

# JMA

## WIRELESS

### Technical Education Catalog

2022



#### Private Training

Individual customers can arrange for private courses to be conducted on-site or at hosted locations.



#### Webinars & Online Learning

Webinars and online learning opportunities are regularly scheduled and can be taken at the student's convenience.



#### On-site In-Person Training

Instructor-led classroom courses are regularly scheduled and conducted globally in various regions along with customer-hosted locations.

JMA Wireless Technical Education Series offers instruction for people designing, installing, commissioning, and maintaining the JMA Wireless products and platforms. Courses cover X-RAN, Cell Hub, TEKO DAS, and PHAZR, Transmission Line Systems, FUZE™ Digital Electricity, Power Boost, and Antenna Systems. Learning opportunities include live, online instruction, on-demand eLearning, and instructor-led classroom courses.

Classroom and Virtual Training			
Audience	Basic	Advanced	PRO
<b>Installer</b>	<ul style="list-style-type: none"> <li>Basic Connector</li> <li>RET Antenna Training</li> <li>FUZE Digital Electricity Installation</li> <li>Power Boost Installation</li> </ul>	<ul style="list-style-type: none"> <li>Advanced Connector</li> <li><i>Prerequisite course: Basic Connector</i></li> </ul>	<ul style="list-style-type: none"> <li>TEKO DAS Operations and Maintenance</li> <li>TEKO DAS Installation and Commissioning</li> </ul>
<b>Operations</b>	<ul style="list-style-type: none"> <li>Basic Connector</li> <li>RET Antenna Training</li> <li>TEKO DAS Operations and Maintenance</li> </ul>	<ul style="list-style-type: none"> <li>Advanced Connector</li> <li><i>Prerequisite course: Basic Connector</i></li> <li>X-RAN OA&amp;M</li> </ul>	<ul style="list-style-type: none"> <li>TEKO DAS Installation and Commissioning</li> <li>X-RAN BBU Activation and RF Commissioning</li> <li>CellHub &amp; CBRS Operation and Activation</li> </ul>
<b>RF engineer</b>	<ul style="list-style-type: none"> <li>TEKO DAS Installation and Commissioning</li> <li>X-RAN OA&amp;M</li> <li>X-RAN BBU Activation and RF Commissioning</li> <li>CellHub &amp; CBRS Operation and Activation</li> </ul>	<ul style="list-style-type: none"> <li>X-RAN Performance Monitor &amp; Optimization</li> <li>X-RAN OA&amp;M</li> </ul>	<ul style="list-style-type: none"> <li>X-RAN &amp; CellHub BBU Configuration and Dimensioning</li> <li>X-RAN Performance Monitor &amp; Optimization</li> </ul>
<b>Design engineer</b>	<ul style="list-style-type: none"> <li>TEKO DAS Advanced Configuration and Architectural Design</li> </ul>	<ul style="list-style-type: none"> <li>X-RAN &amp; CellHub Configuration and Dimensioning</li> </ul>	<ul style="list-style-type: none"> <li>TEKO DAS in iBwave</li> <li><i>Prerequisite: Requires a current iBwave level one (or higher) certification</i></li> </ul>

Webinars			
Audience	Basic	Advanced	PRO
<b>Installer</b>	<ul style="list-style-type: none"> <li>• TEKO DAS Platform</li> <li>• RET Antenna Training</li> <li>• FUZE Basic Training</li> </ul>	<ul style="list-style-type: none"> <li>• TEKO DAS Installation</li> </ul>	<ul style="list-style-type: none"> <li>• CellHub CBRS &amp; CBSD</li> </ul>
<b>Operations</b>	<ul style="list-style-type: none"> <li>• TEKO DAS Platform</li> <li>• TEKO DAS Installation</li> <li>• RET Antenna Training</li> </ul>	<ul style="list-style-type: none"> <li>• TEKO DAS OA&amp;M</li> <li>• XTRAN Platform Overview</li> <li>• Exploring XTRAN</li> </ul>	
<b>RF engineer</b>	<ul style="list-style-type: none"> <li>• TEKO DAS Platform</li> <li>• TEKO DAS Installation</li> <li>• Public Safety</li> <li>• TEKO DAS OA&amp;M</li> </ul>	<ul style="list-style-type: none"> <li>• XTRAN Platform Overview</li> <li>• Exploring XTRAN</li> <li>• CellHub CBRS &amp; CBSD</li> </ul>	<ul style="list-style-type: none"> <li>• TEKO DAS Commissioning</li> <li>• Uplink Performance</li> </ul>
<b>Design engineer</b>	<ul style="list-style-type: none"> <li>• TEKO DAS Platform</li> <li>• Public Safety</li> </ul>	<ul style="list-style-type: none"> <li>• TEKO Components in iBwave</li> <li>• CellHub Overview</li> <li>• IOTA design in iBwave</li> </ul>	<ul style="list-style-type: none"> <li>• Uplink Performance</li> <li>• CellHub CBRS &amp; CBSD</li> </ul>

eLearning/On-demand			
Audience	Basic	Advanced	PRO
<b>Installer</b>	<ul style="list-style-type: none"> <li>• TEKO DAS Platform</li> <li>• FUZE DE Install &amp; Maint</li> </ul>		<ul style="list-style-type: none"> <li>• CellHub CBRS &amp; CBSD</li> </ul>
<b>Operations</b>	<ul style="list-style-type: none"> <li>• TEKO DAS Platform</li> </ul>	<ul style="list-style-type: none"> <li>• Discovering XTRAN</li> </ul>	<ul style="list-style-type: none"> <li>• Exploring XTRAN</li> </ul>
<b>RF engineer</b>	<ul style="list-style-type: none"> <li>• TEKO DAS Platform</li> </ul>	<ul style="list-style-type: none"> <li>• Discovering XTRAN</li> <li>• Exploring XTRAN</li> </ul>	<ul style="list-style-type: none"> <li>• DAS Performance Matters</li> <li>• CellHub CBRS &amp; CBSD</li> </ul>
<b>Design engineer</b>	<ul style="list-style-type: none"> <li>• TEKO DAS Platform</li> <li>• Discovering XTRAN</li> </ul>	<ul style="list-style-type: none"> <li>• DAS Performance Matters</li> <li>• Exploring XTRAN</li> </ul>	<ul style="list-style-type: none"> <li>• CellHub CBRS &amp; CBSD</li> </ul>



**JMA**  
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**TEKO**<sup>TM</sup>



# TEKO DAS Platform Overview

## Webinar and On-demand Learning

**TEKO™**

### Overview

This 1.5-hour interactive webinar provides those working with Distributed Antenna Systems with an overview on the JMA Wireless TEK0 DAS product line components, main features, and key benefits. The webinar is a basic walk-through of the Radio Frequency (RF) end-to-end chain and TEK0 DAS functions.

