



Fiber to the Antenna in 5G Momentum

Anatolia 5G Solutions

Istanbul, Turkey | www.anatoliacom.com

1980s 1G <i>Analog Era</i>		 2.4 kbps
1991 2G <i>Digital Era</i>	 SMS/MMS	 64 kbps
1998 3G <i>Mobile Internet Era</i>	 SMS/MMS Internet Access Video Calls Mobile TV	 2,000 kbps
2008 4G <i>Mobile Internet Era</i>	 SMS/MMS Internet Access Video Calls Mobile TV Gaming Services Cloud Computing	 100,000 kbps
2020 5G <i>Internet of Everything</i>	 SMS/MMS Internet Access Video Calls Mobile TV HD AR/VR Cloud Computing Robotics Automobile	 More than 1 Gbps

5G Enhances 4G Capabilities

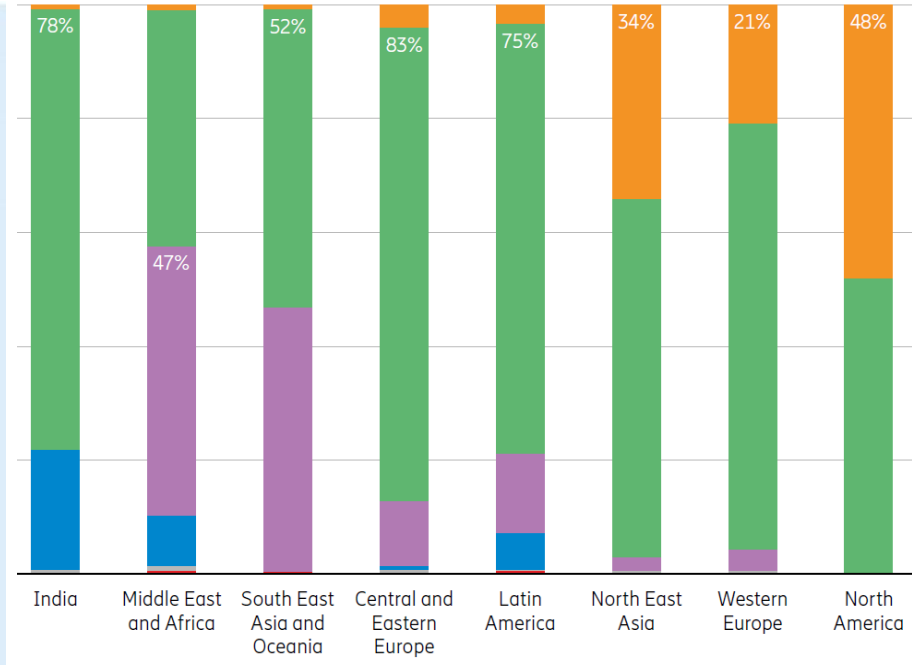
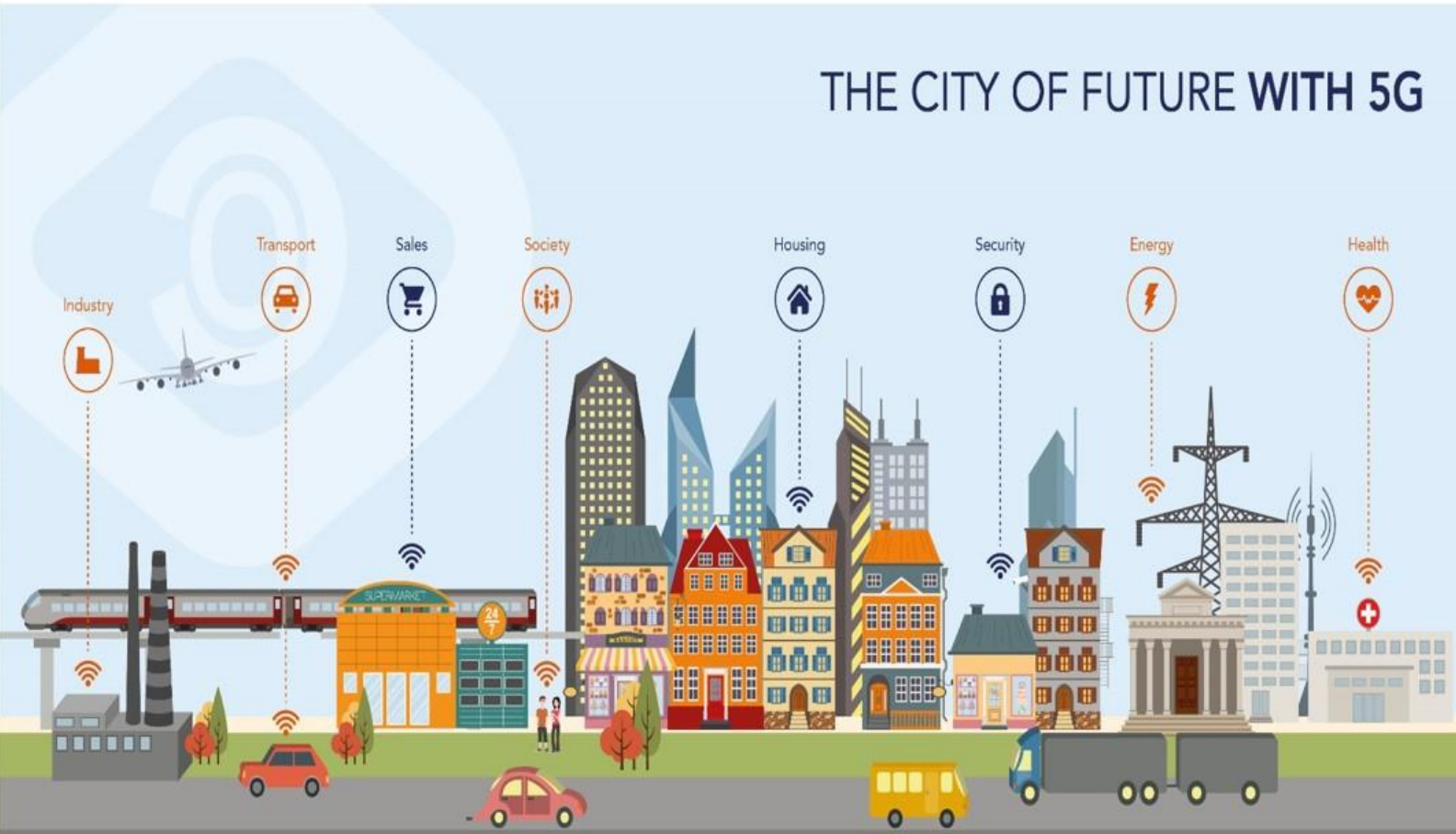
5G infrastructures deployed by FTTA (Fiber To The Antenna) are driven by small cells. 5G cell density is projected to be four to six times that of 4G cell density

