

Department of Public Safety
Calvert County, Maryland



Compliant Public Safety In-Building Two-
Way Radio Communications
Enhancement System Requirements

Revised May 11, 2023

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Introduction

Calvert County, Maryland has adopted NFPA 1, Fire Code, 2018 Edition (NFPA1-2018) as its Fire Code, NFPA 101, Life Safety Code, 2018 Edition (NFPA101-2018) as its Life Safety Code, and NFPA 1221, Standard for the Installation, Maintenance, and Use of Emergency Services Communications Systems, 2016 Edition (NFPA1221-2016) as its standard for Communications Enhancement Systems. NFPA1-2018 and NFPA101-2018 provide requirements for reliable public safety radio system coverage in occupancies, and NFPA1221-2016 provides requirements for the design, installation, and maintenance of communications enhancements systems.

Modern building design and construction techniques, especially those required to satisfy requirements for LEED-certified building designs, make it difficult or impossible for the County to provide reliable two-way radio coverage for first responders operating inside of buildings. Two-way radio communications enhancement systems help ensure the safety of building occupants and first responders by extending the coverage of a public safety communications system to the interior areas of the building through the use of special bi-directional amplifiers (BDAs) and a network of indoor antennas strategically located to provide reliable public safety radio system coverage throughout the interior of a building. The BDA and network of antennas are sometimes collectively known as a Distributed Antenna System (DAS).

DAS systems must be designed, installed, maintained, and repaired by qualified personnel to ensure that they meet the County's coverage reliability code requirements and do not cause unintended harmful interference to County or State radio systems or other users of the RF spectrum licensed by the Federal Communications Commission (FCC).

The FCC requires that DAS systems be either operated by the licensee of the public safety radio system or explicitly authorized by the licensee. Additionally, the licensee must enter the DAS into a nationwide registry maintained by the FCC, so the appropriate parties can be contacted should the DAS cause interference to radio systems operated by any FCC licensee.

The County operates a 15 site, ten channel 800 MHz P25 digital trunked public safety radio system for first responder communications. The County's Emergency Communications Division has responsibility for the day-to-day operation, maintenance, and management of the public safety radio system. Additionally, the State of Maryland operates a statewide 700 MHz digital trunked public safety radio system that is also used by local and state first responders in Calvert County.

This document is intended to provide guidance to building owners and developers who are contemplating projects in the County that are required to meet the requirements of NFPA 1221 2016 and to DAS system installation firms operating in

the County and installing NFPA 1221 2016 compliant systems to meet the County's Emergency Services Communications code requirements.

Summary of Requirements for Owners

When the NFPA 1 Fire Code and the International Building Code, as adopted by Calvert County, require reliable in-building public safety radio system coverage:

All commercial, multi-unit residential, governmental, and educational occupancies must have reliable in-building public safety radio communications coverage that meets the requirements of NFPA 1221 2016, and the radio coverage requirements set forth by the County in Table 1, for both the County 800 MHz and State 700 MHz radio systems. BDA/DAS systems installed to satisfy radio coverage requirements shall also adhere to the system technical parameters provided in Appendix A for both the County 800 MHz and State 700 MHz radio systems.

Table 1 – Calvert County radio coverage requirements

<p><u>Inbound signal strength</u></p>	<p><u>A minimum inbound signal strength of -90 dBm shall be provided throughout the coverage area for the Calvert County 800 MHz system and the State of Maryland 700 MHz system.</u></p>
<p><u>Outbound signal strength</u></p>	<p><u>A minimum outbound signal strength of -90 dBm shall be provided throughout the coverage area for the Calvert County 800 MHz system and the State of Maryland 700 MHz system.</u></p>
<p><u>Balanced uplink/downlink path operation</u></p>	<p><u>All passive and active components used in the BDA/DAS shall provide equal uplink/downlink levels of insertion loss, passive gain, or active gain.</u></p>
<p><u>Voice audio quality</u></p>	<p><u>A minimum voice audio quality of DAQ 3.4 shall be provided throughout the coverage area for the Calvert County 800 MHz system and the State of Maryland 700 MHz system. DAQ 3.4 is defined as “Speech understandable without repetition, some noise/distortion present”</u></p>

<p><u>Coverage area reliability in critical areas</u></p>	<p><u>Fire command centers, fire alarm control panel locations, fire pump rooms, exit stairs, exit passageways, elevators, elevator lobbies, standpipe cabinets, sprinkler valve locations, areas of refuge, and other areas deemed critical by the County shall be provided with 99% floor area reliability coverage for the Calvert County 800 MHz system and the State of Maryland 700 MHz system.</u></p>
<p><u>Coverage area reliability in general building areas</u></p>	<p><u>All other interior levels and areas of the building not defined as critical shall have 90% floor area reliability coverage for the Calvert County 800 MHz system and the State of Maryland 700 MHz system.</u></p>

Occupancies that meet public safety radio coverage reliability requirements without radio communications enhancement systems:

In some occupancies, such as those with smaller footprints, or those located in close proximity to County or State transmission sites, it may be possible to achieve reliable public safety radio communications coverage throughout the occupancy and meet code requirements without the use of a radio communications enhancement system. Public safety radio coverage in these occupancies must meet the same radio coverage reliability requirements as those occupancies that require a radio communications enhancement system (See Table 1) for both the County 800 MHz and State 700 MHz systems. In cases such as these where a radio communications enhancement system is not required, the County will accept an independent certification of compliance with code requirements for reliable in-building public safety radio coverage.

