop should be taken as the actual test result.
10) Perform the audio transfer, editing, leveling and renaming process described in 3.3.2 and 3.3.3.

Presentation of Data

The test results shall consist of digital audio recordings. Each audio cut will be recorded twice on the audio tape. However, the first audio loop will be discarded, as it was intended to allow the processor sufficient settling time. Only the second audio loop will be considered a valid test result.

4.3 Subjective Evaluation of the Main Channel with Multipath Impairments

Objectives

Characterize the performance of analog receivers in the presence of both analog and hybrid interferers in a multipath impaired environment. Quantify the *difference* between the impact of an analog interferer and the impact of a hybrid interferer on analog receivers.

Methodology

The objectives of this test series are nearly identical to those of section 4.1 and 4.2. However, this test series adds an additional type of impairment, namely multipath. Due to the time variant nature of dynamic multipath impairments, it is not possible to use objective evaluation methods in the presence of multipath. Consequently, only subjective evaluation shall be used as the evaluation method for this test series.

As was the case for sections 4.1 and 4.2, various interference scenarios shall be generated by the test platform and coupled into two analog test receivers. These interference scenarios will include 1st and 2nd adjacent analog and hybrid signals at varying power levels.

In this test series, multipath will be added to the interference scenario. Although multipath has a nearly infinite number of permutations and forms, it is broadly grouped into two categories for the purposes of these tests: "Urban Slow" and "Urban Fast". Urban Slow multipath is specified to simulate a vehicle traveling slowly through an urban area. Urban Fast multipath is specified to simulate a vehicle traveling at a moderately high rate of speed through an urban area. These multipath profiles were previously developed by the Electronic Industries Association (EIA)[5], and are used here in accordance with the direction of the NRSC DAB Subcommittee. The details of these multipath profiles may be found in Appendix D.

The performance of the two analog receivers will be *subjectively* evaluated under each of these interference and multipath profiles. For each scenario, a selected audio cut will be played/looped several times, and audio recordings will be made of the analog receivers' outputs. The audio cuts are looped several times because the audio cut lengths are short, relative to the lengths of the multipath simulations. These recordings may then be used for subjective scoring.

Upon completion of these tests and the subjective scoring of the recordings, the scores may be separated into cases with analog interferers and cases with hybrid interferers. All of the

[5] EIA-CEG/DAR Subcommittee, WG-B/Laboratory Testing and SG-1/VHF Channel Characterization Test; Final Report of the Channel Characterization Task Group – The derivation and rational for multipath simulation parameters for the EIA-DAR laboratory testing; July 1995

cases with analog interferers should be used as a baseline. The cases with hybrid interferers may then be compared against the baseline of analog interferers. The result of this comparison will provide the subjectively evaluated *difference* between analog and hybrid interferers.

Test Conditions

Table 4-5 lists all of the interference scenarios to be included in this test series. These scenarios were chosen by the NRSC DAB Subcommittee. The following information may be helpful in understanding the construction of this table:

1. Each row of the table represents one test, and each test is assigned a unique identification number in the # column.
2. In the *Desired* column, the mode of the desired signal is indicated as: *Analog* or *Hybrid.* The power of the desired signal is also indicated: *Strong (-47dBm), Moderate (-62dBm),* or *Weak (-77dBm).*
3. In the interferer columns, the mode of the interferer is indicated: *Analog* or *Hybrid.* Next to the mode of the interferer is a D/U ratio, which indicates the power of the interferer in dB units with respect to the desired signal.
4. The *Multipath* column indicates the multipath profile which shall be applied to the interference scenario. The *US* abbreviation is used for the *Urban Slow* profile, the *UF* abbreviation is used for the *Urban Fast* profile.
5. The *AWGN* column indicates the presence or absence of a broadband noise floor in the interference scenario. If there is to be no additional noise added, the caption *None* appears. If there is additional noise added, the absolute power level of the noise is indicated in Kelvin units.
6. The *Audio Cut* column indicates the audio material which shall be played on the desired channel, and ultimately recorded from the output of the analog receivers under test. Please refer to Appendix B for an index of the audio material.

Table 4-5 Single Interferer Scenarios with Multipath (NRSC G.1)

#	Lower 2nd adjacent	Lower 1st adjacent	Desired	Upper 1st adjacent	Upper 2nd adjacent	Multi-path	AWGN	Audio Cut
1501		Analog: +6dB	Analog: Moderate			US	None	Carmen
1502		Hybrid: +6dB	Analog: Moderate			US	None	Carmen
1503		Analog: +6dB	Analog: Moderate			US	None	Simon
1504		Hybrid: +6dB	Analog: Moderate			US	None	Simon
1505		Analog: +6dB	Analog: Moderate			US	None	Brokaw
1506		Hybrid: +6dB	Analog: Moderate			US	None	Brokaw
1507		Analog: +6dB	Analog: Moderate			US	30,000K	Carmen
1508		Hybrid: +6dB	Analog: Moderate			US	30,000K	Carmen
1509		Analog: +6dB	Analog: Moderate			US	30,000K	Simon
1510		Hybrid: +6dB	Analog: Moderate			US	30,000K	Simon
1511		Analog: +6dB	Analog: Moderate			US	30,000K	Brokaw
1512		Hybrid: +6dB	Analog: Moderate			US	30,000K	Brokaw
1513		Analog: +6dB	Analog: Moderate			UF	None	Messiah
1514		Hybrid: +6dB	Analog: Moderate			UF	None	Messiah
1515		Analog: +6dB	Analog: Moderate			UF	None	Clapton
1516		Hybrid: +6dB	Analog: Moderate			UF	None	Clapton
1517		Analog: +6dB	Analog: Moderate			UF	None	Man
1518		Hybrid: +6dB	Analog: Moderate			UF	None	Man
1519		Analog: +6dB	Analog: Moderate			UF	30,000K	Messiah
1520		Hybrid: +6dB	Analog: Moderate			UF	30,000K	Messiah

#	Lower 2nd adjacent	Lower 1st adjacent	Desired	Upper 1st adjacent	Upper 2nd adjacent	Multi-path	AWGN	Audio Cut
1521		Analog: +6dB	Analog: Moderate			UF	30,000K	Clapton
1522		Hybrid: +6dB	Analog: Moderate			UF	30,000K	Clapton
1523		Analog: +6dB	Analog: Moderate			UF	30,000K	Man
1524		Hybrid: +6dB	Analog: Moderate			UF	30,000K	Man
1525			Analog: Moderate	Analog: +6dB		US	None	Stravinsky
1526			Analog: Moderate	Hybrid: +6dB		US	None	Stravinsky
1527			Analog: Moderate	Analog: +6dB		US	None	Fleetwood
1528			Analog: Moderate	Hybrid: +6dB		US	None	Fleetwood
1529			Analog: Moderate	Analog: +6dB		US	None	Woman
1530			Analog: Moderate	Hybrid: +6dB		US	None	Woman
1531			Analog: Moderate	Analog: +6dB		US	30,000K	Stravinsky
1532			Analog: Moderate	Hybrid: +6dB		US	30,000K	Stravinsky
1533			Analog: Moderate	Analog: +6dB		US	30,000K	Fleetwood
1534			Analog: Moderate	Hybrid: +6dB		US	30,000K	Fleetwood
1535			Analog: Moderate	Analog: +6dB		US	30,000K	Woman
1536			Analog: Moderate	Hybrid: +6dB		US	30,000K	Woman
1537			Analog: Moderate	Analog: +6dB		UF	None	Debussy
1538			Analog: Moderate	Hybrid: +6dB		UF	None	Debussy
1539			Analog: Moderate	Analog: +6dB		UF	None	REO
1540			Analog: Moderate	Hybrid: +6dB		UF	None	REO
1541			Analog: Moderate	Analog: +6dB		UF	None	Brokaw
1542			Analog: Moderate	Hybrid: +6dB		UF	None	Brokaw
1543			Analog: Moderate	Analog: +6dB		UF	30,000K	Debussy
1544			Analog: Moderate	Hybrid: +6dB		UF	30,000K	Debussy
1545			Analog: Moderate	Analog: +6dB		UF	30,000K	REO
1546			Analog: Moderate	Hybrid: +6dB		UF	30,000K	REO
1547			Analog: Moderate	Analog: +6dB		UF	30,000K	Brokaw
1548			Analog: Moderate	Hybrid: +6dB		UF	30,000K	Brokaw
1549		Analog:+16dB	Analog: Moderate			US	None	Carmen
1550		Hybrid:+16dB	Analog: Moderate			US	None	Carmen
1551			Analog: Moderate	Analog:+16dB		US	None	Messiah
1552			Analog: Moderate	Hybrid:+16dB		US	None	Messiah
1553		Analog:+16dB	Analog: Moderate			UF	None	Debussy
1554		Hybrid:+16dB	Analog: Moderate			UF	None	Debussy
1555			Analog: Moderate	Analog:+16dB		UF	None	Stravinsky
1556			Analog: Moderate	Hybrid:+16dB		UF	None	Stravinsky

Setup

Please refer to the test bed schematics and proof-of-performance record for details of the test platform setup. Note that SW7 thru SW12 shall be set such that the multipath simulators are in-line. SW1 thru SW6 shall be used to set each channel to either analog, hybrid or off mode. AT1 thru AT3 shall be used to set D, U1 and U2 signal power levels in 0.25dB increments. Noise power levels shall be set with the AWGN generator's internal attenuator in 0.1dB increments.

Procedure

1) The two automobile receivers (see Appendix A) shall be used for this test series.
2) Table 4-5 shall be used as a guide for setting up each interference scenario. Each row of this table shall be executed individually.
3) Establish the noise floor according to the AWGN column of the test grid. Refer to section 2.1.17 for a definition of AWGN noise, and 3.1.5 for the procedures of AWGN noise power measurement.
4) Establish the signal strength, frequency, and mode of the desired signal as indicated in the test grid. For a complete definition of the desired analog and desired hybrid signals,

refer to 2.1.2 and 2.1.8, respectively. The procedure for measuring FM power *in the presence of multipath* may be found in 3.1.3.

5) Establish the signal strength, frequency, and mode of the interfering signals as indicated in the test grid. For a complete definition of the undesired analog interferer and undesired hybrid interferer signals, refer to 2.1.14 and 2.1.16, respectively. The procedure for measuring FM power *in the presence of multipath* may be found in 3.1.3.
6) Set the audio dynamic range processing of the desired channel to a preset which corresponds to the audio cut indicated in the test grid. Refer to Appendix B for a list of presets that should be used with each audio cut.
7) Set up the appropriate multipath simulation (Urban Slow or Urban Fast) on the desired channel and undesired channels. Note that there are actually three separate simulations to set up, one for each channel. Refer to Appendix D for complete details on each multipath profile.
8) Modulate the interferers with the CD recordings of processed rock (2.2.2).
9) Start all three multipath simulations. Stagger the start time of each multipath profile by some repeatable amount of time. Wait 30 seconds for the multipath simulation to "settle" into its nominal operating mode.
10) Begin recording the output of the analog receiver(s) to digital audio tape according to 3.3.1.
11) Play the appropriate audio cut on the desired channel, as indicated in the test grid. Loop this audio cut repeatedly for a total of 90 seconds. (e.g. a 15 second cut would be looped 6 times).
12) Perform the audio transfer, editing, leveling and renaming process described in 3.3.2 and 3.3.3.

Presentation of Data

The test results shall consist of digital audio recordings. Each audio cut will be recorded a number of times within the 90 second recording window. However, the first audio loop will be discarded, as it was intended to allow the processor sufficient settling time. The remaining audio loops shall be considered valid test results.

