



BKtel



# V-OLT

Ultra Compact Video OLT

# V-OLT: FTTH RF Video Overlay Solution

BKtel's V-OLT system is a modular Central Office solution for the extension of FTTH data/voice networks with RF video overlay functionality. The ultra compact equipment form factor is compatible with state-of-the-art EPTP or GPON-GEAPON equipment, allowing installation in 300 mm deep 19" racks with termination of up to 256 ports, each 64 FTTH subscribers. Optimal space utilization and the modularity of the system provide high flexibility and create various capacity grow scenarios for the network operator.

The kind of television signal transmitted to the subscriber can originate from a whole range of different sources. The classical approach is the distribution of cable TV (CATV), in general consisting of analog TV channels. But also digital cable TV (DVB-C, DVB-C2), digital terrestrial TV (DVB-T, DVB-T2) and satellite TV (DVB-S, DVB-S2) can be transmitted. Moreover, CATV or digital terrestrial TV combined with satellite TV can be offered simultaneously to the subscriber.



The signals broadcasted by RF Video Overlay solutions are inherently compatible with standard TV sets and STBs

(set-top boxes). The following table shows the extremely high DVB data rate capacities for the various options.

RF Video Overlay solution	No. of AM TV channels (PAL, NTSC)	No. of QAM256 channels (DVB-C)	No. of QAM64 channels (DVB-T)	No. of 8-PSK channels (DVB-S)	DVB total data rate
CATV	35	59			3,04
DVB-C		94			4,85
DVB-T			94		2,98
CATV + 1xDVB-S	35	59		25	5,54
DVB-C+ 1xDVB-S		94		25	7,35
DVB-T + 1xSAT			94	25	5,48
1xDVB-S				25	2,50
2xDVB-S				50	5,00
4xDVB-S				100	10,00

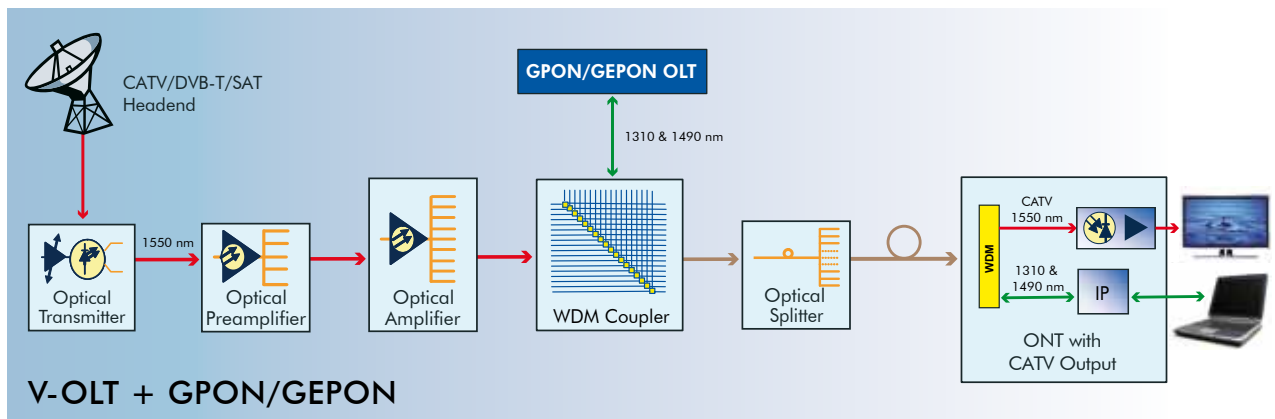
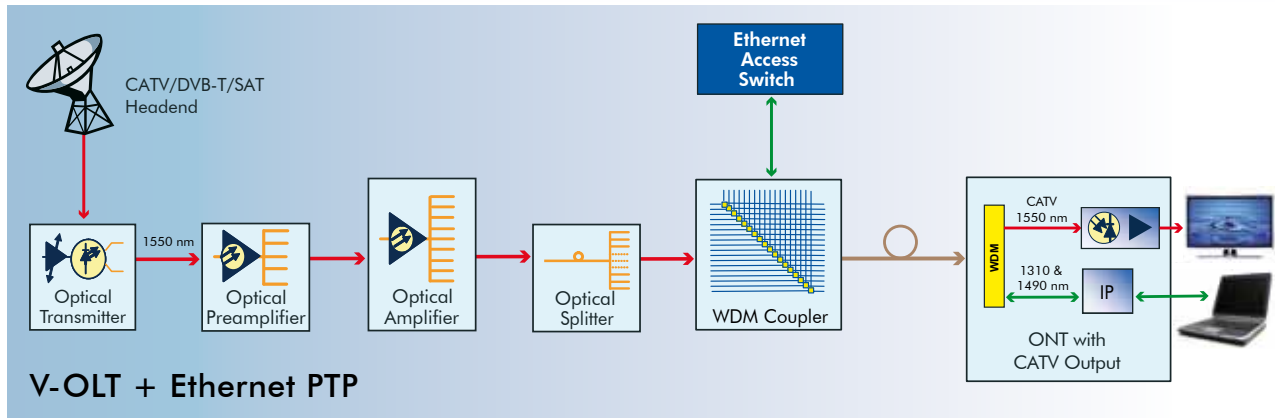
**Notes:**  
 CATV: average number of TV channels  
 AM-TV: Transmission usually with 36 FM radio channels  
 DVB-T: QAM64 and 31.688 Mbit/s in 8 MHz and 7/8 FEC rate  
 DVB-C: QAM256 with 6.8 MSym/s and 188/204 FEC rate  
 DVB-S: L-band 950...2200 MHz with 8-PSK and 36 MSym/s, 9/10 BCH-LDPC and 188/204 RS FEC 188/204 FEC rate

