PTP 650S

Small Form Factor Sub-6 GHz NLOS Backhaul

Service providers have experienced massive growth in data, voice, and video traffic over the past few years. This growth has imposed new requirements for high bandwidth and secure, reliable connectivity in areas not previously covered. Heterogeneous networks of small cells are increasingly being deployed in traffic "hotspot" areas to address these increasing capacity demands. In addition, data "not spots" are being addressed in suburban and rural areas with lower capacity small cell deployments.

Cambium Networks disrupts the performance-reliability continuum with the Cambium Point-to-Point (PTP) 650S backhaul solution. With up to 450 Mbps aggregate throughput, small form factor, and proven rugged performance. PTP650S links let you reliably and securely handle today's needs with scalability to meet future requirements.

PTP 650S Front

PTP 650S Mounted

PTP 650S Back

Main Differentiators

» **FLEXIBLE NON-LINE-OF-SIGHT (NLOS) SUPPORT** is delivered by sub-6 GHz spectrum featuring 2x2 MIMO OFDM, Fast Adaptive Modulation (AMOD), Dynamic Spectrum Optimization™ (DSO) and high spectral efficiency. With NLOS capabilities, service providers have a significant advantage in deploying capacity in the areas where most needed.

» **EASY DEPLOYMENTS** are supported by agile mounting options, a small form factor and low power consumption. PTP 650s simplifies the installation in all kinds of urban and rural environments. With built in alignment tools and flexible management interfaces, service providers can plan, install, monitor and support their network while keeping cost low.

» **SMALL CELL BACKHAUL OPTIMIZED FOR 2G/3G/4G/LTE NETWORKS** The PTP 650S is especially well suited to Small Cell Backhaul applications with features delivering more capacity and reliability with less spectrum, maximizing your investments in the most challenging environments. **Precise Network Timing** (IEEE 1588v2 and Synchronous Ethernet) ensures 4G interoperability and scalability.

Powerful Features

The PTP 650S solution offers an ideal array of features that give you more capacity, greater operational flexibility and the highest spectral efficiency in the industry. PTP 650S provides sub-6 GHz, multi-band flexibility in wide-band radios, operating in channel sizes from 5 to 45 MHz to maximize the use of precious backhaul spectrum.

With **Dynamic Spectrum Optimization (DSO)**, PTP 650S systems are constantly optimizing the channel of operation to maximize performance in virtually any environment including NLOS, high interference, and through extreme weather conditions.

Using **Fast Adaptive Modulation (AMOD)**, PTP 650S analyzes the channel and automatically selects the most suitable modultion. These rapid adjustments greatly increase link reliability and efficiency.

Robust Security is enabled by feature-rich set of capabilities in all areas of information assurance. **Physical** security is ensured by a tamper-evident seal with all software images encrypted and signed. **Management** interfaces are secured with HTTPS and SNMPv3 for remote access. Finally, **over-the-air data** can be encrypted with 128 or 256-bit AES encryption.

Specifications

RADIO TECHNOLOGY

RF BANDS[1]	Wide-band operation 4.9 to 6.05 GHz (allowable frequencies and bands are dictated by individual country regulations. The most common bands are listed here.) 4.940 – 4.990 GHz (Public safety) 5.15 – 5.25 GHz 5.25 – 5.35 GHz 5.470 – 5.725 GHz 5.725 – 5.850 GHz 5.825 – 6.050 GHz 2.5 – 2.6 GHz[3] 3. .3 – 3.6 GHz[3]
CHANNEL SIZES	5, 10, 15, 20, 30, 40, and 45 MHz channels Channel sizes depend on individual country regulations
SPECTRAL EFFICIENCY	10 bps/Hz maximum
CHANNEL SELECTION	By dynamic spectrum optimization or manual intervention; Automatic selection on start-up and continual self-optimization to avoid interference
MAXIMUM TRANSMIT POWER[2]	Up to 27 dbm at bPsK; up to 23 dbm at 256 QaM
SYSTEM GAIN[2]	Integrated: Up to 160 db with 20 MHz channel and integrated 19 dbi antenna; Varies with modulation mode, Channel size and spectrum
RECEIVER SENSITIVITY	-98 dbm with 5 MHz channel
MODULATION / ERROR CORRECTION	Fast Preemptive adaptive Modulation featuring 13 modulation / FeC coding levels ranging from bPsK to 256 QaM dual payload MiMo
DUPLEX SCHEME	Synchronized Time division duplex (Tdd) and Half duplex Frequency division duplex (Hd-Fdd); dynamic or fixed transmit/receive ratio; each Tdd-synchronized link requires a Cambium Tdd-synC synchronization unit5 to provide an accurate timing reference signal
ANTENNA	Integrated: Flat panel – 19 dbi
RANGE	Software limited to 1.25 miles (2.0km); optional software license key to enable long-range applications
SECURITY	FiPs-197 compliant 128/256-bit aes encryption (optional) HTTPs and snMPv3 Identity-based user accounts Configurable password rules User authentication and Radius support Event logging and management; optional logging via syslog disaster recovery and vulnerability management

