

# OSA 5430

Compact, redundant, high-capacity PTP grandmaster, SB/MB-GNSS receiver



5G Mobile



Telecom



Defense



Data center



Smart grid



Transportation



Financial



Broadcast

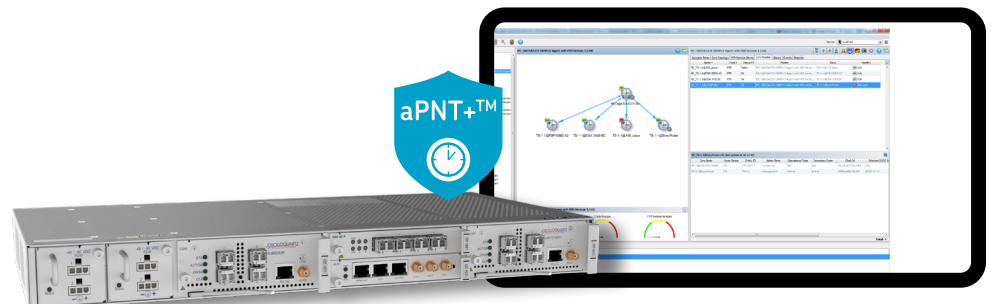
## Benefits

- Fully redundant hardware
- All key modules are protected ensuring no loss of performance and high service availability
- CSM modules with single (L1) and Multiband (L1/L5) GNSS receivers
- Multisource ePRTC combiner introducing redundancy to ePRTC systems by combining up to five phase and frequency references
- Reference Validator provides cross reference validation for ePRTC multi-source combiner. With three or more phase references, validator is able to distinguish and invalidate the faulty source
- High performance NTP server supporting up to 500.000 TPS
- High-speed connectivity
- First telecom grandmaster supporting PTP, NTP and SyncE over 10G as well as 1G interfaces with hardware timestamping
- Simple migration to IP networks  
Migration from legacy TDM to IP based networks, including support for Composite Clock, BITS and TI/DS1/E1 signals
- Syncjack™ technology  
Built-in synchronization accuracy monitoring, testing and assurance functionality
- Unique flexibility  
Modular and scalable design, configurable to operate in ePRTC, PRTC A/B, SSU, PTP GM clock, APTS, boundary/slave clock mode and NTP server
- Operational simplicity  
Ensemble Controller, including Ensemble Sync Director, and GNSS assurance for superior management and synchronization monitoring

## Overview

**Reliable and accurate delivery of synchronization from the core to the network edge is essential to meet the stringent requirements of new mobile, fixed and cable networks.** However, the challenges go beyond accuracy. As well as strict precision, network operators need a robust, scalable and cost-effective solution that can work over packet-based networks as well as legacy infrastructure.

Our OSA 5430 is a carrier-grade ePRTC, PRTC A/B, SSU and IEEE 1588v2 grandmaster clock supporting 10G as well as 1G interfaces with hardware timestamping. With a modular design and technology-focused cards, it enables seamless capacity as well as technology migrations. Its NTP server, multiple BITS/composite clock (CC) outputs and GNSS receiver capabilities, make it ideal for the smooth upgrade of legacy synchronization architectures. And with its ability to deliver precise timing to DOCSIS 3.1 remote PHY devices, the OSA 5430 is also a powerful tool to help cable operators tackle booming demand. With a modular, scalable and fully redundant design, our OSA 5430 offers the highest configuration flexibility and reliability. In addition, our integrated Syncjack™ technology enables in-service synchronization monitoring and assurance without the need for expensive test equipment. With our OSA 5430, cost-effective and accurate synchronization distribution for next-generation technologies such as LTE-A and 5G is no longer a challenge.



