OSCILLOQUARTZ
A division of Adtran

Oscilloquartz coreSync™

Data sheet

OSA 3300

Industry-first high-performance optical pumping cesium clock

Science | Metrology | Research | Ground station | Time scale

Benefits

- **Ultra-high stability and longevity**
  Offers a 10-year warranty with superior frequency stability and twice the lifespan of traditional magnetic cesium atomic clocks
- **Unique innovation**
  First commercial cesium atomic clock utilizing optical pumping technology for high-performance applications
- **Compact and modern design**
  Features an intuitive LCD touch screen and Ethernet connectivity for simplified local and remote configuration
- **Proven physics**
  Builds on and improves widely deployed magnetic cesium atomic clock technology
- **Technology leadership**
  Developed by the only company with deep expertise in both synchronization and photonic solutions, pioneering optical pumping cesium technology
- **RoHS-compliant**
  Fully compliant with the latest RoHS standards, meeting strict EU demands
- **Secure and remote management**
  Featuring SNMPv3 support, fully integrated with Adtran's Mosaic Network Controller management system for enhanced security

Overview

In critical applications such as metrology labs, timekeeping systems, satellite navigation and communication, an ultra-stable and precise frequency source is essential to ensure reliable performance. The OSA 3300 HP/SHP is the industry's first commercial optical cesium atomic clock, delivering nanosecond precision and unmatched long-term accuracy. With an Enhanced Short Term Unit (ESTU) option, it sets new benchmarks in short-term stability and drives innovation in timekeeping and scientific research.

Engineered for demanding environments, the OSA 3300 HP/SHP provides highly precise synchronization over an extended lifetime, making it ideal for metrology institutes, mission-critical networks and defense operations. Its advanced optical cesium technology delivers significantly higher accuracy, stability and a robust design compared to legacy magnetic cesium clocks. What's more, it's well-suited for GPS/GNSS backup-as-a-service, ensuring continuity in critical applications.

Compact and portable, the OSA 3300 HP/SHP supports space-constrained environments while maintaining exceptional stability. The ESTU option further enhances its suitability for ground-based space stations and defense radar systems, offering exceptional short-term stability comparable to hydrogen masers. What's more, the OSA 3300 HP/SHP with ESTU option is well-suited for ground-based space stations and defense radar systems, offering exceptional short-term stability comparable to that of hydrogen masers.

Front view

Rear view

Metrology cesium clock

OSA 3300

High-level technical specifications

Optical pumping benefits

- No magnetic selection; optical preparation of atoms instead
- 100 times more atoms can be measured
- 10 times higher clock stability
- Simpler mechanical design
- Higher product reliability

Longest lifetime

- Optical cesium has much higher efficiency in utilizing cesium atoms
- Double lifetime compared with legacy magnetic cesium clocks
- No compromise between lifetime and performance

Highest accuracy

- Superior short-term and long-term stability compared to magnetic cesium clocks
- Tenfold accuracy improvement over 10 years

Robust design

- Building on our longstanding and field-proven competence with magnetic clock and photonic technology
- Reusing unique cesium tube assembly competence
- Operating critical components outside vacuum tube

Modular design

- 3RU 19" rack-mounting shelf
- Hot-swappable power supplies and battery modules
- Wide range of synchronization input and ultra-low noise output interfaces

Common management

- Easy to use with automated startup and an intuitive menu with touch screen
- Remote (IP) and local (RS232) management via Windows GUI
- Syslog: alarm log, audit log, security log and clock data
- Simple integration with any host infrastructure

Applications in your network

Metrology, time keeping institutes and science labs

- Provides highly stable, low-noise frequency outputs for precise measurements
- Supports national time scales with significantly higher accuracy and stability, ideal for applications like GPS/GNSS backup-as-a-service (GBaaS)

Defense communication and space navigation

- Delivers superior short-term stability to enhance navigation precision
- Offers longer holdover for frequency and timekeeping, ensuring consistent long-term performance
- Produces ultra-stable carrier frequencies with low phase noise, optimizing communication systems for critical applications

OSA 3300

Product specifications

Frequency accuracy

- Frequency accuracy: ≤ +/- $5x10^{-13}$
- Frequency reproducibility after power cycle ≤ +/- $1x10^{-13}$

Frequency offset adjustments

- Resolution: +/-$1x10^{-15}$
- Range: +/-$1x10^{-9}$

Frequency stability versus magnetic field

- Versus +/- 1 Gauss: ≤ +/- 10^{-13}

Short-term stability (frequency outputs), Allan Deviation

Tau(T)	HP/10Y	SHP/10Y
1s	≤$5x10^{-12}$	≤$3x10^{-12}$
10s	≤$3.5x10^{-12}$	≤ $1.5x10^{-12}$
100s	≤$8.5x10^{-13}$	≤ $4.5x10^{-13}$
1,000s	≤$2.7x10^{-13}$	≤ $1.5x10^{-13}$
10,000s	≤$8.5x10^{-14}$	≤ $4.5x10^{-14}$
100,000s	≤$2.7x10^{-14}$	≤ $1.5x10^{-14}$
10 days	≤ $1x10^{-14}$	≤ $8x10^{-15}$
30 days	≤ $1x10^{-14}$	≤ $8x10^{-15}$
Floor (guaranteed)	≤ $1x10^{-14}$	≤ $8x10^{-15}$
Floor (typical)	≤$5x10^{-15}$	≤ $5x10^{-15}$

- Warm-up time: 60 minutes at 25°C (Typical 30 minutes)