- A firm qualified in the engineering and design of two-way radio communications enhancement systems shall be engaged to assist with this determination and provide the required certification for eligible occupancies.
- For buildings not equipped with two-way radio communications enhancement systems, testing for signal strength, audio quality, and area coverage reliability compliance and certification must be performed when all construction and interior finishing work is complete, under full foliage conditions, between May 1 and October 1. Testing for this certification shall be conducted for both the County 800 MHz and State 700 MHz radio systems. Building owners/developers must submit all test documentation and a

Certificate of Radio Coverage Compliance, signed and sealed by the engineer of record, stating that County 800 MHz and State 700 MHz public safety radio system coverage reliability within the occupancy meets the signal strength, audio quality, and area coverage reliability requirements set forth in Table 1, and was tested in accordance with the provisions set forth in NFPA 1221 2016 A.11.3.9. Calvert Emergency Communications will issue loaner portable radios to integrators upon request to accomplish the required DAQ testing.

- The Certificate of Radio Coverage Compliance shall be posted at the fire alarm control panel, or at the main electrical panel if no fire alarm control panel is present.

Occupancies requiring radio communications enhancement systems to meet radio coverage reliability requirements:

In occupancies where two-way radio communications enhancement systems are required in order to meet code requirements for County 800 MHz and State 700 MHz radio system coverage, two-way radio communications enhancement systems and related equipment must meet all County, NFPA 1221 2016 and IBC 2018 requirements. More specifically, the requirements of Table 1, Appendix A, and the following NFPA 1221 2016 sections are incorporated herein by reference:

- *Section 9.6 Two Way Radio Communications Enhancement Systems*
- *Section 11.3.9 (Annual testing)*
- *Annex A.11.3.9 Test Procedures*
- NOTE: In cases where a County requirement is more stringent than a requirement defined in NFPA 1221, the County requirement shall take precedence.
- Systems shall be designed to provide compliant coverage area reliability for both the County 800 MHz system and the State 700 MHz system.
- Building owners/developers must submit plans for the design of proposed two-way radio communications enhancement systems to Calvert Emergency Communications staff for review, and approval of the selected donor site(s).
- Building owners/developers must apply for and obtain a Retransmission Authorization from Calvert Emergency Communications prior to commissioning the two-way radio communications enhancement system. The Retransmission Authorization is required by the FCC and is the System operator's proof that the County and State have granted permission to operate equipment that uses radio frequencies licensed to the County and the State¹. Provisional Retransmission

¹ See 47CFR90.219(b)(1)(i)

Authorizations are issued for initial system activation, optimization, and testing and are valid for one year from the date of issuance. Final Retransmission Authorizations are issued upon successful commissioning of the system. Final Retransmission Authorizations remain valid indefinitely, provided that the Operator performs annual system maintenance and testing as required by NFPA 1221 2016 Section 11.3.9 (Annual testing), and A.11.3.9, *Annual Tests*, or unless otherwise rescinded by the County or the State.

- Two-way communications enhancement systems shall be operated, maintained, and tested annually in accordance with manufacturer's instructions, FCC rules and regulations, and the requirements of NFPA 1221 2016 Section 11.3.9 (Annual testing), and A.11.3.9, *Annual Tests*. Operators shall provide proof of annual system maintenance and testing upon request by the County or the State.
- Equipment used by the two-way radio communications enhancement system must be type accepted by the FCC.
- The two-way radio communications enhancement system must be operated in accordance with FCC rules and regulations at all times.
- The two-way radio communications enhancement system shall not cause interference to County or State radio systems or equipment, or systems or equipment operated by any other FCC licensee.
- Building owners/developers must submit as-built documentation, in soft copy format (e.g., PDF) to Calvert Emergency Communications after testing is completed.
- All active equipment (BDAs, Line Amplifiers, Remotes, etc.) shall be labeled with a "To Report Problems with this Equipment" label, providing the company name, contact name, telephone number, email address, and business address of the party responsible for care and maintenance of the equipment.

Sensitive Compartmented Information Facilities

Sensitive Compartmented Information Facilities (SCIFs) are enclosed areas inside of occupancies specifically designed for handling of classified information. SCIFs are often found inside buildings occupied by government and defense agencies and contractors.

Intelligence Community Standard Number 705-1, "Physical and Technical Standards for Sensitive Compartmented Information Facilities" requires that SCIF design and construction be compliant with the NFPA 1 Fire Code and the NFPA 101 Life Safety Code. Accordingly, in Calvert County, reliable first responder radio coverage must be provided inside of SCIFs. In-Building Two-Way Radio Communications Enhancement Systems must be provided if needed to ensure reliable first responder radio coverage inside of the SCIF.

