



Customized Microwave Solutions ™

Point-to-Point
Microwave Radio
Equipment for
Data and Voice
Communication

Produced in Europe

SAF Tehnika

SAF Tehnika is a Latvian (Europe) designer, manufacturer and distributor of digital microwave data transmission equipment. SAF Tehnika products provide wireless backhaul solutions for digital voice and data transmission to mobile and fixed network operators, data service providers, governments and private

companies. Our company offers 2 product lines: **CFIP family** – 366Mbps Lumina FODU (Optical or Electrical Gigabit Ethernet interface), 108Mbps FODU (Fast Ethernet interface) and CFIP Phoenix split mount system (up to 366Mbps), and **CFQ family** – high capacity split mount systems (Super PDH).



CFIP - 108 FODU

CFIP-108 is primarily designed for IP networks and provides Fast Ethernet interface with capacities ranging from 3.5 to 100 Mbps full duplex. In addition to that, CFIP-108 also has a 4E1/T1 port for legacy equipment connectivity and for use in hybrid TDM/IP networks.

CFIP Lumina FODU

CFIP Lumina systems are intended for Gigabit Ethernet backbone applications delivering up to 366 Mbps per radio. 2+0 aggregation is available for higher bandwidth users. Both single or dual, electrical and fibre optical interface versions are available.

CFIP Phoenix Split Mount

CFIP Phoenix split-mount systems are designed to fit into classical telecom architecture with a radio located outdoors and a sheltered indoor unit. CFIP Phoenix also enables transition from TDM networks to hybrid TDM/ IP networks providing up to 20E1/T1 + GigE. Total maximum capacity is 366 Mbps full duplex.

CFIP Series Technical Specification

Radio & Modem	Full outdoor system with built-in radio, modem and traffic interfaces		Split Mount system
Product name	CFIP - 108 FODU	CFIP Lumina FODU	CFIP Phoenix Split Mount
Frequency Bands	6, 7, 8, 10, 11, 13, 15, 18, 23, 24, 26, 38 GHz		
Capacity	8,7Mbps - 108Mbps	34 - 366 Mbps	IDU: 8 - 366 Mbps ODU Standard Band: 8 - 175 Mbps ODU Wide Band: 34 - 366 Mbps
Channel bandwidth	7/14/28 MHz	28/40/56 MHz	IDU: 7/14/28/40/56 MHz ODU Standard Band: 7/14/28 MHz ODU Wide Band: 28/40/56 MHz
Modulation	QPSK, 16APSK, 32APSK, 64QAM; only for 14MHz bw: 128QAM	QPSK, 16APSK, 32APSK, 64QAM, 128QAM, 256QAM	
Protection Switching	1+0 Ring/Mesh (with STP)	1+0, Ring/Mesh (with STP), 2+0 (Eth Aggregation)	1+0, 1+1 (HSB, SD, FD), Ring/Mesh (with STP), 2+0, 3+0, 4+0 (Eth Aggregation)
ACM switching	Hitless ACM		
Interfaces			
Ethernet port	1xRJ45 (electrical)	1 or 2 RJ-45 (electrical) or 1 or 2 ODC (fiber optical)	4x RJ-45 (electrical)
E1/T1	4 xE1/T1 (18-pin connector)	none	20E1/T1 (RJ-45)
Power	Proprietary PoE	DC over 2 wire cable	DC over IF cable
RSSI port		BNC	ODU: BNC
Serial Port		Twin-BNC	DB9 (RS-232)
EOW		-	2x 3.5mm headset ports (Mic&Speaker)
Alarm port		-	DB26HD
1+1 Port		-	RJ-45
IDU-ODU connection		-	N-Type
Connection to antenna	Standard flange according to frequency		