4.4 Objective Evaluation of 67/92kHz SCA's

Objectives

Characterize the performance of analog SCA receivers in the presence of both analog and hybrid interferers. Quantify the *difference* between the impact of an analog interferer and the impact of a hybrid interferer on SCA receivers.

Methodology

In order to achieve the objectives of this tests series, various interference scenarios shall be generated by the test platform and coupled into four analog SCA receivers and a wideband professional demodulator. These interference scenarios will include 1st and 2nd adjacent analog and hybrid signals at varying power levels. IBOC sidebands will also be added to an analog "host" signal to evaluate the impact of these sidebands on the SCA frequencies of the analog host. There shall be *no* multipath present in the interference scenarios of this test series.

The performance of the four SCA receivers will then be objectively evaluated under each of these interference scenarios. The S/N ratio of each receiver will be measured under each

interference scenario. This S/N measurement may then be used as an objective measure of receiver performance.

For the wideband professional demodulator/receiver, spectrum analyzer plots will be made (instead of S/N measurements). The plots shall span the DC-120kHz range of the demodulator's composite baseband output.

Upon completion of these tests, the test results data may be separated into cases with analog interferers and cases with hybrid interferers. All of the cases with analog interferers should be used as a baseline. The cases with hybrid interferers may then be compared against the baseline of analog interferers. The result of this comparison will provide the objectively evaluated *difference* between analog and hybrid interferers.

Test Conditions

Table 4-6, Table 4-7 and Table 4-8 list all of the interference scenarios to be included in this test series. These scenarios were chosen by the NRSC DAB Subcommittee. The following information may be helpful in understanding the construction of these tables:

1. Each row of the table represents one test, and each test is assigned a unique identification number in the # column.
2. In the *Desired* column, the mode of the desired signal is indicated as: *Analog* or *Hybrid.* The power of the desired signal is also indicated: *Strong (-47dBm), Moderate (-62dBm),* or *Weak (-77dBm).* In addition, Table 4-6 and Table 4-7 specify the SCA frequency of interest as either 67kHz or 92kHz.
3. In the interferer columns, the mode of the interferer is indicated: *Analog* or *Hybrid.* Next to the mode of the interferer is a D/U ratio, which indicates the power of the interferer in dB units with respect to the desired signal.
4. The *AWGN* column indicates the presence or absence of a broadband noise floor in the interference scenario. If there is to be no additional noise added, the caption *None* appears. If there is additional noise added, the absolute power level of the noise is indicated in Kelvin units.
5. In cases where the main channel audio is considered to be a test variable (as in Table 4-8), an additional column specifies the audio which shall modulate the main channel.

Table 4-6 Single Interferer 67/92 SCA Scenarios (NRSC F/SC.1 and F/SC.2)

#	Lower 2nd adj.	Lower 1st adj.	Desired	Upper 1st adj.	Upper 2nd adj.	AWGN
1701		Analog: +16dB	Analog:67kHz: Moderate			None
1702		Hybrid: +16dB	Analog:67kHz: Moderate			None
1703		Analog: +6dB	Analog:67kHz: Moderate			None
1704		Hybrid: +6dB	Analog:67kHz: Moderate			None
1705		Analog: +16dB	Analog:67kHz: Moderate			30,000K
1706		Hybrid: +16dB	Analog:67kHz: Moderate			30,000K
1707		Analog: +6dB	Analog:67kHz: Moderate			30,000K
1708		Hybrid: +6dB	Analog:67kHz: Moderate			30,000K
1709			Analog:67kHz: Moderate	Analog: +16dB		None
1710			Analog:67kHz: Moderate	Hybrid: +16dB		None
1711			Analog:67kHz: Moderate	Analog: +6dB		None
1712			Analog:67kHz: Moderate	Hybrid: +6dB		None
1713			Analog:67kHz: Moderate	Analog: +16dB		30,000K
1714			Analog:67kHz: Moderate	Hybrid: +16dB		30,000K

#	Lower 2nd adj.	Lower 1st adj.	Desired	Upper 1st adj.	Upper 2nd adj.	AWGN
1715			Analog:67kHz: Moderate	Analog: +6dB		30,000K
1716			Analog:67kHz: Moderate	Hybrid: +6dB		30,000K
1717	Analog: 0dB		Analog:67kHz: Moderate			None
1718	Hybrid: 0dB		Analog:67kHz: Moderate			None
1719	Analog: -10dB		Analog:67kHz: Moderate			None
1720	Hybrid: -10dB		Analog:67kHz: Moderate			None
1721	Analog: -20dB		Analog:67kHz: Moderate			None
1722	Hybrid: -20dB		Analog:67kHz: Moderate			None
1723	Analog: -30dB		Analog:67kHz: Moderate			None
1724	Hybrid: -30dB		Analog:67kHz: Moderate			None
1725	Analog: 0dB		Analog:67kHz: Moderate			30,000K
1726	Hybrid: 0dB		Analog:67kHz: Moderate			30,000K
1727	Analog: -10dB		Analog:67kHz: Moderate			30,000K
1728	Hybrid: -10dB		Analog:67kHz: Moderate			30,000K
1729	Analog: -20dB		Analog:67kHz: Moderate			30,000K
1730	Hybrid: -20dB		Analog:67kHz: Moderate			30,000K
1731	Analog: -30dB		Analog:67kHz: Moderate			30,000K
1732	Hybrid: -30dB		Analog:67kHz: Moderate			30,000K
1733			Analog:67kHz: Moderate		Analog: 0dB	None
1734			Analog:67kHz: Moderate		Hybrid: 0dB	None
1735			Analog:67kHz: Moderate		Analog: -10dB	None
1736			Analog:67kHz: Moderate		Hybrid: -10dB	None
1737			Analog:67kHz: Moderate		Analog: -20dB	None
1738			Analog:67kHz: Moderate		Hybrid: -20dB	None
1739			Analog:67kHz: Moderate		Analog: -30dB	None
1740			Analog:67kHz: Moderate		Hybrid: -30dB	None
1741			Analog:67kHz: Moderate		Analog: 0dB	30,000K
1742			Analog:67kHz: Moderate		Hybrid: 0dB	30,000K
1743			Analog:67kHz: Moderate		Analog: -10dB	30,000K
1744			Analog:67kHz: Moderate		Hybrid: -10dB	30,000K
1745			Analog:67kHz: Moderate		Analog: -20dB	30,000K
1746			Analog:67kHz: Moderate		Hybrid: -20dB	30,000K
1747			Analog:67kHz: Moderate		Analog: -30dB	30,000K
1748			Analog:67kHz: Moderate		Hybrid: -30dB	30,000K
1749		Analog: +16dB	Analog:92kHz: Moderate			None
1750		Hybrid: +16dB	Analog:92kHz: Moderate			None
1751		Analog: +6dB	Analog:92kHz: Moderate			None
1752		Hybrid: +6dB	Analog:92kHz: Moderate			None
1753		Analog: +16dB	Analog:92kHz: Moderate			30,000K
1754		Hybrid: +16dB	Analog:92kHz: Moderate			30,000K
1755		Analog: +6dB	Analog:92kHz: Moderate			30,000K
1756		Hybrid: +6dB	Analog:92kHz: Moderate			30,000K
1757			Analog:92kHz: Moderate	Analog: +16dB		None
1758			Analog:92kHz: Moderate	Hybrid: +16dB		None
1759			Analog:92kHz: Moderate	Analog: +6dB		None
1760			Analog:92kHz: Moderate	Hybrid: +6dB		None
1761			Analog:92kHz: Moderate	Analog: +16dB		30,000K
1762			Analog:92kHz: Moderate	Hybrid: +16dB		30,000K
1763			Analog:92kHz: Moderate	Analog: +6dB		30,000K
1764			Analog:92kHz: Moderate	Hybrid: +6dB		30,000K
1765	Analog: 0dB		Analog:92kHz: Moderate			None
1766	Hybrid: 0dB		Analog:92kHz: Moderate			None
1767	Analog: -10dB		Analog:92kHz: Moderate			None
1768	Hybrid: -10dB		Analog:92kHz: Moderate			None
1769	Analog: -20dB		Analog:92kHz: Moderate			None
1770	Hybrid: -20dB		Analog:92kHz: Moderate			None
1771	Analog: -30dB		Analog:92kHz: Moderate			None
1772	Hybrid: -30dB		Analog:92kHz: Moderate			None
1773	Analog: 0dB		Analog:92kHz: Moderate			30,000K
1774	Hybrid: 0dB		Analog:92kHz: Moderate			30,000K

#	Lower 2nd adj.	Lower 1st adj.	Desired	Upper 1st adj.	Upper 2nd adj.	AWGN
1775	Analog: -10dB		Analog:92kHz: Moderate			30,000K
1776	Hybrid: -10dB		Analog:92kHz: Moderate			30,000K
1777	Analog: -20dB		Analog:92kHz: Moderate			30,000K
1778	Hybrid: -20dB		Analog:92kHz: Moderate			30,000K
1779	Analog: -30dB		Analog:92kHz: Moderate			30,000K
1780	Hybrid: -30dB		Analog:92kHz: Moderate			30,000K
1781			Analog:92kHz: Moderate		Analog: 0dB	None
1782			Analog:92kHz: Moderate		Hybrid: 0dB	None
1783			Analog:92kHz: Moderate		Analog: -10dB	None
1784			Analog:92kHz: Moderate		Hybrid: -10dB	None
1785			Analog:92kHz: Moderate		Analog: -20dB	None
1786			Analog:92kHz: Moderate		Hybrid: -20dB	None
1787			Analog:92kHz: Moderate		Analog: -30dB	None
1788			Analog:92kHz: Moderate		Hybrid: -30dB	None
1789			Analog:92kHz: Moderate		Analog: 0dB	30,000K
1790			Analog:92kHz: Moderate		Hybrid: 0dB	30,000K
1791			Analog:92kHz: Moderate		Analog: -10dB	30,000K
1792			Analog:92kHz: Moderate		Hybrid: -10dB	30,000K
1793			Analog:92kHz: Moderate		Analog: -20dB	30,000K
1794			Analog:92kHz: Moderate		Hybrid: -20dB	30,000K
1795			Analog:92kHz: Moderate		Analog: -30dB	30,000K
1796			Analog:92kHz: Moderate		Hybrid: -30dB	30,000K

Table 4-7 Host Compatibility 67/92 SCA Scenarios (NRSC J.4)

#	Lower 2nd adj.	Lower 1st adj.	Desired	Upper 1st adj.	Upper 2nd adj.	AWGN
1851			67kHz:Analog: Strong			None
1852			67kHz: Hybrid: Strong			None
1853			67kHz: Analog: Moderate			None
1854			67kHz: Hybrid: Moderate			None
1855			67kHz:Analog: Strong			30,000K
1856			67kHz: Hybrid: Strong			30,000K
1857			67kHz: Analog: Moderate			30,000K
1858			67kHz: Hybrid: Moderate			30,000K
1859			92kHz:Analog: Strong			None
1860			92kHz: Hybrid: Strong			None
1861			92kHz: Analog: Moderate			None
1862			92kHz: Hybrid: Moderate			None
1863			92kHz:Analog: Strong			30,000K
1864			92kHz: Hybrid: Strong			30,000K
1865			92kHz: Analog: Moderate			30,000K
1866			92kHz: Hybrid: Moderate			30,000K

Table 4-8 Host Compatibility 67/92 SCA Scenarios – Baseband Plots (NRSC J.3)

#	Lower 2nd adj.	Lower 1st adj.	Desired	Upper 1st adj.	Upper 2nd adj.	AWGN	Main Audio
1867			Analog: Strong			None	1kHz
1868			Hybrid: Strong			None	1kHz
1869			Analog: Moderate			None	1kHz
1870			Hybrid: Moderate			None	1kHz
1871			Analog: Strong			30,000K	1kHz
1872			Hybrid: Strong			30,000K	1kHz
1873			Analog: Moderate			30,000K	1kHz
1874			Hybrid: Moderate			30,000K	1kHz
1875			Analog: Strong			None	Silence
1876			Hybrid: Strong			None	Silence

#	Lower 2nd adj.	Lower 1st adj.	Desired	Upper 1st adj.	Upper 2nd adj.	AWGN	Main Audio
1877			Analog: Moderate			None	Silence
1878			Hybrid: Moderate			None	Silence
1879			Analog: Strong			30,000K	Silence
1880			Hybrid: Strong			30,000K	Silence
1881			Analog: Moderate			30,000K	Silence
1882			Hybrid: Moderate			30,000K	Silence

Setup

Please refer to the test bed schematics and proof-of-performance record for details of the test platform setup. Note that SW7 thru SW12 shall be set such that the multipath simulators are bypassed. SW1 thru SW6 shall be used to set each channel to either analog, hybrid or off mode. AT1 thru AT3 shall be used to set D, U1 and U2 signal power levels in 0.25dB increments. Noise power levels shall be set with the AWGN generator's internal attenuator in 0.1dB increments.