In-Building Two-Way Radio Communications Enhancement Systems installed in SCIFs can be designed and equipped for automatic and manual activation to ensure that the security of the SCIF is not compromised by the operation of the coverage enhancement system. In such cases the following requirements apply:

- The In-Building Two-Way Radio Communications Enhancement System shall be equipped to automatically activate in the event of a building fire alarm smoke or heat detection event, manual pull station alarm, sprinkler system water flow detection, clean agent suppression discharge, or any other fire alarm condition.
- The In-Building Two-Way Radio Communications Enhancement System shall be equipped with a clearly marked manual activation switch to allow manual activation of the coverage enhancement by first responders upon their arrival at the occupancy. The manual activation switch shall be located at the fire alarm annunciator or fire alarm control panel at the building's main entrance. Manual activation of the coverage enhancement system shall not require the use of special keys or other restrictions and shall not require the involvement of building staff. The automatic and manual activation capabilities shall be tested annually to ensure proper functionality.
- The SCIF area can be equipped with visual beacons or similar visual annunciator devices to alert staff working in the SCIF when the coverage enhancement system is active such that staff can take appropriate steps to protect sensitive information.

Initial Determination Process

- In all new buildings and existing buildings that are modified, minimum County 800 MHz and State 700 MHz radio signal strength must be provided. An applicant submits building plans to the Calvert County Department of Planning and Zoning for review.
- Inspections and Permits plan review staff will provide a plan comment as part of the building permit review stating that compliant public safety radio coverage is required for the occupancy, including the installation of a two-way radio communication enhancement system if necessary to meet code requirements.
- The applicant is directed to Calvert Emergency Communications for additional information. This Compliant Public Safety In-Building Two-Way Radio Communications Enhancement System Requirements document is provided upon request and is available for download from the Calvert Emergency Communications' website.
- The applicant proceeds with the **Radio Communications Enhancement System Implementation Process** described below.

Buildings That Do Not Need a Radio Communications Enhancement System

In certain occupancies, such as those with smaller footprints, or those located in close proximity to County and State transmission sites, it may be possible to achieve reliable public safety radio communications coverage throughout the occupancy and meet code requirements without the use of a radio communications enhancement system. Public safety radio coverage in these occupancies must meet the same reliability requirements as those occupancies that require a radio communications enhancement system.

- The applicant engages the services of a qualified integrator or consultant to assess available radio coverage at the location of the occupancy and determine if County 800 MHz and State 700 MHz public safety radio coverage reliability in the occupancy will meet code requirements after it is fully constructed and finished, without the use of a two-way radio communications enhancement system, and under full foliage conditions.
- Once construction is complete, and prior to occupancy, owners/developers must submit all test documentation and a Certificate of Radio Coverage Compliance, signed and sealed by the engineer of record, stating that County 800 MHz and State 700 MHz public safety radio system coverage reliability within the occupancy meets the signal strength, audio quality, and area coverage reliability requirements outlined in Table 1 and was tested in accordance with the provisions outlined in NFPA 1221 2016 A.11.3.9.
- The Certificate of Radio Coverage Compliance shall be posted at the fire alarm control panel, or at the main electrical panel if no fire alarm control panel is present. Testing for coverage reliability compliance and certification must be performed under full foliage conditions, between the months of May and September.
- **If testing determines that County 800 MHz or State 700 MHz public safety coverage reliability does not meet code requirements, a compliant radio communications enhancement system must be installed and tested prior to issuance of the certificate of occupancy.**

Radio Communications Enhancement System Implementation Process

The County has defined the following process for owners or developers planning new occupancies or modifications to existing occupancies that require a radio communications enhancement system to ensure operation of the Calvert County public safety communication system inside buildings.

1. Conduct System Planning and Design

The applicant includes an NFPA 1221 2016, IBC 2018, and County compliant two-way radio communication enhancement system in the design requirements for the project, designed to provide compliant coverage for the County 800 MHz and State 700 MHz radio systems. A qualified integrator or installation firm is retained by the developer to design, install and activate the two-way radio communications enhancement system as a part of the building project. Calvert Emergency Communications provides consultation assistance to the integrator/installer and directs the selection of the donor site(s) for the proposed two-way radio communications enhancement system. The applicant must obtain a separate low-voltage permit to cover the installation of the two-way radio communication enhancement system. The fire alarm contractor is responsible for the fire alarm permit application, and integration of the radio communications enhancement system into the fire alarm supervisory notification/alarm panel.

2. Submit Retransmission Application

Integrator/installer completes a Retransmission Application for each BDA headend in the system design. Retransmission Applications must include the Low Voltage Permit Number assigned for the work. The owner submits Retransmission Application(s) and proposed design documentation (system design diagrams, bill of materials, and floor plan diagrams) to Calvert Emergency Communications.

3. Calvert Emergency Communications Creates Entry in FCC Signal Booster Database

Calvert Emergency Communications utilizes the contact information provided in the Retransmission Application to create an entry for the two-way radio communications enhancement system in the FCC's Signal Booster database for both the County and State frequencies. **Applicants, integrators, and installers should not create entries in the FCC Signal Booster database for proposed two-way radio communications enhancement systems that will operate on frequencies licensed to the County.**

4. Calvert Emergency Communications and State review application and issue Provisional Retransmission Authorization

Calvert Emergency Communications and the State conduct a technical review of the proposed design. Upon approval of the design, Calvert Emergency Communications and the State issue a signed Provisional Retransmission Authorization to owner, which authorizes operation of the system for the purposes of installation, testing, and optimization. The Provisional Retransmission Authorization is valid for a period of one year from the date of issuance.