Management			
Product name	CFIP - 108 FODU	CFIP Lumina FODU	CFIP Phoenix Split Mount
Management ports	RJ-45 (same as traffic port)	RJ-45 (electrical) or ODC (optical)	RJ-45
Management	In-band	In-band (traffic port) or VLAN port separated	
SNMP	SNMP traps, MIB, SNMP v1/v2c		
EMS	Web based HTTP, Telnet, FTP, Terminal		
Performance graphs	Uptime, Rx level, Tx level, System temperature, Radial MSE, LDPC decoder stress, constellation diagram, equalizer graph		
Ethernet performance	Per port Ethernet counters, Enhanced radio Ethernet statistics		
Loopbacks	E1, modem, IF loopback		
Ethernet			
Ethernet switch	Fast Ethernet	Gigabit Ethernet	
QoS, CoS	Basic	Advanced	
	DiffServ (DSCP) 802.1p 4 prioritization queues, strict queues only	DiffServ (DSCP) 802.1p 4 queues with adjustable priorities, strict queues and Weighted Round Robin (WRR)	
Max VLAN with 802.1p QoS	up to 15 concurrent VLANs	up to 4094 concurrent VLANs	
Max Ethernet frame size	1916 bytes	9728 bytes	
Ethernet Aggregation	No	Yes (2+0)	Yes (2+0, 3+0, 4+0)
Spanning Tree Protocol	802.1d-1998 STP		
Flow Control, 802.3x	Yes		
Mechanical & Electrical			
Power consumption	19 - 26 W	25-33W (SP) / 29 - 41W (HP)	IDU: 20 - 30W ODU: 13 - 18W
Weight	3.5 kg	3.9 kg	IDU: 3.1 kg ODU: 3.5 kg
Temperature Range	-33°C to +55°C		IDU: -5°C to +45°C ODU: -33°C to +55°C
Dimensions: HxWxD, mm	288x288x80		IDU: 1U rack (45x430x240) ODU: 288x288x80

CFIP FODU/ODU Ports



CFIP-108

- RJ-45 (Eth + power)
- 18-pin (balanced E1)
- BNC
- Twin BNC



CFIP Lumina (Optical)

- 1 or 2 optical ODC (Eth)
- 48V DC (Power)
- BNC
- Twin BNC



CFIP Lumina (Electrical)

- 1 or 2 electrical RJ-45 (Eth)
- 48V DC (Power)
- BNC
- Twin BNC



CFIP Phoenix

- N-type (data + power)
- BNC

CFIP-108 & CFIP Lumina Total payload capacity (Mbps)

Modulation	Channel bandwidths (MHz)					
	CFIP - 108			CFIP Lumina		
	7	14	28	28	40	56
QPSK	8 - 10	17 - 21	34 - 43	34 - 43	48 - 60	71 - 89
16APSK	17 - 20	34 - 41	69 - 84	69 - 84	97 - 119	143 - 176
32APSK	21 - 25	43 - 52	100 - 108	86 - 104	121 - 146	179 - 216
64QAM	28 - 32	57 - 65	-	115 - 131	162 - 185	239 - 273
128QAM	-	69 - 75	-	138 - 153	194 - 216	286 - 319
256QAM	-	-	-	161 - 176	226 - 248	334 - 366

SAF CFIP-108, CFIP Lumina, CFIP Phoenix ODU max Tx Power

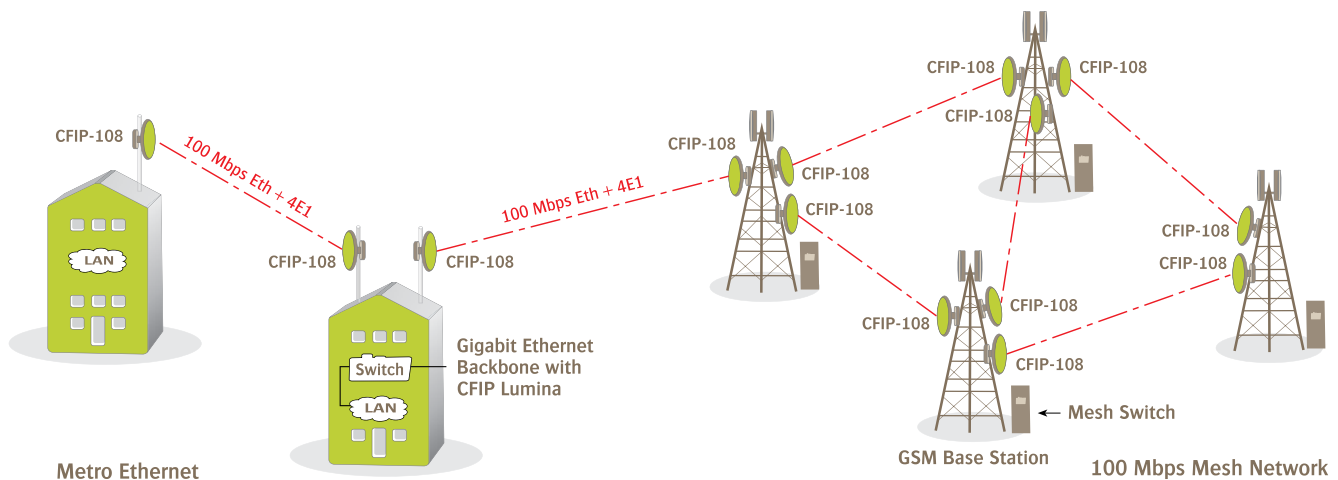
Modulation	Standard/High Tx Power, dBm				
	6, 7, 8 GHz	10, 11, 13, 15 GHz	18, 23, 26 GHz	24 GHz	38 GHz
QPSK	+19 / +27	+19 / +25	+19	-30 to +3	+17
16APSK	+18 / +26	+18 / +24	+18	-30 to +2	+16
32APSK	+17 / +25	+17 / +23	+17	-30 to +1	+15
64QAM	+15 / +23	+15 / +21	+15	-30 to -1	+13
128QAM	+15 / +23	+15 / +21	+15	-30 to -1	+12
256QAM	+12 / +20	+12 / +17	+12	-30 to -4	+10