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# System Overview

## Basic FTTH Architectures realized with BKtel V-OLT: Point-to-Point and PON



### Optical Platform

- ◆ Modular optical transmission platform for RF video Overlay in FTTx networks
- ◆ Modules ranging from optical transmitters, optical amplifiers, power supplies, element controller up to passive optical modules
- ◆ Forward transmission 47 (70) ... 1006/2605 MHz
- ◆ SNMP and Web browser based system management (HMS compatible)
- ◆ Optical connectors: SC/APC, LC/APC, E2000, MPO-APC
- ◆ RF connectors: F-type
- ◆ Suitable for installation in 300 mm deep racks
- ◆ 10 slots per subrack, 6 RU height
- ◆ Operation environmental conditions according ETS 300 019-1-3, class 3.1 (temperature controlled locations)

### Modules

#### External Modulated Transmitters

- ◆ CATV broadcast transmitter (1550 nm or DWDM, 47 (70)... 1006 MHz bandwidth)
- ◆ CATV+SAT TV broadcast transmitter (1550 nm or DWDM, 47...2605 MHz bandwidth)

#### Optical Amplifier (EDFA)

- ◆ Pre-, in-line- or distribution amplifier
- ◆ Erbium doped fiber amplifier technology
- ◆ 1 up to 8 optical outputs
- ◆ Output power: 13... 24 dBm per port

#### Optical High-Power Amplifier (YEDFA)

- ◆ Distribution and booster amplifier with high total output power
- ◆ Ytterbium-Erbium doped fiber amplifier technology
- ◆ 1 up to 32 optical outputs
- ◆ Output power: 16... 20 dBm per port

#### Element Controller

- ◆ Element management controller
- ◆ Ethernet interface, SNMP and Web, HMS compatible
- ◆ One server manages up to 48 V-OLT modules.

#### Passive Optical Modules

- ◆ Wavelength multiplexing (WDM) arrays (1310 nm & 1490 nm/1550 nm) for RF video and data/voice combination
- ◆ Optical Splitters e.g. 1:32, 2:32, 1:64, 2:64

# Optical Transmitter

## Optical Transmission

A key component of an RF video overlay system is the optical transmitter converting the electrical TV signal into an optical modulated signal. The optical wavelength is generally chosen in the range of 1550 nm because optical amplifiers with high performance are available for this wavelength.