5. Perform System Installation

The integrator/installer proceeds with the installation of the approved system in accordance with the project's plan and schedule. Substantial design changes from those specified in the initial design must be approved by Calvert Emergency Communications and the State (e.g., selection of a different donor site, selection of different model BDA, selection of a different donor antenna, additions or changes to the number of line amplifiers in the design, and changes to the equipment room location in the building).

Updated Calvert Emergency Communications and State review and approval is not required for minor changes that do not impact the number of active amplification devices used by the system or impact the donor site (e.g., changes to the number or location of indoor coverage antennas in the design).

The two-way radio communication enhancement system should not be activated for optimization and testing without prior Calvert Emergency Communications and State authorization. Calvert Emergency Communications and/or the State may, at their sole discretion, require that an initial desense test be conducted prior to initial activation to ensure that no harmful interference occurs to the County's 800 MHz radio system or the State's 700 MHz radio system.

Integration with supervisory notification/alarm panel(s) shall comply with the requirements of NFPA 1221 2016 9.6.13.1 and must be completed prior to fire alarm and two-way radio communication enhancement system testing.

6. Perform Pre-Commissioning Activation and Optimization

Integrator/installer posts the Provisional Retransmission Authorization at the headend location(s). The integrator/installer notifies Calvert Emergency Communications staff when ready to activate the system for the first time.

If required by Calvert Emergency Communications and/or the State, an initial desense test is coordinated for the first activation of the system.

The integrator/installer conducts system activation and optimization. Calvert Emergency Communications will issue loaner radios to integrators for system commissioning and testing upon request.

7. Perform Fire Alarm/Two-way Radio Communications Enhancement System Testing

The integrator/installer coordinates scheduling of initial Calvert Emergency Communications BDA system inspection and testing with Calvert Emergency Communications. Calvert Emergency Communications shall inspect the system for the following criteria:

- Compliance with NFPA installation requirements
- Donor antenna orientation
- Grounding, bonding, and general workmanship
- Actual signal strength and DAQ in the occupancy consistent with integrator's test results submittal
- Coverage reliability
- Proper commissioning, testing, and as-built documentation
- Fire alarm control panel integration
- Donor site desense

Upon successful completion of testing, Calvert Emergency Communications staff will affix a Calvert Emergency Communications inspection sticker to the BDA equipment to indicate completion of Calvert Emergency Communications testing to Inspections and Permits staff. The BDA system and fire alarm control panel integration will then receive a final inspection by members of the Fire Marshal's Office.

8. Submit As-Built Documentation

The integrator/installer provides test results and full system as-built documentation to Calvert Emergency Communications in soft copy (e.g., PDF) format. Calvert Emergency Communications and the State issue a Final Retransmission Authorization. The Final Retransmission Authorization must be posted at all headend location(s). Calvert Emergency Communications adds the as-built documentation to the system archives.

9. Issue Certificate of Occupancy

The Department of Inspections and Permits issues a Certificate of Occupancy after all requirements for occupancy are met, including the following:

- Successful Calvert Emergency Communications and Fire Marshal's Office inspection
- Receipt of required documentation
- Posting of Final Retransmission Authorization(s) at the system headend(s)

- Posting the “To Report Problems with this Equipment” label providing the company name, contact name, telephone number, email address, and business address of the party responsible for care and maintenance of the equipment on all active system components

10. Annual System Testing and Maintenance

The building owner retains the services of a qualified firm to conduct annual system preventive maintenance and assist with annual testing. The building owner coordinates annual testing of the two-way radio communications enhancement system with annual testing of other fire alarm and fire safety systems. Annual testing of two-way radio communications enhancement systems shall be performed in accordance with the requirements of NFPA 1221 2016 Section 11.3.9 (Annual testing), and A.11.3.9, *Annual Tests*.

Sample Retransmission Authorization

CALVERT COUNTY, MARYLAND 700/800 MHz RETRANSMISSION AUTHORIZATION

AUTHORIZATION NUMBER: FRA-YYYYMM-NNN

Calvert County, Maryland (the County) and the State of Maryland (the State) hereby grant authorization to **name of operator** (Operator) to operate a Two-Way Radio Communications Enhancement System (the System) on frequencies licensed to the County and the State of Maryland by the Federal Communications Commission (FCC) at the following location:

Site Name: **site name**
Site Address: **street, city, state, zip**
Latitude: **latitude** Longitude: **longitude**
FCC Booster ID: **FCC Booster ID**
Site Contact: **site contact**

This Retransmission Authorization is subject to the following conditions:

