Collier County P25 Radio System Guidelines for Deployment of In-Building Radio Coverage Systems

Version Date June 2026

Administrative Contacts

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Collier County owns and operates an 800 MHz P25 Phase 2 Trunked system under call signs WNLK955, WNSK615, WQMB408, WQMD549, and WQPW733.

The system consists of 14 radio sites

- 4 are single-site base stations
- 10 tower sites comprise the simulcast cluster

Below are the requirements for installation of in-building Emergency Responder Communication Enhancement Systems (ERCES) which building owners and system integrators must follow in order to receive authorization from Collier County to retransmit the frequencies licensed to Collier County.

This document also includes a radio system map, a draft version of the retransmission authorization letter, a list of Cellular Bands by network operator, and an FCC public notice regarding signal boosters.

This document is kept current at the following location on the Collier County Government web page

https://www.collier.gov/Public-Safety/Radio-Communications-Systems/ERCESBDA-Overview

General Requirements

1. Acceptance and approval of an ERCES for commercial service is at the sole discretion of the AHJ and the FCC Licensee.
1. Written authorization of both
    a. FCC License Holder (Collier County)
    b. the AHJ (Fire Marshal)

   are required upon initial installation and prior to activation for commercial service.
2. Emergency Responder Communications Enhancement Systems (ERCES) are only to be deployed if coverage testing shows that buildings do not meet RF thresholds specified in this document.
3. **Starting in 2026, initial coverage testing will also require downlink LTE measurements of all three cellular network operators (ATT/First Net, Verizon, and T-Mobile).** These test results will be provided for informational purposes to the AHJ along with coverage test results of the P25 Collier County radio system.
4. **The AHJ has the discretion to consider LTE-based communications enhancement solutions in**

lieu of an ERCES. Because these cellular communication enhancement systems fall outside of Part 90, Collier County Radio Group does not have approval authority over these systems.

5. ERCES are to be designed to retransmit only the licensed frequencies of the Collier County P25 radio system. The ERCES are not to retransmit any other spectrum, including LTE (cellular).
6. For buildings where an ERCES is needed based on in-building coverage test data, only the floors or areas requiring coverage are to be addressed in the design.
7. Multi-building complexes (campuses) where the buildings fall under the same ownership and/or are located on the same parcel of land must utilize a single head-end unit (one donor antenna for the complex/campus).
8. Systems are intended to require only the minimum RF gain for the signal boosters to accomplish the coverage objectives.
9. ERCES shall be operated and maintained in accordance with Federal Communications Commission Part 90 rules, NFPA 1225 Standards, manufacturer's instructions, and other Federal, State or Local codes as determined by the AHJ (Authority Having Jurisdiction).
10. Signal boosters must be FCC type accepted.
11. No Harm- The System shall not cause interference to licensed radio systems or equipment operated by Collier County or other government entities in Collier County
12. System owner shall promptly resolve any interference that occurs up to and including deactivation of the system, if necessary, until such time that the interference is corrected.
13. System owner shall provide access to the system for inspection upon request by the AHJ, Collier County Telecommunications, or the FCC.
14. System owner must notify and coordinate with Collier County Radio System group prior to testing, optimizing, and commissioning the in-building system.
15. Proof of a service agreement for the ERCES must be provided prior to being placed into service.
16. The AHJ and License Holder reserve the right to inspect or re-inspect the in-building system at any time.
17. The building owner is responsible that the annual tests are performed, and for requesting the County for a renewal of the Retransmission Authorization

Steps to Obtain Approval for an ERCES

1. During the project life cycle, ERCES system integrators will be working with and communicating with both
    a. the AHJ (Fire District and County Plans Review)
    b. and the FCC License Holder (Collier County Radio System Group).
2. The AHJ will confirm that the FCC License Holder (the County) approves the installation prior to final acceptance.
3. **Initial Determination Coverage Test Report-** will need to be reviewed in order for the AHJ to determine if an ERCES is warranted
    a. This is an "as-is" coverage test report that shows the existing, native radio coverage throughout the building as a percentage of floor area
    b. Collier County requires the use of designated vendors for all coverage test reports, which are listed in the Technical Requirements section below.
    c. Testing will include both P25 signals as well as LTE cellular. The AHJ has the discretion to consider LTE coverage results as a substitute for requiring an ERCES.
    d. This report must be reviewed by Collier County before any coverage enhancement system is contemplated and submitted for building permit

e. If the native radio coverage meets standard indicating an ERCES is not required, Collier County will issue a letter to the AHJ which will affirm that the building fulfills compliance standards for in-building coverage as stated in NFPA 1225 and the Florida Fire Prevention Code.
f. Note: Final determination of whether an ERCES is required is at the discretion of the AHJ in cooperation with the FCC licensee.
g. See Technical Requirements section below for the coverage test thresholds.

4. The System Integrator must successfully meet the requirements for and also receive these two documents from the County prior to final acceptance
    a. **Provisional Retransmission Authorization-** prior to start of any installation work
    b. **Final Retransmission Authorization** – prior to the ERCES being placed into service
5. **A Provisional Retransmission Authorization letter** will be issued from the Collier County Radio System Group (the license holder) after the following are reviewed and approved
   Important Note- the installation of an ERCES cannot begin until a Provisional Retransmission Authorization has been granted, regardless of the status of the electrical permit.
    a. **Project Information**
        - Latitude and Longitude (decimal format)
        - Address of Project Location
        - Name of Building Owner
        - Technical Design Contact Information
        - Electrical Permit #
    b. **ERCES Design package**
        - Overall design plan drawing
        - Floor plans showing locations of equipment locations, donor antenna, and serving antennas
        - "Heat map" showing predicted coverage for each floor
        - Initial determination coverage test report (from above) showing native coverage
        - ERCES link budget
        - Manufacturer's data sheets
6. **A Final Retransmission Authorization letter** will be issued from the Collier County Radio System Group (the license holder) after the following are reviewed and approved
    a. System Commissioning Documentation
        - As-built drawings showing all equipment locations
        - Signal booster settings
            - Uplink and downlink gain
            - Configured Bands
            - Class "A" operation: filters being used and the filter bandwidth
        - Manufacturer's data sheets
    b. Results of tests performed by the Managed Services Provider in collaboration with the System Integrator
        - No Harm Test (Uplink Noise Floor Test and Signal Level)
        - Uplink Maximum Signal level Test (at Donor site)
        - Outdoor Signal Leakage Test
    c. Results of test to be performed by the System Integrator
        - Post-installation Building Coverage Test Report

- P25 KPIs – RSSI, FBER, and SINR measured on downlink
- DAQ subjective test using test radios
- Can be performed by the System Integrator
- LTE measurements **are not required** for post-install coverage tests.