The rigorous developments around 5G suggest that leading mobile operators are prepared for **the commercial rollout of 5G by 2023** and mobile subscribers is estimated to **reach 5.9 billion by 2025**

5G network infrastructure promises higher speeds of up to 100 times of existing 4G LTE

THE CITY OF FUTURE WITH 5G

With the promise of extended coverage, increase in speeds and optimization of power consumption, 5G technology is aimed at a wide range of sectors in the economic fabric: power, healthcare, media, industry and transport.



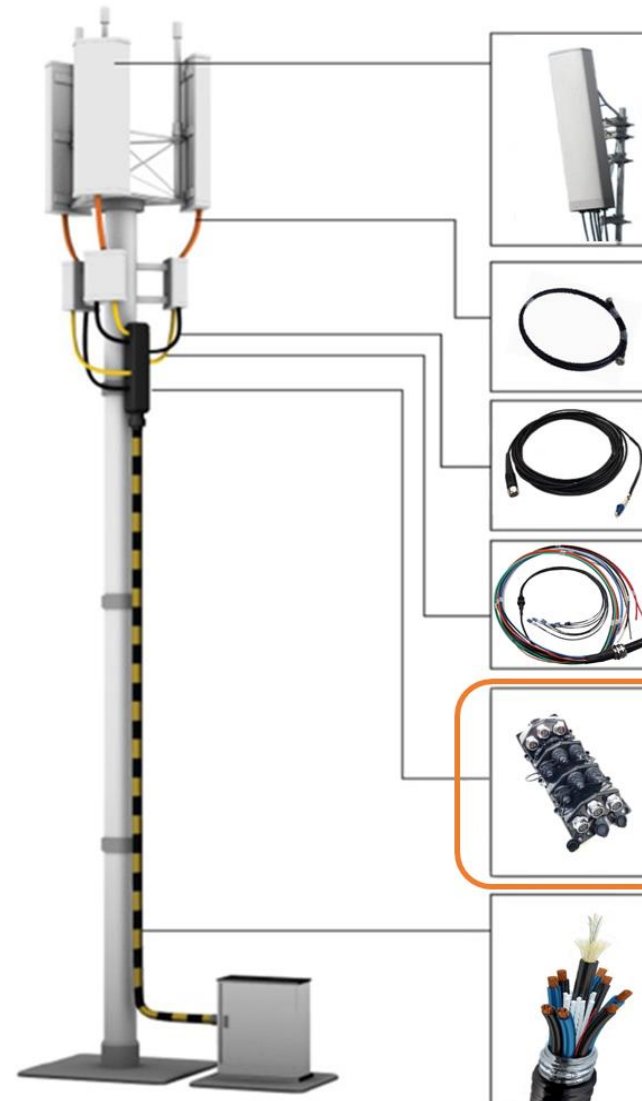
48% 5G subscribers in North America
34% 5G subscribers in Northeast Asia
21% 5G subscribers in W. Europe

