Dark Fiber and DWDM. Service Market Trends "

RUSSIAN NETWORK DEVELOPER
AND TELECOMMUNICATION
EQUIPMENT

QTECH
МИР ДОСТУПНЕЕ

QTECH
МИР ДОСТУПНЕЕ

RUSSIAN DEVELOPER TELECOMMUNICATION EQUIPMENT

- More than 12 years in the telecommunications market of Russia and the CIS More
- than 120 lines of equipment introduced to the Russian market Status "Made in Russia"
- according to Rostelecom standards We provide the work of the largest telecom
- operators in Russia We create innovative Russian products
-
- We create optimal solutions for the corporate market The equipment has all
- the necessary certificates and approvals

More 200 employees

More 400 operators connections

More 50 engineers

More 900 companies, working for equipment QTECH

6 offices QTECH

3 R&D QTECH Center

QTECH - SOLUTIONS OF ANY SCALE

QTECH has a wide range of products.

Develops and manufactures a full range of solutions

for telecom operators, enterprises and organizations of the B2B and B2C segment

IP

- Access switches
- Aggregation switches
- Industrial switches
- Data center switches

TDM

- Multiservice access platforms (MSAN)
- Multiplexers
- Interface converters

WIRELESS TECHNOLOGIES

- Systems for licensed private house
- Systems for unlicensed BH
- Carrier-class Wi-Fi solutions
- Radio bridges

VOIP

- IP-ATC
- IP phones
- Voice gateways

CPE

- Routers
- PLC
- LTE modems

MULTIMEDIA

- Video systems conference calls
- Video panels
- CCTV

COMPLEX IOT SOLUTIONS IOT

PON EQUIPMENT

- GPON OLT
- GPON ONU
- GEPON OLT
- GEPON ONU

PASSIVE EQUIPMENT

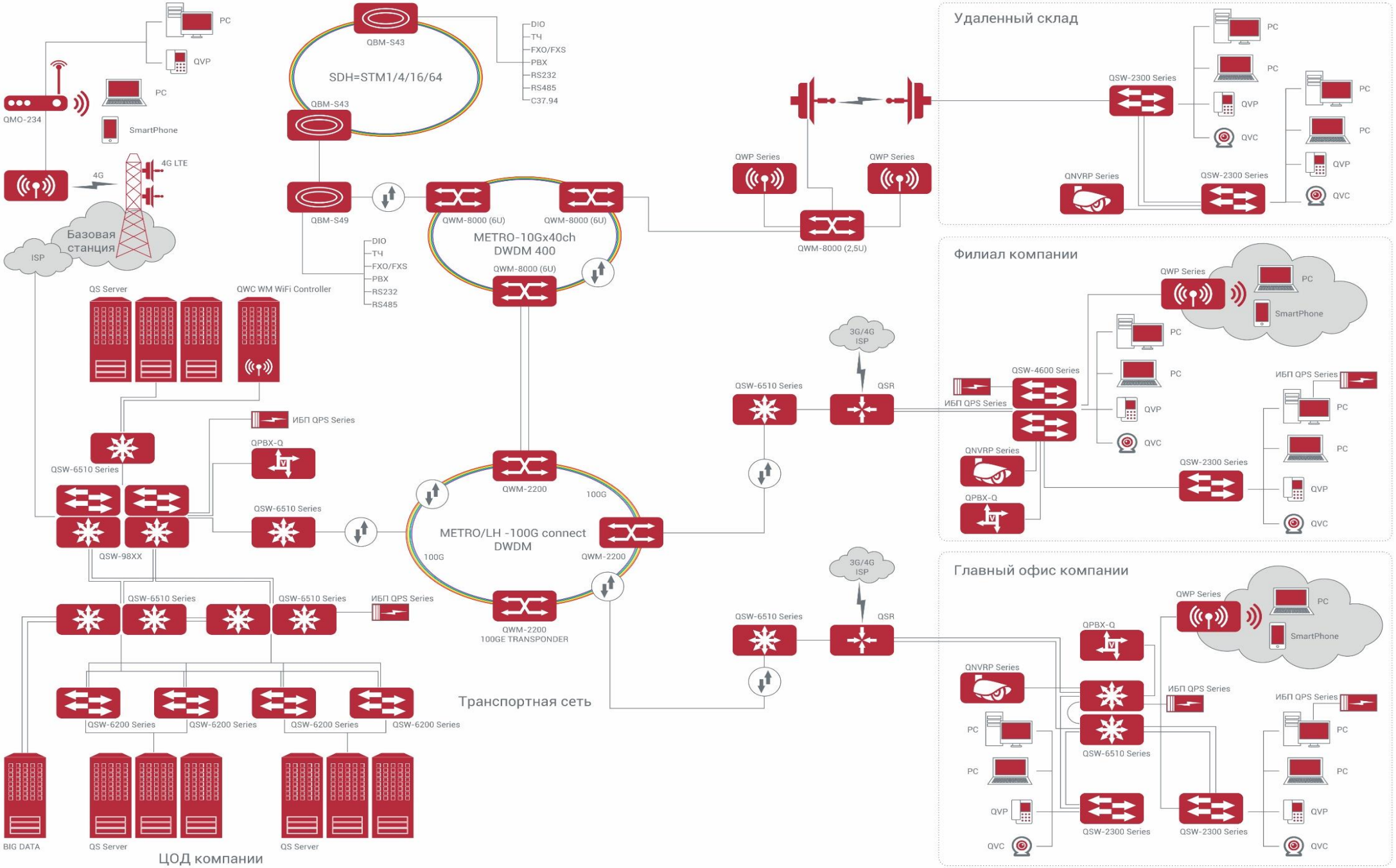
- Cabinets
- Patch panels
- Fiber optic equipment
- SCS components
- Assembly and technological equipment

TRANSPORTATION NETWORKS DATA TRANSMISSION

- Media converters
- CWDM and DWDM systems
- SDH equipment
- SHDSL modems
- Equipment for CCTV transmission by optics

SYSTEMS VIDEO-OBSERVATIONS

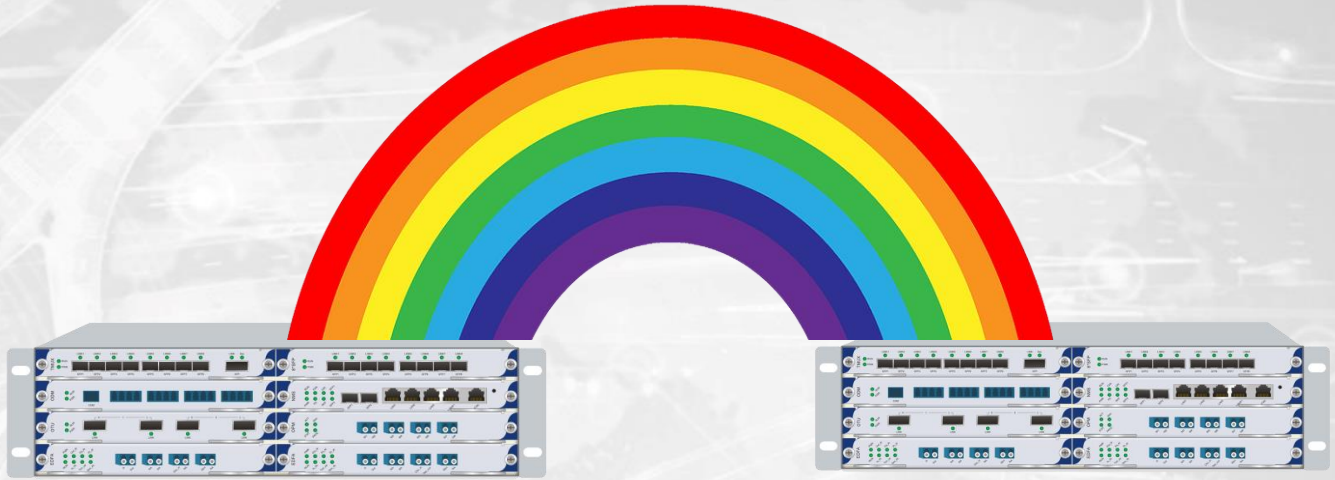
QTECH - SOLUTIONS OF ANY SCALE

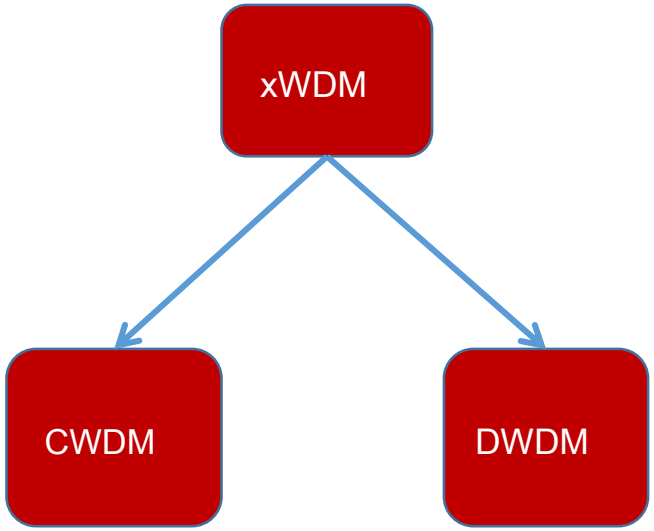


QTECH - SOLUTIONS OF ANY SCALE

What is it about today?