Oscilloquartz zero-trust multisource & redundant aPNT+™ platform

# OSA 5430

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## High-level technical specifications

### System overview

- High-quality OCXO, DOCXO and rubidium
- Up to 8x 1/10G (CSM) plus 4x 1/10G (line card)
- Up to 1536 unicast slaves per CSM
- Hot-swappable redundant CSM and GNSS receiver and oscillator
- Hot-swappable PSU

### Operation modes

- ePRTC, PRTC A and PRTC B
- IEEE 1588 PTP grandmaster, boundary clock, slave and probe
- NTP server
- PRC/SSU (Sync-E and BITS/CC)

### GNSS receiver

- Embedded L1 multi-constellation receiver
- Optional multi band, Multi constellation receiver for enhanced accuracy
- GPS / GALILEO / BEIDOU / GLONASS / SBAS / QZSS

### PTP profiles

- Default profiles over Ethernet and IP multicast
- Telecom profiles G.8265.1, G.8275.1 and G.8275.2
- Enterprise hybrid and power profiles
- Hardware-based packet processing

### NTP server

- High-capacity Stratum 1 server
- Hardened NTP responder
- Hardware timestamping
- NTP/PTP/Sync-E/SSU supported simultaneously
- NTP authentication
- PTP to NTP conversion

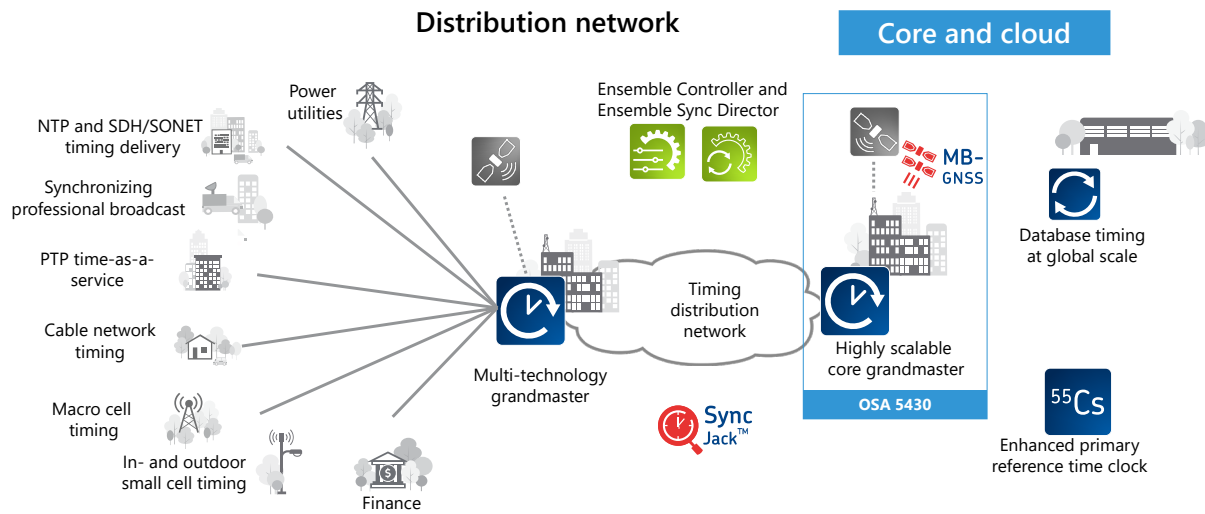
### Expansion cards (optional)

- One hot-swappable expansion card per OSA 5430
- Line cards:
  - 16x E1/T1/2.048MHz (120/100/75ohm)
  - 4x 1/10GbE (PTP/Sync-E)
  - Multiband GNSS
  - 10x composite clock

## Applications in your network

### Timing distribution from the network core


- Radio access network synchronization including 4G, 4.5G LTE/LTE-A, 5G NR, femtocells and small cells
- Precise synchronization of legacy network architectures based on NTP and PRC/SSU/CC
- Cable networks (DOCSIS 3.1) and PON synchronization
- Data centers and enterprise networks synchronization
- Modernized and legacy power utility networks
- Modernized digital broadcasting studios