ETHERNET BRIDGING

PROTOCOL	IEEE 802.3
USER DATA THROUGHPUT	Dynamically variable up to 450 Mbps Maximum conditions – 2x2, 45 MHz channel1, 256 QaM
LATENCY	1 – 3 ms one-direction latency
QoS	8 Queues
PACKET CLASSIFICATION	Layer 2 and layer 3 ieee 802.1p, MPls, ethernet priority
LINE RATE (>850K PACKETS PER SECOND)	Line rate (>850K packets per second)
TIMING TRANSPORT	Synchronous ethernet; IEEE 1588v2
FRAME SUPPORT	Jumbo frame up to 9600 bytes
FLEXIBLE I/O	2x Gigabit ethernet copper ports: Gigabit Port 1: data + Poe power input Gigabit Port 2: 802.3at Poe output port (optional) sFP port (single-mode fiber, multi-mode fiber, and copper Gigabit ethernet options available)
T1/E1 TDM SUPPORT	8 x T1/e1 TdM module (optional indoor unit)3 G.823-compliant timing dC power input (compatible with aC+dC Power injector output)
T1/E1 LATENCY (ONE WAY)	1 to 3 ms typical depending on range, bandwidth, modulation mode and number of T1/e1 ports; Accurate T1/e1 latency figures can be determined for any given configuration using the Cambium PTP linKPlanner

Specifications

MANAGEMENT AND INSTALLATION

LED INDICATORS	Power status, ethernet link status, and activity on extended Range Poe supply
NETWORK MANAGEMENT	In-band and out-of-band management (oobM)[3]
SYSTEM MANAGEMENT	iPv6/iPv4 dual-stack management support Web access via browser using HTTP or HTTPs/Tls[4] snMP v1, v2c and v3, Mib-ii and proprietary PTP Mib Cambium Wireless Manager, WM 4.0/sP4 or higher online spectrum analyzer (no impact on payload traffic or network operation)
INSTALLATION	Built-in audio and graphical assistance for link optimization
CONNECTION	Distance between outdoor unit and primary network connection: up to 330 feet (100 meters) using Power-over-Gigabit ethernet; longer distances up to 984 feet (300 meters) can be achieved using fiber interface

PHYSICAL

DIMENSIONS	Integrated outdoor unit (odu): Width 207mm (8.2"), Height 306mm (12.0"), depth 69mm (2.7"): Weight integrated odu: 4.1 kg (8.95 lbs) including bracket operating temperature -40° to +140° F (-40° to +60° C), including solar radiation dust-water intrusion protection iP66 and iP67
WIND SPEED SURVIVAL	200 mph (322 kph)
POWER SUPPLY	Two options: aC power injector: 32° to 104° F (0° to +40° C); 35 W; 90-240 vaC, 50/60 Hz dimensions: Width 5.2" (132mm), Height 1.4" (36mm), depth 2" (51mm) aC + dC power injector: -40° to 140° F (-40° to +60° C); 70 W; 90-240 vaC, 50/60 Hz dimensions: Width 9.75" (250 mm), Height 1.5" (40 mm), depth 3" (80 mm)
POWER CONSUMPTION	30 W maximum

ENVIRONMENTAL AND REGULATORY

PROTECTION AND SAFETY	ul60950-1; ieC60950-1; en60950-1; Csa-C22.2 no. 60950-1; Cb approval for Global
RADIO	-4.9 GHz: FCC Part 90y, Rss-111 5.x GHz: FCC Part 15, sub-parts 15C and 15e; Rss 210 issue 8; en 302 502; en 301 893 eire ComReg 02/71R1, uK approval to iR2007
EMC	Europe – en 301 489-1 and -4

1   Regulatory conditions for RF bands should be confirmed prior to system purchase. all bands use the same hardware.

     individual bands and channel widths are available pending local regulatory approvals and region code licenses.

2   Gain, maximum transmit power and effective radiated power may vary based on regulatory domain and region code license.

3   Available in a future release.

4   Web access via HTTPs/Tls is available on aes-enabled radios.