We will talk about xWDM equipment for the corporate market

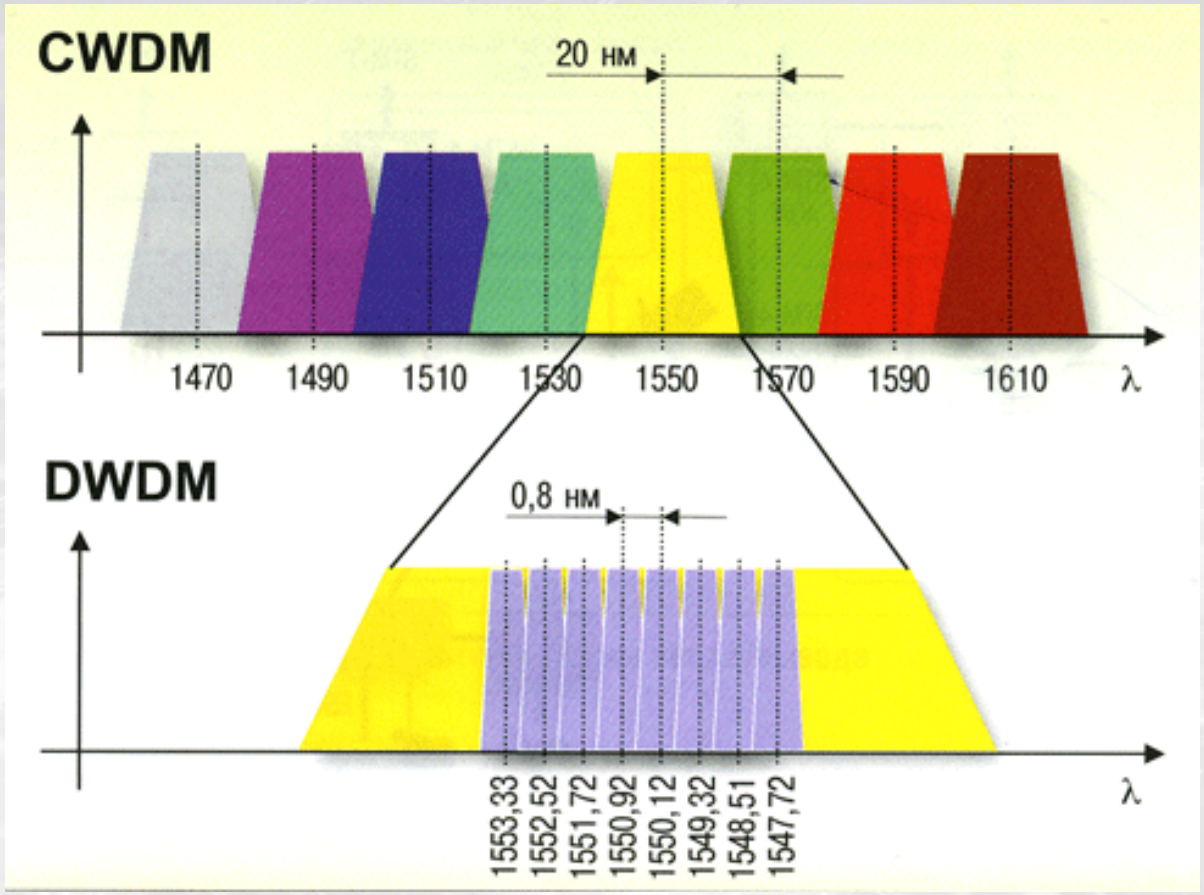




xWDM

Spectral multiplexing of channels (English wavelength-division multiplexing, abbreviated WDM — wavelength division multiplexing) is a technology that allows simultaneous transmission of several information channels over one optical fiber at different wavelengths. (like a rainbow)

xWDM



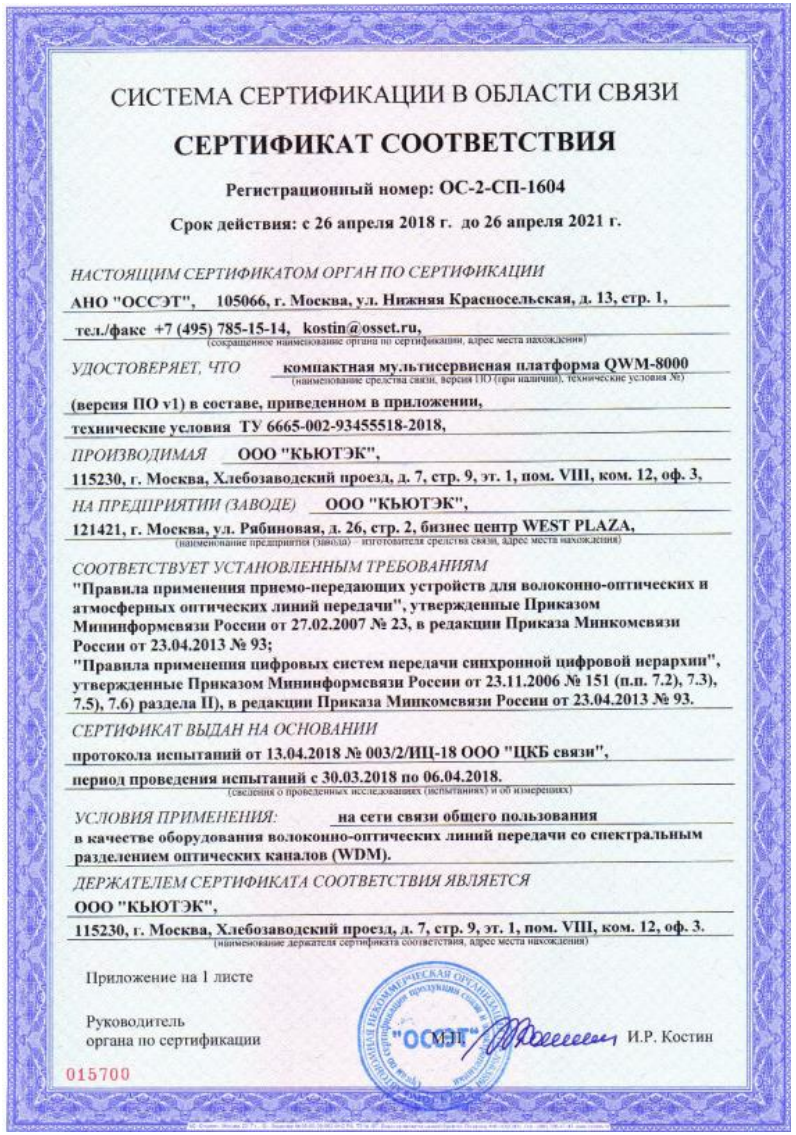
CWDM - 20 nm channel spacing DWDM - 0.8 nm channel spacing

CWDM - available for multiplexing 16 DWDM channels - available for multiplexing 48/96/192

QWM-8000 overview

1. Chassis
2. Line Cards OEO 3R
3. Multiplexers
4. EDFA amplifiers
5. Monitoring boards
6. Line protection boards
7. Control system
8. Application schemes
9. Completed projects
10. Benefits

Certificate Min. Connections



СИСТЕМА СЕРТИФИКАЦИИ В ОБЛАСТИ СВЯЗИ

СЕРТИФИКАТ СООТВЕТСТВИЯ

Регистрационный номер: ОС-2-СП-1604

Срок действия: с 26 апреля 2018 г. до 26 апреля 2021 г.

НАСТОЯЩИМ СЕРТИФИКАТОМ ОРГАН ПО СЕРТИФИКАЦИИ

АНО "ОССЭТ", 105066, г. Москва, ул. Нижняя Красносельская, д. 13, стр. 1,

тел./факс +7 (495) 785-15-14, kostin@osset.ru,

(сокращенное наименование органа по сертификации, адрес места нахождения)

УДОСТОВЕРЯЕТ, ЧТО **компактная мультисервисная платформа QWM-8000**

(наименование средства связи, версия ПО (при наличии), технические условия №)

(версия ПО v1) в составе, приведенном в приложении,

технические условия ТУ 6665-002-93455518-2018,

ПРОИЗВОДИМАЯ **ООО "КЬЮТЭК",**

115230, г. Москва, Хлебозаводский проезд, д. 7, стр. 9, эт. 1, пом. VIII, ком. 12, оф. 3,

НА ПРЕДПРИЯТИИ (ЗАВОДЕ) **ООО "КЬЮТЭК",**

121421, г. Москва, ул. Рябиновая, д. 26, стр. 2, бизнес центр WEST PLAZA,

(наименование предприятия (завода) - изготовителя средства связи, адрес места нахождения)

СООТВЕТСТВУЕТ УСТАНОВЛЕННЫМ ТРЕБОВАНИЯМ

"Правила применения приемо-передающих устройств для волоконно-оптических и атмосферных оптических линий передачи", утвержденные Приказом Мининформсвязи России от 27.02.2007 № 23, в редакции Приказа Минкомсвязи России от 23.04.2013 № 93;

"Правила применения цифровых систем передачи синхронной цифровой иерархии", утвержденные Приказом Мининформсвязи России от 23.11.2006 № 151 (п.п. 7.2), 7.3), 7.5), 7.6) раздела II), в редакции Приказа Минкомсвязи России от 23.04.2013 № 93.

СЕРТИФИКАТ ВЫДАН НА ОСНОВАНИИ

протокола испытаний от 13.04.2018 № 003/2/ИЦ-18 ООО "ЦКБ связи",

период проведения испытаний с 30.03.2018 по 06.04.2018.

(сведения о проведенных исследованиях (испытаниях) и об измерениях)

УСЛОВИЯ ПРИМЕНЕНИЯ: **на сети связи общего пользования**

в качестве оборудования волоконно-оптических линий передачи со спектральным разделением оптических каналов (WDM).