# OSA 5430

## Product specifications

### Product overview

	OSA 5430
	
Size (WxHxD)	1RU 443m m x 44.1mm x 216mm / 17.44" x 1.73" x 8.50"
Clock	Quartz (OCXO) Quartz HQ+ (high-quality OCXO) Quartz HQ++ (enhanced high-quality DOCXO) Rubidium
Expansion line Cards	Up to 1
PTP/NTP/Sync-E ports	Up to 12
Composite clock ports	Up to 10
BITS output ports	Up to 17
PSU	Hot-swappable redundant DC PSU (up to 2)

### Main applications

- Enhanced primary time clock (ePRTC)
- Primary time clock (PRTC A and PRTC B)
- 1588v2 PTP grandmaster clock (up to 1536 PTP clients at 128pps per CSM), G.8273.2 BC type D
- 1588v2 PTP boundary clock (up to 1536 PTP clients at 128pps per CSM)
- 1588v2 PTP slave input (as backup to GNSS) – APTS
- GNSS receiver and PRC/PRTC including fan-out of multiple physical synchronization output interfaces
- Synchronization supply unit (SSU) and composite clock generator
- NTP server
- Sync probe – Syncjack™ monitoring and assurance

### NTP features

- Stratum 1 NTP server when locked to GNSS
- NTP v1, v2, v3 and v4 over IPv4 and IPv6
- NTP unicast/multicast/broadcast
- Symmetric key and Autokey authentication
- TIME & DAYTIME protocol
- NTP peering
- NTP selectable timescale (UTC/GNSS/Local)
- Nanosecond-accurate hardware timestamping
- NTP server accuracy within +/-100nsec from UTC when locked to GNSS

- Up to 16 NTP server IP addresses
- Support PTP and NTP on same Ethernet port
- PTP to NTP translation
- Up to 3 stacked VLANs per flow (Q-in-Q service provider tagged)
- Enhanced NTP statistics and client lists
- Up to 8,000 transactions per second, per CSM
- Up to 500.000 transactions per second without authentication, per CSM
- PTP backup in case of GNSS outage

### PTP networking features

- PTP profiles support:
  - ITU-T G.8265.1 frequency delivery profile (IP unicast over IPv4/IPv6)
  - ITU-T G.8275.1 time/phase delivery profile (full timing support - Ethernet multicast)
  - ITU-T G.8275.2 time/phase delivery profile (assisted partial timing support - IPv4/IPv6)
  - PTP enterprise profile (mixed multicast and unicast)
  - IEEE 1588 2008 PTP default profile over IP multicast
  - IEEE 1588 2008 PTP default profile over Ethernet multicast (Annex F)
  - PTP power and utility profiles: IEC/IEEE 61850-9-3, IEEE C37.238-2011, IEEE C37.238-2017
  - PTP Broadcast and media profiles: SMPTE ST 2059-2, AES67

# Oscilloquartz coreSync+™

- 1-step and 2-step clock
- No performance degradation as slave capacity grows
- Up to 16 master/BC IP addresses (IPv4 and IPv6 supported simultaneously on same port)
- Up to 16 EVCs (IEEE 802.1Q customer-tagged) and stacked VLANs per CSM
- Support for multiple profiles simultaneously
- Support PTP (TAI) and arbitrary (ARB) timescales
- Support master and slave on any port simultaneously
- Up to three stacked VLANs per flow (Q-in-Q service provider tagged)
- Enhanced PTP GM/BC/slave statistics, performance monitoring (15min and 24h), threshold crossing alarm (TCA) and SNMP traps
- Nanosecond-accurate hardware timestamping
- In-house best-in-class clock recovery algorithms
- DoS protection using hardware access control list (ACL) and traffic rate limiting
- Operates as single or double attached clock in PRP IEC 62439-3 network

## Hardware modules

- Modules
  - CSM: Clock synchronization module
  - AUX: Auxiliary I/O module
  - PSU: Dual Feed DC power supply unit
- Expansion line cards (optional):
  - XGE-4S-P: 4x 1/10G Ethernet card
  - BTOH-P-16: 16x BITS outputs card
  - MB-GNSS: multi band GNSS input card
  - CCO: 10x composite clock outputs
- Number of modules cards supported

