

**CONTRACTOR SUBMITTAL COVER SHEET**  
**Marin Emergency Radio Authority (MERA)**  
**Next Generation Radio System**

<b>Contractor:</b>	<u>Motorola Solutions Inc.</u>
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Submittal Response 02-53 R0 2018-05-30		Marin Comments	Motorola Comments
<b>Description:</b> Coverage Acceptance Test Procedure			
<b>Submittal Number:</b> 02-53 Revision: 0			
<b>Requirement RFP 9.7A</b> Motorola shall submit a preliminary Coverage Acceptance Test Plan (CATP) with the Proposal. The final CATP shall be submitted during the Detailed Design stage of the project.			
			<i>Section series numbers have been changed to 10.</i>
<b>Page</b>	<b>Section</b>		
3	3.0.1	The document must confirm that coverage testing will occur after all sites have been commissioned and have passed acceptance testing.	Revised; CATP changed from section series numbers 3 to section series numbers 10. Refer to Section 10.2.1; The CATP will be conducted when the P25 trunked 700MHz subsystems have been installed and the related ATP tests have passed and signed off.
3	3.0.1	The document refers to "Motorola's maps". Specify what maps these are. Final coverage maps should be provided just prior to testing.	Revised, Coverage maps are from the coverage prediction section of the contract. removed the word "maps" and inserted "coverage predictions; final maps will be provided prior to testing and will be base on final placement of antenna locations.
4	3.0.2.1	The document states, "The defined test area(s) are listed in Table 1-2 Coverage Acceptance Test Summary", and the summary refers to two defined test areas--"Marin County" and "Urban Areas". Confirm that the "Marin County" defined test area "meets or exceeds the specified Channel Performance Criterion (CPC) at the specified reliability for the specified equipment configuration(s)" (found in same paragraph). Note that the RFP states that "Covered area testing based on predicted coverage maps shall not be acceptable" (RFP 9.7B).	Revised. The updated document defines the area within the Marin County boundary and the area within the Urban Areas stated in the RFP. Please refer to section 10.2.2.1 and Figure 10.1 and 10.2. in the CATP.
5	3.0.2.3	The document refers to "Motorola map(s)". Specify what maps these are. Note that the RFP states that "Covered area testing based on predicted coverage maps shall not be acceptable" (RFP 9.7B).	Revised. This CATP is a service area CATP.
6	3.1	Explain the "Service Area Reliability" values shown. Why are these not 97%?	"Service Area Reliability consists of averaging the individual reliabilities of all tiles within the defined service area regardless of their reliability. That yields to the Service Area Reliability numbers we are presenting on the table.  In Covered Area Reliability, we average the individual reliabilities of all the points, or tiles, that meet or exceed the minimum tile reliability. If the minimum tile reliability is 85%, for example, then only tiles that have at least 85% reliability will be included in the average. The Covered Area Reliability shown on the coverage maps is 97%." The CATP is based on Service Area Reliability and reflects the contract; the Service Area Reliability numbers are show in table 10-3 in the CATP.
9	3.1.1	Table 1-4 -- Explain the -1.1 dB variation due to "Test Antenna Adjustment".	All antennas in the coverage predictions are referenced to a 1/2 wave antenna. A 1/4 wave antenna gain is specified at 0.0dBq. 0.0dBq translates to -1.1dBd (dBd is referenced to a 1/2 wave dipole)

9	3.1.2	The document refers to "Motorola map(s)". Specify what maps these are. Note that the RFP states that "Covered area testing based on predicted coverage maps shall not be acceptable" (RFP 9.7B).	Revised, CATP will test the service areas listed in Table 10-3 in Coverage Acceptance Test Summary.
9	3.1.2	"No acceptance testing will be performed in locations outside the defined test area as indicated on the Motorola-provided maps." Confirm that the defined test area is "Marin County", as listed in Table 1-2.	Revised and confirmed; refer to Table 10-3
11	3.1.4	This section defines the procedure for the BER test. Provide details for the manual subjective intelligibility test (DAQ).	Revised; refer to section 10.3.5
11	3.1.4	"A voice test radio connected to an antenna..." Provide the specific radio and antenna models that are anticipated to be used.	Revised, magnetic mount base 0180355A80 with the antenna kit HAF4016a
	All	Correct the footnotes on each page.	Revised