ДЕРЖАТЕЛЕМ СЕРТИФИКАТА СООТВЕТСТВИЯ ЯВЛЯЕТСЯ

ООО "КЬЮТЭК",

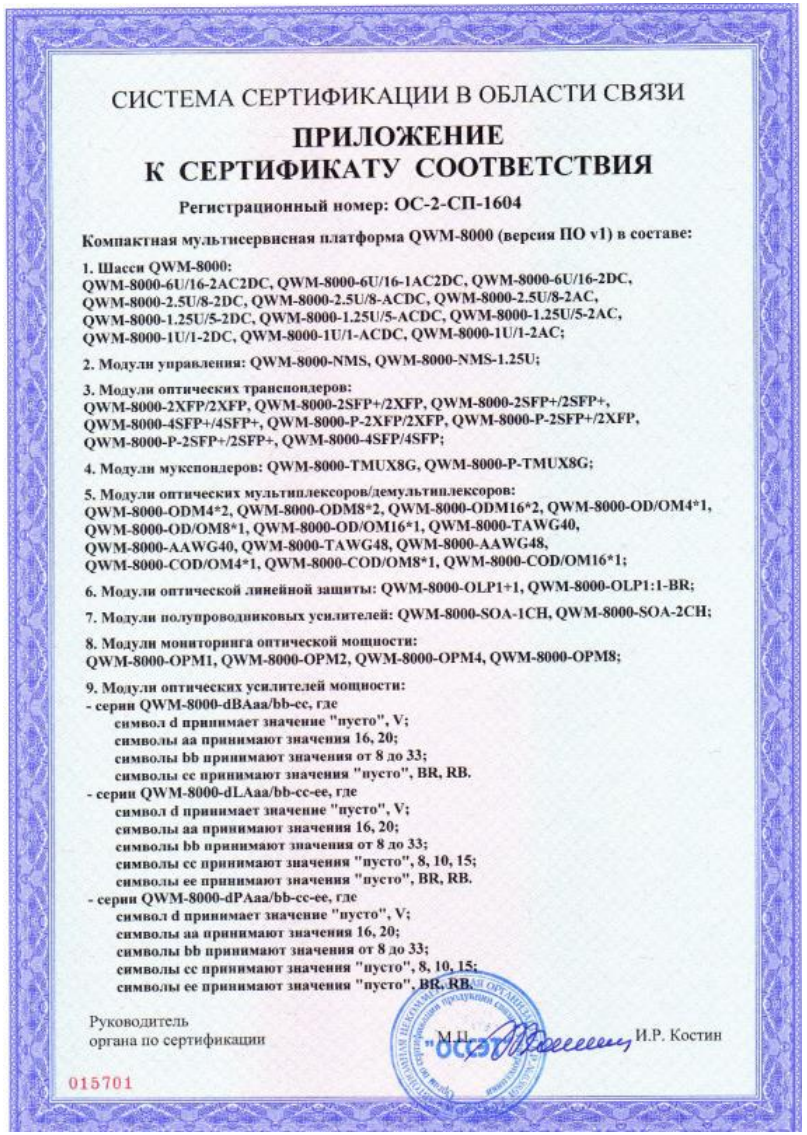
115230, г. Москва, Хлебозаводский проезд, д. 7, стр. 9, эт. 1, пом. VIII, ком. 12, оф. 3.

(наименование держателя сертификата соответствия, адрес места нахождения)

Приложение на 1 листе

Руководитель
органа по сертификации М.П. И.Р. Костин

015700



СИСТЕМА СЕРТИФИКАЦИИ В ОБЛАСТИ СВЯЗИ

ПРИЛОЖЕНИЕ
К СЕРТИФИКАТУ СООТВЕТСТВИЯ

Регистрационный номер: ОС-2-СП-1604

Компактная мультисервисная платформа QWM-8000 (версия ПО v1) в составе:

1. Шасси QWM-8000:
QWM-8000-6U/16-2AC2DC, QWM-8000-6U/16-1AC2DC, QWM-8000-6U/16-2DC, QWM-8000-2.5U/8-2DC, QWM-8000-2.5U/8-ACDC, QWM-8000-2.5U/8-2AC, QWM-8000-1.25U/5-2DC, QWM-8000-1.25U/5-ACDC, QWM-8000-1.25U/5-2AC, QWM-8000-1U/1-2DC, QWM-8000-1U/1-ACDC, QWM-8000-1U/1-2AC;

2. Модули управления: QWM-8000-NMS, QWM-8000-NMS-1.25U;

3. Модули оптических транспондеров:
QWM-8000-2XFP/2XFP, QWM-8000-2SFP+/2XFP, QWM-8000-2SFP+/2SFP+, QWM-8000-4SFP+/4SFP+, QWM-8000-P-2XFP/2XFP, QWM-8000-P-2SFP+/2XFP, QWM-8000-P-2SFP+/2SFP+, QWM-8000-4SFP/4SFP;

4. Модули мукспондеров: QWM-8000-TMUX8G, QWM-8000-P-TMUX8G;

5. Модули оптических мультиплексоров/демультиплексоров:
QWM-8000-ODM4*2, QWM-8000-ODM8*2, QWM-8000-ODM16*2, QWM-8000-OD/OM4*1, QWM-8000-OD/OM8*1, QWM-8000-OD/OM16*1, QWM-8000-TAWG40, QWM-8000-AAWG40, QWM-8000-TAWG48, QWM-8000-AAWG48, QWM-8000-COD/OM4*1, QWM-8000-COD/OM8*1, QWM-8000-COD/OM16*1;

6. Модули оптической линейной защиты: QWM-8000-OLP1+1, QWM-8000-OLP1:1-BR;

7. Модули полупроводниковых усилителей: QWM-8000-SOA-1CH, QWM-8000-SOA-2CH;

8. Модули мониторинга оптической мощности:
QWM-8000-OPM1, QWM-8000-OPM2, QWM-8000-OPM4, QWM-8000-OPM8;

9. Модули оптических усилителей мощности:
- серии QWM-8000-dBAaa/bb-cc, где
символ d принимает значение "пусто", V;
символы aa принимают значения 16, 20;
символы bb принимают значения от 8 до 33;
символы cc принимают значения "пусто", BR, RB.
- серии QWM-8000-dLAaa/bb-cc-ee, где
символ d принимает значение "пусто", V;
символы aa принимают значения 16, 20;
символы bb принимают значения от 8 до 33;
символы cc принимают значения "пусто", 8, 10, 15;
символы ee принимают значения "пусто", BR, RB.
- серии QWM-8000-dPAaa/bb-cc-ee, где
символ d принимает значение "пусто", V;
символы aa принимают значения 16, 20;
символы bb принимают значения от 8 до 33;
символы cc принимают значения "пусто", 8, 10, 15;
символы ee принимают значения "пусто", BR, RB.

Руководитель
органа по сертификации М.П. И.Р. Костин

015701

Managed chassis QWM-8000

QWM-8000 equipment has a whole range of chassis: 6U / 2.5U / 1.25U / 1U

Key chassis features

- Slot slot options:
  - 6U: 15 slots + 1 management card slot
  - 2.5U: 7 slots + 1 management card slot
  - 1.25U: 4 slots + 1 management card slot
  - 1U: 1 slot onboard management card
- Power redundancy 1 + 1
- Various combinations of AC-AC / AC-DC / DC-DC power supplies
- Supports Web GUI, Telnet, SNMP, QNMS.
- Complete interchangeability of service boards
- Service types supported:
  - FE / GE / 10GE
  - STM-1 / STM-4 / STM-16 / STM-64
  - 8GFC / 10GFC

Managed chassis QWM-8000

QWM-8000-1U

QWM-8000-1.25U

QWM-8000-2.5U

QWM-8000-6U

Chassis options and layouts

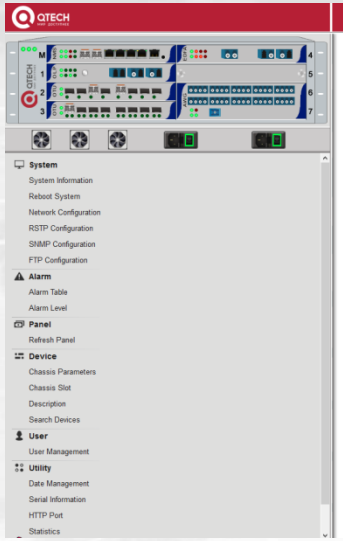
QWM-8000-6U / 16-2AC2DC	6U 15 slots + 1 for control, PSU 2 * 220V + 2 * 48V 6U 15 slots
QWM-8000-6U / 16-1AC2DC	+ 1 for control, PSU 1 * 220V + 2 * 48V 6U 15 slots + 1 for
QWM-8000-6U / 16-2DC	control, PSU 2 * 48V DC
QWM-8000-2.5U / 8-2DC	2.5U 7 slots + 1 for control, PSU 2 * 48V DC
QWM-8000-2.5U / 8-ACDC	2.5U 7 slots + 1 for control, PSU 1 * 220V AC + 1 * 48V DC
QWM-8000-2.5U / 8-2AC	2.5U 7 slots + 1 for control, PSU 2 * 220V AC
QWM-8000-1.25U / 5-2DC	1.25U, 4 slots + 1 for control, PSU 2 * 48V DC
QWM-8000-1.25U / 5-ACDC	1.25U, 4 slots + 1 for control, power supply unit 1 * 220V AC + 1 * 48V DC
QWM-8000-1.25U / 5-2AC	1.25U, 4 slots + 1 for control, PSU 2 * 220V AC 1U 1slot
QWM-8000-1U / 1-2DC	+ built-in control, PSU 2 * 48V DC
QWM-8000-1U / 1-ACDC	1U 1slot + built-in control, PSU 1 * 220V AC + 1 * 48V DC 1U 1slot +
QWM-8000-1U / 1-2AC	built-in control, PSU 2 * 220V AC
QWM-8000-NMS	4 * RJ45 Management Card + 2 * SFP + 1x Console (Support 6U / 2.5U Chassis)
QWM-8000-NMS-1.25U	4 * RJ45 Management Card + 2 * SFP + 1x Console (Support 1.25U Chassis)