Low noise frequency outputs

- Number of 10MHz outputs: 2
- Number of 5MHz outputs: 1
- Number of 100 MHz output: 1
- Signal format: sine wave
- Connector: SMA/F
- Load impedance: 50Ω
- Amplitude: 13dBm +/-1dBm
- Harmonics: ≤ -40dBc
- Non-harmonics (spurious) ≤ -80dBc
- Isolation between outputs: -110dB

SBB phase noise	5MHz output	10MHz output	100MHz output
1Hz	-106dBc/Hz	-100dBc/Hz	-70dBc/Hz
10Hz	-136dBc/Hz	-130dBc/Hz	-90dBc/Hz
100Hz	-145dBc/Hz	-145dBc/Hz	-105dBc/Hz
1,000Hz	-150dBc/Hz	-150dBc/Hz	-115dBc/Hz
10,000Hz	-154dBc/Hz	-154dBc/Hz	-120dBc/Hz
Floor	-154dBc/Hz	-154dBc/Hz	-120dBc/Hz

Timing digital outputs

- Number of 1PPS outputs: 4
- Frequency: 1 Hz
- Connector: BNC/F
- Signal format: pulse LVCMOS
- Load impedance: 50Ω
- Amplitude: 2.5Vpp with 50Ω load
- Jitter ≤1ns RMS
- Rising edge ≤5ns (10% to 90%)
- Output shape pulse
- Output timing signal significant slope: positive
- Pulse width: 20µs

Synchronization input

- Number of 1PPS input: 1
- Frequency: 1 Hz
- Connector: BNC/F
- Signal format: pulse LVCMOS
- Load impedance: 50Ω or 1MΩ (programmable)
- Amplitude: min. 2.5V; max. 5V
- Pulse width: 100ns-100µs
- Input timing signal significant slope: positive or negative (programmable)

Synchronisation of 1PPS timing outputs

- Synchronisation range: +/- 500µs
- One shot external sync resolution (sync on 1PPS Input) ≤ ± 10 ns
- Manual phase adjustment of 1PPS outputs
- 4 outputs adjustable independently
- Resolution of manual adjustment: 1 ns

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Power supply and battery options

- Number of power supply modules: 2
- Redundant and hot swappable
- Automatic switching
- Option 1
  - AC 110-240V, C15 connector
  - Range 88V up to 264V
  - Range 45Hz up to 65Hz
- Option 2
  - DC +24V (range 18V up to 30V)
- Option 3
  - DC-48V (accepted range -36V up to -72V)
- Power consumption steady state at 25°C ≤50W
- Power consumption at warm-up ≤90W
- Battery option: 60 minutes operation (full charge)
- Charge time from empty load: 4 hours

Environment and compliance

- Operating temperature: 10°C to +50°C
- Non operating temperature: -40°C to +70°C
- Operating relative humidity: 10% - 90% non condensing
- Operating DC magnetic field: 0 Gauss to 2 Gauss any direction
- Vibration/Stationary - IEC 60068-2
- Basis ETSI EN 300019-2-3:2015 Stationary use Test specification T3.2 Environmental Class 3.2
- Random Vibration / Storage / Transportation / Drop
  - IEC 60068-2
  - Basis ETSI EN 300019-2 Storage Test specification T1.1 Environmental Class 1.1
  - Basis ETSI EN 300019-2 Transportation Test specification T2.2 Environmental Class 2.2
- Altitude: 0 to 15.000m
- Safety: IEC 62368-1. IEC 60825-1
- EMC and ESD:
  - EN 55032, CISPR 32, 47 CFR, Part 15, Sub part B
  - ICES - 003 Issue 7
  - EN 55035, CISPR 35,
  - EN 61326-1, IEC 61326-1
  - CE & UL compliant
- RoHS 10/10
- Comply with Directive 2011/65/EU of the European Parliament and Commission Delegated Directive (EU) 2015/863

Mechanical

- Table top
- 19'' rack mountable, 19'' 3RU
- Width/with rack ears: 450mm/482.6 mm
- Depth: 510mm
- Height: 132mm
- Weight: 25Kg (with battery, 20 without)

Management features

Status LED

- 3 LEDs on front panel
- Type: Alarm, status, power

Alarm relay

- Maximum rating: U= 50VDC, I = 250mA
- Connector: SUB-D 9/F

Graphical touch screen display

- Management functions
- Alarm and status
- Monitoring
- Parameter setting

Local management port

- Connector: SUB-D9/M
- Port configuration: 115200bps, 8bits, 1 stop bit
- Management commands: CLI
- Management software: Windows GUI

Remote management port

- Remote management port: Ethernet - TCP-IP Connector: RJ45
- Management commands: SNMP v3 (including authentication and encryption)
- Management software: Mosaic Network Controller and Sync Director
- Syslog: alarm log, audit log, security log and clock data

OSA 3300

Enhanced Short Term Unit (ESTU)

Orderable option

ESTU option

Frequency accuracy

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- Frequency reproducibility after power cycle ≤ +/- $1x10^{-13}$

Frequency offset adjustments

- Resolution: +/-$1x10^{-15}$
- Range: +/-$1x10^{-9}$

Short-term stability (frequency outputs), Allan Deviation

Tau(T)	HP/10Y/ESTU-20	SHP/10Y/ESTU-15
1s	**≤$2x10^{-13}$**	**≤$1.5x10^{-13}$**
10s	**≤$2x10^{-13}$**	**≤$1.5x10^{-13}$**
100s	**≤$2x10^{-13}$**	**≤$1.5x10^{-13}$**
1,000s	**≤$2x10^{-13}$**	**≤$1.5x10^{-13}$**
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Low noise frequency outputs/ESTU-option

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Floor	-154dBc/Hz	-150dBc/Hz	-125dBc/Hz

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