Procedure for the Tests of Table 4-6 and Table 4-7

1) All four analog SCA receivers (see Appendix A) shall be used for this test series.
2) Table 4-6 and Table 4-7 shall be used as a guide for setting up each interference scenario. Each row of these tables shall be executed individually.
3) Establish the noise floor according to the AWGN column of the test grid. Refer to section 2.1.17 for a definition of AWGN noise, and 3.1.5 for the procedures of AWGN noise power measurement.
4) Establish the signal strength, frequency, and mode of the desired signal as indicated in the test grid. For a complete definition of the desired analog and desired hybrid signals, refer to 2.1.3 and 2.1.9, respectively. The procedures for measuring FM power may be found in 3.1.1 and 3.1.2.
5) Establish the signal strength, frequency, and mode of the interfering signals as indicated in the test grid. For a complete definition of the undesired analog interferer and undesired hybrid interferer signals, refer to 2.1.13 and 2.1.15, respectively. The procedures for measuring FM power may be found in 3.1.1 and 3.1.2.
6) Modulate the interferer's main channel audio with a CD recording of clipped pink noise (2.2.1).
7) Modulate the desired channel's main audio with a CD recording of clipped pink noise (2.2.1).
8) Modulate the desired channel's *interfering SCA* with the CD recording of LPF USASI noise (2.2.3).
9) Perform S/N measurements on the output audio of the SCA test receivers, according to the procedure detailed in 3.2.1. However, instead of using a 1kHz reference tone for the S/N measurement, use a *400Hz reference tone.*

Presentation of Data for the Tests of Table 4-6 and Table 4-7

The S/N ratio shall be expressed in dB units and rounded to the nearest 0.1dB. Note that this S/N reading is actually an average of multiple noise readings, as described in 3.2.1.

Procedure for the Tests of Table 4-8

1) A wideband professional demodulator shall be used for this test series (Belar RFA-4 downconverter and Belar FMMA-1 demodulator)

2) Table 4-8 shall be used as a guide for setting up each scenario. Each row of this table shall be executed individually.
3) Establish the noise floor according to the AWGN column of the test grid. Refer to section 2.1.17 for a definition of AWGN noise, and 3.1.5 for the procedures of AWGN noise power measurement.
4) Establish the signal strength, frequency, and mode of the desired signal as indicated in the test grid. For a definition of the desired analog and desired hybrid signals, refer to 2.1.1 and 2.1.7, respectively. Note, however, that the main channel modulation is slightly different, and should be set according to the test grid (either silence or 1kHz tone).
5) Use a spectrum analyzer to plot the composite output of the receiver across a frequency span of DC to 120kHz.

Presentation of Data for the Tests of Table 4-8

The spectrum analyzer plot is the sole test result for this series. The plot should contain the test I.D. number for each test, and a brief description of the test conditions.

4.5 Subjective Evaluation of 67/92kHz SCA's

Objectives

Characterize the performance of analog SCA receivers in the presence of both analog and hybrid interferers. Quantify the *difference* between the impact of an analog interferer and the impact of a hybrid interferer on SCA receivers.

Methodology

The objectives of this test series are identical to those of section 4.4. However, rather than using objective evaluation, the methodology is changed to accommodate subjective evaluation. The reader may then use the objective test results of 4.4 in concert with the subjective test results of 4.5 to achieve the aforementioned objectives.

As was the case for section 4.4, various interference scenarios shall be generated by the test platform and coupled into four SCA test receivers. These interference scenarios will include 1st and 2nd adjacent analog and hybrid signals at varying power levels. IBOC sidebands will also be added to an analog "host" signal to evaluate the impact of these sidebands on the analog host. There shall be *no* multipath present in the interference scenarios of this test series.

The performance of the four SCA receivers will then be *subjectively* evaluated under each of these interference scenarios. For each scenario, various audio recordings will be made of the receivers' outputs. These recordings may then be used for subjective scoring.

Upon completion of these tests and the subjective scoring of the recordings, the scores may be separated into cases with analog interferers and cases with hybrid interferers. All of the cases with analog interferers should be used as a baseline. The cases with hybrid interferers may then be compared against the baseline of analog interferers. The result of this comparison will provide the subjectively evaluated *difference* between analog and hybrid interferers.

Test Conditions

Table 4-9 and Table 4-10 list all of the interference scenarios to be included in this test series. These scenarios were chosen by the NRSC DAB Subcommittee. The following information may be helpful in understanding the construction of these tables:

1. Each row of the table represents one test, and each test is assigned a unique identification number in the # column.
2. In the *Desired* column, the mode of the desired signal is indicated as: *Analog* or *Hybrid.* The power of the desired signal is also indicated: *Strong (-47dBm), Moderate (-62dBm),* or *Weak (-77dBm).* The SCA frequency of interest is specified as either 67kHz or 92kHz.
3. In the interferer columns, the mode of the interferer is indicated: *Analog* or *Hybrid.* Next to the mode of the interferer is a D/U ratio, which indicates the power of the interferer in dB units with respect to the desired signal.
4. The *AWGN* column indicates the presence or absence of a broadband noise floor in the interference scenario. If there is to be no additional noise added, the caption *None* appears. If there is additional noise added, the absolute power level of the noise is indicated in Kelvin units.
5. The *Audio Cut* column specifies the audio selection which shall modulate the SCA under test.
6. The *RX* column indicates which one of the four SCA receivers shall be used for each test. A list of the four SCA receivers may be found in Appendix A.

Table 4-9 Single Interferer SCA Scenarios (NRSC F/SC.5 & F/SC.6)

#	Lower 2nd adj.	Lower 1st adj.	Desired	Upper 1st adj.	Upper 2nd adj.	AWGN	Audio Cut	RX
1901		Analog: +16dB	67kHz: Moderate			None	Female A3	1
1902		Hybrid: +16dB	67kHz: Moderate			None	Female A3	1
1903		Analog: +16dB	67kHz: Moderate			None	Male A3	1
1904		Hybrid: +16dB	67kHz: Moderate			None	Male A3	1
1905		Analog: +16dB	67kHz: Moderate			None	Crowded	1
1906		Hybrid: +16dB	67kHz: Moderate			None	Crowded	1
1907		Analog: +16dB	67kHz: Moderate			30,000K	Female A4	1
1908		Hybrid: +16dB	67kHz: Moderate			30,000K	Female A4	1
1909		Analog: +16dB	67kHz: Moderate			30,000K	Male A4	1
1910		Hybrid: +16dB	67kHz: Moderate			30,000K	Male A4	1
1911		Analog: +16dB	67kHz: Moderate			30,000K	Crowded	1
1912		Hybrid: +16dB	67kHz: Moderate			30,000K	Crowded	1
1913		Analog: +6dB	67kHz: Moderate			None	Female A3	1
1914		Hybrid: +6dB	67kHz: Moderate			None	Female A3	1
1915		Analog: +6dB	67kHz: Moderate			None	Male A3	1
1916		Hybrid: +6dB	67kHz: Moderate			None	Male A3	1
1917		Analog: +6dB	67kHz: Moderate			None	Crowded	1
1918		Hybrid: +6dB	67kHz: Moderate			None	Crowded	1
1919		Analog: +6dB	67kHz: Moderate			30,000K	Female A4	1
1920		Hybrid: +6dB	67kHz: Moderate			30,000K	Female A4	1
1921		Analog: +6dB	67kHz: Moderate			30,000K	Male A4	1
1922		Hybrid: +6dB	67kHz: Moderate			30,000K	Male A4	1
1923		Analog: +6dB	67kHz: Moderate			30,000K	Crowded	1
1924		Hybrid: +6dB	67kHz: Moderate			30,000K	Crowded	1
1925			67kHz: Moderate	Analog: +16dB		None	Female A3	1

#	Lower 2nd adj.	Lower 1st adj.	Desired	Upper 1st adj.	Upper 2nd adj.	AWGN	Audio Cut	RX
1926			67kHz: Moderate	Hybrid: +16dB		None	Female A3	1
1927			67kHz: Moderate	Analog: +16dB		None	Male A3	1
1928			67kHz: Moderate	Hybrid: +16dB		None	Male A3	1
1929			67kHz: Moderate	Analog: +16dB		None	Crowded	1
1930			67kHz: Moderate	Hybrid: +16dB		None	Crowded	1
1931			67kHz: Moderate	Analog: +16dB		30,000K	Female A4	1
1932			67kHz: Moderate	Hybrid: +16dB		30,000K	Female A4	1
1933			67kHz: Moderate	Analog: +16dB		30,000K	Male A4	1
1934			67kHz: Moderate	Hybrid: +16dB		30,000K	Male A4	1
1935			67kHz: Moderate	Analog: +16dB		30,000K	Crowded	1
1936			67kHz: Moderate	Hybrid: +16dB		30,000K	Crowded	1
1937			67kHz: Moderate	Analog: +6dB		None	Female A3	1
1938			67kHz: Moderate	Hybrid: +6dB		None	Female A3	1
1939			67kHz: Moderate	Analog: +6dB		None	Male A3	1
1940			67kHz: Moderate	Hybrid: +6dB		None	Male A3	1
1941			67kHz: Moderate	Analog: +6dB		None	Crowded	1
1942			67kHz: Moderate	Hybrid: +6dB		None	Crowded	1
1943			67kHz: Moderate	Analog: +6dB		30,000K	Female A4	1
1944			67kHz: Moderate	Hybrid: +6dB		30,000K	Female A4	1
1945			67kHz: Moderate	Analog: +6dB		30,000K	Male A4	1
1946			67kHz: Moderate	Hybrid: +6dB		30,000K	Male A4	1
1947			67kHz: Moderate	Analog: +6dB		30,000K	Crowded	1
1948			67kHz: Moderate	Hybrid: +6dB		30,000K	Crowded	1
1949	Analog: -10dB		67kHz: Moderate			None	Female A5	1
1950	Hybrid: -10dB		67kHz: Moderate			None	Female A5	1
1951	Analog: -10dB		67kHz: Moderate			None	Male A5	1
1952	Hybrid: -10dB		67kHz: Moderate			None	Male A5	1
1953	Analog: -10dB		67kHz: Moderate			None	CSNY	1
1954	Hybrid: -10dB		67kHz: Moderate			None	CSNY	1
1955	Analog: -10dB		67kHz: Moderate			30,000K	Female A6	1
1956	Hybrid: -10dB		67kHz: Moderate			30,000K	Female A6	1
1957	Analog: -10dB		67kHz: Moderate			30,000K	Male A6	1
1958	Hybrid: -10dB		67kHz: Moderate			30,000K	Male A6	1
1959	Analog: -10dB		67kHz: Moderate			30,000K	CSNY	1
1960	Hybrid: -10dB		67kHz: Moderate			30,000K	CSNY	1
1961	Analog: -30dB		67kHz: Moderate			None	Female A5	1
1962	Hybrid: -30dB		67kHz: Moderate			None	Female A5	1
1963	Analog: -30dB		67kHz: Moderate			None	Male A5	1
1964	Hybrid: -30dB		67kHz: Moderate			None	Male A5	1
1965	Analog: -30dB		67kHz: Moderate			None	CSNY	1
1966	Hybrid: -30dB		67kHz: Moderate			None	CSNY	1
1967	Analog: -30dB		67kHz: Moderate			30,000K	Female A6	1
1968	Hybrid: -30dB		67kHz: Moderate			30,000K	Female A6	1
1969	Analog: -30dB		67kHz: Moderate			30,000K	Male A6	1
1970	Hybrid: -30dB		67kHz: Moderate			30,000K	Male A6	1
1971	Analog: -30dB		67kHz: Moderate			30,000K	CSNY	1
1972	Hybrid: -30dB		67kHz: Moderate			30,000K	CSNY	1
1973			67kHz: Moderate		Analog: -10dB	None	Female A5	1
1974			67kHz: Moderate		Hybrid: -10dB	None	Female A5	1
1975			67kHz: Moderate		Analog: -10dB	None	Male A5	1
1976			67kHz: Moderate		Hybrid: -10dB	None	Male A5	1
1977			67kHz: Moderate		Analog: -10dB	None	CSNY	1