- 5G
- LTE
- WCDMA/HSPA
- GSM/EDGE-only
- CDMA-only

5G Tower Cabling Solution - A

Combined Fiber and Power feeder cable for 3 to 4 RRHs through terminal

- **Hybrid Feeder Cable**
 - Outdoor type
 - Corrugated copper or aluminum Armored
 - Pre-assembled terminal in factory
 - Supports up to terminal covered 3 or 4 RRHs
 - Well mantel corrugated armored aluminum
 - 4, 6, 8, 10, 12 AWG with conductor pair depending on the power consumption of RRH and the associated voltage drop
- **Hybrid Connector Jumper Cable**
 - Hybrid Connector designed Plug & Play system
 - Combined fiber and power in a single construction
 - Factory terminated connectors
 - RRU CPRI interface vender specified connector
 - Fiber 1 or 2 pairs and conductor 1 pair
 - Power 8, 10, 12 AWG 1 pair
 - Corrugated armored aluminum



Antenna

- Single & Broad Band Sector Antenna
- Urban, suburban coverage

RF Jumper Cable

- Sized of 3/8", 1/2" with any length
- Connection between RRHs and Antennas

Fiber Optic Jumper Cable

- Customized design & Length
- Fiber type: G.657

Hybrid Jumper Cable

- Customized design & Length

Hybrid Terminal Cable

- Pre-connected Hybrid Cable System
- Space-efficient

Hybrid Cable

- Power Cable + Fiber Optic Cable
- Rodent & termite proof

Hybrid Terminal Cable

Features

- Pre-connectorized factory-sealed hybrid cable system for 3 and 6 RRHs
- Modular plug & play system compatible with fiber optic jumper and power jumpers
- Encapsulated IP 67 sealed connector head housing
- Robust pulling eye for cable lifting, no hoisting grips required, high cable strain relieve
- Space-efficient, low wind-load
- Easy mounting with adapter plate, mast-pole, and wall mounting
- Optional protection cover for cable exits available



Parameter	LSFH™ hybrid cable (Global market)	UL-listed hybrid cable (US market)
Jacket material	Thermoplastic, low smoke free of halogen	PVC
Standard	IEC 60502-1: 2004-04	UL 1277
Temperature range	-40 °C to +75 °C	
Operating voltage	48 Vdc	
Rated voltage	0.6 kv / 1 kv (1.2 kv)	
Conductors	Stranded copper class 2 IEC 60228: 2004	Stranded copper Class C
Drain wire	Stranded copper class 2 IEC 60228: 2004	Stranded copper Class B
Cable shielding	Copper foil 100% coverage (with drain wire)	
Fiber optic	5mm loose tube cable with up to 36 fibers single mode	
Halogen free	Yes	No
Flame retardant	IEC 60332-1-2: 2004	UL 1685 (UL 1581) vertical tray flame test (70000 BTU/h)
UV resistant	IEC 68-2-5	UL 1581

Hybrid Jumper Cable

(1 pair, 2 pairs RRH-Cost Effective Version)

HYBRID JUMPER CABLE



Cable divider	Glued heat shrink	
Ingress protection	Connectors, cable and divider	IP 68
Cable head connectors (Radio end)	Fiber	RRH connector
	Power	Open end or Connectorized
Cable head connectors (Base station)	Fiber	LC duplex
	Power	Open ended
Breakout cables	Fiber	4.8 mm
	Power	Shielded copper cables
Copper cross section	2x4 mm ² , 2x6 mm ² , or 2x10 mm ²	
Cable diameter	Hybrid	15~20 mm (depending on cross section)
Temperature range	Service	-25 °C to +75 °C
	Installation	-40 °C to +75 °C
Tensile load	Fiber breakout cable	800 N
	Power breakout cable	1000 N
Salt mist	IEC 61300-2-26	96 h
Vibration	IEC 61300-2-1	10~500Hz / 10 g
Shock	IEC 61300-2-9	100 g

Tips:

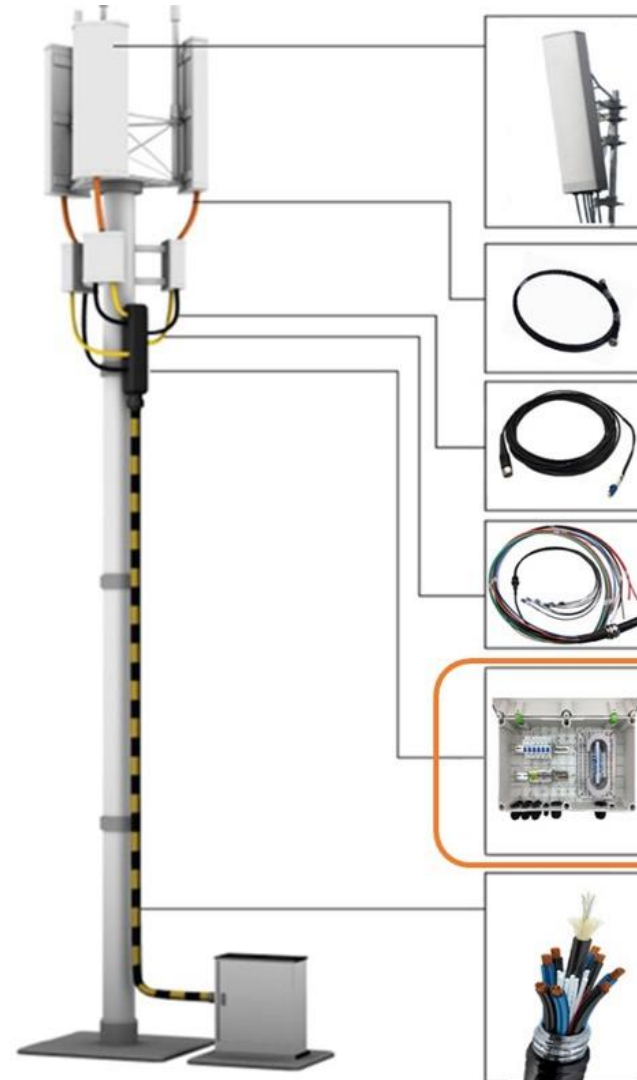
- Hybrid Connector can be replaced by PDLC , MPO, MTP etc.
- Hybrid cable diameters 1/2', 7/8, 1-5/8'... are available

5G Tower Cabling Solution - B

Hybrid Junction Box Cabling

Combined Fiber and Power feeder cable for 3 to 4 RRHs through junction box

- **Hybrid Feeder Cable**
 - Outdoor type
 - Corrugated copper or aluminum armored
 - Top or bottom junction box
 - Fiber optic pre-terminated connections
 - Power non-connector
 - 4, 6, 8, 10, 12 AWG with conductor pair depending on the power consumption of RRH and the associated voltage drop
- **Hybrid Jumper Cable**
 - Jumper of single trunk fiber and power connect to RRH
 - Fiber optic 1 to 2 pairs
 - LC connector or vendor-specified connector
 - Power 8, 10, 12 AWG 1 pair
 - Non-connector or RRH vendor-specified connector



Antenna

- Single & Broad Band Sector Antenna
- Urban, suburban coverage

RF Jumper Cable

- Sized of 3/8", 1/2" with any length
- Connection between RRHs and Antennas

Fiber Optic Jumper Cable

- Customized design & Length
- Fiber type: G.657

Hybrid Jumper Cable

- Customized design & Length

Hybrid Junction Box

- Box for Hybrid feeders
- Up to 6 RRHs

Hybrid Cable

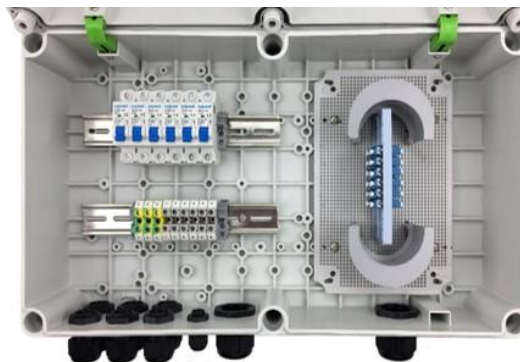
- Power Cable + Fiber Optic Cable
- Rodent & termite proof



Hybrid Junction Box

Features

- Material: Polycarbonate (UV resistant)
- Outdoor type
- Pole mount / Wall mount type
- Pipe: 3" to 6"
- Color : Gray
- Screw terminal Block:
 - *Isolated 4P & Non-isolated 4P (Option)*
- Circuit Breaker 20A 4 pcs (Option)
- Ground earth bar
- LC Adaptor Panel:
 - *LC Duplex 8 pcs (Option)*
- Cable Entry:
 - *Option A: Hybrid feeder 1/Hybrid Jumper 4/Ground 1 (Option)*
 - *Option B: Hybrid feeder 1/Fiber Jumper 4/Power Jumper 4/Ground 1 (Option)*



Power Junction Box

Features

- Material: Polycarbonate (UV resistant)
- Indoor / Outdoor type
- Pole mount / Wall mount type
- Pipe: 3" to 6"
- Color : Gray
- Screw terminal Block:
 - *Isolated 4P & Non-isolated 4P (Option)*
- Circuit Breaker 20A 4 pcs (Option)
- Ground earth bar
- Cable Entry:
 - *Power feeder 1/Power Jumper 4/Ground 1 (Option)*



Fiber Optic Junction Box

Features

- Indoor / Outdoor type
- Pole mount / Wall mount type
- Loop through cable can be installed
- Color : Gray
- PLC Splitter can be installed
- Swing panel design for easy installation and maintenance
- Interrelated splice and fiber management
- Distribution cables can be pre-terminated or spliced to pigtails



