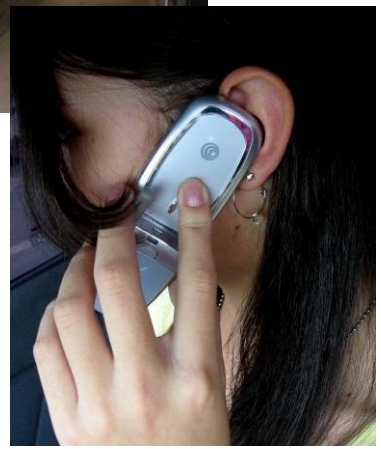
MetaSystem
Group

MULTI-BAND MULTI-OPERATOR OPTICAL SYSTEMS

INTRODUCTION (1)

Every **Mobile Operator** needs:

- **Excellent Coverage:** only uniform coverage can guarantee full access to all 3G services providing higher data rates
- **High Capacity:** maximized capacity optimization with allocation exactly where and when needed
- **Best Quality:** homogeneous power distribution to improve QoS reducing BER (Bit Error Rate), while mobile transmit power optimization reduces wideband interference



Dedicated coverage is fundamental to have best QoS and provide innovative 3G services

INTRODUCTION (2)

Multi-operator systems are the future evolution of Mobile Networks:

- End user costs continue to reduce, so network cost must as well → **Network sharing**
- Network differentiation is no longer the most important point for mobile operators → the critical point is **cost reduction**
- Mobile Operators need to move from network competition to **service competition**
- Mobile Operators can minimize CAPEX and OPEX through **shared solutions**

High Quality end to end shared network at lower cost

Help Mobile Operators focus on service innovation

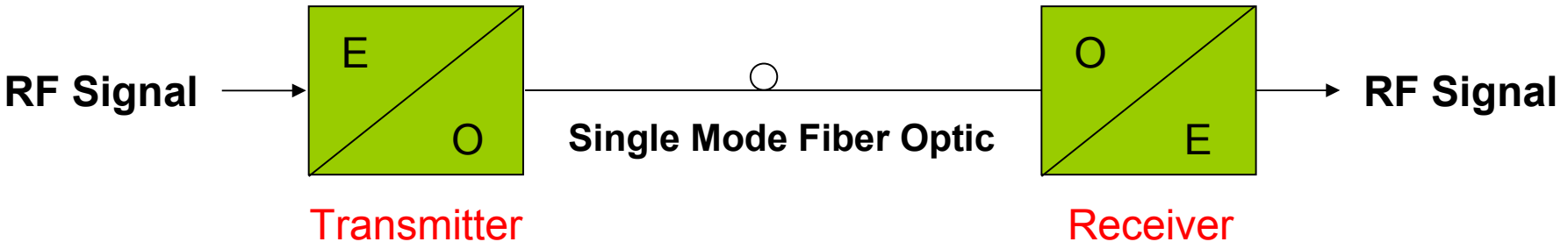
TEKO TELECOM OPTICAL SYSTEM

Teko Telecom Optical System is an **optical distribution system** capable of transporting frequencies from 800 to 2200 MHz.

It is **Multi-band Multi-operator** System that can solve any coverage and/or capacity issue due to its easy adaptation to any band, output power and network topology, regardless of protocol or modulation.

This Optical System provides a **cost-effective solution for indoor and outdoor coverage**, including tunnels, undergrounds, airports, convention centers, high-rise buildings and other shadow areas or hot-spots.

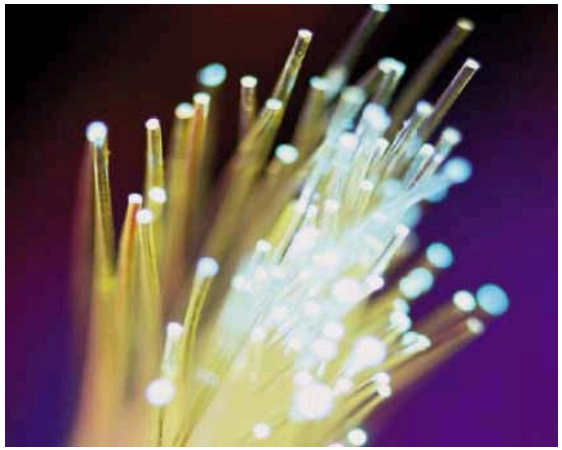
RADIO OVER FIBER CONCEPT



RoF concept: RF is converted to light (in the Fiber Optic Transmitter of the Master Unit) and transported over fiber optic cable. Light is then converted back into RF (in the Fiber Optic Receiver of the Remote Unit) to be transmitted to mobile.