#	Lower 2nd adj.	Lower 1st adj.	Desired	Upper 1st adj.	Upper 2nd adj.	AWGN	Audio Cut	RX
1978			67kHz: Moderate		Hybrid: -10dB	None	CSNY	1
1979			67kHz: Moderate		Analog: -10dB	30,000K	Female A6	1
1980			67kHz: Moderate		Hybrid: -10dB	30,000K	Female A6	1
1981			67kHz: Moderate		Analog: -10dB	30,000K	Male A6	1
1982			67kHz: Moderate		Hybrid: -10dB	30,000K	Male A6	1
1983			67kHz: Moderate		Analog: -10dB	30,000K	CSNY	1
1984			67kHz: Moderate		Hybrid: -10dB	30,000K	CSNY	1
1985			67kHz: Moderate		Analog: -30dB	None	Female A5	1
1986			67kHz: Moderate		Hybrid: -30dB	None	Female A5	1
1987			67kHz: Moderate		Analog: -30dB	None	Male A5	1
1988			67kHz: Moderate		Hybrid: -30dB	None	Male A5	1
1989			67kHz: Moderate		Analog: -30dB	None	CSNY	1
1990			67kHz: Moderate		Hybrid: -30dB	None	CSNY	1
1991			67kHz: Moderate		Analog: -30dB	30,000K	Female A6	1
1992			67kHz: Moderate		Hybrid: -30dB	30,000K	Female A6	1
1993			67kHz: Moderate		Analog: -30dB	30,000K	Male A6	1
1994			67kHz: Moderate		Hybrid: -30dB	30,000K	Male A6	1
1995			67kHz: Moderate		Analog: -30dB	30,000K	CSNY	1
1996			67kHz: Moderate		Hybrid: -30dB	30,000K	CSNY	1
1997		Analog: +16dB	67kHz: Moderate			None	Female B3	2
1998		Hybrid: +16dB	67kHz: Moderate			None	Female B3	2
1999		Analog: +16dB	67kHz: Moderate			None	Male B3	2
2000		Hybrid: +16dB	67kHz: Moderate			None	Male B3	2
2001		Analog: +16dB	67kHz: Moderate			None	Simon	2
2002		Hybrid: +16dB	67kHz: Moderate			None	Simon	2
2003		Analog: +16dB	67kHz: Moderate			30,000K	Female B4	2
2004		Hybrid: +16dB	67kHz: Moderate			30,000K	Female B4	2
2005		Analog: +16dB	67kHz: Moderate			30,000K	Male B4	2
2006		Hybrid: +16dB	67kHz: Moderate			30,000K	Male B4	2
2007		Analog: +16dB	67kHz: Moderate			30,000K	Simon	2
2008		Hybrid: +16dB	67kHz: Moderate			30,000K	Simon	2
2009		Analog: +6dB	67kHz: Moderate			None	Female B3	2
2010		Hybrid: +6dB	67kHz: Moderate			None	Female B3	2
2011		Analog: +6dB	67kHz: Moderate			None	Male B3	2
2012		Hybrid: +6dB	67kHz: Moderate			None	Male B3	2
2013		Analog: +6dB	67kHz: Moderate			None	Simon	2
2014		Hybrid: +6dB	67kHz: Moderate			None	Simon	2
2015		Analog: +6dB	67kHz: Moderate			30,000K	Female B4	2
2016		Hybrid: +6dB	67kHz: Moderate			30,000K	Female B4	2
2017		Analog: +6dB	67kHz: Moderate			30,000K	Male B4	2
2018		Hybrid: +6dB	67kHz: Moderate			30,000K	Male B4	2
2019		Analog: +6dB	67kHz: Moderate			30,000K	Simon	2
2020		Hybrid: +6dB	67kHz: Moderate			30,000K	Simon	2
2021			67kHz: Moderate	Analog: +16dB		None	Female B3	2
2022			67kHz: Moderate	Hybrid: +16dB		None	Female B3	2
2023			67kHz: Moderate	Analog: +16dB		None	Male B3	2
2024			67kHz: Moderate	Hybrid: +16dB		None	Male B3	2
2025			67kHz: Moderate	Analog: +16dB		None	Simon	2
2026			67kHz: Moderate	Hybrid: +16dB		None	Simon	2
2027			67kHz: Moderate	Analog: +16dB		30,000K	Female B4	2
2028			67kHz: Moderate	Hybrid: +16dB		30,000K	Female B4	2

#	Lower 2nd adj.	Lower 1st adj.	Desired	Upper 1st adj.	Upper 2nd adj.	AWGN	Audio Cut	RX
2029			67kHz: Moderate	Analog: +16dB		30,000K	Male B4	2
2030			67kHz: Moderate	Hybrid: +16dB		30,000K	Male B4	2
2031			67kHz: Moderate	Analog: +16dB		30,000K	Simon	2
2032			67kHz: Moderate	Hybrid: +16dB		30,000K	Simon	2
2033			67kHz: Moderate	Analog: +6dB		None	Female B3	2
2034			67kHz: Moderate	Hybrid: +6dB		None	Female B3	2
2035			67kHz: Moderate	Analog: +6dB		None	Male B3	2
2036			67kHz: Moderate	Hybrid: +6dB		None	Male B3	2
2037			67kHz: Moderate	Analog: +6dB		None	Simon	2
2038			67kHz: Moderate	Hybrid: +6dB		None	Simon	2
2039			67kHz: Moderate	Analog: +6dB		30,000K	Female B4	2
2040			67kHz: Moderate	Hybrid: +6dB		30,000K	Female B4	2
2041			67kHz: Moderate	Analog: +6dB		30,000K	Male B4	2
2042			67kHz: Moderate	Hybrid: +6dB		30,000K	Male B4	2
2043			67kHz: Moderate	Analog: +6dB		30,000K	Simon	2
2044			67kHz: Moderate	Hybrid: +6dB		30,000K	Simon	2
2045	Analog: -10dB		67kHz: Moderate			None	Female B5	2
2046	Hybrid: -10dB		67kHz: Moderate			None	Female B5	2
2047	Analog: -10dB		67kHz: Moderate			None	Male B5	2
2048	Hybrid: -10dB		67kHz: Moderate			None	Male B5	2
2049	Analog: -10dB		67kHz: Moderate			None	Travis	2
2050	Hybrid: -10dB		67kHz: Moderate			None	Travis	2
2051	Analog: -10dB		67kHz: Moderate			30,000K	Female B6	2
2052	Hybrid: -10dB		67kHz: Moderate			30,000K	Female B6	2
2053	Analog: -10dB		67kHz: Moderate			30,000K	Male B6	2
2054	Hybrid: -10dB		67kHz: Moderate			30,000K	Male B6	2
2055	Analog: -10dB		67kHz: Moderate			30,000K	Travis	2
2056	Hybrid: -10dB		67kHz: Moderate			30,000K	Travis	2
2057	Analog: -30dB		67kHz: Moderate			None	Female B5	2
2058	Hybrid: -30dB		67kHz: Moderate			None	Female B5	2
2059	Analog: -30dB		67kHz: Moderate			None	Male B5	2
2060	Hybrid: -30dB		67kHz: Moderate			None	Male B5	2
2061	Analog: -30dB		67kHz: Moderate			None	Travis	2
2062	Hybrid: -30dB		67kHz: Moderate			None	Travis	2
2063	Analog: -30dB		67kHz: Moderate			30,000K	Female B6	2
2064	Hybrid: -30dB		67kHz: Moderate			30,000K	Female B6	2
2065	Analog: -30dB		67kHz: Moderate			30,000K	Male B6	2
2066	Hybrid: -30dB		67kHz: Moderate			30,000K	Male B6	2
2067	Analog: -30dB		67kHz: Moderate			30,000K	Travis	2
2068	Hybrid: -30dB		67kHz: Moderate			30,000K	Travis	2
2069			67kHz: Moderate		Analog: -10dB	None	Female B5	2
2070			67kHz: Moderate		Hybrid: -10dB	None	Female B5	2
2071			67kHz: Moderate		Analog: -10dB	None	Male B5	2
2072			67kHz: Moderate		Hybrid: -10dB	None	Male B5	2
2073			67kHz: Moderate		Analog: -10dB	None	Travis	2
2074			67kHz: Moderate		Hybrid: -10dB	None	Travis	2
2075			67kHz: Moderate		Analog: -10dB	30,000K	Female B6	2
2076			67kHz: Moderate		Hybrid: -10dB	30,000K	Female B6	2
2077			67kHz: Moderate		Analog: -10dB	30,000K	Male B6	2
2078			67kHz: Moderate		Hybrid: -10dB	30,000K	Male B6	2
2079			67kHz: Moderate		Analog: -10dB	30,000K	Travis	2
2080			67kHz: Moderate		Hybrid: -10dB	30,000K	Travis	2