### Target Audience

JMA Wireless partners, system integrators, DAS designers, technical staff, sales and marketing

### Prerequisite

Basic knowledge of Radio Frequency (RF) and Distributed Antenna Systems (DAS)

### Objectives

After completing this course, the student will be able to:

- Describe end-to-end TEK0 DAS platform, from RF source to Remote Unit.
- Identify and describe the function of the DAS platform components.
- Define the system RF and optical input/output, fiber link budget and remote unit (RU) power classes.
- Select the appropriate point of interface (POI) for a given application.
- Describe the optical topologies that use standard OTRX, point-to-point link and DWDM modules.
- Describe the supervision, monitoring, and power options available.
- Identify the principal product advantages while adopting TEK0 DAS.
- Explain the process to achieve TEK0 DAS certification.

### Agenda

- - TEK0 DAS product overview
- - Master and remote unit specifications
- - Point-to-point links and DWDM modules
- - OMT and OMC
- - Multiband Spectrum Analyzer (MSA)
- - Digital Electricity™
- - Principal product advantages

# TEKO DAS Installation & Commissioning

Instructor-led, two-day course



**TEKO**

## Overview

This hands-on technical certification course provides students with the experience required to install, commission and maintain the JMA Wireless TEKO DAS platform.

## Target Audience

JMA Wireless customers and partner system integrators, RF engineers, technicians, RF operations personnel and experienced DAS installers.

## Prerequisite

Laptop computer. Working knowledge of RF and current air-link modulation schemes (3G/4G). Experience using RF test equipment.

## Objectives

After completing this course, the student will be able to:

- Explain the DAS installation best practices.
- Install provided DAS equipment and verify proper operation.
- Identify the system RF input/output, fiber link budget, and power specifications.
- With a given installation and RF signaling, use the provided RF test equipment to demonstrate ability to measure, calculate, and adjust the downlink (DL) and uplink (UL) gain settings.
- Perform system settings, changes, status, alarm verification, downloads and troubleshooting using the OMT on a given installation.
- Perform troubleshooting with the provided RF test equipment
- List and demonstrate the steps required to commission the DAS.

## Agenda

- Product overview
- Installation and best practices
- Operation maintenance terminal
- Green light testing
- RF commissioning
- Testing, troubleshooting, and maintenance

# Virtual TEKO DAS Commissioning Certification



Instructor-led, Virtual

**TEKO**

## Overview

Instructor led; interactive virtual learning course provides those familiar with the installation and operation of a TEKO DAS platform the opportunity to become certified in the TEKO DAS commissioning process. Students will interact with the instructor and other students through a series of live video sessions. Students will perform virtual and live, hands-on lab exercises along with remotely commissioning a given TEKO DAS.

## Target Audience

JMA customer, partner and system Integrator RF Engineers, Field Technicians, and RF Performance Engineers.

## Prerequisite

Web camera and microphone, reliable internet connection w/minimum of 2 Mbps DL/UL bandwidth. Good understanding of 4G LTE air interface and Distributed Antenna Systems.

## Objectives

After completing this course, the successful student will be able to:

- Explain the basic TEKO DAS installation best practices.
- Identify the system RF input/output, fiber link budget and power specifications.
- Demonstrate proficiency in the use of the OMT to verify proper operation.
- Perform “Green Light” Testing.
- With a given installation and RF signaling, demonstrate ability to calculate and adjust the Downlink and Uplink gain settings.
- Perform system settings, changes, status, alarm verification, downloads using the OMT on a given installation.
- List and virtually demonstrate the steps required to commission a given DAS.

## Agenda/Format

- **Day 1:** AM and PM virtual sessions (2hrs each)
- **Day 2:** AM and PM virtual sessions (2hrs each)
- **Day 3:** Student/Facilitator virtual lab (1hr session per student)
- **Day 4:** Review session and on-line Exam (3hrs)

# TEKO DAS Certified Commissioning Review

**TEKO™**

## Webinar

### Overview

This 1 ½ hour interactive webinar provides information helpful to RF engineers who are tasked with commissioning the TEK0 DAS platform. A review of the commissioning steps, tools, and required test equipment will be presented, along with a question and answer period.

### Target Audience

JMA Wireless partners, System Integrators, RF Engineers who are currently certified in TEK0 DAS Installation and Commissioning.

### Prerequisite

Successfully completed the TEK0 DAS Installation and Commissioning certification course and holding a current certification.

### Objectives

After completing this course, the student will be able to:

- Describe end-to-end JMA DAS platform, from RF source to Remote Unit
- Identify and describe the function of the DAS platform components
- List the steps required to commission the TEK0 DAS.
- Identify the necessary commissioning tools and describe their functions.
- Calculate POI settings with given examples.

### Agenda

- DAS RF block diagram end-to-end overview
- TEK0 DAS platform components
- RF and optical input/output, fiber link budget, and remote unit power classes
- Commissioning tools
- RF Commissioning process and steps
- Commissioning Exercises
- Questions and answers



# TEKO DAS Operation and Maintenance

Instructor-led, one day course



**TEKO™**

## Overview

This 1-day hands-on technical course covers the TEK0 DAS Operation and Maintenance Terminal, basic troubleshooting and operational best practices to provide students with the experience necessary to maintain and troubleshoot the JMA Wireless TEK0 DAS platform.

## Target Audience

JMA Partner System Integrators, RF Engineers, Technicians and Operations personnel.

## Prerequisite

Laptop computer, Working knowledge of RF and current air-link modulation schemes (3G/4G). Experience using RF and optical test equipment.