Advantages of use of Single Mode Fiber Optics:

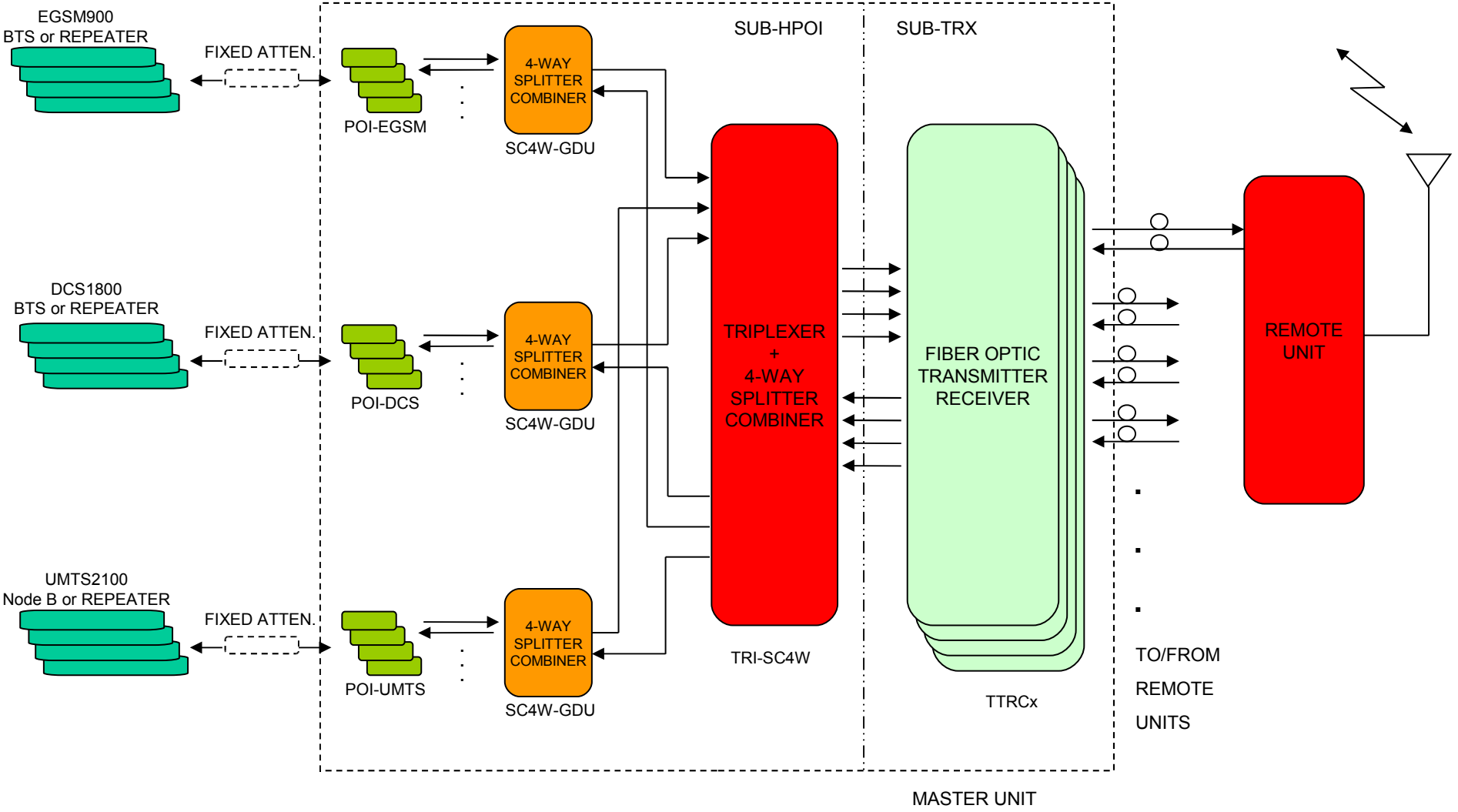
- Wide bandwidth link
- Wide dynamic range
- Linearity and transparency
- Negligible loss for long distance
- Minimum installation costs
- Flexibility and modularity for future evolution



TEKO TELECOM OPTICAL SYSTEM MAIN CHARACTERISTICS

Band	From 800 to 2200 MHz Single, Dual or Tri-Band For 2G and 3G networks		
Composite Output Power	High Power Remote Unit 36 dBm (EGSM900) 38 dBm (DCS1800) 38 dBm (UMTS2100)	Medium Power Remote Unit 29 dBm (EGSM900) 31 dBm (DCS1800) 31 dBm (UMTS2100)	Low Power Remote Unit 26 dBm (EGSM900) 27 dBm (DCS1800) 28 dBm (UMTS2100)
Architecture	1) star-configuration: - using 2 fibre optics per Remote Unit, or - using 1 fiber with the WDM option (High Power/Medium Power Remote Unit); 2) cascade-configuration: - up to 4 Remote Units using a single fibre		
Distribution network	Fiber Optics from the Master Unit to the Remote Units (flexible, unobstrusive), Coax for the passive network from the Remote Units to the antennas		
Applications	• airports and car parks • shopping malls • subways/metro/underground • convention centers • campuses • street level coverage		

