OSCILLOQUARTZ
An ADVA Optical Networking Company

OSA ePRTC

Highly-precise and autonomous timing solution

Today most critical infrastructure relies on Global Navigation Satellite Systems (GNSS) time sources to achieve accurate timing synchronization. This accuracy is essential to meet the stringent synchronization requirements of mission-critial infrastructure. Long GNSS disruptions would cause severe network outages. Our enhanced primary reference time clock (ePRTC) solves this GNSS dependency while providing higher performance levels than standard PRTC systems.

What is an ePRTC?

Defined by the ITU-T G8272.1 recommendation, an ePRTC is a highly accurate frequency, phase and time synchronization source that can keep its performance for a long time even without GNSS signal availability. Unlike current PRTC technology, which has no standardized holdover specifications, an ePRTC is able to hold time accurately for at least 14 days, ensuring time service performance during GNSS outages. ePRTCs also produce much higher levels of accuracy than standard PRTCs. While the time output of PRTCs should be accurate to within 100ns of Coordinated Universal Time (UTC), this new generation of clocks delivers time to within just 30ns. ePRTC specifications provide a new level of stability, accuracy and reliability.

How does ePRTC work?

Combining a GNSS receiver with a cesium clock creates an outstandingly accurate source of time with guaranteed holdover performance. Cesium clocks are the most autonomous and stable frequency source. However, they are not traceable to UTC. On the other hand, GNSS receivers provide long-term traceability to UTC but can be subject to outages and degradation in performance. The combination of both technologies provides an accurate, secure and robust UTC traceable time and frequency source. The GNSS receiver makes it possible to align the ePRTC timescale to the UTC timescale. The use of the cesium clock reduces dependency on GNSS and gives operators control of their network synchronization.

OSA ePRTC major benefits

- **Accurate UTC traceable signal**
  Within +/-30nsec from UTC when locked to GNSS
- **Protection against GNSS outages**
  Time error in holdover mode within +/-100nsec from UTC for two weeks without GNSS
- **Built-in fan-out interfaces**
  Multiple fan-out options , including PTP and NTP over 1/10Gbit/s , PPS, Clock , BITS interfaces directly from the ePRTC
- **Fully redundant hardware**
  All key modules can be protected ensuring no loss of performance
- **Syncjack™ technology**
  Built-in synchronization accuracy monitoring, testing and assurance functionality enabling spoofing detection
- **Operational simplicity**
  Sync Manager SW, part of our network management suite platform, for superior management and synchroni zation monitoring

OSA ePRTC solution components	
OSA 3230B ePRC	
OSA 5421	

Fully protected OSA ePRTC solution components	
Two OSA 3230B ePRC	
OSA 5430	

OSA ePRTC system overview

The *OSA ePRTC solution* (figure 1) comprises two OSA devices: an OSA 3230B ePRC cesium clock that is connected to an OSA 5421 grandmaster. The OSA 3230B ePRC is a cesium clock that fully complies with the stringent ITU-T G.811.1 ePRC, including maintaining sub-nanosecond time deviation for at least 10,000s. The OSA 5421 is a compact grandmaster integrating a multi-technology GNSS receiver and a clock combiner. The clock combiner combines the stable frequency of the cesium clock with the UTC traceable signal provided by the GNSS, providing an extremely accurate and stable UTC traceable signal. The OSA 5421 also provides multiple fan-out signal in different formats including PTP, NTP, SyncE and BITS. This eliminates the need for an additional output signal distribution device.

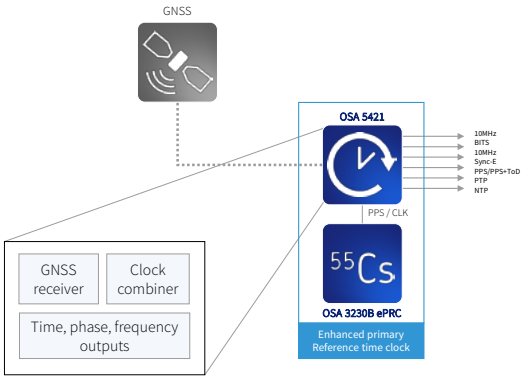

Fig. 1 Unprotected ePRTC (OSA 5421 + OSA 3230B ePRC Cesium)

The *fully protected OSA ePRTC solution* (figure 2) comprises two OSA 3230B ePRC cesium clocks connected to an OSA 5430 grandmaster. The OSA 5430 is a carrier grade grandmaster with fully redundant hardware, including GNSS receivers and clock combiners. With a modular and scalable design, the OSA 5430 offers unique flexibility and redundancy. It supports PTP, NTP and SyncE over multiple 10Gbit/s and 1Gbit/s interfaces with hardware time stamping. It also supports multiple BITS outputs.

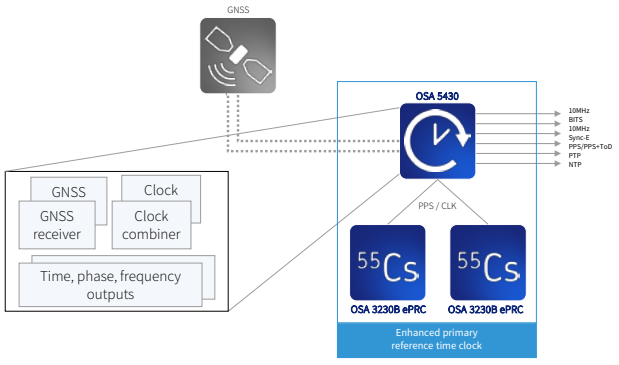

Fig. 2 Protected ePRTC (OSA 5430 + two OSA 3230B ePRC Cesium)

High-level specifications

- Compliant with ITU-T G.8272.1
- High-quality DOXCO and rubidium clocks
- Operates with any G.811.1 ePRC cesium clock over 1PPS or clock input
- Extended holdover capabilities in case of GNSS jamming or lose of signal
- Spoofing detection utilising Syncjack™ clocks comparison capabilities
- Redundant design – all critical hardware modules can be protected
- Multiple operation modes: PTP, NTP, Sync-E, PPS / PPS+ToD, BITS, Clock
- Multi-technology built-in GNSS receiver supporting GPS, GLONASS, BEIDOU and GALILEO

Partially protected OSA ePRTC solutions are also possible. A solution where all components are protected except for the cesium clock, would comprise an OSA 3230B ePRC cesium clock and an OSA 5430 with redundant configuration.

Applications in your network

ePRTC offers unprecedented accuracy and stability even without GNSS signal availability. This makes it the ideal timing source for mission-critical infrastructure such us radio access networks, utility networks, government and military networks, or metrology networks. This fundamental infrastructure needs to move away from reliance on GNSS alone.

GNSS vulnerabilities have increased in recent years due to deliberate spoofing and jamming attacks as well as the natural threats of solar flares and space weather events. A move away from reliance on GNSS alone is essential for more secure network synchronization solutions.

> “Enhanced PRTCs (ePRTCs) provide a new level of stability, accuracy and reliability even without GNSS”

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