5G Tower Cabling Solution - C

CWDM Wireless RU to DU Cabling

- Current radio systems mount the active RRH on the mast in order to save energy
- Reduction in high cost and labor-intensive installation for coaxial cable
- Allows for quick fault finding and upgrading RRH

CWDM MUX + Junction Box

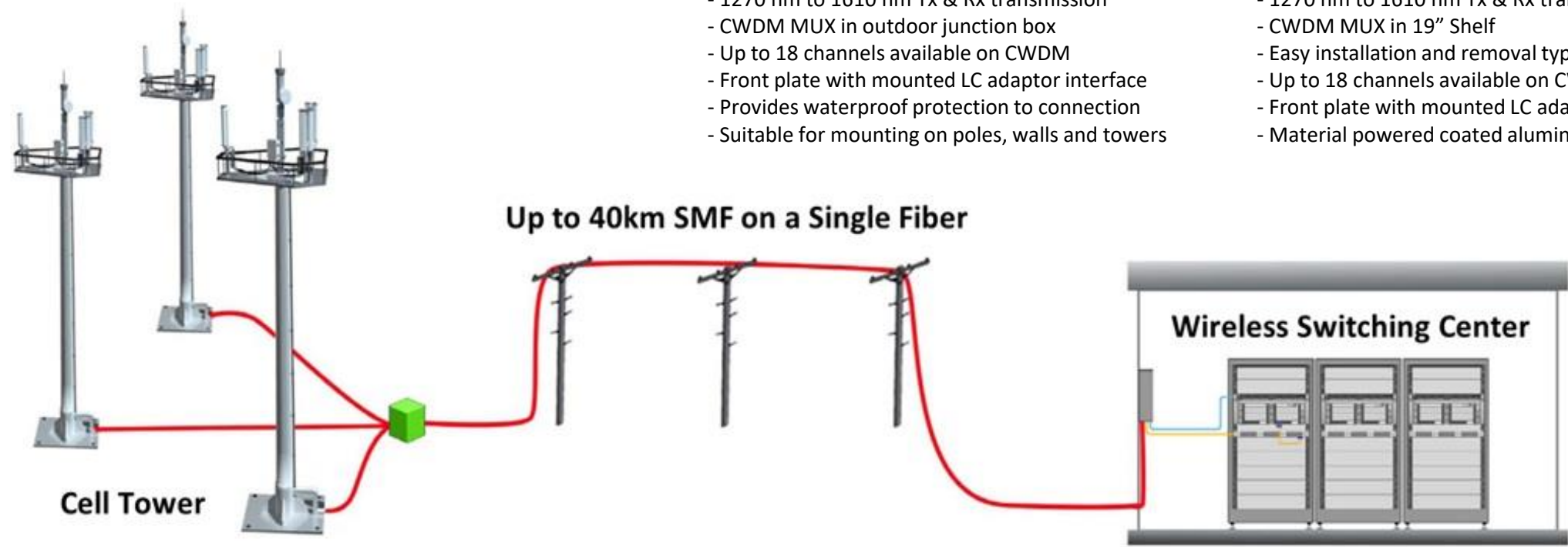


CWDM MUX + Shelf



- CWDM MUX + Junction Box
 - 1270 nm to 1610 nm Tx & Rx transmission
 - CWDM MUX in outdoor junction box
 - Up to 18 channels available on CWDM
 - Front plate with mounted LC adaptor interface
 - Provides waterproof protection to connection
 - Suitable for mounting on poles, walls and towers

- CWDM MUX + Shelf
 - 1270 nm to 1610 nm Tx & Rx transmission
 - CWDM MUX in 19" Shelf
 - Easy installation and removal type
 - Up to 18 channels available on CWDM
 - Front plate with mounted LC adaptor
 - Material powered coated aluminum



TOWER CABLING

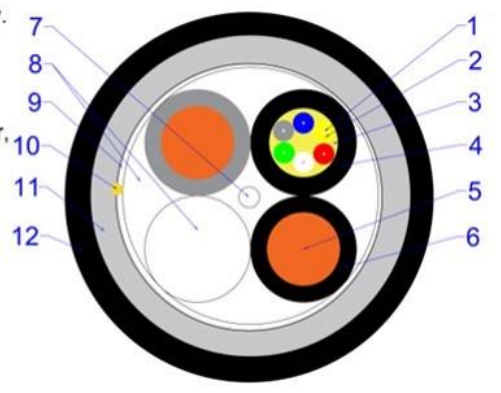
Mini Hybrid Cable

Features

- Pre-assembled “plug & play” cabling
- Supports up to terminal covered 3 or 4 RRHs
- Wall mounted corrugated armored aluminum
- 4, 6, 8, 10, 12 AWG with conductor pair depending on design
- Ruggedized design with robust pulling tube
- Outdoor and indoor with high flame resistance
- Temperature range -40 °C up to +75 °C
- Ingress protection IP 67 when installed
- Loose tube cables with up to 24 fibers, rodent protected, UV resistant
- LC Uniboot connectors
- Breakouts numbered for easy channel identification
- Easy and time-saving installation
- Easy system, factory-tested, rodent-resistant