TEKO TELECOM OPTICAL SYSTEM BLOCK DIAGRAM



TEKO TELECOM OPTICAL SYSTEM MAIN COMPONENTS

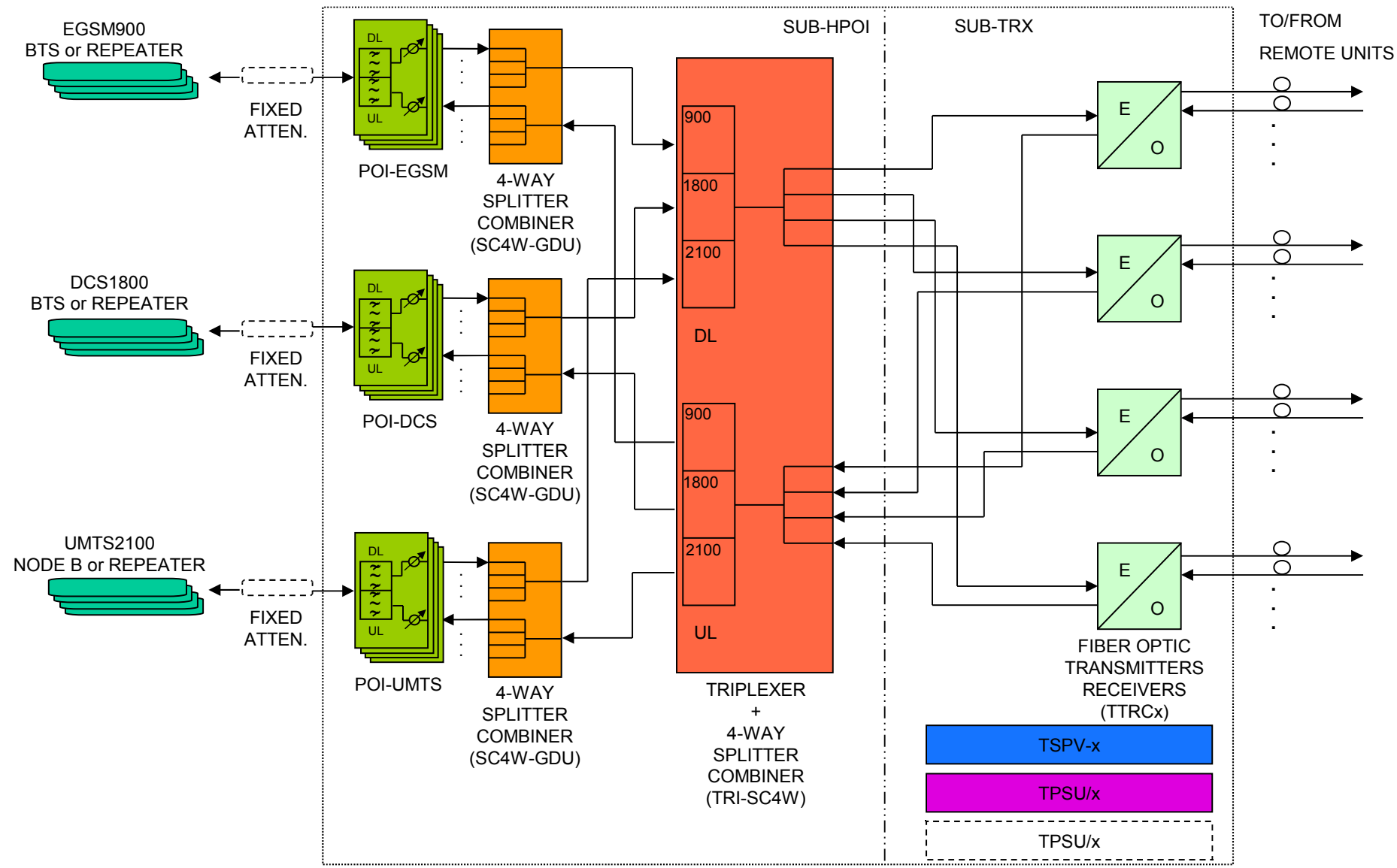
Master Unit

Single-Band, Dual-Band & Tri-Band Remote Units

The **Master Unit** is located near the signal source (BTS, Node B, Repeater) and connected to it via coaxial cable. It hosts various modules including the Fiber Optic Transmitter/Receiver, passive RF devices, and the Supervision Module. The RF signals are transformed in Optical signals and sent to the Remote Units over Single Mode Fiber.

The **Remote Unit**, which can be up to 20 km away, has an optical to RF converter, HPA and duplexer. The output port can be connected directly to an antenna or to a passive coaxial cable network.

TEKO TELECOM OPTICAL SYSTEM
MASTER UNIT BLOCK DIAGRAM



TEKO TELECOM OPTICAL SYSTEM

MASTER UNIT: MULTI-BAND MULTI-OPERATOR INTERFACE

Modular RF interfaces towards

BTS/Node-B or Off-Air Repeaters for all the bands

- Flexible BTS interface up to 4 Operators per Band
- Passive POI with 30dB independent adjustment for Downlink and Uplink
- Integrated Band Combiner and 1:4 Splitter/Combiner to drive up to 4 Fiber Optic Transmitter/Receiver Modules (16 RUs)

TEKO TELECOM OPTICAL SYSTEM: MASTER UNIT: TRIPLEXER MODULE

The **Triplexer module** (TRI-SC4W) includes:

- EGSM / DCS / UMTS combiner (DL side)
- EGSM / DCS / UMTS splitter (UL side)
- 4-way splitter (DL side)
- 4-way combiner (UL side)