BKtel offers a range of optical transmitters: The high end external modulated-types BET10XL and BET26XL are required for extended networks with large distances to be covered. The medium performance external modulated transmitter BET10N is useful for shorter distances and their usage is therefore restricted to small or medium size networks with local available CATV or SAT TV feeds.

## External Modulated Optical Transmitter 1550 nm

- ◆ Broadcast transmitter (1550 nm or ITU DWDM grid wavelength)
- ◆ Bandwidth
  - BET10XL (CATV): 47... 1006 MHz
  - BET26XL (CATV + SAT): CATV: 47...870 MHz, SAT: 950...2605 MHz
- ◆ Long distance transmission > 100 km
- ◆ SBS threshold adjustment
  - BET10XL (CATV):  
up to +19 dBm (65 km fiber)
  - BET26XL (CATV + SAT):  
up to +15 dBm (40 km fiber)
- ◆ Automatic Gain Control (AGC)
- ◆ Up to 2 x 10.5 dBm optical output power

## BET10XL/BET26XL



## External Modulated Optical Transmitter 1550 nm

- ◆ 1550 nm Optical Transmitter for FTTH-Networks
- ◆ Bandwidth: 70 ... 1006 MHz
- ◆ Medium distance transmission < 40 km
- ◆ SBS threshold adjustment up to +15.0 dBm (40 km fiber)
- ◆ Automatic Gain Control (AGC)
- ◆ 7.5 dBm optical output power

## BET10N



# Optical Amplifier

## Optical Amplification

The optical amplifier, the second key component, is required in order to recover the optical signal level after transmission over long fiber distances (inline amplifier, EDFA) or to boost its level for the final distribution (YEDFA) to a large number of end users.

## Optical Amplifier (EDFA)

- ◆ Amplification of 1550 nm optical signals in FTTx networks
- ◆ Erbium doped fiber amplifier technology
- ◆ +13 to +24 dBm optical output power per port
- ◆ Input signal wavelength 1540 ... 1560 nm
- ◆ Broad optical input power range: -5 ... +10 dBm
- ◆ 1, 2, 4, 6, or 8 optical output ports (internal optical splitter)
- ◆ Constant output power control
- ◆ Supervision of the optical input level, optical output level and pump laser current
- ◆ Optional measurement unit for SBS threshold of succeeding fiberoptic links (SBS detection)

## BOAnxxx



- ◆ Optical connectors: SC/APC, LC/APC, E2000
- ◆ Width: 1 or 2 slots

## Very High Power Amplifier

- ◆ Amplification of 1550 nm optical signals in FTTx networks
- ◆ Cladding pumped Ytterbium / Erbium doped fiber amplifier technology
- ◆ Optical preamplifier (EDFA) included
- ◆ Optical output power of +16.5 or +20 dBm per port
- ◆ Input signal wavelength 1545 ... 1565 nm
- ◆ Broad optical input power range: -5 dBm ... +10 dBm
- ◆ Up to 16 optical output ports (internal optical splitter)
- ◆ Constant output power control
- ◆ Supervision of the optical input level, optical output level and pump laser current
- ◆ Test Port (2 dBm output power)
- ◆ Optical connectors: SC/APC, LC/APC, E2000
- ◆ Width: 1 or 2 slots

## BOAnnxxx



## Very High Power Booster Amplifier

- ◆ Amplification of 1550 nm optical signals in FTTx networks
- ◆ Cladding pumped Ytterbium / Erbium doped fiber amplifier technology
- ◆ Optical output power of +16.5 or +20 dBm per port
- ◆ Input signal wavelength 1545 ... 1565 nm
- ◆ Optical input power: +6 ... +15 dBm (recommended for optimum system performance)
- ◆ Up to 32 optical output ports (internal optical splitter)
- ◆ Supervision of the optical input level, optical output level and pump laser current
- ◆ Optical connectors: SC/APC, LC/APC, Output: MPO/APC
- ◆ Width: 1 slot