## Objectives

After completing this course, the successful student will be able to:

- Identify the system RF input/output, fiber link budget, and power specifications.
- With a given installation and RF signaling, demonstrate ability to identify faults and conducted corrective actions.
- Perform system settings, changes, status, alarm verification, downloads and troubleshooting using the OMT on a given installation.
- List the steps required to commission a given DAS.
- Pass Assessment

## Agenda

- TEK0 DAS System overview
- Basic DAS Installation and best practices
- Operation maintenance terminal
- Testing, troubleshooting, and maintenance
- RF commissioning Overview
- Assessment

# TEKO DAS Operation and Maintenance

## Webinar



**TEKO**

### Overview

This 2hour webinar covers the TEK0 DAS Operation and Maintenance Terminal, basic troubleshooting and operational best practices to provide students with information necessary to maintain and troubleshoot the JMA TEK0 DAS platform.

### Target Audience

JMA Partners, System Integrators, Network Operations personnel and technical staff.

### Prerequisite

None

### Objectives

After completing this course, the successful student will be able to:

- Identify the system RF input/output, fiber link budget, and power specifications.
- Locate system status, alarm verification, settings, and available downloads for troubleshooting within the OMT
- Describe the steps required to replace a faulty component.
- List the test equipment required for maintenance and troubleshooting.

### Agenda

- TEK0 DAS System overview
- Operation maintenance terminal (OMT)
- Testing, troubleshooting, and maintenance

# TEKO DAS Basic Installation

## Webinar

**TEKO™**

### Overview

This 2-hour technical webinar provides students with the information necessary to install the TEK0 DAS Master Unit and Remote units. Topics covered include installation best practices, accessing the operation and maintenance terminal (OMT) and performing green light testing.

### Target Audience

JMA Partners, System Integrators, Technicians, Operations personnel and Installers.

### Prerequisite

Basic knowledge of AC and DC electrical circuits, grounding, antenna and electronic equipment installation.

### Objectives

After completing this webinar, the student will be able to:

- Identify the Master Unit and Remote unit Components RF interfacing
- List the system optical input/output, fiber link budget and electrical specifications
- Describe the standard optical topologies
- List the required tools and installation best practices
- Explain how to log into the OMT and perform green light testing

### Agenda

- DAS RF block diagram end-to-end overview
- Master Unit components, Installation and best practices
- Remote Unit components, installation and best practices
- Optical Topology and link budgets
- Operation and Maintenance Terminal (OMT)
- Green Light Testing
- Installation tools and equipment
- Assessment

# TEKO DAS Components in iBwave

## Webinar



### Overview

This 1.5-hour interactive webinar provides students with the information necessary to identify the TEK0 DAS equipment, install vex files, configure master unit components and utilization of the automatic and manual power sharing while designing active DAS within the iBwave environment.

### Target Audience

JMA Wireless partners, system integrators, DAS designers, technical staff, sales and marketing.

### Prerequisite

Good working knowledge of iBwave software. Basic knowledge of radio frequency (RF) and distributed antenna systems (DAS).

### Objectives

After completing this webinar, the student will be able to:

- Identify TEK0 DAS components in iBwave Parts menu list.
- Describe main features of TEK0 DAS components in iBwave.
- Position TEK0 DAS equipment in the rack at master unit side.
- Perform iBwave commissioning with both automatic and manual power sharing.
- Illustrate how to import TEK0 DAS VEX files.

### Agenda

- Find TEK0 components in iBwave
- TEK0 remote units
- Building a TEK0 master unit
- Power sharing: automatic vs. manual
- TEK0 VEX files

# TEKO DAS in iBwave Certification

Instructor-led, two-day course



## Overview

JMA Wireless TEKO DAS in iBwave is an instructor-led, hands-on, two-day certification course. The purpose of this course is to enable iBwave users to proficiently design JMA Wireless TEKO DAS solutions using provided vex and template files. Attendees will gain the experience to effectively design TEKO DAS systems.

## Target Audience

JMA Wireless partners and customers, RF engineers and radio planners designing with the JMA Wireless TEKO platform in iBwave.

## Prerequisite

Current iBwave Level 1 certification or higher, attended JMA Wireless TEKO DAS Platform Webinar or I&C course, laptop with the following minimum specifications: 2.0 GHz processor, Windows 7, 8 or 10 OS, 500 MB hard disk, 1024 x 768 resolution, 24-bit monitor.

## Objectives

After completing this course, the student will be able to:

- Describe the TEKO DAS platform product specifications and end-to-end architecture.
- Locate and import JMA Wireless TEKO vex file.
- Define the necessary design parameters.
- Obtain the correct output power from the amplifier.
- Demonstrate the ability to use automatic and manual power sharing.
- Recognize where to adjust system gains.
- Identify, select, and assemble JMA Wireless TEKO components in iBwave (das, connectors, antennas) based on given design parameters
- Construct rack elevation drawings following JMA Wireless TEKO best practices
- Generate BOM

## Agenda

- Product overview
- Locate and Import JMA TEKO vex file
- Define the design parameters
- Identify, select, and assemble JMA TEKO components
- Automatic and manual power sharing/system gains
- Generate BOM

# TEKO DAS Advanced Configuration and Architectural Design Certification



## Instructor-led

### Overview

This 2 day hands on instructor led course will enable experienced RF/Radio planners and designers to effectively select the correct product(s), determine power supply requirements, assemble accurate bill of materials, and optimize a design for both cost and performance. Students will evaluate multiple design applications to include SISO, MIMO, 7-Band, 9-Band, 4G and, 5G migration strategies.

### Target Audience

JMA Partners, System Integrators, DAS designers and Radio planners who have experience designing indoor and outdoor Distributed Antenna Systems.

### Prerequisite

Working knowledge of RF and Radio planning applications, techniques and tools. Laptop computer. Attend either TEKODAS Product Webinar or TEKODAS Installation and Commissioning course.