- Isolation Test

d. FCC Signal Booster Registration ID

e. Maintenance Contract- Collier County requires that each ERCES be under a maintenance contract to provide services for break-fix events as well as annual maintenance and testing.
   - A copy of the agreement is to be provided.
   - Break-fix repair support 24/7 with 4-hour response after notification

7. Once the above items have been reviewed and system and no-harm tests are completed, then Collier County will issue written authorization for commercial service.
8. The letter must be posted conspicuously with the headend equipment (location of Bi-directional amplifier and associated alarm panel)
9. Commercial properties that have multiple signal boosters (head end) shall require a separate retransmission authorization letter for each signal booster.
10. The Retransmission Authorization is valid for one (1) year. Maintenance and Periodic testing must be performed prior to requesting renewal of the Retransmission Authorization.

Technical Requirements

1. Collier County requires that all signal boosters, be registered in the FCC signal booster database: https://signalboosters.fcc.gov/signal-boosters/
   a. The operator of the ERCES, typically the building owner, is responsible to register the ERCES. The building owner may ask the vendor to assist with the registration process.
   b. The vendor is allowed to register as the operator of the ERCES only if the vendor will accept full responsibility for ensuring the ongoing proper operation of the booster and, therefore, be responsible for any violation of the FCC's rules.
   c. See Public Notice DA 19-1255 later in this document: "If the vendor does not assume that responsibility, the individual or company registered as the booster owner (typically the building owner) will be responsible for complying with the FCC's rules and liable for any penalties assessed for improper operation of the booster".
2. Where several buildings in close proximity are going to require an ERCES, a Fiber-distributed or equivalent solution will be utilized to minimize the number of ERCES with donor antennas (NFPA 1225 A18.3).
3. Selection of signal boosters and associated RF hardware
   a. **The use of Class A (which is narrow band signal booster designed to retransmit signals on specific RF channels) is required** for all ERCES in Collier County.
      i. A Class "A" device is a signal booster designed to retransmit signals on one or more specific channels; whereas, a Class B signal booster is designed to retransmit any signal within a wide frequency band.
      ii. A signal booster is considered Class A if none of its passbands exceed 75 kHz
      iii. A signal booster is considered Class B signal booster if any of its passbands exceed 75 kHz.
   b. The signal boosters will therefore be designed and configured to retransmit only

Collier County P25 RF channels. No other narrowband or cellular frequencies will be retransmitted.

c. The signal booster must be equipped with an “uplink squelch” feature, where the uplink RF signal amplifier (i.e. mobile radio to Tower site) of the signal booster is inactive during idle periods where there are no mobile radios transmitting using the in-building system.

d. The serving antennas and the associated passive distribution hardware (coaxial cable, splitters, tappers, etc.) associated with the serving antennas must support frequencies between 700 and 2700 MHz. This is to ensure future compatibility with both 700 / 800 MHz Public safety spectrum as well as the most commonly-utilized cellular spectrum.

e. The maximum radio signal propagation delay introduced by the ERCES shall not exceed 32 microseconds.

   i. **Collier County recommends a filter bandwidth of either 25 kHz or 75 kHz on Class A amplifiers to reduce the observed propagation delay.**

   ii. Narrower filter bandwidths will increase propagation delay above 32 uS.

4. Donor antennas and associated mounting hardware must meet 140 mph sustained winds (150 mph, 3 second gust) in accordance with Florida Building Code for South Florida region.
5. Sharing of Infrastructure with non-public safety systems
   a. Sharing of the in-building distribution infrastructure (serving antennas, distribution coaxial cable, RF splitters, etc.) between public safety and non-public safety services (i.e. Cellular/LTE/5G) and bands is cost effective and beneficial to the end users in many cases.
   b. The performance of the public safety retransmitted signal quality and strength shall not be degraded regardless of the amount of traffic carried by the non-public safety elements of the in-building system.

Required Tests to be Performed

Test	System Integrator	Authorized Test Vendor	Radio System Managed Services Provider	Network Operator- Collier County	AHJ/ Fire Marshal
In-building coverage test- Initial Determination	A	R	S	I, C	I
In-building coverage test-post ERCES install	A, R	C	S, C	I, C	I
Isolation	A, R	C		I	I
No Harm	A		R	I	I
Uplink Max Signal Level	A		R	I, C	I
Outdoor Signal Leakage	A		R	I, C	I

Responsibility Matrix (RASCI) - Roles of each group below for each test

- R=Responsible- perform the testing and provide the test results
- A=Accountable- ensure overall completion of the tests, request, schedule, provide test reports to both Collier County and the AHJ, and pay for the testing
- S=Support – provide resources to the those Responsible for the test
- C=Consult- provide technical assistance on request
- I=Inform- receive and reviews the test results

Initial Determination ("Native") Coverage Testing

List of Authorized Test and Measurement Vendor- listed in Alphabetical Order

The building owner / potential system integrator must contract for native (initial) testing services with the below vendors.