## BBAnnxxx



MPO connectors

# Accessories

## V-OLT-Modules Chassis

- ◆ Module carrier chassis for installation, feeding and cooling of V-OLT modules
- ◆ 19 inch/6 RU subrack
- ◆ BBT001-B: 10 slots
- ◆ BBT003-B: 8 slots +2 extra slots for local power supply modules
- ◆ Adaptable to metric (ETSI) racks
- ◆ Integrated rear side bus for powering, signalling and management interfaces
- ◆ Automatic slot and chassis identification
- ◆ Several chassis can be controlled by one Network Element Controller (NEC)

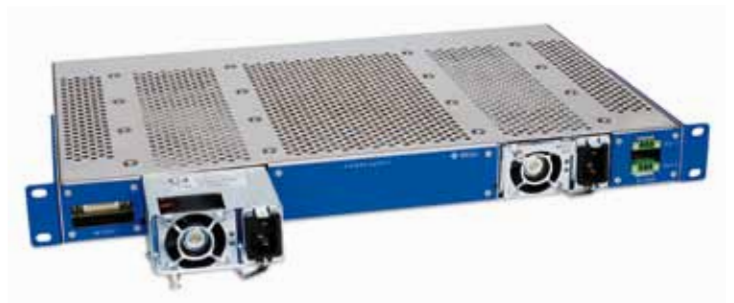
## BBT00x-B



## Power Converter Module + Chassis

- ◆ 19" rack mountable power supply for V-OLT
- ◆ MPS-AC: AC power converter module
- ◆ MPS-DC: DC power converter module
- ◆ MPS-chassis: 19" chassis for mounting of MPS-AC and MPS-DC power converter modules
- ◆ Hot redundancy option (2 modules working simultaneously in hot standby)
- ◆ Max. power 365 W

## MPS-xx & MPS chassis



## V-OLT rack mountable Fan Unit

- ◆ Fan unit V-OLT
- ◆ 19" rack mountable
- ◆ LED status indication on module front
- ◆ Network management interface

## OLT-FAN



## Power Converter Module

- ◆ Power converter module for BBT00x-B chassis
- ◆ Converts both, AC remote powering voltage and DC battery input voltage into 24 V DC
- ◆ Hot redundancy option (2 modules working simultaneously in hot standby)
- ◆ Up to 3 A output current (optionally 4 A)
- ◆ Max power: 72 W