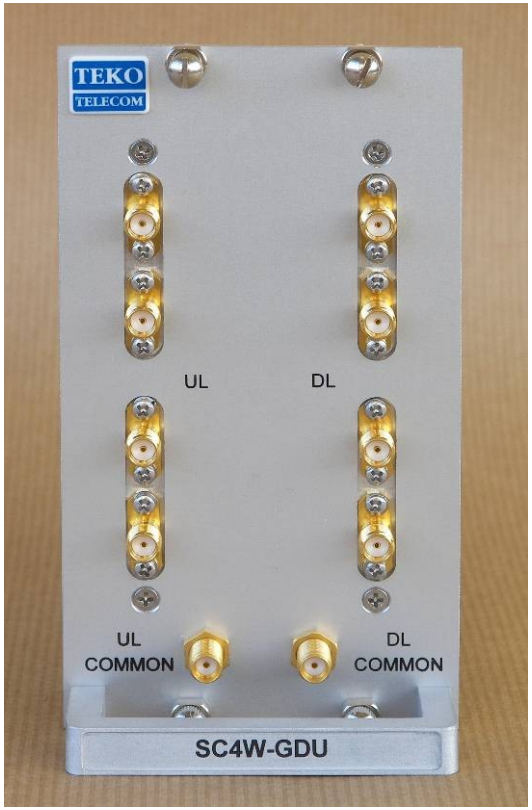
The 4-way splitter/combiner can be used to drive up to 4 Fiber Optic Transmitter/Receiver Modules

TEKO TELECOM OPTICAL SYSTEM: MASTER UNIT: COMBINER/SPLITTER MODULE

The **Combiner/Splitter module** (SC4W-GDU) includes:

- 4-way splitter
- 4-way combiner

The 4-way splitter/combiner can be used to drive up to 4 Fiber Optic Transmitter/Receiver Modules and/or split/combine signals (of the same band) coming from up to 4 POIs



TEKO TELECOM OPTICAL SYSTEM
MASTER UNIT: POI MODULE/SUB-HPOI SUBRACK

Each **POI module** includes:

- BTS port (N type connector): RF connection with BTS or Off-Air Repeater (by directional coupler)
- Duplexer to separate DL & UL
- Adjustable attenuators (0-30dB), one for each path (UL & DL)
- UL input, DL output (SMA connectors)
- Monitor port -60dB (SMA connector) used for measurements and/or to connect to a modem (for remote management)

The **19”-3HE subrack** (SUB-HPOI) hosts all passive modules (POI, TRI-SC4W, SC4W-GDU).

For a Tri-Band System (EGSM/DCS/UMTS), the scheme is:

POI-EGSM *POI-DCS* *POI-UMTS* *TRI-SC4W*

TEKO TELECOM OPTICAL SYSTEM
MASTER UNIT: OPTICAL SUBRACK/POWER SUPPLY

Optical Subrack (SUB-TRX)

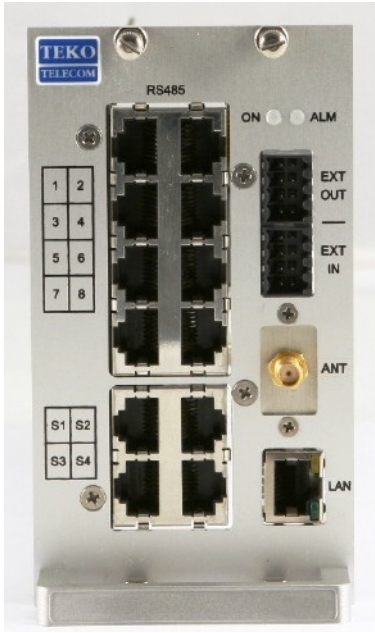
- 19” 3HE Subrack with
  12 auto addressing slots
- The optical subrack is able to host up to 4 Fiber Optic
  Transmitter/Receiver Modules

Power Supply (TPSU)

- Dimensions: 3HE x 7TE
- AC plug connection on the front
- AC/DC 85-264Vac in 100W 28Vdc out
- DC/DC -72 to -36Vdc in 100W 28Vdc out
- Possibility of 1+1 Redundancy
- RS485 connector to the front

TEKO TELECOM OPTICAL SYSTEM
MASTER UNIT: SUPERVISION MODULE

Through the **Supervision Module** (TSPV), located in the Master Unit, it is possible to centrally manage the entire system.

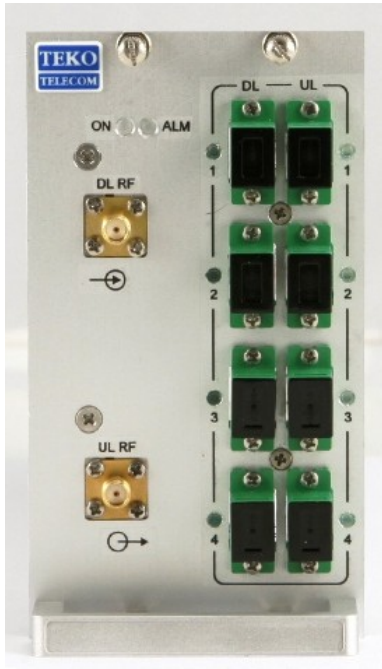


- Dimensions: 3 HE x 14TE
- Able to manage up to 8 Subracks through the RS485 (RJ45 connectors) on the front
- RS232 port for the Local Management
- Equipped with Master Supervision unit (option):
  - Ethernet port
  - Battery pack with 15min autonomy in case of black out
  - Webserver (HTTP/FTP)
  - SNMP
  - Wireless Modem (GSM850/900/1800/1900 or CDMA850/1900) with SMS capabilities

TEKO TELECOM OPTICAL SYSTEM
FIBER OPTIC TRANSMITTER/RECEIVER MODULE

The **Fiber Optic Transmitter/Receiver Module (TTRCx)**, the RF to optical/optical to RF conversion module, is the core element of the Master Unit.