<b>Contractor's Remarks:</b>			

<b>Contractor Certification</b>
The enclosed submittal data has been reviewed and it is in accordance with the Work and the Contract documents unless otherwise noted.
Signed: <i>Steve Gonzales</i>

# CUSTOMER DESIGN REVIEW COVERAGE ATP

RADIO COMMUNICATIONS SYSTEM

SEPTEMBER, 2018



**MOTOROLA SOLUTIONS**



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# COVERAGE ATP

## 10.1 SYSTEM COVERAGE TESTS

### Description

Motorola will conduct system coverage testing as defined in the Coverage Acceptance Test Plan (CATP) include in Section 10.

Responsibilities and deliverables for Motorola and MERA are defined in Table 10-1.

**Table 10-1: Responsibility Matrix**

Task	Responsibility	Deliverable
Motorola will perform coverage testing for the communications system. During each test, test results will be recorded for review and approval of the test.	Motorola	Execution of coverage acceptance testing
Upon successful completion of the coverage testing, MERA and Motorola will sign acceptance certificates documenting acceptance.	MERA	Written approval of successful coverage acceptance testing

## 10.2 COVERAGE ACCEPTANCE TESTING

### 10.2.1 Overview

This Coverage Acceptance Test Plan (CATP) is designed to verify that the voice radio system implemented by Motorola for MERA/Marin County meets or exceeds the required reliability as shown on Motorola's coverage predictions. The CATP defines the coverage testing method and procedure, the coverage acceptance criterion, the test documentation, and the responsibilities of both Motorola and MERA/Marin County.

The CATP will be conducted when the P25 trunked 700MHz subsystems have been installed and the related ATP tests have passed and signed off.

Coverage Acceptance Testing is based upon a coverage prediction that accurately represents the implemented infrastructure and parameters that are consistent with the contract agreements.

Subsequent sections define the coverage acceptance test configurations and test criteria.

### 10.2.2 CATP Definitions

Several definitions are needed to accurately describe the coverage acceptance test method and criteria. Where cited, these terms or methods are defined in TIA TSB-88.1-D1 or TSB-88.3-D2.

### 10.2.2.1 Defined Test Area

The defined test area is the geographical area in which communications will be provided that meet or exceed the specified Channel Performance Criterion (CPC) at the specified reliability for the specified equipment configuration(s). The defined test area(s) are listed in the following paragraphs and referenced in Table 10-3 Coverage Acceptance Test Summary.

The main service area or Defined Test Area #1 refers to the political boundaries of Marin County outlined in blue on Figure 10-1.

**Figure 10-1 Defined Test Area #1 – Marin County**



The Urban Areas Service Area is outlined in red on figure 10-2 and is composed by the following municipality boundaries (based on the TIGER City Boundaries Database), Corte Madera, Fairfax, Inverness, Kentfield, Lagunitas-Forest Knolls, Larkspur, Lucas Valley-Marinwood, Mill Valley, Novato, Ross, San Anselmo, San Rafael, Sausalito, Strawberry, Tiburon, and Woodacre.



Figure 10-2 Defined Test Area #2 – Urban Areas



For the defined test areas (service areas) identified in Table 10-3 Coverage Acceptance Test Summary and MERA RFP, the coverage reliability commitment is only on-roads. The roads included in the on-roads commitment are defined by all the roads in the US Census Bureau 2017 TIGER streets that are accessible by 2-wheel drive vehicles.

For coverage testing, each defined test area will be divided into a grid pattern by Motorola to produce at least the number of uniformly sized test locations (or tiles) required by the Estimate of Proportions formula. [TSB-88.3-D, §5.2.1, equation 2]

### 10.2.2.2 Channel Performance Criterion (CPC)

The CPC is the specified minimum design performance level in a faded channel. [TSB-88.1-D, §5.2] For this system, the CPC is the Delivered Audio Quality (DAQ) as stated in Table 10-3 Coverage Acceptance Test Summary. The DAQ definitions are provided in Table 10-2 [TSB-88.1-D, §5.4.2, Table 3].