## PSC24-B



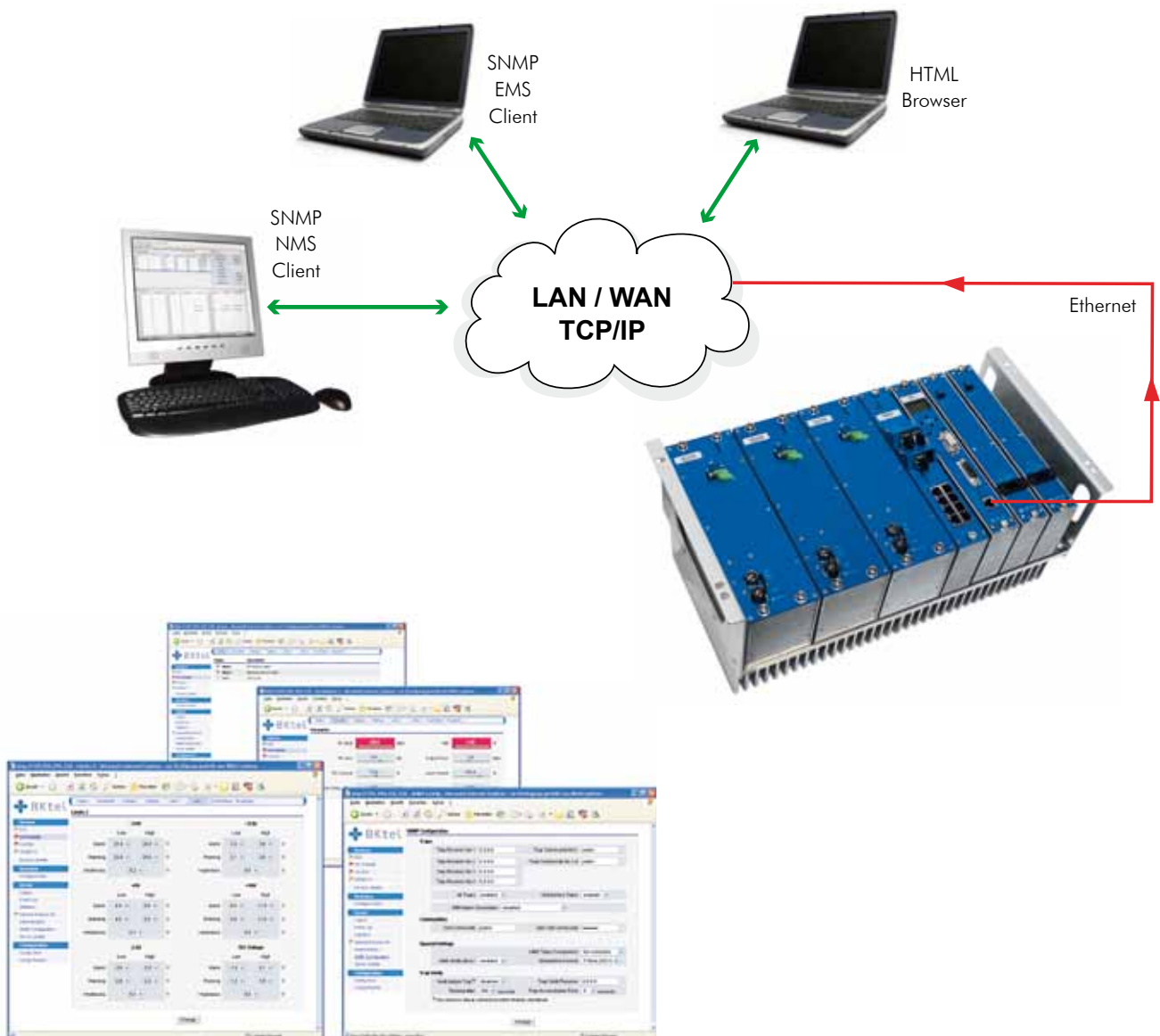
# Network Management

For monitoring, control and configuration of the active equipment a Network Element Controller (NEC-E) is available. The NEC-E is equipped with an embedded Web-Server, accessible by standardized security procedures via an Ethernet interface from any Web-Browser. The remote SNMP interface allows controlling and monitoring of all active components and provides the interface to a higher level Umbrella Management System, such as the BKtel *CABLE*watch EMS.

## Element Management Controller

- ◆ Management and supervision of network elements
- ◆ Translation of RS-485 polled data
- ◆ SNMP/Ethernet and Webbrowser/ Ethernet protocol
- ◆ RS-485 interface to poll slave units
- ◆ Ethernet 10/100 Mbps RJ-45 supporting SNMPv1 and embedded Webserver via Webbrowser

## NEC-E



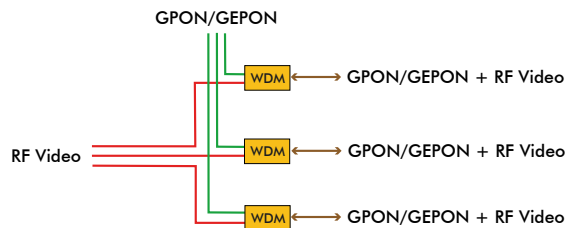
# Passive Optical Components

## Optical Multiplexing and Optical Power Splitting

The third key component is represented by optical wavelength division multiplexers (WDM) and optical splitters. The components are required to combine

or separate the different optical wavelengths on a fiber optic link or for splitting optical power to supply adequate optical signal level to the subscriber.