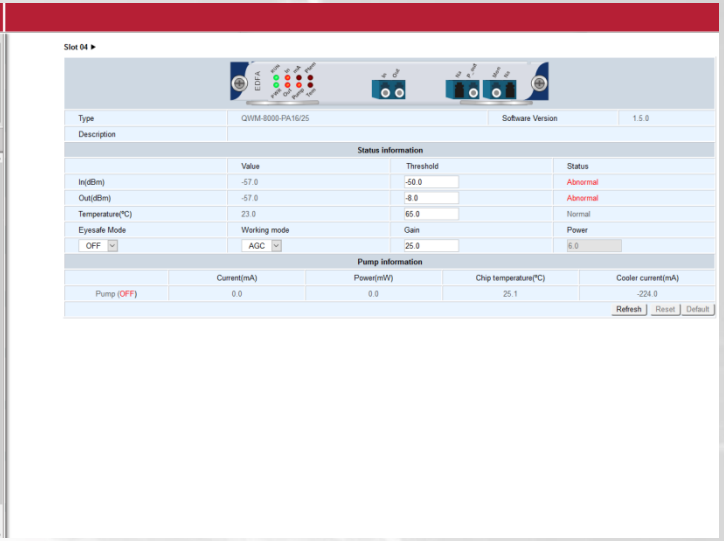
Control module QWM-8000-NMS

- **Chassis control module QWM - 8000**
  - 4x10 / 100 Base-TX
  - 2x100Mb Base-FX SFP
  - 1xE1 (RJ45)
  - 1xRS232

QWM-8000-NMS

- **Control**
  - QNMS, SNMP / Web / Telnet





- **Main functions performed**
  - Alarm Monitoring
  - Event Monitoring
  - Parameters and operating modes of boards
  - user management
  - Differentiation of user rights

- **Cascading chassis QWM - 8000**
- **OSC optical control channel**

OEO 3R Line Cards

Key features of line cards

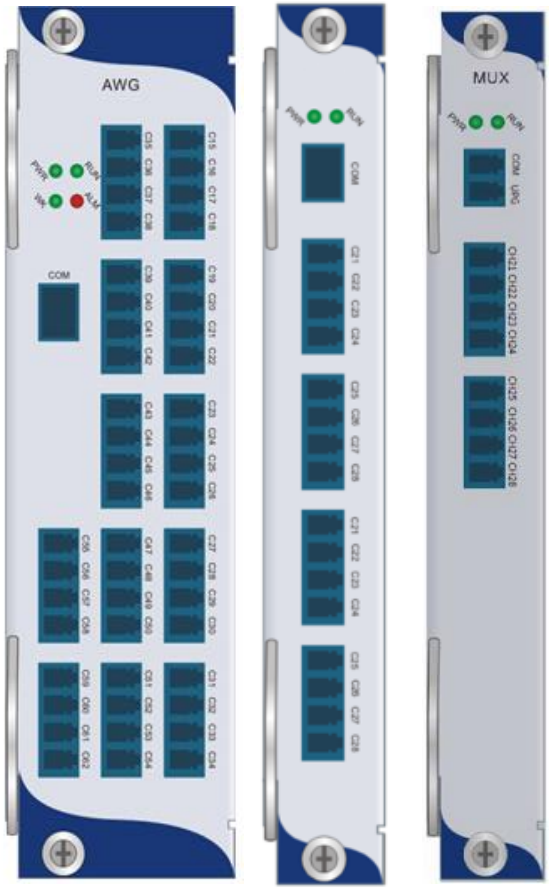
- **Supported Speeds transmission:**
  - 10GE / 1GE
  - STM-64 / STM-16 / STM-4 / STM-1
  - 8GFC / 10GFC
- **Optical interface type**
  - SFP / SFP + / XFP - client
  - SFP / SFP + / XFP - Linear
  - CWDM
  - DWDM
- **Management via:**
  - QNMS
  - TELNET
  - SNMP
  - WEB GUI
- **Wide range of applications:**
  - 3R signal recovery;
  - Flexibility and scalability;
  - Easy to replace transceivers;
  - **Linear redundancy interfaces 1 + 1**
- **Support for the following optical transceivers on:**
  - Standard wavelengths (850, 1310, 1550 nm);
  - CWDM range;
  - DWDM range;
  - Support for modules with tunable wavelength (tunable module)

OEO 3R Line Cards

Various OEO 3R Line Cards

QWM-8000-2XFP / 2XFP	Line card 2 * XFP in 2 * XFP Line card 2
QWM-8000-2SFP + / 2XFP	* SFP + in 2 * XFP Line card 2 * SFP +
QWM-8000-2SFP + / 2SFP +	in 2 * SFP + Line card 4 * SFP + in 4 *
QWM-8000-4SFP + / 4SFP +	SFP +
QWM-8000-P-2XFP / 2XFP	Line card 2 * XFP in 2 * XFP (with 1 + 1 protection) Line card 2 *
QWM-8000-P-2SFP + / 2XFP	SFP + in 2 * XFP (with 1 + 1 protection) Line card 2 * SFP + in 2 *
QWM-8000-P-2SFP + / 2SFP +	SFP + (with 1 + 1 protection) Line card 4 * SFP in 4 * SFP (10MB ~
QWM-8000-4SFP / 4SFP	2.5Gb / s) Line card muxponder 8 * 1.25G in 1 * 10G XFP
QWM-8000-TMUX8G	
QWM-8000-P-TMUX8G	Line card muxponder 8 * 1.25G in 2 * 10G XFP (with 1 + 1 protection)

Multiplexers / demultiplexers



MUX / DEMUX versions:

- CWDM - TFF
- at 4,8,16 wavelengths

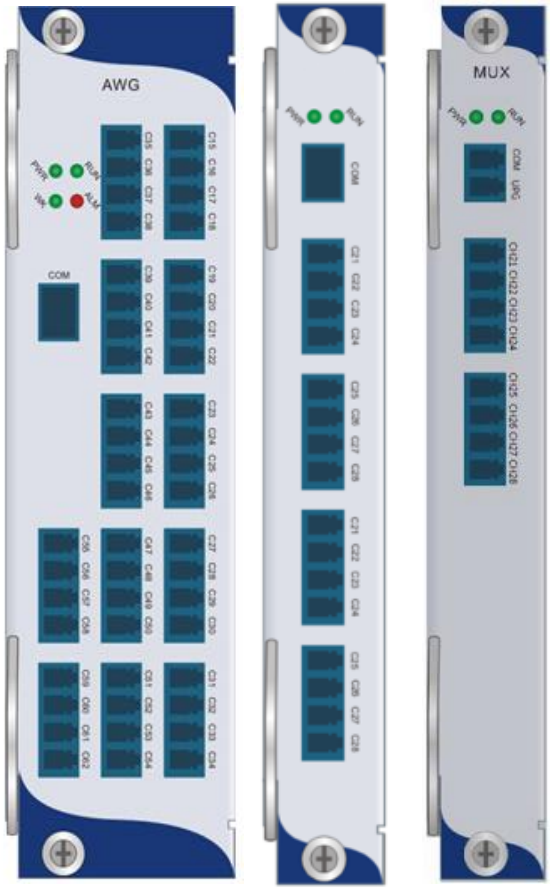
- DWDM - 100GHz, TFF, TAWG, AAWG
- at 4/8/16/40/48 wavelengths

- 1-fiber communication line
- 2-fiber communication line

Key features

- Monitoring port (MON)
- Complete interchangeability
- Connector type LC, output connector (COM) SC
- UPG port for expandability
- LED indication

Multiplexers / demultiplexers



Various options MUX / DEMUX

QWM-8000-ODM4 * 2	DWDM 4-channel 100GHz I / O card 2-fiber DWDM 8-channel 100GHz I / O card 2-fiber
QWM-8000-ODM8 * 2	DWDM 16-channel 100GHz I / O card 2-fiber
QWM-8000-ODM16 * 2	
QWM-8000-OD / OM4 * 1	DWDM Mux / Demux card for 4 channels (2 services), 100 GHz, 1-o fiber line
QWM-8000-OD / OM8 * 1	DWDM Mux / Demux card for 8 channels (4 services), 100 GHz, 1 fiber line
QWM-8000-OD / OM16 * 1	DWDM Mux / Demux card for 16 channels (8 services), 100 GHz, 1 fiber line
QWM-8000-TAWG40	DWDM TAWG card for 40 channels (20 services), 100GHz, 1 DWDM fiber line AAWG card for
QWM-8000-AAWG40	40 channels (20 services), 100 GHz, 1 DWDM fiber line TAWG card for 48 channels (24
QWM-8000-TAWG48	services), 100 GHz, 1 -o DWDM fiber line AAWG card for 48 channels (24 services), 100 GHz,
QWM-8000-AAWG48	1 CWDM fiber line Mux / demux card for 4 channels (2 services), 1 fiber line
QWM-8000-COD / OM4 * 1	
QWM-8000-COD / OM8 * 1	CWDM 8-channel mux / demux card (4 services), 1 fiber line CWDM 16-channel mux /
QWM-8000-COD / OM16 * 1	demux card (8 services), 1 fiber line

EDFA amplifiers

EDFA board

QWM-8000-BA, QWM-8000-LA, QWM-8000-PA

EXECUTION OPTIONS

- BA boosters;
- Linear LA,
- PA preamplifiers
- **EDFA with BLUE / RED filters**

KEY FEATURES

- Low NF (~ 5 dB)
- Gain Smoothing Filter (GFF)
- Various operating modes: AGC, APC, ACC
- Various gains: 8 to 30dB
- Various optical power output options: from 13 to 24dB
- Compatible with any type of QWM-8000 series chassis

APPLICATION

- **For communication lines with 1 optical fiber up to 170 km without repeaters!**
- For communication lines with 2 OB