Advanced Telecom Systems 8402 US Hwy 301 N Tampa, FL 33637 (813) 343-2334 https://advancedtelecom.us	**All Digital Technology, LLC** 5750 Zip Drive Fort Myers FL 33905 (239) 278-4111 http://www.alldigitaltechnology.com
Communications International 1910 J and C Blvd Naples FL 34109 (239) 514-4428 http://www.ask4ci.com	**CSLS** 7946 Villa Nova Drive Boca Raton FL 33433 (561) 237-5565 http://www.cslsllc.com
Everon Solutions 1501 Yamato Road Boca Raton FL 33431-4438 (732) 921-6373 https://www.everonsolutions.com/	**Mann Wireless, Ltd.** 7303 124th Avenue Largo FL 33773 (727) 216-6200 http://www.mannwireless.com
Pure Wireless, LLC 9244 Mercato Way Naples FL 34108 (540) 287-0649 http://www.purewireless.io	**Source 1 Solutions** 16331 Bay Vista Drive Clearwater FL 33760 Office: (727) 538-4114 Mobile (727) 250-8687 https://source1solutions.com/
Spectrum RF 6713 Highland Pines Circle Ft Myers FL 33966 Office (866) 425-4638 Mobile (239) 851-7947 http://www.spectrumrfconsulting.com	**Stellar Communications dba BDA Pro, LLC** 3950 NW 120th Ave. Coral Springs FL 33065 Office: (954) 323-1010 extension 110 Mobile (561) 501-8775 http://www.stellarcommgroup.com
Time Out Systems 380 Indian Creek Circle Adel GA 31620 Office (229) 563-3080 option 2 Mobile (813) 345-1129 https://www.timeoutsystems.com	**Wireless Data Collections** 1490 Sunshadow Drive Suite 3030 Casselberry FL 32707 (407) 562-7223 http://wirelessdatacollections.com
WISE Building Technologies 1211 NW 93rd Ct. Doral FL 33172 Office (844) 599-9473 Mobile (786) 299-7150 https://www.wisebt.com	**Intentionally Left Blank**

Tests to Be Performed

1. **In-Building Coverage Tests**- NFPA 1225 18.8, 8.9
    a. Indoor coverage tests shall be performed so that the percentage of coverage for both general building areas and critical areas can be recorded and displayed in an easy-to-read format acceptable to the AHJ.
        i. The coverage test will be performed twice
            1. Initial Determination- Native coverage (no ERCES present). Building at 95% or greater completion (construction & interior finishing work is complete)
            2. Post-installation- once the ERCES is integrated, optimized, and commissioned
        ii. The Initial Determination coverage test must be performed by one of the authorized test vendors.
        iii. The Post-installation coverage test can be performed by the system integrator
        iv. P25 test radios will need to be obtained for DAQ testing.
        v. The radio coverage Pass/Fail standard is based on signal quality, known as Delivered Audio Quality.
    b. **Initial Coverage Tests- both coverage of both the Collier P25 radio system as well as commercial LTE cellular networks are to be measured.**
        i. Both P25 and LTE signal level testing should be performed simultaneously using the same test and measurement equipment.
        ii. **DAQ testing is only to be performed on the P25 network** (not for LTE)
    c. **Post Install Coverage Tests of ERCES systems- only P25 testing is to be performed**, because the ERCES installation only retransmits Collier County P25 channels, not LTE/cellular. Therefore, LTE testing is not applicable for post-install coverage testing.
    d. Key Performance Indicators (KPI) are measured using specialized calibrated RF Test & Measurement equipment
        i. P25 KPI's
            1. Frame Bit Error Rate (FBER)
            2. Signal to Noise ratio (SINR)
            3. These two KPIs are proxies for DAQ values of 3.0 (TSB-88.1 Table A)
            4. P25 Downlink power (RSSI) is measured & reported for informational purposes and does not factor into the overall Pass/Fail status.
        ii. LTE KPI's (LTE testing applies only to Initial Coverage tests & is Downlink-only)
            1. LTE Reference Signal Received Power (RSRP)
            2. LTE Signal vs Noise and Interference (SINR)
            3. LTE Carrier Received Signal Strength Indicator (RSSI)- is measured and reported for informational purposes and does not factor into the overall Pass/Fail status.
    e. Reference signal levels are to be measured outdoors for at least 4 corners of each building being assessed.
        i. This provides information on the on-street/outdoor coverage of the public safety radio system and also the relevant RF carriers for each cellular network operator to be tested indoors.

ii. Usable carriers for each network operator are to be identified by scanning the below LTE bands used in the US. See reference sheet "Table of Cellular Bands by Network Operator" in this document.
    1. FDD- 2, 4, 5, 12, 13, 14, 17, 25, 26, 27, 30, 66, 71, 85
    2. TDD- 41
iii. Based on the reference signal levels, this will determine the specific cellular carriers to be measured.

f. Subjective audio testing (DAQ) will be accomplished using test radios provisioned on the Collier County P25 radio system.
    i. DAQ Testing using test radios is performed on both P25 Downlink & Uplink paths. **DAQ is not required to be tested on LTE cellular networks.**
    ii. Communications International, the managed services provider, has provisioned P25 radios that are available for rental.
    iii. Use of Harvard Sentences will allow objective assessment of the delivered audio quality

g. Coverage Test Specifications
    i.

General Area	95% floor area	NFPA 1225 18.8.4
Critical Areas	99% floor area	NFPA 1225 18.8.3

h. P25 Testing Settings
    i. P25 KPI Thresholds

Key Performance Indicator	Downlink	Uplink	Notes
DAQ (audio tests)	>= 3.0	>= 3.0	2 P25 test radios
P25 Power (RSSI)	>= -118 dBm	NA	RSSI is reported but not factored as Pass/Fail
Bit Error Rate	<= 2.5%	NA	Corresponds to DAQ 3.0
Signal to Noise Ratio (SINR)	>= 18 dB	NA	Corresponds to DAQ 3.0