**Table 10-2: DAQ Definitions**

DAQ	Subjective Performance Description
1	Unusable, speech present but unreadable.
2	Understandable with considerable effort. Frequent repetition due to noise/distortion.
3	Speech understandable with slight effort. Occasional repetition required due to noise/distortion.
3.4	Speech understandable with repetition only rarely required. Some noise/distortion.
4	Speech easily understood. Occasional noise/distortion.
4.5	Speech easily understood. Infrequent noise/distortion.
5	Speech easily understood.

The CPC pass/fail criterion is the faded performance threshold, plus any adjustments for antenna performance, external noise, and in-building or in-vehicle losses. [TSB-88.1-D, §5.4.2, Figure 5] The faded performance threshold for the specified CPC is determined using the receiver's static reference sensitivity adjusted by the projected CPC parameters for the applicable Modulation Type and DAQ as listed in the current version of TSB-88.1, Annex A, Table A-1. For coverage testing of digital voice radio systems, the faded performance threshold is the applicable Bit Error Rate (BER) from the projected CPC parameters.

### 10.2.2.3 Reliability

The Service Area reliability is the percentage of locations within the defined test area that are predicted to meet or exceed the specified CPC. The Motorola coverage prediction indicates the Service Area(s) within which this system is predicted to provide at least the reliability of meeting or exceeding the CPC as stated in Table 10-3 Coverage Acceptance Test Summary.

After all accessible tiles in the defined test area have been tested, the Service Area reliability will be determined by dividing the number of tiles tested that meet or exceed the CPC pass/fail criterion by the total number of tiles tested. [TSB-88.3-D, §5.1, equation 1]

### 10.2.2.4 Direction(s) of Test

The direction(s) of test in Table 10-3 Coverage Acceptance Test Summary defines the direction(s) which will be tested for coverage acceptance. Outbound (also called forward link, downlink, or talk-out) is the path from the fixed equipment outward to the mobile or portable radios. Inbound (also called reverse link, uplink, or talk-in) is the path from the mobile or portable radios inward to the fixed equipment. Outbound and inbound independently means each direction will be evaluated as a separate independent test.

## 10.3 EQUIPMENT CONFIGURATIONS

This section defines the equipment configurations and infrastructure design parameters upon which the coverage guarantee and the coverage acceptance test are based. The equipment configurations are defined in Table 10-3 Coverage Acceptance Test Summary, and include user equipment, outdoor/in-building definition, and defined test area, number of test tiles, reliability, CPC, CPC pass/fail, and direction of test. The infrastructure design parameters are defined in Table 10-4 Infrastructure Design Parameters, and include site names, site locations, and antenna system parameters. If the implemented

system equipment configuration and/or infrastructure design parameters vary from these configurations and/or parameters, a revised coverage prediction will be provided. used to define the test configuration and potential areas from which test tiles will be included in the revised coverage acceptance test. Motorola: please check and update Table 10-4 as needed.

Coverage testing will be conducted with equipment installed per the configurations in Table 10-3 Coverage Acceptance Test Summary, and with the antennas in unobstructed locations that are not adjacent to other objects or metallic items which would distort the antenna patterns.

Note: We recommend that MERA request that in Table 10-3 below, in the service area reliability column, each inbound percentage be changed to match the outbound percentage. For example, in the first row, the service area reliability column would read “88.80% Outbound. 88.80% Inbound”.