CFIP-108 FODU Highlights

- **Excellent system gain** allows to efficiently upgrade PDH radios to 108 Mbps capacity without increasing antenna sizes;
- **Low power consumption** enables Power over Ethernet and use of solar/wind energy;
- **ACM and ATPC** for high availability and high density deployments;
- **Very high flexibility** allows to configure the system to various channel bandwidths, modulation schemes and capacity settings.
- **SNMP support** for remote network monitoring and management.

Metro Ethernet and Mesh Networks with CFIP 108 Mbps FODU

- Suitable for any network topology – star, ring, mesh networks;
- Full Outdoor solution with Power over Ethernet wires is efficient for All-Outdoor BIS connectivity,
- Last mile access for customers with high capacity requirements
- SAF CFIP Lumina or SAF CFQ radios can be used for Gigabit Ethernet backhaul

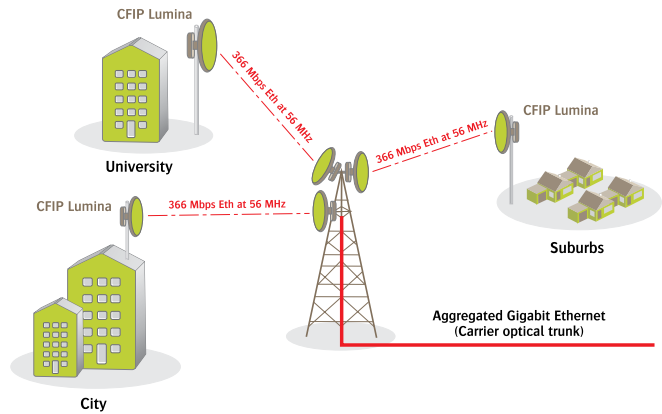


CFIP Lumina Highlights

- Leading edge technology with **up to 256QAM modulation and 56MHz channel bandwidth** allows high capacity throughput up to 366 Mbps;
- **Optical Ethernet connections** provide **excellent protection against lightning strikes** and allow long distances between user equipment and the radio;
- **2 Gigabit Ethernet ports** provide the convenience of having separate ports for management (both basic and advanced) and user traffic;
- **Up to 4094 concurrent VLAN traffic** allows building many port-to-port networks paths for specific client services;
- **Jumbo frame size supports up to 9728 bytes**, which allows using longer header info (VLAN, MPLS) and transmitting more useful content and less headers, thus gaining on total throughput;
- **ACM and ATPC** for high availability and high density deployments.