EDFA amplifiers

Various EDFA Amplifier Options

QWM-8000-BA16 / 12	Booster (C-band EDFA, output power: 16dBm, Gain 12db, 40ch)
QWM-8000-BA16 / 12-BR	Booster (C-band EDFA, output power: 16dBm, Gain 12db, 40channels and PASS blue / REFLECTION red filter)
QWM-8000-BA16 / 12-RB	Booster (C-band EDFA, output power: 16dBm, Gain 12db, 40 channels and REFLECTION blue / PASS red filter)
QWM-8000-BA20 / 12	Booster (C-band EDFA, output power: 20dBm, Gain 12db, 40ch)
QWM-8000-BA20 / 12-BR	Booster (C-band EDFA, output power: 20dBm, Gain 12db, 40 channels and PASS blue / REFLECTION red filter)
QWM-8000-BA20 / 12-RB	Booster (C-band EDFA, output power: 20dBm, Gain 12db, 40 channels and REFLECTION blue / PASS red filter)
QWM-8000-PA16 / 25	Preamplifier (C-band EDFA, output power: 16dBm, gain 25db, 40ch)
QWM-8000-LA16 / 25	Linear amplifier (C-band EDFA, output power: 16dBm, gain 25db, 40channels)
QWM-8000-PA20 / 25	Preamplifier (C-band EDFA, output power: 20dBm, gain 25db, 40ch)
QWM-8000-LA20 / 25	Linear amplifier (C-band EDFA, output power: 20dBm, gain 25db, 40channels)
QWM-8000-LA20 / 25-BR	Linear amplifier (C-band EDFA, output power: 20dBm, gain 25db, 40channels and PASS blue / REFLECTION red filter)
QWM-8000-LA20 / 25-RB	Linear amplifier (C-band EDFA, output power: 20dBm, gain 25db, 40channels and REFLECTION blue / PASS red filter)

OPM monitoring board

OPMQWM-8000-OPM monitoring board

QWM-8000-OPM8

EXECUTION OPTIONS

- **1/2/4/8 monitoring ports**

KEY FEATURES

- **Control support:** QNMS, SNMP, TELNET, WEB GUI.
- Graphic display of optical channels in real time

	(nm)	(dBm)	(dB)
C60	1529.57	-31.94	28.00
C42	1543.73	-30.45	28.00
C37	1547.72	-29.17	28.00
C36	1548.52	-28.88	28.00
C28	1554.97	-31.01	28.00
C21	1560.58	-31.19	28.00

APPLICATION

- **Measurement of optical power at standard DWDM ITU-T wavelengths;**

Execution options

QWM-8000-OPM1	1-port optical power monitoring board
QWM-8000-OPM2	2-port optical power monitoring board
QWM-8000-OPM4	4-port optical power monitoring board
QWM-8000-OPM8	8-port optical power monitoring board

OLP protection board

OPMQWM-8000-OLP monitoring board

EXECUTION OPTIONS

- 1 + 1
- 1: 1
- With BLUE / RED filters

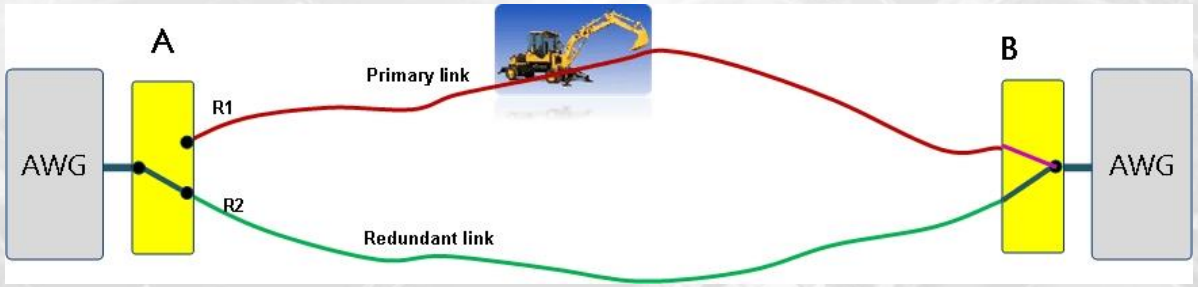
KEY FEATURES

- **Control support:** QNMS, SNMP, CLI, TELNET, WEB GUI.
- Switching time less than 50ms

APPLICATION

- Make redundancy on the line side
- Make client-side reservation
- Carry out redundancy on 1-fiber communication line
- Make redundancy on a 2-fiber communication line

QWM-8000-OLP



7. CONTROL SYSTEM

WEB GUI

CONTROL SYSTEM

KEY FEATURES

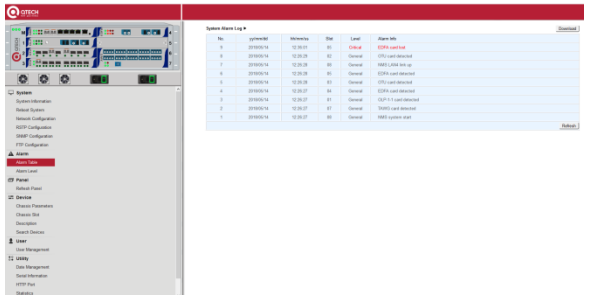
- Simple and friendly WEB GUI
- Graphical display of chassis / boards / indications
- Alarm logging
- Alarm management: minor / major / critical
- Differentiation of user rights
- Complete information about chassis / cards / modules Search
- for equipment in a single subnet
- Automatic addition and initialization of boards Statistics on
- board / module parameters

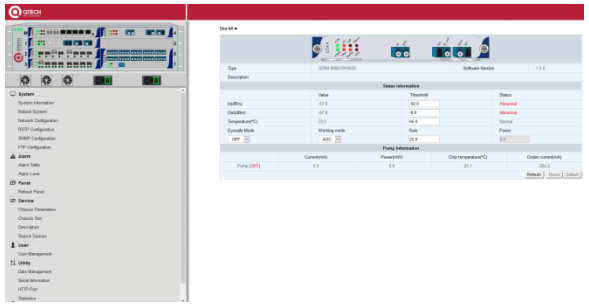
DEMO STAND

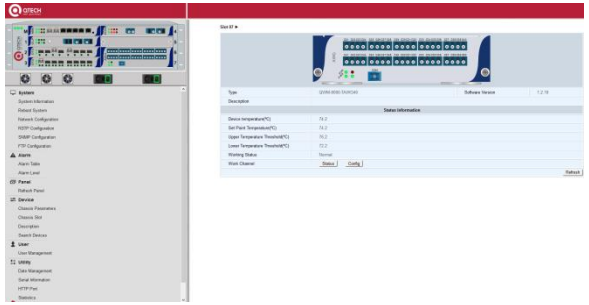
IP: 87.249.11.83

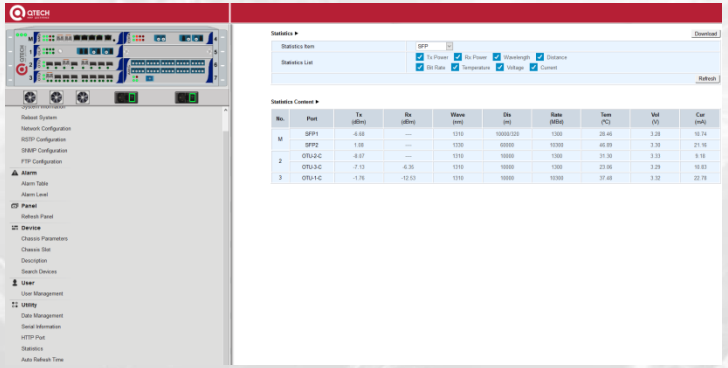
Login: guest

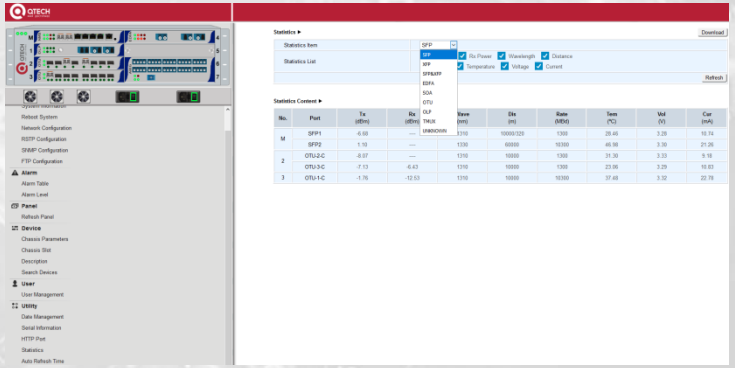
Pass: qtech











Difference from competitors

Segment HUAWEI, CISCO, INFINERA

1. Backbone communication networks.
2. Too expensive equipment due to the use of technologies:

- Coherent maps (for speeds over 100G).

- FEC, SD-FEC, HD-FEC.
- Rebuildable maps adding / separating wavelengths (ROADM / WSS).

3. Paid training from the vendor (it is required to keep a trained staff member)

4. Service contract. Waiting time for spare parts

QTECH segment

1. Zone / Metro networks.
2. Equipment for corporate market due to:

- 10G / 40G (which is currently sufficient)