ii. DAQ Description

DAQ 1:	Unusable. Speech present.
DAQ 2:	Speech is understandable with considerable effort. Requires frequent repetition due to noise or distortion.
DAQ 3:	Speech is understandable with slight effort. Requires occasional repetition due to noise or distortion.
DAQ 3.4:	Speech understandable without repetition. Some noise or distortion present.
DAQ 4:	Speech is easily understandable - little noise or distortion.
DAQ 4.5:	Speech is easily understandable - rare noise or distortion.
DAQ 5:	Perfect. No distortion or noise discernable

i. LTE Testing Settings
    i. LTE KPI Thresholds

Key Performance Indicator	Downlink	Uplink	Notes
LTE RSSI	>= -115 dBm	NA	RSSI is reported but not factored as Pass/Fail
LTE RSRP	>= -95 dBm	NA	Corresponds to CQI of 7
LTE SINR	>= 5 dB	NA	Corresponds to CQI of 7

    ii. LTE Cellular Testing Bands
        1. The carriers identified as reference signals above should be grouped by network operator.
        2. The pass/fail status of each grid or critical point will be evaluated for each network operator, based on the RSRP and CINR of the best performing carrier for that network operator.

2. **Isolation Test**- NFPA 1225 18.3.3.2, 18.10- to be performed if a donor antenna is present at the building. This does not apply if the head end has already been commissioned in another building, for example in a fiber distribution system across several buildings.
    a. Isolation between the donor antenna and all serving antennas must be measured to be at least 20 dB above the configured signal booster system gain.
    b. Most recent ERCES signal boosters have an integrated isolation test mode that does not require any additional RF equipment to perform the isolation test. This is the preferred method if supported by the signal booster.
    c. Either Transmit path or Receive path isolation measurements can be selected as the Isolation test
    d. Isolation tests should be made at 2 test frequencies in each band being retransmitted
    e. Note that if the isolation test is performed using the built-in method in the Signal booster, then a second test frequency may not be available, which is acceptable.
    f. Transmit path (downlink) isolation measurement method
        i. With the BDA shut off and donor antenna cable disconnected from the BDA, connect the CW transmitter to the serving antenna cable.
        ii. The CW signal level should be set to a level of at least 0 dBm
        iii. The donor antenna cable is to be connected to the measuring receiver, and the measurement recorded
        iv. Record the signal level measurement
        v. Isolation is determined as the difference between the signal level of the CW transmitter and the received levels.
    g. Receive path (uplink) isolation measurement method
        i. With the BDA shut off and donor antenna cable disconnected from the BDA, connect the CW transmitter to the donor antenna cable.
        ii. The CW signal level should be set to a level of at least 0 dBm
        iii. The service antenna cable is to be connected to the measuring received
        iv. Record the signal level measurement
        v. Isolation is determined as the difference between the signal level of the CW transmitter and the received levels.

h. Test results need to state the isolation values that were calculated above, including the BDA uplink and downlink system gain values configured during installation.

3. **No Harm Tests**- performed at the RF Donor site
    a. The Managed Services Provider will perform this test under contract with the System Integrator.
        i. One technician will conduct testing at the Donor RF site
        ii. A second technician will be on site.
        iii. Before no harm testing starts, the on-site technician will confirm that the donor antenna is aimed at the correct donor site per design.
    b. Receiver noise floor testing- NFPA 1225 18.9.3
    c. The Spectrum analyzer should be set as follows for noise measurement
        i. Detection- RMS or Average
        ii. Pre-Amp= ON
        iii. Ref Level = -40 dBm
        iv. Input attenuation- 0 dB
        v. 10 kHz Resolution bandwidth
    d. The maximum uplink RF noise (noise crown) created by the ERCES shall not raise the noise floor measured at the multi-coupler at the donor P25 tower site
    e. The idle noise floor is to be measured with the ERCES shut off, and then with the ERCES turned on (uplink squelch needs to be temporarily disabled for this test). There should not be a noticeable increase in noise floor.
4. **Uplink Gain**- Maximum RF signal level Test at Donor Site
    a. This test should be performed during No Harm testing, as it will require the assistance of the Managed Services provider at the P25 Donor site.
    b. Perform the uplink near input signal strength test by transmitting with a portable radio at a point 10 feet away from the closest serving antenna to the ERCES Head-End.
    c. Verify that the signal received by the donor site is no more than -75dBm (Managed Services provider is at the donor site).
    d. Adjust the Uplink Gain level as needed.
5. **Outdoor Signal Leakage from ERCES**- NFPA 1225 20.3.10
    a. This test will be conducted by the Managed Services provider at the project location.
    b. This test is to confirm that signal leakage from the in-building ERCES is at a negligible level and therefore does not increase the measured power level outside the building.
    c. A walk test should be performed where signal power (RSSI) is measured along the perimeter of the building at 3 feet distance away from the building walls with the ERCES active and also turned off.

Maintenance and Periodic Testing- NFPA 1225 20.3.10.2.3

1. **The Retransmission Authorization must be renewed annually.** The test reports are to be submitted along with the request to renew the Retransmission agreement. To renew, submit a request to radiorepair@collier.gov .
2. **Annual Operational Tests-** NFPA 1225 20.3.10.2.3.2
    a. Inspect building for any physical changes that impact ERCES coverage
    b. Review frequency plan of the radio system(s) being retransmitted and make any required configuration changes to the BDA. Any changes to gain settings shall require retesting with Collier Counties system maintenance vendor and be documented.
    c. Apply any firmware or software updates to the BDA recommended by the OEM.
    d. Expected signal levels shall be verified at every serving antenna.
    e. A sweep test of the donor antenna and the RF distribution elements (coax cable, surge arrestor, passive devices) shall be performed from the RF connection at the signal booster head end
    f. Test backup batteries and power supplies under load for one (1) hour
    g. Verify supervisory monitoring signals
    h. Perform the following performance tests, which were performed during system commissioning
        - Perform DAQ test on each floor on at least one location (add additional tests if floor area is > 128,000 sq feet)
            - These tests can be performed using P25 test radios
            - The Building Coverage Test report is not required to be performed yearly.
        - Isolation Test
    i. The test reports are to be submitted along with the request to renew the Retransmission agreement. To renew, submit a request to radiorepair@collier.gov .
3. **Tests to be Performed Every Five Years-** NFPA 1225 20.3.10.2.3.3
    a. All Annual Operational Tests listed above
    b. Building Coverage Test report- for all floors
    c. Isolation Test
    d. These test reports are to be submitted along with the request to renew the transmission agreement.