	OSA 5430
<b>CSM</b>	2
<b>AUX</b>	1
<b>PSU</b>	2
<b>Line Cards</b>	1

## Clock Synchronization Module (CSM)

- Dual CSM design allows full protection of all critical components including GNSS , PTP/NTP ports, oscillator and management

### CSM oscillator options

- Quartz (OCXO)
- Quartz HQ+ (high quality OCXO)
- Quartz HQ++ (enhanced high quality DOCXO)
- Rubidium

### 4xEthernet ports

- Hardware-based timestamping (PTP and NTP)
- 4x 1G/100MbFE(SFP) or 10G(SFP+), user configurable per port
- All fiber ports support SM/MM colored/non-colored/dual/single fiber SFP / SFP+ and copper SFP
- Per-flow hardware-based policing and scheduling
- Configurable link asymmetry delay compensation

### Synchronous Ethernet (SyncE)

- Compliant to ITU-T G.8261/G.8262/G.8262.1/G.8264
- Ethernet synchronization message channel (ESMC) and enhanced ESMC with enhanced SSM codes
- Sync-E for time holdover during GNSS outage

### CSM Multiband GNSS Receiver

- Redundant GNSS receivers and antenna inputs (one on each CSM)
- Provide enhanced accuracy for ePRTC and PRTC-B
- Concurrent reception of multiple L1/L5 frequency GNSS constellations:
  - GPS / QZSS (L1C/A L5), Galileo (E1B/C, E5a), GLONASS (L1OF), Beidou (B1C, B2a), NavIC (SPS-L5), QZSS (L1C/A L2C), SBAS (EGNOS, GAGAN, MSAS, WAAS)
- Skyview and GNSS satellites status
- Configurable SNR, elevation and PDOP masks
- User-configurable antenna cable delay Compensation
- Jamming and spoofing detection
- Advanced spoofing detection and mitigation
  - Support fix positioning – single satellite mode
  - Voltage to antenna +5VDC
  - Antenna connector SMA-F (50ohm)

# OSA 5430

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## CSM GNSS Receiver

- Redundant GNSS receivers and antenna inputs (one on each CSM)
- Multi-constellation GNSS (GPS / GLONASS / BEIDOU/ GALILEO) L1 32-channel receiver
- Skyview and GNSS satellites status
- Configurable SNR, elevation and PDOP masks
- User-configurable antenna cable delay compensation
- Support fix positioning – single satellite mode
- Software configurable mode of operation
  - GPS L1 (1575.42MHz)
  - GLONASS (1601.5MHz)
  - BEIDOU (1561MHz)
  - GALILEO (1575.42 MHz)
  - Combined GPS + GLONASS
  - Combined GPS + BEIDOU
  - Combined GPS + GALILEO
- Voltage to antenna +5VDC
- Antenna connector SMA-F (50ohm)

## Multi band GNSS receiver Line card

- Hot swappable
- Provide enhanced accuracy for ePRTC and PRTC-B
- Multi-band, Multi-constellation 184-channel GNSS receiver
- GPS (L1C/A L2C), Galileo (E1B/C E5b), GLONASS (L1OF, L2OF), Beidou (B1I, B2I), QZSS (L1C/A L2C), SBAS (L1C/A: WAAS, EGNOS, MSAS, GAGAN)
- 4 concurrent GNSS constellations
- Skyview and GNSS satellites status
- Configurable SNR, elevation and PDOP masks
- User-configurable antenna cable delay compensation
- Support fixed positioning – single satellite mode
- Jamming and spoofing detection
- Advanced spoofing detection and mitigation
- Voltage to antenna +5VDC
- Antenna connector SMA-F (50ohm)

## Auxiliary card (AUX)

### Synchronization interfaces

- 1x BITS in/out
- 1x PPS in/out
- 1x Time-of-day (ToD) + PPS in/out
- 2x CLK in(2.048/10MHz)/out(10MHz)

