



# Fiber to the Antenna

## Detailed Course Outline

This course focuses on the integration and installation of optical components in order to successfully establish connectivity in fiber to the antenna (FTTA) and cell tower networks including macrocell, microcell, femtocell, picocell, and DAS applications. Attendees will use the latest technology and equipment in hands-on skills exercises that give practical hands-on experience with splicing, cable preparation, OTDR testing, and optical loss testing.

**Prerequisites:** None. Entry level.

**Certifications and Credits:** ETA FTTA Fiber Optic Technician (FTTA-FOT) Certification  
Light Brigade Certificate of Completion

### Chapter 1 — Introduction

- Fiber to the antenna
- FTTA deployment methods
- Basic fiber optic terminology
- Three critical considerations
- Optical fiber transmission systems
- Fiber optic standards

### Chapter 2 — Theory

- Key fiber optic terms
- Key wireless terms
- Total internal reflection
- Lightwave transmission
- Extrinsic losses
- Loss in radio frequency
- Graded-index lightwave propagation
- Single-mode systems
- Mode field diameter
- Optical dispersion

### Chapter 3 — Fiber

- Single-mode fiber types
- Single-mode dispersion
- Multimode fiber types
- Bandwidth and distance limits

### Chapter 4 — Cable

- Distribution cables
- Breakout cables
- Cable cordage
- Indoor optical cables
- Composite and hybrid cables
- Loose tube outside plant cables
- Stranded cables
- Unitube cables

- FTTx distribution and drop cables
- Outdoor cable with ribbon fiber
- Microduct cables
- ADSS and OPGW cables
- Indoor/outdoor cables

### Chapter 5 — Connectors

- What to look for in a connector
- Main connector components
- Attenuation in optical systems
- Connector types and polishes
- Multimode termination techniques
- Splice-on connectors
- Single-mode termination options
- Single-mode connectorization issues
- Yield
- Attenuators and terminators
- Connector inspection
- Cleaning methods
- Fanout and breakout kits

### Chapter 6 — Splicing

- Splice performance issues
- Fiber cleaving
- Common fiber optic cleavers
- Splicer and technician tasks
- Fusion splicing
- The profile alignment system
- Fixed V-groove alignment
- Improper splice causes and remedies
- Mechanical splicing
- Splice protection

Your Fiber Optic Training and Equipment Resource

### Chapter 7 — Cable Management

- Fiber optic interconnect hardware
- Patch panels
- Premises panels
- Cabling buildings in FTTA applications
- Underground cable storage
- Indoor/outdoor splice products
- Splice trays and closures
- Tower splice closures
- Splice panels
- Optical entrance enclosures
- Fiber distribution units
- Pedestals
- Slack storage methods

### Chapter 8 — Installation

- Cable handling
- Standards, regulations, and codes
- Mid-span (express) entries
- Loose tube cable preparation
- Installation tools

### Chapter 9 — Optical Testing

- Optical loss testing
- Multimode launch conditions
- Loss testing with a mandrel
- Reference test methods
- Insertion loss methods
- Testing dissimilar connectors
- Loopback testing
- “Not to exceed” charts
- Testing input and output power
- Fiber identifiers
- Visual tracers
- Optical talk sets
- OTDR testing
- OTDR deadzone
- Reading OTDR signatures
- Loopback testing with an OTDR
- Index of refraction
- Testing pigtailed
- Acceptance testing
- Splice testing
- Reflection testing
- CPRI testing

### Chapter 10 — Restoration

- Types of fiber optic damage
- Failure rates of fiber optic systems
- Emergency restoration kit requirements
- Equipment used in the restoration role
- FTTA restorations
- Post-restoration recommendations

### Chapter 11 — Safety

- Laser safety
- RF safety
- Working with optical fibers
- Chemicals
- Safety data sheets
- The work area
- Installation practices

### Chapter 12 — Loss Budgets

- Lasers, VCSELs, and LEDs
- Detector types and requirements
- Creating a loss budget
- System budgets

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## Hands-on Skills Learning

### Station 1 – Splicing (120 minutes)

Fusion / mechanical / pigtail  
Fiber handling and cleaving

### Station 2 – Cable Preparation (180 minutes)

Loose tube cable preparation  
Breakout and distribution cable preparation  
Patch panel and splice closure preparation  
Mid-entry practices

### Station 3 – OTDR Operation (120 minutes)

Acceptance testing  
Reflection testing  
Span testing and splice loss  
Emergency restoration  
Troubleshooting

### Station 4 – Optical Loss Testing (180 minutes)

Link loss measurement  
Transmit and receive power  
Visual inspection / cleaning  
Variable and fixed attenuators

### Class Review Q&A (120 minutes)