### Objectives

After completing this course, the student will be able to:

- Identify the major components that comprise the TEKODAS platform
- Select the appropriate Point of Interface for a given application
- Select the appropriate Remote Unit(s) for a given application
- Determine the type of Optical Transceiver (OTRX) needed for a given scenario
- Identify the most effective passive chain between POI and OTRX
- Describe the use of Software Defined Remote Unit (SDRU) applications
- Explain how to implement Point to Point link with WDM or DWDM
- Calculate power requirements and create an accurate Bill of Material
- Assemble the needed number of basic building blocks components

### Agenda

- TEKODAS product overview
- Between POI and OTRX: the most effective passive chain in the Master Unit
- Sub rack and RU power calculations
- Standard and alternate fiber architectures
- Special applications
- Product selection and Bill of material



# JMA Wireless Uplink Performance

## Webinar

**TEKO™**

### Overview

This 1 ½ hour interactive webinar provides those working with Distributed Antenna Systems with an overview on uplink considerations. The webinar is a deep walk-through on how uplink dimensioning affects system's performances and how TEKO DAS product line components can be optimized for uplink capacity.

### Target Audience

JMA Partners, System Integrators, RF Engineers, DAS designers.

### Prerequisite

Deep knowledge of Radio Frequency (RF) and Distributed Antenna Systems (DAS).

### Objectives

- Identify the main uplink (UL) elements of the Radio link budget
- Describe how coverage area can be divided into different data-rate categories
- Explain the impact of Noise Figure, Uplink system gain and Uplink passive insertion loss on uplink performances
- Describe the effect on uplink performances using a D-RAN approach vs. DAS
- Describe how TEKO DAS system can increase uplink data-rate
- Explain how the different Remote Unit power classes affect the uplink
- Select the Remote Unit power class to meet the highest possible uplink data-rate
- Distinguish between downlink and uplink limited systems

### Agenda

- Typical DAS design approach: downlink only
- Uplink link budget elements
- Uplink cell radius
- Uplink Key Performance Indicator (KPI) specifications
- Solutions Comparison
- Active DAS advantages in Uplink performances

# Supervision and Monitoring of TEKO DAS platform: OMT and OMC

Webinar



TEKO™

## Overview

This 1 ½ hour interactive webinar provides those working with Distributed Antenna Systems with an overview on OMC (Operation and Management Center), main features and key benefits. The webinar is a walk-through of remote monitoring options for TEKO DAS system.

## Target Audience

JMA Partners, System Integrators, Network Operations personnel and technical staff.

## Prerequisite

Basic knowledge of Distributed Antenna Systems (DAS), Network operations, SNMP, Ethernet and networking architectures.

## Objectives

After completing this course, the successful student will be able to:

- Describe current SPV hardware module and future module
- Illustrate how the SPV can notify alarms
- Describe the main features of OMC and its architectures
- Understand how alarms can be managed through OMC
- List all the possible options to interface our SPV & OMC to external monitoring systems

## Agenda

- SPV hardware features
- OMT (Operation Management Terminal) Overview
- OMC (Operation Management Center)
- SPV and OMC alarm interface
- OMC highlights



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**XRAN**<sup>®</sup>



# XRAN Platform Overview

## Webinar and On-demand Learning

**XRAN**

### Overview

This 1 1/2-hour interactive course provides an overview on the JMA XRAN platform components, main features, architecture, specifications, and application advantages.

### Target Audience

JMA customers, partners, sales, radio planners, system integrators and network operations staff.

### Prerequisite

None

### Objectives

Upon successful completion of this course the student will be able to:

- Describe the XRAN platform architecture from baseband source to RF transmission
- List the principal advantages when adopting a software-based RAN approach vs. a legacy RAN
- Explain the advantages of XRAN deployment from a CAPEX and OPEX perspective.
- Identify key specifications, supported frequency bands and features of the XRAN platform.

### Agenda

- XRAN Introduction
- XRAN architecture and product elements
- XRAN CPRI DAS
- CellHub
- IOTA
- CAPEX and OPEX applications

# Exploring X-RAN: TEKO DAS

## Webinar and On-demand Learning

**X-RAN**

### Overview

This 1 1/2-hour interactive course provides a closer look into the X-RAN platform BBU and TEKO DAS CPRI POI component features, architecture, DAS network applications, design considerations, implementation and configuration tools.

### Target Audience

JMA customers, partners, sales, system integrators, radio planners, and network operations staff.

### Prerequisite

X-RAN Product Overview

### Objectives

Upon successful completion of this course the student will be able to:

- Describe the X-RAN platform architecture from baseband source to TEKO DAS RF distribution
- Identify the hardware components usage and specifications
- Identify the installation considerations of the BBU and CPRIPOI's.
- Explain the RF equivalent bandwidth capability of the CPRI links.
- Describe CPRI-link fiber topology, distance capabilities, and fiber selection between the X-RAN server and the CPRIPOI's.
- Illustrate the flexibility of the X-RAN platform to implement various sector, MIMO and band configurations
- List the software tools used to monitor and configure the X-RAN platform when deployed with the TEKO DAS.

### Agenda

- X-RAN Introduction
- X-RAN hardware: Server, PCIe card, CPRI POI, fiber, and coax connectivity
- Design configuration examples
- X-RAN and TEKO DAS Monitoring: local and remote

# XRAN BBU Activation and RF Commissioning



Instructor Led

**XRAN**

## Overview

This 2-day hands-on technical course will enable experienced RF Systems Engineers to effectively install XRAN server config files, verify server operation, conduct XRAN BBU Activation and RF Commissioning.

## Target Audience

Wireless Service Provider Systems and RF Engineering staff with experience commissioning radio access equipment and Distributed Antenna Systems.

## Prerequisite

Working knowledge of RF, Network Radio applications, radio access equipment operation, integration, and commissioning techniques and tools. Laptop computer with a web browser.

## Objectives

After completing this course, the successful student will be able to:

- Describe the process for validating XRAN server set up.
- Install XRAN BBU configuration file.
- Verify XRAN activation
- Describe the purpose and key features of the XOAS and TEKO Supervision software.
- Demonstrate ability to log into the XOAS and OMT.
- Complete a BBU activation with a given system.
- Perform CPRI POI discovery and server mapping.
- Describe and perform a TEKO DAS RF Commissioning
- List the installation best practices and explain the steps to verify installation.

## Agenda

- Session 1: System Architecture
- Session 2: XRAN Service Activation overview
- Session 3: XOAS Overview
- Session 4: XRAN and DAS Installation
- Session 5: BBU Activation and Lab
- Session 6: TEKO OMT Overview
- Session 7: RF Commissioning and Lab

# XRAN Operation, Administration and Maintenance (OA&M)



## Instructor Led



### Overview

Virtual, 10-hour, hands-on, instructor led technical course will enable experienced RF Engineers and Field Operations Staff to effectively operate, maintain and troubleshoot the JMA Wireless XRAN platforms. The 10-hours of instruction are broken out over a multi-day format for effective in-class time and student lab assignments.