**Table 10-3: MERA / Marin County Coverage Acceptance Test Summary**

User Equipment	Outdoor / In-Building	Defined Test Area	Number of Test Tiles Minimum	Service Area Reliability	CPC	CPC Pass/Fail	Direction(s) of Test
<b>700MHz P25 TDMA Simulcast</b>							
APX Portable with half-wave flex whip antenna in swivel case with remote speaker microphone for transmit and receive	Outdoor	Marin County (On-Roads Only)	1774 (0.50 mile tiles)	88.80% Outbound. <del>88.80</del> 73- 89% Inbound	DAQ-3.4	2.4% BER Outbound. 2.6% BER Inbound	Outbound and Inbound <del>Independently</del>
APX Portable with half-wave flex whip antenna in swivel case with remote speaker microphone for transmit and receive	Outdoor w/ 18 dB Attenuation for Building Loss	Urban Areas (On-Roads Only)	1077 (0.25 mile tiles)	72.51% Outbound. <del>72.51</del> 57- 39% Inbound	DAQ-3.4	2.4% BER Outbound. 2.6% BER Inbound	Outbound and Inbound <del>Independently</del>
APX Portable with half-wave flex whip antenna in swivel case with remote speaker microphone for transmit and receive	Outdoor	Marin County (On-Roads Only)	1774 (0.50 mile tiles)	88.80% Outbound. <del>88.80</del> 73- 89% Inbound	DAQ-3.4	Subjective DAQ	Outbound <del>and</del> <u>AND</u> Inbound <del>Independently</del>
APX Portable with half-wave flex whip antenna in swivel case with remote speaker microphone for transmit and receive	Outdoor w/ 18 dB Attenuation for Building Loss	Urban Areas (On-Roads Only)	1077 (0.25 mile tiles)	72.51% Outbound. <del>72.51</del> 57- 39% Inbound	DAQ-3.4	Subjective DAQ	Outbound <u>AND</u> <del>and</del> Inbound <del>Independently</del>
APX Portable with half-wave flex whip antenna in swivel case with remote speaker microphone for transmit and receive	Outdoor	Marin County (On-Roads Only)	1774 (0.50 mile tiles)	Information Only	DAQ-3.4	SSI provided for informational purposes	Outbound and Inbound Independently
APX Portable with half-wave flex whip antenna in swivel case with remote speaker microphone for transmit and receive	Outdoor w/ 18 dB Attenuation for Building Loss	Urban Areas (On-Roads Only)	1077 (0.25 mile tiles)	Information Only	DAQ-3.4	SSI provided for informational purposes	Outbound and Inbound Independently

**Table 10-4: MERA / Marin County Infrastructure Design Parameters**

Site Name	Latitude	Longitude	Transmit Antenna System			Receive Antenna System			Effective Faded Sensitivity
			TX Mount Height / Azimuth	Antenna Model	ERP (dBm)	RX Mount Height / Azimuth	Antenna Model	External Noise assumed (relative to KToB)	
<b>East Simulcast Cell</b>									
Big Rock	38°3'32.7" N	122°36'13.9" W	55 ft / 0°	SC476-HF1LDF(D06)	50.52 dBm	95 ft / 0°	SC479-HF1LDF(D06-E5765)	0 dB	-120.80 dBm
Dollar Hill	37°58'48.94" N	122°31'45.52" W	25 ft / 0°	SC476-HF1LDF(D06)	50.72 dBm	60 ft / 0°	CC807-08-T5	0 dB	-120.80 dBm
Mill Valley Water Tank	37°54'11.31" N	122°33'28.78" W	A.1.1 40 ft / 0°	SC476-HF1LDF(D10-E5608)	48.37 dBm	50 ft / 0°	CC807-08-T5	0 dB	-120.80 dBm
Mt. Tamalpais	37°55'44" N	122°35'15" W	A.1.2 48 ft / 0°	SC476-HF1LDF(D10-E5608)	49.52 dBm	60 ft / 0°	CC807-08-T5	0 dB	-120.80 dBm
OTA Broadcasting	38°8'59.7" N	122°35'34.9" W	A.1.3 50 ft / 0°	SC476-HF1LDF(D06)	50.52 dBm	60 ft / 0°	SC479-HF1LDF(D06-E5765)	0 dB	-120.80 dBm
San Pedro	37°59'24.7" N	122°30'1.9" W	A.1.4 65 ft / 0°	SC476-HF1LDF(D06)	50.32 dBm	100 ft / 0°	CC807-08-T5	0 dB	-120.80 dBm
Mt Tiburon	37°53'25.7" N	122°27'52.9" W	A.1.5 40 ft / 230°	SE414-SWBPALDF(D06)_160D	50.1 dBm	60 ft / 0°	CC807-08-T3	0 dB	-120.14 dBm
Wolfback Ridge	37°51'3.72" N	122°29'54.3" W	A.1.6 45 ft / 0°	SC476-HF1LDF(D10-E5608)	48.4 dBm	60 ft / 0°	CC807-08-T5	0 dB	-120.80 dBm
<b>West Simulcast Cell</b>									
Coyote Peak	38°11'9.04" N	122°49'30.62" W	40 ft / 0°	SC476-HF1LDF(D10-E5608)	49.62 dBm	60 ft / 0°	CC807-08-T3	0 dB	-120.80 dBm
Mt. Barnabe	38°1'37.7" N	122°42'59" W	40 ft / 0°	SC476-HF1LDF(D06)	50.62 dBm	70 ft / 0°	CC807-08-T5	0 dB	-120.80 dBm
Muir Beach	37°51'48.06" N	122°35'7.44" W	40 ft / 0°	SC476-HF1LDF(D06)	50.62 dBm	60 ft / 0°	CC807-08-T5	0 dB	-120.80 dBm
Pt Reyes	38°4'48.1" N	122°52'2" W	17 ft / 0°	SC476-HF1LDF(D06)	50.82 dBm	17 ft / 0°	SC476-HF1LDF(D06)	0 dB	-119.30 dBm
Stewart Pt	37°55'49.31" N	122°43'12.62" W	18 ft / 0°	SC476-HF1LDF(D06)	50.82 dBm	35 ft / 0°	CC807-08-T5	0 dB	-120.80 dBm
Tomales	38°15'39.1" N	122°54'13.2" W	55 ft / 0°	SC476-HF1LDF(D06)	50.52 dBm	70 ft / 0°	CC807-08-T5	0 dB	-120.80 dBm

