

Optical Access Architecture Reference Document: Nokia 1830 PSS Wavelength Tracker Technology

TECHNOLOGY OVERVIEW

The Nokia 1830 PSS Wavelength Tracker is an embedded optical performance monitoring and wavelength identification technology that enables per-channel tracing and power measurement across WDM networks . Unlike conventional optical supervisory channel methods that provide only span-level telemetry, Wavelength Tracker encodes a unique optical signature—termed a wave key pair —directly onto each service wavelength at the transponder transmitter before the signal enters the WDM layer . This in-band signature travels with the wavelength through every ROADM, amplifier, and fiber span, allowing the network to identify and measure each channel independently at any detection point without requiring external test equipment or service interruption.

The technology addresses a fundamental operational challenge in agile photonic networks: as ROADM-based infrastructures enable dynamic wavelength routing, the ability to verify that a given wavelength arrives at the correct destination with the correct power level becomes critical for fault isolation and SLA assurance. Wavelength Tracker provides this visibility at line rate, transforming the optical layer from a passive transport medium into an instrumented, observable infrastructure .



OPTICAL TRANSCEIVER INTERFACES

Wavelength Tracker functionality is integrated directly into the optical transponder and muxponder line cards deployed across the 1830 PSS portfolio. The encoding occurs at the transmitter before the wavelength is multiplexed into the line system, meaning no additional external hardware or dedicated OSC bandwidth is consumed . Detection is performed by encoder and decoder points embedded within the photonic line cards, including ROADMs degrees, amplifier stages, and add/drop ports. The system supports C-band, L-band, and S-band channel plans, with wave key tables defined per ITU channel number across both 100 GHz grid and 50 GHz offset spacings .

For bidirectional services, a wave key pair is assigned per direction, yielding a

pool of up to 113 unique signatures per OCH frequency. This translates to 56 bidirectional services per wavelength frequency before key reuse becomes necessary . The key assignment can be managed automatically by the network element, automatically by the Network Management System (Auto Keying NMS), or manually during service provisioning . The Auto Keying NMS mode is mandatory for services originating on third-party transponders and traversing an 1830 PSS network, ensuring consistent key mapping across multi-vendor environments.

REDUNDANT SUBSYSTEMS

The Wavelength Tracker operates as a non-intrusive, always-on diagnostic layer that does not interfere with service-bearing traffic. In the event of a fiber cut, misconnection, or rogue wavelength, the system enables rapid fault correlation by comparing expected wave key assignments against detected signatures at each monitoring point . This capability complements the 1830 PSS platform's hardware redundancy features — including protected controller cards, redundant fans, and 1+1 AC/DC power supplies—by adding a photonic-layer assurance mechanism that operates independently of electrical-layer protection schemes .

The integration of Wavelength Tracker with Nokia NFM-P or 5620 SAM

management platforms provides graphical power-level representation across the optical path, allowing operators to visualize per-channel power at encoder and decoder points and track changes over time . When combined with GMPLS restoration or optical protection switching, the tracker supplies the diagnostic data necessary to confirm that restoration actions have successfully reinstated the correct wavelength on the correct path.

CAPABILITY METRICS

The core capability of Wavelength Tracker is its ability to measure optical power level at each detection point for each encoded channel passing through an 1830 PSS port . This per-channel granularity distinguishes it from aggregate power monitoring, which cannot distinguish between a degraded channel and a neighboring channel that has drifted in power. The wave key signature pool supports up to 113 signatures per OCH frequency, sufficient for current and planned service densities across metro, regional, and long-haul applications . The technology is supported across the 1830 PSS-4II, PSS-8, PSS-16II, PSS-32, and PSS-HC platforms, leveraging the common optical networking cards and software management framework that characterizes the 1830 portfolio .

TECHNICAL SPECIFICATIONS

The specifications below represent the Wavelength Tracker feature parameters as deployed within the Nokia 1830 PSS platform family. Values are derived from Nokia optical user documentation and platform datasheets.

Parameter	Specification
Technology Type	In-band optical wavelength signature encoding and detection
Signature Mechanism	Wave key pair encoded at transponder transmitter
Signature Pool Capacity	Up to 113 signatures per OCH frequency
Bidirectional Service Capacity	56 bidirectional services per OCH frequency
Supported Bands	L-band, C-band, S-band
Channel Grid Compatibility	100 GHz grid and 50 GHz offset per ITU channel plan
Key Assign Modes	Auto Keying NE, Auto Keying NMS, Manual Keying
Mandatory Mode (Multi-vendor)	Auto Keying NMS for services originating on third-party transponders
Detection Points	Encoder and decoder points on 1830

	PSS photonic line cards
Measurement Capability	Per-channel optical power level at each detection point
Management Integration	Nokia NFM-P / 5620 SAM graphical power-level representation
Platform Support	1830 PSS-4II, PSS-8, PSS-16II, PSS-32, PSS-HC

COMPLIANCE AUDIT

Wavelength Tracker operates within the established optical transport standards governing the 1830 PSS platform. The technology supports ITU-T G.709 OTN framing and management requirements, with wave key assignment and detection functioning transparently across OTN, Ethernet, and Fibre Channel client signals . The 1830 PSS platforms carrying Wavelength Tracker are compliant with applicable telecom equipment standards including ETSI and NEBS requirements for the target deployment environments, and the management interfaces align with Nokia's NMS integration specifications for NFM-P and 5620 SAM .

SCALING STRATEGY

Wavelength Tracker scales linearly with the number of wavelengths provisioned in the network. Each encoded channel carries its unique wave key signature from source transponder to destination decoder, independent of the number of intermediate ROADM nodes traversed. This architecture eliminates the exponential complexity associated with per-span or per-node monitoring approaches. For networks expanding into C+L-band operation, the wave key tables extend across the extended spectrum, with separate key assignments for L-band, C-band, and S-band channels as documented in the Nokia optical user guides .

As operators transition toward higher-baud-rate coherent interfaces — including 400G, 800G, and 1.2T wavelengths — the Wavelength Tracker encoding remains compatible with the transponder line interfaces, as the signature is applied at the optical transmitter independent of the coherent modulation format. This forward compatibility ensures that investments in Wavelength Tracker-based operational processes remain valid across multiple generations of coherent technology deployed on the 1830 PSS platform .