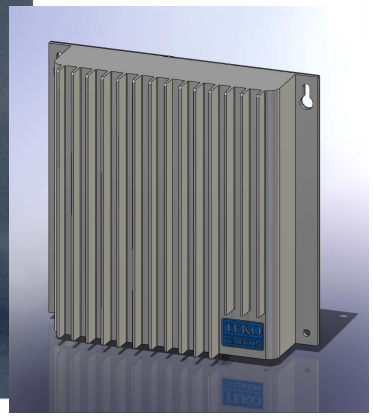
- Dimensions: 3 HE x 14TE
- Wideband (800 to 2200 MHz)
- Configurations:
  - 1TX and 1RX (able to drive up to 4 Remote Units with WDM option and different wavelength in Uplink): 10dB optical link budget, up to 20km distance
  - 1TX split by 2 and 2 combined RX, 9dB, up to 15km
  - 1TX split by 4 and 4 combined RX, 5dB, up to 5km
- Automatic Gain Control for optical loss compensation
- WDM option
- SC/APC (standard) or E2000 (optional) optical connectors



TEKO TELECOM OPTICAL SYSTEM
SINGLE, DUAL, TRI-BAND REMOTE UNITS

The **Remote Unit,** that contains the Optical to RF conversion (and vice versa), HPAs and filtering, can be Single, Dual and Tri-band (in only one box) with different power classes.

Each type of Remote Unit can be driven by the same Master Unit, so the system design can maintain the **maximum flexibility** → it's possible to distribute capacity or extend coverage into different locations at the same time!



- New equipment case: IP65 (with handles) for the HP/MP version, IP31 for the LP
- Dimensions: 570 x 415 x 260 mm (HP/MP)
  350 x 350 x 100 mm (LP)
- Weight: approx. 30 Kg. (HP), 28 Kg. (MP), 10 Kg. (LP)
- Power supply: 85-264 Vac (50-60Hz) or -72 ÷ -36 Vdc

TEKO TELECOM OPTICAL SYSTEM
POWER CLASSES OF THE REMOTE UNITS

- **High Power Tri-Band EGSM/DCS/UMTS (**Outdoor/Indoor application, High capacity Multi-Operator)

Carriers	*Output Power per carrier*	*Noise Figure*
4 carriers EGSM900	30 dBm	6 dB
4 carriers DCS1800	32 dBm	6 dB
2 carriers UMTS2100	35 dBm	6 dB

- **Medium Power Tri-Band EGSM/DCS/UMTS** (Outdoor/Indoor application)

Carriers	*Output Power per carrier*	*Noise Figure*
4 carriers EGSM900	23 dBm	6 dB
4 carriers DCS1800	25 dBm	6 dB
2 carriers UMTS2100	28 dBm	6 dB

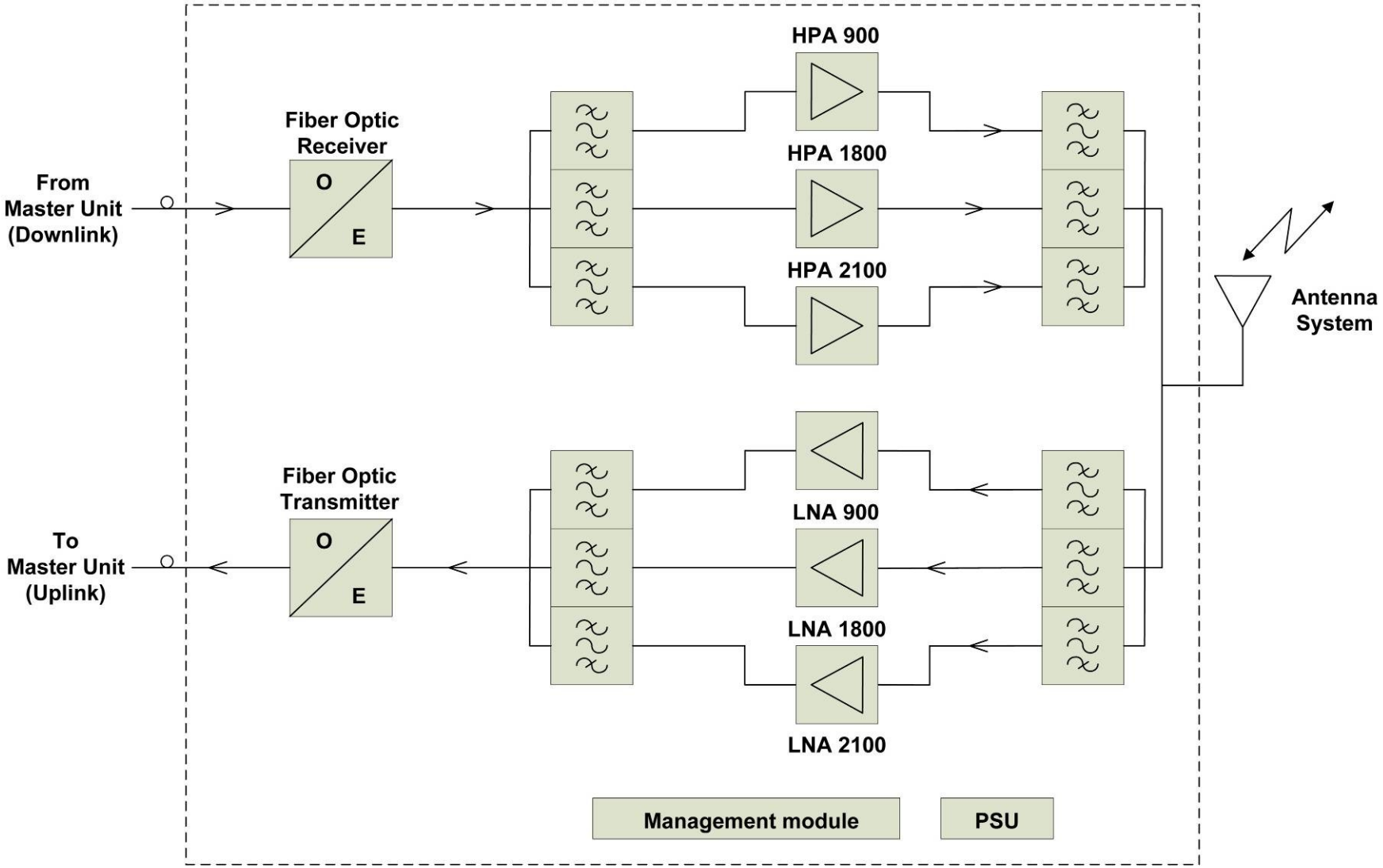
- **Low Power Tri-Band EGSM/DCS/UMTS** (Indoor application, Outdoor with the optional kit)