P25 800 MHz Tower Site Technical Data

1. Below is the list of the location and fundamental physical information of each P25 tower site
2. **Please read before starting RF field testing**
    a. The P25 Trunking system control channel can be assigned by the system on any the licensed RF channels (see Table of Licensed Frequencies below).
    b. RF channels assigned as Data Channels or Voice Traffic Channels are not suitable for this test. **Testing only on the Control channel is recommended.**
    c. Before taking the downlink readings in the field, if you need to verify the active control channel RF frequency for measurement, please reach out to Radio system administrative team (see front page) for confirmation.

P25 800 MHz Tower Site Technical Data

Site Name	Site Category	Latitude	Longitude	Antenna Center-Line (ft.)	Effective Radiated Power (dBm)
Loop Road	Single-site	25-45-45.4	80-56-09.2	236	55.3
Carnestown	Single-site	25-54-36.4	81-21-49.3	275	54.7
Miles City	Single-site	26-09-42.1	81-20-56.9	190	55.3
I-75 East- DOT	Single-site	26-10-08.3	81-04-57.3	200	55.2
Immokalee	Simulcast	26-23-42.2	81-24-46.2	280	54.6
NCH-Baker	Simulcast	26-09-03.50	81-47-55.2	145	57.6
Corkscrew	Simulcast	26-16-36.0	81-36-04.0	200	57.3
North Naples	Simulcast	26-13-33.3	81-46-45.3	250	54.9
Old 41	Simulcast	26-19-03.3	81-47-13.7	210	55.2
Gulf Coast HS	Simulcast	26-16-12.9	81-42-22.4	155	55.6
County Barn	Simulcast	26-07-34.5	81-43-40.0	245	54.9
Marco Island	Simulcast	25-55-28.2	81-43-42.1	130	55.8
Krehling	Simulcast	26-01-51.0	81-38-32.0	200	55.2
WAVV	Simulcast	26-10-59.0	81-34-29.0	295	54.5

Collier County

Table of Licensed Frequencies

COLLIER P25 SIMULCAST SYSTEM		
Channel	**Tx Frequency**	**Rx Frequency**
1	854.3625	809.3625
2	856.4375	811.4375
3	856.4875	811.4875
4	856.9375	811.9375
5	856.9625	811.9625
6	857.4875	812.4875
7	857.9625	812.9625
8	858.9375	813.9375
9	858.9625	813.9625
10	859.4875	814.4875
11	860.4375	815.4375
12	860.7625	815.7625
Expansion 13	860.4875	815.4875
Expansion 14	860.9625	815.9625

CARNESTOWN SINGLE SITE SYSTEM		
Channel	**Tx Frequency**	**Rx Frequency**
1	854.4375	809.4375
2	855.4875	810.4875
3	859.2625	814.2625
4	859.9375	814.9375
5	860.9375	815.9375

I75 EAST DOT SINGLE SITE SYSTEM		
Channel	**Tx Frequency**	**Rx Frequency**
1	856.7625	811.7625
2	857.7625	812.7625
3	858.7625	813.7625
4	858.0375	813.0375

LOOP ROAD SINGLE SITE SYSTEM		
Channel	**Tx Frequency**	**Rx Frequency**
1	856.2625	811.2625
2	857.2125	812.2125
3	857.9375	812.9375

MUTUAL AID CHANNELS		
Channel	**Tx Frequency**	**Rx Frequency**
8CALL90	851.0125	806.0125
8TAC91	851.5125	806.5125
8TAC92	852.0125	807.0125
8TAC93	852.5125	807.5125
8TAC94	853.0125	808.0125

MILES CITY SINGLE SITE SYSTEM		
Channel	**Tx Frequency**	**Rx Frequency**
1	851.0875	806.0875
2	852.0875	807.0875
3	852.6500	807.6500
4	853.5625	808.5625