1. Fiber: Single-mode fiber (G.657A1, 9/125 μm)
2. Tight buffer: Blue, Yellow, Red, White, Green, Grey. Nylon or equivalent material.
3. Reinforcement: Aramid yarn, 25000 dtex.
4. Tube: Black LSOH, UV resistance.
5. Power cable conductor: Stranded copper conductor, 5.5mm².
6. Power cable insulation: Grey, black LSOH, UV resistance.
7. Reinforcement: FRP.
8. Filler: PP.
9. Wrap tape: PET.
10. Rip cord: Kevlar.
11. Armor: Corrugated aluminum tape.
12. Overall jacket: PE, diameter 16mm.



Plug & Play Cable - A Type (LC to LC)

Features

- Pre-assembled “plug & play” cabling system
- Ruggedized design with robust pulling tube
- Outdoor and indoor with high flame resistance
- Temperature range -40 °C up to +75 °C
- Ingress protection IP 67 when installed
- Loose tube cables with up to 24 fibers, rodent protected and UV resistant
- LC Uniboot connectors
- Breakouts numbered for easy channel identification
- Easy and time-saving installation
- Easy system, factory-tested, rodent-resistant

Assembly specifications

Number of fibers	Up to 1152
Divider	Small or medium or large
Built-in hole dimension	15.6~16.4 mm

Pulling tube with pulling eye

Outer diameter	36 mm
Maximum tensile strength	1000 N
Crush resistance	250 N/cm
Ingress protection	IP 67

Glass-armored loose-tube cable

Jacket material		LSFH™
Cable diameter		8.5 mm
Tensile strength during installation in service		3000 N
		1500 N
Crush resistance	Short term	400 N/cm
	Long term	200 N/cm
Temperature range installation service		-25°C to +75°C
		-40°C to +75°C
Flame resistance	IEC 60332-1	Passed
	IEC 60332-3-24	



Plug & Play Cable - B Type (LC to Multi-Connector Choice)

Features

- Pre-assembled plug & play cabling system
- Termination with Multi-Connector extension or with RRH-specific interface
- Ruggedized design with robust breakout cables
- Robust pulling tube for cable lifting
- Outdoor and indoor with high flame resistance
- Temperature range -40 °C up to +75 °C
- Loose tube cables with up to 24 fibers, rodent-protected and UV-resistant
- Fibers and connectors numbered for easy channel identification
- Easy and time-saving installation

Assemblies Specifications

Number of fibers	Up to 12	18 to 24
Number of RRHs	Up to 6	9 to 12
Built-in hole dimension	16.0 mm	26.0 mm
Tensile load on individual breakout cable	600 N	
Ingress protection with the connector	IP 67	
Maximum breakout lengths	4 m	
Breakout cable diameter	5 mm	

Glass-armored loose-tube cable

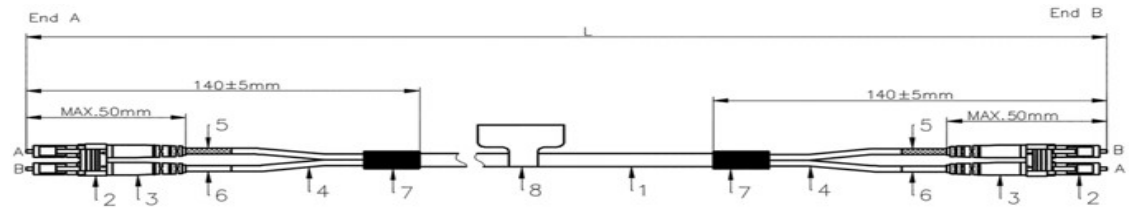
Jacket material	LSFH™	
Cable diameter	8.5 mm	
Tensile strength	During installation	3000 N
	In service	1500 N
Crush resistance	Short term	400 N/cm
	Long term	200 N/cm
Temperature range	Installation	-25 °C to +75 °C
	Service	-40 °C to +75 °C
Flame resistance	IEC 60332-1	Passed
	IEC 60332-3-24	