Carriers	*Output Power per carrier*	*Noise Figure*
4 carriers EGSM900	20 dBm	6 dB
4 carriers DCS1800	21 dBm	5.5 dB
2 carriers UMTS2100	25 dBm	5 dB

TEKO TELECOM OPTICAL SYSTEM
REMOTE UNITS FEATURES

- Multi-carrier capabilities
- Efficient power balancing
- AGC for optical loss compensation
- Blocking protection with Uplink ALC independent for each band
- **High Power RU** - power consumption: 450W (active cooling with fans)
- **Medium Power RU** - power consumption: 250W (passive cooling with natural convection)
- **Low Power RU** – power consumption: 90W (passive cooling)
- WDM option for the HP/MP versions
- Choice between 4 wavelengths in Uplink for cascaded system (driven by 1 TTRCx with 1TX and 1RX) (Optional)
- Remote Management via built-in modem through Master Unit Supervision

TEKO TELECOM OPTICAL SYSTEM
REMOTE UNIT BLOCK DIAGRAM



TEKO TELECOM OPTICAL SYSTEM
SYSTEM MANAGEMENT

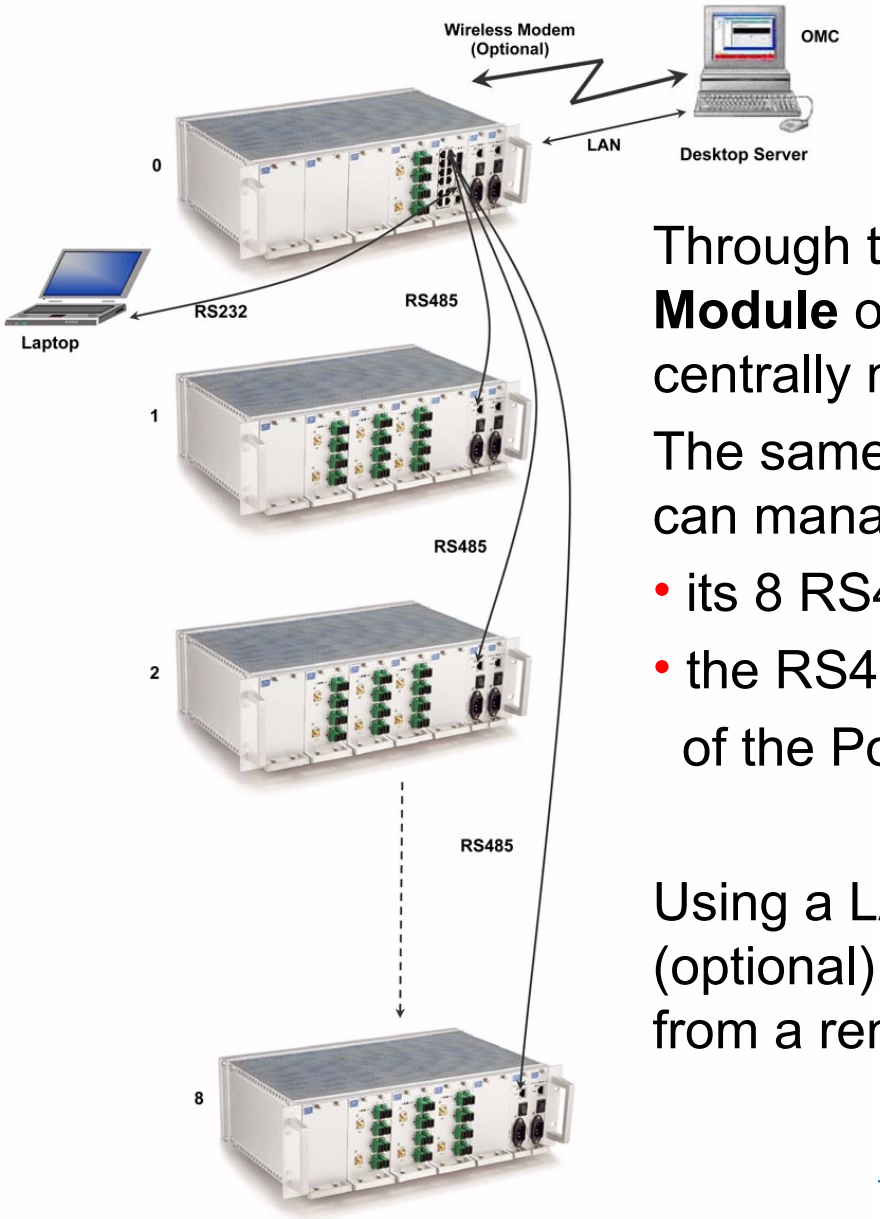
Teko Telecom Optical System can be easily set-up and supervised locally or remotely with a web page browser through a graphical user interface.