### WDM Arrays



### 16 x 1310 & 1490 & 1610 / 1550nm Modular WDM Array

#### FWM016-OLT-M:

- ◆ 16 x 1310 & 1490 & 1610/1550 nm WDM
- ◆ 2 MPO/APC RF Video In (8 ports each)
- ◆ 2 MPO/APC GPON/GEAPON In/Out (8 ports each)
- ◆ 16 LC/APC combined RF Video+ GPON/GEAPON In/Out
- ◆ Insertion Loss RF Video: < 1.5 dB
- ◆ Insertion Loss GPON/GEAPON: < 1.2 dB

#### CPM Chassis:

- ◆ 8 FWM016-OLT-M Modules per chassis
- ◆ 2 RU



MPO connectors in order to realize ultra compact setup

### FWM016-OLT-M & CPM Chassis

### 16 x 1310 & 1490 & 1610 / 1550nm WDM Array in 19" housing

- ◆ 16 x 1310 & 1490 & 1610/1550 nm WDM
- ◆ 16 SC/APC RF Video In
- ◆ 16 SC/PC GPON/GEAPON In/Out
- ◆ 16 LC/APC combined RF Video + GPON/GEAPON In/Out
- ◆ Insertion Loss RF Video: < 1.0 dB
- ◆ Insertion Loss GPON/GEAPON: < 0.6 dB
- ◆ 1 RU

### FWM016-OLT



Also available with 8 WDMs

## Optical Splitter

- ◆ Video Overlay in FTTH-Networks
- ◆ 64 output ports available in 1 or 2 RU
- ◆ Optical connector: SC/APC or LC/APC
- ◆ Insertion loss < 19.7 dB
- ◆ Uniformity < 1.5 dB
- ◆ Wavelength range: 1260 -1620 nm

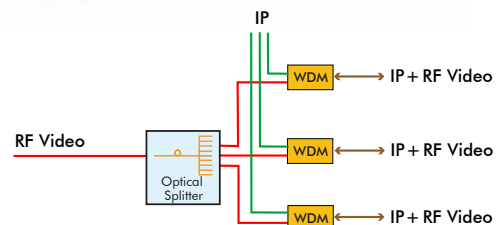
## FOVnnn-PLC



## Optical Splitter + Integrated WDM Array

- ◆ IP-Network and Video Overlay in FTTH-Networks over one fiber:  
1310 & 1490 & 1610 nm IP /  
1550 nm RF Video
- ◆ 1 Input port RF Video
- ◆ 1 RU

## FOVnnn-PLC-IP



### Available Versions:

#### FOV016-PLC-IP

- ◆ 16 In/Out ports IP (MPO APC)
- ◆ 16 combined Video and IP In/Out ports (LC APC)
- ◆ Insertion loss < 15 dB
- ◆ Uniformity < 1.9 dB

#### FOV032-PLC-IP

- ◆ 32 In/Out ports IP (MPO APC)
- ◆ 32 combined Video and IP In/Out ports (LC APC)
- ◆ Insertion loss < 18 dB
- ◆ Uniformity < 1.9 dB

#### FOV064-PLC-IP

- ◆ 64 In/Out ports IP (MPO APC)
- ◆ 64 combined Video and IP In/Out ports (LC APC)
- ◆ Insertion loss < 20.5 dB
- ◆ Uniformity < 2 dB