#	Lower 2nd adj.	Lower 1st adj.	Desired	Upper 1st adj.	Upper 2nd adj.	AWGN	Audio Cut	RX
2081			67kHz: Moderate		Analog: -30dB	None	Female B5	2
2082			67kHz: Moderate		Hybrid: -30dB	None	Female B5	2
2083			67kHz: Moderate		Analog: -30dB	None	Male B5	2
2084			67kHz: Moderate		Hybrid: -30dB	None	Male B5	2
2085			67kHz: Moderate		Analog: -30dB	None	Travis	2
2086			67kHz: Moderate		Hybrid: -30dB	None	Travis	2
2087			67kHz: Moderate		Analog: -30dB	30,000K	Female B6	2
2088			67kHz: Moderate		Hybrid: -30dB	30,000K	Female B6	2
2089			67kHz: Moderate		Analog: -30dB	30,000K	Male B6	2
2090			67kHz: Moderate		Hybrid: -30dB	30,000K	Male B6	2
2091			67kHz: Moderate		Analog: -30dB	30,000K	Travis	2
2092			67kHz: Moderate		Hybrid: -30dB	30,000K	Travis	2
2093		Analog: +16dB	92kHz: Moderate			None	Female C3	3
2094		Hybrid: +16dB	92kHz: Moderate			None	Female C3	3
2095		Analog: +16dB	92kHz: Moderate			None	Male C3	3
2096		Hybrid: +16dB	92kHz: Moderate			None	Male C3	3
2097		Analog: +16dB	92kHz: Moderate			None	Simon	3
2098		Hybrid: +16dB	92kHz: Moderate			None	Simon	3
2099		Analog: +16dB	92kHz: Moderate			30,000K	Female C4	3
2100		Hybrid: +16dB	92kHz: Moderate			30,000K	Female C4	3
2101		Analog: +16dB	92kHz: Moderate			30,000K	Male C4	3
2102		Hybrid: +16dB	92kHz: Moderate			30,000K	Male C4	3
2103		Analog: +16dB	92kHz: Moderate			30,000K	Simon	3
2104		Hybrid: +16dB	92kHz: Moderate			30,000K	Simon	3
2105		Analog: +6dB	92kHz: Moderate			None	Female C3	3
2106		Hybrid: +6dB	92kHz: Moderate			None	Female C3	3
2107		Analog: +6dB	92kHz: Moderate			None	Male C3	3
2108		Hybrid: +6dB	92kHz: Moderate			None	Male C3	3
2109		Analog: +6dB	92kHz: Moderate			None	Simon	3
2110		Hybrid: +6dB	92kHz: Moderate			None	Simon	3
2111		Analog: +6dB	92kHz: Moderate			30,000K	Female C4	3
2112		Hybrid: +6dB	92kHz: Moderate			30,000K	Female C4	3
2113		Analog: +6dB	92kHz: Moderate			30,000K	Male C4	3
2114		Hybrid: +6dB	92kHz: Moderate			30,000K	Male C4	3
2115		Analog: +6dB	92kHz: Moderate			30,000K	Simon	3
2116		Hybrid: +6dB	92kHz: Moderate			30,000K	Simon	3
2117			92kHz: Moderate	Analog: +16dB		None	Female C3	3
2118			92kHz: Moderate	Hybrid: +16dB		None	Female C3	3
2119			92kHz: Moderate	Analog: +16dB		None	Male C3	3
2120			92kHz: Moderate	Hybrid: +16dB		None	Male C3	3
2121			92kHz: Moderate	Analog: +16dB		None	Simon	3
2122			92kHz: Moderate	Hybrid: +16dB		None	Simon	3
2123			92kHz: Moderate	Analog: +16dB		30,000K	Female C4	3
2124			92kHz: Moderate	Hybrid: +16dB		30,000K	Female C4	3
2125			92kHz: Moderate	Analog: +16dB		30,000K	Male C4	3
2126			92kHz: Moderate	Hybrid: +16dB		30,000K	Male C4	3
2127			92kHz: Moderate	Analog: +16dB		30,000K	Simon	3
2128			92kHz: Moderate	Hybrid: +16dB		30,000K	Simon	3
2129			92kHz: Moderate	Analog: +6dB		None	Female C3	3
2130			92kHz: Moderate	Hybrid: +6dB		None	Female C3	3
2131			92kHz: Moderate	Analog: +6dB		None	Male C3	3

#	Lower 2nd adj.	Lower 1st adj.	Desired	Upper 1st adj.	Upper 2nd adj.	AWGN	Audio Cut	RX
2132			92kHz: Moderate	Hybrid: +6dB		None	Male C3	3
2133			92kHz: Moderate	Analog: +6dB		None	Simon	3
2134			92kHz: Moderate	Hybrid: +6dB		None	Simon	3
2135			92kHz: Moderate	Analog: +6dB		30,000K	Female C4	3
2136			92kHz: Moderate	Hybrid: +6dB		30,000K	Female C4	3
2137			92kHz: Moderate	Analog: +6dB		30,000K	Male C4	3
2138			92kHz: Moderate	Hybrid: +6dB		30,000K	Male C4	3
2139			92kHz: Moderate	Analog: +6dB		30,000K	Simon	3
2140			92kHz: Moderate	Hybrid: +6dB		30,000K	Simon	3
2141	Analog: -10dB		92kHz: Moderate			None	Female C5	3
2142	Hybrid: -10dB		92kHz: Moderate			None	Female C5	3
2143	Analog: -10dB		92kHz: Moderate			None	Male C5	3
2144	Hybrid: -10dB		92kHz: Moderate			None	Male C5	3
2145	Analog: -10dB		92kHz: Moderate			None	Travis	3
2146	Hybrid: -10dB		92kHz: Moderate			None	Travis	3
2147	Analog: -10dB		92kHz: Moderate			30,000K	Female C6	3
2148	Hybrid: -10dB		92kHz: Moderate			30,000K	Female C6	3
2149	Analog: -10dB		92kHz: Moderate			30,000K	Male C6	3
2150	Hybrid: -10dB		92kHz: Moderate			30,000K	Male C6	3
2151	Analog: -10dB		92kHz: Moderate			30,000K	Travis	3
2152	Hybrid: -10dB		92kHz: Moderate			30,000K	Travis	3
2153	Analog: -30dB		92kHz: Moderate			None	Female C5	3
2154	Hybrid: -30dB		92kHz: Moderate			None	Female C5	3
2155	Analog: -30dB		92kHz: Moderate			None	Male C5	3
2156	Hybrid: -30dB		92kHz: Moderate			None	Male C5	3
2157	Analog: -30dB		92kHz: Moderate			None	Travis	3
2158	Hybrid: -30dB		92kHz: Moderate			None	Travis	3
2159	Analog: -30dB		92kHz: Moderate			30,000K	Female C6	3
2160	Hybrid: -30dB		92kHz: Moderate			30,000K	Female C6	3
2161	Analog: -30dB		92kHz: Moderate			30,000K	Male C6	3
2162	Hybrid: -30dB		92kHz: Moderate			30,000K	Male C6	3
2163	Analog: -30dB		92kHz: Moderate			30,000K	Travis	3
2164	Hybrid: -30dB		92kHz: Moderate			30,000K	Travis	3
2165			92kHz: Moderate		Analog: -10dB	None	Female C5	3
2166			92kHz: Moderate		Hybrid: -10dB	None	Female C5	3
2167			92kHz: Moderate		Analog: -10dB	None	Male C5	3
2168			92kHz: Moderate		Hybrid: -10dB	None	Male C5	3
2169			92kHz: Moderate		Analog: -10dB	None	Travis	3
2170			92kHz: Moderate		Hybrid: -10dB	None	Travis	3
2171			92kHz: Moderate		Analog: -10dB	30,000K	Female C6	3
2172			92kHz: Moderate		Hybrid: -10dB	30,000K	Female C6	3
2173			92kHz: Moderate		Analog: -10dB	30,000K	Male C6	3
2174			92kHz: Moderate		Hybrid: -10dB	30,000K	Male C6	3
2175			92kHz: Moderate		Analog: -10dB	30,000K	Travis	3
2176			92kHz: Moderate		Hybrid: -10dB	30,000K	Travis	3
2177			92kHz: Moderate		Analog: -30dB	None	Female C5	3
2178			92kHz: Moderate		Hybrid: -30dB	None	Female C5	3
2179			92kHz: Moderate		Analog: -30dB	None	Male C5	3
2180			92kHz: Moderate		Hybrid: -30dB	None	Male C5	3
2181			92kHz: Moderate		Analog: -30dB	None	Travis	3
2182			92kHz: Moderate		Hybrid: -30dB	None	Travis	3

#	Lower 2nd adj.	Lower 1st adj.	Desired	Upper 1st adj.	Upper 2nd adj.	AWGN	Audio Cut	RX
2183			92kHz: Moderate		Analog: -30dB	30,000K	Female C6	3
2184			92kHz: Moderate		Hybrid: -30dB	30,000K	Female C6	3
2185			92kHz: Moderate		Analog: -30dB	30,000K	Male C6	3
2186			92kHz: Moderate		Hybrid: -30dB	30,000K	Male C6	3
2187			92kHz: Moderate		Analog: -30dB	30,000K	Travis	3
2188			92kHz: Moderate		Hybrid: -30dB	30,000K	Travis	3
2189		Analog: +16dB	92kHz: Moderate			None	Female C9	4
2190		Hybrid: +16dB	92kHz: Moderate			None	Female C9	4
2191		Analog: +16dB	92kHz: Moderate			None	Male A9	4
2192		Hybrid: +16dB	92kHz: Moderate			None	Male A9	4
2193		Analog: +16dB	92kHz: Moderate			None	Crowded	4
2194		Hybrid: +16dB	92kHz: Moderate			None	Crowded	4
2195		Analog: +16dB	92kHz: Moderate			30,000K	Female C10	4
2196		Hybrid: +16dB	92kHz: Moderate			30,000K	Female C10	4
2197		Analog: +16dB	92kHz: Moderate			30,000K	Male A10	4
2198		Hybrid: +16dB	92kHz: Moderate			30,000K	Male A10	4
2199		Analog: +16dB	92kHz: Moderate			30,000K	Crowded	4
2200		Hybrid: +16dB	92kHz: Moderate			30,000K	Crowded	4
2201		Analog: +6dB	92kHz: Moderate			None	Female C9	4
2202		Hybrid: +6dB	92kHz: Moderate			None	Female C9	4
2203		Analog: +6dB	92kHz: Moderate			None	Male A9	4
2204		Hybrid: +6dB	92kHz: Moderate			None	Male A9	4
2205		Analog: +6dB	92kHz: Moderate			None	Crowded	4
2206		Hybrid: +6dB	92kHz: Moderate			None	Crowded	4
2207		Analog: +6dB	92kHz: Moderate			30,000K	Female C10	4
2208		Hybrid: +6dB	92kHz: Moderate			30,000K	Female C10	4
2209		Analog: +6dB	92kHz: Moderate			30,000K	Male A10	4
2210		Hybrid: +6dB	92kHz: Moderate			30,000K	Male A10	4
2211		Analog: +6dB	92kHz: Moderate			30,000K	Crowded	4
2212		Hybrid: +6dB	92kHz: Moderate			30,000K	Crowded	4
2213			92kHz: Moderate	Analog: +16dB		None	Female C9	4
2214			92kHz: Moderate	Hybrid: +16dB		None	Female C9	4
2215			92kHz: Moderate	Analog: +16dB		None	Male A9	4
2216			92kHz: Moderate	Hybrid: +16dB		None	Male A9	4
2217			92kHz: Moderate	Analog: +16dB		None	Crowded	4
2218			92kHz: Moderate	Hybrid: +16dB		None	Crowded	4
2219			92kHz: Moderate	Analog: +16dB		30,000K	Female C10	4
2220			92kHz: Moderate	Hybrid: +16dB		30,000K	Female C10	4
2221			92kHz: Moderate	Analog: +16dB		30,000K	Male A10	4
2222			92kHz: Moderate	Hybrid: +16dB		30,000K	Male A10	4
2223			92kHz: Moderate	Analog: +16dB		30,000K	Crowded	4
2224			92kHz: Moderate	Hybrid: +16dB		30,000K	Crowded	4
2225			92kHz: Moderate	Analog: +6dB		None	Female C9	4
2226			92kHz: Moderate	Hybrid: +6dB		None	Female C9	4
2227			92kHz: Moderate	Analog: +6dB		None	Male A9	4
2228			92kHz: Moderate	Hybrid: +6dB		None	Male A9	4
2229			92kHz: Moderate	Analog: +6dB		None	Crowded	4
2230			92kHz: Moderate	Hybrid: +6dB		None	Crowded	4
2231			92kHz: Moderate	Analog: +6dB		30,000K	Female C10	4
2232			92kHz: Moderate	Hybrid: +6dB		30,000K	Female C10	4
2233			92kHz: Moderate	Analog: +6dB		30,000K	Male A10	4
2234			92kHz: Moderate	Hybrid: +6dB		30,000K	Male A10	4

