FLEX4G-10000

Flex4G-10000
shown with 12" (30cm) Antenna

80GHz Ultra High Capacity Backhaul System with Optional XPIC Operation

As mobile data consumption increases exponentially, operators are looking for a backhaul solution that provides flexibility and easy scalability to meet tomorrow's bandwidth demands. The BridgeWave Flex4G-10000, which supports backhaul capacity of up to 9.7 Gbps per radio, meets this demand. Operating up to 256QAM modulation, Flex4G-10000, supports cross-polarization interference cancellation (XPIC) technology, to double link capacity in spectrum-limited or congested markets. Using XPIC, a network operator can assign the same frequency to both the vertical and horizontal polarizations of an RF channel, effectively doubling data throughput in the same channel. The Flex4G-10000 has been designed to alleviate the strain of backhaul connections by combining advanced radio and modem capabilities with carrier-grade 10G Ethernet, CPRI, and SONET/SDH features at the lowest total cost of ownership.

Carrier Ethernet services are provided through the use of an integrated low-latency switch supporting jumbo frames and advanced Ethernet functionality including Quality of Service (QoS), VLAN support, Provider Bridge (Q-in-Q), and Ethernet OAM management. The Flex4G-10000 provides the comprehensive timing support required for 5G/4G/LTE deployments including Synchronous Ethernet and IEEE1588v2 Transparent Clock with hardware-based time stamping for one-step clocks.

With low power consumption and PoE along with direct DC power, the Flex4G-10000 provides all of its capabilities in an environmentally friendly, compact and lightweight, zero-footprint all-outdoor solution.

The Flex4G-10000 leverages BridgeWave's expertise in providing high reliability gigabit millimeter wave wireless solutions. BridgeWave has delivered tens of thousands of gigabit millimeter wave radios worldwide.

Performance
- Up to 9.7Gbps in 1+0 and 19.3Gbps in 2+0 using respectively one or two 2000Mhz channels
- XPIC frequency re-use technology to double capacity when spectrum is scarce and provide up to 10.5Gbps in just a single 1000Mhz channel or up to 6.0Gbps in just a single 500MHz channel
- Adaptive Code Modulation from QPSK through 256QAM
- 2000, 1000, 500, and 250MHz bandwidth support
- Highest bit/Hz spectral efficiency at the longest link distances
- LDPC FEC providing threshold improvement over other FEC technologies
- AdaptRate™ technology, working in conjunction with ACM and QOS, automatically reduces bandwidth during extreme fade conditions to increase availability and deliver critical traffic
- Automatic Transmit Power Control
- Zero-footprint ODU with low power consumption and Power-over-Ethernet

Carrier-Grade:
- Carrier Ethernet services enabled via built-in low-latency switch
- Quality of Service 802.1p traffic prioritization, VLAN 802.1q, and Provider Bridge Q-in-Q 802.1ad
- Synchronous Ethernet per G.8261 and G.8262 and G.8264
- PTP per 1588V2 Transparent Clock
- Ethernet OAM support per 802.3ah, 802.1ag and Y.1731
- SONET/SDH & CPRI interfaces

Security:
- Highly secure narrow beamwidth antennas
- FIPS-197 compliant AES Encryption provides the ultimate in data protection at full line rate gigabit speeds with minimal latency

Proven Reliability:
- Based on proven design – tens of thousands of systems deployed worldwide
- Rigorous HALT/HASS testing
- Carrier-grade 99.999% availability

FLEX4G-10000 SPECIFICATIONS

Frequency	Range: 71 – 76 GHz / 81 – 86 GHz T/R Spacing: 10 GHz, FDD operation Stability: ±10 ppm
Configurations	1+0, 2+0, 2+0 XPIC
Data Rate	Up to 9.7Gbps in 1+0 and 19.3Gbps in 2+0 configuration using respectively one or two 2000Mhz channels Up to 10.5Gbps in 1000Mhz channels and 6Gbps in 500Mhz channels in 2+0 XPIC configuration
F.E.C	Low Density Parity Check (LDPC)
Capacity	