### 10.3.1 CPC Pass / Fail Criterion for a Test Tile

For each equipment configuration, the CPC pass/fail criterion for a test tile is stated in Table 10-3 Coverage Acceptance Test Summary. Each equipment configuration will have only one CPC pass/fail criterion for a test tile.

The CPC pass/fail criterion in Table 10-3 (subjective ~~ive~~DAQ and BER) must be met in both directions for the tile to be considered passing.

~~To measure BER,~~ The coverage test will be performed with the appropriate attenuator value installed in the test radio antenna line, to establish an equivalent signal level performance for each equipment configuration.

Coverage for the portable outdoor equipment configurations will be verified for acceptance by attenuation of the test radio for BER-tests. The attenuation will be the difference between the test radio’s antenna system and the additional loss used in Motorola’s coverage prediction to account for portable antenna performance. The attenuator values are provided in Table 10-5.

This provides a method of verifying that the radio system provides the required DAQ and BER for the specified CPC for each of the defined equipment configurations.

The methodology to determine the attenuator value is demonstrated in TSB-88.1-D §5.4.2, Figure 5. The attenuator value includes the proper values for the equipment configuration requirement plus adjustments for the test equipment configuration. Should the test equipment setup losses vary, an adjustment to the attenuator value may be required to represent the required equipment configuration accurately. The attenuator values required to evaluate each equipment configuration are cited below in Table 10-5.

**Table 10-5: Attenuator Values for each Equipment Configuration**

User Equipment Configuration and Outdoor / In-Building	Attenuator Value
Portable On Street +9dB Portable Antenna Body Loss (Swivel Case with Speaker Mic) +1dB Height Adjustment (Hip Level verses Test AntHeight) -1.1dB Test Antenna Adjustment (conversion of dBqw to dBd reference) -2.9dB Mag Mount Adjustment (Connectors, Cable and Antenna Base)	6dB
Portable [In 18 dB Building] +6dB On Street Attenuator Value +18dB In Building Loss	24dB

### 10.3.2 Required Number of Test Tiles in the Defined Test Area

The method used to test coverage is a statistical sampling of the defined test area to verify that the CPC is met or exceeded at the required reliability for each of the defined equipment configurations. It is impossible to verify every point within a defined test area, because there are infinite points; therefore, coverage reliability will be verified by sampling a statistically significant number of randomly selected locations, quasi-uniformly distributed throughout the defined test area. There is one test sample per test tile, where a sample consists of multiple sub-samples.

Coverage acceptance testing will be performed in the defined test area as indicated on Motorola-provided coverage prediction. To verify that the reliability requirement is met, the defined test area will

be divided into uniformly sized test tiles, with at least the number of test tiles indicated in Table 10-3 Coverage Acceptance Test Summary. The number of test tiles indicated in Table 10-3 is at least

the minimum required by the Estimate of Proportions formula as stated in section 1.2.1 (Defined Test Area) of this document.

Per TSB-88.3-D, the stated minimum outdoor tile size is 100 by 100 wavelengths; however, the minimum practical test tile size is typically about 400 by 400 meters (about 0.25 by 0.25 miles). The minimum practical tile size for any system is determined by the distance traveled at the speed of the test vehicle while sampling, GPS error margin, and availability of road access within very small test tiles. A related consideration is the time, resources, and cost involved in testing very large numbers of very small tiles. For defined test area #1 (Marin County), all test tiles will be 0.50 by 0.50 miles. For the defined test area #2 (Urban Areas), all test tiles will be 0.25 by 0.25 miles.