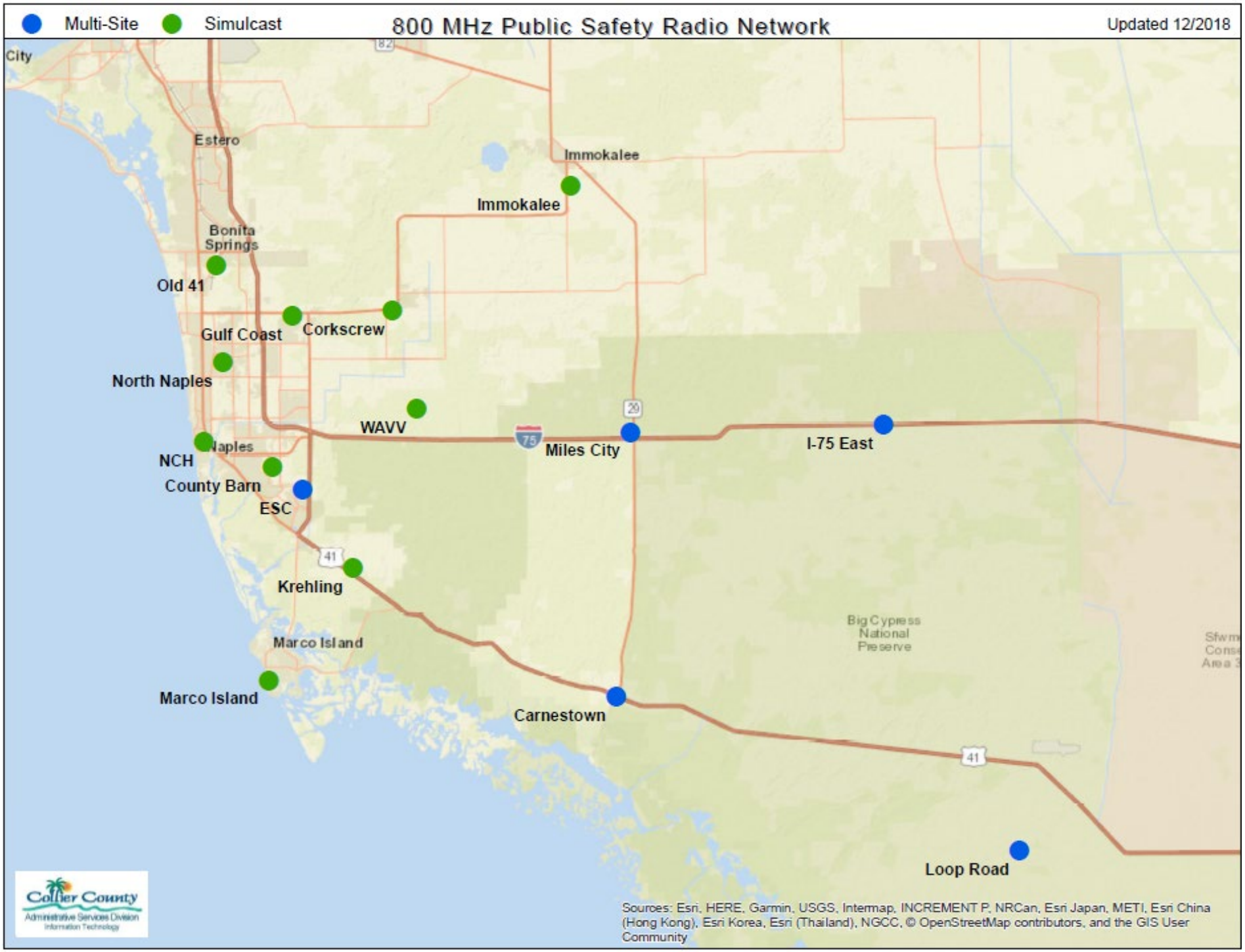
Multi-Site
Simulcast
800 MHz Public Safety Radio Network
Updated 12/2018
City
Estero
Immokalee
Immokalee
Bonita Springs
Old 41
Gulf Coast
Corkscrew
North Naples
WAVV
Naples
NCH
County Barn
ESC
Miles City
I-75 East
Krehling
Marco Island
Marco Island
Carnestown
Big Cypress National Preserve
Loop Road
Collier County
Administrative Services Division
Information Technology
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, © OpenStreetMap contributors, and the GIS User Community

Table of Cellular Bands by Network Operator

Note- this is a general guide. Not all bands are in use in a specific area.

Network Operator	Band	Frequency Range	Notes
AT&T	12	700 MHz	Primary LTE low-band
AT&T	17	700 MHz	Legacy AT&T LTE
AT&T	14	700 MHz	FirstNet (Public Safety Broadband)
AT&T	5	850 MHz	LTE/5G low-band
AT&T	2	1900 MHz	PCS
AT&T	4 / 66	1700/2100 MHz	AWS / AWS-Extended
Verizon	13	700 MHz	Primary Verizon LTE low-band
Verizon	5	850 MHz	LTE/5G
Verizon	2	1900 MHz	PCS
Verizon	4 / 66	AWS	LTE
T-Mobile	71	600 MHz	T-Mobile low-band
T-Mobile	12	700 MHz	LTE
T-Mobile	5	850 MHz	LTE/5G
T-Mobile	2	1900 MHz	PCS
T-Mobile	4 / 66	AWS	LTE
T-Mobile	41	2.5 GHz	T-Mobile 5G mid-band

Public Safety Radio Retransmission Authorization

Annual Renewal Required on XX-XX-XXXX

Collier County authorizes ***[name of system operator]*** to operate a two-way emergency radio communications enhancement system (ERCES) on 800 MHz frequencies licensed to Collier County by the Federal Communications Commission (FCC) at the following location:

System Name	Permit PRELXXXXXXX	
System Address		
Latitude/Longitude	26.XXXX N	81.XXXX- W
Building Owner		
FCC Signal Booster ID	SB0XXXXXX	
Technical Design Contact		
Contact phone #		
Contact email address		

1. Call signs, system frequencies and site locations are included in Collier County P25 System Guidelines for ERCES Installations document.
2. The ERCES shall be operated and maintained in accordance with manufacturer's instructions, FCC Part 90 FCC rules and regulations, and requirements of NFPA 1225 Standard, including required periodic maintenance and testing of the ERCES.
3. No Harm- The ERCES shall not cause interference to radio systems or equipment operated by Collier County or other government entities in Collier County
4. Operator shall promptly resolve any interference that occurs to radio systems or equipment operated by government entities, up to and including deactivation of the System, if necessary, until such time that the interference is corrected.
5. Operator shall provide access to the System for inspection upon request by the AHJ (Authority Having Jurisdiction), Collier County Telecommunications, or the FCC.
6. This retransmission authorization shall be posted at the headend equipment location (Bi-directional amplifier and associated alarm panel).
7. System testing, final, acceptance, and approval of the system for commercial service is at the sole discretion of the AHJ and FCC licensee.
8. Any system installed shall have a service level agreement with a responsible company.