It manages alarms with **four levels of severity** (warning, minor, major and critical according to the X733 standard), supports the TCP/IP protocol, SNMP, FTP, HTTP, and is fully compatible with SNMP managers. The software supports standard and enterprise MIBs.

Alarm notification can be forwarded via SNMP trap, SMS, e-mail or software configurable dry contacts (located in the Supervision Module of the MU) connected to the BTS/Node B external alarms.

Remote communication can be easily managed through an external PSTN or internal wireless modem (optional) with optional Battery Backup.

TEKO TELECOM OPTICAL SYSTEM
SYSTEM MANAGEMENT



Through the RS232 port of the **Supervision Module** of the Master Unit, it's possible to centrally manage the entire system locally.

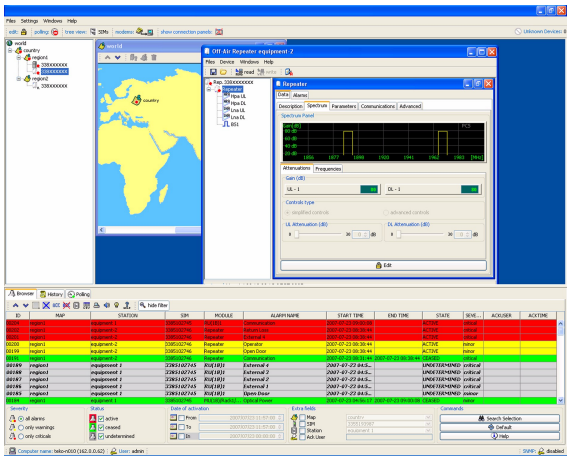
The same Module of the first Subrack (address 0) can manage up to 8 Subracks through:

- its 8 RS485 connections
- the RS485 connector situated on the front panel of the Power Supply Modules.

Using a LAN connection or a wireless link (optional), a PC can manage the same system from a remote site.