#	Lower 2nd adj.	Lower 1st adj.	Desired	Upper 1st adj.	Upper 2nd adj.	AWGN	Audio Cut	RX
2235			92kHz: Moderate	Analog: +6dB		30,000K	Crowded	4
2236			92kHz: Moderate	Hybrid: +6dB		30,000K	Crowded	4
2237	Analog: -10dB		92kHz: Moderate			None	Female C11	4
2238	Hybrid: -10dB		92kHz: Moderate			None	Female C11	4
2239	Analog: -10dB		92kHz: Moderate			None	Male A11	4
2240	Hybrid: -10dB		92kHz: Moderate			None	Male A11	4
2241	Analog: -10dB		92kHz: Moderate			None	CSNY	4
2242	Hybrid: -10dB		92kHz: Moderate			None	CSNY	4
2243	Analog: -10dB		92kHz: Moderate			30,000K	Female C12	4
2244	Hybrid: -10dB		92kHz: Moderate			30,000K	Female C12	4
2245	Analog: -10dB		92kHz: Moderate			30,000K	Male A12	4
2246	Hybrid: -10dB		92kHz: Moderate			30,000K	Male A12	4
2247	Analog: -10dB		92kHz: Moderate			30,000K	CSNY	4
2248	Hybrid: -10dB		92kHz: Moderate			30,000K	CSNY	4
2249	Analog: -30dB		92kHz: Moderate			None	Female C11	4
2250	Hybrid: -30dB		92kHz: Moderate			None	Female C11	4
2251	Analog: -30dB		92kHz: Moderate			None	Male A11	4
2252	Hybrid: -30dB		92kHz: Moderate			None	Male A11	4
2253	Analog: -30dB		92kHz: Moderate			None	CSNY	4
2254	Hybrid: -30dB		92kHz: Moderate			None	CSNY	4
2255	Analog: -30dB		92kHz: Moderate			30,000K	Female C12	4
2256	Hybrid: -30dB		92kHz: Moderate			30,000K	Female C12	4
2257	Analog: -30dB		92kHz: Moderate			30,000K	Male A12	4
2258	Hybrid: -30dB		92kHz: Moderate			30,000K	Male A12	4
2259	Analog: -30dB		92kHz: Moderate			30,000K	CSNY	4
2260	Hybrid: -30dB		92kHz: Moderate			30,000K	CSNY	4
2261			92kHz: Moderate		Analog: -10dB	None	Female C11	4
2262			92kHz: Moderate		Hybrid: -10dB	None	Female C11	4
2263			92kHz: Moderate		Analog: -10dB	None	Male A11	4
2264			92kHz: Moderate		Hybrid: -10dB	None	Male A11	4
2265			92kHz: Moderate		Analog: -10dB	None	CSNY	4
2266			92kHz: Moderate		Hybrid: -10dB	None	CSNY	4
2267			92kHz: Moderate		Analog: -10dB	30,000K	Female C12	4
2268			92kHz: Moderate		Hybrid: -10dB	30,000K	Female C12	4
2269			92kHz: Moderate		Analog: -10dB	30,000K	Male A12	4
2270			92kHz: Moderate		Hybrid: -10dB	30,000K	Male A12	4
2271			92kHz: Moderate		Analog: -10dB	30,000K	CSNY	4
2272			92kHz: Moderate		Hybrid: -10dB	30,000K	CSNY	4
2273			92kHz: Moderate		Analog: -30dB	None	Female C11	4
2274			92kHz: Moderate		Hybrid: -30dB	None	Female C11	4
2275			92kHz: Moderate		Analog: -30dB	None	Male A11	4
2276			92kHz: Moderate		Hybrid: -30dB	None	Male A11	4
2277			92kHz: Moderate		Analog: -30dB	None	CSNY	4
2278			92kHz: Moderate		Hybrid: -30dB	None	CSNY	4
2279			92kHz: Moderate		Analog: -30dB	30,000K	Female C12	4
2280			92kHz: Moderate		Hybrid: -30dB	30,000K	Female C12	4
2281			92kHz: Moderate		Analog: -30dB	30,000K	Male A12	4
2282			92kHz: Moderate		Hybrid: -30dB	30,000K	Male A12	4
2283			92kHz: Moderate		Analog: -30dB	30,000K	CSNY	4
2284			92kHz: Moderate		Hybrid: -30dB	30,000K	CSNY	4

Table 4-10 Host Compatibility SCA Scenarios (NRSC J.4.4 & J.4.5)

#	Lower 2nd adj.	Lower 1st adj.	Desired	Upper 1st adj.	Upper 2nd adj.	AWGN	Audio Cut	RX
2301			67kHz Analog: Strong			None	Female A1	1
2302			67kHz Hybrid: Strong			None	Female A1	1
2303			67kHz Analog: Strong			None	Male A1	1
2304			67kHz Hybrid: Strong			None	Male A1	1
2305			67kHz Analog: Strong			None	Clapton	1
2306			67kHz Hybrid: Strong			None	Clapton	1
2307			67kHz Analog: Strong			30,000K	Female A2	1
2308			67kHz Hybrid: Strong			30,000K	Female A2	1
2309			67kHz Analog: Strong			30,000K	Male A2	1
2310			67kHz Hybrid: Strong			30,000K	Male A2	1
2311			67kHz Analog: Strong			30,000K	Clapton	1
2312			67kHz Hybrid: Strong			30,000K	Clapton	1
2313			67kHz Analog: Moderate			None	Female A1	1
2314			67kHz Hybrid: Moderate			None	Female A1	1
2315			67kHz Analog: Moderate			None	Male A1	1
2316			67kHz Hybrid: Moderate			None	Male A1	1
2317			67kHz Analog: Moderate			None	Clapton	1
2318			67kHz Hybrid: Moderate			None	Clapton	1
2319			67kHz Analog: Moderate			30,000K	Female A2	1
2320			67kHz Hybrid: Moderate			30,000K	Female A2	1
2321			67kHz Analog: Moderate			30,000K	Male A2	1
2322			67kHz Hybrid: Moderate			30,000K	Male A2	1
2323			67kHz Analog: Moderate			30,000K	Clapton	1
2324			67kHz Hybrid: Moderate			30,000K	Clapton	1
2325			67kHz Analog: Strong			None	Female B1	2
2326			67kHz Hybrid: Strong			None	Female B1	2
2327			67kHz Analog: Strong			None	Male B1	2
2328			67kHz Hybrid: Strong			None	Male B1	2
2329			67kHz Analog: Strong			None	Fagen	2
2330			67kHz Hybrid: Strong			None	Fagen	2
2331			67kHz Analog: Strong			30,000K	Female B2	2
2332			67kHz Hybrid: Strong			30,000K	Female B2	2
2333			67kHz Analog: Strong			30,000K	Male B2	2
2334			67kHz Hybrid: Strong			30,000K	Male B2	2
2335			67kHz Analog: Strong			30,000K	Fagen	2
2336			67kHz Hybrid: Strong			30,000K	Fagen	2
2337			67kHz Analog: Moderate			None	Female B1	2
2338			67kHz Hybrid: Moderate			None	Female B1	2
2339			67kHz Analog: Moderate			None	Male B1	2
2340			67kHz Hybrid: Moderate			None	Male B1	2
2341			67kHz Analog: Moderate			None	Fagen	2
2342			67kHz Hybrid: Moderate			None	Fagen	2
2343			67kHz Analog: Moderate			30,000K	Female B2	2
2344			67kHz Hybrid: Moderate			30,000K	Female B2	2
2345			67kHz Analog: Moderate			30,000K	Male B2	2
2346			67kHz Hybrid: Moderate			30,000K	Male B2	2
2347			67kHz Analog: Moderate			30,000K	Fagen	2
2348			67kHz Hybrid: Moderate			30,000K	Fagen	2
2349			92kHz Analog: Strong			None	Female C1	3
2350			92kHz Hybrid: Strong			None	Female C1	3

#	Lower 2nd adj.	Lower 1st adj.	Desired	Upper 1st adj.	Upper 2nd adj.	AWGN	Audio Cut	RX
2351			92kHz Analog: Strong			None	Male C1	3
2352			92kHz Hybrid: Strong			None	Male C1	3
2353			92kHz Analog: Strong			None	Fagen	3
2354			92kHz Hybrid: Strong			None	Fagen	3
2355			92kHz Analog: Strong			30,000K	Female C2	3
2356			92kHz Hybrid: Strong			30,000K	Female C2	3
2357			92kHz Analog: Strong			30,000K	Male C2	3
2358			92kHz Hybrid: Strong			30,000K	Male C2	3
2359			92kHz Analog: Strong			30,000K	Fagen	3
2360			92kHz Hybrid: Strong			30,000K	Fagen	3
2361			92kHz Analog: Moderate			None	Female C1	3
2362			92kHz Hybrid: Moderate			None	Female C1	3
2363			92kHz Analog: Moderate			None	Male C1	3
2364			92kHz Hybrid: Moderate			None	Male C1	3
2365			92kHz Analog: Moderate			None	Fagen	3
2366			92kHz Hybrid: Moderate			None	Fagen	3
2367			92kHz Analog: Moderate			30,000K	Female C2	3
2368			92kHz Hybrid: Moderate			30,000K	Female C2	3
2369			92kHz Analog: Moderate			30,000K	Male C2	3
2370			92kHz Hybrid: Moderate			30,000K	Male C2	3
2371			92kHz Analog: Moderate			30,000K	Fagen	3
2372			92kHz Hybrid: Moderate			30,000K	Fagen	3
2373			92kHz Analog: Strong			None	Female C7	4
2374			92kHz Hybrid: Strong			None	Female C7	4
2375			92kHz Analog: Strong			None	Male A7	4
2376			92kHz Hybrid: Strong			None	Male A7	4
2377			92kHz Analog: Strong			None	Clapton	4
2378			92kHz Hybrid: Strong			None	Clapton	4
2379			92kHz Analog: Strong			30,000K	Female C8	4
2380			92kHz Hybrid: Strong			30,000K	Female C8	4
2381			92kHz Analog: Strong			30,000K	Male A8	4
2382			92kHz Hybrid: Strong			30,000K	Male A8	4
2383			92kHz Analog: Strong			30,000K	Clapton	4
2384			92kHz Hybrid: Strong			30,000K	Clapton	4
2385			92kHz Analog: Moderate			None	Female C7	4
2386			92kHz Hybrid: Moderate			None	Female C7	4
2387			92kHz Analog: Moderate			None	Male A7	4
2388			92kHz Hybrid: Moderate			None	Male A7	4
2389			92kHz Analog: Moderate			None	Clapton	4
2390			92kHz Hybrid: Moderate			None	Clapton	4
2391			92kHz Analog: Moderate			30,000K	Female C8	4
2392			92kHz Hybrid: Moderate			30,000K	Female C8	4
2393			92kHz Analog: Moderate			30,000K	Male A8	4
2394			92kHz Hybrid: Moderate			30,000K	Male A8	4
2395			92kHz Analog: Moderate			30,000K	Clapton	4
2396			92kHz Hybrid: Moderate			30,000K	Clapton	4

Setup

Please refer to the test bed schematics and proof-of-performance record for details of the test platform setup. Note that SW7 thru SW12 shall be set such that the multipath simulators are bypassed. SW1 thru SW6 shall be used to set each channel to either analog,

hybrid or off mode. AT1 thru AT3 shall be used to set D, U1 and U2 signal power levels in 0.25dB increments. Noise power levels shall be set with the AWGN generator's internal attenuator in 0.1dB increments.