- OEO 3R conversion on maps. FOADM maps
- using AWG

3. Free training.

4. Service contract. Possibility to keep spare parts in stock.

Benefits

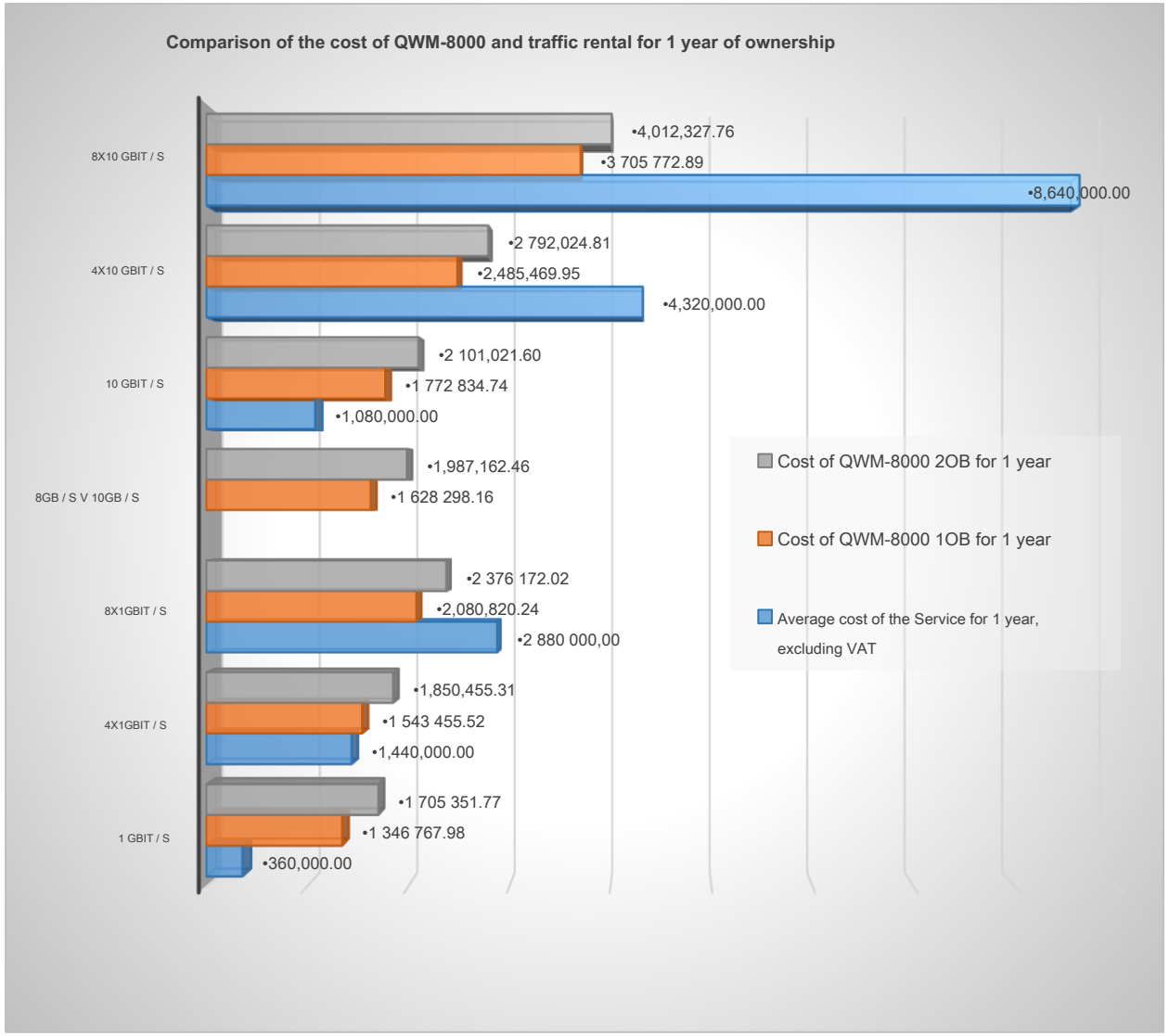
- Profitable

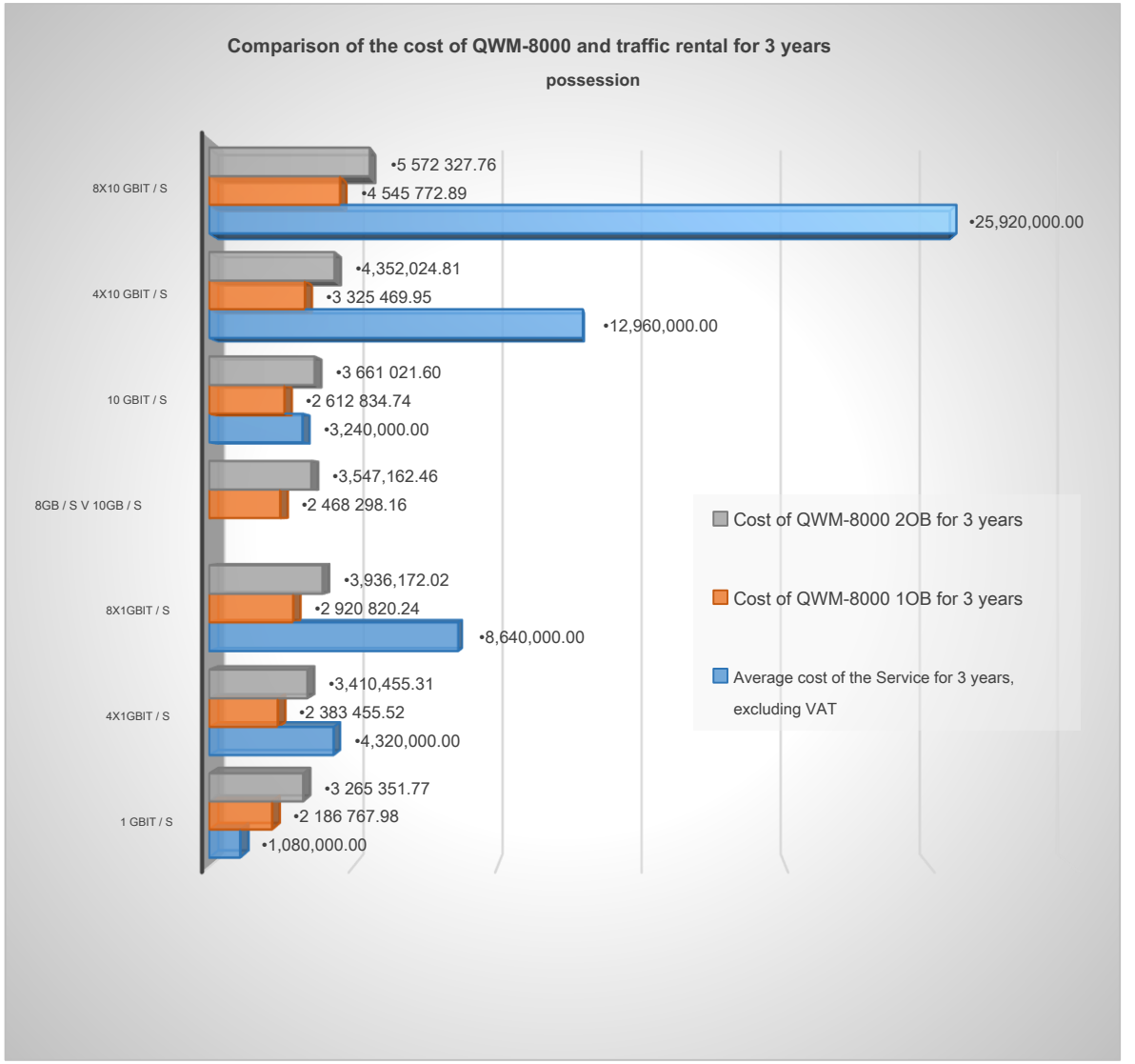
Ownership cost of QWM-8000 including lease 2OB	Cost for 1 year	Cost for 3 years
DWDM 1x1Gb / s	1 705 351.77 •	3 265 351.77 •
DWDM 4x1Gb / s	1 850 455.31 •	3 410 455.31 •
DWDM 8x1Gbps	2 376 172.02 •	3 936 172.02 •
DWDM 8x1Gbps to 10Gbps	1 987 162.46 •	•3,547,162.46
DWDM 1x10Gbps	2 101 021.60 •	3 661 021.60 •
DWDM 4x10Gbps	2 792 024.81 •	4 352 024.81 •
DWDM 8x10Gbps	4 012 327.76 •	5 572 327.76 •

- Instead of

Service	average cost Services for 1 month, without VAT	average cost Services for 1 year, without VAT	average cost rent Services for 3 years, excluding VAT
1 Gbps	30,000.00 •	360,000.00 •	1,080,000.00 •
4x1 Gbps	120,000.00 •	1,440,000.00 •	4 320 000,00 •
8x1 Gbps	240,000.00 •	2 880 000,00 •	8,640,000.00 •
10 Gbps	90,000.00 •	1,080,000.00 •	3,240,000.00 •
4x10 Gbps	360,000.00 •	4 320 000,00 •	12,960,000.00 •
8x10 Gbps	720,000.00 •	8,640,000.00 •	RUB 25,920,000.00

Benefits of xWDMQTECH + MASTERTEL solution





Benefits

1. The cost of ownership pays off in 2-3 years for traffic over 2x1Gbps and 1 year for traffic over 1x10Gbps in relation to simple traffic lease.

2. Segmentation of the network into backbone and client parts. For what? In this case, the Customer's IT services clearly understand that if there is a break in the line, it is not the "fault" of the switch, sfp transceiver or IT service. This is the responsibility of the operator / provider that leased the dark fiber. Thus, the quick definition of the area of responsibility gives an additional advantage for the Customer's IT department and minimizes costs).

3. Easy to operate and maintain equipment. Does not require deep knowledge from the staff, in comparison with other vendors. The QWM-8000 equipment is controlled via WebGUI or QNMS.

4. Additionally, the ability to organize redundancy to increase network resiliency.

five. Possibility to expand without additional expenses for renting "dark fiber".

6. Rapid system deployment.

7. No dependence on the Telecom Operator. Own infrastructure network.

eight. Free Russian-language technical support.

How can we help

1. Calculate the best options for wavelength division multiplexing + lease of "dark" fiber.

2. In the QTECH laboratory, assemble the desired circuit, test and provide an opinion on the feasibility of implementing the wavelength division multiplexing task.

3. Jointly conduct an audit of the current network of the Customer in order to optimize its communication costs.

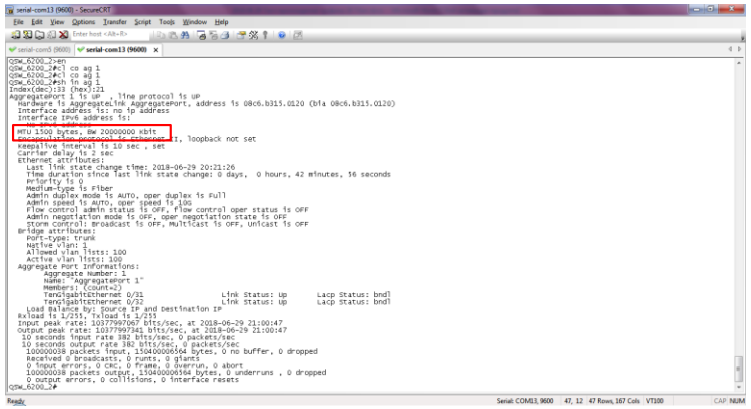
4. Organize redundancy to increase network resiliency.