1. Retransmission Authorizations remain valid indefinitely, provided that the Operator performs annual system maintenance and testing as required by NFPA 1221 2016 and unless otherwise rescinded by the County or the State. This Retransmission Authorization shall be posted conspicuously at the BDA headend location.
2. The System shall be operated, maintained and tested annually in accordance with manufacturer's instructions, FCC rules and regulations, and the requirements of NFPA 1221, Standard for the Installation, Maintenance, and Use of Emergency Services Communications Systems, (National Fire Protection Association 2016). Operator shall provide proof of annual system maintenance and testing upon request by the County.
3. The System shall not cause interference to radio systems or equipment operated by the County, the State, or any other FCC licensee.
4. Operator shall promptly resolve any interference that occurs to radio systems or equipment operated by the County, the State, or any other FCC licensee, up to and including deactivation of the System, if necessary, until such time that the interference is corrected.
5. In the event of an outage of the System, Operator shall notify the Radio System Administrator for Calvert County at radiusupport@calvertcountymd.gov.
6. Operator shall provide access to the System for inspection upon request by the County, the State, or the FCC.
7. A separate Retransmission Authorization shall be obtained for each headend location used in the system design and posted conspicuously with the headend equipment.
8. The County and State, as FCC licensees for their respective frequencies, reserve the right to terminate this Retransmission Authorization at their sole discretion.

Date: **date issued**

Stanley D. Harris, Jr., Communications Chief, Calvert Emergency Communications

Date: **date issued**

(name), (title), State of Maryland

Sample Retransmission Application

CALVERT EMERGENCY COMMUNICATIONS, CALVERT COUNTY, MARYLAND 700/800 MHz RETRANSMISSION APPLICATION

INSTRUCTIONS: Provide all information requested on the Retransmission Application. Include system design diagrams, bill of materials and floor plan diagrams as separate attachments. Complete a separate form for each BDA headend in the design. The information provided will be used to create a record for the proposed system in the FCC Signal Booster registry in accordance with FCC rules. A Provisional Retransmission Authorization will be issued for system startup upon review and approval by County and State staff. Systems shall not be activated prior to issuance of the Provisional Retransmission Authorization. The County or State, at their sole discretion, may require an initial desense test when the system is activated for the first time, to ensure that no harmful interference is occurring to nearby donor sites. The Provisional Retransmission Authorization will indicate if the initial desense test is required. Submit completed application electronically via email to radiosupport@calvertcountymd.gov. For questions, email to radiosupport@calvertcountymd.gov or contact Radio Systems Administrator at (410) 414-3269.

1. SITE INFORMATION		
Site Name: _____		
Site Address: _____		
Low Voltage Permit Number (Issued by Calvert County Division of Inspections and Permits): _____		
Site Description (type of construction, number of floors, interior square footage): _____		
Site Latitude and Longitude: _____		
BDA Manufacturer and Model: _____	Class: _____	Total System Delay in μ s: _____
BDA Headend Location: _____		
Number of Line Amplifiers or Fiber Remotes: _____	Line Amplifier/Fiber Remote Manufacturer and Model: _____	
Type of System: <input type="checkbox"/> 700/800 MHz Public safety only	<input type="checkbox"/> Multiple carrier neutral host	<input type="checkbox"/> Other (describe below) _____
2. BUILDING/DEVELOPMENT OWNER CONTACT INFORMATION		
Owner: _____		
Owner address: _____		
Point of contact: _____	Email: _____	
Work phone: _____	Mobile phone: _____	
3. SITE ACCESS OR TECHNICAL CONTACT INFORMATION (will provide access for inspections and testing)		
Company: _____		
Address: _____		
Point of contact: _____	Email: _____	
Work phone: _____	Mobile phone: _____	
4. SYSTEM INTEGRATOR/INSTALLER/MAINTAINER		
Company: _____		
Address: _____		
Point of contact: _____	Email: _____	
Work phone: _____	Mobile phone: _____	
5. PREPARER SIGNATURE AND DATE:		
Signature: _____	Date: _____	
Print name and title: _____		

Appendix A - System Technical Criteria

Public safety agencies operating in Calvert County utilize the County's 15 site, 10 channel 800 MHz P25 Phase 2 TDMA radio system and the Maryland FiRST statewide 700 MHz simulcast trunked radio when operating in Calvert County.

Integrators shall design and configure BDA/DAS equipment to pass the frequencies that are currently used in the County's Motorola 800 MHz P25 Phase 2 TDMA radio system, the MD FiRST 700 MHz system. Each system shall be designed and configured for balanced uplink/downlink path operation. All passive and active components used in the BDA/DAS shall provide equal uplink/downlink levels of insertion loss, passive gain, or active gain. It is strongly recommended that BDA equipment deployed in Calvert County be configured for Class B broadband operation to ensure compliance with the County's $\leq 8\mu\text{s}$ propagation delay requirement. Channelized systems are permitted, provided that the propagation delay does not exceed $8\mu\text{s}$.

The following system technical data is provided to assist two-way radio communications enhancement system designers.