Regards,

Nathaniel Hinkle, Telecommunications Manager, Collier County Department of Public Safety
Nathaniel.Hinkle@collier.gov

PUBLIC NOTICE

Federal Communications Commission
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Washington, D.C. 20554

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DA 19-1255
Released: December 11, 2019

REMINDER OF THE OBLIGATIONS OF NON-LICENSEES THAT OPERATE PART 90 PRIVATE LAND MOBILE RADIO SIGNAL BOOSTERS

WT Docket No. 10-4

The Public Safety and Homeland Security Bureau and the Wireless Telecommunications Bureau issue this notice to remind building owners and other non-licensee operators of Part 90 Private Land Mobile Radio (PLMR) signal boosters that they may not operate these boosters until they: (a) obtain the express written consent of the licensee(s) whose signals they would re-transmit and (b) register Class B signal boosters[1] with the Federal Communications Commission (Commission) at the website: www.fcc.gov/signal-boosters/registration.[2] **Failure to do so risks harmful interference to first responders and others and may subject you to enforcement action.**

(a) PART 90 SIGNAL BOOSTERS

Part 90 PLMR signal boosters include a wide variety of devices that serve multiple users simultaneously and are designed to improve, for example, public safety agency radio coverage in large but confined areas such as stadiums, airports, office buildings, hospitals, tunnels, and educational campuses.[3] Booster technology such as distributed antenna systems (DAS) plays a crucial role in allowing users to communicate in areas where their radio signals would otherwise be blocked.[4]

The Bureaus recognize that many building owners install Part 90 signal boosters to comply with building codes that require the building owner to ensure that users, typically first responders, have seamless indoor radio coverage when they respond to an incident. But improperly installed or operated signal boosters can interfere with the very communications they are designed to re-transmit. It therefore is essential that the licensees whose signals are re-transmitted (e.g., public safety agencies) and the Commission have accurate information on such boosters. Without such information, the licensees and the Commission cannot promptly act to identify and eliminate interference that can seriously impair first responders' ability to respond and provide aid. Consequently, as detailed below, Part 90 signal booster

[1] See definition of Class A and B boosters under Section (c) below (Registration Requirement for Class B Signal Boosters).

[2] This Public Notice focuses only on Part 90 PLMR signal boosters and does not address other types of signal boosters, including those consumer and industrial signal boosters that are intended to retransmit signals of commercial wireless carriers. For more information regarding signal boosters that operate on wireless carrier frequencies, *see* Section 20.21 of the Commission's rules.

[3] *Amendment of Parts 1, 2, 22, 24, 27, 90 and 95 of the Commission's Rules to Improve Wireless Coverage Through the Use of Signal Boosters*, WT Docket No. 10-4, Report and Order, 28 FCC Rcd 1663, 1665, para. 5 (2013) (*Signal Booster R&O*).

[4] *Id.* at 1717, para. 151.

operators must obtain consent from the licensees whose signals are re-transmitted and register Class B devices.

(b) **CONSENT REQUIREMENT**

Although building codes or other regulations may require installation of Part 90 signal boosters, they do not authorize non-licensee building owners or others to operate them. Commission rules prohibit Part 90 booster operation unless the proposed operator has obtained the express written consent of the licensee(s) whose signals are to be re-transmitted. The Part 90 booster operator must retain that written consent and provide it to the Commission or a licensee representative on request.[5] Boosters should be installed and maintained only by qualified installers.[6]

You may search the Commission's Universal Licensing System (ULS) for PLMR licensees operating in your area in order to determine whose consent is required. The ULS search engine can be found at: https://wireless2.fcc.gov/UlsApp/UlsSearch/searchLicense.jsp.[7]

Part 90 boosters, on occasion, may incidentally and intermittently re-transmit signals of licensees other than the licensee(s) that have provided express written consent for retransmission of their signals. Such incidental retransmission does not require the express written consent of the incidentally re-transmitted licensee.

All booster operators should be mindful that boosters are authorized strictly on a non-interference basis – they must not cause interference to other users and must accept interference they may receive from other users. If a booster causes interference, you must adjust it so that it does not cause interference or immediately discontinue operation.[8]

(c) **REGISTRATION REQUIREMENT FOR CLASS B SIGNAL BOOSTERS**

The Commission recognizes two types of Part 90 PLMR signal boosters: A **Class A device** is a signal booster designed to retransmit signals *on one or more specific channels* and does not require registration with the Commission. A **Class B device** is a signal booster designed to retransmit *any signal within a wide frequency band* and must be registered with the Commission.[9] Class B Signal booster operators, e.g., building owners, must register their Class B devices with the Commission at www.fcc.gov/signal-boosters/registration prior to beginning operation of a signal booster.

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[5] 47 CFR § 90.219(b)(1)(i).

[6] *Signal Booster R&O*, 28 FCC Rcd at 1665, para. 5. Although the Commission has not adopted standards for qualified installers, several state and local jurisdictions have done so. Parties intending to install boosters should check state and local codes for installer qualifications.

[7] A booster operator, installer, or the operator's counsel can use the Commission's ULS database to identify the location and ownership of Part 90 stations in the booster's area. The database allows searching by frequency, frequency range, county, state or radius around a center point. The ULS database may be accessed at https://wireless2.fcc.gov/UlsApp/UlsSearch/searchLicense.jsp and selecting Advanced License Search. Assistance in use of the database may be obtained at https://wireless2.fcc.gov/helpfiles/licenseSearch/helpAdvanced.html or by calling 1-877-480-3201.

[8] 47 CFR § 90.219(c).

[9] *Id.* § 90.219(a).

Registration of Class B signal boosters allows parties to identify the source interference when it occurs and arrange for shut down of the booster until interference is resolved.[10] Registration must include, at a minimum:

- the call sign and frequency of the station to be re-transmitted;
- the operating range of the Class B signal booster;
- the physical location (address, city and state) of the signal booster; and
- contact information for the individual(s) responsible for the signal booster's operation.

The signal booster database is searchable by state, county, frequency range, and location of the device.

(d) **ENFORCEMENT ACTION**

If Part 90 booster operators do not obtain express written consent from the re-transmitted licensee or fail to register their Class B boosters with the Commission, their violation of Commission rules can subject them to enforcement action, including fines and the seizure of equipment. Causing interference that hampers first responders' ability to render aid could result in harm to persons or property.

Booster installers should carefully note the strict technical requirements specified in Section 90.219(d) of the Commission's rules when deploying Part 90 PLMR signal boosters.[11]

(e) **FACT SHEET**

Attached is a fact sheet summarizing the obligations and requirements for non-licensees who operate Part 90 PLMR signal boosters.