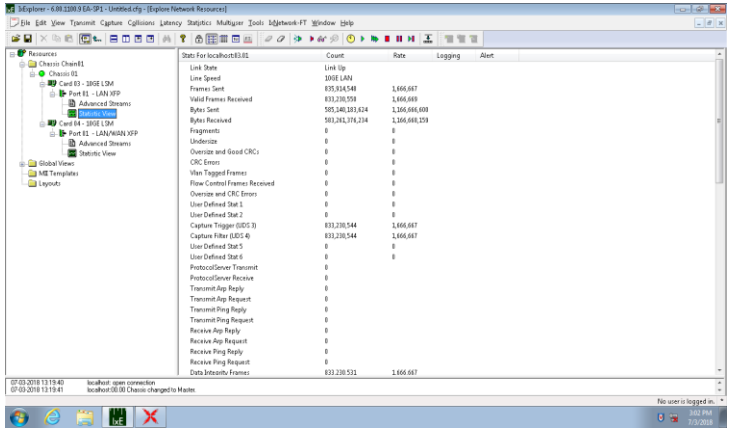
5. Take training for xWDM equipment free of charge.

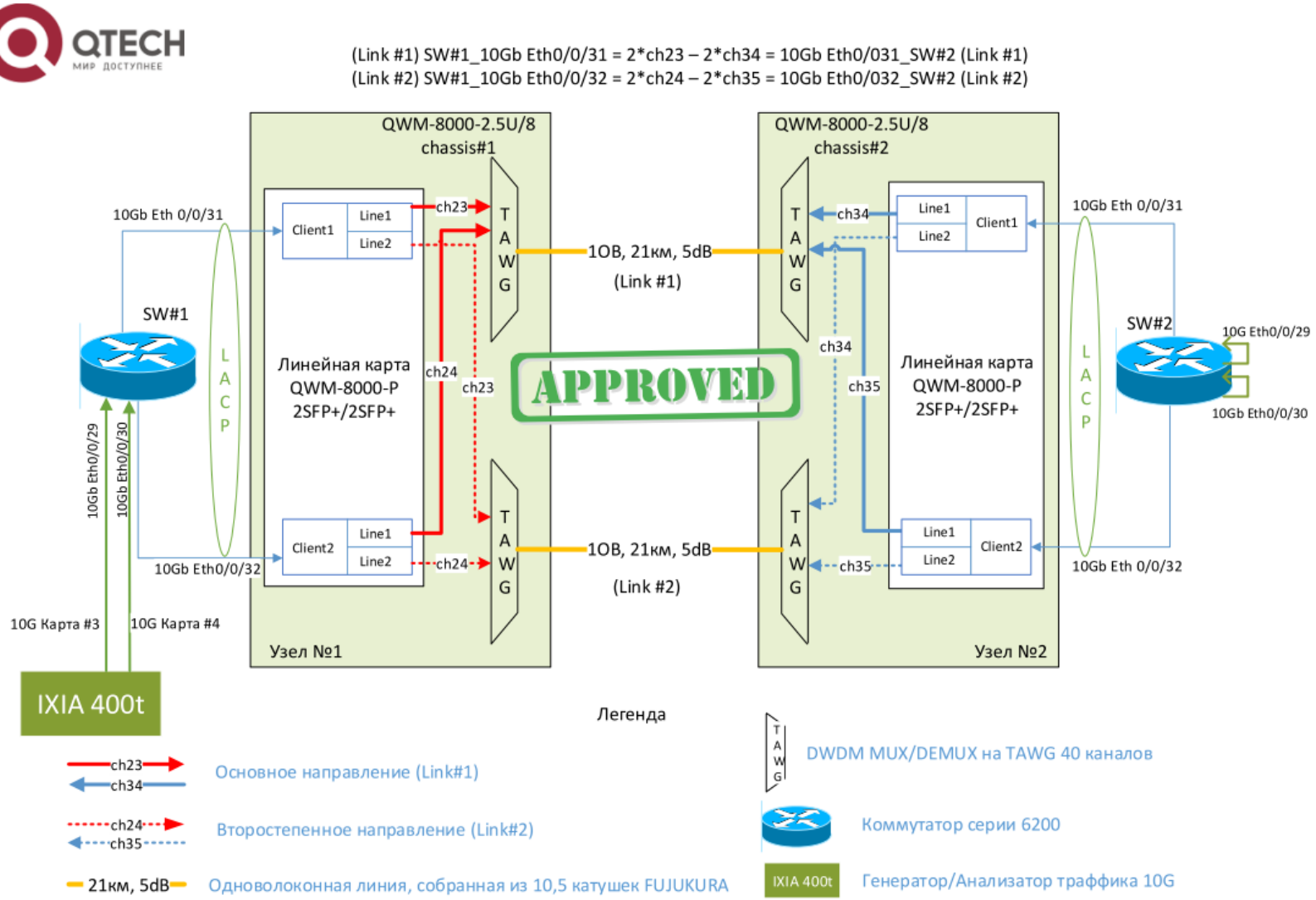
6. Provide Russian-language technical support.

LACP connectivity testing with 20 GB failover

aggregated channel through DWDM network for 1 fiber







8. Schemes of application

Application scheme

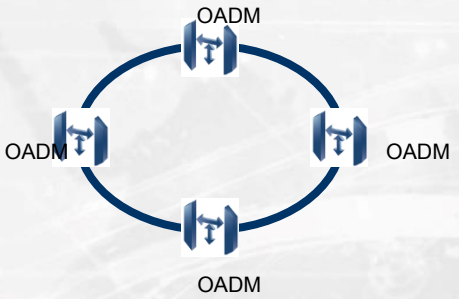
If there is a backbone, the QWM-8000
It is possible to apply in takeaway quality.
For example: a ring with a chain.

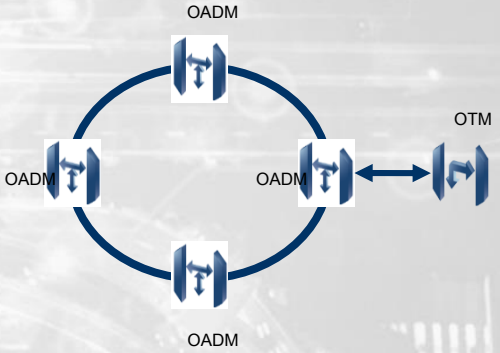
IN APPLICATION OPTIONS for QWM-8000

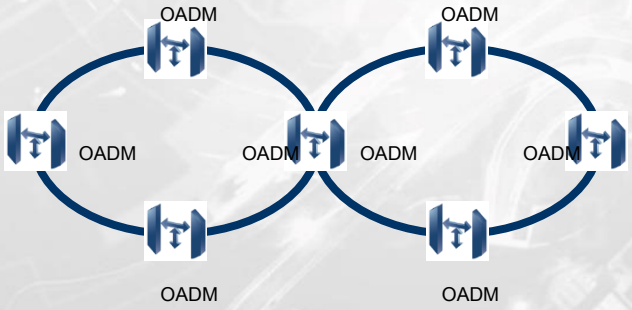
- For 1 fiber communication lines
- For 2 fiber communication lines

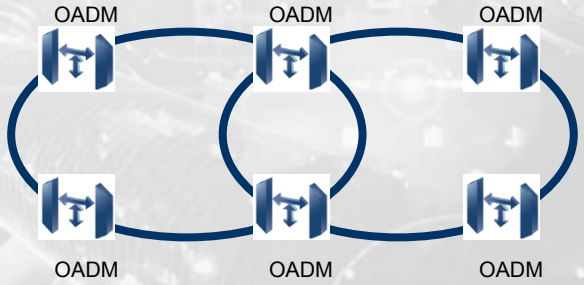
SCHEMES OF APPLICATION

- Point to point
- Chain
- Ring
- Ring with chain
- Touching rings
- Intersecting rings