1. **Radio coverage requirements:** see Table 1.
2. **Isolation:** A minimum of 20 dB isolation, or greater if required by the equipment manufacturer, shall be provided between the donor antenna and the service antennas inside of the building.
3. **Delay:** Total propagation delay introduced by the system shall not exceed $8\mu\text{s}$.
4. **Frequency Configuration:**

Table 2 - Class B 700/800 MHz Frequency Configuration

Band	Downlink	Uplink
800 MHz	806-815 MHz	851-860 MHz
700 MHz	799-805 MHz	769-775 MHz

Table 3 - System Frequencies

System	Channel	Downlink	Uplink
Calvert County	9	852.1875	807.1875
Calvert County	10	852.2500	807.2500
Calvert County	7	857.1375	812.1375
Calvert County	5	857.6375	812.6375
Calvert County	8	858.1375	813.1375
Calvert County	6	858.5125	813.5125
Calvert County	3	858.5625	813.5625
Calvert County	4	859.1125	814.1125
Calvert County	2	859.5125	814.5125
Calvert County	1	859.5625	814.5625
MD FiRST Calvert Simulcast Cell	1	774.81875	804.81875
MD FiRST Calvert Simulcast Cell	2 (Control)	774.08125	804.08125
MD FiRST Calvert Simulcast Cell	3	773.53125	803.53125
MD FiRST Calvert Simulcast Cell	4	772.19375	802.19375
MD FiRST Calvert Simulcast Cell	5	771.25625	801.25625
MD FiRST Calvert Simulcast Cell	6	769.93125	799.93125
MD FiRST Tracy's Landing ASR	1	774.45625	804.45625
MD FiRST Tracy's Landing ASR	2 (Control)	773.68125	803.68125
MD FiRST Tracy's Landing ASR	3	772.85625	802.85625
MD FiRST Tracy's Landing ASR	4	772.23125	802.23125
MD FiRST Tracy's Landing ASR	5	771.88125	801.88125
MD FiRST Tracy's Landing ASR	6	771.15625	801.15625
800MHZ Nationwide Interoperability Channel (Conventional)	1	851.0125	806.0125
800MHZ Nationwide Interoperability Channel (Conventional)	2	851.5125	806.5125
800MHZ Nationwide Interoperability Channel (Conventional)	3	852.0125	807.0125
800MHZ Nationwide Interoperability Channel (Conventional)	4	852.5125	807.5125
800MHZ Nationwide Interoperability Channel (Conventional)	5	853.0125	808.0125

5. Site Information:

Table 4 - Site Information

Calvert County P25 Phase 2 TDMA 800 MHz Site Locations								
Site	Lat	Lon	AMSL'	HTC'	TX Antenna	Gain dBd	Az	ERP W
Mt Hope	38 40 27.60 N	76 35 38.40 W	184	315	Sinclair SC412-HF2LDF (D02-E5608)	11.5	0	223.87
Island Creek	38 27 47.80 N	76 33 26.20 W	148	240	Sinclair SC412-HF2LDF (D02-E5608)	11.5	0	251.19
Barstow	38 32 11.58 N	76 37 2.77 W	151	365	Sinclair SC412-HF2LDF (D02-E5608)	11.5	0	208.93
Emmanuel Church	38 35 31.22 N	76 33 12.62 W	98	365	Sinclair SC412-HF2LDF (D02-E5608)	11.5	0	208.93
Huntingtown	38 37 9.30 N	76 36 44.10 W	161	365	Sinclair SC412-HF2LDF (D02-E5608)	11.5	0	208.93
Lusby	38 22 58.71 N	76 26 34.58 W	115	410	Sinclair SC412-HF2LDF (D02-E5608)	11.5	0	194.98
Dunkirk	38 43 34.09 N	76 39 14.63 W	115	282	Sinclair SC412-HF2LDF (D02-E5608)	11.5	0	234.42
Bayside Forest WT	38 34 3.94 N	76 31 40.59 W	108	132	Penetrator BMR10-H	13.4	90	446.68
Chesapeake Village WT	38 40 32.31 N	76 32 27.32 W	59	146	Penetrator BMR12-H	15.4	270	707.95
Southern Connector	38 21 22.2 N	76 26 3.54 W	69	235	Sinclair SC412-HF2LDF (D02-E5608)	11.5	0	251.19
Highlands WT	38 42 27.31 N	76 33 3.56 W	115	85	Sinclair SC412-HF2LDF (D02-E5608)	11.5	0	316.23
SHA	38 32 3.9 N	76 35 18.47 W	115	240	Sinclair SC412-HF2LDF (D02-E5608)	11.5	0	251.19
St Leonard WT	38 28 22.97 N	76 30 32.31 W	115	135	Penetrator BMR12-H	15.4	270	707.95
BG&E	38 26 2.6 N	76 26 52.4 W	138	340	Sinclair SC412-HF2LDF (D02-E5608)	11.5	0	218.78
North Calvert Cliffs	38 26 20.35 N	76 28 3.66 W	95	365	Penetrator BMR12-H	15.4	60	512.86

MDFIRST Calvert Simulcast Cell Site Locations ²								
Site	Lat	Lon	AMSL'	HTC'	TX Antenna	Gain dBd	Az	ERP W
Sunderland SHA	38°39'31.99"N	76°36'31.28"W		330				355
Prince Frederick SHA	38°32'3.85"N	76°35'18.11"W		348				355
Benedict	38°31'44.60"N	76°43'56.80"W		330				355
North Calvert Cliffs	38°26'20.3"N	76°28'03.6"W		446				224
Lusby	38°22'56.87"N	76°26'34.46"W		430				282

MDFIRST Tracy's Landing ASR Site Location								
Site	Lat	Lon	AMSL'	HTC'	TX Antenna	Gain dBd	Az	ERP W
Tracy's Landing	38°47'08.1"N	76°35'54.0"W		315				158

² The MDFIRST Calvert Simulcast Cell is preferred for use as the State donor site/system whenever possible. Integrators may instead select the Tracy's Landing ASR site if insufficient signal is available from the MDFIRST Calvert Simulcast Cell and the ASR site provides usable levels.