Carrier Gigabit Ethernet trunk distribution with CFIP Lumina FODU

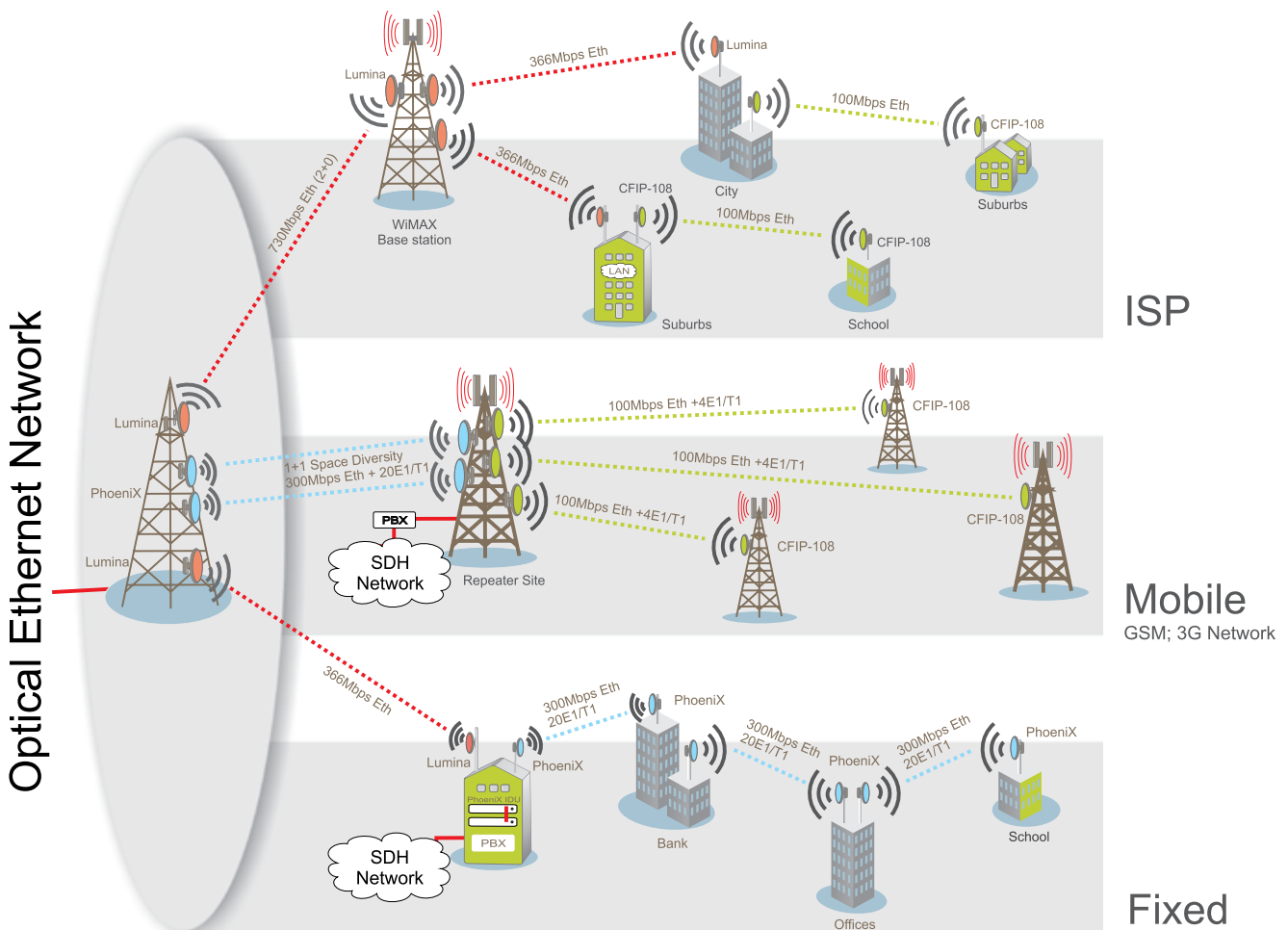
- Suitable for any network topology – star, ring, mesh networks
- Ideal for wireless extensions of fibre optics networks
- Designed for Ethernet backhaul applications



CFIP Phoenix Highlights

- High capacity system with **up to 20 E1 and up to 366 Mbps Gigabit Ethernet** - ideal for building **hybrid networks** to facilitate **transition from TDM to IP**;
- Industrial grade **fanless design** increases reliability and enables low power consumption;
- Leading edge technology utilizing **256QAM modulation and 56MHz channel bandwidth** allows high capacity throughput up to 366 Mbps;
- Excellent **upgrade for existing PDH** split mount systems;
- **Up to 4094 concurrent VLAN traffic** allows building many port-to-port networks paths for specific client services;
- **Jumbo frame size support (up to 9728 bytes)**, allows using longer header info (VLAN, MPLS) and transmitting more useful content and less headers, thus gaining on total throughput.