### BITS in/out

- BITS input/output over shielded RJ-48
- User-configurable: E1, T1 (DS1), 2.048MHz
- G.823 / G.824 sync interface compliant
- Synchronization status message (SSM)
- BITS input for time holdover during GNSS outage
- Output squelch option
- SSU filtering option

### PPS in/out

- PPS input/output (user configurable)
- User configurable input and output delay compensation
- SMA-F connector (50ohm)
- Output squelch option
- PPS configurable width

### ToD + PPS In/Out

- G.8271 compliant
- ToD formats – NMEA 0183 (\$GPZDA sentence), ITU-T G.8271 and CCSA
- RS422 over shielded RJ-45
- PPS configurable width
- Output squelch option

### CLK in/out





- 2x CLK in(2.048/10MHz)/out(10MHz) user configurable
- SMA-F connector (50ohm)
- Output squelch option

## Output expansion line cards

- Line cards:
  - XGE-4S-P: 4x 1/10G Ethernet card
  - BTOH-16: 16x BITS card
  - CCO : 10x composite clock outputs
- One line card per OSA 5430
- Field upgradable
- Hot insertion / extraction support
- Overvoltage / current protection
- Hot swappable

# Oscilloquartz coreSync+™

## Product overview

	BTOH-P-16 (16x BITS)	XGE-4S-P (4x 1/10Gbit/s)
		
Capabilities	16x BITS outputs over high density connector (VHDCI) – supporting 2.048MHz, E1 or T1 (DS1), Per output configurable signals type (E1, 2.048MHz)	4x1/10Gbit/s fiber Ethernet ports (PTP / Sync-E)
	MB-GNSS	CCO (10x CC)
		
Capabilities	Multi-band, multi-constellation GNSS input card	10x composite clock outputs over high density connector – supporting 10 composite clock output pairs. SW configurable shutdown of output signals. One composite clock input 1:1 output card redundancy

## Holdover performance

	Clock	Aging / Day (after 30 days)	Temperature stability
Quartz CSM	High-quality OCXO Stratum 3 / G.812 Type III	$\pm 5 \times 10^{-10}$	$\pm 50 \times 10^{-10}$
Quartz HQ+ CSM	High-quality OCXO G.812 Type I	$\pm 2 \times 10^{-10} / \pm 1 \times 10^{-10}^*$	$\pm 2 \times 10^{-10}$
Quartz HQ++ CSM	DOCXO Stratum 2 / G.812 Type II	$\pm 5 \times 10^{-11} / \pm 1 \times 10^{-11}^*$	$\pm 1 \times 10^{-11}$
Rubidium CSM	Rubidium Stratum 2 / G.812 Type II	$\pm 5 \times 10^{-12}$	$\pm 2 \times 10^{-10} / \pm 2 \times 10^{-11}^{**}$

\*Note: Effective daily aging after device has been powered for one month and locked to GPS for three days, for the following three days.

\*\*Note: Effective temperature stability after compensation.

	200nsec	400nsec	1.1usec	1.5usec	5usec	10usec	16ppb
Quartz	1 hour	2 hours	4 hours	5 hours	8 hours	14 hours	1 month
Quartz HQ+	4 hours	8 hours	14.5 hours	16.5 hours	1.5 days	2 days	0.5 years
Quartz HQ++	10 hours	17 hours	1.5 days	2.2 days	4.4 days	6.6 days	>1.5 years
Rubidium	1 day	1.8 days	3.5 days	4 days	8 days	12 days	>5 years

Note: The above are typical values (1 sigma confident) assuming controlled temperature environment, after the device has been powered for one month and locked to GPS for 72 hours. Due to the excellent temperature stability of the HQ+, the HQ++ holdover will outperform the Rubidium holdover when significant temperature variations are presented.