Appendix B – 47CFR90.219, FCC rules governing use of Signal Boosters

§90.219 Use of signal boosters.

This section contains technical and operational rules allowing the use of signal boosters in the Private Land Mobile Radio Services (PLMRS). Rules for signal booster operation in the Commercial Mobile Radio Services under part 90 are found in §20.21 of this chapter.

(a) *Definitions.* The definitions in this paragraph apply only to the rules in this section.

Class A signal booster. A signal booster designed to retransmit signals on one or more specific channels. A signal booster is deemed to be a Class A signal booster if none of its passbands exceed 75 kHz.

Class B signal booster. A signal booster designed to retransmit any signals within a wide frequency band. A signal booster is deemed to be a Class B signal booster if it has a passband that exceeds 75 kHz.

Coverage area of a PLMRS station. All locations within the normal reliable operating range (service contour) of a PLMRS station.

Deploy a signal booster. Install and/or initially adjust a signal booster.

Distributed Antenna System (DAS). A network of spatially separated antenna nodes connected to a common source via a transport medium that provides wireless service within a geographic area or structure.

Operate a signal booster. Maintain operational control over, and responsibility for the proper functioning of, a signal booster.

Signal booster. A device or system that automatically receives, amplifies, and retransmits signals from wireless stations into and out of building interiors, tunnels, shielded outdoor areas and other locations where these signals would otherwise be too weak for reliable communications. Signal booster systems may contain both Class A and Class B signal boosters as components.

(b) *Authority to operate.* PLMRS licensees for stations operating on assigned channels higher than 150 MHz may operate signal boosters, limited to the service band for which they are authorized, as needed anywhere within the PLMRS stations service contour, but may not extend the stations service contour.

(1) PLMRS licensees may also consent to operation of signal boosters by non-licensees (such as a building owner or a signal booster installation contractor) within their service contour and across their applicable

frequencies, but must maintain a reasonable level of control over these operations in order to resolve interference problems.

- (i) Non-licensees seeking to operate signal boosters must obtain the express consent of the licensee(s) of the frequencies for which the device or system is intended to amplify. The consent must be maintained in a recordable format that can be presented to an FCC representative or other relevant licensee investigating interference.
- (ii) Consent is not required from third party (unintended) licensees whose signals are incidentally retransmitted. However, signal booster operation is on a non-interference basis and operations may be required to cease or alter the operating parameters due to a request from an FCC representative or a licensee's request to resolve interference.

(2) [Reserved]

(c) *Licensee responsibility; interference.* PLMRS licensees that operate signal boosters are responsible for their proper operation, and are responsible for correcting any harmful interference that signal booster operation may cause to other licensed communications services. Normal co-channel transmissions are not considered to be harmful interference. Licensees are required to resolve interference problems pursuant to §90.173(b). Licensees shall act in good faith regarding the operation of signal boosters and in the resolution of interference due to signal booster operation. Licensees who are unable to determine the location or cause of signal booster interference may seek assistance from the FCC to resolve such problems.

(d) *Deployment rules.* Deployment of signal boosters must be carried out in accordance with the rules in this paragraph.

- (1) Signal boosters may be used to improve coverage in weak signal areas only.
- (2) Signal boosters must not be used to extend PLMRS stations normal operating range.
- (3) Signal boosters must be deployed such that the radiated power of each retransmitted channel, on the forward link and on the reverse link, does not exceed 5 Watts effective radiated power (ERP).
- (4) Class B signal boosters may be deployed only at fixed locations; mobile operation of Class B signal boosters is prohibited after November 1, 2014.
- (5) Class B signal booster installations must be registered in the FCC signal booster database that can be accessed at the following URL:
www.fcc.gov/signal-boosters/registration.