Procedure

1) All four analog SCA receivers (see Appendix A) shall be used for this test series.
2) Table 4-9 and Table 4-10 shall be used as a guide for setting up each interference scenario. Each row of these tables shall be executed individually.
3) Establish the noise floor according to the AWGN column of the test grid. Refer to section 2.1.17 for a definition of AWGN noise, and 3.1.5 for the procedures of AWGN noise power measurement.
4) Establish the signal strength, frequency, and mode of the desired signal as indicated in the test grid. For a complete definition of the desired analog and desired hybrid signals, refer to 2.1.4 and 2.1.10, respectively. The procedures for measuring FM power may be found in 3.1.1 and 3.1.2.
5) Establish the signal strength, frequency, and mode of the interfering signals as indicated in the test grid. For a complete definition of the undesired analog interferer and undesired hybrid interferer signals, refer to 2.1.14 and 2.1.16, respectively. The procedure for measuring FM power may be found in 3.1.1 and 3.1.2.
6) Modulate the interferer's main channel audio with a CD recording of processed rock (2.2.2).
7) Modulate the desired channel's main audio with a CD recording of MMW with Medium processing applied (see Appendices B and C).
8) Modulate the desired channel's *interfering SCA* with the MaleB1 audio cut (see Table B-2 in Appendix B).
9) Begin recording the output of the SCA receiver(s) to digital audio tape according to 3.3.1.
10) Play the appropriate audio cut on the SCA of the desired channel, as indicated in the test grid.
11) Perform the audio transfer, editing, leveling and renaming process described in 3.3.2 and 3.3.3.

Presentation of Data

The test results shall consist of digital audio recordings. Individual cuts/tests on the recordings shall be easily accessible, and identified with unique time code and track numbers.

4.6 Objective Evaluation of RBDS

Objectives

Characterize the performance of an RBDS receiver in the presence of both analog and hybrid interferers. Quantify the *difference* between the impact of an analog interferer and the impact of a hybrid interferer on an RBDS receiver.

Methodology

In order to meet the above objectives, various interference scenarios shall be generated by the test platform and coupled into an RBDS receiver. These interference scenarios will include 1st and 2nd adjacent analog and hybrid signals at varying power levels. IBOC sidebands will also be added to an analog "host" signal to evaluate the impact of these

sidebands on the RBDS of the analog host. In addition to these variables, the RBDS injection level will also be switched between 3% and 10% in order to evaluate the performance of RBDS under varying station configurations. There will be *no* multipath present in the interference scenarios of this test series.

The performance of the RBDS receiver will then be objectively evaluated under each of these interference scenarios. For each scenario, the Block Error Rate (BLER) of the received RBDS signal will be measured. The RBDS receiver under test, the Audemat system, incorporates RBDS evaluation software, which facilitates these measurements. This BLER measurement may then be used as an objective measure of receiver performance.

Upon completion of these tests, the test results data may be separated into cases with analog interferers and cases with hybrid interferers. All of the cases with analog interferers should be used as a baseline. The cases with hybrid interferers may then be compared against the baseline of analog interferers. The result of this comparison will provide the objectively evaluated *difference* between analog and hybrid interferers.

Test Conditions

1. Each row of the table represents one test, and each test is assigned a unique identification number in the # column.
2. In the *Desired* column, the mode of the desired signal is indicated as: *Analog* or *Hybrid.* The power of the desired signal is also indicated: *Strong (-47dBm), Moderate (-62dBm),* or *Weak (-77dBm).*
3. In the interferer columns, the mode of the interferer is indicated: *Analog* or *Hybrid.* Next to the mode of the interferer is a D/U ratio, which indicates the power of the interferer in dB units with respect to the desired signal.
4. The *AWGN* column indicates the presence or absence of a broadband noise floor in the interference scenario. If there is to be no additional noise added, the caption *None* appears. If there is additional noise added, the absolute power level of the noise is indicated in Kelvin units.
5. In cases where the main channel audio is considered to be a test variable (as in Table 4-12), an additional column specifies the audio which shall modulate the main channel.
6. In cases where the RBDS injection level is considered to be a test variable (as in Table 4-12), an additional column specifies the appropriate RBDS injection for each test.

Table 4-11 Single Interferer RBDS Scenarios (NRSC F/SC.3)

#	Lower 2nd adj.	Lower 1st adj.	Desired	Upper 1st adj.	Upper 2nd adj.	AWGN
2101		Analog: +26dB	RBDS: Analog: Moderate			None
2102		Hybrid: +26dB	RBDS: Analog: Moderate			None
2103		Analog: +16dB	RBDS: Analog: Moderate			None
2104		Hybrid: +16dB	RBDS: Analog: Moderate			None
2105		Analog: +6dB	RBDS: Analog: Moderate			None
2106		Hybrid: +6dB	RBDS: Analog: Moderate			None
2107		Analog: +26dB	RBDS: Analog: Moderate			30,000K
2108		Hybrid: +26dB	RBDS: Analog: Moderate			30,000K
2109		Analog: +16dB	RBDS: Analog: Moderate			30,000K
2110		Hybrid: +16dB	RBDS: Analog: Moderate			30,000K
2111		Analog: +6dB	RBDS: Analog: Moderate			30,000K

#	Lower 2nd adj.	Lower 1st adj.	Desired	Upper 1st adj.	Upper 2nd adj.	AWGN
2112		Hybrid: +6dB	RBDS: Analog: Moderate			30,000K
2113			RBDS: Analog: Moderate	Analog: +26dB		None
2114			RBDS: Analog: Moderate	Hybrid: +26dB		None
2115			RBDS: Analog: Moderate	Analog: +16dB		None
2116			RBDS: Analog: Moderate	Hybrid: +16dB		None
2117			RBDS: Analog: Moderate	Analog: +6dB		None
2118			RBDS: Analog: Moderate	Hybrid: +6dB		None
2119			RBDS: Analog: Moderate	Analog: +26dB		30,000K
2120			RBDS: Analog: Moderate	Hybrid: +26dB		30,000K
2121			RBDS: Analog: Moderate	Analog: +16dB		30,000K
2122			RBDS: Analog: Moderate	Hybrid: +16dB		30,000K
2123			RBDS: Analog: Moderate	Analog: +6dB		30,000K
2124			RBDS: Analog: Moderate	Hybrid: +6dB		30,000K
2125	Analog: 0dB		RBDS: Analog: Moderate			None
2126	Hybrid: 0dB		RBDS: Analog: Moderate			None
2127	Analog: -10dB		RBDS: Analog: Moderate			None
2128	Hybrid: -10dB		RBDS: Analog: Moderate			None
2129	Analog: -20dB		RBDS: Analog: Moderate			None
2130	Hybrid: -20dB		RBDS: Analog: Moderate			None
2131	Analog: -30dB		RBDS: Analog: Moderate			None
2132	Hybrid: -30dB		RBDS: Analog: Moderate			None
2133	Analog: 0dB		RBDS: Analog: Moderate			30,000K
2134	Hybrid: 0dB		RBDS: Analog: Moderate			30,000K
2135	Analog: -10dB		RBDS: Analog: Moderate			30,000K
2136	Hybrid: -10dB		RBDS: Analog: Moderate			30,000K
2137	Analog: -20dB		RBDS: Analog: Moderate			30,000K
2138	Hybrid: -20dB		RBDS: Analog: Moderate			30,000K
2139	Analog: -30dB		RBDS: Analog: Moderate			30,000K
2140	Hybrid: -30dB		RBDS: Analog: Moderate			30,000K
2141			RBDS: Analog: Moderate		Analog: 0dB	None
2142			RBDS: Analog: Moderate		Hybrid: 0dB	None
2143			RBDS: Analog: Moderate		Analog: -10dB	None
2144			RBDS: Analog: Moderate		Hybrid: -10dB	None
2145			RBDS: Analog: Moderate		Analog: -20dB	None
2146			RBDS: Analog: Moderate		Hybrid: -20dB	None
2147			RBDS: Analog: Moderate		Analog: -30dB	None
2148			RBDS: Analog: Moderate		Hybrid: -30dB	None
2149			RBDS: Analog: Moderate		Analog: 0dB	30,000K
2150			RBDS: Analog: Moderate		Hybrid: 0dB	30,000K
2151			RBDS: Analog: Moderate		Analog: -10dB	30,000K
2152			RBDS: Analog: Moderate		Hybrid: -10dB	30,000K
2153			RBDS: Analog: Moderate		Analog: -20dB	30,000K
2154			RBDS: Analog: Moderate		Hybrid: -20dB	30,000K
2155			RBDS: Analog: Moderate		Analog: -30dB	30,000K
2156			RBDS: Analog: Moderate		Hybrid: -30dB	30,000K

Table 4-12 Host Compatibility RBDS Scenarios (NRSC J.5)

#	Lower 2nd adj.	Lower 1st adj.	Desired	Upper 1st adj.	Upper 2nd adj.	RBDS Inj.	AWGN	Main Ch. Audio
2201			RBDS: Analog: Strong			3.0%	None	CPN
2202			RBDS: Hybrid: Strong			3.0%	None	CPN
2203			RBDS: Analog: Moderate			3.0%	None	CPN
2204			RBDS: Hybrid: Moderate			3.0%	None	CPN
2205			RBDS: Analog: Strong			3.0%	30,000K	CPN
2206			RBDS: Hybrid: Strong			3.0%	30,000K	CPN
2207			RBDS: Analog: Moderate			3.0%	30,000K	CPN
2208			RBDS: Hybrid: Moderate			3.0%	30,000K	CPN
2209			RBDS: Analog: Strong			3.0%	None	None

#	Lower 2nd adj.	Lower 1st adj.	Desired	Upper 1st adj.	Upper 2nd adj.	RBDS Inj.	AWGN	Main Ch. Audio
2210			RBDS: Hybrid: Strong			3.0%	None	None
2211			RBDS: Analog: Moderate			3.0%	None	None
2212			RBDS: Hybrid: Moderate			3.0%	None	None
2213			RBDS: Analog: Strong			3.0%	30,000K	None
2214			RBDS: Hybrid: Strong			3.0%	30,000K	None
2215			RBDS: Analog: Moderate			3.0%	30,000K	None
2216			RBDS: Hybrid: Moderate			3.0%	30,000K	None
2217			RBDS: Analog: Strong			10.0%	None	CPN
2218			RBDS: Hybrid: Strong			10.0%	None	CPN
2219			RBDS: Analog: Moderate			10.0%	None	CPN
2220			RBDS: Hybrid: Moderate			10.0%	None	CPN
2221			RBDS: Analog: Strong			10.0%	30,000K	CPN
2222			RBDS: Hybrid: Strong			10.0%	30,000K	CPN
2223			RBDS: Analog: Moderate			10.0%	30,000K	CPN
2224			RBDS: Hybrid: Moderate			10.0%	30,000K	CPN
2225			RBDS: Analog: Strong			10.0%	None	None
2226			RBDS: Hybrid: Strong			10.0%	None	None
2227			RBDS: Analog: Moderate			10.0%	None	None
2228			RBDS: Hybrid: Moderate			10.0%	None	None
2229			RBDS: Analog: Strong			10.0%	30,000K	None
2230			RBDS: Hybrid: Strong			10.0%	30,000K	None
2231			RBDS: Analog: Moderate			10.0%	30,000K	None
2232			RBDS: Hybrid: Moderate			10.0%	30,000K	None

Setup

Please refer to the test bed schematics and proof-of-performance record for details of the test platform setup. Note that SW7 thru SW12 shall be set such that the multipath simulators are bypassed. SW1 thru SW6 shall be used to set each channel to either analog, hybrid or off mode. AT1 thru AT3 shall be used to set D, U1 and U2 signal power levels in 0.25dB increments. Noise power levels shall be set with the AWGN generator's internal attenuator in 0.1dB increments.