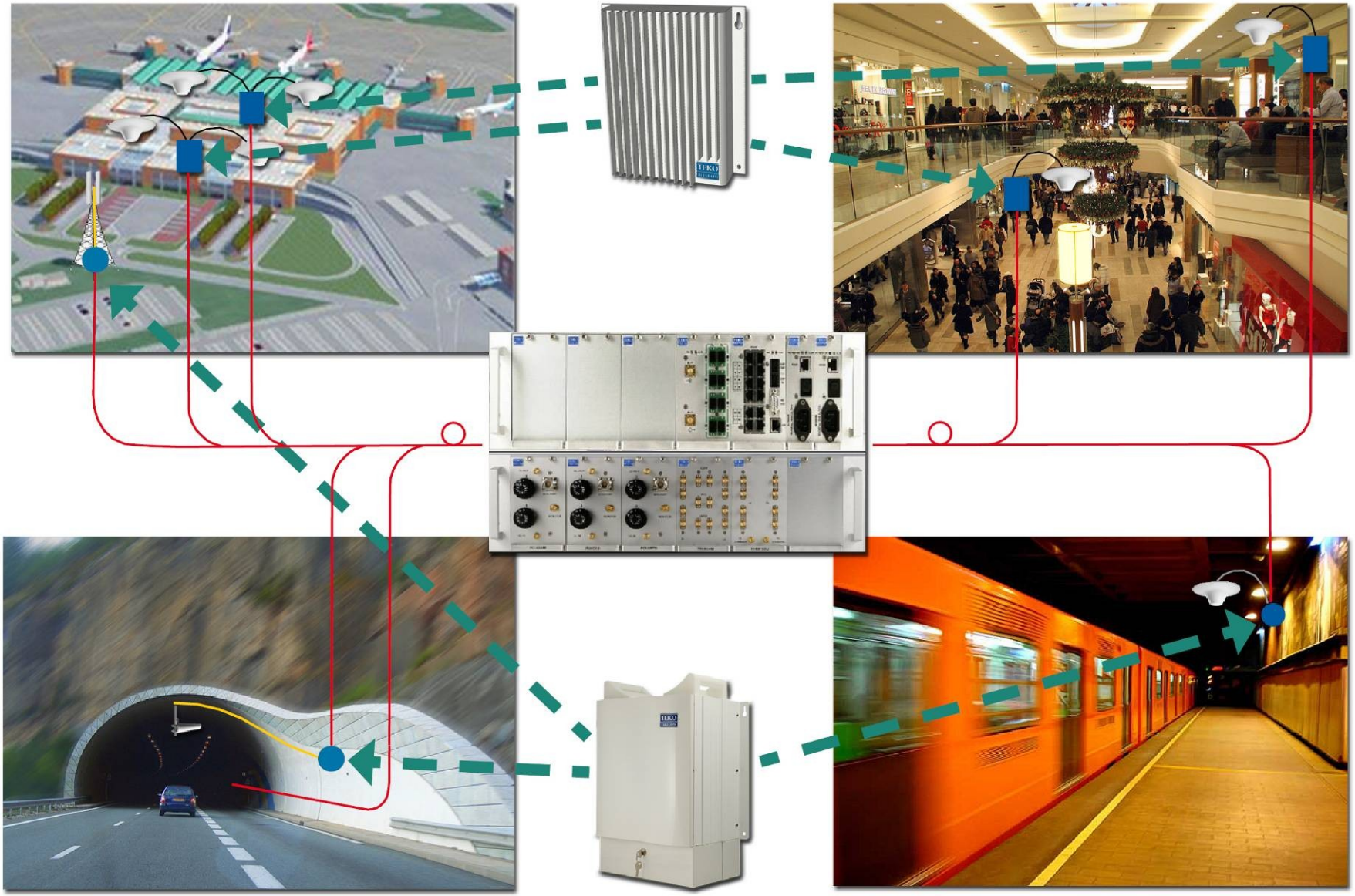
TEKO TELECOM OPTICAL SYSTEM
SYSTEM MANAGEMENT

- Summary alarms
- Automatic module discovery
- Integrated info about S/N, firmware rel, hw rel., etc… for each type of equipment
- Troubleshooting capabilities through detailed alarm info
- Remote control and management via LAN or external dial-up modem
- High level alarm management via SNMP trap, SMS messages, or e-mail
- Summary dry contacts
- Different kinds of reports for alarm and system composition



Teko Telecom OMC allows management of a cluster of our systems (Optical Systems, Repeaters) and, through SNMP protocols, guarantees full integration into any NMS.

TEKO TELECOM OPTICAL SYSTEM
TYPICAL APPLICATIONS



TEKO TELECOM OPTICAL SYSTEM
FEATURES AND BENEFITS (1)

FEATURES	BENEFITS
Multi-band	Solution for any coverage and/or capacity issue, due to easy adaptation to any band combination requested
Modularity	Rapid adaptation to changes in conditions (addition of other operators or new services), possibility to expand the system afterwards, easier arrangement of system re-sectorisation
Completely transparent	Designed for any protocol or modulation (ready also for future evolutions of modulation schemes)
Connectable to any signal source: pico/micro/macro BTS-Node B, Repeater	Flexibility
Signal remoting up to 20 Km distance, up to 144 RUs connectable to a single MU	Possibility to cover areas very far from the Master Unit site
Possible various network structures (star-configuration, WDM or cascaded)	Adaptation to different network topology requested by the customer

TEKO TELECOM OPTICAL SYSTEM
FEATURES AND BENEFITS (2)

FEATURES	BENEFITS
A variable number of Remote Units can be assigned to different sectors	Easier system design phase
Master Unit can drive High and Medium Power Remote Units at the same time	Possibility to distribute capacity or extend coverage into different locations at the same time
Optical subrack with power supply redundancy	Higher reliability
AGC compensates for the optical link loss to guarantee constant gain over different link budgets	Simplifies system installation, makes commissioning quick and easy
Compact mechanical design of the Remote Unit case	Minimal visual impact, easy and quick installation
Local or remote supervision with a web page browser through a GUI	Simple set-up and management of the system
Teko Telecom OMC uses SNMP protocols towards high level OSS	Guaranteed full integration into any NMS

TEKO TELECOM OPTICAL SYSTEM
REMOTE UNITS AVAILABLE

POWER CLASS	BAND			
HIGH POWER	SINGLE BAND	EGSM900		
		DCS1800		
		UMTS2100		
	DUAL BAND	EGSM900	DCS1800	
		UMTS2100	DCS1800	
		EGSM900	UMTS2100	
	TRI BAND	EGSM900	DCS1800	UMTS2100
MEDIUM POWER	SINGLE BAND	EGSM900		
		DCS1800		
		UMTS2100		
	DUAL BAND	EGSM900	DCS1800	
		UMTS2100	DCS1800	
		EGSM900	UMTS2100	
	TRI BAND	EGSM900	DCS1800	UMTS2100
LOW POWER	SINGLE BAND	EGSM900		
		DCS1800		
		UMTS2100		
	DUAL BAND	EGSM900	DCS1800	
		UMTS2100	DCS1800	
		EGSM900	UMTS2100	
	TRI BAND	EGSM900	DCS1800	UMTS2100

THANK YOU!