# OSA 5430

## Sync signal conversion

From/To	SyncE Tx	BITS OUT	CLK OUT (10MHz)	PTP	NTP	PPS OUT	ToD
GNSS	✓	✓	✓	✓	✓	✓	✓
SyncE Rx	✓	✓	✓	✓	n/a	freq.	n/a
BITS IN	✓	✓	✓	✓	n/a	freq.	n/a
CLK IN	✓	✓	✓	✓	n/a	freq.	n/a
PPS IN	✓	✓	✓	✓	✓	✓	✓
PTP	✓	✓	✓	✓	✓	✓	✓

### GM/PRTC frequency and time accuracy

- While locked to GNSS
  - Phase and time – PRTC/ G.8272 phase accuracy
    - <15nsec RMS from UTC
    - Single-band GNSS, PRTC-A: ±100nsec from UTC
    - Multi-band GNSS, PRTC-B: ±40nsec from UTC
  - Frequency – PRC/ G.811 frequency accuracy

### GM/ePRTC frequency and time accuracy

- While locked to GNSS and connected to ePRC
- Phase and time – ePRTC/ G.8272.1 phase accuracy: ±30nsec from UTC
- Holdover:
  - 100nsec over min 25 days (guaranteed) with ePRC+(typical 30 days)
  - 100nsec over min 45 days (guaranteed) with SePRC(typical 55 days)
- Up to five phase/frequency references to ePRTC Multisource combiner

### Assured PNT (aPNT) Solution

- Multiple backups to GNSS including PTP, SyncE, CLK, BITS and local oscillator
- PRTC can automatically select between 3 available input references
- Frequency automatically selected between 3 available input frequency references
- Improved holdover with HQ+/HQ++/Rubidium oscillator
- Automatic switchover in case of jamming / spoofing/interference detection
- ePRTC combines GNSS/PTP/PPS+ToD with cesium clock from improved accuracy in locked mode and extended holdover in case of GNSS outage
- Interoperable with OSA 5405 smart antenna
- PTP and GNSS assurance using ENC Sync Director

### Syncjack™ monitoring and assurance tools

- Clock accuracy for up to two clock probes – computing TE, TIE and MTIE of physical clocks
  - Calculation of maximum, constant and dynamic TE, TIE and MTIE between physical source and reference signals
  - Programmable source and reference signals including SyncE, BITS, PPS, GNSS and CLK
  - MTIE mask and time error threshold alarms based on SNMP traps
  - TE/TIE raw data collection and export to server
  - Daily MTIE and TE performance monitoring reports
  - Detect and disqualify spoofed GNSS reference based on trusted PTP/PPS source
- Clock analysis for up to four PTP clock probes – packet TE, TIE and MTIE
  - Calculation of packet maximum, constant and dynamic TE, TIE and MTIE between physical reference signal and timestamps within the PTP packets
  - Support for active and passive probe mode
  - Programmable reference signals including SyncE, BITS, PPS, GNSS and CLK
  - MTIE mask and Time Error threshold alarms based on SNMP traps
  - TE/TIE raw data collection and export to server
  - Daily MTIE and TE performance monitoring reports



- PTP network analysis including PTP network probe
  - Packet delay and packet delay variation performance statistics
  - Delay asymmetry
  - Network usability statistics (FPP based on G.8261.1)
  - Packet loss statistics
  - Programmable reference signals including SyncE, BITS, PPS, GNSS and CLK
  - Enhanced sync assurance statistics, performance monitoring (15min & 24h), including data export, threshold crossing alarm (TCA) and SNMP traps
- User-configurable MTIE masks

## Low-touch provisioning

- Text-based configuration files
- FTP/SFTP/SCP for configuration file copy
- Remote software upgrade

## Management and security

### Local management

- Serial port (RS232 over RJ45) for CLI (on CSM)

### Remote management

- Local LAN port (100/1000BaseT over RJ45) using CLI, SNMP and Web GUI interfaces (on AUX)
- Support for IPv4 and IPv6 (dual stack)
- Maintains in-band management tunnels
- Configurable static routes and default gateways
- Fully interoperable with Adtran FSP 150 and Adtran FSP 3000 products
- Supported by Adtran Ensemble Controller, including Ensemble Sync Director and GNSS assurance