Application diagram of CFIP Product line



SAF CFQ Product Line – SDH system

CFQ-SD-IDU and ODU system

Model	CFQ-6	CFQ-6-HP*	CFQ-7	CFQ-8	CFQ-8-HP*	CFQ-10**	CFQ-11	CFQ-11-HP*	CFQ-13	CFQ-15	CFQ-18	
Capacity	SDH - STM-1; PDH/Eth/GigE - up to 155 Mbps; up to 63E1											
Channel bandwidths (MHz)	7 / 13.75 / 14 / 27.5 / 28 MHz (according to specific channel plan)											
Received thresholds dBm (guaranteed**)/ Max.transmit power dBm BER10⁻⁶ at 28MHz (56MHz for wideband radio)	Modulation											
	QPSK	-86 / +27	-86 / +32	-87.5 / +30	-86 / +27	-86 / +32	-86 / +27	-86 / +27	-86 / +32	-87.5 / +28	-86.5 / +27	-86 / +22
	16QAM	-81 / +24	-81 / +29	-79 / +27	-81 / +24	-81 / +29	-81 / +24	-81 / +24	-81 / +29	-79 / +25	-78 / +24	-77.5 / +19.5
	32QAM	-75 / +24	-75 / +29	-76 / +24	-74 / +24	-74 / +29	-74 / +24	-74 / +24	-74 / +29	-76 / +23	-75 / +21	-74.5 / +18
	128QAM	-69 / +22	-69 / +27	-70 / +24	-68 / +22	-68 / +27	-68 / +21	-68 / +21	-68 / +26	-70 / +22	-69 / +21	-68.5 / +18
Flange type	UDR70	UDR70	UBR84	UBR84	UBR84	UDR120	UDR120	UDR120	UBR140	UBR140	UBR220	

Applications	
Configuration	1+0, 1+1, 2+0, 3+0, 4+0, Ring, East-West
Protection switching	Hot Stand-by, Space/Frequency diversity (hitless, errorless; Active Tx <50ms)
Other data	
Power consumption IDU / ODU	30-50W / 24-42W (depending on capacity and modules installed)
Temperature range: IDU / ODU	-5°C to +55°C / -33°/-45°C to +55°C
Dimensions: HxWxD, weight IDU / ODU	445x44.5x238.5 mm, 3.4 kg / 280x280x120 mm, max. 4kg

* HP - high power

** Typical received thresholds are up to 3 dBm better than guaranteed thresholds (depending on frequency, channel bandwidth and modulation)

*** To find out specific modulation for each bandwidth, please contact your sales representative

CFQ-SD-IDU Data Modules

Base Modules	Ports & Description
Standard Base	A standard module provides connectivity up to 155Mbps, e.g., 100Mbps Ethernet and 16E1. By adding an expansion module – up to 37 x E1. Interfaces:
Enhanced Base Supports ADM up to 63E1 via STM-1	- 14 x E1, high-density Molex connector; - 2 x E1, RJ-48C connector; - Voice, Data ORW RJ-48C connectors; - 100BaseTX, 25-100 Mbps, two RJ-45 ports
42E1 Base	Provides 63E1 capacity with 21E1 expansion module. Interfaces: - 42 x E1, 3x high-density Molex connector; - Voice, Data ORW RJ-48C connectors; - 100BaseTX, 25-100 Mbps, two RJ-45 ports
GigE Base	Provides connectivity for Gigabit Ethernet. Interfaces:
Enhanced GigE Base With jumbo frames size up to 9728 bytes	- 4x10/100/1000Base-T ports with RJ-45 connector; - Ethernet SFP port;
Enhanced GigE Base Supports ADM up to 63E1 via STM-1 and jumbo frames size up to 4000 bytes	- 2 x E1, RJ-48C connector; - Voice, Data ORW RJ-48C connectors
Optional Modules	Ports & Description
16E1 Expansion module	- 14 x E1, high-density Molex connector; - 2 x E1, RJ-48C connector
21E1 Expansion module	21 x E1, 2x high-density Molex connector
STM-1 Optical mini module	STM-1, Single mode 1310 nm, SC Duplex Transceiver. Unconditionally eyesafe laser IEC 825/CDRH Class 1 Compliant
STM-1 Electrical mini module	STM-1, 2xBNC, ITU-T Rec. G.703, 75 Ω
2xSTM-1 Optical expansion module	2xSTM-1, Single mode 1310 nm, SC Duplex Transceiver. Unconditionally eyesafe laser IEC 825/CDRH Class 1 Compliant
2xSTM-1 Electrical expansion module	2xSTM-1, 2xBNC, ITU-T Rec. G.703, 75 Ω
2xSTM-1 SFP module	2 SFP ports for connection various optical or electrical adapters corresponding to STM-1 standards
Modems	
Standard Band modem	Wide Band modem
Channel bandwidths: 7 / 14 / 28 MHz	Channel bandwidths: 14 / 28 / 40 / 56 MHz
	Unified modem
	Channel bandwidths: 7 / 14 / 28 / 40 / 56 MHz