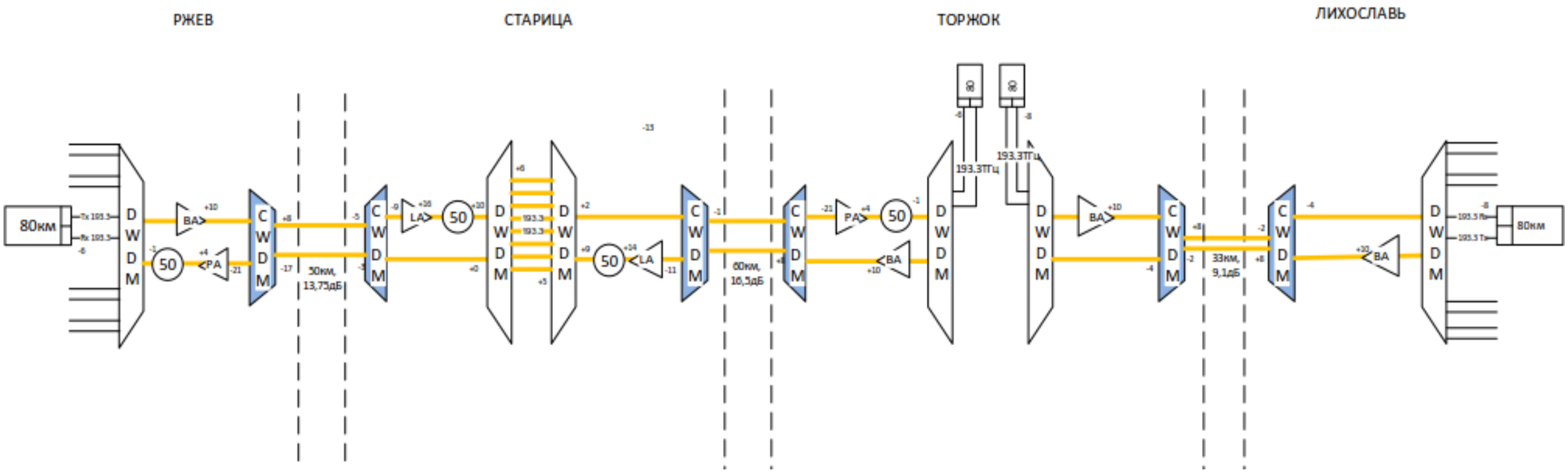




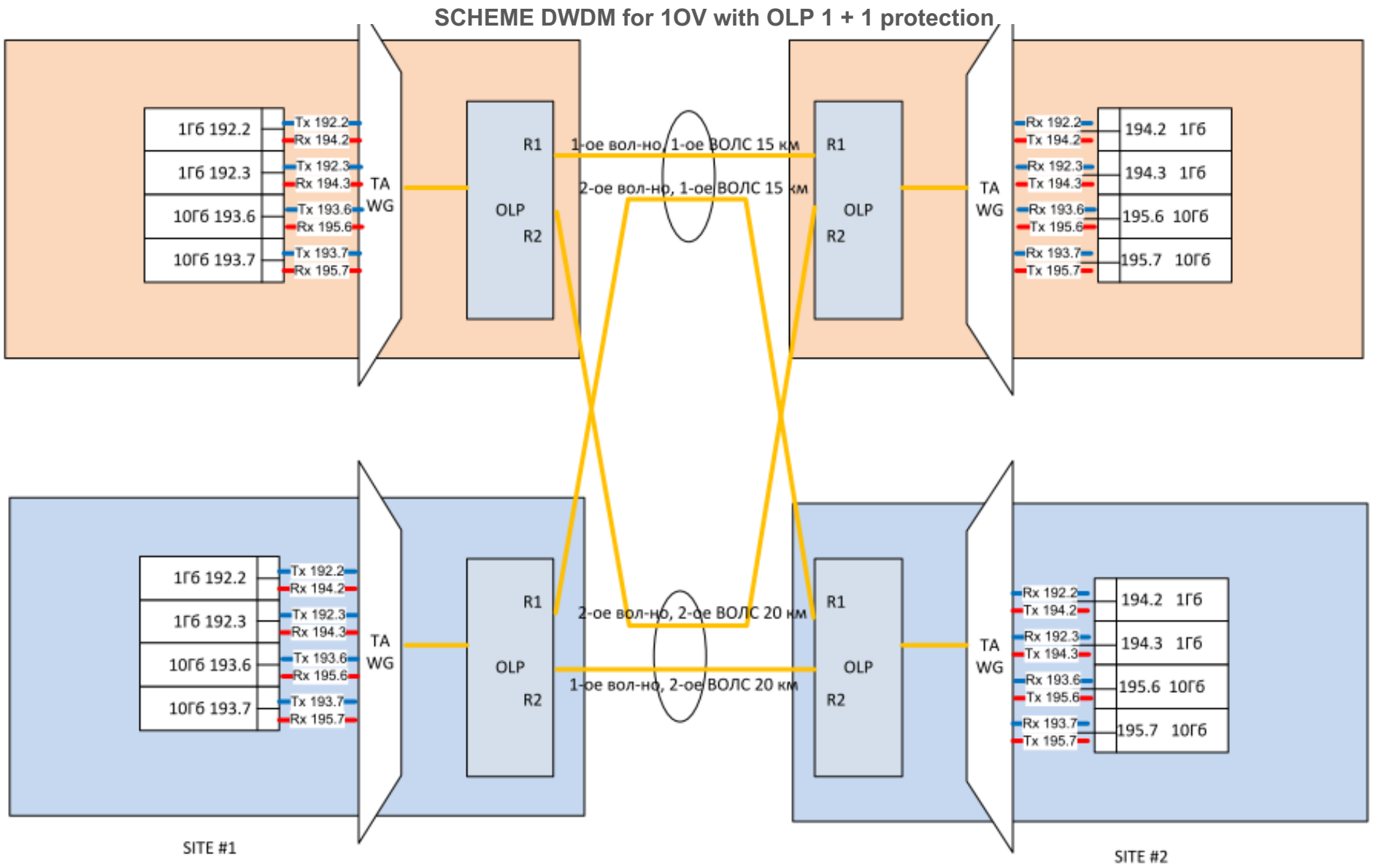


9. Completed projects

Organization of DWDM in CWDM

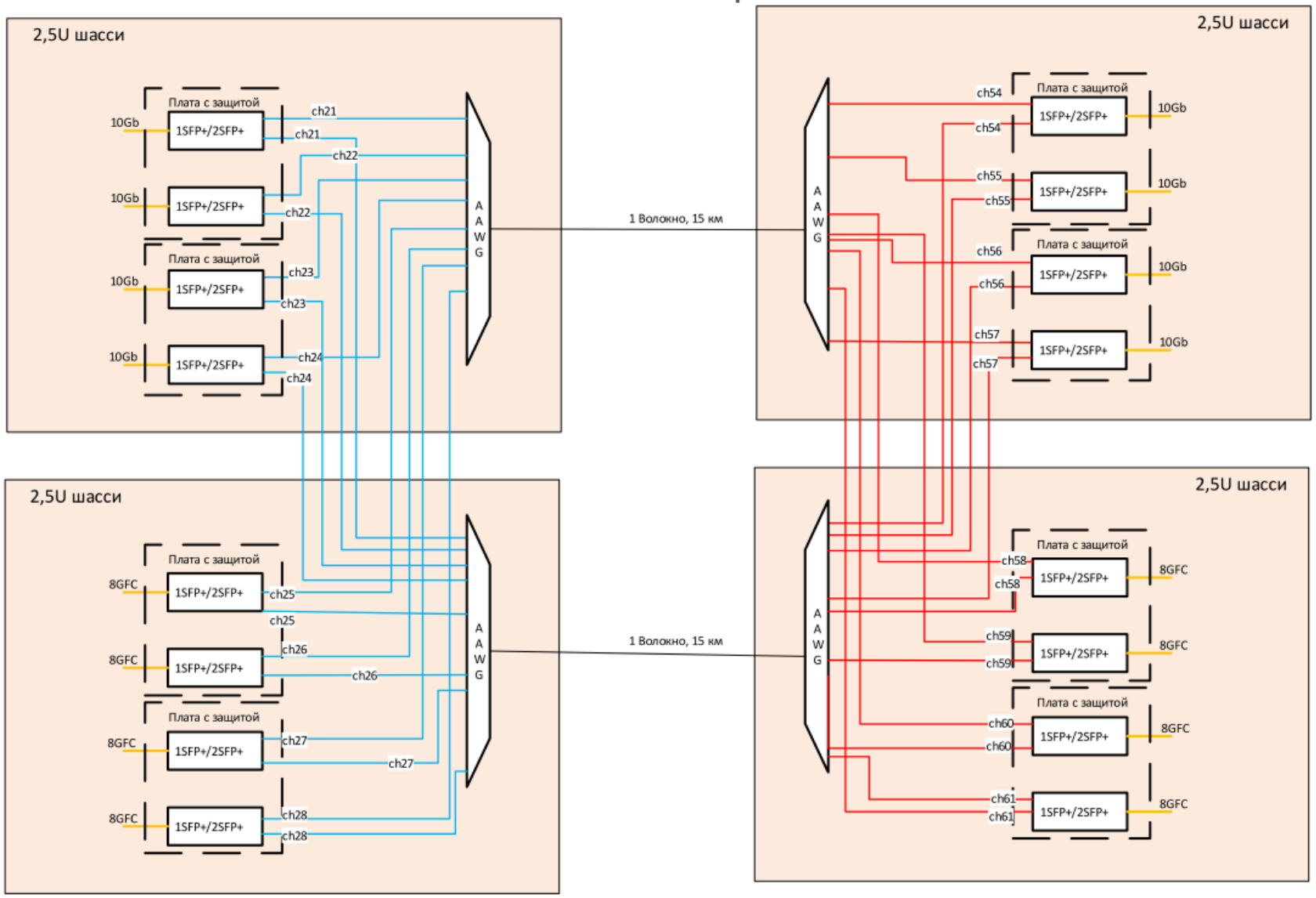


Completed projects



Completed projects

1OB DWDM SCHEME with 1 + 1 protection on the board



QTECH
МИР ДОСТУПНЕЕ

10. ADVANTAGES EQUIPMENT QWM-8000

ADVANTAGES OF THE QWM-8000 EQUIPMENT

- **The xWDMQWM-8000 wavelength division multiplexing equipment has:**

  - Convenient WEB GUI / QNMS management system
  - Support for up to 16 channels of CWDM multiplexing;
  - Supports up to 48 channels of DWDM multiplexing;
  - Low noise EDFA amplifiers;
  - OEO 3R conversion. Full transparency of the transfer of client services;

  - Optical control and monitoring channel;
  - Service support: 1GB-10Gb / s, 8GFC, STM-1_STM-64;
  - The possibility of organizing transmission over the 1st OF;
  - Possibility of organizing transmission over the 2nd OF;
  - High resiliency. 1 + 1 power redundancy.
  - 1 + 1 reservation for services.
  - Easy to maintain.
  - FREE TECHNICAL SUPPORT!

QWM-8000 CUSTOMER ADVANTAGES

- **The equipment of wavelength division multiplexing xWDMQWM-8000 allows to solve problems on:**

  - Reduction of capital costs for the construction of fiber-optic lines;
  - Reducing the cost of renting fiber optic cable. DWDM implementation for 1OB;

  - Reducing the cost of renting intermediate points;
  - Reducing the cost of subsequent operation. Does not require deep training of the Customer's personnel;
  - Solving non-typical tasks, an individual approach to each Customer;

  - Optimal price of equipment and spare parts;
  - Technical support during implementation and operation.

For 2017 we were entrusted with the construction of a DWDM network

Telecom operators:

ТТК

Fuel and Energy Complex:

t1 group

ООО «Башкирэнерго»

УГМК UMMC
УРАЛЬСКАЯ ГОРНО-МЕТАЛЛУРГИЧЕСКАЯ КОМПАНИЯ

State institutions:

Департамент информационных технологий города Москвы

For calculations of various design projects and specifications, please send information to

agents@qtech.ir-09129532560

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