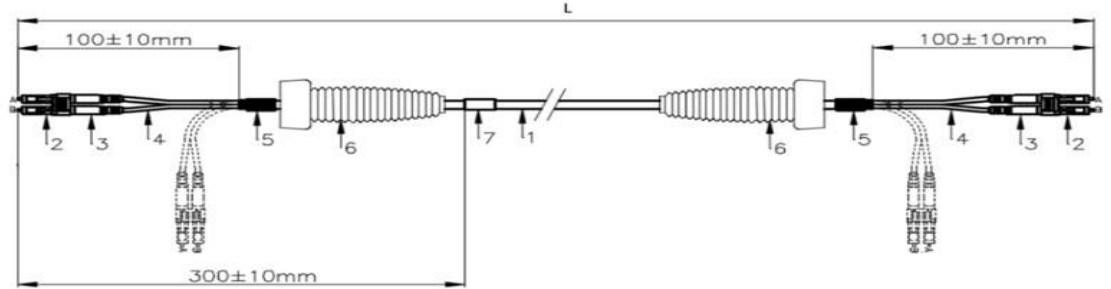
Major RRU Connector Series

Multi-Vendor Jumper for RRHs Fiber-To-The-Antenna (FTTA)

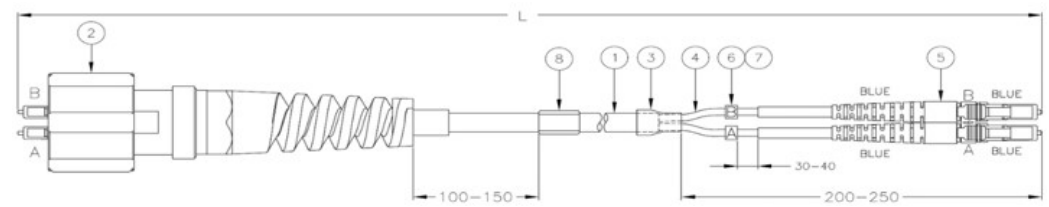
- LC Feeder with metal divider and ruggedized breakout, 4.8 mm cable, single mode bend insensitive fiber



- LC Feeder with 90° boot, 5 mm cable, OFNR, multi mode fiber



- PDLC Feeder with 7 mm, single mode bend insensitive fiber, PDSC, IP 67



DLC-DLC



FDLC-DLC



FDLC-FDLC



PDLC-DLC



NDLC-NDLC



Mini Hybrid
FDLC-DLC

RF Cabling and Connectivity Solutions

Mainly used in broadcast and microwave telecommunication, military use, aerospace, vessels or other circumstance where the RF is needed.

Advantages: Low attenuation, low standing wave, high shielding, flexible, high anti-tensile strength



RF Cabling Solution



RF Foam Cable



Leaky Foam Cable



Air Dielectric Cable

RF Cabling and Connectivity Solutions

RF Jumper Cables

The lengths are available on request

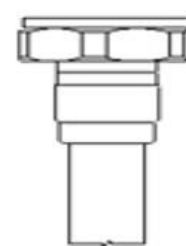
Size	Frequency	1.5 m	2.0 m	3.0 m	5.0 m
1/4"	450 MHz	0.14	0.19	0.28	0.47
	900 MHz	0.20	0.27	0.41	0.68
	1800 MHz	0.30	0.39	0.59	0.99
	2400 MHz	0.35	0.46	0.69	1.15
1/4" S	450 MHz	0.18	0.24	0.37	0.61
	900 MHz	0.26	0.35	0.53	0.88
	1800 MHz	0.39	0.51	0.77	1.29
	2400 MHz	0.45	0.60	0.90	1.50
3/8"	450 MHz	0.10	0.14	0.20	0.34
	900 MHz	0.15	0.20	0.29	0.49
	1800 MHz	0.21	0.29	0.43	0.71
	2400 MHz	0.25	0.33	0.50	0.84
3/8" S	450 MHz	0.14	0.18	0.27	0.46
	900 MHz	0.20	0.26	0.39	0.66
	1800 MHz	0.29	0.38	0.58	0.96
	2400 MHz	0.34	0.45	0.68	1.13
1/2"	450 MHz	0.07	0.09	0.14	0.24
	900 MHz	0.10	0.14	0.20	0.34
	1800 MHz	0.15	0.20	0.30	0.50
	2400 MHz	0.17	0.23	0.35	0.58
1/2" S	450 MHz	0.11	0.14	0.22	0.36
	900 MHz	0.16	0.21	0.32	0.53
	1800 MHz	0.23	0.31	0.47	0.78
	2400 MHz	0.27	0.36	0.54	0.91



4.3-10-M



DIN-M



DIN-F



N-M



N-F



RF Cabling and Connectivity Solutions

RF Connectors

Extremely robust and waterproof, typically used in mobile communication applications with demanding mechanical and electrical requirements.