No acceptance testing will be performed in locations outside the defined test areas indicated on the Motorola-provided maps (figure 3-1 and Figure 3-2). Motorola and MERA/Marin County may agree to perform “information only” tests in locations outside the defined test area; however, these “information only” test results will not be used for coverage acceptance. Any “information only” test locations must be defined before starting the test. If the added locations require significant additional time and resources to test, a change order will be required and Motorola may charge MERA/Marin County on a time-and- materials basis.

### 10.3.3 Accessibility to Test Tiles

Prior to testing, Motorola and MERA/Marin County will plan the route for the test vehicle(s) through the defined test area, seeking to include all TIGER roads, to ensure that at least the minimum required number of tiles is tested. While planning the route (if possible) or during the test, Motorola and MERA/Marin County will identify any test tiles that are inaccessible for the coverage test (due to lack of roads, restricted land, etc.).

Inaccessible tiles will be eliminated from the acceptance test calculation. [TSB-88.3-D, §5.5.4]

If elimination of inaccessible test tiles results in less than a statistically significant number of test tiles or substantially alters the defined test area, Motorola reserves the right to adjust-expand the drive route or gridding to maintain the needed number of test tiles. Only as a last resort will Motorola adjust the committed reliability based on the reduced number of accessible test tiles within the altered test area and the Estimate of Proportions formula. [TSB-88.3-D, §5.2.1, equation 2]

#### 10.3.3.1 Random Selection of a Test Location in Each Tile

This CATP provides an objective method of randomly selecting and tracking test locations using the Motorola’s Voyager<sup>SM</sup> coverage testing tool. The method has direct correlation with Motorola’s coverage prediction methodology.

Using Voyager, the actual test location within each test tile will be randomly selected by the test vehicle crossing into the tile at an arbitrary point, with an arbitrary speed and direction. If the selected test location is in a shielded area such as a tunnel or underground parking garage, the data from that test location must be eliminated and a replacement test location must-in the tile will be used.

The mobile driver may slow down or stop in order to complete the test sequence for the tile. If all tests for the tile are not completed before the vehicle leaves the tile, the mobile test team will return to the tile and restart the test sequence.

#### 10.3.3.2 CPC Measurements in Each Tile



For Outbound and Inbound BER testing, complementary timing profiles will be used by Voyager and the Voyager Fixed Network application, VFNE-2, to interleave the inbound and outbound testing. VFNE-2 will be used to gather inbound test statistics. The mobile application, Voyager, will gather outbound test statistics and will send an inbound test pattern to VFNE-2.

For Outbound and Inbound DAQ subjective testing, upon entering the grid location the mobile test unit-operator will call into the designated console operator and state the time, grid number and short description of



the test location. Console operator will reply with the time, grid number, and DAQ quality of the received transmission and repeat the short description of the test location. The mobile test unit will reply with the time, the grid number, the DAQ quality of the transmission and whether or not the returned location description matches the transmitted description. Each entity shall record on paper the time, the grid location number and DAQ quality received.

Motorola shall provide a means of recording each test radio voice transmission in a .WAV file commonly playable on a PC.

### 10.3.4 Responsibilities and Preparation

This section identifies the responsibilities of MERA/Marin County and Motorola regarding requirements for equipment, personnel, and time during the coverage test.

MERA/Marin County will provide the following for the duration of the coverage test:

- At least one test vehicle(s) that is representative of the vehicles to be installed with radios, and will provide the driver(s).
- Exclusive use of the test channels required by Motorola during the test.
- Exclusive use of the TDMA talkgroups used in the DAQ test. Additional talkgroups for administrative use between the console location and the field unit(s).
- Motorola will provide the following for the duration of the coverage test:
  - At least one Motorola Voyager coverage testing tool.
  - One or more computers equipped with Motorola VFNE-2 software, and connected to the radio network for collecting inbound signal statistics.
  - A timing profile to allow the test radio to transmit and receive at regular intervals will be established to facilitate automatic inbound and outbound BER statistics gathering.
- Provide a magnetic mount, ¼ wave test antenna for the subjective DAQ test radio. (Magnetic mount base 0180355A80 with the antenna kit HAF4016a or similar type)
- DAQ test voice recording equipment.