CFQ Wideband ODU												
CFQ-23	CFQ-26	CFQ-38	CFQ-6-WB	CFQ-7-WB	CFQ-8-WB	CFQ-10-WB**	CFQ-11-WB	CFQ-13-WB	CFQ-15-WB	CFQ-18-WB	CFQ-23-WB	CFQ-26-WB
SDH - 2 x STM-1; PDH/Eth/GigE - up to 310 Mbps												
13.75 / 14 / 27.5 / 28 / 30 / 40 / 56 MHz (according to specific channel plan)												
-85 / +22	-84 / +23	-83.5 / +20	-83 / +27	-83 / +27	-83 / +27	-83 / +26	-83 / +26	-82 / +25	-82 / +25	-82 / +23	-80 / +23	-80 / +23
-76.5 / +19	-79 / +20	-75 / +17	-78 / +24	-78 / +24	-78 / +24	-78 / +23	-78 / +23	-74 / +22	-74 / +22	-77 / +21	-72 / +21	-72 / +20
-73.5 / +17	-73 / +20	-72 / +15	-72 / +24	-72 / +24	-72 / +24	-71 / +23	-71 / +23	-71 / +23	-74 / +22	-73 / +21	-69 / +21	-69 / +20
-67.5 / +16	-67 / +18	-68 / +14	-66 / +22	-66 / +22	-66 / +22	-65 / +21	-65 / +21	-65 / +21	-66 / +20	-65 / +19	-64 / +19	-64 / +18
UBR220	UBR260	UBR320	UDR70	UDR70	UBR84	UBR100	UBR100	UBR140	UBR140	UBR220	UBR220	UBR260



CFQ ODU

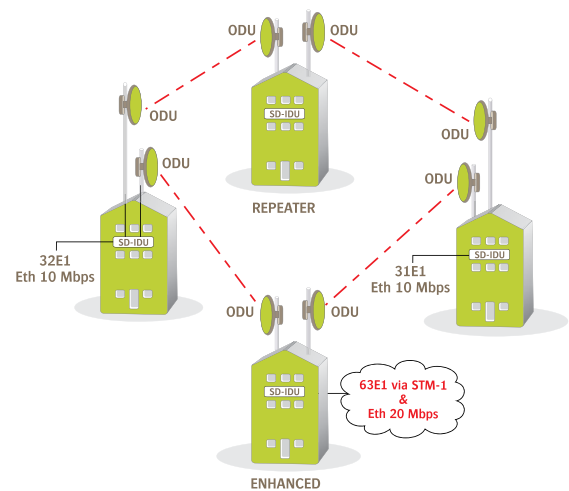


CFQ-SD-IDU

SAF CFQ Application Examples

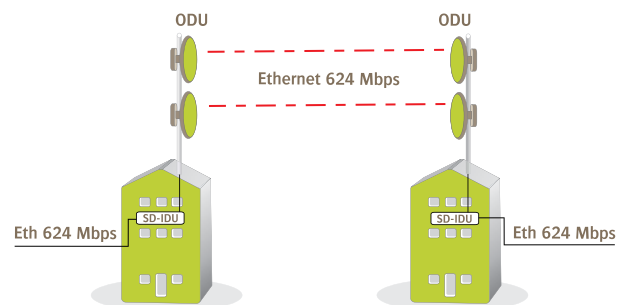
■ CFQ Ring STM-1, 63E1

- CFQ-SD-IDU provides the ability to demultiplex 63 x E1 PDH signal from SDH signal.
- STM-1 Mux Demux feature requires Enhanced module
- The ring is divided into 2 parts – the active ring and the protection ring. During normal operation, data only flows in a counter-clockwise direction around the ring. If the active ring goes down, the protection ring comes into service.