# Configuration Examples

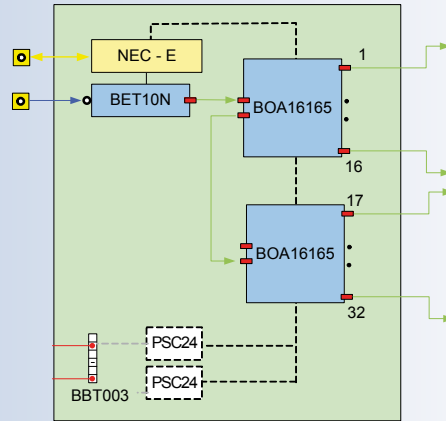
## FTTH Ethernet PTP network

2048 subscribers, short range RF overlay network, one fiber or two fiber, (16 x FOV064-PLC-IP or 16x FOV064-PLC not shown)  
32 ports, 16.5 dBm output power each, 6 RU

Rack Layout



Schematic



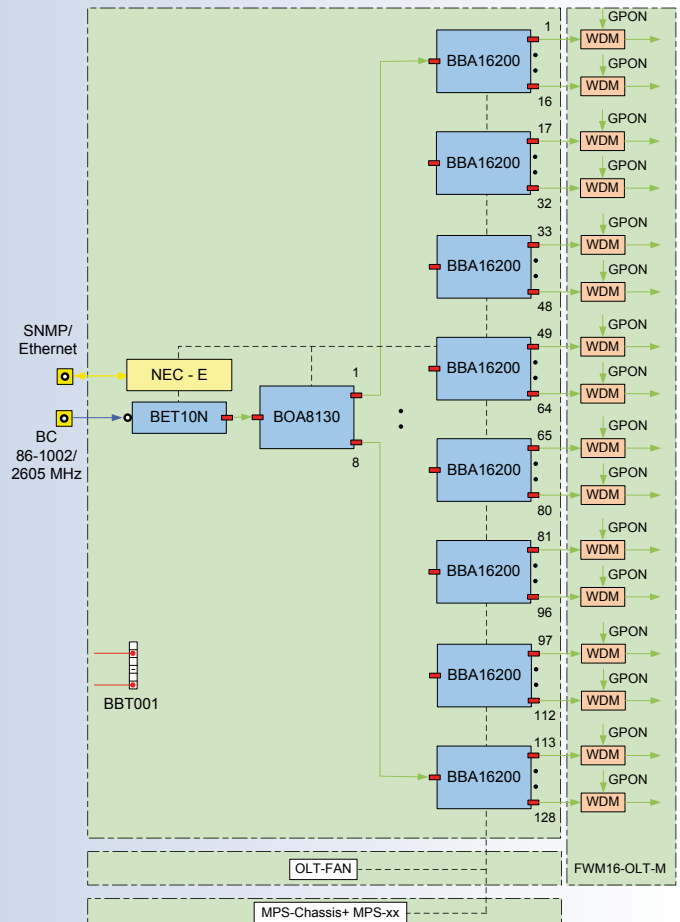
## FTTH GPON network

4096 subscribers, long range RF overlay network, (128 x FOV032-PLC not shown)  
128 Ports, 20.0 dBm output power each, 12 RU

Rack Layout



Schematic





#### **Our Company**

BKtel was founded 1997 as a result of a management buy-out from Alcatel Cable and has currently a workforce of approx. 100 employees worldwide. The company is based in two locations in Germany, the headquarters in Hueckelhoven-Baal, near Düsseldorf and a second office in Kornwestheim, near Stuttgart. Further international offices were founded in China and Japan for the growing Asian market. The company develops and manufactures products in the field of interactive FTTH-, Video Overlay-, RFoG- and HFC-networks for high performance data, telephone and cable TV services. The active and passive components are designed and manufactured in company-own facilities. The high quality products as well as the comprehensive support in designing optical networks make BKtel to one of the leading international suppliers in the FTTH and HFC market.

#### **Our Products**

BKtel designs FTTH, Video Overlay, RFoG and HFC broadband networks and related network management. The product portfolio includes a wide range of products starting from optical transmitters, optical amplifiers, optical receivers, optical return channel systems, customer premises equipment up to DWDM technology for upstream and downstream applications. The own manufacturing facilities guarantee a high quality standard (ISO 9001 certified). Furthermore the company offers a complete range of services such as planning, installation and training.



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