- (6) Good engineering practice must be used in regard to the radiation of intermodulation products and noise, such that interference to licensed communications systems is avoided. In the event of harmful interference caused by any given deployment, the FCC may require additional attenuation or filtering of the emissions and/or noise from signal boosters or signal booster systems, as necessary to eliminate the interference.
- (i) In general, the ERP of intermodulation products should not exceed -30 dBm in 10 kHz measurement bandwidth.
 - (ii) In general, the ERP of noise within the passband should not exceed -43 dBm in 10 kHz measurement bandwidth.
 - (iii) In general, the ERP of noise on spectrum more than 1 MHz outside of the passband should not exceed -70 dBm in a 10 kHz measurement bandwidth.
- (7) Signal booster passbands are limited to the service band or bands for which the operator is authorized. In general, signal boosters should utilize the minimum passband that is sufficient to accomplish the purpose. Except for distributed antenna systems (DAS) installed in buildings, the passband of a Class B booster should not encompass both commercial services (such as ESMR and Cellular Radiotelephone) and part 90 Land Mobile and Public Safety Services.
- (e) *Device Specifications.* In addition to the general rules for equipment certification in §90.203(a)(2) and part 2, subpart J of this chapter, a signal booster must also meet the rules in this paragraph.
- (1) The output power capability of a signal booster must be designed for deployments providing a radiated power not exceeding 5 Watts ERP for each retransmitted channel.
 - (2) The noise figure of a signal booster must not exceed 9 dB in either direction.
 - (3) Spurious emissions from a signal booster must not exceed -13 dBm within any 100 kHz measurement bandwidth.
 - (4) A signal booster must be designed such that all signals that it retransmits meet the following requirements:
 - (i) The signals are retransmitted on the same channels as received. Minor departures from the exact provider or reference frequencies of the input signals are allowed, *provided that* the retransmitted signals meet the requirements of §90.213.

- (ii) There is no change in the occupied bandwidth of the retransmitted signals.
 - (iii) The retransmitted signals continue to meet the unwanted emissions limits of §90.210 applicable to the corresponding received signals (assuming that these received signals meet the applicable unwanted emissions limits by a reasonable margin).
- (5) On or after March 1, 2014, a signal booster must be labeled to indicate whether it is a Class A or Class B device, and the label must include the following advisory
- (1) In on-line point-of-sale marketing materials,
 - (2) In any print or on-line owners manual and installation instructions,
 - (3) On the outside packaging of the device, and
 - (4) On a label affixed to the device:

“WARNING. This is NOT a CONSUMER device. It is designed for installation by FCC LICENSEES and QUALIFIED INSTALLERS. You MUST have an FCC LICENSE or express consent of an FCC Licensee to operate this device. You MUST register Class B signal boosters (as defined in 47 CFR 90.219) online at www.fcc.gov/signal-boosters/registration. Unauthorized use may result in significant forfeiture penalties, including penalties in excess of \$100,000 for each continuing violation.”

[78 FR 21564, Apr. 12, 2013]

Appendix C - BDA/DAS Vendor List

Calvert County cannot recommend or endorse a specific BDA/DAS vendor for providing services related to the design, installation, testing, maintenance, and repair of NFPA 1221 2016 compliant BDA/DAS systems deployed in the County. The following list of BDA/DAS vendors is provided for informational purposes only. The order of this list does not imply a preference for any particular firm.

This list is by no means a complete list of all firms that are available to perform NFPA 1221 compliant BDA/DAS system installation and integration work in Calvert County, Maryland. Experienced and qualified firms that wish to be added to this list may submit contact information to radiosupport@calvertcountymd.gov.

Project developers in Calvert County are encouraged to thoroughly research and vet any firm under consideration for use with public safety BDA/DAS projects in Calvert County. When evaluating firms, consider asking the following questions:

- Does the firm have experience in the engineering and implementation of NFPA 1221 compliant public safety DAS systems? Can the firm summarize the requirements of NFPA 1221 as they apply to Radio Communications Enhancement Systems?
- Does the firm have experience in the engineering and implementation of DAS systems designed to work with 700/800 MHz digital simulcast P25 public safety trunked radio systems? Can the firm describe their experience with small, medium, and large implementations?
- Can the firm provide references for NFPA 1221 compliant 700/800 MHz DAS system implementations in the Mid-Atlantic region? In the Baltimore-Washington region?
- What is the firm's equipment and installation labor warranty policy?
- Can the firm provide the required ongoing post-warranty repair and annual maintenance services? What are the costs of these services?
- What licenses and certifications are maintained by the firm's engineering, technical, and construction staff?

Airtower Networks
80 M Street SE, 1st Floor
Washington, DC 20003
877-327-1785
bharris@airtower.com

Communications Electronics, Incorporated
1953 Greenspring Drive
Timonium, MD 21093
410-252-1222
<http://www.communicationselectronics.com>

Fiber Plus
8221 Hermitage Rd
Richmond, VA 23228
804-212-2796
<http://www.fiberplusinc.com>

Goodman Networks
2801 Network Blvd., Suite 300
Frisco, TX 75034
972-406-9692
<http://goodmannetworks.com>

GPD Group, Incorporated
5595 Transportation Boulevard
Suite 100
Cleveland, Ohio 44125
216-518-5544
<http://gpdgroup.com>

Lord and Company Technologies
8809 Sudley Road
Manassas, VA 20110
703-361-3530
<http://www.lordcotech.com/>

Morcom International, Inc.
P. O. Box 220824
Chantilly, VA 20153-0824
Phone: 703-263-9305
Fax: 703-263-9308
sales@morcom.com

SCE Site Development
9305 Gerwig Lane
Columbia, MD 21046
410-381-5705
<http://www.sceeng.com>

System Integrators
15947 Frederick Road
Lisbon, MD 21765
301-854-5421
<http://www.systemintegrators.net>

Turnkey Wireless
Atlanta, Georgia
770-677-9991
koehlera@bellsouth.net

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