For further information regarding this matter contact Brian Marenco, Electronics Engineer, Policy and Licensing Division, Public Safety and Homeland Security Bureau, at (202) 418-0838 or Brian.Marenco@fcc.gov, or Jaclyn Rosen, Mobility Division, Wireless Telecommunications Bureau, at (202) 418-0154 or Jaclyn.Rosen@fcc.gov.

- FCC -

[10] *Signal Booster R&O*, 28 FCC Rcd at 1722, para. 162. Registration of Class A devices is not required.

[11] 47 CFR § 90.219(d).

Attachment A
Fact Sheet on Non-Licensee Operation of Part 90 Private Land Mobile Radio (PLMR) Signal Boosters

Question 1: *What is a Part 90 PLMR signal booster and what is it intended to do?*

Answer 1: A Part 90 PLMR signal booster is a device designed to re-transmit radio signals from PLMR licensees to improve radio coverage in weak signal areas. A common type of Part 90 PLMR signal booster is a distributed antenna systems (DAS). DAS are typically deployed in large areas such as stadiums, airports, office buildings, hospitals, tunnels, and educational campuses. Part 90 PLMR signal boosters play a crucial role in allowing public safety-first responder agencies to communicate in buildings, tunnels, and other areas where their radio signals would normally be blocked.

Question 2: *May I operate a Part 90 PLMR signal booster without a license from the FCC?*

Answer 2: Yes. An entity such as a building owner may operate a Part 90 PLMR signal booster without a license from the Commission provided that the operator first obtains the express written consent of the licensee(s) of the frequencies for which the device is intended to amplify. Consent must be maintained in a recordable format that can be presented to a Commission representative or other relevant licensee if interference occurs. Part 90 PLMR signal boosters may only be installed by "qualified installers."

Question 3: *Why is it necessary for me to obtain consent from the licensee(s) whose signals will be retransmitted by my Part 90 PLMR signal booster?*

Answer 3: It is necessary to obtain consent because improperly installed or operated signal boosters can interfere with radio communications of, for example, first responders who the boosters are intended to assist. Therefore, coordinating with the appropriate licensees ahead of time and obtaining their consent may avoid interference before it occurs.

Question 4: *How can I find out which PLMR licensees operate in my area on the frequencies or frequency range re-transmitted by my Part 90 PLMR signal booster?*

Answer 4: You may search the Commission's Universal Licensing System (ULS) for PLMR licensees operating in your area. By choosing the "Advanced Search Options" you can search the ULS database for licensees based on individual frequencies or a frequency range and you may limit your search to a geographic area such as a state, county, or a radius around a center point. The ULS search engine can be found at: https://wireless2.fcc.gov/UlsApp/UlsSearch/searchLicense.jsp. Your installer should be able to inform you what frequencies or frequency range your device is designed to retransmit.

Question 5: *Are there limitations to how I may deploy a Part 90 PLMR signal booster?*

Answer 5: Part 90 PLMR signal boosters should be deployed by qualified installers. Furthermore, the signal booster may only be used to improve coverage in weak signal areas. It may not be deployed to extend the coverage of PLMR licensees' radio systems. Finally, the signal booster must be deployed and adjusted so the effective radiated power (ERP) is limited to 5 Watts on both the forward link and return link of the booster.

Question 6: *What if my Part 90 PLMR signal booster retransmits signals from third party licensees?*

Answer 6: Consent is not required from third party (unintended) licensees whose signals are incidentally retransmitted.

Question 7: *What is the difference between a Class A and Class B Part 90 PLMR signal booster?*

Answer 7: A **Class A device** is a signal booster designed to retransmit signals *on one or more specific channels* while a **Class B device** is signal booster designed to retransmit *any signal within a wide frequency band*. A signal booster is deemed to be a Class A signal booster if none of its passbands exceed 75 kHz; it is deemed to be a Class B signal booster if any of its passbands exceed 75 kHz.

Question 8: *Do I need to register my Part 90 PLMR signal booster?*

Answer 8: Maybe. If you install a Class B signal booster you must register the device with the Commission at: www.fcc.gov/signal-boosters/registration. Required information includes: (1) the operating range of the Class B signal booster; (2) the physical location of the Class B signal booster; and (3) contact information for the individual(s) responsible for the Class B signal booster's operation. You may want to ask your installer to register your Class B signal booster device for you or to assist you with registration. Class A devices are not required to be registered.

Question 9: *Why is registration necessary?*

Answer 9: Registration of Class B signal boosters is a valuable tool to help PLMR licensees or the Commission locate and identify devices causing interference.

Question 10: *How can I tell if my Part 90 PLMR signal booster is a Class A or Class B device?*

Answer 10: Commission rules require manufacturers to label their signal boosters to indicate whether the unit is a Class A or a Class B device. You should check with your installer if you are uncertain which type of device is being deployed at your facility.

Question 11: *What should I do if I'm told my Part 90 PLMR signal booster is causing interference?*

Answer 11: Operation of a Part 90 PLMR signal booster is on a non-interference basis. If a signal booster causes interference, the operator is required by Commission rules to either cease operation or alter the operating parameters of the device to eliminate the interference.

Question 12: *What is the penalty for operating a Part 90 PLMR signal booster out of compliance with Commission rules?*

Answer 12: Unauthorized or improper operation of a Part 90 PLMR signal booster may result in significant forfeiture penalties, including penalties in excess of $100,000 for each continuing violation.

Question 13: Is a building code requirement a suitable substitute for express written consent of the licensee(s) of the frequencies for which the device is intended to amplify?

Answer 13: No. Express written consent must come directly from retransmitted Part 90 Licensee(s).

Question 14: Can a vendor register with the Commission as the operator of a booster?

Answer 14: Yes, but only if the vendor will accept full responsibility for ensuring the ongoing proper operation of the booster and, therefore, be responsible for any violation of the FCC's rules. If the vendor does not assume that responsibility, the individual or company registered as the booster owner (typically the building owner) will be responsible for complying with the FCC's rules and liable for any penalties assessed for improper operation of the booster.