Procedure

1) The Audemat system's integrated RBDS receiver shall be used for this test series.
2) Table 4-11 and Table 4-12 shall be used as a guide for setting up each interference scenario. Each row of these tables shall be executed individually.
3) Establish the noise floor according to the AWGN column of the test grid. Refer to section 2.1.17 for a definition of AWGN noise, and 3.1.5 for the procedures of AWGN noise power measurement.
4) Establish the signal strength, frequency, and mode of the desired signal as indicated in the test grid. For a complete definition of the desired analog and desired hybrid signals, refer to 2.1.5 and 2.1.11, respectively. Note that tests 2217 thru 2232 will require an adjustment of the RBDS injection from 3% to 10%. In this case, the main channel modulation should also be reduced by 7% to compensate for the increased RBDS injection. The procedures for measuring FM power may be found in 3.1.1 and 3.1.2.
5) Establish the signal strength, frequency, and mode of the interfering signals as indicated in the test grid. For a complete definition of the undesired analog interferer and undesired hybrid interferer signals, refer to 2.1.13 and 2.1.15, respectively. The procedures for measuring FM power may be found in 3.1.1 and 3.1.2.
6) Modulate the interferer's main channel audio with a CD recording of clipped pink noise (2.2.1).

7) Modulate the desired channel's main audio with a CD recording of clipped pink noise (2.2.1).
8) Record BLER measurements from the Audemat integrated RBDS receiver over a time interval of 30 seconds.

Presentation of Data

The BLER test results shall be presented in percentage (%) units (i.e. percentage of blocks that were in error out of a total of xx measured blocks). The measurement interval of 30 seconds shall also be clearly indicated with the BLER percentage.

4.7 Objective Evaluation of DARC Digital SCA

Objectives

Characterize the performance of a High Speed Subcarrier (HSSC) SCA receiver in the presence of both analog and hybrid interferers. Quantify the *difference* between the impact of an analog interferer and the impact of a hybrid interferer on an HSSC SCA receiver.

Methodology

The NRSC has determined that the HSSC commonly referred to as "DARC" shall be used for this series of compatibility tests.

In order to meet the above objectives, various interference scenarios shall be generated by the test platform and coupled into a DARC receiver. These interference scenarios will include 1st and 2nd adjacent analog and hybrid signals at varying power levels. IBOC sidebands will also be added to an analog "host" signal to evaluate the impact of these sidebands on the RBDS of the analog host. There will be *no* multipath present in the interference scenarios of this test series.

The performance of the DARC receiver will then be objectively evaluated under each of these interference scenarios. For each scenario, the Block Error Rate (BLER) of the received DARC signal will be measured. The DARC receiver under test includes system monitoring software, which provides a variety of BLER measurements and logging. This BLER measurement may then be used an objective measure of receiver performance.

Upon completion of these tests, the test results data may be separated into cases with analog interferers and cases with hybrid interferers. All of the cases with analog interferers should be used as a baseline. The cases with hybrid interferers may then be compared against the baseline of analog interferers. The result of this comparison will provide the objectively evaluated *difference* between analog and hybrid interferers.

Test Conditions

1. Each row of the table represents one test, and each test is assigned a unique identification number in the # column.
2. In the *Desired* column, the mode of the desired signal is indicated as: *Analog* or *Hybrid.* The power of the desired signal is also indicated: *Strong (-47dBm), Moderate (-62dBm),* or *Weak (-77dBm).*
3. In the interferer columns, the mode of the interferer is indicated: *Analog* or *Hybrid.* Next to the mode of the interferer is a D/U ratio, which indicates the power of the interferer in dB units with respect to the desired signal.

4. The *AWGN* column indicates the presence or absence of a broadband noise floor in the interference scenario. If there is to be no additional noise added, the caption *None* appears. If there is additional noise added, the absolute power level of the noise is indicated in Kelvin units.
5. In cases where the main channel audio is considered to be a test variable (as in Table 4-14), an additional column specifies the audio which shall modulate the main channel.

Table 4-13 Single Interferer DARC SCA Scenarios (NRSC F/SC.3 & F/SC.4)

#	Lower 2nd adj.	Lower 1st adj.	Desired	Upper 1st adj.	Upper 2nd adj.	AWGN
2301		Analog: +26dB	DARC: Moderate			None
2302		Hybrid: +26dB	DARC: Moderate			None
2303		Analog: +16dB	DARC: Moderate			None
2304		Hybrid: +16dB	DARC: Moderate			None
2305		Analog: +6dB	DARC: Moderate			None
2306		Hybrid: +6dB	DARC: Moderate			None
2307		Analog: +26dB	DARC: Moderate			30,000K
2308		Hybrid: +26dB	DARC: Moderate			30,000K
2309		Analog: +16dB	DARC: Moderate			30,000K
2310		Hybrid: +16dB	DARC: Moderate			30,000K
2311		Analog: +6dB	DARC: Moderate			30,000K
2312		Hybrid: +6dB	DARC: Moderate			30,000K
2313			DARC: Moderate	Analog: +26dB		None
2314			DARC: Moderate	Hybrid: +26dB		None
2315			DARC: Moderate	Analog: +16dB		None
2316			DARC: Moderate	Hybrid: +16dB		None
2317			DARC: Moderate	Analog: +6dB		None
2318			DARC: Moderate	Hybrid: +6dB		None
2319			DARC: Moderate	Analog: +26dB		30,000K
2320			DARC: Moderate	Hybrid: +26dB		30,000K
2321			DARC: Moderate	Analog: +16dB		30,000K
2322			DARC: Moderate	Hybrid: +16dB		30,000K
2323			DARC: Moderate	Analog: +6dB		30,000K
2324			DARC: Moderate	Hybrid: +6dB		30,000K
2325	Analog: 0dB		DARC: Moderate			None
2326	Hybrid: 0dB		DARC: Moderate			None
2327	Analog: -10dB		DARC: Moderate			None
2328	Hybrid: -10dB		DARC: Moderate			None
2329	Analog: -20dB		DARC: Moderate			None
2330	Hybrid: -20dB		DARC: Moderate			None
2331	Analog: -30dB		DARC: Moderate			None
2332	Hybrid: -30dB		DARC: Moderate			None
2333	Analog: 0dB		DARC: Moderate			30,000K
2334	Hybrid: 0dB		DARC: Moderate			30,000K
2335	Analog: -10dB		DARC: Moderate			30,000K
2336	Hybrid: -10dB		DARC: Moderate			30,000K
2337	Analog: -20dB		DARC: Moderate			30,000K
2338	Hybrid: -20dB		DARC: Moderate			30,000K
2339	Analog: -30dB		DARC: Moderate			30,000K
2340	Hybrid: -30dB		DARC: Moderate			30,000K
2341			DARC: Moderate		Analog: 0dB	None
2342			DARC: Moderate		Hybrid: 0dB	None
2343			DARC: Moderate		Analog: -10dB	None
2344			DARC: Moderate		Hybrid: -10dB	None
2345			DARC: Moderate		Analog: -20dB	None
2346			DARC: Moderate		Hybrid: -20dB	None
2347			DARC: Moderate		Analog: -30dB	None
2348			DARC: Moderate		Hybrid: -30dB	None

#	Lower 2nd adj.	Lower 1st adj.	Desired	Upper 1st adj.	Upper 2nd adj.	AWGN
2349			DARC: Moderate		Analog: 0dB	30,000K
2350			DARC: Moderate		Hybrid: 0dB	30,000K
2351			DARC: Moderate		Analog: -10dB	30,000K
2352			DARC: Moderate		Hybrid: -10dB	30,000K
2353			DARC: Moderate		Analog: -20dB	30,000K
2354			DARC: Moderate		Hybrid: -20dB	30,000K
2355			DARC: Moderate		Analog: -30dB	30,000K
2356			DARC: Moderate		Hybrid: -30dB	30,000K

Table 4-14 Host Compatibility DARC Scenarios (NRSC J.6)

#	Lower 2nd adj.	Lower 1st adj.	Desired	Upper 1st adj.	Upper 2nd adj.	AWGN	Main Ch. Audio
2401			DARC: Analog: Strong			None	CPN
2402			DARC: Hybrid: Strong			None	CPN
2403			DARC: Analog: Moderate			None	CPN
2404			DARC: Hybrid: Moderate			None	CPN
2405			DARC: Analog: Strong			30,000K	CPN
2406			DARC: Hybrid: Strong			30,000K	CPN
2407			DARC: Analog: Moderate			30,000K	CPN
2408			DARC: Hybrid: Moderate			30,000K	CPN
2409			DARC: Analog: Strong			None	None
2410			DARC: Hybrid: Strong			None	None
2411			DARC: Analog: Moderate			None	None
2412			DARC: Hybrid: Moderate			None	None
2413			DARC: Analog: Strong			30,000K	None
2414			DARC: Hybrid: Strong			30,000K	None
2415			DARC: Analog: Moderate			30,000K	None
2416			DARC: Hybrid: Moderate			30,000K	None

Setup

Please refer to the test bed schematics and proof-of-performance record for details of the test platform setup. Note that SW7 thru SW12 shall be set such that the multipath simulators are bypassed. SW1 thru SW6 shall be used to set each channel to either analog, hybrid or off mode. AT1 thru AT3 shall be used to set D, U1 and U2 signal power levels in 0.25dB increments. Noise power levels shall be set with the AWGN generator's internal attenuator in 0.1dB increments.

Procedure

1) The Sectra DRB-3000 DARC receiver shall be used for this test series.
2) Table 4-13 and Table 4-14 shall be used as a guide for setting up each interference scenario. Each row of these tables shall be executed individually.
3) Establish the noise floor according to the AWGN column of the test grid. Refer to section 2.1.17 for a definition of AWGN noise, and 3.1.5 for the procedures of AWGN noise power measurement.
4) Establish the signal strength, frequency, and mode of the desired signal as indicated in the test grid. For a complete definition of the desired analog and desired hybrid signals, refer to 2.1.6 and 2.1.12, respectively. The procedures for measuring FM power may be found in 3.1.1 and 3.1.2.
5) Establish the signal strength, frequency, and mode of the interfering signals as indicated in the test grid. For a complete definition of the undesired analog interferer

and undesired hybrid interferer signals, refer to 2.1.13 and 2.1.15, respectively. The procedure for measuring FM power may be found in 3.1.1

6) Modulate the interferer's main channel audio with a CD recording of clipped pink noise (2.2.1).
7) Modulate the desired channel's main audio with a CD recording of clipped pink noise (2.2.1).
8) Use the DARC receiver software to record two types of BLER measurements: *BLER before correction* and *BLER after correction*. Record 30 of each type of BLER measurement. Each BLER measurement should be taken over a 5 second interval (~ 1 frame). The total measurement interval will therefore be 150 seconds (5 seconds x 30 intervals).

Presentation of Data

The two types of BLER measurements shall be presented as mean values, accompanied by a 95% confidence interval. The confidence interval may be computed using standard statistics formulas for a "population" of 30 BLER measurements. The final result shall be given in percentage (%) units (i.e. percentage of blocks that were in error out of a total of xx measured blocks during 150 seconds).