Connectors have the following advantages:

- Low VSWR
- Low Intermodulation
- Easy attachment
- Waterproof
- Premium PIM
- The Best Solid
- Longer Durability



Cable size		1/2" S	1/4" S	1/2"
Item	Characteristic impedance(Ω)	50	50	50
	Frequency range	1M~11GHz	0~18GHz	0~3GHz
	Dielectric strength(Min at sea level)(V)	2500	500	1500
	VSWR	$\leq 1.06(1M-3G)$ $\leq 1.08(3G-11G)$	$\leq 1.2(0-3G)$ $\leq 1.4(3-18G)$	$\leq 1.15(0-3G)$
Contact resistance	Inner conductor(m Ω)	≤ 0.8	≤ 5	≤ 5
	Outer conductor(m Ω)	≤ 0.4	≤ 2.5	≤ 2.5
	Insulated resistance(m Ω)	≥ 5000	≥ 5000	≥ 5000
	Insertion loss(dB)	≤ 0.1	≤ 0.1	≤ 0.1
	Center retentivity(N)	> 0.6	> 0.28	> 0.57
	Durability(cycles)	≥ 500	≥ 500	≥ 500



RF Cabling and Connectivity Solutions

RF Connectivity Accessories

RF Cabling Solution

Power Coupler



The entire frequency spectrum from PMR to 5G. As a result, DAS networks can now be completely assembled

RF Clamps



Feeder clamps are made of stainless steel and anti-UV rubber by adopting a special technique of coating. Widely used in fixing of RF cables. Can be applied in different operational temperatures

Ground Kits



Various indoor & outdoor grounding kits are applied to the grounding protection of various feeders, installed easily and performance is reliable

Feeder Cable Cutter

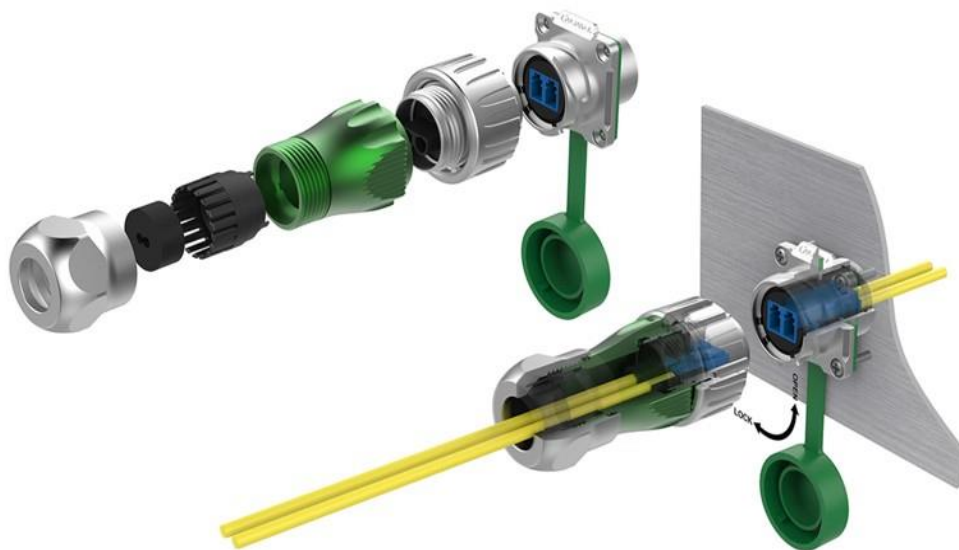


All stripping surfaces are manufactured to precise tolerances to assure clean and smooth strips

Harsh Environment Connector (Bayonet Type) (VHEC24-BT)

Features

- Connecting mode: ¼ bayonet connection
- Protection level: IP 65 / IP 67
- Line diameter scope: $\varnothing 5.5 \text{ mm} \sim \varnothing 7 \text{ mm}$
- Durability: ≥ 500 mating/unmating cycle
- Temperature rating: $-40 \text{ }^{\circ}\text{C} \sim 80 \text{ }^{\circ}\text{C}$



Harsh Environment Connector (Plug & Play Type) (VHEC24-PPT)

Features

- Connecting mode: plug / unplug
- Protection level: IP 65 / IP 67
- Line diameter scope: $\varnothing 5.5 \text{ mm} \sim \varnothing 7 \text{ mm}$
- Durability: 2500 mating/unmating cycle
- Temperature rating: $-40 \text{ }^{\circ}\text{C} \sim 80 \text{ }^{\circ}\text{C}$





- Anatolia Telecom Ltd. delivers turnkey innovative, commercial and public safety coverage and capacity solutions that give network operators, facility owners and neutral hosts an edge over the competition.
- Designed for even the most challenging indoor and outdoor environments, Anatolia Telecom's modular and integrated solutions are designed to reduce capital and operating expenses, speed up rollout of services and help improve coverage, signal quality and capacity.

Registered Name:

Anatolia Telekom ve Ileri Malzeme Teknolojileri Arge Imalat San Tic. Ltd. Sti.

Brand Name:

Anatolia Telekom

Sales Office:

DAP Vadisi Business Center, S Office No: 5/75, Kagithane, Istanbul, Turkey

Factory:

1185 Cadde, No: 42-44, OSTIM Yenimahalle, Ankara, Turkey

Tel: *Mob: +90 506 509 1411 | Fixed: +90 850 622 9063*