Modulation	QPSK	16QAM	32QAM	64QAM	128QAM	256QAM
Channel Bandwidth (MHz)	250/500/1000/2000	250/500/1000/2000	250/500/1000/2000	250/500/1000/2000	250/500/1000/2000	250/500
1+0 Data Rate (Mbps)	374/752/1504/2760	749/1504/3008/5525	937/1880/3761/6905	1125/2257/4513/8285	1312/2633/5265/9660	1500/3009
2+0 XPIC Data Rate (Mbps)	748/1504/3008/NA	1498/3008/6016/NA	1874/3760/7522/NA	2250/4514/9026/NA	2624/5266/10530/NA	3000/6018
2+0 Data Rate (Mbps)	748/1504/3008/5520	1498/3008/6016/11050	1874/3760/7522/13810	2250/4514/9026/16570	2624/5266/10530/19320	3000/6018

Tx Power Output (dBm)	Up to 17dBm
Link Budget (10E^{-6} BER)	Up to 178dB (1ft/30cm antenna) and 192dB (2ft/60cm antenna)
Fade Mitigation	Adaptive Coding and Modulation and AdaptRate™ automatic bandwidth control

Traffic Interfaces	Ethernet: 1 x 10G/2.5G/1G SFP+, 2 x 2.5G/1G SFP+, and 1 x RJ-45 for 1G
	SDH/SONET/CPRI: 1 x SFP
	   SDH/SONET: 1 x STM-4/OC-12 (622.08 Mbps) or 1 x STM-16/OC-48 (2488.32 Mbps)
	   CPRI: 1 x Option 1 to 7 (614.4 Mbps to 9830.4 Mbps)

Networking	Quality of Service per IEEE 802.1p, DSCP and port based Scheduling: 8 queues allowing user configurable Strict Priority or Shaped Deficit Weighted Round Robin (SDWRR) MEF compliant traffic policing (two rate, three color scheme) VLAN per IEEE 802.1q, up to 4096 VLANs Provider Bridge Q-in-Q per IEEE 802.1ad Synchronous Ethernet (SyncE) per ITU-T G.8261, G.8262 and DNU section of G.8264 Precision Time Protocol (PTP) per IEEE1588V2 Transparent Clock One Step Congestion Management: Tail Dropping Ethernet Protection: Ring per G.8032 Maximum Ethernet frame length: Jumbo packets up to 10,000 bytes MAC Layer: Supports MAC Learning, MAC Switching, MAC Ageing Multiple Spanning Tree Protocol (MSTP), Rapid Spanning Tree Protocol: (RSTP) Link State Propagation: Rapid Link Shutdown (RSP) supports remote port LSP
Latency	Dependent on configuration, as low as 12 µSec
Security	Inherently secure ultra-narrow beamwidth antennas for low probability of detection and interception Option: FIPS-197 compliant 256-bit AES Encryption (export controlled)
Management	Web-based (HTTP/HTTPS) embedded management agent; Console Interface (CLI/SSH), IPv6 protocol stack SNMP Support: MIB-II and BridgeWave enterprise MIB, SNMP V1, V2, V3 SysLog (RFC 3164, RFC 3195) event support, RADUIS RFC2865 client support Ethernet OAM per 802.3ah (Link OAM), 802.1ag (Configuration Fault Management), Y.1731 (Performance Monitoring) Loopbacks: Ethernet (per port, per direction), Local Modem Test
Power	48 VDC nominal input, ± (44 to 57) VDC input to POE or +/- (37.5 to 60) VDC direct DC input; 73W typical power consumption Max POE Cat5E/6 cable length is 328 ft (100 m) Max DC cable length with 12 AWG cable is 650 ft (198 m) and with 14 AWG cable is 400 ft (122 m)
Size & Weight	13.1" w x 11.6" h x 4" d (33.4 cm x 29.5 cm x 10.2 cm); 9.6 lbs (4.4 kg)
Environmental	Operating Temperature: -33ºC to +55ºC (-27ºF to +131ºF) per EN 300 019-1-4 Class 4.1 Humidity: 100% all-weather operation Operating Altitude: Up to 4,500m (14,764 ft) Water Ingress: NEMA 4X (IP66) RoHS & WEEE Compliant
Regulatory	RF Certifications: U.S. FCC Part 101, EN 302 217-3; RF Exposure : meets FCC 1.310 General Population & EN 62311 RF MPE limits Safety: CE Mark; 60950-1; Corrosion : EN 60950-22 EMC/EMI: EN 301 489-1 and -4; FCC Part 15 Class B Surge & Immunity: IEC61000-4-5, GR-1089, K.21, K.44
Antennas	12" (30cm) Parabolic, 44dBi gain, 0.7º beamwidth or 24" (60cm) Parabolic, 51dBi gain, 0.4º beamwidth