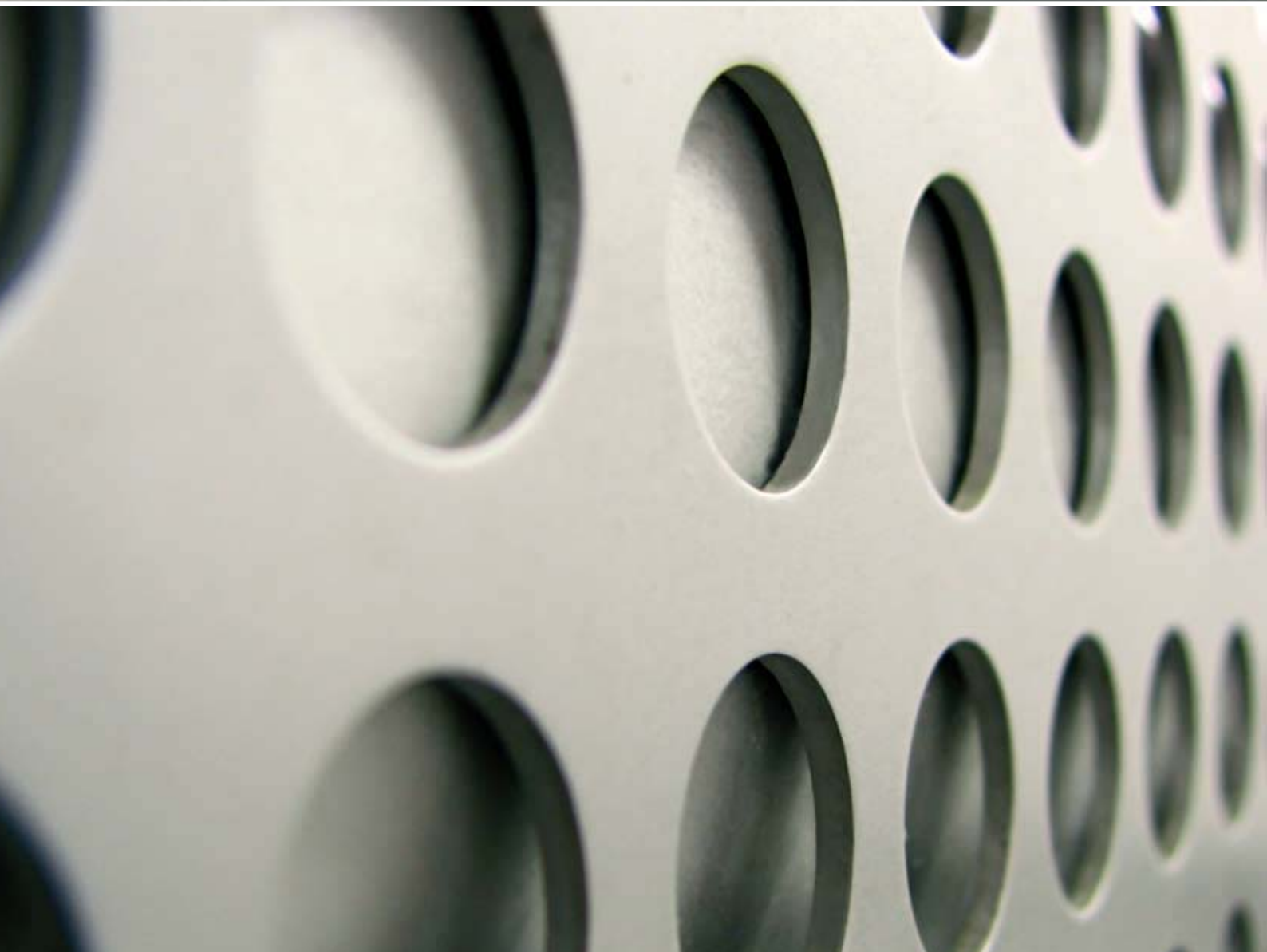
■ CFQ 624 Mbps 2+0 East/East Solution

- Ethernet capacity up to 624 Mbps by using 2x56 Mhz channels. 311Mbps by using 2x28 MHz channels;
- Protected system - loss of a link reduces bandwidth only by 50%;
- Optional E1 expansion;
- Available with Dual-polarization and Single-polarization antenna with a coupler;
- 3+0 and 4+0 solutions are also available.



CFQ Highlights

- Ring configuration with built-in add-drop functionality for up to 63E1;
- 311 Mbps radio (56 MHz) for capacities of up to 933 Mbps per link in 3+0 configuration;
- 63E1 + 25-30Mbps Ethernet with a single ODU (28 MHz);
- Easy upgrade of existing set-up to 1+1 or 2+0, 3+0, 4+0 configurations with GigE.



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