### Target Audience

Wireless Service Providers, Private LTE, and 3PO's Network and Field Operations staff who have experience maintaining radio access network equipment and Distributed Antenna Systems.

### Prerequisite

Working knowledge of RF, maintenance of radio access networks, DAS, tools and test equipment. Laptop computer.

### Objectives

After completing this course, the successful student will be able to:

- Describe the XRAN and Cell Hub architecture and major components.
- Explain the purpose and features of the XRAN XOAS and TEKO OMT
- Demonstrate ability to log into the XOAS, OMT and navigate the supervisor.
- Perform basic fault management identification and troubleshooting.
- Differentiate between stopping an eNB and locking a cell.
- Demonstrate the ability to lock and unlock cells and start and stop eNBs.
- Identify the steps to manage and update XRAN BBU and XOAS software upgrades.

### Agenda

- Session 1: System Architecture
- Session 2: XOAS Functional Overview
- Session 3: XOAS Fault Management and troubleshooting
- Session 4: XOAS Software Management
- Student Labs

# XRAN & CellHub Performance Monitoring and Optimization

**XRAN**

## Instructor Led

### Overview

This 1 ½ day hands-on technical course will enable experienced RF Engineers to effectively monitor and optimize the performance of the XRAN and CellHub platform.

### Target Audience

Wireless Service Provider RF Engineering staff with experience in radio access network optimization and performance monitoring.

### Prerequisite

Working knowledge of RF, radio access networks, equipment operation, performance monitoring and optimization. Laptop computer.

### Objectives

After completing this course, the successful student will be able to:

- Describe the purpose and key features of the XOAS software.
- Demonstrate ability to log into the XOAS to view both Audits and Notifications
- Explain the XRAN primary parameters and settings used for optimization.
- Differentiate between Fault, and Performance management.
- Identify the Performance Measurement categories and features list.
- Recognize Key Performance Indicators (KPI) used for performance monitoring and network optimization.
- Explain the purpose and use of the XRAN license servers, license pooling, XOAS management and software maintenance.

### Agenda

- Session 1: XRAN System Architecture
- Session 2: XRAN Primary Parameters and Features list
- Session 3: XOAS Fault Management
- Session 4: XOAS Performance Management
- Session 5: XOAS Software Management, Licensing and Audits

# XRAN & CellHub Configuration, Dimensioning and Design



Instructor Led

**XRAN**

## Overview

This 1-day Instructor led hands-on technical course will enable experienced RF/Radio planners and designers to effectively complete the Service Activation Form, BBU Configuration file, system dimensioning, configuration and assembling of a bill of material for the JMA Wireless XRAN and CellHub platforms.

## Target Audience

Wireless Service Provider radio network planners, DAS designers, and RF Engineers who have experience designing radio access networks and Distributed Antenna Systems.

## Prerequisite

Working knowledge of Radio Access Networks, RF and Radio planning applications, techniques and tools. Laptop computer.

## Objectives

After completing this course, the successful student will be able to:

- Explain the XRAN eNB activation procedure
- Describe the key System Information Block parameters of the XRAN eNB
- Prepare the Service Activation Form.
- Configure, modify and edit the BBU Configuration File
- Create a dimensioning plan for a basic XRAN System BBU, eNB and CPRI POI.
- Identify and select the necessary components for a given XRAN dimensioning plan and create an accurate bill of materials.

## Agenda

- Session 1: System Architecture
- Session 2: Service Activation Form
- Session 3: XRAN Dimensioning Configuration Tool
- Session 4: Primary Parameters
- Session 5: Features List
- Session 6: BBU Configuration File

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**XRAN**<sup>®</sup>

**CellHub**



# Exploring X-RAN: CellHub

## Webinar and On-demand Learning



### CellHub

#### Overview

This 1.5-hour interactive course provides an overview on the JMA X-RAN CellHub product line components, main features, architecture, installation requirements, and software tools for system configuration. The course explores bandwidth, fiber and RF sector design planning and considerations.

#### Target Audience

JMA Partners, System Integrators, DAS designers, and Network Operations staff.

#### Prerequisite

X-RAN Product Overview course, Basic knowledge of Radio Frequency (RF) planning, and Distributed Antenna Systems (DAS)

#### Objectives

After completing this course, the successful student will be able to:

- Describe the X-RAN platform architecture from baseband source to CellHub radio
- Identify the main hardware components of a CellHub system.
- Identify the installation considerations of the BBU and CellHub radio
- Explain the RF equivalent bandwidth capability of the CPRI links.
- Describe CPRI-link fiber topology, distance capabilities, and fiber selection between the X-RAN server and the CellHub radio.
- Illustrate the flexibility of the X-RAN platform to implement various sector, MIMO and band configurations
- List the software tools used to monitor and configure the X-RAN platform when deployed with the CellHub radio.

#### Agenda

- CellHub Introduction
- X-RAN/CellHub hardware installation.
- X-RAN server, PCIe interface card, and Radio overview
- Design configuration considerations and examples
- CellHub monitoring and supervision software

# CellHub CBRS & CBSD Overview

Instructor Led - Virtual



CellHub

## Overview

This 1 ½ hour (90Min) interactive webinar provides a closer look into the X-RAN CellHub CBRS architecture, CBRS parameters, CBSD Registration and Grant process considerations.

## Target Audience

JMA customers, Certified Professional Installers (CPI), partners, sales, system integrators, radio planners, and network operations staff.

## Prerequisite

X-RAN CellHub Overview Webinar

## Objectives

Upon successful completion of this course the student will be able to:

- Explain the CBRS Organizations, Capacity, and Applications
- Describe the Spectrum Sharing CBRS framework
- Explain the SAS-CBSD Communication Protocol
- Locate and explain the use of the X-RAN CBRS Daemon GUI
- Identify basic parameter changes in the X-RAN CBRS Daemon

## Agenda

- CBRS Overview
- Frequencies (Bands)
- Communications Protocol
- CBRS Web Pages
- CellHub Activation
- Wrap up

# Virtual CellHub/CBRS Operation & Activation

## Instructor Led



### Overview

Virtual, 12-hour, hands-on instructor-led course enables experienced Radio Access Network and Network Systems Engineers to effectively install, activate and test the CellHub platform. CPI's will also learn how to activate and register the CellHub Radio's (CBSD's). The 12-hour course is broken up over multiple days to maximize the students schedule.