Motorola shall produce two grid map overlays to guide the drive test team(s). One grid overlay will be applied each of the two defined test areas. The result is two gridded maps each showing all the TIGER database 2-wheel drive roads. All parties shall meet and agree, prior to driving, on any grids which to be excluded from testing, for example 4-wheel drive roads or roads on private property. Border grids with any part of the grid in the defined test area shall be included in the drive plan. The resultant maps shall be grid numbered and available to the drive team(s) and the stationary console team. The maps shall preferably reside on the Voyager testing tool laptop and be correlated to GPS location for real-time drive route guidance.

As required, Motorola will provide a receiver signal strength calibration file for the test radio(s) used with the Voyager coverage testing tool.

Before starting the test, MERA/Marin County and Motorola will agree upon the time frame for Motorola's submission of a report containing the coverage test results.

Each entity, MERA/County, their consultant, and Motorola will provide a person for the DAQ scoring team. One scoring team will be situated in each mobile test vehicle and each console location.

Each member of a DAQ scoring team will meet prior to testing in a DAQ scoring class for training

on how to listen to and evaluate recorded audio samples and score them correctly on the DAQ scale.  
Motorola shall provide MERA the opportunity to inspect and approve the vehicular and fixed test setup before starting the testing.

### 10.3.5 CATP Procedures

A coverage acceptance test will be performed using Motorola's Voyager tool to randomly select test locations, and to manage BER DAQ data collection.

Voyager consists of the following for objective BER data collection:

- A voice test radio connected to an antenna installed in a representative location on the test vehicle. The test radio will monitor transmissions from the fixed network radio sites.
- A Global Positioning System (GPS) receiver, which will provide the computer with the location and speed of the test vehicle.
- A laptop computer with Voyager software and a mapping database, which includes highways and local streets.
- A computer with the Voyager Fixed Network (VFNE-2) application, connected to the system network to retrieve inbound BER statistics and to initiate the outbound test pattern.

The procedure for the objective BER coverage test will be as follows:

- The Voyager tool will be installed in a test vehicle, which will be driven over a route planned to cover the accessible tiles within the defined test area.

- During the coverage test, the laptop computer screen will display the vehicle's location on a map of the defined test area overlaid with the grid of test tiles. Voyager will automatically initiate outbound measurements and inbound transmissions based on the defined timing profile. The computer will provide a visual indication that a measurement has been completed. Voyager will manage the coverage test data collection, and will store the outbound measurements for each tested tile for later analysis. Voyager will use the information collected by the VFNE-2 fixed end application for the inbound tests. Voyager will use its merge and export feature to match the inbound measurements to a test tile and display the BER statistics.

For TDMA System Inbound/Outbound BER/SSI Coverage Testing, one channel is required. The TDMA inbound and outbound test will use a 1031Hz test pattern. A single TDMA channel can be used for both the inbound and outbound testing. The TDMA base stations must be put into test mode to gather inbound signal strength and BER information and to transmit the outbound test pattern. The outbound test will send the 1031 Hz pattern on both TDMA logical channel 0 and 1 at the same time. The inbound test from the mobile can use either TDMA logical channel 0 or TDMA logical channel 1. The Voyager Fixed Network (VFNE-2) application will connect to the system test port to establish an IP session to each base station to gather inbound signal statistics and initiate the outbound test pattern. An outbound test pattern generated by the prime site will transmit a continuous test pattern allowing the Voyager test kit to gather BER and RSSI statistics as required.

DAQ subjective testing requires the following for data collection:

- An APX 6000 radio connected to a test antenna, magnetic mount base 0180355A80 with the antenna kit HAF4016a, installed in a representative location on the test vehicle.
- A Global Positioning System (GPS) receiver, which will provide the test team with the grid location test vehicle.
- A laptop computer with Voyager software and a mapping database and the pre-planned grid maps, which includes highways and local streets.
- The mobile test team will consist of a designated driver, navigator referencing the team's location, and a radio operator to conduct the test. The team will include representatives from MERA/County, it's consultant, and Motorola.
- A manned console position to respond to the mobile test team's transmissions. The console team will include representatives from MERA/County, it's consultant, and Motorola.
- Exclusive use of one 700MHz talkgroup per test team.
- Voice recorders for the mobile and console teams with facility for grid number identification.