### Management protocols

- Telnet, SSH (v1/v2)
- HTTP/HTTPS (TLS 1.2)
- SNMP (v1/v2c/v3)

### Secure administration

- Configuration database backup and restore
- System software download via FTP, HTTPS, SFTP or SCP (dual flash banks)
- Remote authentication via RADIUS/TACACS+
- SNMPv3 with authentication and encryption
- Access control list (ACL)
- ICMP filtering and rate limiting
- Automatic certificate enrollment with full integration into PKI

### IP networking

- DHCP v4/v6
- ARP cache access control
- IPv4 RIPv2 and static routes
- IPv6 NDP address resolution and static routes
- RIPng for IPv6
- ICMP

### System logging

- Syslog, alarm log, audit log and security log
- Configurable system timing source – local/NTP/PTP/PRTC (GNSS)
- User configurable time zone and daylight saving time (DST)

### Standards compliance

- ITU-T G.8261, G.8262, G.8262.1, G.8264, G.703, G.704, G.781, G.812, G.811
- ITU-T G.8272.1, G.8272, G.8273.2
- ITU-T G.8265.1, G.8275.1, G.8275.2
- IEEE 1588v2 (PTP), 802.1Q (VLAN), 802.1ad, 802.1p (priority), 802.3ae (10G)
- RFC 2863 (IF-MIB), RFC 2865 (RADIUS), RFC 2819 (RMON), RFC 2460 (IPv6)
- RFC 1059 (NTPv1), RFC 1119 (NTPv2), RFC 1305 (NTPv3), RFC 5905 (SNTPv4), RFC868 (TIME), RFC867(DAYTIME), RFC 1321 (autokey)

### Regulatory compliance

- CE compliance, directive 2014/30/EU (EMC)
- EMI
  - EN 55024 :2010 Class A,
  - EN 55032: 2012/AC:2013 Class A,
  - EN 61000-3-2-2014,
  - EN 61000-3-3 2013,
  - EN 300 386 V2.1.1:2016
  - FCC 47FR Part 15 2014 Class A
  - ICES-003 Issue 6 :2019 Class A
  - ANSI C63.4:2014
- Safety
  - EN/IEC 62368-1:2014 2nd Ed. +A11:2017
  - UL/TUV 62368-1
  - 21CFR1040.10 Compliance by using ADTRAN SFPs [CFR for LASER products]
  - EN 60825 Compliance by using ADTRAN SFPs [LASER Safety]
- NEBS Level-3:
  - GR-1089-CORE, Issue 7
  - GR-63-CORE, Issue 5
- RoSH compliance , directive 2011/65/EU (ROHS)

# OSA 5430

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## Power Supply

- Hot-swappable, modular DC-PSU: -48 / -60VDC (tolerate)
- -36 to -72VDC) with over-voltage and over-current protection
- Each PSU supports dual power feeds
- Optional external 85-264VAC to 48VDC converter

## Environmental

- Dimensions (W x H x D): 443mm x 44mm x 216mm / 17.44" x 1.73" x 8.50"
- Weight (depending on the configuration): 3.6Kg to 5.5Kg
- Operating temperature (ambient): -5 to +45°C
- Storage temperature: -40 to +70°C (GR-63-CORE)
- Humidity: 5 to 95% (non-condensing)
- Operational altitude: -450m to 5000m

## Optional accessories

- GNSS(GPS/GLONASS/BEIDOU/GALILEO/SBAS/QZSS) single and multiband antenna kits 10 / 20 / 60 / 120 / 150m (32.8ft / 65.6ft / 196.85ft / 393.7ft / 492.1ft), including indoor and outdoor cables, roof antenna, lighting protector and mounting kit
- Anti-jamming/anti-spoofing single band GNSS (GPS/ GLONASS/BEIDOU/ GALILEO/SBAS/QZSS) antenna
- 1:2/1:4/1:8 GNSS (GPS / GLONASS/BEIDOU/GALILEO) splitters
- GNSS window antenna
- Cables and adapters accessory kit
- Patch panels for BITS line cards