### Target Audience

JMA Customers and Partners System Network Engineers, Radio Access Network Engineers and CBRS Certified Professional Installers (CPI's).

### Prerequisite

Working knowledge of RF and Radio planning applications, techniques, and tools. Laptop computer with a web browser. Qualified CBRS Certified Professional Installer (CPI) for those working with CBRS.

### Objectives

After completing this course, the successful student will be able to:

- Explain X-RAN and CellHub system architecture from both hardware and software perspective
- Identify the major components that comprise the X-RAN and CellHub platform
- Perform system settings, changes, status, alarm verification, and troubleshooting on a given installation
- Explain the CellHub configuration and installation steps, and best practices
- Identify the system digital input, RF output, and fiber link budget
- Locate and Modify CBRS Parameters for Certified Professional Installers

### Agenda

- **Day 1:** AM or PM virtual session (4hrs)
- **Day 2:** AM or PM virtual session (4hrs)
- **Day 3:** Student/Facilitator virtual lab (1hr session per student)
- **Day 4:** Review session and on-line Exam (3hrs)

# CellHub & CBRS Operation and Activation

Instructor Led



**CellHub**

## Overview

This 2-day, hands-on instructor-led course enables experienced Radio Access Network and Network Systems Engineers to effectively install, activate and test the Cell Hub platform. CPI's will also learn how to activate and register the CellHub Radio's (CBSD's).

## Target Audience

JMA Customers and Partners System Network Engineers, Radio Access Network Engineers and CBRS Certified Professional Installers (CPI's).

## Prerequisite

Working knowledge of RF and Radio planning applications, techniques and tools. Laptop computer with a web browser. Completed XTRAN and CellHub overview courses. Qualified CBRS Certified Professional Installer (CPI) for those working with CBRS.

## Objectives

After completing this course, the successful student will be able to:

- Explain CellHub system architecture
- Perform system settings, changes, status, alarm verification, downloads and troubleshooting using the SPV BBU on a given installation
- Recognize key dimensioning parameters
- Explain the CellHub configuration and installation steps, and best practices
- Install provided CellHub equipment and verify proper operation
- Identify the system CPRI input, RF output, and fiber link budget
- Demonstrate the ability to measure, calculate and adjust CBRS and CBSD parameters
- List and demonstrate the steps required to activate and register the CellHub Radio (CBSD)

## Agenda

- CellHub Introduction
- TEKO CellHub Product Overview
- CellHub fiber architecture
- BBU Installation and Best Practices
- CellHub Remote Unit Installation and best practices
- BBU and Remote Unit Activation



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**PHAZR™**



# JMA 5G IOTA in iBwave

Virtual, Instructor Led



## Overview

This 1 ½ hour webinar will enable radio planners to import the JMA vex files, identify the JMA 5G IOTA NR components from the equipment list, recognize the IOTA NR key features, and configure components while designing the IOTA 5G NR within the iBwave environment.

## Target Audience

Radio network planners who design using iBwave.

## Prerequisite

Good command and experienced in the use of the iBwave software environment. Basic knowledge of Radio Frequency planning, 5G NR's, and Distributed Antenna Systems (DAS).

## Objectives

Upon successful completion of this course the student will be able to:

- Identify 5G IOTA NR components in iBwave Parts menu list
- Describe the key features of IOTA NR components in iBwave
- Position the 5G IOTA NR equipment in the rack at Head End and Remote End
- Perform iBwave commissioning with both automatic and manual power sharing
- Import IOTA .vex file

## Agenda

JMA Phazr 5G IOTA Overview

Locating 5G IOTA components in iBwave

Building a 5G IOTA in iBwave

Importing JMA Private IOTA .vex files

# PHAZR IOTA Configuration, Dimensioning and Design



Instructor Led

## Overview

This 1-day hands-on technical course will enable experienced RF/Radio planners and designers to effectively complete the Service activation Form, gNB Configuration file, system dimensioning, configuration and assembling of a bill of material for the JMA Wireless PHAZR platform.

## Target Audience

Wireless Service Provider radio network planners, DAS designers, and RF Engineers who have experience designing radio access networks and Distributed Antenna Systems.

## Prerequisite

Working knowledge of RF and Radio planning applications, techniques and tools. Laptop computer.

## Objectives

After completing this course, the successful student will be able to:

- Explain the PHAZR gNB activation procedure
- Describe the key System Information Block parameters of the PHAZR gNB
- Prepare the Service Activation Form.
- Configure, modify and edit the gNB-CU Configuration File
- Create a dimensioning plan for a basic PHAZR 5G NR system gNB-CU and gNB-DU.
- Identify and select the necessary components for a given PHAZR 5G NR system dimensioning plan in the creation of a bill of materials.

## Agenda

- Session 1: System Architecture
- Session 2: Service Activation Form
- Session 3: PHAZR Dimensioning Configuration Tool
- Session 4: Primary Parameters
- Session 5: Features List
- Session 6: gNB-CU configuration File

# PHAZR IOTA gNB Activation and RF Commissioning



Instructor Led

## Overview

This 2-day hands-on technical course will enable experienced RF Systems Engineers to effectively install PHAZR gNB-CU config files, verify server operation, conduct PHAZR gNB activation and RF commissioning.

## Target Audience

Wireless Service Provider Systems and RF Engineering staff with experience commissioning radio access equipment and Distributed Antenna Systems.

## Prerequisite

Working knowledge of RF, Network Radio applications, radio access equipment operation, integration, and commissioning techniques and tools. Laptop computer.

## Objectives

After completing this course, the successful student will be able to:

- Describe the process for validating PHAZR gNB-CU set up.
- Install PHAZR gNB configuration file and verify activation.
- Describe the purpose and key features of the XOAS software.
- Demonstrate ability to log into the XOAS and gNB-CU.
- Complete a PHAZR gNB activation with a given system.
- Perform gNB-DU discovery.
- Conduct gNB-CU to gNB-DU (IOTOA, STRAN) mapping and verify operation with a given system.
- Describe and perform a PHAZR gNB RF Commissioning
- List the installation best practices and explain the steps to verify installation.