The procedure for the subjective DAQ coverage test will be as follows:

- The Voyager tool will be installed in a test vehicle, which will be driven by a designated driver to cover the accessible tiles within the defined test area as directed by the team's navigator.
- During the coverage test, the laptop computer screen will display the vehicle's location on a map of the defined test area overlaid with the grid of test tiles. The navigator will give the grid coordinates to the radio operator.
- Upon entering the grid location the radio operator will call the console operator as per the CPC Measurements in Each Tile section above. stating the grid number and a short description of the test location.
- Console operator will reply as per the CPC Measurements in Each Tile section above. with the time, mobile team's grid location, and DAQ number of the transmission.
- The radio operator will reply as per the CPC Measurements in Each Tile section above with the DAQ number of the console operator's transmission.
- Testing results shall be recorded by the radio and console operator.

- The mobile and console teams ~~Each entity~~ shall record the grid location and the consensus DAQ quality received.
- ~~Discrepancies between mobile team members in evaluation of the console transmissions shall be noted by the radio operator.~~



- The inbound and outbound ~~DAQ scores results~~ shall be noted and recorded ~~evaluated~~ independently of one another. However, a passing grid score requires passing subjective DAQ scores and BER scores for BOTH the inbound and outbound tests.

### 10.3.6 CATP Documentation and Coverage Acceptance

During the coverage acceptance test, Voyager generates computer files that include the raw BER test data. A copy of this data will be provided to MERA/Marin County at the conclusion of the coverage test. Motorola will process this data to produce a map detailing the coverage test results, and to determine whether the coverage test was passed for each user equipment configuration. A full test report will be submitted within the timeframe agreed upon in the Responsibilities and Preparation section above. 30 days from the conclusion of the CATP test.

During the coverage acceptance test, the mobile and console test teams record the consensus DAQ test scores and grid numbers. Also, the mobile and console voice recorders record the voice test call and the grid numbers. The original copy of the consensus DAQ test scores and grid numbers, and a tabulated soft copy of this data will be provided to MERA/Marin County at the conclusion of the coverage test. Motorola will process this data to produce a map detailing the coverage test results, and to determine whether the DAQ coverage test was passed for each user equipment configuration. Also, Motorola will produce a soft copy file containing all the test grid numbers with hyperlinks to .wav audio files corresponding to the inbound and outbound audio recordings. A full test report will be submitted within the timeframe agreed upon in the Responsibilities and Preparation section above.

The coverage acceptance criterion for a user equipment configuration will be that the voice radio system implemented by Motorola for MERA/Marin County meets or exceeds the reliability stated in Table 10-3 Coverage Acceptance Test Summary for that user equipment configuration. The system coverage acceptance criterion will be the successful passing of each of the user equipment configurations defined in Table 10-3 Coverage Acceptance Test Summary.

The overall coverage acceptance passing criterion requires passing DAQ tests for both equipment configurations in Table 10-3.

Motorola reserves the right to review any test tiles that fail. If a coverage test, or a portion thereof, is suspected by Motorola to have failed due to external interference, those tiles suspected of being affected by an interferer may be re-tested. If the test tiles re-tested are confirmed to have failed due to interference or external noise, ~~those test tiles will be excluded from all acceptance calculations and~~ Motorola will work with MERA/Marin County to identify potential solutions to the interference issues.

Motorola ~~will intend to~~ conduct this Coverage Acceptance Test only once. If any portion of the test is determined to be affected by proven equipment malfunctions or failures, Motorola will repeat the portion of the test affected by the equipment malfunction or failure. Motorola will pay all costs of repeated testing including those costs experienced by MERA/Marin County personnel and equipment. MERA/Marin County will have the option to accept the coverage at any time prior to completion of the coverage test or documentation process.

Motorola will submit to MERA/Marin County a report detailing the coverage test results within the timeframe agreed upon in the Responsibilities and Preparation section above. This report will include a document, which is to be signed by both MERA/Marin County and Motorola, indicating the test was performed in accordance with this CATP and the results of the test indicate the acceptance or non-acceptance of the coverage portion of the system.