## Agenda

- Session 1: System Architecture
- Session 2: PHAZR gNB Service Activation overview
- Session 3: XOAS Overview
- Session 4: PHAZR gNB-CU and gNB-DU (IOTA/STRAN)
- Session 5: gNB Activation and Lab
- Session 6: gNB-DU RF Commissioning and Lab



# PHAZR Operation, Administration and Maintenance (OA&M)



Instructor Led

## Overview

This 2-day hands-on technical course will enable experienced RF Engineers and Field Operations Staff to effectively operate, maintain and troubleshoot the JMA Wireless PHAZR platforms.

## Target Audience

Wireless Service Provider Network and Field Operations staff who have experience maintaining radio access network equipment and Distributed Antenna Systems.

## Prerequisite

Working knowledge of RF, maintenance of radio access networks, DAS, tools and test equipment.  
Laptop computer.

## Objectives

After completing this course, the successful student will be able to:

- Describe the PHAZR CU, IOTA-DU, STRAN-DU architecture and major components.
- Explain the purpose and features of the XLAN XOAS
- Demonstrate ability to log into the XOAS
- Perform basic fault management identification and troubleshooting.
- With a given system, troubleshoot and take corrective action to restore the system and verify proper operation.
- Identify the steps to manage and update PHAZR gNB-CU, gNB-DU, and XOAS software upgrades.

## Agenda

- Session 1: System Architecture
- Session 2: PHAZR gNB 5G NR overview
- Session 3: PHAZR IOTA and STRAN DU's
- Session 4: XOAS Fault Management
- Session 5: XOAS Software Management, Audits and User Actions
- Session 6: Maintenance and Troubleshooting

## PHAZR gNB Performance Monitoring and Optimization

Instructor Led



### Overview

This 1 ½ day hands-on technical course will enable experienced RF Engineers to effectively monitor and optimize the performance of the PHAZR gNB 5G NR platform.

### Target Audience

Wireless Service Provider RF Engineering staff with experience in radio access network optimization and performance monitoring.

### Prerequisite

Working knowledge of RF, radio access networks, equipment operation, performance monitoring and optimization. Laptop computer.

### Objectives

After completing this course, the successful student will be able to:

- Describe the purpose and key features of the XOAS software.
- Demonstrate ability to log into the XOAS to view both Audits and Notifications
- Explain the PHAZR gNB primary parameters and settings used for optimization.
- Differentiate between Fault, and Performance management.
- Identify the Performance Measurement categories and features list.
- Recognize the Key Performance Indicators (KPI) used for performance monitoring and network optimization.
- Explain the purpose and use of the XTRAN license servers, license pooling, XOAS management and software maintenance.

### Agenda

- Session 1: PHAZR gNB System Architecture
- Session 2: PHAZR gNB Primary Parameters and Features list
- Session 3: XOAS Overview, access and Fault Management
- Session 4: XOAS Performance Management
- Session 5: XOAS Software Management, Licensing, and Audits

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**PUBLIC  
SAFETY  
SYSTEM**

# JMA Wireless Public Safety

## Webinar



### Overview

This 1.5-hour interactive webinar provides an overview of the key parameters, applications, specifications, and technical information on the current public safety product offerings.

### Target Audience

JMA customers, partners and integrators, radio network planners and designers, technical personnel who support radio systems.

### Prerequisite

Basic knowledge of Radio Access Networks, Signal Boosters, Distributed Antenna Systems and Public Safety applications.

### Objectives

Upon successful completion of this module the student will be able to:

- Recognize key parameters to be considered when designing a Public Safety solution
- Describe the purpose and use case of signal boosters
- Differentiate between band selective and channel selective boosters.
- Identify the key features of public safety Distributed Antenna System (DAS) platforms
- Describe the purpose and use of the external branch filtering
- Identify the application and use of public safety enclosures and digital electricity

### Agenda

- Public Safety Key parameters
- Signal Boosters
- Public Safety DAS
- External Branch Filtering
- Public Safety Enclosures
- Digital Electricity applications

# JMA Wireless Public Safety (INTL)

## Webinar



### Overview

This 1.5-hour interactive webinar provides an overview of the JMA Wireless Public Safety products, main features, and key benefits.

### Target Audience

JMA Wireless partners, system integrators, DAS designers, technical staff, sales and marketing

### Prerequisite

Basic knowledge of Radio Frequency (RF), Repeaters and Distributed Antenna Systems (DAS)

### Objectives

After completing this course, the student will be able to:

- Differentiate between band selective and channel selective repeaters
- Identify the products to be used with P.S. base stations and P.S. off-air applications
- Describe both analog and digital products into TEKO DAS Public Safety offer
- Recognize key parameters to be considered when using a P.S. repeater
- Identify the P.S. frequency bands covered by the TEKO DAS platforms.

### Agenda

- Public Safety Key parameters
- Adjustable Bandwidth Off-Air repeaters
- Channel Selective Off-Air repeaters
- Public Safety DAS – VHF, UHF, 700, 800
- Public Safety DAS – Tetra 400 MHz



CONNECTORS, ANTENNA'S AND  
FUZE DIGITAL ELECTRICITY

# FUZE Digital Electricity Installation and Maintenance Basics

On-demand Learning



## Overview

This interactive eLearning course provides an overview on the JMA FUZE Digital Electricity platform including system components, installation and commissioning. This course also covers maintenance and troubleshooting to ensure system performance over time.

## Target Audience

JMA Partners, System Integrators, Installers, and Network Operations staff.

## Prerequisite

Basic understanding of AC and DC power

## Objectives

After completing this training, the student will be able to:

- Describe the main differences between digital electricity (DE) and traditional power
- List the components of the FUZE DE platform
- Identify 3 key design rules and where to find them
- Explain the FUZE DE installation steps and commissioning best practices
- Locate the FUZE DE system status and alarm indicators
- Identify system faults and troubleshooting steps

## Agenda

- FUZE Digital Electricity Introduction
- System architecture and cabling
- Head-end and remote requirements
- Installation and commissioning best practices
- User interface, maintenance, & troubleshooting

# Basic Connector Training

Instructor-led, four-hour course



## Overview

This four-hour, technical, connector-and-tool training includes a presentation of features and benefits, failure mode, instructor demonstration of proper techniques and hands-on tech cable and connector jumper completion to ensure the audience has the ability and confidence to complete connector installation successfully. Once you successfully complete the training, you will receive a certification card.

## Target Audience

Technicians planning to install JMA Wireless compression connectors.

## Requirements

To ensure optimum delivery, we require the following:

- Two sessions per training request. A session is four hours in duration, with no more than eight and no fewer than four attendees per session.
- Training starts on time and ends as scheduled.
- JMA Wireless tools purchased prior to scheduling training. Location, seating, and tables provided by the customer. Proper cables provided by the customer.

## Objectives

After completing this course, the student will be able to:

- Install JMA Wireless connectors.
- Understand how to use and maintain JMA Wireless tools.
- Identify which connectors and tools are compatible with which cable types
- Understand the reasons for poor PIM and sweep test results.
- Reduce repeated trouble calls.
- Increase awareness of craftsmanship.

## Agenda

- JMA Wireless presentation.
- Connector and tool demonstration.
- Connector and tool preparation performed by attendees.

## Cancellation Policy

Reservations canceled within two weeks of the training date are subject to a \$2,000 cancellation fee.



# Advanced Connector Training

Instructor-led, four-hour course



## Overview

This carrier-sponsored, four-hour, advanced technical training class covers JMA Wireless connectors and tools for those contractors who have previously attended the JMA Wireless Basic Training class. It provides the carrier with a better understanding of how their contractors install JMA Wireless connectors. Testing for passive intermodulation (PIM) and maintenance of JMA Wireless tools and PIM test equipment are taught in depth. The JMA Wireless class is taught in cooperation with a PIM-test-set vendor (either Kaelus or Anritsu). Kaelus and Anritsu both audit the contractor's PIM test equipment and review the importance of testing for PIM and provide a refresher of what PIM is. Once the contractor successfully completes the training, they will receive an advanced certification card, and the carrier sponsoring the training will also receive course results for their records.

## Requirements

To ensure optimum delivery, we require the following:

- Must be sponsored by a carrier or neutral host company.
- Each contractor attending must bring one set of JMA Wireless tools and one PIM test set.
- Individuals attending must have attended JMA Wireless Basic Training.
- Individuals attending must have installed JMA Wireless connectors for at least three months.
- Two sessions per training request, both of which are to start on time.
- Location, seating and tables provided by the carrier or neutral host company. Proper cables provided by the customer.

## Objectives

After completing this course, the student will:

- Refresh their knowledge of the installation and testing of JMA Wireless connectors.
- Increase their understanding of how to properly maintain JMA Wireless tools and conduct a tool audit.
- Build three jumpers and pass two of three with PIM results -153 dB or better.
- Correctly answer 16 of 20 questions.

## Agenda

- JMA Wireless tool audit
- Kaelus/Anritsu test set audit
- JMA Wireless presentation on new products
- Quick review of JMA Wireless connector installation
- Teams of two building three jumpers and passing two of three with a -153 dB or better
- JMA Wireless questioner hands out test. Participants correctly answer 16 of 20.

## Cancellation Policy

Reservations canceled within two weeks of the training date are subject to a \$2,000 cancellation fee.

# RET Antenna Training

## Instructor-led, two-hour course



### Overview

This two-hour, carrier or neutral host company sponsored JMA Wireless Remote Electrical Tilt Workshop encourages discussion and continued learning of JMA Wireless RET products, AISG 2.0, and troubleshooting tips.

### Requirements

To ensure optimum delivery, we require the following:

- One session per training request. A session is two hours in duration with no more than 10 and no fewer than eight technicians attending per session.
- Need to have read the JMA Wireless PCU-220 user guide and have our graphical user interface installed on your laptop before attending.
- Location, seating, power, and projector provided by the customer.
- Training starts on time and ends as scheduled.

### Objectives

After completing this course, the student will be able to:

- Connect a JMA Wireless controller to a laptop.
- Configure a JMA Wireless RET motor.
- Troubleshoot RET issues.
- Understand AISG 2.0 and RET system diagrams.
- Increase awareness of JMA Wireless RET products.

### Agenda

- JMA Wireless presentation of features, common RET configurations, troubleshooting review.
- Instructor demonstration on using the graphical user interface, hands-on tech software, controller, motor.
- RET AISG 2.0 review.
- Student hands-on RET operations from GUI to the motor.
- Questions and answers.

### Cancellation Policy

Reservations canceled within two weeks of the training date are subject to a \$2,000 cancellation fee.

## FUZE Digital Electricity™ Installation & Maintenance

Instructor-led, two-hour course



### Overview

This 2-hour interactive FUZE Digital Electricity™ training session will improve installation and maintenance techniques when operating the JMA Wireless FUZE Digital Electricity™ system components.

### Target Audience

JMA Wireless contractors that are installing and maintaining FUZE Digital Electricity™ systems.

### Prerequisite

Attendees must have purchased a JMA Wireless FUZE Digital Electricity™ system or be planning to complete work for a JMA Wireless customer who has purchased. Each session is 2-hours in duration and requires no more than 10 and no less than 8 technicians attending per session. Location, seating, tables provided by the customer.

### Objectives

After completing this training, the student will be able to:

- Increase awareness of FUZE Digital Electricity™ system
- Become educated on how to receive support when installing the system
- Complete typical installation maintenance and commissioning practices
- Earn FUZE Digital Electricity™ certification card upon completion

### Agenda

- FUZE Digital Electricity™ presentation of features/benefits failure modes
- Instructor demonstration of proper techniques and hands-on support
- Review typical installation maintenance and commissioning practices

## Additional Course Information

Flexible on-site or online learning

### Training Locations

Instructor-led classroom courses are regularly scheduled and conducted globally in various regions along with customer-hosted locations.

### Private Training

Individual customers may request private courses to be conducted on-site or at hosted locations. Minimum of six students required.

### Online Learning

Webinars, virtual instructor led, and online learning opportunities are regularly scheduled and can be taken at the student's convenience.

### Contact Us:

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